

ROBOTICS

Product manual

IRB 5710



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Product manual

IRB 5710

OmniCore

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Table of contents

Overview of this manual	9
Product documentation	11
How to read the product manual	13
1 Safety	15
1.1 Safety information	15
1.1.1 Limitation of liability	15
1.1.2 Requirements on personnel	16
1.2 Safety signals and symbols	17
1.2.1 Safety signals in the manual	17
1.2.2 Safety symbols on manipulator labels	19
1.3 Robot stopping functions	25
1.4 Safety during installation and commissioning	26
1.5 Safety during operation	28
1.6 Safety during maintenance and repair	29
1.6.1 Safety during maintenance and repair	29
1.6.2 Emergency release of the robot axes	32
1.6.3 Brake testing	33
1.7 Safety during troubleshooting	34
1.8 Safety during decommissioning	35
2 Technical data	37
2.1 Technical data	37
2.2 Working range	41
2.3 The unit is sensitive to ESD	47
3 Installation and commissioning	49
3.1 Introduction to installation and commissioning	49
3.2 Unpacking	50
3.2.1 Pre-installation procedure	50
3.2.2 Risk of tipping/stability	51
3.3 On-site installation	52
3.3.1 Brief installation procedure	52
3.3.2 Installing a base plate	53
3.3.3 Lifting the robot	60
3.3.3.1 Lifting the robot with fork lift	60
3.3.3.2 Lifting and rotating a suspended mounted manipulator	61
3.3.3.3 Lifting the robot with roundslings	62
3.3.4 Orienting and securing the robot	67
3.3.5 Manually releasing the brakes	71
3.3.6 Setting the system parameters for an inverted or a tilted robot	73
3.3.7 Loads fitted to the robot, stopping time and braking distances	75
3.3.8 Fitting equipment on the robot (robot dimensions)	76
3.4 Working range alterations	86
3.4.1 Adjusting the working range	86
3.4.2 Installing movable mechanical stops on axis 1 (option 3323-1)	87
3.4.3 Extended working range, axis 1 (option)	90
3.5 Electrical connections	92
3.5.1 Robot cabling and connection points	92
3.6 Test run after installation, maintenance, or repair	95
4 Maintenance	97
4.1 Introduction	97
4.2 Maintenance schedule and expected component life	98
4.2.1 Specification of maintenance intervals	98

Table of contents

4.2.2	Maintenance schedule	99
4.2.3	Expected component life	101
4.3	Inspection activities	102
4.3.1	Inspecting the motor seal	102
4.3.2	Inspecting the information labels	104
4.3.3	Inspecting the dampers	107
4.3.4	Inspecting the axis-1 mechanical stop	109
4.3.5	Inspecting the cable harness	111
4.3.6	Inspecting the oil level in axis-1 gearbox	113
4.3.7	Inspecting the oil level in axis-2 gearbox	119
4.3.8	Inspecting the oil level in axis-3 gearbox	123
4.3.9	Inspecting the oil level in axis-4 gearbox	127
4.3.10	Inspecting the oil level in axis-5 gearbox	130
4.3.11	Inspecting the oil level in axis-6 gearbox	133
4.4	Replacement/changing activities	137
4.4.1	Type of lubrication in gearboxes	137
4.4.2	Changing the oil in axis-1 gearbox	139
4.4.3	Changing the oil in axis-2 gearbox	150
4.4.4	Changing the oil in axis-3 gearbox	156
4.4.5	Changing the oil in axis-4 gearbox	161
4.4.6	Changing the oil in axis-5 gearbox	166
4.4.7	Changing the oil in axis-6 gearbox	171
4.4.8	Replacing the SMB battery	176
4.5	Cleaning activities	179
4.5.1	Cleaning the IRB 5710	179
5	Repair	183
5.1	Introduction	183
5.2	General procedures	184
5.2.1	Performing a leak-down test	184
5.2.2	Mounting instructions for bearings	185
5.2.3	Mounting instructions for sealings	187
5.2.4	Cut the paint or surface on the robot before replacing parts	190
5.3	Lifting procedures	191
5.3.1	Lifting down the manipulator from inverted to floor-standing position	191
5.4	Axes 1 and 2	194
5.4.1	Replacing the axis-1 cassette sealing	194
5.5	Axes 3 and 4	209
5.5.1	Replacing the arm house cover including the axis-4 cassette sealing	209
5.6	Wrist	235
5.6.1	Replacing the wrist	235
5.6.2	Replacing the turning disc	253
5.7	Electronic parts	260
5.7.1	Removing the cable harness	260
5.7.2	Refitting the cable harness	281
5.7.3	Replacing the brake release unit	306
5.7.4	Replacing the SMB unit	313
5.8	Motors	319
5.8.1	Replacing the axis-1 motor	319
5.8.2	Replacing the axis-2 motor	341
5.8.3	Replacing the axis-3 motor	358
5.8.4	Replacing the axis-4 motor	371
5.8.5	Replacing the axis-5 motor	386
5.8.6	Replacing the axis-6 motor	400
5.9	Gears	416
5.9.1	Replacing the axis-1 gearbox	416
5.9.2	Replacing the axis-2 gearbox	470
5.9.3	Replacing the axis-3 gearbox	508
5.9.4	Replacing the axis-6 gearbox	545

6	Calibration	563
6.1	Introduction to calibration	563
6.1.1	Introduction and calibration terminology	563
6.1.2	Calibration methods	564
6.1.3	When to calibrate	566
6.2	Synchronization marks and axis movement directions	567
6.2.1	Synchronization marks and synchronization position for axes	567
6.2.2	Calibration movement directions for all axes	569
6.3	Updating revolution counters	570
6.3.1	Updating revolution counters on OmniCore robots	570
6.4	Calibrating with Axis Calibration method	572
6.4.1	Description of Axis Calibration	572
6.4.2	Calibration tools for Axis Calibration	575
6.4.3	Installation locations for the calibration tools	577
6.4.4	Axis Calibration - Running the calibration procedure	579
6.4.5	Reference calibration	583
6.5	Verifying the calibration	585
6.6	Checking the synchronization position	586
7	Troubleshooting	587
7.1	Introduction to troubleshooting	587
7.2	Oil and grease stains on motors and gearboxes	589
7.3	Mechanical noise or dissonance	590
7.4	Manipulator collapses on power down	592
8	Decommissioning	593
8.1	Environmental information	593
9	Reference information	595
9.1	Introduction	595
9.2	Applicable standards	596
9.3	Unit conversion	597
9.4	Screw joints	598
9.5	Weight specifications	601
9.6	Standard toolkit	602
9.7	Special tools	603
9.8	Lifting accessories and lifting instructions	609
Index		611

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Overview of this manual

About this manual

This manual contains instructions for:

- mechanical and electrical installation of the IRB 5710
- maintenance of the IRB 5710
- mechanical and electrical repair of the IRB 5710

The robot described in this manual has the following protection types:

- *Standard*
 - *Foundry Plus*
-

Product manual scope

The manual covers all variants and designs of the IRB 5710. Some variants and designs may have been removed from the business offer and are no longer available for purchase.

Usage

This manual should be used during:

- installation and commissioning, from lifting the product to its work site and securing it to the foundation, to making it ready for operation
- maintenance work
- repair work
- decommissioning work



Note

It is the responsibility of the integrator to conduct a risk assessment of the final application.

It is the responsibility of the integrator to provide safety and user guides for the robot system.

Who should read this manual?

This manual is intended for:

- installation personnel
 - maintenance personnel
 - repair personnel.
-

Prerequisites

A maintenance/repair/installation craftsman working with an ABB robot must:

- be trained by ABB and have the required knowledge of mechanical and electrical installation/repair/maintenance work.
 - be trained to respond to emergencies or abnormal situations.
-

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References

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

Document name	Document ID
<i>Product manual, spare parts - IRB 5710</i>	<i>3HAC079891-001</i>
<i>Product specification - IRB 5710</i>	<i>3HAC075188-001</i>
<i>Product manual - DressPack IRB 5710</i>	<i>3HAC082052-001</i>
<i>Product manual - OmniCore V250XT</i>	<i>3HAC073447-001</i>
<i>Circuit diagram - IRB 5710/IRB 5720</i>	<i>3HAC080367-001</i>
<i>Technical reference manual - System parameters</i>	<i>3HAC065041-001</i>
<i>Operating manual - Service Information System</i>	<i>3HAC050944-001</i>



Tip

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Revisions

Revision	Description
A	First edition.

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.



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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 15](#).

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.

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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 19](#).

The information labels can contain information in text.

Symbols on safety labels

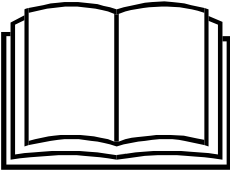
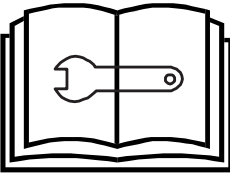
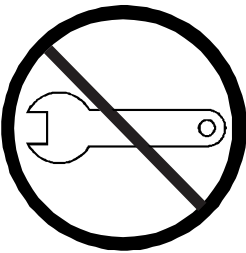
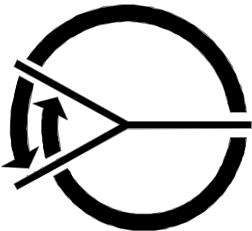

Symbol	Description
 xx0900000812	Warning! Warns that an accident <i>may</i> occur if the instructions are not followed that can lead to serious injury, possibly fatal, and/or great damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical 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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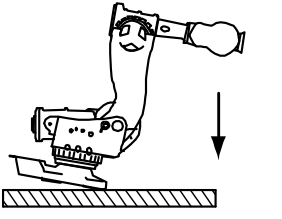

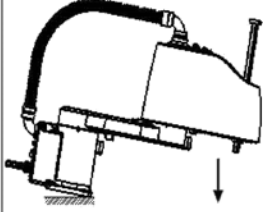


1 Safety

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>.
 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.



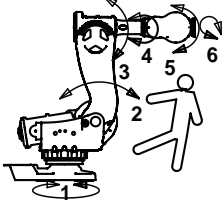
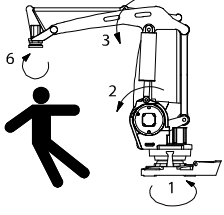
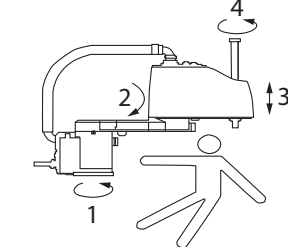
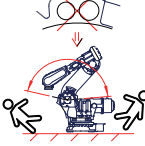
Continues on next page

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>

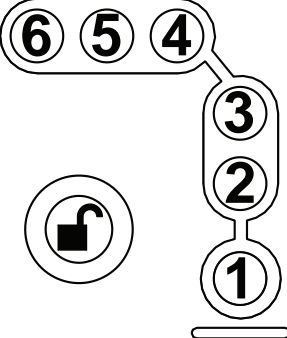

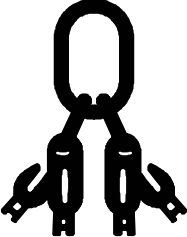



1 Safety

1.2.2 Safety symbols on manipulator labels

Continued

Symbol	Description
 <p>xx0900000818</p>  <p>xx1300001087</p>	<p>Heat Risk of heat that can cause burns. (Both signs are used)</p>
 <p>xx0900000819</p>  <p>xx1000001141</p>  <p>xx1500002616</p>	<p>Moving robot The robot can move unexpectedly.</p>
 <p>xx1700000813</p>	<p>Moving robot The robot can move unexpectedly when floor standing. Always use transportation lock screw in floor standing position.</p>

Continues on next page



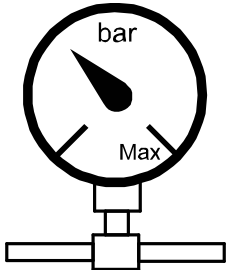
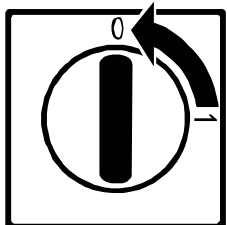

Symbol	Description
 <p>xx2100002463</p>	<p>Brake release buttons</p>
 <p>xx0900000821</p>	<p>Lifting bolt</p>
 <p>xx1000001242</p>	<p>Chain sling with shortener</p>
 <p>xx0900000822</p>	<p>Lifting of robot</p>
 <p>xx0900000823</p>	<p>Oil Can be used in combination with prohibition if oil is not allowed.</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 V250XT*

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 593](#) 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.

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 Safety

1.5 Safety during operation

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.

1.6 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

1 Safety

1.6.1 Safety during maintenance and repair

Continued

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.
 Do not mix types of oil	Mixing types of oil may cause severe damage to the gearbox.	When filling gearbox oil, do not mix different types of oil unless specified in the instructions. Always use the type of oil specified for the product.
 Heat up the oil	Warm oil drains quicker than cold oil.	Run the robot before changing the gearbox oil, if possible.
 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.

Continues on next page

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 39](#).

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

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 Safety

1.6.2 Emergency release of the robot axes

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 71](#).

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.

1.6.3 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 Safety

1.7 Safety during troubleshooting

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.



CAUTION

Risk of hot surfaces that can cause burns.

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.

1.8 Safety during decommissioning

General

See section [Decommissioning on page 593](#).

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.

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2 Technical data

2.1 Technical data

Weight, robot

The table shows the weight of the robot.

Robot model	Nominal weight ⁱ
IRB 5710-110/2.3	830 kg
IRB 5710-90/2.7	830 kg
IRB 5710-90/2.3 LID	890 kg
IRB 5710-70/2.7 LID	885 kg

ⁱ Option *Inverted (3317-1)* adds approximately 15 kg to the nominal weight.



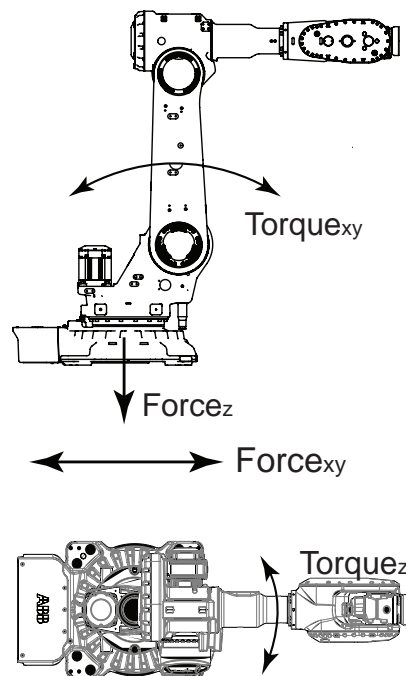
Note

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

Loads on foundation, robot

The illustration shows the directions of the robots stress forces.

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



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Continues on next page

2 Technical data

2.1 Technical data

Continued

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)	Maximum load (emergency stop)
Force xy	± 6.7 kN	± 14.1 kN
Force z	9.6 ± 4.4 kN	9.6 ± 10.7 kN
Torque xy	± 13.9 kNm	± 23.7 kNm
Torque z	± 4.2 kNm	± 10.2 kNm

Inverted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	± 6.1 kN	± 14.4 kN
Force z	-9.6 ± 4.3 kN	-9.6 ± 10.2 kN
Torque xy	± 13 kNm	± 23 kNm
Torque z	± 4.2 kNm	± 10.2 kNm

Tilted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	± 9.4 kN	± 16.5 kN
Force z	8.9 ± 4.5 kN	8.9 ± 11.1 kN
Torque xy	± 14.7 kNm	± 24.6 kNm
Torque z	± 4.2 kNm	± 10.4 kNm




Note

Values valid for maximum tilted robot.

Continues on next page

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	0.3 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	20°	
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 <i>Application manual - Controller software OmniCore</i> , section <i>Motion Process Mode</i> .

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, 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.

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%

Operating conditions, robot

The table shows the allowed operating conditions for the robot:

Parameter	Value
Minimum ambient temperature	5° C ⁱ
Maximum ambient temperature	50° C

Continues on next page

2 Technical data

2.1 Technical data

Continued

Parameter	Value
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.

Protection classes, robot

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

Protection type	Protection class ⁱ
Manipulator, protection type Standard	IP67
Manipulator, protection type Foundry Plus 2	IP67

ⁱ According to IEC 60529.

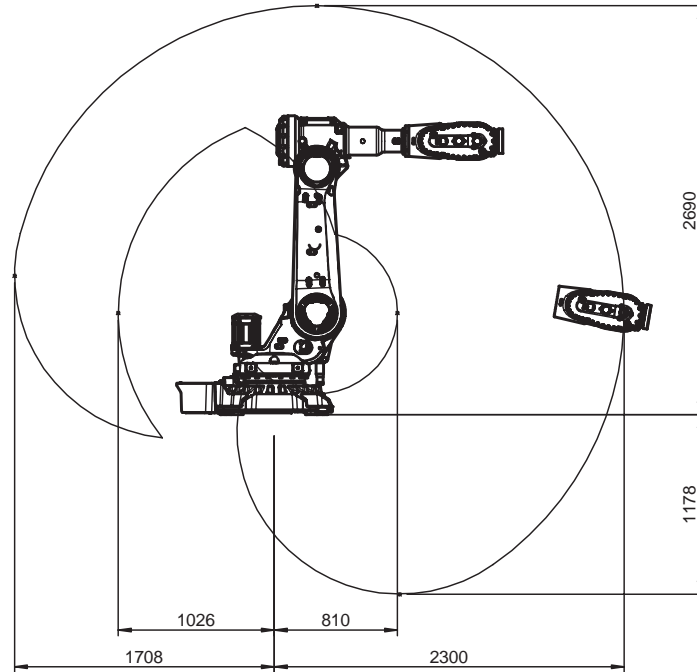
Environmental information

The product complies with IEC 63000. *Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances.*

2.2 Working range

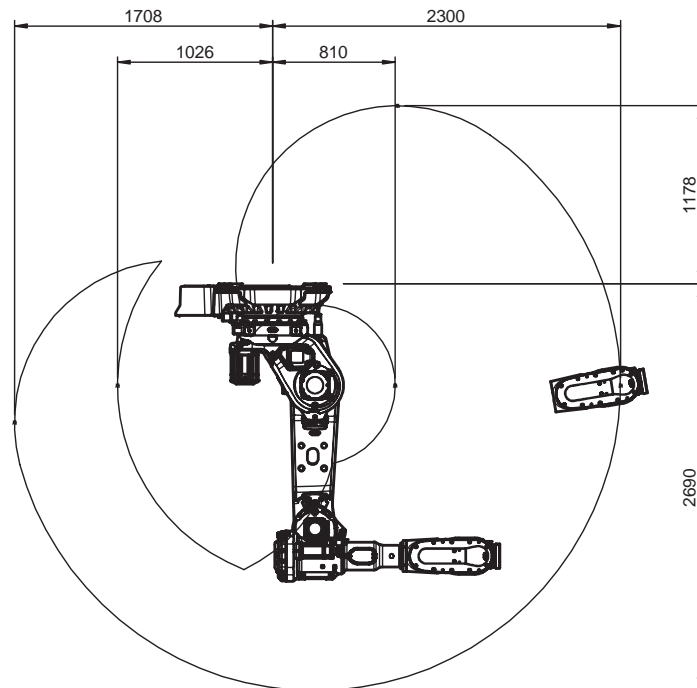
Illustration, working range IRB 5710-110/2.3

This illustration shows the unrestricted working range of the robot.



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IRB 5710-110/2.3 inverted (with option 3317-1)



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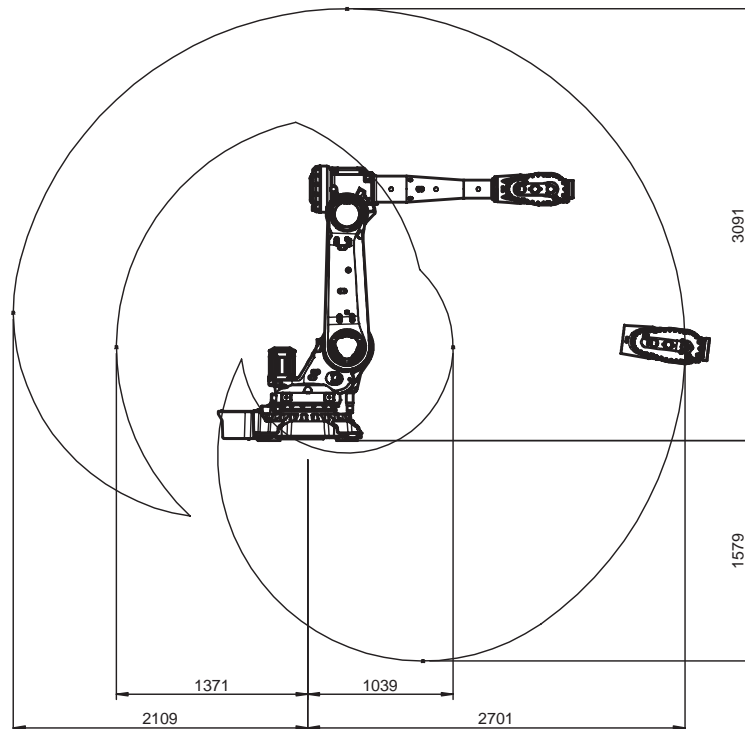
2 Technical data

2.2 Working range

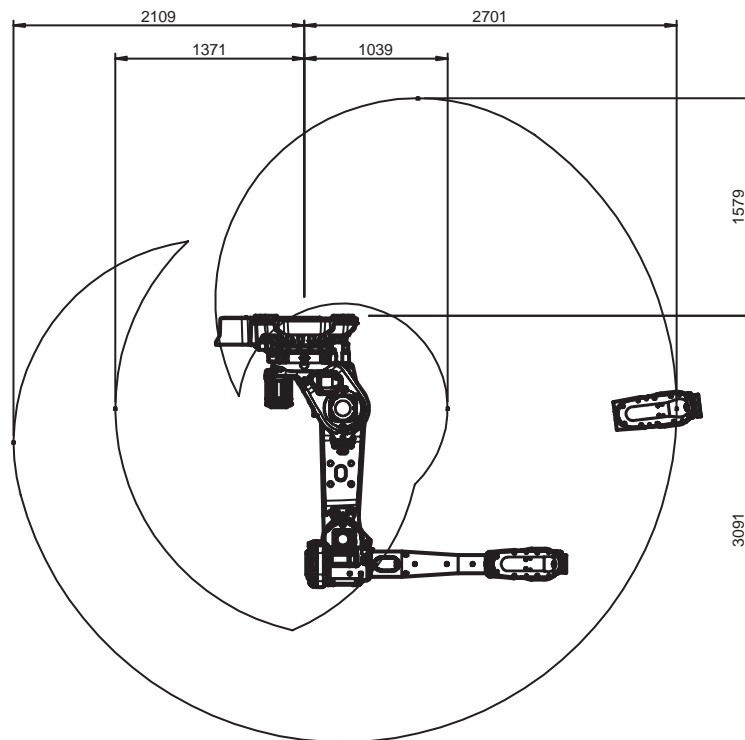
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Illustration, working range IRB 5710-90/2.7

This illustration shows the unrestricted working range of the robot.



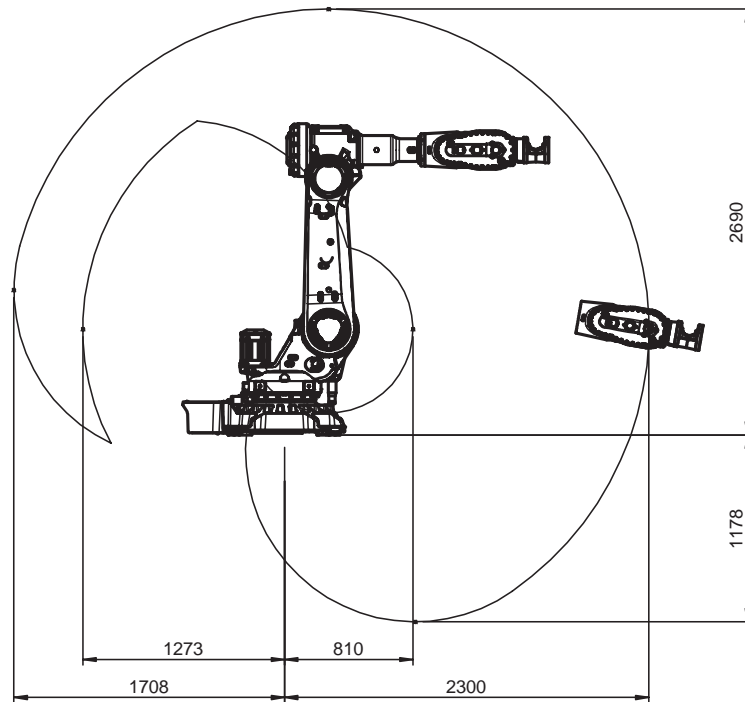
IRB 5710-90/2.7 inverted (with option 3317-1)



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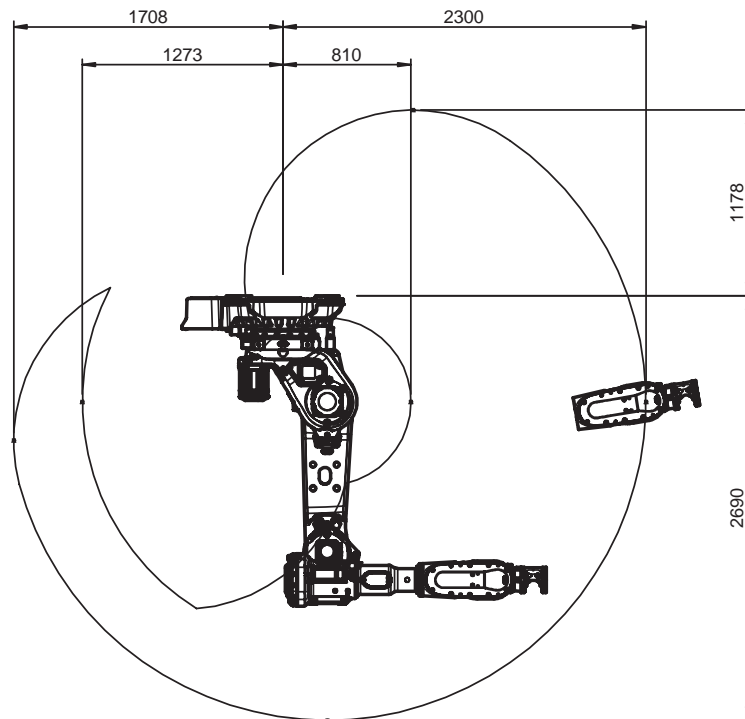
Illustration, working range IRB 5710-90/2.3 LID

This illustration shows the unrestricted working range of the robot.



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IRB 5710-90/2.3 LID inverted (with option 3317-1)



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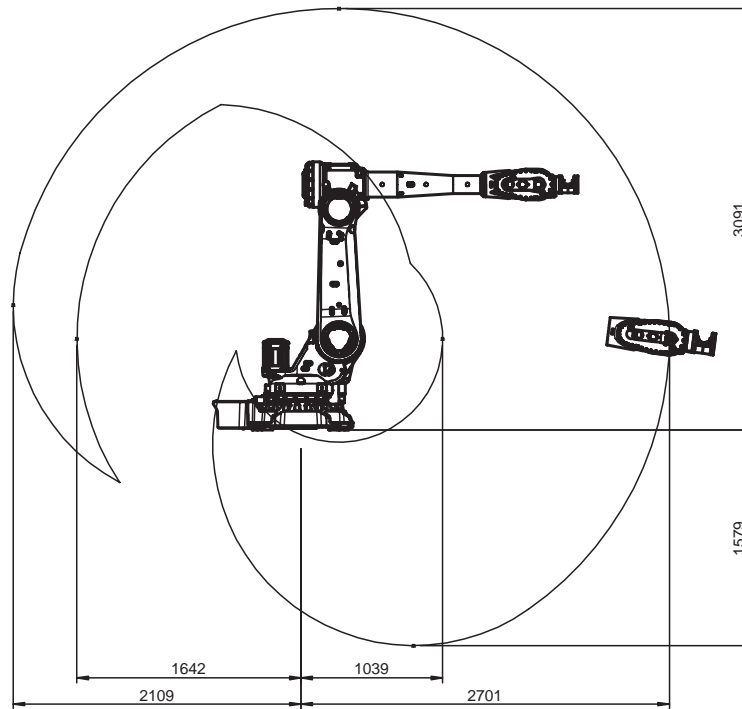
2 Technical data

2.2 Working range

Continued

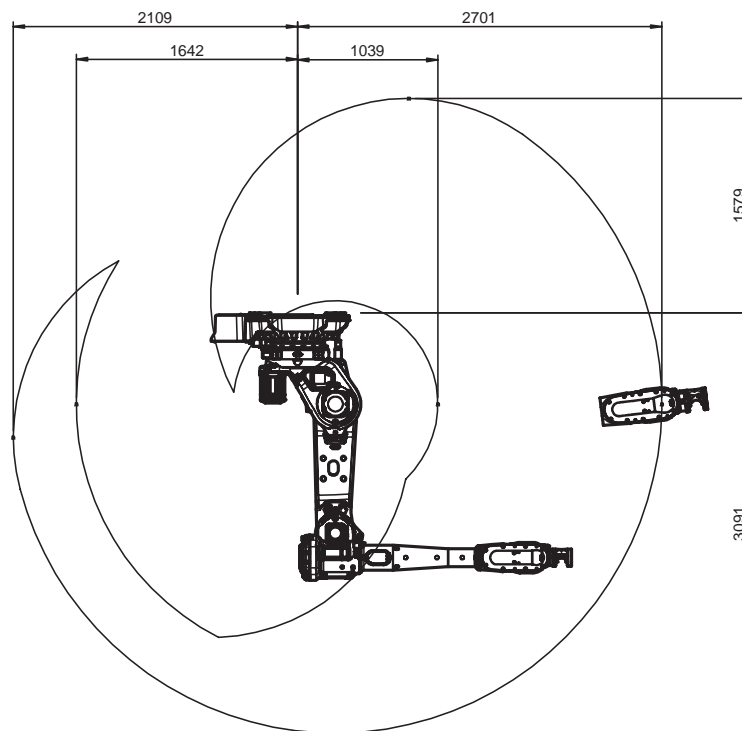
Illustration, working range IRB 5710-70/2.7 LID

This illustration shows the unrestricted working range of the robot.



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IRB 5710-70/2.7 LID inverted (with option 3317-1)

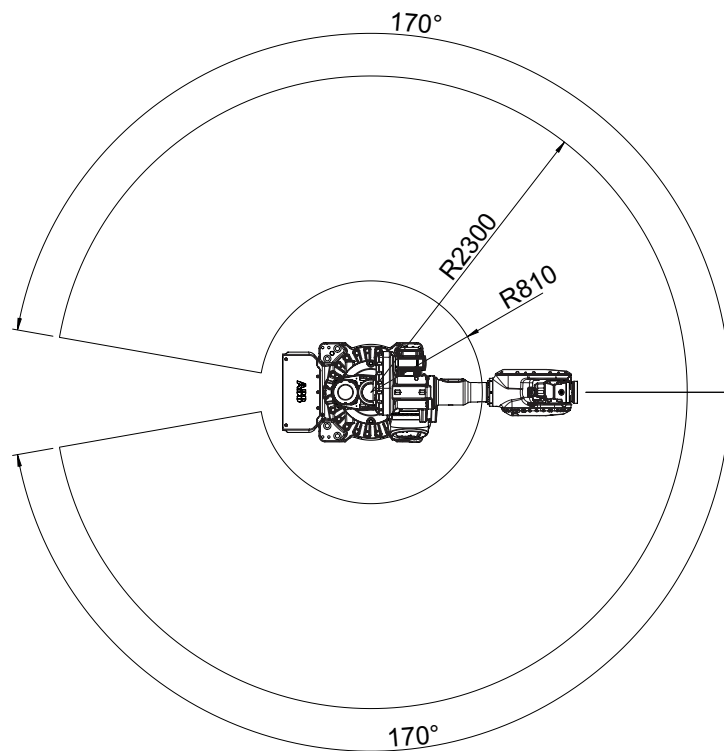


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Top view of working range

IRB 5710-110/2.3, IRB 5710-90/2.3 LID



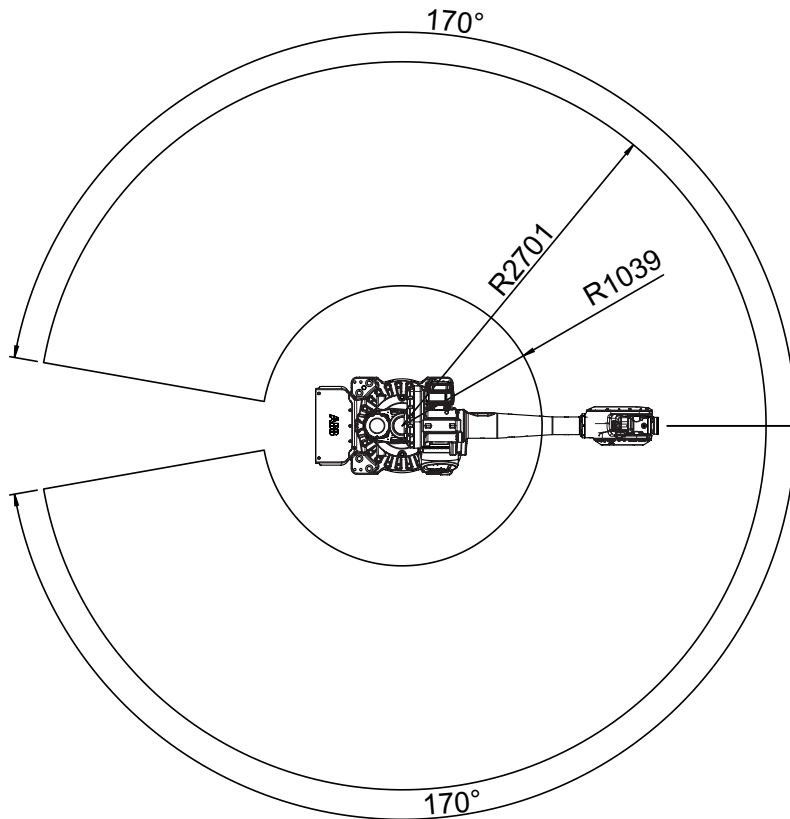
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2 Technical data

2.2 Working range

Continued

IRB 5710-90/2.7, IRB 5710-70/2.7 LID



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Working range

Axis	Working range	Note
Axis 1	$\pm 170^\circ$	The default working range for axis 1 can be extended as an option. See Extended working range, axis 1 (option) on page 90.
	$\pm 220^\circ$ ⁱ	
Axis 2	$-75^\circ/+145^\circ$	
Axis 3	$-180^\circ/+70^\circ$ (IRB 5710-110/2.3, IRB 5710-90/2.7) $-160^\circ/+70^\circ$ (IRB 5710-90/2.3 LID, IRB 5710-70/2.7 LID)	
Axis 4	$\pm 300^\circ$	
Axis 5	$\pm 130^\circ$ (IRB 5710-110/2.3, IRB 5710-90/2.7) $\pm 120^\circ$ ⁱⁱ (IRB 5710-90/2.3 LID, IRB 5710-70/2.7 LID)	
Axis 6	$\pm 360^\circ$ (IRB 5710-110/2.3, IRB 5710-90/2.7) $\pm 200^\circ$ ⁱⁱ (IRB 5710-90/2.3 LID, IRB 5710-70/2.7 LID)	

ⁱ Option Extended Working Range Axis 1 (3324-1)

Not valid for option Inverted (3317-1)

Not valid with DressPack.

ⁱⁱ Maximum combined movements reduced.

2.3 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.

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3 Installation and commissioning

3.1 Introduction to installation and commissioning

General

This chapter contains assembly instructions and information for installing the IRB 5710 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 15](#) before performing any installation work.



Note

Always connect the IRB 5710 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 V250XT*

3 Installation and commissioning

3.2.1 Pre-installation procedure

3.2 Unpacking

3.2.1 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.

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	Check for any visible transport damage.  Note Stop unpacking and contact ABB if transport damages are found.
4	Clean the unit with a lint-free cloth, if necessary.
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 37
6	If the robot is not installed directly, it must be stored as described in: Storage conditions, robot on page 39
7	Make sure that the expected operating environment of the robot conforms to the specifications as described in: Operating conditions, robot on page 39
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 37• Protection classes, robot on page 40• Requirements, foundation on page 39
9	Before moving the robot, please observe the stability of the robot: Risk of tipping/stability on page 51
10	When these prerequisites are met, the robot can be taken to its installation site as described in section: On-site installation on page 52
11	Install required equipment, if any.

3.2.2 Risk of tipping/stability

Risk of tipping

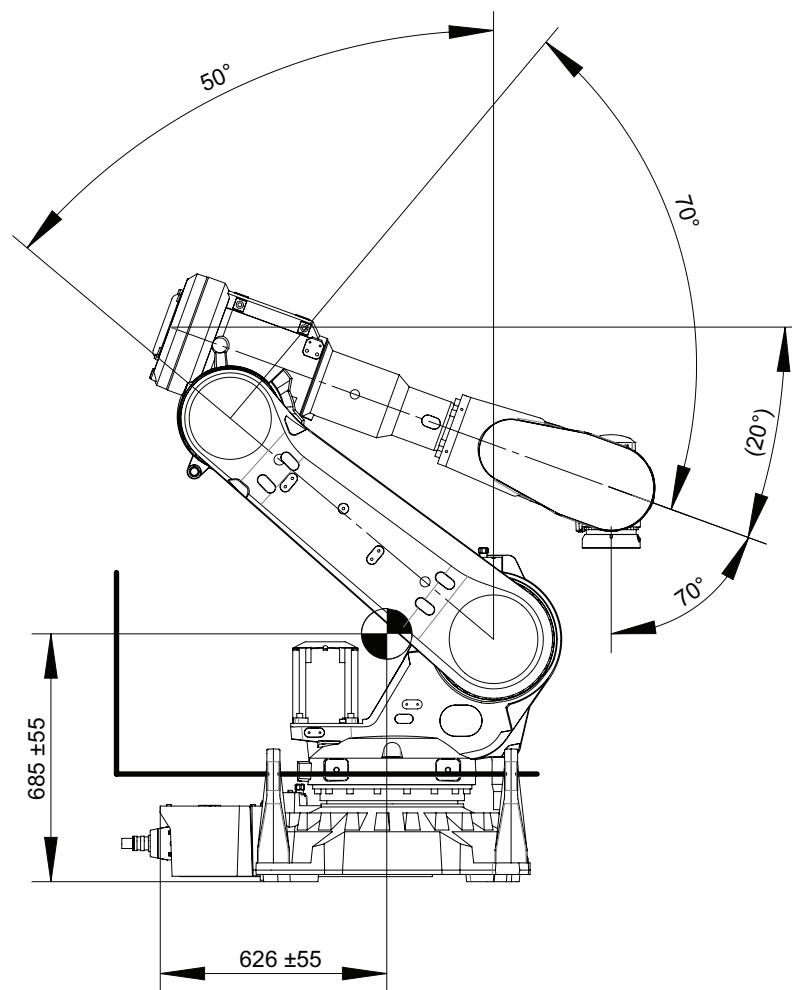
If the robot is not fastened to the foundation while moving the arm, the robot is not stable in the whole working area. Moving the arm will displace the center of gravity, which may cause the robot to tip over.

The shipping position is the most stable position.

Do not change the robot position before securing it to the foundation!

Shipping and transportation position

This figure shows the robot in its shipping position and transportation position.



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WARNING

The robot is likely to be mechanically unstable if not secured to the foundation.

3 Installation and commissioning

3.3.1 Brief installation procedure

3.3 On-site installation


3.3.1 Brief installation procedure

Introduction

This procedure is a brief guide when installing the robot for the first time. Also see [Pre-installation procedure on page 50](#).

First installation

Use these procedures to install the IRB 5710.

	Action	Note
1	Transport the manipulator to its intended location.	
2	Install the valid platform or prepare the foundation for the manipulator.	See Installing a base plate on page 53 .
3	Lift and secure the manipulator to the platform/foundation.	See Lifting the robot on page 60 . See Orienting and securing the robot on page 67 .
4	Connect the manipulator to the controller.	See <ul style="list-style-type: none">• <i>Product manual - OmniCore V250XT</i>
5	Configure the safety settings.	See <ul style="list-style-type: none">• <i>Product manual - OmniCore V250XT</i>
6	How to start and run the robot is described in the product manual for the controller.	See <ul style="list-style-type: none">• <i>Product manual - OmniCore V250XT</i>
7	Install required equipment, if any.	
8	 DANGER Make sure all safety requirements are met when performing the first test run.	

3.3.2 Installing a base plate

Advantages of using a base plate

Instead of installing the robot directly on the floor, a base plate can be manufactured and used as an adapter between the floor and the robot base. This list specifies some of the advantages of using a base plate:

- to ensure a plain surface with a high precision of the robot base hole configuration
- to simplify adjustment of levelness by machined surfaces or by using shims
- to distribute the press force from the robot to a larger foot print
- to compensate poor floor quality that might not be suitable for fastening the robot base directly onto. The base plate has a greater number of fastening points to the foundation and makes a larger footprint, which reduces the load on each fastening point.
- to reduce surface pressure on the foundation contact points, which minimizes the risk of wearing down an uneven surface and thereby causing changes in the robot fastening tightening torque
- to be able to prepare the installation site before robot delivery
- to increase the precision between the positions of an installed robot and other equipment



Note

Do not use a base plate for installation of an inverted robot.

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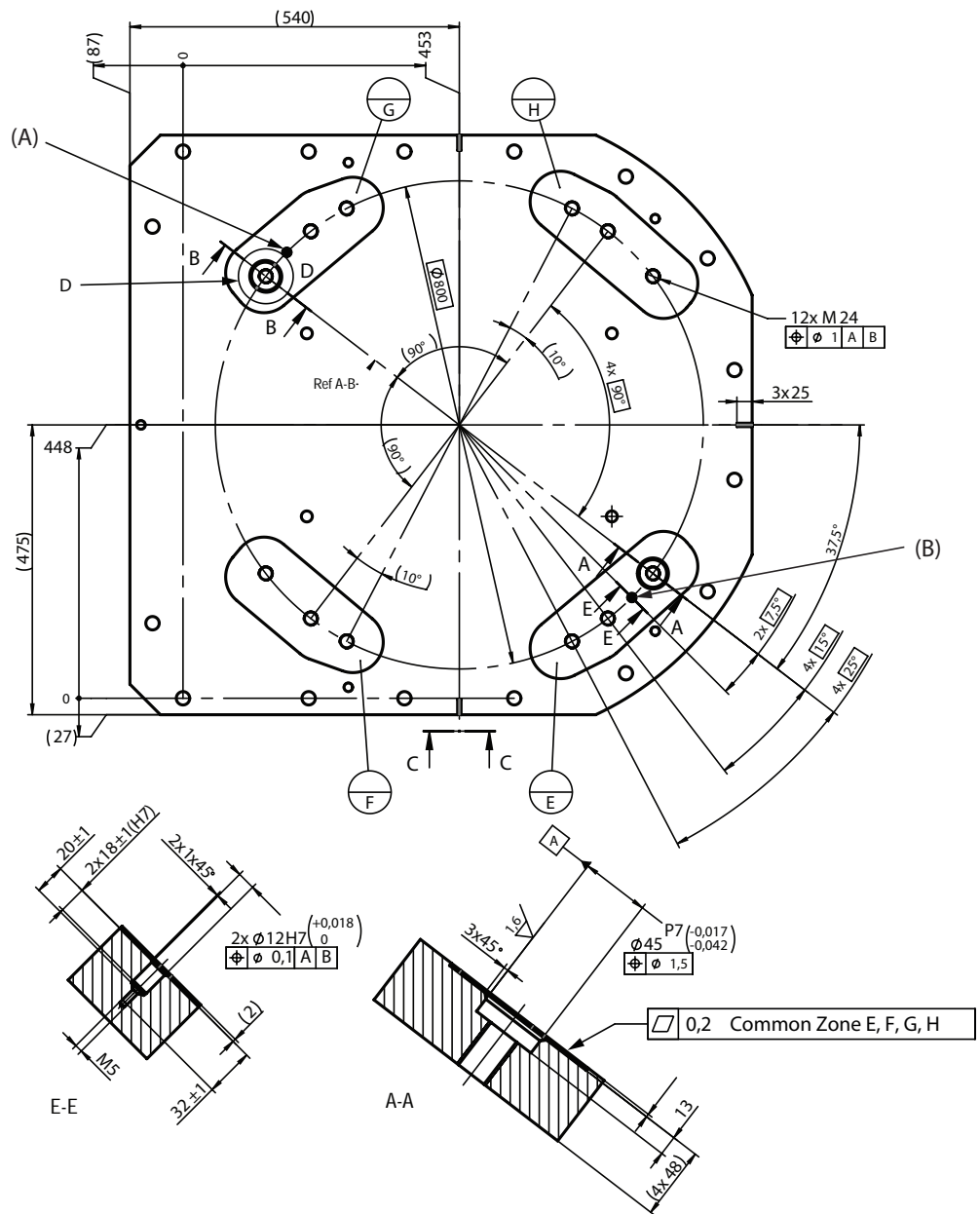
3 Installation and commissioning

3.3.2 Installing a base plate

Continued

Base plate drawing

The following figure shows the option base plate (dimensions in mm).



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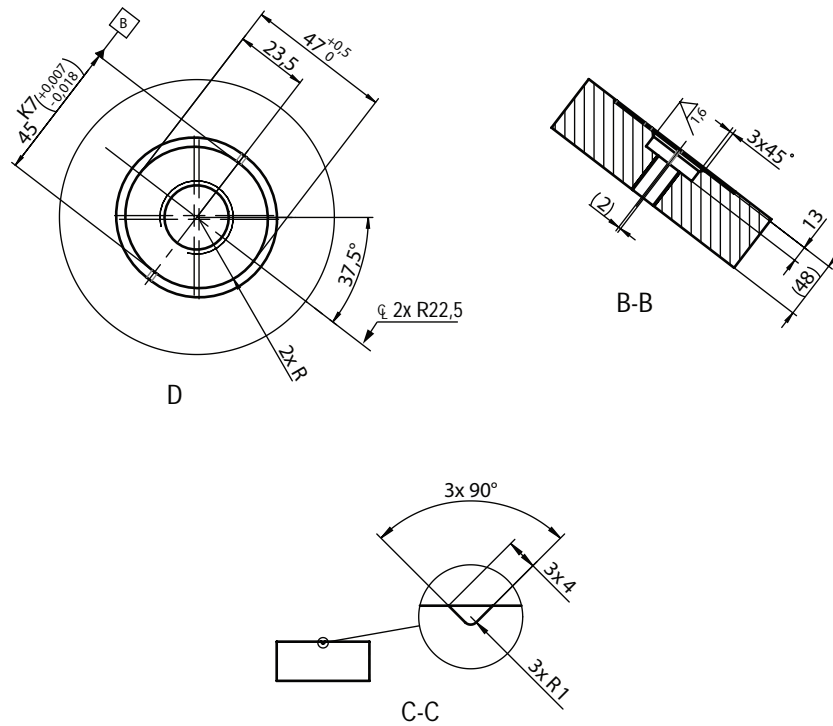
Pos	Description
A, B	Hole for guide pin, cylindrical, see Guide pins on page 56
E, F, G, H	Common tolerance zone (accuracy all over the base plate from one contact surface to the other)

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3 Installation and commissioning

3.3.2 Installing a base plate

Continued



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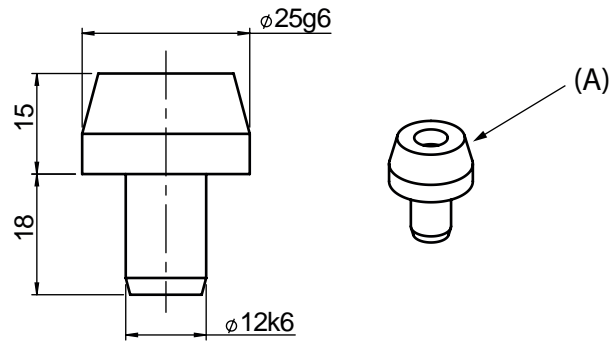
3 Installation and commissioning

3.3.2 Installing a base plate

Continued

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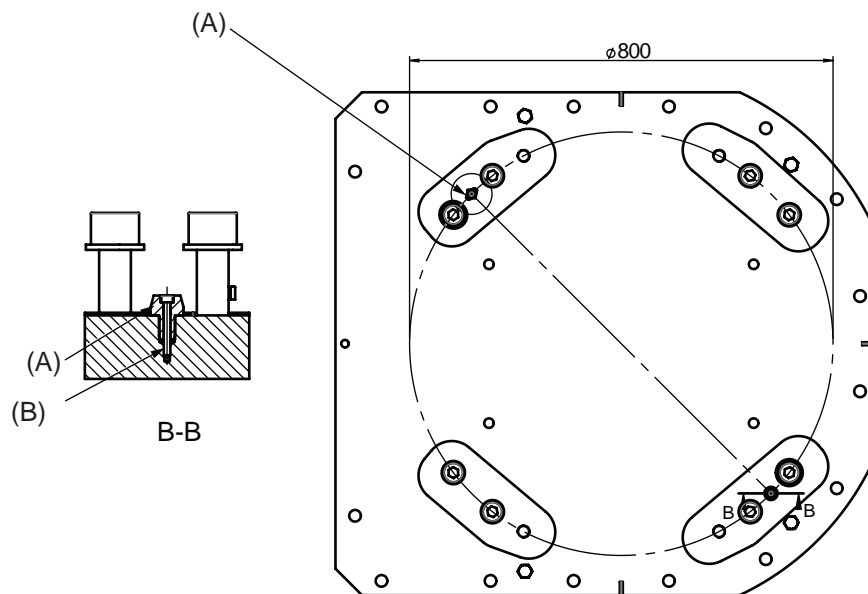
Guide pins



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Pos	Description
A	Cylindrical guide pin (x2)

Assembly of guide pins

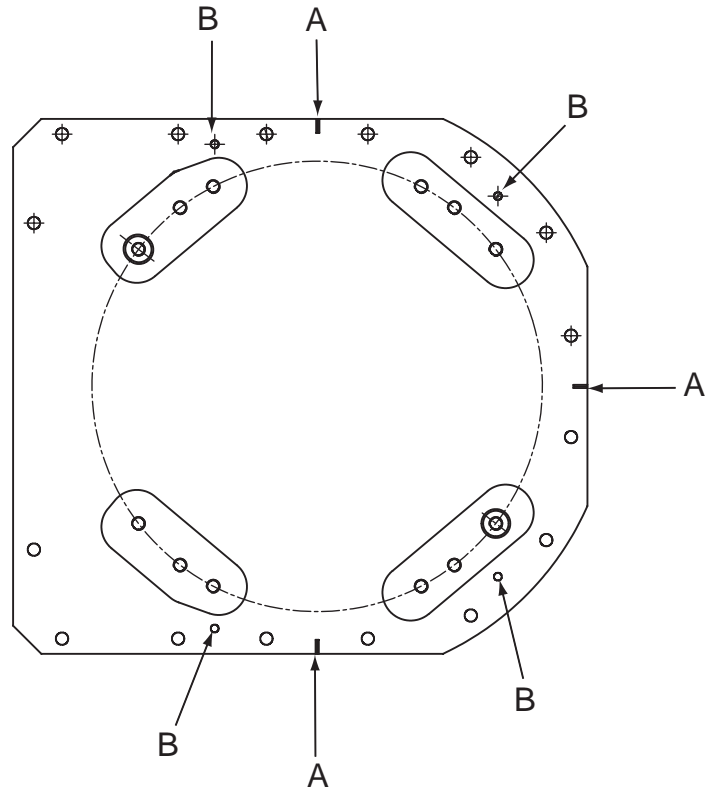


Pos	Description
A	Cylindrical guide pin (x2)
B	M5 x 40. Tightening torque 6 Nm. (x2)

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Base plate, orienting grooves and leveling bolts

The illustration below shows the orienting grooves and attachment holes for leveling bolts in the base plate.



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A	Orienting grooves (3 pcs)
B	Levelling bolts, attachment holes (4 pcs)

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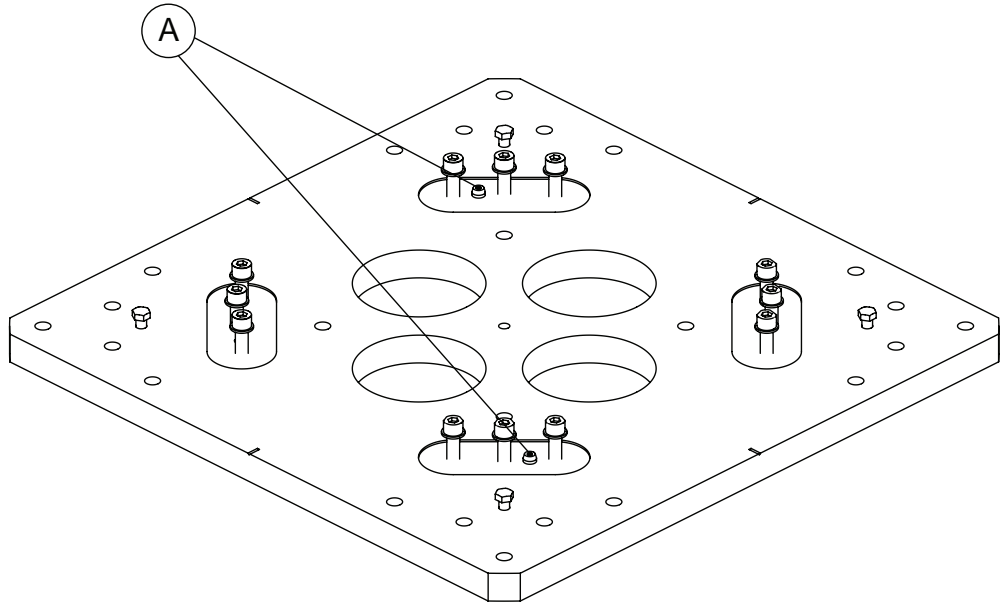
3 Installation and commissioning

3.3.2 Installing a base plate

Continued

Base plate, locating pins

The illustration below shows the locating pins in the base plate.

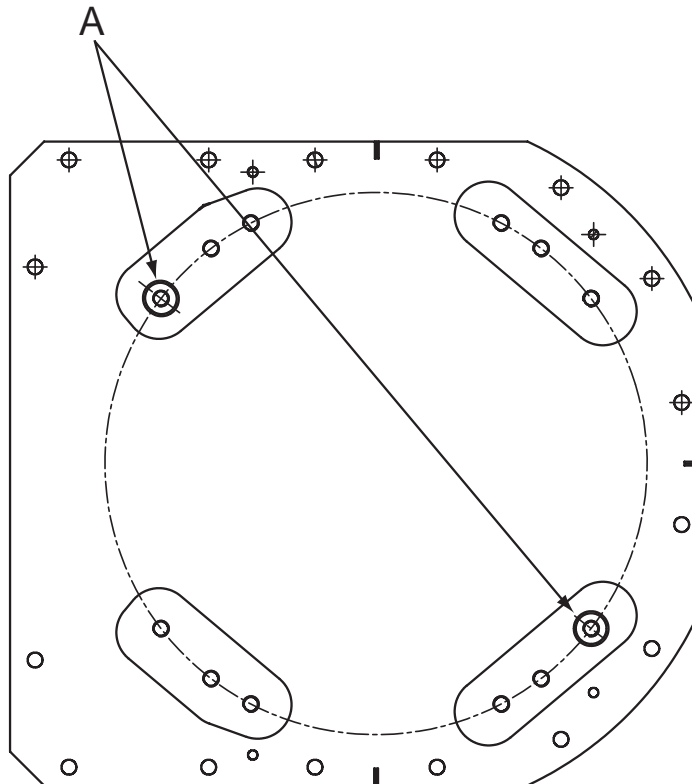


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A	Locating pins (2 pcs)
---	-----------------------

Base plate, guide sleeve holes

The illustration below shows the guide sleeve holes in the base plate.




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A	Guide sleeve holes (2 pcs)
---	----------------------------

Base plate

This section details how to secure the base plate to the foundation.

	Action	Note
1	Make sure the foundation is levelled.	
2	 CAUTION All lifting equipment used must be sized accordingly!	
3	Position base plate in relation to the robot work location using the grooves in the base plate.	Shown in figure Base plate, orienting grooves and leveling bolts on page 57 .
4	Lift the base plate to its mounting position.	
5	Use the base plate as a template and drill attachment holes as required by the selected bolt dimension.	Attachment holes: 16 pcs.
6	Fit the base plate and use the levelling bolts to level the base plate.	Shown in figure Base plate, orienting grooves and leveling bolts on page 57 .
7	If required, fit strips of sheet metal underneath the base plate to fill any gaps.	
8	Secure the base plate to the foundation with screws and sleeves.	
9	Recheck the four contact surfaces on the base plate to make sure the base plate is levelled and flat. If it is not, use pieces of sheet metal or similar to bring the base plate to a levelled position.	Maximum allowed deviation all over the base plate, from one contact surface to the other: 0.3 mm.

3 Installation and commissioning

3.3.3.1 Lifting the robot with fork lift

3.3.3 Lifting the robot

3.3.3.1 Lifting the robot with fork lift

Lifting methods

The robot may be lifted and transported using a fork lift, provided that available special aids are used.

For rotation of the robot to an inverted position, the fork lift accessory must be used together with a special turning tool or a fork lift truck with a rotator attachment.

This section specifies available special aids and references to valid user documentation for the lifting accessories.

Required tools and equipment

Equipment	Article number	Note
Fork lift accessory set	3HAC058825-001	Contains fork lift pockets and all required hardware for installation on frame. User instructions are enclosed with the tool.
Fork lift accessory set	3HAC047054-001	Contains fork lift pockets and all required hardware for installation on robot base. User instructions are enclosed with the tool.
Fork lift truck with rotator attachment	-	Required for rotating the robot to an inverted position.

Required documents

Document	Document number
Directions for use - Fork lift accessory for IRB 5710/IRB5720	3HAC061161-001
Directions for use - Fork lift accessory for IRB 5710/IRB5720	3HAC082151-001

Lifting the robot

	Action	Note
1	Lift the robot according to the user instructions enclosed with the fork lift accessory.	

3.3.3.2 Lifting and rotating a suspended mounted manipulator

Introduction

How to lift and turn the robot to a suspended/inverted 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 603](#). 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 tilted position: Contact ABB for more information.

Illustration



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3 Installation and commissioning

3.3.3.3 Lifting the robot with roundslings

3.3.3.3 Lifting the robot with roundslings

Recommended lifting method

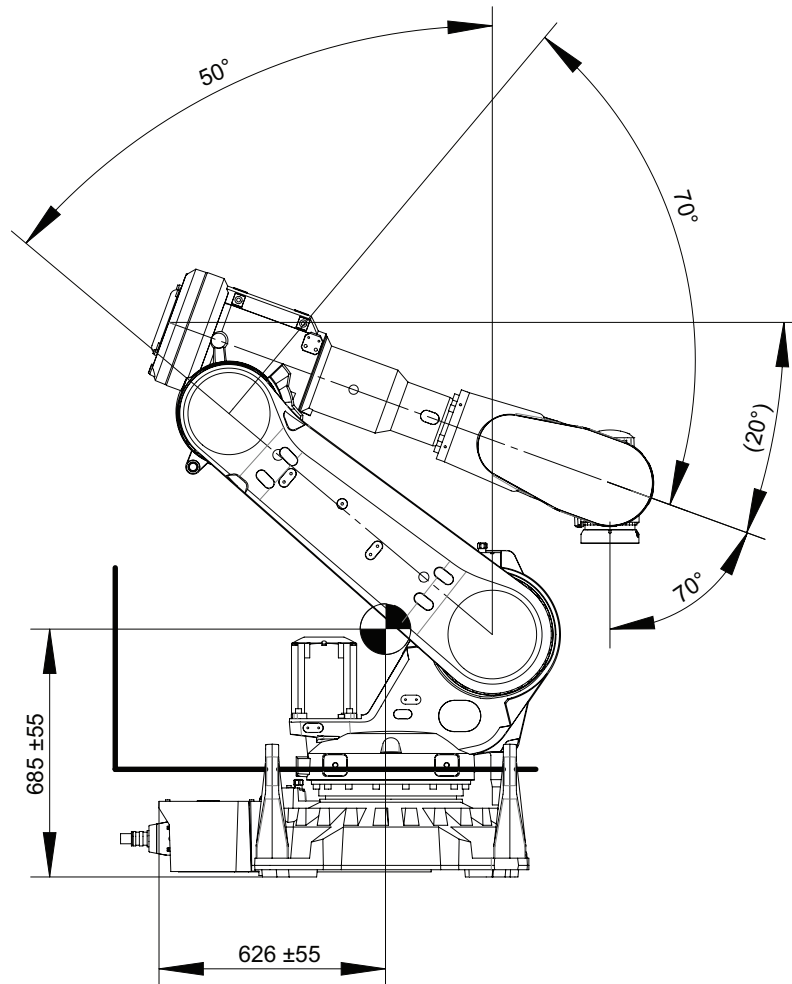
Recommended lifting method for the robot includes one of following lifting accessories:

- Fork lift accessory set: 3HAC058825-001. See [Lifting the robot with fork lift on page 60](#).
- Fork lift accessory set: 3HAC047054-001. See [Lifting the robot with fork lift on page 60](#).
- Lifting and turning tool: 3HAC073537-001. See [Lifting and rotating a suspended mounted manipulator on page 61](#).

The robot can also be lifted with roundslings as detailed in this section.

Illustration - lifting position

This figure shows the robot in its lifting and transportation position.



xx210000477

Continues on next page

3 Installation and commissioning

3.3.3.3 Lifting the robot with roundslings

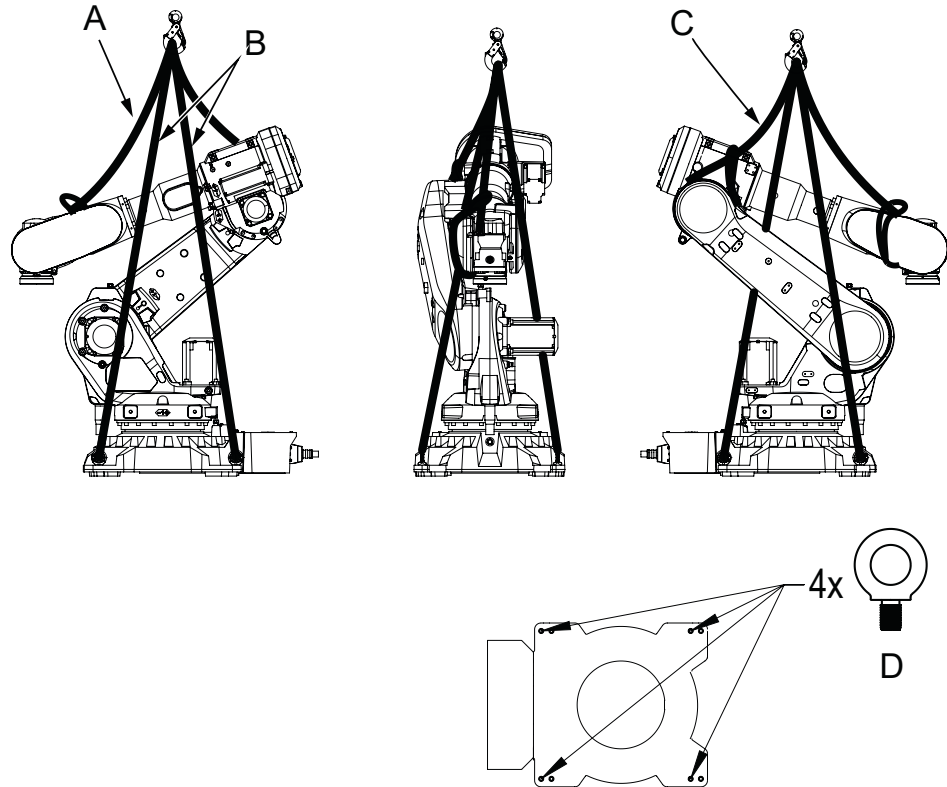
Continued



DANGER

Attempting to lift a robot in any other position than the recommended lifting position may result in the robot tipping over, causing severe damage or injury.

Illustration - attaching the roundslings



xx210000703

Pos	Description	Note	Quantity
A	Roundsling	2 m or 2.5 m depending on robot variant. ⁱ	1 pcs
B	Roundsling	2.5 m	4 pcs
C	Roundsling	2 m or 2.5 m depending on robot variant. ⁱⁱ	1 pcs
D	Lifting eye M20		4 pcs


- ⁱ Fit the roundsling with slack. They prevent the robot from rotating if there is a sudden stop during transport.
- ⁱⁱ Fit the roundsling with slack. They prevent the robot from rotating if there is a sudden stop during transport.

Continues on next page

3 Installation and commissioning

3.3.3.3 Lifting the robot with roundslings

Continued


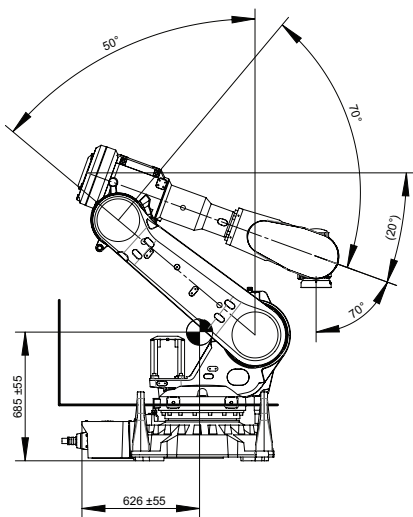

	<p>CAUTION</p> <p>The weight of the IRB 5710 robot is</p> <p>IRB 5710-110/2.3: 830 kg (<i>Inverted: 845 kg</i>)</p> <p>IRB 5710-90/2.7: 830 kg (<i>Inverted: 840 kg</i>)</p> <p>IRB 5710-90/2.3 LID: 890 kg (<i>Inverted: 905 kg</i>)</p> <p>IRB 5710-70/2.7 LID: 885 kg (<i>Inverted: 900 kg</i>)</p> <p>All lifting accessories used must be sized accordingly.</p>
---	--

Required tools and equipment

Equipment	Article number	Note
Overhead crane	-	
Roundslings and lifting eyes	-	See <i>Illustration - attaching the roundslings on page 63.</i>

Lifting the robot with roundslings

Use this procedure to lift the robot with roundslings.

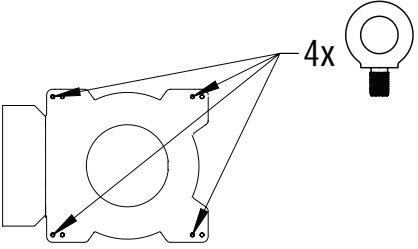
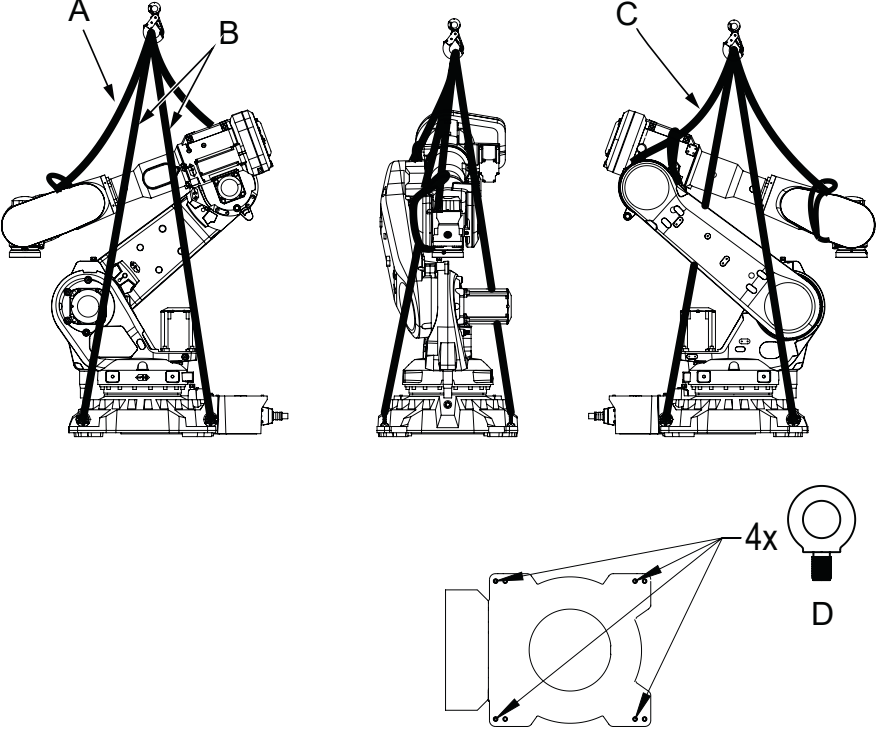
	Action	Note
1	<p>Make sure the robot is positioned in the recommended position for transportation and lifting.</p> <p> WARNING</p> <p>The robot is mechanically unstable if not secured to the foundation.</p>	 <p>xx2100000477</p>
2	<p> CAUTION</p> <p>The weight of the IRB 5710 robot is</p> <p>IRB 5710-110/2.3: 830 kg (<i>Inverted: 845 kg</i>)</p> <p>IRB 5710-90/2.7: 830 kg (<i>Inverted: 840 kg</i>)</p> <p>IRB 5710-90/2.3 LID: 890 kg (<i>Inverted: 905 kg</i>)</p> <p>IRB 5710-70/2.7 LID: 885 kg (<i>Inverted: 900 kg</i>)</p> <p>All lifting accessories used must be sized accordingly.</p>	

Continues on next page

3 Installation and commissioning

3.3.3.3 Lifting the robot with roundslings

Continued


	Action	Note																				
3	Fit four lifting eyes to the base of the robot.	Lifting eye M20  xx2100000718																				
4	Attach the roundslings to the robot according to the figure. Make sure the roundslings do not rub against any sharp edges. Fit roundslings A and C with slack. They prevent the robot from rotating if there is a sudden stop during transport.	 xx2100000703																				
	<table border="1"> <thead> <tr> <th>Pos</th> <th>Description</th> <th>Note</th> <th>Quantity</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>Roundslings</td> <td>2 m or 2.5 m depending on robot variant.ⁱ</td> <td>1 pcs</td> </tr> <tr> <td>B</td> <td>Roundslings</td> <td>2.5 m</td> <td>4 pcs</td> </tr> <tr> <td>C</td> <td>Roundslings</td> <td>2 m or 2.5 m depending on robot variant.ⁱⁱ</td> <td>1 pcs</td> </tr> <tr> <td>D</td> <td>Lifting eye M20</td> <td></td> <td>4 pcs</td> </tr> </tbody> </table>	Pos	Description	Note	Quantity	A	Roundslings	2 m or 2.5 m depending on robot variant. ⁱ	1 pcs	B	Roundslings	2.5 m	4 pcs	C	Roundslings	2 m or 2.5 m depending on robot variant. ⁱⁱ	1 pcs	D	Lifting eye M20		4 pcs	
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Continues on next page

3 Installation and commissioning

3.3.3.3 Lifting the robot with roundslings

Continued

	Action	Note
5	 WARNING Personnel must not, under any circumstances, be present under the suspended load.	
6	Raise the overhead crane to lift the robot.	

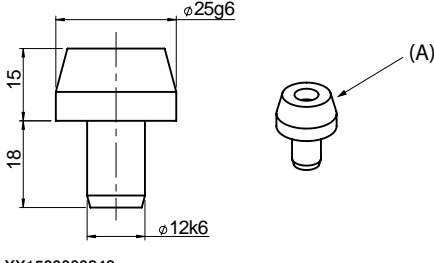
3.3.4 Orienting and securing the robot

General

This section describes how to orient and secure the robot to the base plate or foundation in order to run the robot safely.

Attachment screws

The table below specifies the type of securing screws and washers to be used for securing the robot to the base plate/foundation.

Suitable screws	M24 x 100		
Quantity	8 pcs		
Quality	8.8		
Suitable washer	4 mm flat washer		
Guide pins	<p>Guide pins are required if mounting the manipulator to a track motion or to a base plate.</p>  <p>XX1500000248</p> <table border="1"> <tr> <td>A</td> <td>Cylindrical guide pin</td> </tr> </table>	A	Cylindrical guide pin
A	Cylindrical guide pin		
Tightening torque	550 Nm (screws lubricated with Molykote 1000) 600-725 Nm, typical 650 Nm (screws none or lightly lubricated)		
Screw tightening yield point utilization factor (v) (according to VDI2230)	90% (v=0.9)		
Level surface requirements	0.3 mm		

Securing a floor mounted robot

Use this procedure to orient and secure the robot floor mounted.



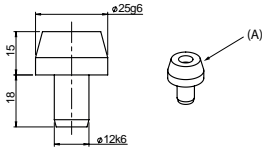
	Action	Note
1	Make sure the installation site for the robot conforms to the specifications in section Technical data on page 37 .	
2	<p>Prepare the installation site with attachment holes. The foundation surface must be clean and unpainted.</p> <p>If using a base plate: fit two guide sleeves to the guide sleeve holes in the base plate. See Base plate, guide sleeve holes on page 58.</p>	The hole configuration of the base is shown in the figure in Hole configuration, base on page 70 .

Continues on next page

3 Installation and commissioning

3.3.4 Orienting and securing the robot

Continued

	Action	Note		
3	 CAUTION The weight of the IRB 5710 robot is IRB 5710-110/2.3: 830 kg (<i>Inverted: 845 kg</i>) IRB 5710-90/2.7: 830 kg (<i>Inverted: 840 kg</i>) IRB 5710-90/2.3 LID: 890 kg (<i>Inverted: 905 kg</i>) IRB 5710-70/2.7 LID: 885 kg (<i>Inverted: 900 kg</i>) All lifting accessories used must be sized accordingly.			
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.	See Lifting the robot on page 60 .		
6	Fit two pins to the holes in the base.	Guide pins are required if mounting the manipulator to a track motion or to a base plate.  XX1500000248 <table border="1"> <tr> <td>A</td> <td>Cylindrical guide pin</td> </tr> </table>	A	Cylindrical guide pin
A	Cylindrical guide pin			
7	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.		
8	Fit the securing screws and washers in the attachment holes of the base.	Screws: M24 x 100, 8 pcs, quality 8.8 Washers: 4 mm flat washer		
9	Tighten the bolts in a crosswise pattern to ensure that the base is not distorted.	Tightening torque: 550 Nm (screws lubricated with Molykote 1000) 600-725 Nm, typical 650 Nm (screws none or lightly lubricated)		

Securing an inverted robot

Use this procedure to orient and secure the robot inverted.




	Action	Note
1	Make sure the installation site for the robot conforms to the specifications in section Technical data on page 37 .	
2	Prepare the installation site with attachment holes. The foundation surface must be clean and unpainted.	The hole configuration of the base is shown in the figure in Hole configuration, base on page 70 .

Continues on next page

3 Installation and commissioning

3.3.4 Orienting and securing the robot

Continued

	Action	Note
3	Lift the robot using the fork lift accessory.	Fork lift accessory set: 3HAC058825-001 See user instructions enclosed with the fork lift accessory.
4	Move the robot close to its installation location.	
5	<p>Rotate the robot into inverted position using the turning tool or using a fork lift truck with a rotator attachment.</p>  <p>DANGER</p> <p>Make sure that there is enough space underneath the robot. See user instructions for the turning tool.</p>	<p>Lifting and turning tool: 3HAC073537-001 See user instructions enclosed with the turning tool.</p>
6	Guide the robot using two attachment screws while lifting it into its mounting position.	
7	<p>Fit the bolts and washers in the base attachment holes.</p>  <p>Note</p> <p>Lightly lubricate screws before assembly.</p>  <p>CAUTION</p> <p>If high stress on screws are suspected, replace used screws with new ones.</p>	<p>Suitable screws, lightly lubricated: M24 x 100 (8 pcs), 8.8. Suitable washer: 4 mm flat washer. Screw tightening yield point utilization factor (v) (according to VDI2230): 90% ($v=0.9$). Tightening torque: 550 Nm (screws lubricated with Molykote 1000) 600-725 Nm, typical 650 Nm (screws none or lightly lubricated)</p>
8	Tighten bolts in a crosswise pattern to ensure that the base is not distorted.	

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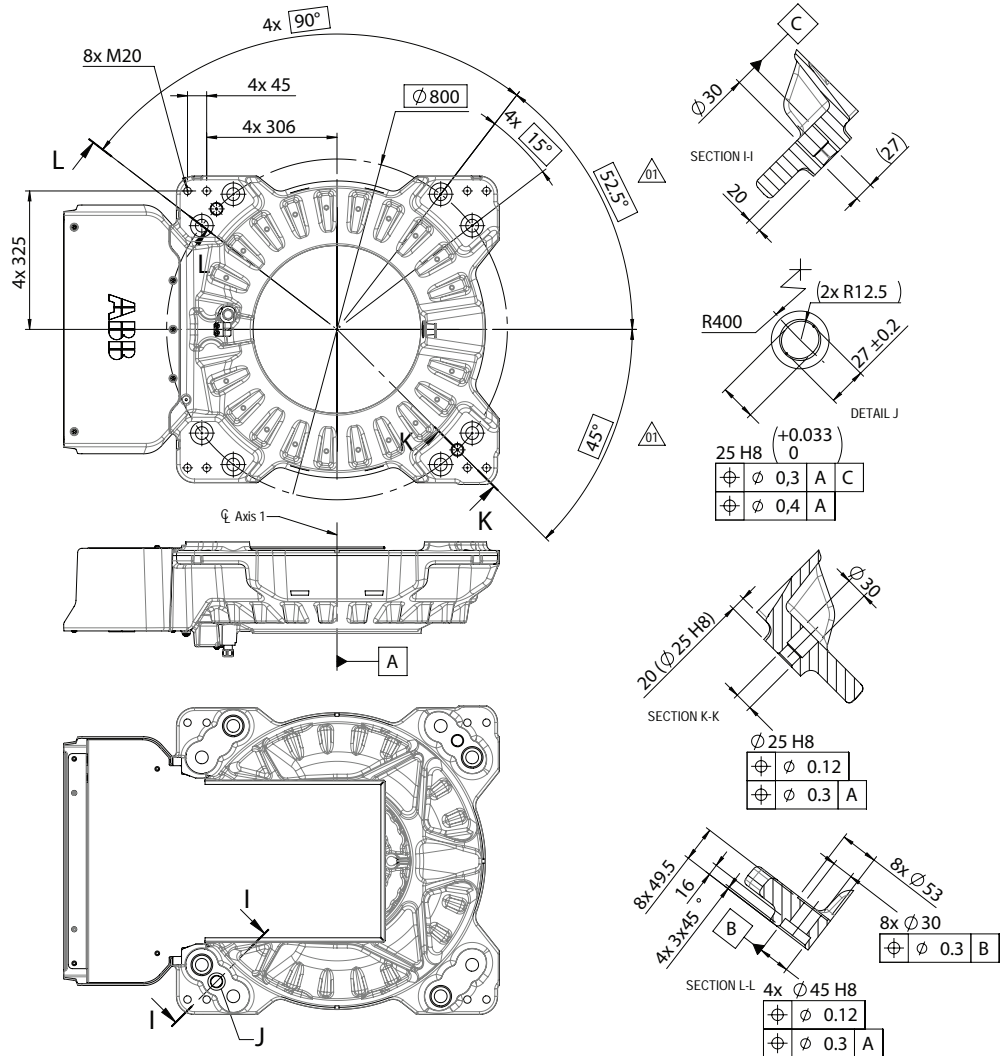
3 Installation and commissioning

3.3.4 Orienting and securing the robot

Continued

Hole configuration, base

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



xx210000788

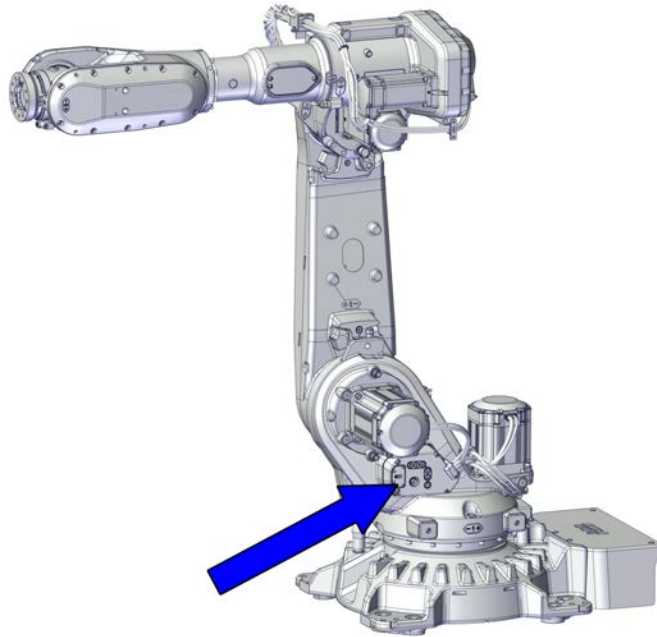
3.3.5 Manually releasing the brakes

Introduction to manually releasing the brakes

This section describes how to release the holding brakes for the axes motors.

Location of the brake release unit


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



xx200000232

Releasing the brakes

This procedure describes how to release the holding brakes when the robot is equipped with a brake release unit.


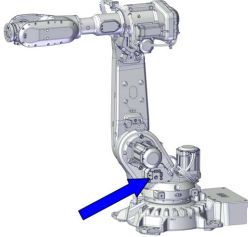
	Action	Note
1	<p>The internal brake release unit is equipped with buttons for controlling the axes brakes. The buttons are numbered according to the numbers of the axes.</p> <p> Note</p> <p>If the robot is not connected to the controller, power must be supplied to the connector R1.MP according to the section Supplying power to connector R1.MP on page 72.</p>	

Continues on next page

3 Installation and commissioning



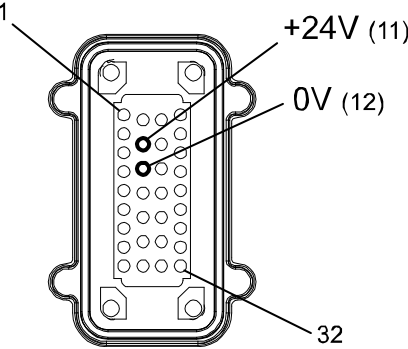
3.3.5 Manually releasing the brakes

Continued

	Action	Note
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.</p>	
3	<p>Release the holding brake on a particular robot axis by pressing the corresponding button and the padlock button simultaneously, on the internal brake release unit.</p> <p>The brake will be enable as soon as the button is released.</p>	 <p>xx2000000232</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 and instantly!</p>	
2	<p>Supply</p> <ul style="list-style-type: none"> • 0V on pin 12. • 24V on pin 11.  <p>Note</p> <p>Do not interchange the 24V and 0V pins.</p> <p>If they are mixed up, damage can be caused to internal electrical components.</p>	 <p>xx0600002937</p>
3	<p>Use the brake releasing button as described in Releasing the brakes on page 71.</p>	

3.3.6 Setting the system parameters for an inverted or a 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 inverted (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 inverted 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 39](#).

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

When the robot is mounted other than floor-standing (rotated around the y-axis), the robot base frame and the system parameter *Gravity Beta* must be redefined. If the robot is mounted upside down (inverted), then *Gravity Beta* should be π (+3.141593).

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

Gamma Rotation

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

Continues on next page

3 Installation and commissioning

3.3.6 Setting the system parameters for an inverted or a tilted robot

Continued

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	Example: 20°	Corresponds to: 0.349066 rad
Inverted mounting	180°	3.141593

Defining the system parameters 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*.

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

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

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

Define loads carefully

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.

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

Stopping time and braking distances

The performance of the motor brake depends on if there are any loads attached to the robot.

See *Product specification - Robot stopping distances according to ISO 10218-1*.

3 Installation and commissioning

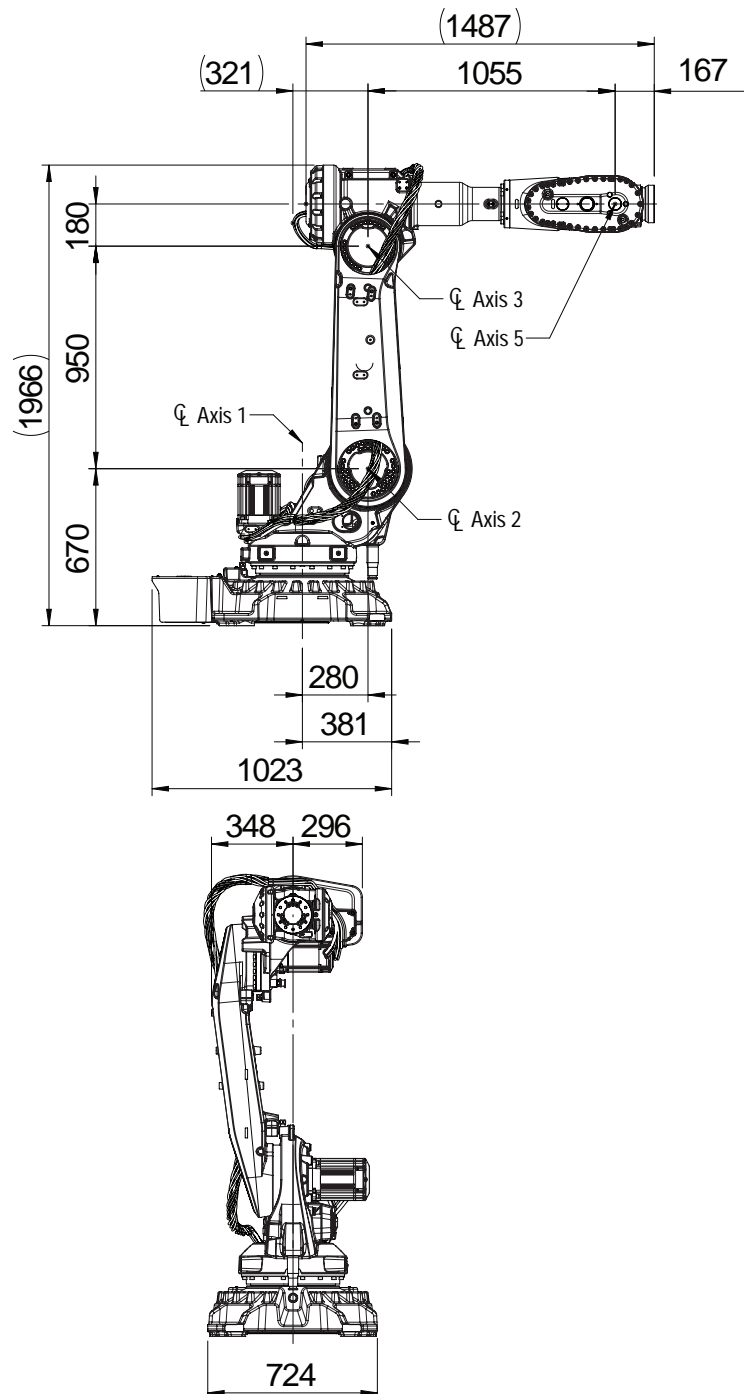
3.3.8 Fitting equipment on the robot (robot dimensions)

3.3.8 Fitting equipment on the robot (robot dimensions)

Robot dimensions

The figure shows the dimension of the robot. For more information regarding geometry, see CAD models online.

IRB 5710-110/2.3



xx210000792

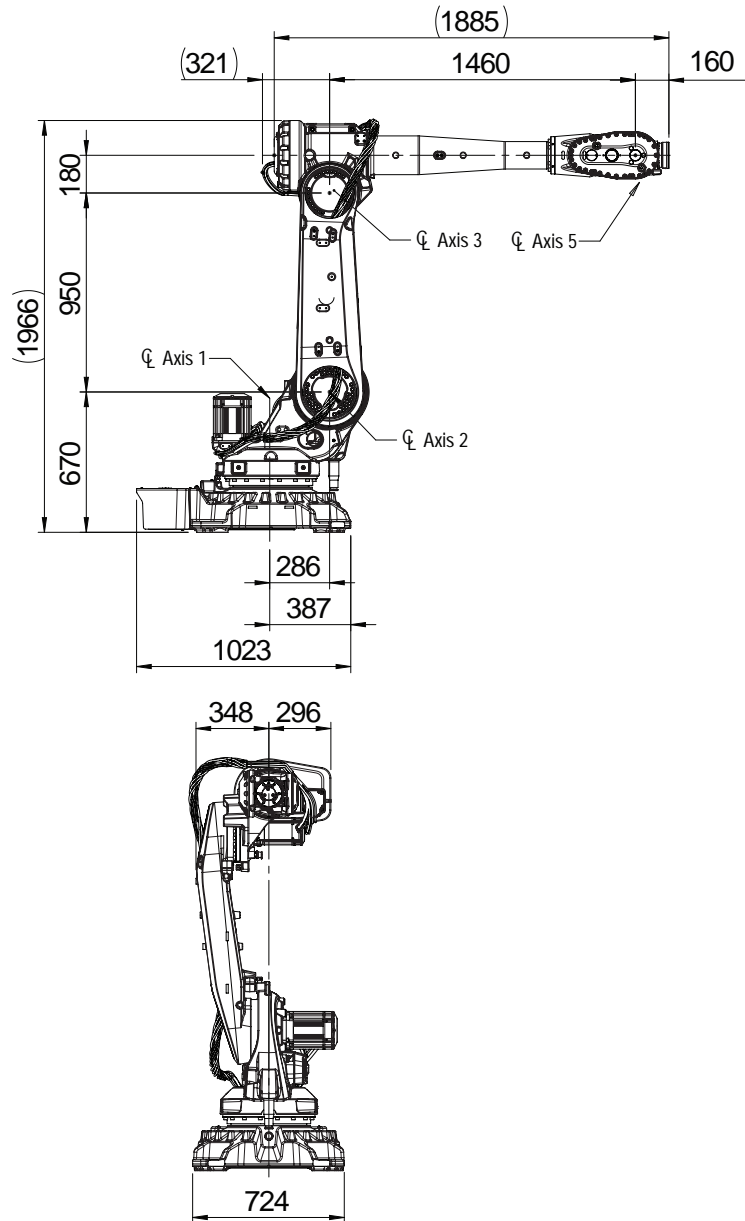
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3 Installation and commissioning

3.3.8 Fitting equipment on the robot (robot dimensions)

Continued

IRB 5710-90/2.7



xx210000794

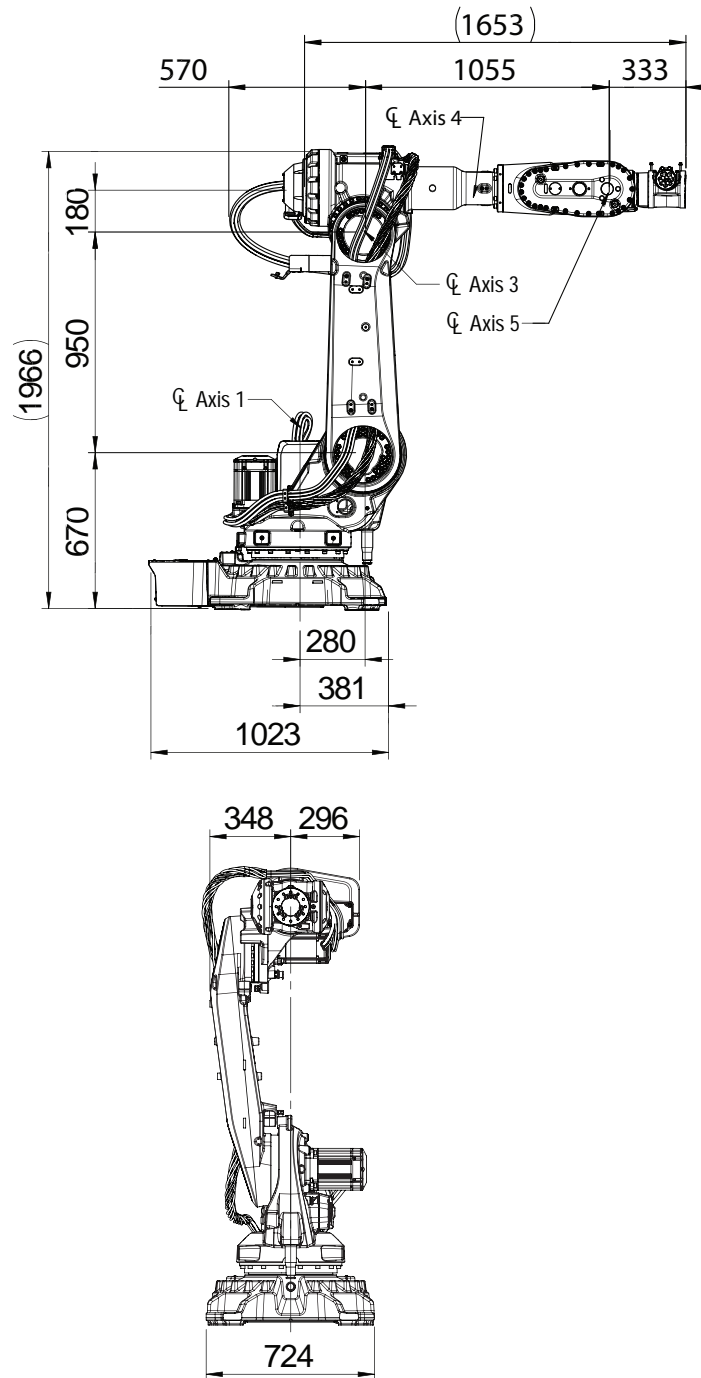
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3 Installation and commissioning

3.3.8 Fitting equipment on the robot (robot dimensions)

Continued

IRB 5710-90/2.3 LID



xx210000793

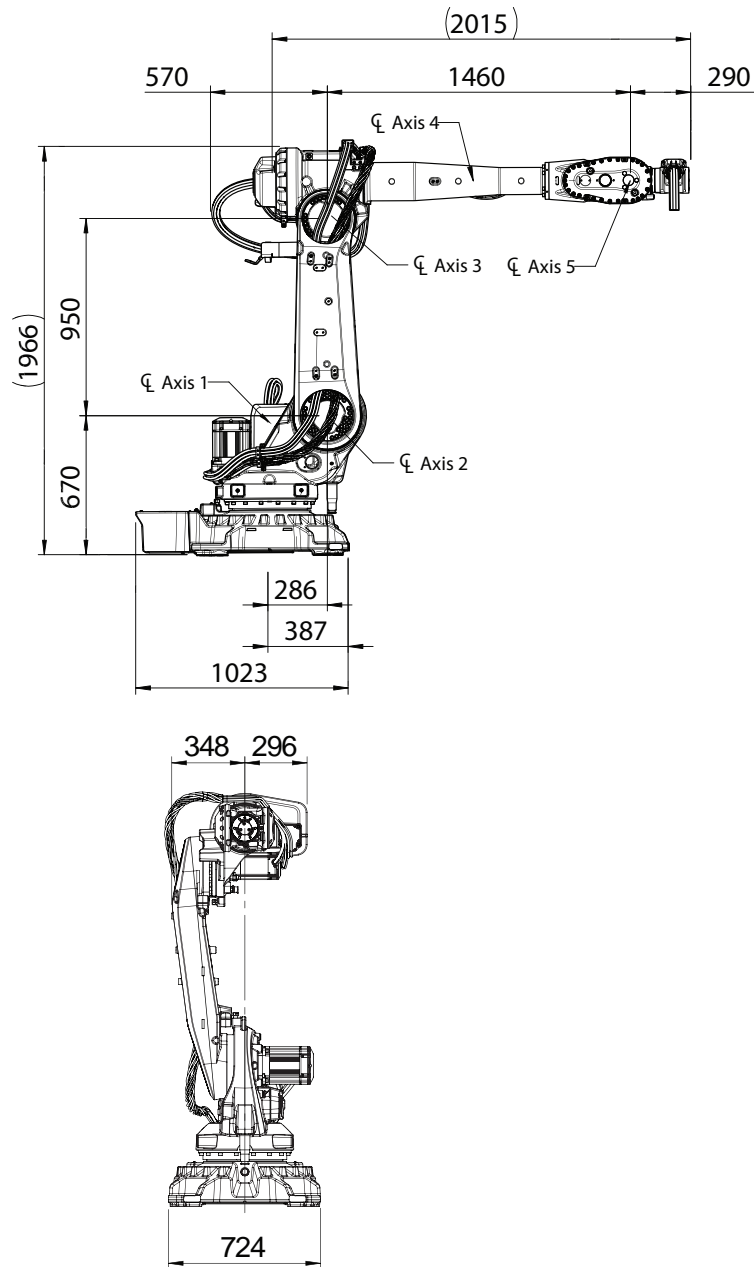
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3 Installation and commissioning

3.3.8 Fitting equipment on the robot (robot dimensions)

Continued

IRB 5710-70/2.7 LID



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3 Installation and commissioning

3.3.8 Fitting equipment on the robot (robot dimensions)

Continued

Extra load on the robot

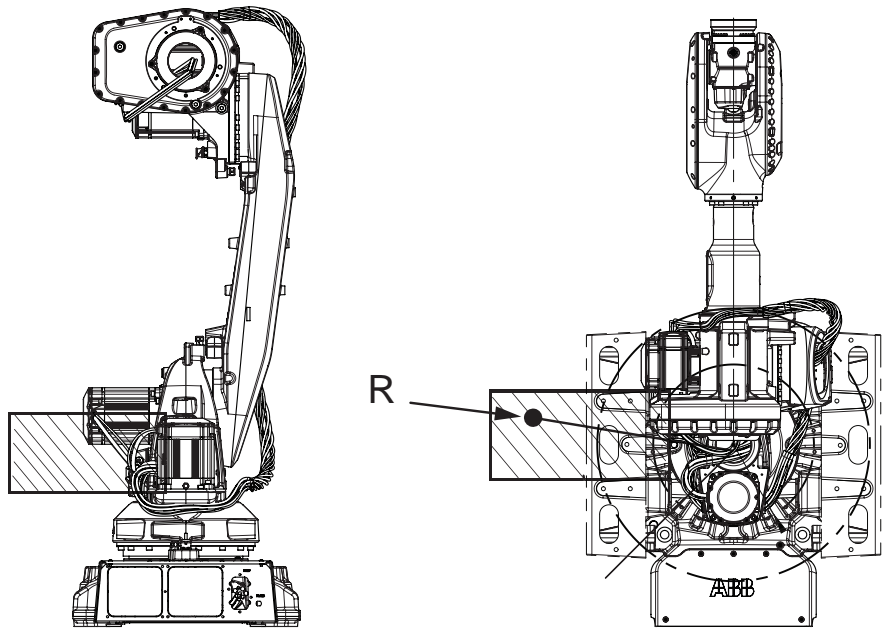
Extra loads can be mounted on robot. Definitions of dimensions and masses are shown in the following figures. The robot is supplied with holes for fitting extra equipment.

Maximum allowed arm load depends on center of gravity of arm load and robot payload.

Frame

The table and figure shows allowed extra load on the frame.

	Description
Permitted extra load on frame	$J_H = 100 \text{ kgm}^2$
Recommended position (see the following figure)	$J_H = J_{H0} + M4 \times R^2$ where: <ul style="list-style-type: none">• J_{H0} is the moment of inertia of the equipment• R is the radius (m) from the center of axis 1• $M4$ is the total mass (kg) of the equipment including bracket and harness ($\leq 250 \text{ kg}$)



xx210000824

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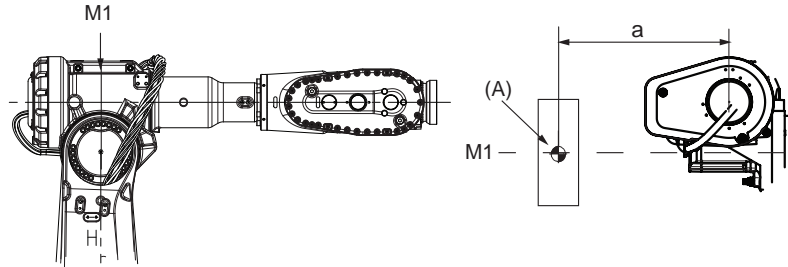
3 Installation and commissioning

3.3.8 Fitting equipment on the robot (robot dimensions)

Continued

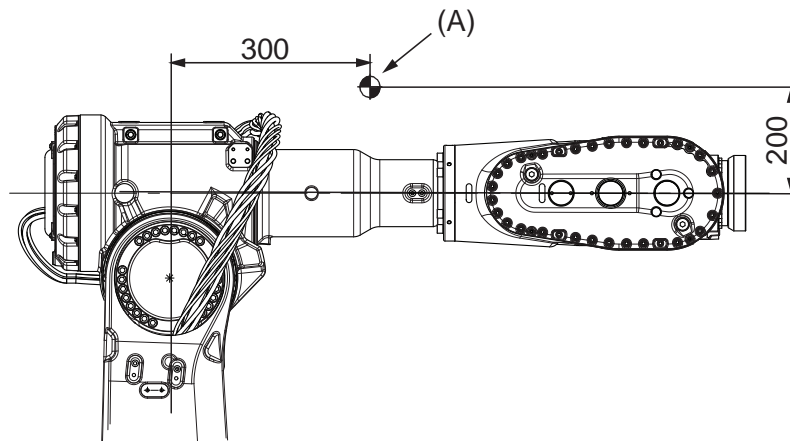
Upper arm

Allowed extra load on the upper arm housing, in addition to the nominal handling weight, is $M1 \leq 20$ kg with a distance (a) ≤ 500 mm from the center of gravity in the axis-3 extension.



xx210000822

A	Mass center
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xx210000823

A	Center of gravity in the axis-3 extension
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3 Installation and commissioning

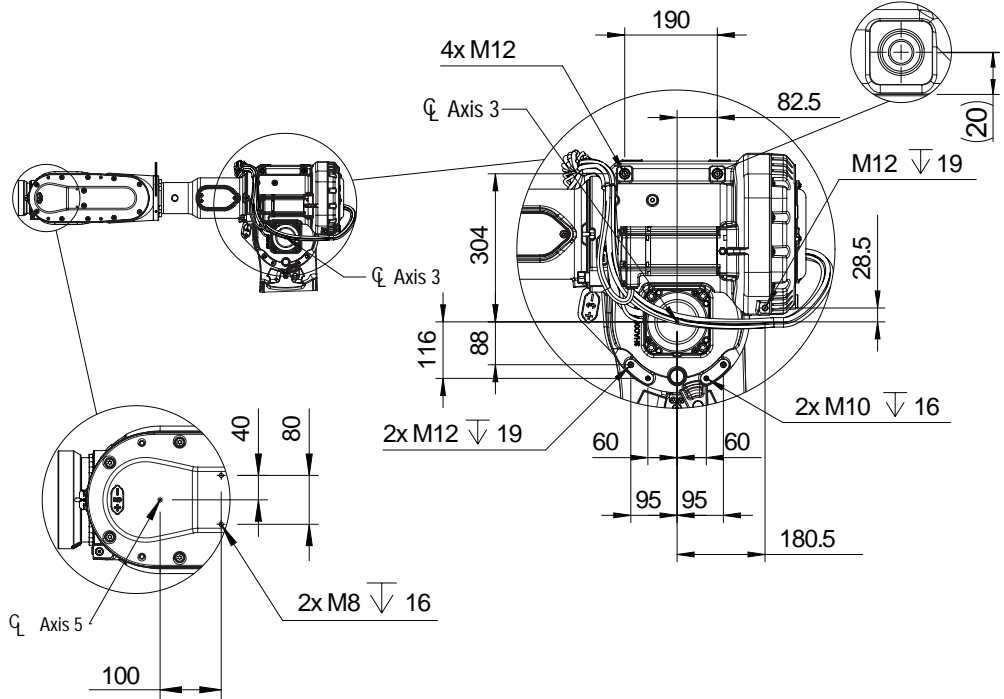
3.3.8 Fitting equipment on the robot (robot dimensions)

Continued

Attachment holes for fitting extra equipment

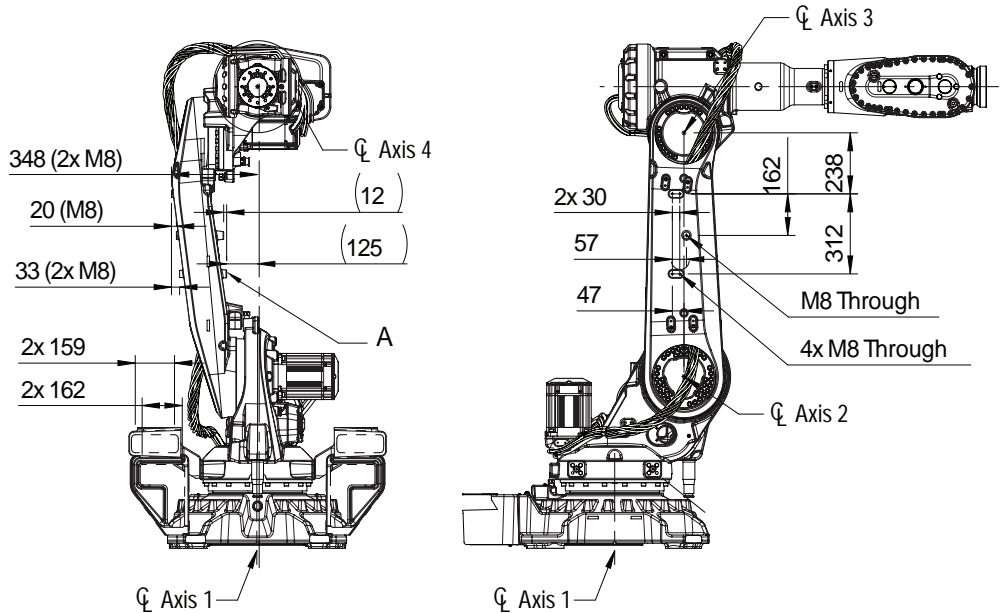
The robot is supplied with holes for fitting extra equipment.

Upper arm



xx2100000810

Lower arm



xx2100000811

A	Allowed positions for attachment holes. 4x M12 through. Avoid damaging cables when drilling.
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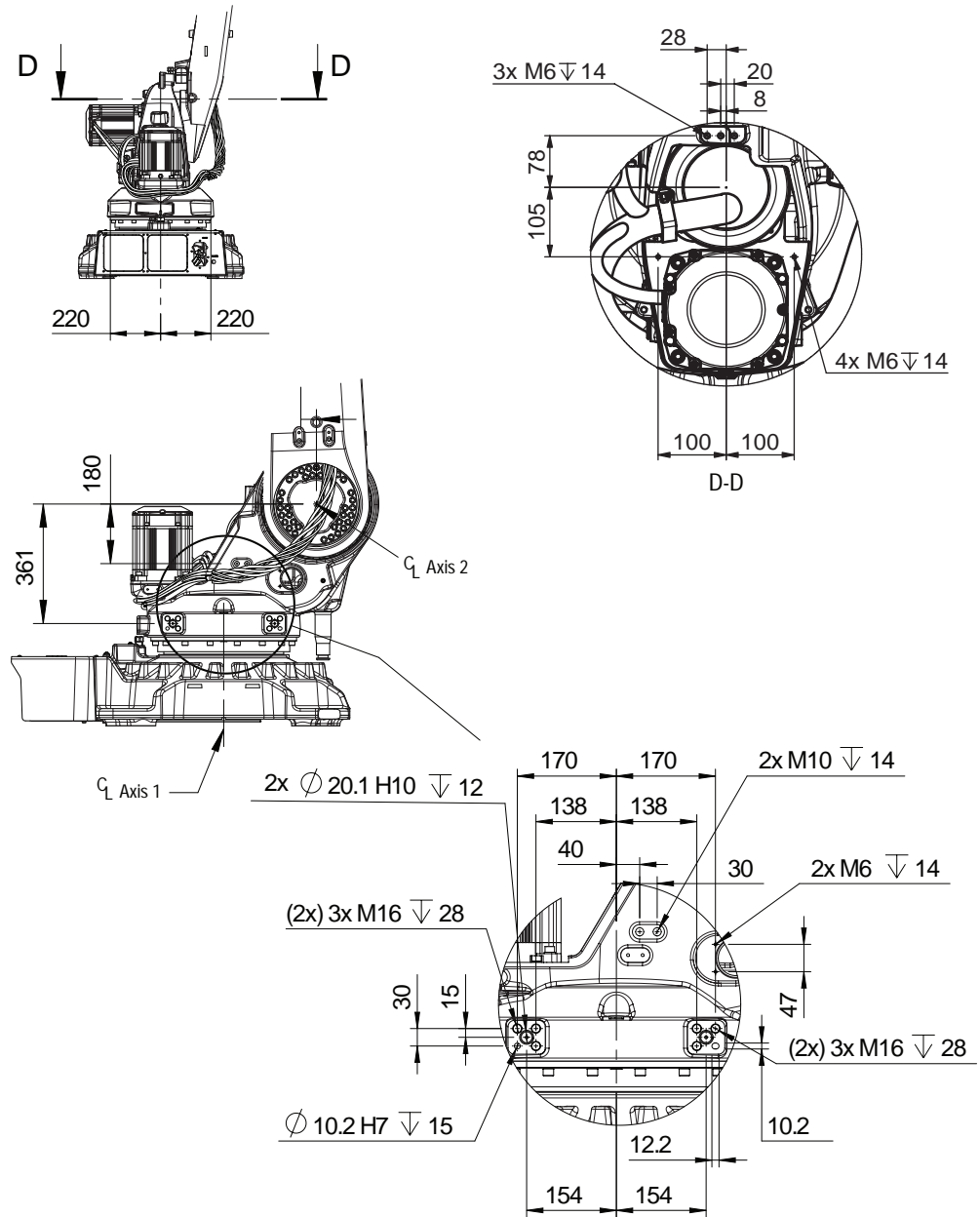
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3 Installation and commissioning

3.3.8 Fitting equipment on the robot (robot dimensions)

Continued

Frame



xx210000812

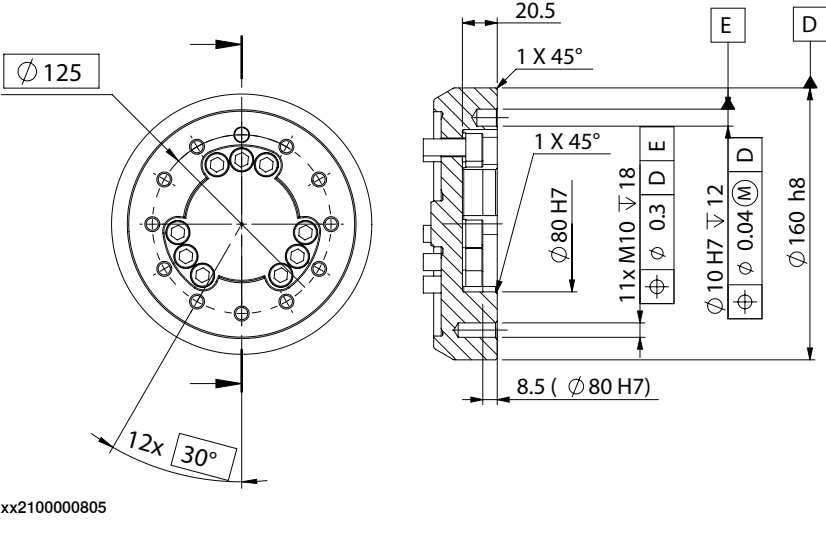
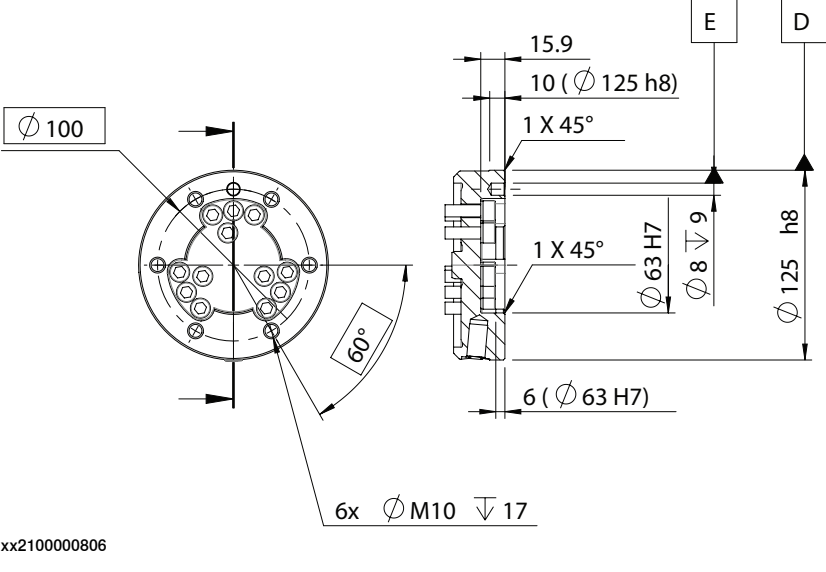
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3 Installation and commissioning

3.3.8 Fitting equipment on the robot (robot dimensions)

Continued

Tool flange dimensions

Robot variant	Tool flange dimension
<p>IRB 5710-110/2.3</p>  <p>xx210000805</p>	
<p>IRB 5710-90/2.7</p>  <p>xx210000806</p>	
<p>IRB 5710-90/2.3 LID</p>	

Continues on next page

3 Installation and commissioning

3.3.8 Fitting equipment on the robot (robot dimensions)

Continued

Robot variant	Tool flange dimension
	<p>xx210000807</p>
<p>IRB 5710-70/2.7 LID</p>	<p>xx210000808</p>

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.

3 Installation and commissioning

3.4.1 Adjusting the working range

3.4 Working range alterations

3.4.1 Adjusting the working range

Reasons for adjusting the manipulator working range

The working range of each manipulator axis is configured in the software. If there is a risk that the manipulator may collide with other objects at installation site, its working space should be limited. The manipulator must always be able to move freely within its entire working space.

Working range configurations

The parameter values for the axes working range can be altered within the allowed working range and according to available options for the robot, either to limit or to extend a default working range. Allowed working ranges and available options for each manipulator axis are specified in [Working range on page 46](#).

Mechanical stops on the manipulator

Mechanical stops are and can be installed on the manipulator as limiting devices to ensure that the manipulator axis does not exceed the working range values set in the software parameters.



Note

The mechanical stops are only installed as safety precaution to physically stop the robot from exceeding the working range set. A collision with a mechanical stop always requires actions for repair and troubleshooting.

Axis	Fixed mechanical stop ⁱ	Movable mechanical stop ⁱⁱ
Axis 1	yes	yes The working range can be reduced by altering the parameter values. Installation of additional mechanical stops is recommended. See Installing movable mechanical stops on axis 1 (option 3323-1) on page 87 . The working range can be extended (option 3324-1) by altering the parameter values and removing the movable mechanical stop pin.
Axis 2	yes	no
Axis 3	yes	no
Axis 4	no	no
Axis 5	yes	no
Axis 6	no	no

ⁱ Part of the casting or fixed on the casting and can not /should not be removed.

ⁱⁱ Can be installed in one or more than one position, to ensure a reduced working range, or be removed to allow extended working range.

3.4.2 Installing movable mechanical stops on axis 1 (option 3323-1)

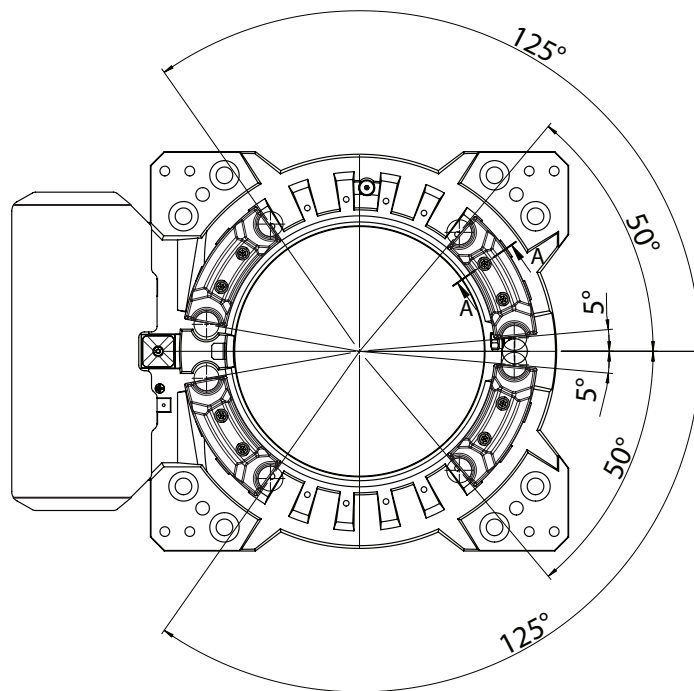
Reduction of the axis-1 working range

The working range of axis 1 is limited by system parameter configuration. To reduce the working range from default range, first adjust the parameter values and then install additional mechanical stops as a safety measure.

The movable mechanical stops reduce the working range according to the table.

Graduation of limited working range	Reduction of working range
15°	from ±5° and ±125° in both directions

Illustration, reduced working range



xx210000973



WARNING

If the mechanical stop pin is deformed after a hard collision, it must be replaced!
Deformed movable stops and/or additional stops as well as deformed attachment screws must also be replaced after a hard collision.

Continues on next page

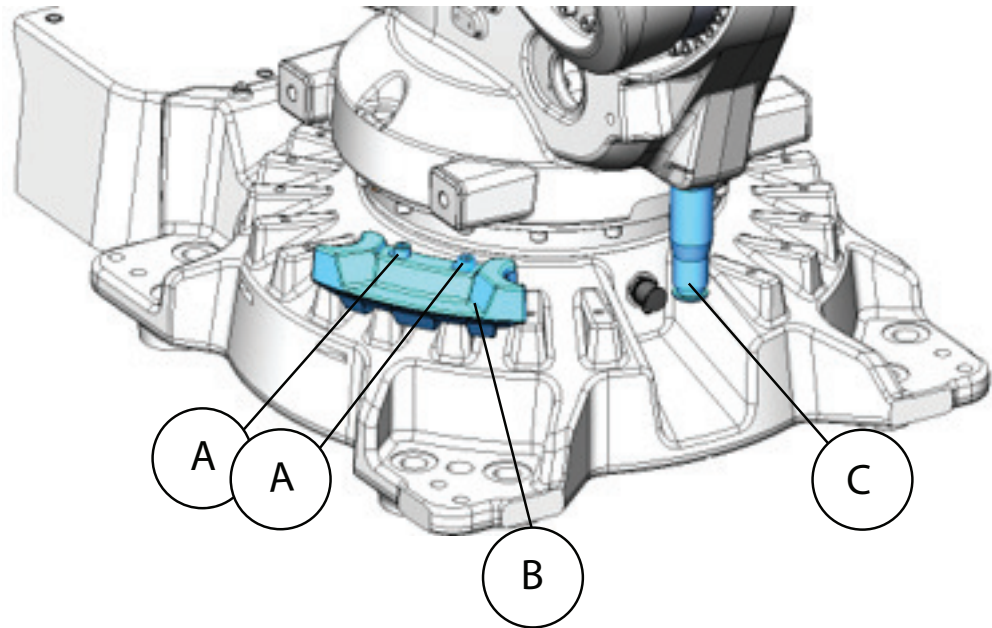
3 Installation and commissioning

3.4.2 Installing movable mechanical stops on axis 1 (option 3323-1)

Continued

Location of the mechanical stops

The mechanical stops are located as shown in the figure.



xx2100002647

A ⁱ	Attachment screws M12x70 quality 12.9 and washers DIN 125 (2 pcs per additional mechanical stop); Tightening torque 60 Nm
B	Movable mechanical stop
C	Mechanical stop pin axis-1

ⁱ Need to drill and make threaded M12 holes in base.

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 5710 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Movable mechanical stop set, axis 1	3HAC048533-003	Screws and washers are enclosed



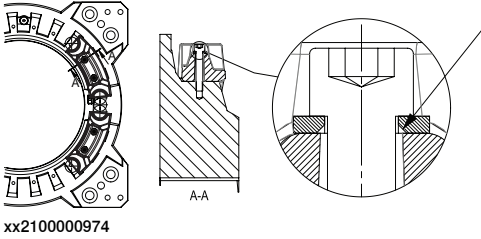

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

Continues on next page

Installing the movable mechanical stops

Use this procedure to fit the additional mechanical stops. An assembly drawing is also enclosed with the product.

	Action	Note
1	 <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 safeguarded space.</p>	
2	<p>Use the additional mechanical stop as a template and drill fastening holes with dimension M12 at the base.</p>	<p>See Location of the mechanical stops on page 88.</p>
3	<p>Fit the additional mechanical stop according to the figure Location of the mechanical stops on page 88.</p>  <p>Note</p> <p>Install the washer with the chamfer turned downwards.</p> 	<p>Tightening torque: 60 Nm.</p>
4	<p>Adjust the software working range limitations (system parameter configuration) to correspond to the mechanical limitations.</p>	<p>The system parameters that must be changed (<i>Upper joint bound</i> and <i>Lower joint bound</i>) are described in <i>Technical reference manual - System parameters</i>.</p>
5	 <p>DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

3 Installation and commissioning

3.4.3 Extended working range, axis 1 (option)

3.4.3 Extended working range, axis 1 (option)

Overview

The working range of axis 1 can be extended on a floor-mounted robot, from the default range limited by mechanical stops. The working range can be extended to $\pm 220^\circ$.



CAUTION

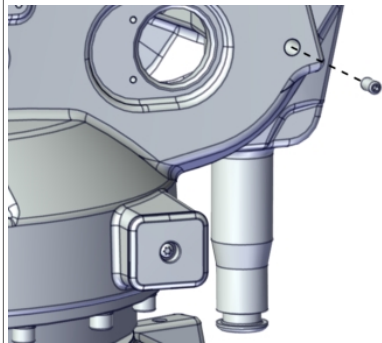
The option *Extended work range* enables an extension of the working range for axis 1, through a software configuration. With this option installed, the working range can exceed the range limited by the mechanical stop on axis 1. The working range shall be limited through the option *SafeMove*.

A risk analysis must be done to ensure that no risks remain when using option *Extended work range*, to limit the working range, and before removing the mechanical stops.

For information about the option *SafeMove*, see *Application manual - Functional safety and SafeMove*.

If the mechanical stop is removed, then the manipulator should have a marking for this, for example, a label. If the robot is delivered with the option *Extended work range*, then such a label is included on delivery.

Extending the working range

	Action	Note/Illustration
1	Configure the safety setup and verify it by test.	
2	Hold the mechanical stop pin in a firm grip, and remove it by unscrewing the attachment screw.	 xx2100001410
3	In RobotWare, redefine the working range limitations in the system parameters, topic <i>Motion</i> . The Arm parameters <i>Upper Joint Bound</i> and <i>Lower Joint Bound</i> can be changed to the values corresponding to the actual installation.	With the option <i>Extended working range</i> , the maximum value for the system parameters <i>Upper Joint Bound</i> and <i>Lower Joint Bound</i> is 3.84 respectively -3.84. The values are in radians, that is 3.84 radians = 220 degrees.

Related information

The system parameters are described in detail in the reference manual, see [References on page 10](#).

Continues on next page

For more information about SafeMove, see *Application manual - Functional safety and SafeMove*.

3 Installation and commissioning

3.5.1 Robot cabling and connection points

3.5 Electrical connections

3.5.1 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.



DANGER

Turn off the main power before connecting any cables.



CAUTION

Verify that the robot serial number is according to the number(s) in the *Declaration of Incorporation (DoI)*.

Main cable categories

The following table specifies cabling categories between the robot and the controller. Some of the cabling belong to optional applications.

Cable category	Description
Robot cables	Handles power supply to and control of the robot's motors as well as feedback from the serial measurement board. Specified in the table Robot cables on page 92 .
Customer cables	Handles communication with equipment fitted on the robot by the customer, low voltage signals and high voltage power supply + protective ground. The customer cables also handle databus 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 cables, power	Transfers drive power from the drive units in the control cabinet to the robot motors.	X1	R1.MP
Robot cable, signals	Transfers resolver data from and power supply to the serial measurement board.	X2	R1.SMB

Robot cable, power

Power cable length	Article number
Power cable 7 m	3HAC026787-001
Power cable 15 m	3HAC026787-002

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3 Installation and commissioning

3.5.1 Robot cabling and connection points

Continued

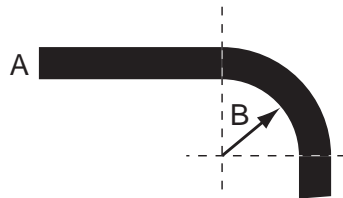
Power cable length	Article number
Power cable 22 m	3HAC026787-003
Power cable 30 m	3HAC026787-004

Robot cable, signals

Signal cable length	Article number
Signal cable, shielded: 7 m	3HAC2493-1
Signal cable, shielded: 15 m	3HAC2530-1
Signal cable, shielded: 22 m	3HAC2540-1
Signal cable, shielded: 30 m	3HAC2566-1

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

Continues on next page

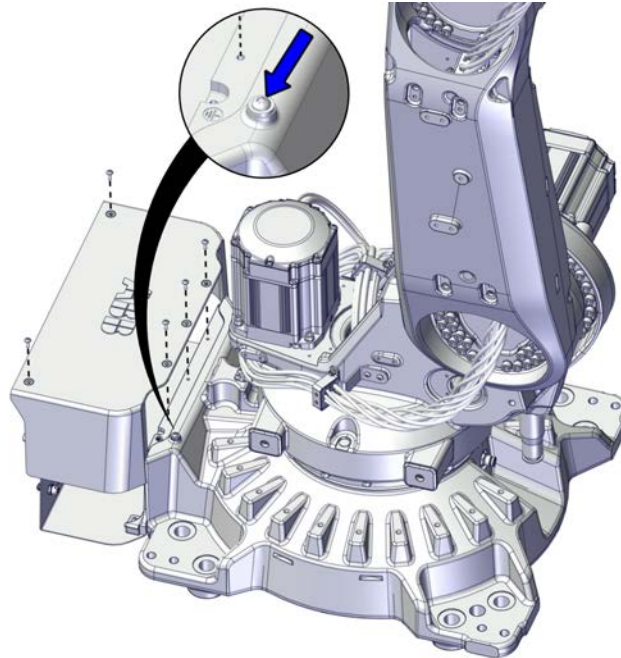
3 Installation and commissioning

3.5.1 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.



xx210000853

3.6 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.

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4 Maintenance

4.1 Introduction

Structure of this chapter

This chapter describes all the maintenance activities recommended for the IRB 5710.

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 15](#) 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 5710 is connected to power, always make sure that the IRB 5710 is connected to protective earth and a residual current device (RCD) before starting any maintenance work.

For more information see:

- *Product manual - OmniCore V250XT*
- [Robot cabling and connection points on page 92.](#)

4 Maintenance

4.2.1 Specification of maintenance intervals

4.2 Maintenance schedule and expected component life

4.2.1 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 5710:

- 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.

4.2.2 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. Values for these are specified in the section [Expected component life on page 101](#)

Maintenance schedule

Maintenance activities	Regularly	Every 6 months	Every 12 months	Every 36 months	Every 8,000 hours ⁱ	Every 12,000 hours ⁱ	Every 20,000 hours	Every 40,000 hours ⁱ	Reference
Cleaning the robot	x								Cleaning the IRB 5710 on page 179
Inspecting the dampers			x						Inspecting the dampers on page 107
Inspecting the information labels			x						Inspecting the information labels on page 104
Inspecting the mechanical stop			x						Inspecting the axis-1 mechanical stop on page 109
Inspecting the oil level in gearboxes									Inspect the oil level in the actual gearbox if there is a suspected leakage, after an oil change or a maintenance or repair activity where draining and filling oil is required.
Inspecting the robot harness			x ⁱⁱ						Inspecting the cable harness on page 111
Changing the oil in axis-1 gearbox							x		Changing the oil in axis-1 gearbox on page 139
Changing the oil in axis-2 gearbox							x		Changing the oil in axis-2 gearbox on page 150
Changing the oil in axis-3 gearbox							x		Changing the oil in axis-3 gearbox on page 156
Changing the oil in axis-4 gearbox							x		Changing the oil in axis-4 gearbox on page 161

Continues on next page

4 Maintenance

4.2.2 Maintenance schedule

Continued

Maintenance activities	Regularly	Every 6 months	Every 12 months	Every 36 months	Every 8,000 hours ⁱ	Every 12,000 hours ⁱ	Every 20,000 hours	Every 40,000 hours ⁱ	Reference
Changing the oil in axis-5 gearbox							x		Changing the oil in axis-5 gearbox on page 166
Changing the oil in axis-6 gearbox							x		Changing the oil in axis-6 gearbox on page 171
Replacing the SMB battery pack				x ⁱⁱⁱ					Replacing the SMB battery on page 176

ⁱ Operating hours counted by the DTC = Duty Time Counter

ⁱⁱ Replace when damage or cracks is detected or life limit is approaching that specified in section [Expected component life on page 101](#).

ⁱⁱⁱ The battery is to be replaced at given maintenance interval or at battery low alert.

4.2.3 Expected component life

Expected life depends on usage

The expected life of a specific component of the robot can vary greatly depending on how hard it is run.

Expected component life

Component	Expected life	Note
Cable harness, normal usage ⁱ	40,000 hours ⁱⁱ	
Cable harness, extreme usage ⁱⁱⁱ	20,000 hours ⁱⁱ	
Gearboxes	40,000 hours	The SIS system is described in <i>Operating manual - Service Information System</i> .

- ⁱ Examples of "normal usage" in regard to movement: most material handling applications and limited use of bending backwards mode of axis 3.
- ⁱⁱ Severe chemical or thermal environments, or similar environments, can result in shortened life expectancy.
- ⁱⁱⁱ Examples of "extreme usage" in regard to movement: press tending, very severe palletizing applications, major use of axis 1 movement and major use of bending backwards of axis 3.

4 Maintenance

4.3.1 Inspecting the motor seal

4.3 Inspection activities

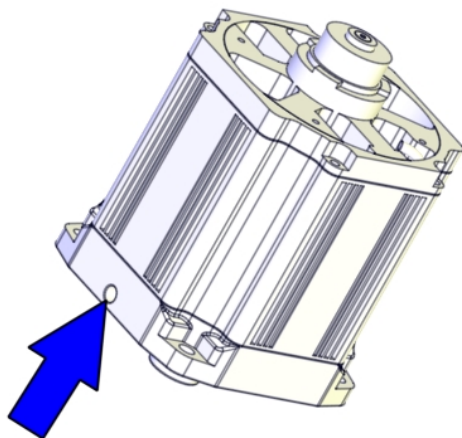
4.3.1 Inspecting the motor seal

Purpose of evacuation holes

The motors include evacuation on the motor flange to indicate failure of primary sealing between the gearbox and the motor.

Location of evacuation hole on motor

The evacuation hole is located on each motor flange. The figure shows axis-1 motor as an example.



xx1500001057

Plug in the evacuation hole

Robots with protection type Standard have a protection filter installed in the evacuation hole.

Robots with protection type Foundry Plus have a transparent plug/sight glass installed in the evacuation holes.



xx1800000101

Protection filter (Standard).



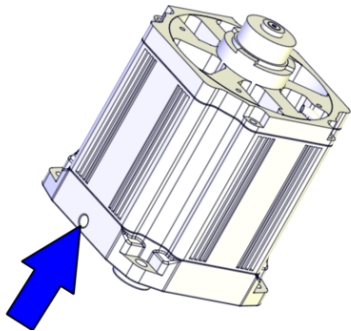


xx1800000102

Transparent plug (Foundry Plus).

Continues on next page

Inspecting the evacuation hole

	Action	Note
1	 <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>	
2	 <p>WARNING</p> <p>Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 29.</p>	
3	<p>Do a leakage check of the sight glass/evacuation hole of each motor.</p> <p>If any oil is available on the sight glass or if any oil has been spilled out from the evacuation hole, replacement of the motor is recommended.</p>	 <p>xx1500001057</p> <p>Replacing of motors is described in the repair chapter Motors on page 319.</p>

4 Maintenance

4.3.2 Inspecting the information labels

4.3.2 Inspecting the information labels

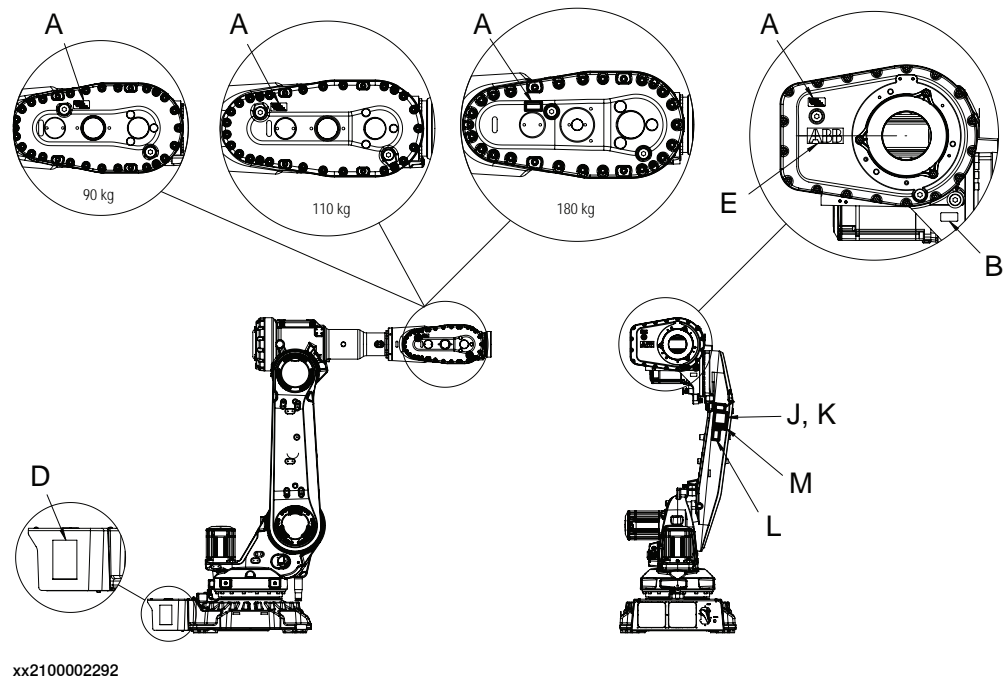
Required spare parts



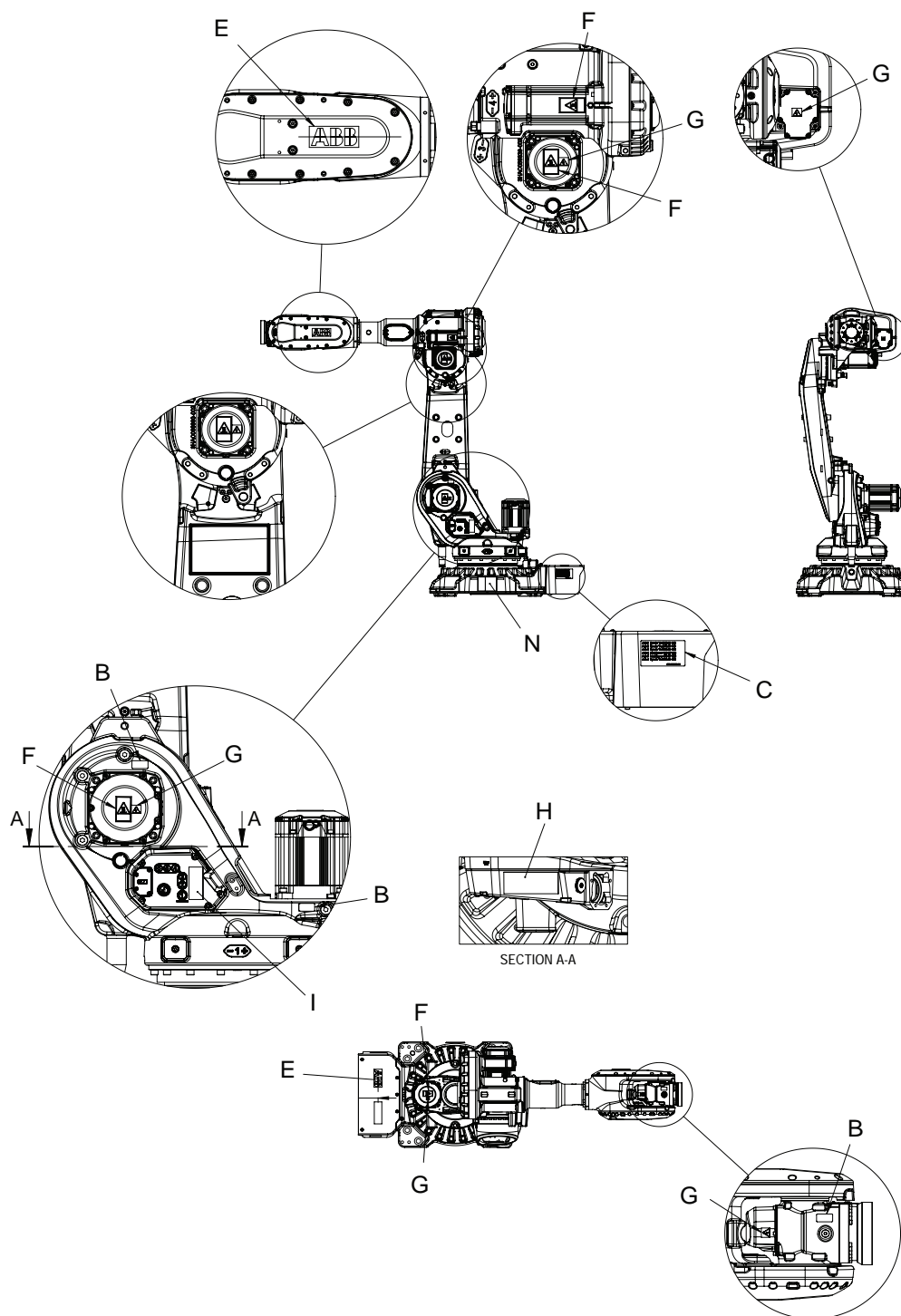
Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 5710 via myABB Business Portal, www.abb.com/myABB.

The figures show the location of the information labels to be inspected. The symbols are described in section [Safety symbols on manipulator labels on page 19](#).



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xx2100002291

	Spare part number	Description
A	3HAC021485-001	Lubrication label Mobilgear 600 XP 320
B	3HAC032726-001	Lubrication label Kyodo Yushi TMO 150
C	3HAC032905-001	Lubrication label

Continues on next page

4 Maintenance

4.3.2 Inspecting the information labels


Continued

	Spare part number	Description
D	3HAC9191-1	Warning label Tipping robot
E	3HAC0453-5	ABB logotype label
F	29454489-16	Warning label Hot surface
G	3HAC1589-1	Warning label Electrical (flash)
H	3HAC076756-001	Warning label / Instruction label Moving robot / MOTORS OFF
I	3HAC076755-001	Instruction label Brake release
J	3HAB9549-1	Rating label
K	3HAC067800-001	Waste Electrical & Electronic Equipment (WEEE) label
L	3HAC13488-1	Calibration label
M	3HAC14257-1	ABB information sign
N	3HAC021761-001	Warning label Extended working range

Required tools and equipment

Visual inspection, no tools are required.

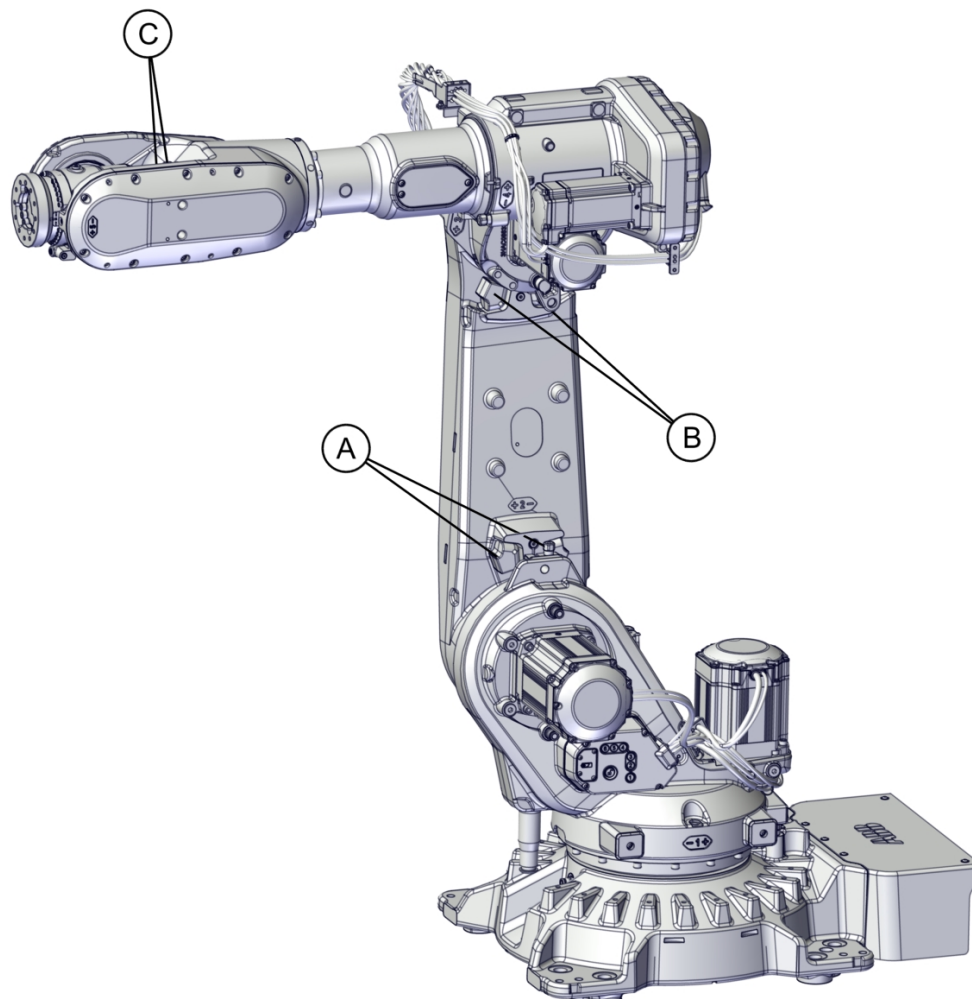
Inspecting, labels

	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 <i>Inspecting the information labels on page 104</i> .

4.3.3 Inspecting the dampers

Location of the dampers

The figure below shows the location of all the dampers to be inspected.



xx2100002296

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 5710 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note
Damper	3HAC12320-1	Axis 2, axis 3
Damper	3HAC054956-001	Axis 5

Continues on next page

4 Maintenance

4.3.3 Inspecting the dampers

Continued

Required equipment

Visual inspection, no tools are required.



Inspecting, dampers

The procedure below details how to inspect the dampers.



Note

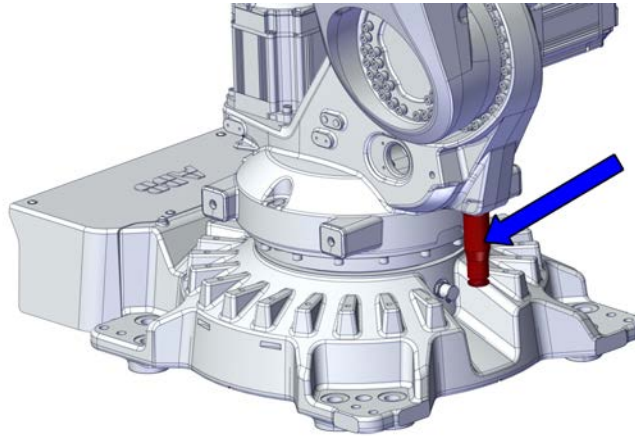
A damaged damper must be replaced.

	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	Check all dampers for damage, cracks or existing impressions larger than 1 mm.	
3	Check attachment screws for deformation.	
4	If any damage is detected, the damper must be replaced with a new one.	Attachment screws: Axis 2 and axis 3: M6x60 8.8-A2F (9ADA624-65) Axis 5: M6x25 Steel 8.8-A2F (9ADA624-58) Locking liquid: Loctite 2400 (3HAC041807-004).
5	 DANGER Make sure all safety requirements are met when performing the first test run.	

4.3.4 Inspecting the axis-1 mechanical stop

Location of mechanical stop pin

The mechanical stop is located as shown in the figure.





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Required equipment

Visual inspection, no tools are required.

Inspecting the mechanical stop pin

Use this procedure to inspect the axis-1 mechanical stop pin.


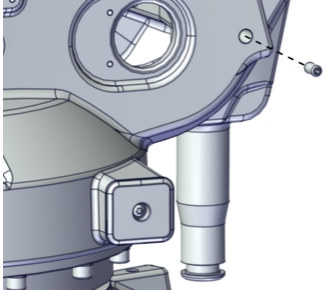
	Action	Note
1	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
2	Inspect the axis-1 mechanical stop pin. If the mechanical stop pin is bent or damaged, it must be replaced.  Note The expected life of gearboxes can be reduced after collision with the mechanical stop.	

Continues on next page

4 Maintenance

4.3.4 Inspecting the axis-1 mechanical stop

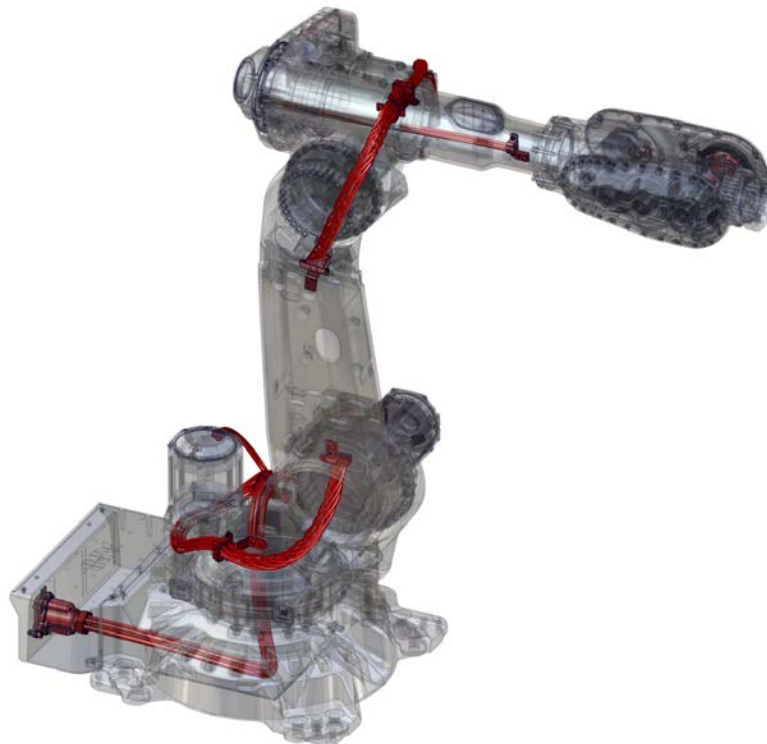
Continued

	Action	Note
3	<p>Check that the mechanical stop pin attachment screw is tightened correctly.</p> <p> Note</p> <p>Do not overtighten the attachment screw, use specified tightening torque.</p>	<p>Tightening torque: 24 Nm Locking liquid: 3HAC041807-004 (Loctite 2400)</p> <p>The attachment screw is accessed from the side.</p>  <p>xx2100001410</p>

4.3.5 Inspecting the cable harness

Location of cable harness

The cable harness is located as shown in the figure.




xx210000483

Required tools

Visual inspection, no tools are needed.

Inspecting the cable harness

Use this procedure to inspect cable harness of axes 1-6.

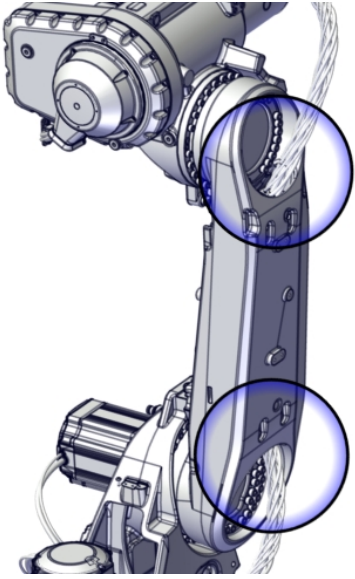
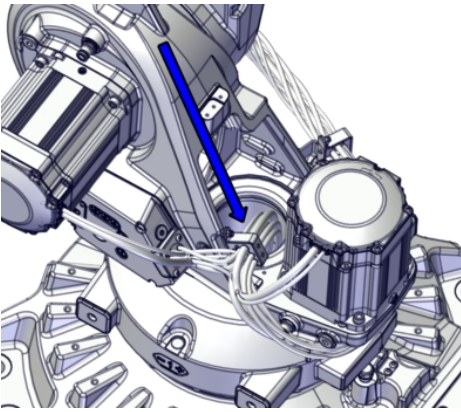
	Action	Note
1	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safe-guarded space.	

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4 Maintenance

4.3.5 Inspecting the cable harness

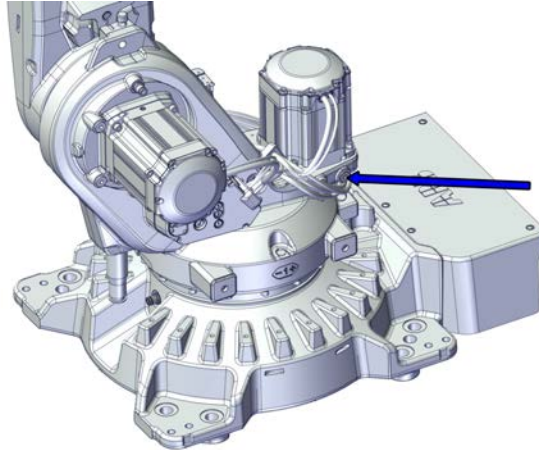
Continued

	Action	Note
2	<p>Make an overall inspection of the cable harness in order to detect wear and damage.</p> <p>Pay special attention to the areas of axis-2 and axis-3 movement, shown in the figure. Make sure the cabling is not damaged between the cable brackets in these areas.</p>	 <p>xx2100001472</p>
3	<p>Check that all visible cable brackets, velcro straps and attachments are properly secured, by following the cable harness from the base to the wrist.</p>	
4	<p>Check the motor cables visually for any damage.</p>	
5	<p>Check the connectors at the base visually for any damage.</p>	
6	<p>Check the cabling going through the protection tube, to detect possible cable chafing, by using your hands inside the tube to feel the cables. Ensure that the cables are undamaged.</p> <p>Remove any objects that may cause possible cable chafing.</p> <p>Replace damaged cabling, if any.</p>	 <p>xx2100001473</p>
7	<p>Replace the cable harness if wear, cracks or damage is detected.</p>	<p>See Removing the cable harness on page 260.</p>

4.3.6 Inspecting the oil level in axis-1 gearbox

Location of the oil plug

The oil plug for inspection is located as shown in the figure.

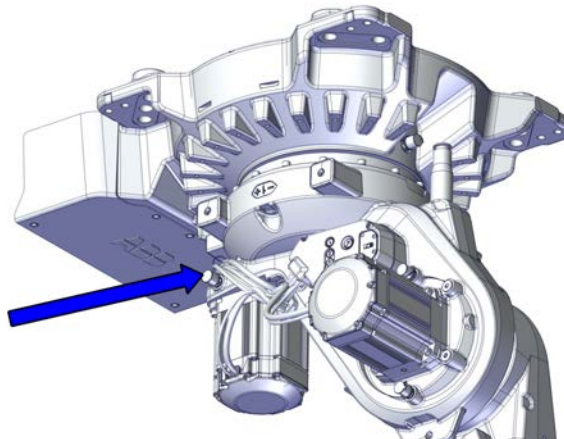


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Option Inverted (3317-1)

Measure the oil level in the axis-1 gearbox with an oil level gauge connected to the oil plug pointed out in the figure.

If no oil level gauge is available, take down the manipulator to floor-standing and measure the oil level according to floor-standing manipulator.



xx2100002062

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .
Oil level gauge	3HAC061881-001	Used to inspect the oil level in the axis-1 gearbox when the manipulator is mounted inverted. The tool also includes an air vent.

Continues on next page

4 Maintenance

4.3.6 Inspecting the oil level in axis-1 gearbox

Continued

Required consumables and wear parts



Wear part	Article number	Note
Lubricating oil	-	See Type of lubrication in gearboxes on page 137 .
O-ring, G 1/2"	3HAC061327-059	Used on oil plug. Always replace when refitting oil plug.

Required documents

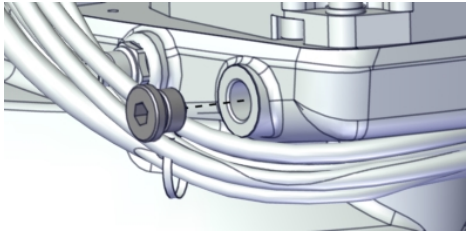
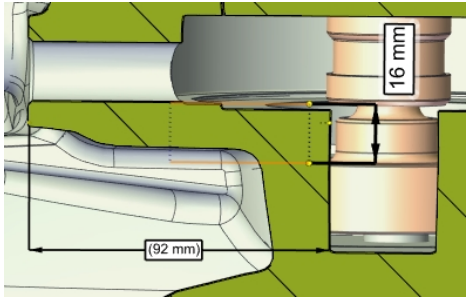
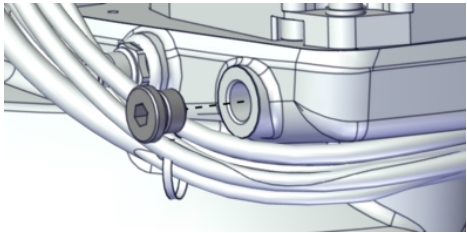

Document name	Document number
<i>Technical reference manual - Lubrication in gearboxes</i>	3HAC042927-001

Floor-mounted robot: Inspecting the oil level in axis-1 gearbox

Use this procedure to inspect the oil level in the gearbox, when the robot is floor-standing.

	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 safe-guarded space.	
2	 WARNING Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 29 .	
3	Make sure that the oil temperature is +25 °C ± 10 °C.	

Continues on next page

	Action	Note
4	Open the oil plug.	 <p>xx2100002056</p>
5	Check the oil level. Required oil level is: 0-16 mm below oil plug hole.	 <p>xx2100001479</p>
6	Add or drain oil, if required.	Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes</i> . Further information about how to drain or fill with oil is found in section Changing the oil in axis-1 gearbox on page 139 .
7	Refit the oil plug with a new o-ring.	O-ring, G 1/2": 3HAC061327-059 Tightening torque: 24 Nm.  <p>xx2100002056</p>
8	 DANGER Make sure all safety requirements are met when performing the first test run.	




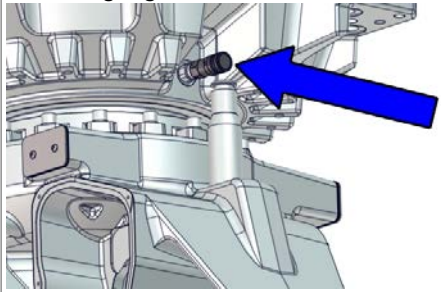
4 Maintenance

4.3.6 Inspecting the oil level in axis-1 gearbox

Continued

Inverted robot: Inspecting the oil level in axis-1 gearbox

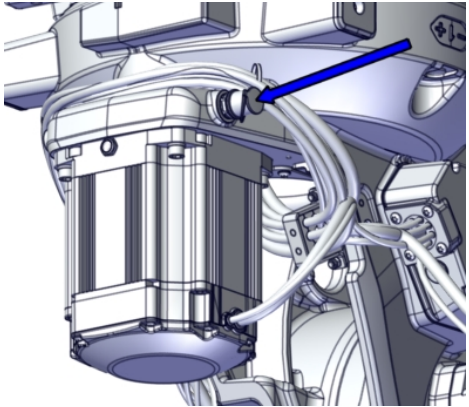
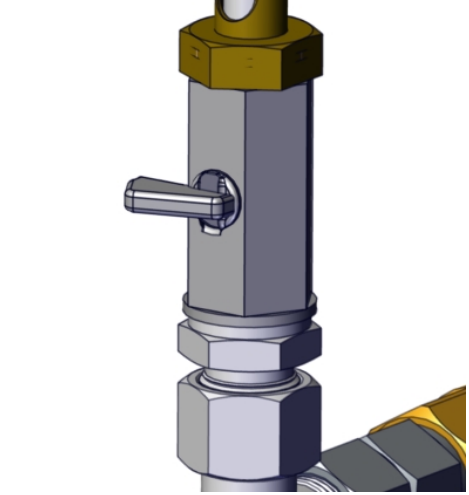
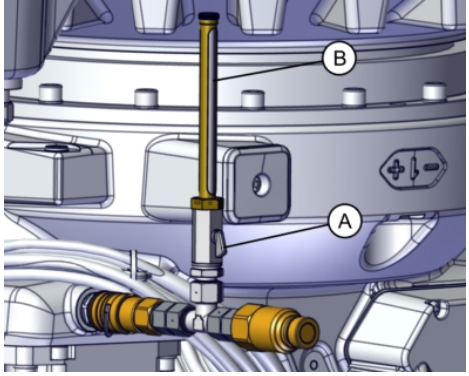
Use this procedure to inspect the oil level in the gearbox, when the robot is inverted.

	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 safe-guarded space.	
2	 WARNING Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 29 .	
3	Make sure that the oil temperature is $+25^{\circ}\text{C} \pm 10^{\circ}\text{C}$.  CAUTION The gearbox can contain an <i>excess pressure</i> that can be hazardous. Open the oil plug carefully in order to let the excess pressure out.	
4	Remove the protective cap and install the ventilating valve enclosed with the oil level gauge.	Oil level gauge: 3HAC061881-001  xx170000349

Continues on next page

4.3.6 Inspecting the oil level in axis-1 gearbox

Continued


	Action	Note
5	Remove the protective cap from the inspection hole.	 <p>xx2100002057</p>
6	Make sure that the valve is closed (horizontal) and install the oil level gauge to the inspection hole.	 <p>xx2100002418</p>
7	<p>Open the valve (A) slowly to reduce built-up pressure slowly.</p> <p>Check the oil level by reading the markings (B) on the oil level gauge.</p> <p>Required oil level is: at level measurement mark 57 on tool ± 5 mm.</p>	 <p>xx2100002102</p> <p>A Valve in open position B Level measurement marks</p>
8	Add or drain oil, if required.	<p>Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes</i>.</p> <p>Further information about how to drain or fill with oil is found in section Changing the oil in axis-1 gearbox on page 139.</p>

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4 Maintenance

4.3.6 Inspecting the oil level in axis-1 gearbox

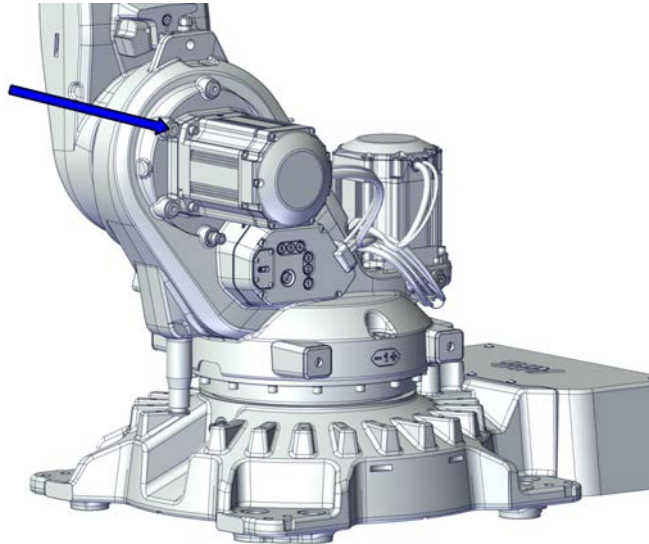
Continued

	Action	Note
9	Remove the tools and refit the protective caps.	
10	 DANGER Make sure all safety requirements are met when performing the first test run.	

4.3.7 Inspecting the oil level in axis-2 gearbox

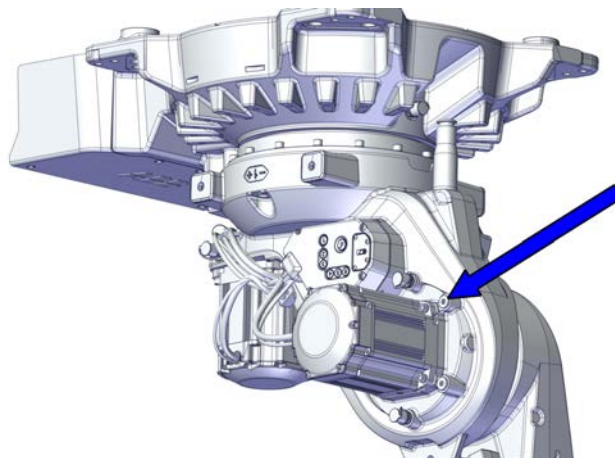
Location of the oil plug

The oil plug for inspection is located as shown in the figure.



xx2100002058

Option Inverted (3317-1)



xx2100002060

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

Required consumables and wear parts

Wear part	Article number	Note
Lubricating oil	-	See Type of lubrication in gearboxes on page 137 .

Continues on next page

4 Maintenance

4.3.7 Inspecting the oil level in axis-2 gearbox

Continued



Wear part	Article number	Note
O-ring, G 1/2"	3HAC061327-059	Used on oil plug. Always replace when refitting oil plug.

Required documents

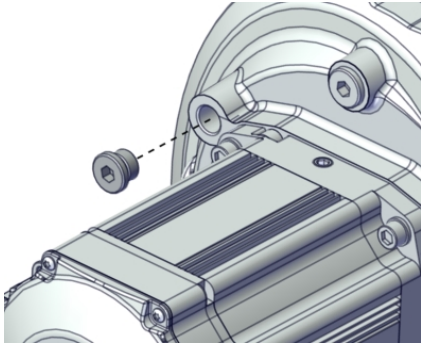
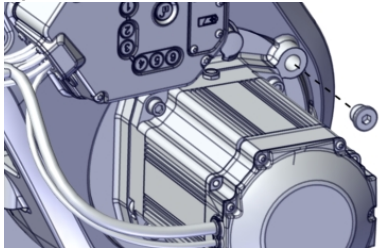
Document name	Document number
<i>Technical reference manual - Lubrication in gearboxes</i>	<i>3HAC042927-001</i>

Inspecting the oil level in axis-2 gearbox

Use this procedure to inspect the oil level in the gearbox.

	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	 WARNING Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 29 .	
3	Make sure that the oil temperature is $+25^{\circ}\text{C} \pm 10^{\circ}\text{C}$.	

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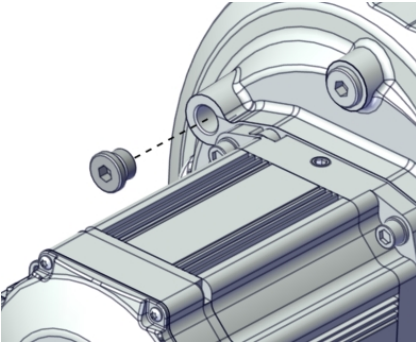
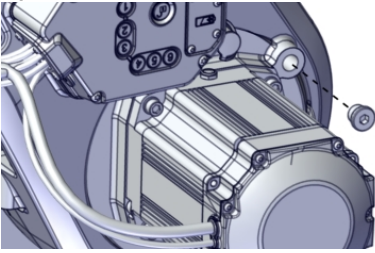

	Action	Note
4	Open the oil plug.	 <p>xx2100002059</p> <p><i>Option Inverted (3317-1)</i></p>  <p>xx2100002061</p>
5	Check the oil level. Required oil level is: 0-10 mm below oil plug hole (floor-mounted robot). Required oil level is: 0-10 mm below oil plug hole (inverted robot).	
6	Add or drain oil, if required.	Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes</i> . Further information about how to drain or fill with oil is found in section Changing the oil in axis-2 gearbox on page 150 .

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4 Maintenance

4.3.7 Inspecting the oil level in axis-2 gearbox

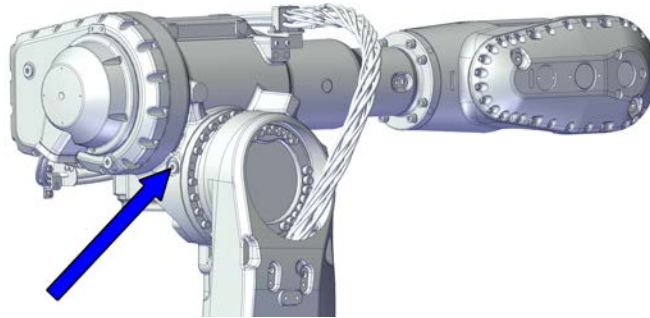
Continued

	Action	Note
7	Refit the oil plug with a new o-ring.	<p>O-ring, G 1/2": 3HAC061327-059 Tightening torque: 24 Nm.</p>  <p>xx2100002059</p> <p><i>Option Inverted (3317-1)</i></p>  <p>xx2100002061</p>
8	 DANGER Make sure all safety requirements are met when performing the first test run.	

4.3.8 Inspecting the oil level in axis-3 gearbox

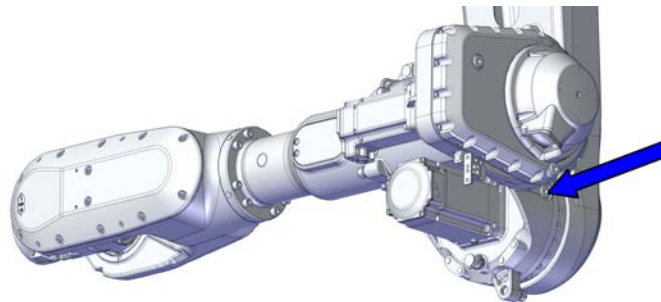
Location of the oil plug

The oil plug for inspection is located as shown in the figure.



xx2100002066

Option Inverted (3317-1)



xx2100002063

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

Required consumables and wear parts

Wear part	Article number	Note
Lubricating oil	-	See Type of lubrication in gearboxes on page 137 .
O-ring, G 1/2"	3HAC061327-059	Used on oil plug. Always replace when refitting oil plug.

Required documents

Document name	Document number
<i>Technical reference manual - Lubrication in gearboxes</i>	3HAC042927-001

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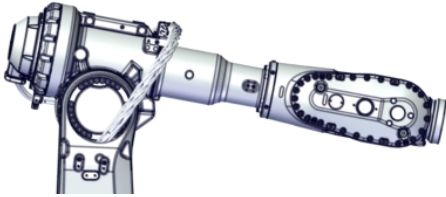
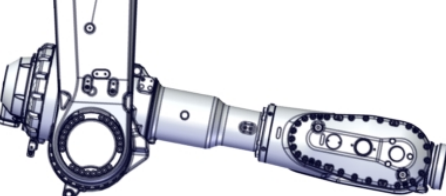


4 Maintenance

4.3.8 Inspecting the oil level in axis-3 gearbox

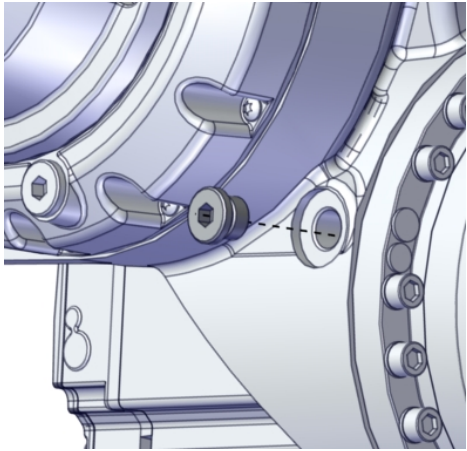
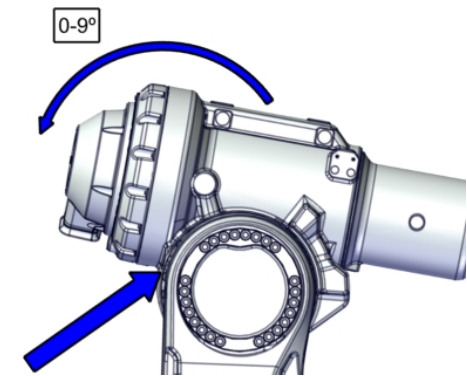
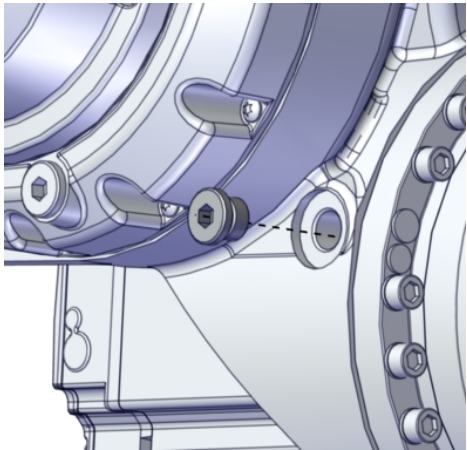
Continued

Inspecting the oil level in axis-3 gearbox

Use this procedure to inspect the oil level in the gearbox.

	Action	Note
1	<p><i>Floor-mounted robot:</i></p> <p>Jog the robot into position:</p> <ul style="list-style-type: none"> • Axis 1: no significance • Axis 2: 0° • Axis 3: +14° • Axis 4: no significance • Axis 5: no significance • Axis 6: no significance 	 <p>xx2100002068</p>
2	<p><i>Option Inverted (3317-1)</i></p> <p>Jog the robot into position:</p> <ul style="list-style-type: none"> • Axis 1: no significance • Axis 2: 0° • Axis 3: -166° • Axis 4: no significance • Axis 5: no significance • Axis 6: no significance 	 <p>xx2100002069</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 safe-guarded space.</p>	
4	<p>Make sure that the oil temperature is +25° C ± 10° C.</p>	
5	<p> WARNING</p> <p>Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 29.</p>	

Continues on next page


	Action	Note
6	Open the oil plug.	 <p>xx2100002064</p>
7	<p>Check the oil level.</p> <p>Rotate axis 3 up to 9°, if needed, to achieve correct oil level measurement.</p> <p><i>Floor-mounted robot:</i></p> <p>Required oil level: in level with the oil plug hole when axis 3 is in position +14° to +5°.</p> <p><i>Option Inverted (3317-1)</i></p> <p>Required oil level: in level with the oil plug hole when axis 3 is in position -166° to -175° (0-7 mm).</p>	 <p>xx2100002067</p>
8	Add or drain oil, if required.	<p>Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes</i>.</p> <p>Further information about how to drain or fill with oil is found in section Changing the oil in axis-3 gearbox on page 156.</p>
9	Refit the oil plug with a new o-ring.	<p>O-ring, G 1/2": 3HAC061327-059</p> <p>Tightening torque: 24 Nm.</p>  <p>xx2100002064</p>

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4 Maintenance

4.3.8 Inspecting the oil level in axis-3 gearbox

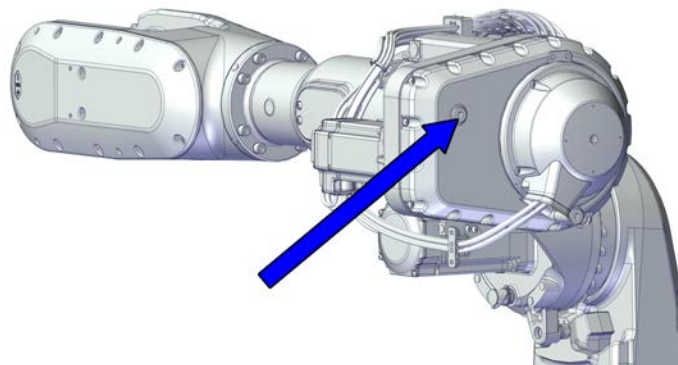
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	Action	Note
10	 DANGER Make sure all safety requirements are met when performing the first test run.	

4.3.9 Inspecting the oil level in axis-4 gearbox

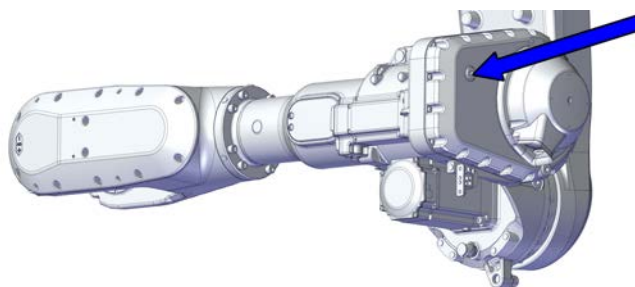
Location of the oil plug

The oil plug for inspection is located as shown in the figure.



xx2100002070

Option Inverted (3317-1)



xx2100002071

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

Required consumables and wear parts

Wear part	Article number	Note
Lubricating oil	-	See Type of lubrication in gearboxes on page 137 .
O-ring, G 1/2"	3HAC061327-059	Used on oil plug. Always replace when refitting oil plug.

Required documents

Document name	Document number
<i>Technical reference manual - Lubrication in gearboxes</i>	3HAC042927-001

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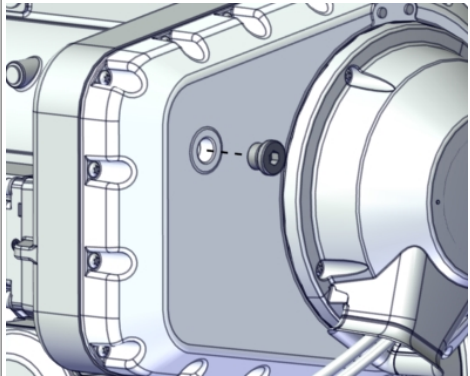
4 Maintenance

4.3.9 Inspecting the oil level in axis-4 gearbox

Continued

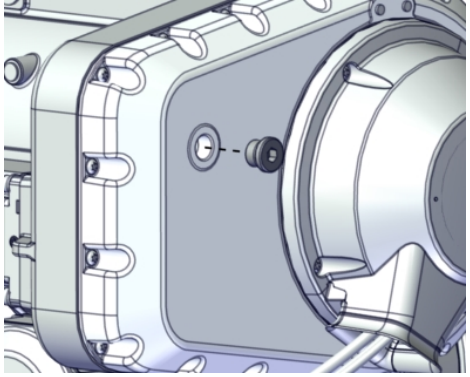

Inspecting the oil level in axis-4 gearbox

Use this procedure to inspect the oil level in the gearbox.

	Action	Note
1	<i>Floor-mounted robot:</i> Run the robot to calibration position.	
2	<i>Option Inverted (3317-1)</i> Jog the robot into position: <ul style="list-style-type: none"> • Axis 1: no significance • Axis 2: 0° • Axis 3: -180° • Axis 4: no significance • Axis 5: no significance • Axis 6: no significance 	
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 safe-guarded space.	
4	Make sure that the oil temperature is +25°C ± 10°C.	
5	 WARNING Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 29 .	
6	Open the oil plug.	 <p style="text-align: right; font-size: small;">xx2100002072</p>
7	Check the oil level. Required oil level is: 0-10 mm below oil plug hole	

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4.3.9 Inspecting the oil level in axis-4 gearbox Continued

	Action	Note
8	Add or drain oil, if required.	<p>Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes</i>.</p> <p>Further information about how to drain or fill with oil is found in section Changing the oil in axis-4 gearbox on page 161.</p>
9	Refit the oil plug with a new o-ring.	<p>O-ring, G 1/2": 3HAC061327-059 Tightening torque: 24 Nm.</p>  <p>xx2100002072</p>
10	 <p>DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

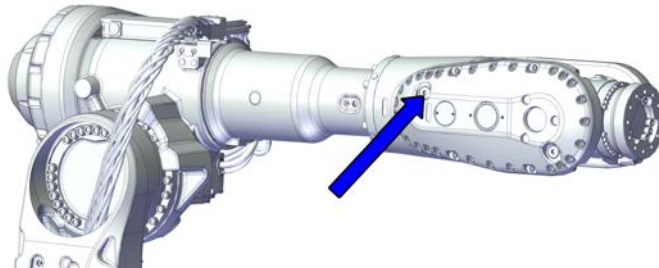
4 Maintenance

4.3.10 Inspecting the oil level in axis-5 gearbox

4.3.10 Inspecting the oil level in axis-5 gearbox

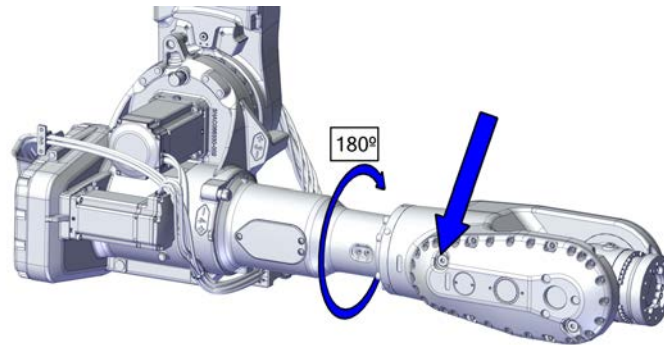
Location of the oil plug

The oil plug for inspection is located as shown in the figure.



xx2100002073

Option Inverted (3317-1)



xx2100002074

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

Required consumables and wear parts

Wear part	Article number	Note
Lubricating oil	-	See Type of lubrication in gearboxes on page 137 .
O-ring, G 1/2"	3HAC061327-059	Used on oil plug. Always replace when refitting oil plug.

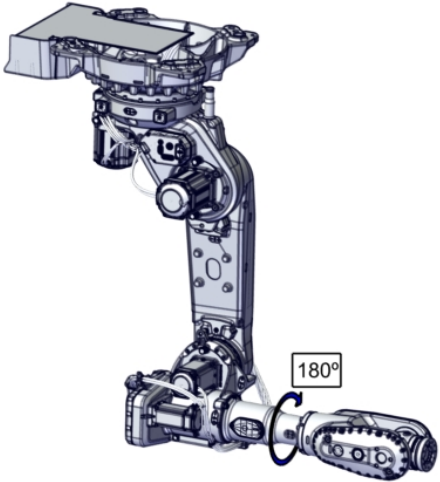


Required documents

Document name	Document number
<i>Technical reference manual - Lubrication in gearboxes</i>	3HAC042927-001

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Inspecting the oil level in axis-5 gearbox

Use this procedure to inspect the oil level in the gearbox.

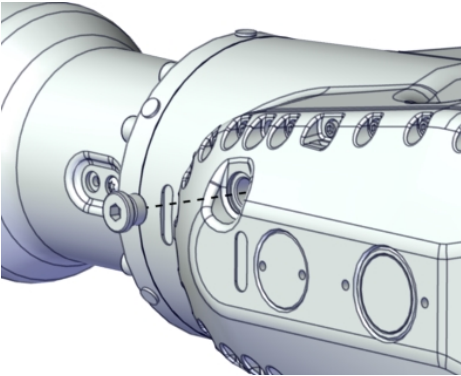
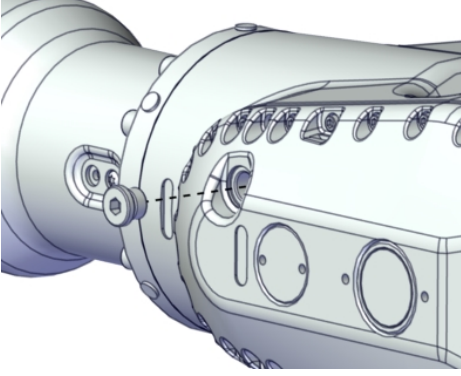

	Action	Note
1	<p><i>Floor-mounted robot:</i> Run the robot to calibration position.</p>	
2	<p><i>Option Inverted (3317-1)</i> Jog the robot into position:</p> <ul style="list-style-type: none"> • Axis 1: no significance • Axis 2: 0° • Axis 3: 0° • Axis 4: 180° • Axis 5: no significance • Axis 6: no significance 	 <p>xx2100002080</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 safe-guarded space.</p>	
4	<p>Make sure that the oil temperature is +25°C ± 10°C.</p>	
5	<p> WARNING</p> <p>Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 29.</p>	

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4 Maintenance

4.3.10 Inspecting the oil level in axis-5 gearbox

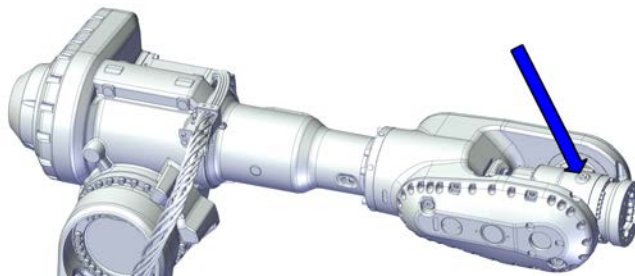
Continued

	Action	Note
6	Open the oil plug.	 <p>xx2100002075</p>
7	Check the oil level. Required oil level is: 0-10 mm below oil plug hole.	
8	Add or drain oil, if required.	<p>Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes</i>.</p> <p>Further information about how to drain or fill with oil is found in section Changing the oil in axis-5 gearbox on page 166.</p>
9	Refit the oil plug with a new o-ring.	<p>O-ring, G 1/2": 3HAC061327-059</p> <p>Tightening torque: 24 Nm.</p>  <p>xx2100002075</p>
10	 <p>DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

4.3.11 Inspecting the oil level in axis-6 gearbox

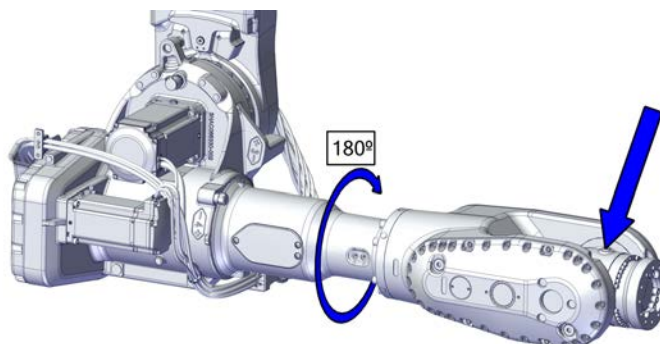
Location of the oil plug

The oil plug for inspection is located as shown in the figure.



xx2100002076

Option Inverted (3317-1)



xx2100002081

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

Required consumables and wear parts

Wear part	Article number	Note
Lubricating oil	-	See Type of lubrication in gearboxes on page 137 .
O-ring, G 1/4"	3HAC061327-060	Used on oil plug. Always replace when refitting oil plug.

Required documents

Document name	Document number
<i>Technical reference manual - Lubrication in gearboxes</i>	3HAC042927-001

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4 Maintenance

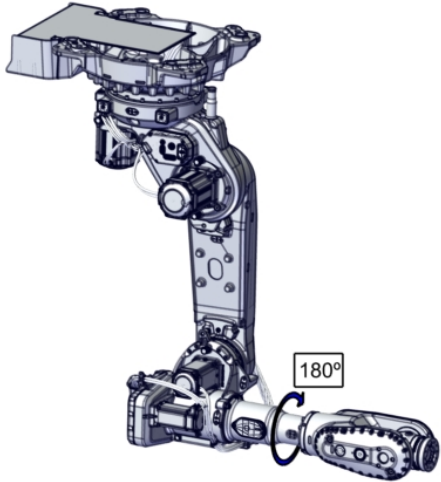


4.3.11 Inspecting the oil level in axis-6 gearbox

Continued

Inspecting the oil level in axis-6 gearbox

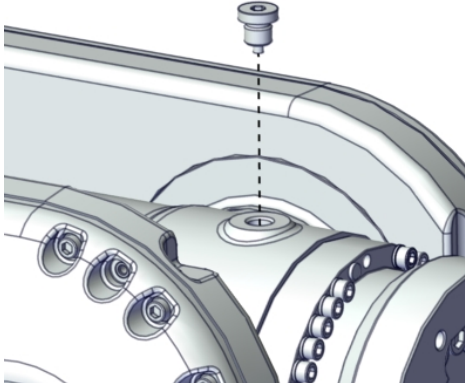
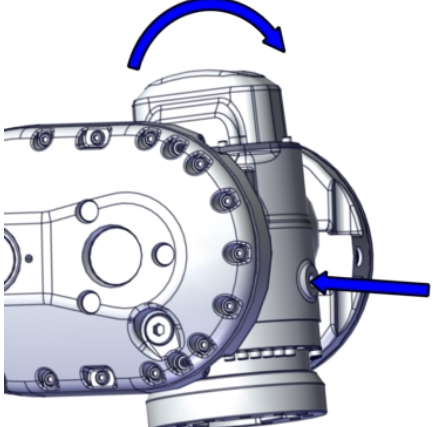
Use this procedure to inspect the oil level in the gearbox.

The procedure includes two alternative positions for axis 5, where one of the positions makes it possible to use the filling plug as a level plug.

	Action	Note
1	<i>Floor-mounted robot:</i> Run the robot to calibration position.	
2	<i>Option Inverted (3317-1)</i> Jog the robot into position: <ul style="list-style-type: none"> • Axis 1: no significance • Axis 2: 0° • Axis 3: 0° • Axis 4: 180° • Axis 5: 0° • Axis 6: no significance 	 <p>xx2100002080</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 safe-guarded space.	
4	Make sure that the oil temperature is +25° C ± 10° C.	
5	 WARNING Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 29 .	

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4.3.11 Inspecting the oil level in axis-6 gearbox
Continued

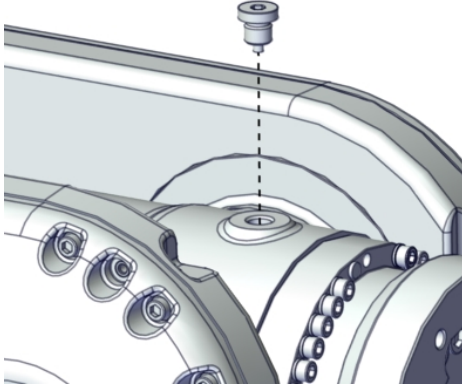

	Action	Note
6	Open the oil plug.	 <p>xx2100002077</p>
7	<p>Method 1</p> <p>Check the oil level. Required oil level is: IRB 5710-110/2.3, IRB 5710-90/2.3 LID 52-59 mm below oil plug hole IRB 5710-90/2.7, IRB 5710-70/2.7 LID 46-53 mm below oil plug hole</p>	
8	<p>Method 2</p> <p>IRB 5710-110/2.3, IRB 5710-90/2.3 LID Rotate axis 5 to +85°. IRB 5710-90/2.7, IRB 5710-70/2.7 LID Rotate axis 5 to +84°. Required oil level is: oil is visible through the oil plug hole. If the oil level is not visible, rotate axis 5 up to additionally 5°, to achieve visual check of oil level.</p>	 <p>xx2100002079</p>
9	Add or drain oil, if required.	<p>Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes</i>.</p> <p>Further information about how to drain or fill with oil is found in section Changing the oil in axis-6 gearbox on page 171.</p>

Continues on next page

4 Maintenance

4.3.11 Inspecting the oil level in axis-6 gearbox

Continued

	Action	Note
10	Refit the oil plug with a new o-ring.	<p>O-ring, G 1/2": 3HAC061327-059 Tightening torque: 20 Nm.</p>  <p>xx2100002077</p>
11	 DANGER Make sure all safety requirements are met when performing the first test run.	

4.4 Replacement/changing activities

4.4.1 Type of lubrication in gearboxes

Introduction

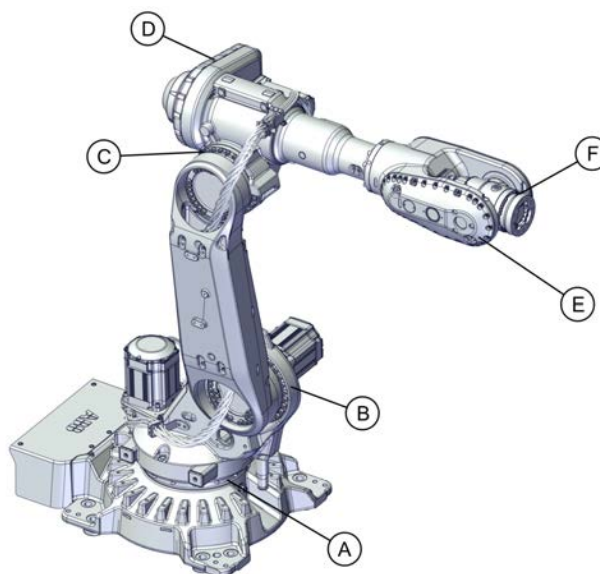
This section describes where to find information about the type of lubrication, article number and the amount of lubrication in the specific gearbox. It also describes the equipment needed when working with lubrication.

Type and amount of oil in gearboxes

Information about the type of lubrication, article number as well as the amount in the specific gearbox can be found in *Technical reference manual - Lubrication in gearboxes* available for registered users on myABB Business Portal, www.abb.com/myABB.

Location of gearboxes

The figure shows the location of the gearboxes.



xx2100002078

A	Axis-1 gearbox
B	Axis-2 gearbox
C	Axis-3 gearbox
D	Axis-4 gearbox
E	Axis-5 gearbox
F	Axis-6 gearbox

Continues on next page

4 Maintenance

4.4.1 Type of lubrication in gearboxes

Continued

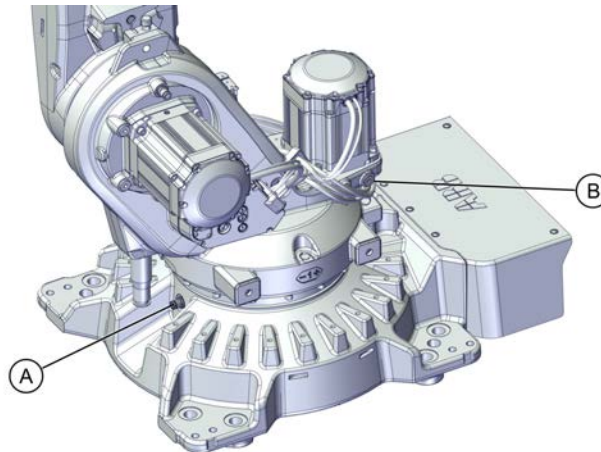
Equipment

Equipment	Note
Oil dispenser	Includes pump with outlet pipe. Use the suggested dispenser or a similar one: <ul style="list-style-type: none">• Orion OriCan article number 22590 (pneumatic)
Nipple for quick connect fitting, with o-ring	
Oil level gauge	Used to inspect the oil level in the axis-1 gearbox when the manipulator is mounted inverted. The tool also includes an air vent.

4.4.2 Changing the oil in axis-1 gearbox

Location of the gearbox and oil nipples / plugs

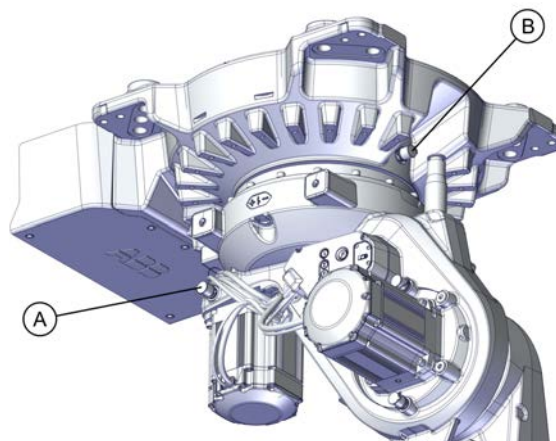
The gearbox and its oil plugs / nipples are located as shown in the figure.



xx2100001474

A	Oil nipple for draining and filling with an oil dispenser
B	Oil plug hole for venting and inspection

Option Inverted (3317-1)



xx2100001475

A	Oil nipple for draining and filling with an oil dispenser
B	Oil nipple for venting

Changing oil in an inverted robot

The oil in the axis-1 gearbox can either be changed when the robot is inverted or standing on the floor.

Continues on next page

4 Maintenance

4.4.2 Changing the oil in axis-1 gearbox

Continued

Required tools and equipment

Equipment	Article number	Note
Oil collecting vessel	-	The capacity of the vessel must be sufficient to take the complete amount of oil.
Oil dispenser	-	One example of oil dispenser can be found in section Type of lubrication in gearboxes on page 137 .
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

Required consumables and wear parts



Wear part	Article number	Note
Lubricating oil	-	See Type of lubrication in gearboxes on page 137 .
O-ring, G 1/2"	3HAC061327-059	Used on oil plug. Always replace when refitting oil plug.

Required documents



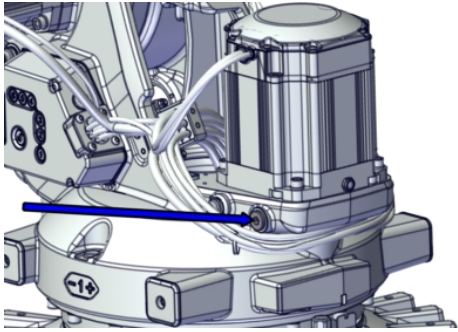
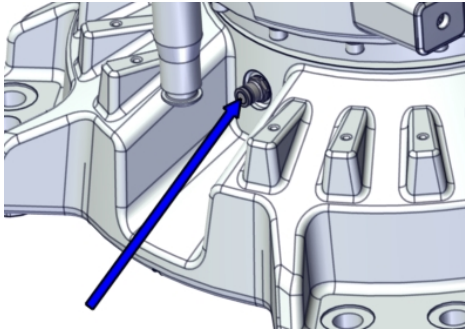


Document name	Document number	Note
<i>Technical reference manual - Lubrication in gearboxes</i>	3HAC042927-001	

Floor-mounted robot: Draining the axis-1 gearbox

Use this procedure to drain the gearbox.

	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	 WARNING Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 29 .	
3	Make sure that the oil temperature is +25 °C ± 10 °C.	

Continues on next page

	Action	Note
4	<p> CAUTION</p> <p>The gearbox can contain an excess of pressure that can be hazardous. Open the oil plug carefully in order to let the excess pressure out.</p>	
5	<p>Remove the plug from the venting hole.</p> <p> WARNING</p> <p>Open the venting hole while using the dispenser, to avoid damaging vital parts in the gear.</p>	 <p>xx2100001477</p>
6	<p>Remove the protective cap from the nipple of the oil hole and connect the oil dispenser.</p>	 <p>xx2100001476</p>
7	<p>Suck out the oil with the oil dispenser.</p> <p> Note</p> <p>There will be some oil left in the gear after draining.</p>	
8	<p> WARNING</p> <p>Used oil is hazardous material and must be disposed of in a safe way. See Decommissioning on page 593 for more information.</p>	



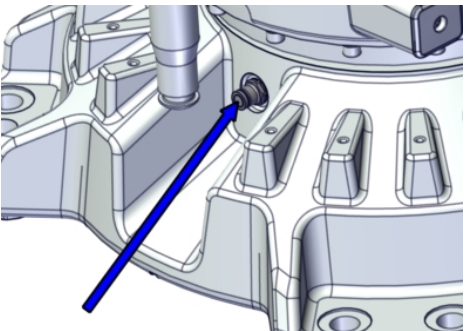

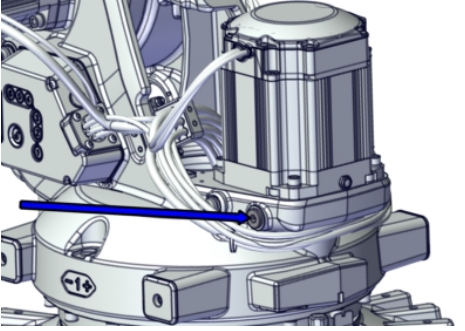

4 Maintenance

4.4.2 Changing the oil in axis-1 gearbox


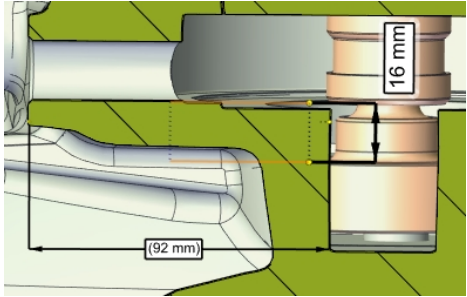
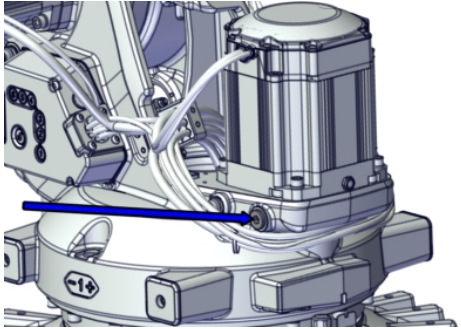


Continued

Floor-mounted robot: Filling oil into the axis-1 gearbox

Use this procedure to refill the gearbox with oil.

	Action	Note
1	<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 safe-guarded space.</p>	
2	<p> WARNING</p> <p>Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 29.</p>	
3	<p>Remove the protective cap from the nipple of the oil hole and connect the oil dispenser.</p>	 <p>xx2100001476</p>
4	<p>Remove the plug from the venting hole.</p> <p> Note</p> <p>The venting hole is opened to let out air during the filling process.</p>	 <p>xx2100001477</p>
5	<p>Refill the gearbox with oil with the oil dispenser.</p> <p> Note</p> <p>The amount of oil to be filled depends on the amount previously being drained.</p>	<p>Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes</i>.</p>

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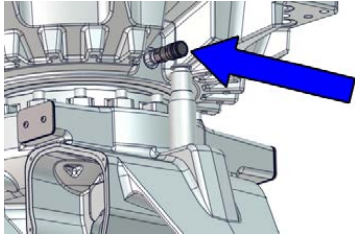
	Action	Note
6	<p>Inspect the oil level through the venting hole.</p> <p> CAUTION</p> <p>The oil level sinks when the oil fills all cavities in the gearbox. Wait until the oil stops sinking, before measuring the oil level.</p>	<p>Required oil level: 0-16 mm below oil plug hole</p>  <p>xx2100001479</p>
7	<p>Remove the oil dispenser and refit the protective cap to the nipple.</p>	
8	<p>Refit the oil plug with a new o-ring.</p>	<p>O-ring, G 1/2": 3HAC061327-059 Tightening torque: 24 Nm.</p>  <p>xx2100001477</p>
9	<p> Note</p> <p>After all repair and maintenance work involving oil, always wipe the robot clean from all surplus oil. The robot color can otherwise be discolored.</p>	
10	<p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

4 Maintenance

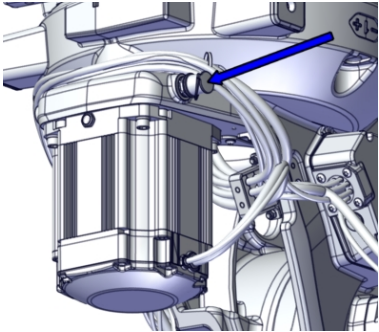
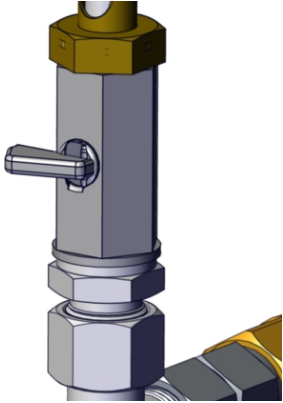



4.4.2 Changing the oil in axis-1 gearbox

Continued

Inverted robot: Draining the axis-1 gearbox

	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	 WARNING Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 29 .	
3	Make sure that the oil temperature is $+25^{\circ}\text{C} \pm 10^{\circ}\text{C}$.	
4	 CAUTION The gearbox can contain an excess of pressure that can be hazardous. Open the oil plug carefully in order to let the excess pressure out.	
5	Remove the protective cap and install the ventilating valve enclosed with the oil level gauge.	Oil level gauge: 3HAC061881-001  xx1700000349

Continues on next page


	Action	Note
6	Remove the protective cap from the drain hole.	 <p>xx2100002057</p>
7	Make sure that the valve is closed (horizontal) on the oil level gauge and install the gauge to the oil plug hole.	 <p>xx2100002418</p>
8	Connect the oil dispenser to the oil level gauge.	
9	Suck out the oil with the oil dispenser.  Note There will be some oil left in the gear after draining.	
10	Suck out as much remaining oil as possible with a small hose or syringe through the venting hole.	
11	 WARNING Used oil is hazardous material and must be disposed of in a safe way. See Decommissioning on page 593 for more information.	
12	 Note After all repair and maintenance work involving oil, always wipe the robot clean from all surplus oil. The robot color can otherwise be discolored.	

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4 Maintenance




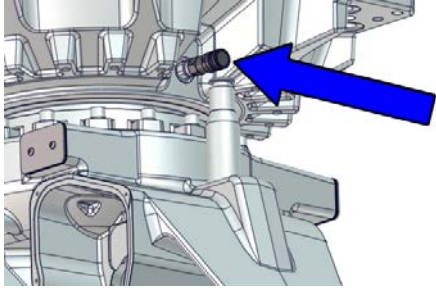
4.4.2 Changing the oil in axis-1 gearbox

Continued

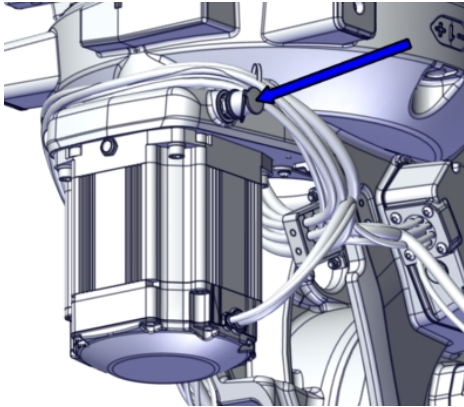
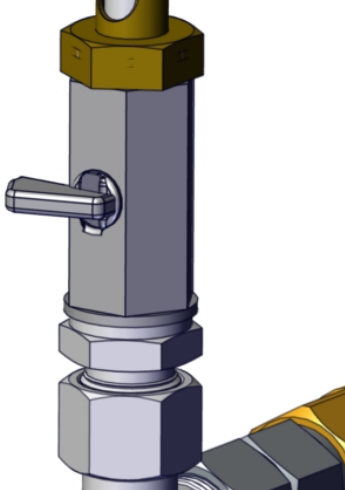

	Action	Note
13	 DANGER Make sure all safety requirements are met when performing the first test run.	

Inverted robot: Filling oil into the axis-1 gearbox

Use this procedure to refill the gearbox with oil.

	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 safe-guarded space.	
2	 WARNING Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 29 .	
3	Remove the protective cap and install the ventilating valve enclosed with the oil level gauge.  Note The venting hole is opened to let out air during the filling process.	Oil level gauge: 3HAC061881-001  xx170000349

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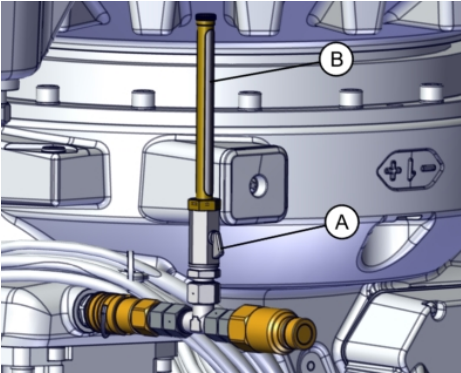



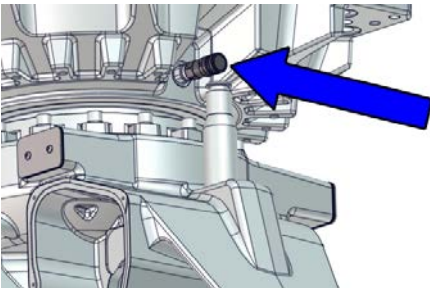
	Action	Note
4	Remove the protective cap from the fill hole.	 <p>xx2100002057</p>
5	Make sure that the valve is closed (horizontal) on the oil level gauge and install the gauge to the oil plug hole.	 <p>xx2100002418</p>
6	Connect the oil dispenser to the oil level gauge.	
7	Refill the gearbox with oil with the oil dispenser.  Note The amount of oil to be filled depends on the amount previously being drained.	Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes</i> .
8	Remove the oil dispenser.	

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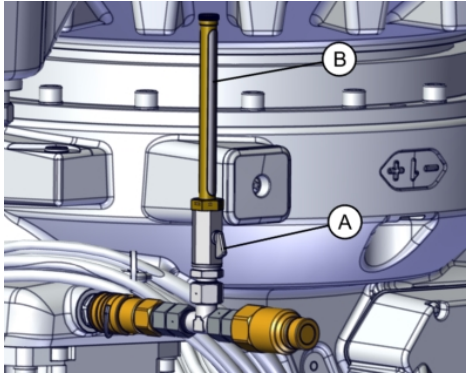


4 Maintenance

4.4.2 Changing the oil in axis-1 gearbox

Continued

Action	Note
<p>9 Open the valve (A) slowly to reduce built-up pressure slowly. Check the oil level by reading the markings (B) on the oil level gauge. Required oil level is: at level measurement mark 57 on tool ± 5 mm. Drain or fill more oil, if required.</p> <p> Tip</p> <p>If oil is visible at the level gauge but does not reach to the marking, the amount of oil to be filled is maximum 5 cl.</p> <p> CAUTION</p> <p>The oil level sinks when the oil fills all cavities in the gearbox. Wait until the oil stops sinking, before measuring the oil level.</p>	 <p>xx2100002102</p> <p>A Valve in open position B Level measurement marks</p>
<p>10 Remove the oil level gauge.</p>	
<p>11 Remove the ventilating valve from the upper oil nipple.</p>	
<p>12 Turn on the power to the robot and let axis 1 move for approximately 5 minutes.</p> <p> Tip</p> <p>This is done to eliminate any air bubbles in the oil.</p>	
<p>13 Let the manipulator stand still 1 hour.</p>	
<p>14  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 safeguarded space.</p>	
<p>15 Remove the protective cap and install the ventilating valve enclosed with the oil level gauge.</p> <p> Note</p> <p>The venting hole is opened to let out air during the filling process.</p>	 <p>xx1700000349</p>

Continues on next page

	Action	Note
16	Remove the protective cap from the fill hole.	
17	Make sure that the valve is closed (horizontal) and install the oil level gauge to the oil plug hole.	
18	<p>Open the valve (A) slowly to avoid air bubbles in the oil.</p> <p>Check the oil level by reading the markings (B) on the oil level gauge.</p> <p>Required oil level is: at level measurement mark 57 on tool ± 5 mm.</p> <p> Tip</p> <p>If oil is visible at the level gauge but does not reach to the marking, the amount of oil to be filled is maximum 5 cl.</p> <p>Drain or fill more oil, if required.</p>	 <p>xx2100002102</p> <p>A Valve in open position B Level measurement marks</p>
19	Remove the oil dispenser and the oil level gauge. Refit the protective cap to the nipple.	
20	Remove the ventilating valve from the upper oil nipple. Refit the protective cap to the nipple.	
21	<p> Note</p> <p>After all repair and maintenance work involving oil, always wipe the robot clean from all surplus oil. The robot color can otherwise be discolored.</p>	
22	<p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

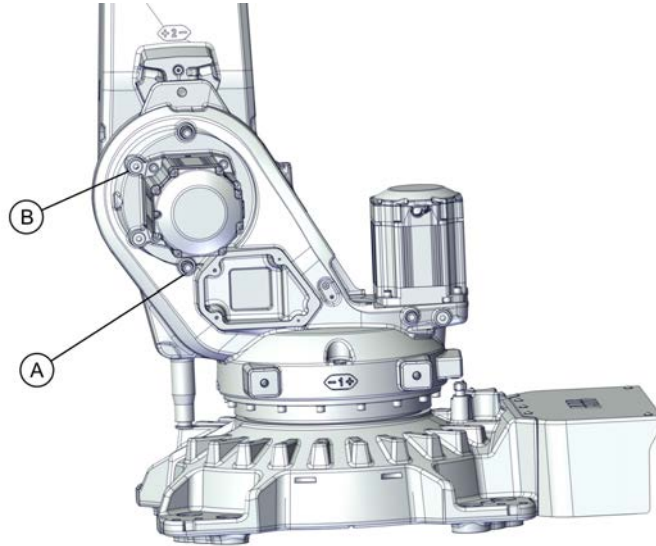
4 Maintenance

4.4.3 Changing the oil in axis-2 gearbox

4.4.3 Changing the oil in axis-2 gearbox

Location of the gearbox and oil plugs

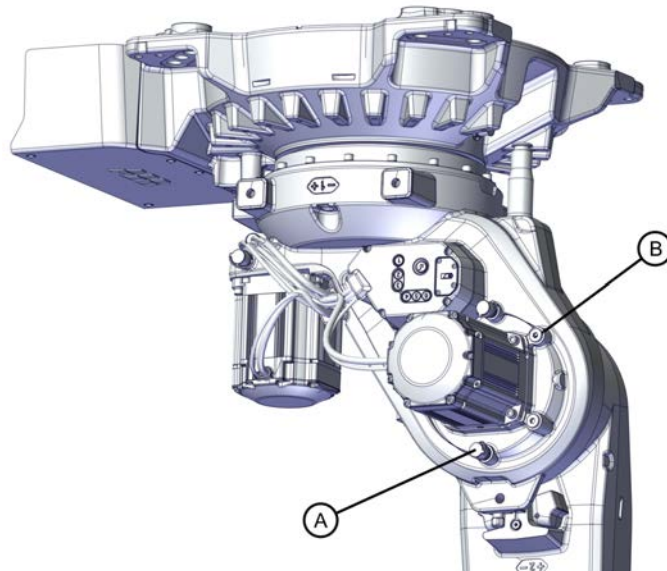
The gearbox and its oil plugs are located as shown in the figure.



xx2100002087

A	Oil plug with nipple for draining and filling with an oil dispenser
B	Oil plug hole for ventilation and inspection

Option Inverted (3317-1)



xx2100002088

A	Oil plug with nipple for draining and filling with an oil dispenser
B	Oil plug hole for ventilation and inspection

Continues on next page

Required tools and equipment

Equipment	Article number	Note
Oil collecting vessel	-	The capacity of the vessel must be sufficient to take the complete amount of oil.
Oil dispenser	-	One example of oil dispenser can be found in section Type of lubrication in gearboxes on page 137 .
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

Required consumables and wear parts




Wear part	Article number	Note
Lubricating oil	-	See Type of lubrication in gearboxes on page 137 .
O-ring, G 1/2"	3HAC061327-059	Used on oil plug. Always replace when refitting oil plug.

Required documents

Document name	Document number	Note
<i>Technical reference manual - Lubrication in gearboxes</i>	3HAC042927-001	

Draining the axis-2 gearbox

Use this procedure to drain the gearbox.

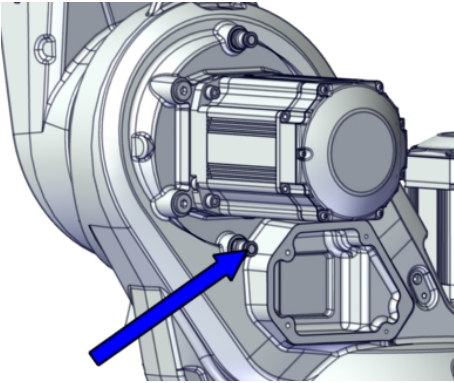
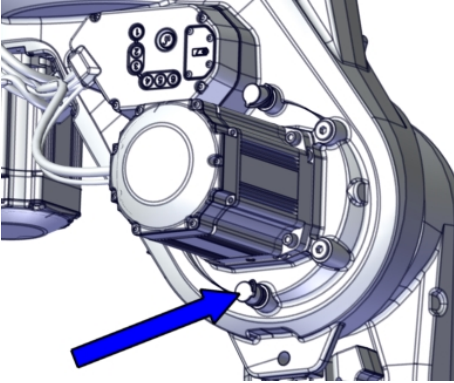

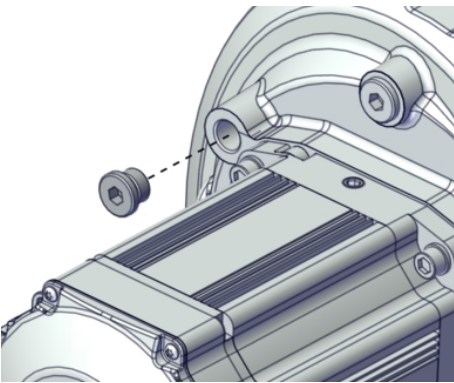
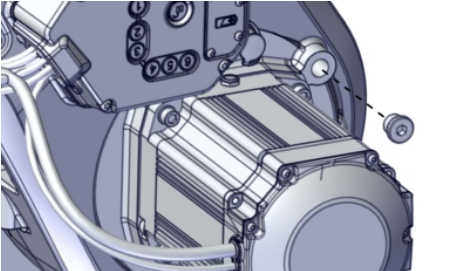
	Action	Note
1	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	
2	 WARNING Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 29 .	
3	 CAUTION The gearbox can contain an excess of pressure that can be hazardous. Open the oil plug carefully in order to let the excess pressure out.	

Continues on next page



4 Maintenance

4.4.3 Changing the oil in axis-2 gearbox

Continued



	Action	Note
4	Remove the protective cap from the nipple of the oil hole and connect the oil dispenser.	 <p>xx2100002090</p> <p><i>Option Inverted (3317-1)</i></p>  <p>xx2100002089</p>
5	<p>Remove the plug from the ventilation hole.</p> <p> WARNING</p> <p>Open the venting hole while using the dispenser, to avoid damaging vital parts in the gear.</p>	 <p>xx2100002059</p> <p><i>Option Inverted (3317-1)</i></p>  <p>xx2100002061</p>

Continues on next page

	Action	Note
6	<p>Suck out the oil with the oil dispenser.</p> <p> Note</p> <p>There will be some oil left in the gear after draining.</p>	
7	<p> WARNING</p> <p>Used oil is hazardous material and must be disposed of in a safe way. See Decommissioning on page 593 for more information.</p>	

Filling oil into the axis-2 gearbox

Use this procedure to refill the gearbox with oil.

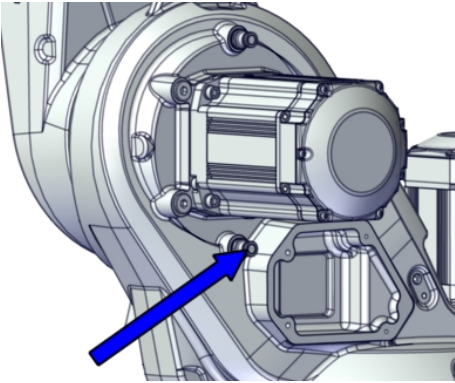
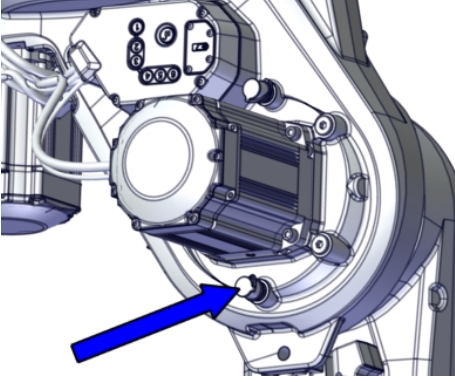

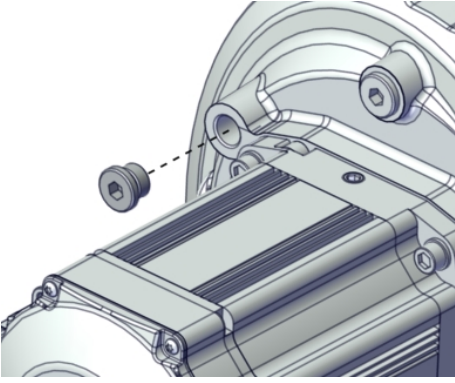
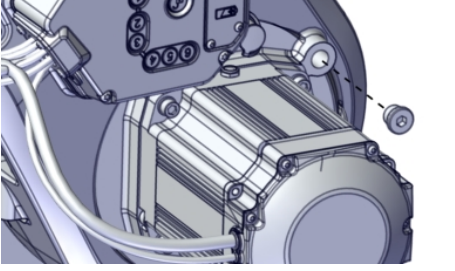
	Action	Note
1	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the safe-guarded space.</p>	
2	<p> WARNING</p> <p>Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 29.</p>	

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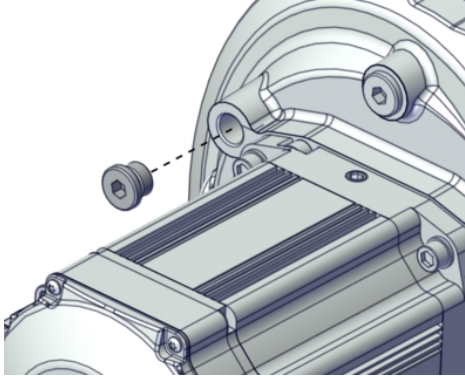
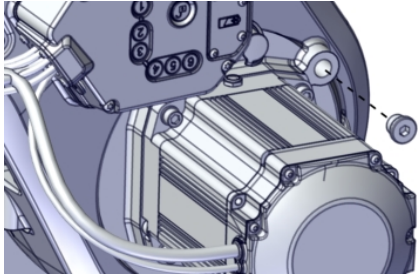

4 Maintenance

4.4.3 Changing the oil in axis-2 gearbox

Continued

	Action	Note
3	Remove the protective cap from the nipple of the oil hole and connect the oil dispenser.	 <p>xx2100002090</p> <p><i>Option Inverted (3317-1)</i></p>  <p>xx2100002089</p>
4	<p>Remove the plug from the ventilation hole.</p> <p> WARNING</p> <p>Open the venting hole while using the dispenser, to avoid damaging vital parts in the gear.</p>	 <p>xx2100002059</p> <p><i>Option Inverted (3317-1)</i></p>  <p>xx2100002061</p>

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	Action	Note
5	Refill the gearbox with oil.  Note The amount of oil to be filled depends on the amount previously being drained.	Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes</i> .
6	Inspect the oil level at the ventilation hole (level plug).  CAUTION The oil level sinks when the oil fills all cavities in the gearbox. Wait until the oil stops sinking, before measuring the oil level.	Required oil level is: 0-10 mm below oil plug hole (floor-mounted robot). Required oil level is: 0-10 mm below oil plug hole (inverted robot). More information is found in <i>Inspecting the oil level in axis-2 gearbox on page 120</i> .
7	Remove the oil dispenser. Refit the protective cap on the nipple.	
8	Refit the oil plug with a new o-ring.	O-ring, G 1/2": 3HAC061327-059 Tightening torque: 24 Nm.  xx2100002059 <i>Option Inverted (3317-1)</i>  xx2100002061
9	 DANGER Make sure all safety requirements are met when performing the first test run.	

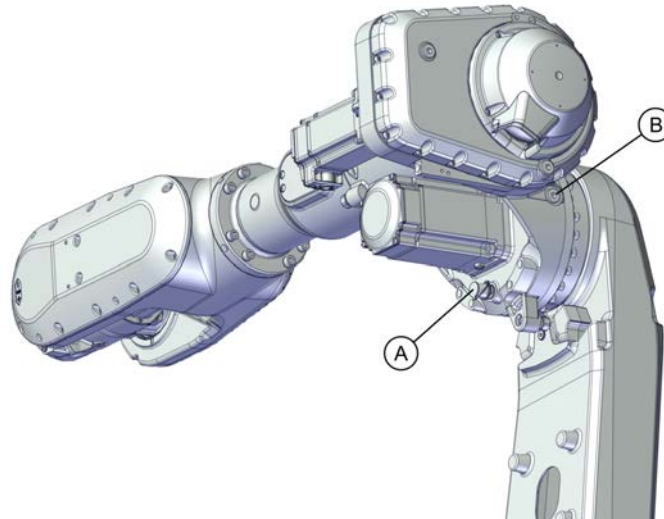
4 Maintenance

4.4.4 Changing the oil in axis-3 gearbox

4.4.4 Changing the oil in axis-3 gearbox

Location of the gearbox and oil plugs

The gearbox and its oil plugs are located as shown in the figure.



xx2100002092

A	Oil plug with nipple for draining and filling with an oil dispenser
B	Oil plug hole for ventilation and inspection

Required tools and equipment

Equipment	Article number	Note
Oil collecting vessel	-	The capacity of the vessel must be sufficient to take the complete amount of oil.
Oil dispenser	-	One example of oil dispenser can be found in section Type of lubrication in gearboxes on page 137 .
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

Required consumables and wear parts

Wear part	Article number	Note
Lubricating oil	-	See Type of lubrication in gearboxes on page 137 .
O-ring, G 1/2"	3HAC061327-059	Used on oil plug. Always replace when refitting oil plug.

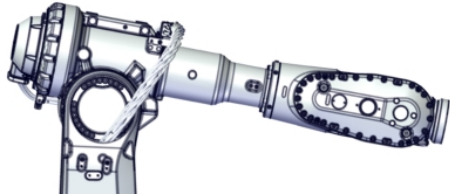
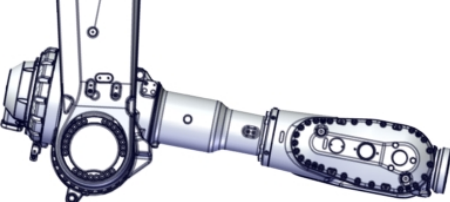



Required documents

Document name	Document number	Note
<i>Technical reference manual - Lubrication in gearboxes</i>	3HAC042927-001	

Continues on next page

Draining the axis-3 gearbox

Use this procedure to drain the gearbox.

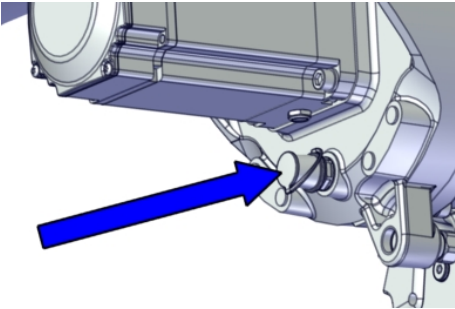

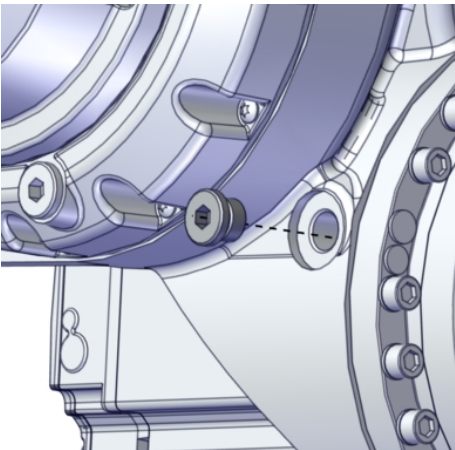


	Action	Note
1	<p><i>Floor-mounted robot:</i></p> <p>Jog the robot into position:</p> <ul style="list-style-type: none"> • Axis 1: no significance • Axis 2: 0° • Axis 3: +14° • Axis 4: no significance • Axis 5: no significance • Axis 6: no significance 	 <p>xx2100002068</p>
2	<p><i>Option Inverted (3317-1)</i></p> <p>Jog the robot into position:</p> <ul style="list-style-type: none"> • Axis 1: no significance • Axis 2: 0° • Axis 3: -166° • Axis 4: no significance • Axis 5: no significance • Axis 6: no significance 	 <p>xx2100002069</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 safe-guarded space.</p>	
4	<p> WARNING</p> <p>Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 29.</p>	
5	<p> CAUTION</p> <p>The gearbox can contain an excess of pressure that can be hazardous. Open the oil plug carefully in order to let the excess pressure out.</p>	

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4 Maintenance

4.4.4 Changing the oil in axis-3 gearbox



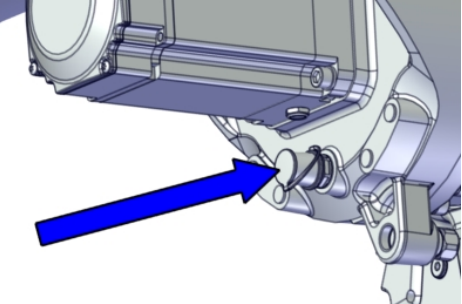

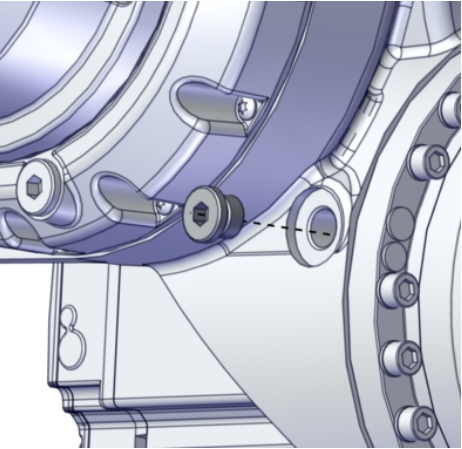

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	Action	Note
6	Remove the protective cap from the nipple of the oil hole and connect the oil dispenser.	 <p>xx2100002093</p>
7	<p>Remove the plug from the ventilation hole.</p> <p> WARNING</p> <p>Open the venting hole while using the dispenser, to avoid damaging vital parts in the gear.</p>	 <p>xx2100002064</p>
8	<p>Suck out the oil with the oil dispenser.</p> <p><i>Floor-mounted robot:</i> Run axis 3 to 0° while draining, to reach all oil.</p> <p><i>Option Inverted (3317-1):</i> Run axis 3 to -180° while draining, to reach all oil.</p> <p> Note</p> <p>There will be some oil left in the gear after draining.</p>	
9	<p> WARNING</p> <p>Used oil is hazardous material and must be disposed of in a safe way. See Decommissioning on page 593 for more information.</p>	

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Filling oil into the axis-3 gearbox

Use this procedure to refill the gearbox with oil.


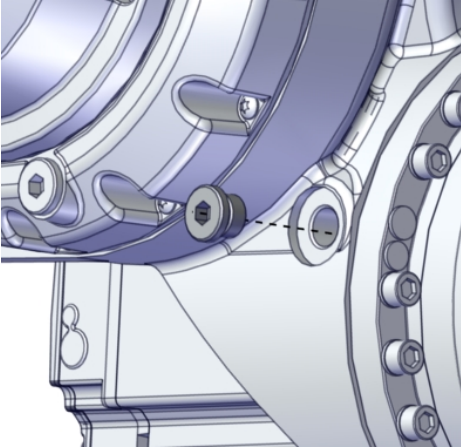

	Action	Note
1	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the safe-guarded space.</p>	
2	<p> WARNING</p> <p>Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 29.</p>	
3	<p>Remove the protective cap from the nipple of the oil hole and connect the oil dispenser.</p>	 <p>xx2100002093</p>
4	<p>Remove the plug from the ventilation hole.</p> <p> WARNING</p> <p>Open the venting hole while using the dispenser, to avoid damaging vital parts in the gear.</p>	 <p>xx2100002064</p>
5	<p>Refill the gearbox with oil.</p> <p> Note</p> <p>The amount of oil to be filled depends on the amount previously being drained.</p>	<p>Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes</i>.</p>

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4 Maintenance

4.4.4 Changing the oil in axis-3 gearbox

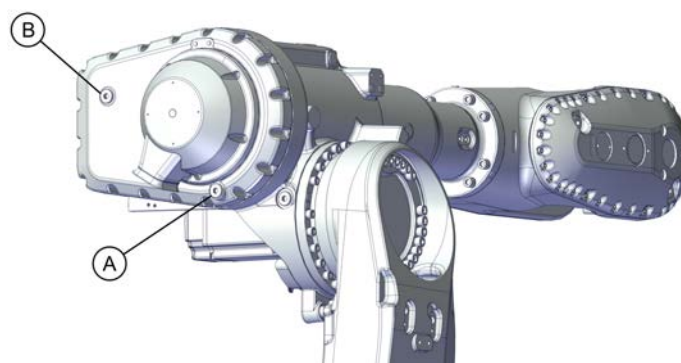
Continued

	Action	Note
6	<p>Inspect the oil level at the ventilation hole (level plug).</p> <p> CAUTION</p> <p>The oil level sinks when the oil fills all cavities in the gearbox. Wait until the oil stops sinking, before measuring the oil level.</p>	<p>More information is found in Inspecting the oil level in axis-3 gearbox on page 124.</p>
7	<p>Remove the oil dispenser. Refit the protective cap on the nipple.</p>	
8	<p>Refit the oil plug with a new o-ring.</p>	<p>O-ring, G 1/2": 3HAC061327-059 Tightening torque: 24 Nm.</p>  <p>xx2100002064</p>
9	<p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

4.4.5 Changing the oil in axis-4 gearbox

Location of the gearbox and oil plugs

The gearbox and its oil plugs are located as shown in the figure.



xx2100002094

A	Oil plug for draining
B	Oil plug for filling and ventilation

Required tools and equipment

Equipment	Article number	Note
Oil collecting vessel	-	The capacity of the vessel must be sufficient to take the complete amount of oil.
Oil dispenser	-	One example of oil dispenser can be found in section Type of lubrication in gearboxes on page 137 .
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

Required consumables and wear parts

Wear part	Article number	Note
Lubricating oil	-	See Type of lubrication in gearboxes on page 137 .
O-ring, G 1/2"	3HAC061327-059	Used on oil plug. Always replace when refitting oil plug.

Required documents

Document name	Document number	Note
<i>Technical reference manual - Lubrication in gearboxes</i>	3HAC042927-001	

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4 Maintenance

4.4.5 Changing the oil in axis-4 gearbox

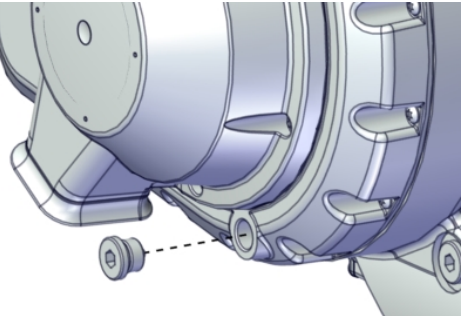

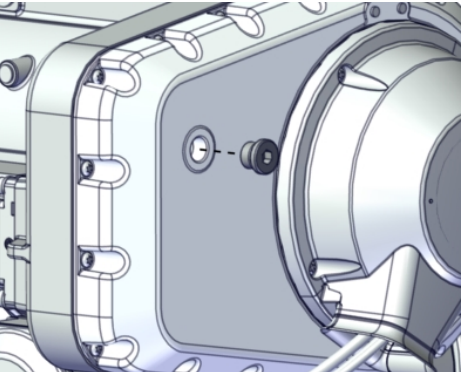

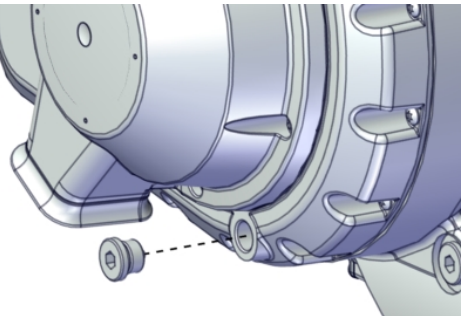
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Draining the axis-4 gearbox

Use this procedure to drain the gearbox.

	Action	Note
1	<i>Floor-mounted robot:</i> Run the robot to calibration position.	
2	<i>Option Inverted (3317-1)</i> <ul style="list-style-type: none">• Axis 1: no significance• Axis 2: 0°• Axis 3: -180°• Axis 4: no significance• Axis 5: no significance• Axis 6: no significance	
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 safe-guarded space.	
4	 WARNING Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 29 .	
5	 CAUTION The gearbox can contain an excess of pressure that can be hazardous. Open the oil plug carefully in order to let the excess pressure out.	
6	Place the oil collecting vessel underneath the oil drain plug.	

Continues on next page

	Action	Note
7	Remove the oil plug from the drain hole and let the oil run into the vessel.	 <p>xx2100002095</p>
8	Remove the oil plug from the fill/level hole.  Note The oil plug hole is opened to speed up the drainage.	 <p>xx2100002072</p>
9	 WARNING Used oil is hazardous material and must be disposed of in a safe way. See Decommissioning on page 593 for more information.	
10	Refit the oil plug for the drainage hole, with a new o-ring.	O-ring, G 1/2": 3HAC061327-059 Tightening torque: 24 Nm.  <p>xx2100002095</p>



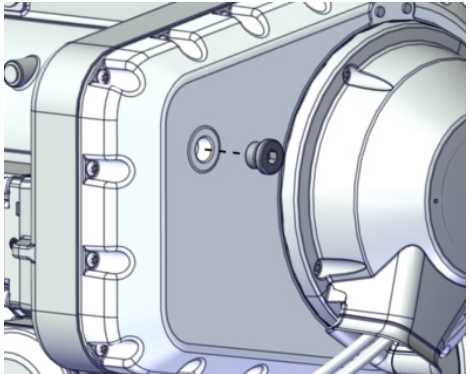


4 Maintenance

4.4.5 Changing the oil in axis-4 gearbox

Continued

Filling oil into the axis-4 gearbox

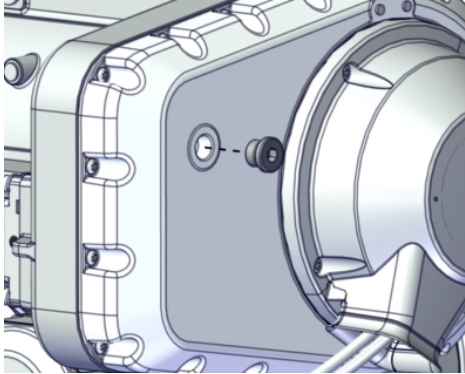

Use this procedure to refill the gearbox with oil.

	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 safe-guarded space.	
2	 WARNING Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 29 .	
3	Open the fill/level plug.	 xx2100002072
4	Refill the gearbox with oil.  Note The amount of oil to be filled depends on the amount previously being drained.	Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes</i> .
5	Inspect the oil level.  CAUTION The oil level sinks when the oil fills all cavities in the gearbox. Wait until the oil stops sinking, before measuring the oil level.	Required oil level is: 0-10 mm below oil plug hole See Inspecting the oil level in axis-4 gearbox on page 128 .

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4.4.5 Changing the oil in axis-4 gearbox

Continued

	Action	Note
6	Refit the oil plug with a new o-ring.	<p>O-ring, G 1/2": 3HAC061327-059 Tightening torque: 24 Nm.</p>  <p>xx2100002072</p>
7	<p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

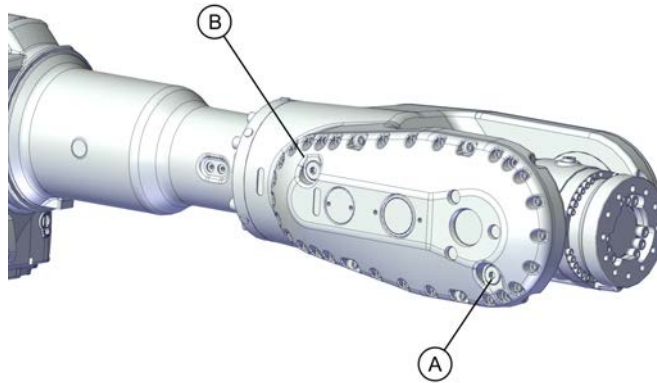
4 Maintenance

4.4.6 Changing the oil in axis-5 gearbox

4.4.6 Changing the oil in axis-5 gearbox

Location of the gearbox and oil plugs

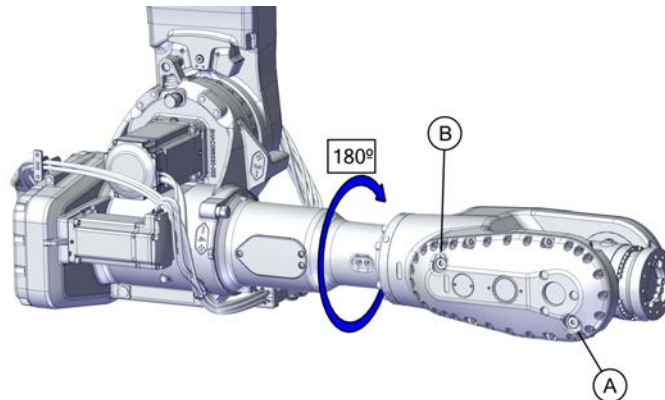
The gearbox and its oil plugs are located as shown in the figure.



xx2100002096

A	Oil plug for draining
B	Oil plug for filling and ventilation

Option Inverted (3317-1)



xx2100002098

A	Oil plug for draining
B	Oil plug for filling and ventilation

Required tools and equipment

Equipment	Article number	Note
Oil collecting vessel	-	The capacity of the vessel must be sufficient to take the complete amount of oil.
Oil dispenser	-	One example of oil dispenser can be found in section Type of lubrication in gearboxes on page 137 .
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

Continues on next page

Required consumables and wear parts




Wear part	Article number	Note
Lubricating oil	-	See <i>Type of lubrication in gearboxes on page 137</i> .
O-ring, G 1/2"	3HAC061327-059	Used on oil plug. Always replace when refitting oil plug.

Required documents

Document name	Document number	Note
<i>Technical reference manual - Lubrication in gearboxes</i>	3HAC042927-001	

Draining the axis-5 gearbox

Use this procedure to drain the gearbox.

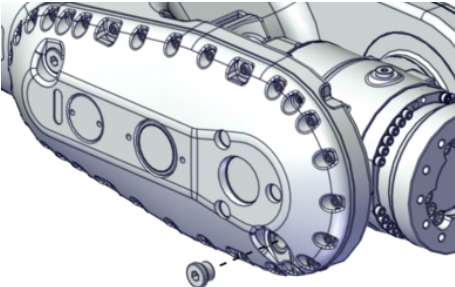

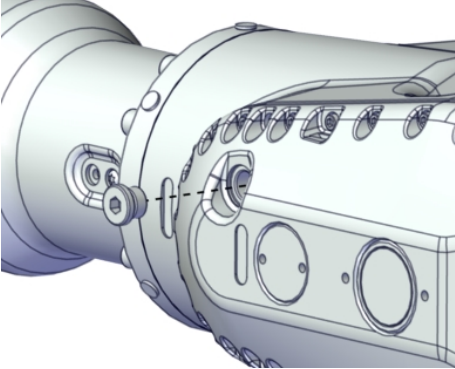

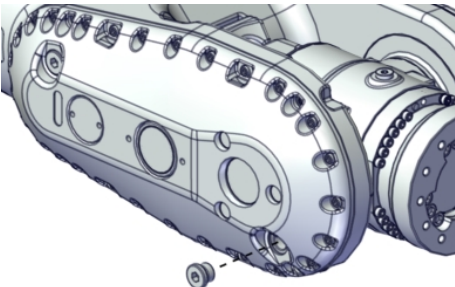
	Action	Note
1	<i>Floor-mounted robot:</i> Jog the robot to calibration position.	
2	<i>Option Inverted (3317-1)</i> <ul style="list-style-type: none"> • Axis 1: no significance • Axis 2: 0° • Axis 3: 0° • Axis 4: -180° • Axis 5: no significance • Axis 6: no significance 	
3	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safe-guarded space.	
4	 WARNING Handling gearbox oil involves several safety risks, see <i>Gearbox lubricants (oil or grease) on page 29</i> .	
5	 CAUTION The gearbox can contain an excess of pressure that can be hazardous. Open the oil plug carefully in order to let the excess pressure out.	
6	Place the oil collecting vessel underneath the oil drain plug.	

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4 Maintenance

4.4.6 Changing the oil in axis-5 gearbox



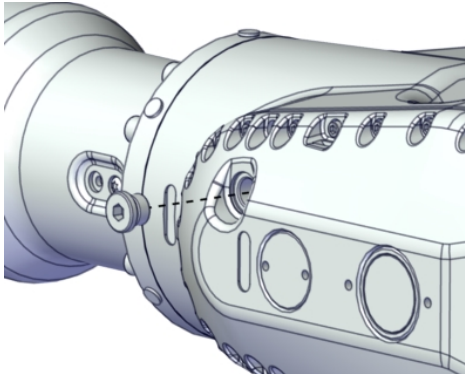


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	Action	Note
7	Remove the oil plug from the drain hole and let the oil run into the vessel.	 <p>xx2100002099</p>
8	Remove the oil plug from the fill hole.  Note The oil plug hole is opened to speed up the drainage.	 <p>xx2100002075</p>
9	 WARNING Used oil is hazardous material and must be disposed of in a safe way. See Decommissioning on page 593 for more information.	
10	Refit the oil plug for the drainage hole, with a new o-ring.	O-ring, G 1/2": 3HAC061327-059 Tightening torque: 24 Nm.  <p>xx2100002099</p>

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Filling oil into the axis-5 gearbox

Use this procedure to refill the gearbox with oil.

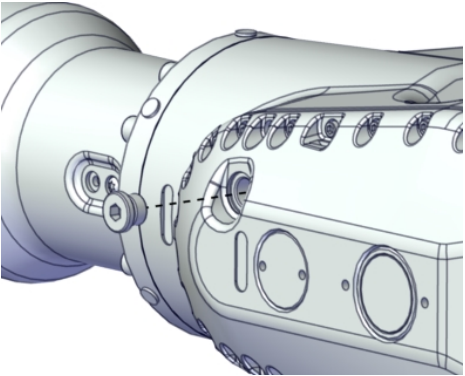

	Action	Note
1	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the safe-guarded space.</p>	
2	<p> WARNING</p> <p>Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 29.</p>	
3	<p>Open the fill/level plug.</p>	 <p>xx2100002075</p>
4	<p>Refill the gearbox with oil.</p> <p> Note</p> <p>The amount of oil to be filled depends on the amount previously being drained.</p>	<p>Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes</i>.</p>
5	<p>Inspect the oil level at the oil fill/level hole (level plug).</p> <p> CAUTION</p> <p>The oil level sinks when the oil fills all cavities in the gearbox. Wait until the oil stops sinking, before measuring the oil level.</p>	<p>Required oil level is: 0-10 mm below oil plug hole.</p> <p>More information is found in Inspecting the oil level in axis-5 gearbox on page 131.</p>

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4 Maintenance

4.4.6 Changing the oil in axis-5 gearbox

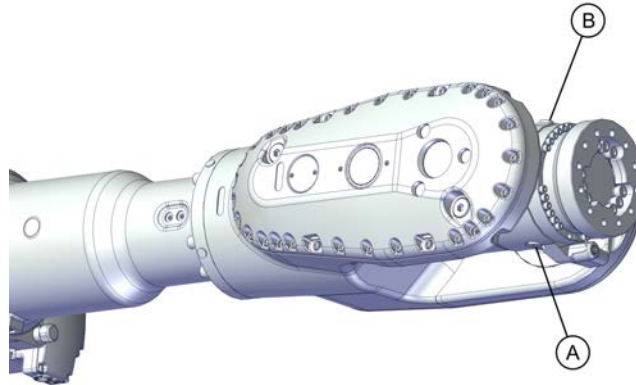
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	Action	Note
6	Refit the oil plug with a new o-ring.	<p>O-ring, G 1/2": 3HAC061327-059 Tightening torque: 24 Nm.</p>  <p>xx2100002075</p>
7	 DANGER Make sure all safety requirements are met when performing the first test run.	

4.4.7 Changing the oil in axis-6 gearbox

Location of the gearbox and oil plugs

The gearbox and its oil plugs are located as shown in the figure.



xx2100002100

A	Oil plug for draining
B	Oil plug for filling and ventilation

Required tools and equipment

Equipment	Article number	Note
Oil collecting vessel	-	The capacity of the vessel must be sufficient to take the complete amount of oil.
Oil dispenser	-	One example of oil dispenser can be found in section Type of lubrication in gearboxes on page 137 .
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

Required consumables and wear parts

Wear part	Article number	Note
Lubricating oil	-	See Type of lubrication in gearboxes on page 137 .
O-ring, G 1/4"	3HAC061327-060	Used on oil plug. Always replace when refitting oil plug.

Required documents

Document name	Document number	Note
<i>Technical reference manual - Lubrication in gearboxes</i>	3HAC042927-001	

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4 Maintenance

4.4.7 Changing the oil in axis-6 gearbox

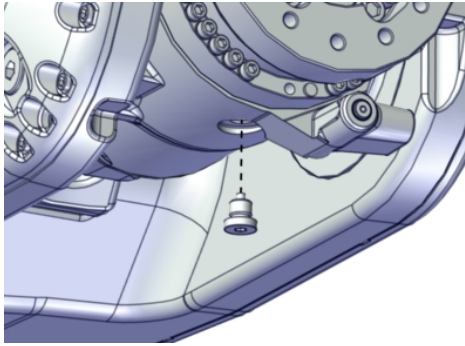

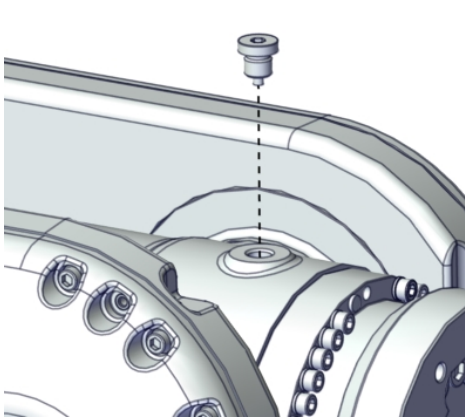

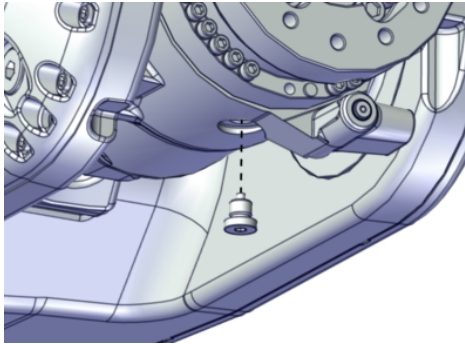
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Draining the axis-6 gearbox

Use this procedure to drain the gearbox.

	Action	Note
1	<i>Floor-mounted robot:</i> Jog the robot to calibration position.	
2	<i>Option Inverted (3317-1)</i> <ul style="list-style-type: none">• Axis 1: no significance• Axis 2: 0°• Axis 3: 0°• Axis 4: -180°• Axis 5: 0°• Axis 6: no significance	
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 safe-guarded space.	
4	 WARNING Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 29 .	
5	 CAUTION The gearbox can contain an excess of pressure that can be hazardous. Open the oil plug carefully in order to let the excess pressure out.	
6	Place the oil collecting vessel underneath the oil drain plug.	

Continues on next page

	Action	Note
7	Remove the oil plug from the drain hole and let the oil run into the vessel.	 <p>xx2100002101</p>
8	Remove the oil plug from the fill hole.  Note The oil plug hole is opened to speed up the drainage.	 <p>xx2100002077</p>
9	 WARNING Used oil is hazardous material and must be disposed of in a safe way. See Decommissioning on page 593 for more information.	
10	Refit the oil plug for the drainage hole, with a new o-ring.	O-ring, G 1/4": 3HAC061327-060 Tightening torque: 20 Nm.  <p>xx2100002101</p>

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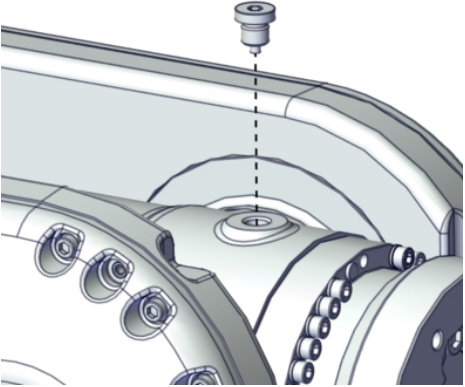


4 Maintenance

4.4.7 Changing the oil in axis-6 gearbox

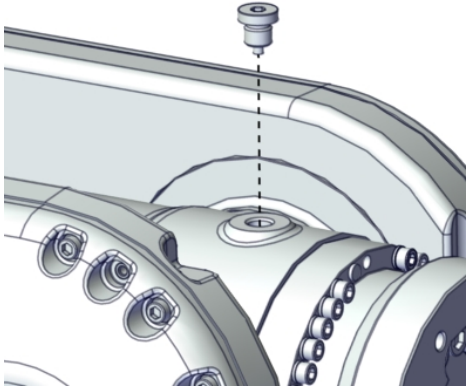

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Filling oil into the axis-6 gearbox

Use this procedure to refill the gearbox with oil.

	Action	Note
1	<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 safe-guarded space.</p>	
2	<p> WARNING</p> <p>Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 29.</p>	
3	<p>Open the fill plug.</p>	 <p>xx2100002077</p>
4	<p>Refill the gearbox with oil.</p> <p> Note</p> <p>The amount of oil to be filled depends on the amount previously being drained.</p>	<p>Type of oil and total amount is detailed in <i>Technical reference manual - Lubrication in gearboxes</i>.</p>
5	<p>Check the oil level.</p> <p> CAUTION</p> <p>The oil level sinks when the oil fills all cavities in the gearbox. Wait until the oil stops sinking, before measuring the oil level.</p>	<p>See Inspecting the oil level in axis-6 gearbox on page 134.</p>

Continues on next page

	Action	Note
6	Refit the oil plug with a new o-ring.	<p>O-ring, G 1/4": 3HAC061327-060 Tightening torque: 20 Nm.</p>  <p>xx2100002077</p>
7	<p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

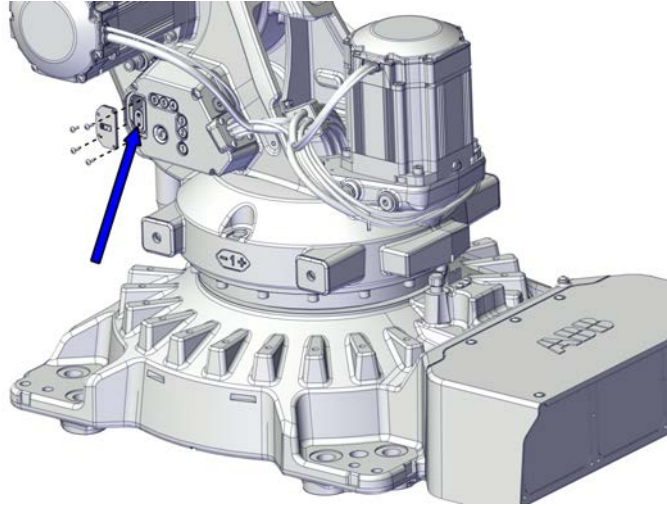
4 Maintenance

4.4.8 Replacing the SMB battery

4.4.8 Replacing the SMB battery

Location of the SMB battery

The SMB battery is located as shown in the figure.



xx2100002103

Required consumables and wear 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 5710 via myABB Business Portal, www.abb.com/myABB.

Wear part	Article number	Note
Battery pack	3HAC044075-001	Battery includes protection circuits. Only replace with the specified spare part or an ABB-approved equivalent.

Required tools and equipment




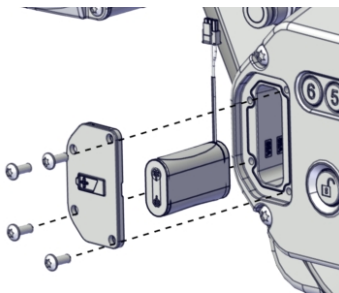

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

Removing the battery

Use this procedure to remove the SMB battery.


	Action	Note
1	Jog the robot to its calibration position.	This is done in order to facilitate updating of the revolution counter.

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	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit read the safety information in section <i>The unit is sensitive to ESD on page 47</i> .	
4	Remove the SMB battery cover by unscrewing the attachment screws.  CAUTION Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures.	
5	Pull out the battery and disconnect the battery cable.	xx2100002131
6	Remove the SMB battery.  Note Battery includes protection circuits. Only replace with a specified spare part or with an ABB-approved equivalent.	

Refitting the battery

Use this procedure to refit the SMB battery.



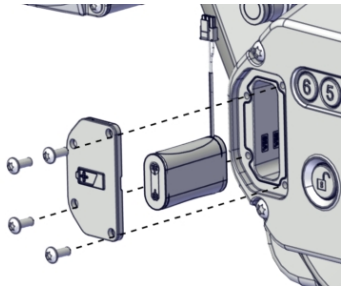

	Action	Note
1	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

Continues on next page

4 Maintenance

4.4.8 Replacing the SMB battery

Continued

	Action	Note
2	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit read the safety information in section The unit is sensitive to ESD on page 47 .	
3	Connect the battery cable and install the battery pack into the SMB/battery recess.  Note Make sure that the connector is assembled in the correct direction according to its keying.	Torx pan head screw: M5x12 Stainless steel A2-70 (4 pcs) Tightening torque: 6 Nm.
4	Secure the SMB battery cover with its attachment screws.	 xx2100002131
5	Update the revolution counters.	See Updating revolution counters on page 570 .
6	 DANGER Make sure all safety requirements are met when performing the first test run.	

4.5 Cleaning activities

4.5.1 Cleaning the IRB 5710

General

To secure high uptime it is important that the IRB 5710 is cleaned regularly. The frequency of cleaning depends on the environment in which the manipulator works. Different cleaning methods are allowed depending on the type of protection of the IRB 5710.



Note

Always verify the protection type of the robot before cleaning.

Oil spills

Oil spills from gearboxes

Use the following procedure if any oil spills are detected that can be suspected to originate from a gearbox.

	Action	Note
1	Inspect that the oil level in the suspected gearbox is according to the recommendations.	See Inspection activities on page 102
2	Write down the oil level.	
3	Inspect the oil level again after, for example, 6 months.	
4	If the oil level is decreased, replace the gearbox.	

Oil spills discolors painted surfaces

Oil spills on painted surfaces of the robot can result in discoloration.



Note

After all repair and maintenance work involving oil, always wipe the robot clean from all surplus oil.



WARNING

Turn off all electrical power supplies to the robot before starting the 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.
- Do not point the water jet at connectors, joints, sealings or gaskets.
- Do not use compressed air to clean the robot.

Continues on next page

4 Maintenance

4.5.1 Cleaning the IRB 5710

Continued

- Do not 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

This following table defines what cleaning methods are allowed for ABB manipulators depending on the protection type.

Protection type	Cleaning method			
	Vacuum cleaner	Wipe with cloth	Rinse with water	High pressure water or steam
Standard	Yes	Yes. With light cleaning detergent.	Yes. It's highly recommended to inspect the fans for contamination that could hinder the air supply at the regular cleaning, and then clean if necessary.	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.

ⁱ Perform according to section [Cleaning with water and steam on page 180](#).

Cleaning with water and steam

Instructions for rinsing with water

ABB robots with protection types *Standard*, *Foundry Plus*, *Wash*, or *Foundry Prime* 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

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

¹ See [Cleaning methods on page 180](#) for exceptions.

² See [Cleaning methods on page 180](#) for exceptions.

Continues on next page

- 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.
-

Cassette sealings

Minor seepage of grease from the seals can occur. Wipe down affected areas with a dry cloth.

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5 Repair

5.1 Introduction

Structure of this chapter

This chapter describes repair activities for the IRB 5710. 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 5710, 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 15](#) before commencing any service work.



Note

If the IRB 5710 is connected to power, always make sure that the IRB 5710 is connected to protective earth and a residual current device (RCD) before starting any repair work.

For more information see:

- *Product manual - OmniCore V250XT*

5 Repair

5.2.1 Performing a leak-down test

5.2 General procedures

5.2.1 Performing a leak-down test


When to perform a leak-down test

After refitting any motor and gearbox, the integrity of all seals enclosing the gearbox oil must be tested. This is done in a leak-down test.

Required equipment

Equipment, etc.	Article number	Note
Leak-down tester	-	
Leak detection spray	-	

Performing a leak-down test

	Action	Note
1	Finish the refitting procedure of the motor or gear in question.	
2	Remove the upper oil plug on the gear and replace it with the leak-down tester. Regulators, which are included in the leak-down test, may be required.	
3	Use caution, apply compressed air and raise the pressure with the knob until the correct value is shown on the manometer.  CAUTION The pressure must under no circumstance be higher than 0.25 bar (20-25 kPa). Also during the time when the pressure is raised.	Correct value: 0.2-0.25 bar (20-25 kPa)
4	Disconnect the compressed air supply.	
5	Wait for approximately 8-10 minutes and make sure that no pressure loss occurs.	If the compressed air is significantly colder or warmer than the gearbox to be tested, a slight pressure increase or decrease may occur. This is quite normal.
6	If any pressure drop occurred, then localize the leak as described in step 7. If no pressure drop occurred, then remove the leak-down tester and refit the oil plug. The test is complete.	
7	Spray any suspected leak areas with the leak detection spray. Bubbles indicate a leak.	
8	When the leak has been localized, take the necessary measures to correct the leak.	

5.2.2 Mounting instructions for bearings

General

This section describes how to mount and grease different types of bearings on the robot.

Equipment

Equipment, etc.	Article number	Note
Grease	3HAC042536-001	Shell Gadus S2 Used to grease the bearings, if not specified otherwise.

Assembly of all bearings


Attend to the following instructions while mounting a bearing on the robot.

	Action	Note
1	To avoid contamination, let a new bearing remain in its wrapping until it is time for fitting.	
2	Ensure that the parts included in the bearing fitting are free from burrs, grinding waste, and other contamination. Cast components must be free of foundry sand.	
3	Bearing rings, inner rings, and roller elements must not be subjected to direct impact. The roller elements must not be exposed to any stresses during the assembly work.	

Assembly of tapered bearings

Follow the preceding instructions for the assembly of the bearings when mounting a tapered bearing on the robot.

In addition to those instructions, the following procedure must be carried out to enable the roller elements to adjust to the correct position against the race flange.

	Action	Note
1	Tension the bearing gradually until the recommended pre-tension is achieved.  Note The roller elements must be rotated a specified number of turns before pre-tensioning is carried out and also rotated during the pre-tensioning sequence.	
2	Make sure the bearing is properly aligned as this will directly affect the durability of the bearing.	

Greasing of bearings



Note

This instruction is not valid for solid oil bearings.

Continues on next page

5 Repair

5.2.2 Mounting instructions for bearings

Continued

The bearings must be greased after assembly according to the following instructions:

- The bearings must not be completely filled with grease. However, if space is available beside the bearing fitting, the bearing may be totally filled with grease when mounted, as excessive grease will be pressed out from the bearing when the robot is started.
- During operation, the bearing should be filled to 70-80% of the available volume.
- Ensure that grease is handled and stored properly to avoid contamination.

Grease the different types of bearings as following description:

- *Grooved ball bearings* must be filled with grease from both sides.
- *Tapered roller bearings* and axial needle bearings must be greased in the split condition.

5.2.3 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

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.

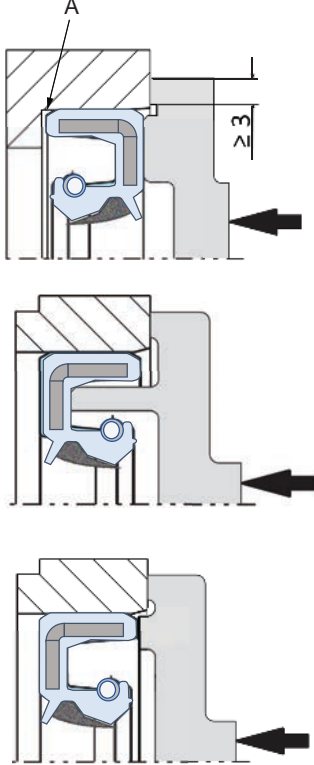
Action	Note
1 Check the sealing to ensure that: <ul style="list-style-type: none"> • The sealing is of the correct type. • There is no damage on the main lip. 	
2 Inspect the shaft surface before mounting. If scratches or damage are found, the shaft must be replaced since it may result in future leakage. Do not try to grind or polish the shaft surface to get rid of the defect.	
3 Lubricate the sealing with grease just before fitting. (Not too early - there is a risk of dirt and foreign particles adhering to the sealing.) 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>Article number is specified in Equipment on page 187.</p> <p>xx2000000071</p> <p>A Main lip B Grease C Dust lip</p>

Continues on next page

5 Repair

5.2.3 Mounting instructions for sealings

Continued

	Action	Note
4	<p>Mount the sealing correctly with a mounting tool. Never hammer directly on the sealing as this may result in leakage.</p>	 <p>xx2000000072</p> <p>A Gap</p>

Flange sealings and static sealings

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

	Action
1	<p>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.</p>
2	<p>Clean the surfaces properly in accordance with the recommendations of ABB.</p>
3	<p>Distribute the sealing compound evenly over the surface, preferably with a brush.</p>
4	<p>Tighten the screws evenly when fastening the flange joint.</p>

O-rings

The following procedure describes how to fit o-rings.

	Action	Note
1	<p>Ensure that the correct o-ring size is used.</p>	
2	<p>Check the o-ring for surface defects, burrs, shape accuracy, or deformation.</p>	<p>Defective o-rings, including damaged or deformed o-rings, may not be used.</p>

Continues on next page

	Action	Note
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.	

5 Repair

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

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

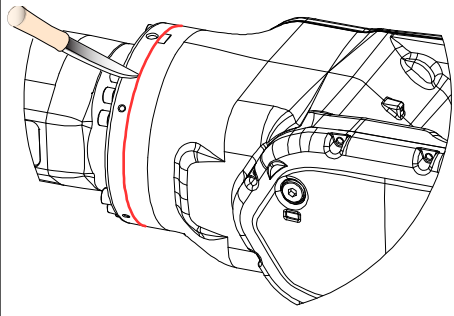
General

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

Required equipment

Equipment	Spare parts	Note
Cleaning agent		Ethanol
Knife		
Lint free cloth		
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.	

5.3.1 Lifting down the manipulator from inverted to floor-standing position

5.3 Lifting procedures

5.3.1 Lifting down the manipulator from inverted to floor-standing position

General

This section details how to lift down the robot from its inverted position, rotate it and secure it floor mounted in order to perform service procedures that require the robot to be standing on the floor.

Required tools and equipment

Equipment	Article number	Note
Fork lift accessory set	3HAC058825-001	Contains fork lift pockets and all required hardware for installation on frame. User instructions are enclosed with the tool.
Fork lift accessory set	3HAC047054-001	Contains fork lift pockets and all required hardware for installation on robot base. User instructions are enclosed with the tool.
Fork lift truck with rotator attachment	-	Required for rotating the robot to an inverted position.


Required documents

Document	Document number
Directions for use - Fork lift accessory for IRB 5710/IRB5720	3HAC061161-001
Directions for use - Fork lift accessory for IRB 5710/IRB5720	3HAC082151-001

Removing the robot from inverted position

Use these procedures to lift down the robot from inverted position and rotate it to floor standing.

Lifting down the robot from inverted position

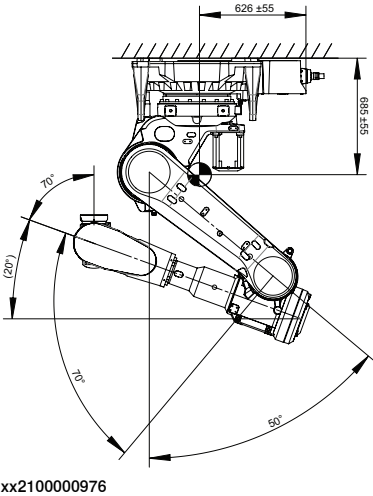



	Action	Note
1	 DANGER The robot must always be secured to the foundation if any kind of repair or maintenance work is to be performed. For some repair work support legs are required.	Suitable screws, lightly lubricated: M24 x 100 (min. 4 pcs) For hole configuration, see Hole configuration, base on page 70 .
2	Remove any payload and tools from the robot.	DressPack can stay fitted.

Continues on next page

5 Repair

5.3.1 Lifting down the manipulator from inverted to floor-standing position



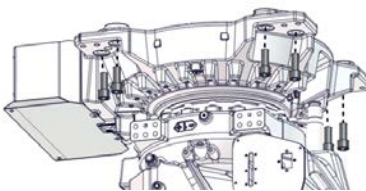
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	Action	Note
3	<p>Jog the robot into position:</p> <ul style="list-style-type: none"> • Axis 1: calibration position (0°) • Axis 2: -50° • Axis 3: +70° • Axis 4: calibration position (0°) • Axis 5: +70° • Axis 6: no significance 	 <p>xx210000976</p>
4	<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 safeguarded space.</p>	
5	<p>Disconnect the robot cables at the base.</p>	
6	<p> CAUTION</p> <p>The weight of the IRB 5710 robot is</p> <p>IRB 5710-110/2.3: 830 kg (<i>Inverted: 845 kg</i>)</p> <p>IRB 5710-90/2.7: 830 kg (<i>Inverted: 840 kg</i>)</p> <p>IRB 5710-90/2.3 LID: 890 kg (<i>Inverted: 905 kg</i>)</p> <p>IRB 5710-70/2.7 LID: 885 kg (<i>Inverted: 900 kg</i>)</p> <p>All lifting accessories used must be sized accordingly.</p>	
7	<p>Install the fork lift pockets to the robot.</p> <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury.</p> <p>Read and follow enclosed user instructions for the tool.</p>	<p>See user instructions enclosed with the fork lift accessory set.</p> <p>Fork lift accessory set: 3HAC058825-001.</p>

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5.3.1 Lifting down the manipulator from inverted to floor-standing position

Continued

	Action	Note
8	<p>Choose one of the following lifting methods:</p> <ul style="list-style-type: none"> Lifting and turning with the fork lift (rotator attachment required): <ol style="list-style-type: none"> 1 Insert the forks of the fork lift truck into the fork lift pockets, as far as possible. 2 Raise the forks of the fork lift truck to make sure that the weight of the robot rests on the forks. <p> Tip</p> <p>Two M16 screws can be fitted to the fork lift pockets, to press the forks against the pockets and make the lift more stable.</p> Lifting and turning with the turning tool and overhead crane: <ol style="list-style-type: none"> 1 Install and use the turning tool according to enclosed user instructions. <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury.</p> <p>Read and follow enclosed user instructions for the tool.</p> 	<p>See user instructions enclosed with the turning tool.</p> <p>Lifting and turning tool: 3HAC073537-001.</p>
9	Remove the bolts that secure the robot to the foundation.	<p>Quantity: 8 pcs.</p>  <p>xx1600002098</p>
10	Rotate the robot to floor standing position.	Follow the user instructions enclosed with the turning tool.
11	<p>Lower and secure the robot to the floor. (Or to support legs, if replacing the axis-1 gear-box.)</p> <p>The lifting accessories can be kept installed if they are not in the way for the upcoming service procedure.</p>	Attachment screws: M24 x 100 (min. 4 pcs required to perform service)

5 Repair

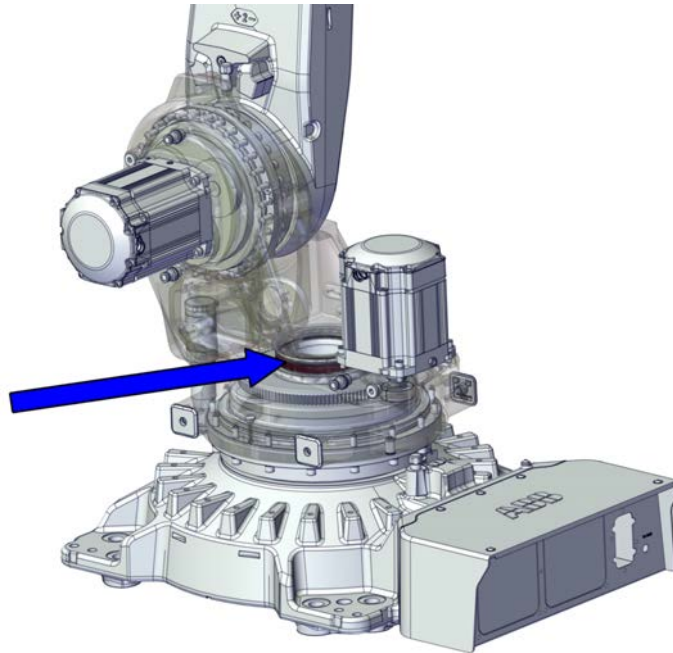
5.4.1 Replacing the axis-1 cassette sealing

5.4 Axes 1 and 2

5.4.1 Replacing the axis-1 cassette sealing

Location of the cassette sealing

The arm house cover including the cassette sealing is located as shown in the figure.



xx2100002220

Summary of the replacement procedure

This is a brief summary of the replacement procedure, containing the major actions to be performed.

- 1 Remove the cable harness from the base.
- 2 Remove the sealing ring and protection tube from the frame.
- 3 Replace the cassette sealing.

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 5710 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note	Level
Cassette sealing	3HAC070194-013		L2

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5.4.1 Replacing the axis-1 cassette sealing
Continued

Required service parts

Consumable	Article number	Note
Grease	3HAC042536-001	Shell Gadus S2
Rust preventive	3HAC034903-001	Mercasol 3110 Waxcoat. Recommended drying time is 24h.
Sealant (grey)	3HAC026759-001	Sikaflex 521FC. <i>Protection type Foundry Plus.</i> <i>Not required for option Inverted (3317-1).</i>
O-ring, nitrile rubber	3HAB3772-57	164.69x3.53 On axis-1 sealing ring. <i>Not required for option Inverted (3317-1).</i>
Locking liquid	3HAC041807-004	Loctite 2400


Required tools and equipment

Equipment	Article number	Note
Replacement tool for cassette sealing	3HAC079880-001	For removing and fitting cassette sealing on axis 1
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

Removing the cassette sealing

Use these procedures to remove the cassette sealing.

Preparations before removing the cassette sealing

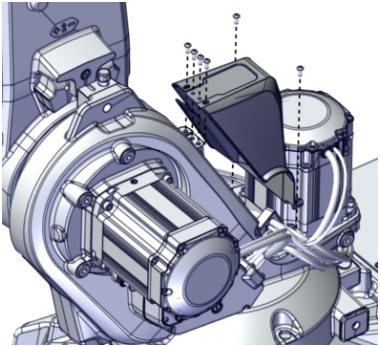
	Action	Note
1	Jog the robot to synchronization position.	
2	 DANGER Turn off all: <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply to the robot, before entering the safeguarded space.	

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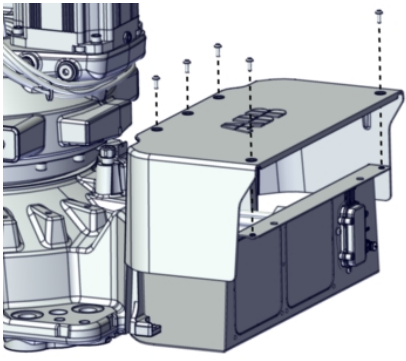
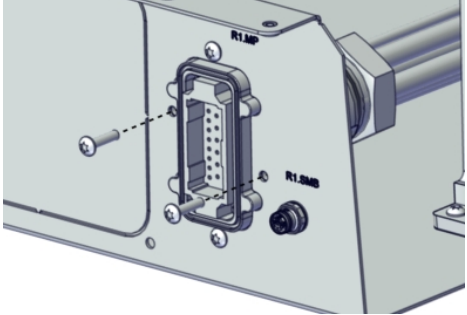
5 Repair

5.4.1 Replacing the axis-1 cassette sealing

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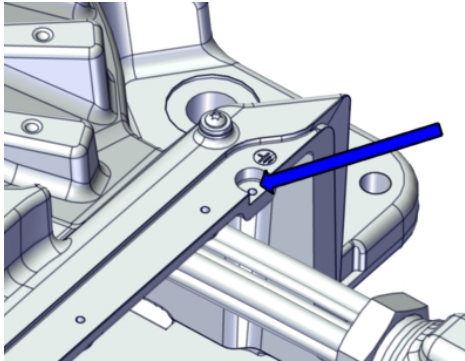
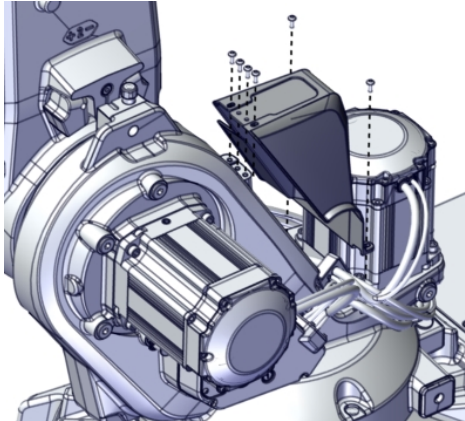
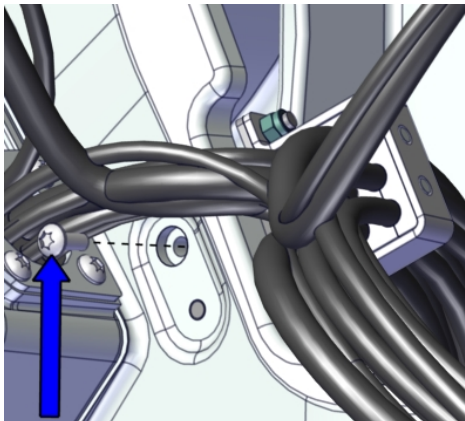
	Action	Note
3	<p><i>Foundry Plus</i></p> <p>Remove the axis-1 cable protection plate by removing the attachment screws.</p>	 <p>xx210000979</p>

Preparations before removing the cable harness in 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	Remove the base cover.	 <p>xx210000981</p>
3	<p>Loosen the connectors:</p> <ul style="list-style-type: none"> • R1.MP • R1.SMB 	 <p>xx2100001109</p>

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5.4.1 Replacing the axis-1 cassette sealing
Continued

	Action	Note
4	Disconnect the earth cable.	 <p>xx210000982</p>
5	<p><i>Foundry Plus</i></p> <p>Remove the axis-1 cable protection plate by removing the attachment screws.</p>	 <p>xx210000979</p>
6	Loosen the cable bracket from the frame by removing the screw.	 <p>xx2100001108</p>

Removing the cable harness from the base

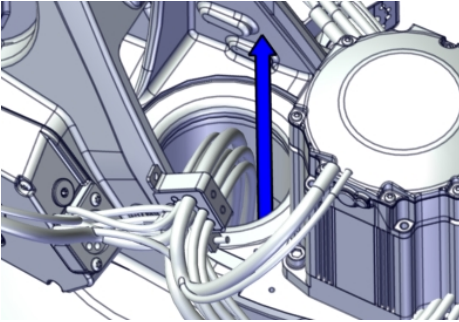
	Action	Note
1	Pull out the robot cable harness through the protection tube.	

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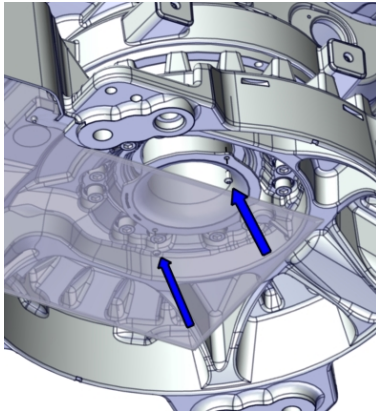
5 Repair

5.4.1 Replacing the axis-1 cassette sealing

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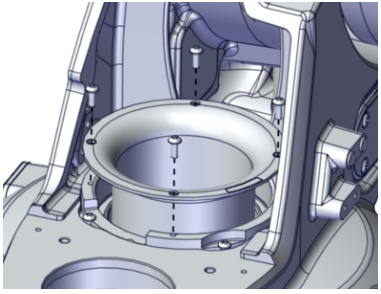
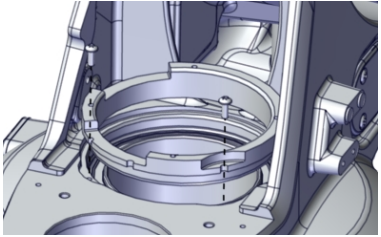
	Action	Note
		 xx2100001111
2	Place the cable harness safely on the frame.	

Removing the protection tube

	Action	Note
1	<i>Floor-mounted robot:</i> Loosen the protection tube by removing the two screws underneath. Let the tube slide down.	 xx2100002214

Continues on next page

5.4.1 Replacing the axis-1 cassette sealing
Continued

	Action	Note
2	<p><i>Option Inverted (3317-1):</i> Remove the protection tube by removing the attachment screws.</p>	 <p>xx2100002492</p>
3	<p><i>Option Inverted (3317-1):</i> Remove the adapter by removing the attachment screws.</p>	 <p>xx2100002493</p>

Removing the sealing ring in the frame

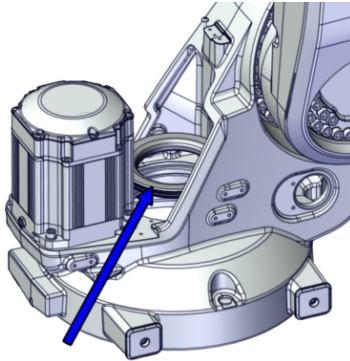
	Action	Note
1	<p><i>Only for floor-mounted robot Foundry Plus</i> Cut the flange sealant at the sealing ring (protection tube).</p>	

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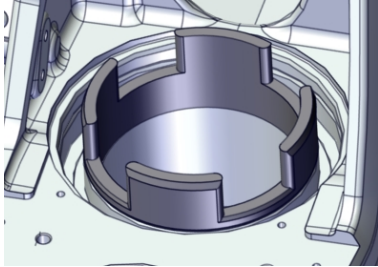
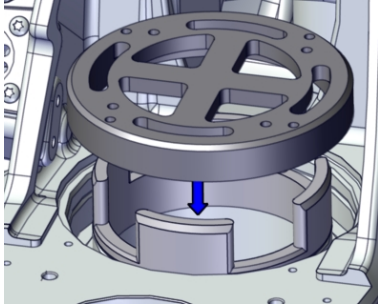
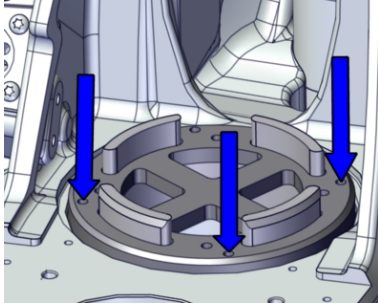
5 Repair

5.4.1 Replacing the axis-1 cassette sealing

Continued

	Action	Note
2	<p><i>Only for floor-mounted robot</i> Remove the sealing ring.</p>	 <p>xx2100001116</p>

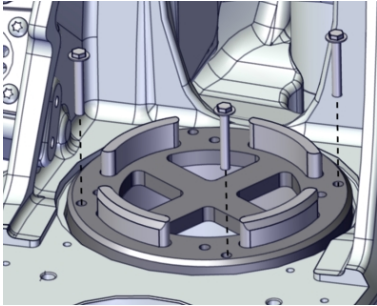
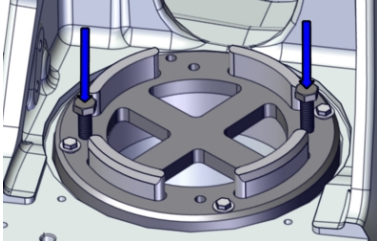
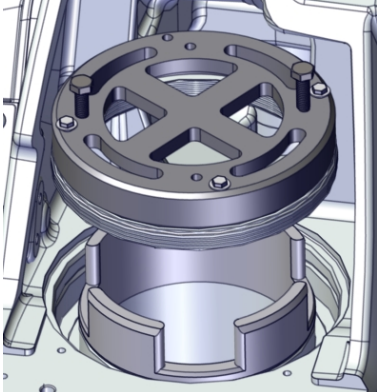
Removing the cassette sealing

	Action	Note
1	<p>Fit the first part of the mounting tool to the frame. Make sure the tool is centered correctly.</p>	<p>Replacement tool for cassette sealing: 3HAC079880-001</p>  <p>xx2100001188</p>
2	<p>Fit the second part of the mounting tool.</p>	 <p>xx2100002215</p>
3	<p>Drill three holes in the old cassette sealing, through the holes in the tool. Use a drill 3.5 mm.</p>	 <p>xx2100002216</p>

Continues on next page

5.4.1 Replacing the axis-1 cassette sealing

Continued

	Action	Note
4	Screw the three enclosed wood screws through the drilled holes and into the cassette sealing.	 <p>xx2100002217</p>
5	Press out the cassette sealing with the two enclosed press out screws. Screw down the screws alternately.	 <p>xx2100002218</p>
6	Remove the cassette sealing and the tool. Clean the area from metal shavings with a magnet or a vacuum cleaner.	 <p>xx2100002219</p>

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5 Repair

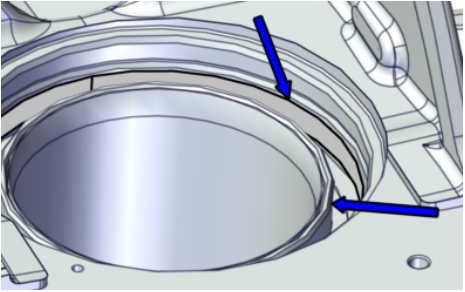
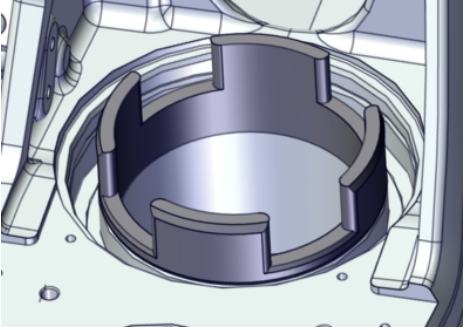
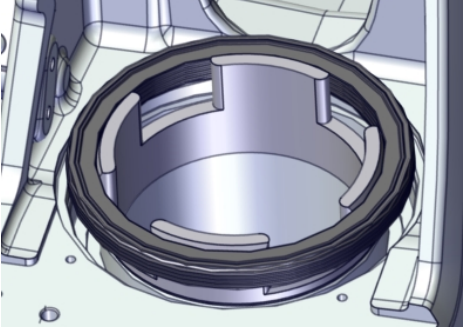
5.4.1 Replacing the axis-1 cassette sealing

Continued

Refitting the cassette sealing

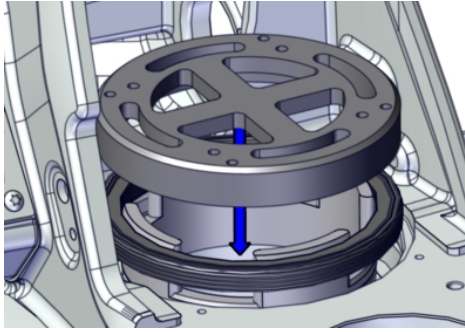
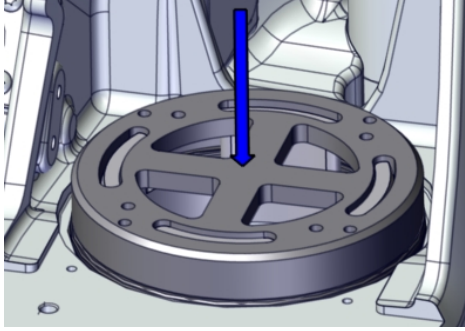
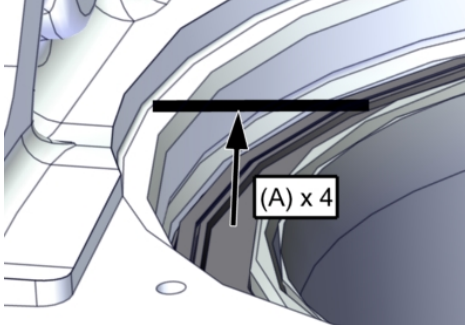
Use these procedures to refit the cassette sealing.

Refitting the cassette sealing

	Action	Note
1	Remove any old assembly lubricant residues or other contamination from the contact surfaces for the sealing in the frame.	Grease: 3HAC042536-001 (Shell Gadus S2) 
2	Lubricate the mounting surfaces in the frame with grease.	xx2100002377
3	Fit the first part of the mounting tool to the frame.	Replacement tool for cassette sealing: 3HAC079880-001 
4	Fit the cassette sealing on the tool with the plain side facing upwards (groove downwards).	xx2100001189 

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5.4.1 Replacing the axis-1 cassette sealing
Continued

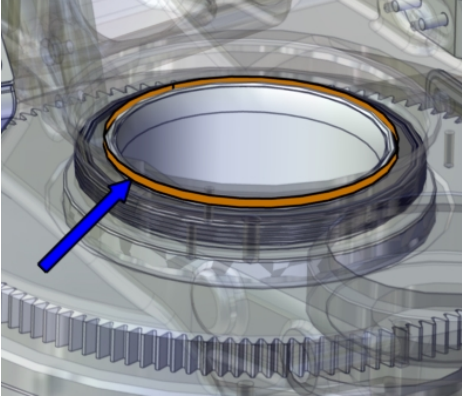
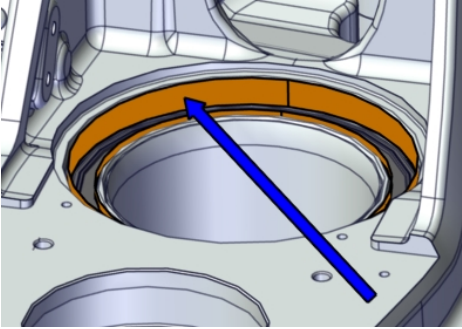
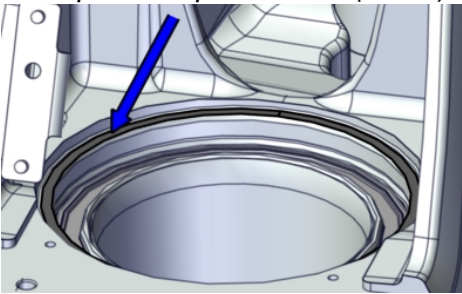
	Action	Note
5	Fit the second part of the mounting tool on top of the sealing.	 <p>xx2100001191</p>
6	<p>First push down the tool by hand to guide down the sealing aligned.</p> <p>Then use a rubber mallet to knock down the tool and sealing evenly, until the sealing has reached the bottom all the way around.</p>	 <p>xx2100001192</p>
7	Remove the mounting tool.	
8	Verify that the cassette sealing is fitted evenly by measuring the distance (A) between the painted edge of the frame and down to the sealing, at four (4) locations. The measurement is approximately 16 mm.	 <p>xx2100001193</p>

Continues on next page

5 Repair

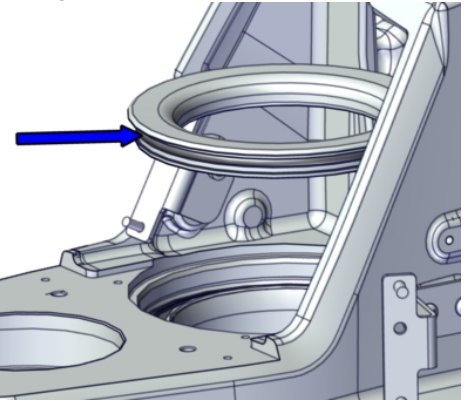
5.4.1 Replacing the axis-1 cassette sealing

Continued

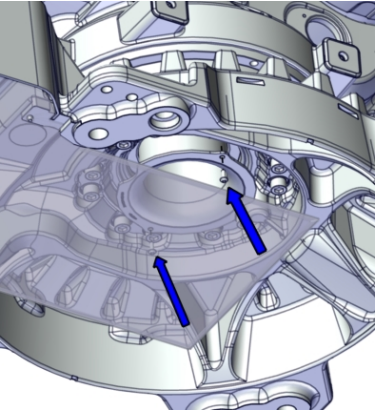
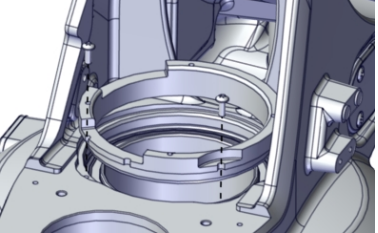
	Action	Note
9	<p>Protection type Foundry Plus Apply rust preventive to the outer surface of the gearbox tube and outer surface of the frame hole, all the way down to the cassette sealing, as shown in the figure.</p>	<p>Rust preventive: 3HAC034903-001 (Mercasol 3110 Waxcoat. Recommended drying time is 24h.)</p>  <p>xx2100001170</p>  <p>xx2100001172</p>
10	<p>Only for floor-mounted robot with protection type Foundry Plus Apply sealant to the mounting surface for the sealing ring.</p>	<p>Sealant (grey): 3HAC026759-001 () Sikaflex 521FC. Protection type Foundry Plus. Not required for option Inverted (3317-1).</p>  <p>xx2100001173</p>

Continues on next page

5.4.1 Replacing the axis-1 cassette sealing
Continued

	Action	Note
11	<p><i>Only for floor-mounted robot</i> Refit the sealing ring. Verify that the o-ring is undamaged and placed in its groove on the sealing ring. Replace if damaged.</p>	<p>O-ring, nitrile rubber: 3HAB3772-57</p>  <p>xx2100001136</p>

Refitting the protection tube

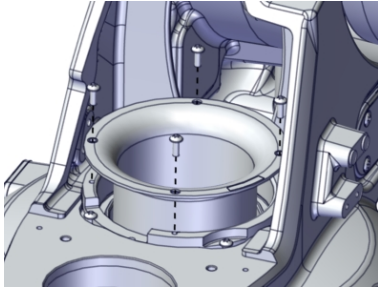
	Action	Note
1	<p><i>Floor-mounted robot:</i> Lift the protection tube and secure with the two screws from below.</p>	 <p>xx2100002214</p>
2	<p><i>Option Inverted (3317-1):</i> Refit the adapter with the attachment screws.</p>	<p>Torx pan head screw: M6x16 A4-80 (2 pcs)</p>  <p>xx2100002493</p>

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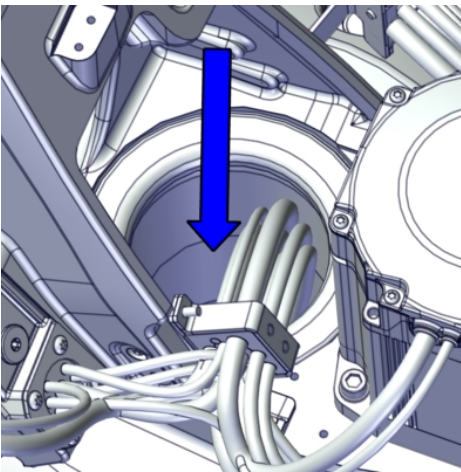
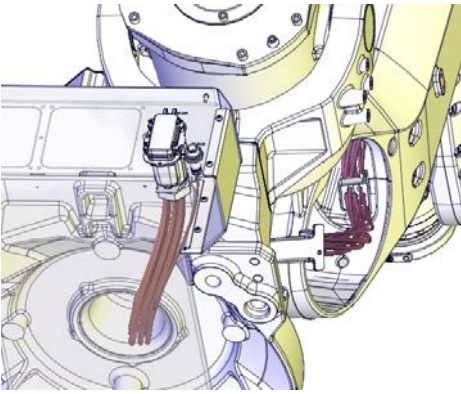
5 Repair

5.4.1 Replacing the axis-1 cassette sealing

Continued

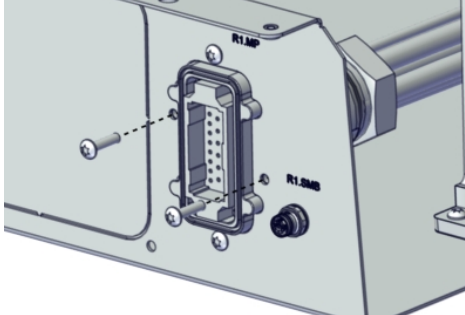
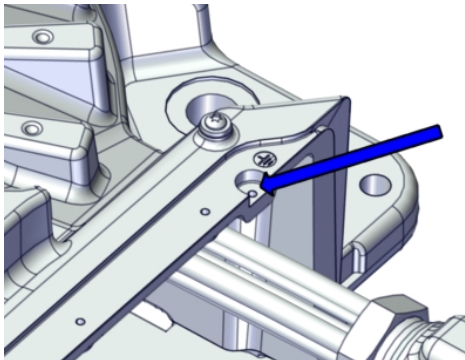
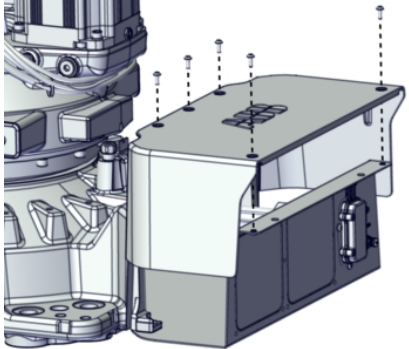
	Action	Note
3	<p><i>Option Inverted (3317-1):</i> Refit the protection tube with the attachment screws. Apply locking liquid on the screws.</p>	<p>Torx pan head screw: M6x16 A4-80 (4 pcs) Locking liquid: 3HAC041807-004 (Loctite 2400) Tightening torque: 10 Nm.</p>  <p>xx2100002492</p>

Refitting the cable harness in the base

	Action	Note
1	Run the cables through the protection tube.	 <p>xx2100001216</p>
2	<ul style="list-style-type: none"> • Make sure that the cables are not twisted. Each cable must be in line with its position on the base plate. • Make sure that the R1.SMB cable will run on the correct side of the R1.MP1, see the figure. 	 <p>xx1300000736</p>
3	Make sure that the markings on the cables are facing the base cover, when connected.	

Continues on next page

5.4.1 Replacing the axis-1 cassette sealing
Continued

	Action	Note
4	Connect connectors R1.MP and R1.SMB.	<p>Screw dimension for R1.MP: M6x25 A2-70 Tightening torque for R1.MP: 10 Nm. Tightening torque for R1.SMB: 10 Nm.</p>  <p>xx2100001109</p>
5	Connect the earth cable.	<p>Screw dimension: M6x16. Washer dimension: 6.4x17x3. Tightening torque: 10 Nm.</p>  <p>xx2100000982</p>
6	Refit the base cover.	<p>Torx pan head screw: M6x16 Stainless steel A2-70 Tightening torque: 10 Nm.</p>  <p>xx2100000981</p>

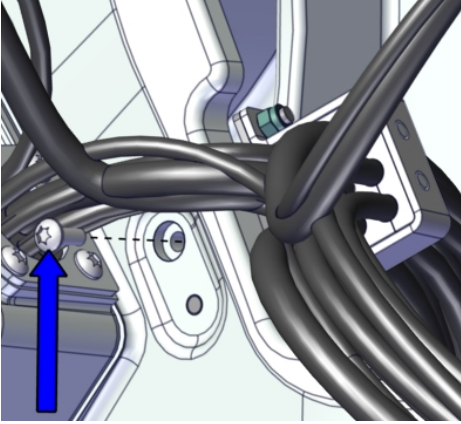

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5 Repair

5.4.1 Replacing the axis-1 cassette sealing

Continued

Concluding procedure

	Action	Note
1	Refit the cable bracket to the frame.	<p>Torx pan head screw: M6x16 Stainless steel A2-70 Tightening torque: 6 Nm.</p>  <p>xx2100001108</p>
2	 DANGER Make sure all safety requirements are met when performing the first test run.	

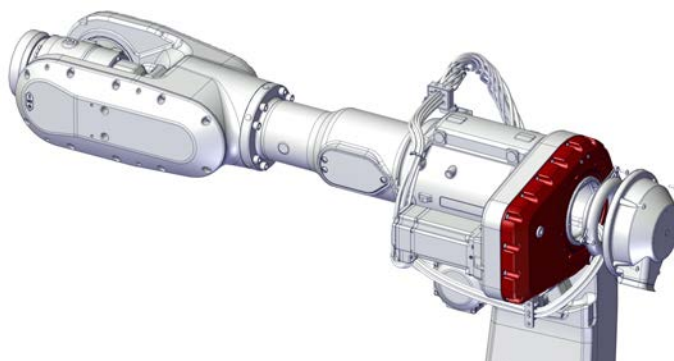
5.5.1 Replacing the arm house cover including the axis-4 cassette sealing

5.5 Axes 3 and 4

5.5.1 Replacing the arm house cover including the axis-4 cassette sealing

Location of the arm house cover and cassette sealing

The arm house cover including the cassette sealing is located as shown in the figure.



xx2100001241

Summary of the replacement procedure

This is a brief summary of the replacement procedure, containing the major actions to be performed.

- 1 *Protection type Foundry Plus*: Remove the cover.
- 2 Remove the cable harness from the upper arm.
- 3 Remove the cable guide.
- 4 Replace the arm house cover including the cassette sealing.

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 5710 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note	Level
Arm house cover including cassette sealing	3HAC073375-003 (Graphite White) 3HAC070735-004 (ABB Orange)		L2

Required service parts

Consumable	Article number	Note
Grease	3HAC042536-001	Shell Gadus S2
Locking liquid	3HAC041807-004	Loctite 2400

Continues on next page

5 Repair

5.5.1 Replacing the arm house cover including the axis-4 cassette sealing

Continued

Consumable	Article number	Note
Rust preventive	3HAC034903-001	Mercasol 3110 Waxcoat. Recommended drying time is 24h.
Lubricating oil	-	See Type of lubrication in gear-boxes on page 137 .
O-ring, G 1/2"	3HAC061327-059	Used on oil plug. Always replace when refitting oil plug.

Required tools and equipment

Equipment	Article number	Note
Replacement tool for arm house cover	3HAC079878-001	For removing and fitting the arm house cover, including the axis-4 cassette sealing.
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

Removing the arm house cover including the cassette sealing


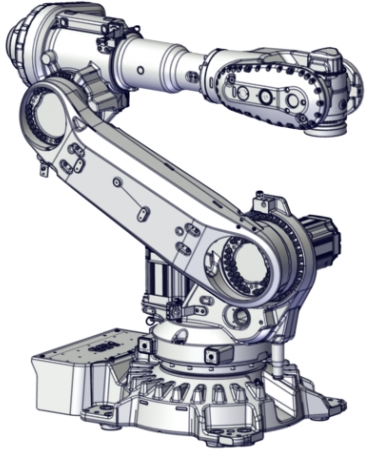

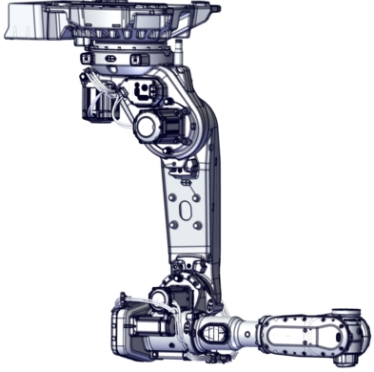

Use these procedures to remove the arm house cover including the cassette sealing.

Preparations before removing the arm house cover

	Action	Note
1	Drain the axis-4 gearbox.	See Draining the axis-4 gearbox on page 162 .

Continues on next page

5.5.1 Replacing the arm house cover including the axis-4 cassette sealing
Continued

	Action	Note
2	<p>Jog the robot to the specified position:</p> <ul style="list-style-type: none"> • Axis 1: 0° • Axis 2: -60° • Axis 3: +60° • Axis 4: 0° • Axis 5: +90° • Axis 6: No significance. <p> Note</p> <p>The specified position is a recommended position for service.</p> <p>Axis-5 must be oriented as close as possible to +90° to be able to open the axis-6 motor cover and to remove the axis-6 motor cables, and in order to avoid the spiral of the cable harness in the carrier, being unwound or placed in the wrong position.</p> <p>Depending on what tool is used, the other axes may need to be jogged to another position.</p>	 <p>xx2100002132</p>
3	<p><i>Option Inverted (3317-1)</i></p> <p>Jog the robot to the specified position:</p> <ul style="list-style-type: none"> • Axis 1: 0° • Axis 2: 0° • Axis 3: 0° • Axis 4: 0° • Axis 5: +90° • Axis 6: No significance. <p> Note</p> <p>The specified position is a recommended position for service.</p> <p>Axis-5 must be oriented as close as possible to +90° to be able to open the axis-6 motor cover and to remove the axis-6 motor cables, and in order to avoid the spiral of the cable harness in the carrier, being unwound or placed in the wrong position.</p> <p>Depending on what tool is used, the other axes may need to be jogged to another position.</p>	 <p>xx2100002138</p>
4	<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 safeguarded space.</p>	

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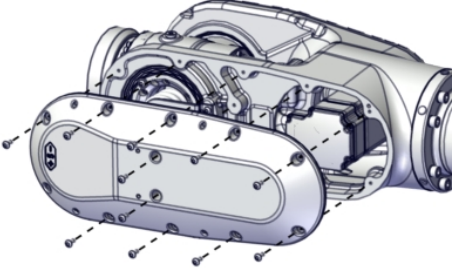
5 Repair

5.5.1 Replacing the arm house cover including the axis-4 cassette sealing


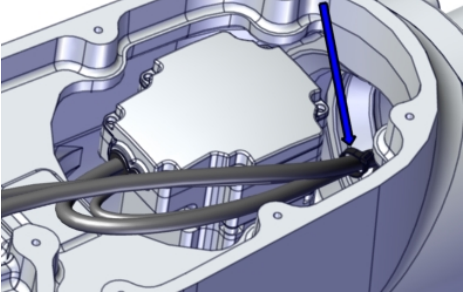
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Retrieving access to the wrist cabling

Use this procedure to remove the wrist cover.

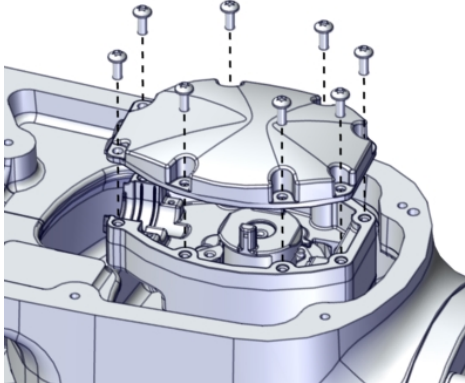
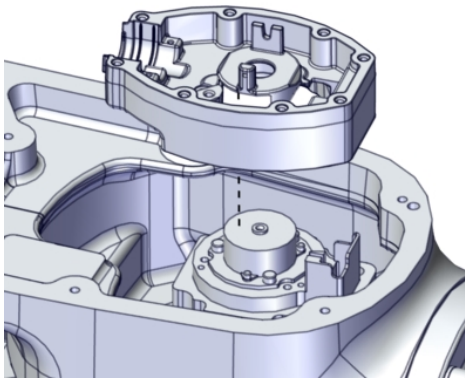
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the wrist cover.	 <p>xx2000000373</p>

Disconnecting the axis-5 motor cables


	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Cut the cable tie.	 <p>xx2100002630</p>

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5.5.1 Replacing the arm house cover including the axis-4 cassette sealing
Continued

	Action	Note
3	Remove the motor cover by removing the screws.	 <p>xx2100002315</p>
4	Disconnect the power cable connector by removing the attachment screw.	
5	Disconnect the signal cable connector.	
6	Remove the cable bracket by removing the screws.	
7	Remove the motor cables.	
8	IRB 5710-90/2.7, IRB 5710-70/2.7 LID: Remove the connection box.	 <p>xx2100002316</p>

Disconnecting the axis-6 motor cables

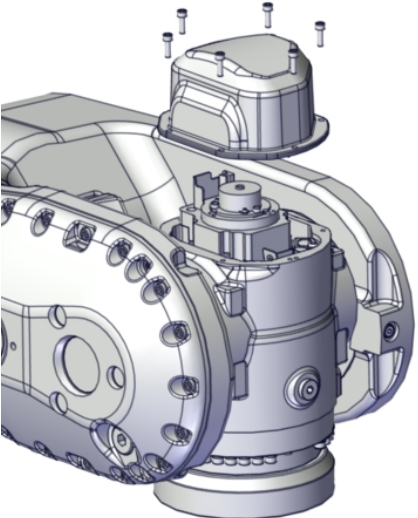
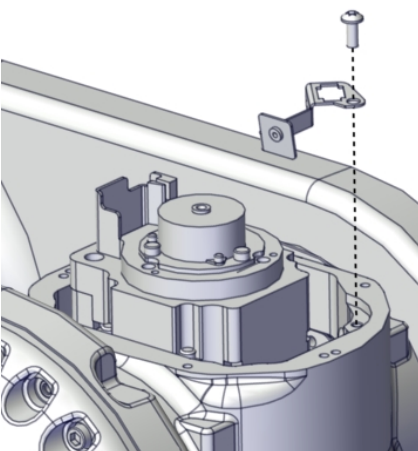
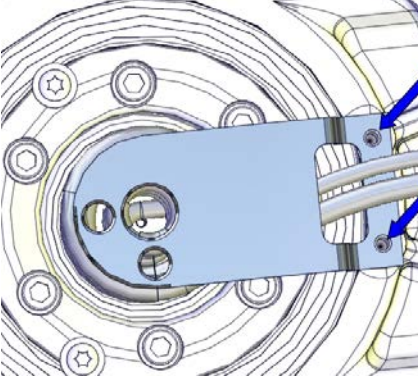
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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5 Repair


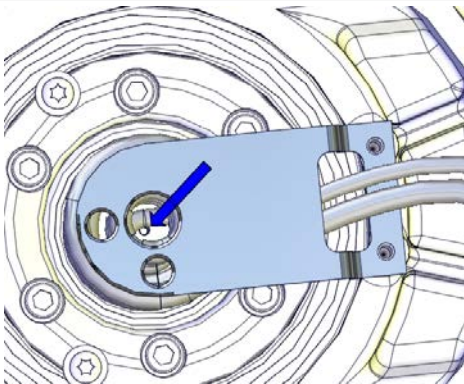
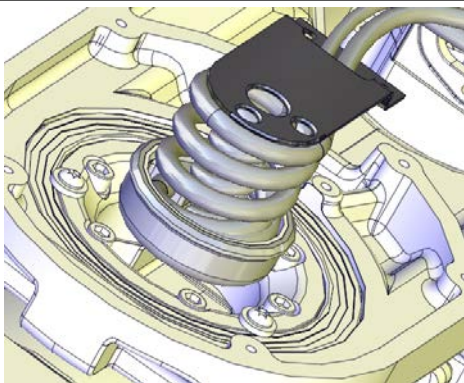
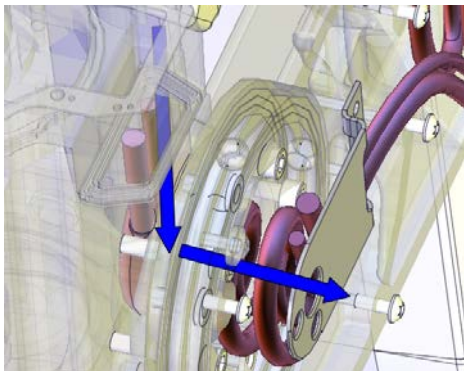
5.5.1 Replacing the arm house cover including the axis-4 cassette sealing

Continued

	Action	Note
2	Unscrew the attachment screws and remove the motor cover.	 <p>xx200000376</p>
3	Remove the connector bracket.	 <p>xx200000375</p>
4	Disconnect the motor cables.	
5	Unscrew the attachment screws that hold the cable bracket.	 <p>xx130000484</p>

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5.5.1 Replacing the arm house cover including the axis-4 cassette sealing
Continued

	Action	Note
6	<p>Unscrew the M4 screw that holds the carrier.</p> <p> Note</p> <p>The screw is located at the bottom of the carrier.</p>	 <p>xx130000485</p>
7	<p>Pull out the carrier from its position.</p>	 <p>xx1300001113</p>
8	<p>Pull out the axis-6 motor cables by holding the cables with one hand at the motor and the other at the carrier.</p>	 <p>xx130000666</p>


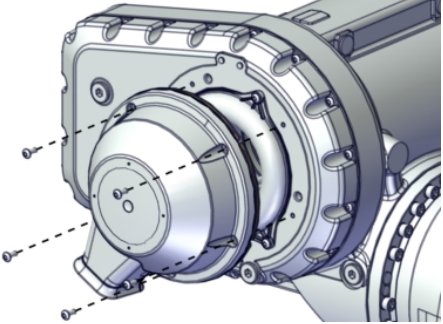
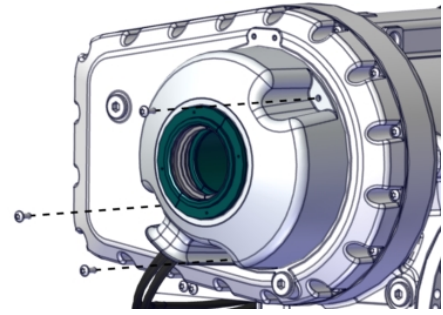


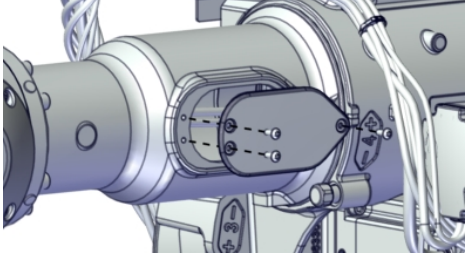
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5 Repair

5.5.1 Replacing the arm house cover including the axis-4 cassette sealing


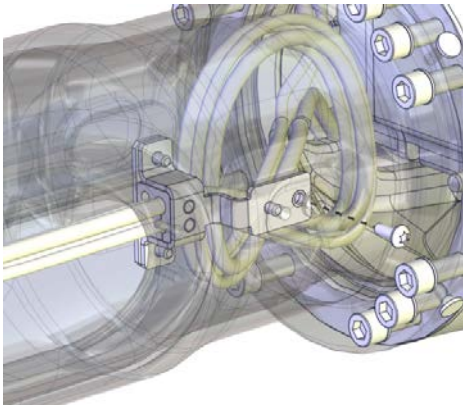
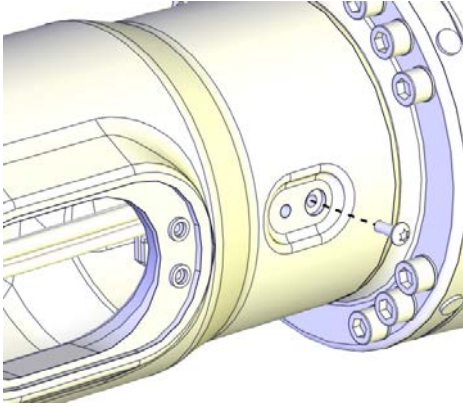
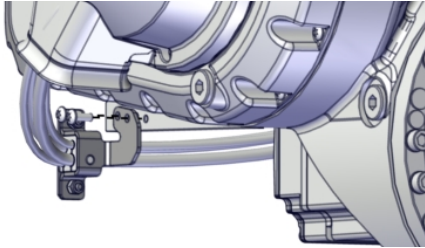
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Removing the cable harness from the wrist and upper arm

	Action	Note
1	<p><i>Foundry Plus, DressPack:</i> Remove the cover.</p> <p> Note</p> <p>Use caution not to damage the gasket.</p>	<p><i>Foundry Plus</i></p>  <p>xx200000422</p> <p><i>DressPack</i></p>  <p>xx2100002679</p>
2	<p> Tip</p> <p>Use tape and tie the axis-5 and axis-6 connectors and carrier into a bundle (if not already done). This is done to facilitate the removal and to avoid damaging the parts. This will also make it easier to run the cable harness through the inside of the upper arm.</p>	 <p>xx1300000668</p>
3	<p>Remove the side cover on the arm tube.</p>	 <p>xx200000420</p>

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5.5.1 Replacing the arm house cover including the axis-4 cassette sealing
Continued


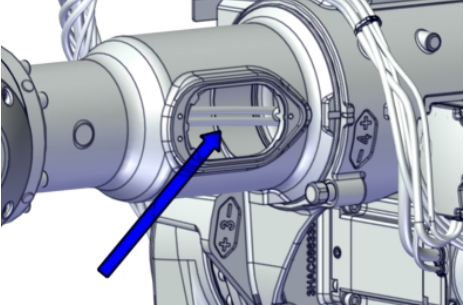
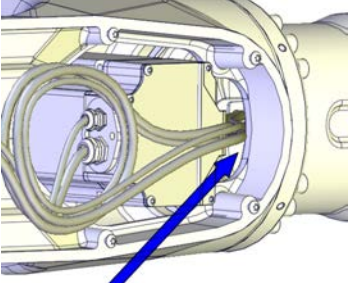

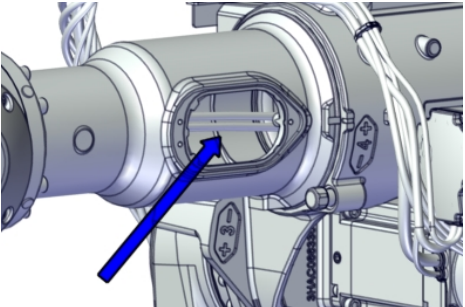
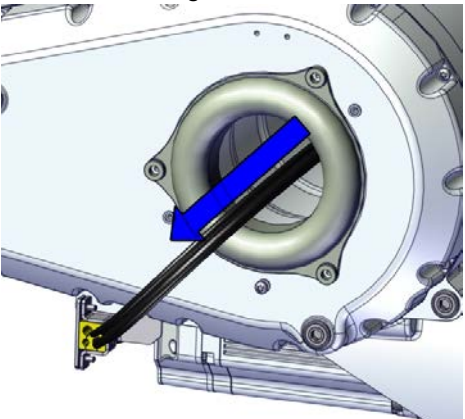
	Action	Note
4	<p>Unscrew the attachment screw that secures the axis-4 metal clamp inside the arm tube.</p> <p> Note</p> <p>The screw is reached from outside the upper arm.</p>	 <p>xx170000340</p>  <p>xx170000339</p>
5	<p>Remove the arm house metal clamp.</p>	 <p>xx2100002154</p>

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5 Repair

5.5.1 Replacing the arm house cover including the axis-4 cassette sealing

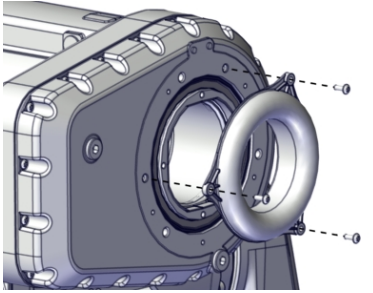
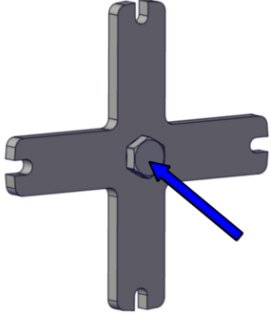
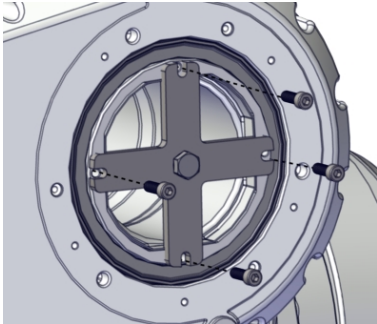
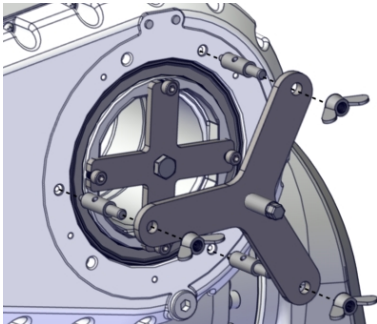
Continued

	Action	Note
6	<p>Remove the cable harness out from the wrist.</p> <p> Tip</p> <p>This step is best performed by two persons working together:</p> <ul style="list-style-type: none">• Person 1: Put one hand inside the side hole and take a hold of the cable harness.• Person 2: Take a hold on the cable harness inside the wrist.• Together: Move the cable harness past the axis-5 motor and into the arm tube.	<p>Person 1, working at the side hole:</p>  <p>xx2000000416</p> <p>Person 2, working at the wrist:</p>  <p>xx1300000746</p>
7	<p>Remove the cable harness out of the arm tube, at the back of the upper arm.</p> <p> Tip</p> <p>This step is best performed by two persons working together:</p> <ul style="list-style-type: none">• Person 1: Put one hand inside the side hole and take a hold of the cable harness.• Person 2: Take a hold on the cable harness at the back of the robot.• Together: Move the cable harness out of the arm tube.	<p>Person 1, working at side hole:</p>  <p>xx2000000416</p> <p>Person 2, working at the back:</p>  <p>xx1700001568</p>

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5.5.1 Replacing the arm house cover including the axis-4 cassette sealing
Continued

Removing the arm house cover including the cassette sealing

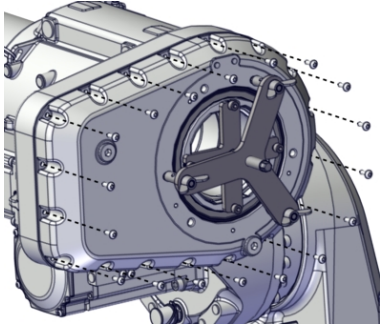
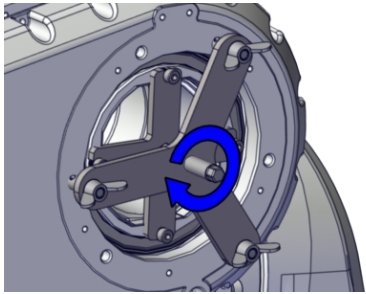



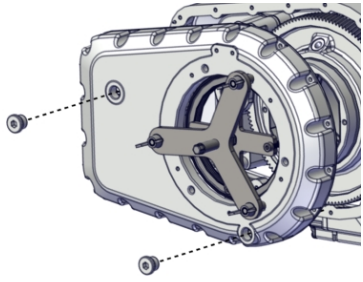
	Action	Note
1	Remove the cable guide by removing the attachment screws.	 <p>xx2100001242</p>
2	Prepare the removal tool by fitting the middle screw to the part of the tool designed as a cross, all the way until it bottoms.	<p>Replacement tool for arm house cover: 3HAC079878-001</p>  <p>xx2100001253</p>
3	Fit the cross to the tube shaft with four M8 screws.	 <p>xx2100001243</p>
4	Fit the three armed tool part with three screws and wing nuts.	 <p>xx2100001254</p>

Continues on next page

5 Repair

5.5.1 Replacing the arm house cover including the axis-4 cassette sealing

Continued

	Action	Note
5	Remove the arm house cover screws.	 xx2100001255
6	Fit the M12 bolt and rotate it to press out the complete cover.	 xx2100001256
7	Remove the complete cover. Remove and save the oil plugs for refitting on the new cover.  WARNING Oil residues will drip out during removal. Make sure that protective gear like goggles and gloves are always worn.  WARNING Handling gearbox oil involves several safety risks, see Gearbox lubricants (oil or grease) on page 29 .  WARNING Used oil is hazardous material and must be disposed of in a safe way. See Decommissioning on page 593 for more information.	 xx2100001286
8	Remove the tool from the arm house cover. The tool on the tube shaft can stay fitted.	

Refitting the arm house cover including the cassette sealing

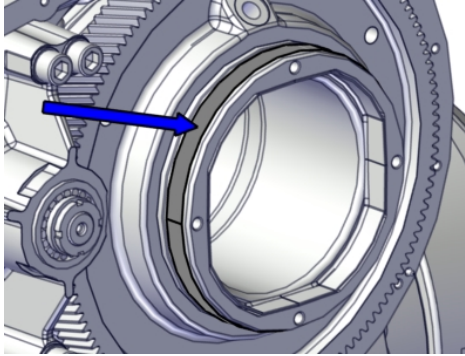
Use these procedures to refit the arm house cover including the cassette sealing.

Preparations before refitting the arm house cover

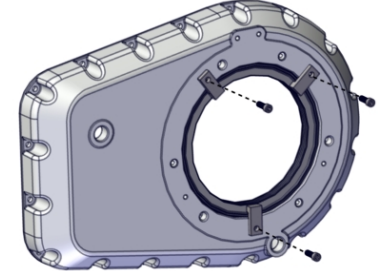
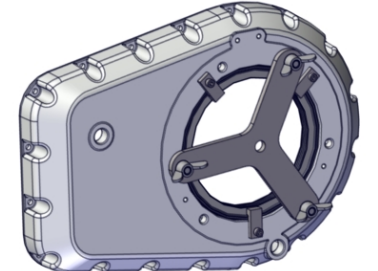
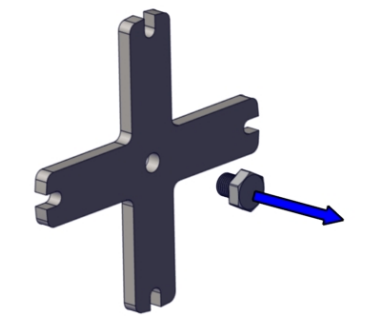
	Action	Note
1	Wipe clean all contact surfaces.	

Continues on next page

5.5.1 Replacing the arm house cover including the axis-4 cassette sealing
Continued

	Action	Note
2	Apply grease on the tube shaft, as shown in the figure.	Grease: 3HAC042536-001 (Shell Gadus S2)  xx2100001263

Refitting the arm house cover including the cassette sealing


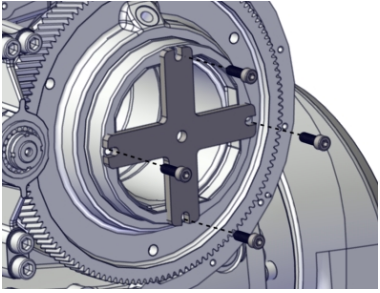
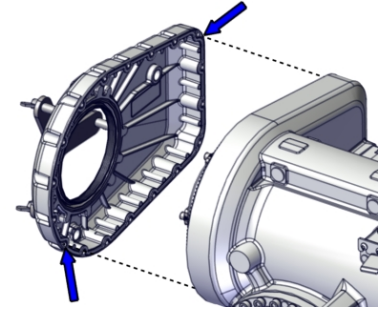
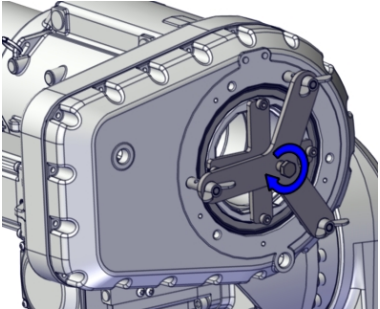
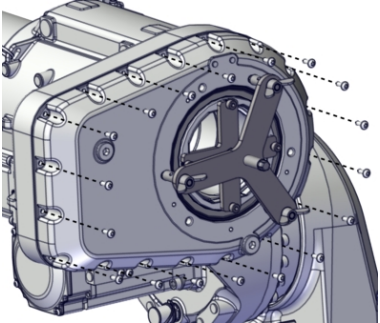
	Action	Note
1	Fit three holders to the arm house cover, to hold the cassette sealing in place during refitting of cover.	Replacement tool for arm house cover: 3HAC079878-001  xx2100001266
2	Fit the three armed tool part with three screws.	 xx2100001267
3	Prepare the refitting tool by removing the middle screw from the part of the tool designed as a cross.	 xx2100001265

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5 Repair

5.5.1 Replacing the arm house cover including the axis-4 cassette sealing

Continued

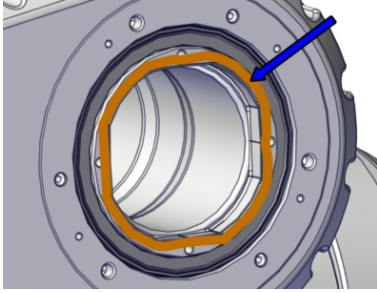
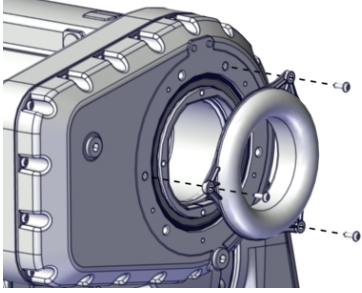
	Action	Note
4	Fit the cross to the tube shaft with four M8 screws.  CAUTION Center the cross on the tube shaft, to not damage the sealing.	 xx2100001264
5	Fit the arm house cover to the arm house with guidance from the two guide pins in the cover.	 xx2100001269
6	Fit the M12 screw to the tool and pull the cover and cassette sealing into place by rotating the screw. Check that the guide pins are inserted in the arm house.	 xx2100001270
7	Secure the cover with the attachment screws. Use locking liquid. Ensure gap closure between cover and arm house.	Torx pan head screw: M6x16 Stainless steel A2-70 Locking liquid: 3HAC041807-004 (Loctite 2400) Tightening torque: 10 Nm  xx2100001255
8	Remove the tool.	

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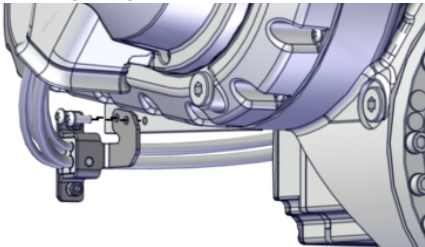
5.5.1 Replacing the arm house cover including the axis-4 cassette sealing
Continued

	Action	Note
9	Perform a leak-down test.	See Performing a leak-down test on page 184 .

Refitting the arm house cable guide

	Action	Note
1	Apply rust preventive on the arm tube machined surface.	<p>Rust preventive: 3HAC034903-001 (Mercasol 3110 Waxcoat. Recommended drying time is 24h.)</p>  <p>xx2100001271</p>
2	Fit the cable guide with attachment screws. Use locking liquid.	<p>Torx pan head screw: M6x16 Stainless steel A2-70 Locking liquid: 3HAC041807-004 (Loctite 2400)</p>  <p>xx2100001242</p>

Refitting the cable harness to the upper arm




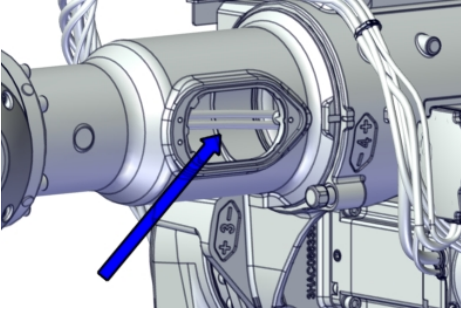
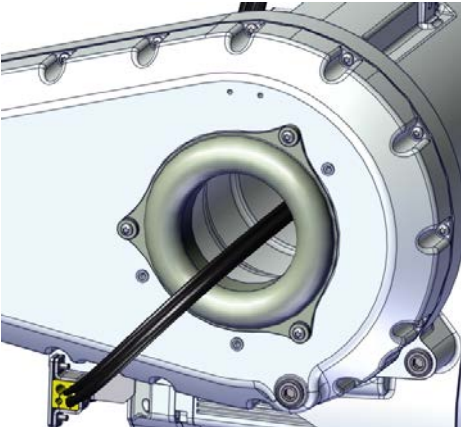
	Action	Note
1	Refit the metal clamp beneath the arm house.	<p>Torx pan head screw: M6x16 Stainless steel A2-70 Tightening torque: 10 Nm.</p>  <p>xx2100002154</p>

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5 Repair


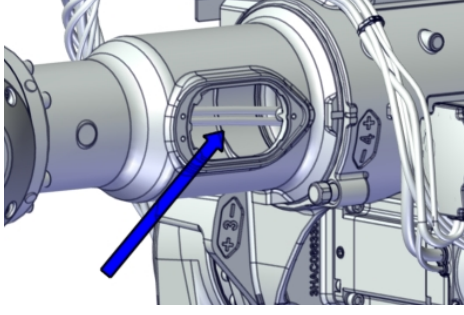
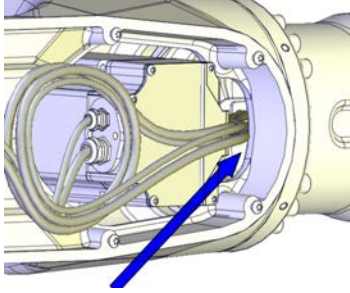

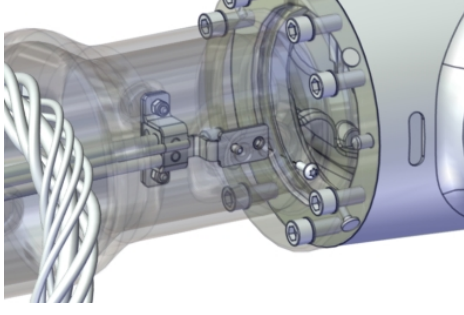
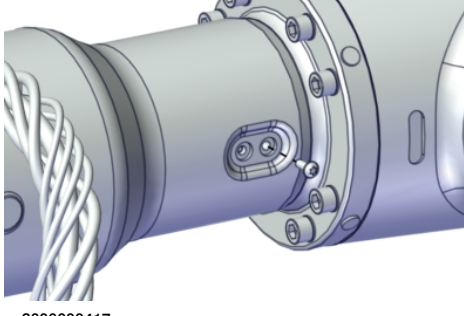
5.5.1 Replacing the arm house cover including the axis-4 cassette sealing

Continued

	Action	Note
2	<p> Tip</p> <p>Use tape and tie the axis-5 and axis-6 connectors and carrier into a bundle (if not already done). This is done to facilitate the procedure and to avoid damaging the parts during the procedure.</p> <p>This will also make it easier to run the cable harness through the inside of the robot.</p>	 <p>xx130000668</p>
3	<p>Run the cable harness through the cable guide and then into and through the upper arm tube.</p> <p> Tip</p> <p>This step is best performed by two persons working together:</p> <ul style="list-style-type: none">• Person 1: Put one hand inside the side hole of the arm tube and take a hold of the cable harness.• Person 2: Take a hold on the cable harness at the back of the robot.• Together: Use caution and move the cable harness into the arm tube.	<p>Person 1, working at the side hole:</p>  <p>xx200000416</p> <p>Person 2, working at the back:</p>  <p>xx1700001569</p>

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5.5.1 Replacing the arm house cover including the axis-4 cassette sealing
Continued


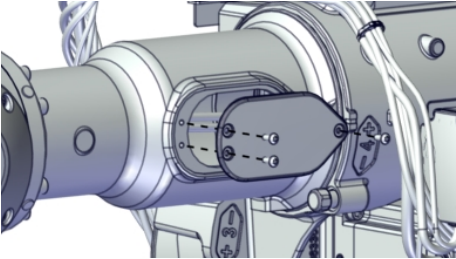
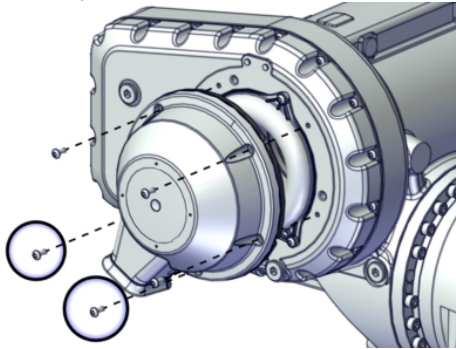
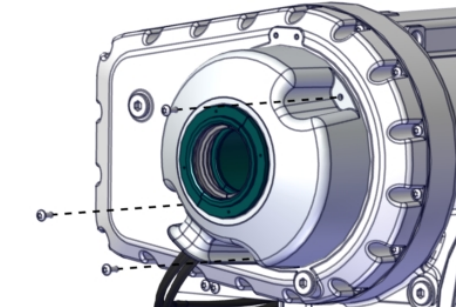
	Action	Note
4	<p>Use caution and push the cable harness into the wrist.</p> <p> Tip</p> <p>This step is best performed by two persons working together:</p> <ul style="list-style-type: none"> • Person 1: Put one hand inside the side cover hole and take a hold of the cable harness. • Person 2: Take a hold of the cable harness from inside the wrist. • Together: Move the cable harness past the axis-5 motor and into the wrist. 	<p>Person 1, working at the side hole:</p>  <p>xx2000000416</p> <p>Person 2, working at the wrist:</p>  <p>xx1300000746</p>
5	<p>Refit the metal clamp axis-4, inside the arm tube.</p> <p> Note</p> <p>The screws are reached from outside the upper arm.</p>	<p>Torx pan head screw: M6x16 Stainless steel A2-70 Tightening torque: 10 Nm.</p>  <p>xx2000000418</p>  <p>xx2000000417</p>

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5 Repair

5.5.1 Replacing the arm house cover including the axis-4 cassette sealing

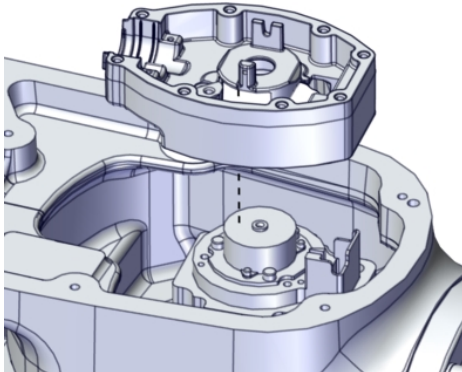
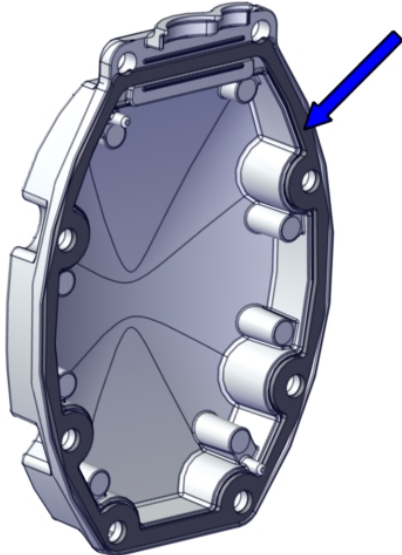
Continued

	Action	Note
6	<p>Refit the side cover.</p> <p> Note</p> <p><i>Foundry Plus:</i></p> <ul style="list-style-type: none">• Make sure the gasket is fitted correctly on the side cover• Use attachment screws made of stainless steel to fit the side cover.	 <p>xx200000420</p>
7	<p><i>DressPack or Foundry Plus:</i></p> <p>Refit the back cover with the attachment screws.</p> <p>Tighten the two screws closest to the outlet first (shown in figure), to avoid deformation.</p>	<p>Torx pan head screw: M6x16 Stainless steel A2-70</p> <p>Tightening torque: 10 Nm.</p> <p><i>Foundry Plus</i></p>  <p>xx2100002636</p> <p><i>DressPack</i></p>  <p>xx2100002679</p>

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5.5.1 Replacing the arm house cover including the axis-4 cassette sealing
Continued

Connecting the axis-5 motor cables


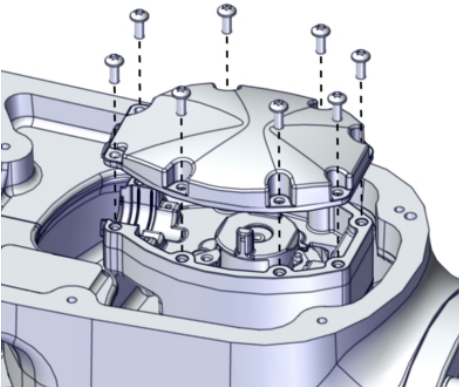
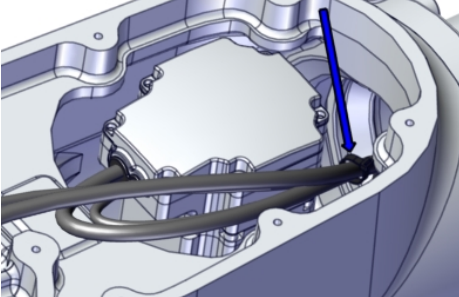
	Action	Note
1	IRB 5710-90/2.7, IRB 5710-70/2.7 LID: Refit the connection box with the screws.	 <p>xx2100002316</p>
2	Put the motor cables in place in the opening.	
3	Refit the cable bracket with the screws.	Torx pan head screw: M3x12 Stainless steel A2-70
4	Connect the motor cables. Connect in accordance with the markings on the connectors.	
5	Secure the power connector with a screw.	Tightening torque: 1 Nm
6	Inspect the gasket. Replace the complete cover if the gasket is damaged.	<p>Connection box cover with gasket: IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange) IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 3HAC072861-003 (Graphite White) 3HAC072861-004 (ABB Orange)</p>  <p>xx2100002317</p>

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5 Repair

5.5.1 Replacing the arm house cover including the axis-4 cassette sealing

Continued

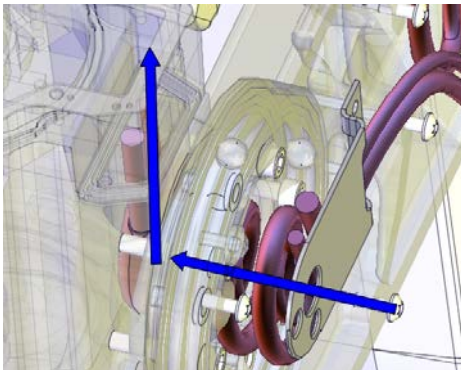
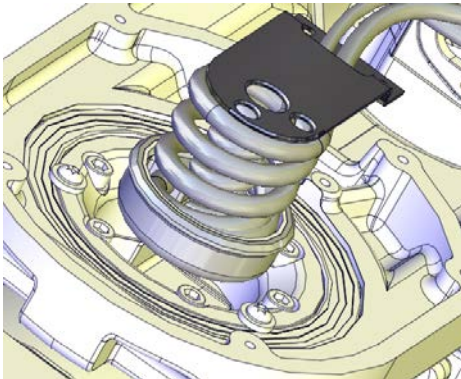


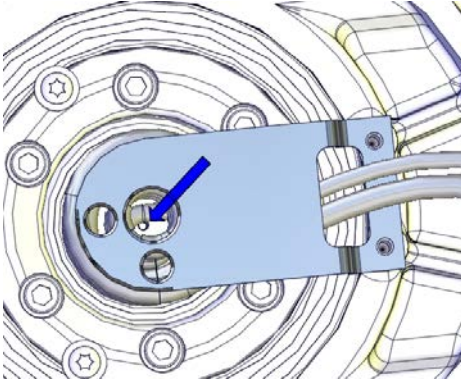
	Action	Note
7	 CAUTION When fitting the motor cover, make sure that none of the cables inside will be damaged.	
8	Refit the motor cover with its attachment screws. Use locking liquid.	Torx pan head screw: M5x12 Stainless steel A2-70 Locking liquid: 3HAC041807-004 (Loctite 2400) Tightening torque: 6 Nm.  <small>xx2100002315</small>
9	Secure the cabling with a cable strap.	Cable strap, outdoor: 21662055-3  <small>xx2100002630</small>

Connecting the axis-6 motor cables

	Action	Note
1	 Note Axis 5 must be in position +90° (or as close as possible) for a correct installation of the cable harness in the wrist. If not, connect the brake release tool to the axis-5 motor connector, release the brakes and move axis 5 manually to +90°.	

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5.5.1 Replacing the arm house cover including the axis-4 cassette sealing
Continued

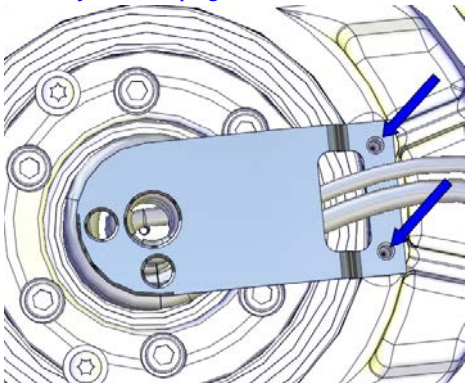
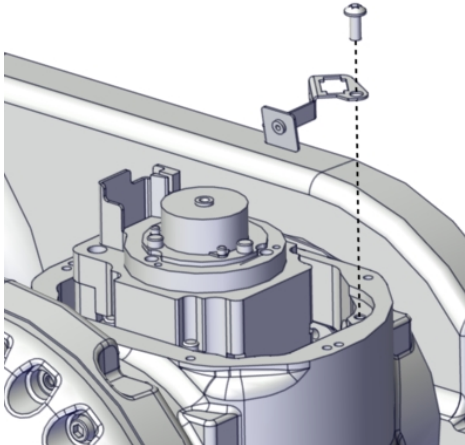
	Action	Note
2	Push the cable harness into the wrist recess and up into the axis-6 motor.	 <p>xx130000667</p>
3	Push the carrier carefully into position.	 <p>xx1300001113</p>
4	<p>Secure the carrier with the M4 screw.</p> <p> Note The screw is located at the bottom of the carrier.</p> <p> Tip The attachment screw securing the carrier may be difficult to fit. Make sure the carrier is level and completely pressed against the bottom.</p>	 <p>xx130000485</p>

Continues on next page

5 Repair

5.5.1 Replacing the arm house cover including the axis-4 cassette sealing

Continued

	Action	Note
5	Secure the cable bracket with its attachment screws.	<p>Torx pan head screw: M6x16 Stainless steel A2-70</p> <p>Tightening torque: see standard torque in Screw joints on page 598..</p>  <p>xx1300000484</p>
6	Connect the motor cables. Connect in accordance with the markings on the connectors.	
7	Secure the power connector to the connector bracket with a screw.	Tightening torque: 1 Nm
8	Refit the connector bracket with the attached connectors.	<p>Torx pan head screw: M5x12 Stainless steel A2-70</p>  <p>xx2000000375</p>

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5.5.1 Replacing the arm house cover including the axis-4 cassette sealing
Continued

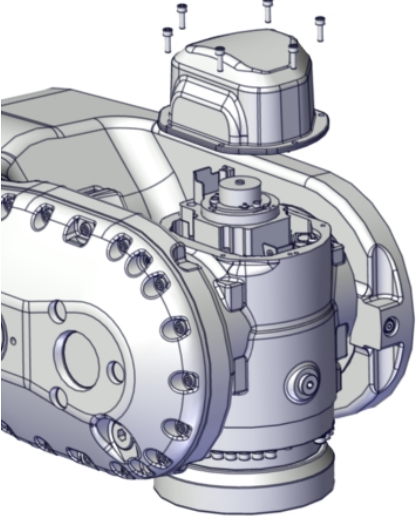
	Action	Note
9	Verify correct cable layout as shown in the figure.	 <p>xx2100001293</p>
10	Inspect the gasket. Replace if damaged.	<p>Gasket, tilt housing cover: 3HAC071520-001</p>  <p>xx2100001287</p>
11	 <p>CAUTION</p> <p>When fitting the motor cover, make sure that none of the cables inside will be damaged.</p>	

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5 Repair

5.5.1 Replacing the arm house cover including the axis-4 cassette sealing

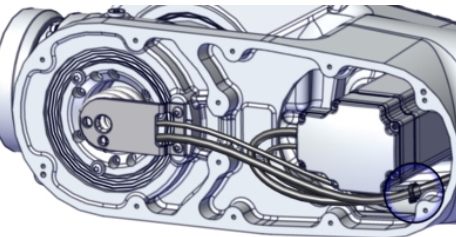
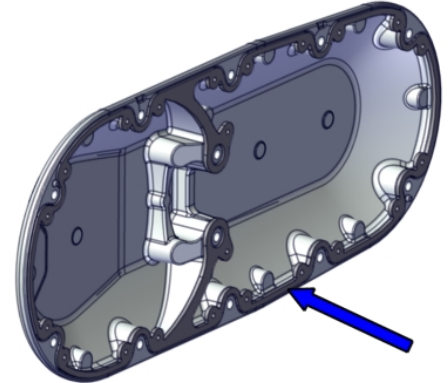
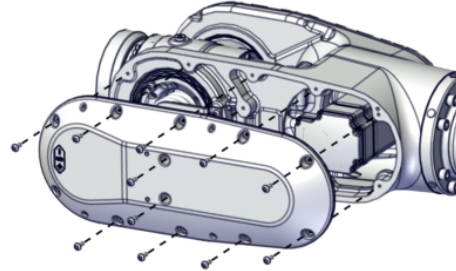
Continued

	Action	Note
12	Refit the motor cover.	<p>Hex socket head cap screw: M5x16 12.9 Lafre 2C2B/FC6.9 (6 pcs) Tightening torque: 4 Nm.</p>  <p>xx200000376</p>

Continues on next page

5.5.1 Replacing the arm house cover including the axis-4 cassette sealing
Continued

Refitting the wrist cover

	Action	Note
1	Make sure that the cable harness is routed and secured as shown in the figure.	 <p>xx2100002627</p>
2	<p><i>Foundry Plus:</i> Inspect the gasket. Replace the complete cover if the gasket is damaged.</p>	<p>Wrist cover: IRB 5710-110/2.3 / IRB 5710-90/2.3 LID: 3HAC073390-002 (Graphite White) 3HAC073390-004 (ABB Orange) IRB 5710-90/2.7 / IRB 5710-70/2.7 LID: 3HAC070151-004 (Graphite White) 3HAC070151-006 (ABB Orange)</p>  <p>xx2100001407</p>
3	Refit the wrist cover and secure with screws.	<p>Torx pan head screw: M6x16 Stainless steel A2-70 Tightening torque: 10 Nm.</p>  <p>xx2000000373</p>

Concluding procedure


	Action	Note
1	Refill oil to the axis-4 gearbox.	See Filling oil into the axis-4 gearbox on page 164 .

Continues on next page

5 Repair

5.5.1 Replacing the arm house cover including the axis-4 cassette sealing

Continued

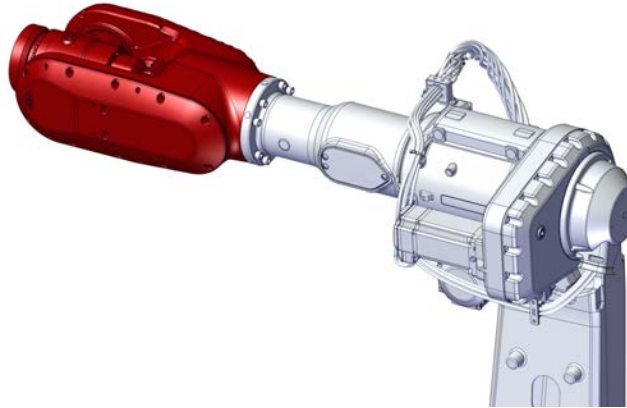
	Action	Note
2	Calibrate the robot.	See Calibration on page 563 .
3	 DANGER Make sure all safety requirements are met when performing the first test run.	

5.6 Wrist

5.6.1 Replacing the wrist

Location of the wrist

The wrist is located as shown in the figure.



xx2100001288

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 5710 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note	Level
Wrist	IRB 5710-110/2.3 / IRB 5710-90/2.3 LID: 3HAC072470-002 (Graphite White) 3HAC072470-004 (ABB Orange) IRB 5710-90/2.7 / IRB 5710-70/2.7 LID: 3HAC072492-002 (Graphite White) 3HAC072492-004 (ABB Orange)	Complete unit with motors and gears.	L2

Required tools and equipment

Equipment	Article number	Note
Brake release tool	3HAC081310-001	User instructions are enclosed with the tool.

Continues on next page

5 Repair

5.6.1 Replacing the wrist

Continued

Equipment	Article number	Note
Roundsling, 1 m	-	Length: 1 m.
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

Required service parts

Consumable	Article number	Note
Tilt housing cover with gasket	3HAC073918-003 (Graphite White) 3HAC073918-004 (ABB Orange)	Replace if damaged.
Connection box cover with gasket	IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange) IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 3HAC072861-003 (Graphite White) 3HAC072861-004 (ABB Orange)	Replace if damaged.
Wrist cover	IRB 5710-110/2.3 / IRB 5710-90/2.3 LID: 3HAC073390-002 (Graphite White) 3HAC073390-004 (ABB Orange) IRB 5710-90/2.7 / IRB 5710-70/2.7 LID: 3HAC070151-004 (Graphite White) 3HAC070151-006 (ABB Orange)	Replace if damaged.
Cable strap, out-door	21662055-3	Polyamide 6.6

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. 	
	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 573 .

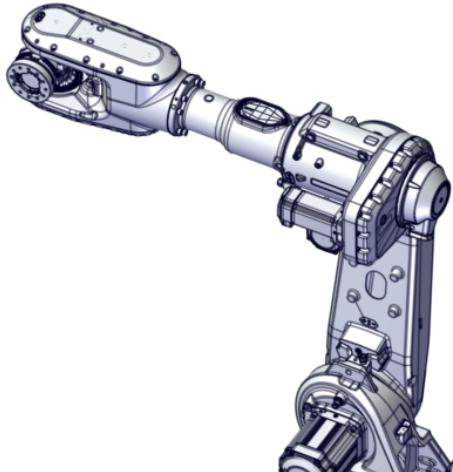

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Action	Note
<p>If the robot is to be calibrated with fine calibration:</p> <p>Remove all external cable packages (DressPack) and tools from the robot.</p>	

Removing the wrist


Use these procedures to remove the wrist.

Preparations before removing the wrist

Action	Note	
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Remove tools and other equipment fitted to the wrist.	
3	<p>Jog the robot into position:</p> <ul style="list-style-type: none"> • Axis 1: no significance • Axis 2: no significance • Axis 3: no significance • Axis 4: +90° • Axis 5: +90° • Axis 6: no significance 	 <p>xx2100002164</p>
4	<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 safe-guarded space.</p>	

Retrieving access to the wrist cabling

Use this procedure to remove the wrist cover.

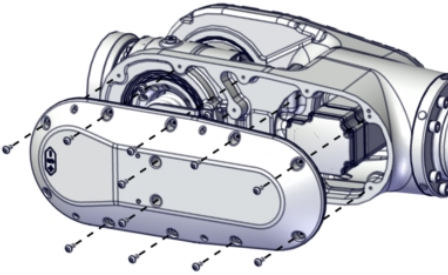
Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>

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5 Repair

5.6.1 Replacing the wrist

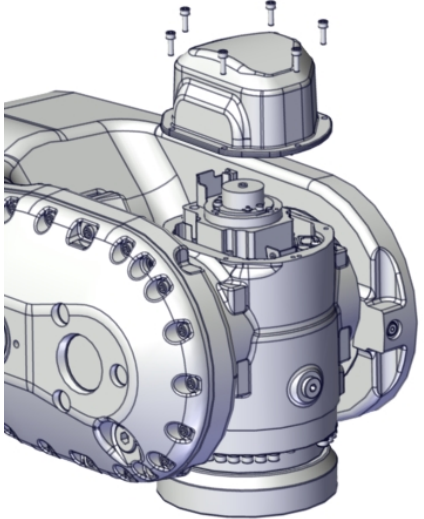
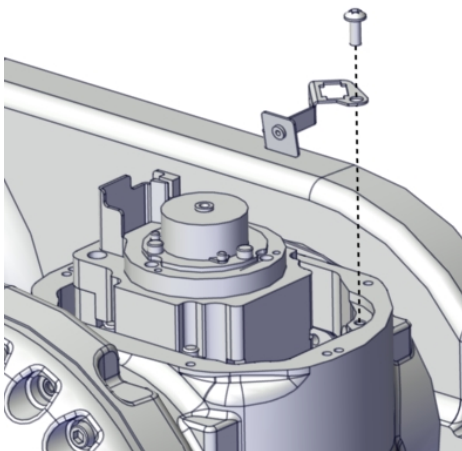
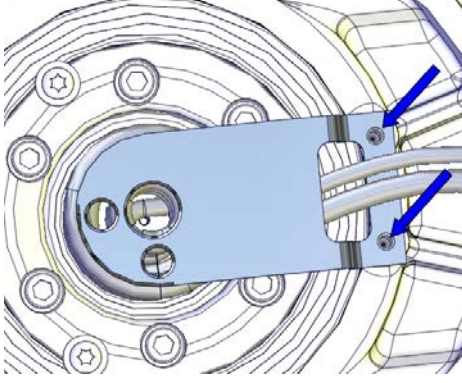
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	Action	Note
2	Remove the wrist cover.	 <p>xx2000000373</p>

Disconnecting the axis-6 motor cables

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

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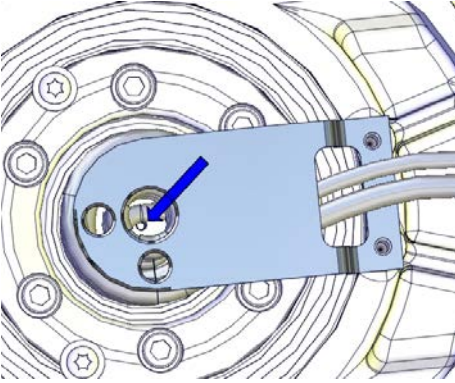
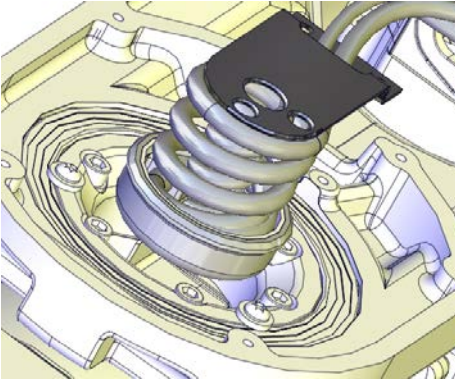
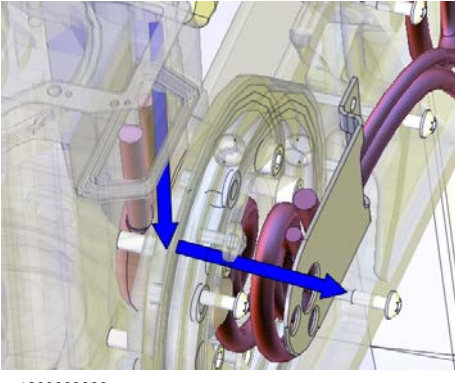
	Action	Note
2	Unscrew the attachment screws and remove the motor cover.	 <p>xx2000000376</p>
3	Remove the connector bracket.	 <p>xx2000000375</p>
4	Disconnect the motor cables.	
5	Unscrew the attachment screws that hold the cable bracket.	 <p>xx1300000484</p>

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5 Repair

5.6.1 Replacing the wrist

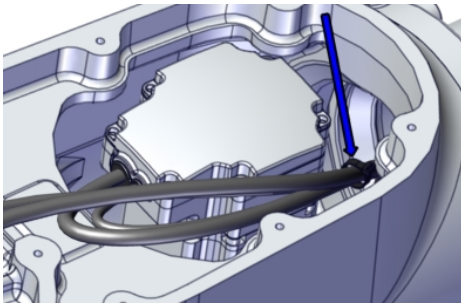
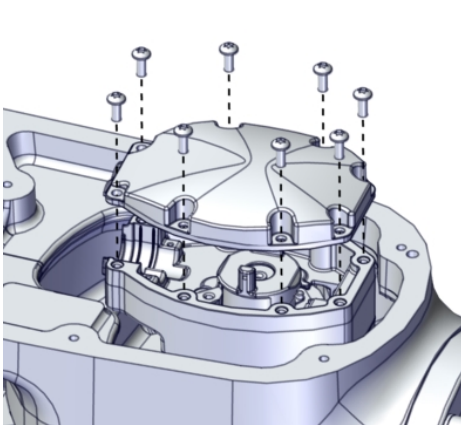
Continued

	Action	Note
6	<p>Unscrew the M4 screw that holds the carrier.</p> <p> Note</p> <p>The screw is located at the bottom of the carrier.</p>	 <p>xx1300000485</p>
7	<p>Pull out the carrier from its position.</p>	 <p>xx1300001113</p>
8	<p>Pull out the axis-6 motor cables by holding the cables with one hand at the motor and the other at the carrier.</p>	 <p>xx1300000666</p>

Disconnecting the axis-5 motor cables

	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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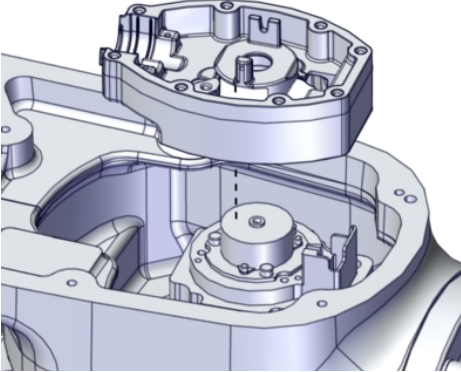
	Action	Note
2	Cut the cable tie.	 <p>xx2100002630</p>
3	Remove the motor cover by removing the screws.	 <p>xx2100002315</p>
4	Disconnect the power cable connector by removing the attachment screw.	
5	Disconnect the signal cable connector.	
6	Remove the cable bracket by removing the screws.	
7	Remove the motor cables.	

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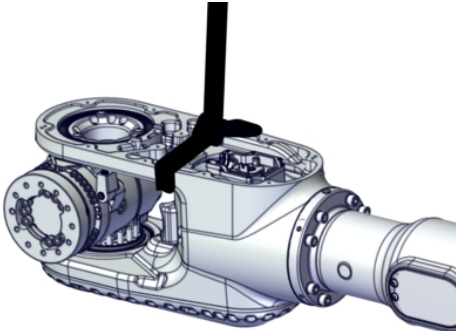
5 Repair

5.6.1 Replacing the wrist

Continued

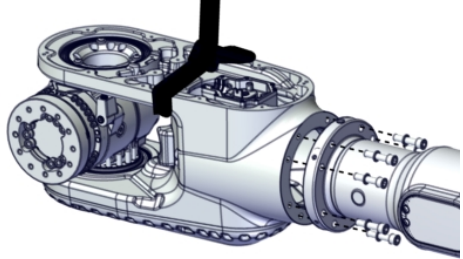

	Action	Note
8	IRB 5710-90/2.7, IRB 5710-70/2.7 LID: Remove the connection box.	 <p>xx2100002316</p>

Attaching the lifting accessories to the wrist

	Action	Note
1	 CAUTION The weight of the wrist is IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 70 kg IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 40 kg All lifting accessories used must be sized accordingly.	
2	Attach a roundsling to the wrist as shown in the figure.  CAUTION The roundsling placement shown in the figure keeps the wrist balanced when lifted, which reduces risk of damage or injury. Do not attach the roundsling around the axis-5 gearbox!	Roundsling, 1 m: Length: 1 m. 
3	Stretch the roundsling so it carries the weight of the wrist.	<p>xx2100001290</p>

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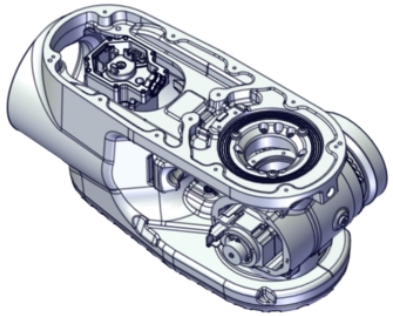

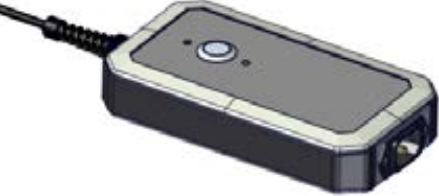
Removing the wrist

	Action	Note
1	Remove the attachment screws.	 <p>xx2100001289</p>
2	Pull out the wrist a bit and bring out the cabling from the wrist unit.  CAUTION Make sure that the cabling does not get damaged.	
3	Lift away the wrist.	

Refitting the wrist

These procedures describes how to refit the wrist.

Preparations before refitting the wrist


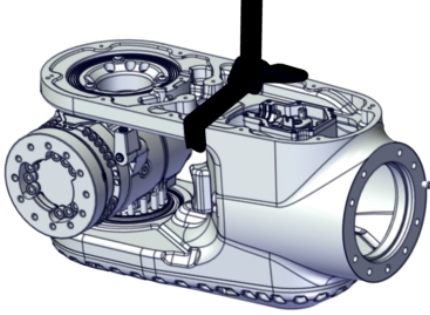
	Action	Note
1	Wipe clean all contact surfaces.	 <p>xx2100001292</p>
2	Prepare the new wrist spare part by removing the wrist cover and the motor covers.	
3	If axis 5 is not already in position +90°, connect the brake release tool, release the brakes and move the axis manually into that position. Release the brakes of the axis-5 motor with the brake release tool. <ol style="list-style-type: none"> 1 Turn off the brake release tool. 2 Connect the tool to the R2.MP5 connector. 3 Release the brakes by turning on the brake release tool and pressing the brake release button on the tool.  DANGER Handling the tool incorrectly will cause serious injury. Read and follow enclosed user instructions for the tool.	Brake release tool: 3HAC081310-001 User instructions are enclosed with the tool.  <p>xx2100000666</p>

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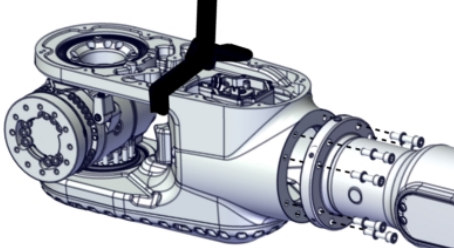
5 Repair

5.6.1 Replacing the wrist

Continued

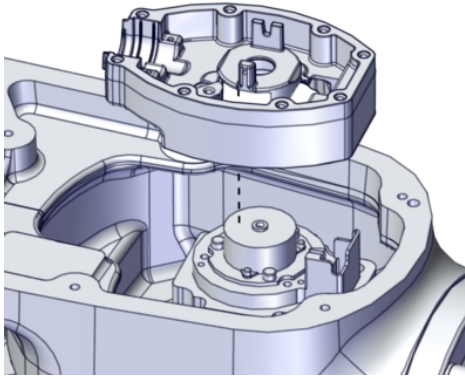
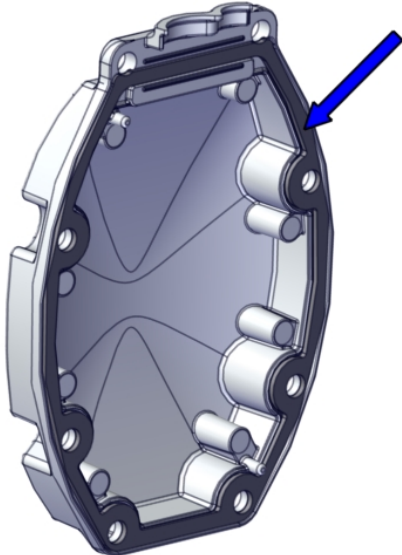
	Action	Note
4	<p>Attach a roundsling to the wrist as shown in the figure.</p> <p> CAUTION</p> <p>The roundsling placement shown in the figure keeps the wrist balanced when lifted, which reduces risk of damage or injury. Do not attach the roundsling around the axis-5 gearbox!</p>	<p>Roundsling, 1 m: Length: 1 m.</p>  <p>xx2100001291</p>

Refitting the wrist

	Action	Note
1	<p>Lift the wrist into mounting position and run the cabling into the wrist housing. Be careful not to damage any part of the cable harness.</p>	
2	<p>Slide the wrist into fitting position.</p>	<p>Hex socket head cap screw: M12x50 12.9 Gleitmo 603+Geomet 500 (IRB 5710-110/2.3, IRB 5710-90/2.3 LID) M10x40 12.9 Gleitmo 603+Geomet 500 (IRB 5710-90/2.7, IRB 5710-70/2.7 LID)</p>  <p>xx2100001289</p>
4	<p>Tighten the attachment screws.</p>	<p>Tightening torque: see standard torque in Screw joints on page 598.</p>

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Connecting the axis-5 motor cables


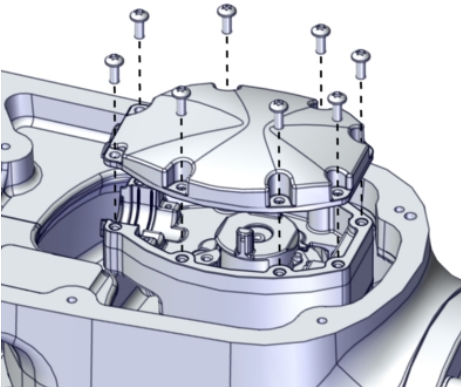
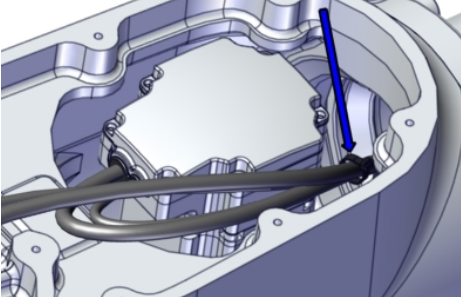
	Action	Note
1	IRB 5710-90/2.7, IRB 5710-70/2.7 LID: Refit the connection box with the screws.	 <p>xx2100002316</p>
2	Put the motor cables in place in the opening.	
3	Refit the cable bracket with the screws.	Torx pan head screw: M3x12 Stainless steel A2-70
4	Connect the motor cables. Connect in accordance with the markings on the connectors.	
5	Secure the power connector with a screw.	Tightening torque: 1 Nm
6	Inspect the gasket. Replace the complete cover if the gasket is damaged.	<p>Connection box cover with gasket: IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange) IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 3HAC072861-003 (Graphite White) 3HAC072861-004 (ABB Orange)</p>  <p>xx2100002317</p>

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5 Repair

5.6.1 Replacing the wrist

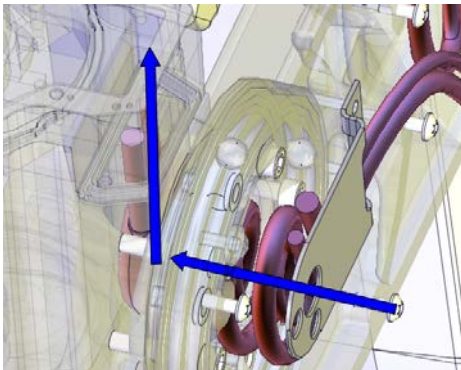
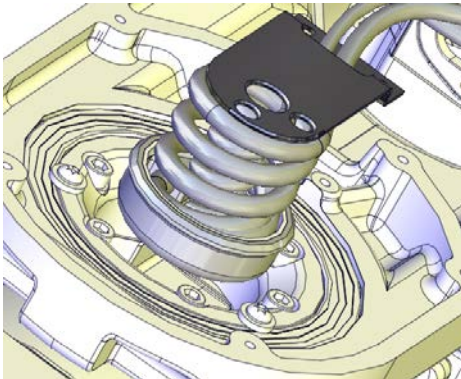


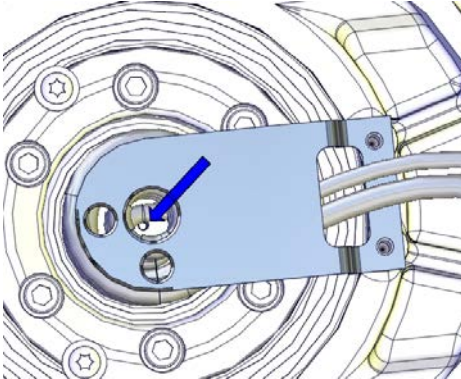
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	Action	Note
7	 CAUTION When fitting the motor cover, make sure that none of the cables inside will be damaged.	
8	Refit the motor cover with its attachment screws. Use locking liquid.	Torx pan head screw: M5x12 Stainless steel A2-70 Locking liquid: 3HAC041807-004 (Loctite 2400) Tightening torque: 6 Nm.  xx2100002315
9	Secure the cabling with a cable strap.	Cable strap, outdoor: 21662055-3  xx2100002630

Connecting the axis-6 motor cables

	Action	Note
1	 Note Axis 5 must be in position +90° (or as close as possible) for a correct installation of the cable harness in the wrist. If not, connect the brake release tool to the axis-5 motor connector, release the brakes and move axis 5 manually to +90°.	

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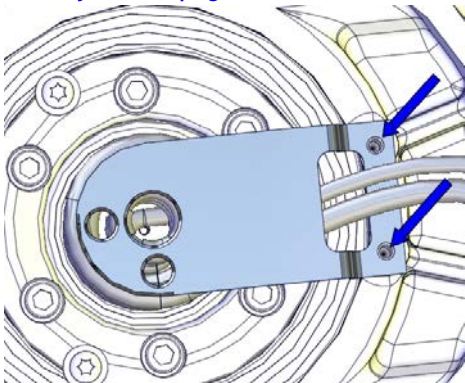
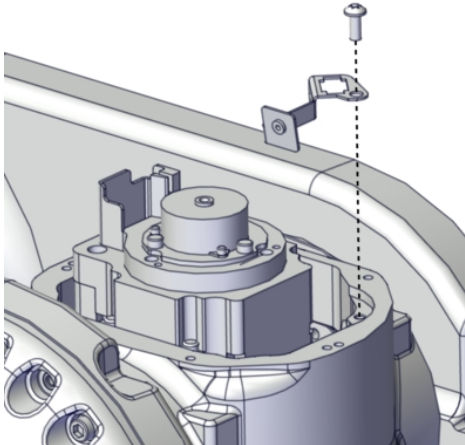
	Action	Note
2	<p>Push the cable harness into the wrist recess and up into the axis-6 motor.</p>	 <p>xx130000667</p>
3	<p>Push the carrier carefully into position.</p>	 <p>xx1300001113</p>
4	<p>Secure the carrier with the M4 screw.</p> <p> Note The screw is located at the bottom of the carrier.</p> <p> Tip The attachment screw securing the carrier may be difficult to fit. Make sure the carrier is level and completely pressed against the bottom.</p>	 <p>xx130000485</p>

Continues on next page

5 Repair

5.6.1 Replacing the wrist

Continued

	Action	Note
5	Secure the cable bracket with its attachment screws.	<p>Torx pan head screw: M6x16 Stainless steel A2-70</p> <p>Tightening torque: see standard torque in Screw joints on page 598..</p>  <p>xx1300000484</p>
6	Connect the motor cables. Connect in accordance with the markings on the connectors.	
7	Secure the power connector to the connector bracket with a screw.	Tightening torque: 1 Nm
8	Refit the connector bracket with the attached connectors.	<p>Torx pan head screw: M5x12 Stainless steel A2-70</p>  <p>xx2000000375</p>

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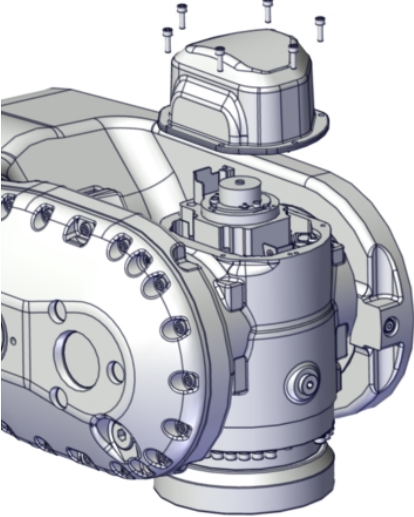
	Action	Note
9	Verify correct cable layout as shown in the figure.	 <p>xx2100001293</p>
10	Inspect the gasket. Replace if damaged.	<p>Gasket, tilt housing cover: 3HAC071520-001</p>  <p>xx2100001287</p>
11	 CAUTION When fitting the motor cover, make sure that none of the cables inside will be damaged.	

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5 Repair

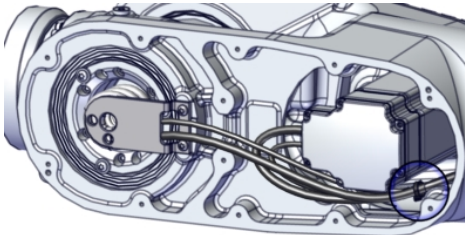
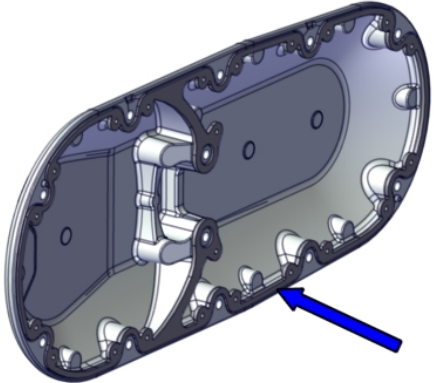
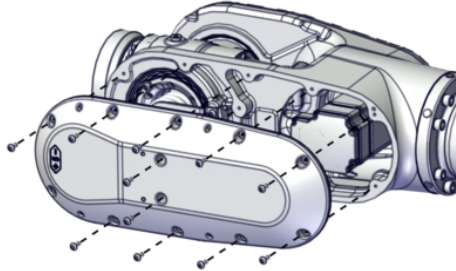
5.6.1 Replacing the wrist

Continued

	Action	Note
12	Refit the motor cover.	<p>Hex socket head cap screw: M5x16 12.9 Lafre 2C2B/FC6.9 (6 pcs) Tightening torque: 4 Nm.</p>  <p>xx200000376</p>

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Refitting the wrist cover

	Action	Note
1	Make sure that the cable harness is routed and secured as shown in the figure.	 <p>xx2100002627</p>
2	<p><i>Foundry Plus:</i> Inspect the gasket. Replace the complete cover if the gasket is damaged.</p>	<p>Wrist cover: IRB 5710-110/2.3 / IRB 5710-90/2.3 LID: 3HAC073390-002 (Graphite White) 3HAC073390-004 (ABB Orange) IRB 5710-90/2.7 / IRB 5710-70/2.7 LID: 3HAC070151-004 (Graphite White) 3HAC070151-006 (ABB Orange)</p>  <p>xx2100001407</p>
3	Refit the wrist cover and secure with screws.	<p>Torx pan head screw: M6x16 Stainless steel A2-70 Tightening torque: 10 Nm.</p>  <p>xx2000000373</p>

Concluding procedure


	Action	Note
1	<p><i>Foundry Plus:</i> Refit protection plugs.</p>	

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5 Repair

5.6.1 Replacing the wrist

Continued

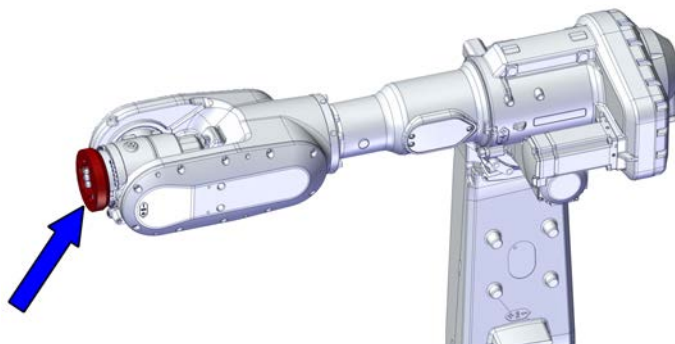
	Action	Note
2	Calibrate the robot.	See Calibration on page 563 .
3	 DANGER Make sure all safety requirements are met when performing the first test run.	

5.6.2 Replacing the turning disc

Location of the turning disc

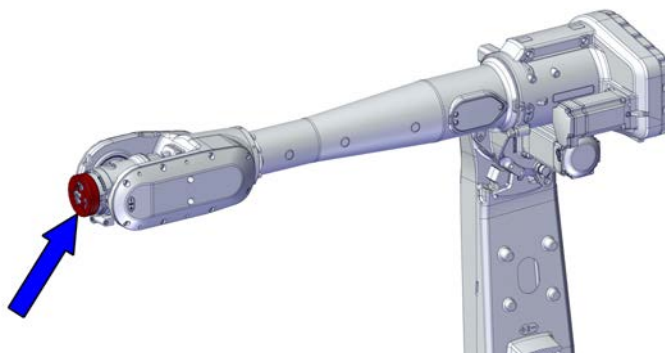
The turning disc is located as shown in the figure.

IRB 5710-110/2.3:



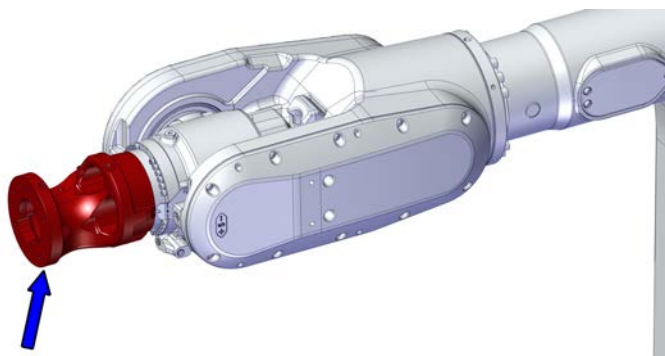
xx2100002166

IRB 5710-90/2.7:



xx2100002260

IRB 5710-90/2.3 LID, IRB 5710-70/2.7 LID:



xx2100002628

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5 Repair

5.6.2 Replacing the turning disc

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 5710 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note	Level
Turning disc	IRB 5710-110/2.3: 3HAC077309-002 IRB 5710-90/2.7: 3HAC077311-002		L2
Process turning disc	IRB 5710-90/2.3 LID: 3HAC070389-004 IRB 5710-70/2.7 LID: 3HAC070180-004		L2

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

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.	
	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 573 .


Continues on next page

	Action	Note
	<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 turning disc

Use these procedures to remove the turning disc.

Preparations before removing the turning disc

	Action	Note
1	Run the robot to a position most comfortable for the removal of the turning disc.	
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 safeguarded space.</p>	
3	Remove any equipment fitted to the turning disc.	

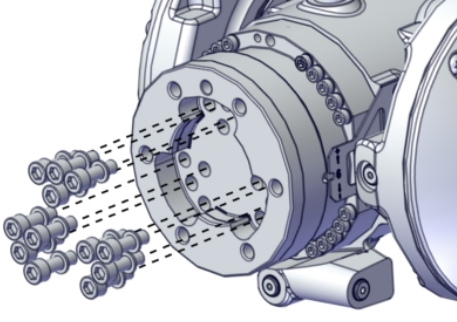
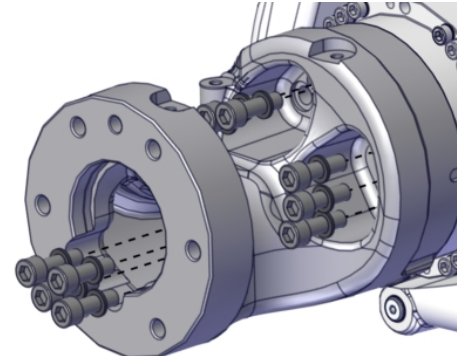
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5 Repair

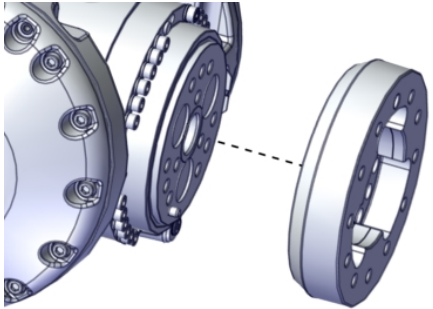
5.6.2 Replacing the turning disc

Continued

Removing the turning disc

	Action	Note
1	Remove the screws and washers, that secure the turning disc.	<p>IRB 5710-110/2.3:</p>  <p>xx2100002167</p> <p>IRB 5710-90/2.7:</p>  <p>xx2100002265</p> <p>IRB 5710-90/2.3 LID, IRB 5710-70/2.7 LID:</p>  <p>xx2100002690</p>

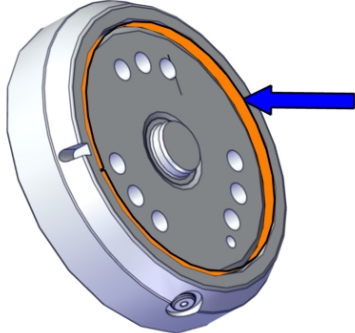
Continues on next page

	Action	Note
2	Remove the turning disc.	 <p>xx2100002168</p>

Refitting the turning disc

Use these procedures to refit the turning disc.

Refitting the turning disc

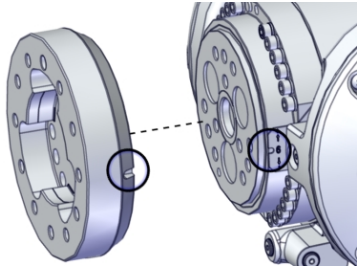
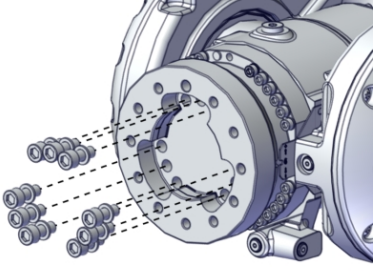
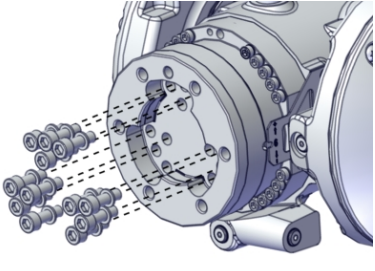
	Action	Note
1	Wipe clean the contact surfaces.	
2	<p><i>Protection type Foundry Plus:</i> Apply rust preventive to the surface shown in the figure.</p>	<p>Rust preventive: 3HAC034903-001 (Mercasol 3110 Waxcoat. Recommended drying time is 24h.)</p>  <p>xx2100002232</p>

Continues on next page

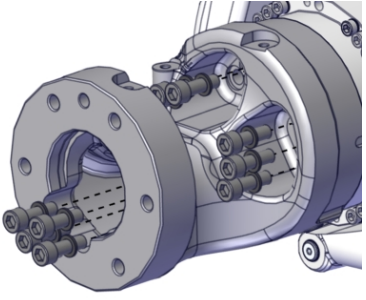
5 Repair

5.6.2 Replacing the turning disc


Continued

	Action	Note
3	<p>Fit the turning disc to the wrist. Orient the disc according to the synchronization marks.</p>	 <p>xx2100002169</p>
4	<p>Secure the turning disc with its attachment screws and washers.</p>	<p>Hex socket head cap screw: M10x25 12.9 Gleitmo 603+Geomet 500 (IRB 5710-110/2.3, IRB 5710-90/2.3 LID) M8x25 12.9 Gleitmo 603+Geomet 500 (IRB 5710-90/2.7, IRB 5710-70/2.7 LID) Washer: 3HAB4233-1 (IRB 5710-110/2.3, IRB 5710-90/2.3 LID), 9 pcs IRB 5710-90/2.7, IRB 5710-70/2.7 LID: Steel 8.4x13x1.5 Tightening torque: see standard torque in Screw joints on page 598. IRB 5710-110/2.3:</p>  <p>xx2100002167</p> <p>IRB 5710-90/2.7:</p>  <p>xx2100002265</p> <p>IRB 5710-90/2.3 LID, IRB 5710-70/2.7 LID:</p>

Continues on next page

	Action	Note
		 <p>xx2100002690</p>

Concluding procedure

	Action	Note
1	 <p>DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

5 Repair

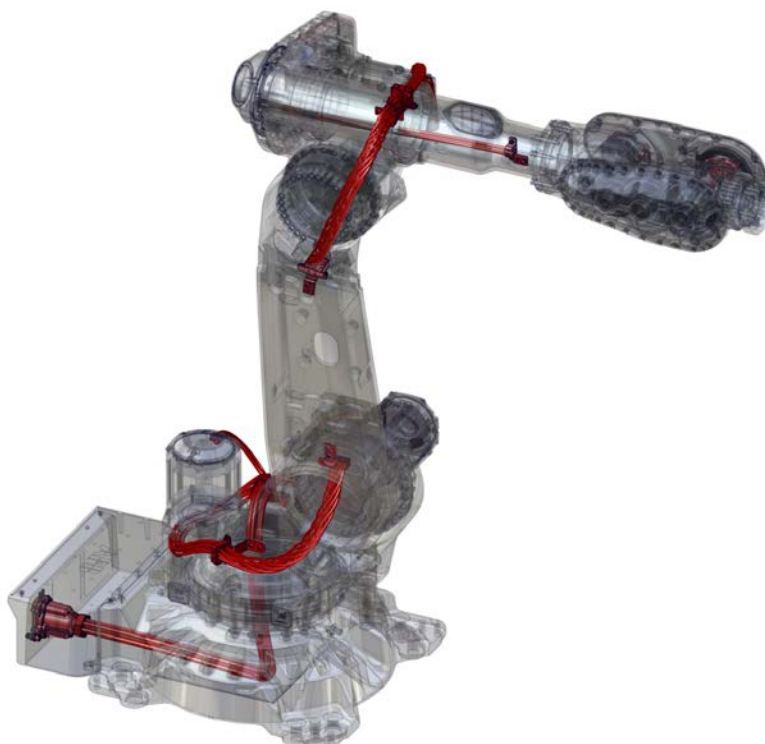
5.7.1 Removing the cable harness

5.7 Electronic parts

5.7.1 Removing the cable harness

Location of the cable harness

The cable harness is located as shown in the figure.



xx210000483

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 5710 via myABB Business Portal, www.abb.com/myABB.


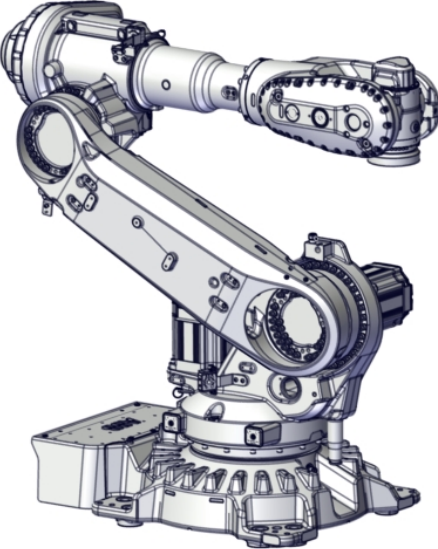

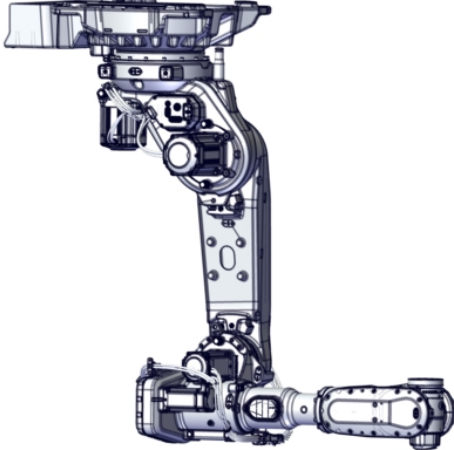

Spare part	Article number	Note	Level
Cable harness	3HAC071396-001		L2

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

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Preparations before removing the cable harness

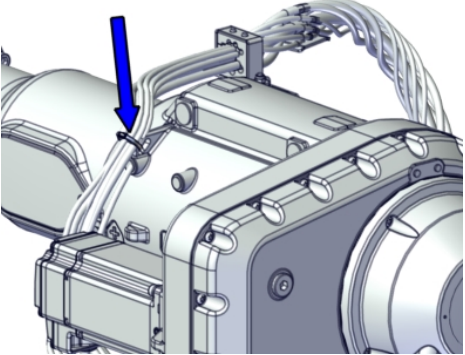
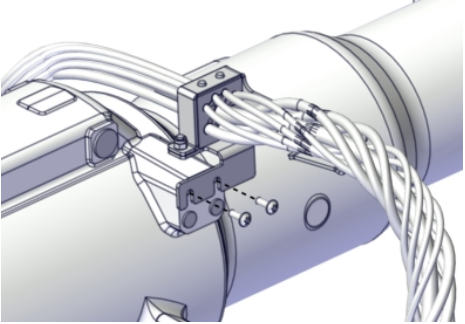
	Action	Note
1	<p>Floor-standing robot:</p> <p>Jog the robot to the specified position:</p> <ul style="list-style-type: none"> • Axis 1: 0° • Axis 2: -60° • Axis 3: +60° • Axis 4: 0° • Axis 5: +90° • Axis 6: No significance. <p> Note</p> <p>The specified position is a recommended position.</p> <p>Orient axis-5 as close as possible to +90° to be able to open the axis-6 motor cover and to remove the axis-6 motor cables. The axis-5 position is also important to avoid the spiral of the cable harness in the carrier being unwound or placed in wrong position.</p> <p>Depending on what tool is used, the other axes may need to be jogged to another position.</p>	 <p>xx2100002132</p>
2	<p>Option Inverted (3317-1)</p> <p>Jog the robot to the specified position:</p> <ul style="list-style-type: none"> • Axis 1: 0° • Axis 2: 0° • Axis 3: 0° • Axis 4: 0° • Axis 5: +90° • Axis 6: No significance. <p> Note</p> <p>The specified position is a recommended position.</p> <p>Orient axis-5 as close as possible to +90° to be able to open the axis-6 motor cover and to remove the axis-6 motor cables. The axis-5 position is also important to avoid the spiral of the cable harness in the carrier being unwound or placed in wrong position.</p> <p>Depending on what tool is used, the other axes may need to be jogged to another position.</p>	 <p>xx2100002138</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 safe-guarded space.</p>	

Continues on next page

5 Repair

5.7.1 Removing the cable harness

Continued


	Action	Note
4	Cut the cable tie at the eyelet on top of the arm house.	 xx2000000415
5	Remove the metal clamp on top of the arm house.	 xx2100001285

Removing the cable harness - upper arm and wrist

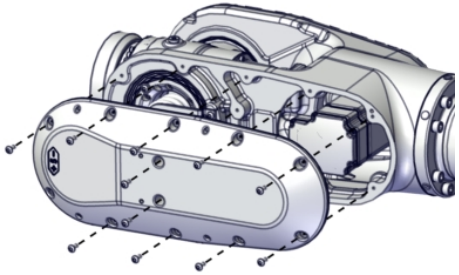
These procedures describe how to remove the cable harness in the upper arm and wrist.

Retrieving access to the wrist cabling


Use this procedure to remove the wrist cover.

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

Continues on next page

	Action	Note
2	Remove the wrist cover.	 <p>xx2000000373</p>

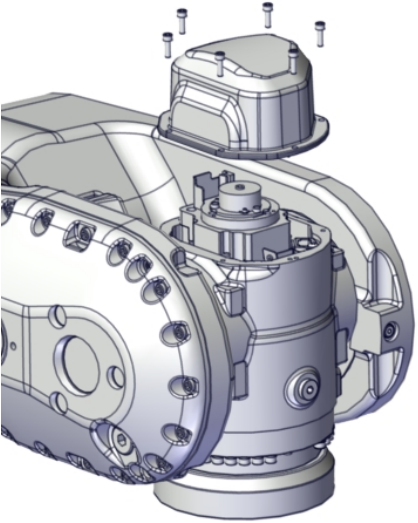
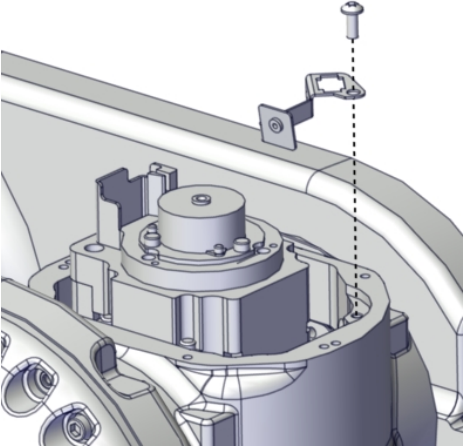
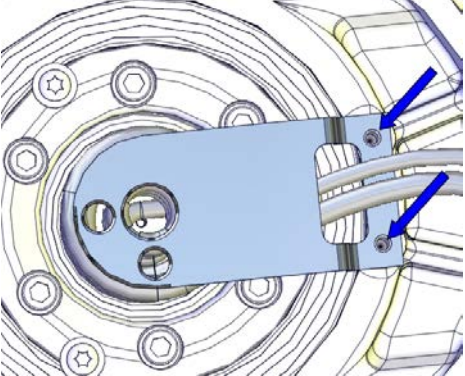
Disconnecting the axis-6 motor cables

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


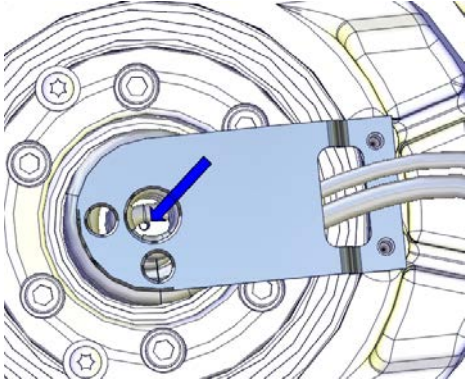
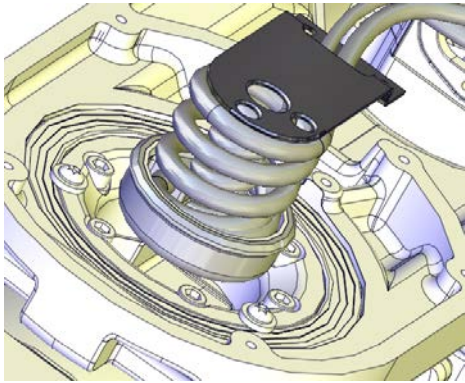
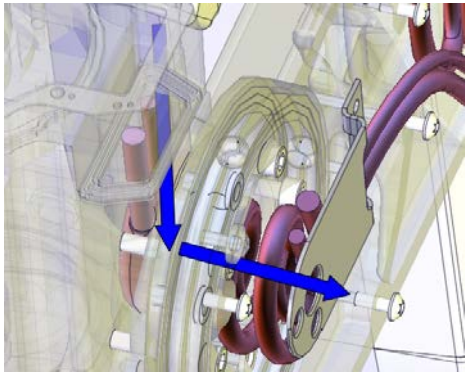
5 Repair

5.7.1 Removing the cable harness


Continued

	Action	Note
2	Unscrew the attachment screws and remove the motor cover.	 <p>xx200000376</p>
3	Remove the connector bracket.	 <p>xx200000375</p>
4	Disconnect the motor cables.	
5	Unscrew the attachment screws that hold the cable bracket.	 <p>xx130000484</p>

Continues on next page

	Action	Note
6	<p>Unscrew the M4 screw that holds the carrier.</p> <p> Note</p> <p>The screw is located at the bottom of the carrier.</p>	 <p>xx130000485</p>
7	<p>Pull out the carrier from its position.</p>	 <p>xx1300001113</p>
8	<p>Pull out the axis-6 motor cables by holding the cables with one hand at the motor and the other at the carrier.</p>	 <p>xx130000666</p>

Disconnecting the axis-5 motor cables

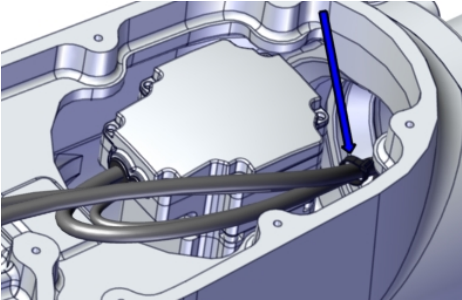
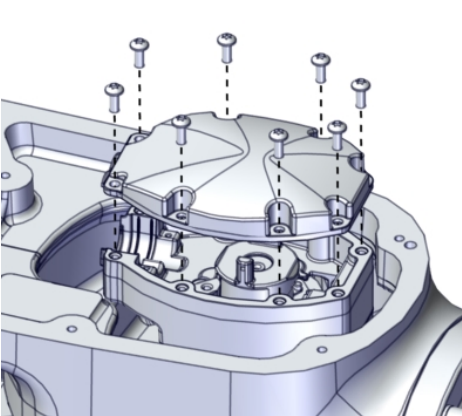
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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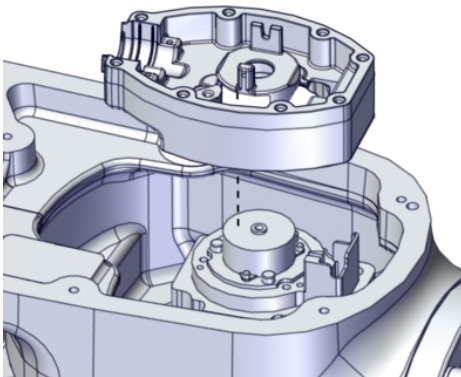
5 Repair

5.7.1 Removing the cable harness


Continued

	Action	Note
2	Cut the cable tie.	 xx2100002630
3	Remove the motor cover by removing the screws.	 xx2100002315
4	Disconnect the power cable connector by removing the attachment screw.	
5	Disconnect the signal cable connector.	
6	Remove the cable bracket by removing the screws.	
7	Remove the motor cables.	

Continues on next page

	Action	Note
8	IRB 5710-90/2.7, IRB 5710-70/2.7 LID: Remove the connection box.	 <p>xx2100002316</p>

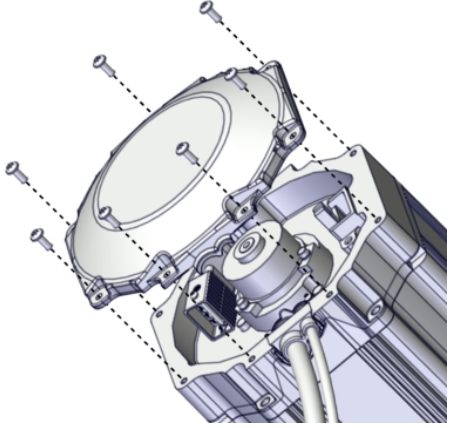
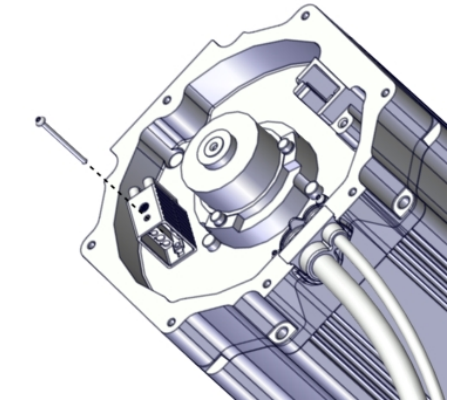
Disconnecting the axis-3 and axis-4 motor cables

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

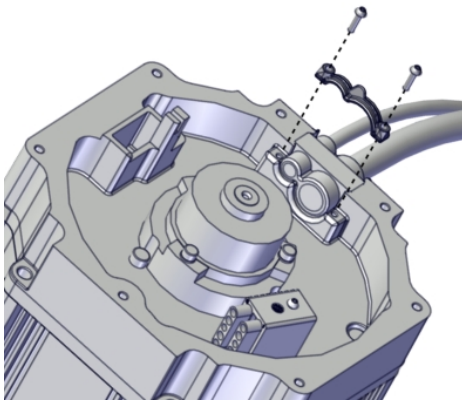
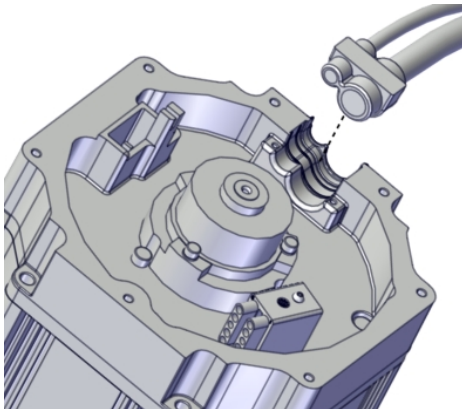
5 Repair

5.7.1 Removing the cable harness


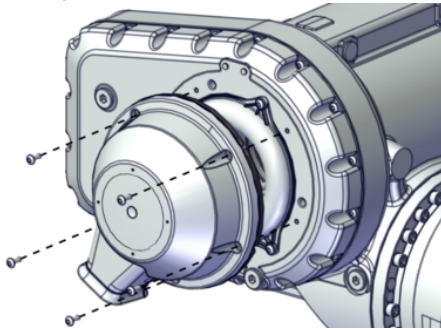
Continued

	Action	Note
2	Remove the motor cover by removing the screws.	 <p>xx210000596</p>
3	Disconnect the power cable connector by removing the attachment screw.	 <p>xx210000667</p>
4	Disconnect the signal cable connector.	

Continues on next page

	Action	Note
5	Remove the cable bracket by removing the screws.	 <p>xx2100000598</p>
6	Remove the motor cables.	 <p>xx2100000599</p>

Removing the cable harness from the wrist and upper arm

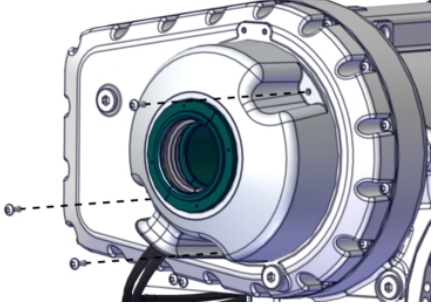


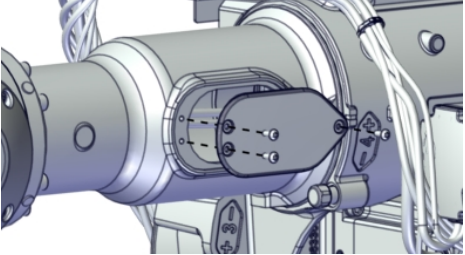
	Action	Note
1	<p><i>Foundry Plus, DressPack:</i> Remove the cover.</p> <p> Note Use caution not to damage the gasket.</p>	<p><i>Foundry Plus</i></p>  <p>xx2000000422</p> <p><i>DressPack</i></p>

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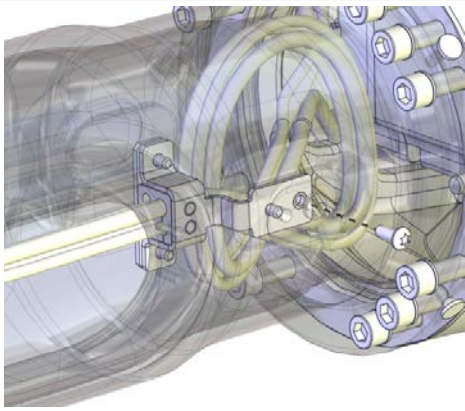
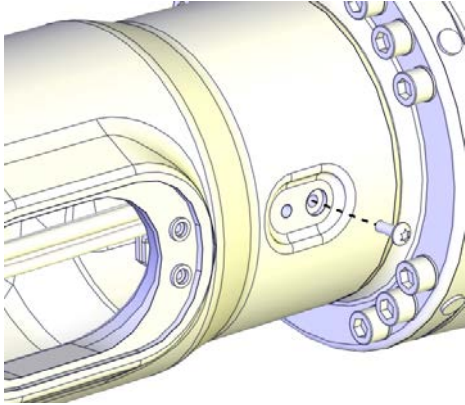
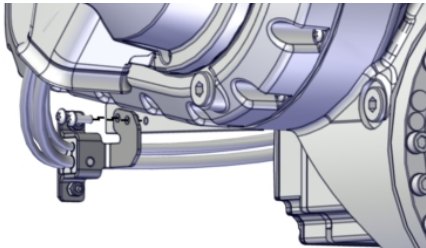
5 Repair

5.7.1 Removing the cable harness

Continued

Action	Note
	 <p>xx2100002679</p>
<p>2</p> <p> Tip</p> <p>Use tape and tie the axis-5 and axis-6 connectors and carrier into a bundle (if not already done). This is done to facilitate the removal and to avoid damaging the parts. This will also make it easier to run the cable harness through the inside of the upper arm.</p>	 <p>xx1300000668</p>
<p>3</p> <p>Remove the side cover on the arm tube.</p>	 <p>xx2000000420</p>


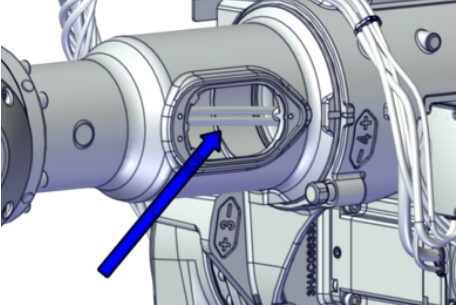
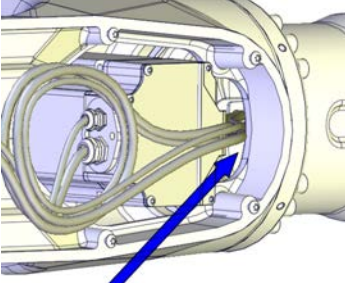

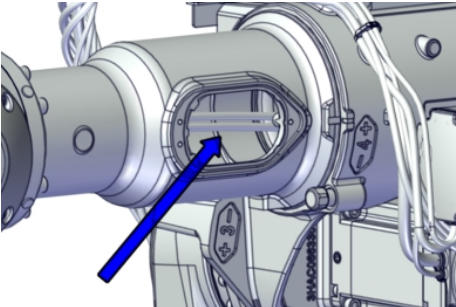
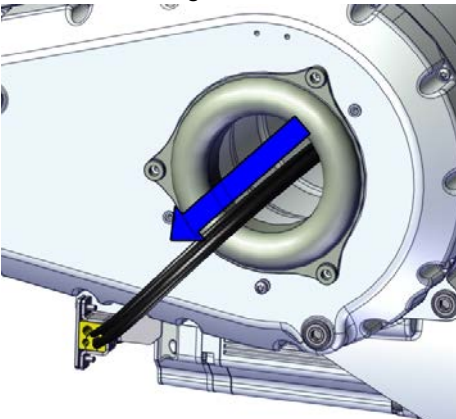
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	Action	Note
4	<p>Unscrew the attachment screw that secures the axis-4 metal clamp inside the arm tube.</p> <p> Note</p> <p>The screw is reached from outside the upper arm.</p>	 <p>xx170000340</p>  <p>xx170000339</p>
5	<p>Remove the arm house metal clamp.</p>	 <p>xx2100002154</p>

5 Repair

5.7.1 Removing the cable harness

Continued


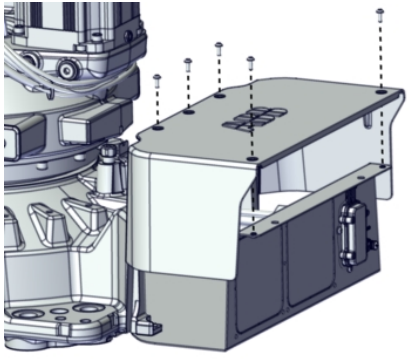
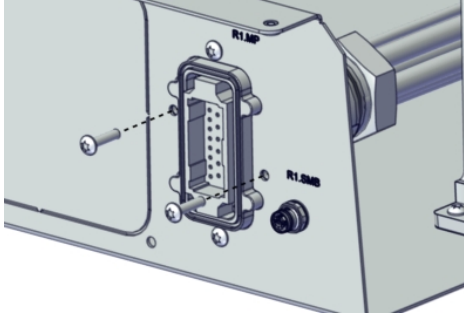
	Action	Note
6	<p>Remove the cable harness out from the wrist.</p> <p> Tip</p> <p>This step is best performed by two persons working together:</p> <ul style="list-style-type: none">• Person 1: Put one hand inside the side hole and take a hold of the cable harness.• Person 2: Take a hold on the cable harness inside the wrist.• Together: Move the cable harness past the axis-5 motor and into the arm tube.	<p>Person 1, working at the side hole:</p>  <p>xx2000000416</p> <p>Person 2, working at the wrist:</p>  <p>xx1300000746</p>
7	<p>Remove the cable harness out of the arm tube, at the back of the upper arm.</p> <p> Tip</p> <p>This step is best performed by two persons working together:</p> <ul style="list-style-type: none">• Person 1: Put one hand inside the side hole and take a hold of the cable harness.• Person 2: Take a hold on the cable harness at the back of the robot.• Together: Move the cable harness out of the arm tube.	<p>Person 1, working at side hole:</p>  <p>xx2000000416</p> <p>Person 2, working at the back:</p>  <p>xx1700001568</p>

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Removing the cable harness - base, frame and lower arm

These procedures describes how to remove the cable harness from base, frame and lower arm.

Preparations before removing the cable harness in the base

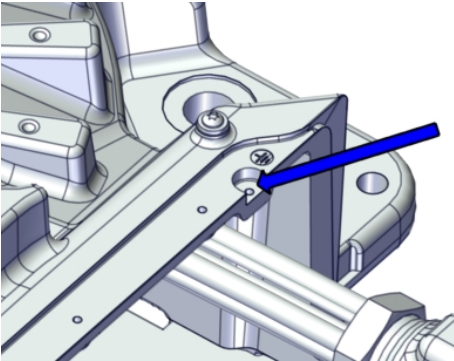
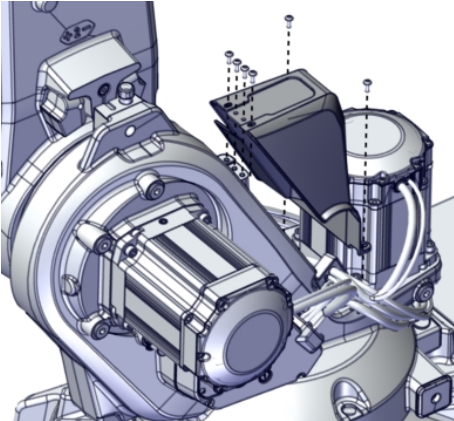
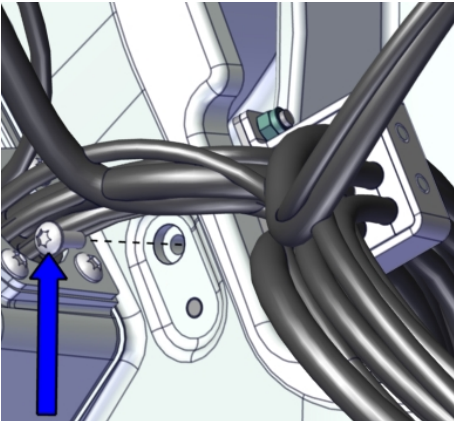
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the base cover.	 <p>xx210000981</p>
3	Loosen the connectors: <ul style="list-style-type: none"> • R1.MP • R1.SMB 	 <p>xx2100001109</p>

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5 Repair

5.7.1 Removing the cable harness

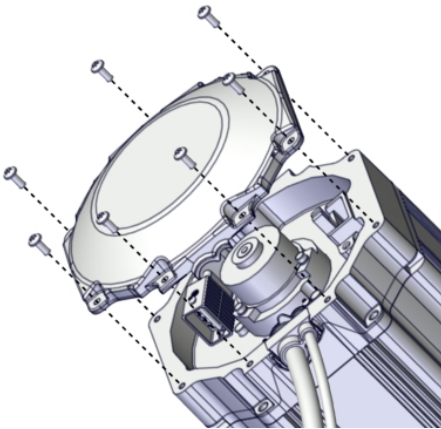
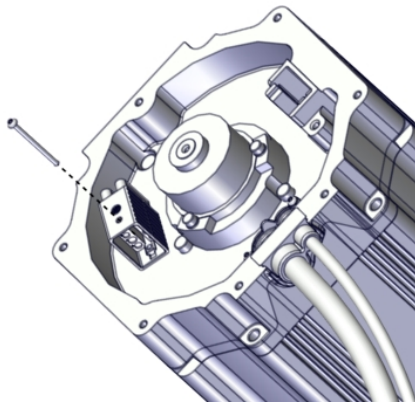
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	Action	Note
4	Disconnect the earth cable.	 <p>xx210000982</p>
5	Foundry Plus Remove the axis-1 cable protection plate by removing the attachment screws.	 <p>xx210000979</p>
6	Loosen the cable bracket from the frame by removing the screw.	 <p>xx2100001108</p>

Disconnecting the axis-1 and axis-2 motor cables

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

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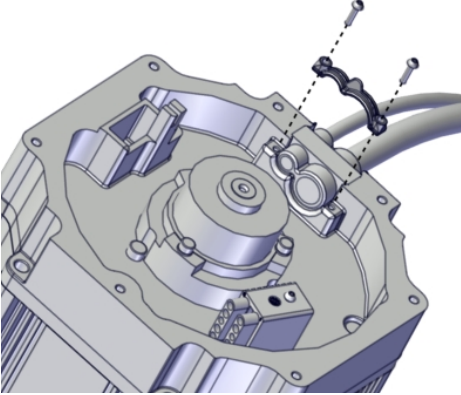
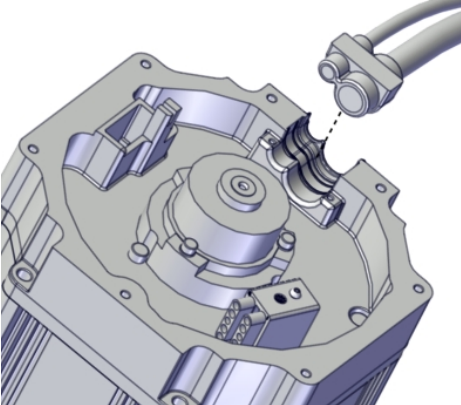
	Action	Note
2	Remove the motor cover by removing the screws.	 <p>xx210000596</p>
3	Disconnect the power cable connector by removing the attachment screw.	 <p>xx210000667</p>
4	Disconnect the signal cable connector.	

Continues on next page



5 Repair

5.7.1 Removing the cable harness

Continued

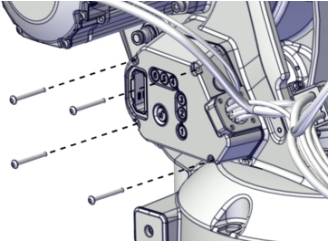

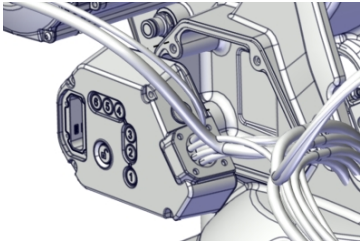
	Action	Note
5	Remove the cable bracket by removing the screws.	 <p>xx210000598</p>
6	Remove the motor cables.	 <p>xx210000599</p>

Removing the electronic box


	Action	Note
1	 <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 safeguarded space.</p>	
2	 <p>ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit read the safety information in section <i>The unit is sensitive to ESD on page 47</i>.</p>	

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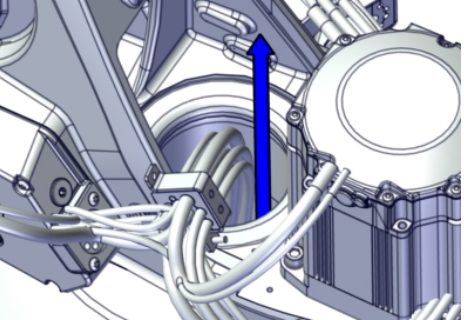
5.7.1 Removing the cable harness
Continued

	Action	Note
3	Remove the electronic box screws.	 <p>xx2100002134</p>
4	Remove the electronic box, including all internal equipment.  CAUTION Clean cover from metal residues before opening. Metal residues can cause shortage on the boards which can result in hazardous failures.	 <p>xx2100002135</p>

Disconnecting the SMB and brake release units

	Action	Note
1	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit read the safety information in section <i>The unit is sensitive to ESD on page 47</i> .	
2	Disconnect all connectors from the SMB board.	
3	Disconnect the connectors R2.BU1 and R2.BU2 from the brake release board.	

Removing the cable harness from the base

	Action	Note
1	Pull out the robot cable harness through the protection tube.	 <p>xx2100001111</p>
2	Place the cable harness safely on the frame.	

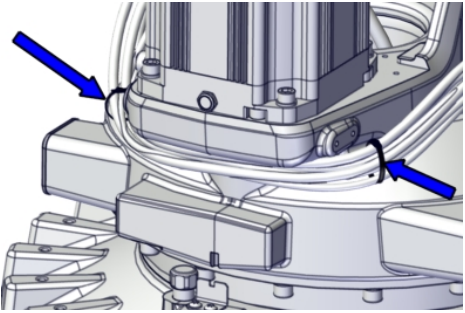
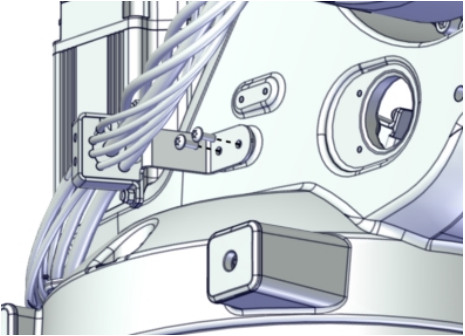
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5 Repair


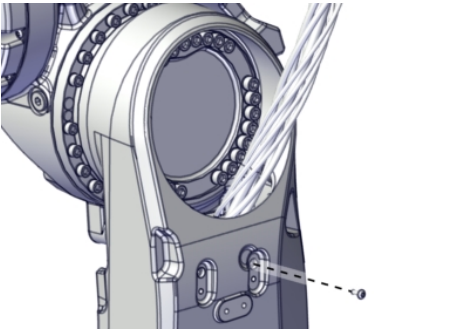
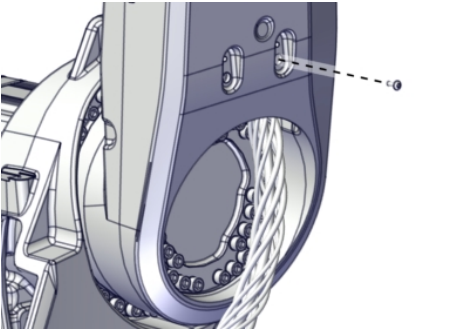
5.7.1 Removing the cable harness

Continued

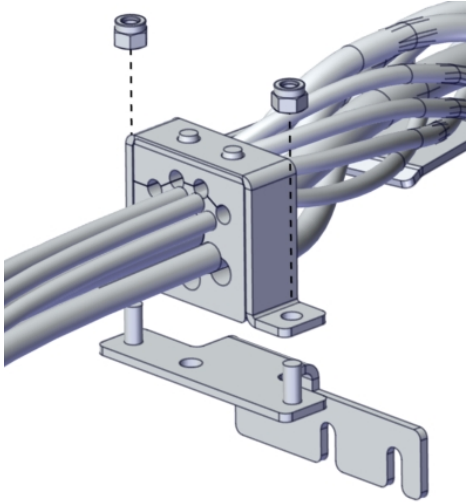
Removing the cable harness from the frame

	Action	Note
1	Cut the cable ties at the frame.	 <p>xx2100002133</p>
2	Loosen the cable bracket from the frame by removing the screws.	 <p>xx2000000442</p>

Removing the cable harness from the lower arm

	Action	Note
1	<p>Loosen the upper and lower cable clamps inside the lower arm by removing the attachment screws.</p> <p> Note</p> <p>The screws are reached from the outside of the lower arm.</p>	 <p>xx2100002182</p>  <p>xx2100002183</p>

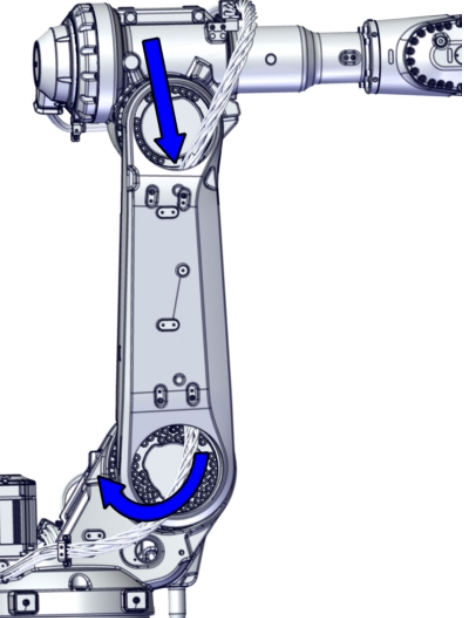
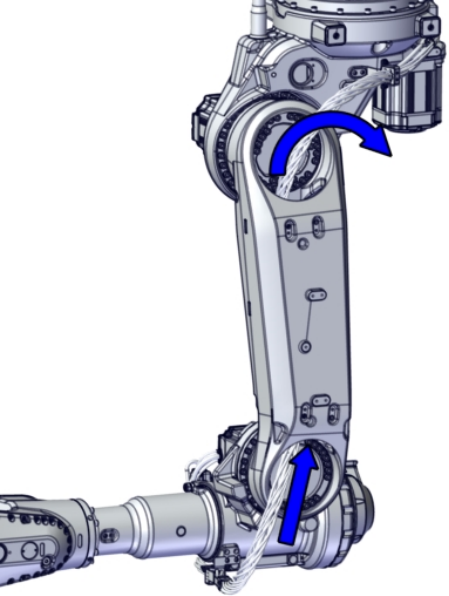
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	Action	Note
2	Remove the arm house metal clamp from the harness.	 <p>xx2100002139</p>

5 Repair

5.7.1 Removing the cable harness

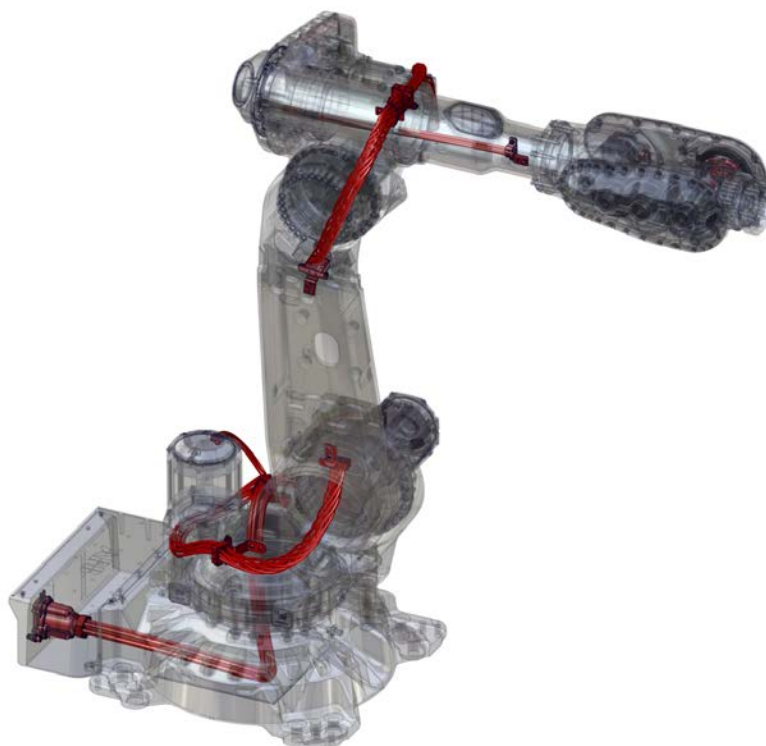
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	Action	Note
3	Use caution and pull the cable harness out.	<p><i>Floor-standing robot:</i></p>  <p>xx2100002144</p> <p><i>Option Inverted (3317-1):</i></p>  <p>xx2100002140</p>

5.7.2 Refitting the cable harness

Location of the cable harness

The cable harness is located as shown in the figure.



xx210000483

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 5710 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note	Level
Cable harness	3HAC071396-001		L2

Required service parts

Consumable	Article number	Note
Cable strap, outdoor	21662055-3	Polyamide 6.6
Metal strap	3HAC033886-001	
Locking liquid	3HAC041807-004	Loctite 2400

Continues on next page

5 Repair

5.7.2 Refitting the cable harness

Continued

Consumable	Article number	Note
Connection box cover FS180 with gasket	3HAC072864-003 (Graphite White) 3HAC072864-005 (ABB Orange)	Replace if damaged.
Connection box cover FS130 with gasket	3HAC072863-003 (Graphite White) 3HAC072863-005 (ABB Orange)	Replace if damaged.
Connection box cover FS100 with gasket	3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange)	Replace if damaged.
Tilt housing cover with gasket	3HAC073918-003 (Graphite White) 3HAC073918-004 (ABB Orange)	Replace if damaged.
Wrist cover	IRB 5710-110/2.3 / IRB 5710-90/2.3 LID: 3HAC073390-002 (Graphite White) 3HAC073390-004 (ABB Orange) IRB 5710-90/2.7 / IRB 5710-70/2.7 LID: 3HAC070151-004 (Graphite White) 3HAC070151-006 (ABB Orange)	Replace if damaged.
Gasket for cover, electronics	3HAC073671-001	Replace if damaged.

Required tools and equipment



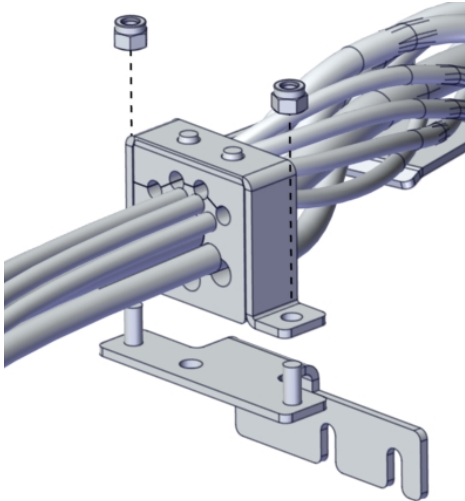
Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

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Refitting the cable harness - base, frame and lower arm

These procedures describes how to refit the cable harness in base, frame and lower arm.

Refitting the cable harness in the lower arm

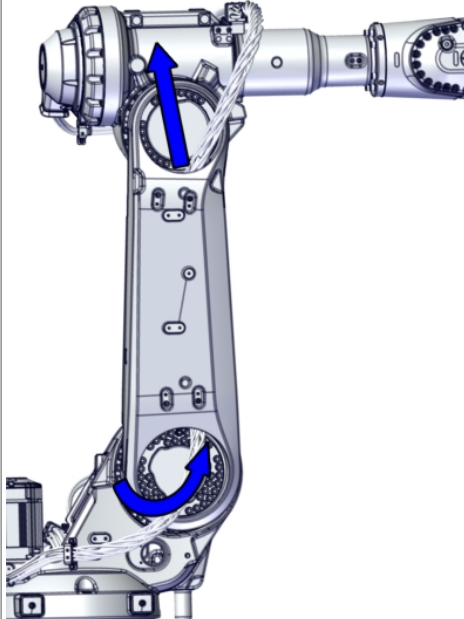
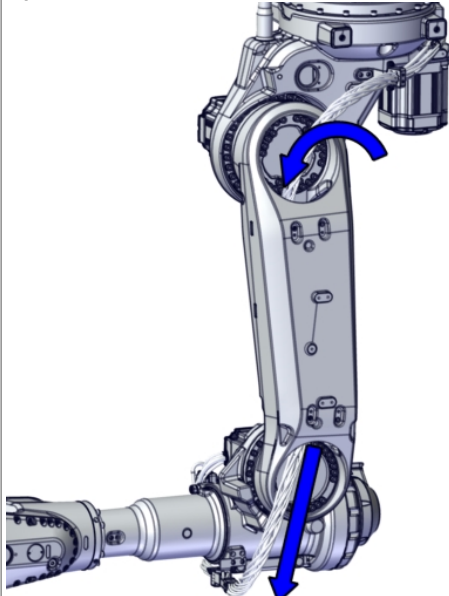
	Action	Note
1	<p> Tip</p> <p>Use tape and tie the axis-5 and axis-6 connectors and carrier into a bundle (if not already done). This is done to facilitate the procedure and to avoid damaging the parts during the procedure.</p> <p>This will also make it easier to run the cable harness through the inside of the robot.</p>	 <p>xx130000668</p>
2	<p>Remove the arm house metal clamp from the harness, if installed.</p>	 <p>xx2100002139</p>

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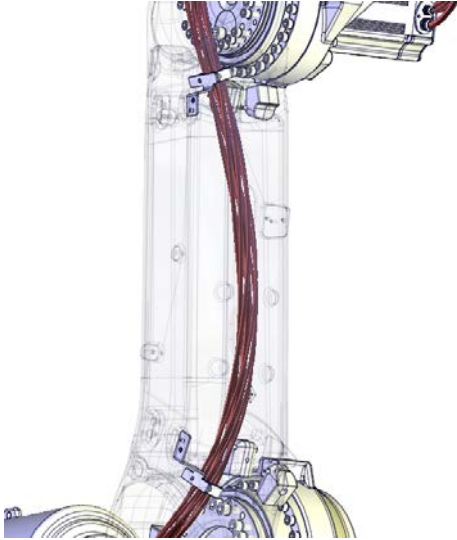
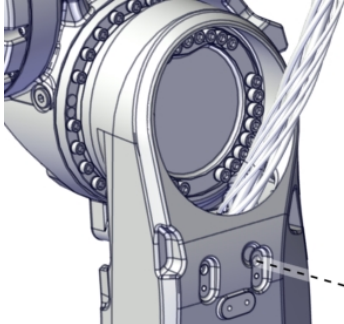
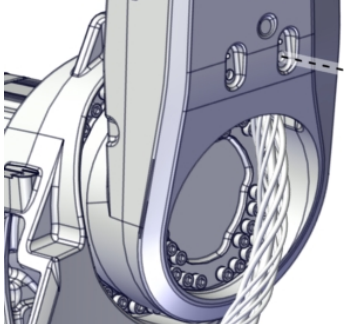
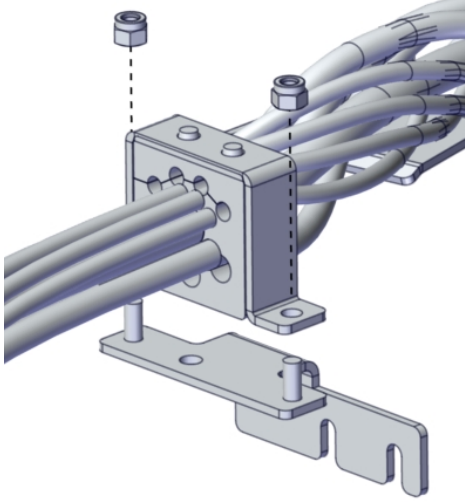
5 Repair

5.7.2 Refitting the cable harness

Continued

	Action	Note
3	Run the cable harness through the lower arm.	<p><i>Floor-standing robot:</i></p>  <p>xx2100002184</p> <p><i>Option Inverted (3317-1):</i></p>  <p>xx2100002185</p>

Continues on next page

	Action	Note
4	<p>Secure the upper and lower cable clamps inside the lower arm with the attachment screws.</p> <p> Note</p> <p>The screws are reached from the outside of the lower arm.</p> <p> Note</p> <p>Check that the cabling will stay a little bit twisted between the cable clamps. Do not change the position of the brackets!</p>  <p>xx130000595</p>	<p>Torx pan head screw: M6x16 Stainless steel A2-70</p> <p>Tightening torque: 6 Nm.</p>  <p>xx2100002182</p>  <p>xx2100002183</p>
5	<p>Refit the arm house metal clamp to the harness.</p>	 <p>xx2100002139</p>

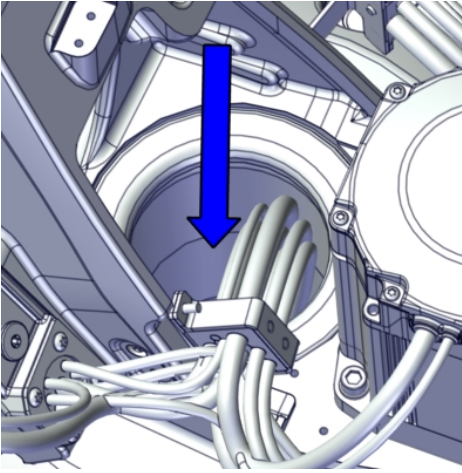
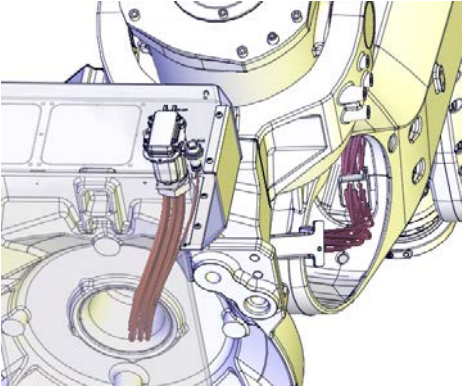
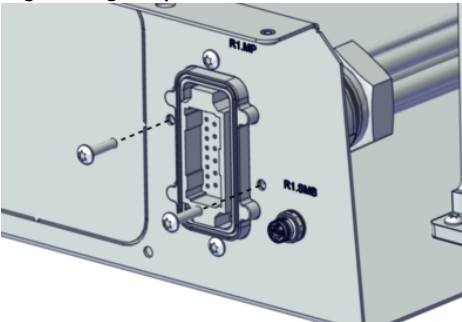
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5 Repair

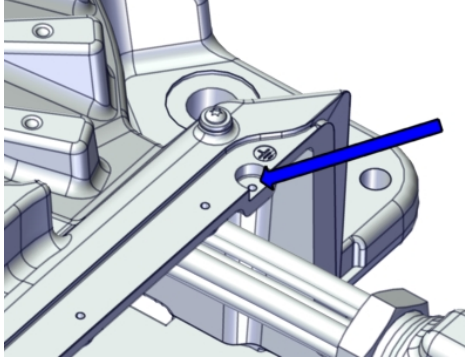
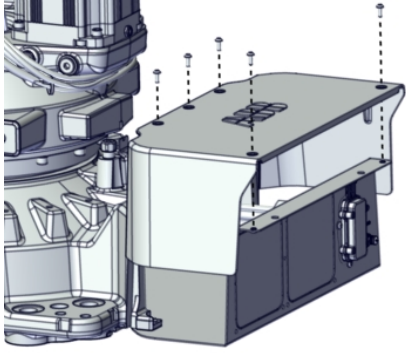
5.7.2 Refitting the cable harness

Continued


Refitting the cable harness in the base

	Action	Note
1	Run the cables through the protection tube.	 <p>xx2100001216</p>
2	<ul style="list-style-type: none"> • Make sure that the cables are not twisted. Each cable must be in line with its position on the base plate. • Make sure that the R1.SMB cable will run on the correct side of the R1.MP1, see the figure. 	 <p>xx1300000736</p>
3	Make sure that the markings on the cables are facing the base cover, when connected.	
4	Connect connectors R1.MP and R1.SMB.	<p>Screw dimension for R1.MP: M6x25 A2-70 Tightening torque for R1.MP: 10 Nm. Tightening torque for R1.SMB: 10 Nm.</p>  <p>xx2100001109</p>

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	Action	Note
5	Connect the earth cable.	<p>Screw dimension: M6x16. Washer dimension: 6.4x17x3. Tightening torque: 10 Nm.</p>  <p>xx210000982</p>
6	Refit the base cover.	<p>Torx pan head screw: M6x16 Stainless steel A2-70 Tightening torque: 10 Nm.</p>  <p>xx210000981</p>

Reconnecting the SMB and BU units


	Action	Note
1	 <p>ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit read the safety information in section <i>The unit is sensitive to ESD on page 47.</i></p>	

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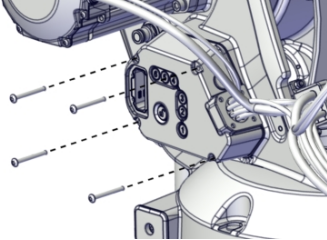
5 Repair

5.7.2 Refitting the cable harness

Continued

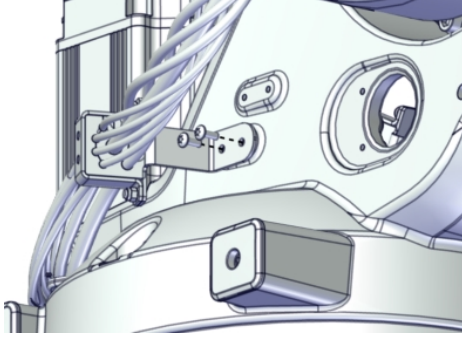
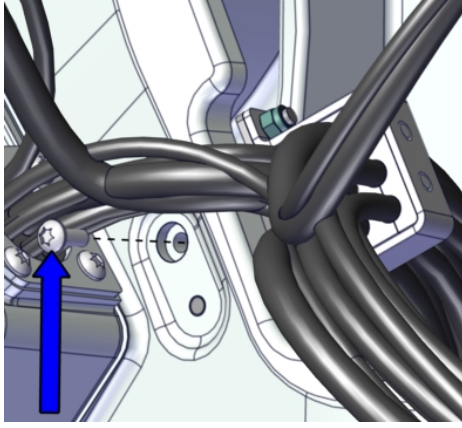
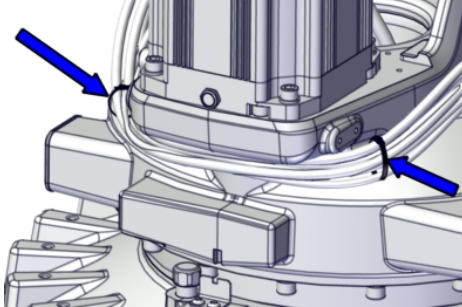
	Action	Note
2	Connect all connectors to the SMB board: <ul style="list-style-type: none"> • R1.SMB1-3, R1.SMB4-6 and R2.SMB • If cabling is used for 7th axis (option), refit the connector R1.SMB7 	 <p>xx2100002162</p>
3	Connect the connectors R2.BU1 and R2.BU2 to the brake release board.	

Refitting the electronic box

	Action	Note
1	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit read the safety information in section <i>The unit is sensitive to ESD on page 47</i> .	
2	Check the electronic box gasket. Replace if damaged.	Gasket for cover, electronics: 3HAC073671-001
3	Refit the electronic box with the attachment screws.	Torx pan head screw: M6x60 (5 pcs) Tightening torque: 10 Nm.  <p>xx2100002134</p>

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Refitting the cable harness to the frame

	Action	Note
1	Refit the cable brackets to the frame.	<p>Torx pan head screw: M6x16 Stainless steel A2-70 Tightening torque: 6 Nm.</p>  <p>xx200000442</p>  <p>xx2100001108</p>
2	Secure the cable at the frame with metal straps.	<p>Metal strap: 3HAC033886-001</p>  <p>xx2100002133</p>

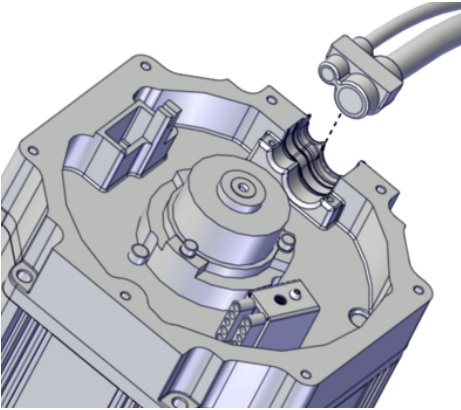
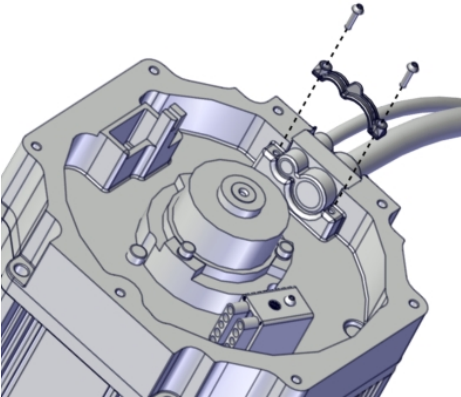
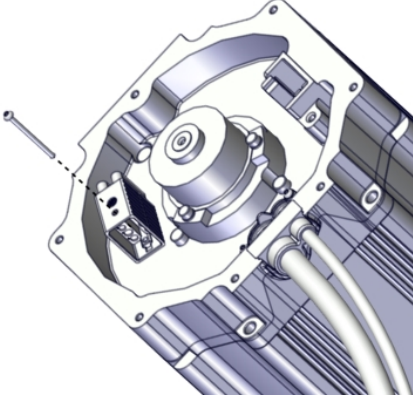
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5 Repair

5.7.2 Refitting the cable harness

Continued

Reconnecting the axis-1 and axis-2 motor cables

	Action	Note
1	Put the motor cables in place in the opening.	 xx210000599
2	Refit the cable bracket with the screws.	Torx pan head screw: M3x12 Stainless steel A2-70  xx210000598
3	Connect the motor cables. Connect in accordance with the markings on the connectors.	
4	Secure the power connector with a screw.	Tightening torque: 1 Nm  xx210000667

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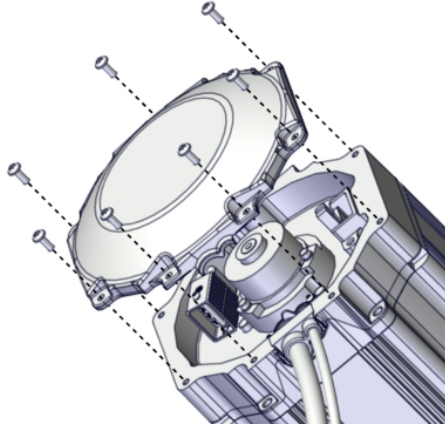
	Action	Note
5	<p>Inspect the gasket. Replace the complete cover if the gasket is damaged.</p>	<p>Axis-1 Connection box cover FS180 with gasket: 3HAC072864-003 (Graphite White) 3HAC072864-005 (ABB Orange)</p> <p>Axis-2 Connection box cover FS180 with gasket: 3HAC072864-003 (Graphite White) 3HAC072864-005 (ABB Orange)</p> <p>Axis-3 Connection box cover FS130 with gasket: 3HAC072863-003 (Graphite White) 3HAC072863-005 (ABB Orange)</p> <p>Axis-4 Connection box cover FS100 with gasket: 3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange)</p> <p>Axis-5 Connection box cover with gasket: (gasket not needed for protection type Standard)</p> <p>IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange)</p> <p>IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 3HAC072861-003 (Graphite White) 3HAC072861-004 (ABB Orange)</p>  <p>xx210000600</p>
6	<p> CAUTION</p> <p>When fitting the motor cover, make sure that none of the cables inside will be damaged.</p>	

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5 Repair

5.7.2 Refitting the cable harness

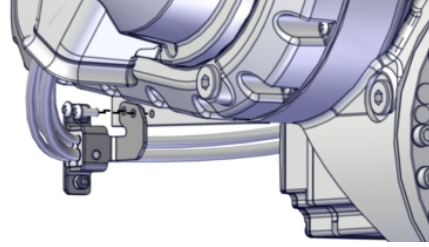


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	Action	Note
7	Refit the motor cover with its attachment screws. Use locking liquid.	Torx pan head screw: M5x12 Stainless steel A2-70 Locking liquid: 3HAC041807-004 (Loctite 2400) Tightening torque: 6 Nm.  <small>xx210000596</small>


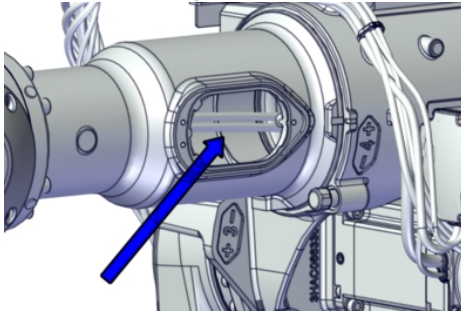
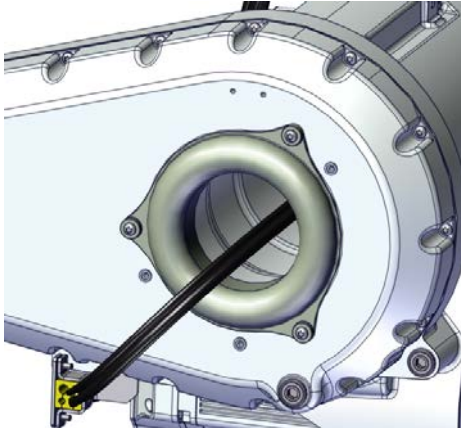

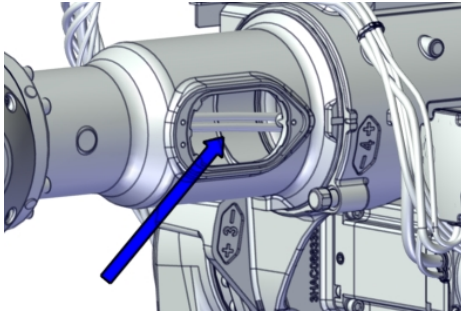
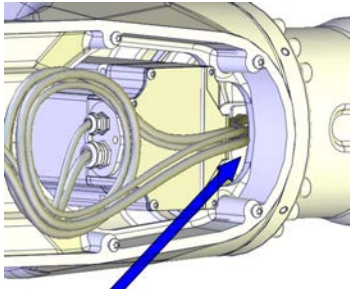
Refitting the cable harness - upper arm and wrist

These procedures describes how to refit the cable harness in upper arm and wrist.

Refitting the cable harness to the upper arm

	Action	Note
1	Refit the metal clamp beneath the arm house.	Torx pan head screw: M6x16 Stainless steel A2-70 Tightening torque: 10 Nm.  <small>xx2100002154</small>
2	 Tip Use tape and tie the axis-5 and axis-6 connectors and carrier into a bundle (if not already done). This is done to facilitate the procedure and to avoid damaging the parts during the procedure. This will also make it easier to run the cable harness through the inside of the robot.	 <small>xx1300000668</small>

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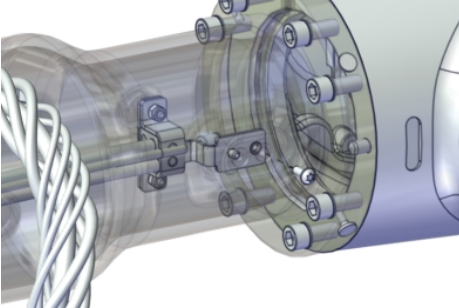
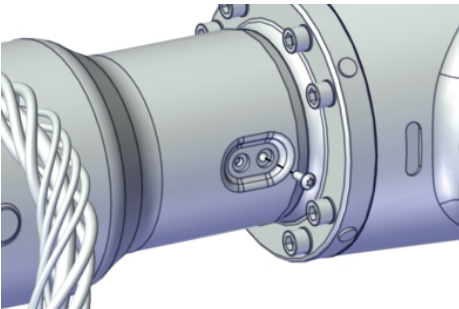

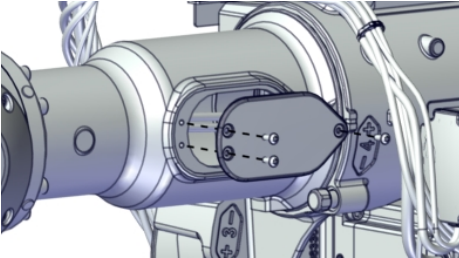
	Action	Note
3	<p>Run the cable harness through the cable guide and then into and through the upper arm tube.</p> <p> Tip</p> <p>This step is best performed by two persons working together:</p> <ul style="list-style-type: none"> • Person 1: Put one hand inside the side hole of the arm tube and take a hold of the cable harness. • Person 2: Take a hold on the cable harness at the back of the robot. • Together: Use caution and move the cable harness into the arm tube. 	<p>Person 1, working at the side hole:</p>  <p>xx2000000416</p> <p>Person 2, working at the back:</p>  <p>xx1700001569</p>
4	<p>Use caution and push the cable harness into the wrist.</p> <p> Tip</p> <p>This step is best performed by two persons working together:</p> <ul style="list-style-type: none"> • Person 1: Put one hand inside the side cover hole and take a hold of the cable harness. • Person 2: Take a hold of the cable harness from inside the wrist. • Together: Move the cable harness past the axis-5 motor and into the wrist. 	<p>Person 1, working at the side hole:</p>  <p>xx2000000416</p> <p>Person 2, working at the wrist:</p>  <p>xx1300000746</p>

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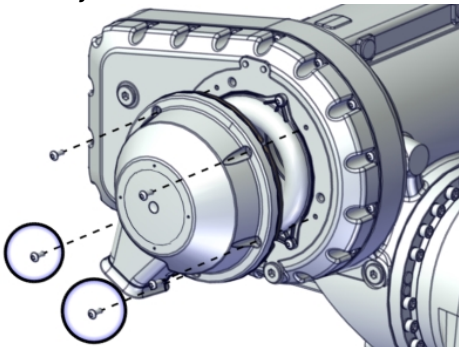
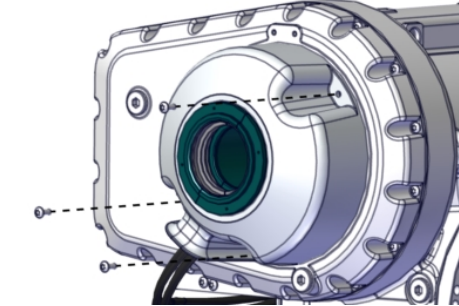
5 Repair

5.7.2 Refitting the cable harness

Continued

	Action	Note
5	<p>Refit the metal clamp axis-4, inside the arm tube.</p> <p> Note</p> <p>The screws are reached from outside the upper arm.</p>	<p>Torx pan head screw: M6x16 Stainless steel A2-70 Tightening torque: 10 Nm.</p>  <p>xx2000000418</p>  <p>xx2000000417</p>
6	<p>Refit the side cover.</p> <p> Note</p> <p><i>Foundry Plus:</i></p> <ul style="list-style-type: none">• Make sure the gasket is fitted correctly on the side cover• Use attachment screws made of stainless steel to fit the side cover.	 <p>xx2000000420</p>

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	Action	Note
7	<p><i>DressPack</i> or <i>Foundry Plus</i>: Refit the back cover with the attachment screws. Tighten the two screws closest to the outlet first (shown in figure), to avoid deformation.</p>	<p>Torx pan head screw: M6x16 Stainless steel A2-70 Tightening torque: 10 Nm.</p> <p><i>Foundry Plus</i></p>  <p>xx2100002636</p> <p><i>DressPack</i></p>  <p>xx2100002679</p>

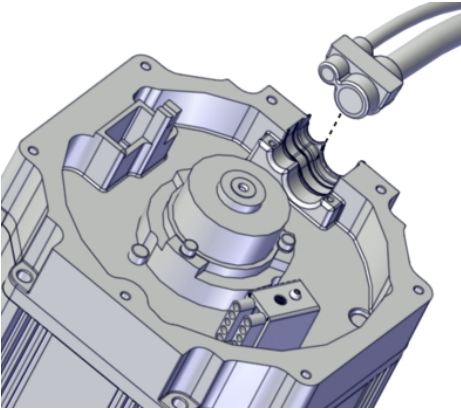
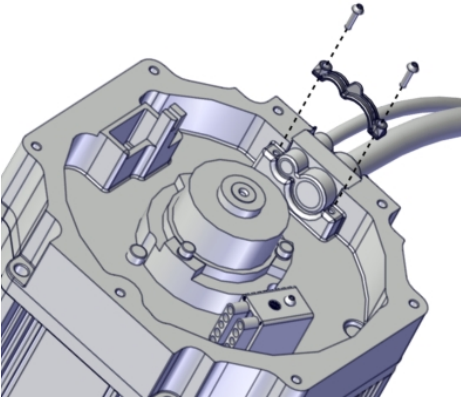
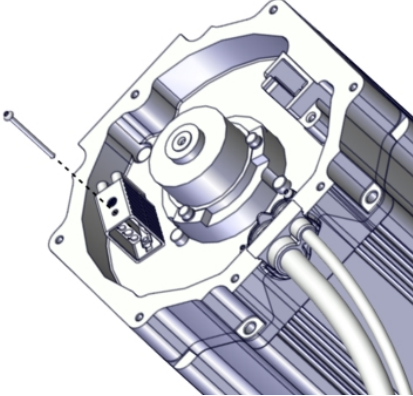
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5 Repair

5.7.2 Refitting the cable harness

Continued

Reconnecting the axis-3 and axis-4 motor cables

	Action	Note
1	Put the motor cables in place in the opening.	 xx210000599
2	Refit the cable bracket with the screws.	Torx pan head screw: M3x12 Stainless steel A2-70  xx210000598
3	Connect the motor cables. Connect in accordance with the markings on the connectors.	
4	Secure the power connector with a screw.	Tightening torque: 1 Nm  xx210000667

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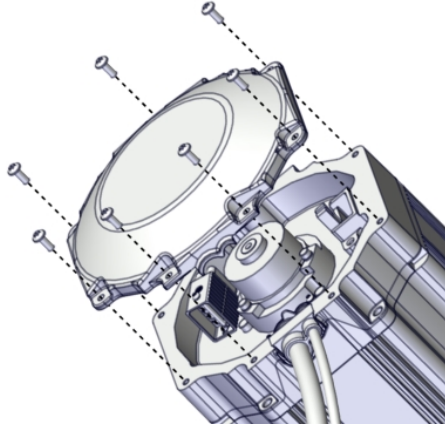
	Action	Note
5	<p>Inspect the gasket. Replace the complete cover if the gasket is damaged.</p>	<p>Axis-1 Connection box cover FS180 with gasket: 3HAC072864-003 (Graphite White) 3HAC072864-005 (ABB Orange)</p> <p>Axis-2 Connection box cover FS180 with gasket: 3HAC072864-003 (Graphite White) 3HAC072864-005 (ABB Orange)</p> <p>Axis-3 Connection box cover FS130 with gasket: 3HAC072863-003 (Graphite White) 3HAC072863-005 (ABB Orange)</p> <p>Axis-4 Connection box cover FS100 with gasket: 3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange)</p> <p>Axis-5 Connection box cover with gasket: (gasket not needed for protection type Standard)</p> <p>IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange)</p> <p>IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 3HAC072861-003 (Graphite White) 3HAC072861-004 (ABB Orange)</p>  <p>xx210000600</p>
6	<p> CAUTION</p> <p>When fitting the motor cover, make sure that none of the cables inside will be damaged.</p>	

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5 Repair

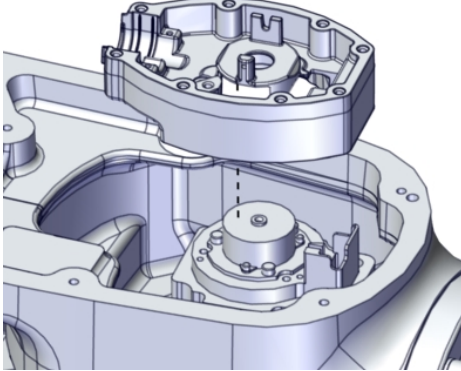
5.7.2 Refitting the cable harness

Continued

	Action	Note
7	Refit the motor cover with its attachment screws. Use locking liquid.	Torx pan head screw: M5x12 Stainless steel A2-70 Locking liquid: 3HAC041807-004 (Loctite 2400) Tightening torque: 6 Nm. <div style="text-align: right;">  </div>

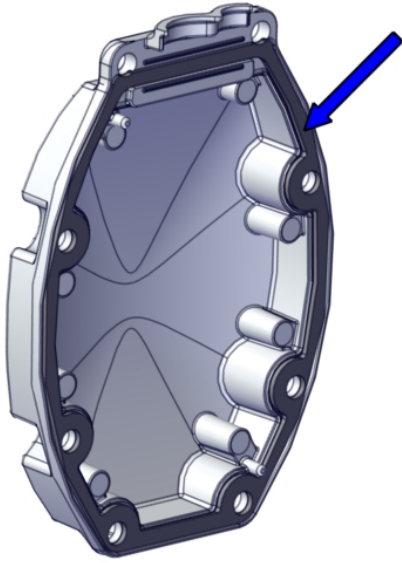

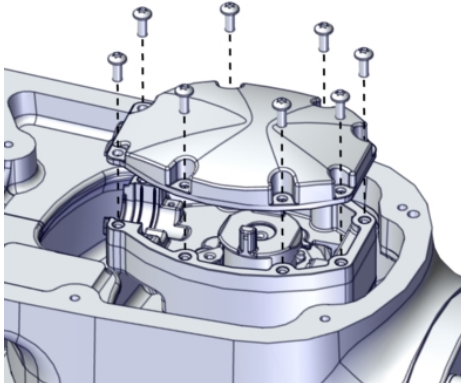
xx210000596

Connecting the axis-5 motor cables

	Action	Note
1	IRB 5710-90/2.7, IRB 5710-70/2.7 LID: Refit the connection box with the screws.	<div style="text-align: right;">  </div>
2	Put the motor cables in place in the opening.	
3	Refit the cable bracket with the screws.	Torx pan head screw: M3x12 Stainless steel A2-70
4	Connect the motor cables. Connect in accordance with the markings on the connectors.	
5	Secure the power connector with a screw.	Tightening torque: 1 Nm

xx2100002316

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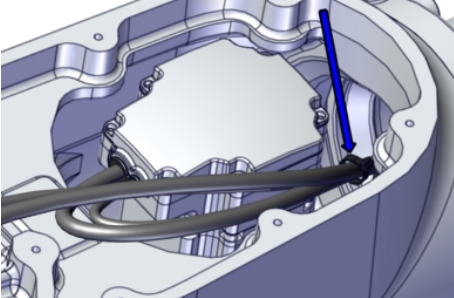
	Action	Note
6	<p>Inspect the gasket. Replace the complete cover if the gasket is damaged.</p>	<p>Connection box cover with gasket: IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange) IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 3HAC072861-003 (Graphite White) 3HAC072861-004 (ABB Orange)</p>  <p>xx2100002317</p>
7	<p> CAUTION</p> <p>When fitting the motor cover, make sure that none of the cables inside will be damaged.</p>	
8	<p>Refit the motor cover with its attachment screws. Use locking liquid.</p>	<p>Torx pan head screw: M5x12 Stainless steel A2-70 Locking liquid: 3HAC041807-004 (Loctite 2400) Tightening torque: 6 Nm.</p>  <p>xx2100002315</p>

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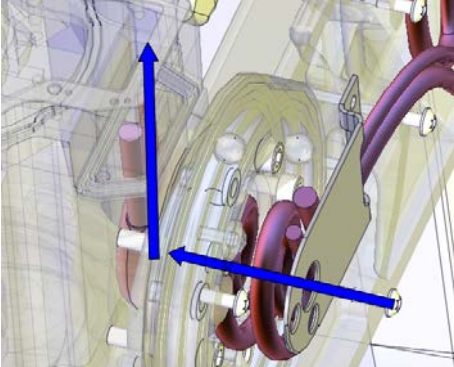
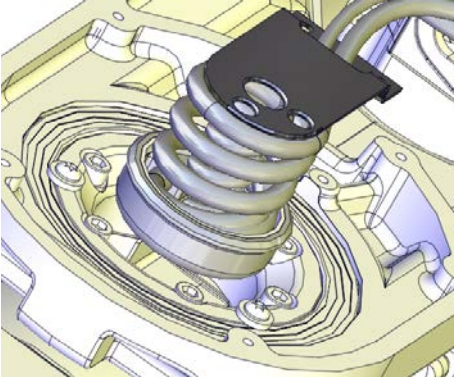
5 Repair

5.7.2 Refitting the cable harness



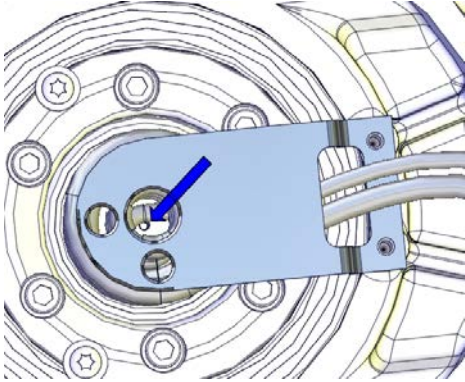
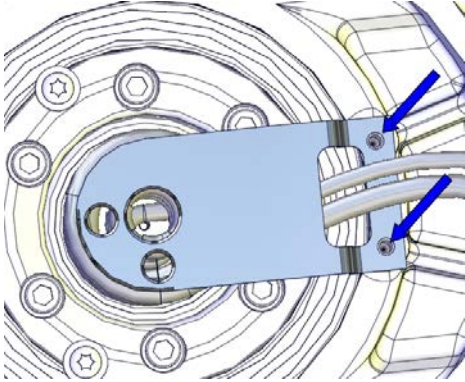
Continued

	Action	Note
9	Secure the cabling with a cable strap.	Cable strap, outdoor: 21662055-3  xx2100002630

Connecting the axis-6 motor cables

	Action	Note
1	 Note Axis 5 must be in position +90° (or as close as possible) for a correct installation of the cable harness in the wrist. If not, connect the brake release tool to the axis-5 motor connector, release the brakes and move axis 5 manually to +90°.	
2	Push the cable harness into the wrist recess and up into the axis-6 motor.	 xx1300000667
3	Push the carrier carefully into position.	 xx1300001113

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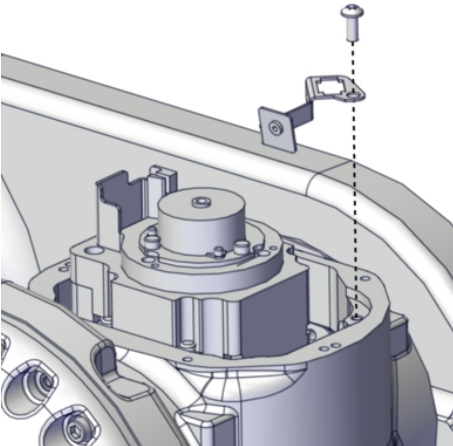

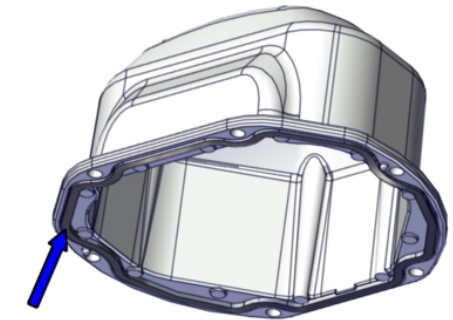
	Action	Note
4	<p>Secure the carrier with the M4 screw.</p> <p> Note</p> <p>The screw is located at the bottom of the carrier.</p> <p> Tip</p> <p>The attachment screw securing the carrier may be difficult to fit. Make sure the carrier is level and completely pressed against the bottom.</p>	 <p>xx1300000485</p>
5	<p>Secure the cable bracket with its attachment screws.</p>	<p>Torx pan head screw: M6x16 Stainless steel A2-70</p> <p>Tightening torque: see standard torque in Screw joints on page 598..</p>  <p>xx1300000484</p>
6	<p>Connect the motor cables.</p> <p>Connect in accordance with the markings on the connectors.</p>	
7	<p>Secure the power connector to the connector bracket with a screw.</p>	<p>Tightening torque: 1 Nm</p>

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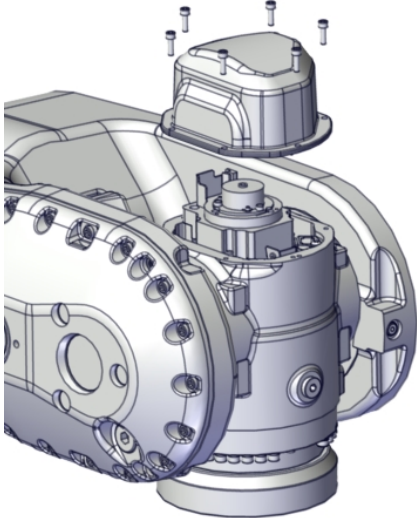
5 Repair

5.7.2 Refitting the cable harness

Continued

	Action	Note
8	Refit the connector bracket with the attached connectors.	<p>Torx pan head screw: M5x12 Stainless steel A2-70</p>  <p>xx2000000375</p>
9	Verify correct cable layout as shown in the figure.	 <p>xx2100001293</p>
10	Inspect the gasket. Replace if damaged.	<p>Gasket, tilt housing cover: 3HAC071520-001</p>  <p>xx2100001287</p>

Continues on next page

	Action	Note
11	<p> CAUTION</p> <p>When fitting the motor cover, make sure that none of the cables inside will be damaged.</p>	
12	Refit the motor cover.	<p>Hex socket head cap screw: M5x16 12.9 Lafre 2C2B/FC6.9 (6 pcs) Tightening torque: 4 Nm.</p>  <p>xx2000000376</p>

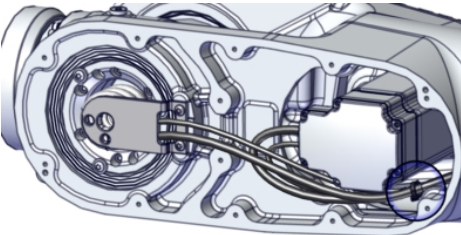
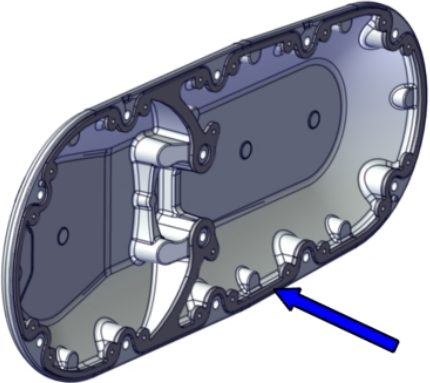
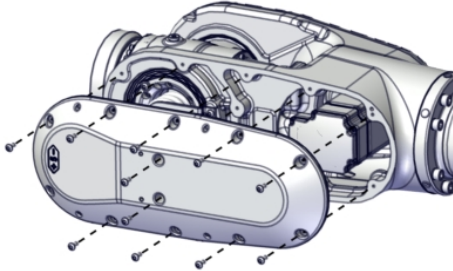
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5 Repair

5.7.2 Refitting the cable harness

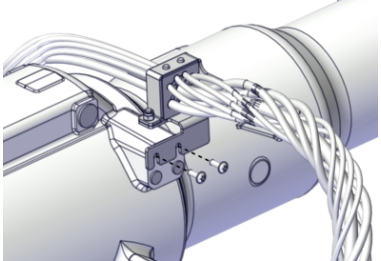
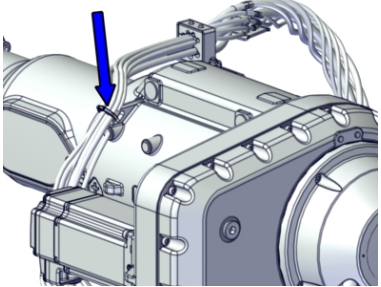

Continued

Refitting the wrist cover

	Action	Note
1	Make sure that the cable harness is routed and secured as shown in the figure.	 <p>xx2100002627</p>
2	<p><i>Foundry Plus:</i> Inspect the gasket. Replace the complete cover if the gasket is damaged.</p>	<p>Wrist cover: IRB 5710-110/2.3 / IRB 5710-90/2.3 LID: 3HAC073390-002 (Graphite White) 3HAC073390-004 (ABB Orange) IRB 5710-90/2.7 / IRB 5710-70/2.7 LID: 3HAC070151-004 (Graphite White) 3HAC070151-006 (ABB Orange)</p>  <p>xx2100001407</p>
3	Refit the wrist cover and secure with screws.	<p>Torx pan head screw: M6x16 Stainless steel A2-70 Tightening torque: 10 Nm.</p>  <p>xx2000000373</p>

Continues on next page

Concluding procedure

	Action	Note
1	Refit the metal clamp on top of the arm house.	<p>Torx pan head screw: M6x16 Stainless steel A2-70 Tightening torque: 10 Nm.</p>  <p>xx2100001285</p>
2	Secure the cable harness to the arm house eyelet with a metal strap.	<p>Metal strap: 3HAC033886-001</p>  <p>xx2000000415</p>
3	Update the revolution counters.	See Updating revolution counters on page 570 .
4	 DANGER Make sure all safety requirements are met when performing the first test run.	

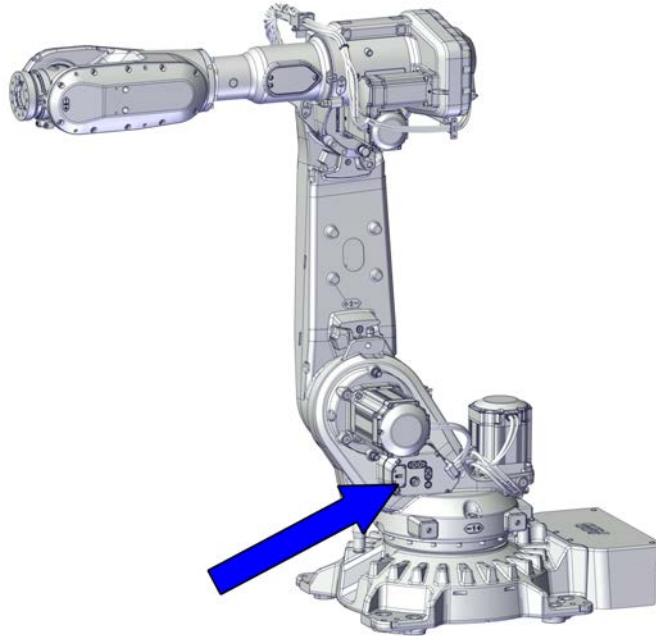
5 Repair

5.7.3 Replacing the brake release unit

5.7.3 Replacing the brake release unit

Location of the brake release unit

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



xx200000232

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 5710 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note	Level
Brake release unit	3HAC073540-001		L2

Required service parts

Consumable	Article number	Note
Gasket for cover, electronics	3HAC073671-001	Replace if damaged.

Required tools and equipment



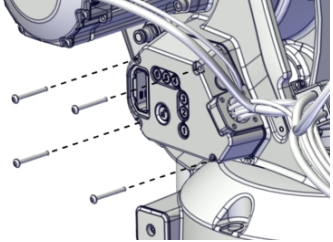

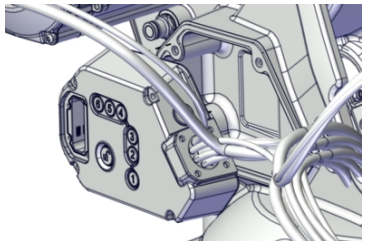
Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

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Removing the brake release unit

Use this procedure to remove the brake release unit.

Removing the electronic box

	Action	Note
1	 <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 safeguarded space.</p>	
2	 <p>ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit read the safety information in section <i>The unit is sensitive to ESD on page 47</i>.</p>	
3	<p>Remove the electronic box screws.</p>	 <p>xx2100002134</p>
4	<p>Remove the electronic box, including all internal equipment.</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>xx2100002135</p>

Disconnecting and removing the SMB unit


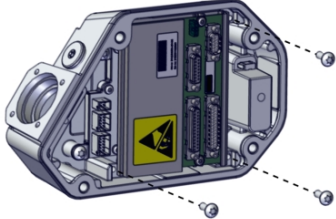
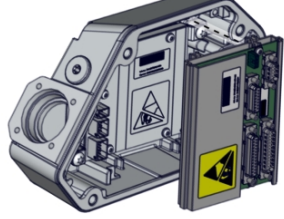
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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5 Repair

5.7.3 Replacing the brake release unit

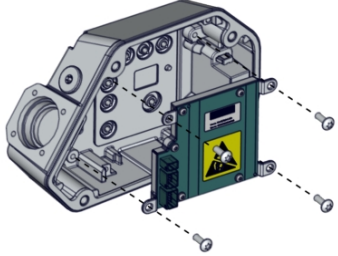
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	Action	Note
2	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit read the safety information in section <i>The unit is sensitive to ESD on page 47</i> .	
3	Disconnect all connectors from the SMB board.	
4	Remove the screws that secure the SMB unit.	 xx2100002159
5	Snap loose and remove the SMB unit. Put the unit in an ESD bag.	 xx2100002160

Disconnecting and removing the brake release unit

	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 read the safety information in section <i>The unit is sensitive to ESD on page 47</i> .	
3	Disconnect the connectors R2.BU1 and R2.BU2 from the brake release board.	


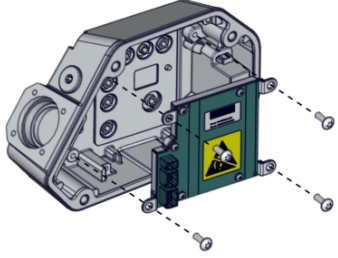
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	Action	Note
4	Remove the brake release unit by removing the screws. Put the unit in an ESD bag.	 <p>xx2100002163</p>



Refitting the brake release unit

Use this procedure to refit the brake release unit.

Refitting the brake release unit

	Action	Note
1	 <p>ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit read the safety information in section <i>The unit is sensitive to ESD on page 47.</i></p>	
2	Fit brake release unit into the electronic box and secure with the screws.	<p>Torx pan head tapping screw: Steel-Fe/Zn 8c M6x16 Tightening torque: 10 Nm.</p>  <p>xx2100002163</p>

Refitting and connecting the SMB unit

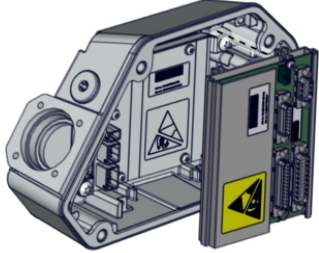
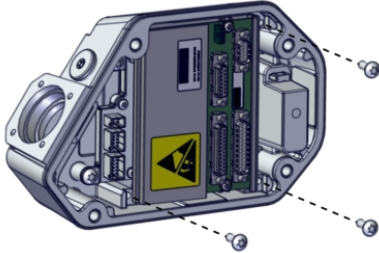
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	 <p>ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit read the safety information in section <i>The unit is sensitive to ESD on page 47.</i></p>	

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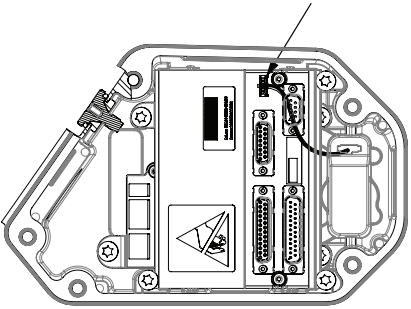

5 Repair

5.7.3 Replacing the brake release unit


Continued

	Action	Note
3	Fit the SMB unit into the electronic box.	 <p>xx2100002160</p>
4	Secure the SMB unit with the attachment screws.	<p>Torx pan head tapping screw: Steel-Fe/Zn 8c M6x16 Tightening torque: 10 Nm.</p>  <p>xx2100002159</p>


Continues on next page

	Action	Note
5	<p>Connect the battery cable to the SMB unit. Make sure the lock snaps into place during refitting.</p> <p> Note</p> <p>Make sure that the connector is assembled in the correct direction according to its keying.</p>	 <p>xx2100002161</p>
6	<p>Connect all connectors to the SMB board:</p> <ul style="list-style-type: none"> • R1.SMB1-3, R1.SMB4-6 and R2.SMB • If cabling is used for 7th axis (option), refit the connector R1.SMB7 	 <p>xx2100002162</p>

Reconnecting the brake release unit

	Action	Note
1	<p> ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit read the safety information in section The unit is sensitive to ESD on page 47.</p>	
2	<p>Reconnect the connectors R2.BU1 and R2.BU2 to the brake release board.</p>	

Refitting the electronic box

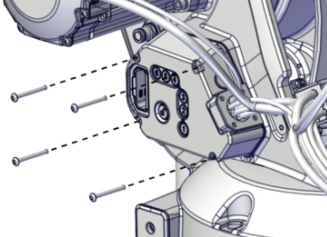
	Action	Note
1	<p> ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit read the safety information in section The unit is sensitive to ESD on page 47.</p>	
2	<p>Check the electronic box gasket. Replace if damaged.</p>	<p>Gasket for cover, electronics: 3HAC073671-001</p>

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5 Repair

5.7.3 Replacing the brake release unit

Continued

	Action	Note
3	Refit the electronic box with the attachment screws.	Torx pan head screw: M6x60 (5 pcs) Tightening torque: 10 Nm.  xx2100002134

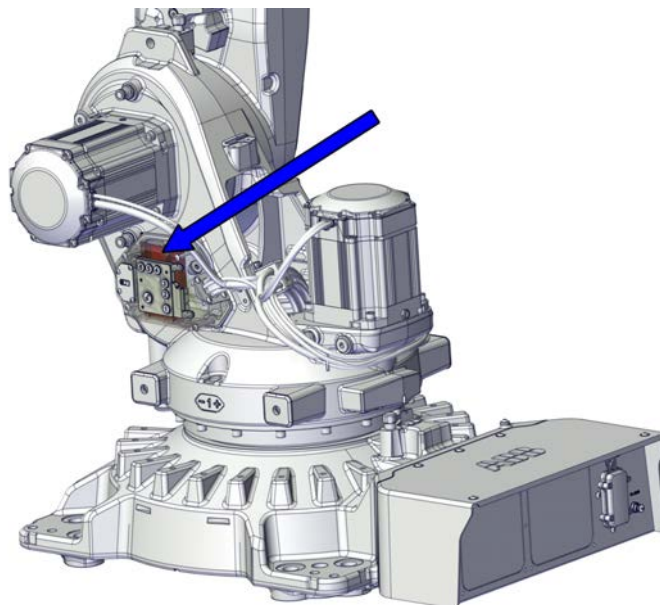
Concluding procedures

	Action	Note
1	Update the revolution counters if the battery has been disconnected.	See Updating revolution counters on page 570 .
2	 DANGER Make sure all safety requirements are met when performing the first test run.	

5.7.4 Replacing the SMB unit

Location of the SMB unit

The SMB unit is located as shown in the figure.



xx2100002158

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 5710 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note	Level
Serial measurement unit	3HAC043904-001		L2

Required service parts

Consumable	Article number	Note
Gasket for cover, electronics	3HAC073671-001	Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

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5 Repair



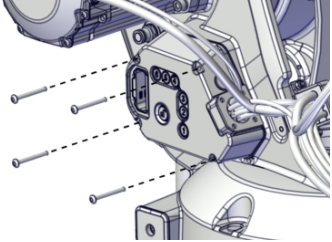

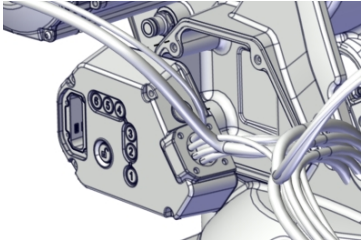
5.7.4 Replacing the SMB unit

Continued


Removing the SMB unit

Use these procedures to disconnect and remove the SMB unit.


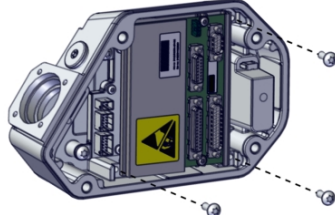
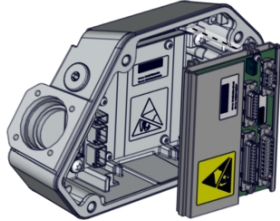
Removing the electronic box

	Action	Note
1	 <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 safeguarded space.</p>	
2	 <p>ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit read the safety information in section <i>The unit is sensitive to ESD on page 47</i>.</p>	
3	Remove the electronic box screws.	 <p>xx2100002134</p>
4	<p>Remove the electronic box, including all internal equipment.</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>xx2100002135</p>

Disconnecting and removing the SMB 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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	Action	Note
2	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit read the safety information in section <i>The unit is sensitive to ESD on page 47</i> .	
3	Disconnect all connectors from the SMB board.	
4	Remove the screws that secure the SMB unit.	 xx2100002159
5	Snap loose and remove the SMB unit. Put the unit in an ESD bag.	 xx2100002160

Refitting the SMB unit

Refitting and connecting the SMB unit

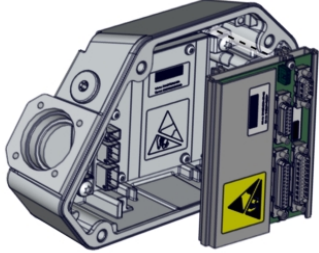
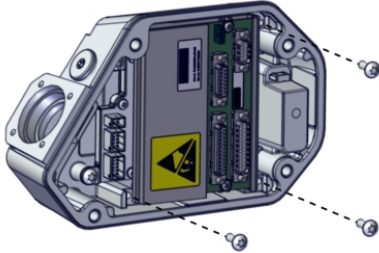
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	 ELECTROSTATIC DISCHARGE (ESD) The unit is sensitive to ESD. Before handling the unit read the safety information in section <i>The unit is sensitive to ESD on page 47</i> .	

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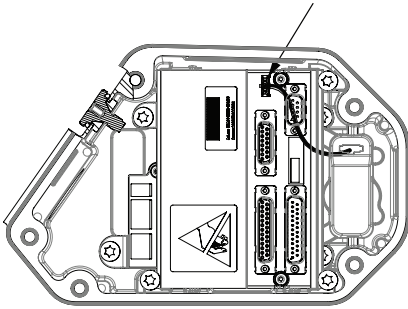

5 Repair

5.7.4 Replacing the SMB unit


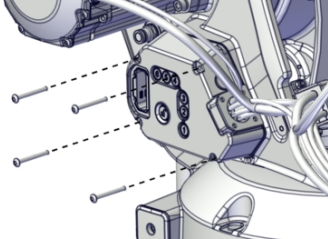
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	Action	Note
3	Fit the SMB unit into the electronic box.	 <p>xx2100002160</p>
4	Secure the SMB unit with the attachment screws.	<p>Torx pan head tapping screw: Steel-Fe/Zn 8c M6x16 Tightening torque: 10 Nm.</p>  <p>xx2100002159</p>

Continues on next page

	Action	Note
5	<p>Connect the battery cable to the SMB unit. Make sure the lock snaps into place during refitting.</p> <p> Note</p> <p>Make sure that the connector is assembled in the correct direction according to its keying.</p>	 <p>xx2100002161</p>
6	<p>Connect all connectors to the SMB board:</p> <ul style="list-style-type: none"> • R1.SMB1-3, R1.SMB4-6 and R2.SMB • If cabling is used for 7th axis (option), refit the connector R1.SMB7 	 <p>xx2100002162</p>

Refitting the electronic box

	Action	Note
1	<p> ELECTROSTATIC DISCHARGE (ESD)</p> <p>The unit is sensitive to ESD. Before handling the unit read the safety information in section The unit is sensitive to ESD on page 47.</p>	
2	<p>Check the electronic box gasket. Replace if damaged.</p>	<p>Gasket for cover, electronics: 3HAC073671-001</p>
3	<p>Refit the electronic box with the attachment screws.</p>	<p>Torx pan head screw: M6x60 (5 pcs) Tightening torque: 10 Nm.</p>  <p>xx2100002134</p>


Continues on next page

5 Repair

5.7.4 Replacing the SMB unit

Continued

Concluding procedures

	Action	Note
1	Update the revolution counters.	See Updating revolution counters on page 570 .
2	 DANGER Make sure all safety requirements are met when performing the first test run.	

5.8 Motors

5.8.1 Replacing the axis-1 motor

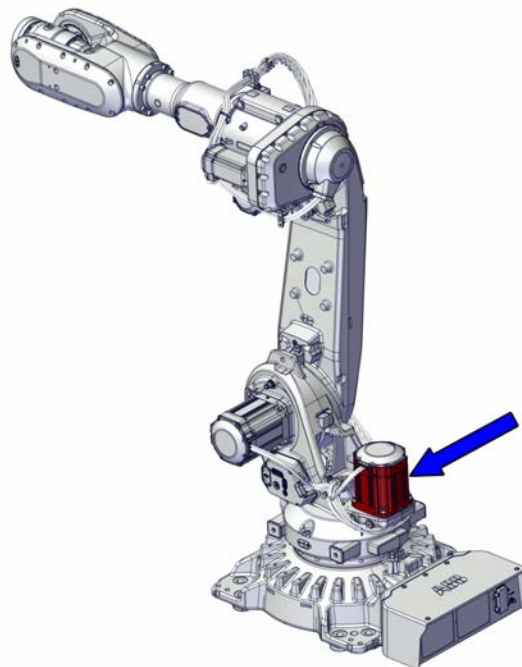
Replacing the motor on an inverted manipulator

To replace the motor on an inverted manipulator, the axis-1 gearbox must be drained and a special lifting accessory must be used, according to the procedures in this section.

The alternative is to lift down the manipulator to floor-standing, see [Lifting down the manipulator from inverted to floor-standing position on page 191](#).

Location of the motor

The motor is located as shown in the figure.



xx200000241

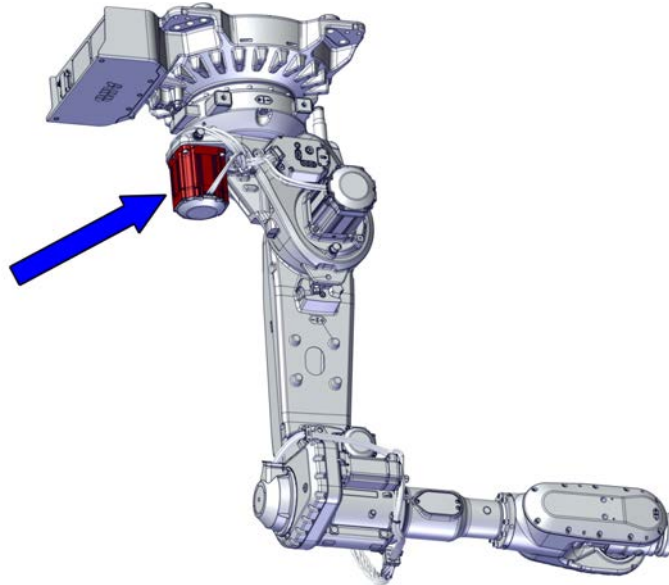
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5 Repair

5.8.1 Replacing the axis-1 motor

Continued

Option Inverted (3317-1)




xx2100002150

Summary of the replacement procedure

This list is a brief summary of the replacement procedure, containing the major actions to be performed.

- 1 If installed in an inverted position (option 3317-1): drain the axis-1 gearbox.
- 2 Replace the motor.

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 5710 via myABB Business Portal, www.abb.com/myABB .

Spare part	Article number	Note	Level
Motor unit	3HAC072252-003 (Graphite White) 3HAC072252-004 (ABB Orange)		L2

Required service parts

Consumable	Article number	Note
Flange sealant	3HAC041807-007	Loctite 5800
Connection box cover FS180 with gasket	3HAC072864-003 (Graphite White) 3HAC072864-005 (ABB Orange)	Replace if damaged.

Continues on next page

Consumable	Article number	Note
Lubricating oil	-	See Type of lubrication in gear-boxes on page 137 .

Required tools and equipment

Equipment	Article number	Note
Lifting and turning tool	3HAC073537-001	Lift and rotation of inverted robot. Requires fork lift accessory set 3HAC058825-001. User instructions are enclosed with the tool.
Removal tool motor M12	3HAC14631-1	Used to push out the motor, if necessary. Always use removal tools in pairs.
Oil dispenser	-	One example of oil dispenser can be found in section Type of lubrication in gearboxes on page 137 .
Oil level gauge	3HAC061881-001	Used to inspect the oil level in the axis-1 gearbox when the manipulator is mounted inverted. The tool also includes an air vent.
Brake release tool	3HAC081310-001	User instructions are enclosed with the tool.
Rotation tool	3HAB7887-1	Used to rotate the motor pinion.
Calibration toolbox, Axis Calibration	3HAC074564-001 (axes 1, 2, 3 and 4) 3HAC074119-001 (axes 5 and 6)	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

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. 	

Continues on next page

5 Repair

5.8.1 Replacing the axis-1 motor


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. 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 573.</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

Use these procedures to remove the motor.

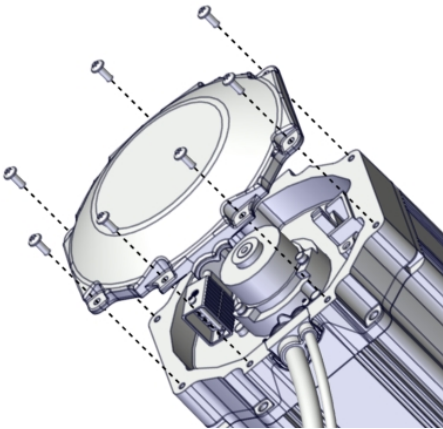
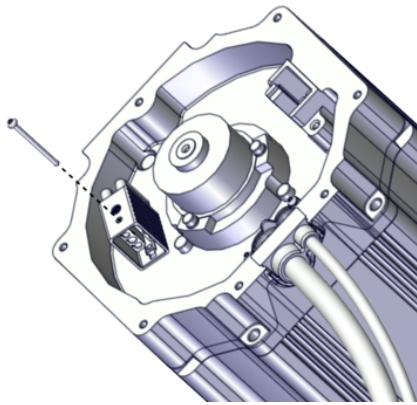
Preparations before removing the motor

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	If needed, jog the robot to an appropriate working position that allows space for motor replacement.	
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 safeguarded space.</p>	
4	<p><i>Option Inverted (3317-1)</i> Drain the axis-1 gearbox, if the motor is replaced on an inverted manipulator.</p>	See Inverted robot: Draining the axis-1 gearbox on page 144 .

Floor-mounted robot: Disconnecting the axis-1 motor cables

	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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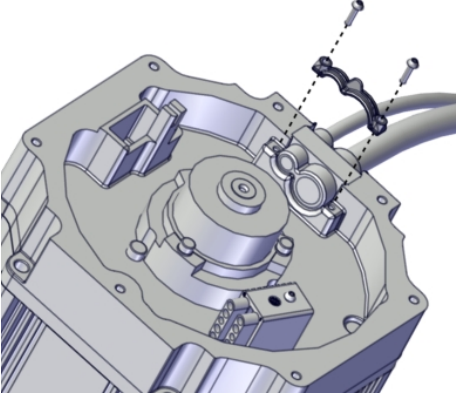
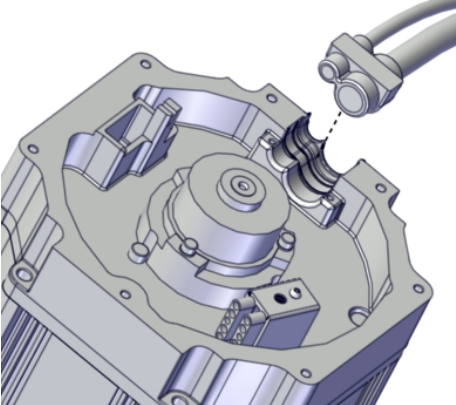
	Action	Note
2	Remove the motor cover by removing the screws.	 <p>xx210000596</p>
3	Disconnect the power cable connector by removing the attachment screw.	 <p>xx210000667</p>
4	Disconnect the signal cable connector.	

Continues on next page


5 Repair

5.8.1 Replacing the axis-1 motor



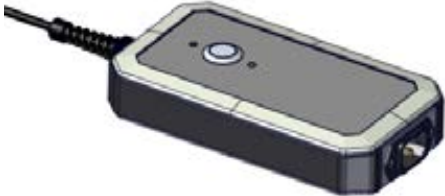
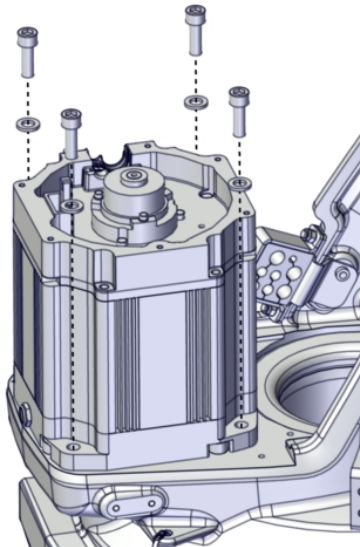
Continued

	Action	Note
5	Remove the cable bracket by removing the screws.	 <p>xx210000598</p>
6	Remove the motor cables.	 <p>xx210000599</p>

Floor-mounted robot: Removing the axis-1 motor

	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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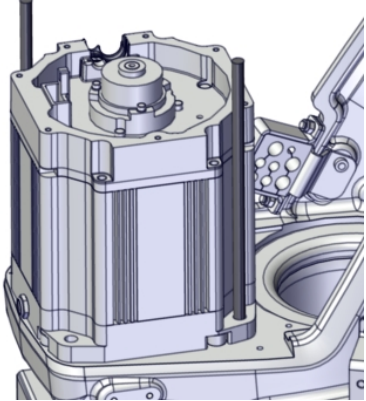


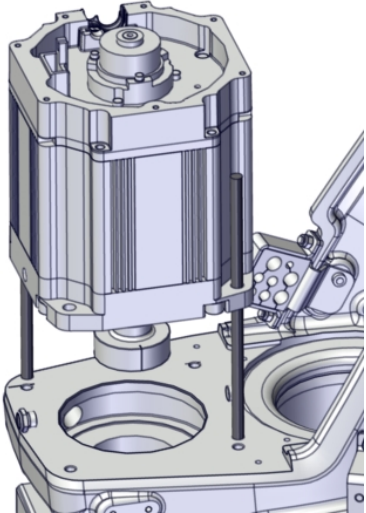
	Action	Note
2	<p>Release the brakes of the axis-1 motor with the brake release tool.</p> <ol style="list-style-type: none"> 1 Turn off the brake release tool. 2 Connect the tool to the R2.MP1 connector. 3 Release the brakes by turning on the brake release tool and pressing the brake release button on the tool. <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury.</p> <p>Read and follow enclosed user instructions for the tool.</p> <p> WARNING</p> <p>Electrical damage to the motor may occur if 24V is supplied to the motor connector for more than 30 seconds. Use the specified brake release tool to eliminate the risk.</p>	<p>Brake release tool: 3HAC081310-001 User instructions are enclosed with the tool.</p>  <p>xx210000666</p>
3	<p>Unscrew the attachment screws and washers.</p> <p>Use a bits extender to reach the screws.</p>	<p>Bits extender: 3HAC12342-1</p>  <p>xx210000503</p>

Continues on next page

5 Repair

5.8.1 Replacing the axis-1 motor

Continued

	Action	Note
4	Fit guide pins in opposite holes.	<p>Guide pin, M10x150: 3HAC15521-2 Always use guide pins in pairs.</p>  <p>xx210000504</p>
5	<p> CAUTION</p> <p>The weight of the motor is 21 kg All lifting accessories used must be sized accordingly.</p>	
6	<p> CAUTION</p> <p>Whenever parting/mating motor and gear-box, the gears may be damaged if excessive force is used.</p>	
7	Press the motor out of its position by using the removal tool in opposite holes of the motor.	<p>Removal tool motor M12: 3HAC14631-1 Always use removal tools in pairs.</p>
8	Use caution and lift the motor straight up to get the pinion parted from the gear.	 <p>xx2100002186</p>
9	Disconnect the brake release tool.	

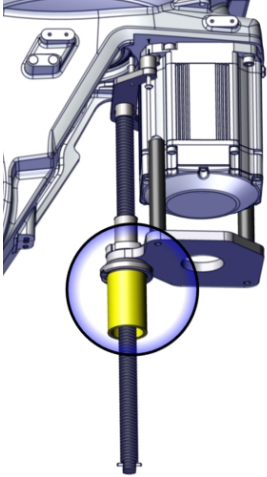
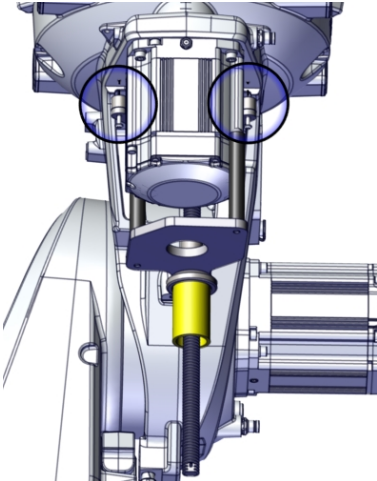
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Inverted robot: Attaching the motor lifting accessory



Note

This procedure is valid for inverted robots.

	Action	Note
1	Lower the revolving handle on the lifting accessory, to be able to fit the shelf beneath the motor while fastening the tool.	<p>Lifting accessory, motor (inverted robot): 3HAC081586-001</p>  <p>xx2100002807</p>
2	Secure the tool to the robot frame with the attachment screws.	 <p>xx2100002808</p>
3	Screw the revolving handle to lift and fit the shelf against the motor.	

Inverted robot: Removing the axis-1 motor



Note

This procedure is valid for inverted robots.

Continues on next page

5 Repair

5.8.1 Replacing the axis-1 motor

Continued

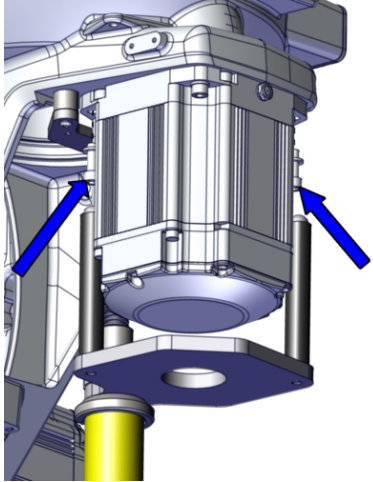

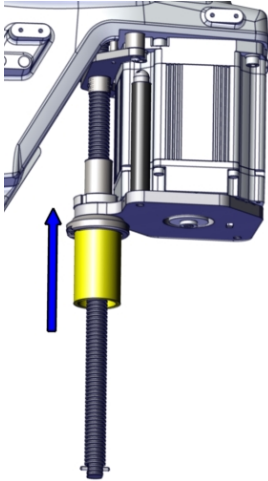


WARNING

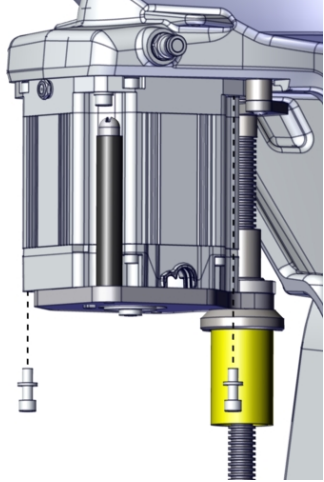


Oil residues will pour out during removal.

Always wear protective visor, gloves and arm protection.

Put oil absorbent cloth or paper round the motor flange and below the motor during removal.

	Action	Note
1	Remove the two shown motor screws and washers.	Bits extender, 3HAC12342-1  xx2100002810
2	Raise the revolving handle to fit the motor on the tool shelf.  CAUTION Risk of pinching! Do not pinch the motor cabling. Route the cables throughout the motor connector hole.	 xx2100002809


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	Action	Note
3	Remove the two remaining screws holding the motor.	Bits extender, 3HAC12342-1  <small>xx2100002811</small>
4	 WARNING Oil residues will pour out during removal. Always wear protective visor, gloves and arm protection. Put oil absorbent cloth or paper round the motor flange and below the motor during removal.	
5	Lower the revolving handle. If needed, use removal tools to help remove the motor.	Removal tool motor M12: 3HAC14631-1 Always use removal tools in pairs.
6	Rotate the shelf to remove the motor.  CAUTION The weight of the motor is 21 kg All lifting accessories used must be sized accordingly.	
7	Lift away the motor.	

Refitting the motor

Use these procedures to refit the motor.

Preparations prior to refitting motor



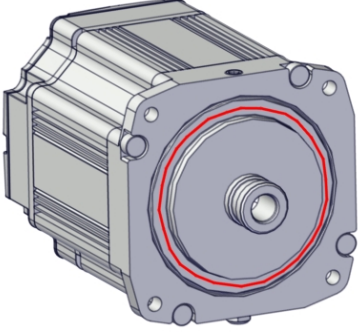
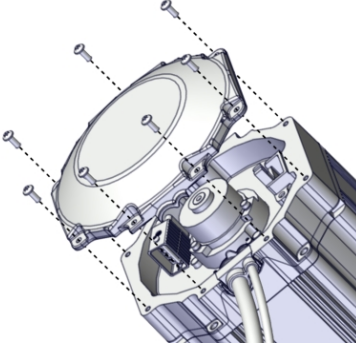


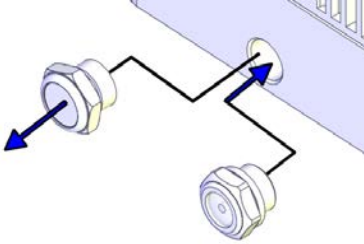
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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5 Repair

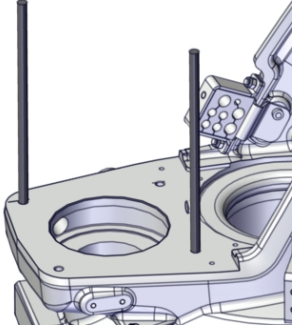



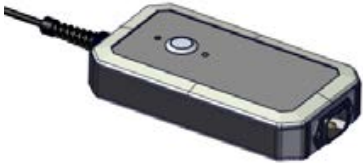

5.8.1 Replacing the axis-1 motor

Continued

	Action	Note
2	<p>Remove any old paint or flange sealant residues or other contamination from the contact surfaces on both the motor and the mating parts.</p> <p> Tip</p> <p>Remove flange sealant residues with Loctite 7200. Then use Loctite 7063 for cleaning the mating surface.</p>	
3	<p>Apply a continuous bead of flange sealant, 1-2 mm wide, inside of the groove on the motor contact surface.</p> <p> Note</p> <p>The purpose of the groove is to catch excess sealant. No o-ring is used.</p>	<p>Flange sealant: 3HAC041807-007 (Loctite 5800)</p>  <p>xx2100000520</p>
4	<p>Remove the cover, if fitted to the new spare part motor.</p>	 <p>xx2100000596</p>
5	<p><i>Protection type Foundry Plus</i></p> <p>Valid for axis-1, axis-2, axis-3 and axis-4.</p> <p>If the motor is a new spare part, the evacuation hole protection filter must be replaced with a transparent plug/sight glass (enclosed with the spare part delivery). Remove the protection filter and install the transparent plug/sight glass.</p>  <p>xx1800000101</p>  <p>xx1800000102</p> <p>Protection filter (Stand-ard). Transparent plug (Foundry Plus).</p>	<p>Tightening torque, transparent plug: 20 Nm</p> <p>Tightening torque, protection filter: 20 Nm</p>  <p>xx1600000576</p>

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Floor-mounted robot: Refitting the axis-1 motor

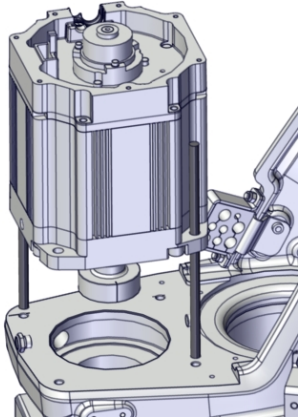
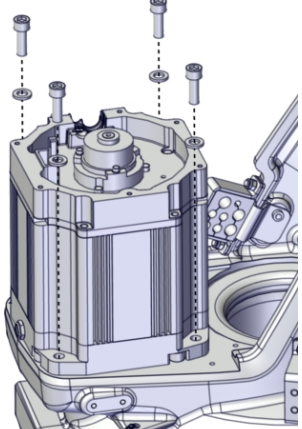
	Action	Note
1	Fit guide pins in opposite holes.	<p>Guide pin, M10x150: 3HAC15521-2</p> <p>Always use guide pins in pairs.</p>  <p>xx2100001194</p>
2	 CAUTION The weight of the motor is 21 kg All lifting accessories used must be sized accordingly.	
3	Fit the rotation tool.	Rotation tool: 3HAB7887-1
4	<p>Release the brakes on the motor with the brake release tool.</p> <ol style="list-style-type: none"> 1 Make sure the brake release tool is turned off. 2 Connect the tool to the R2.MP1 connector. 3 Release the brakes by pressing the button on the tool. <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury.</p> <p>Read and follow enclosed user instructions for the tool.</p> <p> WARNING</p> <p>Electrical damage to the motor may occur if 24V is supplied to the motor connector for more than 30 seconds. Use the specified brake release tool to eliminate the risk.</p>	<p>Brake release tool: 3HAC081310-001</p> <p>User instructions are enclosed with the tool.</p>  <p>xx2100000666</p>
5	 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	

Continues on next page

5 Repair

5.8.1 Replacing the axis-1 motor

Continued

	Action	Note
6	<p>Lower the motor into position.</p> <ul style="list-style-type: none">• Make sure that the motor pinion is properly mated to the gear in the gearbox.• Make sure that the motor pinion does not get damaged.• Make sure that the direction of the cable gland exit is facing the correct way.	 <p>xx2100002186</p>
7	<p>Secure the motor with its attachment screws and washers. Use a bits extender to reach the screws.</p>	<p>Hex socket head cap screw: M10x30 12.9 Gleitmo 603+Geomet 500 (4 pcs) Bits extender: 3HAC12342-1 Tightening torque: 50 Nm.</p>  <p>xx2100000503</p>
8	Disconnect the brake release tool.	
9	Perform a leak-down test (if not already done).	See Performing a leak-down test on page 184 .

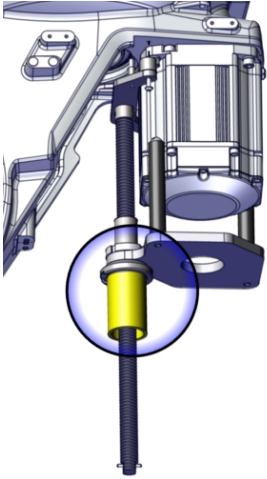
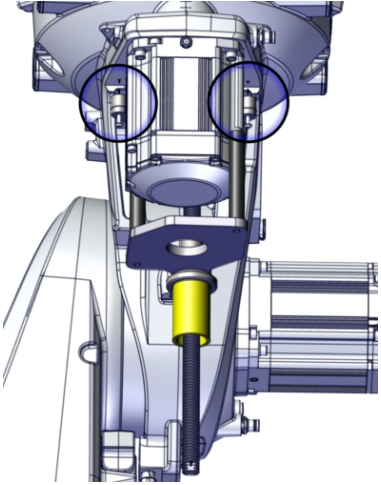
Inverted robot: Attaching the motor lifting accessory




Note

This procedure is valid for inverted robots.

Continues on next page

	Action	Note
1	Lower the revolving handle on the lifting accessory, to be able to fit the shelf beneath the motor while fastening the tool.	<p>Lifting accessory, motor (inverted robot): 3HAC081586-001</p>  <p>xx2100002807</p>
2	Secure the tool to the robot frame with the attachment screws.	 <p>xx2100002808</p>
3	Screw the revolving handle to lift and fit the shelf against the motor.	

Inverted robot: Refitting the axis-1 motor


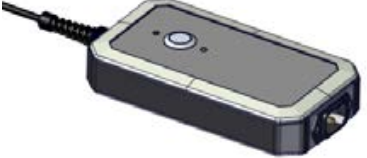

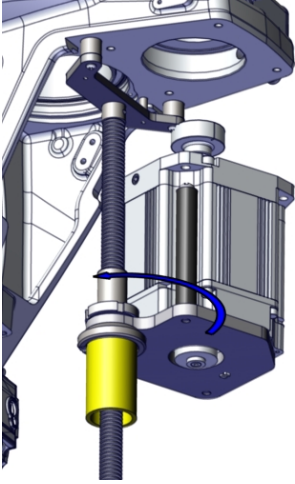
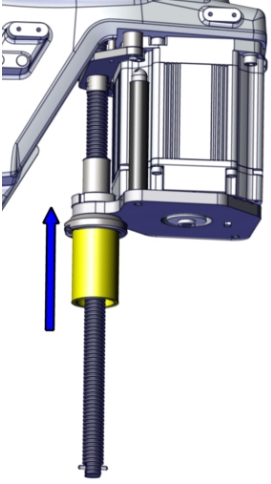
	Action	Note
1	 CAUTION The weight of the motor is 21 kg All lifting accessories used must be sized accordingly.	

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5 Repair

5.8.1 Replacing the axis-1 motor

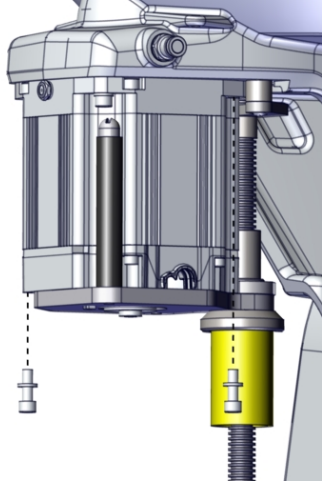
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	Action	Note
2	<p>Release the brakes of the axis-1 motor with the brake release tool.</p> <ol style="list-style-type: none"> 1 Turn off the brake release tool. 2 Connect the tool to the R2.MP1 connector. 3 Release the brakes by turning on the brake release tool and pressing the brake release button on the tool. <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury. Read and follow enclosed user instructions for the tool.</p>	<p>Brake release tool: 3HAC081310-001</p> <p>User instructions are enclosed with the tool.</p>  <p>xx210000666</p>
3	Fit guide pins in opposite holes.	Guide pin, M10x150: 3HAC15521-2
4	<p>Put the motor on the tool shelf and rotate it into position.</p> <p> CAUTION</p> <p>Risk of pinching! Do not pinch the motor cabling. Route the cables throughout the motor connector hole.</p>	 <p>xx2100002815</p>
5	<p>Raise the revolving handle to assemble motor.</p> <ul style="list-style-type: none"> • Make sure that the motor pinion is properly mated to the gear in the gearbox. • Make sure that the motor pinion does not get damaged. • Make sure that the direction of the cable exit is facing the correct way. 	 <p>xx2100002809</p> <p><i>Figure 5.1:</i></p>

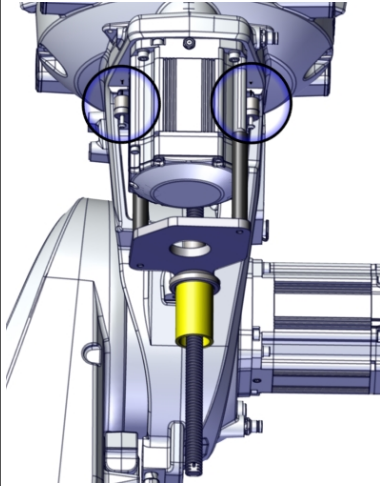
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5.8.1 Replacing the axis-1 motor

Continued

	Action	Note
6	Secure the motor with its attachment screws and washers. Use a bits extender to reach the screws.	Hex socket head cap screw: M10x30 12.9 Gleitmo 603+Geomet 500 (4 pcs) Bits extender: 3HAC12342-1 Tightening torque: 50 Nm.  xx2100002811
7	Perform a leak-down test (if not already done).	See Performing a leak-down test on page 184 .
8	Disconnect the brake release tool.	

Inverted robot: Removing the motor lifting accessory

	Action	Note
1	Remove the lifting accessory by removing the attachment screws.	 xx2100002808

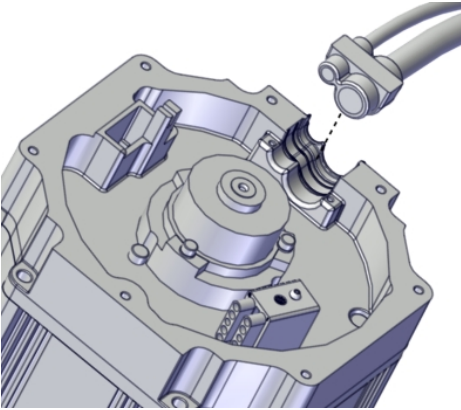
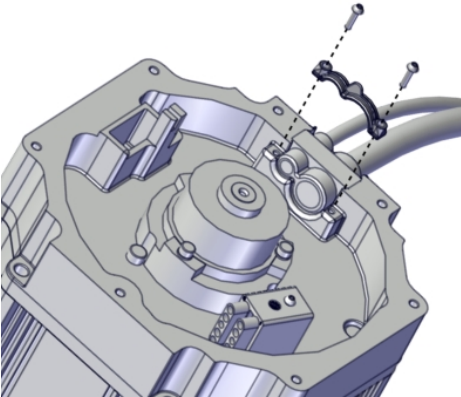
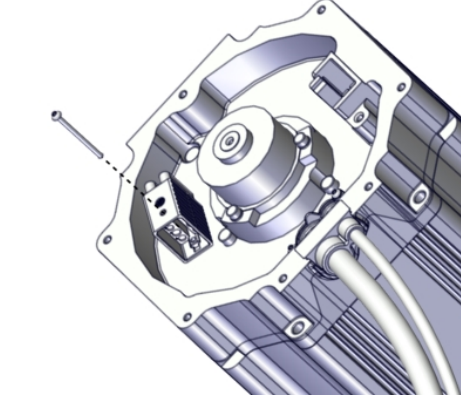
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5 Repair

5.8.1 Replacing the axis-1 motor

Continued

Connecting the motor cables

	Action	Note
1	Put the motor cables in place in the opening.	 <p>xx210000599</p>
2	Refit the cable bracket with the screws.	<p>Torx pan head screw: M3x12 Stainless steel A2-70</p>  <p>xx210000598</p>
3	Connect the motor cables. Connect in accordance with the markings on the connectors.	
4	Secure the power connector with a screw.	<p>Tightening torque: 1 Nm</p>  <p>xx210000667</p>

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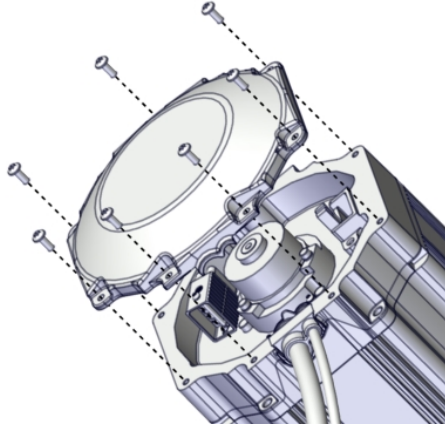
	Action	Note
5	<p>Inspect the gasket. Replace the complete cover if the gasket is damaged.</p>	<p>Axis-1 Connection box cover FS180 with gasket: 3HAC072864-003 (Graphite White) 3HAC072864-005 (ABB Orange) Axis-2 Connection box cover FS180 with gasket: 3HAC072864-003 (Graphite White) 3HAC072864-005 (ABB Orange) Axis-3 Connection box cover FS130 with gasket: 3HAC072863-003 (Graphite White) 3HAC072863-005 (ABB Orange) Axis-4 Connection box cover FS100 with gasket: 3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange) Axis-5 Connection box cover with gasket: (gasket not needed for protection type Standard) IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange) IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 3HAC072861-003 (Graphite White) 3HAC072861-004 (ABB Orange)</p>  <p>xx210000600</p>
6	<p> CAUTION When fitting the motor cover, make sure that none of the cables inside will be damaged.</p>	

Continues on next page

5 Repair

5.8.1 Replacing the axis-1 motor


Continued

	Action	Note
7	Refit the motor cover with its attachment screws. Use locking liquid.	Torx pan head screw: M5x12 Stainless steel A2-70 Locking liquid: 3HAC041807-004 (Loctite 2400) Tightening torque: 6 Nm. <div style="text-align: right;">  </div>






xx2100000596

Securing an inverted robot to the foundation

Use this procedure to orient and secure the robot inverted.

	Action	Note
1	Install the fork lift pockets to the robot.  DANGER Handling the tool incorrectly will cause serious injury. Read and follow enclosed user instructions for the tool.	See user instructions enclosed with the fork lift accessory set. Fork lift accessory set: 3HAC058825-001.

Continues on next page

	Action	Note
2	<p>Choose one of the following lifting methods:</p> <ul style="list-style-type: none"> • Lifting and turning with the fork lift (rotator attachment required): <ol style="list-style-type: none"> 1 Insert the forks of the fork lift truck into the fork lift pockets, as far as possible. 2 Raise the forks of the fork lift truck to make sure that the weight of the robot rests on the forks. <div style="text-align: center;">  Tip </div> <p>Two M16 screws can be fitted to the fork lift pockets, to press the forks against the pockets and make the lift more stable.</p> • Lifting and turning with the turning tool and overhead crane: <ol style="list-style-type: none"> 1 Install and use the turning tool according to enclosed user instructions. <div style="text-align: center;">  DANGER </div> <p>Handling the tool incorrectly will cause serious injury. Read and follow enclosed user instructions for the tool.</p> 	
3	Remove the bolts that secure the robot to the foundation/support legs.	
4	Move the robot close to its installation location.	
5	<p>Rotate the robot into inverted position using the turning tool or using a fork lift truck with a rotator attachment.</p> <div style="text-align: center;">  DANGER </div> <p>Make sure that there is enough space underneath the robot. See user instructions for the turning tool.</p>	<p>Lifting and turning tool: 3HAC073537-001 See user instructions enclosed with the turning tool.</p>
6	Guide the robot using two attachment screws while lifting it into its mounting position.	
7	<p>Fit the bolts and washers in the base attachment holes.</p> <div style="text-align: center;">  Note </div> <p>Lightly lubricate screws before assembly.</p> <div style="text-align: center;">  CAUTION </div> <p>If high stress on screws are suspected, replace used screws with new ones.</p>	<p>Suitable screws, lightly lubricated: M24 x 100 (8 pcs), 8.8. Suitable washer: 4 mm flat washer. Screw tightening yield point utilization factor (v) (according to VDI2230): 90% (v=0.9). Tightening torque: 550 Nm (screws lubricated with Molykote 1000) 600-725 Nm, typical 650 Nm (screws none or lightly lubricated)</p>

Continues on next page

5 Repair


5.8.1 Replacing the axis-1 motor

Continued

	Action	Note
8	Tighten bolts in a crosswise pattern to ensure that the base is not distorted.	
9	Reconnect the robot cables to the base.	

Concluding procedure

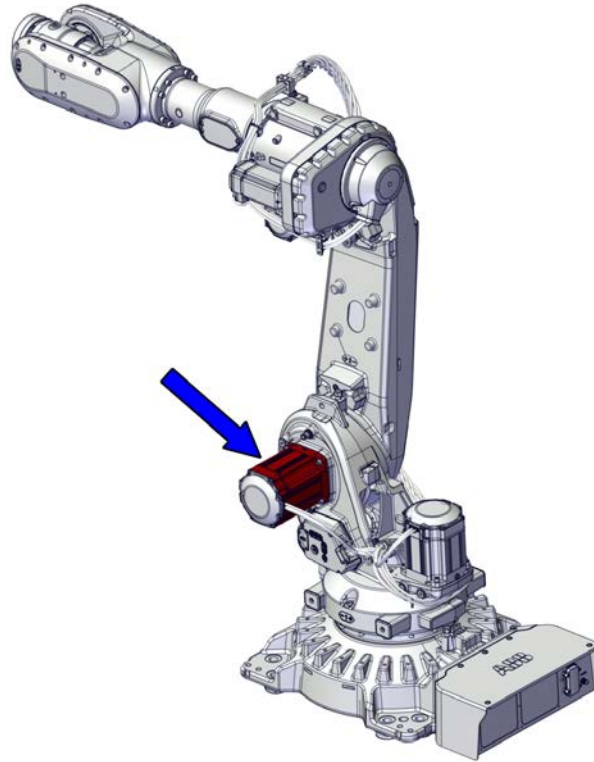
Use this procedure for the concluding refitting.

	Action	Note
1	Re-calibrate the robot.	See Calibration on page 563 .
2	 DANGER Make sure all safety requirements are met when performing the first test run.	

5.8.2 Replacing the axis-2 motor

Location of the motor

The motor is located as shown in the figure.



xx210000486

Summary of the replacement procedure

This list is a brief summary of the replacement procedure, containing the major actions to be performed.

- 1 Drain the axis-2 gearbox.
- 2 Secure the lower arm.
- 3 Replace the motor.

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 5710 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note	Level
Motor unit	3HAC072099-003 (Graphite White) 3HAC072099-004 (ABB Orange)		L2

Continues on next page

5 Repair

5.8.2 Replacing the axis-2 motor

Continued

Required service part

Consumable	Article number	Note
Lubricating oil	-	See Type of lubrication in gear-boxes on page 137 .
Flange sealant	3HAC041807-007	Loctite 5800
Connection box cover FS180 with gasket	3HAC072864-003 (Graphite White) 3HAC072864-005 (ABB Orange)	Replace if damaged.
O-ring, G 1/2"	3HAC061327-059	Used on oil plug. Always replace when refitting oil plug.

Required tools and equipment

Equipment	Article number	Note
Lock screw, M16x120	-	Used to secure lower arm.
Brake release tool	3HAC081310-001	User instructions are enclosed with the tool.
Bits extender	3HAC12342-1	300 mm, bits 1/2"
Guide pin, M10x150	3HAC15521-2	Always use guide pins in pairs.
Removal tool motor M12	3HAC14631-1	Used to push out the motor, if necessary. Always use removal tools in pairs.
Lifting accessory, motor	3HAC15534-1	Lifting instruction 3HAC15640-2 enclosed.
Lifting accessory (chain)	3HAC15556-1	Lifting instruction 3HAC15880-2 enclosed.
Rotation tool	3HAB7887-1	Used to rotate the motor pinion.
Calibration toolbox, Axis Calibration	3HAC074564-001 (axes 1, 2, 3 and 4) 3HAC074119-001 (axes 5 and 6)	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

Continues on next page

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. 	
	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 573 .
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Removing the motor

Use these procedures to remove the motor.

Preparations before removing the motor


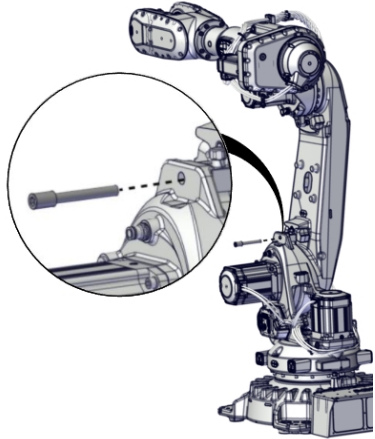

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog the robot to the synchronization position.	

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5 Repair

5.8.2 Replacing the axis-2 motor

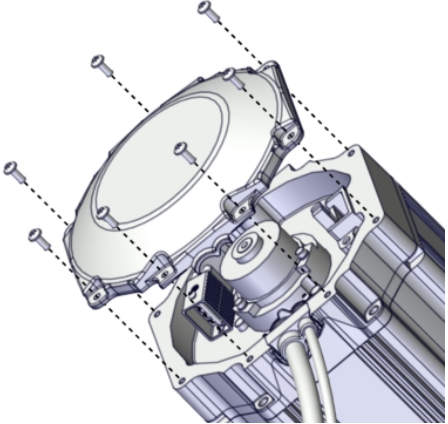
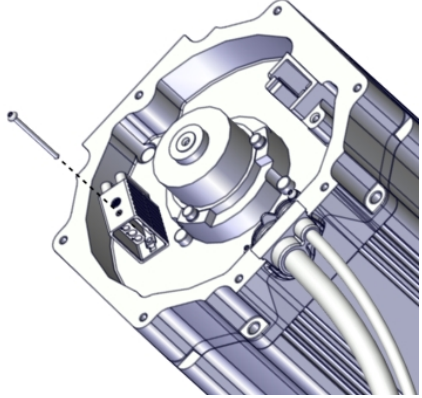
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	Action	Note
3	<p>Insert the lock screw into the frame. If needed, adjust the position of axis-2 to make it possible to insert the lock screw.</p> <p>The lock screw is used to secure the weight of the lower arm, in order to avoid accidents or damage.</p> <p> Note</p> <p>Tighten the lock screw manually, no tools needed.</p>	<p>Lock screw, M16x120</p>  <p>xx2100000592</p>
4	<p>Drain the oil from the gearbox.</p>	<p>See Changing the oil in axis-2 gearbox on page 150.</p>
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 safeguarded space.</p>	

Disconnecting the motor cables

	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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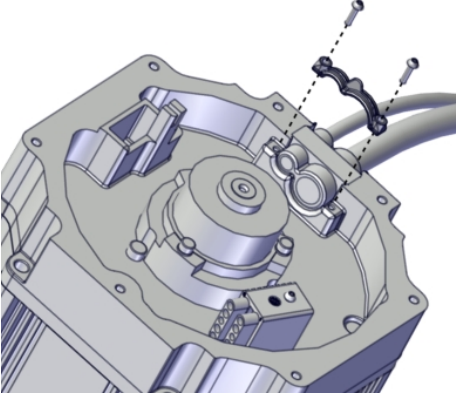
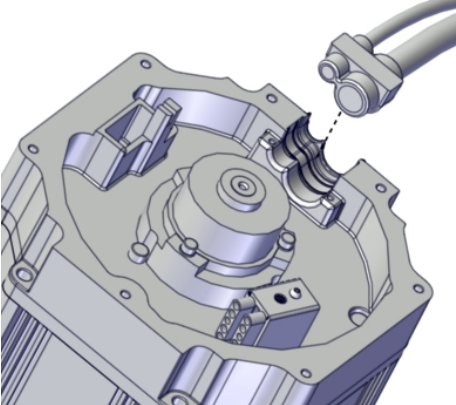
	Action	Note
2	Remove the motor cover by removing the screws.	 <p>xx210000596</p>
3	Disconnect the power cable connector by removing the attachment screw.	 <p>xx210000667</p>
4	Disconnect the signal cable connector.	

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5 Repair

5.8.2 Replacing the axis-2 motor





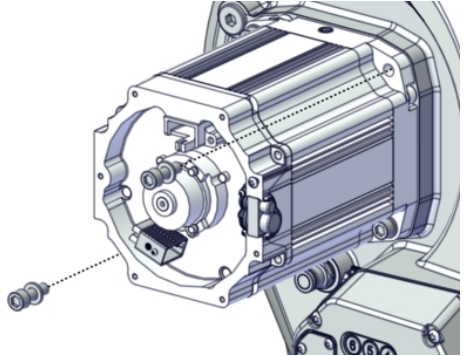
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	Action	Note
5	Remove the cable bracket by removing the screws.	 <p>xx210000598</p>
6	Remove the motor cables.	 <p>xx210000599</p>

Removing the axis-2 motor

	Action	Note
1	Before removing the motor, make sure that the gearbox is completely drained.	
2	 <p>DANGER</p> <p>When releasing the holding brakes of the motor, the lower arm will be movable and may fall down if not secured. Verify that the lower arm is secured as previously described, before continuing.</p>	

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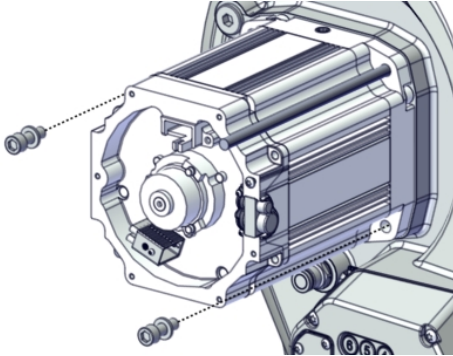


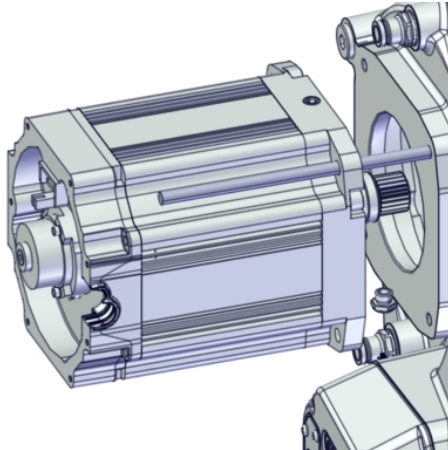
	Action	Note
3	<p>Release the brakes on the motor with the brake release tool.</p> <ol style="list-style-type: none"> 1 Make sure the brake release tool is turned off. 2 Connect the tool to the R2.MP2 connector. 3 Release the brakes by pressing the button on the tool. <p> CAUTION</p> <p>Releasing the brakes on the axis-2 motor results in weight transfer of upper and lower arm weight to the inserted lock screw in the lower arm or to the attached lifting accessories (whichever is used). If lifting accessories are used, verify that the lifting chains and roundslings are stretched by raising the overhead crane, before releasing the brakes.</p> <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury.</p> <p>Read and follow enclosed user instructions for the tool.</p> <p> WARNING</p> <p>Electrical damage to the motor may occur if 24V is supplied to the motor connector for more than 30 seconds. Use the specified brake release tool to eliminate the risk.</p>	<p>Brake release tool: 3HAC081310-001 User instructions are enclosed with the tool.</p>  <p>xx2100000666</p>
4	<p>Remove two opposite attachment screws. Use a bits extender in order to reach the screws.</p>	<p>Bits extender: 3HAC12342-1</p>  <p>xx2000000468</p>

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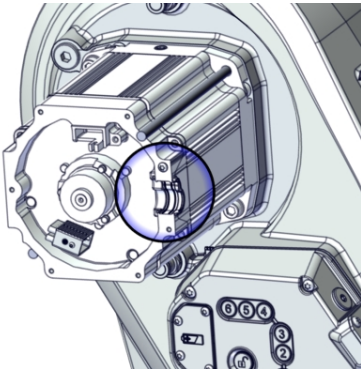
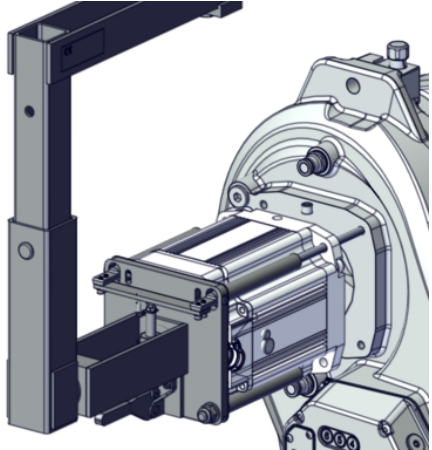
5 Repair

5.8.2 Replacing the axis-2 motor

Continued

	Action	Note
5	<p>Fit guide pins in the opposite holes and remove the remaining two screws.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the motor slide better.</p>	<p>Guide pin, M10x150: 3HAC15521-2 Always use guide pins in pairs.</p>  <p>xx200000467</p>
6	<p> CAUTION</p> <p>Whenever parting/mating motor and gear-box, the gears may be damaged if excessive force is used.</p>	
7	<p>Press the motor out of its position by using the removal tool in opposite holes of the motor.</p>	<p>Removal tool motor M12: 3HAC14631-1 Used to push out the motor, if necessary. Always use removal tools in pairs.</p>
8	<p> CAUTION</p> <p>The weight of the motor is 25 kg All lifting accessories used must be sized accordingly.</p>	
9	<p>Carefully lift the motor out on the guide pins, in order to get the pinion away from the gear and let it rest on the guide pins.</p>	 <p>xx200000457</p>
10	<p>Disconnect the brake release tool.</p>	



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	Action	Note
11	Fasten the lifting accessory. Attach the lifting chain to the accessory and an overhead crane.	Lifting accessory, motor: 3HAC15534-1 Lifting accessory (chain): 3HAC15556-1
12	<p>Remove the motor by sliding it out on the guide pins and lift it off.</p> <p> Tip</p> <p>Make a note in which direction the cable gland hole is facing. The motor shall be refitted in the same position.</p>  <p>xx2100000595</p>	 <p>xx200000455</p> <p>Make sure the pinion is not damaged.</p>

Refitting the motor

Use these procedures to refit the axis-2 motor.

Preparations prior to refitting motor


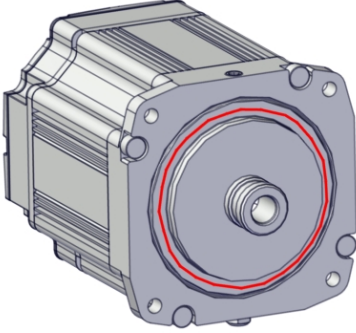
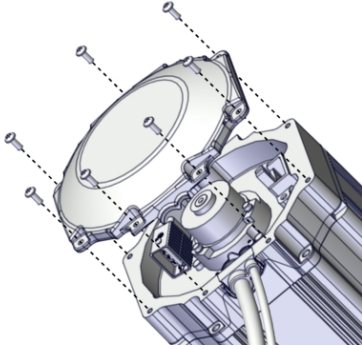


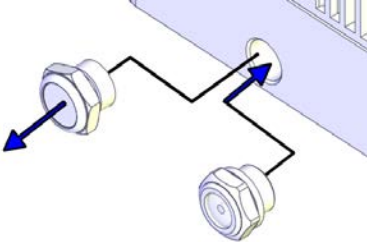
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Remove any old paint or flange sealant residues or other contamination from the contact surfaces on both the motor and the mating parts.</p> <p> Tip</p> <p>Remove flange sealant residues with Loctite 7200. Then use Loctite 7063 for cleaning the mating surface.</p>	

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5 Repair

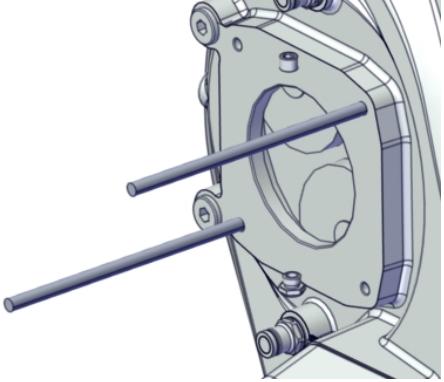

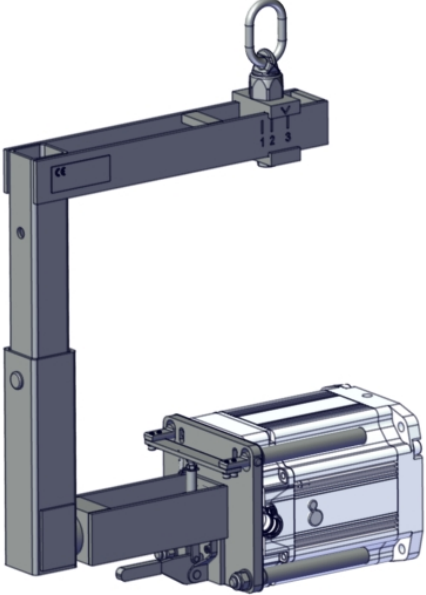
5.8.2 Replacing the axis-2 motor

Continued

	Action	Note
3	<p>Apply a continuous bead of flange sealant, 1-2 mm wide, inside of the groove on the motor contact surface.</p> <p> Note</p> <p>The purpose of the groove is to catch excess sealant. No o-ring is used.</p>	<p>Flange sealant: 3HAC041807-007 (Loctite 5800)</p>  <p>xx2100000520</p>
4	<p>Remove the cover, if fitted to the new spare part motor.</p>	 <p>xx2100000596</p>
5	<p><i>Protection type Foundry Plus</i> Valid for axis-1, axis-2, axis-3 and axis-4.</p> <p>If the motor is a new spare part, the evacuation hole protection filter must be replaced with a transparent plug/sight glass (enclosed with the spare part delivery). Remove the protection filter and install the transparent plug/sight glass.</p>  <p>xx1800000101</p>  <p>xx1800000102</p> <p>Protection filter (Stand-ard). Transparent plug (Foundry Plus).</p>	<p>Tightening torque, transparent plug: 20 Nm Tightening torque, protection filter: 20 Nm</p>  <p>xx1600000576</p>

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Refitting the axis-2 motor


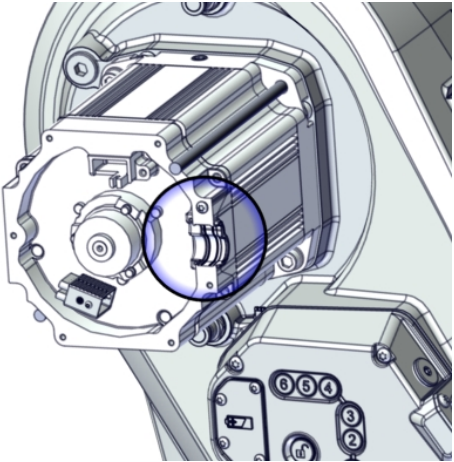
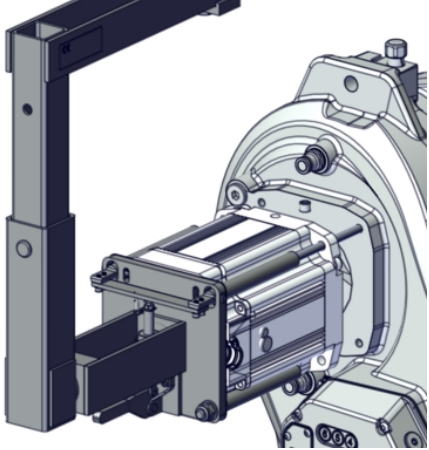
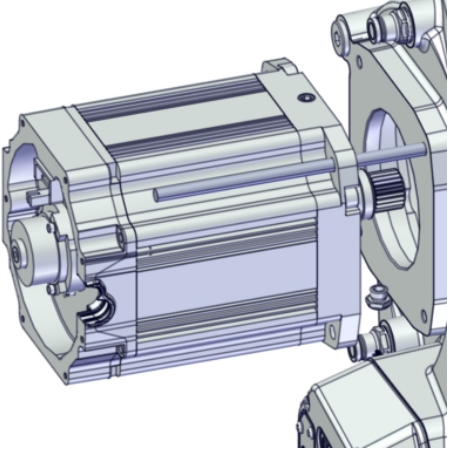
	Action	Note
1	Fit guide pins in opposite holes.	<p>Guide pin, M10x150: 3HAC15521-2 Always use guide pins in pairs.</p>  <p>xx210000593</p>
2	<p> CAUTION</p> <p>The weight of the motor is 25 kg All lifting accessories used must be sized accordingly.</p>	
3	Apply the lifting accessory.	<p>Lifting accessory, motor: 3HAC15534-1 Lifting accessory (chain): 3HAC15556-1</p>  <p>xx210000594</p>

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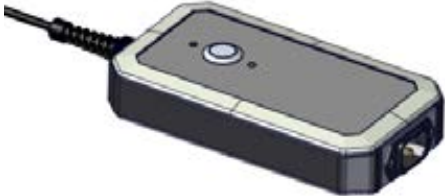

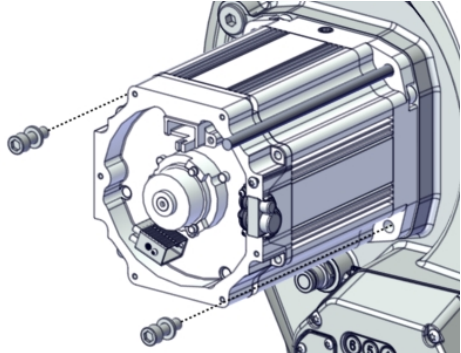
5 Repair

5.8.2 Replacing the axis-2 motor

Continued

	Action	Note
4	<p> Note</p> <p>Make sure the cable gland opening is turned the correct way.</p>	 <p>xx2100000595</p>
5	<p>Lift the motor and put it on the guide pins as close as possible to its final position without pushing the motor pinion into the gear.</p>	 <p>xx2000000455</p>
6	<p>Remove the lifting accessory and allow the motor to rest on the guide pins.</p>	 <p>xx2000000457</p>

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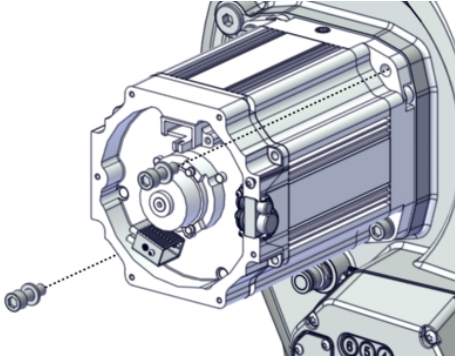
	Action	Note
7	<p>Release the brakes of the axis-2 motor with the brake release tool.</p> <ol style="list-style-type: none"> 1 Make sure the brake release tool is turned off. 2 Connect the tool to the R2.MP2 connector. 3 Release the brakes by pressing the button on the tool. <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury.</p> <p>Read and follow enclosed user instructions for the tool.</p> <p> WARNING</p> <p>Electrical damage to the motor may occur if 24V is supplied to the motor connector for more than 30 seconds. Use the specified brake release tool to eliminate the risk.</p>	<p>Brake release tool: 3HAC081310-001 User instructions are enclosed with the tool.</p>  <p>xx2100000666</p>
8	<p> CAUTION</p> <p>Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.</p>	
9	<p>Apply the rotation tool.</p> <p>Use caution and fit the motor in its final position while at the same time rotating the motor pinion slightly using the rotation tool.</p> <ul style="list-style-type: none"> • Make sure that the motor pinion is properly mated to the gear of the gearbox. • Make sure that the motor pinion does not get damaged. • Make sure that the direction of the cable exit is facing the correct way. 	<p>Rotation tool: 3HAB7887-1</p>
10	<p>Fit two of the attachment screws and washers.</p> <p>Use a bits extender in order to reach the screws.</p>	<p>Hex socket head cap screw: M10x30 12.9 Gleitmo 603+Geomet 500 (2 pcs) Bits extender: 3HAC12342-1</p>  <p>xx2000000467</p>

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5 Repair

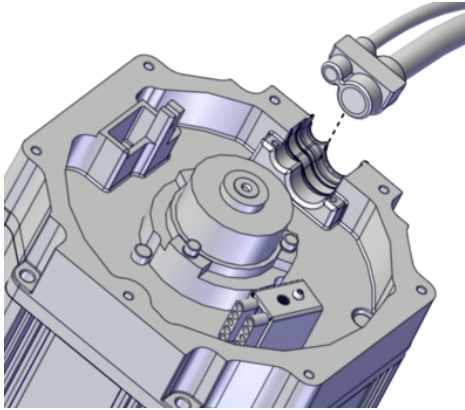
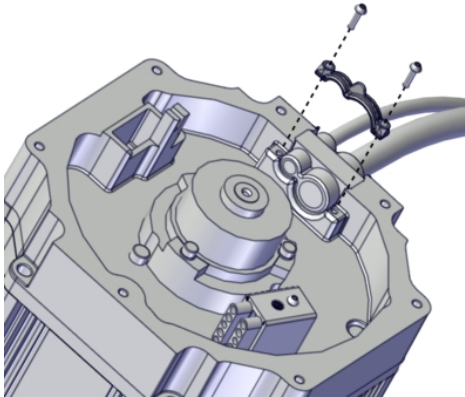
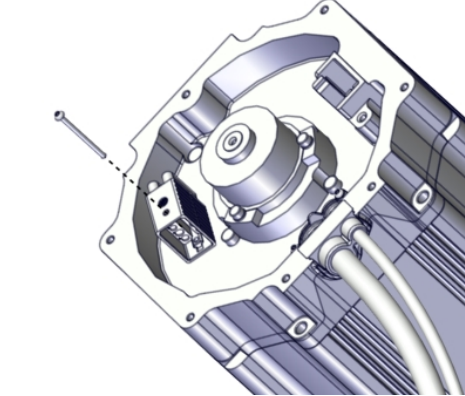
5.8.2 Replacing the axis-2 motor

Continued

	Action	Note
11	Remove the guide pins and replace with the remaining attachment screws.	<p>Hex socket head cap screw: M10x30 12.9 Gleitmo 603+Geomet 500 (2 pcs)</p>  <p>xx2000000468</p>
12	Tighten the screws.	Tightening torque: 50 Nm.
13	Disconnect the brake release tool.	
14	Perform a leak-down test.	See Performing a leak-down test on page 184 .

Continues on next page

Connecting the motor cables

	Action	Note
1	Put the motor cables in place in the opening.	 <p>xx210000599</p>
2	Refit the cable bracket with the screws.	<p>Torx pan head screw: M3x12 Stainless steel A2-70</p>  <p>xx210000598</p>
3	Connect the motor cables. Connect in accordance with the markings on the connectors.	
4	Secure the power connector with a screw.	<p>Tightening torque: 1 Nm</p>  <p>xx210000667</p>

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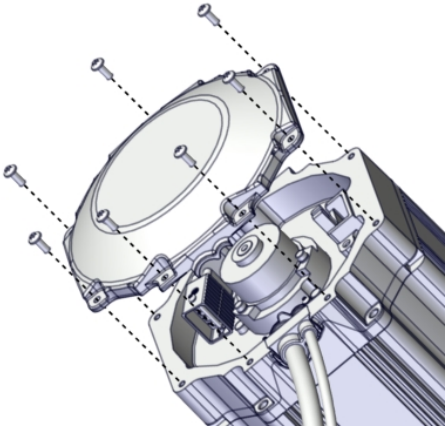
5 Repair

5.8.2 Replacing the axis-2 motor

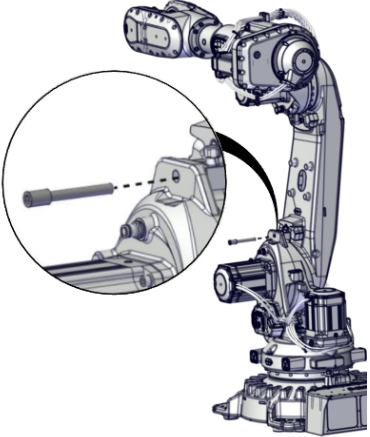

Continued

	Action	Note
5	<p>Inspect the gasket. Replace the complete cover if the gasket is damaged.</p>	<p>Axis-1 Connection box cover FS180 with gasket: 3HAC072864-003 (Graphite White) 3HAC072864-005 (ABB Orange)</p> <p>Axis-2 Connection box cover FS180 with gasket: 3HAC072864-003 (Graphite White) 3HAC072864-005 (ABB Orange)</p> <p>Axis-3 Connection box cover FS130 with gasket: 3HAC072863-003 (Graphite White) 3HAC072863-005 (ABB Orange)</p> <p>Axis-4 Connection box cover FS100 with gasket: 3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange)</p> <p>Axis-5 Connection box cover with gasket: (gasket not needed for protection type Standard)</p> <p>IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange)</p> <p>IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 3HAC072861-003 (Graphite White) 3HAC072861-004 (ABB Orange)</p>  <p>xx210000600</p>
6	<p> CAUTION</p> <p>When fitting the motor cover, make sure that none of the cables inside will be damaged.</p>	

Continues on next page

	Action	Note
7	Refit the motor cover with its attachment screws. Use locking liquid.	Torx pan head screw: M5x12 Stainless steel A2-70 Locking liquid: 3HAC041807-004 (Loctite 2400) Tightening torque: 6 Nm.  xx210000596

Concluding procedure

	Action	Note
1	Use caution and jog axis-2 a little to facilitate the removal of the lock screw that secures the lower arm.	
2	Remove the lock screw.	 xx210000592
3	Refill the gearbox with oil.	See Filling oil into the axis-2 gearbox on page 153 .
4	Re-calibrate the robot.	See Calibration on page 563 .
5	 DANGER Make sure all safety requirements are met when performing the first test run.	

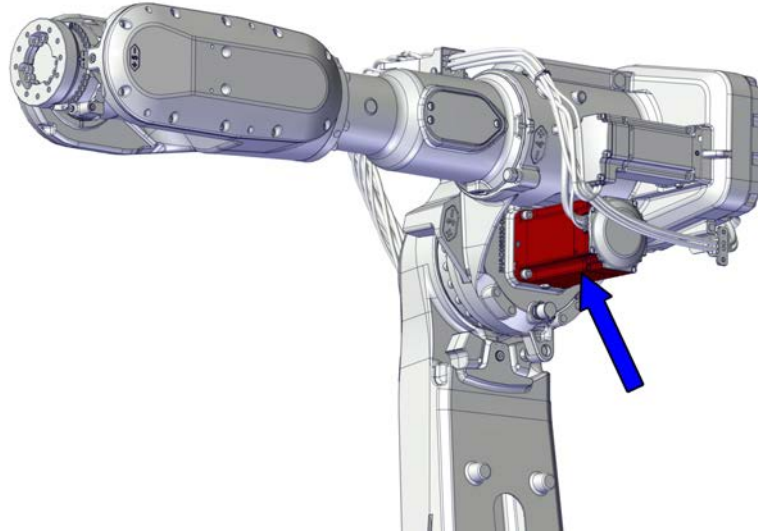
5 Repair

5.8.3 Replacing the axis-3 motor

5.8.3 Replacing the axis-3 motor

Location of the motor

The motor is located as shown in the figure.



xx210000487

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 5710 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note	Level
Motor unit	3HAC072174-003 (Graphite White) 3HAC072174-004 (ABB Orange)		L2

Required service parts

Consumable	Article number	Note
Lubricating oil	-	See <i>Type of lubrication in gear-boxes on page 137</i> .
Flange sealant	3HAC041807-007	Loctite 5800
Connection box cover FS130 with gasket	3HAC072863-003 (Graphite White) 3HAC072863-005 (ABB Orange)	Replace if damaged.
O-ring, G 1/2"	3HAC061327-059	Used on oil plug. Always replace when refitting oil plug.

Continues on next page

Required tools and equipment

Equipment	Article number	Note
Brake release tool	3HAC081310-001	User instructions are enclosed with the tool.
Rotation tool	3HAB7887-1	Used to rotate the motor pinion.
Guide pin, M10x150	3HAC15521-2	Always use guide pins in pairs.
Bits extender	3HAC12342-1	300 mm, bits 1/2"
Removal tool motor M12	3HAC14631-1	Used to push out the motor, if necessary. Always use removal tools in pairs.
Calibration toolbox, Axis Calibration	3HAC074564-001 (axes 1, 2, 3 and 4) 3HAC074119-001 (axes 5 and 6)	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

Removing the motor

Use these procedures to remove the motor.

Preparations before removing the motor

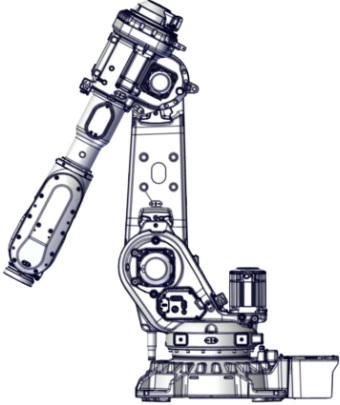
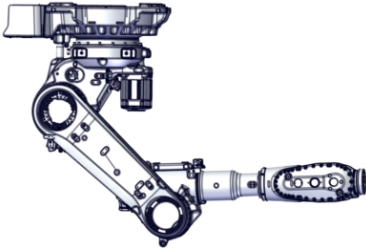

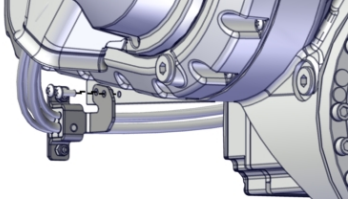
	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Drain the axis-3 gearbox.	See Draining the axis-3 gearbox on page 157 .

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5 Repair


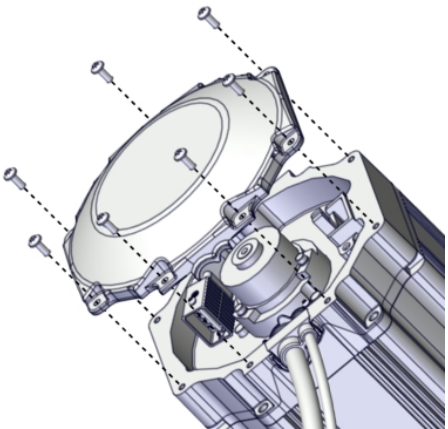
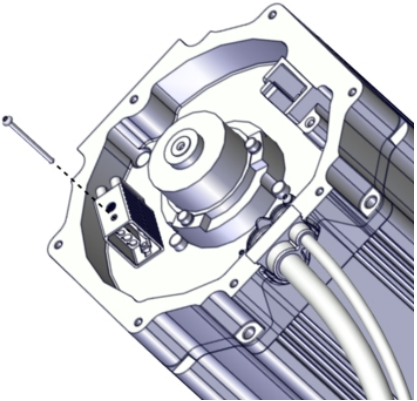
5.8.3 Replacing the axis-3 motor

Continued

	Action	Note
3	<p><i>Floor-mounted robot:</i></p> <p>Unload the upper arm using one of these methods:</p> <ul style="list-style-type: none"> • Use caution and jog axis-3 to maximum + position. Release the brakes and let the upper arm rest against the axis-3 damper. Position shown in figure. • Robot in synchronization position: use a fork lift to rest the upper arm onto. • Robot in synchronization position: use lifting slings and an overhead crane to rest the upper arm onto. 	 <p>xx2100002187</p>
4	<p><i>Option Inverted (3317-1)</i></p> <p>Jog the robot into position:</p> <ul style="list-style-type: none"> • Axis 1: position that allows best possible access to fit the lifting accessories to the upper arm (170° shown in figure) • Axis 2: -47° • Axis 3: -135° (upper arm horizontal) • Axis 4: 0° • Axis 5: no significance • Axis 6: no significance <p>Unload the weight of the upper arm using one of these methods:</p> <ul style="list-style-type: none"> • Use a fork lift to rest the upper arm onto. • Use lifting slings and an overhead crane to rest the upper arm onto. 	 <p>xx2100002137</p>
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 safeguarded space.</p>	
6	<p>Remove the cable bracket underneath the arm house.</p>	 <p>xx2100002154</p>

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Disconnecting the motor cables

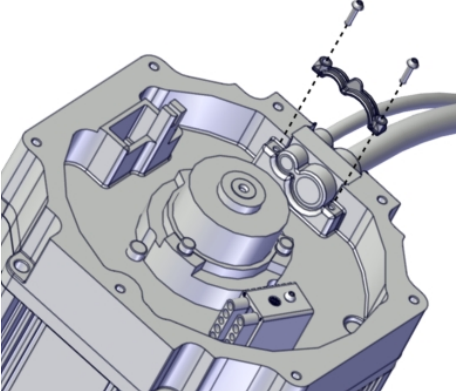
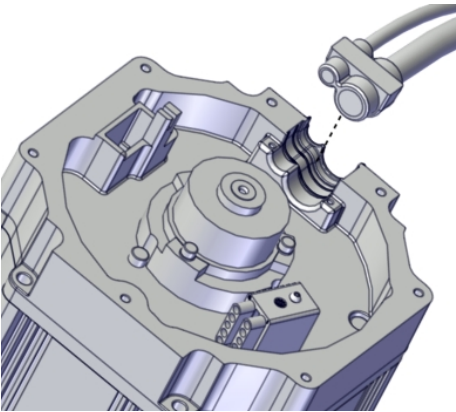
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Remove the motor cover by removing the screws.</p>	 <p>xx210000596</p>
3	<p>Disconnect the power cable connector by removing the attachment screw.</p>	 <p>xx210000667</p>
4	<p>Disconnect the signal cable connector.</p>	

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5 Repair

5.8.3 Replacing the axis-3 motor




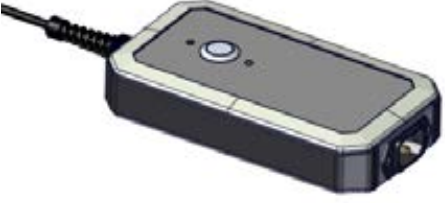
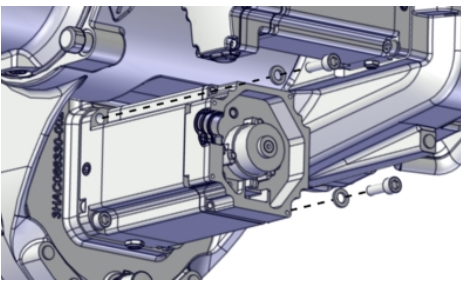

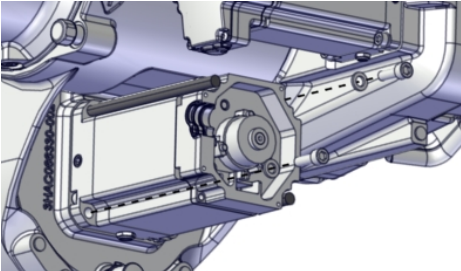
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	Action	Note
5	Remove the cable bracket by removing the screws.	 xx210000598
6	Remove the motor cables.	 xx210000599

Removing the axis-3 motor

	Action	Note
1	Before removing the motor, make sure that the gearbox is completely drained.	
2	 DANGER When releasing the holding brakes of the motor, the upper arm will be movable and falls down if not secured. Verify that the upper arm is secured as previously described, before continuing.	

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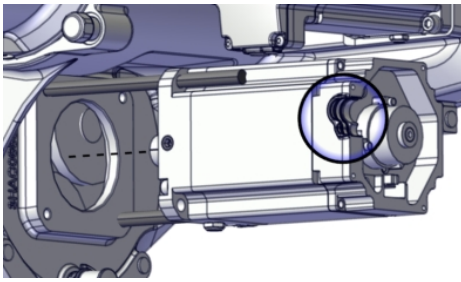
	Action	Note
3	<p>Release the brakes on the motor with the brake release tool.</p> <ol style="list-style-type: none"> 1 Make sure the brake release tool is turned off. 2 Connect the tool to the R2.MP3 connector. 3 Release the brakes by pressing the button on the tool. <p> CAUTION</p> <p>Releasing the brakes on the axis-3 motor results in weight transfer of upper arm weight. Verify that the upper arm rests against the mechanical stop or installed lifting accessories, before releasing the brakes.</p> <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury.</p> <p>Read and follow enclosed user instructions for the tool.</p> <p> WARNING</p> <p>Electrical damage to the motor may occur if 24V is supplied to the motor connector for more than 30 seconds. Use the specified brake release tool to eliminate the risk.</p>	<p>Brake release tool: 3HAC081310-001 User instructions are enclosed with the tool.</p>  <p>xx2100000666</p>
4	<p>Remove two opposite attachment screws. Use a bits extender in order to reach the screws.</p>	<p>Bits extender: 3HAC12342-1</p>  <p>xx2100002153</p>
5	<p>Fit guide pins in the opposite holes and remove the remaining two screws.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the motor slide better.</p>	<p>Guide pin, M10x150: 3HAC15521-2 Always use guide pins in pairs.</p>  <p>xx2100002152</p>

Continues on next page

5 Repair

5.8.3 Replacing the axis-3 motor



Continued

	Action	Note
6	 CAUTION Whenever parting/mating motor and gear-box, the gears may be damaged if excessive force is used.	
7	Press the motor out of its position by using the removal tool in opposite holes of the motor.	Removal tool motor M12: 3HAC14631-1 Used to push out the motor, if necessary. Always use removal tools in pairs.
8	 CAUTION The weight of the motor is 13 kg All lifting accessories used must be sized accordingly.	
	Remove the motor by sliding it out on the guide pins and lift it off.  Tip Make a note in which direction the cable gland hole is facing. The motor shall be refitted in the same position.	 <small>xx2100002149</small> Make sure the pinion is not damaged.


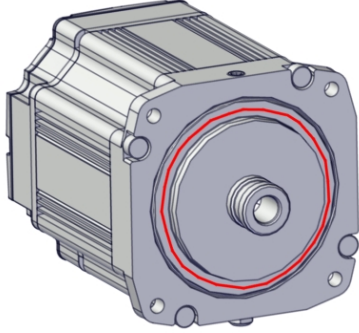
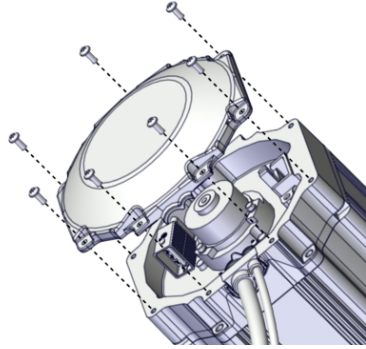


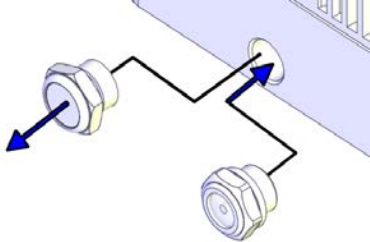
Refitting the motor

Use these procedures to refit the motor.

Preparations prior to refitting motor

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove any old paint or flange sealant residues or other contamination from the contact surfaces on both the motor and the mating parts.  Tip Remove flange sealant residues with Loctite 7200. Then use Loctite 7063 for cleaning the mating surface.	

Continues on next page

	Action	Note
3	<p>Apply a continuous bead of flange sealant, 1-2 mm wide, inside of the groove on the motor contact surface.</p> <p> Note</p> <p>The purpose of the groove is to catch excess sealant. No o-ring is used.</p>	<p>Flange sealant: 3HAC041807-007 (Loctite 5800)</p>  <p>xx2100000520</p>
4	<p>Remove the cover, if fitted to the new spare part motor.</p>	 <p>xx2100000596</p>
5	<p><i>Protection type Foundry Plus</i> Valid for axis-1, axis-2, axis-3 and axis-4.</p> <p>If the motor is a new spare part, the evacuation hole protection filter must be replaced with a transparent plug/sight glass (enclosed with the spare part delivery). Remove the protection filter and install the transparent plug/sight glass.</p>  <p>xx1800000101</p>  <p>xx1800000102</p> <p>Protection filter (Standard). Transparent plug (Foundry Plus).</p>	<p>Tightening torque, transparent plug: 20 Nm Tightening torque, protection filter: 20 Nm</p>  <p>xx1600000576</p>

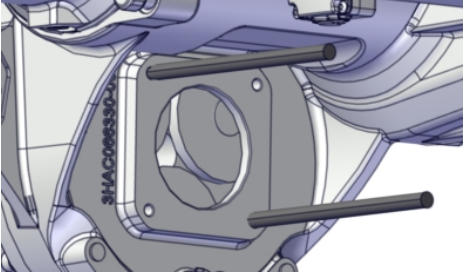


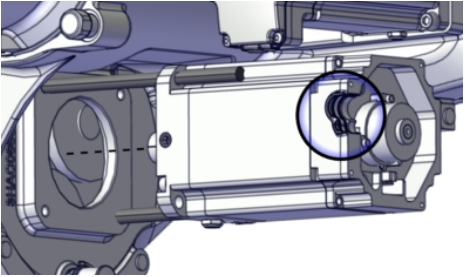


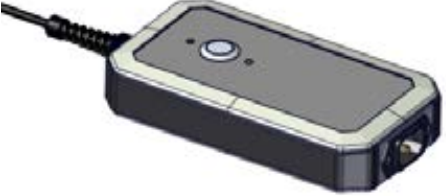
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5 Repair


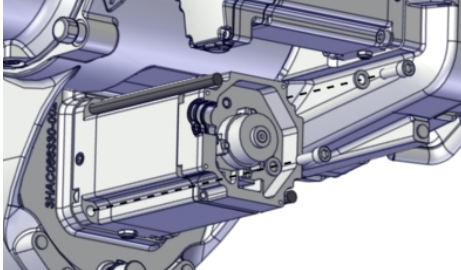
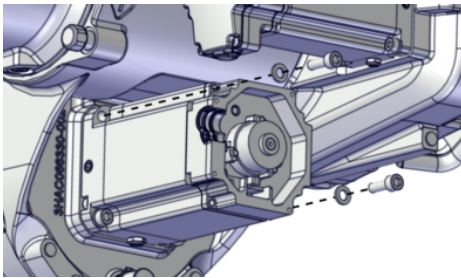
5.8.3 Replacing the axis-3 motor

Continued

Refitting the axis-3 motor

	Action	Note
1	Fit guide pins in opposite holes.	<p>Guide pin, M10x150: 3HAC15521-2 Always use guide pins in pairs.</p>  <p>xx2100002151</p>
2	<p> CAUTION</p> <p>The weight of the motor is 13 kg All lifting accessories used must be sized accordingly.</p>	
3	<p>Lift the motor and put it on the guide pins as close as possible to its final position without pushing the motor pinion into the gear.</p> <p> Note</p> <p>Make sure the cable gland opening is turned the correct way.</p>	 <p>xx2100002149</p>
4	<p>Release the brakes of the axis-3 motor with the brake release tool.</p> <ol style="list-style-type: none"> 1 Make sure the brake release tool is turned off. 2 Connect the tool to the R2.MP3 connector. 3 Release the brakes by pressing the button on the tool. <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury. Read and follow enclosed user instructions for the tool.</p> <p> WARNING</p> <p>Electrical damage to the motor may occur if 24V is supplied to the motor connector for more than 30 seconds. Use the specified brake release tool to eliminate the risk.</p>	<p>Brake release tool: 3HAC081310-001 User instructions are enclosed with the tool.</p>  <p>xx2100000666</p>

Continues on next page

	Action	Note
5	 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
6	Apply the rotation tool. Use caution and fit the motor in its final position while at the same time rotating the motor pinion slightly using the rotation tool. <ul style="list-style-type: none"> • Make sure that the motor pinion is properly mated to the gear of the gearbox. • Make sure that the motor pinion does not get damaged. • Make sure that the direction of the cable exit is facing the correct way. 	Rotation tool: 3HAB7887-1
7	Fit two of the attachment screws and washers. Use a bits extender in order to reach the screws.	Hex socket head cap screw: M10x30 12.9 Gleitmo 603+Geomet 500 (2 pcs) Bits extender: 3HAC12342-1  xx2100002152
8	Remove the guide pins and replace with the remaining attachment screws.	Hex socket head cap screw: M10x30 12.9 Gleitmo 603+Geomet 500 (2 pcs)  xx2100002153
9	Tighten the screws.	Tightening torque: 50 Nm.
10	Disconnect the brake release tool.	
11	Perform a leak-down test.	See Performing a leak-down test on page 184 .

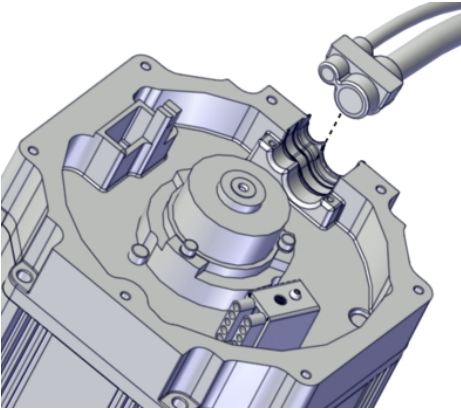
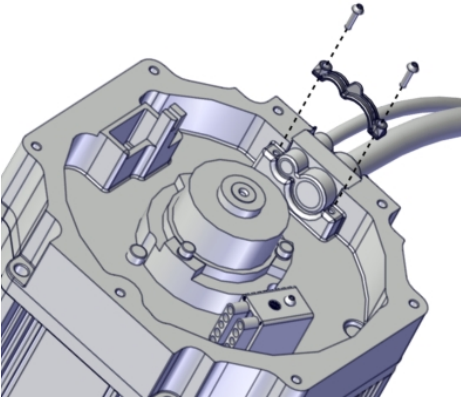
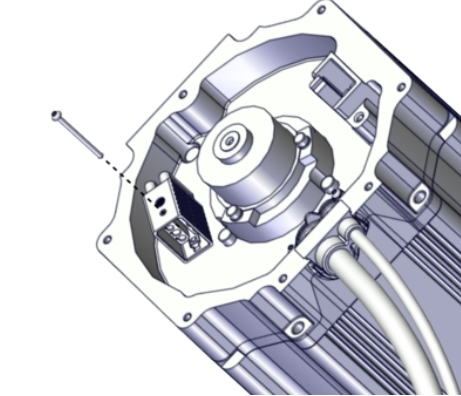
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5 Repair

5.8.3 Replacing the axis-3 motor

Continued

Connecting the motor cables

	Action	Note
1	Put the motor cables in place in the opening.	 <p>xx210000599</p>
2	Refit the cable bracket with the screws.	<p>Torx pan head screw: M3x12 Stainless steel A2-70</p>  <p>xx210000598</p>
3	Connect the motor cables. Connect in accordance with the markings on the connectors.	
4	Secure the power connector with a screw.	<p>Tightening torque: 1 Nm</p>  <p>xx210000667</p>

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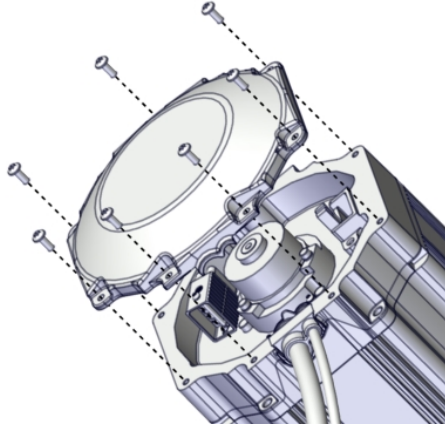
	Action	Note
5	<p>Inspect the gasket. Replace the complete cover if the gasket is damaged.</p>	<p>Axis-1 Connection box cover FS180 with gasket: 3HAC072864-003 (Graphite White) 3HAC072864-005 (ABB Orange)</p> <p>Axis-2 Connection box cover FS180 with gasket: 3HAC072864-003 (Graphite White) 3HAC072864-005 (ABB Orange)</p> <p>Axis-3 Connection box cover FS130 with gasket: 3HAC072863-003 (Graphite White) 3HAC072863-005 (ABB Orange)</p> <p>Axis-4 Connection box cover FS100 with gasket: 3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange)</p> <p>Axis-5 Connection box cover with gasket: (gasket not needed for protection type Standard)</p> <p>IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange)</p> <p>IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 3HAC072861-003 (Graphite White) 3HAC072861-004 (ABB Orange)</p>  <p>xx210000600</p>
6	<p> CAUTION</p> <p>When fitting the motor cover, make sure that none of the cables inside will be damaged.</p>	

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5 Repair

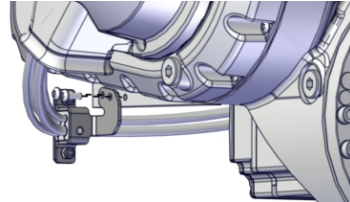

5.8.3 Replacing the axis-3 motor

Continued

	Action	Note
7	Refit the motor cover with its attachment screws. Use locking liquid.	Torx pan head screw: M5x12 Stainless steel A2-70 Locking liquid: 3HAC041807-004 (Loctite 2400) Tightening torque: 6 Nm. <div style="text-align: right;">  </div>

xx210000596

Concluding procedure

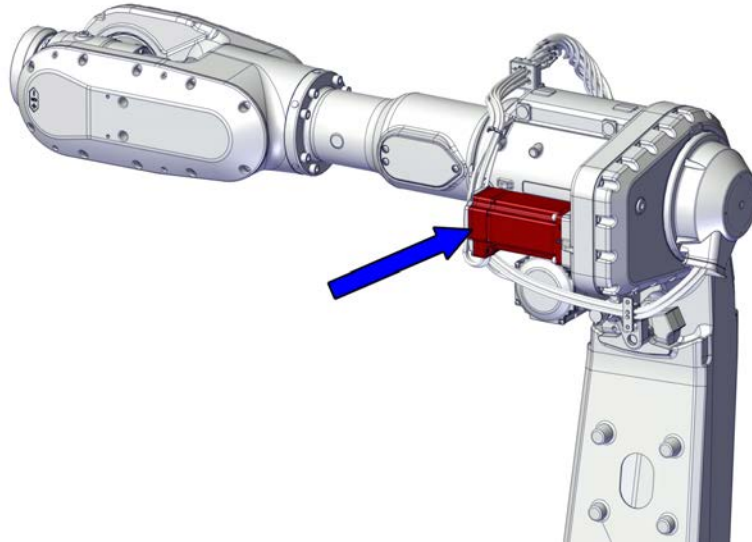
	Action	Note
1	Remove the equipment used to unload the upper arm.	
2	Refit the metal clamp beneath the arm house.	Torx pan head screw: M6x16 Stainless steel A2-70 Tightening torque: 10 Nm. <div style="text-align: right;">  </div>
3	Refill the gearbox with oil.	See Filling oil into the axis-3 gearbox on page 159 .
4	Re-calibrate the robot.	See Calibration on page 563 .
5	 DANGER Make sure all safety requirements are met when performing the first test run.	

xx2100002154

5.8.4 Replacing the axis-4 motor

Location of the motor

The motor is located as shown in the figure.



xx210000488

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 5710 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note	Level
Motor unit	IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 3HAC072255-003 (Graphite White) 3HAC072255-004 (ABB Orange) IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 3HAC070735-003 (Graphite White) 3HAC070735-004 (ABB Orange)		L2

Required service parts

Consumable	Article number	Note
Flange sealant	3HAC041807-007	Loctite 5800

Continues on next page

5 Repair

5.8.4 Replacing the axis-4 motor

Continued

Consumable	Article number	Note
Connection box cover FS100 with gasket	3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange)	Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Brake release tool	3HAC081310-001	User instructions are enclosed with the tool.
Guide pin, M8x150	3HAC15520-2	Always use guide pins in pairs.
Bits extender	3HAC12342-1	300 mm, bits 1/2"
Removal tool motor M10	3HAC14972-1	Used to push out the motor, if necessary.
Rotation tool	3HAB7887-1	Used to rotate the motor pinion.
Calibration toolbox, Axis Calibration	3HAC074564-001 (axes 1, 2, 3 and 4) 3HAC074119-001 (axes 5 and 6)	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

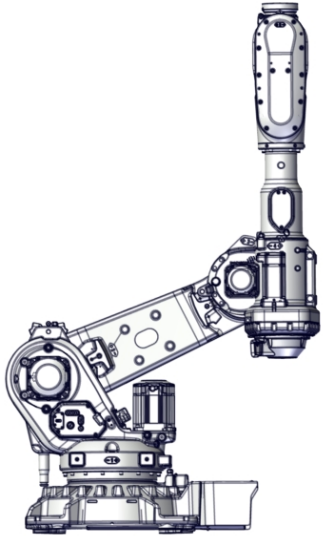
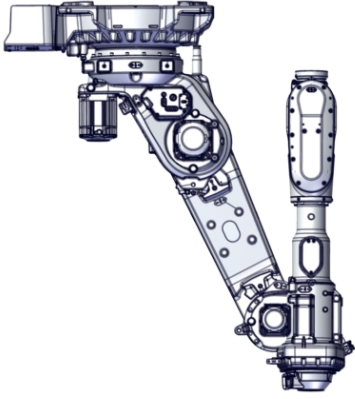

Removing the motor

Use these procedures to remove the motor.

Preparations before removing the motor

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

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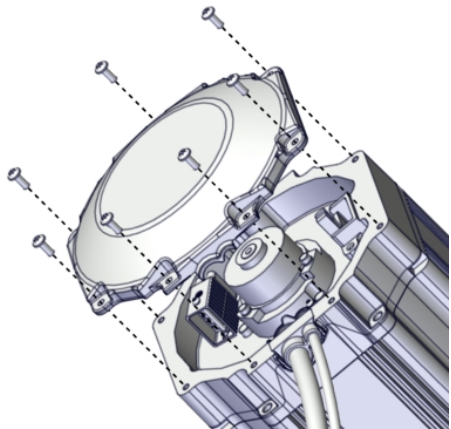
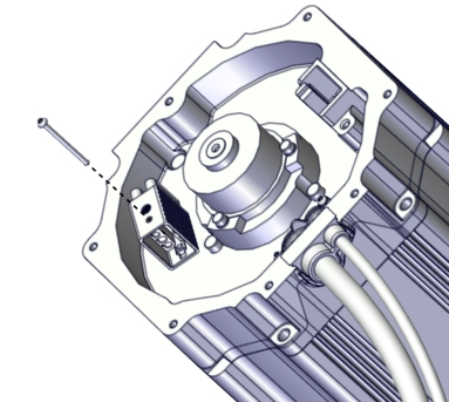
	Action	Note
2	<p><i>Floor-mounted robot:</i></p> <p>Jog the robot into position:</p> <ul style="list-style-type: none"> • Axis 1: no significance • Axis 2: -65° • Axis 3: upper arm pointing straight up (if possible). • Axis 4: no significance • Axis 5: no significance • Axis 6: no significance <p>With the robot in this position, there is no need to drain oil from the axis-4 gearbox when the motor is replaced.</p>	 <p>xx2100002188</p>
3	<p><i>Option Inverted (3317-1)</i></p> <p>Jog the robot into position:</p> <ul style="list-style-type: none"> • Axis 1: no significance • Axis 2: approximately +30° • Axis 3: upper arm pointing straight up (if possible). • Axis 4: no significance • Axis 5: no significance • Axis 6: no significance <p>With the robot in this position, there is no need to drain oil from the axis-4 gearbox when the motor is replaced.</p>	 <p>xx2100002200</p>
4	<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 safeguarded space.</p>	
5	<p>If there is no space to position the upper arm pointed straight up, drain the axis-4 gearbox.</p>	<p>See Draining the axis-4 gearbox on page 162.</p>

5 Repair

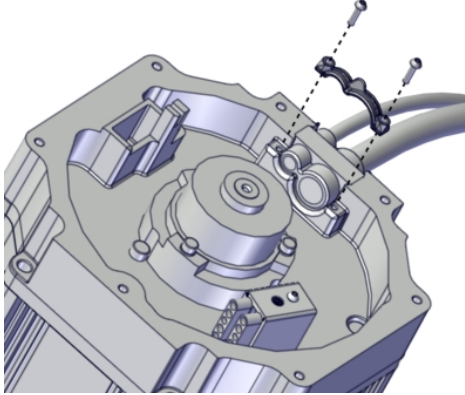
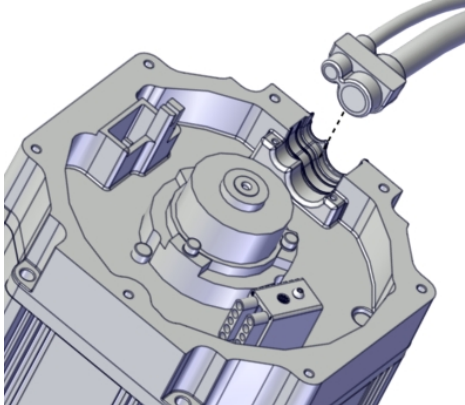
5.8.4 Replacing the axis-4 motor

Continued


Disconnecting the motor cables

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the motor cover by removing the screws.	 xx210000596
3	Disconnect the power cable connector by removing the attachment screw.	 xx210000667
4	Disconnect the signal cable connector.	

Continues on next page

	Action	Note
5	Remove the cable bracket by removing the screws.	 <p>xx210000598</p>
6	Remove the motor cables.	 <p>xx210000599</p>

Removing the axis-4 motor




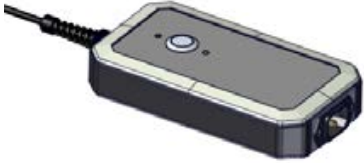
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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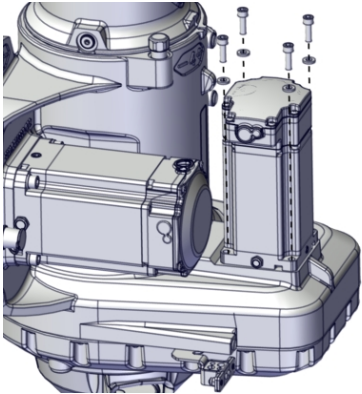
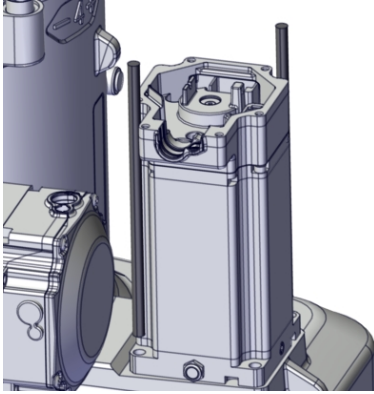


5 Repair

5.8.4 Replacing the axis-4 motor

Continued

	Action	Note
2	<p>Release the brakes on the motor with the brake release tool.</p> <ol style="list-style-type: none">1 Make sure the brake release tool is turned off.2 Connect the tool to the R2.MP4 connector.3 Release the brakes by pressing the button on the tool. <p> CAUTION</p> <p>Releasing the brakes on the axis-4 motor may cause axis-4 to move unexpectedly.</p> <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury.</p> <p>Read and follow enclosed user instructions for the tool.</p> <p> WARNING</p> <p>Electrical damage to the motor may occur if 24V is supplied to the motor connector for more than 30 seconds. Use the specified brake release tool to eliminate the risk.</p>	<p>Brake release tool: 3HAC081310-001</p> <p>User instructions are enclosed with the tool.</p>  <p>xx2100000666</p>

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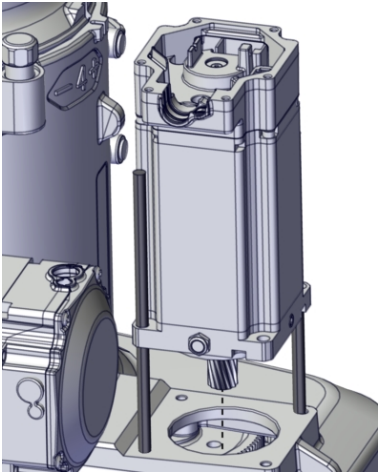
	Action	Note
3	Unscrew the attachment screws that secure the motor.	 <p>xx2100002155</p>
4	Apply two guide pins in opposite holes.	<p>Guide pin, M8x150: 3HAC15520-2 Always use guide pins in pairs.</p>  <p>xx2100002156</p>
5	 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
6	Press the motor out of its position by using the removal tool in opposite holes of the motor.	<p>Removal tool motor M10: 3HAC14972-1 Used to push out the motor, if necessary.</p>
7	 CAUTION The weight of the motor is 7 kg All lifting accessories used must be sized accordingly.	

Continues on next page

5 Repair

5.8.4 Replacing the axis-4 motor




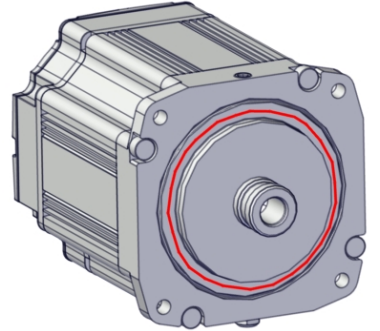
Continued

	Action	Note
8	<p>Remove the motor by carefully lifting it straight out/straight up (if the upper arm points upwards). Make sure the pinion is not damaged.</p>	 <p>xx2100002157</p>

Refitting the motor

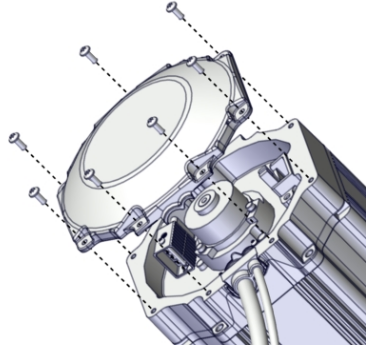

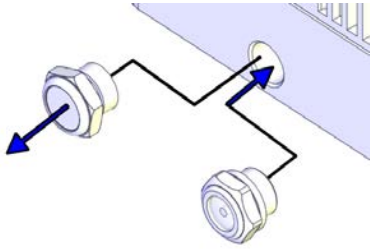
Use these procedures to refit the motor.

Preparations prior to refitting motor

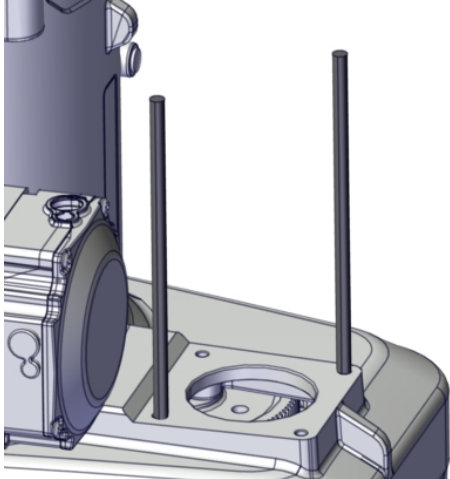
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Remove any old paint or flange sealant residues or other contamination from the contact surfaces on both the motor and the mating parts.</p> <p> Tip</p> <p>Remove flange sealant residues with Loctite 7200. Then use Loctite 7063 for cleaning the mating surface.</p>	
3	<p>Apply a continuous bead of flange sealant, 1-2 mm wide, inside of the groove on the motor contact surface.</p> <p> Note</p> <p>The purpose of the groove is to catch excess sealant. No o-ring is used.</p>	<p>Flange sealant: 3HAC041807-007 (Loctite 5800)</p>  <p>xx2100000520</p>

Continues on next page

5.8.4 Replacing the axis-4 motor
Continued

	Action	Note
4	Remove the cover, if fitted to the new spare part motor.	 <p>xx210000596</p>
5	<p><i>Protection type Foundry Plus</i> Valid for axis-1, axis-2, axis-3 and axis-4.</p> <p>If the motor is a new spare part, the evacuation hole protection filter must be replaced with a transparent plug/sight glass (enclosed with the spare part delivery). Remove the protection filter and install the transparent plug/sight glass.</p>  <p>xx1800000101 xx1800000102</p> <p>Protection filter (Standard). Transparent plug (Foundry Plus).</p>	<p>Tightening torque, transparent plug: 20 Nm Tightening torque, protection filter: 20 Nm</p>  <p>xx1600000576</p>

Refitting the axis-4 motor



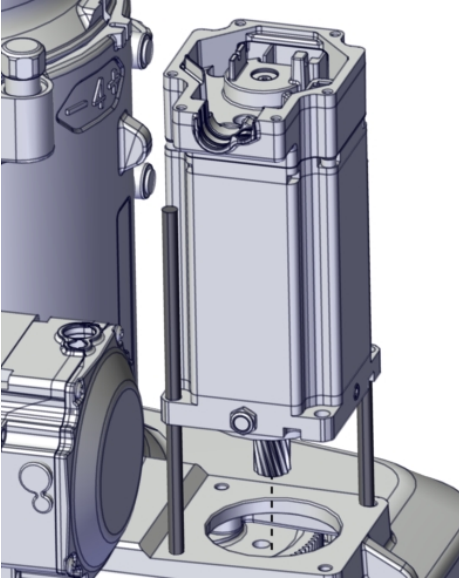


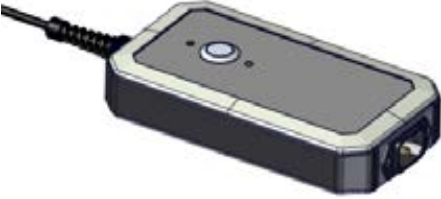

	Action	Note
1	Fit guide pins in opposite holes.	<p>Guide pin, M8x150: 3HAC15520-2 Always use guide pins in pairs.</p>  <p>xx2100002201</p>

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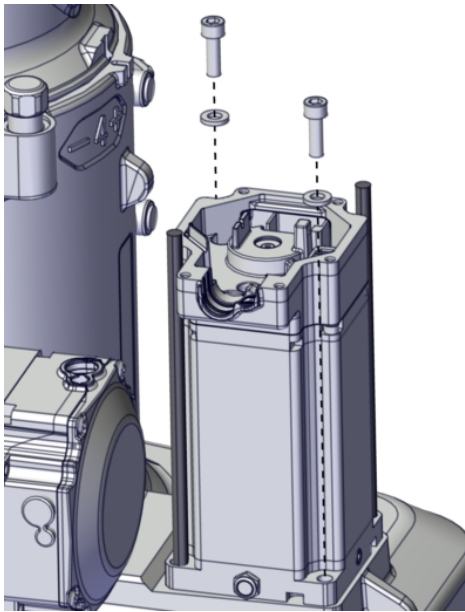
5 Repair

5.8.4 Replacing the axis-4 motor

Continued

	Action	Note
2	<p> CAUTION</p> <p>The weight of the motor is 7 kg All lifting accessories used must be sized accordingly.</p>	
3	<p>Lift the motor and put it on the guide pins as close as possible to its final position without pushing the motor pinion into the gear.</p> <p> Note</p> <p>Make sure the cable gland opening is turned the correct way.</p>	 <p>xx2100002157</p>
4	<p>Release the brakes of the axis-4 motor with the brake release tool.</p> <ol style="list-style-type: none"> 1 Make sure the brake release tool is turned off. 2 Connect the tool to the R2.MP4 connector. 3 Release the brakes by pressing the button on the tool. <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury.</p> <p>Read and follow enclosed user instructions for the tool.</p> <p> WARNING</p> <p>Electrical damage to the motor may occur if 24V is supplied to the motor connector for more than 30 seconds. Use the specified brake release tool to eliminate the risk.</p>	<p>Brake release tool: 3HAC081310-001 User instructions are enclosed with the tool.</p>  <p>xx2100000666</p>
5	<p> CAUTION</p> <p>Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.</p>	

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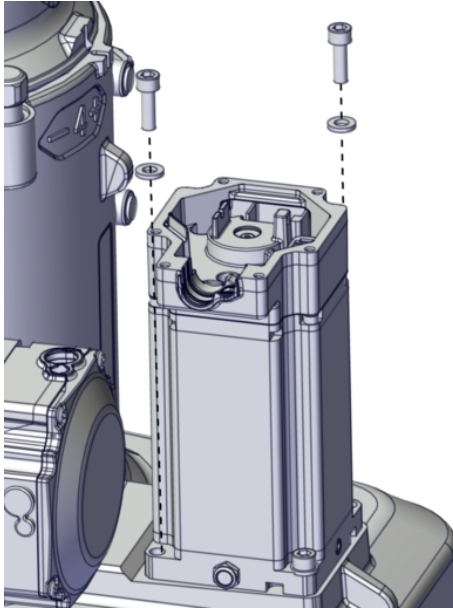
	Action	Note
6	<p>Apply the rotation tool.</p> <p>Use caution and fit the motor in its final position while at the same time rotating the motor pinion slightly using the rotation tool.</p> <ul style="list-style-type: none"> • Make sure that the motor pinion is properly mated to the gear of the gearbox. • Make sure that the motor pinion does not get damaged. • Make sure that the direction of the cable exit is facing the correct way. 	<p>Rotation tool: 3HAB7887-1</p>
7	<p>Fit two of the attachment screws and washers.</p> <p>Use a bits extender in order to reach the screws.</p>	<p>Hex socket head cap screw: M8x25 12.9 Gleitmo 603+Geomet 500 (2 pcs)</p> <p>Bits extender: 3HAC12342-1</p>  <p>xx210002212</p>

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5 Repair

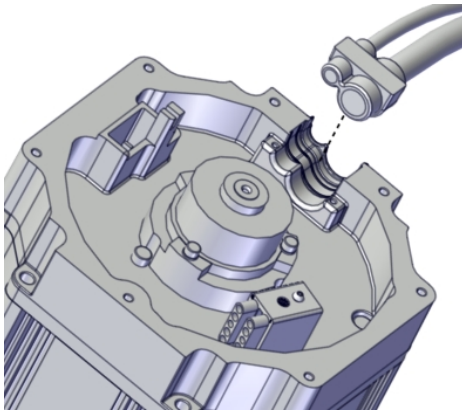
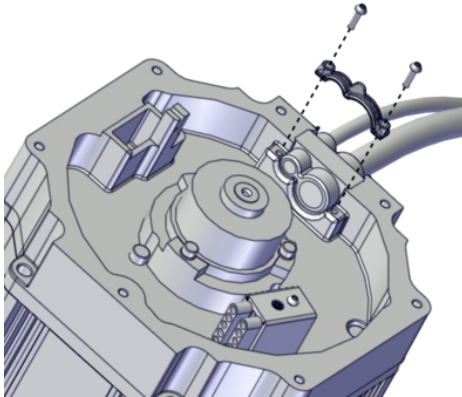
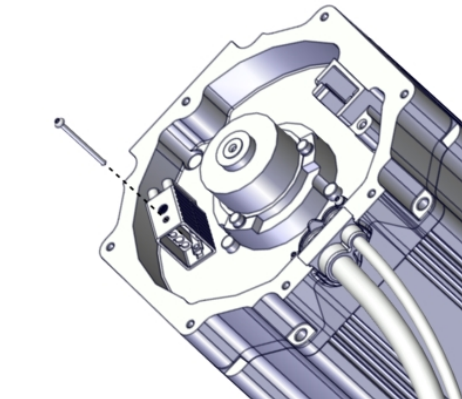
5.8.4 Replacing the axis-4 motor

Continued

	Action	Note
8	Remove the guide pins and replace with the remaining attachment screws.	<p>Hex socket head cap screw: M8x25 12.9 Gleitmo 603+Geomet 500 (2 pcs)</p>  <p>xx2100002213</p>
9	Tighten the screws.	Tightening torque: 24 Nm.
10	Disconnect the brake release tool.	
11	Perform a leak-down test.	See Performing a leak-down test on page 184 .

Continues on next page

Connecting the motor cables

	Action	Note
1	Put the motor cables in place in the opening.	 <p>xx210000599</p>
2	Refit the cable bracket with the screws.	<p>Torx pan head screw: M3x12 Stainless steel A2-70</p>  <p>xx210000598</p>
3	Connect the motor cables. Connect in accordance with the markings on the connectors.	
4	Secure the power connector with a screw.	<p>Tightening torque: 1 Nm</p>  <p>xx210000667</p>

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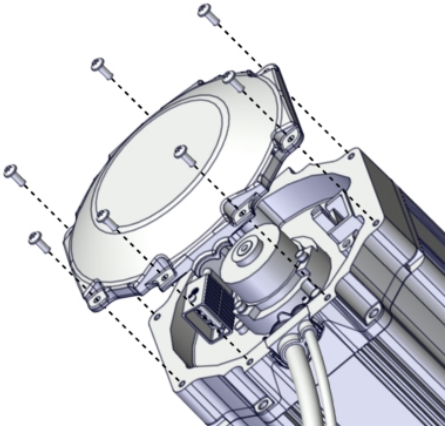
5 Repair

5.8.4 Replacing the axis-4 motor


Continued

	Action	Note
5	<p>Inspect the gasket. Replace the complete cover if the gasket is damaged.</p>	<p>Axis-1 Connection box cover FS180 with gasket: 3HAC072864-003 (Graphite White) 3HAC072864-005 (ABB Orange)</p> <p>Axis-2 Connection box cover FS180 with gasket: 3HAC072864-003 (Graphite White) 3HAC072864-005 (ABB Orange)</p> <p>Axis-3 Connection box cover FS130 with gasket: 3HAC072863-003 (Graphite White) 3HAC072863-005 (ABB Orange)</p> <p>Axis-4 Connection box cover FS100 with gasket: 3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange)</p> <p>Axis-5 Connection box cover with gasket: (gasket not needed for protection type Standard)</p> <p>IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange)</p> <p>IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 3HAC072861-003 (Graphite White) 3HAC072861-004 (ABB Orange)</p>  <p>xx210000600</p>
6	<p> CAUTION</p> <p>When fitting the motor cover, make sure that none of the cables inside will be damaged.</p>	

Continues on next page

	Action	Note
7	<p>Refit the motor cover with its attachment screws. Use locking liquid.</p>	<p>Torx pan head screw: M5x12 Stainless steel A2-70 Locking liquid: 3HAC041807-004 (Loctite 2400) Tightening torque: 6 Nm.</p>  <p>xx210000596</p>

Concluding procedure

	Action	Note
1	Refill the gearbox with oil, if drained.	See Filling oil into the axis-4 gearbox on page 164 .
2	Re-calibrate the robot.	See Calibration on page 563 .
3	 <p>DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

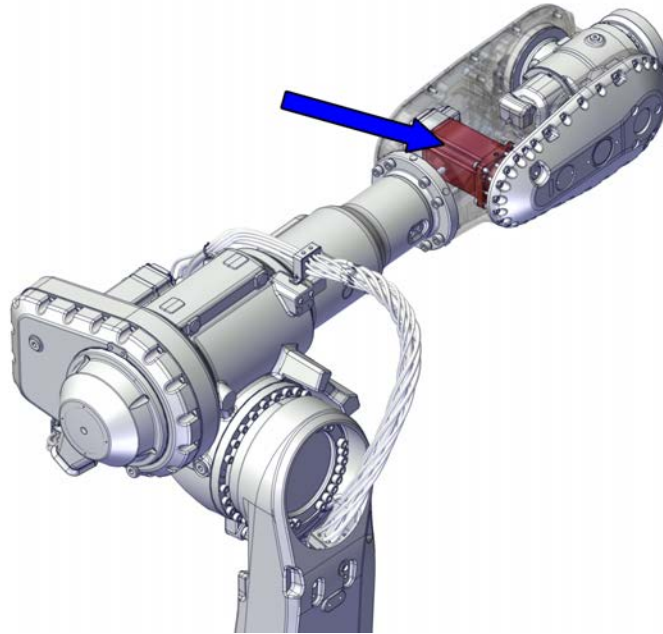
5 Repair

5.8.5 Replacing the axis-5 motor

5.8.5 Replacing the axis-5 motor

Location of the motor

The motor is located as shown in the figure.



xx2100000489

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 5710 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note	Level
Motor unit	IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 3HAC070735-005 IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 3HAC071189-003		L2

Required service parts

Consumable	Article number	Note
Flange sealant	3HAC041807-007	Loctite 5800

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Consumable	Article number	Note
Connection box MT080X with gasket	IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 3HAC072859-003 (Graphite White) 3HAC072859-004 (ABB Orange)	Replace if damaged.
Connection box cover with gasket	IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange) IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 3HAC072861-003 (Graphite White) 3HAC072861-004 (ABB Orange)	Replace if damaged.
Cable strap, outdoor	21662055-3	Polyamide 6.6

Required tools and equipment

Equipment	Article number	Note
Brake release tool	3HAC081310-001	User instructions are enclosed with the tool.
IRB 5710-110/2.3, IRB 5710-90/2.3 LID: Guide pin, M8x150 IRB 5710-90/2.7, IRB 5710-70/2.7 LID: Guide pin, M6x150	IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 3HAC15520-2 IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 3HAC080345-001	Always use guide pins in pairs.
Bits extender	3HAC12342-1	300 mm, bits 1/2"
IRB 5710-110/2.3, IRB 5710-90/2.3 LID: Removal tool motor M10 IRB 5710-90/2.7, IRB 5710-70/2.7 LID: Removal tool motor M8	IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 3HAC14972-1 IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 3HAC080346-001	Used to push out the motor, if necessary.
Rotation tool	3HAB7887-1	Used to rotate the motor pinion.
Calibration toolbox, Axis Calibration	3HAC074564-001 (axes 1, 2, 3 and 4) 3HAC074119-001 (axes 5 and 6)	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

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5 Repair

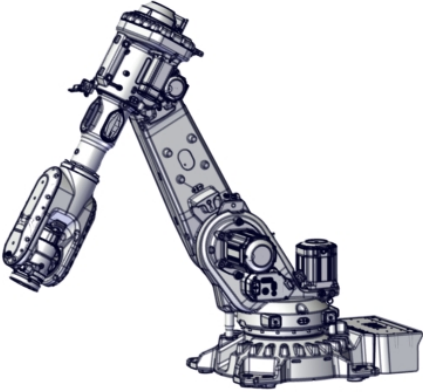
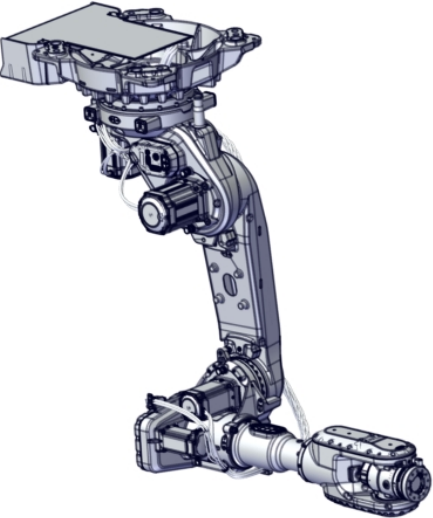

5.8.5 Replacing the axis-5 motor

Continued

Removing the motor

Use these procedures to remove the motor.


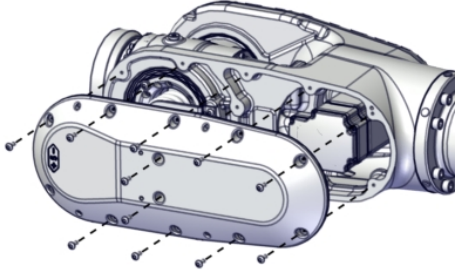
Preparations before removing the axis-5 motor

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	<p><i>Floor-mounted robot:</i></p> <p>Jog the robot into position:</p> <ul style="list-style-type: none"> • Axis 1: no significance • Axis 2: suitable working position to replace axis-5 motor (for example: +25°) • Axis 3: suitable working position to replace axis-5 motor (for example: +35°) • Axis 4: -90° • Axis 5: no significance • Axis 6: no significance <p>With the robot in this position, there is no need to drain oil from the axis-5 gearbox when the motor is replaced.</p>	 <p>xx2100002202</p>
3	<p><i>Option Inverted (3317-1)</i></p> <p>Jog the robot into position:</p> <ul style="list-style-type: none"> • Axis 1: no significance • Axis 2: 0° • Axis 3: suitable working position to replace axis-5 motor (for example: +0°) • Axis 4: +90° • Axis 5: no significance • Axis 6: no significance <p>With the robot in this position, there is no need to drain oil from the axis-5 gearbox when the motor is replaced.</p>	 <p>xx2100002203</p>
4	<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 safe-guarded space.</p>	


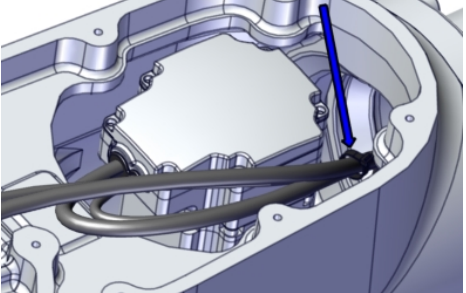
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Retrieving access to the wrist cabling

Use this procedure to remove the wrist cover.

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the wrist cover.	 <p>xx2000000373</p>

Disconnecting the axis-5 motor cables

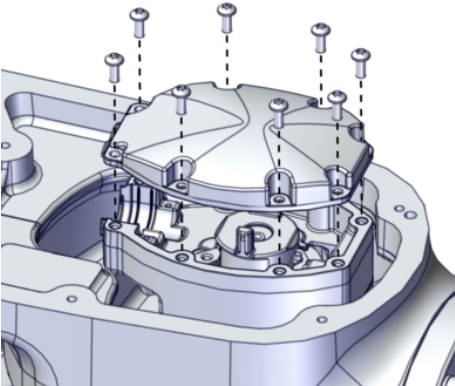
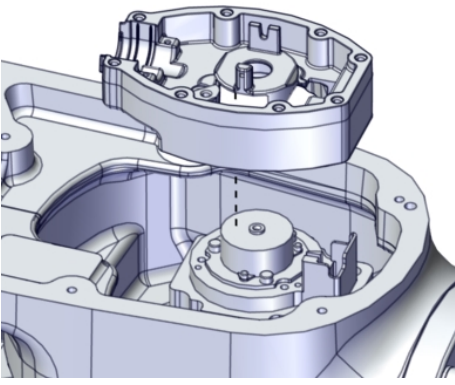
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Cut the cable tie.	 <p>xx2100002630</p>

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5 Repair

5.8.5 Replacing the axis-5 motor




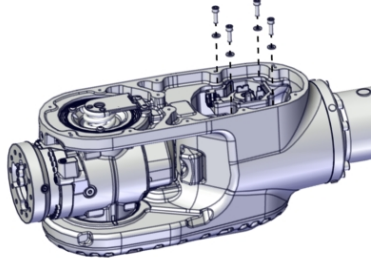

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	Action	Note
3	Remove the motor cover by removing the screws.	 <p>xx2100002315</p>
4	Disconnect the power cable connector by removing the attachment screw.	
5	Disconnect the signal cable connector.	
6	Remove the cable bracket by removing the screws.	
7	Remove the motor cables.	
8	IRB 5710-90/2.7, IRB 5710-70/2.7 LID: Remove the connection box.	 <p>xx2100002316</p>

Removing the axis-5 motor

	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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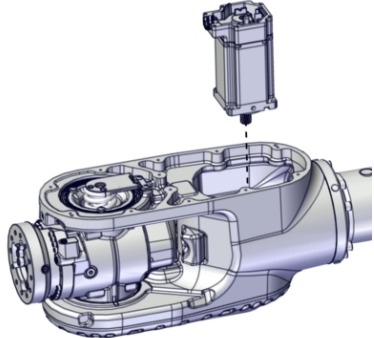
	Action	Note
2	<p>Release the brakes on the motor with the brake release tool.</p> <ol style="list-style-type: none"> 1 Make sure the brake release tool is turned off. 2 Connect the tool to the R2.MP5 connector. 3 Release the brakes by pressing the button on the tool. <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury.</p> <p>Read and follow enclosed user instructions for the tool.</p> <p> WARNING</p> <p>Electrical damage to the motor may occur if 24V is supplied to the motor connector for more than 30 seconds. Use the specified brake release tool to eliminate the risk.</p>	<p>Brake release tool: 3HAC081310-001</p> <p>User instructions are enclosed with the tool.</p>  <p>xx2100000666</p>
3	<p>Unscrew the attachment screws that secure the motor, using a bits extender.</p>	<p>Bits extender: 3HAC12342-1</p>  <p>xx2100002204</p>
4	<p> CAUTION</p> <p>Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.</p>	
5	<p>Press the motor out of its position by using the removal tool in opposite holes of the motor.</p>	<p>IRB 5710-110/2.3, IRB 5710-90/2.3 LID: Removal tool motor M10 IRB 5710-90/2.7, IRB 5710-70/2.7 LID: Removal tool motor M8 IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 3HAC14972-1 IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 3HAC080346-001 Used to push out the motor, if necessary.</p>

Continues on next page

5 Repair

5.8.5 Replacing the axis-5 motor



Continued

	Action	Note
6	 CAUTION The weight of the motor is IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 6 kg IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 4 kg All lifting accessories used must be sized accordingly.	
7	Remove the motor by carefully lifting it straight out/straight up. Make sure the pinion is not damaged.	 xx2100002205


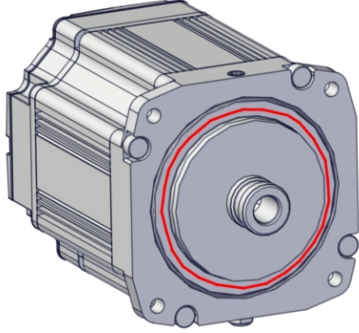
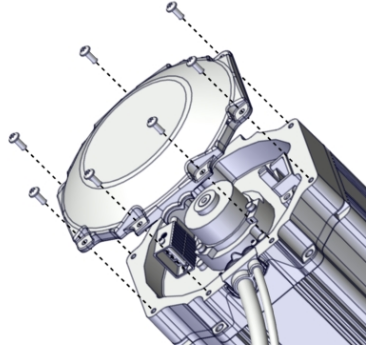


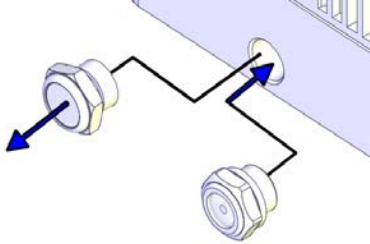
Refitting the motor

Use these procedures to refit the motor.

Preparations prior to refitting motor

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove any old paint or flange sealant residues or other contamination from the contact surfaces on both the motor and the mating parts.  Tip Remove flange sealant residues with Loctite 7200. Then use Loctite 7063 for cleaning the mating surface.	

Continues on next page

	Action	Note
3	<p>Apply a continuous bead of flange sealant, 1-2 mm wide, inside of the groove on the motor contact surface.</p> <p> Note</p> <p>The purpose of the groove is to catch excess sealant. No o-ring is used.</p>	<p>Flange sealant: 3HAC041807-007 (Loctite 5800)</p>  <p>xx2100000520</p>
4	<p>Remove the cover, if fitted to the new spare part motor.</p>	 <p>xx2100000596</p>
5	<p><i>Protection type Foundry Plus</i> Valid for axis-1, axis-2, axis-3 and axis-4.</p> <p>If the motor is a new spare part, the evacuation hole protection filter must be replaced with a transparent plug/sight glass (enclosed with the spare part delivery). Remove the protection filter and install the transparent plug/sight glass.</p>  <p>xx1800000101</p>  <p>xx1800000102</p> <p>Protection filter (Standard). Transparent plug (Foundry Plus).</p>	<p>Tightening torque, transparent plug: 20 Nm Tightening torque, protection filter: 20 Nm</p>  <p>xx1600000576</p>






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5 Repair

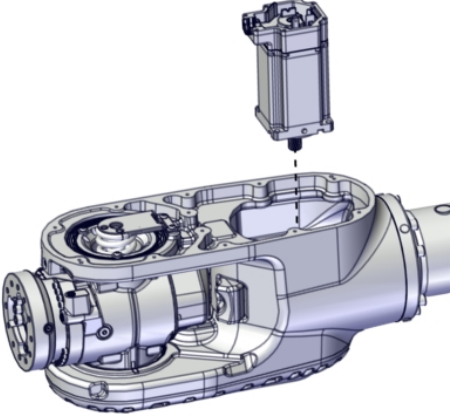
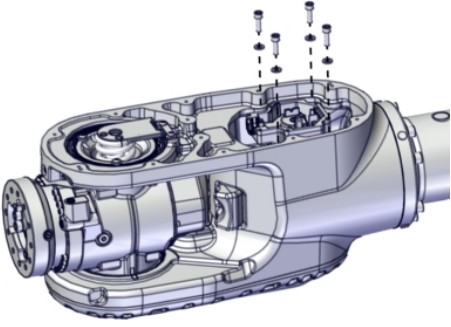
5.8.5 Replacing the axis-5 motor

Continued

Refitting the axis-5 motor

	Action	Note
1	Apply two guide pins in opposite holes.	IRB 5710-110/2.3, IRB 5710-90/2.3 LID: Guide pin, M8x150 IRB 5710-90/2.7, IRB 5710-70/2.7 LID: Guide pin, M6x150 IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 3HAC15520-2 IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 3HAC080345-001
2	 CAUTION Whenever parting/mating motor and gear-box, the gears may be damaged if excessive force is used.	
3	Apply the rotation tool and use it to rotate the pinion when mating it into the gear.	Rotation tool: 3HAB7887-1
4	Release the brakes on the motor with the brake release tool. <ol style="list-style-type: none"> 1 Make sure the brake release tool is turned off. 2 Connect the tool to the R2.MP5 connector. 3 Release the brakes by pressing the button on the tool.  DANGER Handling the tool incorrectly will cause serious injury. Read and follow enclosed user instructions for the tool.  WARNING Electrical damage to the motor may occur if 24V is supplied to the motor connector for more than 30 seconds. Use the specified brake release tool to eliminate the risk.	Brake release tool: 3HAC081310-001 User instructions are enclosed with the tool.  xx210000666
5	 CAUTION The weight of the motor is IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 6 kg IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 4 kg All lifting accessories used must be sized accordingly.	

Continues on next page

	Action	Note
6	<p>Use caution and lower the motor into position on the guide pins, while at the same time rotating the motor pinion slightly.</p> <p>Make sure that:</p> <ul style="list-style-type: none"> • the motor pinion is properly mated to the gear of the gearbox. • the motor pinion does not get damaged. • the direction of the cable exit is facing the same way as before removal. 	<p>Rotation tool, 3HAB7887-1</p>  <p>xx2100002205</p>
7	Remove the guide pins.	
8	Secure the motor with its attachment screws and washers.	<p>Tightening torque: 24 Nm.</p> <p>Hex socket head cap screw: (4) IRB 5710-110/2.3, IRB 5710-90/2.3 LID: M8x25 12.9 Gleitmo 603+Geomet 500 IRB 5710-90/2.7, IRB 5710-70/2.7 LID: M6x25 12.9 Gleitmo 603+Geomet 500</p>  <p>xx2100002204</p>
9	Perform a leak-down test.	See Performing a leak-down test on page 184 .
10	Disconnect the brake release tool.	

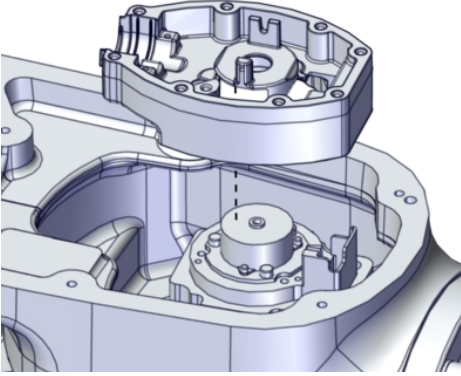
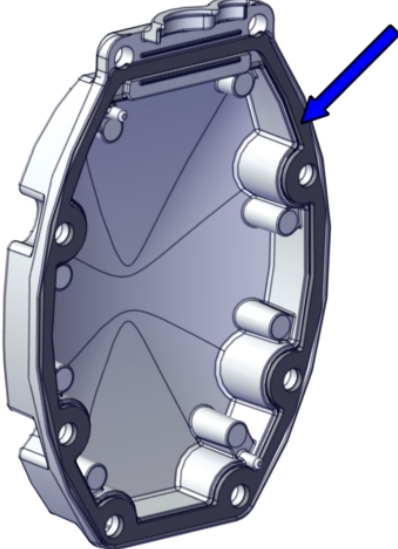
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5 Repair


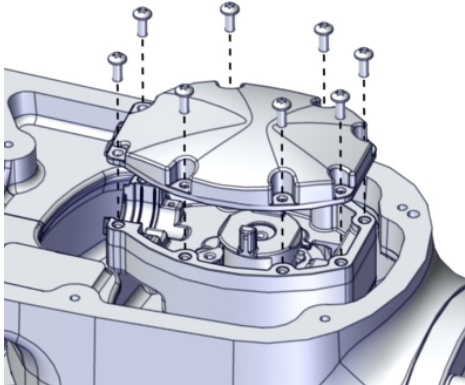
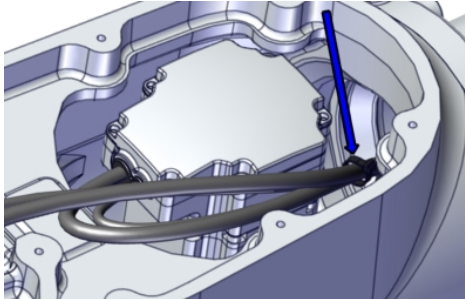
5.8.5 Replacing the axis-5 motor

Continued

Connecting the axis-5 motor cables

	Action	Note
1	IRB 5710-90/2.7, IRB 5710-70/2.7 LID: Refit the connection box with the screws.	 <p>xx2100002316</p>
2	Put the motor cables in place in the opening.	
3	Refit the cable bracket with the screws.	Torx pan head screw: M3x12 Stainless steel A2-70
4	Connect the motor cables. Connect in accordance with the markings on the connectors.	
5	Secure the power connector with a screw.	Tightening torque: 1 Nm
6	Inspect the gasket. Replace the complete cover if the gasket is damaged.	Connection box cover with gasket: IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange) IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 3HAC072861-003 (Graphite White) 3HAC072861-004 (ABB Orange)  <p>xx2100002317</p>

Continues on next page

	Action	Note
7	<p> CAUTION</p> <p>When fitting the motor cover, make sure that none of the cables inside will be damaged.</p>	
8	<p>Refit the motor cover with its attachment screws.</p> <p>Use locking liquid.</p>	<p>Torx pan head screw: M5x12 Stainless steel A2-70</p> <p>Locking liquid: 3HAC041807-004 (Loctite 2400)</p> <p>Tightening torque: 6 Nm.</p>  <p>xx2100002315</p>
9	<p>Secure the cabling with a cable strap.</p>	<p>Cable strap, outdoor: 21662055-3</p>  <p>xx2100002630</p>

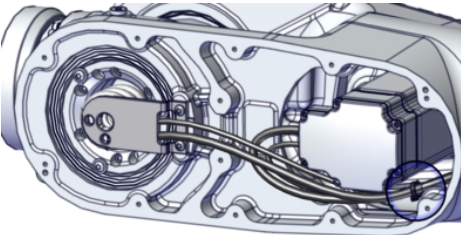
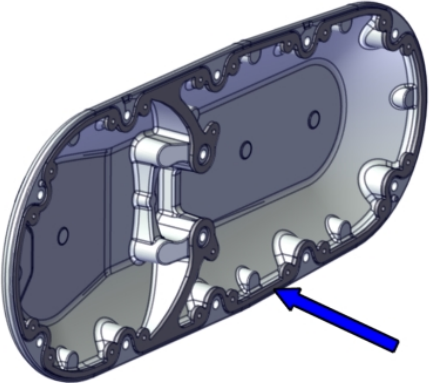
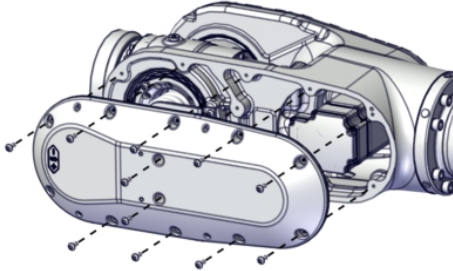
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5 Repair

5.8.5 Replacing the axis-5 motor

Continued


Refitting the wrist cover

	Action	Note
1	Make sure that the cable harness is routed and secured as shown in the figure.	 <p>xx2100002627</p>
2	<p><i>Foundry Plus:</i> Inspect the gasket. Replace the complete cover if the gasket is damaged.</p>	<p>Wrist cover: IRB 5710-110/2.3 / IRB 5710-90/2.3 LID: 3HAC073390-002 (Graphite White) 3HAC073390-004 (ABB Orange) IRB 5710-90/2.7 / IRB 5710-70/2.7 LID: 3HAC070151-004 (Graphite White) 3HAC070151-006 (ABB Orange)</p>  <p>xx2100001407</p>
3	Refit the wrist cover and secure with screws.	<p>Torx pan head screw: M6x16 Stainless steel A2-70 Tightening torque: 10 Nm.</p>  <p>xx2000000373</p>

Concluding procedure

	Action	Note
1	Refill the gearbox with oil, if drained.	See Filling oil into the axis-5 gearbox on page 169 .

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	Action	Note
2	Re-calibrate the robot.	See Calibration on page 563 .
3	 DANGER Make sure all safety requirements are met when performing the first test run.	

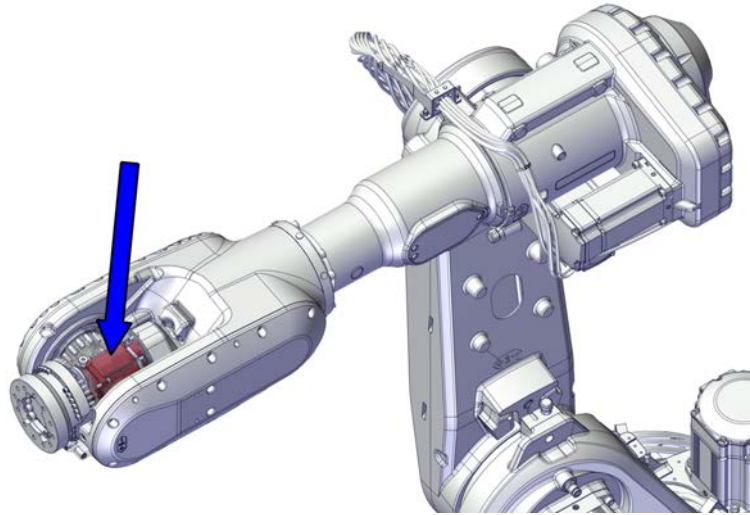
5 Repair

5.8.6 Replacing the axis-6 motor

5.8.6 Replacing the axis-6 motor

Location of the motor

The motor is located as shown in the figure.



xx210000490

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 5710 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note	Level
Motor unit	IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 3HAC070736-003 IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 3HAC071191-003		L2

Required service parts

Consumable	Article number	Note
Flange sealant	3HAC041807-007	Loctite 5800
Tilt housing cover with gasket	3HAC073918-003 (Graphite White) 3HAC073918-004 (ABB Orange)	Replace if damaged.
Gasket, tilt housing cover	3HAC071520-001	Replace if damaged.

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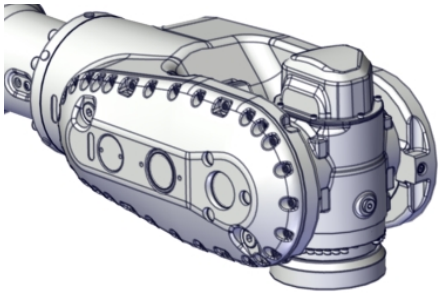

Required tools and equipment

Equipment	Article number	Note
Brake release tool	3HAC081310-001	User instructions are enclosed with the tool.
Removal tool motor M8	3HAC080346-001	Used to push out the motor, if necessary.
Guide pin, M6x150	3HAC080345-001	Always use guide pins in pairs.
Rotation tool	3HAB7887-1	Used to rotate the motor pinion.
Calibration toolbox, Axis Calibration	3HAC074564-001 (axes 1, 2, 3 and 4) 3HAC074119-001 (axes 5 and 6)	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

Removing the motor

Use these procedures to remove the motor.

Preparations before removing the axis-6 motor

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Jog the robot to a position where axis 5 can be positioned with the motor pointing straight up at an acceptable working position. With axis 5 in this position it is possible to replace the motor without draining the oil from the axis-6 gearbox.	 xx2000000374
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 safe-guarded space.	

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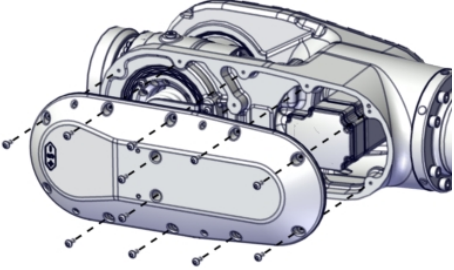
5 Repair

5.8.6 Replacing the axis-6 motor


Continued

Retrieving access to the wrist cabling

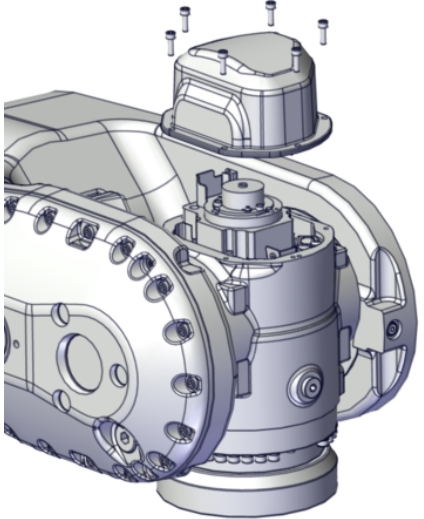
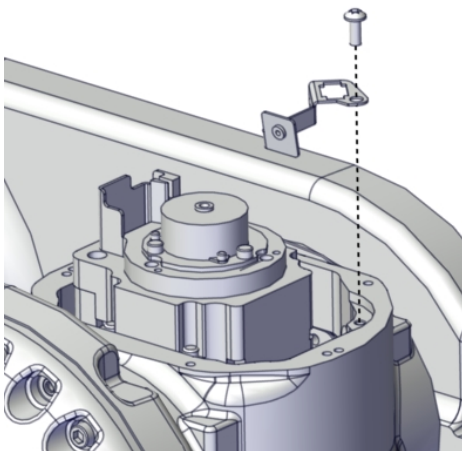
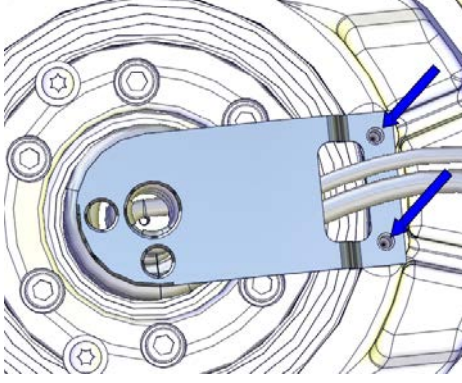
Use this procedure to remove the wrist cover.

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the wrist cover.	 xx2000000373

Disconnecting the axis-6 motor cables

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

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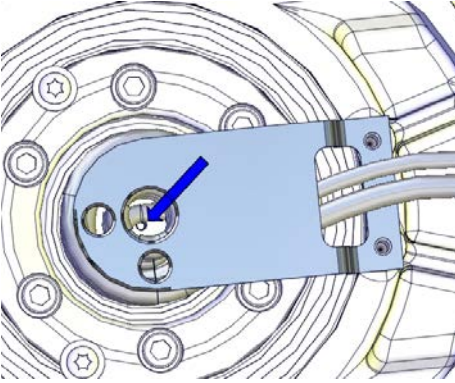
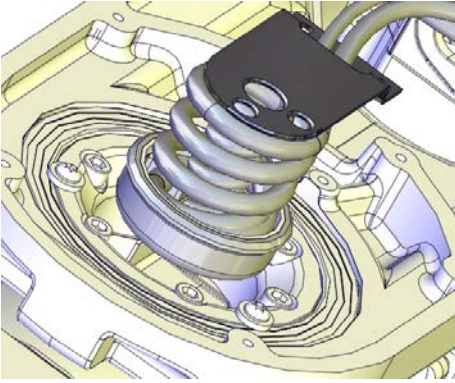
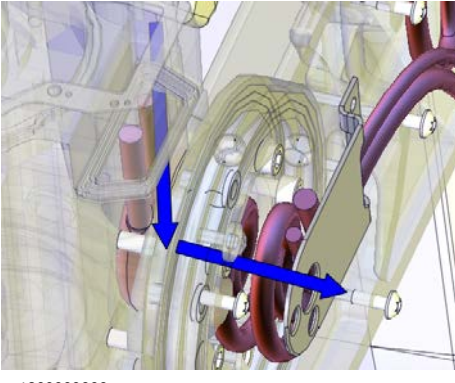
	Action	Note
2	Unscrew the attachment screws and remove the motor cover.	 <p>xx2000000376</p>
3	Remove the connector bracket.	 <p>xx2000000375</p>
4	Disconnect the motor cables.	
5	Unscrew the attachment screws that hold the cable bracket.	 <p>xx1300000484</p>

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5 Repair



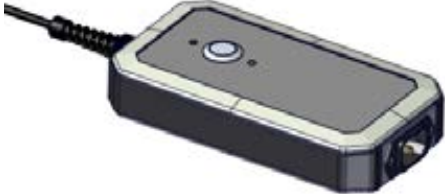
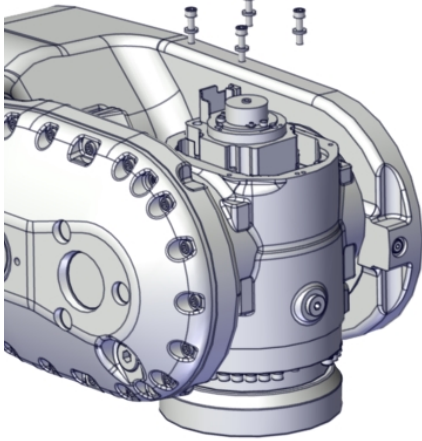

5.8.6 Replacing the axis-6 motor

Continued

	Action	Note
6	<p>Unscrew the M4 screw that holds the carrier.</p> <p> Note</p> <p>The screw is located at the bottom of the carrier.</p>	 <p>xx130000485</p>
7	<p>Pull out the carrier from its position.</p>	 <p>xx1300001113</p>
8	<p>Pull out the axis-6 motor cables by holding the cables with one hand at the motor and the other at the carrier.</p>	 <p>xx130000666</p>

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Removing the axis-6 motor


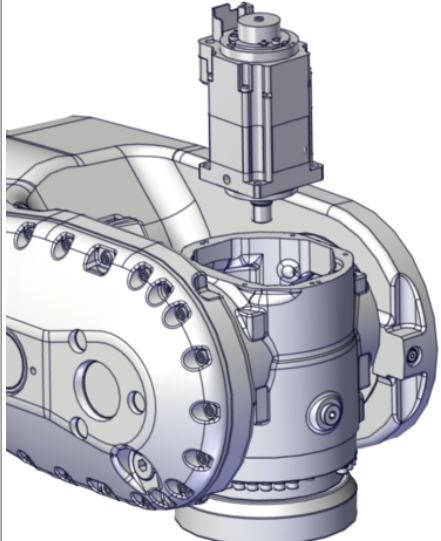
	Action	Note
1	<p>Release the brakes on the motor with the brake release tool.</p> <ol style="list-style-type: none"> 1 Make sure the brake release tool is turned off. 2 Connect the tool to the R2.MP6 connector. 3 Release the brakes by pressing the button on the tool. <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury.</p> <p>Read and follow enclosed user instructions for the tool.</p> <p> WARNING</p> <p>Electrical damage to the motor may occur if 24V is supplied to the motor connector for more than 30 seconds. Use the specified brake release tool to eliminate the risk.</p>	<p>Brake release tool: 3HAC081310-001 User instructions are enclosed with the tool.</p>  <p>xx2100000666</p>
2	<p>Unscrew the motor attachment screws.</p>	 <p>xx2000000377</p>
3	<p> CAUTION</p> <p>Whenever parting/mating motor and gear-box, the gears may be damaged if excessive force is used.</p>	
4	<p>Press the motor out of its position by using the removal tool in opposite holes of the motor.</p>	<p>Removal tool motor M8: 3HAC080346-001 Used to push out the motor, if necessary.</p>

Continues on next page

5 Repair

5.8.6 Replacing the axis-6 motor



Continued

	Action	Note
5	 CAUTION The weight of the motor is 4 kg All lifting accessories used must be sized accordingly.	
6	Remove the motor by lifting it straight up from the gear. Make sure the motor pinion is not damaged!	 <small>xx2000000378</small>
7	Disconnect the brake release tool.	


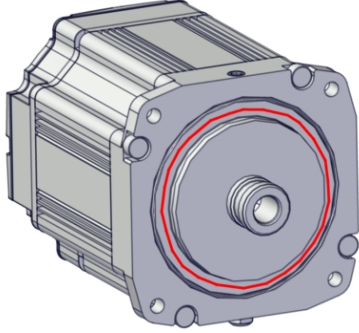
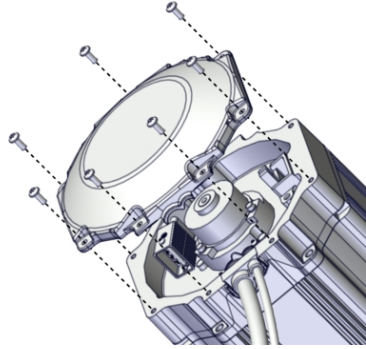


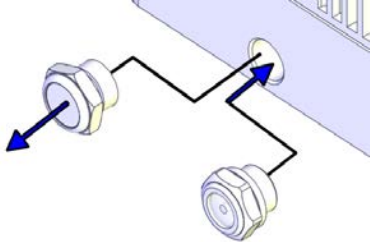
Refitting the motor

Use these procedures to refit the motor.

Preparations prior to refitting motor

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove any old paint or flange sealant residues or other contamination from the contact surfaces on both the motor and the mating parts.  Tip Remove flange sealant residues with Loctite 7200. Then use Loctite 7063 for cleaning the mating surface.	

Continues on next page

	Action	Note
3	<p>Apply a continuous bead of flange sealant, 1-2 mm wide, inside of the groove on the motor contact surface.</p> <p> Note</p> <p>The purpose of the groove is to catch excess sealant. No o-ring is used.</p>	<p>Flange sealant: 3HAC041807-007 (Loctite 5800)</p>  <p>xx2100000520</p>
4	<p>Remove the cover, if fitted to the new spare part motor.</p>	 <p>xx2100000596</p>
5	<p><i>Protection type Foundry Plus</i> Valid for axis-1, axis-2, axis-3 and axis-4.</p> <p>If the motor is a new spare part, the evacuation hole protection filter must be replaced with a transparent plug/sight glass (enclosed with the spare part delivery). Remove the protection filter and install the transparent plug/sight glass.</p>  <p>xx1800000101</p>  <p>xx1800000102</p> <p>Protection filter (Standard). Transparent plug (Foundry Plus).</p>	<p>Tightening torque, transparent plug: 20 Nm Tightening torque, protection filter: 20 Nm</p>  <p>xx1600000576</p>

Refitting the axis-6 motor




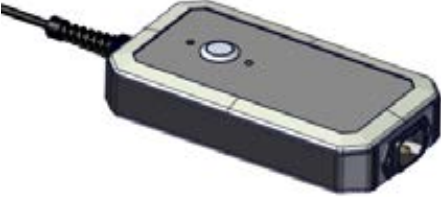

	Action	Note
1	<p>Apply two guide pins in opposite holes.</p>	<p>Guide pin, M6x150</p>

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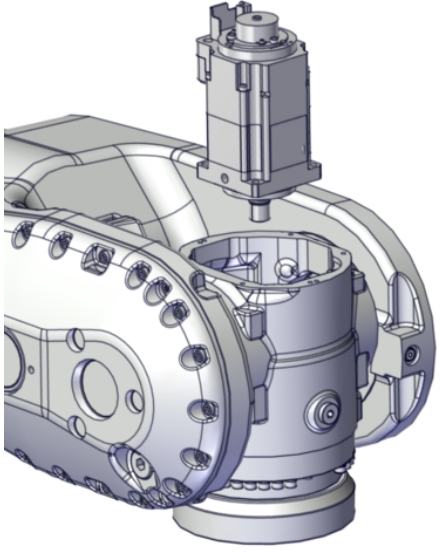
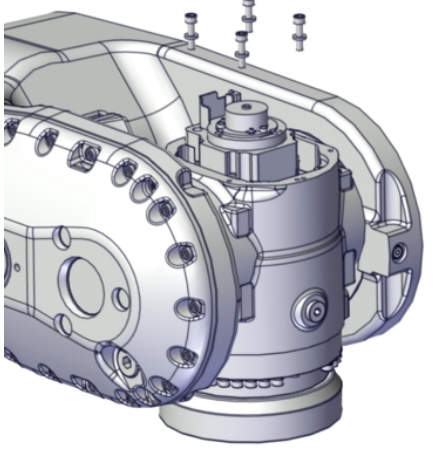
5 Repair

5.8.6 Replacing the axis-6 motor

Continued

	Action	Note
2	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
3	<p>Release the brakes on the motor with the brake release tool.</p> <ol style="list-style-type: none"> 1 Make sure the brake release tool is turned off. 2 Connect the tool to the R2.MP6 connector. 3 Release the brakes by pressing the button on the tool. <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury.</p> <p>Read and follow enclosed user instructions for the tool.</p> <p> WARNING</p> <p>Electrical damage to the motor may occur if 24V is supplied to the motor connector for more than 30 seconds. Use the specified brake release tool to eliminate the risk.</p>	<p>Brake release tool: 3HAC081310-001 User instructions are enclosed with the tool.</p>  <p>xx210000666</p>
4	<p> CAUTION</p> <p>Whenever parting/mating motor and gear-box, the gears may be damaged if excessive force is used.</p>	

Continues on next page

	Action	Note
5	<p>Use caution and lower the motor into position on the guide pins, while at the same time rotating the motor pinion slightly.</p> <p>Make sure that:</p> <ul style="list-style-type: none"> • the motor pinion is properly mated to the gear of the gearbox. • the motor pinion does not get damaged. 	<p>Rotation tool, 3HAB7887-1</p>  <p>xx2000000378</p>
6	Remove the guide pins.	
7	Secure the motor with its attachment screws.	<p>Hex socket head cap screw: M6x25 12.9 Gleitmo 603+Geomet 500 (4 pcs) Tightening torque: 10 Nm</p>  <p>xx2000000377</p>
8	Perform a leak-down test.	See Performing a leak-down test on page 184 .


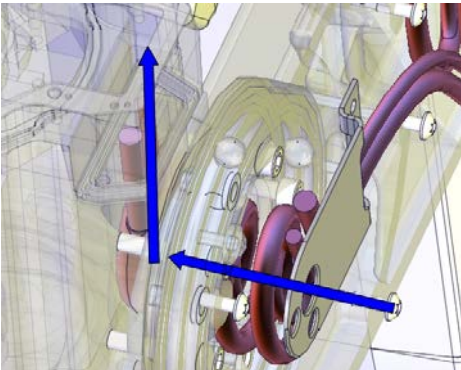
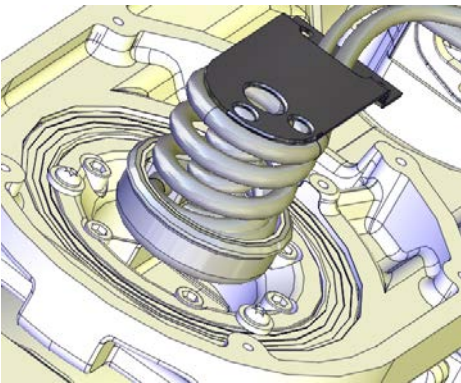


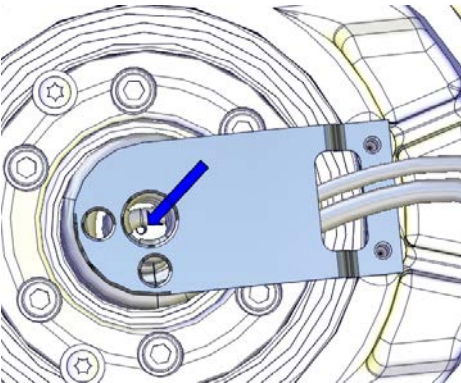
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5 Repair

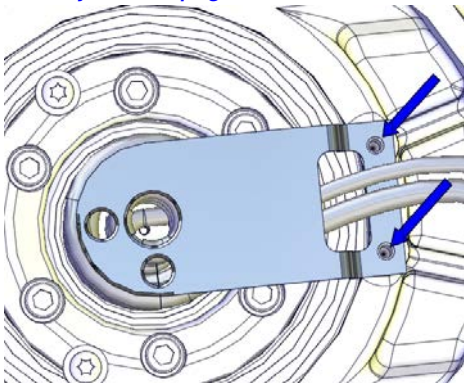
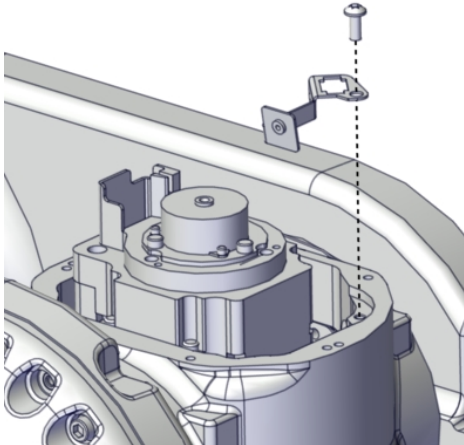
5.8.6 Replacing the axis-6 motor

Continued

Connecting the axis-6 motor cables

	Action	Note
1	<p> Note</p> <p>Axis 5 must be in position $+90^\circ$ (or as close as possible) for a correct installation of the cable harness in the wrist. If not, connect the brake release tool to the axis-5 motor connector, release the brakes and move axis 5 manually to $+90^\circ$.</p>	
2	<p>Push the cable harness into the wrist recess and up into the axis-6 motor.</p>	 <p>xx130000667</p>
3	<p>Push the carrier carefully into position.</p>	 <p>xx1300001113</p>
4	<p>Secure the carrier with the M4 screw.</p> <p> Note</p> <p>The screw is located at the bottom of the carrier.</p> <p> Tip</p> <p>The attachment screw securing the carrier may be difficult to fit. Make sure the carrier is level and completely pressed against the bottom.</p>	 <p>xx130000485</p>

Continues on next page

	Action	Note
5	Secure the cable bracket with its attachment screws.	<p>Torx pan head screw: M6x16 Stainless steel A2-70</p> <p>Tightening torque: see standard torque in Screw joints on page 598..</p>  <p>xx1300000484</p>
6	Connect the motor cables. Connect in accordance with the markings on the connectors.	
7	Secure the power connector to the connector bracket with a screw.	Tightening torque: 1 Nm
8	Refit the connector bracket with the attached connectors.	<p>Torx pan head screw: M5x12 Stainless steel A2-70</p>  <p>xx2000000375</p>

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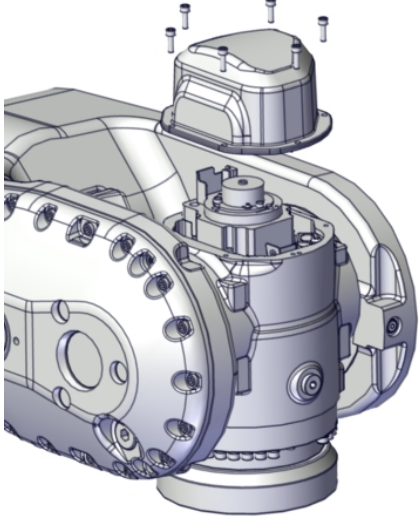
5 Repair

5.8.6 Replacing the axis-6 motor

Continued

	Action	Note
9	Verify correct cable layout as shown in the figure.	 <p>xx2100001293</p>
10	Inspect the gasket. Replace if damaged.	<p>Gasket, tilt housing cover: 3HAC071520-001</p>  <p>xx2100001287</p>
11	 CAUTION When fitting the motor cover, make sure that none of the cables inside will be damaged.	

Continues on next page

	Action	Note
12	Refit the motor cover.	<p>Hex socket head cap screw: M5x16 12.9 Lafre 2C2B/FC6.9 (6 pcs) Tightening torque: 4 Nm.</p>  <p>xx200000376</p>

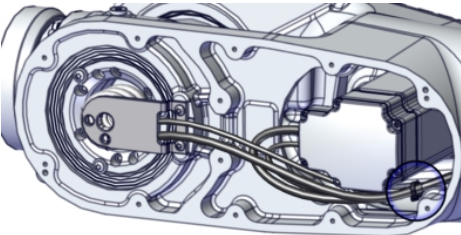
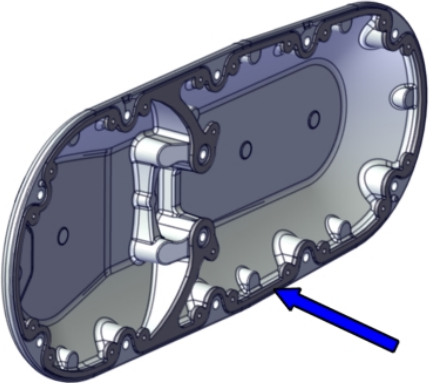
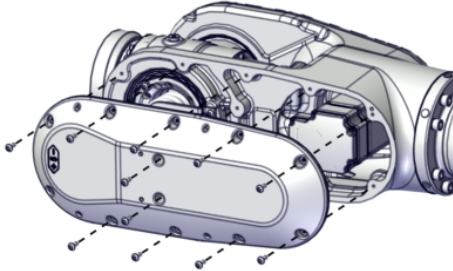
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5 Repair

5.8.6 Replacing the axis-6 motor


Continued

Refitting the wrist cover

	Action	Note
1	Make sure that the cable harness is routed and secured as shown in the figure.	 <p>xx2100002627</p>
2	<p><i>Foundry Plus:</i> Inspect the gasket. Replace the complete cover if the gasket is damaged.</p>	<p>Wrist cover: IRB 5710-110/2.3 / IRB 5710-90/2.3 LID: 3HAC073390-002 (Graphite White) 3HAC073390-004 (ABB Orange) IRB 5710-90/2.7 / IRB 5710-70/2.7 LID: 3HAC070151-004 (Graphite White) 3HAC070151-006 (ABB Orange)</p>  <p>xx2100001407</p>
3	Refit the wrist cover and secure with screws.	<p>Torx pan head screw: M6x16 Stainless steel A2-70 Tightening torque: 10 Nm.</p>  <p>xx2000000373</p>

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Concluding procedure

	Action	Note
1	Re-calibrate the robot.	Axis Calibration is described in Calibrating with Axis Calibration method on page 572 . General calibration information is included in section Calibration on page 563 .
2	 DANGER Make sure all safety requirements are met when performing the first test run.	

5 Repair

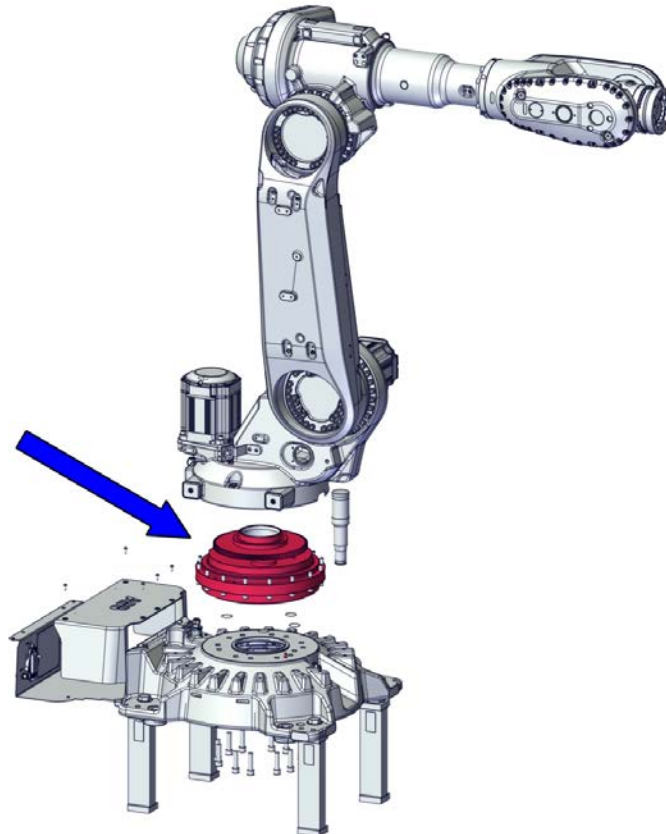
5.9.1 Replacing the axis-1 gearbox

5.9 Gears

5.9.1 Replacing the axis-1 gearbox

Location of the gearbox

The gearbox is located as shown in the figure.



xx2000000403

Summary of the replacement procedure

This is a brief summary of the replacement procedure, containing the major actions to be performed.

- 1 If installed in an inverted position (option 3317-1): Lift down the robot to floor standing and secure onto four support legs.
- 2 If installed floor mounted: Lift the robot and secure onto four support legs.
- 3 Drain the axis-1 gearbox.
- 4 Remove the cabling from the base.
- 5 Remove the axis-1 motor.
- 6 Remove the complete arm system (complete robot excluding the base and axis-1 gearbox) as an assembly.
- 7 Replace the axis-1 gearbox.

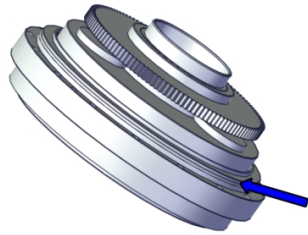
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Required spare parts



Note

The spare part numbers that are listed in the table can be out of date. See the latest spare parts of the IRB 5710 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note	Level
Gearbox	3HAC072003-003 (Graphite White) 3HAC072003-005 (ABB Orange)	Includes o-ring  xx2100001132	L2

Required service parts

Consumable	Article number	Note
Cassette sealing	3HAC070194-013	
Rust preventive	3HAC034903-001	Mercasol 3110 Waxcoat. Recommended drying time is 24h.
Grease	3HAC042536-001	Shell Gadus S2
Flange sealant	3HAC041807-007	Loctite 5800
O-ring	3HAB3772-93	Replace if damaged.
Connection box cover FS180 with gasket	3HAC072864-003 (Graphite White) 3HAC072864-005 (ABB Orange)	Replace if damaged.
Flange sealant	-	Loctite 574
Sealant (grey)	3HAC026759-001	Sikaflex 521FC. <i>Protection type Foundry Plus.</i> <i>Not required for option Inverted (3317-1).</i>
Locking liquid	3HAC041807-004	Loctite 2400
Flange sealant	3HAC041807-007	Loctite 5800
O-ring	3HAC061327-033	4 pcs. <i>Not required for option Inverted (3317-1).</i>
O-ring, NBR	3HAB3772-150	183.74x3.53 On base. <i>Option Inverted (3317-1)</i>

Continues on next page

5 Repair

5.9.1 Replacing the axis-1 gearbox

Continued

Consumable	Article number	Note
O-ring, nitrile rubber	3HAB3772-57	164.69x3.53 On axis-1 sealing ring. <i>Not required for option Inverted (3317-1).</i>
Lubricating oil	-	See Type of lubrication in gear-boxes on page 137 .
O-ring, G 1/2"	3HAC061327-059	Used on oil plug. Always replace when refitting oil plug.

Required tools and equipment

Equipment	Article number	Note
Lifting accessory set	3HAC15607-1	Lift of floor standing robot.
Lifting and turning tool	3HAC073537-001	Lift and rotation of inverted robot. Requires fork lift accessory set 3HAC058825-001. User instructions are enclosed with the tool.
Fork lift accessory set	3HAC058825-001	Contains fork lift pockets and all required hardware for installation on frame. User instructions are enclosed with the tool.
Support legs	3HAC15535-1	
Guide pin, M12x150	3HAC13056-2	Always use guide pins in pairs.
Lifting eye	3HAC16131-1	M12, 2 pcs
Lifting adapter	3HAC081565-001	Adapter for lifting axis-1 gearbox, 2 pcs
Fender washer	-	Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.
Lifting accessory (chain)	3HAC15556-1	Lifting instruction 3HAC15880-2 enclosed.
Brake release tool	3HAC081310-001	User instructions are enclosed with the tool.
Bits extender	3HAC12342-1	300 mm, bits 1/2"
Bit holder	3HAC029090-001	
Rotation tool	3HAB7887-1	Used to rotate the motor pinion.
Replacement tool for cassette sealing	3HAC079880-001	For removing and fitting cassette sealing on axis 1
Calibration toolbox, Axis Calibration	3HAC074564-001 (axes 1, 2, 3 and 4) 3HAC074119-001 (axes 5 and 6)	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

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Required documents

Document	Document number
Directions for use - Lifting and rotating accessory for IRB 5710/IRB5720	TBD
Directions for use - Fork lift accessory for IRB 5710/IRB5720	3HAC061161-001

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>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 573.</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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5 Repair

5.9.1 Replacing the axis-1 gearbox

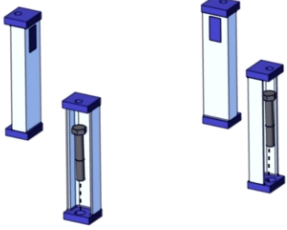
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Removing the gearbox


These procedures describe how to remove the gearbox.

Preparing an installation area for an inverted robot

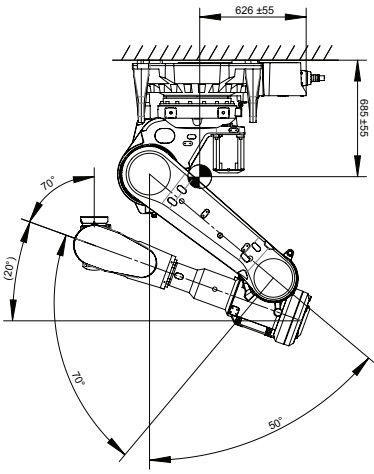



An inverted robot must be taken down and installed standing on the floor for replacement of the axis-1 gearbox. Use this procedure to prepare the installation area for the robot.

	Action	Note
1	Secure four support legs to the foundation using the same hole pattern as to secure the base to the foundation. For hole configuration, see Hole configuration, base on page 70 .	Support legs: 3HAC15535-1 Tightening torque: 550 Nm  xx2100001114

Lifting down the robot from inverted position

	Action	Note
1	 DANGER The robot must always be secured to the foundation if any kind of repair or maintenance work is to be performed. For some repair work support legs are required.	Suitable screws, lightly lubricated: M24 x 100 (min. 4 pcs) For hole configuration, see Hole configuration, base on page 70 .
2	Remove any payload and tools from the robot.	DressPack can stay fitted.

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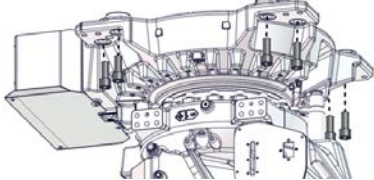
	Action	Note
3	<p>Jog the robot into position:</p> <ul style="list-style-type: none"> • Axis 1: calibration position (0°) • Axis 2: -50° • Axis 3: +70° • Axis 4: calibration position (0°) • Axis 5: +70° • Axis 6: no significance 	 <p>xx210000976</p>
4	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the safeguarded space.</p>	
5	<p>Disconnect the robot cables at the base.</p>	
6	<p> CAUTION</p> <p>The weight of the IRB 5710 robot is</p> <p>IRB 5710-110/2.3: 830 kg (<i>Inverted: 845 kg</i>)</p> <p>IRB 5710-90/2.7: 830 kg (<i>Inverted: 840 kg</i>)</p> <p>IRB 5710-90/2.3 LID: 890 kg (<i>Inverted: 905 kg</i>)</p> <p>IRB 5710-70/2.7 LID: 885 kg (<i>Inverted: 900 kg</i>)</p> <p>All lifting accessories used must be sized accordingly.</p>	
7	<p>Install the fork lift pockets to the robot.</p> <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury.</p> <p>Read and follow enclosed user instructions for the tool.</p>	<p>See user instructions enclosed with the fork lift accessory set.</p> <p>Fork lift accessory set: 3HAC058825-001.</p>

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5 Repair

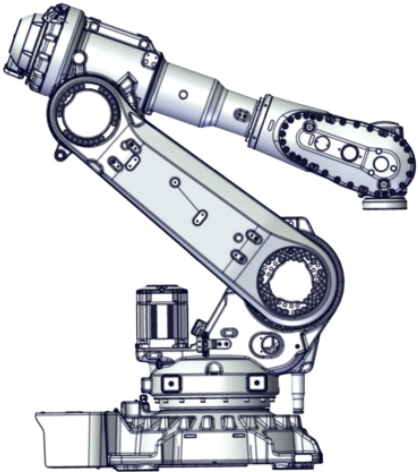

5.9.1 Replacing the axis-1 gearbox

Continued

	Action	Note
8	<p>Choose one of the following lifting methods:</p> <ul style="list-style-type: none"> Lifting and turning with the fork lift (rotator attachment required): <ol style="list-style-type: none"> 1 Insert the forks of the fork lift truck into the fork lift pockets, as far as possible. 2 Raise the forks of the fork lift truck to make sure that the weight of the robot rests on the forks. <p> Tip</p> <p>Two M16 screws can be fitted to the fork lift pockets, to press the forks against the pockets and make the lift more stable.</p> Lifting and turning with the turning tool and overhead crane: <ol style="list-style-type: none"> 1 Install and use the turning tool according to enclosed user instructions. <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury.</p> <p>Read and follow enclosed user instructions for the tool.</p> 	<p>See user instructions enclosed with the turning tool.</p> <p>Lifting and turning tool: 3HAC073537-001.</p>
9	<p>Remove the bolts that secure the robot to the foundation.</p>	<p>Quantity: 8 pcs.</p>  <p>xx1600002098</p>
10	<p>Rotate the robot to floor standing position.</p>	<p>Follow the user instructions enclosed with the turning tool.</p>
11	<p>Lower and secure the robot to the floor. (Or to support legs, if replacing the axis-1 gearbox.)</p> <p>The lifting accessories can be kept installed if they are not in the way for the upcoming service procedure.</p>	<p>Attachment screws: M24 x 100 (min. 4 pcs required to perform service)</p>


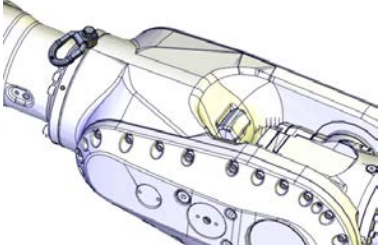
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Preparing the floor mounted robot

	Action	Note
1	Jog the robot into position: <ul style="list-style-type: none"> • Axis 1: 0° • Axis 2: -50° • Axis 3: +70° • Axis 4: 0° • Axis 5: +70° • Axis 6: no significance. 	 <p style="text-align: right; font-size: small;">xx210000977</p>
2	 <p>DANGER</p> 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.	

Attaching the lifting accessories to the arm system

This procedure is mainly meant for the floor mounted robot. The inverted robot can use the already mounted lifting accessories.


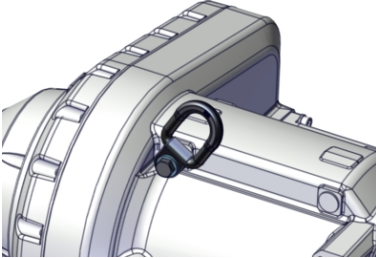
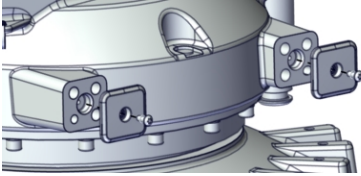

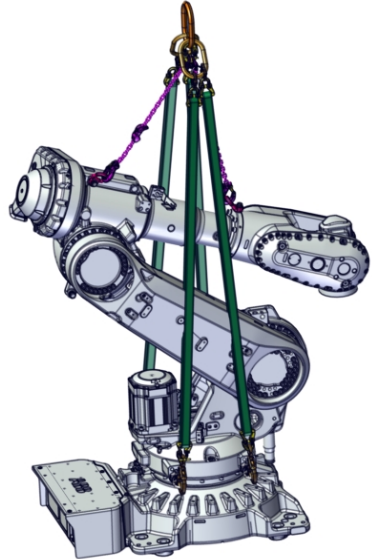
	Action	Note
1	 <p>DANGER</p> Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Fit a lifting eye to the wrist.	Lifting eye: 3HAC16131-1 

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5 Repair


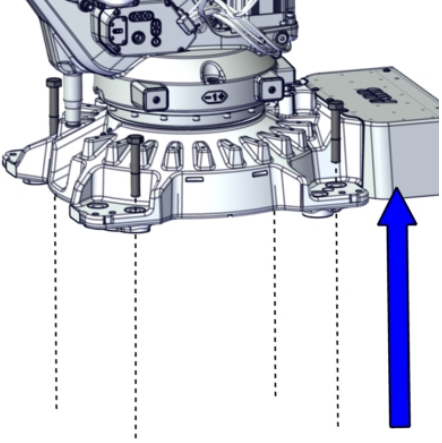
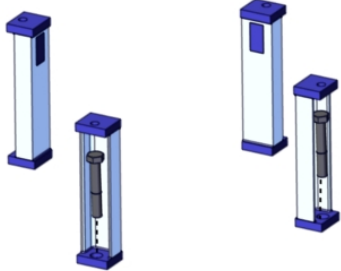
5.9.1 Replacing the axis-1 gearbox

Continued

	Action	Note
3	<p>Fit a lifting eye to the arm house, with a fender washer underneath.</p> 	<p>Lifting eye: 3HAC16131-1 Fender washer. Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.</p>  <p>xx2100002146</p>
4	<p>Remove the fork lift protection covers on both sides of the robot frame (4 pcs).</p>	 <p>xx2100001409</p>
5	<p>Insert the lifting eyes to the fork lift attachment holes. Use the lower attachment holes.</p>	<p>Lifting accessory set: 3HAC15607-1</p>  <p>xx2100001165</p>
6	<p>Attach the lifting accessories to the robot. The back and front chains are only used as precaution for any movement of the robot during the lift. They do not need to be strained.</p>	 <p>xx2100001140</p>

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Fitting support legs under the floor mounted robot

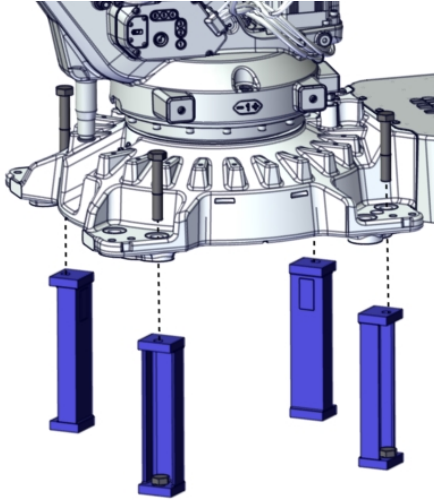
	Action	Note
1	<p> CAUTION</p> <p>The weight of the IRB 5710 robot is IRB 5710-110/2.3: 830 kg (<i>Inverted: 845 kg</i>) IRB 5710-90/2.7: 830 kg (<i>Inverted: 840 kg</i>) IRB 5710-90/2.3 LID: 890 kg (<i>Inverted: 905 kg</i>) IRB 5710-70/2.7 LID: 885 kg (<i>Inverted: 900 kg</i>) All lifting accessories used must be sized accordingly.</p>	
2	<p>Unscrew the attachment screws from the foundation and lift away the robot to be able to fit the four support legs to the foundation.</p>	 <p>xx2100001115</p>
3	<p>Secure the support legs to the foundation using the same holes as to secure the base.</p>	<p>Support legs: 3HAC15535-1 Tightening torque: 550 Nm</p>  <p>xx2100001114</p>

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5 Repair


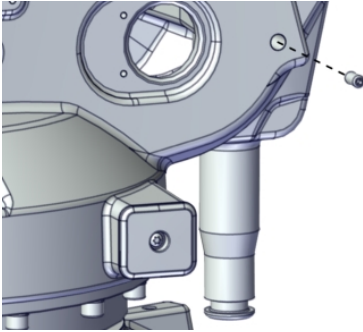

5.9.1 Replacing the axis-1 gearbox

Continued

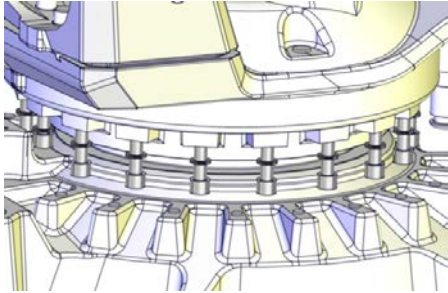

Action	Note
<p>4 Lower the robot to the support legs and secure.</p>	 <p>xx2100001113</p>

Preparations before removing the axis-1 gearbox


Use this procedure to do the necessary preparations, before removing the gearbox.

Action	Note
<p>1 Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.</p>	
<p>2  DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
<p>3 Remove tools and other equipment fitted on the turning disc. DressPack can stay fitted for the time being.</p>	<p>This is done to achieve the best stability of the complete arm system, when it is resting by itself, after it has been removed.</p>
<p>4 Hold the mechanical stop pin in a firm grip, and remove it by unscrewing the attachment screw.</p>	 <p>xx2100001410</p>
<p>5 Begin draining the axis-1 gearbox.</p> <p> Note</p> <p>There will be some oil left in the gear after draining.</p>	<p>See Floor-mounted robot: Draining the axis-1 gearbox on page 140.</p>

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	Action	Note
6	Loosen the attachment screws as far as it is possible at this point.	 <p>xx1400002169</p> <p>  Note </p> <p>It will not be possible to remove the screws completely at this point.</p>

Disconnecting the axis-1 motor cables

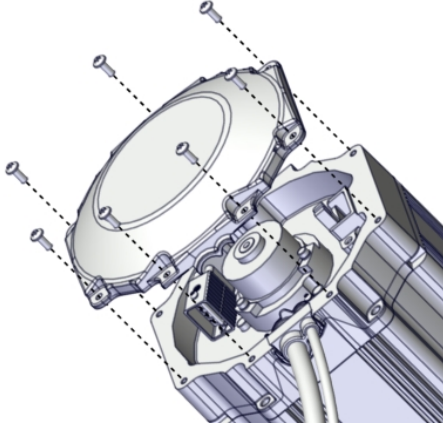
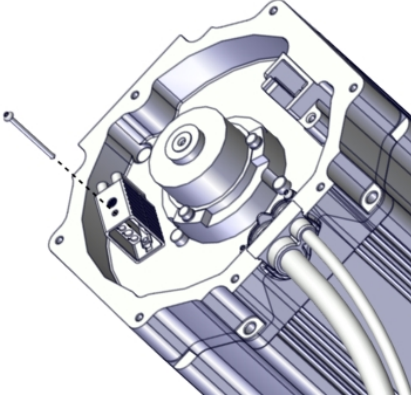
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	

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5 Repair

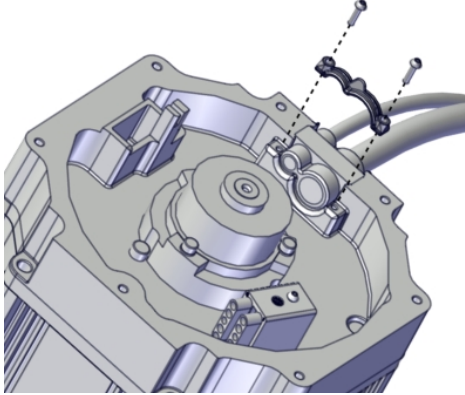
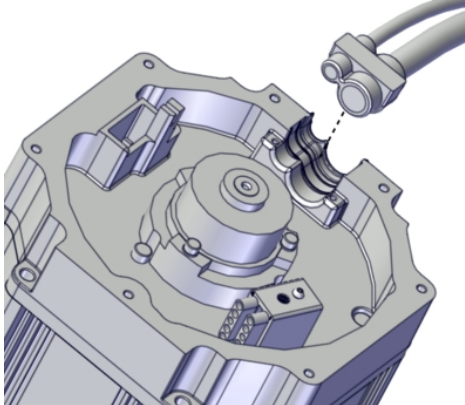
5.9.1 Replacing the axis-1 gearbox

Continued


	Action	Note
2	Remove the motor cover by removing the screws.	 <p>xx210000596</p>
3	Disconnect the power cable connector by removing the attachment screw.	 <p>xx210000667</p>
4	Disconnect the signal cable connector.	

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5.9.1 Replacing the axis-1 gearbox
Continued

	Action	Note
5	Remove the cable bracket by removing the screws.	 <p>xx210000598</p>
6	Remove the motor cables.	 <p>xx210000599</p>

Removing the axis-1 motor



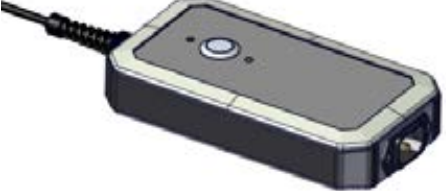
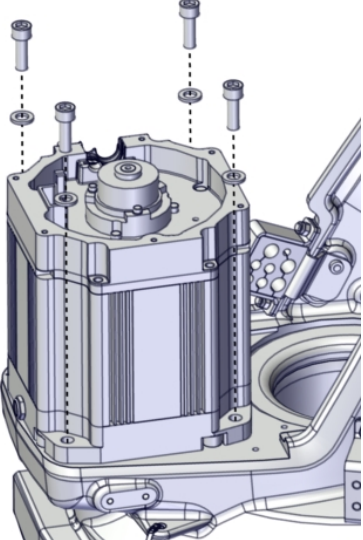
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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5 Repair

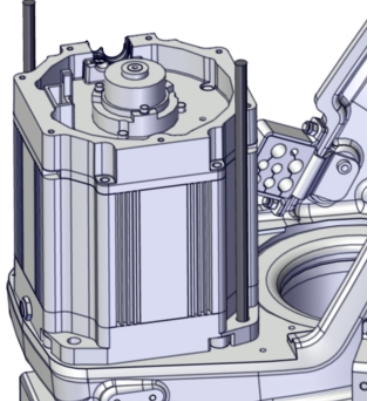


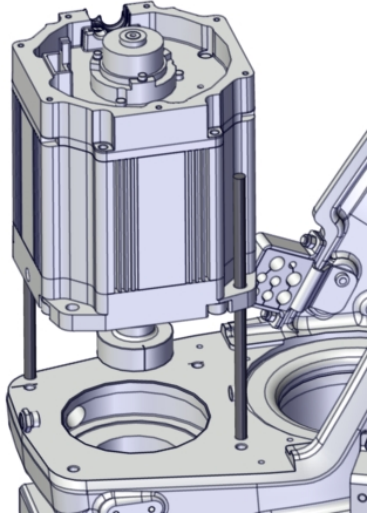
5.9.1 Replacing the axis-1 gearbox

Continued

	Action	Note
2	<p>Release the brakes of the axis-1 motor with the brake release tool.</p> <ol style="list-style-type: none">1 Turn off the brake release tool.2 Connect the tool to the R2.MP1 connector.3 Release the brakes by turning on the brake release tool and pressing the brake release button on the tool. <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury.</p> <p>Read and follow enclosed user instructions for the tool.</p> <p> WARNING</p> <p>Electrical damage to the motor may occur if 24V is supplied to the motor connector for more than 30 seconds. Use the specified brake release tool to eliminate the risk.</p>	<p>Brake release tool: 3HAC081310-001 User instructions are enclosed with the tool.</p>  <p>xx210000666</p>
3	<p>Unscrew the attachment screws and washers.</p> <p>Use a bits extender to reach the screws.</p>	<p>Bits extender: 3HAC12342-1</p>  <p>xx210000503</p>

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5.9.1 Replacing the axis-1 gearbox
Continued

	Action	Note
4	Fit guide pins in opposite holes.	<p>Guide pin, M10x150: 3HAC15521-2 Always use guide pins in pairs.</p>  <p>xx210000504</p>
5	<p> CAUTION</p> <p>The weight of the motor is 21 kg All lifting accessories used must be sized accordingly.</p>	
6	<p> CAUTION</p> <p>Whenever parting/mating motor and gear-box, the gears may be damaged if excessive force is used.</p>	
7	Press the motor out of its position by using the removal tool in opposite holes of the motor.	<p>Removal tool motor M12: 3HAC14631-1 Always use removal tools in pairs.</p>
8	Use caution and lift the motor straight up to get the pinion parted from the gear.	 <p>xx2100002186</p>
9	Disconnect the brake release tool.	


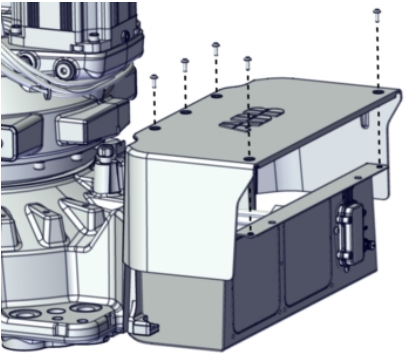
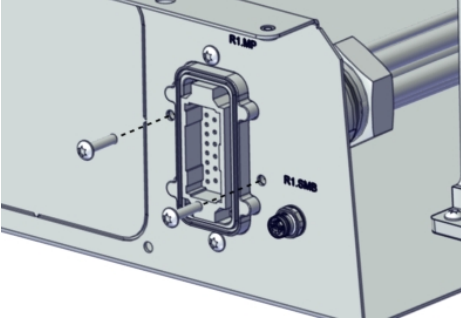
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5 Repair

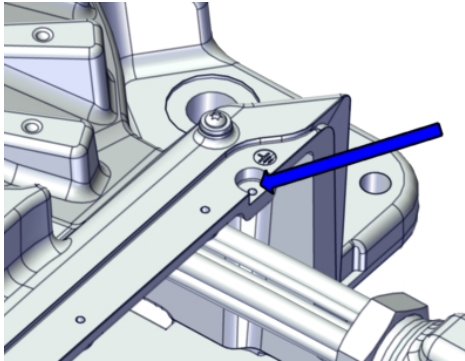
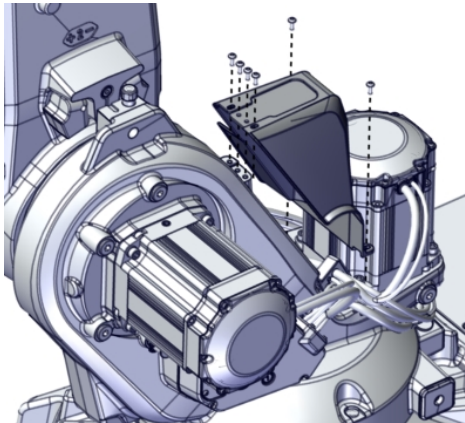
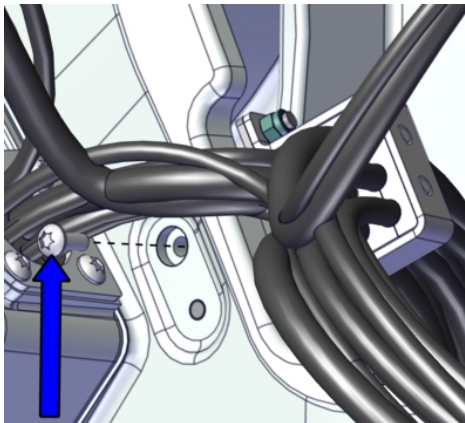
5.9.1 Replacing the axis-1 gearbox

Continued

Preparations before removing the cable harness in the base

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the base cover.	 xx210000981
3	Loosen the connectors: <ul style="list-style-type: none">• R1.MP• R1.SMB	 xx2100001109

Continues on next page

	Action	Note
4	Disconnect the earth cable.	 <p>xx210000982</p>
5	<p><i>Foundry Plus</i></p> <p>Remove the axis-1 cable protection plate by removing the attachment screws.</p>	 <p>xx210000979</p>
6	Loosen the cable bracket from the frame by removing the screw.	 <p>xx2100001108</p>

Removing the cable harness from the base

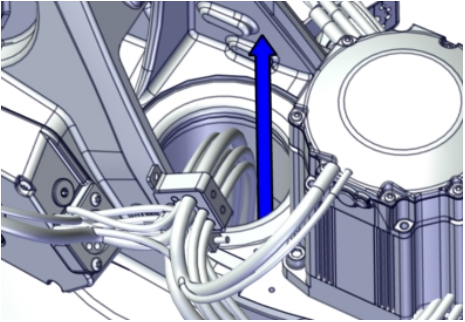
	Action	Note
1	Pull out the robot cable harness through the protection tube.	

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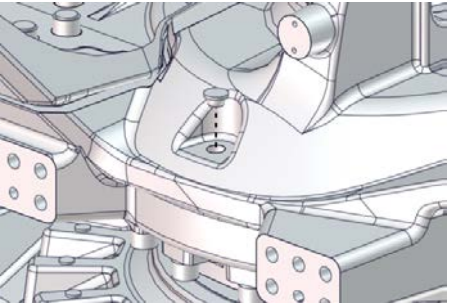
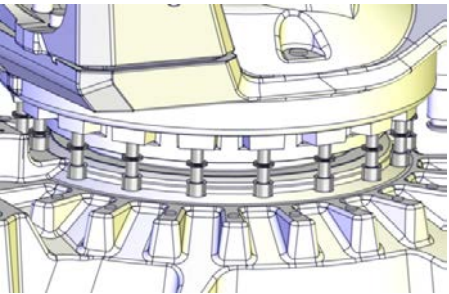

5 Repair

5.9.1 Replacing the axis-1 gearbox



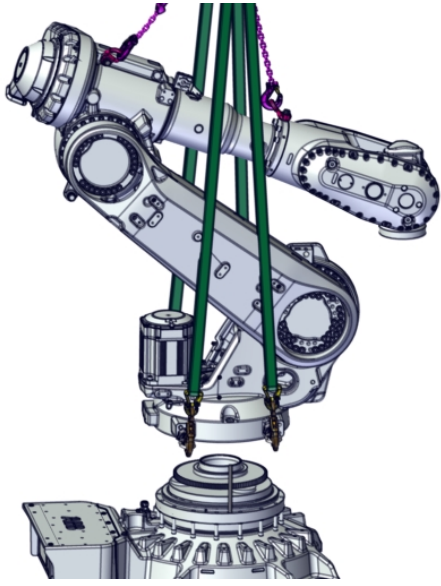

Continued

Action	Note
	 <p>xx2100001111</p>
2	Place the cable harness safely on the frame.

Lifting away the complete arm system

Action	Note
1	Check that the axis-1 gearbox is drained and then remove the draining equipment.
2	Raise the overhead crane to stretch all lifting accessories.
3 Remove the two protection plugs or M16 screws on the left and right hand side of the frame and install guide pins in the holes.  Tip Lubricate the guide pins with some grease to make the frame slide better.	 <p>xx1700000320</p> <p>Guide pin, M12x150: 3HAC13056-2 Always use guide pins in pairs.</p>
4	Verify that all attachment screws are loosened from the frame.  <p>xx1400002169</p>
5	 CAUTION The weight of the complete arm system is 546-616 kg (depending on robot variant) All lifting accessories must be sized accordingly.

Continues on next page

	Action	Note
6	<p>Lift away the complete arm system.</p> <p> CAUTION</p> <p>When the arm system has left the guide pins it can move. Use caution in order to avoid injury or damage!</p> <p> Note</p> <p>There will be some oil spill!</p>	 <p>xx2100001411</p>
7	<p>Put down the arm system on the floor.</p>	
8	<p> DANGER</p> <p>When the complete arm system is removed and resting by itself on the floor, make sure it is resting completely stable before removing the lifting accessories. Do not change the position of the axes from the position described earlier.</p>	

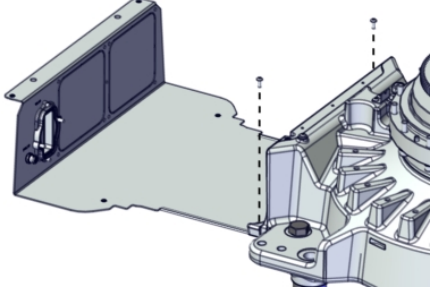

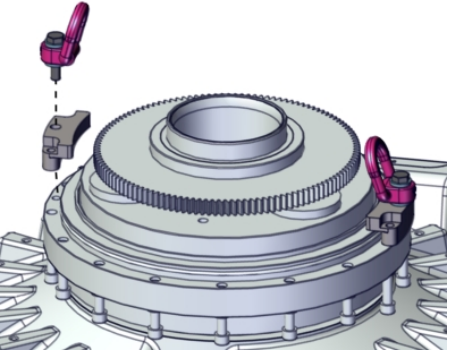

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5 Repair

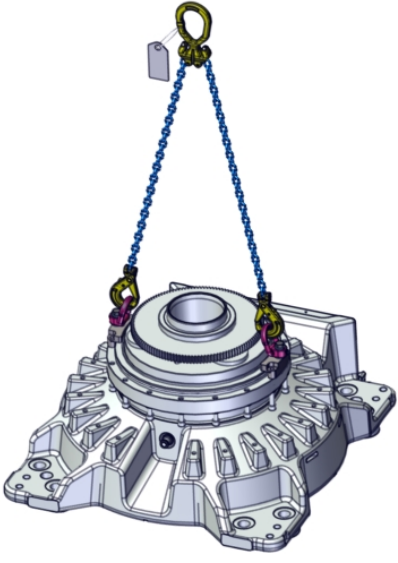

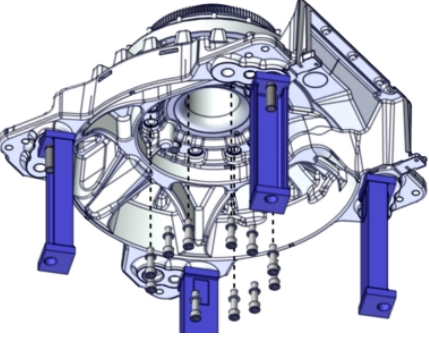
5.9.1 Replacing the axis-1 gearbox

Continued

Removing the axis-1 gearbox

	Action	Note
1	Remove the bottom plate by removing the two small screws and pulling the plate out.	 xx200000411
2	Fit the lifting accessories in opposite holes in the gearbox.  CAUTION Leave a couple of millimeters of space between the adapter and the surface of the gearbox. This is done in order not to damage the surface of the gearbox which is a sealing surface.	Lifting adapter: 3HAC081565-001 Lifting eye: 3HAC16131-1  xx2100002817
3	 CAUTION The weight of the gearbox is 97 kg All lifting accessories used must be sized accordingly.	

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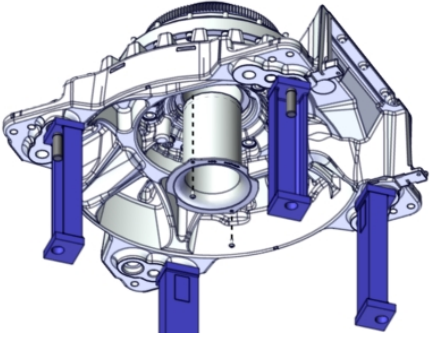
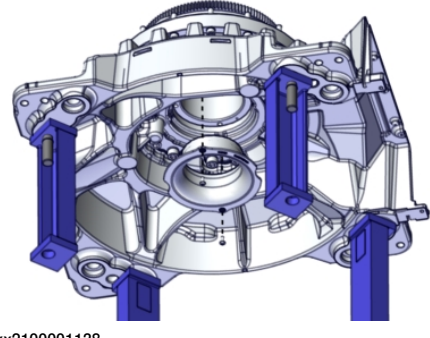



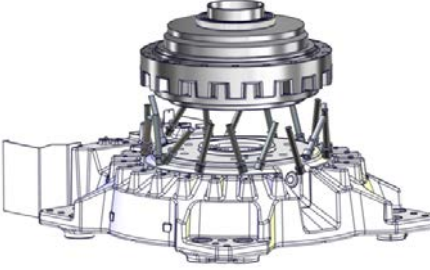
	Action	Note
4	Attach the lifting accessory.	Lifting accessory (chain): 3HAC15556-1  xx2100002818
5	Remove the gearbox attachment screws, from underneath the base.  Tip This procedure is best performed by two persons working together: <ul style="list-style-type: none"> • one underneath the robot base making sure that the bit is being fitted into the screw head holes, all the way until they reach the bottom • one using the torque wrench, loosening the screws from beside the base. 	 xx2000000412

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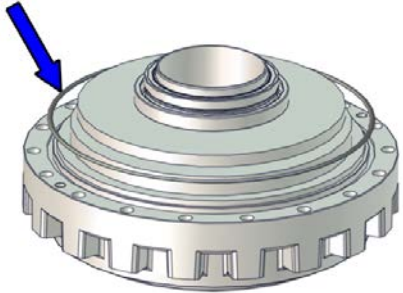
5 Repair

5.9.1 Replacing the axis-1 gearbox

Continued

	Action	Note
6	<p>Remove the protection tube from the base by removing the two attachment screws and pulling the tube downwards.</p>	 <p>xx2100001112</p> <p><i>Option Inverted (3317-1)</i></p>  <p>xx2100001138</p>
7	<p> CAUTION</p> <p>The weight of the gearbox is 97 kg All lifting accessories used must be sized accordingly.</p>	
8	<p>Lift away the gearbox.</p> <p> WARNING</p> <p>Approximately 0.5 l of oil residues will drip out during lifting of the gearbox. Make sure that protective gear like goggles and gloves are always worn.</p> <p> WARNING</p> <p>Used oil is hazardous material and must be disposed of in a safe way. See Decommissioning on page 593 for more information.</p>	 <p>xx1700000566</p>


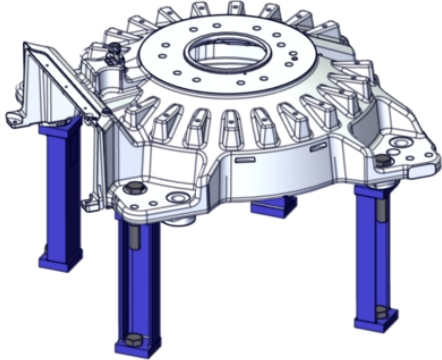
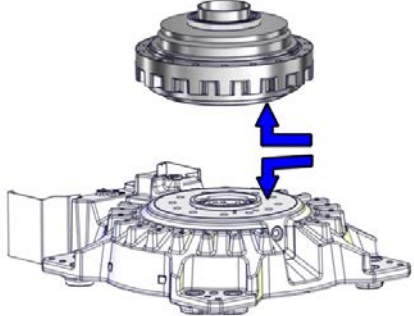
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	Action	Note
9	<p>Remove the old o-ring to use it as aid in holding the screws during fitting of the new gearbox. A new o-ring is fitted on the new gearbox.</p>	 <p>xx1700001378</p>

Refitting the gearbox

These procedures describe how to refit the axis-1 gearbox.

Preparations before refitting the axis-1 gearbox

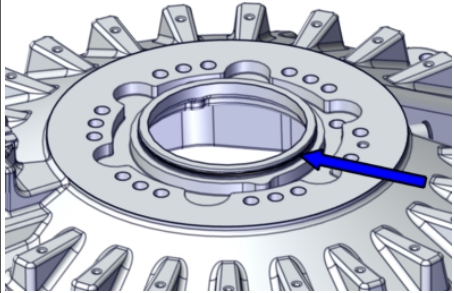
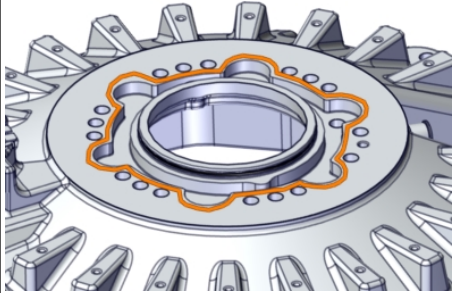

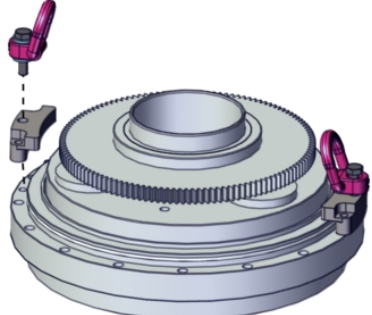

	Action	Note
1	<p> CAUTION</p> <p>The weight of the base is 170 kg All lifting accessories used must be sized accordingly.</p>	
2	<p>If not already done, fit and secure the four support legs to the foundation. Then lift up and secure the base on top of the legs.</p>	<p>Support legs: 3HAC15535-1. Tightening torque: 550 Nm</p>  <p>xx2100001135</p>
3	<p>Wipe the contact surfaces between gearbox and base clean from any contamination.</p>	 <p>xx1700000567</p>

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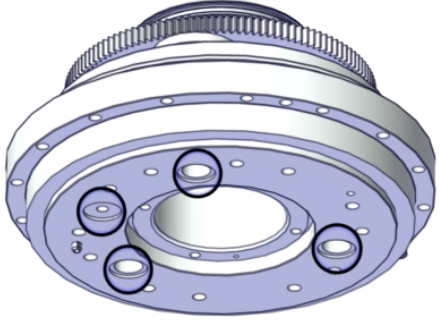
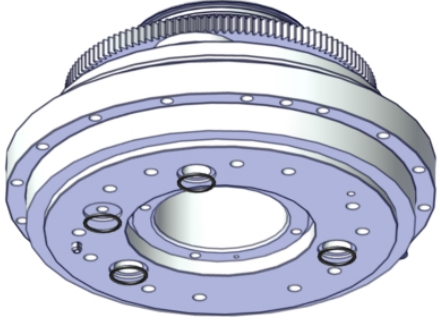
5 Repair

5.9.1 Replacing the axis-1 gearbox

Continued

	Action	Note
4	<p><i>Option Inverted (3317-1)</i> Replace the o-ring on the base with a new. Lubricate with some grease and fit it in the groove.</p>	<p>O-ring, NBR: 3HAB3772-150 (183.74x3.53). Grease, Shell Gadus S2: 3HAC042536-001.</p>  <p>xx2100001195</p>
5	<p><i>Option Inverted (3317-1)</i> Apply flange sealant to the mounting interface on the base, outside of the groove.</p>	<p>Flange sealant: Loctite 574 (-).</p>  <p>xx2100001196</p>
6	<p>Fit the lifting accessories in opposite holes in the gearbox.</p> <p> CAUTION</p> <p>Leave a couple of millimeters of space between the lug and the surface of the gearbox. This is done in order not to damage the surface of the gearbox which is a sealing surface.</p>	<p>Lifting adapter: 3HAC081565-001 Lifting eye: 3HAC16131-1</p>  <p>xx2100002819</p>
7	<p> CAUTION</p> <p>The weight of the gearbox is 97 kg All lifting accessories used must be sized accordingly.</p>	

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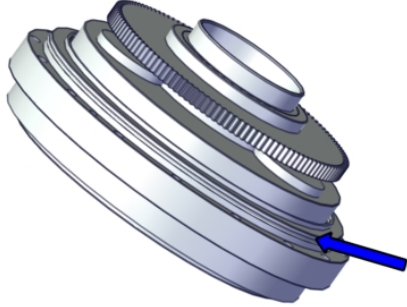
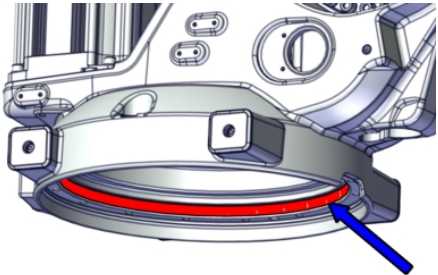
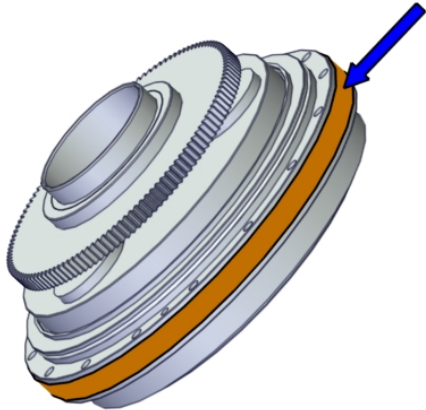
	Action	Note
8	Attach the lifting accessory and lift the gearbox.	Lifting accessory (chain): 3HAC15556-1  xx2100002820
9	Wipe clean the o-ring grooves for the small o-rings beneath the gearbox.	 xx2100001008
10	Clean the new o-rings, lubricate them with some grease and fit them in their grooves in the gearbox. <i>Not required for option Inverted (3317-1).</i>	O-ring: 3HAC061327-033 (32x4). Grease, Shell Gadus S2: 3HAC042536-001.  xx2000000413

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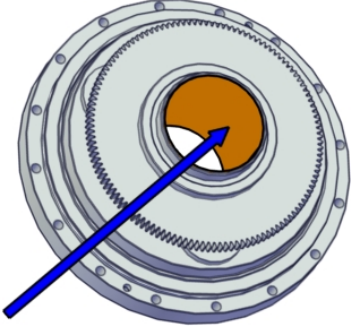

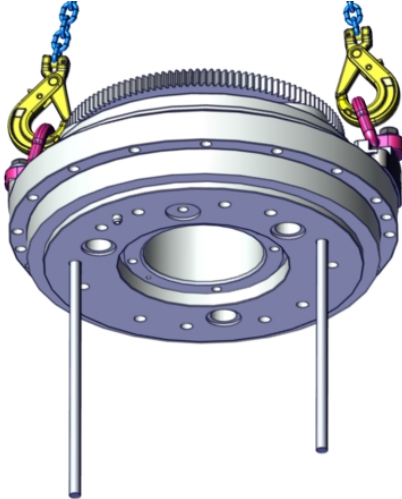
5 Repair

5.9.1 Replacing the axis-1 gearbox

Continued

	Action	Note
11	Check the o-ring. Replace if damaged.	Grease, Shell Gadus S2: 3HAC042536-001.  xx2100001132
12	Lubricate the contact surface inside the frame with grease.	Grease, Shell Gadus S2: 3HAC042536-001.  xx2100002793
13	Apply rust preventive to the gearbox surface shown in the figures.	Rust preventive: 3HAC034903-001 (Mercial 3110 Waxcoat. Recommended drying time is 24h.)  xx2100001117

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Action	Note
<p>14 <i>Protection type Foundry Plus:</i> Apply rust preventive to the inner surface of the hole in the axis-1 gearbox, as shown in the figure.</p>	<p>Rust preventive: 3HAC034903-001 (Mercasol 3110 Waxcoat. Recommended drying time is 24h.)</p>  <p>xx2100001169</p>
<p>15 Fit guide pins in opposite holes in the gearbox.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the gearbox slide better.</p>	<p>Guide pin, M16x200: 3HAC13120-3 Always use guide pins in pairs.</p>  <p>xx2100002821</p>



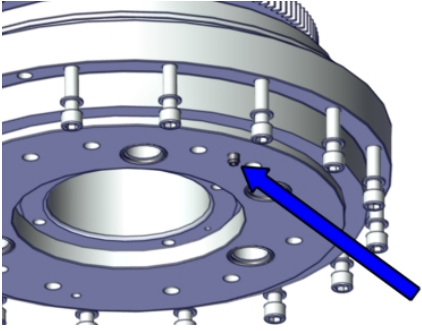
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5 Repair


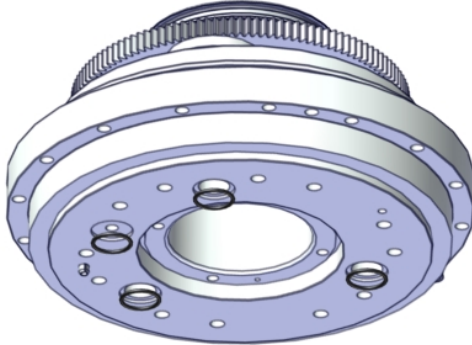
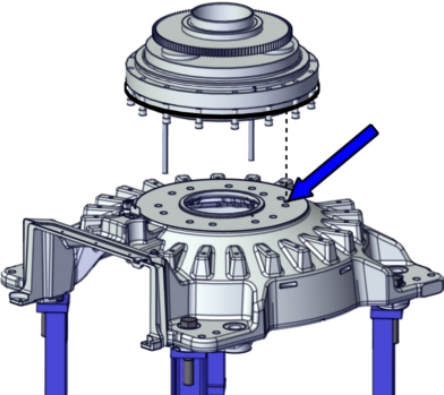
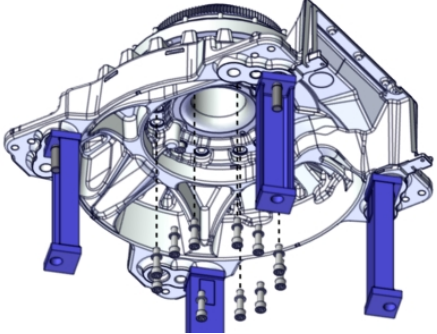

5.9.1 Replacing the axis-1 gearbox

Continued

Refitting the axis-1 gearbox to the base

	Action	Note
1	<p>Before the gearbox is being fitted, place the attachment screws that will secure the gearbox to the frame, temporarily in their holes and lock screws with the old o-ring. This is done to prevent the screws from falling out.</p> <p> Note Do not use the new o-ring!</p>	<p>Hex socket head cap screw: M12x60 12.9 Gleitmo 603+Geomet 500 (16 pcs)</p> <p>If the attachment screws are not fitted like this at this point, they must be fitted by rotating axis 1 to get access at the mechanical stop pin location, one at a time.</p>  <p>xx1400002176</p>
2	<p>Verify that the locating pin in the gearbox will match the hole in the base.</p>	 <p>xx2100001167</p>

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Action	Note
<p>3 Lower the gearbox against the base with guidance from the guide pins and locating pin.</p> <p> Note</p> <p>Verify that the small o-rings underneath the gearbox, stays fitted correctly when the gearbox is being fitted.</p> <p><i>Not required for option Inverted (3317-1).</i></p>  <p>xx2000000413</p>	<p>Note</p>  <p>xx2100001134</p>
<p>4 Lower the lifting accessory so that the chain is no longer stretched.</p>	
<p>5 Fit the attachment screws that secure the gearbox to the base, from underneath.</p>	<p>Attachment screws: M16x60 12.9 Gleitmo 603+Geomet 500 (12 pcs).</p>  <p>xx2000000412</p>
<p>6 Remove the guide pins and fit the two remaining screws.</p>	
<p>7 Secure the attachment screws.</p> <p> Tip</p> <p>This procedure is best performed by two persons working together:</p> <ul style="list-style-type: none"> • one underneath the robot base making sure that the bit is being fitted into the screw head holes, all the way until they reach the bottom • one using the torque wrench, tightening the screws from beside the base. 	<p>Tightening torque: 300 Nm.</p>

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5 Repair

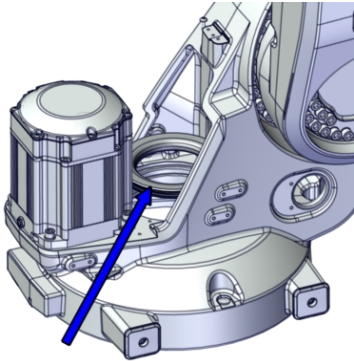
5.9.1 Replacing the axis-1 gearbox

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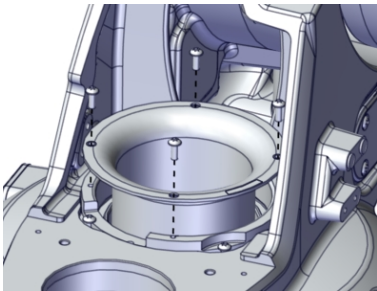
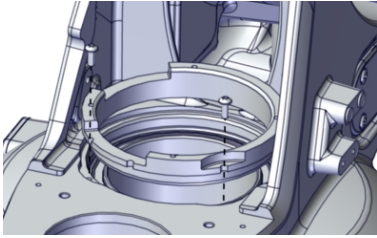
Removing the sealing ring in the frame

	Action	Note
1	<i>Only for floor-mounted robot Foundry Plus</i> Cut the flange sealant at the sealing ring (protection tube).	

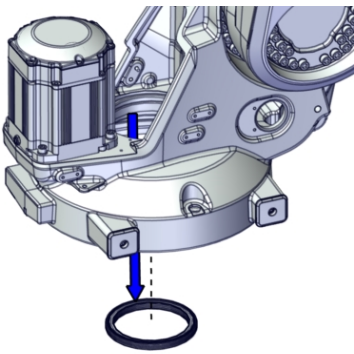
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	Action	Note
2	<p><i>Only for floor-mounted robot</i> Remove the sealing ring.</p>	 <p>xx2100001116</p>

Removing the protection tube

	Action	Note
1	<p><i>Option Inverted (3317-1):</i> Remove the protection tube by removing the attachment screws.</p>	 <p>xx2100002492</p>
2	<p><i>Option Inverted (3317-1):</i> Remove the adapter by removing the attachment screws.</p>	 <p>xx2100002493</p>

Removing the cassette sealing

	Action	Note
1	<p>Remove the cassette sealing by knocking it down through the frame.</p>	 <p>xx2100002309</p>

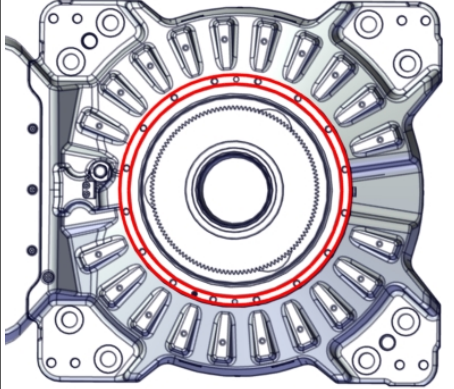

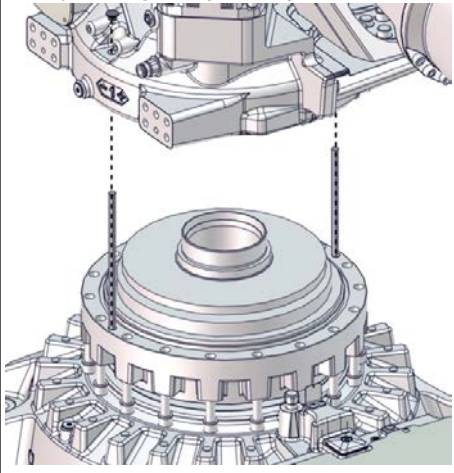
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5 Repair


5.9.1 Replacing the axis-1 gearbox

Continued



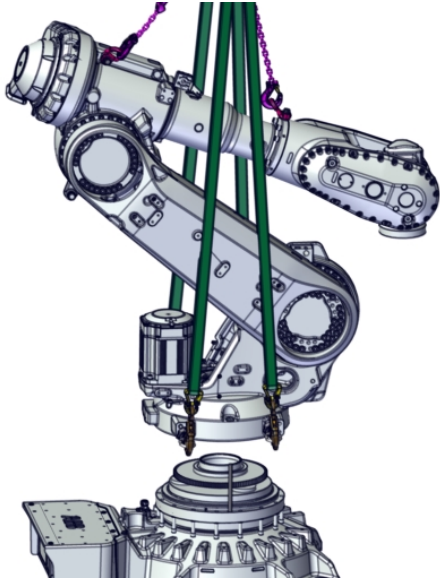

Preparations before refitting the arm system

	Action	Note
1	Wipe clean the contact surfaces from any contamination.	
2	<p><i>Protection type Foundry Plus:</i> Apply flange sealant to the mounting interface on the gearbox, both inside and outside of the screw holes.</p>	<p>Flange sealant: 3HAC041807-007 (Loctite 5800)</p>  <p>xx210000225</p>
3	<p>Apply some grease on:</p> <ul style="list-style-type: none"> • the edge of the protection tube • the edge around the gearbox. 	
4	<p>Apply guide pins in the guide pin holes in the gearbox.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the frame slide better.</p>	<p>Guide pin, M12x150: 3HAC13056-2 (2 pcs) Always use guide pins in pairs.</p>  <p>xx1700000329</p>

Refitting the arm system

	Action	Note
1	<p> CAUTION</p> <p>The weight of the complete arm system is 546-616 kg (depending on robot variant) All lifting accessories must be sized accordingly.</p>	

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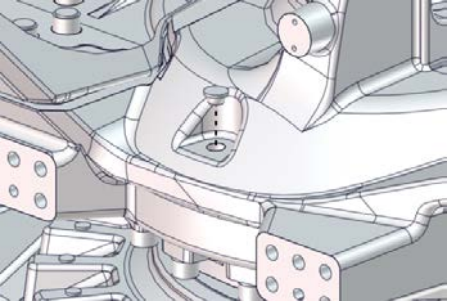
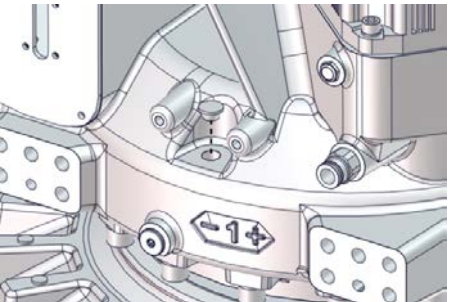
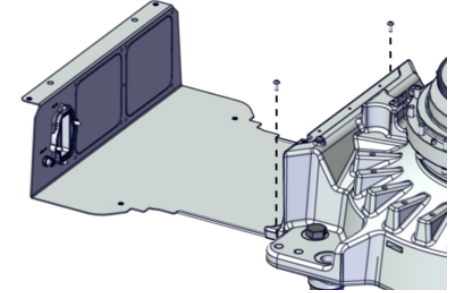
	Action	Note
2	Make sure that all lifting accessories still is fitted correctly on the arm system.	See Attaching the lifting accessories to the arm system on page 423 .
3	Lift the arm system up, to be able to reach the contact surfaces underneath the frame.	
4	Wipe clean the contact surfaces from any remaining contamination.	
5	Before putting the complete arm system on to the guide pins, make sure that the hole pattern will match and that the guide pins will enter the correct holes in the frame.	
6	<p>Remove the big o-ring that holds the attachment screws in the temporary position and let them drop down on the base.</p> <p> Note</p> <p>Make sure that none of the screws or washers are missing and that they are in correct position.</p>	
7	<p>Lift the complete arm system and lower it slowly down over the guide pins, until it is possible to insert the attachment screws manually.</p> <p> CAUTION</p> <p>Do not lower the arm system completely at this stage! The attachment screws must be fitted in two steps. If not, the complete arm system will risk resting on the attachment screws in the wrong position!</p>	 <p>xx2100001411</p>
8	Fit the attachment screws manually as far as possible. Lower the complete arm system slowly in steps, until all attachment screws no longer can reach the base, when the arm system is lowered all the way down.	Hex socket head cap screw: M12x60 12.9 Gleitmo 603+Geomet 500 (16 pcs)
9	Make sure that the complete arm system is lowered all the way down.	
10	<p> Note</p> <p>The attachment screw at the axis-1 synchronization plate can not be reached to be secured at this stage. Make sure it is still in its place and will not be damaged in the continued procedure.</p>	

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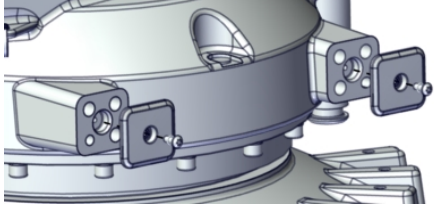
5 Repair

5.9.1 Replacing the axis-1 gearbox

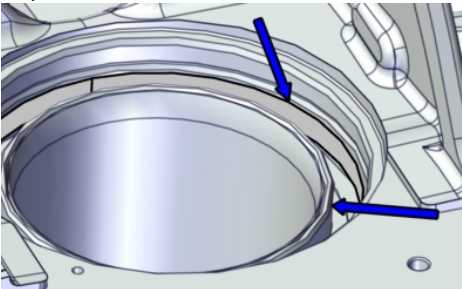
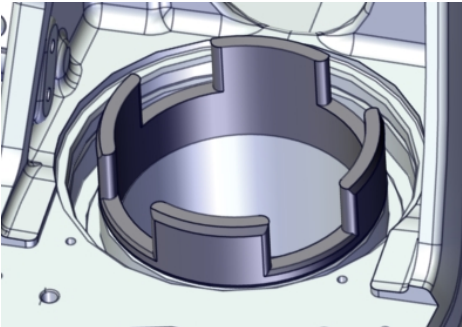
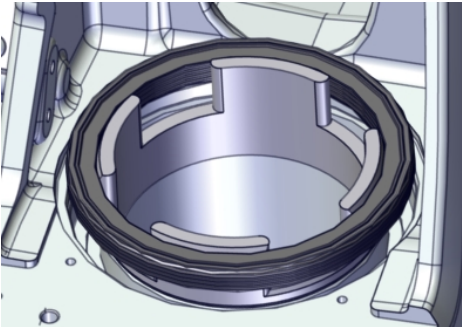
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Action	Note
<p>11 Secure all screws now possible to reach.</p> <p> Note</p> <p>A bits holder is needed to be able to reach the attachment screws.</p>	<p>Bit holder: 3HAC029090-001.</p> <p>Tightening torque: see standard torque in Screw joints on page 598.</p>
<p>12 If required, manually rotate axis-1 to a position where the remaining attachment screw can be secured.</p>	
<p>13 Remove the guide pins and refit the two plastic protection plugs.</p>	 <p>xx1700000320</p>  <p>xx1700000321</p>
<p>14 Refit the back plate and secure with two screws.</p>	<p>Tightening torque: 10 Nm</p> <p>Torx pan head screw: M6x16 Stainless steel A2-70 (2 pcs)</p>  <p>xx2000000411</p>
<p>15 Remove the lifting accessories.</p>	

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Action	Note
<p>16 Refit the fork lift protection covers on both sides of the robot (4 pcs) with screws and washers.</p>	<p>Tightening torque: 10 Nm</p>  <p>xx2100001409</p>

Refitting the cassette sealing

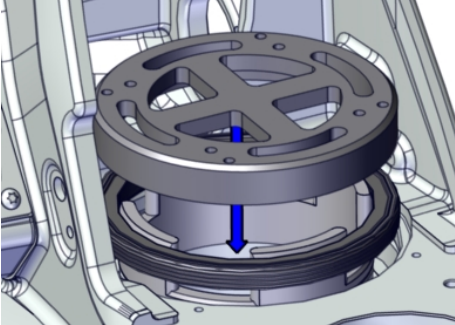
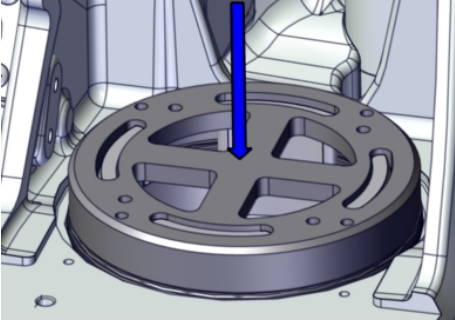
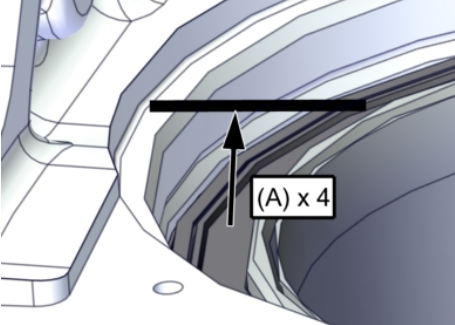
Action	Note
<p>1 Remove any old assembly lubricant residues or other contamination from the contact surfaces for the sealing in the frame.</p>	<p>Grease: 3HAC042536-001 (Shell Gadus S2)</p>
<p>2 Lubricate the mounting surfaces in the frame with grease.</p>	 <p>xx2100002377</p>
<p>3 Fit the first part of the mounting tool to the frame.</p>	<p>Replacement tool for cassette sealing: 3HAC079880-001</p>  <p>xx2100001188</p>
<p>4 Fit the cassette sealing on the tool with the plain side facing upwards (groove downwards).</p>	 <p>xx2100001189</p>

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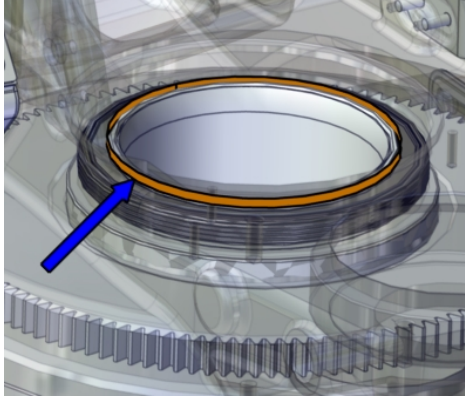
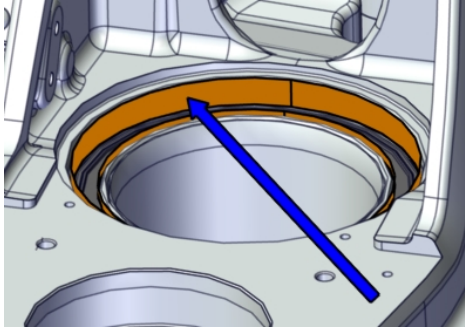
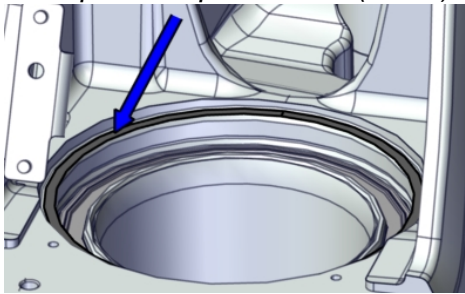
5 Repair

5.9.1 Replacing the axis-1 gearbox

Continued

	Action	Note
5	Fit the second part of the mounting tool on top of the sealing.	 xx2100001191
6	First push down the tool by hand to guide down the sealing aligned. Then use a rubber mallet to knock down the tool and sealing evenly, until the sealing has reached the bottom all the way around.	 xx2100001192
7	Remove the mounting tool.	
8	Verify that the cassette sealing is fitted evenly by measuring the distance (A) between the painted edge of the frame and down to the sealing, at four (4) locations. The measurement is approximately 16 mm.	 xx2100001193

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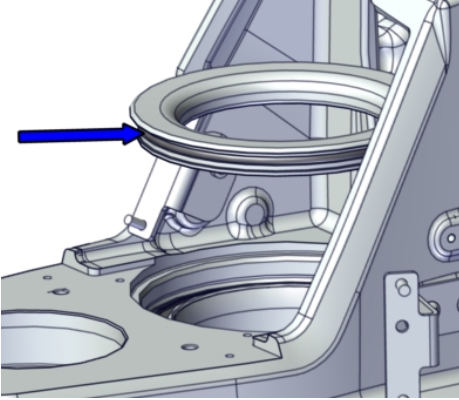
	Action	Note
9	<p><i>Protection type Foundry Plus</i></p> <p>Apply rust preventive to the outer surface of the gearbox tube and outer surface of the frame hole, all the way down to the cassette sealing, as shown in the figure.</p>	<p>Rust preventive: 3HAC034903-001 (Mercasol 3110 Waxcoat. Recommended drying time is 24h.)</p>  <p>xx2100001170</p>  <p>xx2100001172</p>
10	<p><i>Only for floor-mounted robot with protection type Foundry Plus</i></p> <p>Apply sealant to the mounting surface for the sealing ring.</p>	<p>Sealant (grey): 3HAC026759-001 () Sikaflex 521FC.</p> <p><i>Protection type Foundry Plus.</i></p> <p><i>Not required for option Inverted (3317-1).</i></p>  <p>xx2100001173</p>

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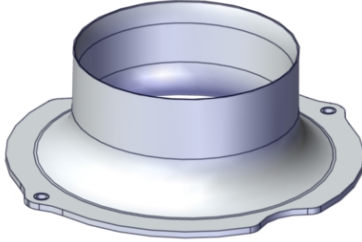
5 Repair

5.9.1 Replacing the axis-1 gearbox

Continued

	Action	Note
11	<p><i>Only for floor-mounted robot</i></p> <p>Refit the sealing ring. Verify that the o-ring is undamaged and placed in its groove on the sealing ring.</p> <p>Replace if damaged.</p>	<p>O-ring, nitrile rubber: 3HAB3772-57</p>  <p>xx2100001136</p>

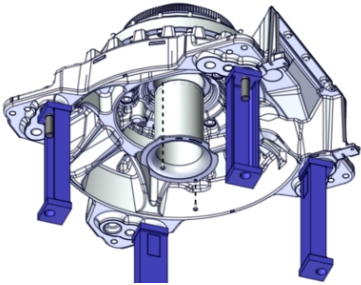
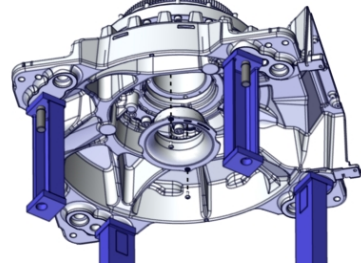
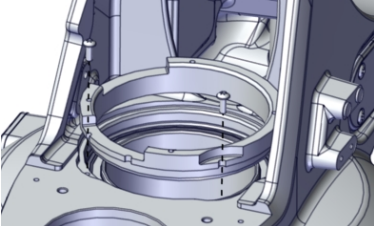
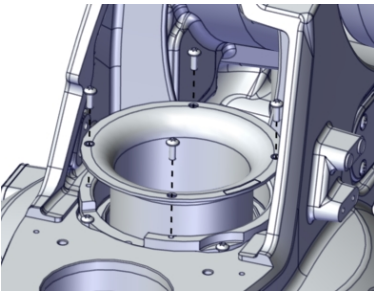
Refitting the protection tube

	Action	Note
1	<p>Check the protection tube for damages.</p> <p>Especially inspect the surface for the sealing ring (<i>not available for option Inverted (3317-1)</i>).</p> <p>Replace if damaged.</p>	 <p>xx1700001374</p> <p><i>Option Inverted (3317-1):</i></p>  <p>xx2100001168</p>
2	<p>Wipe the surfaces of the protection tube clean from any contamination.</p>	

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5.9.1 Replacing the axis-1 gearbox

Continued

	Action	Note
3	<p>Refit the protection tube to the base. Secure with the attachment screws. <i>Option Inverted (3317-1):</i> Apply locking liquid on the screws.</p>	<p>Torx pan head screw: M6x16 Stainless steel A2-70 (2 pcs). Tightening torque: 10 Nm.</p>  <p>xx2100001112</p> <p><i>Option Inverted (3317-1)</i></p>  <p>xx2100001138</p> <p>Locking liquid: 3HAC041807-004 (Loctite 2400)</p>
4	<p><i>Option Inverted (3317-1):</i> Refit the adapter with the attachment screws.</p>	<p>Torx pan head screw: M6x16 A4-80 (2 pcs)</p>  <p>xx2100002493</p>
5	<p><i>Option Inverted (3317-1):</i> Refit the protection tube with the attachment screws. Apply locking liquid on the screws.</p>	<p>Torx pan head screw: M6x16 A4-80 (4 pcs) Locking liquid: 3HAC041807-004 (Loctite 2400) Tightening torque: 10 Nm.</p>  <p>xx2100002492</p>




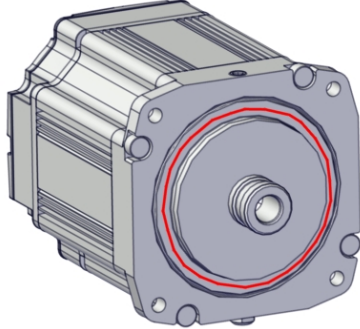
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5 Repair

5.9.1 Replacing the axis-1 gearbox

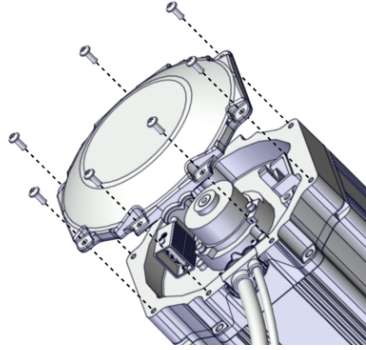

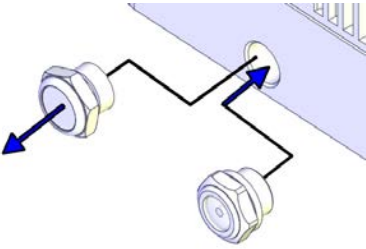
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Preparations prior to refitting motor

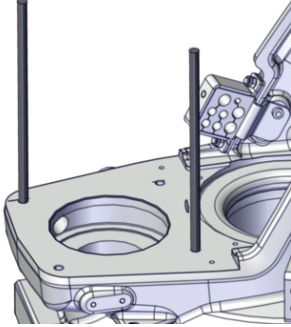
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove any old paint or flange sealant residues or other contamination from the contact surfaces on both the motor and the mating parts.  Tip Remove flange sealant residues with Loctite 7200. Then use Loctite 7063 for cleaning the mating surface.	
3	Apply a continuous bead of flange sealant, 1-2 mm wide, inside of the groove on the motor contact surface.  Note The purpose of the groove is to catch excess sealant. No o-ring is used.	Flange sealant: 3HAC041807-007 (Loctite 5800)  xx2100000520

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5.9.1 Replacing the axis-1 gearbox
Continued

	Action	Note
4	Remove the cover, if fitted to the new spare part motor.	 <p>xx210000596</p>
5	<p><i>Protection type Foundry Plus</i> Valid for axis-1, axis-2, axis-3 and axis-4. If the motor is a new spare part, the evacuation hole protection filter must be replaced with a transparent plug/sight glass (enclosed with the spare part delivery). Remove the protection filter and install the transparent plug/sight glass.</p>  <p>xx1800000101 xx1800000102</p> <p>Protection filter (Standard). Transparent plug (Foundry Plus).</p>	<p>Tightening torque, transparent plug: 20 Nm Tightening torque, protection filter: 20 Nm</p>  <p>xx1600000576</p>

Floor-mounted robot: Refitting the axis-1 motor






	Action	Note
1	Fit guide pins in opposite holes.	<p>Guide pin, M10x150: 3HAC15521-2 Always use guide pins in pairs.</p>  <p>xx2100001194</p>

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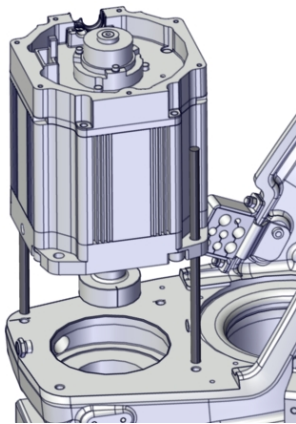
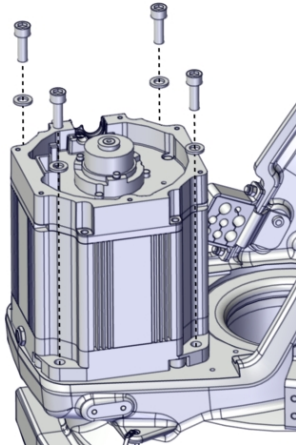
5 Repair

5.9.1 Replacing the axis-1 gearbox

Continued

	Action	Note
2	<p> CAUTION</p> <p>The weight of the motor is 21 kg All lifting accessories used must be sized accordingly.</p>	
3	Fit the rotation tool.	Rotation tool: 3HAB7887-1
4	<p>Release the brakes on the motor with the brake release tool.</p> <ol style="list-style-type: none"> 1 Make sure the brake release tool is turned off. 2 Connect the tool to the R2.MP1 connector. 3 Release the brakes by pressing the button on the tool. <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury. Read and follow enclosed user instructions for the tool.</p> <p> WARNING</p> <p>Electrical damage to the motor may occur if 24V is supplied to the motor connector for more than 30 seconds. Use the specified brake release tool to eliminate the risk.</p>	<p>Brake release tool: 3HAC081310-001 User instructions are enclosed with the tool.</p>  <p>xx2100000666</p>
5	<p> CAUTION</p> <p>Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.</p>	

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	Action	Note
6	<p>Lower the motor into position.</p> <ul style="list-style-type: none"> • Make sure that the motor pinion is properly mated to the gear in the gearbox. • Make sure that the motor pinion does not get damaged. • Make sure that the direction of the cable gland exit is facing the correct way. 	 <p>xx2100002186</p>
7	<p>Secure the motor with its attachment screws and washers. Use a bits extender to reach the screws.</p>	<p>Hex socket head cap screw: M10x30 12.9 Gleitmo 603+Geomet 500 (4 pcs) Bits extender: 3HAC12342-1 Tightening torque: 50 Nm.</p>  <p>xx2100000503</p>
8	<p>Disconnect the brake release tool.</p>	
9	<p>Perform a leak-down test (if not already done).</p>	<p>See Performing a leak-down test on page 184.</p>

Refilling oil in the gearbox

	Action	Note
1	<p>Refill oil in the gearbox. <i>Option Inverted (3317-1):</i> Because of the risk of getting air bubbles into axis-1 gear in inverted position when filling oil, it is recommended to fill the gearbox with oil before lifting up the robot to inverted position.</p>	<p>See Changing the oil in axis-1 gearbox on page 139.</p>

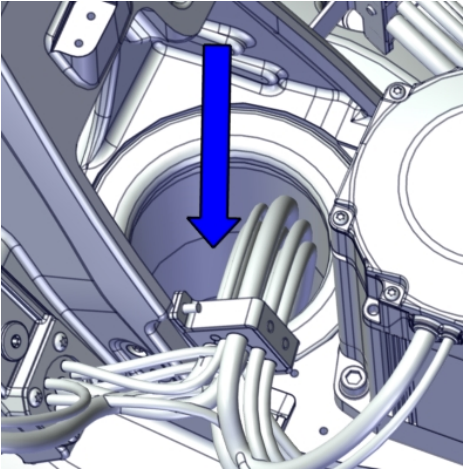
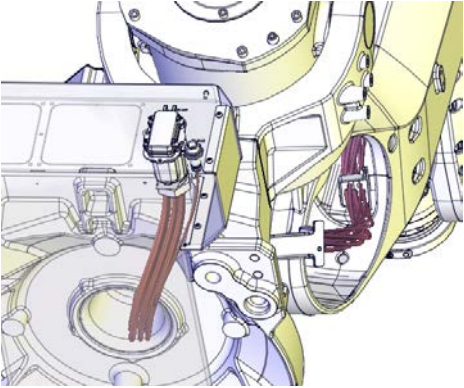
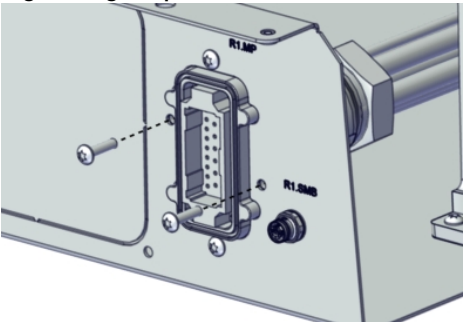
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5 Repair

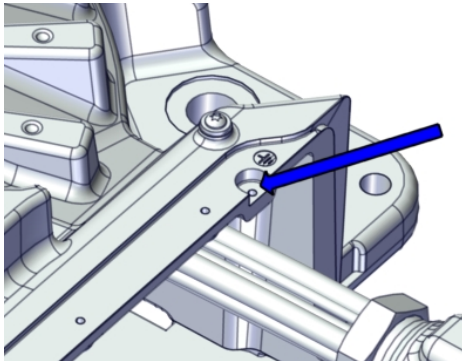
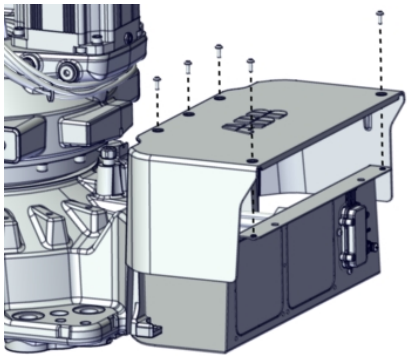
5.9.1 Replacing the axis-1 gearbox

Continued

Refitting the cable harness in the base

	Action	Note
1	Run the cables through the protection tube.	 <p>xx2100001216</p>
2	<ul style="list-style-type: none"> • Make sure that the cables are not twisted. Each cable must be in line with its position on the base plate. • Make sure that the R1.SMB cable will run on the correct side of the R1.MP1, see the figure. 	 <p>xx1300000736</p>
3	Make sure that the markings on the cables are facing the base cover, when connected.	
4	Connect connectors R1.MP and R1.SMB.	<p>Screw dimension for R1.MP: M6x25 A2-70 Tightening torque for R1.MP: 10 Nm. Tightening torque for R1.SMB: 10 Nm.</p>  <p>xx2100001109</p>

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	Action	Note
5	Connect the earth cable.	<p>Screw dimension: M6x16. Washer dimension: 6.4x17x3. Tightening torque: 10 Nm.</p>  <p>xx210000982</p>
6	Refit the base cover.	<p>Torx pan head screw: M6x16 Stainless steel A2-70 Tightening torque: 10 Nm.</p>  <p>xx210000981</p>

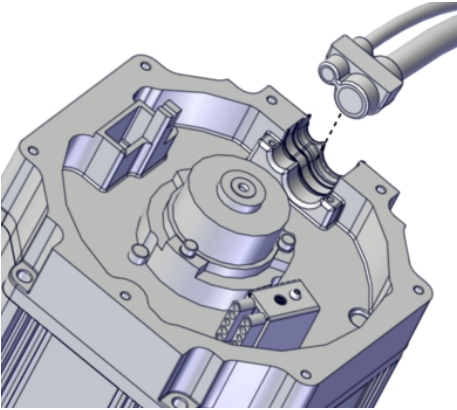
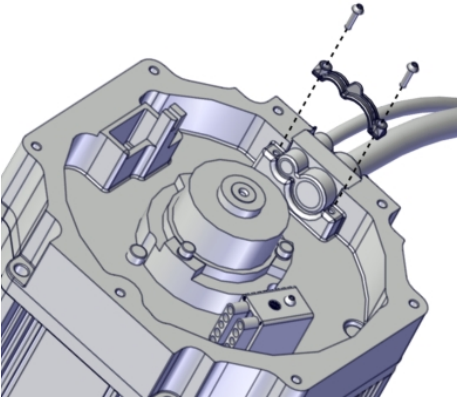
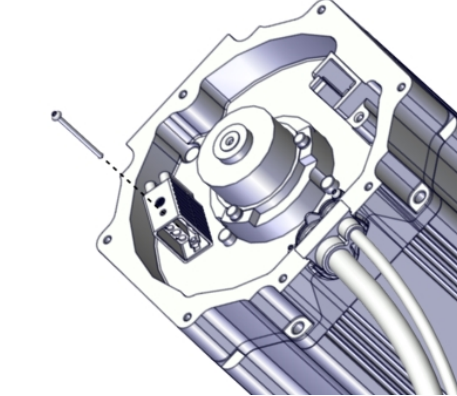
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5 Repair

5.9.1 Replacing the axis-1 gearbox

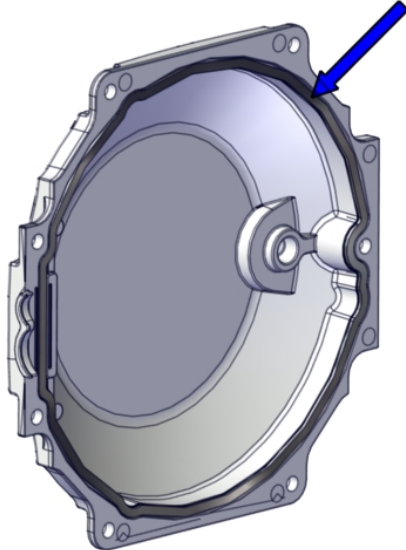

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Connecting the axis-1 motor cables

	Action	Note
1	Put the motor cables in place in the opening.	 <p>xx210000599</p>
2	Refit the cable bracket with the screws.	<p>Torx pan head screw: M3x12 Stainless steel A2-70</p>  <p>xx210000598</p>
3	Connect the motor cables. Connect in accordance with the markings on the connectors.	
4	Secure the power connector with a screw.	<p>Tightening torque: 1 Nm</p>  <p>xx210000667</p>

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5.9.1 Replacing the axis-1 gearbox
Continued

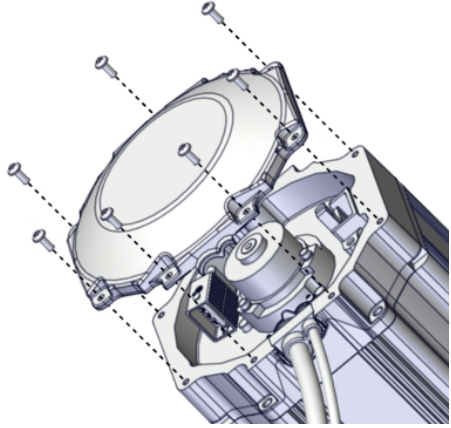
	Action	Note
5	<p>Inspect the gasket. Replace the complete cover if the gasket is damaged.</p>	<p>Axis-1 Connection box cover FS180 with gasket: 3HAC072864-003 (Graphite White) 3HAC072864-005 (ABB Orange)</p> <p>Axis-2 Connection box cover FS180 with gasket: 3HAC072864-003 (Graphite White) 3HAC072864-005 (ABB Orange)</p> <p>Axis-3 Connection box cover FS130 with gasket: 3HAC072863-003 (Graphite White) 3HAC072863-005 (ABB Orange)</p> <p>Axis-4 Connection box cover FS100 with gasket: 3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange)</p> <p>Axis-5 Connection box cover with gasket: (gasket not needed for protection type Standard)</p> <p>IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange)</p> <p>IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 3HAC072861-003 (Graphite White) 3HAC072861-004 (ABB Orange)</p>  <p>xx210000600</p>
6	<p> CAUTION</p> <p>When fitting the motor cover, make sure that none of the cables inside will be damaged.</p>	

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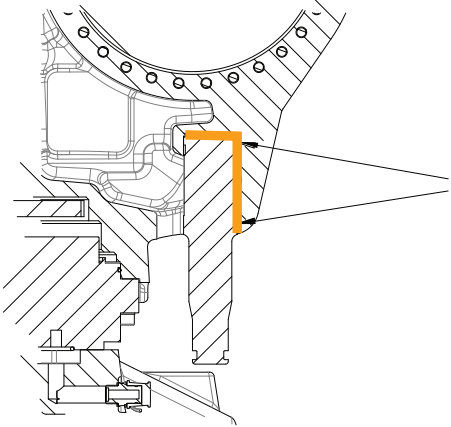
5 Repair

5.9.1 Replacing the axis-1 gearbox

Continued


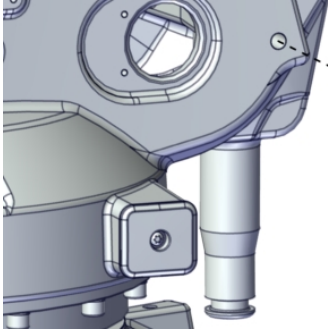
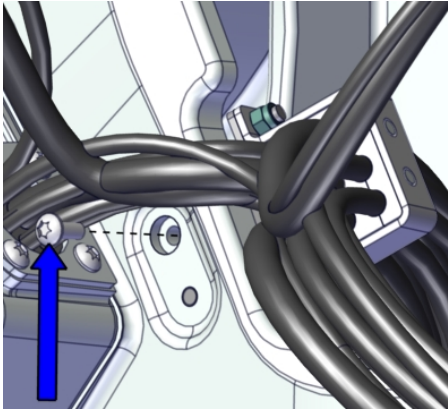
	Action	Note
7	Refit the motor cover with its attachment screws. Use locking liquid.	Torx pan head screw: M5x12 Stainless steel A2-70 Locking liquid: 3HAC041807-004 (Loctite 2400) Tightening torque: 6 Nm.  xx210000596

Refitting the mechanical stop and remaining cable brackets

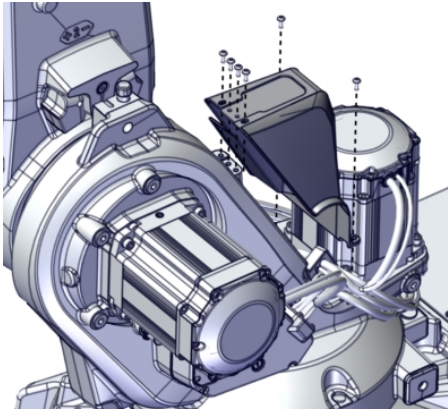
	Action	Note
1	<i>Protection type Foundry Plus</i> Apply rust preventive on the surfaces shown in the figure, on stop pin and in the hole as shown in the figure.	Rust preventive: 3HAC034903-001 (Mercasol 3110 Waxcoat. Recommended drying time is 24h.)  xx2100001139

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5.9.1 Replacing the axis-1 gearbox
Continued

	Action	Note
2	<p>Refit the mechanical stop pin and secure it with the attachment screw. Apply locking liquid on the screw.</p> <p> Note</p> <p>Do not overtighten the attachment screw, use specified tightening torque.</p>	<p>Hex socket screw with cup: M10x20 Stainless Steel Locking liquid: 3HAC041807-004 (Loctite 2400) Tightening torque: 24 Nm</p>  <p>xx2100001410</p>
3	<p>Refit the cable bracket on the frame.</p>	 <p>xx2100001108</p>

Refitting covers for Foundry Plus and floor mounted robots

	Action	Note
1	<p><i>Protection type Foundry Plus</i></p> <p>Refit the axis-1 cable protection plate with the attachment screws.</p>	<p>Torx pan head screw: M6x16 Stainless steel A2-70 (6 pcs)</p>  <p>xx2100000979</p>


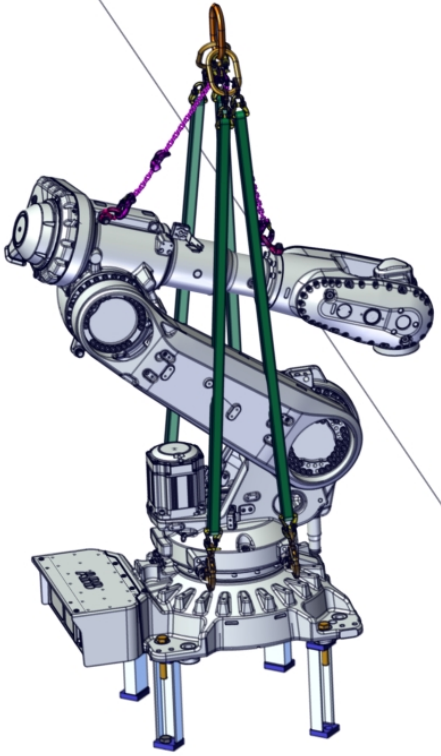
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5 Repair

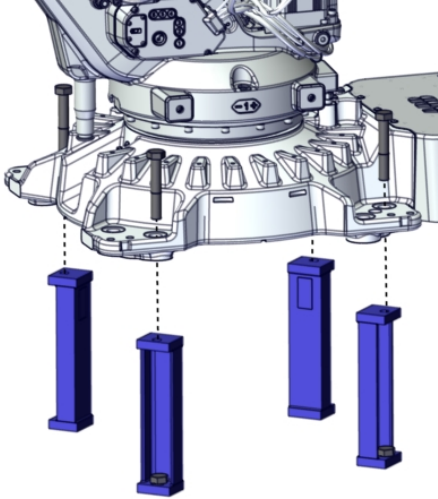
5.9.1 Replacing the axis-1 gearbox

Continued

Securing the floor mounted robot to the foundation


	Action	Note
1	<p> CAUTION</p> <p>The weight of the IRB 5710 robot is IRB 5710-110/2.3: 830 kg (<i>Inverted: 845 kg</i>) IRB 5710-90/2.7: 830 kg (<i>Inverted: 840 kg</i>) IRB 5710-90/2.3 LID: 890 kg (<i>Inverted: 905 kg</i>) IRB 5710-70/2.7 LID: 885 kg (<i>Inverted: 900 kg</i>)</p> <p>All lifting accessories used must be sized accordingly.</p>	
2	Attach the lifting accessories to the robot.	<p>Lifting accessory set: 3HAC15607-1</p>  <p>xx2100002226</p>
3	Stretch the lifting accessories enough to secure the robot, but without taking the full weight of the robot.	

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	Action	Note
4	Unscrew the screws that secure the base to the support legs and lift up the robot.	 <p>xx2100001113</p>
5	Remove the support legs.	
6	Lower the robot to the foundation.	
7	Secure the robot to the foundation.	<p>M24 x 100 (8 pcs) 550 Nm (screws lubricated with Molykote 1000) 600-725 Nm, typical 650 Nm (screws none or lightly lubricated)</p>

Securing an inverted robot to the foundation

Use this procedure to orient and secure the robot inverted.






	Action	Note
1	<p>Install the fork lift pockets to the robot.</p>  <p>DANGER</p> <p>Handling the tool incorrectly will cause serious injury. Read and follow enclosed user instructions for the tool.</p>	<p>See user instructions enclosed with the fork lift accessory set. Fork lift accessory set: 3HAC058825-001.</p>

Continues on next page

5 Repair

5.9.1 Replacing the axis-1 gearbox


Continued

	Action	Note
2	<p>Choose one of the following lifting methods:</p> <ul style="list-style-type: none"> Lifting and turning with the fork lift (rotator attachment required): <ol style="list-style-type: none"> 1 Insert the forks of the fork lift truck into the fork lift pockets, as far as possible. 2 Raise the forks of the fork lift truck to make sure that the weight of the robot rests on the forks. <div style="text-align: center;">  Tip </div> <p>Two M16 screws can be fitted to the fork lift pockets, to press the forks against the pockets and make the lift more stable.</p> Lifting and turning with the turning tool and overhead crane: <ol style="list-style-type: none"> 1 Install and use the turning tool according to enclosed user instructions. <div style="text-align: center;">  DANGER </div> <p>Handling the tool incorrectly will cause serious injury. Read and follow enclosed user instructions for the tool.</p> 	
3	Remove the bolts that secure the robot to the foundation/support legs.	
4	Move the robot close to its installation location.	
5	<p>Rotate the robot into inverted position using the turning tool or using a fork lift truck with a rotator attachment.</p> <div style="text-align: center;">  DANGER </div> <p>Make sure that there is enough space underneath the robot. See user instructions for the turning tool.</p>	<p>Lifting and turning tool: 3HAC073537-001</p> <p>See user instructions enclosed with the turning tool.</p>
6	Guide the robot using two attachment screws while lifting it into its mounting position.	
7	<p>Fit the bolts and washers in the base attachment holes.</p> <div style="text-align: center;">  Note </div> <p>Lightly lubricate screws before assembly.</p> <div style="text-align: center;">  CAUTION </div> <p>If high stress on screws are suspected, replace used screws with new ones.</p>	<p>Suitable screws, lightly lubricated: M24 x 100 (8 pcs), 8.8.</p> <p>Suitable washer: 4 mm flat washer.</p> <p>Screw tightening yield point utilization factor (v) (according to VDI2230): 90% (v=0.9).</p> <p>Tightening torque: 550 Nm (screws lubricated with Molykote 1000) 600-725 Nm, typical 650 Nm (screws none or lightly lubricated)</p>

Continues on next page

	Action	Note
8	Tighten bolts in a crosswise pattern to ensure that the base is not distorted.	
9	Reconnect the robot cables to the base.	

Concluding procedure

	Action	Note
1	Calibrate the robot.	See Calibration on page 563 .
2	 DANGER Make sure all safety requirements are met when performing the first test run.	

5 Repair

5.9.2 Replacing the axis-2 gearbox

5.9.2 Replacing the axis-2 gearbox

Space required nearby robot

This section describes how to replace the gearbox without needing to remove the cable harness and DressPack cable package (if installed) from the robot.

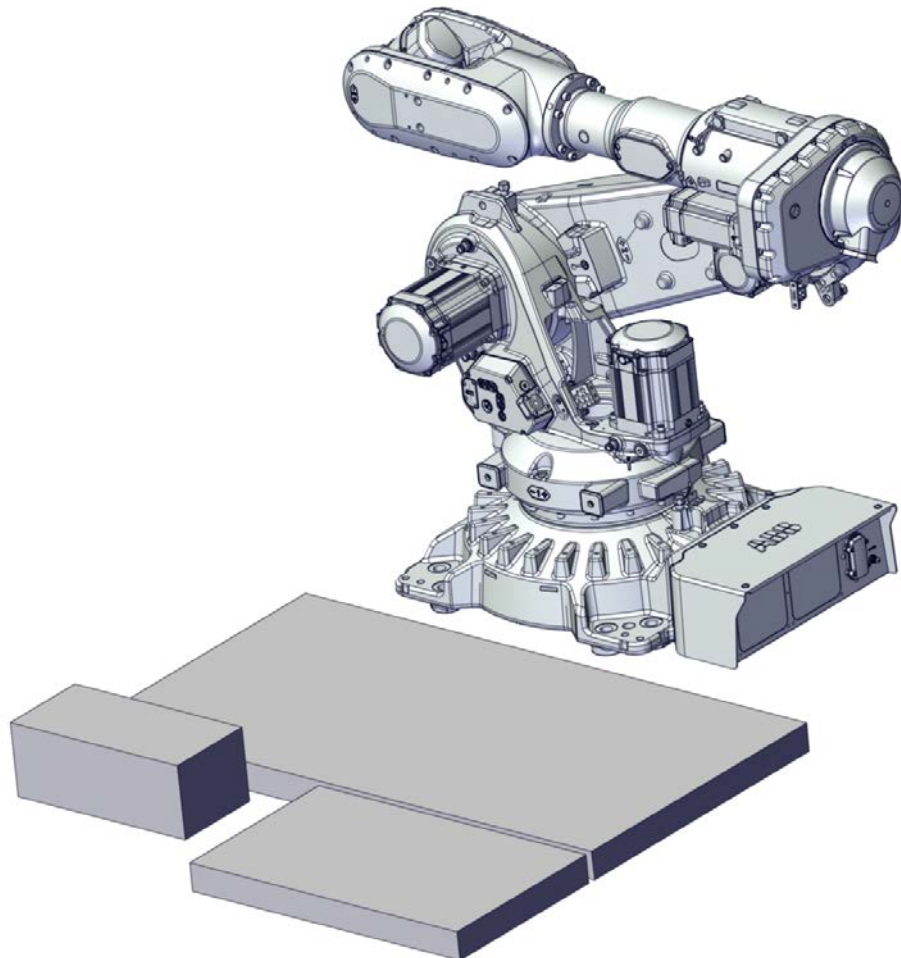
The described procedure requires free space on the floor nearby the robot. There should be enough space to place foam boards, pallets or similar protective material nearby the robot.

If needed, run axis-1 into a position that gives the required space. The figure shows an example.



DANGER

The base shall be fitted to the foundation when performing this procedure!



xx200000441

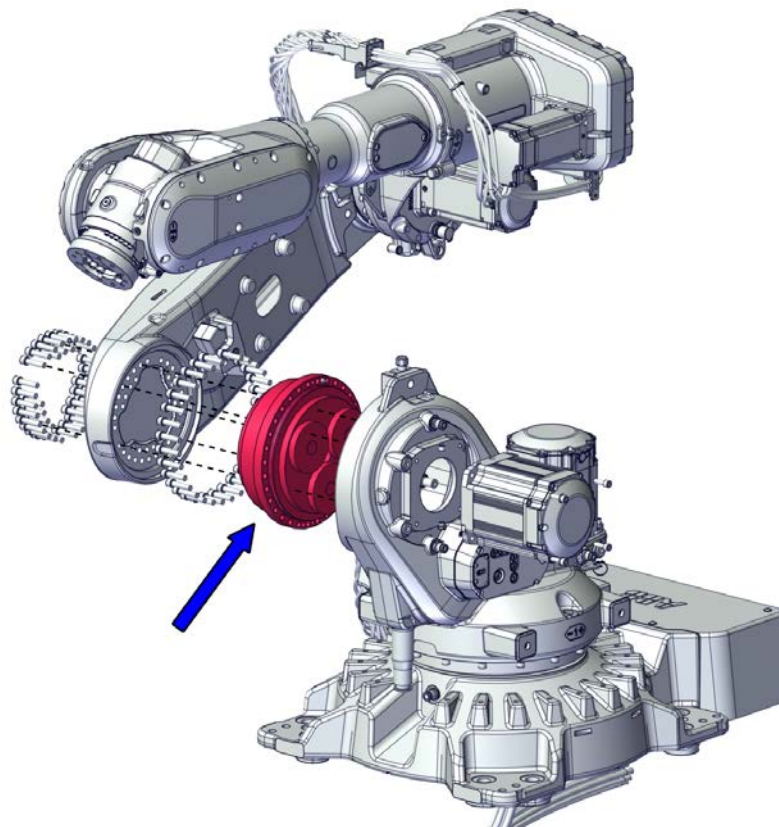
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**Note**

Keeping the cable harness and DressPack fitted on the robot during gearbox replacement is only a recommendation. If it is not possible to put the lower and upper arm close enough to the robot, the cable harness and DressPack in the base and in the frame must be removed first.

Location of the gearbox

The gearbox is located as shown in the figure.



xx2000000450

Summary of the replacement procedure

This is a brief summary of the replacement procedure, containing the major actions to be performed.

- 1 If installed in an inverted position (option 3317-1): Lift down the robot to floor standing and secure to the foundation.
- 2 Drain the axis-2 gearbox.
- 3 Loosen the cabling brackets inside the lower arm and on the frame.
- 4 Remove the upper and lower arm mounted together, as an assembly.
- 5 Remove the axis-2 motor.
- 6 Replace the axis-2 gearbox.

Continues on next page

5 Repair

5.9.2 Replacing the axis-2 gearbox

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 5710 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note	Level
Gearbox	3HAC072004-003 (Graphite White) 3HAC072004-005 (ABB Orange)	Includes o-ring	L2

Required tools and equipment

Equipment	Article number	Note
Lifting and turning tool	3HAC073537-001	Lift and rotation of inverted robot. Requires fork lift accessory set 3HAC058825-001. User instructions are enclosed with the tool.
Lifting eye	3HAC16131-1	M12, 2 pcs
Lifting shackle	-	SA-10-8-NA1
Fender washer	-	Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.
Lifting accessory (chain)	3HAC15556-1	Lifting instruction 3HAC15880-2 enclosed.
Roundsling, 1.5 m	-	Length: 1.5 m.
Roundsling, 1 m	-	Length: 1 m.
Brake release tool	3HAC081310-001	User instructions are enclosed with the tool.
Bits extender	3HAC12342-1	300 mm, bits 1/2"
Removal tool motor M12	3HAC14631-1	Used to push out the motor, if necessary. Always use removal tools in pairs.
Lifting accessory, motor	3HAC15534-1	Lifting instruction 3HAC15640-2 enclosed.
Guide pin, M10x150	3HAC15521-2	Always use guide pins in pairs.
Guide pin, M12x150 / Guide pin, M12x200	3HAC13056-2 / 3HAC13056-3	Always use guide pins in pairs.
Screws M10x60, fully threaded	-	Used to push out the gearbox, if necessary.
Guide pin, M16x150	3HAC13120-2	Always use guide pins in pairs.
Guide pin, M16x200	3HAC13120-3	Always use guide pins in pairs.
Lifting accessory for gear	3HAC081585-001	For lifting the gearbox

Continues on next page

Equipment	Article number	Note
Rotation tool	3HAB7887-1	Used to rotate the motor pinion.
Adjustment tool for gear	3HAC080331-001	Used to rotate the gear for matching hole pattern with frame.
Calibration toolbox, Axis Calibration	3HAC074564-001 (axes 1, 2, 3 and 4) 3HAC074119-001 (axes 5 and 6)	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

Required service parts

Consumable	Article number	Note
Grease	3HAC042536-001	Shell Gadus S2
Rust preventive	3HAC034903-001	Mercasol 3110 Waxcoat. Recommended drying time is 24h.
Flange sealant	3HAC041807-007	Loctite 5800
O-ring	3HAC061327-066	Replace if damaged.
Connection box cover FS180 with gasket	3HAC072864-003 (Graphite White) 3HAC072864-005 (ABB Orange)	Replace if damaged.
Lubricating oil	-	See Type of lubrication in gearboxes on page 137 .
O-ring, G 1/2"	3HAC061327-059	Used on oil plug. Always replace when refitting oil plug.

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. 	

Continues on next page

5 Repair

5.9.2 Replacing the axis-2 gearbox

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. 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 573.</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 gearbox


Use these procedures to remove the gearbox.



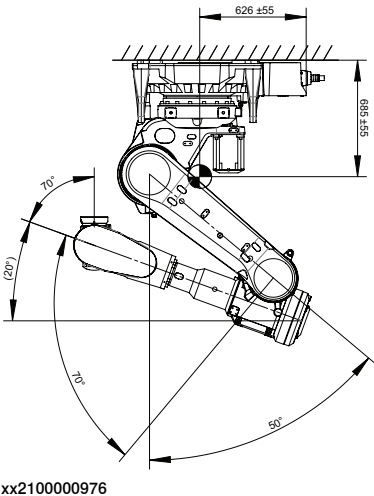



CAUTION

When performing these procedures, the cable harness will still be fitted or partly fitted to the robot. Use extreme caution not to cause any damage to the cable harness.

Lifting down the robot from inverted position

	Action	Note
1	<p> DANGER</p> <p>The robot must always be secured to the foundation if any kind of repair or maintenance work is to be performed. For some repair work support legs are required.</p>	<p>Suitable screws, lightly lubricated: M24 x 100 (min. 4 pcs) For hole configuration, see Hole configuration, base on page 70.</p>
2	<p>Remove any payload and tools from the robot.</p>	<p>DressPack can stay fitted.</p>

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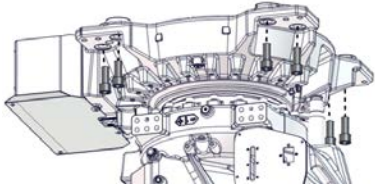
	Action	Note
3	<p>Jog the robot into position:</p> <ul style="list-style-type: none"> • Axis 1: calibration position (0°) • Axis 2: -50° • Axis 3: +70° • Axis 4: calibration position (0°) • Axis 5: +70° • Axis 6: no significance 	 <p>xx2100000976</p>
4	<p> DANGER</p> <p>Turn off all:</p> <ul style="list-style-type: none"> • electric power supply • hydraulic pressure supply • air pressure supply <p>to the robot, before entering the safeguarded space.</p>	
5	<p>Disconnect the robot cables at the base.</p>	
6	<p> CAUTION</p> <p>The weight of the IRB 5710 robot is</p> <p>IRB 5710-110/2.3: 830 kg (<i>Inverted: 845 kg</i>)</p> <p>IRB 5710-90/2.7: 830 kg (<i>Inverted: 840 kg</i>)</p> <p>IRB 5710-90/2.3 LID: 890 kg (<i>Inverted: 905 kg</i>)</p> <p>IRB 5710-70/2.7 LID: 885 kg (<i>Inverted: 900 kg</i>)</p> <p>All lifting accessories used must be sized accordingly.</p>	
7	<p>Install the fork lift pockets to the robot.</p> <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury.</p> <p>Read and follow enclosed user instructions for the tool.</p>	<p>See user instructions enclosed with the fork lift accessory set.</p> <p>Fork lift accessory set: 3HAC058825-001.</p>

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5 Repair

5.9.2 Replacing the axis-2 gearbox

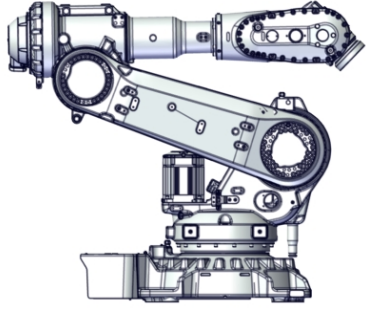

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	Action	Note
8	<p>Choose one of the following lifting methods:</p> <ul style="list-style-type: none"> Lifting and turning with the fork lift (rotator attachment required): <ol style="list-style-type: none"> 1 Insert the forks of the fork lift truck into the fork lift pockets, as far as possible. 2 Raise the forks of the fork lift truck to make sure that the weight of the robot rests on the forks. <p> Tip</p> <p>Two M16 screws can be fitted to the fork lift pockets, to press the forks against the pockets and make the lift more stable.</p> Lifting and turning with the turning tool and overhead crane: <ol style="list-style-type: none"> 1 Install and use the turning tool according to enclosed user instructions. <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury. Read and follow enclosed user instructions for the tool.</p> 	<p>See user instructions enclosed with the turning tool. Lifting and turning tool: 3HAC073537-001.</p>
9	<p>Remove the bolts that secure the robot to the foundation.</p>	<p>Quantity: 8 pcs.</p>  <p>xx1600002098</p>
10	<p>Rotate the robot to floor standing position.</p>	<p>Follow the user instructions enclosed with the turning tool.</p>
11	<p>Lower and secure the robot to the floor. (Or to support legs, if replacing the axis-1 gearbox.) The lifting accessories can be kept installed if they are not in the way for the upcoming service procedure.</p>	<p>Attachment screws: M24 x 100 (min. 4 pcs required to perform service)</p>


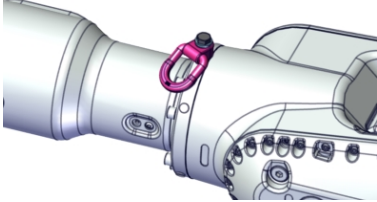
Preparations before removing the gearbox

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

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	Action	Note
2	<p>Jog the robot into position:</p> <ul style="list-style-type: none"> • Axis-1: 0° • Axis-2: -70° • Axis-3: +70° (approximately) • Axis-4: 0° • Axis-5: -45° • Axis-6: +90° (if DressPack is installed) 	 <p>xx2000000449</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 safeguarded space.</p>	
4	<p>Begin draining the gearbox.</p>	<p>See Draining the axis-2 gearbox on page 151.</p>

Attaching lifting accessories to the lower and upper arm

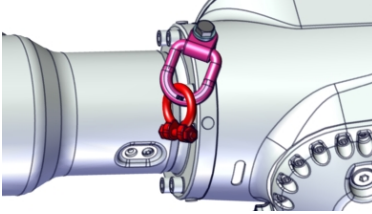
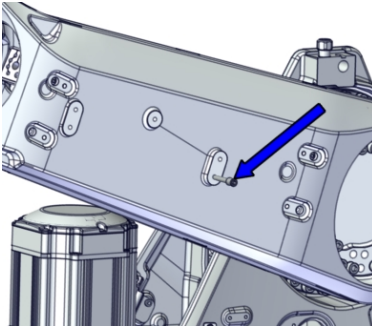
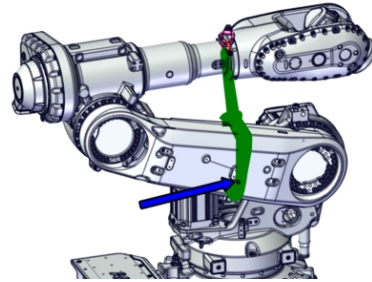
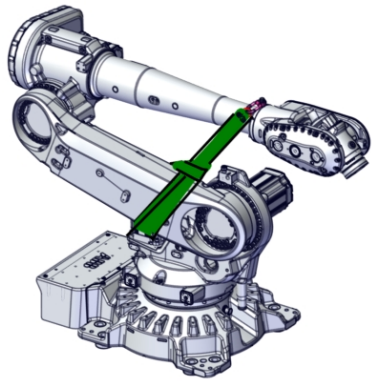
	Action	Note
1	<p> CAUTION</p> <p>The weight of the complete upper and lower arm together is</p> <p>IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 345 kg IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 295 kg</p> <p>All lifting accessories used must be sized accordingly.</p>	
2	<p>Fit a lifting eye to the wrist.</p>	<p>Lifting eye: 3HAC16131-1</p>  <p>xx2100001413</p>

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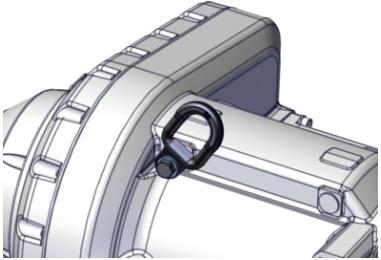
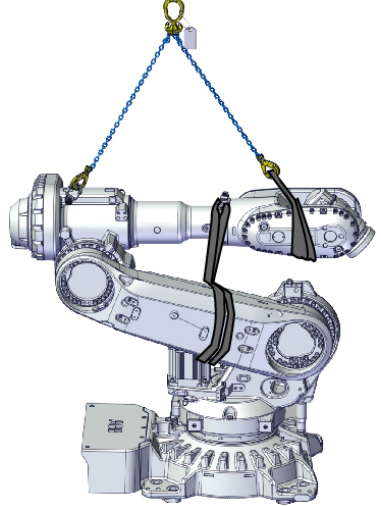
5 Repair

5.9.2 Replacing the axis-2 gearbox

Continued

	Action	Note
3	Fit a lifting shackle in the wrist lifting eye.	Lifting shackle: SA-10-8-NA1  xx2100001414
4	IRB 5710-110/2.3, IRB 5710-90/2.3 LID Insert a M12x50 securing screw, not more than 10-15 mm, into the screw hole shown in the figure. This is done to secure the roundsling from gliding when lifting.	 xx2100001412
5	Run a roundsling around the lower arm.	Roundsling, 1.5 m: Length: 1.5 m. IRB 5710-110/2.3, IRB 5710-90/2.3 LID
6	Attach the roundsling to the shackle on the wrist.	IRB 5710-110/2.3, IRB 5710-90/2.3 LID  xx2100001415 IRB 5710-90/2.7, IRB 5710-70/2.7 LID  xx2100001469

Continues on next page

	Action	Note
7	<p>Stretch the roundsling between the wrist and the lower arm by slowly jogging the axis-3.</p> <p> Note</p> <p>Make sure the roundsling is stretched, in order to carry the weight of the lower arm.</p>	
8	<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 safeguarded space.</p>	
9	<p>Fit a lifting eye in the arm house, with a fender washer underneath.</p>	<p>Lifting eye: 3HAC16131-1 Fender washer: Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.</p>  <p>xx2100002146</p>
10	<p>Attach the Lifting accessory (chain) to an overhead crane (or similar), then to the lifting eye in the arm house and to a roundsling run through the wrist.</p>	<p>Lifting accessory (chain): 3HAC15556-1 Roundsling, 1 m: Length: 1 m.</p>  <p>xx2000000452</p>

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5 Repair


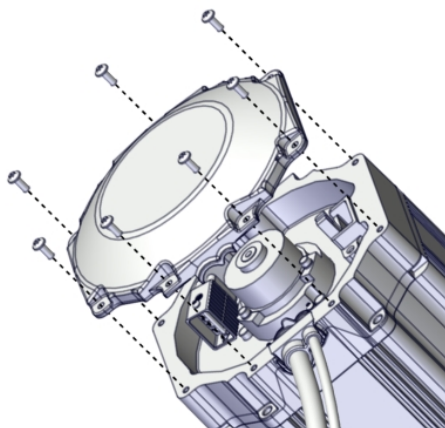
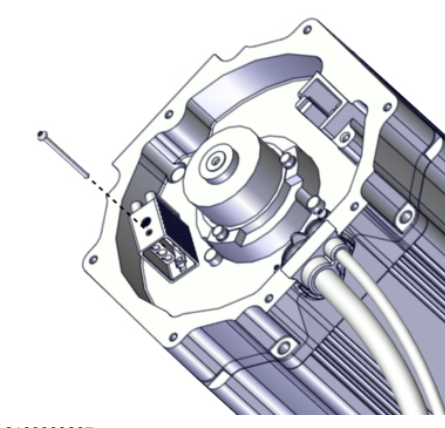
5.9.2 Replacing the axis-2 gearbox

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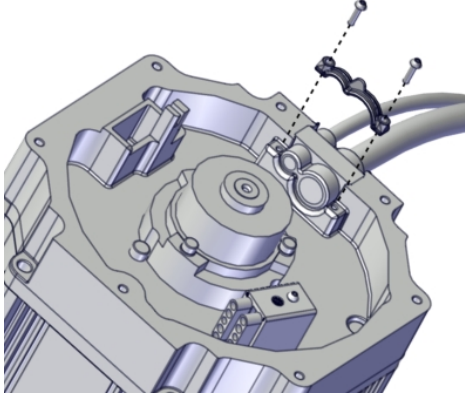
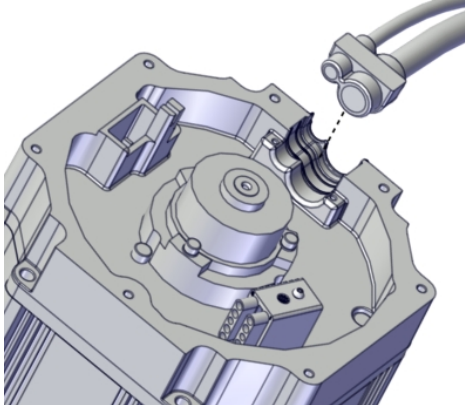
	Action	Note
11	Raise the overhead crane to stretch the chains and roundslings. Verify that the roundsling between the wrist and the lower arm is stretched.	

Disconnecting the axis-2 motor cables


Use this procedure to disconnect the motor cables.

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the motor cover by removing the screws.	 xx210000596
3	Disconnect the power cable connector by removing the attachment screw.	 xx210000667
4	Disconnect the signal cable connector.	

Continues on next page

	Action	Note
5	Remove the cable bracket by removing the screws.	 <p>xx210000598</p>
6	Remove the motor cables.	 <p>xx210000599</p>

Removing the axis-2 motor





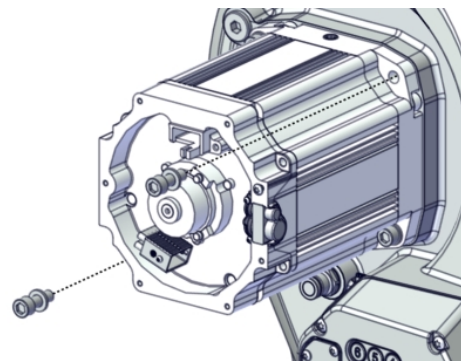
	Action	Note
1	Before removing the motor, make sure that the gearbox is completely drained.	
2	 DANGER When releasing the holding brakes of the motor, the lower arm will be movable and may fall down if not secured. Verify that the lower arm is secured as previously described, before continuing.	

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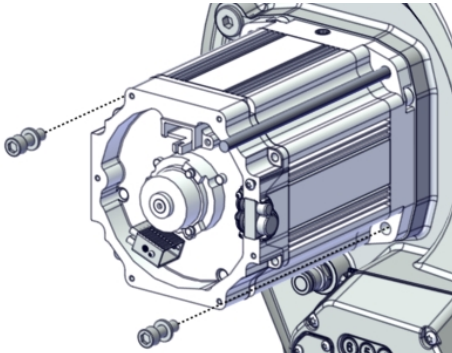


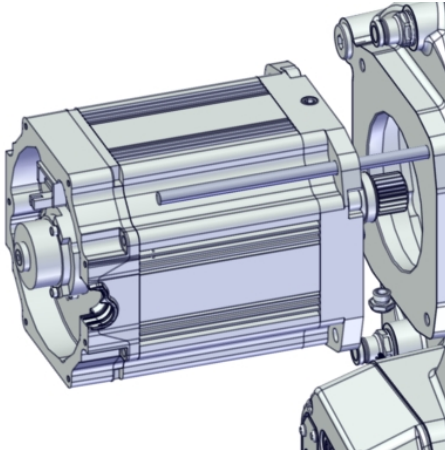
5 Repair

5.9.2 Replacing the axis-2 gearbox

Continued

	Action	Note
3	<p>Release the brakes on the motor with the brake release tool.</p> <ol style="list-style-type: none"> 1 Make sure the brake release tool is turned off. 2 Connect the tool to the R2.MP2 connector. 3 Release the brakes by pressing the button on the tool. <p> CAUTION</p> <p>Releasing the brakes on the axis-2 motor results in weight transfer of upper and lower arm weight to the inserted lock screw in the lower arm or to the attached lifting accessories (whichever is used). If lifting accessories are used, verify that the lifting chains and roundslings are stretched by raising the overhead crane, before releasing the brakes.</p> <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury.</p> <p>Read and follow enclosed user instructions for the tool.</p> <p> WARNING</p> <p>Electrical damage to the motor may occur if 24V is supplied to the motor connector for more than 30 seconds. Use the specified brake release tool to eliminate the risk.</p>	<p>Brake release tool: 3HAC081310-001 User instructions are enclosed with the tool.</p>  <p>xx2100000666</p>
4	<p>Remove two opposite attachment screws. Use a bits extender in order to reach the screws.</p>	<p>Bits extender: 3HAC12342-1</p>  <p>xx2000000468</p>

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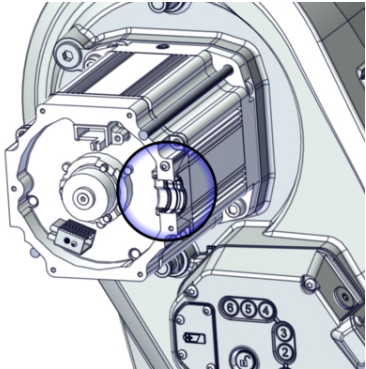
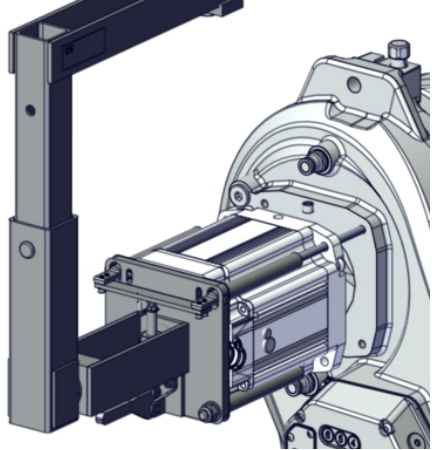
	Action	Note
5	<p>Fit guide pins in the opposite holes and remove the remaining two screws.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the motor slide better.</p>	<p>Guide pin, M10x150: 3HAC15521-2 Always use guide pins in pairs.</p>  <p>xx200000467</p>
6	<p> CAUTION</p> <p>Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.</p>	
7	<p>Press the motor out of its position by using the removal tool in opposite holes of the motor.</p>	<p>Removal tool motor M12: 3HAC14631-1 Used to push out the motor, if necessary. Always use removal tools in pairs.</p>
8	<p> CAUTION</p> <p>The weight of the motor is 25 kg All lifting accessories used must be sized accordingly.</p>	
9	<p>Carefully lift the motor out on the guide pins, in order to get the pinion away from the gear and let it rest on the guide pins.</p>	 <p>xx200000457</p>
10	<p>Disconnect the brake release tool.</p>	

Continues on next page

5 Repair

5.9.2 Replacing the axis-2 gearbox

Continued

Action	Note
11 Fasten the lifting accessory. Attach the lifting chain to the accessory and an overhead crane.	Lifting accessory, motor: 3HAC15534-1 Lifting accessory (chain): 3HAC15556-1
12 Remove the motor by sliding it out on the guide pins and lift it off.  Tip Make a note in which direction the cable gland hole is facing. The motor shall be refitted in the same position.  xx2100000595	 xx2000000455 Make sure the pinion is not damaged.

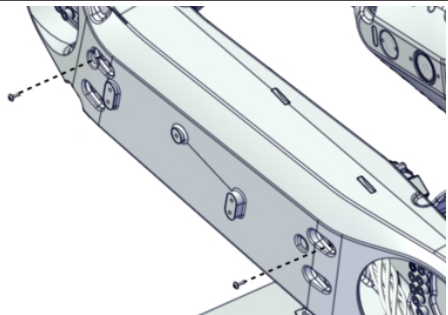
Loosening the cable brackets

Use this procedure to lift the lower and upper arm mounted together, with the cable harness and DressPack kept installed in the base and in the frame.

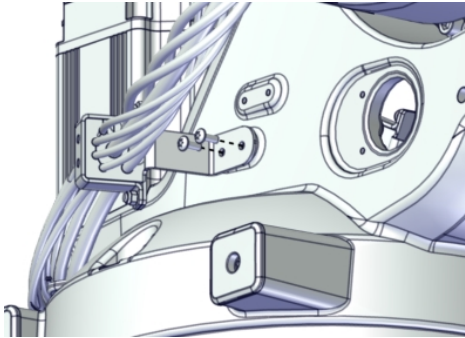


Note

Keeping the cable harness and DressPack fitted on the robot during gearbox replacement is only a recommendation. If it is not possible to put the lower and upper arm close enough to the robot, the cable harness and DressPack in the base and in the frame must be removed first.



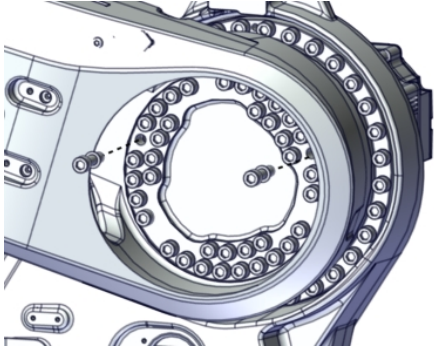
Action	Note
1 Unscrew the attachment screws that secure the axis-2 lower arm metal clamp and the axis-3 lower arm metal clamp located on the inside of the lower arm by removing the attachment screws.	 xx2100001104

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	Action	Note
2	Loosen the cable bracket from the frame by removing the nuts. Let it hang loose.	 <p>xx2000000442</p>

Removing and lifting away the lower and upper arms un-separated (Step 1)

Use this procedure for the first step of removing and lifting away the lower and upper arm un-separated.

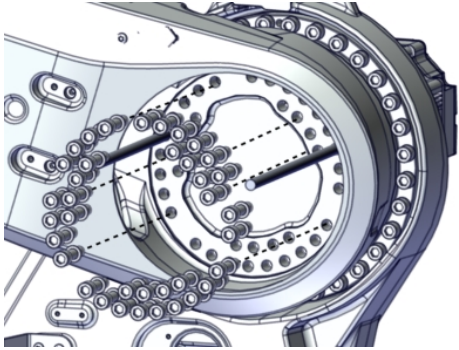
	Action	Note
1	Remove two attachment screws in opposite holes and replace them with guide pins.  Tip Use different lengths on the guide pins to simplify guidance.  Tip Lubricate the guide pins with some grease to make the lower arm slide better.	Guide pin, M12x150 / Guide pin, M12x200: 3HAC13056-2 / 3HAC13056-3 Always use guide pins in pairs.  <p>xx2000000458</p>

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5 Repair


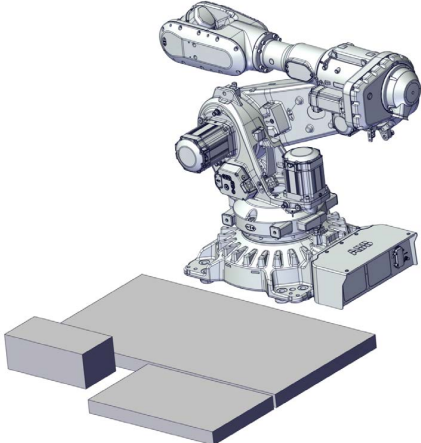

5.9.2 Replacing the axis-2 gearbox

Continued


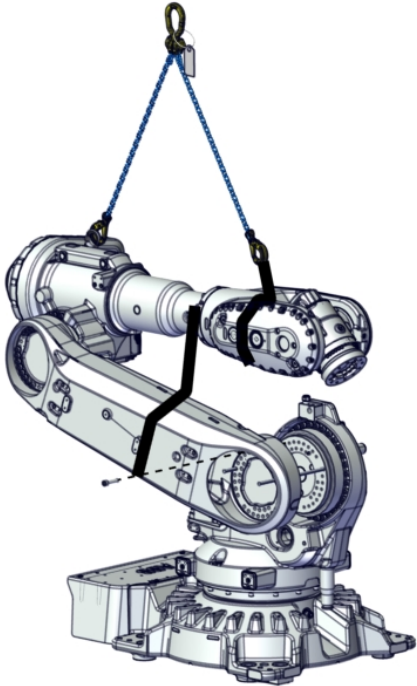
	Action	Note
2	Remove all but one of the remaining attachment screws that secure the lower arm to the axis-2 gearbox.	 <p>xx2000000459</p>

Removing and lifting away the lower and upper arms un-separated (Step 2)

Use this procedure for the second step to remove and lift the lower and upper arm un-separated.

	Action	Note
1	<p>Put two foam boards, pallets or similar protective material on the floor, somewhere close to the robot.</p> <p>Put one higher foam block as protection for the wrist.</p> <p>If needed, move axis-1 into a position that gives the required space.</p> <p> Note</p> <p>Keeping the cable harness and DressPack fitted on the robot during gearbox replacement is only a recommendation. If it is not possible to put the lower and upper arm close enough to the robot, the cable harness and DressPack in the base and in the frame must be removed first.</p>	 <p>xx2000000441</p>
2	<p> CAUTION</p> <p>The weight of the complete upper and lower arm together is</p> <p>IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 345 kg</p> <p>IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 295 kg</p> <p>All lifting accessories used must be sized accordingly.</p>	

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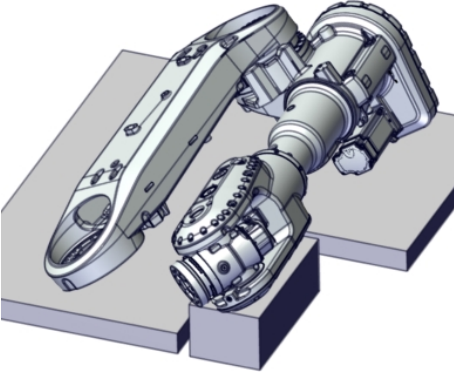
	Action	Note
3	<p>Remove the remaining screw and slowly lift away the lower and upper arm together. Let the cabling run in the lower arm. Make sure not to stretch any cabling!</p> <p> CAUTION</p> <p>Use extreme caution when lifting away the arms. The cable harness is still partly connected.</p>	<p>Image does not show the installed cable harness.</p>  <p>xx200000460</p>

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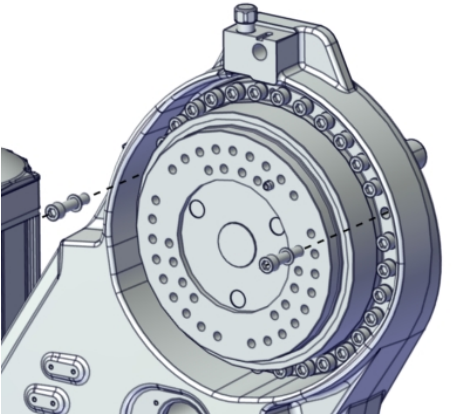
5 Repair

5.9.2 Replacing the axis-2 gearbox

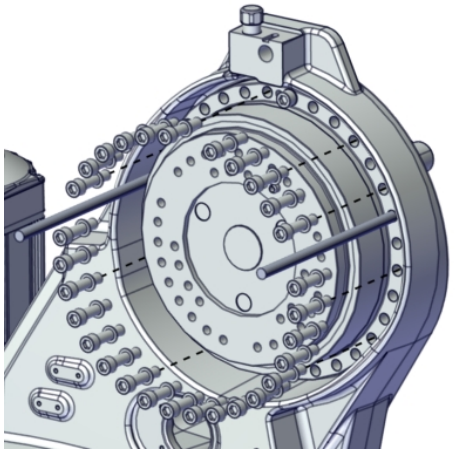
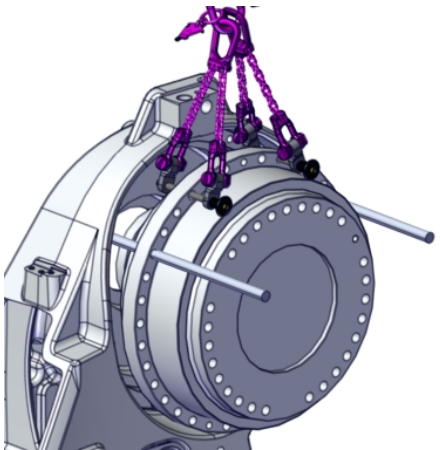
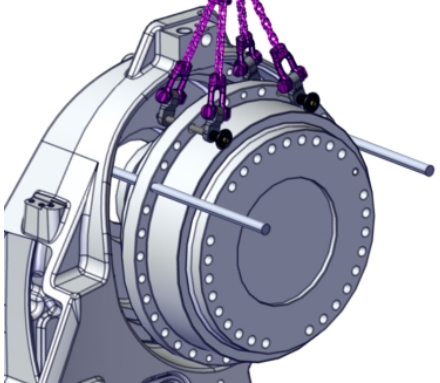
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	Action	Note
4	<p>Lift the arm system and lay it down safely on the boards.</p> <p>Use a higher block as support under the wrist unit when the arms are put down on the boards.</p> <p> CAUTION</p> <p>Check that the cable bracket underneath the arm housing is not damaged.</p>	 <p>xx2100001103</p>

Removing the axis-2 gearbox

	Action	Note
1	<p>Remove two attachment screws in opposite holes and replace them with guide pins.</p> <p> CAUTION</p> <p>Use stoppers on the guide pins.</p> <p> Tip</p> <p>Use different lengths on the guide pins to simplify guidance.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the lower arm slide better.</p>	<p>Guide pin, M12x150 / Guide pin, M12x200: 3HAC13056-2 / 3HAC13056-3</p> <p>Always use guide pins in pairs.</p>  <p>xx200000464</p>

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	Action	Note
2	<p>Leave one of the upper attachment screws and remove the rest. The remaining screw is used to prevent the gearbox from falling down.</p>	 <p>xx2000000465</p>
3	<p>! CAUTION</p> <p>The weight of the gearbox is 56 kg All lifting accessories used must be sized accordingly.</p>	
4	<p>Remove the remaining screw left in the gearbox.</p>	
5	<p>Use removal tools to press the gearbox out of position.</p>	<p>Screws M10x60, fully threaded: -</p>
6	<p>Use caution and let the gearbox slide out on the guide pins.</p> <p>! CAUTION</p> <p>Use stoppers on the guide pins.</p>	<p>Lifting accessory for gear: 3HAC081585-001</p>
7	<p>Attach the lifting accessory to the gearbox.</p>	
8	<p>Remove the gearbox.</p>	 <p>xx2100002414</p>

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5 Repair


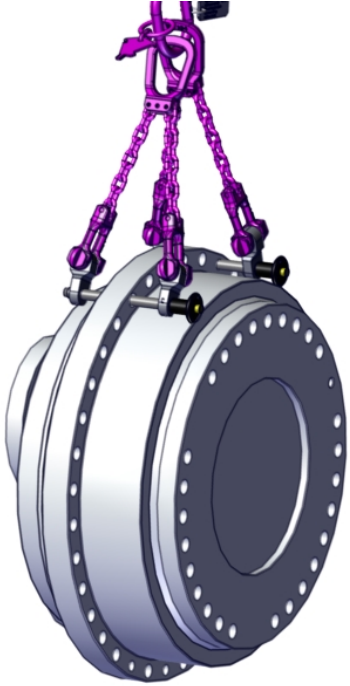

5.9.2 Replacing the axis-2 gearbox

Continued

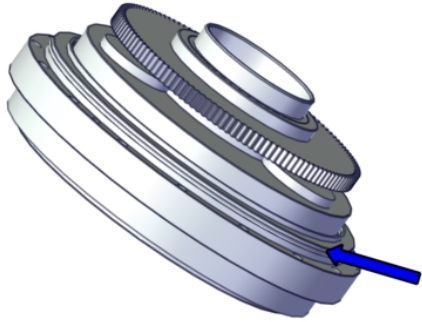
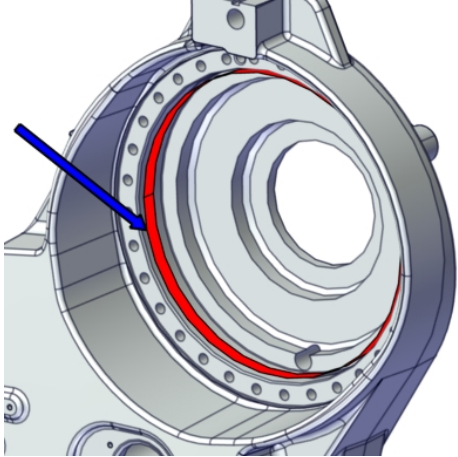
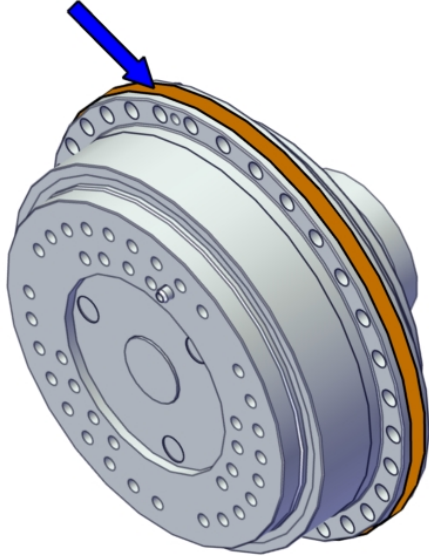
Refitting the gearbox

Use these procedures to refit the gearbox.

Preparations before refitting the axis-2 gearbox

	Action	Note
1	 CAUTION The weight of the gearbox is 56 kg All lifting accessories used must be sized accordingly.	
2	Apply the lifting accessory to the gearbox.	Lifting accessory for gear: 3HAC081585-001  xx2100002416
3	Lift the gearbox so that it rests on its side.	
4	Wipe clean the contact surfaces on both the gearbox and the frame from any contamination.  Note Also wipe clean the o-ring groove.	

Continues on next page

	Action	Note
5	Check the o-ring. Replace if damaged.	<p>O-ring: 3HAC061327-066</p>  <p>xx2100001132</p>
6	Lubricate the contact surface inside the frame with grease.	<p>Grease, Shell Gadus S2: 3HAC042536-001.</p>  <p>xx2100002792</p>
7	Apply rust preventive to the gearbox surface shown in the figures.	<p>Rust preventive: 3HAC034903-001 (Mercasol 3110 Waxcoat. Recommended drying time is 24h.)</p>  <p>xx2100001105</p>

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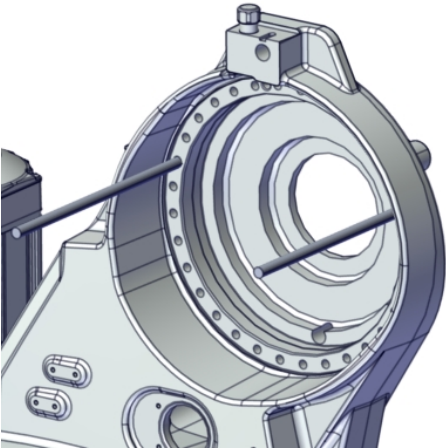

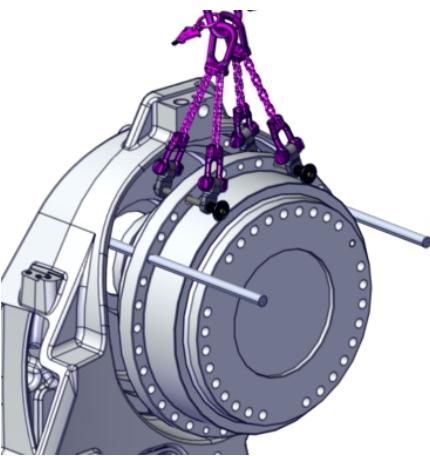

5 Repair

5.9.2 Replacing the axis-2 gearbox

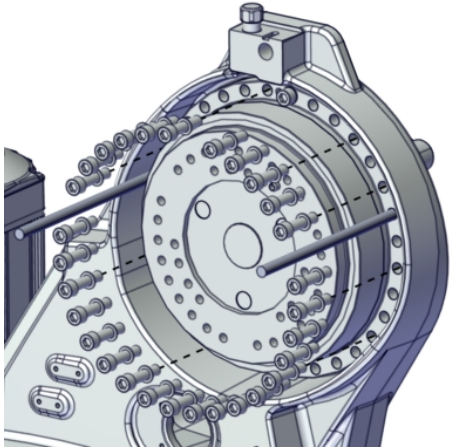
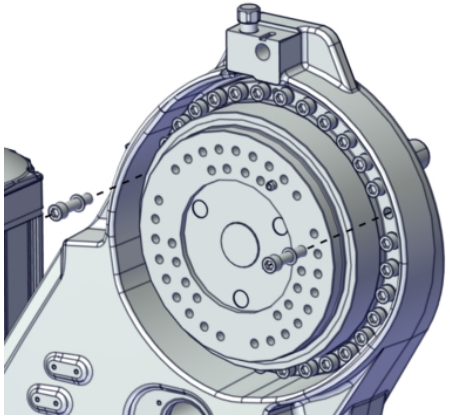
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Refitting the axis-2 gearbox

Use this procedure to refit the gearbox.

	Action	Note
1	<p> CAUTION</p> <p>The weight of the gearbox is 56 kg All lifting accessories used must be sized accordingly.</p>	
2	<p>Fit two guide pins in opposite holes.</p> <p> Tip</p> <p>Use different lengths on the guide pins to simplify guidance.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the lower arm slide better.</p>	<p>Guide pin, M12x150 / Guide pin, M12x200: 3HAC13056-2 / 3HAC13056-3</p> <p>Always use guide pins in pairs.</p>  <p>xx200000466</p>
3	<p>Lift the gearbox and let it rest on the guide pins.</p> <p> CAUTION</p> <p>Use stoppers on the guide pins.</p>	 <p>xx2100002414</p>
4	<p>Remove the lifting accessory.</p> <p> DANGER</p> <p>There is a risk that the gearbox may glide out and fall down if it is too far out to on the guide pins.</p>	

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	Action	Note
5	Slide the gearbox into position and fit the attachment screws and washers.	<p>Hex socket head cap screw: M16x60 12.9 Gleitmo 603+Geomet 500 (32 pcs).</p>  <p>xx2000000465</p>
6	Remove the guide pins and fit the remaining attachment screws and washers.	 <p>xx2000000464</p>
7	Tighten the attachment screws.	Tightening torque: see standard torque in Screw joints on page 598..

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5 Repair

5.9.2 Replacing the axis-2 gearbox

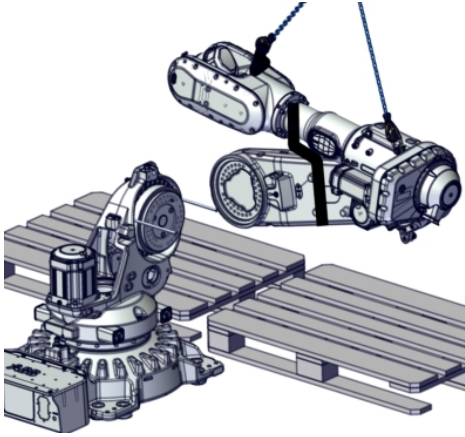
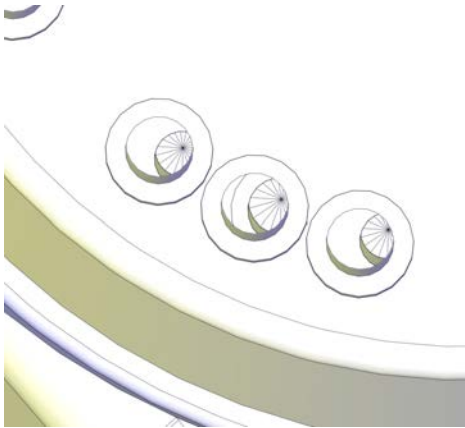
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Lifting back and refitting the lower and upper arm

Use this procedure to lift back and refit the lower and upper arm mounted together.

	Action	Note
1	<p>Fit two guide pins in opposite holes in the axis-2 gearbox.</p> <p> Tip</p> <p>Use different lengths on the guide pins to simplify guidance.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the lower arm slide better.</p>	<p>Guide pin, M12x150 / Guide pin, M12x200: 3HAC13056-2 / 3HAC13056-3</p> <p>Always use guide pins in pairs.</p>  <p>xx2100001217</p>
2	<p> CAUTION</p> <p>The weight of the complete upper and lower arm together is</p> <p>IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 345 kg</p> <p>IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 295 kg</p> <p>All lifting accessories used must be sized accordingly.</p>	
3	<p>Attach the lifting accessories to the arm assembly, if not already fitted.</p>	

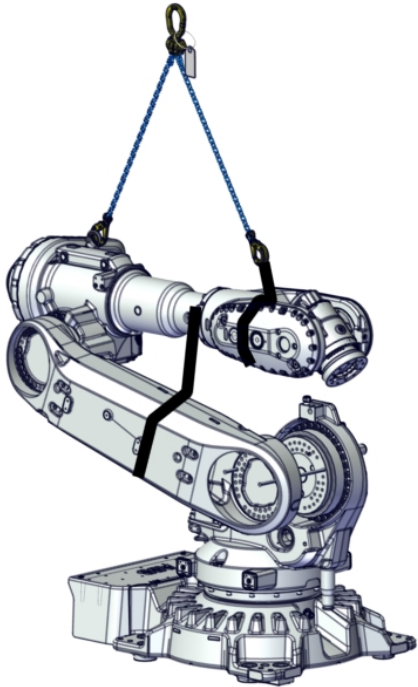
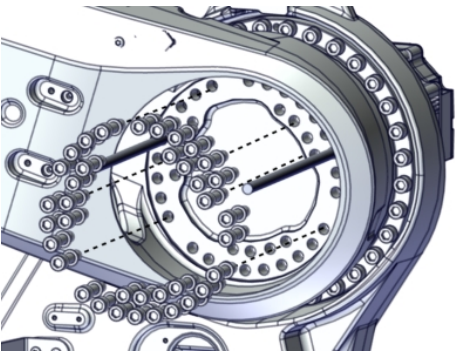
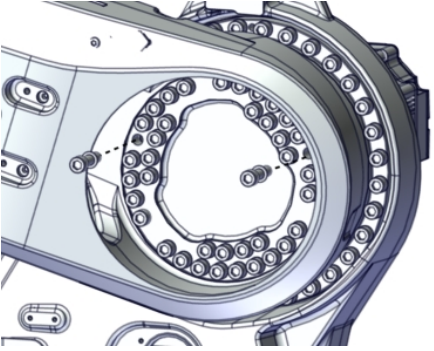
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	Action	Note
4	<p>Use caution and slowly lift the lower and upper arm together.</p> <p>Make sure:</p> <ul style="list-style-type: none"> • not to stretch any of the cables • that the arm package is level when lifted. 	 <p>xx2100001106</p>
5	<p>Guide the lower arm onto the guide pins and check if the hole pattern between the gearbox and the lower arm matches.</p> <p>If the hole pattern does not match, use the adjustment tool in the axis-2 gear and rotate until a matching hole pattern is achieved.</p>  <p>xx1300000819</p>	<p>Adjustment tool for gear: 3HAC080331-001</p>

5 Repair

5.9.2 Replacing the axis-2 gearbox




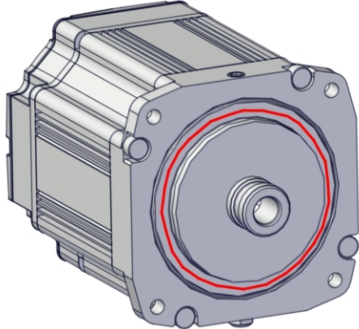
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	Action	Note
6	Slide the arms into position on the guide pins.	 <p>xx2100001107</p>
7	Fit all now accessible attachment screws and washers.	<p>Screws: M12x40 12.9 Gleitmo 603+Geomet 500 (39 pcs)</p>  <p>xx2000000459</p>
8	Remove the two guide pins and replace with the remaining attachment screws and washers.	<p>Screws: M12x40 12.9 Gleitmo 603+Geomet 500</p>  <p>xx2000000458</p>

Continues on next page

	Action	Note
9	Tighten the attachment screws.	Tightening torque: see standard torque in Screw joints on page 598 .
10	Remove the lifting accessories.	

Preparations prior to refitting motor

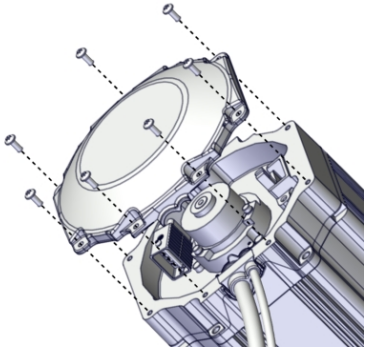


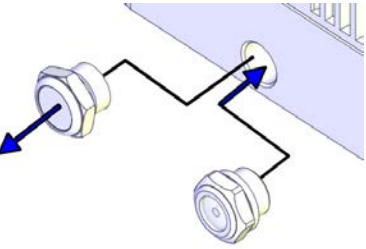
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove any old paint or flange sealant residues or other contamination from the contact surfaces on both the motor and the mating parts.  Tip Remove flange sealant residues with Loctite 7200. Then use Loctite 7063 for cleaning the mating surface.	
3	Apply a continuous bead of flange sealant, 1-2 mm wide, inside of the groove on the motor contact surface.  Note The purpose of the groove is to catch excess sealant. No o-ring is used.	Flange sealant: 3HAC041807-007 (Loctite 5800)  xx2100000520

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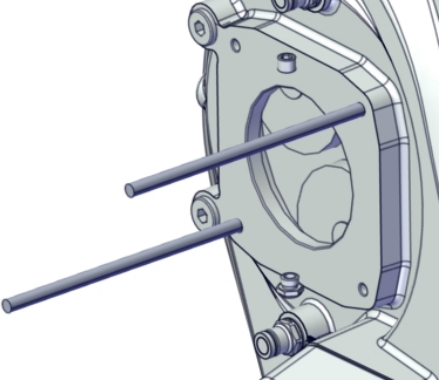
5 Repair

5.9.2 Replacing the axis-2 gearbox


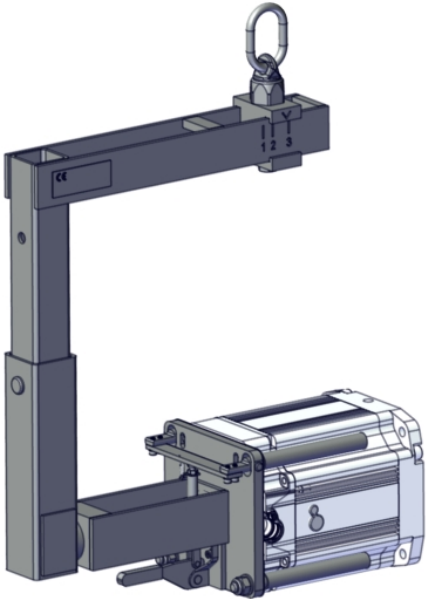
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	Action	Note
4	Remove the cover, if fitted to the new spare part motor.	 <p>xx2100000596</p>
5	<p>Protection type Foundry Plus Valid for axis-1, axis-2, axis-3 and axis-4.</p> <p>If the motor is a new spare part, the evacuation hole protection filter must be replaced with a transparent plug/sight glass (enclosed with the spare part delivery). Remove the protection filter and install the transparent plug/sight glass.</p> <div style="display: flex; justify-content: space-around;"> <div>  <p>xx1800000101</p> </div> <div>  <p>xx1800000102</p> </div> </div> <p>Protection filter (Stand-ard). Transparent plug (Foundry Plus).</p>	<p>Tightening torque, transparent plug: 20 Nm Tightening torque, protection filter: 20 Nm</p>  <p>xx1600000576</p>

Refitting the axis-2 motor

	Action	Note
1	Fit guide pins in opposite holes.	<p>Guide pin, M10x150: 3HAC15521-2 Always use guide pins in pairs.</p>  <p>xx2100000593</p>

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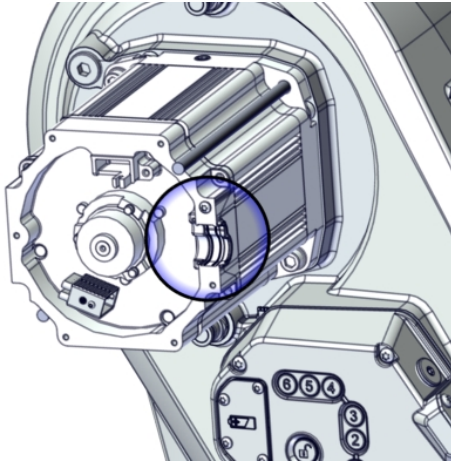
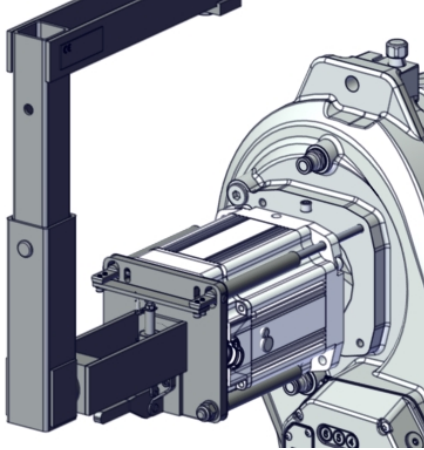
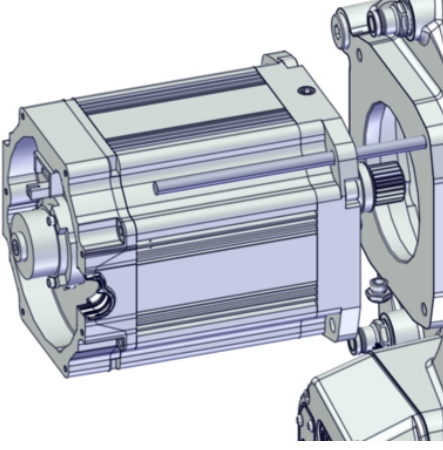
	Action	Note
2	<p> CAUTION</p> <p>The weight of the motor is 25 kg All lifting accessories used must be sized accordingly.</p>	
3	<p>Apply the lifting accessory.</p>	<p>Lifting accessory, motor: 3HAC15534-1 Lifting accessory (chain): 3HAC15556-1</p>  <p>xx210000594</p>

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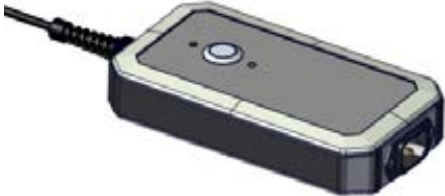

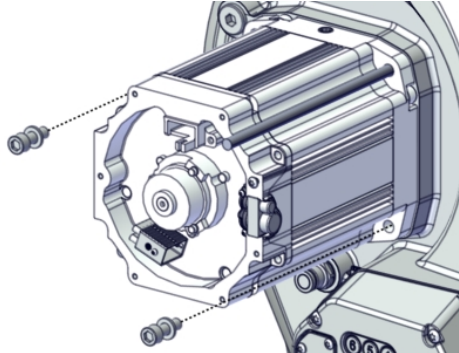
5 Repair

5.9.2 Replacing the axis-2 gearbox

Continued

	Action	Note
4	<p> Note</p> <p>Make sure the cable gland opening is turned the correct way.</p>	 <p>xx2100000595</p>
5	<p>Lift the motor and put it on the guide pins as close as possible to its final position without pushing the motor pinion into the gear.</p>	 <p>xx2000000455</p>
6	<p>Remove the lifting accessory and allow the motor to rest on the guide pins.</p>	 <p>xx2000000457</p>

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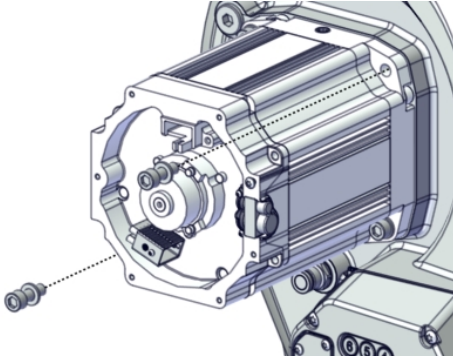
	Action	Note
7	<p>Release the brakes of the axis-2 motor with the brake release tool.</p> <ol style="list-style-type: none"> 1 Make sure the brake release tool is turned off. 2 Connect the tool to the R2.MP2 connector. 3 Release the brakes by pressing the button on the tool. <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury.</p> <p>Read and follow enclosed user instructions for the tool.</p> <p> WARNING</p> <p>Electrical damage to the motor may occur if 24V is supplied to the motor connector for more than 30 seconds. Use the specified brake release tool to eliminate the risk.</p>	<p>Brake release tool: 3HAC081310-001 User instructions are enclosed with the tool.</p>  <p>xx2100000666</p>
8	<p> CAUTION</p> <p>Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.</p>	
9	<p>Apply the rotation tool.</p> <p>Use caution and fit the motor in its final position while at the same time rotating the motor pinion slightly using the rotation tool.</p> <ul style="list-style-type: none"> • Make sure that the motor pinion is properly mated to the gear of the gearbox. • Make sure that the motor pinion does not get damaged. • Make sure that the direction of the cable exit is facing the correct way. 	<p>Rotation tool: 3HAB7887-1</p>
10	<p>Fit two of the attachment screws and washers.</p> <p>Use a bits extender in order to reach the screws.</p>	<p>Hex socket head cap screw: M10x30 12.9 Gleitmo 603+Geomet 500 (2 pcs) Bits extender: 3HAC12342-1</p>  <p>xx2000000467</p>

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5 Repair

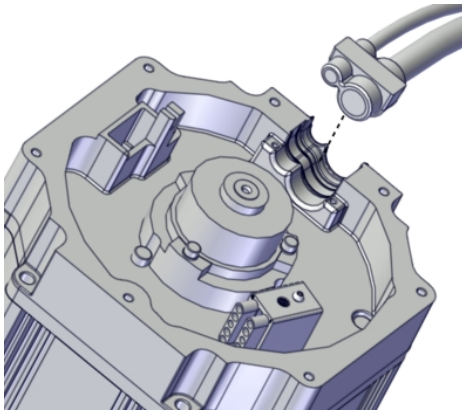
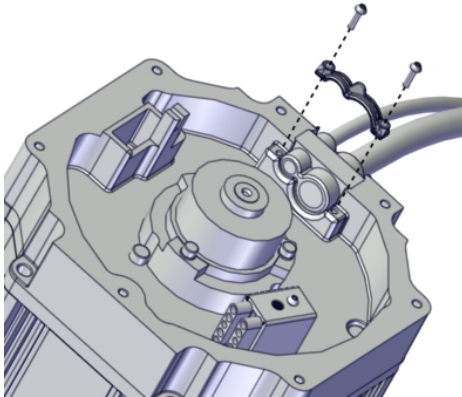
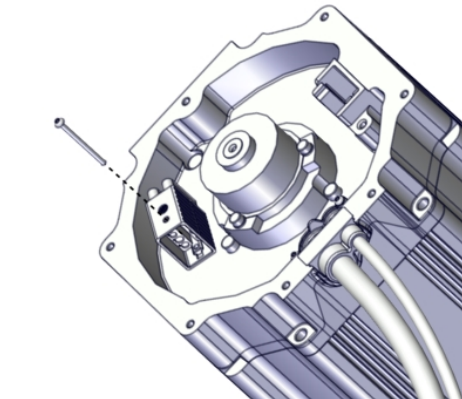
5.9.2 Replacing the axis-2 gearbox

Continued

	Action	Note
11	Remove the guide pins and replace with the remaining attachment screws.	<p>Hex socket head cap screw: M10x30 12.9 Gleitmo 603+Geomet 500 (2 pcs)</p>  <p>xx2000000468</p>
12	Tighten the screws.	Tightening torque: 50 Nm.
13	Disconnect the brake release tool.	
14	Perform a leak-down test.	See Performing a leak-down test on page 184 .

Continues on next page

Connecting the axis-2 motor cables

	Action	Note
1	Put the motor cables in place in the opening.	 <p>xx210000599</p>
2	Refit the cable bracket with the screws.	<p>Torx pan head screw: M3x12 Stainless steel A2-70</p>  <p>xx210000598</p>
3	Connect the motor cables. Connect in accordance with the markings on the connectors.	
4	Secure the power connector with a screw.	<p>Tightening torque: 1 Nm</p>  <p>xx210000667</p>

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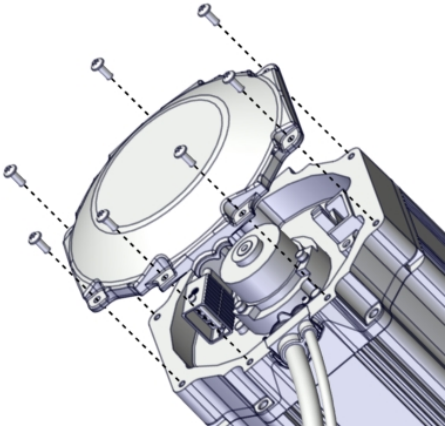
5 Repair

5.9.2 Replacing the axis-2 gearbox

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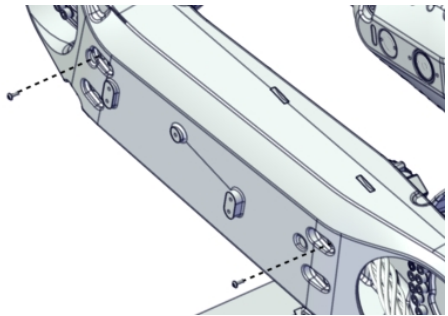
	Action	Note
5	<p>Inspect the gasket. Replace the complete cover if the gasket is damaged.</p>	<p>Axis-1 Connection box cover FS180 with gasket: 3HAC072864-003 (Graphite White) 3HAC072864-005 (ABB Orange)</p> <p>Axis-2 Connection box cover FS180 with gasket: 3HAC072864-003 (Graphite White) 3HAC072864-005 (ABB Orange)</p> <p>Axis-3 Connection box cover FS130 with gasket: 3HAC072863-003 (Graphite White) 3HAC072863-005 (ABB Orange)</p> <p>Axis-4 Connection box cover FS100 with gasket: 3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange)</p> <p>Axis-5 Connection box cover with gasket: (gasket not needed for protection type Standard)</p> <p>IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange)</p> <p>IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 3HAC072861-003 (Graphite White) 3HAC072861-004 (ABB Orange)</p>  <p>xx210000600</p>
6	<p> CAUTION</p> <p>When fitting the motor cover, make sure that none of the cables inside will be damaged.</p>	

Continues on next page

	Action	Note
7	<p>Refit the motor cover with its attachment screws. Use locking liquid.</p>	<p>Torx pan head screw: M5x12 Stainless steel A2-70 Locking liquid: 3HAC041807-004 (Loctite 2400) Tightening torque: 6 Nm.</p>  <p>xx210000596</p>

Refitting the cabling

Use this procedure to refit the cabling.

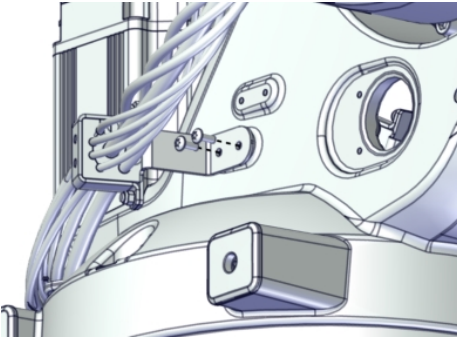
	Action	Note
1	<p>Use caution and push the cable harness into the lower arm.</p>	
2	<p>Refit the axis-2 lower arm metal clamp and the axis-3 lower arm metal clamp located on the inside of the lower arm.</p>	 <p>xx2100001104</p>

Continues on next page

5 Repair




5.9.2 Replacing the axis-2 gearbox

Continued




	Action	Note
3	Refit the cable bracket on the frame.	 <p>xx2000000442</p>

Securing an inverted robot to the foundation


Use this procedure to orient and secure the robot inverted.

	Action	Note
1	Install the fork lift pockets to the robot.  DANGER Handling the tool incorrectly will cause serious injury. Read and follow enclosed user instructions for the tool.	See user instructions enclosed with the fork lift accessory set. Fork lift accessory set: 3HAC058825-001.
2	Choose one of the following lifting methods: <ul style="list-style-type: none"> • Lifting and turning with the fork lift (rotator attachment required): <ol style="list-style-type: none"> 1 Insert the forks of the fork lift truck into the fork lift pockets, as far as possible. 2 Raise the forks of the fork lift truck to make sure that the weight of the robot rests on the forks.  Tip Two M16 screws can be fitted to the fork lift pockets, to press the forks against the pockets and make the lift more stable. 	
	<ul style="list-style-type: none"> • Lifting and turning with the turning tool and overhead crane: <ol style="list-style-type: none"> 1 Install and use the turning tool according to enclosed user instructions.  DANGER Handling the tool incorrectly will cause serious injury. Read and follow enclosed user instructions for the tool. 	See user instructions enclosed with the turning tool. Lifting and turning tool: 3HAC073537-001.

Continues on next page

	Action	Note
3	Remove the bolts that secure the robot to the foundation/support legs.	
4	Move the robot close to its installation location.	
5	<p>Rotate the robot into inverted position using the turning tool or using a fork lift truck with a rotator attachment.</p> <p> DANGER</p> <p>Make sure that there is enough space underneath the robot. See user instructions for the turning tool.</p>	<p>Lifting and turning tool: 3HAC073537-001</p> <p>See user instructions enclosed with the turning tool.</p>
6	Guide the robot using two attachment screws while lifting it into its mounting position.	
7	<p>Fit the bolts and washers in the base attachment holes.</p> <p> Note</p> <p>Lightly lubricate screws before assembly.</p> <p> CAUTION</p> <p>If high stress on screws are suspected, replace used screws with new ones.</p>	<p>Suitable screws, lightly lubricated: M24 x 100 (8 pcs), 8.8.</p> <p>Suitable washer: 4 mm flat washer.</p> <p>Screw tightening yield point utilization factor (v) (according to VDI2230): 90% ($v=0.9$).</p> <p>Tightening torque: 550 Nm (screws lubricated with Molykote 1000) 600-725 Nm, typical 650 Nm (screws none or lightly lubricated)</p>
8	Tighten bolts in a crosswise pattern to ensure that the base is not distorted.	
9	Reconnect the robot cables to the base.	

Concluding procedure

	Action	Note
1	Refill oil to the axis-2 gearbox.	See Filling oil into the axis-2 gearbox on page 153 .
2	Calibrate the robot.	See Calibration on page 563 .
3	<p> DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

5 Repair

5.9.3 Replacing the axis-3 gearbox

5.9.3 Replacing the axis-3 gearbox

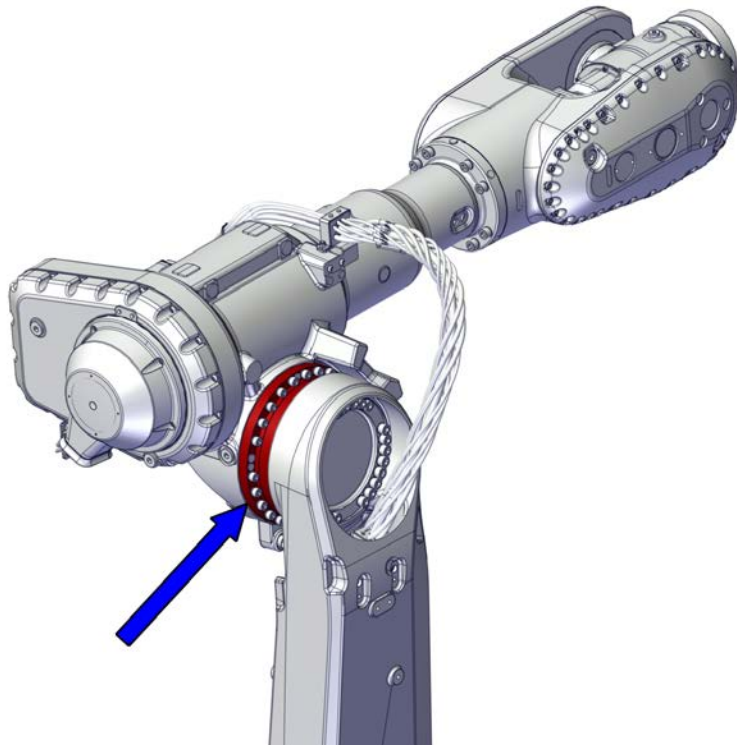
Keeping the cabling installed during gearbox replacement

For floor-mounted manipulators the cable harness and DressPack cable package (if installed) can be kept installed on the robot, if there is enough free space on the floor to put down the upper arm next to the manipulator. There should be enough space to place two pallets in a row.

For inverted manipulators, the cable harness and DressPack cable package must be removed from the upper arm.

Location of the gearbox

The gearbox is located as shown in the figure.



xx210000484

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 5710 via myABB Business Portal, www.abb.com/myABB.

Continues on next page

Spare part	Article number	Note	Level
Gearbox	3HAC072170-003 (Graphite White) 3HAC072170-005 (ABB Orange)	Includes o-ring	L2

Required service parts

Consumable	Article number	Note
Flange sealant	3HAC041807-007	Loctite 5800
O-ring	3HAC062327-062	Replace if damaged.

Required tools and equipment

Equipment	Article number	Note
Lifting eye	3HAC16131-1	M12, 2 pcs
Fender washer	-	Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.
Roundsling, 1.5 m	-	Length: 1.5 m.
Lifting accessory (chain)	3HAC15556-1	Lifting instruction 3HAC15880-2 enclosed.
Brake release tool	3HAC081310-001	User instructions are enclosed with the tool.
Guide pin, M10x150	3HAC15521-2	Always use guide pins in pairs.
Lifting accessory for gear	3HAC081585-001	For lifting the gearbox
Screws M8x75, fully threaded	-	Used to push out the gearbox, if necessary.
Adjustment tool for gear	3HAC080331-001	Used to rotate the gear for matching hole pattern with frame.
Calibration toolbox, Axis Calibration	3HAC074564-001 (axes 1, 2, 3 and 4) 3HAC074119-001 (axes 5 and 6)	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

Continues on next page

5 Repair

5.9.3 Replacing the axis-3 gearbox

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	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.	
	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 573 .
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

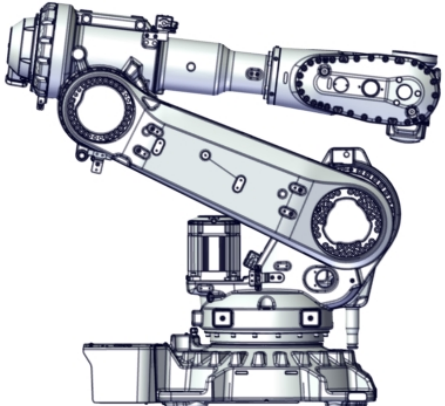
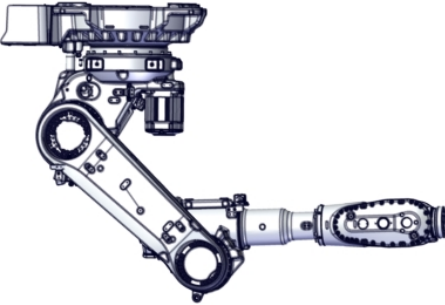

Removing the gearbox

Use these procedures to remove the gearbox.

Preparations before removing the axis-3 gearbox

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
2	Drain the axis-3 gearbox.	See Draining the axis-3 gearbox on page 157 .

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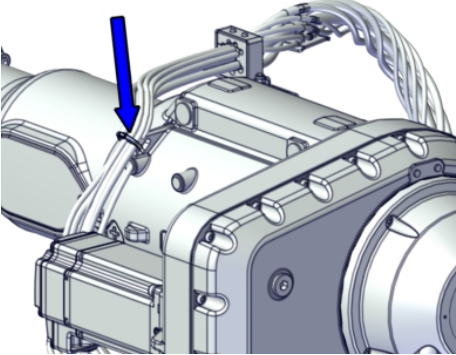
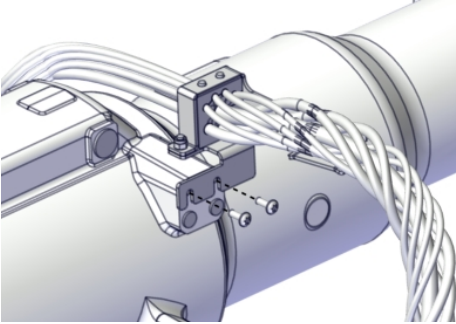
	Action	Note
3	<p><i>Floor-mounted robot:</i></p> <p>Jog the robot into position:</p> <ul style="list-style-type: none"> • Axis 1: no significance • Axis 2: -65° • Axis 3: maximum position in positive direction, upper arm resting against the mechanical stop (approximately +70°) • Axis 4: 0° • Axis 5: -90° • Axis 6: 0° 	<p>If needed, run the axis-1 into a position that gives the required space (space to place two pallets in a row) at the right-hand side of the robot, as seen from behind.</p>  <p>xx2100001218</p>
4	<p><i>Option Inverted (3317-1)</i></p> <p>Jog the robot into position:</p> <ul style="list-style-type: none"> • Axis 1: position that allows best possible access to fit the lifting accessories to the upper arm (170° shown in figure) • Axis 2: -47° • Axis 3: -135° (upper arm horizontal) • Axis 4: 0° • Axis 5: +90° • Axis 6: 0° 	 <p>xx2100002137</p>
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 safeguarded space.</p>	
6	<p>Choose to remove the cabling from the upper arm, if any of following circumstances is true:</p> <ul style="list-style-type: none"> • There is not enough free space to put down the upper arm next to the floor-mounted manipulator. • The manipulator is inverted. <p>How to remove the cabling is described in following procedures. Skip them if the cabling can be kept installed.</p>	

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5 Repair


5.9.3 Replacing the axis-3 gearbox

Continued

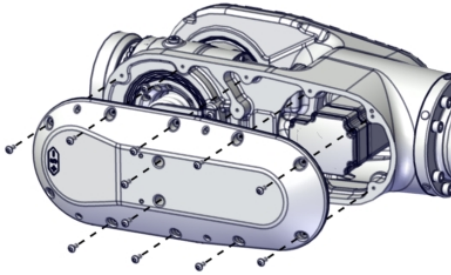
	Action	Note
7	<p>If cabling needs to be removed: Cut the cable tie at the eyelet on top of the arm house.</p>	 <p>xx2000000415</p>
8	<p>If cabling needs to be removed: Remove the metal clamp on top of the arm house.</p>	 <p>xx2100001285</p>

If cabling needs to be removed: Retrieving access to the wrist cabling


Use this procedure to remove the wrist cover.

	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	Remove the wrist cover.	 <p>xx2000000373</p>

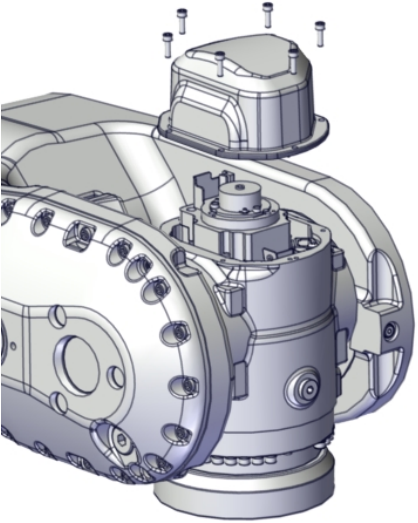
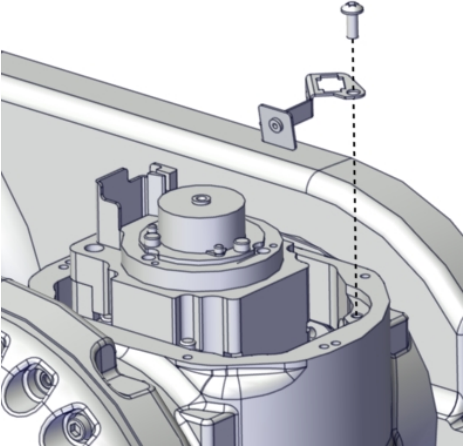
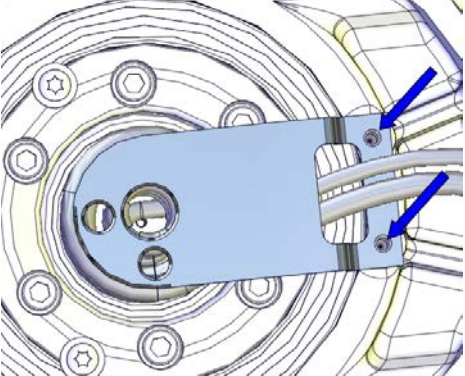
If cabling needs to be removed: Disconnecting the axis-6 motor cables

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


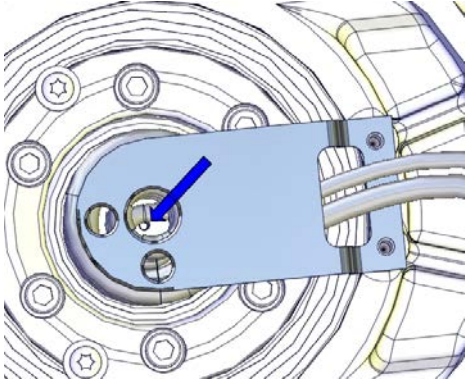
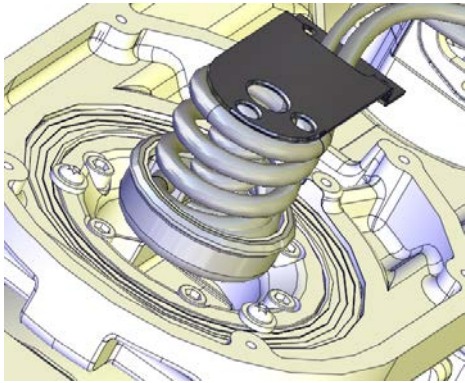
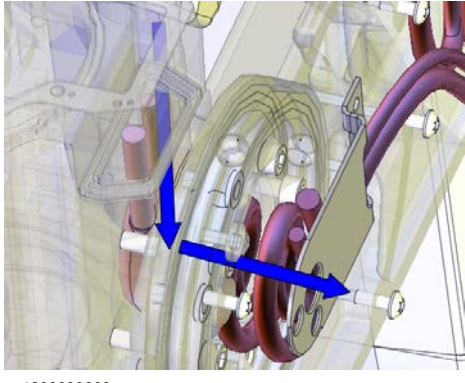
5 Repair

5.9.3 Replacing the axis-3 gearbox


Continued

	Action	Note
2	Unscrew the attachment screws and remove the motor cover.	 <p>xx200000376</p>
3	Remove the connector bracket.	 <p>xx200000375</p>
4	Disconnect the motor cables.	
5	Unscrew the attachment screws that hold the cable bracket.	 <p>xx130000484</p>

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	Action	Note
6	<p>Unscrew the M4 screw that holds the carrier.</p> <p> Note</p> <p>The screw is located at the bottom of the carrier.</p>	 <p>xx130000485</p>
7	<p>Pull out the carrier from its position.</p>	 <p>xx1300001113</p>
8	<p>Pull out the axis-6 motor cables by holding the cables with one hand at the motor and the other at the carrier.</p>	 <p>xx130000666</p>

If cabling needs to be removed: Disconnecting the axis-5 motor cables

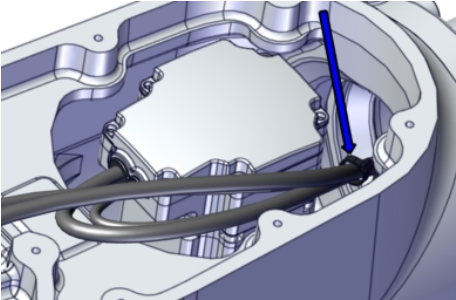
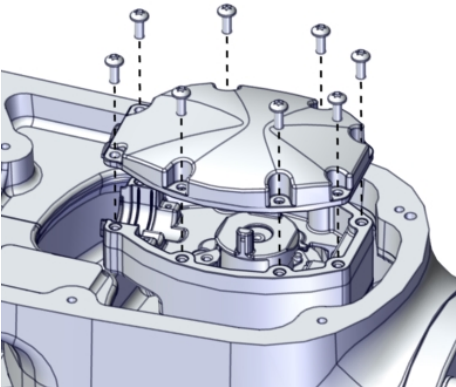
	Action	Note
1	<p> DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	

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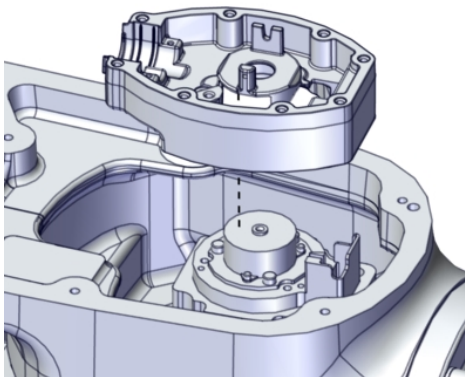
5 Repair

5.9.3 Replacing the axis-3 gearbox


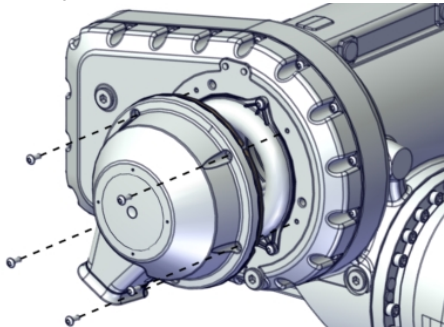
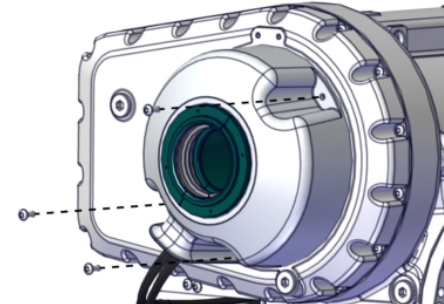
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	Action	Note
2	Cut the cable tie.	 xx2100002630
3	Remove the motor cover by removing the screws.	 xx2100002315
4	Disconnect the power cable connector by removing the attachment screw.	
5	Disconnect the signal cable connector.	
6	Remove the cable bracket by removing the screws.	
7	Remove the motor cables.	

Continues on next page

	Action	Note
8	IRB 5710-90/2.7, IRB 5710-70/2.7 LID: Remove the connection box.	 <p>xx2100002316</p>

If cabling needs to be removed: Removing the cable harness - wrist and upper arm



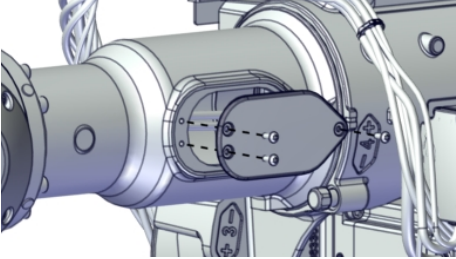

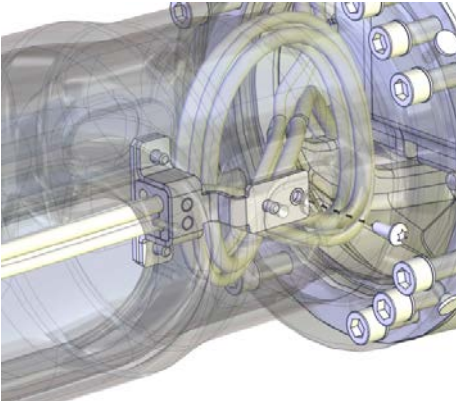
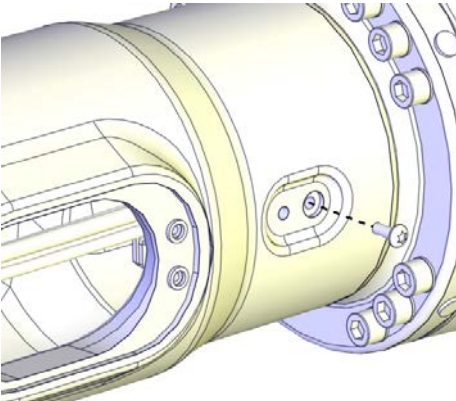
	Action	Note
1	<p><i>Foundry Plus, DressPack:</i> Remove the cover.</p> <p> Note Use caution not to damage the gasket.</p>	<p><i>Foundry Plus</i></p>  <p>xx2000000422</p> <p><i>DressPack</i></p>  <p>xx2100002679</p>

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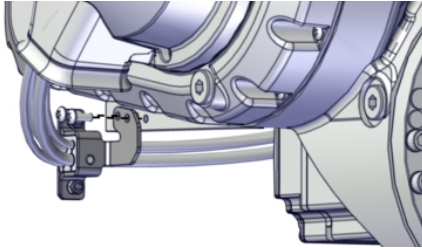

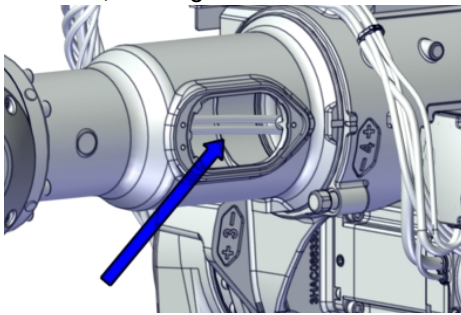
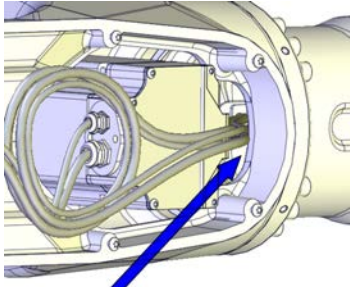
5 Repair

5.9.3 Replacing the axis-3 gearbox

Continued

	Action	Note
2	<p> Tip</p> <p>Use tape and tie the axis-5 and axis-6 connectors and carrier into a bundle (if not already done). This is done to facilitate the removal and to avoid damaging the parts. This will also make it easier to run the cable harness through the inside of the upper arm.</p>	 <p>xx1300000668</p>
3	Remove the side cover on the arm tube.	 <p>xx2000000420</p>
4	<p>Unscrew the attachment screw that secures the axis-4 metal clamp inside the arm tube.</p> <p> Note</p> <p>The screw is reached from outside the upper arm.</p>	 <p>xx1700000340</p>  <p>xx1700000339</p>

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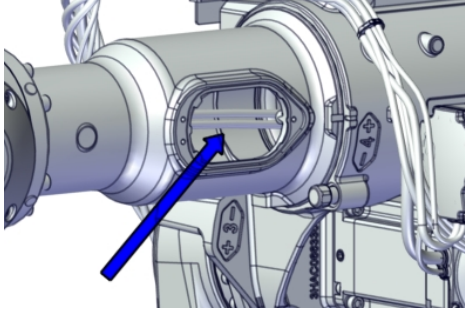
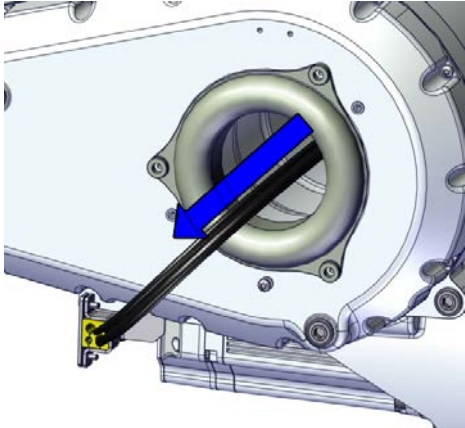
	Action	Note
5	Remove the arm house metal clamp.	 <p>xx2100002154</p>
6	<p>Remove the cable harness out from the wrist.</p> <p> Tip</p> <p>This step is best performed by two persons working together:</p> <ul style="list-style-type: none">• Person 1: Put one hand inside the side hole and take a hold of the cable harness.• Person 2: Take a hold on the cable harness inside the wrist.• Together: Move the cable harness past the axis-5 motor and into the arm tube.	<p>Person 1, working at the side hole:</p>  <p>xx2000000416</p> <p>Person 2, working at the wrist:</p>  <p>xx1300000746</p>

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5 Repair

5.9.3 Replacing the axis-3 gearbox


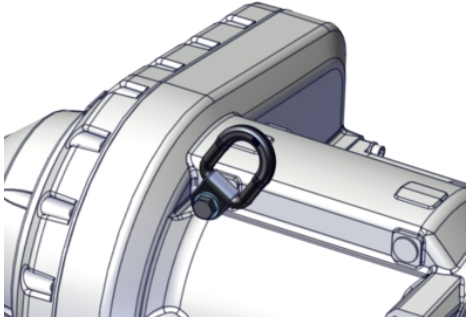
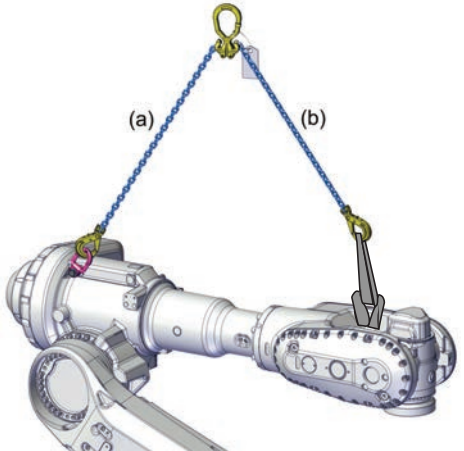

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	Action	Note
7	<p>Remove the cable harness out of the arm tube, at the back of the upper arm.</p> <p> Tip</p> <p>This step is best performed by two persons working together:</p> <ul style="list-style-type: none"> • Person 1: Put one hand inside the side hole and take a hold of the cable harness. • Person 2: Take a hold on the cable harness at the back of the robot. • Together: Move the cable harness out of the arm tube. 	<p>Person 1, working at side hole:</p>  <p>xx200000416</p> <p>Person 2, working at the back:</p>  <p>xx1700001568</p>

Attaching the lifting accessories to the upper arm

	Action	Note
1	<p> CAUTION</p> <p>The weight of the complete upper arm (including the wrist) is</p> <p>IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 260 kg</p> <p>IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 210 kg</p> <p>All lifting accessories used must be sized accordingly.</p>	

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	Action	Note
2	<p>Fit a lifting eye in the arm house, with a fender washer underneath.</p>  <p>xx1400002196</p>	<p>Lifting eye: 3HAC16131-1 Fender washer: Outer diameter: minimum 26 mm, maximum 30 mm, hole diameter: 13 mm, thickness: 3 mm.</p>  <p>xx2100002146</p>
3	<p>Attach the upper arm lifting accessory (chain) to the lifting eye, to an overhead crane (or similar) and then to a roundsling in the wrist.</p> <p>Approximate length of the chain:</p> <ul style="list-style-type: none"> • (a): 1,200 mm • (b): 1,420 mm 	<p>Lifting accessory (chain): 3HAC15556-1 Roundsling, 1.5 m: -</p>  <p>xx2100002145</p>
4	<p>Raise the lifting accessories to take the weight of the upper arm.</p>	
5	<p>In case of necessary adjustments, use the shortening loops on the lifting accessory (chain) to find the level position.</p>	 <p>xx1400002197</p>


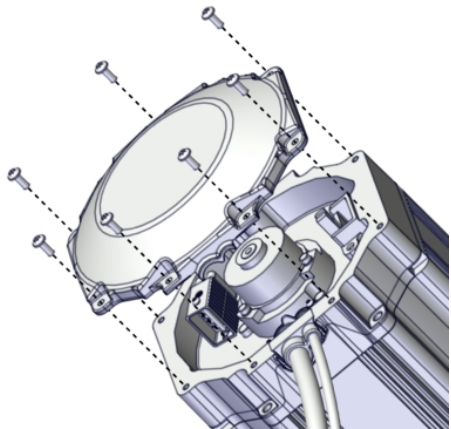
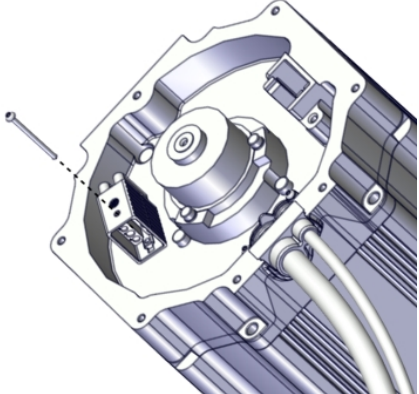
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5 Repair

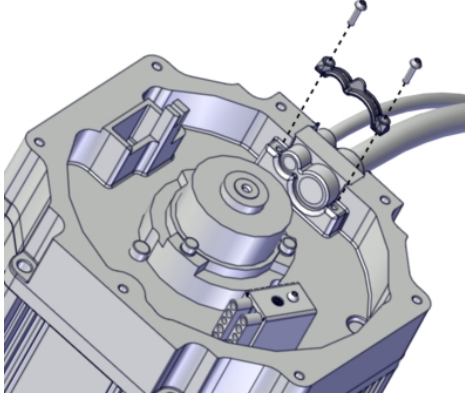
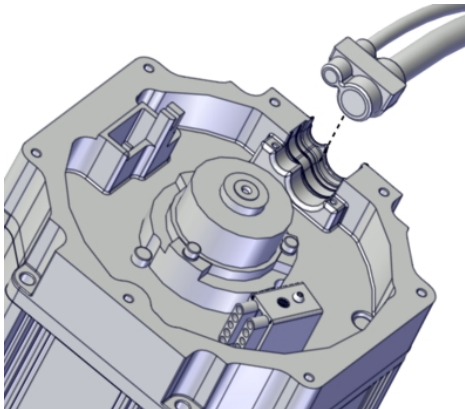
5.9.3 Replacing the axis-3 gearbox

Continued


Disconnecting the axis-3 and axis-4 motor cables

	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Remove the motor cover by removing the screws.	 xx210000596
3	Disconnect the power cable connector by removing the attachment screw.	 xx210000667
4	Disconnect the signal cable connector.	

Continues on next page

	Action	Note
5	Remove the cable bracket by removing the screws.	 <p>xx210000598</p>
6	Remove the motor cables.	 <p>xx210000599</p>

Removing the axis-3 motor





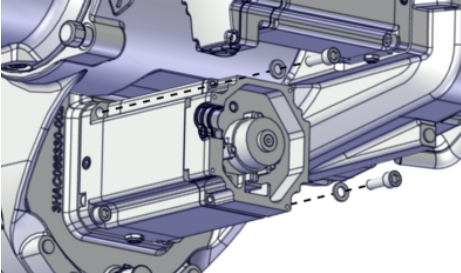

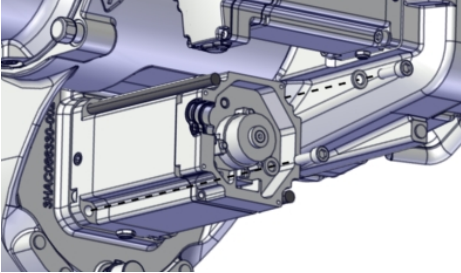
	Action	Note
1	Before removing the motor, make sure that the gearbox is completely drained.	
2	 <p>DANGER</p> <p>When releasing the holding brakes of the motor, the upper arm will be movable and falls down if not secured. Verify that the upper arm is secured as previously described, before continuing.</p>	

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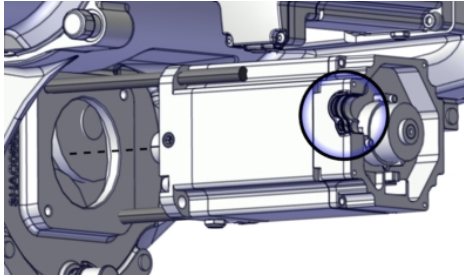
5 Repair

5.9.3 Replacing the axis-3 gearbox

Continued

	Action	Note
3	<p>Release the brakes on the motor with the brake release tool.</p> <ol style="list-style-type: none"> 1 Make sure the brake release tool is turned off. 2 Connect the tool to the R2.MP3 connector. 3 Release the brakes by pressing the button on the tool. <p> CAUTION</p> <p>Releasing the brakes on the axis-3 motor results in weight transfer of upper arm weight. Verify that the upper arm rests against the mechanical stop or installed lifting accessories, before releasing the brakes.</p> <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury. Read and follow enclosed user instructions for the tool.</p> <p> WARNING</p> <p>Electrical damage to the motor may occur if 24V is supplied to the motor connector for more than 30 seconds. Use the specified brake release tool to eliminate the risk.</p>	<p>Brake release tool: 3HAC081310-001 User instructions are enclosed with the tool.</p>  <p>xx2100000666</p>
4	<p>Remove two opposite attachment screws. Use a bits extender in order to reach the screws.</p>	<p>Bits extender: 3HAC12342-1</p>  <p>xx2100002153</p>
5	<p>Fit guide pins in the opposite holes and remove the remaining two screws.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the motor slide better.</p>	<p>Guide pin, M10x150: 3HAC15521-2 Always use guide pins in pairs.</p>  <p>xx2100002152</p>


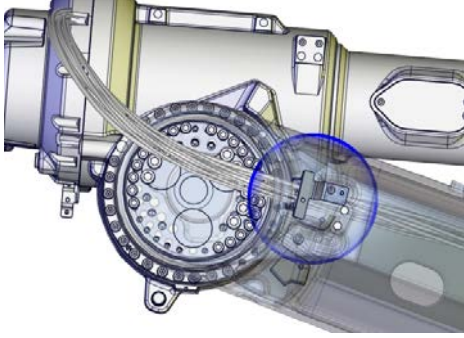
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	Action	Note
6	 CAUTION Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.	
7	Press the motor out of its position by using the removal tool in opposite holes of the motor.	Removal tool motor M12: 3HAC14631-1 Used to push out the motor, if necessary. Always use removal tools in pairs.
8	 CAUTION The weight of the motor is 13 kg All lifting accessories used must be sized accordingly.	
	Remove the motor by sliding it out on the guide pins and lift it off.  Tip Make a note in which direction the cable gland hole is facing. The motor shall be refitted in the same position.	 xx2100002149 Make sure the pinion is not damaged.

Floor-mounted robot: Keeping cabling installed in upper arm - loosening the cable brackets

This procedure is valid if wanting to keep the cabling installed in the upper arm, when removing the upper arm from the robot. If this is not possible due to lack of space where to put the upper arm, the cable harness must be removed from the upper arm, see [Removing the cable harness - upper arm and wrist on page 262](#).

Use this procedure to loosen required cable brackets of the robot cable harness, in order to get the longest possible length of the cable harness between the lower and upper arm.

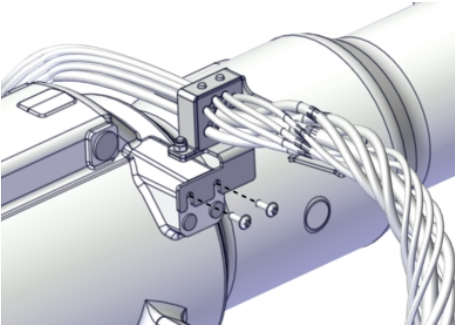
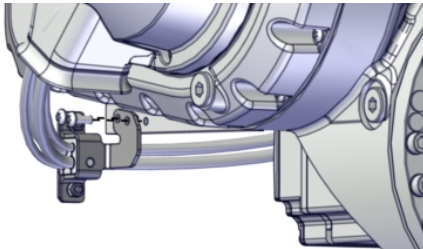
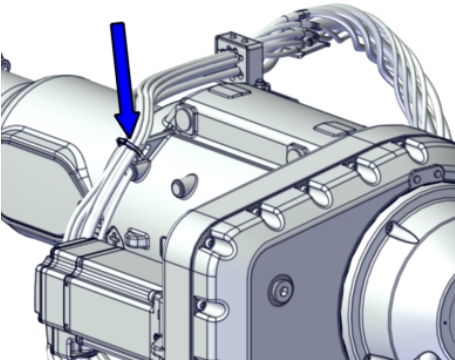
	Action	Note
1	Unscrew the attachment screws that hold the axis-3 lower arm metal clamp (the one closest to the axis-3 gearbox) located on the inside of the lower arm.  Note The screw is reached from the outside of the lower arm!	 xx1800000042

Continues on next page

5 Repair

5.9.3 Replacing the axis-3 gearbox

Continued

	Action	Note
2	Remove the metal clamp on top of the arm house.	 xx2100001285
3	Remove the arm house metal clamp.	 xx2100002154
4	Cut the cable tie at the eyelet on top of the arm house.	 xx2000000415


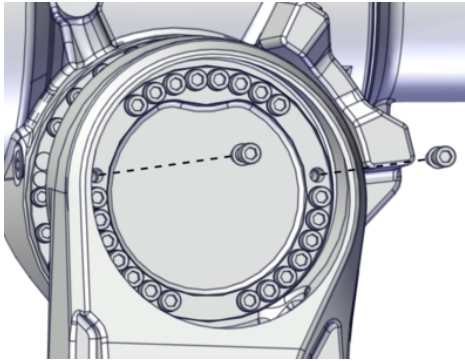
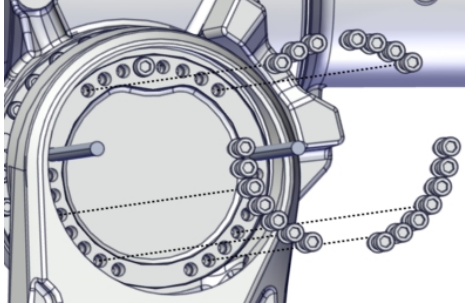
Inverted robot: Removing the cable harness from the upper arm and wrist

The upper arm cabling can stay fitted, if the distance between the axis-3 rotation centre and the floor does not exceed 2.1 m. If the distance exceeds 2.1 m, the cabling in the upper arm and the wrist must be removed.



Removal of the cabling in the upper arm and wrist is described in [Removing the cable harness - upper arm and wrist on page 262](#).

Continues on next page

Preparations before removing the upper arm

	Action	Note
1	<p>Remove two attachment screws in opposite holes and replace them with guide pins.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the upper arm slide better.</p>	<p>Guide pin, M12x150: 3HAC13056-2 Always use guide pins in pairs.</p>  <p>xx2000000392</p>
2	<p>Leave one of the remaining attachment screws fitted, remove the other screws.</p>	 <p>xx2000000393</p>

Removing the upper arm

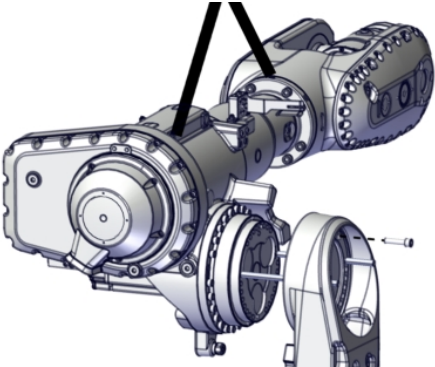

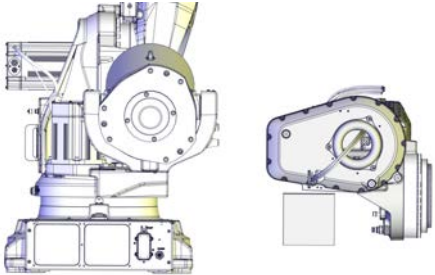
	Action	Note
1	<p> Note</p> <p>Make sure the lift is done completely leveled! In case of necessary adjustments, use the shortening loops on the lifting accessory (chain), and make sure to place the chain the right way through the loops.</p>	 <p>xx1400002197</p>

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5 Repair

5.9.3 Replacing the axis-3 gearbox


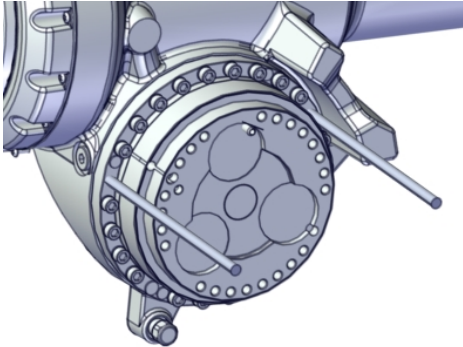
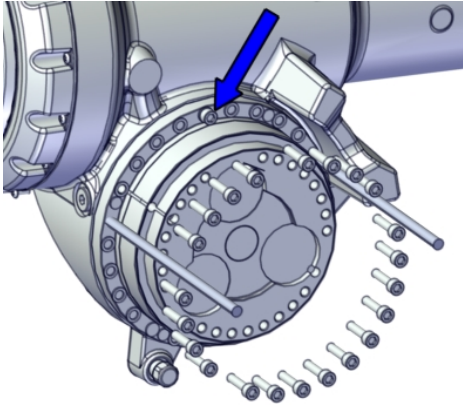
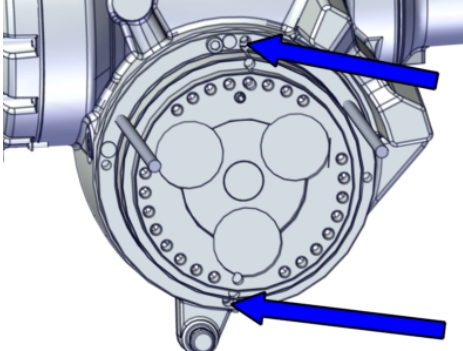

Continued

	Action	Note
2	Remove the remaining attachment screw and let the upper arm slide out from the lower arm with support from the guide pins.	 <p>xx2000000394</p>
3	Lift the upper arm and place it on the prepared area.  CAUTION <i>Only valid when the upper arm is removed due to replacement of the axis-3 gearbox:</i> If the cable harness is still fitted or partly fitted, use caution when lifting the upper arm over to the other side of the robot, in order not to cause any damage to the cable harness.	
4	<i>This step is only valid when the upper arm is removed due to replacement of the axis-3 gearbox:</i> Place pieces of wood (or similar) under arm house and wrist. Lower the upper arm, and let the upper arm rest as shown in the figure. This is done in order to keep the axis-3 gearbox in a vertical position and to get the best position to replace the axis-3 gearbox, if applicable.	 <p>xx1300000553</p>

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Removing the axis-3 gearbox

Use this procedure to remove the gearbox.


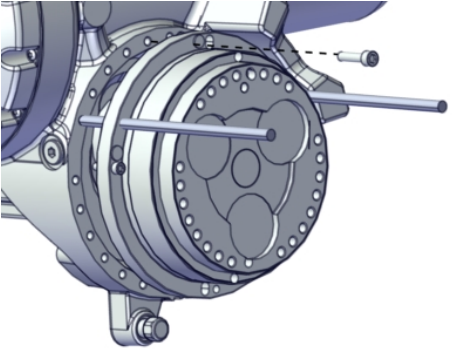

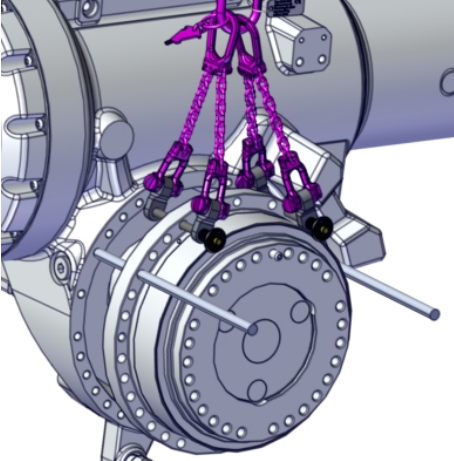
	Action	Note
1	<p>Remove two attachment screws in opposite holes and replace them with guide pins.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the gearbox slide better.</p>	<p>Guide pin, M10x150: 3HAC15521-2 Always use guide pins in pairs.</p>  <p>xx2100001222</p>
2	<p>Remove all but one of the remaining attachment screws and washers.</p>	 <p>xx2100001223</p>
3	<p>Fit two fully threaded screws in the press out holes.</p>	<p>Screws M8x75, fully threaded: Used to push out the gearbox, if necessary.</p>  <p>xx2100001224</p>
4	<p> Note</p> <p>There will be some oil spill when the gearbox is removed. Put some oil absorbent cloth or paper below the gearbox.</p>	

Continues on next page

5 Repair

5.9.3 Replacing the axis-3 gearbox


Continued

	Action	Note
5	<p>Remove the remaining attachment screw and loosen the gearbox with help of the removal tools. Only pull out the gearbox a little bit on the guide pins.</p> <p> DANGER</p> <p>There is a risk that the gearbox may glide out and fall down if it is too far out to on the guide pins.</p>	 <p>xx2100001236</p>
6	<p> CAUTION</p> <p>The weight of the gearbox is 36 kg All lifting accessories used must be sized accordingly.</p>	
7	Apply the lifting accessory to the gearbox.	Lifting accessory for gear: 3HAC081585-001
8	With the gearbox attached to the lifting accessory, remove the gearbox by letting it slide out on the guide pins.	 <p>xx2100002460</p>
9	Remove the gearbox.	

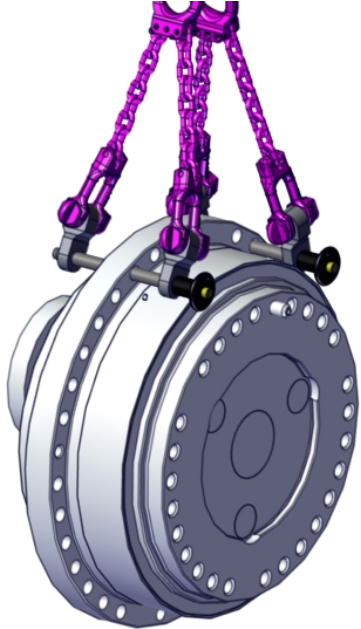
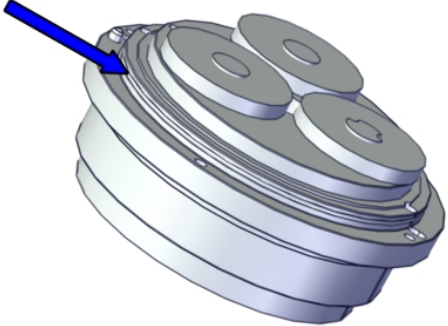
Refitting the gearbox

Use these procedures to refit the axis-3 gearbox.

Preparations before refitting the axis-3 gearbox

	Action	Note
1	<p> CAUTION</p> <p>The weight of the gearbox is 36 kg All lifting accessories used must be sized accordingly.</p>	

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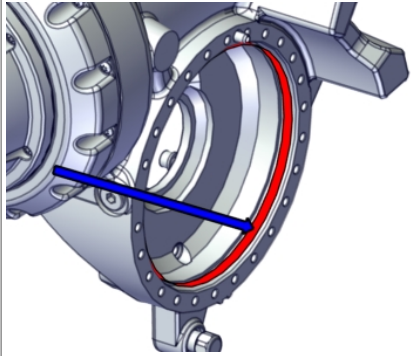
	Action	Note
2	Apply the lifting accessory to the gearbox.	Lifting accessory for gear: 3HAC081585-001  xx2100002461
3	Lift the gearbox so that it rests on its side.	
4	Wipe clean the contact surfaces of both the gearbox and the upper arm from any contamination.	
5	Check the o-ring. Replace if damaged.	O-ring: 3HAC062327-062  xx2100001237

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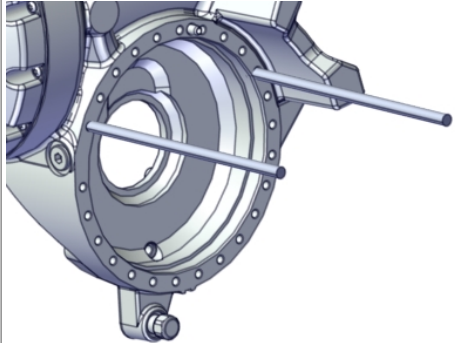
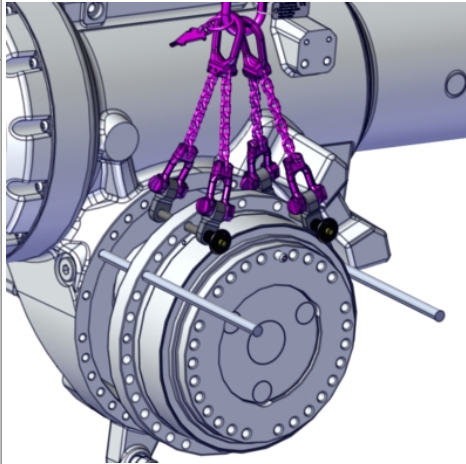

5 Repair

5.9.3 Replacing the axis-3 gearbox

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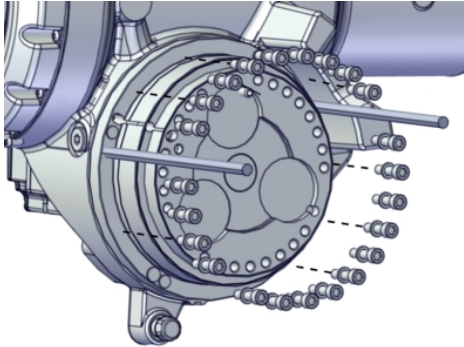
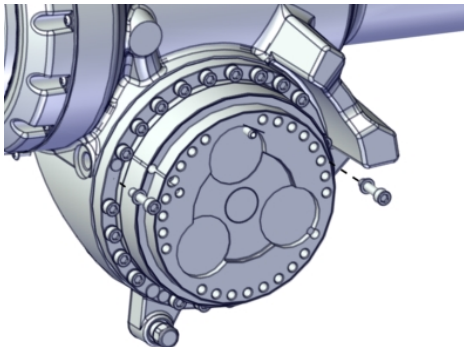
	Action	Note
6	Lubricate the contact surface inside the upper arm with grease.	Grease, Shell Gadus S2: 3HAC042536-001.  <small>xx2100002775</small>

Refitting the axis-3 gearbox


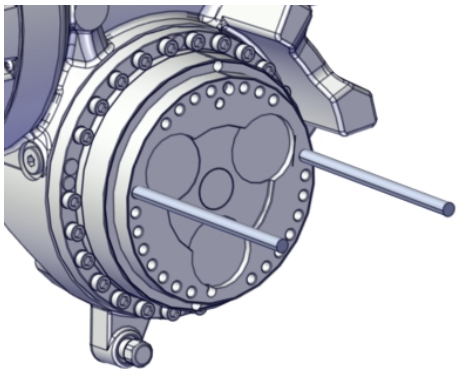
	Action	Note
1	Fit two guide pins in opposite holes.  Tip Use different lengths on the guide pins to simplify guidance.  Tip Lubricate the guide pins with some grease to make the lower arm slide better.	Guide pin, M10x150: 3HAC15521-2 Always use guide pins in pairs.  <small>xx2100001238</small>
2	Lift the gearbox and let it rest on the guide pins.	 <small>xx2100002460</small>
3	Remove the lifting accessory.  DANGER There is a risk that the gearbox may glide out and fall down if it is too far out to on the guide pins.	

Continues on next page

5.9.3 Replacing the axis-3 gearbox
Continued

	Action	Note
4	Slide the gearbox into position and fit the attachment screws and washers.	<p>Hex socket head cap screw : M10x40 12.9 Gleitmo 603+Geomet 500 (25 pcs).</p>  <p>xx2100001239</p>
5	Remove the guide pins and fit the remaining attachment screws and washers.	 <p>xx2100001240</p>
6	Tighten the attachment screws.	Tightening torque: see standard torque in Screw joints on page 598 .

Preparations before refitting the upper arm

	Action	Note
1	Wipe clean all contact surfaces.	
2	<p>Fit two guide pins in opposite M12 holes in the axis-3 gearbox.</p> <p> Tip</p> <p>Lubricate the guide pins with some grease to make the upper arm slide better.</p>	<p>Guide pin, M12x150: 3HAC13056-2 Always use guide pins in pairs.</p>  <p>xx2000000396</p>


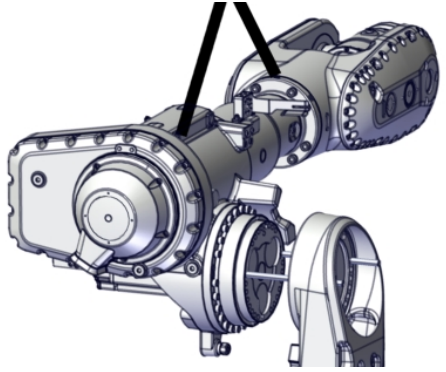
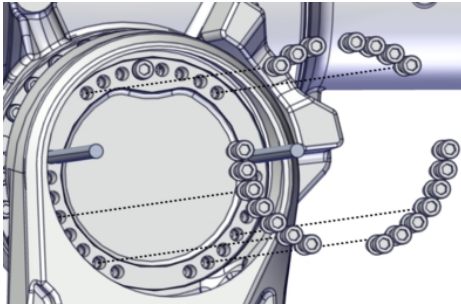
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5 Repair

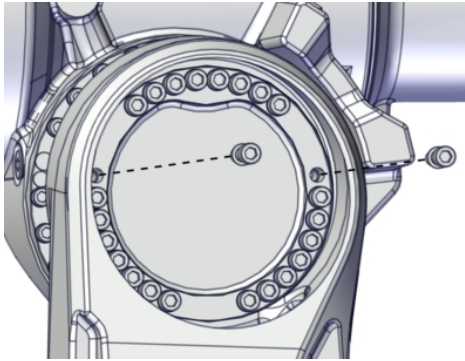
5.9.3 Replacing the axis-3 gearbox

Continued




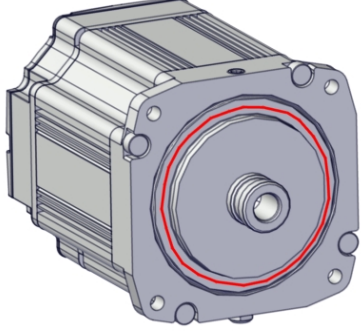
Securing the upper arm

	Action	Note
1	 CAUTION The weight of the complete upper arm (including the wrist) is IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 260 kg IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 210 kg All lifting accessories used must be sized accordingly.	
2	Attach the lifting accessories, if not already fitted.	See Attaching the lifting accessories to the upper arm on page 520 .
3	Lift the upper arm to mounting position.	
4	Use the adjustment tool to rotate the axis-3 gearbox and find the correct position for the guide pins in the lower arm.	Adjustment tool for gear: 3HAC080331-001  <small>xx2000000395</small>
5	Insert all but two of the screws and washers.	Hex socket head cap screw: M12x40 12.9 Gleitmo 603+Geomet 500 (24 pcs). Washer: Steel 13x19x1.5 (24 pcs).  <small>xx2000000393</small>

Continues on next page

	Action	Note
6	Remove the guide pins and fit the two remaining screws and washers.	 <p>xx200000392</p>
7	Tighten the attachment screws.	Tightening torque: see standard torque in Screw joints on page 598 .

Preparations prior to refitting motor

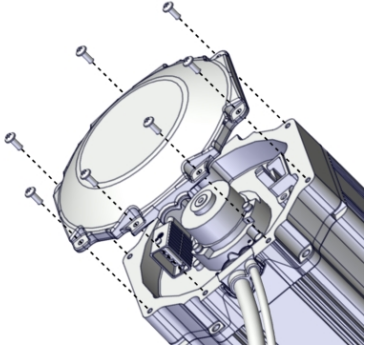


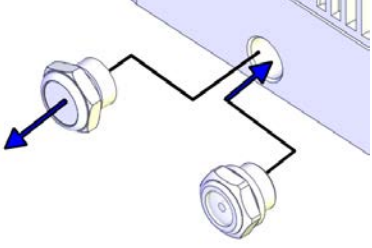
	Action	Note
1	 <p>DANGER</p> <p>Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.</p>	
2	<p>Remove any old paint or flange sealant residues or other contamination from the contact surfaces on both the motor and the mating parts.</p>  <p>Tip</p> <p>Remove flange sealant residues with Loctite 7200. Then use Loctite 7063 for cleaning the mating surface.</p>	
3	<p>Apply a continuous bead of flange sealant, 1-2 mm wide, inside of the groove on the motor contact surface.</p>  <p>Note</p> <p>The purpose of the groove is to catch excess sealant. No o-ring is used.</p>	<p>Flange sealant: 3HAC041807-007 (Loctite 5800)</p>  <p>xx210000520</p>

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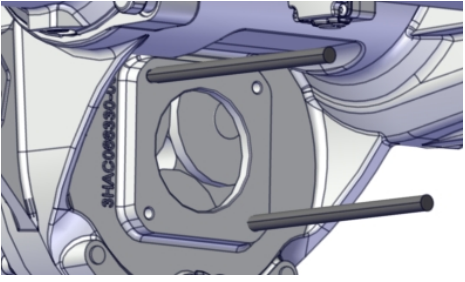

5 Repair

5.9.3 Replacing the axis-3 gearbox


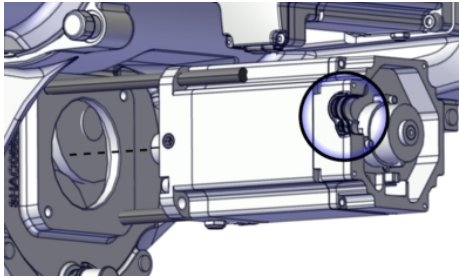


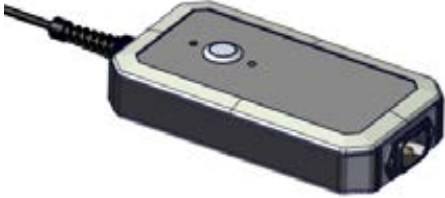

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	Action	Note
4	Remove the cover, if fitted to the new spare part motor.	 <p>xx2100000596</p>
5	<p>Protection type Foundry Plus Valid for axis-1, axis-2, axis-3 and axis-4.</p> <p>If the motor is a new spare part, the evacuation hole protection filter must be replaced with a transparent plug/sight glass (enclosed with the spare part delivery). Remove the protection filter and install the transparent plug/sight glass.</p> <div style="display: flex; justify-content: space-around;"> <div>  <p>xx1800000101</p> </div> <div>  <p>xx1800000102</p> </div> </div> <p>Protection filter (Stand-ard). Transparent plug (Foundry Plus).</p>	<p>Tightening torque, transparent plug: 20 Nm Tightening torque, protection filter: 20 Nm</p>  <p>xx1600000576</p>

Refitting the axis-3 motor

	Action	Note
1	Fit guide pins in opposite holes.	<p>Guide pin, M10x150: 3HAC15521-2 Always use guide pins in pairs.</p>  <p>xx2100002151</p>
2	<p> CAUTION</p> <p>The weight of the motor is 13 kg All lifting accessories used must be sized accordingly.</p>	

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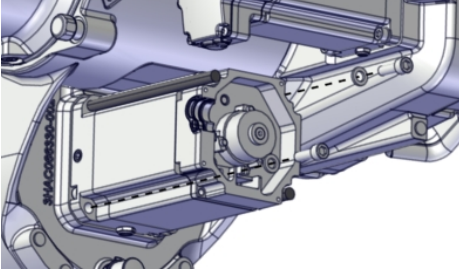
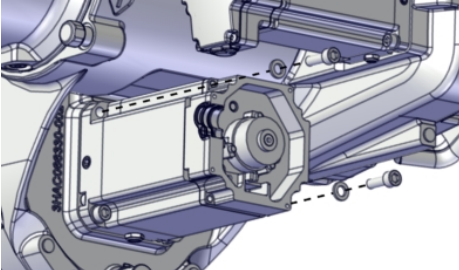
	Action	Note
3	<p>Lift the motor and put it on the guide pins as close as possible to its final position without pushing the motor pinion into the gear.</p> <p> Note</p> <p>Make sure the cable gland opening is turned the correct way.</p>	 <p>xx2100002149</p>
4	<p>Release the brakes of the axis-3 motor with the brake release tool.</p> <ol style="list-style-type: none"> 1 Make sure the brake release tool is turned off. 2 Connect the tool to the R2.MP3 connector. 3 Release the brakes by pressing the button on the tool. <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury.</p> <p>Read and follow enclosed user instructions for the tool.</p> <p> WARNING</p> <p>Electrical damage to the motor may occur if 24V is supplied to the motor connector for more than 30 seconds. Use the specified brake release tool to eliminate the risk.</p>	<p>Brake release tool: 3HAC081310-001 User instructions are enclosed with the tool.</p>  <p>xx2100000666</p>
5	<p> CAUTION</p> <p>Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.</p>	
6	<p>Apply the rotation tool.</p> <p>Use caution and fit the motor in its final position while at the same time rotating the motor pinion slightly using the rotation tool.</p> <ul style="list-style-type: none"> • Make sure that the motor pinion is properly mated to the gear of the gearbox. • Make sure that the motor pinion does not get damaged. • Make sure that the direction of the cable exit is facing the correct way. 	<p>Rotation tool: 3HAB7887-1</p>

Continues on next page

5 Repair

5.9.3 Replacing the axis-3 gearbox

Continued

	Action	Note
7	Fit two of the attachment screws and washers. Use a bits extender in order to reach the screws.	Hex socket head cap screw: M10x30 12.9 Gleitmo 603+Geomet 500 (2 pcs) Bits extender: 3HAC12342-1  xx2100002152
8	Remove the guide pins and replace with the remaining attachment screws.	Hex socket head cap screw: M10x30 12.9 Gleitmo 603+Geomet 500 (2 pcs)  xx2100002153
9	Tighten the screws.	Tightening torque: 50 Nm.
10	Disconnect the brake release tool.	
11	Perform a leak-down test.	See Performing a leak-down test on page 184 .


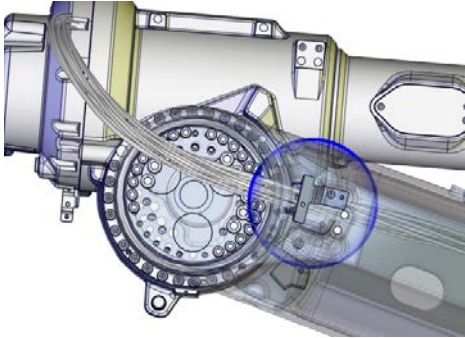
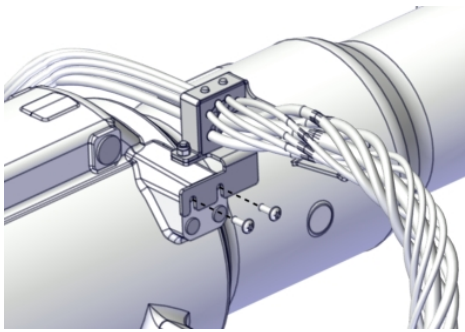
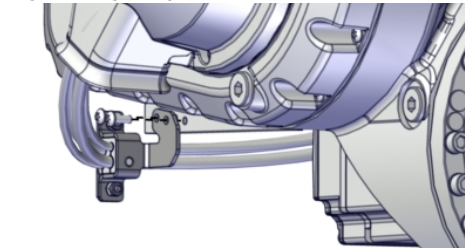
Refitting cable brackets

This procedure is valid if the cabling has been kept installed in the upper arm, when removing the upper arm from the robot. If the cable harness in the upper arm instead has been removed completely, see [Refitting the cable harness - upper arm and wrist on page 292](#).

Use this procedure to refit the cable brackets.

	Action	Note
1	Remove the lifting accessories.	
2	Move the cable harness and DressPack back to the correct side of the robot.	

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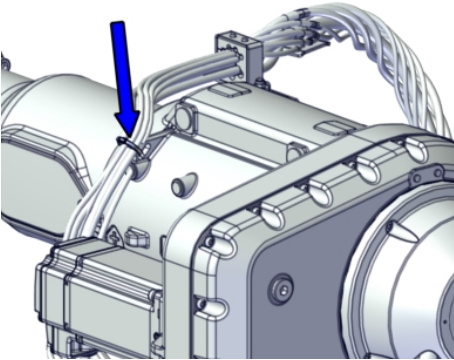
	Action	Note
3	<p>Refit the axis-3 lower arm metal clamp (the one closest to the axis-3 gearbox) located on the inside of the lower arm.</p> <p> Note</p> <p>The screw is reached from the outside of the lower arm!</p>	 <p>xx180000042</p>
4	<p>Refit the metal clamp on top of the arm house.</p>	<p>Torx pan head screw: M6x16 Stainless steel A2-70 Tightening torque: 10 Nm.</p>  <p>xx2100001285</p>
5	<p>Refit the metal clamp beneath the arm house.</p>	<p>Torx pan head screw: M6x16 Stainless steel A2-70 Tightening torque: 10 Nm.</p>  <p>xx2100002154</p>

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5 Repair

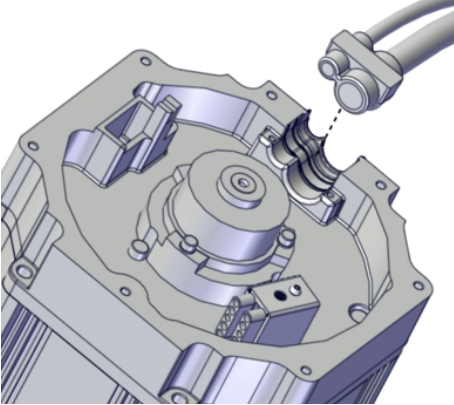
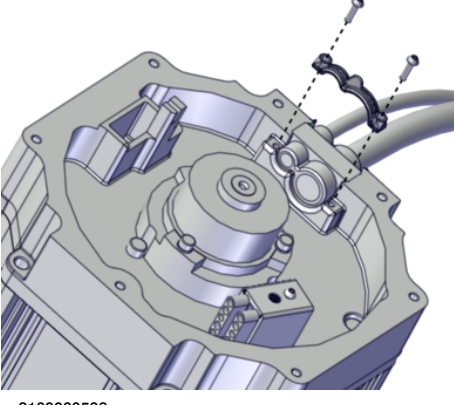
5.9.3 Replacing the axis-3 gearbox

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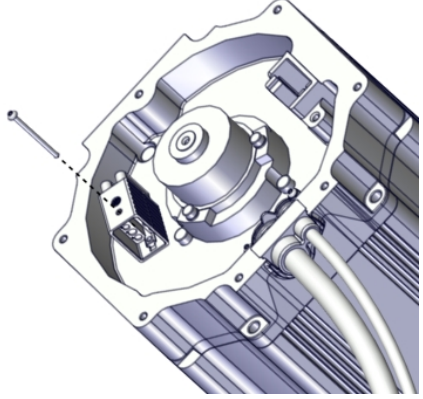
	Action	Note
6	Secure the cable harness to the arm house eyelet with a cable tie.	 <p>xx200000415</p>

Connecting the axis-3 motor cables

Use this procedure to connect the motor cables.

	Action	Note
1	Put the motor cables in place in the opening.	 <p>xx210000599</p>
2	Refit the cable bracket with the screws.	<p>Torx pan head screw: M3x12 Stainless steel A2-70</p>  <p>xx210000598</p>
3	Connect the motor cables. Connect in accordance with the markings on the connectors.	

Continues on next page

	Action	Note
4	Secure the power connector with a screw.	<p>Tightening torque: 1 Nm</p>  <p>xx210000667</p>

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5 Repair

5.9.3 Replacing the axis-3 gearbox

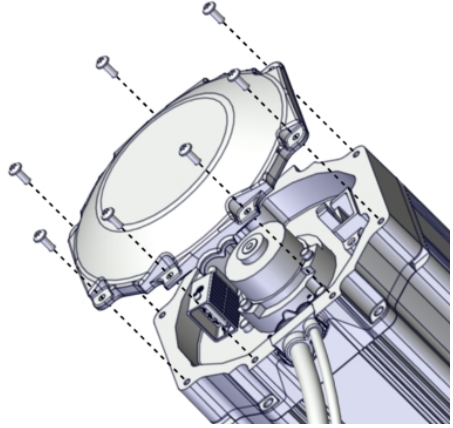
Continued

	Action	Note
5	<p>Inspect the gasket. Replace the complete cover if the gasket is damaged.</p>	<p>Axis-1 Connection box cover FS180 with gasket: 3HAC072864-003 (Graphite White) 3HAC072864-005 (ABB Orange)</p> <p>Axis-2 Connection box cover FS180 with gasket: 3HAC072864-003 (Graphite White) 3HAC072864-005 (ABB Orange)</p> <p>Axis-3 Connection box cover FS130 with gasket: 3HAC072863-003 (Graphite White) 3HAC072863-005 (ABB Orange)</p> <p>Axis-4 Connection box cover FS100 with gasket: 3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange)</p> <p>Axis-5 Connection box cover with gasket: (gasket not needed for protection type Standard)</p> <p>IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 3HAC072862-003 (Graphite White) 3HAC072862-005 (ABB Orange)</p> <p>IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 3HAC072861-003 (Graphite White) 3HAC072861-004 (ABB Orange)</p>  <p>xx210000600</p>
6	<p> CAUTION</p> <p>When fitting the motor cover, make sure that none of the cables inside will be damaged.</p>	

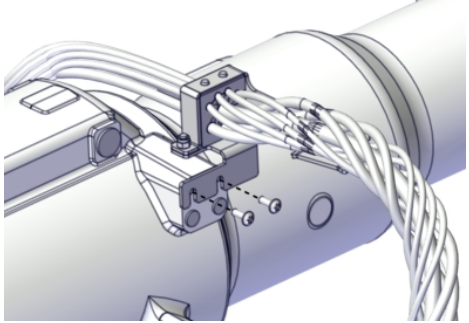
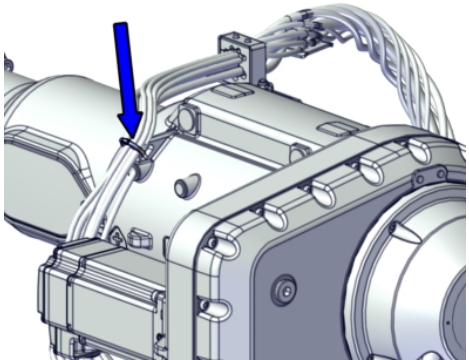
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5.9.3 Replacing the axis-3 gearbox

Continued

	Action	Note
7	<p>Refit the motor cover with its attachment screws. Use locking liquid.</p>	<p>Torx pan head screw: M5x12 Stainless steel A2-70 Locking liquid: 3HAC041807-004 (Loctite 2400) Tightening torque: 6 Nm.</p>  <p>xx210000596</p>

Concluding procedures


	Action	Note
1	<p>If cabling has been removed: Refit the metal clamp on top of the arm house.</p>	<p>Torx pan head screw: M6x16 Stainless steel A2-70 Tightening torque: 10 Nm.</p>  <p>xx2100001285</p>
2	<p>If cabling has been removed: Secure the cable harness to the arm house eyelet with a cable tie.</p>	<p>Cable ties</p>  <p>xx2000000415</p>

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5 Repair

5.9.3 Replacing the axis-3 gearbox

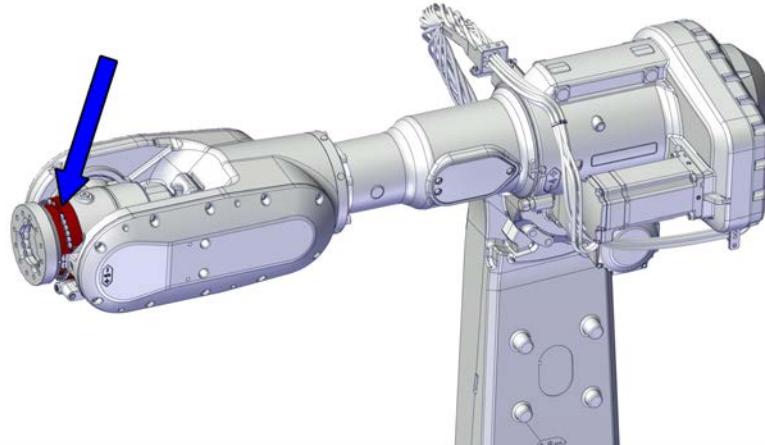
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	Action	Note
3	Refill oil in the gearbox.	See Filling oil into the axis-3 gearbox on page 159 .
4	Calibrate the robot.	See Calibration on page 563 .
5	 DANGER Make sure all safety requirements are met when performing the first test run.	

5.9.4 Replacing the axis-6 gearbox

Location of the gearbox

The gearbox is located as shown in the figure.



xx210000485

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 5710 via myABB Business Portal, www.abb.com/myABB.

Spare part	Article number	Note	Level
Gearbox	IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 3HAC072405-003 (Graphite White) 3HAC072405-004 (ABB Orange) IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 3HAC072452-003 (Graphite White) 3HAC072452-004 (ABB Orange)	Includes o-ring	L2

Required service parts

Consumable	Article number	Note
P-80 rubber lubration gel	3HAC074427-001	P-80 Emulsion IFC
Flange sealant	3HAC041807-007	Loctite 5800
Rust preventive	3HAC034903-001	Mercasol 3110 Waxcoat. Recommended drying time is 24h.

Continues on next page

5 Repair

5.9.4 Replacing the axis-6 gearbox

Continued

Consumable	Article number	Note
Lubricating oil	-	See Type of lubrication in gear-boxes on page 137 .
O-ring	3HAC061327-070	Used on gearbox. Replace if damaged.
Gasket, tilt housing cover	3HAC071520-001	Replace if damaged.
O-ring, G 1/4"	3HAC061327-060	Used on oil plug. Always replace when refitting oil plug.

Required tools and equipment

Equipment	Article number	Note
Brake release tool	3HAC081310-001	User instructions are enclosed with the tool.
Calibration toolbox, Axis Calibration	3HAC074564-001 (axes 1, 2, 3 and 4) 3HAC074119-001 (axes 5 and 6)	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.
Standard toolkit	-	Content is defined in section Standard toolkit on page 602 .

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. 	
	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 573 .
	If the robot is to be calibrated with fine calibration: Remove all external cable packages (DressPack) and tools from the robot.	

Continues on next page

Removing the gearbox

Use these procedures to remove the axis-6 gearbox.

Preparations before removing the axis-6 gearbox

	Action	Note
1	Decide which calibration routine to use, and take actions accordingly prior to beginning the repair procedure.	
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 safe-guarded space.	
3	Drain the gearbox.	See Draining the axis-6 gearbox on page 172 .
4	Remove all equipment fitted on the turning disc.	
5	Floor-mounted robot: Jog the robot into position: <ul style="list-style-type: none"> • Axis 1 = no significance • Axis 2 = suitable working position to replace axis-6 gearbox (for example: +25°) • Axis 3 = suitable working position to replace axis-6 gearbox (for example: +20°) • Axis 4 = 0° • Axis 5 = -55° • Axis 6 = 0° 	
6	Option Inverted (3317-1) Jog the robot into position: <ul style="list-style-type: none"> • Axis 1 = no significance • Axis 2 = suitable working position to replace axis-6 gearbox • Axis 3 = suitable working position to replace axis-6 gearbox • Axis 4 = 0° • Axis 5 = +55° • Axis 6 = 0° 	
7	 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 safe-guarded space.	

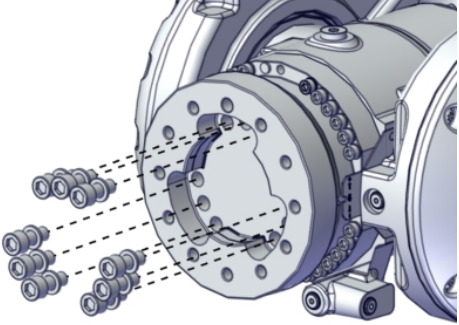
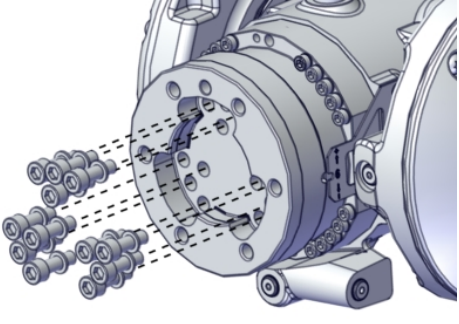
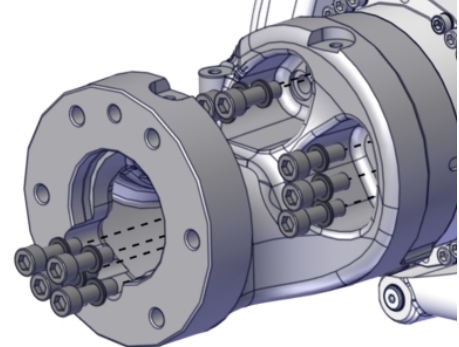
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5 Repair

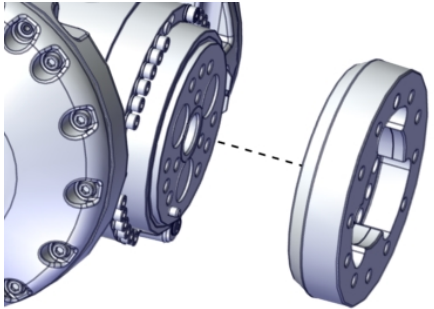
5.9.4 Replacing the axis-6 gearbox

Continued


Removing the turning disc

	Action	Note
1	Remove the screws and washers, that secure the turning disc.	<p>IRB 5710-110/2.3:</p>  <p>xx2100002167</p> <p>IRB 5710-90/2.7:</p>  <p>xx2100002265</p> <p>IRB 5710-90/2.3 LID, IRB 5710-70/2.7 LID:</p>  <p>xx2100002690</p>

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	Action	Note
2	Remove the turning disc.	 <p>xx2100002168</p>

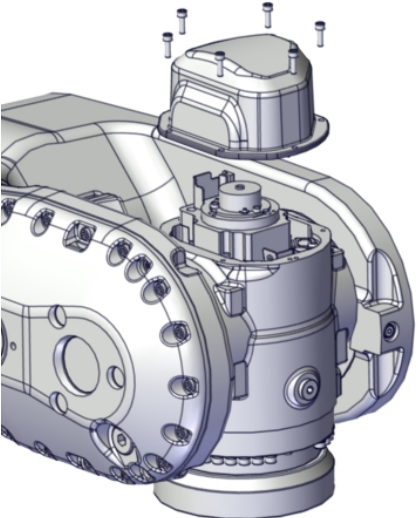
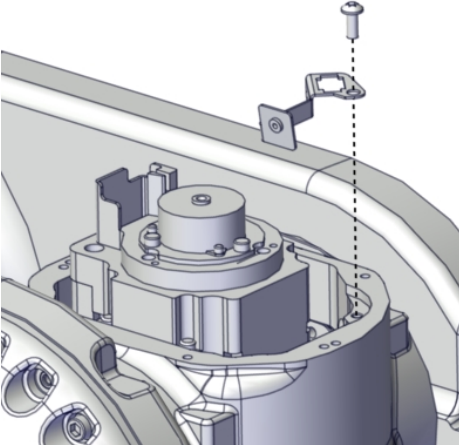
Disconnecting the axis-6 motor cables

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

5 Repair



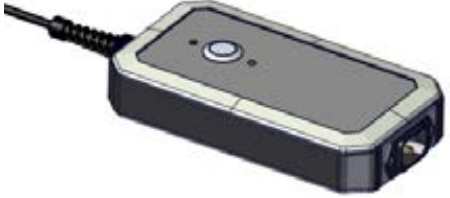
5.9.4 Replacing the axis-6 gearbox

Continued

	Action	Note
2	Unscrew the attachment screws and remove the motor cover.	 <p>xx200000376</p>
3	Remove the connector bracket.	 <p>xx200000375</p>
4	Disconnect the motor cables.	

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Removing the axis-6 gearbox

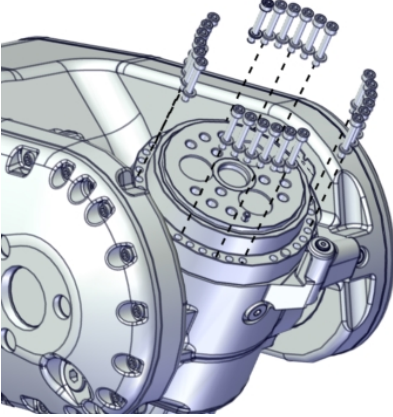
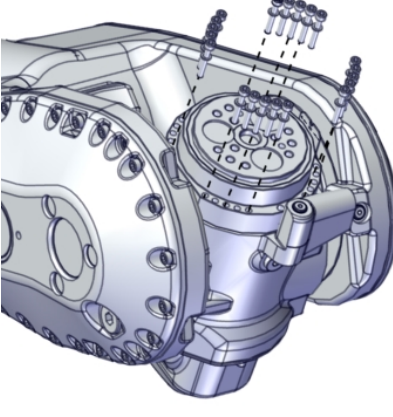
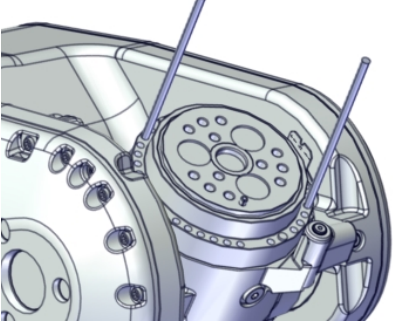

	Action	Note
1	<p>Release the brakes on the motor with the brake release tool.</p> <ol style="list-style-type: none"> 1 Make sure the brake release tool is turned off. 2 Connect the tool to the R2.MP6 connector. 3 Release the brakes by pressing the button on the tool. <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury.</p> <p>Read and follow enclosed user instructions for the tool.</p> <p> WARNING</p> <p>Electrical damage to the motor may occur if 24V is supplied to the motor connector for more than 30 seconds. Use the specified brake release tool to eliminate the risk.</p>	<p>Brake release tool: 3HAC081310-001 User instructions are enclosed with the tool.</p>  <p>xx210000666</p>

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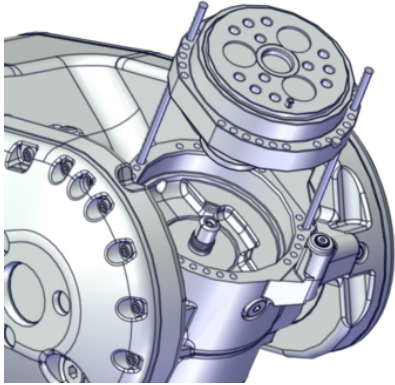
5 Repair

5.9.4 Replacing the axis-6 gearbox

Continued

	Action	Note
2	Unscrew the attachment screws that secure the axis-6 gearbox.	<p>IRB 5710-110/2.3, IRB 5710-90/2.3 LID:</p>  <p>xx2100002227</p> <p>IRB 5710-90/2.7, IRB 5710-70/2.7 LID:</p>  <p>xx2100002231</p>
3	Fit guide pins.	 <p>xx2100002228</p>
4	 <p>CAUTION</p> <p>Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.</p>	


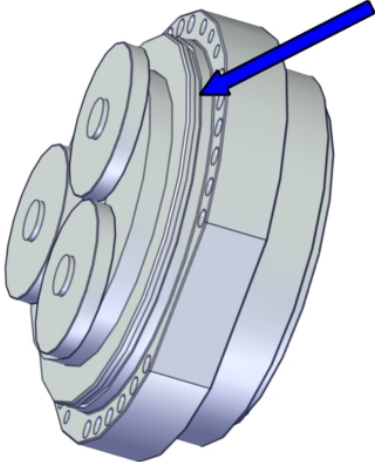
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	Action	Note
5	Remove the gearbox. If required fit two attachment screws and press out the gearbox.	 <p>xx2100002259</p>

Refitting the gearbox

Use these procedures to refit the gearbox.

Preparations before refitting the axis-6 gearbox

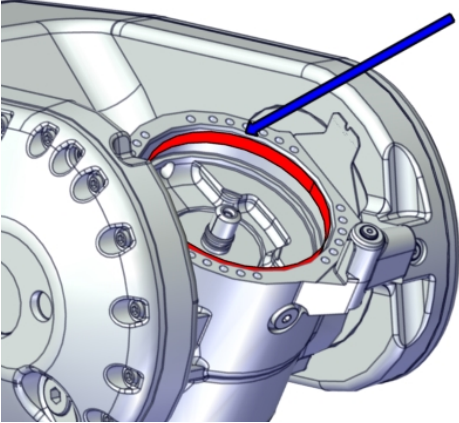
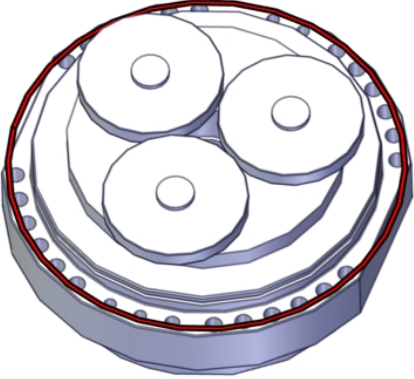
	Action	Note
1	 DANGER Make sure that all supplies for electrical power, hydraulic pressure, and air pressure are turned off.	
2	Wipe clean the contact surfaces of both gearbox and wrist from any contamination.	
3	Check the o-ring. Replace if damaged.	O-ring: 3HAC061327-070  <p>xx2100002258</p>

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5 Repair

5.9.4 Replacing the axis-6 gearbox


Continued

	Action	Note
4	Lubricate the contact surface inside the wrist with grease.	<p>P-80 rubber lubrication gel: 3HAC074427-001</p>  <p>xx2100002791</p>
5	<p><i>Protection type Foundry Plus:</i> Apply flange sealant on the surface shown in the figure.</p>	<p>Flange sealant: 3HAC041807-007</p>  <p>xx2100002233</p>

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	Action	Note
6	<p>Release the brakes on the motor with the brake release tool.</p> <ol style="list-style-type: none"> 1 Make sure the brake release tool is turned off. 2 Connect the tool to the R2.MP6 connector. 3 Release the brakes by pressing the button on the tool. <p> DANGER</p> <p>Handling the tool incorrectly will cause serious injury.</p> <p>Read and follow enclosed user instructions for the tool.</p> <p> WARNING</p> <p>Electrical damage to the motor may occur if 24V is supplied to the motor connector for more than 30 seconds. Use the specified brake release tool to eliminate the risk.</p>	<p>Brake release tool: 3HAC081310-001 User instructions are enclosed with the tool.</p>  <p>xx210000666</p>

Refitting the axis-6 gearbox



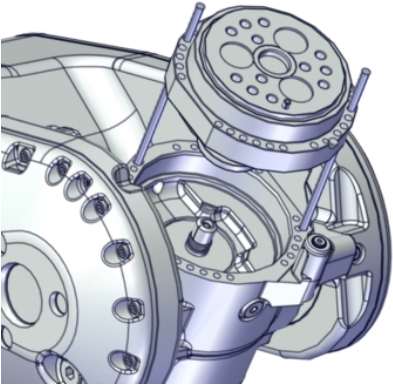
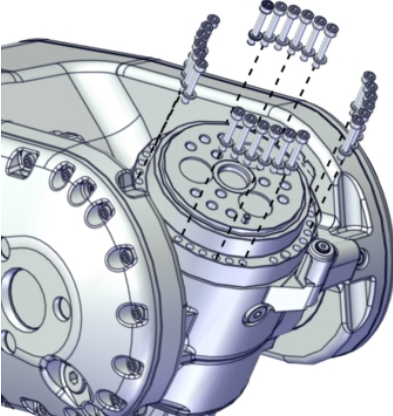
	Action	Note
1	<p> CAUTION</p> <p>Whenever parting/mating motor and gearbox, the gears may be damaged if excessive force is used.</p>	

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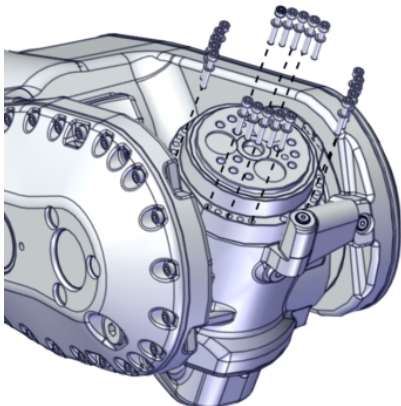
5 Repair

5.9.4 Replacing the axis-6 gearbox

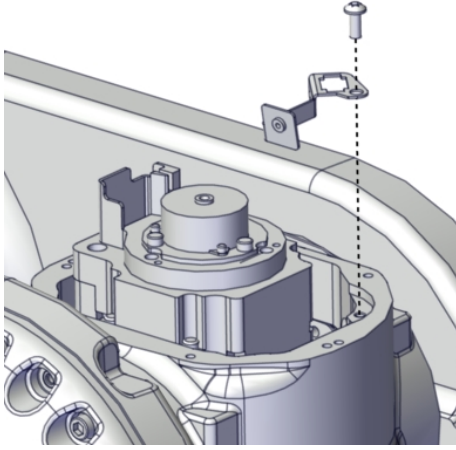
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	Action	Note
2	<p>Fit the gearbox to the wrist.</p> <p> CAUTION</p> <p>Be careful not to damage motor pinion or gears!</p> <p> Tip</p> <p>Verify that the oil plug is removed so the air can be pressed out during fitting of the gearbox.</p>	 <p>xx210002259</p>
3	<p>Secure the gearbox with its attachment screws.</p>	<p>Hex socket head cap screw: M6x40 12.9 Gleitmo 603+Geomet 500 (IRB 5710-110/2.3, IRB 5710-90/2.3 LID) M5x35 12.9 Lafre 2C2B/FC6.9 (IRB 5710-90/2.7, IRB 5710-70/2.7 LID)</p> <p>Washer: IRB 5710-110/2.3, IRB 5710-90/2.3 LID: 3HAC045621-001, 24 pcs IRB 5710-90/2.7, IRB 5710-70/2.7 LID: 3HAC045621-002, 20 pcs</p> <p>Tightening torque: see standard torque in Screw joints on page 598</p> <p>IRB 5710-110/2.3, IRB 5710-90/2.3 LID:</p>  <p>xx210002227</p> <p>IRB 5710-90/2.7, IRB 5710-70/2.7 LID:</p>

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	Action	Note
		 <p>xx2100002231</p>
4	Disconnect the brake release tool.	
5	Perform a leak-down test.	See Performing a leak-down test on page 184 .
6	Jog axis-5 to horizontal position.	
7	Refill oil in the gearbox.	See Filling oil into the axis-6 gearbox on page 174 .

Connecting the axis-6 motor cables

	Action	Note
1	Connect the motor cables. Connect in accordance with the markings on the connectors.	
2	Secure the power connector to the connector bracket with a screw.	Tightening torque: 1 Nm
3	Refit the connector bracket with the attached connectors.	<p>Torx pan head screw: M5x12 Stainless steel A2-70</p>  <p>xx2000000375</p>

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5 Repair

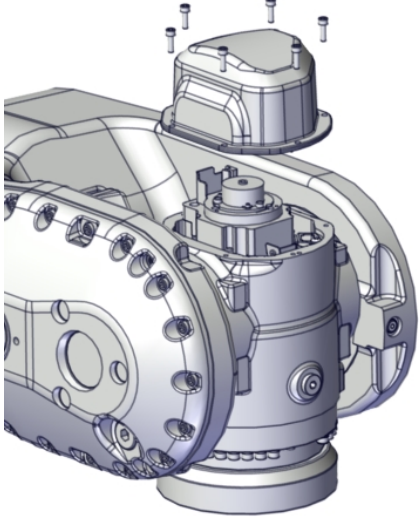
5.9.4 Replacing the axis-6 gearbox

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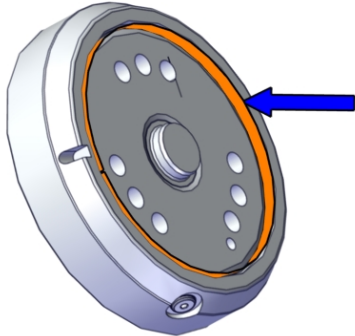
	Action	Note
4	Verify correct cable layout as shown in the figure.	 <p>xx2100001293</p>
5	Inspect the gasket. Replace if damaged.	<p>Gasket, tilt housing cover: 3HAC071520-001</p>  <p>xx2100001287</p>
6	 CAUTION When fitting the motor cover, make sure that none of the cables inside will be damaged.	

Continues on next page

5.9.4 Replacing the axis-6 gearbox
Continued

	Action	Note
7	Refit the motor cover.	<p>Hex socket head cap screw: M5x16 12.9 Lafre 2C2B/FC6.9 (6 pcs) Tightening torque: 4 Nm.</p>  <p>xx200000376</p>

Refitting the turning disc

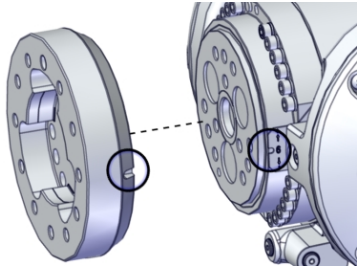
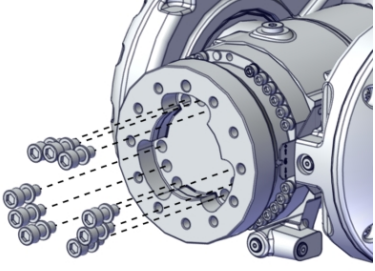
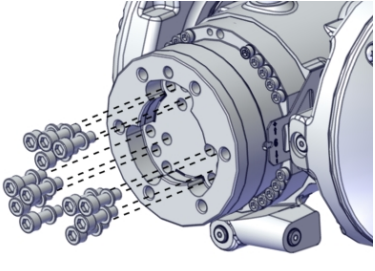
	Action	Note
1	Wipe clean the contact surfaces.	
2	<p><i>Protection type Foundry Plus:</i> Apply rust preventive to the surface shown in the figure.</p>	<p>Rust preventive: 3HAC034903-001 (Mercasol 3110 Waxcoat. Recommended drying time is 24h.)</p>  <p>xx2100002232</p>

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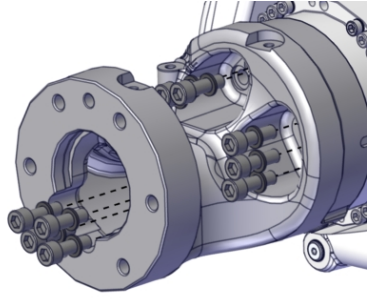
5 Repair

5.9.4 Replacing the axis-6 gearbox


Continued

	Action	Note
3	<p>Fit the turning disc to the wrist. Orient the disc according to the synchronization marks.</p>	 <p>xx2100002169</p>
4	<p>Secure the turning disc with its attachment screws and washers.</p>	<p>Hex socket head cap screw: M10x25 12.9 Gleitmo 603+Geomet 500 (IRB 5710-110/2.3, IRB 5710-90/2.3 LID) M8x25 12.9 Gleitmo 603+Geomet 500 (IRB 5710-90/2.7, IRB 5710-70/2.7 LID) Washer: 3HAB4233-1 (IRB 5710-110/2.3, IRB 5710-90/2.3 LID), 9 pcs IRB 5710-90/2.7, IRB 5710-70/2.7 LID: Steel 8.4x13x1.5 Tightening torque: see standard torque in Screw joints on page 598. IRB 5710-110/2.3:</p>  <p>xx2100002167</p> <p>IRB 5710-90/2.7:</p>  <p>xx2100002265</p> <p>IRB 5710-90/2.3 LID, IRB 5710-70/2.7 LID:</p>

Continues on next page

	Action	Note
		 <p>xx2100002690</p>

Concluding procedure

	Action	Note
1	Calibrate the robot.	See Calibration on page 563 .
2	 <p>DANGER</p> <p>Make sure all safety requirements are met when performing the first test run.</p>	

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6 Calibration

6.1 Introduction to calibration

6.1.1 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 572](#).

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.

6 Calibration

6.1.2 Calibration methods

6.1.2 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	The calibrated robot is positioned at calibration position. Standard calibration data is found on the SMB (serial measurement board) or EIB in the robot.	Axis Calibration
Absolute accuracy calibration (optional)	Based on standard calibration, and besides positioning the robot at synchronization position, the Absolute accuracy calibration also compensates for: <ul style="list-style-type: none">• Mechanical tolerances in the robot structure• Deflection due to load Absolute accuracy calibration focuses on positioning accuracy in the Cartesian coordinate system for the robot. Absolute accuracy calibration data is found on the SMB (serial measurement board) in the robot. A robot calibrated with Absolute accuracy has the option information printed on its name plate. To regain 100% Absolute accuracy performance, the robot must be recalibrated for absolute accuracy after repair or maintenance that affects the mechanical structure.	CalibWare

Brief description of calibration methods

Axis Calibration method

Axis Calibration is a standard calibration method for calibration of IRB 5710. 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 572](#).

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.

Continues on next page

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*.

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 603](#).

6 Calibration

6.1.3 When to calibrate

6.1.3 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 570](#). 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.

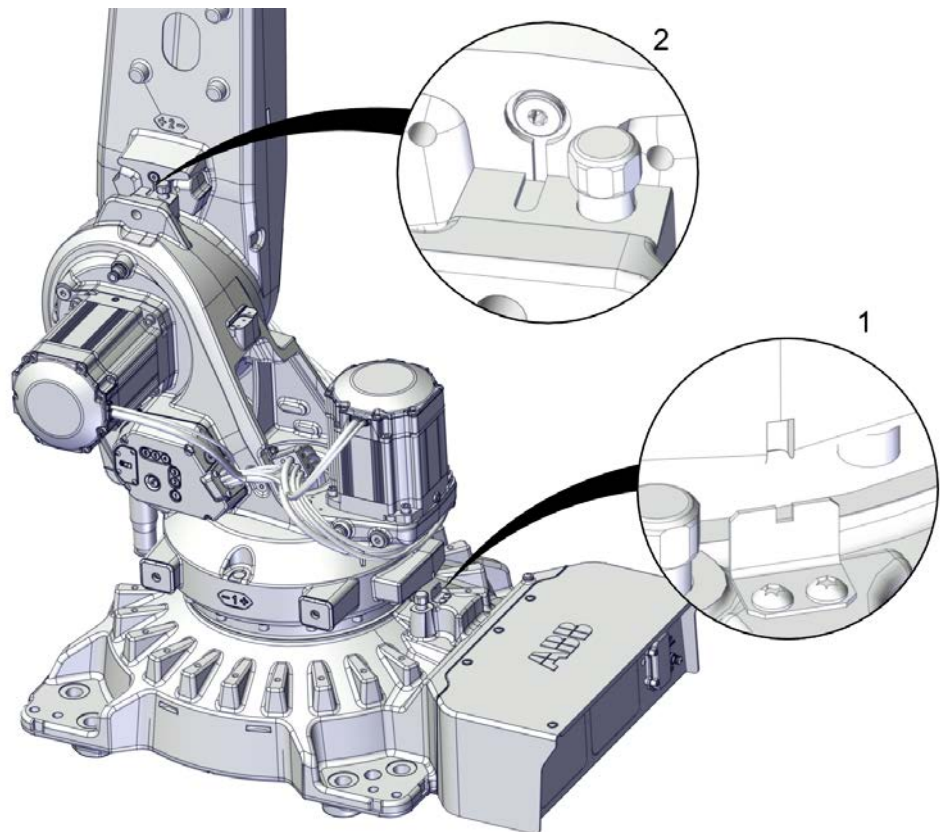
6.2 Synchronization marks and axis movement directions

6.2.1 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 5710



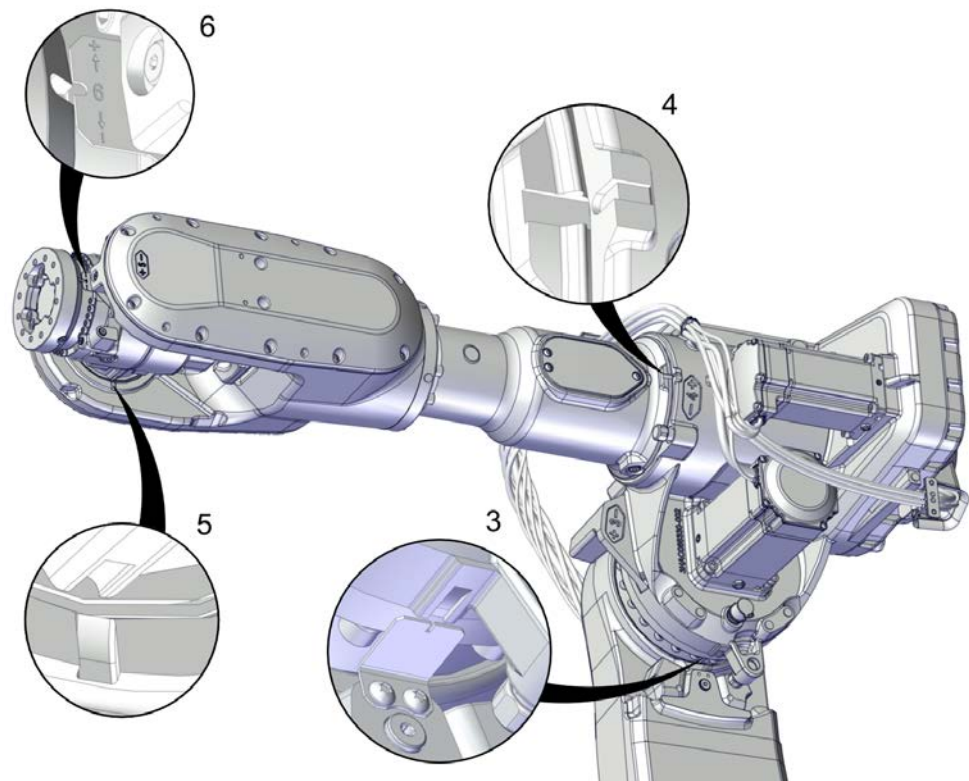
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6 Calibration

6.2.1 Synchronization marks and synchronization position for axes

Continued



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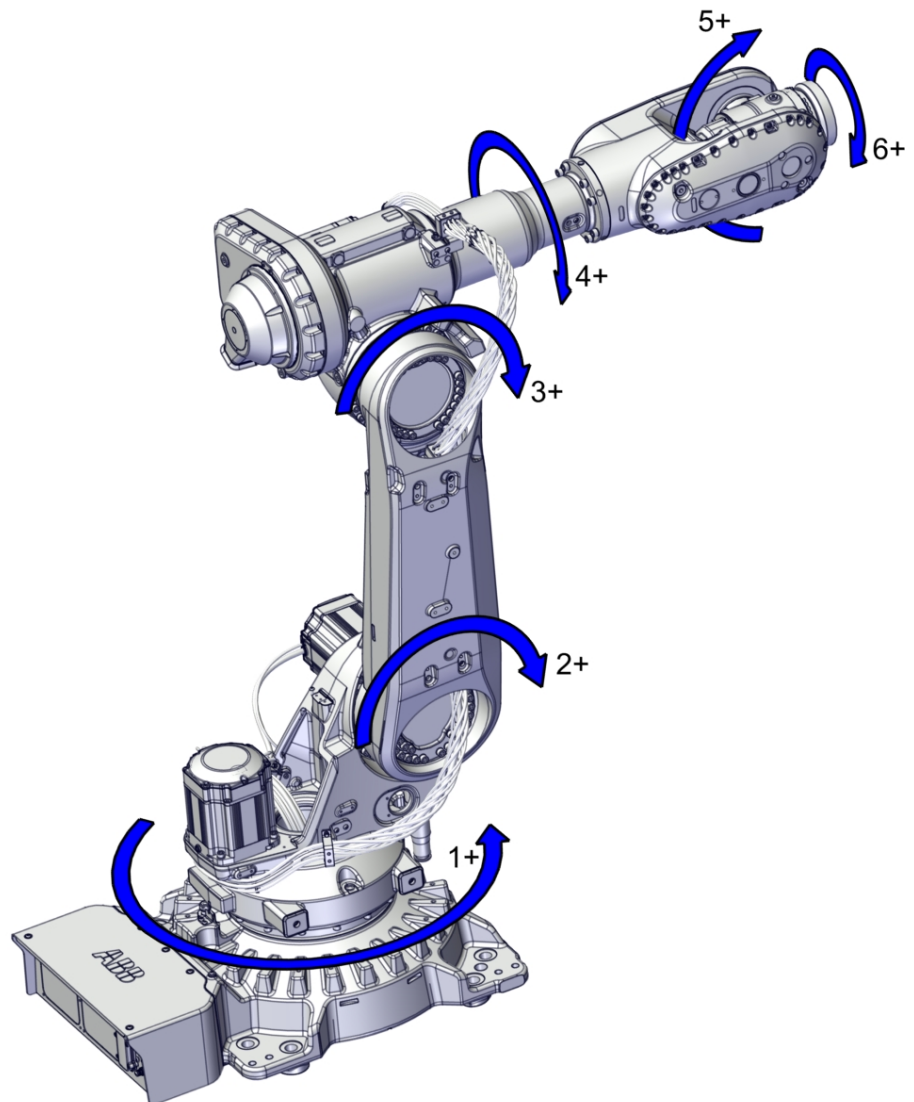
6.2.2 Calibration movement directions for all axes

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



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6 Calibration

6.3.1 Updating revolution counters on OmniCore robots

6.3 Updating revolution counters

6.3.1 Updating revolution counters on OmniCore robots

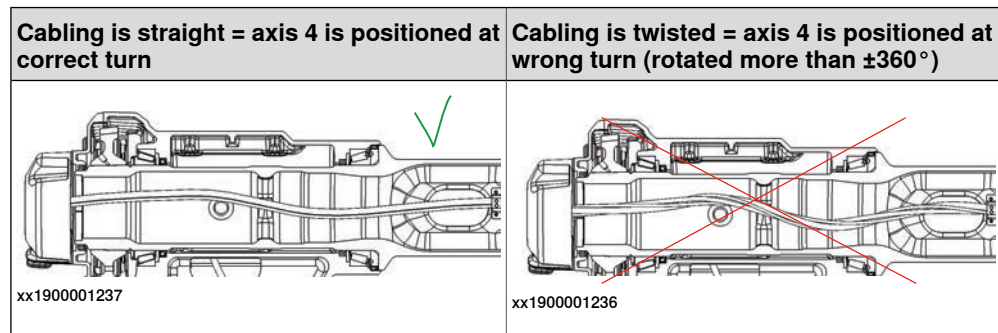
Introduction

This section describes how to do a rough calibration of each manipulator axis by updating the revolution counter for each axis, using the FlexPendant.

Mandatory check of cable harness prior to revolution counter update or calibration

Before updating the revolution counter or performing calibration, the status of the cable harness in the tubular shaft must be checked. There is a possibility that axis 4 has been rotated more than $\pm 360^\circ$ and therefore is positioned incorrectly (at wrong turn), causing the cable harness inside the tubular shaft to be twisted, which can damage the cabling.

Check the cable harness using a flashlight into the tubular shaft. Check that the cable harness is not twisted inside the tubular shaft.



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 567 .
3	When all axes are positioned, update the revolution counter.	Step 2 - Updating the revolution counter with the FlexPendant on page 570 .

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 .

Continues on next page

	Action
2	<p>Select Calibration from the menu. The Mechanical Units page displays a list of available mechanical units.</p> <p> Note</p> <p>This step is required only if you are not already in the Mechanical Unit page when you open Calibrate.</p> <p> Note</p> <p>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.</p>
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	<p>Tap Update. 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 and a confirmation window is displayed.</p>
9	Tap OK . The revolution counter for the selected axes is updated.
10	<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 586.</p>

6 Calibration

6.4.1 Description of Axis Calibration

6.4 Calibrating with Axis Calibration method

6.4.1 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.

A fixed calibration pin/bushing is installed on each robot axis at delivery.

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.

- 3 The axis position is stored in RobotWare with an active choice from the operator.

Continues on next page

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.



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

6 Calibration

6.4.1 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	*	*	*	*	-	*
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.

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.

How to calibrate an inverted robot

The IRB 5710 is calibrated inverted in factory, prior to shipping. To recalibrate an inverted robot, use either fine calibration or reference calibration routine.

6.4.2 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 toolbox, Axis Calibration	3HAC074564-001 (axes 1, 2, 3 and 4) 3HAC074119-001 (axes 5 and 6)	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.

Examining the calibration tool

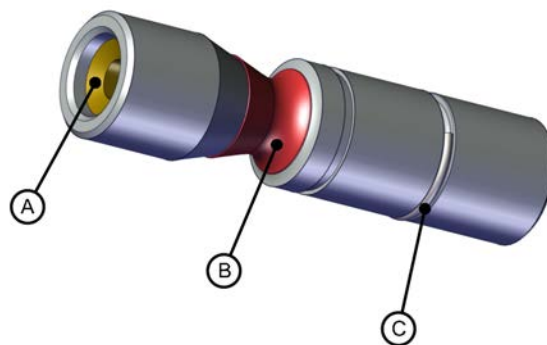
Check prior to usage

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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A	Tube insert
B	Plastic protection
C	Steel spring ring

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6 Calibration

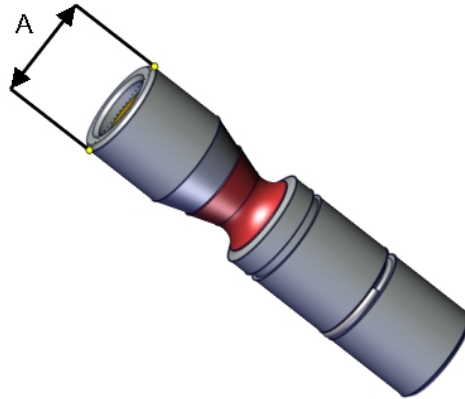
6.4.2 Calibration tools for Axis Calibration

Continued

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 $\varnothing 12g4$ mm, $\varnothing 8g4$ mm or $\varnothing 6g5$ mm (depending on calibration tool size).
- Straightness within 0.005 mm.



xx150000951

A	Outer diameter
---	----------------

Identifying the calibrating tools

It is possible to make the calibration tool identifiable with, for example, an RFID chip. The procedure of how to install an RFID chip is described below.



Note

The tool identifier is NOT delivered from ABB, it is a customized solution.

	Action	Note
1	<p>It is possible to use any RFID solution, with the correct dimensions. ABB has verified function on some suppliers fulfilling the requirements of NFC compatible devices (13.56 Mhz) according to ISO 14443 or ISO 15693.</p> <p>Note</p> <p>The maximum dimensions on the RFID chip must not exceed $\varnothing 7.9$ mm x 8.0 mm, $\varnothing 5.9$ mm x 8.0 mm or $\varnothing 3.9$ mm x 8.0 mm (depending on calibration tool size).</p>	
2	<p>There is a cavity on one end of the calibration tool in which the RFID chip can be installed.</p> <p>Install the RFID chip according to supplier instructions.</p> <p>Install the chip in flush with the tool end.</p>	

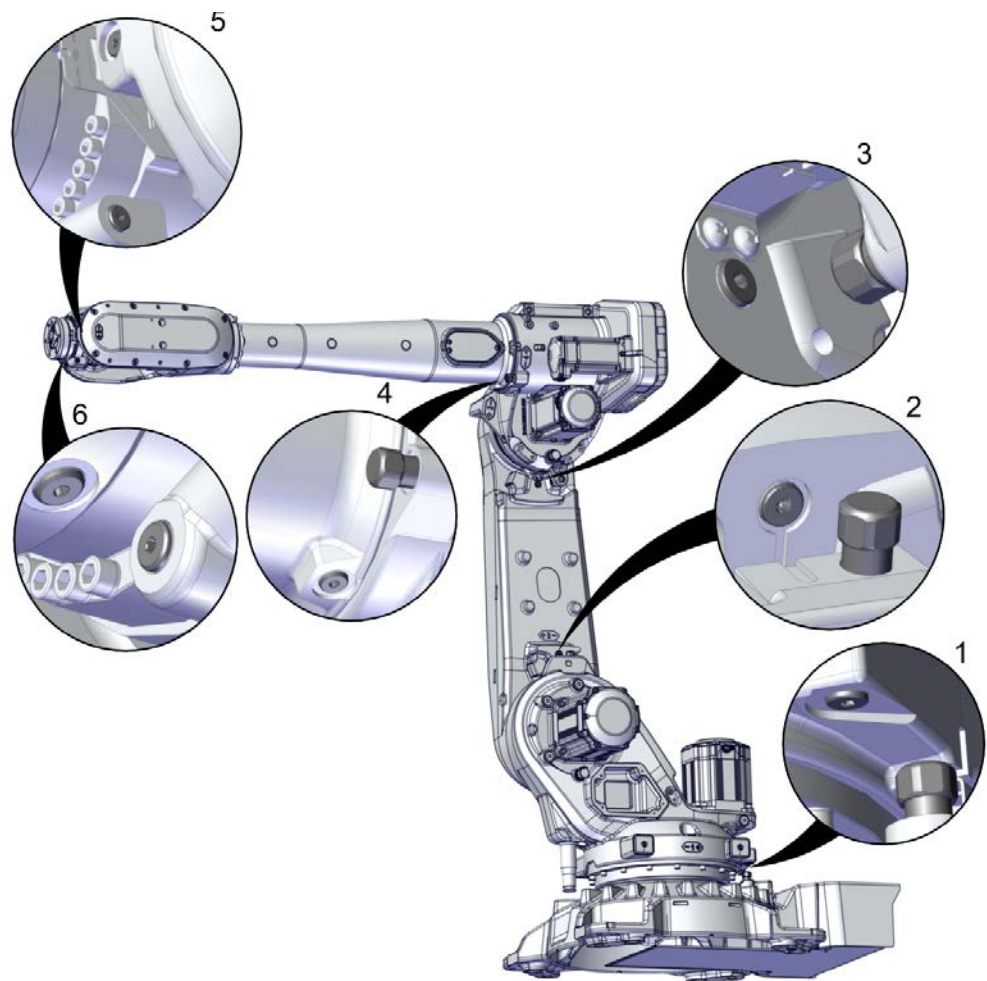
6.4.3 Installation locations for the calibration tools

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.



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6 Calibration

6.4.3 Installation locations for the calibration tools

Continued

Spare parts

When calibration is not being performed, a protective cover and an o-ring should always be installed on the fixed calibration pin as well as a protective plug, included a sealing, in the bushing. Replace damaged parts with new.

Spare part	Article number	Note
Protection cover and plug set	3HAC064875-001 (axes 1, 2, 3 and 4) 3HAC059487-001 (axes 5 and 6)	Contains replacement calibration pin covers and protective plugs for the bushings.

6.4.4 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 toolbox, Axis Calibration	3HAC074564-001 (axes 1, 2, 3 and 4) 3HAC074119-001 (axes 5 and 6)	Delivered as a set of calibration tools. Required if Axis Calibration is the valid calibration method for the robot.

Required consumables

Consumable	Article number	Note
Clean cloth	-	

Spare parts

Spare part	Article number	Note
Protection cover and plug set	3HAC064875-001 (axes 1, 2, 3 and 4) 3HAC059487-001 (axes 5 and 6)	Contains replacement calibration pin covers and protective plugs for the bushings.

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.

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 573](#).
- 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 protective cover from the fixed pin and the protection plug from the bushing, if any, and install the calibration tool.

Continues on next page

6 Calibration

6.4.4 Axis Calibration - Running the calibration procedure



Continued

- 7 The robot performs a measurement sequence by rotating the axis back and forth.
- 8 Remove the calibration tool and reinstall the protective cover on the fixed pin and the protection plug in the bushing, if any.
- 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.

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.	
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 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.	

Continues on next page

6.4.4 Axis Calibration - Running the calibration procedure

Continued

	Action	Note
5	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 579 .

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 569

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.

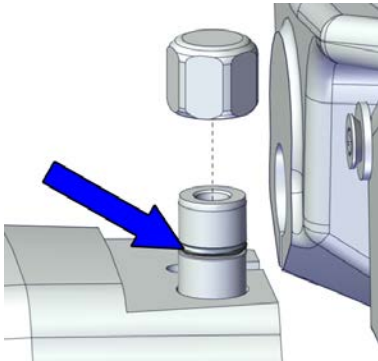
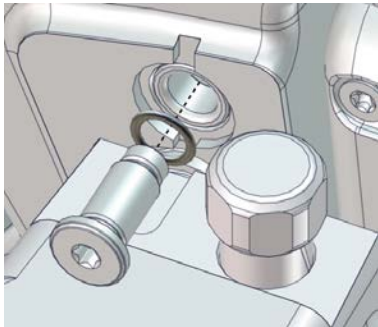
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6 Calibration

6.4.4 Axis Calibration - Running the calibration procedure

Continued

After calibration

	Action	Note
1	Check the o-ring on the fixed calibration pin. Replace if damaged or missing.	 <p>xx1600002102</p> <p>Protection cover and plug set: . 3HAC064875-001 (axes 1, 2, 3 and 4) 3HAC059487-001 (axes 5 and 6)</p>
2	Reinstall the protective cover on the fixed calibration pin on each axis, directly after the axis has been calibrated. Replace the cover with new spare part, if missing or damaged.	
	Reinstall the protective plug and sealing in the bushing on each axis, directly after the axis has been calibrated. Ensure that the sealing is not damaged. Replace the plug and the sealing with new spare part, if missing or damaged.	 <p>xx1500000952</p> <p>Protection cover and plug set: . 3HAC064875-001 (axes 1, 2, 3 and 4) 3HAC059487-001 (axes 5 and 6)</p>

6.4.5 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) Download new calibration values to SafeMove. Use Visual SafeMove in RobotStudio.
- 12 (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 583](#)).

Example "Adjust axis 4":

- 1 Create a backup.

Continues on next page

6 Calibration

6.4.5 Reference calibration

Continued

- 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.

6.5 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 586 .
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 567 .
3	Write down the values on a new label and stick it on top of the calibration label. The label is located on the lower arm.	

6 Calibration

6.6 Checking the synchronization position

6.6 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 **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	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]] \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 567 and Updating revolution counters on page 570 .

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 567 and Updating revolution counters on page 570 .

7 Troubleshooting

7.1 Introduction to troubleshooting

Introduction

The product manual and the circuit diagram contains information that can be good when troubleshooting.

For OmniCore, all event logs from the software can be seen on the FlexPendant, or in *Technical reference manual - Event logs for RobotWare 7*.

Make sure to read through the section [Safety on page 15](#) before starting.

Troubleshooting strategies

- 1 Isolate the fault to pinpoint the cause of the problem from consequential problems.
- 2 Divide the fault chain in two.
- 3 Check communication parameters and cables.
- 4 Check that the software version is compatible with the hardware.

Work systematically

- 1 Take a look around to make sure that all screws, connectors, and cables are secured, and that the robot and other parts are clean, not damaged, and correctly fitted.
- 2 Replace one thing at a time.
- 3 Do not replace units randomly.
- 4 Make sure that there are no loose screws, turnings, or other unexpected parts remaining after work has been performed.
- 5 When the work is completed, verify that the safety functions are working as intended.

Keep a track of history

- Make a historical fault log to keep track of problems over time.
- Consult those working with the robot when the problem occurred.

Basic scenarios

What to look for during troubleshooting depends on when the fault occurred. Was the robot recently installed or was it recently repaired? The following table gives hints on what to look for in specific situations.

The robot has recently been installed	Check: <ul style="list-style-type: none"> • the configuration files • connectors • options and their configuration • changes in the robot working space/movements.
---------------------------------------	--

Continues on next page

7 Troubleshooting

7.1 Introduction to troubleshooting

Continued

The robot has recently been repaired	Check: <ul style="list-style-type: none">• all connections to the replaced part• power supplies• that the correct part has been fitted• the last repair documents.
The robot recently had a software upgrade	Check: <ul style="list-style-type: none">• software versions• compatibilities between hardware and software• options and their configuration
The robot has recently been moved from one site to another (an already working robot)	Check: <ul style="list-style-type: none">• connections• software versions

7.2 Oil and grease stains on motors and gearboxes

Description

The area surrounding the motor or gearbox shows signs of oil leaks. This can be at the base, closest to the mating surface, or at the furthest end of the motor at the resolver.

Consequences

Besides the dirty appearance, in most cases there are no serious consequences if the leaked amount of oil is very small.


Possible causes

The symptom can be caused by:

- Leakage of rust preventives or mounting grease. This should be wiped off.
- Leaking sealing between gearbox and motor.
- Gearbox overfilled with oil.
- Gearbox oil too hot.

Recommended actions

The following actions are recommended:

	Action	Information
1	 CAUTION Allow hot parts to cool down.	
2	Wipe off the oil or grease, see Cleaning the IRB 5710 on page 179 . Monitor the robot over time to see if new oil or grease occurs.	If the oil spill is small, this step is sufficient.
3	Check the gearbox oil level.	
4	Too hot gearbox oil may be caused by: <ul style="list-style-type: none"> • Incorrect oil quality or level. • The robot work cycle runs a specific axis too hard. Investigate whether it is possible to program small "cooling periods" into the application. • Overpressure created inside gearbox. 	Robots performing certain, extremely heavy duty work cycles may be fitted with vented oil plugs. These are not fitted to normal duty robots, but can be purchased from your local ABB representative.
5	Inspect all sealings and gaskets between motor and gearbox. Replace broken parts.	

7 Troubleshooting

7.3 Mechanical noise or dissonance

7.3 Mechanical noise or dissonance

Description

Mechanical noise or dissonance that has not been observed before can indicate problems in bearings, motors, gearboxes, or similar. Be observant of changes over time.

A faulty bearing often emits scraping, grinding, or clicking noises shortly before failing.

Consequences

Failing bearings cause the path accuracy to become inconsistent, and in severe cases, the joint can seize completely.

Possible causes

The symptom can be caused by:


- Worn bearings.
- Contaminations have entered the bearing grooves.
- Loss of lubrication in bearings.
- Loose heat sinks, fans, or metal parts.

If the noise is emitted from a gearbox, the following can also apply:

- Overheating.

Recommended actions

The following actions are recommended:

	Action	Information
1	 CAUTION Allow hot parts to cool down.	
2	Verify that the service is done according to the maintenance schedule.	
3	If a bearing is emitting the noise, determine which one and make sure that it has sufficient lubrication.	
4	If possible, disassemble the joint and measure the clearance.	
5	Bearings inside motors are not to be replaced individually, but the complete motor is replaced.	
6	Make sure the bearings are fitted correctly.	
7	Tighten the screws if a heat sink, fan, or metal sheet is loose.	

Continues on next page

	Action	Information
8	Too hot gearbox oil may be caused by: <ul style="list-style-type: none">• Incorrect oil quality or level.• The robot work cycle runs a specific axis too hard. Investigate whether it is possible to program small "cooling periods" into the application.• Overpressure created inside gearbox.	Robots performing certain, extremely heavy duty work cycles may be fitted with vented oil plugs. These are not fitted to normal duty robots, but can be purchased from your local ABB representative.

7 Troubleshooting

7.4 Manipulator collapses on power down

7.4 Manipulator collapses on power down

Description

The manipulator is able to work correctly while Motors ON is active, but when Motors OFF is active, one or more axes drops or collapses under its own weight. The holding brakes (normally one in each motor), is not able to hold the weight of the manipulator arm.

Consequences

For a heavy robot, the collapse can cause severe injury to personnel working in the area or severe damage to the robot and/or surrounding equipment.
For a small robot, the collapse can cause injury to personnel working close to the robot or damage to the robot and/or surrounding equipment.

Possible causes

The symptom can be caused by:

- Faulty brake.
 - Faulty power supply to the brake.
-

Recommended actions

The following actions are recommended:

	Action	Information
1	Determine which motor(s) causes the robot to collapse.	
2	Check the brake power supply to the collapsing motor during the Motors OFF state.	See the circuit diagram.
3	Remove the resolver or resolver cover of the motor to see if there are any signs of oil leaks.	If found faulty, the motor must be replaced as a complete unit.
4	Remove the motor from the gearbox to inspect it from the drive side.	If found faulty, the motor must be replaced as a complete unit.

8 Decommissioning

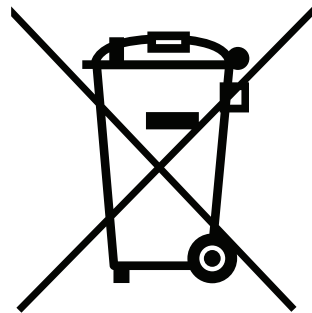
8.1 Environmental information

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	Wrist house, tilt house, covers, connection box, motor housing
Batteries, Lithium	Serial measurement board
Brass, zinc alloys	Calibration protection cap and plug and couplings, connectors and nuts in cable harness
Cast iron/nodular iron	Structural parts (base, frame, lower arm, arm house, tube shaft, process turning disc)
Circuit boards	Serial measurement unit, brake release unit
Copper	Cables, motor wiring, pins, sockets
Dysprosium	Motor magnets
Lithium	Battery

Continues on next page

8 Decommissioning

8.1 Environmental information

Continued

Material	Example application
Neodymium	Motor magnets
Nickel	Coating of turning disc, calibration caps, quick coupling, connectors, pins, sockets
Oil, grease	Gearboxes
Steel	Turning disc, gears, shafts, bearings, motors, brackets, screws, washers
Thermo plastics	Protection tubes, protection covers, plugs, cable jackets, cable filler, connectors
Thermo setting polymers	Motor winding, cable jackets, hoses, clamps, dampers, o-rings, sealings, gaskets

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.

9 Reference information

9.1 Introduction

General

This chapter includes general information, complementing the more specific information in the different procedures in the manual.

9 Reference information

9.2 Applicable standards

9.2 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

Region specific standards and regulations

Standard	Description
ANSI/RIA R15.06	Safety requirements for industrial robots and robot systems
	Safety standard for robots and robotic equipment
CAN/CSA Z 434-14	Industrial robots and robot Systems - General safety requirements
EN ISO 10218-1	Robots and robotic devices — Safety requirements for industrial robots — Part 1: Robots

9.3 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	

9 Reference information

9.4 Screw joints

9.4 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

Stainless steel screws

Stainless steel screws should be secured by hand at least 2 turns before using an electric screwdriver.

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.
-

Continues on next page

- 3 Screw dimensions of M8 or larger must be tightened with a torque wrench. Screw dimensions of M6 or smaller may be tightened without a torque wrench if this is done by trained and qualified personnel.

Lubricant	Article number
Molykote 1000 (molybdenum disulphide grease)	3HAC042472-001
Molykote P1900 (molybdenum disulphide grease)	3HAC070875-001

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

Continues on next page

9 Reference information

9.4 Screw joints

Continued

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
M12	82	115	140
M16	200	290	340
M20	400	560	670
M24	680	960	1150

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

9.5 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.	

9 Reference information

9.6 Standard toolkit

9.6 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	Ring-open-end spanner 8-19 mm	
1	Socket head cap 2.5-17 mm	
1	Torx socket no: 10-30	
1	Box spanner set	
1	Torque wrench 10-100 Nm	
1	Torque wrench 75-400 Nm	
1	Ratchet head for torque wrench 1/2	
2	Hexagon-headed screw M10x100	
1	Hexagon-headed screw M16x90	
1	Hex bit socket head cap no. 14 socket 40 mm L=100 mm	
1	Hex bit socket head cap no. 14 socket 40 mm L=20 mm	To be shortened to 12 mm
1	Hex bit socket head cap no. 6 socket 40 mm L=145 mm	
1	Hex bit socket head cap no. 6 socket 40mm bit L=220 mm	
1	Plastic mallet	

9.7 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 602](#), and of special tools, listed directly in the instructions and also gathered in this section.

Special tools



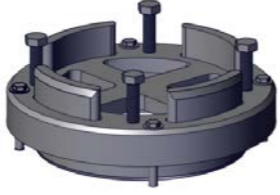

Note

If the replacing procedure is not listed in the table below, only standard tools are needed for the procedure.

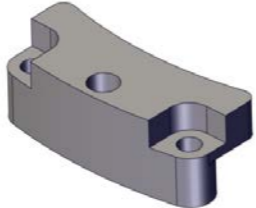




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9 Reference information

9.7 Special tools

Tools and equipment with spare part number: (These tools can be ordered from ABB)			Axis-1 motor	Axis-2 motor	Axis-3 motor	Axis-4 motor	Axis-5 motor	Axis-6 motor	Axis-1 cassette sealing	Axis-4 cassette sealing (including arm house cover)	Axis-1 gearbox	Axis-2 gearbox	Axis-3 gearbox	Axis-6 gearbox	Wrist
Removal/refitting tools															
3HAC079880-001	Replacement tool for cassette sealing	 xx2100002288							1		1				
3HAC079878-001	Replacement tool for arm house cover	 xx2100002289								1					
3HAC14631-1	Removal tool motor M12			2	2								2		
3HAC14972-1	Removal tool motor M10					2	2								
3HAC080346-001	Removal tool motor M8							2							
-	Screws M8x75, fully threaded													2	
-	Screws M10x60, fully threaded												2		
3HAC12342-1	Bits extender			1	1	1	1				1	1			
3HAC029090-001	Bit holder										1				
Lifting accessories															
-	Roundsling, 1 m											1			1
-	Roundsling, 1.5 m											1	1		
3HAC15607-1	Lifting accessory set										1				

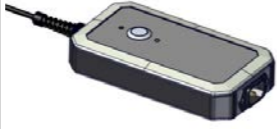
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Tools and equipment with spare part number: (These tools can be ordered from ABB)			Axis-1 motor	Axis-2 motor	Axis-3 motor	Axis-4 motor	Axis-5 motor	Axis-6 motor	Axis-1 cassette sealing	Axis-4 cassette sealing (including arm house cover)	Axis-1 gearbox	Axis-2 gearbox	Axis-3 gearbox	Axis-6 gearbox	Wrist
3HAC081565-001	Lifting adapter	 xx220000205									1				
3HAC081585-001	Lifting accessory for gear	 xx2100002415										1	1		
3HAC15534-1	Lifting accessory, motor			1								1			
-	Fender washer										1	1	1		
3HAC15556-1	Lifting accessory (chain)	 xx1200001241		1							1	1	1		
3HAC16131-1	Lifting eye	 xx1200001242									1	1	1		
-	Lifting shackle	 xx1200001243										1			
Guide pins															
3HAC080345-001	Guide pin, M6x150							2							




Continues on next page

9 Reference information

9.7 Special tools

Tools and equipment with spare part number: (These tools can be ordered from ABB)		Axis-1 motor	Axis-2 motor	Axis-3 motor	Axis-4 motor	Axis-5 motor	Axis-6 motor	Axis-1 cassette sealing	Axis-4 cassette sealing (including arm house cover)	Axis-1 gearbox	Axis-2 gearbox	Axis-3 gearbox	Axis-6 gearbox	Wrist
3HAC15520-2	Guide pin, M8x150				2	2								
3HAC15521-2	Guide pin, M10x150		2	2							2	2		
3HAC13056-2	Guide pin, M12x150									2	1			
3HAC13056-3	Guide pin, M12x200										1			
3HAC13120-2	Guide pin, M16x150										1			
3HAC13120-3	Guide pin, M16x200										1			
Brake release														
3HAC081310-001	Brake release tool			1	1	1	1	1	1		1	1	1	1
		<small>xx210000666</small>												
Calibration tools														
3HAC074564-001 (axes 1, 2, 3 and 4) 3HAC074119-001 (axes 5 and 6)	Calibration toolbox, Axis Calibration	1	1	1	1	1	1			1	1	1	1	
Adjustment and fixing tools														
3HAB7887-1	Rotation tool	1	1	1	1	1	1			1	1			
3HAC080331-001	Adjustment tool for gear										1	1		
-	Lock screw, M16x120		1											
3HAC15535-1	Support legs									4				
Special tools for inverted robot														

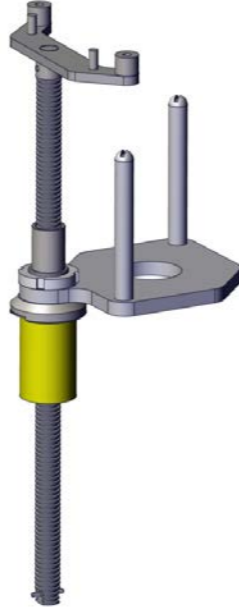
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Tools and equipment with spare part number: (These tools can be ordered from ABB)			Axis-1 motor	Axis-2 motor	Axis-3 motor	Axis-4 motor	Axis-5 motor	Axis-6 motor	Axis-1 cassette sealing	Axis-4 cassette sealing (including arm house cover)	Axis-1 gearbox	Axis-2 gearbox	Axis-3 gearbox	Axis-6 gearbox	Wrist
3HAC073537-001	Lifting and turning tool	 xx1700000761									1	1			
3HAC058825-001	Fork lift accessory set	 xx2200000207									1	1			
3HAC061881-001	Oil level gauge	 xx16000002093	1												
3HAC081586-001	Lifting accessory, motor (inverted robot)		1												

Continues on next page

9 Reference information

9.7 Special tools

Tools and equipment with spare part number: (These tools can be ordered from ABB)		Axis-1 motor	Axis-2 motor	Axis-3 motor	Axis-4 motor	Axis-5 motor	Axis-6 motor	Axis-1 cassette sealing	Axis-4 cassette sealing (including arm house cover)	Axis-1 gearbox	Axis-2 gearbox	Axis-3 gearbox	Axis-6 gearbox	Wrist
	 <p>xx2100002816</p>													

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9.8 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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Index

A

Absolute Accuracy, calibration, 565
 allergenic material, 26
 aluminum
 disposal, 593
 ambient humidity
 operation, 39
 storage, 39
 ambient temperature
 operation, 39
 storage, 39
 assembly instructions, 49
 assessment of hazards and risks, 26
 axis-6 gearbox
 changing oil, 171
 replacing, 545
 axis-6 motor
 replacing, 400
 axis-5 gearbox
 changing oil, 166
 axis-5 motor
 replacing, 386
 axis-4 gearbox
 changing oil, 161
 axis-4 motor
 replacing, 371
 axis-3 gearbox
 changing oil, 156
 replacing, 508
 axis-3 motor
 replacing, 358
 axis-2 gearbox
 changing oil, 150
 replacing, 470
 axis-2 motor
 replacing, 341
 axis-1 cassette sealing
 replacing, 194
 axis-1 gearbox
 changing oil, 139
 replacing, 416
 axis-1 motor
 replacing, 319
 Axis Calibration, 572
 calibration tool
 article number, 575, 579
 examining, 575
 installation position, 577
 overview of method, 572
 procedure on FlexPendant, 579
 protective cover and protection plug, 577, 579

B

base plate, 53
 batteries
 disposal, 593
 Brake power supply, faulty, 592
 brake release unit
 replacing, 306
 brake releasing, 71
 brakes
 testing function, 33

C

cabinet lock, 27
 cable harness
 inspecting, 111
 refitting, 281
 removing, 260
 cabling between robot and controller, 92
 calibrating
 robot, 572
 roughly, 570
 calibrating robot, 572
 calibration
 Absolute Accuracy type, 564
 rough, 570
 standard type, 564
 verification, 585
 when to calibrate, 566
 calibration, Absolute Accuracy, 565
 calibration manuals, 565
 calibration marks, 567
 calibration position
 jogging to, 586
 scales, 567
 calibration scales, 567
 CalibWare, 564
 carbon dioxide extinguisher, 27
 cassette sealing axis 4
 replacing, 209
 cast iron
 disposal, 593
 changing oil
 axis-6 gearbox, 171
 axis-5 gearbox, 166
 axis-4 gearbox, 161
 axis-3 gearbox, 156
 axis-2 gearbox, 150
 axis-1 gearbox, 139
 circuit boards
 disposal, 593
 cleaning, 179
 climbing on robot, 29
 connecting the robot and controller, cabling, 92
 copper
 disposal, 593

D

damaged bearings, 590
 damper
 inspecting, 107
 dimensions
 robot, 76
 direction of axes, 569
 dysprosium
 disposal, 593

E

environmental information, 593
 EPS, 90
 equipment, robot, 76
 ESD
 damage elimination, 47
 sensitive equipment, 47
 expected life, 101
 extended working range, 90
 extended working range, axis 1, 90
 extra equipment, 76

F

- faulty brake, 592
- fire extinguishing, 27
- fitting, equipment, 76
- FlexPendant
 - jogging to calibration position, 586
 - MoveAbsJ instruction, 586
 - updating revolution counters, 570
- foundation
 - requirements, 39

G

- gearbox
 - inspecting oil level axis 1, 113
 - inspecting oil level axis 2, 119
 - inspecting oil level axis 3, 123
 - inspecting oil level axis 4, 127
 - inspecting oil level axis 5, 130
 - inspecting oil level axis 6, 133
- gearboxes
 - location of, 137
- Gravity Beta, 73
- grease, 29
 - disposal, 594

H

- hanging
 - installed hanging, 26
- hazard levels, 17
- hazardous material, 593
- height
 - installed at a height, 26
- hot gearbox oil, 589–590
- hot surfaces, 29
- HRA, 26
- humidity
 - operation, 39
 - storage, 39

I

- information labels
 - inspecting, 104
- inspecting
 - cable harness, 111
 - damper, 107
 - information labels, 104
 - mechanical stop, 109
 - motor seal, 102
- inspecting oil levels
 - axis 1, 113
 - axis 2, 119
 - axis 3, 123
 - axis 4, 127
 - axis 5, 130
 - axis 6, 133
- installation
 - equipment, 76
- installation procedure, 52
- instructions for assembly, 49
- integrator responsibility, 26
- intervals for maintenance, 99
- inverted mounting, 73

L

- labels
 - robot, 19
- leak-down test, 184

- leaking sealing, 589
- lifting
 - robot, 60, 62
 - robot down, 191
- lifting accessory, 601
- limitation of liability, 15
- lithium
 - disposal, 593
- Lithium
 - disposal, 593
- loads on foundation, 37
- lock and tag, 27
- lubricants, 29
- lubrication
 - amount in gearboxes, 137
 - type of lubrication, 137

M

- magnesium
 - disposal, 594
- maintenance intervals, 99
- maintenance schedule, 99
- mechanical stop
 - inspecting, 109
- motor seal
 - inspecting, 102
- mounting, equipment, 76
- movable mechanical stop, 87
- MoveAbsJ instruction, 586

N

- national regulations, 26
- negative directions, axes, 569
- neodymium
 - disposal, 594
- nodular iron
 - disposal, 593
- noise, 590

O

- oil, 29
 - amount in gearboxes, 137
 - disposal, 594
 - type of oil, 137
- oil leaks, 589
- oil level
 - gearbox axis 1, 113
 - gearbox axis 2, 119
 - gearbox axis 3, 123
 - gearbox axis 4, 127
 - gearbox axis 5, 130
 - gearbox axis 6, 133
- operating conditions, 39
- option
 - Extended working range, 90
- original spare parts, 15
- overfilled gearbox, 589

P

- pedestal
 - installed on pedestal, 26
- personnel
 - requirements, 16
- positive directions, axes, 569
- PPE, 16
- product standards, 596
- protection classes, 40

protection type, 40
 protective equipment, 16
 protective wear, 16

R

recycling, 593
 refitting
 cable harness, 281
 regional regulations, 26
 release brakes, 32
 removing
 cable harness, 260
 replacements, report, 183
 replacing
 axis-6 gearbox, 545
 axis-6 motor, 400
 axis-5 motor, 386
 axis-4 motor, 371
 axis-3 gearbox, 508
 axis-3 motor, 358
 axis-2 gearbox, 470
 axis-2 motor, 341
 axis-1 cassette sealing, 194
 axis-1 gearbox, 416
 axis-1 motor, 319
 brake release unit, 306
 cassette sealing axis 4, 209
 SMB battery, 176
 SMB unit, 313
 turning disc, 253
 wrist, 235
 xx, 51, 61
 report replacements, 183
 requirements on foundation, 39
 responsibility and validity, 15
 restricting
 working range axis 1, 90
 revolution counters
 storing on FlexPendant, 570
 updating, 570
 risk of burns, 29
 robot
 dimensions, 76
 equipment, fitting, 76
 labels, 19
 lifting, 60, 62
 lifting down from inverted position, 191
 protection class, 40
 protection types, 40
 symbols, 19
 technical data, 37
 working range, 41

S

safety
 brake testing, 33
 ESD, 47
 fire extinguishing, 27
 release robot axes, 32
 signals, 17
 signals in manual, 17
 symbols, 17
 symbols on robot, 19
 test run, 95
 safety devices, 27
 safety signals
 in manual, 17

safety standards, 596
 scales on robot, 567
 schedule of maintenance, 99
 screw joints, 598
 securing, robot, 67
 securing the robot to foundation, attachment screws, 67
 signals
 safety, 17
 SMB battery
 replacing, 176
 SMB unit
 replacing, 313
 standards, 596
 ANSI, 596
 CAN, 596
 steel
 disposal, 594
 storage conditions, 39
 symbols
 safety, 17
 synchronization position, 570
 sync marks, 567
 system integrator requirements, 26
 system parameter
 Gravity Beta, 73

T

taking
 robot down, 191
 technical data
 robot, 37
 temperatures
 operation, 39
 storage, 39
 testing
 brakes, 33
 thermo plastics
 disposal, 594
 thermo setting polymers
 disposal, 594
 tilted mounting, 73
 torques on foundation, 37
 troubleshooting
 safety, 34
 turning disc
 replacing, 253
 turning radius, 45

U

upcycling, 593
 updating revolution counters, 570
 users
 requirements, 16

V

validity and responsibility, 15
 verifying calibration, 585

W

weight, 37
 axis-1 gearbox, 436, 438, 440, 489–490, 492, 530
 axis-1 motor, 326, 329, 331, 333, 348, 351, 364, 366,
 377, 380, 392, 394, 406, 431, 458, 483, 499, 525, 536
 base, 439
 complete arm system, 434, 448
 robot, 64, 68, 192, 421, 425, 466, 475
 upper and lower arm, 477, 486, 494

upper arm, complete, 520, 534
wrist, 242
working range, 46
robot, 41
wrist
replacing, 235

X
xx
replacing, 51, 61

Z
zero position
checking, 586