

Trace back information:
Workspace 21C version a1
Checked in 2021-09-23
Skribenta version 5.4.005

Product specification

IRB 6790 - 235/2.65

IRB 6790 - 205/2.80

IRC5

Document ID: 3HAC064168-001

Revision: A

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Overview of this product specification

About this product specification

It describes the performance of the manipulator or a complete family of manipulators in terms of:

- The structure and dimensions prints
- The fulfillment of standards, safety and operating requirements
- The load diagrams, mounting or extra equipment, the motion and the robot reach
- The specification of variants and options available

Usage

Product specifications are used to find data and performance about the product, for example to decide which product to buy. How to handle the product is described in the product manual.

Users

It is intended for:

- Product managers and product personnel
- Sales and marketing personnel
- Order and customer service personnel
- Robot programmers
- Project leaders
- Design engineers

References

| Reference | Document ID |
|---|----------------|
| <i>Product specification - Controller IRC5</i> IRC5 with main computer DSQC1000. | 3HAC047400-001 |
| <i>Product specification - Controller software IRC5</i> IRC5 with main computer DSQC1000 and RobotWare 5.6x. | 3HAC050945-001 |
| <i>Product specification - Controller software IRC5</i> IRC5 with main computer DSQC1000 and RobotWare 6. | 3HAC050945-001 |
| <i>Product manual - IRB 6790 Foundry Prime</i> | 3HAC063331-001 |
| <i>Product specification - Robot stopping distances according to ISO 10218-1</i> | 3HAC048645-001 |
| <i>Product specification - Robot user documentation, IRC5 with RobotWare 6</i> | 3HAC052355-001 |

Revisions

| Revision | Description |
|----------|---------------|
| A | First release |

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1 Description

1.1 Structure

1.1.1 Introduction

General

The IRB 6790 series is ABB Robotics 7th generation of high payload, high performance industrial robots. Based on the famous IRB 6700 series, with large working range, the very high wrist torque, the service friendly modular built up and the high availability, significant for ABB's robots.

The IRB 6790 is designed to generally withstand a very harsh environment, including detergents used in spraying applications. Even with this very robust design, some limitations exist:

- Detergents and allowed PH levels are specified in the product manual.
- Warranty will not apply if corrosion happens on structural parts. This corrosion/rust will not influence the functionality of the product.
- Maintenance needs to be performed according to recommendations in the product manuals.

Software product range

We have added a range of software products - all falling under the umbrella designation of Active Safety - to protect not only personnel in the unlikely event of an accident, but also robot tools, peripheral equipment and the robot itself.

Operating system

The robot is equipped with the IRC5 controller and robot control software, RobotWare. RobotWare supports every aspect of the robot system, such as motion control, development and execution of application programs, communication etc. See *Product specification - Controller IRC5*.

Safety

Safety standards valid for complete robot, manipulator and controller.

Additional functionality

For additional functionality, the robot can be equipped with optional software for application support - for example communication features - network communication - and advanced functions such as multitasking, sensor control etc. For a complete description on optional software, see the *Product specification - Controller software IRC5*.

Continues on next page

1 Description

1.1.1 Introduction

Continued

Foundry Prime

Robots with protection type Foundry Prime are specially designed to work in harsh environments such as water jet cleaning, high pressure deburring, immersion cleaning, washing and similar applications. To ensure that the protection offers the best reliability, special measures are required during installation and operation. It is required that the environmental and application conditions are fulfilled and that the special maintenance activities and intervals for the Foundry Prime protected robot are followed.

The manipulator can withstand indirect spray from jet pressure (max. 700 bar) and 100% humidity (gaseous mixture only). The manipulator can work with a cleaning bath temperature up to 60 °C.

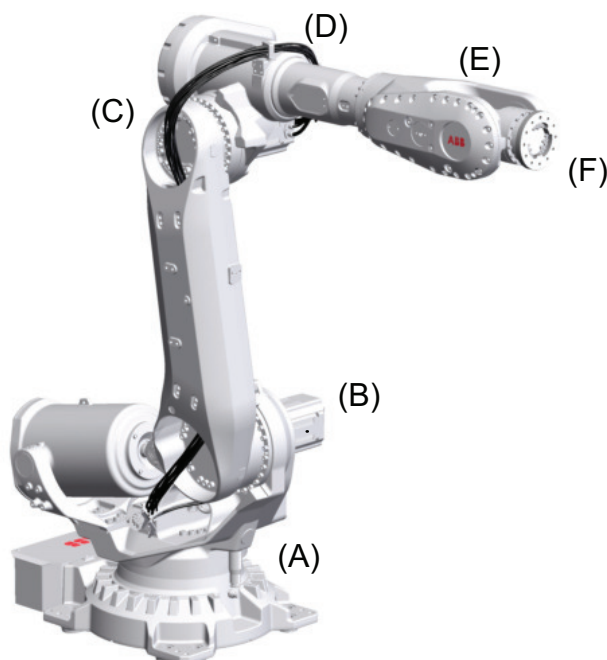
The motors, the balancing device, and the serial measurement board cavity must be pressurized on Foundry Prime robots during operation and shut down. For detailed information of the maintenance program, see chapter Maintenance in the *Product manual - IRB 6790 Foundry Prime*.

Washing and cleaning detergents

General washing detergent requirements:

- Washing and cleaning detergent with pH 7-10. Down to pH6 during short periods provided that the robot is washed carefully with tap water afterwards.
- Max. temperature on washing detergent is 60 °C
- The user must follow the supplier's recommendations regarding detergent concentration and pH value
- Washing and cleaning detergents with corrosion inhibitor should be used

Robot axes



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Continues on next page

1 Description

1.1.1 Introduction

Continued

| Pos | Description | Pos | Description |
|-----|-------------|-----|-------------|
| A | Axis 1 | B | Axis 2 |
| C | Axis 3 | D | Axis 4 |
| E | Axis 5 | F | Axis 6 |

1 Description

1.1.2 Different robot versions

1.1.2 Different robot versions

General

The IRB 6790 is available in two versions.

Robot types

The following Foundry Prime robot versions are available.

| Robot type | Handling capacity (kg) | Reach (m) |
|------------|------------------------|-----------|
| IRB 6790 | 235 kg | 2.65 m |
| IRB 6790 | 205 kg | 2.80 m |

1.1.3 Definition of version designations

IRB 6790 mounting

| | Prefix | Description |
|----------|--------|-------------------------------------|
| Mounting | - | IRB 6790: Floor-mounted manipulator |

Manipulator weight

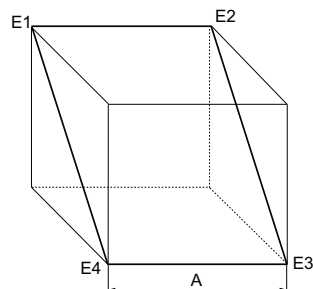
| Robot type | Weight |
|-------------------|----------|
| IRB 6790-235/2.65 | 1,260 kg |
| IRB 6790-205/2.80 | 1,270 kg |

Other technical data

| Data | Description | Note |
|----------------------|---|--|
| Airborne noise level | The sound pressure level outside the working space. | < 71 dB (A) Leq (acc. to machinery directive 2006/42/EG) |

Power consumption at max load

| Type of movement | 235/2.65 | 205/2.80 |
|--------------------------------|----------|----------|
| ISO Cube Max. velocity (kW) | 2.7 | 2.6 |
| Robot in calibration position | 235/2.65 | 205/2.80 |
| Brakes engaged (kW) | 0.16 | 0.17 |
| Brakes disengaged (kW) | 0.71 | 0.84 |



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| Pos | Description |
|-----|-------------|
| A | 1,000 mm |

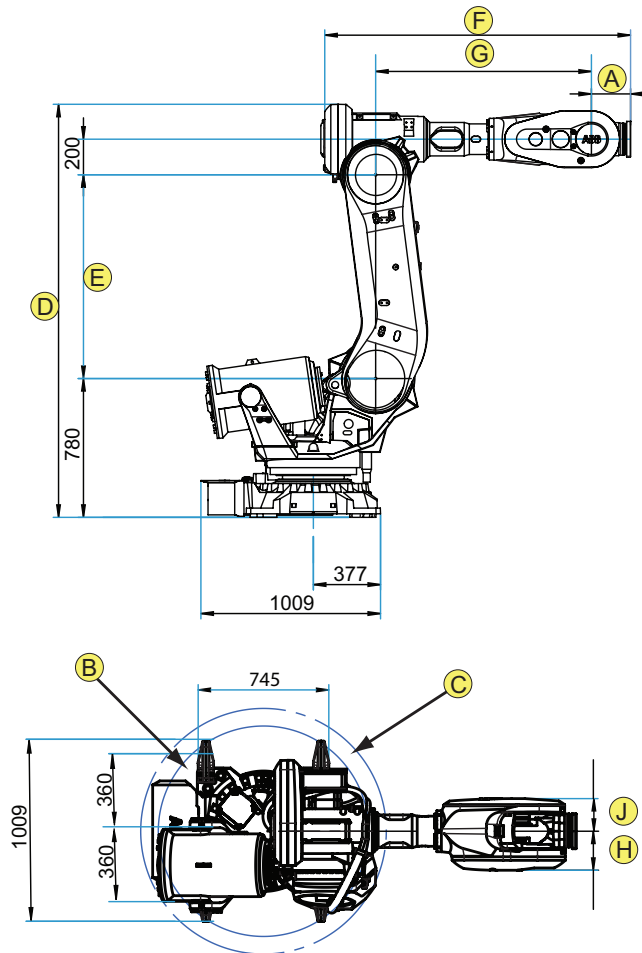
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1 Description

1.1.3 Definition of version designations

Continued

Main dimensions of IRB 6790



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| Pos | Description |
|-----|----------------------------|
| A | 200 mm |
| B | Radius ax1, front = 532 mm |
| C | Radius ax1, back = 633 mm |

| Robot variant | D | E | F | G | H | J |
|---------------------|------|------|------|---------|-----|-----|
| IRB 6790 - 235/2.65 | 2300 | 1135 | 1670 | 1,182.5 | 209 | 186 |
| IRB 6790 - 205/2.80 | 2445 | 1280 | 1670 | 1,182.5 | 186 | 209 |

1.2 Standards

1.2.1 Applicable standards



Note

The listed standards are valid at the time of the release of this document. Phased out or replaced standards are removed from the list when needed.

General

The product is designed in accordance 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 deviations from ISO 10218-1:2011, these are listed in the declaration of incorporation which is part of the product delivery.

Normative standards as referred to from ISO 10218-1

| Standard | Description |
|------------------|--|
| ISO 9283:1998 | Manipulating industrial robots - Performance criteria and related test methods |
| ISO 10218-2 | Robots and robotic devices - Safety requirements for industrial robots - Part 2: Robot systems and integration |
| ISO 12100 | Safety of machinery - General principles for design - Risk assessment and risk reduction |
| ISO 13849-1:2006 | Safety of machinery - Safety related parts of control systems - Part 1: General principles for design |
| ISO 13850 | Safety of machinery - Emergency stop - Principles for design |
| IEC 60204-1:2005 | Safety of machinery - Electrical equipment of machines - Part 1: General requirements |
| IEC 62061:2005 | Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems |

Other standards used in design

| Standard | Description |
|------------------------------|---|
| ISO 9787:2013 | Robots and robotic devices -- Coordinate systems and motion nomenclatures |
| IEC 61000-6-2 | Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments |
| IEC 61000-6-4 (option 129-1) | Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments |
| ISO 13732-1:2006 | Ergonomics of the thermal environment - Part 1 |
| IEC 60529:1989 + A2:2013 | Degrees of protection provided by enclosures (IP code) |

Continues on next page

1 Description

1.2.1 Applicable standards

Continued

Consulted guidelines

The following guidelines have inspired and guided the product design:

| Guideline | Description |
|-----------------|--|
| VDI 3397 Part 1 | Metalworking Fluids |
| VDI 3035 | Design of machine tools, production lines and peripheral equipment for the use of metalworking fluids |
| DIN 51385 | Lubricants – Processing fluids for forming and machining of materials – Terms |
| DIN 51485 | Lubricants – Processing fluids for forming and machining of materials – Metalworking and forming fluids: Requirements and test methods |

1.3 Installation

1.3.1 Introduction to installation

General

IRB 6790 are designed for floor mounting (no tilting allowed around X-axis or Y-axis). Depending on the robot version, an end effector with max. weight of 205 to 235 kg including payload, can be mounted on the tool flange (axis 6). See [Load diagrams on page 33](#).

Extra loads

The upper arm can handle an additional load of 50 kg and the frame on axis 1 can handle an additional load of 250 kg.

See [Fitting equipment to the robot on page 42](#).

Working range limitation

The working range of axes 1 can be limited by mechanical stops as option. See [Working range limitation on page 59](#).

1 Description

1.3.2 Operating requirements

1.3.2 Operating requirements

Protection standards

| Robot version/Protection standard | IEC 60529 |
|-----------------------------------|-------------------|
| All variants, manipulator | IP69 ⁱ |

ⁱ Includes all manipulator electrical compartments, excludes the Harting connector on the connection panel which is IP67.

Explosive environments

The robot must not be located or operated in an explosive environment.

Ambient temperature

| Description | Standard/Option | Temperature |
|--|-----------------|---|
| Manipulator during operation | Standard | Minimum: +5 °C ⁱ (41 °F) Maximum: +50 °C (122 °F) |
| For the controller | Standard/Option | See <i>Product specification - Controller IRC5</i> |
| Complete robot during transportation and storage | Standard | Minimum: -25 °C (-13 °F) Maximum: +55 °C (+131 °F) |
| for short periods (not exceeding 24 hours) | Standard | +70 °C (+158 °F) |

ⁱ At low environmental temperature (below 10 °C) a warm-up phase is recommended to be run with the robot. Otherwise there is a risk that the robot stops or runs with lower performance due to temperature dependent oil and grease viscosity.

Relative humidity

| Description | Relative humidity |
|--|--|
| Complete robot during transportation and storage | 100% at constant temperature (gaseous only) |
| Complete robot during operation | 100% at constant temperature (gaseous only). |

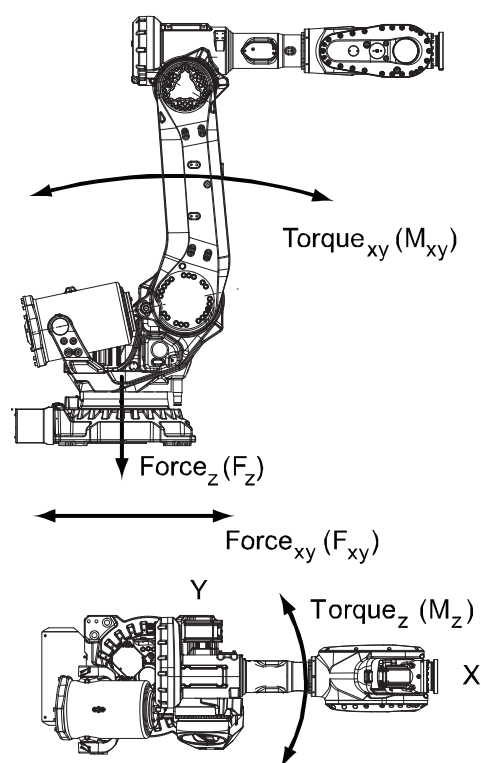
1.3.3 Assembling the manipulator

Maximum load

Maximum load in relation to the base coordinate system.

Floor mounted

| Force | Endurance load (in operation) | Max. load (emergency stop) |
|-----------|-------------------------------|----------------------------|
| Force xy | ± 7.4 kN | ± 19.8 kN |
| Force z | 14.6 ± 4.5 kN | 14.6 ± 15.7 kN |
| Torque xy | ± 21.0 kNm | ± 37.1 kNm |
| Torque z | ± 5.0 kNm | ± 11.4 kNm |



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Note regarding M_{xy} and F_{xy}

The bending torque (M_{xy}) can occur in any direction in the XY-plane of the base coordinate system.

The same applies to the transverse force (F_{xy}).

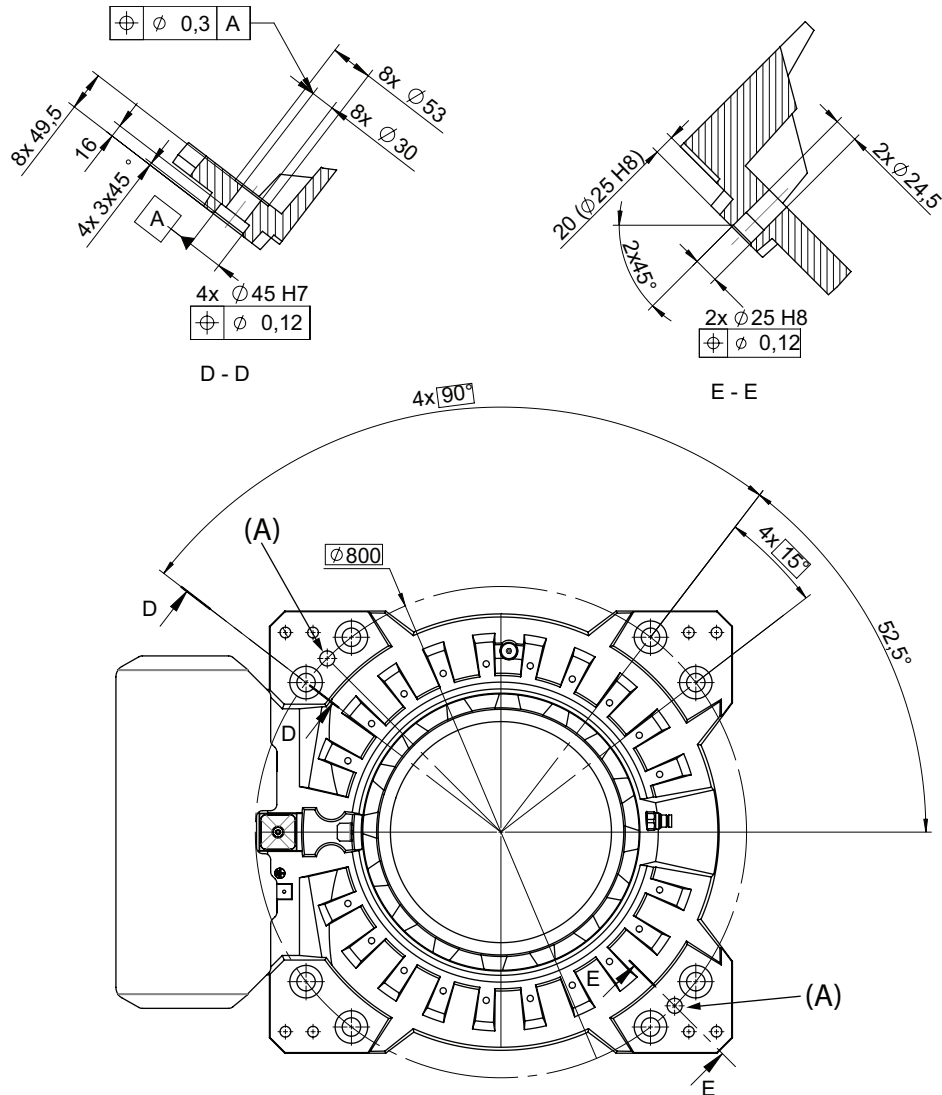
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1 Description

1.3.3 Assembling the manipulator

Continued

Fastening holes robot base - for all variants



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| Pos | Description |
|-----|---------------------------|
| A | Holes for guide pins (x2) |



Note

Holes for guide pins (x2) Rear hole straight slot, see [Guide pins on page 24](#).

Fastener quality

| | |
|---|-------------------------------|
| Suitable screws: | M24 x 100 ⁱ |
| Quality: | 8.8 |
| Screw tightening yield point utilization factor (v) (according to VDI2230): | 90% (v=0.9) |
| Suitable washer: | 4 mm flat washer ⁱ |

Continues on next page

| | |
|--------------------|---|
| Tightening torque: | 550 Nm (screws lubricated with Molykote 1000) 600-725 Nm, typical 650 Nm (screws none or lightly lubricated) |
|--------------------|---|

- i Stainless steel versions recommended in corrosive environments.



Note

Only two guide pins shall be used. The corresponding holes in the base plate shall be circular according to figure [Base plate drawing on page 22](#).

AbsAcc performance

Regarding AbsAcc performance, the use of guide pins are mandatory.

1 Description

1.3.3 Assembling the manipulator

Continued

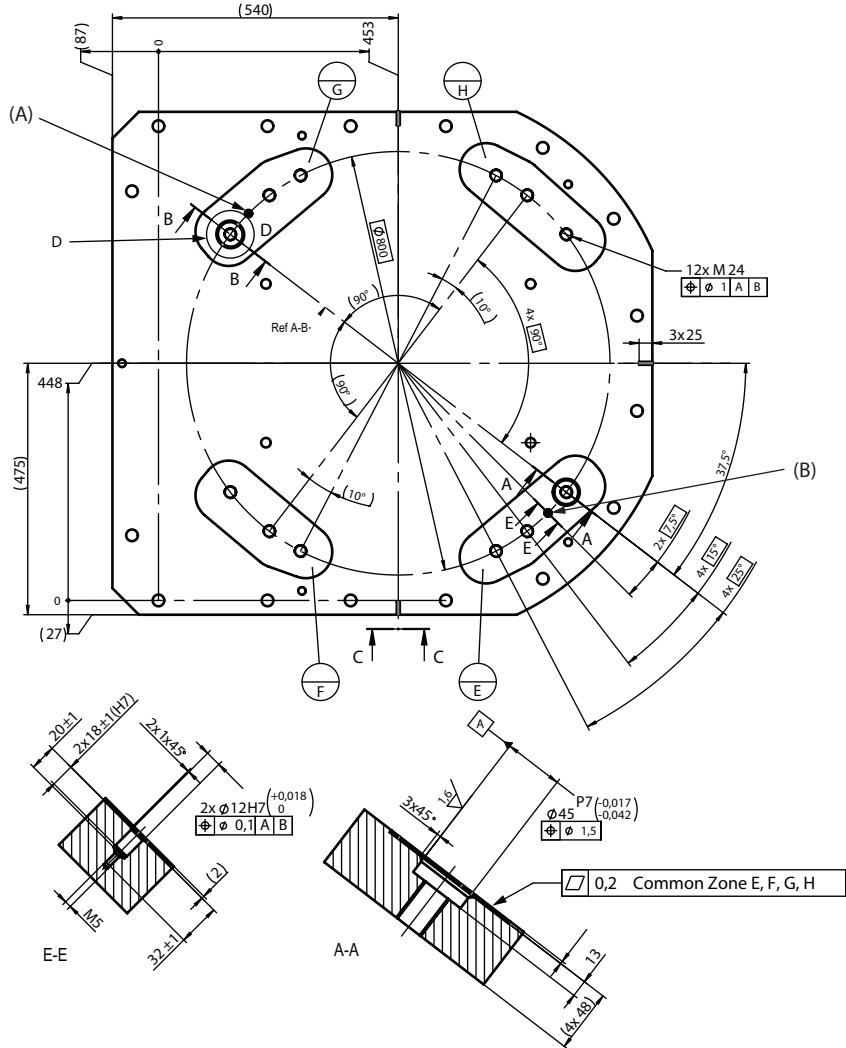
Base plate drawing



Note

Base plate are not recommended for corrosive environments.

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



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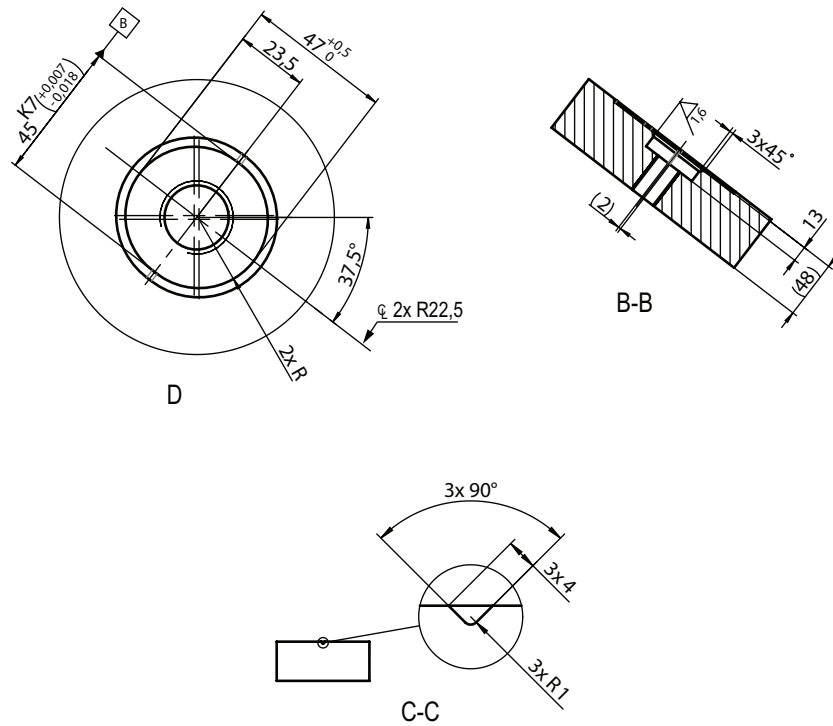
| Pos | Description |
|------------|--|
| A, B | Hole for guide pin, cylindrical, see Guide pins on page 24 |
| E, F, G, H | Common tolerance zone (accuracy all over the base plate from one contact surface to the other) |

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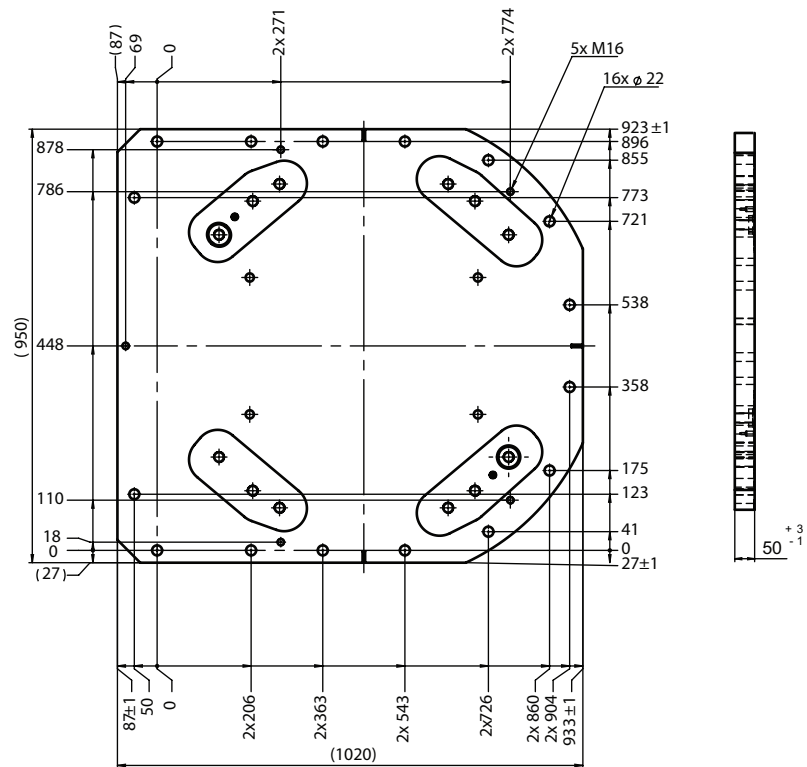
1 Description

1.3.3 Assembling the manipulator

Continued



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| | |
|---|--|
| A | <p>Color: RAL 9005 Thickness: 80-100 µm Weight: 360 kg</p> |
|---|--|

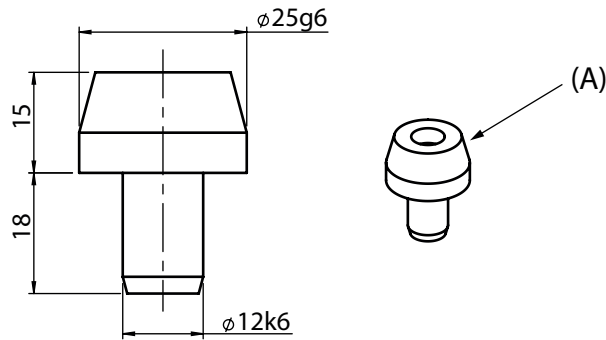
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1 Description

1.3.3 Assembling the manipulator

Continued

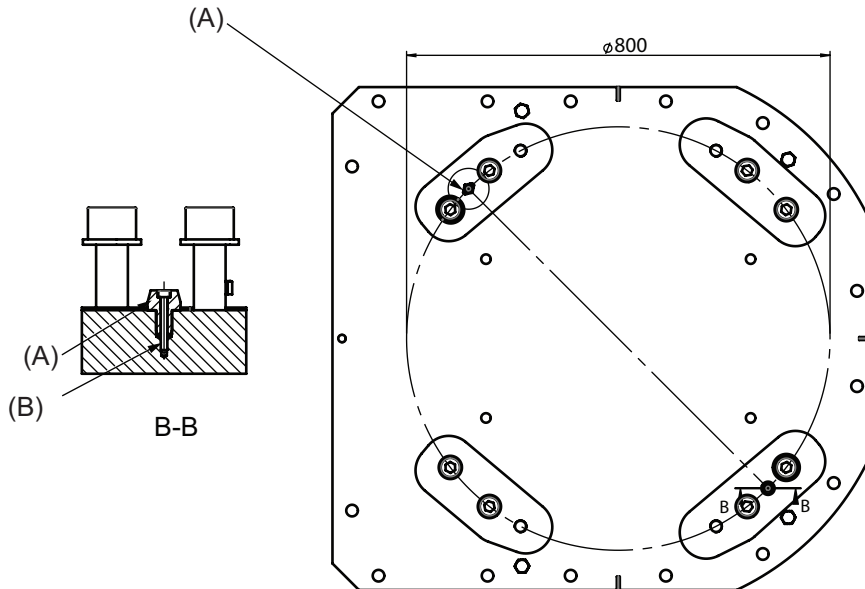
Guide pins



XX1500000248

| 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) |



Note

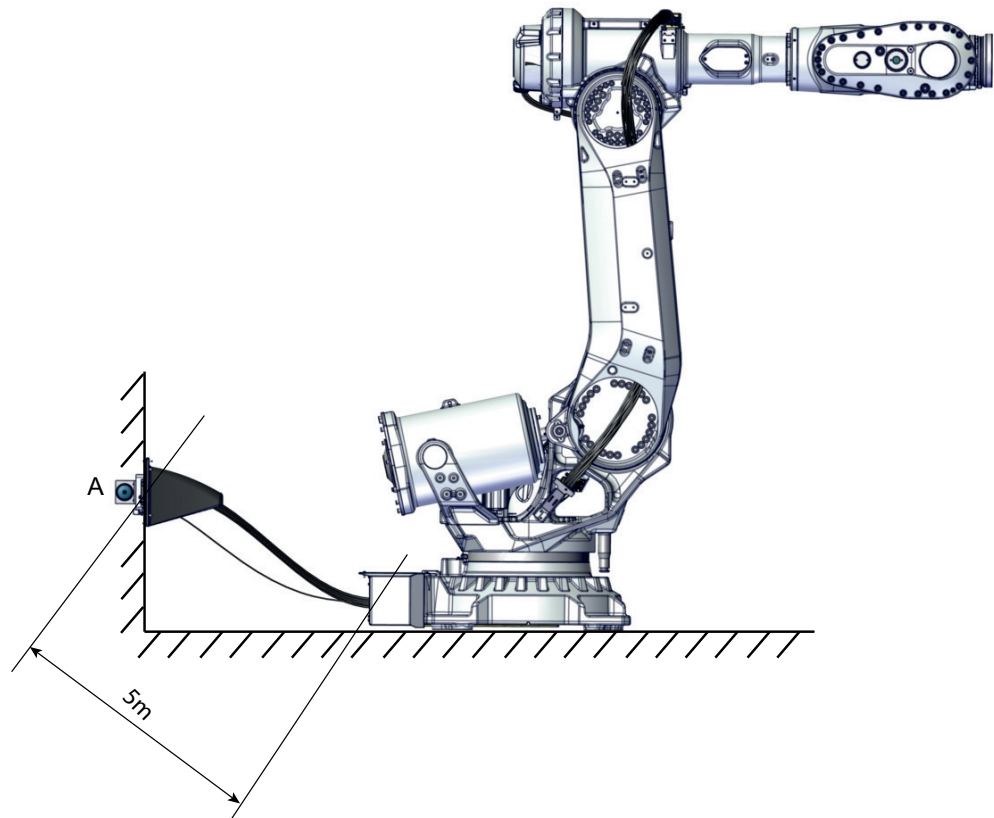
All screws and pins are delivered in a plastic bag together with the base plate.

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Installation on a coherent and conductive structure

The manipulator must be installed on a coherent and conductive metallic structure which reaches the connector point on the wall (to be able to connect to ground).

The connector point is installed on the outside (dry) wall to protect the connectors from detergents. The flow sensor at the connection point does not withstand fluids.



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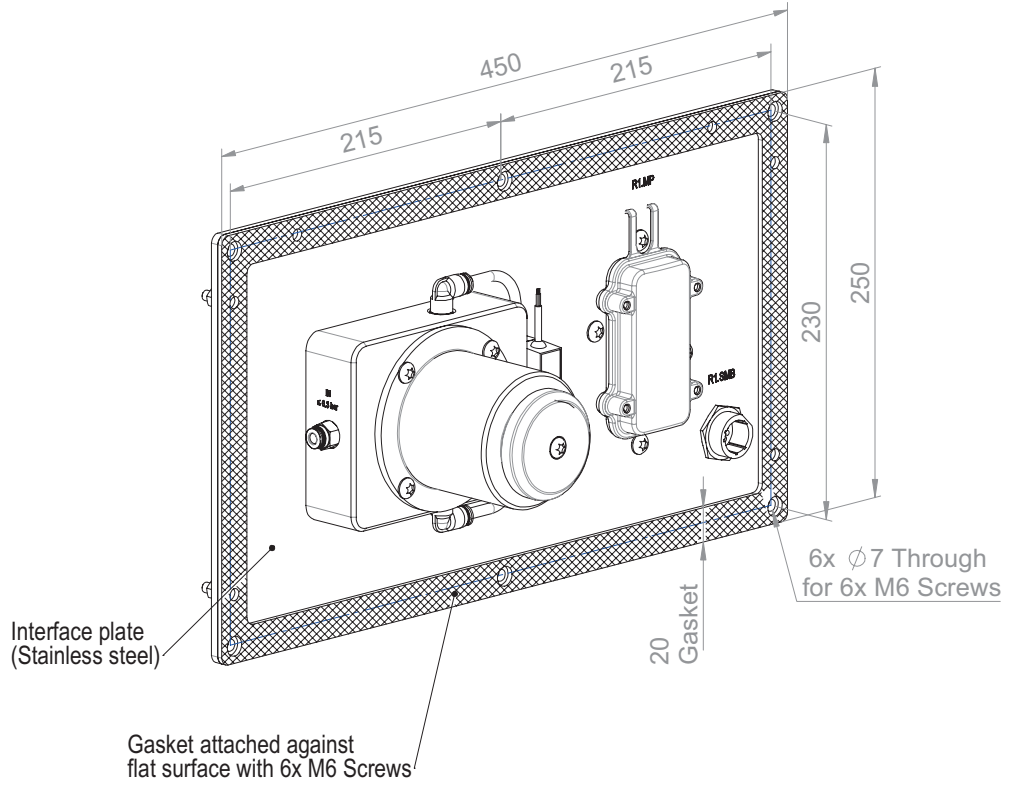
1 Description

1.3.3 Assembling the manipulator

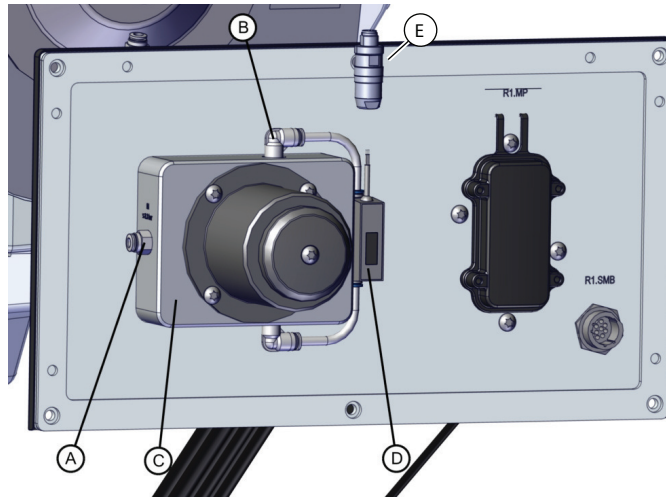
Continued

Flow sensor

Pressurized system



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| | |
|---|------------------------------|
| A | Air inlet |
| B | Outlet air to flow indicator |
| C | Pressure relief valve |
| D | Flow sensor display |
| E | Flow sensor cable |

Continues on next page

The system is equipped with an over pressure device and a flow sensor.

The control system will alert if the air leakage exceeds the preset value.

Air quality for pressurizing the robot

The air must be dry and clean, such as instrument air. The following table describes the air specifications.



WARNING

If the pressurized air contains oil, it could result in a brake failure in the motors and cause the robot arms to fall down, leading to personal injury or physical damage.

| Parameter | Value |
|---------------------|-------------------------------|
| Dew point | <+2° C at 6 bar |
| Solid particle size | <5 microns |
| Oil content | <1 ppm (1 mg/m ³) |
| Air flow | >200 L/min |

1 Description

1.4.1 Calibration methods

1.4 Calibration and references


1.4.1 Calibration methods

Overview

This section specifies the different types of calibration and the calibration methods that are supplied by ABB.

More information is available in the product manual.

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 structureDeflection 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 a sticker next to the identification plate of the robot. To regain 100% Absolute accuracy performance, the robot must be recalibrated for absolute accuracy after repair or maintenance that affects the mechanical structure.  xx0400001197 | CalibWare |

Brief description of calibration methods

Axis Calibration method

Axis Calibration is a standard calibration method for calibration of IRB 6790 and is the most accurate method for the standard calibration. 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

Continues on next page

- Reference calibration

The calibration equipment for Axis Calibration is delivered as a toolkit.

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.

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.

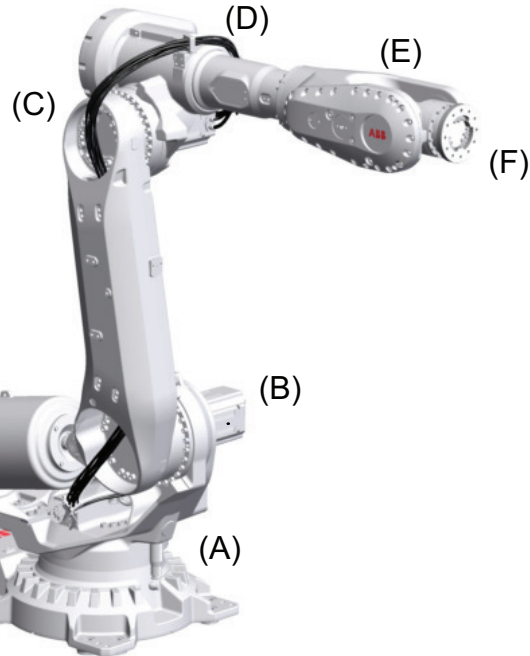
1 Description

1.4.2 Fine calibration

1.4.2 Fine calibration

General

The fine calibration is done with the Axis calibration method.



xx1300000244

Axes

| Pos | Description | Pos | Description |
|-----|-------------|-----|-------------|
| A | Axis 1 | B | Axis 2 |
| C | Axis 3 | D | Axis 4 |
| E | Axis 5 | F | Axis 6 |

1.4.3 Absolute Accuracy calibration

Purpose

Absolute Accuracy is a calibration concept that improves TCP accuracy. The difference between an ideal robot and a real robot can be several millimeters, resulting from mechanical tolerances and deflection in the robot structure. *Absolute Accuracy* compensates for these differences.

Here are some examples of when this accuracy is important:

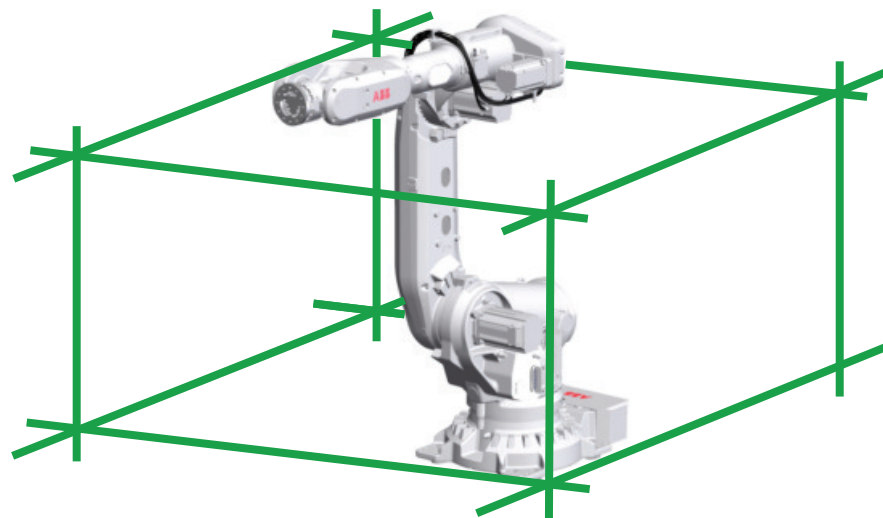
- Exchangeability of robots
- Offline programming with no or minimum touch-up
- Online programming with accurate movement and reorientation of tool
- Programming with accurate offset movement in relation to eg. vision system or offset programming
- Re-use of programs between applications

The option *Absolute Accuracy* is integrated in the controller algorithms and does not need external equipment or calculation.



Note

The performance data is applicable to the corresponding RobotWare version of the individual robot.



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What is included

Every *Absolute Accuracy* robot is delivered with:

- compensation parameters saved on the robot's serial measurement board
- a birth certificate representing the *Absolute Accuracy* measurement protocol for the calibration and verification sequence.

A robot with *Absolute Accuracy* calibration has a label with this information on the manipulator.

Continues on next page

1 Description

1.4.3 Absolute Accuracy calibration

Continued

Absolute Accuracy supports floor mounted, wall mounted and ceiling mounted installations. Compensation parameters saved in the robot's serial measurement board differ depending on which Absolute Accuracy option is selected.

When is *Absolute Accuracy* being used

Absolute Accuracy works on a robot target in Cartesian coordinates, not on the individual joints. Therefore, joint based movements (e.g. `MoveAbsJ`) will not be affected.

If the robot is inverted, the Absolute Accuracy calibration must be performed when the robot is inverted.

Absolute Accuracy active

Absolute Accuracy will be active in the following cases:

- Any motion function based on robtargets (e.g. `MoveL`) and ModPos on robtargets
- Reorientation jogging
- Linear jogging
- Tool definition (4, 5, 6 point tool definition, room fixed TCP, stationary tool)
- Work object definition

Absolute Accuracy not active

The following are examples of when Absolute Accuracy is not active:

- Any motion function based on a jointtarget (`MoveAbsJ`)
- Independent joint
- Joint based jogging
- Additional axes
- Track motion



Note

In a robot system with, for example, an additional axis or track motion, the Absolute Accuracy is active for the manipulator but not for the additional axis or track motion.

RAPID instructions

There are no RAPID instructions included in this option.

Production data

Typical production data regarding calibration are:

| Robot | Positioning accuracy (mm) | | |
|-------------------|---------------------------|------|---------------|
| | Average | Max | % Within 1 mm |
| IRB 6790-235/2.55 | 0.35 | 0.75 | 100 |
| IRB 6790-205/2.80 | 0.35 | 0.75 | 100 |

1.5 Load diagrams

1.5.1 Introduction



WARNING

It is very important to always define correct actual load data and correct payload of the robot. Incorrect definitions of load data can result in overloading of the robot.

If incorrect load data is used, and/or if loads outside the load diagram are used, the following parts can be damaged due to overload:

- motors
- gearboxes
- mechanical structure



WARNING

In RobotWare, the service routine LoadIdentify can be used to determine correct load parameters. The routine automatically defines the tool and the load. See *Operating manual - IRC5 with FlexPendant*, for detailed information.



WARNING

Robots running with incorrect load data and/or with loads outside the load diagram, will not be covered by robot warranty.

General

The load diagrams include a nominal payload inertia, J_0 of 15 kgm^2 , and an extra load of 50 kg at the upper arm housing.

At different moment of inertia the load diagram will be changed. For robots that are allowed tilted, wall or inverted mounted, the load diagrams as given are valid and thus it is also possible to use RobotLoad within those tilt and axis limits.

Control of load case with RobotLoad

To verify a specific load case, use the RobotStudio add-in RobotLoad.

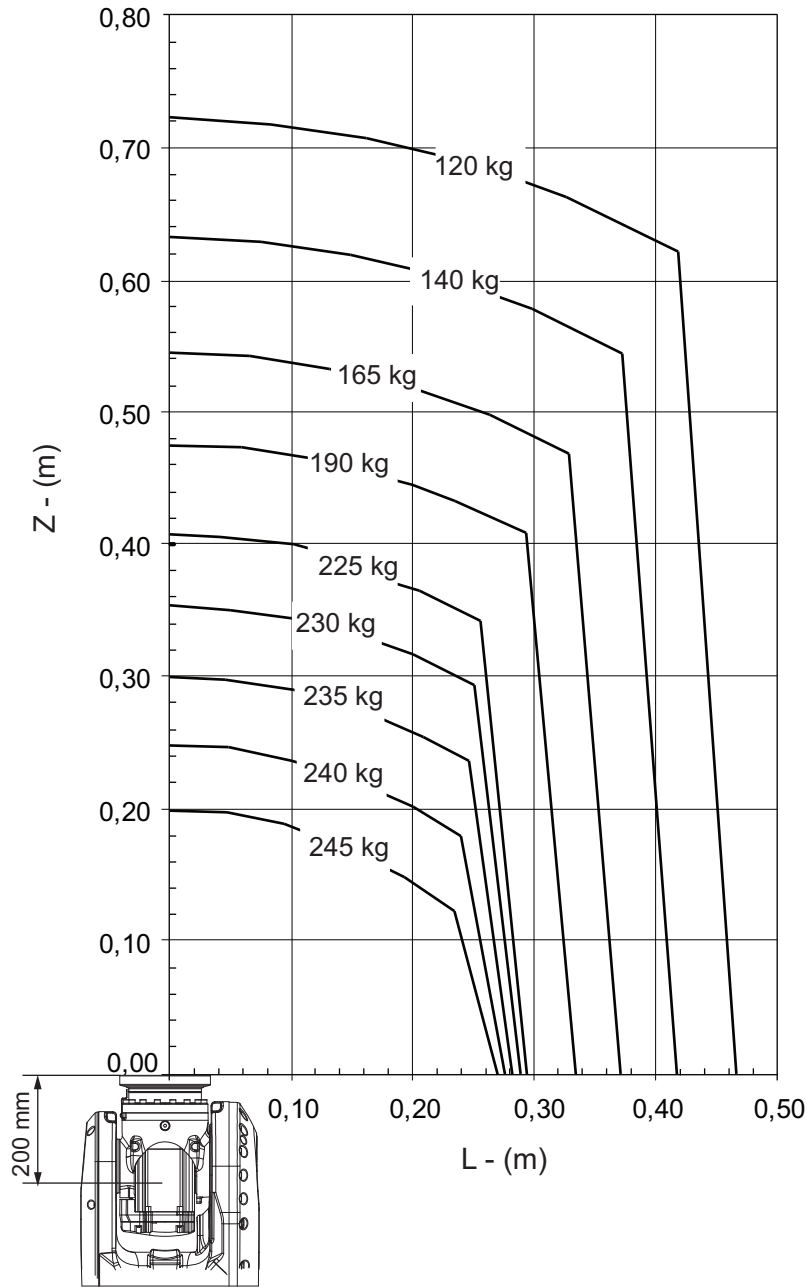
The result from RobotLoad is only valid within the maximum loads and tilt angles. There is no warning if the maximum permitted arm load is exceeded. For over-load cases and special applications, contact ABB for further analysis.

1 Description

1.5.2 Diagrams

1.5.2 Diagrams

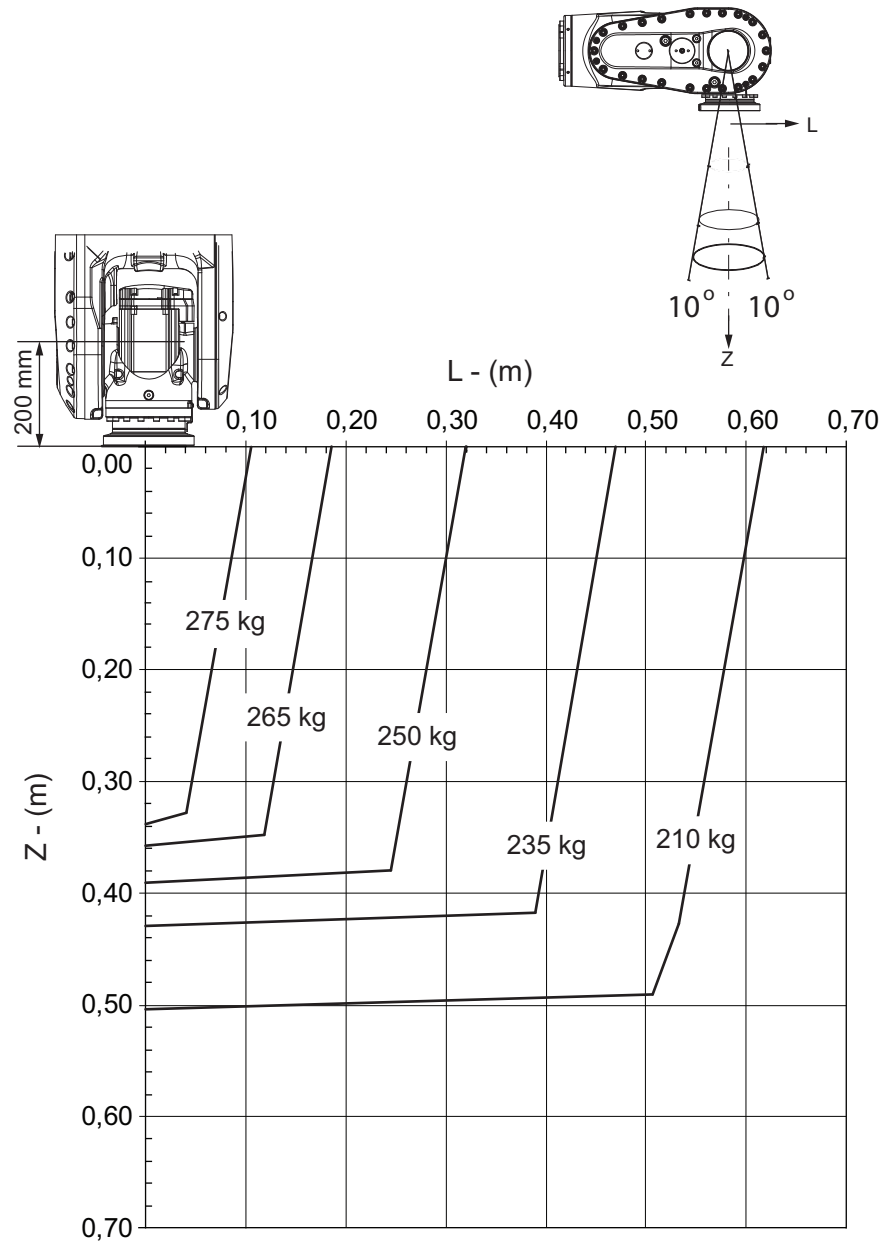
IRB 6790-235/2.65



xx1300000245

Continues on next page

IRB 6790-235/2.65 "Vertical Wrist" ($\pm 10^\circ$)



xx1300000246

For wrist down (0° deviation from the vertical line).

| | Description |
|------------------|-------------|
| Max load | 280 kg |
| Z _{max} | 0.327 m |
| L _{max} | 0.100 m |

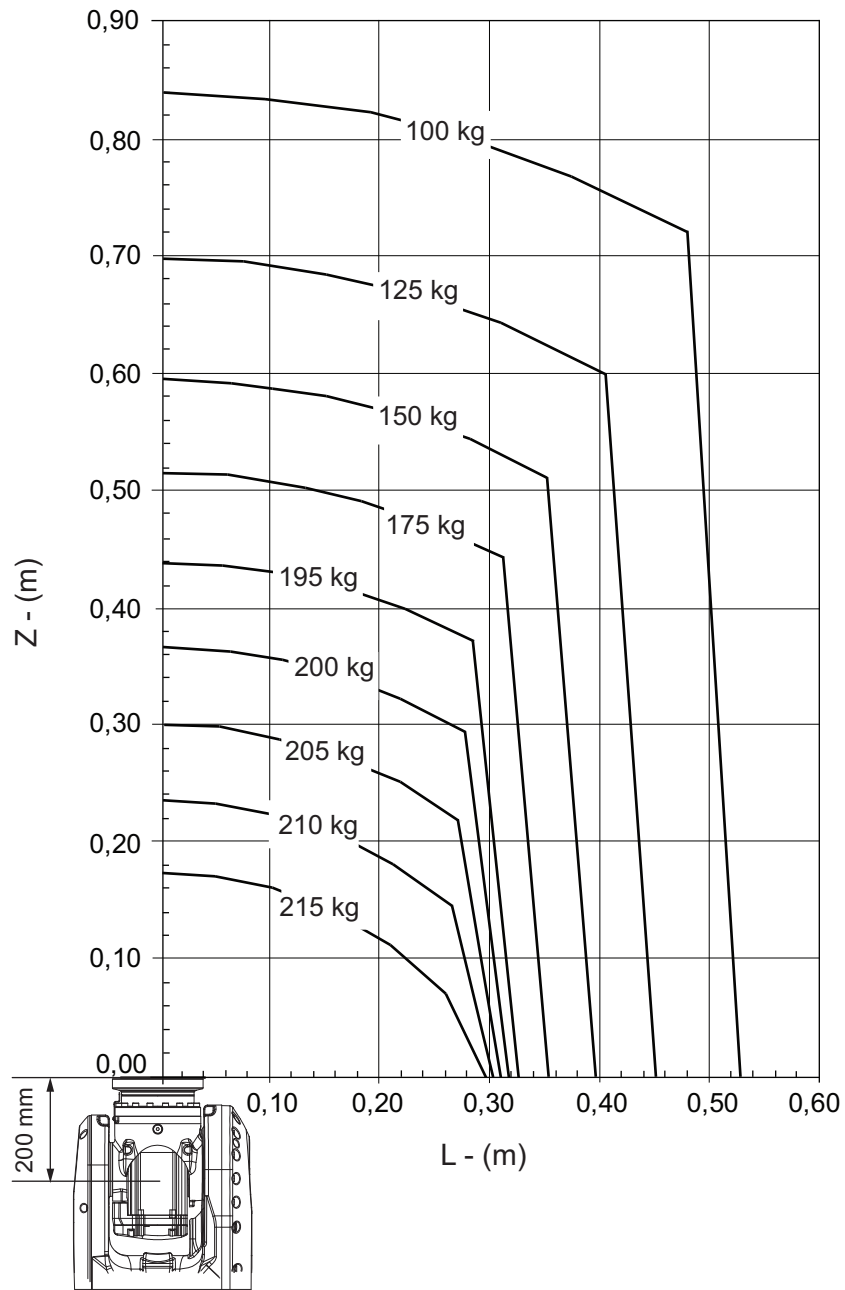
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1 Description

1.5.2 Diagrams

Continued

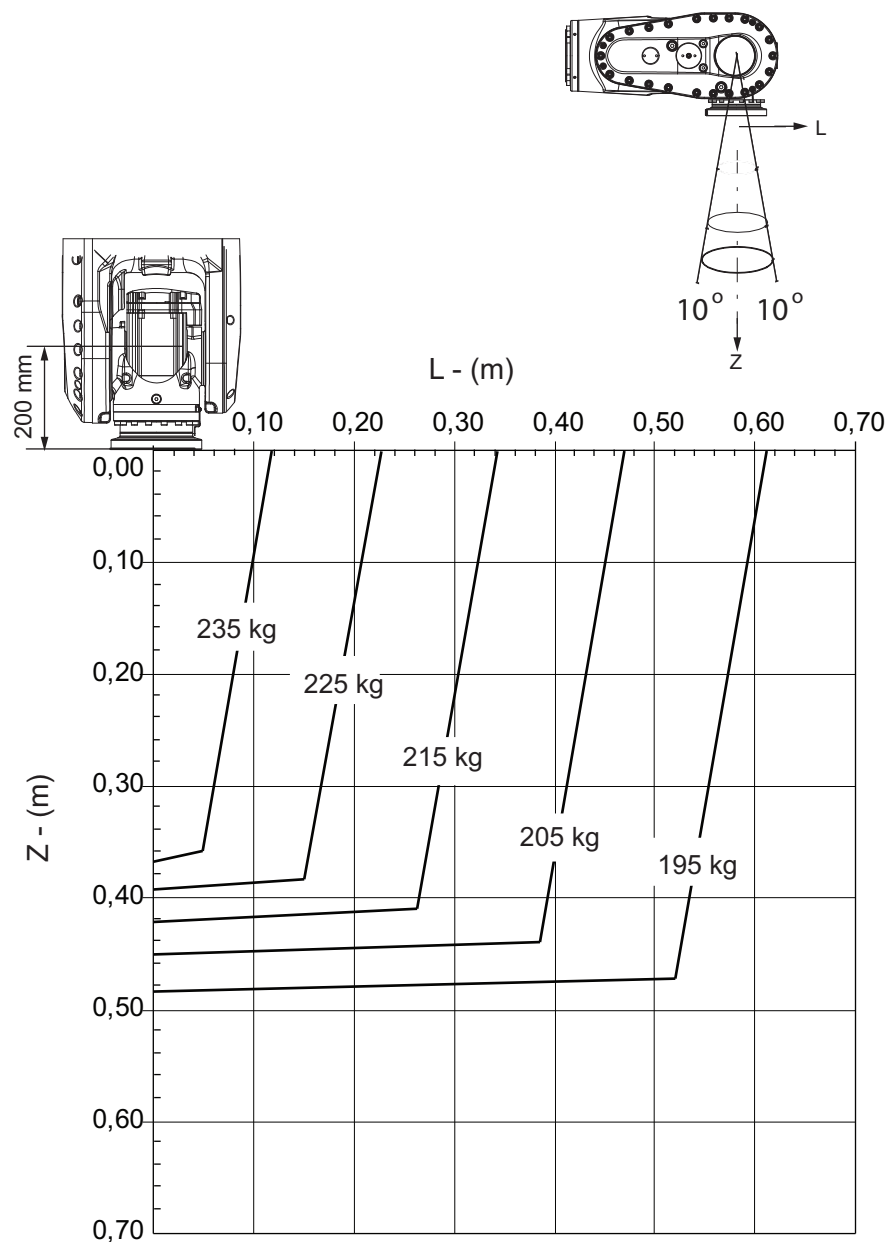
IRB 6790-205/2.80



xx1300000249

Continues on next page

IRB 6790-205/2.80 "Vertical Wrist" ($\pm 10^\circ$)



xx1300000250

For wrist down (0° deviation from the vertical line).

| | Description |
|------------------|-------------|
| Max load | 240 kg |
| Z _{max} | 0.355 m |
| L _{max} | 0.103 m |

1 Description

1.5.3 Maximum load and moment of inertia for full and limited axis 5 (center line down) movement

1.5.3 Maximum load and moment of inertia for full and limited axis 5 (center line down) movement

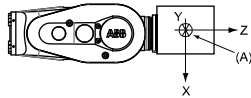


Note

Total load given as: mass in kg, center of gravity (Z and L) in meters and moment of inertia (J_{ox} , J_{oy} , J_{oz}) in kgm^2 . $L = \text{sqr}(X^2 + Y^2)$, see the following figure.

Full movement of axis 5 ($\pm 130^\circ$)

| Axis | Robot type | Maximum moment of inertia |
|------|--|---|
| 5 | IRB 6790-235/2.65 IRB 6790-205/2.80 | $Ja_5 = \text{Load} \times ((Z + 0,200)^2 + L^2) + \max(J_{0x}, J_{0y}) \leq 250 \text{ kgm}^2$ |
| 6 | IRB 6790-235/2.65 IRB 6790-205/2.80 | $Ja_6 = \text{Load} \times L^2 + J_{0z} \leq 185 \text{ kgm}^2$ |



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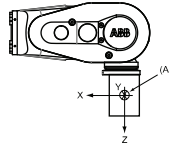
| Pos | Description |
|--------------------------------|---|
| A | Center of gravity |
| Description | |
| J_{ox} , J_{oy} , J_{oz} | Max. moment of inertia around the X, Y and Z axes at center of gravity. |

Continues on next page

1.5.3 Maximum load and moment of inertia for full and limited axis 5 (center line down) movement Continued

Limited axis 5, center line down

| Axis | Robot type | Maximum moment of inertia |
|------|--|---|
| 5 | IRB 6790-235/2.65 IRB 6790-205/2.80 | $Ja_5 = \text{Load} \times ((Z + 0,200)^2 + L^2) + \max(J_{0x}, J_{0y}) \leq 275 \text{ kgm}^2$ |
| 6 | IRB 6790-235/2.65 IRB 6790-205/2.80 | $Ja_6 = \text{Load} \times L^2 + J_{0z} \leq 250 \text{ kgm}^2$ |



xx1400002029

| Pos | Description |
|--------------------------|---|
| A | Center of gravity |
| | Description |
| J_{0x}, J_{0y}, J_{0z} | Max. moment of inertia around the X, Y and Z axes at center of gravity. |

1 Description

1.5.4 Wrist torque

1.5.4 Wrist torque



Note

The wrist torque values are for reference only, and should not be used for calculating permitted load offset (position of center of gravity) within the load diagram, since those also are limited by main axes torques as well as dynamic loads. Furthermore, arm loads will influence the permitted load diagram. To find the absolute limits of the load diagram, use the RobotStudio add-in RobotLoad.

Torque

The table below shows the maximum permissible torque due to payload.

| Robot type | Max wrist torque axis 4 and 5 | Max wrist torque axis 6 | Max torque valid at load |
|-------------------|-------------------------------|-------------------------|--------------------------|
| IRB 6790-235/2.65 | 1324 Nm | 650 Nm | 225 kg |
| IRB 6790-205/2.80 | 1263 Nm | 625 Nm | 192 kg |

1.5.5 Maximum TCP acceleration

General

Higher values can be reached with lower loads than the nominal because of our dynamical motion control QuickMove2. For specific values in the unique customer cycle, or for robots not listed in the table below, we recommend then to use RobotStudio.

Maximum Cartesian design acceleration for nominal loads

| Robot type | E-stop Max acceleration at nominal load COG [m/s ²] | Controlled Motion Max acceleration at nominal load COG [m/s ²] |
|---------------------|---|--|
| IRB 6790 - 235/2.65 | 41 | 22 |
| IRB 6790 - 205/2.8 | 45 | 24 |



Note

Acceleration levels for emergency stop and controlled motion includes acceleration due to gravitational forces. Nominal load is defined with nominal mass and cog with max offset in Z and L (see the load diagram).

1 Description

1.6 Fitting equipment to the robot

1.6 Fitting equipment to the robot

General

Extra loads can be fitted on the upper arm housing, the lower arm, and on the frame. Definitions of distances and masses are shown in the following figures. The robot is supplied with holes for fitting extra equipment (see figure in [Holes for fitting extra equipment on page 45](#)). Maximum allowed arm load depends on center of gravity of arm load and robot payload.



Note

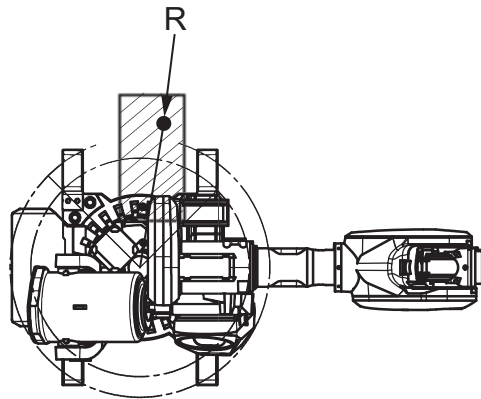
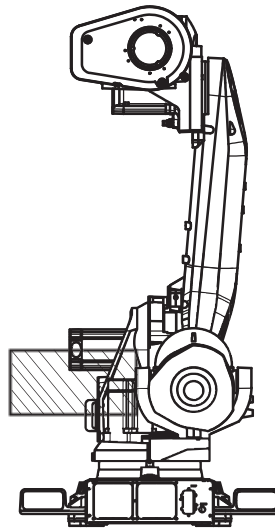
All equipment and cables used on the robot, must be designed and fitted not to damage the robot and/or its parts.

Frame (hip load)

Extra load can be fitted 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 ($\leq 250 \text{ kg}$) |

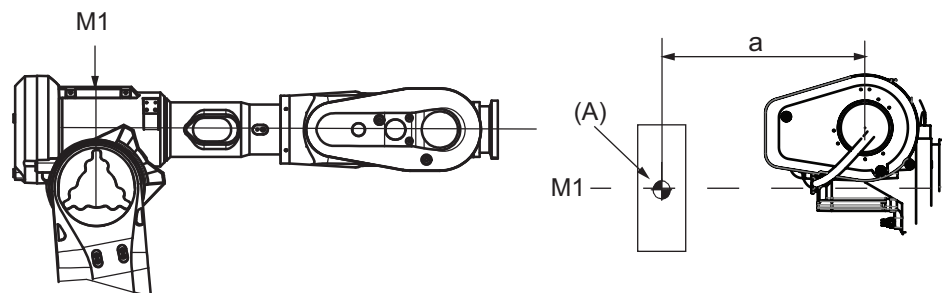
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Upper arm

Allowed extra load on the upper arm housing, in addition to the maximum handling weight, is $M1 \leq 50$ kg with a distance (a) ≤ 500 mm from the center of gravity in the axis-3 extension.



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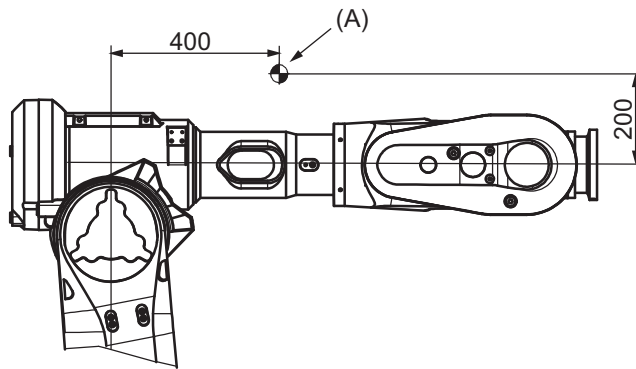
| | |
|---|-------------|
| A | Mass center |
|---|-------------|

Continues on next page

1 Description

1.6 Fitting equipment to the robot

Continued



xx130000866

| | |
|---|-------------------------|
| A | Center of gravity 50 kg |
|---|-------------------------|

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1 Description

1.6 Fitting equipment to the robot

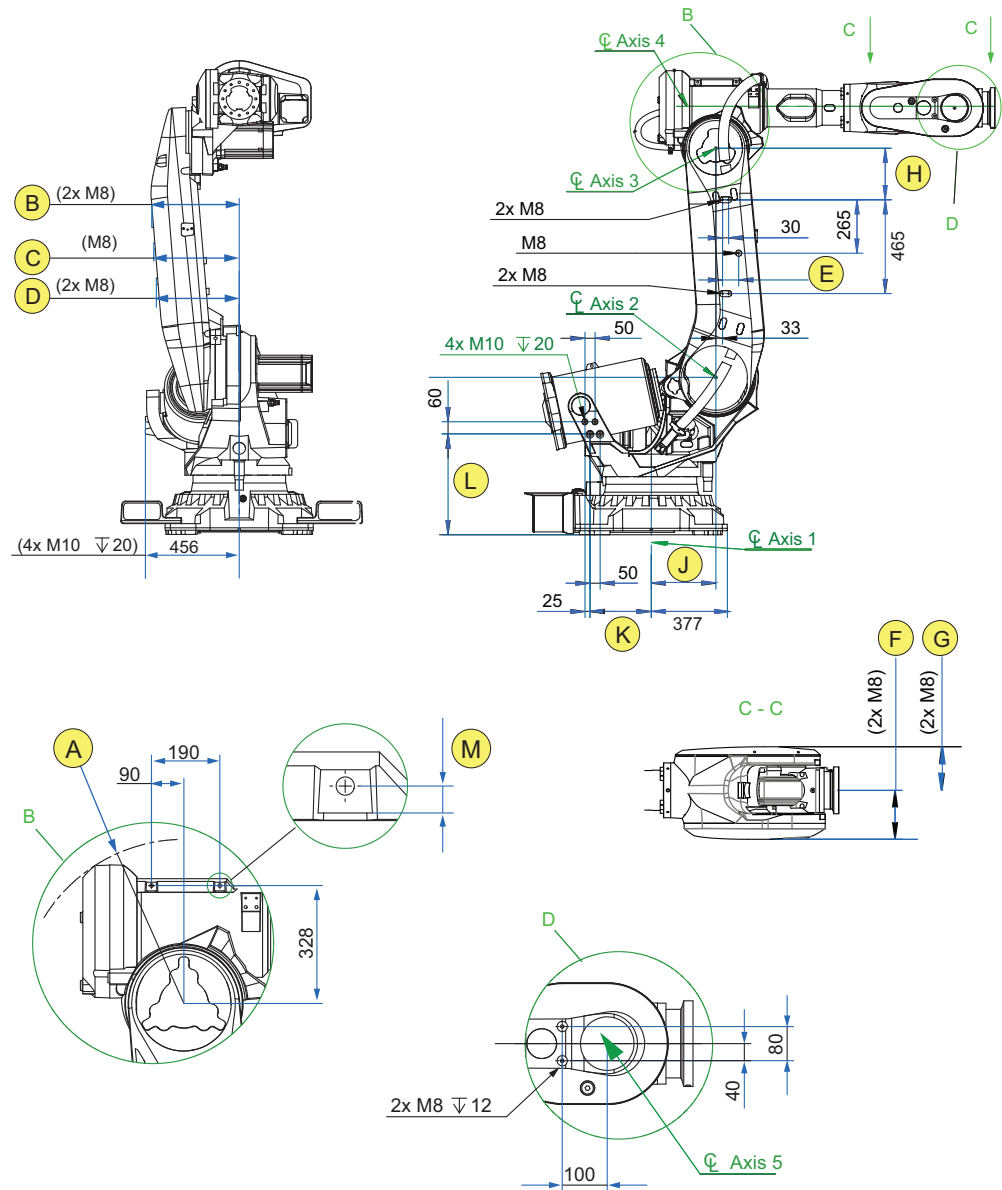
Continued

| Variant | B ⁱ | C | D | E | F | G | H | J | K | L | M | N |
|---------------------|----------------|-----|-----|-------|-----|-----|-----|-----|----|-----|-----|-----|
| IRB 6790 - 235/2.65 | R=216 | 270 | 400 | 652.5 | 365 | 437 | 349 | 147 | 33 | 102 | 104 | 210 |
| IRB 6790 - 205/2.80 | R=216 | 270 | 500 | 652.5 | 365 | 437 | 349 | 147 | 33 | 102 | 104 | 210 |

ⁱ Smallest circumscribed radius axis-4.

Continues on next page

Position of attachment holes - drawing 2



xx130000264

| Variant | A ⁱ | B | C | D | E | F | G | H | J | K | L | M |
|---------------------|----------------|-----|-----|-----|----|-------|-----|-----|-----|-------|-----|------|
| IRB 6790 - 235/2.65 | R=456 | 433 | 418 | 403 | 80 | 208.5 | 186 | 255 | 320 | 303.5 | 500 | 13.8 |
| IRB 6790 - 205/2.80 | R=456 | 438 | 423 | 408 | 80 | 208.5 | 186 | 255 | 320 | 303.5 | 500 | 13.8 |

ⁱ Smallest circumscribed radius axis-3.

Continues on next page

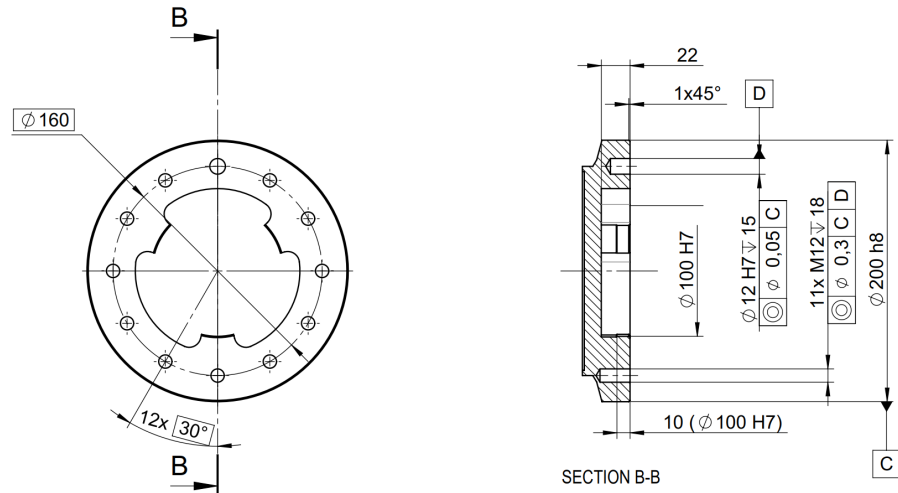
1 Description

1.6 Fitting equipment to the robot

Continued

Tool flange, standard

Below is the standard tool flange. The guide pin hole is, in calibration position, pointing upwards in Z-direction.



xx1700001491

| | |
|---|-----------------------|
| A | Thread length: 18 mm. |
|---|-----------------------|

Fastener quality

In general, the fastener quality must correspond to the application environment. 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.

1.7 Maintenance and troubleshooting

General

The robot requires only minimum maintenance during operation. It has been designed to make it as easy to service as possible:

- Maintenance-free AC motors are used.
- Oil is used for the gearboxes.
- The cabling is routed for longevity, and in the unlikely event of a failure, its modular design makes it easy to change.

Maintenance

The maintenance intervals depend on the use of the robot. The required maintenance activities also depend on the selected options. For detailed information on maintenance procedures, see the maintenance section in *Product manual - IRB 6790 Foundry Prime*.

Warranty

Harsh environments typically involve a lot of different process parameters such as specific fluids, their concentration and certain additives etc. These parameters might affect the visual appearance of selected parts on the robot or cell by means of discoloration, surface or cosmetic corrosion. These cases as well as defects caused by damages in the surface treatment during transport or improper storage that do not directly impact proper function of the robot are excluded from the standard warranty and will not be covered.

1 Description

1.8.1 Robot motion

1.8 Robot motion

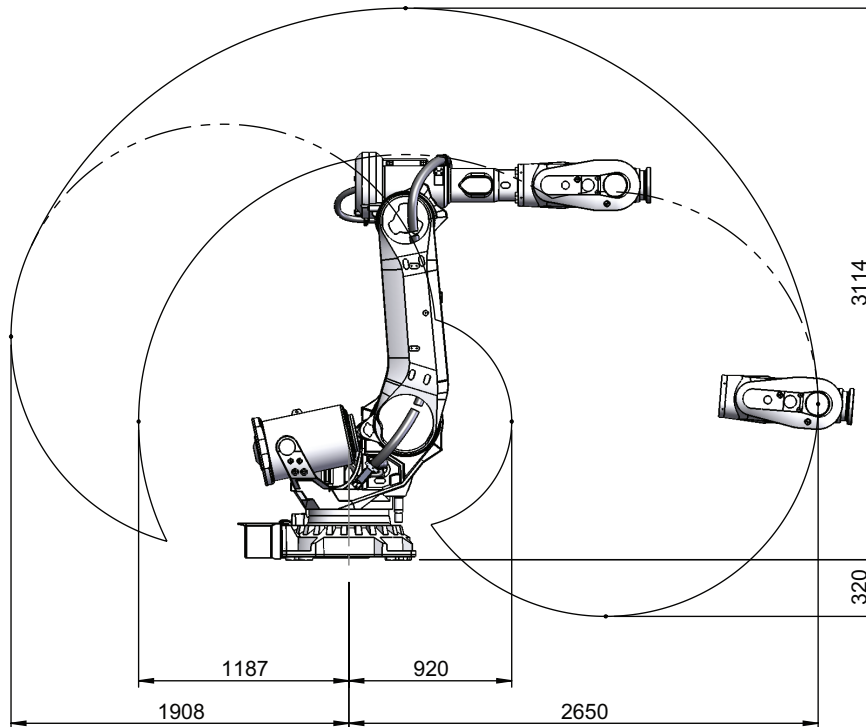
1.8.1 Robot motion

Type of motion

| Axis | Type of motion | Range of movement - IRB 6790 | Note |
|--------|-----------------|---|---|
| Axis 1 | Rotation motion | $\pm 170^\circ$ or $\pm 220^\circ$ (option) | |
| Axis 2 | Arm motion | $-65^\circ/+85^\circ$ | |
| Axis 3 | Arm motion | $-180^\circ/+70^\circ$ | |
| Axis 4 | Wrist motion | $\pm 300^\circ$ | |
| Axis 5 | Bend motion | $\pm 130^\circ$ | |
| Axis 6 | Turn motion | $\pm 360^\circ$ ± 93.7 revolutions | Maximum value. The default working range for axis 6 can be extended by changing parameter values in the software. Option 610-1 <i>Independent axis</i> can be used for resetting the revolution counter after the axis has been rotated (no need for "rewinding" the axis). |

Working range

| Robot type | Handling capacity (kg) | Reach (m) |
|------------|------------------------|-----------|
| IRB 6790 | 235 | 2.65 |



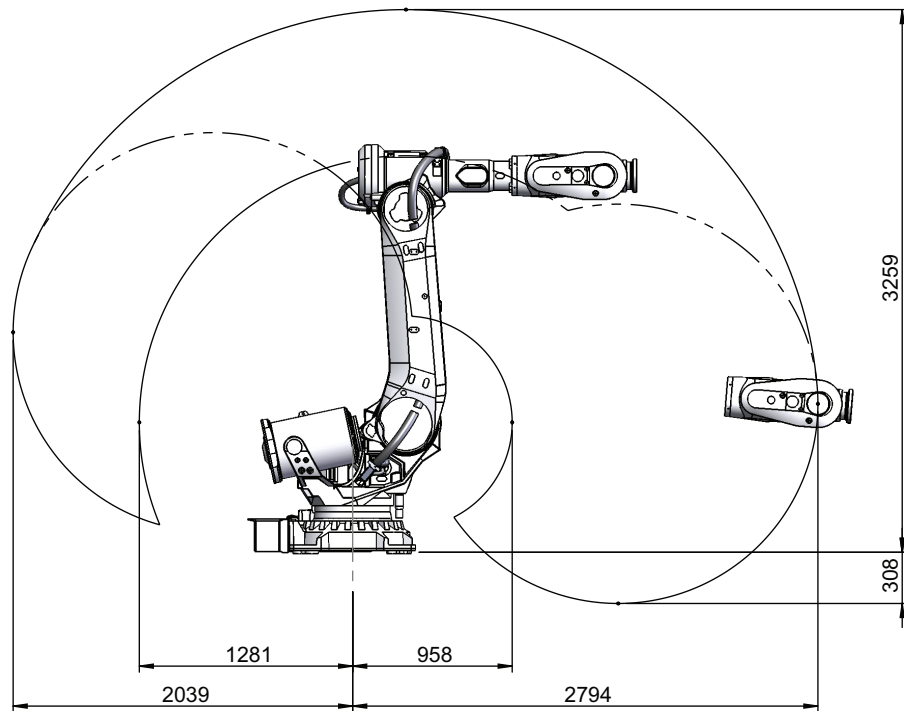
xx1300000281

Continues on next page

1 Description

1.8.1 Robot motion *Continued*

| Robot type | Handling capacity (kg) | Reach (m) |
|------------|------------------------|-----------|
| IRB 6790 | 205 | 2.80 |



xx1300000282

1 Description

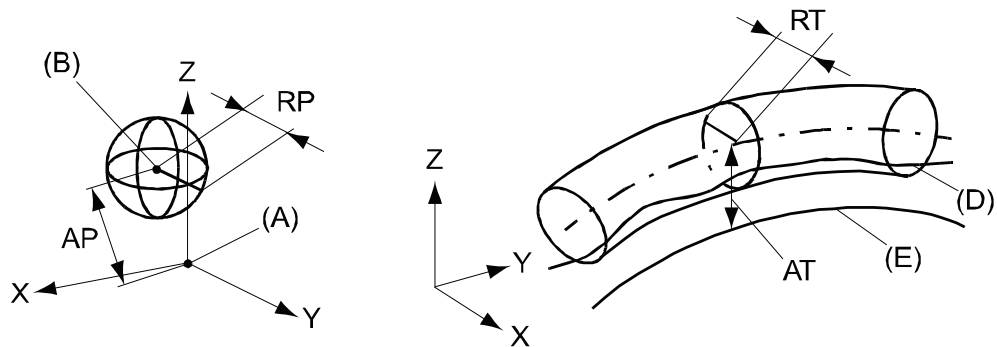
1.8.2 Performance according to ISO 9283

1.8.2 Performance according to ISO 9283

General

At rated maximum load, maximum offset and 1.6 m/s velocity on the inclined ISO test plane, with all six axes in motion. Values in the table below are the average result of measurements on a small number of robots. The result may differ depending on where in the working range the robot is positioning, velocity, arm configuration, from which direction the position is approached, the load direction of the arm system. Backlashes in gearboxes also affect the result.

The figures for AP, RP, AT and RT are measured according to figure below.



xx0800000424

| Pos | Description | Pos | Description |
|-----|---|-----|---|
| A | Programmed position | E | Programmed path |
| B | Mean position at program execution | D | Actual path at program execution |
| AP | Mean distance from programmed position | AT | Max deviation from E to average path |
| RP | Tolerance of position B at repeated positioning | RT | Tolerance of the path at repeated program execution |

| IRB 6790 | 235/2.65 | 205/2.80 |
|--|----------|----------|
| Pose accuracy, AP ⁱ (mm) | 0.03 | 0.06 |
| Pose repeatability, RP (mm) | 0.05 | 0.05 |
| Pose stabilization time, PSt (s) within 0.4 mm of the position | 0.16 | 0.17 |
| Path accuracy, AT (mm) | 1.7 | 1.5 |
| Path repeatability, RT (mm) | 0.08 | 0.08 |

ⁱ AP according to the ISO test above, is the difference between the taught position (position manually modified in the cell) and the average position obtained during program execution.

1.8.3 Velocity**Maximum axis speed**

| Robot type | Axis 1 | Axis 2 | Axis 3 | Axis 4 | Axis 5 | Axis 6 |
|-------------------|---------|--------|--------|---------|---------|---------|
| IRB 6790-235/2.65 | 100 °/s | 90 °/s | 90 °/s | 170 °/s | 120 °/s | 190 °/s |
| IRB 6790-205/2.80 | 100 °/s | 90 °/s | 90 °/s | 170 °/s | 120 °/s | 190 °/s |

There is a supervision function to prevent overheating in applications with intensive and frequent movements (high duty cycle).

1 Description

1.8.4 Robot stopping distances and times

1.8.4 Robot stopping distances and times

Introduction

The stopping distances and times for category 0 and category 1 stops, as required by EN ISO 10218-1 Annex B, are listed in *Product specification - Robot stopping distances according to ISO 10218-1 (3HAC048645-001)*.

2 Specification of variants and options

2.1 Introduction to variants and options

General

The different variants and options for the IRB 6790 are described in the following sections. The same option numbers are used here as in the specification form.

The variants and options related to the robot controller are described in the product specification for the controller.

2 Specification of variants and options

2.2 Manipulator

2.2 Manipulator

Variants

| Option | IRB Type | Handling capacity (kg) | Reach (m) |
|---------|----------|------------------------|-----------|
| 435-142 | 6790 | 235 | 2.65 |
| 435-143 | 6790 | 205 | 2.80 |

Protection types

| Option | Protection type | Note |
|--------|-----------------|---|
| 287-12 | Foundry Prime 3 | See Foundry Prime on page 10 for a complete description of protection type Foundry Prime 3. |

Requirement

The option [287-12] Foundry Prime 3 requires option [430-1] Upper arm covers.

Upper arm covers

| Option | Description | Note |
|--------|------------------|------|
| 430-1 | Upper arm covers | |

Warranty

For the selected period of time, ABB will provide spare parts and labour to repair or replace the non-conforming portion of the equipment without additional charges. During that period, it is required to have a yearly Preventative Maintenance according to ABB manuals to be performed by ABB. If due to customer restrains no data can be analyzed in the ABB Ability service *Condition Monitoring & Diagnostics* for robots with OmniCore controllers, and ABB has to travel to site, travel expenses are not covered. The Extended Warranty period always starts on the day of warranty expiration. Warranty Conditions apply as defined in the Terms & Conditions.




Note

This description above is not applicable for option *Stock warranty* [438-8]

| Option | Type | Description |
|--------|-------------------|---|
| 438-1 | Standard warranty | Standard warranty is 12 months from <i>Customer Delivery Date</i> or latest 18 months after <i>Factory Shipment Date</i> , whichever occurs first. Warranty terms and conditions apply. |

Continues on next page

| Option | Type | Description |
|--------|----------------|--|
| 438-8 | Stock warranty | <p>Maximum 6 months postponed start of standard warranty, starting from factory shipment date. Note that no claims will be accepted for warranties that occurred before the end of stock warranty. Standard warranty commences automatically after 6 months from <i>Factory Shipment Date</i> or from activation date of standard warranty in WebConfig.</p> <p> Note</p> <p>Special conditions are applicable, see <i>Robotics Warranty Directives</i>.</p> |

Remote Service enabled

| Option | Description | Note |
|--------|-------------------------|------|
| 890-4 | Connected Services 3G | |
| 890-5 | Connected Services WiFi | |

2 Specification of variants and options

2.3 Equipment

2.3 Equipment

General

| Option | Type | Description |
|--------|-------------------------------|--|
| 159-1 | Fork lift device ⁱ | Lifting device for fork-lift handling. |

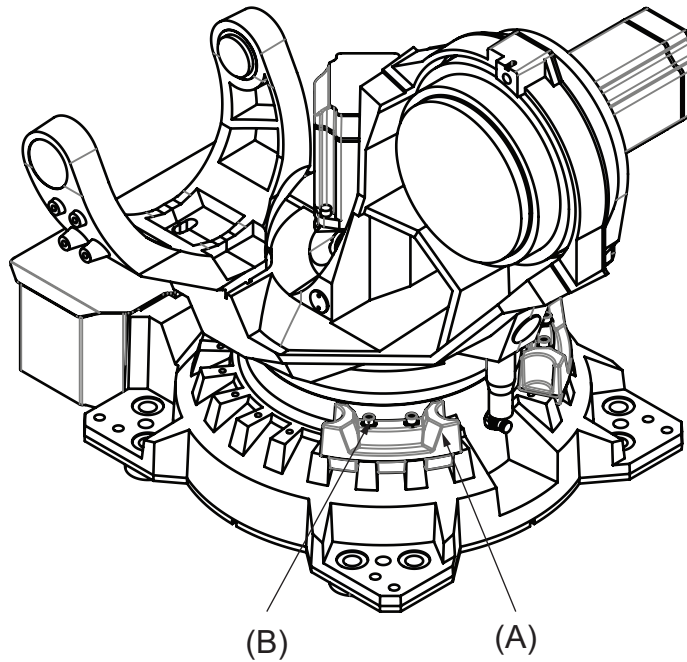
ⁱ Its recommended to remove the fork lift devices after use

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Working range limitation

To increase the safety of the robot, the working range of axis 1 can be restricted by extra mechanical stops.

| Option | Type | Description |
|--------|--------------------|--|
| 29-1 | Axis 1, 15 degrees | Two stops which allow the working range to be restricted in increments of 15°. |



xx1400002035

| Pos | Description |
|-----|--|
| A | Two mechanical stops |
| B | Bolt tightening torque: 60 Nm ⁱ |

ⁱ In corrosive environment exchange bolts to stainless steel variants.

Extended working range

| Option | Type | Description |
|--------|----------------------------|--|
| 561-1 | Extended work range axis 1 | To extend the working range on axis 1 from $\pm 170^\circ$ to $\pm 220^\circ$. The option 561-1 requires option 810-2, SafeMove. When the option is used, the mechanical stop can after a risk-assessment be removed. |

Continues on next page

2 Specification of variants and options

2.3 Equipment

Continued



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 SafeMove2*.

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.

Standard calibration method

| Option | Type | Description |
|--------|------------------|--|
| 1999-1 | Axis calibration | Preferred standard calibration method. Robust, high performance axis calibration using only mechanical calibration stops and software. |

2.4 Floor cables

Manipulator cable length

| Option | Lengths | Description |
|--------|---------|--|
| 210-2 | 7 m | Length from the manipulator interface plate to controller. |
| 210-3 | 15 m | |
| 210-4 | 22 m | |

2 Specification of variants and options

2.5 Process cabinet

2.5 Process cabinet

Empty cabinet

| Option | Type | Description |
|--------|---------------------|---|
| 768-1 | Empty cabinet small | See <i>Product specification - Controller IRC5 with FlexPendant</i> |
| 768-2 | Empty cabinet large | See <i>Product specification - Controller IRC5 with FlexPendant</i> |
| 715-1 | Installation kit | See <i>Product specification - Controller IRC5 with FlexPendant</i> |

3 Accessories

3.1 Introduction to accessories

General

There is a range of tools and equipment available, especially designed for the manipulator.

Basic software and software options for robot and PC

For more information, see *Product specification - Controller IRC5* and *Product specification - Controller software IRC5*.

Robot peripherals



Note

The peripherals are not available with the Foundry Prime protection type. Always use with caution when installed together with Foundry Prime robots in Foundry Prime environment.

- The Track Motion is not adapted for the remote connector plate on IRB 6790 and the air supply needed for the overpressure in manipulator and the air pressure supervision.
- Track Motion
- Motor Units

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