

ROBOTICS

Product manual

IRB 1200



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Product manual

IRB 1200-5/0.9

IRB 1200-5/0.9 type A

IRB 1200-5/0.9 type B

IRB 1200-7/0.7

IRB 1200-7/0.7 type A

IRB 1200-7/0.7 type B

IRC5, OmniCore

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Original instructions.

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Overview of this manual

About this manual

This manual contains instructions for:

- mechanical and electrical installation of the robot
 - maintenance of the robot
 - mechanical and electrical repair of the robot.
-

Usage

This manual should be used during:

- installation, from lifting the robot to its work site and securing it to the foundation, to making it ready for operation
 - maintenance work
 - repair work and calibration.
-

Who should read this manual?

This manual is intended for:

- installation personnel
 - maintenance personnel
 - repair personnel.
-

Prerequisites

Maintenance/repair/installation personnel working with an ABB Robot must:

- be trained by ABB and have the required knowledge of mechanical and electrical installation/repair/maintenance work.
-

Product manual scope

The manual covers covers all variants and designs of the IRB 1200. Some variants and designs may have been removed from the business offer and are no longer available for purchase.

Organization of chapters

The manual is organized in the following chapters:

Chapter	Contents
Safety, service	Safety information that must be read through before performing any installation or service work on robot. Contains general safety aspects as well as more specific information on how to avoid personal injuries and damage to the product.
Installation and commissioning	Required information about lifting and installation of the robot.
Maintenance	Step-by-step procedures that describe how to perform maintenance of the robot. Based on a maintenance schedule that may be used to plan periodical maintenance.
Repair	Step-by-step procedures that describe how to perform repair activities of the robot. Based on available spare parts.

Continues on next page

Overview of this manual

Continued

Chapter	Contents
Calibration	Calibration procedures and general information about calibration.
Decommissioning	Environmental information about the robot and its components.
Reference information	Useful information when performing installation, maintenance or repair work. Includes lists of necessary tools, additional documents, safety standards, etc.
Spare parts and exploded views	Reference to the spare part list for the robot.
Circuit diagram	Reference to the circuit diagram for the robot.

References

Documentation referred to in the manual, is listed in the table below.

General

Document name	Document ID
<i>Product manual, spare parts - IRB 1200</i>	<i>3HAC046984-001</i>
<i>Product specification - IRB 1200</i>	<i>Document.ID-1</i>
<i>Safety manual for robot - Manipulator and IRC5 or OmniCore controllerⁱ</i>	<i>3HAC031045-001</i>
<i>Circuit diagram - IRB 1200</i>	<i>3HAC046307-003</i>
<i>Technical reference manual - Lubrication in gearboxes</i>	<i>3HAC042927-001</i>
<i>Technical reference manual - System parameters</i>	<i>3HAC050948-001</i>

ⁱ This manual contains all safety instructions from the product manuals for the manipulators and the controllers.

IRC5

Document name	Document ID
<i>Product manual - IRC5</i>	<i>3HAC021313-001</i>
<i>Product manual - IRC5 Compact</i>	<i>3HAC047138-001</i>
<i>Operating manual - IRC5 with FlexPendant</i>	<i>3HAC050941-001</i>

OmniCore

Document name	Document ID
<i>Product manual - OmniCore C30</i>	<i>3HAC060860-001</i>
<i>Product manual - OmniCore C90XT</i>	<i>3HAC073706-001</i>
<i>Product manual - OmniCore E10</i>	<i>3HAC079399-001</i>
<i>Operating manual - OmniCore</i>	<i>3HAC065036-001</i>

Revisions

Revision	Description
-	First edition.

Continues on next page

Revision	Description
A	<p>Changes made in this revision:</p> <ul style="list-style-type: none"> • Information added about removal of axis-4 mechanical stop and axis-4 FPC unit from housing extender unit, prior to replacing the radial sealing at the housing extender unit. See Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings on page 247. • Information added about disconnecting and reconnecting the air hoses at the tubular, when replacing the axis-4 timing belt. See Replacing the axis-4 timing belt on page 742. • Information added about removing screws that fasten the fix sheet to the inner plastic guide inside housing, when removing axis-3 drive unit, see Creating space for separation of upper and lower arm on page 671. Information also added about refitting the same screws, throughout complete manual. • Information added about releasing the holding brakes prior to rotating axes manually, in calibration procedures, chapter Calibration on page 807. • Working range of axis 6 corrected from $\pm 360^\circ$ to $\pm 400^\circ$, see Working range on page 59. • Information added about extra o-rings that are enclosed with the robot at delivery, see Installation of extra O-ring on page 76 and Installation of extra O-ring on page 109. Also added to repair procedures, where needed. • Changed pin number for 24V connection, see Manually releasing the brakes on page 72.

Revision	Description
B	<p>Changes made in this revision:</p> <ul style="list-style-type: none"> • Information regarding how to read the procedures in this product manual are updated, see How to read the product manual on page 18. • Information added about protection covers for water and dust proofing, see Protection covers on page 44. • Information added about transportation bracket that is used during shipping and transport and must be removed before lifting the robot, see Transportation bracket on page 45 and Attaching the roundslings on page 65. • Timing belt tension of axis-4 and axis-5 motors changed from 13 N and 15 N to 26 N and 30 N, respectively, in repair procedures, chapter Repair on page 159. • Tightening torque of M3 screws used on plastic materials changed from 1.5 Nm to 0.3 Nm, in repair procedures, chapter Repair on page 159. • Total amount of harmonic grease 4B No.2 changed from 42 g to 32 g, see Replacing the axis-3 drive unit on page 666. • Information added about checking PTFE film before refitting the cable housing cover, see Replacing the EIB/SMB unit on page 293, Replacing the axis-2 drive unit on page 644, Replacing the axis-3 drive unit on page 666, and Replacing the axis-4 timing belt on page 742. • No need to remove and refit cable bracket when removing and refitting the cable package to the axis-1 sealing ring, see Replacing the main cable package on page 171. • No need to remove and refit connector plate when removing and refitting the axis-5 motor with pulley, see Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings on page 247, Replacing the axis-4 gearbox, drive shaft and pulley on page 688, Replacing the axis-5 motor with pulley on page 760. • No need to remove and refit mechanical stop screw when removing the axis-4 mechanical stop, see Replacing the axis-4 mechanical stop on page 462. • Information modified about replacing motor bracket together with motor flange when removing and refitting the axis-4 motor, see Replacing the axis-4 gearbox, drive shaft and pulley on page 688 and Replacing the axis-4 motor with pulley on page 730. • No need to remove tilt covers when replacing axis-5 drive unit, see Replacing the axis-5 and axis-6 drive unit on page 780.

Revision	Description
C	<p>Changes made in this revision</p> <ul style="list-style-type: none"> • Flange sealing changed from 12340011-116 Loctite 574 to 3HAC026759-002 Sikaflex-521FC for small cover on the housing, see Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings on page 247. • Tightening torque for attachment screws on lifting accessories is changed from 40 Nm to 15 Nm. • Tightening torque for lower arm cable • Tightening torque for the axis-4 FPC unit attachment screws is changed from 1.5 Nm to 0.3 Nm. • Added a tightening torque for the attachment screws of the axis-1 calibration stop pin and the axis-1 calibration pin. • Added a caution note to keep a straight line when fitting the axis-1 calibration pin. • Article number of grease harmonic grease 4B No. 2 changed from 3HAC031695-001 to 3HAC037302-001. • Total amount of harmonic grease 4B No.2 for axis 2 and axis 5 changed from 80 g and 12 g to 60 g and 9 g, respectively, • Maximum revolution of axis 6 corrected to $\pm 242^\circ$, see Working range on page 61. • Clean Room option added. • Food grade lubrication option added. • Spare part numbers for several gaskets (IP67) updated. • The base, the swing and the axis-1 sealing ring are updated due to IP67 improvements
D	<p>Published in release R16.2. The following updates are done in this revision:</p> <ul style="list-style-type: none"> • New standard calibration method introduced (Axis Calibration). See Calibration on page 807. • Information about grounding point is added, see Grounding and bonding point on manipulator on page 109. • Foundry Plus option added.
E	<p>Published in release R17.1. The following updates are done in this revision:</p> <ul style="list-style-type: none"> • A new standard IEC 61340-5-1:2010 added. See Applicable standards on page 886. • V-ring on axis-1 sealing ring version 3HAC058568-001 added as a spare part. • Notes added for spare part versions. See Description of spare part versions on page 876. • Information about Type B robots supporting SafeMove 2 added. • Plug on base added to options IP67 and Foundry Plus.

Revision	Description
F	<p>Published in release R17.2. The following updates are made in this revision:</p> <ul style="list-style-type: none"> • Caution about removing metal residues added in sections about EIB/SMB boards. • Information about minimum resonance frequency added. • Bending radius for static floor cables added. • Updated list of applicable standards. • Article number for the Calibration tool box, Axis Calibration is changed. • Section Start of robot in cold environments on page 115 added. • Tightening torque of screws securing the axis-5 and axis-6 drive unit updated. • Information about mechanically restricting the working range added. • Updated description about Clean Room class. • Label added to remind the fitting of extra o-ring for robots with protection class IP67 and with protection type Foundry Plus.
G	<p>Published in release R18.1. The following updates are made in this revision:</p> <ul style="list-style-type: none"> • Added sections in General procedures on page 160 • Safety section restructured. • Note added to clarify the usage of the two M4 thread holes on the upper arm. • Added transportation bracket information for robots delivered with a force control package. • Updated extra o-ring fitting information for robots with protection type Clean Room and robots with food grade lubrication. • Note added to calibration chapter to emphasize the requirement of equally dressed robot when using previously created reference calibration values. • Information about myABB Business Portal added. • Spare part number of axis-4 gearbox shaft changed from 3HAC049631-001 to 3HAC044692-001.
H	<p>Published in release R18.2. The following updates are made in this revision:</p> <ul style="list-style-type: none"> • Added customer connection information. • Spare part information about axis-2 drive unit and axis-3 drive unit updated. • Updated axis-4 and -5 timing belt inspection procedure. • Added note for transportation bracket removal procedure.
J	<p>Published in release R18.2. The following updates are made in this revision:</p> <ul style="list-style-type: none"> • Updated references.
K	<p>Published in release 19B. The following updates are made in this revision:</p> <ul style="list-style-type: none"> • New touch up color Graphite White available. See Cut the paint or surface on the robot before replacing parts on page 160. • New article numbers for manipulator cables in section Robot cables on page 107.

Revision	Description
L	<p>Published in release 19D. The following updates are made in this revision:</p> <ul style="list-style-type: none"> • Spare part version of axis-1 sealing ring updated. See Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 880. • Compatibility between cable harness and axis-1 sealing ring added. See Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 880. • Note added about the need to calibrate if the robot is other than floor mounted. See When to calibrate on page 811.
M	<p>Published in release 20B. The following updates are made in this revision:</p> <ul style="list-style-type: none"> • Clarified and added information in mounting instructions for rotating sealings, see Mounting instructions for sealings on page 163. • Clarified text about position of robot and added table with dependencies between axes during Axis Calibration. • Article number of Calibration tool box, Axis Calibration is changed from 3HAC062326-001 to 3HAC074119-001. • Replaced article number and name of grease, previously 3HAB3537-1. • Added information about Wrist Optimization in calibration chapter.
N	<p>Published in release 20C. The following updates are made in this revision:</p> <ul style="list-style-type: none"> • Flange sealing changed from 12340011-116 Loctite 574 to 3HAC026759-003 Sikaflex 521FC for tubular covers for robots with protection class IP67 and protection type Clean Room. • Updated the figure of customer connection information.
P	<p>Published in release 20D. The following updates are made in this revision:</p> <ul style="list-style-type: none"> • Added information about maintenance activity of robot overhaul.
Q	<p>Published in release 21A. The following updates are made in this revision:</p> <ul style="list-style-type: none"> • Added step about applying Loctite 243 to screws securing the cable housing cover on lower arm for robots with protection class IP67, protection types Clean Room and Foundry Plus and food grade lubrication.
R	<p>Published in release 21B. The following updates are done in this revision:</p> <ul style="list-style-type: none"> • Text regarding fastener quality is updated, see Fastener quality on page 92. • Text regarding diameter of air hoses is updated, see Customer connections on page 112.
S	<p>Published in release 21D. The following updates are done in this revision:</p> <ul style="list-style-type: none"> • Hygienic option added. • Controllers OmniCore C30, OmniCore C90XT and OmniCore E10 supported.
T	<p>Published in release 22A. The following updates are done in this revision:</p> <ul style="list-style-type: none"> • IRB 1200 Hygienic supported working with OmniCore C line controllers. See Manipulator description on page 873. • Added information about length of thread engagement for attachment screws. • Modified the replacing interval of the axis-6 sealing set on tool flange for Hygienic robots from 60000 operating hours to 6000 hours. • Updated information about Gleitmo treated screws, see Screw joints on page 888.

Product documentation

Categories for user documentation from ABB Robotics

The user documentation from ABB Robotics is divided into a number of categories. This listing is based on the type of information in the documents, regardless of whether the products are standard or optional.



Tip

All documents can be found via myABB Business Portal, www.abb.com/myABB.

Product manuals

Manipulators, controllers, DressPack/SpotPack, and most other hardware is delivered with a **Product manual** that generally contains:

- Safety information.
- Installation and commissioning (descriptions of mechanical installation or electrical connections).
- Maintenance (descriptions of all required preventive maintenance procedures including intervals and expected life time of parts).
- Repair (descriptions of all recommended repair procedures including spare parts).
- Calibration.
- Decommissioning.
- Reference information (safety standards, unit conversions, screw joints, lists of tools).
- Spare parts list with corresponding figures (or references to separate spare parts lists).
- References to circuit diagrams.

Technical reference manuals

The technical reference manuals describe reference information for robotics products, for example lubrication, the RAPID language, and system parameters.

Application manuals

Specific applications (for example software or hardware options) are described in **Application manuals**. An application manual can describe one or several applications.

An application manual generally contains information about:

- The purpose of the application (what it does and when it is useful).
- What is included (for example cables, I/O boards, RAPID instructions, system parameters, software).
- How to install included or required hardware.
- How to use the application.
- Examples of how to use the application.

Continues on next page

Operating manuals

The operating manuals describe hands-on handling of the products. The manuals are aimed at those having first-hand operational contact with the product, that is production cell operators, programmers, and troubleshooters.

How to read the product manual

Reading the procedures

The procedures contain all information required for the installation or service activity and can be printed out separately when needed for a certain service procedure.

Safety information

The manual includes a separate safety chapter that must be read through before proceeding with any service or installation procedures. All procedures also include specific safety information when dangerous steps are to be performed.

Read more in the chapter [Safety on page 19](#).

Illustrations

The product is illustrated with general figures that does not take painting or protection type in consideration.

Likewise, certain work methods or general information that is valid for several product models, can be illustrated with illustrations that show a different product model than the one that is described in the current manual.

1 Safety

1.1 Safety information

1.1.1 Limitation of liability

Limitation of liability

Any information given in this manual regarding safety must not be construed as a warranty by ABB that the industrial robot will not cause injury or damage even if all safety instructions are complied with.

The information does not cover how to design, install and operate a robot system, nor does it cover all peripheral equipment that can influence the safety of the robot system.

In particular, liability cannot be accepted if injury or damage has been caused for any of the following reasons:

- Use of the robot in other ways than intended.
- Incorrect operation or maintenance.
- Operation of the robot when the safety devices are defective, not in their intended location or in any other way not working.
- When instructions for operation and maintenance are not followed.
- Non-authorized design modifications of the robot.
- Repairs on the robot and its spare parts carried out by in-experienced or non-qualified personnel.
- Foreign objects.
- Force majeure.

Spare parts and equipment

ABB supplies original spare parts and equipment which have been tested and approved. The installation and/or use of non-original spare parts and equipment can negatively affect the safety, function, performance, and structural properties of the robot. ABB is not liable for damages caused by the use of non-original spare parts and equipment.

1 Safety

1.1.2 Requirements on personnel

1.1.2 Requirements on personnel

General

Only personnel with appropriate training are allowed to install, maintain, service, repair, and use the robot. This includes electrical, mechanical, hydraulics, pneumatics, and other hazards identified in the risk assessment.

Persons who are under the influence of alcohol, drugs or any other intoxicating substances are not allowed to install, maintain, service, repair, or use the robot.

The plant liable must make sure that the personnel is trained on the robot, and on responding to emergency or abnormal situations.

Personal protective equipment

Use personal protective equipment, as stated in the instructions.

1.2 Safety signals and symbols

1.2.1 Safety signals in the manual







Introduction to safety signals

This section specifies all safety signals used in the user manuals. Each signal consists of:

- A caption specifying the hazard level (DANGER, WARNING, or CAUTION) and the type of hazard.
- Instruction about how to reduce the hazard to an acceptable level.
- A brief description of remaining hazards, if not adequately reduced.

Hazard levels

The table below defines the captions specifying the hazard levels used throughout this manual.


Symbol	Designation	Significance
	DANGER	Signal word used to indicate an imminently hazardous situation which, if not avoided, will result in serious injury.
	WARNING	Signal word used to indicate a potentially hazardous situation which, if not avoided, could result in serious injury.
	ELECTRICAL SHOCK	Signal word used to indicate a potentially hazardous situation related to electrical hazards which, if not avoided, could result in serious injury.
	CAUTION	Signal word used to indicate a potentially hazardous situation which, if not avoided, could result in slight injury.
	ELECTROSTATIC DISCHARGE (ESD)	Signal word used to indicate a potentially hazardous situation which, if not avoided, could result in severe damage to the product.
	NOTE	Signal word used to indicate important facts and conditions.

Continues on next page

1 Safety

1.2.1 Safety signals in the manual

Continued

Symbol	Designation	Significance
	TIP	Signal word used to indicate where to find additional information or how to do an operation in an easier way.

1.2.2 Safety symbols on manipulator labels

Introduction to symbols

This section describes safety symbols used on labels (stickers) on the manipulator. Symbols are used in combinations on the labels, describing each specific warning. The descriptions in this section are generic, the labels can contain additional information such as values.



Note

The symbols on the labels on the product must be observed. Additional symbols added by the integrator must also be observed.




Types of symbols

Both the manipulator and the controller are marked with symbols, containing important information about the product. This is important for all personnel handling the robot, for example during installation, service, or operation.

The safety labels are language independent, they only use graphics. See [Symbols on safety labels on page 23](#).

The information labels can contain information in text.

Symbols on safety labels

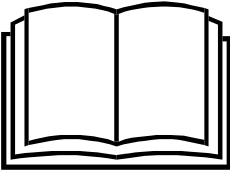
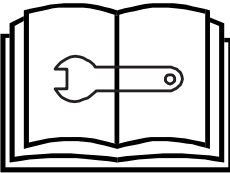
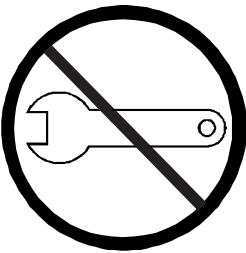
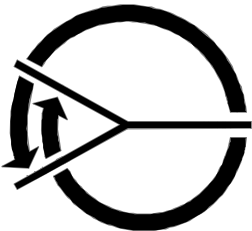

Symbol	Description
 xx0900000812	Warning! Warns that an accident <i>may</i> occur if the instructions are not followed that can lead to serious injury, possibly fatal, and/or great damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical units, explosion or fire risk, risk of poisonous gases, risk of crushing, impact, fall from height, etc.
 xx0900000811	Caution! Warns that an accident may occur if the instructions are not followed that can result in injury and/or damage to the product. It also applies to warnings of risks that include burns, eye injury, skin injury, hearing damage, crushing or slipping, tripping, impact, fall from height, etc. Furthermore, it applies to warnings that include function requirements when fitting and removing equipment where there is a risk of damaging the product or causing a breakdown.
 xx0900000839	Prohibition Used in combinations with other symbols.

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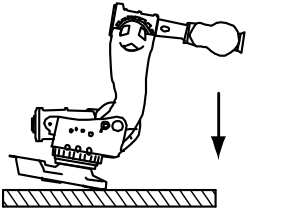

1 Safety

1.2.2 Safety symbols on manipulator labels

Continued

Symbol	Description
 xx0900000813	See user documentation Read user documentation for details. Which manual to read is defined by the symbol: <ul style="list-style-type: none">• No text: <i>Product manual</i>.• EPS: <i>Application manual - Electronic Position Switches</i>.
 xx0900000816	Before disassembly, see product manual
 xx0900000815	Do not disassemble Disassembling this part can cause injury.
 xx0900000814	Extended rotation This axis has extended rotation (working area) compared to standard.
 xx0900000808	Brake release Pressing this button will release the brakes. This means that the robot arm can fall down.



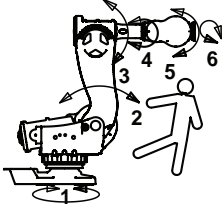
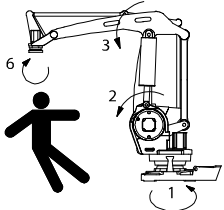
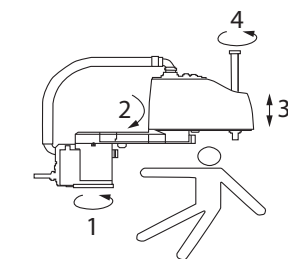
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Symbol	Description
 <p>xx0900000810</p> <p>3HAC 057068-001</p> <p>xx1500002402</p>	<p>Tip risk when loosening bolts The robot can tip over if the bolts are not securely fastened.</p>
 <p>xx0900000817</p>	<p>Crush Risk of crush injuries.</p>

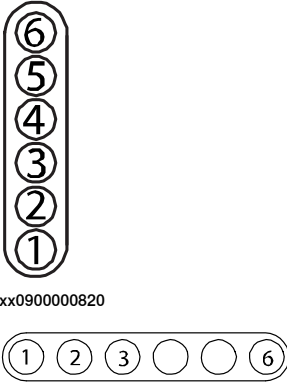

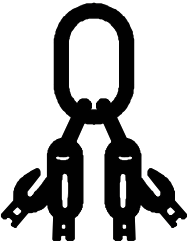



1 Safety

1.2.2 Safety symbols on manipulator labels

Continued

Symbol	Description
 xx0900000818  xx1300001087	Heat Risk of heat that can cause burns. (Both signs are used)
 xx0900000819  xx1000001141  xx1500002616	Moving robot The robot can move unexpectedly.

Continues on next page



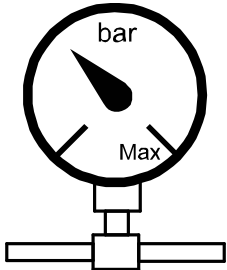
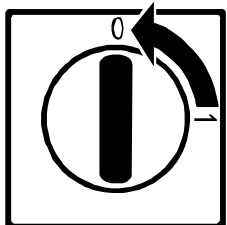

Symbol	Description
 <p>xx0900000820</p> <p>xx1000001140</p>	<p>Brake release buttons</p>
 <p>xx0900000821</p>	<p>Lifting bolt</p>
 <p>xx1000001242</p>	<p>Chain sling with shortener</p>
 <p>xx0900000822</p>	<p>Lifting of robot</p>
 <p>xx0900000823</p>	<p>Oil Can be used in combination with prohibition if oil is not allowed.</p>
 <p>xx0900000824</p>	<p>Mechanical stop</p>

Continues on next page

1 Safety

1.2.2 Safety symbols on manipulator labels

Continued

Symbol	Description
 xx1000001144	No mechanical stop
 xx0900000825	Stored energy Warns that this part contains stored energy. Used in combination with <i>Do not disassemble</i> symbol.
 xx0900000826	Pressure Warns that this part is pressurized. Usually contains additional text with the pressure level.
 xx0900000827	Shut off with handle Use the power switch on the controller.
 xx1400002648	Do not step Warns that stepping on these parts can cause damage to the parts.

1.3 Robot stopping functions

Protective stop and emergency stop

The protective stops and emergency stops are described in the product manual for the controller.

For more information see:

- *Product manual - OmniCore C30*
- *Product manual - OmniCore C90XT*
- *Product manual - OmniCore E10*
- *Product manual - IRC5*
- *Product manual - IRC5 Compact*

1 Safety

1.4 Safety during installation and commissioning

1.4 Safety during installation and commissioning

National or regional regulations

The integrator of the robot system is responsible for the safety of the robot system.

The integrator is responsible that the robot system is designed and installed in accordance with the safety requirements set forth in the applicable national and regional standards and regulations.

The integrator of the robot system is required to perform a risk assessment.

Layout

The robot integrated to a robot system shall be designed to allow safe access to all spaces during installation, operation, maintenance, and repair.

If robot movement can be initiated from an external control panel then an emergency stop must also be available.

If the manipulator is delivered with mechanical stops, these can be used for reducing the working space.

A perimeter safeguarding, for example a fence, shall be dimensioned to withstand the following:

- The force of the manipulator.
- The force of the load handled by the robot if dropped or released at maximum speed.
- The maximum possible impact caused by a breaking or malfunctioning rotating tool or other device fitted to the robot.

The maximum TCP speed and the maximum velocity of the robot axes are detailed in the section *Robot motion* in the product specification for the respective manipulator.

Consider exposure to hazards, such as slipping, tripping, and falling.

Hazards due to the working position and posture for a person working with or near the robot shall be considered.

Hazards due to noise emission from the robot needs to be considered.

Consider hazards from other equipment in the robot system, for example, that guards remain active until identified hazards are reduced to an acceptable level.

Allergenic material

See [Environmental information on page 870](#) for specification of allergenic materials in the product, if any.

Securing the robot to the foundation

The robot must be properly fixed to its foundation/support, as described in the respective product manual.

When the robot is installed at a height, hanging, or other than mounted directly on the floor, there will be additional hazards.

Continues on next page

Electrical safety

Incoming mains must be installed to fulfill national regulations.

The power supply wiring to the robot must be sufficiently fused and if necessary, it must be possible to disconnect it manually from the mains power.

The power to the robot must be turned off with the main switch and the mains power disconnected when performing work inside the controller cabinet. Lock and tag shall be considered.

Harnesses between controller and manipulator shall be fixed and protected to avoid tripping and wear.

Wherever possible, power on/off or rebooting the robot controller shall be performed with all persons outside the safeguarded space.



Note

Use a CARBON DIOXIDE (CO₂) extinguisher in the event of a fire in the robot.

Safety devices

The integrator is responsible for that the safety devices necessary to protect people working with the robot system are designed and installed correctly.

When integrating the robot with external devices to a robot system:

- The integrator of the robot system must ensure that emergency stop functions are interlocked in accordance with applicable standards.
- The integrator of the robot system must ensure that safety functions are interlocked in accordance with applicable standards.

Other hazards

A robot may perform unexpected limited movement.



WARNING

Manipulator movements can cause serious injuries on users and may damage equipment.

The risk assessment should also consider other hazards arising from the application, such as, but not limited to:

- Water
- Compressed air
- Hydraulics

End-effector hazards require particular attention for applications which involve close human collaboration with the robot.

Continues on next page

1 Safety

1.4 Safety during installation and commissioning

Continued

Pneumatic or hydraulic related hazards



Note

The pressure in the complete pneumatic or hydraulic systems must be released before service and maintenance.

All components in the robot system that remain pressurized after switching off the power to the robot must be marked with clearly visible drain facilities and a warning sign that indicates the hazard of stored energy.

Loss of pressure in the robot system may cause parts or objects to drop.

Dump valves should be used in case of emergency.

Shot bolts should be used to prevent tools, etc., from falling due to gravity.

All pipes, hoses, and connections have to be inspected regularly for leaks and damage. Damage must be repaired immediately.

Verify the safety functions

Before the robot system is put into operation, verify that the safety functions are working as intended and that any remaining hazards identified in the risk assessment are mitigated to an acceptable level.

1.5 Safety during operation

Automatic operation

Verify the application in the operating mode manual reduced speed, before changing mode to automatic and initiating automatic operation.

Unexpected movement of robot arm



WARNING

Hazards due to the use of brake release devices and/or gravity beneath the manipulator shall be considered.

A robot may perform unexpected limited movement.



WARNING

Manipulator movements can cause serious injuries on users and may damage equipment.

1 Safety

1.6.1 Safety during maintenance and repair

1.6 Safety during maintenance and repair

1.6.1 Safety during maintenance and repair

General

Corrective maintenance must only be carried out by personnel trained on the robot. Maintenance or repair must be done with all electrical, pneumatic, and hydraulic power switched off, that is, no remaining hazards.

Hazards due to stored mechanical energy in the manipulator for the purpose of counterbalancing axes must be considered before maintenance or repair.

Never use the robot as a ladder, which means, do not climb on the controller, manipulator, including motors, or other parts. There are hazards of slipping and falling. The robot might be damaged.


Make sure that there are no loose screws, turnings, or other unexpected parts remaining after work on the robot has been performed.

When the work is completed, verify that the safety functions are working as intended.

Hot surfaces

Surfaces can be hot after running the robot, and touching these may result in burns. Allow the surfaces to cool down before maintenance or repair.

Allergic reaction

Warning	Description	Elimination/Action
 Allergic reaction	When working with lubricants there is a risk of an allergic reaction.	Make sure that protective gear like goggles and gloves are always worn.


Gearbox lubricants (oil or grease)

When handling oil, grease, or other chemical substances the safety information of the respective manufacturer must be observed.








Note

Take special care when handling hot lubricants.

Warning	Description	Elimination/Action
 Hot oil or grease	Changing and draining gearbox oil or grease may require handling hot lubricant heated up to 90 °C.	Make sure that protective gear like goggles and gloves are always worn during this activity.

Continues on next page

Warning	Description	Elimination/Action
 Allergic reaction	When working with lubricants there is a risk of an allergic reaction.	Make sure that protective gear like goggles and gloves are always worn.
 Possible pressure build-up in gearbox	When opening the oil or grease plug, there may be pressure present in the gearbox, causing lubricant to spray from the opening.	Open the plug carefully and keep away from the opening. Do not overfill the gearbox when filling.
 Do not overfill	Overfilling of gearbox lubricant can lead to internal over-pressure inside the gearbox which in turn may: <ul style="list-style-type: none"> • damage seals and gaskets • completely press out seals and gaskets • prevent the robot from moving freely. 	Make sure not to overfill the gearbox when filling it with oil or grease. After filling, verify that the level is correct.
 Specified amount depends on drained volume	The specified amount of oil or grease is based on the total volume of the gearbox. When changing the lubricant, the amount refilled may differ from the specified amount, depending on how much has previously been drained from the gearbox.	After filling, verify that the level is correct.
 Contaminated oil in gearboxes	For lifetime reasons always drain as much oil as possible from the gearbox. The magnetic oil plugs will gather residual metal chips.	

Hazards related to batteries

Under rated conditions, the electrode materials and liquid electrolyte in the batteries are sealed and not exposed to the outside.

There is a hazard in case of abuse (mechanical, thermal, electrical) which leads to the activation of safety valves and/or the rupture of the battery container. As a result under certain circumstances, electrolyte leakage, electrode materials reaction with moisture/water or battery vent/explosion/fire may follow.

Do not short circuit, recharge, puncture, incinerate, crush, immerse, force discharge or expose to temperatures above the declared operating temperature range of the product. Risk of fire or explosion.

Operating temperatures are listed in [Operating conditions, robot on page 53](#).

See safety instructions for the batteries in *Material/product safety data sheet - Battery pack (3HAC043118-001)*.

Continues on next page

1 Safety

1.6.1 Safety during maintenance and repair

Continued

Unexpected movement of robot arm



WARNING

Hazards due to the use of brake release devices and/or gravity beneath the manipulator shall be considered.

A robot may perform unexpected limited movement.



WARNING

Manipulator movements can cause serious injuries on users and may damage equipment.

Related information

See also the safety information related to installation and operation.

1.6.2 Emergency release of the robot axes

Description

In an emergency situation, the brakes on a robot axis can be released manually by pushing a brake release button.

How to release the brakes is described in the section:

- [Manually releasing the brakes on page 72.](#)

The robot may be moved manually on smaller robot models, but larger models may require using an overhead crane or similar equipment.

Increased injury

Before releasing the brakes, make sure that the weight of the manipulator does not result in additional hazards, for example, even more severe injuries on a trapped person.



DANGER

When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways.

Make sure no personnel is near or beneath the robot.

1 Safety

1.6.3 Brake testing

1.6.3 Brake testing

When to test

During operation, the holding brake of each axis normally wears down. A test can be performed to determine whether the brake can still perform its function.

How to test

The function of the holding brake of each axis motor may be verified as described below:

- 1 Run each axis to a position where the combined weight of the manipulator and any load is maximized (maximum static load).
- 2 Switch the motor to the MOTORS OFF.
- 3 Inspect and verify that the axis maintains its position.

If the manipulator does not change position as the motors are switched off, then the brake function is adequate.



Note

It is recommended to run the service routine *BrakeCheck* as part of the regular maintenance, see the operating manual for the robot controller.

For robots with the option SafeMove, the *Cyclic Brake Check* routine is recommended. See the manual for SafeMove in [References on page 10](#).

1.7 Safety during troubleshooting

General

When troubleshooting requires work with power switched on, special considerations must be taken:

- Safety circuits might be muted or disconnected.
- Electrical parts must be considered as *live*.
- The manipulator can move unexpectedly at any time.



DANGER

Troubleshooting on the controller while powered on must be performed by personnel trained by ABB or by ABB field engineers.

A risk assessment must be done to address both robot and robot system specific hazards.



WARNING

Hazards due to the use of brake release devices and/or gravity beneath the manipulator shall be considered.

A robot may perform unexpected limited movement.



WARNING

Manipulator movements can cause serious injuries on users and may damage equipment.

Related information

See also the safety information related to installation, operation, maintenance, and repair.

1 Safety

1.8 Safety during decommissioning

1.8 Safety during decommissioning

General

See section [Decommissioning on page 869](#).

Unexpected movement of robot arm



WARNING

Hazards due to the use of brake release devices and/or gravity beneath the manipulator shall be considered.

A robot may perform unexpected limited movement.



WARNING

Manipulator movements can cause serious injuries on users and may damage equipment.

2 Installation and commissioning

2.1 Introduction to installation and commissioning

General

This chapter contains assembly instructions and information for installing the IRB 1200 at the working site.

See also the product manual for the robot controller.

The installation must be done by qualified installation personnel in accordance with the safety requirements set forth in the applicable national and regional standards and regulations.

Safety information

Before any installation work is commenced, all safety information must be observed. There are general safety aspects that must be read through, as well as more specific safety information that describes the danger and safety risks when performing the procedures. Read the chapter [Safety on page 19](#) before performing any installation work.



Note

Always connect the IRB 1200 and the robot to protective earth and residual current device (RCD) before connecting to power and starting any installation work.

For more information see:

- *Product manual - OmniCore C30*
- *Product manual - OmniCore C90XT*
- *Product manual - OmniCore E10*
- *Product manual - IRC5*
- *Product manual - IRC5 Compact*

2 Installation and commissioning

2.2.1 Extra O-rings

2.2 Unpacking

2.2.1 Extra O-rings

Installation of extra O-rings

For robots with protection class IP67

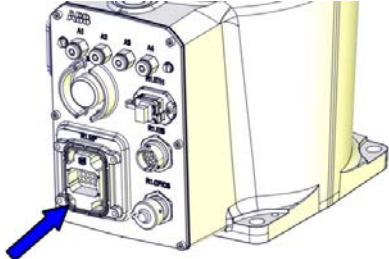
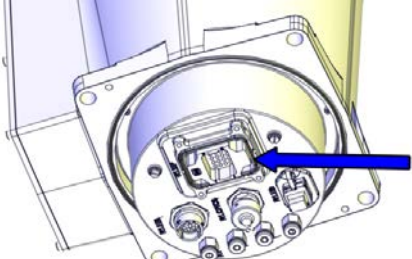
For robots with protection type Foundry Plus

For robots with protection type Clean Room

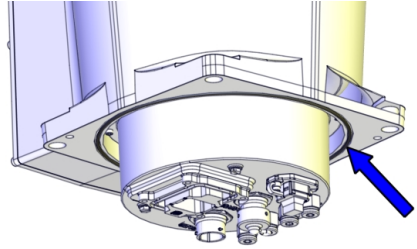
For robots with food grade lubrication

For robots with protection type Hygienic

Two extra O-rings are delivered together with the robot and must be fitted to the robot during installation.

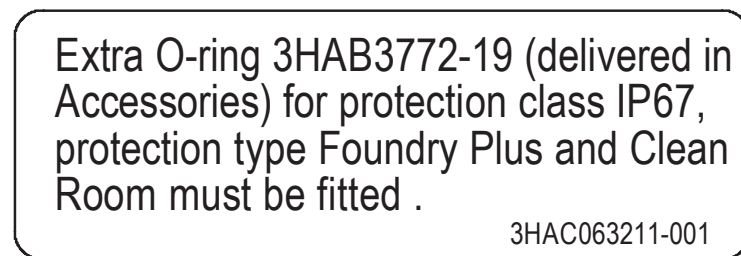
Equipment	Art. no.	Note
O-ring	3HAB3772-19	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Used to seal between the main power cable and the connector. Robots with manipulator cables routed from the rear of the base:</p>  <p>xx1500000243</p> <p>Robots with manipulator cables routed from below (option 996-1):</p>  <p>xx1500000242</p>

Continues on next page

Equipment	Art. no.	Note
O-ring	3HAB3772-141	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Used with manipulator cables routed from below</p>  <p>xx1500000241</p>

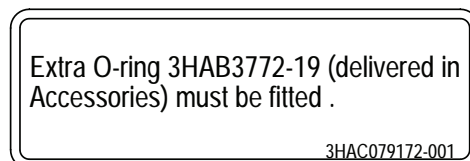
A label, as shown in the following, is fitted on the connector to remind the fitting of extra O-ring 3HAB3772-19. The label must be removed before the O-ring and main cable is fitted.

Label for IP67, Foundry Plus, Clean Room and food grade lubrication robots



xx1700001298

Label for Hygienic robots



xx2100001272

Further information

For installation information, see [Orienting and securing the robot on page 75](#) and [Electrical connections on page 107](#).

2 Installation and commissioning

2.2.2 Protection covers

2.2.2 Protection covers

Protection covers for water and dust proofing

For robots delivered with option 803-2 Ethernet, Parallel, Air (IRC5)

For robot delivered with option 3303-2 Ethernet, Parallel, Air (OmniCore)

A dust cap and two protectors are delivered together with the robot and must be well fitted to the connectors in any application requiring water and dust proofing.

Equipment	Art. no.	Note
Dust cap	3HEA800897-002	Used to cover unused connectors for water and dust proofing. Replace if damaged.
M12 protector	3HAC047543-001	Used with option 803-2 (IRC5) or option 3303-2 (OmniCore). Used to cover unused connectors for water and dust proofing. Replace if damaged.
RJ 45 protector	3HAC047539-001	Used with option 803-2 (IRC5) or option 3303-2 (OmniCore). Used to cover unused connectors for water and dust proofing. Replace if damaged.

Protection covers for Foundry Plus robots

For robots with protection type Foundry Plus

Extra protection covers, sealing and plugs are delivered together with Foundry Plus robots and must be fitted to the robot during installation.

Equipment	Art. no.	Note
Protection bracket for CP/CS connectors	3HAC058350-001	Used with protection type Foundry Plus. Replace if damaged.
Protection cover for axis-6 turning disk	3HAC044666-001	Used with protection type Foundry Plus. Replace if damaged.
T40 variseal sealing	3HAC044641-012	Used with protection type Foundry Plus. Replace if damaged.
Protection plug for lifting holes	3HAC4836-24	Used with protection type Foundry Plus. Replace if damaged.

2.2.3 Transportation bracket

Location of the transportation bracket

A transportation bracket is installed and delivered together with the robot for securing the robot position during shipping and transport. The transportation bracket must be removed before fitting the lifting accessory to the robot during the lifting of the robot to the installation site.



Note

For robots delivered with option 636-1 Force Control Package (IRC5)
 For robot delivered with option 3038-1 Force Control Interface (OmniCore)
 The transportation bracket is installed on the force sensor.

IRB 1200-7/0.7		IRB 1200-5/0.9	
Without force control package	With force control package	Without force control package	With force control package
<p>xx1500001605</p>	<p>xx1800000004</p>	<p>xx1800000003</p>	<p>xx1800000002</p>
3HAC051896-001	3HAC064317-001	3HAC051897-001	3HAC064318-001

Removing the transportation bracket

Use this procedure to remove the bracket.



Note


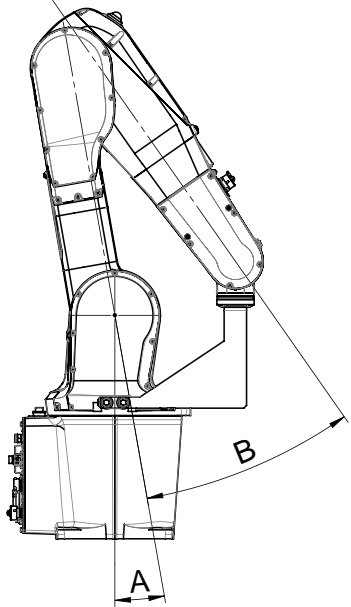

The bracket must be kept for reuse after removal. Once robot shipping and transportation are required, the transportation bracket has to be reinstalled for securing the robot position.

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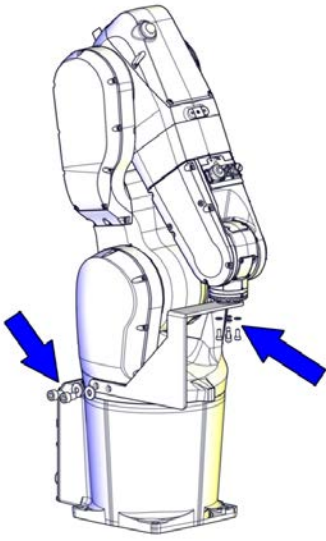
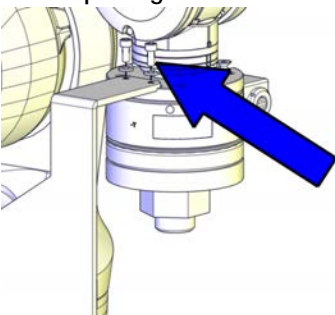
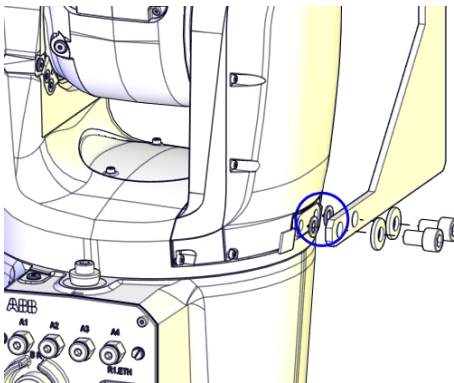
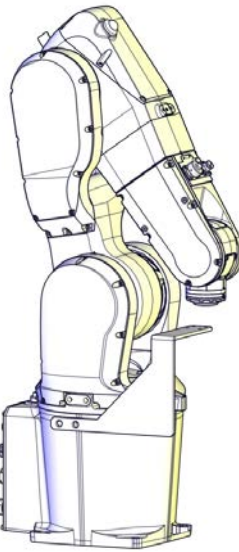
2 Installation and commissioning

2.2.3 Transportation bracket

Continued

	Action	Note												
1	<p>Move the robot to an appropriate position.</p> <p> WARNING</p> <p>The robot is likely to be mechanically unstable if not secured to the foundation!</p>	<p>Taking IRB 1200-5/0.9 as an example</p>  <p>xx1500001399</p> <table border="1" data-bbox="1029 1079 1406 1422"> <thead> <tr> <th></th> <th>A</th> <th>B</th> </tr> </thead> <tbody> <tr> <td>IRB 1200 all variants (not in protection type Hygienic)</td> <td>10°</td> <td>25°</td> </tr> <tr> <td>IRB 1200-7/0.7 (in protection type Hygienic)</td> <td>11.95°</td> <td>25.66°</td> </tr> <tr> <td>IRB 1200-5/0.9 (in protection type Hygienic)</td> <td>11.77°</td> <td>25.48°</td> </tr> </tbody> </table>		A	B	IRB 1200 all variants (not in protection type Hygienic)	10°	25°	IRB 1200-7/0.7 (in protection type Hygienic)	11.95°	25.66°	IRB 1200-5/0.9 (in protection type Hygienic)	11.77°	25.48°
	A	B												
IRB 1200 all variants (not in protection type Hygienic)	10°	25°												
IRB 1200-7/0.7 (in protection type Hygienic)	11.95°	25.66°												
IRB 1200-5/0.9 (in protection type Hygienic)	11.77°	25.48°												
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>It is important not to rub against the paint of the robot while performing any service work on the robot.</p>													

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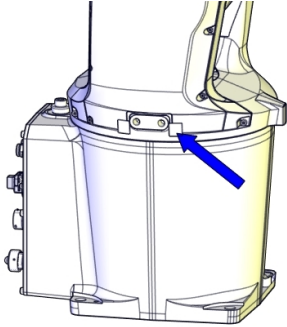
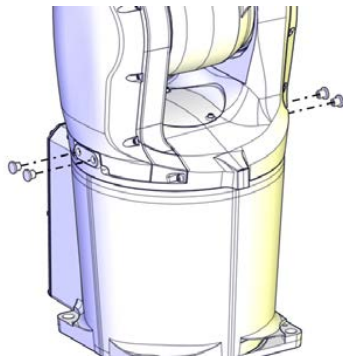
	Action	Note
3	<p>Remove the screws and washers.</p> <p> CAUTION</p> <p>Do not remove the force sensor if the robot is delivered with a force control package.</p> <p>For robots with protection type Hygienic Hygienic robots use M5x20 screws for fixing the transportation bracket on the tool flange. Do not mix the screws with those used on robots not in protection type Hygienic, which are M5x12.</p>	 <p>xx1500001604</p> <p>For robots delivered with force control package</p>  <p>xx1800000005</p>
4	<p>Remove the bracket.</p> <p>For robots with protection type Foundry Plus Remove the two M10 rubber washers, as circled in the figure, together with the bracket and reserve them for further use.</p>  <p>xx1600001178</p>	 <p>xx1500001400</p>

Continues on next page

2 Installation and commissioning

2.2.3 Transportation bracket

Continued

	Action	Note
5	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Make sure the swing sealing plug is intact and the sealant around fully covers the joint.</p> <p>If not, replace the swing sealing plug and seal the joint. See Swing sealing plug for Clean Room, food grade lubrication and Hygienic robots on page 167.</p> <p>After the replacement, wipe clean.</p>	<p>Swing sealing plug: 3HAC053687-001</p>  <p>xx160000205</p>
6	<p>For robots with protection type Foundry Plus</p> <p>Fit protection plugs to the lifting holes.</p>	<p>Protection plug for lifting holes: 3HAC4836-24</p>  <p>xx1600001147</p>

2.2.4 Pre-installation procedure

Introduction

This section is intended for use when unpacking and installing the robot for the first time. It also contains information useful during later re-installation of the robot.

Prerequisites for installation personnel

Installation personnel working with an ABB product must:

- be trained by ABB and have the required knowledge of mechanical and electrical installation/maintenance/repair work
- conform to all national and local codes.

Risk assessment for special environments


During the planning of applications using robots with protection type Hygienic, it is recommended to perform an initial hygienic risk assessment according to EN ISO 14159 and SS-EN 1672-2. The risk assessment should fully involve considerations from production process experts, risk assessment experts and any personnel who will work with the robots.

If performing a risk assessment according to EN ISO 14159, it shall be assumed that the robot conforms to Level 1 as defined in EN ISO 14159 Annex A.

Following risks (but not limited to) should be assessed:

- Leakage of oil and grease
- Wearing of gaskets and sealings
- Loss of plugs and screws
- Tiny clearances and hard-to-reach areas of the robot
- Flakes of paint
- Uncoated areas on the robot
- Residuals of products and/or cleaning and disinfecting agents
- Improper installation of customer tools
- Misuse of cleaning and disinfecting agents
- Improper cleaning and disinfecting practices

Checking the pre-requisites for installation

	Action
1	Make a visual inspection of the packaging and make sure that nothing is damaged.
2	Remove the packaging.
3	<p>Check for any visible transport damage.</p> <p> Note</p> <p>Stop unpacking and contact ABB if transport damages are found.</p>
4	Clean the unit with a lint-free cloth, if necessary.

Continues on next page

2 Installation and commissioning

2.2.4 Pre-installation procedure

Continued

	Action
5	Make sure that the lifting accessory used (if required) is suitable to handle the weight of the robot as specified in: Weight, robot on page 50
6	If the robot is not installed directly, it must be stored as described in: Storage conditions, robot on page 53
7	Make sure that the expected operating environment of the robot conforms to the specifications as described in: Operating conditions, robot on page 53
8	Before taking the robot to its installation site, make sure that the site conforms to: <ul style="list-style-type: none">• Loads on foundation, robot on page 51• Protection classes, robot on page 53• Requirements, foundation on page 52
9	Before moving the robot, please observe the stability of the robot: Risk of tipping/stability on page 62
10	When these prerequisites are met, the robot can be taken to its installation site as described in section: On-site installation on page 65
11	Install required equipment, if any. <ul style="list-style-type: none">• Installing the signal lamp on IRC5 robots on page 95

Weight, robot

The table shows the weight of the robot.

Robot model	Weight
IRB 1200	IRB 1200-5/0.9: 54 kg IRB 1200-7/0.7: 52 kg



Note

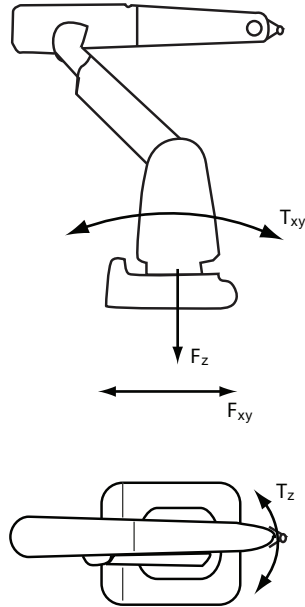
The weight does not include tools and other equipment fitted on the robot.

Continues on next page

Loads on foundation, robot

The illustration shows the directions of the robots stress forces.

The directions are valid for all floor mounted, suspended and inverted robots.



xx1100000521

F_{xy}	Force in any direction in the XY plane
F_z	Force in the Z plane
T_{xy}	Bending torque in any direction in the XY plane
T_z	Bending torque in the Z plane

The table shows the various forces and torques working on the robot during different kinds of operation.



Note

These forces and torques are extreme values that are rarely encountered during operation. The values also never reach their maximum at the same time!



WARNING

The robot installation is restricted to the mounting options given in following load table(s).

Floor mounted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	±910 N	±1620 N
Force z	-550 ±980 N	-550 ±1610 N
Torque xy	±570 Nm	±1550 Nm
Torque z	±280 Nm	±580 Nm

Continues on next page

2 Installation and commissioning

2.2.4 Pre-installation procedure

Continued

Wall mounted


Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	±1210 N	±1940 N
Force z	0 ±900 N	0 ±1340 N
Torque xy	±700 Nm	±1650 Nm
Torque z	±300 Nm	±610 Nm

Suspended

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	±910 N	±1620 N
Force z	+550 ±980 N	+550 ±1610 N
Torque xy	±570 Nm	±1550 Nm
Torque z	±280 Nm	±580 Nm

Requirements, foundation

The table shows the requirements for the foundation where the weight of the installed robot is included:

Requirement	Value	Note
Flatness of foundation surface	0.1/500 mm	Flat foundations give better repeatability of the resolver calibration compared to original settings on delivery from ABB. The value for levelness aims at the circumstance of the anchoring points in the robot base. In order to compensate for an uneven surface, the robot can be recalibrated during installation. If resolver/encoder calibration is changed this will influence the absolute accuracy.
Maximum tilt	5°	The limit for the maximum payload on the robot is reduced if the robot is tilted from 0°. Contact ABB for further information about acceptable loads.
Minimum resonance frequency	22 Hz  Note It may affect the manipulator lifetime to have a lower resonance frequency than recommended.	The value is recommended for optimal performance. Due to foundation stiffness, consider robot mass including equipment. ⁱ For information about compensating for foundation flexibility, see the application manual of the controller software, section <i>Motion Process Mode</i> .
Minimum foundation material yield strength	150 MPa	

ⁱ The minimum resonance frequency given should be interpreted as the frequency of the robot mass/inertia, robot assumed stiff, when a foundation translational/torsional elasticity is added, i.e., the stiffness of the pedestal where the robot is mounted. The minimum resonance frequency should not be interpreted as the resonance frequency of the building, floor etc. For example, if the equivalent mass of the floor is very high, it will not affect robot movement, even if the frequency is well below the stated frequency. The robot should be mounted as rigid as possible to the floor.

Disturbances from other machinery will affect the robot and the tool accuracy. The robot has resonance frequencies in the region 10 – 20 Hz and disturbances in this region will be amplified,

Continues on next page

although somewhat damped by the servo control. This might be a problem, depending on the requirements from the applications. If this is a problem, the robot needs to be isolated from the environment.



Note

For robots with protection type Hygienic, the foundation where the robot is installed and the robot base must be far away from the food contact areas.

Storage conditions, robot

The table shows the allowed storage conditions for the robot:

Parameter	Value
Minimum ambient temperature	-25°C
Maximum ambient temperature	+55°C
Maximum ambient temperature (less than 24 hrs)	+70°C
Maximum ambient humidity	95% at constant temperature (gaseous only)

Operating conditions, robot

The table shows the allowed operating conditions for the robot:

Parameter	Value
Minimum ambient temperature	+5°C ⁱ
Maximum ambient temperature	+45°C
Maximum ambient temperature for robots with food grade lubrication for robots in protection type Hygienic	+35°C ⁱⁱ
Maximum ambient humidity	95% at constant temperature

ⁱ At low environmental temperature < 10°C is, as with any other machine, a warm-up phase recommended to be run with the robot. Otherwise there is a risk that the robot stops or run with lower performance due to temperature dependent oil and grease viscosity.

ⁱⁱ For robots with food grade lubrication
For robots with protection type Hygienic
If environment temperature > 35°C, contact ABB for further information.

Protection classes, robot

The table shows the available protection types of the robot, with the corresponding protection class.

Protection type	Protection class ¹
Manipulator, protection type Standard	IP40 IP67 (option 287-10, with IRC5 controllers) IP67 (option 3350-670, with Omni-Core controllers)
Manipulator, protection type Foundry Plus	IP67 (option 287-3) IP67 (option 3352-10, with Omni-Core controllers)

Continues on next page

2 Installation and commissioning

2.2.4 Pre-installation procedure

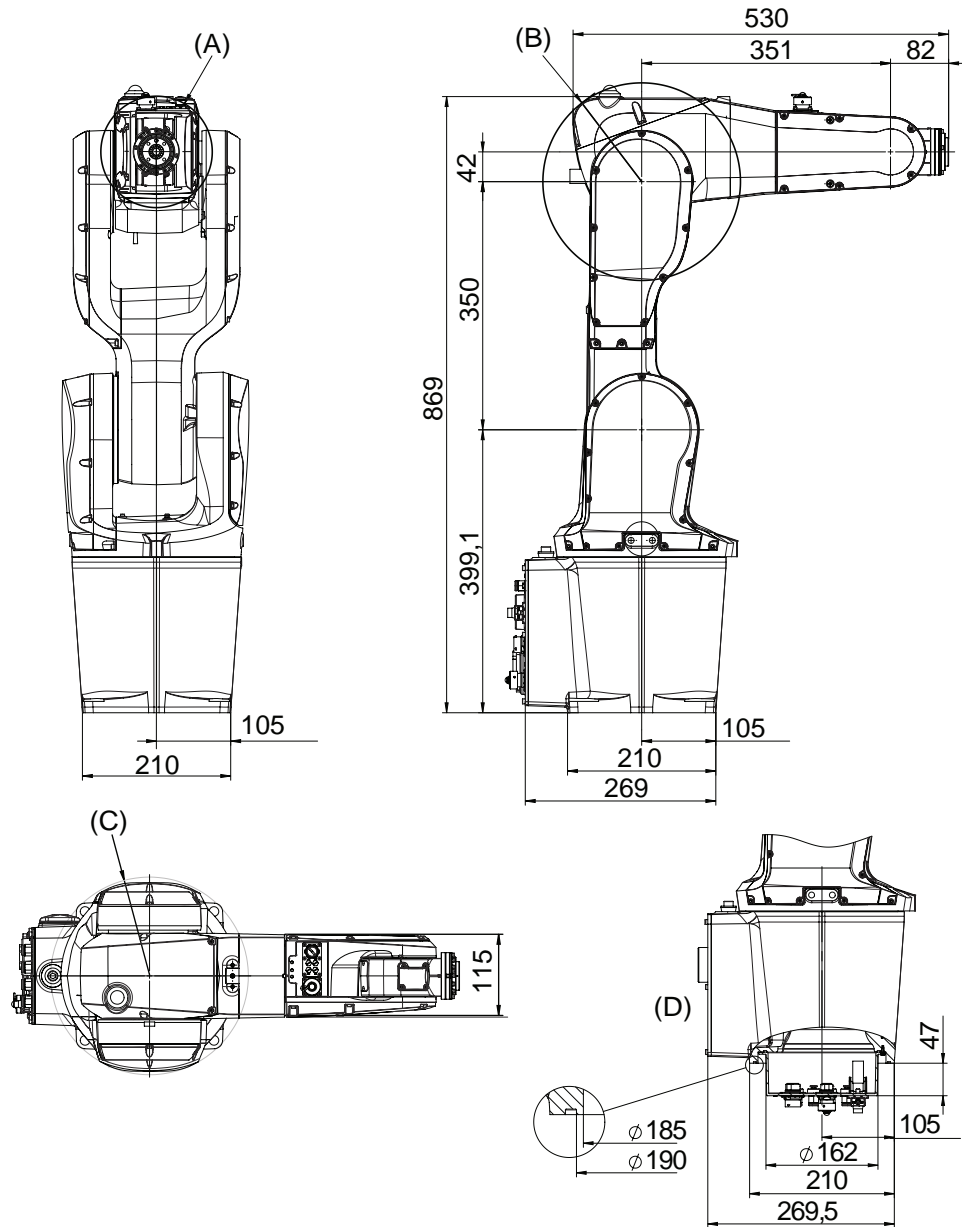
Continued

Protection type	Protection class ¹
Manipulator, protection type Clean Room	Cleanroom (option 287-1) ISO Class 3 (option 3351-3, with OmniCore controllers)
Manipulator, protection type Hygienic	IP67 IP69K (max.30bar) on axis 6 flange

2.2.5 Dimensions

Dimensions IRB 1200-7/0.7

For robots in protection type IP67, Foundry Plus, Clean Room and food grade lubrication robots



xx130000366

Position	Description
A	Minimum turning radius axis 4 R=79 mm
B	Minimum turning radius axis 3 R=139 mm
C	Minimum turning radius axis 1 R=138 mm
D	Valid for option Robot cabling routing, 966-1 From below

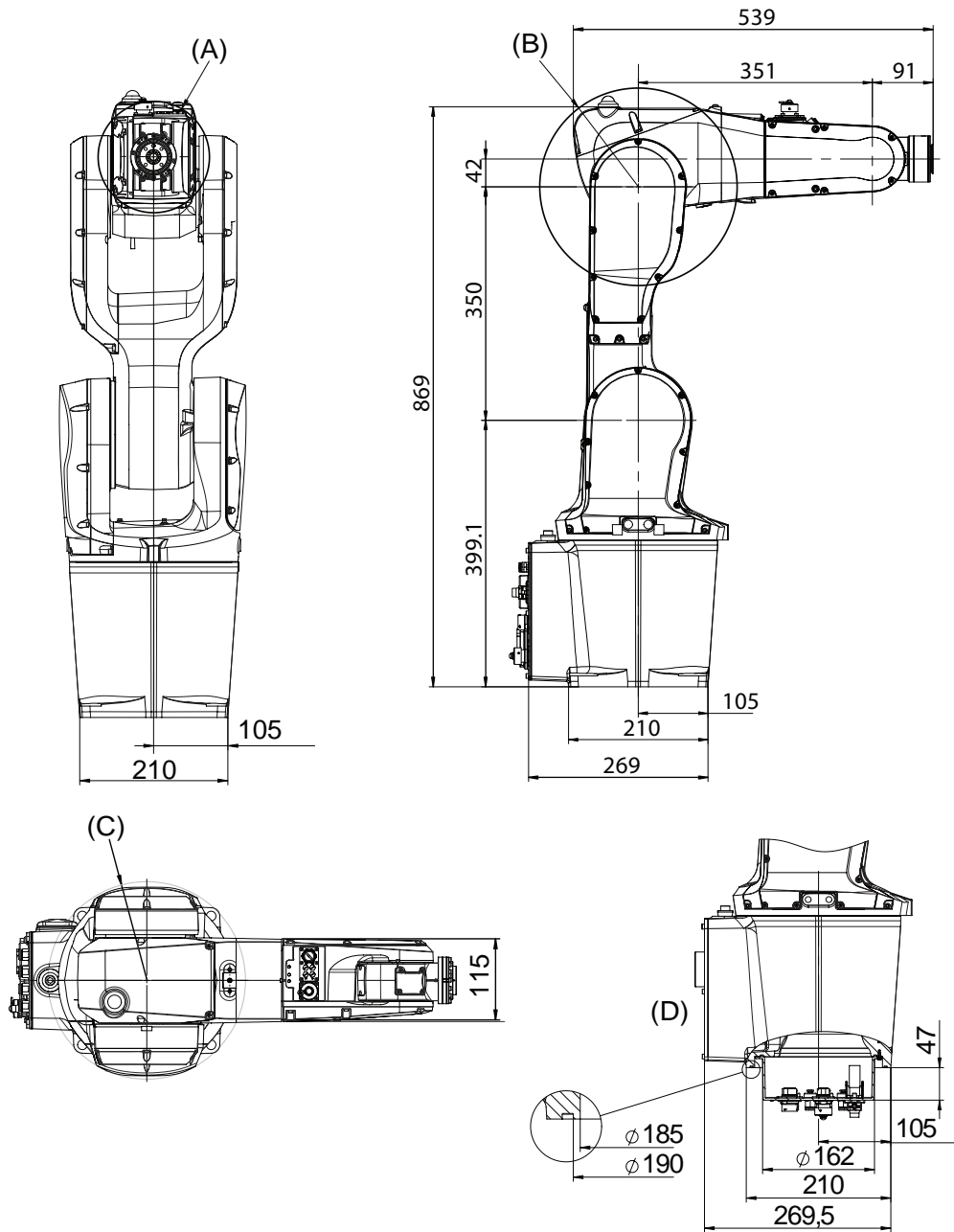
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2 Installation and commissioning

2.2.5 Dimensions

Continued

For robots in protection type Hygienic



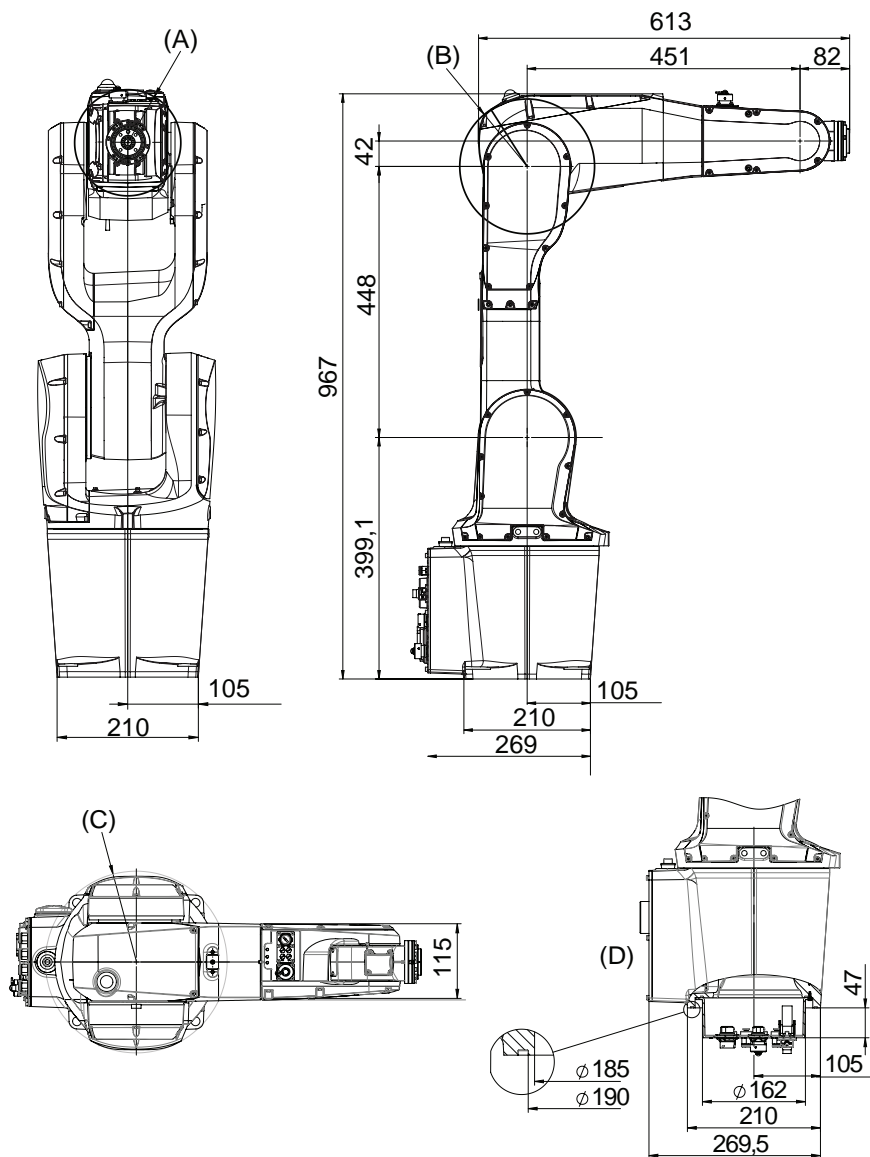
xx2100001277

Position	Description
A	Minimum turning radius axis 4 R=79 mm
B	Minimum turning radius axis 3 R=139 mm
C	Minimum turning radius axis 1 R=138 mm
D	Valid for option Robot cabling routing, 966-1 From below

Continues on next page

Dimensions IRB 1200-5/0.9

For robots in protection type IP67, Foundry Plus, Clean Room and food grade lubrication robots



xx140000339

Pos	Description
A	Minimum turning radius axis 4 R=79 mm
B	Minimum turning radius axis 3 R=111 mm
C	Minimum turning radius axis 1 R=138 mm
D	Valid for option Robot cabling routing, 966-1 From below

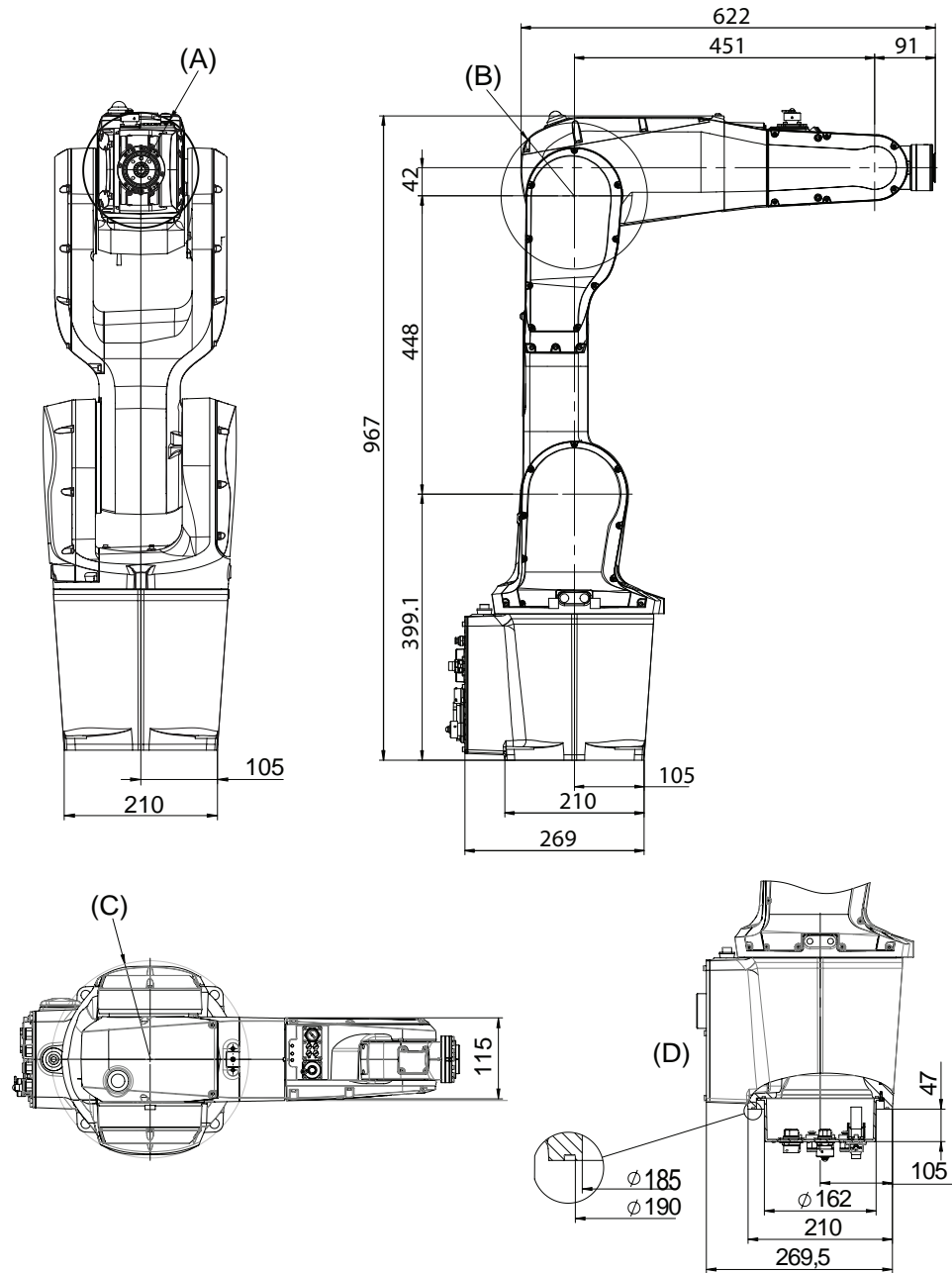
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2 Installation and commissioning

2.2.5 Dimensions

Continued

For robots in protection type Hygienic



xx2100001278

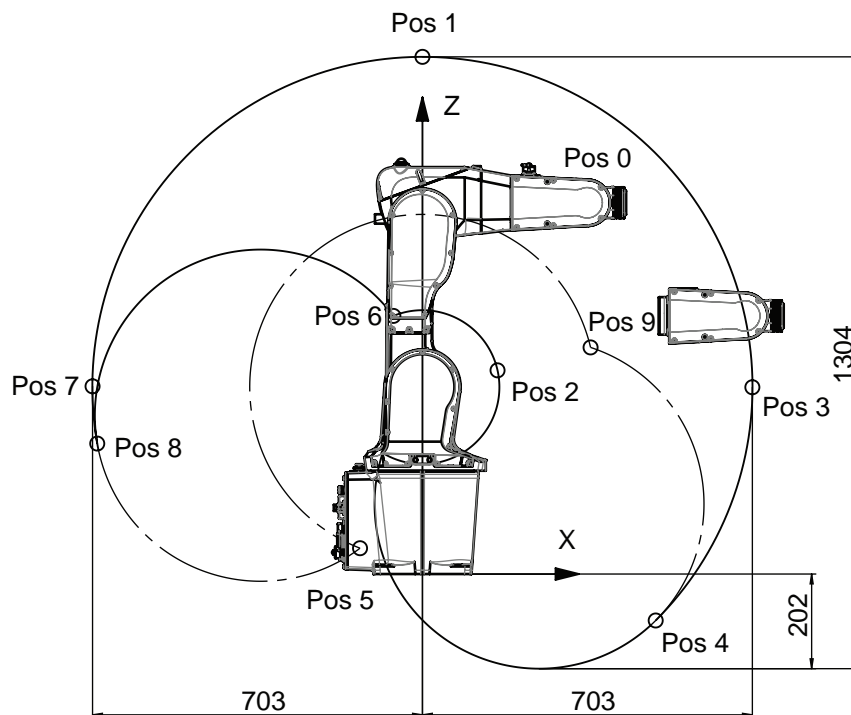
Position	Description
A	Minimum turning radius axis 4 R=79 mm
B	Minimum turning radius axis 3 R=139 mm
C	Minimum turning radius axis 1 R=138 mm
D	Valid for option Robot cabling routing, 966-1 From below

2.2.6 Working range

Illustration, working range IRB 1200-7/0.7

IRB 1200-7/0.7 Working range, positions at wrist center and angle of axes 2 and 3

The illustration shows the unrestricted working range of the robot.



xx130000386

Position in the figure	Positions at wrist center (mm)		Angle (degrees)	
	X	Z	Axis 2	Axis 3
Pos0	351	791	0°	0°
Pos1	0	1102	0°	-83°
Pos2	160	434	0°	+70°
Pos3	703	398	+90°	-83°
Pos4	497	-99	+135°	-83°
Pos5	-133	55	-100°	-200°
Pos6	-62	550	-100°	+70°
Pos7	-703	400	-90°	-83°
Pos8	-693	278	-100°	-83°
Pos9	358	488	+135°	-200°

Continues on next page

2 Installation and commissioning

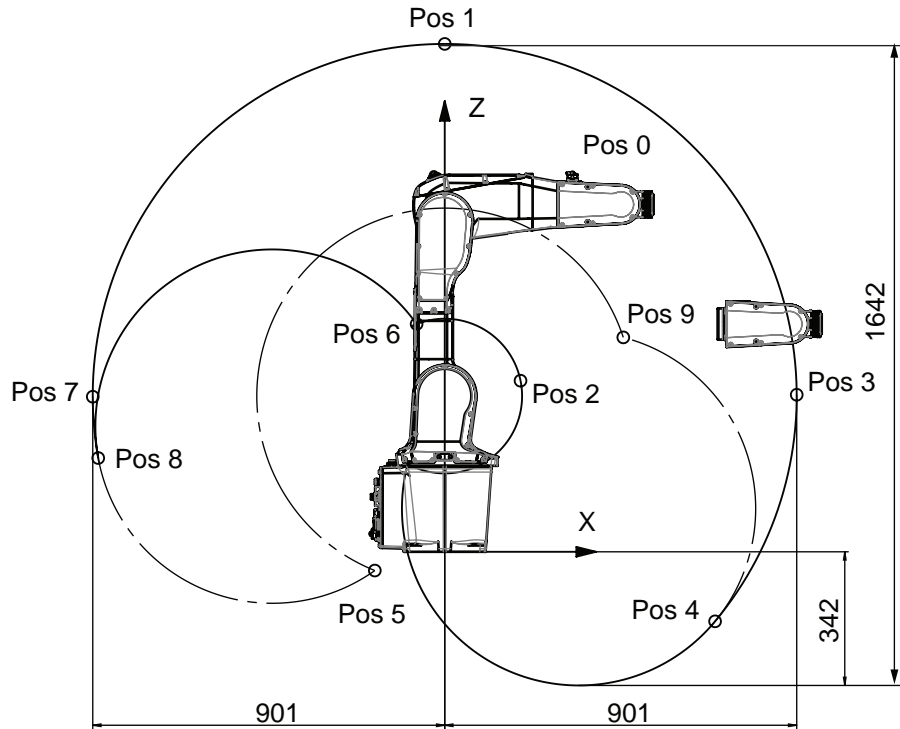
2.2.6 Working range

Continued

Illustration, working range IRB 1200-5/0.9

IRB 1200-5/0.9 Working range, positions at wrist center and angle of axes 2 and 3

The illustration shows the unrestricted working range of the robot.

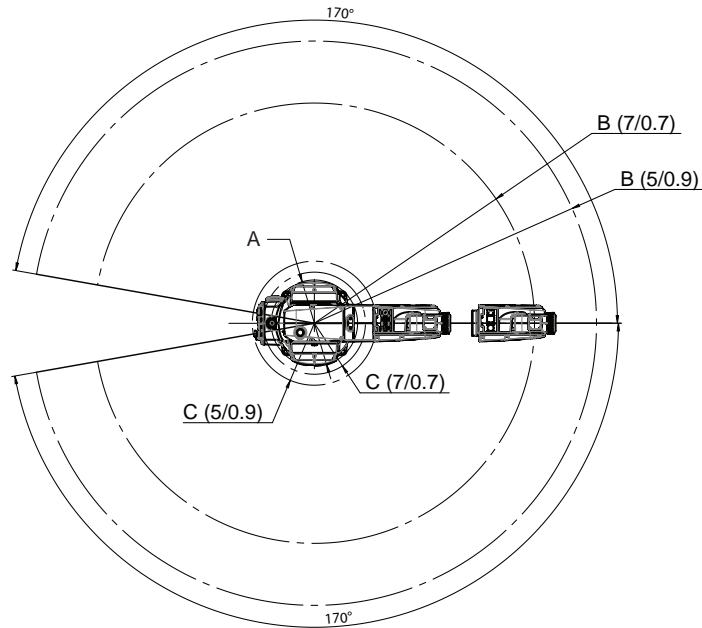


xx1300000387

Position in the figure	Positions at wrist center (mm)		Angle (degrees)	
	X	Z	Axis 2	Axis 3
Pos0	451	889	0°	0°
Pos1	0	1300	0°	-85°
Pos2	194	438	0°	+70°
Pos3	901	402	+90°	-85°
Pos4	692	-178	+130°	-85°
Pos5	-179	-48	-100°	-200°
Pos6	-72	583	-100°	+70°
Pos7	-901	397	-90°	-85°
Pos8	-887	240	-100°	-85°
Pos9	458	549	+130°	-200°

Continues on next page

Minimum turning radius of axis 1



xx140000681

Robot variant	Radius A	Radius B	Radius C
IRB 1200-5/0.9	138 mm ⁱ	901 mm	198 mm
IRB 1200-7/0.7	138 mm ⁱ	703 mm	163 mm

ⁱ Maximum turning radius of axis 1.

Working range

Axis	Type of motion	IRB 1200-7/0.7	IRB 1200-5/0.9
Axis 1	Rotation motion	+170° to -170°	+170° to -170°
Axis 2	Arm motion	+135° to -100°	+130° to -100°
Axis 3	Arm motion	+70° to -200°	+70° to -200°
Axis 4	Wrist motion	+270° to -270°	+270° to -270°
Axis 5	Bend motion	±130° (not Hygienic robots) ±128° (Hygienic robots)	±130° (not Hygienic robots) ±128° (Hygienic robots)
Axis 6	Turn motion	Default: +400° to -400° Maximum revolution: ±242 ⁱ	Default: +400° to -400° Maximum revolution: ±242 ⁱ

ⁱ The default working range for axis 6 can be extended by changing parameter values in the software. Option Independent axis can be used for resetting the revolution counter after the axis has been rotated (no need for "rewinding" the axis).

2 Installation and commissioning

2.2.7 Risk of tipping/stability

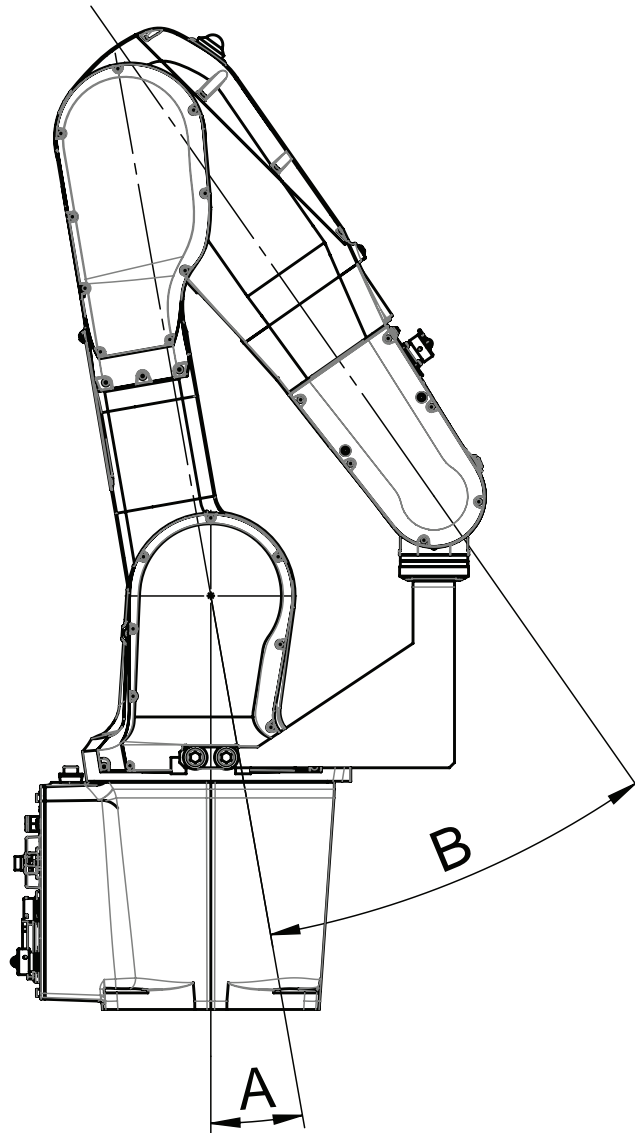
2.2.7 Risk of tipping/stability

Risk of tipping

Do not change the robot position before securing it to the foundation.
The shipping position is the most stable position.

Shipping and transportation position

This figure shows the robot in its shipping position and transportation position.
Taking IRB 1200-5/0.9 as an example



xx1500001399

	A	B
IRB 1200 all variants (not in protection type Hygienic)	10°	25°

Continues on next page

	A	B
IRB 1200-7/0.7 (in protection type Hygienic)	11.95°	25.66°
IRB 1200-5/0.9 (in protection type Hygienic)	11.77°	25.48°

Transportation bracket

A transportation bracket is installed and delivered together with the robot for securing the robot position during shipping and transportation. The transportation bracket must be removed before fitting the lifting accessory to the robot during the lifting of the robot to the installation site.

For details, see [Transportation bracket on page 45](#).



WARNING

The robot will be mechanically unstable if not properly secured to the foundation.

2 Installation and commissioning

2.2.8 The unit is sensitive to ESD

2.2.8 The unit is sensitive to ESD

Description

ESD (electrostatic discharge) is the transfer of electrical static charge between two bodies at different potentials, either through direct contact or through an induced electrical field. When handling parts or their containers, personnel not grounded may potentially transfer high static charges. This discharge may destroy sensitive electronics.

Safe handling

Use one of the following alternatives:

- Use a wrist strap.

Wrist straps must be tested frequently to ensure that they are not damaged and are operating correctly.

- Use an ESD protective floor mat.

The mat must be grounded through a current-limiting resistor.

- Use a dissipative table mat.

The mat should provide a controlled discharge of static voltages and must be grounded.

2.3 On-site installation

2.3.1 Lifting robot with roundslings

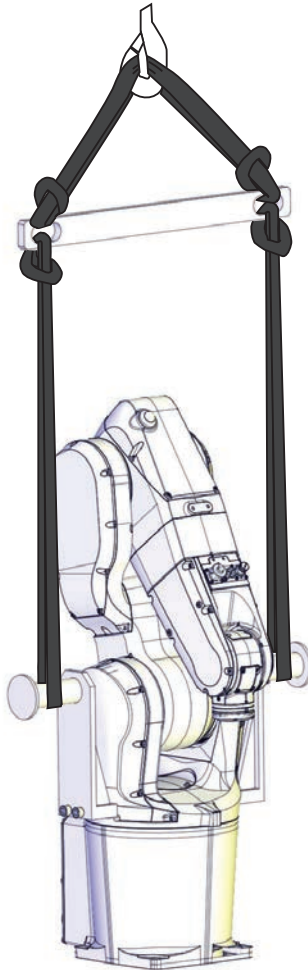
Attaching the roundslings



Note

A transportation bracket is installed and delivered together with the robot for securing the robot position during shipping and transport. The transportation bracket must be removed before fitting the lifting accessory to the robot during the lifting of the robot to the installation site.

For details, see [Transportation bracket on page 45](#).



xx140000501

Required equipment

Equipment, etc.	Article number	Note
Overhead crane	-	

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2 Installation and commissioning

2.3.1 Lifting robot with roundslings


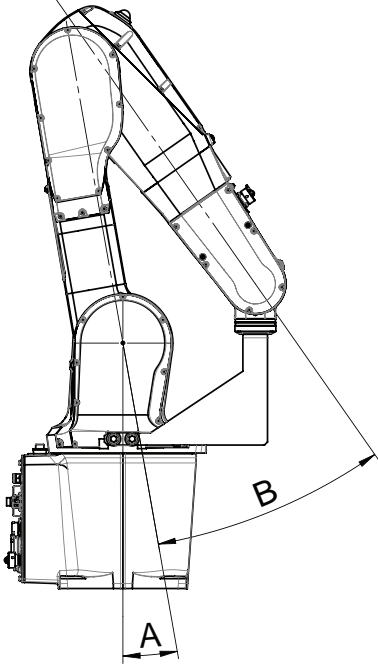

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Equipment, etc.	Article number	Note
Roundsling, 0.6 m	-	2 pcs. Length: 0.6 m. Lifting capacity: 60 kg.
Roundsling, 1.5 m	-	2 pcs. Length: 1.5 m. Lifting capacity: 60 kg.
Lifting accessory, robot	3HAC049711-001	Includes lifting accessories, lifting beam and screws.

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Lifting and turning the robot with roundslings

Use this procedure to lift the robot with roundslings.

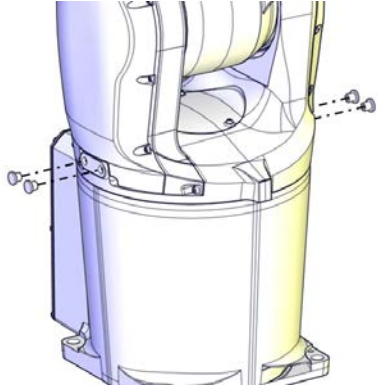
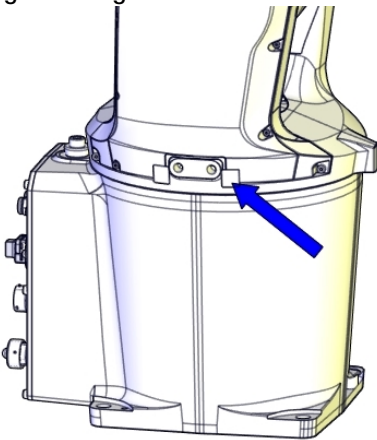
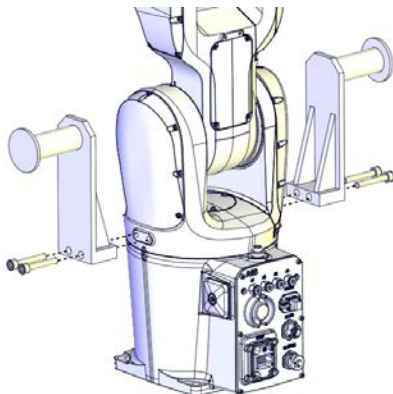
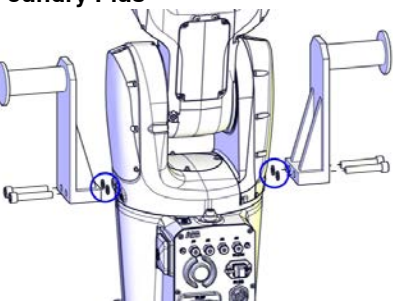
	Action	Note												
1	<p>Move the robot to an appropriate lifting position.</p> <p> WARNING</p> <p>The robot is likely to be mechanically unstable if not secured to the foundation!</p>	<p>Taking IRB 1200-5/0.9 as an example</p>  <p>xx1500001399</p> <table border="1" data-bbox="1023 1207 1437 1550"> <thead> <tr> <th></th> <th>A</th> <th>B</th> </tr> </thead> <tbody> <tr> <td>IRB 1200 all variants (not in protection type Hygienic)</td> <td>10°</td> <td>25°</td> </tr> <tr> <td>IRB 1200-7/0.7 (in protection type Hygienic)</td> <td>11.95°</td> <td>25.66°</td> </tr> <tr> <td>IRB 1200-5/0.9 (in protection type Hygienic)</td> <td>11.77°</td> <td>25.48°</td> </tr> </tbody> </table>		A	B	IRB 1200 all variants (not in protection type Hygienic)	10°	25°	IRB 1200-7/0.7 (in protection type Hygienic)	11.95°	25.66°	IRB 1200-5/0.9 (in protection type Hygienic)	11.77°	25.48°
	A	B												
IRB 1200 all variants (not in protection type Hygienic)	10°	25°												
IRB 1200-7/0.7 (in protection type Hygienic)	11.95°	25.66°												
IRB 1200-5/0.9 (in protection type Hygienic)	11.77°	25.48°												
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>It is important not to rub against the paint of the robot while performing any service work on the robot.</p>													

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2 Installation and commissioning

2.3.1 Lifting robot with roundslings

Continued

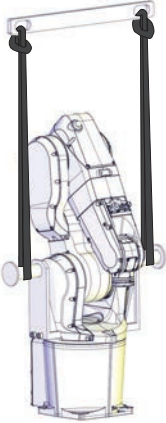
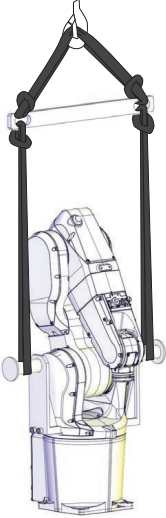


	Action	Note
3	<p>For robots with protection type Foundry Plus Remove the protection plugs in lifting holes.</p>	 <p>xx1600001147</p>
4	<p>Fit the lifting tools to the robot. Use the enclosed screws.</p> <p>For robots with protection type Foundry Plus Use two M10 rubber washers, as circled in the figure, on the lifting holes at each side of the robot (4 pcs in total) for protection when fitting the lifting tools.</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Pay attention not to damage the swing sealing plug and the sealant covering the joint when fitting the lifting tools.</p>  <p>xx160000205</p> <p>Replace the swing sealing plug if damaged and seal the joint. See Swing sealing plug for Clean Room, food grade lubrication and Hygienic robots on page 167.</p> <p>After the replacement, wipe clean.</p>	<p>Lifting accessory, robot: 3HAC049711-001</p>  <p>xx1400000498</p> <p>Tightening torque: 15 Nm</p> <p>For robots with protection type Foundry Plus</p>  <p>xx1600001177</p>

Continues on next page

2 Installation and commissioning

2.3.1 Lifting robot with roundslings

Continued


	Action	Note
5	Fit the roundslings to the lifting tools and attach them to the lifting beam.	<p>Make sure the roundsling has free space and does not wear against any part of the robot.</p> <p>Roundsling, 1.5 m</p>  <p>xx1400000511</p>
6	Fit the roundslings to the lifting beam and to the overhead crane.	<p>Roundsling, 0.6 m</p>  <p>xx1400000501</p>
7	<p> CAUTION</p> <p>The IRB 1200 robot weighs . IRB 1200-5/0.9: 54 kg IRB 1200-7/0.7: 52 kg All lifting accessories used must be sized accordingly!</p>	
8	<p> WARNING</p> <p>Personnel must not, under any circumstances, be present under the suspended load!</p>	
9	Raise the overhead crane to lift the robot.	

Continues on next page

2 Installation and commissioning

2.3.1 Lifting robot with roundslings

Continued

	Action	Note
10	If the manipulator should be mounted on a wall, or in an suspended position the manipulator can now be tilted slowly by hand.	 <p>xx160000005</p>

2.3.2 Lifting and turning a suspended mounted robot

Introduction

How to lift and turn the robot to a suspended position using the turning accessory is described in the lifting instruction delivered with the turning accessory. Article numbers for the accessory and the instruction is specified in [Special tools on page 893](#). Any additional equipment required is specified in the instruction for the lifting accessory. Contact ABB for more information.

How to lift and turn the robot into position for wall position: Contact ABB for more information.

How to lift and turn the robot into position for tilted position: Contact ABB for more information.

2 Installation and commissioning

2.3.3 Manually releasing the brakes

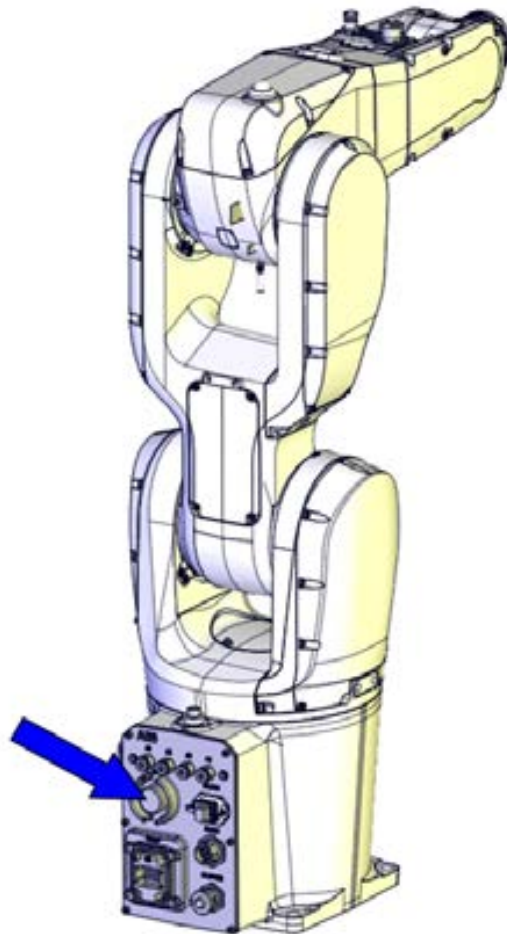
2.3.3 Manually releasing the brakes

Introduction to manually releasing the brakes

This section describes how to release the holding brakes for the motors of each axis.

Location of brake release unit

The internal brake release unit is located as shown in the figure.

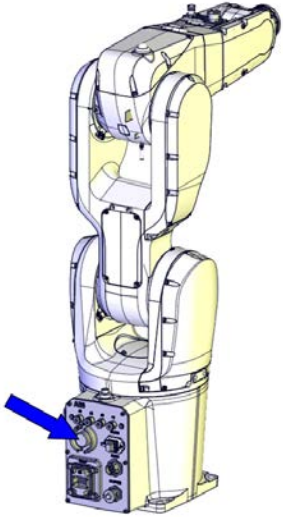



xx140000030

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Releasing the brakes

This procedure details how to release the holding brakes when the robot is equipped with an internal brake release unit.

	Action	Note
1	<p>The internal brake release unit is equipped with a button for controlling the axes brakes. If the robot is not connected to the controller, power must be supplied to the connector R1.MP according to the section Supplying power to connector R1.MP on page 73.</p>	 <p>xx140000030</p>
2	<p> DANGER</p> <p>When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways!</p> <p>Make sure no personnel is near or beneath the robot arm!</p>	
3	<p>Release the holding brake on all robot axes by pressing the button on the internal brake release unit.</p> <p>The brake will function again as soon as the button is released.</p>	

Supplying power to connector R1.MP

If the robot is not connected to the controller, power must be supplied to connector R1.MP on the robot in order to enable the brake release buttons.


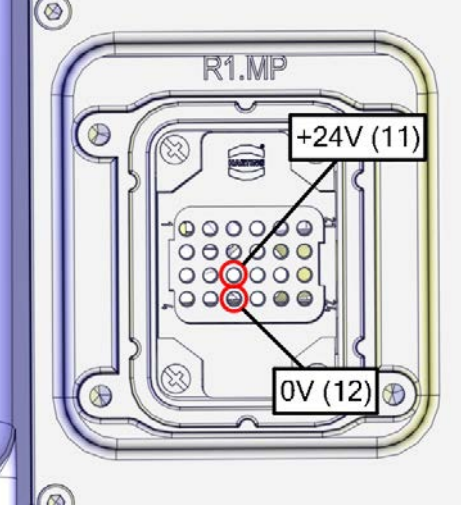
	Action	Note
1	<p> DANGER</p> <p>Incorrect connections, such as supplying power to the wrong pin, may cause all brakes to be released simultaneously!</p>	

Continues on next page

2 Installation and commissioning

2.3.3 Manually releasing the brakes

Continued

Action	Note
<p>2 Supply +24V on pin 11 and 0V on pin 12.</p> <p> Note</p> <p>Do not interchange the 24V and 0V pins. If they are mixed up, damage can be caused to the brake release unit and to the system board.</p>	 <p>xx140000031</p>

2.3.4 Orienting and securing the robot

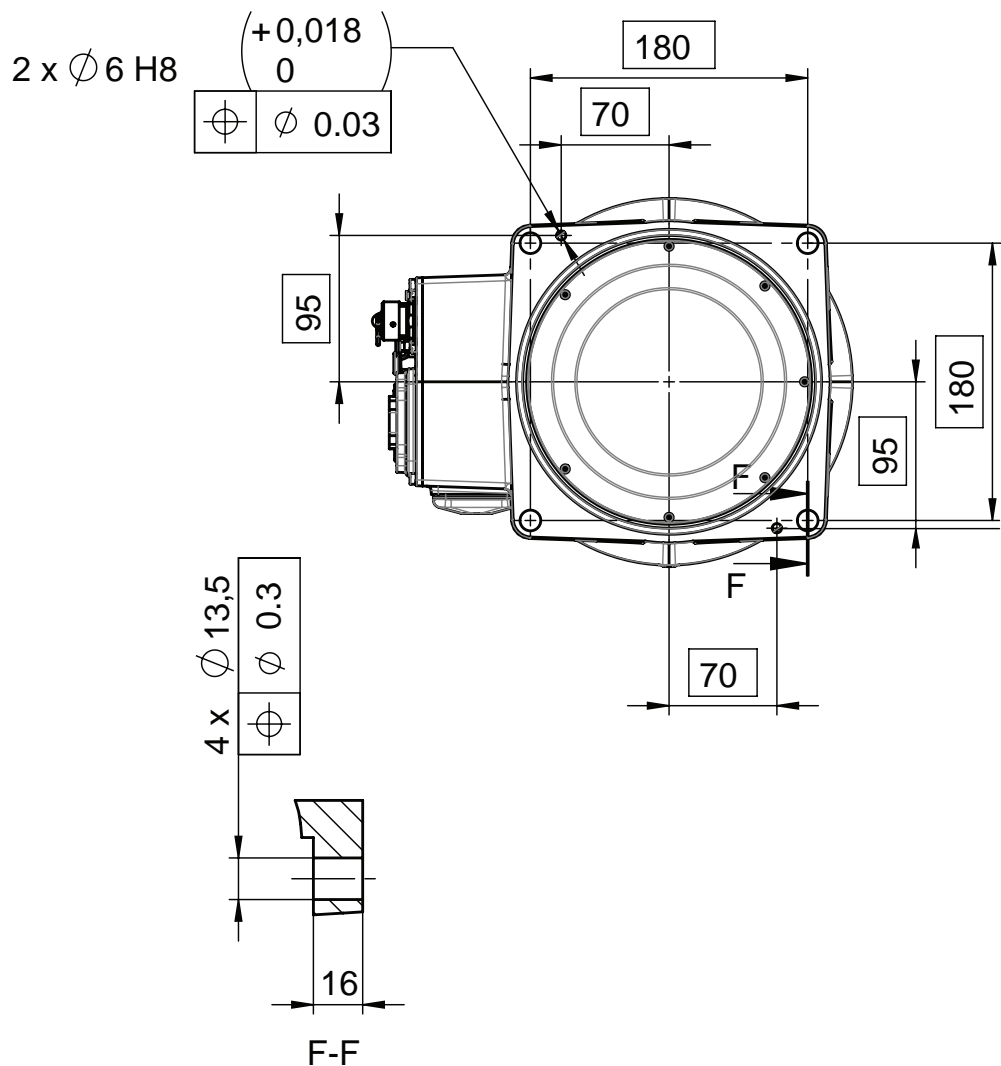
Introduction

This section details how to orient and secure the robot to the foundation or base plate in order to run the robot safely. The requirements made on the foundation are shown in sections:

- [Loads on foundation, robot on page 51](#)
- [Requirements, foundation on page 52.](#)

Hole configuration, base

The illustration shows the hole configuration used when securing the robot.



xx130000368

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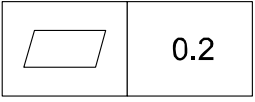
2 Installation and commissioning

2.3.4 Orienting and securing the robot

Continued

Specification, attachment screws and pins

The table specifies the type of securing screws and washers to be used to secure the robot directly to the foundation. It also specifies the type of pins to be used.

Suitable screws	M12x35 (robot installation directly on foundation)
Quantity	4 pcs
Quality	8.8
Suitable washer	13 x 20 x 2, steel hardness class 300HV
Guide pins	2 pcs, D6x20, ISO 2338 - 6m6x20 - A1
Tightening torque	55 Nm \pm 5 Nm
Length of thread engagement	Minimum 17 mm for ground with material yield strength 150 MPa
Level surface requirements	 xx0900000643

Installation of extra O-ring

For robots with protection class IP67

For robots with protection type FoundryPlus

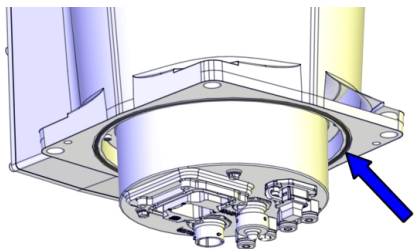
For robots with protection type Clean Room

For robots with food grade lubrication

For robots with protection type Hygienic

Manipulator cables routed from below



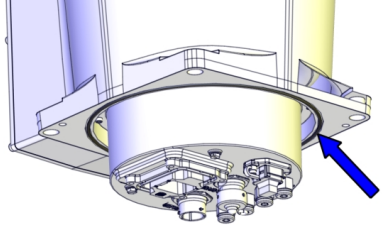
The O-ring specified below is delivered together with the robot and must be installed to the bottom of the base during installation.

Equipment	Art. no.	Note
O-ring	3HAB3772-141	For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Used with manipulator cables routed from below  xx1500000241

Continues on next page

Orienting and securing the robot

Use this procedure to orient and secure the robot.

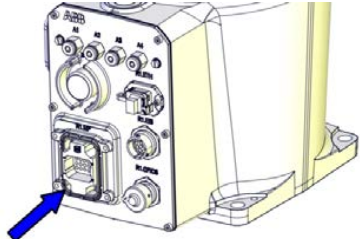
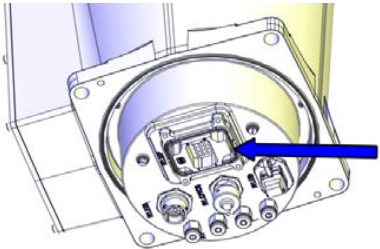
	Action	Information
1	Make sure the installation site for the robot conforms to the specifications in section: <ul style="list-style-type: none"> • Pre-installation procedure on page 49. 	
2	Prepare the installation site with attachment holes.	The hole configuration of the base is shown in the figure in: <ul style="list-style-type: none"> • Hole configuration, base on page 75
3	 CAUTION The robot weighs . All lifting equipment must be sized accordingly! IRB 1200-5/0.9: 54 kg IRB 1200-7/0.7: 52 kg	
4	 CAUTION When the robot is put down after being lifted or transported, there is a risk of it tipping, if not properly secured.	
5	Lift the robot to its installation site.	How to lift the robot is described in section: <ul style="list-style-type: none"> • Lifting robot with roundslings on page 65
6	For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Cabling routed from below Fit the O-ring 3HAB3772-141 to underneath the robot base.	 xx1500000241
7	Fit two <i>pins</i> to the holes in the base.	2 pcs, D6x20, ISO 2338 - 6m6x20 - A1
8	Guide the robot gently, using the attachment screws while lowering it into its mounting position.	Make sure the robot base is correctly fitted onto the pins.
9	Fit the <i>securing screws</i> and <i>washers</i> in the attachment holes of the base.	Screws: M12x35 (robot installation directly on foundation), quality: 8.8
10	Tighten the bolts in a criss-cross pattern to ensure that the base is not distorted.	Tightening torque: 55 Nm ± 5 Nm

Continues on next page

2 Installation and commissioning

2.3.4 Orienting and securing the robot

Continued

	Action	Information
11	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Fit the O-ring 3HAB3772-19 to the main power connector on the robot base.</p>	<p>Robots with manipulator cables routed from the rear of the base:</p>  <p>xx150000243</p> <p>Robots with manipulator cables routed from below (option 996-1):</p>  <p>xx150000242</p>

Securing robot on a mounting plate

When bolting a mounting plate or frame to a concrete floor, follow the general instructions for expansion-shell bolts.

Screw joints must be able to withstand the stress loads defined in section [Loads on foundation, robot on page 51](#).

2.3.5 Setting the system parameters for a suspended or tilted robot

General

The robot is configured for mounting parallel to the floor, without tilting, on delivery. The method for mounting the robot in a suspended (upside down) or tilted position is basically the same as for floor mounting, but the system parameters that describe the mounting angle (how the robot is oriented relative to the gravity) must be re-defined.



Note

With suspended installation, make sure that the gantry or corresponding structure is rigid enough to prevent unacceptable vibrations and deflections, so that optimum performance can be achieved.



Note

The allowed mounting positions are described in the product specification for the robot. The requirements on the foundation are described in [Requirements, foundation on page 52](#).

System parameters



Note

The mounting angle must be configured correctly in the system parameters so that the robot system can control the movements in the best possible way. An incorrect definition of the mounting angle will result in:

- Overloading the mechanical structure.
- Lower path performance and path accuracy.
- Some functions will not work properly, for example *Load Identification* and *Collision detection*.

Gravity Beta

If the robot is mounted upside down or on a wall (rotated around the y-axis), then the robot base frame and the system parameter *Gravity Beta* must be redefined. *Gravity Beta* should then be π (+3.141593) if the robot is mounted upside down (suspended), or $\pm\pi/2$ (± 1.570796) if mounted on a wall.

The *Gravity Beta* is a positive rotation direction around the y-axis in the base coordinate system. The value is set in radians.

Gravity Alpha

If the robot is mounted on a wall (rotated around the x-axis), then the robot base frame and the system parameter *Gravity Alpha* must be redefined. The value of *Gravity Alpha* should then be $\pm\pi/2$ (± 1.570796).

Continues on next page

2 Installation and commissioning

2.3.5 Setting the system parameters for a suspended or tilted robot

Continued

The *Gravity Alpha* is a positive rotation direction around the x-axis in the base coordinate system. The value is set in radians.



Note

The system parameter *Gravity Alpha* is not supported for all robot types. It is not supported for IRB 140, IRB 1410, IRB 1600ID, IRB 2400, IRB 4400, IRB 6400R, IRB 6400 (except for IRB 6400 200/2.5 and IRB 6400 200/2.8), IRB 6600, IRB 6650, IRB 6650S and IRB 7600 (except for IRB 7600 325/3.1).

If the robot does not support *Gravity Alpha*, then use *Gravity Beta* along with the recalibration of axis 1 to define the rotation of the robot around the x-axis.



Note

The parameter is supported for all robots on track when the system parameter *7 axes high performance motion* is set, see *Technical reference manual - System parameters*.

Gamma Rotation

Gamma Rotation defines the orientation of the robot foot on the travel carriage (track motion).

Mounting angles and values

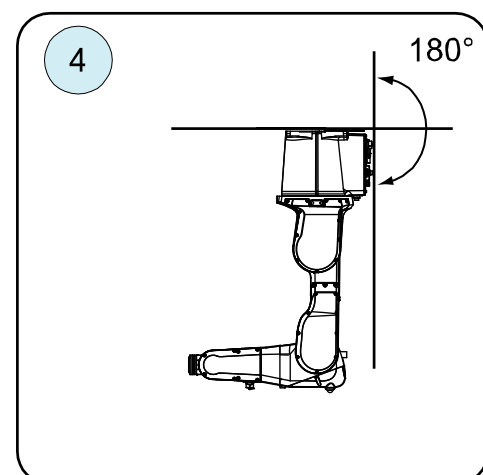
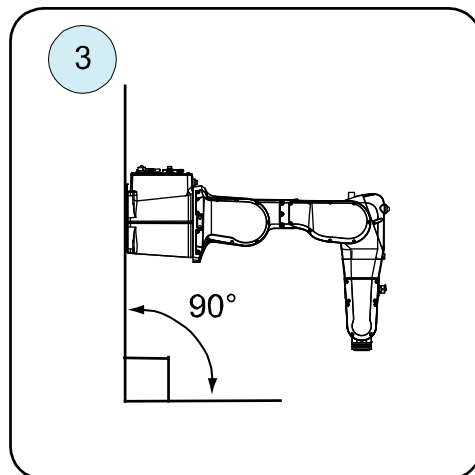
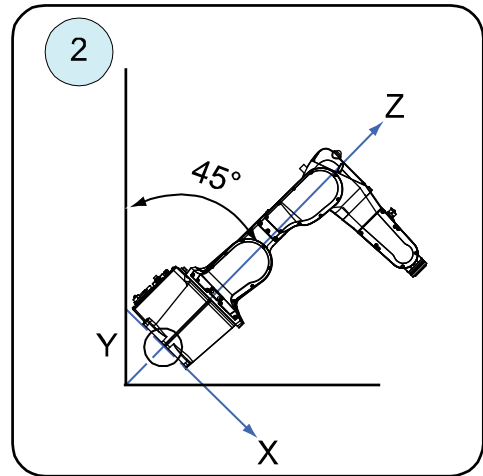
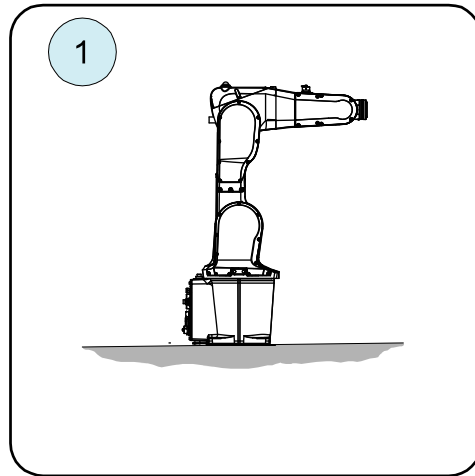
The parameter *Gravity Beta* (or *Gravity Alpha*) specifies the mounting angle of the robot in radians. It is calculated in the following way.

$\text{Gravity Beta} = A^\circ \times 3.141593/180 = B \text{ radians}$, where **A** is the mounting angle in degrees and **B** is the mounting angle in radians.

Example of position	Mounting angle (A °)	Gravity Beta
Floor mounted	0°	0.000000 (Default)
Tilted mounting	45°	0.785398
Wall mounting	90°	1.570796
Suspended mounting	180°	3.141593

Continues on next page

Examples of mounting angles tilted around the Y axis (*Gravity Beta*)



xx140000682

Pos 1	Floor mounted
Pos 2	Mounting angle 45° (Tilted)
Pos 3	Mounting angle 90° (Wall)
Pos 4	Mounting angle 180° (Suspended)

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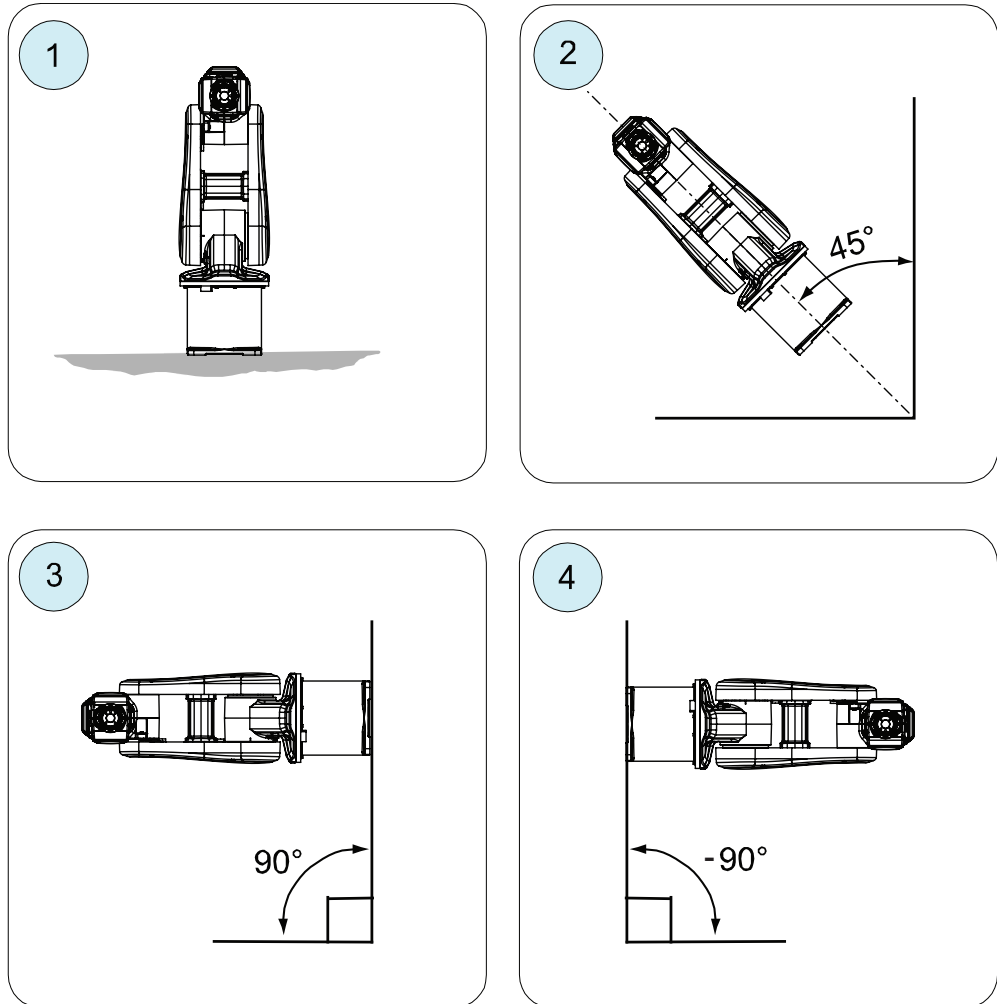
2 Installation and commissioning

2.3.5 Setting the system parameters for a suspended or tilted robot

Continued

Examples of mounting angles tilted around the X axis (*Gravity Alpha*)

The following illustration shows the IRB 120, but the same principle applies for all robots.



xx1500000532

Pos	Mounting angle	Gravity Alpha
1	0° (Floor mounted)	0
2	45° (Tilted)	0.785398
3	90° (Wall)	1.570796
4	-90° (Wall)	-1.570796



Note

For suspended robots (180°), it is recommended to use *Gravity Beta* instead of *Gravity Alpha*.

Continues on next page

Defining the parameter in RobotWare

The value of the system parameters that define the mounting angle must be redefined when changing the mounting angle of the robot. The parameters belong to the type *Robot*, in the topic *Motion*.

How to calculate a new value is detailed in [Mounting angles and values on page 80](#).

The system parameters are described in *Technical reference manual - System parameters*.

The system parameters are configured in RobotStudio or on the FlexPendant.

2 Installation and commissioning

2.3.6 Loads fitted to the robot, stopping time and braking distances

2.3.6 Loads fitted to the robot, stopping time and braking distances

General

Any loads mounted on the robot must be defined correctly and carefully (with regard to the position of center of gravity and mass moments of inertia) in order to avoid jolting movements and overloading motors, gears and structure.



CAUTION

Incorrectly defined loads may result in operational stops or major damage to the robot.

References

Load diagrams, permitted extra loads (equipment) and their positions are specified in the product specification. The loads must be defined in the software.

- *Operating manual - IRC5 with FlexPendant*
- *Operating manual - OmniCore*

Stopping time and braking distances

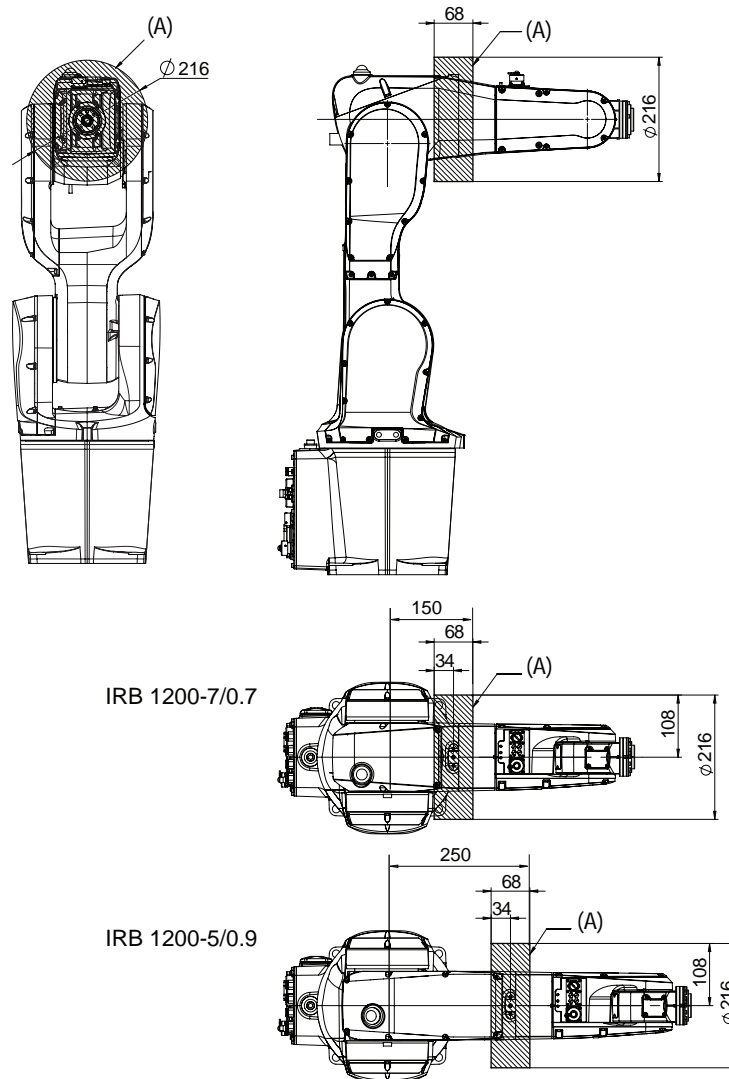
The performance of the motor brake depends on if there are any loads attached to the robot. For more information, see product specification for the robot.

2.3.7 Fitting of equipment on the robot

2.3.7.1 Introduction to fitting of equipment

General

Extra loads can be mounted on to the upper arm. Definitions of load area and permitted load are shown in figure below. The center of gravity of the extra load shall be within the marked load areas. The robot is supplied with holes for fitting of extra equipment. (See [Holes for fitting extra equipment on page 86](#)).



xx130000384

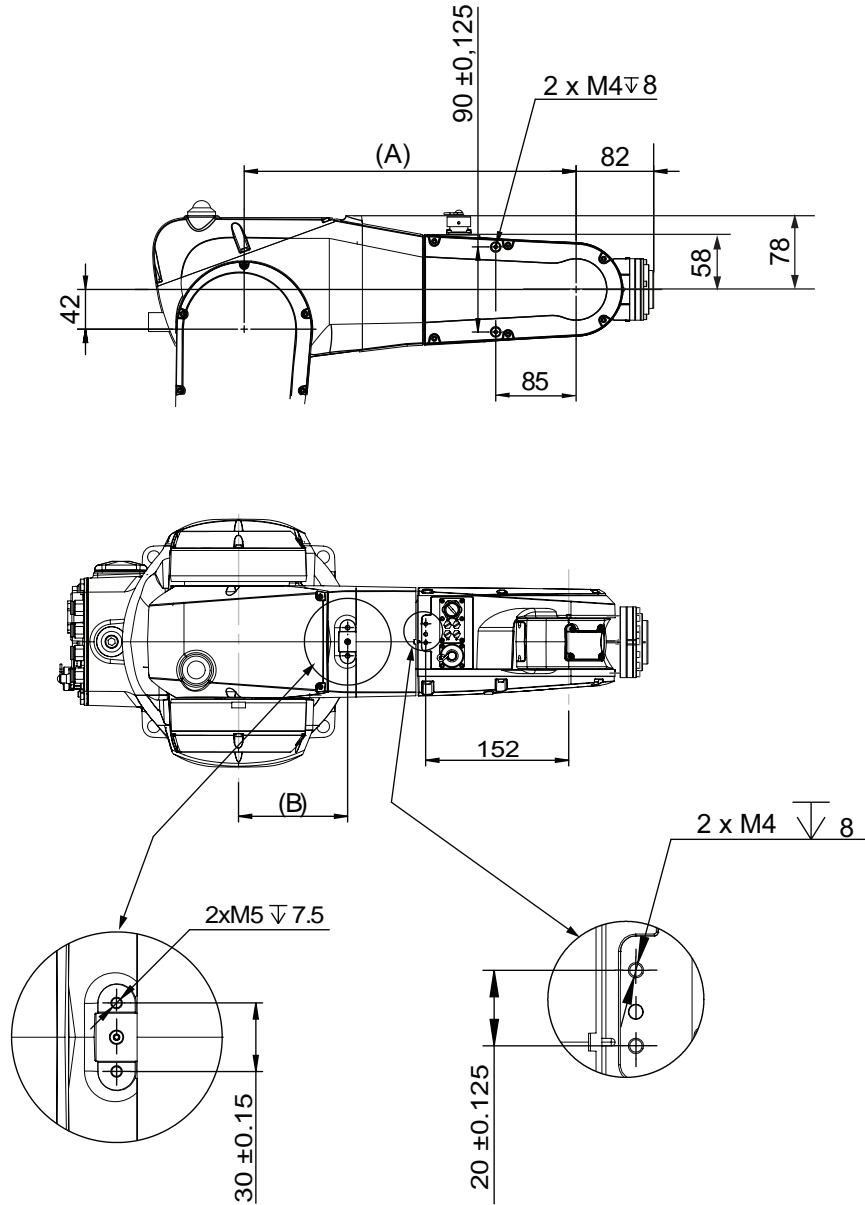
Load area (A)	Max load
IRB 1200-5/0.9	0.3 kg
IRB 1200-7/0.7	

2 Installation and commissioning

2.3.7.2 Holes for fitting extra equipment

2.3.7.2 Holes for fitting extra equipment

Upper arm



xx1300000381

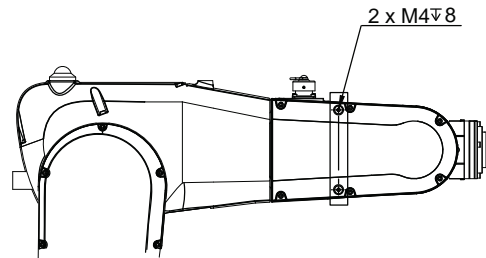
Pos	Description
A	IRB 1200-5/0.9 = 451 mm, IRB 1200-7/0.7 = 351 mm
B	IRB 1200-5/0.9 = 216 mm, IRB 1200-7/0.7 = 116 mm

Continues on next page



Note

The two M4 thread holes shown in the following figure are used for fitting the cable harness or air hoses of the tools rather than fitting extra equipment.



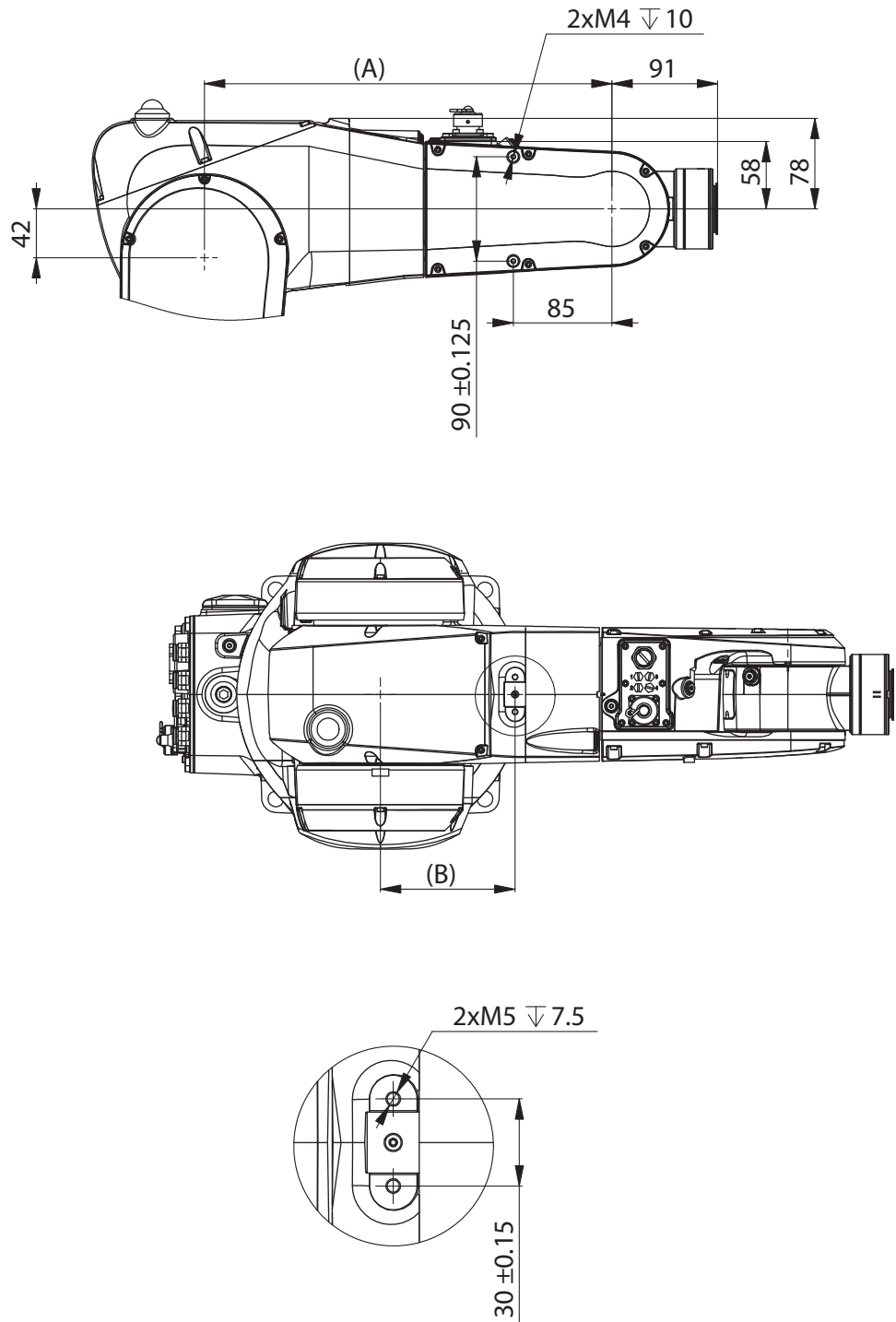
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2 Installation and commissioning

2.3.7.2 Holes for fitting extra equipment

Continued

Upper arm for Hygienic robots



xx2100001279

Pos	Description
A	IRB 1200-5/0.9 = 451 mm, IRB 1200-7/0.7 = 351 mm
B	IRB 1200-5/0.9 = 216 mm, IRB 1200-7/0.7 = 116 mm

Continues on next page

2 Installation and commissioning

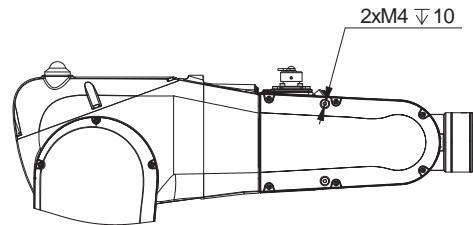
2.3.7.2 Holes for fitting extra equipment

Continued



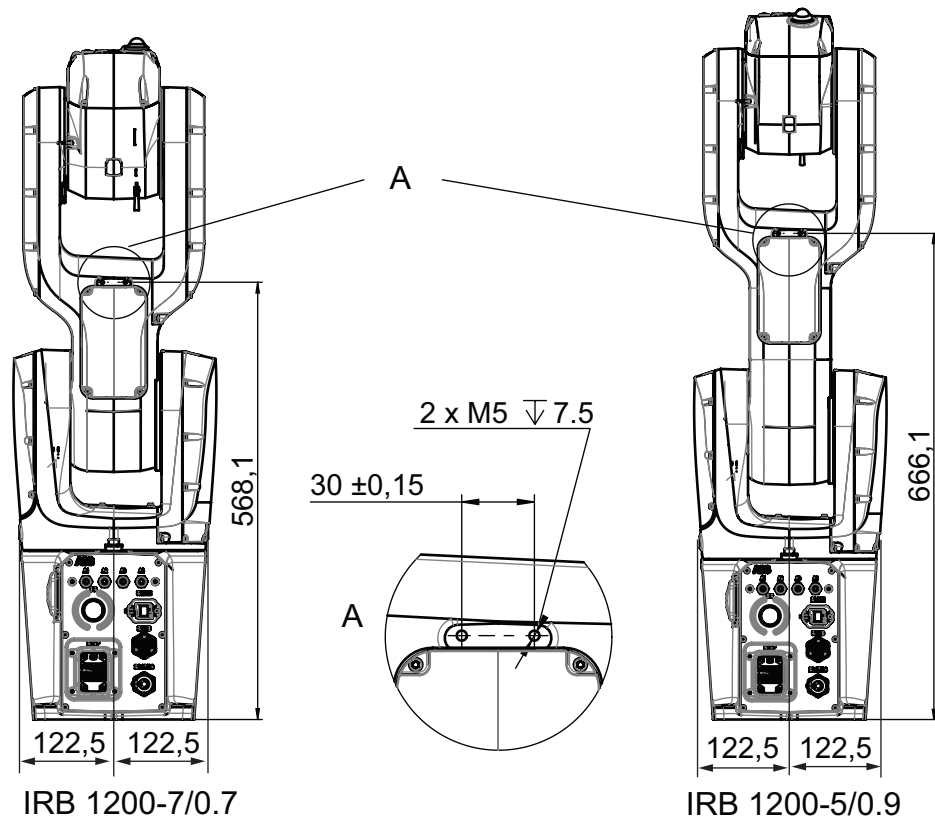
Note

The two M4 thread holes shown in the following figure are used for fitting the cable harness or air hoses of the tools rather than fitting extra equipment.



xx2100001280

Lower arm



xx1300000382

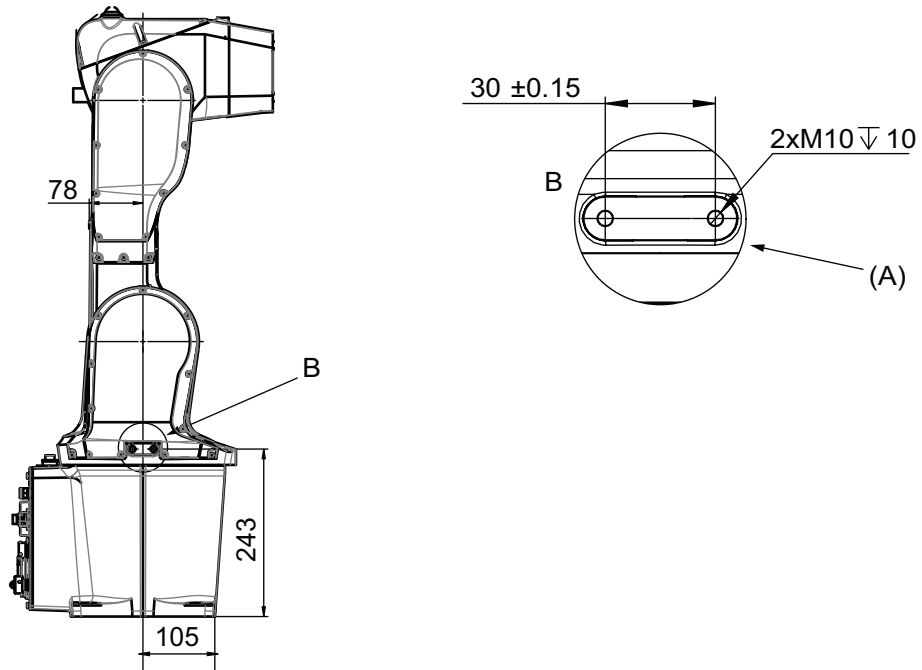
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2 Installation and commissioning

2.3.7.2 Holes for fitting extra equipment

Continued

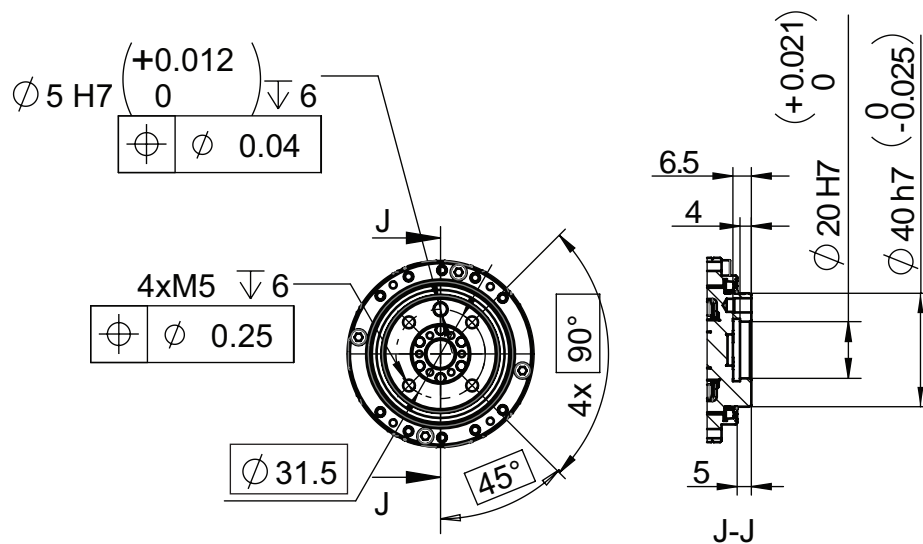
Frame



xx1400000590

Pos	Description
A	Holes on both sides

Robot tool flange



xx1300000383

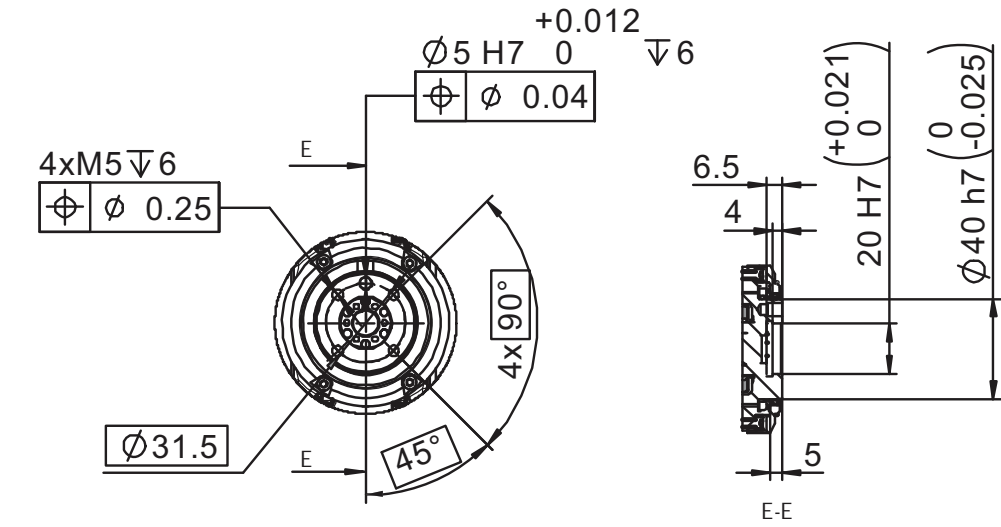
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2 Installation and commissioning

2.3.7.2 Holes for fitting extra equipment

Continued

Robot tool flange for Foundry Plus robots



xx1600001322

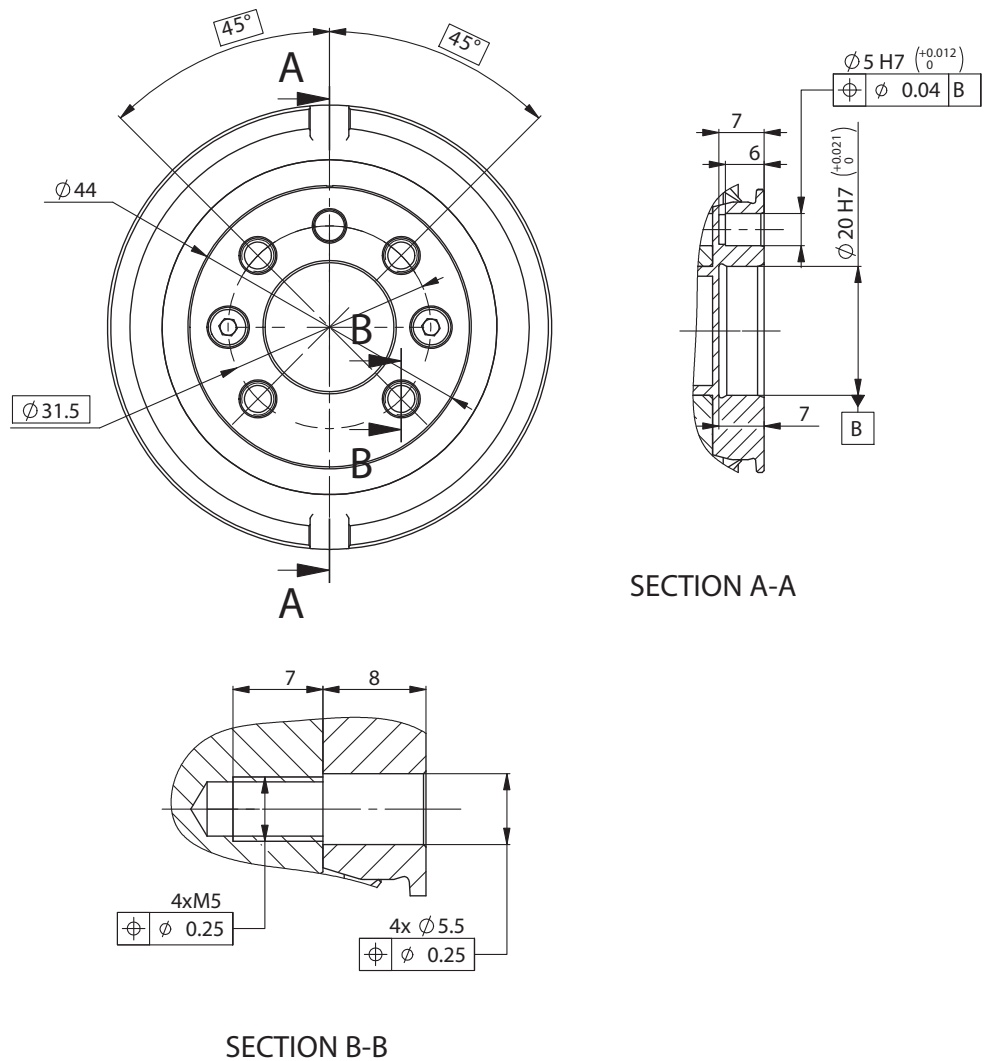
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2 Installation and commissioning

2.3.7.2 Holes for fitting extra equipment

Continued

Robot tool flange for Hygienic robots



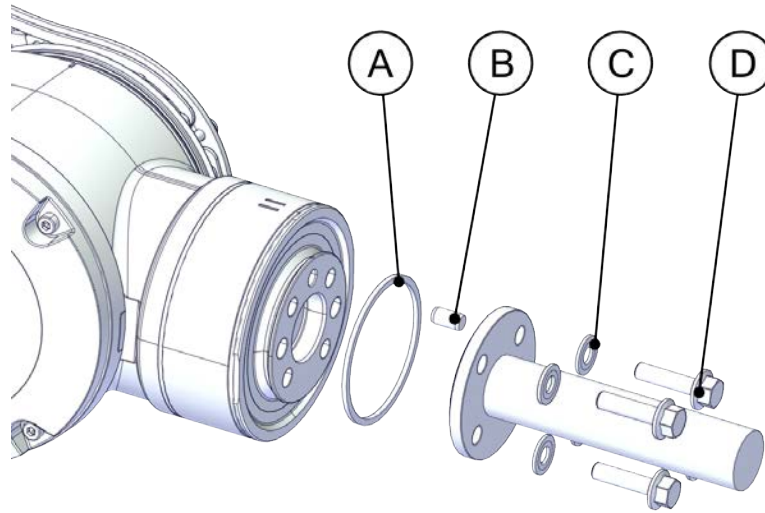
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Fastener quality

When fitting tools on the tool flange, only use screws with quality 12.9. For other equipment use suitable screws and tightening torque for your application.

2.3.7.3 Fitting tools on Hygienic robots

For robots with protection type Hygienic, the gap between the tool flange and tool must be sealed by fitting a gasket, guide pin, stainless flange bolts and FDA washers, which are packaged (package number: 3HAC078800-001) with the robot at delivery.



xx2100002211

Item	Description	Qty.	Note
A	Gasket	1	
B	Guide pin	1	
C	FDA washers	4	
D	Stainless flange bolts	4	Tightening torque: 6 Nm Always apply a little grease Molykote P1900 to the bolt thread before fitting the tool using the bolts.

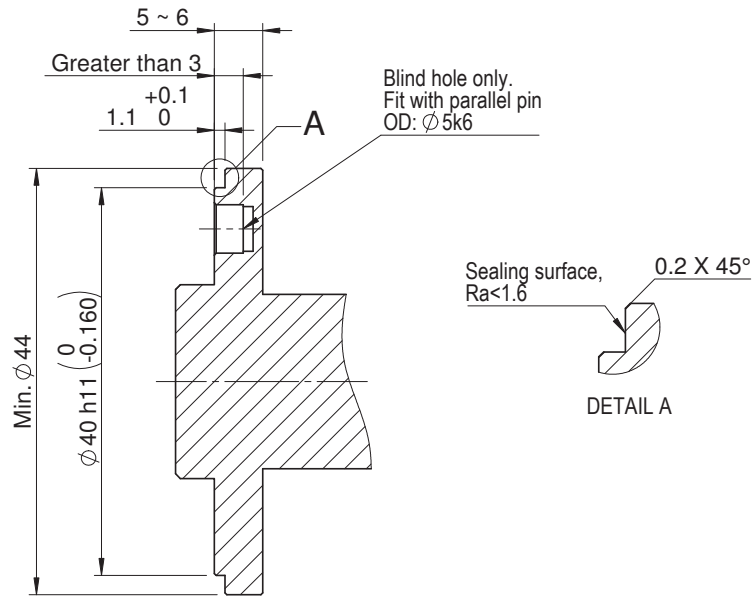
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2 Installation and commissioning

2.3.7.3 Fitting tools on Hygienic robots

Continued

When designing the tools to be fit on the tool flange, make sure the tool dimension meets the following requirements in addition to the dimension of the robot tool flange specified in [Robot tool flange on page 90](#).



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2.4 Installation of options

2.4.1 Installing the signal lamp on IRC5 robots

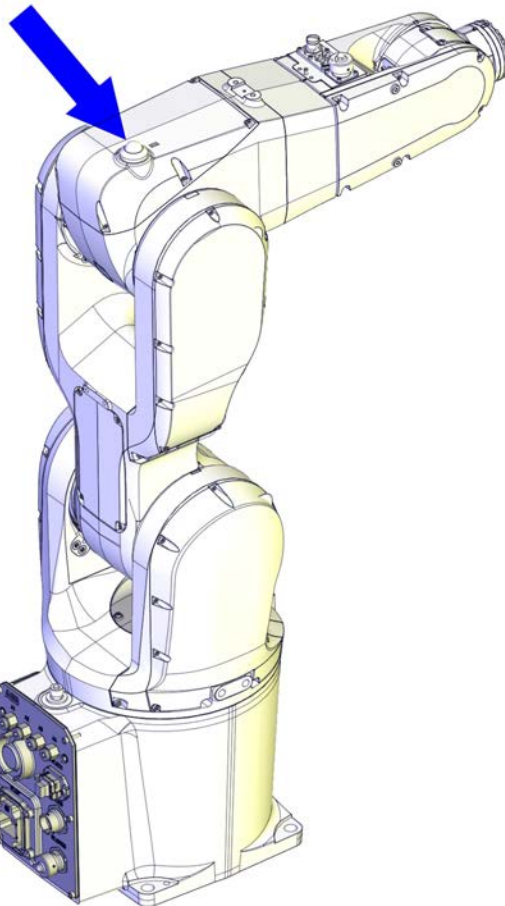
General

A signal lamp with an yellow fixed light can be mounted on the robot, as a safety device. The signal lamp is required on an UL/UR approved robot.

The lamp is active in MOTORS ON mode.

Location of signal lamp

The signal lamp is located as shown in the figure.



xx130000455

Required spare parts

Spare part	Article number	Note
Signal lamp	3HAC16738-1	

Continues on next page

2 Installation and commissioning



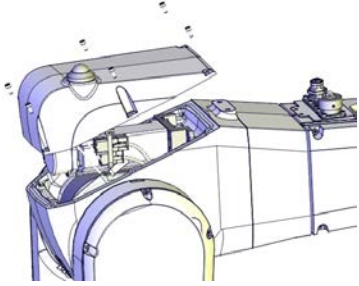
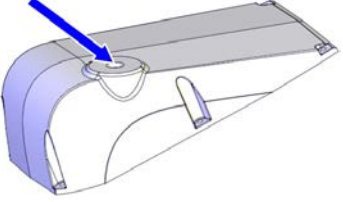
2.4.1 Installing the signal lamp on IRC5 robots

Continued

Required tools

Equipment, etc.	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .

Installing the signal lamp

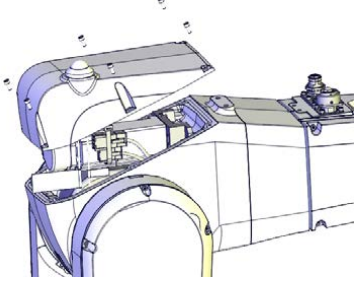


	Action	Note
1	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Remove the cover from the upper arm housing.	 xx1300000464
4	Drill a hole with a diameter of 22.5 mm in the center of the raised platform.	 xx1300000465
5	Fit the lamp and tighten the nut.	
6	Connect the two lamp cables connectors (R3.H1 and R3.H2) to the cable harness lamp connectors (H1 and H2).	

Continues on next page

2 Installation and commissioning

2.4.1 Installing the signal lamp on IRC5 robots

Continued

	Action	Note
7	Refit the cover on the upper arm housing.	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p>  <p>xx1300000456</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
8	<p>For robots with protection type Clean Room: For robots with food grade lubrication: For robots with protection type Hygienic: Clean, seal and paint the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160.</p> <p> Note</p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>	
9	The signal lamp is now ready for use and is lit in MOTORS ON mode.	

2 Installation and commissioning

2.4.2 Installing the signal lamp for OmniCore robots

2.4.2 Installing the signal lamp for OmniCore robots




Description

A signal lamp with a yellow fixed light can be mounted in the cell or any other visible location, and driven by I/O signal or MON_LAMP signal from the controller.



Function

The lamp is active in MOTORS ON mode.


Installation of signal lamp from I/O signal

	Action
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.
2	For robots with OmniCore C line Connect the lamp cable connector to the local I/O connector on the controller.  Note The local I/O connectors provides 16 digital output signals for use.
3	For robots with OmniCore E line Connect the lamp cable connector to the I/O connector on the controller.  Note The I/O connectors provides 8 digital output signals for use.
4	Configure the lamp by adding a <i>System Output</i> type signal with status set to <i>Motors On State</i> .
5	The lamp is now ready for use and is lit in MOTORS ON mode.

Installation of signal lamp from MON_LAMP signal

	Action
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.
2	For robots with OmniCore C line Connect the lamp cable connector to the X15 connector on the controller.  Note The X15 connector provides MON_LAMP output signals for use. For more details, see chapter <i>Descriptions for connectors</i> in OmniCore product manuals.

Continues on next page

	Action
3	<p>For robots with OmniCore E line Connect the lamp cable connector to the MON connector on the controller.</p> <p> Note</p> <p>The MON connector provides MON_LAMP output signals for use. For more details, see chapter <i>Descriptions for connectors</i> in OmniCore product manuals.</p>
4	The lamp is now ready for use and is lit in MOTORS ON mode.

Further information

Further information about the MOTORS ON/MOTORS OFF mode may be found in the product manual for the controller.

Further information about how to set up I/O system may be found in *Technical reference manual - System parameters*.

2 Installation and commissioning

2.5.1 Axes with restricted working range

2.5 Restricting the working range

2.5.1 Axes with restricted working range

General

When installing the robot, make sure that it can move freely within its entire working space. If there is a risk that it may collide with other objects, its working space should be limited.

The working range of the following axes may be restricted:

- Axis 1, hardware (mechanical stop) and software. **Note!** The axis 1 stop is a fixed stop that must be installed during operation of robot!
- Axis 2, hardware (mechanical stop) and software. **Note!** The axis 2 stop is a fixed stop that must be installed during operation of robot!
- Axis 3, hardware (mechanical stop) and software. **Note!** The axis 3 stop is a fixed stop that must be installed during operation of robot!
- Axis 4, hardware (mechanical stop) and software. **Note!** The axis 4 stop is a fixed stop that must be installed during operation of robot!
- Axis 5, hardware (mechanical stop) and software
- Axis 6, software

This section describes how to install hardware that restricts the working range.



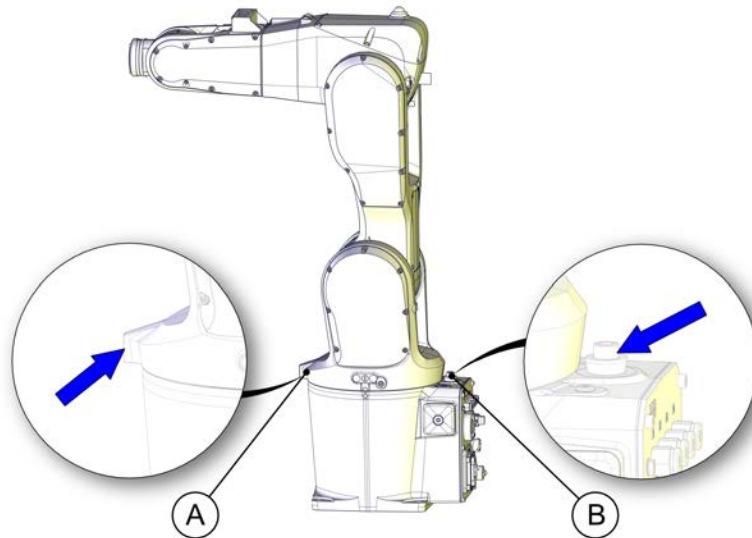
Note

Adjustments must also be made in the robot configuration software (system parameters). References to relevant manuals are included in the installation procedures.

2.5.2 Mechanically restricting the working range

Location of mechanical stops

The figures shows where the mechanical stops are placed on the robot.



xx1700001293

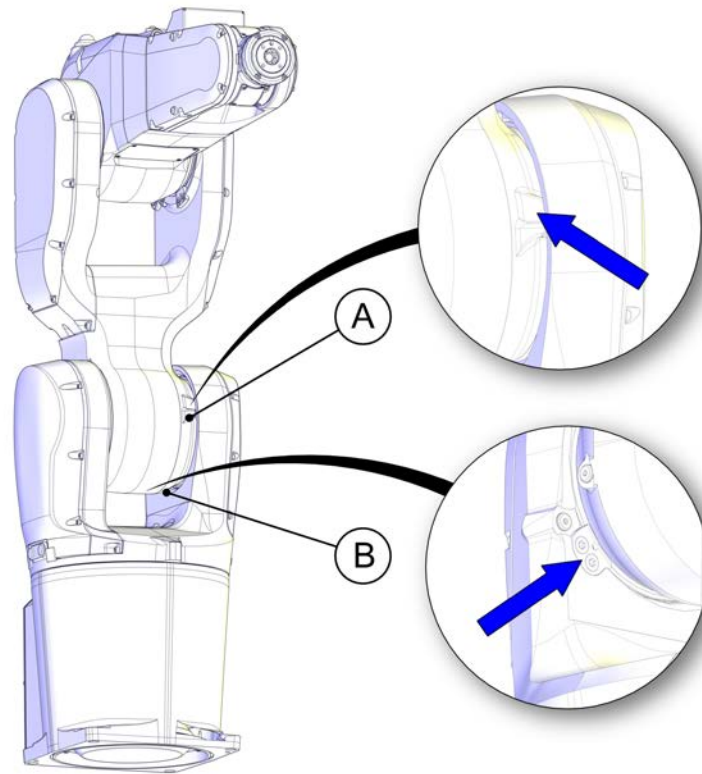
A	Mechanical stop axis 1 (swing)
B	Mechanical stop axis 1 (base)

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2 Installation and commissioning

2.5.2 Mechanically restricting the working range

Continued



xx1700001294

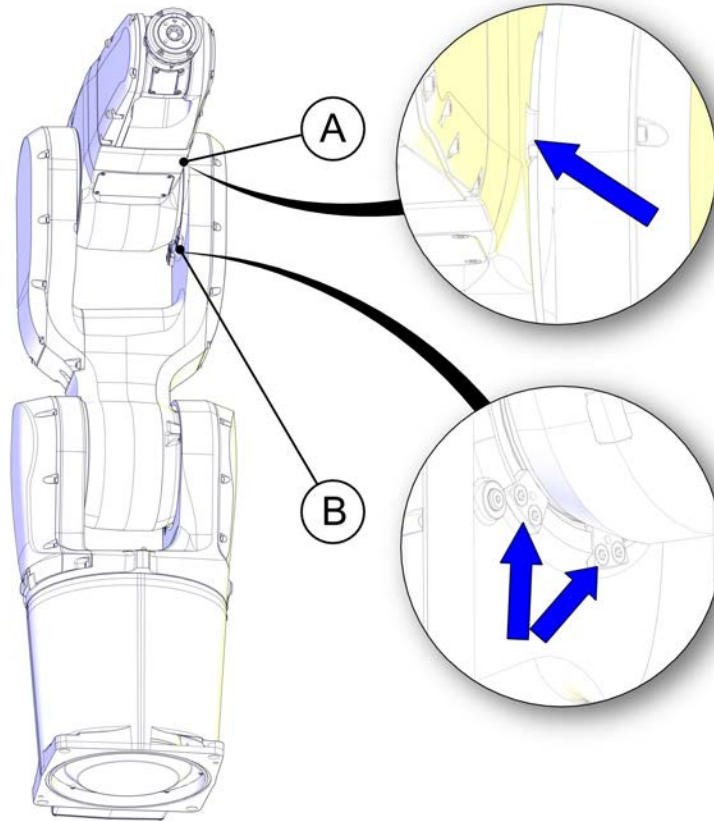
A	Mechanical stop axis 2 (lower arm)
B	Mechanical stop axis 2 (swing)

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2 Installation and commissioning

2.5.2 Mechanically restricting the working range

Continued



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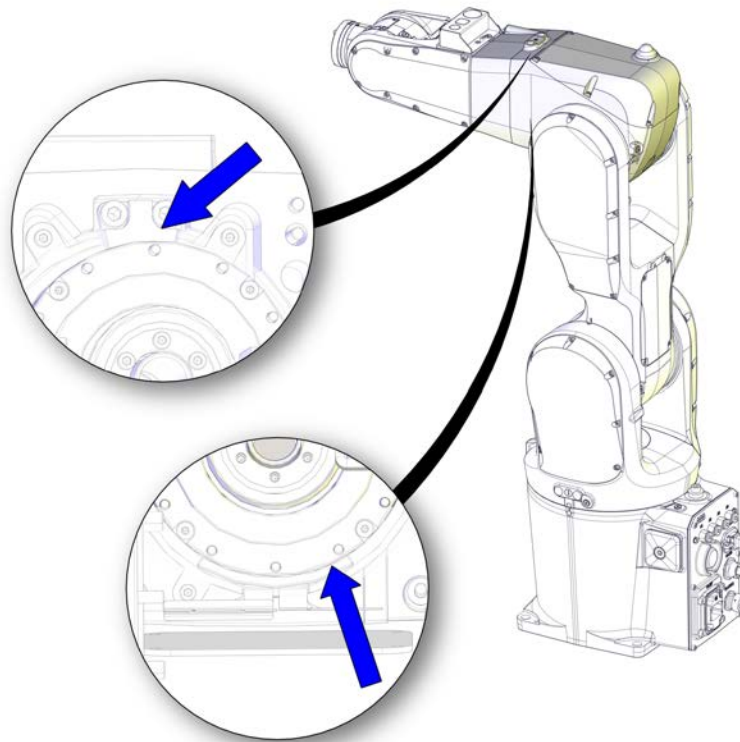
A	Mechanical stop axis 3 (lower arm)
B	Mechanical stop axis 3 (tubular)

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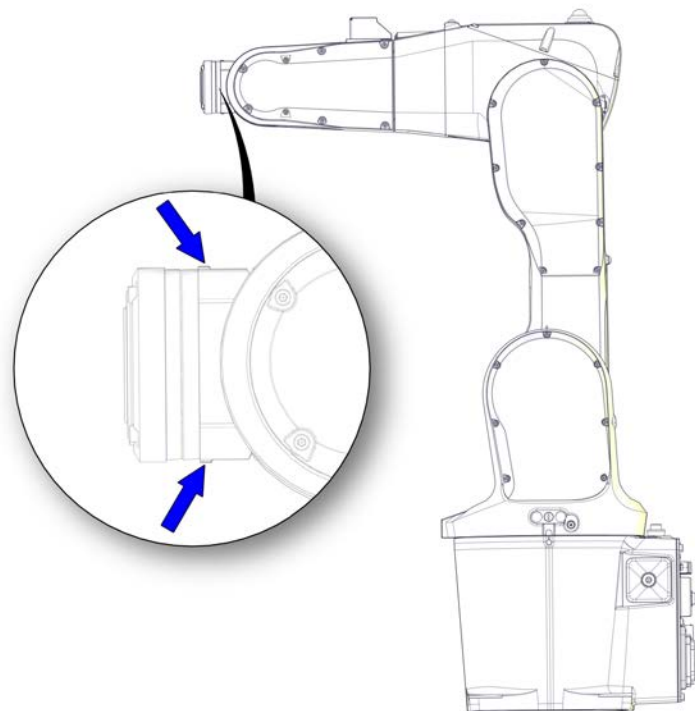
2 Installation and commissioning

2.5.2 Mechanically restricting the working range

Continued



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xx1700001297

Continues on next page

The axis-1, axis-2, axis-3, and axis-4 stops are fixed stops that must be installed during operation of robot. For details about how to install the stops, see:

- [Replacing the axis-1 mechanical stop on page 640](#)
- [Replacing the axis-2 mechanical stop on page 456](#)
- [Replacing the axis-3 mechanical stop on page 459](#)
- [Replacing the axis-4 mechanical stop on page 462](#)

2 Installation and commissioning

2.6.1 Additional installation procedure, Clean Room

2.6 Making robot ready for operation

2.6.1 Additional installation procedure, Clean Room

General

Robots with protection type Clean Room are specially designed to work in a clean room environment.

Clean Room robots are designed to prevent from particle emission from the robot. For example, the maintenance work possible to perform without cracking the paint. The robot is painted with four layers of polyurethane paint. The last layer being a varnish over labels to simplify cleaning. The paint has been tested regarding outgassing of Volatile Organic Compounds (VOC) and been classified in accordance with ISO 14644-8.

Any Clean Room parts that are replaced must be replaced with parts designed for use in Clean Room environments.

Clean Room class 3

According to **IPA test result**, the robot IRB 1200 is suitable for use in Clean Room environment.

Classification of airborne molecular contamination

Parameter				Outgassing amount		
Area (m ²)	Test duration (s)	Temp (°C)	Performed test	Total detected (ng)	Norm based on 1m ² and 1s(g)	Classification in accordance to ISO 14644-8
4.5E-03	3600	23	TVOC	2848	1.7E-07	-6.8
4.5E-03	60	90	TVOC	46524	1.7E-04	-3.8

Preparations before commissioning a Clean Room robot

During transport and handling of a Clean Room robot, it is likely that the robot has been contaminated with particles of different kinds. Therefore the robot must be carefully cleaned before installation.

Do not apply force on the plastic covers when lifting the robot! This may result in damage or cracks in the paint around the plastic cover.

2.7 Electrical connections

2.7.1 Robot cabling and connection points

Introduction

Connect the robot and controller to each other after securing them to the foundation. The lists below specify which cables to use for each respective application.

Main cable categories

All cables between the robot and controller are divided into the following categories:

Cable category	Description
Robot cables	Handles power supply to and control of the robot's motors as well as feedback from the encoder interface board. Specified in the table Robot cables on page 107 .
Customer cables (option)	Handles communication with equipment fitted on the robot by the customer (low voltage signals). The customer cables also handle Ethernet communication. See the product manual for the controller, see document number in References on page 10 .

Robot cables

These cables are included in the standard delivery. They are completely pre-manufactured and ready to plug in.

Cable sub-category	Description	Connection point, cabinet	Connection point, robot
Robot cable, power	Transfers drive power from the drive units in the control cabinet to the robot motors.	XS1 (IRC5 controllers) X1 (OmniCore controllers)	R1.MP
Robot cable, signals	Transfers encoder data from and power supply to the encoder interface board. Transfers resolver data from and power supply to the serial measurement board.	XS2 (IRC5 controllers) X2 (OmniCore controllers)	R1.EIB

Robot cable, power

The following table lists the power cables for connecting IRC5 controller.

Power cable length	Article number
3 m (IRC5)	3HAC040503-007
7 m (IRC5)	3HAC040503-001
15 m (IRC5)	3HAC040503-002
22 m (IRC5)	3HAC040503-003
30 m (IRC5)	3HAC040503-004

Continues on next page

2 Installation and commissioning

2.7.1 Robot cabling and connection points

Continued

The following table lists the power cables for connecting OmniCore controller.

Power cable length	Article number
3 m (OmniCore)	3HAC061139-001
7 m (OmniCore)	3HAC061139-002
15 m (OmniCore)	3HAC061139-003

Robot cable, signals

The following table lists the signal cables for connecting IRC5 controller.

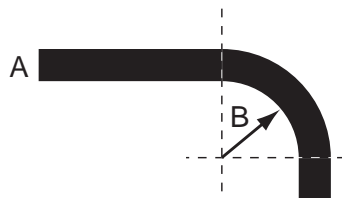
Signal cable length	Article number
3 m (IRC5)	3HAC068916-001
7 m (IRC5)	3HAC068917-001
15 m (IRC5)	3HAC068918-001
22 m (IRC5)	3HAC068919-001
30 m (IRC5)	3HAC068920-001

The following table lists the signal cables for connecting OmniCore controller.

Power cable length	Article number
3 m (OmniCore)	3HAC080671-001
7 m (OmniCore)	3HAC080671-002
15 m (OmniCore)	3HAC080671-003

Bending radius for static floor cables

The minimum bending radius is 10 times the cable diameter for static floor cables.



xx1600002016

A	Diameter
B	Diameter x10

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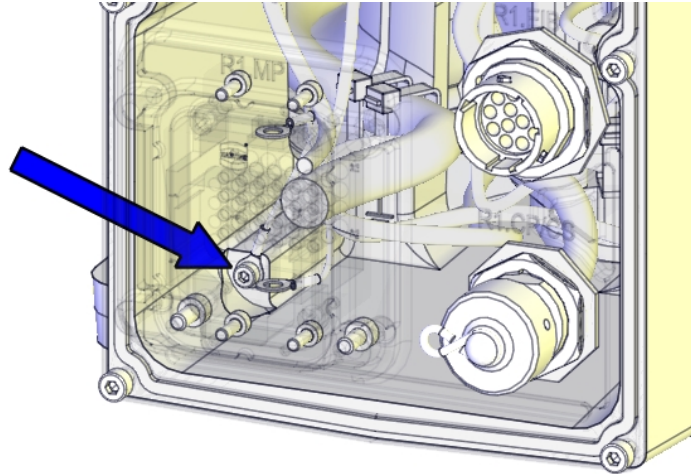
2 Installation and commissioning

2.7.1 Robot cabling and connection points

Continued

Grounding and bonding point on manipulator

There is a grounding/bonding point on the manipulator base. The grounding/bonding point is used for potential equalizing between control cabinet, manipulator and any peripheral devices.



xx1600001081

Installation of extra O-ring

For robots with protection class IP67

For robots with protection type FoundryPlus

For robots with protection type Clean Room

For robots with food grade lubrication

For robots with protection type Hygienic

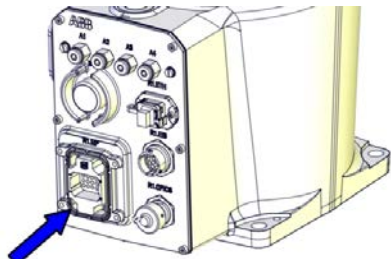
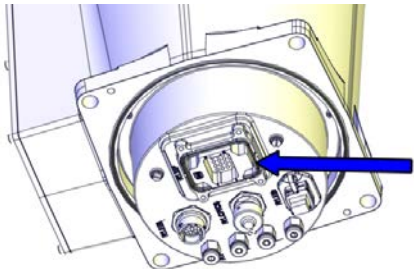
Continues on next page

2 Installation and commissioning

2.7.1 Robot cabling and connection points

Continued

The O-ring specified below is delivered together with the robot and must be installed to the main power connector during electrical installation.

Equipment	Art. no.	Note
O-ring	3HAB3772-19	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Used to seal between the main power cable and the connector. Robots with manipulator cables routed from the rear of the base:</p>  <p>xx1500000243</p> <p>Robots with manipulator cables routed from below (option 996-1):</p>  <p>xx1500000242</p>

Customer cables - CP/CS cable (option)

The following table lists the CP/CS cables for connecting IRC5/IRC5C controller.

CP/CS cable length	Article number
3 m (IRC5)	3HAC049089-001
7 m (IRC5)	3HAC049089-004
15 m (IRC5)	3HAC049089-005
22 m (IRC5)	3HAC049089-006
30 m (IRC5)	3HAC049089-007
3 m (IRC5C)	3HAC049186-001
7 m (IRC5C)	3HAC049186-004
15 m (IRC5C)	3HAC049186-005

Continues on next page

2 Installation and commissioning

2.7.1 Robot cabling and connection points

Continued

CP/CS cable length	Article number
22 m (IRC5C)	3HAC049186-006
30 m (IRC5C)	3HAC049186-007

The following table lists the CP/CS cables for connecting OmniCore controller.

CP/CS cable length	Article number
3 m (OmniCore)	3HAC049186-001
7 m (OmniCore)	3HAC049186-004
15 m (OmniCore)	3HAC049186-005

Customer cables - Ethernet floor cable (option)

The following table lists the Ethernet cables for connecting IRC5/IRC5C controller.

Ethernet floor cable length	Article number
3 m (IRC5/IRC5C)	3HAC055518-001
7 m (IRC5/IRC5C)	3HAC055518-002
15 m (IRC5/IRC5C)	3HAC055518-003
22 m (IRC5/IRC5C)	3HAC055518-004
30 m (IRC5/IRC5C)	3HAC055518-005

The following table lists the Ethernet cables for connecting OmniCore controller.

Ethernet floor cable length	Article number
7 m (OmniCore)	3HAC055518-002
15 m (OmniCore)	3HAC055518-003

2 Installation and commissioning

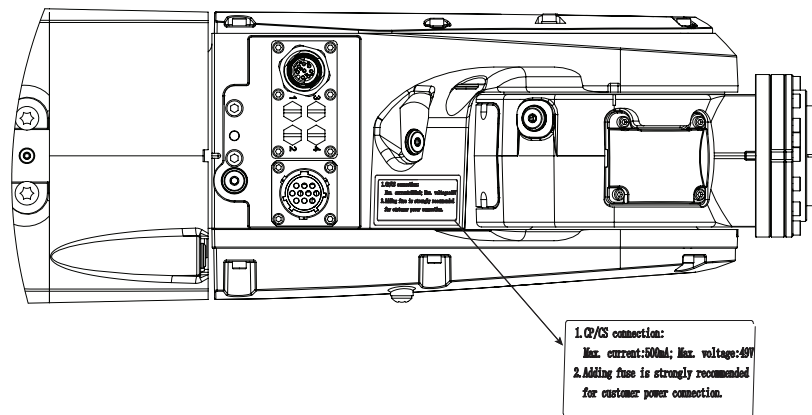
2.7.2 Customer connections

2.7.2 Customer connections

Introduction to customer connections

The cables for customer connection are integrated in the robot and the connectors are placed on the tubular housing (upper arm) and one at the base. There is one connector R4.CP/CS at the tubular housing. Corresponding connector R1.CP/CS is located at the base.

It is recommended to use a fuse protector for customer connection; otherwise, application overload will burn out the CP/CS cables in the robot. Detailed information about the CP/CS connection is provided in a warning label on the tubular housing.

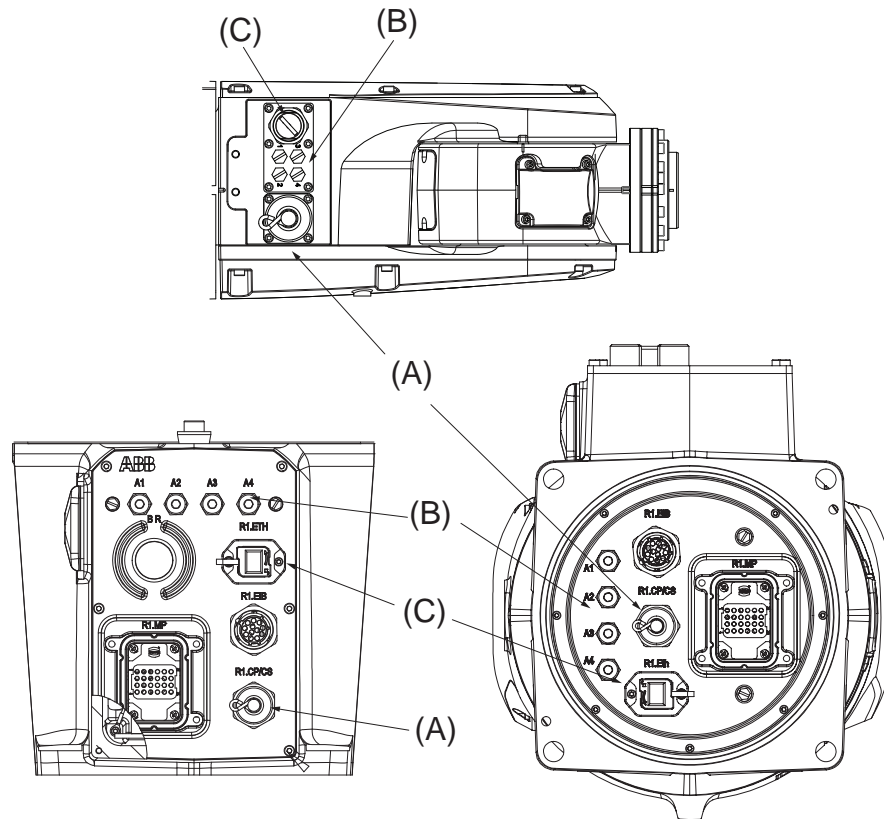


xx1600001687

There is also connections for Ethernet, one connector R4.Ethernet at the tubular housing and the corresponding connector R1.Ethernet located at the base.

Continues on next page

Hose for compressed air is also integrated into the manipulator. There are 4 inlets (R1/8") and 4 outlets (M5) on the tubular housing.



xx130000385

Position	Connection	Description	Number	Value
A	(R1)R4.CP/CS	Customer power/signal	10	49 V, 500 mA
B	Air	Max. 5 bar	4	Outer diameter of air hose: 4 mm
C	(R1)R4.Ethernet	Customer Ethernet	8	100/10 Base-TX

Connectors

The tables describes the connectors on base and tubular housing (upper arm).

Connectors, base

Position	Description	Art. no.
Robot	Pin connector 10p, bulkhead	3HAC022117-002
Customer connector	Connector set R1.CP/CS	3HAC037038-001

Connectors, tubular housing

Position	Description	Art. no.
Robot	Socket connector 10p, flange mounted	3HAC023624-002
Customer connector	Connector set R3.CP/CS	3HAC037070-001

Continues on next page

2 Installation and commissioning

2.7.2 Customer connections

Continued

Air, connector

Position	Description	Art. no.
Robot	4xM5	
Customer cable	Air connector	3HAC032049-001

2.8 Start of robot in cold environments

Introduction

This section describes how to start the robot in a cold environment if it is not starting the normal way.

Problems with starting the robot

Event message from Motion Supervision

Use this procedure if an event message indicates a problem with Motion supervision at start-up. More information about Motion Supervision is found in *Technical reference manual - System parameters*.

	Action	Note
1	Turn off Motion Supervision.	
2	Start the robot.	
3	When the robot has reached normal working temperature, the Motion Supervision can be turned on again.	

Robot stopping with other event message

Use this procedure if the robot is not starting.

	Action	Note
1	Start the robot with its normal program but with reduced speed.	The speed can be regulated with the RAPID instruction <code>VelSet</code> .

Adjusting the speed and acceleration during warm-up

Depending on how cold the environment is and what program is being used, the speed might need to be ramped up until reached maximum. The table shows examples of how to adjust the speed:

Work cycles	AccSet	Speed/velocity
3 Work cycles	20, 20	v100 (100 mm/s)
5 Work cycles	40, 40	v400 (400 mm/s)
5 Work cycles	60, 60	v600 (600 mm/s)
5 Work cycles	100, 100	v1000 (1000 mm/s)
More than 5 Work cycles	100, 100	Max.

If the program consists of large wrist movements, it is possible that the reorientation velocity, which is always high in predefined velocities, needs to be included in the ramping up.

2 Installation and commissioning

2.9 Test run after installation, maintenance, or repair

2.9 Test run after installation, maintenance, or repair

Safe handling

Use the following procedure after installation, maintenance, or repair, before initiating motion.



DANGER

Initiating motion without fulfilling the following aspects, may increase the risk for injury or cause damage to the robot.

	Action
1	Remove all tools and foreign objects from the robot and its working area.
2	Verify that the robot is properly secured to its position by all screws, before it is powered up.
3	Verify that any safety equipment installed to secure the position or restrict the robot motion during service activity is removed.
4	Verify that the fixture and work piece are well secured, if applicable.
5	Verify that all safety equipment is installed, as designed for the application.
6	Verify that no personnel are inside the safeguarded space.
7	If maintenance or repair has been done, verify the function of the part that was maintained.
8	Verify the application in the operating mode manual reduced speed.

Collision risks



CAUTION

When programming the movements of the robot, always identify potential collision risks before initiating motion.

3 Maintenance

3.1 Introduction

Structure of this chapter

This chapter describes all the maintenance activities recommended for the IRB 1200.

It is based on the maintenance schedule found at the beginning of the chapter. The schedule contains information about required maintenance activities including intervals, and refers to procedures for the activities.

Each procedure contains all the information required to perform the activity, including required tools and materials.

The procedures are gathered in different sections and divided according to the maintenance activity.

Safety information

Observe all safety information before conducting any service work.

There are general safety aspects that must be read through, as well as more specific safety information that describes the danger and safety risks when performing the procedures. Read the chapter [Safety on page 19](#) before performing any service work.

The maintenance must be done by qualified personnel in accordance with the safety requirements set forth in the applicable national and regional standards and regulations.



Note

If the IRB 1200 is connected to power, always make sure that the IRB 1200 is connected to protective earth and a residual current device (RCD) before starting any maintenance work.

For more information see:

- *Product manual - OmniCore C30*
- *Product manual - OmniCore C90XT*
- *Product manual - OmniCore E10*
- *Product manual - IRC5*
- *Product manual - IRC5 Compact*
- [Robot cabling and connection points on page 107.](#)

3 Maintenance

3.2.1 Specification of maintenance intervals

3.2 Maintenance schedule

3.2.1 Specification of maintenance intervals

Introduction

The intervals are specified in different ways depending on the type of maintenance activity to be carried out and the working conditions of the IRB 1200:

- Calendar time: specified in months regardless of whether the system is running or not.
- Operating time: specified in operating hours. More frequent running means more frequent maintenance activities.

Robots with the functionality *Service Information System* activated can show active counters in the device browser in RobotStudio, or on the FlexPendant.

Overhaul

Depending on application and operational environment a complete overhaul may be necessary in average around 30000 hours.

ABB Connected Services and its Assessment tools can help you to identify the real stress level of your robot, and define the optimal ABB support to maintain your robot working.

Contact your local ABB Customer Service to get more information.

3.2.2 Maintenance schedule

Scheduled and non-predictable maintenance

The robot must be maintained regularly to ensure proper function. The maintenance activities and intervals are specified in the table below.

Non-predictable situations also give rise to inspections of the robot. Any damages must be attended to immediately!

Life of each component

The inspection intervals *do not* specify the life of each component.

Activities and intervals, standard equipment

The table below specifies the required maintenance activities and intervals:

Maintenance activities	Regularly ⁱ	Every 12 months	Every 36 months	Every 6000 operating hours	Reference
<i>Cleaning activities</i>					
Cleaning the robot	x				Cleaning the IRB 1200 on page 151
<i>Inspection activities</i>					
Inspecting the robot	x				Check for abnormal wear or contamination. For robots with protection type Clean Room: Inspect daily
Inspecting the paint	x				Inspecting the robot paint on page 121
Inspecting the robot cabling ⁱⁱ	x ⁱⁱⁱ				Inspecting the robot cabling on page 122
Inspecting the information labels		x			Inspecting the information labels on page 123
Inspecting the axis-1 mechanical stop pin	x ^{iv}				Inspecting mechanical stops on page 128
Inspecting the axis-2 mechanical stop	x ^{iv}				Inspecting mechanical stops on page 128
Inspecting the axis-3 mechanical stop	x ^{iv}				Inspecting mechanical stops on page 128
Inspecting the axis-4 mechanical stop	- ^v				
Inspecting the timing belts			x		Inspecting timing belts on page 131
<i>Replacement/changing activities</i>					

Continues on next page

3 Maintenance

3.2.2 Maintenance schedule

Continued

Maintenance activities					Reference
	Regularly ⁱ	Every 12 months	Every 36 months	Every 6000 operating hours	
Replacing the battery pack ^{vi}					Replacing the battery pack on page 136
Replacing the axis-6 sealing set on tool flange for Hygienic robots		x ^{vii}		x ^{vii}	Replacing the sealing set on tool flange of Hygienic robots on page 146

ⁱ "Regularly" implies that the activity is to be performed regularly, but the actual interval may not be specified by the robot manufacturer. The interval depends on the operation cycle of the robot, its working environment and movement pattern. Generally, the more contaminated environment, the shorter intervals. The more demanding movement pattern (sharper bending cable harness), the shorter intervals.

ⁱⁱ The robot cabling comprises the cabling between the robot and controller cabinet.

ⁱⁱⁱ Replace when damage or cracks is detected or life limit is approaching.

^{iv} Inspect immediately if the mechanical stop is hit.

^v Inspect immediately if the mechanical stop is hit.

The robot needs to be disassembled according to section [Replacing the axis-4 mechanical stop on page 462](#) in order to get access to and inspect the mechanical stop.

^{vi} The battery low alert (38213 **Battery charge low**) is displayed when remaining backup capacity (robot powered off) is less than 2 months. Typical life of a new battery is 36 months if the robot is powered off 2 days/week, or 18 months if the robot is powered off 16 hours/day. The life can be extended (approximately 3 times) for longer production breaks by a battery shutdown service routine. See the operating manual of the controller.

See the replacement instruction for more details.

^{vii} Replace the sealing set every 12 months or every 6000 operating hours. The actual interval depends on the operation cycle of the robot, its working environment and movement pattern. Generally, the more contaminated environment, the shorter intervals.

Activities and intervals, optional equipment

The table below specifies the required maintenance activities and intervals:

Maintenance activities			Reference
	Every 12 months		
<i>Inspection activities</i>			
Inspecting the signal lamp	x		Inspecting the signal lamp (option) on page 134

3.3 Inspection activities

3.3.1 Inspecting the robot paint


General

For robots with protection type Hygienic, there is a risk of surface corrosion or paint peeling in case of mechanical damage to the coated surface. Therefore, it is important to regularly inspect robot surfaces for any paint breaking or damage.

Required tools and equipment

Equipment	Spare parts	Note
Lint free cloth		
Touch up paint Clean Room/Hy-gienic	3HAC036639-001	White

Inspection, robot paint

	Action	Description
1	Visually inspect the robot surface paint for any paint breaking.	
2	If there is paint breaking, clean the surface so that it is free from oil and grease.	Use a lint free cloth.
3	Use Touch up paint Clean Room/Hygienic, white to paint any damaged surfaces.  Note Always read the instruction in the product data sheet in the paint repair kit for Clean Room/Hygienic.	3HAC036639-001

3 Maintenance

3.3.2 Inspecting the robot cabling

3.3.2 Inspecting the robot cabling

Introduction



CAUTION

For robots with protection type Clean Room

For robots with protection type Hygienic

Always read the specific instructions before doing any repair work, see [Cut the paint or surface on the robot before replacing parts on page 160](#)

Location of robot cabling

The robot cabling comprises the cabling between the robot and controller cabinet.


Required tools and equipment

Visual inspection, no tools are required.

Other tools and procedures may be required if the spare part needs to be replaced. These are specified in the replacement procedure.

Inspection, robot cabling

Use this procedure to inspect the robot cabling.

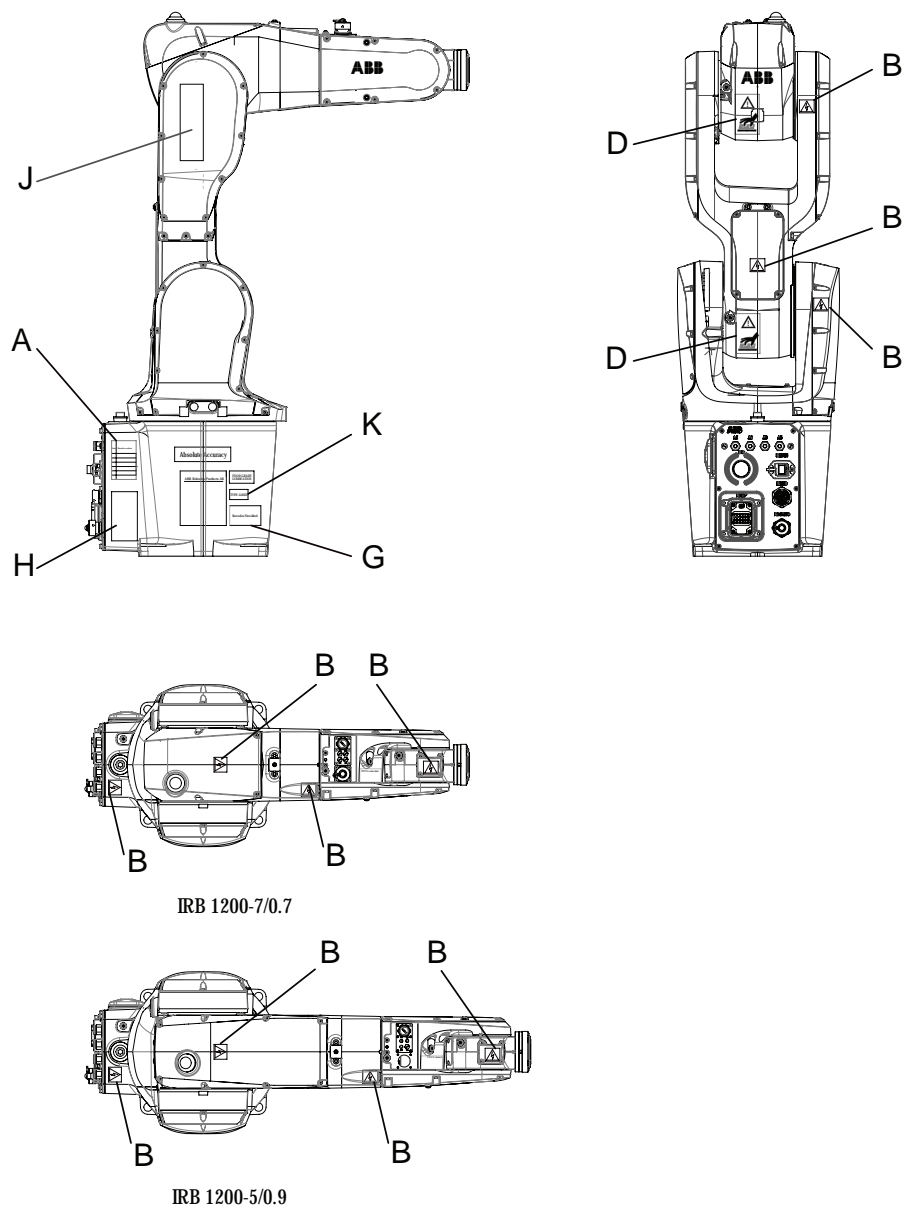
	Action	Note
1	 DANGER Turn off all: <ul style="list-style-type: none">• electric power supply to the robot• hydraulic pressure supply to the robot• air pressure supply to the robot Before entering the robot working area.	
2	Visually inspect: <ul style="list-style-type: none">• the control cabling between the robot and control cabinet Look for abrasions, cuts or crush damage.	
3	Replace the cabling if wear or damage is detected.	

3.3.3 Inspecting the information labels

Location of labels

These figures show the location of the information labels to be inspected. The symbols are described in section [Safety symbols on manipulator labels on page 23](#).

Illustration 1 of 2



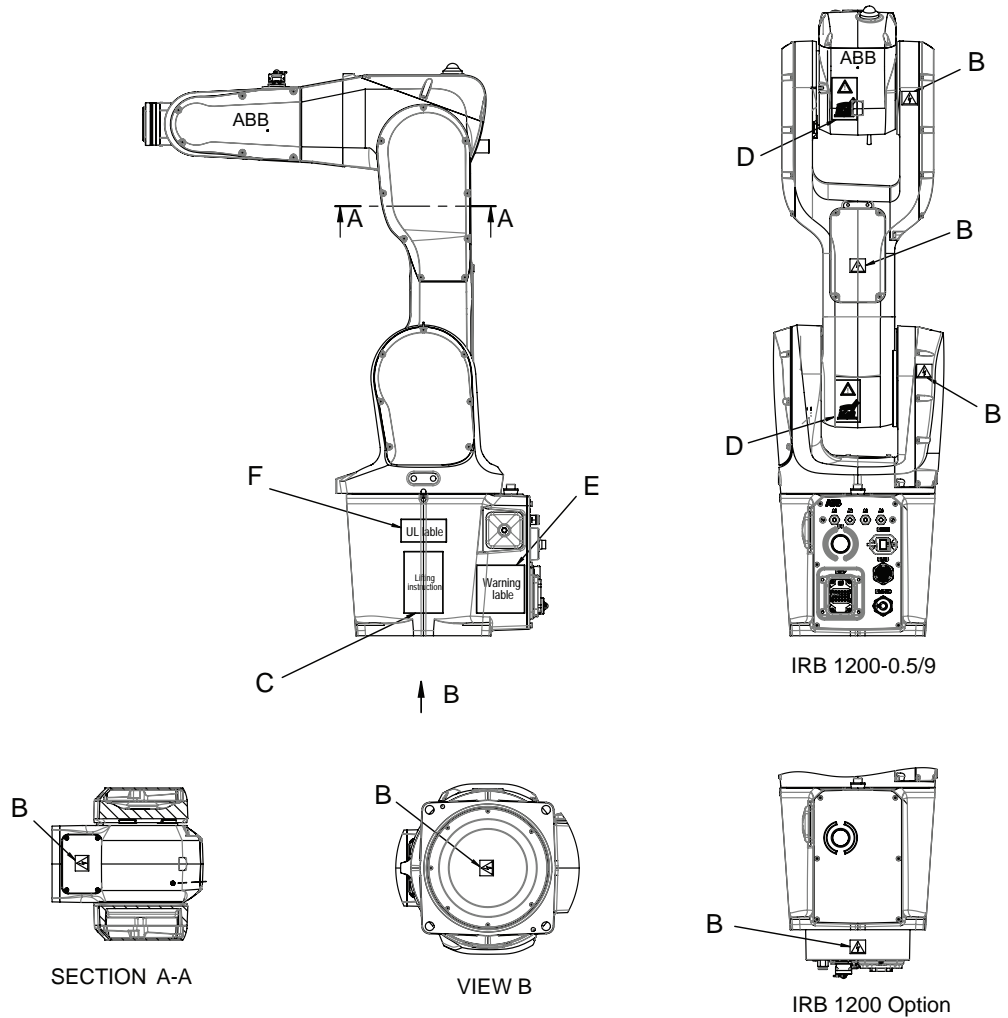
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3 Maintenance

3.3.3 Inspecting the information labels

Continued

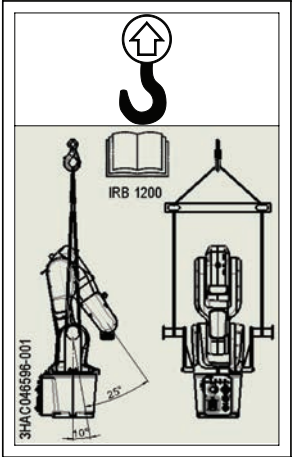
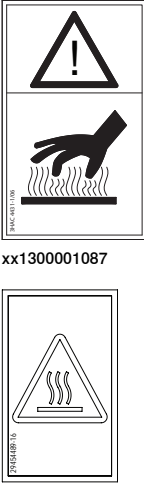
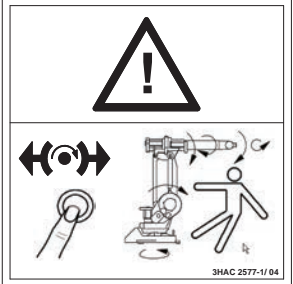
Illustration 2 of 2



	Description	Illustration
A	Calibration label	
B	Warning label Flash	 xx1300001091

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Continued

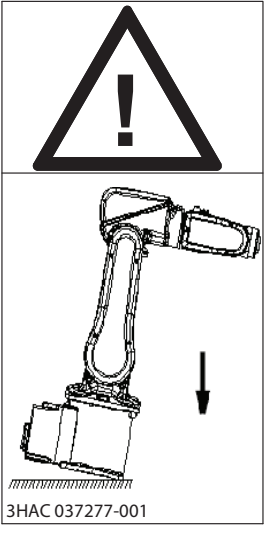


C	<p>Instruction label Lifting of robot</p>	 <p>xx140000518</p>
D	<p>Warning label Heat</p>	 <p>xx1300001087</p> <p>xx1700000984</p>
E	<p>Instruction label Brake release Moving robot Brake release buttons</p>	 <p>xx140000519</p>
F	<p>UL label</p>	
G	<p>Rating label</p>	

Continues on next page

3 Maintenance

3.3.3 Inspecting the information labels

Continued

H	Warning label Tip risk when loosening bolts	 <p>3HAC 037277-001</p> <p>xx140000527</p>
J	Clean Room label	 <p>xx1600001074</p>
	Foundry Plus label	 <p>xx1600001075</p>

Continues on next page

K	Type A label	
	Type B label	

Required spare parts



Note


The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Labels and plate set	3HAC051417-001	Not valid for protection type Hygienic. Includes all safety and information labels required for the robot. Missing, damaged or illegible labels must be replaced.

Required tools and equipment

Visual inspection, no tools are required.

Inspecting, labels

	Action	Note
1	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
2	Inspect the labels, located as shown in the figures.	
3	Replace any missing or damaged labels.	Article numbers for the labels and plate set is specified in Spare parts on page 899 .

3 Maintenance

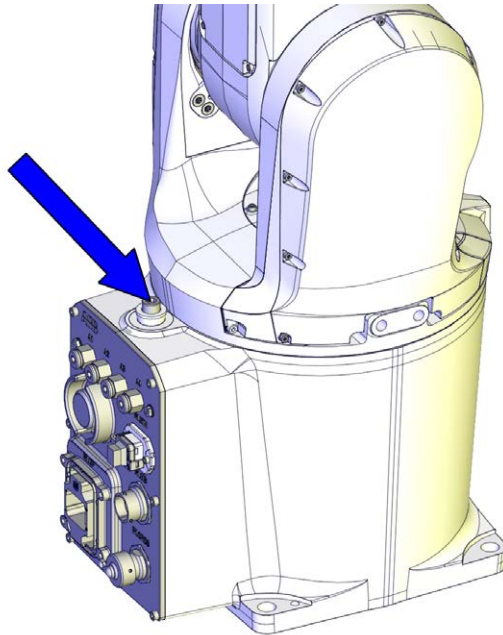
3.3.4 Inspecting mechanical stops

3.3.4 Inspecting mechanical stops

Location of mechanical stops

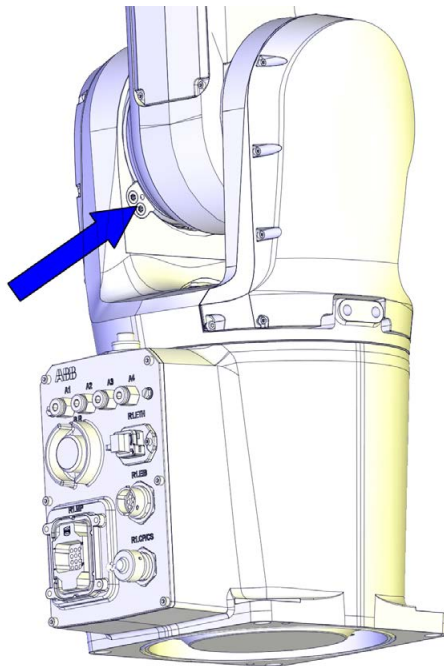
The mechanical stops on axes 1, 2 and 3 are located as shown in the figures.

Axis 1



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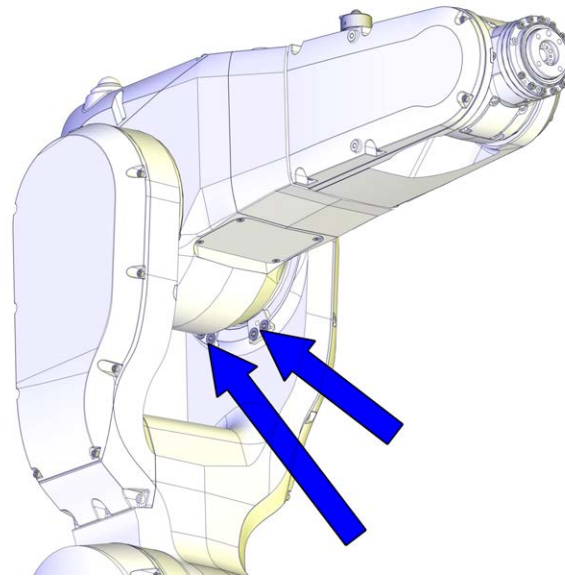
Axis 2



xx140000389

Continues on next page

Axis 3



xx140000386

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Mechanical stop set, axis 1	3HAC049630-001	Includes mechanical stop pin (1 pc), washer and screw.
Mechanical stop set, axis 2	3HAC049637-001	Includes mechanical stop pin (1 pc) and screws.
Mechanical stop set, axis 3	3HAC049644-001	Includes mechanical stop pin (1 pc) and screws.

Required tools and equipment

Visual inspection, no tools are required.

Other tools and procedures may be required if the spare part needs to be replaced. These are specified in the replacement procedure.

Continues on next page



3 Maintenance

3.3.4 Inspecting mechanical stops

Continued

Inspecting mechanical stops

Use this procedure to inspect mechanical stops on axes 1, 2 and 3.

	Action	Information
1	 DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
2	Inspect the <i>mechanical stops</i> .	See the figures in: <ul style="list-style-type: none">• Location of mechanical stops on page 128
3	Replace if the mechanical stop is: <ul style="list-style-type: none">• bent• loose• damaged.  Note The expected life of gearboxes can be reduced as a result of collisions with the mechanical stop.	

3.3.5 Inspecting timing belts

Introduction



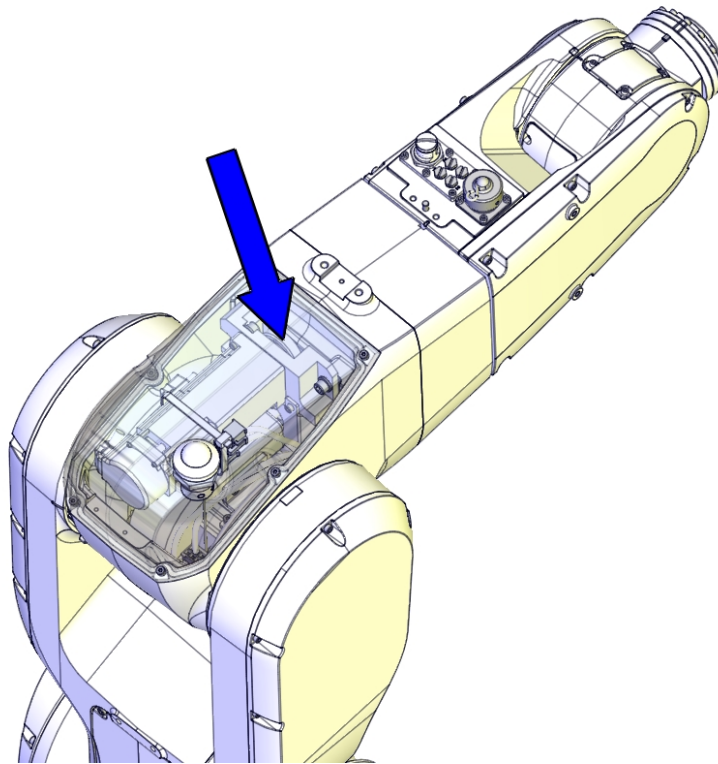
CAUTION

Always read the section "General procedures" before doing any repair work.
Cut the paint or surface on the robot before replacing parts on page 160.

Location of timing belts

The timing belts are located as shown in the figures.

Axis 4



xx140000036

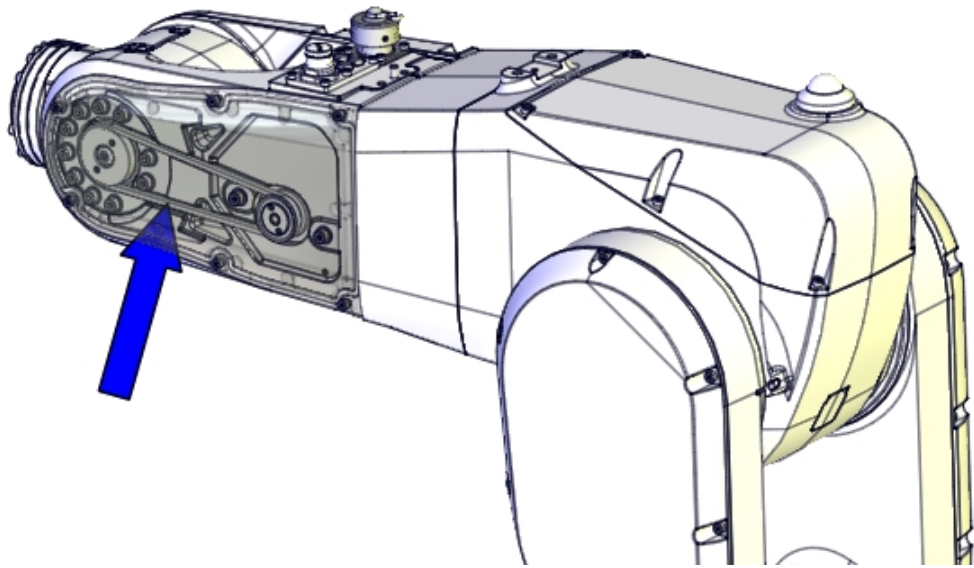
Continues on next page

3 Maintenance

3.3.5 Inspecting timing belts

Continued

Axis 5




xx140000032

Required tools and equipment

Equipment	Note
Standard toolkit	The content is defined in the section Standard toolkit on page 892 .
Other tools and procedures may be required if the spare part needs to be replaced. These are specified in the replacement procedure.	

Inspecting timing belts

Use this procedure to inspect timing belts.

Action	Information
1  DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
2	Gain access to each <i>timing belt</i> by removing the cover.
3	Check the timing belts for damage or wear.
4	Check the <i>timing belt pulleys</i> for damage.
5	If any damage or wear is detected, the part must be replaced!

Continues on next page

	Action	Information
6	Check whether timing belts are slack manually. If the belt has no tension, adjust it!	

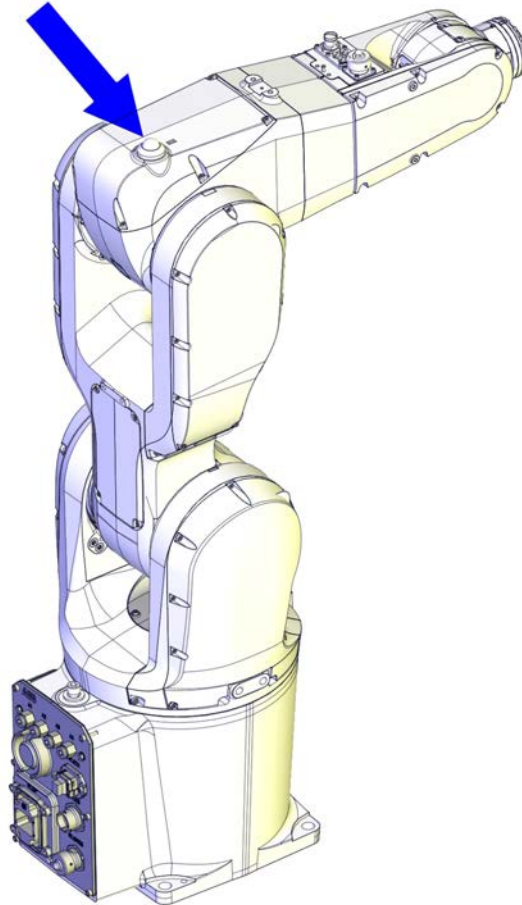
3 Maintenance

3.3.6 Inspecting the signal lamp (option)

3.3.6 Inspecting the signal lamp (option)

Location of signal lamp

The signal lamp is located as shown in this figure.



xx130000455

Required tools and equipment


Equipment	Article number	Note
Signal lamp kit	See Spare parts on page 899 .	To be replaced if damage is detected.
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .

Inspecting, signal lamp

Use this procedure to inspect the function of the signal lamp.

	Action	Note
1	Inspect that signal lamp is lit when motors are put in operation ("MOTORS ON").	

Continues on next page

	Action	Note
2	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
3	If the lamp is not lit, trace the fault by: <ul style="list-style-type: none"> • inspecting whether the signal lamp is broken. If so, replace it. • inspecting cable connections. • inspecting the cabling. Replace the cabling if a fault is detected. 	Article number is specified in <i>Required tools and equipment on page 134</i> .

3 Maintenance

3.4.1 Replacing the battery pack

3.4 Replacement/changing activities

3.4.1 Replacing the battery pack

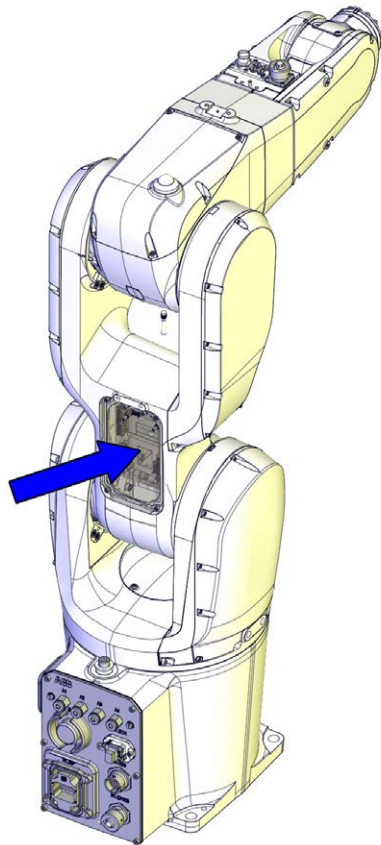


Note

The battery low alert (38213 **Battery charge low**) is displayed when remaining backup capacity (robot powered off) is less than 2 months. Typical life of a new battery is 36 months if the robot is powered off 2 days/week, or 18 months if the robot is powered off 16 hours/day. The life can be extended (approximately 3 times) for longer production breaks by a battery shutdown service routine. See the operating manual for the robot controller.

Location of battery pack

The battery pack is located as shown in the figure.



xx1300002574

Continues on next page

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Battery pack	3HAC051036-001	Battery includes protection circuits. Only replace with a specified spare part or an ABB-approved equivalent.
Battery pack, SafeMove 2-supported Battery pack, Hygienic	3HAC044075-001	Used for IRB 1200 Type B. See Type B of IRB 1200 on page 875 . For robots with protection type Hygienic Battery includes protection circuits. Only replace with a specified spare part or an ABB-approved equivalent.
Gasket on EIB/SMB cover	3HAC056728-001 / 3HAC080706-001	Not used with protection class IP40. Replace if damaged.

Required tools and equipment

Equipment, etc.	Article number	Note
24 VDC power supply	-	Used to release the motor brakes.
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .



CAUTION

Always cut the paint with a knife and grind the paint edge when disassembling parts. See [Cut the paint or surface on the robot before replacing parts on page 160](#).

Required consumables

Consumable	Article number	Note
Cable straps	-	

Removing the battery pack

Use this procedure to remove the battery pack.

Preparations before removing the battery pack



	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	

Continues on next page




3 Maintenance

3.4.1 Replacing the battery pack



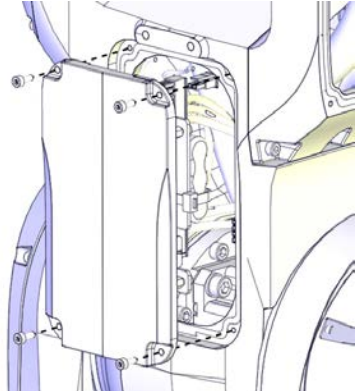
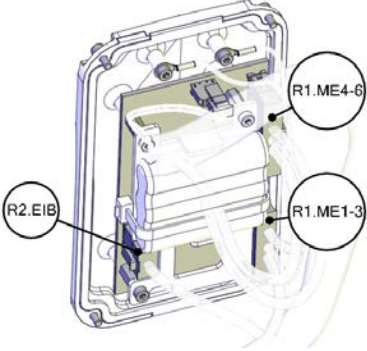
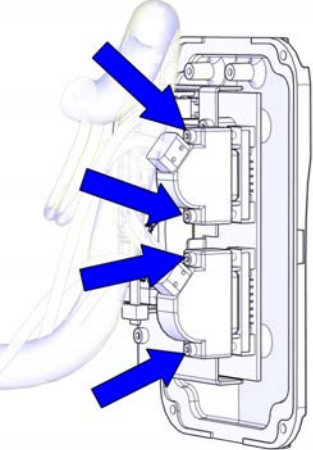
Continued

	Action	Note
2	Jog all axes to zero position.	This is done in order to facilitate updating of the revolution counter.
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
4	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i>	

Removing the battery pack

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <i>The unit is sensitive to ESD on page 64</i>	
3	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i>	

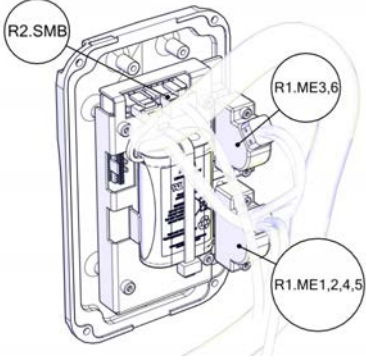
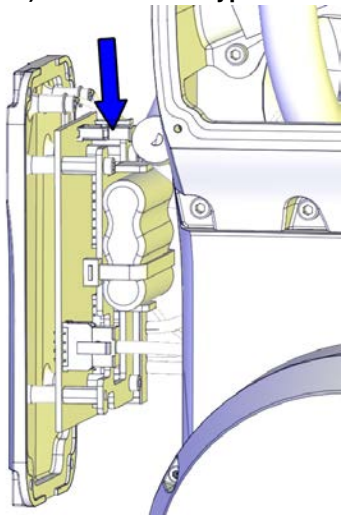
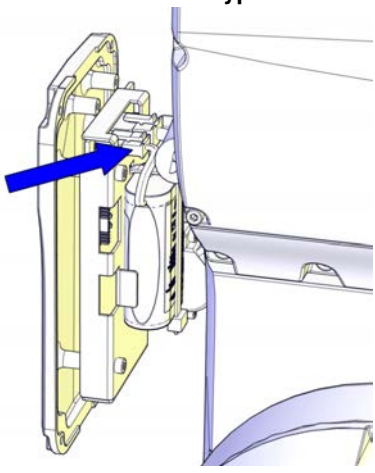
Continues on next page

	Action	Note
4	<p>Remove the connector cover attachment screws on the lower arm and carefully open the cover.</p> <p> CAUTION</p> <p>Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures.</p> <p> CAUTION</p> <p>Be aware of the cabling that is attached to the cover!</p>	 <p>xx1300002427</p>
5	<p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Disconnect the connectors on the EIB unit.</p> <ul style="list-style-type: none"> • R1.ME1-3 • R1.ME4-6 • R2.EIB 	 <p>xx1400000812</p>
6	<p>Valid for IRB 1200 Type B</p> <p>Loose the connector screws.</p>	 <p>xx1700000004</p>


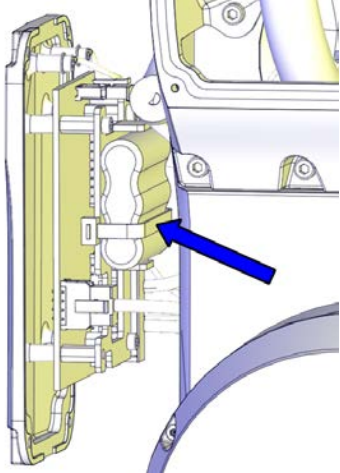
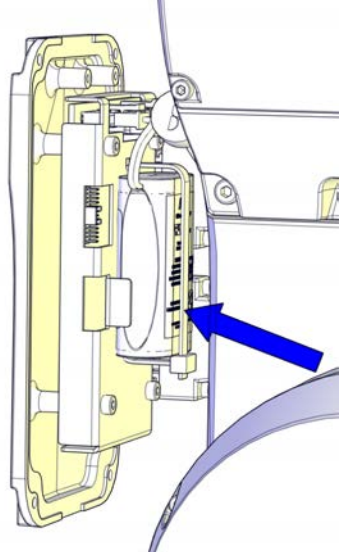
3 Maintenance

3.4.1 Replacing the battery pack

Continued

	Action	Note
7	Valid for IRB 1200 Type B Disconnect the connectors on the SMB unit. <ul style="list-style-type: none">• R1.ME1,2,4,5• R1.ME3,6• R2.SMB	 <p>The diagram shows a close-up of the SMB unit with three connectors highlighted by circles and labels: R2.SMB at the top, R1.ME3,6 on the right, and R1.ME1,2,4,5 at the bottom.</p> <p>xx170000005</p>
8	Disconnect the battery cable.	Valid for IRB 1200 (no type specified) and IRB 1200 Type A  <p>The diagram shows a battery pack being disconnected from the chassis. A blue arrow points to the top of the battery pack where it is connected to the chassis.</p> <p>xx1300002571</p> Valid for IRB 1200 Type B  <p>The diagram shows a battery pack being disconnected from the chassis. A blue arrow points to the side of the battery pack where it is connected to the chassis.</p> <p>xx170000006</p>


Continues on next page

	Action	Note
9	<p>Cut the cable strap that secures the battery and remove the battery.</p> <p> Note</p> <p>Battery includes protection circuits. Only replace with a specified spare part or with an ABB- approved equivalent.</p>	<p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p>  <p>xx1300002579</p> <p>Valid for IRB 1200 Type B</p>  <p>xx1700000007</p>

Refitting the battery pack

Use these procedures to refit the battery pack.

Refitting the battery pack


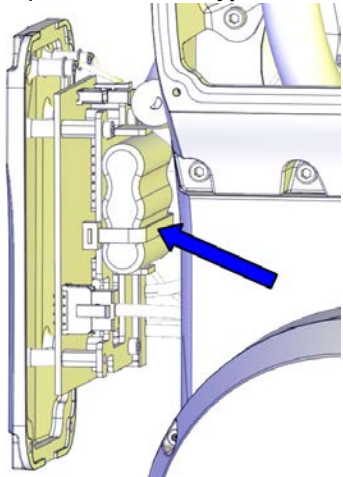
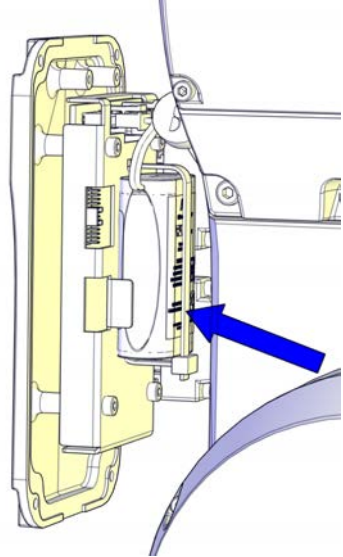
	Action	Note
1	<p> ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section The unit is sensitive to ESD on page 64</p>	

Continues on next page

3 Maintenance

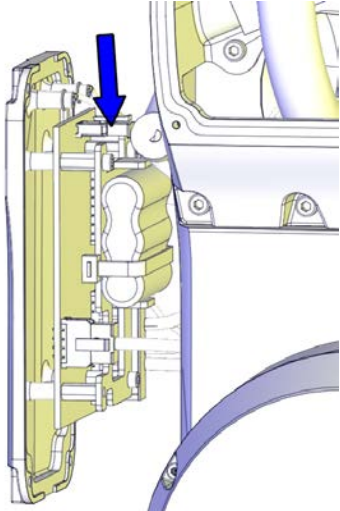
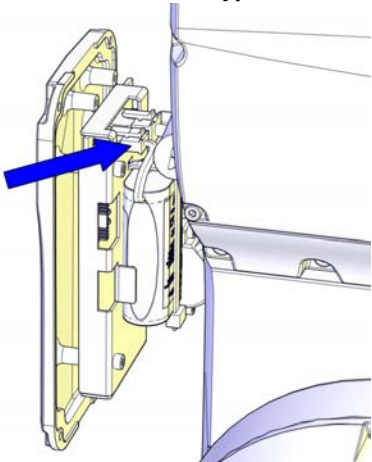

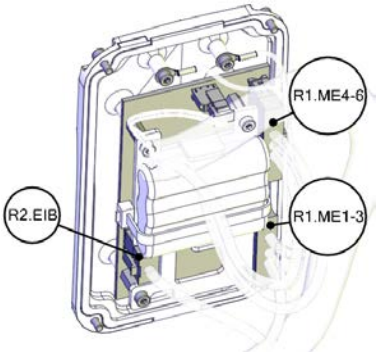
3.4.1 Replacing the battery pack

Continued

	Action	Note
2	For robots with protection type Clean Room: For robots with food grade lubrication: For robots with protection type Hygienic: Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
3	Fit the battery and and secure it with a cable strap.  Note Battery includes protection circuits. Only replace with a specified spare part or with an ABB- approved equivalent.	Valid for IRB 1200 (no type specified) and IRB 1200 Type A  xx1300002579 Valid for IRB 1200 Type B  xx1700000007

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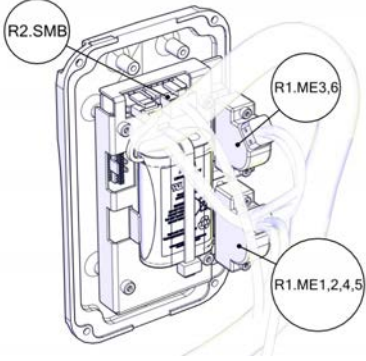
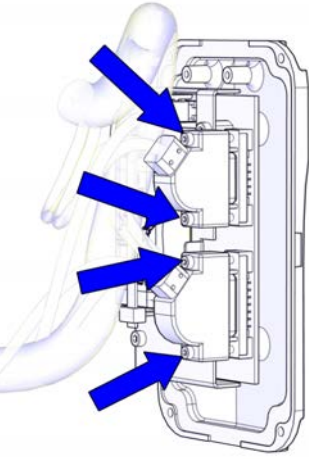
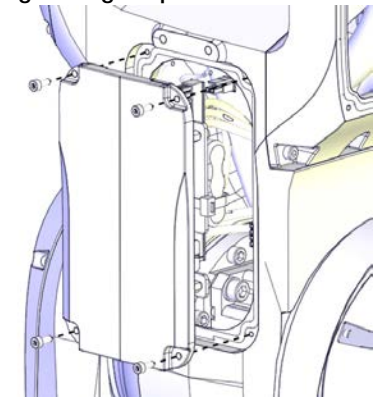

	Action	Note
4	<p>Connect the battery cable.</p>	<p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p>  <p>xx1300002571</p> <p>Valid for IRB 1200 Type B</p>  <p>xx1700000006</p>
5	<p>Valid for IRB 1200 (not type specified) and IRB 1200 Type A</p> <p>Connect the connectors to the EIB unit.</p> <ul style="list-style-type: none"> • R1.ME1-3 • R1.ME4-6 • R2.EIB <p> WARNING</p> <p>Make sure not to mix the R2.EIB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.</p>	 <p>xx1400000812</p>

Continues on next page

3 Maintenance



3.4.1 Replacing the battery pack

Continued

	Action	Note
6	<p>Valid for IRB 1200 Type B</p> <p>Connect the connectors to the SMB unit.</p> <ul style="list-style-type: none"> • R1.ME1,2,4,5 • R1.ME3,6 • R2.SMB <p> WARNING</p> <p>Make sure not to mix the R2.SMB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.</p>	 <p>xx1700000005</p>
7	<p>Valid for IRB 1200 Type B</p> <p>Tighten the connector screws.</p>	<p>Tightening torque: 0.3 Nm</p>  <p>xx1700000004</p>
8	<p>Refit the EIB/SMB cover to the lower arm with the attachment screws.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm</p>  <p>xx1300002427</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

Continues on next page

Concluding procedure

	Action	Note
1	Update the revolution counters.	See Updating revolution counters on page 815 .
2	<p>For robots with protection type Clean Room: For robots with food grade lubrication: For robots with protection type Hygienic: Clean, seal and paint the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160.</p> <p> Note</p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>	
3	<p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

3 Maintenance

3.4.2 Replacing the sealing set on tool flange of Hygienic robots

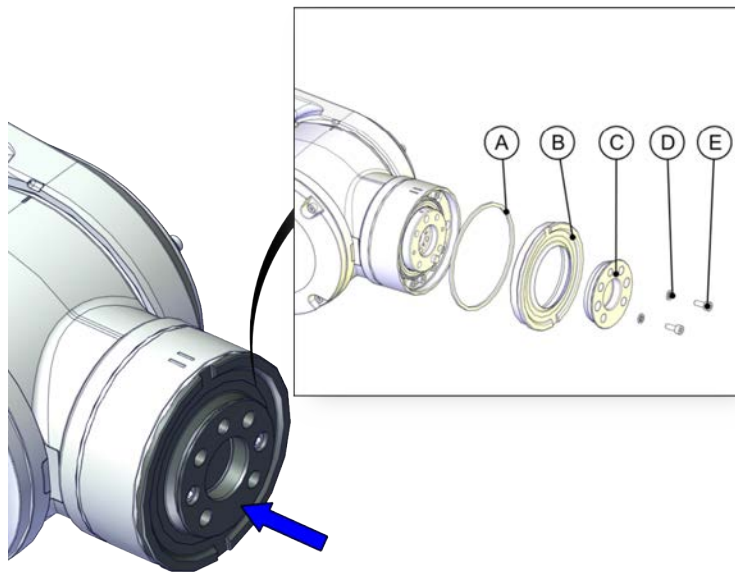
3.4.2 Replacing the sealing set on tool flange of Hygienic robots

General

To ensure the sealing efficiency, sealing parts on the tool flange of Hygienic robots is recommended to be replaced at an interval of 12 months or 60000 operating hours.

Location of the sealing set

Parts of the sealing set on the tool flange of Hygienic robots are located as shown in the figure.



xx2100001485

A	Gasket, axis 6, Hygienic	Recommended to replace at a 12-month interval.
B	Seal ring unit	Recommended to replace at a 12-month interval.
C	Stainless shaft	Replace if damaged.
D	Sealing washer	Recommended to replace at a 12-month interval.
E	Stainless screws	Replace if damaged.

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

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3.4.2 Replacing the sealing set on tool flange of Hygienic robots

Continued

Spare part	Art. no.	Note
Gasket, axis 6, Hygienic	3HAC078798-001	Used with protection type Hygienic. Replace if damaged.
Seal ring unit	3HAC079688-001	Used with protection type Hygienic. Replace if damaged. The seal ring unit is wear part.
Sealing washer	3HAC034160-003	Used with protection type Hygienic. Replace if damaged.

Required tools and equipment

Equipment, etc.	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .
Flange tightening tool	3HAC079686-001	Used with robots in protection type Hygienic Used for loosen and tighten the seal ring unit on tool flange of the Hygienic robots.
Guide pin for stainless shaft on tool flange	3HAC079684-001	Used with robots in protection type Hygienic

Required consumables

Consumable	Art. no.	Note
Grease	3HAC070875-001	Molykote P1900 For robots with protection type Hygienic



CAUTION

Always cut the paint with a knife and grind the paint edge when disassembling parts. See [Cut the paint or surface on the robot before replacing parts on page 160](#).

Replacing the sealing parts on tool flange of Hygienic robots

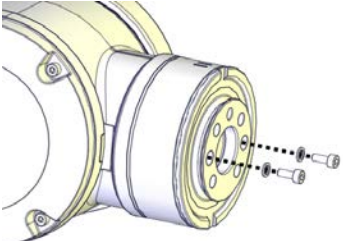
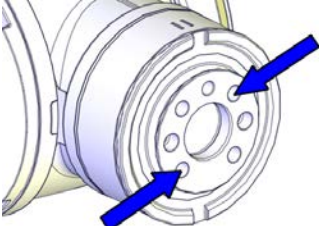
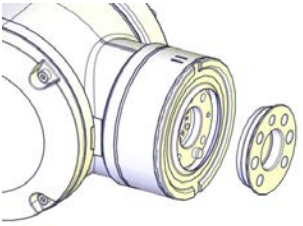
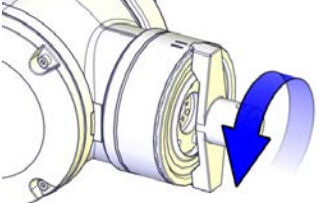
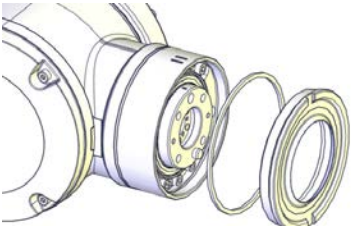
	Action	Note
1	DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	

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3 Maintenance

3.4.2 Replacing the sealing set on tool flange of Hygienic robots

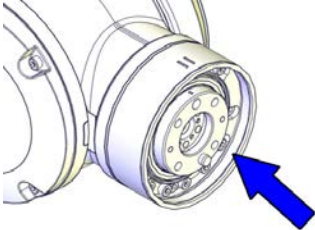
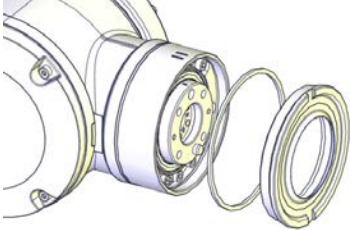
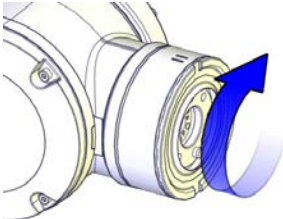
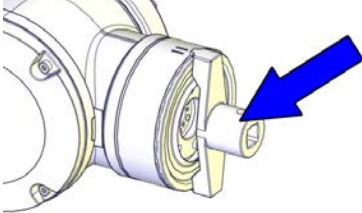
Continued

	Action	Note
2	Remove the screws and washers.	 <p>xx2100001449</p>
3	Insert two M4 screws to the pressed out holes and press out the stainless shaft.	 <p>xx2100001450</p>  <p>xx2100001451</p>
4	Place the flange tightening tool together with a 3/8" (10 mm) socket spanner on the seal ring unit and loosen the unit.	<p>Flange tightening tool: 3HAC079686-001</p>  <p>xx2100001452</p>
5	Remove the gasket and seal ring unit.	 <p>xx2100001453</p>

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3.4.2 Replacing the sealing set on tool flange of Hygienic robots

Continued

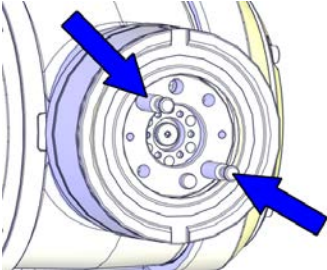
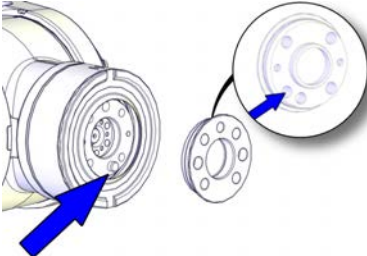
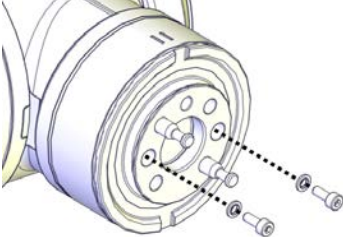
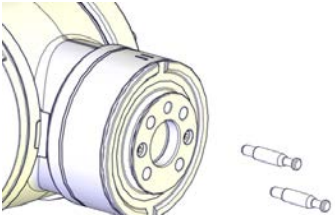
	Action	Note
6	Replace the parts with new ones.	
7	Apply a little grease to the screw thread.	<p>Grease: Molykote P1900</p>  <p>xx2100001454</p>
8	Put the gasket in place and then screw the seal ring unit.	 <p>xx2100001453</p>  <p>xx2100001455</p>
9	Place the flange tightening tool together with a 3/8" (10 mm) socket spanner on the seal ring unit and tighten the unit.	<p>Flange tightening tool: 3HAC079686-001 Tightening torque: 8 Nm</p>  <p>xx2100001456</p>

Continues on next page

3 Maintenance

3.4.2 Replacing the sealing set on tool flange of Hygienic robots

Continued

	Action	Note
10	Fit two guide pins to the tool flange.	<p>Guide pin for stainless shaft on tool flange: 3HAC079684-001</p>  <p>xx2100001457</p>
11	<p>Place the stainless shaft on the tool flange with guidance of the two guide pins.</p> <p>Make sure the pin hole on the shaft aligned with the pin on the tool flange.</p>	 <p>xx2100001458</p>
12	Secure with screws and washers.	<p>Tightening torque: 1.5 Nm</p>  <p>xx2100001459</p>
13	Remove the guide pins.	 <p>xx2100001460</p>

3.5 Cleaning activities

3.5.1 Cleaning the IRB 1200



DANGER

Turn off all:

- electric power supply
- hydraulic pressure supply
- air pressure supply

to the robot, before entering the safeguarded space.

General

To secure high uptime it is important that the IRB 1200 is cleaned regularly. The frequency of cleaning depends on the environment in which the product works. Different cleaning methods are allowed depending on the type of protection of the IRB 1200.



Note

Always verify the protection type of the robot before cleaning.

Special cleaning considerations

This section specifies some special considerations when cleaning the robot.

- Always use cleaning equipment as specified. Any other cleaning equipment may shorten the life of the robot.
- Always check that all protective covers are fitted to the robot before cleaning.
- Never point the water jet at connectors, joints, sealings, or gaskets.
- Do not use compressed air to clean the robot.
- Never use solvents that are not approved by ABB to clean the robot.
- Do not spray from a distance closer than 0.4 m.
- Do not remove any covers or other protective devices before cleaning the robot.

Cleaning methods

The following table defines what cleaning methods are allowed depending on the protection type.

Protection type	Cleaning method			
	Vacuum cleaner	Wipe with cloth	Rinse with water	High pressure water or steam
Standard IP40	Yes	Yes. With light cleaning detergent.	No	No

Continues on next page

3 Maintenance

3.5.1 Cleaning the IRB 1200

Continued

Protection type	Cleaning method			
	Vacuum cleaner	Wipe with cloth	Rinse with water	High pressure water or steam
IP67 (option)	Yes	Yes. With light cleaning detergent.	Yes. It is highly recommended that the water contains a rust-prevention solution and that the manipulator is dried afterwards.	No
Foundry Plus	Yes	Yes. With light cleaning detergent or spirit.	Yes. It is highly recommended that the water contains a rust-prevention solution.	Yes ⁱ . It is highly recommended that the water and steam contains rust preventive, without cleaning detergents.
Clean room	Yes	Yes. With light cleaning detergent, spirit or isopropyl alcohol.	No	No
Hygienic	Yes	Yes. Only with detergent and disinfectants recommended by ABB.	Yes. Only limited to specific areas rather than the complete robot. ⁱⁱ	Yes. Only limited to specific areas with assistance of protective equipment. ⁱⁱ

ⁱ Perform according to section [Cleaning with water and steam on page 152](#).

ⁱⁱ Perform according to section [Cleaning the IRB 1200 with protection type Hygienic on page 154](#).

Wiping with cloth

Additional cleaning instructions for robots with food grade lubrication

Make sure that no liquid flows into the robot or stagnates in any gap or surface after cleaning.

Cleaning with water and steam

Instructions for rinsing with water

IRB 1200 with protection class IP67 (option) and with protection type *Foundry Plus* can be cleaned by rinsing with water (water cleaner).¹

The following list defines the prerequisites:

- Maximum water pressure at the nozzle: 700 kN/m² (7 bar)¹
- Fan jet nozzle should be used, min. 45° spread
- Minimum distance from nozzle to encapsulation: 0.4 meters
- Maximum flow: 20 liters/min¹

¹ Typical tap water pressure and flow

Instructions for steam or high pressure water cleaning

ABB robots with protection types *Foundry Plus*, *Wash*, or *Foundry Prime* can be cleaned using a steam cleaner or high pressure water cleaner.²

¹ See [Cleaning methods on page 151](#) for exceptions.

² See [Cleaning methods on page 151](#) for exceptions.

Continues on next page

The following list defines the prerequisites:

- Maximum water pressure at the nozzle: 2500 kN/m² (25 bar)
- Fan jet nozzle should be used, min. 45° spread
- Minimum distance from nozzle to encapsulation: 0.4 meters
- Maximum water temperature: 80° C

Cables

Movable cables need to be able to move freely:

- Remove waste material, such as sand, dust and chips, if it prevents cable movement.
- Clean the cables if they have a crusty surface, for example from dry release agents.

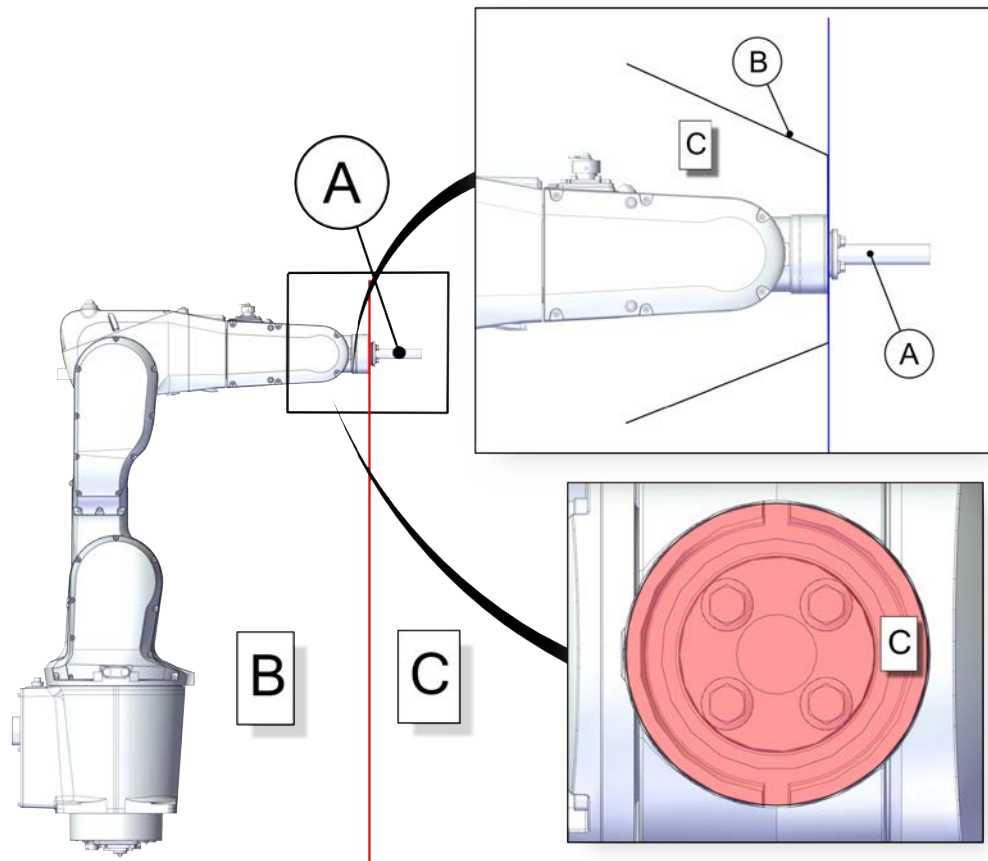
3 Maintenance

3.5.2 Cleaning the IRB 1200 with protection type Hygienic

3.5.2 Cleaning the IRB 1200 with protection type Hygienic

Overview

Hygienic robots are designed with special sealings and coatings. The axis-6 tool flange is also equipped with stainless steel sealing set. These special designs allow the Hygienic robots to be wiped down or washed down using corresponding proper detergents according to actual working environments and applications. Cleaning methods also vary according to the to-be-cleaned surfaces and parts of the IRB 1200 with protection type Hygienic. Always use the proper cleaning method according to the actual applications and strictly follow the cleaning procedure.



xx2100001401

A	User tools	
B	Wipe down area	The robot body without any protection should use the wipe down method for cleaning. If the robot body is properly covered by protective device or equipment, the wash down method is also applicable.
C	Wash down area	In most cases, the tool flange surface should use the wash down method for cleaning. Users can also perform wipe down cleaning on this part according to their applications.

Continues on next page

Required equipment

Equipment	Note
High pressure washer	
Lint free cloth	

Usable detergents

Detergent	Type	Product concentration (v/v)	Note
Disinfectant	DRYSAN™ DUO	100%	
Disinfectant	Topactive DES	2%-3%	
Detergent	Topax66	2%-4%	Applicable to protein cleaning
Detergent	Topaz AC3	2%-4%	
Detergent	Topaz HD 1	2%-10%	Applicable to fat cleaning

Always use the recommended detergents listed in previous table for cleaning the IRB 1200 with protection type Hygienic. Contact ABB if using any disinfectants and detergents other than the listed ones before conducting cleaning activities.

The following list defines the prerequisites:

- Read the material safety data sheet (MSDS) before using any chemicals.
- Always use proper protective equipment like gloves, goggles, safety boots, face shields and apron when using chemicals.

Cleaning instructions



DANGER

Turn off all electrical power, hydraulic and pneumatic pressure supplies before entering the workspace of the manipulator.

Also read the safety sections:

- [Pneumatic or hydraulic related hazards on page 32](#)
- [Electrical safety on page 31](#)
- [Safety during maintenance and repair on page 34](#)

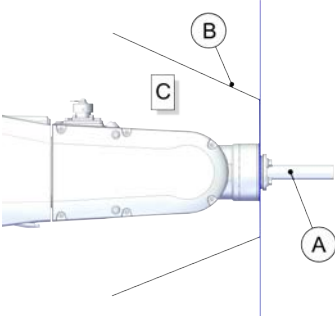
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3 Maintenance

3.5.2 Cleaning the IRB 1200 with protection type Hygienic

Continued

Wash down procedure

	Action	Note						
1	<p>Before cleaning,</p> <ul style="list-style-type: none"> Use protective devices and equipment to make sure the painted surfaces of the robot body (wipe down areas) not exposed directly to sprayed detergents, disinfectants and ejected water. If user tools are removed from the robot flange before the cleaning, conduct protective measures on screw holes to make sure no intrusion of soils, water, detergents and disinfectants into the holes during cleaning. 	 <p>xx2100001402</p> <table border="1"> <tr> <td>A</td> <td>User tools</td> </tr> <tr> <td>B</td> <td>Protective devices or equipment</td> </tr> <tr> <td>C</td> <td>Wipe down area</td> </tr> </table>	A	User tools	B	Protective devices or equipment	C	Wipe down area
A	User tools							
B	Protective devices or equipment							
C	Wipe down area							
2	<p>Pre-rinse with water for removal of food residues from to-be-cleaned areas. Make sure no visible residues left.</p>	Recommended water temperature: 40 - 60 °C						
3	<p>Foam the surface with detergent Topax66 or Topaz HD 1. Use a sprinkling can so that the to-be-cleaned areas can be covered evenly with sufficient foamy detergent.</p>	<ul style="list-style-type: none"> Detergent: Topax66, concentration (v/v) 2 % Detergent: Topaz HD1, concentration (v/v) 2 % 						
4	<p>Wait 15 minutes. Let the detergent work for approx 15 minutes to retain effective cleaning properties. Ensure that the cleaning agent does not dry on the surface.</p>							
5	<p>Rinse thoroughly with water to remove the detergent.</p>	Recommended water temperature: 40 - 60 °C						
6	<p>Foam the surface with detergent Topaz AC3. Use a sprinkling can so that the to-be-cleaned areas can be covered evenly with sufficient foamy detergent.</p>	Detergent: Topaz AC3, concentration (v/v) 2 %						
7	<p>Wait 15 minutes. Let the detergent work for approx 15 minutes to retain effective cleaning properties. Ensure that the cleaning agent does not dry on the surface.</p>							
8	<p>Rinse thoroughly with water to remove the detergent.</p>	Recommended water temperature: 40 - 60 °C						
9	<p>Foam the surface with disinfection Topactive DES. Use a sprinkling can so that the to-be-cleaned areas can be covered evenly with sufficient foamy disinfection.</p>	Detergent: Topactive DES, concentration (v/v) 2 %						
10	<p>Wait 15 minutes.</p>							

Continues on next page

3.5.2 Cleaning the IRB 1200 with protection type Hygienic *Continued*

	Action	Note
11	Rinse thoroughly with water to remove the disinfection.	Water temperature: ambient
12	Wipe the surface dry with lint free cloth.	
13	If user tools are removed from the robot flange before the cleaning, then, after cleaning, <ul style="list-style-type: none"> • Make sure no residues left on the tool flange or screw holes before reinstall the tools or any other accessories to the flange. 	

Wipe down procedure

	Action	Note
1	Before cleaning, <ul style="list-style-type: none"> • Make sure no spraying or ejecting of any detergents, disinfectants and water to the robot surfaces during the cleaning. 	
2	Use the lint free cloth to remove soils or any other contaminant from the to-be-cleaned surfaces. Make sure no visible residues left.	
3	Spray disinfectant DRYSAN™ DUO on robot surfaces.	Disinfectant: DRYSAN™ DUO, concentration (v/v) 100 %
4	Wait 2-3 minutes for disinfectant volatilization and then wipe the robot with lint free cloth.	

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4 Repair

4.1 Introduction

Structure of this chapter

This chapter describes repair activities for the IRB 1200. Each procedure contains the information required to perform the activity, for example spare parts numbers, required special tools, and materials.



WARNING

Repair activities not described in this chapter must only be carried out by ABB.

Report replaced units



Note

When replacing a part on the IRB 1200, report to your local ABB the serial number, the article number, and the revision of both the replaced unit and the replacement unit.

This is particularly important for safety equipment to maintain the safety integrity of the installation.

Safety information

Make sure to read through the chapter [Safety on page 19](#) before commencing any service work.



Note

If the IRB 1200 is connected to power, always make sure that the IRB 1200 is connected to protective earth and a residual current device (RCD) before starting any repair work.

For more information see:

- *Product manual - OmniCore C30*
- *Product manual - OmniCore C90XT*
- *Product manual - OmniCore E10*
- *Product manual - IRC5*
- *Product manual - IRC5 Compact*

4 Repair

4.2.1 Cut the paint or surface on the robot before replacing parts

4.2 General procedures

4.2.1 Cut the paint or surface on the robot before replacing parts

General

Follow the procedures in this section whenever breaking the paint of the robot during replacement of parts.

For robots with protection type Clean Room

For robots with food grade lubrication

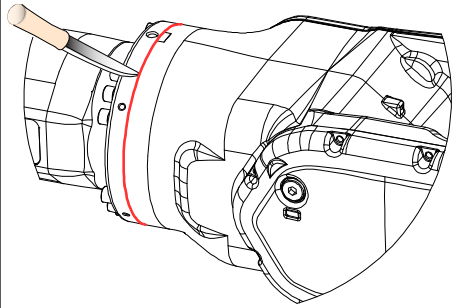
For robots with protection type Hygienic

When replacing parts on the robot, it is important to make sure that after the replacement, no particles will be emitted from the joint between the structure and the new part, and that the easy cleaned surface is retained.

Required equipment

Equipment	Spare parts	Note
Sealing compound	3HAC026759-001	Sikaflex 521 FC. Color white.
Sealing compound for Hygienic robots	3HAC073510-001	Trans clear
Tooling pin		Width 6-9 mm, made of wood.
Cleaning agent		Ethanol
Knife		
Lint free cloth		
Touch up paint Clean Room/Hy-gienic	3HAC036639-001	White
Touch up paint Standard/Foundry Plus	3HAC067974-001	Graphite White

Removing

	Action	Description
1	Cut the paint with a knife in the joint between the part that will be removed and the structure, to avoid that the paint cracks.	 xx0900000121
2	Carefully grind the paint edge that is left on the structure to a smooth surface.	

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4.2.1 Cut the paint or surface on the robot before replacing parts

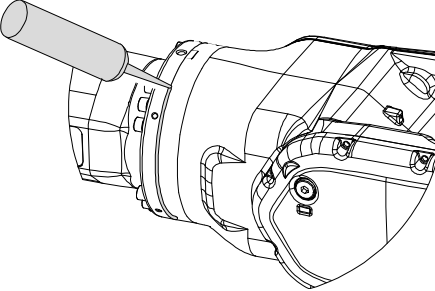
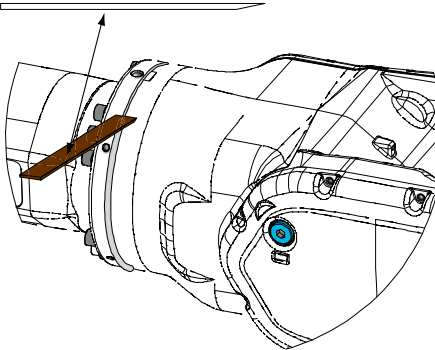
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Refitting



Note

Refitting is required only for robots with protection type Clean Room, with food grade lubrication and with protection type Hygienic.

	Action	Description
1	Before the parts are refitted, clean the joint so that it is free from oil and grease.	Use ethanol on a lint free cloth.
2	Place the tooling pin in hot water.	
3	Seal all refitted joints with sealing compound.	 <p>xx0900000122</p>
4	Use the tooling pin to even out the surface of the sealing compound.	 <p>xx0900000125</p>
5	<p>For robots with protection type Clean Room For robots with food grade lubrication Wait 10 minutes. For robots with protection type Hygienic Wait 40 minutes.</p>	<p>For robots with protection type Clean Room For robots with food grade lubrication Sikaflex 521FC skin dry time (10 minutes). For robots with protection type Hygienic Trans Clear skin dry time (40 minutes).</p>
6	<p>Use Touch up paint Clean Room/Hygienic, white to paint any damaged surfaces.</p> <div data-bbox="491 1733 552 1792" data-label="Image"> </div> <div data-bbox="576 1749 639 1778" data-label="Section-Header"> <p>Note</p> </div> <div data-bbox="485 1805 957 1888" data-label="Text"> <p>Always read the instruction in the product data sheet in the paint repair kit for Clean Room/Hygienic.</p> </div>	<p>3HAC036639-001</p>

Continues on next page

4 Repair

4.2.1 Cut the paint or surface on the robot before replacing parts

Continued



Note

After all repair work, wipe the robot free from particles with spirit on a lint free cloth.

4.2.2 Mounting instructions for sealings

General

This section describes how to mount different types of sealings.

Equipment

Consumable	Article number	Note
Grease	3HAC042536-001	Shell Gadus S2
Grease	3HAC043771-001	LUBRIPLATE SYNXTREME FG-0 Used for robots with food grade lubrication. Used for robots with protection type Hygienic.

Rotating sealings

The procedure below describes how to fit rotating sealings.



CAUTION

Please observe the following before commencing any assembly of sealings:

- Protect the sealing during transport and mounting, especially the main lip.
- Keep the sealing in its original wrappings or protect it well before actual mounting.
- The fitting of sealings and gears must be carried out on clean workbenches.
- Use a protective sleeve for the main lip during mounting, when sliding over threads, keyways or other sharp edges.

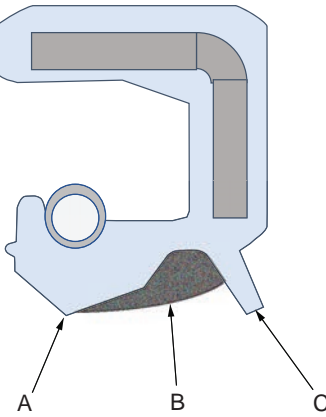
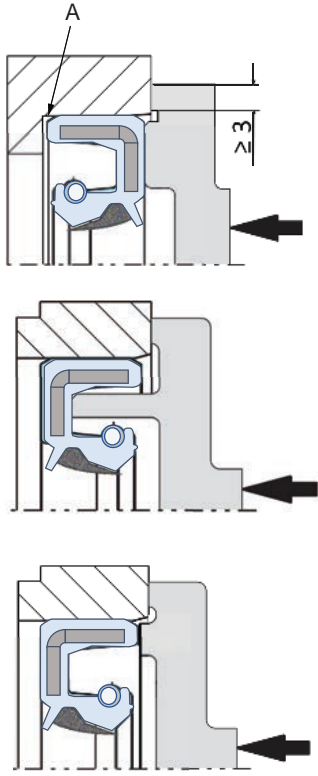
	Action	Note
1	Check the sealing to ensure that: <ul style="list-style-type: none"> • The sealing is of the correct type. • There is no damage on the main lip. 	
2	Inspect the shaft surface before mounting. If scratches or damage are found, the shaft must be replaced since it may result in future leakage. Do not try to grind or polish the shaft surface to get rid of the defect.	

Continues on next page

4 Repair

4.2.2 Mounting instructions for sealings

Continued

	Action	Note
3	<p>Lubricate the sealing with grease just before fitting. (Not too early - there is a risk of dirt and foreign particles adhering to the sealing.)</p> <p>Fill 2/3 of the space between the dust lip and the main lip with grease. If the sealing is without dust lip, just lubricate the main lip with a thin layer of grease.</p>	<p>Article number is specified in Equipment on page 163.</p>  <p>xx200000071</p> <p>A Main lip B Grease C Dust lip</p>
4	<p>Mount the sealing correctly with a mounting tool. Never hammer directly on the sealing as this may result in leakage.</p>	 <p>xx200000072</p> <p>A Gap</p>
5	<p>Make sure that no grease is left on the robot surface.</p>	

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Flange sealings and static sealings

The following procedure describes how to fit flange sealings and static sealings.

	Action
1	Check the flange surfaces. They must be even and free from pores. It is easy to check flatness using a gauge on the fastened joint (without sealing compound). If the flange surfaces are defective, the parts may not be used because leakage could occur.
2	Clean the surfaces properly in accordance with the recommendations of ABB.
3	Distribute the sealing compound evenly over the surface, preferably with a brush.
4	Tighten the screws evenly when fastening the flange joint.

O-rings

The following procedure describes how to fit o-rings.

	Action	Note
1	Ensure that the correct o-ring size is used.	
2	Check the o-ring for surface defects, burrs, shape accuracy, or deformation.	Defective o-rings, including damaged or deformed o-rings, may not be used.
3	Check the o-ring grooves. The grooves must be geometrically correct and should be free of pores and contamination.	
4	Lubricate the o-ring with grease.	
5	Tighten the screws evenly while assembling.	
6	Check that the o-ring is not squashed outside the o-ring groove.	
7	Make sure that no grease is left on the robot surface.	

4 Repair

4.2.3 Sealing differences depending on protection class

4.2.3 Sealing differences depending on protection class

Standard IP40 vs optional IP67

The IRB 1200 has IP40 as standard protection class. If the robot is delivered with option IP67, many of the covers are equipped with gaskets, several components has been applied with locking liquid etc.

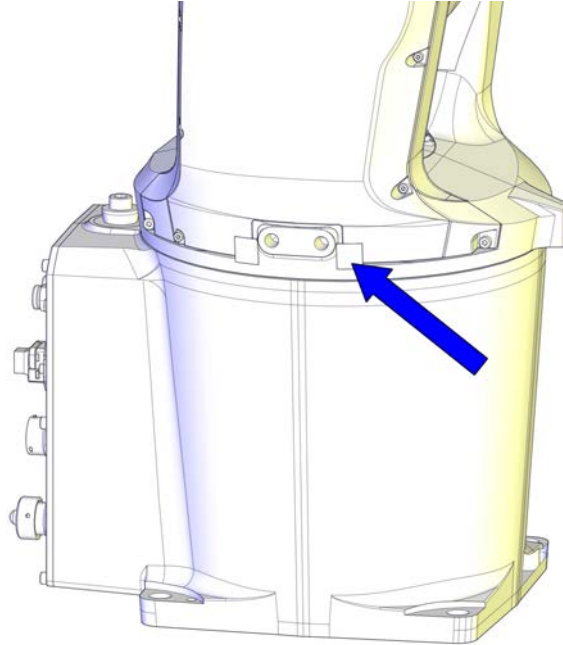
This means that there are differences in the repair procedures depending on the robot protection class. These are clearly stated in the step-by-step procedures.

4.2.4 Swing sealing plug for Clean Room, food grade lubrication and Hygienic robots

4.2.4 Swing sealing plug for Clean Room, food grade lubrication and Hygienic robots

Location of the swing sealing plug

The swing sealing plug is located as shown in the figure.



xx160000264

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Swing sealing plug	3HAC053687-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.

Required tools and equipment

Equipment, etc.	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .

Continues on next page

4 Repair

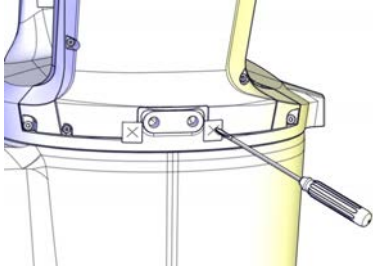
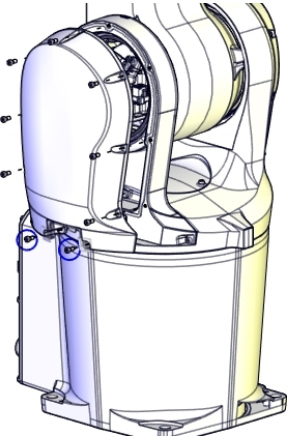
4.2.4 Swing sealing plug for Clean Room, food grade lubrication and Hygienic robots

Continued

Required consumables

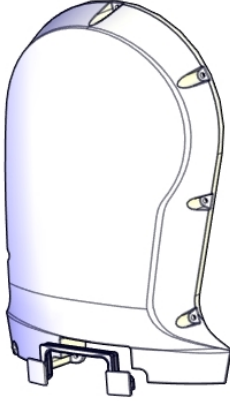
Consumable	Art. no.	Note
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room For robots with food grade lubrication
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

Removing the swing sealing plug

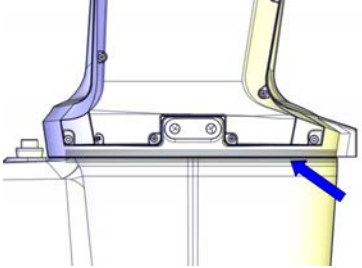
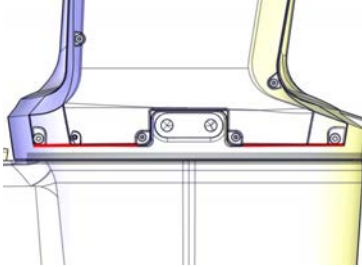
	Action	Note
1	Cut the swing sealing plug through with a sharp object to get access to the screws.	 <p>xx1600000206</p>
2	Remove the cable housing cover of the swing by removing the screws.	 <p>xx1600000207</p>

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4.2.4 Swing sealing plug for Clean Room, food grade lubrication and Hygienic robots
Continued

	Action	Note
3	Detach the swing sealing plug from the cable housing cover.	 <p data-bbox="1059 748 1166 763">xx1600000208</p>

Refitting the swing sealing plug

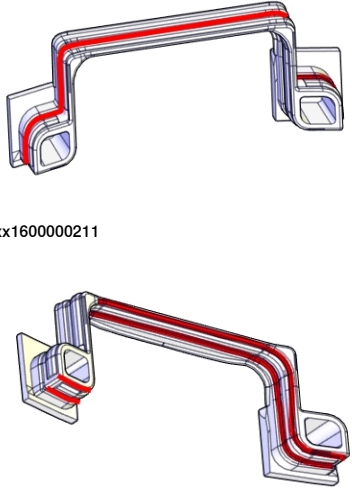
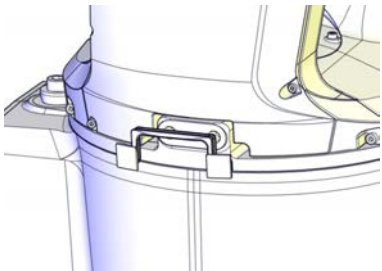
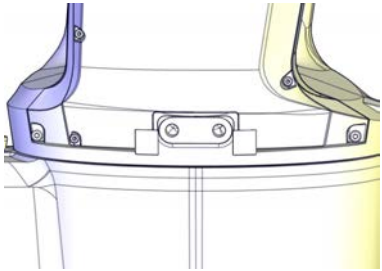
	Action	Note
1	Mask the gap between the swing and the base.	 <p data-bbox="1059 1200 1166 1216">xx1600000209</p>
2	Apply a string of the sealant to the joint of the swing cable housing cover.	<p data-bbox="1059 1256 1422 1312">For robots with protection type Clean Room</p> <p data-bbox="1059 1317 1422 1373">For robots with food grade lubrication</p> <p data-bbox="1059 1377 1326 1406">Sealant, Sikaflex 521FC</p> <p data-bbox="1059 1411 1422 1467">For robots with protection type Hygienic</p> <p data-bbox="1059 1471 1289 1500">Sealant, Trans Clear</p>  <p data-bbox="1059 1776 1166 1792">xx1600000210</p>
3	Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint. Make sure the sealant fully covers the gap but is not applied to the screw cavities.	

Continues on next page

4 Repair

4.2.4 Swing sealing plug for Clean Room, food grade lubrication and Hygienic robots

Continued

	Action	Note
4	Wait for the sealant to dry and then remove the mask.	Sikaflex 521FC skin dry time: 10 minutes Trans Clear skin dry time: 40 minutes
5	Apply a little sealant to the inner surface of the swing sealing plug.	<p>For robots with protection type Clean Room For robots with food grade lubrication Sealant, Sikaflex 521FC</p> <p>For robots with protection type Hygienic Sealant, Trans Clear</p>  <p>xx1600000211</p> <p>xx1600000261</p>
6	Refit the swing sealing plug.	 <p>xx1600000212</p>
7	<p>If there is any overflowing sealant, remove and clean it.</p> <p>Make sure no space exists between the swing sealing plug and the robot casting, and the sealant string is fully jointed with the plug.</p>	 <p>xx1600000213</p>

4.3 Cable harness

4.3.1 Replacing the main cable package

Location of the main cable package

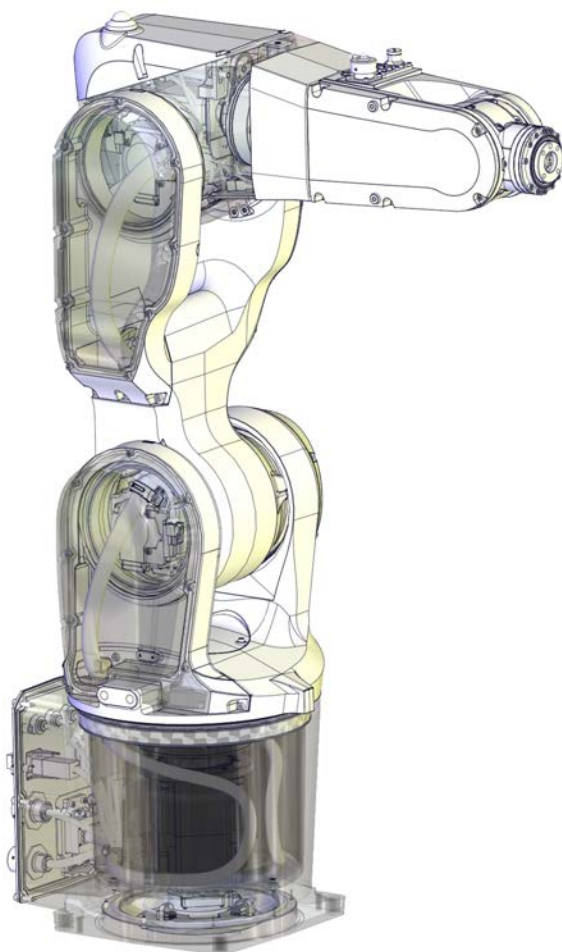
The main cable package runs from the base, up through the swing, up through the lower arm and into the housing. Inside the housing there is a division point for the axis-5 and axis-6 motor cables.

The main cable package includes the air hoses and the cabling for all the six motors. Optional Ethernet cabling can also be included.

The air hoses and optional Ethernet must be disconnected inside the wrist unit before the cable package can be removed.

As standard feature, the connector interface is located at the rear of the base. The interface can also be bottom mounted, as an option. This section describes both configurations.

Connector interface at the rear of the base (standard)



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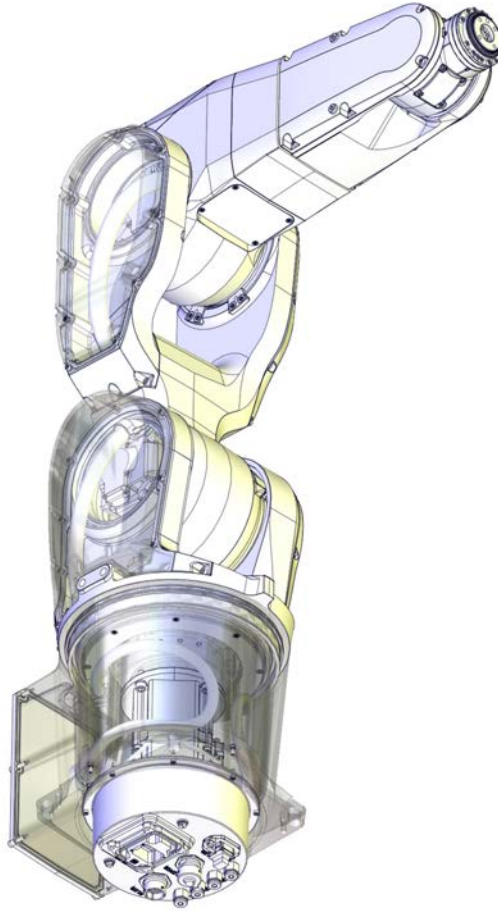
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4 Repair

4.3.1 Replacing the main cable package

Continued

Connector interface at the bottom of the base (option)



xx140000410

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Manipulator cable harness with Ethernet (rear interface)	3HAC059673-001	With connector interface at rear of the base.
Manipulator cable harness without Ethernet (rear interface)	3HAC059674-001	With connector interface at rear of the base.
Manipulator cable harness with Ethernet (rear interface), Clean Room Manipulator cable harness with Ethernet (rear interface), food grade lubrication	3HAC056219-001	Used with protection type Clean Room. Used for robots with food grade lubrication. With connector interface at rear of the base.

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4.3.1 Replacing the main cable package
Continued

Spare part	Article number	Note
Manipulator cable harness without Ethernet (rear interface), Clean Room Manipulator cable harness without Ethernet (rear interface), food grade lubrication	3HAC056220-001	Used with protection type Clean Room. Used for robots with food grade lubrication. With connector interface at rear of the base.
Manipulator cable harness with Ethernet (bottom interface)	3HAC051415-001	With connector interface at bottom of the base.
Manipulator cable harness without Ethernet (bottom interface)	3HAC051416-001	With connector interface at bottom of the base.
Manipulator cable harness with Ethernet (rear interface), SafeMove 2-supported	3HAC061282-001	Used for IRB 1200 Type B. See Type B of IRB 1200 on page 875 . With connector interface at rear of the base.
Manipulator cable harness without Ethernet (rear interface), SafeMove 2-supported	3HAC061283-001	Used for IRB 1200 Type B. See Type B of IRB 1200 on page 875 . With connector interface at rear of the base.
Manipulator cable harness with Ethernet (rear interface), Clean Room and SafeMove 2-supported Manipulator cable harness with Ethernet (rear interface), food grade lubrication and SafeMove 2-supported Manipulator cable harness with Ethernet (rear interface), Hygienic	3HAC061286-001	Used for IRB 1200 Type B. See Type B of IRB 1200 on page 875 . Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. With connector interface at rear of the base.
Manipulator cable harness without Ethernet (rear interface), Clean Room and SafeMove 2-supported Manipulator cable harness without Ethernet (rear interface), food grade lubrication and SafeMove 2-supported Manipulator cable harness without Ethernet (rear interface), Hygienic	3HAC061287-001	Used for IRB 1200 Type B. See Type B of IRB 1200 on page 875 . Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. With connector interface at rear of the base.
Manipulator cable harness with Ethernet (bottom interface), SafeMove 2-supported Manipulator cable harness with Ethernet (bottom interface), Hygienic.	3HAC061284-001	Used for IRB 1200 Type B. See Type B of IRB 1200 on page 875 . Used with protection type Hygienic. With connector interface at bottom of the base.
Manipulator cable harness without Ethernet (bottom interface), SafeMove 2-supported Manipulator cable harness without Ethernet (bottom interface), Hygienic.	3HAC061285-001	Used for IRB 1200 Type B. See Type B of IRB 1200 on page 875 . Used with protection type Hygienic. With connector interface at bottom of the base.

Continues on next page

4 Repair

4.3.1 Replacing the main cable package

Continued

Spare part	Article number	Note
Cable harness material set	3HAC049663-001	Includes brackets, sheets, distance screws, plastics, cable clamp, seal bolts and air protection in tubular.
Air connector set with Ethernet hole in flange	3HAC049664-001	Includes tubular flange, air connectors and seal bolts. Replace if damaged.
Air connector set without Ethernet hole in flange	3HAC049665-001	Includes tubular flange, air connectors and seal bolts. Replace if damaged.
Plate without connector set	3HAC078810-001	Used with protection type Hygienic. Includes gasket (3HAC078804-001).
Plate with connector set	3HAC079691-001	Used with protection type Hygienic. Includes Ethernet connector, air connectors, CP/CS connector and gasket (3HAC078804-001).
Gasket	3HAC078804-001	Used with protection type Hygienic. Replace if damage.
Base bottom cover (standard configuration)	3HAC049667-001	Replace if damaged.
Base rear cover, without connector interface	3HAC059675-001	Replace if damaged.
Base rear cover, without connector interface, Clean Room Base rear cover, without connector interface, food grade lubrication Base rear cover, without connector interface, Hygienic	3HAC056147-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket for rear base cover	3HAC058566-001 / 3HAC080710-001	Not used with protection class IP40. Replace if damaged.
O-ring	3HAB3772-86	Not used with protection class IP40. Replace if damaged.
Radial sealing with dust lip	3HAB3701-47	Not used with protection class IP40. Replace if damaged.
M2 variseal sealing	3HAC044641-002	Used with protection class IP67. Used only on base 3HAC049628-001. See Spare part versions for the base on IP40/IP67 robots on page 876 . Replace if damaged.
Axis-1 sealing ring	3HAC044676-001 / 3HAC068107-001 ⁱ	Replace if damaged.

Continues on next page

4.3.1 Replacing the main cable package
Continued

Spare part	Article number	Note
V-ring	3HAB3732-34	Used with protection class IP67. Used with protection type Foundry Plus. Only on swing version 3HAC058000-001 and 3HAC059554-001. See Spare part versions for the swing on IP40/IP67 robots on page 878 . Replace if damaged.
Axis-2 sealing ring	3HAC044677-001	Replace if damaged.
Gasket of axis-2 sealing ring	3HAC045688-001 / 3HAC080697-001	Not used with protection class IP40. Replace if damaged.
Radial sealing with dust lip	3HAB3701-41	Not used with protection class IP40. Replace if damaged.
Gasket of plastic plate	3HAC044894-001 / 3HAC080695-001	Not used with protection class IP40. Replace if damaged.
Cable protection	3HAC044691-001	Replace if damaged.
Torx countersunk head screw M3x5	3HAC14286-4	Replace if damaged.
Cover on top of swing	3HAC059679-001	Replace if damaged.
Cover on top of swing, Clean Room Cover on top of swing, food grade lubrication Cover on top of swing, Hygienic	3HAC056133-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket on top swing cover	3HAC056696-001 / 3HAC080698-001	Not used with protection class IP40. Replace if damaged.
M2 variseal sealing	3HAC044641-004	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
Cable housing cover of the swing	3HAC059678-001	Replace if damaged.
Cable housing cover of the swing, Clean Room Cable housing cover of the swing, food grade lubrication Cable housing cover of the swing, Hygienic	3HAC056214-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket on cable housing cover	3HAC056726-001 / 3HAC080704-001	Not used for robots with protection class IP40. Replace if damaged.

Continues on next page

4 Repair

4.3.1 Replacing the main cable package

Continued

Spare part	Article number	Note
PTFE film on cable housing cover	3HAC044660-001	Replace if damaged.
Gasket on cable housing cover	3HAC056724-001 / 3HAC080702-001	Not used with protection class IP40. Replace if damaged.
EIB/SMB cover	3HAC059692-001	Replace if damaged.
EIB/SMB cover, Clean Room EIB/SMB cover, food grade lubrication EIB/SMB cover, Hygienic	3HAC056137-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket on EIB/SMB cover	3HAC056728-001 / 3HAC080706-001	Not used with protection class IP40. Replace if damaged.
Motor bracket	3HAC044689-001	Replace if damaged.
Housing small cover	3HAC059684-001	Replace if damaged.
Housing small cover, Clean Room Housing small cover, food grade lubrication Housing small cover, Hygienic	3HAC056142-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket on cable housing cover	3HAC056724-001 / 3HAC080702-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cover	3HAC058822-001 / 3HAC080709-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cable housing cover	3HAC056707-001 / 3HAC080701-001	Not used with protection class IP40. Replace if damaged.
Housing cover gasket (IRB 1200-7/0.7)	3HAC056698-001 / 3HAC080700-001	Not used with protection class IP40. Replace if damaged.
Housing cover gasket (IRB 1200-5/0.9)	3HAC056697-001 / 3HAC080699-001	Not used with protection class IP40. Replace if damaged.

ⁱ For information on which sealing ring to be ordered, see [Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 880](#).

Required tools and equipment

Equipment, etc.	Article number	Note
Roundsling, 2 m	-	Length: 2 m. Lifting capacity: 100 kg.
Guide pin for axis-1 gear unit	3HAC049703-001	Always use three guide pins together!
24 VDC power supply	-	Used to release the motor brakes.

Continues on next page

Equipment, etc.	Article number	Note
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. ⁱ
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .

- ⁱ The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, manual calibration is used as default.

Required consumables

Equipment	Article number	Note
Cable straps	-	
Grease	3HAC042536-001	Used for lubrication of cable contact areas.
Grease	3HAC029132-001	Used for lubrication of cable contact areas for robots with food grade lubrication and robots in protection type Hygienic.
Locking liquid	3HAB7116-1	Loctite 243
Cleaning agent	-	Loctite 7063
Flange sealing	12340011-116	Loctite 574 For robots with protection type Clean Room. For robots with food grade lubrication.
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room. For robots with food grade lubrication. For robots with protection class IP67. For robots with protection type Foundry Plus.
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

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4 Repair

4.3.1 Replacing the main cable package

Continued

Deciding calibration routine

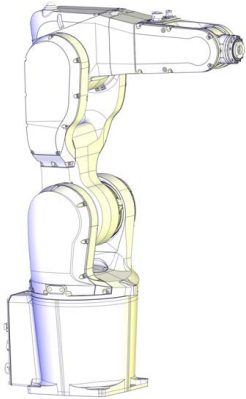
Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	<p>Decide which calibration routine to use for calibrating the robot.</p> <ul style="list-style-type: none"> Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	<p> Note</p> <p>Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.</p>
	<p>If the robot is to be calibrated with reference calibration:</p> <p>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p>	<p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in Reference calibration routine on page 821.</p>
	<p>If the robot is to be calibrated with fine calibration:</p> <p>Remove all external cable packages (DressPack) and tools from the robot.</p>	



Removing the main cable package

Use these procedures to remove the main cable package from the robot.



Preparations before removing the main cable package

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 <p>xx1300002581</p>

Continues on next page

	Action	Note
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
4	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i>	

Getting access to inside of the wrist unit


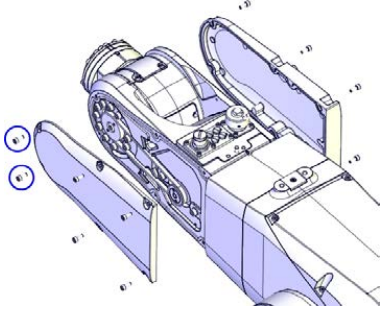

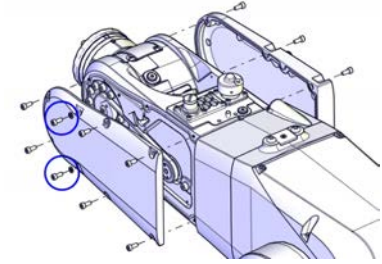

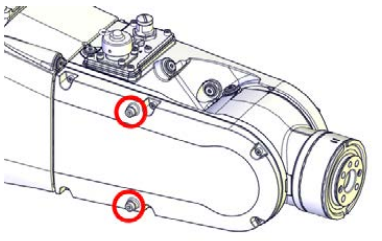
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i>	

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4 Repair

4.3.1 Replacing the main cable package



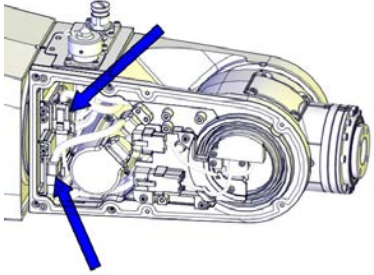
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	Action	Note
3	Remove the covers on each side of the wrist by removing their screws.	
	 Note For robots with protection class IP67 For robots with protection type Foundry Plus The two front screws on the left hand side cover (encircled in the figure) have been fitted with locking liquid. The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.	For robots with protection class IP67 For robots with protection type Foundry Plus  xx1300002349
	 Note For robots with protection type Clean Room For robots with food grade lubrication The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.	For robots with protection type Clean Room  xx1600001148
	 Note For robots with protection type Hygienic The tubular cover (right hand side cover) has two extra screws, as encircled in the figure. Do not remove the two screws when removing the cover. The screws are used for blocking the screw holes rather than fixing the cover to the tubular. Replace if damaged or missing.	For robots with protection type Hygienic  xx2100001406



Disconnecting the axis-5 motor connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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	Action	Note
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	
3	<p>Snap loose the motor connectors from their holders and then disconnect them.</p> <ul style="list-style-type: none"> • R3.MP5 • R3.ME5 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx1300002360</p>

Disconnecting the axis-5 FPC connectors

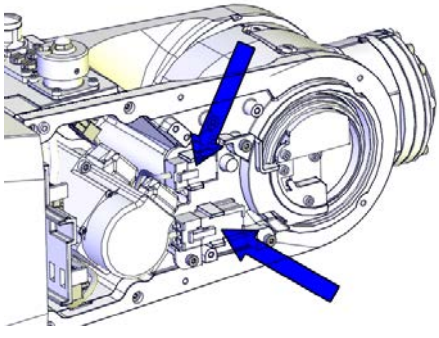
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	

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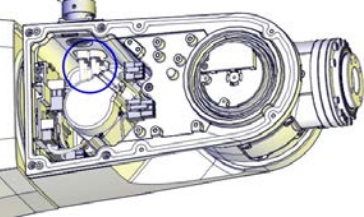
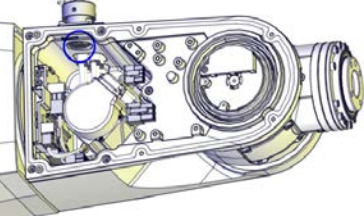
4 Repair

4.3.1 Replacing the main cable package

Continued



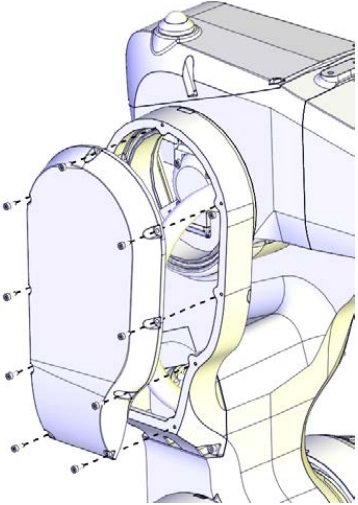
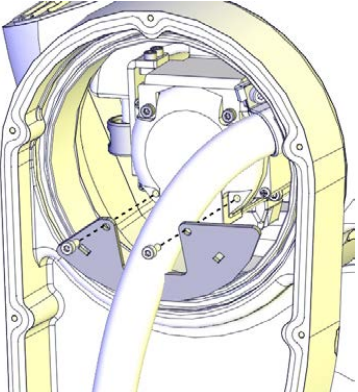
	Action	Note
3	Snap loose and disconnect the axis-5 FPC connectors.	 <p>xx1300002390</p>

Disconnecting the air hoses and CP/CS cabling (if equipped)

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	Disconnect the air hoses.	 <p>xx1400000738</p>
4	If equipped, disconnect the CP/CS connector.	 <p>xx1500000252</p>

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Disconnecting the axis-4 FPC connectors

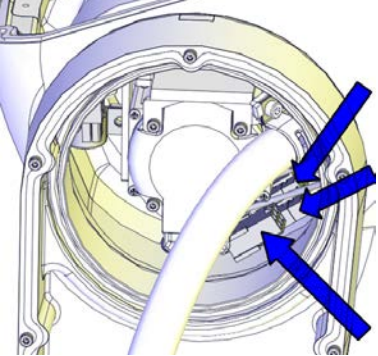
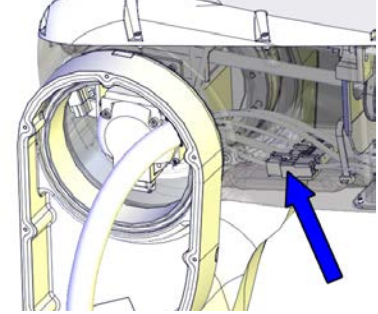
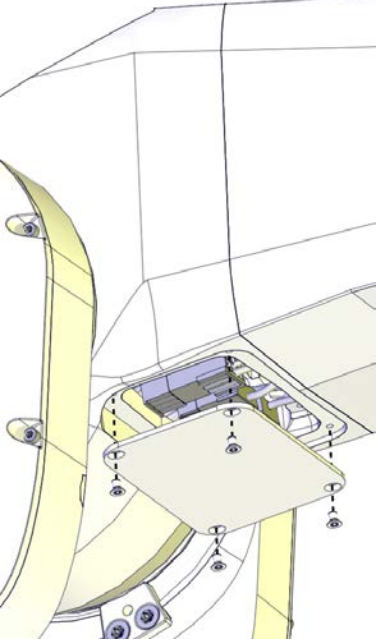
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	
3	<p>Remove the cable housing cover.</p>	 <p>xx1300002400</p>
4	<p>Remove the plate.</p>	 <p>xx1300002413</p>

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4 Repair

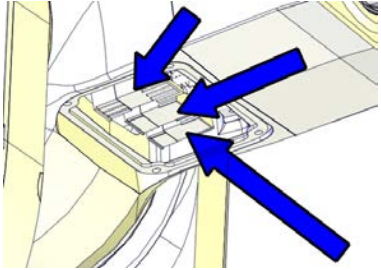
4.3.1 Replacing the main cable package

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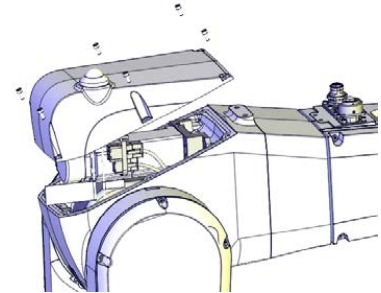
	Action	Note
5	Pull out the FPC connectors from the housing and disconnect them.	<p data-bbox="1031 315 1382 342">Cable layout in IRB 1200-7/0.7 :</p>  <p data-bbox="1031 712 1139 730">xx1300002412</p> <p data-bbox="1031 748 1382 775">Cable layout in IRB 1200-5/0.9 :</p>  <p data-bbox="1031 1102 1139 1120">xx1400001471</p>
6	Remove the small cover of the housing.	 <p data-bbox="1031 1803 1139 1821">xx1300002398</p>

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4.3.1 Replacing the main cable package
Continued

	Action	Note
7	Disconnect the remaining FPC connectors.	 <p>xx1300002399</p>

Disconnecting the axis-4 motor connectors

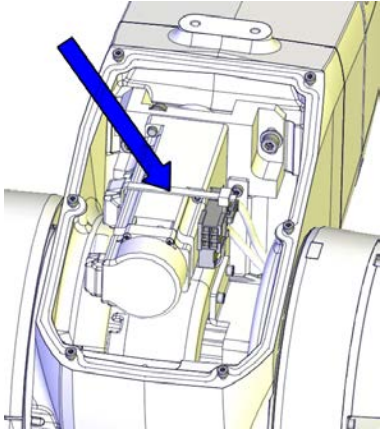

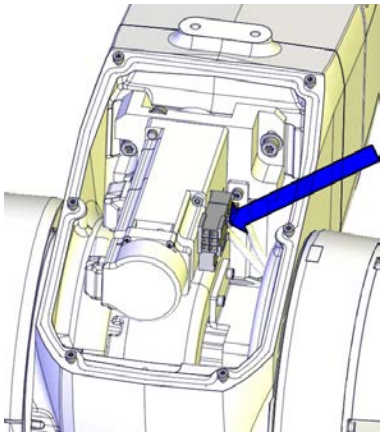
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	<p>Remove the cover from the upper arm housing.</p>  <p>CAUTION</p> <p>For robots with safety lamp (option) Be aware of the signal lamp cables that are attached inside the housing! Disconnect the lamp cable connectors R3.H1 and R3.H2 and then lift away the cover completely.</p>	 <p>xx1300000456</p>

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4 Repair

4.3.1 Replacing the main cable package

Continued

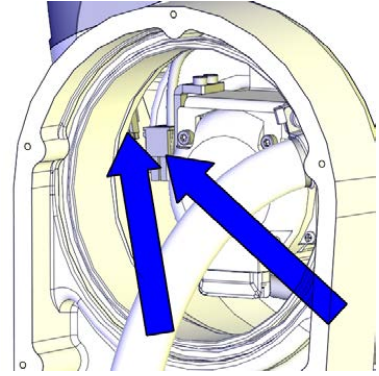
	Action	Note
4	Cut the strap that holds the connectors.	 <p>xx1300002494</p>
5	Disconnect the motor connectors.  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 <p>xx1300002495</p>

Disconnecting the axis-3 motor connectors



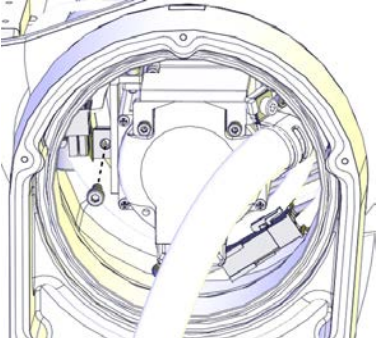
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	

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4.3.1 Replacing the main cable package
Continued

	Action	Note
3	Pull out the axis-3 motor connectors from the housing and disconnect them.	 <p>xx1300002420</p>

Removing the cable package in the housing

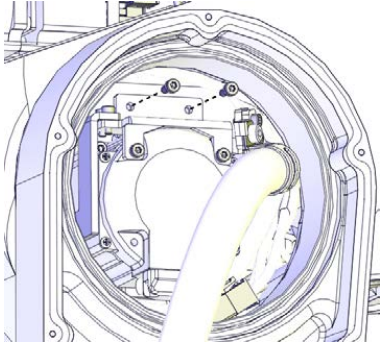
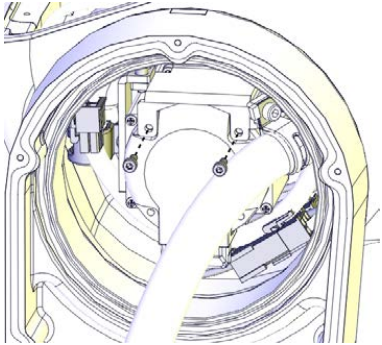

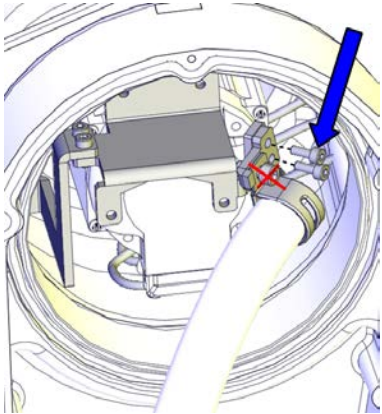
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160</i>.</p>	
3	Remove the screw that fastens the air hose holder.	 <p>xx1300002422</p>

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4 Repair

4.3.1 Replacing the main cable package





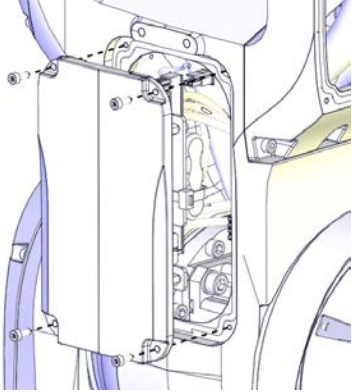
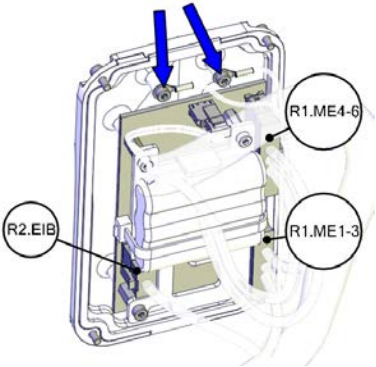
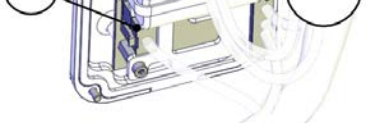
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	Action	Note
4	Remove the screws that fasten the fix sheet to the inner plastic guide.	 <p>xx1300002421</p>
5	Remove the screws that fasten the fix sheet to the motor.	 <p>xx1300002423</p>
6	<p>Pull out the fix sheet a bit, to access the screws that fasten the cable bracket to the sheet. Loosen the bracket from the sheet by removing the two screws.</p> <p> CAUTION</p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>	 <p>xx1300002424</p>
7	<p>Valid for IRB 1200-5/0.9</p> <p>Cut the cable straps at the bottom of the housing.</p>	

Disconnecting the cabling in the lower arm

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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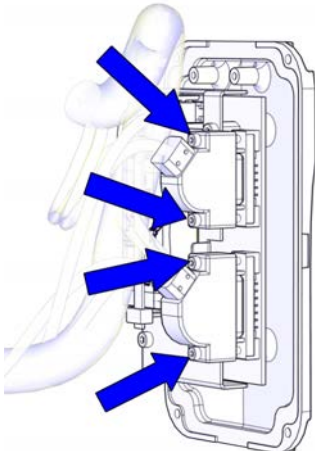
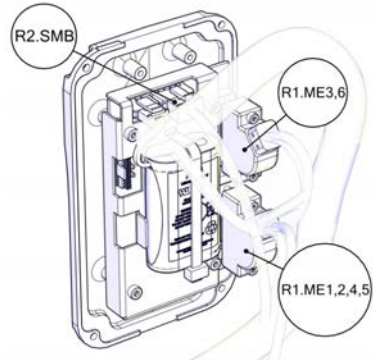
	Action	Note
2	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <i>The unit is sensitive to ESD on page 64</i>	
3	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i>	
4	Remove the EIB/SMB cover attachment screws on the lower arm and carefully open the cover.  CAUTION Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures.  CAUTION Be aware of the cabling that is attached to the cover! The cover can not be removed completely until the connectors and lugs are disconnected, as shown in following step.	 <p>xx1300002427</p>
5	Valid for IRB 1200 (no type specified) and IRB 1200 Type A Disconnect the connectors on the EIB unit. <ul style="list-style-type: none"> • R1.ME1-3 • R1.ME4-6 • R2.EIB Remove the EIB/SMB cover completely from the lower arm.	 <p>xx1300002428</p>
6	Valid for IRB 1200 (no type specified) and IRB 1200 Type A Disconnect the lugs on the EIB/SMB cover.	 <p>xx1300002428</p>

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4 Repair

4.3.1 Replacing the main cable package

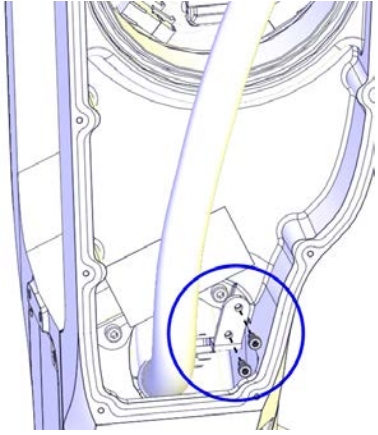

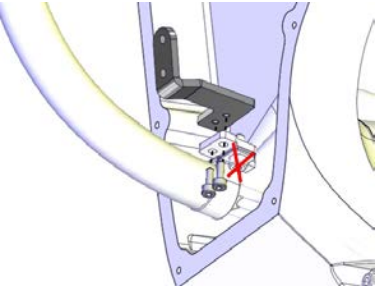
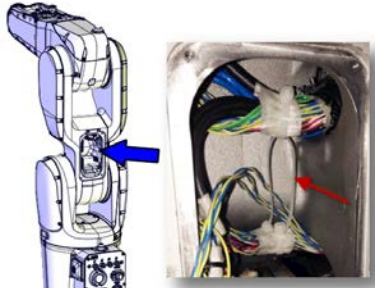
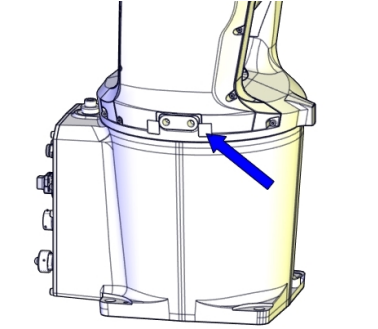
Continued

	Action	Note
7	<p>Valid for IRB 1200 Type B</p> <p>Loose the connector screws.</p>	 <p>xx170000004</p>
8	<p>Valid for IRB 1200 Type B</p> <p>Disconnect the connectors on the SMB unit.</p> <ul style="list-style-type: none"> • R1.ME1,2,4,5 • R1.ME3,6 • R2.SMB <p>Remove the EIB/SMB cover completely from the lower arm.</p>	 <p>xx170000005</p>

Removing the cable package in the lower arm

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	<p>Pull the cable package out from the upper arm housing.</p>	

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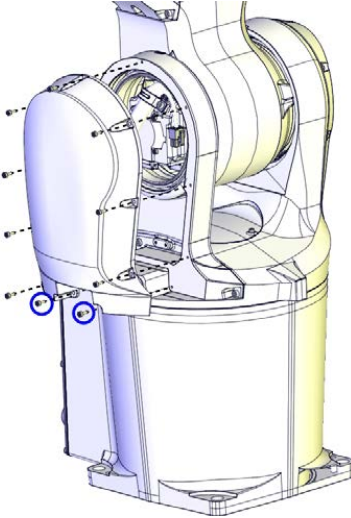
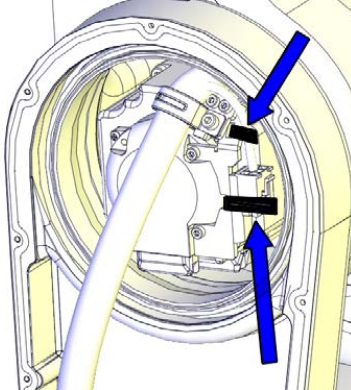
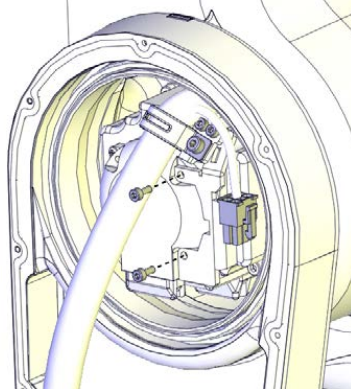
	Action	Note
4	Remove the fix sheet attachment screws in the lower arm.	 <p>xx1300002426</p>
5	Pull out the cable package a bit from the lower arm and remove the bracket from the cable package by removing the screws.  CAUTION Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	 <p>xx1300002430</p>
6	Cut the cable strap that holds the cabling together inside the EIB/SMB cavity.	 <p>xx1400001130</p>
7	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Remove the swing sealing plug. Follow the procedure specified in Removing the swing sealing plug on page 168 .	 <p>xx1600000205</p>

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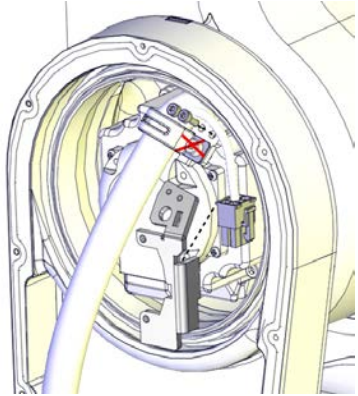
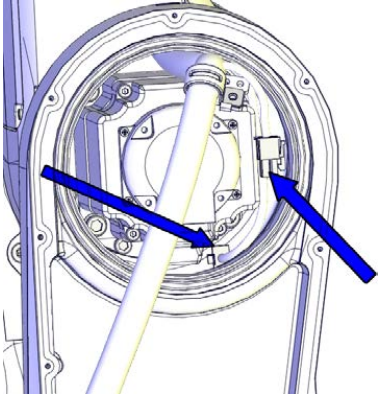
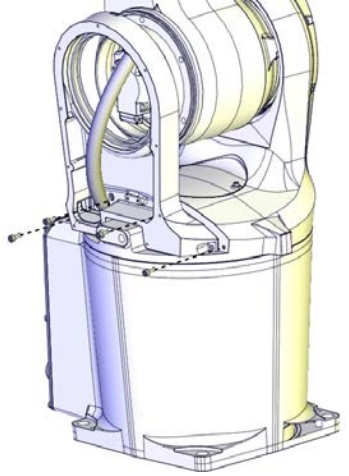
4 Repair

4.3.1 Replacing the main cable package

Continued

	Action	Note
8	Remove the swing cable housing cover by removing the screws.	 xx1300002431
9	Cut the cable straps.	 xx1400001528
10	Remove the axis-2 motor bracket screws.	 xx1300002432

Continues on next page

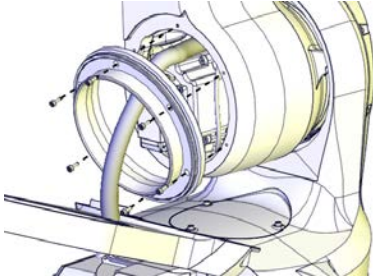

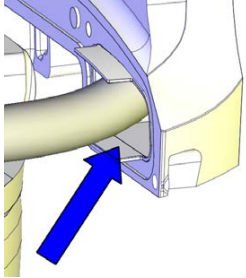
	Action	Note
11	<p>Pull out the cabling and then remove the axis-2 motor bracket from the cable package by removing the screws.</p> <p> CAUTION</p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>	 <p>xx1300002433</p>
12	<p>Disconnect the motor connectors.</p> <ul style="list-style-type: none"> • R2.ME2 • R2.MP2 	 <p>xx1300002434</p>
13	<p>Loosen the cable housing from the swing by removing the screws. Leave it hanging on the cable package.</p>	 <p>xx1300002435</p>

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4 Repair

4.3.1 Replacing the main cable package



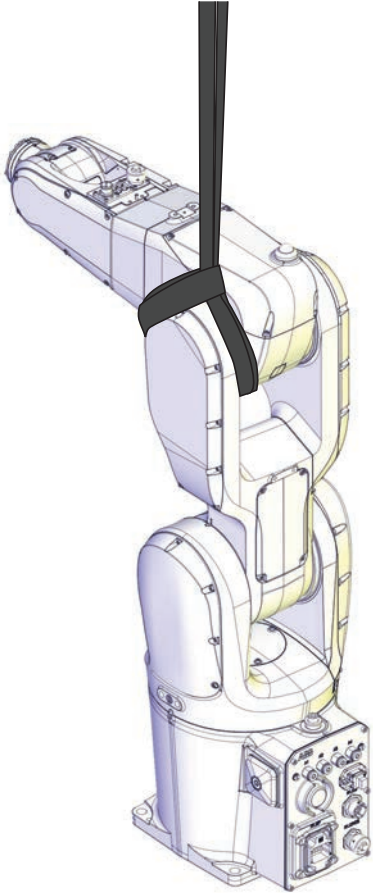


Continued

	Action	Note
14	Remove the axis-2 sealing ring by removing the screws.	 xx140000020
15	Pull out the cable package from the lower arm.  Tip There is a groove on the lower arm casting that simplifies cable passage, if needed. Its position can easily be felt by hand.	
16	Loosen the plastic plate from the cable housing in order to facilitate continued removal of the cable package .	 xx140000023

Putting the robot on its side

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.	

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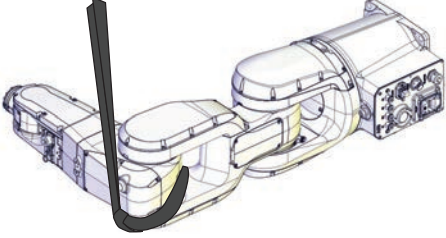
	Action	Note
3	<p> CAUTION</p> <p>The robot weighs . IRB 1200-5/0.9: 54 kg IRB 1200-7/0.7: 52 kg All lifting accessories used must be sized accordingly!</p>	
4	<p>Run a roundsling between the housing and the lower arm.</p> <p> CAUTION</p> <p>Put the sling on the lower arm side and not on the cable arm side, which would damage the robot.</p>	<p>Roundsling, 2 m</p>  <p>xx140000679</p>
5	<p> WARNING</p> <p>The robot is likely to be mechanically unstable if not secured to the foundation!</p>	
6	<p> CAUTION</p> <p>The robot weighs . IRB 1200-5/0.9: 54 kg IRB 1200-7/0.7: 52 kg All lifting accessories used must be sized accordingly!</p>	

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4 Repair

4.3.1 Replacing the main cable package

Continued

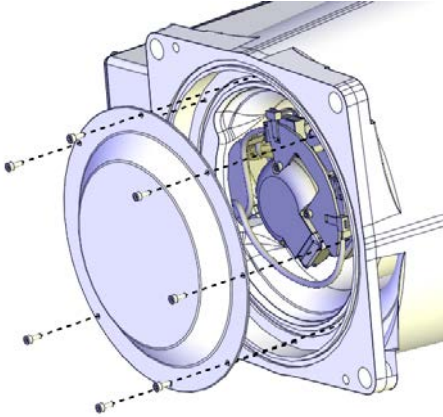
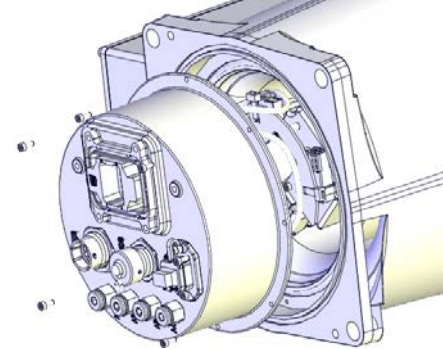
	Action	Note
7	Loosen the robot from the foundation by removing the foundation attachment screws and put the robot on its side.	 xx140000680

Disconnecting the axis-1 motor connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	

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4.3.1 Replacing the main cable package
Continued

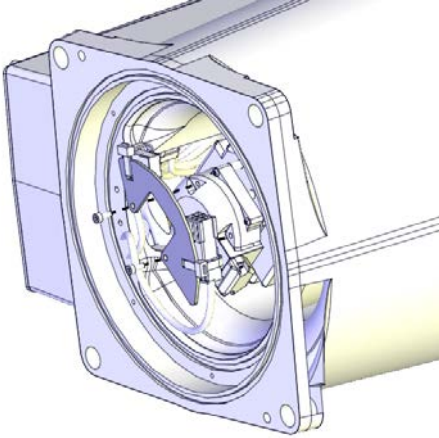
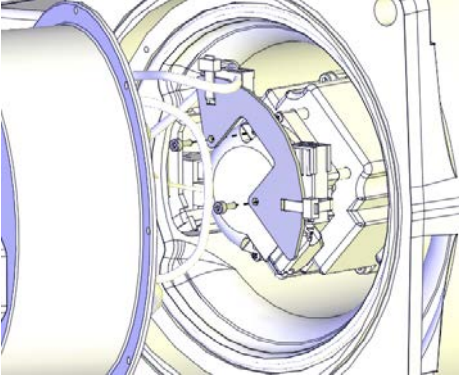
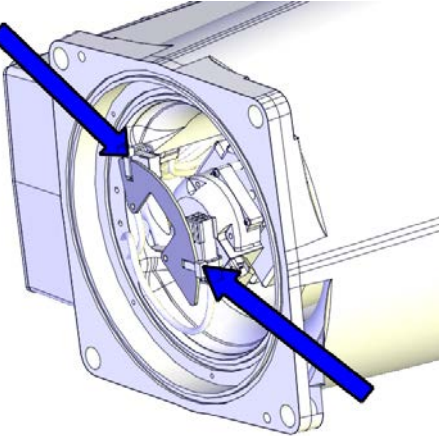
	Action	Note
3	Remove the bottom cover.	<p>Rear connector interface:</p>  <p>xx130000469</p> <p>Bottom connector interface:</p>  <p>xx140000403</p>

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4 Repair




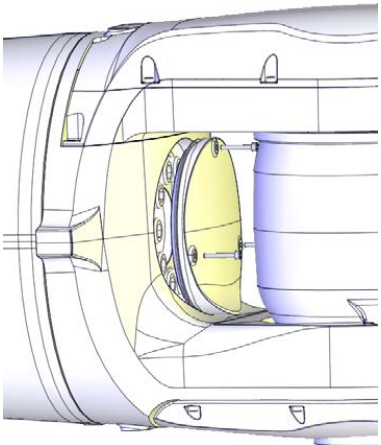
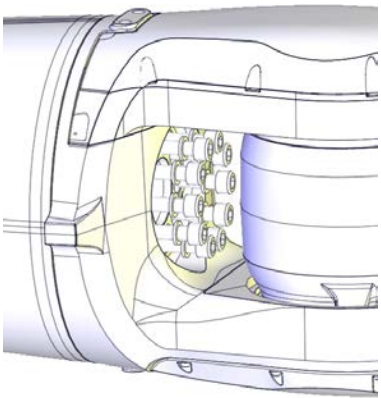
4.3.1 Replacing the main cable package

Continued

	Action	Note
4	Remove the axis-1 motor bracket.	<p data-bbox="943 315 1225 342">Rear connector interface:</p>  <p data-bbox="943 797 1050 819">xx130000470</p> <p data-bbox="943 837 1254 864">Bottom connector interface:</p>  <p data-bbox="943 1249 1050 1272">xx140000404</p>
5	Loosen the connectors from the bracket by cutting the cable straps, and disconnect the connectors.	 <p data-bbox="943 1751 1050 1774">xx1300002496</p>

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Separating the arm system from base


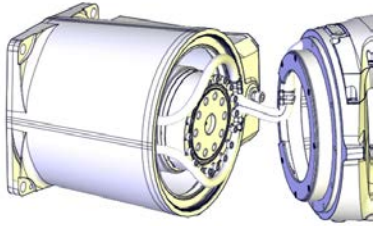
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Remove the swing top cover by removing the screws.  Tip Fit M4 screws in the cover holes to pull out the cover more easily. Only tighten the screws lightly in order not to damage the threads.	 <p>xx1300000467</p>
4	Remove the screws and washers.	 <p>xx1300000471</p>

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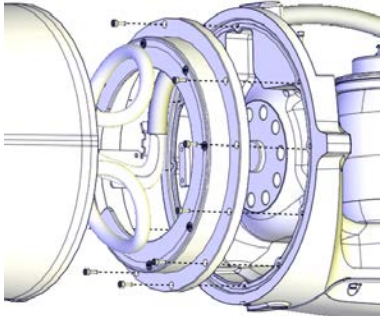
4 Repair

4.3.1 Replacing the main cable package

Continued

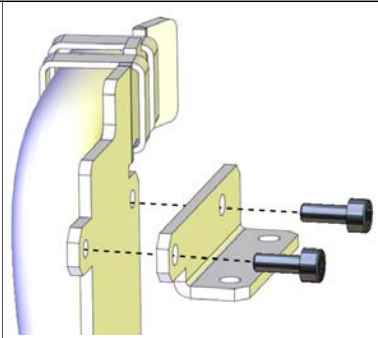
	Action	Note
5	<p>Pull out the base slightly and turn it aside.</p> <p> Tip</p> <p>Remember the cable layout in the base. The cabling must be positioned and angled in the same way during refitting.</p>	 <p>xx1300000472</p>

Removing the cable package from the axis-1 sealing ring

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	<p>Remove the axis-1 sealing ring from the swing and carefully run the cable package out from the swing.</p>	 <p>xx1300002438</p>
4	<p>Remove the swing (including arm system) completely from the base and lay it aside on a safe location.</p>	

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4.3.1 Replacing the main cable package
Continued



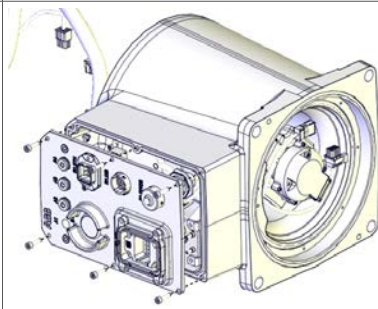
	Action	Note
5	Remove the cable bracket from the cabling, if the cable package is to be replaced with a new spare part.	 <p>xx1300002446</p>

Removing the cable package from the base

Notice that the procedure differs depending on if the connector interface is located either at the rear or at the bottom of the base.

Cabling with rear interface

Use this procedure if the cable connector interface is located at the rear of the base.

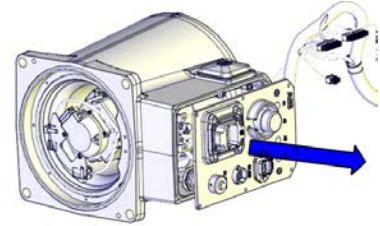
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	Open the base cover.	 <p>xx1300002448</p>
4	Disconnect the earth cable.	

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4 Repair



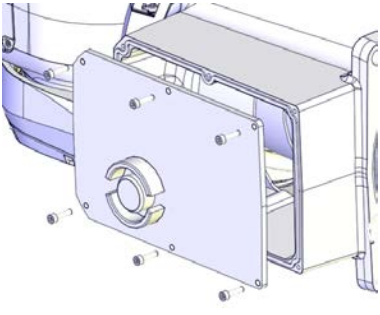
4.3.1 Replacing the main cable package

Continued

	Action	Note
5	Pull the cable package out from the base, through the rear.	 <p>xx1300002456</p>

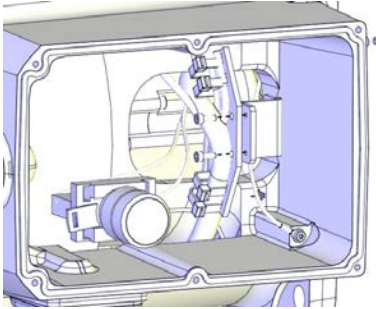
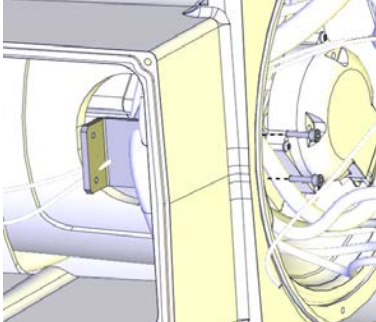
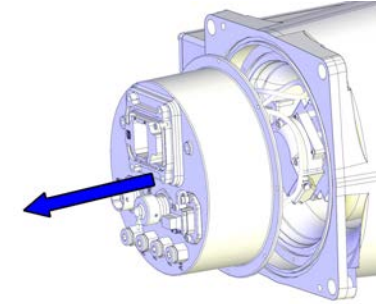
Cabling with bottom interface, and cabling routed from below

Use this procedure if the cable connector interface is located at the bottom of the base and the cabling is routed from below.

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	Open the base cover.	 <p>xx1400000405</p>
4	Remove the brake release button from the base cover.	
5	Disconnect the earth cable.	

Continues on next page

4.3.1 Replacing the main cable package
Continued

	Action	Note
6	Remove the cable bracket by removing the screws.	 <p>xx140000406</p>
7	Remove the bracket inside the base by removing the screws.	 <p>xx140000407</p>
8	Pull the cable package out from the base, through the bottom.	 <p>xx140000411</p>

Refitting the main cable package

Use these procedures to refit the cable package.

Adjusting the air hose length for IRB 1200-7/0.7


	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

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4 Repair

4.3.1 Replacing the main cable package

Continued

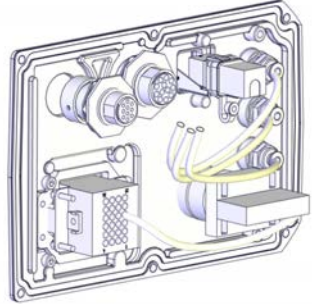
	Action	Note
2	<p>Valid for IRB 1200-7/0.7</p> <p>If the cable harness is a new spare part, cut off 100 mm length of each air hose at the upper end.</p> <p> Note</p> <p>The same cable harness spare part is used for IRB 1200-5/0.9 .</p>	

Refitting the cable package to the base

Notice that the procedure differs depending on if the connector interface is located either at the rear or at the bottom of the base.

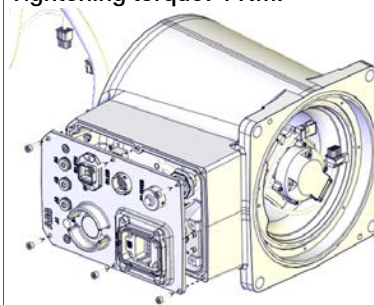

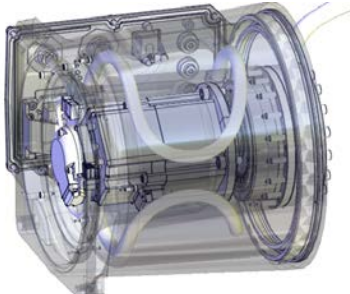
Cabling with rear interface

Use this procedure if the cable connector interface is located at the rear of the base.

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Check the gasket on the base cover.</p> <p>Replace if damaged.</p>	<p>Gasket for rear base cover: 3HAC058566-001 (not Hygienic robots) / 3HAC080710-001 (Hygienic robots)</p>  <p>xx1400000741</p>
3	<p>Insert the cable package in and up through the base, through the rear.</p>	
4	<p>Reconnect the earth cable.</p>	

Continues on next page

4.3.1 Replacing the main cable package *Continued*

	Action	Note
5	Refit the base cover with the attachment screws.	<p>Screws: 3HAB3409-212 (M4x16). Tightening torque: 4 Nm.</p>  <p>xx1300002448</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
6	<p>Route the cable package inside the base as shown in the figure.</p> <p>Apply grease to the cable package, cover all moving area of the package.</p>	 <p>xx1400000480</p>

Cabling with bottom interface, cabling routed from below

Use this procedure if the cable connector interface is located at the bottom of the base and the cabling is routed from below.

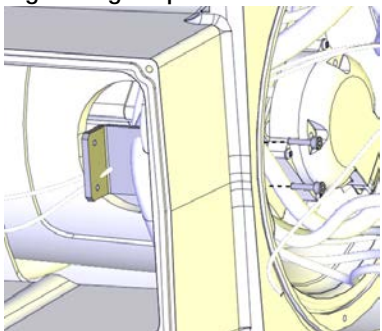
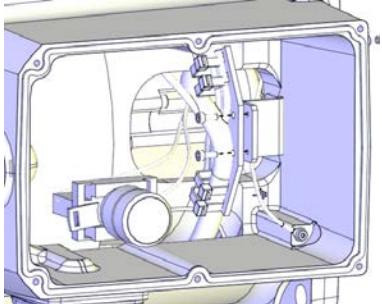
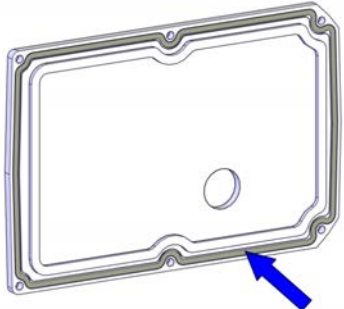
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	Insert the cable package in and up through the base, through the bottom.	

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4 Repair

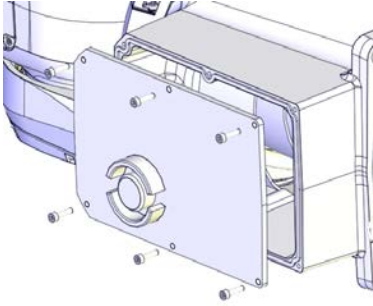

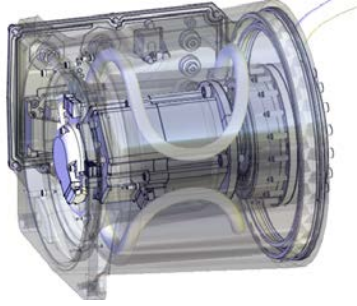
4.3.1 Replacing the main cable package

Continued

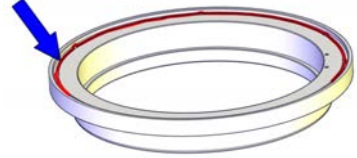
	Action	Note
3	Refit the bracket inside the base with the screws.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1400000407</p>
4	Refit the cable bracket with the screws.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1400000406</p>
5	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the gasket of the base cover. Replace if damaged.</p>	<p>Gasket for rear base cover: 3HAC058566-001 (not Hygienic robots) / 3HAC080710-001 (Hygienic robots)</p>  <p>xx1400000413</p>
6	Reconnect the earth cable.	
7	Refit the brake release button to the base cover.	

Continues on next page

4.3.1 Replacing the main cable package Continued

	Action	Note
8	Refit the base cover.	<p>Screws: 3HAB3409-212 (M4x16). Tightening torque: 4 Nm.</p>  <p>xx1400000405</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
9	<p>Route the cable package inside the base as shown in the figure.</p> <p>Apply grease to the cable package, cover all moving area of the package.</p>	 <p>xx1400000480</p>

Refitting the cable package to the axis-1 sealing ring




	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Check the axis-1 sealing ring. Replace if damaged.</p>	<p>Axis-1 sealing ring: 3HAC044676-001 / 3HAC068107-001 ⁱ</p>
3	<p>For robots with protection class IP67</p> <p>On axis-1 sealing ring version 3HAC056658-001: Add sealant to the axis-1 sealing ring. (See Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 880.)</p>	<p>Sealant: Sikaflex 521FC.</p>  <p>xx1600001125</p>

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4 Repair





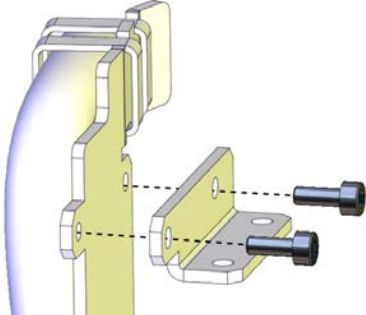
4.3.1 Replacing the main cable package

Continued

	Action	Note
4	<p>For robots with protection class IP67 On axis-1 sealing ring version 3HAC044676-001, 3HAC058568-001 or 3HAC068107-001:</p> <p>For robots with protection type Foundry Plus On axis-1 sealing ring version 3HAC058568-001 or 3HAC068107-001:</p> <p>Check the gasket on the axis-1 sealing ring. (See <i>Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 880.</i>)</p> <p>Replace if damaged.</p>	<p>On axis-1 sealing ring version 3HAC044676-001: Axis-1 sealing ring gasket: 3HAC045685-001</p>  <p>xx1400000458</p> <p>On axis-1 sealing ring version 3HAC058568-001: Axis-1 sealing ring gasket: 3HAC058349-001 (not Hygienic robots) / 3HAC080707-001 (Hygienic robots)</p>  <p>xx1600001149</p> <p>On axis-1 sealing ring version 3HAC068107-001: Axis-1 sealing ring gasket: 3HAC058349-001 (not Hygienic robots) / 3HAC080707-001 (Hygienic robots)</p>  <p>xx1900001735</p>

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4.3.1 Replacing the main cable package
Continued

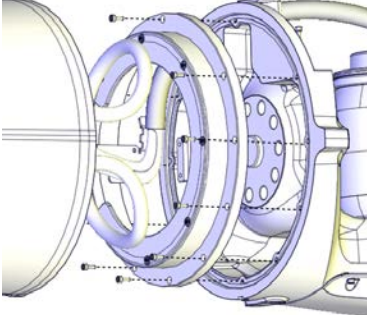
	Action	Note
5	<p>For robots with protection class IP67 On axis-1 sealing ring version 3HAC056658-001, 3HAC058568-001 or 3HAC068107-001:</p> <p>For robots with protection type Foundry Plus On axis-1 sealing ring version 3HAC058568-001 or 3HAC068107-001:</p> <p>Check the V-ring on the axis-1 sealing ring. (See <i>Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 880.</i>)</p> <p>Replace if damaged.</p>	<p>V-ring: 3HAB3732-34</p> <p>On axis-1 sealing ring version 3HAC056658-001:</p>  <p>xx1600001124</p> <p>On axis-1 sealing ring version 3HAC058568-001:</p>  <p>xx1600001150</p> <p>On axis-1 sealing ring version 3HAC068107-001:</p>  <p>xx1900001736</p>
6	<p>Check the cable protection on the axis-1 sealing ring. Replace if damaged.</p> <p>If replacing the cable protection, use locking liquid Loctite 243 on the screws.</p>	<p>Cable protection: 3HAC044691-001 Torx countersunk head screw M3x5: 3HAC14286-4 Tightening torque: 0.3 Nm</p>  <p>xx1400000456</p>
7	<p>Refit the cable bracket to the cabling, if removed. Use Loctite 243 on the screw threads.</p>	<p>Tightening torque: 1 Nm.</p>  <p>xx1300002446</p>

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4 Repair



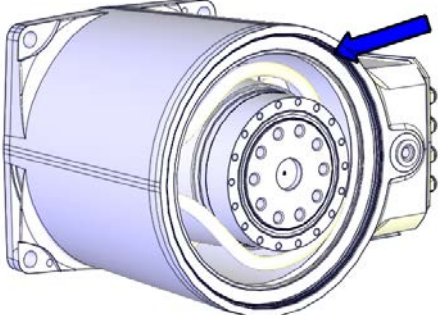
4.3.1 Replacing the main cable package

Continued

	Action	Note
8	Refit the axis-1 sealing ring to the swing and carefully run the cabling into the swing.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002438</p>

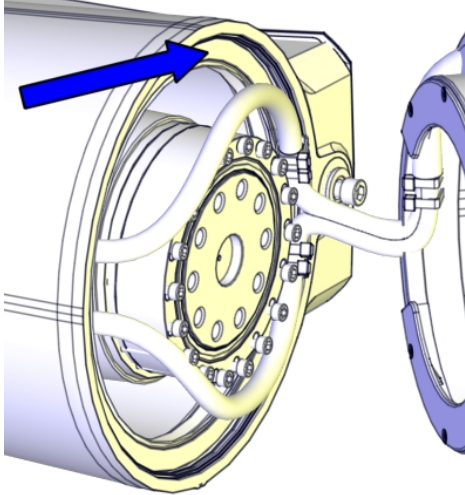
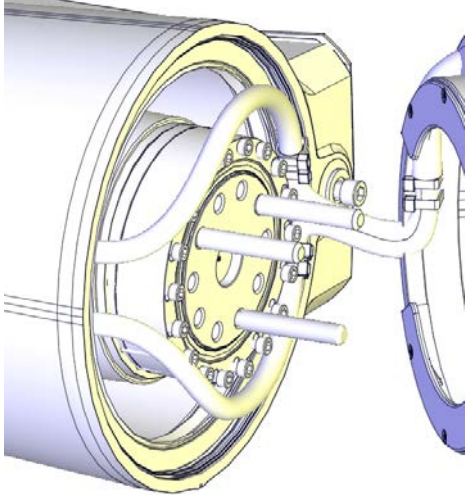

ⁱ For information on which sealing ring to be ordered, see [Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 880](#).

Assembling the swing and base

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Check the axis-1 radial sealing in the base. Replace if damaged.</p> <p> Note</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p> <p>For robots with protection class IP67</p> <p>Check the M2 variseal sealing in the base. Replace if damaged.</p> <p>The M2 variseal sealing is only installed on base version 3HAC049628-001. See Spare part versions for the base on IP40/IP67 robots on page 876.</p> <p> CAUTION</p> <p>Do not fit M2 variseal sealing on robots in other protection class or protection types.</p>	<p>Radial sealing with dust lip: 3HAB3701-47 M2 variseal sealing: 3HAC044641-002</p>  <p>xx1400000472</p> <p>Replacement is detailed in Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve) on page 494.</p>

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4.3.1 Replacing the main cable package
Continued

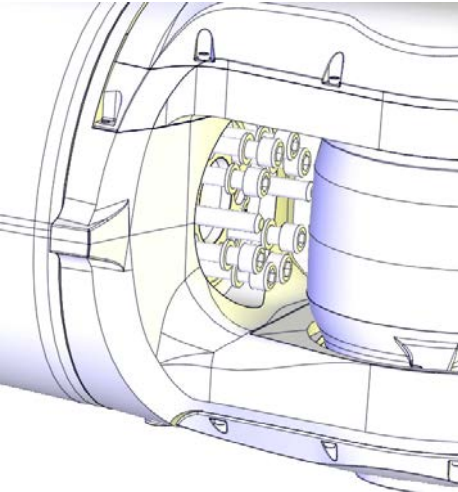

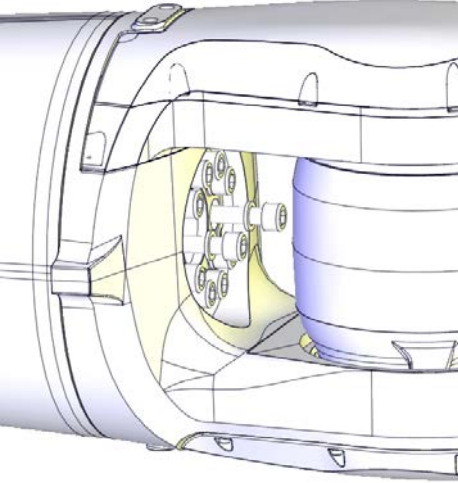
	Action	Note
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus Apply grease to the radial sealing surface.</p>	<p>Grease: 3HAC058065-001.</p>  <p>xx160000170</p>
4	<p>Fit the guide pins to the drive unit.</p>	<p>Guide pin for axis-1 gear unit: 3HAC049703-001</p>  <p>xx1300002566</p> <p>Always use three guide pins together!</p>
5	<p>Refit the swing to the base with guidance from the guide pins while running the cabling up through the swing. Position and angle the cabling inside the base as it was positioned during removal.</p> <p> CAUTION</p> <p>Be careful not to squeeze any cabling during the refitting procedure.</p>	

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4 Repair

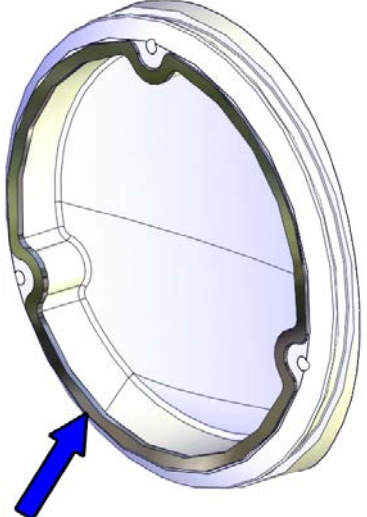
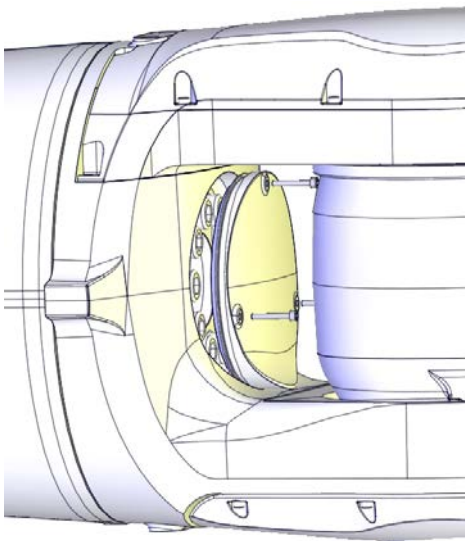

4.3.1 Replacing the main cable package

Continued

	Action	Note
6	Secure with attachment screws and washers, but do not tighten yet.	<p data-bbox="944 315 1310 342">Screws: 3HAB3409-52 (M10x35).</p>  <p data-bbox="944 840 1050 857">xx1300002567</p> <p data-bbox="944 880 1002 936"> Note</p> <p data-bbox="944 952 1401 1003">Only use specified screws, never replace them with other screws.</p>
7	Remove the guide pins and refit the remaining attachment screws and washers.	 <p data-bbox="944 1529 1050 1547">xx1300000523</p>
8	Tighten all screws.	Tightening torque: 40 Nm.

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4.3.1 Replacing the main cable package
Continued

	Action	Note
9	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the gasket. Replace if damaged.</p>	<p>Gasket on top swing cover 3HAC056696-001 (not Hygienic robots) / 3HAC080698-001 (Hygienic robots)</p>  <p>xx140000425</p>
10	<p>Refit the swing top cover with the screws. Replace if damaged.</p>	<p>Cover on top of swing: 3HAC059679-001 Cover on top of swing, Clean Room Cover on top of swing, food grade lubrication Cover on top of swing, Hygienic : 3HAC056133-001 Screws: 3HAB3409-209 (M3x20). Tightening torque: 1.5 Nm.</p>  <p>xx130000467</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

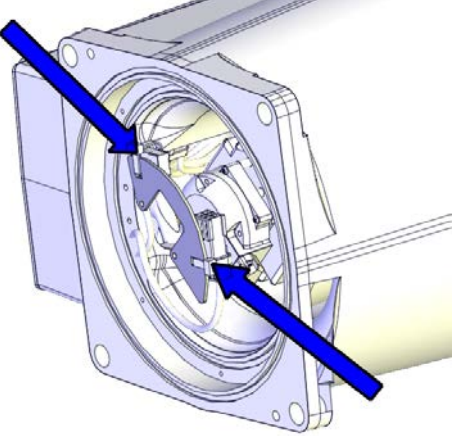
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4 Repair

4.3.1 Replacing the main cable package

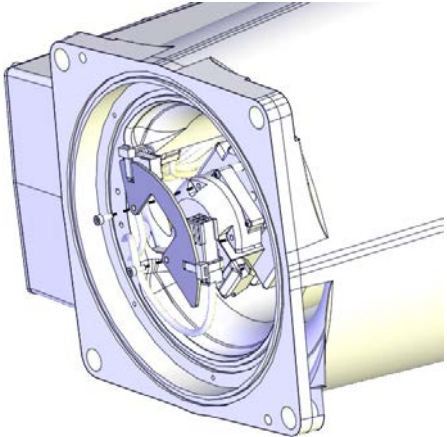
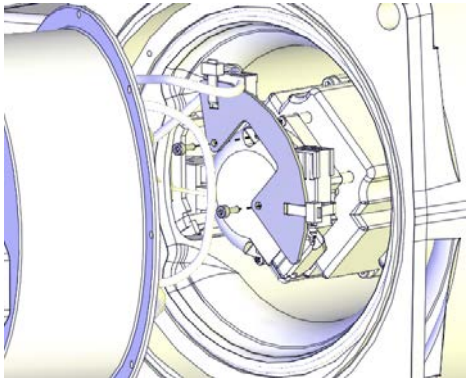
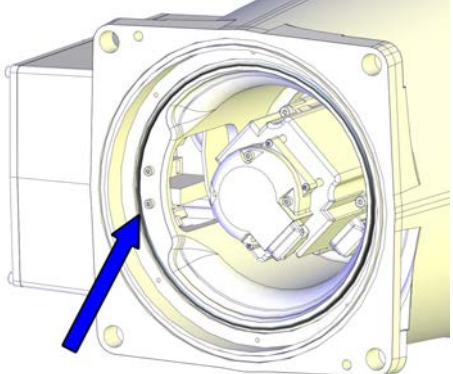
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Connecting the axis-1 motor connectors

	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the connectors and secure the connectors to the bracket with cable straps.	 <p>xx1300002496</p>

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4.3.1 Replacing the main cable package
Continued

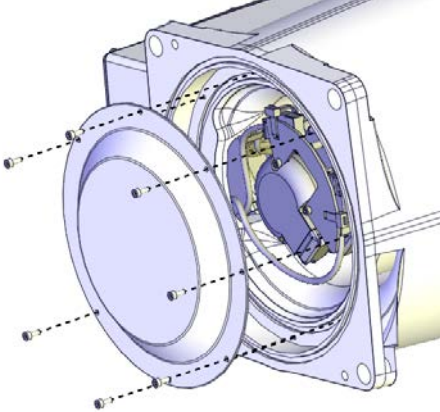
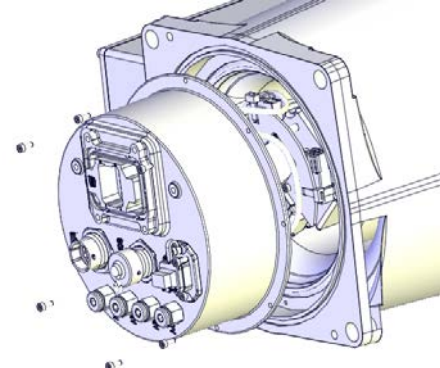

	Action	Note
3	Refit the axis-1 motor bracket.	<p>Tightening torque: 1.5 Nm. Rear connector interface:</p>  <p>xx130000470</p> <p>Bottom connector interface:</p>  <p>xx140000404</p>
4	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the O-ring. Replace if damaged.</p>	<p>O-ring: 3HAB3772-86</p>  <p>xx140000412</p>

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4 Repair

4.3.1 Replacing the main cable package

Continued


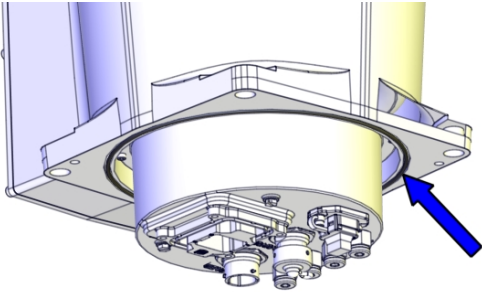
	Action	Note
5	Refit the bottom cover.	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm. Rear connector interface:</p>  <p>xx130000469</p> <p>Bottom connector interface:</p>  <p>xx140000403</p> <p> Note Only use specified screws, never replace them with other screws.</p>

Securing the robot to the foundation

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

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4.3.1 Replacing the main cable package *Continued*

	Action	Note
2	 CAUTION The robot weighs . IRB 1200-5/0.9: 54 kg IRB 1200-7/0.7: 52 kg All lifting accessories used must be sized accordingly!	
3	For robots with: protection class IP67, protection type Foundry Plus protection type Clean Room food grade lubrication with protection type Hygienic and manipulator cables routed from below Check the gasket at the bottom of the base. Replace if damaged.	O-ring: 3HAB3772-141 For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Used with manipulator cables routed from below  xx1500000241
4	Raise the robot to standing and secure to the foundation with the attachment screws and washers.	Attachment screws: M12x35 (robot installation directly on foundation), quality: 8.8. Washers: 13 x 20 x 2, steel hardness class 300HV. Pin: 2 pcs, D6x20, ISO 2338 - 6m6x20 - A1. Tightening Torque: 55 Nm ± 5 Nm.

Refitting the cable package in the lower arm

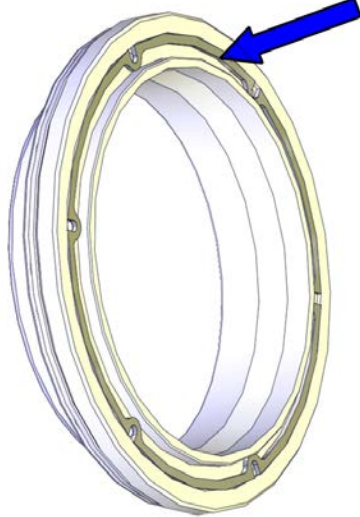
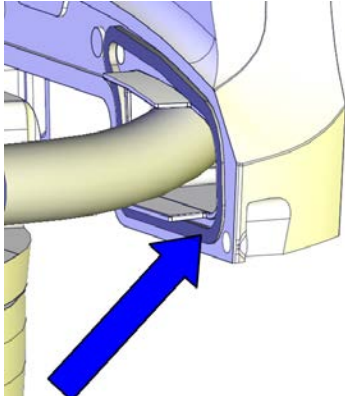
	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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4 Repair

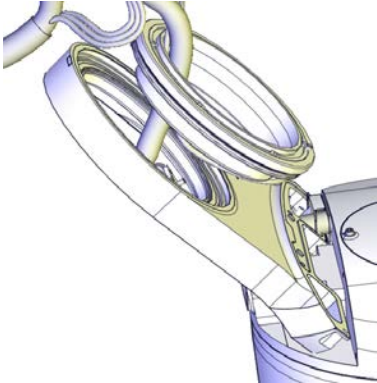
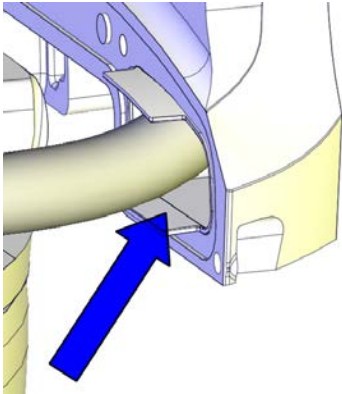
4.3.1 Replacing the main cable package

Continued

	Action	Note
2	<p>Check the axis-2 sealing ring. For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the gasket. Replace if damaged.</p>	<p>Axis-2 sealing ring: 3HAC044677-001 Gasket of axis-2 sealing ring: 3HAC045688-001 (not Hygienic robots) / 3HAC080697-001 (Hygienic robots)</p>  <p>xx1400000476</p>
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the gasket of the cable housing plastic plate. Replace if damaged.</p>	<p>Gasket of plastic plate: 3HAC044894-001 (not Hygienic robots) / 3HAC080695-001 (Hygienic robots)</p>  <p>xx1400000457</p>

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4.3.1 Replacing the main cable package
Continued


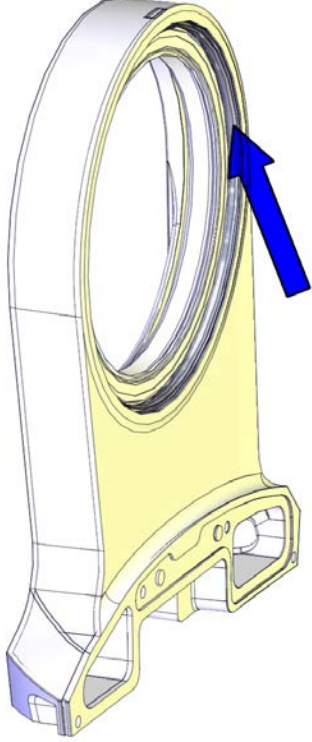
	Action	Note
4	Fetch the cable housing, the plastic plate and the axis-2 sealing ring and run the cable package through them.	 <p>xx140000025</p>
5	Fasten the plastic plate to the cable housing, if removed. Replace if damaged.	<p>The plastic plate is included in: Cable harness material set: 3HAC049663-001.</p>  <p>xx140000023</p>

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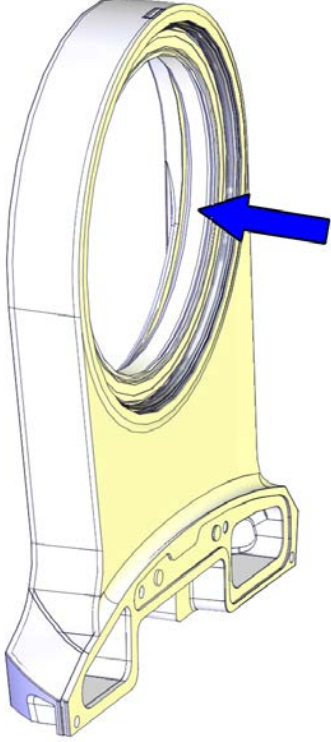

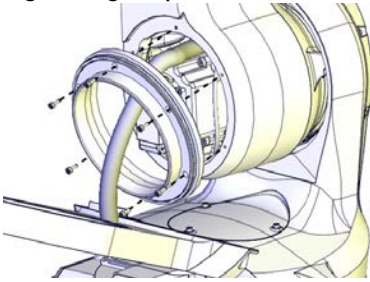
4 Repair

4.3.1 Replacing the main cable package

Continued

	Action	Note
6	<p>For robots with protection class IP67 For robots with protection type Foundry Plus Check the sealing. Replace if damaged.</p> <p> CAUTION</p> <p>Do not fit M2 variseal sealing on robots in other protection class or protection types.</p>	<p>M2 variseal sealing: 3HAC044641-004</p>  <p>xx1400000454</p>

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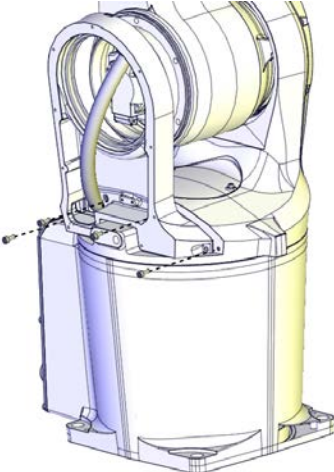

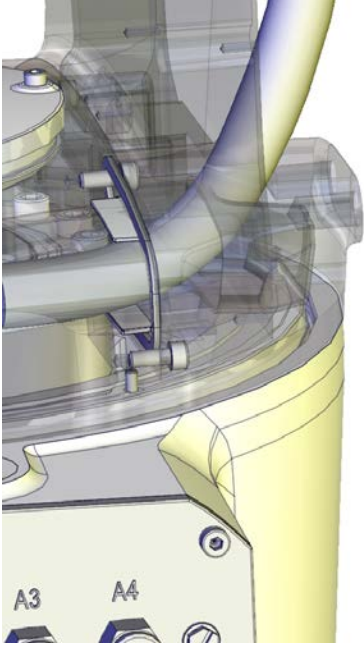
	Action	Note
7	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the radial sealing. Replace if damaged.</p> <p> Note</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p>	<p>Radial sealing with dust lip: 3HAB3701-41</p>  <p>xx1400000753</p> <p>Replacement is detailed in Replacing the swing spare parts (swing, axis-2 radial sealing) on page 574.</p>
8	<p>Guide the cable package into the lower arm.</p> <p> Tip</p> <p>There is a groove on the lower arm casting that simplifies cable passage, if needed. Its position can easily be felt by hand.</p>	
9	<p>Refit the axis-2 sealing ring with the screws.</p>	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1400000020</p>

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4 Repair

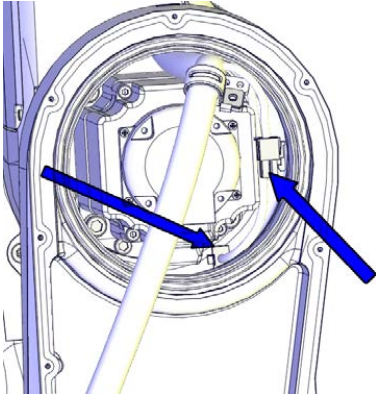

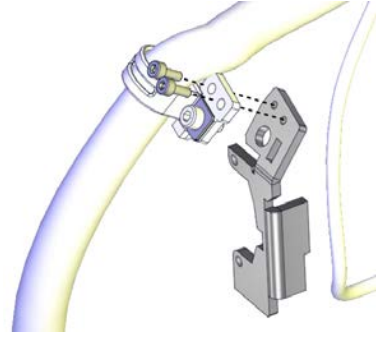
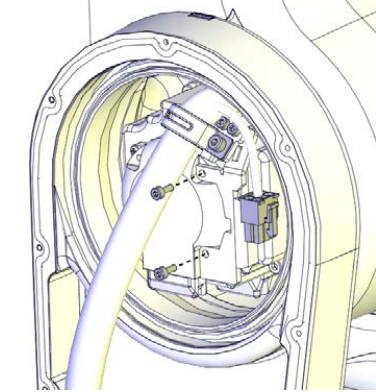
4.3.1 Replacing the main cable package

Continued

	Action	Note
10	Refit the cable housing with the screws.	<p>Screws: 3HAB3409-236 (M4x10). Tightening torque: 3 Nm.</p>  <p>xx1300002435</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
11	Apply grease to the cable package, cover all moving area of the package.	 <p>xx1400000481</p>

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4.3.1 Replacing the main cable package
Continued

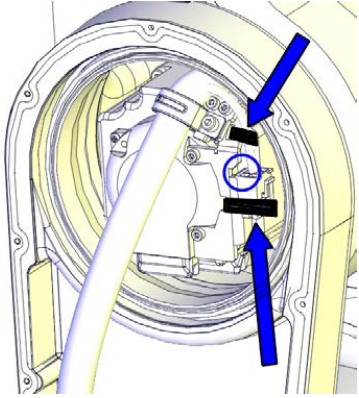
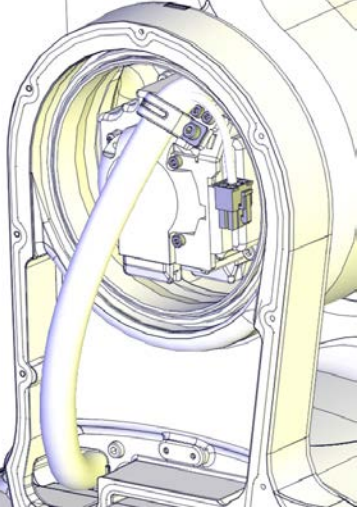
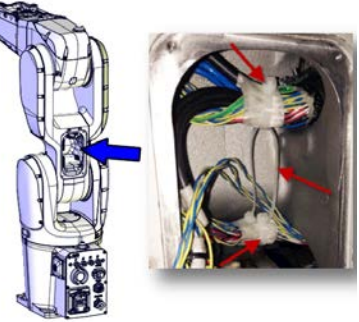
	Action	Note
12	Reconnect the motor connectors. <ul style="list-style-type: none"> • R2.ME2 • R2.MP2 	 <p>xx1300002434</p>
13	Refit the axis-2 motor bracket to the cable package with the two screws. <p> CAUTION</p> Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	Tightening torque: 1.5 Nm.  <p>xx1400000021</p>
14	Refit the axis-2 motor bracket to the motor.	 <p>xx1300002432</p>

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4 Repair

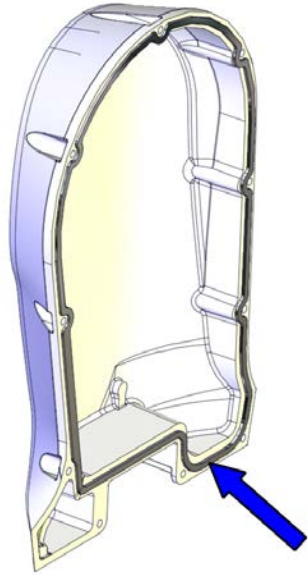
4.3.1 Replacing the main cable package

Continued

	Action	Note
15	Secure the connector R2.MP2 and its cable with cable straps onto the motor bracket. Make sure the connector is fixed by its tab to the bracket.	 xx1400001529
16	Apply grease to the cable package, cover all moving area of the package.	 xx1400000482
17	<p>In order to keep the cabling away from the hot axis-2 motor, the cable package must be secured accordingly inside the EIB/SMB cavity:</p> <ol style="list-style-type: none">1 The cable package is strapped with tape by the supplier at two locations. Put a cable strap around the cable package at each location.2 Insert a third cable strap through the top strap and the bottom strap, and close the strap to secure the cable package and keep it in place. <p>See the figure.</p>	 xx1400001131

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4.3.1 Replacing the main cable package
Continued


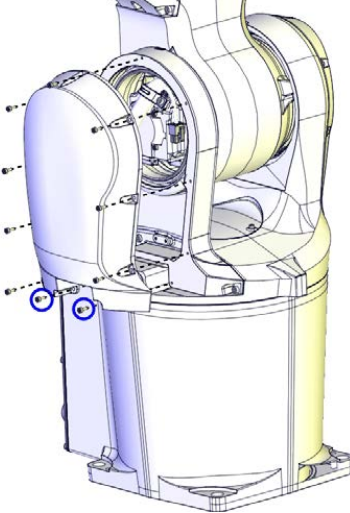

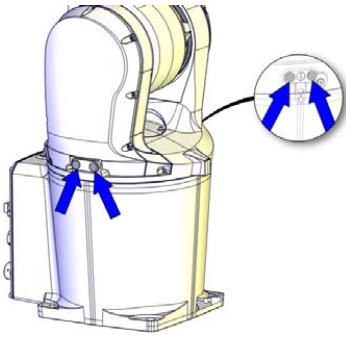
	Action	Note
18	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the gasket of the cable housing cover. Replace if damaged.</p>	<p>Gasket on cable housing cover: 3HAC056726-001 (not Hygienic robots) / 3HAC080704-001 (Hygienic robots)</p>  <p>xx1400000424</p>
19	<p>Check the PTFE film. Replace if damaged.</p>	<p>PTFE film on cable housing cover: 3HAC044660-001</p>
20	<p>Apply grease to the inner surface of the cable housing cover and to the PTFE film surface.</p>	

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4 Repair

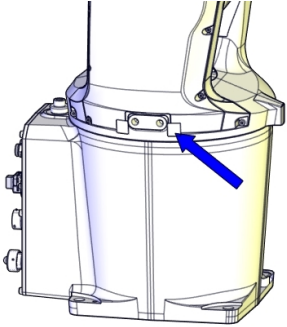

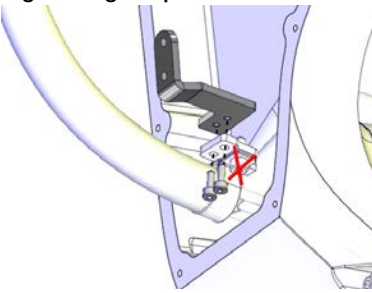
4.3.1 Replacing the main cable package

Continued


	Action	Note
21	<p>Refit the cable housing cover. Replace if damaged.</p> <p> Note</p> <p>Remember to refit the two lower screws shown in the figure.</p>	<p>Cable housing cover of the swing: 3HAC059678-001</p> <p>Cable housing cover of the swing, Clean Room</p> <p>Cable housing cover of the swing, food grade lubrication</p> <p>Cable housing cover of the swing, Hygienic : 3HAC056214-001</p> <p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p>  <p>xx1300002431</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
22	<p>For robots with protection type Foundry Plus Check the protection plugs for lifting holes. Replace if damaged.</p>	<p>Protection plug for lifting holes: 3HAC4836-24</p>  <p>xx1600001151</p>

Continues on next page

4.3.1 Replacing the main cable package Continued

	Action	Note
23	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Refit the swing sealing plug. Follow the procedure specified in Refitting the swing sealing plug on page 169.</p>	<p>Swing sealing plug:3HAC053687-001</p>  <p>xx1600000205</p>
24	<p>Refit the lower arm bracket to the cable package.</p> <p> CAUTION</p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002430</p>

Connecting the cabling in the lower arm

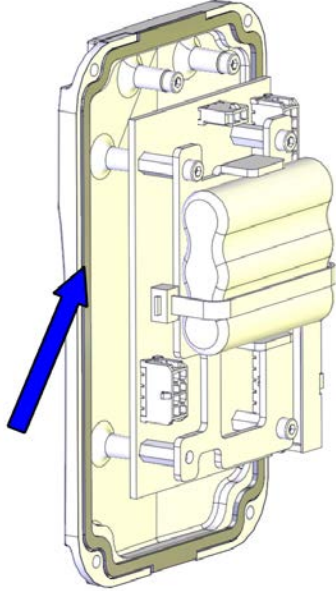

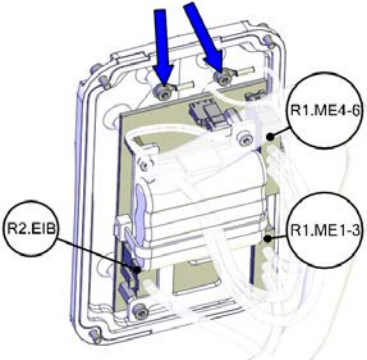

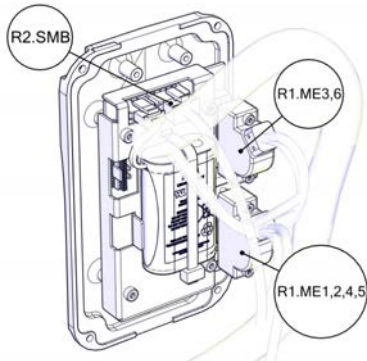
	Action	Note
1	<p> ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section The unit is sensitive to ESD on page 64</p>	
2	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

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4 Repair

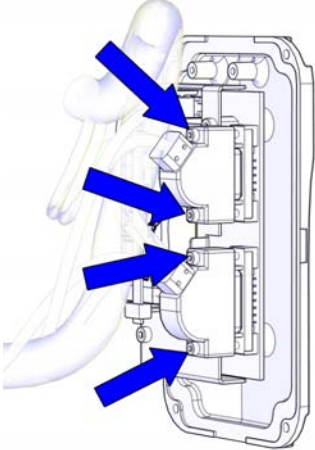
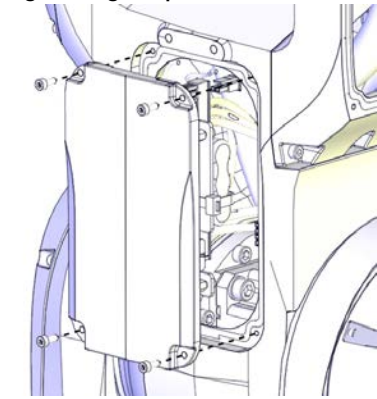

4.3.1 Replacing the main cable package

Continued

	Action	Note
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the EIB/SMB cover gasket. Replace if damaged.</p>	<p>Gasket on EIB/SMB cover: 3HAC056728-001 (not Hygienic robots) / 3HAC080706-001 (Hygienic robots)</p>  <p>xx1400000475</p>
4	<p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Connect the connectors to the EIB unit.</p> <ul style="list-style-type: none"> • R1.ME1-3 • R1.ME4-6 • R2.EIB <p> WARNING</p> <p>Make sure not to mix the R2.EIB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.</p>	 <p>xx1300002428</p>
5	<p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Connect the lugs to the EIB/SMB cover.</p>	
6	<p>Valid for IRB 1200 Type B</p> <p>Connect the connectors to the SMB unit.</p> <ul style="list-style-type: none"> • R1.ME1,2,4,5 • R1.ME3,6 • R2.SMB <p> WARNING</p> <p>Make sure not to mix the R2.SMB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.</p>	 <p>xx1700000005</p>

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4.3.1 Replacing the main cable package
Continued

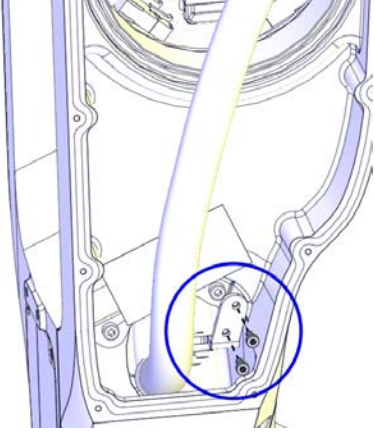
	Action	Note
7	<p>Valid for IRB 1200 Type B Tighten the connector screws.</p>	<p>Tightening torque: 0.3 Nm</p>  <p>xx1700000004</p>
8	<p>Refit the EIB/SMB cover to the lower arm with the attachment screws.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm</p>  <p>xx1300002427</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

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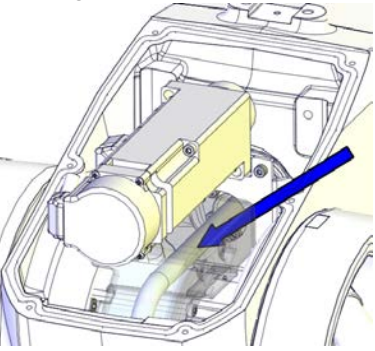
4 Repair

4.3.1 Replacing the main cable package

Continued



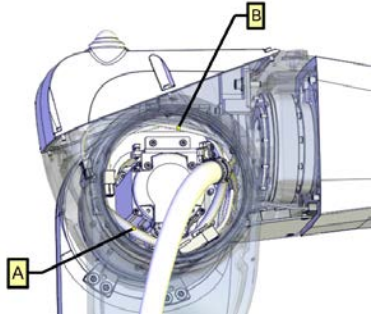

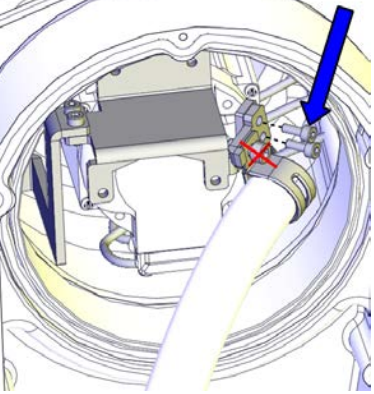
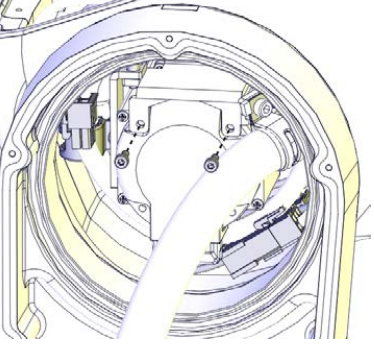
	Action	Note
9	Refit the fix sheet attachment screws in the lower arm.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002426</p>

Refitting the cable package in the housing

	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Before guiding the cable package into the housing and upper arm, apply grease to the cable package, to the area going into the upper arm, shown in the figure. Cover all moving area of the package.</p>	<p>Area to be lubricated, shown in cable package already fitted to the housing.</p>  <p>xx1400000483</p>

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4.3.1 Replacing the main cable package
Continued

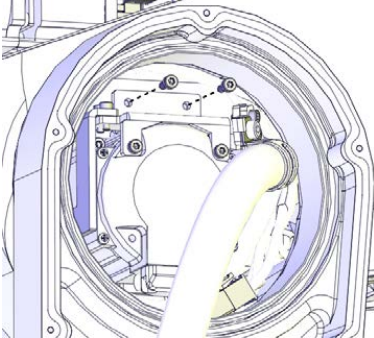

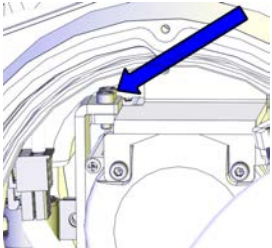
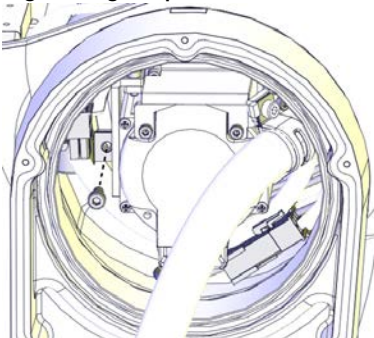
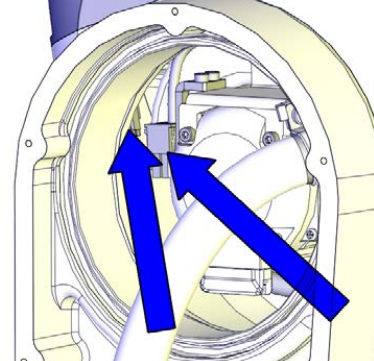
	Action	Note
3	<p>Guide the cable package into the upper arm, through the housing.</p> <p> Note</p> <p>Guide the air hoses (A) underneath the bottom side of the axis-3 motor and the axis-3 motor cables (B) on top of the motor, see cable layout figure. The fix point of the air hoses is pre-determined (marked) and must be matched against the air hose holder on the left side of the axis-3 motor.</p> <p> Note</p> <p>The air hose holder keeps the air hoses arranged in an optimized way. It is necessary to keep the air hose holder vertically and firmly against the left side of the axis-3 motor.</p>	 <p>xx1400001472</p>
4	<p>Refit the bracket to the sheet with two screws.</p> <p> CAUTION</p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002424</p>
5	<p>Refit the fix sheet to the motor.</p>	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002423</p>

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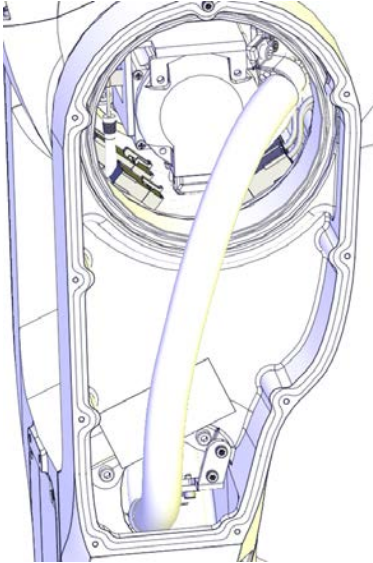
4 Repair

4.3.1 Replacing the main cable package

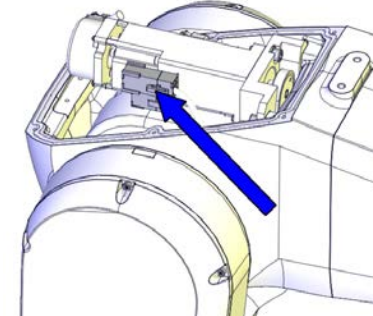
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	Action	Note
6	Refit the fix sheet to the inner plastic guide.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002421</p>
7	<p>Fit the air hose holder to the bracket. Replace the holder, if damaged.</p> <p> Tip</p> <p>If the air hose holder is difficult to fit, firstly remove the bracket from the fix sheet by removing the two M3 screws. Fit the holder to the bracket and then refit the complete assembly to the fix sheet again. Tightening torque for the two M3 screws: 1.5 Nm.</p>  <p>xx1400001133</p>	<p>Air hose holders are included in Cable harness material set (3HAC049663-001). Tightening torque: 4 Nm.</p>  <p>xx1300002422</p>
8	Reconnect the axis-3 motor connectors.	 <p>xx1300002420</p>

Continues on next page

	Action	Note
9	Apply grease to the cable package, cover all moving area of the package.	 <p>xx140000754</p>
10	Valid for IRB 1200-5/0.9 Secure the cable package at the bottom of the housing with cable straps.	

Connecting the axis-4 motor connectors

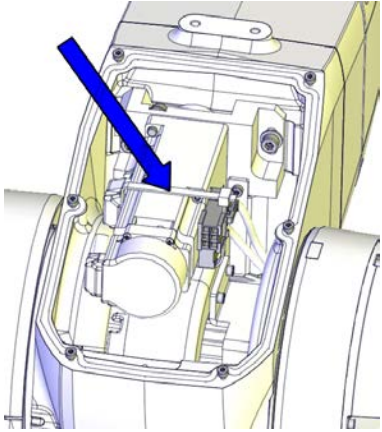
	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the motor connectors.	 <p>xx1300002371</p>

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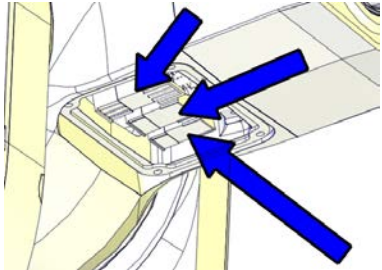
4 Repair

4.3.1 Replacing the main cable package

Continued


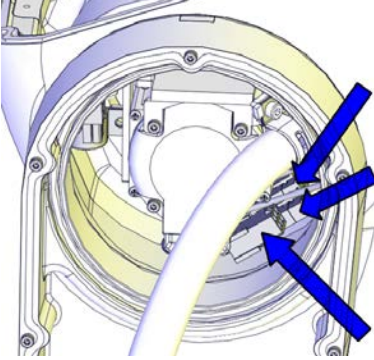
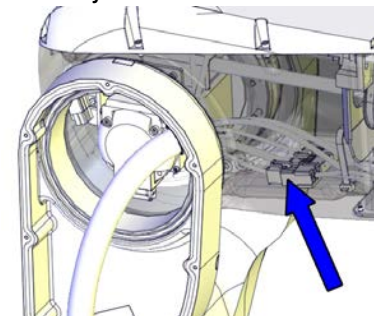
	Action	Note
3	Secure the connectors to the motor with a cable strap.	 xx1300002494

Connecting the axis-4 FPC connectors

	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the FPC connectors.  Tip See the number markings on the connectors for help to find the corresponding connector.	 xx1300002399

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4.3.1 Replacing the main cable package
Continued

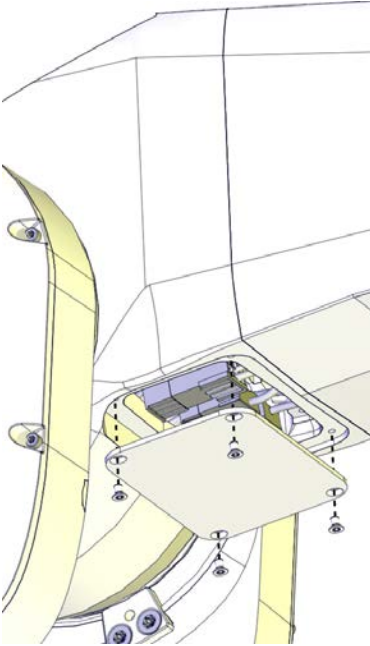
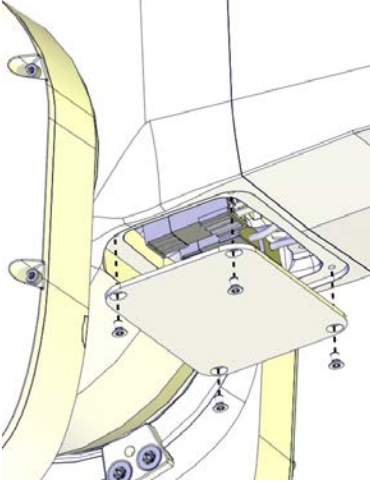
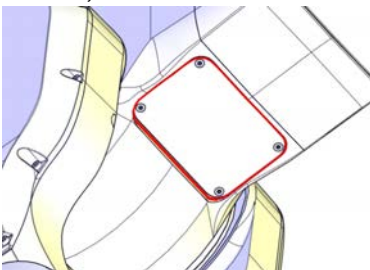
	Action	Note
3	<p>Reconnect the FPC connectors and push them into place inside the housing.</p> <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	<p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p>
4	<p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p>	

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4 Repair

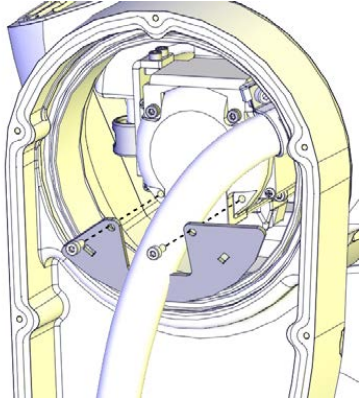
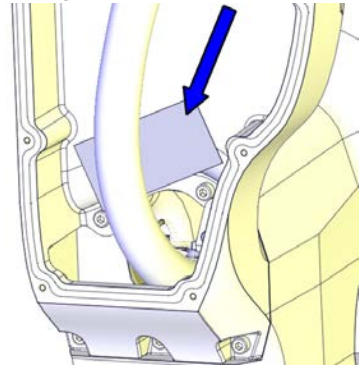
4.3.1 Replacing the main cable package

Continued

	Action	Note
5	<p>For robots with protection class IP67 For robots with protection type Foundry Plus Apply flange sealing Sikaflex 521FC on the mounting surfaces of the small cover on the housing.</p>	
6	<p>Refit the small cover to the housing. Replace if damaged.</p>	 <p>xx1300002398</p> <p>Housing small cover: 3HAC059684-001 Housing small cover, Clean Room Housing small cover, food grade lubrication Housing small cover, Hygienic : 3HAC056142-001 Screws: 3HAC14286-4 (M3X5). Tightening torque: 1 Nm.</p>
7	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Apply a string of the sealant to the joint of the small cover on the housing. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.</p>	<p>For robots with protection type Clean Room For robots with food grade lubrication Sealant, SikaFlex 521FC For robots with protection type Hygienic Sealant, Trans Clear</p>  <p>xx1600000214</p>

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4.3.1 Replacing the main cable package
Continued

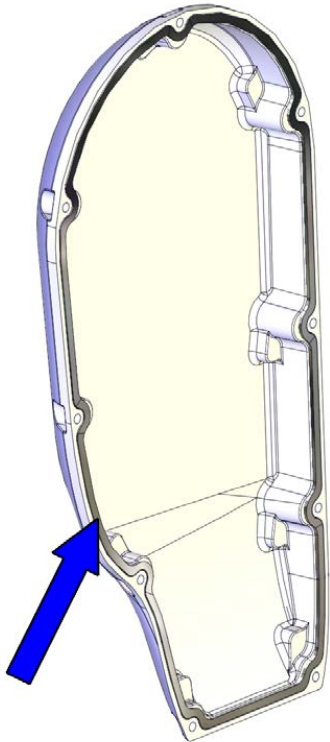
	Action	Note
8	Refit the plate.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002413</p>
9	Check the PTFE film on the cable housing. Replace if damaged.	<p>PTFE film on lower arm cable housing: 3HAC044710-001</p>  <p>xx1400000740</p>

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4 Repair

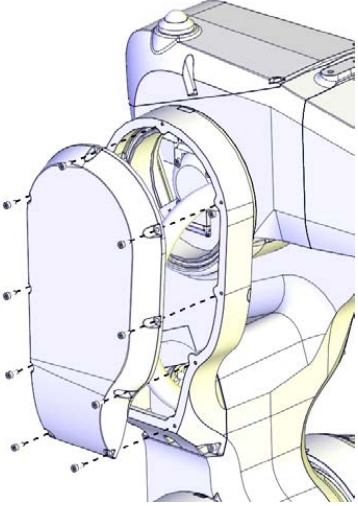

4.3.1 Replacing the main cable package

Continued

	Action	Note
10	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the gasket of the cable housing cover. Replace if damaged.</p>	<p>Gasket on cable housing cover: 3HAC056724-001 (not Hygienic robots) / 3HAC080702-001 (Hygienic robots) PTFE film on cable housing cover: 3HAC044660-001</p>  <p>xx140000048</p>
11	<p>Check the PTFE film on the cable housing cover. Replace if damaged.</p>	
12	<p>Apply grease to the inner surface of the cable housing cover and the PTFE film surface.</p>	

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4.3.1 Replacing the main cable package
Continued

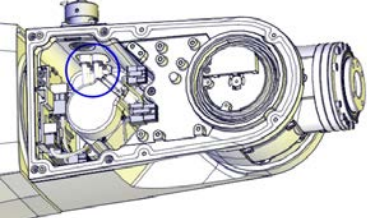
	Action	Note
13	<p>Refit the cable housing cover.</p> <p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Apply locking liquid Loctite 243 to all the screws securing the cover.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm</p>  <p>xx1300002400</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

Connecting the air hoses and CP/CS cabling (if equipped)

Notice that the procedure differs depending on the protection class and protection type.

Connecting the air hoses and CP/CS cabling on robots not in protection type Hygienic

Use this procedure if the robot is not in protection type Hygienic.

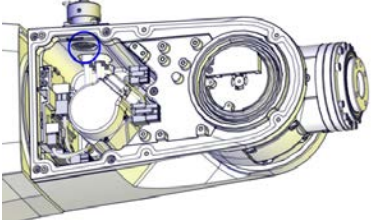
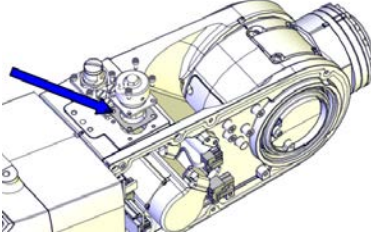
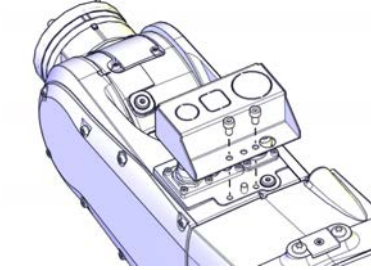
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Reconnect the air hoses.</p> <p>Replace the air hose connector set if damaged.</p>	<p>Air connector set with Ethernet hole in flange: 3HAC049664-001</p> <p>Air connector set without Ethernet hole in flange: 3HAC049665-001</p>  <p>xx1400000738</p>

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4 Repair

4.3.1 Replacing the main cable package

Continued

	Action	Note
3	<p>If equipped, reconnect the CP/CS connector.</p> <p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <ol style="list-style-type: none"> 1 Check the gasket. 2 Replace if damaged. <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <ol style="list-style-type: none"> 1 Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. 2 Apply flange sealing Loctite 574 on the mounting surfaces of the CP/CS connector and wipe clean if there is any overflowing Loctite 574. 	 <p>xx1500000252</p> <p>On robots with protection class IP67</p> <p>On robots with protection type Foundry Plus</p> <p>Gasket: 3HAC058567-001</p>  <p>xx1500000251</p>
4	<p>For robots with protection type Foundry Plus</p> <p>If required, fit the protection bracket for CP/CS connectors.</p>	<p>Protection bracket for CP/CS connectors: 3HAC058350-001</p>  <p>xx1600001152</p>

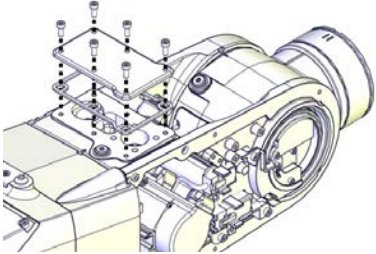
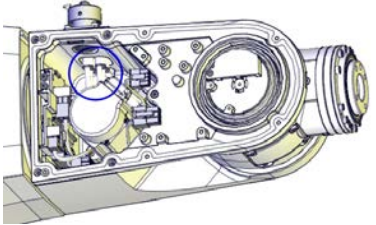
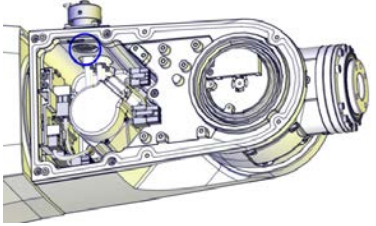
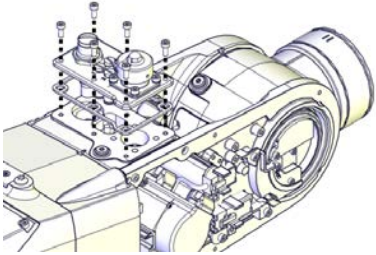
Connecting the air hoses and CP/CS cabling on robots in protection type Hygienic

Use this procedure if the robot is with protection type Hygienic.

	Action	Note
1	<p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

Continues on next page

4.3.1 Replacing the main cable package
Continued

	Action	Note
2	<p>If the Hygienic robot not equipped with air hoses and CP/CS cabling: Check the plate without connector set and the attached gasket. Replace if damaged.</p>	<p>Plate without connector set: 3HAC078810-001 Gasket: 3HAC078804-001</p>  <p>xx2100001433</p>
3	<p>Reconnect the air hoses.</p>	 <p>xx1400000738</p>
4	<p>Reconnect the CP/CS cabling.</p>	 <p>xx1500000252</p>
5	<p>Check the connectors on the plate with connector set and the attached gasket. Replace if damaged.</p>	<p>Plate with connector set: 3HAC079691-001 Gasket: 3HAC078804-001</p>  <p>xx2100001434</p>

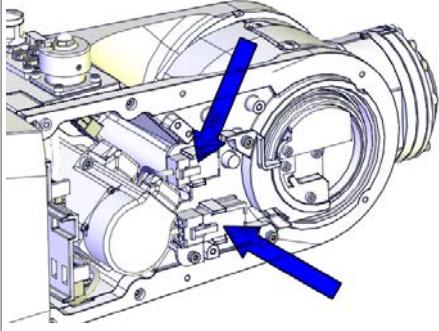
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4 Repair

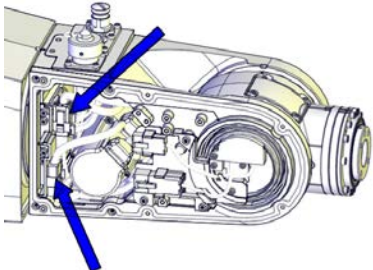
4.3.1 Replacing the main cable package

Continued

Connecting the axis-5 motor FPC connectors

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Connect the axis-5 FPC connectors and snap them to their holders.</p>	 <p>xx1300002390</p>

Connecting the axis-5 motor connectors

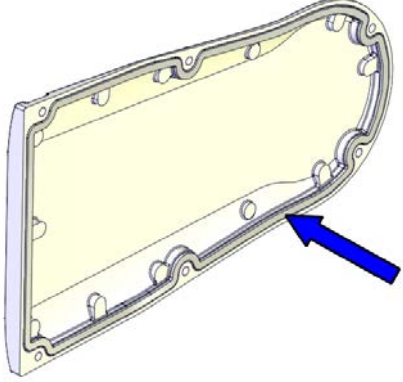
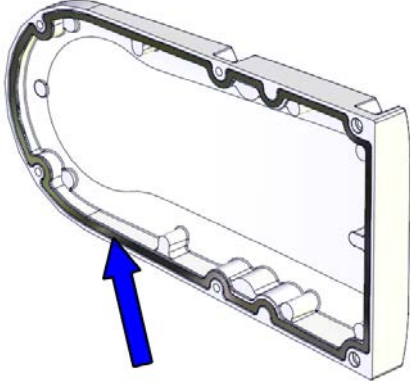
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Reconnect the motor cables.</p> <ul style="list-style-type: none"> • R3.MP5 • R3.ME5 	 <p>xx1300002360</p>

Refitting the wrist covers

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

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4.3.1 Replacing the main cable package
Continued

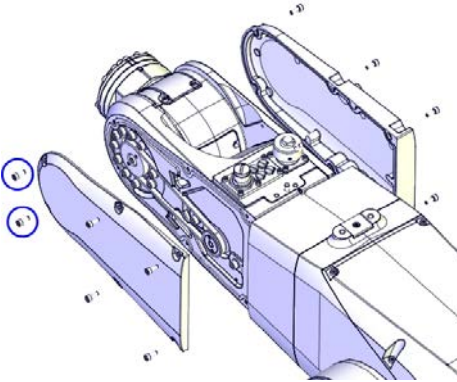
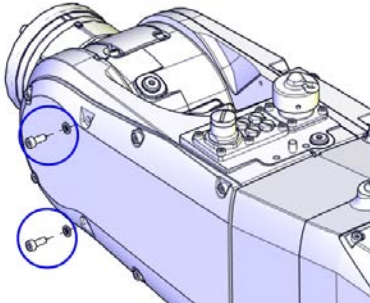


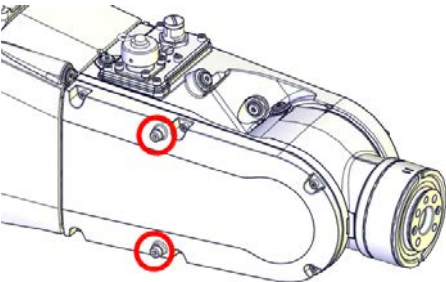
	Action	Note
2	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the tubular cover gasket. Replace if damaged.</p>	<p>Gasket for tubular cover: 3HAC058822-001 (not Hygienic robots) / 3HAC080709-001 (Hygienic robots)</p>  <p>xx140000034</p>
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the tubular cable housing cover gasket. Replace if damaged.</p>	<p>Gasket for tubular cable housing cover: 3HAC056707-001 (not Hygienic robots) / 3HAC080701-001 (Hygienic robots)</p>  <p>xx1400000345</p>

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4 Repair

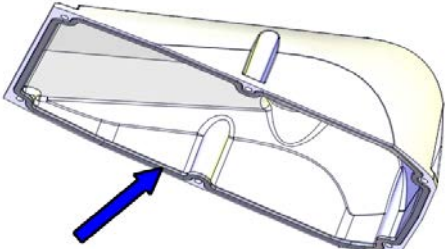

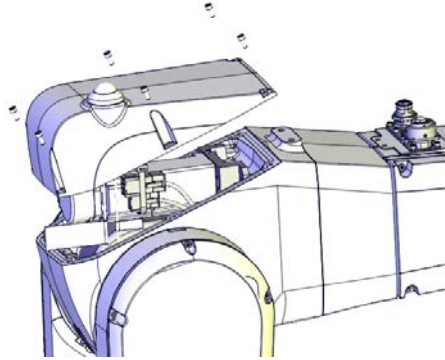

4.3.1 Replacing the main cable package

Continued

	Action	Note
4	<p>Refit the both covers to the wrist.</p> <p>For robots with protection class IP67 For robots with protection type Foundry Plus</p> <p>Apply locking liquid Loctite 243 to the two front screws on the left hand side cover, encircled in the figure.</p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p> <p>For robots with protection class IP67 For robots with protection type Foundry Plus</p>  <p>xx1300002349</p>
	<p>For robots with protection type Clean Room For robots with food grade lubrication</p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p>	<p>For robots with protection type Clean Room For robots with food grade lubrication</p>  <p>xx1600001153</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
	<p> Note</p> <p>For robots with protection type Hygienic</p> <p>Check the two extra screws on the tubular cover (right hand side cover), as encircled in the figure.</p> <p>Replace if damaged or missing.</p>	<p>For robots with protection type Hygienic</p>  <p>xx2100001406</p>

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Concluding procedure

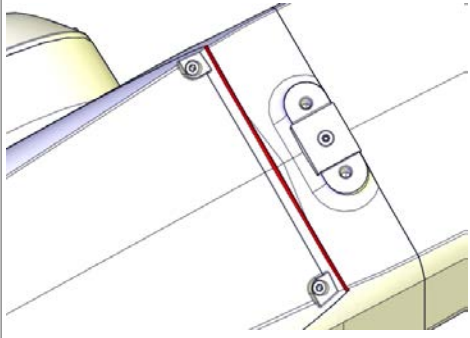


	Action	Note
1	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the gasket. Replace if damaged.</p>	<p>Housing cover gasket (IRB 1200-7/0.7): 3HAC056698-001 (not Hygienic robots) / 3HAC080700-001 (Hygienic robots)</p> <p>Housing cover gasket (IRB 1200-5/0.9): 3HAC056697-001 (not Hygienic robots) / 3HAC080699-001 (Hygienic robots)</p>  <p>xx1400000477</p>
2	<p>Refit the upper arm housing cover with the screws.</p> <p> CAUTION</p> <p>For robots with safety lamp (option) Reconnect the lamp cable connectors R3.H1 and R3.H2 and then secure the cover.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p>  <p>xx1300000456</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

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4 Repair

4.3.1 Replacing the main cable package

Continued

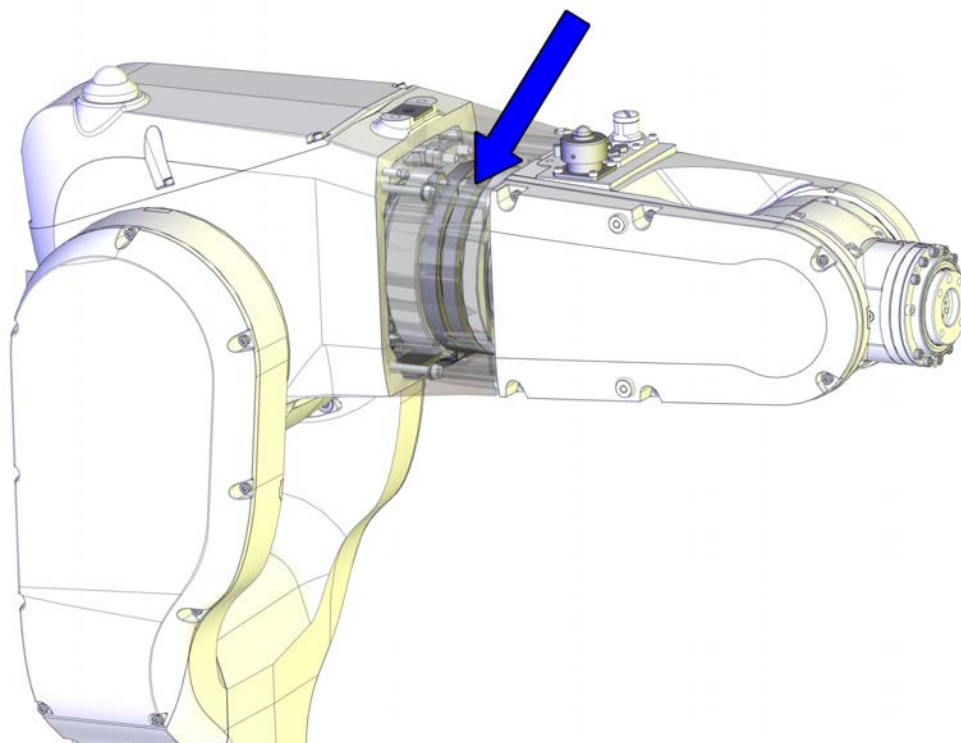
	Action	Note
3	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Apply a string of the sealant to the joint of the upper arm housing cover.</p> <p>Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p>	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication Sealant, SikaFlex 521FC</p> <p>For robots with protection type Hygienic Sealant, Trans Clear</p>  <p>xx1600000215</p>
4	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean, seal and paint the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160.</p> <p> Note</p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>	
5	Recalibrate the robot.	Calibration is detailed in section Calibration on page 807 .
6	<p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Location of the FPC unit

The axis-4 FPC unit and the housing extender sealings are located inside the housing extender unit, as shown in the figure.



xx1300002419

Required spare parts

**Note**

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
FPC unit, axis 4	3HAC055517-001	
Radial sealing with dust lip	3HAB3701-48	Not used with protection class IP40. Replace if damaged.
M2 variseal sealing	3HAC044641-007	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
Housing extender unit	3HAC059686-001	Replace if damaged.

Continues on next page

4 Repair

4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued

Spare part	Article number	Note
Housing extender unit, Clean Room Housing extender unit, food grade lubrication Housing extender unit, Hygienic	3HAC059703-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket on cable housing cover	3HAC056724-001 / 3HAC080702-001	Not used with protection class IP40. Replace if damaged.
PTFE film on cable housing cover	3HAC044660-001	Replace if damaged.
Washer	3HAC044869-001	Replace if damaged
Housing small cover	3HAC059684-001	Replace if damaged.
Housing small cover, Clean Room Housing small cover, food grade lubrication Housing small cover, Hygienic	3HAC056142-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket for tubular cover	3HAC058822-001 / 3HAC080709-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cable housing cover	3HAC056707-001 / 3HAC080701-001	Not used with protection class IP40. Replace if damaged.

Required tools and equipment

Equipment, etc.	Article number	Note
Axis-4 sealing assembly tool set	3HAC049699-001	Used to refit the radial sealing, if replacement is needed.
24 VDC power supply	-	Used to release the motor brakes.
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .

Required consumables

Consumable	Art. no.	Note
Cleaning agent	-	Loctite 7063
Flange sealing	12340011-116	Loctite 574 For robots with protection class IP67 For robots with protection type Foundry Plus
Locking liquid	3HAB7116-1	Loctite 243

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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued

Consumable	Art. no.	Note
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room For robots with food grade lubrication For robots with protection class IP67 For robots with protection type Foundry Plus
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none"> Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	 Note Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in Reference calibration routine on page 821 .
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the FPC unit and the housing extender sealings

Use these procedures to remove the axis-4 FPC unit and the housing extender sealings.

Preparations before removing the axis-4 FPC unit



	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog axis 4 to zero position.	

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4 Repair

4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued


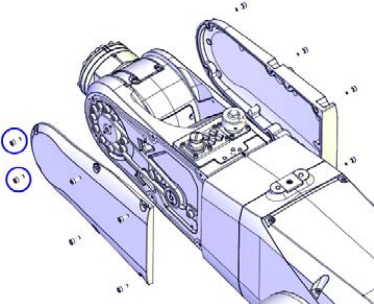

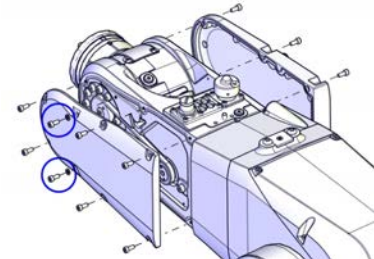

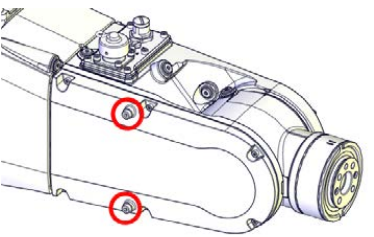
	Action	Note
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
4	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	

Getting access to inside of the wrist unit


	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	

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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

	Action	Note
3	<p>Remove the covers on each side of the wrist by removing their screws.</p> <p> Note For robots with protection class IP67 For robots with protection type Foundry Plus The two front screws on the left hand side cover (encircled in the figure) have been fitted with locking liquid. The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.</p>	<p>For robots with protection class IP67 For robots with protection type Foundry Plus</p>  <p>xx1300002349</p>
	<p> Note For robots with protection type Clean Room For robots with food grade lubrication The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.</p>	<p>For robots with protection type Clean Room</p>  <p>xx1600001148</p>
	<p> Note For robots with protection type Hygienic The tubular cover (right hand side cover) has two extra screws, as encircled in the figure. Do not remove the two screws when removing the cover. The screws are used for blocking the screw holes rather than fixing the cover to the tubular. Replace if damaged or missing.</p>	<p>For robots with protection type Hygienic</p>  <p>xx2100001406</p>

Disconnecting the axis-5 motor connectors



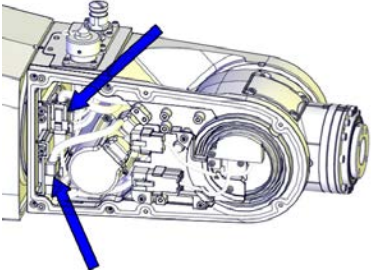
	Action	Note
1	<p> DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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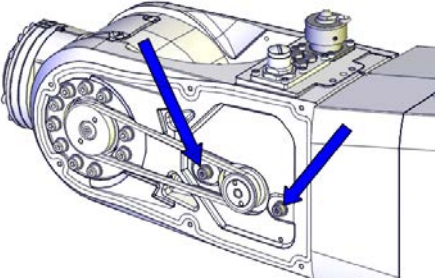
4 Repair

4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued

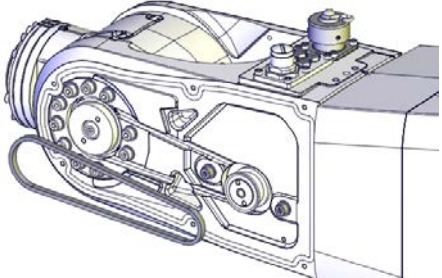
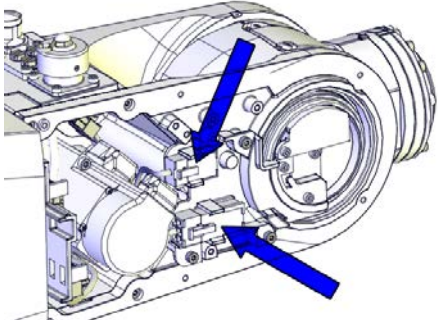
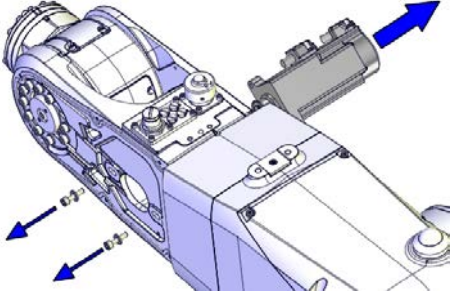
	Action	Note
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Snap loose the motor connectors from their holders and then disconnect them. <ul style="list-style-type: none"> • R3.MP5 • R3.ME5  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1300002360

Removing the axis-5 motor with pulley


	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Loosen the screws so that the motor can be moved sideways.	 xx1300002350

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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

	Action	Note
4	Remove the timing belt.	 <p>xx1300002351</p>
5	Snap loose and disconnect the axis-5 FPC connectors.	 <p>xx1300002390</p>
6	Remove the screws and pull out the motor.	 <p>xx1300002352</p>

Removing the wrist


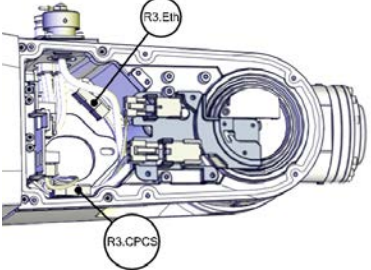
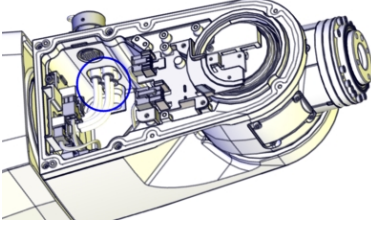
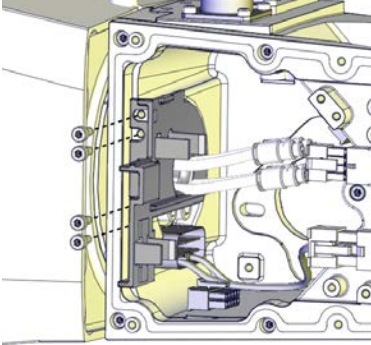
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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4 Repair

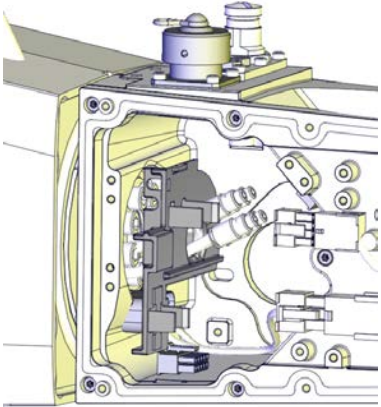
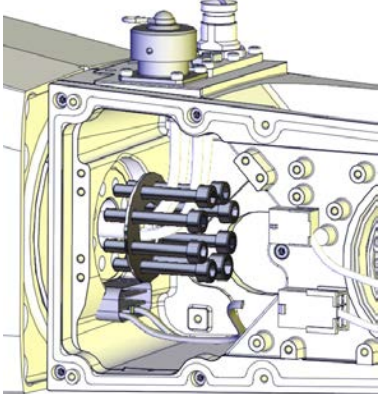

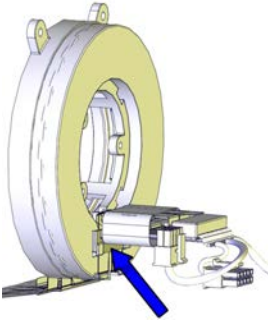
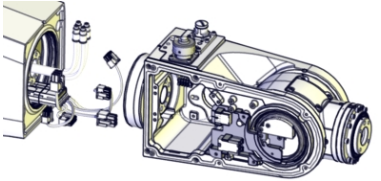
4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued

	Action	Note
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	
3	Disconnect the connectors shown in the figure.	 <p>xx1300002353</p>
4	Disconnect the air hoses.	 <p>xx1300002355</p>
5	Remove the connector plate attachment screws.	 <p>xx1300002356</p>

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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

	Action	Note
6	Guide the hoses through the plate hole and remove the plate.	 <p>xx1300002357</p>
7	Support the weight of the wrist and remove the screws and the washer.	 <p>xx1300002358</p>
8	<p>Pull out the wrist carefully while at the same time pulling all connectors and the air hoses out of the wrist.</p> <p>Be careful not to damage the FPC cabling and the connectors.</p> <p> CAUTION</p> <p>Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.</p>  <p>xx1300002611</p>	 <p>xx1300002359</p>



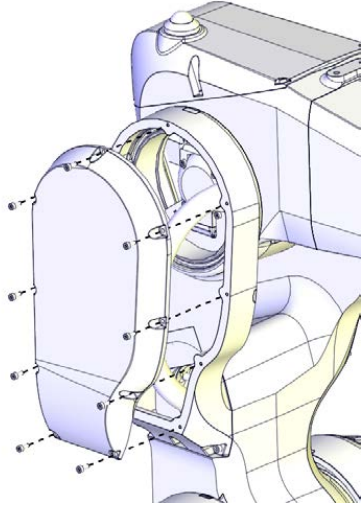
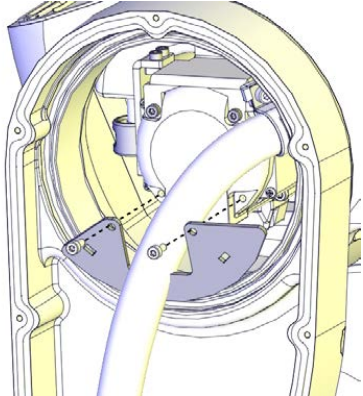
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4 Repair

4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

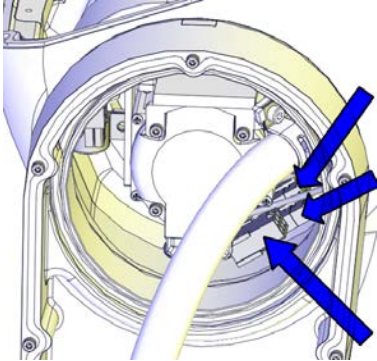
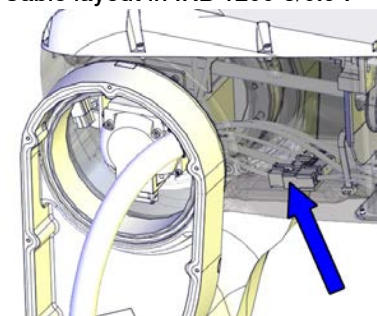
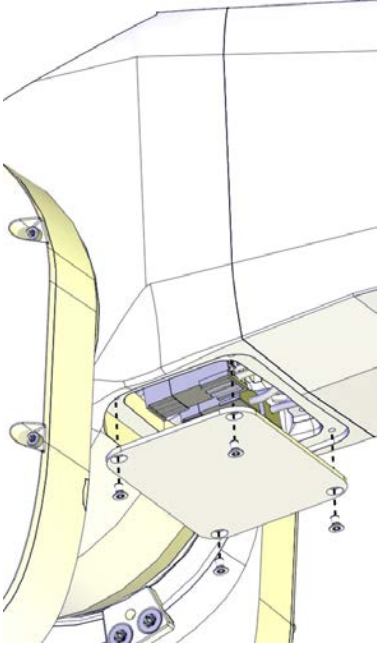
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Disconnecting the axis-4 FPC connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Remove the cable housing cover.	 xx1300002400
4	Remove the plate.	 xx1300002413

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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

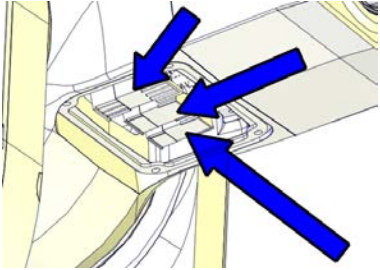
	Action	Note
5	Pull out the FPC connectors from the housing and disconnect them.	<p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p>
6	Remove the small cover of the housing.	 <p>xx1300002398</p>

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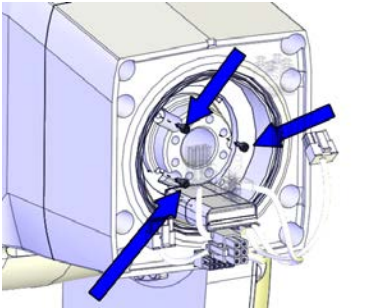
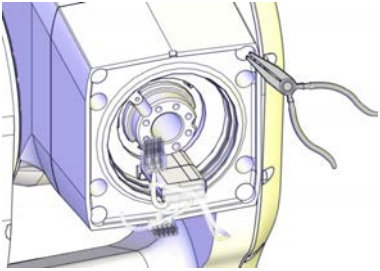
4 Repair

4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued

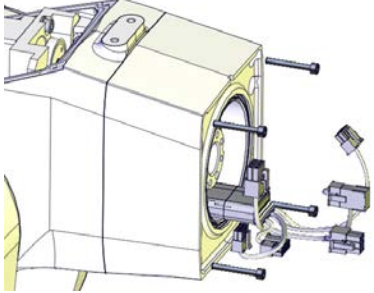
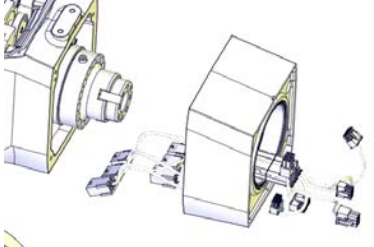
	Action	Note
7	Disconnect the remaining FPC connectors.	 xx1300002399

Removing the housing extender unit



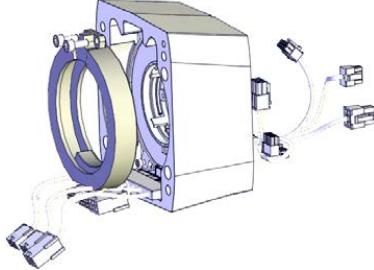
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Remove the axis-4 FPC unit screws.	 xx1300002373
4	For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Remove the plugs covering the extender unit screws with a needle-nose plier.	 xx1600000262

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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

	Action	Note
5	Remove the extender unit screws.	 <p>xx1300002372</p>
6	Remove the housing extender unit. Be careful not to damage the cabling.	 <p>xx1300002374</p>

Removing the axis-4 mechanical stop

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	Remove the mechanical stop assembly from the housing extender unit by removing the screws.	 <p>xx1300002415</p>




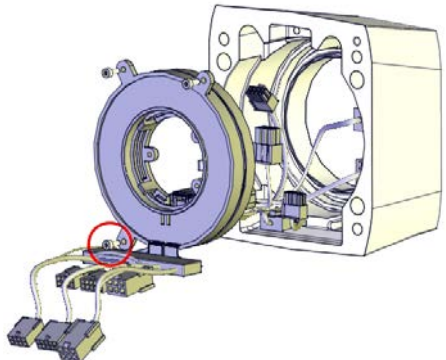
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4 Repair

4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued

Removing the axis-4 FPC unit

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Remove the FPC unit from the housing extender unit by removing the screws.  CAUTION The lower screw, highlighted with a ring in the figure, is very closely located to the cabling. Be careful not to damage the cabling with the screwdriver when removing/refitting the screw.	 xx1300002417

Refitting the FPC unit and the housing extender sealings


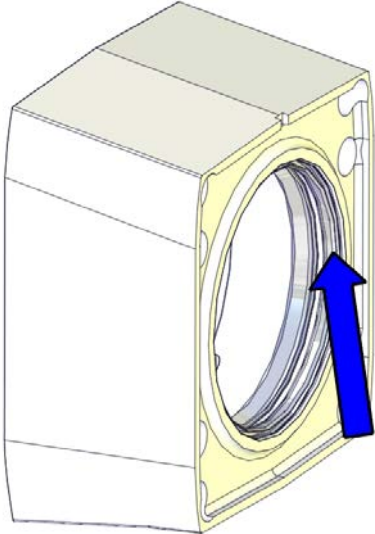
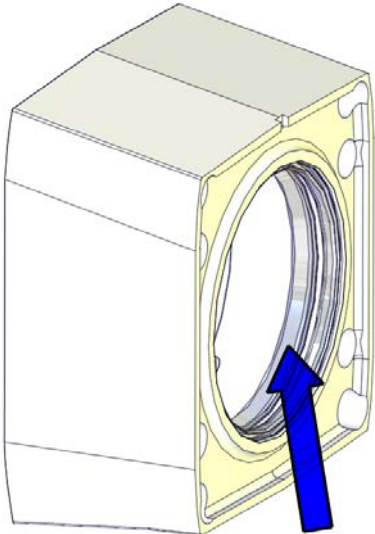
Use these procedures to refit the FPC unit and the housing extender sealings.

Checking the housing extender sealings

	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

Continues on next page

4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

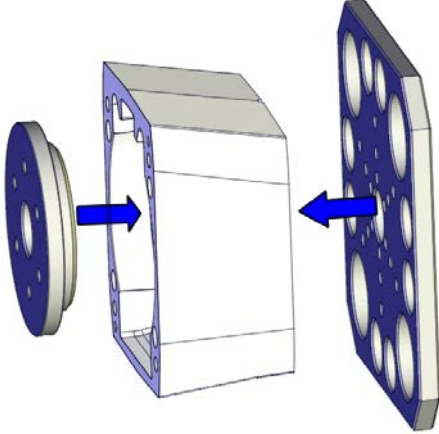
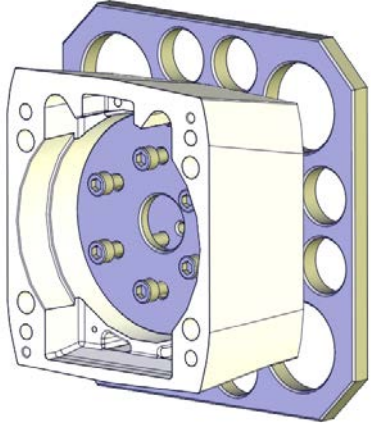
	Action	Note
2	<p>For robots with protection class IP67 For robots with protection type Foundry Plus</p> <p>Check the sealing. Replace if damaged.</p> <p> CAUTION</p> <p>Do not fit M2 variseal sealing on robots in other protection class or protection types.</p>	<p>M2 variseal sealing: 3HAC044641-007</p>  <p>xx1300002418</p>
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the radial sealing. Replace if damaged, as described below. In order to replace the radial sealing, both the axis-4 mechanical stop and the axis-4 FPC unit must be removed from the housing extender unit, if not already removed.</p>	<p>Radial sealing with dust lip: 3HAB3701-48</p>  <p>xx1400000438</p>
4	<p>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p>	
5	<p>Fit the radial sealing into the housing extender unit.</p>	

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4 Repair

4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued



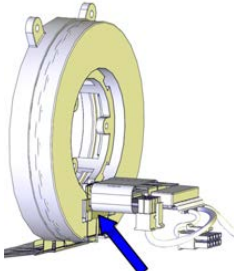
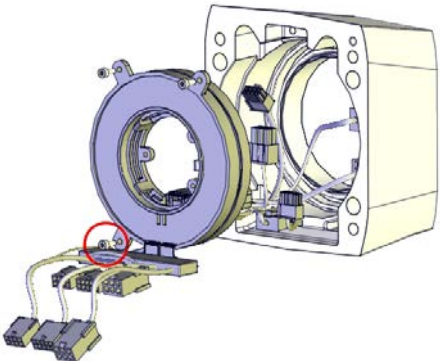
	Action	Note
6	Fit the circular part of the radial sealing assembly tool against the radial sealing.	Axis-4 sealing assembly tool set: 3HAC049699-001
7	Fit the tool plate to the other side of the housing extender unit with the six screws M6X50.	 <p data-bbox="943 831 1050 846">xx140000436</p>
8	Screw the screws, little by little, to press the sealing into place.	 <p data-bbox="943 1339 1050 1355">xx140000437</p>
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	
11	Refit both the axis-4 mechanical stop and the axis-4 FPC unit to the housing extender unit.	

Refitting the axis-4 FPC unit

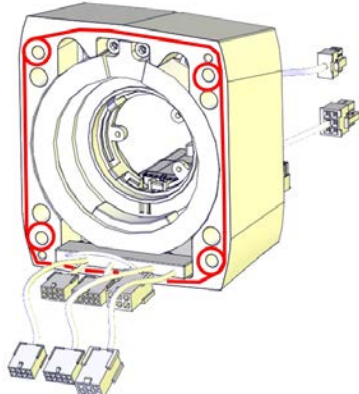
	Action	Note
1	<p data-bbox="464 1720 900 1776">For robots with protection type Clean Room</p> <p data-bbox="464 1783 906 1816">For robots with food grade lubrication</p> <p data-bbox="464 1823 932 1856">For robots with protection type Hygienic</p> <p data-bbox="464 1863 932 1933">Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

Continues on next page

4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

	Action	Note
2	<p>Refit the FPC unit to the housing extender unit and secure with the screws.</p> <p> CAUTION</p> <p>The lower screw, highlighted with a ring in the figure, is very closely located to the cabling. Be careful not to damage the cabling with the screwdriver when removing/refitting the screw.</p> <p> CAUTION</p> <p>Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.</p>  <p>xx1300002611</p>	<p>Tightening torque: 0.5 Nm.</p>  <p>xx1300002417</p>

Refitting the housing extender unit

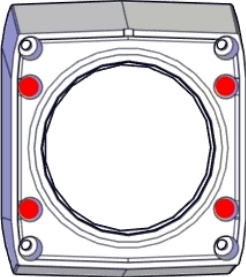


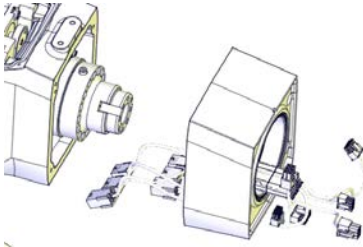
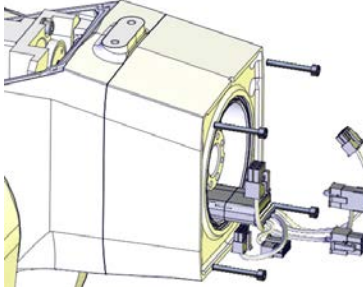
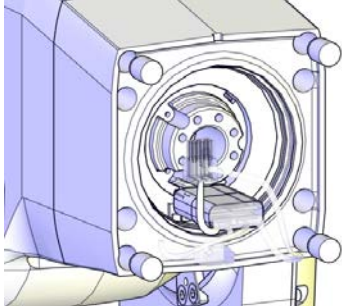
	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>For robots with protection class IP67 For robots with protection type Foundry Plus</p> <p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p> <p>Apply flange sealing Loctite 574 on the mounting surfaces of the housing extender unit.</p>	 <p>xx1300002613</p>

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4 Repair

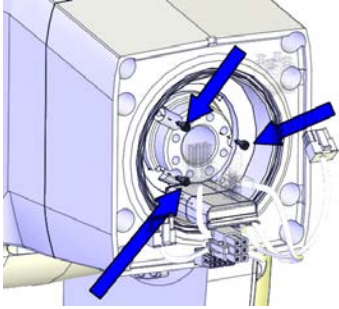
4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued


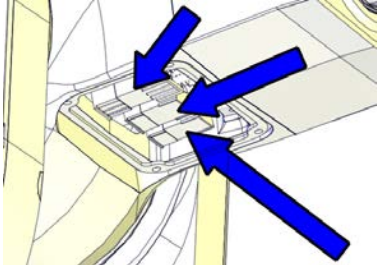
	Action	Note
3	<p>For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Make sure the four cavities are fully filled with glue. If not, fill glue again before the refitting.</p>	 <p>xx160000216</p>
4	<p>Refit the housing extender unit to the housing while putting the FPC cables into the housing and the air hoses through the housing extender unit. Be careful not to damage the cabling.</p> <p> CAUTION</p> <p>Make sure that the axis-4 FPC unit is in its zero position when refitting the housing extender unit.</p> <p> Note</p> <p>Mate the unit to the two locating pins attached to the housing.</p>	 <p>xx1300002374</p>
5	<p>Secure with screws and washers, using locking liquid Loctite 243.</p>	<p>Screws: M4x30. Tightening torque: 2.7 Nm.</p>  <p>xx1300002372</p>
6	<p>For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Press in screw sealing plugs to cover the screws.</p>	<p>Screw sealing plug: 3HAC053685-001</p>  <p>xx160000263</p>

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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

	Action	Note
7	Fit and secure the axis-4 FPC unit screws.	<p>Tightening torque: 0.3 Nm.</p>  <p>xx1300002373</p>

Connecting the axis-4 FPC connectors


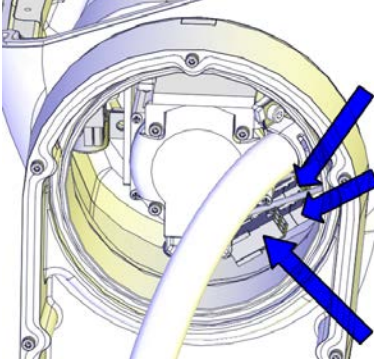
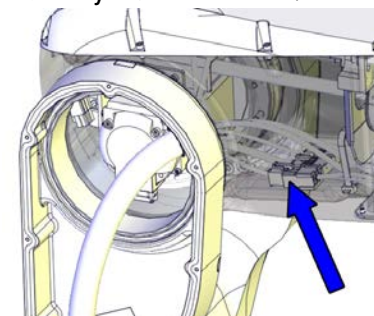
	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Reconnect the FPC connectors.</p> <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx1300002399</p>

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4 Repair

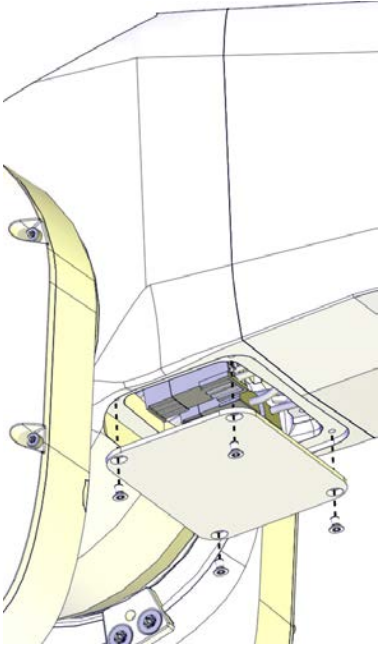
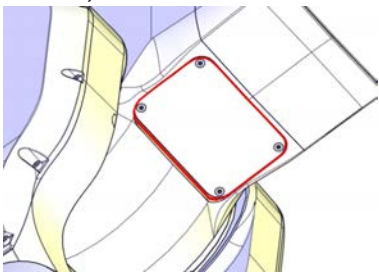
4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued

	Action	Note
3	<p>Reconnect the FPC connectors and push them into place inside the housing.</p> <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	<p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p>
4	<p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p>	

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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

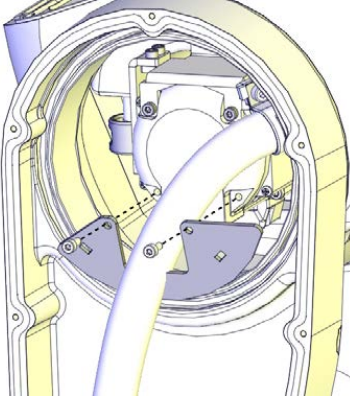
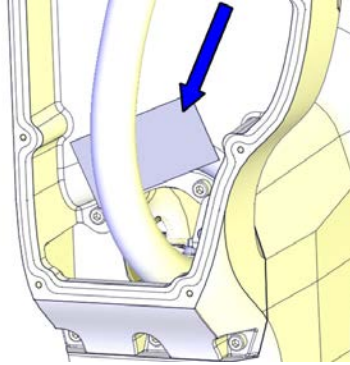
	Action	Note
5	<p>For robots with protection class IP67 For robots with protection type Foundry Plus Apply flange sealing Sikaflex 521FC on the mounting surfaces of the small cover on the housing.</p>	
6	<p>Refit the small cover to the housing. Replace if damaged.</p>	<p>xx1300002398</p> <p>Housing small cover: 3HAC059684-001 Housing small cover, Clean Room Housing small cover, food grade lubrication Housing small cover, Hygienic : 3HAC056142-001 Screws: 3HAC14286-4 (M3X5). Tightening torque: 1 Nm.</p>
7	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Apply a string of the sealant to the joint of the small cover on the housing. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.</p>	<p>For robots with protection type Clean Room For robots with food grade lubrication Sealant, SikaFlex 521FC For robots with protection type Hygienic Sealant, Trans Clear</p>  <p>xx1600000214</p>

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4 Repair

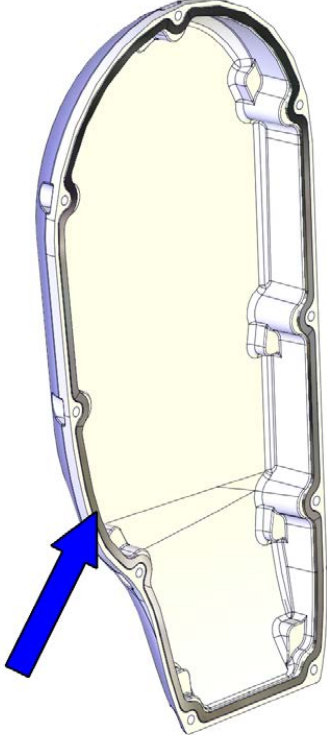
4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued

	Action	Note
8	Refit the plate.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002413</p>
9	Check the PTFE film on the cable housing. Replace if damaged.	<p>PTFE film on lower arm cable housing: 3HAC044710-001</p>  <p>xx1400000740</p>

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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

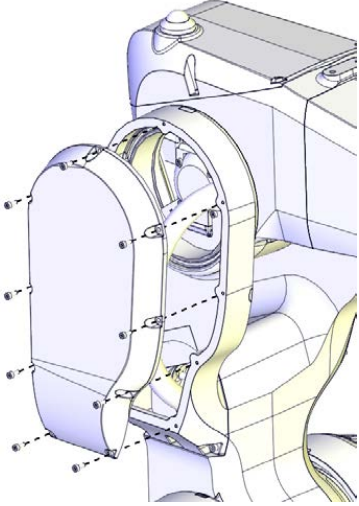

	Action	Note
10	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the gasket of the cable housing cover. Replace if damaged.</p>	<p>Gasket on cable housing cover: 3HAC056724-001 (not Hygienic robots) / 3HAC080702-001 (Hygienic robots) PTFE film on cable housing cover: 3HAC044660-001</p>  <p>xx1400000048</p>
11	<p>Check the PTFE film on the cable housing cover. Replace if damaged.</p>	
12	<p>Apply grease to the inner surface of the cable housing cover and the PTFE film surface.</p>	

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4 Repair

4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued


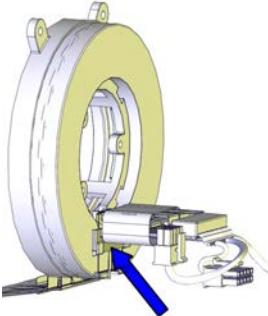
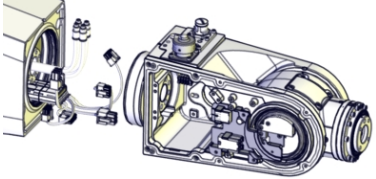
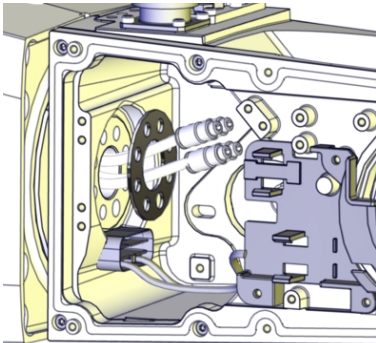
	Action	Note
13	<p>Refit the cable housing cover.</p> <p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Apply locking liquid Loctite 243 to all the screws securing the cover.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm</p>  <p>xx1300002400</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

Refitting the wrist

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

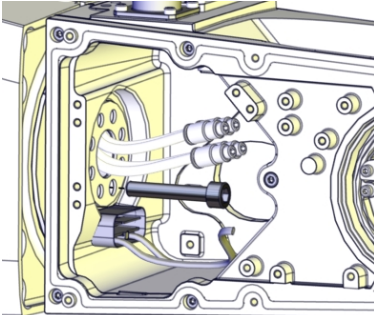

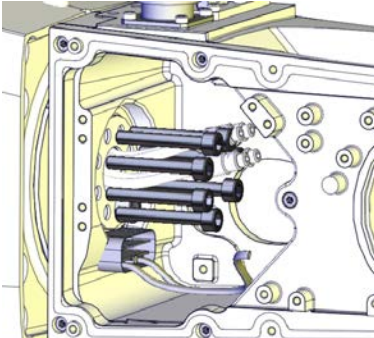

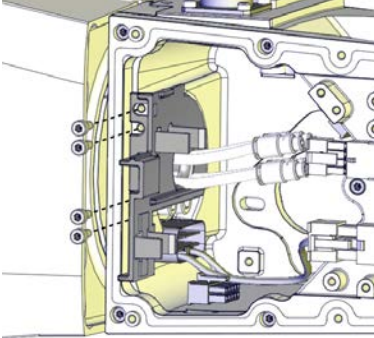
	Action	Note
2	<p>Put the connectors and air hoses into the wrist carefully while at the same time refitting the wrist to the housing extender unit. Be careful not to damage the FPC cabling and the connectors.</p> <p> CAUTION</p> <p>Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.</p>  <p>xx1300002611</p>	 <p>xx1300002359</p>
3	<p>Refit the washer while at the same time putting the cables through its center. Replace washer, if damaged.</p>	<p>Washer: 3HAC044869-001</p>  <p>xx1400000001</p>

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4 Repair


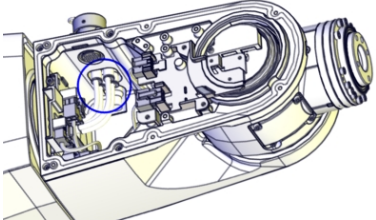
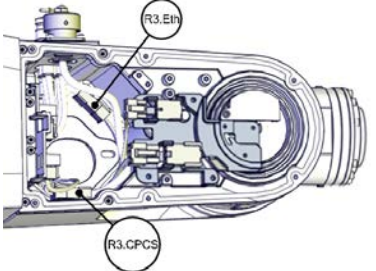
4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued

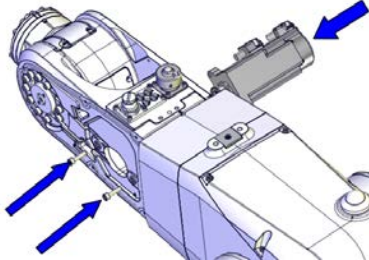

	Action	Note
4	Refit the screw M6x35 (1 pc). Do not tighten yet.	<p>Screw: 3HAB3409-238 (M6x35 (1 pc)).</p>  <p>xx140000002</p> <p> Note Only use specified screws, never replace them with other screws.</p>
5	Refit the rest of the screws (M5x35 (7 pcs)).	<p>Screw: 3HAB3409-237 (M5x35 (7 pcs)).</p>  <p>xx140000003</p> <p> Note Only use specified screws, never replace them with other screws.</p>
6	Tighten all screws.	Tightening torque: 8 Nm.
7	Put the cables through the plate hole and refit the plate.	<p>Tightening torque: 0.3 Nm.</p>  <p>xx1300002356</p>

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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

	Action	Note
8	Reconnect the air hoses.  CAUTION Make sure to connect the air hoses correctly, according to the marking on hoses and connectors.	 xx1300002355
9	Reconnect the connectors. <ul style="list-style-type: none"> • R3.Eth • R3.CPCS 	 xx1300002353

Preparations before securing the axis-5 motor

	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check that: <ul style="list-style-type: none"> • all assembly surfaces are clean and without damages • the motor is clean and undamaged. 	
3	Place the motor at its mounting position and fasten the attachment screws and washers just enough to still be able to move the motor.	Screws: 3HAB3409-212 (M4x16).  xx1300002463  Note Only use specified screws, never replace them with other screws.

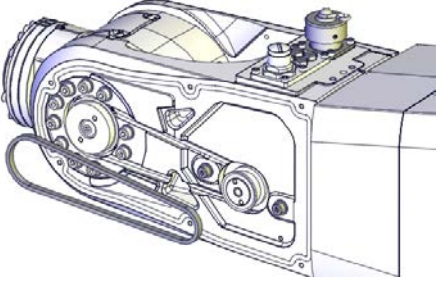

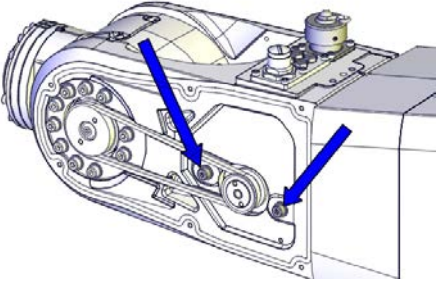
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4 Repair

4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued

Securing the axis-5 motor and timing belt

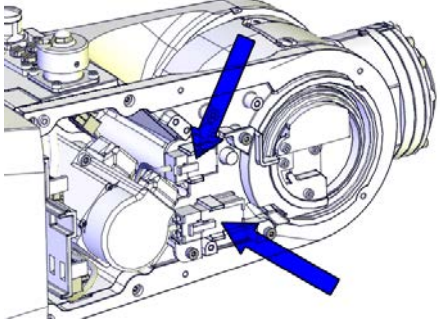
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	Refit the timing belt on the pulley.	 <p>xx1300002351</p>
3	Move the motor to a position where a good timing belt tension is reached ($F = 26 \text{ N}$).	 Note Do not stretch the timing belt too much!
4	Secure the motor with its attachment screws.	 <p>xx1300002350</p> <p>Tightening torque: 3.5 Nm.</p>

Connecting the axis-5 motor FPC connectors

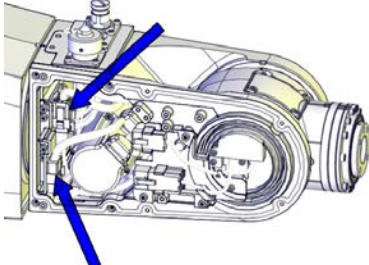
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

Continues on next page

4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

	Action	Note
2	Connect the axis-5 FPC connectors and snap them to their holders.	 <p>xx1300002390</p>

Connecting the axis-5 motor connectors

	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the motor cables. <ul style="list-style-type: none"> • R3.MP5 • R3.ME5 	 <p>xx1300002360</p>

Refitting the wrist covers

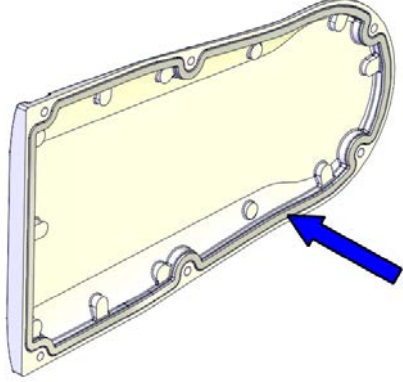
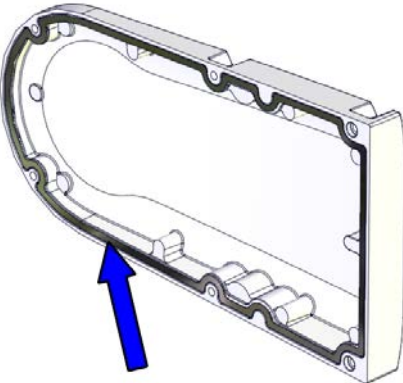
	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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4 Repair

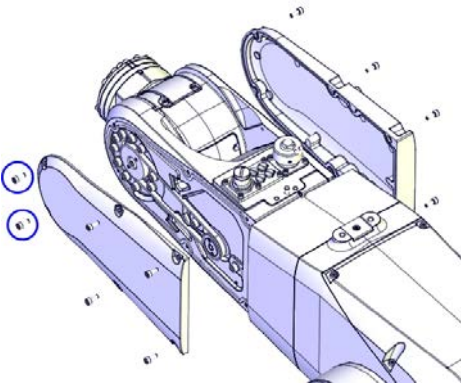
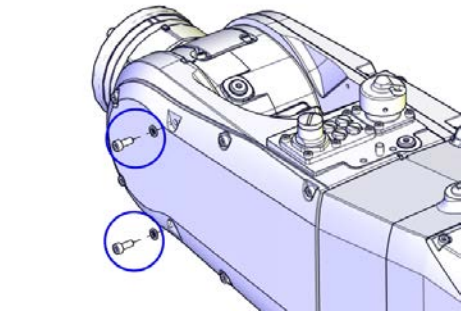


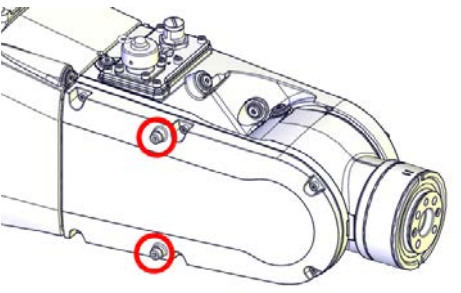
4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued

	Action	Note
2	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the tubular cover gasket. Replace if damaged.</p>	<p>Gasket for tubular cover: 3HAC058822-001 (not Hygienic robots) / 3HAC080709-001 (Hygienic robots)</p>  <p>xx140000034</p>
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the tubular cable housing cover gasket. Replace if damaged.</p>	<p>Gasket for tubular cable housing cover: 3HAC056707-001 (not Hygienic robots) / 3HAC080701-001 (Hygienic robots)</p>  <p>xx1400000345</p>

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4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings
Continued

	Action	Note
4	<p>Refit the both covers to the wrist.</p> <p>For robots with protection class IP67 For robots with protection type Foundry Plus</p> <p>Apply locking liquid Loctite 243 to the two front screws on the left hand side cover, encircled in the figure.</p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p> <p>For robots with protection class IP67 For robots with protection type Foundry Plus</p>  <p>xx1300002349</p>
	<p>For robots with protection type Clean Room For robots with food grade lubrication</p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p>	<p>For robots with protection type Clean Room For robots with food grade lubrication</p>  <p>xx1600001153</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
	<p> Note</p> <p>For robots with protection type Hygienic</p> <p>Check the two extra screws on the tubular cover (right hand side cover), as encircled in the figure.</p> <p>Replace if damaged or missing.</p>	<p>For robots with protection type Hygienic</p>  <p>xx2100001406</p>



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4 Repair

4.3.2 Replacing the axis-4 FPC unit, housing extender unit and housing extender sealings

Continued

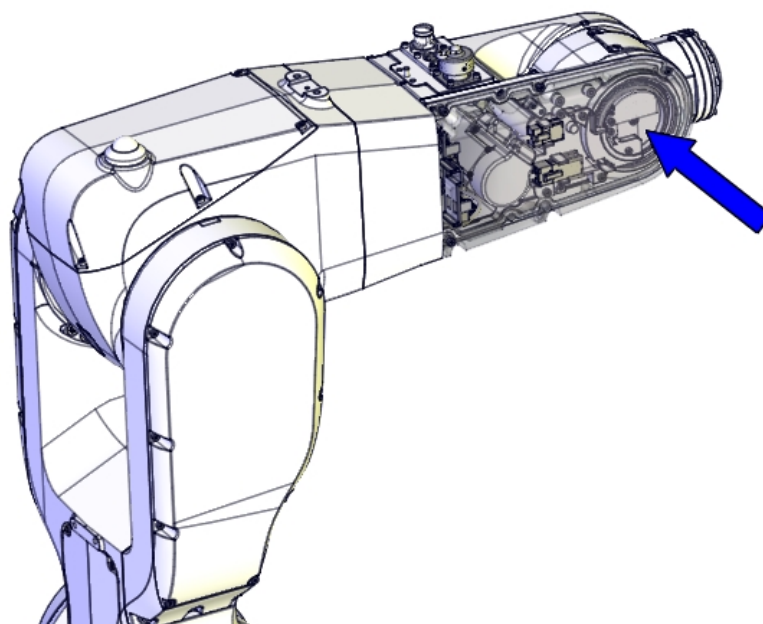
Concluding procedure

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic Clean, seal and paint the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160.</p> <p> Note</p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>	
2	Recalibrate the robot.	Calibration information is included in section Calibration on page 807 .
3	<p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

4.3.3 Replacing the axis-5 FPC unit

Location of axis-5 FPC unit

The axis-5 FPC unit is located as shown in the figure.



xx1300002397

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
FPC unit, axis 5	3HAC045743-001	
M2 variseal sealing	3HAC044641-009	Replace if damaged.
Radial sealing	3HAB3701-42	Not used with protection class IP40 and protection type Hygienic. Replace if damaged.
Gasket for tubular cable housing cover	3HAC056707-001 / 3HAC080701-001	Not used with protection class IP40. Replace if damaged.
Tubular cable housing	3HAC059695-001	
Tubular cable housing, Clean Room	3HAC056143-001	Used with protection type Clean Room.
Tubular cable housing, food grade lubrication		Used for robots with food grade lubrication.

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4 Repair

4.3.3 Replacing the axis-5 FPC unit

Continued

Spare part	Article number	Note
Tubular cable housing, Hygienic	3HAC079692-001	Used with protection type Hygienic.

Required tools and equipment


Equipment, etc.	Article number	Note
Axis-5 sealing assembly tool set	3HAC049701-001	Used to refit the radial sealing, if replacement is needed.
24 VDC power supply	-	Used to release the motor brakes.
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .

Required consumables

Consumable	Art. no.	Note
Cleaning agent	-	Loctite 7063
Flange sealing	12340011-116	Loctite 574 For robots with protection class IP67 For robots with protection type Foundry Plus
Flange sealing	3HAC026759-003	Sikaflex 521FC For robots with protection class IP67 For robots with protection type Foundry Plus
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none">Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot.Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	 Note Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.


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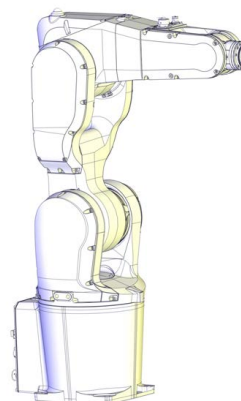
Action	Note
<p>If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p>	<p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in Reference calibration routine on page 821.</p>
<p>If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.</p>	

Removing the FPC unit

Use these procedures to remove the FPC unit.

Preparations before removing the axis-5 FPC unit

Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.
2	Jog all axes to zero position.
3	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>




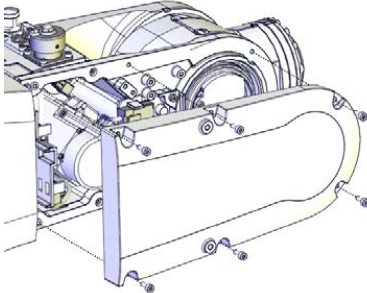
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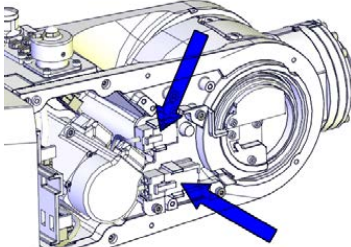
4 Repair

4.3.3 Replacing the axis-5 FPC unit

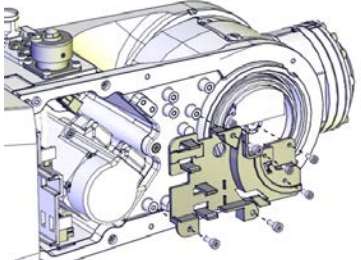

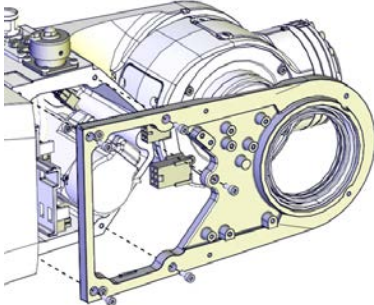
Continued

	Action	Note
4	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i>	
5	Remove the tubular cable housing cover.	 xx1300002389



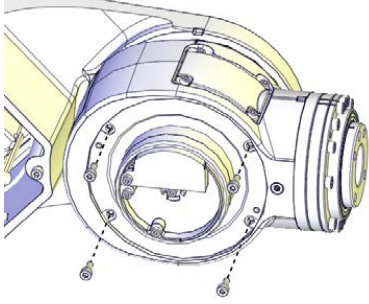
Removing the tubular cable housing

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i>	
3	Snap loose and disconnect the axis-5 FPC connectors.	 xx1300002390

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	Action	Note
4	Remove the connector plate by first removing the screws.	 <p>xx1300002391</p>
5	Remove the cable housing of the tubular by first removing the screws.  Note For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Hygienic The frame is glued and needs to be pried off.	 <p>xx1300002392</p>

Removing the axis-5 FPC unit

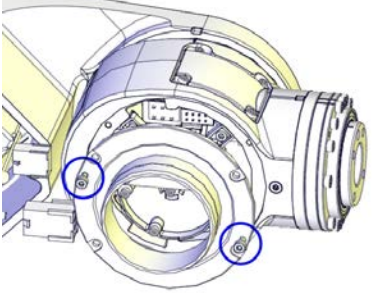
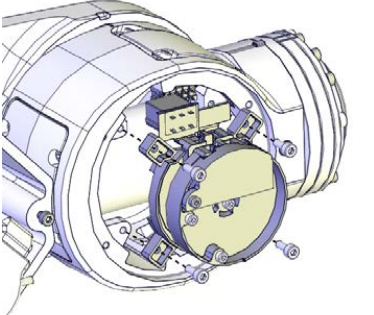
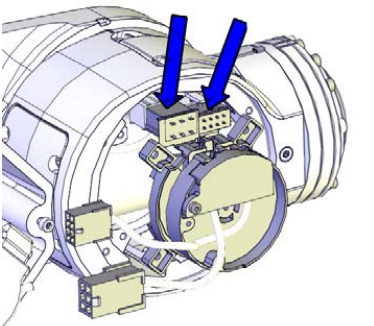
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Remove the sleeve screws.	 <p>xx1300002393</p>

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4 Repair

4.3.3 Replacing the axis-5 FPC unit


Continued

	Action	Note
4	Remove the sleeve by screwing in two of the screws into the press out holes to force the sleeve out.	 <p>xx1300002582</p>
5	Remove the FPC unit attachment screws and pull out the FPC unit as far as required for the axis-6 motor connectors to be accessed.	 <p>xx1300002394</p>
6	Disconnect the axis-6 motor connectors and remove the FPC unit completely.	 <p>xx1300002395</p>

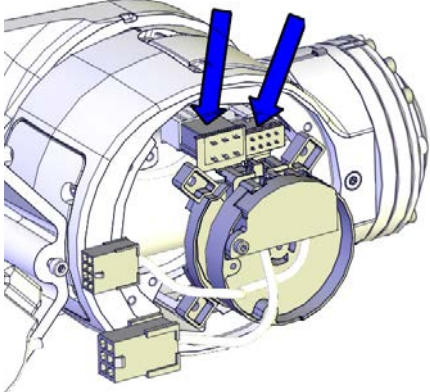

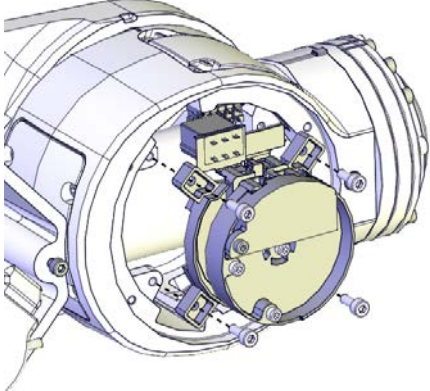
Refitting the FPC unit

Use these procedures to refit the FPC unit.

Refitting the axis-5 FPC unit

	Action	Note
1	 <p>WARNING</p> <p>It is important that axis 5 is in zero position when fitting the FPC unit.</p> <p>Make sure that the FPC is in zero position and does not get twisted during refitting.</p>	

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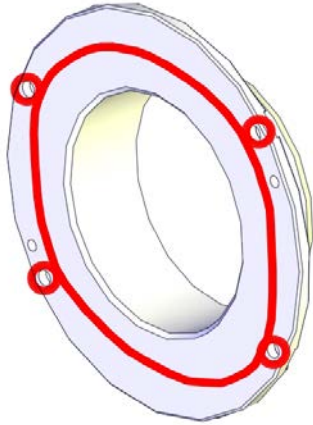
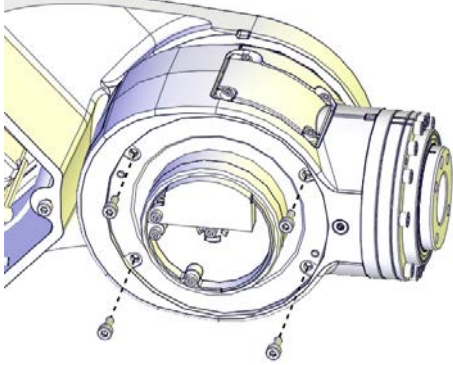
	Action	Note
2	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
3	<p>Reconnect the axis-6 motor connectors to the FPC unit.</p>	 <p>xx1300002395</p>
4	<p>Carefully refit the FPC unit and secure with screws.</p> <p> Note</p> <p>Check that the FPC unit is at the zero position when refitting it.</p>	<p>Tightening torque: 0.3 Nm.</p>  <p>xx1300002394</p>

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4 Repair

4.3.3 Replacing the axis-5 FPC unit


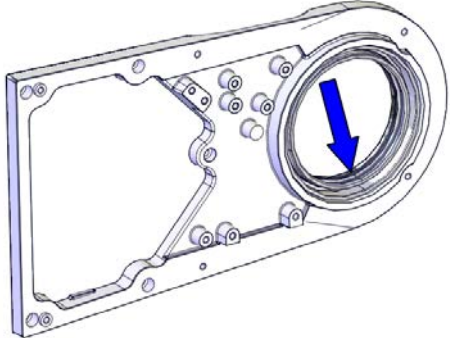
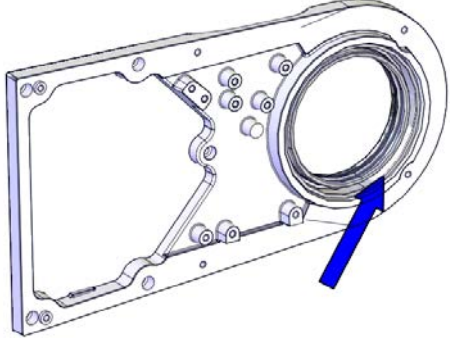
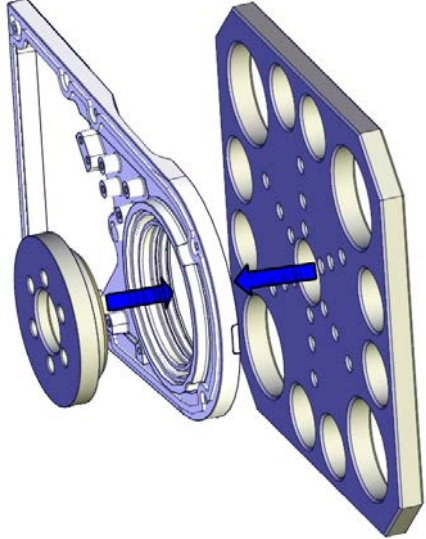
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	Action	Note
5	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Hygienic Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing on the mounting surfaces of the sleeve.</p> <p> Note</p> <p>For Hygienic robots, wipe clean the overflowing flange sealing if there is any.</p>	<p>For robots with protection class IP67 For robots with protection type Foundry Plus Flange sealing, Loctite 574 For robots with protection type Hygienic Flange sealing, Trans Clear</p>  <p>xx1300002609</p>
6	<p>Refit the sleeve and secure with screws. Replace if damaged.</p>	<p>Sleeve: 3HAC044661-001 Tightening torque: 1.5 Nm.</p>  <p>xx1300002393</p>

Checking the tubular cable housing sealings

	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

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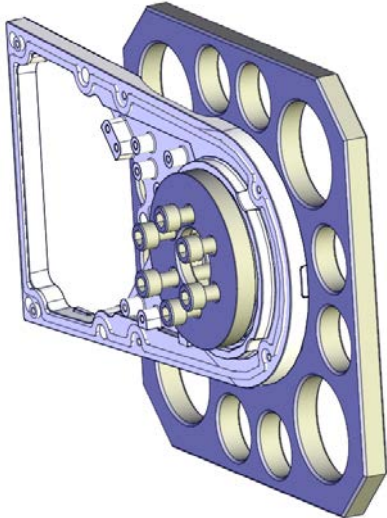
	Action	Note
2	<p>Check the sealing. Replace if damaged.</p> <p> CAUTION</p> <p>Do not fit M2 variseal sealing on Clean Room, food grade lubrication and Hygienic robots.</p>	<p>M2 variseal sealing: 3HAC044641-009</p>  <p>xx1300002396</p>
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication</p> <p>Check the radial sealing. Replace if damaged, as described below. If undamaged and properly seated, skip to the next procedure table.</p>	<p>Radial sealing: 3HAB3701-42</p>  <p>xx1300002608</p>
4	<p>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p>	
5	<p>Fit the radial sealing into the tubular cable housing.</p>	
6	<p>Fit the circular part of the radial sealing assembly tool against the radial sealing.</p>	<p>Axis-5 sealing assembly tool set: 3HAC049701-001</p>
7	<p>Fit the tool plate to the other side of the tubular cable housing with the six screws M6x40.</p>	 <p>xx1400000485</p>

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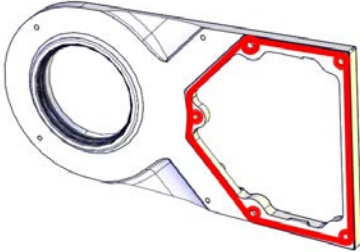
4 Repair

4.3.3 Replacing the axis-5 FPC unit

Continued

	Action	Note
8	Screw the screws, little by little, to press the sealing into place.	 <p data-bbox="943 846 1050 864">xx140000486</p>
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	

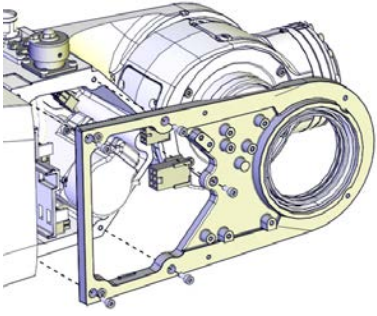
Refitting the tubular cable housing

	Action	Note
1	<p data-bbox="480 1122 986 1223">For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p data-bbox="480 1229 1018 1308">Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p data-bbox="480 1332 1018 1485">For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Hygienic</p> <p data-bbox="480 1491 1018 1547">Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p> <p data-bbox="480 1554 1018 1610">Apply flange sealing on the mounting surfaces of the tubular cable housing.</p> <div data-bbox="480 1563 544 1619" style="display: inline-block; vertical-align: middle;">  </div> <p data-bbox="571 1581 628 1608">Note</p> <p data-bbox="480 1630 1018 1686">For Hygienic robots, wipe clean the overflowing flange sealing if there is any.</p>	<p data-bbox="1027 1332 1401 1384">For robots with protection class IP67</p> <p data-bbox="1027 1391 1401 1442">For robots with protection type Foundry Plus</p> <p data-bbox="1027 1449 1401 1478">Flange sealant, SikaFlex 521FC</p> <p data-bbox="1027 1485 1401 1536">For robots with protection type Hygienic</p> <p data-bbox="1027 1543 1401 1572">Flange sealant, Trans Clear</p>  <p data-bbox="1027 1845 1134 1863">xx1300002610</p>

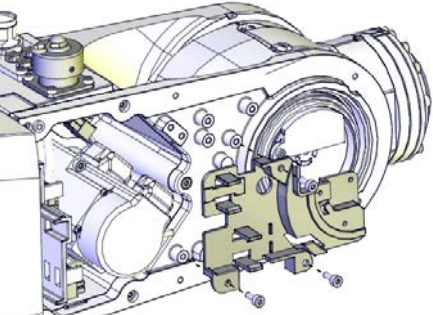
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4.3.3 Replacing the axis-5 FPC unit

Continued

	Action	Note
3	Refit the tubular cable housing with the screws.	<p>Tightening torque: 1.5 Nm.</p> <p>Tubular cable housing: 3HAC059695-001</p> <p>Tubular cable housing, Clean Room</p> <p>Tubular cable housing, food grade lubrication : 3HAC056143-001</p> <p>Tubular cable housing, Hygienic: 3HAC079692-001</p>  <p>xx1300002392</p>

Refitting the connector plate

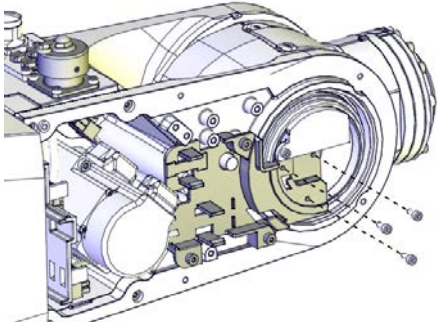
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	Refit the connector plate and secure with the M3 screws.	<p>Tightening torque: 0.3 Nm.</p>  <p>xx1400001401</p>

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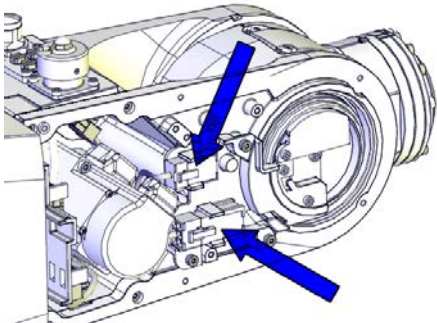
4 Repair

4.3.3 Replacing the axis-5 FPC unit

Continued

	Action	Note
3	Secure the three M2.5 screws.	Tightening torque: 0.3 Nm.  <small>xx1400001402</small>

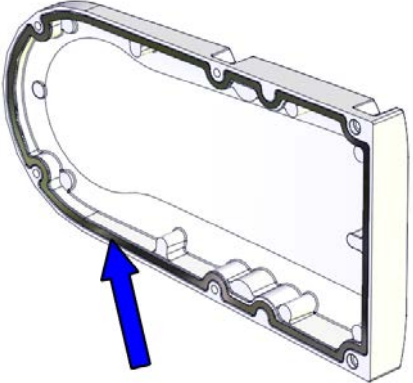
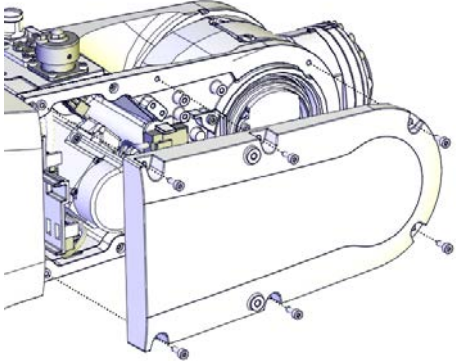

Connecting the axis-5 motor FPC connectors

	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Connect the axis-5 FPC connectors and snap them to their holders.	 <small>xx1300002390</small>

Refitting the tubular cable housing cover

	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

Continues on next page



	Action	Note
2	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the tubular cable housing cover gasket. Replace if damaged.</p>	<p>Gasket for tubular cable housing cover: 3HAC056707-001 (not Hygienic robots) / 3HAC080701-001 (Hygienic robots)</p>  <p>xx140000345</p>
3	<p>Refit the cover to the cable housing.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p>  <p>xx1300002389</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

4 Repair

4.3.3 Replacing the axis-5 FPC unit

Continued

Concluding procedure

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic Clean, seal and paint the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160.</p> <p> Note</p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>	
2	Recalibrate the robot.	Calibration information is included in section Calibration on page 807 .
3	<p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

4.3.4 Replacing the EIB/SMB unit

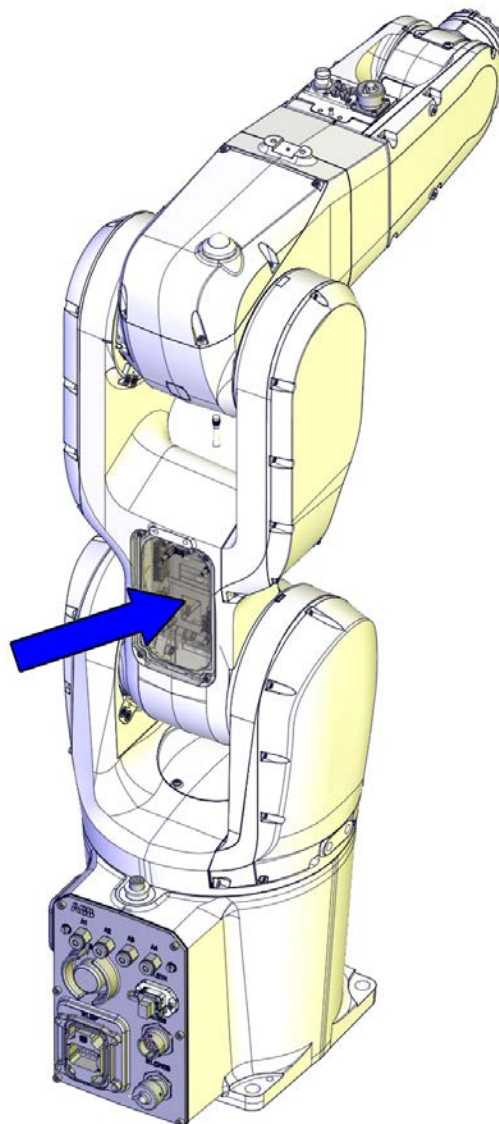
Location of EIB/SMB unit

The EIB/SMB unit is located as shown in the figure.



Note

The EIB unit is used for IRB 1200 no type specified and IRB 1200 Type A.
The SMB unit is used for IRB 1200 Type B.



xx1300002574

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4 Repair

4.3.4 Replacing the EIB/SMB unit

Continued

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
EIB unit	3HAC045759-001	
SMB unit	3HAC059122-001	Used for IRB 1200 Type B. See Type B of IRB 1200 on page 875 .
Gasket on EIB/SMB cover	3HAC056728-001 / 3HAC080706-001	Not used with protection class IP40. Replace if damaged.
Gasket on cable housing cover	3HAC056724-001 / 3HAC080702-001	Not used with protection class IP40. Replace if damaged.

Required tools and equipment

Equipment, etc.	Article number	Note
24 VDC power supply	-	Used to release the motor brakes.
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .

Required consumables

Equipment	Article number	Note
Locking liquid	3HAB7116-1	Loctite 243

Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none">Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot.Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	Note Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.

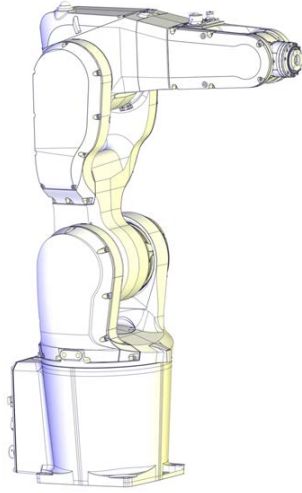

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Action	Note
<p>If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p>	<p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in Reference calibration routine on page 821.</p>
<p>If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.</p>	

Removing the EIB/SMB unit

Use these procedures to remove the EIB/SMB unit.

Preparations before removing the EIB/SMB unit


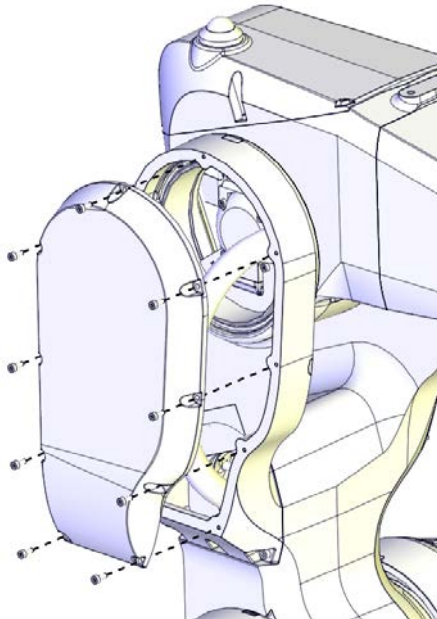
Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.
2	<p>Jog all axes to zero position.</p>  <p>xx1300002581</p>
3	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>

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4 Repair

4.3.4 Replacing the EIB/SMB unit




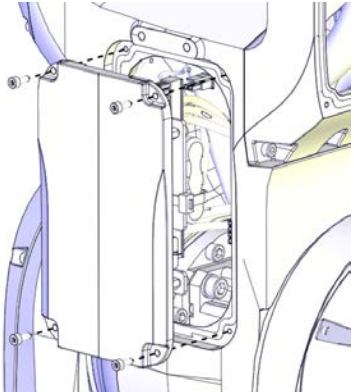
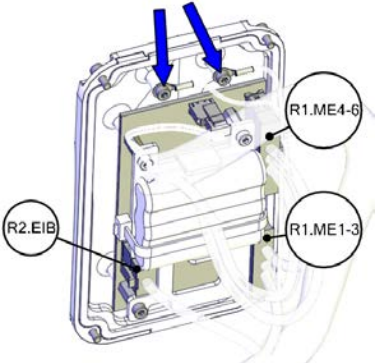
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	Action	Note
4	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
5	Remove the lower arm cable housing cover.	 <p>xx1300002400</p>

Disconnecting the cabling in the lower arm

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section The unit is sensitive to ESD on page 64</p>	

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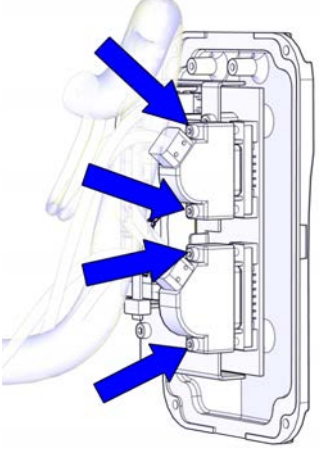
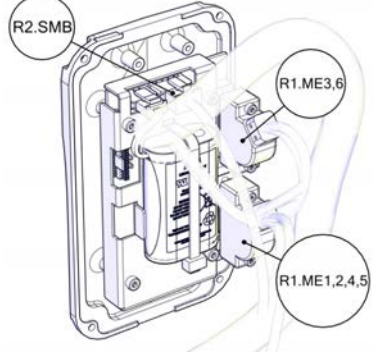
	Action	Note
3	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	
4	<p>Remove the EIB/SMB cover attachment screws on the lower arm and carefully open the cover.</p> <p> CAUTION</p> <p>Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures.</p> <p> CAUTION</p> <p>Be aware of the cabling that is attached to the cover! The cover can not be removed completely until the connectors and lugs are disconnected, as shown in following step.</p>	 <p>xx1300002427</p>
5	<p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Disconnect the connectors on the EIB unit.</p> <ul style="list-style-type: none"> • R1.ME1-3 • R1.ME4-6 • R2.EIB <p>Remove the EIB/SMB cover completely from the lower arm.</p>	 <p>xx1300002428</p>
6	<p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Disconnect the lugs on the EIB/SMB cover.</p>	

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4 Repair

4.3.4 Replacing the EIB/SMB unit


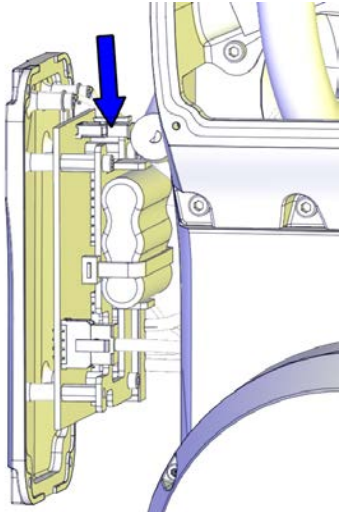
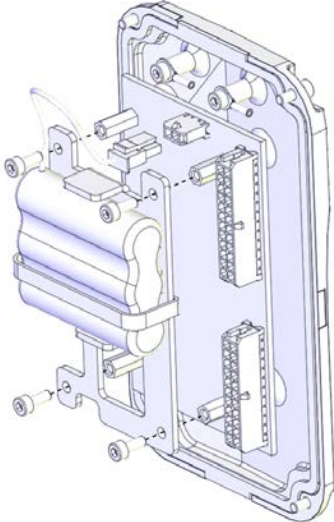
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	Action	Note
7	<p>Valid for IRB 1200 Type B</p> <p>Loose the connector screws.</p>	 <p>xx1700000004</p>
8	<p>Valid for IRB 1200 Type B</p> <p>Disconnect the connectors on the SMB unit.</p> <ul style="list-style-type: none"> • R1.ME1,2,4,5 • R1.ME3,6 • R2.SMB <p>Remove the EIB/SMB cover completely from the lower arm.</p>	 <p>xx1700000005</p>

Removing the EIB unit (IRB 1200 no type specified and IRB 1200 Type A)

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section The unit is sensitive to ESD on page 64</p>	

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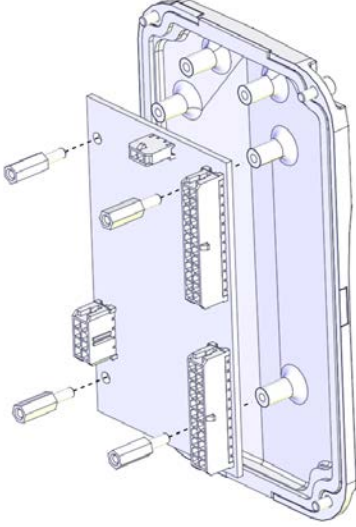
	Action	Note
3	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	
4	Disconnect the battery cable.	 <p>xx1300002571</p>
5	Remove the battery pack plate by removing the screws.	 <p>xx1300002572</p>

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4 Repair

4.3.4 Replacing the EIB/SMB unit

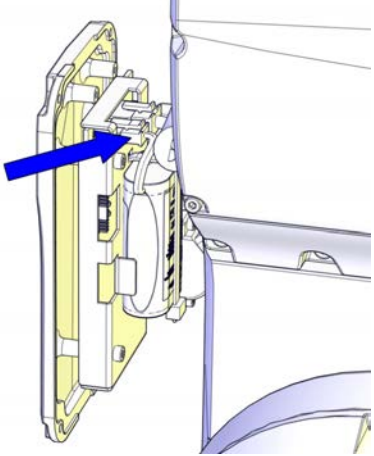
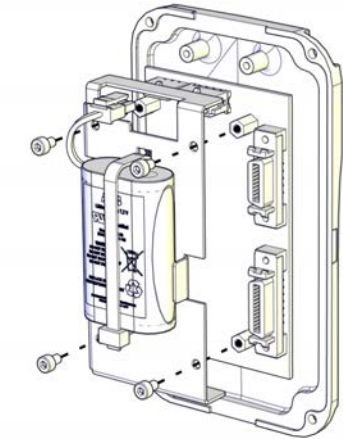
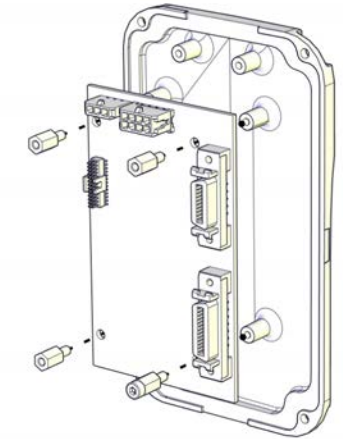
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	Action	Note
6	Remove the EIB unit by removing the distance screws.	 <p data-bbox="1027 864 1134 882">xx1300002573</p>

Removing the SMB unit (IRB 1200 Type B)

	Action	Note
1	 <p data-bbox="571 1055 679 1081">DANGER</p> <p data-bbox="480 1115 1007 1193">Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p data-bbox="571 1263 999 1290">ELECTROSTATIC DISCHARGE (ESD)</p> <p data-bbox="480 1328 1018 1406">The unit is sensitive to ESD. Before handling the unit please read the safety information in the section The unit is sensitive to ESD on page 64</p>	
3	 <p data-bbox="571 1471 686 1498">CAUTION</p> <p data-bbox="480 1527 1018 1736"> For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160. </p>	

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	Action	Note
4	Disconnect the battery cable.	 <p>xx170000006</p>
5	Remove the battery pack plate by removing the screws.	 <p>xx170000008</p>
6	Remove the SMB unit by removing the distance screws.	 <p>xx170000009</p>

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4 Repair


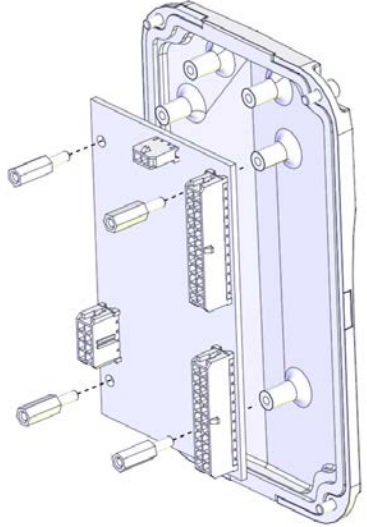
4.3.4 Replacing the EIB/SMB unit

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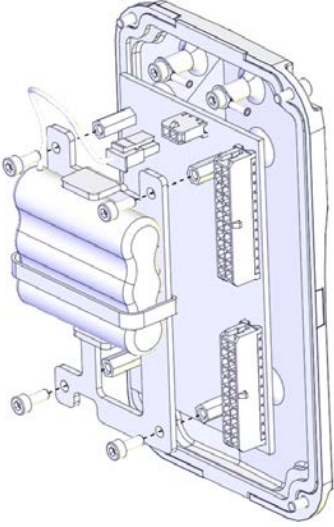
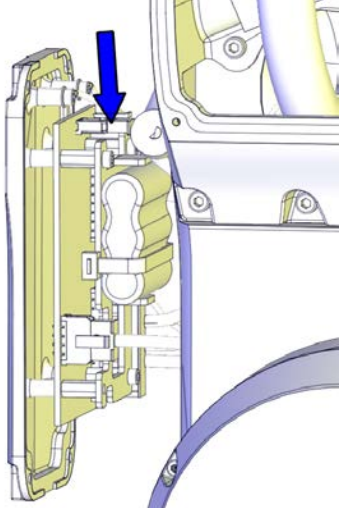
Refitting the EIB/SMB unit

Use these procedures to refit the EIB/SMB unit.


Refitting the EIB unit (IRB 1200 no type specified and IRB 1200 Type A)

	Action	Note
1	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <i>The unit is sensitive to ESD on page 64</i>	
2	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
3	Refit the EIB unit with the distance screws.	 xx1300002573

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	Action	Note
4	Refit the battery pack plate with the screws.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002572</p>
5	Reconnect the battery cable.	 <p>xx1300002571</p>

Refitting the SMB unit (IRB 1200 Type B)

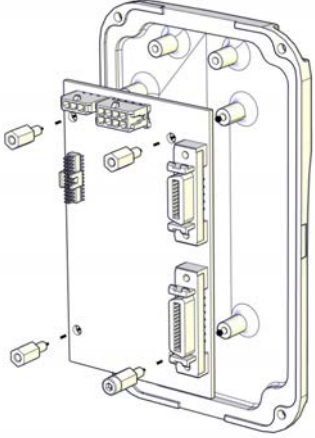
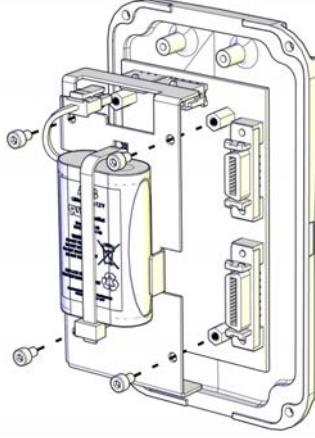
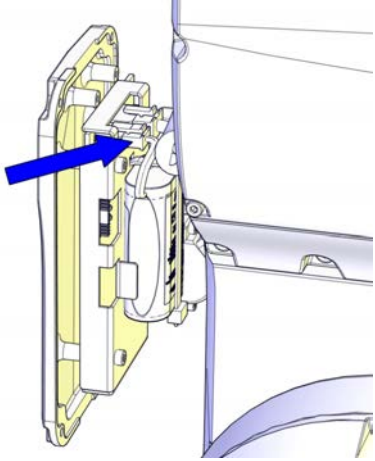
	Action	Note
1	 <p>ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section The unit is sensitive to ESD on page 64</p>	
2	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

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4 Repair


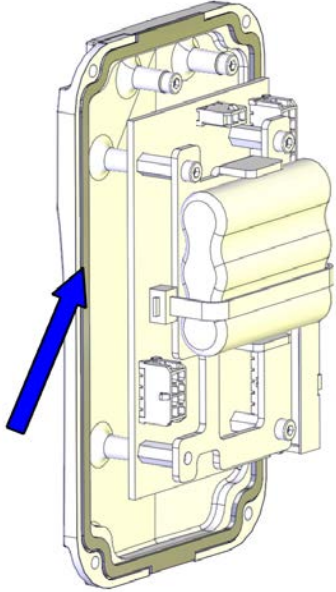
4.3.4 Replacing the EIB/SMB unit

Continued

	Action	Note
3	Refit the SMB unit with the distance screws.	 <p>xx170000009</p>
4	Refit the battery pack plate with the screws.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx170000008</p>
5	Reconnect the battery cable.	 <p>xx170000006</p>

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Connecting the cabling in the lower arm


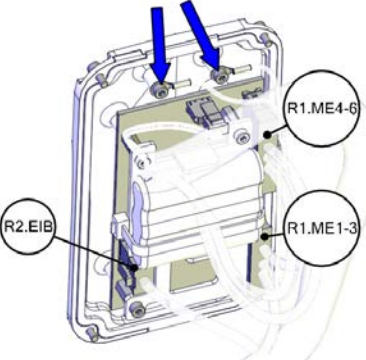

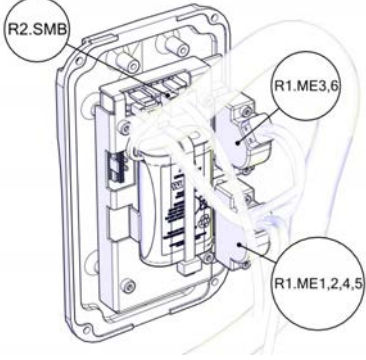
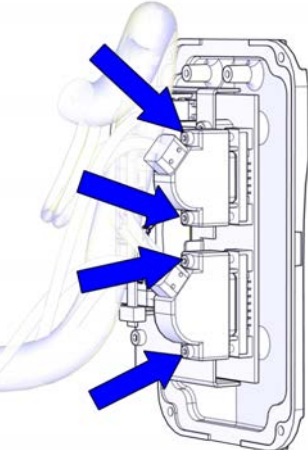
	Action	Note
1	 <p>ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <i>The unit is sensitive to ESD on page 64</i></p>	
2	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the EIB/SMB cover gasket. Replace if damaged.</p>	<p>Gasket on EIB/SMB cover: 3HAC056728-001 (not Hygienic robots) / 3HAC080706-001 (Hygienic robots)</p>  <p>xx1400000475</p>

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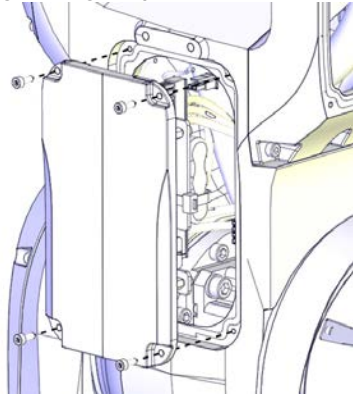

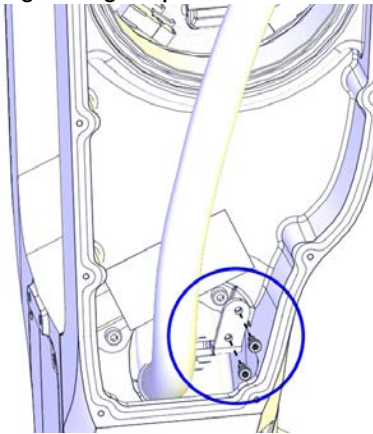
4 Repair

4.3.4 Replacing the EIB/SMB unit

Continued

	Action	Note
4	<p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Connect the connectors to the EIB unit.</p> <ul style="list-style-type: none"> • R1.ME1-3 • R1.ME4-6 • R2.EIB <p> WARNING</p> <p>Make sure not to mix the R2.EIB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.</p>	
5	<p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Connect the lugs to the EIB/SMB cover.</p>	<p>xx1300002428</p>
6	<p>Valid for IRB 1200 Type B</p> <p>Connect the connectors to the SMB unit.</p> <ul style="list-style-type: none"> • R1.ME1,2,4,5 • R1.ME3,6 • R2.SMB <p> WARNING</p> <p>Make sure not to mix the R2.SMB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.</p>	 <p>xx1700000005</p>
7	<p>Valid for IRB 1200 Type B</p> <p>Tighten the connector screws.</p>	<p>Tightening torque: 0.3 Nm</p>  <p>xx1700000004</p>

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	Action	Note
8	Refit the EIB/SMB cover to the lower arm with the attachment screws.	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm</p>  <p>xx1300002427</p> <p> Note Only use specified screws, never replace them with other screws.</p>
9	Refit the fix sheet attachment screws in the lower arm.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002426</p>

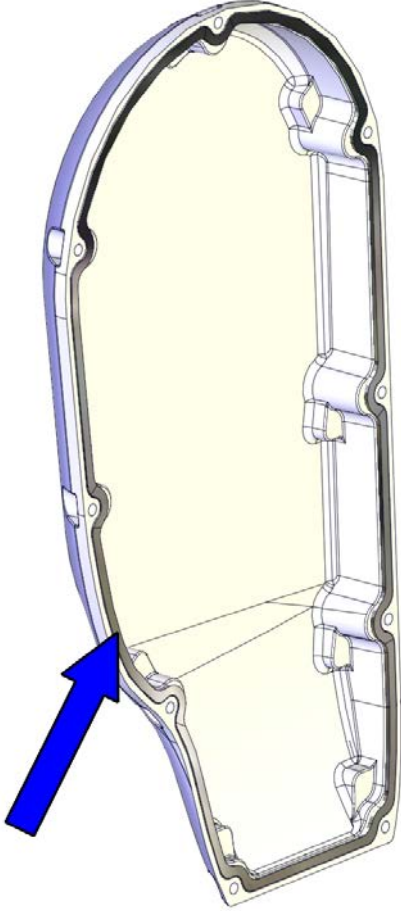
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4 Repair

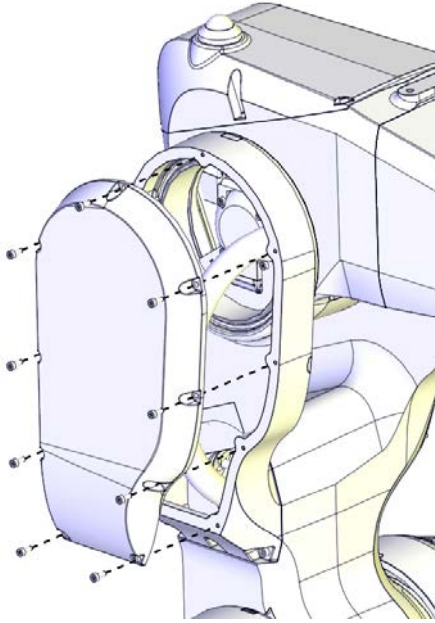



4.3.4 Replacing the EIB/SMB unit

Continued

Concluding procedure

	Action	Note
1	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the gasket of the cable housing cover. Replace if damaged.</p>	<p>Gasket on cable housing cover: 3HAC056724-001 (not Hygienic robots) / 3HAC080702-001 (Hygienic robots)</p>  <p>xx140000048</p>
2	<p>Check the PTFE film on the cable housing cover. Replace if damaged.</p>	<p>PTFE film on cable housing cover: 3HAC044660-001</p>
3	<p>Apply grease to the inner surface of the cable housing cover and the PTFE film surface.</p>	

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	Action	Note
4	<p>Refit the cable housing cover.</p> <p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Apply locking liquid Loctite 243 to all the screws securing the cover.</p>	<p>Screws: 3HAB3409-207 (M3x8).</p> <p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002400</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
5	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean, seal and paint the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160.</p> <p> Note</p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>	
6	Recalibrate the robot.	Calibration information is included in section Calibration on page 807 .
7	<p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

4 Repair

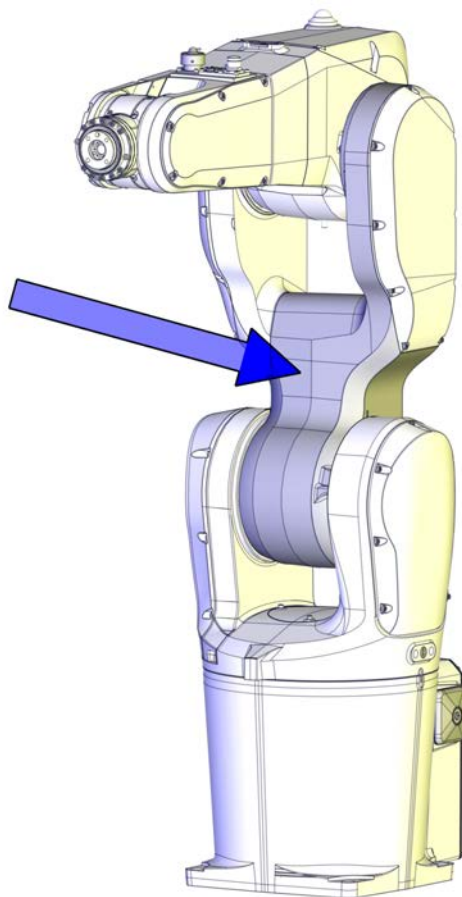
4.4.1 Replacing the lower arm

4.4 Upper and lower arms

4.4.1 Replacing the lower arm

Location of the lower arm

The lower arm is located as shown in the figure.



xx140000423

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Lower arm (IRB 1200-7/0.7)	3HAC059687-001	Includes guide pin.

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Spare part	Article number	Note
Lower arm, Clean Room (IRB 1200-7/0.7) Lower arm, food grade lubrication (IRB 1200-7/0.7) Lower arm, Hygienic (IRB 1200-7/0.7)	3HAC059704-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Includes guide pin.
Lower arm (IRB 1200-5/0.9)	3HAC059688-001	Includes guide pin.
Lower arm, Clean Room (IRB 1200-5/0.9) Lower arm, food grade lubrication (IRB 1200-5/0.9) Lower arm, Hygienic (IRB 1200-5/0.9)	3HAC059705-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Includes guide pin.
M2 variseal sealing	3HAC044641-005	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
Cable housing of the lower arm	3HAC059690-001	Replace if damaged.
Cable housing of the lower arm, Clean Room Cable housing of the lower arm, food grade lubrication Cable housing of the lower arm, Hygienic	3HAC056135-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket on lower arm cable housing	3HAC044895-001 / 3HAC080696-001	Not used with protection class IP40. Replace if damaged.
M2 variseal sealing	3HAC044641-006	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
Radial sealing	3HAC024865-001	Not used with protection class IP40. Replace if damaged.
Axis-2 sealing ring	3HAC044677-001	Replace if damaged.
Gasket of axis-2 sealing ring	3HAC045688-001 / 3HAC080697-001	Not used with protection class IP40. Replace if damaged.
Gasket of plastic plate	3HAC044894-001 / 3HAC080695-001	Not used with protection class IP40. Replace if damaged.
Lower arm cover	3HAC059689-001	Replace if damaged.

Continues on next page

4 Repair

4.4.1 Replacing the lower arm

Continued

Spare part	Article number	Note
Lower arm cover, Clean Room Lower arm cover, food grade lubrication Lower arm cover, Hygienic	3HAC056136-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket on lower arm cover	3HAC056725-001 / 3HAC080703-001	Not used with protection class IP40. Replace if damaged.
Cable housing of the swing	3HAC059677-001	Replace if damaged.
Cable housing of the swing, Clean Room Cable housing of the swing, food grade lubrication Cable housing of the swing, Hygienic	3HAC056213-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Cable housing cover of the swing	3HAC059678-001	Replace if damaged.
Cable housing cover of the swing, Clean Room Cable housing cover of the swing, food grade lubrication Cable housing cover of the swing, Hygienic	3HAC056214-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket on cable housing cover	3HAC056726-001 / 3HAC080704-001	Not used for robots with protection class IP40. Replace if damaged.
M2 variseal sealing	3HAC044641-003	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
M2 variseal sealing	3HAC044641-004	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
Radial sealing with dust lip	3HAB3701-41	Not used with protection class IP40. Replace if damaged.
O-ring	3HAC048939-001	Replace if damaged.
Swing cover	3HAC059676-001	Replace if damaged.
Swing cover, Clean Room Swing cover, food grade lubrication Swing cover, Hygienic	3HAC056215-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.

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Spare part	Article number	Note
Gasket on swing cover	3HAC056727-001 / 3HAC080705-001	Not used with protection class IP40. Replace if damaged.
Cable harness material set	3HAC049663-001	Includes brackets, sheets, distance screws, plastics, cable clamp, seal bolts and air protection in tubular.
Housing small cover	3HAC059684-001	Replace if damaged.
Housing small cover, Clean Room Housing small cover, food grade lubrication Housing small cover, Hygienic	3HAC056142-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket on cable housing cover	3HAC056724-001 / 3HAC080702-001	Not used with protection class IP40. Replace if damaged.
PTFE film on cable housing cover	3HAC044660-001	Replace if damaged.
Gasket for tubular cover	3HAC058822-001 / 3HAC080709-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cable housing cover	3HAC056707-001 / 3HAC080701-001	Not used with protection class IP40. Replace if damaged.
Housing cover gasket (IRB 1200-7/0.7)	3HAC056698-001 / 3HAC080700-001	Not used with protection class IP40. Replace if damaged.
Housing cover gasket (IRB 1200-5/0.9)	3HAC056697-001 / 3HAC080699-001	Not used with protection class IP40. Replace if damaged.
Air connector set with Ethernet hole in flange	3HAC049664-001	Includes tubular flange, air connectors and seal bolts. Replace if damaged.
Air connector set without Ethernet hole in flange	3HAC049665-001	Includes tubular flange, air connectors and seal bolts. Replace if damaged.
Plate with connector set	3HAC079691-001	Used with protection type Hygienic. Includes Ethernet connector, air connectors, CP/CS connector and gasket (3HAC078804-001).
Plate without connector set	3HAC078810-001	Used with protection type Hygienic. Includes gasket (3HAC078804-001).
Gasket	3HAC078804-001	Used with protection type Hygienic. Replace if damage.

Continues on next page

4 Repair

4.4.1 Replacing the lower arm

Continued

Required tools and equipment

Equipment, etc.	Article number	Note
Guide pin for axis-2 gear unit	3HAC049704-001	Always use three guide pins together!
Guide pin for upper arm	3HAC049705-001	Always use three guide pins together!
24 VDC power supply	-	Used to release the motor brakes.
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. ⁱ
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .

- ⁱ The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, manual calibration is used as default.


Required consumables

Consumable	Art. no.	Note
Cable straps	-	
Cleaning agent	-	Loctite 7063
Locking liquid	3HAB7116-1	Loctite 243
Flange sealing	12340011-116	Loctite 574
Grease	3HAC042536-001	Used for lubrication of cable contact areas.
Grease	3HAC029132-001	Used for lubrication of cable contact areas for robots with food grade lubrication and robots in protection type Hygienic.
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room For robots with food grade lubrication For robots with protection class IP67 For robots with protection type Foundry Plus
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

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Deciding calibration routine

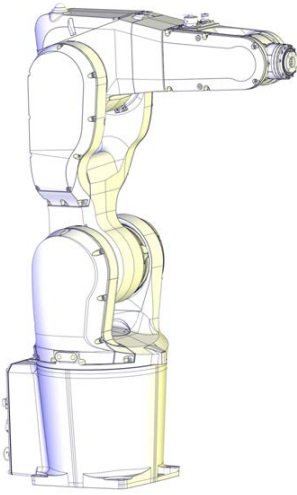
Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	<p>Decide which calibration routine to use for calibrating the robot.</p> <ul style="list-style-type: none"> Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	<p> Note</p> <p>Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.</p>
	<p>If the robot is to be calibrated with reference calibration:</p> <p>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p>	<p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in Reference calibration routine on page 821.</p>
	<p>If the robot is to be calibrated with fine calibration:</p> <p>Remove all external cable packages (DressPack) and tools from the robot.</p>	

Removing the lower arm

Use this procedure to remove the lower arm.

Preparations before removing the lower arm



	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 <p>xx1300002581</p>

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4 Repair

4.4.1 Replacing the lower arm


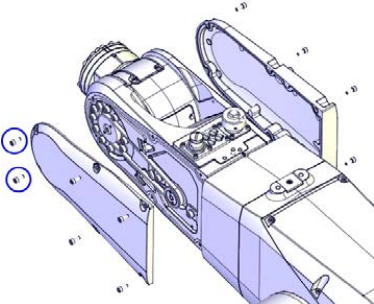

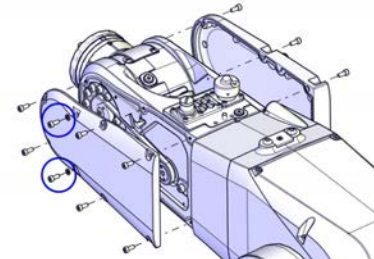

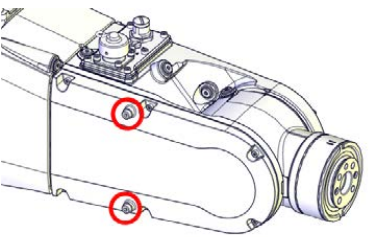
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	Action	Note
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
4	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.	


Getting access to inside of the wrist unit

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.	

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	Action	Note
3	<p>Remove the covers on each side of the wrist by removing their screws.</p> <p> Note For robots with protection class IP67 For robots with protection type Foundry Plus The two front screws on the left hand side cover (encircled in the figure) have been fitted with locking liquid. The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.</p>	<p>For robots with protection class IP67 For robots with protection type Foundry Plus</p>  <p>xx1300002349</p>
	<p> Note For robots with protection type Clean Room For robots with food grade lubrication The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.</p>	<p>For robots with protection type Clean Room</p>  <p>xx1600001148</p>
	<p> Note For robots with protection type Hygienic The tubular cover (right hand side cover) has two extra screws, as encircled in the figure. Do not remove the two screws when removing the cover. The screws are used for blocking the screw holes rather than fixing the cover to the tubular. Replace if damaged or missing.</p>	<p>For robots with protection type Hygienic</p>  <p>xx2100001406</p>

Disconnecting the axis-5 motor connectors



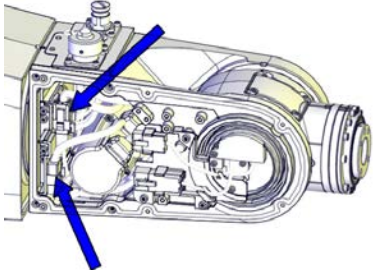
	Action	Note
1	<p> DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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4 Repair

4.4.1 Replacing the lower arm

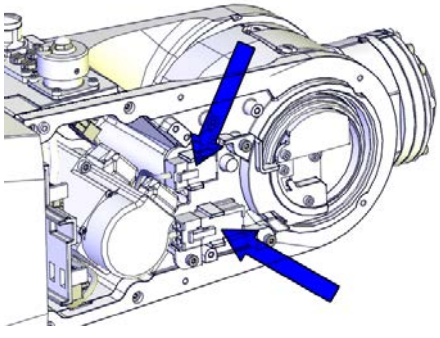
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	Action	Note
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Snap loose the motor connectors from their holders and then disconnect them. <ul style="list-style-type: none"> • R3.MP5 • R3.ME5  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1300002360



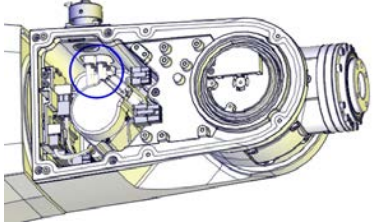
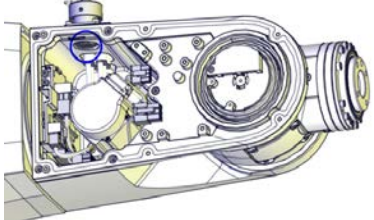
Disconnecting the axis-5 FPC connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	

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	Action	Note
3	Snap loose and disconnect the axis-5 FPC connectors.	 <p>xx1300002390</p>

Disconnecting the air hoses and CP/CS cabling (if equipped)

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Disconnect the air hoses.	 <p>xx1400000738</p>
4	If equipped, disconnect the CP/CS connector.	 <p>xx1500000252</p>



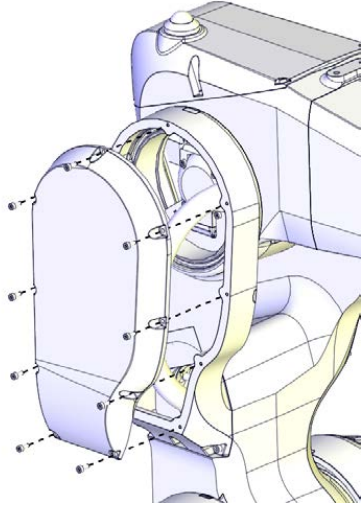
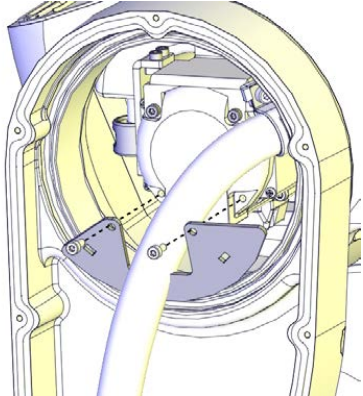
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4 Repair

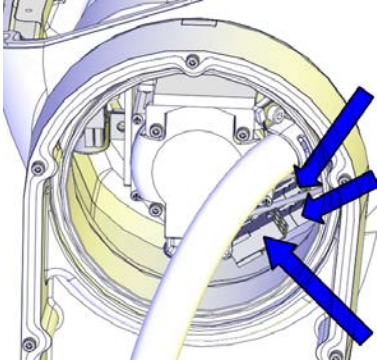
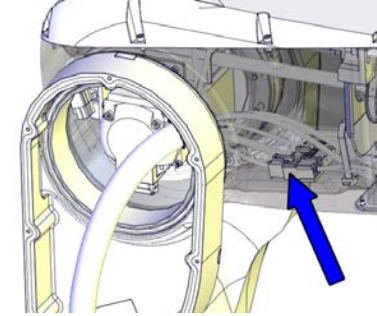
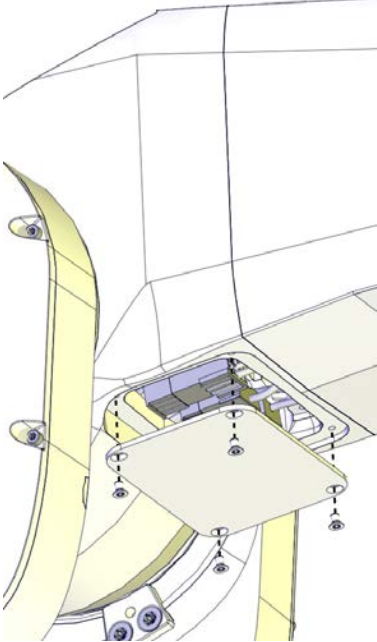
4.4.1 Replacing the lower arm

Continued

Disconnecting the axis-4 FPC connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Remove the cable housing cover.	 xx1300002400
4	Remove the plate.	 xx1300002413

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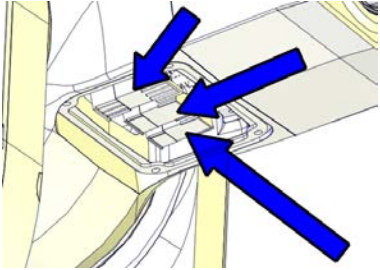
	Action	Note
5	Pull out the FPC connectors from the housing and disconnect them.	<p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p>
6	Remove the small cover of the housing.	 <p>xx1300002398</p>

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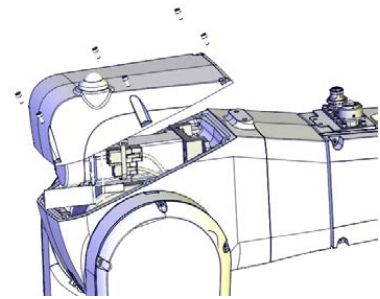
4 Repair

4.4.1 Replacing the lower arm

Continued

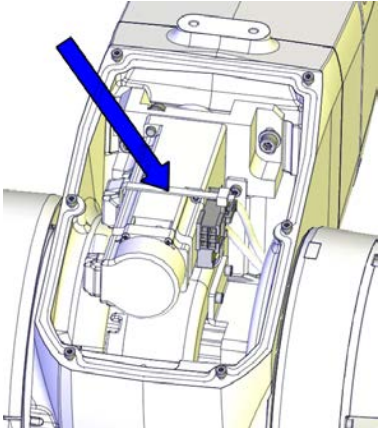

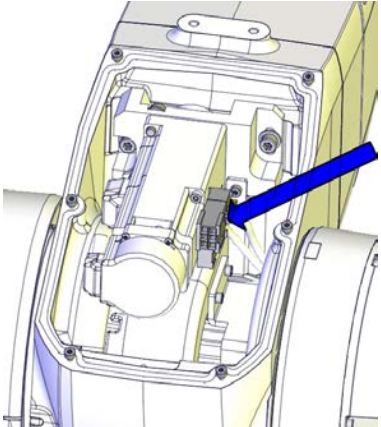
	Action	Note
7	Disconnect the remaining FPC connectors.	 <p>xx1300002399</p>

Disconnecting the axis-4 motor connectors



	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	<p>Remove the cover from the upper arm housing.</p>  <p>CAUTION</p> <p>For robots with safety lamp (option) Be aware of the signal lamp cables that are attached inside the housing! Disconnect the lamp cable connectors R3.H1 and R3.H2 and then lift away the cover completely.</p>	 <p>xx1300000456</p>

Continues on next page

4.4.1 Replacing the lower arm
Continued

	Action	Note
4	Cut the strap that holds the connectors.	 <p>xx1300002494</p>
5	Disconnect the motor connectors.  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 <p>xx1300002495</p>

Disconnecting the axis-3 motor connectors

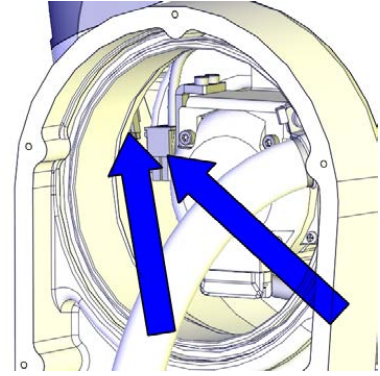
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	

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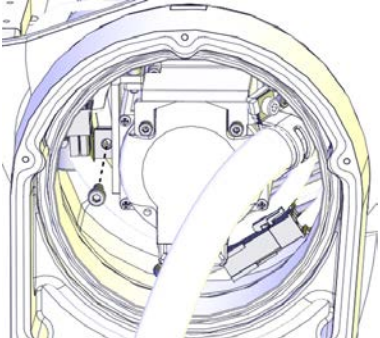
4 Repair

4.4.1 Replacing the lower arm

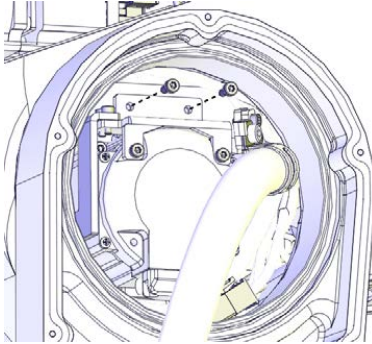
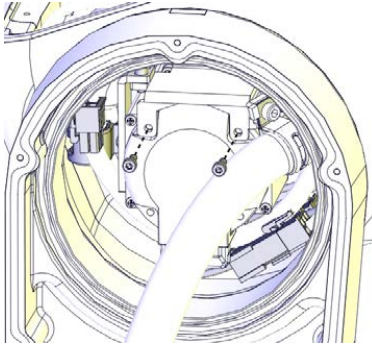

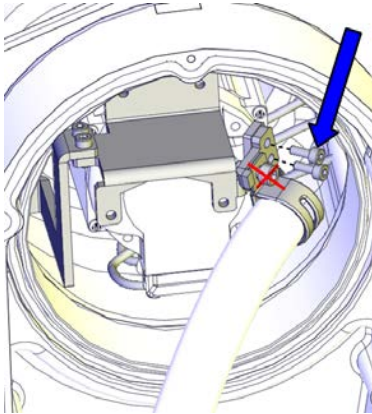
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	Action	Note
3	Pull out the axis-3 motor connectors from the housing and disconnect them.	 <p>xx1300002420</p>


Removing the cable package in the housing

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Remove the screw that fastens the air hose holder.	 <p>xx1300002422</p>

Continues on next page

	Action	Note
4	Remove the screws that fasten the fix sheet to the inner plastic guide.	 <p>xx1300002421</p>
5	Remove the screws that fasten the fix sheet to the motor.	 <p>xx1300002423</p>
6	<p>Pull out the fix sheet a bit, to access the screws that fasten the cable bracket to the sheet. Loosen the bracket from the sheet by removing the two screws.</p> <p> CAUTION</p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>	 <p>xx1300002424</p>
7	<p>Valid for IRB 1200-5/0.9</p> <p>Cut the cable straps at the bottom of the housing.</p>	





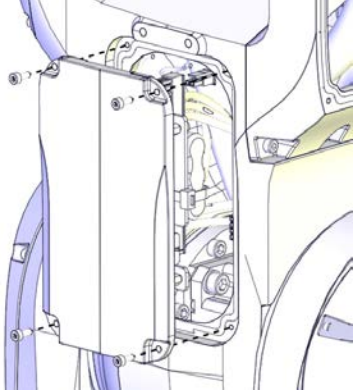
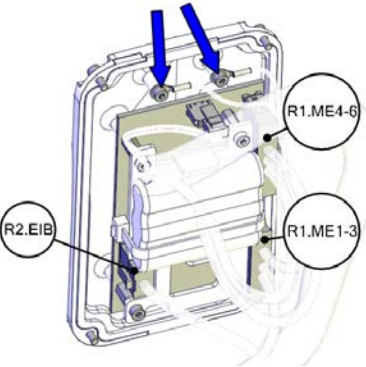
Disconnecting the cabling in the lower arm

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

4 Repair

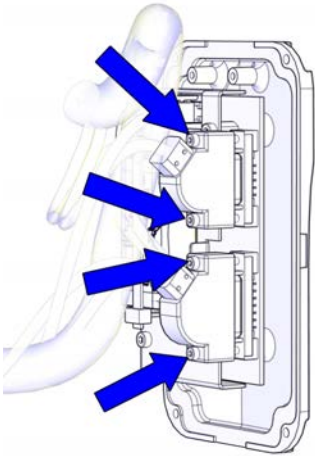
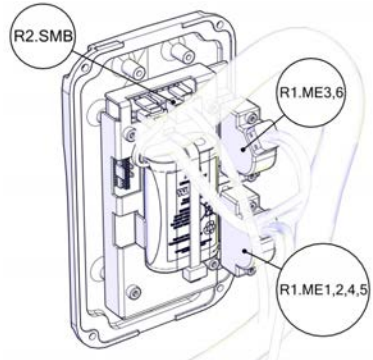
4.4.1 Replacing the lower arm

Continued



	Action	Note
2	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <i>The unit is sensitive to ESD on page 64</i>	
3	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i>	
4	Remove the EIB/SMB cover attachment screws on the lower arm and carefully open the cover.  CAUTION Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures.  CAUTION Be aware of the cabling that is attached to the cover! The cover can not be removed completely until the connectors and lugs are disconnected, as shown in following step.	 <small>xx1300002427</small>
5	Valid for IRB 1200 (no type specified) and IRB 1200 Type A Disconnect the connectors on the EIB unit. <ul style="list-style-type: none"> • R1.ME1-3 • R1.ME4-6 • R2.EIB Remove the EIB/SMB cover completely from the lower arm.	 <small>xx1300002428</small>
6	Valid for IRB 1200 (no type specified) and IRB 1200 Type A Disconnect the lugs on the EIB/SMB cover.	

Continues on next page

4.4.1 Replacing the lower arm
Continued

	Action	Note
7	<p>Valid for IRB 1200 Type B</p> <p>Loose the connector screws.</p>	 <p>xx1700000004</p>
8	<p>Valid for IRB 1200 Type B</p> <p>Disconnect the connectors on the SMB unit.</p> <ul style="list-style-type: none"> • R1.ME1,2,4,5 • R1.ME3,6 • R2.SMB <p>Remove the EIB/SMB cover completely from the lower arm.</p>	 <p>xx1700000005</p>

Removing the cable package in the lower arm

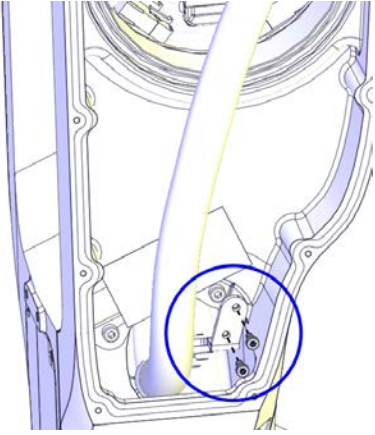

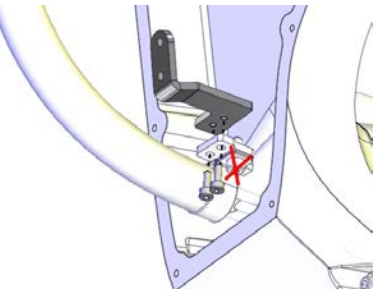
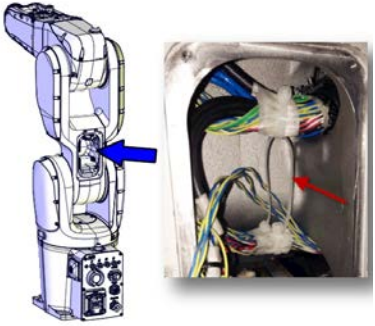
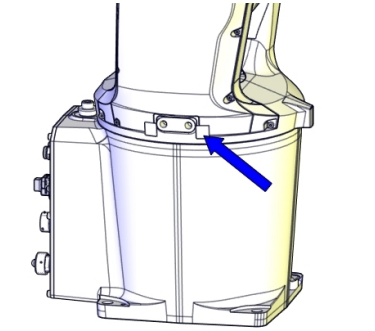
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	<p>Pull the cable package out from the upper arm housing.</p>	

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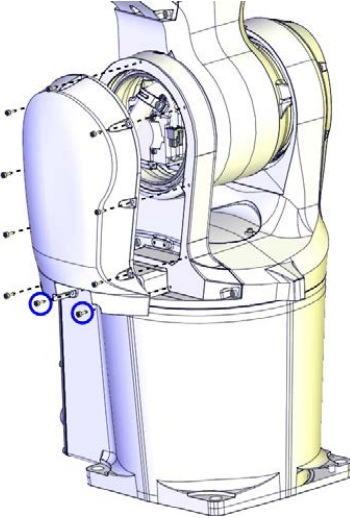
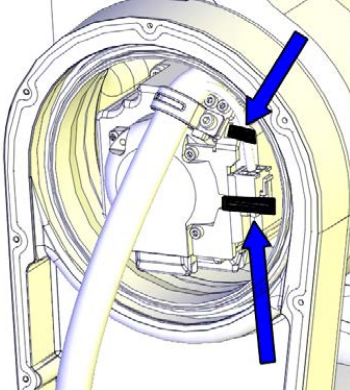
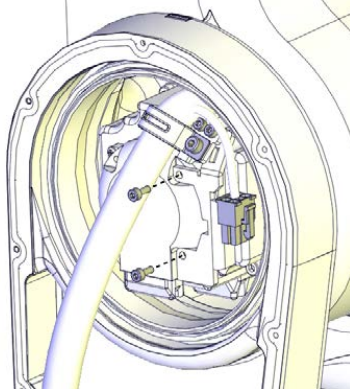
4 Repair

4.4.1 Replacing the lower arm

Continued

	Action	Note
4	Remove the fix sheet attachment screws in the lower arm.	 <p>xx1300002426</p>
5	Pull out the cable package a bit from the lower arm and remove the bracket from the cable package by removing the screws.  CAUTION Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	 <p>xx1300002430</p>
6	Cut the cable strap that holds the cabling together inside the EIB/SMB cavity.	 <p>xx1400001130</p>
7	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Remove the swing sealing plug. Follow the procedure specified in Removing the swing sealing plug on page 168 .	 <p>xx1600000205</p>

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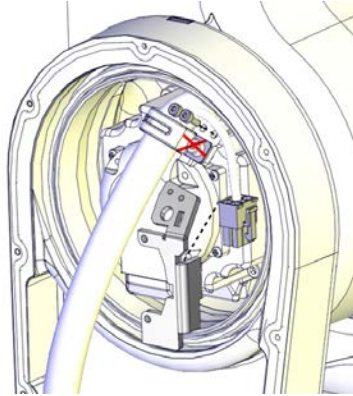
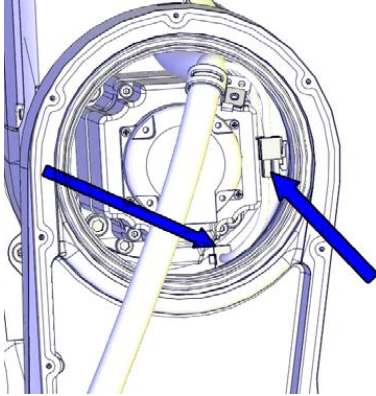
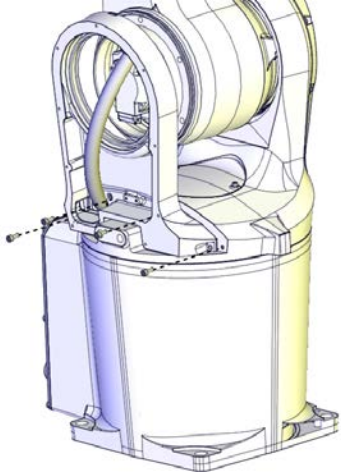
	Action	Note
8	Remove the swing cable housing cover by removing the screws.	 <p>xx1300002431</p>
9	Cut the cable straps.	 <p>xx1400001528</p>
10	Remove the axis-2 motor bracket screws.	 <p>xx1300002432</p>

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4 Repair

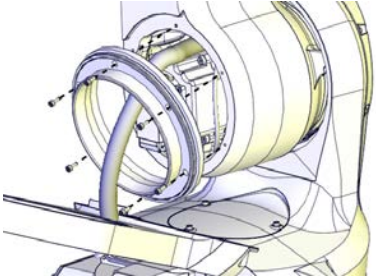

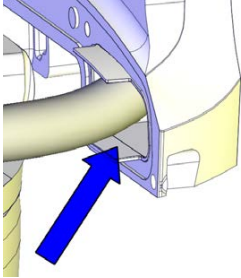
4.4.1 Replacing the lower arm

Continued



	Action	Note
11	<p>Pull out the cabling and then remove the axis-2 motor bracket from the cable package by removing the screws.</p> <p> CAUTION</p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>	 <p>xx1300002433</p>
12	<p>Disconnect the motor connectors.</p> <ul style="list-style-type: none">• R2.ME2• R2.MP2	 <p>xx1300002434</p>
13	<p>Loosen the cable housing from the swing by removing the screws. Leave it hanging on the cable package.</p>	 <p>xx1300002435</p>

Continues on next page

4.4.1 Replacing the lower arm
Continued

	Action	Note
14	Remove the axis-2 sealing ring by removing the screws.	 <p>xx140000020</p>
15	<p>Pull out the cable package from the lower arm.</p> <p> Tip</p> <p>There is a groove on the lower arm casting that simplifies cable passage, if needed. Its position can easily be felt by hand.</p>	
16	Loosen the plastic plate from the cable housing in order to facilitate continued removal of the cable package .	 <p>xx140000023</p>

Removing the lower arm cable housing

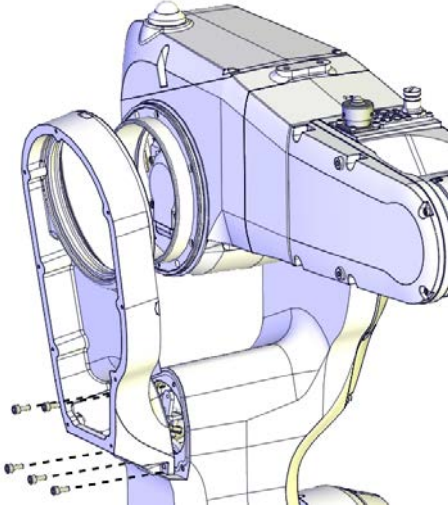
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	

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4 Repair

4.4.1 Replacing the lower arm

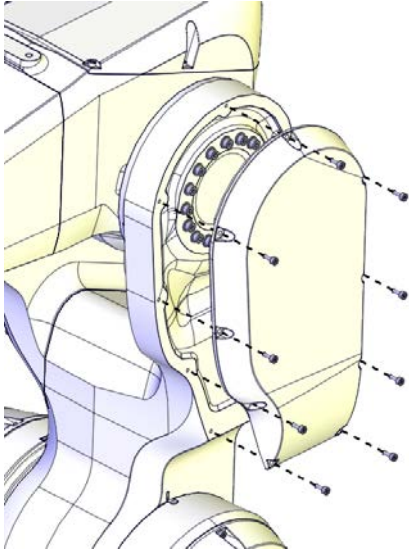


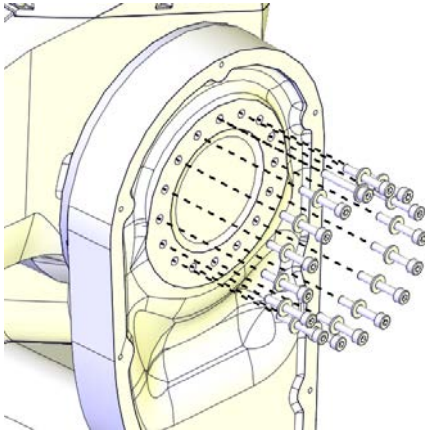
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	Action	Note
3	Remove the cable housing of the lower arm by removing the screws.	 <p>xx1300002529</p>

Removing the upper arm

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.	

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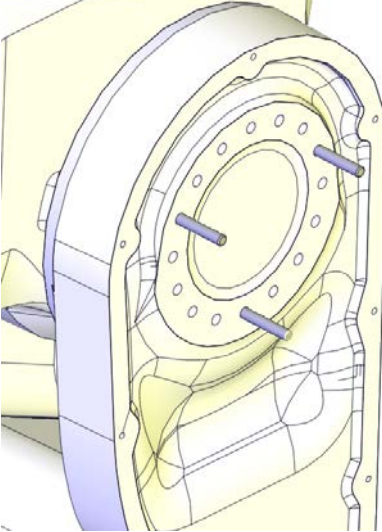
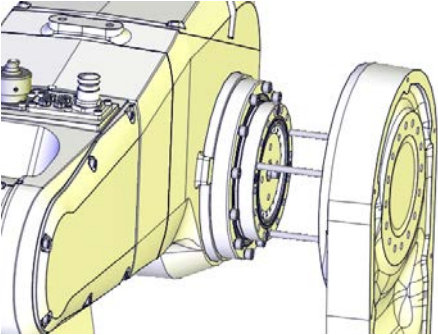
	Action	Note
3	Remove the lower arm cover.	 <p>xx1300002528</p>
4	 CAUTION The upper arm weighs 17 kg. All lifting accessories used must be sized accordingly!	
5	Fit lifting slings to the upper arm to support the weight of the arm. (no force)	
6	 WARNING This releases the upper arm from the lower arm. Make sure the weight of the upper arm is properly secured by the lifting slings.	 <p>xx1300002531</p>

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4 Repair

4.4.1 Replacing the lower arm


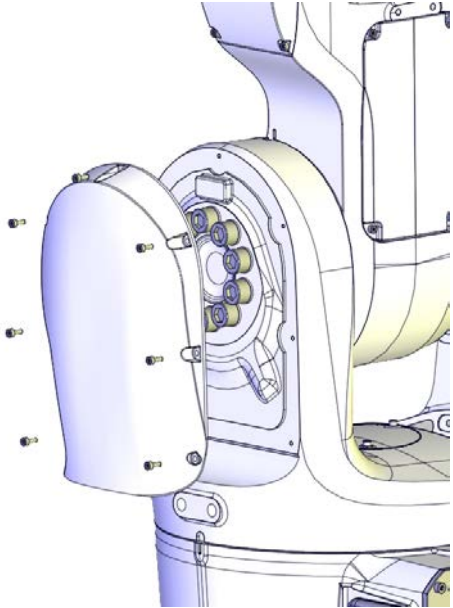

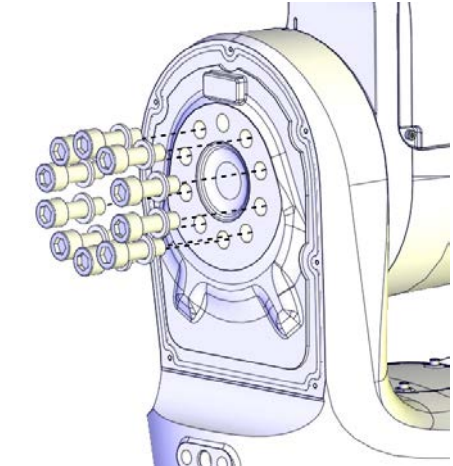
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	Action	Note
7	Fit guide pins to the upper arm.	<p>Guide pin for upper arm: 3HAC049705-001 Always use three guide pins together!</p>  <p>xx140000771</p>
8	Separate the upper and lower arm with guidance from the guide pins.	 <p>xx1300002533</p>

Removing the lower arm

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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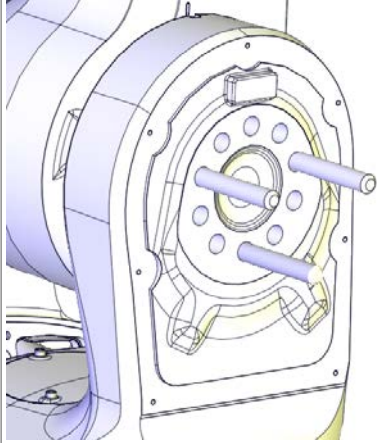

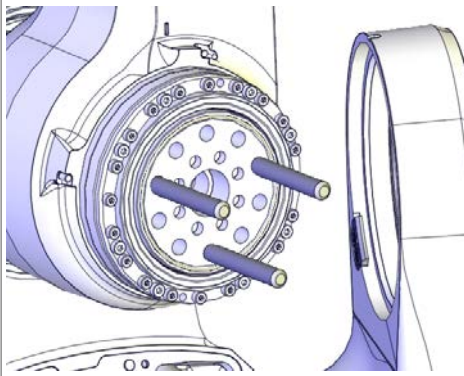
	Action	Note
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	<p>Remove the swing cover.</p>	 <p>xx1300002551</p>
4	<p>Remove the lower arm screws and washers.</p> <p> WARNING</p> <p>This releases the lower arm from the swing. Make sure the weight of the arm is properly secured.</p> <p>The lower arm weighs 13 kg. If the upper arm is also attached to the lower arm, it adds an additional 17 kg to the total weight.</p>	 <p>xx1300002552</p>

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4 Repair

4.4.1 Replacing the lower arm


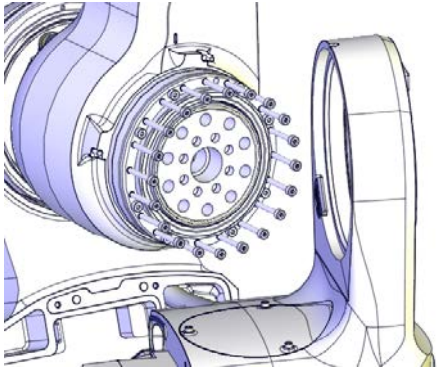

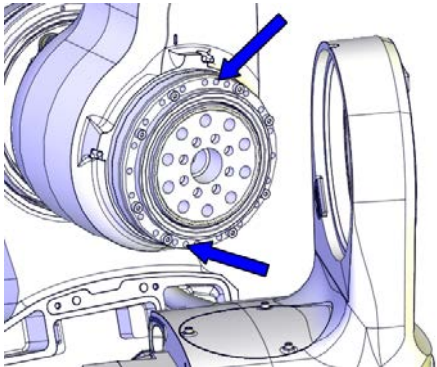
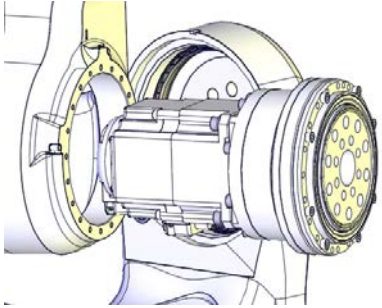
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	Action	Note
5	Fit guide pins to the gearbox.	<p>Guide pin for axis-2 gear unit: 3HAC049704-001</p> <p>Always use three guide pins together!</p>  <p>xx1300002563</p>
6	<p>Separate the lower arm from the swing.</p> <p> Tip</p> <p>If the lower arm is hard to loosen from the swing, two of the lower arm screws can be refitted in their attachment holes. Leave some space between the screw head and the swing casting. Then use a plastic hammer to knock on the screws lightly and evenly.</p>	 <p>xx1300002553</p>

Removing the axis-2 drive unit

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	

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	Action	Note
3	<p> CAUTION</p> <p>The lower and upper arms together weigh 30 kg. All lifting accessories used must be sized accordingly!</p>	
4	<p>If there is enough space on the site, lay down the lower arm on a workbench. Make sure to support the gravity center of the lower arm.</p> <p>If the site is cramped, the procedure can be performed having the lower arm hanging in the lifting slings.</p> <p>If removing the axis-2 drive unit from a hanging lower arm, it is best performed by two persons working together:</p> <ul style="list-style-type: none"> • Person 1: Hold the lower arm still. • Person 2: Remove the drive unit screws according to step below. 	 <p>xx1300002554</p>
5	<p>Remove the grey screws from the drive unit.</p> <p> WARNING</p> <p>Keep the eight black screws fitted. They hold the gearbox together. Removing them can damage the gearbox severely.</p>	
6	<p>Insert two M4 screws to the press out holes and press out the drive unit.</p>	 <p>xx1400000008</p>
7	<p>Carefully pull out the complete drive unit.</p>	 <p>xx1300002555</p>

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4 Repair

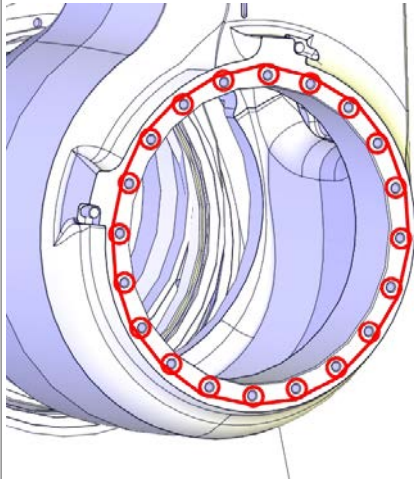
4.4.1 Replacing the lower arm

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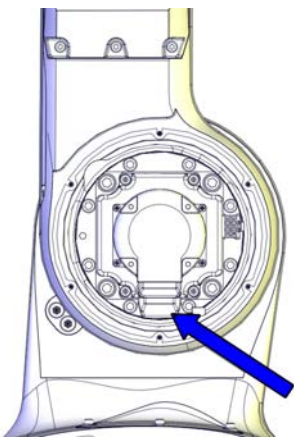
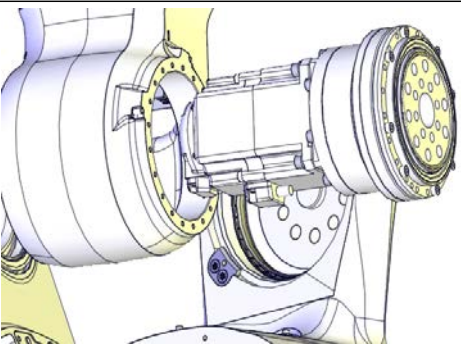
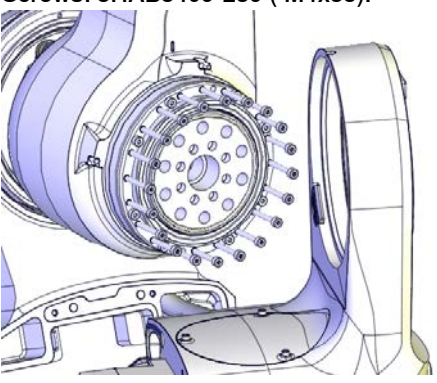

Refitting the lower arm

Use these procedures to refit the lower arm.

Refitting the axis-2 drive unit

	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check if there is a sufficient amount of grease on the gear. Apply more grease, if needed.	Harmonic grease 4B No. 2: 3HAC037302-001 For robots with food grade lubrication For robots with protection type Hygienic LUBRIPLATE SYNXTREME FG-0: 3HAC043771-001
3	For robots with protection class IP67 For robots with protection type Foundry Plus Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing Loctite 574 on the mounting surfaces of the lower arm.	 xx140000006

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	Action	Note
4	<p>Carefully insert the complete drive unit.</p> <p> Note</p> <p>Pay attention to the relative position between the motor connector block and the lower arm, so that the drive unit is positioned correctly inside the lower arm.</p>  <p>xx1400000795</p> <p>The figure shows the position of the motor connector block when axis 2 is in position 0°.</p>	 <p>xx1300002580</p>
5	<p>If the gear is refitted in a hanging lower arm, this step requires two persons.</p> <ul style="list-style-type: none"> • Person 1: Hold the lower arm still. • Person 2: Refit the drive unit screws. <p>Secure the screws but do not tighten yet.</p>	<p>Screws: 3HAB3409-239 (M4x35).</p>  <p>xx1300002554</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
6	<p>If the drive unit is refitted in a hanging lower arm, this step requires two persons.</p> <ul style="list-style-type: none"> • Person 1: Hold the lower arm still. • Person 2: Tighten the screws. 	<p>Tightening torque: 5 Nm</p>

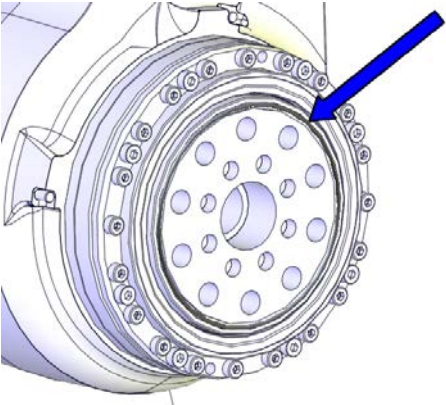

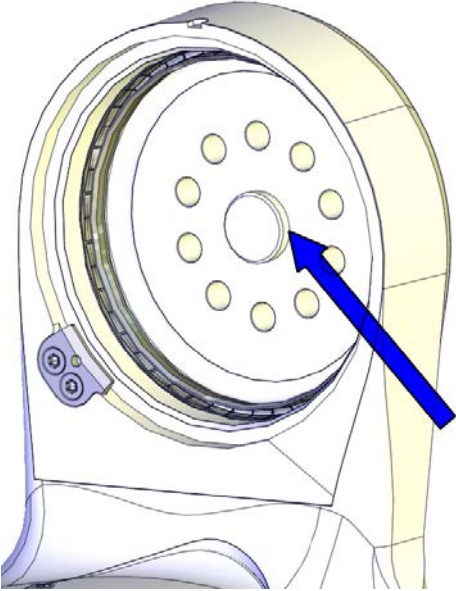
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4 Repair

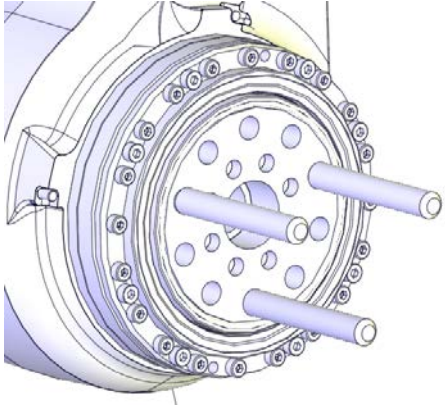

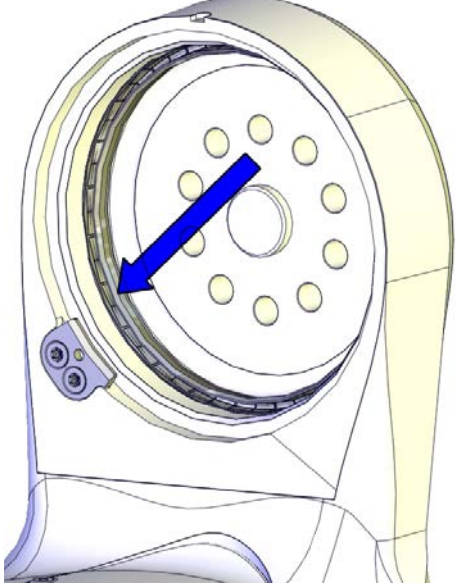
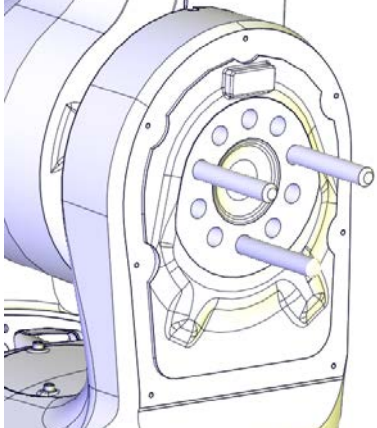
4.4.1 Replacing the lower arm

Continued

Refitting the lower arm

	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Check the o-ring. Replace if damaged.</p>	<p>O-ring: 3HAC048939-001</p>  <p>xx1300002556</p>
3	<p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing Loctite 574 to the cylindrical surface in the swing.</p> <p> Note</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Wipe clean the overflowing Loctite 574 if there is any.</p>	 <p>xx1400001403</p>

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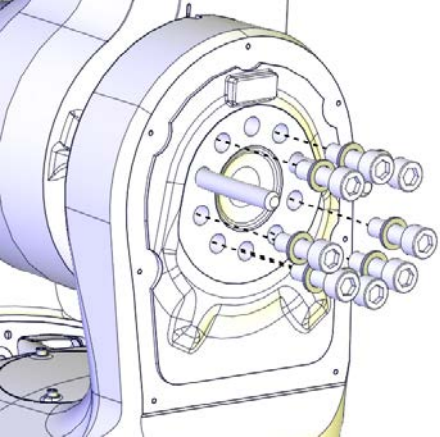

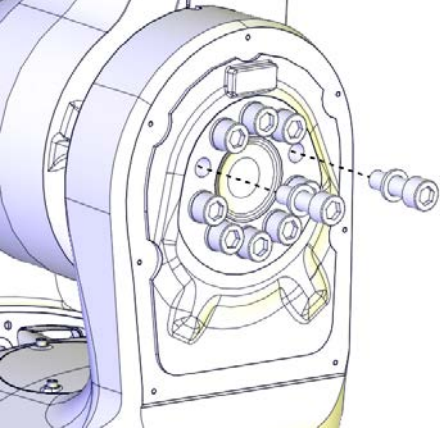
	Action	Note
4	Fit guide pins to the gearbox.	<p>Guide pin for axis-2 gear unit: 3HAC049704-001</p>  <p>xx1300002562</p> <p>Always use three guide pins together!</p>
5	<p>For robots with protection class IP67 For robots with protection type Foundry Plus</p> <p>Check the sealing. Replace if damaged.</p> <p> CAUTION</p> <p>Do not fit M2 variseal sealing on robots in other protection class or protection types.</p>	<p>M2 variseal sealing: 3HAC044641-003</p>  <p>xx140000453</p>
6	Fit the lower arm to the swing, with guidance from the guide pins.	 <p>xx1300002563</p>

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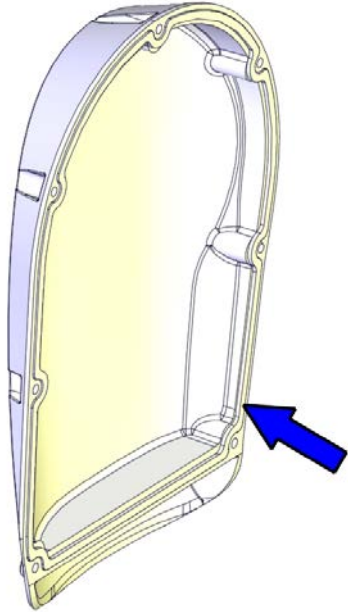
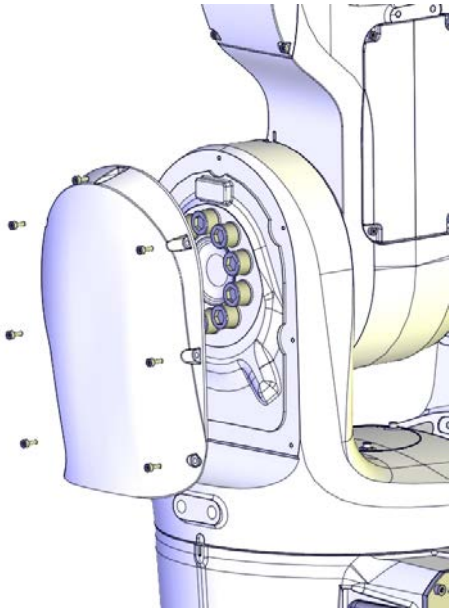
4 Repair

4.4.1 Replacing the lower arm

Continued

	Action	Note
7	Refit the lower arm screws and washers, using locking liquid Loctite 243. Secure the screws but do not tighten yet.	<p data-bbox="944 315 1310 344">Screws: 3HAB3409-51 (M10x30).</p>  <p data-bbox="944 786 1050 808">xx1300002564</p> <p data-bbox="944 831 1002 887"> Note</p> <p data-bbox="944 902 1401 958">Only use specified screws, never replace them with other screws.</p>
8	Remove the guide pins and refit the remaining screws and washers using locking liquid Loctite 243.	 <p data-bbox="944 1435 1050 1458">xx1300002565</p>
9	Tighten all screws.	Tightening torque: 45 Nm

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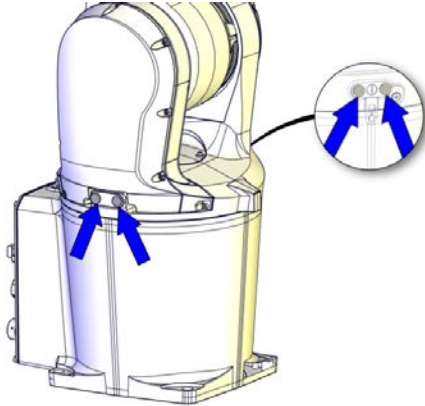
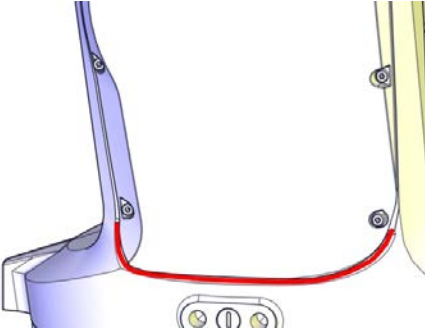
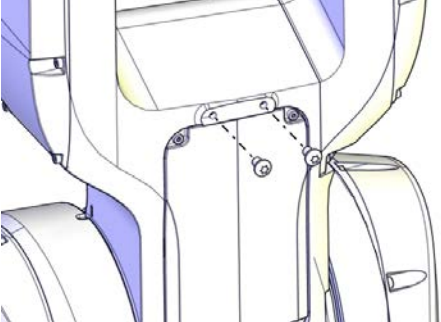
	Action	Note
10	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the swing cover gasket. Replace if damaged.</p>	<p>Gasket on swing cover: 3HAC056727-001 (not Hygienic robots) / 3HAC080705-001 (Hygienic robots)</p>  <p>xx140000007</p>
11	<p>Refit the swing cover. Replace if damaged.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm. Swing cover: 3HAC059676-001 Swing cover, Clean Room Swing cover, food grade lubrication Swing cover, Hygienic : 3HAC056215-001</p>  <p>xx1300002551</p>

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4 Repair

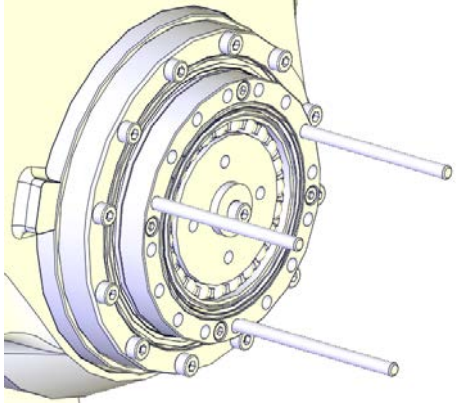

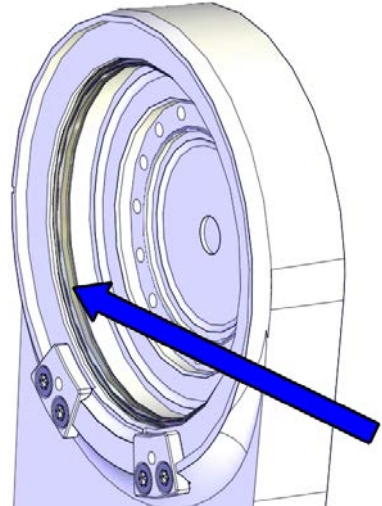
4.4.1 Replacing the lower arm

Continued

	Action	Note
12	<p>For robots with protection type Foundry Plus Check the protection plugs for lifting holes. Replace if damaged.</p>	<p>Protection plug for lifting holes: 3HAC4836-24</p>  <p>xx1600001151</p>
13	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Apply a string of the sealant to the joint of the swing cover. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.</p>	<p>For robots with protection type Clean Room For robots with food grade lubrication Sealant, SikaFlex 521FC For robots with protection type Hygienic Sealant, Trans Clear</p>  <p>xx1600000217</p>
14	<p>For robots with protection type Foundry Plus If required, fit two screws for protection.</p>	 <p>xx1600001154</p>

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Refitting the upper arm

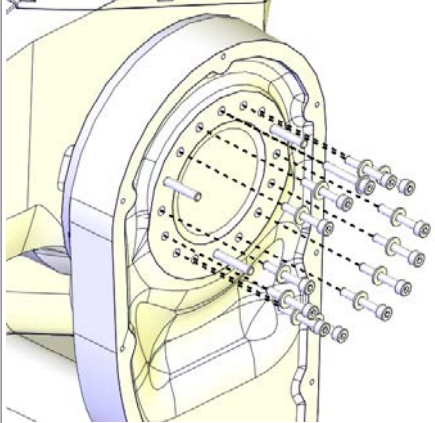

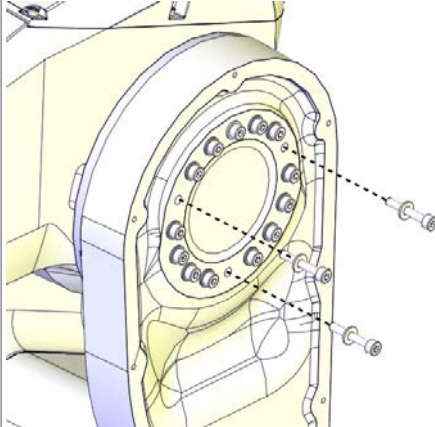
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Fit guide pins to the axis-3 gear unit.</p>	<p>Guide pin for upper arm: 3HAC049705-001</p> <p>Always use three guide pins together!</p>  <p>xx140000027</p>
3	<p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <p>Check the sealing.</p> <p>Replace if damaged.</p> <p> CAUTION</p> <p>Do not fit M2 variseal sealing on robots in other protection class or protection types.</p>	<p>M2 variseal sealing: 3HAC044641-005</p>  <p>xx1400000474</p>

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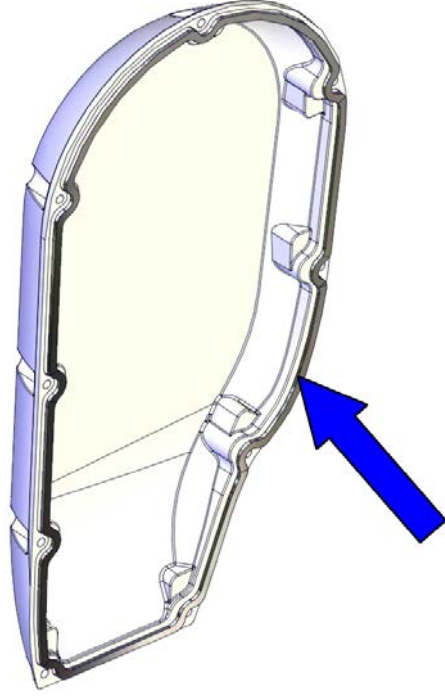
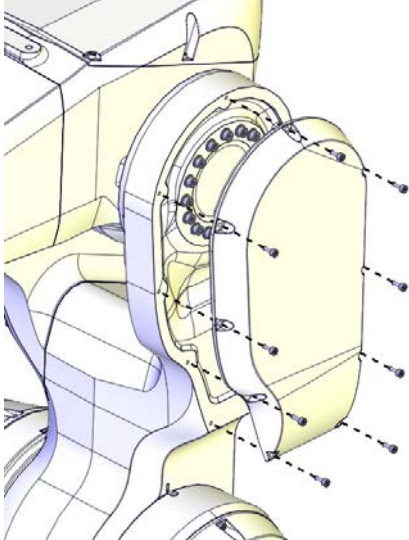

4 Repair

4.4.1 Replacing the lower arm

Continued

	Action	Note
4	Refit the upper arm to the lower arm and secure with the upper arm screws and washers. Do not tighten yet.	<p data-bbox="938 315 1310 342">Screws: 3HAB3409-213 (M4x25).</p>  <p data-bbox="938 779 1050 797">xx140000028</p> <p data-bbox="943 819 1002 875"></p> <p data-bbox="1031 835 1090 862">Note</p> <p data-bbox="938 891 1401 943">Only use specified screws, never replace them with other screws.</p>
5	Remove the guide pins and refit the remaining screws and washers.	 <p data-bbox="938 1406 1050 1424">xx140000029</p>
6	Tighten all screws.	Tightening torque: 4.5 Nm.

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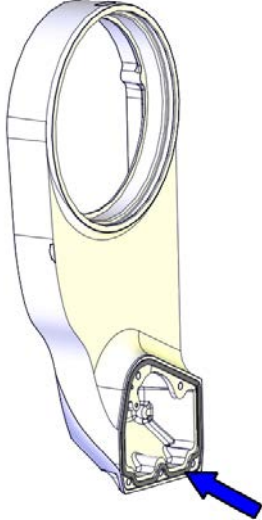


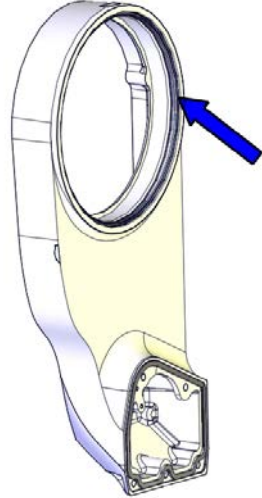
	Action	Note
7	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the lower arm cover gasket. Replace if damaged.</p>	<p>Gasket on lower arm cover: 3HAC056725-001 (not Hygienic robots) / 3HAC080703-001 (Hygienic robots)</p>  <p>xx140000047</p>
8	<p>Refit the lower arm cover.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p>  <p>xx1300002528</p> <p> Note Only use specified screws, never replace them with other screws.</p>

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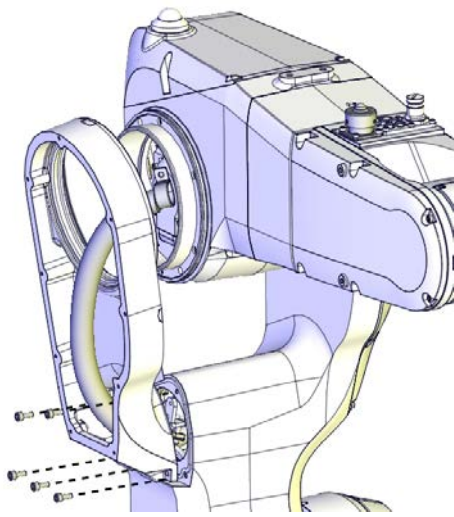

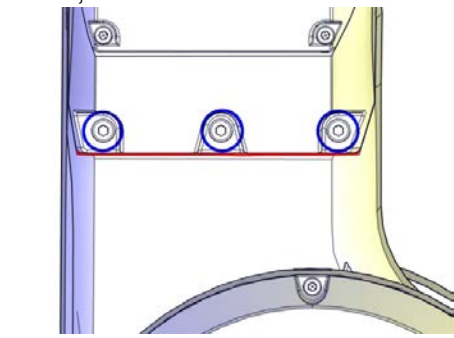
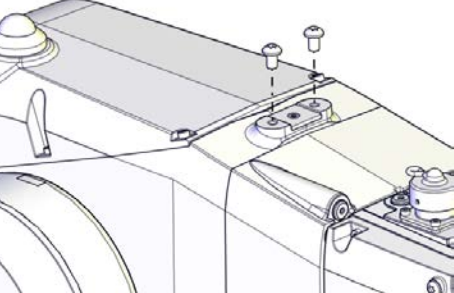
4 Repair

4.4.1 Replacing the lower arm

Continued

	Action	Note
9	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the cable housing gasket. Replace if damaged.</p>	<p>Gasket on lower arm cable housing: 3HAC044895-001 (not Hygienic robots) / 3HAC080696-001 (Hygienic robots)</p>  <p>xx1400000414</p>
10	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the axis-3 radial sealing and the M2 variseal sealing in the cable housing. Replace if damaged.</p> <p> CAUTION</p> <p>Do not fit M2 variseal sealing on Clean Room, food grade lubrication and Hygienic robots.</p> <p> Note</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p>	<p>M2 variseal sealing: 3HAC044641-006 Radial sealing: 3HAC024865-001</p>  <p>xx1400000473</p> <p>Replacement is detailed in Replacing the axis-3 radial sealing and sealing ring on page 420.</p>

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	Action	Note
11	Refit the cable housing of the lower arm.	<p>Tightening torque: 3 Nm</p>  <p>xx1400000785</p>
12	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Apply a string of the sealant to the joint of the cable housing of the lower arm. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.</p> <p> Note</p> <p>No sealing is required in the cavities of the three lower screws highlighted with a ring in the figure.</p>	<p>For robots with protection type Clean Room For robots with food grade lubrication Sealant, SikaFlex 521FC For robots with protection type Hygienic Sealant, Trans Clear</p>  <p>xx1600000218</p>
13	<p>For robots with protection type Foundry Plus</p> <p>If required, fit two screws for protection.</p>	 <p>xx1600001155</p>

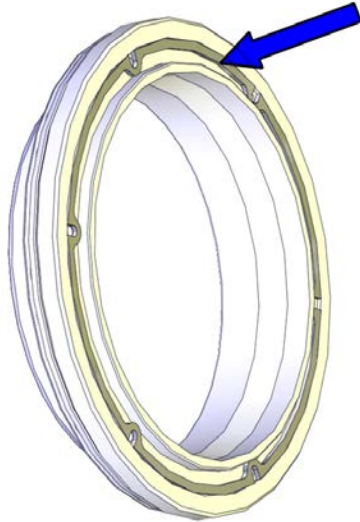
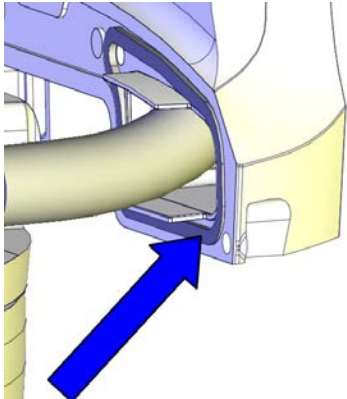
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4 Repair

4.4.1 Replacing the lower arm

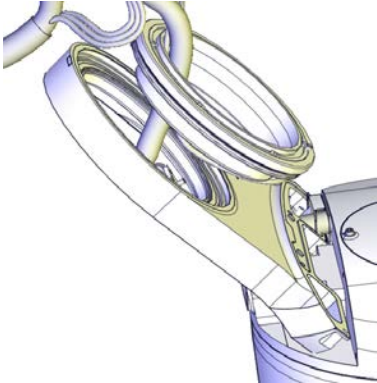
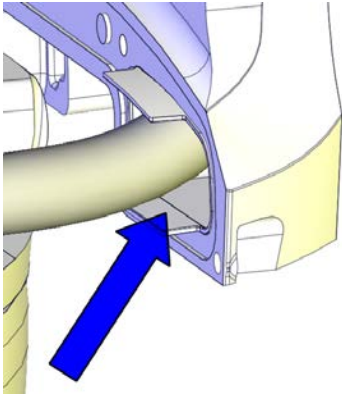
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Refitting the cable package in the lower arm

	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Check the axis-2 sealing ring. For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the gasket. Replace if damaged.</p>	<p>Axis-2 sealing ring: 3HAC044677-001 Gasket of axis-2 sealing ring: 3HAC045688-001 (not Hygienic robots) / 3HAC080697-001 (Hygienic robots)</p>  <p>xx1400000476</p>
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the gasket of the cable housing plastic plate. Replace if damaged.</p>	<p>Gasket of plastic plate: 3HAC044894-001 (not Hygienic robots) / 3HAC080695-001 (Hygienic robots)</p>  <p>xx1400000457</p>

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4.4.1 Replacing the lower arm
Continued


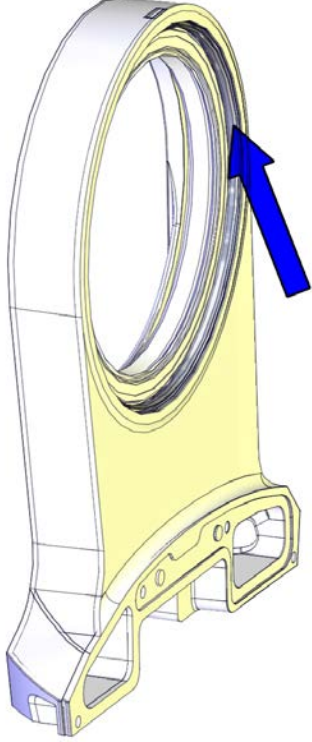
	Action	Note
4	Fetch the cable housing, the plastic plate and the axis-2 sealing ring and run the cable package through them.	 <p>xx140000025</p>
5	Fasten the plastic plate to the cable housing, if removed. Replace if damaged.	<p>The plastic plate is included in: Cable harness material set: 3HAC049663-001.</p>  <p>xx140000023</p>

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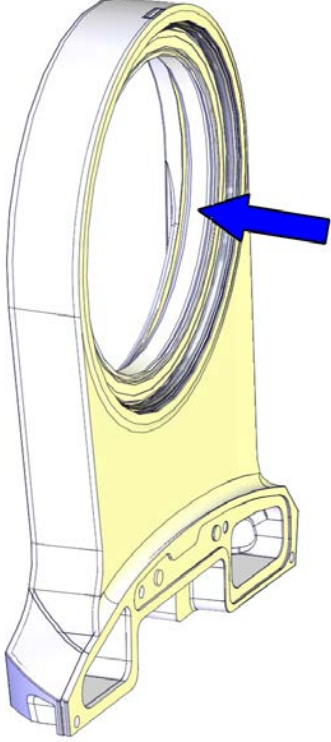

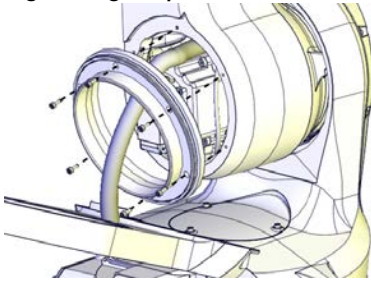
4 Repair

4.4.1 Replacing the lower arm

Continued

	Action	Note
6	<p>For robots with protection class IP67 For robots with protection type Foundry Plus Check the sealing. Replace if damaged.</p> <p> CAUTION</p> <p>Do not fit M2 variseal sealing on robots in other protection class or protection types.</p>	<p>M2 variseal sealing: 3HAC044641-004</p>  <p>xx1400000454</p>

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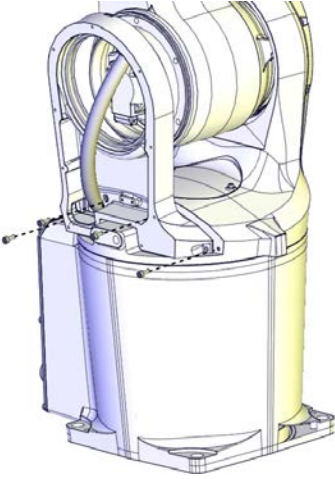

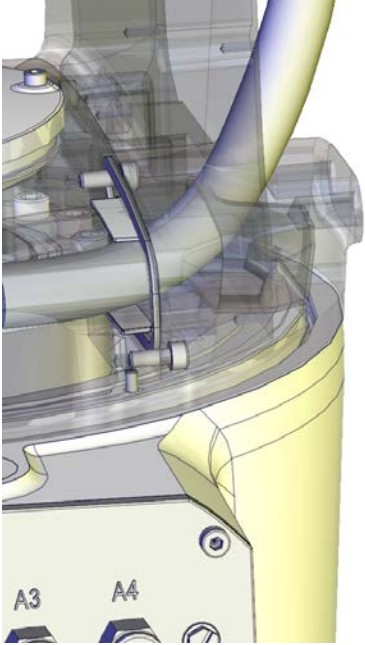
	Action	Note
7	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the radial sealing. Replace if damaged.</p> <p> Note</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p>	<p>Radial sealing with dust lip: 3HAB3701-41</p>  <p>xx1400000753</p> <p>Replacement is detailed in Replacing the swing spare parts (swing, axis-2 radial sealing) on page 574.</p>
8	<p>Guide the cable package into the lower arm.</p> <p> Tip</p> <p>There is a groove on the lower arm casting that simplifies cable passage, if needed. Its position can easily be felt by hand.</p>	
9	<p>Refit the axis-2 sealing ring with the screws.</p>	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1400000020</p>

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4 Repair

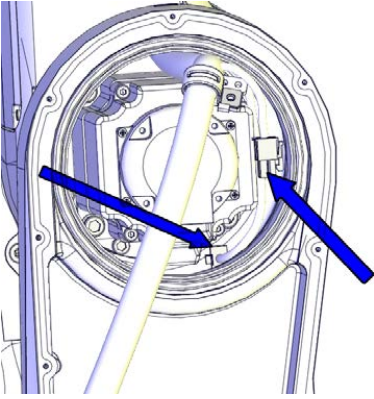

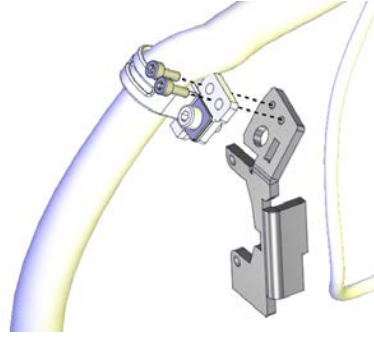
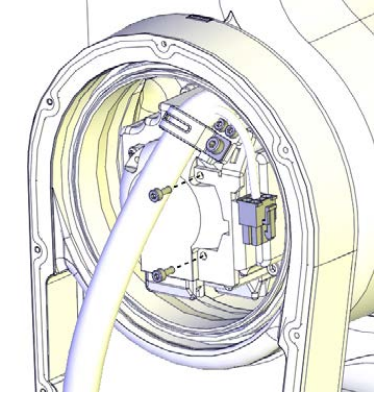
4.4.1 Replacing the lower arm

Continued

	Action	Note
10	Refit the cable housing with the screws.	<p>Screws: 3HAB3409-236 (M4x10). Tightening torque: 3 Nm.</p>  <p>xx1300002435</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
11	Apply grease to the cable package, cover all moving area of the package.	 <p>xx1400000481</p>

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4.4.1 Replacing the lower arm
Continued

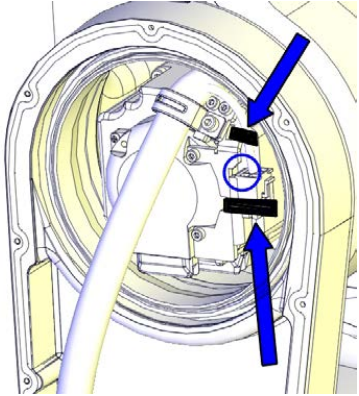
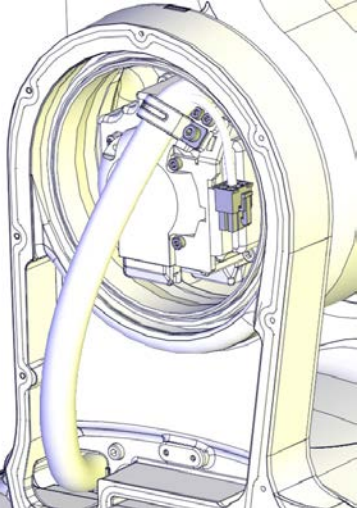
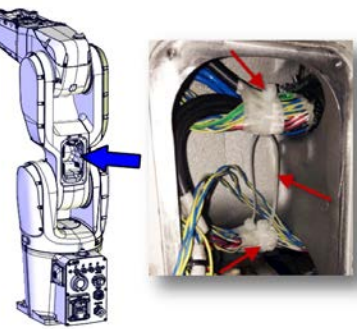
	Action	Note
12	Reconnect the motor connectors. <ul style="list-style-type: none"> • R2.ME2 • R2.MP2 	 <p>xx1300002434</p>
13	Refit the axis-2 motor bracket to the cable package with the two screws. <p> CAUTION</p> Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	Tightening torque: 1.5 Nm.  <p>xx1400000021</p>
14	Refit the axis-2 motor bracket to the motor.	 <p>xx1300002432</p>

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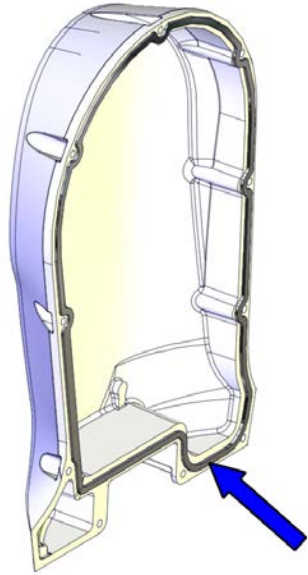
4 Repair

4.4.1 Replacing the lower arm

Continued

	Action	Note
15	Secure the connector R2.MP2 and its cable with cable straps onto the motor bracket. Make sure the connector is fixed by its tab to the bracket.	 xx1400001529
16	Apply grease to the cable package, cover all moving area of the package.	 xx1400000482
17	<p>In order to keep the cabling away from the hot axis-2 motor, the cable package must be secured accordingly inside the EIB/SMB cavity:</p> <ol style="list-style-type: none">1 The cable package is strapped with tape by the supplier at two locations. Put a cable strap around the cable package at each location.2 Insert a third cable strap through the top strap and the bottom strap, and close the strap to secure the cable package and keep it in place. <p>See the figure.</p>	 xx1400001131


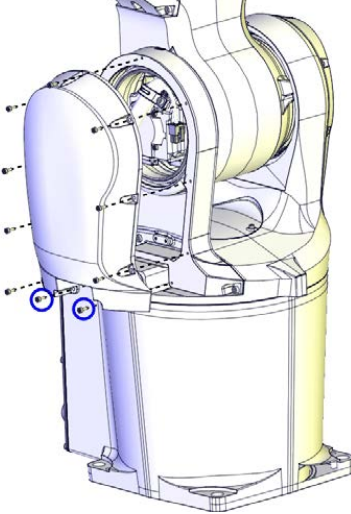

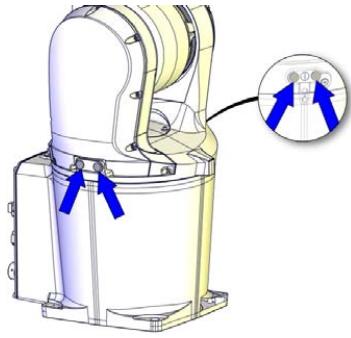
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	Action	Note
18	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the gasket of the cable housing cover. Replace if damaged.</p>	<p>Gasket on cable housing cover: 3HAC056726-001 (not Hygienic robots) / 3HAC080704-001 (Hygienic robots)</p>  <p>xx1400000424</p>
19	<p>Check the PTFE film. Replace if damaged.</p>	<p>PTFE film on cable housing cover: 3HAC044660-001</p>
20	<p>Apply grease to the inner surface of the cable housing cover and to the PTFE film surface.</p>	

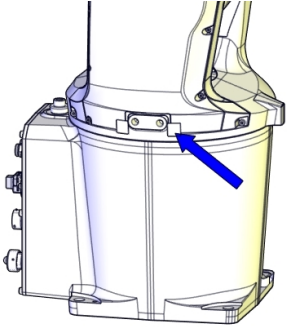

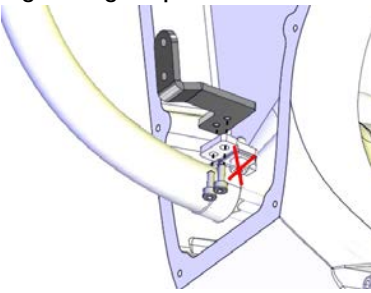
4 Repair

4.4.1 Replacing the lower arm


Continued

	Action	Note
21	<p>Refit the cable housing cover. Replace if damaged.</p> <p> Note</p> <p>Remember to refit the two lower screws shown in the figure.</p>	<p>Cable housing cover of the swing: 3HAC059678-001</p> <p>Cable housing cover of the swing, Clean Room</p> <p>Cable housing cover of the swing, food grade lubrication</p> <p>Cable housing cover of the swing, Hygienic : 3HAC056214-001</p> <p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p>  <p>xx1300002431</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
22	<p>For robots with protection type Foundry Plus Check the protection plugs for lifting holes. Replace if damaged.</p>	<p>Protection plug for lifting holes: 3HAC4836-24</p>  <p>xx1600001151</p>

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	Action	Note
23	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Refit the swing sealing plug. Follow the procedure specified in Refitting the swing sealing plug on page 169.</p>	<p>Swing sealing plug:3HAC053687-001</p>  <p>xx1600000205</p>
24	<p>Refit the lower arm bracket to the cable package.</p> <p> CAUTION</p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002430</p>

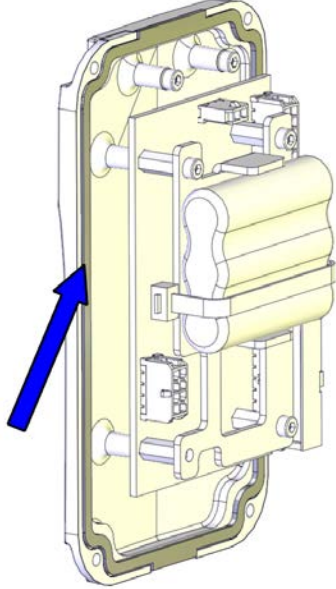

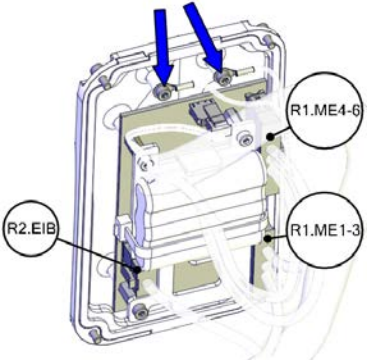

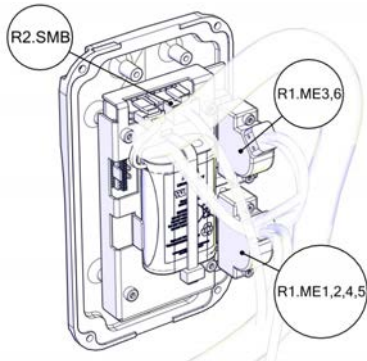
Connecting the cabling in the lower arm

	Action	Note
1	<p> ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section The unit is sensitive to ESD on page 64</p>	
2	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

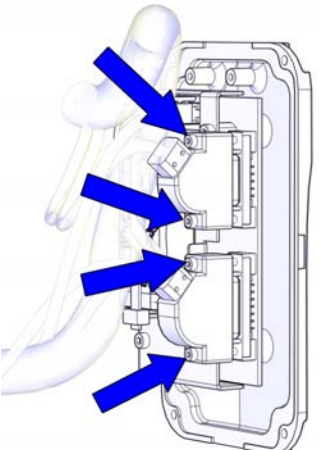
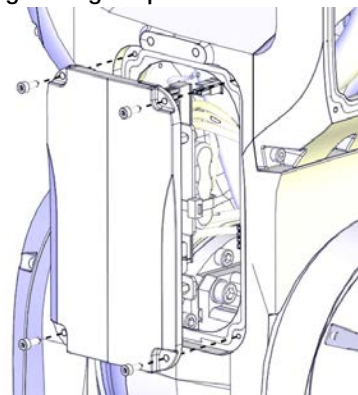

4 Repair

4.4.1 Replacing the lower arm

Continued

	Action	Note
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the EIB/SMB cover gasket. Replace if damaged.</p>	<p>Gasket on EIB/SMB cover: 3HAC056728-001 (not Hygienic robots) / 3HAC080706-001 (Hygienic robots)</p>  <p>xx1400000475</p>
4	<p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Connect the connectors to the EIB unit.</p> <ul style="list-style-type: none"> • R1.ME1-3 • R1.ME4-6 • R2.EIB <p> WARNING</p> <p>Make sure not to mix the R2.EIB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.</p>	 <p>xx1300002428</p>
5	<p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Connect the lugs to the EIB/SMB cover.</p>	
6	<p>Valid for IRB 1200 Type B</p> <p>Connect the connectors to the SMB unit.</p> <ul style="list-style-type: none"> • R1.ME1,2,4,5 • R1.ME3,6 • R2.SMB <p> WARNING</p> <p>Make sure not to mix the R2.SMB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.</p>	 <p>xx1700000005</p>

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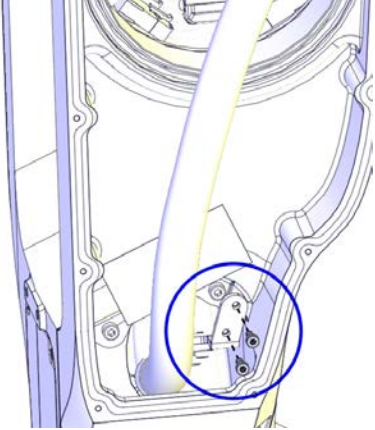
	Action	Note
7	<p>Valid for IRB 1200 Type B Tighten the connector screws.</p>	<p>Tightening torque: 0.3 Nm</p>  <p>xx1700000004</p>
8	<p>Refit the EIB/SMB cover to the lower arm with the attachment screws.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm</p>  <p>xx1300002427</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

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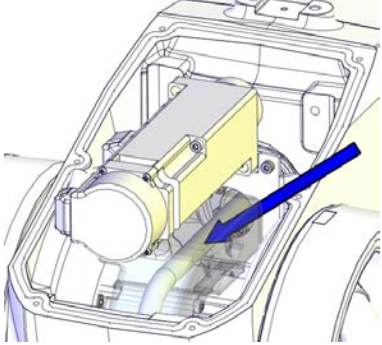
4 Repair

4.4.1 Replacing the lower arm



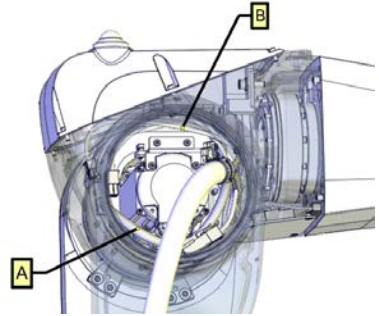

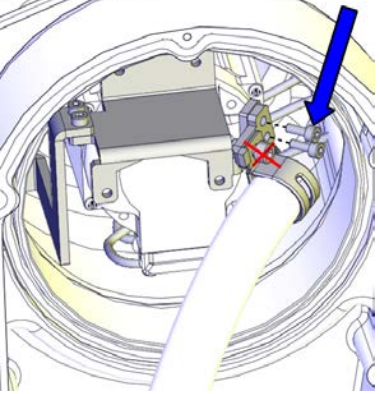
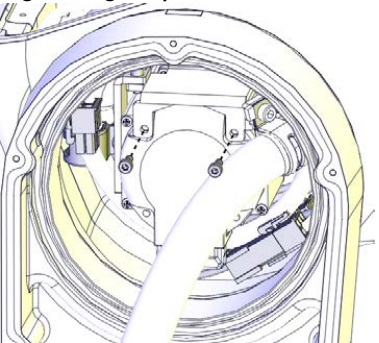
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	Action	Note
9	Refit the fix sheet attachment screws in the lower arm.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002426</p>

Refitting the cable package in the housing

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	Before guiding the cable package into the housing and upper arm, apply grease to the cable package, to the area going into the upper arm, shown in the figure. Cover all moving area of the package.	<p>Area to be lubricated, shown in cable package already fitted to the housing.</p>  <p>xx1400000483</p>

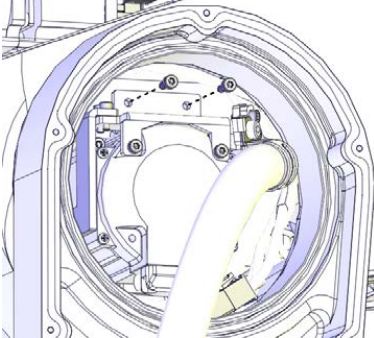

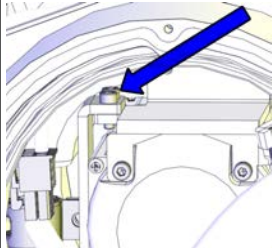
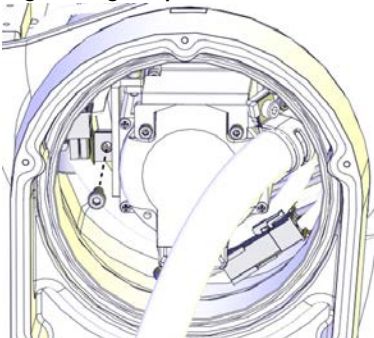
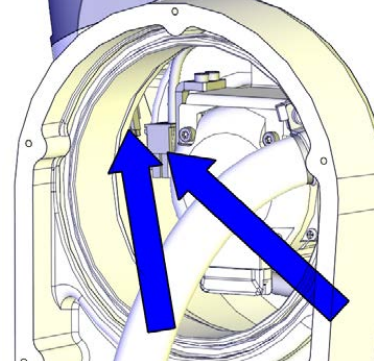
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	Action	Note
3	<p>Guide the cable package into the upper arm, through the housing.</p> <p> Note</p> <p>Guide the air hoses (A) underneath the bottom side of the axis-3 motor and the axis-3 motor cables (B) on top of the motor, see cable layout figure. The fix point of the air hoses is pre-determined (marked) and must be matched against the air hose holder on the left side of the axis-3 motor.</p> <p> Note</p> <p>The air hose holder keeps the air hoses arranged in an optimized way. It is necessary to keep the air hose holder vertically and firmly against the left side of the axis-3 motor.</p>	 <p>xx1400001472</p>
4	<p>Refit the bracket to the sheet with two screws.</p> <p> CAUTION</p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002424</p>
5	<p>Refit the fix sheet to the motor.</p>	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002423</p>

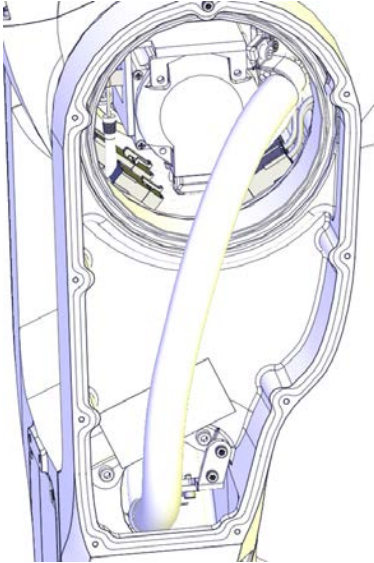
4 Repair

4.4.1 Replacing the lower arm

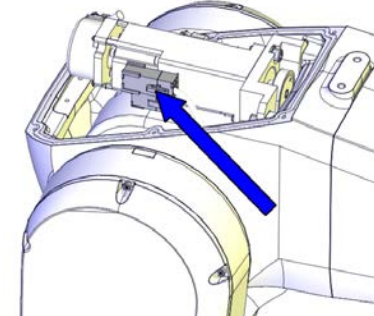
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	Action	Note
6	Refit the fix sheet to the inner plastic guide.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002421</p>
7	<p>Fit the air hose holder to the bracket. Replace the holder, if damaged.</p> <p> Tip</p> <p>If the air hose holder is difficult to fit, firstly remove the bracket from the fix sheet by removing the two M3 screws. Fit the holder to the bracket and then refit the complete assembly to the fix sheet again. Tightening torque for the two M3 screws: 1.5 Nm.</p>  <p>xx1400001133</p>	<p>Air hose holders are included in Cable harness material set (3HAC049663-001). Tightening torque: 4 Nm.</p>  <p>xx1300002422</p>
8	Reconnect the axis-3 motor connectors.	 <p>xx1300002420</p>

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	Action	Note
9	Apply grease to the cable package, cover all moving area of the package.	 <p>xx140000754</p>
10	Valid for IRB 1200-5/0.9 Secure the cable package at the bottom of the housing with cable straps.	

Connecting the axis-4 motor connectors

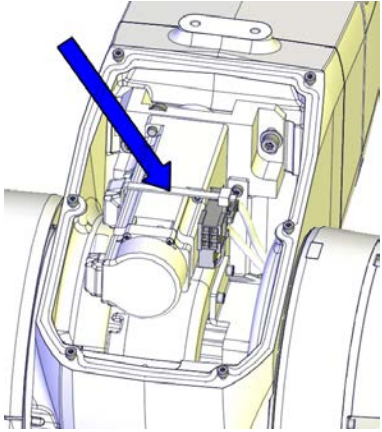
	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the motor connectors.	 <p>xx1300002371</p>

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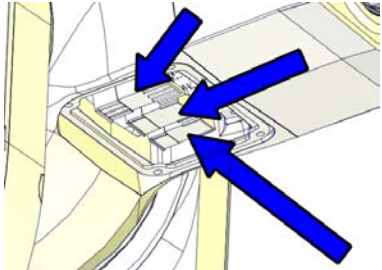
4 Repair

4.4.1 Replacing the lower arm

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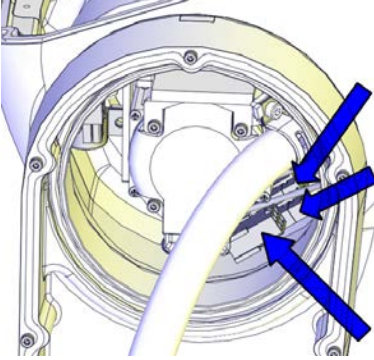
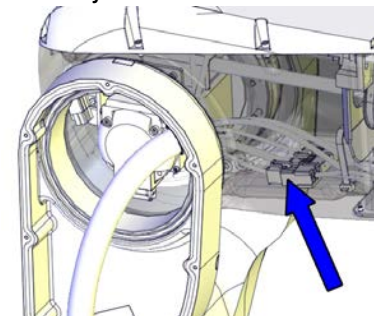
	Action	Note
3	Secure the connectors to the motor with a cable strap.	 xx1300002494

Connecting the axis-4 FPC connectors

	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the FPC connectors.  Tip See the number markings on the connectors for help to find the corresponding connector.	 xx1300002399

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4.4.1 Replacing the lower arm
Continued

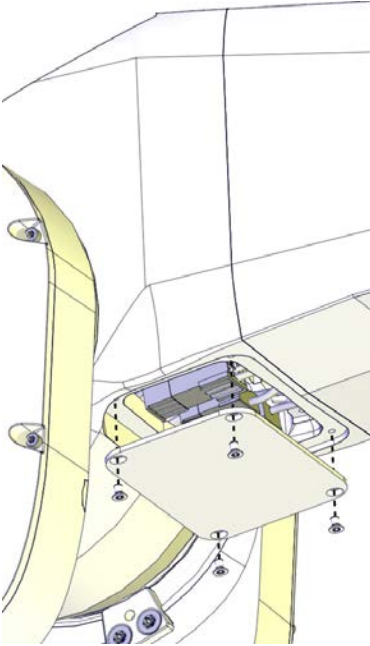
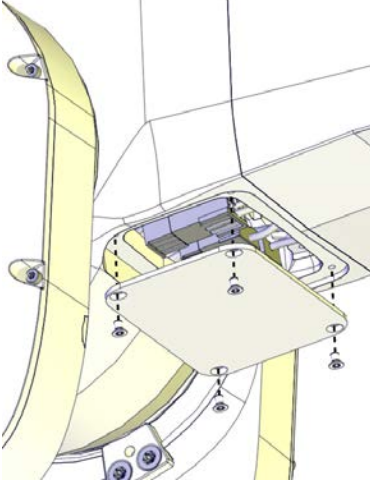
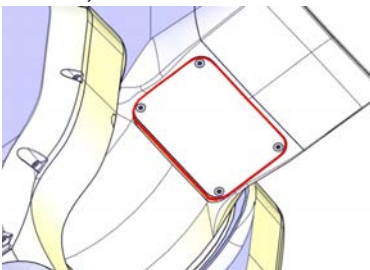
	Action	Note
3	<p>Reconnect the FPC connectors and push them into place inside the housing.</p> <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	<p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p>
4	<p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p>	

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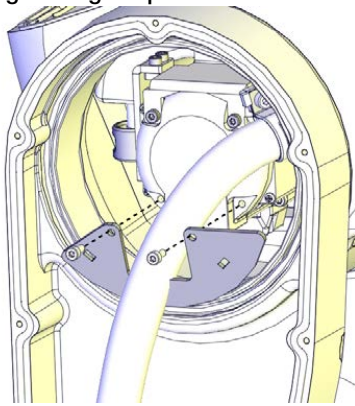
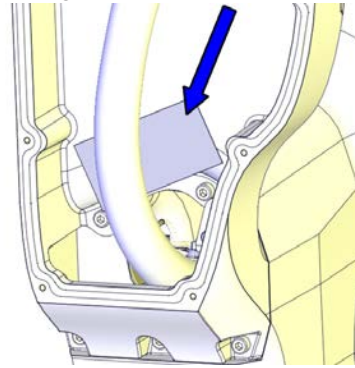
4 Repair

4.4.1 Replacing the lower arm

Continued

	Action	Note
5	<p>For robots with protection class IP67 For robots with protection type Foundry Plus Apply flange sealing Sikaflex 521FC on the mounting surfaces of the small cover on the housing.</p>	
6	<p>Refit the small cover to the housing. Replace if damaged.</p>	 <p>xx1300002398</p> <p>Housing small cover: 3HAC059684-001 Housing small cover, Clean Room Housing small cover, food grade lubrication Housing small cover, Hygienic : 3HAC056142-001 Screws: 3HAC14286-4 (M3X5). Tightening torque: 1 Nm.</p>
7	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Apply a string of the sealant to the joint of the small cover on the housing. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.</p>	<p>For robots with protection type Clean Room For robots with food grade lubrication Sealant, SikaFlex 521FC For robots with protection type Hygienic Sealant, Trans Clear</p>  <p>xx1600000214</p>

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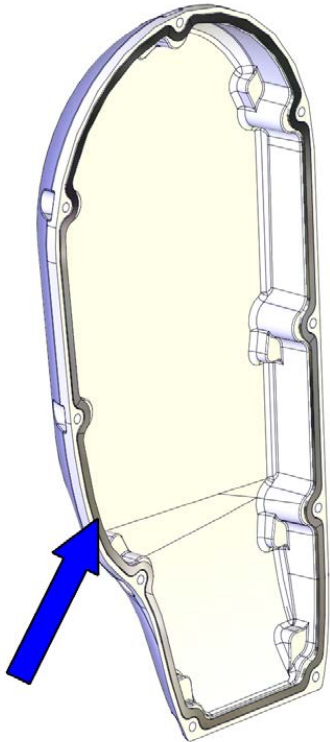
	Action	Note
8	Refit the plate.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002413</p>
9	Check the PTFE film on the cable housing. Replace if damaged.	<p>PTFE film on lower arm cable housing: 3HAC044710-001</p>  <p>xx1400000740</p>

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4 Repair

4.4.1 Replacing the lower arm

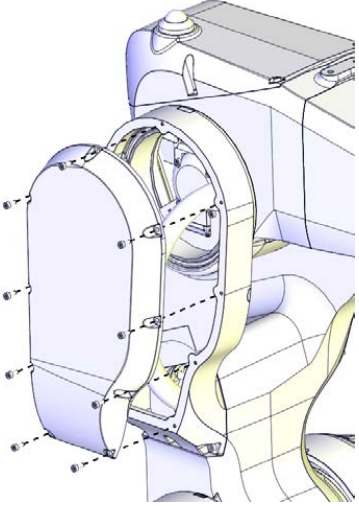

Continued

	Action	Note
10	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the gasket of the cable housing cover. Replace if damaged.</p>	<p>Gasket on cable housing cover: 3HAC056724-001 (not Hygienic robots) / 3HAC080702-001 (Hygienic robots) PTFE film on cable housing cover: 3HAC044660-001</p>  <p>xx140000048</p>
11	<p>Check the PTFE film on the cable housing cover. Replace if damaged.</p>	
12	<p>Apply grease to the inner surface of the cable housing cover and the PTFE film surface.</p>	

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4.4.1 Replacing the lower arm

Continued

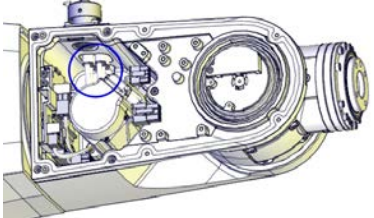
	Action	Note
13	<p>Refit the cable housing cover.</p> <p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Apply locking liquid Loctite 243 to all the screws securing the cover.</p>	<p>Screws: 3HAB3409-207 (M3x8).</p> <p>Tightening torque: 1.5 Nm</p>  <p>xx1300002400</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

Connecting the air hoses and CP/CS cabling (if equipped)

Notice that the procedure differs depending on the protection class and protection type.

Connecting the air hoses and CP/CS cabling on robots not in protection type Hygienic

Use this procedure if the robot is not in protection type Hygienic.

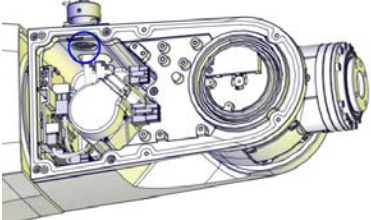
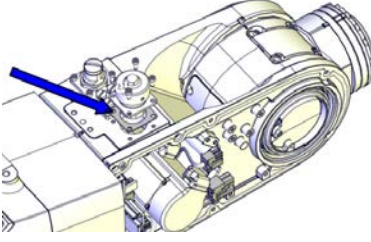
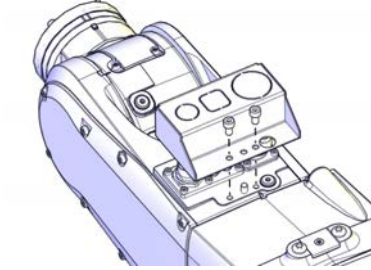
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Reconnect the air hoses.</p> <p>Replace the air hose connector set if damaged.</p>	<p>Air connector set with Ethernet hole in flange: 3HAC049664-001</p> <p>Air connector set without Ethernet hole in flange: 3HAC049665-001</p>  <p>xx1400000738</p>

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4 Repair

4.4.1 Replacing the lower arm

Continued

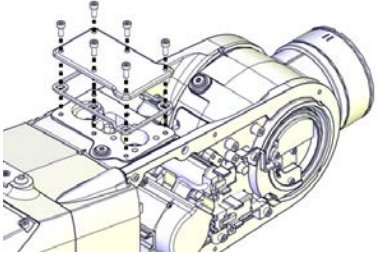
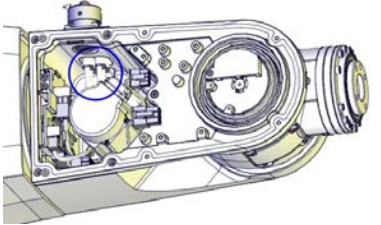
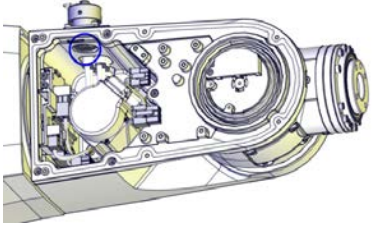
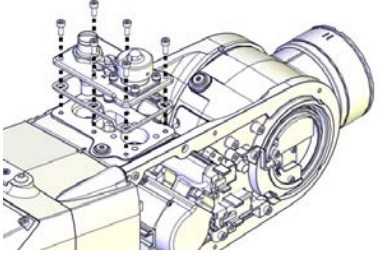
	Action	Note
3	<p>If equipped, reconnect the CP/CS connector.</p> <p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <ol style="list-style-type: none"> 1 Check the gasket. 2 Replace if damaged. <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <ol style="list-style-type: none"> 1 Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. 2 Apply flange sealing Loctite 574 on the mounting surfaces of the CP/CS connector and wipe clean if there is any overflowing Loctite 574. 	 <p>xx1500000252</p> <p>On robots with protection class IP67</p> <p>On robots with protection type Foundry Plus</p> <p>Gasket: 3HAC058567-001</p>  <p>xx1500000251</p>
4	<p>For robots with protection type Foundry Plus</p> <p>If required, fit the protection bracket for CP/CS connectors.</p>	<p>Protection bracket for CP/CS connectors: 3HAC058350-001</p>  <p>xx1600001152</p>

Connecting the air hoses and CP/CS cabling on robots in protection type Hygienic

Use this procedure if the robot is with protection type Hygienic.

	Action	Note
1	<p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

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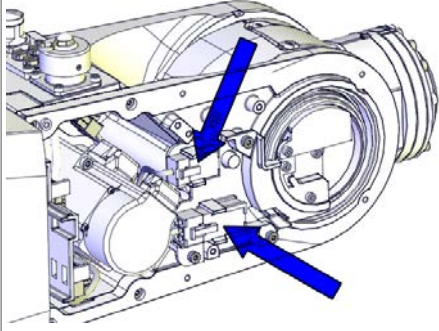
	Action	Note
2	<p>If the Hygienic robot not equipped with air hoses and CP/CS cabling: Check the plate without connector set and the attached gasket. Replace if damaged.</p>	<p>Plate without connector set: 3HAC078810-001 Gasket: 3HAC078804-001</p>  <p>xx2100001433</p>
3	<p>Reconnect the air hoses.</p>	 <p>xx1400000738</p>
4	<p>Reconnect the CP/CS cabling.</p>	 <p>xx1500000252</p>
5	<p>Check the connectors on the plate with connector set and the attached gasket. Replace if damaged.</p>	<p>Plate with connector set: 3HAC079691-001 Gasket: 3HAC078804-001</p>  <p>xx2100001434</p>

4 Repair

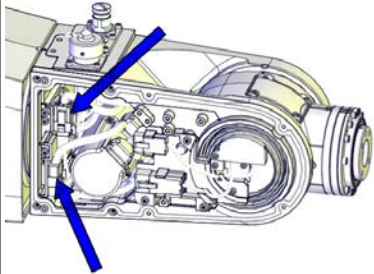
4.4.1 Replacing the lower arm

Continued

Connecting the axis-5 motor FPC connectors

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Connect the axis-5 FPC connectors and snap them to their holders.</p>	 <p>xx1300002390</p>

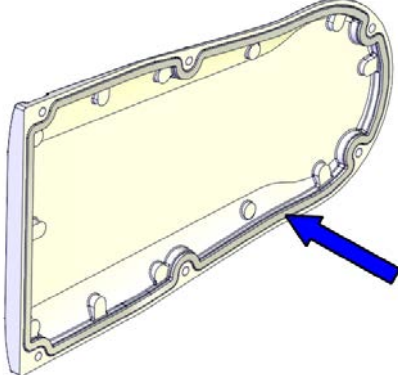
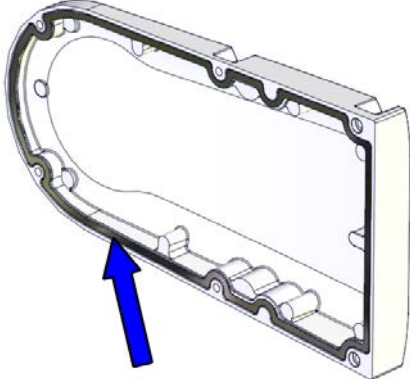
Connecting the axis-5 motor connectors

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Reconnect the motor cables.</p> <ul style="list-style-type: none"> • R3.MP5 • R3.ME5 	 <p>xx1300002360</p>

Refitting the wrist covers

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

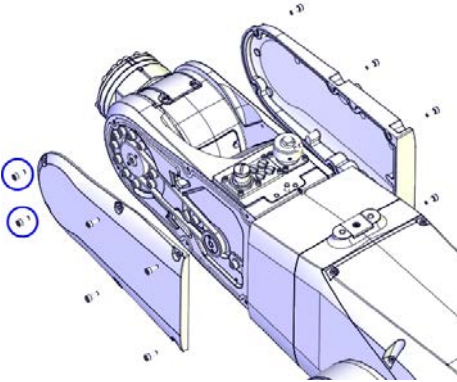
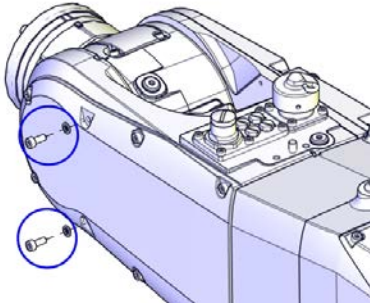


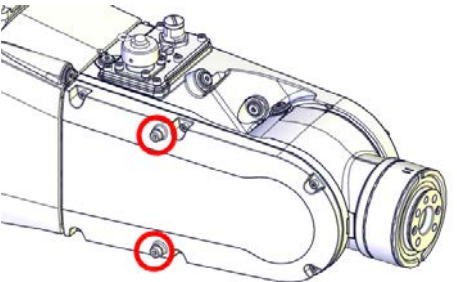
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	Action	Note
2	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the tubular cover gasket. Replace if damaged.</p>	<p>Gasket for tubular cover: 3HAC058822-001 (not Hygienic robots) / 3HAC080709-001 (Hygienic robots)</p>  <p>xx140000034</p>
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the tubular cable housing cover gasket. Replace if damaged.</p>	<p>Gasket for tubular cable housing cover: 3HAC056707-001 (not Hygienic robots) / 3HAC080701-001 (Hygienic robots)</p>  <p>xx1400000345</p>

4 Repair

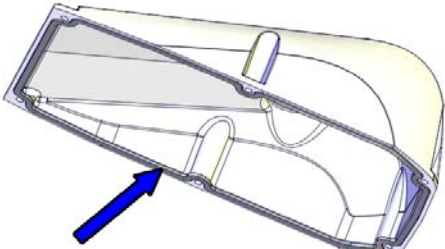

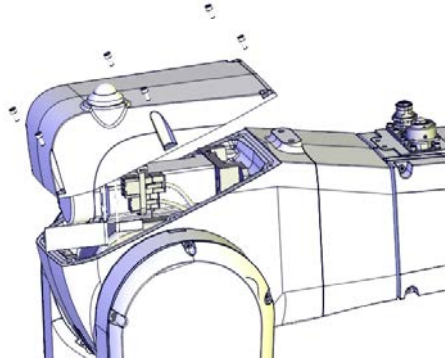

4.4.1 Replacing the lower arm

Continued

	Action	Note
4	<p>Refit the both covers to the wrist.</p> <p>For robots with protection class IP67 For robots with protection type Foundry Plus</p> <p>Apply locking liquid Loctite 243 to the two front screws on the left hand side cover, encircled in the figure.</p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p> <p>For robots with protection class IP67 For robots with protection type Foundry Plus</p>  <p>xx1300002349</p>
	<p>For robots with protection type Clean Room For robots with food grade lubrication</p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p>	<p>For robots with protection type Clean Room For robots with food grade lubrication</p>  <p>xx1600001153</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
	<p> Note</p> <p>For robots with protection type Hygienic</p> <p>Check the two extra screws on the tubular cover (right hand side cover), as encircled in the figure.</p> <p>Replace if damaged or missing.</p>	<p>For robots with protection type Hygienic</p>  <p>xx2100001406</p>

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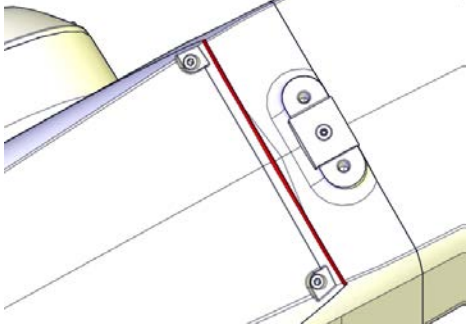


Concluding procedure

	Action	Note
1	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the gasket. Replace if damaged.</p>	<p>Housing cover gasket (IRB 1200-7/0.7): 3HAC056698-001 (not Hygienic robots) / 3HAC080700-001 (Hygienic robots)</p> <p>Housing cover gasket (IRB 1200-5/0.9): 3HAC056697-001 (not Hygienic robots) / 3HAC080699-001 (Hygienic robots)</p>  <p>xx1400000477</p>
2	<p>Refit the upper arm housing cover with the screws.</p> <p> CAUTION</p> <p>For robots with safety lamp (option) Reconnect the lamp cable connectors R3.H1 and R3.H2 and then secure the cover.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p>  <p>xx1300000456</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

4 Repair

4.4.1 Replacing the lower arm

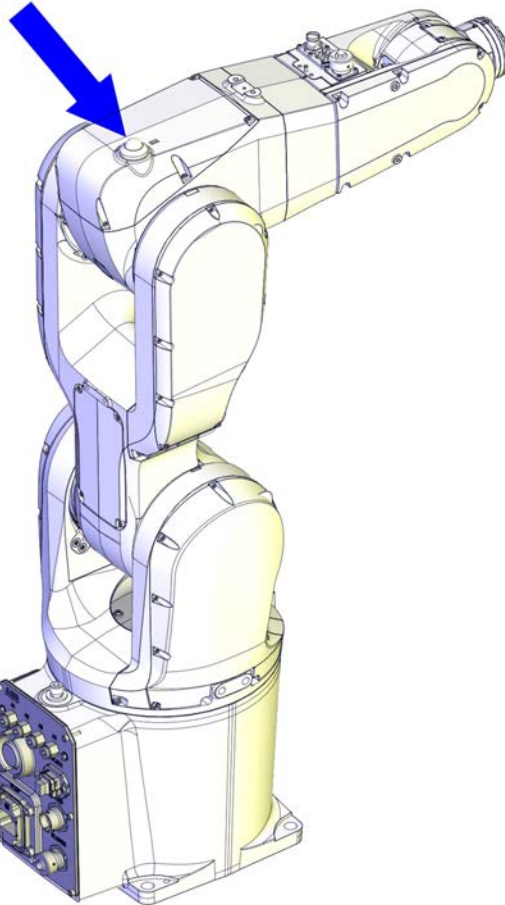
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	Action	Note
3	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Apply a string of the sealant to the joint of the upper arm housing cover.</p> <p>Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p>	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication Sealant, SikaFlex 521FC</p> <p>For robots with protection type Hygienic Sealant, Trans Clear</p>  <p>xx1600000215</p>
4	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean, seal and paint the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160.</p> <p> Note</p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>	
5	Recalibrate the robot.	Calibration is detailed in section Calibration on page 807 .
6	<p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

4.4.2 Replacing the signal lamp

Location of signal lamp

The signal lamp is located as shown in the figure.



xx130000455

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Signal lamp	3HAC16738-1	
Housing cover gasket (IRB 1200-7/0.7)	3HAC056698-001 / 3HAC080700-001	Not used with protection class IP40. Replace if damaged.
Housing cover gasket (IRB 1200-5/0.9)	3HAC056697-001 / 3HAC080699-001	Not used with protection class IP40. Replace if damaged.

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4 Repair



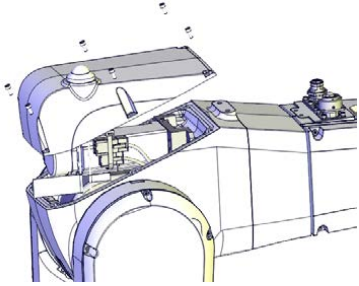
4.4.2 Replacing the signal lamp

Continued

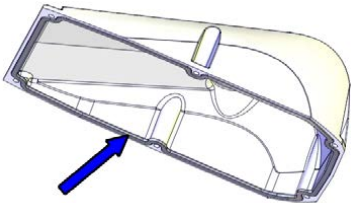


Required tools and equipment

Equipment, etc.	Article number	Note
24 VDC power supply	-	Used to release the motor brakes.
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .

Replacing the signal lamp

	Action	Note
1	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Remove the attachment screws of the upper arm housing cover and lift the cover carefully until the connectors of the signal lamp can be reached.	 xx1300000456
4	Disconnect the connectors and remove the cover from the robot.	
5	Remove the nut from the lamp and pull out the lamp from the cover.	
6	Fit the new lamp to the cover and tighten the nut.	
7	Find the lamp connectors in the cable harness inside the upper arm housing. <ul style="list-style-type: none"> • Connect lamp connector R3.H1 to cable harness connector H1. • Connect lamp connector R3.H2 to cable harness connector H2. 	

Continues on next page

	Action	Note
8	Clean the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160	
9	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the gasket. Replace if damaged.</p>	<p>Housing cover gasket (IRB 1200-7/0.7): 3HAC056698-001 (not Hygienic robots) / 3HAC080700-001 (Hygienic robots) Housing cover gasket (IRB 1200-5/0.9): 3HAC056697-001 (not Hygienic robots) / 3HAC080699-001 (Hygienic robots)</p>  <p>xx1400000477</p>
10	Refit the cover on the upper arm housing.	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p> <p> Note Only use specified screws, never replace them with other screws.</p>
11	The signal lamp is now ready for use and is lit in MOTORS ON mode.	
12	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Clean, seal and paint the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160.</p> <p> Note After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>	

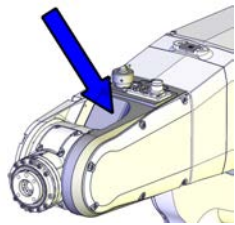
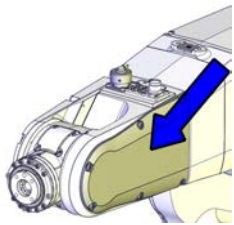
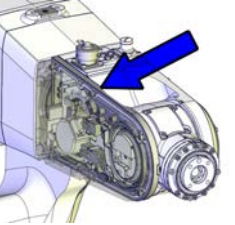
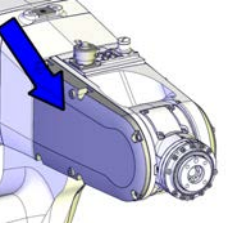
4 Repair

4.4.3 Replacing the tubular spare parts

4.4.3 Replacing the tubular spare parts

Location of tubular spare parts

The tubular parts that are considered spare parts are located as shown in the figure.

Tubular with sleeve	Tubular cover	Tubular cable housing	Tubular cable housing cover
 xx1400000432	 xx1400000433	 xx1400000434	 xx1400000435
3HAC059693-001 / 3HAC059723-001 ⁱ :	3HAC049656-001	3HAC059695-001	3HAC059694-001
3HAC059706-001: Used with protection type Clean Room. Used for robots with food grade lubrication.	3HAC056144-001 / 3HAC059708-001 ⁱⁱ : Used with protection type Clean Room. Used for robots with food grade lubrication. Replace if damaged.	3HAC056143-001: Used with protection type Clean Room. Used for robots with food grade lubrication.	3HAC056145-001: Used with protection type Clean Room. Used for robots with food grade lubrication. Replace if damaged.
3HAC079693-001: Used with protection type Hygienic.	3HAC079689-001: Used with protection type Hygienic. Replace if damaged.	3HAC079692-001: Used with protection type Hygienic.	3HAC079690-001: Used with protection type Hygienic. Replace if damaged.

ⁱ For information on which tubular to be ordered, see [Spare part versions for the tubular on Type A robots on page 883](#).

ⁱⁱ For information on which tubular cover for Clean Room robots to be ordered, see [Spare part versions for the tubular cover on Clean Room robots on page 884](#).

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Tubular with sleeve	3HAC059693-001 / 3HAC059723-001 ⁱ	
Tubular with sleeve, Clean Room Tubular with sleeve, food grade lubrication	3HAC059706-001	Used with protection type Clean Room. Used for robots with food grade lubrication.
Tubular with sleeve, Hygienic	3HAC079693-001	Used with protection type Hygienic.

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4.4.3 Replacing the tubular spare parts
Continued

Spare part	Article number	Note
Tubular cover	3HAC049656-001	Replace if damaged.
Tubular cover, Clean Room Tubular cover, food grade lubrication	3HAC056144-001 / 3HAC059708-001 ⁱⁱ	Used with protection type Clean Room. Used for robots with food grade lubrication. Replace if damaged.
Tubular cover, Hygienic	3HAC079689-001	Used with protection type Hygienic. Replace if damaged.
Gasket for tubular cover	3HAC058822-001 / 3HAC080709-001	Not used with protection class IP40. Replace if damaged.
Tubular cable housing	3HAC059695-001	
Tubular cable housing, Clean Room Tubular cable housing, food grade lubrication	3HAC056143-001	Used with protection type Clean Room. Used for robots with food grade lubrication.
Tubular cable housing, Hygienic	3HAC079692-001	Used with protection type Hygienic.
M2 variseal sealing	3HAC044641-009	Replace if damaged.
Radial sealing	3HAB3701-42	Not used with protection class IP40 and protection type Hygienic. Replace if damaged.
Tubular cable housing cover	3HAC059694-001	Replace if damaged.
Tubular cable housing cover, Clean Room Tubular cable housing cover, food grade lubrication	3HAC056145-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Replace if damaged.
Tubular cable housing cover, Hygienic	3HAC079690-001	Used with protection type Hygienic. Replace if damaged.
Gasket for tubular cable housing cover	3HAC056707-001 / 3HAC080701-001	Not used with protection class IP40. Replace if damaged.
Washer	3HAC044869-001	Replace if damaged
M2 variseal sealing	3HAC044641-008	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.

ⁱ For information on which tubular to be ordered, see [Spare part versions for the tubular on Type A robots on page 883](#).

ⁱⁱ For information on which tubular cover for Clean Room robots to be ordered, see [Spare part versions for the tubular cover on Clean Room robots on page 884](#).

Continues on next page

4 Repair

4.4.3 Replacing the tubular spare parts

Continued

Required tools and equipment

Equipment, etc.	Article number	Note
Axis-5 sealing assembly tool set	3HAC049701-001	Used to refit the radial sealing, if replacement is needed.
Guide pin for tilt unit (axis 5)	3HAC049706-001	Always use three guide pins together!
24 VDC power supply	-	Used to release the motor brakes.
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. ⁱ
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .
Flange tightening tool	3HAC079686-001	Used with robots in protection type Hygienic Used for loosen and tighten the seal ring unit on tool flange of the Hygienic robots.
Guide pin for stainless shaft on tool flange	3HAC079684-001	Used with robots in protection type Hygienic

ⁱ The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, manual calibration is used as default.


Required consumables

Consumable	Art. no.	Note
Cable straps	-	
Cleaning agent	-	Loctite 7063
Flange sealing	3HAC026759-003	Sikaflex 521FC For robots not with protection type Hygienic
Flange sealing	3HAC073510-001	Trans Clear For robots with protection type Hygienic
Locking liquid	3HAB7116-1	Loctite 243
Grease	3HAC070875-001	Molykote P1900 For robots with protection type Hygienic

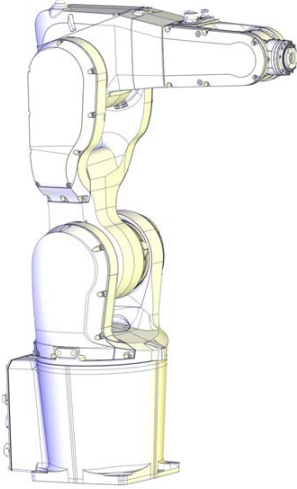
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Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none"> Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	 Note Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in Reference calibration routine on page 821 .
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Preparations before removing the tubular spare parts



	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 <p>xx1300002581</p>

Continues on next page

4 Repair

4.4.3 Replacing the tubular spare parts



Continued

	Action	Note
3	 DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
4	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.	


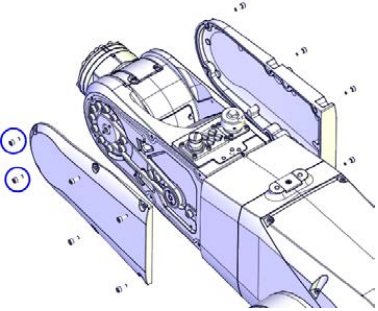

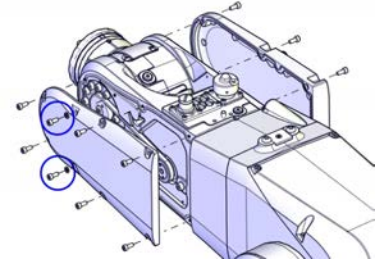

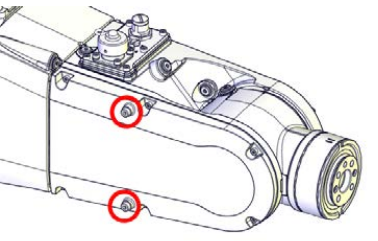
Replacing the tubular cable housing

Use these procedures to replace the tubular cable housing.


Getting access to inside of the wrist unit

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.	

Continues on next page

	Action	Note
3	<p>Remove the covers on each side of the wrist by removing their screws.</p> <p> Note For robots with protection class IP67 For robots with protection type Foundry Plus The two front screws on the left hand side cover (encircled in the figure) have been fitted with locking liquid. The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.</p>	<p>For robots with protection class IP67 For robots with protection type Foundry Plus</p>  <p>xx1300002349</p>
	<p> Note For robots with protection type Clean Room For robots with food grade lubrication The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.</p>	<p>For robots with protection type Clean Room</p>  <p>xx1600001148</p>
	<p> Note For robots with protection type Hygienic The tubular cover (right hand side cover) has two extra screws, as encircled in the figure. Do not remove the two screws when removing the cover. The screws are used for blocking the screw holes rather than fixing the cover to the tubular. Replace if damaged or missing.</p>	<p>For robots with protection type Hygienic</p>  <p>xx2100001406</p>

Removing the tubular cable housing


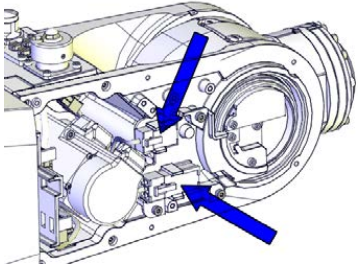
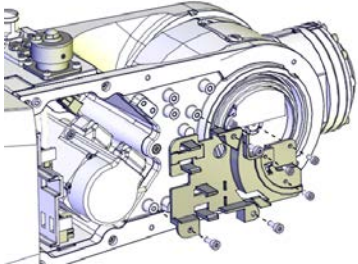

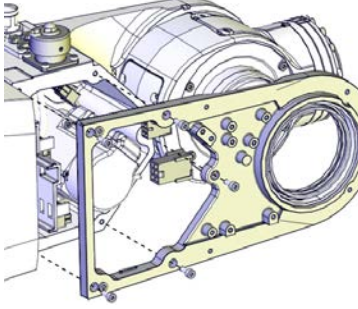
	Action	Note
1	<p> DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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4 Repair

4.4.3 Replacing the tubular spare parts

Continued


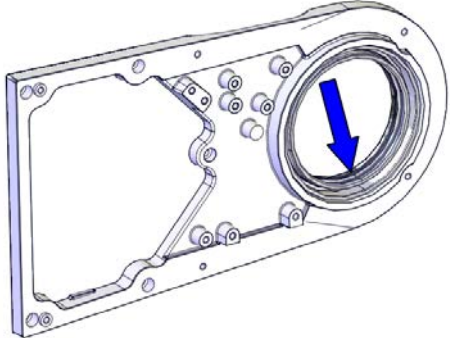
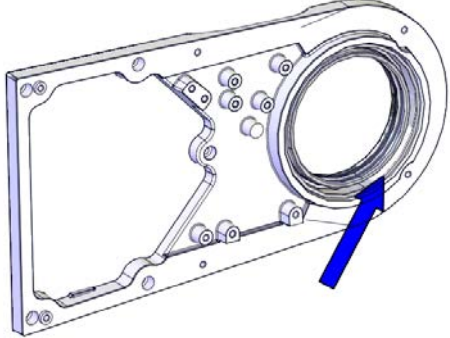
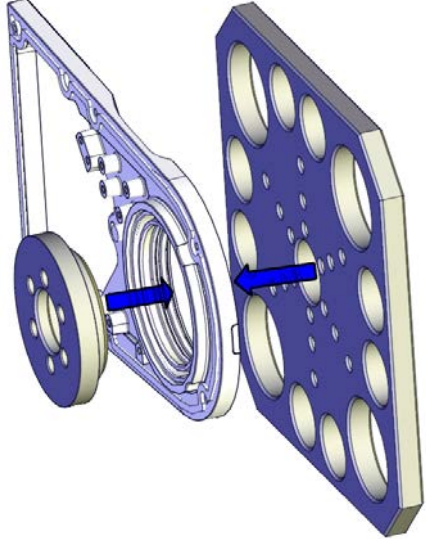
	Action	Note
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i>	
3	Snap loose and disconnect the axis-5 FPC connectors.	 xx1300002390
4	Remove the connector plate by first removing the screws.	 xx1300002391
5	Remove the cable housing of the tubular by first removing the screws.  Note For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Hygienic The frame is glued and needs to be pried off.	 xx1300002392

Checking the tubular cable housing sealings

	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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4.4.3 Replacing the tubular spare parts
Continued

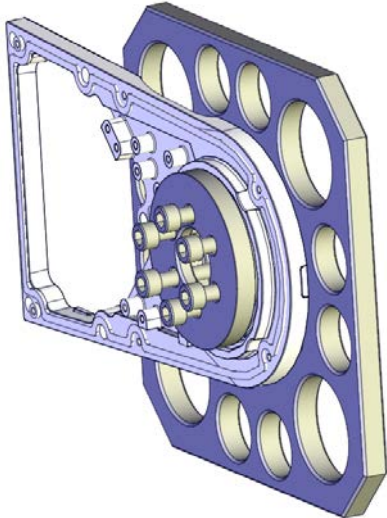
	Action	Note
2	<p>Check the sealing. Replace if damaged.</p> <p> CAUTION</p> <p>Do not fit M2 variseal sealing on Clean Room, food grade lubrication and Hygienic robots.</p>	<p>M2 variseal sealing: 3HAC044641-009</p>  <p>xx1300002396</p>
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication</p> <p>Check the radial sealing. Replace if damaged, as described below. If undamaged and properly seated, skip to the next procedure table.</p>	<p>Radial sealing: 3HAB3701-42</p>  <p>xx1300002608</p>
4	<p>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p>	
5	<p>Fit the radial sealing into the tubular cable housing.</p>	
6	<p>Fit the circular part of the radial sealing assembly tool against the radial sealing.</p>	<p>Axis-5 sealing assembly tool set: 3HAC049701-001</p>
7	<p>Fit the tool plate to the other side of the tubular cable housing with the six screws M6x40.</p>	 <p>xx1400000485</p>

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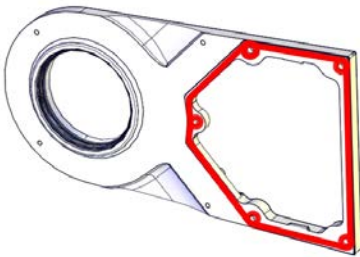
4 Repair

4.4.3 Replacing the tubular spare parts

Continued

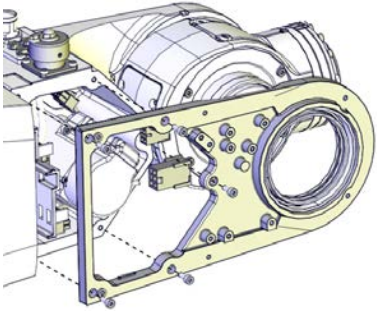
	Action	Note
8	Screw the screws, little by little, to press the sealing into place.	 <p data-bbox="940 846 1050 864">xx140000486</p>
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	

Refitting the tubular cable housing

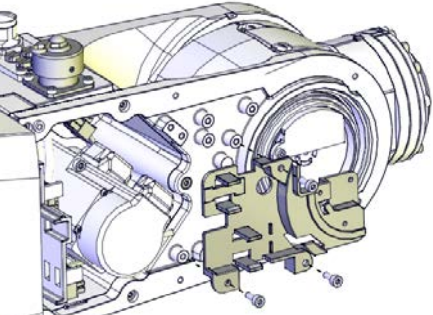
	Action	Note
1	<p data-bbox="464 1122 1023 1223">For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p data-bbox="464 1229 1023 1312">Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p data-bbox="464 1330 1023 1480">For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Hygienic</p> <p data-bbox="464 1487 1023 1547">Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p> <p data-bbox="464 1554 1023 1615">Apply flange sealing on the mounting surfaces of the tubular cable housing.</p> <div data-bbox="485 1563 544 1621" style="display: inline-block; vertical-align: middle;">  </div> <p data-bbox="571 1581 630 1610">Note</p> <p data-bbox="464 1630 1023 1691">For Hygienic robots, wipe clean the overflowing flange sealing if there is any.</p>	<p data-bbox="1027 1330 1404 1368">For robots with protection class IP67</p> <p data-bbox="1027 1375 1404 1435">For robots with protection type Foundry Plus</p> <p data-bbox="1027 1442 1404 1480">Flange sealant, SikaFlex 521FC</p> <p data-bbox="1027 1487 1404 1525">For robots with protection type Hygienic</p> <p data-bbox="1027 1532 1404 1570">Flange sealant, Trans Clear</p>  <p data-bbox="1027 1845 1137 1863">xx1300002610</p>

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4.4.3 Replacing the tubular spare parts
Continued

	Action	Note
3	Refit the tubular cable housing with the screws.	<p>Tightening torque: 1.5 Nm.</p> <p>Tubular cable housing: 3HAC059695-001</p> <p>Tubular cable housing, Clean Room</p> <p>Tubular cable housing, food grade lubrication : 3HAC056143-001</p> <p>Tubular cable housing, Hygienic: 3HAC079692-001</p>  <p>xx1300002392</p>

Refitting the connector plate

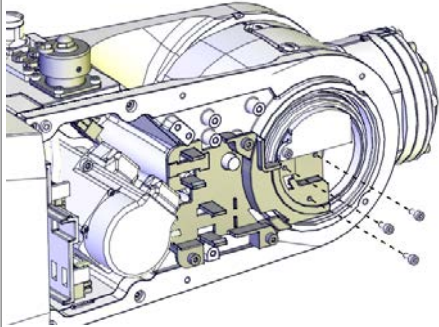
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	Refit the connector plate and secure with the M3 screws.	<p>Tightening torque: 0.3 Nm.</p>  <p>xx1400001401</p>

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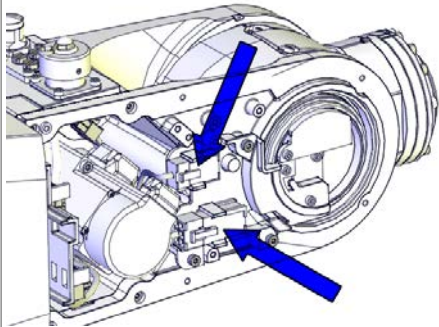
4 Repair

4.4.3 Replacing the tubular spare parts

Continued

	Action	Note
3	Secure the three M2.5 screws.	Tightening torque: 0.3 Nm.  <small>xx1400001402</small>

Connecting the axis-5 motor FPC connectors

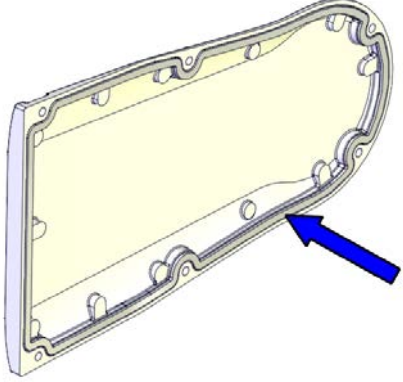
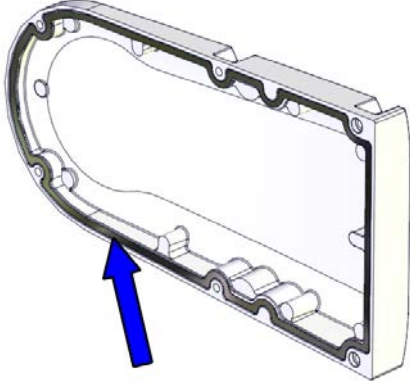
	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Connect the axis-5 FPC connectors and snap them to their holders.	 <small>xx1300002390</small>

Refitting the wrist covers

	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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4.4.3 Replacing the tubular spare parts
Continued

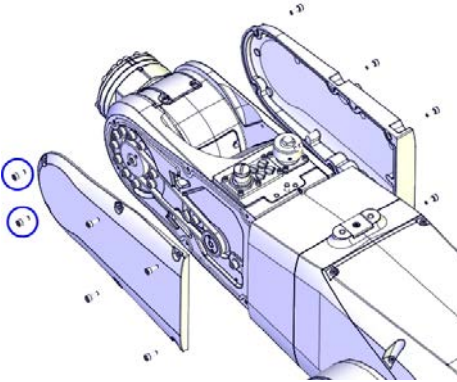
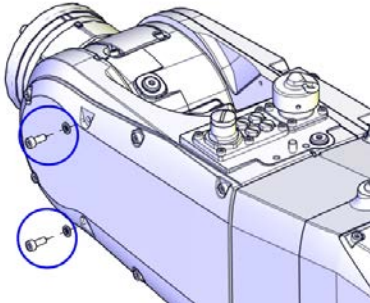


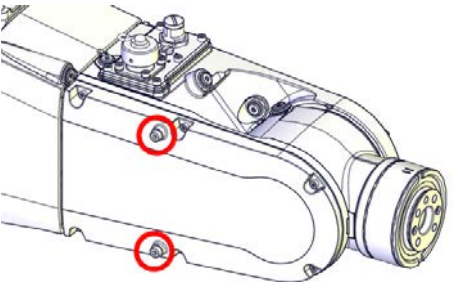
	Action	Note
2	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the tubular cover gasket. Replace if damaged.</p>	<p>Gasket for tubular cover: 3HAC058822-001 (not Hygienic robots) / 3HAC080709-001 (Hygienic robots)</p>  <p>xx140000034</p>
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the tubular cable housing cover gasket. Replace if damaged.</p>	<p>Gasket for tubular cable housing cover: 3HAC056707-001 (not Hygienic robots) / 3HAC080701-001 (Hygienic robots)</p>  <p>xx1400000345</p>

Continues on next page

4 Repair

4.4.3 Replacing the tubular spare parts

Continued



	Action	Note
4	<p>Refit the both covers to the wrist.</p> <p>For robots with protection class IP67 For robots with protection type Foundry Plus</p> <p>Apply locking liquid Loctite 243 to the two front screws on the left hand side cover, encircled in the figure.</p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p> <p>For robots with protection class IP67 For robots with protection type Foundry Plus</p>  <p>xx1300002349</p>
	<p>For robots with protection type Clean Room For robots with food grade lubrication</p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p>	<p>For robots with protection type Clean Room For robots with food grade lubrication</p>  <p>xx1600001153</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
	<p> Note</p> <p>For robots with protection type Hygienic</p> <p>Check the two extra screws on the tubular cover (right hand side cover), as encircled in the figure.</p> <p>Replace if damaged or missing.</p>	<p>For robots with protection type Hygienic</p>  <p>xx2100001406</p>

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Removing the tubular

Use these procedures to remove the tubular.

Getting access to inside of the wrist unit


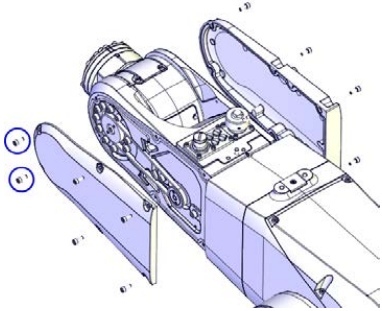

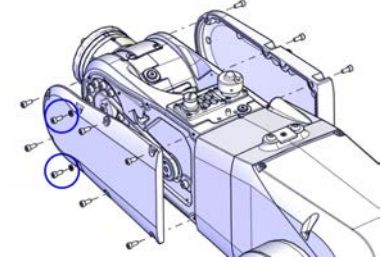

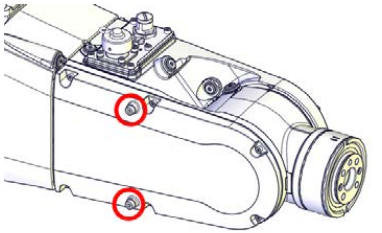
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i>	

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4 Repair

4.4.3 Replacing the tubular spare parts



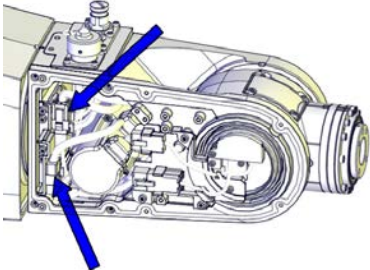
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	Action	Note
3	Remove the covers on each side of the wrist by removing their screws.	
	 Note For robots with protection class IP67 For robots with protection type Foundry Plus The two front screws on the left hand side cover (encircled in the figure) have been fitted with locking liquid. The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.	For robots with protection class IP67 For robots with protection type Foundry Plus  xx1300002349
	 Note For robots with protection type Clean Room For robots with food grade lubrication The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.	For robots with protection type Clean Room  xx1600001148
	 Note For robots with protection type Hygienic The tubular cover (right hand side cover) has two extra screws, as encircled in the figure. Do not remove the two screws when removing the cover. The screws are used for blocking the screw holes rather than fixing the cover to the tubular. Replace if damaged or missing.	For robots with protection type Hygienic  xx2100001406



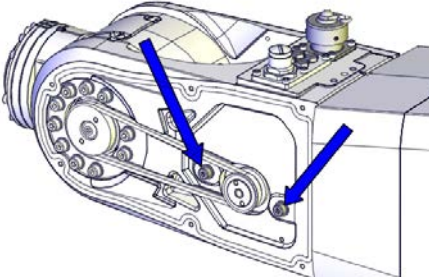
Disconnecting the axis-5 motor connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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	Action	Note
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	<p>Snap loose the motor connectors from their holders and then disconnect them.</p> <ul style="list-style-type: none"> • R3.MP5 • R3.ME5 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx1300002360</p>

Removing the axis-5 motor with pulley

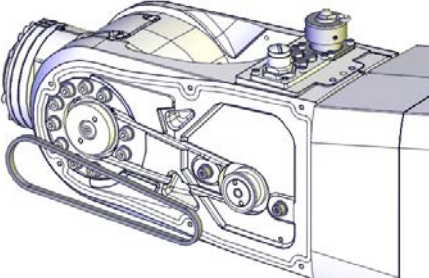
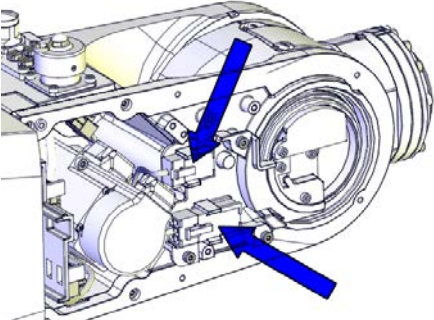
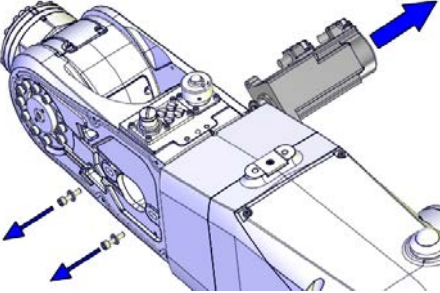
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	<p>Loosen the screws so that the motor can be moved sideways.</p>	 <p>xx1300002350</p>

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4 Repair

4.4.3 Replacing the tubular spare parts


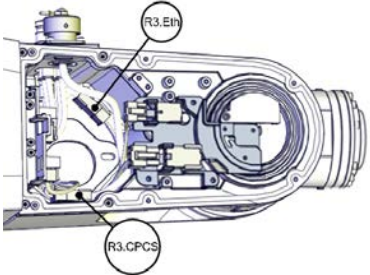
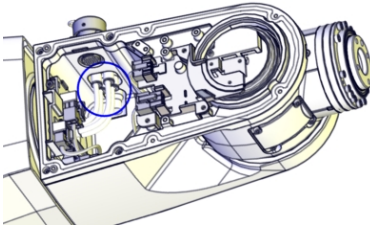
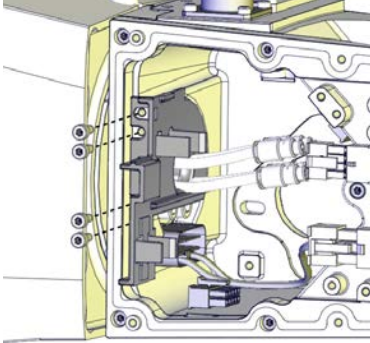
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	Action	Note
4	Remove the timing belt.	 <p>xx1300002351</p>
5	Snap loose and disconnect the axis-5 FPC connectors.	 <p>xx1300002390</p>
6	Remove the screws and pull out the motor.	 <p>xx1300002352</p>

Removing the wrist

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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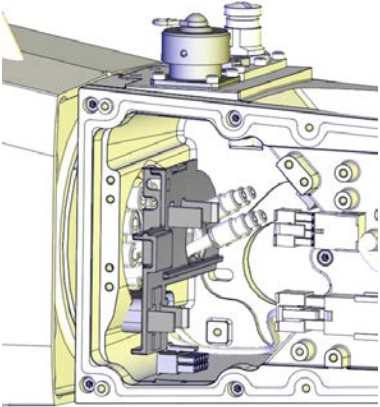
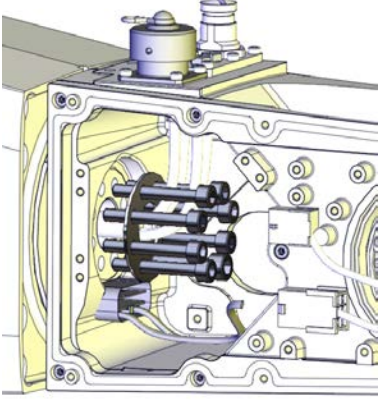

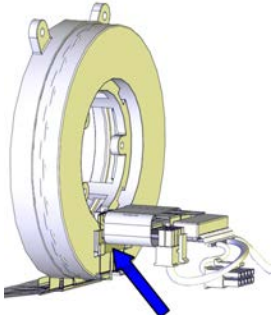
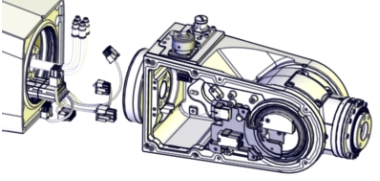
	Action	Note
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	
3	Disconnect the connectors shown in the figure.	 <p>xx1300002353</p>
4	Disconnect the air hoses.	 <p>xx1300002355</p>
5	Remove the connector plate attachment screws.	 <p>xx1300002356</p>

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4 Repair




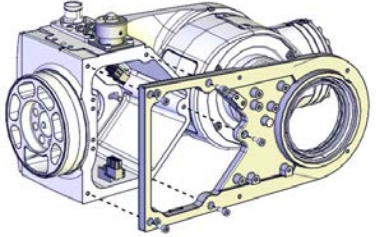
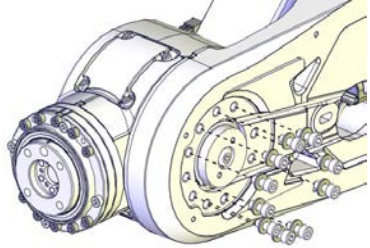
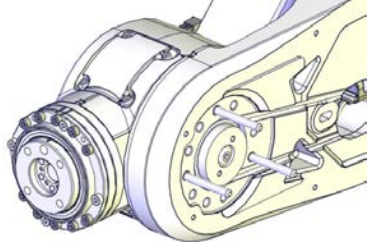
4.4.3 Replacing the tubular spare parts

Continued

	Action	Note
6	Guide the hoses through the plate hole and remove the plate.	 xx1300002357
7	Support the weight of the wrist and remove the screws and the washer.	 xx1300002358
8	<p>Pull out the wrist carefully while at the same time pulling all connectors and the air hoses out of the wrist.</p> <p>Be careful not to damage the FPC cabling and the connectors.</p> <p> CAUTION</p> <p>Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.</p>  xx1300002611	 xx1300002359

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Separating the tilt unit from the tubular

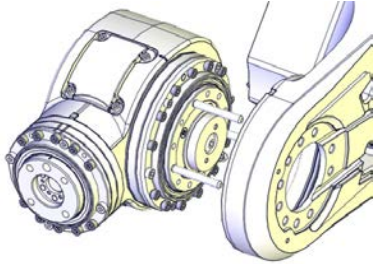
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Remove the cable housing of the tubular by first removing the screws.  Note For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Hygienic The frame is glued and needs to be pried off.	 xx1400000774
4	Support the weight of the tilt unit and remove the screws.	 xx1300002469
5	Fit guide pins to the gearbox.	Guide pin for tilt unit (axis 5): 3HAC049706-001 Always use three guide pins together!  xx1400000775

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4 Repair

4.4.3 Replacing the tubular spare parts

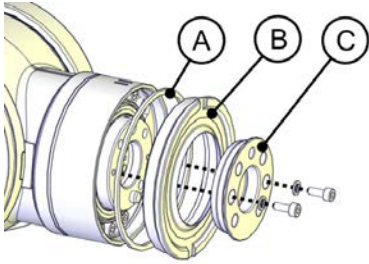
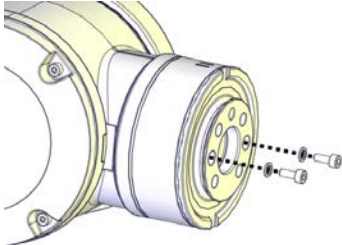
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	Action	Note
6	Remove the tilt unit.	 <p>xx1300002470</p>

Refitting the tubular

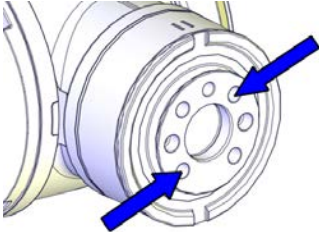
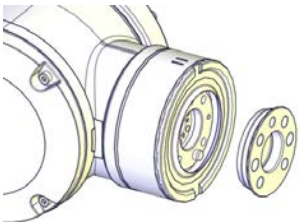
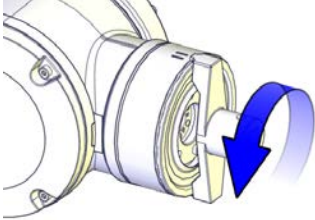
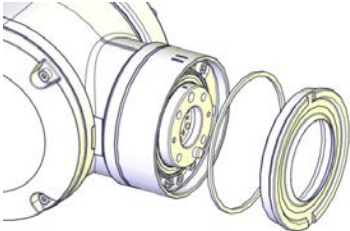
Use these procedures to refit the tubular.

Checking the sealing set on tool flange of Hygienic robots

	Action	Note
1	Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check the gasket (A), seal ring unit (B) and stainless shaft (C) on the tool flange. Replace if damaged, as described below. If undamaged and properly seated, skip to the next procedure table.	 <p>xx2100001448</p>
3	Remove the screws and washers.	 <p>xx2100001449</p>

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4.4.3 Replacing the tubular spare parts
Continued

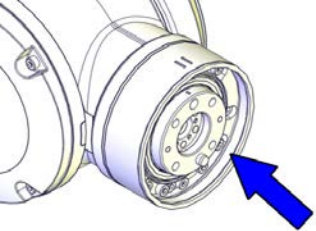
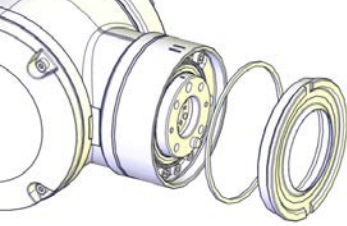
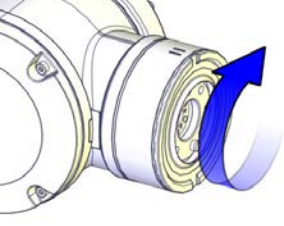
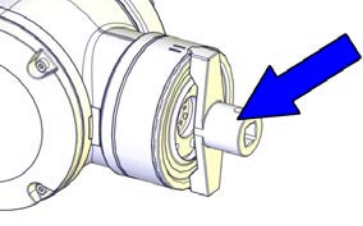
	Action	Note
4	Insert two M4 screws to the pressed out holes and press out the stainless shaft.	 <p>xx2100001450</p>  <p>xx2100001451</p>
5	Place the flange tightening tool together with a 3/8" (10 mm) socket spanner on the seal ring unit and loosen the unit.	<p>Flange tightening tool: 3HAC079686-001</p>  <p>xx2100001452</p>
6	Remove the gasket and seal ring unit.	 <p>xx2100001453</p>
7	Replace the damaged parts with new ones.	

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4 Repair

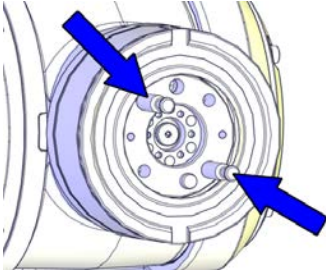
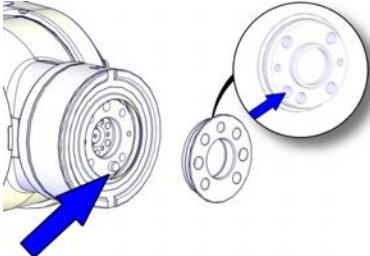
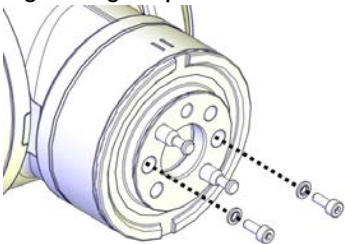
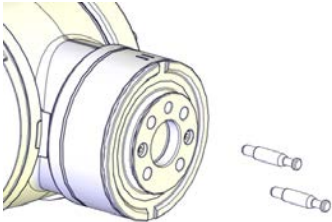
4.4.3 Replacing the tubular spare parts

Continued

	Action	Note
8	Apply a little grease to the screw thread.	<p>Grease: Molykote P1900</p>  <p>xx2100001454</p>
9	Put the gasket in place and then screw the seal ring unit.	 <p>xx2100001453</p>  <p>xx2100001455</p>
10	Place the flange tightening tool together with a 3/8" (10 mm) socket spanner on the seal ring unit and tighten the unit.	<p>Flange tightening tool: 3HAC079686-001 Tightening torque: 6 Nm</p>  <p>xx2100001456</p>

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4.4.3 Replacing the tubular spare parts
Continued

	Action	Note
11	Fit two guide pins to the tool flange.	<p>Guide pin for stainless shaft on tool flange: 3HAC079684-001</p>  <p>xx2100001457</p>
12	<p>Place the stainless shaft on the tool flange with guidance of the two guide pins.</p> <p>Make sure the pin hole on the shaft aligned with the pin on the tool flange.</p>	 <p>xx2100001458</p>
13	Secure with screws and washers.	<p>Tightening torque: 1.5 Nm</p>  <p>xx2100001459</p>
14	Remove the guide pins.	 <p>xx2100001460</p>

Refitting the axis-5 and axis-6 drive unit

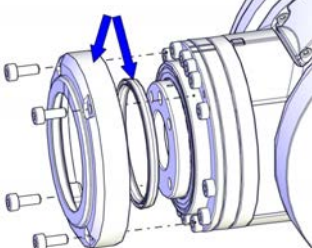

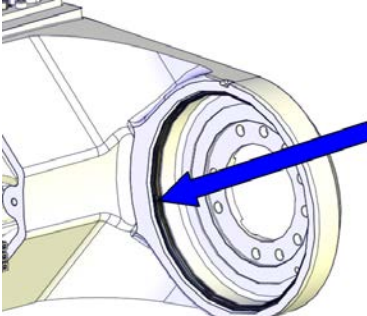

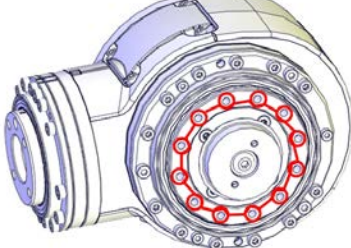
	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

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4 Repair

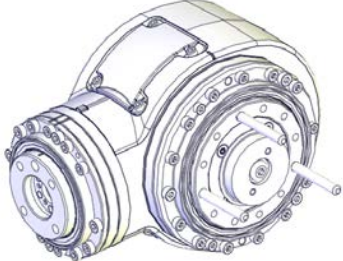
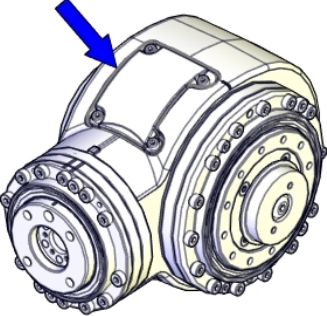
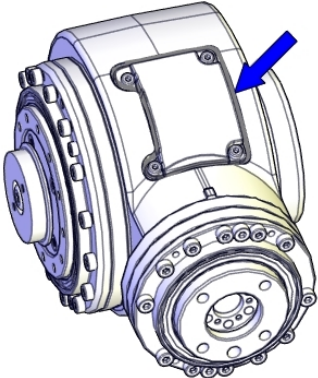
4.4.3 Replacing the tubular spare parts

Continued

	Action	Note
2	<p>For robots with protection type Foundry Plus</p> <p>Check the protection cover for turning disk and T40 variseal sealing.</p> <p>Replace if damaged.</p>	<p>Protection cover for axis-6 turning disk: 3HAC044666-001</p> <p>T40 variseal sealing: 3HAC044641-012</p>  <p>xx1600001126</p>
3	<p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <p>Check the sealing.</p> <p>Replace if damaged.</p> <p> CAUTION</p> <p>Do not fit M2 variseal sealing on robots in other protection class or protection types.</p>	<p>M2 variseal sealing: 3HAC044641-008</p>  <p>xx1300002493</p>
4	<p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p> <p>Apply flange sealing on the mounting surfaces of the drive unit.</p> <p> Note</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Wipe clean the overflowing sealant if there is any.</p>	<p>For robots not in protection type Hygienic</p> <p>Flange sealant, SikaFlex 521FC</p> <p>For robots with protection type Hygienic</p> <p>Flange sealant, Trans Clear</p>  <p>xx1400001404</p>

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4.4.3 Replacing the tubular spare parts
Continued


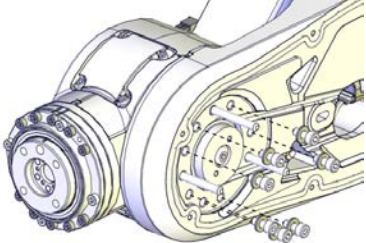

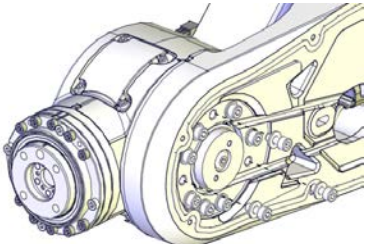
	Action	Note
5	Fit guide pins to the axis-5 gearbox.	<p>Guide pin for tilt unit (axis 5): 3HAC049706-001</p>  <p>xx1300002568</p>
6	<p>For robots with protection type Clean Room For robots with food grade lubrication Make sure the sealing to the tilt covers is intact before the refitting. For robots with protection type Hygienic Hygienic robots do not have tilt covers.</p>	 <p>xx1600000219</p>  <p>xx1600000220</p>

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4 Repair

4.4.3 Replacing the tubular spare parts

Continued


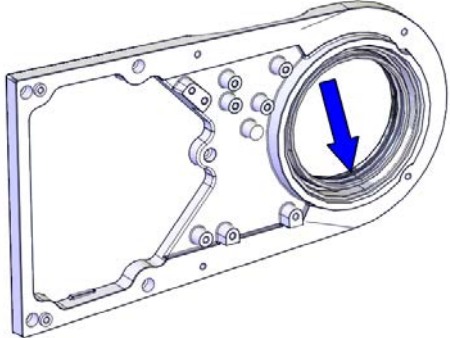
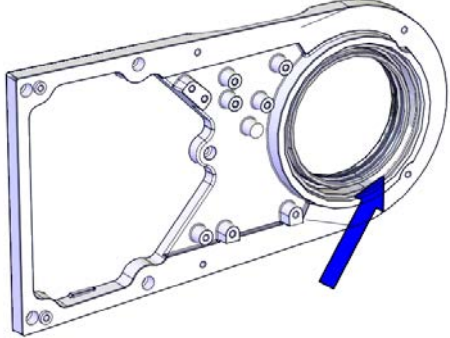
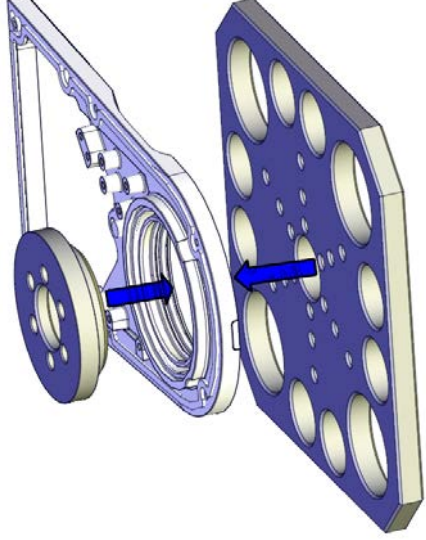
	Action	Note
7	<p>Refit the drive unit and secure with the screws and washers. Secure the screws but do not tighten yet.</p> <p> Note</p> <p>If there is glue on the screw, please clean it or replace it with a new one.</p>	<p>Attachment screws: 3HAB3409-236 (M4x10).</p>  <p>xx1300002569</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
8	<p>Remove the guide pins and refit the remaining screws and washers.</p>	 <p>xx1300002570</p>
9	<p>Cross-tighten all the screws with torque 1 Nm first, then with 2 Nm, with 4 Nm, and finally with 4.5 Nm.</p>	

Checking the tubular cable housing sealings

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

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4.4.3 Replacing the tubular spare parts
Continued

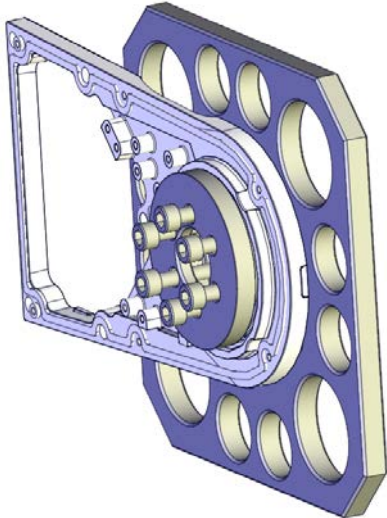
	Action	Note
2	<p>Check the sealing. Replace if damaged.</p> <p> CAUTION</p> <p>Do not fit M2 variseal sealing on Clean Room, food grade lubrication and Hygienic robots.</p>	<p>M2 variseal sealing: 3HAC044641-009</p>  <p>xx1300002396</p>
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication</p> <p>Check the radial sealing. Replace if damaged, as described below. If undamaged and properly seated, skip to the next procedure table.</p>	<p>Radial sealing: 3HAB3701-42</p>  <p>xx1300002608</p>
4	<p>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p>	
5	<p>Fit the radial sealing into the tubular cable housing.</p>	
6	<p>Fit the circular part of the radial sealing assembly tool against the radial sealing.</p>	<p>Axis-5 sealing assembly tool set: 3HAC049701-001</p>
7	<p>Fit the tool plate to the other side of the tubular cable housing with the six screws M6x40.</p>	 <p>xx1400000485</p>

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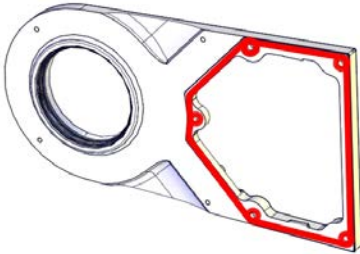
4 Repair

4.4.3 Replacing the tubular spare parts

Continued

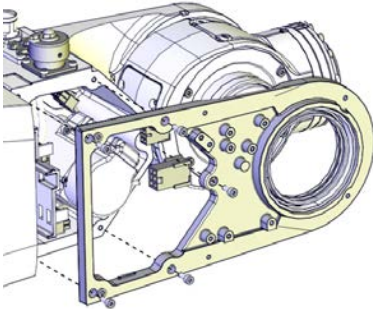
	Action	Note
8	Screw the screws, little by little, to press the sealing into place.	 <p data-bbox="943 846 1050 864">xx140000486</p>
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	

Refitting the tubular cable housing


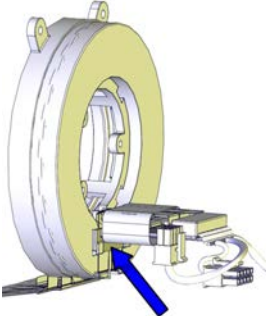
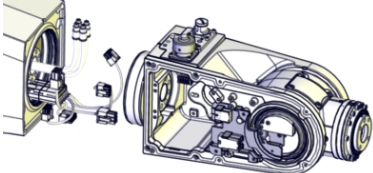
	Action	Note
1	<p data-bbox="480 1122 986 1223">For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p data-bbox="480 1229 1018 1308">Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p data-bbox="480 1332 1018 1485">For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Hygienic</p> <p data-bbox="480 1491 1018 1547">Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p> <p data-bbox="480 1554 1018 1610">Apply flange sealing on the mounting surfaces of the tubular cable housing.</p> <p data-bbox="480 1617 539 1630"></p> <p data-bbox="571 1581 630 1608">Note</p> <p data-bbox="480 1637 1018 1693">For Hygienic robots, wipe clean the overflowing flange sealing if there is any.</p>	<p data-bbox="1027 1332 1401 1384">For robots with protection class IP67</p> <p data-bbox="1027 1391 1401 1442">For robots with protection type Foundry Plus</p> <p data-bbox="1027 1449 1401 1478">Flange sealant, SikaFlex 521FC</p> <p data-bbox="1027 1485 1401 1536">For robots with protection type Hygienic</p> <p data-bbox="1027 1543 1401 1572">Flange sealant, Trans Clear</p>  <p data-bbox="1027 1845 1134 1863">xx1300002610</p>

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4.4.3 Replacing the tubular spare parts
Continued

	Action	Note
3	Refit the tubular cable housing with the screws.	<p>Tightening torque: 1.5 Nm.</p> <p>Tubular cable housing: 3HAC059695-001</p> <p>Tubular cable housing, Clean Room</p> <p>Tubular cable housing, food grade lubrication : 3HAC056143-001</p> <p>Tubular cable housing, Hygienic: 3HAC079692-001</p>  <p>xx1300002392</p>

Refitting the wrist

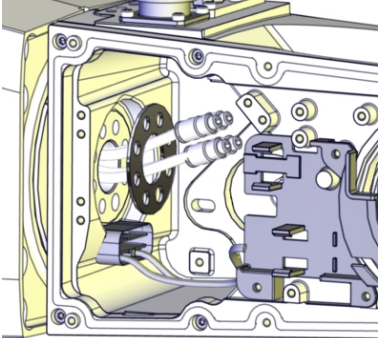
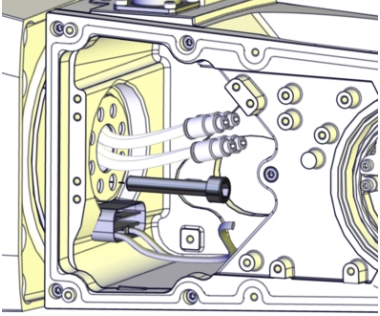

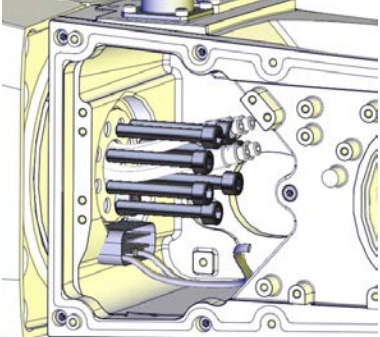

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Put the connectors and air hoses into the wrist carefully while at the same time refitting the wrist to the housing extender unit.</p> <p>Be careful not to damage the FPC cabling and the connectors.</p> <p> CAUTION</p> <p>Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.</p>  <p>xx1300002611</p>	 <p>xx1300002359</p>

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4 Repair

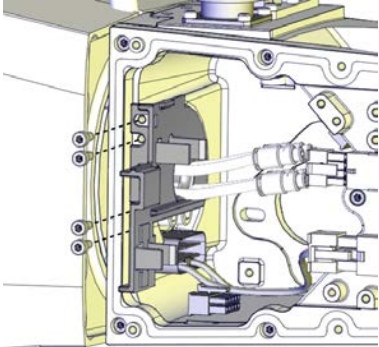

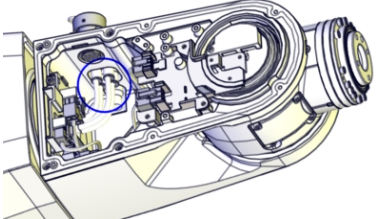
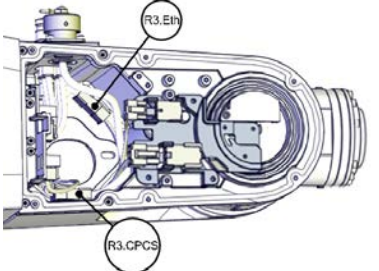
4.4.3 Replacing the tubular spare parts

Continued

	Action	Note
3	<p>Refit the washer while at the same time putting the cables through its center. Replace washer, if damaged.</p>	<p>Washer: 3HAC044869-001</p>  <p>xx1400000001</p>
4	<p>Refit the screw M6x35 (1 pc). Do not tighten yet.</p>	<p>Screw: 3HAB3409-238 (M6x35 (1 pc)).</p>  <p>xx1400000002</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
5	<p>Refit the rest of the screws (M5x35 (7 pcs)).</p>	<p>Screw: 3HAB3409-237 (M5x35 (7 pcs)).</p>  <p>xx1400000003</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
6	<p>Tighten all screws.</p>	<p>Tightening torque: 8 Nm.</p>

Continues on next page

4.4.3 Replacing the tubular spare parts Continued

	Action	Note
7	Put the cables through the plate hole and refit the plate.	<p>Tightening torque: 0.3 Nm.</p>  <p>xx1300002356</p>
8	<p>Reconnect the air hoses.</p> <p> CAUTION</p> <p>Make sure to connect the air hoses correctly, according to the marking on hoses and connectors.</p>	 <p>xx1300002355</p>
9	<p>Reconnect the connectors.</p> <ul style="list-style-type: none"> • R3.Eth • R3.CPCS 	 <p>xx1300002353</p>

Preparations before securing the axis-5 motor

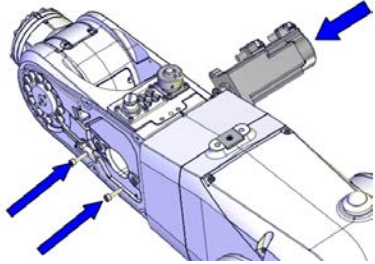

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Check that:</p> <ul style="list-style-type: none"> • all assembly surfaces are clean and without damages • the motor is clean and undamaged. 	

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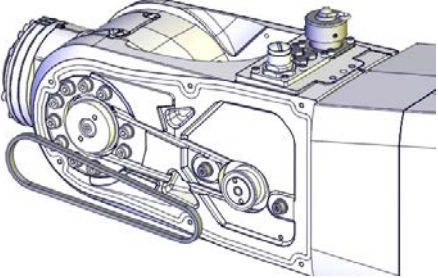

4 Repair

4.4.3 Replacing the tubular spare parts

Continued

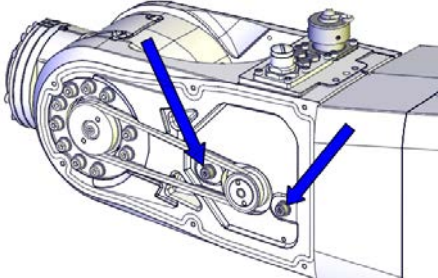
	Action	Note
3	Place the motor at its mounting position and fasten the attachment screws and washers just enough to still be able to move the motor.	<p>Screws: 3HAB3409-212 (M4x16).</p>  <p>xx1300002463</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

Securing the axis-5 motor and timing belt

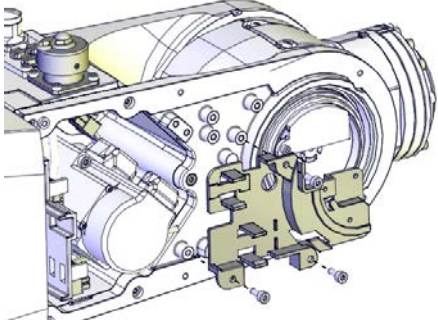
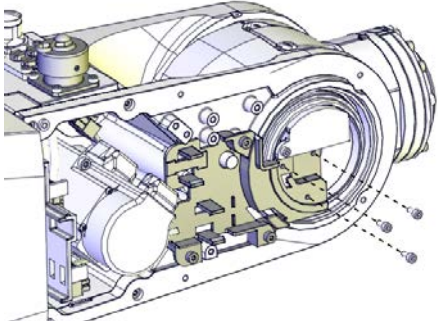
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	Refit the timing belt on the pulley.	 <p>xx1300002351</p>
3	Move the motor to a position where a good timing belt tension is reached (F = 26 N).	<p> Note</p> <p>Do not stretch the timing belt too much!</p>

Continues on next page

4.4.3 Replacing the tubular spare parts
Continued

	Action	Note
4	Secure the motor with its attachment screws.	 <p data-bbox="970 616 1082 633">xx1300002350</p> <p data-bbox="970 651 1270 680">Tightening torque: 3.5 Nm.</p>

Refitting the connector plate

	Action	Note
1	<p data-bbox="496 813 930 866">For robots with protection type Clean Room</p> <p data-bbox="496 873 936 902">For robots with food grade lubrication</p> <p data-bbox="496 909 962 938">For robots with protection type Hygienic</p> <p data-bbox="496 945 962 1021">Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	Refit the connector plate and secure with the M3 screws.	<p data-bbox="971 1041 1270 1070">Tightening torque: 0.3 Nm.</p>  <p data-bbox="970 1415 1082 1433">xx1400001401</p>
3	Secure the three M2.5 screws.	<p data-bbox="971 1473 1270 1503">Tightening torque: 0.3 Nm.</p>  <p data-bbox="970 1848 1082 1865">xx1400001402</p>

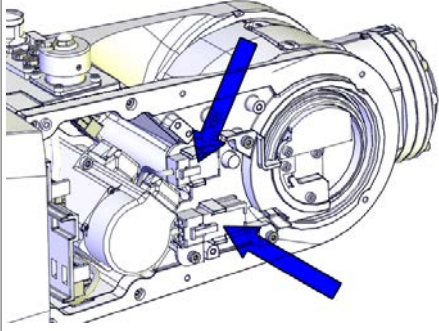
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4 Repair

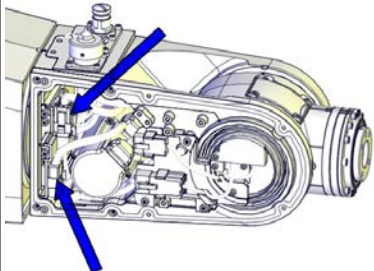
4.4.3 Replacing the tubular spare parts

Continued

Connecting the axis-5 motor FPC connectors

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Connect the axis-5 FPC connectors and snap them to their holders.</p>	 <p>xx1300002390</p>

Connecting the axis-5 motor connectors

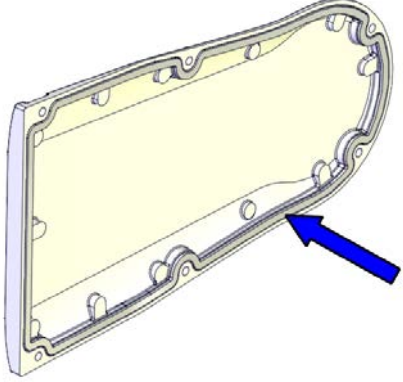
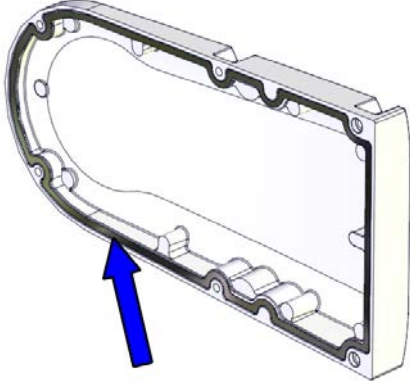
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Reconnect the motor cables.</p> <ul style="list-style-type: none"> • R3.MP5 • R3.ME5 	 <p>xx1300002360</p>

Refitting the wrist covers

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

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4.4.3 Replacing the tubular spare parts
Continued

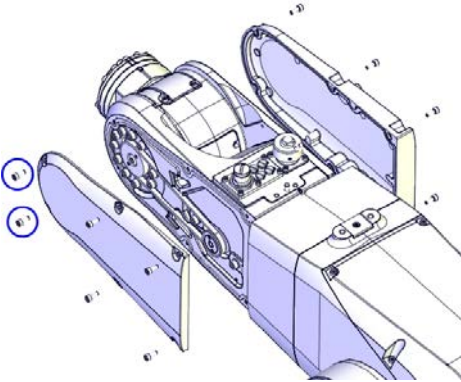
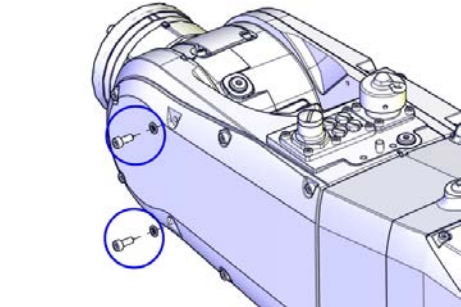


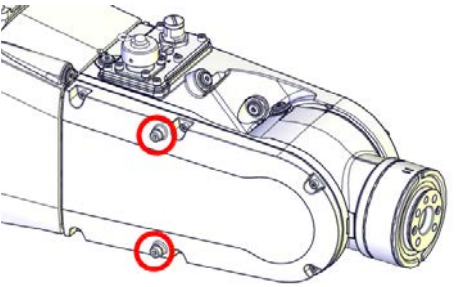
	Action	Note
2	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the tubular cover gasket. Replace if damaged.</p>	<p>Gasket for tubular cover: 3HAC058822-001 (not Hygienic robots) / 3HAC080709-001 (Hygienic robots)</p>  <p>xx140000034</p>
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the tubular cable housing cover gasket. Replace if damaged.</p>	<p>Gasket for tubular cable housing cover: 3HAC056707-001 (not Hygienic robots) / 3HAC080701-001 (Hygienic robots)</p>  <p>xx1400000345</p>

Continues on next page

4 Repair



4.4.3 Replacing the tubular spare parts

Continued

	Action	Note
4	<p>Refit the both covers to the wrist.</p> <p>For robots with protection class IP67 For robots with protection type Foundry Plus</p> <p>Apply locking liquid Loctite 243 to the two front screws on the left hand side cover, encircled in the figure.</p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p> <p>For robots with protection class IP67 For robots with protection type Foundry Plus</p>  <p>xx1300002349</p>
	<p>For robots with protection type Clean Room For robots with food grade lubrication</p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p>	<p>For robots with protection type Clean Room For robots with food grade lubrication</p>  <p>xx1600001153</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
	<p> Note</p> <p>For robots with protection type Hygienic</p> <p>Check the two extra screws on the tubular cover (right hand side cover), as encircled in the figure.</p> <p>Replace if damaged or missing.</p>	<p>For robots with protection type Hygienic</p>  <p>xx2100001406</p>

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Concluding procedures

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean, seal and paint the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160.</p> <p> Note</p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>	
2	Recalibrate the robot.	Calibration information is included in section Calibration on page 807 .
3	<p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

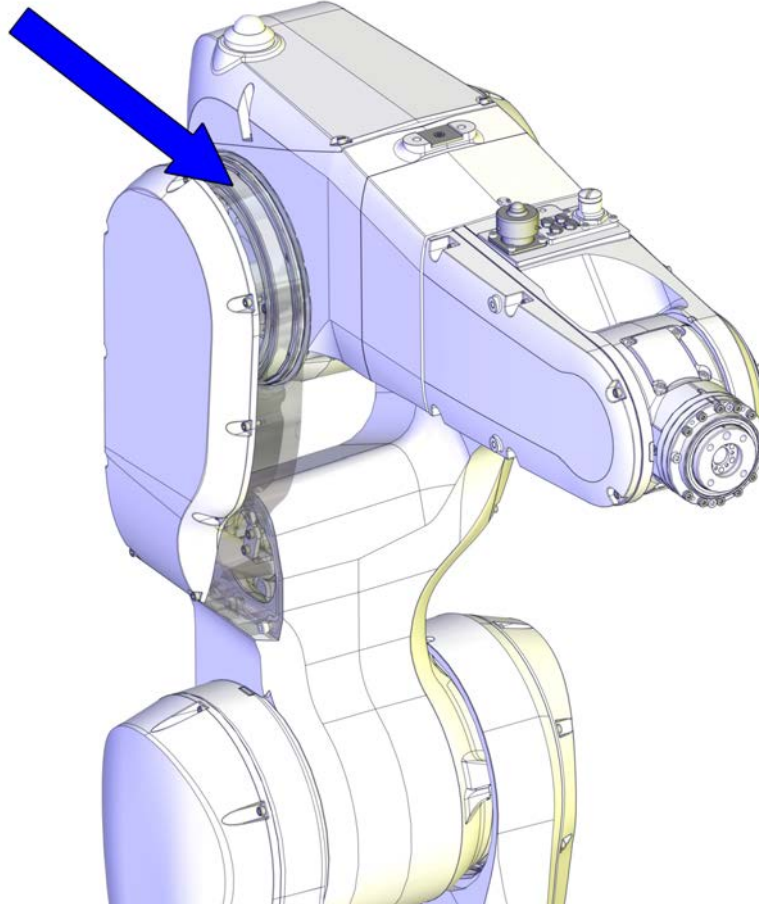
4 Repair

4.4.4 Replacing the axis-3 radial sealing and sealing ring

4.4.4 Replacing the axis-3 radial sealing and sealing ring

Location of the sealings

The axis-3 radial sealing and sealing ring are located as shown in the figure.



xx140000336

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Radial sealing	3HAC024865-001	Not used with protection class IP40. Replace if damaged.
M2 variseal sealing	3HAC044641-006	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.

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4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

Spare part	Article number	Note
Axis-3 sealing ring	3HAC044678-001	Replace if damaged.
Gasket on lower arm cable housing	3HAC044895-001 / 3HAC080696-001	Not used with protection class IP40. Replace if damaged.
Cable harness material set	3HAC049663-001	Includes brackets, sheets, distance screws, plastics, cable clamp, seal bolts and air protection in tubular.
Gasket on cable housing cover	3HAC056724-001 / 3HAC080702-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cable housing cover	3HAC056707-001 / 3HAC080701-001	Not used with protection class IP40. Replace if damaged.
Air connector set with Ethernet hole in flange	3HAC049664-001	Includes tubular flange, air connectors and seal bolts. Replace if damaged.
Air connector set without Ethernet hole in flange	3HAC049665-001	Includes tubular flange, air connectors and seal bolts. Replace if damaged.
Plate with connector set	3HAC079691-001	Used with protection type Hygienic. Includes Ethernet connector, air connectors, CP/CS connector and gasket (3HAC078804-001).
Plate without connector set	3HAC078810-001	Used with protection type Hygienic. Includes gasket (3HAC078804-001).
Gasket	3HAC078804-001	Used with protection type Hygienic. Replace if damage.

Required tools and equipment

Equipment, etc.	Article number	Note
Axis-3 sealing assembly tool set	3HAC049697-001	Used to refit the axis-3 radial sealing.
24 VDC power supply	-	Used to release the motor brakes.
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .

Required consumables

Consumable	Art. no.	Note
Cable straps	-	
Cleaning agent	-	Loctite 7063
Locking liquid	3HAB7116-1	Loctite 243

Continues on next page

4 Repair


4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

Consumable	Art. no.	Note
Sealant	12340011-116	Loctite 574 For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication.
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room For robots with food grade lubrication For robots with protection class IP67 For robots with protection type Foundry Plus
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

Action	Note
1 Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none"> Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	 Note Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in Reference calibration routine on page 821 .
If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

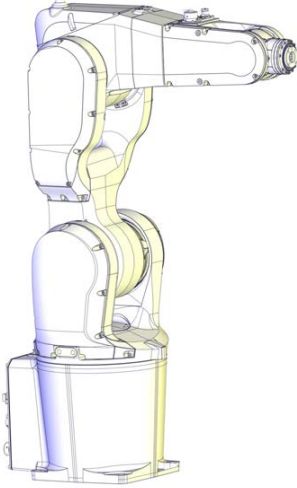


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4.4.4 Replacing the axis-3 radial sealing and sealing ring
Continued

Removing the sealings

Use these procedures to remove the axis-3 radial sealing and/or axis-3 sealing ring.

Preparations before removing the sealings

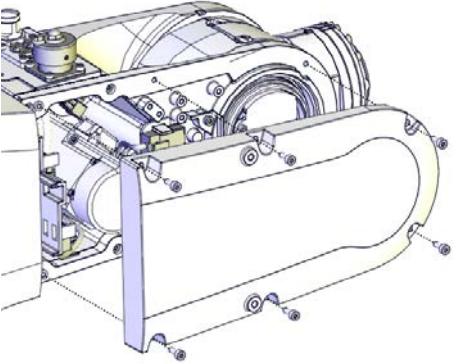
	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 <p>xx1300002581</p>
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
4	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.	

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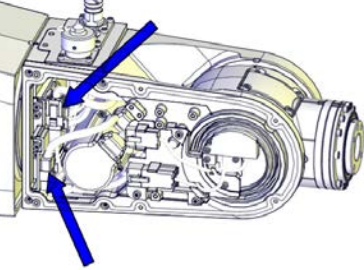
4 Repair

4.4.4 Replacing the axis-3 radial sealing and sealing ring


Continued

	Action	Note
5	Remove the wrist cover.	 <p data-bbox="943 703 1050 725">xx1300002389</p>

Disconnecting the axis-5 motor connectors


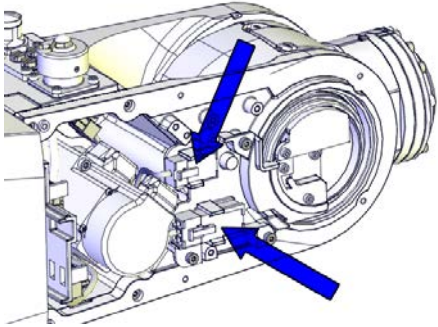
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Snap loose the motor connectors from their holders and then disconnect them. <ul style="list-style-type: none"> • R3.MP5 • R3.ME5  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 <p data-bbox="1034 1682 1141 1704">xx1300002360</p>

Disconnecting the axis-5 FPC connectors



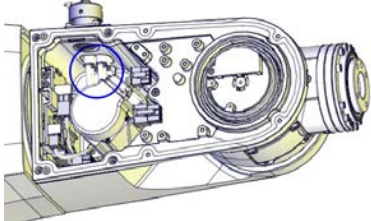
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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4.4.4 Replacing the axis-3 radial sealing and sealing ring
Continued

	Action	Note
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	
3	<p>Snap loose and disconnect the axis-5 FPC connectors.</p>	 <p>xx1300002390</p>

Disconnecting the air hoses and CP/CS cabling (if equipped)

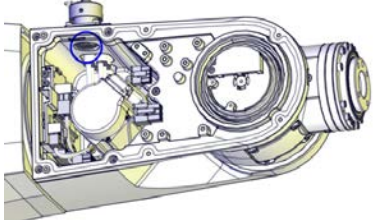
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	
3	<p>Disconnect the air hoses.</p>	 <p>xx1400000738</p>

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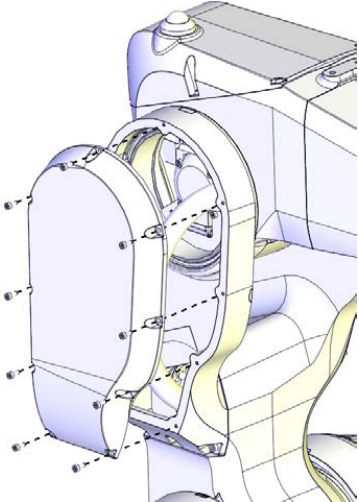
4 Repair

4.4.4 Replacing the axis-3 radial sealing and sealing ring

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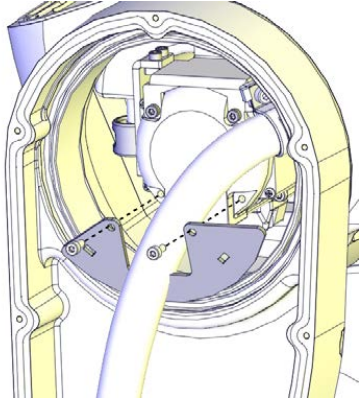
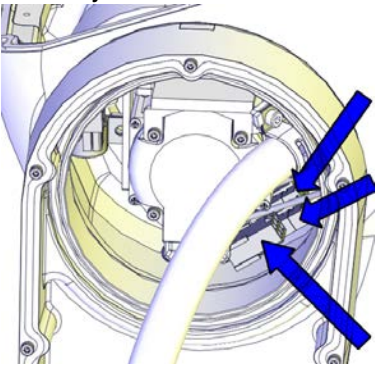
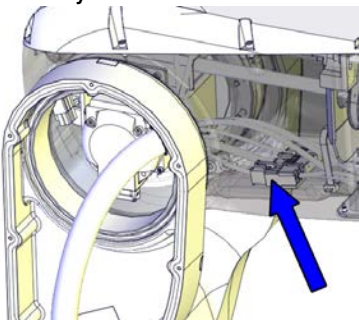
	Action	Note
4	If equipped, disconnect the CP/CS connector.	 xx1500000252

Disconnecting the axis-4 FPC connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Remove the cable housing cover.	 xx1300002400

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4.4.4 Replacing the axis-3 radial sealing and sealing ring
Continued

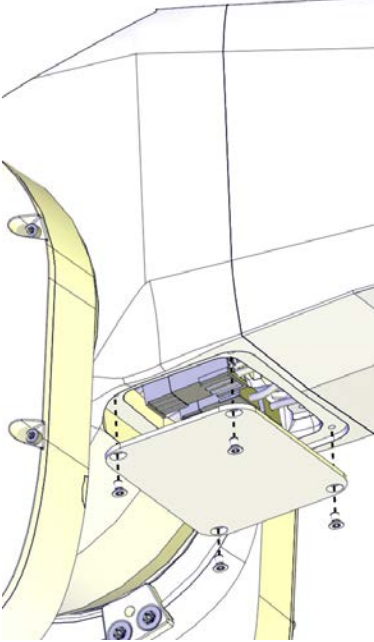
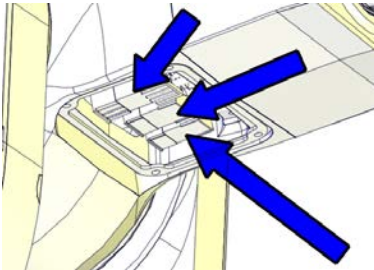
	Action	Note
4	Remove the plate.	 <p>xx1300002413</p>
5	Pull out the FPC connectors from the housing and disconnect them.	<p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p>

Continues on next page



4 Repair

4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

	Action	Note
6	Remove the small cover of the housing.	 <p>xx1300002398</p>
7	Disconnect the remaining FPC connectors.	 <p>xx1300002399</p>


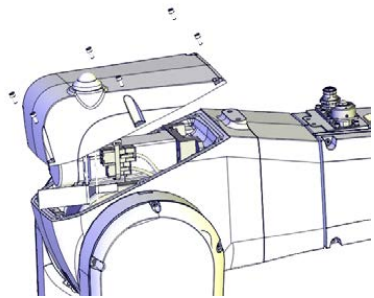
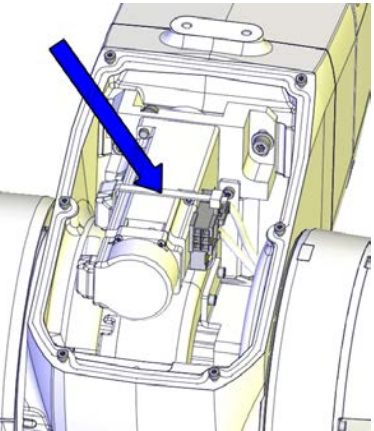

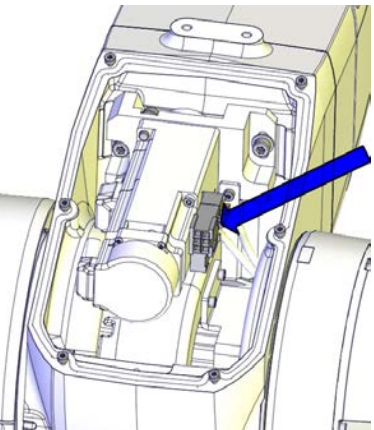
Disconnecting the axis-4 motor connectors

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	


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4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

	Action	Note
3	<p>Remove the cover from the upper arm housing.</p> <p> CAUTION</p> <p>For robots with safety lamp (option) Be aware of the signal lamp cables that are attached inside the housing! Disconnect the lamp cable connectors R3.H1 and R3.H2 and then lift away the cover completely.</p>	 <p>xx1300000456</p>
4	<p>Cut the strap that holds the connectors.</p>	 <p>xx1300002494</p>
5	<p>Disconnect the motor connectors.</p> <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx1300002495</p>

Disconnecting the axis-3 motor connectors


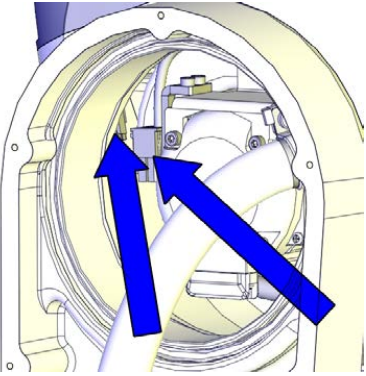
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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4 Repair

4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

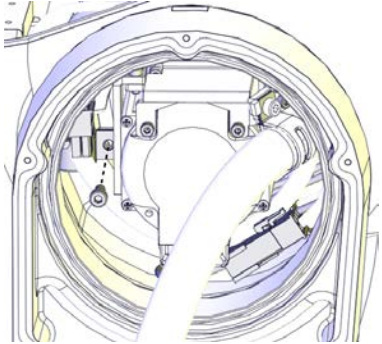
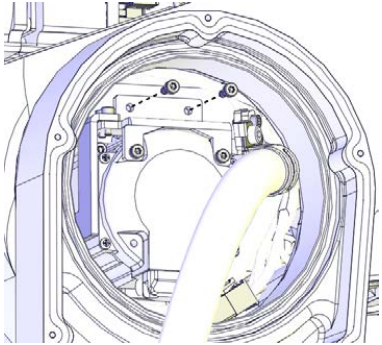
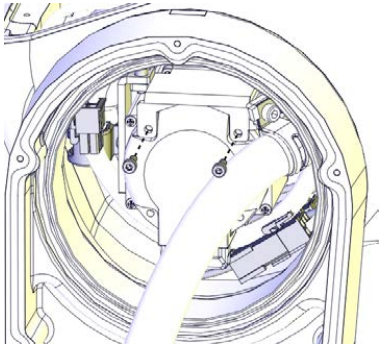

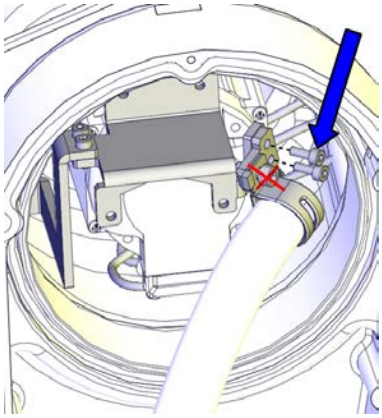
	Action	Note
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	
3	<p>Pull out the axis-3 motor connectors from the housing and disconnect them.</p>	 <p>xx1300002420</p>

Removing the cable package in the housing

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	

Continues on next page

4.4.4 Replacing the axis-3 radial sealing and sealing ring
Continued

	Action	Note
3	Remove the screw that fastens the air hose holder.	 <p>xx1300002422</p>
4	Remove the screws that fasten the fix sheet to the inner plastic guide.	 <p>xx1300002421</p>
5	Remove the screws that fasten the fix sheet to the motor.	 <p>xx1300002423</p>
6	<p>Pull out the fix sheet a bit, to access the screws that fasten the cable bracket to the sheet. Loosen the bracket from the sheet by removing the two screws.</p> <p> CAUTION</p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>	 <p>xx1300002424</p>

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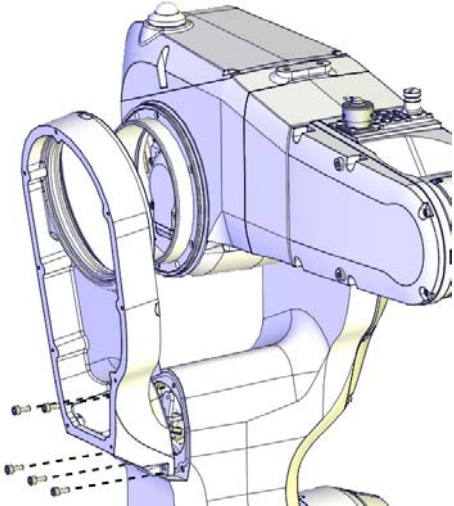
4 Repair

4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

	Action	Note
7	Valid for IRB 1200-5/0.9 Cut the cable straps at the bottom of the housing.	

Removing the lower arm cable housing



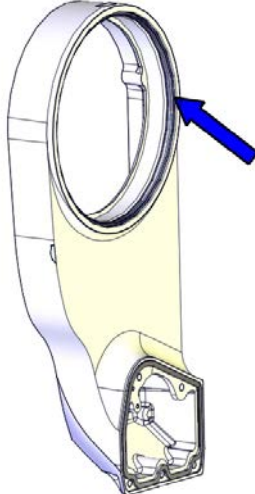
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.	
3	Pull the cable harness out from the upper arm housing.	
4	Remove the cable housing of the lower arm by removing the screws.	 <p>xx1300002529</p>

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4.4.4 Replacing the axis-3 radial sealing and sealing ring
Continued

Removing the axis-3 radial sealing

Use this procedure if the axis-3 radial sealing is to be removed.

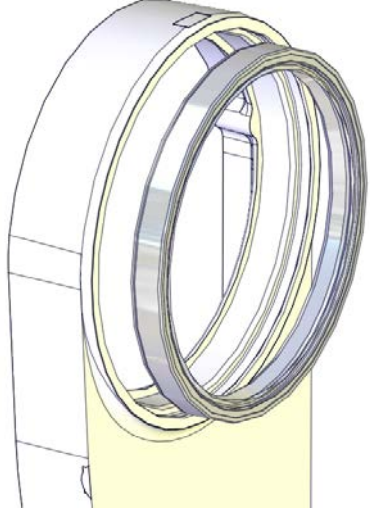
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	For robots with protection class IP67 For robots with protection type Foundry Plus Remove the M2 variseal sealing.	 <p>xx140000473</p>

Continues on next page

4 Repair



4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

	Action	Note
4	Remove the axis-3 radial sealing.	 <p>xx140000334</p>

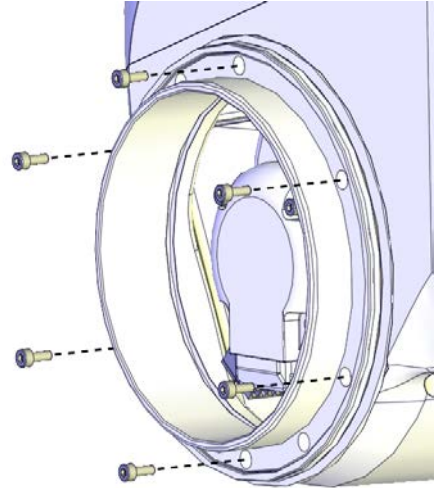
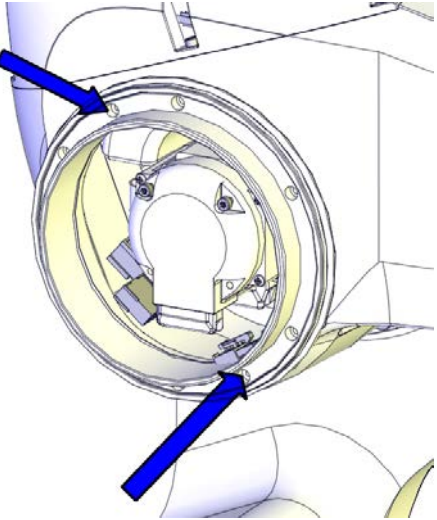
Removing the axis-3 sealing ring

Use this procedure if the axis-3 sealing ring is to be removed.

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	

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4.4.4 Replacing the axis-3 radial sealing and sealing ring
Continued

	Action	Note
3	Remove the screws.	 <p>xx140000332</p>
4	Use screws in the two press out holes to press the sealing ring out.	 <p>xx140000333</p>

Refitting the sealings

Use these procedures to refit the axis-3 radial sealing and/or axis-3 sealing ring.

Refitting the axis-3 sealing ring

Use this procedure if the axis-3 sealing ring needs to be refitted.


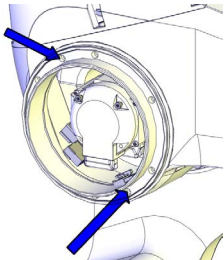
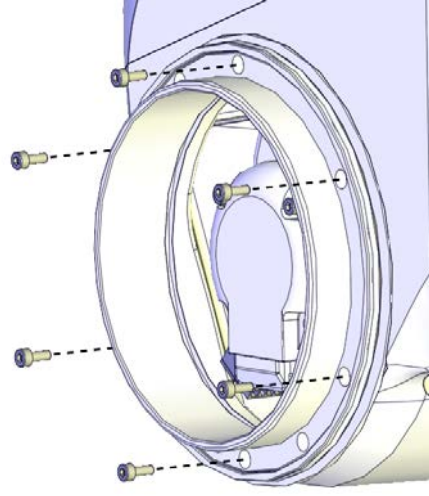
	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

Continues on next page

4 Repair

4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

	Action	Note
2	<p>For robots with protection class IP67 For robots with protection type Foundry Plus</p> <p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing Loctite 574 on the mounting surfaces of the sealing ring.</p>	
3	<p>Refit the axis-3 sealing ring by securing the screws.</p> <p> Note</p> <p>Make sure to use the correct screw holes. The two holes shown in the figure are only used for pressing out the ring during removal.</p>  <p>xx140000333</p>	<p>Tightening torque: 1.5 Nm</p>  <p>xx140000332</p>

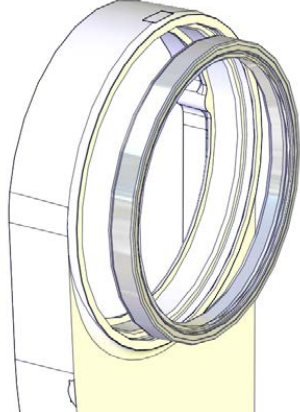
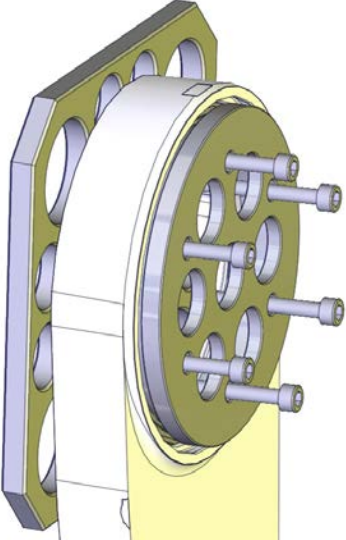
Refitting the axis-3 radial sealing

Use this procedure if the axis-3 radial sealing needs to be refitted.

	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p>	

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4.4.4 Replacing the axis-3 radial sealing and sealing ring
Continued

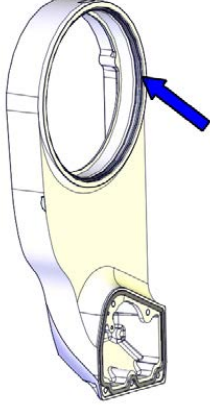
	Action	Note
3	Fit the axis-3 radial sealing to the cable housing.	Radial sealing: 3HAC024865-001  xx1400000334
4	Put the assembly tool on both sides of the cable housing, circular part against the sealing, and then slowly press the sealing into the housing by screwing the six screws (M6X50) into the plate little by little. Fit the circular part of the radial sealing fitting tool against the radial sealing.	Axis-3 sealing assembly tool set: 3HAC049697-001  xx1400000335
5	Fit the tool plate to the other side of the cable housing with the six screws M6X50.	
6	Screw the screws, little by little, to press the sealing into place.	
7	Remove the assembly tool.	

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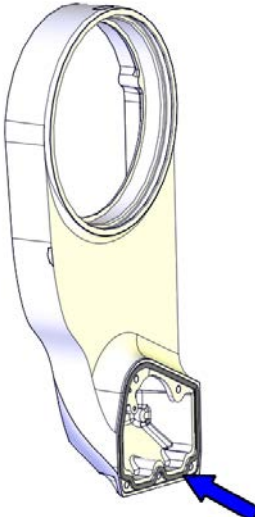
4 Repair

4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued



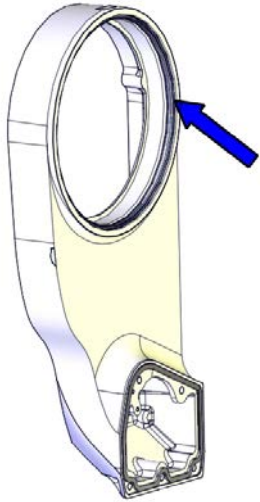
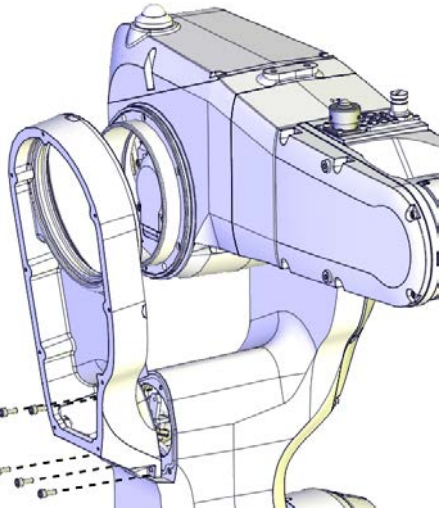
	Action	Note
8	<p>For robots with protection class IP67 For robots with protection type Foundry Plus Fit a new M2 variseal sealing.</p>	<p>M2 variseal sealing: 3HAC044641-006</p>  <p>xx1400000473</p>
9	<p>Check that the sealings are undamaged and properly fitted.</p>	

Refitting the lower arm cable housing

	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the cable housing gasket. Replace if damaged.</p>	<p>Gasket on lower arm cable housing: 3HAC044895-001 (not Hygienic robots) / 3HAC080696-001 (Hygienic robots)</p>  <p>xx1400000414</p>

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4.4.4 Replacing the axis-3 radial sealing and sealing ring
Continued


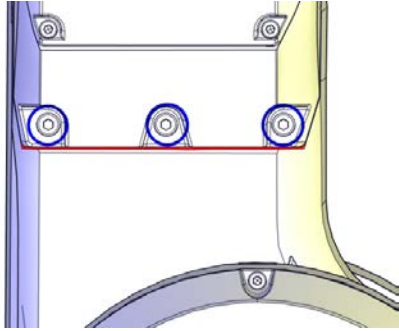
	Action	Note
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the radial sealing and the M2 variseal sealing. Replace if damaged.</p> <p> CAUTION</p> <p>Do not fit M2 variseal sealing on Clean Room, food grade lubrication and Hygienic robots.</p> <p> Note</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p>	<p>Radial sealing: 3HAC024865-001 M2 variseal sealing: 3HAC044641-006</p>  <p>xx140000473</p> <p>Replacement of the radial sealing is detailed in previous section.</p>
4	<p>Refit the cable housing of the lower arm.</p>	<p>Tightening torque: 4 Nm.</p>  <p>xx1300002529</p>

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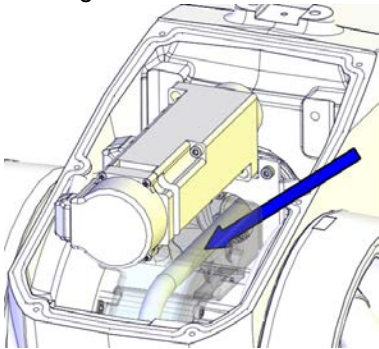
4 Repair

4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued



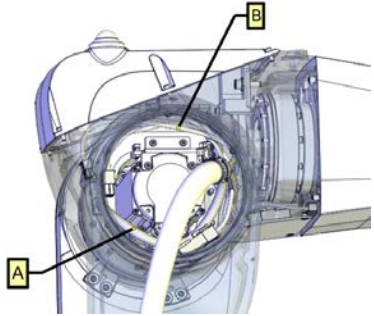

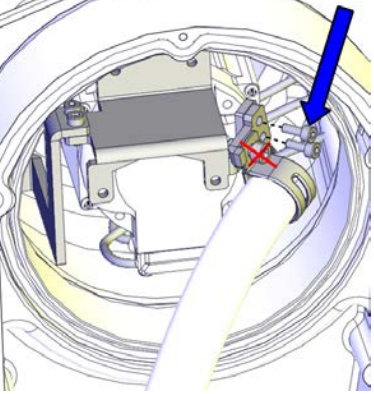
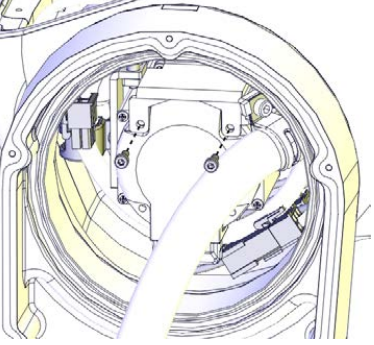
	Action	Note
5	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Apply a string of the sealant to the joint of the cable housing of the lower arm.</p> <p>Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p> <p> Note</p> <p>No sealing is required in the cavities of the three lower screws highlighted with a ring in the figure.</p>	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication Sealant, SikaFlex 521FC</p> <p>For robots with protection type Hygienic Sealant, Trans Clear</p>  <p>xx160000218</p>

Refitting the cable package in the housing

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Before guiding the cable package into the housing and upper arm, apply grease to the cable package, to the area going into the upper arm, shown in the figure. Cover all moving area of the package.</p>	<p>Area to be lubricated, shown in cable package already fitted to the housing.</p>  <p>xx1400000483</p>

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4.4.4 Replacing the axis-3 radial sealing and sealing ring
Continued

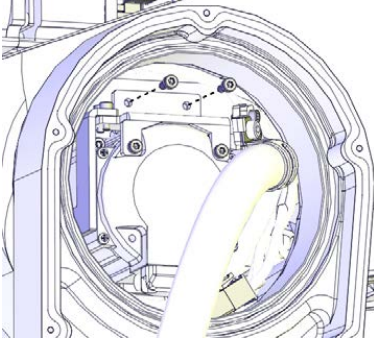

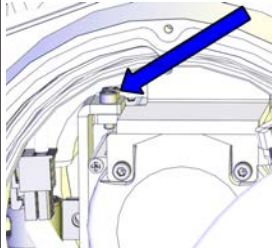
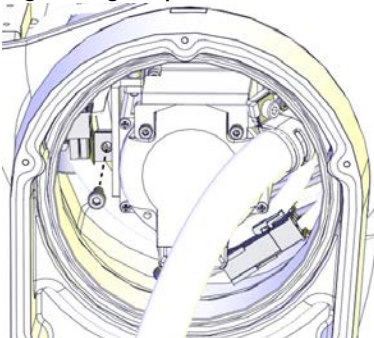
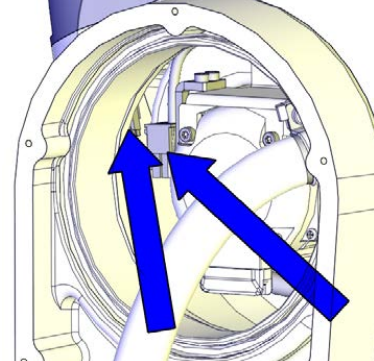
	Action	Note
3	<p>Guide the cable package into the upper arm, through the housing.</p> <p> Note</p> <p>Guide the air hoses (A) underneath the bottom side of the axis-3 motor and the axis-3 motor cables (B) on top of the motor, see cable layout figure. The fix point of the air hoses is pre-determined (marked) and must be matched against the air hose holder on the left side of the axis-3 motor.</p> <p> Note</p> <p>The air hose holder keeps the air hoses arranged in an optimized way. It is necessary to keep the air hose holder vertically and firmly against the left side of the axis-3 motor.</p>	 <p>xx1400001472</p>
4	<p>Refit the bracket to the sheet with two screws.</p> <p> CAUTION</p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002424</p>
5	<p>Refit the fix sheet to the motor.</p>	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002423</p>

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4 Repair

4.4.4 Replacing the axis-3 radial sealing and sealing ring

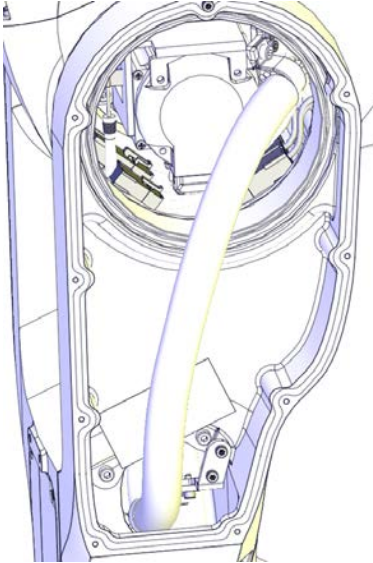
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	Action	Note
6	Refit the fix sheet to the inner plastic guide.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002421</p>
7	<p>Fit the air hose holder to the bracket. Replace the holder, if damaged.</p> <p> Tip</p> <p>If the air hose holder is difficult to fit, firstly remove the bracket from the fix sheet by removing the two M3 screws. Fit the holder to the bracket and then refit the complete assembly to the fix sheet again. Tightening torque for the two M3 screws: 1.5 Nm.</p>  <p>xx1400001133</p>	<p>Air hose holders are included in Cable harness material set (3HAC049663-001). Tightening torque: 4 Nm.</p>  <p>xx1300002422</p>
8	Reconnect the axis-3 motor connectors.	 <p>xx1300002420</p>

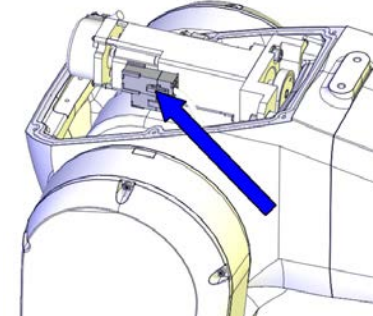
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4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

	Action	Note
9	Apply grease to the cable package, cover all moving area of the package.	 <p>xx140000754</p>
10	Valid for IRB 1200-5/0.9 Secure the cable package at the bottom of the housing with cable straps.	

Connecting the axis-4 motor connectors

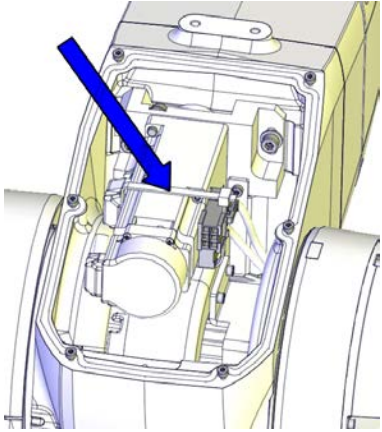
	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the motor connectors.	 <p>xx1300002371</p>

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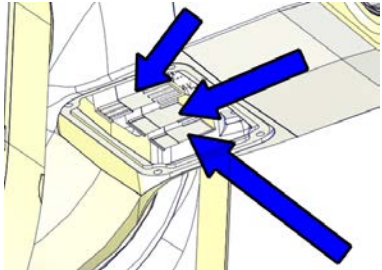
4 Repair

4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued


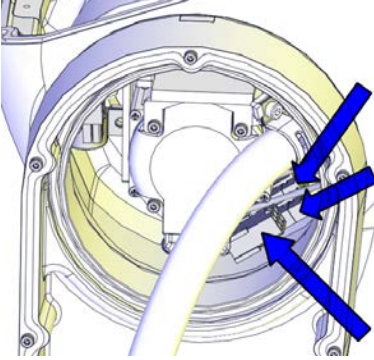
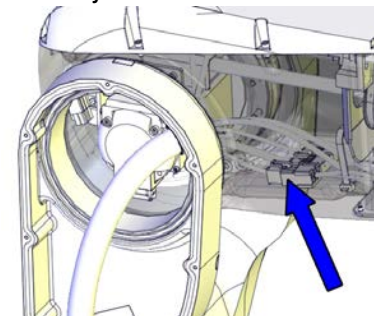
	Action	Note
3	Secure the connectors to the motor with a cable strap.	 xx1300002494

Connecting the axis-4 FPC connectors

	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the FPC connectors.  Tip See the number markings on the connectors for help to find the corresponding connector.	 xx1300002399

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4.4.4 Replacing the axis-3 radial sealing and sealing ring
Continued

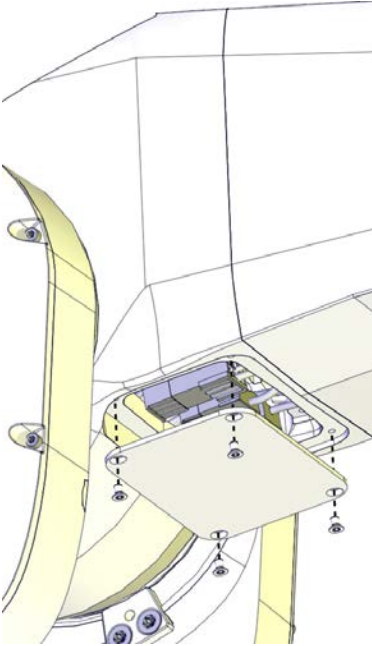
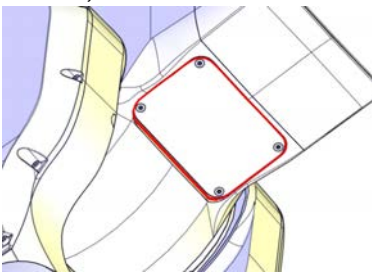
	Action	Note
3	<p>Reconnect the FPC connectors and push them into place inside the housing.</p> <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	<p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p>
4	<p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p>	

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4 Repair

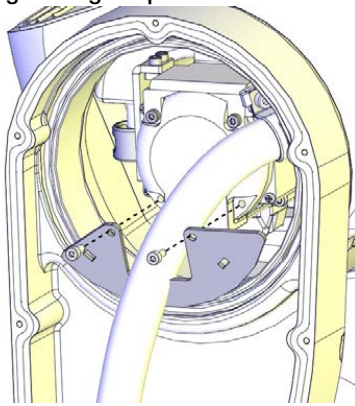
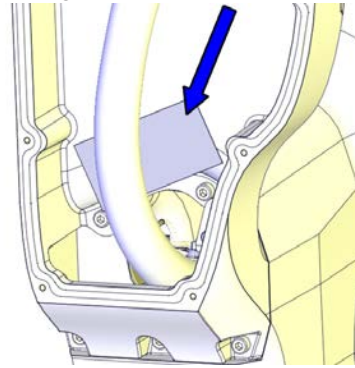
4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

	Action	Note
5	<p>For robots with protection class IP67 For robots with protection type Foundry Plus Apply flange sealing Sikaflex 521FC on the mounting surfaces of the small cover on the housing.</p>	
6	<p>Refit the small cover to the housing. Replace if damaged.</p>	<p>xx1300002398</p> <p>Housing small cover: 3HAC059684-001 Housing small cover, Clean Room Housing small cover, food grade lubrication Housing small cover, Hygienic : 3HAC056142-001 Screws: 3HAC14286-4 (M3X5). Tightening torque: 1 Nm.</p>
7	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Apply a string of the sealant to the joint of the small cover on the housing. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.</p>	<p>For robots with protection type Clean Room For robots with food grade lubrication Sealant, SikaFlex 521FC For robots with protection type Hygienic Sealant, Trans Clear</p>  <p>xx1600000214</p>

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4.4.4 Replacing the axis-3 radial sealing and sealing ring
Continued

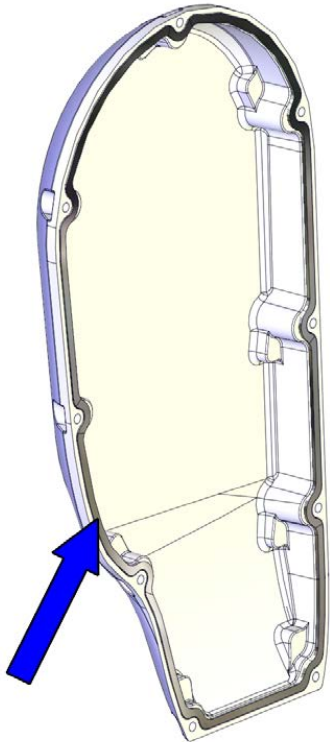
	Action	Note
8	Refit the plate.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002413</p>
9	Check the PTFE film on the cable housing. Replace if damaged.	<p>PTFE film on lower arm cable housing: 3HAC044710-001</p>  <p>xx1400000740</p>

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4 Repair

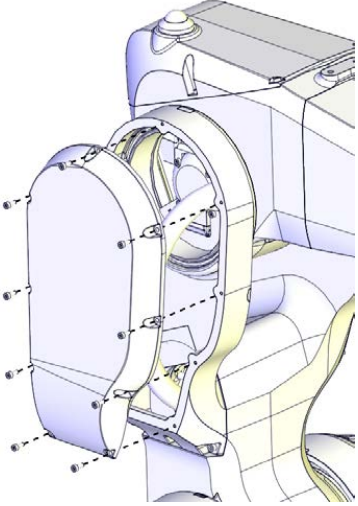

4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

	Action	Note
10	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the gasket of the cable housing cover. Replace if damaged.</p>	<p>Gasket on cable housing cover: 3HAC056724-001 (not Hygienic robots) / 3HAC080702-001 (Hygienic robots) PTFE film on cable housing cover: 3HAC044660-001</p>  <p>xx140000048</p>
11	<p>Check the PTFE film on the cable housing cover. Replace if damaged.</p>	
12	<p>Apply grease to the inner surface of the cable housing cover and the PTFE film surface.</p>	

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4.4.4 Replacing the axis-3 radial sealing and sealing ring
Continued

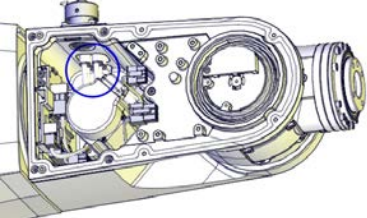
	Action	Note
13	<p>Refit the cable housing cover.</p> <p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Apply locking liquid Loctite 243 to all the screws securing the cover.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm</p>  <p>xx1300002400</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

Connecting the air hoses and CP/CS cabling (if equipped)

Notice that the procedure differs depending on the protection class and protection type.

Connecting the air hoses and CP/CS cabling on robots not in protection type Hygienic

Use this procedure if the robot is not in protection type Hygienic.

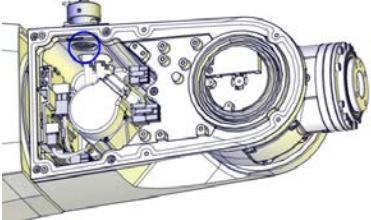
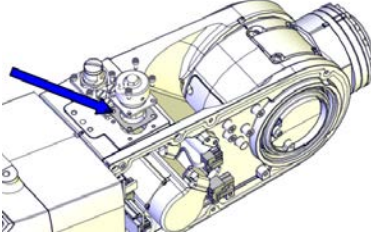
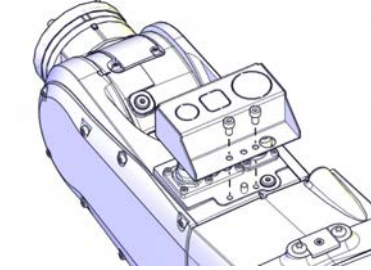
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Reconnect the air hoses.</p> <p>Replace the air hose connector set if damaged.</p>	<p>Air connector set with Ethernet hole in flange: 3HAC049664-001</p> <p>Air connector set without Ethernet hole in flange: 3HAC049665-001</p>  <p>xx1400000738</p>

Continues on next page

4 Repair

4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

	Action	Note
3	<p>If equipped, reconnect the CP/CS connector.</p> <p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <ol style="list-style-type: none"> 1 Check the gasket. 2 Replace if damaged. <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <ol style="list-style-type: none"> 1 Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. 2 Apply flange sealing Loctite 574 on the mounting surfaces of the CP/CS connector and wipe clean if there is any overflowing Loctite 574. 	 <p>xx1500000252</p> <p>On robots with protection class IP67</p> <p>On robots with protection type Foundry Plus</p> <p>Gasket: 3HAC058567-001</p>  <p>xx1500000251</p>
4	<p>For robots with protection type Foundry Plus</p> <p>If required, fit the protection bracket for CP/CS connectors.</p>	<p>Protection bracket for CP/CS connectors: 3HAC058350-001</p>  <p>xx1600001152</p>

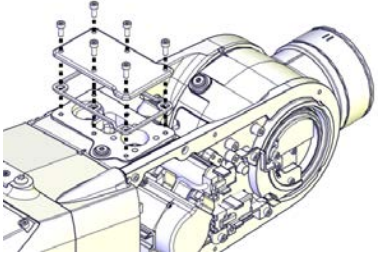
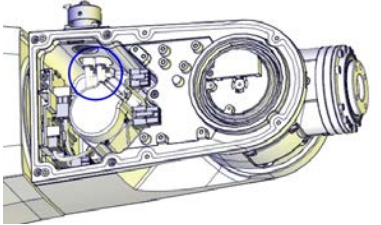
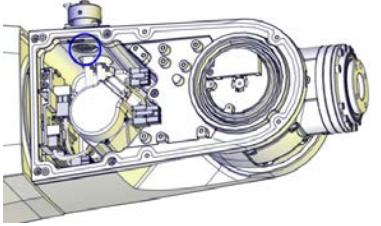
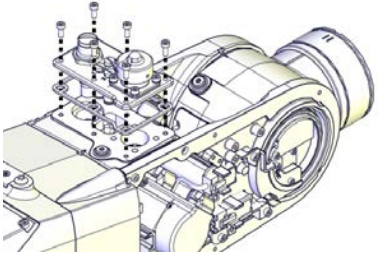
Connecting the air hoses and CP/CS cabling on robots in protection type Hygienic

Use this procedure if the robot is with protection type Hygienic.

	Action	Note
1	<p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

Continues on next page

4.4.4 Replacing the axis-3 radial sealing and sealing ring
Continued

	Action	Note
2	<p>If the Hygienic robot not equipped with air hoses and CP/CS cabling: Check the plate without connector set and the attached gasket. Replace if damaged.</p>	<p>Plate without connector set: 3HAC078810-001 Gasket: 3HAC078804-001</p>  <p>xx2100001433</p>
3	<p>Reconnect the air hoses.</p>	 <p>xx1400000738</p>
4	<p>Reconnect the CP/CS cabling.</p>	 <p>xx1500000252</p>
5	<p>Check the connectors on the plate with connector set and the attached gasket. Replace if damaged.</p>	<p>Plate with connector set: 3HAC079691-001 Gasket: 3HAC078804-001</p>  <p>xx2100001434</p>

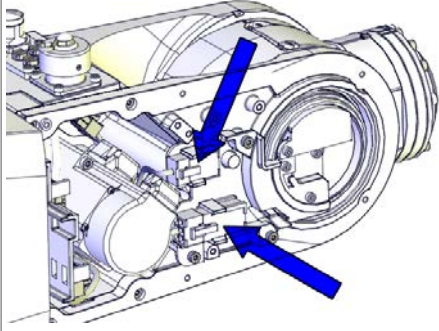
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4 Repair

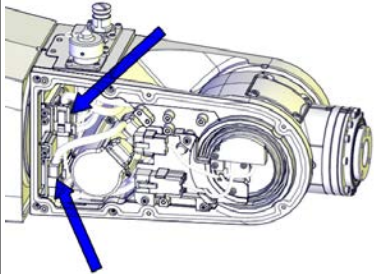
4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

Connecting the axis-5 motor FPC connectors

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Connect the axis-5 FPC connectors and snap them to their holders.</p>	 <p>xx1300002390</p>

Connecting the axis-5 motor connectors

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Reconnect the motor cables.</p> <ul style="list-style-type: none"> • R3.MP5 • R3.ME5 	 <p>xx1300002360</p>

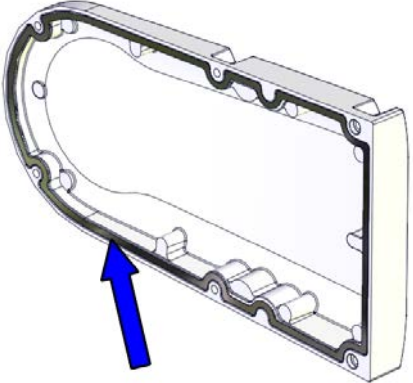
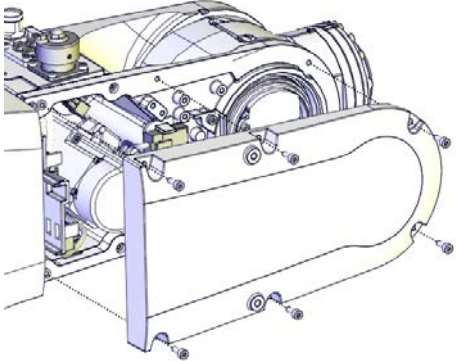

Refitting the tubular cable housing cover

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

Continues on next page

4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

	Action	Note
2	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the tubular cable housing cover gasket. Replace if damaged.</p>	<p>Gasket for tubular cable housing cover: 3HAC056707-001 (not Hygienic robots) / 3HAC080701-001 (Hygienic robots)</p>  <p>xx140000345</p>
3	<p>Refit the cover to the cable housing.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p>  <p>xx1300002389</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

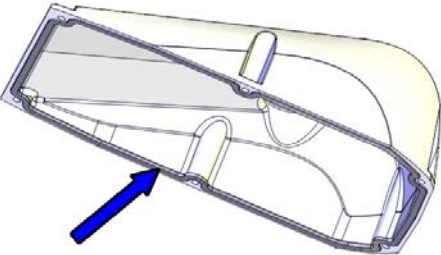

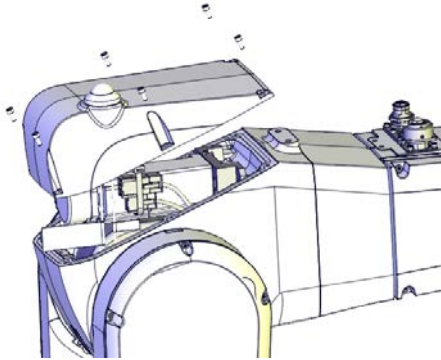

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4 Repair

4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

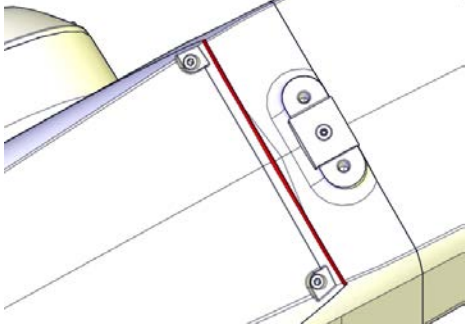


Concluding procedure

	Action	Note
1	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication</p> <p>Check the gasket. Replace if damaged.</p>	<p>Housing cover gasket (IRB 1200-7/0.7): 3HAC056698-001 (not Hygienic robots) / 3HAC080700-001 (Hygienic robots)</p> <p>Housing cover gasket (IRB 1200-5/0.9): 3HAC056697-001 (not Hygienic robots) / 3HAC080699-001 (Hygienic robots)</p>  <p>xx1400000477</p>
2	<p>Refit the upper arm housing cover with the screws.</p> <p> CAUTION</p> <p>For robots with safety lamp (option) Reconnect the lamp cable connectors R3.H1 and R3.H2 and then secure the cover.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p>  <p>xx1300000456</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

Continues on next page

4.4.4 Replacing the axis-3 radial sealing and sealing ring

Continued

	Action	Note
3	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Apply a string of the sealant to the joint of the upper arm housing cover.</p> <p>Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p>	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication Sealant, SikaFlex 521FC</p> <p>For robots with protection type Hygienic Sealant, Trans Clear</p>  <p>xx1600000215</p>
4	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean, seal and paint the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160.</p> <p> Note</p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>	
5	Recalibrate the robot.	Calibration information is included in section Calibration on page 807 .
6	<p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

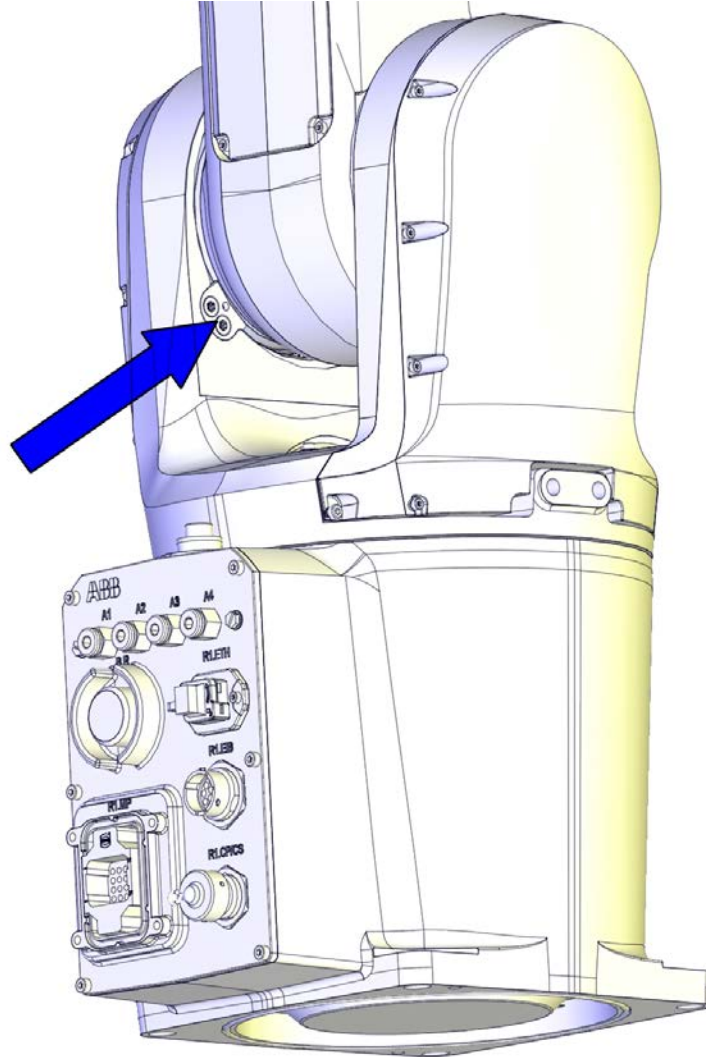
4 Repair

4.4.5 Replacing the axis-2 mechanical stop

4.4.5 Replacing the axis-2 mechanical stop

Location of the mechanical stop

The axis-2 mechanical stop is located as shown in the figure.



xx140000389

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Mechanical stop set, axis 2	3HAC049637-001	Includes mechanical stop pin (1 pc) and screws.

Continues on next page



Required tools and equipment

Equipment, etc.	Article number	Note
24 VDC power supply	-	Used to release the motor brakes.
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .


Replacing the mechanical stop

Use these procedures to remove the axis-2 mechanical stop.

Preparations before removing the mechanical stop

	Action	Note
1	Jog the robot to a position where the mechanical stop is most easily accessed.	
2	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
3	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	

Replacing the axis-2 mechanical stop


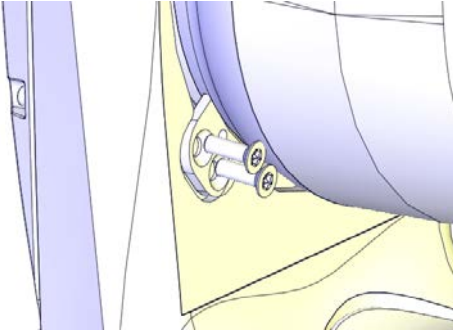



	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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4 Repair

4.4.5 Replacing the axis-2 mechanical stop

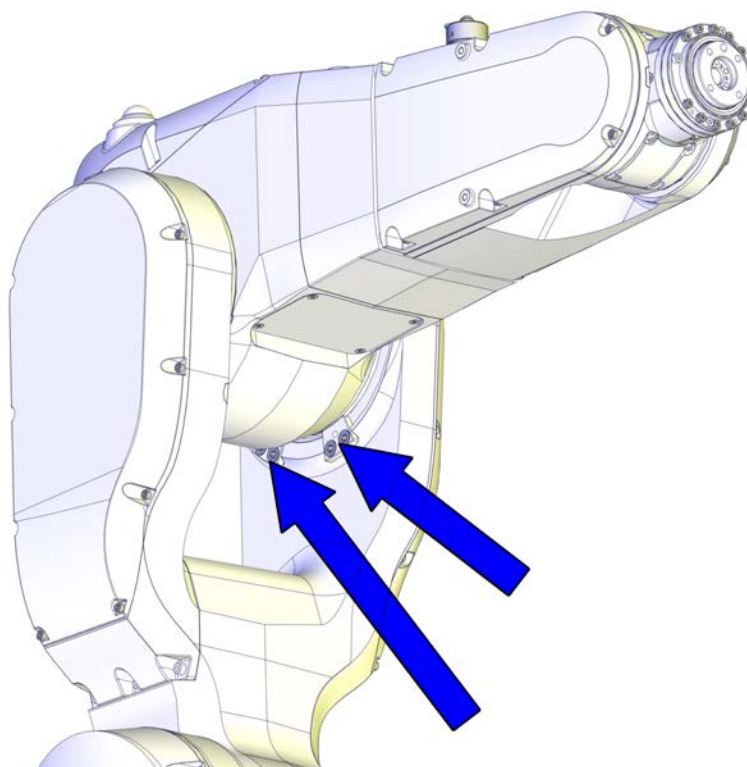
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	Action	Note
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	Remove the mechanical stop by removing the screws.	
4	Discard the old screws.	
5	Refit and secure the new stop with the enclosed screws.	
6	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean, seal and paint the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160.</p> <p> Note</p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>	<p>xx1400000390</p> <p>Screws: 9ADA624-45 (M5x16). Tightening torque: 4 Nm.</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
7	<p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

4.4.6 Replacing the axis-3 mechanical stop

Location of the mechanical stop

The axis-3 mechanical stop is located as shown in the figure.



xx1400000386

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Mechanical stop set, axis 3	3HAC049644-001	Includes mechanical stop pin (1 pc) and screws.

Required tools and equipment

Equipment, etc.	Article number	Note
24 VDC power supply	-	Used to release the motor brakes.
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .

Continues on next page

4 Repair



4.4.6 Replacing the axis-3 mechanical stop

Continued



Replacing the mechanical stop

Use these procedures to replace the axis-3 mechanical stop.

Preparations before removing the mechanical stop

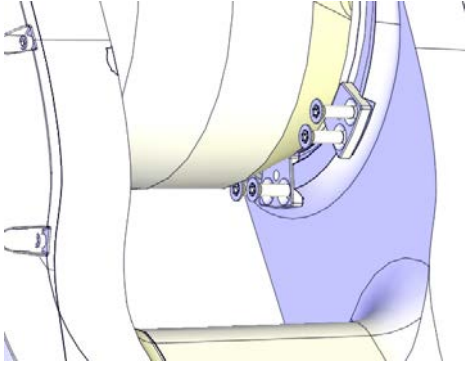



	Action	Note
1	Jog the robot to a position where the mechanical stops are most easily accessed.	
2	 DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
3	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.	

Replacing the axis-3 mechanical stop

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.	

Continues on next page

4.4.6 Replacing the axis-3 mechanical stop
Continued

	Action	Note	
3	Remove the mechanical stop to be replaced by removing the screws.	 <p data-bbox="970 678 1082 696">xx140000387</p> <p data-bbox="970 714 1313 743">Screws: 9ADA624-45 (M5x16).</p> <p data-bbox="970 748 1243 777">Tightening torque: 4 Nm</p> <p data-bbox="975 792 1034 853"> Note</p> <p data-bbox="970 866 1430 920">Only use specified screws, never replace them with other screws.</p>	
4	Discard the old screws.		
5	Refit and secure the new stop with the enclosed screws.		
6	<p data-bbox="496 949 930 1003">For robots with protection type Clean Room</p> <p data-bbox="496 1010 936 1039">For robots with food grade lubrication</p> <p data-bbox="496 1046 963 1075">For robots with protection type Hygienic Clean, seal and paint the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160.</p> <p data-bbox="501 1209 560 1270"> Note</p> <p data-bbox="496 1279 963 1332">After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>		
7	<p data-bbox="501 1375 571 1444"> DANGER</p> <p data-bbox="496 1456 963 1509">Make sure all safety requirements are met when performing the first test run.</p>		

4 Repair

4.4.7 Replacing the axis-4 mechanical stop

4.4.7 Replacing the axis-4 mechanical stop

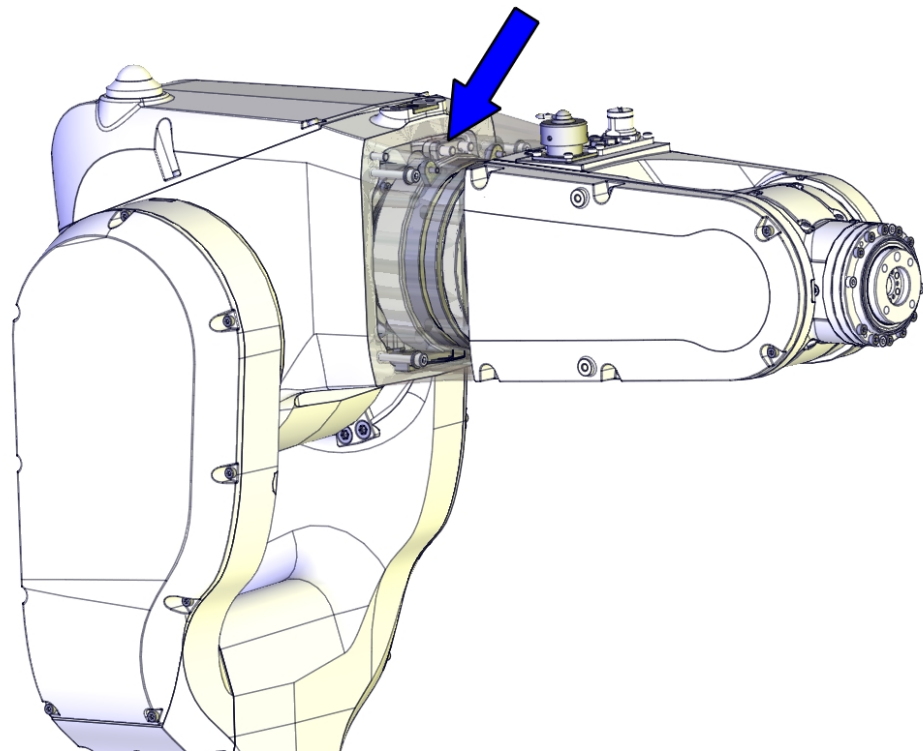


WARNING

The mechanical stop needs to be inspected immediately if it gets hit. Replace the mechanical stop if damage is detected. Access to and inspection of the stop requires disassembly of the robot according to this section.

Location of the mechanical stop

The axis-4 mechanical stop is located inside the housing extender unit, as shown in the figure.



xx1300002416

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Mechanical stop set	3HAC049652-001	Includes mechanical stop pin, guide, slider and screws.

Continues on next page

4.4.7 Replacing the axis-4 mechanical stop
Continued

Spare part	Article number	Note
M2 variseal sealing	3HAC044641-007	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
Radial sealing with dust lip	3HAB3701-48	Not used with protection class IP40. Replace if damaged.
Housing small cover	3HAC059684-001	Replace if damaged.
Housing small cover, Clean Room Housing small cover, food grade lubrication Housing small cover, Hygienic	3HAC056142-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
PTFE film on lower arm cable housing	3HAC044710-001	Replace if damaged.
Gasket on cable housing cover	3HAC056724-001 / 3HAC080702-001	Not used with protection class IP40. Replace if damaged.
PTFE film on cable housing cover	3HAC044660-001	Replace if damaged.
Washer	3HAC044869-001	Replace if damaged
Gasket for tubular cover	3HAC058822-001 / 3HAC080709-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cable housing cover	3HAC056707-001 / 3HAC080701-001	Not used with protection class IP40. Replace if damaged.

Required tools and equipment

Equipment, etc.	Article number	Note
Axis-4 sealing assembly tool set	3HAC049699-001	Used to refit the radial sealing, if replacement is needed.
24 VDC power supply	-	Used to release the motor brakes.
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .

Required consumables

Consumable	Art. no.	Note
Cleaning agent	-	Loctite 7063
Flange sealing	12340011-116	Loctite 574 Used with protection class IP67 Used with protection type Foundry Plus

Continues on next page

4 Repair


4.4.7 Replacing the axis-4 mechanical stop

Continued

Consumable	Art. no.	Note
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room For robots with food grade lubrication For robots with protection class IP67 For robots with protection type Foundry Plus
Locking liquid	3HAB7116-1	Loctite 243

Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none"> Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	 Note Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in Reference calibration routine on page 821 .
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the mechanical stop

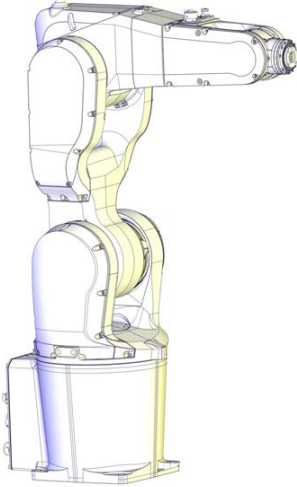


Use these procedures to remove the mechanical stop.

Preparations before removing the axis-4 mechanical stop


	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	

Continues on next page

4.4.7 Replacing the axis-4 mechanical stop
Continued

	Action	Note
2	Jog all axes to zero position.	 <p>xx1300002581</p>
3	 <p>DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>	
4	 <p>CAUTION</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	

Getting access to inside of the wrist unit



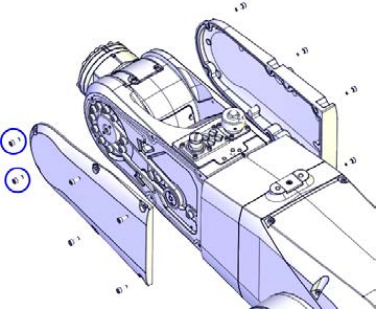

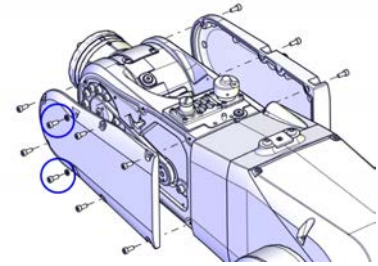

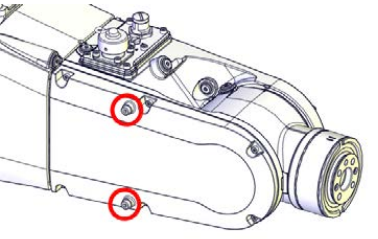
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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4 Repair




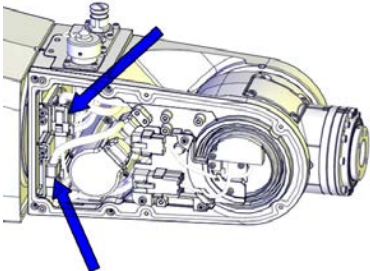
4.4.7 Replacing the axis-4 mechanical stop

Continued



	Action	Note
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	
3	<p>Remove the covers on each side of the wrist by removing their screws.</p> <p> Note</p> <p>For robots with protection class IP67 For robots with protection type Foundry Plus The two front screws on the left hand side cover (encircled in the figure) have been fitted with locking liquid. The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.</p>	<p>For robots with protection class IP67 For robots with protection type Foundry Plus</p>  <p>xx1300002349</p>
	<p> Note</p> <p>For robots with protection type Clean Room For robots with food grade lubrication The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.</p>	<p>For robots with protection type Clean Room</p>  <p>xx1600001148</p>
	<p> Note</p> <p>For robots with protection type Hygienic The tubular cover (right hand side cover) has two extra screws, as encircled in the figure. Do not remove the two screws when removing the cover. The screws are used for blocking the screw holes rather than fixing the cover to the tubular. Replace if damaged or missing.</p>	<p>For robots with protection type Hygienic</p>  <p>xx2100001406</p>

Continues on next page

Disconnecting the axis-5 motor connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Snap loose the motor connectors from their holders and then disconnect them. <ul style="list-style-type: none"> • R3.MP5 • R3.ME5  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1300002360

Removing the axis-5 motor with pulley

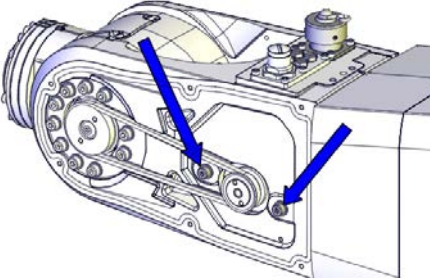
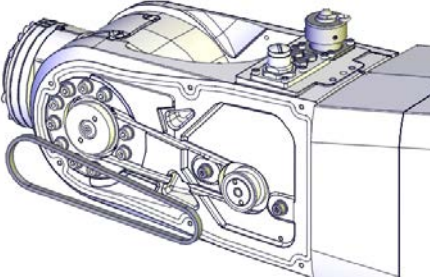
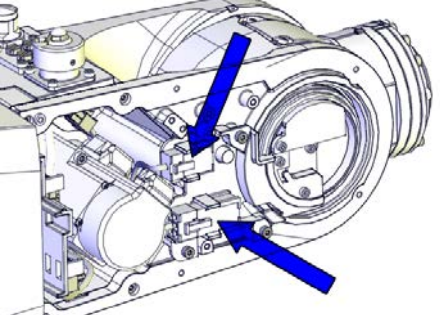
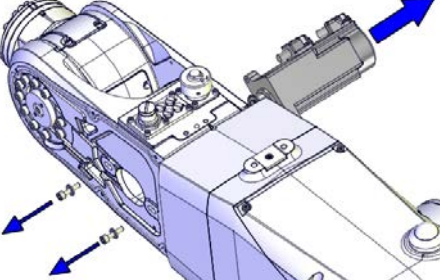
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	

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4 Repair



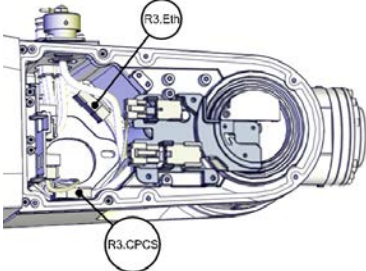
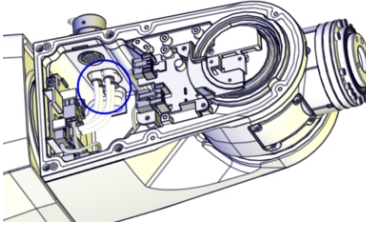
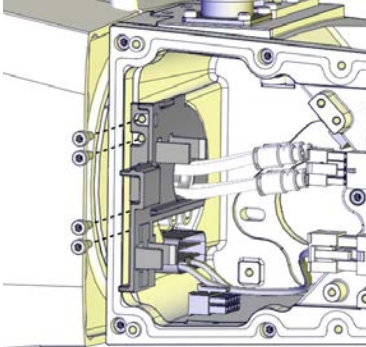
4.4.7 Replacing the axis-4 mechanical stop

Continued

	Action	Note
3	Loosen the screws so that the motor can be moved sideways.	 xx1300002350
4	Remove the timing belt.	 xx1300002351
5	Snap loose and disconnect the axis-5 FPC connectors.	 xx1300002390
6	Remove the screws and pull out the motor.	 xx1300002352

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Removing the wrist

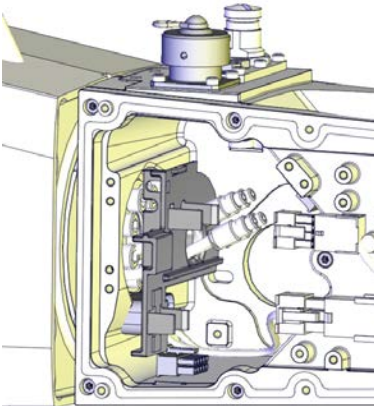
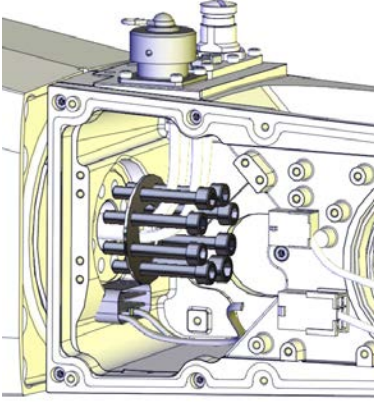

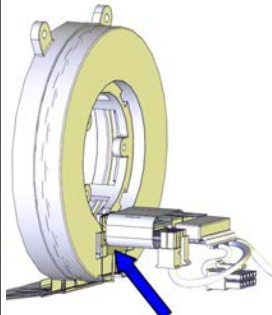
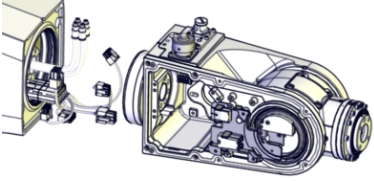
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Disconnect the connectors shown in the figure.	 xx1300002353
4	Disconnect the air hoses.	 xx1300002355
5	Remove the connector plate attachment screws.	 xx1300002356

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4 Repair



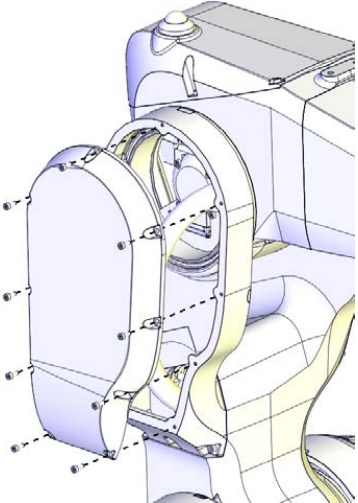
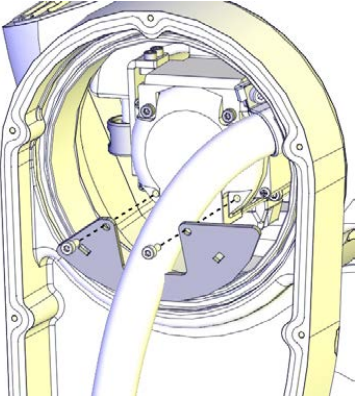
4.4.7 Replacing the axis-4 mechanical stop

Continued

	Action	Note
6	Guide the hoses through the plate hole and remove the plate.	 <p>xx1300002357</p>
7	Support the weight of the wrist and remove the screws and the washer.	 <p>xx1300002358</p>
8	<p>Pull out the wrist carefully while at the same time pulling all connectors and the air hoses out of the wrist.</p> <p>Be careful not to damage the FPC cabling and the connectors.</p> <p> CAUTION</p> <p>Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.</p>  <p>xx1300002611</p>	 <p>xx1300002359</p>

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Disconnecting the axis-4 FPC connectors

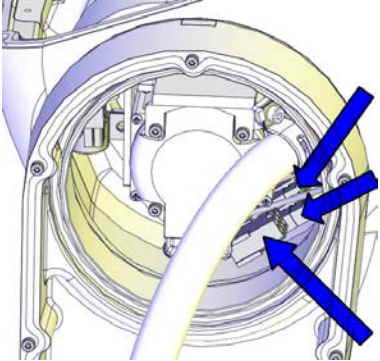
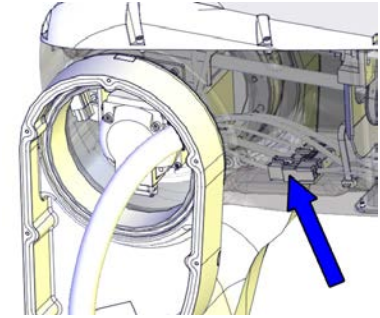
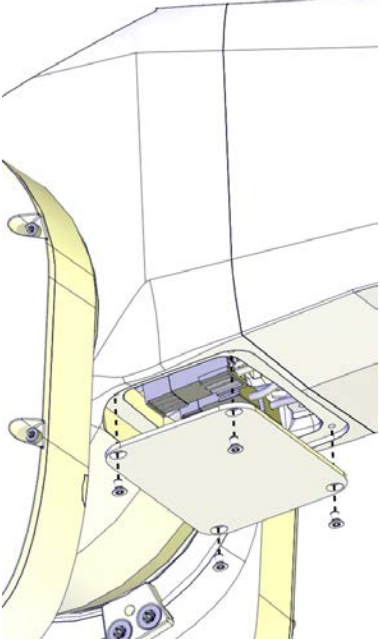
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	<p>Remove the cable housing cover.</p>	 <p>xx1300002400</p>
4	<p>Remove the plate.</p>	 <p>xx1300002413</p>

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4 Repair

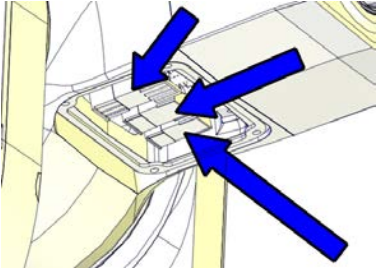
4.4.7 Replacing the axis-4 mechanical stop

Continued



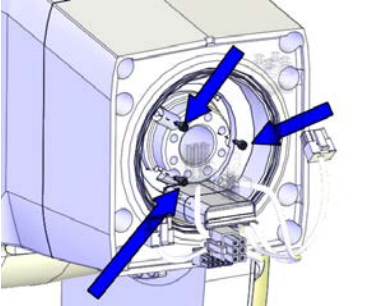
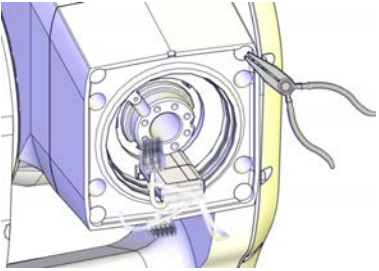
	Action	Note
5	Pull out the FPC connectors from the housing and disconnect them.	<p data-bbox="1029 315 1382 344">Cable layout in IRB 1200-7/0.7 :</p>  <p data-bbox="1029 712 1136 734">xx1300002412</p> <p data-bbox="1029 748 1382 777">Cable layout in IRB 1200-5/0.9 :</p>  <p data-bbox="1029 1102 1136 1124">xx1400001471</p>
6	Remove the small cover of the housing.	 <p data-bbox="1029 1803 1136 1825">xx1300002398</p>

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4.4.7 Replacing the axis-4 mechanical stop
Continued

	Action	Note
7	Disconnect the remaining FPC connectors.	 <p>xx1300002399</p>

Removing the housing extender unit

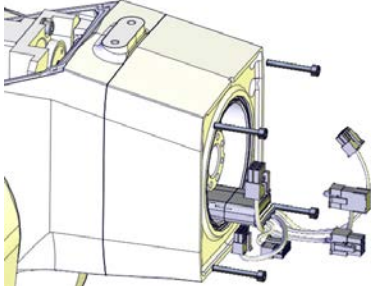
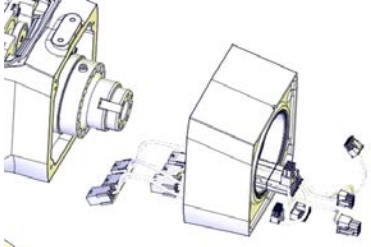
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Remove the axis-4 FPC unit screws.	 <p>xx1300002373</p>
4	For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Remove the plugs covering the extender unit screws with a needle-nose plier.	 <p>xx1600000262</p>

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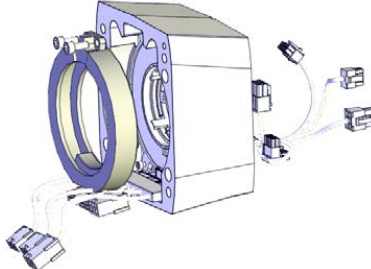
4 Repair

4.4.7 Replacing the axis-4 mechanical stop

Continued

	Action	Note
5	Remove the extender unit screws.	 xx1300002372
6	Remove the housing extender unit. Be careful not to damage the cabling.	 xx1300002374

Removing the axis-4 mechanical stop


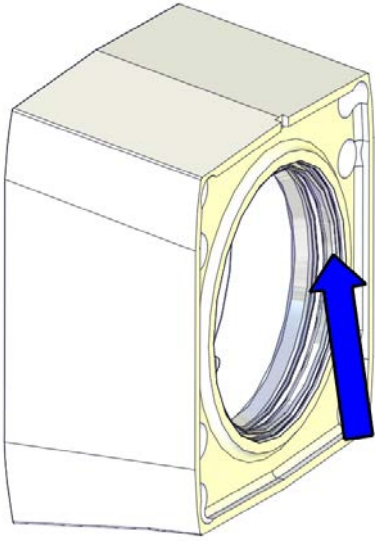
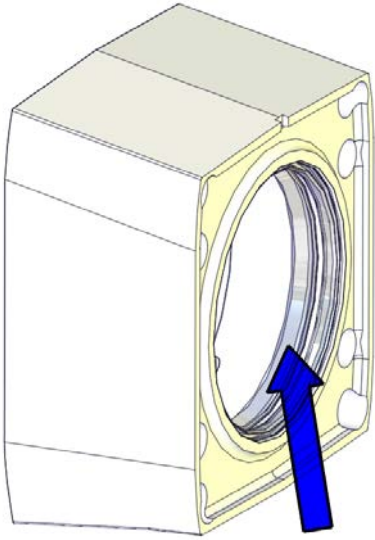
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Remove the mechanical stop assembly from the housing extender unit by removing the screws.	 xx1300002415

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Refitting the mechanical stop

Use these procedures to refit the mechanical stop.

Checking the housing extender sealings

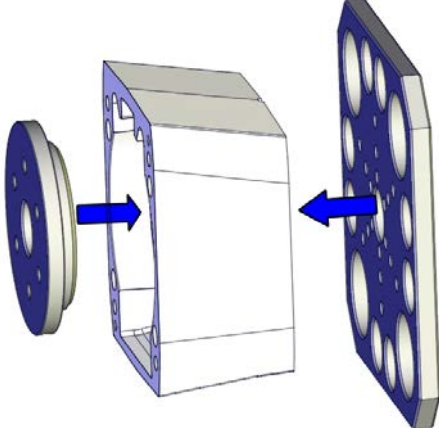
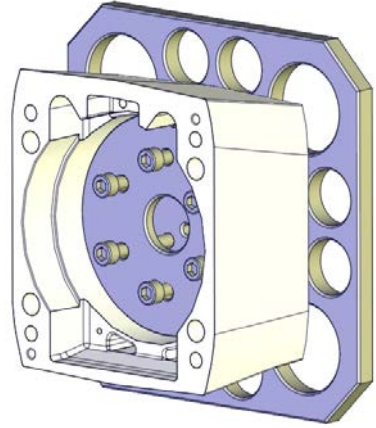
	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>For robots with protection class IP67 For robots with protection type Foundry Plus Check the sealing. Replace if damaged.</p> <p> CAUTION</p> <p>Do not fit M2 variseal sealing on robots in other protection class or protection types.</p>	<p>M2 variseal sealing: 3HAC044641-007</p>  <p>xx1300002418</p>
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the radial sealing. Replace if damaged, as described below. In order to replace the radial sealing, both the axis-4 mechanical stop and the axis-4 FPC unit must be removed from the housing extender unit, if not already removed.</p>	<p>Radial sealing with dust lip: 3HAB3701-48</p>  <p>xx1400000438</p>

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4 Repair

4.4.7 Replacing the axis-4 mechanical stop

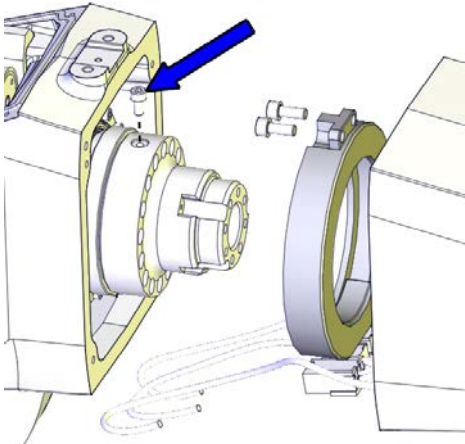
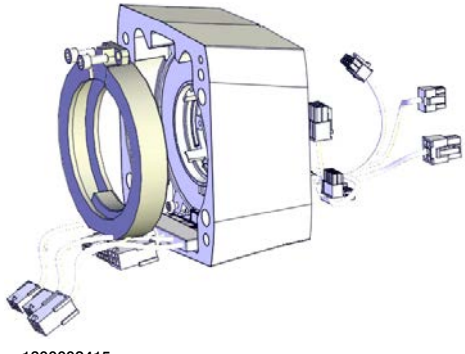

Continued

	Action	Note
4	Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.	
5	Fit the radial sealing into the housing extender unit.	
6	Fit the circular part of the radial sealing assembly tool against the radial sealing.	Axis-4 sealing assembly tool set: 3HAC049699-001
7	Fit the tool plate to the other side of the housing extender unit with the six screws M6X50.	 <p>xx1400000436</p>
8	Screw the screws, little by little, to press the sealing into place.	 <p>xx1400000437</p>
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	
11	Refit both the axis-4 mechanical stop and the axis-4 FPC unit to the housing extender unit.	

Continues on next page

4.4.7 Replacing the axis-4 mechanical stop
Continued

Refitting the axis-4 mechanical stop

	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Fit the mechanical stop screw to the axis-4 shaft.</p>	<p>Screws: 3HAB3409-231 (M4x8). Tightening torque: 4 Nm.</p>  <p>xx140000393</p>
3	<p>Fit the mechanical stop assembly to the housing extender unit and secure with screws.</p>	<p>Screws: 3HAB3409-216 (M5x12). Tightening torque: 4 Nm.</p>  <p>xx1300002415</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

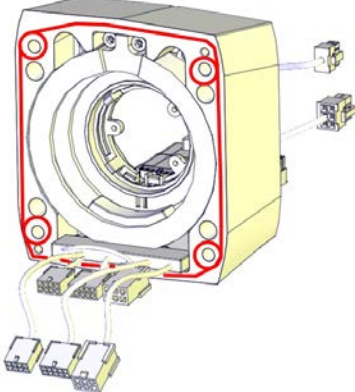
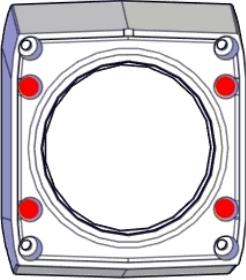


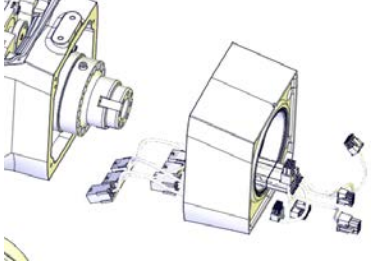
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4 Repair

4.4.7 Replacing the axis-4 mechanical stop

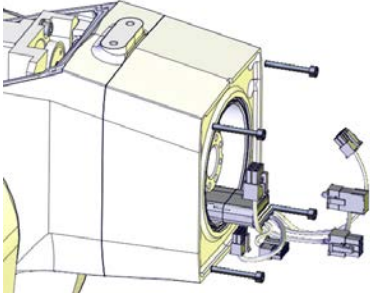
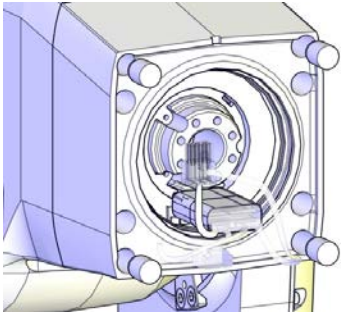
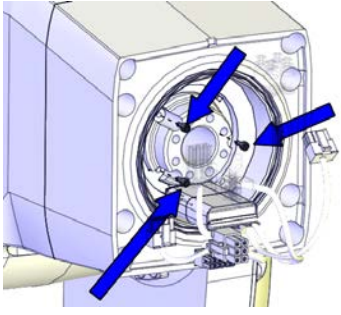
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Refitting the housing extender unit

	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>For robots with protection class IP67 For robots with protection type Foundry Plus</p> <p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing Loctite 574 on the mounting surfaces of the housing extender unit.</p>	 <p>xx1300002613</p>
3	<p>For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Make sure the four cavities are fully filled with glue. If not, fill glue again before the refitting.</p>	 <p>xx1600000216</p>
4	<p>Refit the housing extender unit to the housing while putting the FPC cables into the housing and the air hoses through the housing extender unit. Be careful not to damage the cabling.</p> <p> CAUTION</p> <p>Make sure that the axis-4 FPC unit is in its zero position when refitting the housing extender unit.</p> <p> Note</p> <p>Mate the unit to the two locating pins attached to the housing.</p>	 <p>xx1300002374</p>

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4.4.7 Replacing the axis-4 mechanical stop *Continued*

	Action	Note
5	Secure with screws and washers, using locking liquid Loctite 243.	<p>Screws: M4x30. Tightening torque: 2.7 Nm.</p>  <p>xx1300002372</p>
6	<p>For robots with protection type Foundry Plus</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Press in screw sealing plugs to cover the screws.</p>	<p>Screw sealing plug: 3HAC053685-001</p>  <p>xx1600000263</p>
7	Fit and secure the axis-4 FPC unit screws.	<p>Tightening torque: 0.3 Nm.</p>  <p>xx1300002373</p>

Connecting the axis-4 FPC connectors


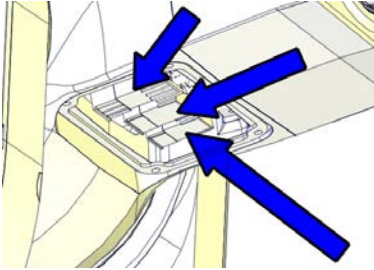

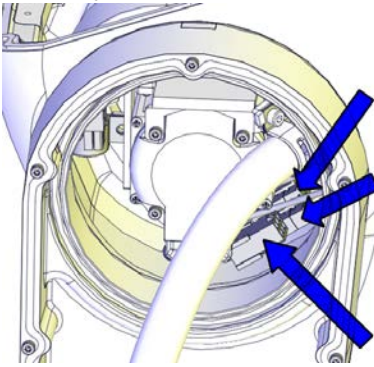
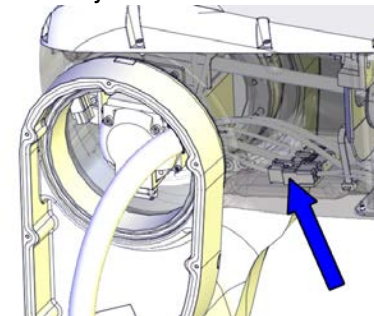
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

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4 Repair

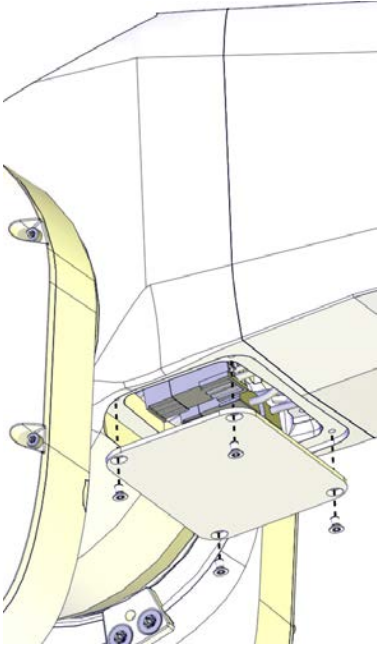
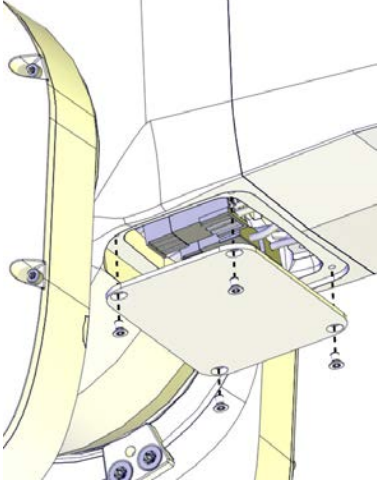
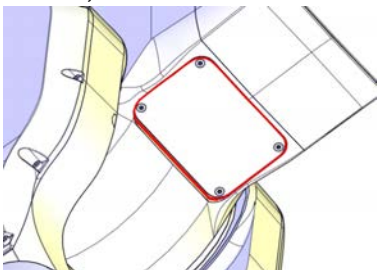
4.4.7 Replacing the axis-4 mechanical stop

Continued

	Action	Note
2	<p>Reconnect the FPC connectors.</p> <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx1300002399</p>
3	<p>Reconnect the FPC connectors and push them into place inside the housing.</p> <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	<p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p>
4	<p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p>	

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4.4.7 Replacing the axis-4 mechanical stop
Continued

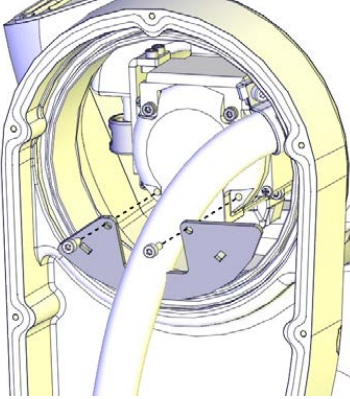
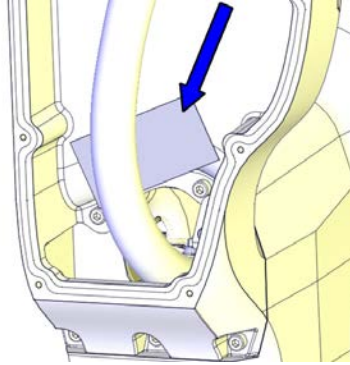
	Action	Note
5	<p>For robots with protection class IP67 For robots with protection type Foundry Plus Apply flange sealing Sikaflex 521FC on the mounting surfaces of the small cover on the housing.</p>	
6	<p>Refit the small cover to the housing. Replace if damaged.</p>	 <p>xx1300002398</p> <p>Housing small cover: 3HAC059684-001 Housing small cover, Clean Room Housing small cover, food grade lubrication Housing small cover, Hygienic : 3HAC056142-001 Screws: 3HAC14286-4 (M3X5). Tightening torque: 1 Nm.</p>
7	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Apply a string of the sealant to the joint of the small cover on the housing. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.</p>	<p>For robots with protection type Clean Room For robots with food grade lubrication Sealant, SikaFlex 521FC For robots with protection type Hygienic Sealant, Trans Clear</p>  <p>xx1600000214</p>

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4 Repair

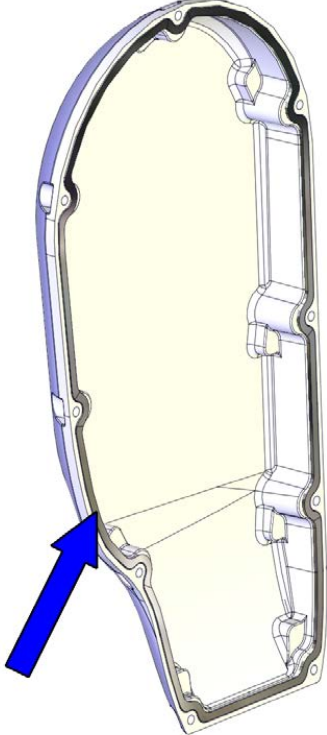
4.4.7 Replacing the axis-4 mechanical stop

Continued

	Action	Note
8	Refit the plate.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002413</p>
9	Check the PTFE film on the cable housing. Replace if damaged.	<p>PTFE film on lower arm cable housing: 3HAC044710-001</p>  <p>xx1400000740</p>

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4.4.7 Replacing the axis-4 mechanical stop
Continued

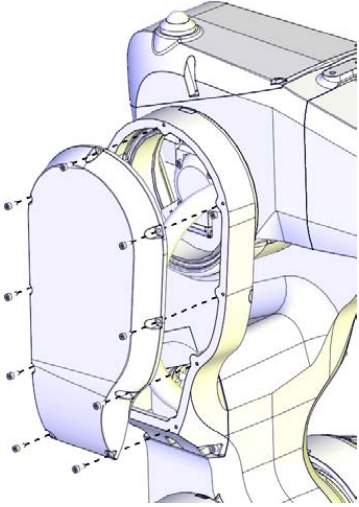

	Action	Note
10	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the gasket of the cable housing cover. Replace if damaged.</p>	<p>Gasket on cable housing cover: 3HAC056724-001 (not Hygienic robots) / 3HAC080702-001 (Hygienic robots) PTFE film on cable housing cover: 3HAC044660-001</p>  <p>xx140000048</p>
11	<p>Check the PTFE film on the cable housing cover. Replace if damaged.</p>	
12	<p>Apply grease to the inner surface of the cable housing cover and the PTFE film surface.</p>	

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4 Repair

4.4.7 Replacing the axis-4 mechanical stop

Continued


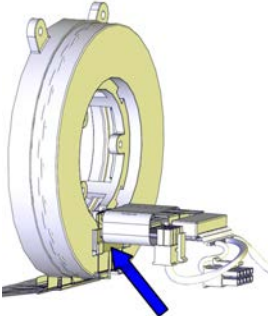
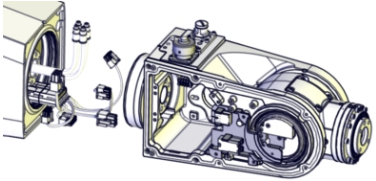
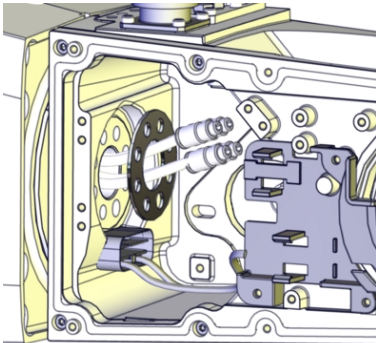
	Action	Note
13	<p>Refit the cable housing cover.</p> <p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Apply locking liquid Loctite 243 to all the screws securing the cover.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm</p>  <p>xx1300002400</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

Refitting the wrist

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

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4.4.7 Replacing the axis-4 mechanical stop
Continued

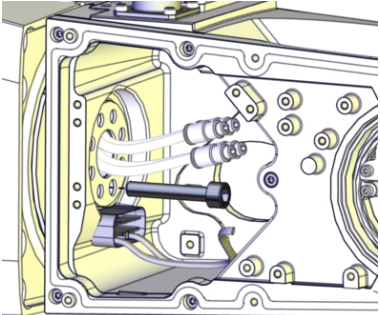

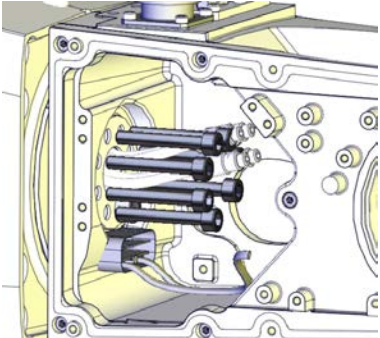

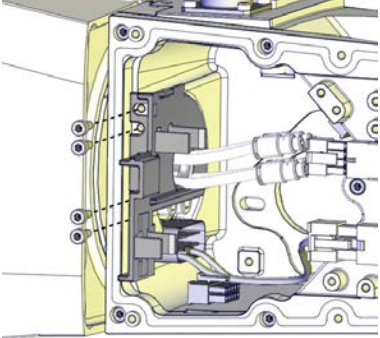
	Action	Note
2	<p>Put the connectors and air hoses into the wrist carefully while at the same time refitting the wrist to the housing extender unit. Be careful not to damage the FPC cabling and the connectors.</p> <p> CAUTION</p> <p>Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.</p>  <p>xx1300002611</p>	 <p>xx1300002359</p>
3	<p>Refit the washer while at the same time putting the cables through its center. Replace washer, if damaged.</p>	<p>Washer: 3HAC044869-001</p>  <p>xx1400000001</p>

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4 Repair


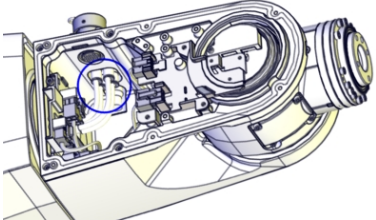
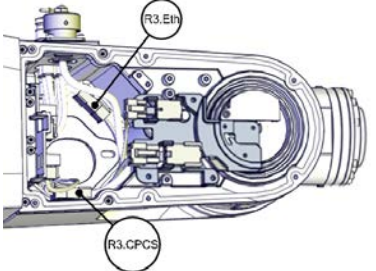
4.4.7 Replacing the axis-4 mechanical stop

Continued

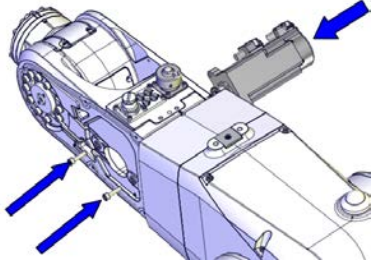

	Action	Note
4	Refit the screw M6x35 (1 pc). Do not tighten yet.	<p>Screw: 3HAB3409-238 (M6x35 (1 pc)).</p>  <p>xx140000002</p> <p> Note Only use specified screws, never replace them with other screws.</p>
5	Refit the rest of the screws (M5x35 (7 pcs)).	<p>Screw: 3HAB3409-237 (M5x35 (7 pcs)).</p>  <p>xx140000003</p> <p> Note Only use specified screws, never replace them with other screws.</p>
6	Tighten all screws.	Tightening torque: 8 Nm.
7	Put the cables through the plate hole and refit the plate.	<p>Tightening torque: 0.3 Nm.</p>  <p>xx1300002356</p>

Continues on next page

4.4.7 Replacing the axis-4 mechanical stop
Continued

	Action	Note
8	Reconnect the air hoses.  CAUTION Make sure to connect the air hoses correctly, according to the marking on hoses and connectors.	 xx1300002355
9	Reconnect the connectors. <ul style="list-style-type: none"> • R3.Eth • R3.CPCS 	 xx1300002353

Preparations before securing the axis-5 motor

	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check that: <ul style="list-style-type: none"> • all assembly surfaces are clean and without damages • the motor is clean and undamaged. 	
3	Place the motor at its mounting position and fasten the attachment screws and washers just enough to still be able to move the motor.	Screws: 3HAB3409-212 (M4x16).  xx1300002463  Note Only use specified screws, never replace them with other screws.

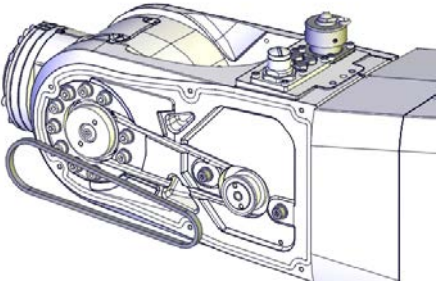

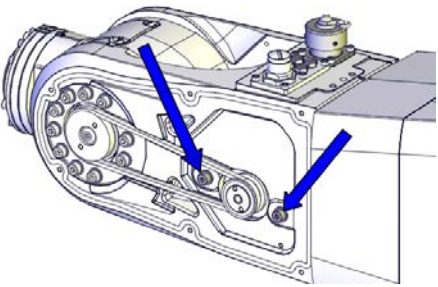
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4 Repair

4.4.7 Replacing the axis-4 mechanical stop

Continued

Securing the axis-5 motor and timing belt

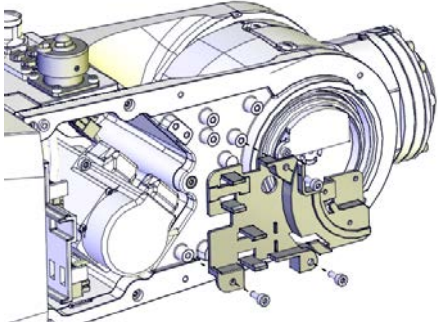
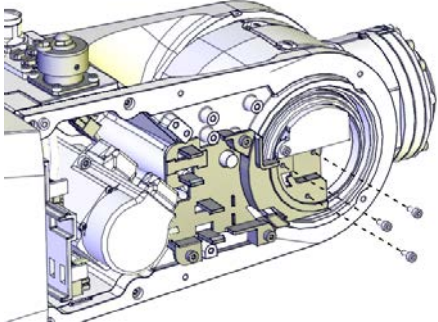
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	Refit the timing belt on the pulley.	 <p>xx1300002351</p>
3	Move the motor to a position where a good timing belt tension is reached ($F = 26\text{ N}$).	 Note Do not stretch the timing belt too much!
4	Secure the motor with its attachment screws.	 <p>xx1300002350</p> <p>Tightening torque: 3.5 Nm.</p>

Refitting the connector plate

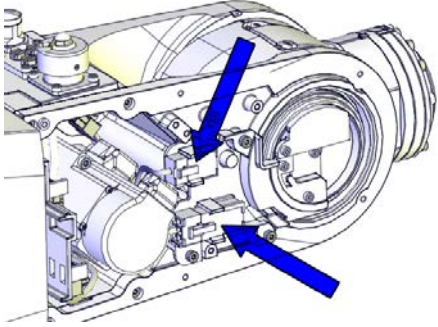
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

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4.4.7 Replacing the axis-4 mechanical stop
Continued

	Action	Note
2	Refit the connector plate and secure with the M3 screws.	Tightening torque: 0.3 Nm.  xx1400001401
3	Secure the three M2.5 screws.	Tightening torque: 0.3 Nm.  xx1400001402

Connecting the axis-5 motor FPC connectors

	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Connect the axis-5 FPC connectors and snap them to their holders.	 xx1300002390

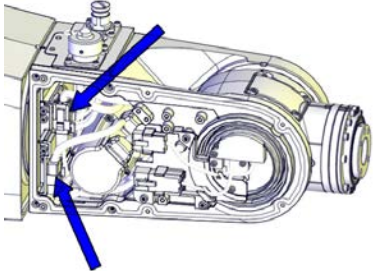
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4 Repair

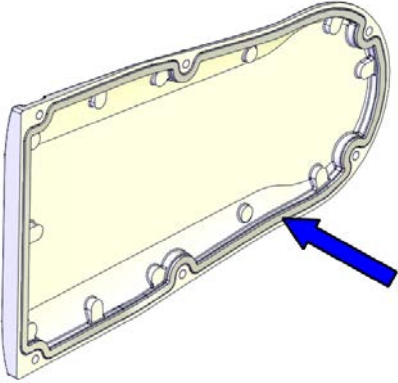
4.4.7 Replacing the axis-4 mechanical stop

Continued

Connecting the axis-5 motor connectors

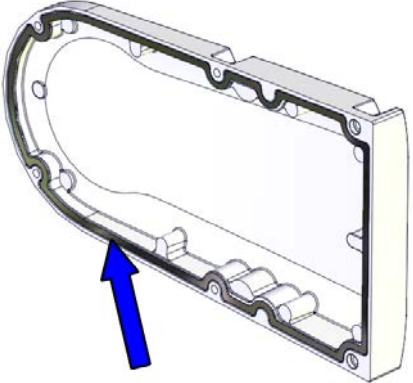
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Reconnect the motor cables.</p> <ul style="list-style-type: none"> • R3.MP5 • R3.ME5 	 <p>xx1300002360</p>

Refitting the wrist covers

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Check the tubular cover gasket.</p> <p>Replace if damaged.</p>	<p>Gasket for tubular cover: 3HAC058822-001 (not Hygienic robots) / 3HAC080709-001 (Hygienic robots)</p>  <p>xx1400000034</p>

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4.4.7 Replacing the axis-4 mechanical stop
Continued

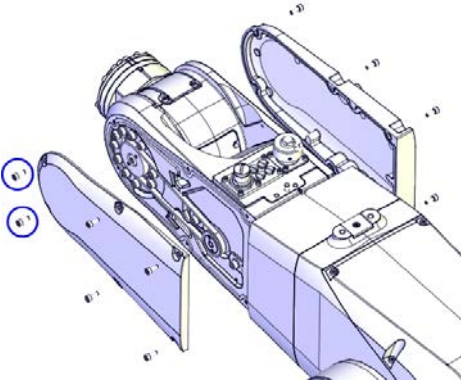
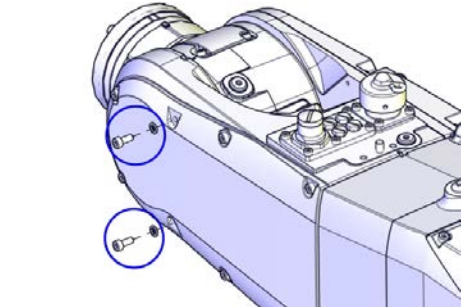


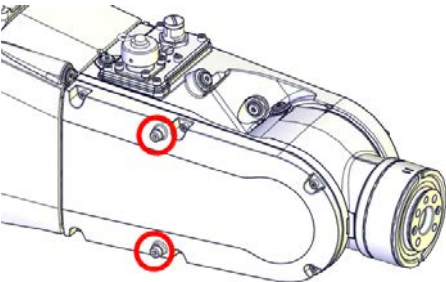
	Action	Note
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the tubular cable housing cover gasket. Replace if damaged.</p>	<p>Gasket for tubular cable housing cover: 3HAC056707-001 (not Hygienic robots) / 3HAC080701-001 (Hygienic robots)</p>  <p>xx140000345</p>

Continues on next page

4 Repair



4.4.7 Replacing the axis-4 mechanical stop

Continued

	Action	Note
4	<p>Refit the both covers to the wrist.</p> <p>For robots with protection class IP67 For robots with protection type Foundry Plus</p> <p>Apply locking liquid Loctite 243 to the two front screws on the left hand side cover, encircled in the figure.</p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p> <p>For robots with protection class IP67 For robots with protection type Foundry Plus</p>  <p>xx1300002349</p>
	<p>For robots with protection type Clean Room For robots with food grade lubrication</p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p>	<p>For robots with protection type Clean Room For robots with food grade lubrication</p>  <p>xx1600001153</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
	<p> Note</p> <p>For robots with protection type Hygienic</p> <p>Check the two extra screws on the tubular cover (right hand side cover), as encircled in the figure.</p> <p>Replace if damaged or missing.</p>	<p>For robots with protection type Hygienic</p>  <p>xx2100001406</p>

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Concluding procedure

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean, seal and paint the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160.</p> <p> Note</p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>	
2	Recalibrate the robot.	Calibration is detailed in section Calibration on page 807 .
3	<p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

4 Repair

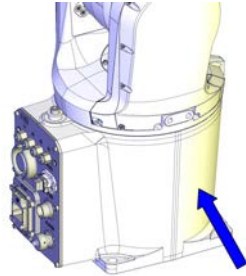

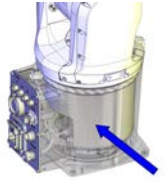
4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

4.5 Swing and base

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Location of the base spare parts

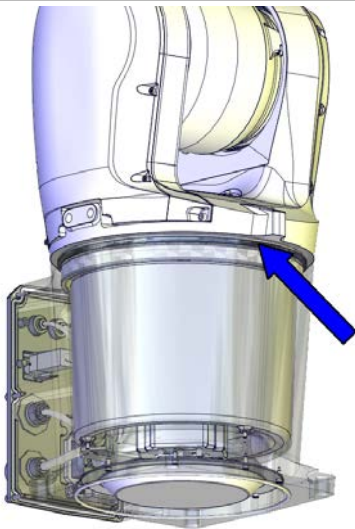
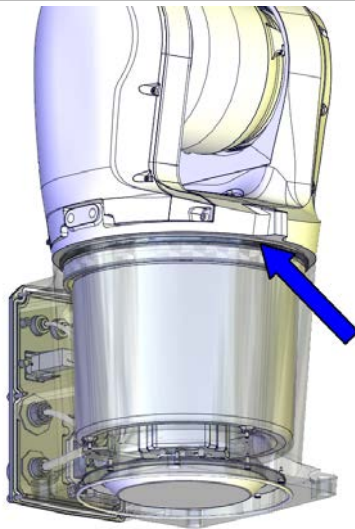
The base parts that are considered spare parts are located as shown in the figure.

Base	Base, SafeMove 2-supported	Radial sealing with dust lip	Cable protection sleeve inside base
 <p>xx1400000396</p>		 <p>xx1400000269</p>	 <p>xx1400000395</p>
<p>3HAC059553-001 Includes base machining, axis-1 gear unit and axis-1 AC motor with encoder interface. Incompatible with swing 3HAC049632-001. See Spare part versions for the base on IP40/IP67 robots on page 876.</p>	<p>3HAC061270-001 Used for IRB 1200 Type B. See Type B of IRB 1200 on page 875. Includes base machining, axis-1 gear unit and axis-1 AC motor with resolver interface.</p>	<p>3HAB3701-47 Not used with protection class IP40. Replace if damaged.</p>	<p>3HAC044690-001</p>
<p>3HAC059699-001 Used with protection type Clean Room.</p>	<p>3HAC061271-001 Used for IRB 1200 Type B. See Type B of IRB 1200 on page 875. Used with protection type Clean Room.</p>		
<p>3HAC057906-001 Used for robots with food grade lubrication.</p>	<p>3HAC061272-001 Used for IRB 1200 Type B. See Type B of IRB 1200 on page 875. Used for robots with food grade lubrication.</p>		

Continues on next page

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

<p>M2 variseal sealing</p>	<p>Sealing ring (IP40) / Sealing ring, gasket and V-ring (IP67)</p>
 <p>xx1400000471</p>	 <p>xx1400000471</p>
<p>3HAC044641-002 Used with protection class IP67. Used only on base 3HAC049628-001. See Spare part versions for the base on IP40/IP67 robots on page 876. Replace if damaged.</p>	<p>Sealing ring: 3HAC068107-001 (IP40) Sealing ring, gasket and V-ring: 3HAC059791-001 (IP67) Used with protection class IP67. Replace if damaged.</p>

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Base	3HAC059553-001	Includes base machining, axis-1 gear unit and axis-1 AC motor with encoder interface. Incompatible with swing 3HAC049632-001. See Spare part versions for the base on IP40/IP67 robots on page 876 .
Base, Clean Room	3HAC059699-001	Used with protection type Clean Room. Includes base machining, axis-1 gear unit and axis-1 AC motor with encoder interface.
Base, food grade lubrication	3HAC057906-001	Used for robots with food grade lubrication. Includes base machining, axis-1 gear unit and axis-1 AC motor with encoder interface.

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4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

Spare part	Article number	Note
Base, SafeMove 2-supported	3HAC061270-001	Used for IRB 1200 Type B. See Type B of IRB 1200 on page 875 . Includes base machining, axis-1 gear unit and axis-1 AC motor with resolver interface.
Base, Clean Room and SafeMove 2-supported	3HAC061271-001	Used for IRB 1200 Type B. See Type B of IRB 1200 on page 875 . Used with protection type Clean Room. Includes base machining, axis-1 gear unit and axis-1 AC motor with resolver interface.
Base, food grade lubrication and SafeMove 2-supported Base, Hygienic	3HAC061272-001	Used for IRB 1200 Type B. See Type B of IRB 1200 on page 875 . Used for robots with food grade lubrication. Used with protection type Hygienic. Includes base machining, axis-1 gear unit and axis-1 AC motor with resolver interface.
Radial sealing with dust lip	3HAB3701-47	Not used with protection class IP40. Replace if damaged.
Axis-1 sealing ring gasket	3HAC045685-001	Used with protection class IP67. Only on axis-1 sealing ring version 3HAC044676-001. See Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 880 . Replace if damaged.
Axis-1 sealing ring gasket	3HAC058349-001 / 3HAC080707-001	Not used with protection class IP40. Only on axis-1 sealing ring version 3HAC058568-001 or 3HAC068107-001. See Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 880 . Replace if damaged.
V-ring	3HAB3732-34	Used with protection class IP67. Used with protection type Foundry Plus. Only on swing version 3HAC058000-001 and 3HAC059554-001. See Spare part versions for the swing on IP40/IP67 robots on page 878 . Replace if damaged.
M2 variseal sealing	3HAC044641-002	Used with protection class IP67. Used only on base 3HAC049628-001. See Spare part versions for the base on IP40/IP67 robots on page 876 . Replace if damaged.

Continues on next page

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

Spare part	Article number	Note
Sealing ring	3HAC068107-001	Used with protection class IP67. Used with protection type Foundry Plus. Used only on base 3HAC059553-001. See Spare part versions for the base on IP40/IP67 robots on page 876 . Replace if damaged.
Sealing ring, gasket and V-ring	3HAC059791-001	Used with protection class IP67. Replace if damaged.
Protection plug	3HAC051199-001	Protection plug for the calibration hole in the swing (the hole is used during calibration of axis 1 with the manual calibration method). Replace if damaged.
Cable protection sleeve inside base	3HAC044690-001	
O-ring	3HAB3772-86	Not used with protection class IP40. Replace if damaged.
Gasket for rear base cover	3HAC058566-001 / 3HAC080710-001	Not used with protection class IP40. Replace if damaged.
M2 variseal sealing	3HAC044641-004	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
Cable harness material set	3HAC049663-001	Includes brackets, sheets, distance screws, plastics, cable clamp, seal bolts and air protection in tubular.
Gasket on cable housing cover	3HAC056724-001 / 3HAC080702-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cable housing cover	3HAC056707-001 / 3HAC080701-001	Not used with protection class IP40. Replace if damaged.
Air connector set with Ethernet hole in flange	3HAC049664-001	Includes tubular flange, air connectors and seal bolts. Replace if damaged.
Air connector set without Ethernet hole in flange	3HAC049665-001	Includes tubular flange, air connectors and seal bolts. Replace if damaged.
Plate with connector set	3HAC079691-001	Used with protection type Hygienic. Includes Ethernet connector, air connectors, CP/CS connector and gasket (3HAC078804-001).

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4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

Spare part	Article number	Note
Plate without connector set	3HAC078810-001	Used with protection type Hygienic. Includes gasket (3HAC078804-001).
Gasket	3HAC078804-001	Used with protection type Hygienic. Replace if damage.

Required tools and equipment

Equipment, etc.	Article number	Note
Roundsling, 2 m	-	Length: 2 m. Lifting capacity: 100 kg.
Axis-1 sealing assembly tool set	3HAC049692-001	Used to refit the axis-1 radial sealing.
Guide pin for axis-1 gear unit	3HAC049703-001	Always use three guide pins together!
24 VDC power supply	-	Used to release the motor brakes.
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. ⁱ
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .

- ⁱ The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, manual calibration is used as default.

Required consumables

Equipment	Art. no.	Note
Cable straps	-	
Grease	3HAC042536-001	Used for lubrication of cable contact areas.
Locking liquid	3HAB7116-1	Loctite 243
Grease	3HAC029132-001	Used for lubrication of cable contact areas for robots with food grade lubrication and robots in protection type Hygienic.
Grease	3HAC058065-001	Used for lubrication of radial sealing surface between base and swing. For robots with protection class IP67 For robots with protection type Foundry Plus
Sealant	12340011-116	Loctite 574 For robots with protection type Clean Room For robots with food grade lubrication

Continues on next page


4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

Equipment	Art. no.	Note
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room For robots with food grade lubrication For robots with protection class IP67 For robots with protection type Foundry Plus
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none"> Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	 Note Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in Reference calibration routine on page 821 .
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the cabling

Before the spare parts of the base can be removed, the cable harness must be removed from upper arm and down to the base. Use these procedures to remove the cabling in order to access the base spare parts.

Preparations before removing the cabling

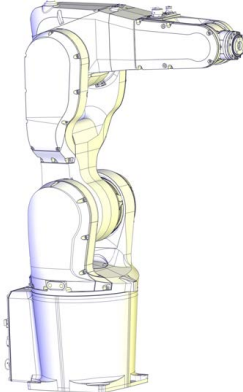


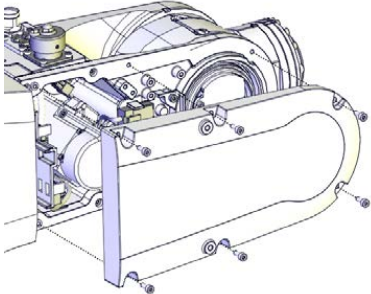
	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	

Continues on next page

4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)




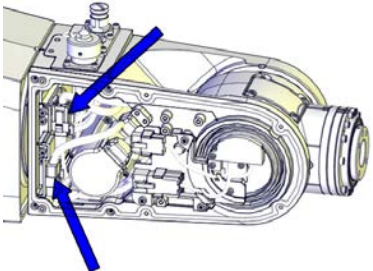
Continued

	Action	Note
2	Jog all axes to zero position.	 xx1300002581
3	 DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
4	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
5	Remove the wrist cover.	 xx1300002389



Continues on next page

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

Disconnecting the axis-5 motor connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Snap loose the motor connectors from their holders and then disconnect them. <ul style="list-style-type: none"> • R3.MP5 • R3.ME5  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1300002360

Disconnecting the axis-5 FPC connectors

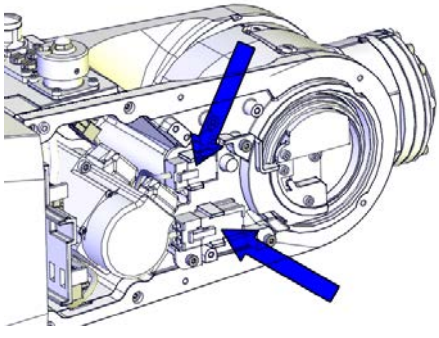
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	

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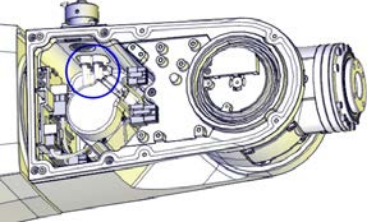
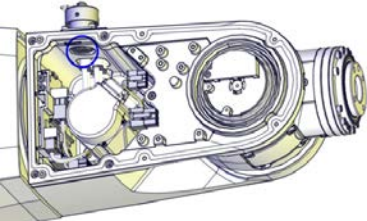
4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
3	Snap loose and disconnect the axis-5 FPC connectors.	 <p>xx1300002390</p>

Disconnecting the air hoses and CP/CS cabling (if equipped)



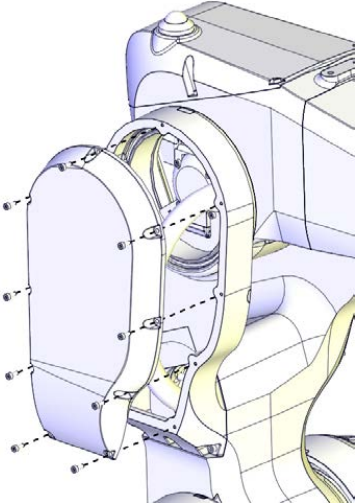
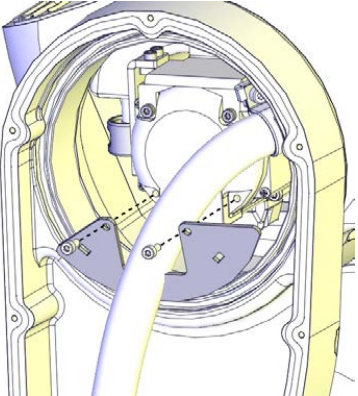
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Disconnect the air hoses.	 <p>xx1400000738</p>
4	If equipped, disconnect the CP/CS connector.	 <p>xx1500000252</p>

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

Disconnecting the axis-4 FPC connectors

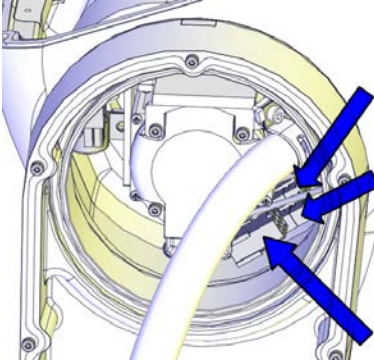
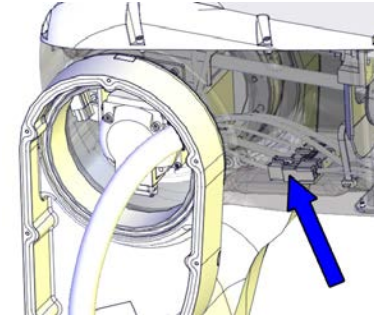
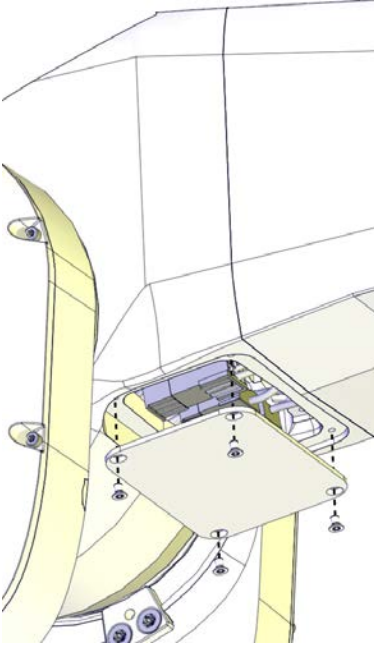
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	
3	<p>Remove the cable housing cover.</p>	 <p>xx1300002400</p>
4	<p>Remove the plate.</p>	 <p>xx1300002413</p>

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4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

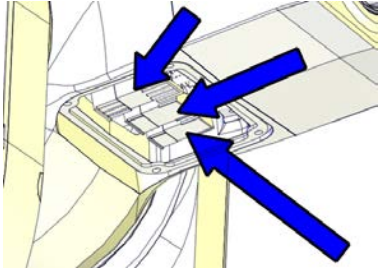
Continued

	Action	Note
5	Pull out the FPC connectors from the housing and disconnect them.	<p data-bbox="1029 315 1382 338">Cable layout in IRB 1200-7/0.7 :</p>  <p data-bbox="1029 712 1136 730">xx1300002412</p> <p data-bbox="1029 748 1382 770">Cable layout in IRB 1200-5/0.9 :</p>  <p data-bbox="1029 1099 1136 1117">xx1400001471</p>
6	Remove the small cover of the housing.	 <p data-bbox="1029 1803 1136 1821">xx1300002398</p>




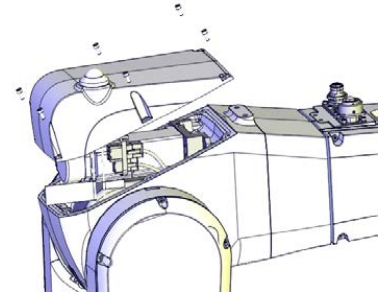
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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
7	Disconnect the remaining FPC connectors.	 <p>xx1300002399</p>

Disconnecting the axis-4 motor connectors

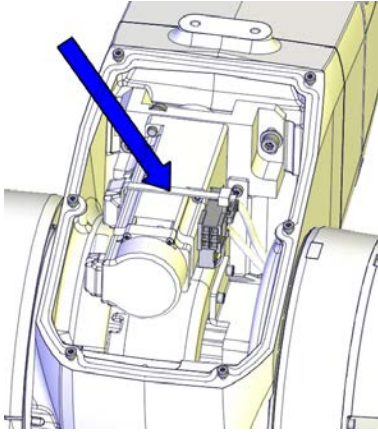

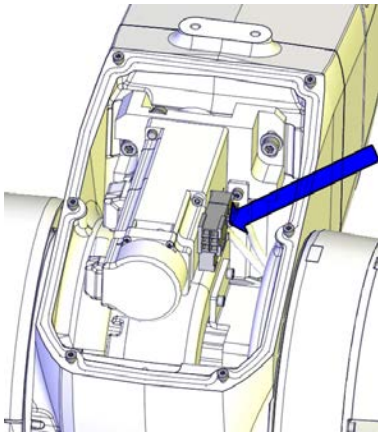
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	<p>Remove the cover from the upper arm housing.</p>  <p>CAUTION</p> <p>For robots with safety lamp (option) Be aware of the signal lamp cables that are attached inside the housing! Disconnect the lamp cable connectors R3.H1 and R3.H2 and then lift away the cover completely.</p>	 <p>xx1300000456</p>

Continues on next page



4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
4	Cut the strap that holds the connectors.	 <p>xx1300002494</p>
5	Disconnect the motor connectors.  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 <p>xx1300002495</p>

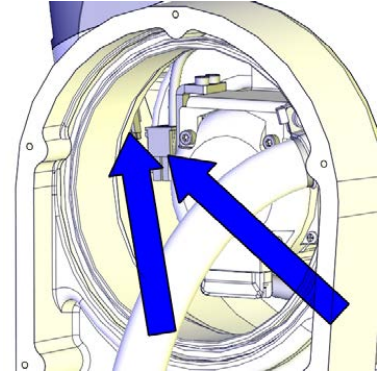
Disconnecting the axis-3 motor connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	



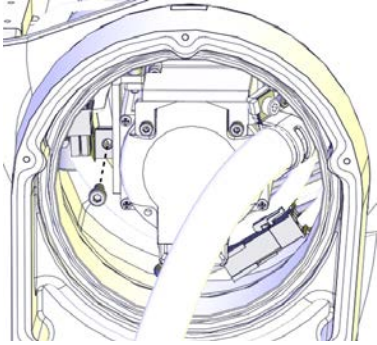
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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
3	Pull out the axis-3 motor connectors from the housing and disconnect them.	 <p>xx1300002420</p>

Removing the cable package in the housing

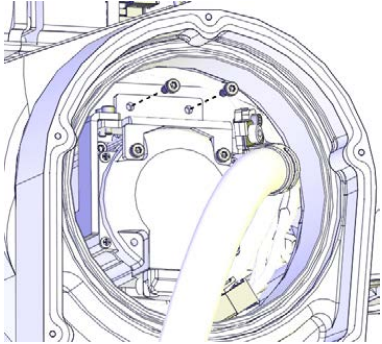
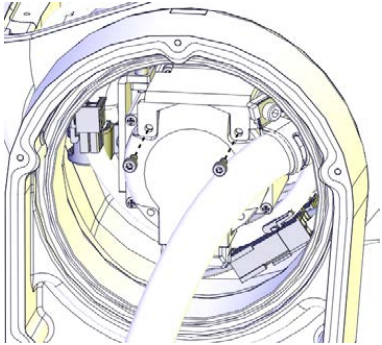

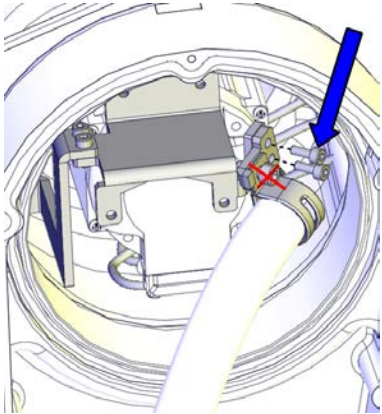
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160</i>.</p>	
3	Remove the screw that fastens the air hose holder.	 <p>xx1300002422</p>

Continues on next page


4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
4	Remove the screws that fasten the fix sheet to the inner plastic guide.	 <p>xx1300002421</p>
5	Remove the screws that fasten the fix sheet to the motor.	 <p>xx1300002423</p>
6	<p>Pull out the fix sheet a bit, to access the screws that fasten the cable bracket to the sheet. Loosen the bracket from the sheet by removing the two screws.</p> <p> CAUTION</p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>	 <p>xx1300002424</p>
7	<p>Valid for IRB 1200-5/0.9</p> <p>Cut the cable straps at the bottom of the housing.</p>	





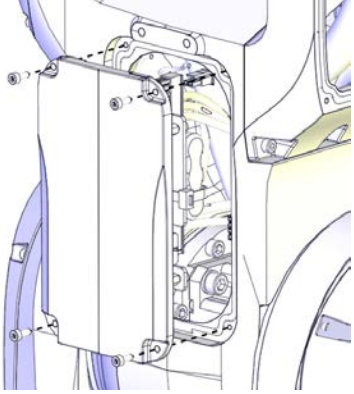
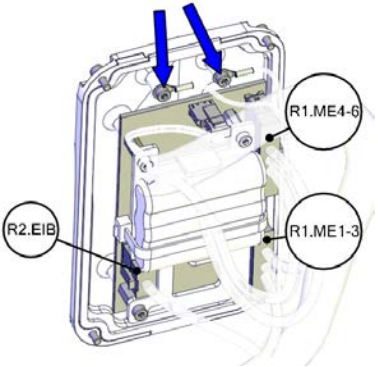
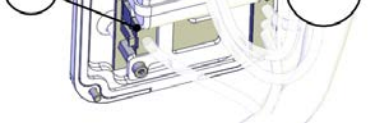
Disconnecting the cabling in the lower arm

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

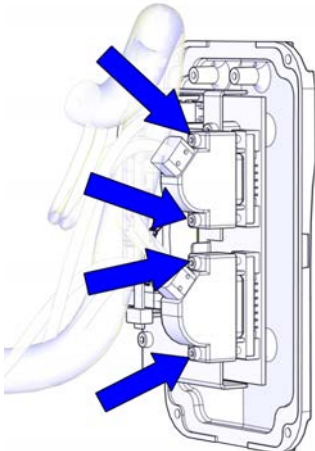
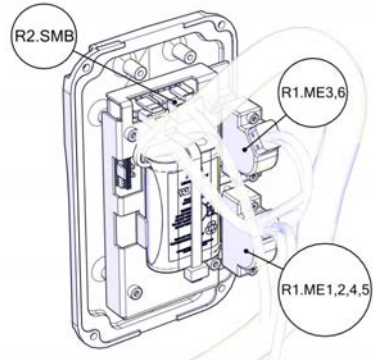
	Action	Note
2	 <p>ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <i>The unit is sensitive to ESD on page 64</i></p>	
3	 <p>CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	
4	<p>Remove the EIB/SMB cover attachment screws on the lower arm and carefully open the cover.</p>  <p>CAUTION</p> <p>Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures.</p>  <p>CAUTION</p> <p>Be aware of the cabling that is attached to the cover! The cover can not be removed completely until the connectors and lugs are disconnected, as shown in following step.</p>	 <p>xx1300002427</p>
5	<p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Disconnect the connectors on the EIB unit.</p> <ul style="list-style-type: none"> • R1.ME1-3 • R1.ME4-6 • R2.EIB <p>Remove the EIB/SMB cover completely from the lower arm.</p>	 <p>xx1300002428</p>
6	<p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Disconnect the lugs on the EIB/SMB cover.</p>	 <p>xx1300002428</p>

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4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

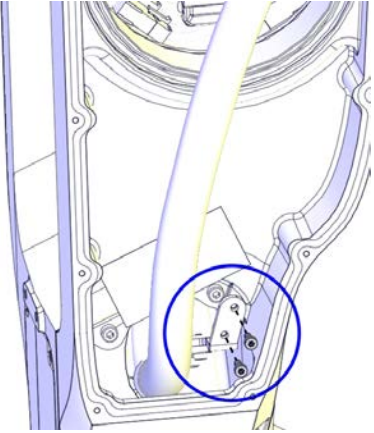

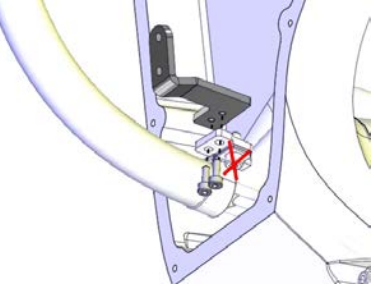
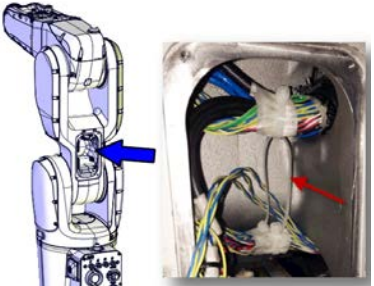
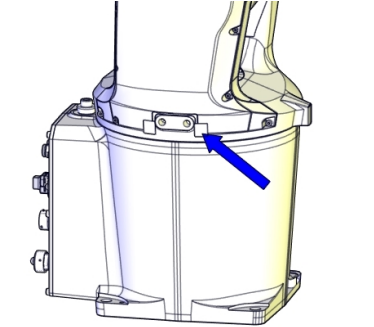
	Action	Note
7	<p>Valid for IRB 1200 Type B</p> <p>Loose the connector screws.</p>	 <p>xx170000004</p>
8	<p>Valid for IRB 1200 Type B</p> <p>Disconnect the connectors on the SMB unit.</p> <ul style="list-style-type: none"> • R1.ME1,2,4,5 • R1.ME3,6 • R2.SMB <p>Remove the EIB/SMB cover completely from the lower arm.</p>	 <p>xx170000005</p>

Removing the cable package in the lower arm

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	<p>Pull the cable package out from the upper arm housing.</p>	

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

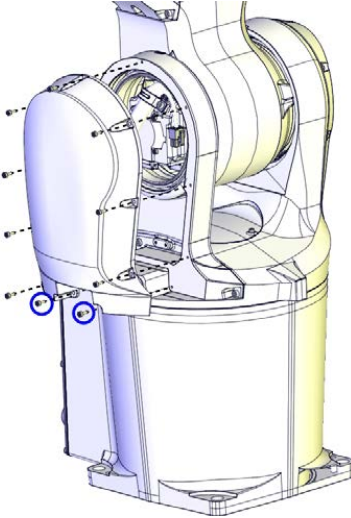
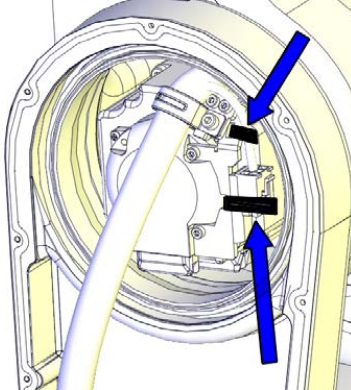
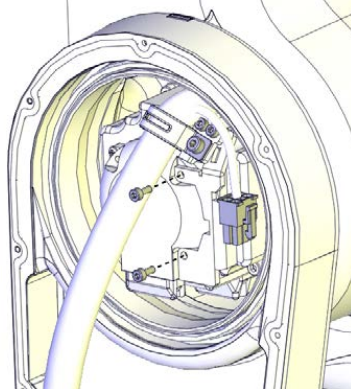
	Action	Note
4	Remove the fix sheet attachment screws in the lower arm.	 <p>xx1300002426</p>
5	Pull out the cable package a bit from the lower arm and remove the bracket from the cable package by removing the screws.  CAUTION Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	 <p>xx1300002430</p>
6	Cut the cable strap that holds the cabling together inside the EIB/SMB cavity.	 <p>xx1400001130</p>
7	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Remove the swing sealing plug. Follow the procedure specified in Removing the swing sealing plug on page 168 .	 <p>xx1600000205</p>

Continues on next page

4 Repair


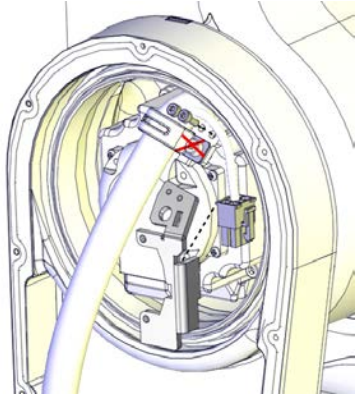
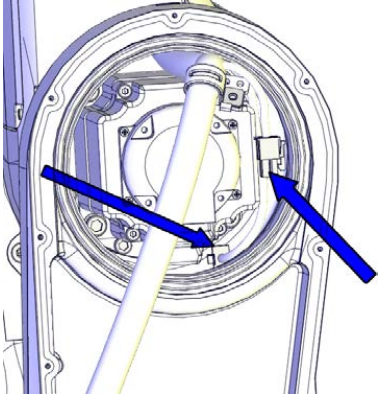
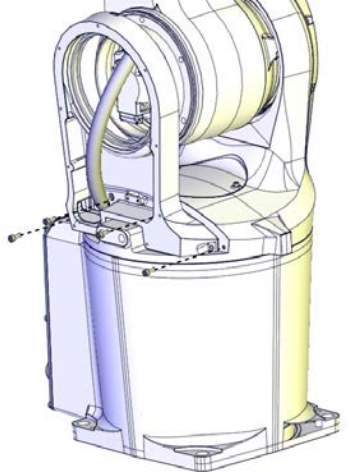
4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
8	Remove the swing cable housing cover by removing the screws.	 <p>xx1300002431</p>
9	Cut the cable straps.	 <p>xx1400001528</p>
10	Remove the axis-2 motor bracket screws.	 <p>xx1300002432</p>

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

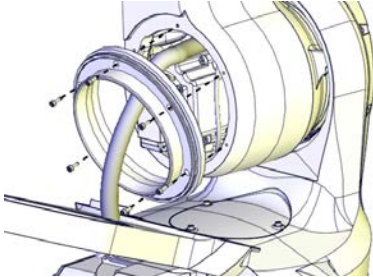

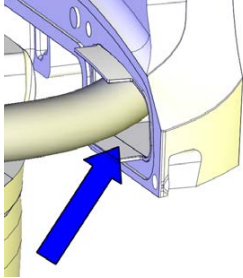
	Action	Note
11	<p>Pull out the cabling and then remove the axis-2 motor bracket from the cable package by removing the screws.</p> <p> CAUTION</p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>	 <p>xx1300002433</p>
12	<p>Disconnect the motor connectors.</p> <ul style="list-style-type: none"> • R2.ME2 • R2.MP2 	 <p>xx1300002434</p>
13	<p>Loosen the cable housing from the swing by removing the screws. Leave it hanging on the cable package.</p>	 <p>xx1300002435</p>

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4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued



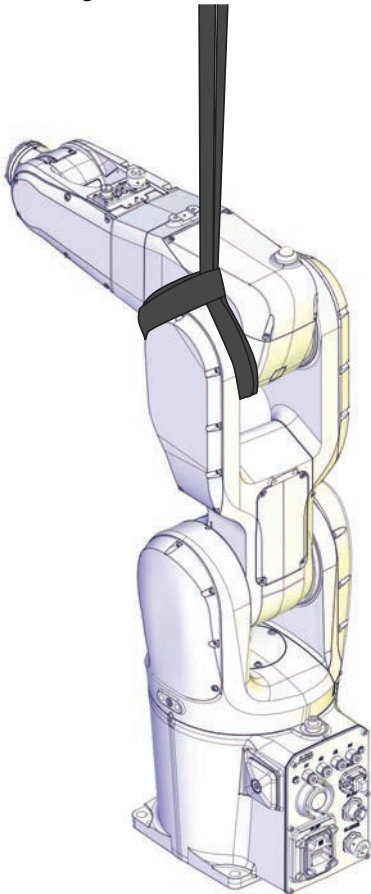


	Action	Note
14	Remove the axis-2 sealing ring by removing the screws.	 xx140000020
15	Pull out the cable package from the lower arm.  Tip There is a groove on the lower arm casting that simplifies cable passage, if needed. Its position can easily be felt by hand.	
16	Loosen the plastic plate from the cable housing in order to facilitate continued removal of the cable package .	 xx140000023

Putting the robot on its side

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.	

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

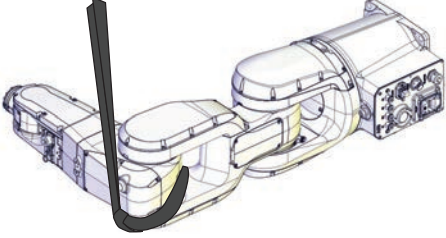
	Action	Note
3	<p> CAUTION</p> <p>The robot weighs . IRB 1200-5/0.9: 54 kg IRB 1200-7/0.7: 52 kg All lifting accessories used must be sized accordingly!</p>	
4	<p>Run a roundsling between the housing and the lower arm.</p> <p> CAUTION</p> <p>Put the sling on the lower arm side and not on the cable arm side, which would damage the robot.</p>	<p>Roundsling, 2 m</p>  <p>xx140000679</p>
5	<p> WARNING</p> <p>The robot is likely to be mechanically unstable if not secured to the foundation!</p>	
6	<p> CAUTION</p> <p>The robot weighs . IRB 1200-5/0.9: 54 kg IRB 1200-7/0.7: 52 kg All lifting accessories used must be sized accordingly!</p>	

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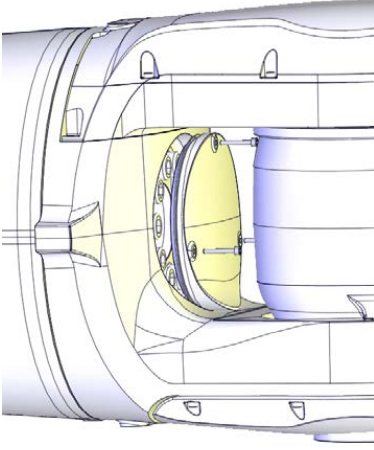
4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

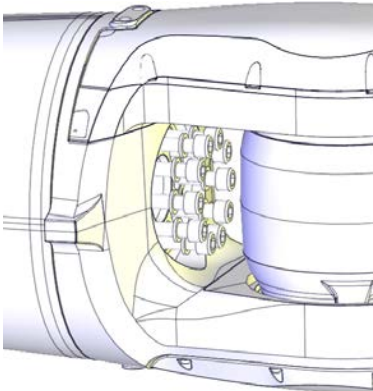

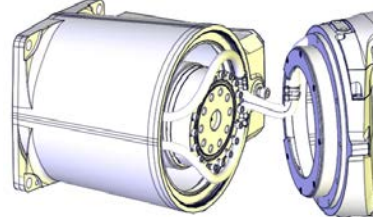
	Action	Note
7	Loosen the robot from the foundation by removing the foundation attachment screws and put the robot on its side.	 <p data-bbox="941 571 1053 593">xx140000680</p>

Separating the arm system from base



	Action	Note
1	 <p data-bbox="566 761 678 795">DANGER</p> <p data-bbox="478 817 1013 907">Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p data-bbox="566 963 686 996">CAUTION</p> <p data-bbox="478 1019 1013 1232"> For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160. </p>	
3	<p data-bbox="478 1265 1013 1321">Remove the swing top cover by removing the screws.</p>  <p data-bbox="566 1355 614 1388">Tip</p> <p data-bbox="478 1422 1013 1512">Fit M4 screws in the cover holes to pull out the cover more easily. Only tighten the screws lightly in order not to damage the threads.</p>	 <p data-bbox="1029 1736 1141 1758">xx130000467</p>

Continues on next page

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

	Action	Note
4	Remove the screws and washers.	 <p>xx1300000471</p>
5	Pull out the base slightly and turn it aside.  Tip Remember the cable layout in the base. The cabling must be positioned and angled in the same way during refitting.	 <p>xx1300000472</p>

Removing the cable package from the axis-1 sealing ring

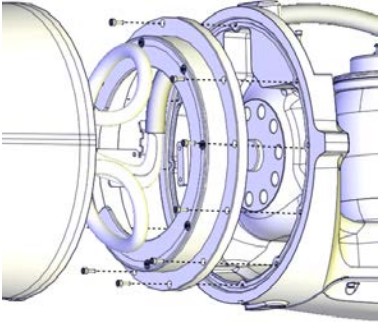
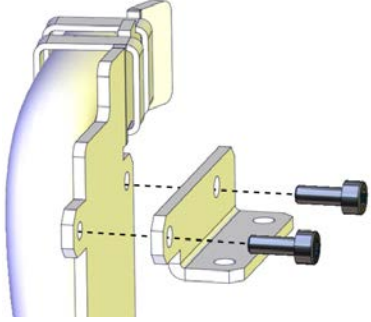
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.	

Continues on next page

4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued


	Action	Note
3	Remove the axis-1 sealing ring from the swing and carefully run the cable package out from the swing.	 <p>xx1300002438</p>
4	Remove the swing (including arm system) completely from the base and lay it aside on a safe location.	
5	Remove the cable bracket from the cabling, if the cable package is to be replaced with a new spare part.	 <p>xx1300002446</p>

Replacing the radial sealing (IP67 and Foundry Plus)

First remove the cabling according to [Removing the cabling on page 499](#), then use this procedure to replace the axis-1 radial sealing.

The sealing is only used for robots with protection class IP67 and protection type Foundry Plus.

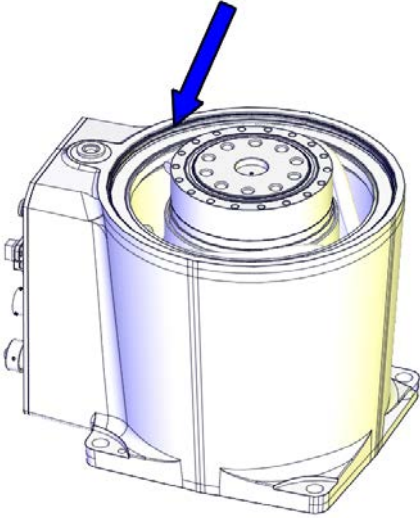

Removing the axis-1 radial sealing and M2 variseal sealing

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Raise the base into standing and put most of the cable harness, including the sealing ring bracket, into the base (in the space of the protection sleeve).	

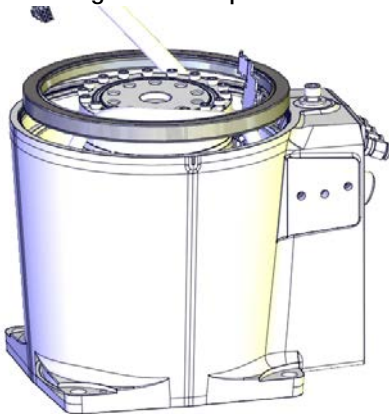
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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
3	<p>Remove the M2 variseal sealing.</p> <p>The M2 variseal sealing is only installed on base version 3HAC049628-001. See Spare part versions for the base on IP40/IP67 robots on page 876.</p>	 <p>xx140000780</p>
4	<p>Remove the radial sealing.</p>	 <p>xx140000270</p>

Refitting the axis-1 radial sealing and M2 variseal sealing

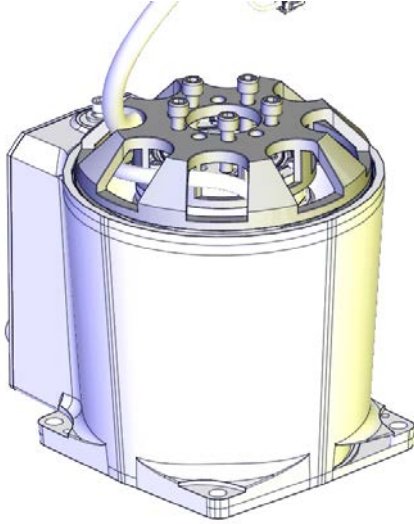

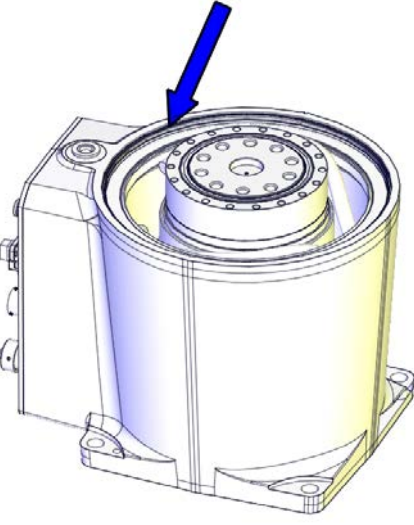
	Action	Note
1	<p>Fit the new sealing in its groove in the base.</p>	<p>Radial sealing with dust lip: 3HAB3701-47</p>  <p>xx140000270</p>

Continues on next page

4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
2	Put the assembly tool against the axis-1 gear and slowly press the sealing into the base by screwing the five screws (M10X35) into the axis-1 gear screws little by little.	<p>Axis-1 sealing assembly tool set: 3HAC049692-001</p>  <p>xx140000271</p>
3	Remove the assembly tool.	
4	<p>Fit a new M2 variseal sealing in its groove in the base.</p> <p>The M2 variseal sealing is only installed on base version 3HAC049628-001. See Spare part versions for the base on IP40/IP67 robots on page 876.</p> <p> CAUTION</p> <p>Do not fit M2 variseal sealing on robots in other protection class or protection types.</p>	 <p>xx140000780</p> <p>M2 variseal sealing: 3HAC044641-002</p>
5	Check that the sealings are undamaged and properly fitted.	

Replacing the M2 variseal sealing (IP67)

The M2 variseal sealing is only installed on base version 3HAC049628-001. See [Spare part versions for the base on IP40/IP67 robots on page 876](#).

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued



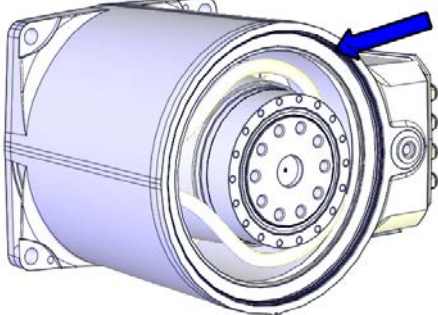
First remove the cabling according to [Removing the cabling on page 499](#), then use this procedure to replace the M2 variseal sealing.



Note

The sealing is only used for robots with protection class IP67. Do not fit M2 variseal sealing on robots in other protection class or protection types.


Replacing the axis-1 M2 variseal sealing (IP67)

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the sealing.	
3	Fit the new sealing in its groove in the base.  CAUTION Do not fit M2 variseal sealing on robots in other protection class or protection types.	 xx140000472 M2 variseal sealing: 3HAC044641-002

Replacing the cable protection sleeve

First remove the cabling according to [Removing the cabling on page 499](#), then use this procedure to replace the protection sleeve.

Replacing the cable protection sleeve


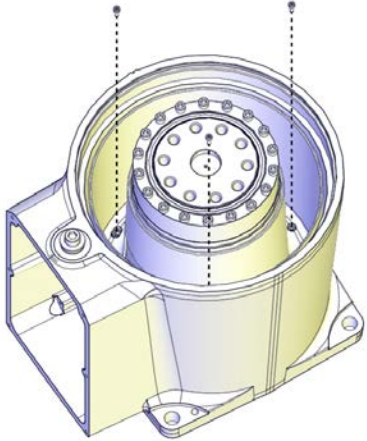
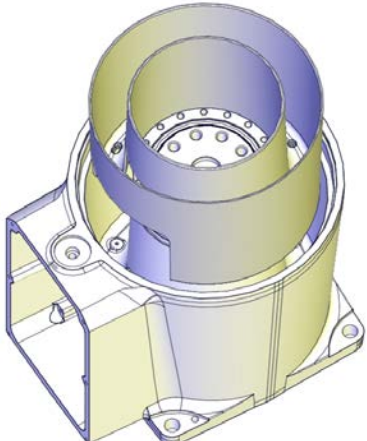
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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4 Repair

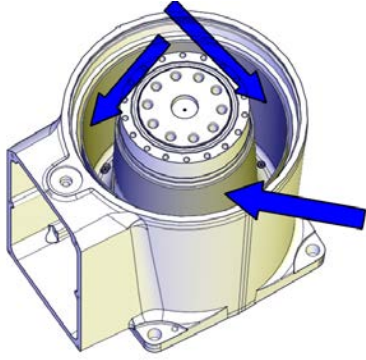
4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	
3	Remove the cabling from the base.	
4	Remove the screws.	 <p>xx140000776</p>
5	Pull up the protection sleeve.	 <p>xx140000777</p>
6	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
7	Fit the new protection sleeve and secure with screws.	Tightening torque: 0.3 Nm.

Continues on next page



4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

	Action	Note
8	Apply grease on the inner surface of the protection sleeve, also on the bottom surface.	 <p>xx140000778</p>

Replacing the base

Use these procedures to replace the base.

Disconnecting the axis-1 motor connectors

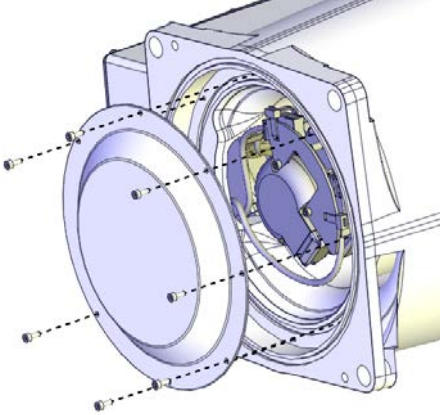
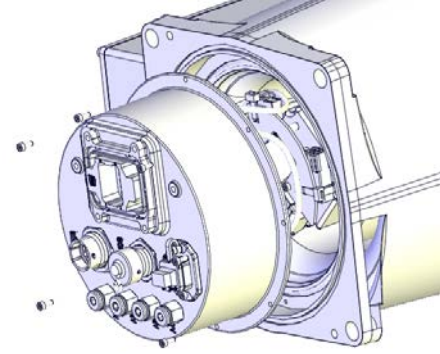
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	

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4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

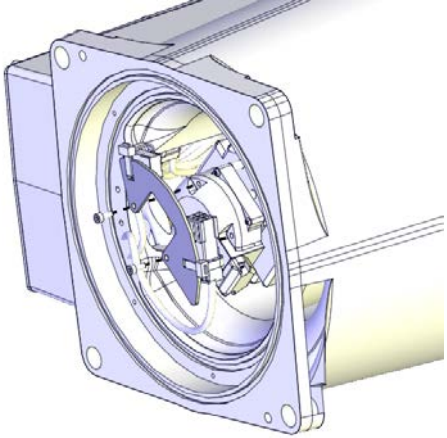
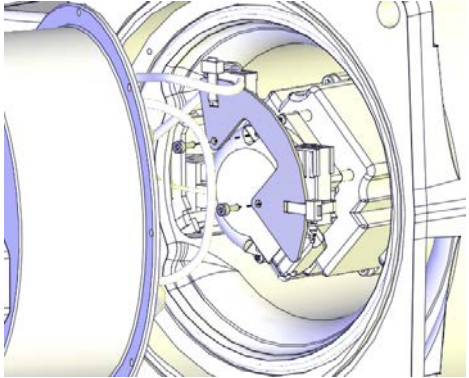
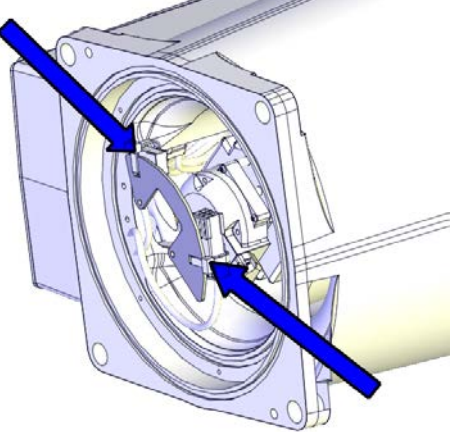
Continued

	Action	Note
3	Remove the bottom cover.	<p data-bbox="944 315 1225 342">Rear connector interface:</p>  <p data-bbox="944 779 1050 797">xx130000469</p> <p data-bbox="944 817 1252 844">Bottom connector interface:</p>  <p data-bbox="944 1227 1050 1245">xx140000403</p>

Continues on next page

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
4	Remove the axis-1 motor bracket.	<p>Rear connector interface:</p>  <p>xx130000470</p> <p>Bottom connector interface:</p>  <p>xx140000404</p>
5	Loosen the connectors from the bracket by cutting the cable straps, and disconnect the connectors.	 <p>xx1300002496</p>

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4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)



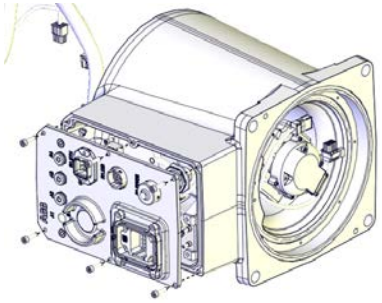
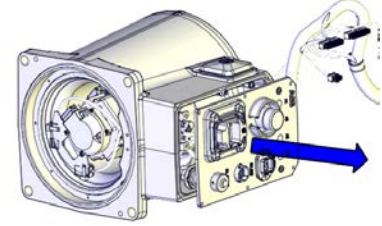
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Removing the cable package from the base

Notice that the procedure differs depending on if the connector interface is located either at the rear or at the bottom of the base.

Cabling with rear interface

Use this procedure if the cable connector interface is located at the rear of the base.

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Open the base cover.	 xx1300002448
4	Disconnect the earth cable.	
5	Pull the cable package out from the base, through the rear.	 xx1300002456



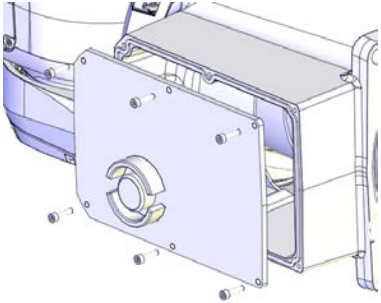
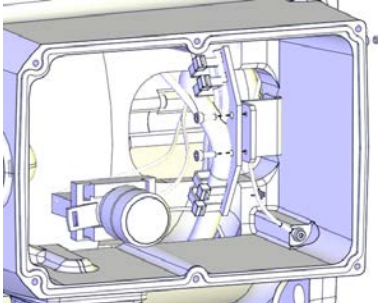
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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

Cabling with bottom interface, and cabling routed from below

Use this procedure if the cable connector interface is located at the bottom of the base and the cabling is routed from below.

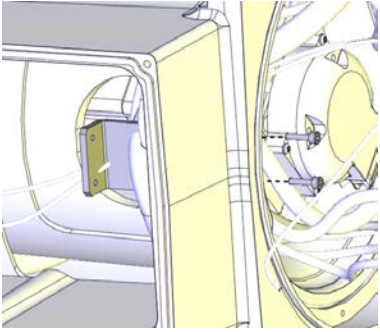
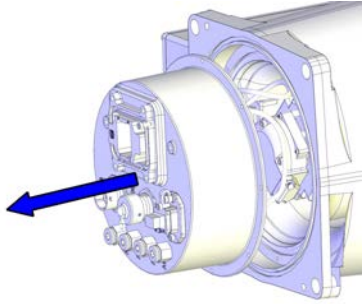
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	
3	<p>Open the base cover.</p>	 <p>xx1400000405</p>
4	<p>Remove the brake release button from the base cover.</p>	
5	<p>Disconnect the earth cable.</p>	
6	<p>Remove the cable bracket by removing the screws.</p>	 <p>xx1400000406</p>

Continues on next page



4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
7	Remove the bracket inside the base by removing the screws.	 <p data-bbox="1029 645 1141 667">xx1400000407</p>
8	Pull the cable package out from the base, through the bottom.	 <p data-bbox="1029 1008 1141 1030">xx1400000411</p>

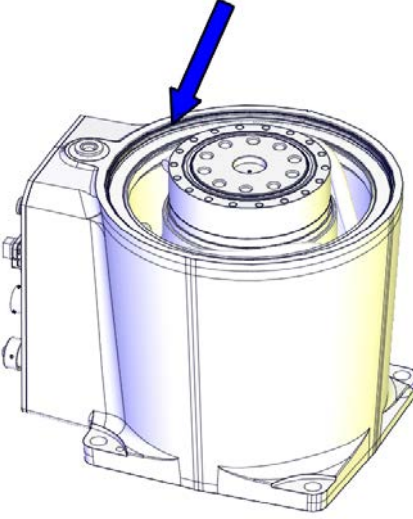
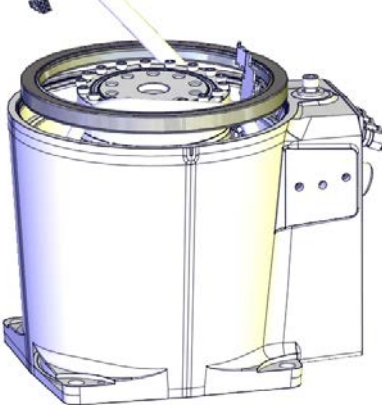
Removing the axis-1 radial sealing and M2 variseal sealing

	Action	Note
1	 <p data-bbox="550 1198 662 1243">DANGER</p> <p data-bbox="470 1265 933 1355">Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p data-bbox="550 1400 678 1444">CAUTION</p> <p data-bbox="470 1467 933 1736"> For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160. </p>	
3	Raise the base into standing and put most of the cable harness, including the sealing ring bracket, into the base (in the space of the protection sleeve).	



Continues on next page

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
4	<p>Remove the M2 variseal sealing.</p> <p>The M2 variseal sealing is only installed on base version 3HAC049628-001. See Spare part versions for the base on IP40/IP67 robots on page 876.</p>	 <p>xx140000780</p>
5	<p>Remove the radial sealing.</p>	 <p>xx140000270</p>

Replacing the base

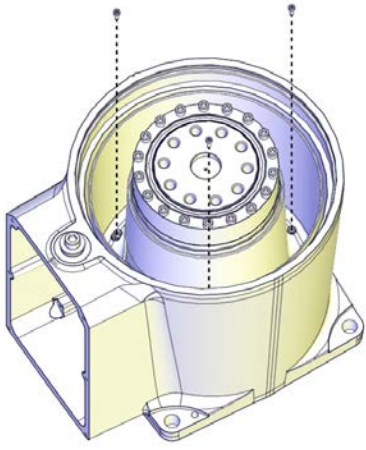
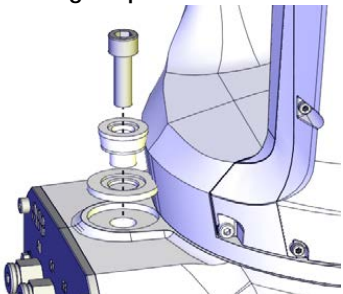
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	

Continues on next page

4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
3	Move the protection sleeve from the old base to the new.	<p>Tightening torque: 0.3 Nm.</p>  <p>xx140000776</p>
4	Move the axis-1 mechanical stop set from the old base to the new. Replace if damaged.	<p>Tightening torque: 12 Nm.</p>  <p>xx140000392</p>


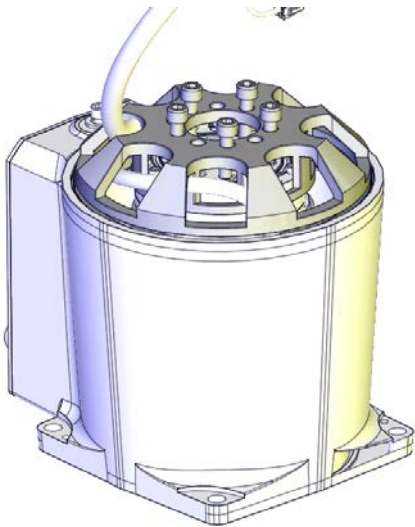
Refitting the axis-1 radial sealing and M2 variseal sealing

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>For robots with protection type Clean Room</p> <p>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p>	

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued


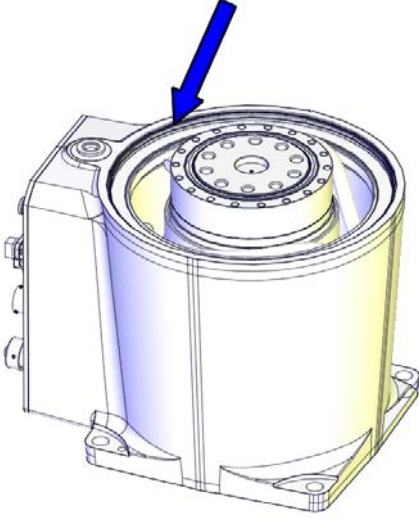
	Action	Note
3	Fit the new sealing in its groove in the base.	Radial sealing with dust lip: 3HAB3701-47  xx140000270
4	Put the assembly tool against the axis-1 gear and slowly press the sealing into the base by screwing the five screws (M10X35) into the axis-1 gear screws little by little.	Axis-1 sealing assembly tool set: 3HAC049692-001  xx140000271
5	Remove the assembly tool.	

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4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

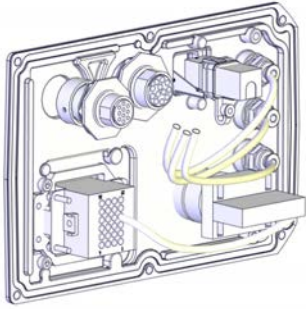
	Action	Note
6	<p>Fit a new M2 variseal sealing in its groove in the base.</p> <p>The M2 variseal sealing is only installed on base version 3HAC049628-001. See Spare part versions for the base on IP40/IP67 robots on page 876.</p> <p> CAUTION</p> <p>Do not fit M2 variseal sealing on robots in other protection class or protection types.</p>	 <p>xx1400000780</p> <p>M2 variseal sealing: 3HAC044641-002</p>
7	<p>Check that the sealings are undamaged and properly fitted.</p>	

Refitting the cable package to the base

Notice that the procedure differs depending on if the connector interface is located either at the rear or at the bottom of the base.

Cabling with rear interface

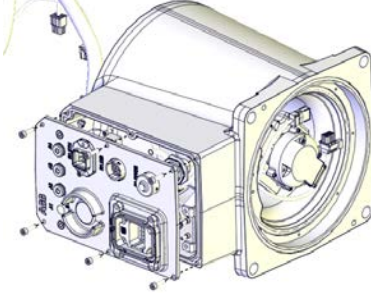

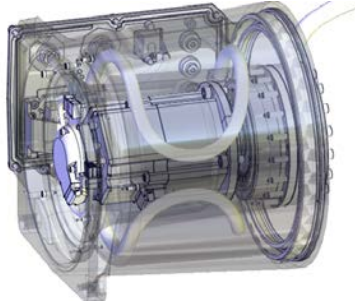
Use this procedure if the cable connector interface is located at the rear of the base.

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Check the gasket on the base cover.</p> <p>Replace if damaged.</p>	<p>Gasket for rear base cover: 3HAC058566-001 (not Hygienic robots) / 3HAC080710-001 (Hygienic robots)</p>  <p>xx1400000741</p>

Continues on next page

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
3	Insert the cable package in and up through the base, through the rear.	
4	Reconnect the earth cable.	
5	Refit the base cover with the attachment screws.	<p>Screws: 3HAB3409-212 (M4x16). Tightening torque: 4 Nm.</p>  <p>xx1300002448</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
6	<p>Route the cable package inside the base as shown in the figure.</p> <p>Apply grease to the cable package, cover all moving area of the package.</p>	 <p>xx1400000480</p>

Cabling with bottom interface, cabling routed from below

Use this procedure if the cable connector interface is located at the bottom of the base and the cabling is routed from below.

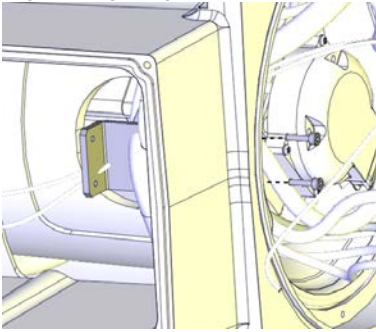
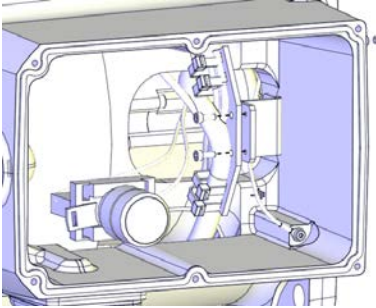
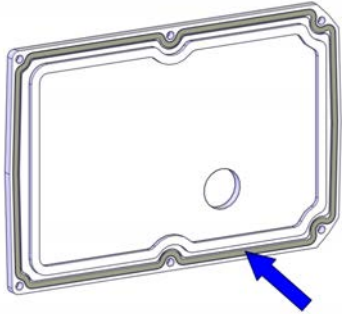
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	Insert the cable package in and up through the base, through the bottom.	

Continues on next page

4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

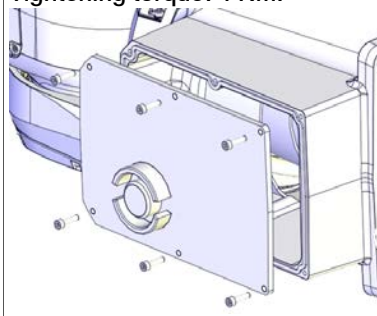

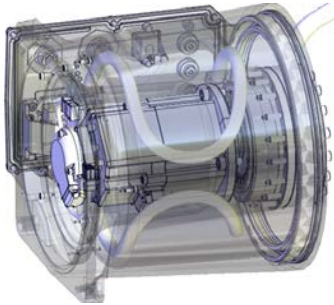
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	Action	Note
3	Refit the bracket inside the base with the screws.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1400000407</p>
4	Refit the cable bracket with the screws.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1400000406</p>
5	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the gasket of the base cover. Replace if damaged.</p>	<p>Gasket for rear base cover: 3HAC058566-001 (not Hygienic robots) / 3HAC080710-001 (Hygienic robots)</p>  <p>xx1400000413</p>
6	Reconnect the earth cable.	
7	Refit the brake release button to the base cover.	

Continues on next page

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
8	Refit the base cover.	<p>Screws: 3HAB3409-212 (M4x16). Tightening torque: 4 Nm.</p>  <p>xx1400000405</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
9	<p>Route the cable package inside the base as shown in the figure.</p> <p>Apply grease to the cable package, cover all moving area of the package.</p>	 <p>xx1400000480</p>

Refitting the cabling

Use these procedures to refit the cabling, after the base part in question has been replaced.

Refitting the cable package to the axis-1 sealing ring

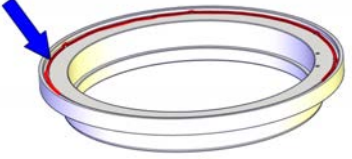



	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Check the axis-1 sealing ring. Replace if damaged.</p>	<p>Axis-1 sealing ring: 3HAC044676-001 / 3HAC068107-001¹</p>

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4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)





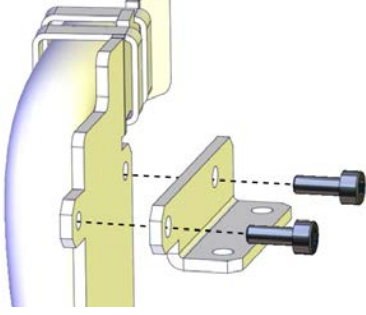
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	Action	Note
3	<p>For robots with protection class IP67 On axis-1 sealing ring version 3HAC056658-001: Add sealant to the axis-1 sealing ring. (See Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 880.)</p>	<p>Sealant: Sikaflex 521FC.</p>  <p>xx1600001125</p>
4	<p>For robots with protection class IP67 On axis-1 sealing ring version 3HAC044676-001, 3HAC058568-001 or 3HAC068107-001: For robots with protection type Foundry Plus On axis-1 sealing ring version 3HAC058568-001 or 3HAC068107-001: Check the gasket on the axis-1 sealing ring. (See Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 880.) Replace if damaged.</p>	<p>On axis-1 sealing ring version 3HAC044676-001: Axis-1 sealing ring gasket: 3HAC045685-001</p>  <p>xx1400000458</p> <p>On axis-1 sealing ring version 3HAC058568-001: Axis-1 sealing ring gasket: 3HAC058349-001 (not Hygienic robots) / 3HAC080707-001 (Hygienic robots)</p>  <p>xx1600001149</p> <p>On axis-1 sealing ring version 3HAC068107-001: Axis-1 sealing ring gasket: 3HAC058349-001 (not Hygienic robots) / 3HAC080707-001 (Hygienic robots)</p>  <p>xx1900001735</p>

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

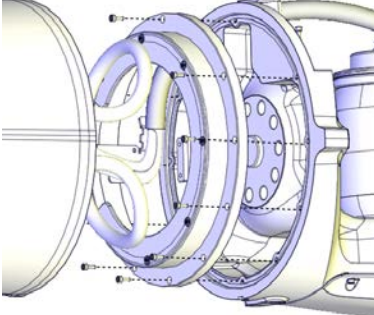
	Action	Note
5	<p>For robots with protection class IP67 On axis-1 sealing ring version 3HAC056658-001, 3HAC058568-001 or 3HAC068107-001:</p> <p>For robots with protection type Foundry Plus On axis-1 sealing ring version 3HAC058568-001 or 3HAC068107-001:</p> <p>Check the V-ring on the axis-1 sealing ring. (See Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 880.)</p> <p>Replace if damaged.</p>	<p>V-ring: 3HAB3732-34</p> <p>On axis-1 sealing ring version 3HAC056658-001:</p>  <p>xx1600001124</p> <p>On axis-1 sealing ring version 3HAC058568-001:</p>  <p>xx1600001150</p> <p>On axis-1 sealing ring version 3HAC068107-001:</p>  <p>xx1900001736</p>
6	<p>Check the cable protection on the axis-1 sealing ring. Replace if damaged.</p> <p>If replacing the cable protection, use locking liquid Loctite 243 on the screws.</p>	<p>Cable protection: 3HAC044691-001 Torx countersunk head screw M3x5: 3HAC14286-4 Tightening torque: 0.3 Nm</p>  <p>xx1400000456</p>
7	<p>Refit the cable bracket to the cabling, if removed. Use Loctite 243 on the screw threads.</p>	<p>Tightening torque: 1 Nm.</p>  <p>xx1300002446</p>

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4 Repair



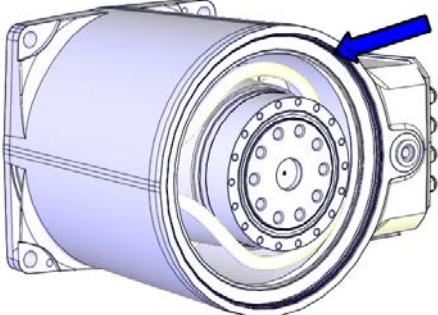
4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
8	Refit the axis-1 sealing ring to the swing and carefully run the cabling into the swing.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002438</p>

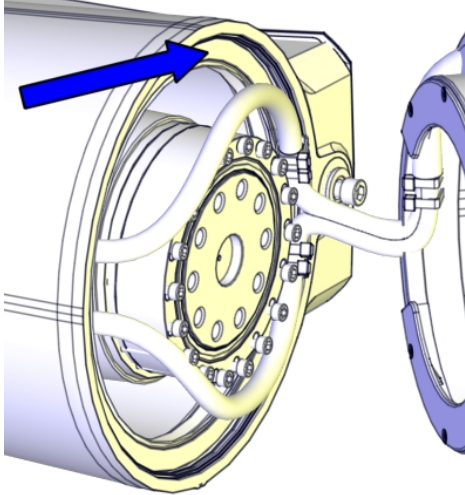
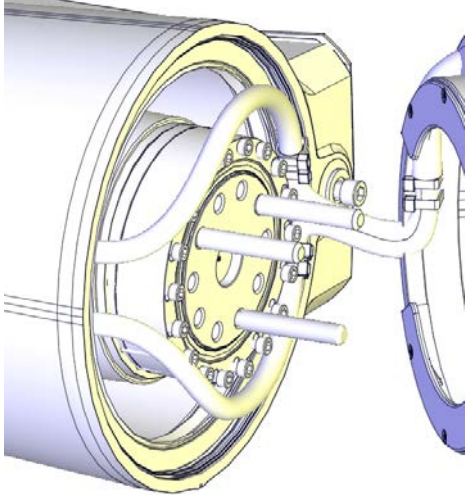

ⁱ For information on which sealing ring to be ordered, see [Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 880](#).

Assembling the swing and base

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Check the axis-1 radial sealing in the base. Replace if damaged.</p> <p> Note</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p> <p>For robots with protection class IP67</p> <p>Check the M2 variseal sealing in the base. Replace if damaged.</p> <p>The M2 variseal sealing is only installed on base version 3HAC049628-001. See Spare part versions for the base on IP40/IP67 robots on page 876.</p> <p> CAUTION</p> <p>Do not fit M2 variseal sealing on robots in other protection class or protection types.</p>	<p>Radial sealing with dust lip: 3HAB3701-47 M2 variseal sealing: 3HAC044641-002</p>  <p>xx1400000472</p> <p>Replacement is detailed in Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve) on page 494.</p>

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

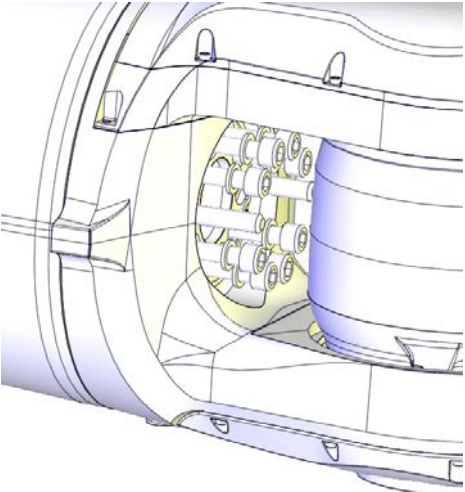

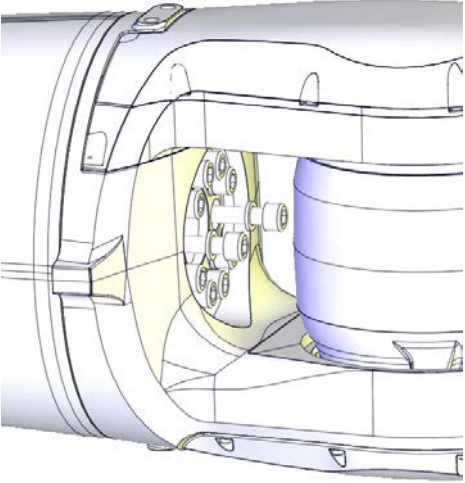
	Action	Note
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus Apply grease to the radial sealing surface.</p>	<p>Grease: 3HAC058065-001.</p>  <p>xx160000170</p>
4	<p>Fit the guide pins to the drive unit.</p>	<p>Guide pin for axis-1 gear unit: 3HAC049703-001</p>  <p>xx1300002566</p> <p>Always use three guide pins together!</p>
5	<p>Refit the swing to the base with guidance from the guide pins while running the cabling up through the swing. Position and angle the cabling inside the base as it was positioned during removal.</p> <p> CAUTION</p> <p>Be careful not to squeeze any cabling during the refitting procedure.</p>	

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4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

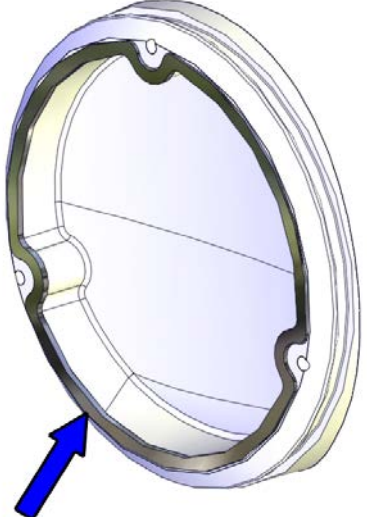
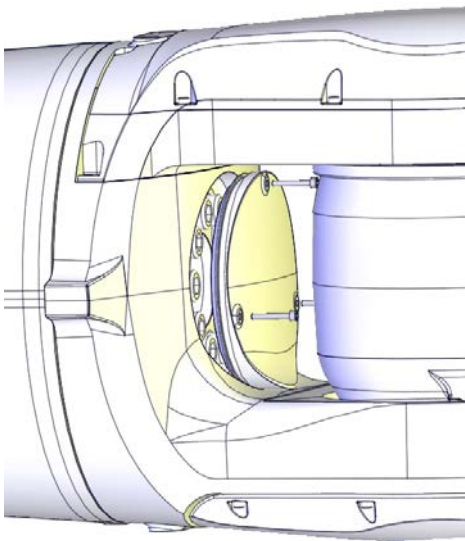

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	Action	Note
6	Secure with attachment screws and washers, but do not tighten yet.	<p>Screws: 3HAB3409-52 (M10x35).</p>  <p>xx1300002567</p> <p> Note Only use specified screws, never replace them with other screws.</p>
7	Remove the guide pins and refit the remaining attachment screws and washers.	 <p>xx1300000523</p>
8	Tighten all screws.	Tightening torque: 40 Nm.

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
9	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the gasket. Replace if damaged.</p>	<p>Gasket on top swing cover 3HAC056696-001 (not Hygienic robots) / 3HAC080698-001 (Hygienic robots)</p>  <p>xx140000425</p>
10	<p>Refit the swing top cover with the screws. Replace if damaged.</p>	<p>Cover on top of swing: 3HAC059679-001 Cover on top of swing, Clean Room Cover on top of swing, food grade lubrication Cover on top of swing, Hygienic : 3HAC056133-001 Screws: 3HAB3409-209 (M3x20). Tightening torque: 1.5 Nm.</p>  <p>xx130000467</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

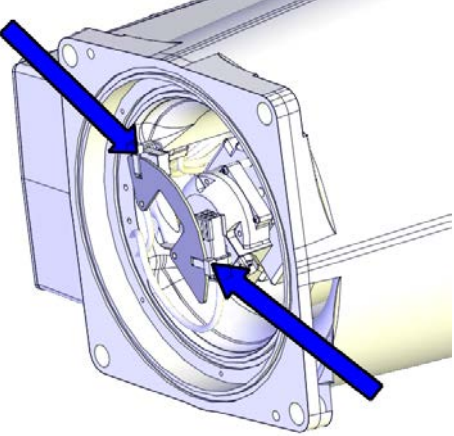
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4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

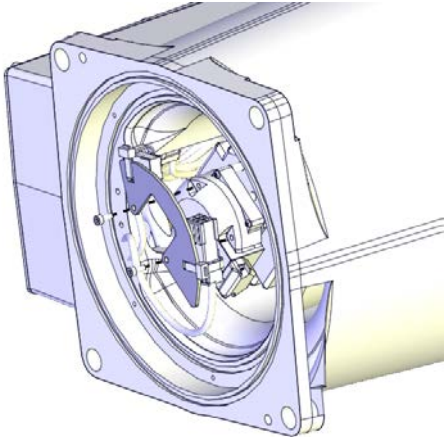
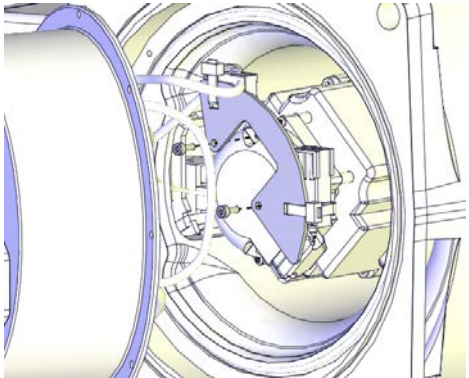
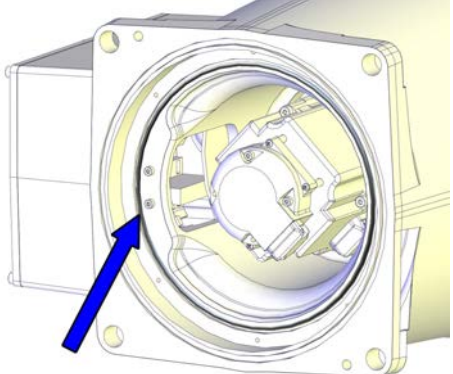
Connecting the axis-1 motor connectors

	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the connectors and secure the connectors to the bracket with cable straps.	 <p>xx1300002496</p>

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

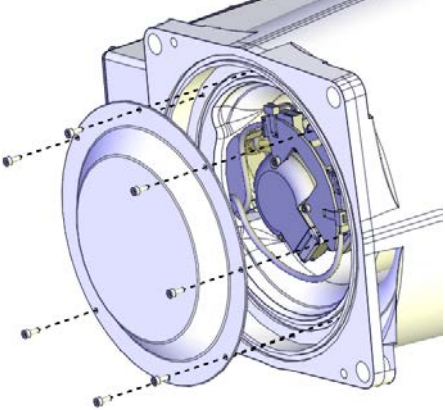
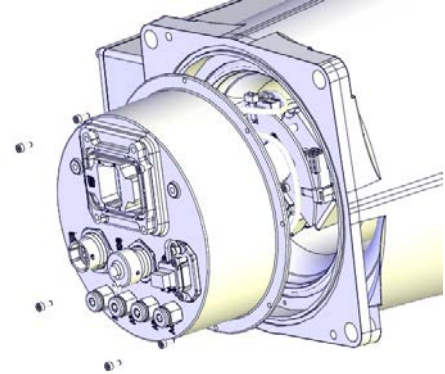

	Action	Note
3	Refit the axis-1 motor bracket.	<p>Tightening torque: 1.5 Nm. Rear connector interface:</p>  <p>xx130000470</p> <p>Bottom connector interface:</p>  <p>xx140000404</p>
4	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the O-ring. Replace if damaged.</p>	<p>O-ring: 3HAB3772-86</p>  <p>xx140000412</p>

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4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
5	Refit the bottom cover.	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm. Rear connector interface:</p>  <p>xx1300000469</p> <p>Bottom connector interface:</p>  <p>xx1400000403</p> <p> Note Only use specified screws, never replace them with other screws.</p>


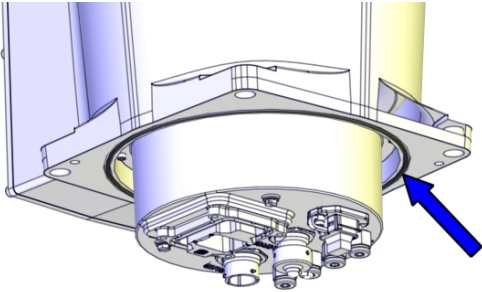
Securing the robot to the foundation

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
2	 CAUTION The robot weighs . IRB 1200-5/0.9: 54 kg IRB 1200-7/0.7: 52 kg All lifting accessories used must be sized accordingly!	
3	For robots with: protection class IP67, protection type Foundry Plus protection type Clean Room food grade lubrication with protection type Hygienic and manipulator cables routed from below Check the gasket at the bottom of the base. Replace if damaged.	O-ring: 3HAB3772-141 For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Used with manipulator cables routed from below  xx1500000241
4	Raise the robot to standing and secure to the foundation with the attachment screws and washers.	Attachment screws: M12x35 (robot installation directly on foundation), quality: 8.8. Washers: 13 x 20 x 2, steel hardness class 300HV. Pin: 2 pcs, D6x20, ISO 2338 - 6m6x20 - A1. Tightening Torque: 55 Nm ± 5 Nm.

Refitting the cable package in the lower arm

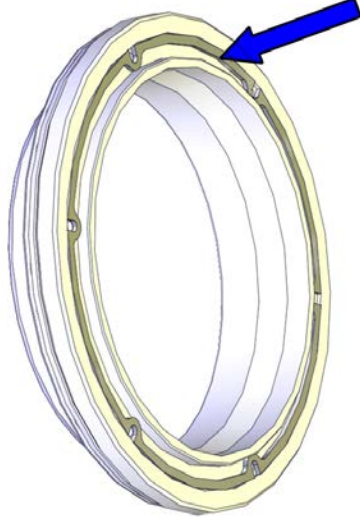
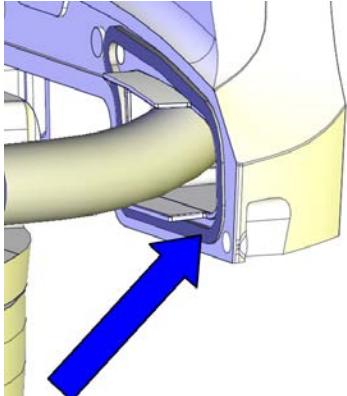
	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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4 Repair

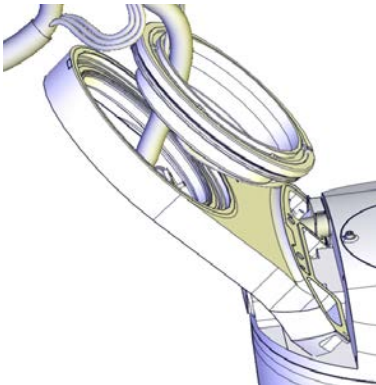
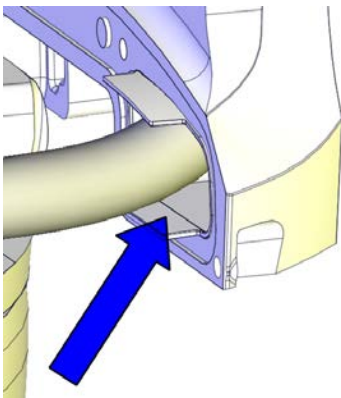
4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
2	<p>Check the axis-2 sealing ring. For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the gasket. Replace if damaged.</p>	<p>Axis-2 sealing ring: 3HAC044677-001 Gasket of axis-2 sealing ring: 3HAC045688-001 (not Hygienic robots) / 3HAC080697-001 (Hygienic robots)</p>  <p>xx1400000476</p>
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the gasket of the cable housing plastic plate. Replace if damaged.</p>	<p>Gasket of plastic plate: 3HAC044894-001 (not Hygienic robots) / 3HAC080695-001 (Hygienic robots)</p>  <p>xx1400000457</p>

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued


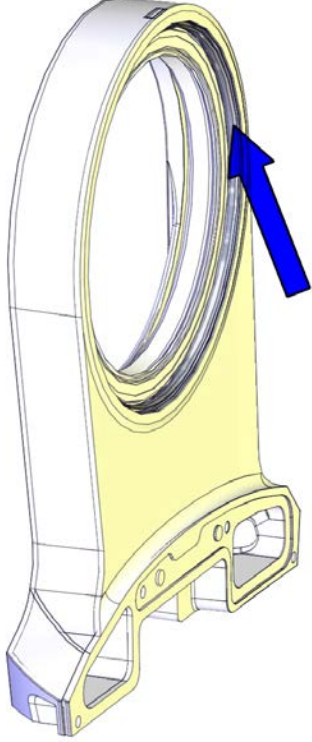
	Action	Note
4	Fetch the cable housing, the plastic plate and the axis-2 sealing ring and run the cable package through them.	 <p>xx140000025</p>
5	Fasten the plastic plate to the cable housing, if removed. Replace if damaged.	<p>The plastic plate is included in: Cable harness material set: 3HAC049663-001.</p>  <p>xx140000023</p>

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4 Repair


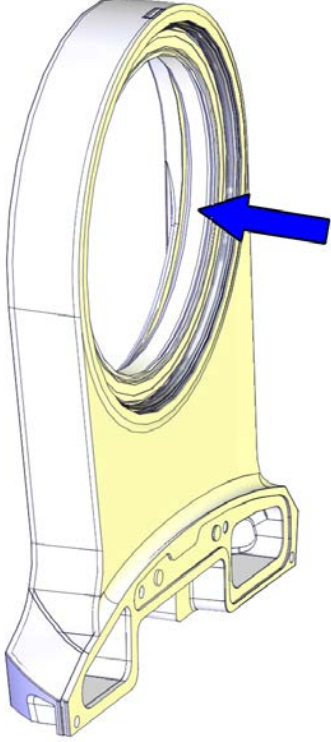

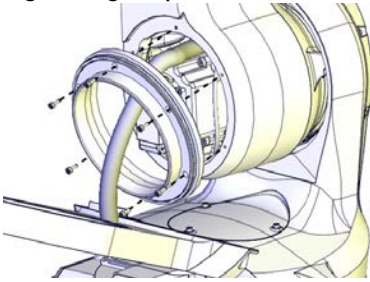
4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
6	<p>For robots with protection class IP67 For robots with protection type Foundry Plus Check the sealing. Replace if damaged.</p> <p> CAUTION</p> <p>Do not fit M2 variseal sealing on robots in other protection class or protection types.</p>	<p>M2 variseal sealing: 3HAC044641-004</p>  <p>xx1400000454</p>

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

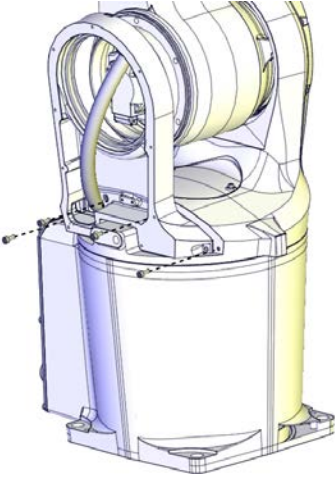

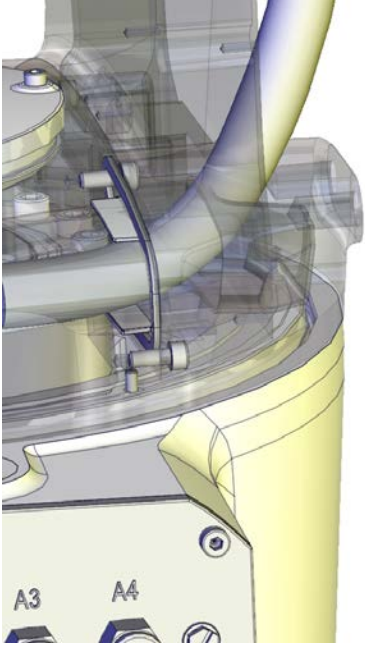
	Action	Note
7	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the radial sealing. Replace if damaged.</p> <p> Note</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p>	<p>Radial sealing with dust lip: 3HAB3701-41</p>  <p>xx1400000753</p> <p>Replacement is detailed in Replacing the swing spare parts (swing, axis-2 radial sealing) on page 574.</p>
8	<p>Guide the cable package into the lower arm.</p> <p> Tip</p> <p>There is a groove on the lower arm casting that simplifies cable passage, if needed. Its position can easily be felt by hand.</p>	
9	<p>Refit the axis-2 sealing ring with the screws.</p>	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1400000020</p>

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4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

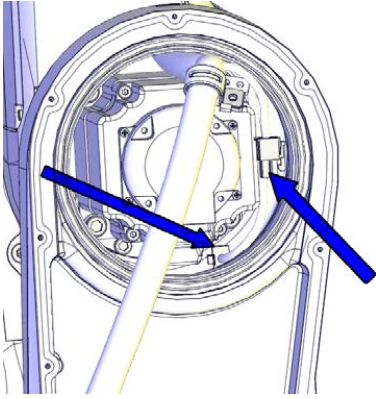

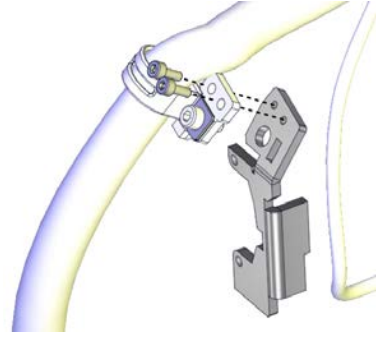
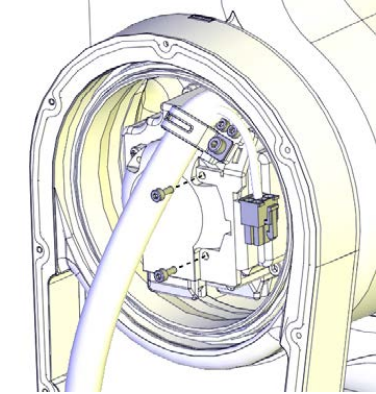
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	Action	Note
10	Refit the cable housing with the screws.	<p>Screws: 3HAB3409-236 (M4x10). Tightening torque: 3 Nm.</p>  <p>xx1300002435</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
11	Apply grease to the cable package, cover all moving area of the package.	 <p>xx1400000481</p>

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

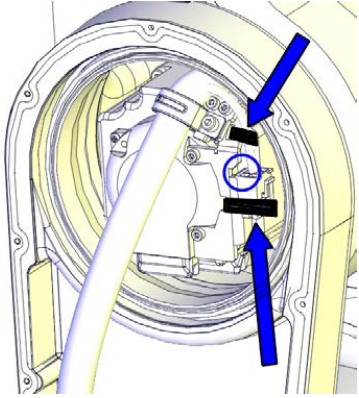
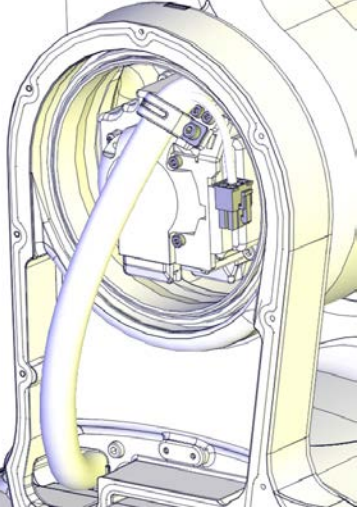
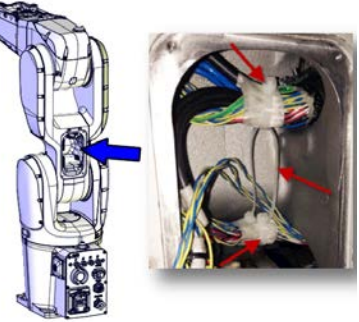
	Action	Note
12	Reconnect the motor connectors. <ul style="list-style-type: none"> • R2.ME2 • R2.MP2 	 <p>xx1300002434</p>
13	Refit the axis-2 motor bracket to the cable package with the two screws.  CAUTION Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	Tightening torque: 1.5 Nm.  <p>xx1400000021</p>
14	Refit the axis-2 motor bracket to the motor.	 <p>xx1300002432</p>

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4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

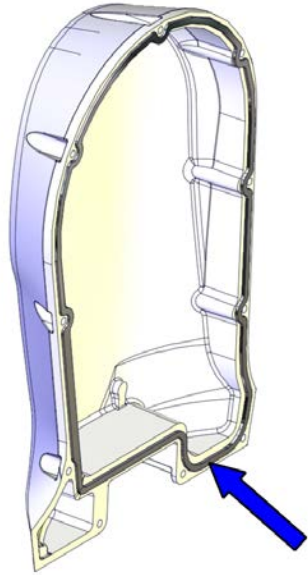
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	Action	Note
15	Secure the connector R2.MP2 and its cable with cable straps onto the motor bracket. Make sure the connector is fixed by its tab to the bracket.	 xx1400001529
16	Apply grease to the cable package, cover all moving area of the package.	 xx1400000482
17	<p>In order to keep the cabling away from the hot axis-2 motor, the cable package must be secured accordingly inside the EIB/SMB cavity:</p> <ol style="list-style-type: none">1 The cable package is strapped with tape by the supplier at two locations. Put a cable strap around the cable package at each location.2 Insert a third cable strap through the top strap and the bottom strap, and close the strap to secure the cable package and keep it in place. <p>See the figure.</p>	 xx1400001131

Continues on next page

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued


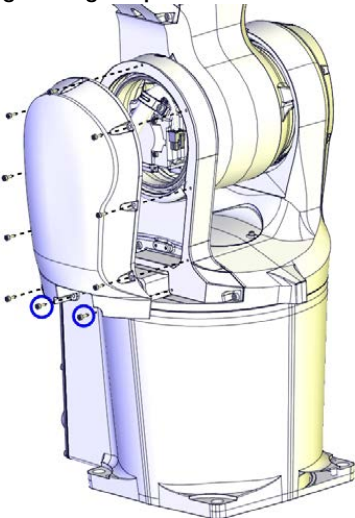

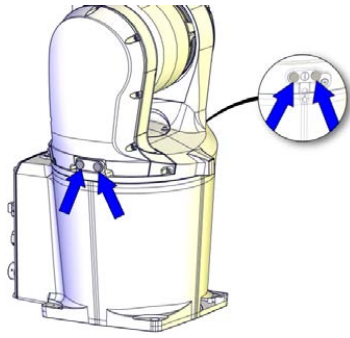
	Action	Note
18	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the gasket of the cable housing cover. Replace if damaged.</p>	<p>Gasket on cable housing cover: 3HAC056726-001 (not Hygienic robots) / 3HAC080704-001 (Hygienic robots)</p>  <p>xx1400000424</p>
19	<p>Check the PTFE film. Replace if damaged.</p>	<p>PTFE film on cable housing cover: 3HAC044660-001</p>
20	<p>Apply grease to the inner surface of the cable housing cover and to the PTFE film surface.</p>	

Continues on next page

4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

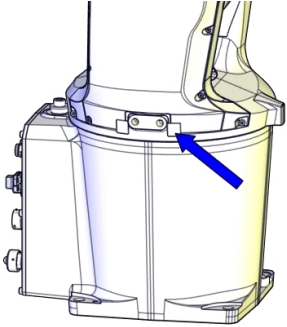

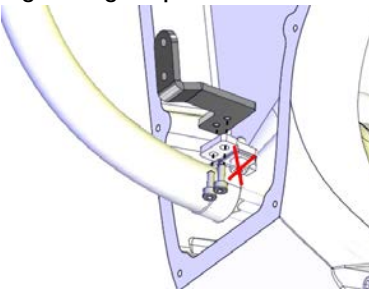
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	Action	Note
21	<p>Refit the cable housing cover. Replace if damaged.</p> <p> Note</p> <p>Remember to refit the two lower screws shown in the figure.</p>	<p>Cable housing cover of the swing: 3HAC059678-001</p> <p>Cable housing cover of the swing, Clean Room</p> <p>Cable housing cover of the swing, food grade lubrication</p> <p>Cable housing cover of the swing, Hygienic : 3HAC056214-001</p> <p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p>  <p>xx1300002431</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
22	<p>For robots with protection type Foundry Plus Check the protection plugs for lifting holes. Replace if damaged.</p>	<p>Protection plug for lifting holes: 3HAC4836-24</p>  <p>xx1600001151</p>


Continues on next page

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
23	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Refit the swing sealing plug. Follow the procedure specified in Refitting the swing sealing plug on page 169.</p>	<p>Swing sealing plug:3HAC053687-001</p>  <p style="text-align: right; font-size: small;">xx1600000205</p>
24	<p>Refit the lower arm bracket to the cable package.</p> <p> CAUTION</p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>	<p>Tightening torque: 1.5 Nm.</p>  <p style="text-align: right; font-size: small;">xx1300002430</p>

Connecting the cabling in the lower arm

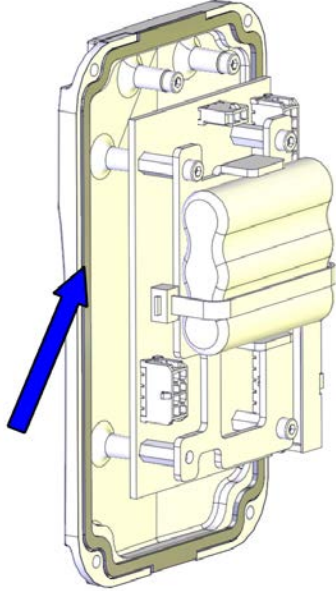

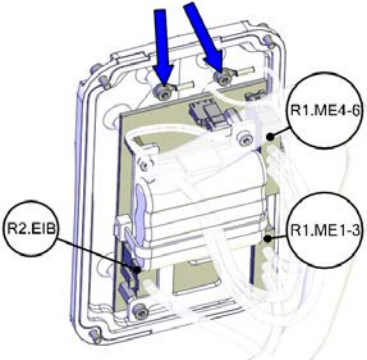

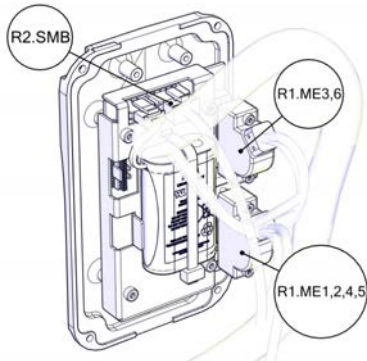
	Action	Note
1	<p> ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section The unit is sensitive to ESD on page 64</p>	
2	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

Continues on next page

4 Repair

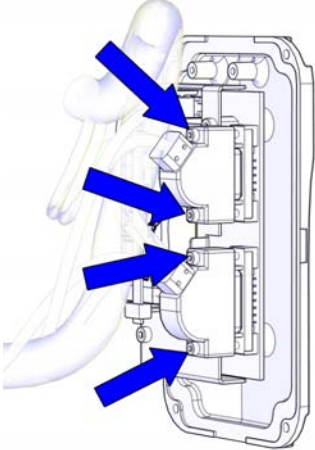
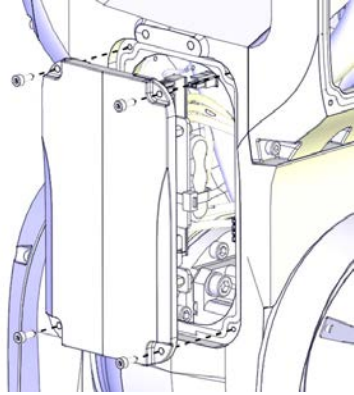

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the EIB/SMB cover gasket. Replace if damaged.</p>	<p>Gasket on EIB/SMB cover: 3HAC056728-001 (not Hygienic robots) / 3HAC080706-001 (Hygienic robots)</p>  <p>xx1400000475</p>
4	<p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Connect the connectors to the EIB unit.</p> <ul style="list-style-type: none"> • R1.ME1-3 • R1.ME4-6 • R2.EIB <p> WARNING</p> <p>Make sure not to mix the R2.EIB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.</p>	 <p>xx1300002428</p>
5	<p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Connect the lugs to the EIB/SMB cover.</p>	
6	<p>Valid for IRB 1200 Type B</p> <p>Connect the connectors to the SMB unit.</p> <ul style="list-style-type: none"> • R1.ME1,2,4,5 • R1.ME3,6 • R2.SMB <p> WARNING</p> <p>Make sure not to mix the R2.SMB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.</p>	 <p>xx1700000005</p>

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

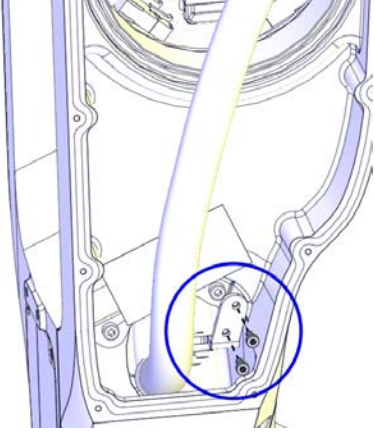
	Action	Note
7	<p>Valid for IRB 1200 Type B Tighten the connector screws.</p>	<p>Tightening torque: 0.3 Nm</p>  <p>xx1700000004</p>
8	<p>Refit the EIB/SMB cover to the lower arm with the attachment screws.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm</p>  <p>xx1300002427</p> <p> Note Only use specified screws, never replace them with other screws.</p>

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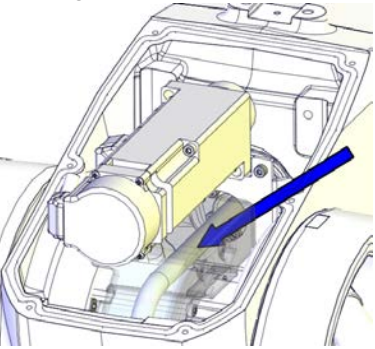
4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
9	Refit the fix sheet attachment screws in the lower arm.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002426</p>



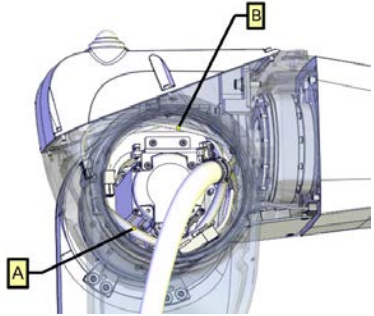

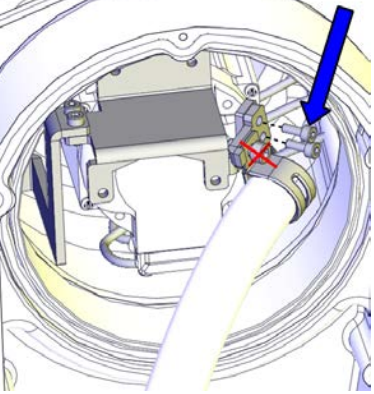
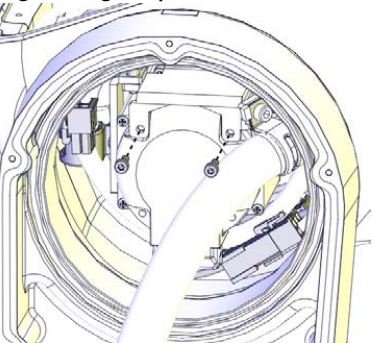
Refitting the cable package in the housing

	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Before guiding the cable package into the housing and upper arm, apply grease to the cable package, to the area going into the upper arm, shown in the figure. Cover all moving area of the package.</p>	<p>Area to be lubricated, shown in cable package already fitted to the housing.</p>  <p>xx1400000483</p>

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

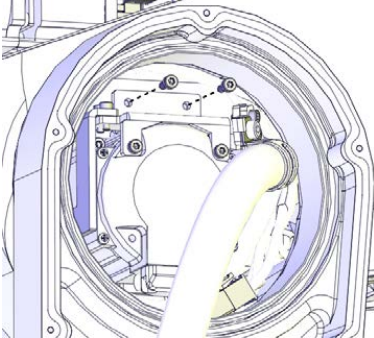

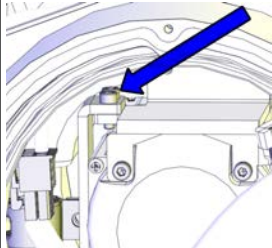
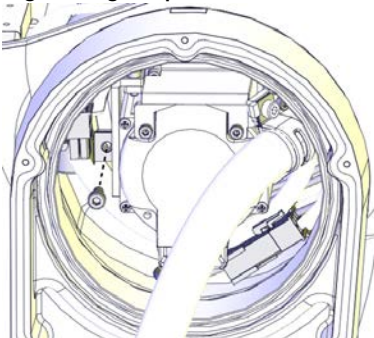
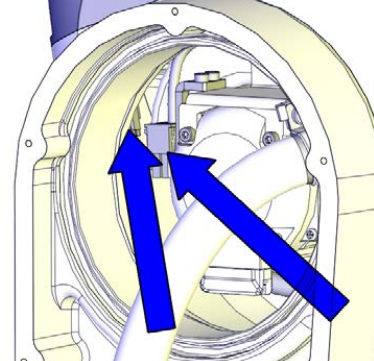
	Action	Note
3	<p>Guide the cable package into the upper arm, through the housing.</p> <p> Note</p> <p>Guide the air hoses (A) underneath the bottom side of the axis-3 motor and the axis-3 motor cables (B) on top of the motor, see cable layout figure. The fix point of the air hoses is pre-determined (marked) and must be matched against the air hose holder on the left side of the axis-3 motor.</p> <p> Note</p> <p>The air hose holder keeps the air hoses arranged in an optimized way. It is necessary to keep the air hose holder vertically and firmly against the left side of the axis-3 motor.</p>	 <p>xx1400001472</p>
4	<p>Refit the bracket to the sheet with two screws.</p> <p> CAUTION</p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002424</p>
5	<p>Refit the fix sheet to the motor.</p>	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002423</p>

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4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

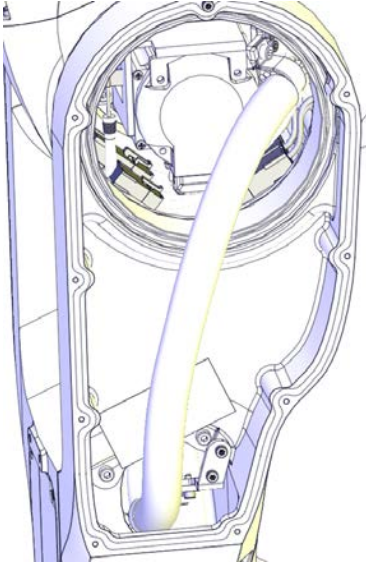
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	Action	Note
6	Refit the fix sheet to the inner plastic guide.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002421</p>
7	<p>Fit the air hose holder to the bracket. Replace the holder, if damaged.</p> <p> Tip</p> <p>If the air hose holder is difficult to fit, firstly remove the bracket from the fix sheet by removing the two M3 screws. Fit the holder to the bracket and then refit the complete assembly to the fix sheet again. Tightening torque for the two M3 screws: 1.5 Nm.</p>  <p>xx1400001133</p>	<p>Air hose holders are included in Cable harness material set (3HAC049663-001). Tightening torque: 4 Nm.</p>  <p>xx1300002422</p>
8	Reconnect the axis-3 motor connectors.	 <p>xx1300002420</p>

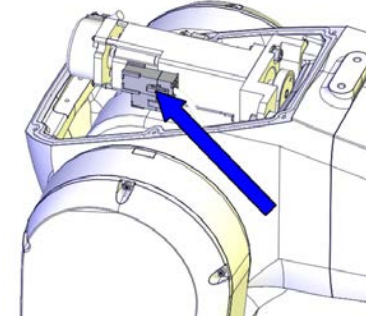
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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
9	Apply grease to the cable package, cover all moving area of the package.	 <p>xx140000754</p>
10	Valid for IRB 1200-5/0.9 Secure the cable package at the bottom of the housing with cable straps.	

Connecting the axis-4 motor connectors

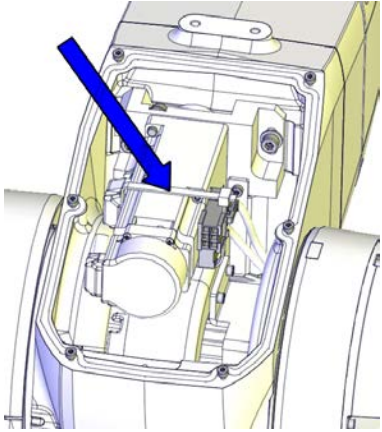
	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the motor connectors.	 <p>xx1300002371</p>

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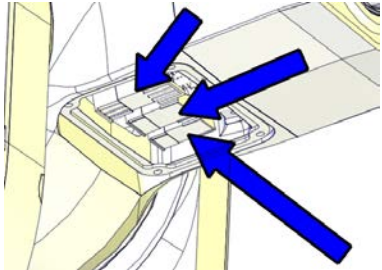
4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued


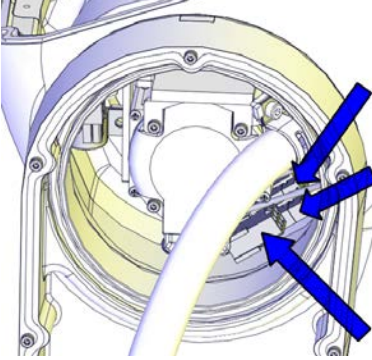
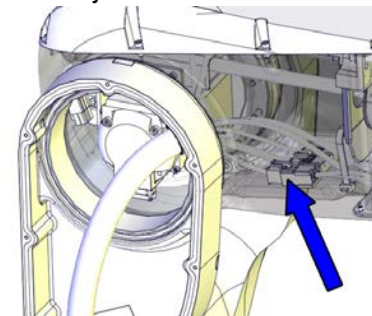
	Action	Note
3	Secure the connectors to the motor with a cable strap.	 xx1300002494

Connecting the axis-4 FPC connectors

	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the FPC connectors.  Tip See the number markings on the connectors for help to find the corresponding connector.	 xx1300002399

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)
Continued

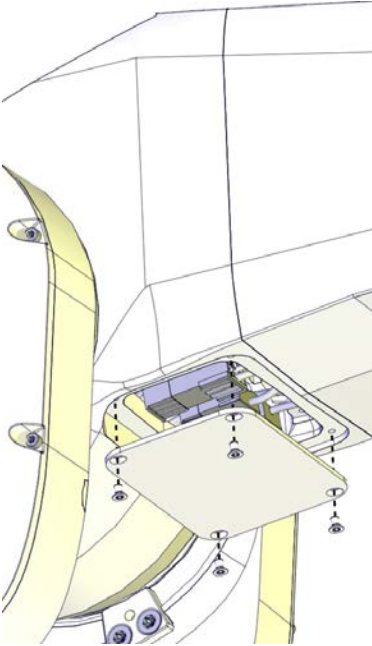
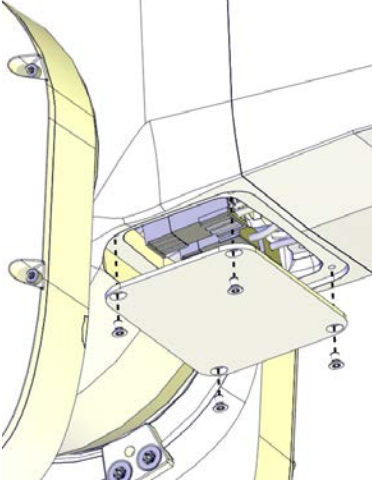
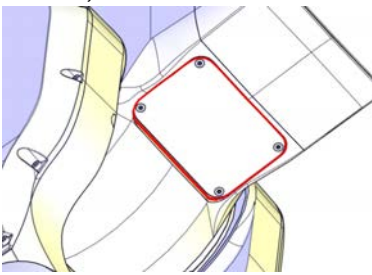
	Action	Note
3	<p>Reconnect the FPC connectors and push them into place inside the housing.</p> <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	<p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p>
4	<p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p>	

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4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

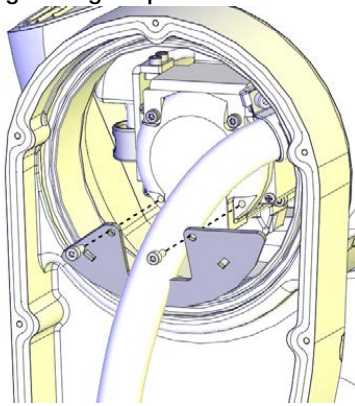
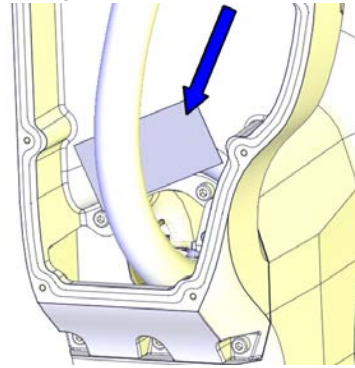
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	Action	Note
5	<p>For robots with protection class IP67 For robots with protection type Foundry Plus Apply flange sealing Sikaflex 521FC on the mounting surfaces of the small cover on the housing.</p>	
6	<p>Refit the small cover to the housing. Replace if damaged.</p>	 <p>xx1300002398</p> <p>Housing small cover: 3HAC059684-001 Housing small cover, Clean Room Housing small cover, food grade lubrication Housing small cover, Hygienic : 3HAC056142-001 Screws: 3HAC14286-4 (M3X5). Tightening torque: 1 Nm.</p>
7	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Apply a string of the sealant to the joint of the small cover on the housing. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.</p>	<p>For robots with protection type Clean Room For robots with food grade lubrication Sealant, SikaFlex 521FC For robots with protection type Hygienic Sealant, Trans Clear</p>  <p>xx1600000214</p>

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

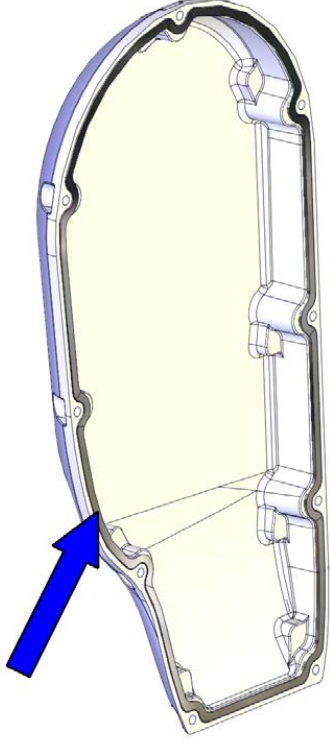
	Action	Note
8	Refit the plate.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002413</p>
9	Check the PTFE film on the cable housing. Replace if damaged.	<p>PTFE film on lower arm cable housing: 3HAC044710-001</p>  <p>xx1400000740</p>

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4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

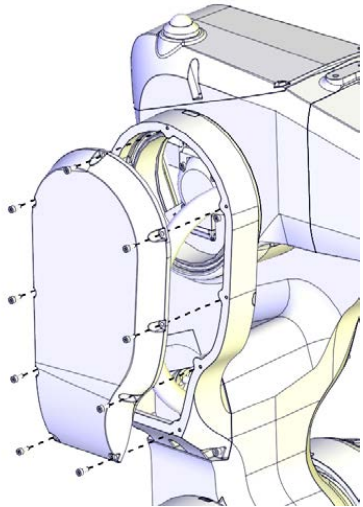

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	Action	Note
10	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the gasket of the cable housing cover. Replace if damaged.</p>	<p>Gasket on cable housing cover: 3HAC056724-001 (not Hygienic robots) / 3HAC080702-001 (Hygienic robots) PTFE film on cable housing cover: 3HAC044660-001</p>  <p>xx140000048</p>
11	<p>Check the PTFE film on the cable housing cover. Replace if damaged.</p>	
12	<p>Apply grease to the inner surface of the cable housing cover and the PTFE film surface.</p>	

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4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

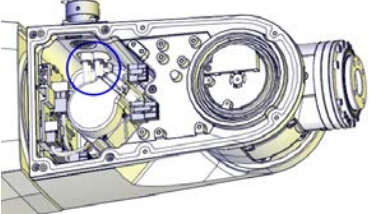
	Action	Note
13	<p>Refit the cable housing cover.</p> <p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Apply locking liquid Loctite 243 to all the screws securing the cover.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm</p>  <p>xx1300002400</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

Connecting the air hoses and CP/CS cabling (if equipped)

Notice that the procedure differs depending on the protection class and protection type.

Connecting the air hoses and CP/CS cabling on robots not in protection type Hygienic

Use this procedure if the robot is not in protection type Hygienic.

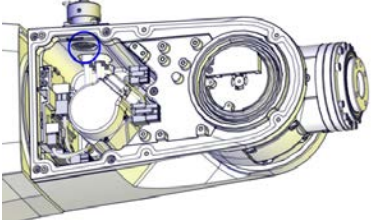
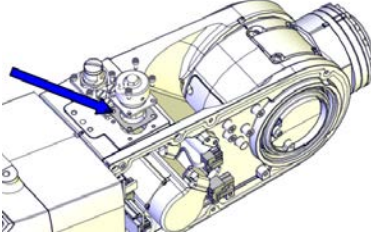
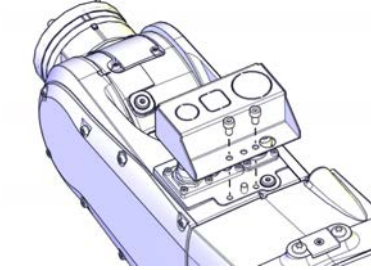
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Reconnect the air hoses.</p> <p>Replace the air hose connector set if damaged.</p>	<p>Air connector set with Ethernet hole in flange: 3HAC049664-001</p> <p>Air connector set without Ethernet hole in flange: 3HAC049665-001</p>  <p>xx1400000738</p>

Continues on next page

4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
3	<p>If equipped, reconnect the CP/CS connector.</p> <p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <ol style="list-style-type: none"> 1 Check the gasket. 2 Replace if damaged. <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <ol style="list-style-type: none"> 1 Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. 2 Apply flange sealing Loctite 574 on the mounting surfaces of the CP/CS connector and wipe clean if there is any overflowing Loctite 574. 	 <p>xx1500000252</p> <p>On robots with protection class IP67</p> <p>On robots with protection type Foundry Plus</p> <p>Gasket: 3HAC058567-001</p>  <p>xx1500000251</p>
4	<p>For robots with protection type Foundry Plus</p> <p>If required, fit the protection bracket for CP/CS connectors.</p>	<p>Protection bracket for CP/CS connectors: 3HAC058350-001</p>  <p>xx1600001152</p>

Connecting the air hoses and CP/CS cabling on robots in protection type Hygienic

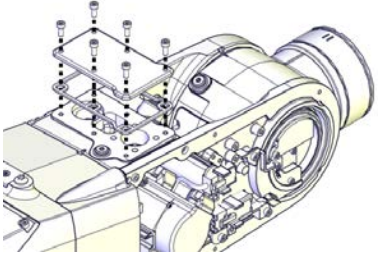
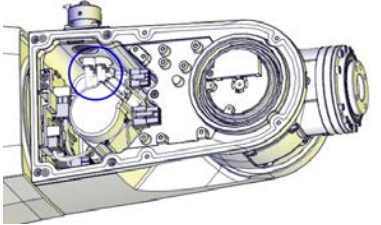
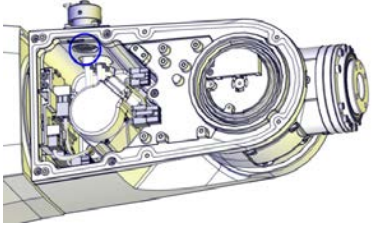
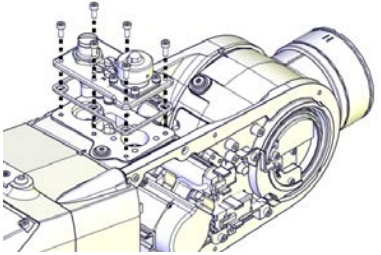
Use this procedure if the robot is with protection type Hygienic.

	Action	Note
1	<p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

Continues on next page

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
2	<p>If the Hygienic robot not equipped with air hoses and CP/CS cabling: Check the plate without connector set and the attached gasket. Replace if damaged.</p>	<p>Plate without connector set: 3HAC078810-001 Gasket: 3HAC078804-001</p>  <p>xx2100001433</p>
3	<p>Reconnect the air hoses.</p>	 <p>xx1400000738</p>
4	<p>Reconnect the CP/CS cabling.</p>	 <p>xx1500000252</p>
5	<p>Check the connectors on the plate with connector set and the attached gasket. Replace if damaged.</p>	<p>Plate with connector set: 3HAC079691-001 Gasket: 3HAC078804-001</p>  <p>xx2100001434</p>

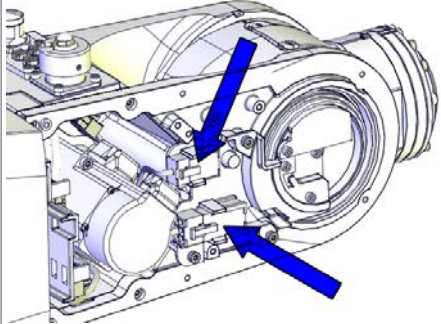
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4 Repair

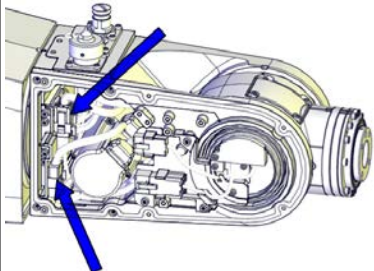
4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

Connecting the axis-5 motor FPC connectors

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Connect the axis-5 FPC connectors and snap them to their holders.</p>	 <p>xx1300002390</p>

Connecting the axis-5 motor connectors

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Reconnect the motor cables.</p> <ul style="list-style-type: none"> • R3.MP5 • R3.ME5 	 <p>xx1300002360</p>

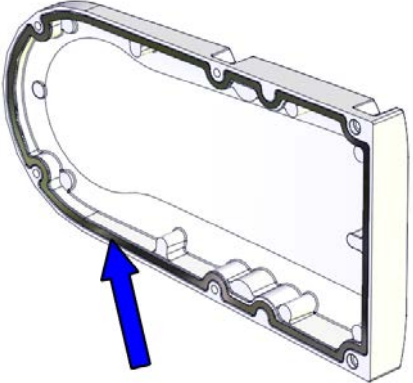
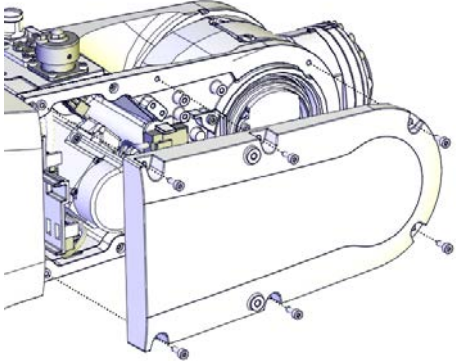

Refitting the tubular cable housing cover

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

Continues on next page

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
2	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the tubular cable housing cover gasket. Replace if damaged.</p>	<p>Gasket for tubular cable housing cover: 3HAC056707-001 (not Hygienic robots) / 3HAC080701-001 (Hygienic robots)</p>  <p>xx140000345</p>
3	<p>Refit the cover to the cable housing.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p>  <p>xx1300002389</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

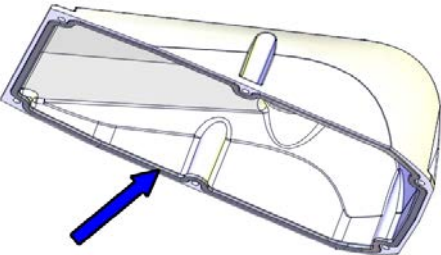

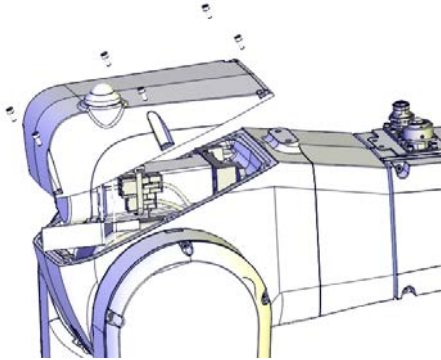

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4 Repair

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

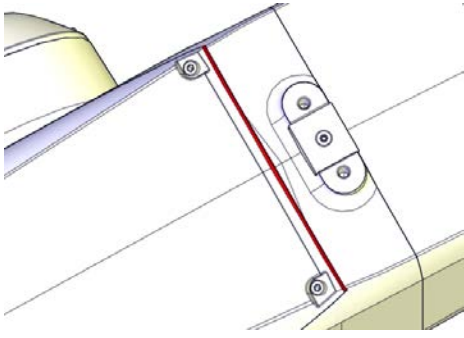


Concluding procedure

	Action	Note
1	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication</p> <p>Check the gasket. Replace if damaged.</p>	<p>Housing cover gasket (IRB 1200-7/0.7): 3HAC056698-001 (not Hygienic robots) / 3HAC080700-001 (Hygienic robots)</p> <p>Housing cover gasket (IRB 1200-5/0.9): 3HAC056697-001 (not Hygienic robots) / 3HAC080699-001 (Hygienic robots)</p>  <p>xx1400000477</p>
2	<p>Refit the upper arm housing cover with the screws.</p> <p> CAUTION</p> <p>For robots with safety lamp (option) Reconnect the lamp cable connectors R3.H1 and R3.H2 and then secure the cover.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p>  <p>xx1300000456</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

Continues on next page

4.5.1 Replacing the base spare parts (base, axis-1 radial sealing, protection sleeve)

Continued

	Action	Note
3	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Apply a string of the sealant to the joint of the upper arm housing cover.</p> <p>Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p>	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication Sealant, SikaFlex 521FC</p> <p>For robots with protection type Hygienic Sealant, Trans Clear</p>  <p>xx1600000215</p>
4	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean, seal and paint the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160.</p> <p> Note</p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>	
5	Recalibrate the robot.	Calibration information is included in section Calibration on page 807 .
6	<p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

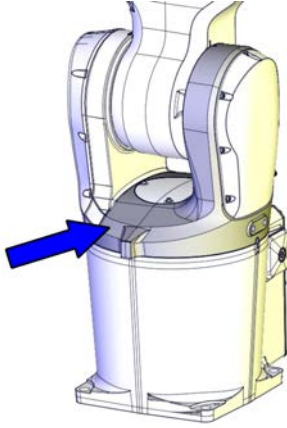
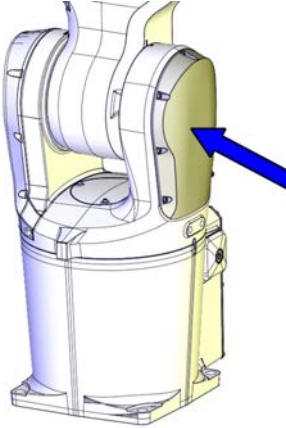
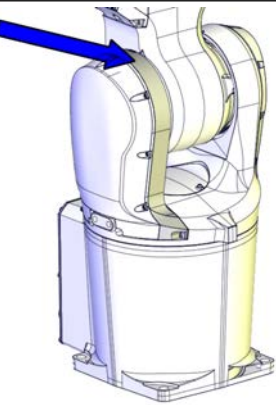
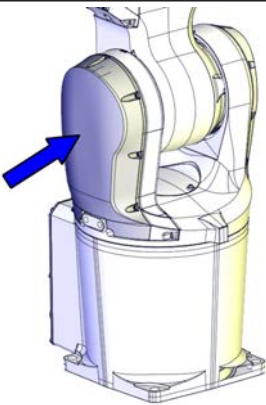
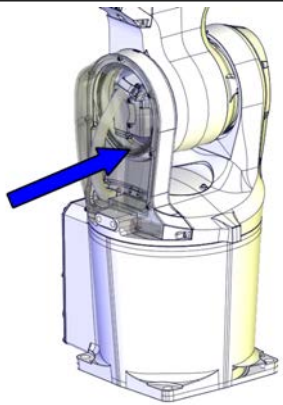
4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Location of the swing spare parts

The swing parts that are considered spare parts are located as shown in the figures.

Swing	Swing cover	
 <p>xx1400000442</p>	 <p>xx1400000443</p>	
3HAC059554-001	3HAC059676-001	
3HAC059700-001 Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic.	3HAC056215-001 Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.	
Cable housing of the swing	Cable housing cover of the swing	Radial sealing with dust lip
 <p>xx1400000446</p>	 <p>xx1400000445</p>	 <p>xx1400000444</p>

Continues on next page

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

Cable housing of the swing	Cable housing cover of the swing	Radial sealing with dust lip
3HAC059677-001	3HAC059678-001	3HAB3701-41
3HAC056213-001 Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.	3HAC056214-001 Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.	Not used with protection class IP40. Replace if damaged.

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Swing	3HAC059554-001	If the swing 3HAC049632-001 or 3HAC058000-001 is previously installed on the robot, also a new sealing ring and, for IP67 and Foundry Plus, a gasket and a V-ring is required. See Spare part versions for the swing on IP40/IP67 robots on page 878 .
Swing, Clean Room Swing, food grade lubrication Swing, Hygienic	3HAC059700-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic.
Axis-1 sealing ring	3HAC044676-001 / 3HAC068107-001 ⁱ	Replace if damaged.
Axis-1 sealing ring gasket	3HAC045685-001	Used with protection class IP67. Only on axis-1 sealing ring version 3HAC044676-001. See Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 880 . Replace if damaged.
Axis-1 sealing ring gasket	3HAC058349-001 / 3HAC080707-001	Not used with protection class IP40. Only on axis-1 sealing ring version 3HAC058568-001 or 3HAC068107-001. See Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 880 . Replace if damaged.
Sealing ring, gasket and V-ring	3HAC059791-001	Used with protection class IP67. Replace if damaged.

Continues on next page

4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

Spare part	Article number	Note
V-ring	3HAB3732-34	Used with protection class IP67. Used with protection type Foundry Plus. Only on swing version 3HAC058000-001 and 3HAC059554-001. See Spare part versions for the swing on IP40/IP67 robots on page 878 . Replace if damaged.
Cable protection	3HAC044691-001	Replace if damaged.
Torx countersunk head screw M3x5	3HAC14286-4	Replace if damaged.
Cover on top of swing	3HAC059679-001	Replace if damaged.
Cover on top of swing, Clean Room Cover on top of swing, food grade lubrication Cover on top of swing, Hygienic	3HAC056133-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket on top swing cover	3HAC056696-001 / 3HAC080698-001	Not used with protection class IP40. Replace if damaged.
Swing cover	3HAC059676-001	Replace if damaged.
Swing cover, Clean Room Swing cover, food grade lubrication Swing cover, Hygienic	3HAC056215-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket on swing cover	3HAC056727-001 / 3HAC080705-001	Not used with protection class IP40. Replace if damaged.
Radial sealing with dust lip	3HAB3701-41	Not used with protection class IP40. Replace if damaged.
Cable housing of the swing	3HAC059677-001	Replace if damaged.
Cable housing of the swing, Clean Room Cable housing of the swing, food grade lubrication Cable housing of the swing, Hygienic	3HAC056213-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Cable housing cover of the swing	3HAC059678-001	Replace if damaged.

Continues on next page

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

Spare part	Article number	Note
Cable housing cover of the swing, Clean Room Cable housing cover of the swing, food grade lubrication Cable housing cover of the swing, Hygienic	3HAC056214-001	Used with protection type Clean Room. Used for robots with food grade lubrication. Used with protection type Hygienic. Replace if damaged.
Gasket on cable housing cover	3HAC056726-001 / 3HAC080704-001	Not used for robots with protection class IP40. Replace if damaged.
Axis-2 sealing ring	3HAC044677-001	Replace if damaged.
M2 variseal sealing	3HAC044641-003	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
O-ring	3HAC048939-001	Replace if damaged.
M2 variseal sealing	3HAC044641-004	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
Cable harness material set	3HAC049663-001	Includes brackets, sheets, distance screws, plastics, cable clamp, seal bolts and air protection in tubular.
Gasket on cable housing cover	3HAC056724-001 / 3HAC080702-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cable housing cover	3HAC056707-001 / 3HAC080701-001	Not used with protection class IP40. Replace if damaged.
Housing cover gasket (IRB 1200-7/0.7)	3HAC056698-001 / 3HAC080700-001	Not used with protection class IP40. Replace if damaged.
Housing cover gasket (IRB 1200-5/0.9)	3HAC056697-001 / 3HAC080699-001	Not used with protection class IP40. Replace if damaged.
Air connector set with Ethernet hole in flange	3HAC049664-001	Includes tubular flange, air connectors and seal bolts. Replace if damaged.
Air connector set without Ethernet hole in flange	3HAC049665-001	Includes tubular flange, air connectors and seal bolts. Replace if damaged.
Plate with connector set	3HAC079691-001	Used with protection type Hygienic. Includes Ethernet connector, air connectors, CP/CS connector and gasket (3HAC078804-001).

Continues on next page

4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

Spare part	Article number	Note
Plate without connector set	3HAC078810-001	Used with protection type Hygienic. Includes gasket (3HAC078804-001).
Gasket	3HAC078804-001	Used with protection type Hygienic. Replace if damage.

ⁱ For information on which sealing ring to be ordered, see [Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 880](#).

Required tools and equipment

Equipment, etc.	Article number	Note
Roundsling, 2 m	-	Length: 2 m. Lifting capacity: 100 kg.
Axis-2 sealing assembly tool set	3HAC049694-001	Used to refit the radial sealing, if replacement is needed.
Guide pin for axis-1 gear unit	3HAC049703-001	Always use three guide pins together!
Guide pin for axis-2 gear unit	3HAC049704-001	Always use three guide pins together!
24 VDC power supply	-	Used to release the motor brakes.
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. ⁱ
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .

ⁱ The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, manual calibration is used as default.


Required consumables

Consumable	Art. no.	Note
Cable straps	-	
Locking liquid	3HAB7116-1	Loctite 243
Cleaning agent	-	Loctite 7063
Flange sealing	12340011-116	Loctite 574
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room For robots with food grade lubrication For robots with protection class IP67 For robots with protection type Foundry Plus
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

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Deciding calibration routine

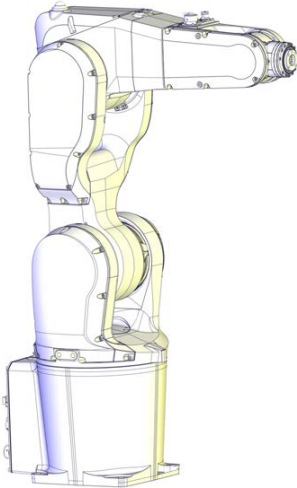
Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none"> Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	 Note Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in Reference calibration routine on page 821 .
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the swing parts

Use these procedures to remove the swing spare parts.

Preparations before removing the swing spare parts



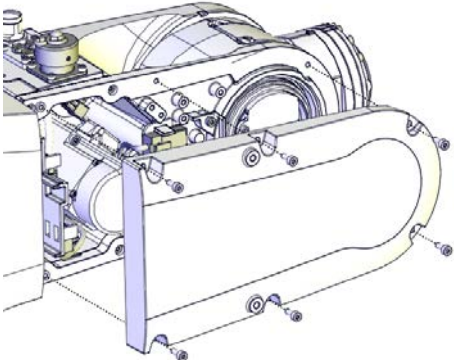
	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx1300002581

Continues on next page


4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
3	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>	
4	<p> CAUTION</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
5	Remove the wrist cover.	 <p>xx1300002389</p>



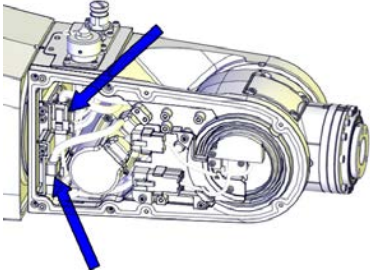
Disconnecting the axis-5 motor connectors

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	



Continues on next page

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	
3	<p>Snap loose the motor connectors from their holders and then disconnect them.</p> <ul style="list-style-type: none"> • R3.MP5 • R3.ME5 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx1300002360</p>

Disconnecting the axis-5 FPC connectors

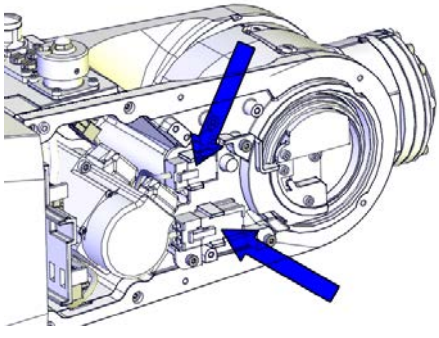
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	

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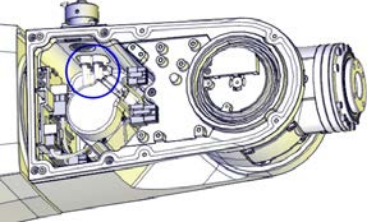
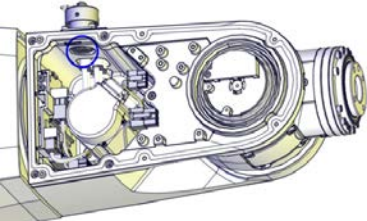
4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
3	Snap loose and disconnect the axis-5 FPC connectors.	 <p>xx1300002390</p>

Disconnecting the air hoses and CP/CS cabling (if equipped)



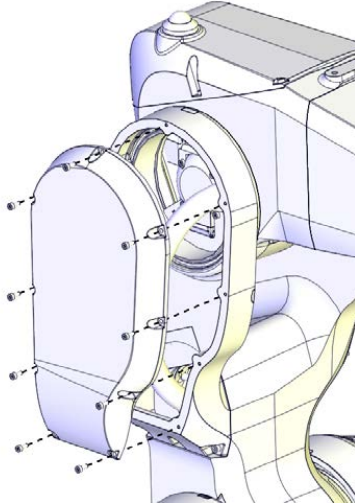
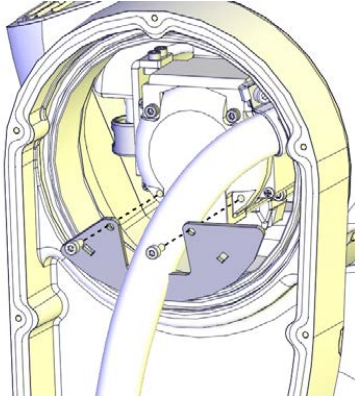
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	Disconnect the air hoses.	 <p>xx1400000738</p>
4	If equipped, disconnect the CP/CS connector.	 <p>xx1500000252</p>

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

Disconnecting the axis-4 FPC connectors

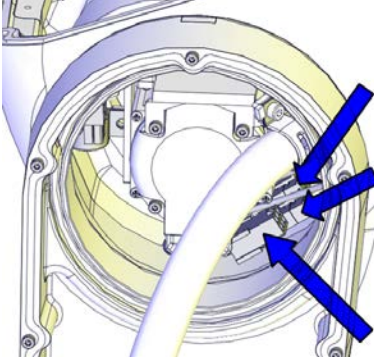
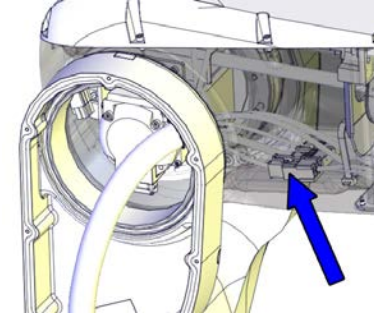
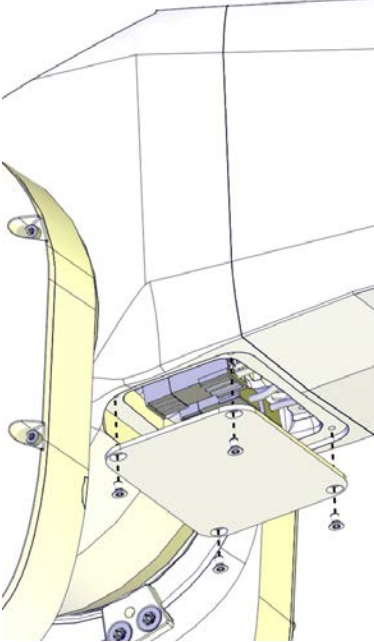
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	
3	<p>Remove the cable housing cover.</p>	 <p>xx1300002400</p>
4	<p>Remove the plate.</p>	 <p>xx1300002413</p>

Continues on next page

4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

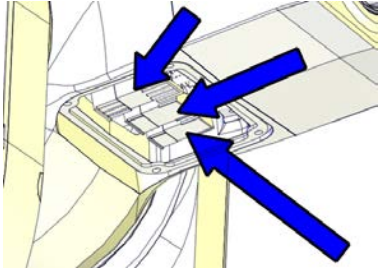
Continued

	Action	Note
5	Pull out the FPC connectors from the housing and disconnect them.	<p data-bbox="1029 315 1382 338">Cable layout in IRB 1200-7/0.7 :</p>  <p data-bbox="1029 712 1136 730">xx1300002412</p> <p data-bbox="1029 748 1382 770">Cable layout in IRB 1200-5/0.9 :</p>  <p data-bbox="1029 1099 1136 1117">xx1400001471</p>
6	Remove the small cover of the housing.	 <p data-bbox="1029 1798 1136 1816">xx1300002398</p>




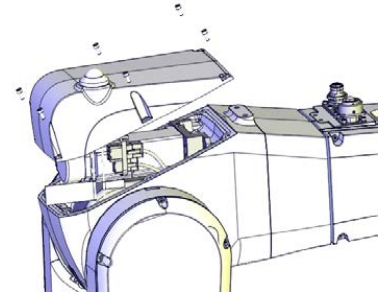
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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
7	Disconnect the remaining FPC connectors.	 <p>xx1300002399</p>

Disconnecting the axis-4 motor connectors

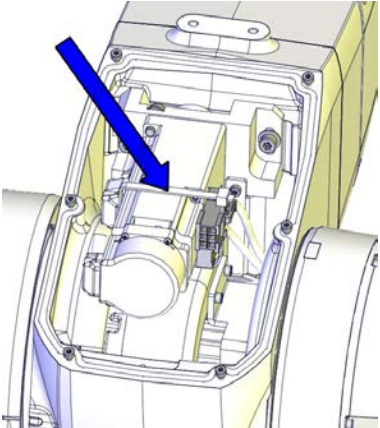

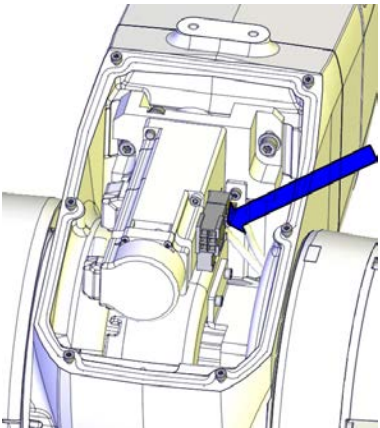
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	<p>Remove the cover from the upper arm housing.</p>  <p>CAUTION</p> <p>For robots with safety lamp (option) Be aware of the signal lamp cables that are attached inside the housing! Disconnect the lamp cable connectors R3.H1 and R3.H2 and then lift away the cover completely.</p>	 <p>xx1300000456</p>

Continues on next page



4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
4	Cut the strap that holds the connectors.	 <p>xx1300002494</p>
5	Disconnect the motor connectors.  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 <p>xx1300002495</p>

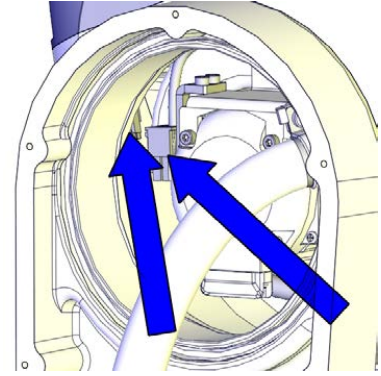
Disconnecting the axis-3 motor connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	



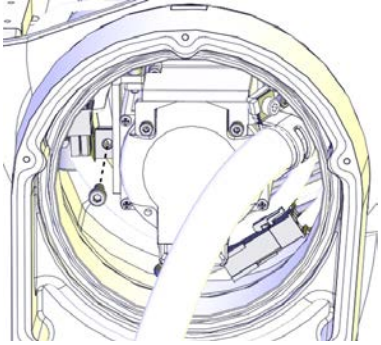
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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
3	Pull out the axis-3 motor connectors from the housing and disconnect them.	 <p>xx1300002420</p>

Removing the cable package in the housing

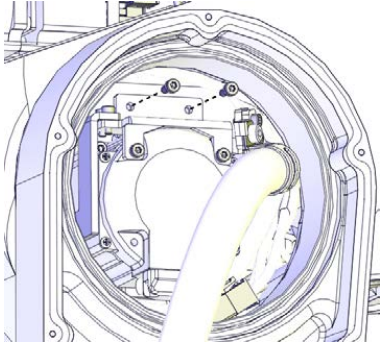
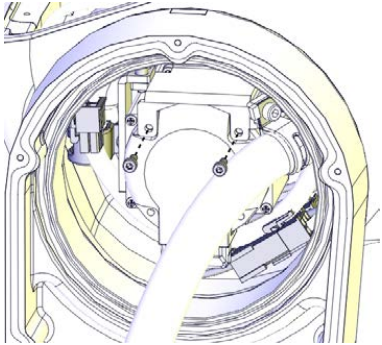

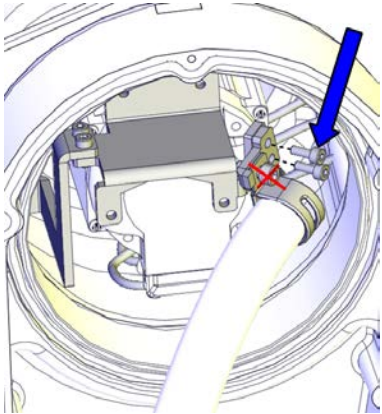
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160</i>.</p>	
3	Remove the screw that fastens the air hose holder.	 <p>xx1300002422</p>

Continues on next page


4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
4	Remove the screws that fasten the fix sheet to the inner plastic guide.	 <p>xx1300002421</p>
5	Remove the screws that fasten the fix sheet to the motor.	 <p>xx1300002423</p>
6	<p>Pull out the fix sheet a bit, to access the screws that fasten the cable bracket to the sheet. Loosen the bracket from the sheet by removing the two screws.</p> <p> CAUTION</p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>	 <p>xx1300002424</p>
7	<p>Valid for IRB 1200-5/0.9</p> <p>Cut the cable straps at the bottom of the housing.</p>	





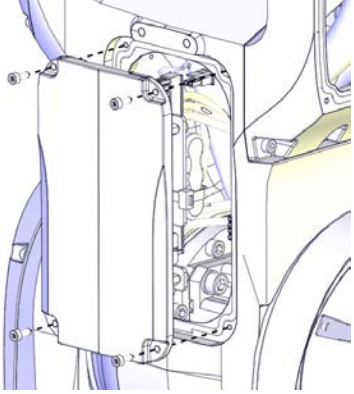
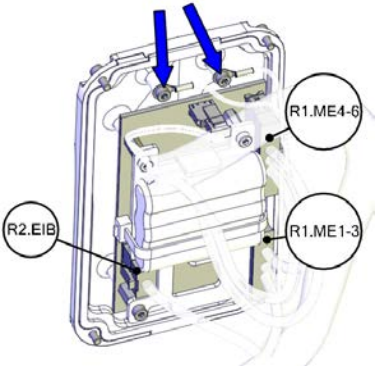
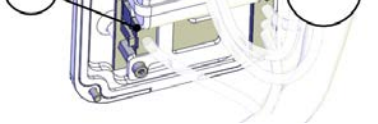
Disconnecting the cabling in the lower arm

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

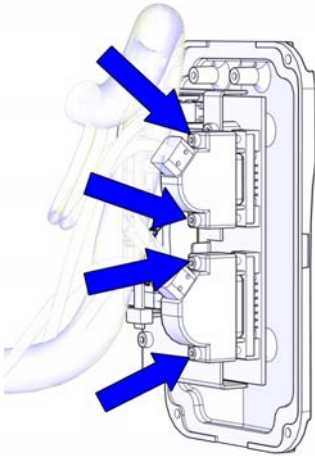
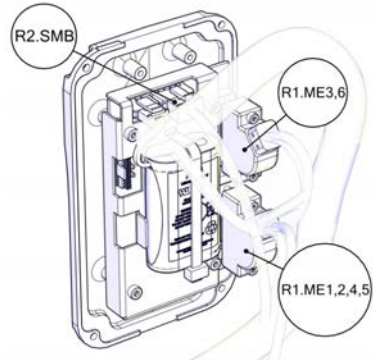
	Action	Note
2	 <p>ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section <i>The unit is sensitive to ESD on page 64</i></p>	
3	 <p>CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	
4	<p>Remove the EIB/SMB cover attachment screws on the lower arm and carefully open the cover.</p>  <p>CAUTION</p> <p>Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures.</p>  <p>CAUTION</p> <p>Be aware of the cabling that is attached to the cover! The cover can not be removed completely until the connectors and lugs are disconnected, as shown in following step.</p>	 <p>xx1300002427</p>
5	<p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Disconnect the connectors on the EIB unit.</p> <ul style="list-style-type: none"> • R1.ME1-3 • R1.ME4-6 • R2.EIB <p>Remove the EIB/SMB cover completely from the lower arm.</p>	 <p>xx1300002428</p>
6	<p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Disconnect the lugs on the EIB/SMB cover.</p>	 <p>xx1300002428</p>

Continues on next page



4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
7	<p>Valid for IRB 1200 Type B</p> <p>Loose the connector screws.</p>	 <p>xx170000004</p>
8	<p>Valid for IRB 1200 Type B</p> <p>Disconnect the connectors on the SMB unit.</p> <ul style="list-style-type: none"> • R1.ME1,2,4,5 • R1.ME3,6 • R2.SMB <p>Remove the EIB/SMB cover completely from the lower arm.</p>	 <p>xx170000005</p>

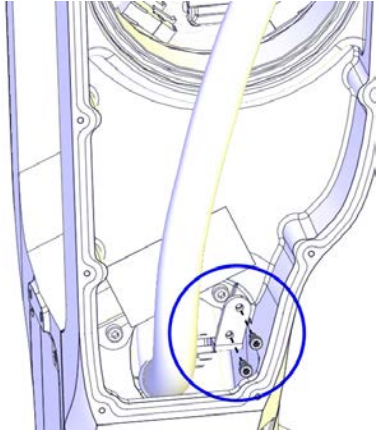

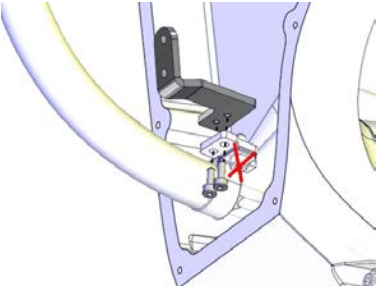
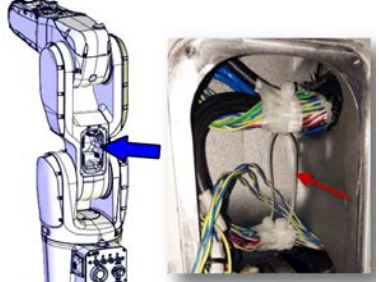
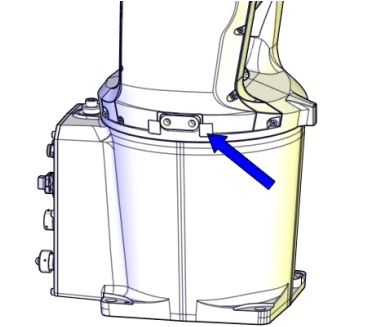
Removing the cable package in the lower arm

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	<p>Pull the cable package out from the upper arm housing.</p>	

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

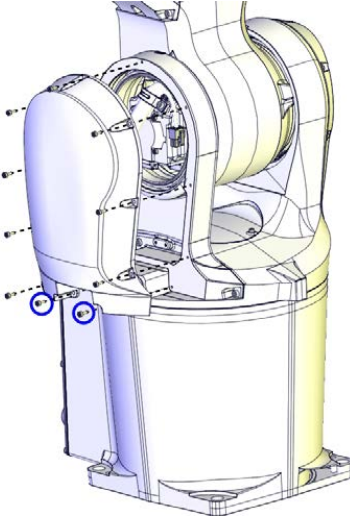
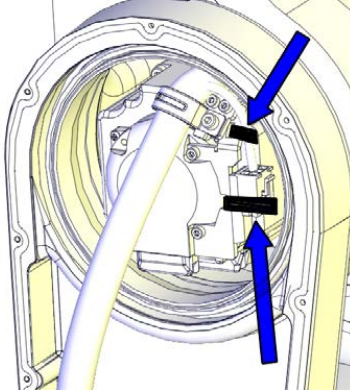
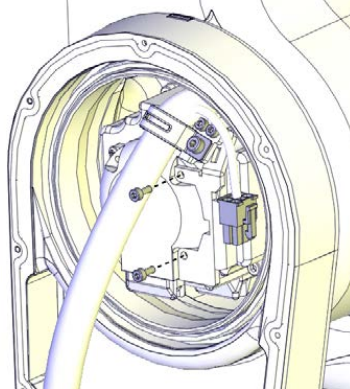
	Action	Note
4	Remove the fix sheet attachment screws in the lower arm.	 <p>xx1300002426</p>
5	<p>Pull out the cable package a bit from the lower arm and remove the bracket from the cable package by removing the screws.</p> <p> CAUTION</p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>	 <p>xx1300002430</p>
6	Cut the cable strap that holds the cabling together inside the EIB/SMB cavity.	 <p>xx1400001130</p>
7	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Remove the swing sealing plug. Follow the procedure specified in Removing the swing sealing plug on page 168.</p>	 <p>xx1600000205</p>

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4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)


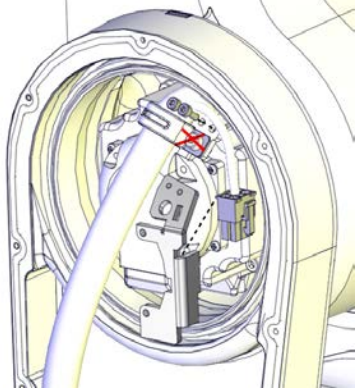
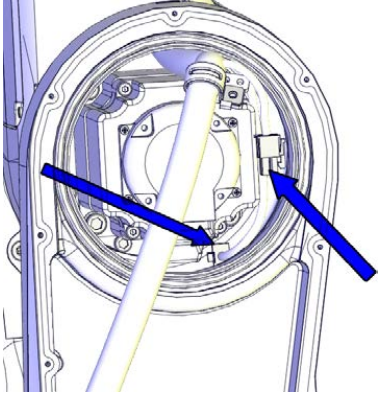
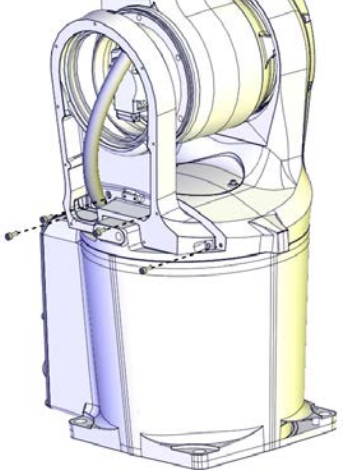
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	Action	Note
8	Remove the swing cable housing cover by removing the screws.	 <p>xx1300002431</p>
9	Cut the cable straps.	 <p>xx1400001528</p>
10	Remove the axis-2 motor bracket screws.	 <p>xx1300002432</p>

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

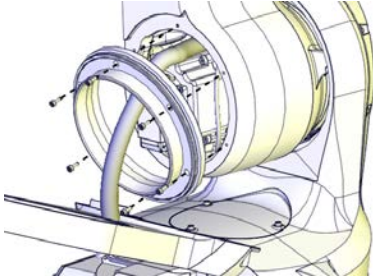

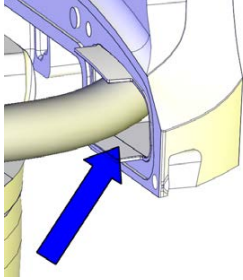
	Action	Note
11	<p>Pull out the cabling and then remove the axis-2 motor bracket from the cable package by removing the screws.</p> <p> CAUTION</p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>	 <p>xx1300002433</p>
12	<p>Disconnect the motor connectors.</p> <ul style="list-style-type: none"> • R2.ME2 • R2.MP2 	 <p>xx1300002434</p>
13	<p>Loosen the cable housing from the swing by removing the screws. Leave it hanging on the cable package.</p>	 <p>xx1300002435</p>

Continues on next page


4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)


Continued

	Action	Note
14	Remove the axis-2 sealing ring by removing the screws.	 xx140000020
15	Pull out the cable package from the lower arm.  Tip There is a groove on the lower arm casting that simplifies cable passage, if needed. Its position can easily be felt by hand.	
16	Loosen the plastic plate from the cable housing in order to facilitate continued removal of the cable package .	 xx140000023

Fitting lifting equipment to the upper and lower arm

	Action	Note
1	 CAUTION The lower and upper arms together weigh 30 kg. All lifting accessories used must be sized accordingly!	
2	Fit lifting slings to the upper and lower arm.	Roundsling, 2 m


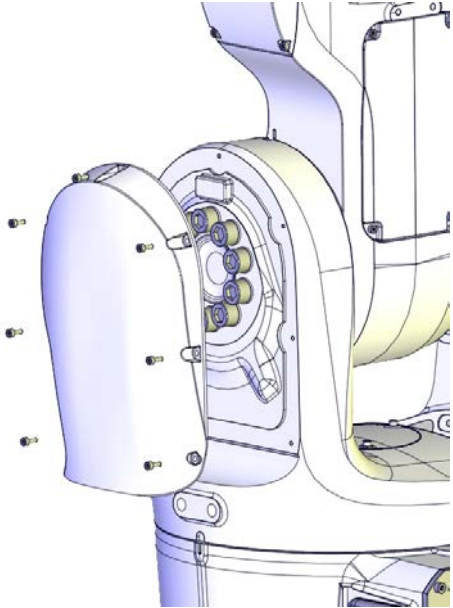

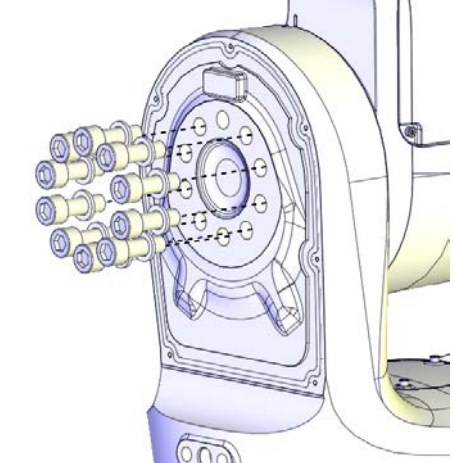
Removing the lower arm

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

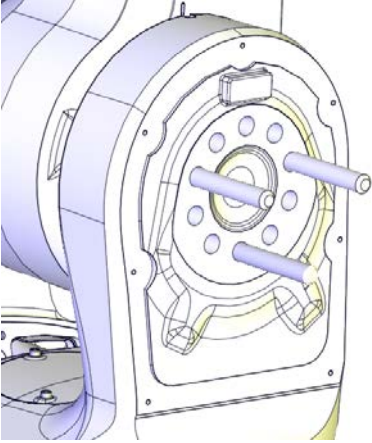

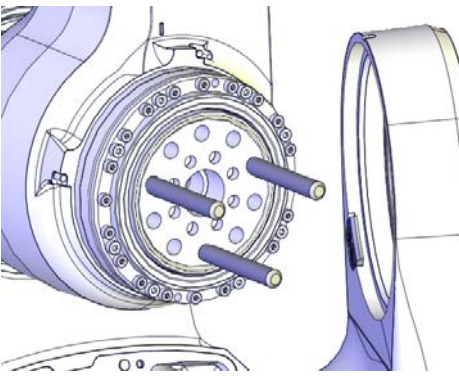
	Action	Note
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	
3	<p>Remove the swing cover.</p>	 <p>xx1300002551</p>
4	<p>Remove the lower arm screws and washers.</p> <p> WARNING</p> <p>This releases the lower arm from the swing. Make sure the weight of the arm is properly secured.</p> <p>The lower arm weighs 13 kg. If the upper arm is also attached to the lower arm, it adds an additional 17 kg to the total weight.</p>	 <p>xx1300002552</p>

Continues on next page

4 Repair



4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
5	Fit guide pins to the gearbox.	<p>Guide pin for axis-2 gear unit: 3HAC049704-001</p> <p>Always use three guide pins together!</p>  <p>xx1300002563</p>
6	<p>Separate the lower arm from the swing.</p> <p> Tip</p> <p>If the lower arm is hard to loosen from the swing, two of the lower arm screws can be refitted in their attachment holes. Leave some space between the screw head and the swing casting. Then use a plastic hammer to knock on the screws lightly and evenly.</p>	 <p>xx1300002553</p>

Removing the swing


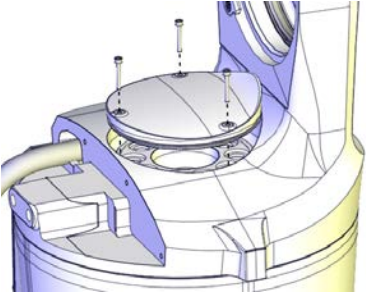
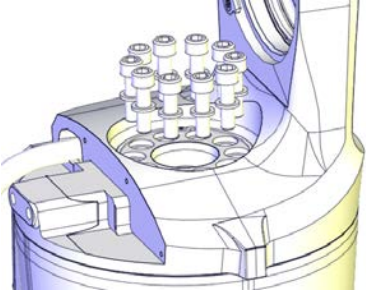

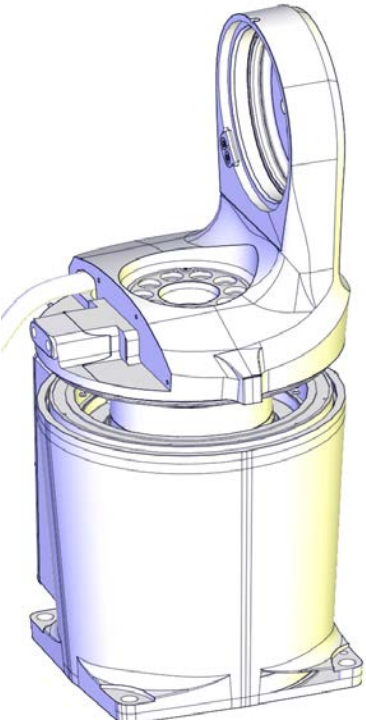
Use this procedure if replacing the swing.

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

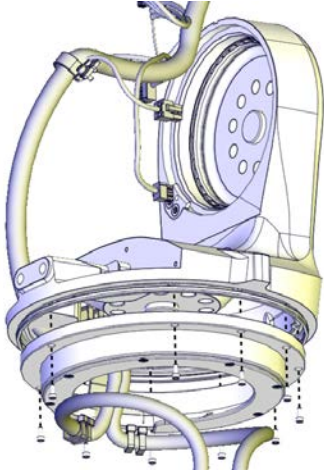
	Action	Note
3	<p>Remove the swing top cover by removing the screws.</p> <p> Tip</p> <p>Fit M4 screws in the cover holes to pull out the cover more easily. Only tighten the screws lightly in order not to damage the threads.</p>	 <p>xx140000447</p>
4	<p>Remove the swing attachment screws and washers.</p>	 <p>xx140000448</p>
5	<p>Lift the swing upwards to access the axis-1 sealing ring.</p> <p> CAUTION</p> <p>Be aware of the cabling that is attached to the sealing ring fitted to the swing! The swing can not be removed completely until the axis-1 sealing ring is removed, as shown in following step.</p>	 <p>xx140000449</p>

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4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)


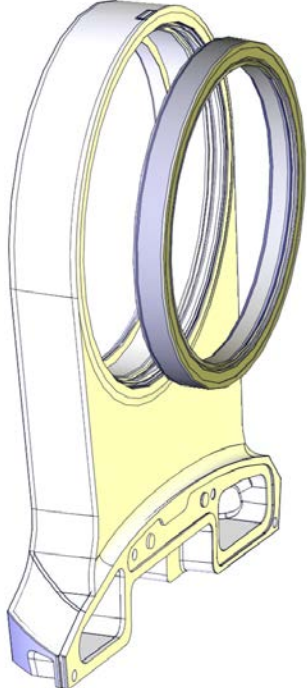
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	Action	Note
6	Remove the axis-1 sealing ring from the swing and carefully run the cabling out from the swing.	 <p>xx1400000455</p>

Removing the axis-2 radial sealing (IP67 and Foundry Plus)

Use this procedure if replacing the axis-2 radial sealing.

The sealing is only used for robots with protection class IP67 and with protection type Foundry Plus.

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	Remove the axis-2 radial sealing from the cable housing.	 <p>xx1400000450</p>

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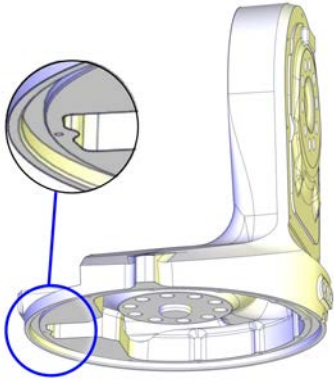

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

Refitting the swing parts

Use these procedures to refit the swing spare parts.

Refitting the swing

Use this procedure if replacing the swing.




	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>For robots with protection class IP67 For robots with protection type Foundry Plus</p> <p>On swing version 3HAC058000-001: Add sealant to the swing groove.</p>	<p>Sealant: Sikaflex 521FC.</p>  <p>xx1600000053</p>
3	<p>For robots with protection class IP67</p> <p>On axis-1 sealing ring version 3HAC056658-001: Add sealant to the axis-1 sealing ring. (See Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 880.)</p>	<p>Sealant: Sikaflex 521FC.</p>  <p>xx1600001125</p>

Continues on next page

4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)





Continued

	Action	Note
4	<p>For robots with protection class IP67 On axis-1 sealing ring version 3HAC044676-001, 3HAC058568-001 or 3HAC068107-001:</p> <p>For robots with protection type Foundry Plus On axis-1 sealing ring version 3HAC058568-001 or 3HAC068107-001:</p> <p>Check the gasket on the axis-1 sealing ring. Replace if damaged. (See <i>Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 880.</i>)</p>	<p>On axis-1 sealing ring version 3HAC044676-001: Axis-1 sealing ring gasket: 3HAC045685-001</p>  <p>xx1400000458</p> <p>On axis-1 sealing ring version 3HAC058568-001: Axis-1 sealing ring gasket: 3HAC058349-001 (not Hygienic robots) / 3HAC080707-001 (Hygienic robots)</p>  <p>xx1600001149</p> <p>On axis-1 sealing ring version 3HAC068107-001: Axis-1 sealing ring gasket: 3HAC058349-001 (not Hygienic robots) / 3HAC080707-001 (Hygienic robots)</p>  <p>xx1900001735</p>

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

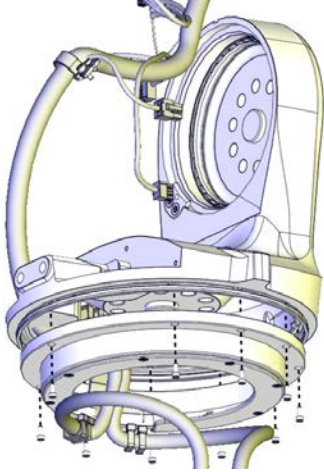
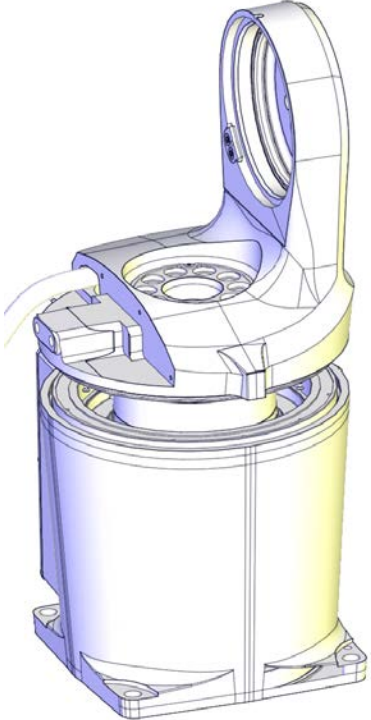
	Action	Note
5	<p>For robots with protection class IP67 On axis-1 sealing ring version 3HAC056658-001, 3HAC058568-001 or 3HAC068107-001:</p> <p>For robots with protection type Foundry Plus On axis-1 sealing ring version 3HAC058568-001 or 3HAC068107-001:</p> <p>Check the V-ring on the axis-1 sealing ring. (See Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 880.)</p> <p>Replace if damaged.</p>	<p>V-ring: 3HAB3732-34</p> <p>On axis-1 sealing ring version 3HAC056658-001:</p>  <p>xx1600001124</p> <p>On axis-1 sealing ring version 3HAC058568-001:</p>  <p>xx1600001150</p> <p>On axis-1 sealing ring version 3HAC068107-001:</p>  <p>xx1900001736</p>
6	<p>Check the cable protection on the axis-1 sealing ring.</p> <p>Replace if damaged.</p> <p>If replacing the cable protection, use locking liquid Loctite 243 on the screws.</p>	<p>Cable protection: 3HAC044691-001</p> <p>Torx countersunk head screw M3x5: 3HAC14286-4</p> <p>Tightening torque: 0.3 Nm</p>  <p>xx1400000456</p>

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4 Repair

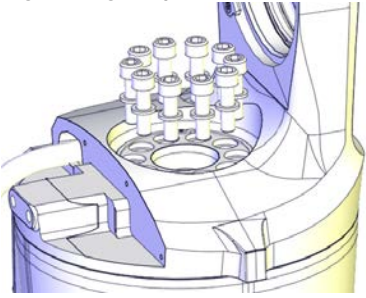

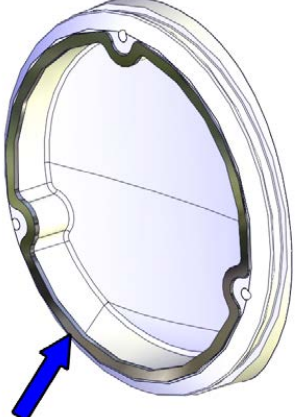
4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
7	Fit the axis-1 sealing ring to the swing with the screws and carefully run the cabling out up through the swing.	<p>Axis-1 sealing ring: 3HAC044676-001 / 3HAC068107-001 ⁱ</p> <p>Tightening torque: 1.5 Nm.</p>  <p>xx1400000455</p>
8	Lower the swing down into place while at the same time guiding the cabling through the cable hole.	 <p>xx1400000449</p>

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

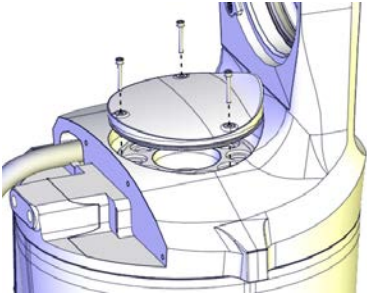

	Action	Note
9	Refit the swing attachment screws and washers.	<p>Screws: 3HAB3409-52 (M10x35). Tightening torque: 40 Nm.</p>  <p>xx1400000448</p> <p> Note Only use specified screws, never replace them with other screws.</p>
10	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the gasket. Replace if damaged.</p>	<p>Gasket on top swing cover: 3HAC056696-001 (not Hygienic robots) / 3HAC080698-001 (Hygienic robots)</p>  <p>xx1400000425</p>

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4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
11	Refit the swing top cover with the screws. Replace if damaged.	<p>Cover on top of swing: 3HAC059679-001</p> <p>Cover on top of swing, Clean Room</p> <p>Cover on top of swing, food grade lubrication</p> <p>Cover on top of swing, Hygienic : 3HAC056133-001</p> <p>Screws: 3HAB3409-209 (M3x20). Tightening torque: 1.5 Nm.</p>  <p>xx1400000447</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

ⁱ For information on which sealing ring to be ordered, see [Spare part versions for the axis-1 sealing ring on IP40/IP67 robots on page 880](#).

Refitting the axis-2 radial sealing (IP67, Foundry Plus, Clean Room, food grade lubrication, Hygienic)

Use this procedure if replacing the axis-2 radial sealing.

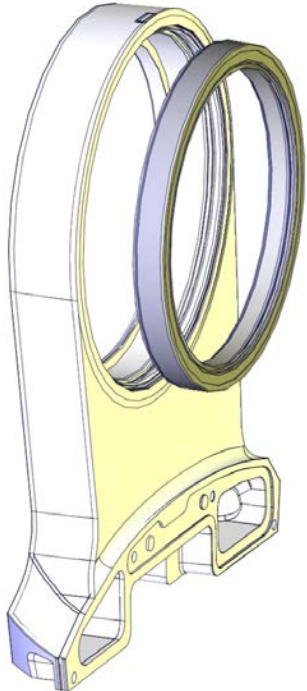
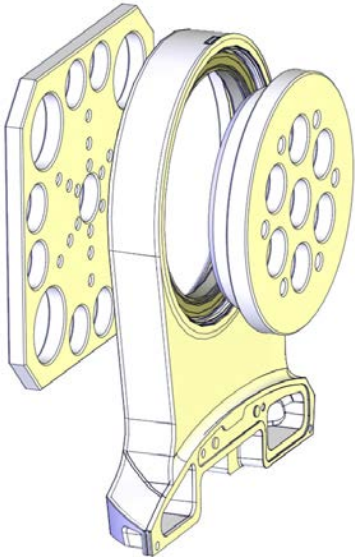
The sealing is only used for robots with protection class IP67, with protection type Foundry Plus, with protection type Clean Room, with food grade lubrication and protection type Hygienic.

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Apply a little grease to the sealing and wipe clean after the refitting.</p>	

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

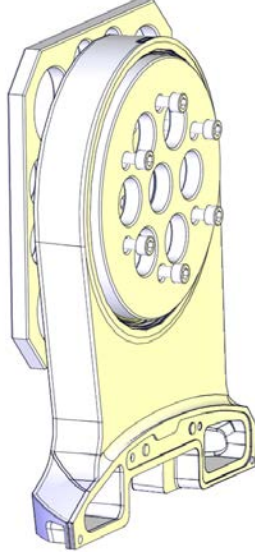
	Action	Note
3	Fit the axis-2 radial sealing into the cable housing.	Radial sealing with dust lip: 3HAB3701-41  xx1400000450
4	Fit the circular part of the radial sealing fitting tool against the radial sealing.	Axis-2 sealing assembly tool set: 3HAC049694-001
5	Fit the tool plate to the other side of the cable housing with the six screws M6X50.	 xx1400000451

Continues on next page


4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
6	Screw the screws, little by little, to press the sealing into place.	 xx1400000452
7	Remove the assembly tool.	
8	Check that the sealing is undamaged and properly fitted.	

Fitting lifting equipment to the upper and lower arm

	Action	Note
1	 CAUTION The lower and upper arms together weigh 30 kg. All lifting accessories used must be sized accordingly!	
2	Fit lifting slings to the upper and lower arm.	Roundsling, 2 m

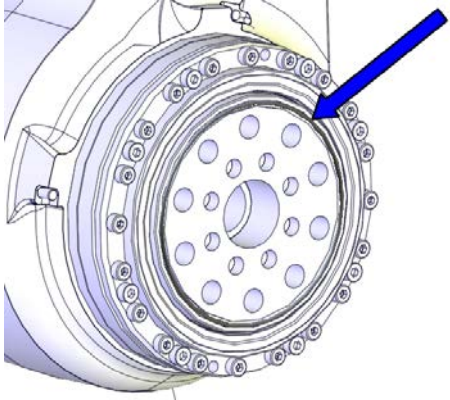

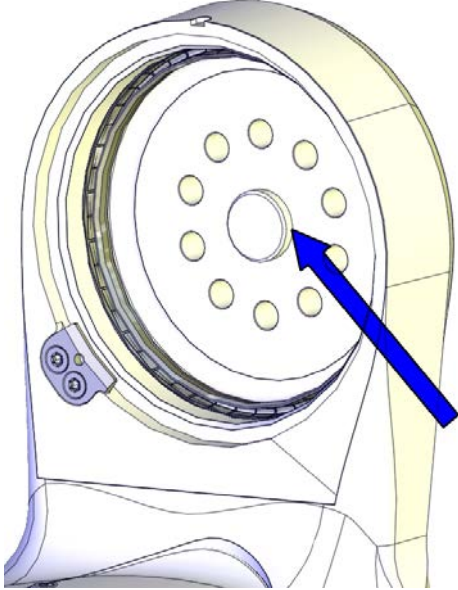
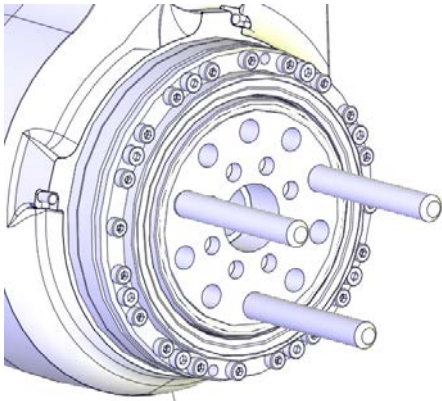
Refitting the lower arm

	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued


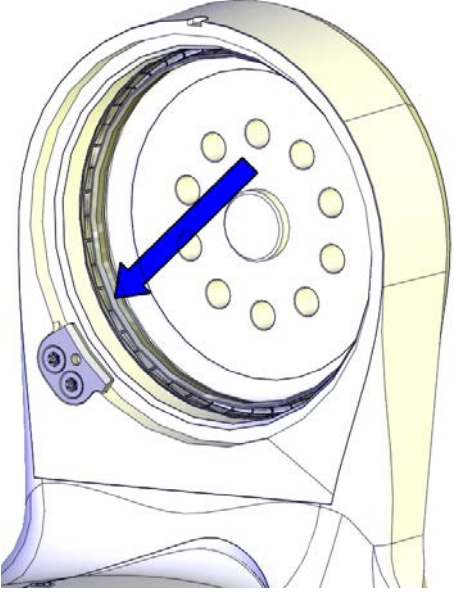
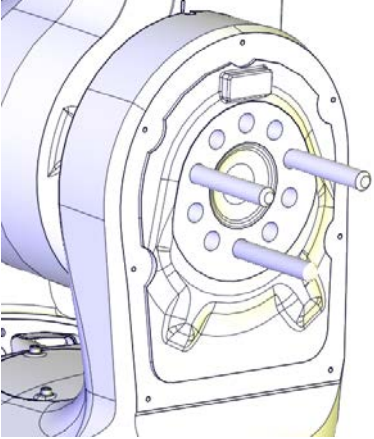
	Action	Note
2	<p>Check the o-ring. Replace if damaged.</p>	<p>O-ring: 3HAC048939-001</p>  <p>xx1300002556</p>
3	<p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing Loctite 574 to the cylindrical surface in the swing.</p> <p> Note</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Wipe clean the overflowing Loctite 574 if there is any.</p>	 <p>xx1400001403</p>
4	<p>Fit guide pins to the gearbox.</p>	<p>Guide pin for axis-2 gear unit: 3HAC049704-001</p>  <p>xx1300002562</p> <p>Always use three guide pins together!</p>

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4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

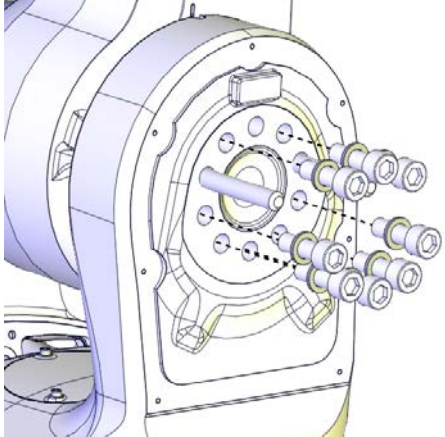

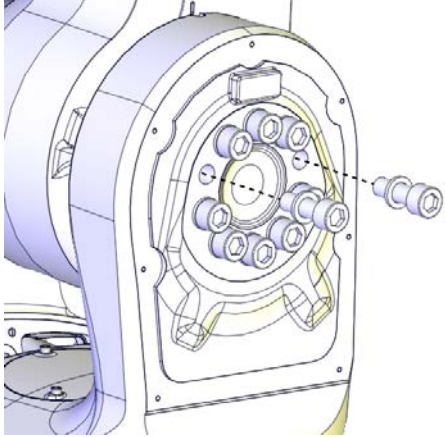
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	Action	Note
5	<p>For robots with protection class IP67 For robots with protection type Foundry Plus</p> <p>Check the sealing. Replace if damaged.</p> <p> CAUTION</p> <p>Do not fit M2 variseal sealing on robots in other protection class or protection types.</p>	<p>M2 variseal sealing: 3HAC044641-003</p>  <p>xx140000453</p>
6	<p>Fit the lower arm to the swing, with guidance from the guide pins.</p>	 <p>xx1300002563</p>

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

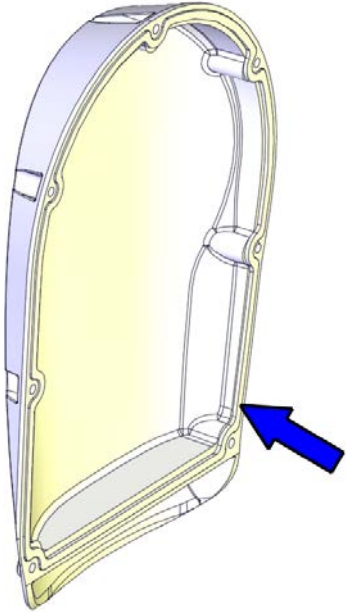
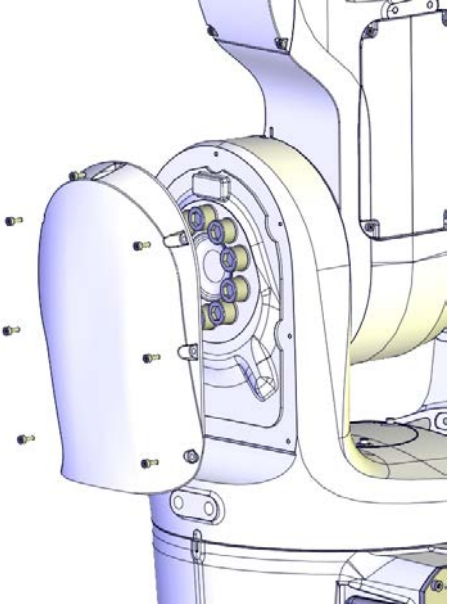
	Action	Note
7	<p>Refit the lower arm screws and washers, using locking liquid Loctite 243. Secure the screws but do not tighten yet.</p>	<p>Screws: 3HAB3409-51 (M10x30).</p>  <p>xx1300002564</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
8	<p>Remove the guide pins and refit the remaining screws and washers using locking liquid Loctite 243.</p>	 <p>xx1300002565</p>
9	<p>Tighten all screws.</p>	<p>Tightening torque: 45 Nm</p>

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4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

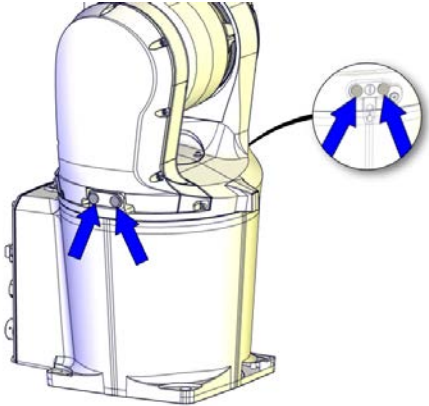
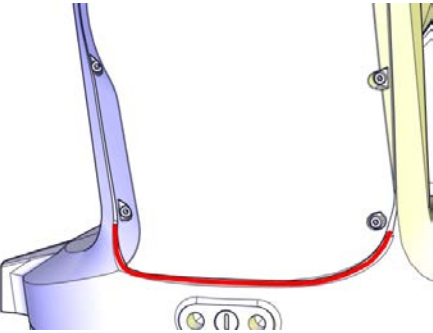
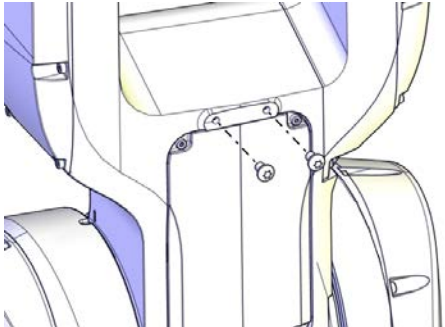
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	Action	Note
10	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the swing cover gasket. Replace if damaged.</p>	<p>Gasket on swing cover: 3HAC056727-001 (not Hygienic robots) / 3HAC080705-001 (Hygienic robots)</p>  <p>xx140000007</p>
11	<p>Refit the swing cover. Replace if damaged.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm. Swing cover: 3HAC059676-001 Swing cover, Clean Room Swing cover, food grade lubrication Swing cover, Hygienic : 3HAC056215-001</p>  <p>xx1300002551</p>

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
12	<p>For robots with protection type Foundry Plus Check the protection plugs for lifting holes. Replace if damaged.</p>	<p>Protection plug for lifting holes: 3HAC4836-24</p>  <p>xx1600001151</p>
13	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Apply a string of the sealant to the joint of the swing cover. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.</p>	<p>For robots with protection type Clean Room For robots with food grade lubrication Sealant, SikaFlex 521FC For robots with protection type Hygienic Sealant, Trans Clear</p>  <p>xx1600000217</p>
14	<p>For robots with protection type Foundry Plus If required, fit two screws for protection.</p>	 <p>xx1600001154</p>

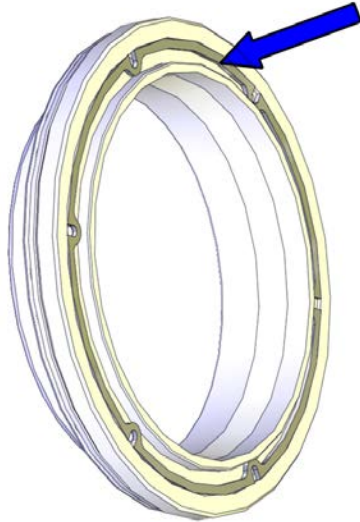
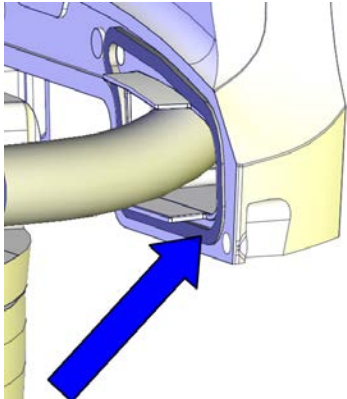
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4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

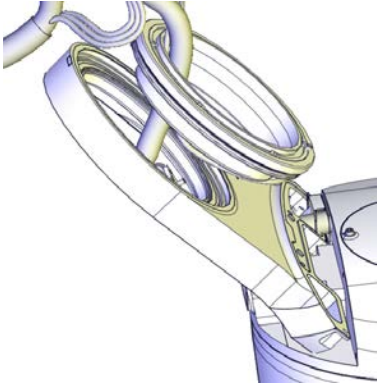
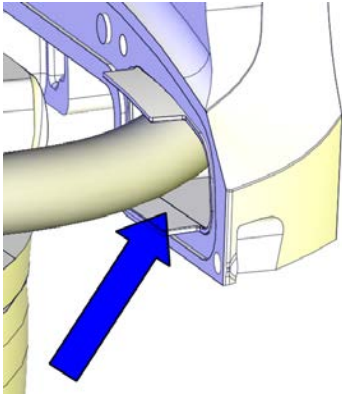
Refitting the cable package in the lower arm

	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Check the axis-2 sealing ring. For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the gasket. Replace if damaged.</p>	<p>Axis-2 sealing ring: 3HAC044677-001 Gasket of axis-2 sealing ring: 3HAC045688-001 (not Hygienic robots) / 3HAC080697-001 (Hygienic robots)</p>  <p>xx1400000476</p>
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the gasket of the cable housing plastic plate. Replace if damaged.</p>	<p>Gasket of plastic plate: 3HAC044894-001 (not Hygienic robots) / 3HAC080695-001 (Hygienic robots)</p>  <p>xx1400000457</p>

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

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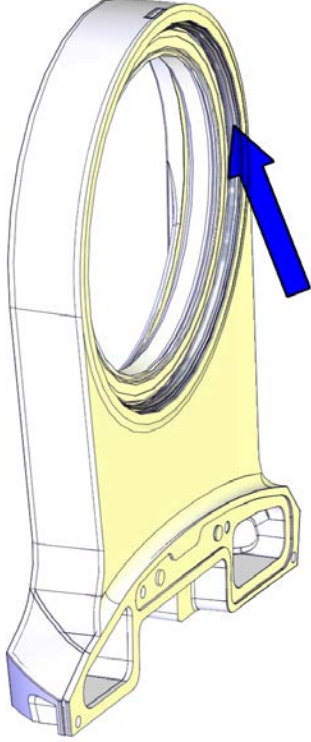
	Action	Note
4	Fetch the cable housing, the plastic plate and the axis-2 sealing ring and run the cable package through them.	 <p>xx140000025</p>
5	Fasten the plastic plate to the cable housing, if removed. Replace if damaged.	<p>The plastic plate is included in: Cable harness material set: 3HAC049663-001.</p>  <p>xx140000023</p>

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4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)


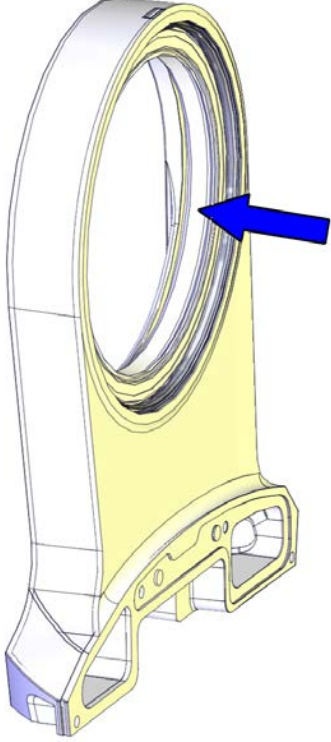

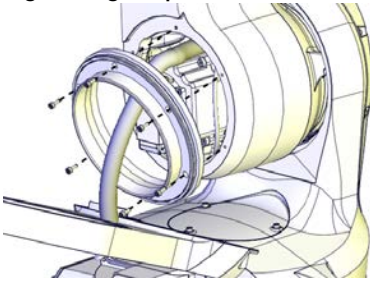
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	Action	Note
6	<p>For robots with protection class IP67 For robots with protection type Foundry Plus Check the sealing. Replace if damaged.</p> <p> CAUTION</p> <p>Do not fit M2 variseal sealing on robots in other protection class or protection types.</p>	<p>M2 variseal sealing: 3HAC044641-004</p>  <p>xx1400000454</p>

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

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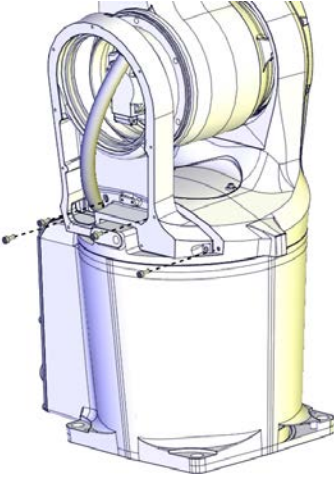

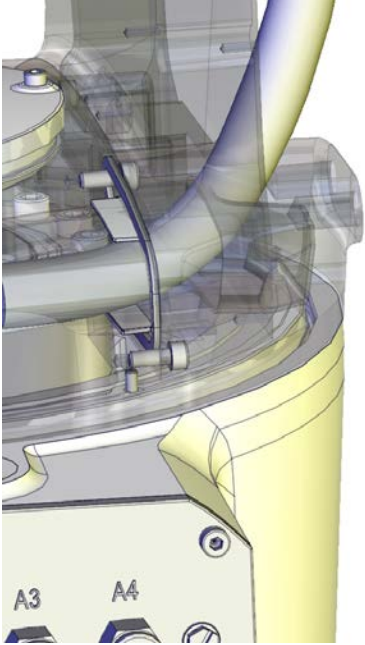
	Action	Note
7	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the radial sealing. Replace if damaged.</p> <p> Note</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p>	<p>Radial sealing with dust lip: 3HAB3701-41</p>  <p>xx1400000753</p> <p>Replacement is detailed in Replacing the swing spare parts (swing, axis-2 radial sealing) on page 574.</p>
8	<p>Guide the cable package into the lower arm.</p> <p> Tip</p> <p>There is a groove on the lower arm casting that simplifies cable passage, if needed. Its position can easily be felt by hand.</p>	
9	<p>Refit the axis-2 sealing ring with the screws.</p>	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1400000020</p>

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4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

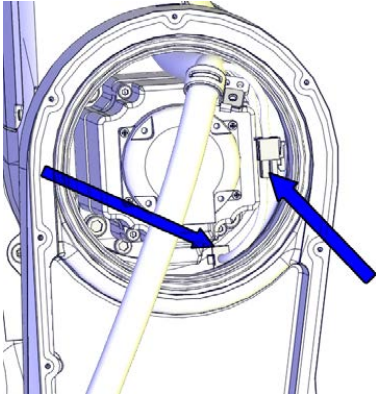

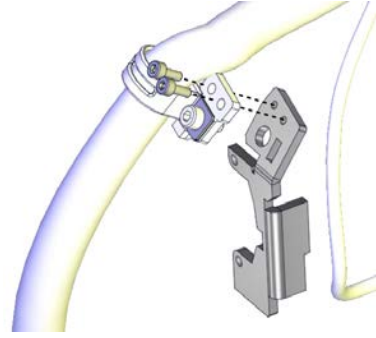
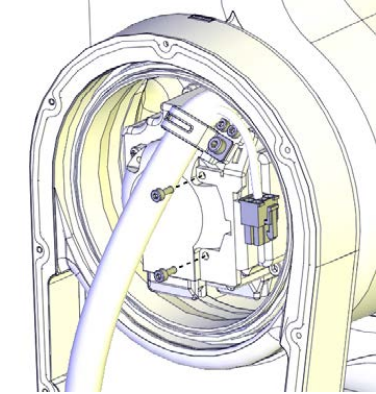
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	Action	Note
10	Refit the cable housing with the screws.	<p>Screws: 3HAB3409-236 (M4x10). Tightening torque: 3 Nm.</p>  <p>xx1300002435</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
11	Apply grease to the cable package, cover all moving area of the package.	 <p>xx1400000481</p>

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

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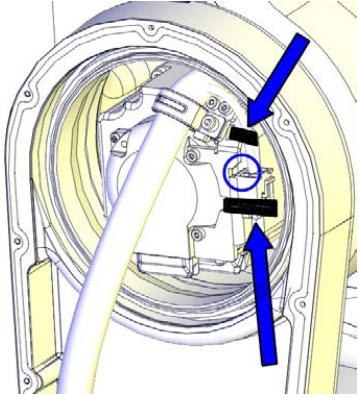
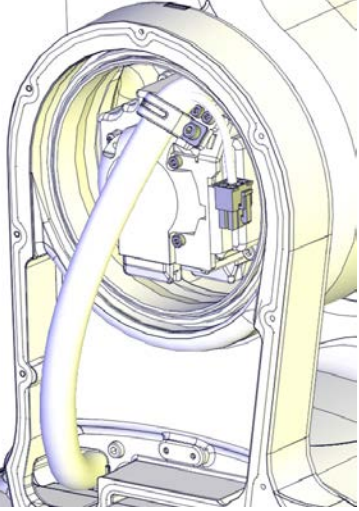
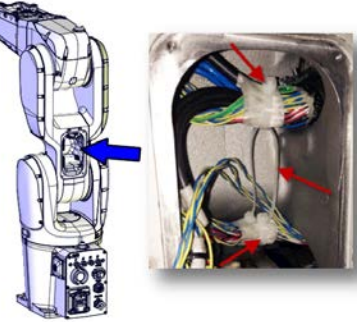
	Action	Note
12	Reconnect the motor connectors. <ul style="list-style-type: none"> • R2.ME2 • R2.MP2 	 <p>xx1300002434</p>
13	Refit the axis-2 motor bracket to the cable package with the two screws. <p> CAUTION</p> Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.	Tightening torque: 1.5 Nm.  <p>xx1400000021</p>
14	Refit the axis-2 motor bracket to the motor.	 <p>xx1300002432</p>

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4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

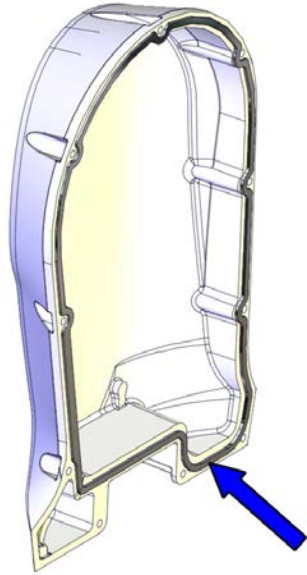
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	Action	Note
15	Secure the connector R2.MP2 and its cable with cable straps onto the motor bracket. Make sure the connector is fixed by its tab to the bracket.	 <p>xx1400001529</p>
16	Apply grease to the cable package, cover all moving area of the package.	 <p>xx1400000482</p>
17	<p>In order to keep the cabling away from the hot axis-2 motor, the cable package must be secured accordingly inside the EIB/SMB cavity:</p> <ol style="list-style-type: none"> 1 The cable package is strapped with tape by the supplier at two locations. Put a cable strap around the cable package at each location. 2 Insert a third cable strap through the top strap and the bottom strap, and close the strap to secure the cable package and keep it in place. <p>See the figure.</p>	 <p>xx1400001131</p>

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

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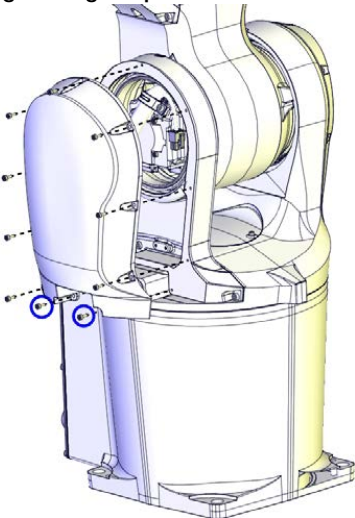

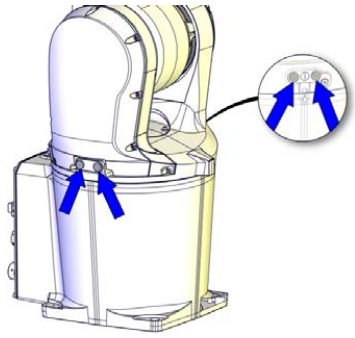
	Action	Note
18	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the gasket of the cable housing cover. Replace if damaged.</p>	<p>Gasket on cable housing cover: 3HAC056726-001 (not Hygienic robots) / 3HAC080704-001 (Hygienic robots)</p>  <p>xx1400000424</p>
19	<p>Check the PTFE film. Replace if damaged.</p>	<p>PTFE film on cable housing cover: 3HAC044660-001</p>
20	<p>Apply grease to the inner surface of the cable housing cover and to the PTFE film surface.</p>	

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4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

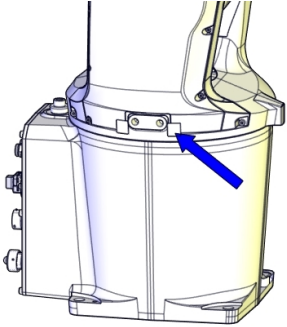

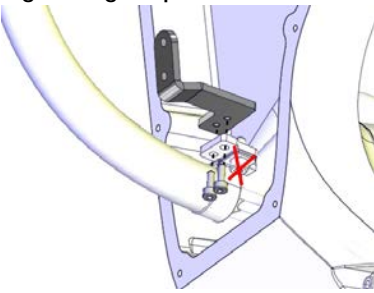
Continued

	Action	Note
21	<p>Refit the cable housing cover. Replace if damaged.</p> <p> Note</p> <p>Remember to refit the two lower screws shown in the figure.</p>	<p>Cable housing cover of the swing: 3HAC059678-001</p> <p>Cable housing cover of the swing, Clean Room</p> <p>Cable housing cover of the swing, food grade lubrication</p> <p>Cable housing cover of the swing, Hygienic : 3HAC056214-001</p> <p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p>  <p>xx1300002431</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
22	<p>For robots with protection type Foundry Plus Check the protection plugs for lifting holes. Replace if damaged.</p>	<p>Protection plug for lifting holes: 3HAC4836-24</p>  <p>xx1600001151</p>


Continues on next page

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
23	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Refit the swing sealing plug. Follow the procedure specified in Refitting the swing sealing plug on page 169.</p>	<p>Swing sealing plug:3HAC053687-001</p>  <p>xx1600000205</p>
24	<p>Refit the lower arm bracket to the cable package.</p> <p> CAUTION</p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002430</p>

Connecting the cabling in the lower arm

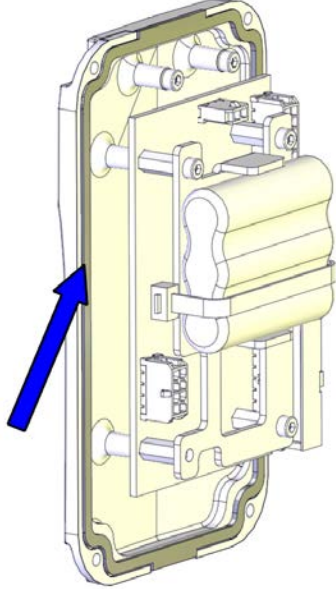

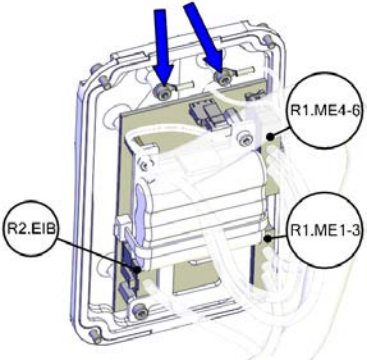

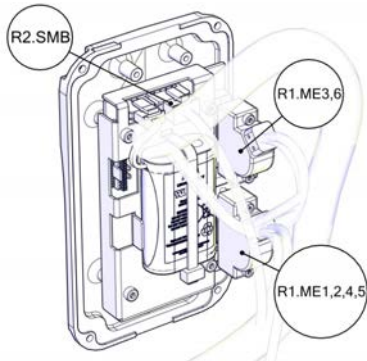
	Action	Note
1	<p> ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit please read the safety information in the section The unit is sensitive to ESD on page 64</p>	
2	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

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4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

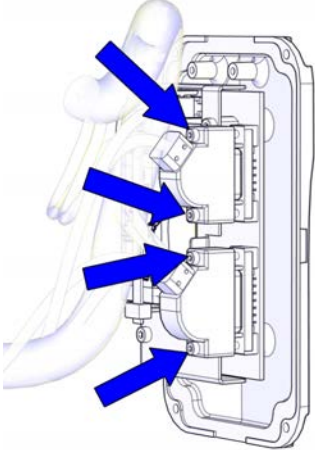
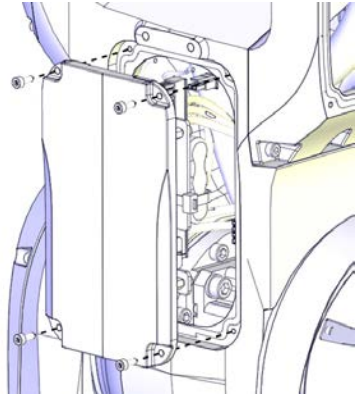

Continued

	Action	Note
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the EIB/SMB cover gasket. Replace if damaged.</p>	<p>Gasket on EIB/SMB cover: 3HAC056728-001 (not Hygienic robots) / 3HAC080706-001 (Hygienic robots)</p>  <p>xx1400000475</p>
4	<p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Connect the connectors to the EIB unit.</p> <ul style="list-style-type: none"> • R1.ME1-3 • R1.ME4-6 • R2.EIB <p> WARNING</p> <p>Make sure not to mix the R2.EIB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.</p>	 <p>xx1300002428</p>
5	<p>Valid for IRB 1200 (no type specified) and IRB 1200 Type A</p> <p>Connect the lugs to the EIB/SMB cover.</p>	
6	<p>Valid for IRB 1200 Type B</p> <p>Connect the connectors to the SMB unit.</p> <ul style="list-style-type: none"> • R1.ME1,2,4,5 • R1.ME3,6 • R2.SMB <p> WARNING</p> <p>Make sure not to mix the R2.SMB and R2.ME2. Axis 2 may be severely damaged. See the labels on the connectors for correct connection.</p>	 <p>xx1700000005</p>

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

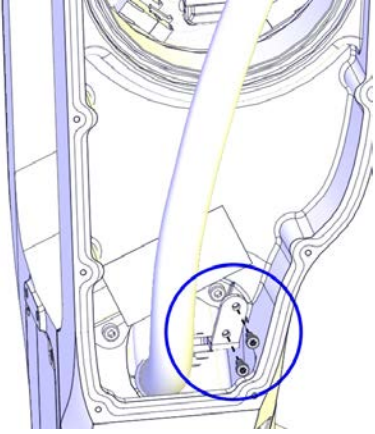
	Action	Note
7	<p>Valid for IRB 1200 Type B Tighten the connector screws.</p>	<p>Tightening torque: 0.3 Nm</p>  <p>xx1700000004</p>
8	<p>Refit the EIB/SMB cover to the lower arm with the attachment screws.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm</p>  <p>xx1300002427</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

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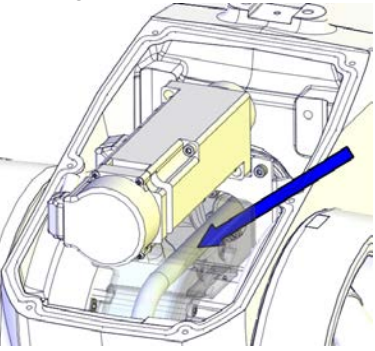
4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
9	Refit the fix sheet attachment screws in the lower arm.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002426</p>



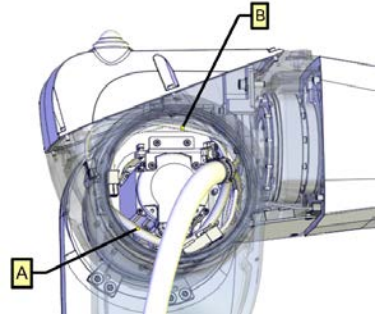

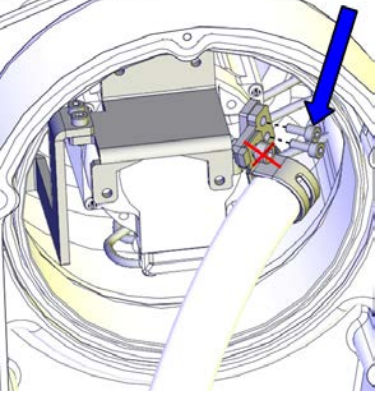
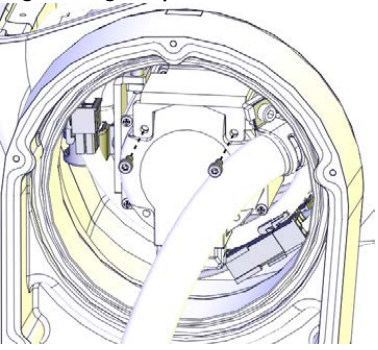
Refitting the cable package in the housing

	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Before guiding the cable package into the housing and upper arm, apply grease to the cable package, to the area going into the upper arm, shown in the figure. Cover all moving area of the package.</p>	<p>Area to be lubricated, shown in cable package already fitted to the housing.</p>  <p>xx1400000483</p>

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

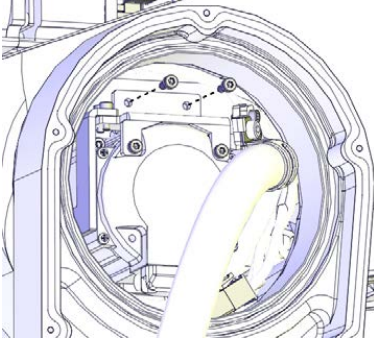

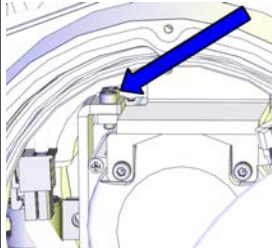
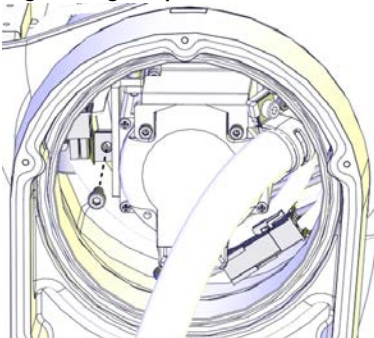
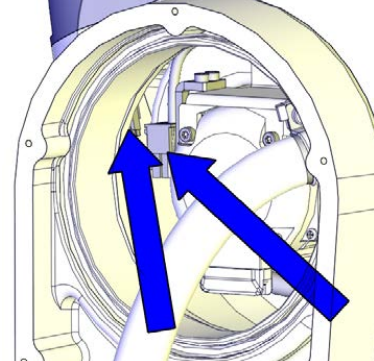
	Action	Note
3	<p>Guide the cable package into the upper arm, through the housing.</p> <p> Note</p> <p>Guide the air hoses (A) underneath the bottom side of the axis-3 motor and the axis-3 motor cables (B) on top of the motor, see cable layout figure. The fix point of the air hoses is pre-determined (marked) and must be matched against the air hose holder on the left side of the axis-3 motor.</p> <p> Note</p> <p>The air hose holder keeps the air hoses arranged in an optimized way. It is necessary to keep the air hose holder vertically and firmly against the left side of the axis-3 motor.</p>	 <p>xx1400001472</p>
4	<p>Refit the bracket to the sheet with two screws.</p> <p> CAUTION</p> <p>Do not loosen the cable clamp screw! There is a risk of rearrangement of the cable layout which would result in shortened lifetime of the cable harness.</p>	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002424</p>
5	<p>Refit the fix sheet to the motor.</p>	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002423</p>

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4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

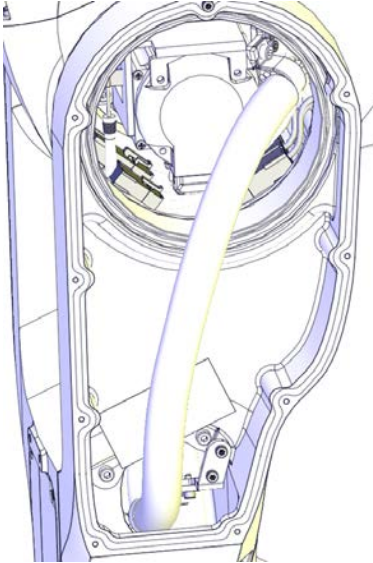
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	Action	Note
6	Refit the fix sheet to the inner plastic guide.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002421</p>
7	<p>Fit the air hose holder to the bracket. Replace the holder, if damaged.</p> <p> Tip</p> <p>If the air hose holder is difficult to fit, firstly remove the bracket from the fix sheet by removing the two M3 screws. Fit the holder to the bracket and then refit the complete assembly to the fix sheet again. Tightening torque for the two M3 screws: 1.5 Nm.</p>  <p>xx1400001133</p>	<p>Air hose holders are included in Cable harness material set (3HAC049663-001).</p> <p>Tightening torque: 4 Nm.</p>  <p>xx1300002422</p>
8	Reconnect the axis-3 motor connectors.	 <p>xx1300002420</p>

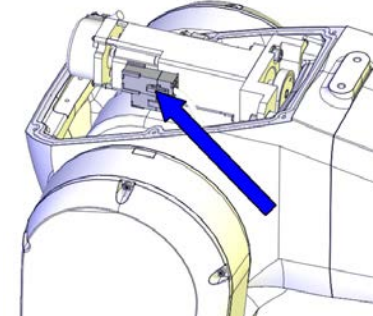
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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
9	Apply grease to the cable package, cover all moving area of the package.	 <p>xx140000754</p>
10	Valid for IRB 1200-5/0.9 Secure the cable package at the bottom of the housing with cable straps.	

Connecting the axis-4 motor connectors

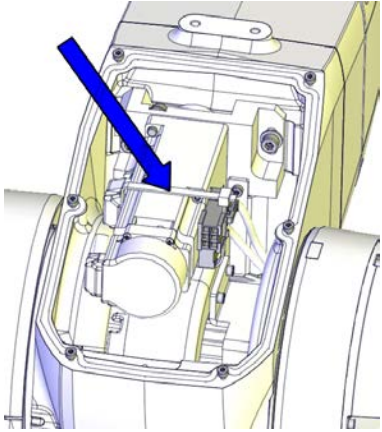
	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the motor connectors.	 <p>xx1300002371</p>

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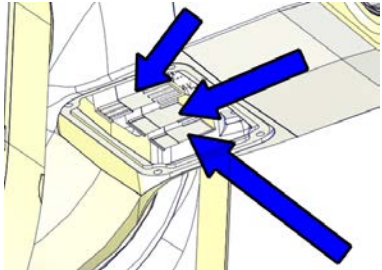
4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
3	Secure the connectors to the motor with a cable strap.	 xx1300002494


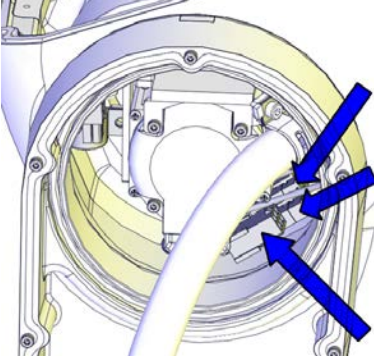
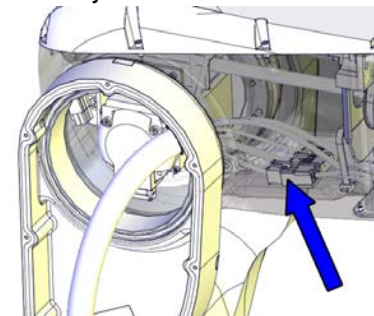
Connecting the axis-4 FPC connectors

	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the FPC connectors.  Tip See the number markings on the connectors for help to find the corresponding connector.	 xx1300002399

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

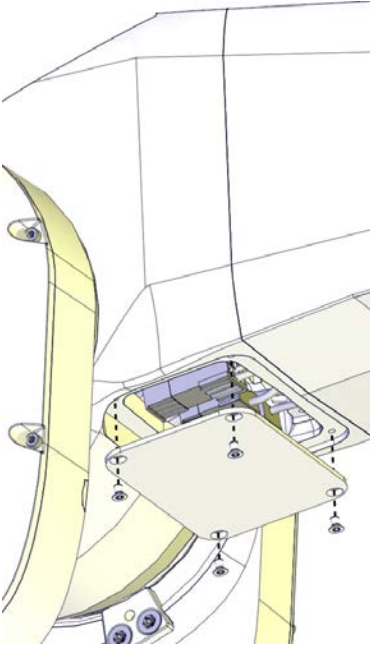
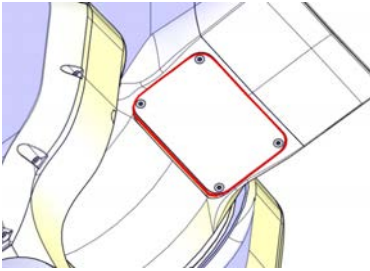
	Action	Note
3	<p>Reconnect the FPC connectors and push them into place inside the housing.</p> <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	<p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p>
4	<p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p>	

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4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

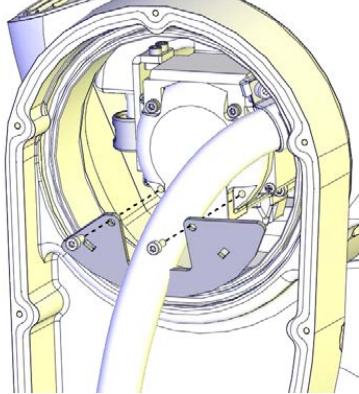
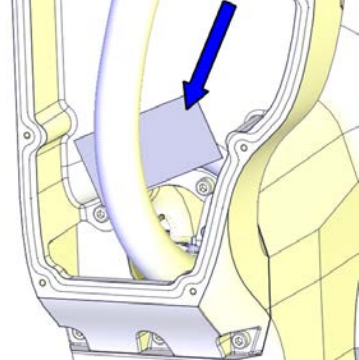
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	Action	Note
5	<p>For robots with protection class IP67 For robots with protection type Foundry Plus Apply flange sealing Sikaflex 521FC on the mounting surfaces of the small cover on the housing.</p>	
6	<p>Refit the small cover to the housing. Replace if damaged.</p>	<p>xx1300002398</p> <p>Housing small cover: 3HAC059684-001 Housing small cover, Clean Room Housing small cover, food grade lubrication Housing small cover, Hygienic : 3HAC056142-001 Screws: 3HAC14286-4 (M3X5). Tightening torque: 1 Nm.</p>
7	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Apply a string of the sealant to the joint of the small cover on the housing. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.</p>	<p>For robots with protection type Clean Room For robots with food grade lubrication Sealant, SikaFlex 521FC For robots with protection type Hygienic Sealant, Trans Clear</p>  <p>xx1600000214</p>

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

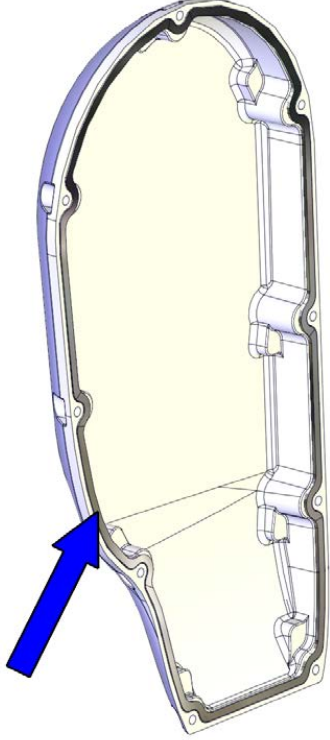
	Action	Note
8	Refit the plate.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002413</p>
9	Check the PTFE film on the cable housing. Replace if damaged.	<p>PTFE film on lower arm cable housing: 3HAC044710-001</p>  <p>xx1400000740</p>

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4 Repair

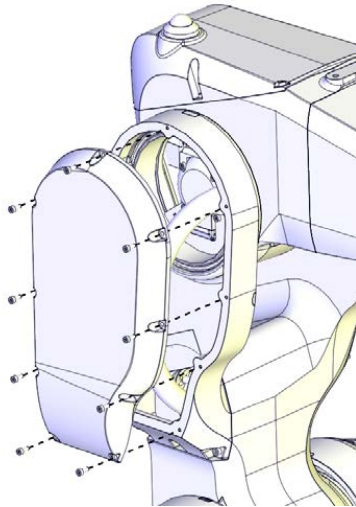

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
10	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the gasket of the cable housing cover. Replace if damaged.</p>	<p>Gasket on cable housing cover: 3HAC056724-001 (not Hygienic robots) / 3HAC080702-001 (Hygienic robots) PTFE film on cable housing cover: 3HAC044660-001</p>  <p>xx140000048</p>
11	<p>Check the PTFE film on the cable housing cover. Replace if damaged.</p>	
12	<p>Apply grease to the inner surface of the cable housing cover and the PTFE film surface.</p>	

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)
Continued

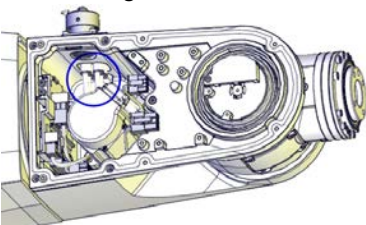
	Action	Note
13	<p>Refit the cable housing cover.</p> <p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Apply locking liquid Loctite 243 to all the screws securing the cover.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm</p>  <p>xx1300002400</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

Connecting the air hoses and CP/CS cabling (if equipped)

Notice that the procedure differs depending on the protection class and protection type.

Connecting the air hoses and CP/CS cabling on robots not in protection type Hygienic

Use this procedure if the robot is not in protection type Hygienic.

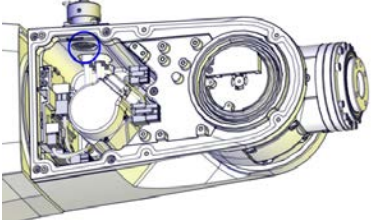
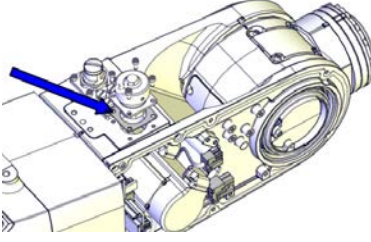
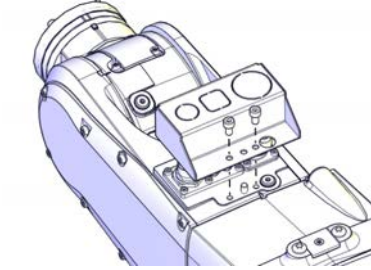
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Reconnect the air hoses.</p> <p>Replace the air hose connector set if damaged.</p>	<p>Air connector set with Ethernet hole in flange: 3HAC049664-001</p> <p>Air connector set without Ethernet hole in flange: 3HAC049665-001</p>  <p>xx1400000738</p>

Continues on next page

4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
3	<p>If equipped, reconnect the CP/CS connector.</p> <p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <ol style="list-style-type: none"> 1 Check the gasket. 2 Replace if damaged. <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <ol style="list-style-type: none"> 1 Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. 2 Apply flange sealing Loctite 574 on the mounting surfaces of the CP/CS connector and wipe clean if there is any overflowing Loctite 574. 	 <p>xx1500000252</p> <p>On robots with protection class IP67</p> <p>On robots with protection type Foundry Plus</p> <p>Gasket: 3HAC058567-001</p>  <p>xx1500000251</p>
4	<p>For robots with protection type Foundry Plus</p> <p>If required, fit the protection bracket for CP/CS connectors.</p>	<p>Protection bracket for CP/CS connectors: 3HAC058350-001</p>  <p>xx1600001152</p>

Connecting the air hoses and CP/CS cabling on robots in protection type Hygienic

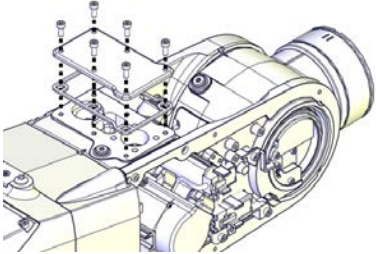
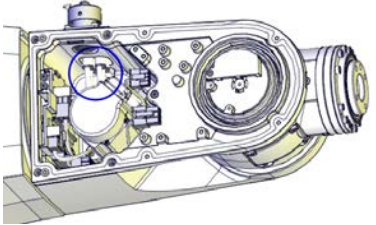
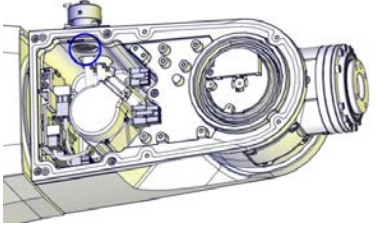
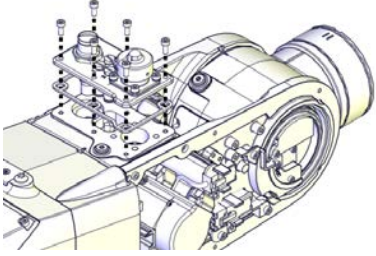
Use this procedure if the robot is with protection type Hygienic.

	Action	Note
1	<p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

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4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
2	<p>If the Hygienic robot not equipped with air hoses and CP/CS cabling: Check the plate without connector set and the attached gasket. Replace if damaged.</p>	<p>Plate without connector set: 3HAC078810-001 Gasket: 3HAC078804-001</p>  <p>xx2100001433</p>
3	<p>Reconnect the air hoses.</p>	 <p>xx1400000738</p>
4	<p>Reconnect the CP/CS cabling.</p>	 <p>xx1500000252</p>
5	<p>Check the connectors on the plate with connector set and the attached gasket. Replace if damaged.</p>	<p>Plate with connector set: 3HAC079691-001 Gasket: 3HAC078804-001</p>  <p>xx2100001434</p>

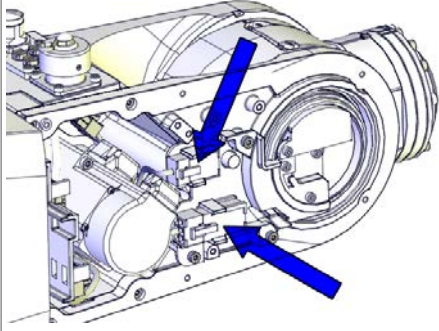
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4 Repair

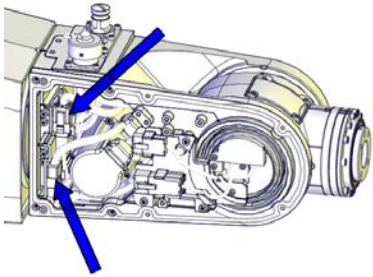
4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

Connecting the axis-5 motor FPC connectors

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Connect the axis-5 FPC connectors and snap them to their holders.</p>	 <p>xx1300002390</p>

Connecting the axis-5 motor connectors

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Reconnect the motor cables.</p> <ul style="list-style-type: none"> • R3.MP5 • R3.ME5 	 <p>xx1300002360</p>

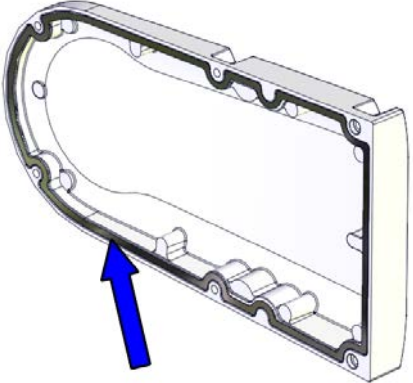
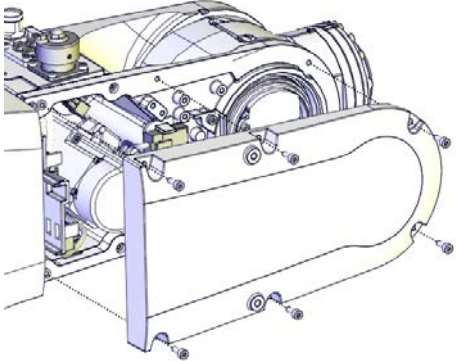

Refitting the tubular cable housing cover

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

Continues on next page

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
2	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the tubular cable housing cover gasket. Replace if damaged.</p>	<p>Gasket for tubular cable housing cover: 3HAC056707-001 (not Hygienic robots) / 3HAC080701-001 (Hygienic robots)</p>  <p>xx140000345</p>
3	<p>Refit the cover to the cable housing.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p>  <p>xx1300002389</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

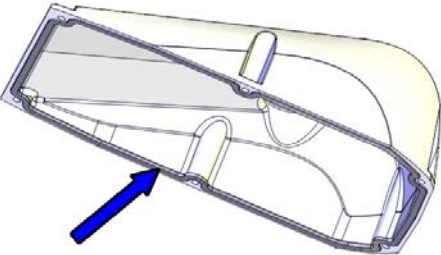

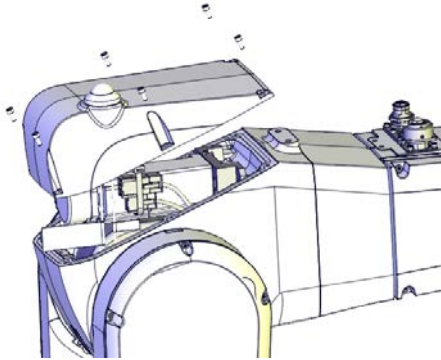

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4 Repair

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

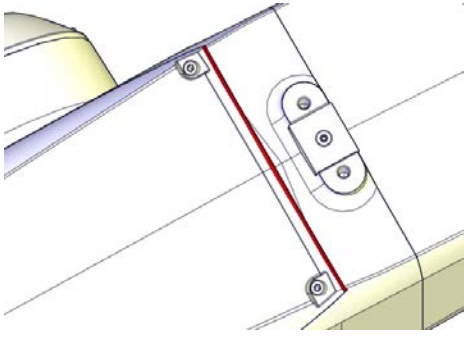


Concluding procedure

	Action	Note
1	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication</p> <p>Check the gasket. Replace if damaged.</p>	<p>Housing cover gasket (IRB 1200-7/0.7): 3HAC056698-001 (not Hygienic robots) / 3HAC080700-001 (Hygienic robots)</p> <p>Housing cover gasket (IRB 1200-5/0.9): 3HAC056697-001 (not Hygienic robots) / 3HAC080699-001 (Hygienic robots)</p>  <p>xx1400000477</p>
2	<p>Refit the upper arm housing cover with the screws.</p> <p> CAUTION</p> <p>For robots with safety lamp (option) Reconnect the lamp cable connectors R3.H1 and R3.H2 and then secure the cover.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p>  <p>xx1300000456</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

Continues on next page

4.5.2 Replacing the swing spare parts (swing, axis-2 radial sealing)

Continued

	Action	Note
3	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Apply a string of the sealant to the joint of the upper arm housing cover.</p> <p>Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p>	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication Sealant, SikaFlex 521FC</p> <p>For robots with protection type Hygienic Sealant, Trans Clear</p>  <p>xx1600000215</p>
4	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean, seal and paint the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160.</p> <p> Note</p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>	
5	<p>Recalibrate the robot.</p>	<p>Calibration is detailed in section Calibration on page 807.</p>
6	<p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

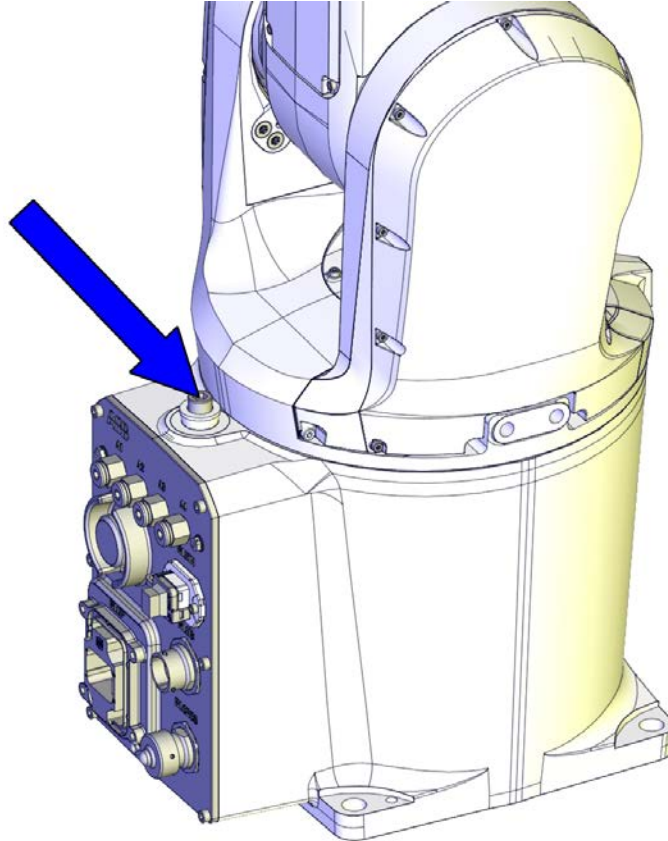
4 Repair

4.5.3 Replacing the axis-1 mechanical stop

4.5.3 Replacing the axis-1 mechanical stop

Location of the mechanical stop

The axis-1 mechanical stop is located as shown in the figure.



xx140000391

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Mechanical stop set, axis 1	3HAC049630-001	Includes mechanical stop pin (1 pc), washer and screw.

Required tools and equipment



Equipment, etc.	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .

Continues on next page



Replacing the mechanical stop

Use these procedures to remove the axis-1 mechanical stop.

Preparations before removing the mechanical stop

	Action	Note
1	Jog the robot to a position where the mechanical stop is most easily accessed.	
2	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
3	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.	

Replacing the axis-1 mechanical stop

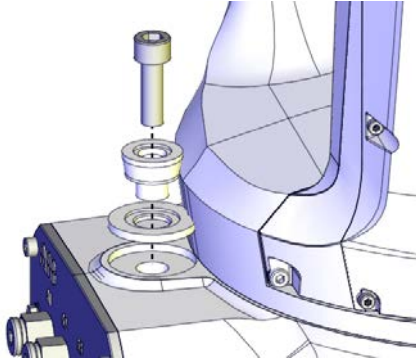



	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.	

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4 Repair

4.5.3 Replacing the axis-1 mechanical stop

Continued

	Action	Note
3	Remove the mechanical stop by removing the screw.	 <p data-bbox="938 674 1050 696">xx1400000392</p> <p data-bbox="938 712 1268 775">Screw: 9ADA183-37 (M8x25). Tightening torque: 12 Nm.</p> <p data-bbox="943 790 1002 846"> Note</p> <p data-bbox="938 862 1401 916">Only use specified screws, never replace them with other screws.</p>
4	Discard the old screw and washer.	
5	Refit and secure the new stop with the enclosed screw and washer.	
6	<p data-bbox="464 943 901 996">For robots with protection type Clean Room</p> <p data-bbox="464 1003 901 1039">For robots with food grade lubrication</p> <p data-bbox="464 1046 933 1189">For robots with protection type Hygienic Clean, seal and paint the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160.</p> <p data-bbox="464 1205 528 1261"> Note</p> <p data-bbox="464 1274 933 1328">After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>	
7	<p data-bbox="464 1375 539 1440"> DANGER</p> <p data-bbox="464 1453 933 1507">Make sure all safety requirements are met when performing the first test run.</p>	

4.6 Motors and gearboxes

4.6.1 Replacing the axis-1 gear unit

Part of complete base

The axis-1 gear unit and axis-1 motor is part of the complete base spare part assembly, see [Replacing the base spare parts \(base, axis-1 radial sealing, protection sleeve\) on page 494](#).

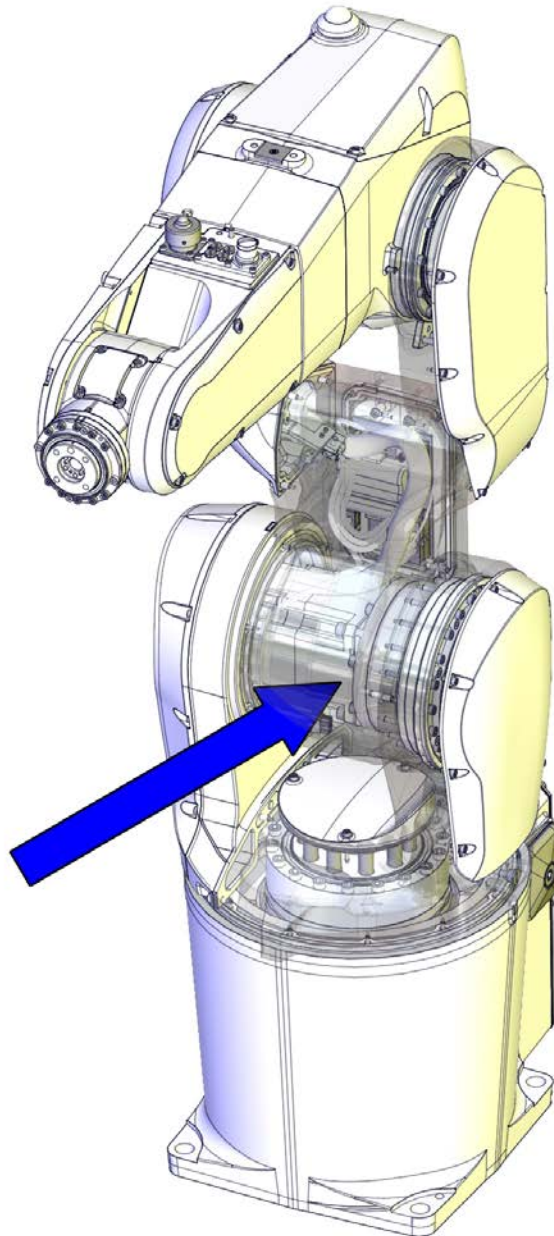
4 Repair

4.6.2 Replacing the axis-2 drive unit

4.6.2 Replacing the axis-2 drive unit

Location of the drive unit

The axis-2 drive unit is located as shown in the figure.



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Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

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Spare part	Article number	Note
Drive unit	3HAC049645-001	Includes axis-2 gearbox, AC motor with encoder interface, motor adapter and O-ring (3HAC048939-001).
Drive unit, food grade lubrication	3HAC057903-001	Used for robots with food grade lubrication. Includes axis-2 gearbox, AC motor with encoder interface, motor adapter and O-ring (3HAC048939-001).
Drive unit, SafeMove 2-supported	3HAC061273-001	Used for IRB 1200 Type B. See Type B of IRB 1200 on page 875 . Includes axis-2 gearbox, AC motor with resolver interface, motor adapter and O-ring (3HAC048939-001).
Drive unit, food grade lubrication and SafeMove 2-supported Drive unit, Hygienic	3HAC061274-001	Used for IRB 1200 Type B. See Type B of IRB 1200 on page 875 . Used for robots with food grade lubrication. Used with protection type Hygienic Includes axis-2 gearbox, AC motor with resolver interface, motor adapter and O-ring (3HAC048939-001).
O-ring	3HAC048939-001	Replace if damaged.
M2 variseal sealing	3HAC044641-003	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
Gasket on swing cover	3HAC056727-001 / 3HAC080705-001	Not used with protection class IP40. Replace if damaged.
Gasket on cable housing cover	3HAC056726-001 / 3HAC080704-001	Not used for robots with protection class IP40. Replace if damaged.

Required tools and equipment

Equipment, etc.	Article number	Note
Roundsling, 2 m	-	Length: 2 m. Lifting capacity: 100 kg.
Guide pin for axis-2 gear unit	3HAC049704-001	Always use three guide pins together!
24 VDC power supply	-	Used to release the motor brakes.
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. ⁱ
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .

ⁱ The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.

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4 Repair

4.6.2 Replacing the axis-2 drive unit

Continued

Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.


If no data is found related to standard calibration, manual calibration is used as default.

Required consumables

Consumable	Art. no.	Note
Cable straps	-	
Cleaning agent	-	Loctite 7063
Flange sealing	12340011-116	Loctite 574
Locking liquid	3HAB7116-1	Loctite 243
Harmonic grease 4B No. 2	3HAC037302-001	Total amount: 60 g. Used to lubricate the gearbox. The gear is pre-filled at delivery but grease may need to be added depending on the actual condition.
LUBRIPLATE SYNXTREME FG-0	3HAC043771-001	Total amount: 60 g. Used to lubricate the gearbox of robots with food grade lubrication and robots with protection type Hygienic. The gear is pre-filled at delivery but grease may need to be added depending on the actual condition.
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room. For robots with food grade lubrication.
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none"> Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	 Note Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.


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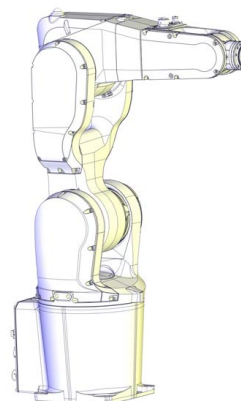
Action	Note
<p>If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p>	<p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in Reference calibration routine on page 821.</p>
<p>If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.</p>	

Removing the drive unit

Use these procedures to remove the axis-2 drive unit.

Preparations before removing the axis-2 drive unit

Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.
2	Jog all axes to zero position.
3	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>





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4 Repair

4.6.2 Replacing the axis-2 drive unit

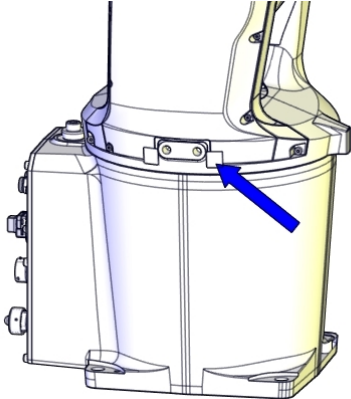
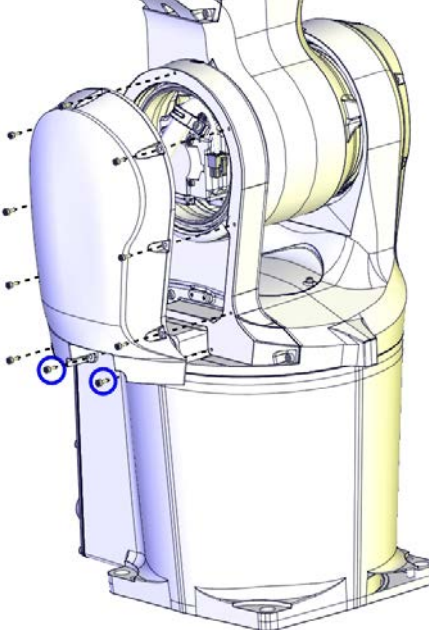
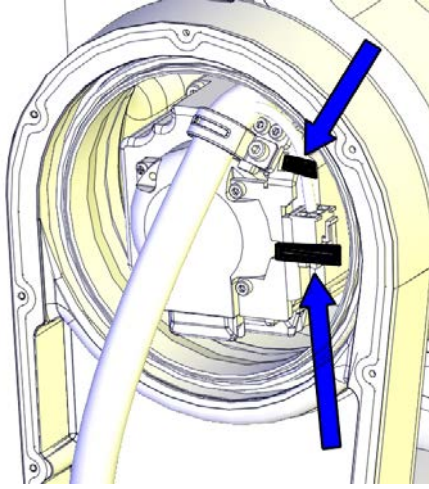
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	Action	Note
4	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i>	
5	 CAUTION The lower and upper arms together weigh 30 kg. All lifting accessories used must be sized accordingly!	
6	Fit a roundsling to the upper arm to support the weight of the upper and lower arm. (no force)	

Loosening the cabling in the swing

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i>	

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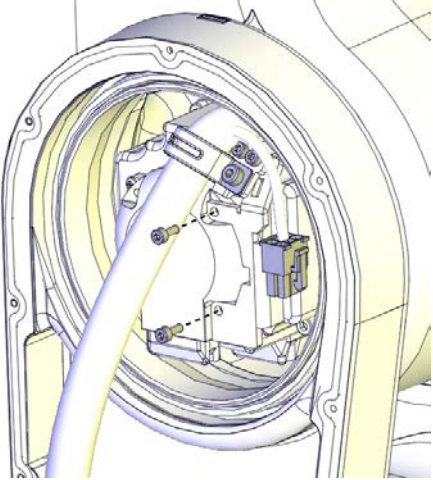
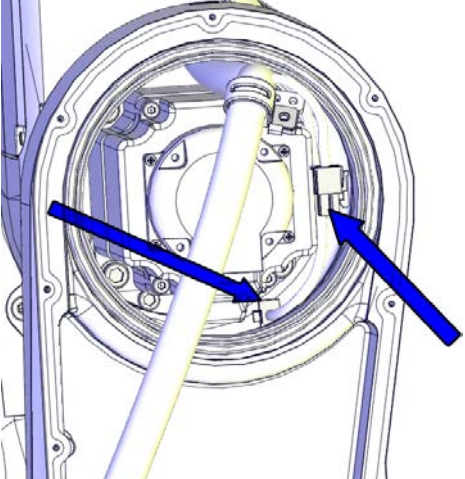

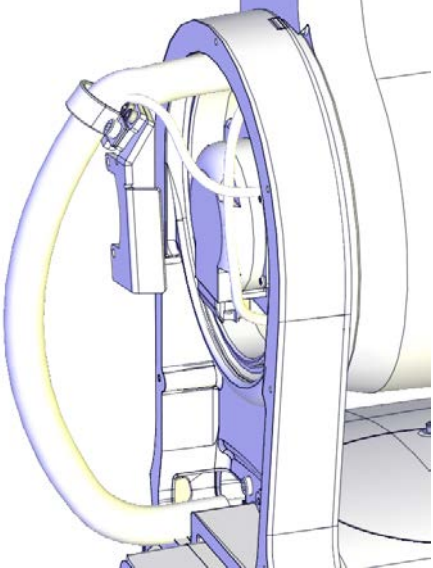
	Action	Note
3	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Remove the swing sealing plug. Follow the procedure specified in Removing the swing sealing plug on page 168.</p>	 <p>xx160000205</p>
4	<p>Remove the cable housing cover of the swing by removing the screws.</p>	 <p>xx1300002431</p>
5	<p>Cut the cable straps.</p>	 <p>xx1400001528</p>

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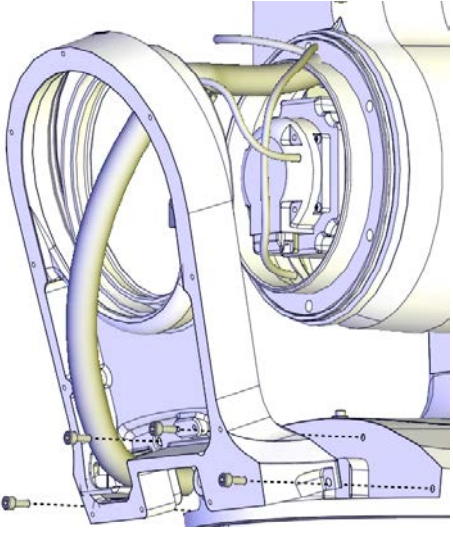
4 Repair

4.6.2 Replacing the axis-2 drive unit



Continued

	Action	Note
6	Remove the axis-2 motor bracket screws.	 <p>xx1300002432</p>
7	Disconnect the motor connectors. <ul style="list-style-type: none">• R2.ME2• R2.MP2	 <p>xx1300002434</p>
8	Pull out the cable harness slightly from the lower arm housing.  Note The cabling is still connected inside the robot, so be careful not to strain the cables!	 <p>xx1300002548</p>

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	Action	Note
9	<p>Loosen the cable housing of the swing by removing the screws, and tilt it outwards.</p> <p> CAUTION</p> <p>Make sure that the sealing in the cable housing does not get damaged when the cable housing is hanging on the cable.</p>	 <p>xx1300002549</p>

Removing the lower arm

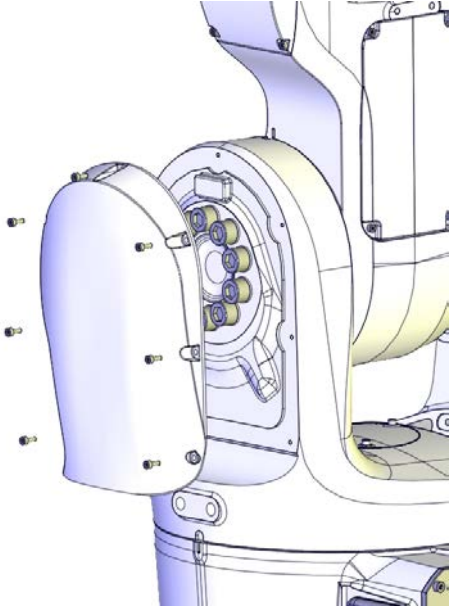

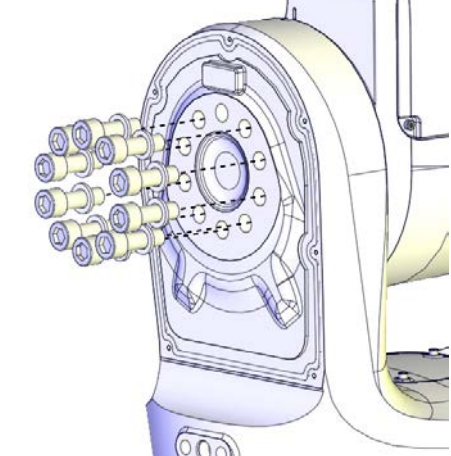
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	

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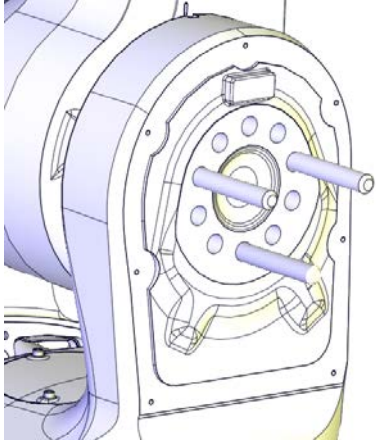

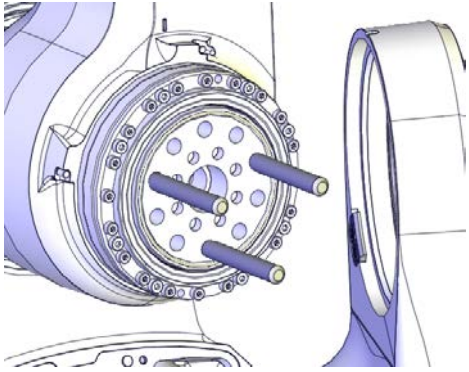
4 Repair

4.6.2 Replacing the axis-2 drive unit



Continued

	Action	Note
3	Remove the swing cover.	 <p>xx1300002551</p>
4	<p>Remove the lower arm screws and washers.</p> <p> WARNING</p> <p>This releases the lower arm from the swing. Make sure the weight of the arm is properly secured.</p> <p>The lower arm weighs 13 kg. If the upper arm is also attached to the lower arm, it adds an additional 17 kg to the total weight.</p>	 <p>xx1300002552</p>

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	Action	Note
5	Fit guide pins to the gearbox.	<p>Guide pin for axis-2 gear unit: 3HAC049704-001</p> <p>Always use three guide pins together!</p>  <p>xx1300002563</p>
6	<p>Separate the lower arm from the swing.</p> <p> Tip</p> <p>If the lower arm is hard to loosen from the swing, two of the lower arm screws can be refitted in their attachment holes. Leave some space between the screw head and the swing casting. Then use a plastic hammer to knock on the screws lightly and evenly.</p>	 <p>xx1300002553</p>

Removing the axis-2 drive unit


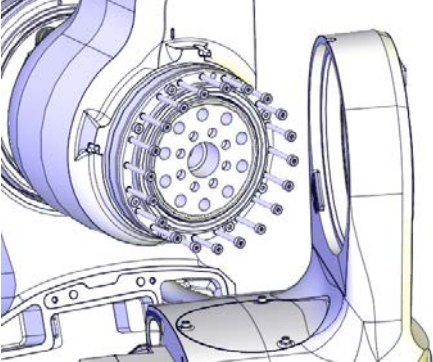

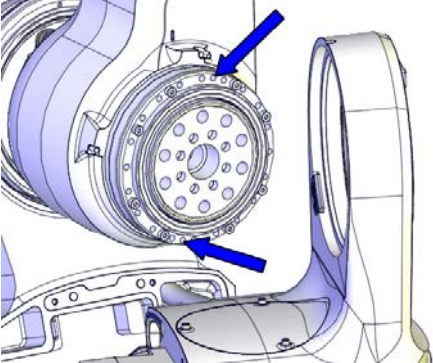
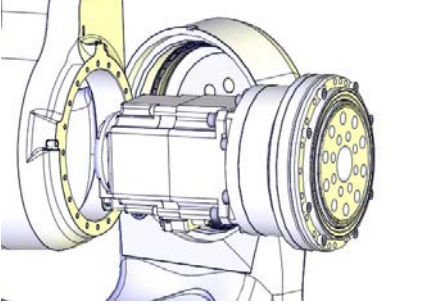
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	

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4 Repair

4.6.2 Replacing the axis-2 drive unit

Continued

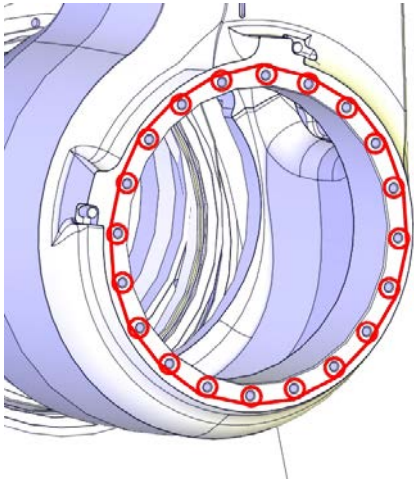
	Action	Note
3	<p> CAUTION</p> <p>The lower and upper arms together weigh 30 kg. All lifting accessories used must be sized accordingly!</p>	
4	<p>If there is enough space on the site, lay down the lower arm on a workbench. Make sure to support the gravity center of the lower arm.</p> <p>If the site is cramped, the procedure can be performed having the lower arm hanging in the lifting slings.</p> <p>If removing the axis-2 drive unit from a hanging lower arm, it is best performed by two persons working together:</p> <ul style="list-style-type: none">• Person 1: Hold the lower arm still.• Person 2: Remove the drive unit screws according to step below.	 <p>xx1300002554</p>
5	<p>Remove the grey screws from the drive unit.</p> <p> WARNING</p> <p>Keep the eight black screws fitted. They hold the gearbox together. Removing them can damage the gearbox severely.</p>	
6	<p>Insert two M4 screws to the press out holes and press out the drive unit.</p>	 <p>xx1400000008</p>
7	<p>Carefully pull out the complete drive unit.</p>	 <p>xx1300002555</p>

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Refitting the drive unit

Use these procedures to refit the axis-2 drive unit.

Refitting the axis-2 drive unit


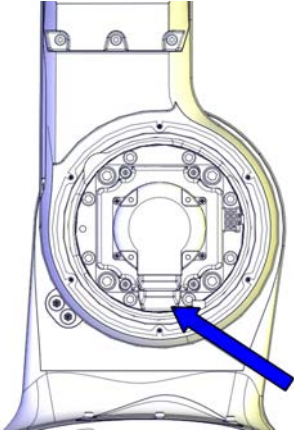
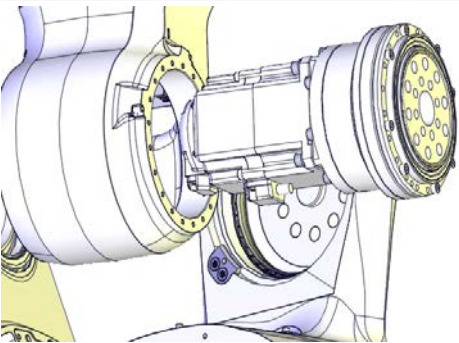
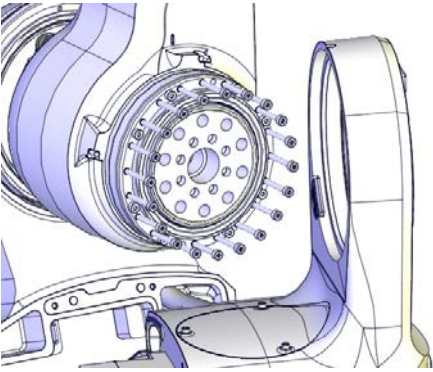

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Check if there is a sufficient amount of grease on the gear. Apply more grease, if needed.</p>	<p>Harmonic grease 4B No. 2: 3HAC037302-001</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>LUBRIPLATE SYNXTREME FG-0: 3HAC043771-001</p>
3	<p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p> <p>Apply flange sealing Loctite 574 on the mounting surfaces of the lower arm.</p>	 <p>xx140000006</p>

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4 Repair

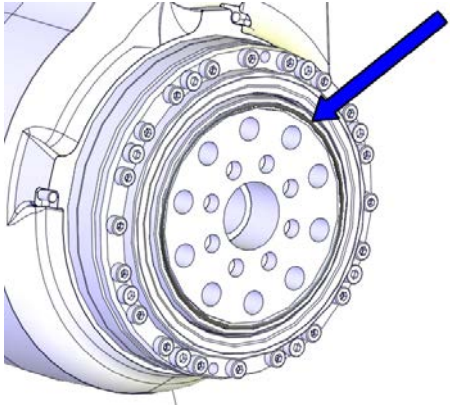

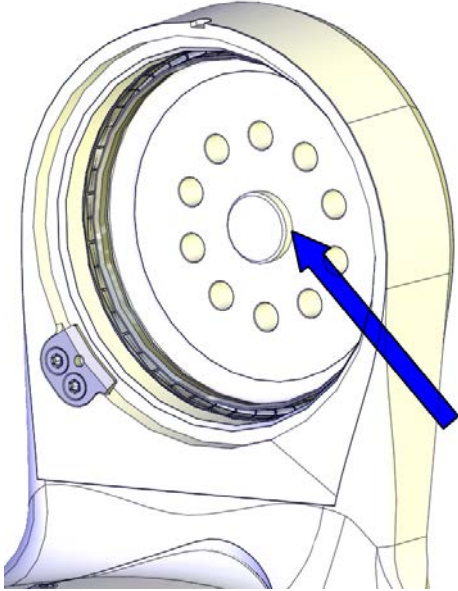
4.6.2 Replacing the axis-2 drive unit

Continued

	Action	Note
4	<p>Carefully insert the complete drive unit.</p> <p> Note</p> <p>Pay attention to the relative position between the motor connector block and the lower arm, so that the drive unit is positioned correctly inside the lower arm.</p>  <p>xx1400000795</p> <p>The figure shows the position of the motor connector block when axis 2 is in position 0°.</p>	 <p>xx1300002580</p>
5	<p>If the gear is refitted in a hanging lower arm, this step requires two persons.</p> <ul style="list-style-type: none"> • Person 1: Hold the lower arm still. • Person 2: Refit the drive unit screws. <p>Secure the screws but do not tighten yet.</p>	<p>Screws: 3HAB3409-239 (M4x35).</p>  <p>xx1300002554</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
6	<p>If the drive unit is refitted in a hanging lower arm, this step requires two persons.</p> <ul style="list-style-type: none"> • Person 1: Hold the lower arm still. • Person 2: Tighten the screws. 	<p>Tightening torque: 5 Nm</p>

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Refitting the lower arm

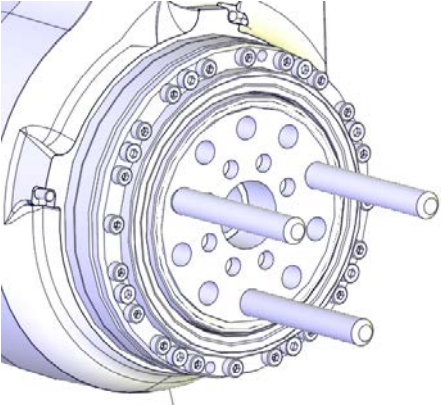

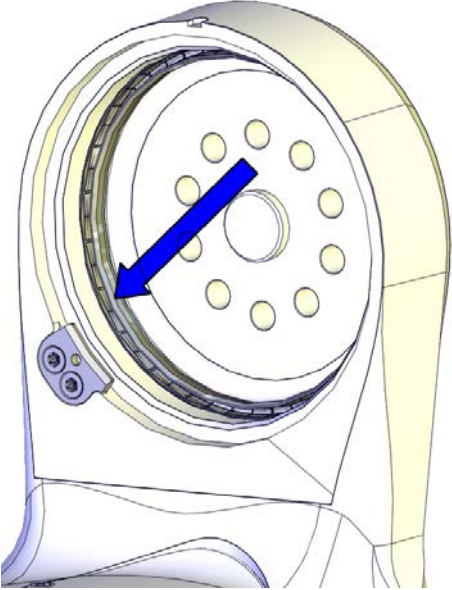
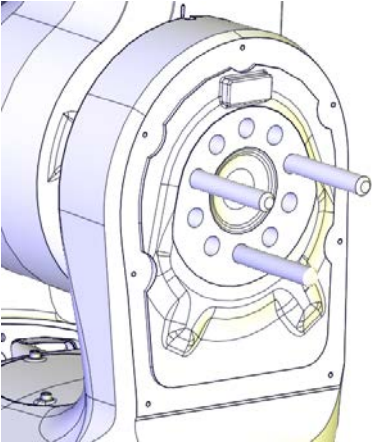
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Check the o-ring.</p> <p>Replace if damaged.</p>	<p>O-ring: 3HAC048939-001</p>  <p>xx1300002556</p>
3	<p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p> <p>Apply flange sealing Loctite 574 to the cylindrical surface in the swing.</p> <p> Note</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Wipe clean the overflowing Loctite 574 if there is any.</p>	 <p>xx1400001403</p>

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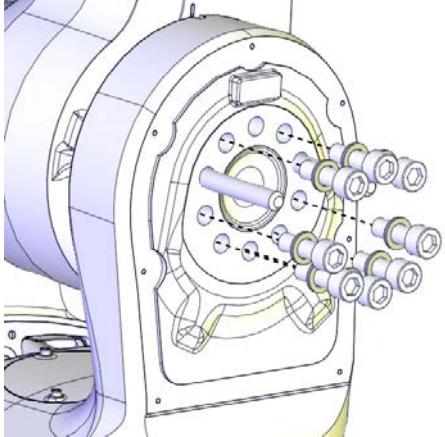

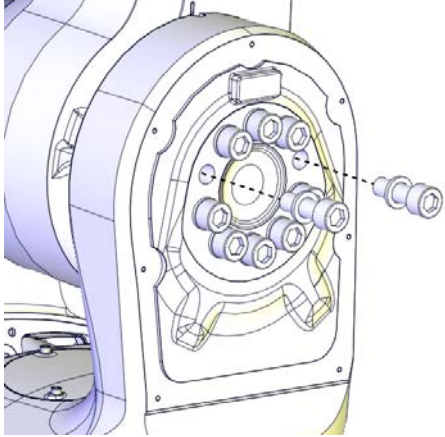
4 Repair

4.6.2 Replacing the axis-2 drive unit

Continued

	Action	Note
4	Fit guide pins to the gearbox.	<p>Guide pin for axis-2 gear unit: 3HAC049704-001</p>  <p>xx1300002562</p> <p>Always use three guide pins together!</p>
5	<p>For robots with protection class IP67 For robots with protection type Foundry Plus</p> <p>Check the sealing. Replace if damaged.</p> <p> CAUTION</p> <p>Do not fit M2 variseal sealing on robots in other protection class or protection types.</p>	<p>M2 variseal sealing: 3HAC044641-003</p>  <p>xx140000453</p>
6	Fit the lower arm to the swing, with guidance from the guide pins.	 <p>xx1300002563</p>

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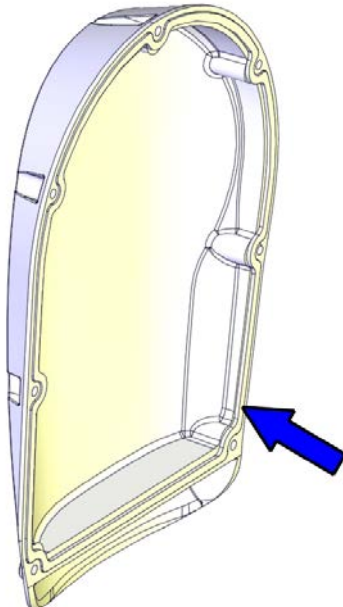
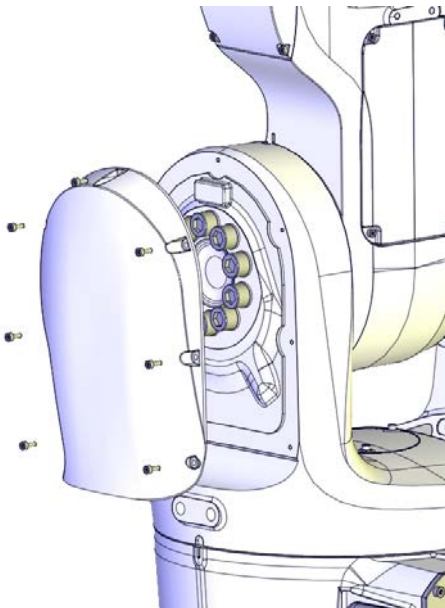
	Action	Note
7	<p>Refit the lower arm screws and washers, using locking liquid Loctite 243. Secure the screws but do not tighten yet.</p>	<p>Screws: 3HAB3409-51 (M10x30).</p>  <p>xx1300002564</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
8	<p>Remove the guide pins and refit the remaining screws and washers using locking liquid Loctite 243.</p>	 <p>xx1300002565</p>
9	<p>Tighten all screws.</p>	<p>Tightening torque: 45 Nm</p>

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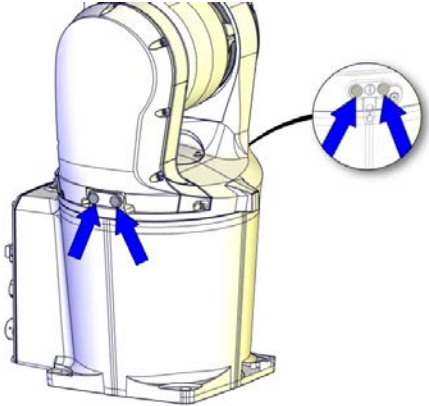
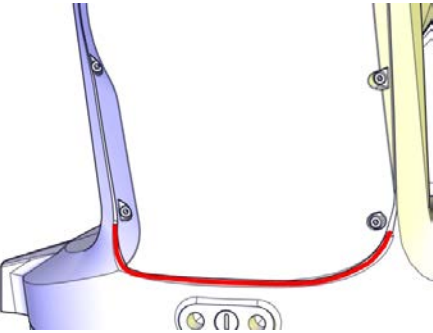
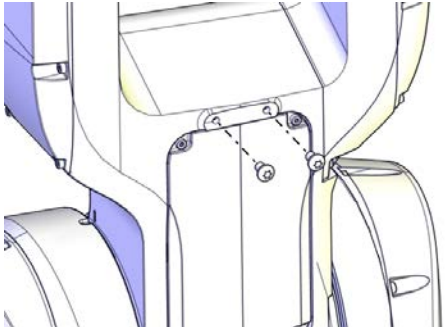
4 Repair

4.6.2 Replacing the axis-2 drive unit

Continued

	Action	Note
10	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the swing cover gasket. Replace if damaged.</p>	<p>Gasket on swing cover: 3HAC056727-001 (not Hygienic robots) / 3HAC080705-001 (Hygienic robots)</p>  <p>xx140000007</p>
11	<p>Refit the swing cover. Replace if damaged.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm. Swing cover: 3HAC059676-001 Swing cover, Clean Room Swing cover, food grade lubrication Swing cover, Hygienic : 3HAC056215-001</p>  <p>xx1300002551</p>

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	Action	Note
12	<p>For robots with protection type Foundry Plus Check the protection plugs for lifting holes. Replace if damaged.</p>	<p>Protection plug for lifting holes: 3HAC4836-24</p>  <p>xx1600001151</p>
13	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Apply a string of the sealant to the joint of the swing cover. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.</p>	<p>For robots with protection type Clean Room For robots with food grade lubrication Sealant, SikaFlex 521FC For robots with protection type Hygienic Sealant, Trans Clear</p>  <p>xx1600000217</p>
14	<p>For robots with protection type Foundry Plus If required, fit two screws for protection.</p>	 <p>xx1600001154</p>

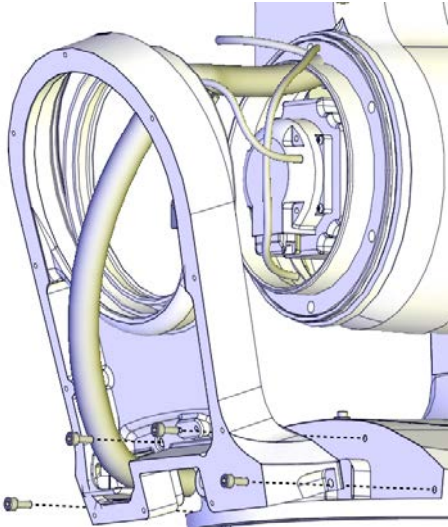
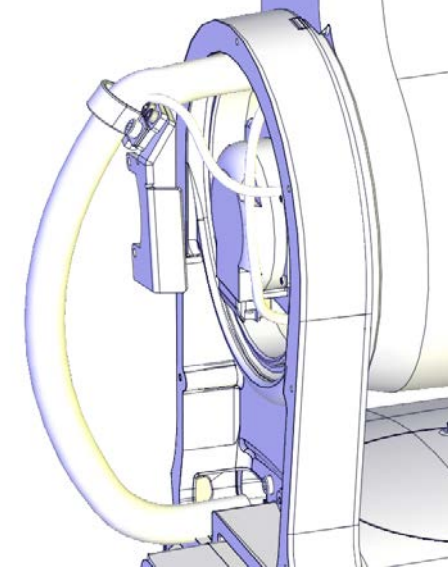
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4 Repair

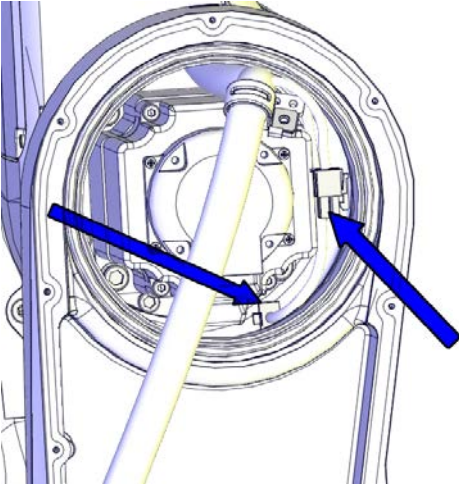
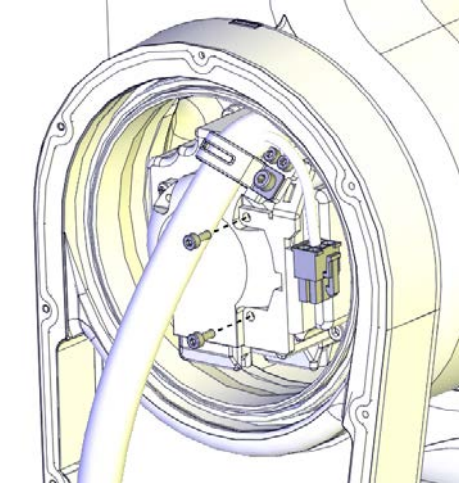
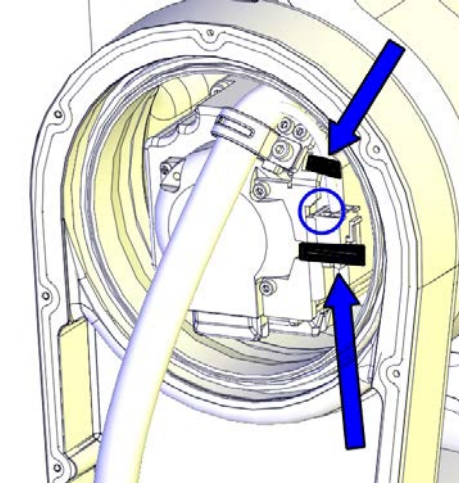
4.6.2 Replacing the axis-2 drive unit

Continued

Securing the cabling to the swing

	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Refit the cable housing to the swing with the screws.	Tightening torque: 3 Nm.  xx1300002549
3	Insert the cable harness into the lower arm.	 xx1300002548

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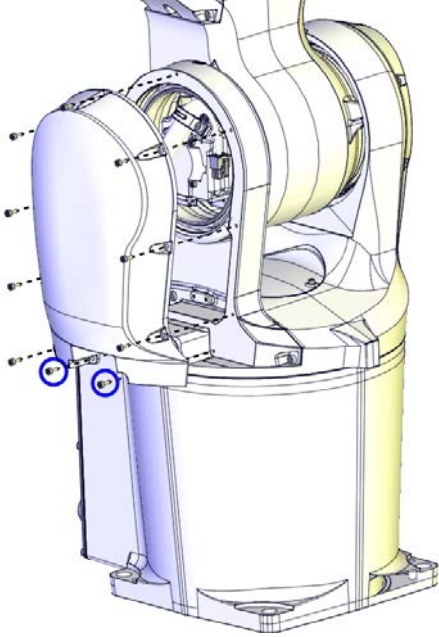

	Action	Note
4	Reconnect the motor connectors. <ul style="list-style-type: none"> • R2.ME2 • R2.MP2 	 <p>xx1300002434</p>
5	Refit the axis-2 motor bracket with the screws.	 <p>xx1300002432</p>
6	Secure the connector R2.MP2 and its cable with cable straps onto the motor bracket. Make sure the connector is fixed by its tab to the bracket.	 <p>xx1400001529</p>

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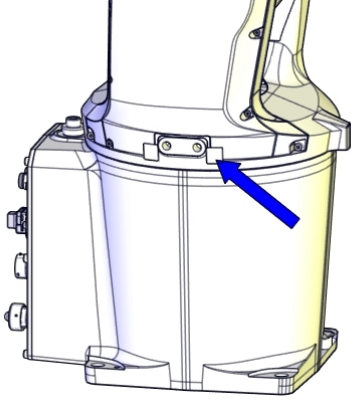
4 Repair

4.6.2 Replacing the axis-2 drive unit



Continued

	Action	Note
7	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the gasket of the cable housing cover. Replace if damaged.</p>	<p>Gasket on cable housing cover: 3HAC056726-001 (not Hygienic robots) / 3HAC080704-001 (Hygienic robots)</p>
8	<p>Check the PTFE film. Replace if damaged.</p>	<p>PTFE film on cable housing cover: 3HAC044660-001</p>
9	<p>Apply grease to the inner surface of the cable housing cover and the PTFE film surface.</p>	
10	<p>Refit the cable housing cover with the screws.</p> <p> Note</p> <p>Remember to refit the two lower screws shown in the figure.</p>	<p>Cable housing cover of the swing: 3HAC059678-001 Cable housing cover of the swing, Clean Room Cable housing cover of the swing, food grade lubrication Cable housing cover of the swing, Hygienic : 3HAC056214-001 Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p>  <p>xx1300002431</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

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	Action	Note
11	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Refit the swing sealing plug.</p> <p>Follow the procedure specified in Refitting the swing sealing plug on page 169.</p>	<p>Swing sealing plug:3HAC053687-001</p>  <p>xx160000205</p>

Concluding procedure

	Action	Note
1	Remove the lifting slings from the robot.	
2	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean, seal and paint the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160.</p> <p> Note</p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>	
3	Recalibrate the robot.	Calibration is detailed in section Calibration on page 807 .
4	<p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

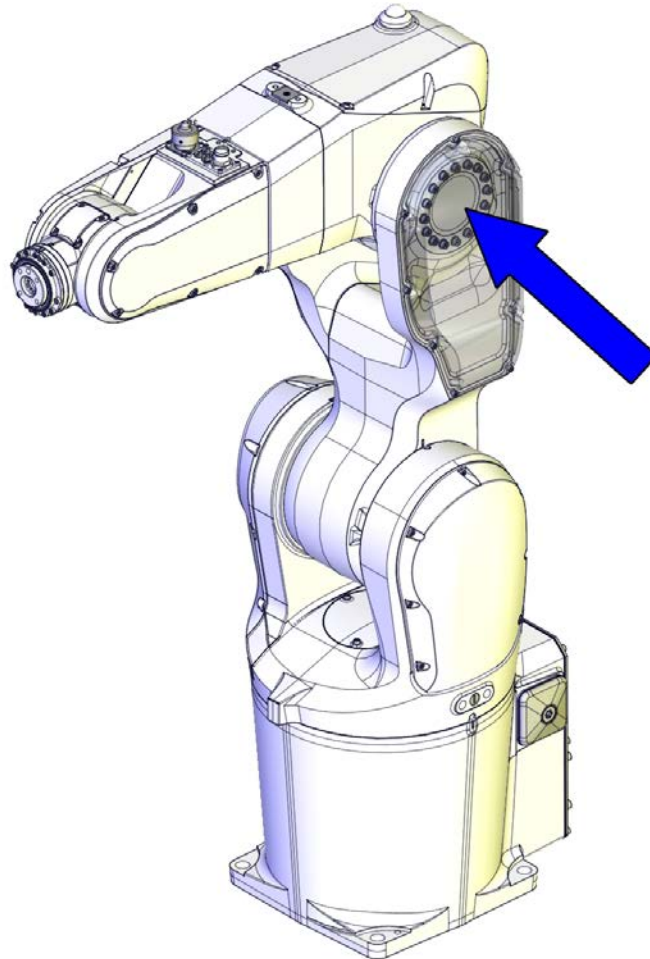
4 Repair

4.6.3 Replacing the axis-3 drive unit

4.6.3 Replacing the axis-3 drive unit

Location of drive unit

The axis-3 drive unit is located as shown in the figure.



xx1300002527

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Drive unit	3HAC061403-001	Includes axis-3 gearbox, AC motor with encoder interface, motor adapter and O-ring (3HAC048939-002).

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Spare part	Article number	Note
Drive unit, food grade lubrication	3HAC057905-001	Used for robots with food grade lubrication. Includes axis-3 gearbox, AC motor with encoder interface, motor adapter and O-ring (3HAC048939-002).
Drive unit, SafeMove 2-supported	3HAC061275-001	Used for IRB 1200 Type B. See Type B of IRB 1200 on page 875 . Includes axis-3 gearbox, AC motor with resolver interface, motor adapter and O-ring (3HAC048939-002).
Drive unit, food grade lubrication and SafeMove 2-supported. Drive unit, Hygienic	3HAC061276-001	Used for IRB 1200 Type B. See Type B of IRB 1200 on page 875 . Used for robots with food grade lubrication. Used with protection type Hygienic Includes axis-3 gearbox, AC motor with resolver interface, motor adapter and O-ring (3HAC048939-002).
O-ring	3HAC048939-002	Replace if damaged.
M2 variseal sealing	3HAC044641-005	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
M2 variseal sealing	3HAC044641-006	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
Radial sealing	3HAC024865-001	Not used with protection class IP40. Replace if damaged.
Gasket on lower arm cover	3HAC056725-001 / 3HAC080703-001	Not used with protection class IP40. Replace if damaged.
Gasket on lower arm cable housing	3HAC044895-001 / 3HAC080696-001	Not used with protection class IP40. Replace if damaged.
Gasket on cable housing cover	3HAC056724-001 / 3HAC080702-001	Not used with protection class IP40. Replace if damaged.

Required tools and equipment

Equipment, etc.	Article number	Note
Guide pin for upper arm	3HAC049705-001	Always use three guide pins together!
Roundsling, 2 m	-	Length: 2 m. Lifting capacity: 100 kg.
24 VDC power supply	-	Used to release the motor brakes.

Continues on next page

4 Repair

4.6.3 Replacing the axis-3 drive unit

Continued

Equipment, etc.	Article number	Note
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. ⁱ
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .

- ⁱ The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, manual calibration is used as default.


Required consumables

Consumable	Art. no.	Note
Cleaning agent	-	Isopropanol
Locking liquid	3HAB7116-1	Loctite 243
Flange sealing	12340011-116	Loctite 574 For robots with protection class IP67 For robots with protection type Foundry Plus
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room. For robots with food grade lubrication.
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic
Harmonic grease 4B No. 2	3HAC037302-001	Total amount: 32 g. Used to lubricate the gearbox. The gear is pre-filled at delivery but grease may need to be added depending on the actual condition.
LUBRIPLATE SYNXTREME FG-0	3HAC043771-001	Total amount: 32 g. Used to lubricate the gearbox of robots with food grade lubrication and robots with protection type Hygienic. The gear is pre-filled at delivery but grease may need to be added depending on the actual condition.

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Deciding calibration routine

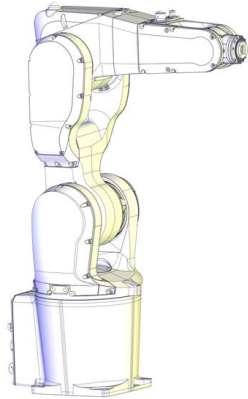
Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none"> Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	 Note Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in Reference calibration routine on page 821 .
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the drive unit

Use these procedures to remove the axis-3 drive unit.

Preparations before removing the axis-3 drive unit



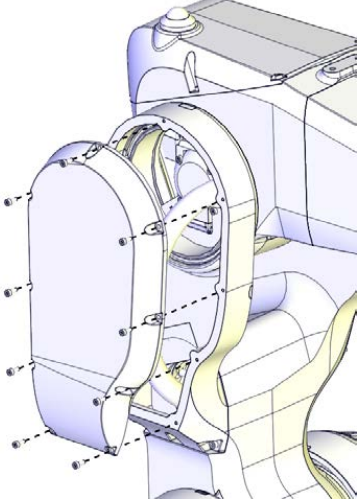
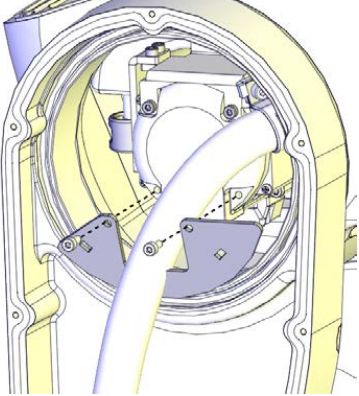
	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx1300002581

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4 Repair



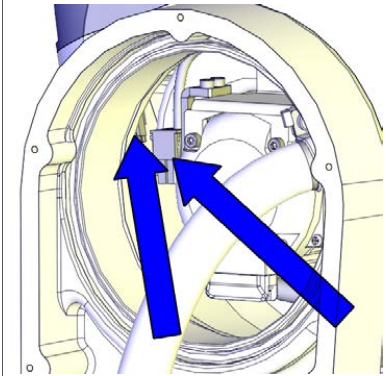
4.6.3 Replacing the axis-3 drive unit

Continued



	Action	Note
3	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply <p>to the robot, before entering the robot working area.</p>	
4	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	
5	Remove the cable housing cover.	 <p>xx1300002400</p>
6	Remove the plate.	 <p>xx1300002413</p>

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Disconnecting the axis-3 motor connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Pull out the axis-3 motor connectors from the housing and disconnect them.	 xx1300002420

Creating space for separation of upper and lower arm

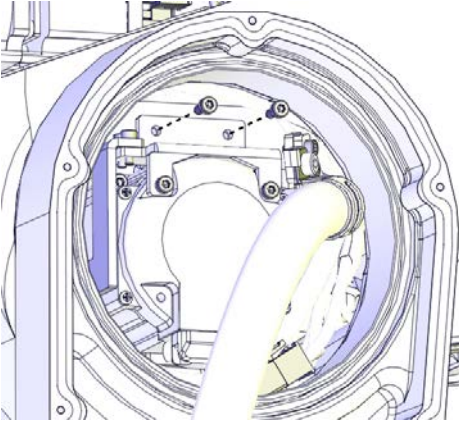
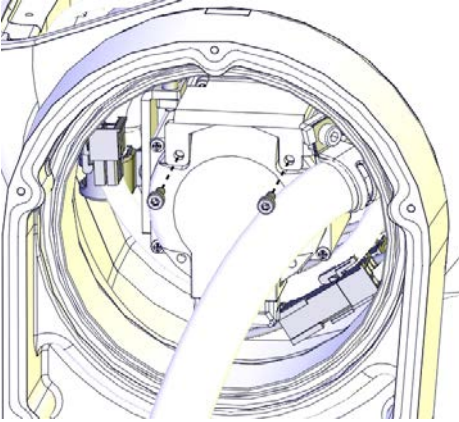

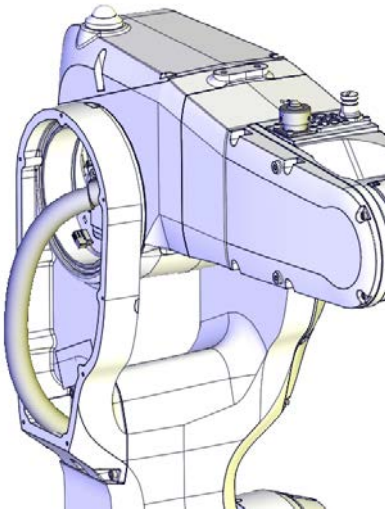
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	

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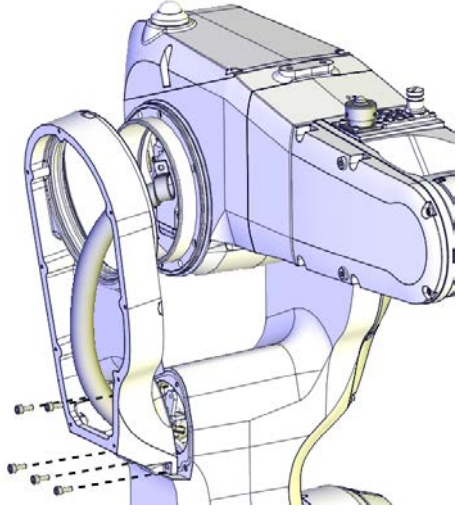
4 Repair

4.6.3 Replacing the axis-3 drive unit



Continued

	Action	Note
3	Remove the screws that fasten the fix sheet to the inner plastic guide.	 <p>xx1300002421</p>
4	Remove the screws that fasten the fix sheet to the motor.	 <p>xx1300002423</p>
5	Pull out the cable harness slightly from the upper arm housing and from the lower arm.  Note The cabling is still connected inside the robot, so be careful not to strain the cables!	 <p>xx1300002530</p>

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	Action	Note
6	Remove the cable housing of the lower arm by removing the screws, and tilt it outwards.	 <p>xx140000785</p>

Removing the upper arm

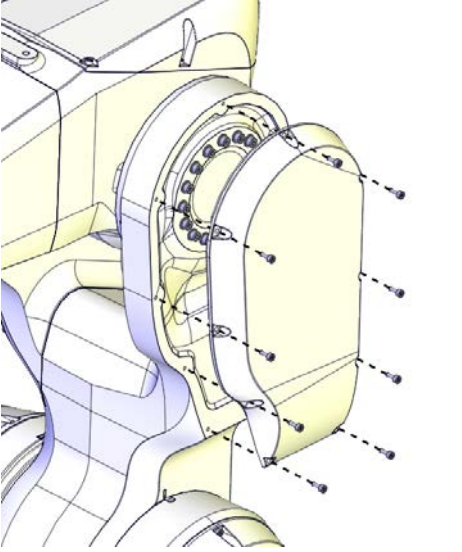


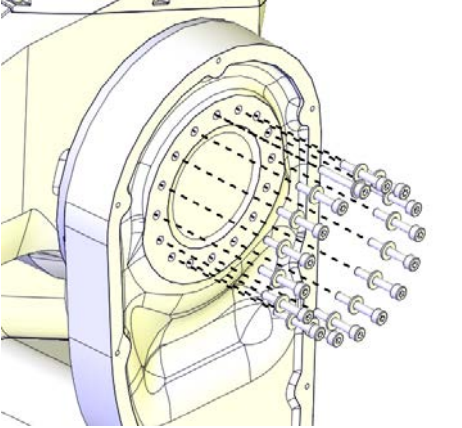
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	

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4 Repair

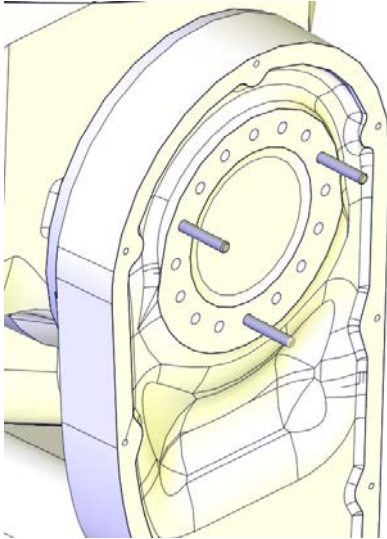
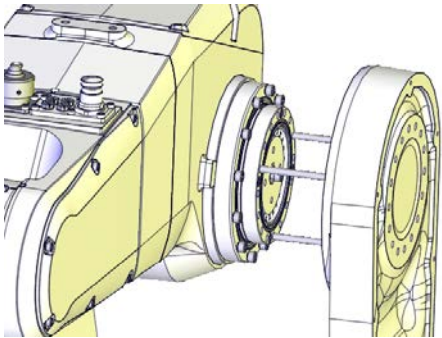
4.6.3 Replacing the axis-3 drive unit

Continued



	Action	Note
3	Remove the lower arm cover.	 xx1300002528
4	 CAUTION The upper arm weighs 17 kg. All lifting accessories used must be sized accordingly!	
5	Fit lifting slings to the upper arm to support the weight of the arm. (no force)	
6	 WARNING This releases the upper arm from the lower arm. Make sure the weight of the upper arm is properly secured by the lifting slings.	 xx1300002531

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4.6.3 Replacing the axis-3 drive unit
Continued

	Action	Note
7	Fit guide pins to the upper arm.	<p>Guide pin for upper arm: 3HAC049705-001 Always use three guide pins together!</p>  <p>xx140000771</p>
8	Separate the upper and lower arm with guidance from the guide pins.	 <p>xx1300002533</p>

Removing the axis-3 drive unit

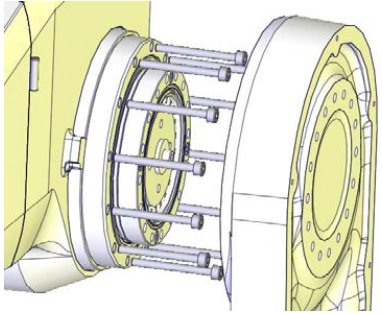

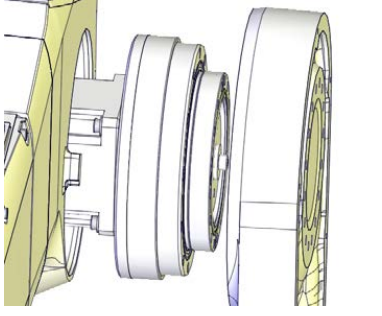
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	

Continues on next page

4 Repair

4.6.3 Replacing the axis-3 drive unit

Continued

	Action	Note
3	Remove the drive unit screws.	 xx1300002532
4	Carefully pull out the complete drive unit.  CAUTION The axis-3 gear unit and motor adapter are not secured to each other with screws! Be careful when handling the drive unit.	 xx1300002534

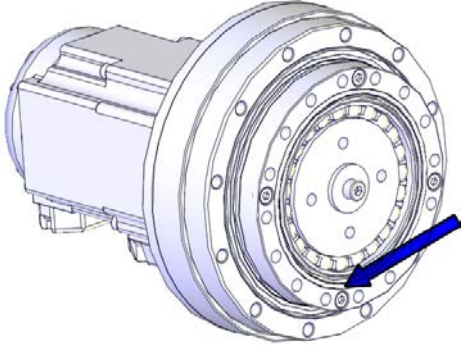
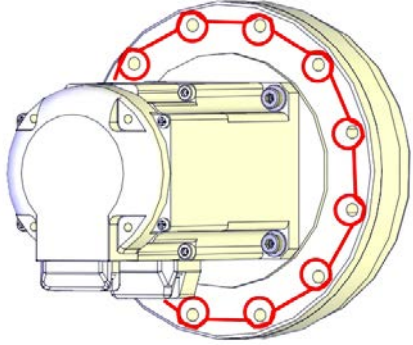

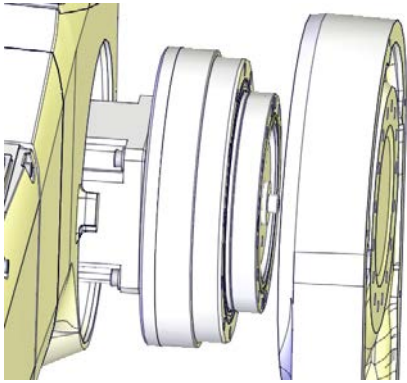
Refitting the drive unit

Use this procedure to refit the axis-3 drive unit.

Refitting the axis-3 drive unit

	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check if there is a sufficient amount of grease on the gear. Apply more grease, if needed.	Harmonic grease 4B No. 2: 3HAC037302-001. For robots with food grade lubrication For robots with protection type Hygienic LUBRIPLATE SYNXTREME FG-0: 3HAC043771-001

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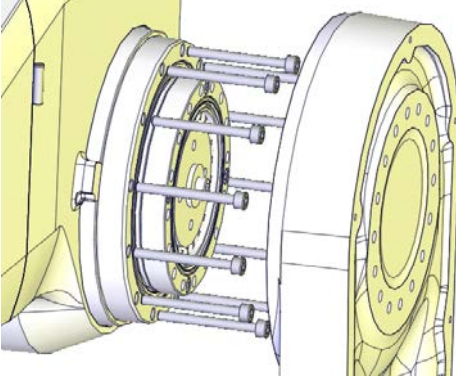


	Action	Note
3	Check the o-ring for damage. Replace if damaged.	<p>O-ring: 3HAC048939-002</p>  <p>xx140000004</p>
4	Remove the two screws and nuts that secure the axis-3 motor adapter and gear unit to each other during transport.	
5	<p>For robots with protection class IP67 For robots with protection type Foundry Plus</p> <p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing Loctite 574 on the mounting surfaces of the motor adapter.</p>	 <p>xx140000784</p>
6	<p>Refit the drive unit into the upper arm.</p> <p> Note</p> <p>Make sure to refit the drive unit correctly oriented. When the upper arm is in its zero position (horizontal), the motor connectors should point downwards.</p>	 <p>xx1300002534</p>

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4 Repair

4.6.3 Replacing the axis-3 drive unit

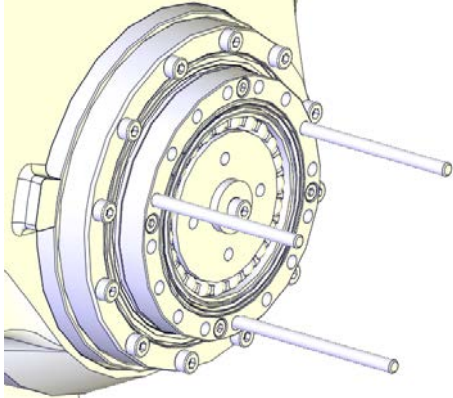

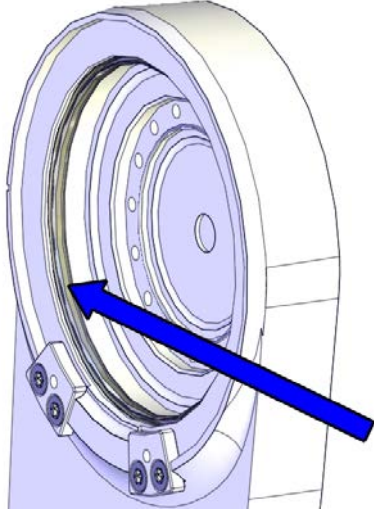
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	Action	Note
7	Refit the drive unit screws.	<p>Screws: 3HAB3409-214 (M4x40) Tightening torque: 4.5 Nm</p>  <p>xx1300002532</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
8	<p>Seal and paint the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160</p> <p> Note</p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>	

Refitting the upper arm

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

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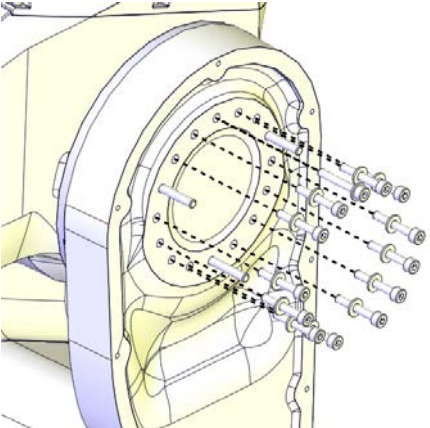

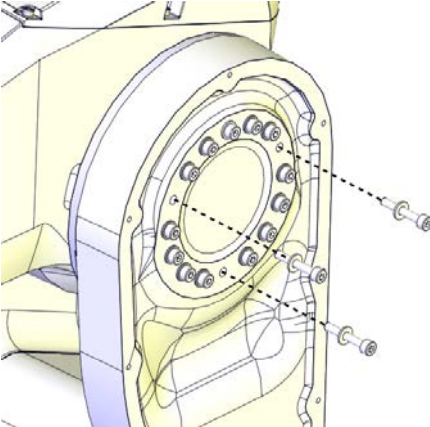
	Action	Note
2	<p>Fit guide pins to the axis-3 gear unit.</p>	<p>Guide pin for upper arm: 3HAC049705-001 Always use three guide pins together!</p>  <p>xx140000027</p>
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus</p> <p>Check the sealing. Replace if damaged.</p> <p> CAUTION</p> <p>Do not fit M2 variseal sealing on robots in other protection class or protection types.</p>	<p>M2 variseal sealing: 3HAC044641-005</p>  <p>xx1400000474</p>

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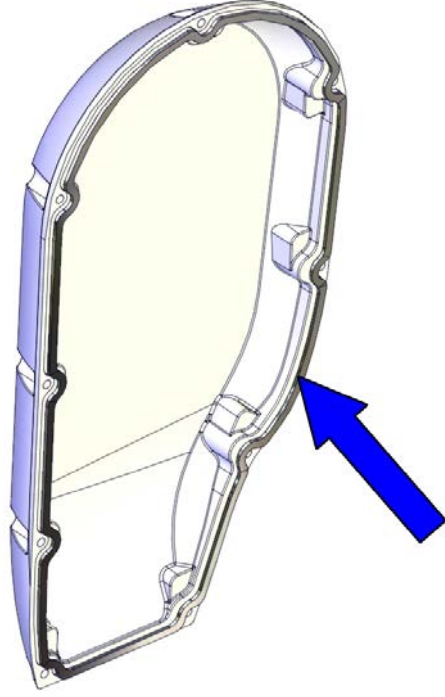
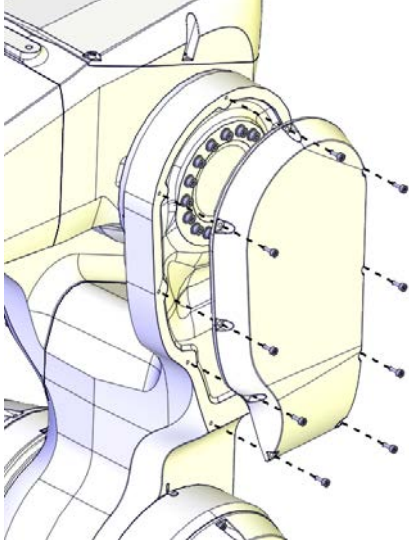

4 Repair

4.6.3 Replacing the axis-3 drive unit

Continued

	Action	Note
4	Refit the upper arm to the lower arm and secure with the upper arm screws and washers. Do not tighten yet.	<p data-bbox="943 315 1310 342">Screws: 3HAB3409-213 (M4x25).</p>  <p data-bbox="943 779 1050 795">xx140000028</p> <p data-bbox="943 819 1002 875"></p> <p data-bbox="1034 835 1086 862">Note</p> <p data-bbox="943 891 1401 943">Only use specified screws, never replace them with other screws.</p>
5	Remove the guide pins and refit the remaining screws and washers.	 <p data-bbox="943 1408 1050 1424">xx140000029</p>
6	Tighten all screws.	Tightening torque: 4.5 Nm.

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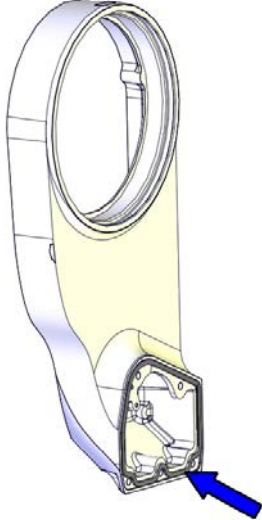


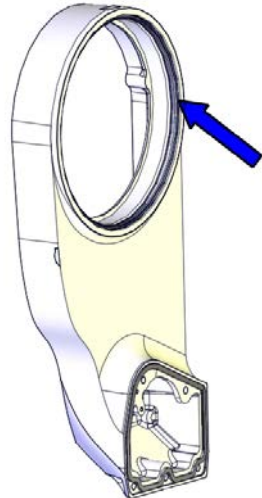
	Action	Note
7	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the lower arm cover gasket. Replace if damaged.</p>	<p>Gasket on lower arm cover: 3HAC056725-001 (not Hygienic robots) / 3HAC080703-001 (Hygienic robots)</p>  <p>xx140000047</p>
8	<p>Refit the lower arm cover.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p>  <p>xx1300002528</p> <p> Note Only use specified screws, never replace them with other screws.</p>

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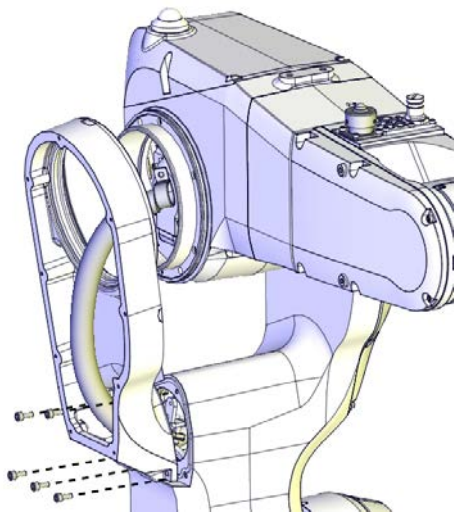

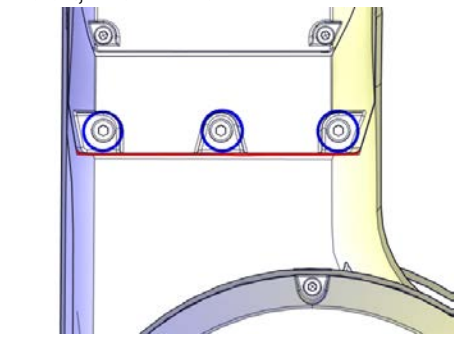
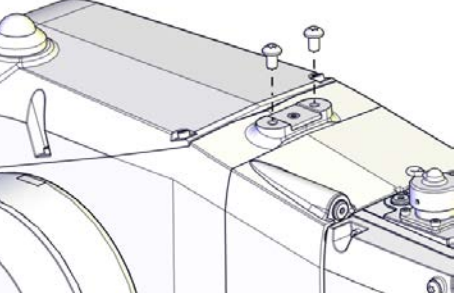
4 Repair

4.6.3 Replacing the axis-3 drive unit

Continued

	Action	Note
9	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the cable housing gasket. Replace if damaged.</p>	<p>Gasket on lower arm cable housing: 3HAC044895-001 (not Hygienic robots) / 3HAC080696-001 (Hygienic robots)</p>  <p>xx1400000414</p>
10	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the axis-3 radial sealing and the M2 variseal sealing in the cable housing. Replace if damaged.</p> <p> CAUTION</p> <p>Do not fit M2 variseal sealing on Clean Room, food grade lubrication and Hygienic robots.</p> <p> Note</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p>	<p>M2 variseal sealing: 3HAC044641-006 Radial sealing: 3HAC024865-001</p>  <p>xx1400000473</p> <p>Replacement is detailed in Replacing the axis-3 radial sealing and sealing ring on page 420.</p>

Continues on next page

	Action	Note
11	Refit the cable housing of the lower arm.	<p>Tightening torque: 3 Nm</p>  <p>xx140000785</p>
12	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Apply a string of the sealant to the joint of the cable housing of the lower arm. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.</p> <p> Note</p> <p>No sealing is required in the cavities of the three lower screws highlighted with a ring in the figure.</p>	<p>For robots with protection type Clean Room For robots with food grade lubrication Sealant, SikaFlex 521FC For robots with protection type Hygienic Sealant, Trans Clear</p>  <p>xx160000218</p>
13	<p>For robots with protection type Foundry Plus</p> <p>If required, fit two screws for protection.</p>	 <p>xx1600001155</p>

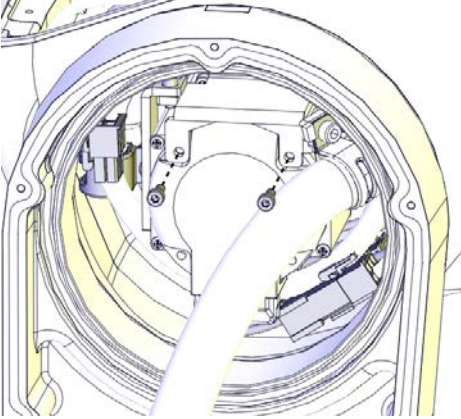
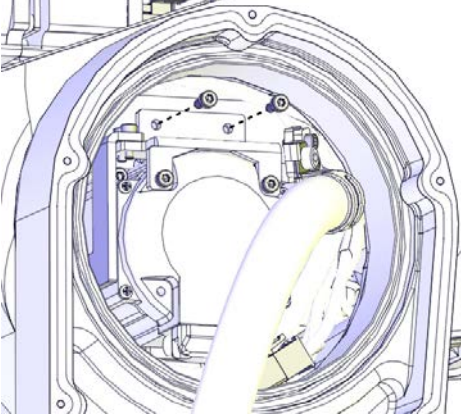
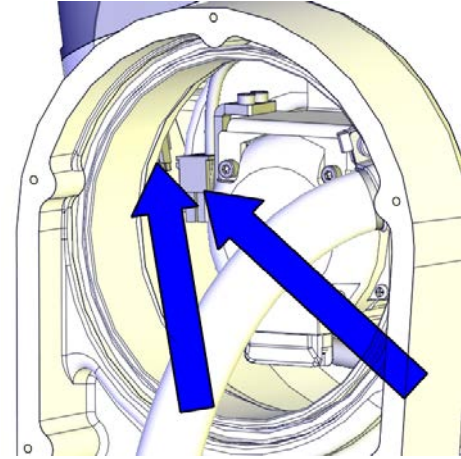
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4 Repair

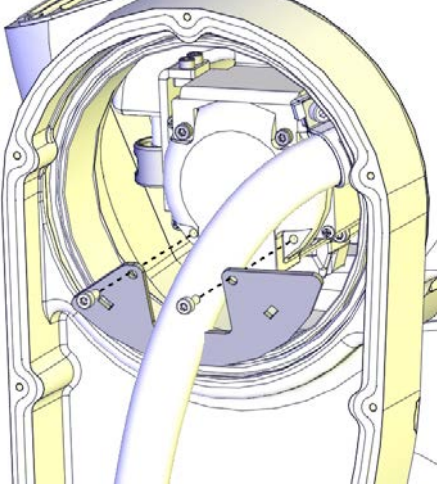
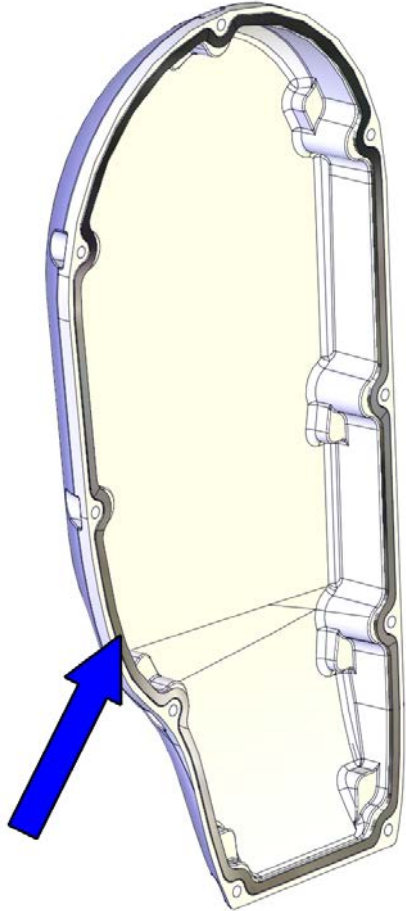
4.6.3 Replacing the axis-3 drive unit

Continued

Concluding procedure

	Action	Note
1	Refit the fix sheet to the motor.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002423</p>
2	Refit the fix sheet to the inner plastic guide.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002421</p>
3	Reconnect the axis-3 motor connectors.	 <p>xx1300002420</p>

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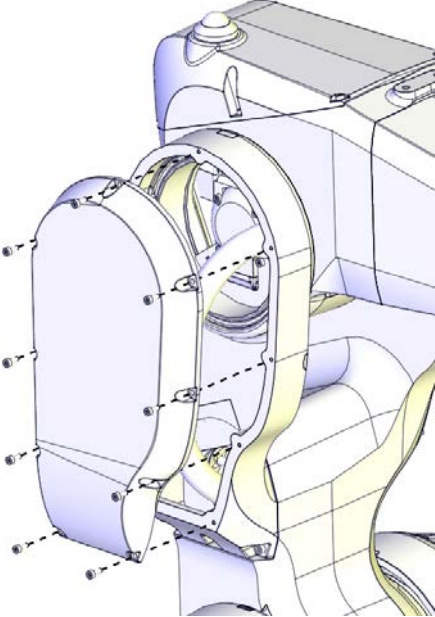


	Action	Note
4	Refit the plate.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002413</p>
5	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the gasket of the cable housing cover. Replace if damaged.</p>	<p>Gasket on cable housing cover: 3HAC056724-001 (not Hygienic robots) / 3HAC080702-001 (Hygienic robots)</p>  <p>xx1400000048</p>

Continues on next page


4 Repair

4.6.3 Replacing the axis-3 drive unit

Continued

	Action	Note
6	Check the PTFE film on the cable housing cover. Replace if damaged.	PTFE film on cable housing cover: 3HAC044660-001
7	Apply grease to the inner surface of the cable housing cover and the PTFE film surface.	
8	Refit the cable housing cover. For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Apply locking liquid Loctite 243 to all the screws securing the cover.	Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm  xx1300002400  Note Only use specified screws, never replace them with other screws.
9	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean, seal and paint the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160 .  Note After all repair work, wipe the robot free from particles with spirit on a lint free cloth.	
10	Recalibrate the robot.	Calibration is detailed in section Calibration on page 807 .

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	Action	Note
11	 DANGER Make sure all safety requirements are met when performing the first test run.	

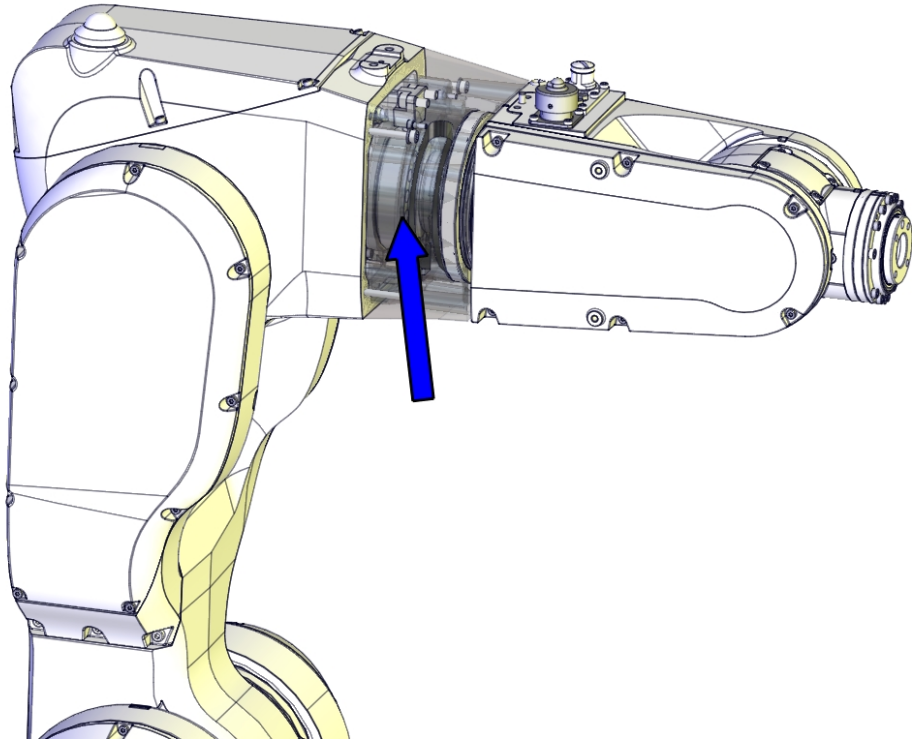
4 Repair

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Location of gearbox, drive shaft and pulley

The axis-4 gearbox, including drive shaft and pulley, is located as shown in the figure.



xx1300002462

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Gearbox	3HAC049629-001	
Gearbox, food grade lubrication Gearbox, Hygienic	3HAC057904-001	Used for robots with food grade lubrication. Used with protection type Hygienic.
Shaft	3HAC044692-001	
Pulley	3HAC044687-001	
Motor bracket	3HAC044689-001	Replace if damaged.
Gearbox sleeve	3HAC044685-001	

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley
Continued

Spare part	Article number	Note
M2 variseal sealing	3HAC044641-007	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
Radial sealing with dust lip	3HAB3701-48	Not used with protection class IP40. Replace if damaged.
Washer	3HAC044869-001	Replace if damaged
Gasket on cable housing cover	3HAC056724-001 / 3HAC080702-001	Not used with protection class IP40. Replace if damaged.
Washer	3HAC044869-001	Replace if damaged
Gasket for tubular cover	3HAC058822-001 / 3HAC080709-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cable housing cover	3HAC056707-001 / 3HAC080701-001	Not used with protection class IP40. Replace if damaged.
Housing cover gasket (IRB 1200-7/0.7)	3HAC056698-001 / 3HAC080700-001	Not used with protection class IP40. Replace if damaged.
Housing cover gasket (IRB 1200-5/0.9)	3HAC056697-001 / 3HAC080699-001	Not used with protection class IP40. Replace if damaged.

Required tools and equipment

Equipment, etc.	Article number	Note
Axis-4 sealing assembly tool set	3HAC049699-001	Used to refit the radial sealing, if replacement is needed.
24 VDC power supply	-	Used to release the motor brakes.
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. ⁱ
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .

ⁱ The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, manual calibration is used as default.

Required consumables

Consumable	Art. no.	Note
Cable straps	-	
Cleaning agent	-	Loctite 7063

Continues on next page

4 Repair


4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

Consumable	Art. no.	Note
Flange sealing	12340011-116	Loctite 574 For robots with protection class IP67 For robots with protection type Foundry Plus
Locking liquid	3HAB7116-1	Loctite 243
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room For robots with food grade lubrication For robots with protection class IP67 For robots with protection type Foundry Plus
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

Deciding calibration routine

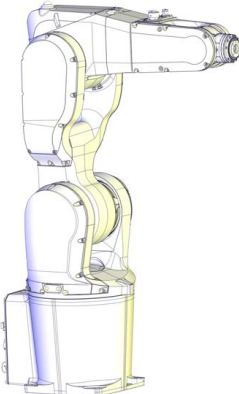


Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	<p>Decide which calibration routine to use for calibrating the robot.</p> <ul style="list-style-type: none"> Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	 Note Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	<p>If the robot is to be calibrated with reference calibration:</p> <p>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p>	<p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in Reference calibration routine on page 821.</p>
	<p>If the robot is to be calibrated with fine calibration:</p> <p>Remove all external cable packages (DressPack) and tools from the robot.</p>	


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Removing the gear unit

Preparations before removing the axis-4 gear unit

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 xx1300002581
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the robot working area.	
4	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	

Getting access to inside of the wrist unit



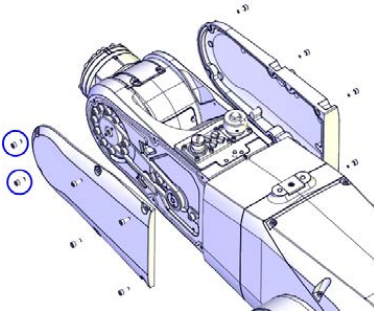

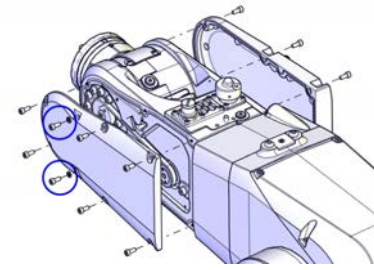

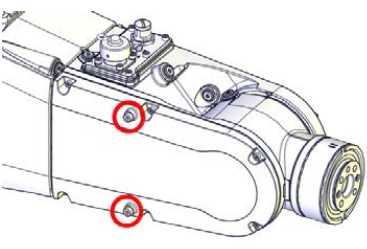
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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4 Repair




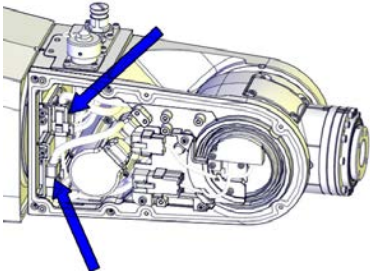
4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued



	Action	Note
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	<p>Remove the covers on each side of the wrist by removing their screws.</p> <p> Note</p> <p>For robots with protection class IP67 For robots with protection type Foundry Plus The two front screws on the left hand side cover (encircled in the figure) have been fitted with locking liquid. The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.</p>	<p>For robots with protection class IP67 For robots with protection type Foundry Plus</p>  <p>xx1300002349</p>
	<p> Note</p> <p>For robots with protection type Clean Room For robots with food grade lubrication The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.</p>	<p>For robots with protection type Clean Room</p>  <p>xx1600001148</p>
	<p> Note</p> <p>For robots with protection type Hygienic The tubular cover (right hand side cover) has two extra screws, as encircled in the figure. Do not remove the two screws when removing the cover. The screws are used for blocking the screw holes rather than fixing the cover to the tubular. Replace if damaged or missing.</p>	<p>For robots with protection type Hygienic</p>  <p>xx2100001406</p>

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Disconnecting the axis-5 motor connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Snap loose the motor connectors from their holders and then disconnect them. <ul style="list-style-type: none"> • R3.MP5 • R3.ME5  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1300002360

Removing the axis-5 motor with pulley

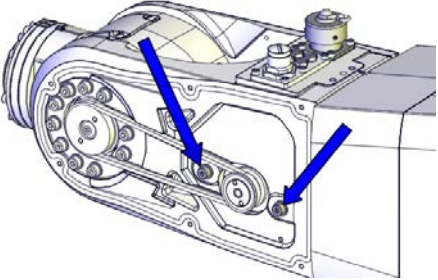
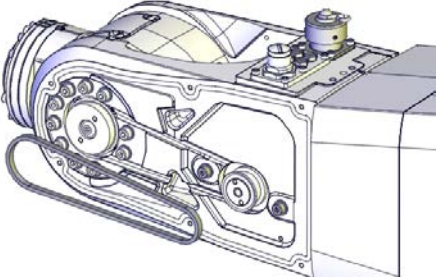
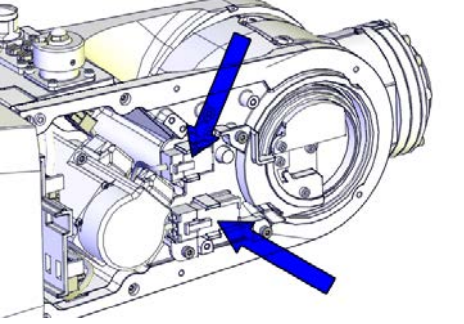
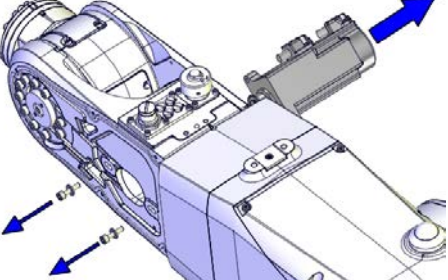
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	

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4 Repair



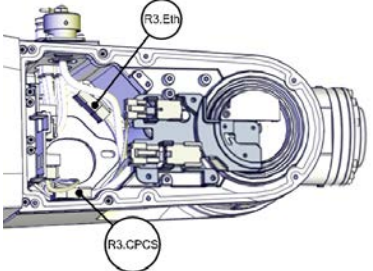
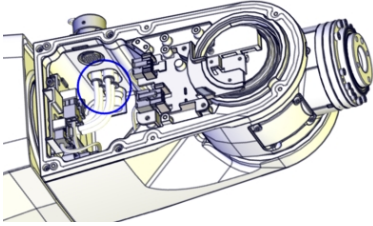
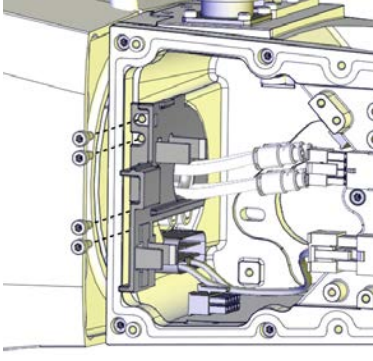
4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

	Action	Note
3	Loosen the screws so that the motor can be moved sideways.	 xx1300002350
4	Remove the timing belt.	 xx1300002351
5	Snap loose and disconnect the axis-5 FPC connectors.	 xx1300002390
6	Remove the screws and pull out the motor.	 xx1300002352

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Removing the wrist

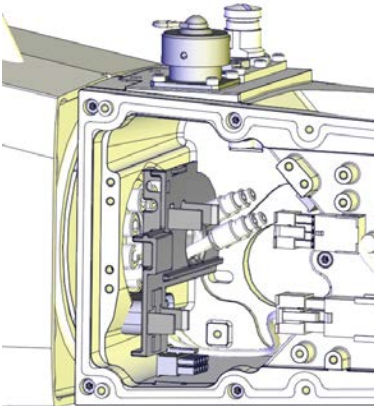
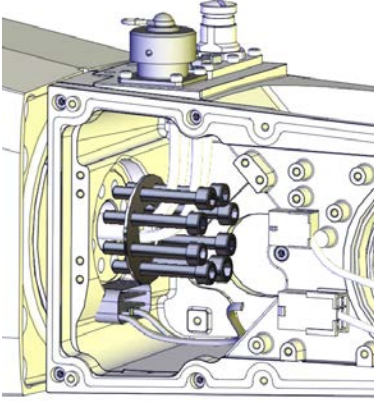

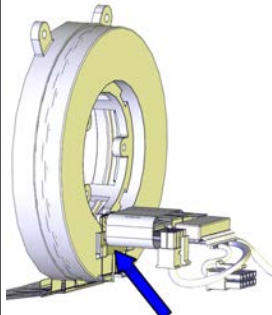
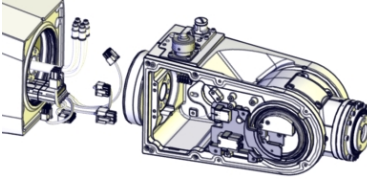
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Disconnect the connectors shown in the figure.	 xx1300002353
4	Disconnect the air hoses.	 xx1300002355
5	Remove the connector plate attachment screws.	 xx1300002356

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4 Repair




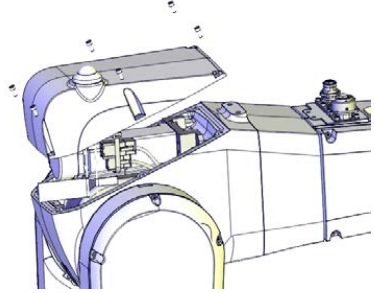
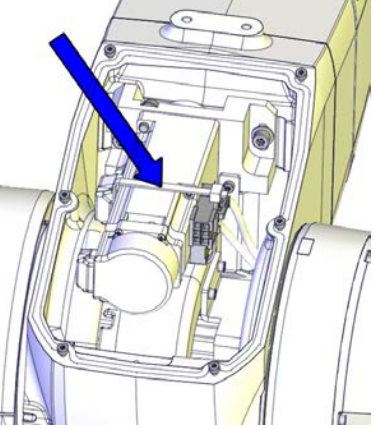
4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

	Action	Note
6	Guide the hoses through the plate hole and remove the plate.	 <p>xx1300002357</p>
7	Support the weight of the wrist and remove the screws and the washer.	 <p>xx1300002358</p>
8	<p>Pull out the wrist carefully while at the same time pulling all connectors and the air hoses out of the wrist.</p> <p>Be careful not to damage the FPC cabling and the connectors.</p> <p> CAUTION</p> <p>Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.</p>  <p>xx1300002611</p>	 <p>xx1300002359</p>

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Disconnecting the axis-4 motor connectors


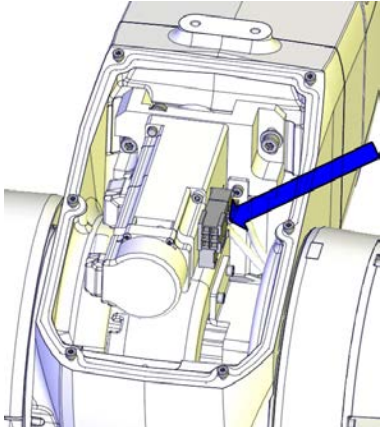
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	<p>Remove the cover from the upper arm housing.</p>  <p>CAUTION</p> <p>For robots with safety lamp (option)</p> <p>Be aware of the signal lamp cables that are attached inside the housing! Disconnect the lamp cable connectors R3.H1 and R3.H2 and then lift away the cover completely.</p>	 <p>xx1300000456</p>
4	<p>Cut the strap that holds the connectors.</p>	 <p>xx1300002494</p>

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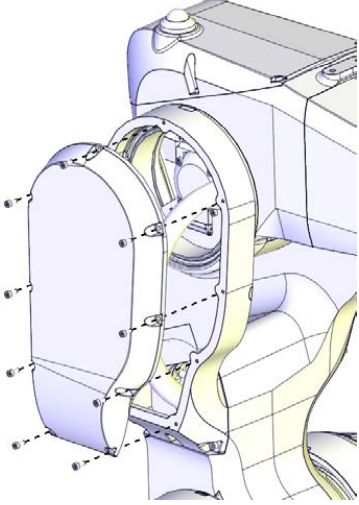
4 Repair

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

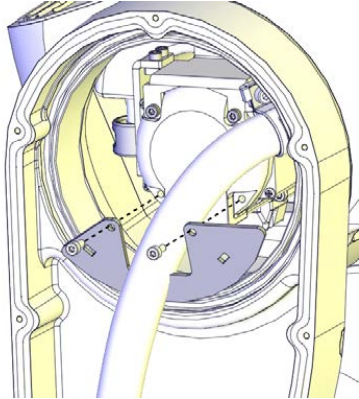
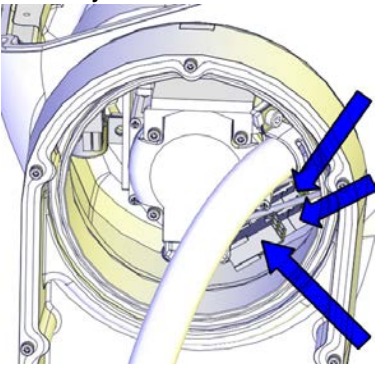
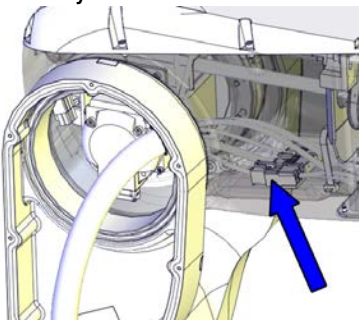
	Action	Note
5	<p>Disconnect the motor connectors.</p> <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx1300002495</p>

Disconnecting the axis-4 FPC connectors

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	<p>Remove the cable housing cover.</p>	 <p>xx1300002400</p>

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley
Continued

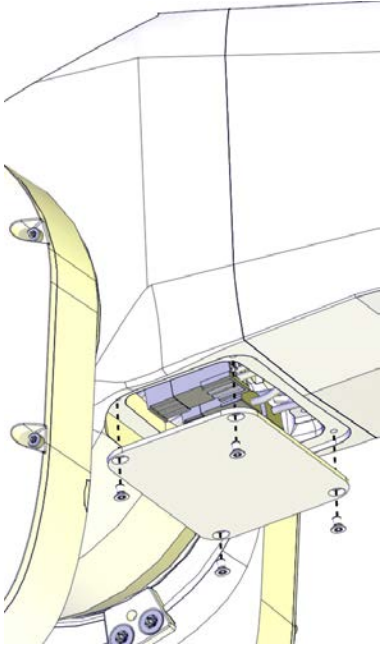
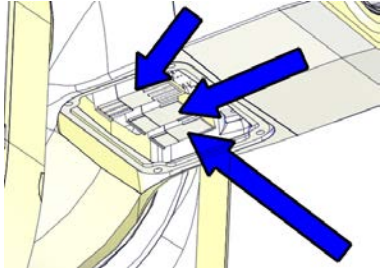
	Action	Note
4	Remove the plate.	 <p>xx1300002413</p>
5	Pull out the FPC connectors from the housing and disconnect them.	<p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p>

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4 Repair

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

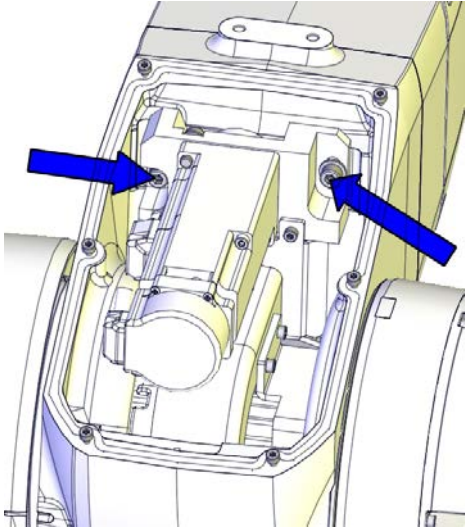
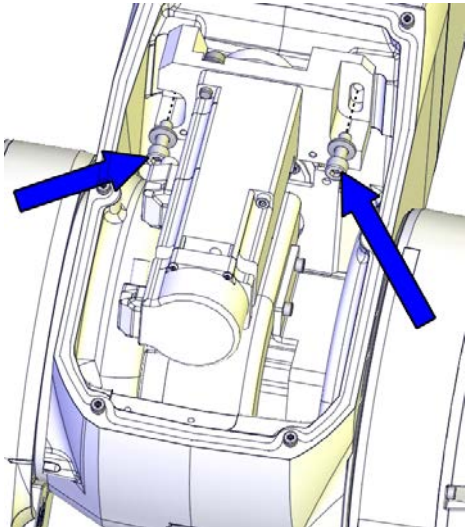
	Action	Note
6	Remove the small cover of the housing.	 xx1300002398
7	Disconnect the remaining FPC connectors.	 xx1300002399

Removing the axis-4 motor


	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley
Continued

	Action	Note
3	Loosen the two attachment screws and move the motor downwards to slacken the timing belt.	 <p>xx1300002524</p>
4	Remove the motor screws and washers and carefully lift out the motor and the pulley.	 <p>xx1300002522</p>
5	Remove the timing belt from its groove on the motor.	

Removing the air hoses


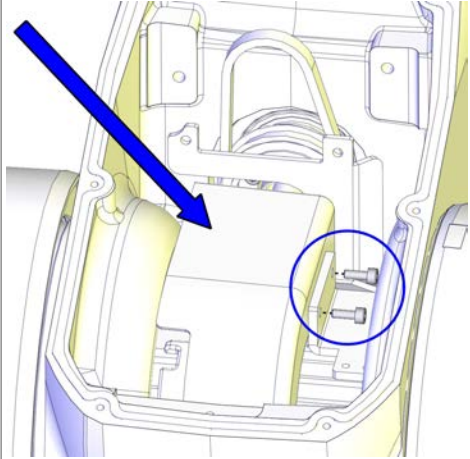
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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4 Repair

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

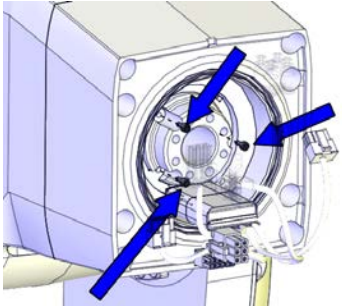
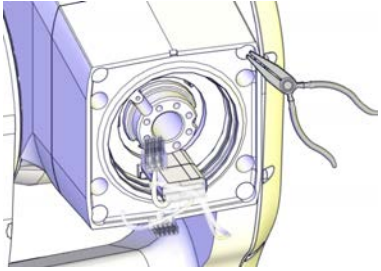
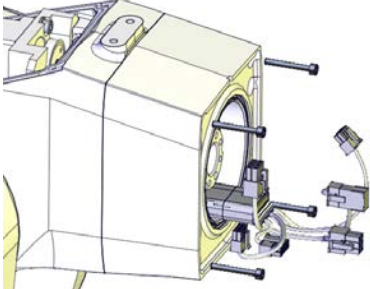
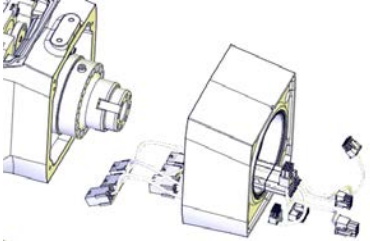
	Action	Note
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	Remove the plastic protection plate by removing its screws.	 <p>xx1400000797</p>
4	Pull in the air hoses into the housing, out from the housing extender unit.	

Removing the housing extender unit


	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley
Continued

	Action	Note
3	Remove the axis-4 FPC unit screws.	 <p>xx1300002373</p>
4	<p>For robots with protection type Foundry Plus</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Remove the plugs covering the extender unit screws with a needle-nose plier.</p>	 <p>xx1600000262</p>
5	Remove the extender unit screws.	 <p>xx1300002372</p>
6	Remove the housing extender unit. Be careful not to damage the cabling.	 <p>xx1300002374</p>

Removing the axis-4 drive shaft


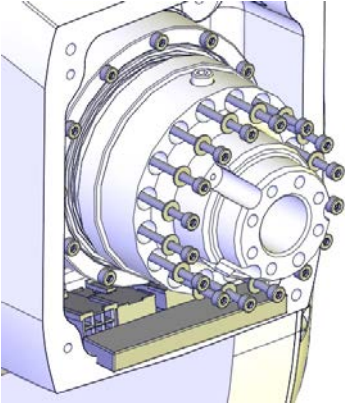
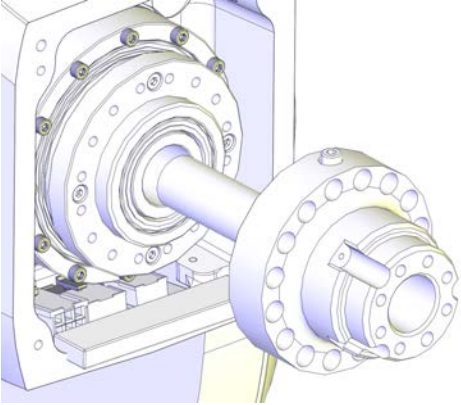
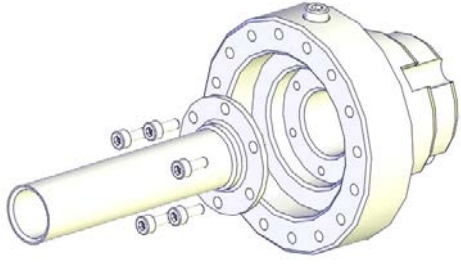
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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4 Repair

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley



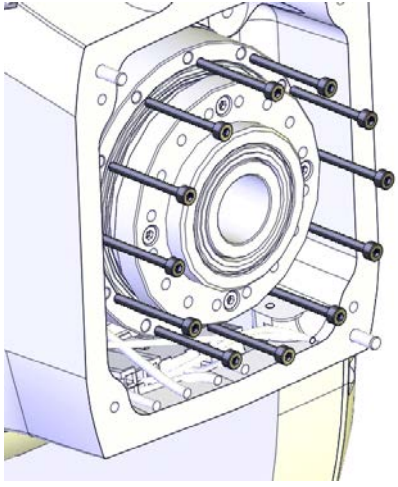
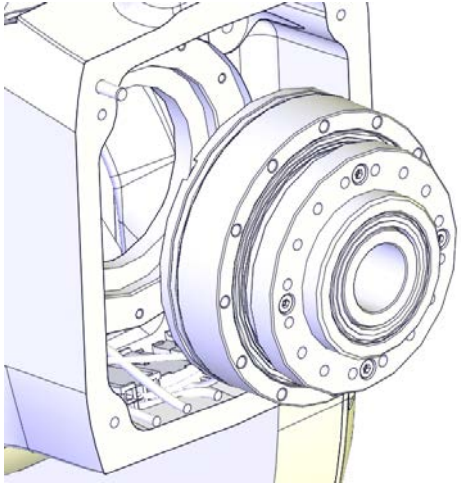
Continued

	Action	Note
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	Remove the screws and washers.	 <p>xx1300002376</p>
4	Remove the shaft.	 <p>xx1400002400</p>
5	If replacing the drive shaft with a new spare part, remove the sleeve from the shaft and fit it to the new shaft.	 <p>xx1300002387</p>

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley
Continued

Removing the axis-4 gear unit and pulley

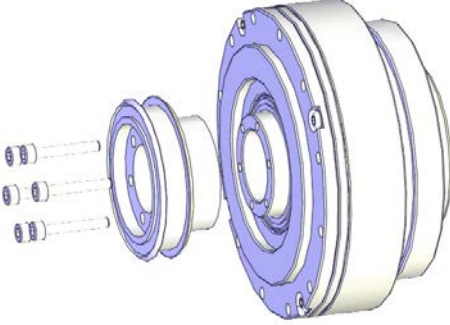
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i>	
3	Remove the gear attachment screws.	 <p>xx1300002378</p>
4	Pull out the gear.	 <p>xx1300002379</p>

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4 Repair

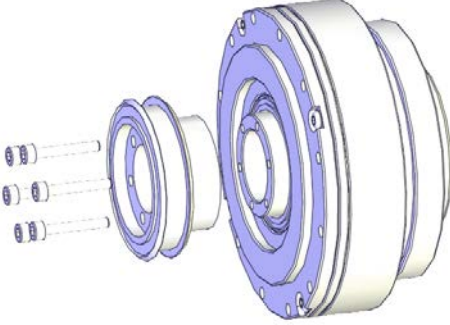

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

	Action	Note
5	Remove the pulley from the gear by removing its attachment screws.	 <p data-bbox="948 658 1050 678">xx1300002380</p>

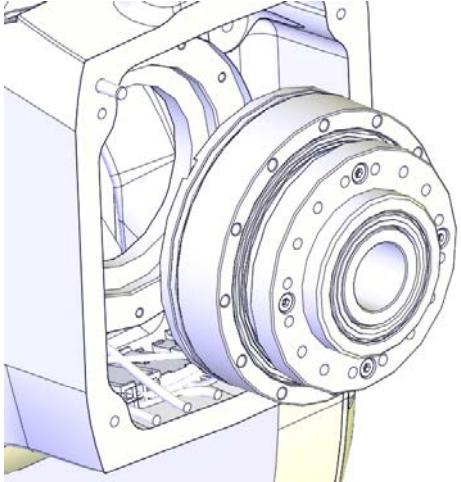
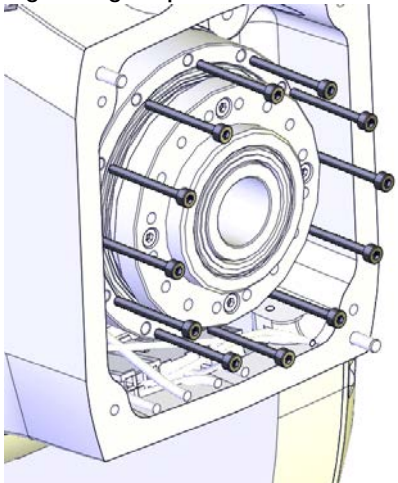

Refitting the gear unit

Refitting the axis-4 gear unit and pulley

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	Refit the pulley to the gear and secure with its attachment screws.	<p>Screws: 3HAB3409-209 (M3x20). Tightening torque: 1.1 Nm.</p>  <p data-bbox="948 1536 1050 1556">xx1300002380</p> <p data-bbox="948 1581 1002 1637"> Note</p> <p data-bbox="948 1653 1399 1711">Only use specified screws, never replace them with other screws.</p>

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley
Continued

	Action	Note
3	Refit the gear to the housing.	 <p>xx1300002379</p>
4	Secure with the attachment screws.	<p>Screws: 3HAB3409-211 (M3x30). Tightening torque: 1.8 Nm.</p>  <p>xx1300002378</p> <p> Note Only use specified screws, never replace them with other screws.</p>

Refitting the axis-4 drive shaft

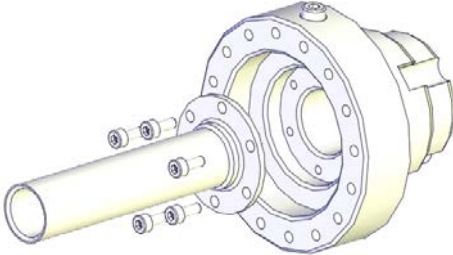
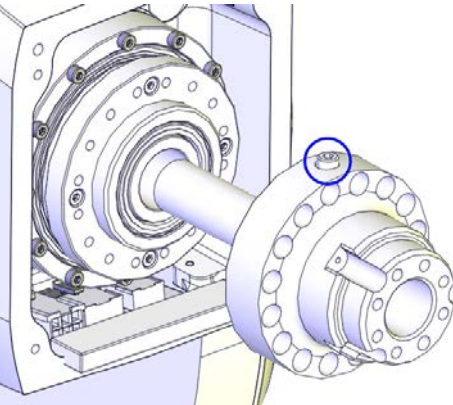
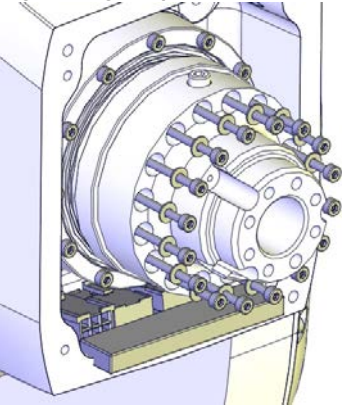

	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

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4 Repair


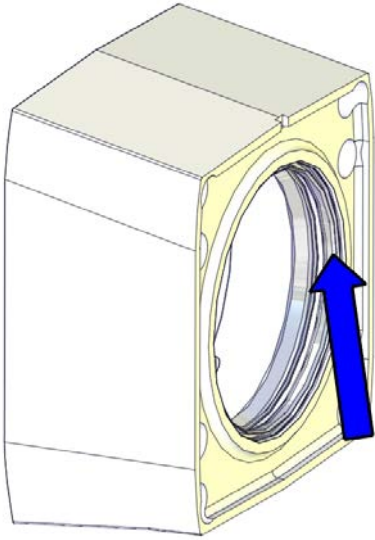
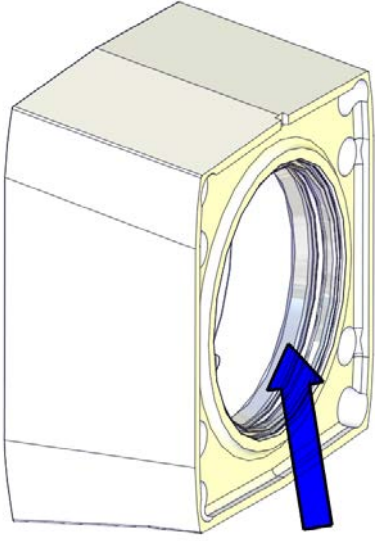
4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

	Action	Note
2	<p>If replacing the drive shaft with a new spare part, remove the sleeve from the old shaft and fit it to the new shaft.</p> <p>Also move the screw on top of the old drive shaft to the new shaft.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p>  <p>xx1300002387</p>
3	<p>Position the shaft so that the encircled screw is on top, then refit the shaft.</p>	 <p>xx1300002377</p>
4	<p>Secure with screws and washers.</p>	<p>Screws: 3HAB3409-210 (M3x25). Tightening torque: 1.8 Nm.</p>  <p>xx1300002376</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

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Checking the housing extender sealings

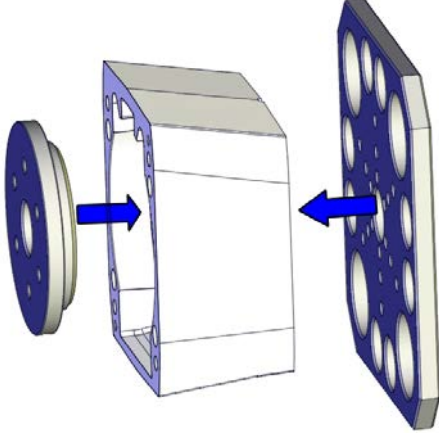
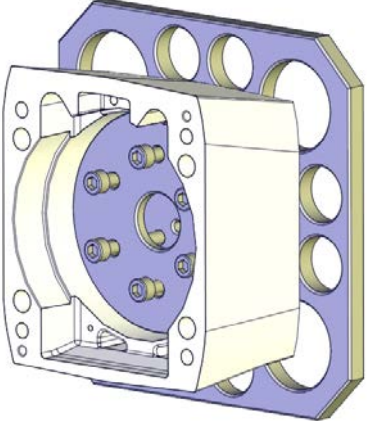
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <p>Check the sealing.</p> <p>Replace if damaged.</p> <p> CAUTION</p> <p>Do not fit M2 variseal sealing on robots in other protection class or protection types.</p>	<p>M2 variseal sealing: 3HAC044641-007</p>  <p>xx1300002418</p>
3	<p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Check the radial sealing.</p> <p>Replace if damaged, as described below.</p> <p>In order to replace the radial sealing, both the axis-4 mechanical stop and the axis-4 FPC unit must be removed from the housing extender unit, if not already removed.</p>	<p>Radial sealing with dust lip: 3HAB3701-48</p>  <p>xx1400000438</p>
4	<p>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p>	

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4 Repair

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

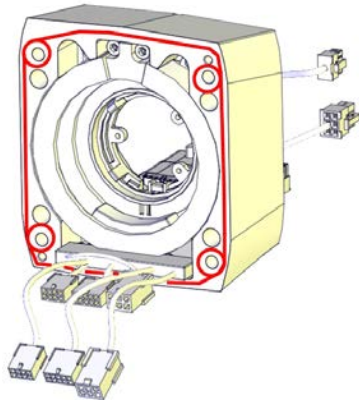
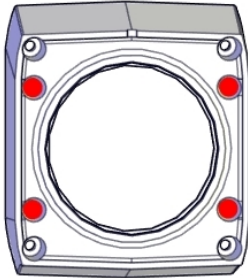


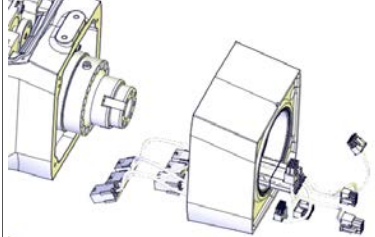
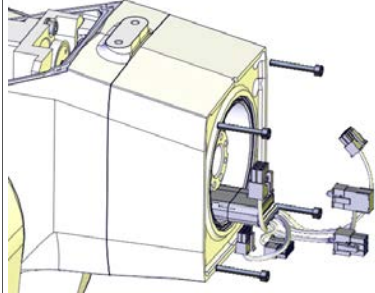
	Action	Note
5	Fit the radial sealing into the housing extender unit.	
6	Fit the circular part of the radial sealing assembly tool against the radial sealing.	Axis-4 sealing assembly tool set: 3HAC049699-001
7	Fit the tool plate to the other side of the housing extender unit with the six screws M6X50.	 <p>xx140000436</p>
8	Screw the screws, little by little, to press the sealing into place.	 <p>xx140000437</p>
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	
11	Refit both the axis-4 mechanical stop and the axis-4 FPC unit to the housing extender unit.	

Refitting the housing extender unit

	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley
Continued

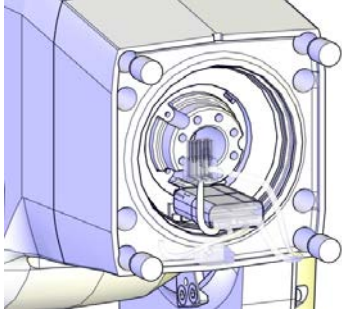
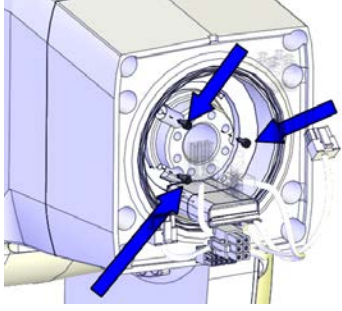
	Action	Note
2	<p>For robots with protection class IP67 For robots with protection type Foundry Plus Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing Loctite 574 on the mounting surfaces of the housing extender unit.</p>	 <p>xx1300002613</p>
3	<p>For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Make sure the four cavities are fully filled with glue. If not, fill glue again before the refitting.</p>	 <p>xx1600000216</p>
4	<p>Refit the housing extender unit to the housing while putting the FPC cables into the housing and the air hoses through the housing extender unit. Be careful not to damage the cabling.</p> <p> CAUTION</p> <p>Make sure that the axis-4 FPC unit is in its zero position when refitting the housing extender unit.</p> <p> Note</p> <p>Mate the unit to the two locating pins attached to the housing.</p>	 <p>xx1300002374</p>
5	<p>Secure with screws and washers, using locking liquid Loctite 243.</p>	<p>Screws: M4x30. Tightening torque: 2.7 Nm.</p>  <p>xx1300002372</p>

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4 Repair

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

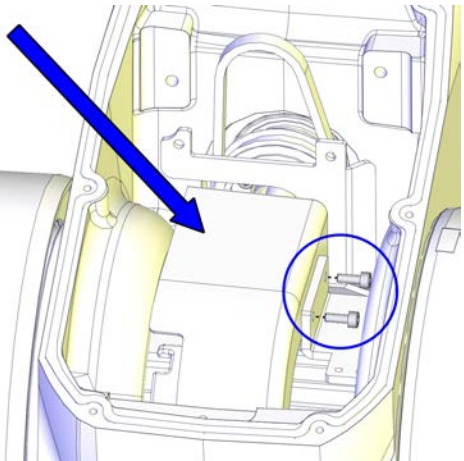
	Action	Note
6	<p>For robots with protection type Foundry Plus</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Press in screw sealing plugs to cover the screws.</p>	<p>Screw sealing plug: 3HAC053685-001</p>  <p>xx1600000263</p>
7	<p>Fit and secure the axis-4 FPC unit screws.</p>	<p>Tightening torque: 0.3 Nm.</p>  <p>xx1300002373</p>

Refitting the axis-4 timing belt and the air hoses

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Place the timing belt at the gear pulley and run the air hoses through the belt.</p>	
3	<p>Install the air hoses in and through the housing extender unit.</p>	

Continues on next page

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley Continued

	Action	Note
4	Refit the plastic protection plate with its screws.	 <p>xx140000797</p>

Securing the axis-4 motor

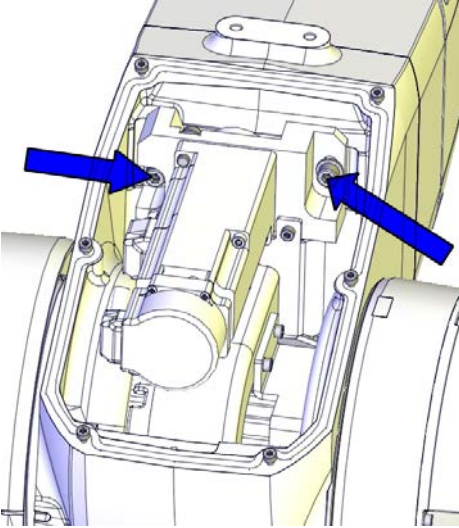

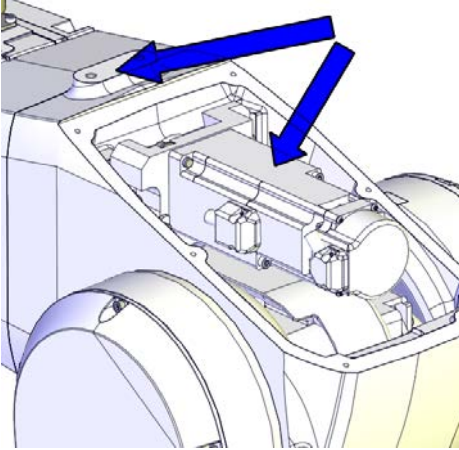
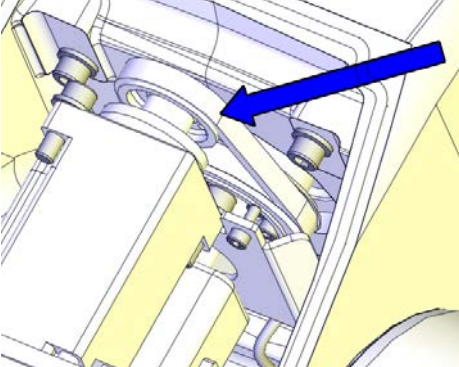
	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check that: <ul style="list-style-type: none"> • all assembly surfaces are clean and undamaged. • the motor is clean and undamaged. 	
3	Fit the timing belt to the motor pulley.	

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4 Repair

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued


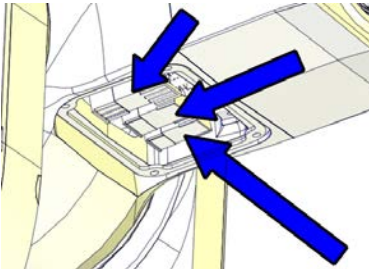

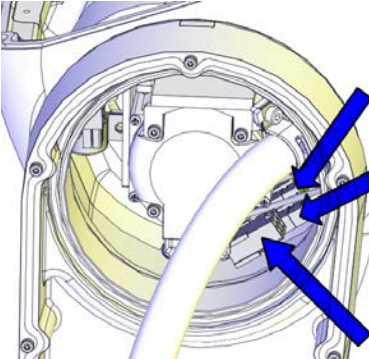
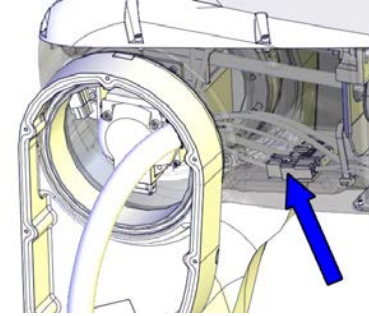
	Action	Note
4	<p>Place the motor at its mounting position and fasten the attachment screws and washers just enough to still be able to move the motor.</p> <p>Position the robot with the connectors directed as shown in the figure.</p> <p>Verify that the top surface of the axis-4 motor is parallel with the mounting flange surface on the housing, shown in the figure, when moving the motor.</p>	<p>Screws: 3HAB3409-14 (M5x16).</p>  <p>xx1300002524</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>  <p>xx1300002612</p>
5	<p>Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.</p>	 <p>xx1300002525</p>

Continues on next page

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley *Continued*

	Action	Note
6	Move the motor to achieve correct belt tension ($F = 30\text{ N}$).	Belt tension: $F = 30\text{ N}$.
7	Secure the motor with its attachment screws.	Tightening torque: 6 Nm .

Connecting the axis-4 FPC connectors

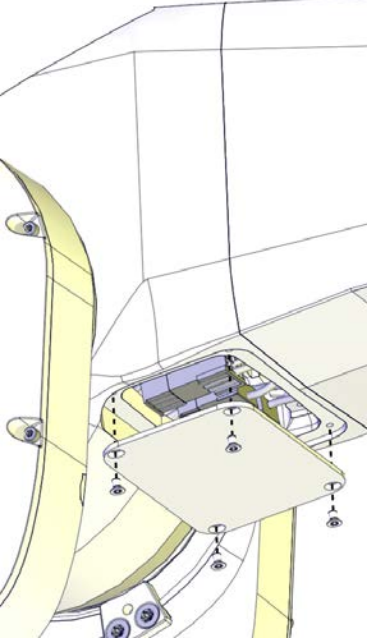
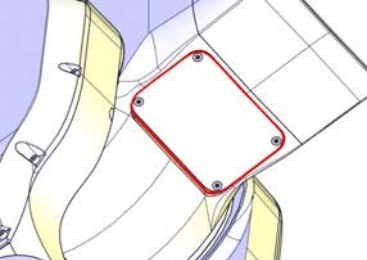
	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Reconnect the FPC connectors.</p> <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	 <p>xx1300002399</p>
3	<p>Reconnect the FPC connectors and push them into place inside the housing.</p> <p> Tip</p> <p>See the number markings on the connectors for help to find the corresponding connector.</p>	<p>Cable layout in IRB 1200-7/0.7 :</p>  <p>xx1300002412</p> <p>Cable layout in IRB 1200-5/0.9 :</p>  <p>xx1400001471</p>
4	Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.	

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4 Repair

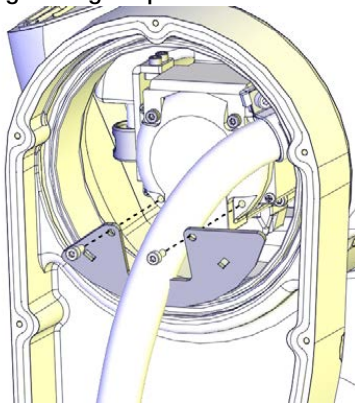
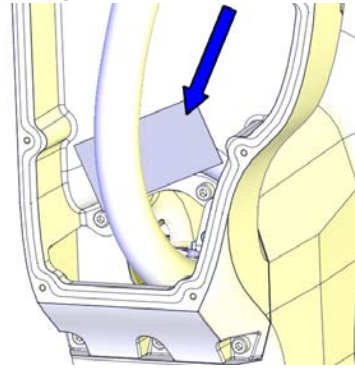
4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

	Action	Note
5	<p>For robots with protection class IP67 For robots with protection type Foundry Plus Apply flange sealing Sikaflex 521FC on the mounting surfaces of the small cover on the housing.</p>	
6	<p>Refit the small cover to the housing. Replace if damaged.</p>	<p>xx1300002398</p> <p>Housing small cover: 3HAC059684-001 Housing small cover, Clean Room Housing small cover, food grade lubrication Housing small cover, Hygienic : 3HAC056142-001 Screws: 3HAC14286-4 (M3X5). Tightening torque: 1 Nm.</p>
7	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Apply a string of the sealant to the joint of the small cover on the housing. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.</p>	<p>For robots with protection type Clean Room For robots with food grade lubrication Sealant, SikaFlex 521FC For robots with protection type Hygienic Sealant, Trans Clear</p>  <p>xx1600000214</p>

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley
Continued

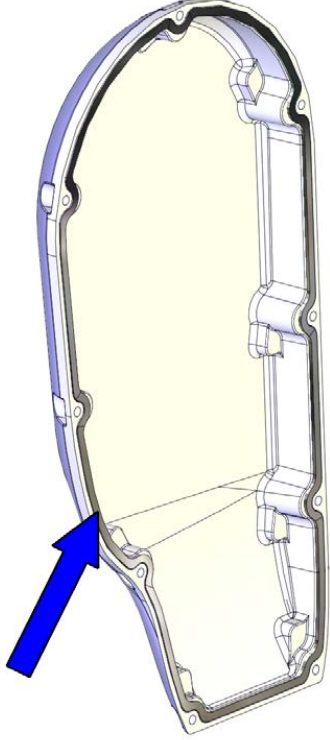
	Action	Note
8	Refit the plate.	<p>Tightening torque: 1.5 Nm.</p>  <p>xx1300002413</p>
9	Check the PTFE film on the cable housing. Replace if damaged.	<p>PTFE film on lower arm cable housing: 3HAC044710-001</p>  <p>xx1400000740</p>

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4 Repair

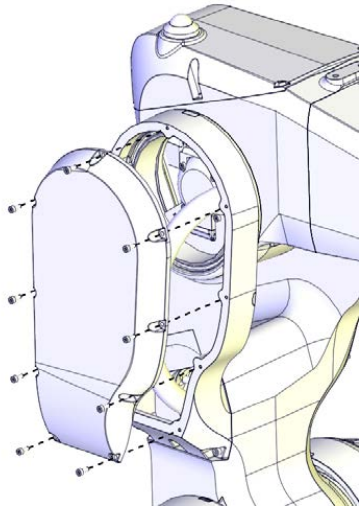

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

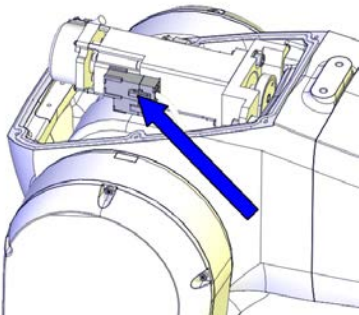
	Action	Note
10	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the gasket of the cable housing cover. Replace if damaged.</p>	<p>Gasket on cable housing cover: 3HAC056724-001 (not Hygienic robots) / 3HAC080702-001 (Hygienic robots) PTFE film on cable housing cover: 3HAC044660-001</p>  <p>xx140000048</p>
11	<p>Check the PTFE film on the cable housing cover. Replace if damaged.</p>	
12	<p>Apply grease to the inner surface of the cable housing cover and the PTFE film surface.</p>	

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley
Continued

	Action	Note
13	<p>Refit the cable housing cover.</p> <p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Apply locking liquid Loctite 243 to all the screws securing the cover.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm</p>  <p>xx1300002400</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

Connecting the axis-4 motor connectors

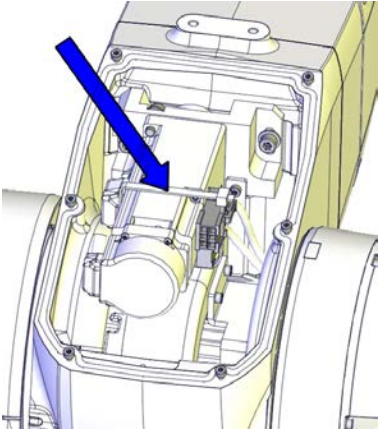
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Reconnect the motor connectors.</p>	 <p>xx1300002371</p>

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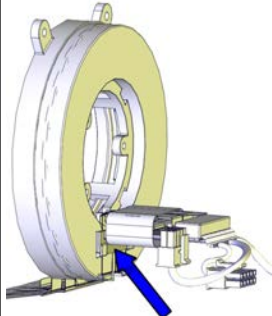
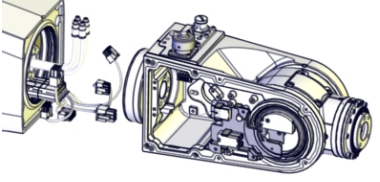
4 Repair

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

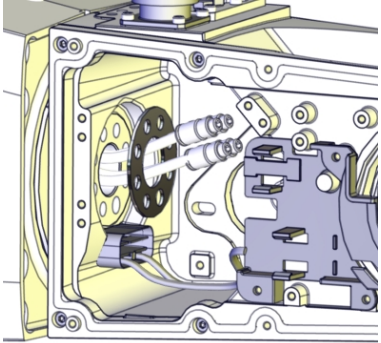
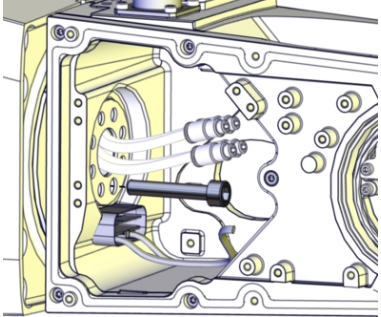

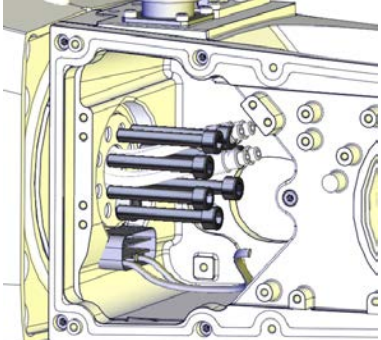

	Action	Note
3	Secure the connectors to the motor with a cable strap.	 <p>xx1300002494</p>

Refitting the wrist

	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Put the connectors and air hoses into the wrist carefully while at the same time refitting the wrist to the housing extender unit.</p> <p>Be careful not to damage the FPC cabling and the connectors.</p> <p> CAUTION</p> <p>Pay special attention to the plastic block on the FPC unit. It is easily pulled off, make sure it stays fitted to the FPC unit.</p>  <p>xx1300002611</p>	 <p>xx1300002359</p>

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley
Continued

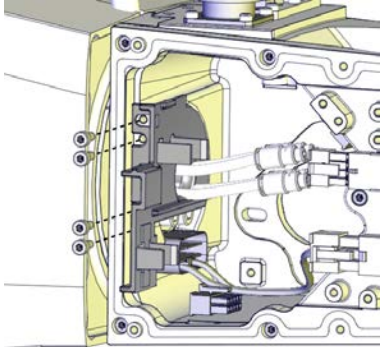

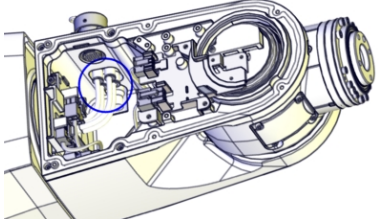
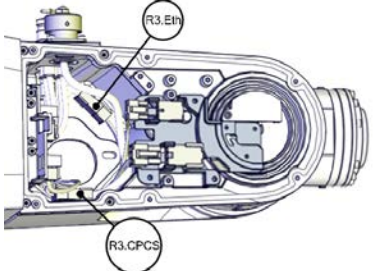
	Action	Note
3	Refit the washer while at the same time putting the cables through its center. Replace washer, if damaged.	<p>Washer: 3HAC044869-001</p>  <p>xx1400000001</p>
4	Refit the screw M6x35 (1 pc). Do not tighten yet.	<p>Screw: 3HAB3409-238 (M6x35 (1 pc)).</p>  <p>xx1400000002</p> <p> Note Only use specified screws, never replace them with other screws.</p>
5	Refit the rest of the screws (M5x35 (7 pcs)).	<p>Screw: 3HAB3409-237 (M5x35 (7 pcs)).</p>  <p>xx1400000003</p> <p> Note Only use specified screws, never replace them with other screws.</p>
6	Tighten all screws.	Tightening torque: 8 Nm.

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4 Repair

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

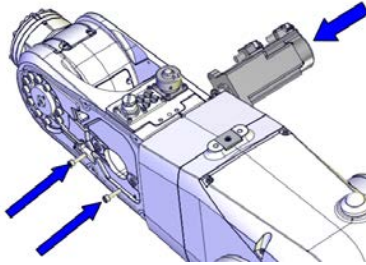

	Action	Note
7	Put the cables through the plate hole and refit the plate.	<p>Tightening torque: 0.3 Nm.</p>  <p>xx1300002356</p>
8	<p>Reconnect the air hoses.</p> <p> CAUTION</p> <p>Make sure to connect the air hoses correctly, according to the marking on hoses and connectors.</p>	 <p>xx1300002355</p>
9	<p>Reconnect the connectors.</p> <ul style="list-style-type: none"> • R3.Eth • R3.CPCS 	 <p>xx1300002353</p>

Preparations before securing the axis-5 motor

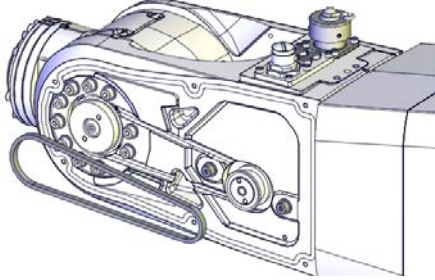

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Check that:</p> <ul style="list-style-type: none"> • all assembly surfaces are clean and without damages • the motor is clean and undamaged. 	

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley
Continued

	Action	Note
3	Place the motor at its mounting position and fasten the attachment screws and washers just enough to still be able to move the motor.	<p>Screws: 3HAB3409-212 (M4x16).</p>  <p>xx1300002463</p> <p> Note Only use specified screws, never replace them with other screws.</p>

Securing the axis-5 motor and timing belt

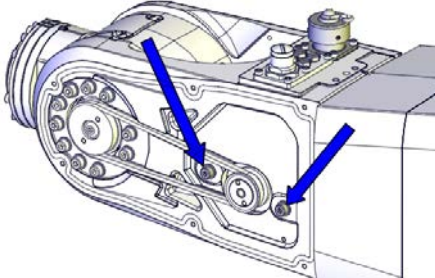
	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	Refit the timing belt on the pulley.	 <p>xx1300002351</p>
3	Move the motor to a position where a good timing belt tension is reached (F = 26 N).	<p> Note Do not stretch the timing belt too much!</p>

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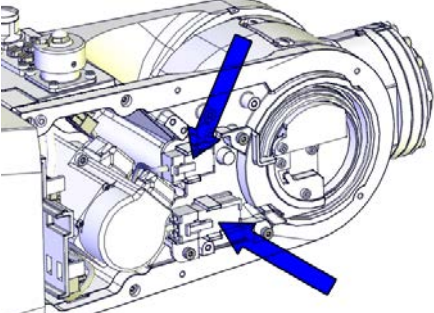
4 Repair

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

	Action	Note
4	Secure the motor with its attachment screws.	 <p data-bbox="943 618 1050 636">xx1300002350</p> <p data-bbox="943 651 1238 680">Tightening torque: 3.5 Nm.</p>

Connecting the axis-5 motor FPC connectors

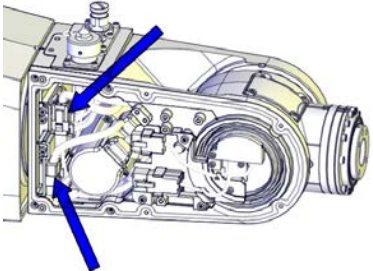
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	Connect the axis-5 FPC connectors and snap them to their holders.	 <p data-bbox="943 1379 1050 1397">xx1300002390</p>

Connecting the axis-5 motor connectors

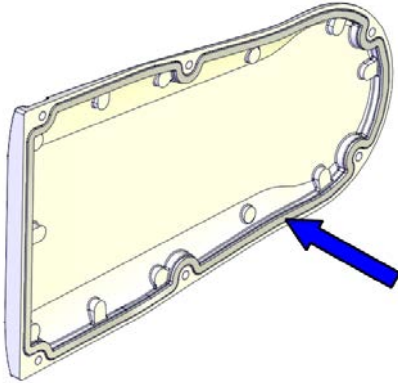
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley
Continued

	Action	Note
2	Reconnect the motor cables. <ul style="list-style-type: none"> • R3.MP5 • R3.ME5 	 <p>xx1300002360</p>

Refitting the wrist covers

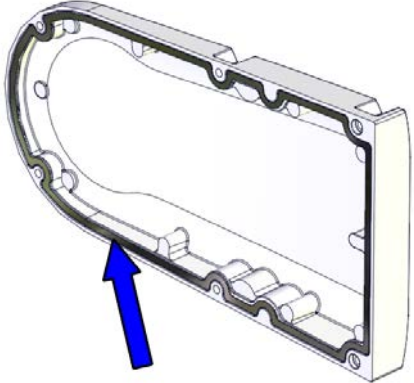
	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the tubular cover gasket. Replace if damaged.	Gasket for tubular cover: 3HAC058822-001 (not Hygienic robots) / 3HAC080709-001 (Hygienic robots)  <p>xx1400000034</p>

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4 Repair

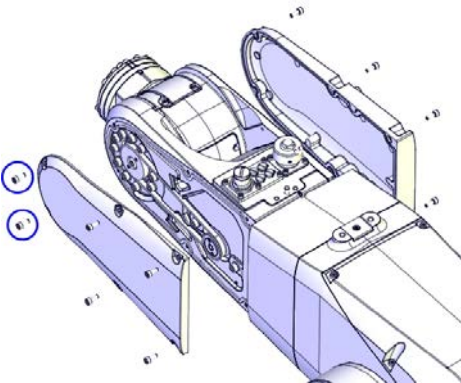
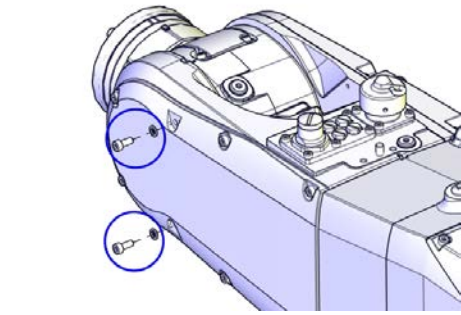


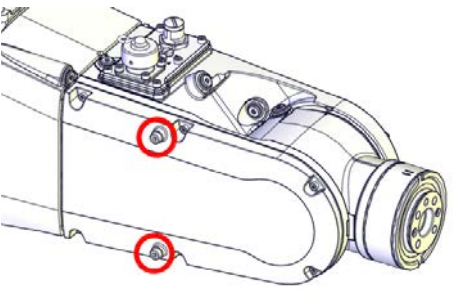
4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley

Continued

	Action	Note
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the tubular cable housing cover gasket. Replace if damaged.</p>	<p>Gasket for tubular cable housing cover: 3HAC056707-001 (not Hygienic robots) / 3HAC080701-001 (Hygienic robots)</p>  <p>xx140000345</p>

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley
Continued

	Action	Note
4	<p>Refit the both covers to the wrist.</p> <p>For robots with protection class IP67 For robots with protection type Foundry Plus</p> <p>Apply locking liquid Loctite 243 to the two front screws on the left hand side cover, encircled in the figure.</p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p> <p>For robots with protection class IP67 For robots with protection type Foundry Plus</p>  <p>xx1300002349</p>
	<p>For robots with protection type Clean Room For robots with food grade lubrication</p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p>	<p>For robots with protection type Clean Room For robots with food grade lubrication</p>  <p>xx1600001153</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
	<p> Note</p> <p>For robots with protection type Hygienic</p> <p>Check the two extra screws on the tubular cover (right hand side cover), as encircled in the figure.</p> <p>Replace if damaged or missing.</p>	<p>For robots with protection type Hygienic</p>  <p>xx2100001406</p>

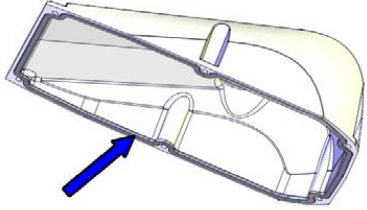
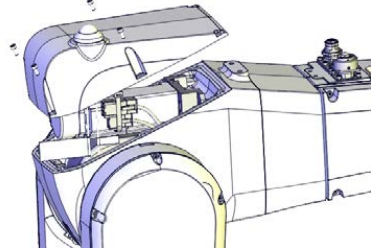

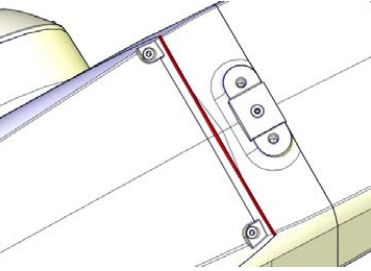
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4 Repair

4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley



Continued

Concluding procedure

	Action	Note
1	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the gasket. Replace if damaged.</p>	<p>Housing cover gasket (IRB 1200-7/0.7): 3HAC056698-001 (not Hygienic robots) / 3HAC080700-001 (Hygienic robots) Housing cover gasket (IRB 1200-5/0.9): 3HAC056697-001 (not Hygienic robots) / 3HAC080699-001 (Hygienic robots)</p>  <p>xx1400000477</p>
2	<p>Refit the upper arm housing cover with the screws.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p>  <p>xx1300000456</p> <p> Note Only use specified screws, never replace them with other screws.</p>
3	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Apply a string of the sealant to the joint of the upper arm housing cover. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.</p>	<p>For robots with protection type Clean Room For robots with food grade lubrication Sealant, SikaFlex 521FC For robots with protection type Hygienic Sealant, Trans Clear</p>  <p>xx1600000215</p>

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4.6.4 Replacing the axis-4 gearbox, drive shaft and pulley
Continued

	Action	Note
4	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean, seal and paint the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160.</p> <p> Note After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>	
5	Recalibrate the robot.	Calibration is detailed in section Calibration on page 807 .
6	<p> DANGER Make sure all safety requirements are met when performing the first test run.</p>	

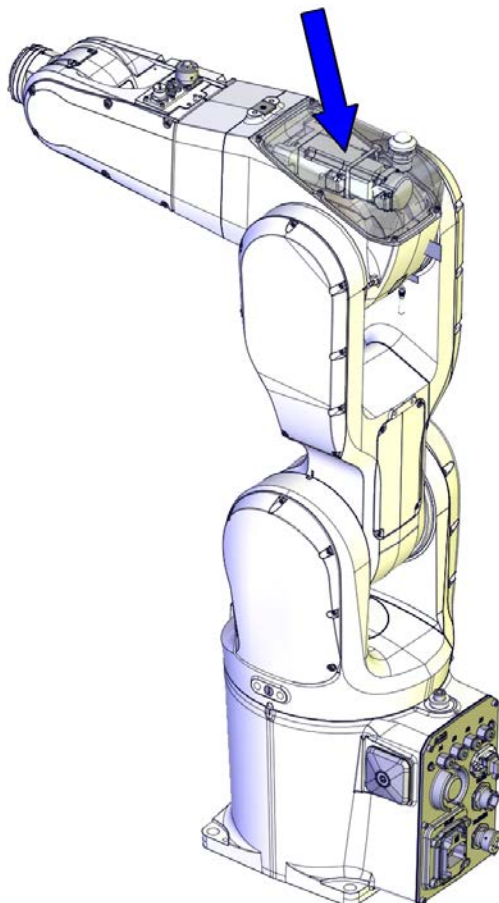
4 Repair

4.6.5 Replacing the axis-4 motor with pulley

4.6.5 Replacing the axis-4 motor with pulley

Location of motor

The axis-4 motor is located as shown in the figure.



xx1300002474

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Motor with pulley	3HAC045827-001	
Motor with pulley, SafeMove 2-supported.	3HAC061277-001	Used for IRB 1200 Type B. See Type B of IRB 1200 on page 875 .
Motor with pulley, Hygienic		Used with protection type Hygienic.
Motor flange	3HAC047479-001	Replace if damaged.

Continues on next page

4.6.5 Replacing the axis-4 motor with pulley
Continued

Spare part	Article number	Note
Motor bracket	3HAC044689-001	Replace if damaged.
Housing cover gasket (IRB 1200-7/0.7)	3HAC056698-001 / 3HAC080700-001	Not used with protection class IP40. Replace if damaged.
Housing cover gasket (IRB 1200-5/0.9)	3HAC056697-001 / 3HAC080699-001	Not used with protection class IP40. Replace if damaged.

Required tools and equipment

Equipment, etc.	Article number	Note
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. ⁱ
24 VDC power supply	-	Used to release the motor brakes.
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .


ⁱ The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, manual calibration is used as default.

Required consumables

Consumable	Art. no.	Note
Cleaning agent	-	Isopropanol
Cable straps	-	
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room. For robots with food grade lubrication.
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none"> Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	 Note Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.

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4 Repair

4.6.5 Replacing the axis-4 motor with pulley


Continued

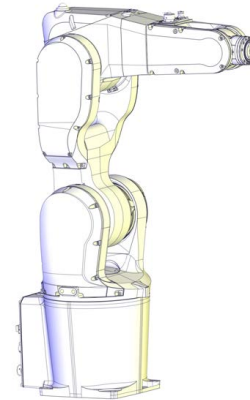
Action	Note
<p>If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p>	<p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in Reference calibration routine on page 821.</p>
<p>If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.</p>	

Removing the motor with pulley

Use these procedures to remove the motor.


Preparations before removing the axis-4 motor

Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.
2	Jog all axes to zero position.
3	 <p>DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>




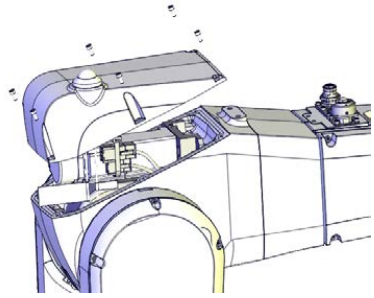


xx1300002581

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	Action	Note
4	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	

Disconnecting the axis-4 motor connectors

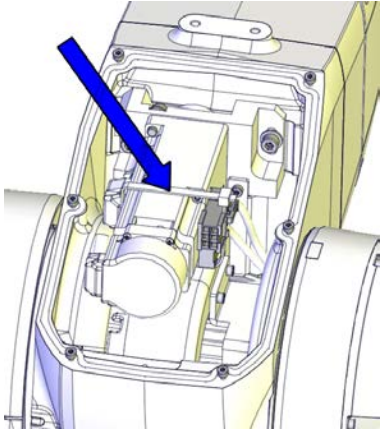

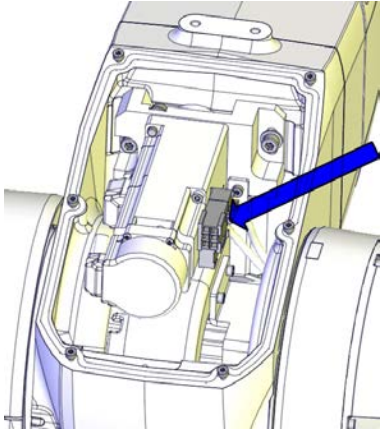
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	
3	<p>Remove the cover from the upper arm housing.</p> <p> CAUTION</p> <p>For robots with safety lamp (option) Be aware of the signal lamp cables that are attached inside the housing! Disconnect the lamp cable connectors R3.H1 and R3.H2 and then lift away the cover completely.</p>	 <p>xx1300000456</p>

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4 Repair

4.6.5 Replacing the axis-4 motor with pulley

Continued

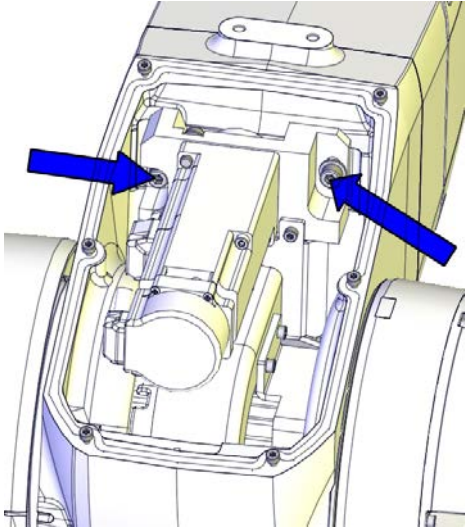
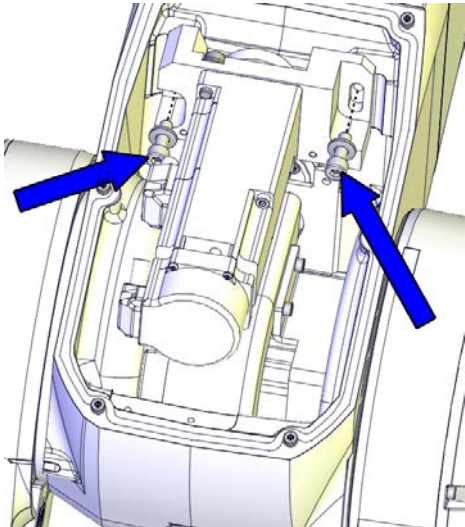
	Action	Note
4	Cut the strap that holds the connectors.	 xx1300002494
5	Disconnect the motor connectors.  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 xx1300002495

Removing the axis-4 motor


	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	

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4.6.5 Replacing the axis-4 motor with pulley
Continued

	Action	Note
3	Loosen the two attachment screws and move the motor downwards to slacken the timing belt.	 <p>xx1300002524</p>
4	Remove the motor screws and washers and carefully lift out the motor and the pulley.	 <p>xx1300002522</p>
5	Remove the timing belt from its groove on the motor.	

Separating the axis-4 motor from the motor flange


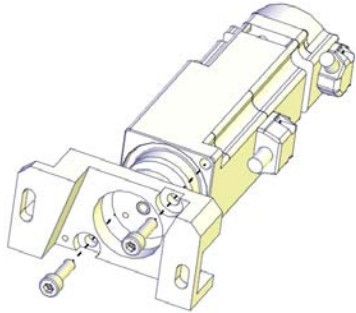
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

Continues on next page

4 Repair

4.6.5 Replacing the axis-4 motor with pulley

Continued

	Action	Note
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i>	
3	Remove the motor flange and bracket from the motor by removing the screws.	 xx1300002523

Refitting the motor with pulley

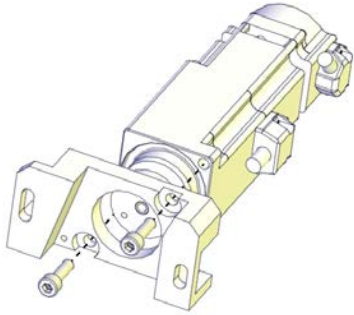

Use these procedures to refit the motor.

Fitting the axis-4 motor to the motor flange

	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

Continues on next page

4.6.5 Replacing the axis-4 motor with pulley
Continued

	Action	Note
2	Refit the motor flange and bracket to the motor with the screws. Replace the flange if damaged.	Motor flange: 3HAC047479-001 Screws: 3HAB3409-14 (M5x16). Tightening torque: 6 Nm.  <p>xx1300002523</p> <p> Note Only use specified screws, never replace them with other screws.</p>

Securing the axis-4 motor

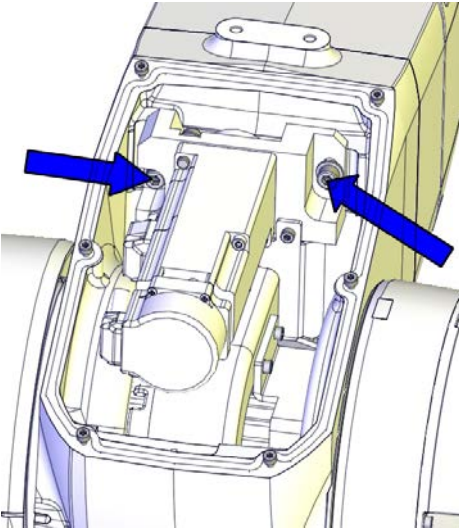

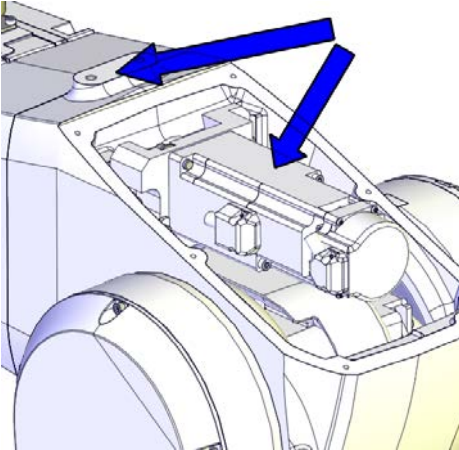
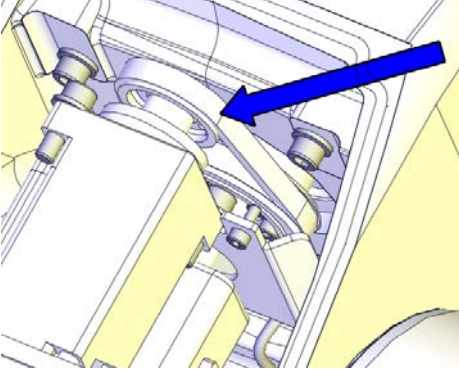
	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check that: <ul style="list-style-type: none"> • all assembly surfaces are clean and undamaged. • the motor is clean and undamaged. 	
3	Fit the timing belt to the motor pulley.	

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4 Repair

4.6.5 Replacing the axis-4 motor with pulley

Continued

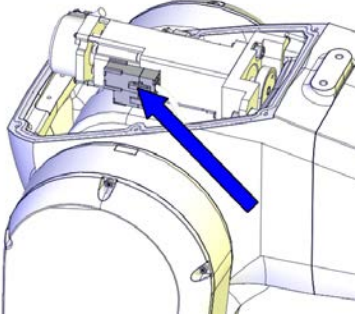
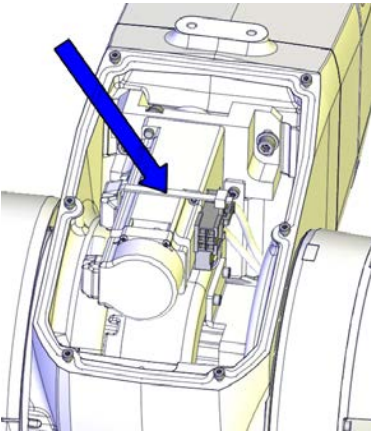
	Action	Note
4	<p>Place the motor at its mounting position and fasten the attachment screws and washers just enough to still be able to move the motor.</p> <p>Position the robot with the connectors directed as shown in the figure.</p> <p>Verify that the top surface of the axis-4 motor is parallel with the mounting flange surface on the housing, shown in the figure, when moving the motor.</p>	<p>Screws: 3HAB3409-14 (M5x16).</p>  <p>xx130000254</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>  <p>xx1300002612</p>
5	<p>Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.</p>	 <p>xx1300002525</p>

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4.6.5 Replacing the axis-4 motor with pulley *Continued*

	Action	Note
6	Move the motor to achieve correct belt tension ($F = 30\text{ N}$).	Belt tension: $F = 30\text{ N}$.
7	Secure the motor with its attachment screws.	Tightening torque: 6 Nm .

Connecting the axis-4 motor connectors

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	Reconnect the motor connectors.	 <p>xx1300002371</p>
3	Secure the connectors to the motor with a cable strap.	 <p>xx1300002494</p>

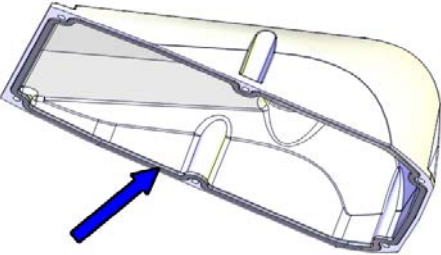
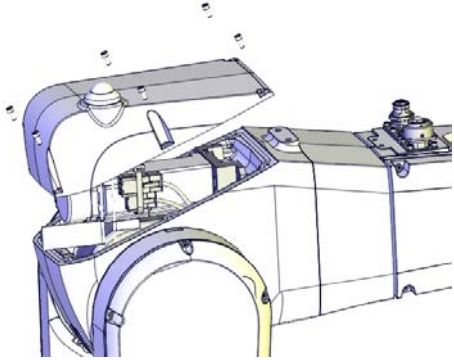

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4 Repair

4.6.5 Replacing the axis-4 motor with pulley

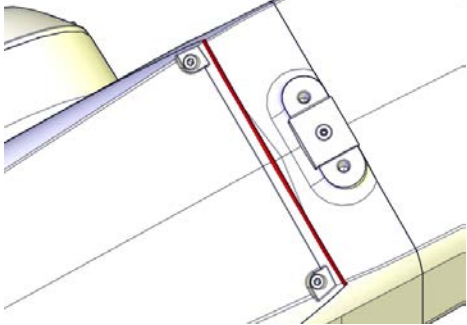


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Concluding procedure

	Action	Note
1	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the gasket. Replace if damaged.</p>	<p>Housing cover gasket (IRB 1200-7/0.7): 3HAC056698-001 (not Hygienic robots) / 3HAC080700-001 (Hygienic robots) Housing cover gasket (IRB 1200-5/0.9): 3HAC056697-001 (not Hygienic robots) / 3HAC080699-001 (Hygienic robots)</p>  <p>xx1400000477</p>
2	<p>Refit the upper arm housing cover with the screws.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p>  <p>xx1300000456</p> <p> Note Only use specified screws, never replace them with other screws.</p>

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4.6.5 Replacing the axis-4 motor with pulley
Continued

	Action	Note
3	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Apply a string of the sealant to the joint of the upper arm housing cover.</p> <p>Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint.</p> <p>If necessary, add extra sealant to get a full cover joint.</p>	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication Sealant, SikaFlex 521FC</p> <p>For robots with protection type Hygienic Sealant, Trans Clear</p>  <p>xx1600000215</p>
4	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean, seal and paint the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160.</p> <p> Note</p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>	
5	Recalibrate the robot.	Calibration information is included in section Calibration on page 807 .
6	<p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

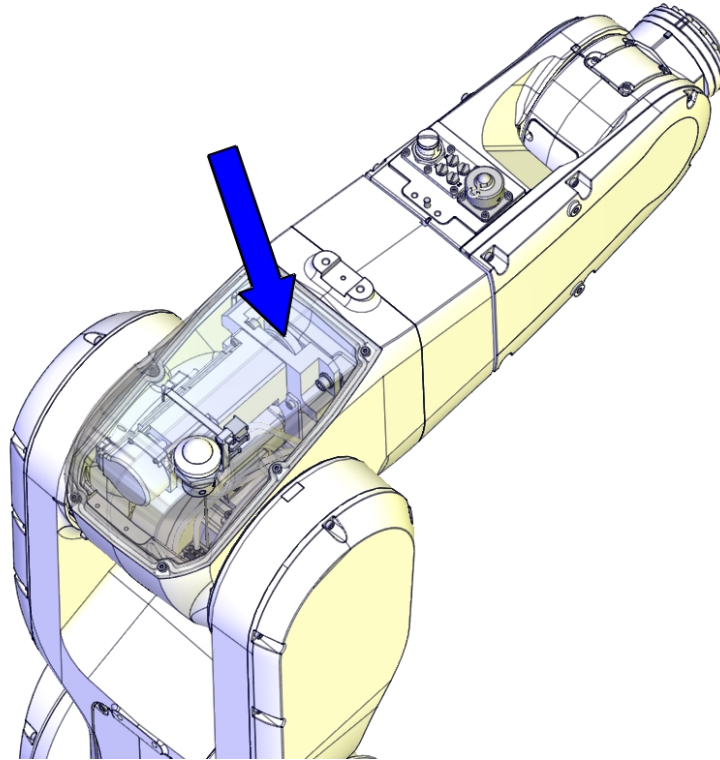
4 Repair

4.6.6 Replacing the axis-4 timing belt

4.6.6 Replacing the axis-4 timing belt

Location of timing belt

The axis-4 timing belt is located as shown in the figure.



xx140000036

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Timing belt	3HAC044694-001	
Gasket on cable housing cover	3HAC056724-001 / 3HAC080702-001	Not used with protection class IP40. Replace if damaged.
Housing cover gasket (IRB 1200-7/0.7)	3HAC056698-001 / 3HAC080700-001	Not used with protection class IP40. Replace if damaged.
Housing cover gasket (IRB 1200-5/0.9)	3HAC056697-001 / 3HAC080699-001	Not used with protection class IP40. Replace if damaged.

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Spare part	Article number	Note
Gasket for tubular cable housing cover	3HAC056707-001 / 3HAC080701-001	Not used with protection class IP40. Replace if damaged.
Air connector set with Ethernet hole in flange	3HAC049664-001	Includes tubular flange, air connectors and seal bolts. Replace if damaged.
Air connector set without Ethernet hole in flange	3HAC049665-001	Includes tubular flange, air connectors and seal bolts. Replace if damaged.
Plate with connector set	3HAC079691-001	Used with protection type Hygienic. Includes Ethernet connector, air connectors, CP/CS connector and gasket (3HAC078804-001).
Plate without connector set	3HAC078810-001	Used with protection type Hygienic. Includes gasket (3HAC078804-001).
Gasket	3HAC078804-001	Used with protection type Hygienic. Replace if damage.

Required tools and equipment

Equipment, etc.	Article number	Note
24 VDC power supply	-	Used to release the motor brakes.
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .

Required consumables

Consumable	Art. no.	Note
Cleaning agent	-	Isopropanol
Cable straps	-	
Cleaning agent	-	Loctite 7063
Flange sealing	12340011-116	Loctite 574 For robots with protection type Clean Room. For robots with food grade lubrication.
Sealant	3HAC026759-001	Sikaflex 521FC For robots with protection type Clean Room. For robots with food grade lubrication.
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic
Locking liquid	3HAB7116-1	Loctite 243

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4 Repair

4.6.6 Replacing the axis-4 timing belt

Continued

Deciding calibration routine

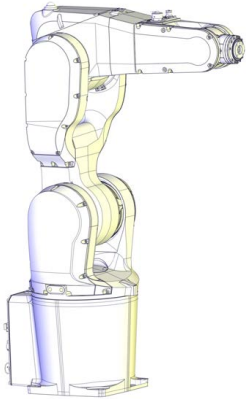
Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	<p>Decide which calibration routine to use for calibrating the robot.</p> <ul style="list-style-type: none"> Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	<p> Note</p> <p>Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.</p>
	<p>If the robot is to be calibrated with reference calibration:</p> <p>Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot.</p> <p>If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p>	<p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.</p> <p>Creating new values requires possibility to move the robot.</p> <p>Read more about reference calibration for Axis Calibration in Reference calibration routine on page 821.</p>
	<p>If the robot is to be calibrated with fine calibration:</p> <p>Remove all external cable packages (DressPack) and tools from the robot.</p>	



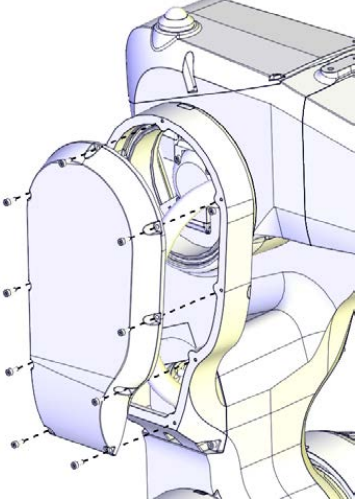
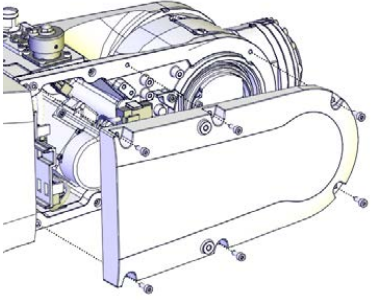
Removing the timing belt

Use these procedures to remove the axis-4 timing belt.

Preparations before removing the axis-4 timing belt

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 <p>xx1300002581</p>

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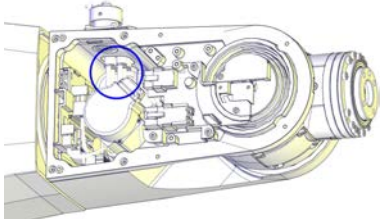
	Action	Note
3	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>	
4	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
5	Remove the lower arm cable housing cover.	 <p>xx1300002400</p>
6	Remove the tubular cable housing cover.	 <p>xx1300002389</p>

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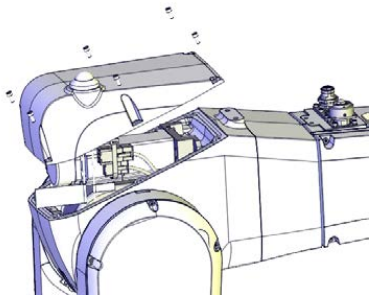
4 Repair

4.6.6 Replacing the axis-4 timing belt

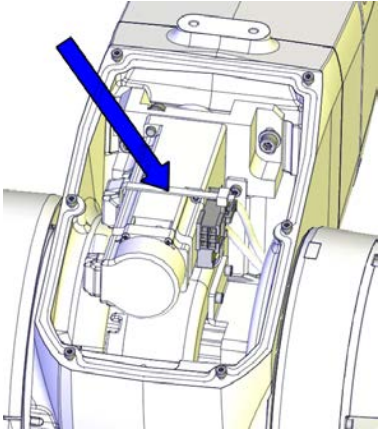

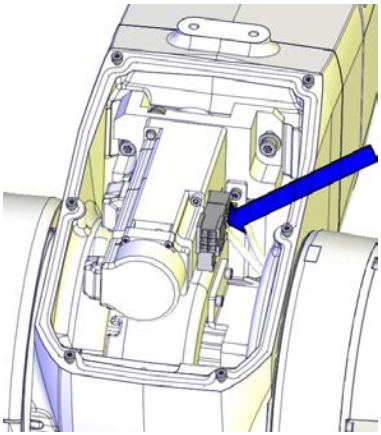
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	Action	Note
7	Disconnect the air hoses.	 xx1400002327



Disconnecting the axis-4 motor connectors

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Remove the cover from the upper arm housing.  CAUTION For robots with safety lamp (option) Be aware of the signal lamp cables that are attached inside the housing! Disconnect the lamp cable connectors R3.H1 and R3.H2 and then lift away the cover completely.	 xx1300000456

Continues on next page

	Action	Note
4	Cut the strap that holds the connectors.	 <p>xx1300002494</p>
5	Disconnect the motor connectors.  Tip Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.	 <p>xx1300002495</p>

Removing the axis-4 motor

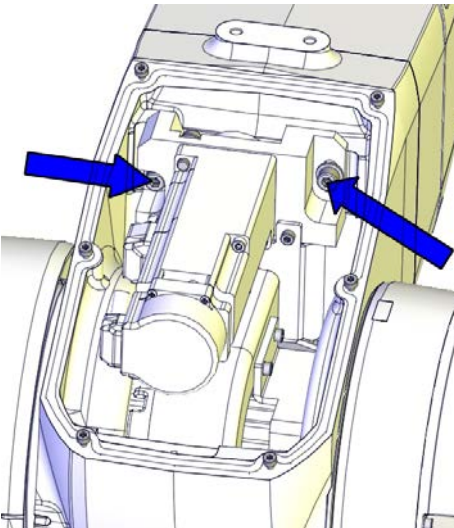
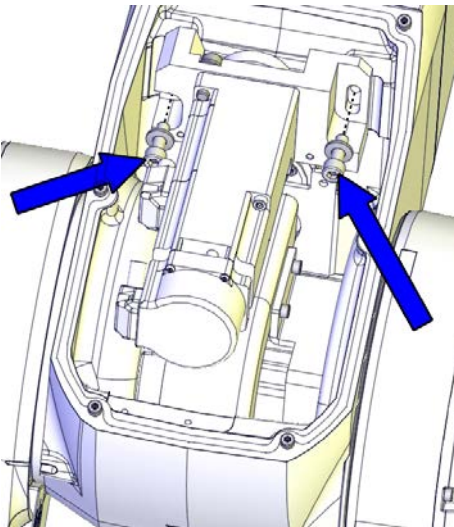
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	

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4 Repair

4.6.6 Replacing the axis-4 timing belt


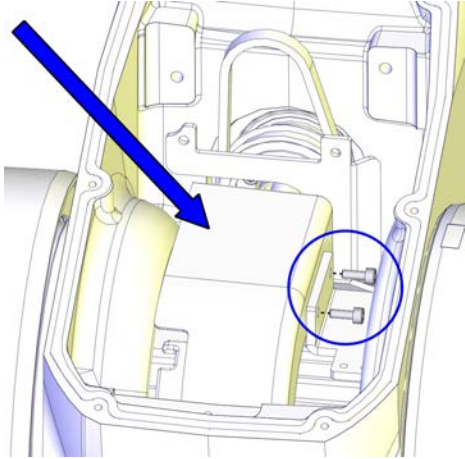
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	Action	Note
3	Loosen the two attachment screws and move the motor downwards to slacken the timing belt.	 <p>xx1300002524</p>
4	Remove the motor screws and washers and carefully lift out the motor and the pulley.	 <p>xx1300002522</p>
5	Remove the timing belt from its groove on the motor.	



Removing the air hoses

	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

Continues on next page

	Action	Note
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	
3	<p>Remove the plastic protection plate by removing its screws.</p>	 <p>xx1400000797</p>
4	<p>Pull in the air hoses into the housing, out from the housing extender unit.</p>	

Removing the axis-4 timing belt

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	
3	<p>Remove the axis-4 timing belt.</p>	

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4 Repair

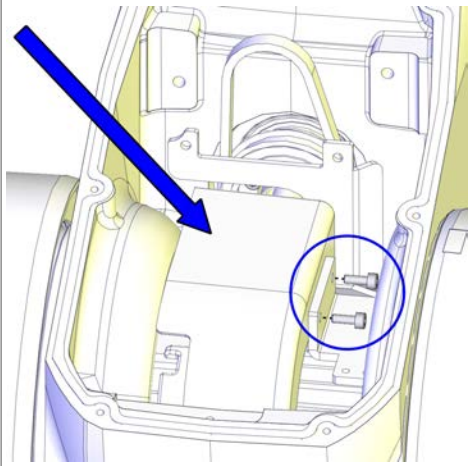
4.6.6 Replacing the axis-4 timing belt

Continued

Refitting the timing belt

Use these procedures to refit the axis-4 timing belt.

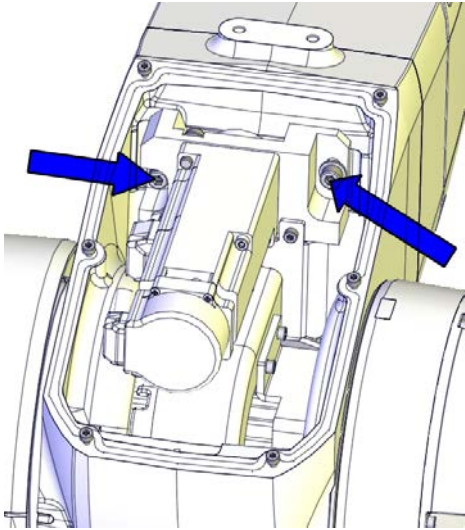

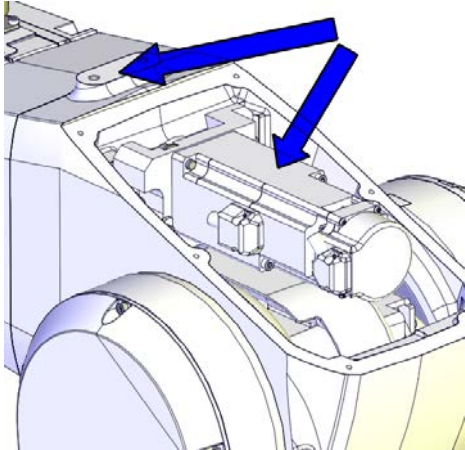
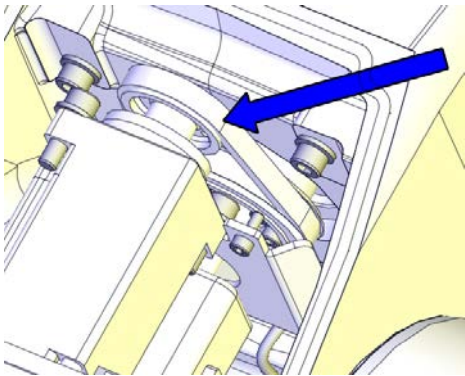
Refitting the axis-4 timing belt and the air hoses

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	Place the timing belt at the gear pulley and run the air hoses through the belt.	
3	Install the air hoses in and through the housing extender unit.	
4	Refit the plastic protection plate with its screws.	 <p>xx1400000797</p>

Securing the axis-4 motor

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Check that:</p> <ul style="list-style-type: none"> all assembly surfaces are clean and undamaged. the motor is clean and undamaged. 	
3	Fit the timing belt to the motor pulley.	

Continues on next page

	Action	Note
4	<p>Place the motor at its mounting position and fasten the attachment screws and washers just enough to still be able to move the motor.</p> <p>Position the robot with the connectors directed as shown in the figure.</p> <p>Verify that the top surface of the axis-4 motor is parallel with the mounting flange surface on the housing, shown in the figure, when moving the motor.</p>	<p>Screws: 3HAB3409-14 (M5x16).</p>  <p>xx130000254</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>  <p>xx1300002612</p>
5	<p>Install the timing belt to the pulleys and verify that the belt runs correctly in the grooves of the pulleys.</p>	 <p>xx1300002525</p>

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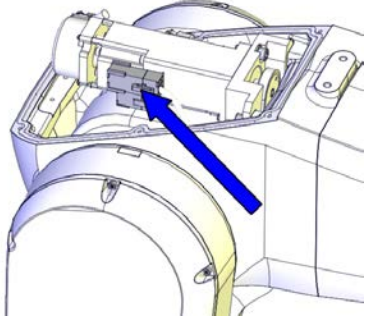
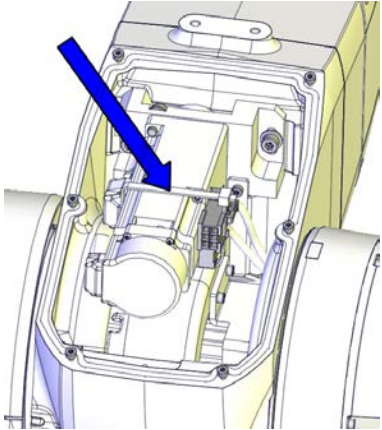
4 Repair

4.6.6 Replacing the axis-4 timing belt

Continued

	Action	Note
6	Move the motor to achieve correct belt tension ($F = 30\text{ N}$).	Belt tension: $F = 30\text{ N}$.
7	Secure the motor with its attachment screws.	Tightening torque: 6 Nm .

Connecting the axis-4 motor connectors

	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Reconnect the motor connectors.	 xx1300002371
3	Secure the connectors to the motor with a cable strap.	 xx1300002494

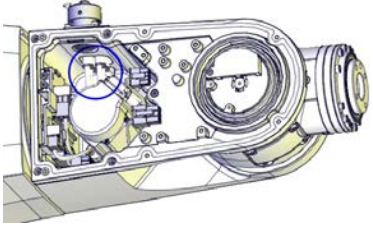
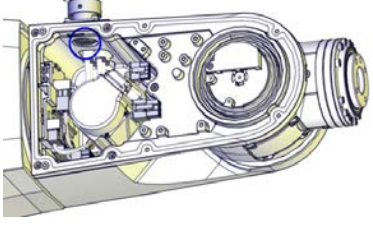
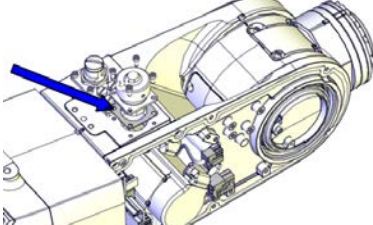
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Connecting the air hoses and CP/CS cabling (if equipped)

Notice that the procedure differs depending on the protection class and protection type.

Connecting the air hoses and CP/CS cabling on robots not in protection type Hygienic

Use this procedure if the robot is not in protection type Hygienic.

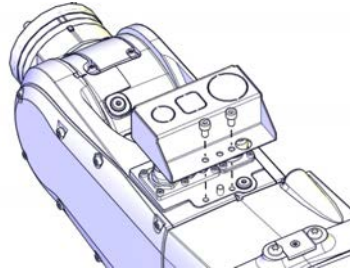
	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Reconnect the air hoses. Replace the air hose connector set if damaged.</p>	<p>Air connector set with Ethernet hole in flange: 3HAC049664-001 Air connector set without Ethernet hole in flange: 3HAC049665-001</p>  <p>xx1400000738</p>
3	<p>If equipped, reconnect the CP/CS connector. For robots with protection class IP67 For robots with protection type Foundry Plus 1 Check the gasket. 2 Replace if damaged. For robots with protection type Clean Room For robots with food grade lubrication 1 Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. 2 Apply flange sealing Loctite 574 on the mounting surfaces of the CP/CS connector and wipe clean if there is any overflowing Loctite 574.</p>	 <p>xx1500000252</p> <p>On robots with protection class IP67 On robots with protection type Foundry Plus Gasket: 3HAC058567-001</p>  <p>xx1500000251</p>

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4 Repair

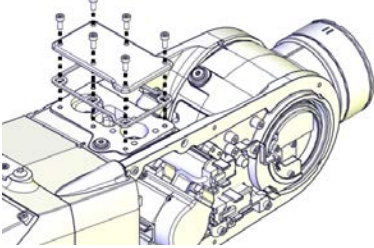
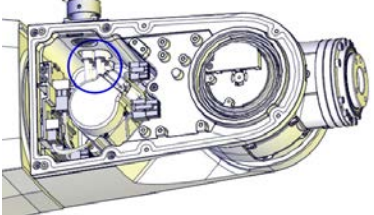
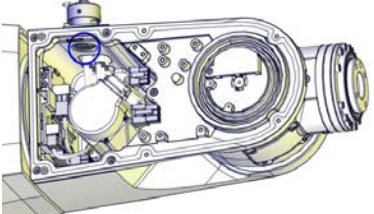
4.6.6 Replacing the axis-4 timing belt

Continued

	Action	Note
4	For robots with protection type Foundry Plus If required, fit the protection bracket for CP/CS connectors.	Protection bracket for CP/CS connectors: 3HAC058350-001  xx1600001152

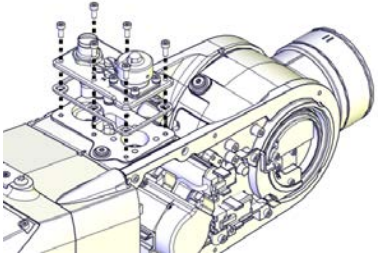
Connecting the air hoses and CP/CS cabling on robots in protection type Hygienic

Use this procedure if the robot is with protection type Hygienic.

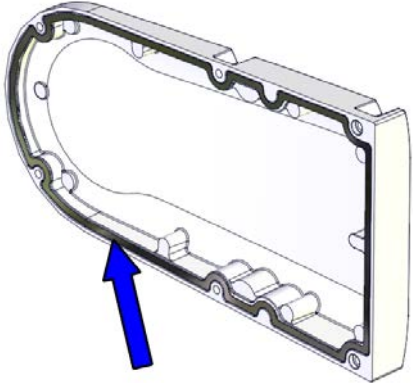
	Action	Note
1	Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	If the Hygienic robot not equipped with air hoses and CP/CS cabling: Check the plate without connector set and the attached gasket. Replace if damaged.	Plate without connector set: 3HAC078810-001 Gasket: 3HAC078804-001  xx2100001433
3	Reconnect the air hoses.	 xx1400000738
4	Reconnect the CP/CS cabling.	 xx1500000252

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4.6.6 Replacing the axis-4 timing belt
Continued

	Action	Note
5	<p>Check the connectors on the plate with connector set and the attached gasket. Replace if damaged.</p>	<p>Plate with connector set: 3HAC079691-001 Gasket: 3HAC078804-001</p>  <p>xx2100001434</p>

Refitting the tubular cable housing cover

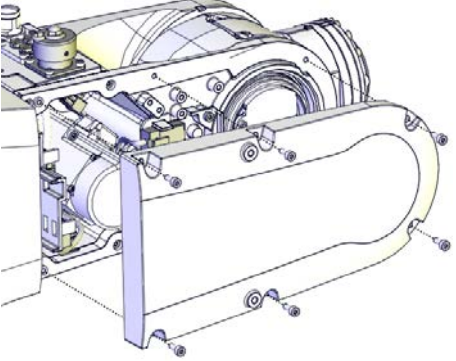

	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the tubular cable housing cover gasket. Replace if damaged.</p>	<p>Gasket for tubular cable housing cover: 3HAC056707-001 (not Hygienic robots) / 3HAC080701-001 (Hygienic robots)</p>  <p>xx1400000345</p>

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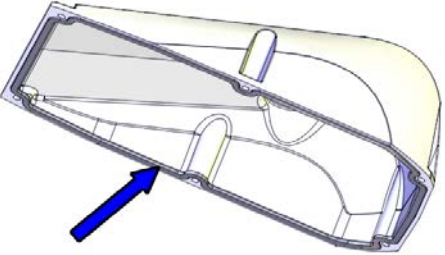
4 Repair

4.6.6 Replacing the axis-4 timing belt

Continued

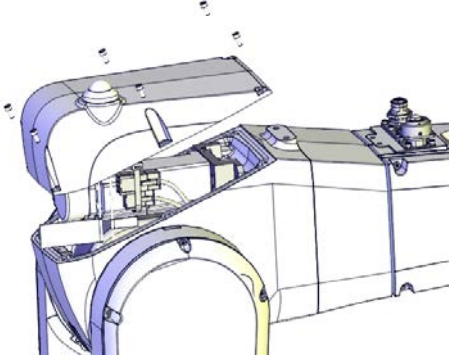

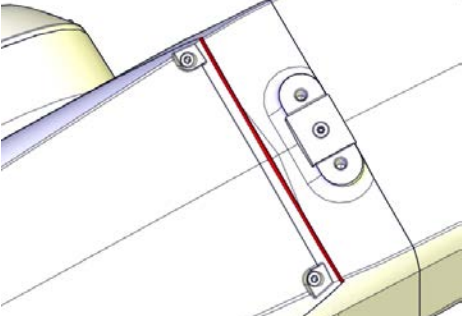
	Action	Note
3	Refit the cover to the cable housing.	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p>  <p>xx1300002389</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>

Concluding procedure

	Action	Note
1	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the gasket. Replace if damaged.</p>	<p>Housing cover gasket (IRB 1200-7/0.7): 3HAC056698-001 (not Hygienic robots) / 3HAC080700-001 (Hygienic robots) Housing cover gasket (IRB 1200-5/0.9): 3HAC056697-001 (not Hygienic robots) / 3HAC080699-001 (Hygienic robots)</p>  <p>xx140000477</p>

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4.6.6 Replacing the axis-4 timing belt
Continued

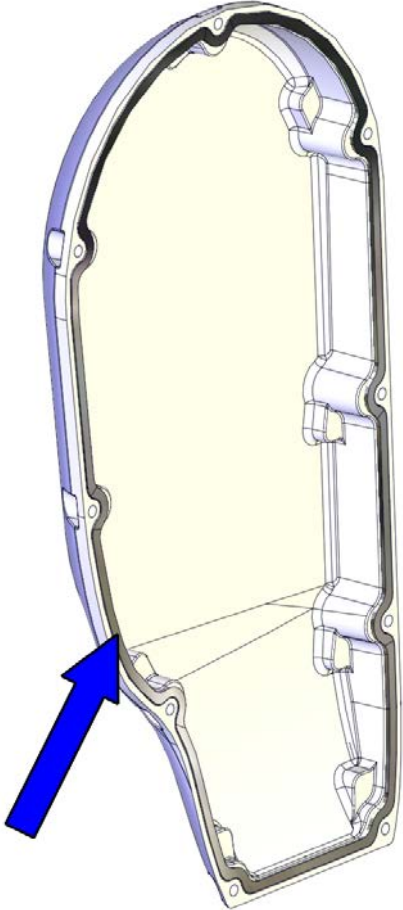
	Action	Note
2	<p>Refit the upper arm housing cover with the screws.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p>  <p>xx1300000456</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
3	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Apply a string of the sealant to the joint of the upper arm housing cover. Smooth out the sealant string using a finger tip. Use washing-up on finger tips to get a smooth joint. If necessary, add extra sealant to get a full cover joint.</p>	<p>For robots with protection type Clean Room For robots with food grade lubrication Sealant, SikaFlex 521FC For robots with protection type Hygienic Sealant, Trans Clear</p>  <p>xx1600000215</p>

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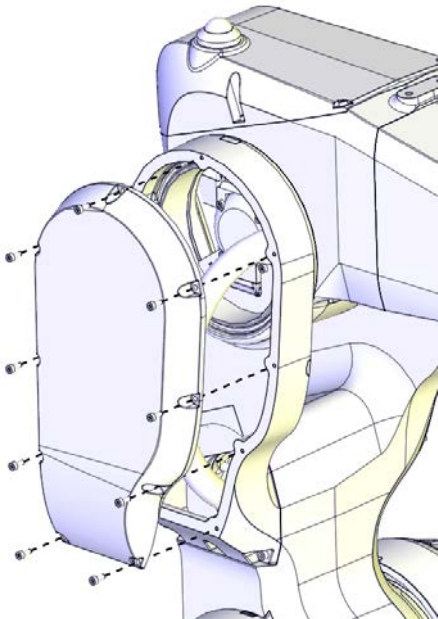



4 Repair

4.6.6 Replacing the axis-4 timing belt

Continued

	Action	Note
4	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the gasket of the cable housing cover. Replace if damaged.</p>	<p>Gasket on cable housing cover: 3HAC056724-001 (not Hygienic robots) / 3HAC080702-001 (Hygienic robots)</p>  <p>xx140000048</p>
5	<p>Check the PTFE film on the cable housing cover. Replace if damaged.</p>	<p>PTFE film on cable housing cover: 3HAC044660-001</p>
6	<p>Apply grease to the inner surface of the cable housing cover and the PTFE film surface.</p>	

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	Action	Note
7	<p>Refit the cable housing cover. For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Apply locking liquid Loctite 243 to all the screws securing the cover.</p>	<p>Tightening torque: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm</p>  <p>xx1300002400</p> <p> Note Only use specified screws, never replace them with other screws.</p>
8	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean, seal and paint the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160.</p> <p> Note After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>	
9	<p>Recalibrate the robot.</p>	<p>Calibration information is included in section Calibration on page 807.</p>
10	<p> DANGER Make sure all safety requirements are met when performing the first test run.</p>	

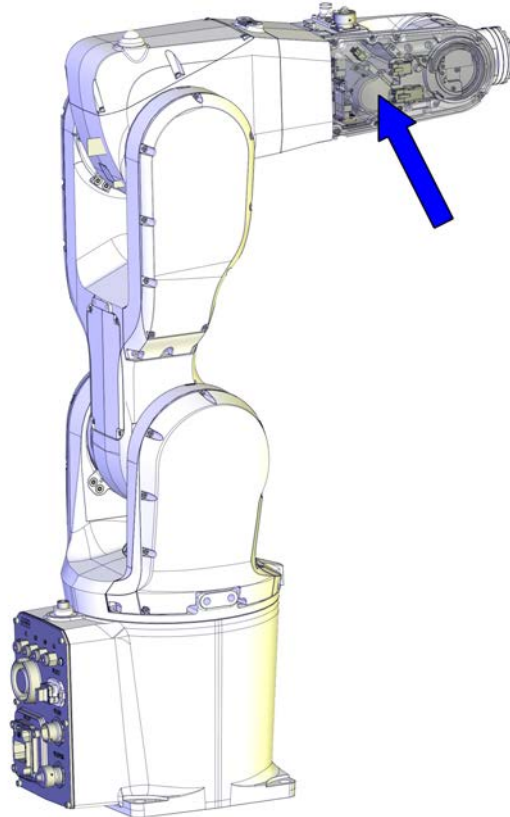
4 Repair

4.6.7 Replacing the axis-5 motor with pulley

4.6.7 Replacing the axis-5 motor with pulley

Location of motor

The axis-5 motor is located as shown in the figure.



xx1300002473

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

Equipment, etc.	Article number	Note
Motor with pulley	3HAC045978-001	
Motor with pulley, SafeMove 2-supported. Motor with pulley, Hygienic	3HAC061278-001	Used for IRB 1200 Type B. See Type B of IRB 1200 on page 875 .
Gasket for tubular cover	3HAC058822-001 / 3HAC080709-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cable housing cover	3HAC056707-001 / 3HAC080701-001	Not used with protection class IP40. Replace if damaged.

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4.6.7 Replacing the axis-5 motor with pulley
Continued

Required tools and equipment

Equipment, etc.	Article number	Note
24 VDC power supply	-	Used to release the motor brakes.
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. ⁱ
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .


- ⁱ The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, manual calibration is used as default.

Required consumables

Consumable	Art. no.	Note
Cleaning agent	-	Isopropanol
Locking liquid	3HAB7116-1	Loctite 243 For robots with protection class IP67 For robots with protection type Foundry Plus
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	<p>Decide which calibration routine to use for calibrating the robot.</p> <ul style="list-style-type: none"> Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	 Note Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	<p>If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.</p>	<p>Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in Reference calibration routine on page 821.</p>

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4 Repair

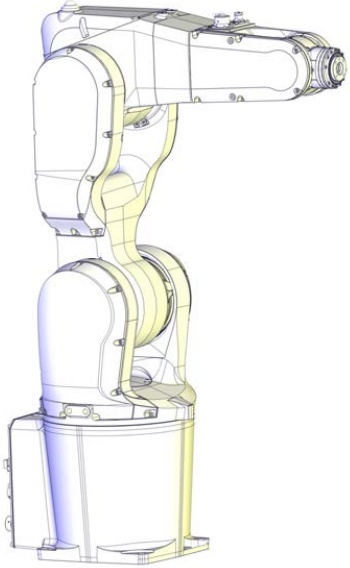


4.6.7 Replacing the axis-5 motor with pulley

Continued

Action	Note
<p>If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.</p>	



Removing the motor with pulley

Preparations before removing the axis-5 motor, pulley or shaft

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog all axes to zero position.	 <p>xx1300002581</p>
3	 <p>DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>	
4	 <p>CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	

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Getting access to inside of the wrist unit


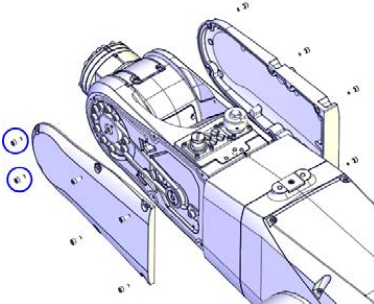

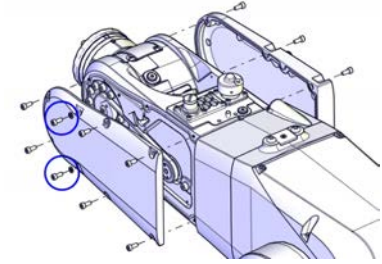

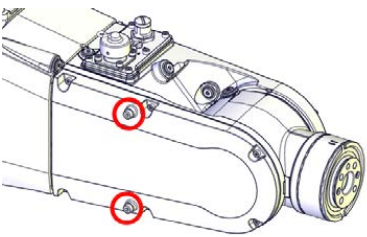
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i>	

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4 Repair

4.6.7 Replacing the axis-5 motor with pulley

Continued



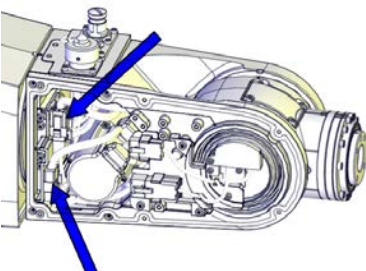
	Action	Note
3	Remove the covers on each side of the wrist by removing their screws.	
	 Note For robots with protection class IP67 For robots with protection type Foundry Plus The two front screws on the left hand side cover (encircled in the figure) have been fitted with locking liquid. The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.	For robots with protection class IP67 For robots with protection type Foundry Plus  xx1300002349
	 Note For robots with protection type Clean Room For robots with food grade lubrication The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.	For robots with protection type Clean Room  xx1600001148
	 Note For robots with protection type Hygienic The tubular cover (right hand side cover) has two extra screws, as encircled in the figure. Do not remove the two screws when removing the cover. The screws are used for blocking the screw holes rather than fixing the cover to the tubular. Replace if damaged or missing.	For robots with protection type Hygienic  xx2100001406

Disconnecting the axis-5 motor connectors



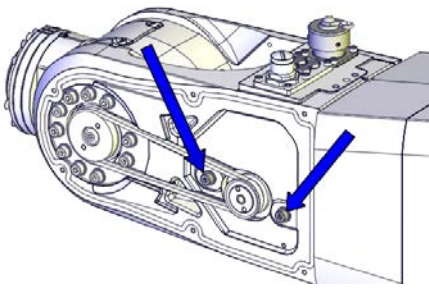
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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4.6.7 Replacing the axis-5 motor with pulley
Continued

	Action	Note
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	<p>Snap loose the motor connectors from their holders and then disconnect them.</p> <ul style="list-style-type: none"> • R3.MP5 • R3.ME5 <p> Tip</p> <p>Take photos of the connector and cable position before disconnecting them, to have as a reference when reconnecting.</p>	 <p>xx1300002360</p>

Removing the axis-5 motor with pulley

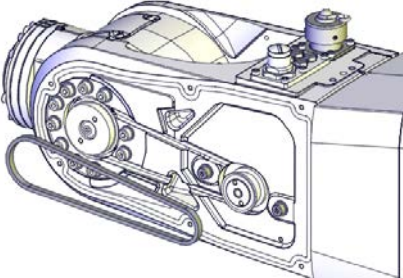
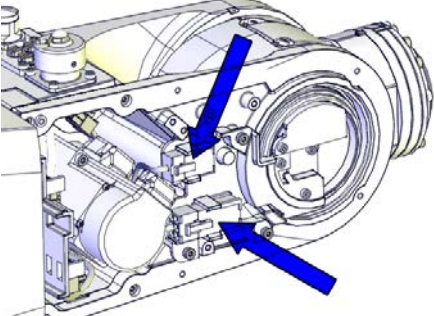
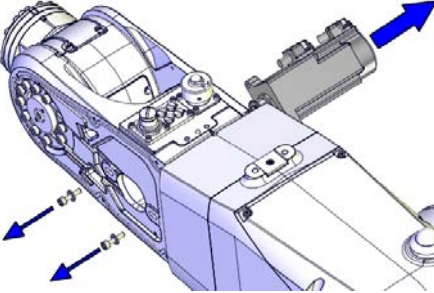
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
3	<p>Loosen the screws so that the motor can be moved sideways.</p>	 <p>xx1300002350</p>

Continues on next page

4 Repair

4.6.7 Replacing the axis-5 motor with pulley

Continued

	Action	Note
4	Remove the timing belt.	 <p>xx1300002351</p>
5	Snap loose and disconnect the axis-5 FPC connectors.	 <p>xx1300002390</p>
6	Remove the screws and pull out the motor.	 <p>xx1300002352</p>

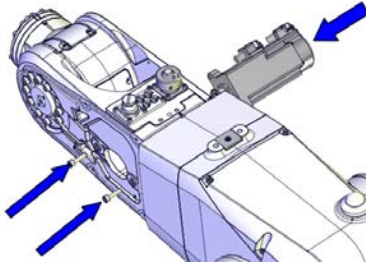

Refitting the motor with pulley

Preparations before securing the axis-5 motor

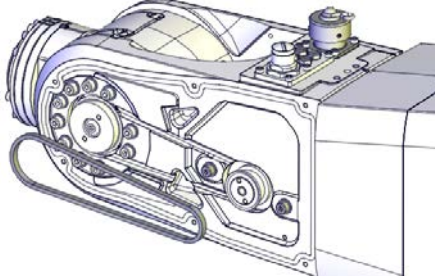

	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	Check that: <ul style="list-style-type: none"> • all assembly surfaces are clean and without damages • the motor is clean and undamaged. 	

Continues on next page

4.6.7 Replacing the axis-5 motor with pulley
Continued

	Action	Note
3	Place the motor at its mounting position and fasten the attachment screws and washers just enough to still be able to move the motor.	<p>Screws: 3HAB3409-212 (M4x16).</p>  <p>xx1300002463</p> <p> Note Only use specified screws, never replace them with other screws.</p>

Securing the axis-5 motor and timing belt

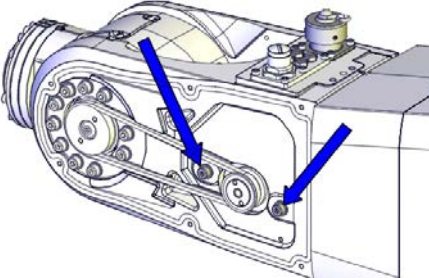
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	Refit the timing belt on the pulley.	 <p>xx1300002351</p>
3	Move the motor to a position where a good timing belt tension is reached (F = 26 N).	<p> Note Do not stretch the timing belt too much!</p>

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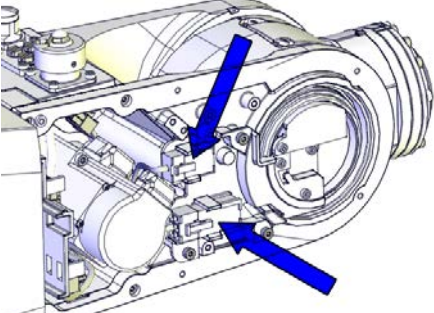
4 Repair

4.6.7 Replacing the axis-5 motor with pulley

Continued

	Action	Note
4	Secure the motor with its attachment screws.	 <p data-bbox="943 618 1050 636">xx1300002350</p> <p data-bbox="943 651 1238 680">Tightening torque: 3.5 Nm.</p>

Connecting the axis-5 motor FPC connectors

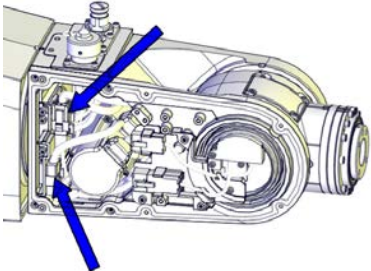
	Action	Note
1	<p data-bbox="464 813 900 869">For robots with protection type Clean Room</p> <p data-bbox="464 875 906 904">For robots with food grade lubrication</p> <p data-bbox="464 911 932 940">For robots with protection type Hygienic</p> <p data-bbox="464 947 932 1025">Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	Connect the axis-5 FPC connectors and snap them to their holders.	 <p data-bbox="943 1379 1050 1397">xx1300002390</p>

Connecting the axis-5 motor connectors

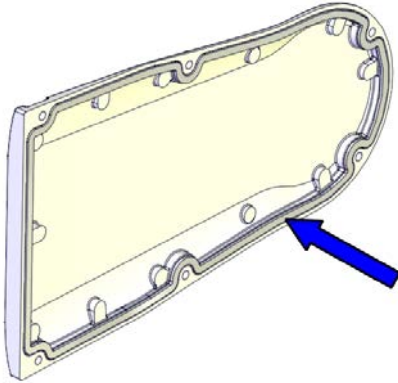
	Action	Note
1	<p data-bbox="464 1547 986 1576">For robots with protection type Clean Room</p> <p data-bbox="464 1583 919 1612">For robots with food grade lubrication</p> <p data-bbox="464 1619 948 1648">For robots with protection type Hygienic</p> <p data-bbox="464 1655 1018 1733">Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

Continues on next page

4.6.7 Replacing the axis-5 motor with pulley
Continued

	Action	Note
2	Reconnect the motor cables. <ul style="list-style-type: none"> • R3.MP5 • R3.ME5 	 <p>xx1300002360</p>

Refitting the wrist covers

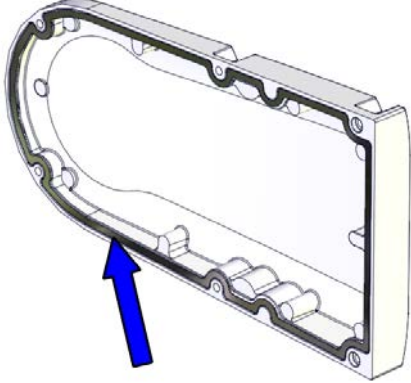
	Action	Note
1	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
2	For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the tubular cover gasket. Replace if damaged.	Gasket for tubular cover: 3HAC058822-001 (not Hygienic robots) / 3HAC080709-001 (Hygienic robots)  <p>xx1400000034</p>

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4 Repair

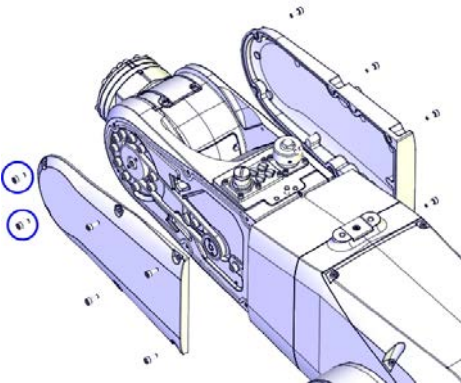
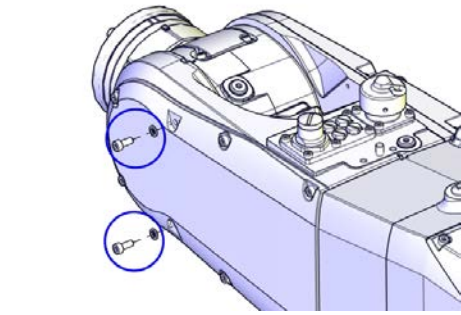


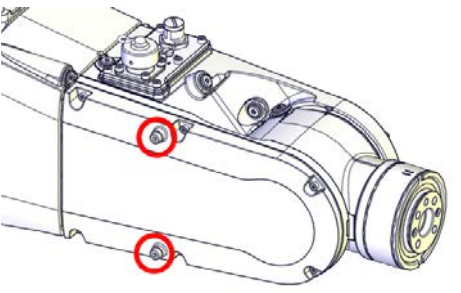
4.6.7 Replacing the axis-5 motor with pulley

Continued

	Action	Note
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the tubular cable housing cover gasket. Replace if damaged.</p>	<p>Gasket for tubular cable housing cover: 3HAC056707-001 (not Hygienic robots) / 3HAC080701-001 (Hygienic robots)</p>  <p>xx140000345</p>

Continues on next page

4.6.7 Replacing the axis-5 motor with pulley
Continued

	Action	Note
4	<p>Refit the both covers to the wrist.</p> <p>For robots with protection class IP67 For robots with protection type Foundry Plus</p> <p>Apply locking liquid Loctite 243 to the two front screws on the left hand side cover, encircled in the figure.</p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p> <p>For robots with protection class IP67 For robots with protection type Foundry Plus</p>  <p>xx1300002349</p>
	<p>For robots with protection type Clean Room For robots with food grade lubrication</p> <p>Remember to refit the extra two screws and washers to the tubular cover.</p>	<p>For robots with protection type Clean Room For robots with food grade lubrication</p>  <p>xx1600001153</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
	<p> Note</p> <p>For robots with protection type Hygienic</p> <p>Check the two extra screws on the tubular cover (right hand side cover), as encircled in the figure.</p> <p>Replace if damaged or missing.</p>	<p>For robots with protection type Hygienic</p>  <p>xx2100001406</p>



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4 Repair

4.6.7 Replacing the axis-5 motor with pulley

Continued

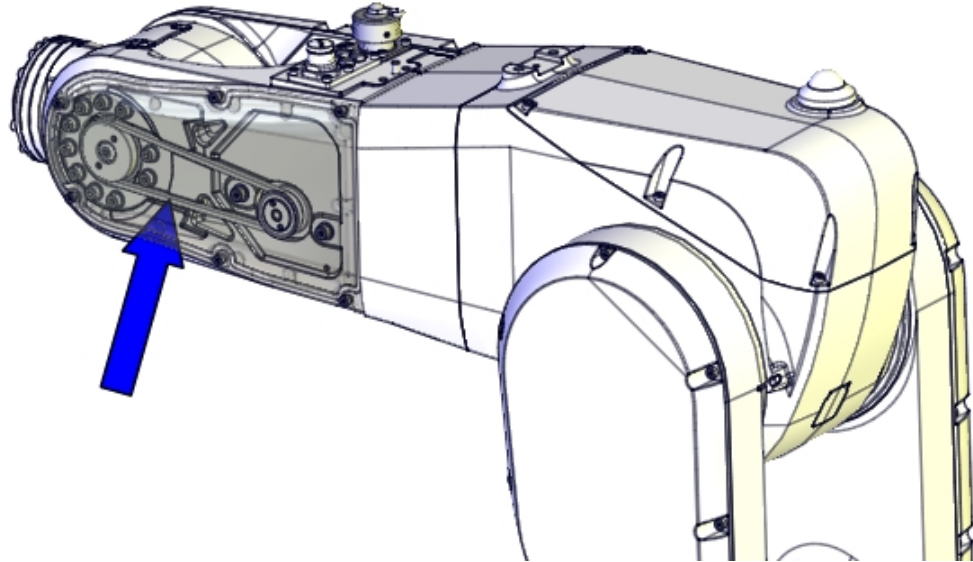
Concluding procedure

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic Clean, seal and paint the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160.</p> <p> Note</p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>	
2	Recalibrate the robot.	Calibration information is included in section Calibration on page 807 .
3	<p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

4.6.8 Replacing the axis-5 timing belt

Location of the timing belt

The axis-5 timing belt is located as shown in the figure.



xx140000032

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Timing belt	3HAC044657-001	
Gasket for tubular cover	3HAC058822-001 / 3HAC080709-001	Not used with protection class IP40. Replace if damaged.

Required tools and equipment

Equipment, etc.	Article number	Note
24 VDC power supply	-	Used to release the motor brakes.
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .

Required consumables

Consumable	Art. no.	Note
Cleaning agent	-	Isopropanol

Continues on next page

4 Repair


4.6.8 Replacing the axis-5 timing belt

Continued

Consumable	Art. no.	Note
Locking liquid	3HAB7116-1	Loctite 243 For robots with protection class IP67 For robots with protection type Foundry Plus
Sealant	3HAC073510-001	Trans Clear For robots with protection type Hygienic

Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none">Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot.Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot.	 Note Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in Reference calibration routine on page 821 .
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

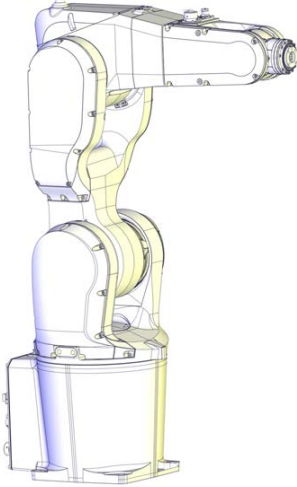


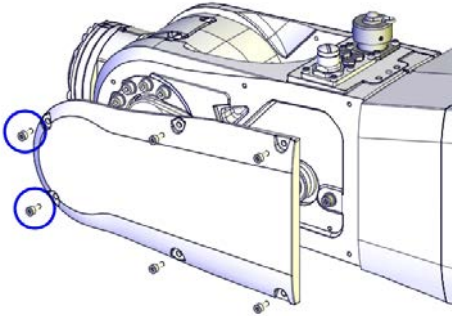
Removing the timing belt

Use these procedures to remove the axis-5 timing belt.

Preparations before removing the timing belt

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	

Continues on next page

	Action	Note
2	Jog all axes to zero position.	 <p>xx1300002581</p>
3	 <p>DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>	
4	 <p>CAUTION</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160.</p>	
5	Remove the left hand side wrist cover.	 <p>xx140000033</p>



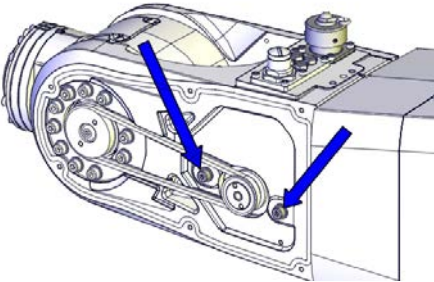
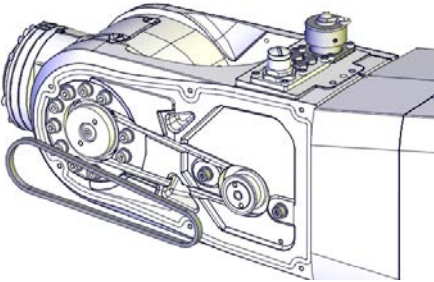
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4 Repair

4.6.8 Replacing the axis-5 timing belt

Continued

Removing the axis-5 timing belt

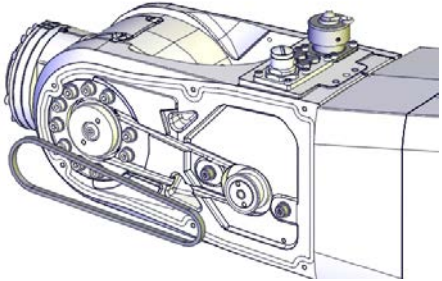
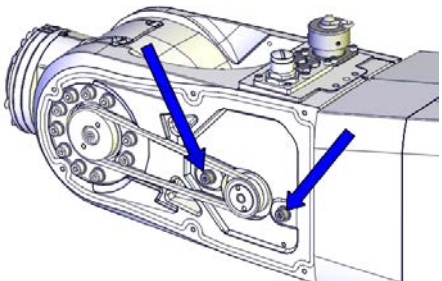
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	
3	Loosen the screws so that the motor can be moved sideways.	 xx1300002350
4	Remove the timing belt.	 xx1300002351

Continues on next page

Refitting the timing belt

Use these procedures to refit the axis-5 timing belt.

Refitting the axis-5 timing belt

	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Refit the timing belt on the pulley.</p>	 <p>xx1300002351</p>
3	<p>Move the motor to achieve correct belt tension (F = 26 N).</p>	<p>Belt tension: F = 26 N.</p>
4	<p>Secure the motor with its attachment screws.</p>	 <p>xx1300002350</p> <p>Tightening torque: 3.5 Nm.</p>

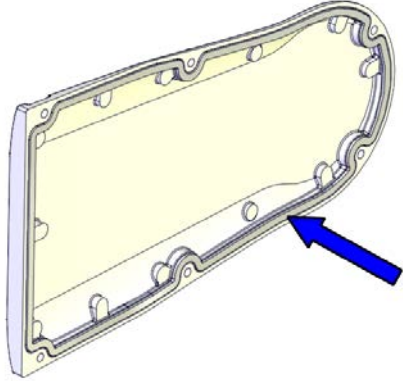
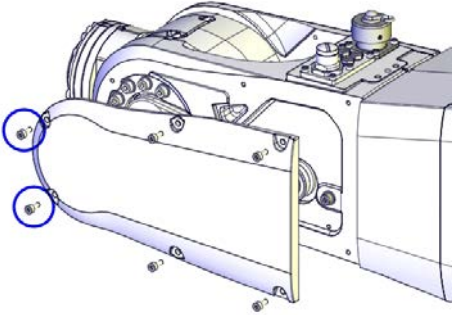


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4 Repair


4.6.8 Replacing the axis-5 timing belt

Continued

Concluding procedure

	Action	Note
1	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Check the gasket of the wrist cover. Replace if damaged.</p>	<p>Gasket for tubular cover: 3HAC058822-001 (not Hygienic robots) / 3HAC080709-001 (Hygienic robots)</p>  <p>xx140000034</p>
2	<p>Refit the cover to the wrist. For robots with protection class IP67 For robots with protection type Foundry Plus Apply locking liquid Loctite 243 to the two front screws on the left hand side cover, encircled in the figure.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p>  <p>xx140000033</p> <p> Note Only use specified screws, never replace them with other screws.</p>
3	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean, seal and paint the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160.</p> <p> Note After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>	
4	<p>Recalibrate the robot.</p>	<p>Calibration information is included in section Calibration on page 807.</p>

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	Action	Note
5	 DANGER Make sure all safety requirements are met when performing the first test run.	

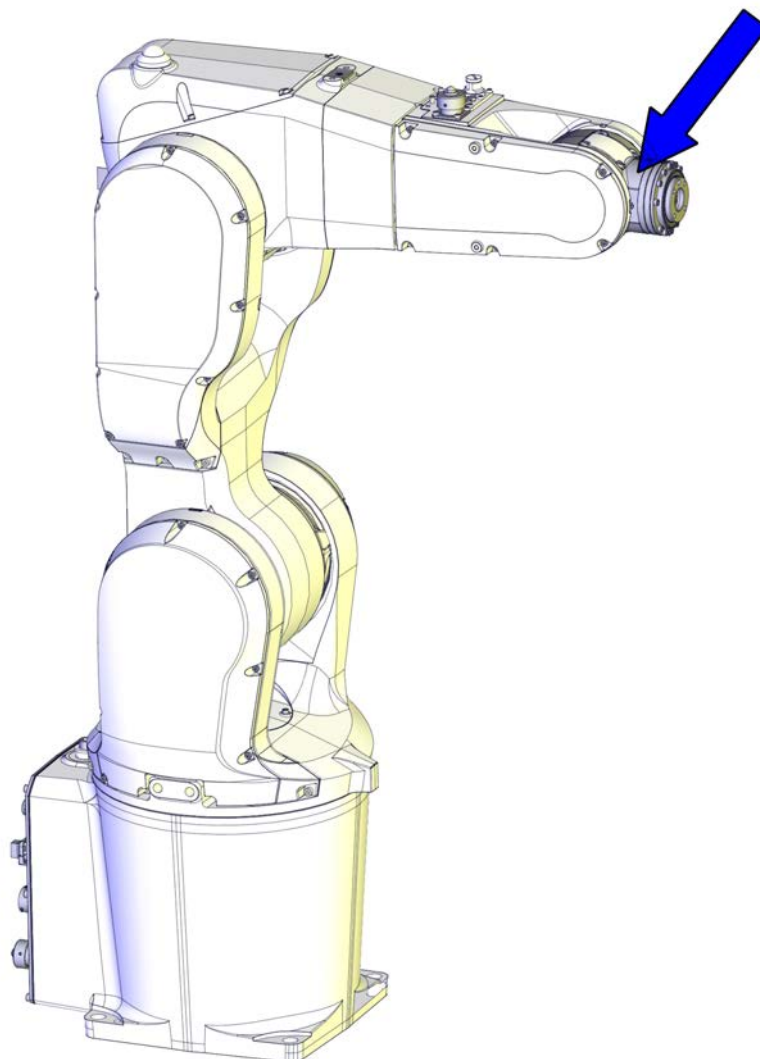
4 Repair

4.6.9 Replacing the axis-5 and axis-6 drive unit

4.6.9 Replacing the axis-5 and axis-6 drive unit

Location of the drive unit

The drive unit of axis-5 and axis-6 is located as shown in the figure.



xx1300002467

Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 1200 via myABB Business Portal, www.abb.com/myABB.

Spare part	Art. no.	Note
Drive unit	3HAC059696-001	Includes axis-5 gear unit and axis-6 drive train unit.

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4.6.9 Replacing the axis-5 and axis-6 drive unit

Continued

Spare part	Art. no.	Note
Drive unit, Clean Room	3HAC059707-001	Used with protection type Clean Room. Includes axis-5 gear unit and axis-6 drive train unit.
Drive unit, food grade lubrication	3HAC057907-001	Used for robots with food grade lubrication. Includes axis-5 gear unit and axis-6 drive train unit.
Drive unit, Hygienic	3HAC079694-001	Used with protection type Hygienic. Includes axis-5 gear unit and axis-6 drive train unit.
Drive unit, SafeMove 2-supported	3HAC061279-001	Used for IRB 1200 Type B. See Type B of IRB 1200 on page 875 . Includes axis-5 gear unit and axis-6 drive train unit.
Drive unit, Clean Room and SafeMove 2-supported	3HAC061280-001	Used for IRB 1200 Type B. See Type B of IRB 1200 on page 875 . Used with protection type Clean Room. Includes axis-5 gear unit and axis-6 drive train unit.
Drive unit, food grade lubrication	3HAC061281-001	Used for IRB 1200 Type B. See Type B of IRB 1200 on page 875 . Used for robots with food grade lubrication. Includes axis-5 gear unit and axis-6 drive train unit.
M2 variseal sealing	3HAC044641-008	Used with protection class IP67. Used with protection type Foundry Plus. Replace if damaged.
M2 variseal sealing	3HAC044641-009	Replace if damaged.
Radial sealing	3HAB3701-42	Not used with protection class IP40 and protection type Hygienic. Replace if damaged.
Sleeve	3HAC044661-001	Replace if damaged.
Gasket for tubular cover	3HAC058822-001 / 3HAC080709-001	Not used with protection class IP40. Replace if damaged.
Gasket for tubular cable housing cover	3HAC056707-001 / 3HAC080701-001	Not used with protection class IP40. Replace if damaged.
Tubular cable housing	3HAC059695-001	

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4 Repair

4.6.9 Replacing the axis-5 and axis-6 drive unit

Continued

Spare part	Art. no.	Note
Tubular cable housing, Clean Room Tubular cable housing, food grade lubrication	3HAC056143-001	Used with protection type Clean Room. Used for robots with food grade lubrication.
Tubular cable housing, Hygienic	3HAC079692-001	Used with protection type Hygienic.
Protection cover for axis-6 turning disk	3HAC044666-001	Used with protection type Foundry Plus. Replace if damaged.
T40 variseal sealing	3HAC044641-012	Used with protection type Foundry Plus. Replace if damaged.

Required tools and equipment

Equipment, etc.	Article number	Note
Guide pin for tilt unit (axis 5)	3HAC049706-001	Always use three guide pins together!
Axis-5 sealing assembly tool set	3HAC049701-001	Used to refit the radial sealing, if replacement is needed.
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. ⁱ
24 VDC power supply	-	Used to release the motor brakes.
Standard toolkit	-	Content is defined in section Standard toolkit on page 892 .
Flange tightening tool	3HAC079686-001	Used with robots in protection type Hygienic Used for loosen and tighten the seal ring unit on tool flange of the Hygienic robots.
Guide pin for stainless shaft on tool flange	3HAC079684-001	Used with robots in protection type Hygienic

ⁱ The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, manual calibration is used as default.

Required consumables


Consumable	Art. no.	Note
Cleaning agent	-	Loctite 7063
Locking liquid	3HAB7116-1	Loctite 243
Flange sealing	12340011-116	Loctite 574 For robots with protection class IP67 For robots with protection type Foundry Plus
Flange sealing	3HAC026759-003	Sikaflex 521FC

Continues on next page

Consumable	Art. no.	Note
Flange sealing	3HAC073510-001	Trans Clear For robots with protection type Hygienic
Grease	3HAC070875-001	Molykote P1900 For robots with protection type Hygienic

Deciding calibration routine

Decide which calibration routine to be used, based on the information in the table. Depending on which routine is chosen, action might be required prior to beginning the repair work of the robot, see the table.

	Action	Note
1	Decide which calibration routine to use for calibrating the robot. <ul style="list-style-type: none"> Reference calibration. External cable packages (DressPack) and tools can stay fitted on the robot. Fine calibration. All external cable packages (DressPack) and tools must be removed from the robot. 	 Note Calibrating axis 6 always requires tools to be removed from the mounting flange (also for reference calibration) since the mounting flange is used for installation of the calibration tool.
	If the robot is to be calibrated with reference calibration: Find previous reference values for the axis or create new reference values. These values are to be used after the repair procedure is completed, for calibration of the robot. If no previous reference values exist, and no new reference values can be created, then reference calibration is not possible.	Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values. Creating new values requires possibility to move the robot. Read more about reference calibration for Axis Calibration in Reference calibration routine on page 821 .
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the drive unit

Use these procedures to remove the drive unit.

Preparations before removing the axis-5 and axis-6 drive unit

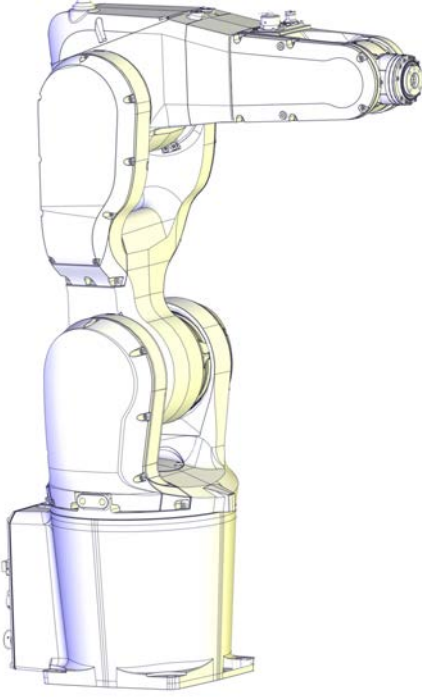


	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	

Continues on next page

4 Repair



4.6.9 Replacing the axis-5 and axis-6 drive unit

Continued

	Action	Note
2	Jog all axes to zero position.	 <p data-bbox="943 1041 1050 1059">xx1300002581</p>
3	 DANGER Turn off all: <ul data-bbox="501 1223 831 1317" style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	
4	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See Cut the paint or surface on the robot before replacing parts on page 160 .	

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Getting access to inside of the wrist unit


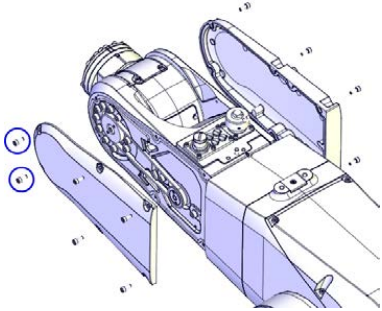

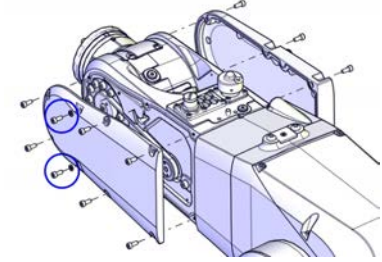

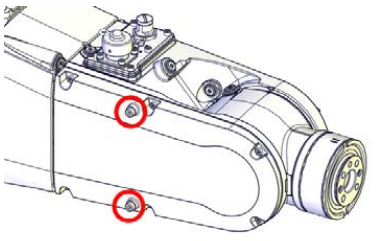
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 CAUTION For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i>	

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4 Repair

4.6.9 Replacing the axis-5 and axis-6 drive unit


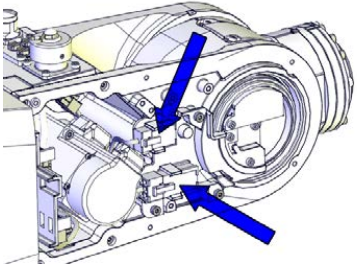
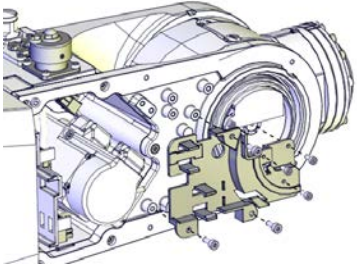

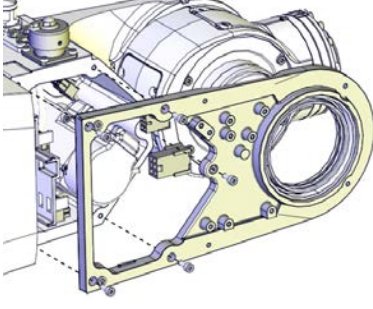
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	Action	Note
3	<p>Remove the covers on each side of the wrist by removing their screws.</p> <p> Note</p> <p>For robots with protection class IP67 For robots with protection type Foundry Plus The two front screws on the left hand side cover (encircled in the figure) have been fitted with locking liquid. The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.</p>	<p>For robots with protection class IP67 For robots with protection type Foundry Plus</p>  <p>xx1300002349</p>
	<p> Note</p> <p>For robots with protection type Clean Room For robots with food grade lubrication The tubular cover (left hand side cover) has two extra screws and washers, as encircled in the figure.</p>	<p>For robots with protection type Clean Room</p>  <p>xx1600001148</p>
	<p> Note</p> <p>For robots with protection type Hygienic The tubular cover (right hand side cover) has two extra screws, as encircled in the figure. Do not remove the two screws when removing the cover. The screws are used for blocking the screw holes rather than fixing the cover to the tubular. Replace if damaged or missing.</p>	<p>For robots with protection type Hygienic</p>  <p>xx2100001406</p>


Removing the tubular cable housing

	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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	Action	Note
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	
3	<p>Snap loose and disconnect the axis-5 FPC connectors.</p>	 <p>xx1300002390</p>
4	<p>Remove the connector plate by first removing the screws.</p>	 <p>xx1300002391</p>
5	<p>Remove the cable housing of the tubular by first removing the screws.</p> <p> Note</p> <p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Hygienic The frame is glued and needs to be pried off.</p>	 <p>xx1300002392</p>

Removing the axis-5 FPC unit


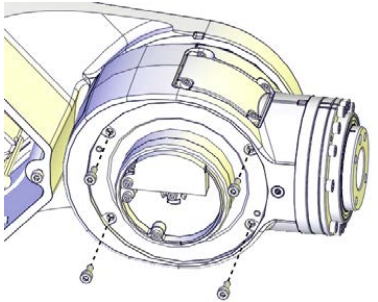
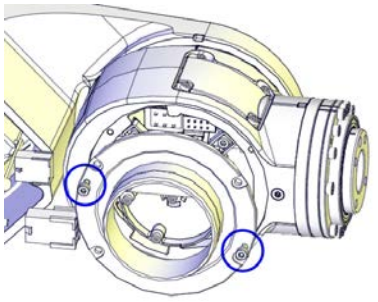
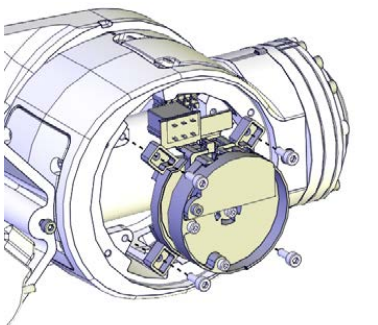
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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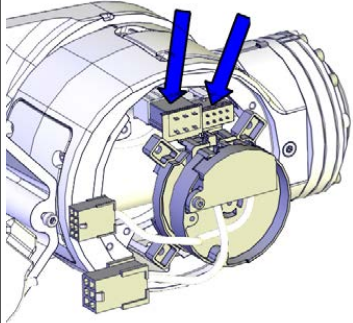
4 Repair

4.6.9 Replacing the axis-5 and axis-6 drive unit



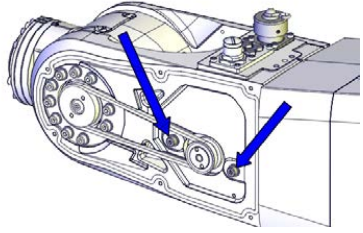
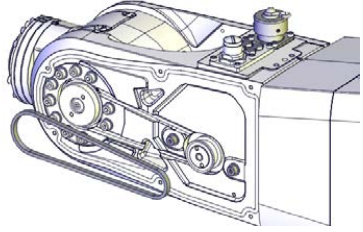
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	Action	Note
2	<p> CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	
3	Remove the sleeve screws.	 <p>xx1300002393</p>
4	Remove the sleeve by screwing in two of the screws into the press out holes to force the sleeve out.	 <p>xx1300002582</p>
5	Remove the FPC unit attachment screws and pull out the FPC unit as far as required for the axis-6 motor connectors to be accessed.	 <p>xx1300002394</p>

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	Action	Note
6	Disconnect the axis-6 motor connectors and remove the FPC unit completely.	 <p>xx1300002395</p>

Removing the drive unit

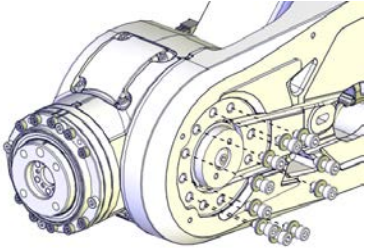
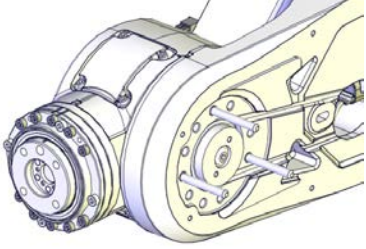
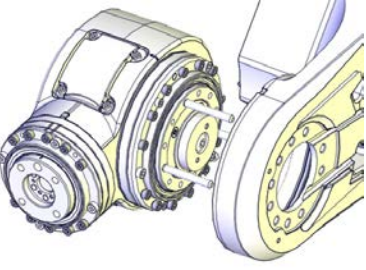
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>CAUTION</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Always cut the paint with a knife and grind the paint edge when disassembling parts of the robot! See <i>Cut the paint or surface on the robot before replacing parts on page 160.</i></p>	
3	Loosen the attachment screws of the axis-5 motor so that the motor can slide sideways.	 <p>xx1300002350</p>
4	Slide the motor sideways to release the tension of the timing belt, and remove the timing belt.	 <p>xx1300002351</p>

Continues on next page

4 Repair

4.6.9 Replacing the axis-5 and axis-6 drive unit

Continued

	Action	Note
5	Support the weight of the drive unit and remove the screws.	 xx1300002469
6	Fit guide pins to the gearbox.	Guide pin for tilt unit (axis 5): 3HAC049706-001 Always use three guide pins together!  xx1400000775
7	Remove the drive unit.	 xx1300002470

Refitting the drive unit

Use these procedures to refit the drive unit.

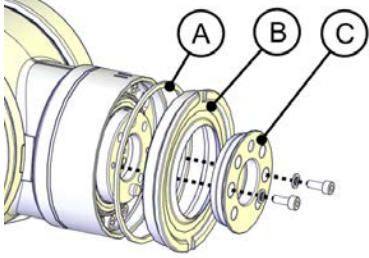
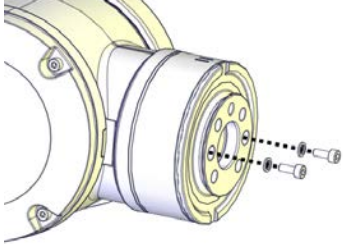
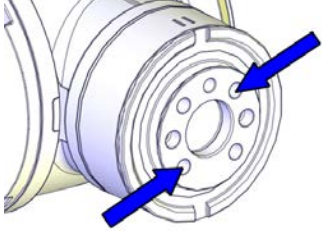
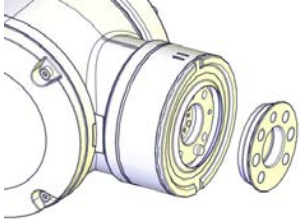
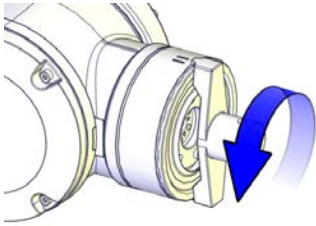
Checking the sealing set on tool flange of Hygienic robots

	Action	Note
1	Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	

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4.6.9 Replacing the axis-5 and axis-6 drive unit

Continued

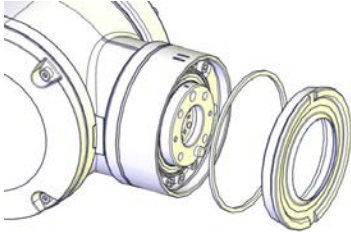
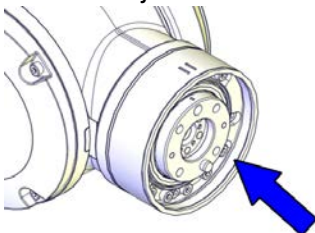
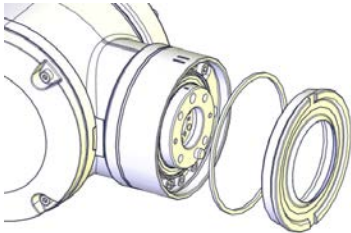
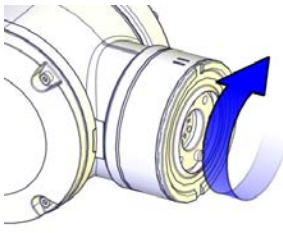
	Action	Note
2	<p>Check the gasket (A), seal ring unit (B) and stainless shaft (C) on the tool flange. Replace if damaged, as described below. If undamaged and properly seated, skip to the next procedure table.</p>	 <p>xx2100001448</p>
3	<p>Remove the screws and washers.</p>	 <p>xx2100001449</p>
4	<p>Insert two M4 screws to the pressed out holes and press out the stainless shaft.</p>	 <p>xx2100001450</p>  <p>xx2100001451</p>
5	<p>Place the flange tightening tool together with a 3/8" (10 mm) socket spanner on the seal ring unit and loosen the unit.</p>	<p>Flange tightening tool: 3HAC079686-001</p>  <p>xx2100001452</p>

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4 Repair

4.6.9 Replacing the axis-5 and axis-6 drive unit

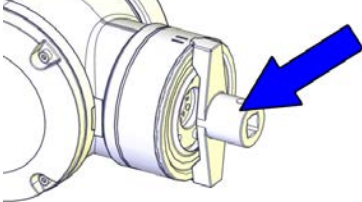
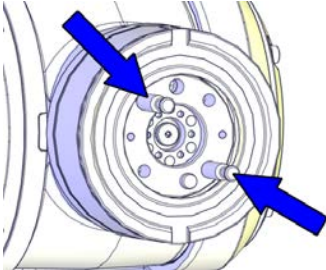
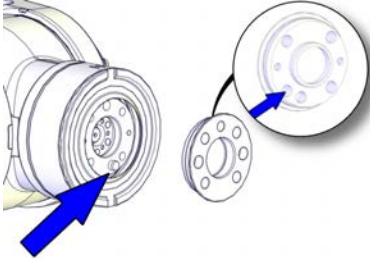
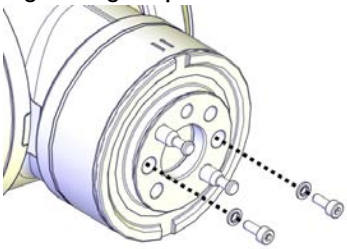
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	Action	Note
6	Remove the gasket and seal ring unit.	 xx2100001453
7	Replace the damaged parts with new ones.	
8	Apply a little grease to the screw thread.	Grease: Molykote P1900  xx2100001454
9	Put the gasket in place and then screw the seal ring unit.	 xx2100001453  xx2100001455

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4.6.9 Replacing the axis-5 and axis-6 drive unit

Continued

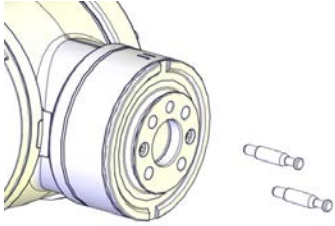
	Action	Note
10	Place the flange tightening tool together with a 3/8" (10 mm) socket spanner on the seal ring unit and tighten the unit.	<p>Flange tightening tool: 3HAC079686-001 Tightening torque: 6 Nm</p>  <p>xx2100001456</p>
11	Fit two guide pins to the tool flange.	<p>Guide pin for stainless shaft on tool flange: 3HAC079684-001</p>  <p>xx2100001457</p>
12	Place the stainless shaft on the tool flange with guidance of the two guide pins. Make sure the pin hole on the shaft aligned with the pin on the tool flange.	 <p>xx2100001458</p>
13	Secure with screws and washers.	<p>Tightening torque: 1.5 Nm</p>  <p>xx2100001459</p>

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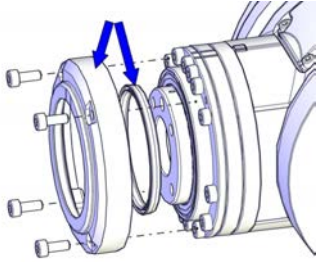

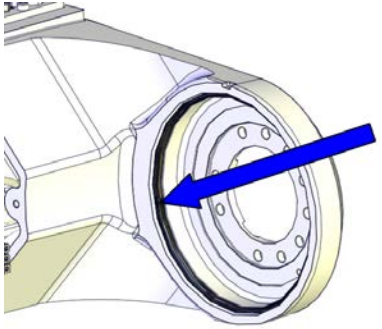
4 Repair

4.6.9 Replacing the axis-5 and axis-6 drive unit

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	Action	Note
14	Remove the guide pins.	 <p>xx2100001460</p>


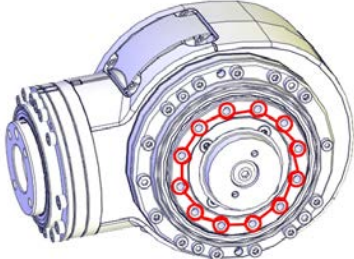
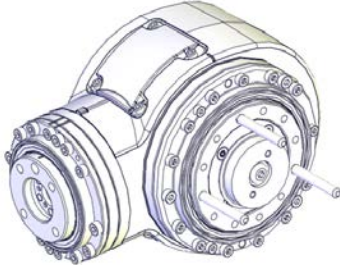
Refitting the axis-5 and axis-6 drive unit

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>For robots with protection type Foundry Plus</p> <p>Check the protection cover for turning disk and T40 variseal sealing.</p> <p>Replace if damaged.</p>	<p>Protection cover for axis-6 turning disk: 3HAC044666-001</p> <p>T40 variseal sealing: 3HAC044641-012</p>  <p>xx1600001126</p>
3	<p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <p>Check the sealing.</p> <p>Replace if damaged.</p> <p> CAUTION</p> <p>Do not fit M2 variseal sealing on robots in other protection class or protection types.</p>	<p>M2 variseal sealing: 3HAC044641-008</p>  <p>xx1300002493</p>

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4.6.9 Replacing the axis-5 and axis-6 drive unit

Continued

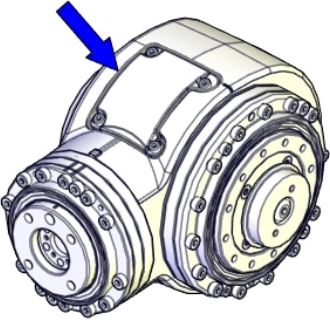
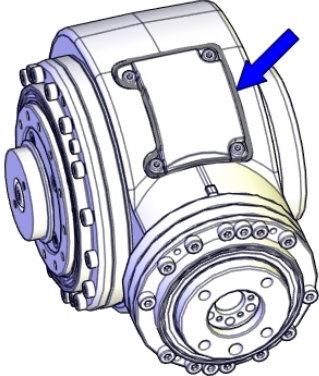

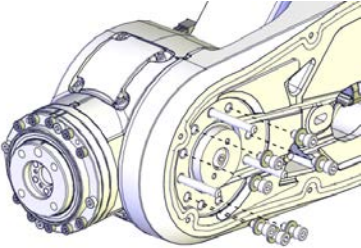

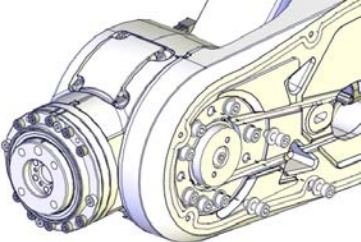
	Action	Note
4	<p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p> <p>Apply flange sealing on the mounting surfaces of the drive unit.</p> <p> Note</p> <p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Wipe clean the overflowing sealant if there is any.</p>	<p>For robots not in protection type Hygienic Flange sealant, SikaFlex 521FC</p> <p>For robots with protection type Hygienic Flange sealant, Trans Clear</p>  <p>xx1400001404</p>
5	<p>Fit guide pins to the axis-5 gearbox.</p>	<p>Guide pin for tilt unit (axis 5): 3HAC049706-001</p>  <p>xx1300002568</p>

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4 Repair

4.6.9 Replacing the axis-5 and axis-6 drive unit


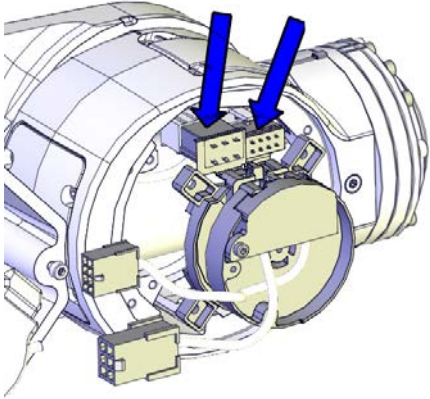

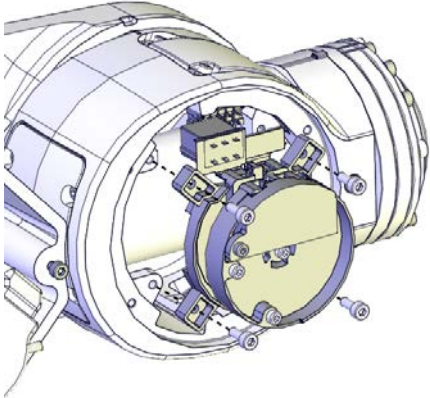
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	Action	Note
6	<p>For robots with protection type Clean Room For robots with food grade lubrication Make sure the sealing to the tilt covers is intact before the refitting. For robots with protection type Hygienic Hygienic robots do not have tilt covers.</p>	 <p>xx160000219</p>  <p>xx160000220</p>
7	<p>Refit the drive unit and secure with the screws and washers. Secure the screws but do not tighten yet.</p> <p> Note</p> <p>If there is glue on the screw, please clean it or replace it with a new one.</p>	<p>Attachment screws: 3HAB3409-236 (M4x10).</p>  <p>xx1300002569</p> <p> Note</p> <p>Only use specified screws, never replace them with other screws.</p>
8	<p>Remove the guide pins and refit the remaining screws and washers.</p>	 <p>xx1300002570</p>

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	Action	Note
9	Cross-tighten all the screws with torque 1 Nm first, then with 2 Nm, with 4 Nm, and finally with 4.5 Nm.	

Refitting the axis-5 FPC unit


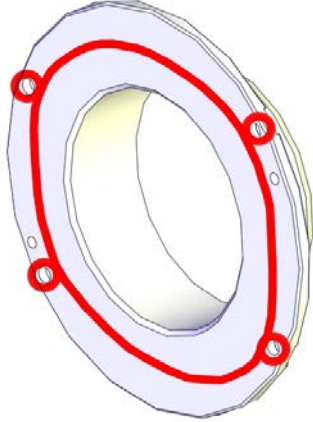
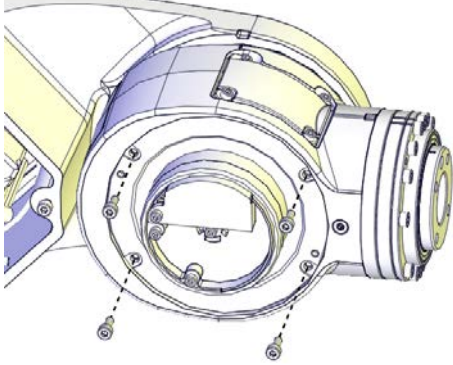
	Action	Note
1	 WARNING It is important that axis 5 is in zero position when fitting the FPC unit. Make sure that the FPC is in zero position and does not get twisted during refitting.	
2	For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.	
3	Reconnect the axis-6 motor connectors to the FPC unit.	 <p>xx1300002395</p>
4	Carefully refit the FPC unit and secure with screws.  Note Check that the FPC unit is at the zero position when refitting it.	Tightening torque: 0.3 Nm.  <p>xx1300002394</p>

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4 Repair

4.6.9 Replacing the axis-5 and axis-6 drive unit


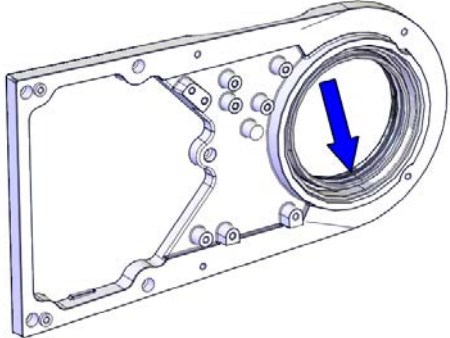
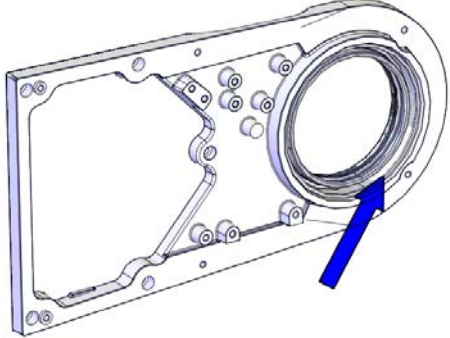
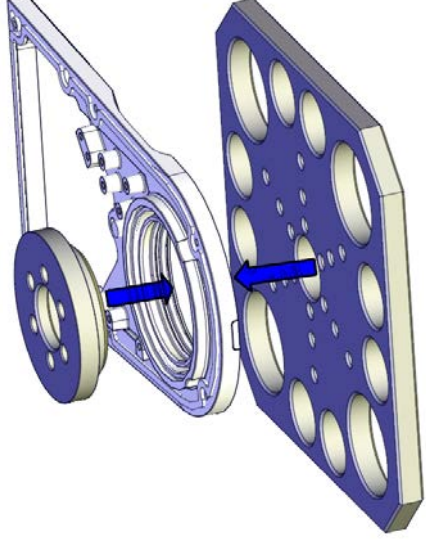
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	Action	Note
5	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Hygienic</p> <p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063. Apply flange sealing on the mounting surfaces of the sleeve.</p> <p> Note</p> <p>For Hygienic robots, wipe clean the overflowing flange sealing if there is any.</p>	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Hygienic</p> <p>Flange sealing, Loctite 574 Flange sealing, Trans Clear</p>  <p>xx1300002609</p>
6	<p>Refit the sleeve and secure with screws. Replace if damaged.</p>	<p>Sleeve: 3HAC044661-001 Tightening torque: 1.5 Nm.</p>  <p>xx1300002393</p>

Checking the tubular cable housing sealings

	Action	Note
1	<p>For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	

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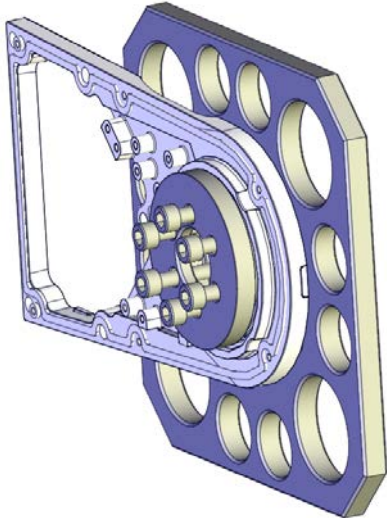
	Action	Note
2	<p>Check the sealing. Replace if damaged.</p> <p> CAUTION</p> <p>Do not fit M2 variseal sealing on Clean Room, food grade lubrication and Hygienic robots.</p>	<p>M2 variseal sealing: 3HAC044641-009</p>  <p>xx1300002396</p>
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication</p> <p>Check the radial sealing. Replace if damaged, as described below. If undamaged and properly seated, skip to the next procedure table.</p>	<p>Radial sealing: 3HAB3701-42</p>  <p>xx1300002608</p>
4	<p>Apply a little grease to the sealing when replacing the radial sealing and wipe clean after the replacement.</p>	
5	<p>Fit the radial sealing into the tubular cable housing.</p>	
6	<p>Fit the circular part of the radial sealing assembly tool against the radial sealing.</p>	<p>Axis-5 sealing assembly tool set: 3HAC049701-001</p>
7	<p>Fit the tool plate to the other side of the tubular cable housing with the six screws M6x40.</p>	 <p>xx1400000485</p>

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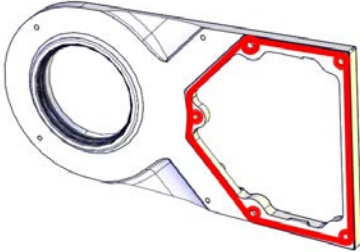
4 Repair

4.6.9 Replacing the axis-5 and axis-6 drive unit

Continued

	Action	Note
8	Screw the screws, little by little, to press the sealing into place.	 <p data-bbox="943 846 1050 869">xx140000486</p>
9	Remove the assembly tool.	
10	Check that the sealing is undamaged and properly fitted.	

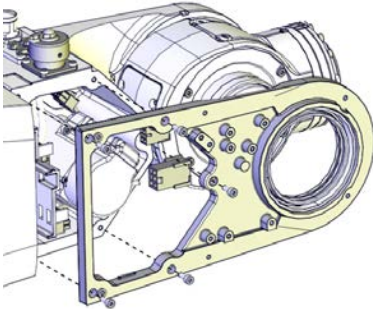
Refitting the tubular cable housing

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <p>For robots with protection type Hygienic</p> <p>Remove residual locking liquid and other pollutants with cleaning agent Loctite 7063.</p> <p>Apply flange sealing on the mounting surfaces of the tubular cable housing.</p> <p> Note</p> <p>For Hygienic robots, wipe clean the overflowing flange sealing if there is any.</p>	<p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <p>Flange sealant, SikaFlex 521FC</p> <p>For robots with protection type Hygienic</p> <p>Flange sealant, Trans Clear</p>  <p data-bbox="1027 1845 1134 1868">xx1300002610</p>

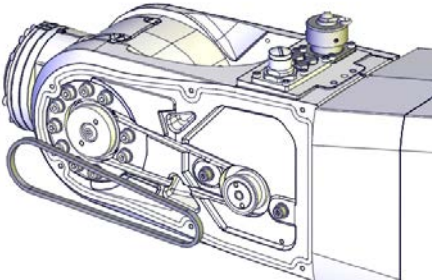

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4.6.9 Replacing the axis-5 and axis-6 drive unit

Continued

	Action	Note
3	Refit the tubular cable housing with the screws.	<p>Tightening torque: 1.5 Nm.</p> <p>Tubular cable housing: 3HAC059695-001</p> <p>Tubular cable housing, Clean Room</p> <p>Tubular cable housing, food grade lubrication : 3HAC056143-001</p> <p>Tubular cable housing, Hygienic: 3HAC079692-001</p>  <p>xx1300002392</p>

Securing the axis-5 motor and timing belt

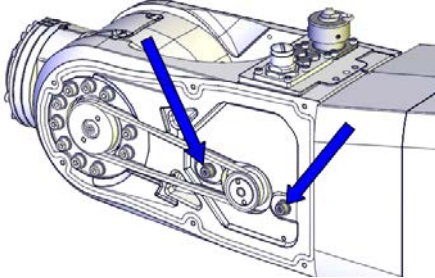
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	Refit the timing belt on the pulley.	 <p>xx1300002351</p>
3	Move the motor to a position where a good timing belt tension is reached (F = 26 N).	 Note Do not stretch the timing belt too much!

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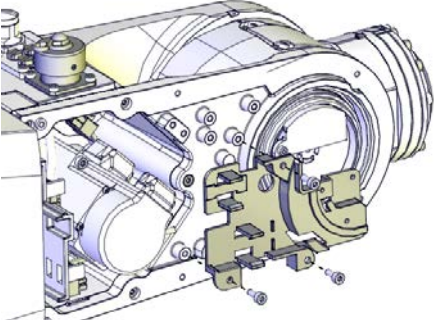
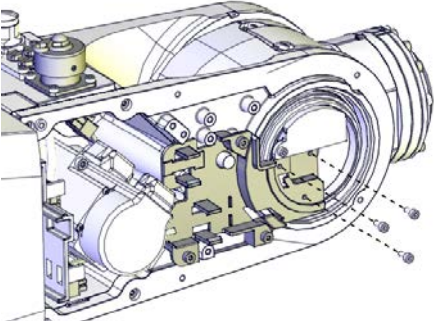
4 Repair

4.6.9 Replacing the axis-5 and axis-6 drive unit

Continued

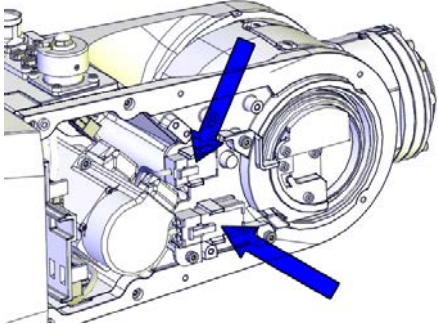
	Action	Note
4	Secure the motor with its attachment screws.	 <p data-bbox="943 618 1050 636">xx1300002350</p> <p data-bbox="943 651 1238 680">Tightening torque: 3.5 Nm.</p>

Refitting the connector plate

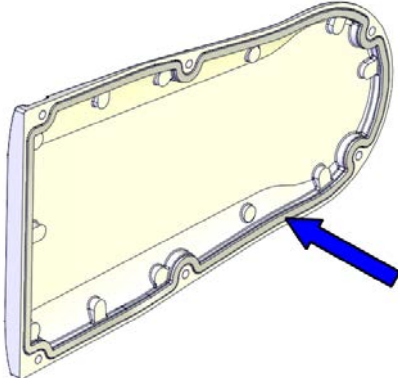
	Action	Note
1	<p data-bbox="464 813 900 869">For robots with protection type Clean Room</p> <p data-bbox="464 875 906 902">For robots with food grade lubrication</p> <p data-bbox="464 909 932 936">For robots with protection type Hygienic</p> <p data-bbox="464 943 932 1021">Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	Refit the connector plate and secure with the M3 screws.	<p data-bbox="943 1043 1238 1072">Tightening torque: 0.3 Nm.</p>  <p data-bbox="943 1417 1050 1435">xx1400001401</p>
3	Secure the three M2.5 screws.	<p data-bbox="943 1476 1238 1505">Tightening torque: 0.3 Nm.</p>  <p data-bbox="943 1850 1050 1868">xx1400001402</p>

Continues on next page

Connecting the axis-5 motor FPC connectors

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>Connect the axis-5 FPC connectors and snap them to their holders.</p>	 <p>xx1300002390</p>

Refitting the wrist covers

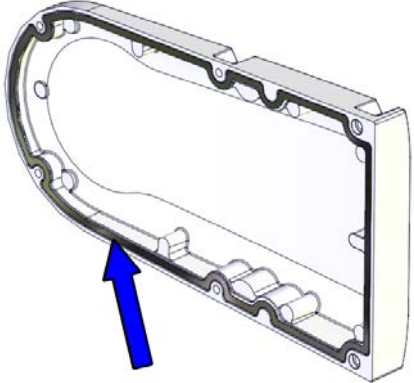
	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Clean the joints that have been opened and wipe the parts free from particles with spirit on a lint free.</p>	
2	<p>For robots with protection class IP67</p> <p>For robots with protection type Foundry Plus</p> <p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic</p> <p>Check the tubular cover gasket.</p> <p>Replace if damaged.</p>	<p>Gasket for tubular cover: 3HAC058822-001 (not Hygienic robots) / 3HAC080709-001 (Hygienic robots)</p>  <p>xx1400000034</p>

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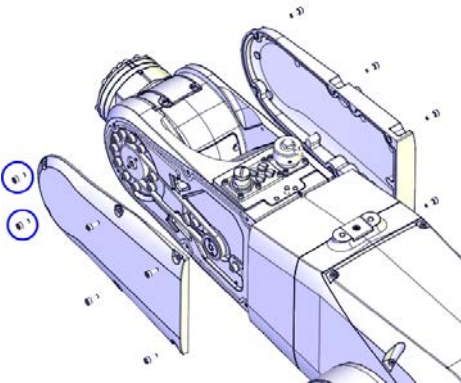
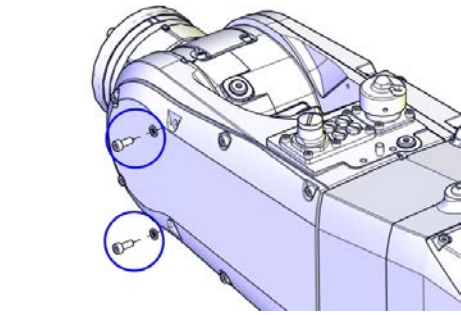


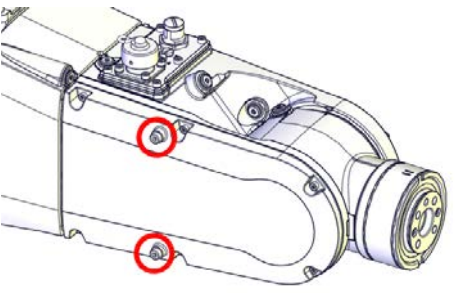
4 Repair

4.6.9 Replacing the axis-5 and axis-6 drive unit

Continued

	Action	Note
3	<p>For robots with protection class IP67 For robots with protection type Foundry Plus For robots with protection type Clean Room For robots with food grade lubrication For robots with protection type Hygienic</p> <p>Check the tubular cable housing cover gasket. Replace if damaged.</p>	<p>Gasket for tubular cable housing cover: 3HAC056707-001 (not Hygienic robots) / 3HAC080701-001 (Hygienic robots)</p>  <p>xx140000345</p>

Continues on next page

	Action	Note
4	<p>Refit the both covers to the wrist.</p> <p>For robots with protection class IP67 For robots with protection type Foundry Plus Apply locking liquid Loctite 243 to the two front screws on the left hand side cover, encircled in the figure. Remember to refit the extra two screws and washers to the tubular cover.</p>	<p>Screws: 3HAB3409-207 (M3x8). Tightening torque: 1.5 Nm.</p> <p>For robots with protection class IP67 For robots with protection type Foundry Plus</p>  <p>xx1300002349</p>
	<p>For robots with protection type Clean Room For robots with food grade lubrication Remember to refit the extra two screws and washers to the tubular cover.</p>	<p>For robots with protection type Clean Room For robots with food grade lubrication</p>  <p>xx1600001153</p> <p> Note Only use specified screws, never replace them with other screws.</p>
	<p> Note For robots with protection type Hygienic Check the two extra screws on the tubular cover (right hand side cover), as encircled in the figure. Replace if damaged or missing.</p>	<p>For robots with protection type Hygienic</p>  <p>xx2100001406</p>



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4 Repair

4.6.9 Replacing the axis-5 and axis-6 drive unit

Continued

Concluding procedure

	Action	Note
1	<p>For robots with protection type Clean Room</p> <p>For robots with food grade lubrication</p> <p>For robots with protection type Hygienic Clean, seal and paint the joints that have been opened. See Cut the paint or surface on the robot before replacing parts on page 160.</p> <p> Note</p> <p>After all repair work, wipe the robot free from particles with spirit on a lint free cloth.</p>	
2	Recalibrate the robot.	Calibration information is included in section Calibration on page 807 .
3	<p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

5 Calibration

5.1 Introduction to calibration

5.1.1 Introduction and calibration terminology

Calibration information

This chapter includes general information about the recommended calibration methods and also the detailed procedures for updating the revolution counters, checking the calibration position etc.

Detailed instructions of how to perform Axis Calibration are given on the FlexPendant during the calibration procedure. To prepare calibration with Axis Calibration method, see [Calibrating with Axis Calibration method on page 820](#).

Calibration terminology

Term	Definition
Calibration method	A collective term for several methods that might be available for calibrating the ABB robot. Each method contains calibration routines.
Synchronization position	Known position of the complete robot where the angle of each axis can be checked against visual synchronization marks.
Calibration position	Known position of the complete robot that is used for calibration of the robot.
Standard calibration	A generic term for all calibration methods that aim to move the robot to calibration position.
Fine calibration	A calibration routine that generates a new zero position of the robot.
Reference calibration	<p>A calibration routine that in the first step generates a reference to current zero position of the robot. The same calibration routine can later on be used to recalibrate the robot back to the same position as when the reference was stored.</p> <p>This routine is more flexible compared to fine calibration and is used when tools and process equipment are installed.</p> <p>Requires that a reference is created before being used for recalibrating the robot.</p> <p>Requires that the robot is dressed with the same tools and process equipment during calibration as during creation of the reference values.</p>
Update revolution counter	A calibration routine to make a rough calibration of each manipulator axis.
Synchronization mark	Visual marks on the robot axes. When marks are aligned, the robot is in synchronization position.

5 Calibration


5.1.2 Calibration methods

5.1.2 Calibration methods

Overview

This section specifies the different types of calibration and the calibration methods that are supplied by ABB.

Types of calibration

Type of calibration	Description	Calibration method
Standard calibration	<p>The calibrated robot is positioned at calibration position.</p> <p>Standard calibration data is found on the SMB (serial measurement board) or EIB in the robot. For robots with RobotWare 5.04 or older, the calibration data is delivered in a file, calib.cfg, supplied with the robot at delivery. The file identifies the correct resolver/motor position corresponding to the robot home position.</p>	Axis Calibration or manual calibration ⁱ
Absolute accuracy calibration (optional)	<p>Based on standard calibration, and besides positioning the robot at synchronization position, the Absolute accuracy calibration also compensates for:</p> <ul style="list-style-type: none"> • Mechanical tolerances in the robot structure • Deflection due to load <p>Absolute accuracy calibration focuses on positioning accuracy in the Cartesian coordinate system for the robot.</p> <p>Absolute accuracy calibration data is found on the SMB (serial measurement board) in the robot.</p> <p>For robots with RobotWare 5.05 or older, the absolute accuracy calibration data is delivered in a file, absacc.cfg, supplied with the robot at delivery. The file replaces the calib.cfg file and identifies motor positions as well as absolute accuracy compensation parameters.</p> <p>A robot calibrated with Absolute accuracy has a sticker next to the identification plate of the robot.</p> <p>A robot calibrated with Absolute accuracy has the option information printed on its name plate.</p> <p>To regain 100% Absolute accuracy performance, the robot must be recalibrated for absolute accuracy after repair or maintenance that affects the mechanical structure.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;">  </div> <p>xx0400001197</p>	CalibWare

Continues on next page

Type of calibration	Description	Calibration method
Optimization	<p>Optimization of TCP reorientation performance. The purpose is to improve reorientation accuracy for continuous processes like welding and gluing.</p> <p>Wrist optimization will update standard calibration data for axes 4 and 5.</p>	Wrist Optimization

- i The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, manual calibration is used as default.

Brief description of calibration methods

Axis Calibration method

Axis Calibration is a standard calibration method for calibration of IRB 1200. It is the recommended method in order to achieve proper performance.

The following routines are available for the Axis Calibration method:

- Fine calibration
- Update revolution counters
- Reference calibration

The calibration equipment for Axis Calibration is delivered as a toolkit.

An introduction to the calibration method is given in this manual, see [Calibrating with Axis Calibration method on page 820](#).

The actual instructions of how to perform the calibration procedure and what to do at each step is given on the FlexPendant. You will be guided through the calibration procedure, step by step.

Wrist Optimization method

Wrist Optimization is a method for improving reorientation accuracy for continuous processes like welding and gluing and is a complement to the standard calibration method.

The following routines are available for the Wrist Optimization method:

- Wrist Optimization

The actual instructions of how to perform the calibration procedure and what to do at each step is given on the FlexPendant. You will be guided through the calibration procedure, step by step.

Manual calibration method

With the manual calibration method, the robot's axes are positioned in specific calibration positions using calibration tools. Under this condition, the position of the axis to be calibrated is pre-determined. The axes must be calibrated one at a time.

CalibWare - Absolute Accuracy calibration

The CalibWare tool guides through the calibration process and calculates new compensation parameters. This is further detailed in the *Application manual - CalibWare Field*.

Continues on next page

5 Calibration

5.1.2 Calibration methods

Continued

If a service operation is done to a robot with the option Absolute Accuracy, a new absolute accuracy calibration is required in order to establish full performance. For most cases after replacements that do not include taking apart the robot structure, standard calibration is sufficient.

The Absolute Accuracy option varies according to the robot mounting position. This is printed on the robot name plate for each robot. The robot must be in the correct mounting position when it is recalibrated for absolute accuracy.

References

Article numbers for the calibration tools are listed in the section [Special tools on page 893](#).

5.1.3 When to calibrate

When to calibrate

The system must be calibrated if any of the following situations occur.

The resolver values are changed

If resolver values are changed, the robot must be re-calibrated using the calibration methods supplied by ABB. Calibrate the robot carefully with standard calibration, according to information in this manual.

If the robot has *absolute accuracy* calibration, it is also recommended, but not always necessary to calibrate for new absolute accuracy.

The resolver values will change when parts affecting the calibration position are replaced on the robot, for example motors or parts of the transmission.

The revolution counter memory is lost

If the revolution counter memory is lost, the counters must be updated. See [Updating revolution counters on page 815](#). This will occur when:

- The battery is discharged
- A resolver error occurs
- The signal between a resolver and measurement board is interrupted
- A robot axis is moved with the control system disconnected

The revolution counters must also be updated after the robot and controller are connected at the first installation.

The robot is rebuilt

If the robot is rebuilt, for example, after a crash or when the reach ability of a robot is changed, it needs to be re-calibrated for new resolver values.

If the robot has *absolute accuracy* calibration, it needs to be calibrated for new absolute accuracy.

Robot is not floor mounted

The original calibration data delivered with the robot is generated when the robot is floor mounted. If the robot is not floor mounted, then the robot accuracy could be affected. The robot needs to be calibrated after it is mounted.

5 Calibration

5.2.1 Synchronization marks and synchronization position for axes

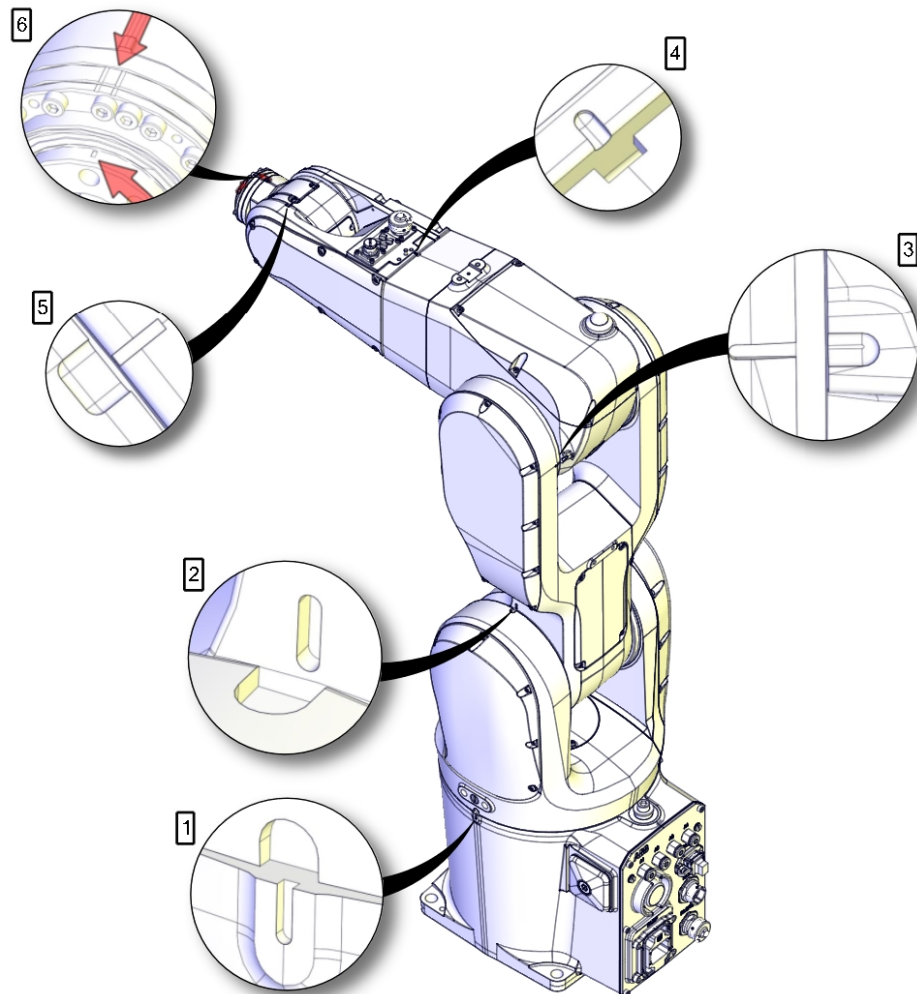
5.2 Synchronization marks and axis movement directions

5.2.1 Synchronization marks and synchronization position for axes

Introduction

This section shows the position of the synchronization marks and the synchronization position for each axis.

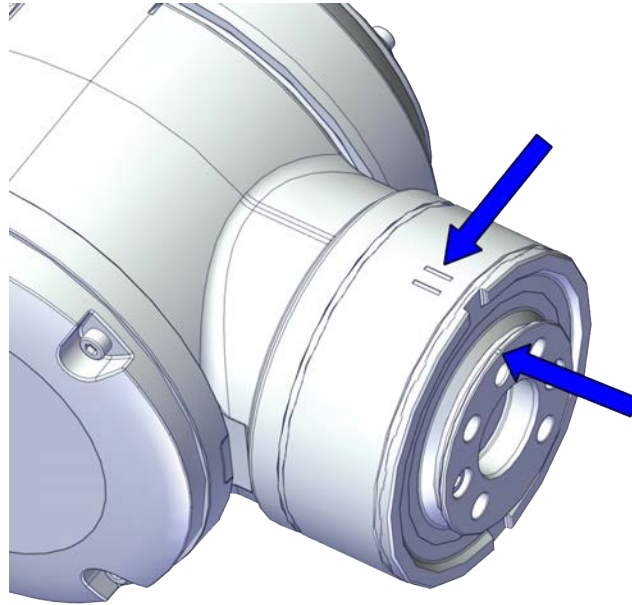
Synchronization marks, IRB 1200



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Synchronization marks at axis 6 on Hygienic robots



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5 Calibration

5.2.2 Calibration movement directions for all axes

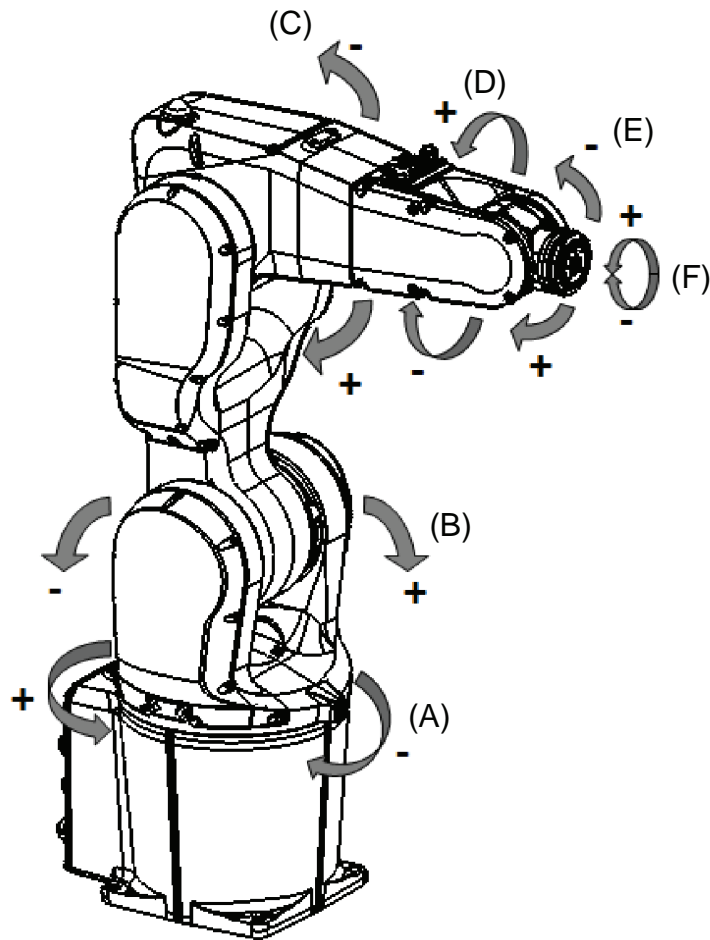
5.2.2 Calibration movement directions for all axes

Overview

When calibrating, the axis must consistently be run towards the calibration position in the same direction in order to avoid position errors caused by backlash in gears and so on. Positive directions are shown in the graphic below.

Calibration service routines will handle the calibration movements automatically and these might be different from the positive directions shown below.

Manual movement directions



xx1300000365

Position	Description	Position	Description
A	Axis 1	B	Axis 2
C	Axis 3	D	Axis 4
E	Axis 5	F	Axis 6

5.3 Updating revolution counters

5.3.1 Updating revolution counters on IRC5 robots

Introduction

This section describes how to do a rough calibration of each manipulator axis by updating the revolution counter for each axis, using the FlexPendant.

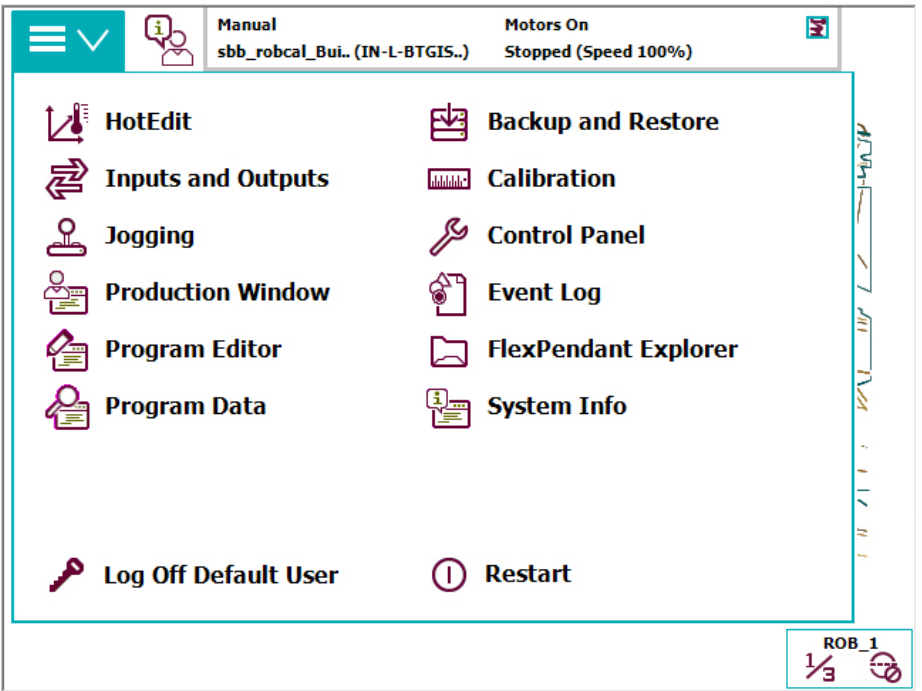
Step 1 - Manually running the manipulator to the synchronization position

Use this procedure to manually run the manipulator to the synchronization position.

	Action	Note
1	Select axis-by-axis motion mode.	
2	Jog the manipulator to align the synchronization marks.	See Synchronization marks and synchronization position for axes on page 812 .
3	When all axes are positioned, update the revolution counter.	Step 2 - Updating the revolution counter with the FlexPendant on page 815 .

Step 2 - Updating the revolution counter with the FlexPendant

Use this procedure to update the revolution counter with the FlexPendant (IRC5).

	Action
1	<p>On the ABB menu, tap Calibration.</p>  <p>The screenshot shows the ABB FlexPendant menu with the following options: HotEdit, Backup and Restore, Inputs and Outputs, Calibration, Jogging, Control Panel, Production Window, Event Log, Program Editor, FlexPendant Explorer, Program Data, System Info, Log Off Default User, and Restart. The 'Calibration' option is highlighted with a red box. The top status bar shows 'Manual sbb_robcal_Bui.. (IN-L-BTGIS..)' and 'Motors On Stopped (Speed 100%)'. The bottom right corner shows 'ROB_1 1/3'.</p>

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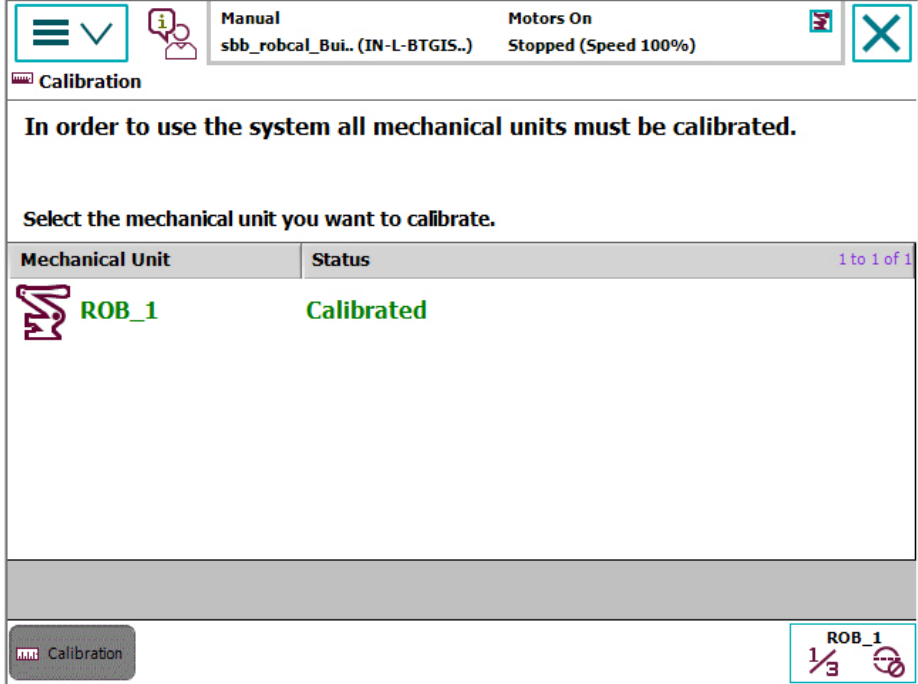
5 Calibration

5.3.1 Updating revolution counters on IRC5 robots

Continued

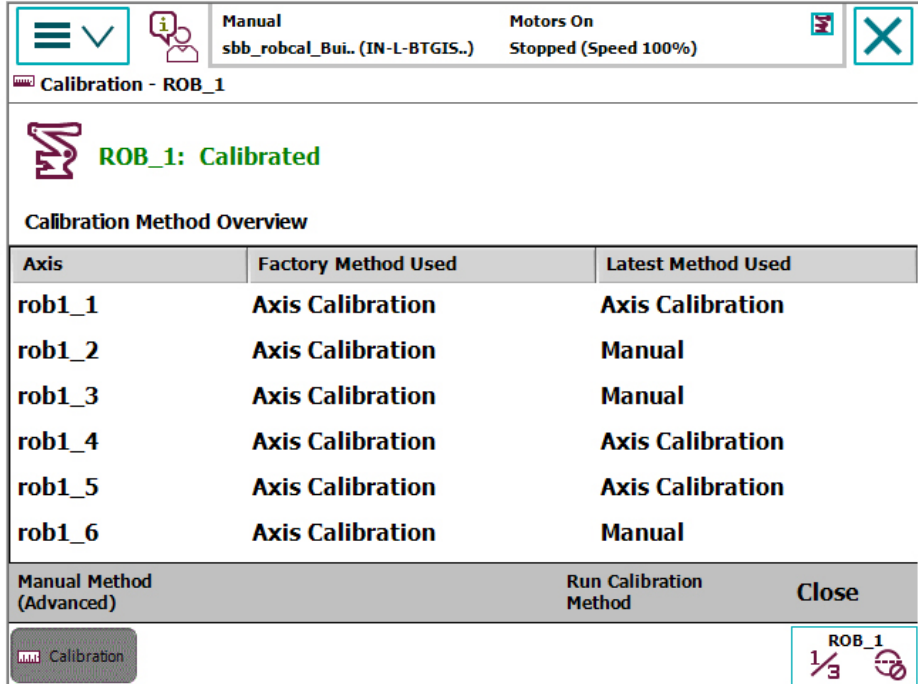
Action

2 All mechanical units connected to the system are shown with their calibration status. Tap the mechanical unit in question.



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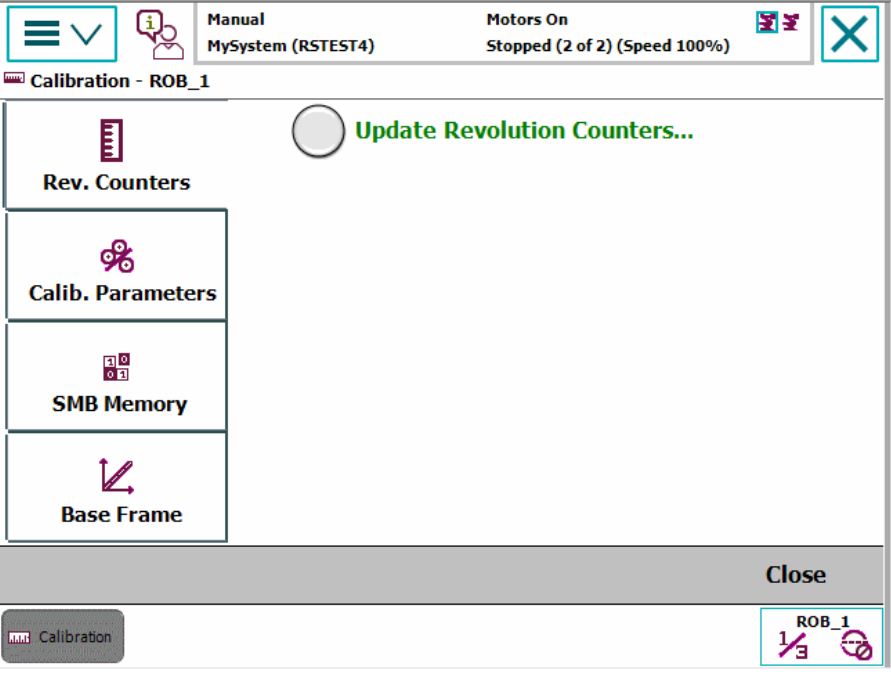

3 This step is valid for RobotWare 6.04 and later. Calibration method used at factory for each axis is shown, as well as calibration method used during last field calibration. Tap Manual Method (Advanced).



xx150000944

Axis	Factory Method Used	Latest Method Used
rob1_1	Axis Calibration	Axis Calibration
rob1_2	Axis Calibration	Manual
rob1_3	Axis Calibration	Manual
rob1_4	Axis Calibration	Axis Calibration
rob1_5	Axis Calibration	Axis Calibration
rob1_6	Axis Calibration	Manual

Continues on next page

	Action
4	<p>A screen is displayed, tap Rev. Counters.</p> 
5	<p>Tap Update Revolution Counters....</p> <p>A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions:</p> <ul style="list-style-type: none"> • Tap Yes to update the revolution counters. • Tap No to cancel updating the revolution counters. <p>Tapping Yes displays the axis selection window.</p>
6	<p>Select the axis to have its revolution counter updated by:</p> <ul style="list-style-type: none"> • Ticking in the box to the left • Tapping Select all to update all axes. <p>Then tap Update.</p>
7	<p>A dialog box is displayed, warning that the updating operation cannot be undone:</p> <ul style="list-style-type: none"> • Tap Update to proceed with updating the revolution counters. • Tap Cancel to cancel updating the revolution counters. <p>Tapping Update updates the selected revolution counters and removes the tick from the list of axes.</p>
8	<p> CAUTION</p> <p>If a revolution counter is incorrectly updated, it will cause incorrect manipulator positioning, which in turn may cause damage or injury!</p> <p>Check the synchronization position very carefully after each update. See Checking the synchronization position on page 867.</p>

5 Calibration

5.3.2 Updating revolution counters on OmniCore robots

5.3.2 Updating revolution counters on OmniCore robots

Introduction

This section describes how to do a rough calibration of each manipulator axis by updating the revolution counter for each axis, using the FlexPendant.



Step 1 - Manually running the manipulator to the synchronization position

Use this procedure to manually run the manipulator to the synchronization position.


	Action	Note
1	Select axis-by-axis motion mode.	
2	Jog the manipulator to align the synchronization marks.	See Synchronization marks and synchronization position for axes on page 812 .
3	When all axes are positioned, update the revolution counter.	Step 2 - Updating the revolution counter with the FlexPendant on page 818 .

Step 2 - Updating the revolution counter with the FlexPendant

Use this procedure to update the revolution counter with the FlexPendant (OmniCore).

	Action
1	On the start screen, tap Calibrate .
2	Select Calibration from the menu. The Mechanical Units page displays a list of available mechanical units.  Note This step is required only if you are not already in the Mechanical Unit page when you open Calibrate .  Note The Mechanical Unit page is displayed only if there are more than one mechanical unit available. Otherwise, the calibration summary page for the available mechanical unit is displayed.
3	Select the mechanical unit for which revolution counter need to be updated.
4	The calibration summary page for the selected mechanical unit is displayed. Calibration method used at factory for each axis is shown, as well as calibration method used during last field calibration.
5	Tap Calibration Methods on the right pane. The calibration options are displayed.
6	Tap Revolution Counters .
7	In the Selection column select the axes for which revolution counters need to be updated.
8	Tap Update . A dialog box is displayed, warning that the updating operation cannot be undone: <ul style="list-style-type: none">• Tap Update to proceed with updating the revolution counters.• Tap Cancel to cancel updating the revolution counters. Tapping Update and a confirmation window is displayed.

Continues on next page

Action	
9	Tap OK. The revolution counter for the selected axes is updated.
10	 CAUTION If a revolution counter is incorrectly updated, it will cause incorrect manipulator positioning, which in turn may cause damage or injury! Check the synchronization position very carefully after each update. See Checking the synchronization position on page 867 .

5 Calibration

5.4.1 Description of Axis Calibration

5.4 Calibrating with Axis Calibration method

5.4.1 Description of Axis Calibration

Instructions for Axis Calibration procedure given on the FlexPendant

The actual instructions of how to perform the calibration procedure and what to do at each step is given on the FlexPendant. You will be guided through the calibration procedure, step by step.

This manual contains a brief description of the method, additional information to the information given on the FlexPendant, article number for the tools and images of where to fit the calibration tools on the robot.

Overview of the Axis Calibration procedure

The Axis Calibration procedure applies to all axes, and is performed on one axis at the time. The robot axes are both manually and automatically moved into position, as instructed on the FlexPendant.

Bushings are installed on each robot axis at delivery, for installation of the calibration tools. For axis 6 calibration there is one bushing on the wrist and one mounting hole on the tool flange.

The Axis Calibration procedure described roughly:

- 1 A removable calibration tool is inserted by the operator into a calibration bushing on the axis chosen for calibration, according to instructions on the FlexPendant.



WARNING

Calibrating the robot with Axis Calibration requires special calibration tools from ABB. Using other pins in the calibration bushings may cause severe damage to the robot and/or personnel.



WARNING

The calibration tool must be fully inserted into the calibration bushing, until the steel spring ring snaps into place.

- 2 During the calibration procedure, RobotWare moves the robot axis chosen for calibration so that the calibration tools get into contact. RobotWare records values of the axis position and repeats the coming-in-contact procedure several times to get an exact value of the axis position.



WARNING

Risk of pinching! The contact force for large robots can be up to 150 kg. Keep a safe distance to the robot.

Continues on next page

- 3 The axis position is stored in RobotWare with an active choice from the operator.

Routines in the calibration procedure

The following routines are available in the Axis Calibration procedure, given at the beginning of the procedure on the FlexPendant.

Fine calibration routine

Choose this routine to calibrate the robot when there are no tools, process cabling or equipment fitted to the robot.

Reference calibration routine

Choose this routine to create reference values and to calibrate the robot when the robot is dressed with tools, process cabling or other equipment.

Also choose this routine if the robot is wall mounted or suspended.



Note

When calibrating the robot with the reference calibration routine, the robot must be dressed with the same tools, process cabling and any other equipment as when the reference values were created.

If calibrating the robot with reference calibration there must be reference values created before repair is made to the robot, if values are not already available. Creating new values requires possibility to move the robot. The reference values contain positions of all axes, torque of axes and technical data about the tool installed. A benefit with reference calibration is that the current state of the robot is stored and not the state when the robot left the ABB factory. The reference value will be named according to tool name, date etc.

Follow the instructions given in the reference calibration routine on the FlexPendant to create reference values.

When reference calibration is performed, the robot is restored to the status given by the reference values.

Update revolution counters

Choose this routine to make a rough calibration of each manipulator axis by updating the revolution counter for each axis, using the FlexPendant.

Validation

In the mentioned routines, it is also possible to validate the calibration data.

Position of robot axes

The robot axes should be positioned close to 0 degrees before commencing the calibration program. The axis chosen for calibration is then automatically run by the calibration program to its exact calibration position during the calibration procedure.

It is possible to position some of the other axes in positions different from 0 degrees. Information about which axes are allowed to be jogged is given on the FlexPendant.

Continues on next page

5 Calibration

5.4.1 Description of Axis Calibration

Continued

These axes are marked with **Unrestricted** in the FlexPendant window. Also the following table shows the dependencies between the axes.

Requirements for axis positioning during calibration

Required position of axis	Axis to calibrate					
	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6
Axis 1	-	*	*	*	*	*
Axis 2	0	-	0	*	*	*
Axis 3	0	0	-	*	*	*
Axis 4	*	*	*	-	*	*
Axis 5	*	*	*	*	-	X
Axis 6	*	*	*	*	*	-

-	Axis to be calibrated
*	Unrestricted. Axis is allowed to be jogged to other position than 0 degrees.
0	Axis must be put in position 0 degrees.
X	Special requirement

System containing SafeMove

SafeMove will lose its synchronization to the controller if a new calibration is done. New calibration values have to be downloaded to SafeMove, and a new SafeMove calibration has to be done. Make sure that the user rights admit to change the safety settings and to synchronize SafeMove.

For robots with EPS, the same applies as for SafeMove.

How to calibrate a suspended or wall mounted robot

The IRB 1200 is fine calibrated floor standing in factory, prior to shipping.

To calibrate a suspended or wall mounted robot, reference calibration could be used. Reference values for a suspended or a wall mounted robot must be created with the robot mounted at its working position, not standing on a floor.

To calibrate a suspended or wall mounted robot with the fine calibration routine, the robot must first be taken down and mounted standing on the floor.

5.4.2 Calibration tools for Axis Calibration

Calibration tool set

The calibration tools used for Axis Calibration are designed to meet requirements for calibration performance, durability and safety in case of accidental damage.

The calibration tool will eventually break from fatigue after longer period of use and then needs to be replaced. There is no risk for bad calibrations as long as the calibration tool is in one piece.



WARNING

Calibrating the robot with Axis Calibration requires special calibration tools from ABB. Using other pins in the calibration bushings may cause severe damage to the robot and/or personnel.

Equipment, etc.	Article number	Note
Calibration tool box, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot. ⁱ The tool box also includes a unique calibration pin for IRB 1200 to be fitted to the tool flange during calibration of axis 6.

- ⁱ The robot is calibrated by either manual calibration or Axis Calibration at ABB factory before delivery. Always use the same calibration method as used at the factory. Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant. If no data is found related to standard calibration, manual calibration is used as default.

Examining the calibration tool

Check prior to usage

Before using the calibration tool, make sure that the tube insert, the plastic protection and the steel spring ring are present.



WARNING

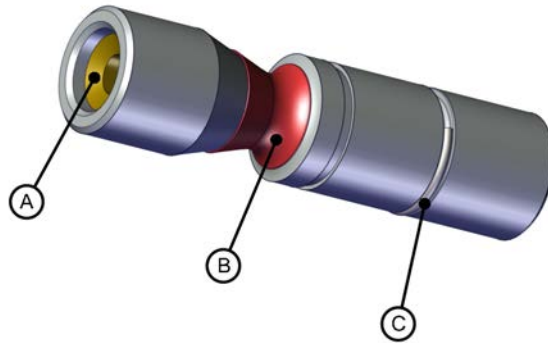
If any part is missing or damaged, the tool must be replaced immediately.

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5 Calibration

5.4.2 Calibration tools for Axis Calibration

Continued



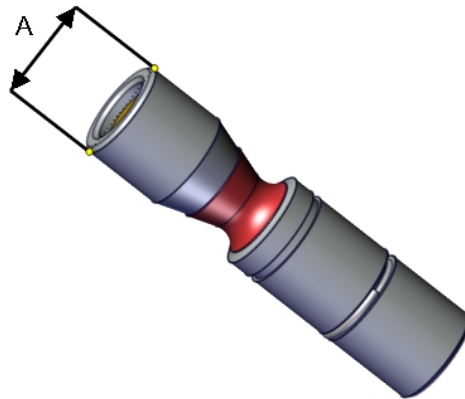
xx1500001914

A	Tube insert
B	Plastic protection
C	Steel spring ring

Periodic check of the calibration tool

If including the calibration tool in a local periodic check system, the following measures should be checked.

- Outer diameter within $\text{Ø}12\text{g}4$ mm, $\text{Ø}8\text{g}4$ mm or $\text{Ø}6\text{g}5$ mm (depending on calibration tool size).
- Straightness within 0.005 mm.



xx1500000951

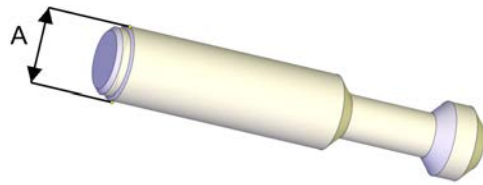
A	Outer diameter
---	----------------

Periodic check of the calibration tool for the tool flange (3HAC058238-001)

If including the tool flange calibration tool in a local periodic check system, the following measures should be checked.

- Outer diameter within $\text{Ø}5\text{g}5$ mm.
- Straightness within 0.005 mm.

Continues on next page



xx1600001142

A	Outer diameter
---	----------------

5 Calibration

5.4.3 Installation locations for the calibration tools

5.4.3 Installation locations for the calibration tools

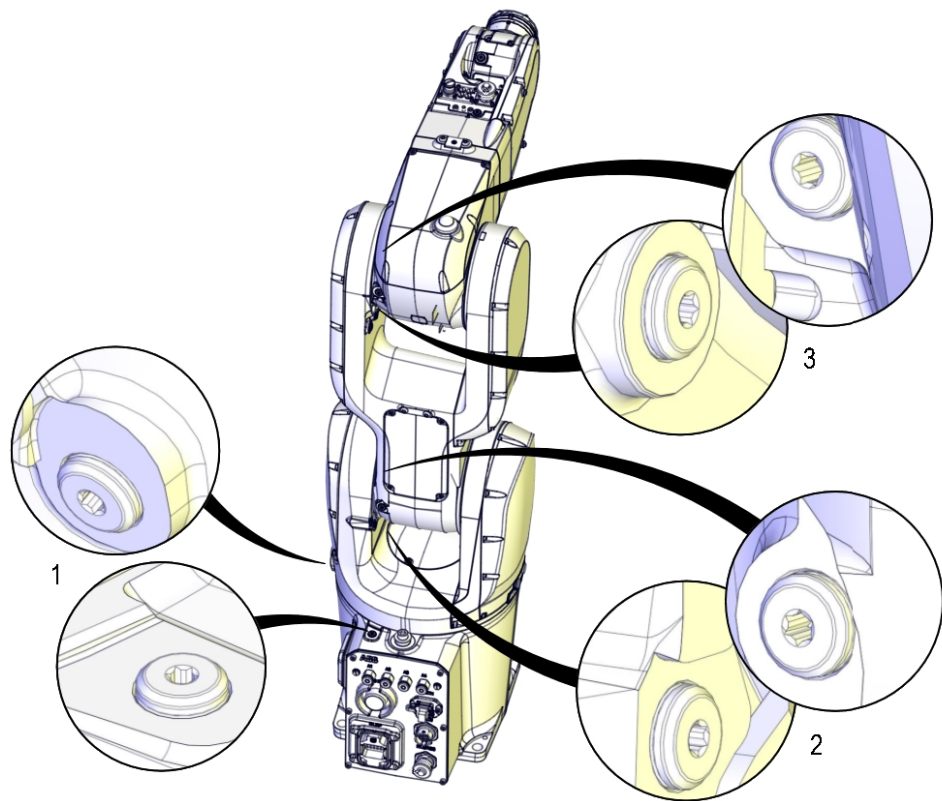
Location of fixed calibration items

This section shows how the robot is equipped with items for installation of calibration tools for Axis Calibration (fixed calibration pins and/or bushings). Installed calibration tools are not shown.

A fixed calibration pin and a bushing for the movable calibration tool are located on each axis as follows.

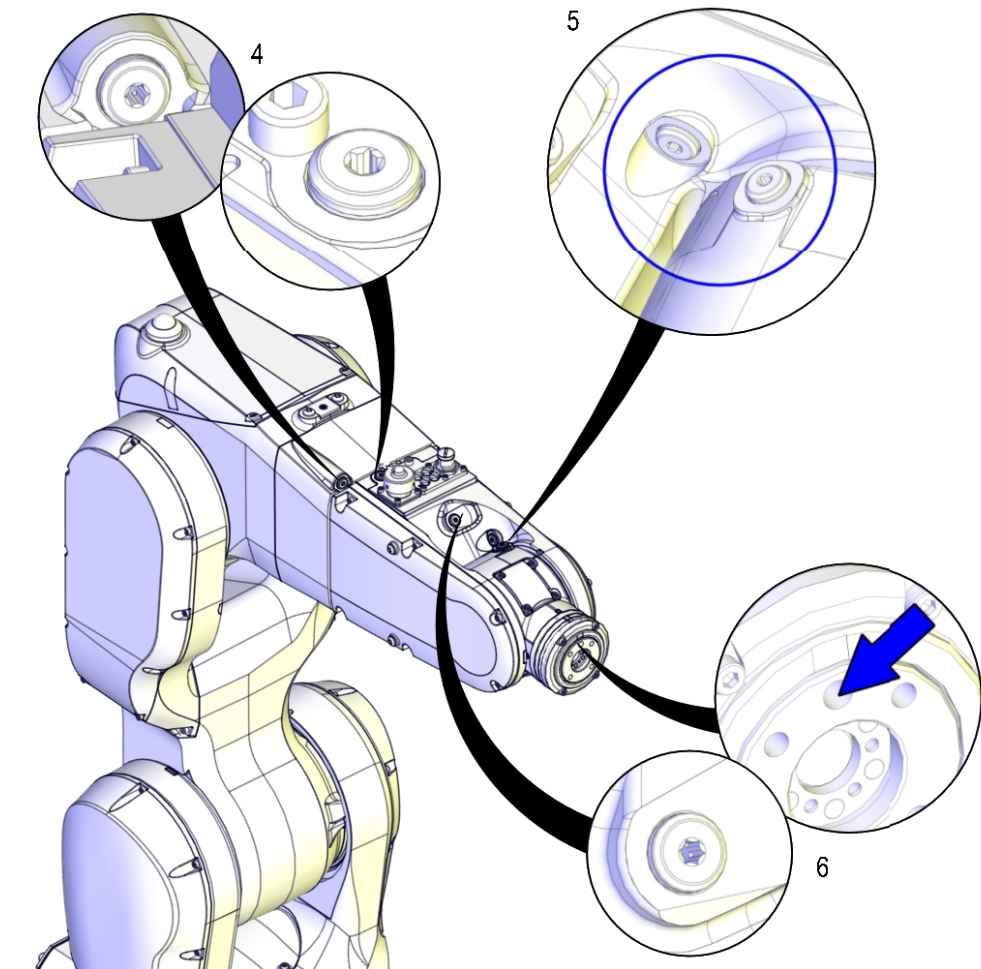
If there is not enough space on an axis to install a fixed calibration pin, the axis is equipped with two bushings instead, for installation of two calibration tools when calibration is carried out. This is shown in the figure.

For axis 6 there is only one bushing, the second calibration tool is installed at the mounting flange of the turning disk.



xx1600001035

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xx1600001036

Spare parts

When calibration is not being performed, a protective plug should always be installed in the bushing. Replace damaged parts with new, if needed.

Spare part	Article number	Note
Protective plug for bushing	3HAC059556-001	Replace if damaged or missing.
Protective plug for bushing, Clean Room	3HAC059557-001	Used with protection type Clean Room
Protective plug for bushing, food grade lubrication		Used for robots with food grade lubrication
Protective plug for bushing, Hygienic		Used with protection type Hygienic
		Replace if damaged or missing.

5 Calibration

5.4.4 Axis Calibration - Running the calibration procedure

5.4.4 Axis Calibration - Running the calibration procedure

Required tools

The calibration tools used for Axis Calibration are designed to meet requirements for calibration performance, durability and safety in case of accidental damage.



WARNING

Calibrating the robot with Axis Calibration requires special calibration tools from ABB. Using other pins in the calibration holes may cause severe damage to the robot and/or personnel.

Equipment, etc.	Article number	Note
Calibration tool box, Axis Calibration	3HAC074119-001	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot. ⁱ The tool box also includes a unique calibration pin for IRB 1200 to be fitted to the tool flange during calibration of axis 6.

- ⁱ The robot is calibrated by either manual calibration or Axis Calibration at ABB factory before delivery. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, manual calibration is used as default.

Required consumables

Consumable	Article number	Note
Clean cloth	-	

Spare parts

Spare part	Article number	Note
Protective plug for bushing	3HAC059556-001	Replace if damaged or missing.
Protective plug for bushing, Clean Room	3HAC059557-001	Used with protection type Clean Room
Protective plug for bushing, food grade lubrication		Used for robots with food grade lubrication
Protective plug for bushing, Hygienic		Used with protection type Hygienic Replace if damaged or missing.

Overview of the calibration procedure on the FlexPendant

The actual instructions of how to perform the calibration procedure and what to do at each step is given on the FlexPendant. You will be guided through the calibration procedure, step by step.

Use the following list to learn about the calibration procedure before running the RobotWare program on the FlexPendant. It gives you a brief overview of the calibration procedure.

Continues on next page



After the calibration method has been started on the FlexPendant, the following sequence will be run.

- 1 Choose calibration routine. The routines are described in [Routines in the calibration procedure on page 821](#).
- 2 Choose which axis/axes to calibrate.
- 3 The robot moves to synchronization position.
- 4 Validate the synchronization marks.
- 5 The robot moves to preparation position.
- 6 Remove the protection plug from the bushings, and install the calibration tool.
- 7 The robot performs a measurement sequence by rotating the axis back and forth.
- 8 Remove the calibration tool and reinstall the protection plugs in the bushings.
- 9 The robot moves to verify that the calibration tool is removed.
- 10 Choose whether to save the calibration data or not.

Calibration of the robot is not finished until the calibration data is saved, as last step of the calibration procedure.

Preparation prior to calibration

The calibration procedure is described in the FlexPendant while conducting it.

	Action	Note
1	 DANGER While conducting the calibration, the robot needs to be connected to power. Make sure that the robot's working area is empty, as the robot can make unpredictable movements.	
2	Wipe the calibration tool clean.  Note The calibration method is exact. Dust, dirt or color flakes will affect the calibration value.	Use a clean cloth.
3	Check if the standard calibration data for axes 4 or 5 are updated with wrist optimization. This is shown in the calibration overview/summary window on the FlexPendant.	If the data is optimized, the calibration routine Wrist Optimization must be re-run after standard calibration. See Calibrating with Wrist Optimization method on page 836 .

Starting the calibration procedure

Use this procedure to start the Axis Calibration routine on the FlexPendant.


	Action	Note
1	Tap the calibration icon and enter the calibration main page.	

Continues on next page

5 Calibration

5.4.4 Axis Calibration - Running the calibration procedure

Continued

	Action	Note
2	All mechanical units connected to the system are shown with their calibration status. Tap the mechanical unit in question.  Note For RobotWare 7, the mechanical unit page is displayed only if there is more than one mechanical unit available.	
3	The calibration method used at ABB factory for each axis is shown, as well as calibration method used for the robot during last field calibration.	The FlexPendant will give all information needed to proceed with Axis Calibration.
4	Valid for RobotWare 6 Tap Call Calibration Method . The software will automatically call for the procedure for the valid calibration method. If not, tap Call Routine and then tap Axis calibration .	
5	Valid for RobotWare 7 Tap Calibration Methods on the right pane and then tap Calibration . The software will automatically call for the procedure for the valid calibration method.	
6	Follow the instructions given on the FlexPendant.	A brief overview of the sequence that will be run on the FlexPendant is given in Overview of the calibration procedure on the FlexPendant on page 828 .

Fitting of calibration tools

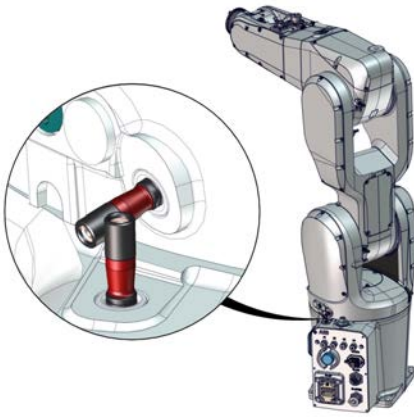
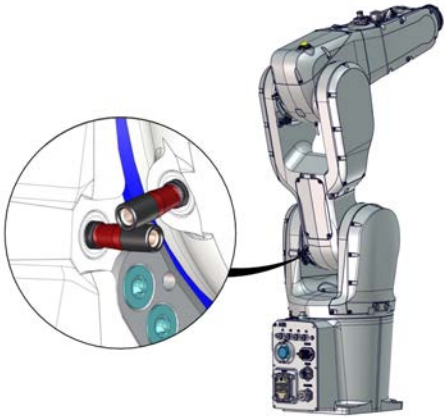
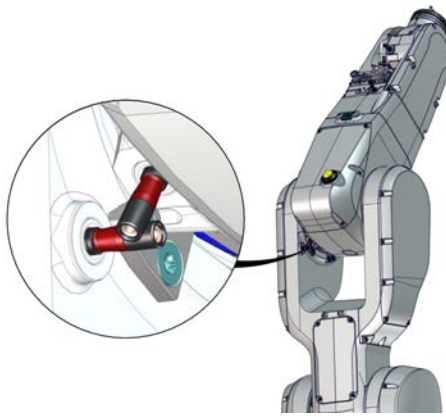
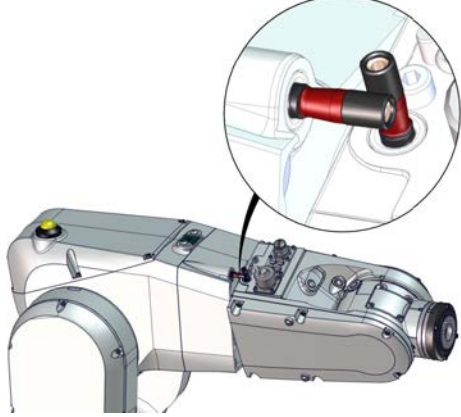
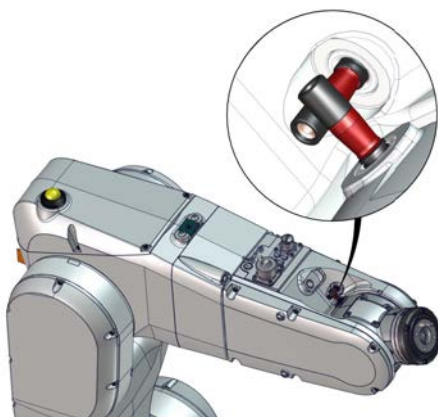
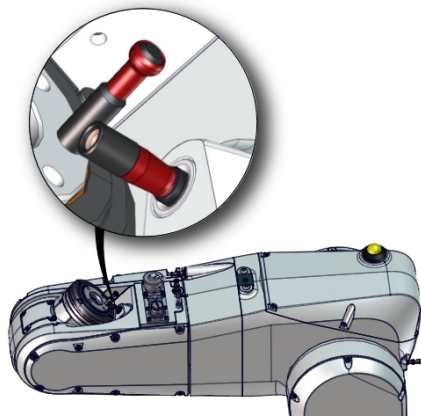
The figures show the calibration tools in contact with each other on each axis.

The position of the complete robot shown for each axis is only an example.

In order for the axis to be able to be moved to calibration position, or in order for getting proper access to the calibration bushing, other axes might need to be jogged to positions different from 0 degrees. Information about which axes are

Continues on next page

allowed to be jogged will be given on the FlexPendant. These axes are marked with **Unrestricted** in the FlexPendant window.

Calibration tools in contact	
<p>Axis 1</p>  <p>xx1600001277</p>	<p>Axis 2</p>  <p>xx1600001276</p>
<p>Axis 3</p>  <p>xx1600001275</p>	<p>Axis 4</p>  <p>xx1600001274</p>
<p>Axis 5</p>  <p>xx1600001273</p>	<p>Axis 6</p> <p>Make sure to orient the tool flange calibration tool correctly.</p>  <p>xx1600001272</p>

Continues on next page

5 Calibration

5.4.4 Axis Calibration - Running the calibration procedure

Continued

Restarting an interrupted calibration procedure

If the Axis Calibration procedure is interrupted before the calibration is finished, the RobotWare program needs to be started again. Use this procedure to take required action.

Situation	Action
The three-position enabling device on the FlexPendant has been released during robot movement.	Press and hold the three-position enabling device and press Play .
The RobotWare program is terminated with PP to Main .	Remove the calibration tool, if it is installed, and restart the calibration procedure from the beginning. See <i>Starting the calibration procedure</i> . If the calibration tool is in contact the robot axis needs to be jogged in order to release the calibration tool. Jogging the axis in wrong direction will cause the calibration tool to break. Directions of axis movement is shown in Calibration movement directions for all axes on page 814

Axis Calibration with SafeMove option

To be able to run Axis Calibration, SafeMove needs to be unsynchronized. The Axis Calibration routine recognizes if the robot is equipped with SafeMove and will force SafeMove to unsynchronize automatically.


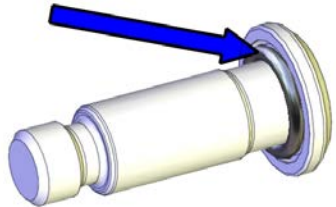
However, SafeMove may generate other warning messages anytime during the Axis Calibration routine. When a warning message is displayed, tap **Acknowledge** to confirm the unsynchronized state and continue Axis Calibration procedure.



CAUTION

SafeMove must be synchronized after the calibration is completed.


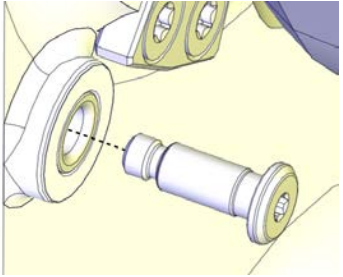
After calibration

	Action	Note
1	<p>Check the o-ring on the plug. Replace the plug with new spare part, if missing or damaged.</p> <p> Note For robots with protection type Hygienic Hygienic robots do not have the o-ring on the plug.</p>	 <p>xx1600001143</p>

Continues on next page

5.4.4 Axis Calibration - Running the calibration procedure

Continued

	Action	Note
2	<p>Reinstall the protective plugs in both bushings on each axis, directly after the axis is calibrated. Replace the plug with new spare part, if missing or damaged.</p> <p> Note</p> <p>For robots with protection type Hygienic Do not forget the washer. Replace the washer with new spare part, if missing or damaged.</p>	 <p>xx1600001144</p> <p>Protective plug for bushing: 3HAC059556-001. Protective plug for bushing, Clean Room Protective plug for bushing, food grade lubrication Protective plug for bushing, Hygienic : 3HAC059557-001.</p>
3	<p>If the standard calibration data for axes 4, 5 or 6 should be updated with wrist optimization, run the calibration routine Wrist Optimization.</p>	<p>See Calibrating with Wrist Optimization method on page 836.</p>

5.4.5 Reference calibration

Brief introduction to Reference Calibration

Reference calibration is a faster method compared to Fine calibration, as it refers to a previously made calibration.

- 1 Create a backup of the current robot system.
- 2 Check that the active calibration offset values corresponds to the values on the silver label (on the lower arm or the base).
- 3 Jog the manipulator so that all axes are in zero position (ex use `MoveAbsJ` instruction). Check that all axis scales are aligned with calibration marks.
- 4 If the scales differ from calibration marks it might depend on wrong turns of the revolution counters. Make a marker line on the corresponding axis to be able to validate the result of the calibration. If more than one motor revolutions are wrong, the calibration will fail.
- 5 Use a verification position. This is especially recommended if all axes were not aligned with the synchronization marks (step 3). Reuse an existing position that is suitable and accurate so it can be used to validate the repair. Use a position where a deviation in axis calibration gives a big deviation in positioning. Note! Check the position after each repair in one axis.
- 6 Use Reference calibration to save reference values for all axes that is to be replaced. Make sure that the values are saved in RobotStudio or FTP program. The files are located in "Active system folder name/HOME/RefCalibFiles".
- 7 Perform the repair.
- 8 Make sure that the tooling and process equipment are the same as when creating the reference. Use Reference calibration to update the system with new calibration offset value for the repaired axis.
- 9 Check the position against the verification position (step 5).
- 10 Proceed with the repair of the next axis, if necessary, and repeat (step 8-9) for every axis.
- 11 (For system containing SafeMove or EPS) Download new calibration values to SafeMove. Use Visual SafeMove in RobotStudio.(For system containing SafeMove) Download new calibration values to SafeMove. Use Visual SafeMove in RobotStudio.
- 12 (For system containing SafeMove or EPS) Synchronize SafeMove to activate SafeMove.(For system containing SafeMove) Synchronize SafeMove to activate SafeMove.
- 13 Perform test run.
- 14 Update the label for resolver values with new calibration values.

Manual tuning of calibration offset

Manual tuning of calibration offset is normally not needed, but can be useful in some situations. The requirement to do manual tuning is that there is a known accurate position, that worked accurately before the repair (step 5, see [Brief introduction to Reference Calibration on page 834](#)).

Continues on next page

Example "Adjust axis 4":

- 1 Create a backup.
- 2 Run the manipulator to the verification position. (The manipulator position is now deviating from the verification position.)
- 3 Read and note current axis 4 value in degrees (example: 96.3 degrees).
- 4 Manually jog, only axis 4, so that the manipulator is correctly positioned to the verification position.
- 5 Read and note current axis 4 value in degrees (example: 94.2 degrees).
- 6 Move the manipulator to its calibration position.
- 7 Calculate the angle difference (ie $96.3 - 94.2 = 2.1$ degrees).
- 8 Manually jog axis 4 the calculated angle difference (-2.1). NOTE! The direction +/- shall be the same direction as the direction used when axis 4 was manually jogged to coincide with the verification process. In the example -2.1 degrees.
- 9 Make a new manual fine calibration of axis 4 with axis in -2.1 degrees position.
- 10 Check again against the verification position.
- 11 Repeat the manual tuning if needed.
- 12 Create a new reference if the intention is to use the reference in the future.

5 Calibration

5.5 Calibrating with Wrist Optimization method

5.5 Calibrating with Wrist Optimization method

When to run Wrist Optimization

Wrist Optimization routine is run to improve TCP reorientation performance.

Calibrating the robot with standard calibration method overwrites the optimized positions of axes 4, 5. Re-run the Wrist Optimization routine after standard calibration to re-achieve the optimized positions of the wrist axes.

Overview of the calibration procedure on the FlexPendant

The actual instructions of how to perform the calibration procedure and what to do at each step is given on the FlexPendant. You will be guided through the calibration procedure, step by step.

Use the following list to learn about the calibration procedure before running the RobotWare program on the FlexPendant. It gives you a brief overview of the calibration procedure sequence.

After the calibration method has been called for on the FlexPendant, the following sequence will be run.

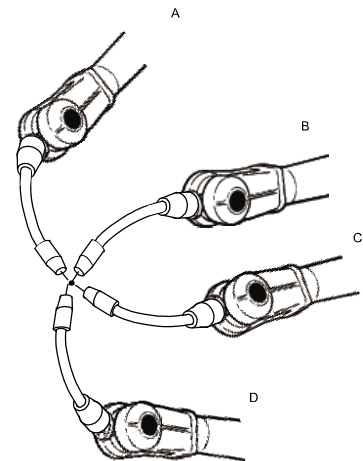
- 1 Choose calibration routine Wrist Optimization.
- 2 Modify targets for 4-point tool frame definition, in Wrist Optimization routine.



Tip

Select positions with large reorientations around the TCP. For best results, make sure that axis 4 and 5 have large movements.

- a Jog the robot to an appropriate position, A, for the first approach point.
Use small increments to accurately position the tool tip as close to the reference point as possible.
- b Tap **Modify Position** to define the point.
- c Repeat for each approach point to be defined, positions B, C, and D.
Jog away from the fixed world point to achieve the best result. Just changing the tool orientation will not give as good a result.



en0400000906

- 3 Improved calibration data to the wrist axes is identified and presented.
- 4 Optimized positions for the wrist axes are presented.

Continues on next page

- 5 The robot moves to the optimized positions for the wrist axes and automatically overwrites previous calibration data.



WARNING

Robot moves automatically when pressing **Calibrate**.

- 6 Wrist optimization is finished.
- 7 Redefine / verify TCP for all tools.

5 Calibration

5.6.1 Manual calibration method - calibration position

5.6 Calibrating with manual calibration method

5.6.1 Manual calibration method - calibration position

Calibration position

The position of the axis to be calibrated is illustrated in each calibration section respectively.

The table below specifies the exact axis positions in degrees.

Axis	IRB 1200-5/0.9	IRB 1200-7/0.7
1	+84.474066°	+84.474066°
2	+131.862755°	+136.862755°
3	+72.250000°	+72.250000°
4	0°	0°
5	-90°	-90°
6	0°	0°

5.6.2 Manual calibration method - content of calibration toolkit 3HAC051256-001

Content of calibration toolkit 3HAC051256-001

Content in calibration toolkit 3HAC051256-001	Art. no.	Note
Calibration pin, axis 1	3HAC051209-001	
Calibration stop pin, axis 1	3HAC051211-001	
Calibration tool, axis 4	3HAC051212-001	
Calibration tool, axes 5 and 6	3HAC051213-001	
Conical screw M3	3HAC055410-001	Used together with the calibration tool, axis 4.
Guide pin	3HAC034513-001	Used together with the calibration tool, axis 5/6.
Calibration block with pin	3HAC051254-001	Fitted on tubular.
Hex socket head screw	9ADA183-19	M5x40
Hex socket head screw	9ADA183-41	M8x45
Hex socket head screw	9ADA183-15	M5x20
Hex socket head screw	9ADA183-5	M4x16
Hex socket head screw	9ADA183-14	M5x16

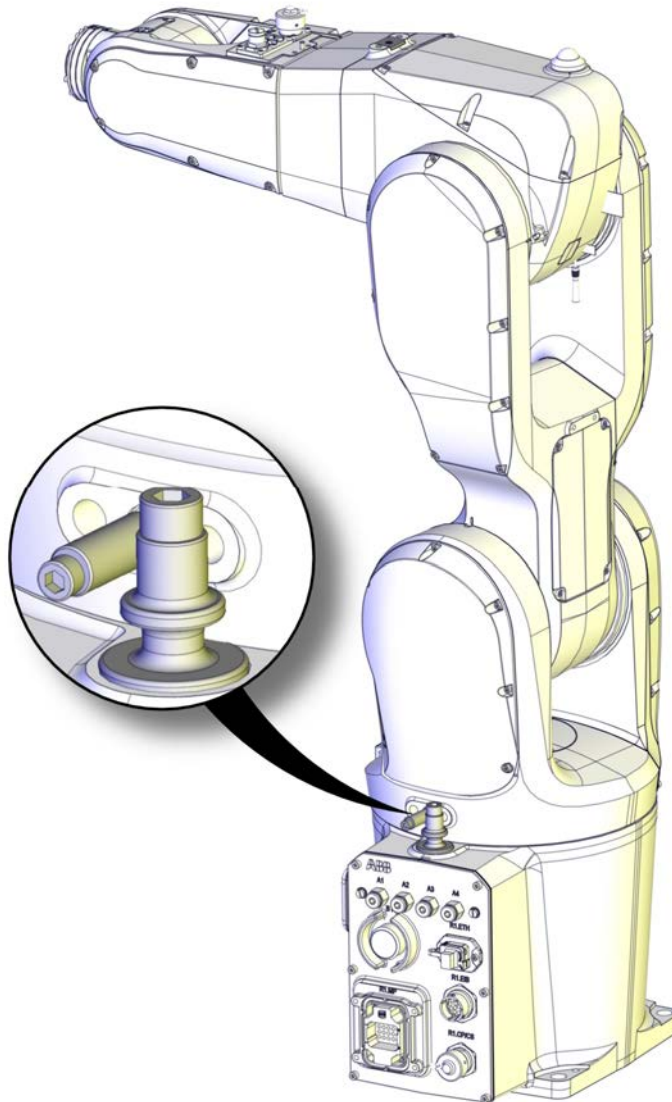
5 Calibration

5.6.3 Manual calibration method - calibrating axis 1

5.6.3 Manual calibration method - calibrating axis 1

Calibration position of axis 1

The figure shows axis 1 in calibration position, with calibration tools fitted.



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Required equipment

Equipment	Art. no.	Note
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. ⁱ

Continues on next page

5.6.3 Manual calibration method - calibrating axis 1

Continued

Equipment	Art. no.	Note
Protection plug	3HAC051199-001	Protection plug for the calibration hole in the swing (the hole is used during calibration of axis 1 with the manual calibration method). Replace if damaged.

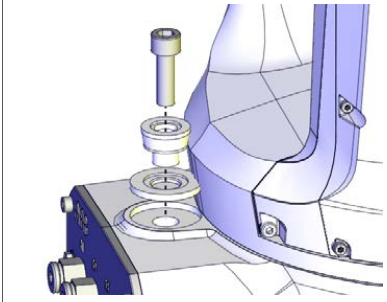
- i The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, manual calibration is used as default.

Required consumables

Equipment	Art. no.	Note
Cleaning agent	-	Isopropanol

Calibrating axis 1

Moving the robot to calibration position


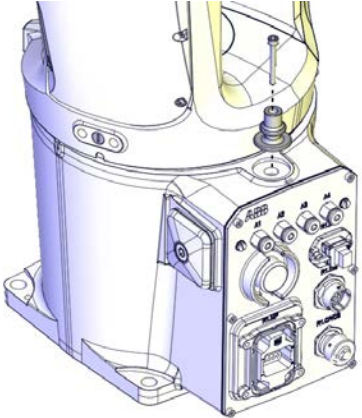

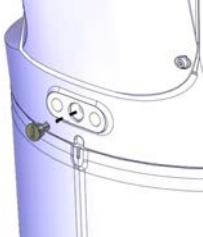
	Action	Note
1	Jog all axes to zero position.	
2	Remove the axis-1 mechanical stop pin.	 <p style="text-align: right; font-size: small;">xx1400000392</p>

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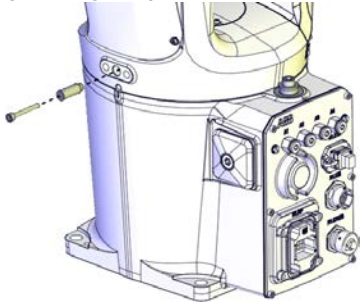

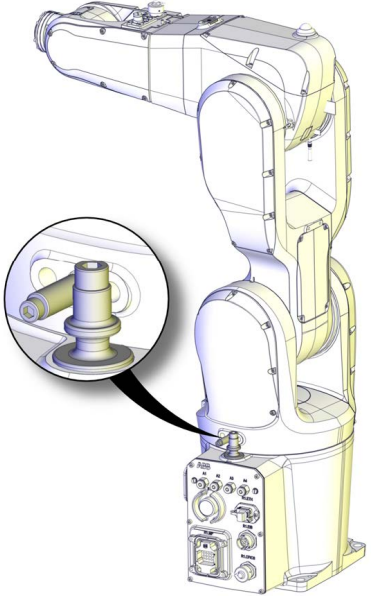
5 Calibration

5.6.3 Manual calibration method - calibrating axis 1

Continued

	Action	Note
3	<p>The axis-1 calibration stop pin should now be fitted to the mechanical stop pin attachment hole, but it does not fit if the axis 1 stands in its zero position.</p> <p>Jog axis 1 to find a suitable position where the axis-1 calibration stop pin can be fitted to the attachment hole in the base.</p> <p>Fit the axis-1 calibration stop pin to the base and secure it with the screw.</p>	<p>Screw: M8x45. Tightening torque: 10 Nm.</p> <p> Note</p> <p>The position of the robot shown in the figure, is only a suggestion. The suitable position in which the axis-1 calibration pin is possible to fit may differ.</p>  <p>xx1400001100</p>
4	Jog axis 1 to zero position.	
5	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>	
6	Remove the protection plug from the swing.	 <p>xx1400001134</p>

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	Action	Note
7	<p>Fit the axis-1 calibration pin to the swing and secure it with the screw.</p> <p> CAUTION</p> <p>Hold the calibration pin firmly with your hands while securing it with the screw, in order to keep a straight line when fitting the screw. The calibration pin must not be tilted.</p>	<p>Screw: M5x40. Tightening Torque: 5 Nm.</p>  <p>xx1400001099</p>
8	<p>Turn on the electric power to the robot.</p>	
9	<p> DANGER</p> <p>When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways!</p> <p>Make sure no personnel is near or beneath the robot arm!</p>	
10	<p>Release the brakes and manually rotate axis 1 until the two axis-1 calibration pins touches each other gently. There should be no pressing force between the pins.</p> <p>When doing this, pay attention to robot pose in order to avoid arm collision.</p> <p>When the axis is in position, release the brake release button to activate the brakes again.</p>	<p>How to release the brakes is detailed in Manually releasing the brakes on page 72.</p>  <p>xx1400001209</p>


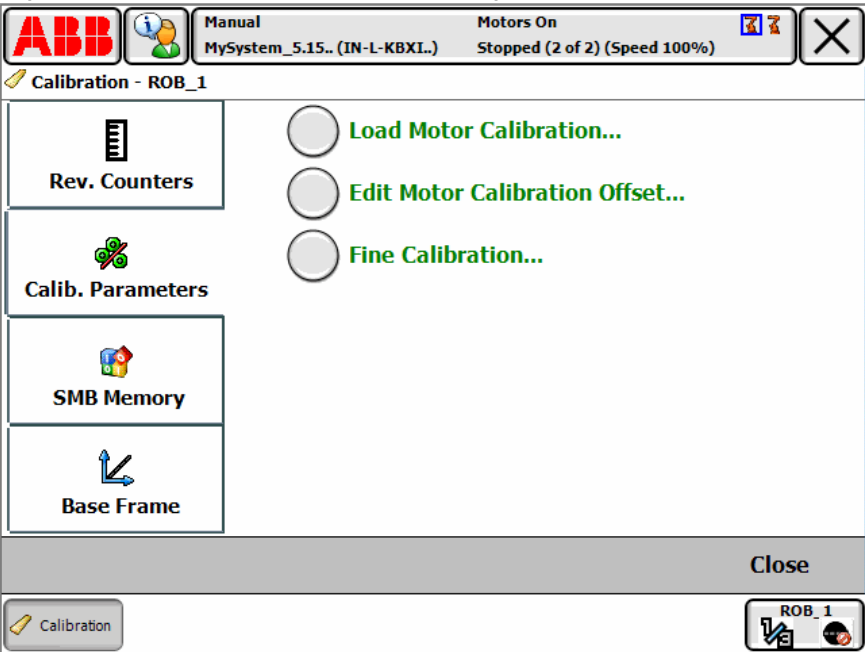
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5 Calibration

5.6.3 Manual calibration method - calibrating axis 1

Continued

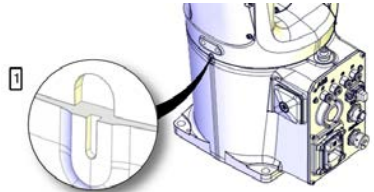
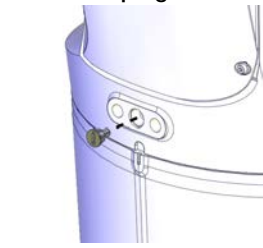
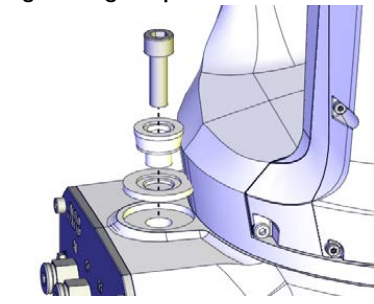
Performing the fine calibration procedure

	Action	Note
1	 WARNING Do not fine calibrate the robot without special equipment used for axis calibration! It would cause an unsatisfied accuracy in the robot movement.	
2	Choose fine calibration from Calib menu On the ABB menu, tap Calibration . All mechanical units connected to the system are shown along with their calibration status.	
3	Tap to select the mechanical unit and then tap Calib. Parameters . 	
4	Tap Fine Calibration.... A dialog box is displayed, urging you to use external equipment to perform the actual calibration. Make sure all necessary calibration equipment is fitted for the axis to be calibrated. A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions: <ul style="list-style-type: none"> • Tap Yes to proceed. • Tap No to cancel. 	
5	Select the check-box for the current axis/axes to be calibrated.	

Continues on next page

	Action	Note
6	<p>Tap Calibrate.</p> <p>A dialog box is displayed, warning that calibration of the selected axes will be changed, which cannot be undone:</p> <ul style="list-style-type: none"> • Tap Calibrate to proceed. • Tap Cancel to cancel. <p>Tapping Calibrate results in briefly displaying a dialog box, announcing that the calibration process has started.</p> <p>The axis is calibrated and the system returns to the list of available mechanical units.</p>	

Checking and finalizing the calibration

	Action	Note
1	Release the brakes and manually rotate the axis to apart the calibration pins from each other. This is done to avoid damage on the pins if incorrect operation should occur during next step of jogging.	
2	Jog axis 1 to zero degree using the FlexPendant.	
3	<p>Check that the synchronization marks on axis 1 are aligned with each other.</p> <p>Are they aligned within the tolerances?</p> <ul style="list-style-type: none"> • If yes, the calibration is verified OK. • If no, redo the fine calibration procedure. 	 <p>xx1400001092</p>
4	Remove the axis-1 calibration pin from the swing and refit the protection plug.	<p>Protection plug: 3HAC051199-001</p>  <p>xx1400001134</p>
5	Rotate axis 1 to a suitable position to get access and remove the calibration stop pin from the base.	
6	Remove the axis-1 calibration stop pin from the base and refit the axis-1 mechanical stop.	<p>Tightening torque: 12 Nm</p>  <p>xx1400000392</p>

Continues on next page

5 Calibration

5.6.3 Manual calibration method - calibrating axis 1

Continued

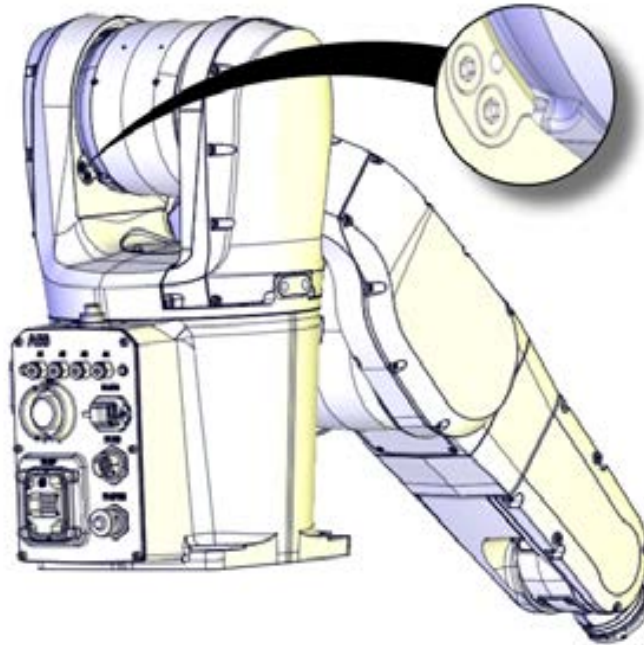
After calibration

	Action	Note
1	Write down the new system parameters on a new label and stick on top of the calibration label on the robot.	

5.6.4 Manual calibration method - calibrating axis 2

Calibration position of axis 2

The figure shows axis 2 in calibration position.



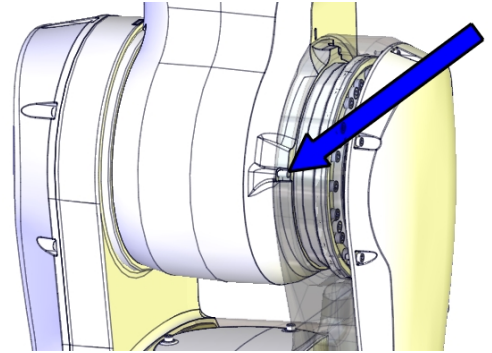
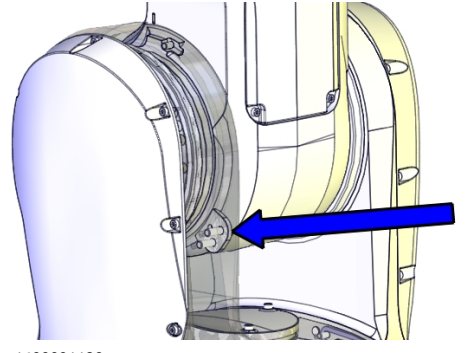
xx1400001201

Required equipment

Calibration of axis 2 is done by moving the lower arm so that the calibration pin and calibration stop touches each other gently.

These parts are already fitted to the robot, no extra installation of calibration equipment is required.

See figures below for reference, and follow the step-by-step procedure that follows.

Calibration pin	Calibration stop
 <p data-bbox="453 1861 560 1883">xx1400001135</p>	 <p data-bbox="962 1854 1069 1877">xx1400001136</p>
<p data-bbox="453 1910 946 2004">The press fit mechanical stop pin fitted to the lower arm is used for calibration of axis 2. No additional equipment is required.</p>	<p data-bbox="962 1910 1433 2004">The axis-2 mechanical stop fitted to the swing is used for calibration of axis 2. No additional equipment is required.</p>

Continues on next page


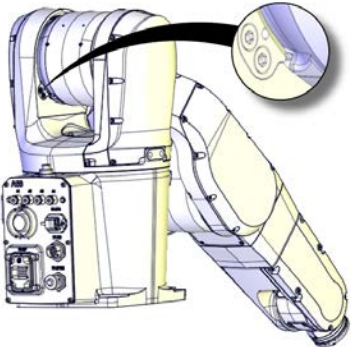
5 Calibration

5.6.4 Manual calibration method - calibrating axis 2


Continued

Calibrating axis 2

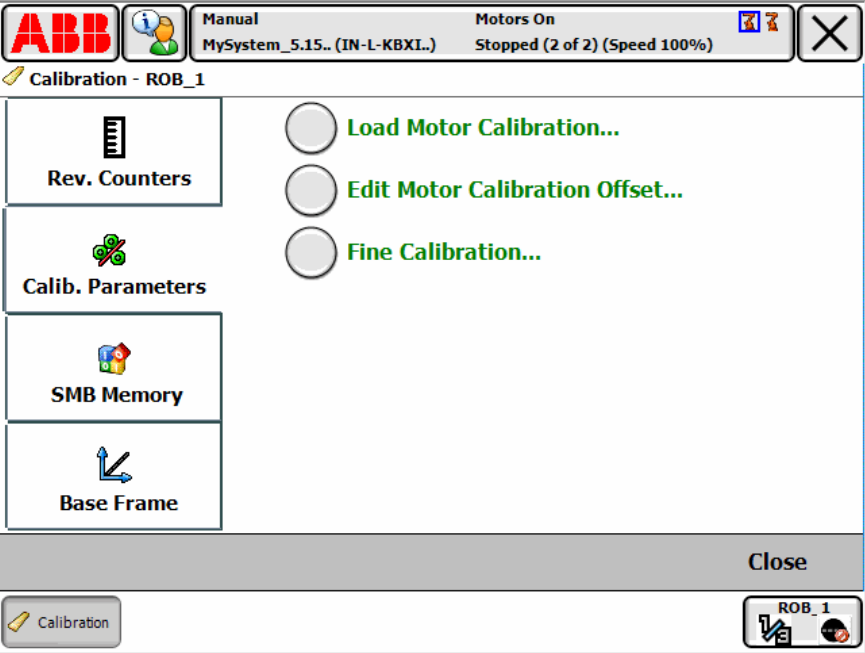
Moving the robot to calibration position

	Action	Note
1	Jog all axes to zero position.	
2	 DANGER When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways! Make sure no personnel is near or beneath the robot arm!	
3	Release the brakes and manually rotate axis 2 until the axis-2 calibration pin and calibration stop touches each other gently. There should be no pressing force between the pins. When doing this, pay attention to robot pose in order to avoid arm collision. When the axis is in position, release the brake release button to activate the brakes again.	How to release the brakes is detailed in Manually releasing the brakes on page 72 . The calibration pin and calibration stop are illustrated in Required equipment on page 847 .  xx1400001201

Performing the fine calibration procedure

	Action	Note
1	 WARNING Do not fine calibrate the robot without special equipment used for axis calibration! It would cause an unsatisfied accuracy in the robot movement.	
2	Choose fine calibration from Calib menu On the ABB menu, tap Calibration . All mechanical units connected to the system are shown along with their calibration status.	

Continues on next page

	Action	Note
3	<p>Tap to select the mechanical unit and then tap Calib. Parameters.</p>  <p>en0400001127</p>	
4	<p>Tap Fine Calibration....</p> <p>A dialog box is displayed, urging you to use external equipment to perform the actual calibration. Make sure all necessary calibration equipment is fitted for the axis to be calibrated.</p> <p>A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions:</p> <ul style="list-style-type: none"> • Tap Yes to proceed. • Tap No to cancel. 	
5	<p>Select the check-box for the current axis/axes to be calibrated.</p>	
6	<p>Tap Calibrate.</p> <p>A dialog box is displayed, warning that calibration of the selected axes will be changed, which cannot be undone:</p> <ul style="list-style-type: none"> • Tap Calibrate to proceed. • Tap Cancel to cancel. <p>Tapping Calibrate results in briefly displaying a dialog box, announcing that the calibration process has started.</p> <p>The axis is calibrated and the system returns to the list of available mechanical units.</p>	

Checking and finalizing the calibration

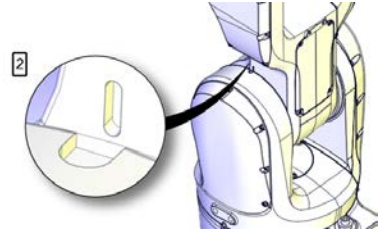
	Action	Note
1	<p>Release the brakes and manually rotate the axis to apart the calibration pins from each other. This is done to avoid damage on the pins if incorrect operation should occur during next step of jogging.</p>	

Continues on next page

5 Calibration

5.6.4 Manual calibration method - calibrating axis 2

Continued

	Action	Note
2	Jog axis 2 to zero degree using the FlexPendant.	
3	<p>Check that the synchronization marks on axis 2 are aligned with each other.</p> <p>Are they aligned within the tolerances?</p> <ul style="list-style-type: none">• If yes, the calibration is verified OK.• If no, redo the fine calibration procedure.	 <p>xx1400001093</p>

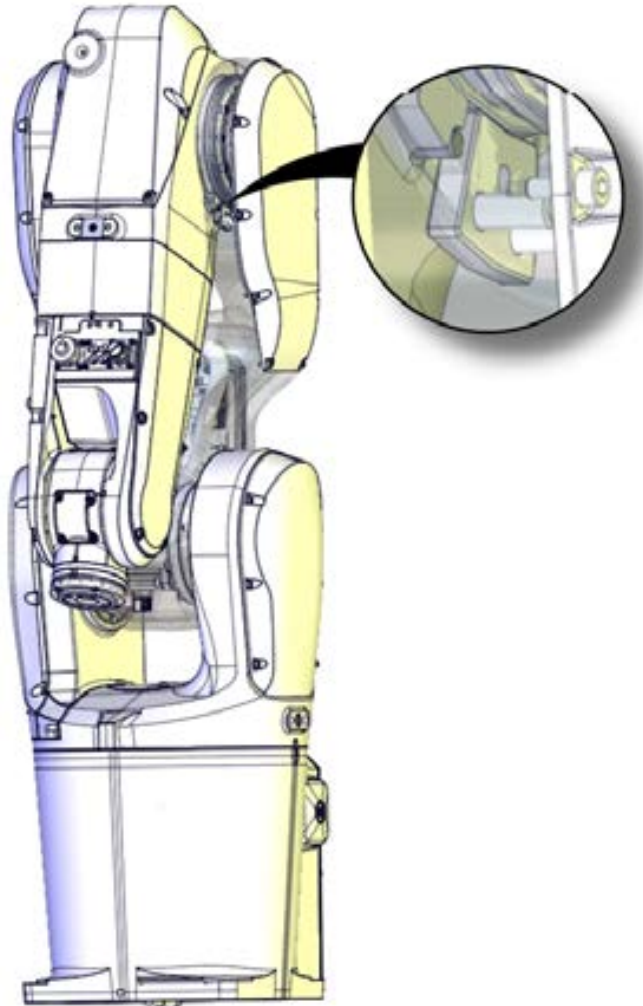
After calibration

	Action	Note
1	Write down the new system parameters on a new label and stick on top of the calibration label on the robot.	

5.6.5 Manual calibration method - calibrating axis 3

Calibration position of axis 3

The figure shows axis 3 in calibration position.



xx1400001204

Required equipment

Calibration of axis 3 is done by moving the upper arm so that the calibration pin and calibration stop touches each other gently.

These parts are already fitted to the robot, no extra installation of calibration equipment is required.

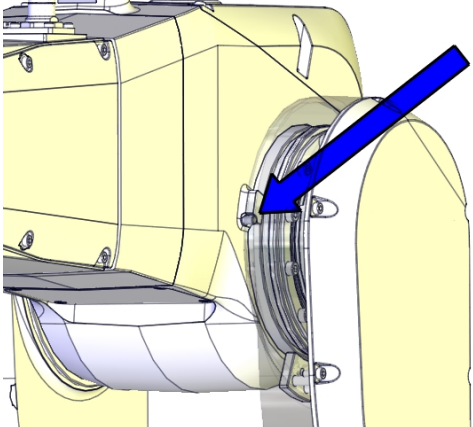
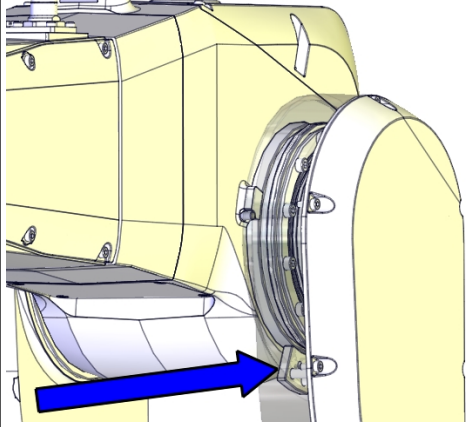
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5 Calibration

5.6.5 Manual calibration method - calibrating axis 3


Continued

See figures below for reference, and follow the step-by-step procedure that follows the figures.

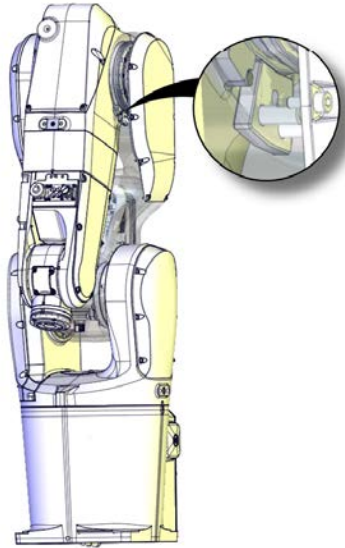
Calibration pin	Calibration stop
 <p data-bbox="421 857 528 875">xx1400001202</p>	 <p data-bbox="920 857 1027 875">xx1400001203</p>
<p>The press fit mechanical stop pin fitted to the upper arm is used for calibration of axis 3. No additional equipment is required.</p>	<p>The axis-3 mechanical stop fitted to the lower arm is used for calibration of axis 3. No additional equipment is required.</p>

Calibrating axis 3


Moving the robot to calibration position

	Action	Note
1	Jog all axes to zero position.	
2	 <p>DANGER</p> <p>When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways! Make sure no personnel is near or beneath the robot arm!</p>	

Continues on next page

	Action	Note
3	<p>Release the brakes and manually rotate axis 3 until the axis-3 calibration calibration pin and calibration stop touches each other gently. There should be no pressing force between the pins.</p> <p>When doing this, pay attention to robot pose in order to avoid arm collision.</p> <p>When the axis is in position, release the brake release button to activate the brakes again.</p>	<p>How to release the brakes is detailed in Manually releasing the brakes on page 72.</p> <p>The calibration pin and calibration stop are illustrated in Required equipment on page 851.</p>  <p>xx1400001204</p>

Performing the fine calibration procedure

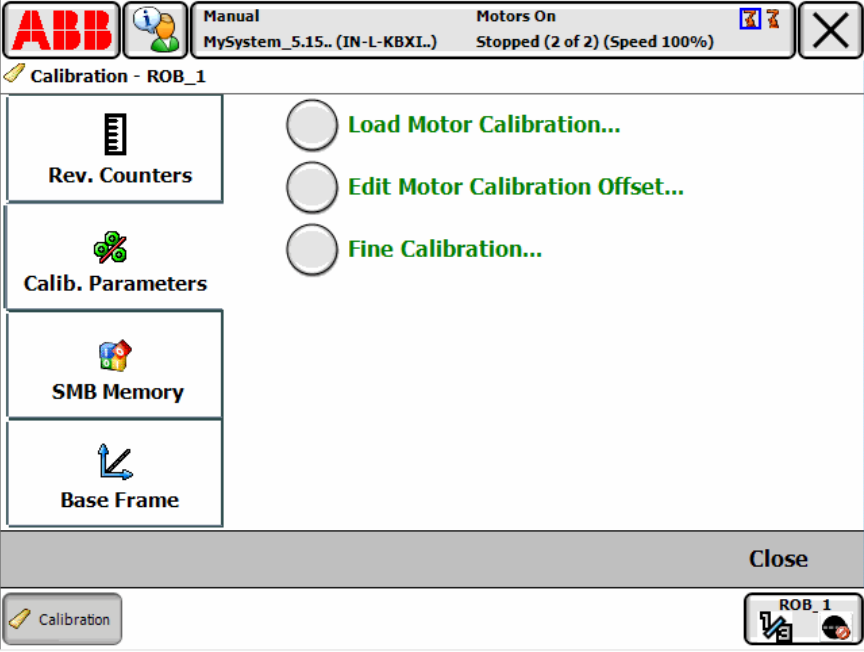
	Action	Note
1	<p> WARNING</p> <p>Do not fine calibrate the robot without special equipment used for axis calibration! It would cause an unsatisfied accuracy in the robot movement.</p>	
2	<p>Choose fine calibration from Calib menu</p> <p>On the ABB menu, tap Calibration.</p> <p>All mechanical units connected to the system are shown along with their calibration status.</p>	

Continues on next page

5 Calibration

5.6.5 Manual calibration method - calibrating axis 3

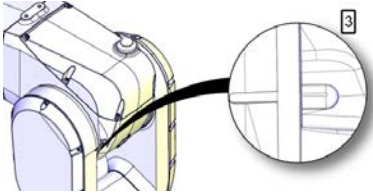
Continued

	Action	Note
3	<p>Tap to select the mechanical unit and then tap Calib. Parameters.</p>  <p>en0400001127</p>	
4	<p>Tap Fine Calibration....</p> <p>A dialog box is displayed, urging you to use external equipment to perform the actual calibration. Make sure all necessary calibration equipment is fitted for the axis to be calibrated.</p> <p>A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions:</p> <ul style="list-style-type: none"> • Tap Yes to proceed. • Tap No to cancel. 	
5	<p>Select the check-box for the current axis/axes to be calibrated.</p>	
6	<p>Tap Calibrate.</p> <p>A dialog box is displayed, warning that calibration of the selected axes will be changed, which cannot be undone:</p> <ul style="list-style-type: none"> • Tap Calibrate to proceed. • Tap Cancel to cancel. <p>Tapping Calibrate results in briefly displaying a dialog box, announcing that the calibration process has started.</p> <p>The axis is calibrated and the system returns to the list of available mechanical units.</p>	

Checking and finalizing the calibration

	Action	Note
1	<p>Release the brakes and manually rotate the axis to apart the calibration pins from each other. This is done to avoid damage on the pins if incorrect operation should occur during next step of jogging.</p>	

Continues on next page

	Action	Note
2	Jog axis 3 to zero degree using the FlexPendant.	
3	<p>Check that the synchronization marks on axis 3 are aligned with each other.</p> <p>Are they aligned within the tolerances?</p> <ul style="list-style-type: none"> • If yes, the calibration is verified OK. • If no, redo the fine calibration procedure. 	 <p>xx1400001094</p>

After calibration

	Action	Note
1	Write down the new system parameters on a new label and stick on top of the calibration label on the robot.	

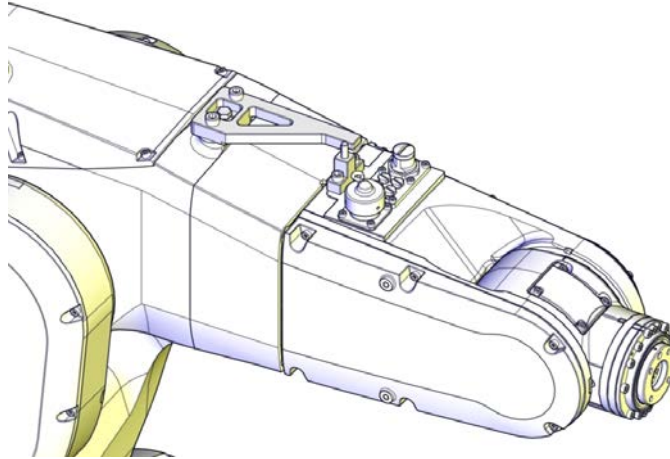
5 Calibration

5.6.6 Manual calibration method - calibrating axis 4

5.6.6 Manual calibration method - calibrating axis 4

Calibration position of axis 4

The figure shows axis 4 in calibration position, with calibration tools fitted.



xx1400001207

Required equipment

Equipment	Art. no.	Note
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. ⁱ

ⁱ The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory. Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant. If no data is found related to standard calibration, manual calibration is used as default.

Required consumables


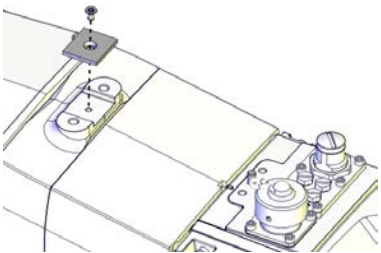
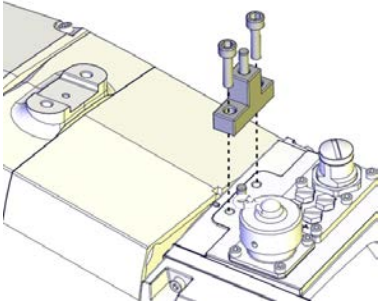

Equipment	Art. no.	Note
Cleaning agent	-	Isopropanol

Calibrating axis 4

Moving the robot to calibration position

	Action	Note
1	Jog all axes to zero position. Rotate axis 4 some degrees toward positive direction to avoid interference between the calibration tools when fitting them.	

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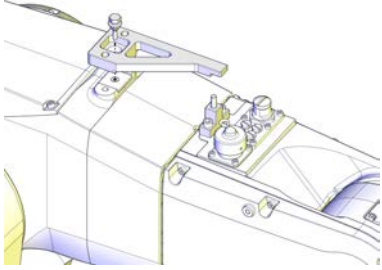
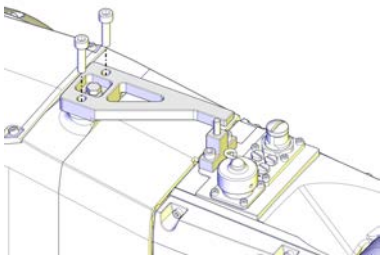

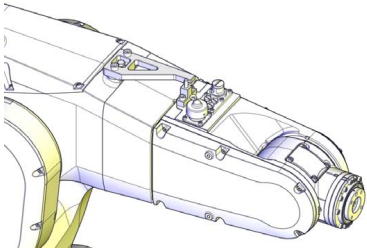
	Action	Note
2	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the robot working area.</p>	
3	Remove the protection cover from the housing.	 <p>xx1400001205</p>
4	Clean the location surfaces on the housing and the calibration tool surfaces to make sure there is no paint or burrs on these surfaces.	
5	Fit the calibration block to the tubular.	<p>Screws: M4x16.</p>  <p>xx1400001208</p>
6	<p>Locate the calibration tool by the location surface on the housing.</p> <p> Tip</p> <p>Press down slightly on the calibration tool to make sure the tool attaches the location surface tightly.</p>	

Continues on next page

5 Calibration


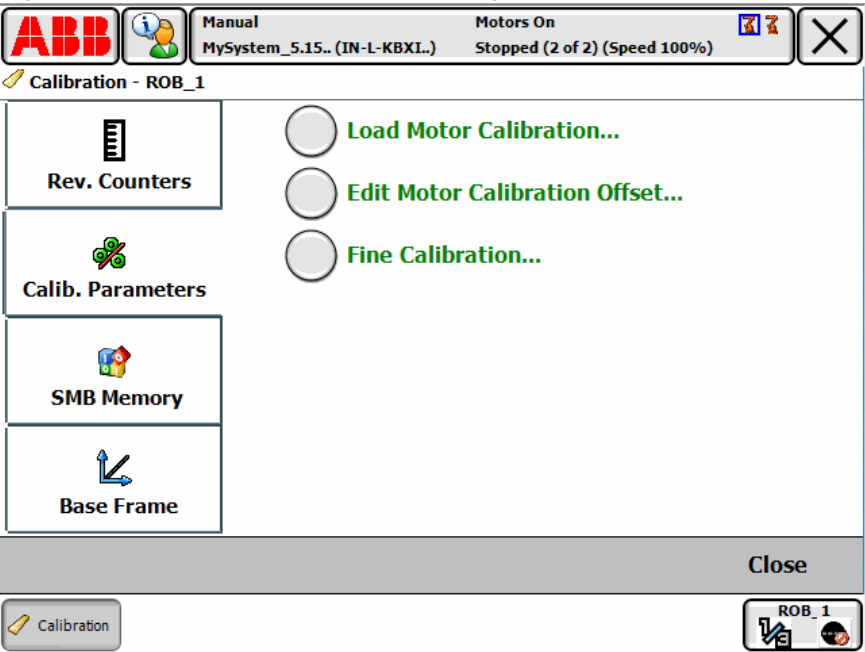
5.6.6 Manual calibration method - calibrating axis 4

Continued

	Action	Note
7	Fit the conical screw to the calibration tool.	<p>Conical screw M3 (3HAC055410-001, 1 pcs) Tightening torque: 1 Nm</p>  <p>xx1500001608</p>
8	Fit the M5 screws.	<p>Screws: M5x20. Tightening torque: 2.5 Nm</p>  <p>xx1400001117</p>
9	Turn on the electric power to the robot.	
10	 DANGER <p>When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways! Make sure no personnel is near or beneath the robot arm!</p>	
11	<p>Release the brakes and manually rotate axis 4 until the axis-4 calibration tool and the calibration block touches each other gently. There should be no pressing force between the pins. When doing this, pay attention to robot pose in order to avoid arm collision. When the axis is in position, release the brake release button to activate the brakes again.</p>	<p>How to release the brakes is detailed in Manually releasing the brakes on page 72.</p>  <p>xx1400001207</p>

Continues on next page

Performing the fine calibration procedure

	Action	Note
1	 WARNING Do not fine calibrate the robot without special equipment used for axis calibration! It would cause an unsatisfied accuracy in the robot movement.	
2	Choose fine calibration from Calib menu On the ABB menu, tap Calibration . All mechanical units connected to the system are shown along with their calibration status.	
3	Tap to select the mechanical unit and then tap Calib. Parameters . 	
4	Tap Fine Calibration.... A dialog box is displayed, urging you to use external equipment to perform the actual calibration. Make sure all necessary calibration equipment is fitted for the axis to be calibrated. A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions: <ul style="list-style-type: none"> • Tap Yes to proceed. • Tap No to cancel. 	
5	Select the check-box for the current axis/axes to be calibrated.	

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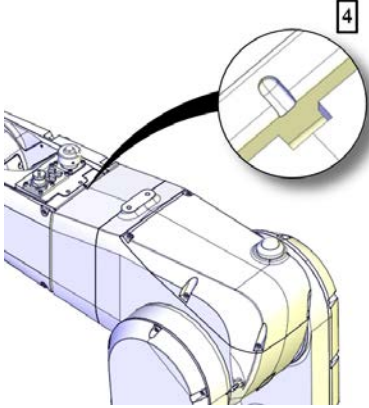
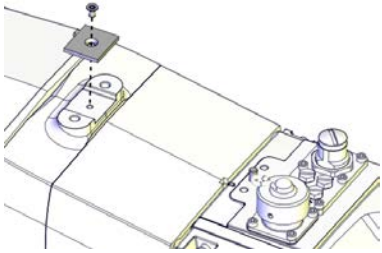
5 Calibration

5.6.6 Manual calibration method - calibrating axis 4

Continued

	Action	Note
6	<p>Tap Calibrate.</p> <p>A dialog box is displayed, warning that calibration of the selected axes will be changed, which cannot be undone:</p> <ul style="list-style-type: none"> • Tap Calibrate to proceed. • Tap Cancel to cancel. <p>Tapping Calibrate results in briefly displaying a dialog box, announcing that the calibration process has started.</p> <p>The axis is calibrated and the system returns to the list of available mechanical units.</p>	

Checking and finalizing the calibration

	Action	Note
1	Release the brakes and manually rotate the axis to apart the calibration pins from each other. This is done to avoid damage on the pins if incorrect operation should occur during next step of jogging.	
2	Remove the calibration tool of axes 4, 5, and 6 from the tubular.	
3	Remove the axis-4 calibration tool from the housing.	
4	Jog axis 4 to zero degree using the FlexPendant.	
5	<p>Check that the synchronization marks on axis 4 are aligned with each other.</p> <p>Are they aligned within the tolerances?</p> <ul style="list-style-type: none"> • If yes, the calibration is verified OK. • If no, redo the fine calibration procedure. 	 <p>xx1400001095</p>
6	Refit the protection cover to the housing.	 <p>xx1400001205</p>

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After calibration

	Action	Note
1	Write down the new system parameters on a new label and stick on top of the calibration label on the robot.	

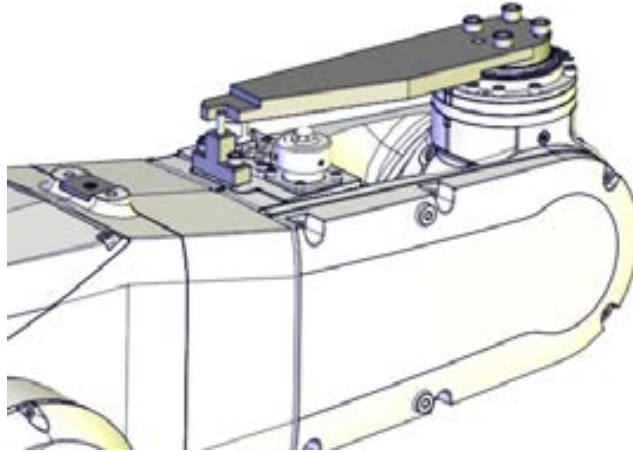
5 Calibration

5.6.7 Manual calibration method - calibrating axis 5 and axis 6

5.6.7 Manual calibration method - calibrating axis 5 and axis 6

Calibration position of axes 5 and 6

The figure shows axes 5 and 6 in calibration position, with calibration tools fitted.



xx1400001206

Required equipment

Equipment	Art. no.	Note
Calibration toolkit, manual calibration	3HAC051256-001	Includes calibration tools, pins and attachment screws for manual calibration method. ⁱ


ⁱ The robot is calibrated by either manual calibration or Axis Calibration at factory. Always use the same calibration method as used at the factory. Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant. If no data is found related to standard calibration, manual calibration is used as default.

Required consumables

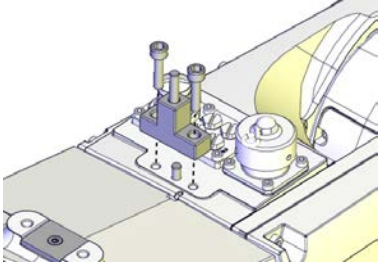
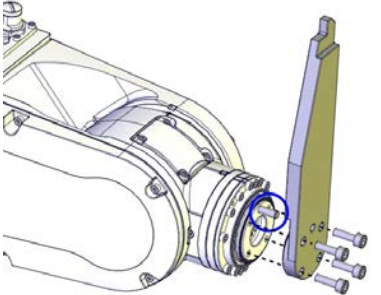

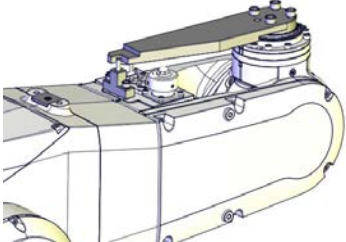
Equipment	Art. no.	Note
Cleaning agent	-	Isopropanol

Calibrating axis 5 and axis 6

Moving the robot to calibration position

	Action	Note
1	Jog all axes to zero position.	
2	 DANGER Turn off all: <ul style="list-style-type: none">• electric power supply• hydraulic pressure supply• air pressure supply to the robot, before entering the robot working area.	

Continues on next page

	Action	Note
3	Fit the calibration block to the tubular.	<p>Screws: M4x16.</p>  <p>xx1400001114</p>
4	Fit the guide pin to the disk and then fit the calibration tool of axes 5 and 6.	<p>Screws: M5x16.</p>  <p>xx1400001115</p>
5	 <p>DANGER</p> <p>When releasing the holding brakes, the robot axes may move very quickly and sometimes in unexpected ways! Make sure no personnel is near or beneath the robot arm!</p>	
6	<p>Release the brakes and manually rotate axes 5 and 6 until the axis-5/6 calibration tool and the calibration block touches each other gently. There should be no pressing force between the pins.</p> <p>When doing this, pay attention to robot pose in order to avoid arm collision.</p> <p>When the axis is in position, release the brake release button to activate the brakes again.</p>	<p>How to release the brakes is detailed in Manually releasing the brakes on page 72.</p>  <p>xx1400001206</p>


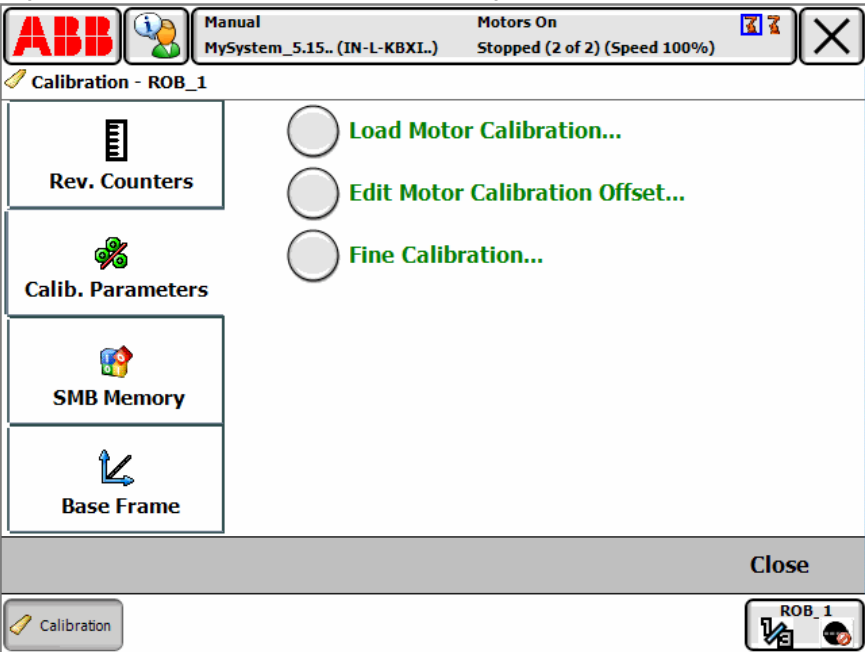
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5 Calibration

5.6.7 Manual calibration method - calibrating axis 5 and axis 6

Continued

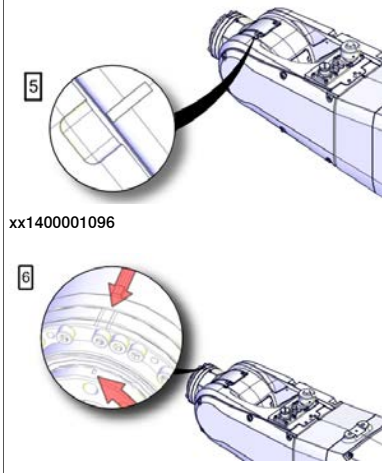
Performing the fine calibration procedure

	Action	Note
1	 WARNING Do not fine calibrate the robot without special equipment used for axis calibration! It would cause an unsatisfied accuracy in the robot movement.	
2	Choose fine calibration from Calib menu On the ABB menu, tap Calibration . All mechanical units connected to the system are shown along with their calibration status.	
3	Tap to select the mechanical unit and then tap Calib. Parameters . 	
4	Tap Fine Calibration.... A dialog box is displayed, urging you to use external equipment to perform the actual calibration. Make sure all necessary calibration equipment is fitted for the axis to be calibrated. A dialog box is displayed, warning that updating the revolution counters may change programmed robot positions: <ul style="list-style-type: none"> • Tap Yes to proceed. • Tap No to cancel. 	
5	Select the check-box for the current axis/axes to be calibrated.	

Continues on next page

	Action	Note
6	<p>Tap Calibrate.</p> <p>A dialog box is displayed, warning that calibration of the selected axes will be changed, which cannot be undone:</p> <ul style="list-style-type: none"> • Tap Calibrate to proceed. • Tap Cancel to cancel. <p>Tapping Calibrate results in briefly displaying a dialog box, announcing that the calibration process has started.</p> <p>The axis is calibrated and the system returns to the list of available mechanical units.</p>	

Checking and finalizing the calibration

	Action	Note
1	Release the brakes and manually rotate the axis to apart the calibration pins from each other. This is done to avoid damage on the pins if incorrect operation should occur during next step of jogging.	
2	Jog axis 5 and 6 to zero degree using the Flex-Pendant.	
3	<p>Check that the synchronization marks on axis 5 and axis 6 are aligned with each other.</p> <p>Are they aligned within the tolerances?</p> <ul style="list-style-type: none"> • If yes, the calibration is verified OK. • If no, redo the fine calibration procedure. 	 <p>xx1400001096</p> <p>xx1400001097</p>
4	Remove the calibration block from the tubular.	
5	Remove the calibration tool of axes 5 and 6 from the disk.	

After calibration

	Action	Note
1	Write down the new system parameters on a new label and stick on top of the calibration label on the robot.	

5 Calibration

5.7 Verifying the calibration

5.7 Verifying the calibration

Introduction

Always verify the results after calibrating *any* robot axis to verify that all calibration positions are correct.

Verifying the calibration

Use this procedure to verify the calibration result.

	Action	Note
1	Run the calibration home position program twice. Do not change the position of the robot axes after running the program!	See Checking the synchronization position on page 867 .
2	Adjust the <i>synchronization marks</i> when the calibration is done, if necessary.	This is detailed in section Synchronization marks and synchronization position for axes on page 812 .
3	Write down the values on a new label and stick it on top of the calibration label. The label is located on one side of the base.	

5.8 Checking the synchronization position

Introduction

Check the synchronization position of the robot before beginning any programming of the robot system. This may be done:

- Using a `MoveAbsJ` instruction with argument zero on all axes.
- Using the **Jogging** window on the FlexPendant. Using the **Jog** window on the FlexPendant.

Using a `MoveAbsJ` instruction

Use this procedure to create a program that runs all the robot axes to their synchronization position.

	Action	Note
1	On ABB menu tap Program editor .	
2	Create a new program.	
3	Use MoveAbsJ in the Motion&Proc menu.	
4	Create the following program: <pre>MoveAbsJ [[0,0,0,0,0,0], [9E9,9E9,9E9,9E9,9E9,9E9]] \NoEOffs, v1000, fine, tool0</pre>	
5	Run the program in manual mode.	
6	Check that the synchronization marks for the axes align correctly. If they do not, update the revolution counters.	See Synchronization marks and synchronization position for axes on page 812 and Updating revolution counters on page 815 .

Using the jogging window

Use this procedure to jog the robot to the synchronization position of all axes.

	Action	Note
1	On the ABB menu, tap Jogging .	
2	Tap Motion mode to select group of axes to jog.	
3	Tap to select the axis to jog, axis 1, 2, or 3.	
4	Manually run the robots axes to a position where the axis position value read on the FlexPendant, is equal to zero.	
5	Check that the synchronization marks for the axes align correctly. If they do not, update the revolution counters.	See Synchronization marks and synchronization position for axes on page 812 and Updating revolution counters on page 815 .

Continues on next page

5 Calibration

5.8 Checking the synchronization position

Continued

Using a MoveAbsJ instruction

Use this procedure to create a program that runs all the robot axes to their synchronization position.

	Action	Note
1	Tap Code.	
2	Create a new program.	
3	Use MoveAbsJ in the Add Instruction menu.	
4	Create the following program: <pre>MoveAbsJ [[0,0,0,0,0,0], [9E9,9E9,9E9,9E9,9E9,9E9]] \NoEOfs, v1000, fine, tool0</pre>	
5	Run the program in manual mode.	
6	Check that the synchronization marks for the axes align correctly. If they do not, update the revolution counters.	See Synchronization marks and synchronization position for axes on page 812 and Updating revolution counters on page 815 .

Using the jogging window

Use this procedure to jog the robot to the synchronization position of all axes.

	Action	Note
1	Tap Jog.	
2	From the Mechanical unit list select a mechanical unit.	
3	From the Motion mode section, select an axis-set that need to be jogged. For example, to jog axis 2, select the axis set Axis 1-3 .	
4	Follow the screen instruction on joystick movements to understand the direction of the axis that you want to move and move the joystick.	
5	Manually run the robots axes to a position where the axis position value read on the FlexPendant, is equal to zero.	
6	Check that the synchronization marks for the axes align correctly. If they do not, update the revolution counters.	See Synchronization marks and synchronization position for axes on page 812 and Updating revolution counters on page 815 .

6 Decommissioning

6.1 Introduction

Introduction

This section contains information to consider when taking a product, robot or controller, out of operation.

It deals with how to handle potentially dangerous components and potentially hazardous materials.

General

All used grease/oils and dead batteries **must** be disposed of in accordance with the current legislation of the country in which the robot and the control unit are installed.

If the robot or the control unit is partially or completely disposed of, the various parts **must** be grouped together according to their nature (which is all iron together and all plastic together), and disposed of accordingly. These parts **must** also be disposed of in accordance with the current legislation of the country in which the robot and control unit are installed.

6 Decommissioning

6.2 Environmental information

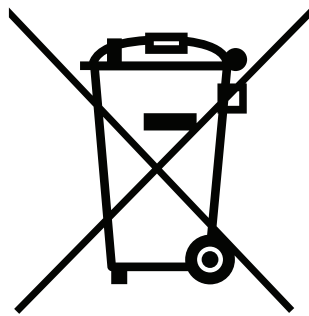
6.2 Environmental information

Introduction

ABB robots contain components in different materials. During decommissioning, all materials should be dismantled, recycled, or reused responsibly, according to the relevant laws and industrial standards. Robots or parts that can be reused or upcycled helps to reduce the usage of natural resources.

Symbol

The following symbol indicates that the product must not be disposed of as common garbage. Handle each product according to local regulations for the respective content (see table below).



xx1800000058

Materials used in the product

The table specifies some of the materials in the product and their respective use throughout the product.

Dispose components properly according to local regulations to prevent health or environmental hazards.

Material	Example application
Aluminium	Base, lower arm, upper arm
Batteries, Lithium	Encoder interface board
Cast iron/nodular iron	Gears
Copper	Cables, motors
Neodymium	Motors
Oil, grease	Gears
Stainless steel	Mechanical stop
Steel	Gears, screws, washers, brackets

Continues on next page

Oil and grease

Where possible, arrange for oil and grease to be recycled. Dispose of via an authorized person/contractor in accordance with local regulations. Do not dispose of oil and grease near lakes, ponds, ditches, down drains, or onto soil. Incineration must be carried out under controlled conditions in accordance with local regulations.

Also note that:

- Spills can form a film on water surfaces causing damage to organisms. Oxygen transfer could also be impaired.
- Spillage can penetrate the soil causing ground water contamination.

6 Decommissioning

6.3 Scrapping of robot

6.3 Scrapping of robot

Important when scrapping the robot



DANGER

When a robot is disassembled while being scrapped, it is very important to remember the following before disassembling starts, in order to prevent injuries:

- Always remove all batteries. If a battery is exposed to heat, for example from a blow torch, it will explode.
- Always remove all oil/grease in gearboxes. If exposed to heat, for example from a blow torch, the oil/grease will catch fire.
- When motors are removed from the robot, the robot will collapse if it is not properly supported before the motor is removed.

7 Robot description

7.1 Introduction

Manipulator description

IRB 1200 is one of ABB 6-axis industrial robots, with multiple variants designed to work in various environments. Different IRB 1200 variant supports to work with either IRC5/IRC5C controller or OmniCore controller, or both. The following table lists the supported controller type for IRB 1200 in different protection classes/types.

Protection	Controller type			
	IRC5	IRC5C	OmniCore C line	OmniCore E line
Standard, IP40	X	X	X	X
Standard, IP67	X	X	X	X
Clean Room	X	X	X	X
Food grade lubrication	X	X		
Foundry plus	X	X	X	X
Hygienic	X	X	X	

For details, see *Product specification - IRB 1200*.

7 Robot description

7.2 Type A of IRB 1200

7.2 Type A of IRB 1200

Type A - Axis Calibration

The difference between IRB 1200 and IRB 1200 Type A is that the Type A is calibrated with Axis Calibration. On each axis there are bushings for installation of calibration tools.

As a result of this, the castings differ between IRB 1200 and IRB 1200 Type A.



Note

IRB 1200 Type B is designed based on IRB 1200 Type A so that Type B has the bushings for installation of calibration tools too.

The difference between IRB 1200 Type A and IRB 1200 Type B is that Type B also supports SafeMove 2. See [Type B of IRB 1200 on page 875](#).

How to know which type the robot is?

The type label on the base of the robot tells if the robot is calibrated with Axis Calibration.

Those robots are named IRB 1200 Type A.



Note

If no type label attached on the robot, use the bushings on each axis to identify a robot calibrated with Axis Calibration.

Those robots which are not equipped for Axis Calibration are simply named IRB 1200 (no type specified).

7.3 Type B of IRB 1200

Type B - SafeMove 2



Note

IRB 1200 working with OmniCore E10 does not support SafeMove 2.

The difference between IRB 1200 Type B and other IRB 1200 versions is that the Type B supports SafeMove 2.

As a result of this, the following parts differ from other versions:

- Base
- Drive unit, axis 2, axis 3, axis 5 and axis 6
- Motor with pulley, axis 4 and axis 5
- Manipulator cable harness
- Battery pack
- SMB unit (replacing EIB unit)

IRB 1200 Type B is designed based on IRB 1200 Type A so that Type B has the bushings for installation of calibration tools too.

How to know which type the robot is?

The type label on the base of the robot tells if the robot supports SafeMove 2.

Those robots are named IRB 1200 Type B.

7 Robot description

7.4.1 Spare part versions for the base on IP40/IP67 robots

7.4 Description of spare part versions



7.4.1 Spare part versions for the base on IP40/IP67 robots

Spare part versions for the base on IP40/IP67 robots



Note

IRB 1200 has different base versions that are not compatible with each other. Always use the following list as a reference to check the base installed on robot and order the correct spare parts.

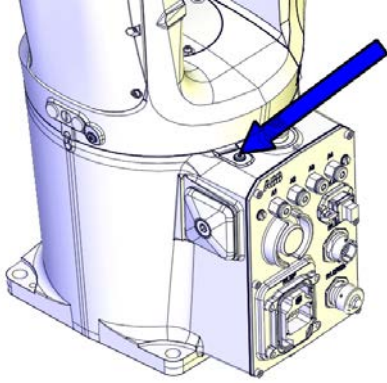
Base installed on robot (spare part number)	Article number in WebConfig	What to order	How to see which version is installed on robot
3HAC049628-001	3HAC044533-001	Order: <ul style="list-style-type: none"> base 3HAC059553-001 swing 3HAC059554-001 IP40: sealing ring 3HAC068107-001 IP67: sealing ring + gasket + V-ring 3HAC059791-001 	Look on the outside of the base. Base 3HAC049628-001 has no hole on the side of the base.  xx160000124
3HAC057999-001	3HAC056657-001	Order: <ul style="list-style-type: none"> base 3HAC059553-001 	Base 3HAC057999-001 has a hole on the side of the base.  xx160000051

Continues on next page

7 Robot description

7.4.1 Spare part versions for the base on IP40/IP67 robots

Continued

Base installed on robot (spare part number)	Article number in WebConfig	What to order	How to see which version is installed on robot
3HAC059553-001	3HAC058386-001	Order: <ul style="list-style-type: none">• base 3HAC059553-001	<p>Base 3HAC059553-001 has a bushing for fitting calibration tool for Axis Calibration.</p>  <p>xx1600001037</p>

7 Robot description

7.4.2 Spare part versions for the swing on IP40/IP67 robots

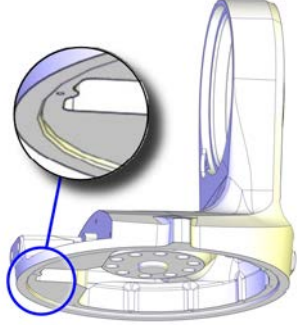
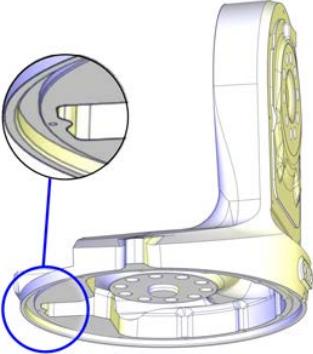
7.4.2 Spare part versions for the swing on IP40/IP67 robots

Spare part versions for the swing on IP40/IP67 robots

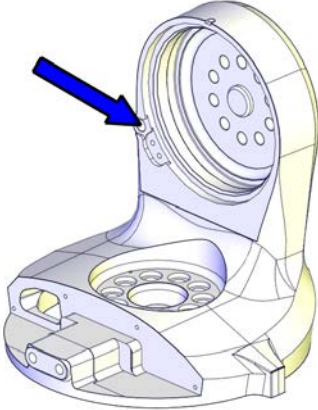


Note

IRB 1200 has different swing versions that are not compatible with each other. Always use the following list as a reference to check the swing installed on robot and order the correct spare parts.

Swing installed on robot (spare part number)	Article number in WebConfig	What to order	How to see which version is installed on robot
3HAC049632-001	3HAC044534-001	Order: <ul style="list-style-type: none"> • swing 3HAC059554-001 • IP67: sealing ring + gasket + V-ring 3HAC059791-001 	Look underneath the swing, the surface is flat.  xx1600000052
3HAC058000-001	3HAC056656-001	Order: <ul style="list-style-type: none"> • swing 3HAC059554-001 	Look underneath the swing, there is a groove.  xx1600000053

Continues on next page

Swing installed on robot (spare part number)	Article number in WebConfig	What to order	How to see which version is installed on robot
3HAC059554-001	3HAC058387-001	Order: <ul style="list-style-type: none"> • swing 3HAC059554-001 	The swing has a bushing for fitting calibration tool for Axis Calibration.  <p>xx1600001038</p>

7 Robot description

7.4.3 Spare part versions for the axis-1 sealing ring on IP40/IP67 robots

7.4.3 Spare part versions for the axis-1 sealing ring on IP40/IP67 robots

Spare part versions for the axis-1 sealing ring on IP40/IP67 robots



Note

IRB 1200 has different axis-1 sealing ring versions that are not compatible with each other. Always use the following list as a reference to check the sealing ring installed on robot and order the correct spare parts.

Sealing ring installed on robot (spare part number)	Article number in WebConfig	What to order	How to see which version is installed on robot
3HAC044676-001	3HAC044676-001	Order: <ul style="list-style-type: none"> sealing ring 3HAC044676-001 	The sealing ring is flat.  xx1600000125
3HAC056658-001	3HAC056658-001	Order: <ul style="list-style-type: none"> IP40: sealing ring 3HAC068107-001 IP67: sealing ring + gasket + V-ring 3HAC059791-001 	The sealing ring has one folded wall on both sides.  xx1600000126
3HAC058568-001	3HAC058568-001	Order: <ul style="list-style-type: none"> sealing ring 3HAC068107-001 	The sealing ring is flat and the edge is thinner.  xx1600001039
3HAC068107-001	3HAC068107-001	Order: <ul style="list-style-type: none"> sealing ring 3HAC068107-001 	The sealing ring has a gap in the inner side.  xx1900001603


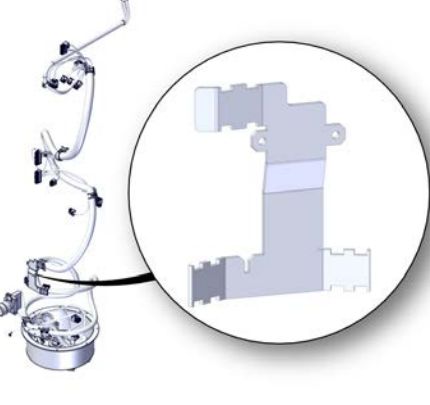
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7.4.3 Spare part versions for the axis-1 sealing ring on IP40/IP67 robots

Continued

Compatibility between cable harness and axis-1 sealing ring on IP40/IP67 robots

The manipulator cable harness is designed with different cable brackets that are compatible with different spare part versions of the axis-1 sealing ring. Always use the following list as a reference to check the cable harness installed on robot and order the correct spare parts.

How to see which kind of cable harness is installed on robot	What to order
 <p data-bbox="448 992 560 1014">xx1900001602</p>	<p data-bbox="943 544 1023 566">Order:</p> <ul data-bbox="983 568 1417 719" style="list-style-type: none"> <li data-bbox="983 568 1417 591">• corresponding cable harness. See "Manipulator cable harness" in <i>Product manual, spare parts - IRB 1200</i> for spare part numbers. <li data-bbox="983 689 1417 712">• sealing ring 3HAC068107-001
 <p data-bbox="448 1469 560 1491">xx1900001601</p>	<p data-bbox="943 1052 1023 1075">Order:</p> <ul data-bbox="983 1077 1417 1189" style="list-style-type: none"> <li data-bbox="983 1077 1417 1099">• corresponding cable harness. See "Manipulator cable harness" in <i>Product manual, spare parts - IRB 1200</i> for spare part numbers.

7 Robot description

7.4.4 Spare part versions for the housing on Type A robots

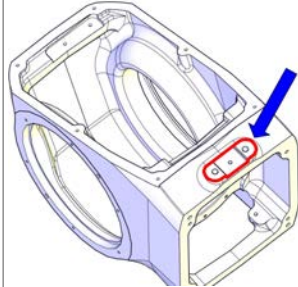
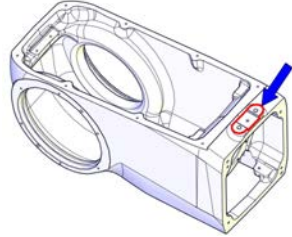
7.4.4 Spare part versions for the housing on Type A robots

Spare part versions for the housing on Type A robots



Note

IRB 1200 and IRB 1200 Type A have different housing versions that are not compatible with each other. Always use the following list as a reference to check the housing installed on robot and to order the correct spare parts.

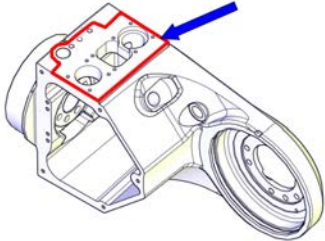
Robot variant	Housing installed on robot (spare part number)	Article number in WebConfig	What to order	How to see which version is installed on robot
IRB 1200-7/0.7	3HAC059680-001	3HAC044544-001	Order: <ul style="list-style-type: none"> housing (IRB 1200-7/0.7): 3HAC059680-001 	<p>The plane (encircled in the figure) on housing 3HAC059680-001 has no painting, while that on housing 3HAC059721-001 is painted.</p>  <p>xx1600001127</p>
	3HAC059721-001	3HAC058389-001	Order: <ul style="list-style-type: none"> housing (IRB 1200-7/0.7): 3HAC059721-001 	
IRB 1200-5/0.9	3HAC059681-001	3HAC04456-001	Order: <ul style="list-style-type: none"> housing (IRB 1200-5/0.9): 3HAC059681-001 	<p>The plane (encircled in the figure) on housing 3HAC059681-001 has no painting, while that on housing 3HAC059722-001 is painted.</p>  <p>xx1600001129</p>
	3HAC059722-001	3HAC058393-001	Order: <ul style="list-style-type: none"> housing (IRB 1200-5/0.9): 3HAC059722-001 	

7.4.5 Spare part versions for the tubular on Type A robots

Spare part versions for the tubular on Type A robots

**Note**

IRB 1200 and IRB 1200 Type A have different tubular versions that are not compatible with each other. Always use the following list as a reference to check the tubular installed on robot and to order the correct spare parts.

Tubular installed on robot (spare part number)	Article number in WebConfig	What to order	How to see which version is installed on robot
3HAC059693-001	3HAC044548-001	Order: <ul style="list-style-type: none"> tubular with sleeve: 3HAC059693-001 	<p>The plane (encircled in the figure) on tubular 3HAC059693-001 has no painting, while that on tubular 3HAC059723-001 is painted.</p>  <p>xx1600001128</p>
3HAC059723-001	3HAC058390-001	Order: <ul style="list-style-type: none"> tubular with sleeve: 3HAC059723-001 	

7 Robot description

7.4.6 Spare part versions for the tubular cover on Clean Room robots

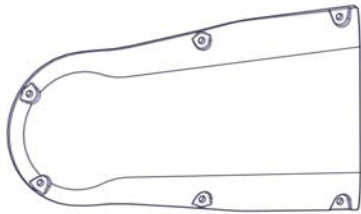
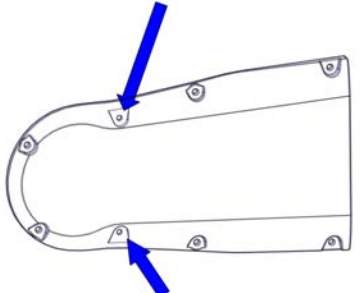
7.4.6 Spare part versions for the tubular cover on Clean Room robots

Spare part versions for the tubular cover on Clean Room robots



Note

IRB 1200 with protection type Clean Room has different tubular cover versions that are not compatible with each other. Always use the following list as a reference to check the tubular cover installed on robot and to order the correct spare parts.

Tubular cover installed on Clean Room robots (spare part number)	Article number in WebConfig	What to order	How to see which version is installed on robot
3HAC056144-001	3HAC044550-001	Order: <ul style="list-style-type: none"> tubular cover, clean room: 3HAC056144-001 	<p>Tubular cover 3HAC056144-001 has six screw holes.</p>  <p>xx1600001117</p>
3HAC059708-001	3HAC058929-001	Order: <ul style="list-style-type: none"> tubular cover, clean room: 3HAC059708-001 	<p>Tubular cover 3HAC059708-001 has eight screw holes.</p>  <p>xx1600001118</p>

8 Reference information

8.1 Introduction

General

This chapter includes general information, complementing the more specific information in the different procedures in the manual.

8 Reference information

8.2 Applicable standards

8.2 Applicable standards

General

The product is compliant with ISO 10218-1:2011, *Robots for industrial environments - Safety requirements - Part 1 Robots*, and applicable parts in the normative references, as referred to from ISO 10218-1:2011. In case of deviation from ISO 10218-1:2011, these are listed in the declaration of incorporation. The declaration of incorporation is part of the delivery.

Robot standards

Standard	Description
ISO 9283	Manipulating industrial robots – Performance criteria and related test methods
ISO 9787	Robots and robotic devices – Coordinate systems and motion nomenclatures
ISO 9946	Manipulating industrial robots – Presentation of characteristics

Other standards used in design

Standard	Description
IEC 60204	Safety of machinery - Electrical equipment of machines - Part 1: General requirements, normative reference from ISO 10218-1
IEC 61000-6-2	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments
IEC 61000-6-4	Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments
ISO 13849-1:2006	Safety of machinery - Safety related parts of control systems - Part 1: General principles for design, normative reference from ISO 10218-1
IEC 61340-5-1	Protection of electronic devices from electrostatic phenomena - General requirements

Region specific standards and regulations

Standard	Description
ANSI/RIA R15.06	Safety requirements for industrial robots and robot systems
ANSI/UL 1740	Safety standard for robots and robotic equipment
CAN/CSA Z 434-03	Industrial robots and robot Systems - General safety requirements
ANSI/ESD S20.20	Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)
EN ISO 10218-1	Robots and robotic devices — Safety requirements for industrial robots — Part 1: Robots

8.3 Unit conversion

Converter table

Use the following table to convert units used in this manual.

Quantity	Units		
Length	1 m	3.28 ft.	39.37 in
Weight	1 kg	2.21 lb.	
Weight	1 g	0.035 ounces	
Pressure	1 bar	100 kPa	14.5 psi
Force	1 N	0.225 lbf	
Moment	1 Nm	0.738 lbf-ft	
Volume	1 L	0.264 US gal	

8 Reference information

8.4 Screw joints

8.4 Screw joints

General

This section describes how to tighten the various types of screw joints on ABB robots.

The instructions and torque values are valid for screw joints comprised of metallic materials and do *not* apply to soft or brittle materials.

UNBRAKO screws

UNBRAKO is a special type of screw recommended by ABB for certain screw joints. It features special surface treatment (Gleitmo as described below) and is extremely resistant to fatigue.

Whenever used, this is specified in the instructions, and in such cases, *no other type of replacement screw* is allowed. Using other types of screws will void any warranty and may potentially cause serious damage or injury.

Gleitmo treated screws

Gleitmo is a special surface treatment to reduce the friction when tightening the screw joint. It is recommended by ABB for M6-M20 screw joints. Screws treated with Gleitmo may be reused 3-4 times before the coating disappears. After this the screw must be discarded and replaced with a new one.

When handling screws treated with Gleitmo, protective gloves of nitrile rubber type should be used.

Generally, screws are lubricated with *Gleitmo 603* mixed with *Geomet 500* or *Geomet 702* in proportion 1:3. *Geomet* thickness varies according to screw dimensions, refer to the following.

Dimension	Lubricant	Geomet thickness
M6-M20 (any length except M20x60)	<i>Gleitmo 603 + Geomet 500</i>	3-5 µm
M6-M20 (any length except M20x60)	<i>Gleitmo 603 + Geomet 720</i>	3-5 µm
M20x60	<i>Gleitmo 603 + Geomet 500</i>	8-12 µm
M20x60	<i>Gleitmo 603 + Geomet 720</i>	6-10 µm

Screws lubricated in other ways

Screws lubricated with Molykote 1000 or Molykote P1900 should *only* be used when specified in the repair, maintenance or installation procedure descriptions.

In such cases, proceed as follows:

- 1 Apply lubricant to the screw thread.
- 2 Apply lubricant between the plain washer and screw head.
- 3 Tighten to the torque as described in the procedures.

Lubricant	Article number
Molykote 1000 (molybdenum disulphide grease)	3HAC042472-001
Molykote P1900 (molybdenum disulphide grease)	3HAC070875-001

Continues on next page

Tightening torque

Before tightening any screw, note the following:

- Determine whether a **standard** tightening torque or **special** torque is to be applied. The **standard torques** are specified in the following tables. Any **special torques** are specified in the repair, maintenance or installation procedure descriptions. **Any special torque specified overrides the standard torque!**
- Use the *correct tightening torque* for each type of screw joint.
- Only use *correctly calibrated* torque keys.
- *Always tighten the joint by hand*, and never use pneumatic tools.
- Use the *correct tightening technique*, that is *do not jerk*. Tighten the screw in a slow, flowing motion.
- Maximum allowed total deviation from the specified value is **10%!**

Oil-lubricated screws with slotted or cross-recess head screws

The following table specifies the recommended standard tightening torque for *oil-lubricated screws with slotted or cross-recess head screws*.

**Note**

A special torque specified in the repair, maintenance or installation procedure overrides the standard torque.

Oil-lubricated screws with allen head screws

The following table specifies the recommended standard tightening torque for *oil-lubricated screws with allen head screws*.

**Note**

A special torque specified in the repair, maintenance or installation procedure overrides the standard torque.

Dimension	Tightening torque (Nm) Class 8.8, oil-lubricated	Tightening torque (Nm) Class 10.9, oil-lubricated	Tightening torque (Nm) Class 12.9, oil-lubricated
M5	6	-	-
M6	10	-	-
M8	24	34	40
M10	47	67	80
M12	82	115	140
M16	200	290	340
M20	400	560	670
M24	680	960	1150

Continues on next page

8 Reference information

8.4 Screw joints

Continued

Lubricated screws (Molykote, Gleitmo or equivalent) with allen head screws

The following table specifies the recommended standard tightening torque for screws lubricated with Molykote 1000, Gleitmo 603 or equivalent with allen head screws.



Note

A special torque specified in the repair, maintenance or installation procedure overrides the standard torque.

Dimension	Tightening torque (Nm) Class 10.9, lubricated ⁱ	Tightening torque (Nm) Class 12.9, lubricated ⁱ
M8	28	35
M10	55	70
M12	96	120
M16	235	300
M20	460	550
M24	790	950

ⁱ Lubricated with Molykote 1000, Gleitmo 603 or equivalent

8.5 Weight specifications


Definition

In installation, repair, and maintenance procedures, weights of the components handled are sometimes specified. All components exceeding 22 kg (50 lbs) are highlighted in this way.

To avoid injury, ABB recommends the use of a lifting accessory when handling components with a weight exceeding 22 kg. A wide range of lifting accessories and devices are available for each manipulator model.

Example

Following is an example of a weight specification in a procedure:

Action	Note
 CAUTION The arm weighs 25 kg. All lifting accessories used must be sized accordingly.	

8 Reference information

8.6 Standard toolkit

8.6 Standard toolkit

General

All service (repairs, maintenance, and installation) procedures contains lists of tools required to perform the specified activity.

All special tools required are listed directly in the procedures while all the tools that are considered standard are gathered in the standard toolkit and defined in the following table.

This way, the tools required are the sum of the standard toolkit and any tools listed in the instruction.

Contents, standard toolkit

Qty	Tool	Rem.
1	Socket head cap 2-17 mm	
1	Torque wrench 0.3-45 Nm	
1	Torque wrench 55 Nm \pm 5 Nm	For securing robot to foundation.
1	Ratchet head for torque wrench 1/2	
1	Hex socket head cap no. 2.5 socket 1/2" bit L=110 mm	
1	Small screwdriver	
1	T-handle with ball head	
1	Small cutting plier	
1	Plastic mallet	
1	Needle-nose plier	

8.7 Special tools

General

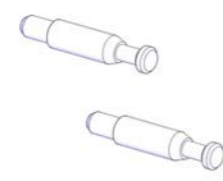
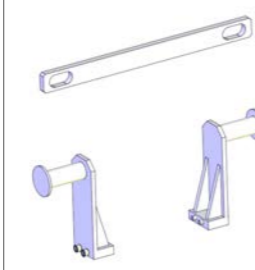
All service instructions contain lists of tools required to perform the specified activity. The required tools are a sum of standard tools, defined in the section [Standard toolkit on page 892](#), and of special tools, listed directly in the instructions and also gathered in this section.

Special tools

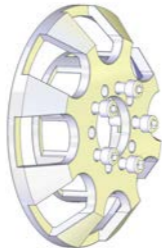
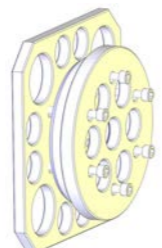
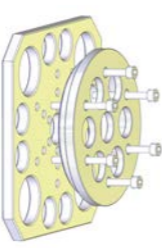
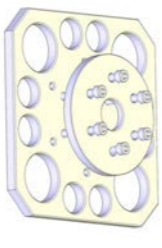
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8 Reference information

8.7 Special tools

Tools and equipment with spare part number: (These tools can be ordered from ABB)			Cable harness	EIB/SMB unit	Axis-4 FPC unit	Axis-5 FPC unit	Housing extender unit (including sealings)	Base spare parts	Swing spare parts	Lower arm	Signal lamp	Axis-3 radial sealing and sealing ring	Axis-1 mechanical stop	Axis-2 mechanical stop	Axis-3 mechanical stop	Axis-4 mechanical stop	Tubular spare parts	Axis-4 motor with pulley	Axis-5 motor with pulley	Axis-5 and axis-6 drive unit	Axis-4 gearbox, drive shaft and pulley	Axis-4 timing belt	Axis-5 timing belt	
Guide pins																								
3HAC049703-001	Guide pin for axis-1 gear unit		3					3	3															
3HAC049704-001	Guide pin for axis-2 gear unit								3	3														
3HAC049705-001	Guide pin for upper arm									3														
3HAC049706-001	Guide pin for tilt unit (axis 5)																3			3				
3HAC079684-001	Guide pin for stainless shaft on tool flange	 xx2100001461															2			2				
Lifting accessories																								
3HAC049711-001	Lifting accessory, robot Includes lifting accessories, lifting beam and screws.	 xx1400000542	1					1																
-	Roundsling, 2 m Length: 2 m. Lifting capacity: 100 kg.		1					1	1															
Press, puller and unloading tools																								

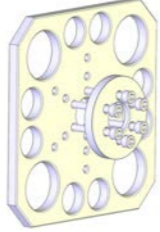
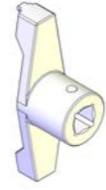
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Tools and equipment with spare part number: (These tools can be ordered from ABB)			Cable harness	EIB/SMB unit	Axis-4 FPC unit	Axis-5 FPC unit	Housing extender unit (including sealings)	Base spare parts	Swing spare parts	Lower arm	Signal lamp	Axis-3 radial sealing and sealing ring	Axis-1 mechanical stop	Axis-2 mechanical stop	Axis-3 mechanical stop	Axis-4 mechanical stop	Tubular spare parts	Axis-4 motor with pulley	Axis-5 motor with pulley	Axis-5 and axis-6 drive unit	Axis-4 gearbox, drive shaft and pulley	Axis-4 timing belt	Axis-5 timing belt	
3HAC049692-001	Axis-1 sealing assembly tool set Used to refit the axis-1 radial sealing.	 xx140000535						1																
3HAC049694-001	Axis-2 sealing assembly tool set Used to refit the radial sealing, if replacement is needed.	 xx140000541							1															
3HAC049697-001	Axis-3 sealing assembly tool set Used to refit the axis-3 radial sealing.	 xx140000538										1												
3HAC049699-001	Axis-4 sealing assembly tool set Used to refit the radial sealing, if replacement is needed.	 xx140000539			1											1					1			
3HAC049701-001	Axis-5 sealing assembly tool set Used to refit the radial sealing, if replacement is needed.					1											1			1				

Continues on next page

8 Reference information

8.7 Special tools

Tools and equipment with spare part number: (These tools can be ordered from ABB)			Cable harness	EIB/SMB unit	Axis-4 FPC unit	Axis-5 FPC unit	Housing extender unit (including sealings)	Base spare parts	Swing spare parts	Lower arm	Signal lamp	Axis-3 radial sealing and sealing ring	Axis-1 mechanical stop	Axis-2 mechanical stop	Axis-3 mechanical stop	Axis-4 mechanical stop	Tubular spare parts	Axis-4 motor with pulley	Axis-5 motor with pulley	Axis-5 and axis-6 drive unit	Axis-4 gearbox, drive shaft and pulley	Axis-4 timing belt	Axis-5 timing belt	
		 xx140000540																						
Other tools																								
-	24 VDC power supply		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3HAC051256-001	Calibration toolkit, manual calibration		1		1		1	1	1	1							1	1	1	1	1	1	1	1
3HAC074119-001	Calibration tool box, Axis Calibration		1		1		1	1	1	1							1	1	1	1	1	1	1	1
3HAC079686-001	Flange tightening tool	 xx2100001462															1				1			

Continues on next page

8.8 Lifting accessories and lifting instructions

General

Many repair and maintenance activities require different pieces of lifting accessories, which are specified in each procedure.

The use of each piece of lifting accessories is *not* detailed in the activity procedure, but in the instruction delivered with each piece of lifting accessories.

The instructions delivered with the lifting accessories should be stored for later reference.

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9 Spare parts

9.1 Spare part lists and illustrations

Location

Spare parts and exploded views are not included in the manual but delivered as a separate document for registered users on myABB Business Portal, www.abb.com/myABB.



Tip

All documents can be found via myABB Business Portal, www.abb.com/myABB.

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10 Circuit diagrams

10.1 Circuit diagrams

Overview

The circuit diagrams are not included in this manual, but are available for registered users on myABB Business Portal, www.abb.com/myABB.

See the article numbers in the tables below.

Controllers

Product	Article numbers for circuit diagrams
<i>Circuit diagram - OmniCore C30, Circuit diagram - OmniCore C30 for IRB 14050, Circuit diagram - OmniCore C30 for CRB 15000</i>	3HAC059896-009, 3HAC063898-009, 3HAC072448-009
<i>Circuit diagram - OmniCore C90XT</i>	3HAC065464-009
<i>Circuit diagram - OmniCore E10</i>	3HAC076810-008
<i>Circuit diagram - IRC5</i>	3HAC024480-011
<i>Circuit diagram - IRC5 Compact</i>	3HAC049406-003
<i>Circuit diagram - Euromap 67, design 14</i>	3HAC024120-005
<i>Circuit diagram - Spot welding cabinet</i>	3HAC057185-001

Manipulators

Product	Article numbers for circuit diagrams
<i>Circuit diagram - IRB 120</i>	3HAC031408-003
<i>Circuit diagram - IRB 140 type C</i>	3HAC6816-3
<i>Circuit diagram - IRB 260</i>	3HAC025611-001
<i>Circuit diagram - IRB 360</i>	3HAC028647-009
<i>Circuit diagram - IRB 460</i>	3HAC036446-005
<i>Circuit diagram - IRB 660</i>	3HAC025691-001
<i>Circuit diagram - IRB 760</i>	3HAC025691-001
<i>Circuit diagram - IRB 1200</i>	3HAC046307-003
<i>Circuit diagram - IRB 1410</i>	3HAC2800-3
<i>Circuit diagram - IRB 1600/1660</i>	3HAC021351-003
<i>Circuit diagram - IRB 1520</i>	3HAC039498-007
<i>Circuit diagram - IRB 2400</i>	3HAC6670-3
<i>Circuit diagram - IRB 2600</i>	3HAC029570-007
<i>Circuit diagram - IRB 4400/4450S</i>	3HAC9821-1
<i>Circuit diagram - IRB 4600</i>	3HAC029038-003
<i>Circuit diagram - IRB 6620</i>	3HAC025090-001
<i>Circuit diagram - IRB 6620 / IRB 6620LX</i>	3HAC025090-001

Continues on next page

10 Circuit diagrams

10.1 Circuit diagrams

Continued

Product	Article numbers for circuit diagrams
<i>Circuit diagram - IRB 6640</i>	<i>3HAC025744-001</i>
<i>Circuit diagram - IRB 6650S</i>	<i>3HAC13347-1</i> <i>3HAC025744-001</i>
<i>Circuit diagram - IRB 6660</i>	<i>3HAC025744-001</i> <i>3HAC029940-001</i>
<i>Circuit diagram - IRB 6700 / IRB 6790</i>	<i>3HAC043446-005</i>
<i>Circuit diagram - IRB 7600</i>	<i>3HAC13347-1</i> <i>3HAC025744-001</i>
<i>Circuit diagram - IRB 14000</i>	<i>3HAC050778-003</i>
<i>Circuit diagram - IRB 910SC</i>	<i>3HAC056159-002</i>

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