Product specification

IRB 6660

Product specification

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

IRC5

Document ID: 3HAC028207-001

Revision: Z

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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 specification - Controller IRC5 IRC5 with main computer DSQC1000.	*3HAC047400-001*
Product specification - Controller software IRC5 IRC5 with main computer DSQC1000 and RobotWare 6.	*3HAC050945-001*
Product specification - Robot user documentation, IRC5 with RobotWare 6	*3HAC052355-001*
Product specification - Robot stopping distances according to ISO 10218-1	*3HAC048645-001*

Revisions

Revision	Description
-	New product specification
A	- New robot variant, IRB 6660-205/1.9, added
B	- Changes for Calibration data - Work range - Explanation of ISO values (new figure and table) - Stopping distance - User documentation on DVD
C	- General update for 9.1 release

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Revision	Description
D	- Foundry Plus 2
E	- Updated Foundry Plus 2 text - ISO-Cube
F	- Text for Standards updated
G	- Some ISO-data adjusted/added and minor corrections
H	• Table for ambient temperature adjusted • Minor corrections
J	• Machinery directive updated • Minor corrections/update
K	• Base plate drawing updated • Info regarding performance for IRB 6660-205/1.9 added. • Drawing for reference holes updated • Minor corrections/update
L	• New variant, IRB 6660-100/3.3 added • Minor corrections/update
M	• Minor corrections/update
N	• Text for ISO test adjusted • Minor corrections/update
P	• Text for Foundry Plus updated. • Minor corrections/update
Q	• Measures for working range IRB 6660-100/3.3 added • Minor corrections/update
R	• Axis Calibration method added
S	• Air connection type on axis 3 (R2) changed from R1/2" to M22x1.5, 24 ° seal. See *Customer connections/Parallel communication*.
T	Published in release R17.1. The following updates are done in this revision: • Restriction of load diagram added.
U	Published in release R17.2. The following updates are done in this revision: • Updated list of applicable standards. • Clarify only 435-83 IRB 6660-205/1.9 can be ordered with Foundry Plus 2. See *Variants and options on page 67*.
V	Published in release R18.2. The following updates are done in this revision: • Robot stopping distances and times for category 0 and category 1 stops are moved to a separate document, *Product specification - Robot stopping distances according to ISO 10218-1*.
X	Published in release R20D. The following updates are done in this revision: • Updated information about *Absolute Accuracy*. • New customer option cable harness (with ethernet cable) added. • Warranty section updated.
Y	Published in release R21D. The following updates are done in this revision: • Text regarding fastener quality is updated. • Removed Axis resolution.

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Revision	Description
Z	Published in release 24D. The following updates are done in this revision: • Added RAL code in manipulator color introduction. • Updated the section *Technical data on page 22*.

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

Performance IRB 6660-205/1.9

IRB 6660-205/1.9 is designed for pre-machining process applications.

The maximum allowed acceleration is lower than on traditional robots and all servo gains are higher in order to increase the robot stiffness. The IRB 6660-205/1.9 includes friction compensation capabilities by default.

If upgrading an IRB 6660-205/1.9 with RobotWare 5.15 or later, it is recommended to test the default motion tuning, delivered with the robot, before considering any modification of the tuning for the actual installation, as further increasing the servo gains may risk oscillations.

The new tuning is availble from November 2012, in RW 5.15.

Safety

Safety standards valid for complete robot, manipulator and controller.

1 Description

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 - Controller software IRC5*.

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.

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See *Variants and options on page 67* for robot versions and other options not selectable together with Foundry Plus 2.

Manipulator axes

Axis 5   Axis 4

Axis 6

Axis 3

Axis 2

Axis 1
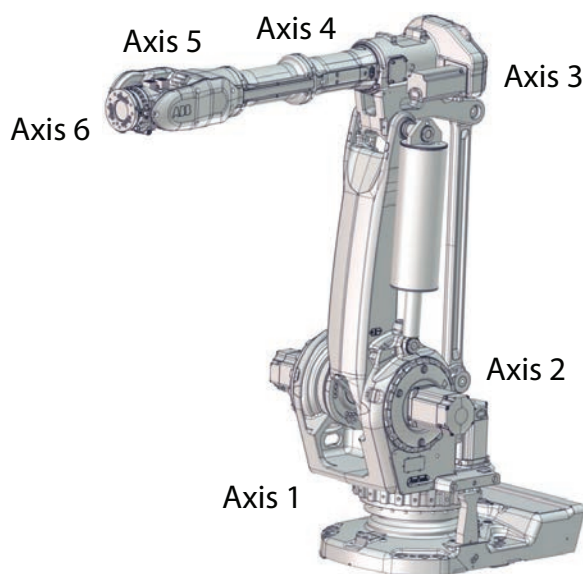
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1.1.2 Technical data

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)		
	-100/3.3	-130/3.1	-205/1.9
ISO Cube 1000 m/s	1.2 kW	1.6 kW	2.2 kW
ISO Cube Max. velocity	2.3 kW	3.1 kW	3.6 kW
Press tending cycle 1000 m/s	3.1 kW	-	-
Press tending cycle Max. velocity	4.7 kW	3.9 kW	-
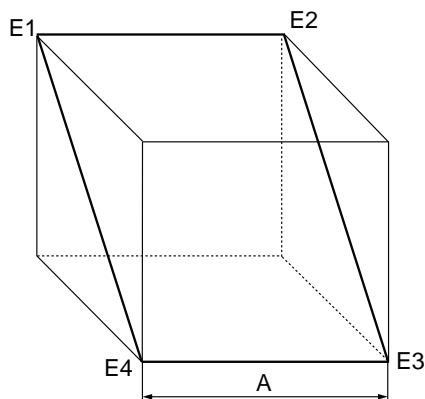
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	IRB 6660-130/3.1 and -100/3.3	IRB 6660-205/1.9
A	1,000 mm	630 mm

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Dimensions IRB 6660-130/3.1
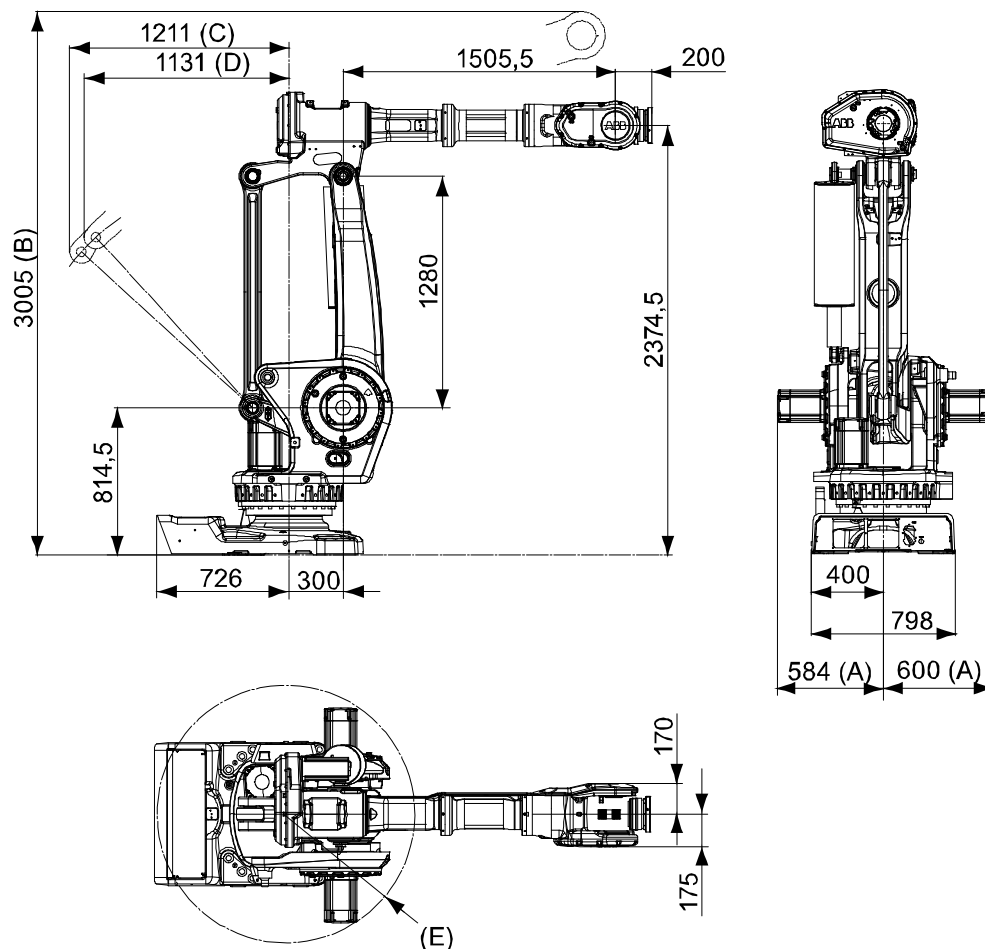
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	Description
A	Forklift width 750 mm
B	Max working range
C	Mechanical stop
D	Max working range
E	R710, Radius for motor axis 3 R750, Right fork lift pocket

Dimensions IRB 6660-100/3.3

xx1200001277

	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

xx1000000635

	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

1 Description

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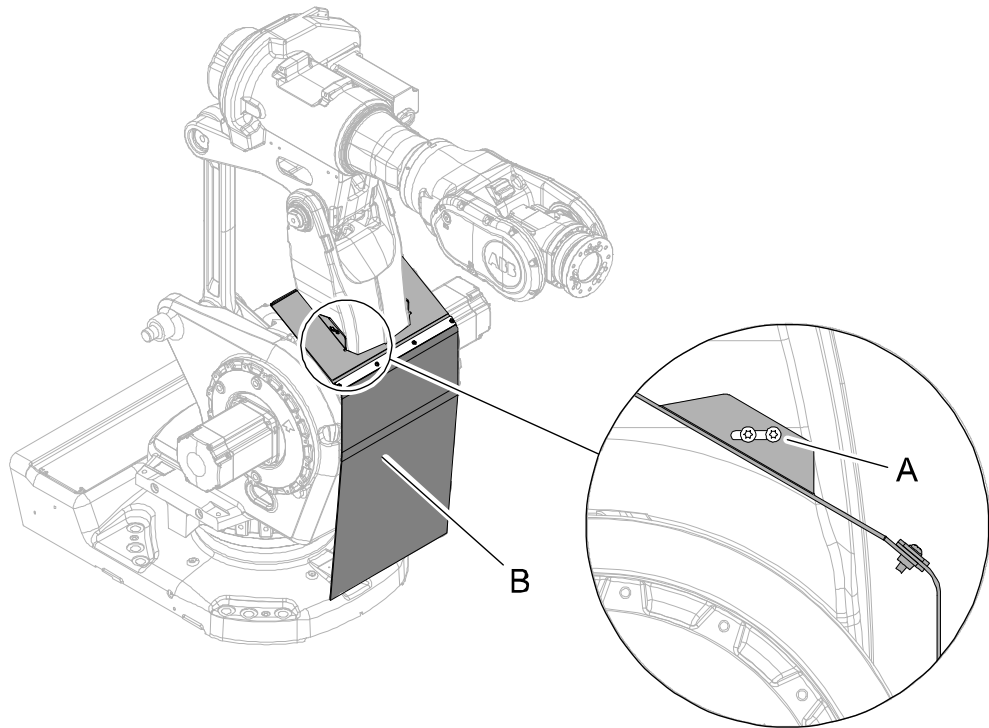
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Type	Description
Chip protection (B)	The protection prevents chips created at applications as for instance, deburring, sawing and milling to be accumulated on the robot and secure its movable functionality. Mandatory for IRB 6660-205/1.9. Not available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

1.2 Standards

1.2.1 Applicable standards

> **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	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

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

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 38*.

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 48*.

Working range limitation

The working range of axis 1 can be limited by mechanical stops as options. See *Equipment on page 72*, working range limit. All main axes can also be limited by using EPS (Electronic Position Switches (option).

Explosive environments

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

1.3.2 Technical data

Weight, robot

The table shows the weight of the robot.

Robot model	Weight
IRB 6660	1950 kg

> ℹ **Note**
>
> The weight does not include tools and other equipment fitted on the robot.

Mounting positions

The table shows valid mounting options for the manipulator.

Mounting option	Installation angle	Note
Floor mounted	0° [i]	

[i] A tilt of up to 5° does not affect the payload or reach, but it can have a negative impact on performance and lifetime. The actual value must be set in the system parameters.

> ℹ **Note**
>
> The actual mounting angle must always be configured in the system parameters, otherwise the performance and lifetime is affected. See the product manual for details.

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Loads on foundation, robot

The illustration shows the directions of the robots stress forces.

The directions are valid for all floor mounted, suspended and inverted robots.
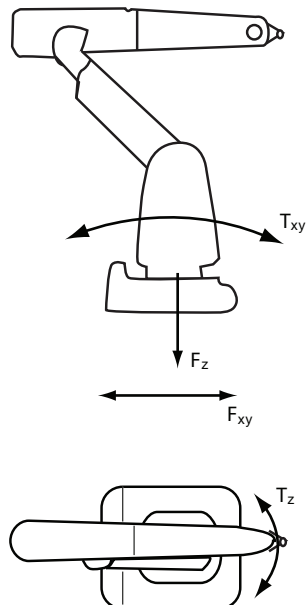
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F_{xy}	Force in any direction in the XY plane
F_z	Force in the Z plane
T_{xy}	Bending torque in any direction in the XY plane
T_z	Bending torque in the Z plane

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

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

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

Floor mounted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	± 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	Endurance load (in operation)	Max. load (emergency stop)
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)

Requirements, foundation

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

Requirement	Value	Note
Flatness of foundation surface	0.3 mm	Flat foundations give better repeatability of the resolver calibration compared to original settings on delivery from ABB. The value for levelness aims at the circumstance of the anchoring points in the robot base. In order to compensate for an uneven surface, the robot can be recalibrated during installation. If resolver/encoder calibration is changed this will influence the absolute accuracy.
Minimum resonance frequency	22 Hz **Note** It may affect the manipulator lifetime to have a lower resonance frequency than recommended.	The value is recommended for optimal performance. Due to foundation stiffness, consider robot mass including equipment.[i] For information about compensating for foundation flexibility, see the application manual of the controller software, section *Motion Process Mode*.

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

Disturbances from other machinery will affect the robot and the tool accuracy. The robot has resonance frequencies in the region 10 – 20 Hz and disturbances in this region will be amplified, although somewhat damped by the servo control. This might be a problem, depending on the requirements from the applications. If this is a problem, the robot needs to be isolated from the environment.

Storage conditions, robot

The table shows the allowed storage conditions for the robot:

Parameter	Value
Minimum ambient temperature	-25° C
Maximum ambient temperature	+55° C
Maximum ambient temperature (less than 24 hrs)	+70° C

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Parameter	Value
Maximum ambient humidity	95% at constant temperature (gaseous only)

Operating conditions, robot

The table shows the allowed operating conditions for the robot:

Parameter	Value
Minimum ambient temperature	+5° C
Maximum ambient temperature	+50° C [i]
Maximum ambient humidity	95% at constant temperature

[i] In a high speed presstending application, max ambient temperature is +40° C.

Protection classes, robot

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

Protection type	Protection class [i]
Manipulator, protection type Standard	IP 67
Manipulator, protection type Foundry Plus	IP 67

[i] According to IEC 60529.

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)

$\text{Torque}_{xy} (M_{xy})$

$\text{Force}_z (F_z)$

$\text{Force}_{xy} (F_{xy})$

Y

$\text{Torque}_z (M_z)$

X

xx1000000637

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).

Fastening holes robot base

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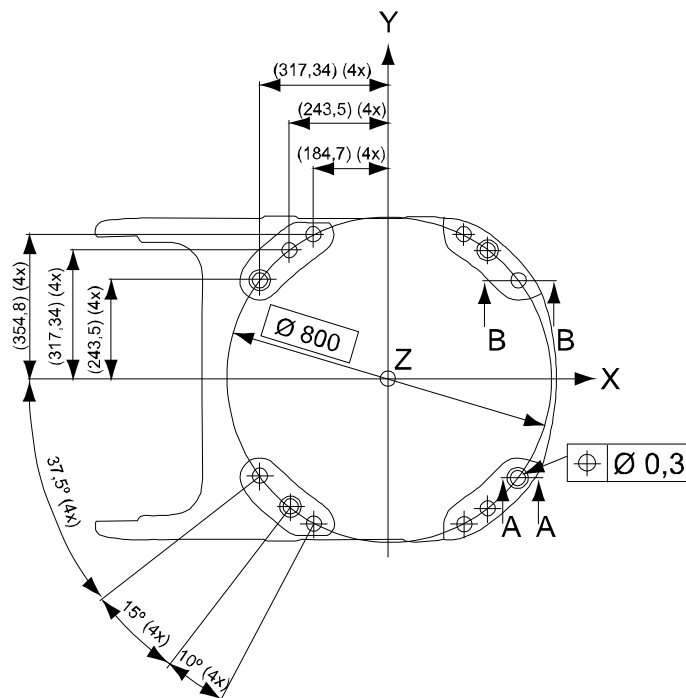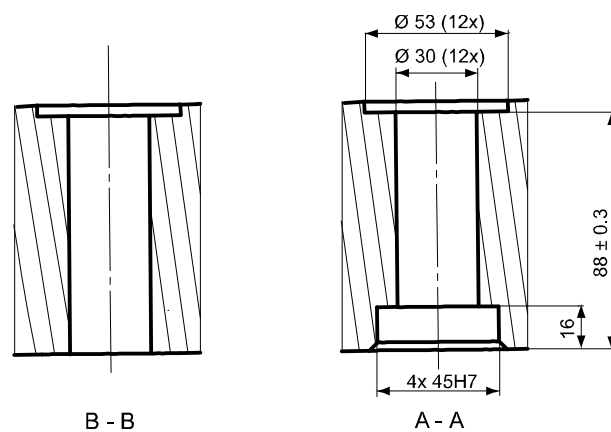
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Recommended screws for fastening the manipulator to the base	M24 x 140 8.8 with 4 mm flat washer
Torque value	725 Nm

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.

1 Description

Base plate drawing

The following figure shows the option base plate (dimensions in mm).
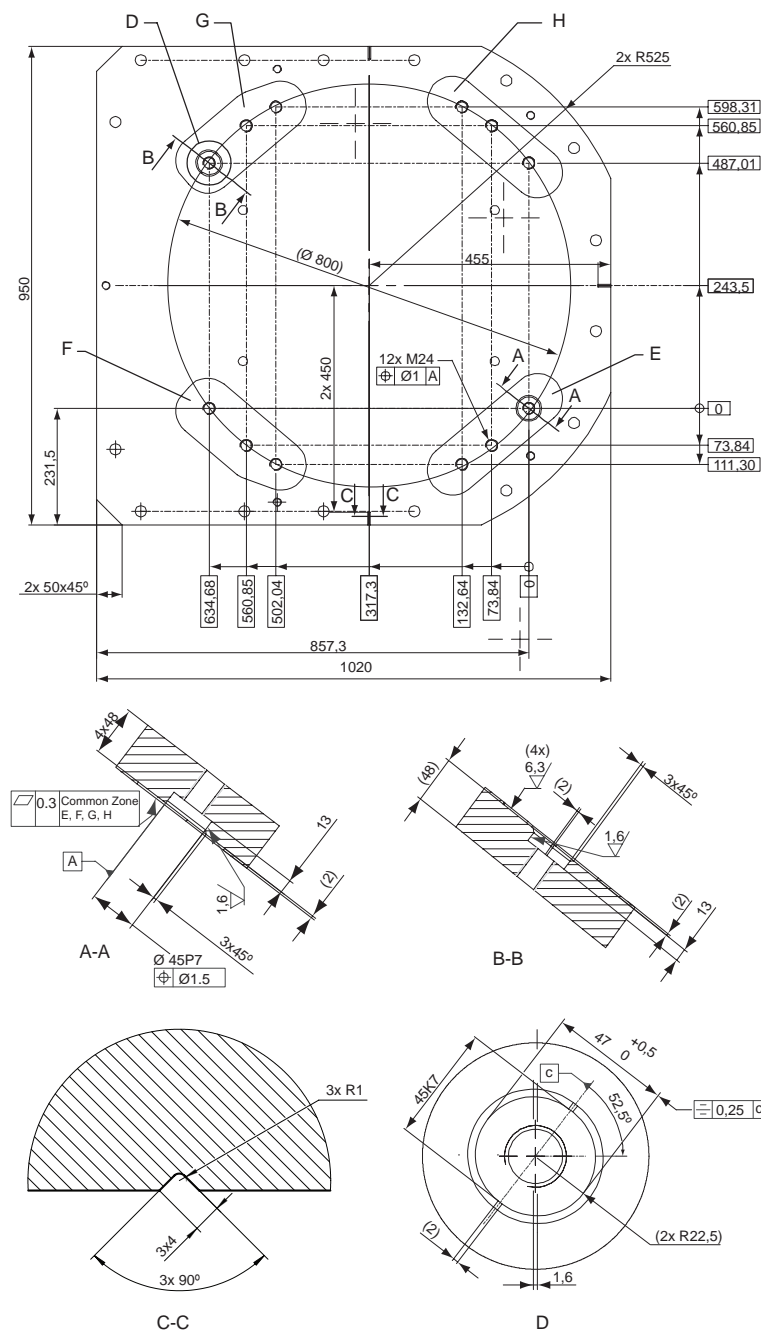
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E, F, G, H	Common tolerance zone (accuracy all over the base plate from one contact surface to the other)

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xx1000001054

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

1.3.3 Mounting the manipulator
Continued
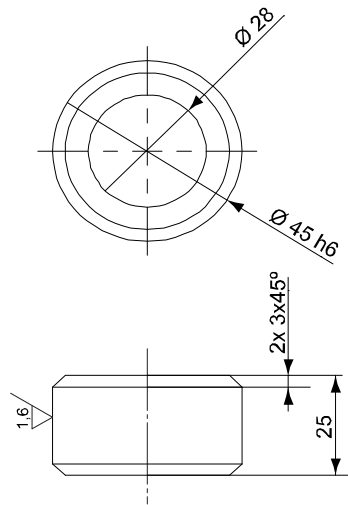
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Pos	Description
A	Guide sleeve protected from corrosion

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. For IRC5 robots, the absolute accuracy calibration data is delivered in a file, absacc.cfg, supplied with the robot at delivery. The file replaces the calib.cfg file and identifies motor positions as well as absolute accuracy compensation parameters. A robot calibrated with Absolute accuracy has a sticker next to the identification plate of the robot (IRC5). To regain 100% Absolute accuracy performance, the robot must be recalibrated for absolute accuracy after repair or maintenance that affects the mechanical structure. ⚠ ABSOLUTE ACCURACY 3HAC 14257-1 xx0400001197	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.	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.
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.

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.

1.4.2 Fine calibration with Calibration Pendulum

General

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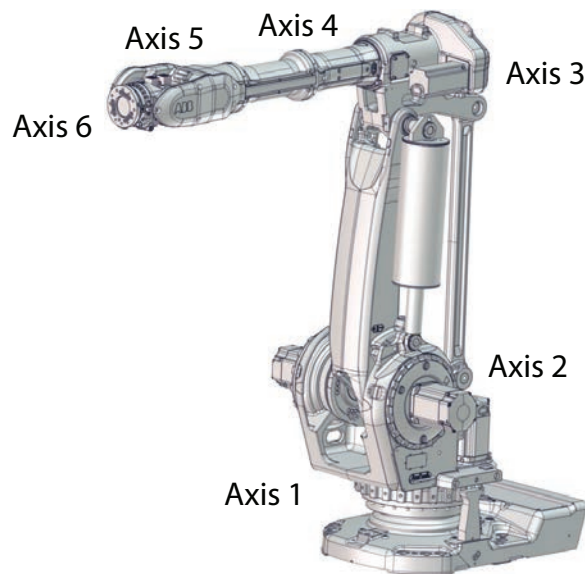
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Calibration

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

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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.

> **ℹ Note**
>
> The performance data is applicable to the corresponding RobotWare version of the individual robot.

> **ℹ Note**
>
> Singularities might appear in slightly different positions on a real robot compared to RobotStudio, where *Absolute Accuracy* is off compared to the real controller.

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.

Continues on next page

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

Absolute Accuracy active

Absolute Accuracy will be active in the following cases:

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

Absolute Accuracy not active

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

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

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

RAPID instructions

There are no RAPID instructions included in this option.

Production data

Typical production data regarding calibration are:

Robot	Positioning accuracy (mm)		
	Average	**Max**	**% Within 1 mm**
IRB 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.

xx1000000645

Product specification - IRB 6660
3HAC028207-001 Revision: Z
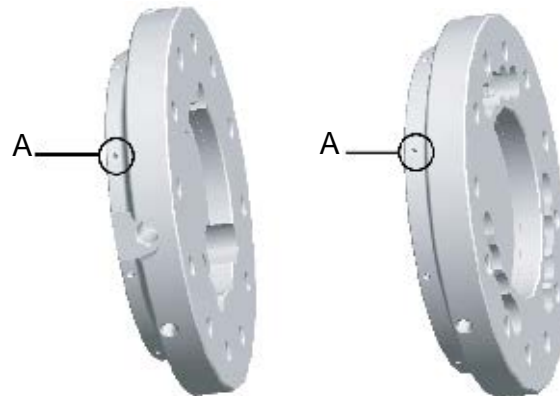
Tool flange
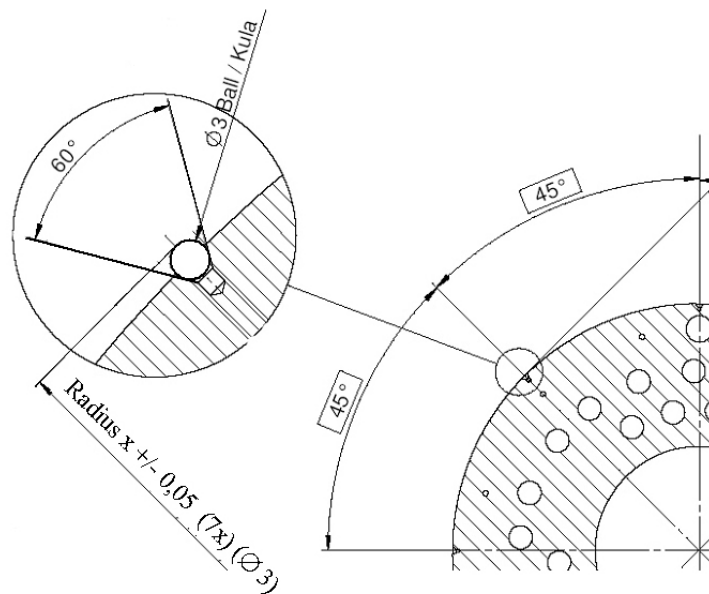
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Robot	Radius X (mm) for references on tool flange
IRB 6660-130/3.1	R=87,5
IRB 6660-100/3.3	R=87,5
IRB 6660-205/1.9	R=87,5

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 - 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 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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IRB 6660-130/3.1" Vertical Wrist" (±10°)
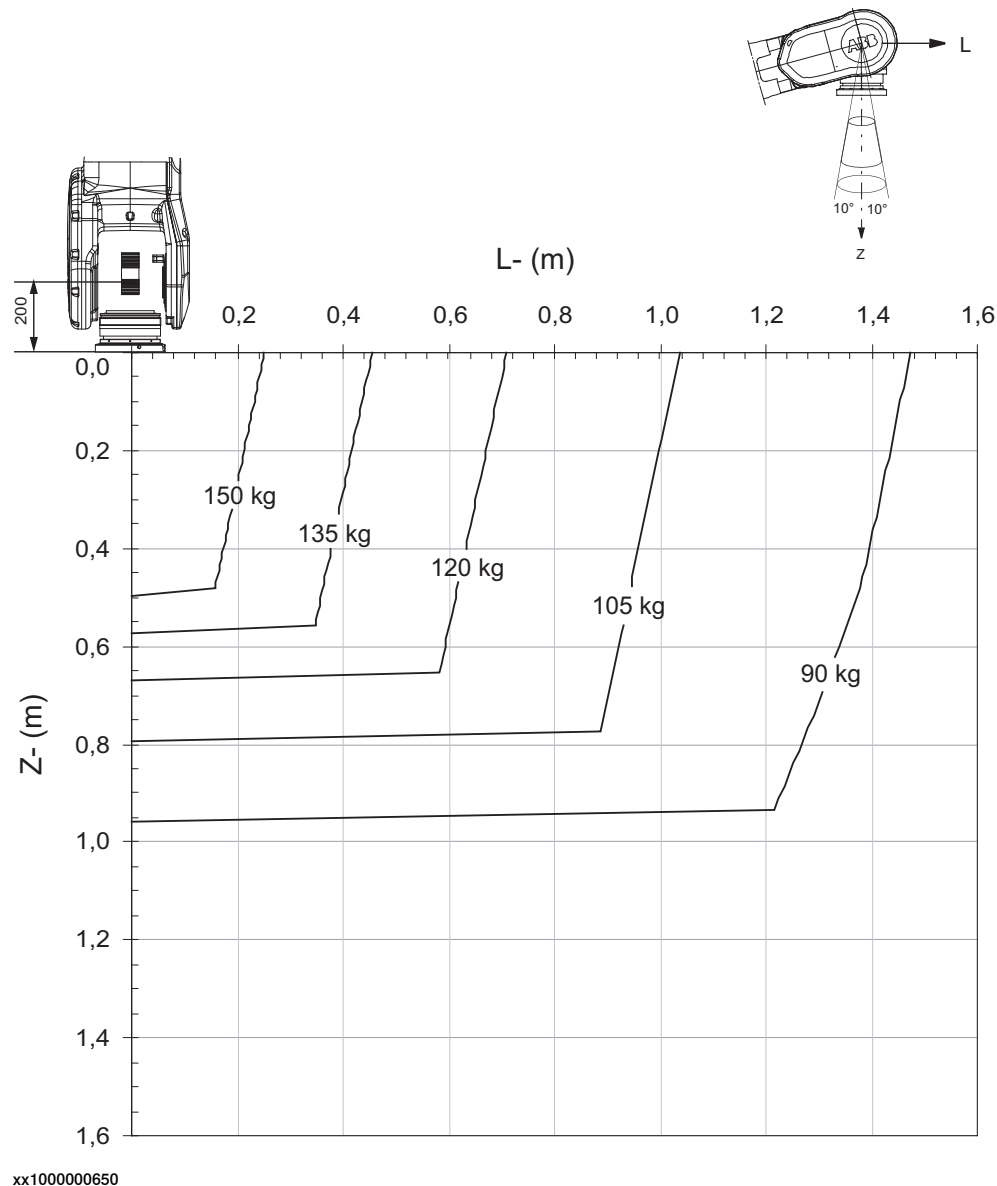
xx1000000650

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

Product specification - IRB 6660
3HAC028207-001 Revision: Z
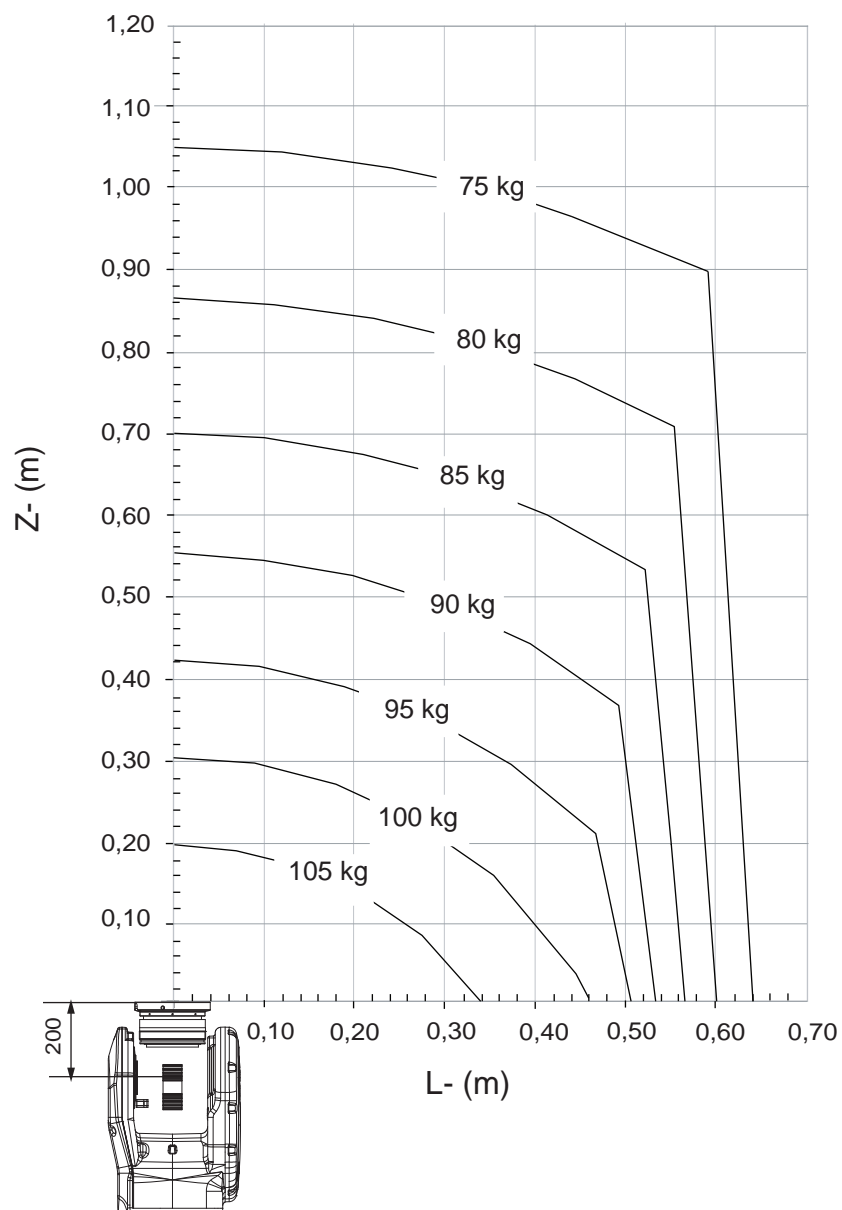
IRB 6660-100/3.3

xx1200001284

1.5.2 Load diagrams
Continued

IRB 6660-100/3.3" Vertical Wrist" (±10°)
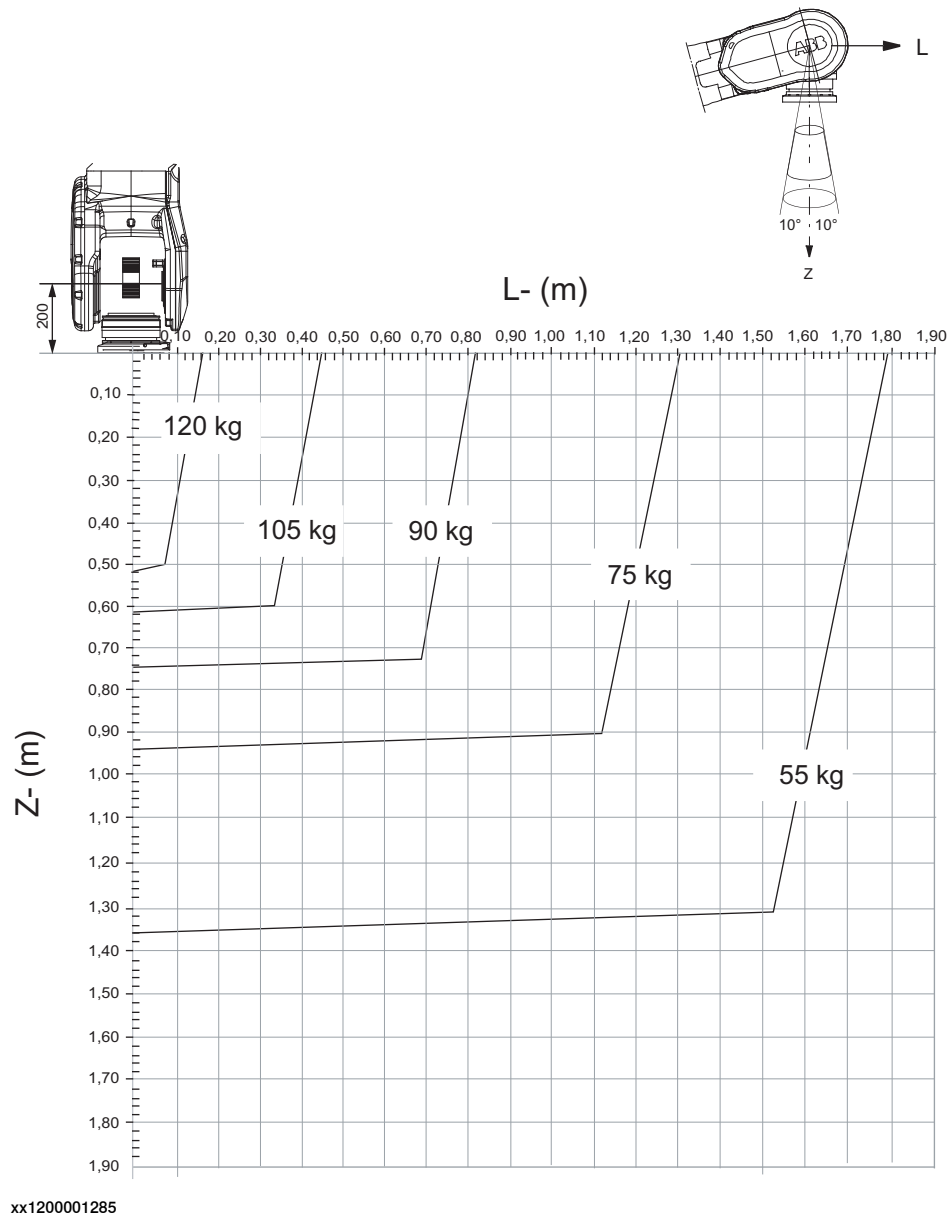
xx1200001285

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

Product specification - IRB 6660
3HAC028207-001 Revision: Z

IRB 6660-205/1.9

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

xx1000000649
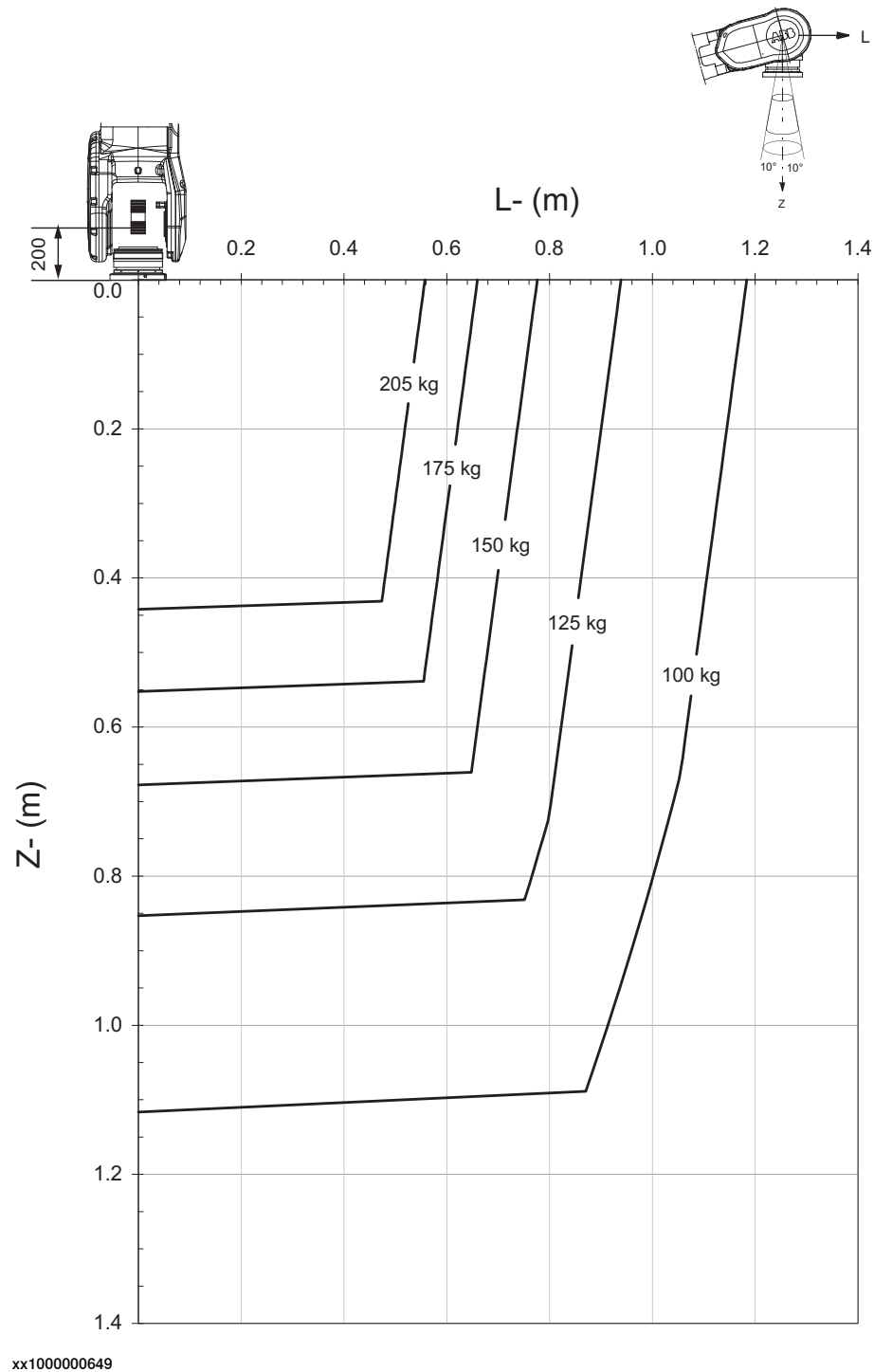
For wrist down (0° deviation from the vertical line).

	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

Product specification - IRB 6660
3HAC028207-001 Revision: Z

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

Information

> ℹ️ **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	$Ja5 = Load \times ((Z + 0,200)^2 + L^2) + \max(J_{0x}, J_{0y}) \leq 250$ kgm^2
	IRB 6660-205/1.9	$Ja5 = Load \times ((Z + 0,200)^2 + L^2) + \max(J_{0x}, J_{0y}) \leq 250$ kgm^2
	IRB 6660-100/3.3	$Ja5 = Load \times ((Z + 0,200)^2 + L^2) + \max(J_{0x}, J_{0y}) \leq 250$ kgm^2
6	IRB 6660-130/3.1	$Ja6 = Load \times L^2 + J_{0Z} \leq 185\ kgm^2$
	IRB 6660-205/1.9	$Ja6 = Load \times L^2 + J_{0Z} \leq 185\ kgm^2$
	IRB 6660-100/3.3	$Ja6 = Load \times L^2 + J_{0Z} \leq 185\ kgm^2$

xx1000000667

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	$Ja5 = Load \times ((Z + 0,200)^2 + L^2) + \max(J_{ox}, J_{oy}) \leq 275$ kgm^2
	IRB 6660-205/1.9	$Ja5 = Load \times ((Z + 0,200)^2 + L^2) + \max(J_{ox}, J_{oy}) \leq 275$ kgm^2
	IRB 6660-100/3.3	$Ja5 = Load \times ((Z + 0,200)^2 + L^2) + \max(J_{ox}, J_{oy}) \leq 275$ kgm^2

1 Description

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	$Ja6 = Load \times L2 + J_{oz} \leq 250\ kgm^2$
	IRB 6660-205/1.9	$Ja6 = Load \times L2 + J_{oz} \leq 250\ kgm^2$
	IRB 6660-100/3.3	$Ja6 = Load \times L2 + J_{oz} \leq 250\ kgm^2$
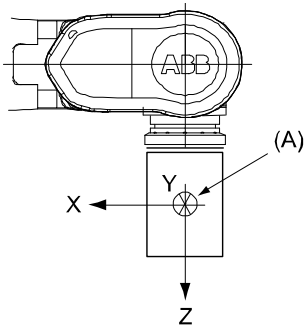
xx1000000668

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

> **ℹ 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.
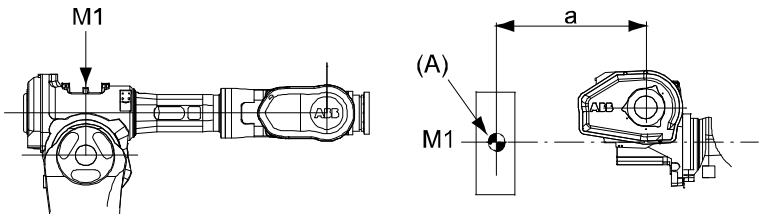
xx1000000651

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
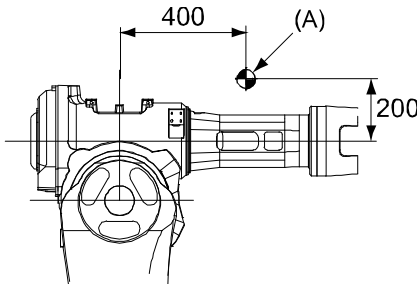
xx1000000652

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 ($\leq$ 500 kg)

(A)

(B)
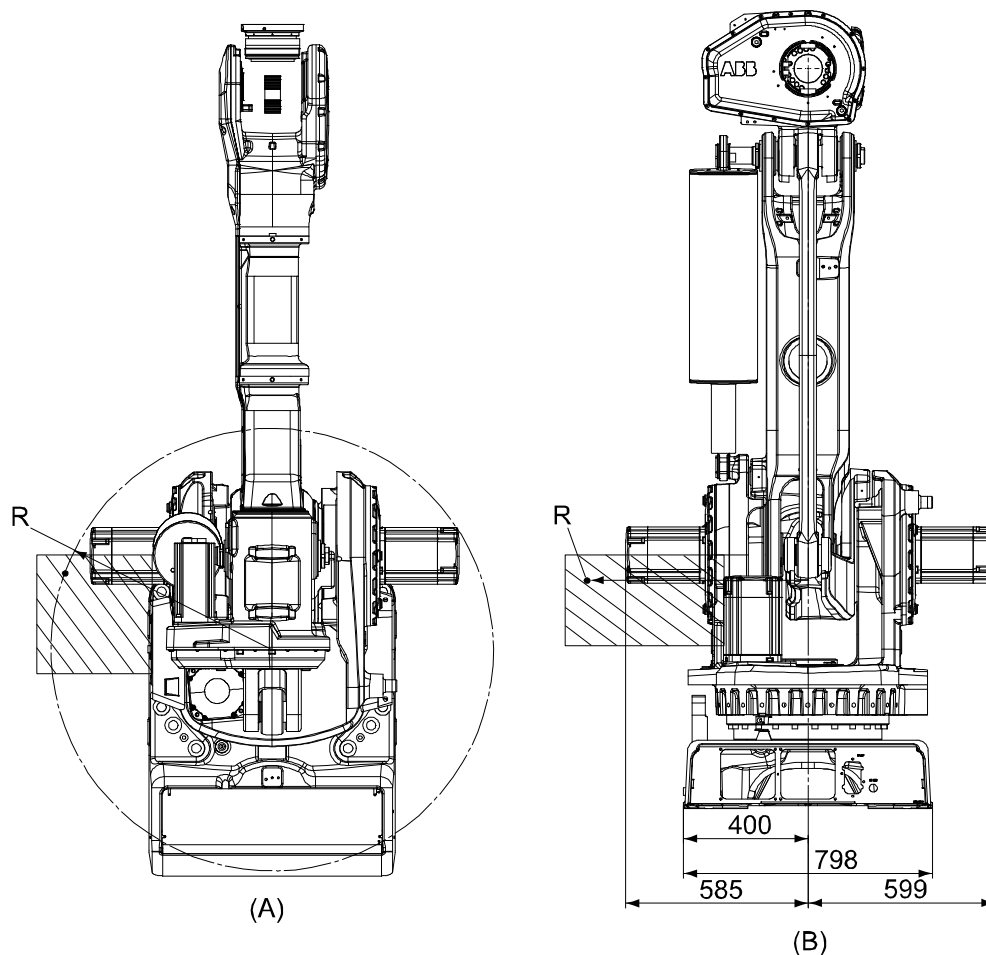
xx1000000653

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

xx1000000659

Product specification - IRB 6660
3HAC028207-001 Revision: Z
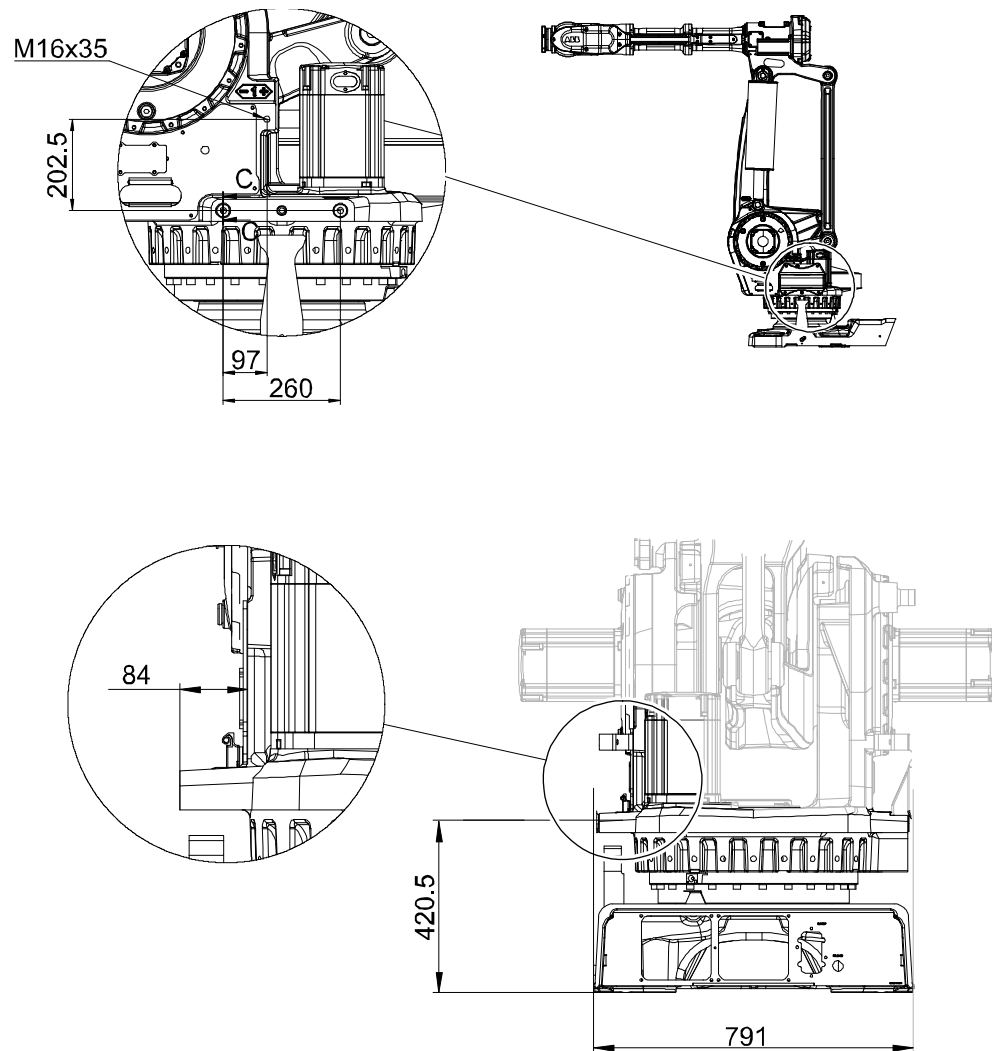
Holes for mounting extra equipment on upper arm
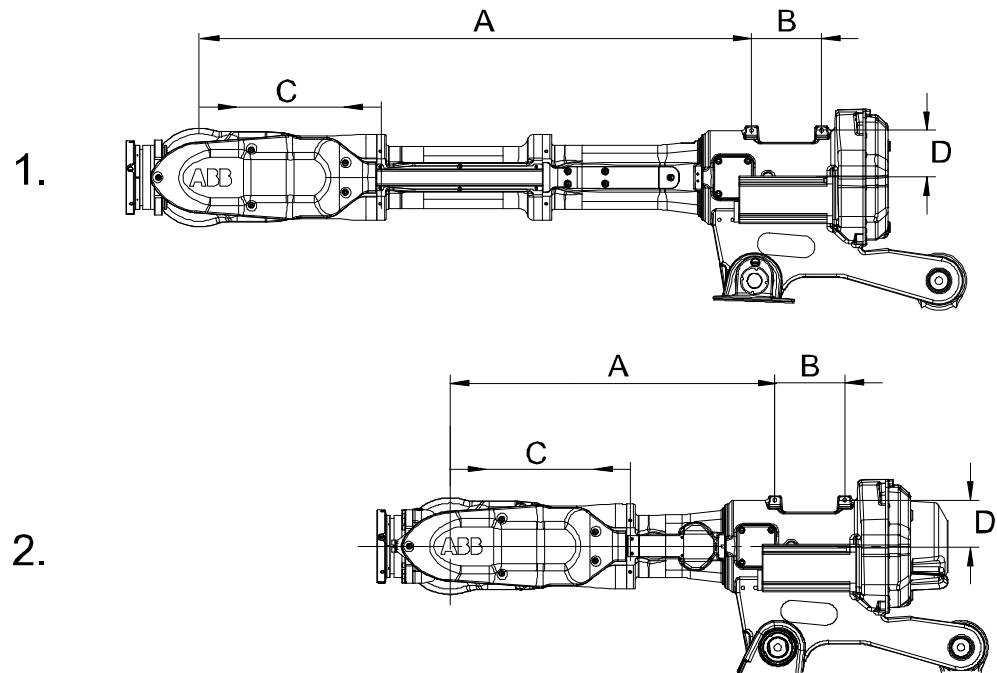
xx1000000655

Robot variant	A	B	C	D
1. IRB 6660-130/3.1	1497.5 mm	190 mm	490 mm	128 mm
1. IRB 6660-100/3.3	1497.5 mm	190 mm	490 mm	128 mm
2. IRB 6660-205/1.9	885 mm	190 mm	490 mm	128 mm
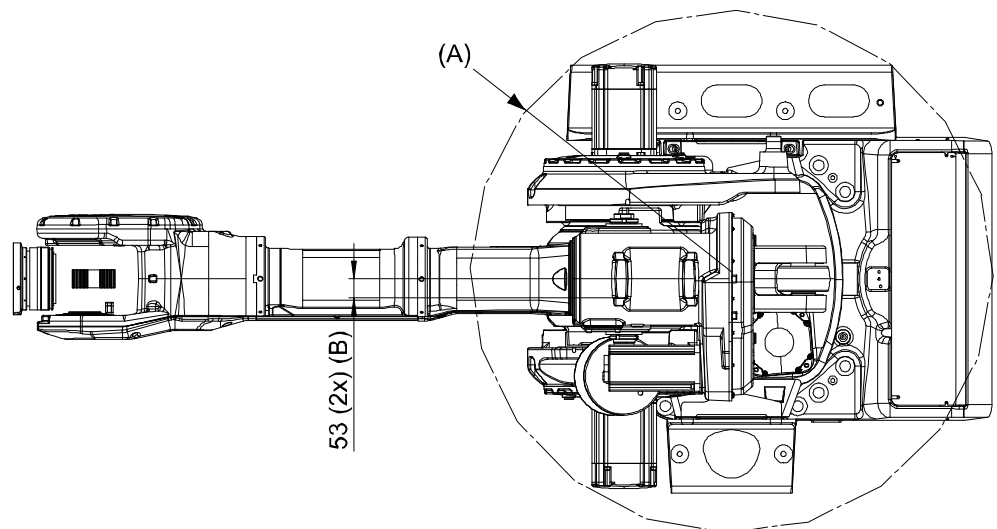
xx1000000654

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

1.6.2 Mounting of hip load
Continued

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Robot Tool Flange

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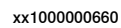
Pos	Description
A	Minimum thread length for screws in M12-hole is 9 mm.
B	Ø 12 H7 Depth 15
C	Ø 100 H7 Depth 8 min

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 610-1 "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
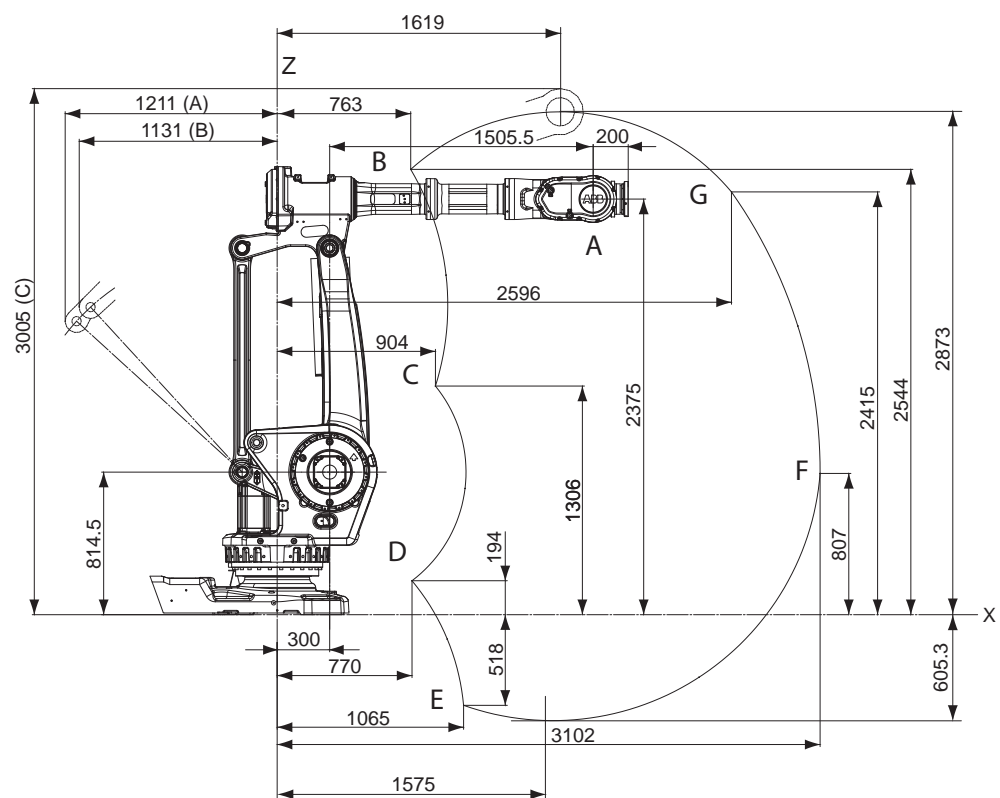
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Product specification - IRB 6660
3HAC028207-001 Revision: Z

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
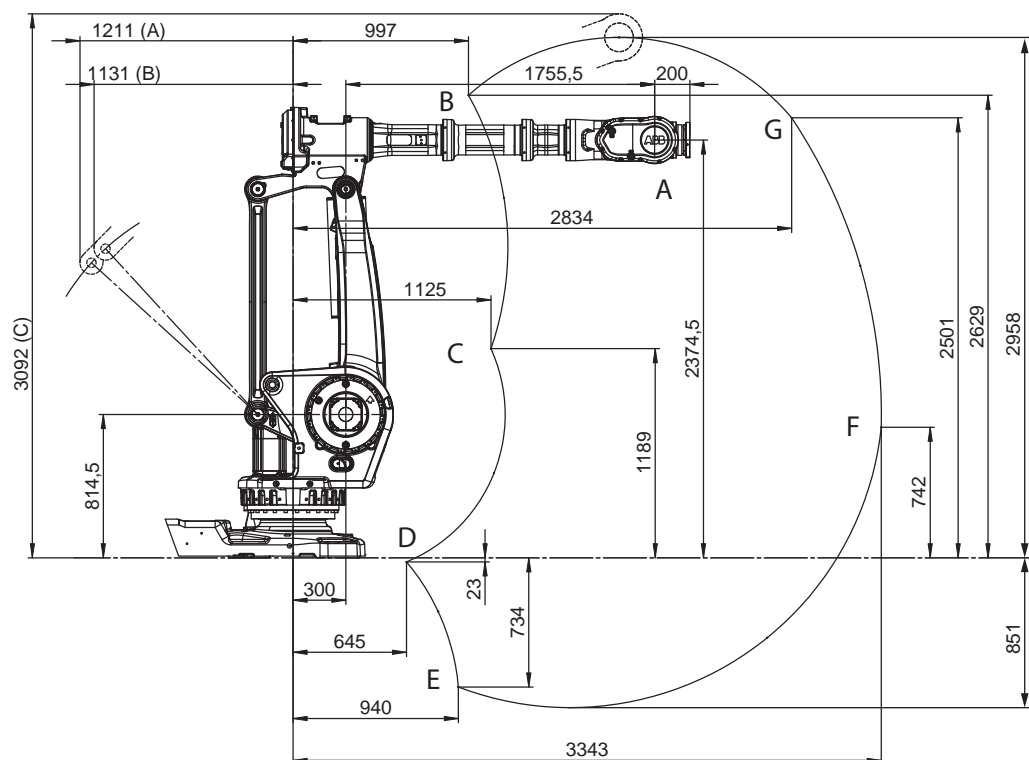
xx1200000979

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

Continues on next page

1 Description

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
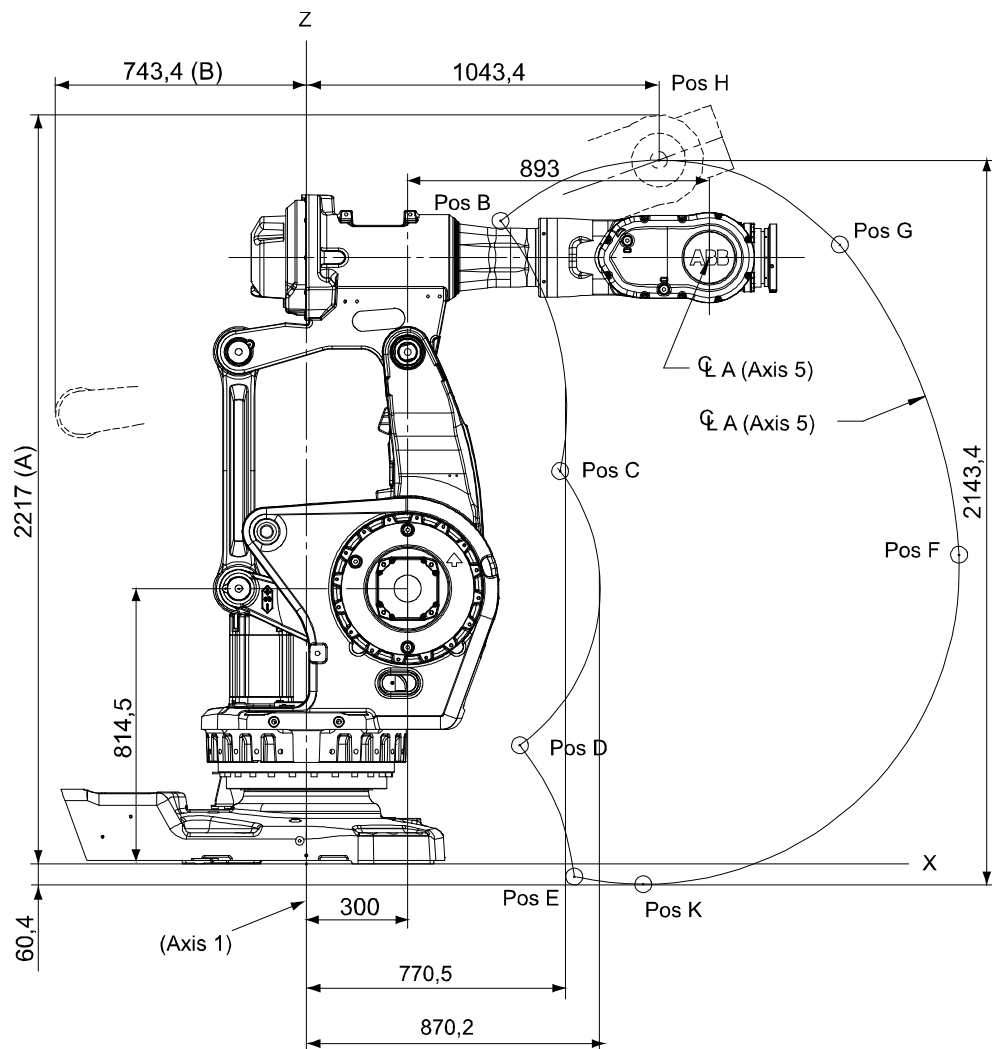
xx1000000663

Note	Description
(A)	Max. working range

Continues on next page

Product specification - IRB 6660
3HAC028207-001 Revision: Z

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.
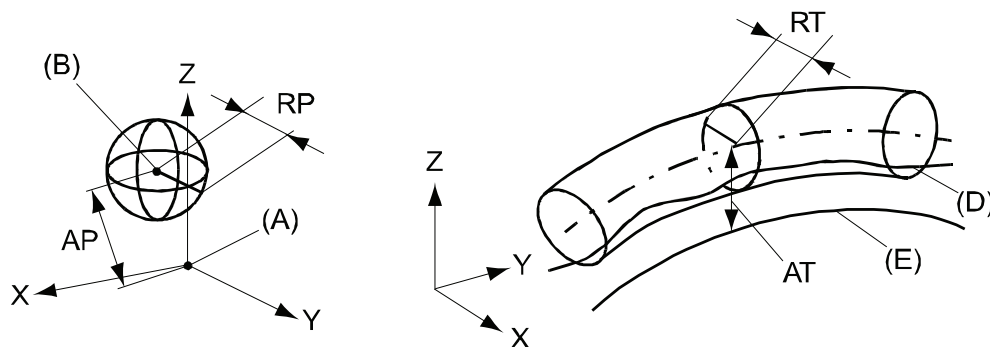
xx0800000424

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

IRB 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

1.8.1 Introduction

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 (option 455-8)

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.

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 (option 455-7).

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.

Product specification - IRB 6660
3HAC028207-001 Revision: Z

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 (option 455-8)

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.

Parallel communication (only IRB 6660-205/1.9)

The table shows the available type of wire/media for parallel communication connection to manipulator (option 455-5)

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 458-1 Connector kit upper arm, offers a kit with customer connectors. This must be assembled by the customer.

1.9 Cooling fan for axis 1 and 2 motor

1.9.1 Introduction

Option 87-1, 88-1

To be used to avoid overheating of motors and gears in applications with intensive motion (high average speed and /or high average torque and/or short wait time) of axis 1 and/or axis 2.

Valid protection for cooling fan is IP54. Fan failure stops the robot.

To determine the use of cooling fans for axis 1 and/or axis 2 motor use the "Gearbox Heat Prediction Tool" in RobotStudio. Reliable facts for the decision of need for fan or not will be achieved by entering the ambient temperature for a specific cycle. Please contact your local ABB organization.

Not together with IRB 6660-205/1.9

1.10 Maintenance and Troubleshooting

1.10.1 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.

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

Variants

Option	IRB Type	Handling capacity (kg)	Reach (m)
435-78	6660	130	3.1
435-83	6660	205	1.9
435-117	6660	100	3.3

Manipulator color

Option	Color	RAL code [i]
209-1	ABB orange standard Standard color with protection option 287-3 Foundry Plus	RAL 7032
209-2	ABB white standard	RAL 9003
209-202	ABB Graphite White std Standard color with protection option 287-4 Standard	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.

> **ℹ Note**
>
> Notice that delivery time for painted spare parts will increase for ABB none standard colors.

Continues on next page

Product specification - IRB 6660
3HAC028207-001 Revision: Z

2.2.1 Protection type

Protection types

Option	Protection type	Note
287-4	Standard	IP 67 Not valid for IRB 6660-205/1.9.
287-3	Foundry Plus 2	See *Protection type Foundry Plus 2 on page 12* for a complete description of protection type Foundry Plus 2. Mandatory for IRB 6660-205/1.9. Not valid for IRB 6660-130/3.1, IRB 6660-100/3.3.

Protection type Clean Room

xx0900000435

The illustration above is a sample of an IPA certified lable.

Robots with the option Clean Room are classified for clean room class according to ISO 14644-1.

The Clean Room robots are protected with a paint appropriate for clean room applications. The paint has been tested regarding outgassing of Volatile Organic Compounds (VOC) and been classified in accordance with ISO 14644-8.

Classification of airborne molecular contamination, see below:

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

Classification results in accordance with ISO 14644-8 at different test temperatures. See *Variants and options on page 67* for options that are not selectable together with the option Clean Room.

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 67* for robot versions and other options not selectable together with Foundry Plus 2.

Protection type Foundry Prime 2

Robots with the option Foundry Prime are designed for water jet cleaning of casts and machined parts, and similar very harsh, but proven robotic application environments. Applicability in other applications cannot be guaranteed without prior testing, previous experience or professional judgment by ABB. Please contact ABB Robotics Sales organization if in doubt regarding specific application feasibility.

The manipulator can withstand surrounding solvent based detergents which must be approved by ABB. In addition, the manipulator can withstand indirect spray from jet pressure (max. 600 bar) and 100% humidity (gaseous mixture only).

The manipulator can work in an environment with a cleaning bath temperature < 60° C, typically used in a washing application with moderate robot speed. Surrounding temperature can not be higher than specified for the option.

If fluids that may cause rust formation, for example water, are continuous splashing the robot or are used in the vicinity of the robot it is strongly recommended to add rust inhibitor to the fluid or take other measures to prevent potential rust formation on the robots unpainted areas, joints, or other unprotected, surfaces.

The robot is protected by well-proven sealings for gears and bearings, pressurized motors and electronic compartment, and detergent resistant painting system in three layers (two layer epoxy paint under a protective layer of clear coat). Non-painted surfaces has rust preventive coating (Mercasol).

As the robot is designed for very harsh environments, an extended service and maintenance program is required. Special care must be taken when replacing parts or performing other maintenance and service that breaks the paint surface as the paint surface act as a protective barrier. For detailed information of the maintenance program, see chapter Maintenance in the product manual. It is highly recommended to sign a Service Agreement with ABB due to difficult and severe environmental conditions.

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

Detergents

General detergent requirements:

- Washing detergent with max pH <9.0, if not stated otherwise
- Washing detergent must be approved by ABB
- ABB maintain a list of approved cleaners/detergents, see 3HAC037554-001
- The washing detergent must:
    - be cleaned continuously
    - contain rust inhibitor
    - be checked regulalry for pH value and concentration
    - not use other additives than water without prior testing
- The user must follow the recommendations regarding detergent concentration anf pH value
- No other additive than water is guaranteed without prior testing or consultation with ABB. Other additives than water may have a harmful effect on the life time of the robot and its components.

Please contact your local ABB organization for an updated list of approved washing detergents.

Available robot versions

The option Foundry Prime might not be available for all robot versions.

See *Variants and options on page 67* for robot versions and other options not selectable together with Foundry Prime.

2.3 Equipment

General

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.
87-1	Cooling fan for axis 1 motor (IP 54)	For in use recommendations see *Cooling fan for axis 1 and 2 motor on page 65*. Not together with IRB 6660-205/1.9 Not together with Foundry Plus.
88-1	Cooling fan for axis 2 motor (IP 54)	For in use recommendations see *Cooling fan for axis 1 and 2 motor on page 65*. Not together with IRB 6660-205/1.9 Not together with Foundry Plus.
37-1	Base plate	Can also be used for IRB 6600 and IRB 7600. See Installation, for dimension drawing.
430-1	Upper arm covers	See Figure below. Included in protection Foundry Plus.

Upper arm covers
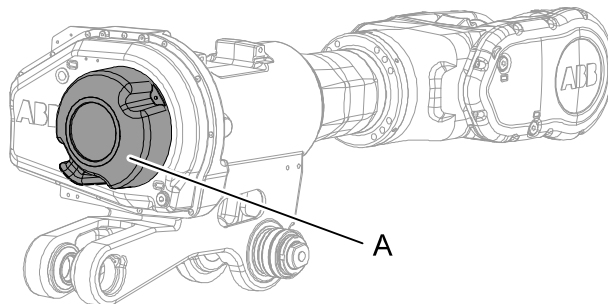
xx1000000665

Pos	Description
A	Option 430-1 Included in option 287-3 Foundry Plus

Resolver connection, axis 7

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

Continues on next page

Electronic Position Switches (EPS)

Electronic Position Switches (EPS) is an additional safety computer in the controller, with the purpose of providing safe output signals representing the position of robot axes. The output signals are typically connected to cell safety circuitry and/or a safety PLC which takes care of interlocking the robot cell, for example in order to prevent robot and operator to enter a common area simultaneously. See *Application manual - Electronic Position Switches*.

Foundry Plus Cable Guard

The manipulator cables are equipped with an additional protection of aluminized leather against e.g. aluminium spitz and flashes and chips from machining. Process cable option 455-1 has the same protection.

Option	Description	Remark
908-1	Foundry Plus Cable Guard	For extra protection of cables. Requires option 287-3 Foundry Plus. Not together with IRB 6660-130/3.1 and IRB 6660-100/3.3

Working Range Limit

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°	Two stops which allow the working range to be restricted in increments of 7.5°.

All axes can also be limited by using Electronic Position Switches, EPS (option).

Standard calibration method

Option	Type	Description
1999-1	Axis calibration	Preferred standard calibration method. Robust, high performance axis calibration using only mechanical calibration stops and software.
1999-2	Calibration Pendulum	Previous standard calibration method only to be used in special cases if customers would like to harmonize calibration with already installed base.

> **Note**
>
> The calibration methods are not interchangeable.

2.4 Floor cables

Manipulator cable length

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

2.5 Process

Connection to

Option	Connection to	Description
16-1	Cabinet	The signals CP/CS are connected to 12-pole screw terminals, Phoenix MSTB 2.5/12-ST-5.08, in the controller. The cable between R1.CP/CS and the controller is supplied.

Communication

Option	Type	Description
455-5	Parallel communication	Includes CP, customer signals and one media hose; Only available together with IRB 6660-205/1.9.
455-7	Parallel, bus and servo communication + air	Includes CP, customer signals, CAN/DeviceNet and Profibus + one air hose, at upper arm housing. Only available together with IRB 6660-130/3.1 and IRB 6660-100/3.3.
455-8	Parallel and Ethernet communication	Includes CP, customer signals and PROFINET or Ethernet/IP for process cable package. IRB 6660-130/3.1 and IRB 6660-100/3.3 includes servo.

Connection to Parallel/CAN/DeviceNet/Ethernet and Profibus

Following information specifies the cable length for Parallel, CAN, DeviceNet, Ethernet and Profibus for connection between manipulator and cabinet.

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

Connection to first additional drive

Following information specifies the cable length for connection to the first additional drive, for example servo driven gripper.

Option	Lengths
786-1	7 m
786-2	15 m
786-3	22 m
786-4	30 m

Process module

Option	Type	Description
768-1	Empty cabinet small	See Product specification - IRC5 Chapter 2
768-2	Empty cabinet large	See Product specification - IRC5 Chapter 2

Continues on next page

Option	Type	Description
715-1	Installation kit	See Product specification - IRC5 Chapter 2

2.6 Connector Kits

Content

The kit consists of connectors, pins and sockets. For technical description, see Connection kits.

Option	Type	Description
558-1	R2.CP/CS	For the Customer Power/Customer Signal connector on the manipulator upper arm. Sockets for bus communication are included.
459-1	R1.CP/CS and PROC1	For the Customer Power/Customer Signal connector and one Process connector on the manipulator base. Sockets for bus communication are included.

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*.

> **ℹ 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. **ℹ Note** Special conditions are applicable, see *Robotics Warranty Directives*.

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*.

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