ROBOTICS

Product specification

IRB 6660

Trace back information:
Workspace 24A version a16
Checked in 2024-03-07
Skribenta version 5.5.019

Product specification

IRB 6660-100/3.3
IRB 6660-130/3.1
IRB 6660-205/1.9

OmniCore

Document ID: 3HAC087212-001

Revision: B

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Original instructions.

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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 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.

Users

It is intended for:

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

References

Reference	Document ID
Product manual - IRB 6660	*3HAC039842-001*
Product manual - OmniCore V250XT Type B	*3HAC087112-001*
Product manual - OmniCore V400XT	*3HAC081697-001*
Product specification - OmniCore V line	*3HAC074671-001*
Product specification - Robot stopping distances according to ISO 10218-1	*3HAC048645-001*

Revisions

Revision	Description
A	First edition.
B	Published in release 24A. The following updates are done in this revision: • Added DressPack options for CC-Link.

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1 Description

1.1 Structure

1.1.1 Introduction

Robot family

The IRB 6660 is one of ABB Robotics generation of high payload, high performance industrial robots.

Based on the famous IRB 6600 robot family, the very high wrist torque, the service friendly modular built up and the very high availability, significant for ABB's robots, the IRB 6660 robot family goes even further, towards the excellence as a flexible tooling in automatic manufacturing.

With a focus on the very high robot performance, simple service and low maintenance cost, the IRB 6660-130/3.1 and IRB 6660-100/3.3 are the most profitable alternatives in automation of Press Tending applications and IRB 6660-205/1.9 is adapted for Pre-machining and cleaning of aluminium castings.

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 OmniCore 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 - OmniCore V line*.

The IRB 6660 manipulator can be connected to the following robot controllers:

- OmniCore V250XT
- OmniCore V400XT

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 features - network communication - and advanced functions such as multitasking, sensor control etc. For a complete description on optional software, see *Product specification - OmniCore V line*.

Continues on next page

1.1.1 Introduction
Continued

Protection type Foundry Plus 2

Robots with the option Foundry Plus 2 are designed for harsh environments where the robot is exposed to sprays of coolants, lubricants and metal spits that are typical for die casting applications or other similar applications.

Typical applications are spraying insertion and part extraction of die-casting machines, handling in sand casting and gravity casting, etc. (Please refer to Foundry Prime robots for washing applications or other similar applications). Special care must be taken in regard to operational and maintenance requirements for applications in foundry are as well as in other applications areas. Please contact ABB Robotics Sales organization if in doubt regarding specific application feasibility for the Foundry Plus 2 protected robot.

The robot is painted with two-component epoxy on top of a primer for corrosion protection. To further improve the corrosion protection additional rust preventive are applied to exposed and crucial areas, e.g. has the tool flange a special preventive coating. Although, continuous splashing of water or other similar rust formation fluids may cause rust attach on the robots unpainted areas, joints, or other unprotected surfaces. Under these circumstances it is recommended to add rust inhibitor to the fluid or take other measures to prevent potential rust formation on the mentioned.

The entire robot is IP67 compliant according to IEC 60529 - from base to wrist, which means that the electrical compartments are sealed against water and solid contaminants. Among other things all sensitive parts are better protected than the standard offer.

Selected Foundry Plus 2 features:

- Improved sealing to prevent penetration into cavities to secure IP67
- Additional protection of cabling and electronics
- Special covers that protect cavities
- Well-proven connectors
- Nickel coated tool flange
- Rust preventives on screws, washers and unpainted/machined surfaces
- Extended service and maintenance program

The Foundry Plus 2 robot can be cleaned with appropriate washing equipment according to the robot product manual. Appropriate cleaning and maintenance is required to maintain the protection, for example can rust preventive be washed off with wrong cleaning method.

Available robot variants

The option Foundry Plus 2 might not be available for all robot variants.

See *Variants and options on page 61* for robot versions and other options not selectable together with Foundry Plus 2.

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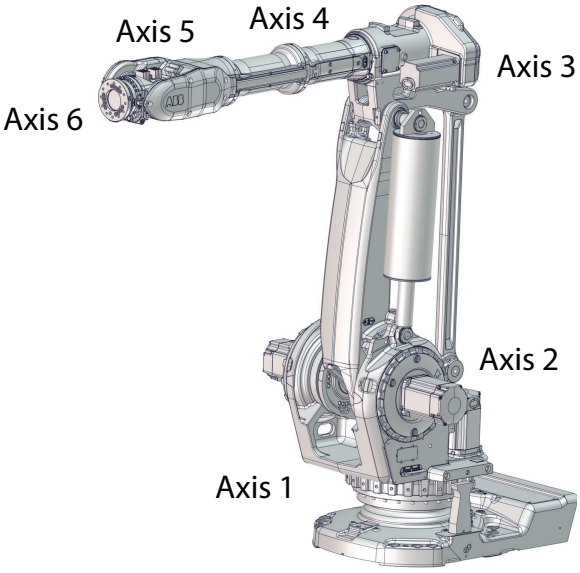
Manipulator axes



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1.1.2 Technical data

General

The IRB 6660 is available in three variants.

Robot	Handling capacity (kg)	Reach (m)
IRB 6660-130/3.1	130 kg	3.1 m
IRB 6660-100/3.3	100 kg	3.3 m
IRB 6660-205/1.9	205 kg	1.9 m

Manipulator weight

Robot variant	Weight
IRB 6660-130/3.1	1,910 kg
IRB 6660-100/3.3	1,950 kg
IRB 6660-205/1.9	1,730 kg

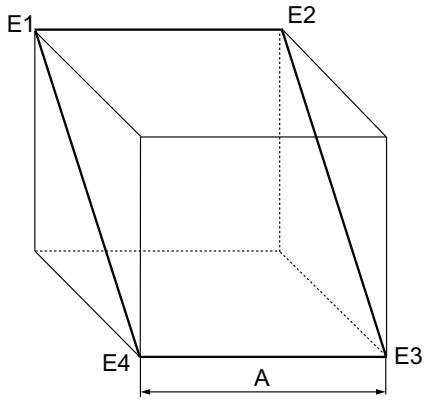
Airborne noise level

Data	Description	Note
Airborne noise level	The sound pressure level outside the working space.	< 69 dB(A) Leq (acc. to Machinery directive 2006/42/EG)

Power consumption at max load

Type of movement	IRB 6660 (all variants)
ISO cube 1000 m/s	1.22 kW
ISO cube max. velocity	1.28 kW

Robot in calibration position	All variants
Brakes engaged	0.24 kW
Brakes disengaged	0.72 kW



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	IRB 6660-130/3.1 and -100/3.3	IRB 6660-205/1.9
A	1,000 mm	630 mm

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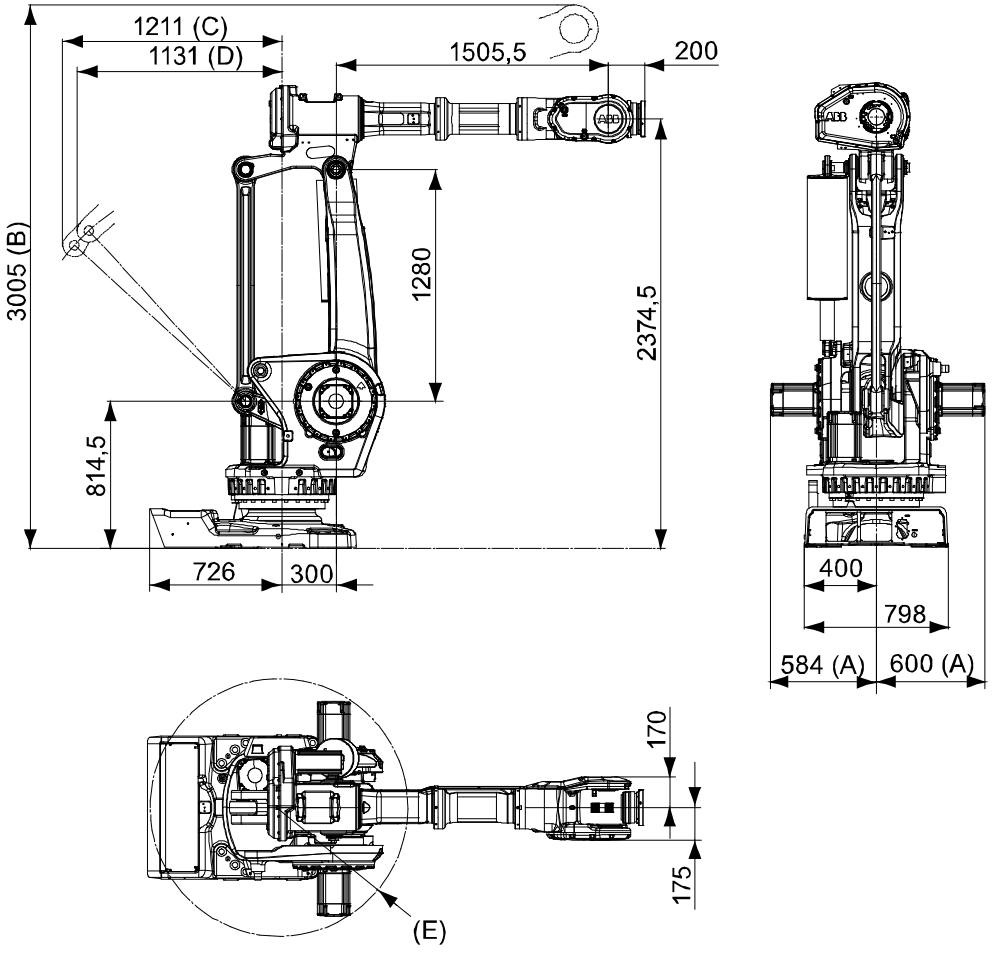
Power factor (cos φ)

The power factor is above 0.95 at a steady state power consumption higher than 2.0 kW, when the IRB 6660 is connected to the OmniCore V line.

Dimensions IRB 6660-130/3.1



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	Description
A	Forklift width 750 mm
B	Max working range
C	Mechanical stop
D	Max working range
E	R710, Radius for motor axis 3 R750, Right fork lift pocket

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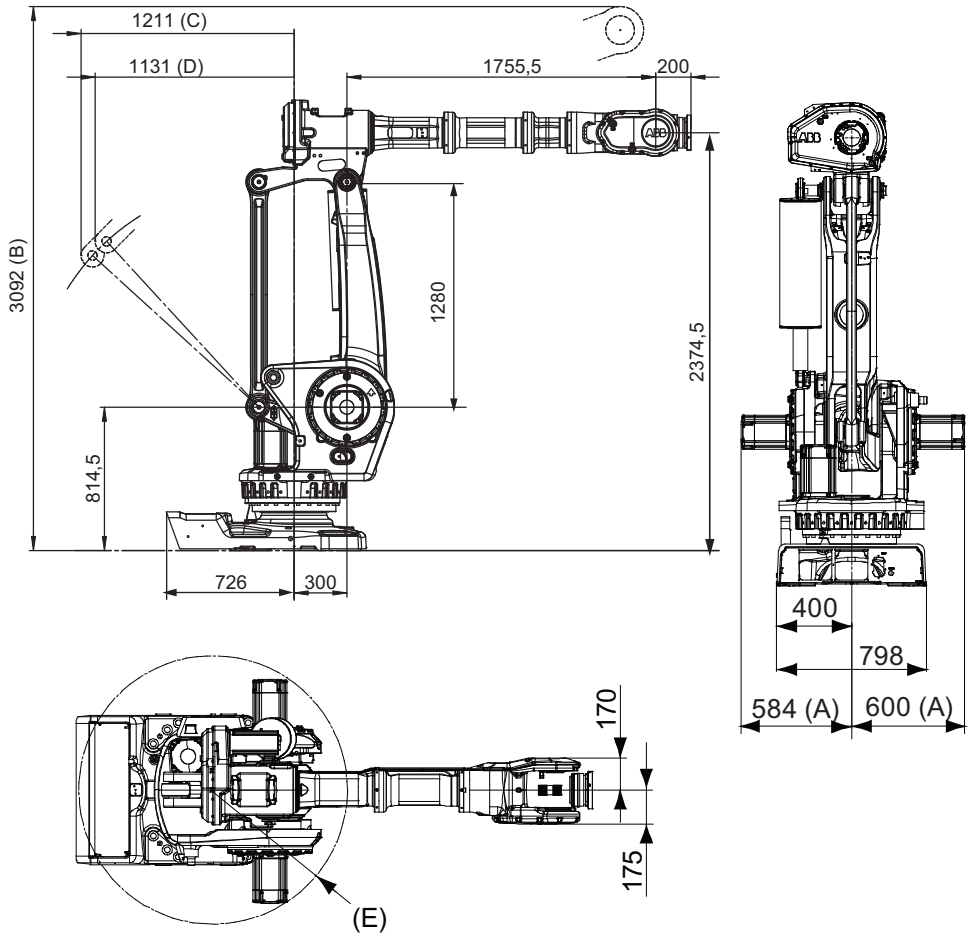
1.1.2 Technical data
Continued

Dimensions IRB 6660-100/3.3



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	Description
A	Forklift width 750 mm
B	Max working range
C	Mechanical stop
D	Max working range
E	R710, Radius for motor axis 3 R750, Right fork lift pocket

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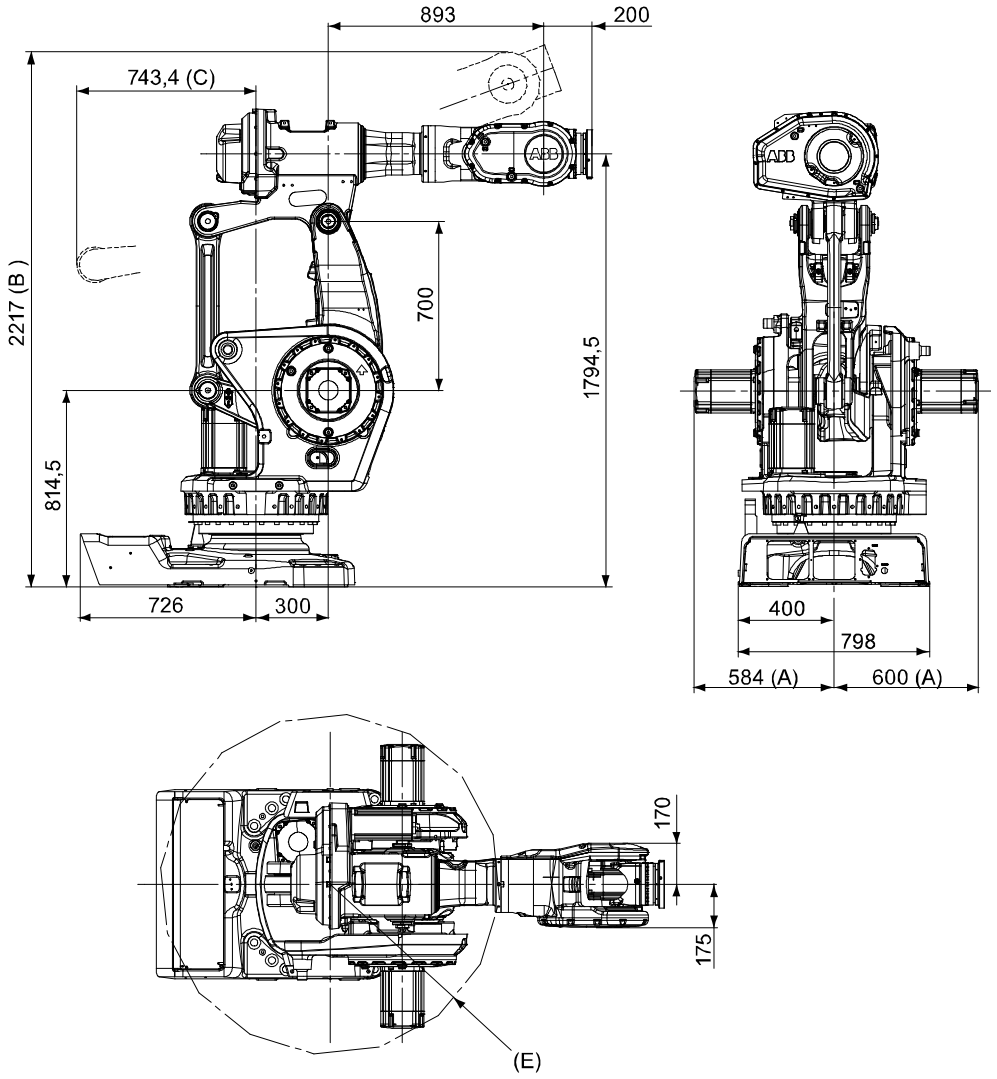
Dimensions IRB 6660-205/1.9



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	Description
A	Forklift width 750 mm
B	Max working range
C	Max working range
D	R710, Radius for motor axis 3 R750, Right fork lift pocket

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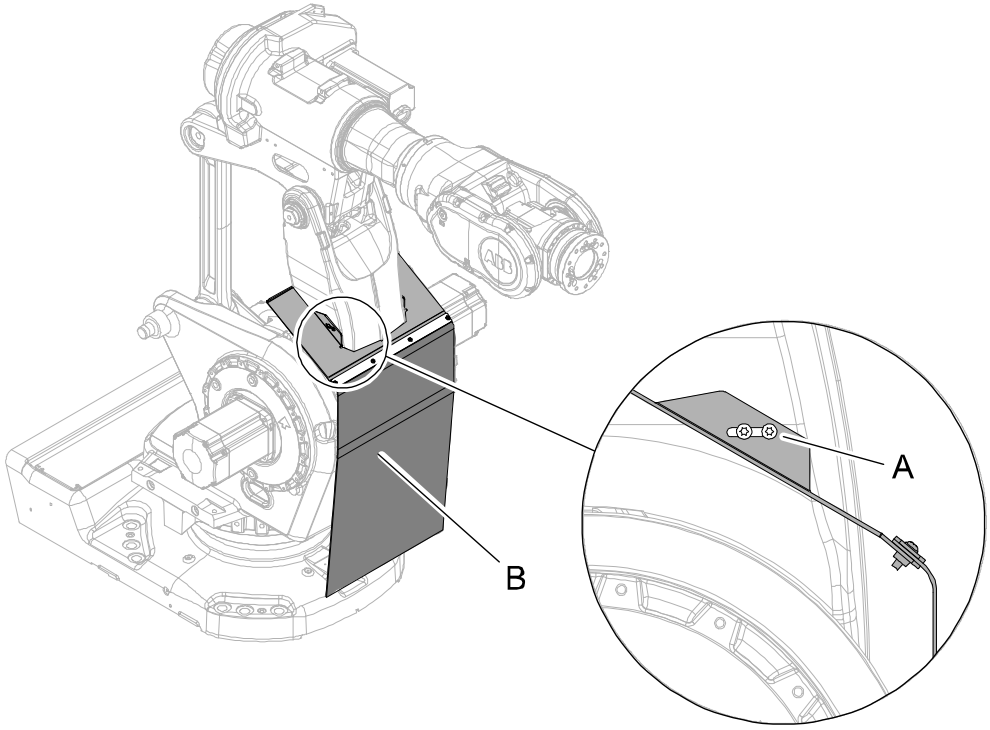
1.1.2 Technical data
Continued

Chip protection, IRB 6660-205/1.9



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Type	Description
Chip protection (B)	The protection prevents chips created at applications as for instance, deburring, sawing and milling to be accumulated on the robot and secure its movable functionality. Mandatory for IRB 6660-205/1.9. Not available for IRB 6660-130/3.1

1.2 Standards

1.2.1 Applicable standards

General

The product is compliant with ISO 10218-1:2011, *Robots for industrial environments - Safety requirements - Part 1 Robots*, and applicable parts in the normative references, as referred to from ISO 10218-1:2011. In case of deviation from ISO 10218-1:2011, these are listed in the declaration of incorporation. The declaration of incorporation is part of the delivery.

Robot standards

Standard	Description
ISO 9283	Manipulating industrial robots – Performance criteria and related test methods
ISO 9787	Robots and robotic devices – Coordinate systems and motion nomenclatures
ISO 9946	Manipulating industrial robots – Presentation of characteristics

Other standards used in design

Standard	Description
IEC 60204-1	Safety of machinery - Electrical equipment of machines - Part 1: General requirements, normative reference from ISO 10218-1
IEC 61000-6-2	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments
IEC 61000-6-4	Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments
ISO 13849-1:2006	Safety of machinery - Safety related parts of control systems - Part 1: General principles for design, normative reference from ISO 10218-1

Region specific standards and regulations

Standard	Description
ANSI/RIA R15.06	Safety requirements for industrial robots and robot systems
ANSI/UL 1740	Safety standard for robots and robotic equipment
CAN/CSA Z 434-03	Industrial robots and robot Systems - General safety requirements
EN ISO 10218-1	Robots and robotic devices — Safety requirements for industrial robots — Part 1: Robots

1.3 Installation

1.3.1 Introduction

General

The IRB 6660 should be mounted on to the floor (no tilting allowed around X-axis or Y-axis). A tool or an end effector with max. weight of 100, 130 or 205 kg including payload, can be mounted on the robot tool flange (axis 6). See*Load diagrams on page 32*.

Extra loads

For IRB 6660-130/3.1 and IRB 6660-100/3.3 can an extra load of 20 kg be mounted on to the upper arm, at a payload of maximum 130 or 100 kg, for IRB 6660-205/1.9 can an extra load of 15 kg be mounted on to the upper arm, at a payload of maximum 205 kg. An extra load of 500 kg can also be mounted on to the frame. See *Mounting of equipment on page 42*.

Working range limitation

The working range of axis 1 can be limited by mechanical stops as options.

1.3.2 Operating requirements

Protection standards

Robot version/ Protection standard	IEC60529
All variants, 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	+ 5°C [a] (41°F) to + 50°C (122°F) [b]
For the controller	Standard/Option	See Product specification - Controller IRC5 with FlexPendant
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)

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

b) Max ambient temperature in a high speed press tending cycle, + 40°C.

Relative humidity

Description	Relative humidity
Complete robot during transportation and storage	Max. 95% at constant temperature
Complete robot during operation	Max. 95% at constant temperature

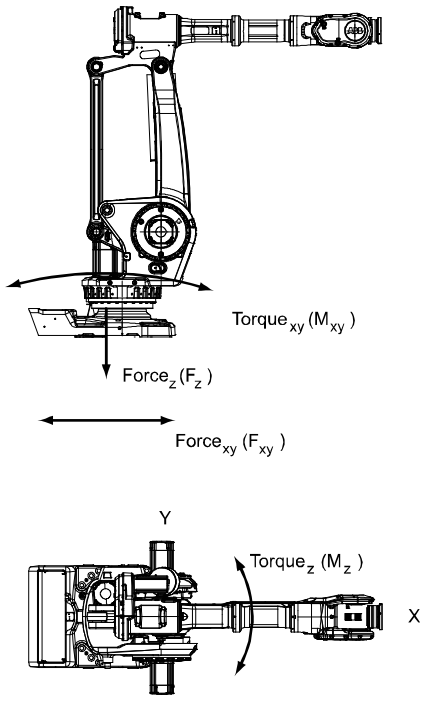
1.3.3 Mounting the manipulator

Maximum Load

Maximum load in relation to the base coordinate system.

Floor Mounted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	± 7.6 kN (IRB 6660 - 100/3.3) ± 8.5 kN (IRB 6660 - 130/3.1) ± 7.9 kN (IRB 6660 - 205/1.9)	± 12.8 kN (IRB 6660 - 100/3.3) ± 16.1 kN (IRB 6660 - 130/3.1) ± 14.9 kN (IRB 6660 - 205/1.9)
Force z	18.5 ± 3.7 kN (IRB 6660 - 100/3.3) 18.8 ± 8.4 kN (IRB 6660 - 130/3.1) 18.0 ± 4.4 kN (IRB 6660 - 205/1.9)	18.5 ± 7.4 kN (IRB 6660 - 100/3.3) 18.8 ±12.8 kN (IRB 6660 - 130/3.1) 18.0 ±7.7 kN (IRB 6660 - 205/1.9)
Torque xy	± 24.4 kNm (IRB 6660 - 100/3.3) ± 25.6 kNm (IRB 6660 - 130/3.1) ± 19.6 kNm (IRB 6660 - 205/1.9)	± 33.4 kNm (IRB 6660 - 100/3.3) ± 37.2 kNm (IRB 6660 - 130/3.1) ± 32.4 kNm (IRB 6660 - 205/1.9)
Torque z	± 7.6 kNm (IRB 6660 - 100/3.3) ± 10.3 kNm (IRB 6660 - 130/3.1) ± 7.1 kNm (IRB 6660 - 205/1.9)	± 14.5 kNm (IRB 6660 - 100/3.3) ± 19.3 kNm (IRB 6660 - 130/3.1) ± 14.7 kNm (IRB 6660 - 205/1.9)



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Note regarding Mxy and Fxy

The bending torque (Mxy) can occur in any direction in the XY-plane of the base coordinate system.

The same applies to the transverse force (Fxy).

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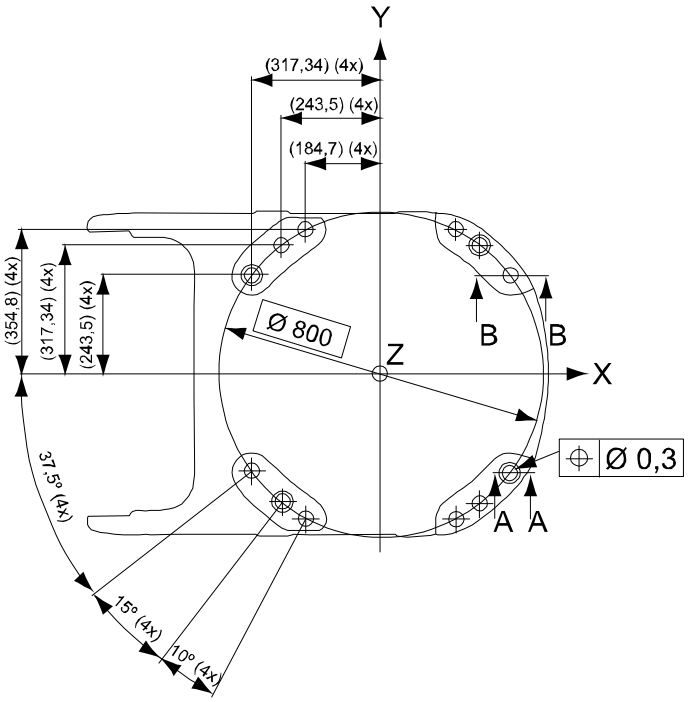
Fastening holes robot base



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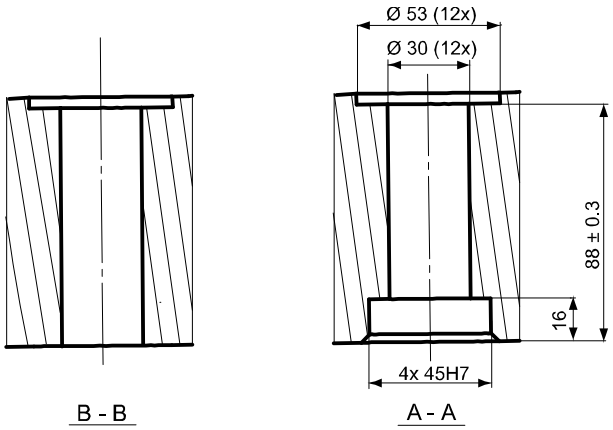

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Recommended screws for fastening the manipulator to the base	M24 x 140 8.8 with 4 mm flat washer
Torque value	725 Nm

Note

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

Regarding AbsAcc performance, the chosen guide holes according to Figure above and last Figure in this chapter are recommended.

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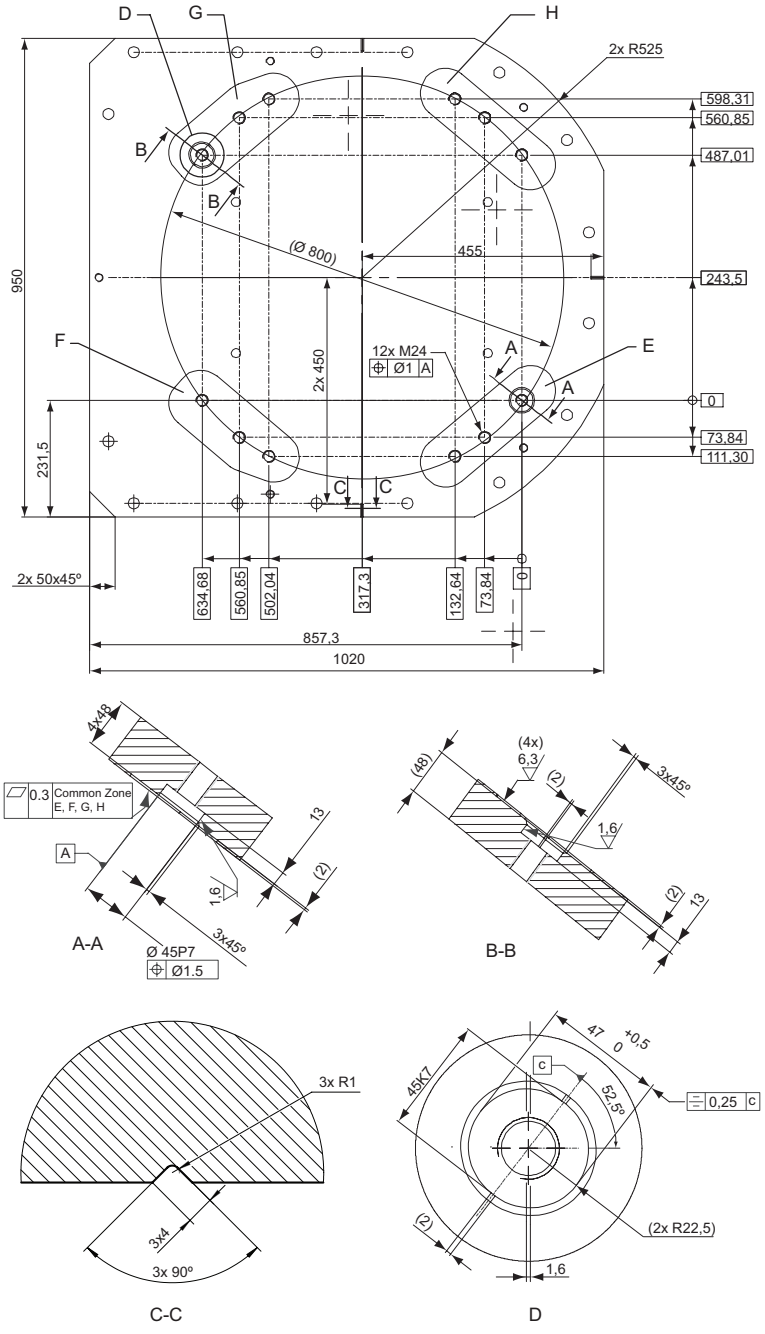
1.3.3 Mounting the manipulator
Continued

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)

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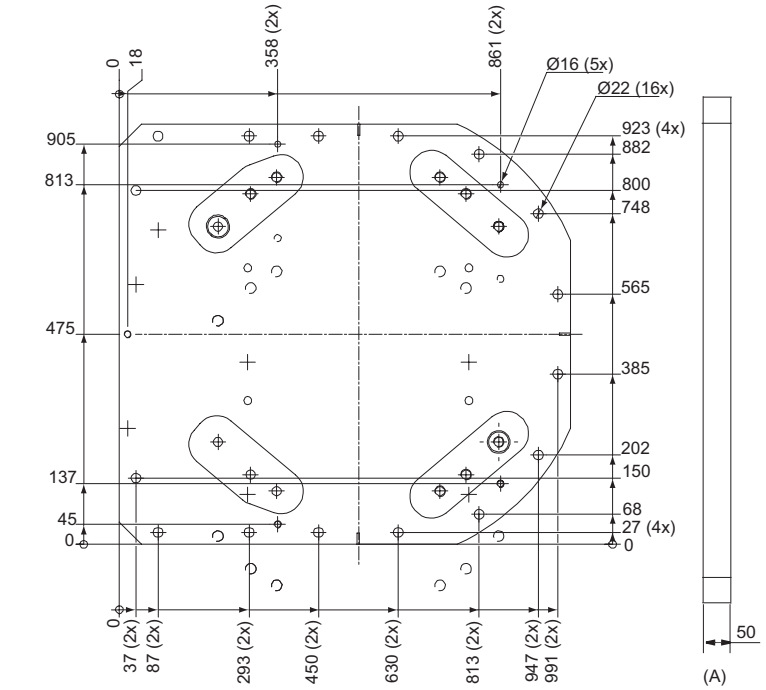

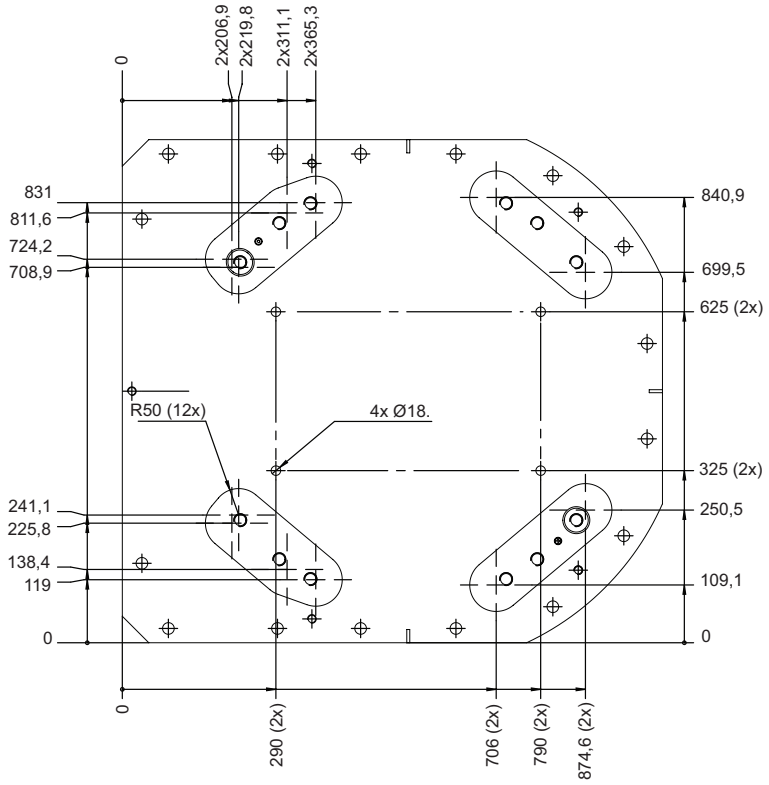

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Pos	Description
A	Color: RAL 9005 Thickness: 80-100 µm

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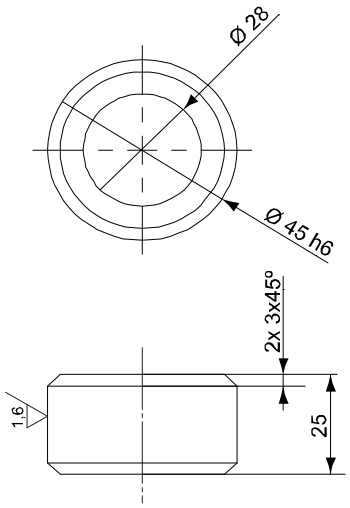
1.3.3 Mounting the manipulator
Continued



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Pos	Description
A	Guide sleeve protected from corrosion

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 or Calibration Pendulum [i]
Absolute accuracy calibration (optional)	Based on standard calibration, and besides positioning the robot at synchronization position, the Absolute accuracy calibration also compensates for: • Mechanical tolerances in the robot structure • Deflection due to load Absolute accuracy calibration focuses on positioning accuracy in the Cartesian coordinate system for the robot. Absolute accuracy calibration data is found on the serial measurement board (SMB) or other robot memory. A robot calibrated with Absolute accuracy has the option information printed on its name plate (OmniCore). To regain 100% Absolute accuracy performance, the robot must be recalibrated for absolute accuracy after repair or maintenance that affects the mechanical structure.	CalibWare
Optimization	Optimization of TCP reorientation performance. The purpose is to improve reorientation accuracy for continuous processes like welding and gluing. Wrist optimization will update standard calibration data for axes 4 and 5. **Note** For advanced users, it is also possible to use the do the wrist optimization using the RAPID instruction `WristOpt`, see *Technical reference manual - RAPID Instructions, Functions and Data types*. This instruction is only available for OmniCore robots.	Wrist Optimization

[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.

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1.4.1 Calibration methods
Continued

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 some ABB robots. On OmniCore, this calibration method is only used on IRB 1510, IRB 1520, IRB 2400, and IRB 4400.

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 6660. 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.

The actual instructions of how to perform the calibration procedure and what to do at each step is given on the FlexPendant. You will be guided through the calibration procedure, step by step.

Wrist Optimization method

Wrist Optimization is a method for improving reorientation accuracy for continuous processes like welding and gluing and is a complement to the standard calibration method.

The actual instructions of how to perform the wrist optimization procedure is given on the FlexPendant.

CalibWare - Absolute Accuracy calibration

The CalibWare tool guides through the calibration process and calculates new compensation parameters. This is further detailed in the *Application manual - CalibWare Field*.

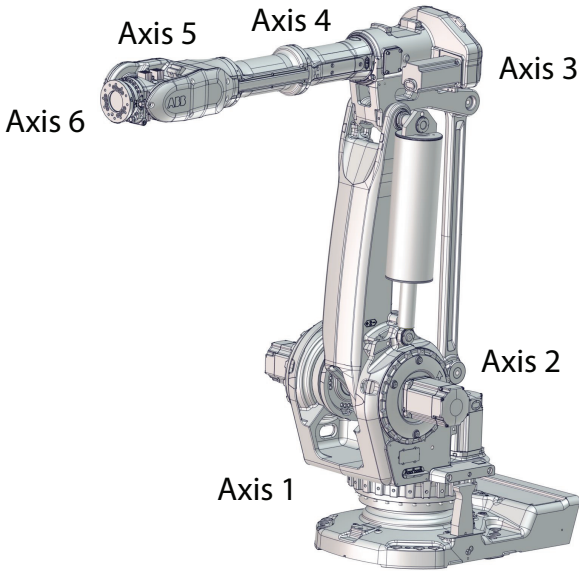
If a service operation is done to a robot with the option Absolute Accuracy, a new absolute accuracy calibration is required in order to establish full performance. For most cases after replacements that do not include taking apart the robot structure, standard calibration is sufficient.

The Absolute Accuracy option varies according to the robot mounting position. This is printed on the robot name plate for each robot. The robot must be in the correct mounting position when it is recalibrated for absolute accuracy.

1.4.2 Fine calibration with Calibration Pendulum

General

Fine calibration can be made using the Calibration Pendulum, see *Operating manual - Calibration Pendulum*.



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Calibration

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

1.4.3 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.

What is included

Every *Absolute Accuracy* robot is delivered with:

- compensation parameters saved in the robot memory
- 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.

Absolute Accuracy supports floor mounted, wall mounted, and ceiling mounted installations. The compensation parameters that are saved in the robot memory 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

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- 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:

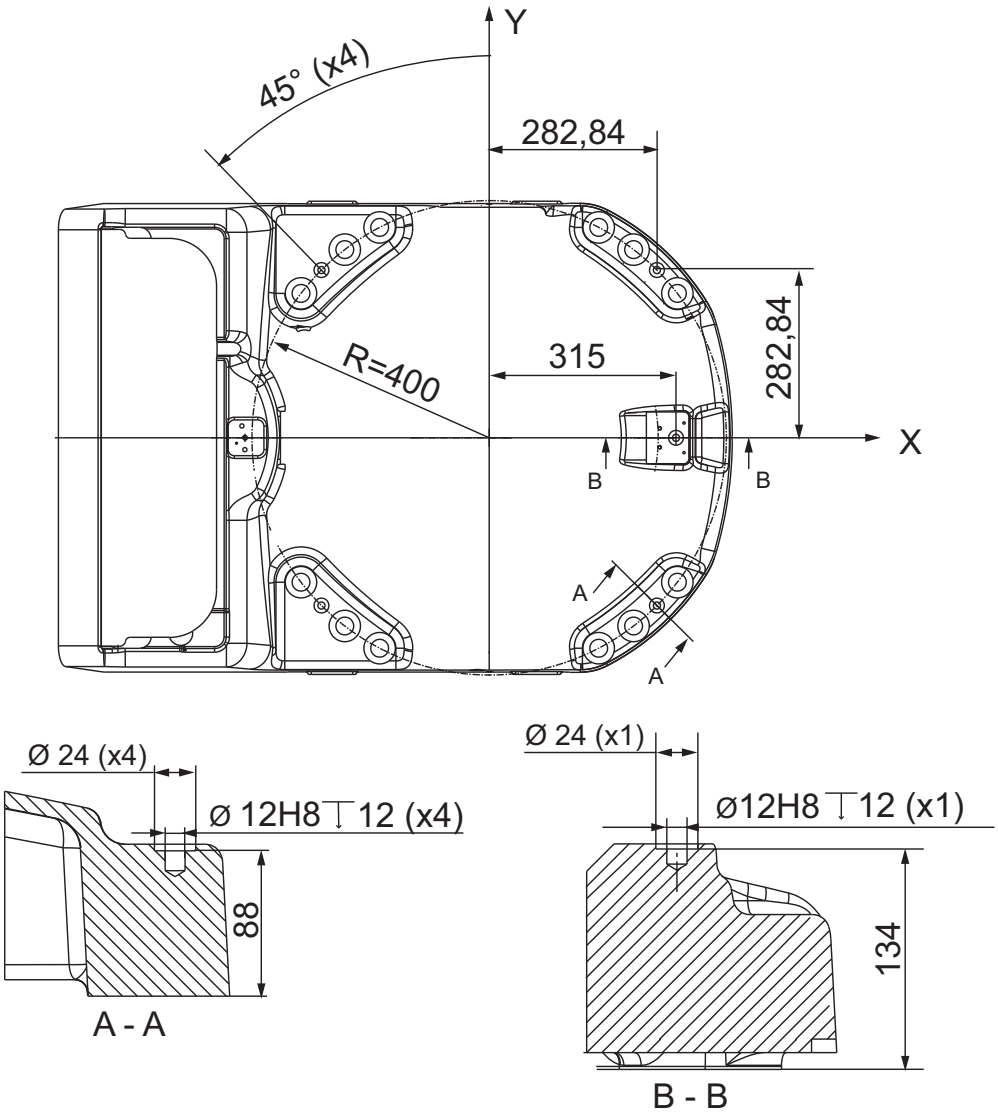
Robot	Positioning accuracy (mm)		
	Average	Max	% Within 1 mm
IRB 6660-130/3.1 IRB 6660-100/3.3	0.5 mm	1.14 mm	98 %
IRB 6660-205/1.9			

1.4.4 Robot references

Base

The holes shown in figure below are used for measuring the robot position when integrated in a production cell.

The holes are not available for option Foundry Plus.



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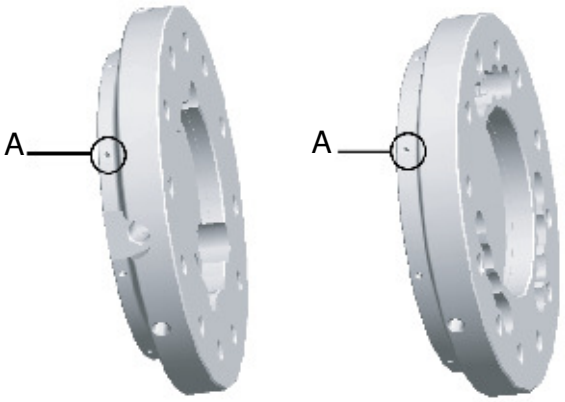
Tool flange



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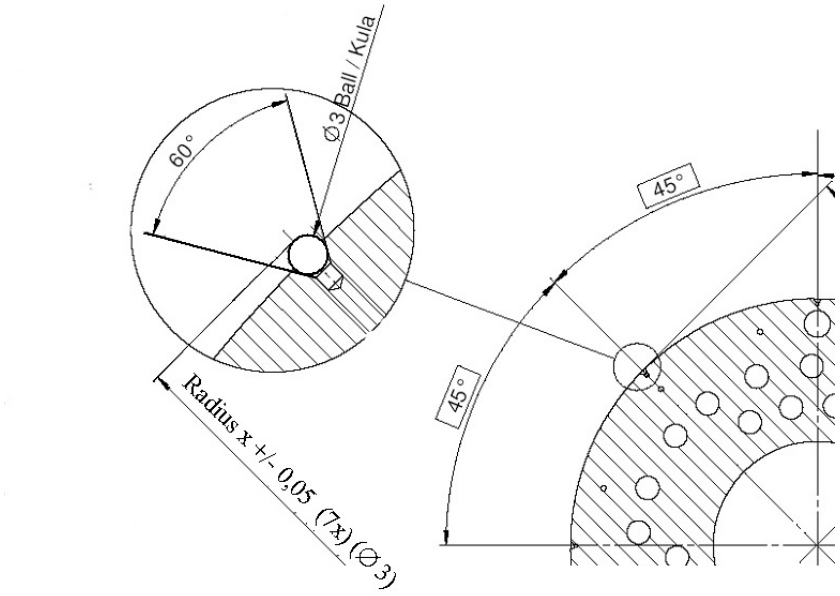

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Robot	Radius X (mm) for references on tool flange
IRB 6660-130/3.1	R=87,5
IRB 6660-100/3.3	R=87,5
IRB 6660-205/1.9	R=87,5

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 - OmniCore*, 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 20 kg (IRB 6660-130/3.1 and IRB 6660-100/3.3) and 15 kg (IRB 6660-205/1.9) 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.

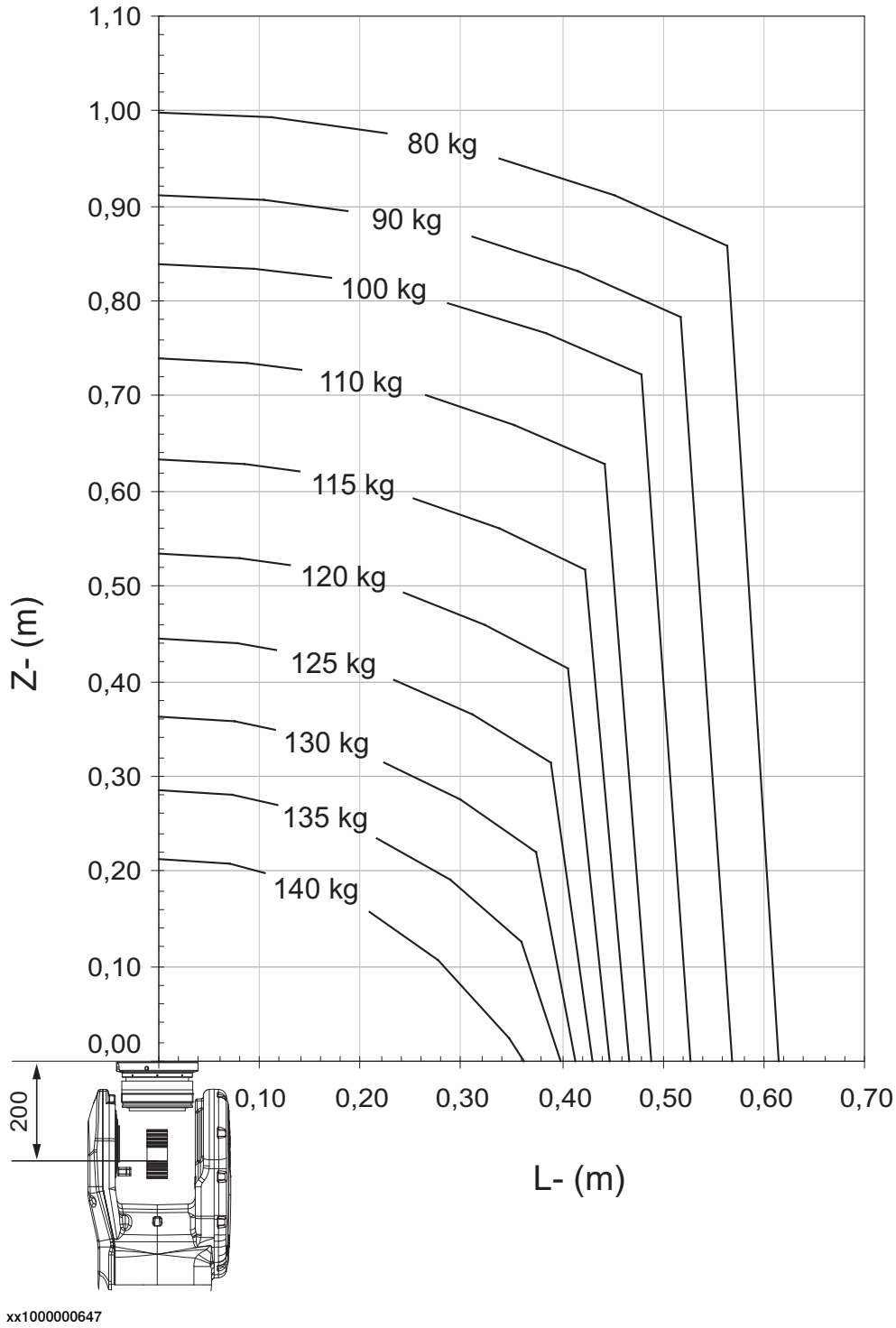
Control of load case with RobotLoad

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 6660-130/3.1



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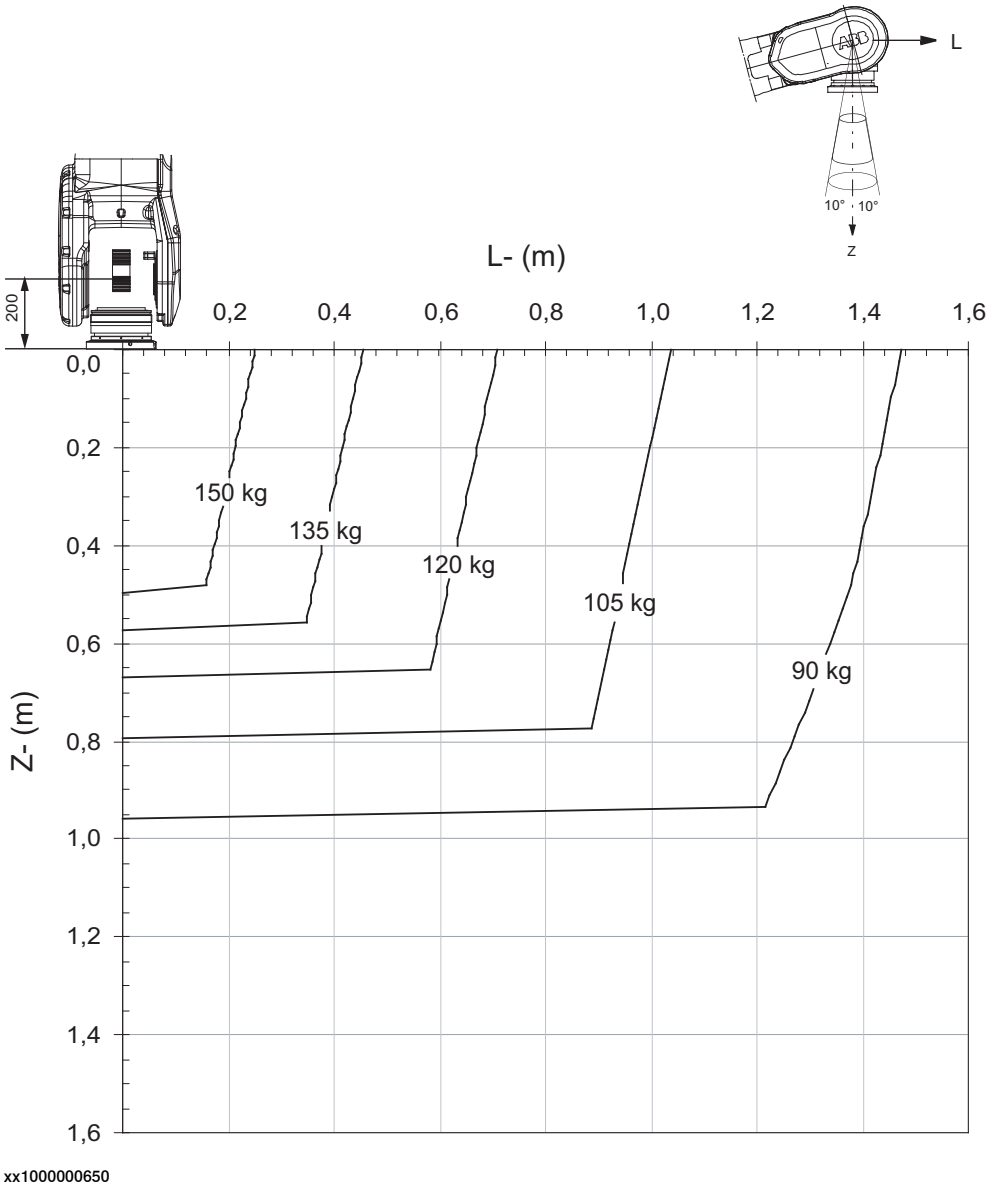
1.5.2 Load diagrams
Continued

IRB 6660-130/3.1“ Vertical Wrist” (±10°)

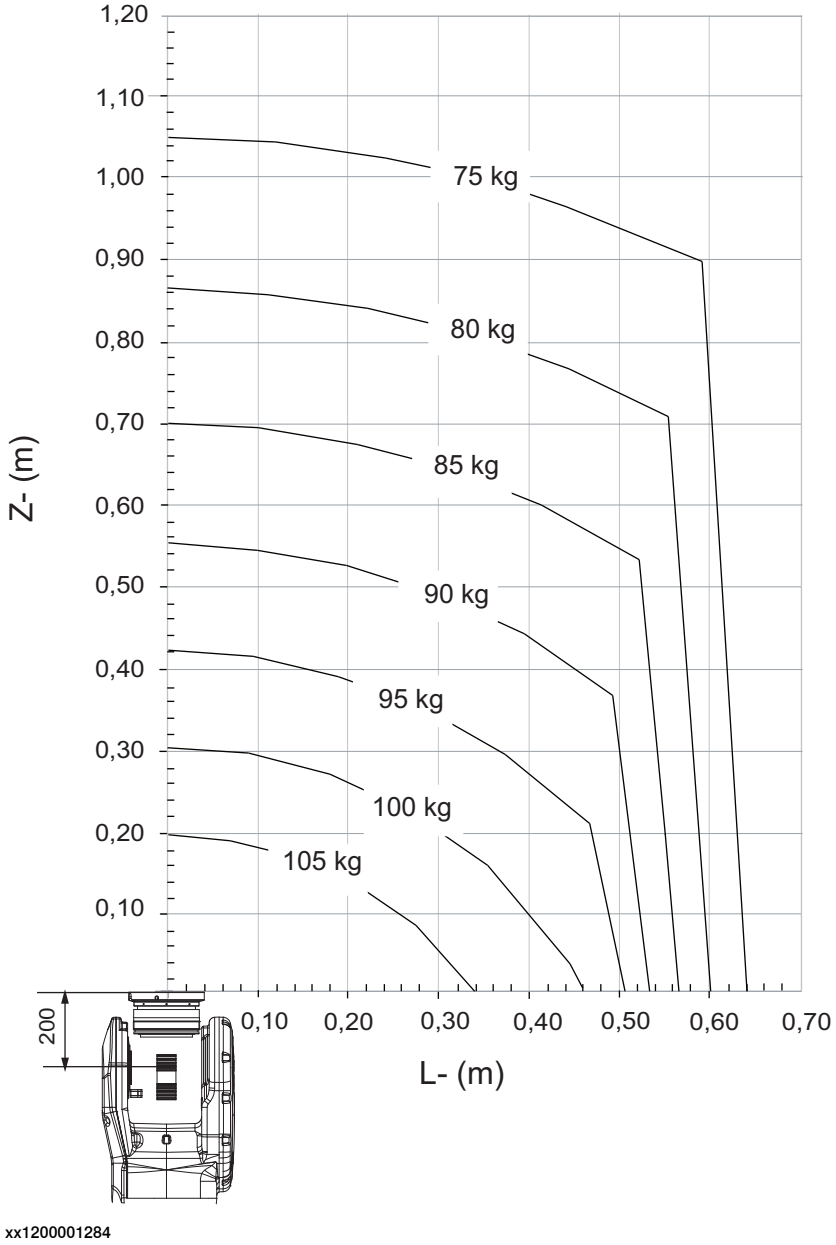


For wrist down (0° deviation from the vertical line).

	Without extra arm load	With 20 kg arm load
Max load	170 kg	150 kg
Z_{max}	0.414 m	0.496 m
L_{max}	0.133 m	0.282 m

Continues on next page

IRB 6660-100/3.3



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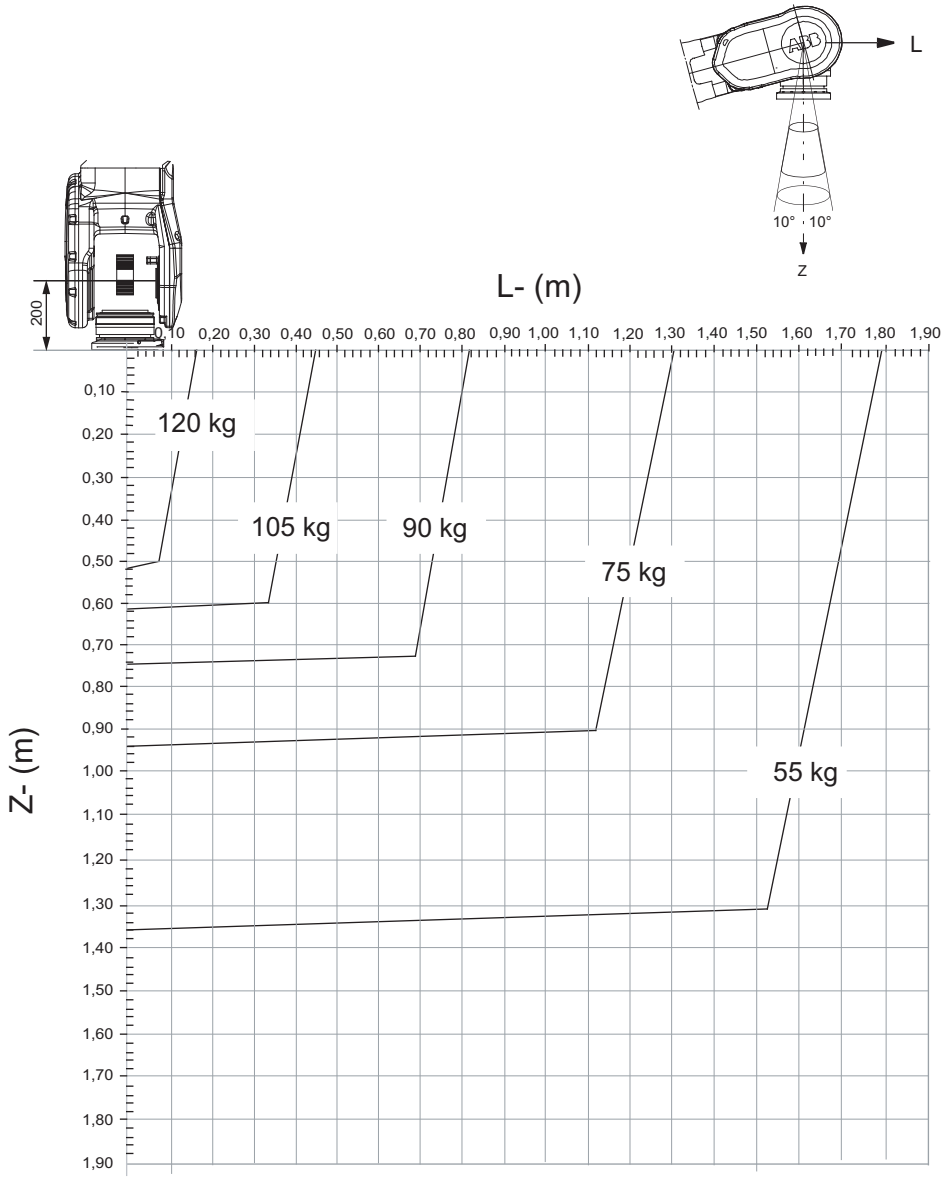
1.5.2 Load diagrams
Continued

IRB 6660-100/3.3“ Vertical Wrist” (±10°)



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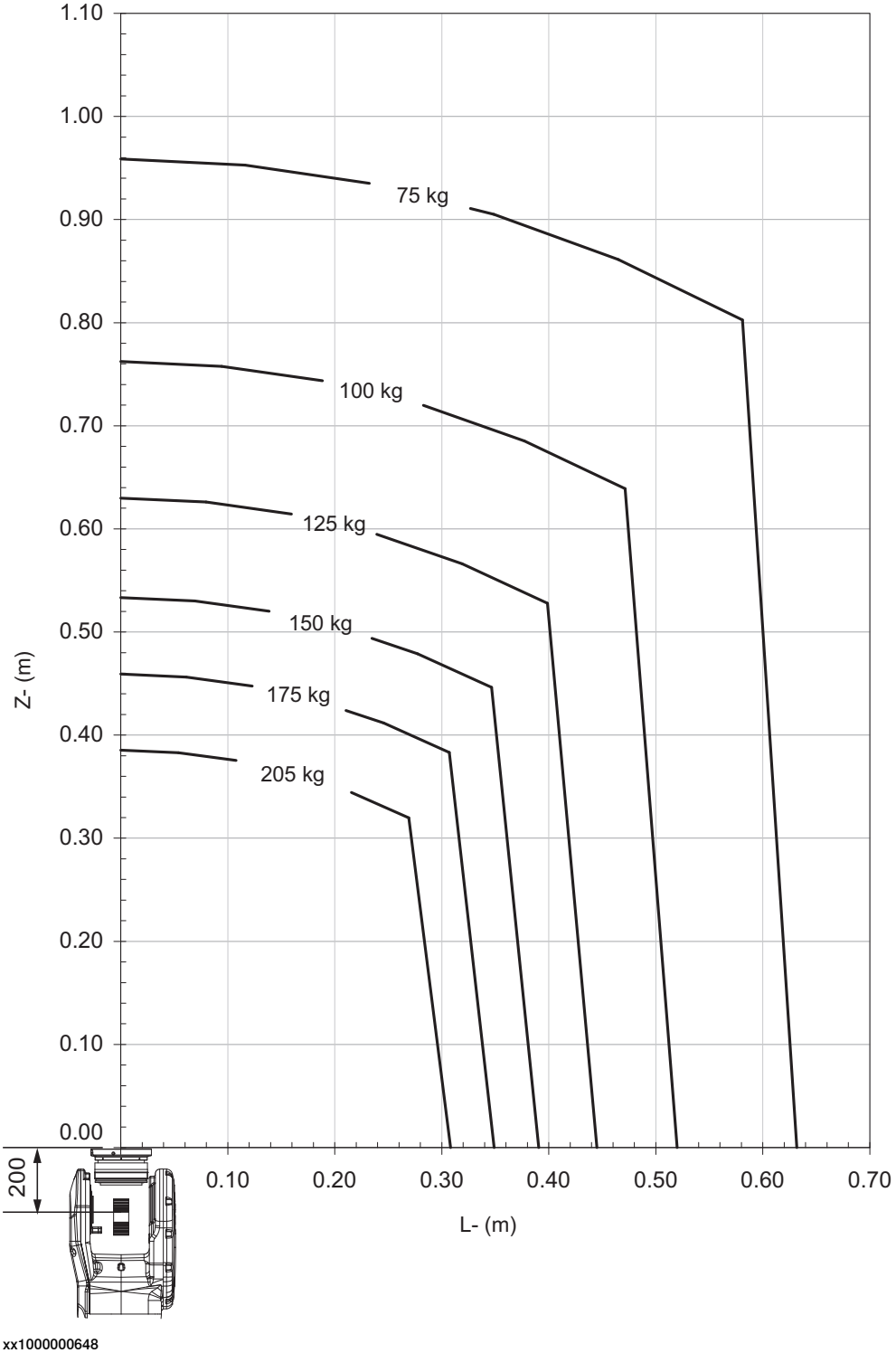
For wrist down (0° deviation from the vertical line).

	Without extra arm load	With 20 kg arm load
Max load	132 kg	125 kg
Z_{max}	0.448 m	0.484 m
L_{max}	0.103 m	0.119 m

Continues on next page

IRB 6660-205/1.9



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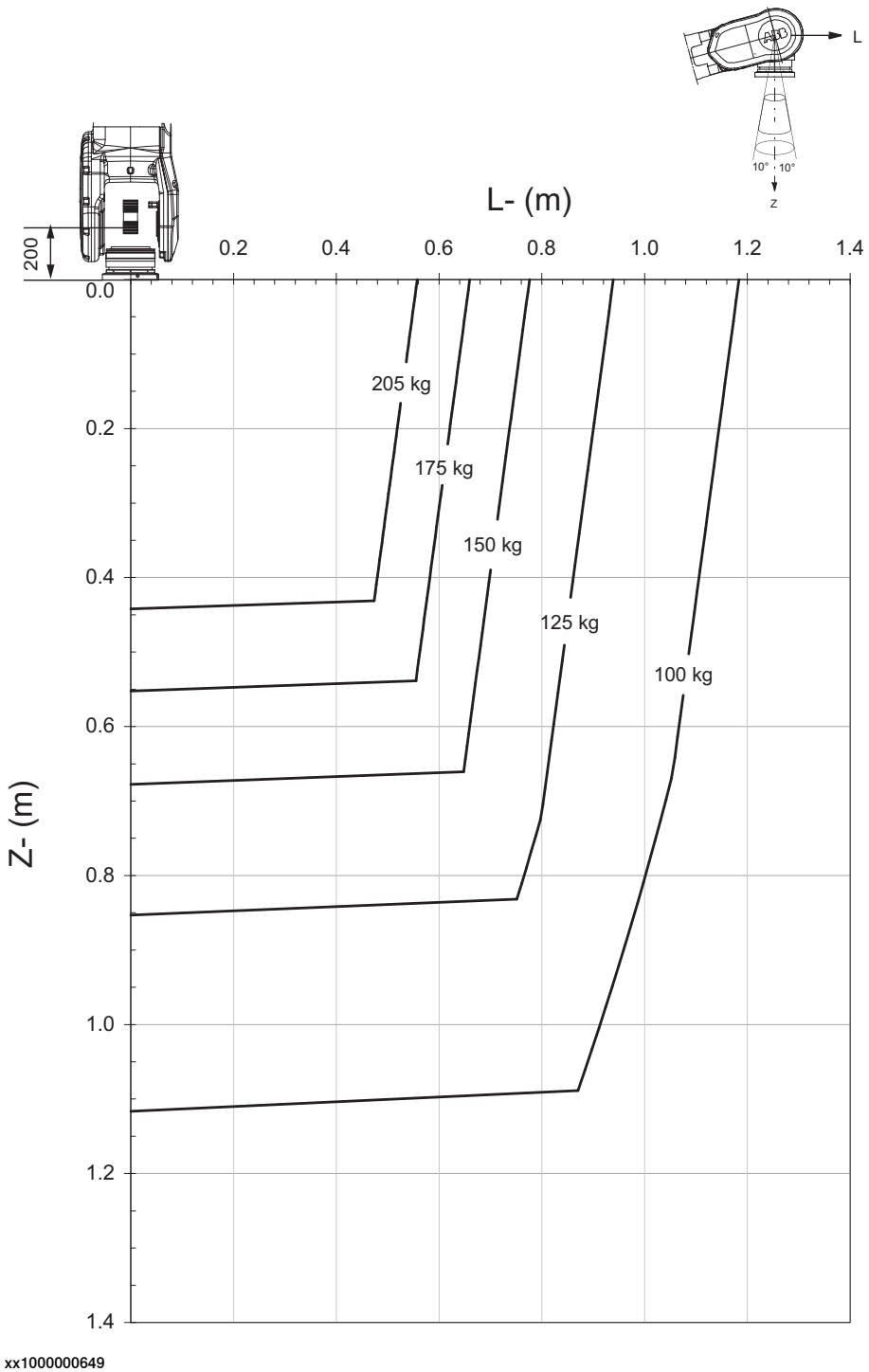
1.5.2 Load diagrams
Continued

IRB 6660-205/1.9“ Vertical Wrist” (±10°)



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

	Without extra arm load	With 15 kg arm load
Max load	220 kg	205 kg
Z_{max}	0.442 m	0.442 m
L_{max}	0.582 m	0.574 m

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

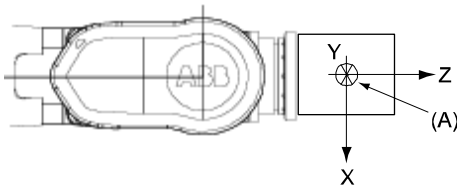
Information

Note

Total load given as: Mass in kg, center of gravity (Z and L) in meter and moment of inertia (J_{ox}, J_{oy}, J_{oz}) in kgm^2 . L= $\div(X^2 + Y^2)$, see Figure below.

Full movement of axis 5

Axis	Robot Type	Maximum moment of inertia
5	IRB 6660-130/3.1	Ja5 = Load x $((Z + 0{,}200)^2 + L^2)$ + max (J_{0x}, J_{0y}) ≤ 250 kgm^2
	IRB 6660-205/1.9	Ja5 = Load x $((Z + 0{,}200)^2 + L^2)$ + max (J_{0x}, J_{0y}) ≤ 250 kgm^2
	IRB 6660-100/3.3	Ja5 = Load x $((Z + 0{,}200)^2 + L^2)$ + max (J_{0x}, J_{0y}) ≤ 250 kgm^2
6	IRB 6660-130/3.1	Ja6 = Load x L^2 + J_{0Z} ≤ 185 kgm^2
	IRB 6660-205/1.9	Ja6 = Load x L^2 + J_{0Z} ≤ 185 kgm^2
	IRB 6660-100/3.3	Ja6 = Load x L^2 + J_{0Z} ≤ 185 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.

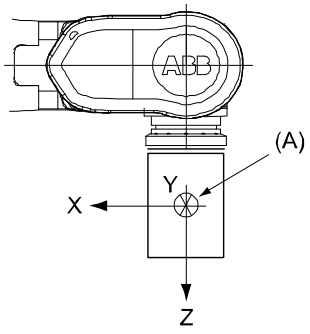
Limited axis 5, center line down

Axis	Robot Type	Maximum moment of inertia
5	IRB 6660-130/3.1	Ja5 = Load x $((Z + 0{,}200)^2 + L^2)$ + max (J_{ox}, J_{oy}) ≤ 275 kgm^2
	IRB 6660-205/1.9	Ja5 = Load x $((Z + 0{,}200)^2 + L^2)$ + max (J_{ox}, J_{oy}) ≤ 275 kgm^2
	IRB 6660-100/3.3	Ja5 = Load x $((Z + 0{,}200)^2 + L^2)$ + max (J_{ox}, J_{oy}) ≤ 275 kgm^2

Continues on next page

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

Axis	Robot Type	Maximum moment of inertia
6	IRB 6660-130/3.1	Ja6 = Load x L2 + $J_{oz} \leq 250$ kgm^2
	IRB 6660-205/1.9	Ja6 = Load x L2 + $J_{oz} \leq 250$ kgm^2
	IRB 6660-100/3.3	Ja6 = Load x L2 + $J_{oz} \leq 250$ 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.

1.5.4 Wrist torque

General

The table below shows the maximum permissible torque due to payload

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.

Robot type	Max wrist torque axis 4 & 5	Max wrist torque axis 6	Max torque valid at load
IRB 6660-130/3.1	1037 Nm	526 Nm	105 kg
IRB 6660-100/3.3	918 Nm	472 Nm	75 kg
IRB 6660-205/1.9	1177 Nm	620 Nm	200 kg

1.6 Mounting of equipment

1.6.1 General

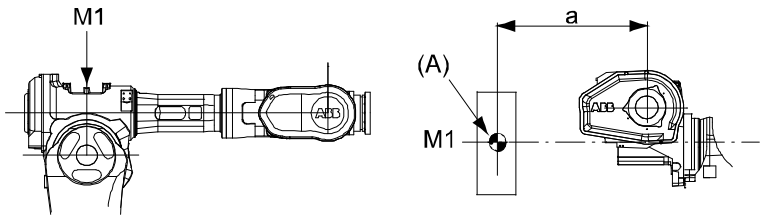
Information

Extra loads can be mounted on the upper arm housing and on the frame. Definitions of distances and mass are shown in Figure below. The robot is supplied with holes for mounting extra equipment (see Figures in next chapter).

Upper arm

Allowed extra load on upper arm housing plus the maximum handling weight (see Figure below):

M1 ≤ 20 or 15 kg with distance a ≤ 500 mm, center of gravity in axis 3 extension.



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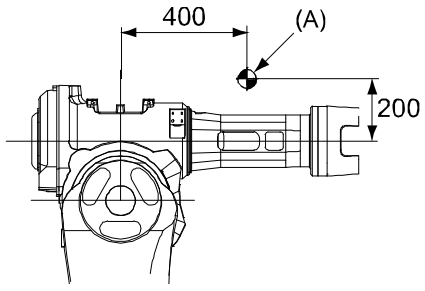
Pos	Description
A	Center of gravity for permitted extra load ≤ 20 kg for IRB 6660-130/3.1
	Center of gravity for permitted extra load ≤ 15 kg for IRB 6660-205/1.9
	Center of gravity for permitted extra load ≤ 20 kg for IRB 6660-100/3.3



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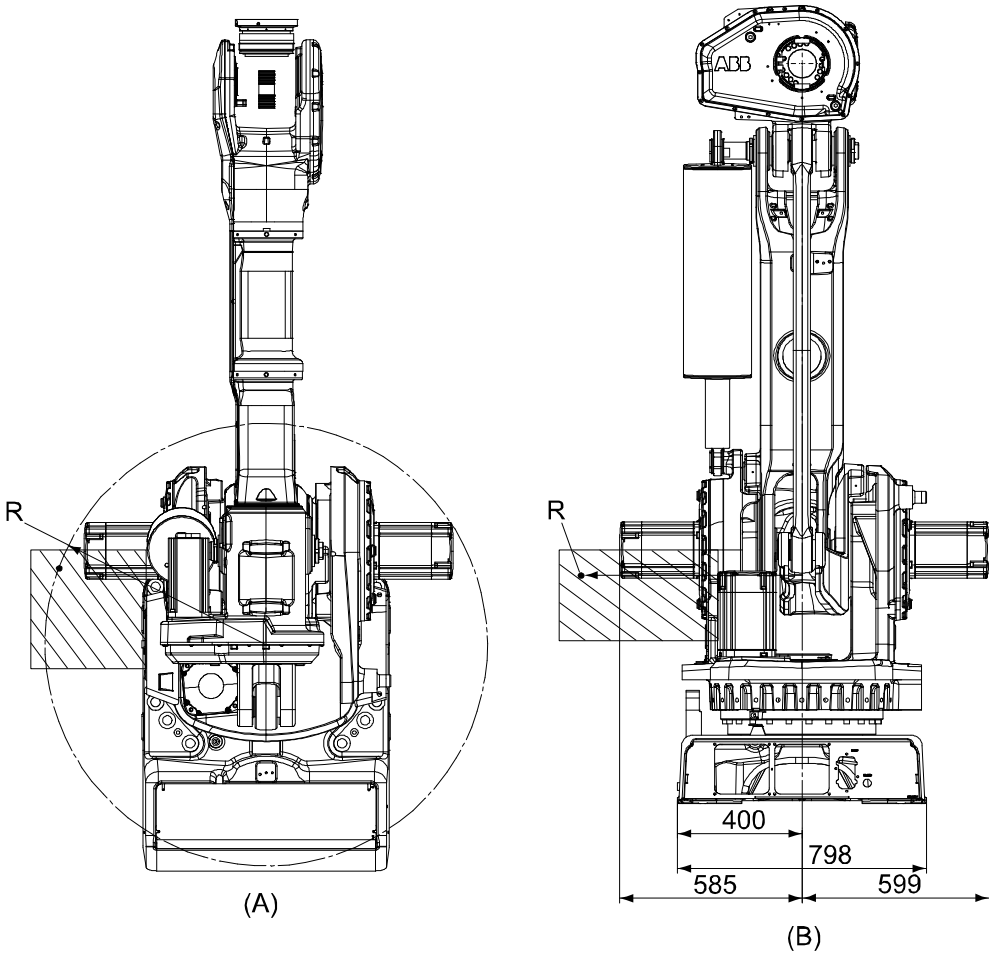
Pos	Description
A	Center of gravity 20 kg or 15 kg

Frame (Hip Load)

	Description
Permitted extra load on frame	J_H = 200 kgm^2

Continues on next page

	Description
Recommended position (see Figure below)	$J_H = J_{H0} + M4 \times R^2$ where: 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 (≤ 500 kg)



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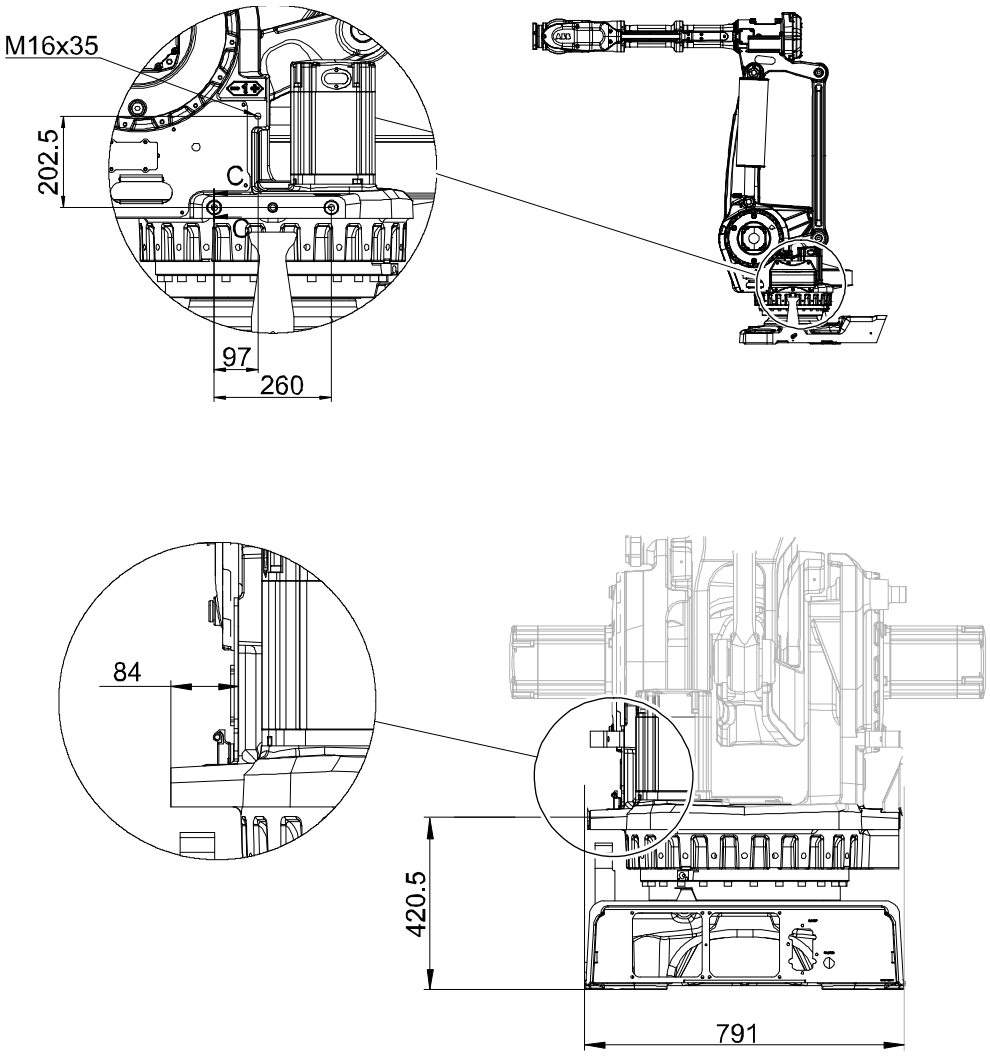
Pos	Description
A	View from above
B	View from the rear
R	710 mm

1.6.2 Mounting of hip load

General

The extra load can be mounted on the frame. Holes for mounting see Figure below. When mounting on the frame all the three holes (2x2, Ø16) on one side must be used.

Holes for mounting hip load on frame



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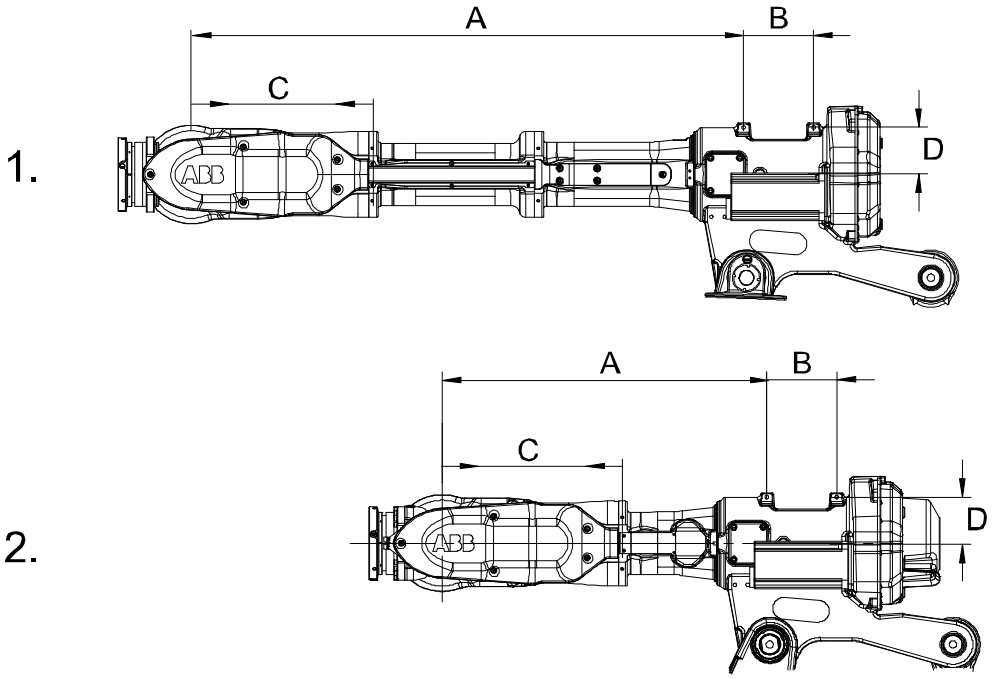
Holes for mounting extra equipment on upper arm



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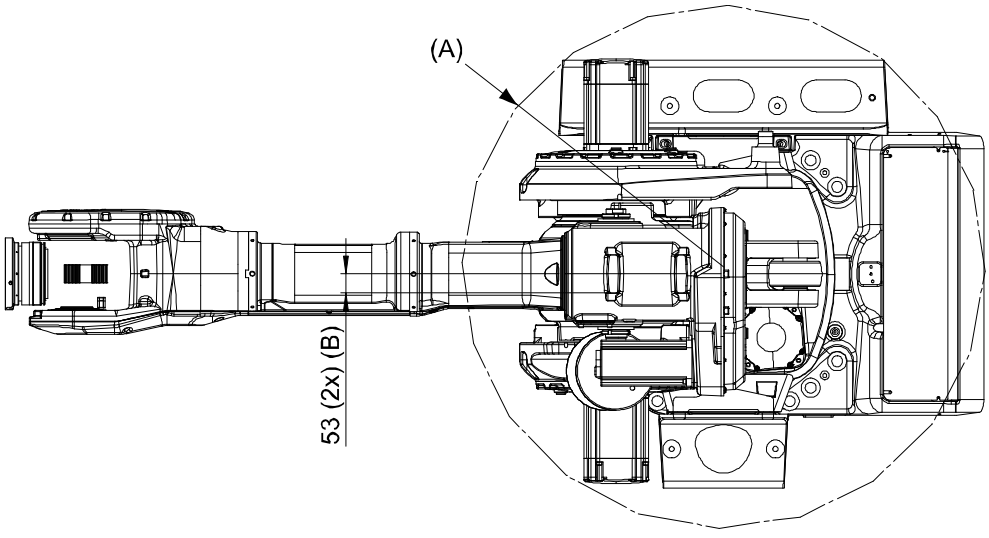
Robot variant	A	B	C	D
1. IRB 6660-130/3.1 1. IRB 6660-100/3.3	1497.5 mm	190 mm	490 mm	128 mm
	1497.5 mm	190 mm	490 mm	128 mm
2. IRB 6660-205/1.9	885 mm	190 mm	490 mm	128 mm



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Pos	Description
A	R750 Right fork lift pocket
B	Mounting hole, upper arm M12 depth 20 (4x)

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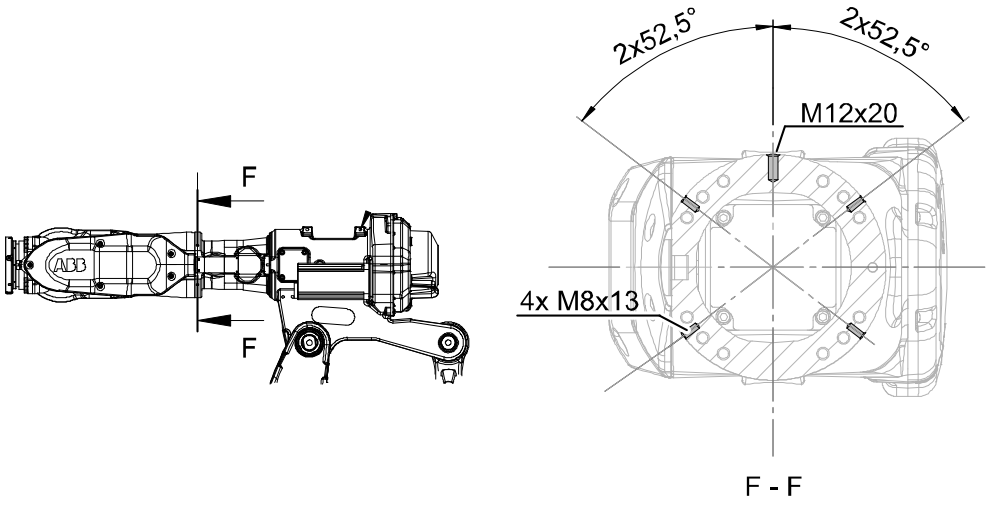
1.6.2 Mounting of hip load
Continued



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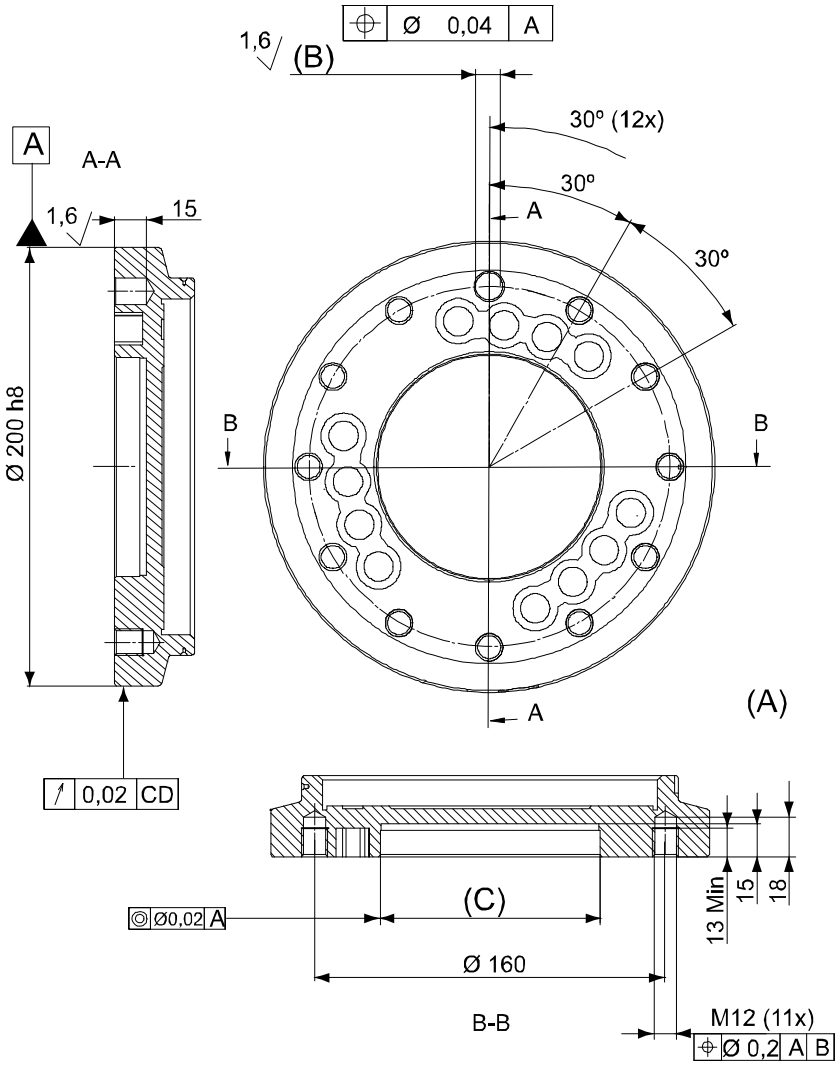
Robot Tool Flange



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Pos	Description
A	Minimum thread length for screws in M12-hole is 9 mm.
B	Ø 12 H7 Depth 15
C	Ø 100 H7 Depth 8 min

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.

1.7 Robot motion

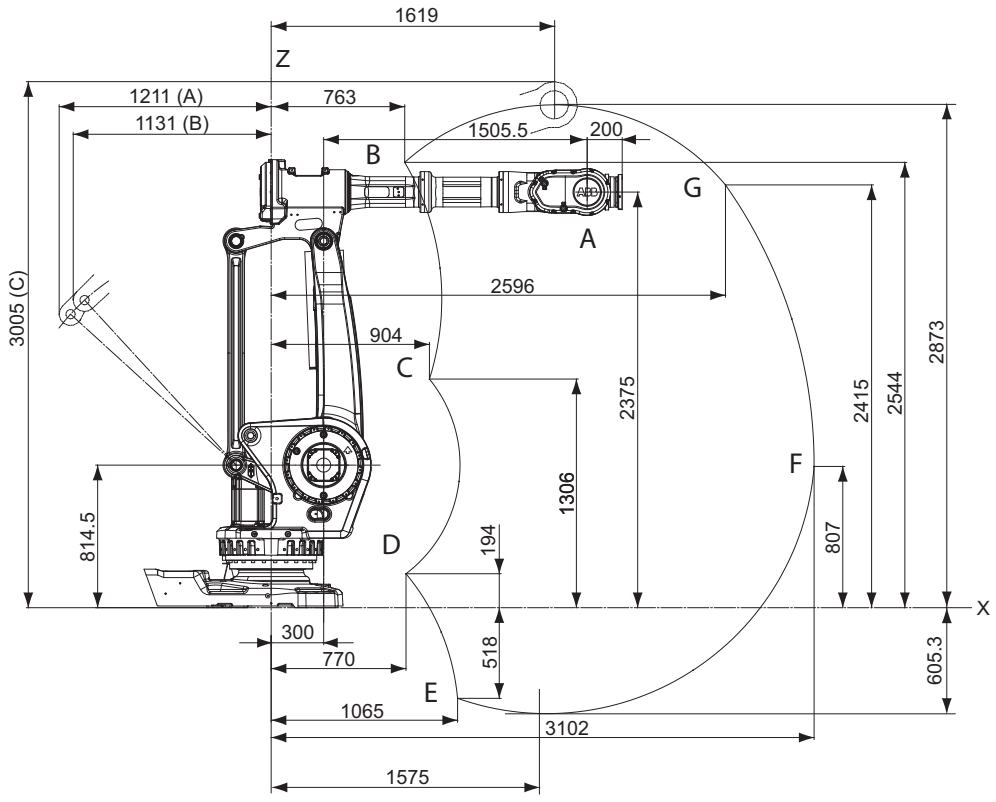
1.7.1 Introduction

Type of Motion

Axis	Type of motion	Range of movement	
		IRB 6660-130/3.1 and IRB 6660-100/3.3	IRB 6660-205/1.9
1	Rotation motion	+ 180° to - 180°	+ 180° to - 180°
2	Arm motion	+ 85° to - 42°	+ 85° to - 42°
3	Arm motion	+ 120° to -20°	+ 120° to -20°
4	Wrist motion	+ 300° to - 300°	+ 300° to - 300°
5	Bend motion	+ 120° to - 120°	+ 120° to - 120°
6	Turn motion	+ 360° to - 360° default Max. ± 150 Revolutions[a]	+ 360° to - 360° default Max. ± 96 Revolutions[a]

a. The default working range for axis 6 can be extended by changing parameter values in the software. Option 3111-1 “Independent axis” can be used for resetting the revolution counter after the axis has been rotated (no need for “rewinding” the axis).

Robot Type	Handling capacity (kg)	Reach (m)
IRB 6660-130/3.1	130	3.1



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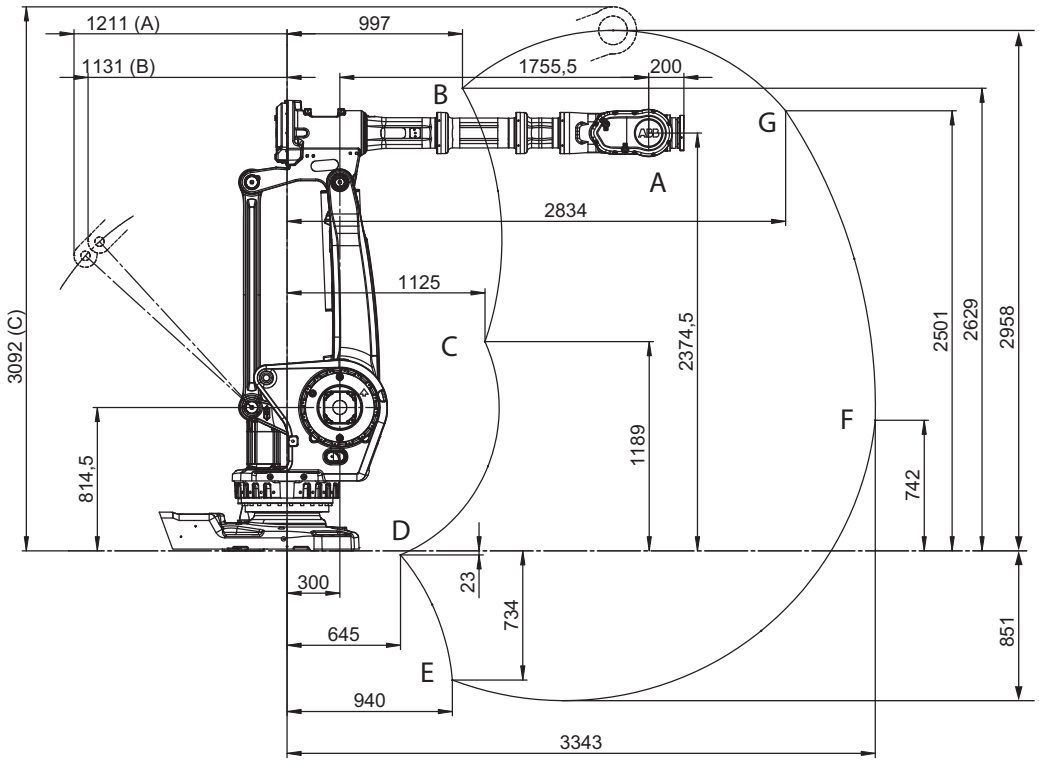
Note	Description
(A)	Max. working range
(B)	Mechanical stop
(C)	Max. working range

Positions at wrist center

Pos No. see Figure above	X Position (mm)	Z Position (mm)	Axis 2 Angle (degrees)	Axis 3 Angle (degrees)
A	1805,5	2374,5	0	0
B	763	2544	-42	-20
C	904	1306	-42	28
D	770	194	50	120
E	1065	-518	85	120
F	3102	807	85	15
G	2596	2415	50	-20

Robot Type	Handling capacity (kg)	Reach (m)
IRB 6660-100/3.3	100	3.3



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Note	Description
(A)	Max. working range
(B)	Mechanical stop
(C)	Max. working range

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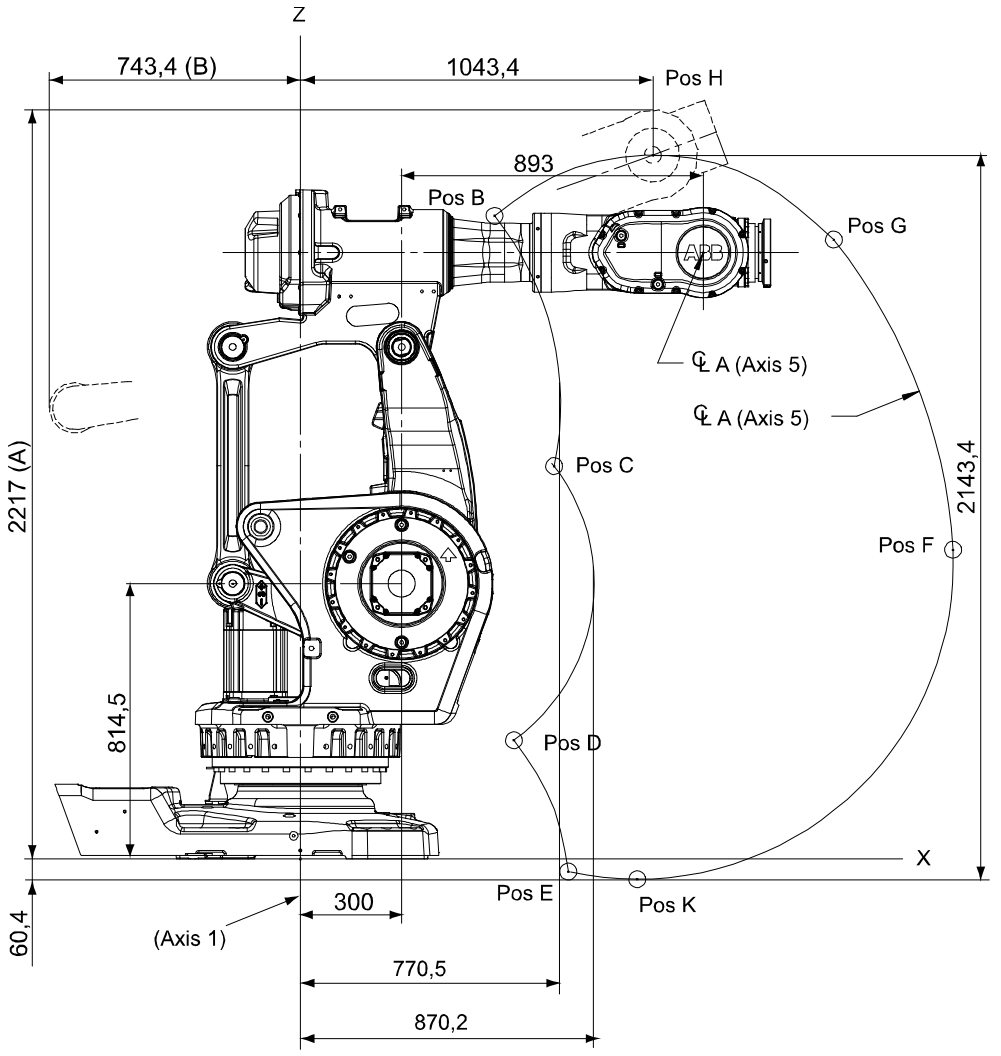
1.7.1 Introduction
Continued

Positions at wrist center

Pos No. see Figure above	X Position (mm)	Z Position (mm)	Axis 2 Angle (degrees)	Axis 3 Angle (degrees)
A	2055,5	2374,5	0	0
B	997	2629	-42	-20
C	1125	1189	-42	28
D	645	-23	50	120
E	940	-734	85	120
F	3343	742	85	15
G	2834	2501	50	-20

Robot Type	Handling capacity (kg)	Reach (m)
IRB 6660-205/1.9	205	1.9



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Note	Description
(A)	Max. working range

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Note	Description
(B)	Max. working range

Positions at wrist center

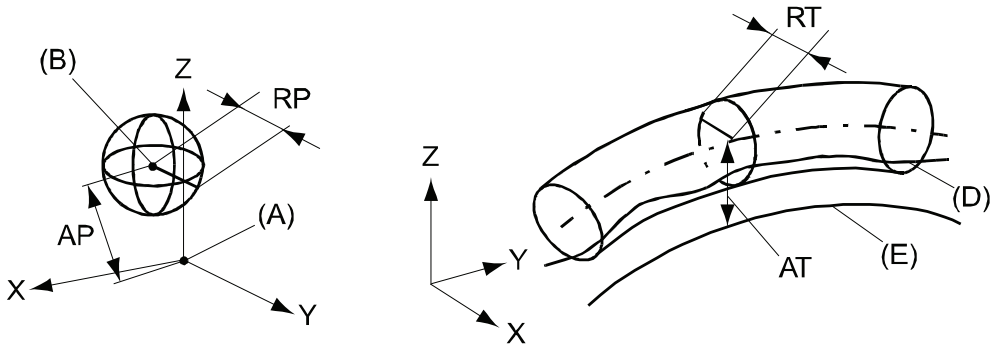
Pos No. see Figure above	X Position (mm)	Z Position (mm)	Axis 2 Angle (degrees)	Axis 3 Angle (degrees)
A	1193	1794,5	0	0
B	575	1903,2	-42	-20
C	751,5	1162,7	-42	28
D	632,2	351,1	50	120
E	793,3	-37,9	85	120
F	1932,4	914,8	85	15
G	1579,6	1833	50	-20
H	1043,4	2083,2	0	-20
K	997,3	-60,4	85	107,4

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.



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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 6660	130/3.1	100/3.3	205/1.9
Pose accuracy, AP[a] (mm)	0.05	0.05	0.18
Pose repeatability, RP (mm)	0.11	0.10	0.07
Pose stabilization time, PSt (s)	0.69	1.41	0.18
Path accuracy, AT (mm)	1.88	2.07	2.47
Path repeatability, RT(mm)	0.88	1.08	0.61

a. AP according to the ISO test above, is the difference between the teached 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

Robot Type	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6
IRB 6660-130/3.1	110°/s	130°/s	130°/s	150°/s	120°/s	240°/s
IRB 6660-100/3.3	110°/s	130°/s	123°/s	150°/s	120°/s	240°/s
IRB 6660-205/1.9	130°/s	130°/s	130°/s	150°/s	120°/s	190°/s

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

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

General

Customer connection in terms of Customer Power (CP), Customer Signals (CS) and Air is an option. The cables and hoses are integrated in the robot and starts at the robot base and ends on the upper arm housing, see Figure below.

Parallel and Ethernet communication (only IRB 6660-130/3.1 and -100/3.3)

The table shows the available type of wire/media for parallel and ethernet communication connection to manipulator

Type	At terminals in cabinet	At Connection point. Base or axis 4	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Protective earth		1	0,5 mm^2	250 VAC
Customer Signals (CS)				
Singnals twisted pair	14	14 (7x2)	0,24 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	4	4 (2x2)	0,24 mm^2	50 V DC, 1 A rms
Functional Earth (FE)				
Functional earth			10 mm^2	
Customer bus (Ethernet)				
Ethernet/IP, PROFINET		4	0,4 mm^2	
Servo motor signals				
Servo motor power	At drive	3	1,5 mm^2	600 VAC, 12 A rms 600 VAC
Protective earth	At drive	1	1,5 mm^2	50 V DC, 1 A rms
Signals twisted pair for resolver	-	6	0,23 mm^2	50 V DC, 1 A rms
Brake	-	2	0,23 mm^2	50 V DC, 1 A rms
Temperature control/PTC	-	2	0,23 mm^2	
Media				
Water, Air (PROC 1)		1	12,5 mm inner diameter	Max. air pressure 16 bar/230 PSI. Max. water pressure 10 bar/145 PSI.

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Parallel and field bus communication, Profibus (only IRB 6660-130/3.1 and -100/3.3)

The table shows the available type of wire/media with Profibus connection to manipulator

Type	At terminals in cabinet	At Connection point. Base or axis 4	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power	2+2	2+2	0,5 mm^2	250 VAC, 5 A rms
Protective earth		1	0,5 mm^2	250 VAC
Customer Signals (CS)				
Signals twisted pair	16	16 (8x2)	0,24 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded	4	4 (2x2)	0,24 mm^2	50 V DC, 1 A rms
Customer bus (CBus)				
Bus signals	At bus board	2	0,14 mm^2	Profibus 12Mbit/s spec
Signals twisted pair	6	6 (3x2)	0,14 mm^2	50 V DC, 1 A rms
Servo motor signals				
Servo motor power	At drive	3	1,5 mm^2	600 VAC, 12 A rms
Protective earth	At drive	1	1,5 mm^2	600 VAC
Signals twisted pair for resolver	-	6	0,23 mm^2	50 V DC, 1 A rms
Brake	-	2	0,23 mm^2	50 V DC, 1 A rms
Temperature control/PTC	-	2	0,23 mm^2	50 V DC, 1 A rms
Media				
Water, Air (PROC 1)		1	12,5 mm inner diameter	Max. air pressure 16 bar/230 PSI. Max. water pressure 10 bar/145 PSI.

Continues on next page

Parallel and Ethernet communication (only IRB 6660-205/1.9)

The table shows the available type of wire/media for parallel communication and ethernet connection to manipulator

Type	Connection point at terminals in cabinet	Connection point at base and upper arm house	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power		2	0,75 mm^2	250 VAC, 5 A rms
Servo motor power		6	2,5 mm^2	600 VAC, 16 A rms
Protective earth		1	0,75 mm^2	250 VAC600 VAC
Protective earth		2	2,5 mm^2	
Customer Signals (CS)				
Signals twisted pair		16 (8x2)	0,24 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded		4 (2x2)	0,24 mm^2	50 V DC, 1 A rms
Customer bus (Ethernet)				
Ethernet/IP, PROFINET		4	0,4 mm^2	
Functional Earth (FE)				
Functional earth			10 mm^2	
Media				
Water, Air (Proc 1)		1	12,5 mm inner diameter	Max. air pressure 16 bar/230 PSI. Max. water pressure 10 bar/145 PSI.

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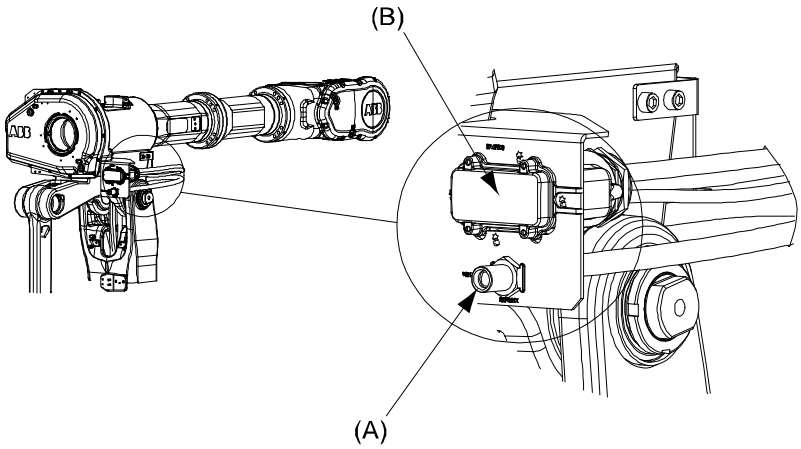
Parallel communication (only IRB 6660-205/1.9)

The table shows the available type of wire/media for parallel communication connection to manipulator

Type	Connection point at terminals in cabinet	Connection point at base and upper arm house	Cable/part area	Allowed capacity
Customer Power (CP)				
Utility Power		2	0,75 mm^2	250 VAC, 5 A rms
Servo motor power		6	2,5 mm^2	600 VAC, 16 A rms
Protective earth		1	0,75 mm^2	250 VAC600 VAC
Protective earth		2	2,5 mm^2	
Customer Signals (CS)				
Signals twisted pair		16 (8x2)	0,24 mm^2	50 V DC, 1 A rms
Signals twisted pair and separate shielded		4 (2x2)	0,24 mm^2	50 V DC, 1 A rms
Media				
Water, Air (Proc 1)		1	12,5 mm inner diameter	Max. air pressure 16 bar/230 PSI. Max. water pressure 10 bar/145 PSI.



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Pos	Description
A	R2.CAIR M22x1.5, 24° seal
B	IRB 6660-130/3.1 and -100/3.3: R2.CP/CS/CBUS/Servo motor signals IRB 6660-205/1.9: R2.CP/CS

Option 3333-2 Connector kit upper arm, offers a kit with customer connectors. This must be assembled by the customer.

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 Maintenance section in the Product Manual.

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2 Variants and options

2.1 Introduction to variants and options

General

The different variants and options for the IRB 6660 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.

2.2 Manipulator

Manipulator variant

Option	Robot variant	Handling capacity (kg)	Reach (m)
3300-101	6660-205/1.9	205	1.9
3300-102	6660-130/3.1	130	3.1
3300-103	6660-100/3.3	100	3.3

Manipulator color

Option	Color	RAL code[i]
209-1	ABB orange standard	RAL 7032
209-202	ABB Graphite White std	RAL 7035
209	RAL code should be specified (ABB non-standard colors)	

i The colors can differ depending on supplier and the material on which the paint is applied.

Note

The delivery time for painted spare parts is longer for non-standard colors.

Manipulator protection

Option	Description
3350-670	Base 67, IP67
3352-10	Foundry Plus2 67, IP67

Requirements

The option *Foundry Plus2 67* [3352-10] requires option *Upper arm cover* [3316-1].

Note

Base 67 includes IP67, according to standard IEC 60529.

Foundry cable guard

Option	Description
3315-1	Foundry cable guard

The manipulator can be equipped with additional cable guards for extra tough environmental conditions, for example, metals spits or frequent weld spatter. These additional covers will prolong cable lifetime and simplify service/maintenance as the robot is kept more clean under the covers.

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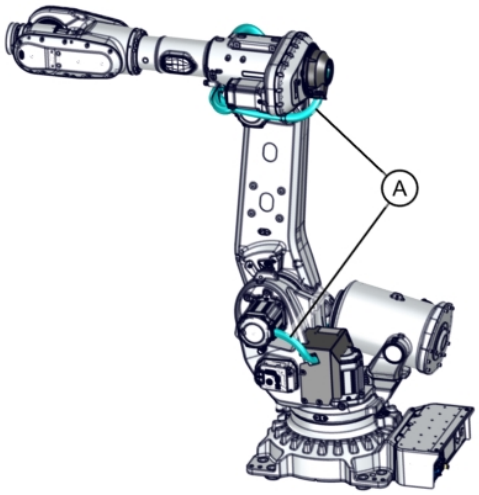
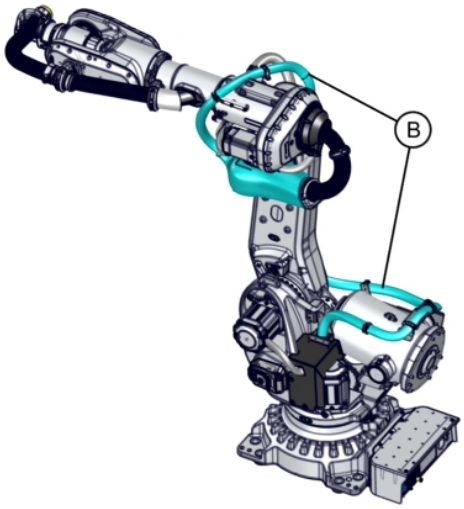
The option *Foundry Cable Guard* is recommended for *Foundry Plus2*.



xx2300001724

Schematic illustration



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Schematic illustration

A	Foundry cable guard for manipulator cable harness
B	Foundry cable guard for DressPack

Requirements

The option *Foundry Cable Guard* requires option *Upper arm cover* [3316-1].

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Upper arm cover

Option	Description
3316-1	Upper arm cover

The manipulator can be equipped with additional upper arm covers for environmental conditions, where you want to further seal off the upper arm in wet or dirty conditions. These additional covers will prolong the lifetime of the cables, and simplify service/maintenance as the robot is kept more clean under the covers.

xx2100002592

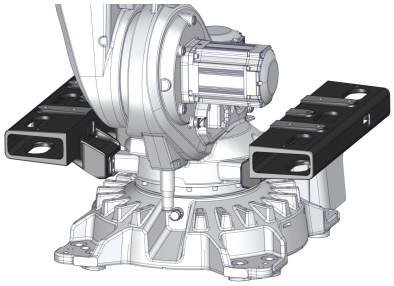
Requirements

This option is mandatory to order with the option *Foundry Plus2 [3352-10]*.

This option is mandatory to order with the option *Foundry Cable Guard [3315-1]*.

Forklift device

The manipulator can be delivered with forklift devices, allowing a forklift to be used when moving the manipulator.

Option	Description	
3318-2	Forklift device on frame Fork lift pockets placed on the frame gives a more balanced lifting point. This can be used together with special tool to invert a robot.	 xx2300001243

Resolver connection 7th axis

Option	Description
3322-1	On base

2.3 Floor cables

Manipulator cable length

Option	Lengths
3200-2	7 m
3200-3	15 m
3200-4	22 m
3200-5	30 m

2.4 Application manipulator

DressPack base-axis 6

Option	Description	Additional information
3337-11	MH Parallel	
3337-13	MH EtherNet	Includes parallel signals. Supports ProfiNet, EtherNetIP
3337-14	MH CC-Link	Includes parallel signals

2.5 Connector kits manipulator

General

Below is an example of how a connector kit and its parts can look like.

xx1300000223

Continues on next page

2.5.1 Base - Connector kits

Available options

		DressPack options		
Option	Name	3325-11/12/13	3325-51/-52/-3	3325-61/-62/-63
3330-2	CP/CS, Proc 1 base	X	X	

Note

Servo power connection kits are not available.

Option CP/CS, Proc 1 on base - 3330-2

R1. CP/CS and Proc 1 on base

This option offers a kit with connectors. This must be assembled by the customer. The kit contains:

- 1 Hose fittings (swivel nut adapter, (½", M22x1.5 Brass, 24 degree seal))
- Connector with:

1 pcs Hood Foundry (Harting)	HAN EMC / M 40
1 pcs Hinged frame (Harting)	Shell size 16
2 pcs Multicontact, female (Harting)	Type HD (25 pin)
1 pcs Multicontact, female (Harting)	Type DD (12 pin)
1 pcs Multicontact, female (Harting)	Type EE (8 pin)
10 pcs Female crimp contacts	For 1.5 mm^2
10 pcs Female crimp contacts	For 0.5 mm^2
10 pcs Female crimp contacts	For 1.0 mm^2
10 pcs Female crimp contacts	For 2.5 mm^2
12 pcs Female crimp contacts	For 0.14 - 0.37 mm^2
45 sockets	For 0.2 - 0.56 mm^2
Assembly Accessories to complete connector	
Assembly instruction	

2.5.2 Axis 3 - Connector kits

Available options

		DressPack options	Description
Option	Name	3325-11/12/13	
3333-2	CP/CS bus, Proc 1 axis 3	X	UTOW

Option CP/CS/CBus, Proc 1 axis 3 - 3333-2

CP/CS/CBus, Proc 1 axis 3 on tool side for option 3326-11/12/13 and 3326-31/32/33.

This kit offers a kit with connectors to be mounted at toolside of axis 3.

This must be assembled by the customer.

The kit contains:

- 1 Hose fitting (Parker Push lock (1/2", M22x1.5 Brass, 24 degree seal))
- Connector with:

CP/CS	
1 pcs UTOW Pin connector 26p, bayonet	UTOW61626PH, Shell size 16
26 pcs Pin	RM18W3K, 0.5-0.82 mm^2
CBUS	
1 pcs UTOW Pin connector 10p, bayonet	UTOW61210PH, Shell size 12
10 pcs Pin	RM18W3K, 0.5-0.82 mm^2
Ethernet	
1 pcs Pin connector M12	Harting 21 03 881 1405
4 pcs Pin	Harting 09670005576, 0.13-0.33 mm^2

2.6 Application floor cables

Parallel cable - Length

Option	Description	Note
3201-2	7 m	
3201-3	15 m	
3201-5	30 m	

CC-Link cable - Length

Option	Description	Note
3205-2	7 m	Includes Parallel cable
3205-3	15 m	Includes Parallel cable
3205-5	30 m	Includes Parallel cable

Servo cable 1 axis - Length

Option	Description	Note
3206-2	7 m	
3206-3	15 m	
3206-5	30 m	

2.7 Warranty

Warranty

For the selected period of time, ABB will provide spare parts and labor 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 with ABB Connected Services 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 *Customer Delivery Date* or latest 18 months after *Factory Shipment Date*, 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	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 *Factory Shipment Date* or from activation date of standard warranty in WebConfig. **Note** Special conditions are applicable, see *Robotics Warranty Directives*.

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