ROBOTICS

Product specification

IRB 1200

Trace back information:
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Checked in 2020-12-11
Skribenta version 5.3.075

Product specification

IRB 1200-5/0.9
IRB 1200-5/0.9 type A
IRB 1200-5/0.9 type B
IRB 1200-7/0.7
IRB 1200-7/0.7 type A
IRB 1200-7/0.7 type B

Document ID: 3HAC046982-001
Revision: N

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Original instructions.

Table of contents

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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 variants and options available

Usage

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

Users

It is intended for:

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

References

Reference	Document ID
Product specification - Controller IRC5 IRC5 with main computer DSQC1000.	*3HAC047400-001*
Product specification - Controller software IRC5 IRC5 with main computer DSQC1000 and RobotWare 5.6x.	*3HAC050945-001*
Product specification - Controller software IRC5 IRC5 with main computer DSQC1000 and RobotWare 6.	*3HAC050945-001*
Product manual - IRB 1200	*3HAC046983-001*
Product manual - IRC5 Compact	*3HAC035738-001*
Operating manual - IRC5 with FlexPendant	*3HAC050941-001*
Product specification - Robot user documentation, IRC5 with RobotWare 6	*3HAC052355-001*

Revisions

Revision	Description
-	New product specification
A	Minor corrections
B	• Working range of axis 6 corrected from ±360° to ±400°, see *Working range on page 45*. • Minor corrections/update

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Continued

Revision	Description
C	• Minor corrections/update
D	• Food grade lubrication option added. • Maximum revolution of axis 6 corrected to ±242, see *Robot motion on page 44*.
E	Published in release R16.2. The following updates are done in this revision: • Recommendation of fitting a fuse protector for customer protection added. See *Customer connections on page 50*. • Foundry Plus option added. • Type A robot information added due to new standard calibration method (Axis Calibration). See *Type A of IRB 1200 on page 9*.
F	Published in release R17.1. The following updates are done in this revision: • Added the standard IEC 61340-5-1:2010, see *Applicable standards on page 17*. • A warning label about CP/CS connection provided on the tubular housing. See *Customer connections on page 50*. • Information about *Type B* robots supporting SafeMove 2 added. • *Absolute Accuracy* calibration added. • Restriction of load diagram added.
G	Published in release 17.2. The following updates are done in this revision: • Updated list of applicable standards. • Changed the protection type of Food grade lubrication. • Updated description about Clean Room class.
H	Published in release 18.1. The following updates are done in this revision: • TCP acceleration should be presented by RobotStudio. • Note added to clarify the usage of the two M4 thread holes on the upper arm.
J	Published in release R18.2. The following updates are done in this revision: • TCP acceleration information updated. • Customer connector information added.
K	Published in release 19B. The following updates are done in this revision: • Velocity data updated. • Updated information about *Absolute Accuracy*.
L	Published in release 19C. The following updates are done in this revision: • Note added about need to calibrate if the robot is other than floor mounted.
M	Published in release 20C. The following updates are done in this revision: • Updated the figure of customer connection information.
N	Published in release 20D. The following updates are done in this revision: • Warranty section updated.

1 Description

1.1 Structure

1.1.1 Introduction to structure

General

The IRB 1200 is one of ABB Robotics latest generation of 6-axis industrial robot, with a payload of 5 to 7 kg, designed specifically for manufacturing industries that use flexible robot-based automation, e.g. 3C industry. The robot has an open structure that is especially adapted for flexible use, and can communicate extensively with external systems.

Type A of IRB 1200

Type A - Axis Calibration

The difference between IRB 1200 and IRB 1200 Type A is that the Type A is calibrated with Axis Calibration. On each axis there are bushings for installation of calibration tools.

As a result of this, the castings differ between IRB 1200 and IRB 1200 Type A.

Note

IRB 1200 Type B is designed based on IRB 1200 Type A so that Type B has the bushings for installation of calibration tools too.

The difference between IRB 1200 Type A and IRB 1200 Type B is that Type B also supports SafeMove 2. See *Type B of IRB 1200 on page 9*.

How to know which type the robot is?

The type label on the base of the robot tells if the robot is calibrated with Axis Calibration.

Those robots are named IRB 1200 Type A.

Note

If no type label attached on the robot, use the bushings on each axis to identify a robot calibrated with Axis Calibration.

Those robots which are not equipped for Axis Calibration are simply named IRB 1200 (no type specified).

Type B of IRB 1200

Type B - SafeMove 2

The difference between IRB 1200 Type B and other IRB 1200 versions is that the Type B supports SafeMove 2.

As a result of this, the following parts differ from other versions:

- Base

Continues on next page

1.1.1 Introduction to structure
Continued

- Drive unit, axis 2, axis 3, axis 5 and axis 6
- Motor with pulley, axis 4 and axis 5
- Manipulator cable harness
- Battery pack
- SMB unit (replacing EIB unit)

IRB 1200 Type B is designed based on IRB 1200 Type A so that Type B has the bushings for installation of calibration tools too.

How to know which type the robot is?

The type label on the base of the robot tells if the robot supports SafeMove 2.

Those robots are named IRB 1200 Type B.

Clean room robots

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Particle emission from the robot fulfill Clean room class 3 standard according to DIN EN ISO 14644-1.

Clean room robots are specially designed to work in a clean room environment.

According to IPA test result, the robot IRB 1200 is suitable for use in clean room environments.

Clean room robots are designed in order to prevent from particle emission from the robot. For example is, frequent maintenance work possible to perform without cracking the paint. The robot is painted with four layers of polyurethane paint. The last layer being a varnish over labels in order to simplify cleaning. 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)	Temp (°C)	Performed test	Total detected (ng)	Normed based on $1m^2$ and 1s(g)	Classification in accordance to 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.

Food grade lubrication

The robot has food grade lubrication (NSF H1) as an option (777-1). The protection type for robots with food grade lubrication is Clean Room and IP67.

Continues on next page

IP67/66 protection

The robot has IP67 as an option. The option will add sealing, machining parts and gasket.

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
- Black chrome 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 versions

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

See *Specification of variants and options on page 53* for robot versions and other options not selectable together with Foundry Plus 2.

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1.1.1 Introduction to structure
Continued

Operating system

The robot is equipped with the IRC5 Compact (IRC5C) or IRC5 (Single cabinet) 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 with FlexPendant* (IRC5C included).

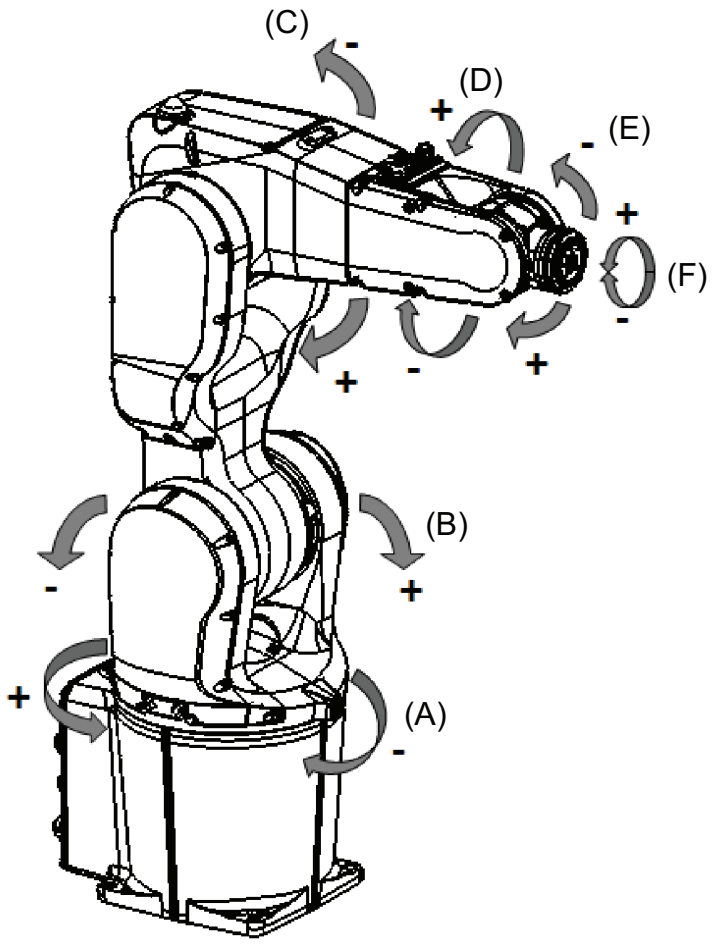
Safety

The safety standards are valid for the complete robot, manipulator and controller.

Additional functionality

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

Manipulator axes



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

1.1.2 The robot

General

The IRB 1200 is available in two versions and both can be mounted on floor, inverted or on wall in any angle (around X-axis or Y-axis).

Robot type	Handling capacity (kg)	Reach (m)
IRB 1200	5 kg	0.9 m
IRB 1200	7 kg	0.7 m

Manipulator weight

Data	Weight
IRB 1200-5/0.9	54 kg
IRB 1200-7/0.7	52 kg

Other technical data

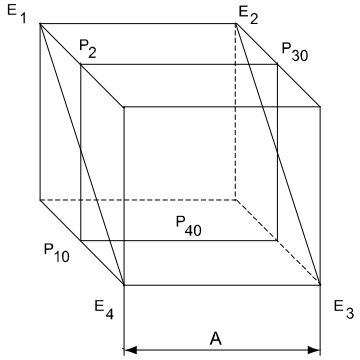
Data	Description	Note
Airborne noise level	The sound pressure level outside	< 70 dB (A) Leq (acc. to the working space Machinery directive 2006/42/EG)

Power consumption

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

Type of movement	Power consumption (kW)	
	IRB 1200-5/0.9	IRB 1200-7/0.7
ISO Cube Max. velocity	0.45 kW	0.39 kW

Robot in 0 degree position	IRB 1200-5/0.9	IRB 1200-7/0.7
Brakes engaged	0.10 kW	0.10 kW
Brakes disengaged	0.18 kW	0.19 kW



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Position	Description
A	250 mm

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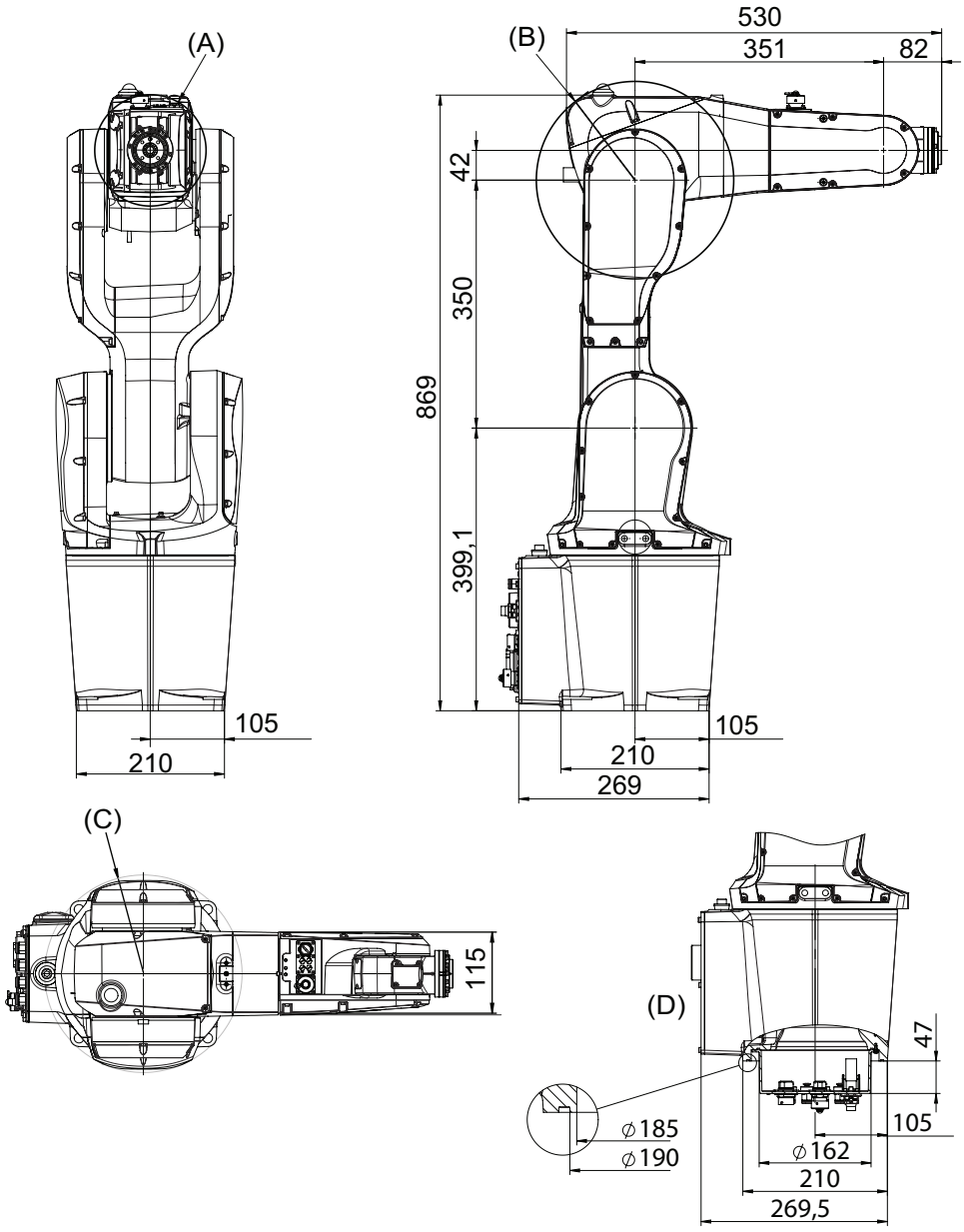
Dimensions IRB 1200-7/0.7



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Position	Description
A	Minimum turning radius axis 4 R=79 mm
B	Minimum turning radius axis 3 R=139 mm
C	Minimum turning radius axis 1 R=138 mm
D	Valid for option Robot cabling routing, 966-1 From below

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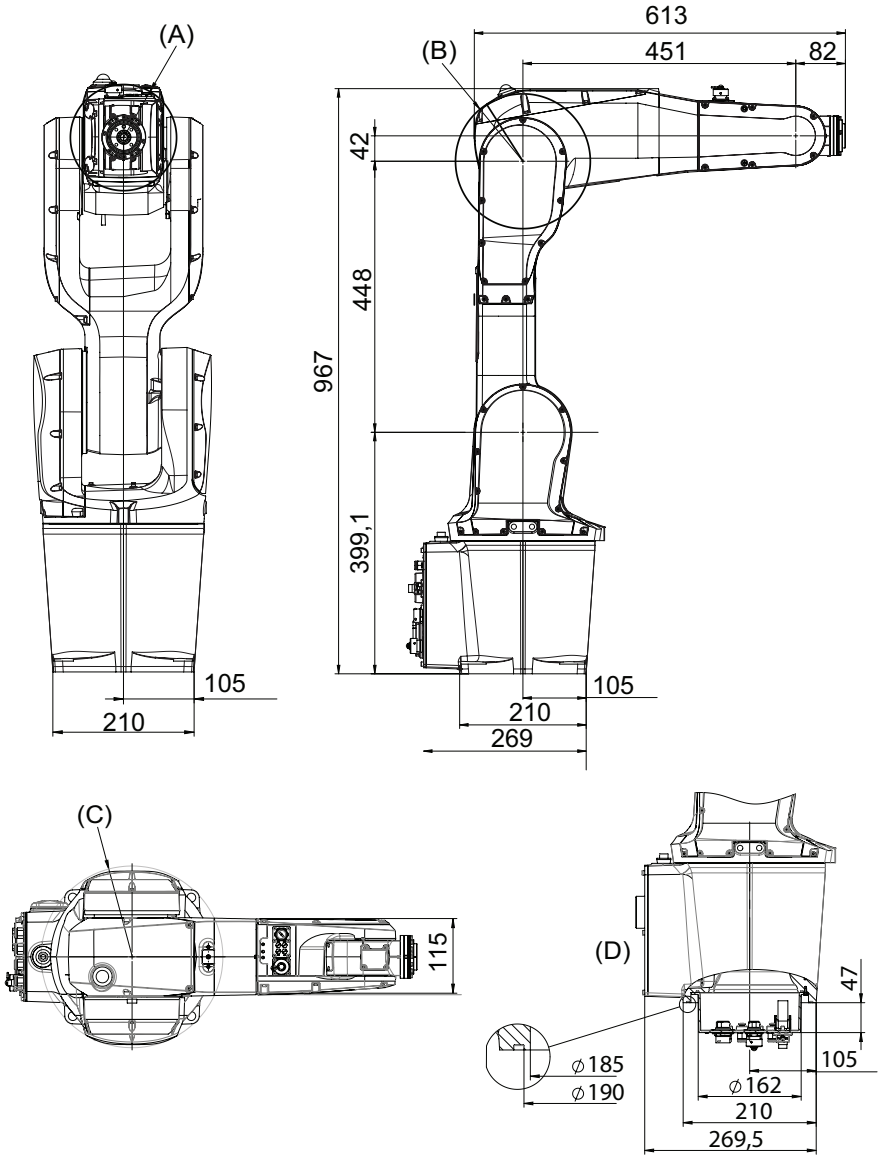
1.1.2 The robot
Continued

Dimensions IRB 1200-5/0.9



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Pos	Description
A	Minimum turning radius axis 4 R=79 mm
B	Minimum turning radius axis 3 R=111 mm
C	Minimum turning radius axis 1 R=138 mm
D	Valid for option Robot cabling routing, 966-1 From below

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 EN ISO 10218-1, Robots for industrial environments - Safety requirements -Part 1 Robot. If there are deviations, these are listed in the declaration of incorporation which is included on delivery.

Standards, EN ISO

The product is designed in accordance with selected parts of:

Standard	Description
EN ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN ISO 13849-1:2015	Safety of machinery, safety related parts of control systems - Part 1: General principles for design
EN ISO 13850:2015	Safety of machinery - Emergency stop - Principles for design
ISO 9787:2013	Robots and robotic devices -- Coordinate systems and motion nomenclatures
ISO 9283:1998	Manipulating industrial robots, performance criteria, and related test methods
EN ISO 14644-1:2015 [i]	Classification of air cleanliness
EN ISO 13732-1:2008	Ergonomics of the thermal environment - Part 1
EN 61000-6-4:2007 + A1:2011 IEC 61000-6-4:2006 + A1:2010 (option 129-1)	EMC, Generic emission
EN 61000-6-2:2005 IEC 61000-6-2:2005	EMC, Generic immunity
EN IEC 60974-1:2012 [ii]	Arc welding equipment - Part 1: Welding power sources
EN IEC 60974-10:2014 [ii]	Arc welding equipment - Part 10: EMC requirements
EN IEC 60204-1:2016	Safety of machinery - Electrical equipment of machines - Part 1 General requirements
IEC 60529:1989 + A2:2013	Degrees of protection provided by enclosures (IP code)
IEC 61340-5-1:2010	Protection of electronic devices from electrostatic phenomena - General requirements

i Only robots with protection Clean Room.
ii Only valid for arc welding robots. Replaces EN IEC 61000-6-4 for arc welding robots.

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1.2.1 Applicable standards
Continued

European standards

The product is designed in accordance with selected parts of:

Standard	Description
EN 614-1:2006 + A1:2009	Safety of machinery - Ergonomic design principles - Part 1: Terminology and general principles
EN 574:1996 + A1:2008	Safety of machinery - Two-hand control devices - Functional aspects - Principles for design

UL, ANSI, and other standards

Standard	Description
ANSI/RIA R15.06	Safety requirements for industrial robots and robot systems
ANSI/UL 1740 (option 429-1)	Safety standard for robots and robotic equipment
CAN/CSA Z 434-14 (option 429-1)	Industrial robots and robot Systems - General safety requirements
ANSI/ESD S20.20:2007	Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices)

1.3 Installation

1.3.1 Introduction to installation

General

IRB 1200 is adapted for normal industrial environment. Depending on robot variant, an end effector with max. weight of 5 or 7 kg, including payload, can be mounted on the robot's mounting flange (axis 6). Other equipment, weighing a maximum of 0.3 kg, can be mounted on the upper arm. For more information about mounting of extra equipment, see *Fitting of equipment on page 32*.

1.3.2 Operating requirements

Protection standard

Robot variant	Protection standard IEC529
All variants, manipulator	IP40
Option, all variants	IP67

Explosive environments

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

Working range limitations

EPS will not be selectable. No mechanical limitation.

Ambient temperature

Description	Protection class	Temperature
Manipulator during operation	Standard	+ 5°C [i] (41°F) to + 45°C (113°F)
Manipulator with food grade lubrication during operation	Option	+ 5°C [i] (41°F) to + 35°C [ii] (113°F)
For the controller	Standard/Option	See *Product specification - Controller IRC5*
Complete robot during transportation and storage	Standard	- 25°C (-13°F) to + 55°C (131°F)
For short periods (not exceeding 24 hours)	Standard	up to + 70°C (158°F)

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

ii For robots with food grade lubrication, if environment temperature > 35ºC, contact ABB for further information.

Relative humidity

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

1.3.3 Mounting the manipulator

Maximum load

Maximum load in relation to the base coordination system. See Figure below.

Floor mounted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	±910 N	±1620 N
Force z	-550 ±980 N	-550 ±1610 N
Torque xy	±570 Nm	±1550 Nm
Torque z	±280 Nm	±580 Nm

Wall mounted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	±1210 N	±1940 N
Force z	0 ±900 N	0 ±1340 N
Torque xy	±700 Nm	±1650 Nm
Torque z	±300 Nm	±610 Nm

Suspended mounting

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	±910 N	±1620 N
Force z	+550 ±980 N	+550 ±1610 N
Torque xy	±570 Nm	±1550 Nm
Torque z	±280 Nm	±580 Nm

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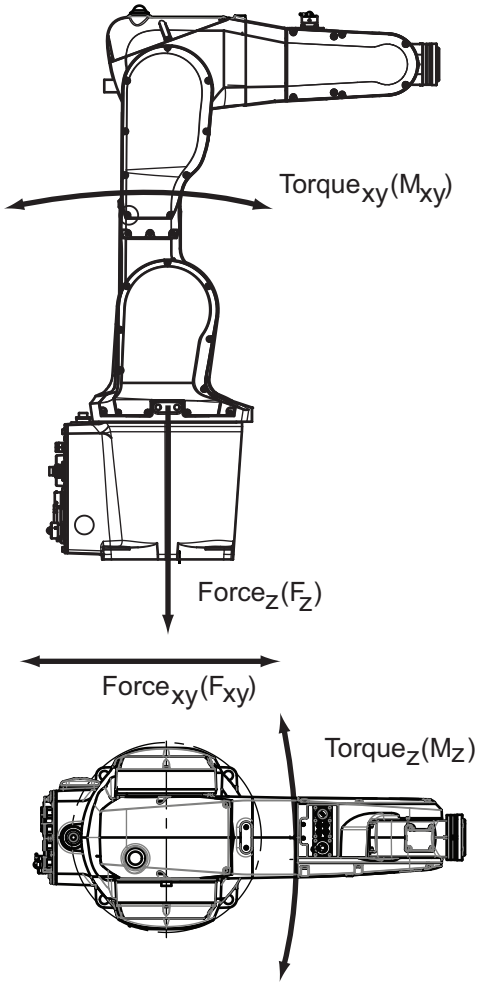
1.3.3 Mounting the manipulator
Continued



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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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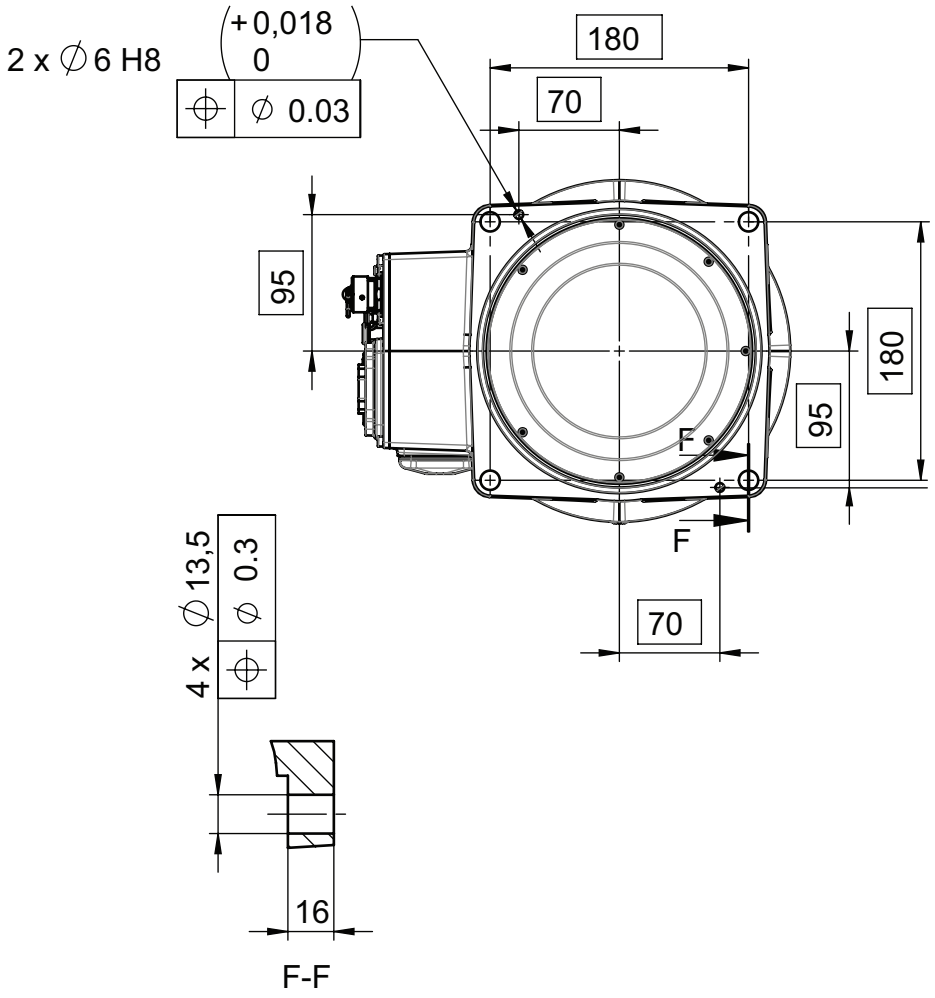
Fastening holes robot base

View from below.



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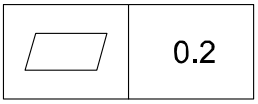
Attachment bolts, specification

The table specifies the type of securing screws and washers to be used to secure the robot directly to the foundation. It also specifies the type of pins to be used.

Suitable screws	M12x35 (robot installation directly on foundation)
Quantity	4 pcs
Quality	8.8
Suitable washer	13 x 20 x 2, steel hardness class 300HV
Guide pins	2 pcs, D6x20, ISO 2338 - 6m6x20 - A1
Tightening torque	55 Nm ± 5 Nm
Level surface requirements	 xx0900000643

1.4 Load diagram

1.4.1 Introduction to load diagram

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

- motors
- gearboxes
- mechanical structure

WARNING

In the robot system is the service routine LoadIdentify available, which allows the user to make an automatic definition of the tool and load, to determine correct load parameters. For detailed information, see *Operating manual - IRC5 with FlexPendant*.

WARNING

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

General

The load diagram includes a nominal pay load inertia, J_0 of 0.06 kgm^2 and an extra load of 0.3 kg at the upper arm housing. At different moment of inertia the load diagram will be changed. For robots that are allowed tilted, wall or inverted mounted, the load diagrams as given are valid and thus it is also possible to use RobotLoad within those tilt and axis limits.

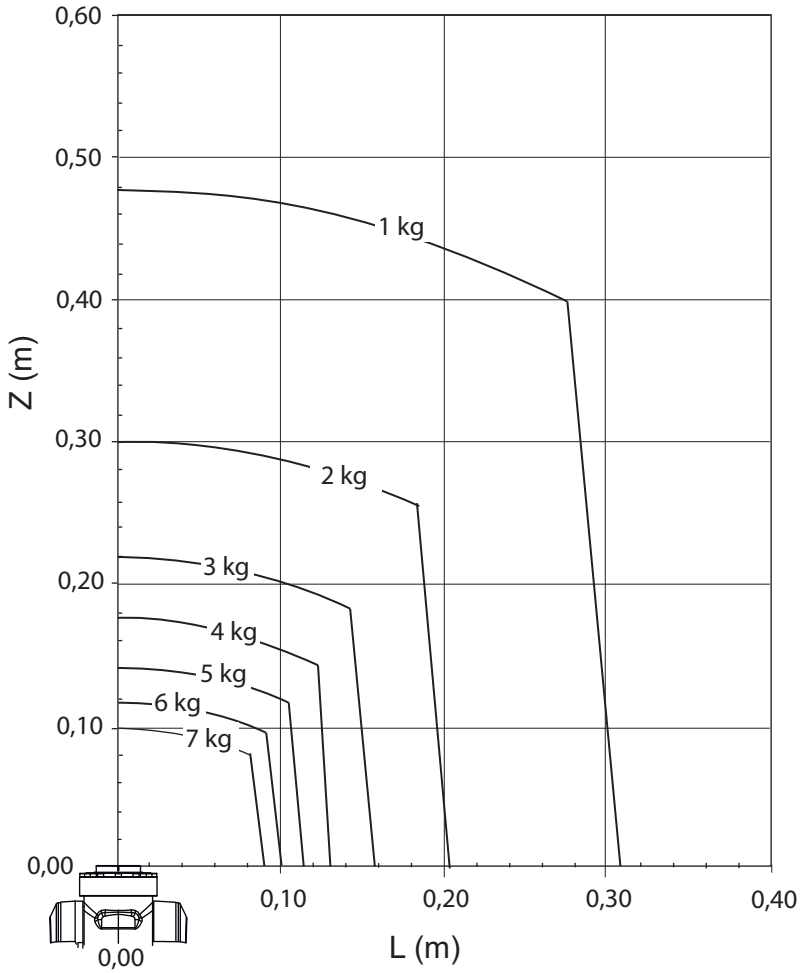
Control of load case by "RobotLoad"

To easily control a specific load case, use the calculation program ABB RobotLoad. Contact your local ABB organization for more information.

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

1.4.2 Load diagram

IRB 1200 - 7/0.7



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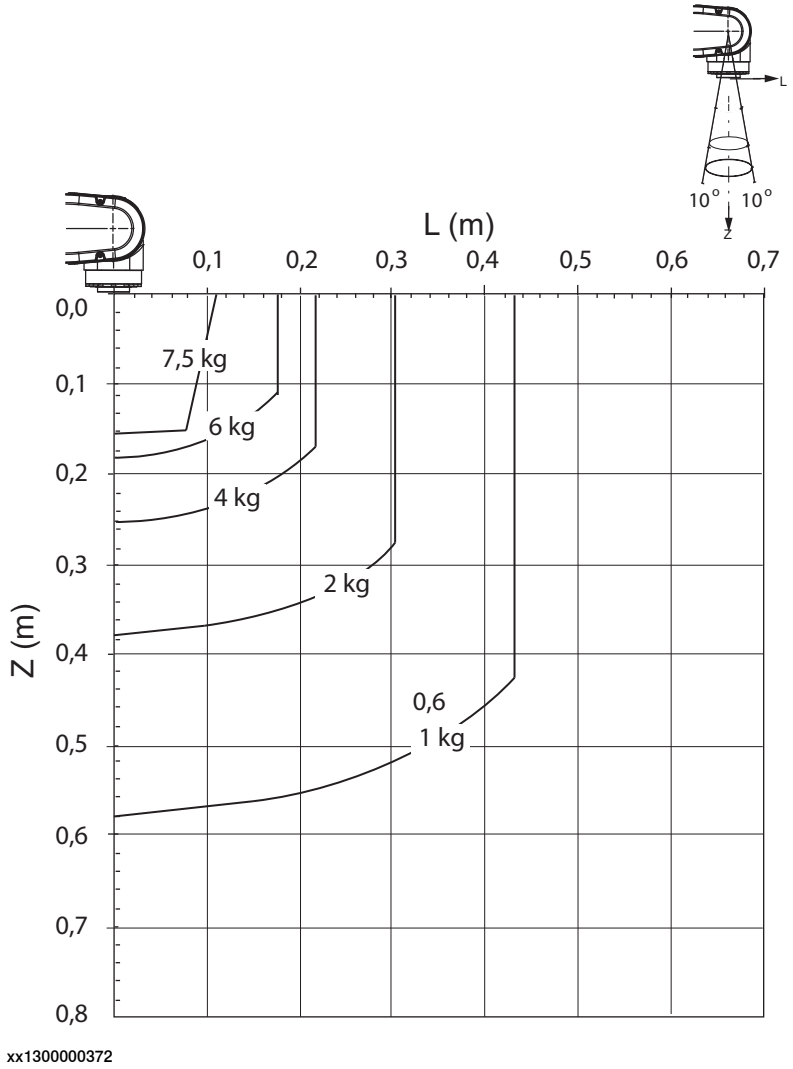
1.4.2 Load diagram
Continued

IRB 1200 - 7/0.7 "Vertical wrist" (± 10°)



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

	Description
Max load	7.5 kg
Z_{max}	0.159 m
L_{max}	0.109 m

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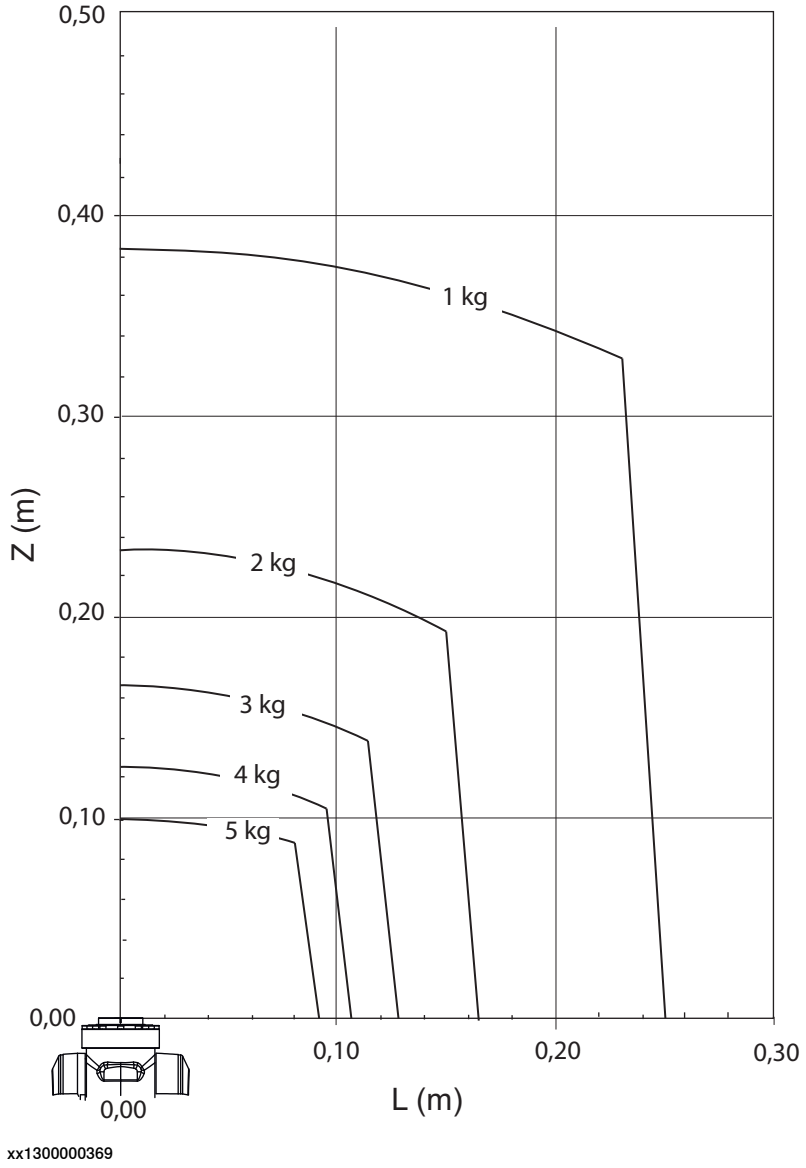
IRB 1200 - 5/0.9



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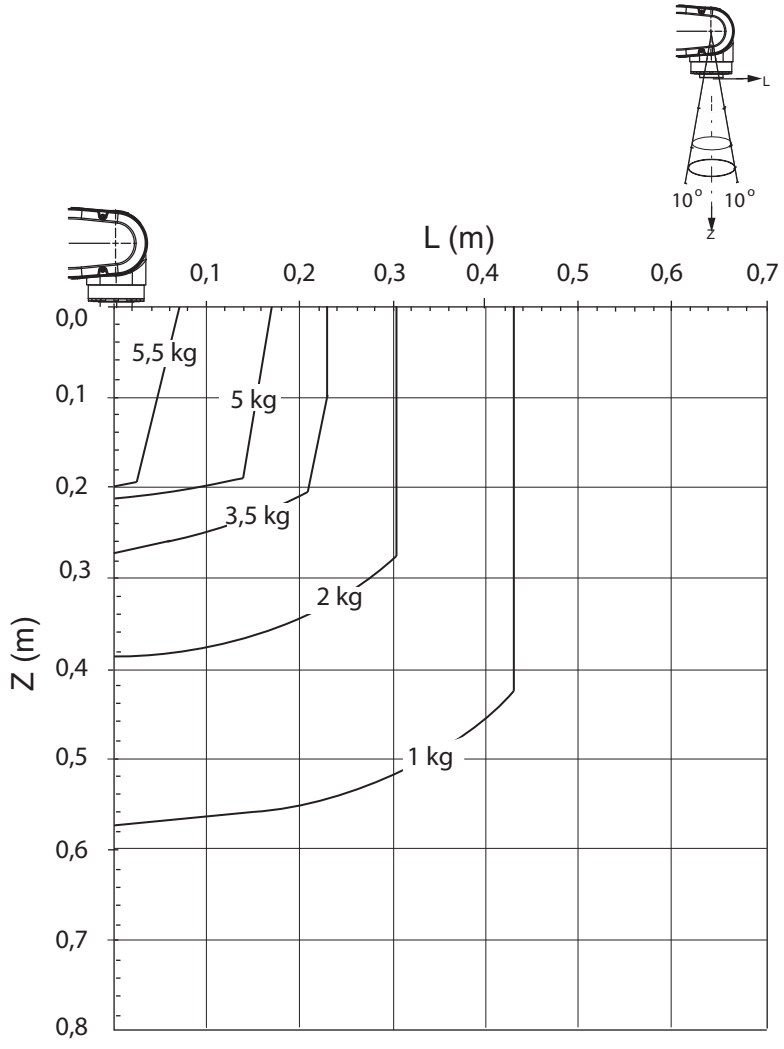
1.4.2 Load diagram
Continued

IRB 1200 - 5/0.9 "Vertical wrist" (± 10°)



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

	Description
Max load	5.5 kg
Z_{max}	0.199 m
L_{max}	0.069 m

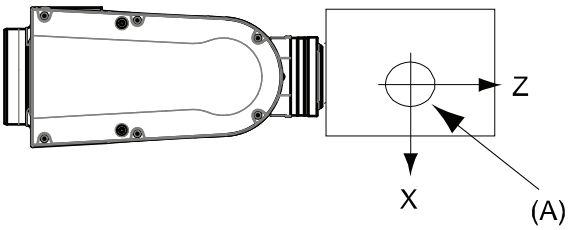
1.4.3 Maximum load and moment of inertia for axis 5

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. $L = \sqrt{(X2 + Y2)}$.

Full movement of Axis 5 (±130º)

Axis	Robot variant	Max. value
5	IRB 1200-7/0.7	J_5 = Mass x $((Z + 0.082)^2 + L^2)$ + max (J_{ox}, J_{oy}) ≤ 0.45 kgm^2
	IRB 1200-5/0.9	J_5 = Mass x $((Z + 0.082)^2 + L^2)$ + max (J_{ox}, J_{oy}) ≤ 0.45 kgm^2
6	IRB 1200-7/0.7	J_6= Mass x L^2 + J_{0Z} ≤ 0.2 kgm^2
	IRB 1200-5/0.9	J_6= Mass x L^2 + J_{0Z} ≤ 0.2 kgm^2



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Position	Description
A	Center of gravity
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 variant	Max. value
5	IRB 1200-7/0.7	J_5 = Mass x $((Z + 0.082)^2 + L^2)$ + max (J_{ox}, J_{oy}) ≤ 0.45 kgm^2
	IRB 1200-5/0.9	J_5 = Mass x $((Z + 0.082)^2 + L^2)$ + max (J_{ox}, J_{oy}) ≤ 0.45 kgm^2
6	IRB 1200-7/0.7	J_6= Mass x L^2 + J_{0Z} ≤ 0.2 kgm^2
	IRB 1200-5/0.9	J_6= Mass x L^2 + J_{0Z} ≤ 0.2 kgm^2

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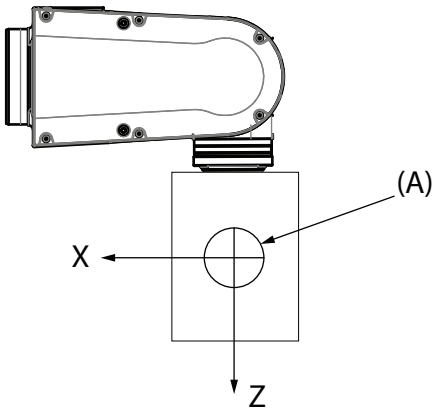
1.4.3 Maximum load and moment of inertia for axis 5
Continued



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

Wrist torque

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

Note

The 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. Also arm loads will influence the permitted load diagram, contact your local ABB organization.

Robot variant	Max wrist torque axis 4 and 5	Max wrist torque axis 6	Max torque valid at load
IRB 1200-7/0.7	12.5 Nm	6.2 Nm	7 kg
IRB 1200-5/0.9	8.9 Nm	4.4 Nm	5 kg

Continues on next page

1.4.3.1 Maximum TCP acceleration

General

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

Maximum Cartesian design acceleration for nominal loads

Robot type	E-stop Max acceleration at nominal load COG [m/s^2]	Controlled Motion Max acceleration at nominal load COG [m/s^2]
IRB 1200-7/0.7	88	68
IRB 1200-5/0.9	94	79

Note

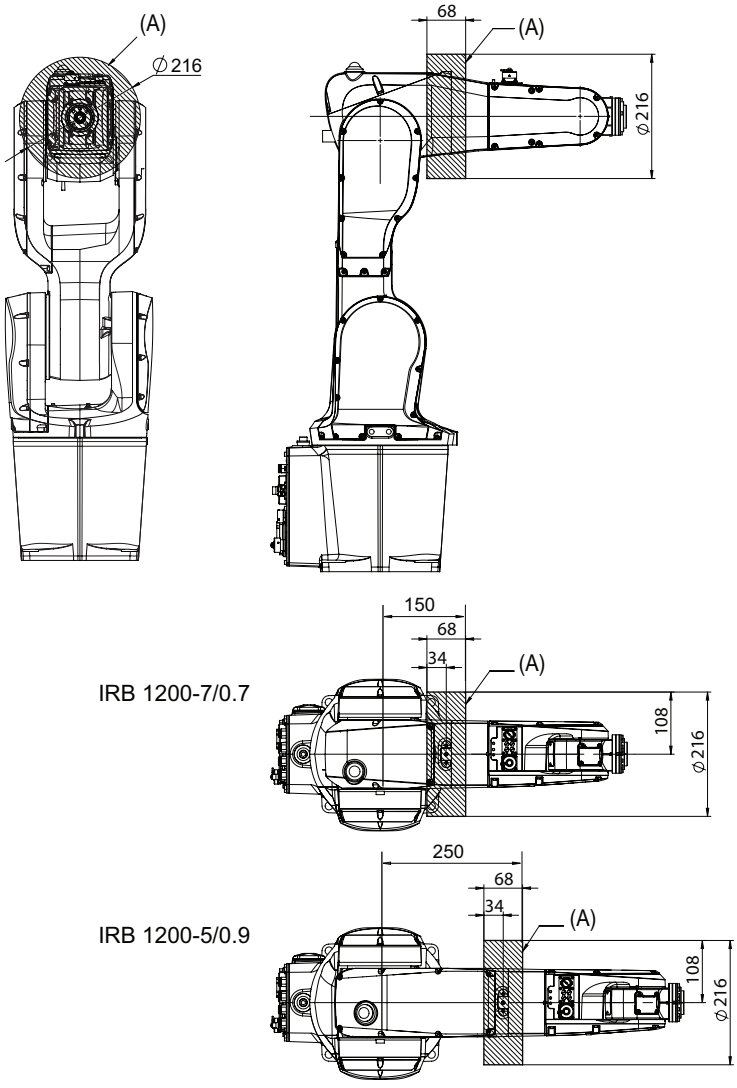
Acceleration levels for E-stop and controlled motion includes acceleration due to gravitational forces. Nominal load is define with nominal mass and cog with max offset in Z and L (see load diagram).

1.5 Fitting of equipment

1.5.1 Introduction to fitting of equipment

General

Extra loads can be mounted on to the upper arm. Definitions of load area and permitted load are shown in figure below. The center of gravity of the extra load shall be within the marked load areas. The robot is supplied with holes for fitting of extra equipment. (See *Holes for fitting extra equipment on page 33*).



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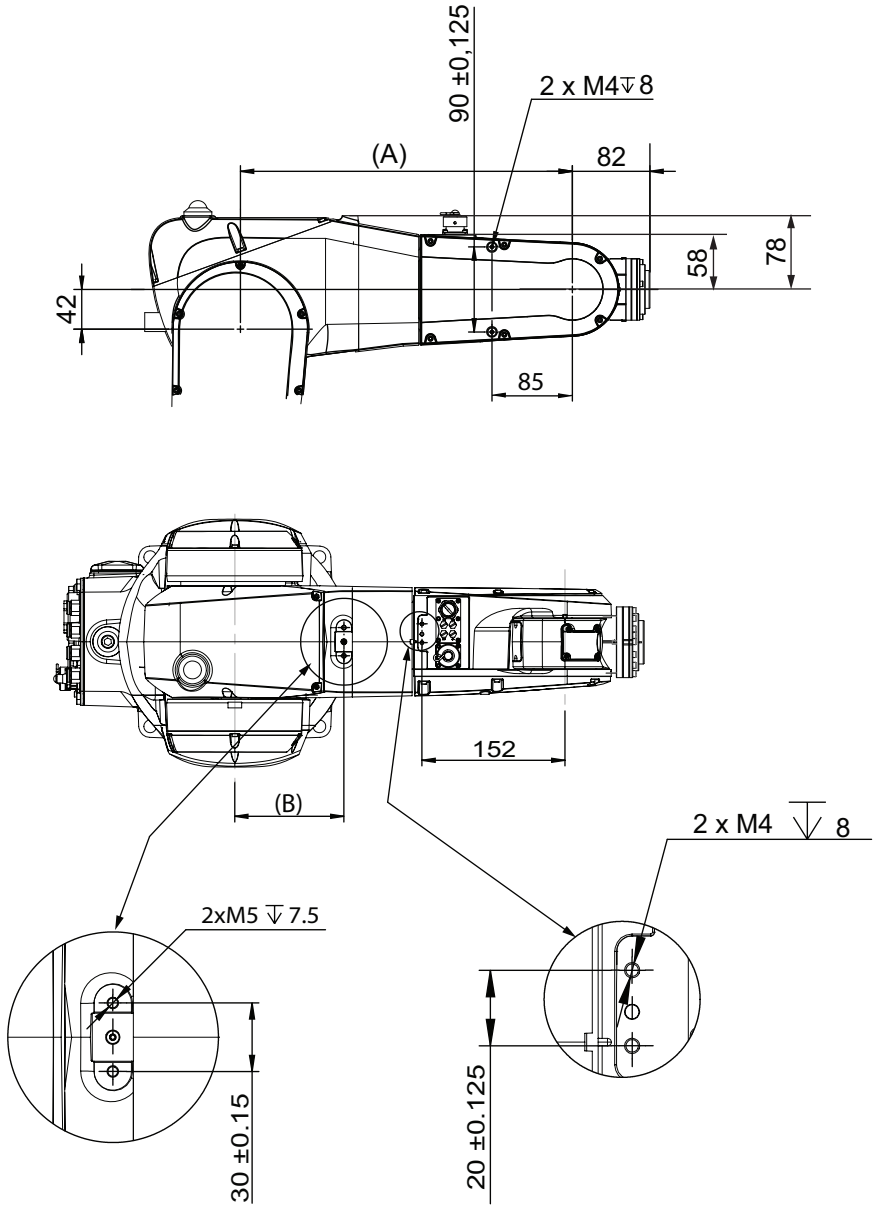
Load area (A)	Max load
IRB 1200-5/0.9	0.3 kg
IRB 1200-7/0.7	

1.5.2 Holes for fitting extra equipment

Upper arm



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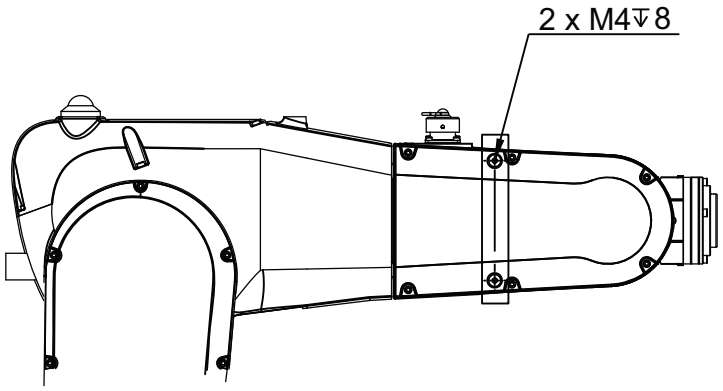
Pos	Description
A	IRB 1200-5/0.9 = 451 mm, IRB 1200-7/0.7 = 351 mm
B	IRB 1200-5/0.9 = 216 mm, IRB 1200-7/0.7 = 116 mm

Continues on next page

1.5.2 Holes for fitting extra equipment
Continued

Note

The two M4 thread holes shown in the following figure are used for fitting the cable harness or air hoses of the tools rather than fitting extra equipment.



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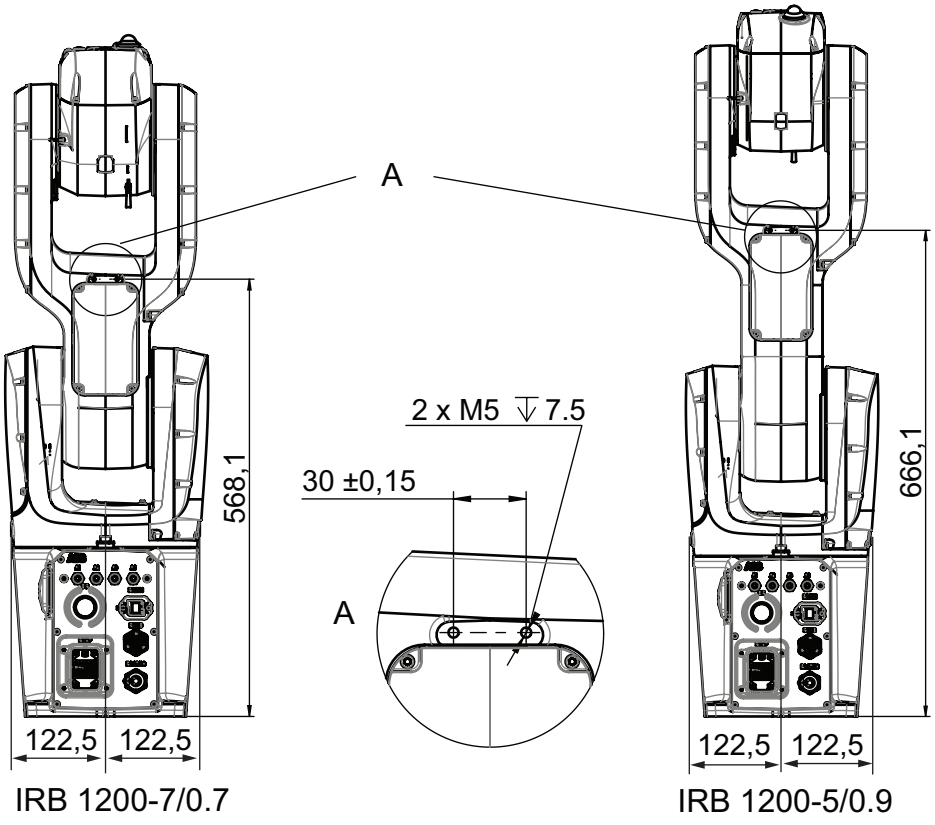
Lower arm



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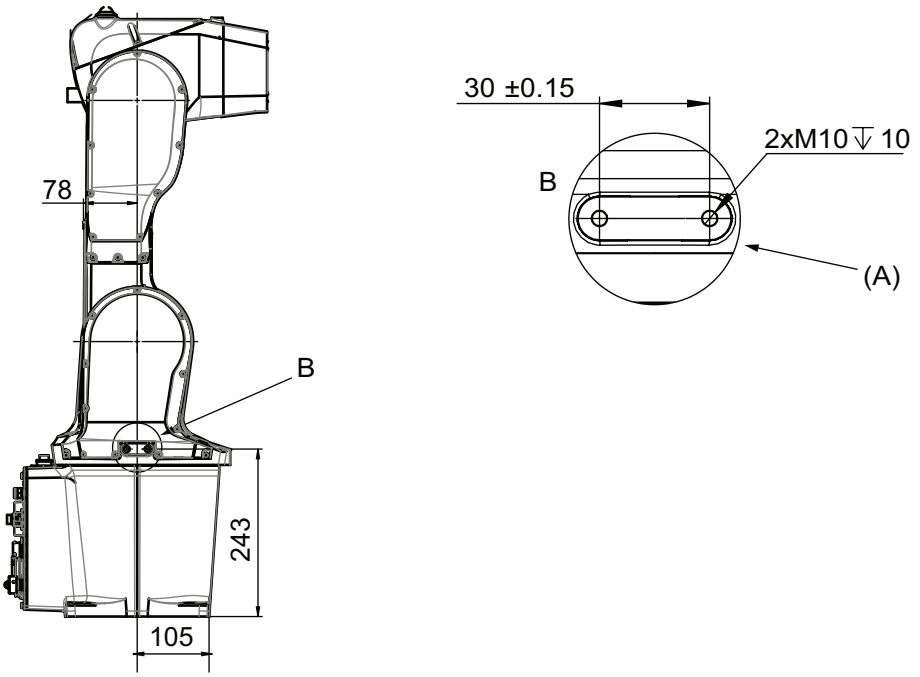
Frame



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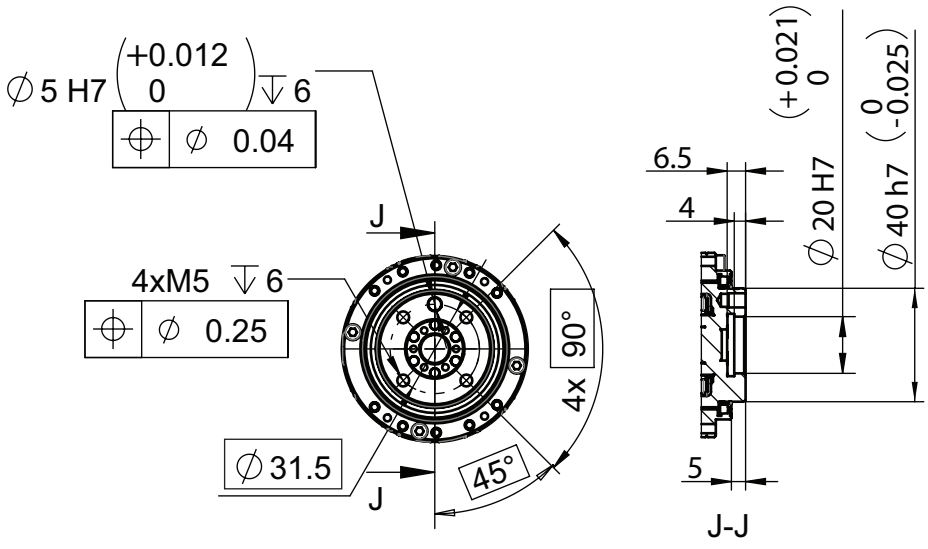
Pos	Description
A	Holes on both sides

Robot tool flange



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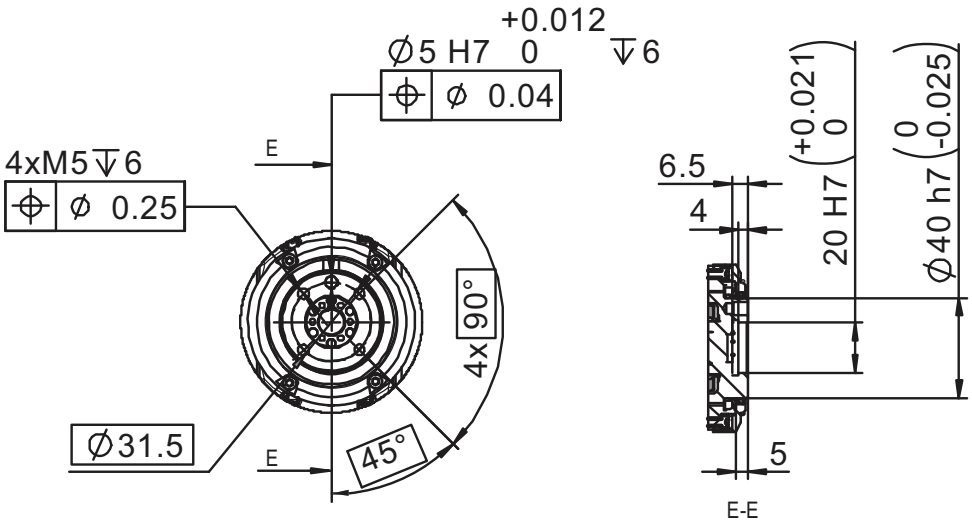
1.5.2 Holes for fitting extra equipment
Continued

Robot tool flange for Foundry Plus robots



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1.6 Calibration

1.6.1 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. For robots with RobotWare 5.04 or older, the calibration data is delivered in a file, calib.cfg, supplied with the robot at delivery. The file identifies the correct resolver/motor position corresponding to the robot home position.	Axis Calibration or manual calibration[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 SMB (serial measurement board) in the robot. For robots with RobotWare 5.05 or older, 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. To regain 100% Absolute accuracy performance, the robot must be recalibrated for absolute accuracy after repair or maintenance that affects the mechanical structure.  xx0400001197	CalibWare

Continues on next page

1.6.1 Calibration methods
Continued

Type of calibration	Description	Calibration method
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 manual calibration 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, manual calibration is used as default.

Brief description of calibration methods

Axis Calibration method

Axis Calibration is a standard calibration method for calibration of IRB 1200 and is the most accurate method for the standard calibration. It is the recommended method in order to achieve proper performance.

The following routines are available for the Axis Calibration method:

- Fine calibration
- Update revolution counters
- 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 following routines are available for the Wrist Optimization method:

- Wrist Optimization

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.

Manual calibration method

With the manual calibration method, the robot's axes are positioned in specific calibration positions using calibration tools. Under this condition, the position of the axis to be calibrated is pre-determined. The axes must be calibrated one at a time.

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*.

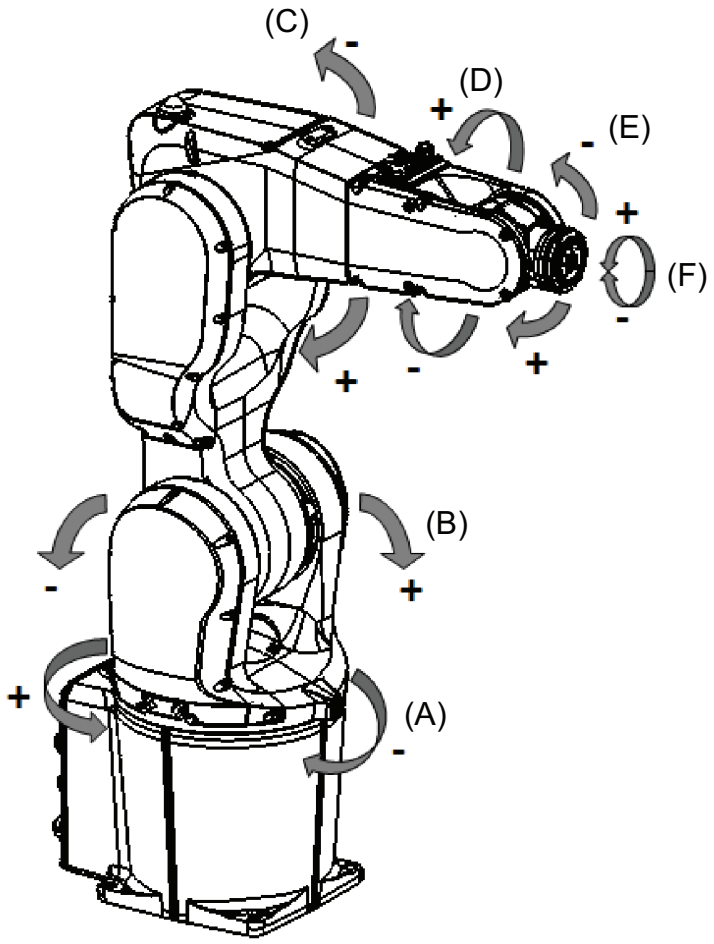
Continues on next page

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.

1.6.2 Fine calibration

General

Fine calibration is made by moving the axes to a fixed position on the frame. For detailed information on calibration of the robot see *Product manual - IRB 1200*.



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

1.6.3 Absolute Accuracy calibration

Purpose

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

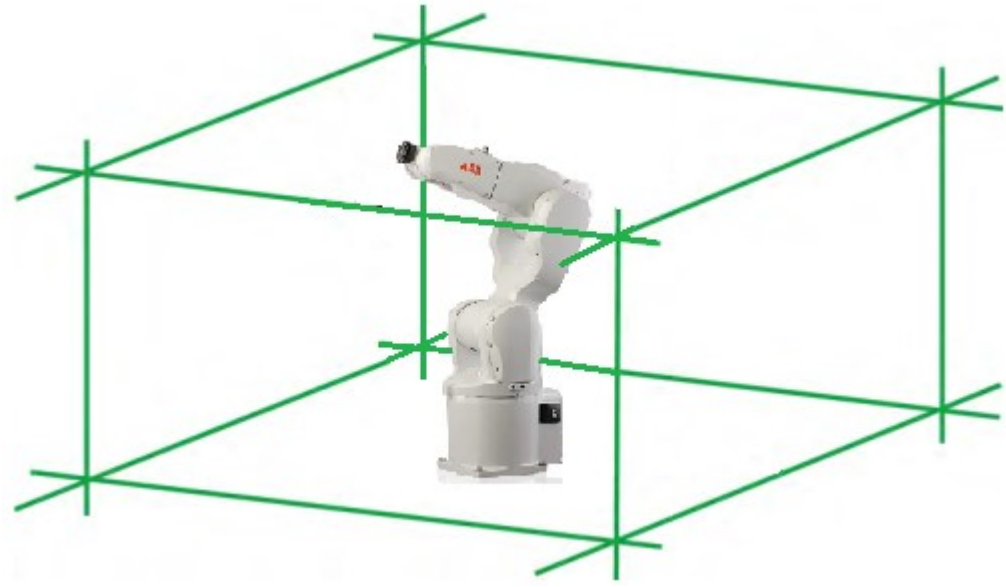
Here are some examples of when this accuracy is important:

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

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

Note

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



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What is included

Every *Absolute Accuracy* robot is delivered with:

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

Continues on next page

1.6.3 Absolute Accuracy calibration
Continued

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

Absolute Accuracy supports both floor mounted and inverted installations. The compensation parameters differ depending on if the robot is floor mounted or inverted.

When is *Absolute Accuracy* being used

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

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

Absolute Accuracy active

Absolute Accuracy will be active in the following cases:

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

Absolute Accuracy not active

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

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

Note

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

RAPID instructions

There are no RAPID instructions included in this option.

Production data

Typical production data regarding calibration are:

Robot	Positioning accuracy (mm)		
	Average	Max	% Within 1 mm
IRB1200-7/0.7	0.13	0.30	100
IRB1200-5/0.9	0.14	0.45	100

1.7 Maintenance and troubleshooting

1.7.1 Introduction to maintenance and trouble shooting

General

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

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

Maintenance

The maintenance intervals depend on the use of the robot, the required maintenance activities also depends on selected options. For detailed information on maintenance procedures, see *Maintenance* section in the *Product Manual - IRB 1200*.

1.8 Robot motion

1.8.1 Working range and type of motion

Robot motion

Location of motion	Type of motion	IRB 1200-7/0.7	IRB 1200-5/0.9
Axis 1	Rotation motion	+170° to -170°	+170° to -170°
Axis 2	Arm motion	+135° to -100°	+130° to -100°
Axis 3	Arm motion	+70° to -200°	+70° to -200°
Axis 4	Wrist motion	+270° to -270°	+270° to -270°
Axis 5	Bend motion	+130° to -130°	+130° to -130°
Axis 6	Turn motion	Default: +400° to -400° Maximum revolution: ±242[i]	Default: +400° to -400° Maximum revolution: ±242[i]

i 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).

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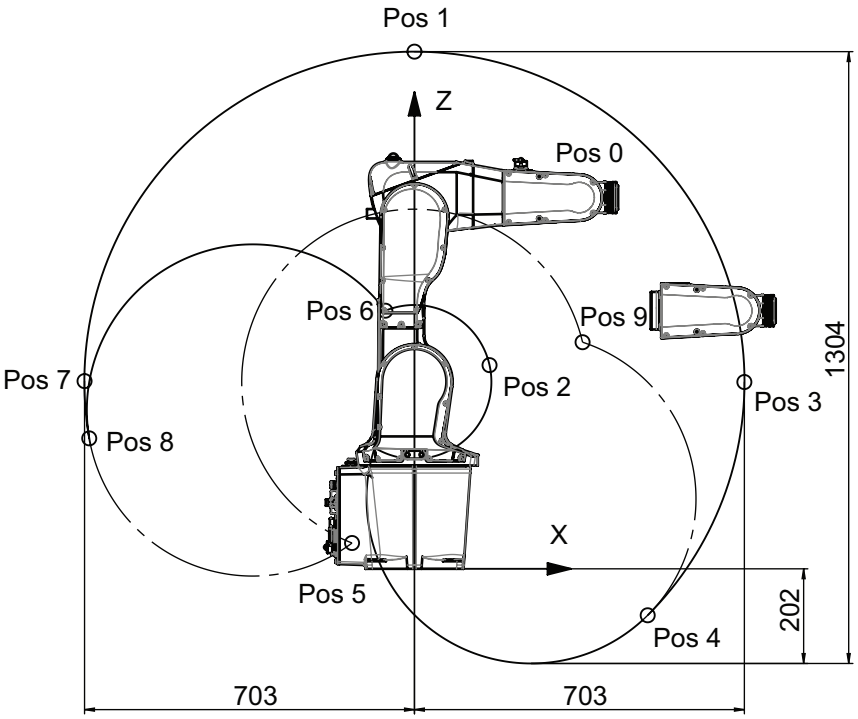
Working range

IRB 1200-7/0.7 Working range, positions at wrist center and angle of axes 2 and 3

The illustration shows the unrestricted working range of the robot.



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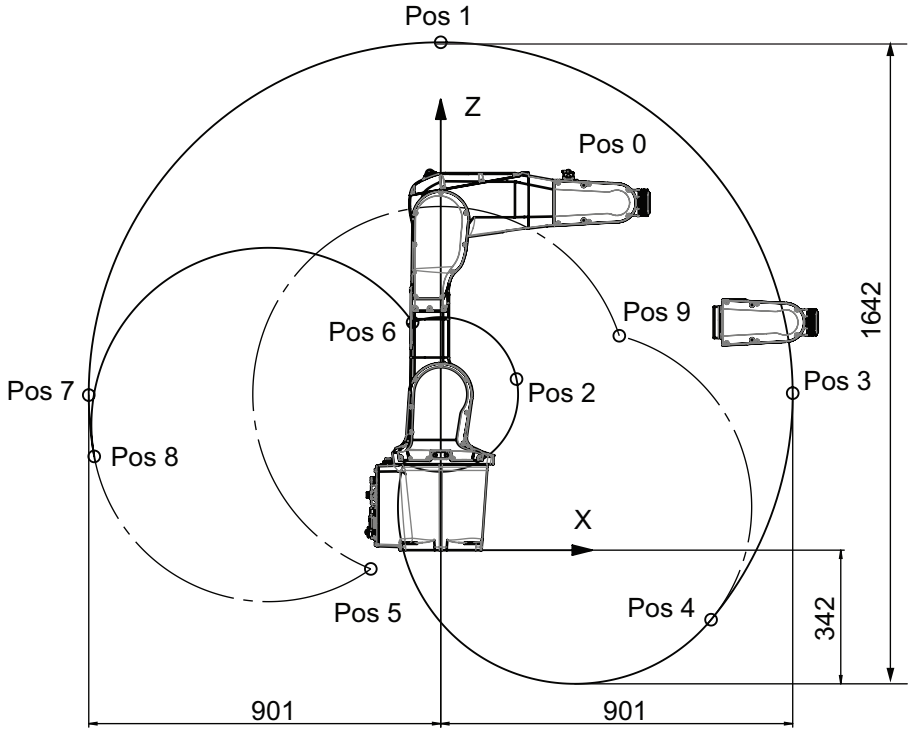
Position in the figure	Positions at wrist center (mm)		Angle (degrees)	
	X	Z	Axis 2	Axis 3
Pos0	351	791	0º	0º
Pos1	0	1102	0º	-83º
Pos2	160	434	0º	+70º
Pos3	703	398	+90º	-83º
Pos4	497	-99	+135º	-83º
Pos5	-133	55	-100º	-200º
Pos6	-62	550	-100º	+70º
Pos7	-703	400	-90º	-83º
Pos8	-693	278	-100º	-83º
Pos9	358	488	+135°	-200°

Continues on next page

1.8.1 Working range and type of motion
Continued

IRB 1200-5/0.9 Working range, positions at wrist center and angle of axes 2 and 3

The illustration shows the unrestricted working range of the robot.



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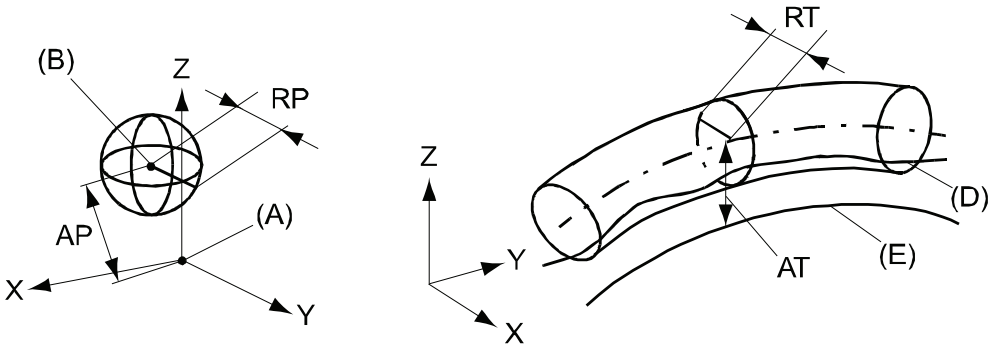
Position in the figure	Positions at wrist center (mm)		Angle (degrees)	
	X	Z	Axis 2	Axis 3
Pos0	451	889	0º	0º
Pos1	0	1300	0º	-85º
Pos2	194	438	0º	+70º
Pos3	901	402	+90º	-85º
Pos4	692	-178	+130º	-85º
Pos5	-179	-48	-100º	-200º
Pos6	-72	583	-100º	+70º
Pos7	-901	397	-90º	-85º
Pos8	-887	240	-100º	-85º
Pos9	458	549	+130°	-200°

1.8.2 Performance according to ISO 9283

General

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

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



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Position	Description	Position	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	Values	
	IRB 1200 - 5/0.9	IRB 1200-7/0.7
Pose repeatability, RP (mm)	0.025	0.02
Pose accuracy, AP (mm)	0.02	0.02
Linear path repeatability, RT (mm)	0.07	0.02
Linear path accuracy, AT (mm)	0.53	0.77
Pose stabilization time, Pst (s) within 0.1 mm of the position	0.113	0.057

1.8.3 Velocity

3-phase power supply

Axis number	1,200-5/0.9	1,200-7/0.7
1	288°/s	288°/s
2	240°/s	240°/s
3	297°/s	297°/s
4	400°/s	400°/s
5	405°/s	405°/s
6	600°/s	600°/s

1-phase power supply

When the robot uses a single phase power supply, like with IRC5 Compact controller, the performance regarding max axis speed is reduced, see table below. The reduced top speed can be increased if the power supply minimum voltage is higher than the default setting 187 V (220x0.85). See the system parameter *Mains tolerance min*, in *Technical reference manual - System parameters*.

Note that the robot acceleration is not affected by the single phase power supply. The cycle time may not be affected at all. RobotStudio can be used to test the cycle. The parameter *Mains tolerance min* can also be modified in RobotStudio.

Axis number	1,200-5/0.9	1,200-7/0.7
1	288°/s	288°/s
2	240°/s	240°/s
3	297°/s	297°/s
4	376°/s	378°/s
5	399°/s	405°/s
6	600°/s	600°/s

Resolution

Approximately 0.01° on each axis.

1.8.4 Stopping distance / time

General

Stopping distance/time for emergency stop (category 0), program stop (category1) and at main power supply failure at max speed, max stretched out and max load, categories according to EN 60204-1. All results are from tests on one moving axis. All stop distances are valid for floor mounted robot, without any tilting.

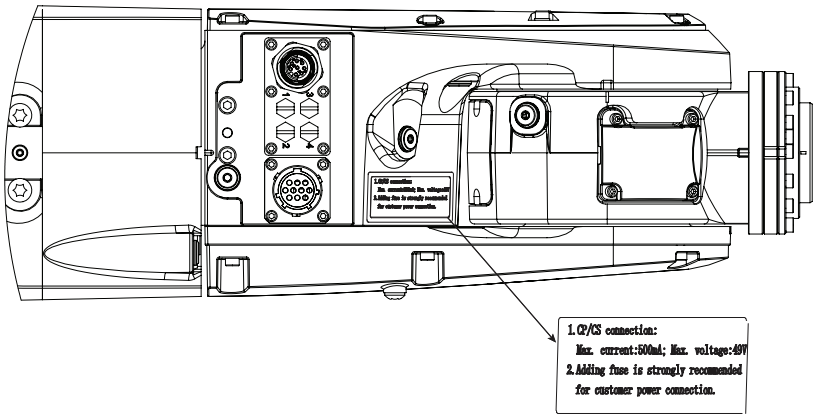
		IRB 1200-7/0.7		IRB 1200-5/0.9	
		Stop time (s)	Stopping distance (º)	Stop time (s)	Stopping distance (º)
Category 0	Axis 1	0.23	36	0.24	49
	Axis 2	0.24	28	0.29	40
	Axis 3	0.21	22	0.34	53
Category 1	Axis 1	0.43	75	0.41	70
	Axis 2	0.40	46	0.34	66
	Axis 3	0.40	34	0.36	53
Main power failure	Axis 1	0.25	49	0.25	42
	Axis 2	0.22	29	0.31	54
	Axis 3	0.31	34	0.21	33

1.9 Customer connections

Introduction to customer connections

The cables for customer connection are integrated in the robot and the connectors are placed on the tubular housing (upper arm) and one at the base. There is one connector R4.CP/CS at the tubular housing. Corresponding connector R1.CP/CS is located at the base.

It is recommended to use a fuse protector for customer connection; otherwise, application overload will burn out the CP/CS cables in the robot. Detailed information about the CP/CS connection is provided in a warning label on the tubular housing.



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There is also connections for Ethernet, one connector R4.Ethernet at the tubular housing and the corresponding connector R1.Ethernet located at the base.

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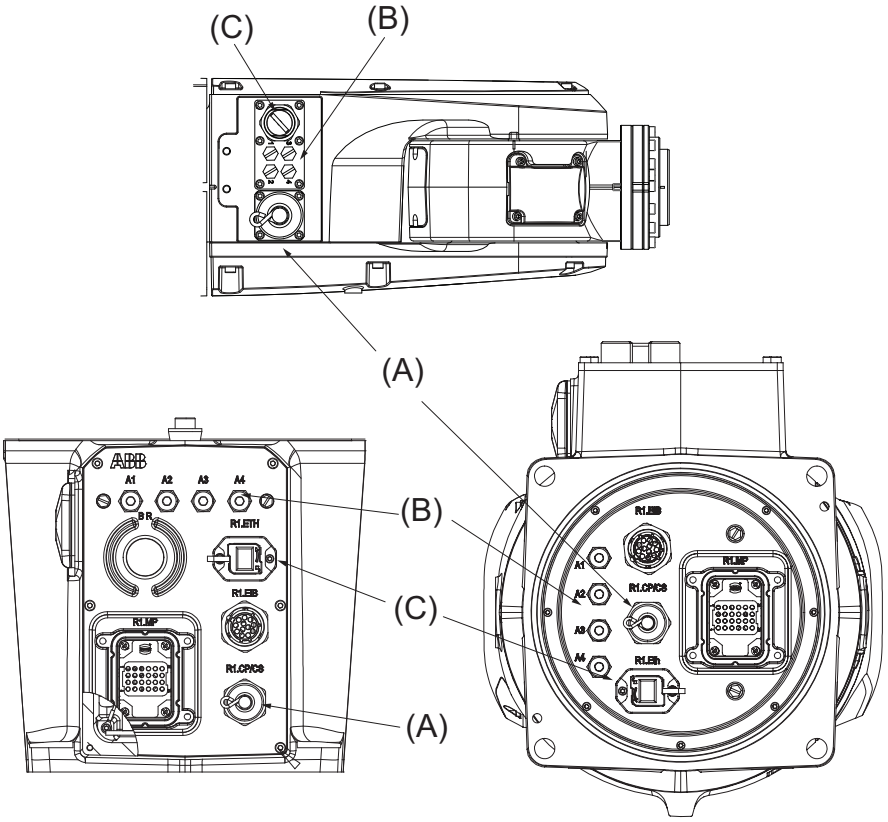
Hose for compressed air is also integrated into the manipulator. There are 4 inlets at the base (R1/8”) and 4 outlets (M5) on the tubular housing.



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Position	Connection	Description	Number	Value
A	(R1)R4.CP/CS	Customer power/signal	10	49 V, 500 mA
B	Air	Max. 5 bar	4	Inner hose diameter 4 mm
C	(R1)R4.Ethernet	Customer Ethernet	8	100/10 Base-TX

Connectors

The tables describes the connectors on base and tubular housing (upper arm).

Connectors, base

Position	Description	Art. no.
Robot	Pin connector 10p, bulkhead	3HAC022117-002
Customer connector	Connector set R1.CP/CS	3HAC037038-001

Connectors, tubular housing

Position	Description	Art. no.
Robot	Socket connector 10p, flange mounted	3HAC023624-002
Customer connector	Connector set R3.CP/CS	3HAC037070-001

Continues on next page

1.9 Customer connections
Continued

Air, connector

Position	Description	Art. no.
Robot	4xM5	
Customer cable	Air connector	3HAC032049-001

2 Specification of variants and options

2.1 Manipulator

General

The different variants and options for the IRB 1200 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.

Manipulator variant [435]

Option	Handling capacity (kg)	Reach (m)
435-121	7 kg	0.7 m
435-122	5 kg	0.9

Manipulator color [209]

General

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.

Note

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

Colors

Option	Color	RAL code
209-1	ABB Orange	RAL7032
209-2	ABB White	RAL 9003
209-202	ABB Graphite White (**Standard color**)	RAL7012
209-4	Green beige	RAL1000
209-5	Beige	RAL1001
209-6	Sand yellow	RAL1002
209-7	Signal yellow	RAL1003
209-8	Golden yellow	RAL1004
209-9	Honey yellow	RAL1005
209-10	Maize yellow	RAL1006
209-11	Daffodil yellow	RAL1007
209-12	Brown beige	RAL1008
209-13	Lemon yellow	RAL1009

Continues on next page

Protection [287]

Clean Room [287-1]

The Clean Room classification ISO 14644-1 is according to IPA.

Clean room robots are designed in order to prevent from particle emission from the robot. For example is, frequent maintenance work possible to perform without cracking the paint. The robot is painted with four layers of polyurethane paint. The last layer being a varnish over labels in order to simplify cleaning. The paint has been tested regarding outgassing of Volatile Organic Compounds (VOC) and been classified in accordance with ISO 14644-8.

- Class 5 according to ISO 14644-1, when operated at a capacity of 50%.
- Class 4 according to ISO 14644-1, when operated at a capacity of 100%.
- Clean Room always in white color.
- 

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Foundry Plus 2 [287-3]

ABB Foundry Plus 2 makes your entire robot IP67 compliant, from base to wrist meaning that the electrical compartments are sealed against liquid and solid contaminants. But it takes more than IP67 to ensure long-term trouble-free operation and long service life.

ABB Foundry Plus 2 robots are unique due to their improved resistance to corrosion and capability to withstand high pressure steam washing. No other foundry robots are up to this task today. See *Protection type Foundry Plus 2 on page 11* for a complete description.

Standard [287-4]

Standard protection IP54.

IP66/67 [287-10]

The robot has IP67 as an option. The option will add sealing, machining parts and gasket.

Continues on next page

Warranty

Description

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

Note

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

Option	Type	Description
438-1	Standard warranty	Standard warranty is 12 months from *Customer Delivery Date* or latest 18 months after *Factory Shipment Date*, whichever occurs first. Warranty terms and conditions apply.
438-2	Standard warranty + 12 months	Standard warranty extended with 12 months from end date of the standard warranty. Warranty terms and conditions apply. Contact Customer Service in case of other requirements.
438-4	Standard warranty + 18 months	Standard warranty extended with 18 months from end date of the standard warranty. Warranty terms and conditions apply. Contact Customer Service in case of other requirements.
438-5	Standard warranty + 24 months	Standard warranty extended with 24 months from end date of the standard warranty. Warranty terms and conditions apply. Contact Customer Service in case of other requirements.
438-6	Standard warranty + 6 months	Standard warranty extended with 6 months from end date of the standard warranty. Warranty terms and conditions apply.
438-7	Standard warranty + 30 months	Standard warranty extended with 30 months from end date of the standard warranty. Warranty terms and conditions apply.
438-8	Stock warranty	Maximum 6 months postponed start of standard warranty, starting from factory shipment date. Note that no claims will be accepted for warranties that occurred before the end of stock warranty. Standard warranty commences automatically after 6 months from *Factory Shipment Date* or from activation date of standard warranty in WebConfig. **Note** Special conditions are applicable, see *Robotics Warranty Directives*.

Continues on next page

Food grade lubrication [777-1]

> **Note**
>
> This option requires option 287-1.

The robot has food grade lubrication (NSF H1) as an option. The protection type for robots with food grade lubrication is Clean Room and IP67.

Media & communication

Parallel & Air [803-1]

Parallel communication and air.

Includes:

- customer power/signal CP/CS
- customer air

EtherNet, Parallel & Air [803-2]

Ethernet, parallel communication and air.

Includes:

- customer power/signal CP/CS
- customer air
- PROFINET, EtherNet/IP™

Connector kits

Connector kit [431-1]

For the connectors on the upper arm, customer connection.

To simplify making customer cable for external equipment, the option connector kits, consists of connectors, pins and sockets fitting customer power (CP) and customer signals (CS) located on the upper arm.

Connector kit [239-1]

For the connectors on the foot.

To simplify making customer cable for external equipment, the option connector kits, consists of connectors, pins and sockets fitting customer power (CP) and customer signals (CS) located on the base.

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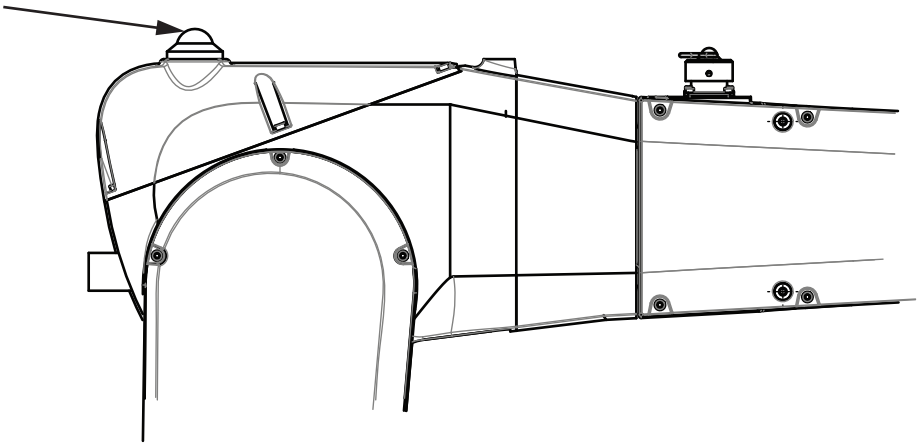
Safety lamp [213-1]

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.



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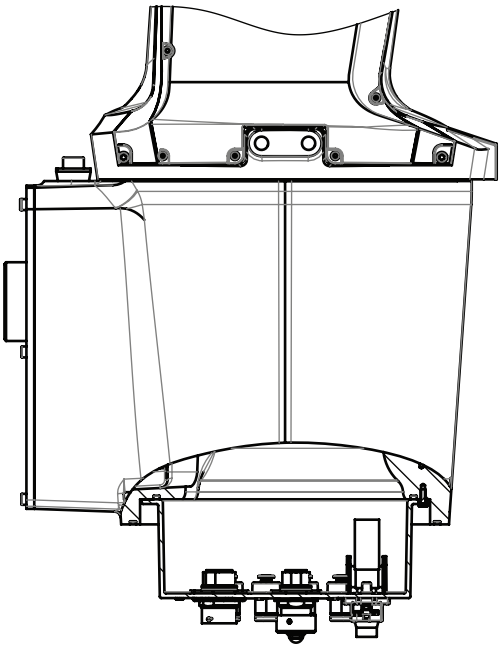
Robot cabling routing

Under the base [966-1]

Manipulator cables routed from below, underneath the base of the manipulator.



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3 Accessories

3.1 Introduction to accessories

General

There is a range of tools and equipment available.

Basic software and software options for robot and PC

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

Robot peripherals

- Motor Units[1]

[1] Not applicable for IRC5 Compact controller.

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Index

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