

ROBOTICS

Product specification

IRB 660



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Product specification

IRB 660-180/3.15

IRB 660-250/3.15

IRC5

Document ID: 3HAC023932-001

Revision: X

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Overview of this specification

About this product specification

This product specification describes the performance of the manipulator or a complete family of manipulators in terms of:

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

The specification covers the manipulator using the IRC5 controller.

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.

The specification is intended for:

- Product managers and product personnel
- Sales and marketing personnel
- Order and customer service personnel

References

| Reference | Document ID |
|---|----------------|
| <i>Product manual - IRB 660</i> | 3HAC025755-001 |
| <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 specification - Robot user documentation, IRC5 with RobotWare 6</i> | 3HAC052355-001 |
| <i>Product specification - Robot stopping distances according to ISO 10218-1</i> | 3HAC048645-001 |

Revisions

| Revision | Description |
|----------|--|
| - | - New Product specification |
| A | - General corrections |
| B | - Changes in Figure 3 and Figure 16. |
| C | - Update Customer connections- Interbus removed - Footnote added to "Pose accuracy" - Stock Warranty |

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Overview of this specification

Continued

| Revision | Description |
|----------|--|
| D | <ul style="list-style-type: none">- Changes in chapter Standards- Directions of forces- Warranty information for Load diagrams |
| E | <ul style="list-style-type: none">- Position switches removed. |
| F | <ul style="list-style-type: none">- Work range- Explanation of ISO values (new figure and table)- Stopping distance- User documentation on DVD |
| G | <ul style="list-style-type: none">- General update for 9.1 release |
| H | <ul style="list-style-type: none">- Text for Standards updated |
| J | <ul style="list-style-type: none">- Tightening torque adjusted |
| K | <ul style="list-style-type: none">• Table for ambient temperature adjusted• New picture of tool flange• Minor corrections of foundation forces |
| L | <ul style="list-style-type: none">• Machinery directive updated• Minor corrections |
| M | <ul style="list-style-type: none">• Base plate drawing updated |
| N | <ul style="list-style-type: none">• Minor corrections/update |
| P | <ul style="list-style-type: none">• Text for ISO test adjusted |
| Q | <ul style="list-style-type: none">• Minor corrections/update |
| R | Published in release R17.1. The following updates are done in this revision: <ul style="list-style-type: none">• Axis Calibration method added• Restriction of load diagram added. |
| S | Published in release R17.2. The following updates are done in this revision: <ul style="list-style-type: none">• Updated list of applicable standards.• TCP acceleration information added |
| T | Published in release R18.2. The following updates are done in this revision: <ul style="list-style-type: none">• Added locating hole position in tool flange view. |
| U | Published in release R20D. The following updates are done in this revision: <ul style="list-style-type: none">• Minor changes.• New customer option cable harness (with ethernet cable) added.• Warranty section updated. |
| V | Published in release 21B. The following updates are done in this revision: <ul style="list-style-type: none">• Text regarding fastener quality is updated.• Specification updated in customer connection section for DressPack, Parallel and Ethernet communication.• Removed Axis resolution.• Updated information about the option <i>Extended working range</i>. |

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| Revision | Description |
|----------|--|
| X | <p>Published in release 21D. The following updates are done in this revision:</p> <ul style="list-style-type: none">• Minor changes.• The data for robot stopping distances is removed. See <i>Product specification - Robot stopping distances according to ISO 10218-1</i>.• Description for option 455-8 updated. |

Overview

About this Product specification

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

- The structure and dimensional prints
- The fulfilment of standards, safety and operating requirements
- The load diagrams, mounting of extra equipment, the motion and the robot reach
- The specification of variant 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.

Who should read this manual?

This manual is intended for:

- Product managers and Product personnel
- Sales and Marketing personnel
- Order and Customer Service personnel

Contents

Please see Table of Contents on page 3.

References

| Reference | Document ID |
|--|-----------------------|
| <i>Product specification - Controller IRC5 with FlexPendant</i> | <i>3HAC041344-001</i> |
| <i>Product specification - Controller software IRC5</i> | <i>3HAC022349-001</i> |
| <i>Product specification - Robot user documentation, IRC5 with RobotWare 5</i> | <i>3HAC024534-001</i> |
| <i>Product manual - IRB 660</i> | <i>3HAC025755-001</i> |

Revisions

| Revision | Description |
|----------|--|
| - | - New Product specification |
| A | - General corrections |
| B | - Changes in Figure 3 and Figure 16. |
| C | - Update Customer connections- Interbus removed - Footnote added to "Pose accuracy" - Stock Warranty |

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| D | - Changes in chapter Standards - Directions of forces - Warranty information for Load diagrams |
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| K | <ul style="list-style-type: none"> • Table for ambient temperature adjusted • New picture of tool flange • Minor corrections of foundation forces |
| L | <ul style="list-style-type: none"> • Machinery directive updated • Minor corrections |
| M | <ul style="list-style-type: none"> • Base plate drawing updated |
| N | <ul style="list-style-type: none"> • Minor corrections/update |
| P | <ul style="list-style-type: none"> • Text for ISO test adjusted |

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1 Description

1.1 Structure

1.1.1 Introduction

Robot family

IRB 660 is ABB Robotics latest generation of 4-axis palletizing robot, designed with a focus on its high production capacity, short cycle time at a high payload, long reach together with the very high uptime, which is significant for ABB's robots. It is available in two versions; a handling capacity of 180 kg and 250 kg, both with a reach of 3.15 m.

Customer connections such as power signals, Bus signals and twin air are integrated in the robot, from the robot base to connections at the robot tool flange.

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 and so on. For more information, see *Product specification - Controller IRC5 with FlexPendant*.

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, gluing and welding, communication feature such as network communication, and advanced functions such as multitasking, sensor control and so on. For a complete description on optional software, see *Product specification - Controller software IRC5*.

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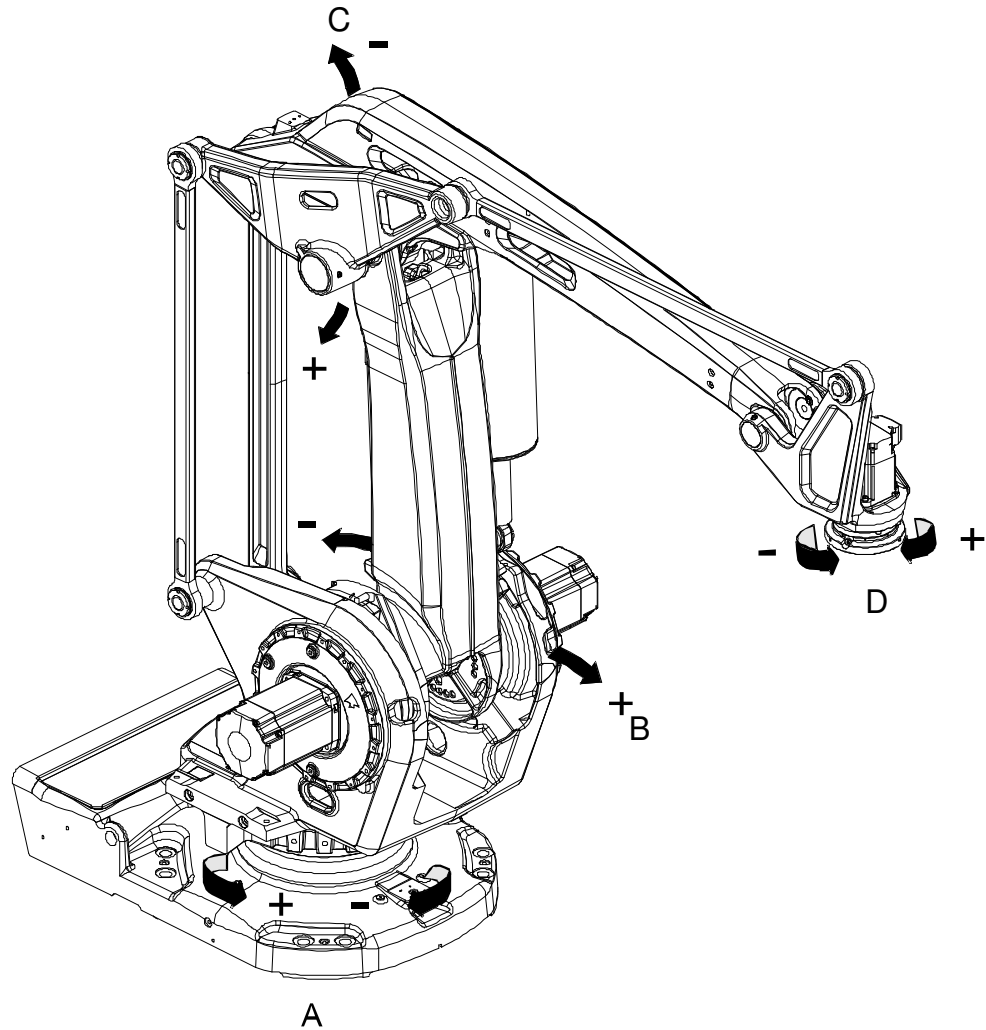
1 Description

1.1.1 Introduction

Continued

Manipulator axes

The IRB 660 manipulator has 4 axes as shown in the following figure.



en100000670

| Pos. | Description |
|------|-------------|
| A | Axis 1 |
| B | Axis 2 |
| C | Axis 3 |
| D | Axis 6 |

1.1.2 Different robot versions

General

The IRB 660 is available in two versions.

| Robot type | Handling capacity (kg) | Reach (m) |
|------------|------------------------|-----------|
| IRB 660 | 180 | 3.15 |
| IRB 660 | 250 | 3.15 |

1 Description

1.1.3 Definition of version designation

1.1.3 Definition of version designation

IRB 660 Mounting

Handling capacity/ Reach

| | Prefix | Description |
|-------------------|--------|---|
| Mounting | - | Floor-mounted manipulator |
| Handling capacity | yyy | Indicates the maximum handling capacity (kg) |
| Reach | x.x | Indicates the maximum reach at wrist center (m) |

Manipulator weight

| Robot type | Handling capacity (kg) | Reach (m) | Weight (kg) |
|------------|------------------------|-----------|-------------|
| IRB 660 | 180 | 3.15 | 1750 |
| IRB 660 | 250 | 3.15 | 1750 |

Other technical data

| Data | Description | Note |
|----------------------|--|---|
| Airborne noise level | The sound pressure level outside the working space | < 70 dB (A) Leq (acc. to Machinery directive 2006/42/EG). |

Continues on next page

Power consumption at max load

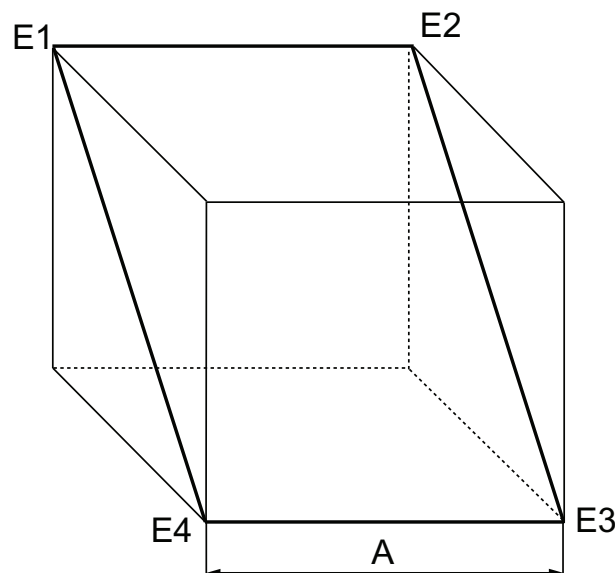
Path E1-E2-E3-E4 in the ISO Cube.

| ISO Cube Speed [mm/s] | Power consumption [kW] | |
|-----------------------|------------------------|------------------|
| | IRB 660-180/3.15 | IRB 660-250/3.15 |
| Max. | 3.17 | 2.36 |
| 1000 | 1.31 | 1.50 |
| 500 | 0.89 | 1.02 |
| 100 | 0.61 | 0.70 |

General Palletizing movements in 48s. at maximum speed.

| General Palletizing movements | Power consumption [kW] | |
|-------------------------------|------------------------|------------------|
| | IRB 660-180/3.15 | IRB 660-250/3.15 |
| Max. speed | 3.08 | 2.34 |

The path E1-E2-E3-E4 in the ISO Cube is shown in the following figure.



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| Pos | Description |
|-----|-------------|
| A | 1000mm |

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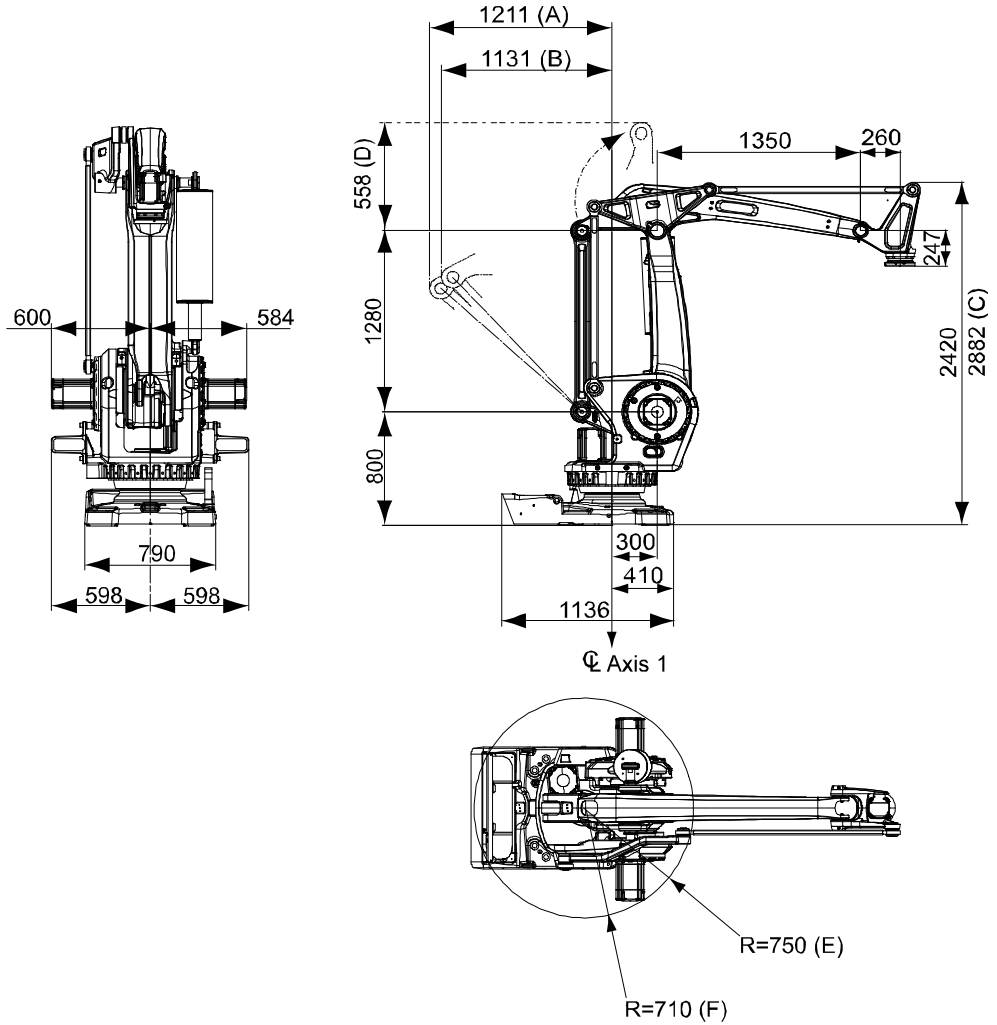
1 Description

1.1.3 Definition of version designation

Continued

Dimensions IRB660

The following figure shows the front, side, and top view of the IRB660 manipulator (dimensions in mm). Allow 200 mm behind the manipulator foot for cables.



en100000821

| Position | Description |
|----------|------------------------------|
| A | At mechanical stop |
| B | At max. working range axis 2 |
| C | At max. working range axis 3 |
| D | At min. working range axis 3 |
| E | Radius for fork lift pocket |
| F | Radius for axis 3 motor |

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 | Safety of machinery - Electrical equipment of machines - Part 1: General requirements |

Region specific standards and regulations

| Standard | Description |
|------------------|---|
| ANSI/RIA R15.06 | Safety requirements for industrial robots and robot systems |
| ANSI/UL 1740 | Safety standard for robots and robotic equipment |
| CAN/CSA Z 434-03 | Industrial robots and robot Systems - General safety requirements |

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 | Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments |

Continues on next page

1 Description

1.2.1 Applicable standards

Continued

| Standard | Description |
|--------------------------------|--|
| ISO 13732-1:2006 | Ergonomics of the thermal environment - Part 1 |
| IEC 60974-1:2012 ⁱ | Arc welding equipment - Part 1: Welding power sources |
| IEC 60974-10:2014 ⁱ | Arc welding equipment - Part 10: EMC requirements |
| ISO 14644-1:2015 ⁱⁱ | Classification of air cleanliness |
| IEC 60529:1989 + A2:2013 | Degrees of protection provided by enclosures (IP code) |

ⁱ Only valid for arc welding robots. Replaces IEC 61000-6-4 for arc welding robots.

ⁱⁱ Only robots with protection Clean Room.

1.3 Installation

1.3.1 Introduction

General

IRB 660 is designed for floor mounting (no tilting allowed around X or Y axis). Depending on the robot version, an end effector with maximum weight of 180 to 250 kg including payload, can be mounted on the mounting flange (axis 6). For more information on Load diagrams, see [Load diagrams on page 33](#).

Working Range

The working range of axis 1 can be limited by mechanical stops. Electronic Position Switches can be used on all axes, for position indication of the manipulator.

External Mains Transformer

Include an external transformer for mains voltage 200V and 220V.

1 Description

1.3.2 Operating requirements

1.3.2 Operating requirements

Protection standards

Manipulator 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 | 0 °C ⁱ (32 °F) to +45 °C (113 °F) |
| For the controller | Standard/Option | See <i>Product specification - Controller IRC5 with FlexPendant</i> |
| Complete robot during transportation and storage | Standard | -25 °C (-13 °F) to +55 °C (131 °F) |
| For short periods (not exceeding 24 hours). | Standard | up to +70 °C (158 °F) |

ⁱ At low environmental temperature < 10 ° C is, as with any other machine, a warm-up phase recommended to be run with the robot. Below 5 ° C this warm-up phase is mandatory. Otherwise there is a risk that the robot stops or run with lower performance due to temperature dependent oil and grease viscosity.

Relative humidity

| Description | Relative humidity |
|---|-------------------------------------|
| Complete robot during operation, transportation and storage | Maximum 95% at constant temperature |

1.3.3 Mounting the manipulator

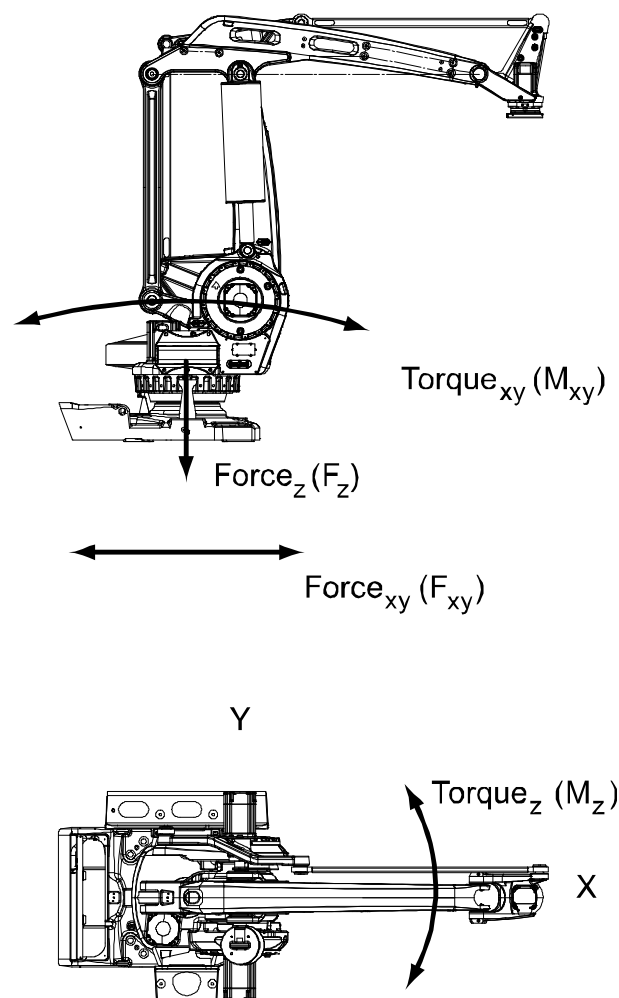
Maximum Load

Maximum load in relation to the base coordinate system.

Floor Mounted

| Force | Endurance load (in operation) | Max. load (emergency stop) |
|-----------|-------------------------------|----------------------------|
| Force xy | ± 8.0 kN | ± 11.7 kN |
| Force z | 18.0 ±4.9 kN | 18.0 ±8.2 kN |
| Torque xy | ± 23.2 kNm | ± 31.2 kNm |
| Torque z | ± 7.7 kNm | ± 9.9 kNm |

The following figure shows the direction of forces.



en100000825

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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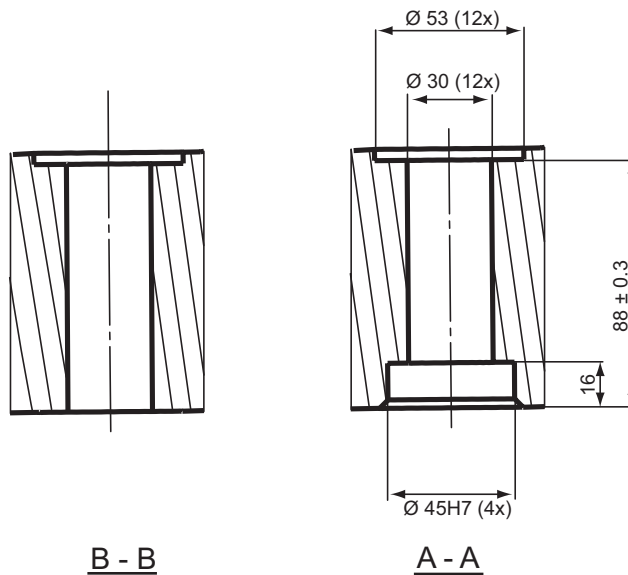
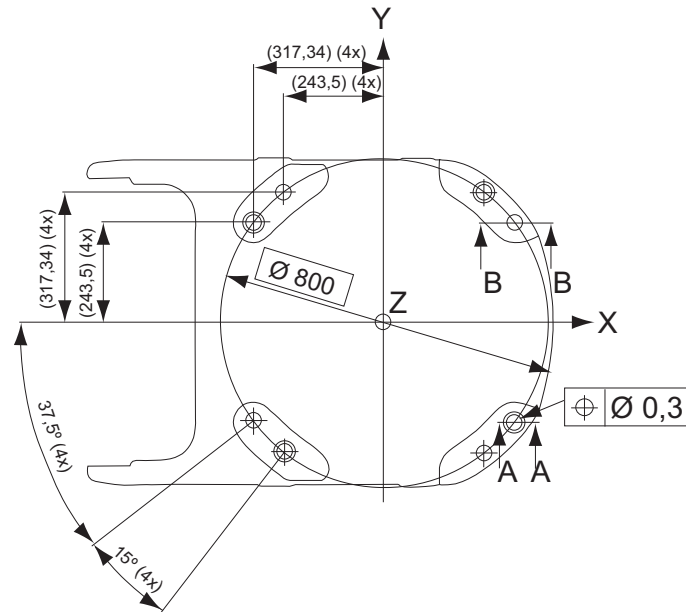
1 Description

1.3.3 Mounting the manipulator

Continued

Fastening holes robot base

The following figure shows the hole configuration (dimensions in mm).



xx100000826

Recommended screws for fastening the manipulator to a base plate:

- M24 x 140 8.8 with 4 mm flat washer. Torque value 725 Nm.



Note

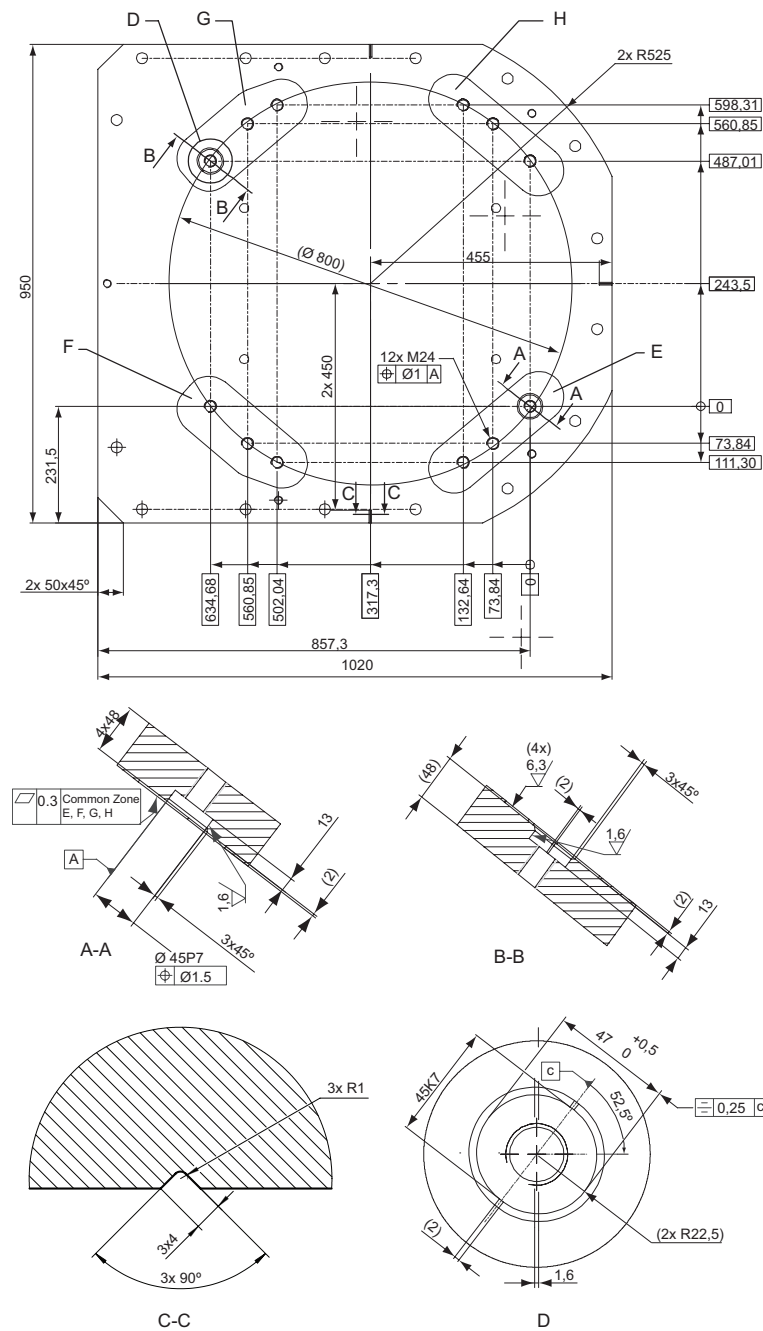
Only two guiding sleeves shall be used. The corresponding holes in the base plate shall be circular and oval according to the following base plate drawing.

Regarding AbsAcc performance, the recommended are the chosen guide holes those are according to the following base plate drawing.

Continues on next page

Base plate drawing

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



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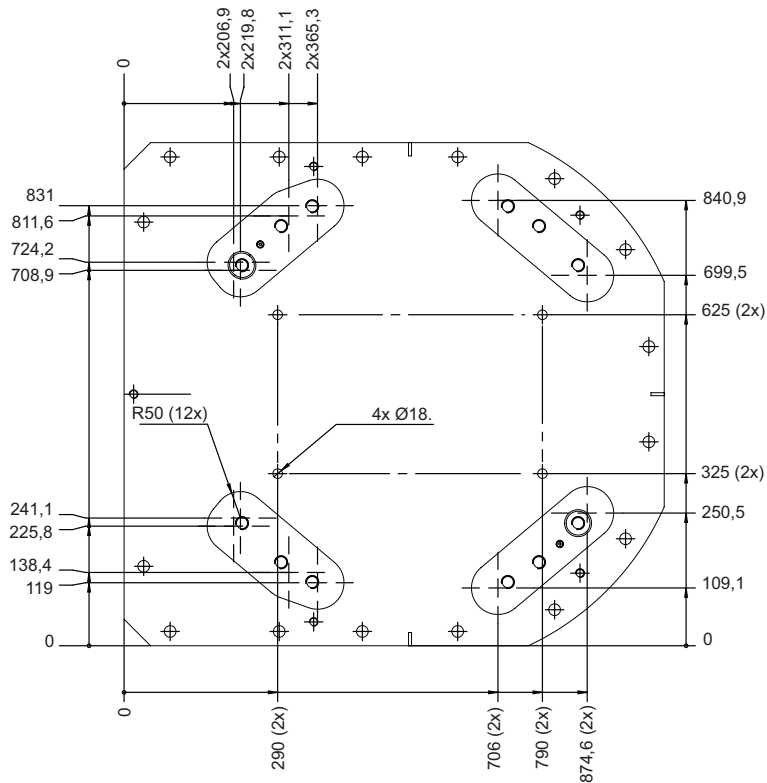
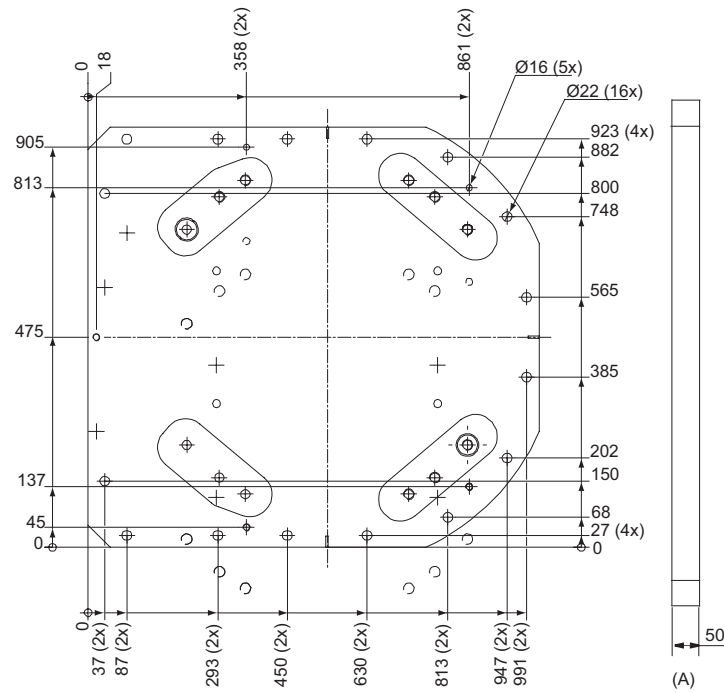
| | |
|------------|--|
| E, F, G, H | Common tolerance zone (accuracy all over the base plate from one contact surface to the other) |
|------------|--|

Continues on next page

1 Description

1.3.3 Mounting the manipulator

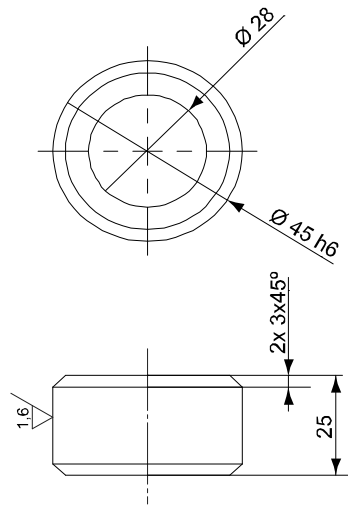
Continued



xx1000001054

| Pos | Description |
|-----|--|
| A | Color: RAL 9005 Thickness: 80-100 μm |

Continues on next page



xx1000001055

| Pos | Description |
|-----|---------------------------------------|
| A | Guide sleeve protected from corrosion |

1 Description

1.4.1 Calibration methods

1.4 Calibration

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. For robots with RobotWare 5.04 or older, the calibration data is delivered in a file, calib.cfg, supplied with the robot at delivery. The file identifies the correct resolver/motor position corresponding to the robot home position. | Axis Calibration or Calibration Pendulum ⁱ |

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

Brief description of calibration methods

Calibration Pendulum method

Calibration Pendulum is a standard calibration method for calibration of many of ABB robots (except IRB 6400R, IRB 640, IRB 1400H, and IRB 4400S).

Two different routines are available for the Calibration Pendulum method:

- Calibration Pendulum II
- Reference calibration

The calibration equipment for Calibration Pendulum is delivered as a complete toolkit, including the *Operating manual - Calibration Pendulum*, which describes the method and the different routines further.

Axis Calibration method

Axis Calibration is a standard calibration method for calibration of IRB 660. 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.

Continues on next page

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.

1 Description

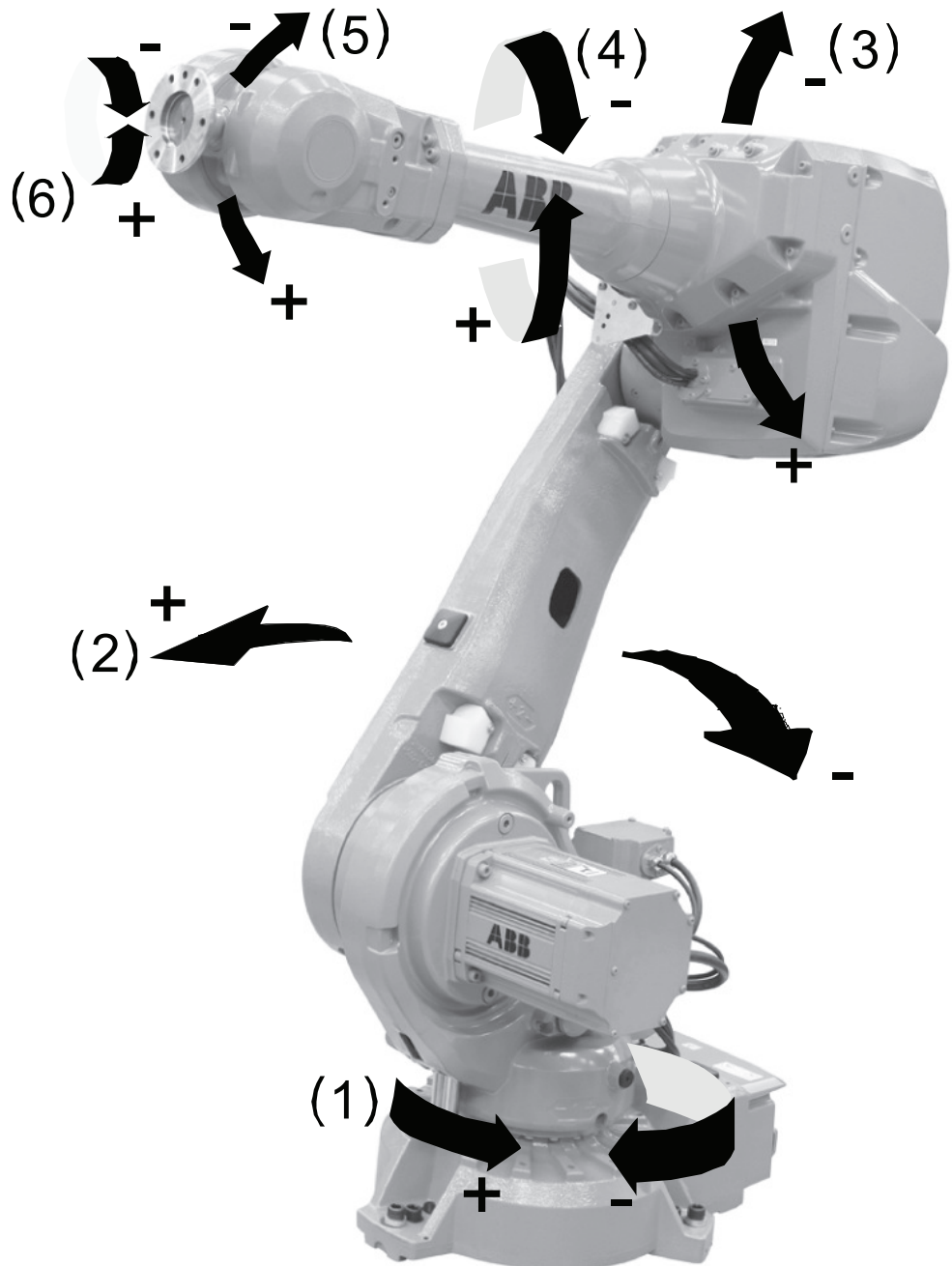
1.4.2 Fine calibration

1.4.2 Fine calibration

Overview

Fine calibration is made using the Calibration Pendulum, see *Operating manual - Calibration Pendulum* or *Axis calibration, see Product manual - IRB 4600* and *Product manual - IRB 4600 Foundry Prime*.

The following figure shows all axes in zero position.



xx1800001381

Continues on next page

| Calibration | Position |
|-----------------------------|--|
| Calibration of all axes | All axes are in zero position |
| Calibration of axis 1 and 2 | Axis 1 and 2 in zero position Axis 3 to 6 in any position |
| Calibration of axis 1 | Axis 1 in zero position Axis 2 to 6 in any position |

1 Description

1.5.1 Introduction to Load diagrams

1.5 Load diagrams

1.5.1 Introduction to Load diagrams

Information



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

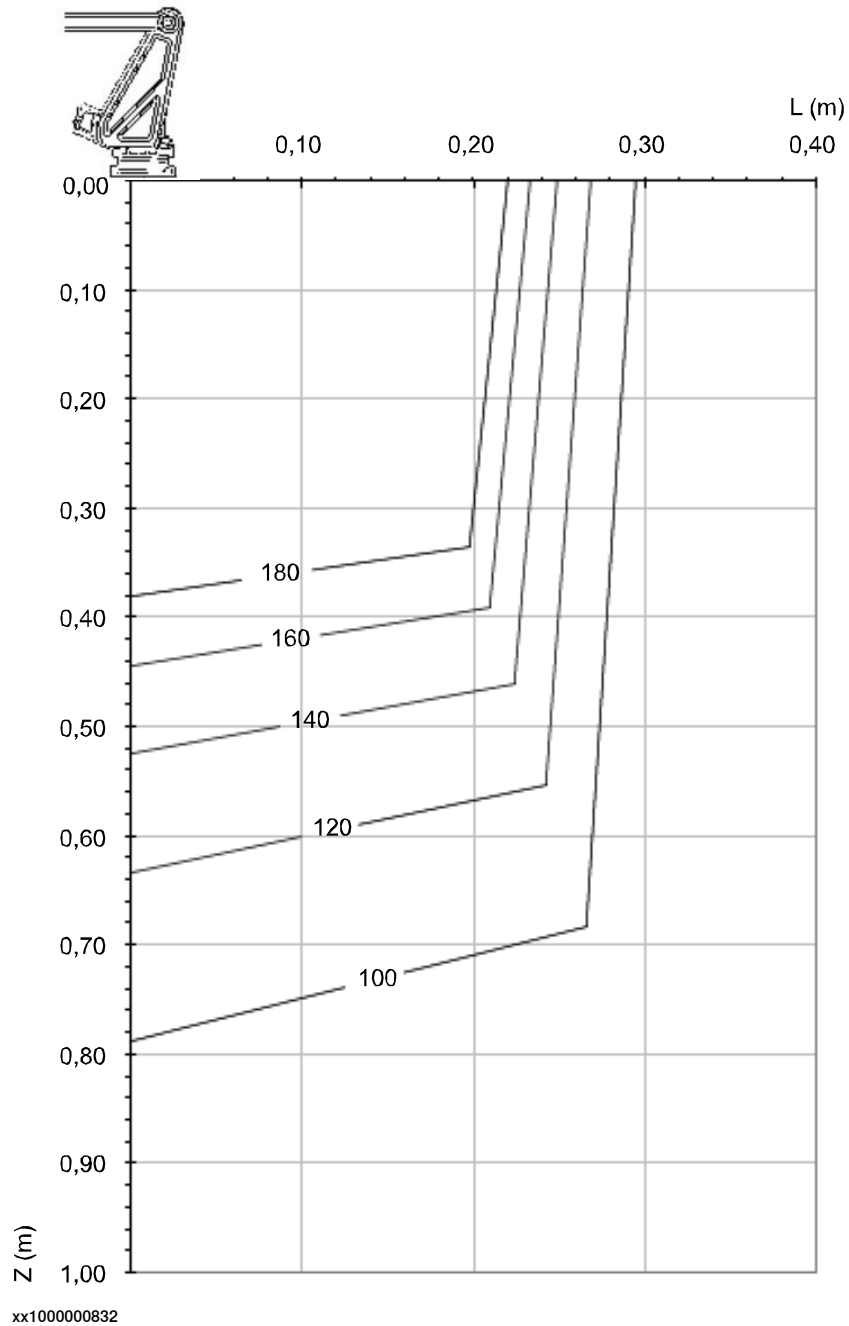
To verify a specific load case, use the RobotStudio add-in RobotLoad.

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.

1.5.2 Load diagrams

IRB 660-180/3.15

The following figures shows the maximum permitted load mounted on the robot tool flange at different positions (center of gravity).



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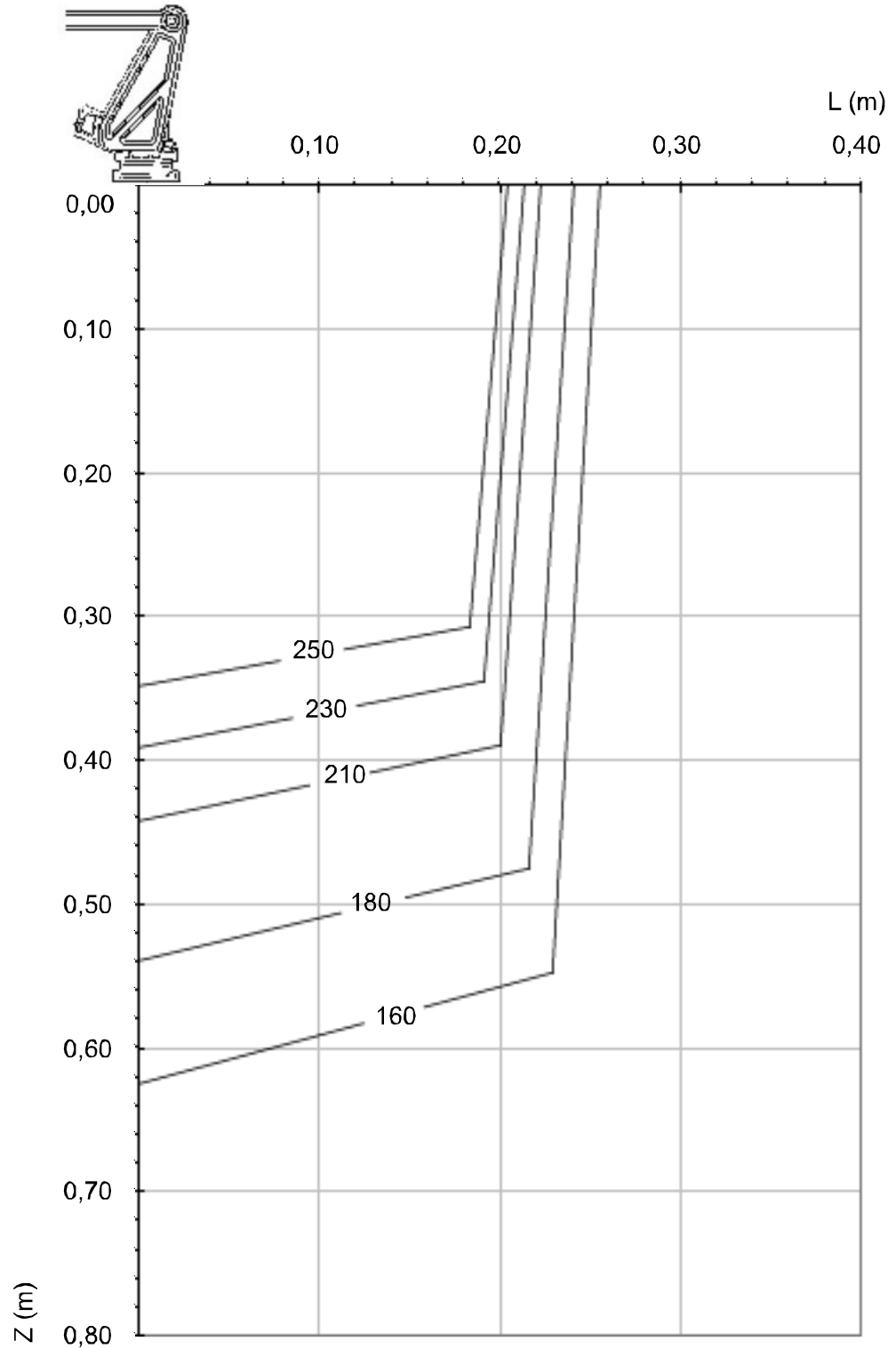
1 Description

1.5.2 Load diagrams

Continued

IRB 660-250/3.15

The following figures shows the maximum permitted load mounted on the robot tool flange at different positions (center of gravity).



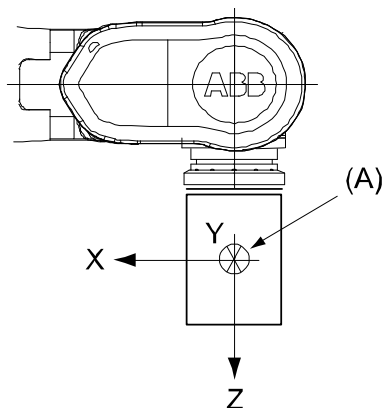
xx100000833

1.5.3 Maximum load and moment of inertia

Overview

Load in kg, Z and L in m and J in kgm^2 .

| Axis | Maximum moment of inertia |
|------|---|
| 6 | $J_{a6} = \text{Load} \times L^2 + J_{0z} \leq 250 \text{ kgm}^2$ |



xx100000834

| 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 Maximum TCP acceleration

1.5.4 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 660 - 250/3.15 | 31 | 18 |
| IRB 660 - 180/3.15 | 37 | 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).

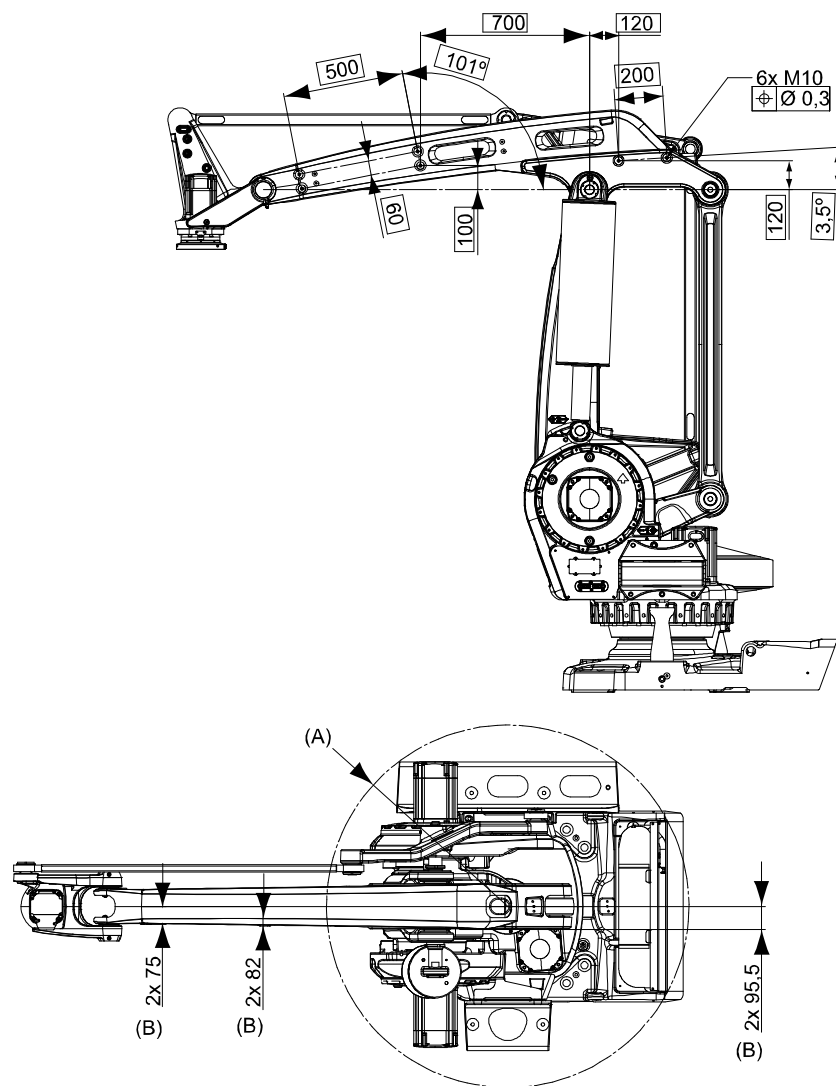
1.6 Mounting of equipment

1.6.1 Overview

General

Extra loads can be mounted on to the upper arm and on to the left side of the frame. Holes and definitions of masses are shown in following figures.

For mounting of an external vacuum hose there are six holes on the upper arm (see the following figure). The maximum weight for the vacuum hose and fastening device is 35kg. When using the holes, the weight of the vacuum hose shall be reduced from the maximum handling capacity, for each variant respectively.



xx100000835

| Position | Description |
|----------|------------------------------|
| A | R750 Right fork lift pocket |
| B | M10 Mounting hole, upper arm |

Continues on next page

1 Description

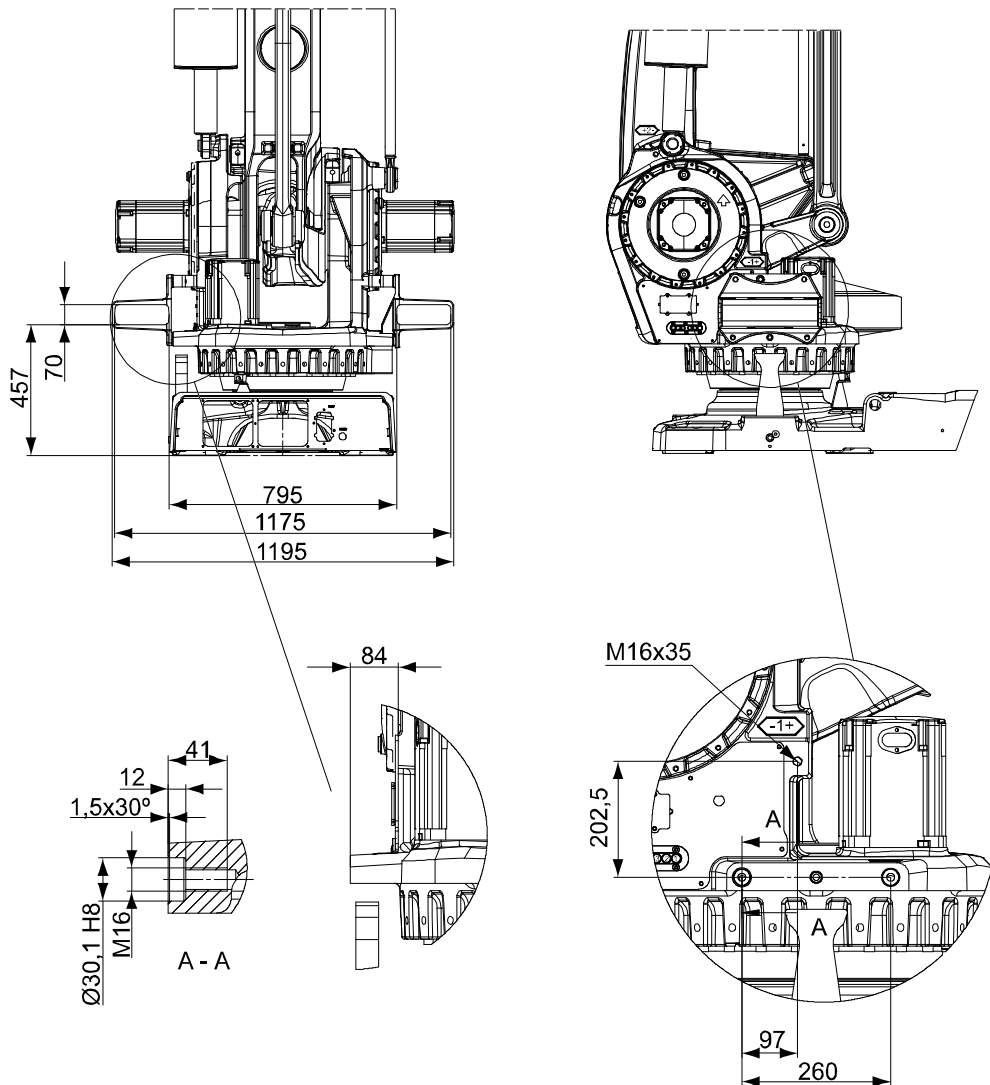
1.6.1 Overview

Continued

Frame

For mounting of extra load on to the frame there are three holes on the left side (see the following figure). The maximum weight of the extra load is 150kg and the maximum moment of inertia is 120kgm².

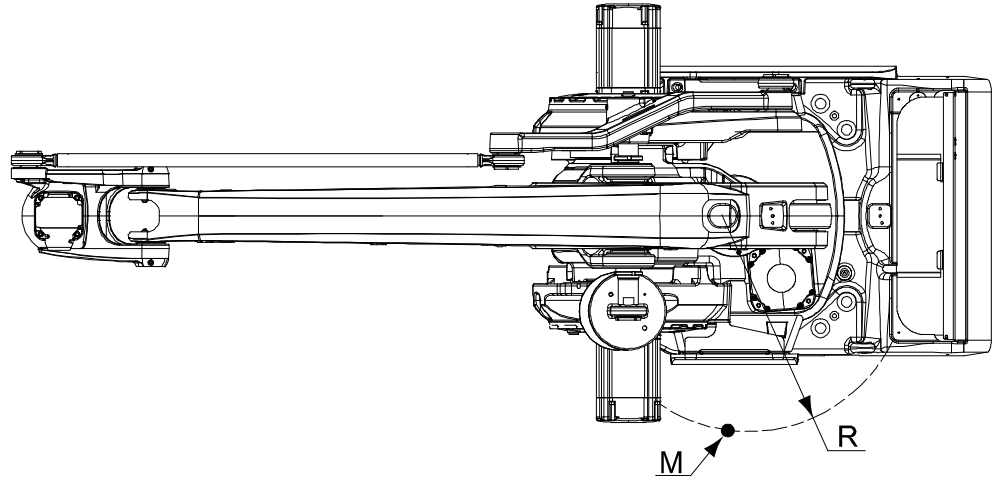
| Description | Value and definition |
|---|--|
| Permitted extra load on frame | M = 150 kg |
| Max. moment of inertia for extra load | $J_H = 120 \text{ kgm}^2$ |
| Recommended position as shown in the following figure | $J_H = J_{H0} + M \times R^2$ J_{H0} is the moment of inertia (kgm ²) for the extra load. R is the radius (m) from the center of axis1. M is the total mass (kg) of the extra load. |



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Continues on next page

The following figure shows the radius for extra load on frame.



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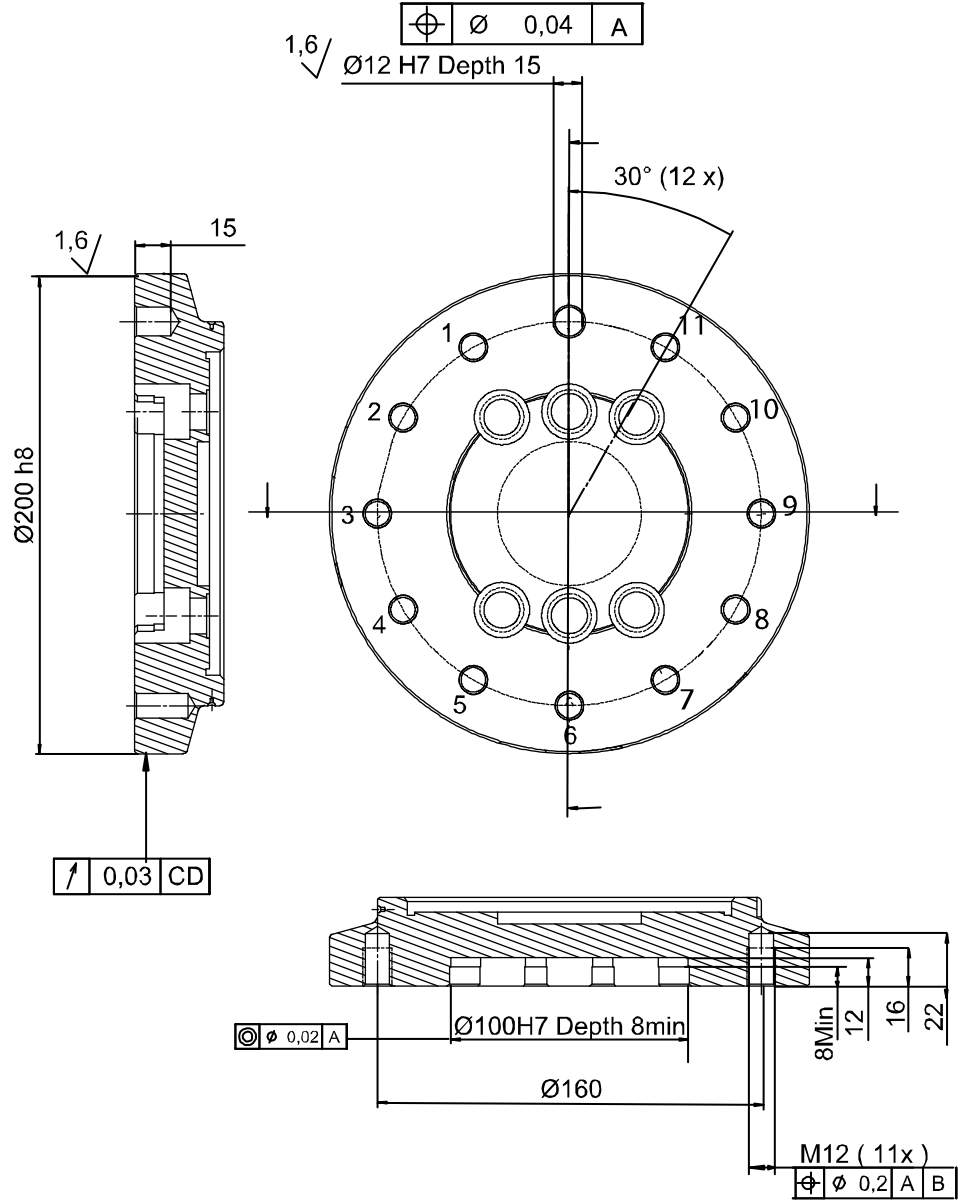
1 Description

1.6.1 Overview

Continued

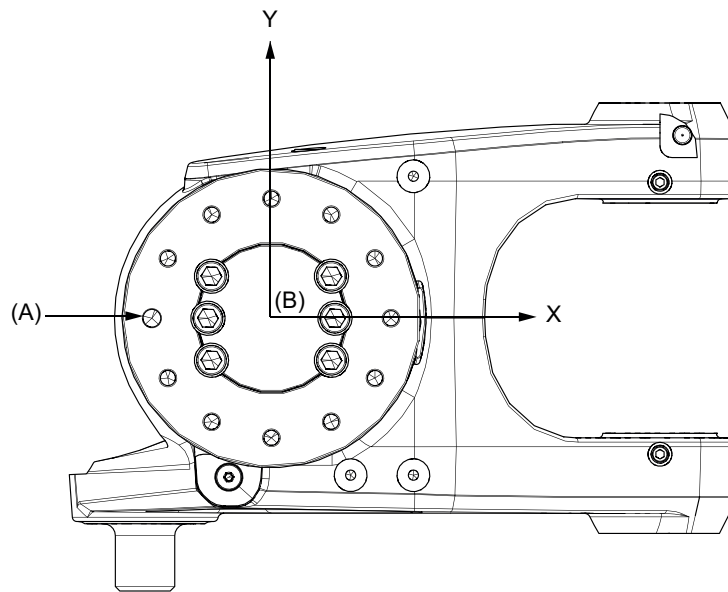
Robot tool flange

The following figure shows the robot tool flange SS-EN ISO 9409-1;2004 (dimensions in mm).



xx0500002292

Continues on next page



xx1800001377

| | |
|---|----------------------------|
| - | Tool flange in bottom view |
| A | Locating hole |
| B | Tool coordinate system |

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.

1 Description

1.7.1 Introduction

1.7 Robot motion

1.7.1 Introduction

Type of Motion

| Axis | Type of motion | Range of movement | Option |
|------|-----------------|--|----------------|
| 1 | Rotation motion | +180° to -180° | +220° to -220° |
| 2 | Arm motion | +85° to -42° | |
| 3 | Arm motion | +120° to -20° | |
| 6 | Turn motion | +300° to -300° (default) +150 revolutions to -150 revolutions Max (see the following note) | |



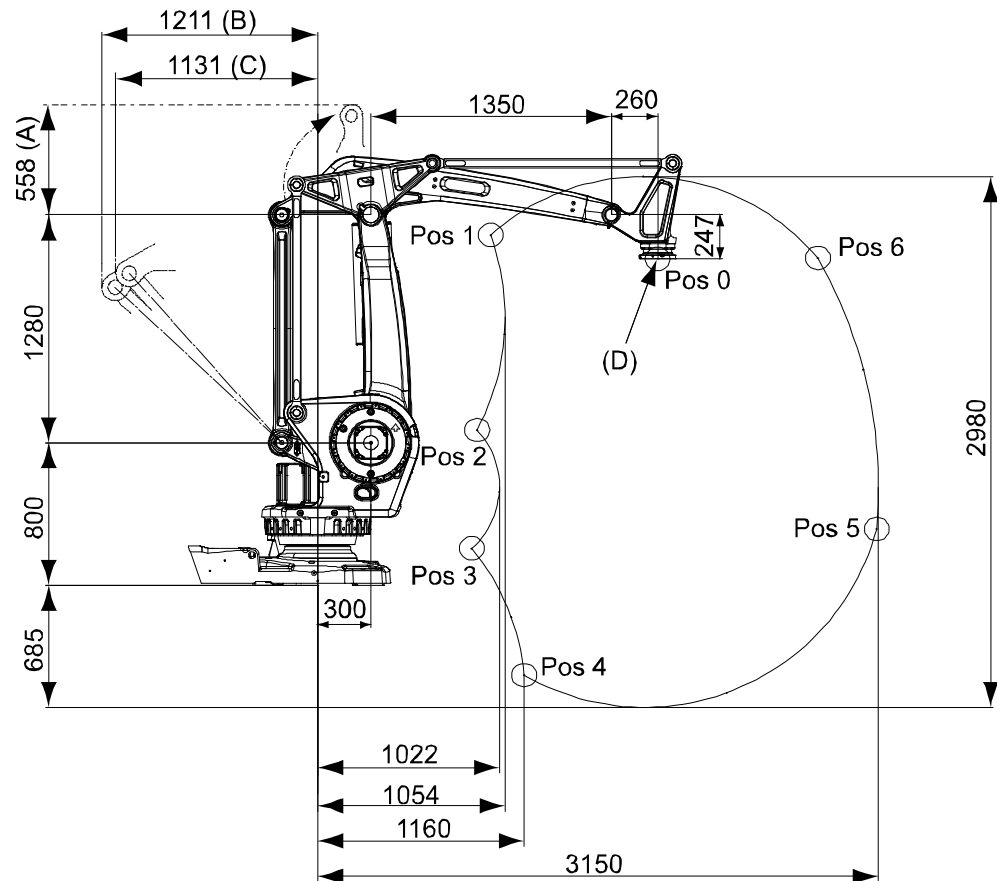
Note

- The default working range for axis 6 can be extended by changing parameter values in the software.
- Option 610-1 *Independent axis* can be used for resetting the revolution counter after the axis has been rotated (no need for “rewinding” the axis).

Continues on next page

Illustration

The following figure shows the extreme positions of the robot arm specified at the tool flange center (dimensions in mm).



xx100000839

| Position | Description |
|----------|--------------------|
| A | Min. working stop |
| B | Mechanical stop |
| C | Max. working stop |
| D | Tool flange center |

Positions at wrist center

| Position number (see preceding figure) | X Position (mm) | Z Position (mm) | Axis2 Angle (degrees) | Axis3 Angle (degrees) |
|--|-----------------|-----------------|-----------------------|-----------------------|
| 0 | 1910 | 1833 | 0 | 0 |
| 1 | 972 | 1966 | -42 | -20 |
| 2 | 895 | 870 | -42 | 28 |
| 3 | 866 | 207 | 50 | 120 |
| 4 | 1160 | -505 | 85 | 120 |
| 5 | 3139 | 315 | 85 | 15 |
| 6 | 2809 | 1837 | 50 | -20 |

1 Description

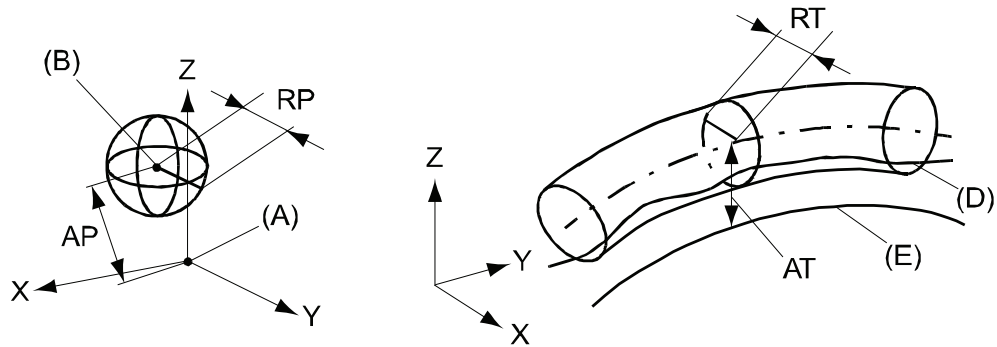
1.7.2 Performance according to ISO 9283

1.7.2 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.



xx080000424

| 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 |

| Description | IRB 660-180/3.15 | IRB 660-250/3.15 |
|--|------------------|------------------|
| Unidirectional pose accuracy, AP ⁱ (mm) | 0.20 | 0.20 |
| Unidirectional pose repeatability, RP (mm) | 0.05 | 0.05 |
| Linear path repeatability, RT (mm) | 0.23 | 0.17 |
| Linear path accuracy, AT (mm) | 2.20 | 2.13 |
| Pose stabilization time PST (s) | 0.17 | 0.22 |

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.
The above values are the range of average test results from a number of robots.

1.7.3 Velocity

Maximum axis speeds

| Axis No. | IRB 660-180/3.15 | IRB 660-250/3.15 |
|----------|------------------|------------------|
| 1 | 130°/s | 95°/s |
| 2 | 130°/s | 95°/s |
| 3 | 130°/s | 95°/s |
| 6 | 300°/s | 240°/s |

There is a supervision function to prevent overheating in applications with intensive and frequent movements.

1 Description

1.7.4 Robot stopping distances and times

1.7.4 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)*.

1.8 Customer connections

1.8.1 Introduction

General

Depending on the choice of options above the DressPack will have different content. The choice of routing will not affect the content. See tables for signal content below. For further information on the customer connection, see [Application interface connection type on page 56](#).

DressPack, Parallel, bus and air communication

| Type | Application | Specification | Connection type | Harting Article No. | Comment |
|-------------------------|-------------------------|--------------------------------------|---|---------------------------------|---|
| Power (CP) | Utility power | 4x0.75mm ² (5A/250VAC) | 3-module Harting, shell size 10B, EE | Female, EE, 8 pin9 140 083 101 | 1x0.75 mm ² protective earth |
| Signals (CS) | Parallel communication | 16x AWG24 + 10x AWG24 (50V/1A) | 3-module Harting, shell size 10B, HD+EE | Female, HD, 25 pin9 140 253 101 | 4 quad twisted, 5 screened pair twisted |
| Signals (CS) | | 5x2AWG24 (50V/1A) | 3-module Harting, shell size 10B, HD | Female, HD, 25 pin9 140 253 101 | Sep. Screened |
| Bus Communication (BUS) | Profibus | 2xAWG26, Z=150 Ohm (1MHz) | 3-module Harting, shell size 10B, DD | Female, DD, 12 pin9 140 123 101 | |
| | CANBus | 2xAWG26, Z=120 Ohm (1MHz) | | | |
| | BUS power & BUS utility | 2x2 AWG24 | | | |
| Air (AIR) | Utility air | 2x12.7 (1/2") P Nom = 16 bar | Parker Push-lock, 1/2" M22x1,5 Brass 24 degree seal | | |

DressPack, Parallel and Ethernet communication

| Type | Application | Specification | Connection type | Supplier Article No. | Comment |
|-------------------------|-----------------------|--------------------------------------|---------------------------------------|--------------------------------|--|
| Functional Earth (FE) | | 10mm ² | M8 Cable lug | | |
| Bus communication (BUS) | Ethernet/IP, PROFINET | 4x0.4mm ² | M12 PFT Slim Design, 4-poles, D-coded | Male, Harting 21038821425 | Ethernet CAT5e 100 Mbit ¹ . |
| Power (CP) | Utility power | 4x0.75mm ² (5A/250VAC) | 3-module Harting, shell size 10B, EE | Female, EE, 8 pin9 140 083 101 | 1x0.75mm ² protective earth |

¹ Ethernet with wire colors according to PROFINET standard

Continues on next page

1 Description

1.8.1 Introduction

Continued

| Type | Application | Specification | Connection type | Supplier Article No. | Comment |
|--------------|------------------------|---|---|---------------------------------------|---|
| Signals (CS) | Parallel communication | 16x AWG24 + 10x AWG24 (50V/1A) | 3-module Harting, shell size 10B, HD+EE | Female, HD, 25 pin9 140 253 101 | 4 quad twisted, 5 screened pair twisted |
| Air (AIR) | Utility air | 2x12.7 (1/2") $P_{Nom} = 16 \text{ bar}$ | Parker Push-lock, 1/2" M22x1,5 Brass 24 degree seal | | |

1.9 Maintenance and troubleshooting

1.9.1 Introduction

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 gear boxes
- 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 depends on selected options. For detailed information on maintenance procedures, see *Product manual - IRB 660*, chapter *Maintenance*.

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2 Specification of variants and options

2.1 Introduction to variants and options

General

The different variants and options for the IRB 660 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) |
|--------|----------|------------------------|-----------|
| 435-58 | 660 | 180 | 3.15 |
| 435-59 | 660 | 250 | 3.15 |

Manipulator color

| Option | Description | Note |
|-------------|--|----------------|
| 209-1 | ABB Orange standard | |
| 209-2 | ABB White standard | |
| 209-202 | ABB Graphite White standard | Standard color |
| 209-3 --192 | The robot is painted in chosen RAL - color | |



Note

Notice that delivery time for painted spare parts will increase for none standard colors.

Equipment

| Option | Type | Description |
|--------|------------------|--|
| 213-1 | Safety lamp | A safety lamp with an orange fixed light can be mounted on the manipulator. The lamp is active in MOTORS ON mode. The safety lamp is required on a UL/UR approved robot. |
| 159-1 | Fork lift device | Lifting device on the manipulator for fork-lift handling. |
| 37-1 | Base plate | Can also be used for IRB 7600. See dimension drawing in Mounting the manipulator on page 23 . |

Resolver connection, axis 7

| Option | Description | Note |
|--------|-------------|--|
| 864-1 | On base | Used together with first additional drive, option 907-1. |

Electronic Position Switches (EPS)

The mechanical position switches indicating the position of the three main axes are replaced with electronic position switches for up to 7 axes, for increased flexibility and robustness. For more detailed information, see *Product specification - Controller IRC5 with FlexPendant*.

Continues on next page

Work range limit Axis 1

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

| Option | Type | Description |
|--------|---------------------|---|
| 29-2 | Axis 1, 7.5 degrees | Two stops which allow the working range to be restricted in increments of 7.5°. |

Extended work range

| Option | Type | Description |
|--------|----------------------------|---|
| 561-1 | Extended work range axis 1 | To extend the working range on Axis1 from $\pm 180^\circ$ to $\pm 220^\circ$. When the option is used the mechanical stop shall be removed. Requires options SafeMove or EPS (Electronic Position Switches). |



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.

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]

Continues on next page

2 Specification of variants and options

2.2 Manipulator

Continued

| 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. |
| 438-2 | Standard warranty + 12 months | Standard warranty extended with 12 months from end date of the standard warranty. Warranty terms and conditions apply. Contact Customer Service in case of other requirements. |
| 438-4 | Standard warranty + 18 months | Standard warranty extended with 18 months from end date of the standard warranty. Warranty terms and conditions apply. Contact Customer Service in case of other requirements. |
| 438-5 | Standard warranty + 24 months | Standard warranty extended with 24 months from end date of the standard warranty. Warranty terms and conditions apply. Contact Customer Service in case of other requirements. |
| 438-6 | Standard warranty + 6 months | Standard warranty extended with 6 months from end date of the standard warranty. Warranty terms and conditions apply. |
| 438-7 | Standard warranty + 30 months | Standard warranty extended with 30 months from end date of the standard warranty. Warranty terms and conditions apply. |
| 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> |

2.3 Floor cables

General

Additional floor cables for customer connections see [Process on page 56](#).

Manipulator cable length

| Option | Lengths |
|--------|---------|
| 210-2 | 7 m |
| 210-3 | 15 m |
| 210-4 | 22 m |
| 210-5 | 30 m |

2 Specification of variants and options

2.4 Process

2.4 Process

Application interface connection type

| Option | Description | |
|--------|----------------------|---|
| 16-1 | Cabinet ⁱ | The signals are connected to 12-pole screw terminals, Phoenix MSTB 2.5/12-ST-5.08, to the control module. |

ⁱ In a MultiMove application, additional robots have no control module. The screw terminal with internal cabling are then delivered separately to be mounted in the main robot control module or in another encapsulation, for example a PLC cabinet.

Communication

| Option | Type | Description |
|--------|-------------------------------------|--|
| 455-6 | Parallel, Bus and Air Communication | Includes Customer Signals (CS), Customer Power (CP), Bus signals and two hoses for Air (inner diameter 12.5 mm) |
| 455-8 | Parallel and Ethernet communication | Includes CP, customer signals and PROFINET or Ethernet/IP for process cable package and two hoses for Air (inner diameter 12.5 mm) |

Parallel/CAN/DeviceNet/Profibus/Ethernet

The following information specifies the cable length for Parallel/CAN/DeviceNet/Profibus/Ethernet for connection to cabinet.

| Option | Lengths |
|----------------------|---------|
| 90-2/92-2/859-1/94-1 | 7 m |
| 90-3/92-3/859-2/94-2 | 15 m |
| 90-4/859-3 | 22 m |
| 90-5/92-5/859-4/94-4 | 30 m |

Empty cabinet

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

Connector kits upper arm

| Option | Type | Description |
|--------|-----------|--|
| 431-1 | Upper arm | Connector for customer Power/Signals/ and bus at axis 6 tool side. |

2.5 User documentation

User documentation

The user documentation describes the robot in detail, including service and safety instructions.



Tip

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

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3 Accessories

3.1 Introduction to accessories

General

There is a range of tools and equipment available.

Basic software and software options for robot and PC

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

Robot peripherals

- Motor Units²

² Not applicable for IRC5 Compact controller.

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