ROBOTICS

Product specification

IRB 1600/1660ID

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Product specification

IRB 1600 - 6/1.2
IRB 1600 - 6/1.45
IRB 1600 - 10/1.2
IRB 1600 - 10/1.45
IRB 1660ID - 6/1.55
IRB 1660ID - 4/1.55

OmniCore

Document ID: 3HAC085911-001

Revision: C

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Original instructions.

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Overview of this 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 1600/1660	*3HAC026660-001*
Product specification - OmniCore C line	*3HAC065034-001*
Product specification - OmniCore V line	*3HAC074671-001*
Product manual - OmniCore C30 Type A	*3HAC089064-001*
Product manual - OmniCore C90XT Type A	*3HAC089065-001*
Product manual - OmniCore V250XT Type B	*3HAC087112-001*
Product manual - OmniCore V400XT	*3HAC081697-001*

Revisions

Revision	Description
A	First edition.
B	Published in release 24C. The following updates are done in this revision: • Added support for OmniCore C90XT Type A controller.
C	Published in release 24D. The following updates are done in this revision: • Updated the section *Technical data on page 19*. • Added option 3201-4 for Connection of parallell communication. • Updated the options available to the product. • Added options *[3203-X] Mains cable*.

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1 Description

1.1 Structure

1.1.1 Introduction

Robot family

The IRB 1600/1660 robot is available in six variants, two of which are AW robot variants, IRB 1660ID-6/1.55 and IRB 1660ID-4/1.55 with a compact arcwelding dressed process upper arm.

The IRB 1600/1660ID family is ideal for Arc Welding, Machine Tending, Material Handling, Gluing and Deburring/Grinding applications.

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 C30/C90XT/V250XT/V400XT 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 *Operating manual - OmniCore*.

Safety

Safety standards valid for complete robot, manipulator and controller.

Additional functionality

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

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1.1.1 Introduction
Continued

Foundry Plus 2

The Foundry Plus option is 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 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 protected robot. The Foundry Plus 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 case 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 liquid and solid contaminants. Among other things all sensitive parts are better protected than the standard offer.

Selected Foundry Plus/Foundry Plus 2 features:

- Improved sealing to prevent penetration into cavities to secure IP67
- Additional protection of cabling and electronics
- Special covers protecting cavities
- Well-proven connectors
- Nickel coated tool flange (Foundry Plus 2)
- Rust preventives on screws, washers and unpainted/machined surfaces

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

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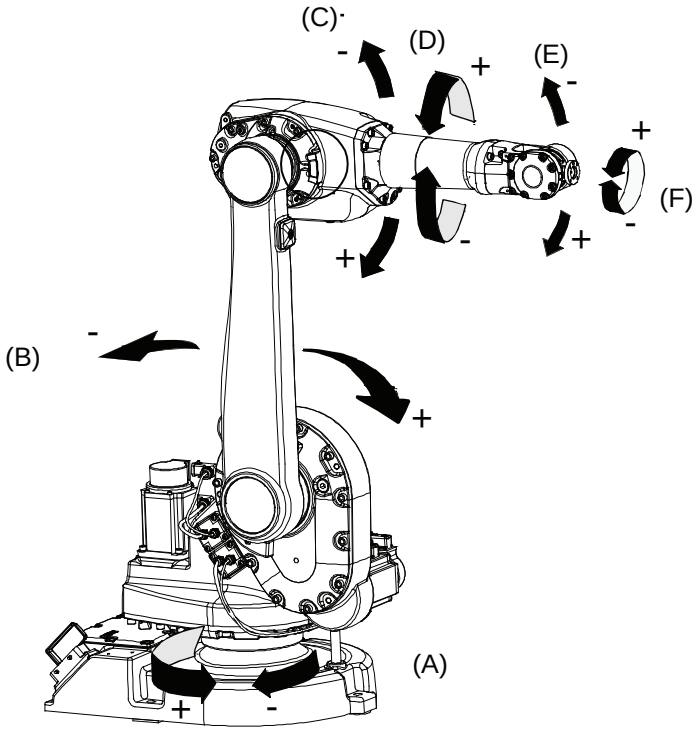
Manipulator axes



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

1.1.2 Technical data

General

The IRB 1600/1660ID is available in six versions and they can be mounted on the floor, wall, tilted (up to 55 degrees around the Y-axis or X-axis) or inverted. See *Robot motion on page 52* for limitations.

Robot type	Handling capacity (kg)	Reach (m)
IRB 1600	6 kg	1.2 m
IRB 1600	6 kg	1.45 m
IRB 1600	10 kg	1.2 m
IRB 1600	10 kg	1.45 m
IRB 1660ID	4 kg	1.55 m
IRB 1660ID	6 kg	1.55 m

Airborne noise level

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

Manipulator weight

Robot	Weight
IRB 1600-X/1.2	250 kg
IRB 1600-X/1.45	250 kg
IRB 1660ID-X/1.55	257 kg

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Power consumption

Path E1-E2-E3-E4 in the ISO Cube, max.load.

With OmniCore C30/C90XT

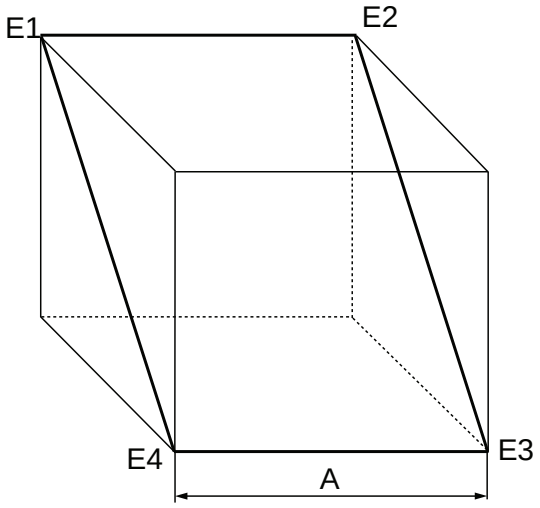
Type of movement	Power consumption (kW) (all variants)
ISO Cube Max. velocity	0.61

Robot in calibration position	All variants (kW)
Brakes engaged	0.10
Brakes disengaged	0.23

With OmniCore V250XT/V400XT

Type of movement	Power consumption (kW) (all variants)
ISO Cube Max. velocity	0.50

Robot in calibration position	All variants (kW)
Brakes engaged	0.13
Brakes disengaged	0.28



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A	400 mm

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 1600/1660 is connected to the OmniCore V line.

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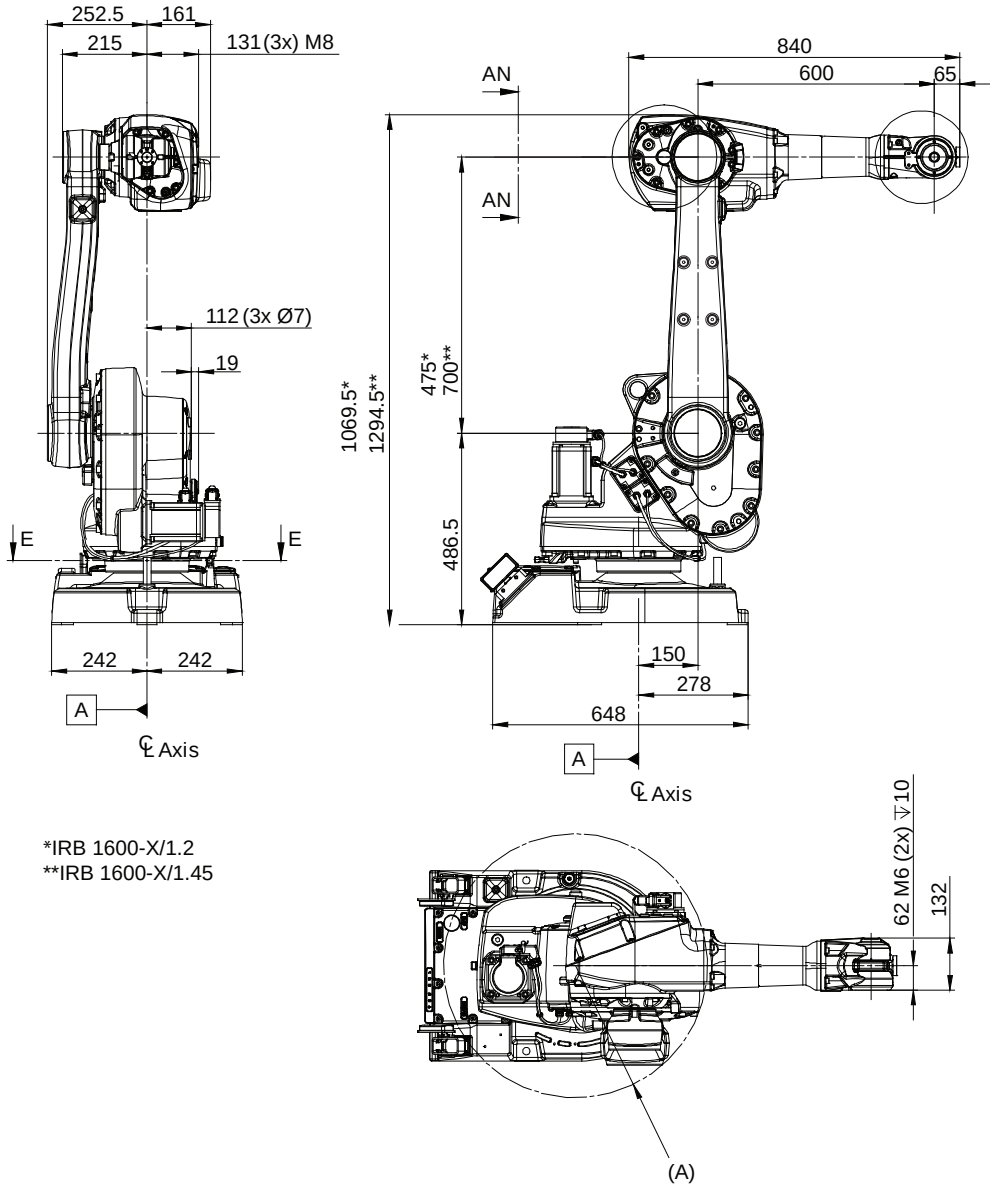
1.1.2 Technical data
Continued

Dimensions IRB 1600-X/1.2 (1.45)



*IRB 1600-X/1.2
**IRB 1600-X/1.45

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A	R= 335 mm minimum turning radius

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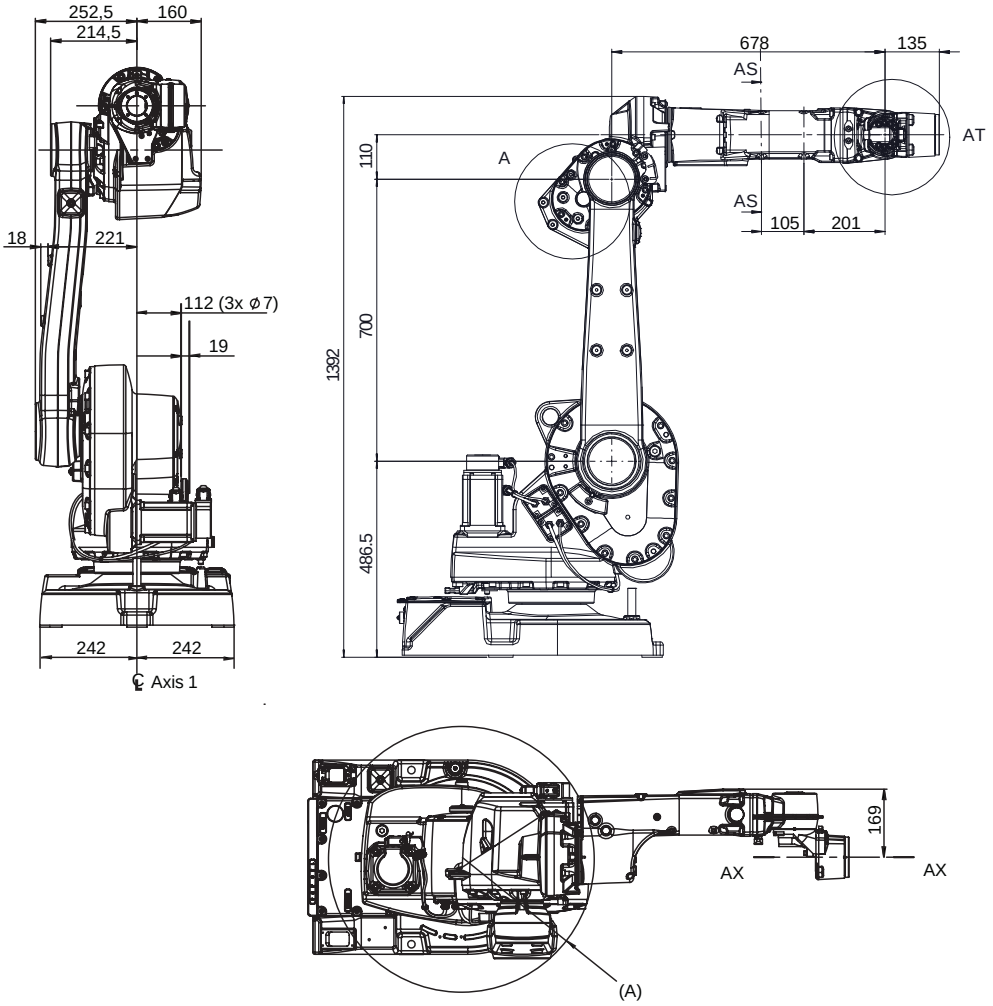
Dimensions IRB 1660ID-X/1.55



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A	R335 Minimum turning radius

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
UL 1740 (option) CSA Z434 (option)	Standards For Safety - Robots and Robotic Equipment Industrial robots and robot Systems - General safety requirements Valid for USA and Canada.

1.3 Installation

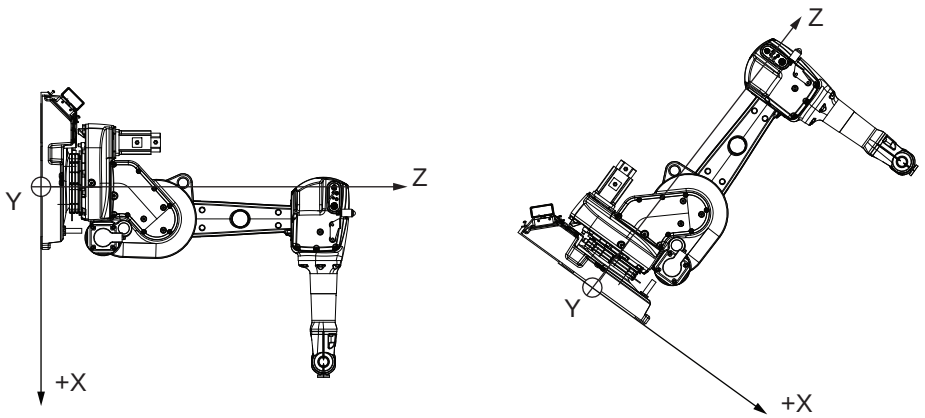
1.3.1 Introduction

General

IRB 1600 can be mounted on the floor, wall, tilted (up to 55 degrees around the Y-axis or X-axis, also valid for inverted robot, for more details see *Product manual - IRB 1600/1660*) or inverted. An end effector with max. weight of 6 kg or 10 kg (depending on variant) can be mounted on the tool flange (axis 6). See figure below for wall/tilted mounting position, regarding the X direction of the base coordinate system. See *Robot motion on page 52* for limitations.

IRB 1660ID-X/1.55 can be mounted on the floor or inverted and generally be tilted up to 45 degrees, around the Y-axis or X-axis, with a ±180 degrees working range on axis 1 (at full payload and arm load). It can also be mounted on the wall, with a ±45 degrees working range on axis 1 (at full payload and arm load), a larger working range is possible with a lower load. For IRB 1660ID-6/1.55, an end effector with max. weight of 6 kg can be mounted on the tool flange (axis 6); for IRB 1660ID-4/1.55, an end effector with max. weight of 4 kg can be mounted on the tool flange (axis 6). See *Load diagrams on page 35*.

Extra equipment can be mounted on to the hip and on the upper arm. See *Mounting of equipment on page 45*.



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Extra loads

Extra load, which is included in the load diagrams, can be mounted on the upper arm. An extra load of 15 kg can also be mounted on the frame of axis 1. See *Holes for mounting of extra equipment for IRB 1600 on page 46*.

Working range

The working range of axes 1-3 of IRB 1600-X/1.2 (1.45) and axes 1-2 of 1660ID can be limited by mechanical stops. Electronic Position Switches can be used on all axes for position indication of the manipulator.

Continues on next page

1.3.1 Introduction
Continued

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 1600/1660ID	IRB 1600/IRB 1600ID: 250 kg IRB 1660ID: 257 kg

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°	
Wall mounted	90°	
Suspended	18°	
Tilted	0-55°	Contact ABB for further information about acceptable loads.

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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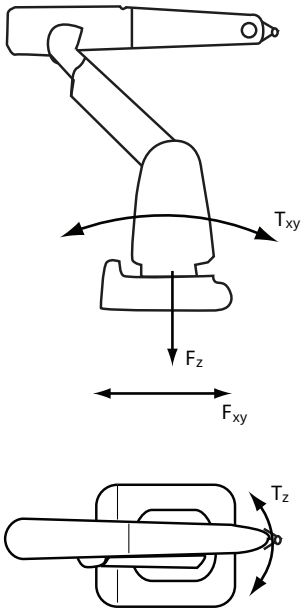
1.3.2 Technical data
Continued

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	± 1850 N	± 3900 N
Force z	2700 ± 1150 N	2700 ± 2200 N
Torque xy	± 1750 Nm	± 4000 Nm
Torque z	± 855 Nm	± 1500 Nm

Continues on next page

Wall mounted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	± 3900 N	± 5300 N
Force z	± 1400 N	± 2800 N
Torque xy	± 2310 Nm	± 3850 Nm
Torque z	± 855 Nm	± 1550 Nm

Suspended

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	± 1850 N	± 3900 N
Force z	- 2700 ± 1150 N	- 2700 ± 2200 N
Torque xy	± 1750 Nm	± 4000 Nm
Torque z	± 855 Nm	± 1500 Nm

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	0.5 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	25 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.

Continues on next page

1.3.2 Technical data
Continued

Storage conditions, robot

The table shows the allowed storage conditions for the robot:

Parameter	Value
Minimum ambient temperature	-25° C
Maximum ambient temperature	+55° C
Maximum ambient temperature (less than 24 hrs)	+70° C
Maximum ambient humidity	95% at constant temperature (gaseous only)

Note

If the manipulator should not be used immediately, all unpainted/unprotected surfaces must be treated with a rust inhibitor, type Vaseline or similar.

Operating conditions, robot

The table shows the allowed operating conditions for the robot:

Parameter	Value
Minimum ambient temperature	+5º C
Maximum ambient temperature	+45º C
Maximum ambient humidity	Max. 95% at constant temperature

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	IRB 1600: IP54 IRB 1600ID: IP40 IRB 1660ID: IP67 (Axis 4: IP40)
Manipulator, protection type Foundry Plus	IP 67
Manipulator, protection type Clean Room	IP 54
Manipulator, protection type Wash	IP 67

[i] According to IEC 60529.

1.3.3 Mounting the manipulator

General

Maximum load in relation to the base coordinate system. See the following figure.

Floor Mounted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	± 1850 N	± 3900 N
Force z	2700 ± 1150 N	2700 ± 2200 N
Torque xy	± 1750 Nm	± 4000 Nm
Torque z	± 855 Nm	± 1500 Nm

Wall Mounted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	± 3900 N	± 5300 N
Force z	± 1400 N	± 2800 N
Torque xy	± 2310 Nm	± 3850 Nm
Torque z	± 855 Nm	± 1550 Nm

Suspended

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	± 1850 N	± 3900 N
Force z	- 2700 ± 1150 N	- 2700 ± 2200 N
Torque xy	± 1750 Nm	± 4000 Nm
Torque z	± 855 Nm	± 1500 Nm

Tilted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	± 2900 N	± 6000 N
Force z	+ 2100 ± 1700 N	+ 2100 ± 3000 N
Torque xy	± 1700 Nm	± 4300 Nm
Torque z	± 855 Nm	± 1550 Nm

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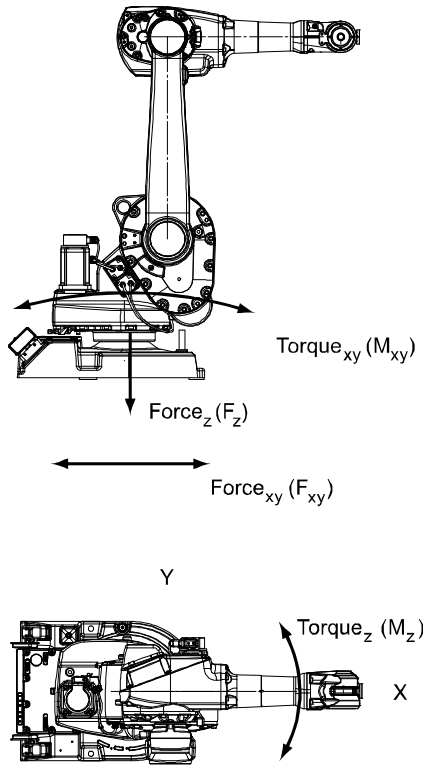
1.3.3 Mounting the manipulator
Continued



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Note regarding M_{xy} and F_{xy}

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

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

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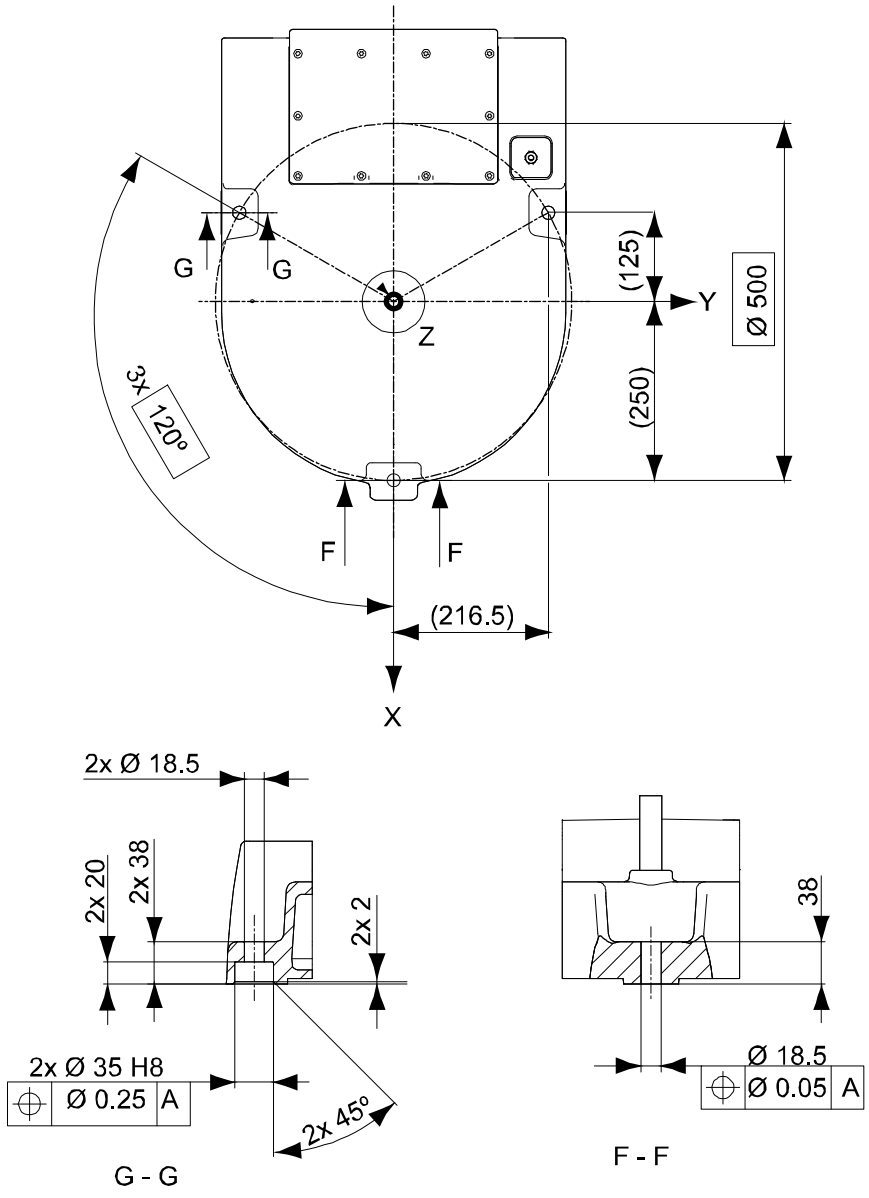
Fastening holes on the robot base



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Attachment bolts, specification

The table below specifies required bolts and washers for securing the robot at installation site.

Specification	Description
Attachment bolts, 3 pcs	M16 x 60 (installation directly on foundation) M16 x 70/80 (installation on foundation or base plate, using guiding sleeves)
Washers, 3 pcs	17 x 30 x 3
Quality	Quality 8.8, wall mounted quality 12.9
Tightening torque	200 Nm

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1.3.3 Mounting the manipulator
Continued

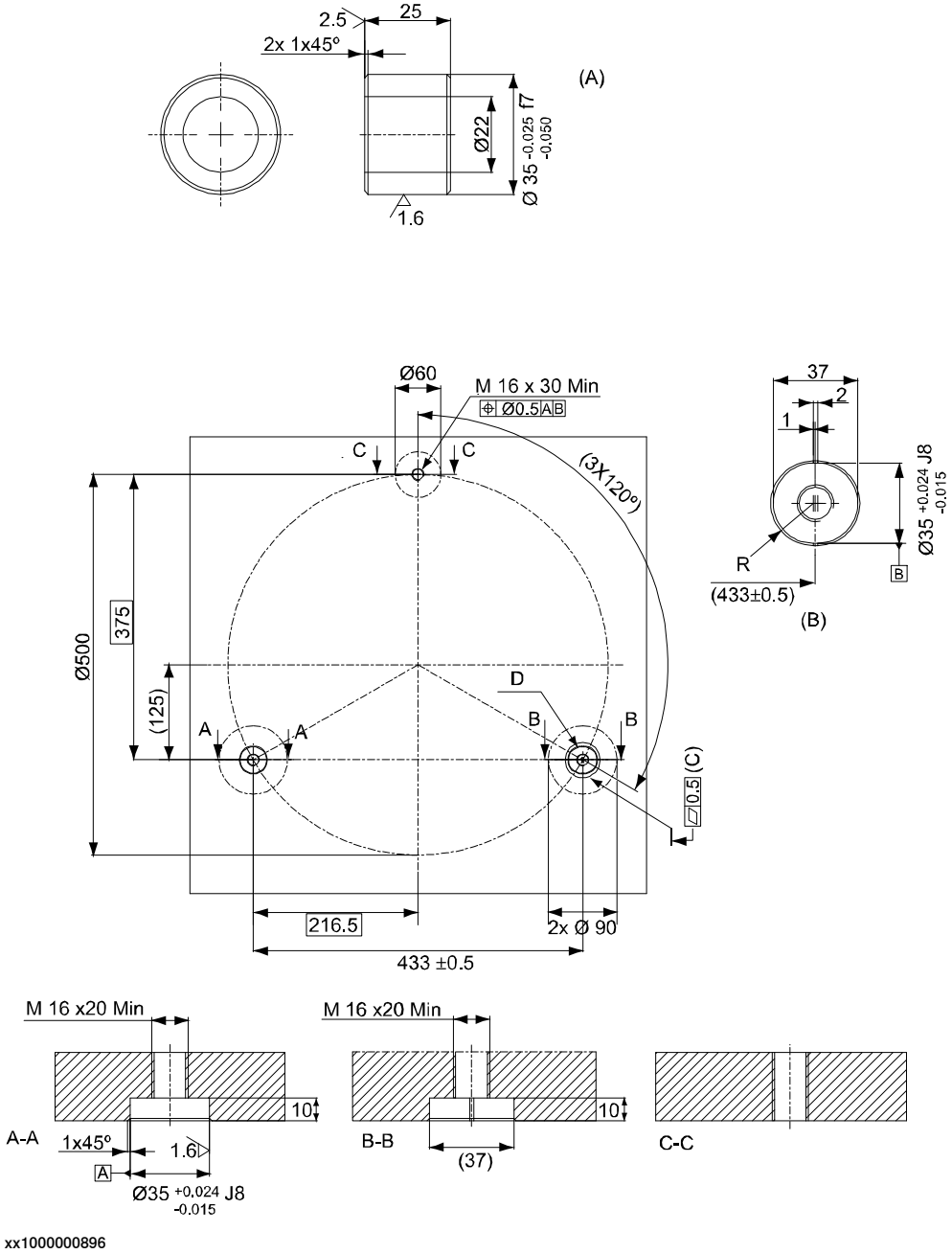
Note

For wall mounted robots, two guide bushings according to the following figure are needed.

Note

Regarding Abs.Acc. performance, the chosen guide holes according to Figure in the beginning of this chapter are recommended.

Mounting surface and bushings



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Position	Description
A	Surface treatment, ISO 2081 Fe/Zn 8 c2, Guide bushing
B	View D
C	3x common zone

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.

1.4 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.

The original calibration data delivered with the robot is generated when the robot is floor mounted. If the robot is not floor mounted, then the robot accuracy could be affected. The robot needs to be calibrated after it is mounted.

More information is available in the product manual.

Types of calibration

Type of calibration	Description	Calibration method
Standard calibration	The calibrated robot is positioned at calibration position. Standard calibration data is found on the SMB (serial measurement board) or EIB in the robot.	Axis Calibration
Absolute accuracy calibration (optional)	Based on standard calibration, and besides positioning the robot at synchronization position, the Absolute accuracy calibration also compensates for: • 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, 5 and 6. **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

Continues on next page

Brief description of calibration methods

Axis Calibration method

Axis Calibration is a standard calibration method for calibration of IRB 1600/1660ID. 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*.

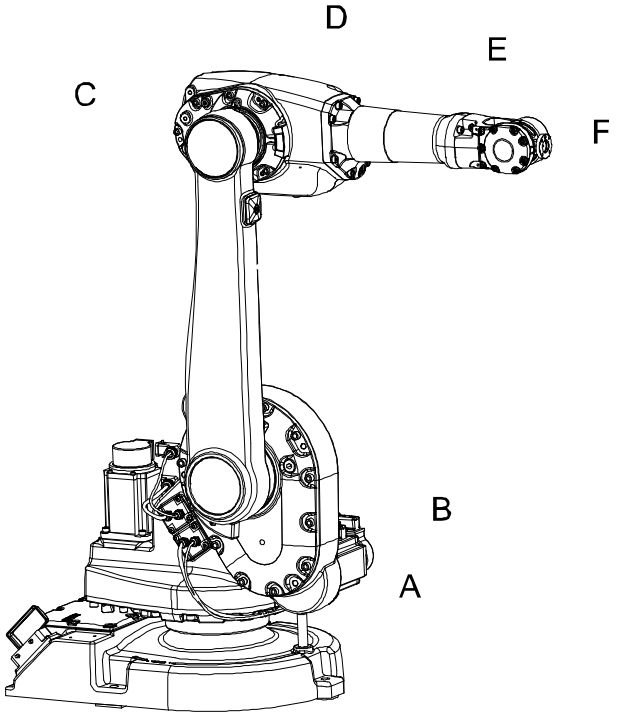
If a service operation is done to a robot with the option Absolute Accuracy, a new absolute accuracy calibration is required in order to establish full performance. For most cases after replacements that do not include taking apart the robot structure, standard calibration is sufficient.

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 is made using the Calibration Pendulum, see *Operating manual - Calibration Pendulum*.



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

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.

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

1.4.3 Absolute Accuracy calibration
Continued

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 1600-6/1.2 0.30 0.65 -6/1.45 -10/1.2 -10/1.45	0.30	0.65	100
IRB 1660ID-6/1.55 -4/1.55	0.30	0.55	100

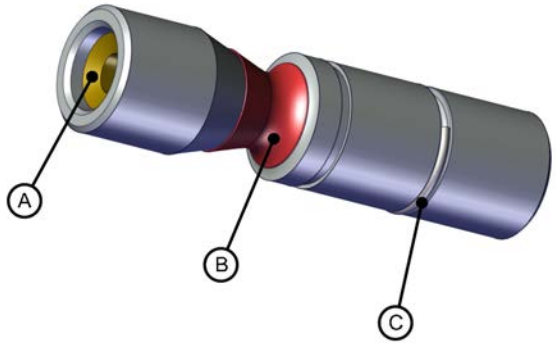
Continues on next page

Calibration tool

Check prior to usage

Before using the calibration tool, make sure that the tube insert, the plastic protection and the steel spring ring are present.

> **WARNING**
>
> If any part is missing or damaged, the tool must be replaced immediately.



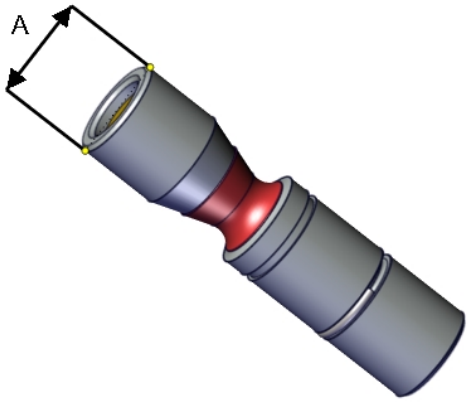
xx1500001914

A	Tube insert
B	Plastic protection
C	Steel spring ring

Periodic check of the calibration tool

If including the calibration tool in a local periodic check system, the following measures should be checked.

- Outer diameter within Ø12g4 mm, Ø8g4 mm or Ø6g5 mm (depending on calibration tool size).
- Straightness within 0.005 mm.



xx1500000951

A	Outer diameter

1.5 Robot load and load diagrams

1.5.1 Introduction

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 pay load inertia, J_0 of 0.012 kgm^2, and an extra load of 15 kg for the IRB 1600-6/x variants, 5 kg for the IRB 1600-10/x variants, 10 kg for IRB 1660ID-6/1.55, 12 kg for IRB 1660ID-4/1.55, 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.

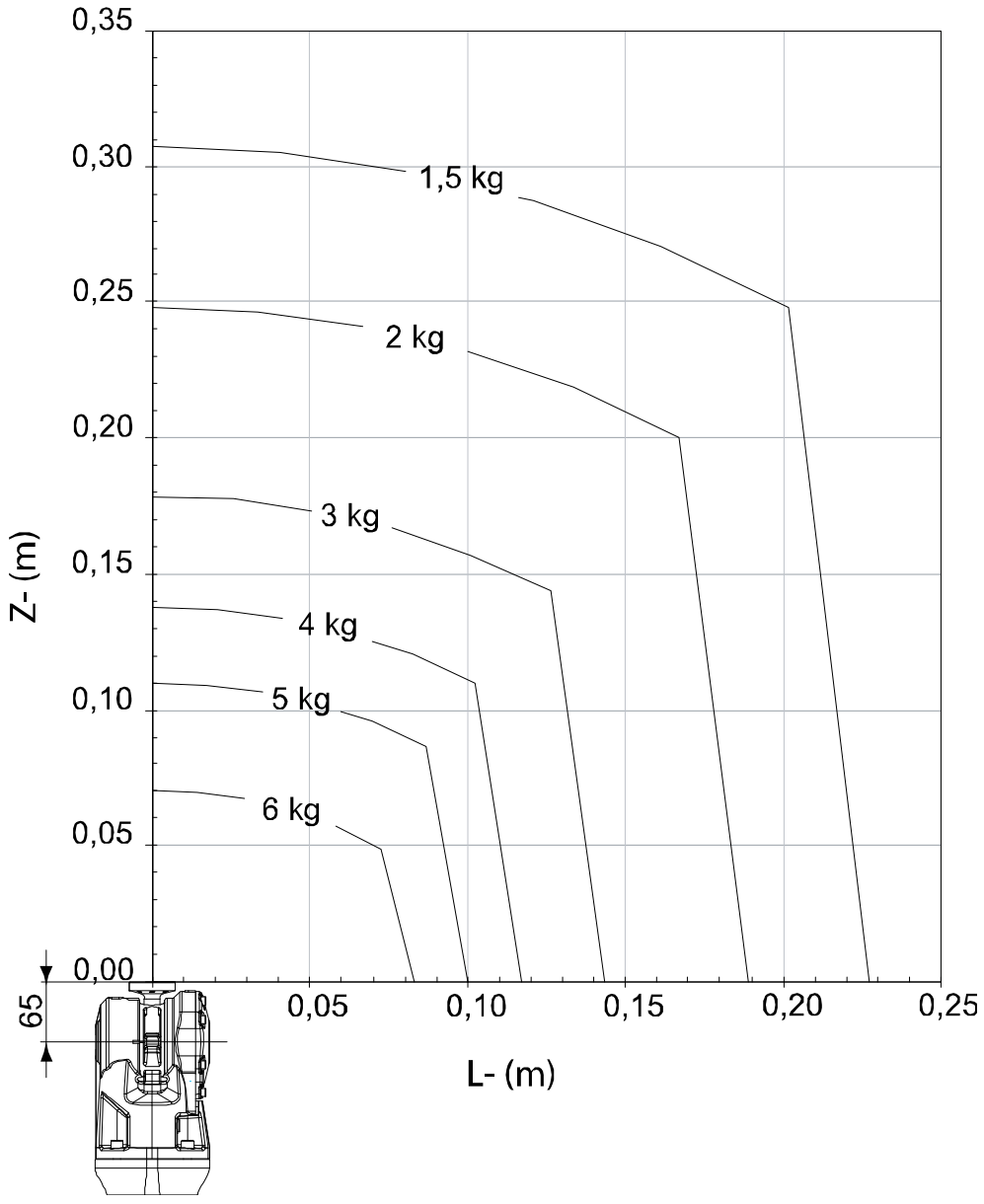
Control of load case with RobotLoad

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 1600-6/1.2, IRB 1600-6/1.45



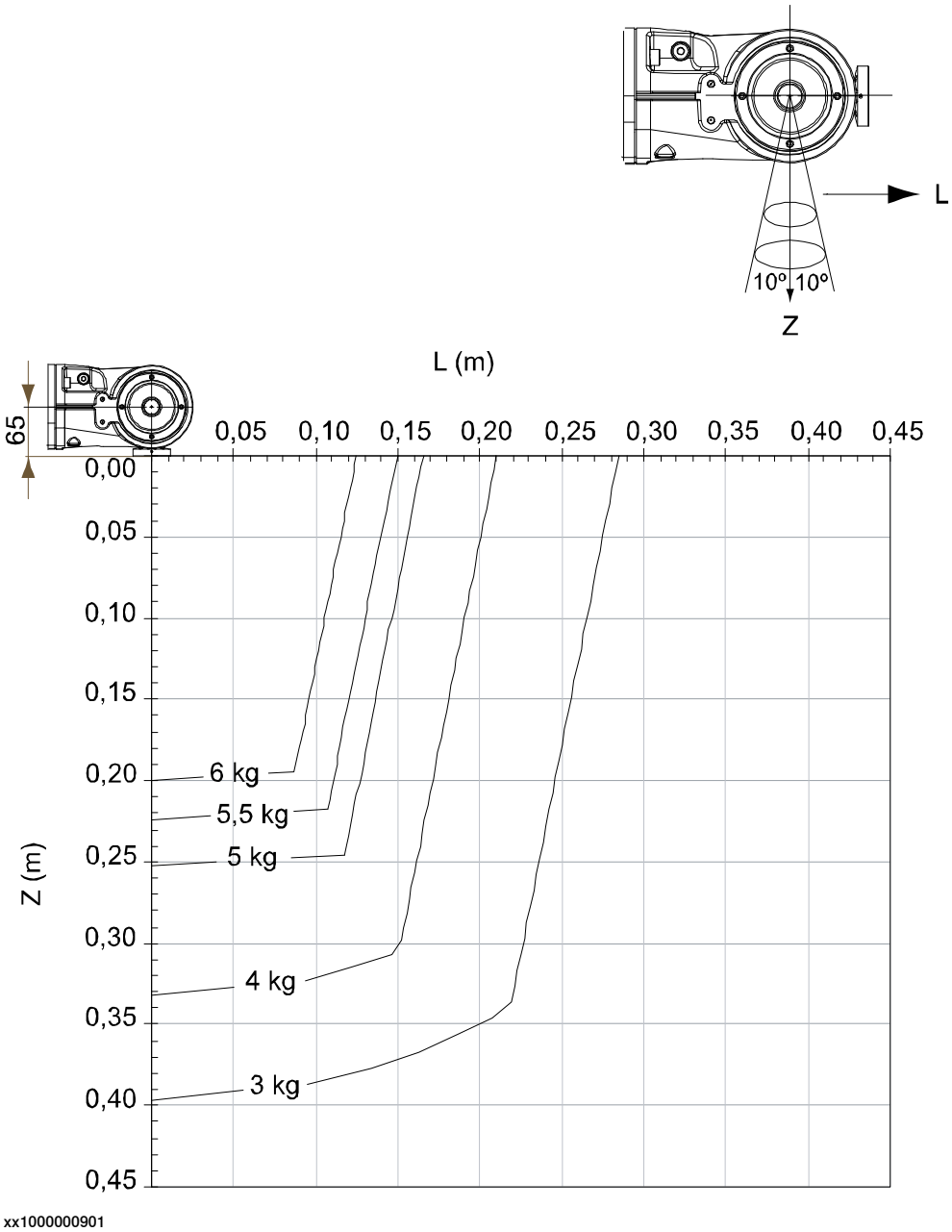
xx1000000899

Extra load of 15 kg at the upper arm housing included in the load diagram.

Continues on next page

1.5.2 Load diagrams
Continued

IRB 1600-6/1.2, IRB 1600-6/1.45 “Vertical Wrist” (±10º)



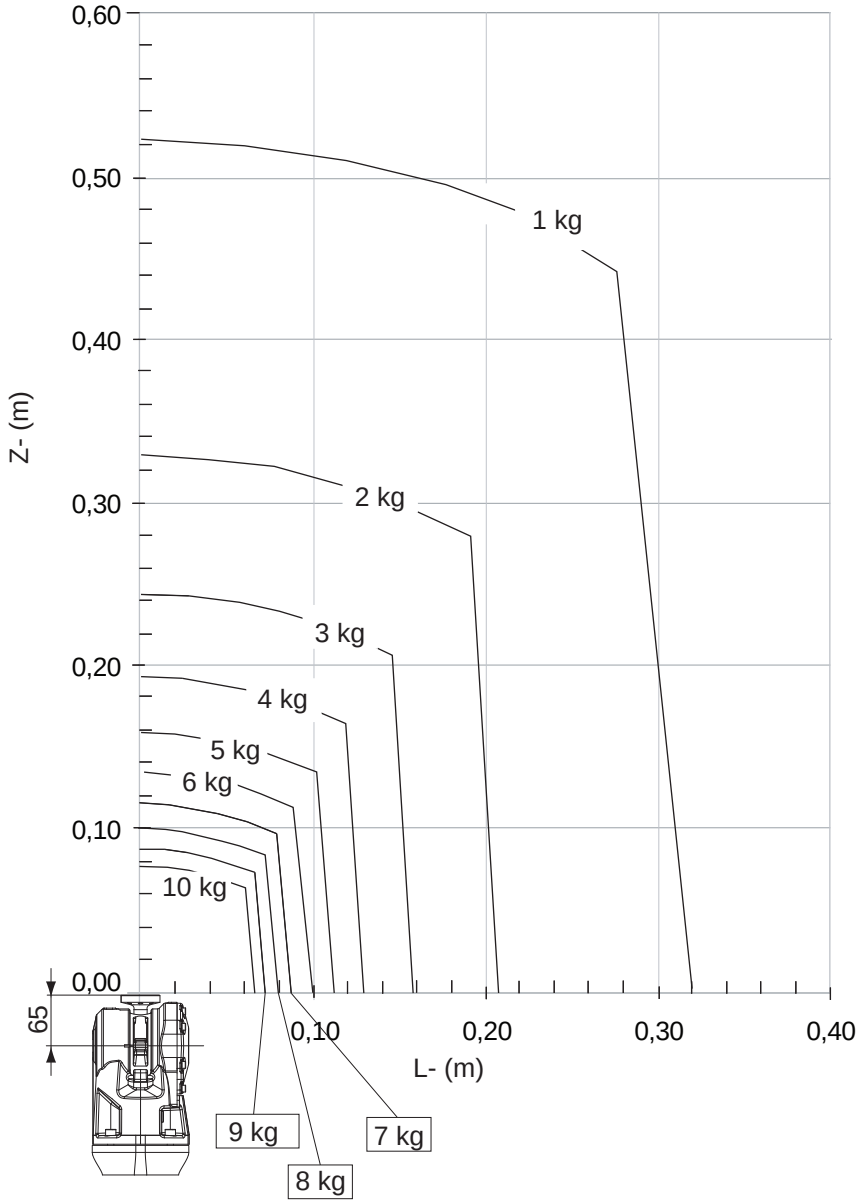
xx1000000901

Extra load of 15 kg at the upper arm housing included in the load diagram.

Description	Values
For wrist down (0° deviation from the vertical line) and no arm loads.	Max load = 13 kg Z_{Max} = 0.057 m L_{Max} = 0.031 m

Continues on next page

IRB 1600-10/1.2, IRB 1600-10/1.45



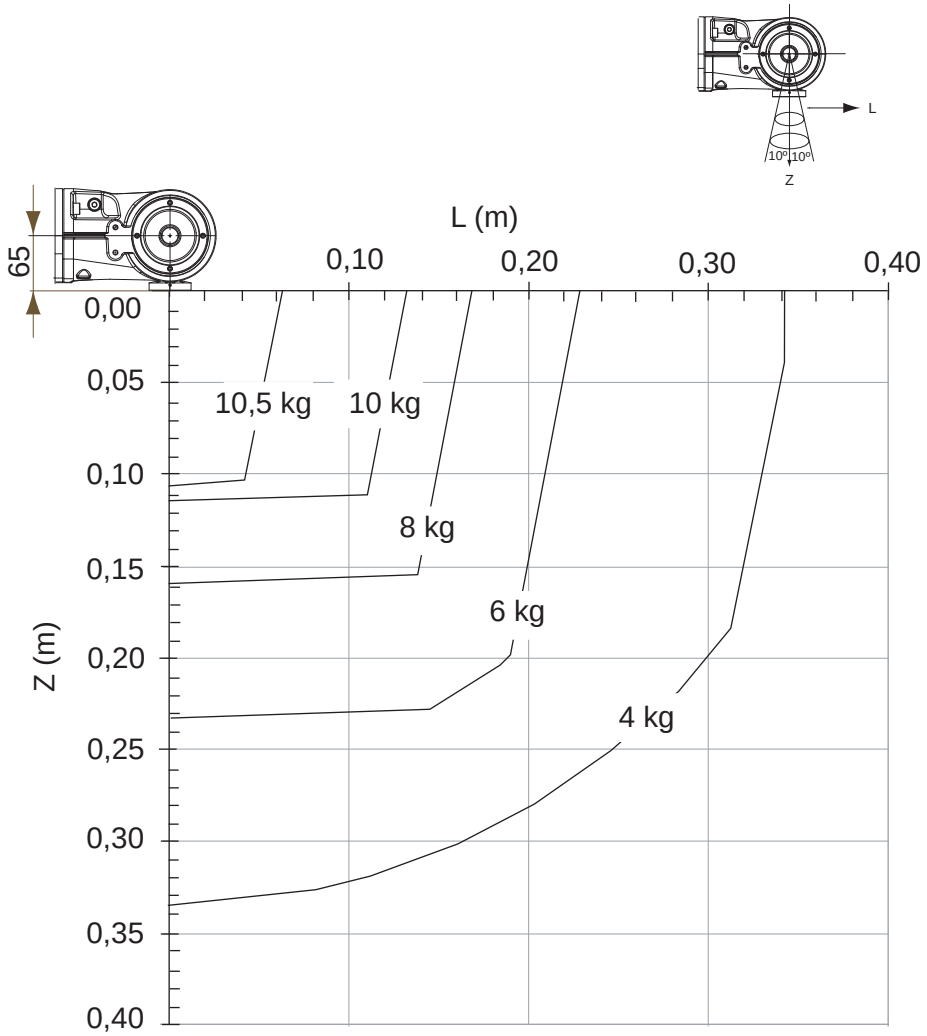
xx1200001333

Extra load of 5 kg at the upper arm housing included in the load diagram.

Continues on next page

1.5.2 Load diagrams
Continued

IRB 1600-10/1.2, IRB 1600-10/1.45 “Vertical Wrist” (±10º)



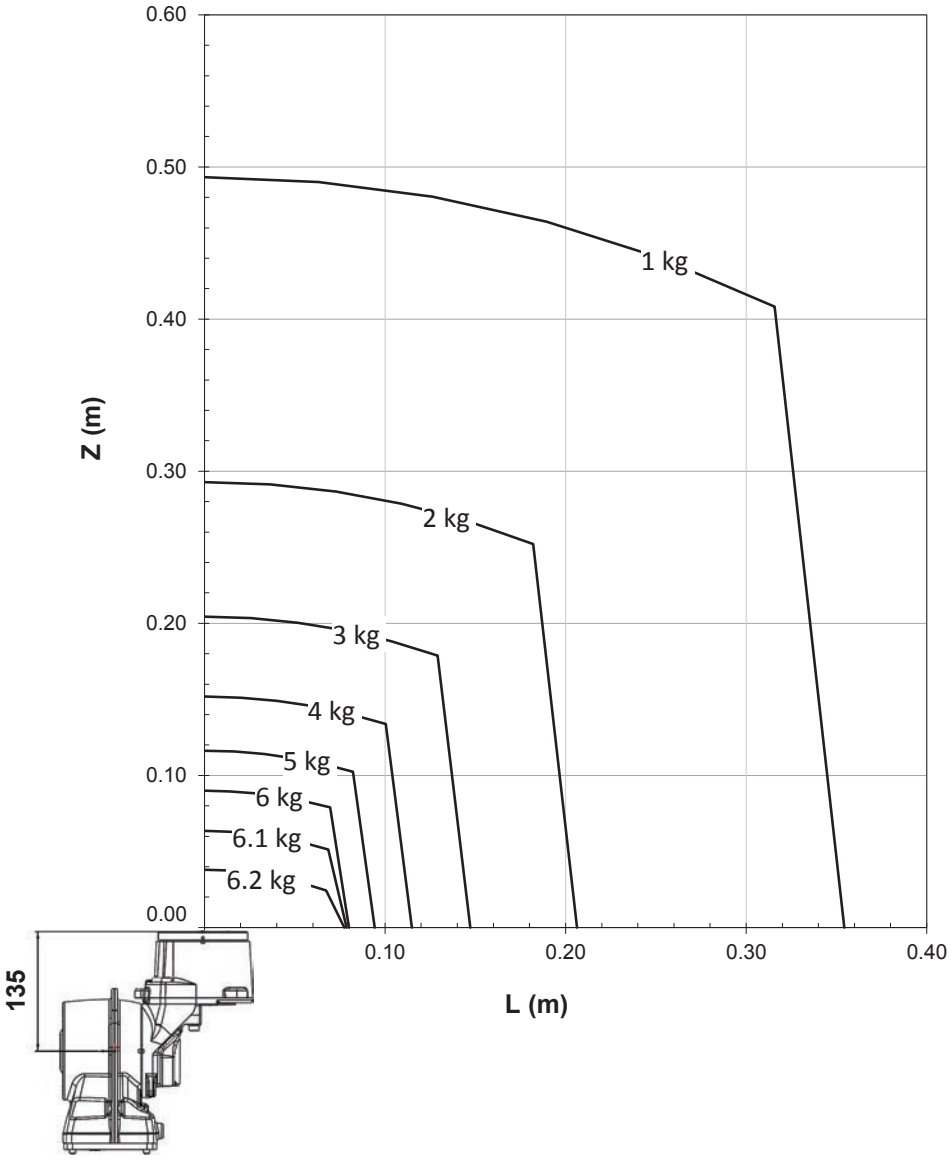
xx1200001334

Extra load of 5 kg at the upper arm housing included in the load diagram.

Description	Values
For wrist down (0° deviation from the vertical line) and no arm loads.	Max load = 12 kg ZMax = 0.055 m LMax = 0.017 m

Continues on next page

IRB 1660ID-6/1.55



xx1500003069

Extra load of 10 kg at the upper arm housing included in the load diagram.

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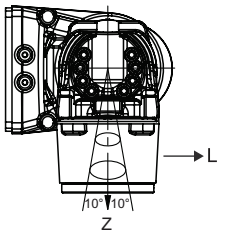
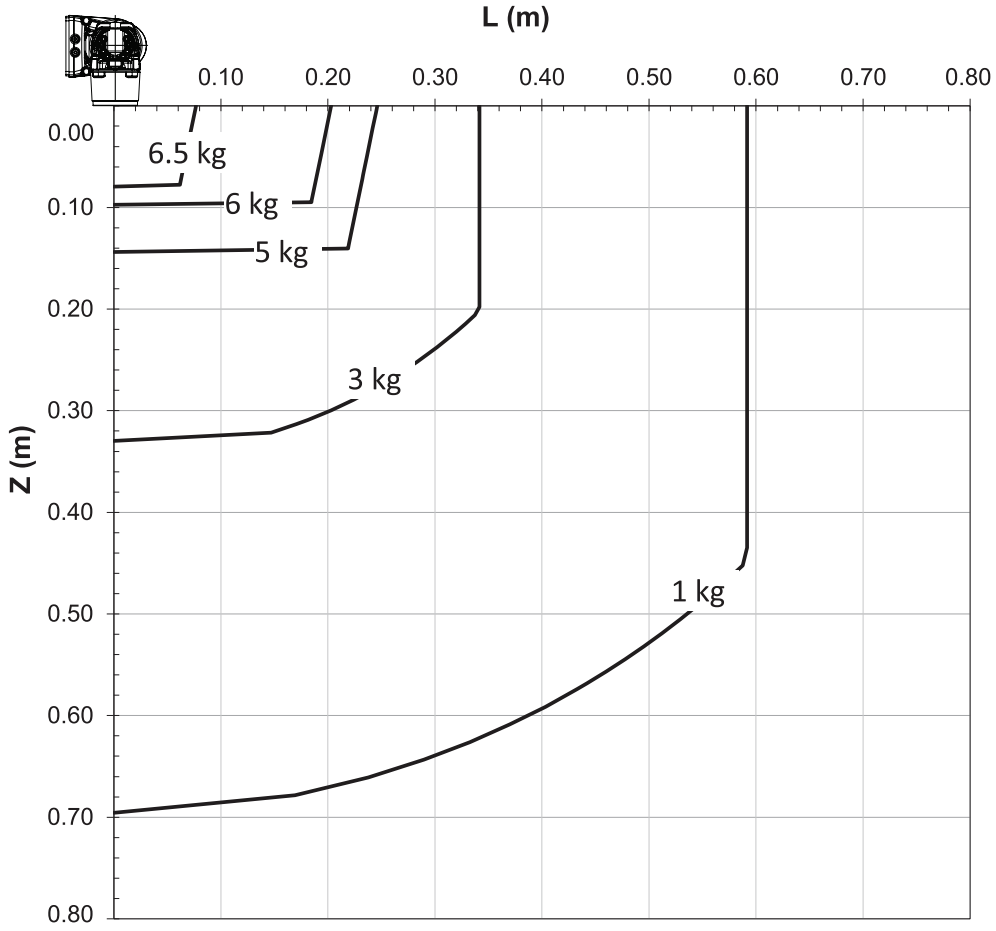
1.5.2 Load diagrams
Continued

IRB 1660ID-6/1.55 "Vertical Wrist" (±10º)





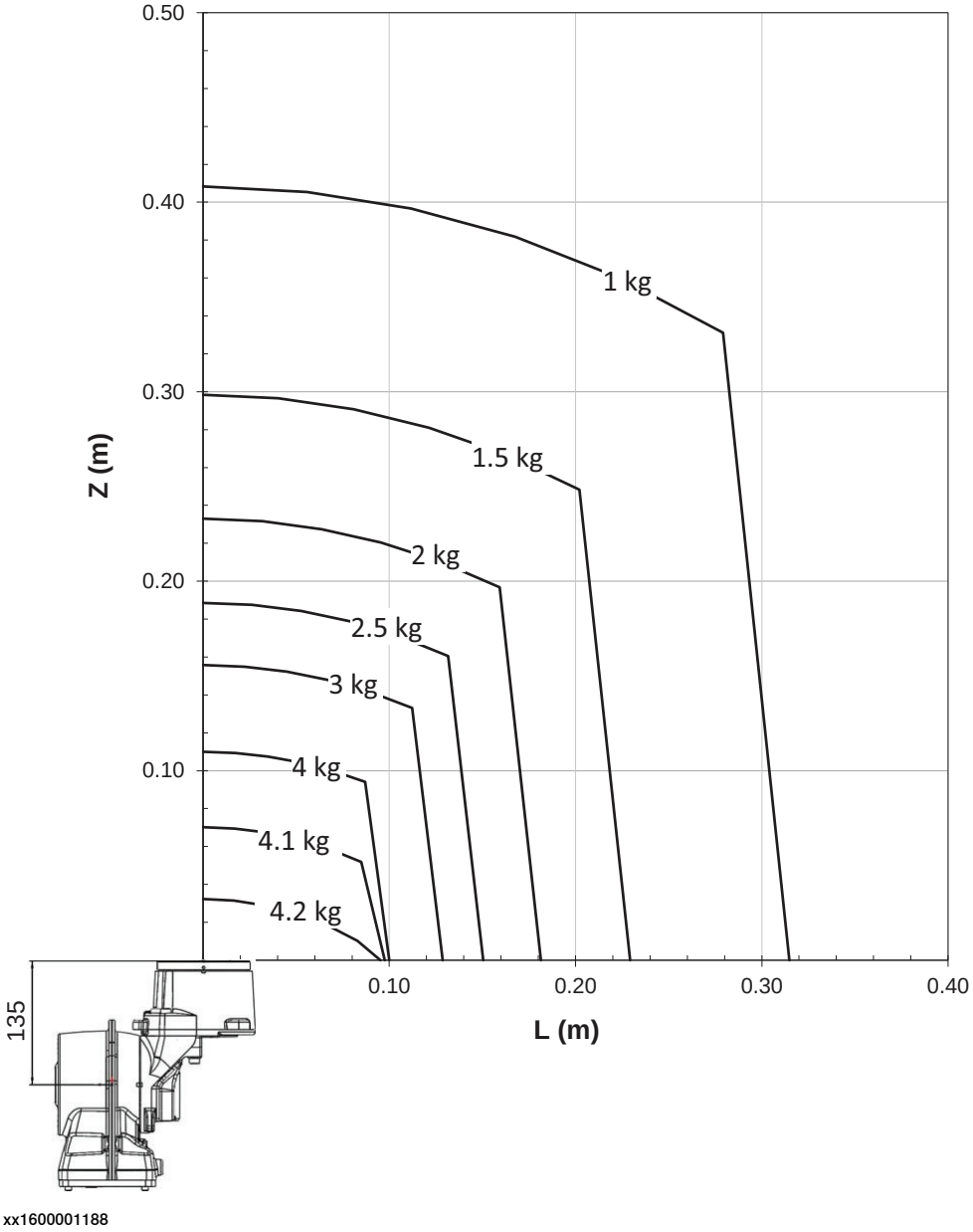
xx1500003070

Extra load of 10 kg at the upper arm housing included in the load diagram.

Description	Values
For wrist down (0° deviation from the vertical line) and no arm loads.	Max load = 7 kg Z_{Max} = 0.064 m L_{Max} = 0.100 m

Continues on next page

IRB 1660ID-4/1.55



xx1600001188

Extra load of 12 kg at the upper arm housing included in the load diagram.

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

General

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

Full movement of Axis 5 (±115º)

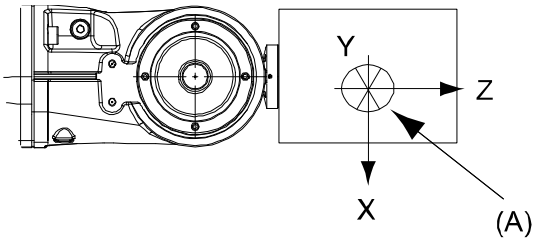
Axis	Robot Type	Max. value
5	IRB 1600-6/x	J5 = Mass x $((Z + 0.065)^2 + L^2)$ + max (J_{ox}, J_{oy}) ≤ 0.42 kgm^2
6	IRB 1600-6/x	J6= Mass x $L^2 + J_{0Z} \leq 0.30$ kgm^2

Axis	Robot Type	Max. value
5	IRB 1600-10/x	J5 = Mass x $((Z + 0.065)^2 + L^2)$ + max (J_{ox}, J_{oy}) ≤ 0.6 kgm^2
6	IRB 1600-10/x	J6= Mass x $L^2 + J_{0Z} \leq 0.4$ kgm^2

Full movement of Axis 5 (+120º to -120º)

Axis	Robot Type	Max. value
5	IRB 1660ID-6/1.55	J5 = Mass x $((Z + 0.135^2 + L^2)$ + max (J_{ox}, J_{oy}) ≤ 0.70 kgm^2
6	IRB 1660ID-6/1.55	J6= Mass x $L^2 + J_{oz} \leq 0.36$ kgm^2

Axis	Robot Type	Max. value
5	IRB 1660ID-4/1.55	J5 = Mass x $((Z + 0.135^2 + L^2)$ + max (J_{ox}, J_{oy}) ≤ 0.60 kgm^2
6	IRB 1660ID-4/1.55	J6= Mass x $L^2 + J_{oz} \leq 0.24$ kgm^2



xx1000000903

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.

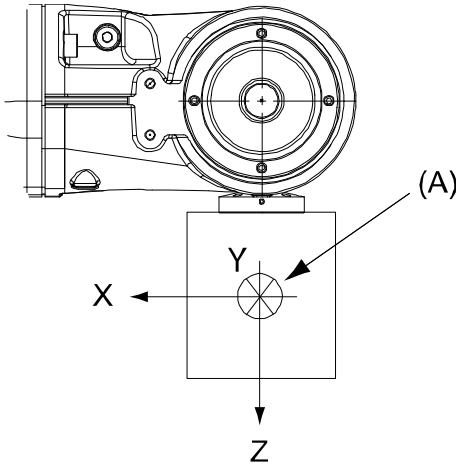
Limited axis 5, Center line down

Axis	Robot Type	Max. value
5	IRB 1600-6/x	J_5 = Mass x $((Z + 0.065)^2 + L^2)$ + max (J_{ox}, Joy) ≤ 0.55 kgm^2
5	IRB 1600-10/x	J_5 = Mass x $((Z + 0.065)^2 + L^2)$ + max (J_{ox}, Joy) ≤ 0.65 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	Max. value
5	IRB 1660ID-6/1.55	J_5 = Mass x $((Z + 0.135)^2 + L^2)$ + max (J_{ox}, Joy) ≤ 0.70 kgm^2
6	IRB 1600-6/x	J_6= Mass x L^2 + J_{0Z} ≤ 0.40 kgm^2
6	IRB 1600-10/x	J_6= Mass x L^2 + J_{0Z} ≤ 0.48 kgm^2
6	IRB 1660ID-6/1.55	J_6= Mass x L^2 + J_{0Z} ≤ 0.36 kgm^2



xx1000000904

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

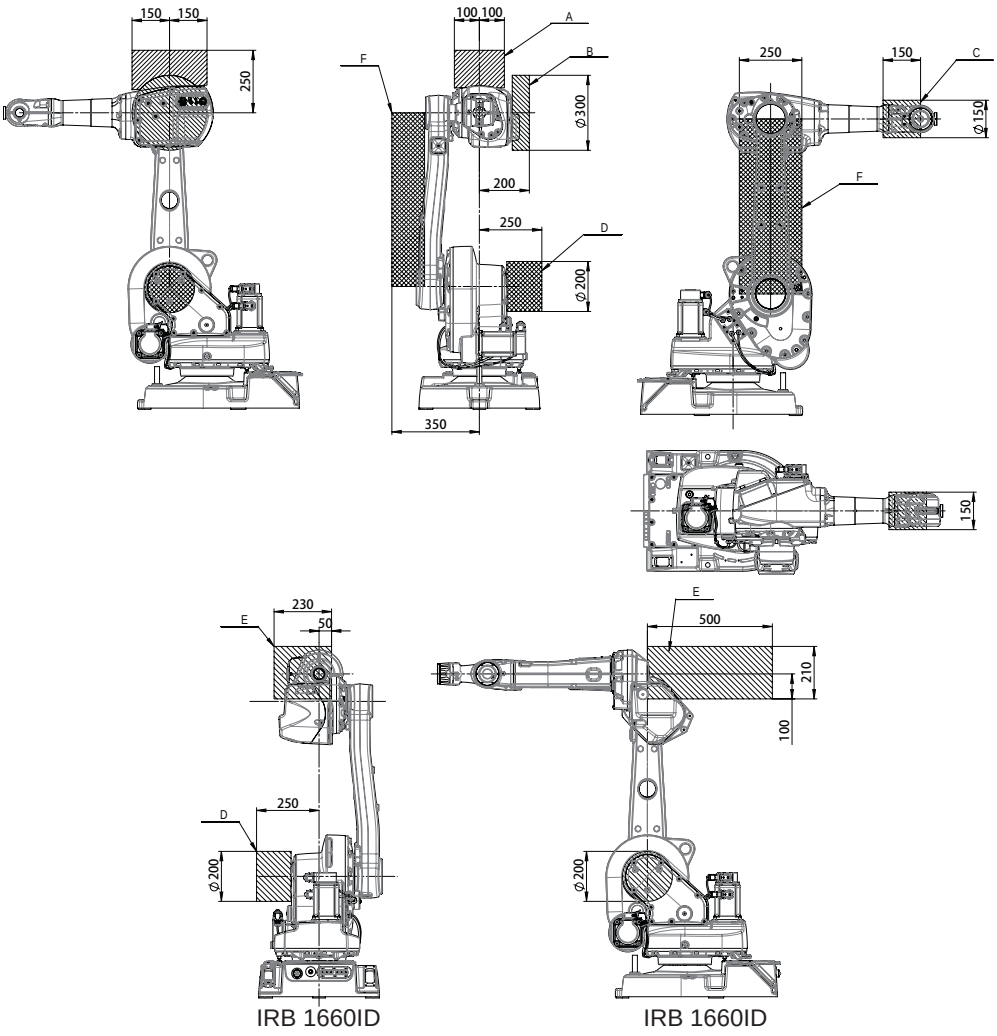
The wrist torque values are for reference only, and should not be used for calculating permitted load offset (position of center of gravity) within the load diagram, since those also are limited by main axes torques as well as dynamic loads. Furthermore, arm loads will influence the permitted load diagram.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

Robot type	Max wrist torque axis 4 and 5	Max wrist torque axis 6	Max torque valid at load
IRB 1600-6/1.2(1.45)	8.58 Nm	4.91 Nm	5 kg
IRB 1600-10/1.2(1.45)	13.93 Nm	6.47 Nm	10 kg
IRB 1660ID-6/1.55	13.24 Nm	4.71 Nm	6 kg
IRB 1660ID-4/1.55	9.61 Nm	3.92 Nm	4 kg

1.5.5 Mounting of equipment

Load areas

Extra loads can be mounted on the wrist, the upper arm housing, and on the frame. Load areas and permitted loads are shown in graphic below. The center of gravity of the extra load shall be within the marked load areas.



xx1500001249

Robot	Maximum load in load area							
	A	B	C	D	E	F	A+B+F	E+F
IRB 1600-6/X	15 kg	5 kg	0.5 kg	15 kg	-	15 kg	15 kg	-
IRB 1600-10/X	5 kg	5 kg	0.5 kg	15 kg	-	5 kg	5 kg	-
IRB 1660ID-6/1.55	-	-	-	15 kg	10 kg	15 kg	-	15 kg
IRB 1660ID-4/1.55	-	-	-	15 kg	12 kg	15 kg	-	15 kg

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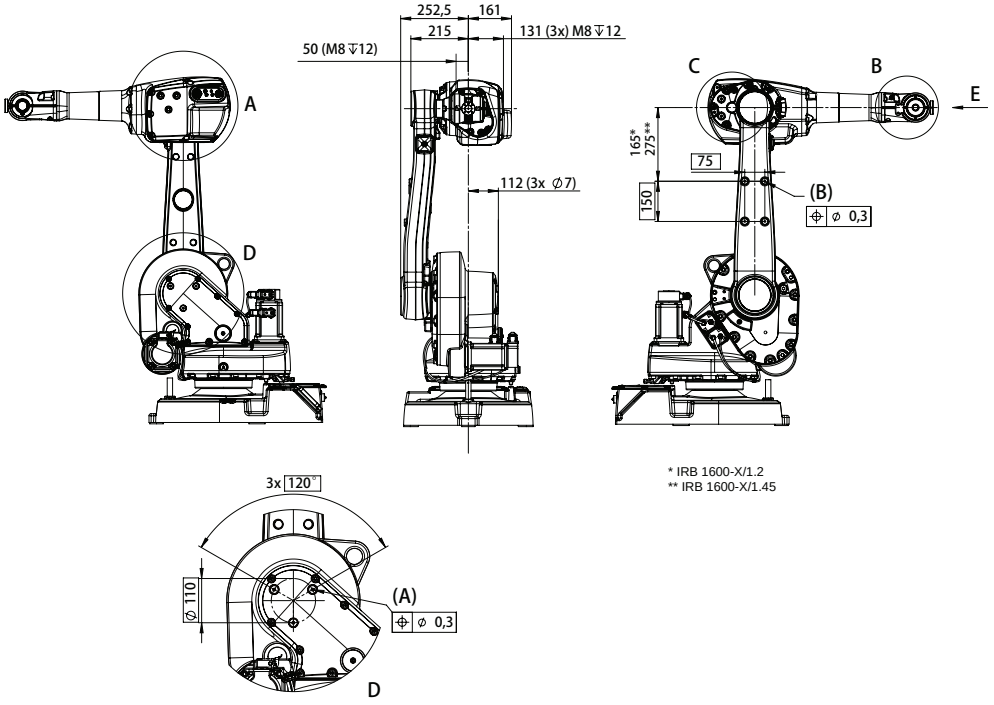
1.5.5 Mounting of equipment
Continued

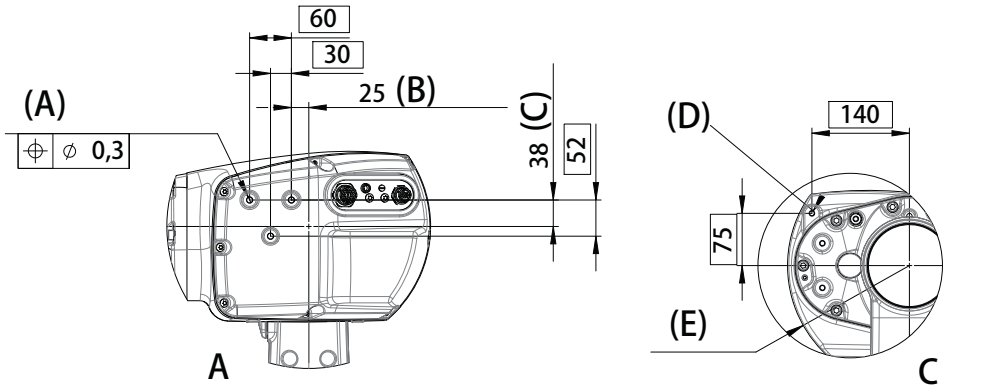
Holes for mounting of extra equipment for IRB 1600

The robot has holes for mounting extra equipment.



xx1500003258

A	3xΦ7 maximum depth 27, mounting holes for equipment
B	4xM8 depth 12, mounting holes for equipment



xx1500003262

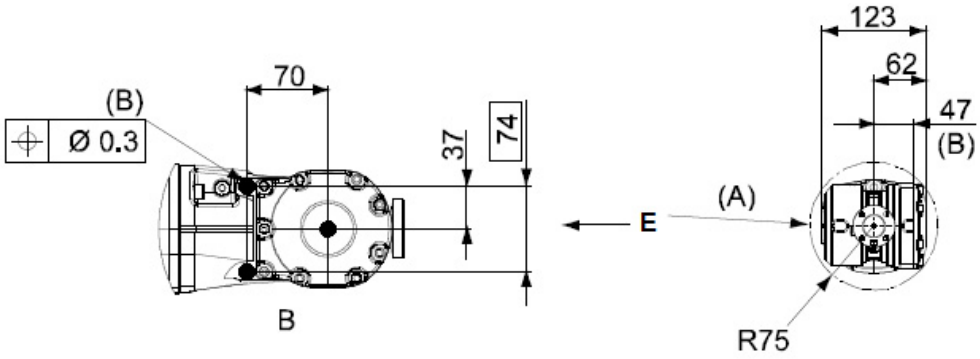
A	3xM8 depth 12, mounting holes for equipment
B	From center line axis 3
C	From center line axis 4
D	3xM8 depth 16, mounting holes for equipment
E	R175, Axis 3 turning radius

Continues on next page

Note

Note! When mounting heavier equipment, for example wire feeders in holes (A), the bracket must be supported in the opposite holes (D).

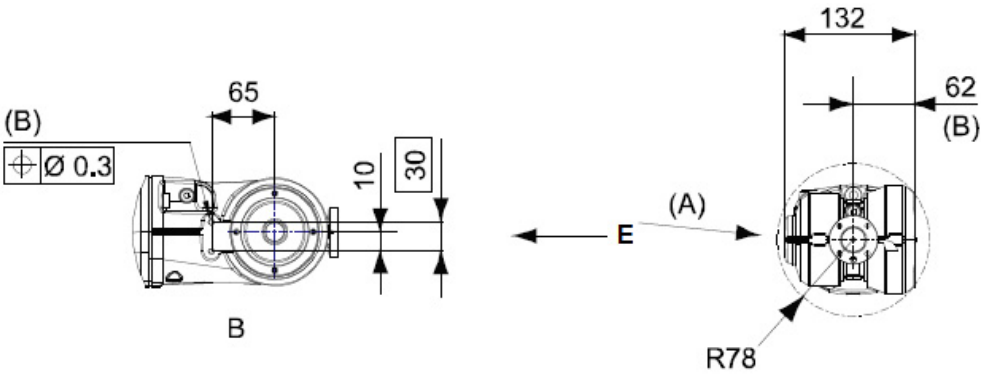
Design until June 2006



xx1500003259

A	View from E
B	2xM5 depth 7.5, mounting holes for equipment

Design after June 2006, type A



xx1500003260

A	View from E
B	2xM6 depth 10, mounting holes for equipment

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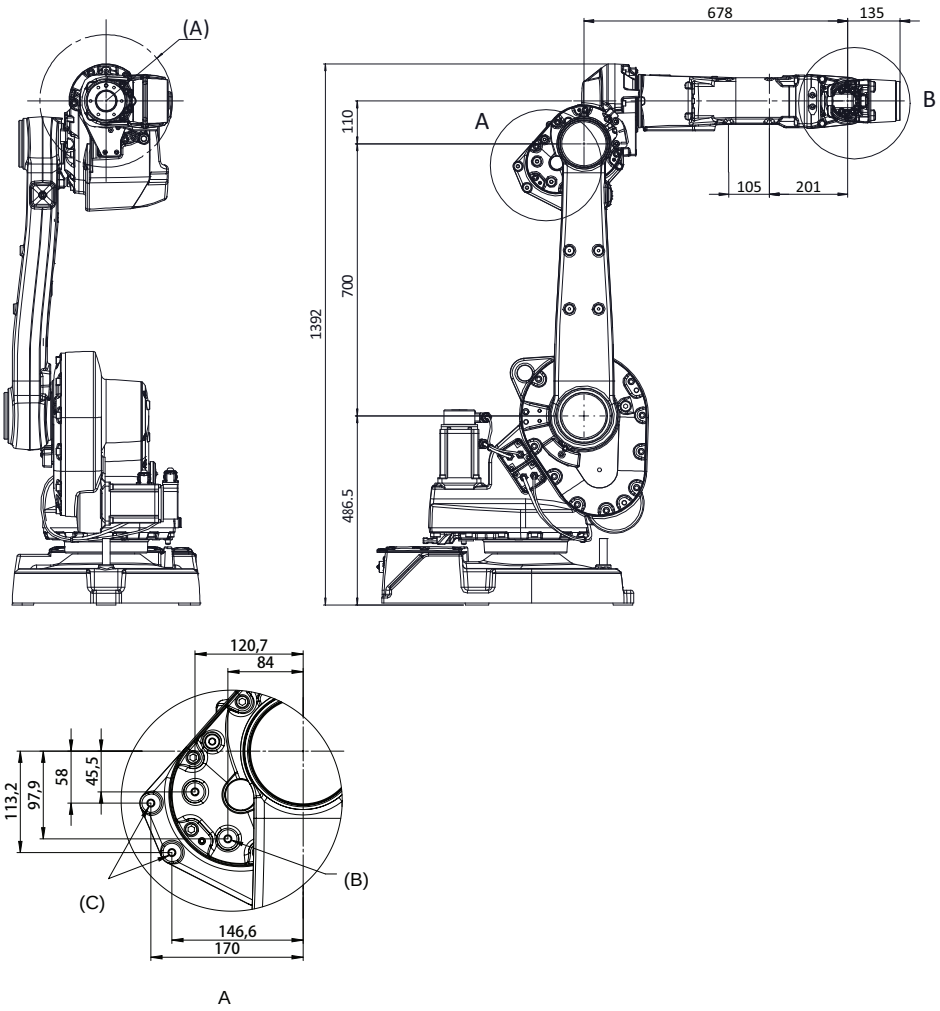
1.5.5 Mounting of equipment
Continued

Holes for mounting of extra equipment for IRB 1660ID

IRB 1660ID-X/1.55



xx1500001253

A	R170.4, smallest circumscribed radius of axis 4
B	2xM8 depth 16, mounting holes for equipment
C	2xM8, mounting holes for equipment

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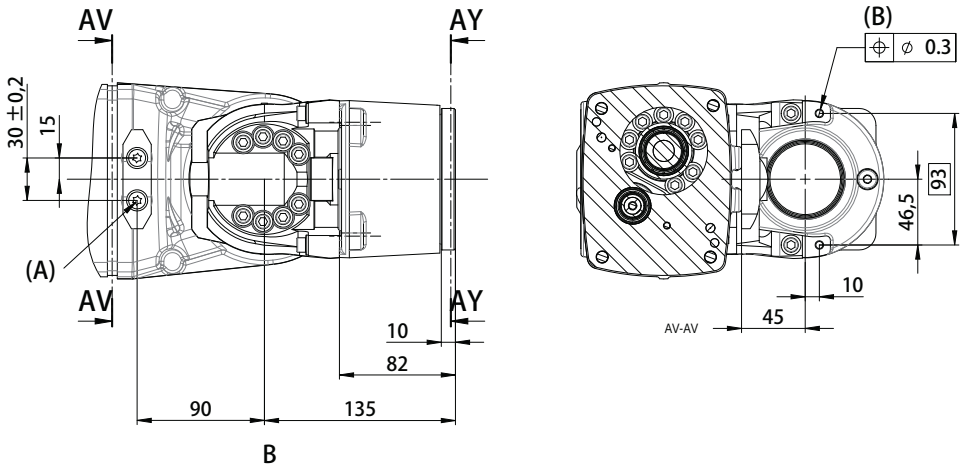


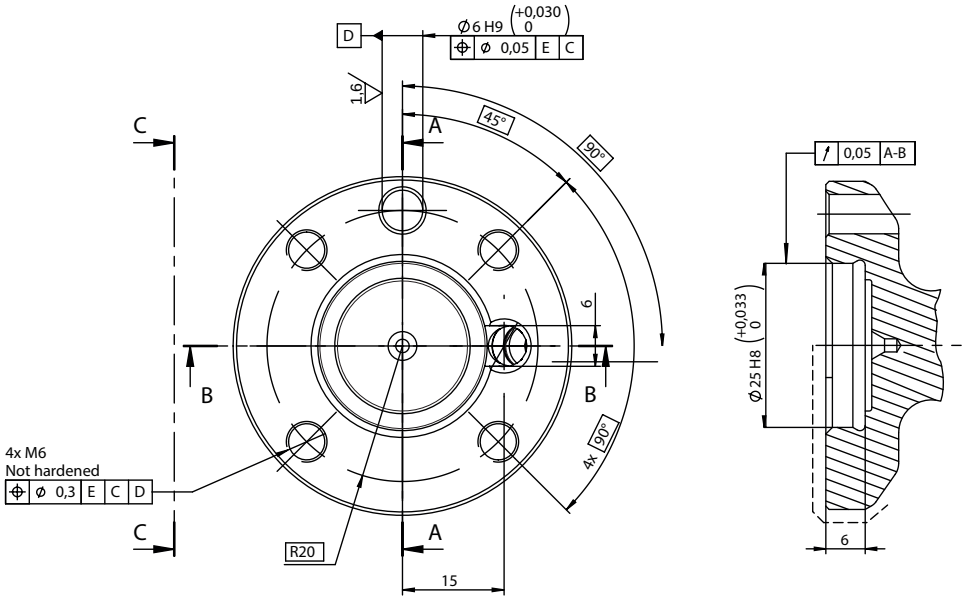
xx1500001251

A	2xM6 depth 12, mounting holes for equipment
B	2xM6 depth 18, mounting holes for equipment

Note

Lower arms among IRB 1600and IRB 1660ID are the same. For holes on the lower arm, see *Holes for mounting of extra equipment for IRB 1600 on page 46*.

Robot tool flange for IRB 1600



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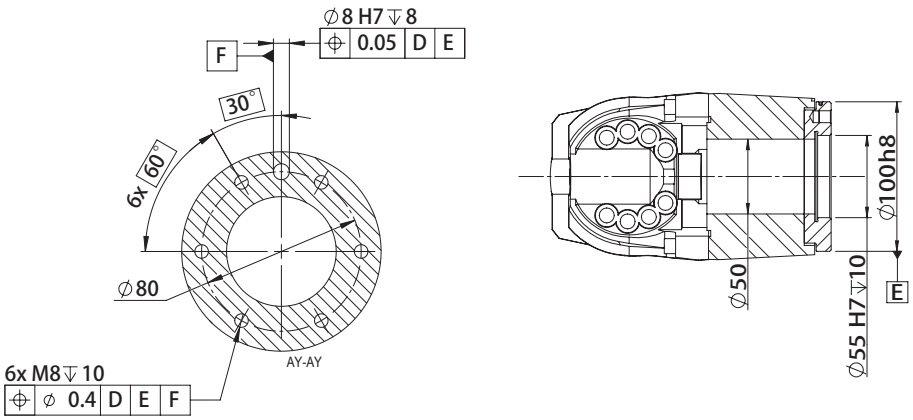
1.5.5 Mounting of equipment
Continued

Robot tool flange for IRB 1660ID

IRB 1660ID-X/1.55



xx1500001254

1.5.6 Maximum TCP acceleration

General

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

Maximum Cartesian design acceleration for nominal loads

Robot type	E-stop Max acceleration at nominal load COG [m/s^2]	Controlled Motion Max acceleration at nominal load COG [m/s^2]
IRB 1600 - 6/1.xx	120	45

Note

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

1.6 Robot motion

1.6.1 Working range

Range of movement - IRB 1600

Axis	Type of motion	Range of movement 1.2 m reach	Range of movement 1.45 m reach
1	Rotation motion	+180° to -180° [i]	+180° to -180° [i]
2	Arm motion	+110° to -63° +136° to -63° (with axis 1 limited to ±100°)	+120° to -90° +150° to -90° (with axis 1 limited to ±95°)
3	Arm motion	+55° to -235°	+65° to -245°
4	Rotation motion	+200° to -200° default +190 rev. [ii] to -190 rev. maximum [iii]	+200° to -200° default +190 rev. [ii] to -190 rev. maximum [iii]
5	Bend motion	+115° to -115°	+115° to -115°
6	Turn motion	+400° to -400° default +288 rev. [ii] to -288 rev. maximum [iii]	+400° to -400° default +288 rev. [ii] to -288 rev. maximum [iii]

i The working range of axis 1 has the following limitations for wall mounted robots:
- IRB 1600-6/x: ± 20°
- IRB 1600-10/x: ± 60°

If the robot is tilted, the following combinations of tilt angles and axis 1 working ranges are allowed:
- IRB 1600-6/x: axis 1 ± 45° with tilt angles up to 30°
- IRB 1600-10/x: axis 1 ± 180° with tilt angles up to 55°

ii rev. = Revolutions

iii The default working range for axis 4 and 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).

Range of movement - IRB 1660ID

Axis	Type of motion	Range of movement 1.55 m reach
1	Rotation motion	+180° to -180° [i]
2	Arm motion	+150° to -90°
3	Arm motion	+79° to -238°
4	Rotation motion	+175° to -175°
5	Bend motion	+120° to -120°
6	Turn motion	+400° to -400° +191 rev. [ii] to -191 rev. maximum [iii]

i The working range of axis 1 has the following limitations for wall mounted robots:
- IRB 1660ID-X/1.55: ±45°

If the robot is tilted, the working range with tilt angles is:
- ± 180° with tilt angles up to 45°

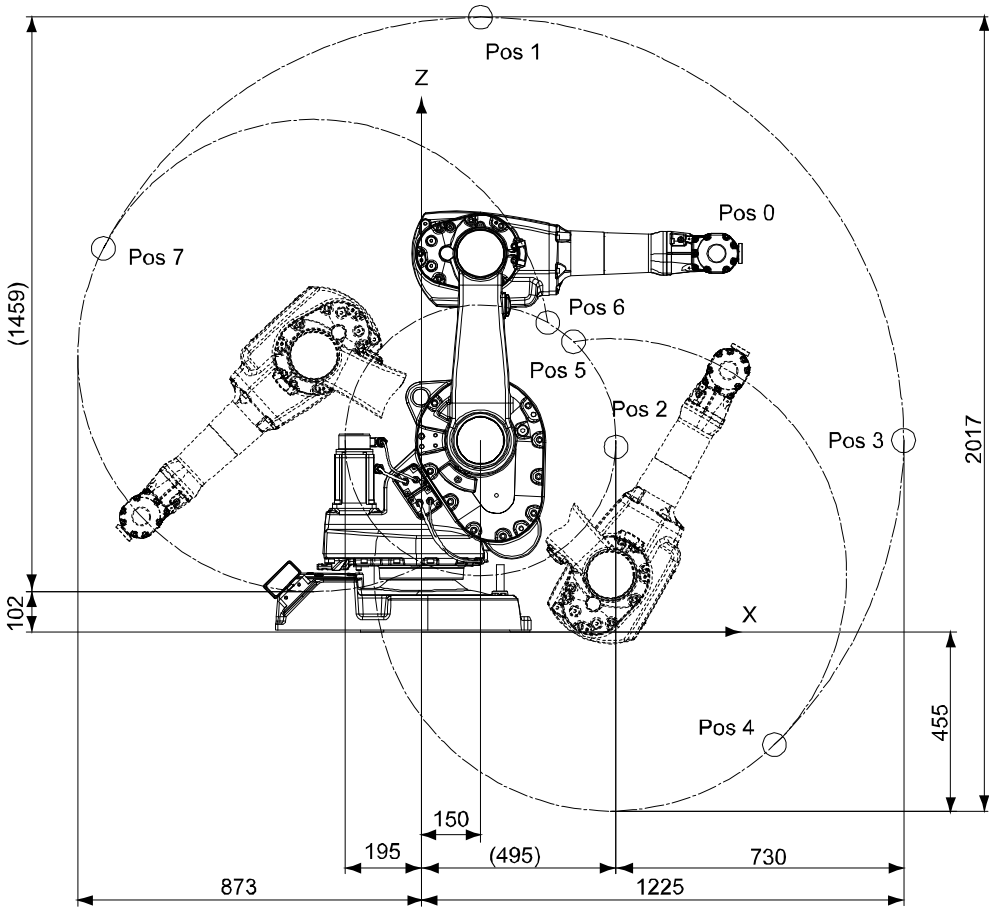
ii rev. = Revolutions

iii The default working range for axis 6 can be extended by changing parameter values in the software.

Option 610-1 “Independent axis” can be used for resetting the revolution counter after the axis has been rotated (no need for “rewinding” the axis).

Continues on next page

Positions at wrist center 1.2 m reach



xx1000000914

Position	X (mm)	Z (mm)	Axis 2 angle (degrees)	Axis 3 angle (degrees)
0	750	962	0	0
1	150	1562	0	-90
2	494	470	0	+55
3	1225	487	+90	-90
4	897	-287	+136	-90
5	386	737	+136	-235
6	321	786	-63	+55
7	-808	975	-63	-90

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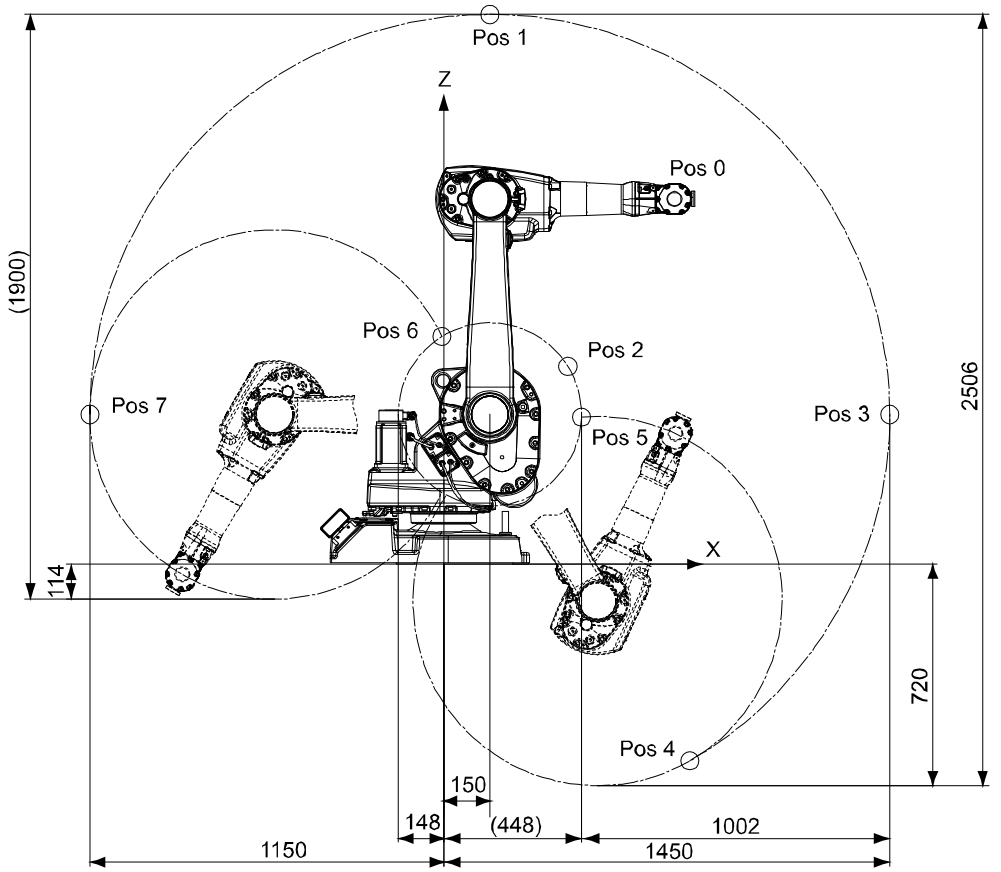
1.6.1 Working range
Continued

Positions at wrist center 1.45 m reach



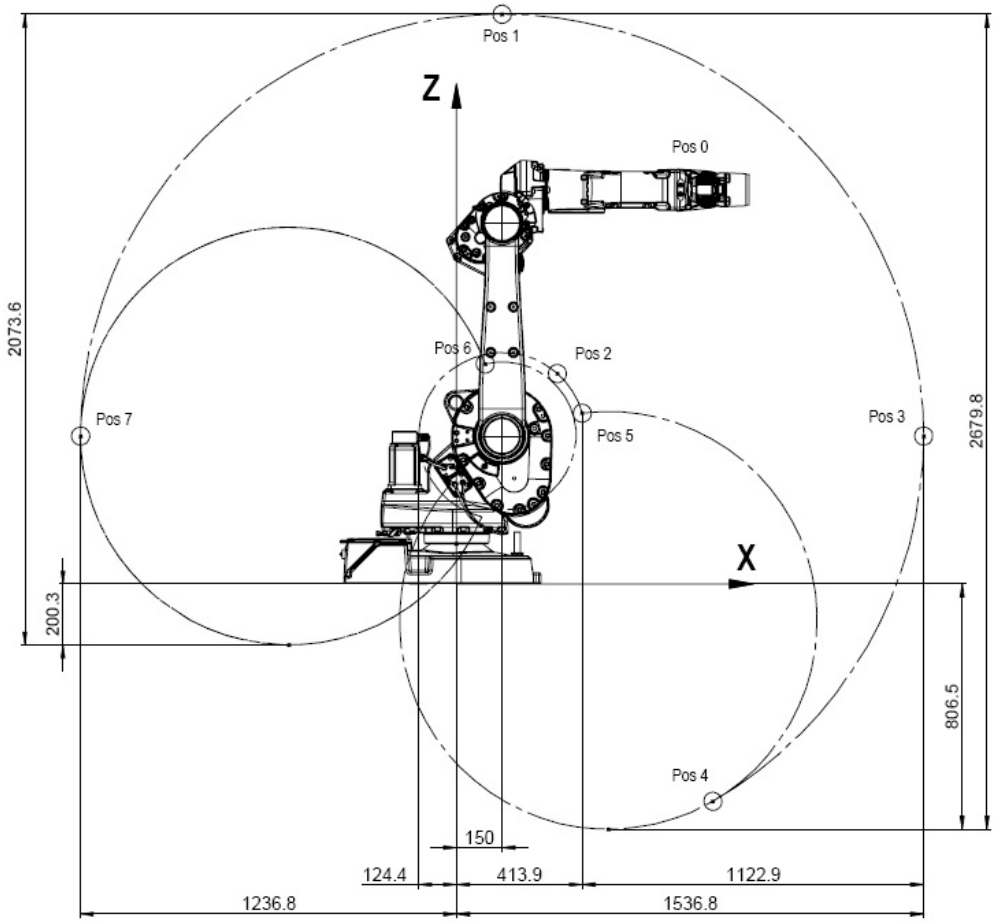
xx1000000915

Position	X (mm)	Z (mm)	Axis 2 angle (degrees)	Axis 3 angle (degrees)
0	750	1187	0	0
1	150	1787	0	-90
2	404	643	0	+65
3	1450	487	+90	-90
4	800	-639	+150	-90
5	448	478	+150	-245
6	-6	740	-90	+65
7	-1150	487	-90	-90

Continues on next page

Positions at wrist center IRB 1660ID

IRB 1660ID-X/1.55



xx1500001246

Position	X (mm)	Z (mm)	Axis 2 angle (degrees)	Axis 3 angle (degrees)
0	828	1,296.5	0	0
1	150	1,873.3	0	-81
2	332.2	691.7	0	+79
3	1,536.8	486.5	+90	-81
4	843.4	-714.5	+150	-81
5	413.9	561.7	+150	-238
6	94.6	723.7	-90	+79
7	-1,236.8	486.5	-90	-81

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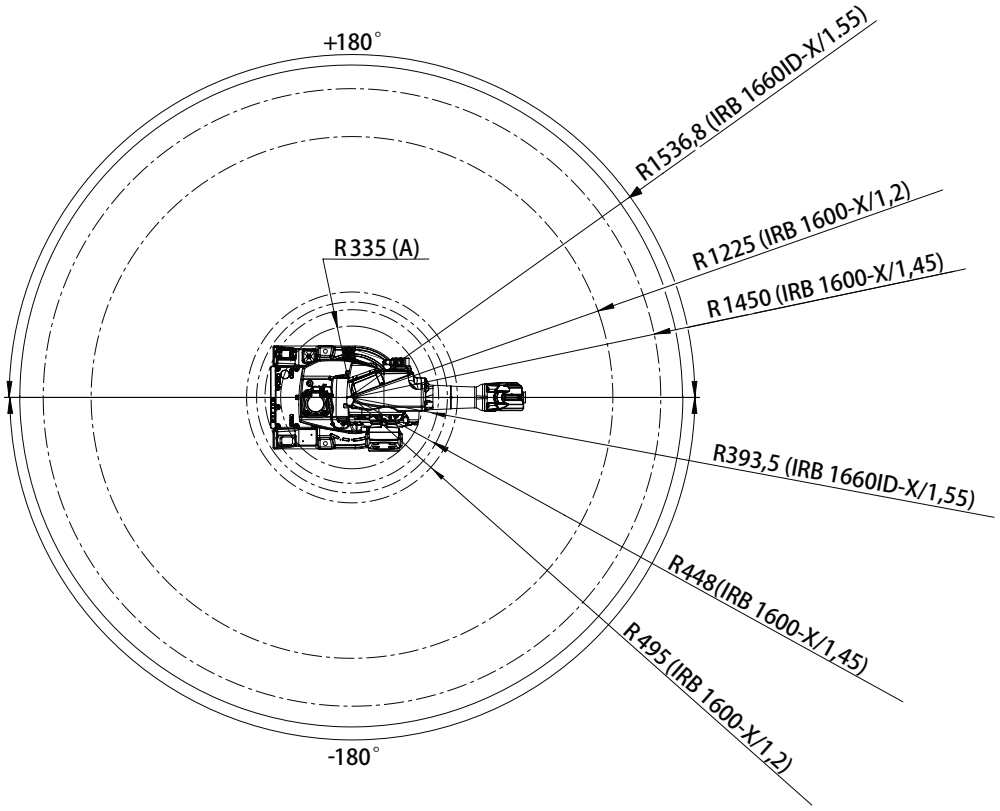
1.6.1 Working range
Continued

Turning radius

The turning radius for the robot is shown in the figure below. Notice the differences depending on the length of the lower arm.



xx1500002817

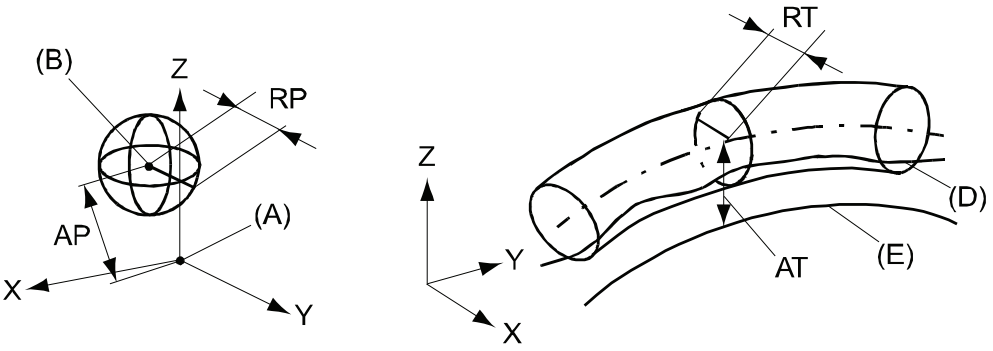
(A)	Minimum turning radius axis 1 (all models)

1.6.2 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

Description	IRB 1600				IRB 1660ID	
	-6/1.2	-6/1.45	-10/1.2	-10/1.45	-6/1.55	-4/1.55
Pose repeatability, RP (mm)	0.02	0.02	0.02	0.05	0.02	0.02
Pose accuracy, AP[i] (mm)	0.04	0.04	0.01	0.02	0.02	0.03
Linear path repeatability, RT (mm)	0.13	0.19	0.06 [ii]	0.13 *ii*	0.05	0.08
Linear path accuracy, AT (mm)	0.97	1.03	0.20 *ii*	0.26 *ii*	0.25 *ii*	0.23 *ii*
Pose stabilization time, (PSt) to within 0.2 mm of the position (s)	0.11	0.11	0.09	0.09	N/A	N/A

Continues on next page

1.6.2 Performance according to ISO 9283
Continued

Description	IRB 1600				IRB 1660ID	
	-6/1.2	-6/1.45	-10/1.2	-10/1.45	-6/1.55	-4/1.55
Pose stabilization time, (PSt) to within 0.1 mm of the position (s)	N/A	N/A	N/A	N/A	0.20	0.13

i 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.

ii Measured at a velocity of 250 mm/s.

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

1.6.3 Velocity

With OmniCore C30/C90XT/V250XT/V400XT

Axis No.	IRB 1600-6/1.2 IRB 1600-6/1.45	IRB 1600-10/1.2 IRB 1600-10/1.45	IRB 1660ID-6/1.55 IRB 1660ID-4/1.55
1	150°/s	180°/s	180°/s
2	160°/s	180°/s	180°/s
3	170°/s	185°/s	180°/s
4	320°/s	385°/s	320°/s
5	400°/s	400°/s	360°/s
6	460°/s	460°/s	500°/s

1.6.4 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*).

1.7 Customer connectors on the robot

General

Customer connections are options, the cables for them are integrated in the robot and the connectors are placed on the upper arm housing.

The customer connections are:

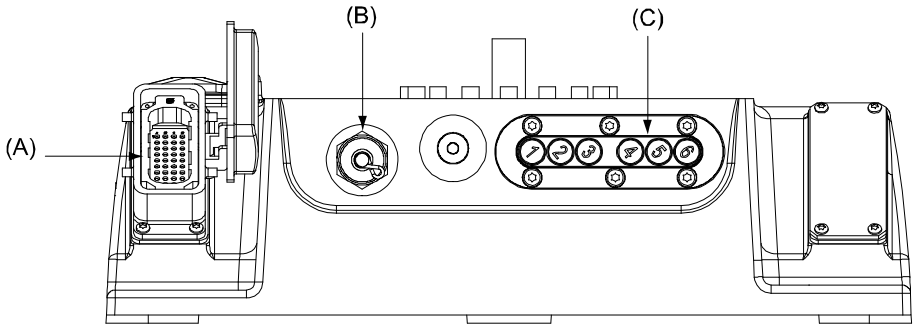
- The standard connections for signals, power and air.
- The integrated wire feed cabling for signals and power.
- The 7-axis connection.

Note

No customer/application connections are available for IRB 1660ID.

Connections at robot base

The graphics below show the customer connections on the robot base. For description of all connection types see *Connection table on page 62*.



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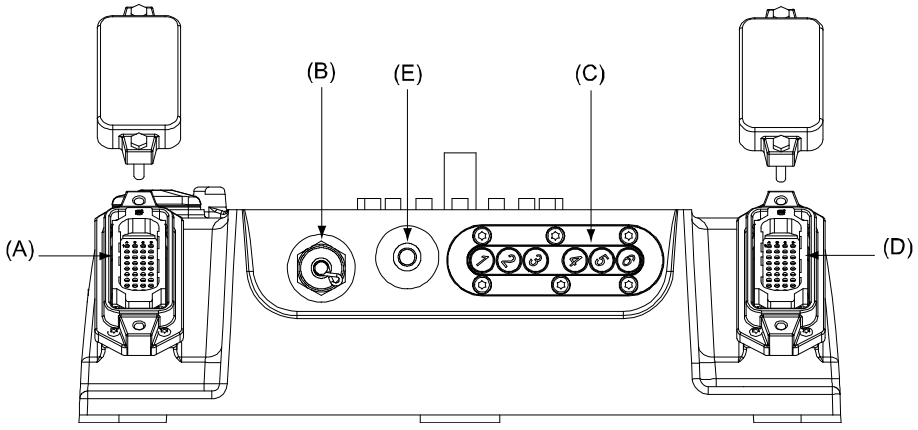

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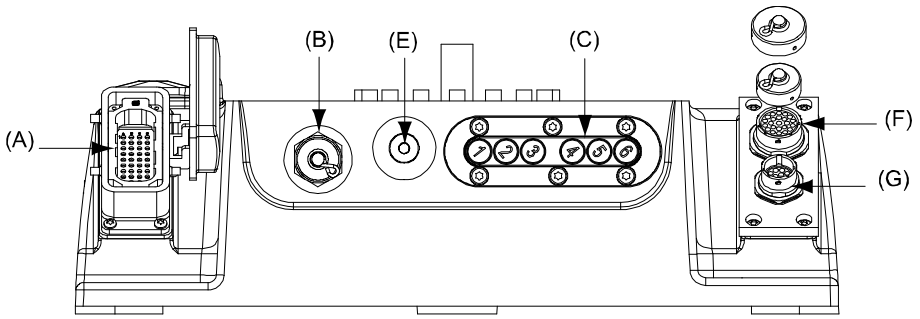
1.7 Customer connectors on the robot

Continued



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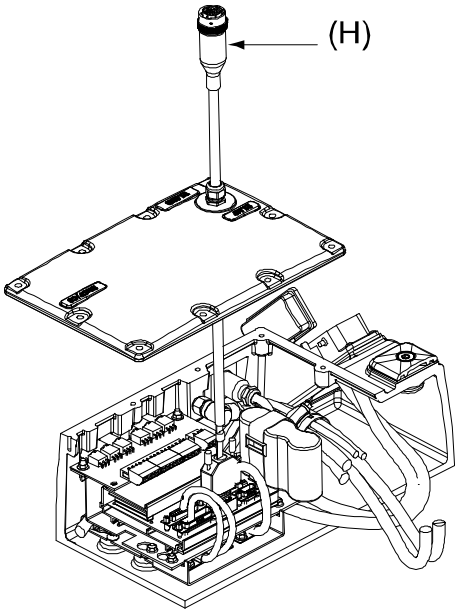

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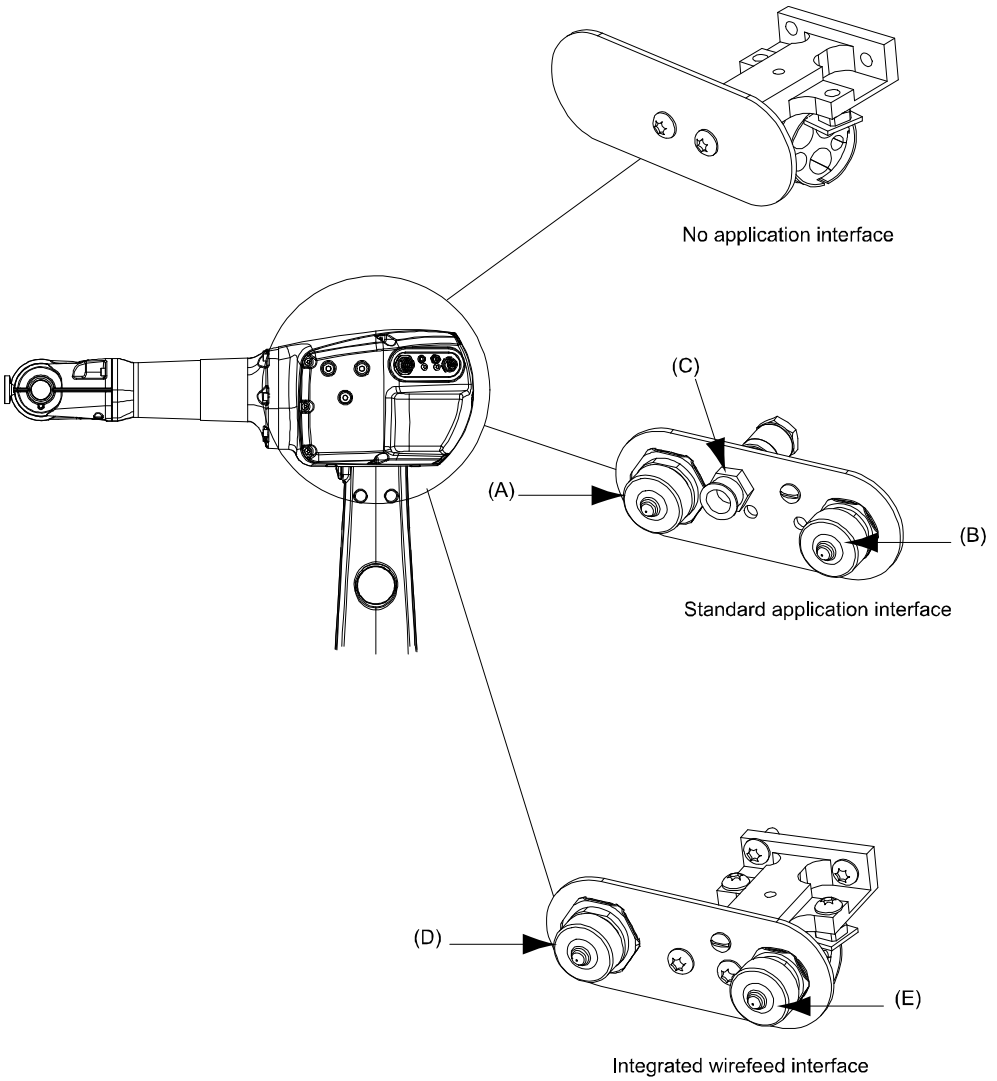
Connection table

Pos	Connection type	Description
A	R1.MP	Motor power
B	R1.SMB	Serial measurement board signal
C	-	Robot axes brake release buttons
D	R.1 CP/CS	Standard customer power and customer signal
E	R.1Air	Standard air
F	R1.CS	Customer signal for integrated wirefeed interface
G	R1.CP	Customer power for integrated wirefeed interface
H	R1.FB7	Axis 7 connection, 1.5 m cable

Continues on next page

Connections on upper arm



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Pos	Connection type	Description
A	R2.CP	Standard customer power
B	R2.CS	Standard customer signal
C	R2.Air	Standard air
D	R2.CP	Customer power for integrated wirefeed interface
E	R2.CS	Customer signal for integrated wirefeed interface

1.8 Maintenance and trouble shooting

General

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

- Maintenance-free AC motors are used.
- Oil and grease are 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.
- It has a progam memory “battery low” alarm.

Maintenance

The maintenance intervals depend on the use of the robot, the required maintenance activities also depends on selected options. For detailed information on maintenance procedures, see *Product manual - IRB 1600/1660*.

2 Specification of variants and options

2.1 Introduction to variants and options

General

The different variants and options for the IRB 1600/1660ID 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)
3300-73	1600	6/1.2
3300-74	1600	6/1.45
3300-75	1600	10/1.2
3300-76	1600	10/1.45
3300-77	1660ID	4/1.55
3300-78	1660ID	6/1.55

Manipulator color

Option	Color[i]	RAL code[ii]
209-1	ABB orange standard	RAL7032
209-202	ABB Graphite White std Standard color	RAL7035
209	RAL code should be specified (ABB non-standard colors)	

i The color of ABB robots is not limited to orange, white or graphite white. Select one of the roughly 200 colors of the RAL CLASSIC scheme. See predefined list of colors with option numbers.

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

Note

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

Manipulator protection

Option	Description
3352-540	Base 54, IP54
3350-670	Base 67,IP67
3352-10	Foundry Prime2 67

Note

Base 54 includes IP54, according to standard IEC 60529.

Base 67 includes IP67, according to standard IEC 60529.

Resolver connection 7th axis

A connector for resolver signals for 7th axis is located on the base.

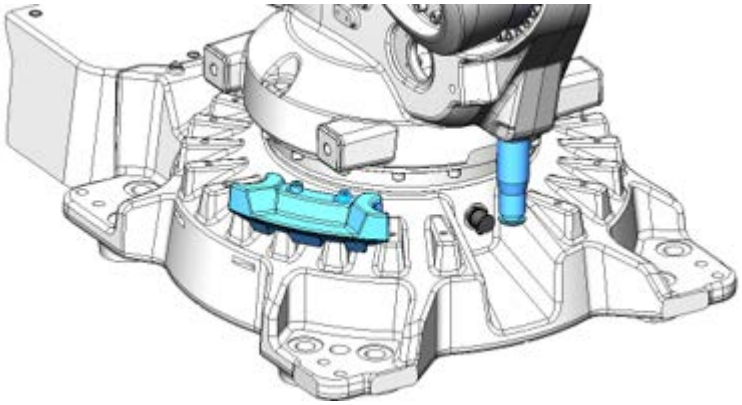
Option	Description	Remark
3322-1	On base	

Continues on next page

Limited working range

Option	Description
3323-4	Axis 1-work range lim.

The manipulator can be equipped with adjustable mechanical stops. This is to mechanically limit the working range on axis 1. The mechanical stops are delivered alongside the robot (not installed). The stops can be placed in steps according to the option.



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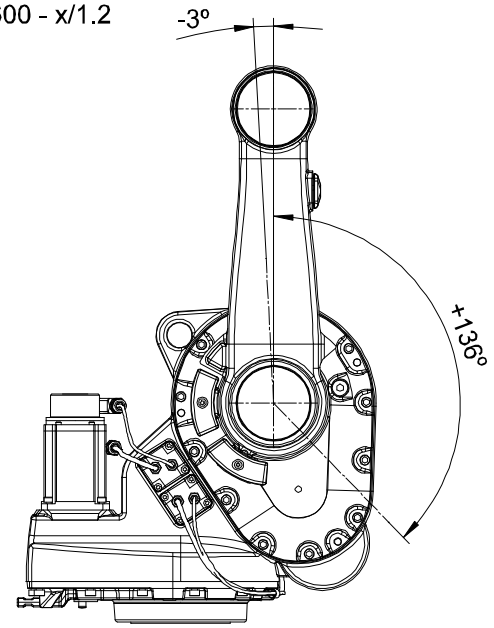
Option	Description
3338-1	Axis 2-work range lim. An additional mechanical stop for restricting the working range of axis 2 can be mounted on the frame. The working range can only be restricted backwards as shown in Figure below. Notice the different working range for the different models.

IRB 1600 - x/1.2



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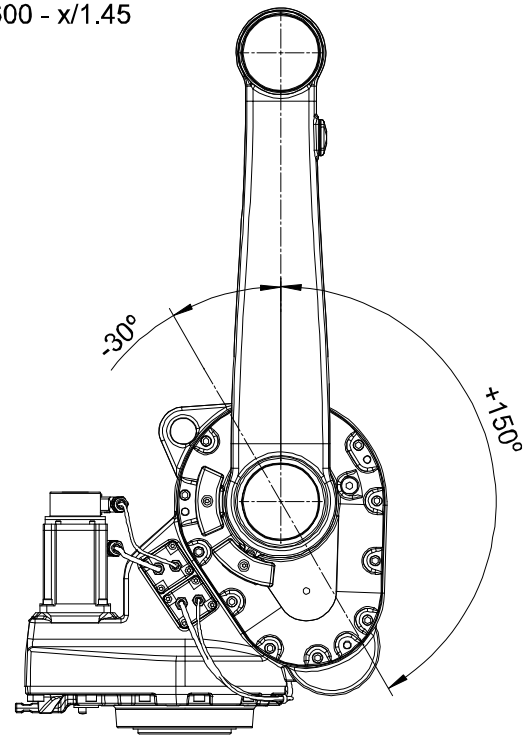
2.2 Manipulator
Continued

IRB 1600 - x/1.45



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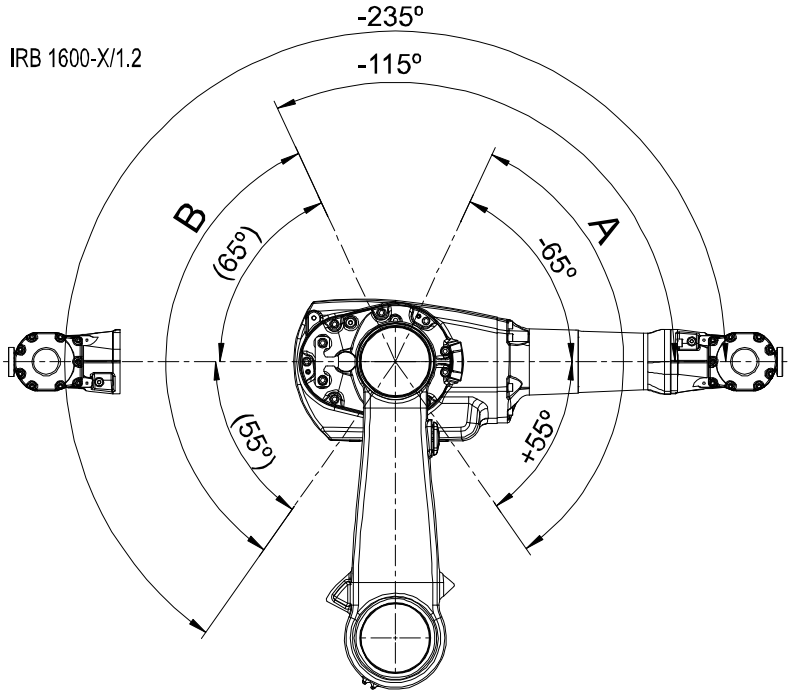
Option	Description
3339-1	The mechanical stop to restrict the working range within zone A and B for axis 3 can be mounted at the upper arm housing. See Figure 4. Notice the different working range for the different models.

IRB 1600-X/1.2



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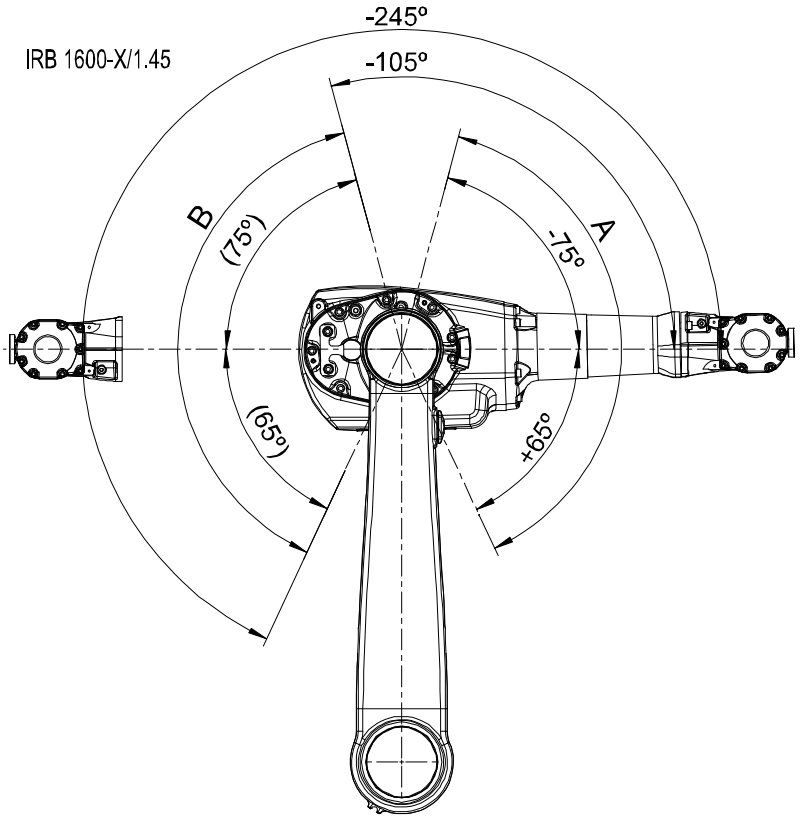

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Warranty

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.

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Option	Type	Description
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*.

2.3 Floor cables

Manipulator cable

Option	Lengths
3200-2	7 m
3200-3	15 m
3200-4	22 m (only for V line)
3200-5	30 m (only for V line)

Mains cable

Option	Lengths	Description
3203-1	EU mains cable, 3 m	Cable assembly with CEE7/VII line-side plug
3203-2	UK mains cable, 3 m	Cable assembly with BS1363 line-side plug, 5A fused
3203-5	CN mains cable, 3 m	Cable assembly with CPCS-CCC line-side plug
3203-6	AU mains cable, 3 m	Cable assembly with AS/NZS 3112 line-side
3203-7	All regions cable, 5 m	Cable assembly without line-side plug

Tip

The option *Mains cable* requires option *3000-105 OmniCore E10* or *3000-130 OmniCore C30*.

2.4 Application

DressPack base-axis 3

Option	Description
3325-11	MH Parallel

Connector kit axis 3

The kit consists of connectors, pins and sockets.

Option	Type	Description
3333-1	CP/CS Proc 1 axis3	

Parallel cable - Length

Option	Description	Note
3201-2	7 m	
3201-3	15 m	
3201-4	22 m	
3201-5	30 m	

Servo cable 1 axis - Length

Option	Description	Note
3206-2	7 m	
3206-3	15 m	
3206-4	22 m	
3206-5	30 m	

Note

The options *3206-X Servo cable 1 axis - Length* are available for IRB 1600/1660ID with OmniCore V line controllers.

PickMaster Ready

Option	Type	Description
3152-1	PickMaster Cell Ready	Includes conveyor tracking functionality. Digital I/O is needed for PickMaster functions.
3152-2	PickMaster Robot Ready	Includes conveyor tracking functionality. Digital I/O is needed for PickMaster functions.

PickMaster Vision

Option	Type	Description
3153-1	PickMaster Vision Ready	REQUIRES: 3152-2 PickMaster Robot Ready

Continues on next page

Requirements

The option *PickMaster Vision Ready*[3153-1] requires option *PickMaster Robot Ready* [3152-2].

Machining

Option	Type	Description
3418-1	Machining Standard	HMI with calibration function
3418-2	Machining Premium	HMI with full function

Requirements

The option *Machining Premium* [3418-2] requires Robotware option *Multitasking* [3114-1].

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