Product specification
IRB 4400

Product specification

IRB 4400/60
IRB 4400/L10

Document ID: 3HAC042478-001

Revision: L-ongoing

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Overview of this product specification

About this product specification

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

- The structure and dimensions prints
- The fulfillment of standards, safety and operating requirements
- The load diagrams, mounting or 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.	3HAC048264-001
Product specification - Controller software IRC5 IRC5 with main computer DSQC1000 and RobotWare 6.	3HAC050945-001
Product manual - IRB 4400	3HAC022032-001
Product specification - Robot user documentation, IRC5 with RobotWare 6	3HAC052355-001

Revisions

Revision	Description
-	• Replaces 3HAC9117-1 (English), 3HAC10768-1 (French), 3HAC10395-1 (German), 3HAC10782-1 (Spanish), and 3HAC10761-1 (Italian) • Table for ambient temperature adjusted • Text for Foundy Prime updated
A	• Machinery directive updated
B	• General updates and minor corrections

Overview of this product specification

Continued

Revision	Description
C	• General updates and minor corrections • Option Foundry Prime removed • Figure for mounting equipment changed
D	• Text for ISO test adjusted • IRB 4400/L10 added
E	• Minor updates/corrections
F	• Text for Foundry Plus updated.
G	• Drawing main dimension for IRB 4400/L10 updated
H	• Minor corrections/updates
J	• RT and AT adjusted after new ISO measurement
K	• Values changed, see *Performance according to ISO 9283 on page 36* • Screw size of IRB 4400 changed to M20 • Restriction of load diagram added
L	• Updated list of applicable standards. • Drawing view of mounting holes for extra equipment added.

1 Description

1.1 Structure

1.1.1 Introduction to structure

Robot family

The IRB 4400 is a 6-axis industrial robot, designed specifically for manufacturing industries that use flexible robot-based automation. The robot has built-in process ware, an open structure that is specially adapted for flexible use, and can communicate extensively with external systems.

Operating system

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

Safety

Safety standards valid for complete robot, manipulator and controller.

Additional functionality

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

Foundry Plus

Foundry Plus

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 robot. The Foundry Plus robot is painted with two-component epoxy on top of a primer for corrosion protection. To further improve the protection additional preventive measures are applied to exposed and crucial areas. Continuous splashing of water or other similar rust formation fluids may case corrosion 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.The entire robot is IP67 compliant according to IEC 60529 - from base

1 Description

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 features:

- Improved sealing to prevent penetration into cavities to secure IP67

- Additional protection of cabling and electronics

- Special covers protecting cavities

- Well-proven connectors

- Rust preventives on screws, washers and unpainted/machined surfaces

- Extended service and maintenance program

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 protection, for example can rust preventive be washed off with wrong cleaning method.

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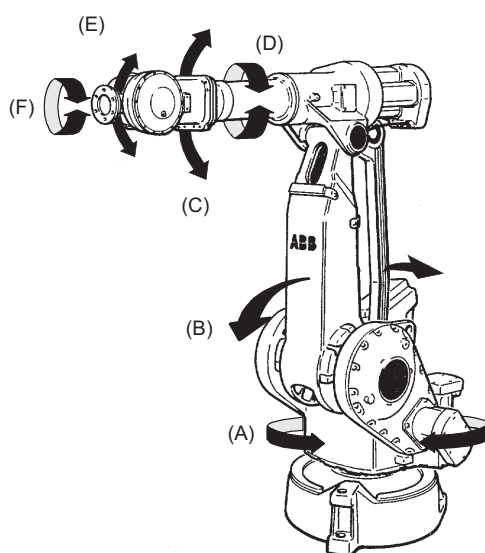
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Pos	Description	Pos	Description
A	Axis 1	B	Axis 2
C	Axis 3	D	Axis 4
E	Axis 5	F	Axis 6

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1.1.2 Different robot versions

General

The IRB 4400 is available in two variants, to be floor mounted (no tilting allowed around X-axis or Y-axis).

Robot type	Handling capacity (kg)	Reach (m)
IRB 4400/60	60	1.96
IRB 4400/L10	10	2.55

Manipulator weight

Robot type	Weight
IRB 4400/60	1040 kg
IRB 4400/L10	1040 kg

Other technical data

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

Power consumption at max load

Type of Movement	IRB 4400/60	IRB 4400/L10
ISO Cube Max. velocity	1.33 kW	1.28 kW

xx0900001012

Pos	Description
A	630 mm [i]

[i] 1000 mm valid for IRB 4400/L10

1 Description

Dimensions IRB 4400/60

xx1100000598

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xx1100000608

xx1100000599

1 Description

Dimensions IRB 4400/L10

xx1300002623

1.2 Standards

1.2.1 Applicable standards

> **ℹ️ 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.

Standards, EN ISO

The product is designed in accordance with the requirements 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
EN ISO 10218-1:2011	Robots for industrial environments - Safety requirements -Part 1 Robot
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 60204-1:2006	Safety of machinery - Electrical equipment of machines - Part 1 General requirements
IEC 60529:1989 + A2:2013	Degrees of protection provided by enclosures (IP code)

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

European standards

Standard	Description
EN 614-1:2006 + A1:2009	Safety of machinery - Ergonomic design principles - Part 1: Terminology and general principles

1.2.1 Applicable standards
Continued

Standard	Description
EN 574:1996 + A1:2008	Safety of machinery - Two-hand control devices - Functional aspects - Principles for design

Other standards

Standard	Description
ANSI/RIA R15.06	Safety requirements for industrial robots and robot systems
ANSI/UL 1740	Safety standard for robots and robotic equipment
CAN/CSA Z 434-14	Industrial robots and robot Systems - General safety requirements

1.3 Installation

1.3.1 Introduction to installation

General

The IRB 4400 is designed for floor mounting (no tilting allowed around X-axis or Y-axis). A end effector of max. weight 10 to 60 kg, including payload, can be mounted on the mounting flange (axis 6). See section Load diagrams.

Extra loads

Extra loads can be mounted on the upper arm and on the base. There are holes for mounting extra equipment, see section Mounting equipment.

Working range limitations

The working range of axes 1-2 can be limited by mechanical stops and axis 3 by limit switches. Electronic Position Switches can be used on all axes for position indicator of manipulator.

1.3.2 Operating requirements

Protection standards

Robot version	Protection Standard IEC60529
Standard manipulator	IP54
Foundry Plus manipulator	IP67, Steam washable

Explosive envirnments

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

Ambient temperature

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

[i]   At low environmental temperature < 10° C is, as with any other machine, a warm-up phase is 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.

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 in relation to the base coordinate system

Maximum load IRB 4400

Floor Mounted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	± 7500 N	± 9000 N
Force z	+9500 ± 2000 N	+9500 ± 3000 N
Torque xy	± 14000 Nm	± 16000 Nm
Torque z	± 2000 Nm	± 4000 Nm
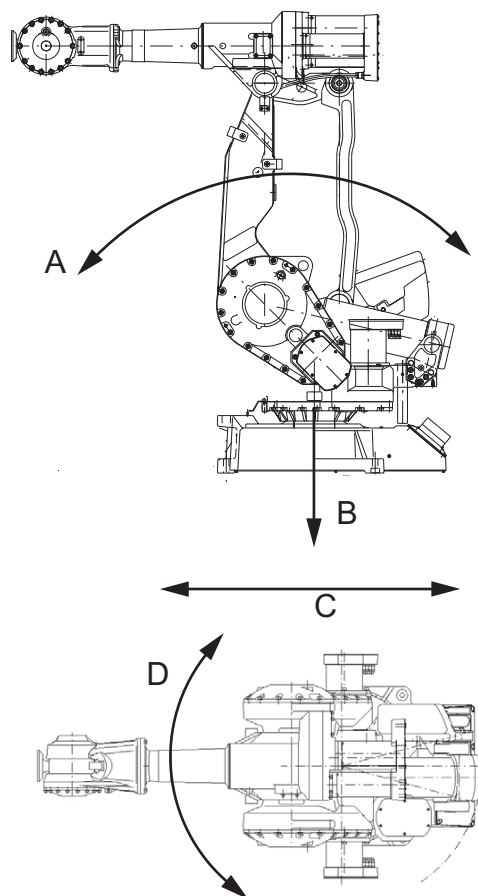
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A	Torque$_{xy}$ (T$_{xy}$)
B	Force $_z$ (F$_z$)
C	Force $_{xy}$ (F$_{xy}$)
D	Torque $_z$ (T$_z$)

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$_{xy}$).

Fastening holes robot base
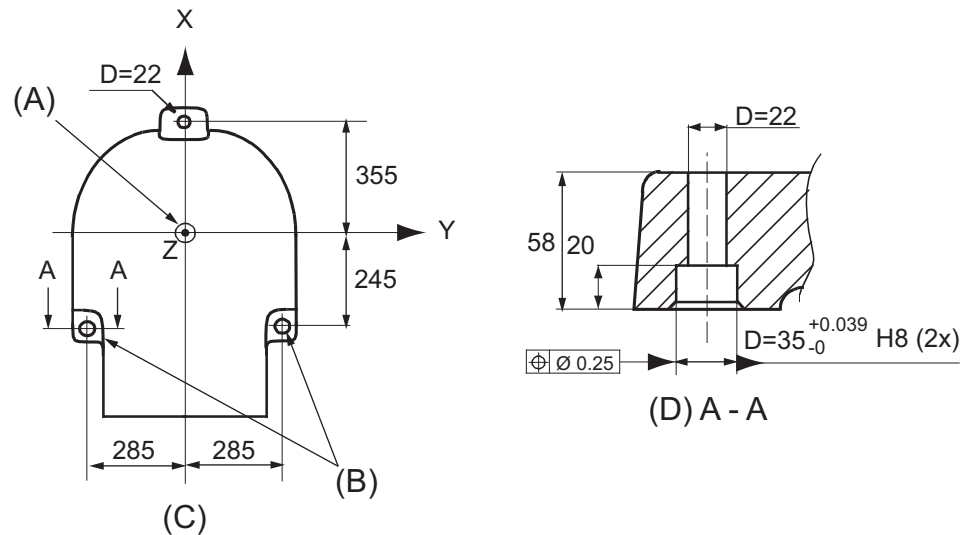
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Pos	Description
A	Z= center line
B	The same dimensions
C	View from bottom of the base
D	Section

Mounting surface and bushings
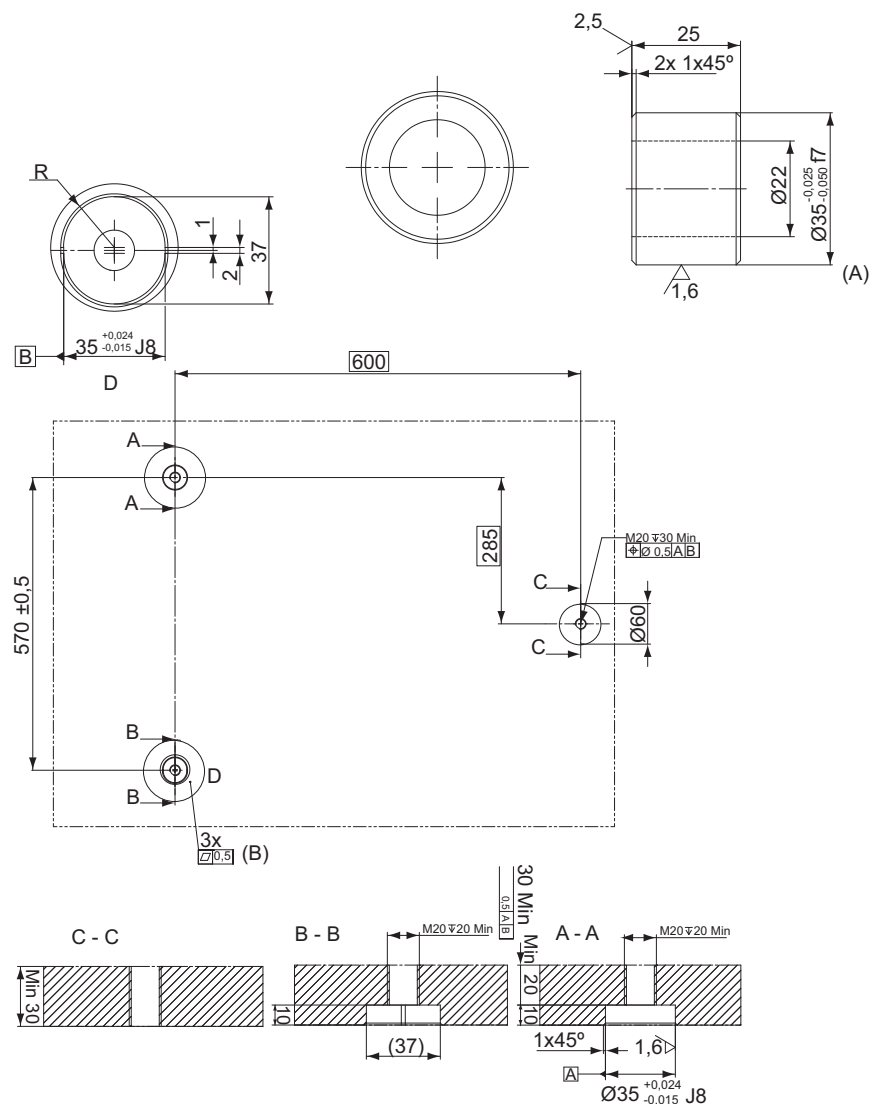
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Pos	Description
A	Surface treatment, ISO 2081 Fe/Zn 8 c2 Guide bushings
B	Common zone

1.4 Calibration and references

1.4.1 Fine calibration

General

Fine calibration is made using the Calibration Pendulum, see *Operating manual - Calibration Pendulum*.
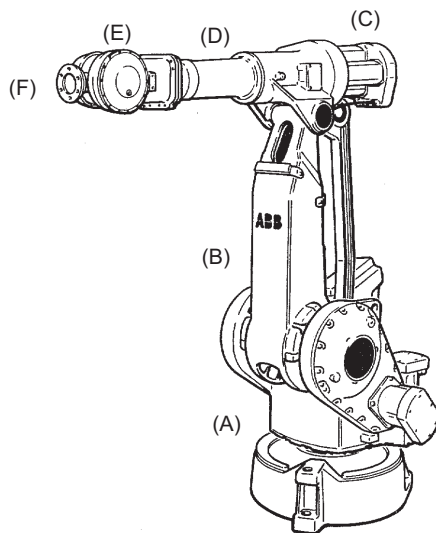
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Pos	Description	Pos	Description
A	Axis 1	B	Axis 2
C	Axis 3	D	Axis 4
E	Axis 5	F	Axis 6

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

1.4.2 Absolute Accuracy calibration

General

Requires RobotWare option *Absolute Accuracy*, see *Product specification - Controller software IRC5* for more details.

The calibration concept

Absolute Accuracy (AbsAcc) is a calibration concept, which ensures a TCP absolute accuracy of better than ±1 mm in the entire working range.

Absolute accuracy compensates for:

- Mechanical tolerances in the robot structure
- Deflection due to load

Absolute accuracy calibration is focusing on positioning accuracy in the cartesian coordinate system for the robot. It also includes load compensation for deflection caused by the tool and equipment. Tool data from robot program is used for this purpose. The positioning will be within specified performance regardless of load.

Calibration data

The user is supplied with robot calibration data (compensation parameter file, absacc.cfg) and a certificate that shows the performance (Birth certificate). The difference between an ideal robot and a real robot without AbsAcc may reach up to 8 mm, resulting from mechanical tolerances and deflection in the robot structure. If there is a difference, at first start-up, between calibration data in controller and the robot SMB, correct by copying data from SMB to controller.

1.4.2 Absolute Accuracy calibration
Continued

Absolute Accuracy option

The Absolute Accuracy option is integrated in the controller algorithms for compensation of this difference and does not need external equipment or calculation. Absolute Accuracy is a RobotWare option and includes an individual calibration of the robot (mechanical arm). Absolute Accuracy is a TCP calibration in order to reach a good positioning in the Cartesian coordinate system.
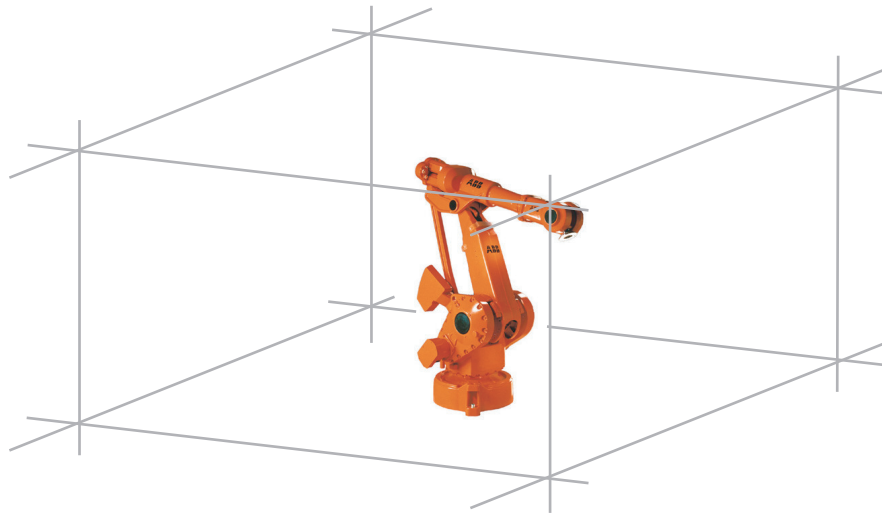
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Product data

Typical production data regarding calibration are:

Robot	Positioning accuracy (mm)		
	Average	Max	% Within 1 mm
IRB 4400/60 IRB 4400/L10	0.30	0.75	100

1.5 Load diagrams

1.5.1 Introduction to load diagrams

Information

> ⚠️ **WARNING**
>
> It is very important to always define correct actual load data and correct payload of the robot. Incorrect definitions of load data can result in overloading of the robot.
>
> If incorrect load data 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. Please see *Operating Manual - IRC5 with FlexPendant*, art. No. 3HAC16590-1, for detailed information.

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

General

Maximum own moment of inertia on the total handle weigth = 2.5 kgm^2 valid for IRB 4400/60 and $\leq$ 0.040 kgm^2 vaild for IRB 4400/L10. 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.
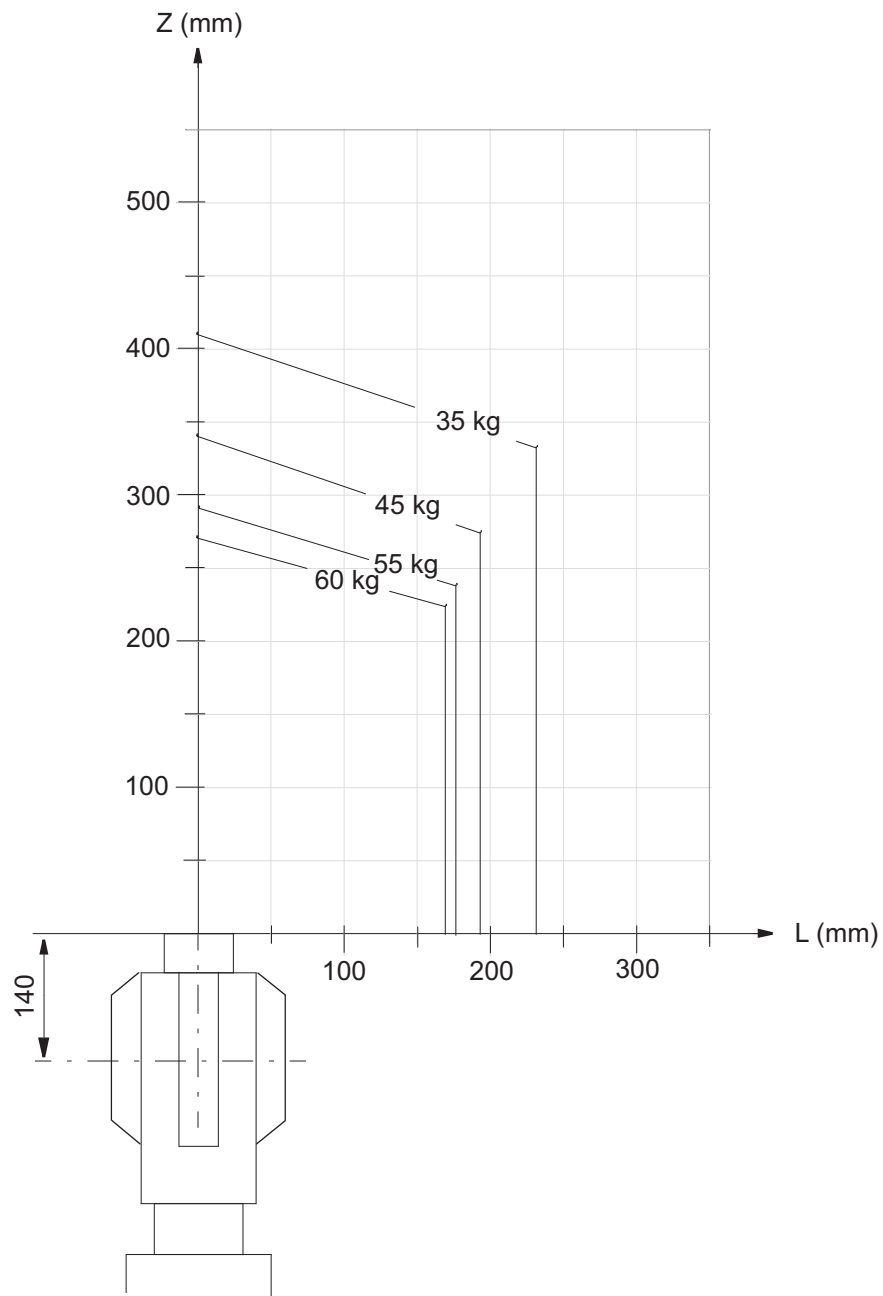
1 Description

Load diagram IRB 4400/60

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Load diagram IRB 4400/L10
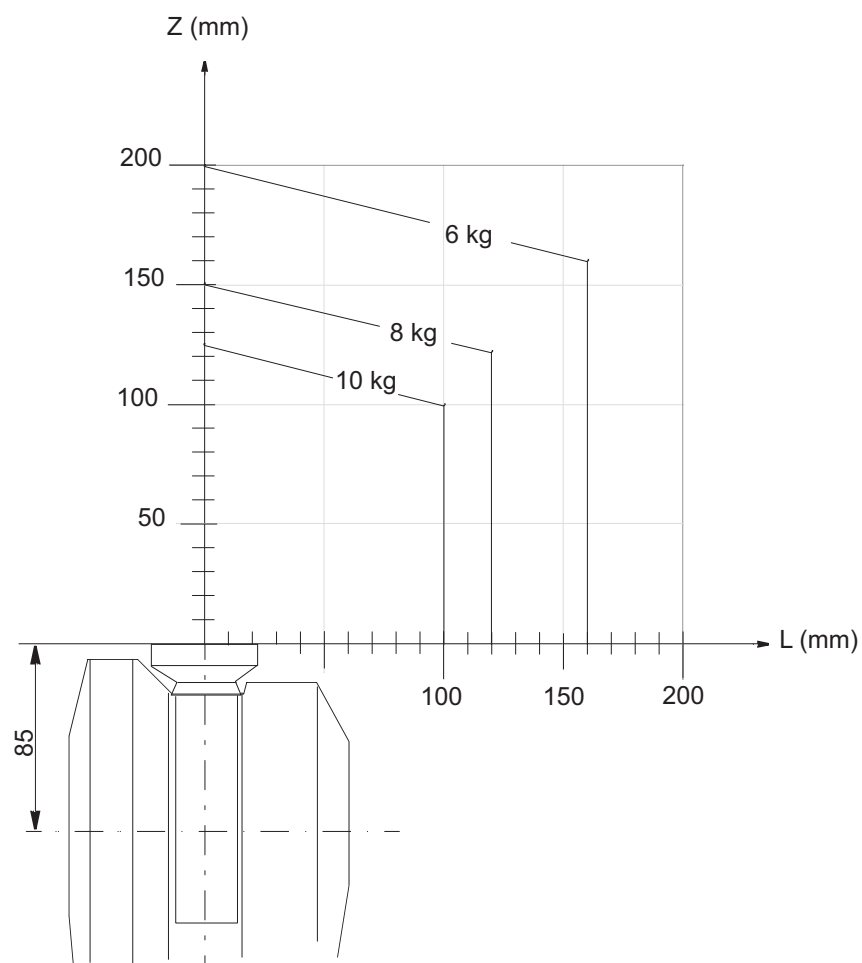
1.5.2 Maximum load and moment of inertia for full and limited axis 5 movement

Information

> ℹ️ **Note**
>
> Total load given as: Mass in kg, center of gravity (Z and L) in meter and moment of inertia (J_{ox} J_{oy} J_{oz}) in kgm^2. $L = sqr(x^2 + y^2)$.

Full movement of axis 5 ($\pm 120^o$)

Axis	Robot type	Maximum moment of interia
5	IRB 4400/60	$Ja5 = Load \times ((Z + 0{,}14^2 + L^2) + max(J_{0x}, J_{0y}) \leq 30.0\ kgm^2$
6	IRB 4400/60	$Ja6 = Load \times L^2 + J_{0Z} \leq 17.5\ kgm^2$

Axis	Robot type	Maximum moment of interia
5	IRB 4400/L10	$Ja5 = Load \times ((Z + 0{,}085^2 + L^2) + max(J_{0x}, J_{0y}) \leq 1.15\ kgm^2$
6	IRB 4400/L10	$Ja6 = Load \times L^2 + J_{0Z} \leq 0.70\ kgm^2$
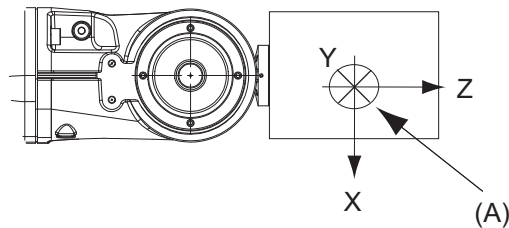
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1.5.3 Wrist torque

Maximum torque due to payload

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

> **ℹ 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, please contact your local ABB organization.

Robot type	Max wrist torque axis 4 and 5	Max wrist torque axis 6	Max torque valid at load
IRB 4400/60	242 Nm	98.9 Nm	60 kg
IRB 4400/L10	20.6 Nm	9.81 Nm	10 kg

1.6 Mounting equipment

Upper arm and base

The robot is supplied with tapped holes on the upper arm and on the base for mounting extra equipment.

IRB 4400/60
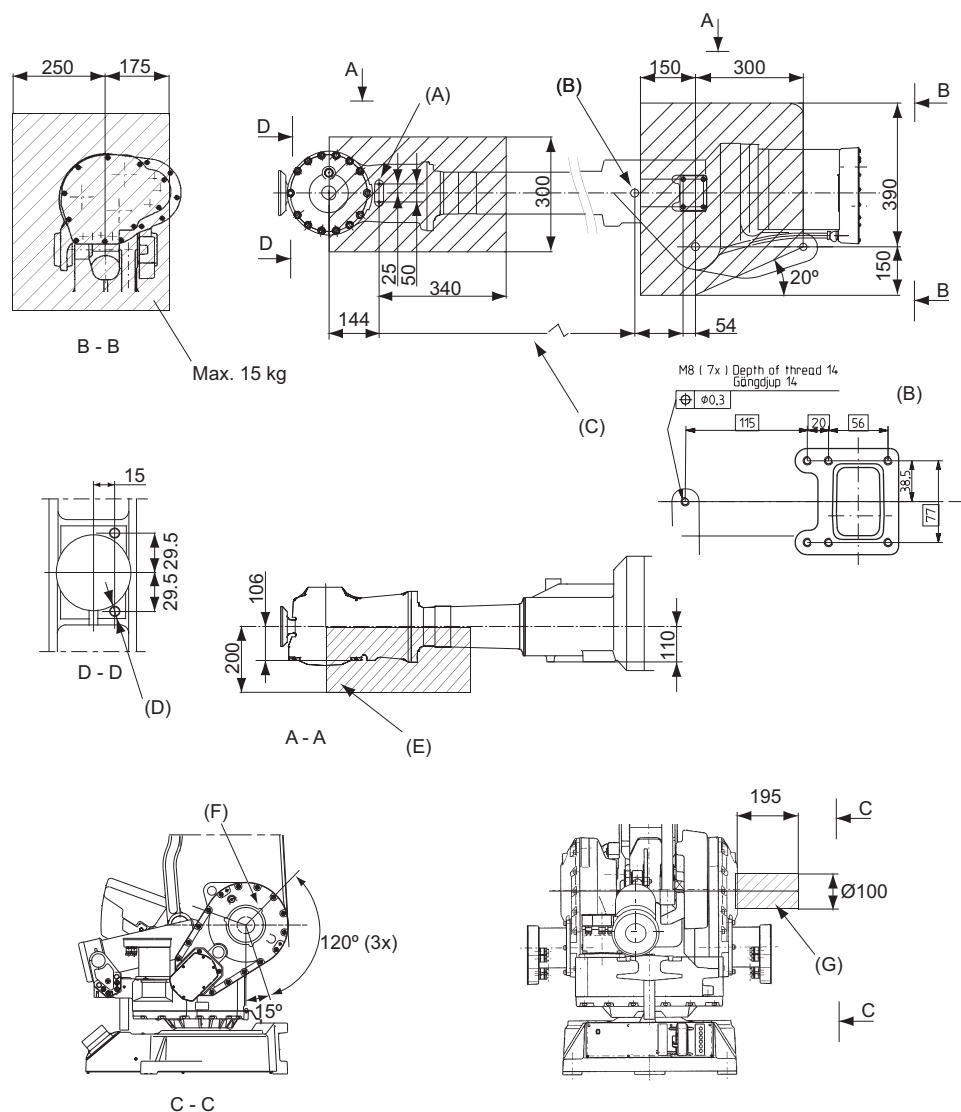
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Pos	Description
A	M8 (x2) Used if option 218-6 is chosen, depth of thread 9 mm
B	M8 (x3) Depth of thread 14 mm
C	571 mm
D	M6 (2x) tapped depth 12 mm
E	Max. 5 kg at max handling weight

Continues on next page

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Pos	Description
F	M8 (x3) R= 92 mm, depth 16 mm (if option 34-1 is chosen these holes are occupied)
G	Max. 35 kg

IRB 4400/L10
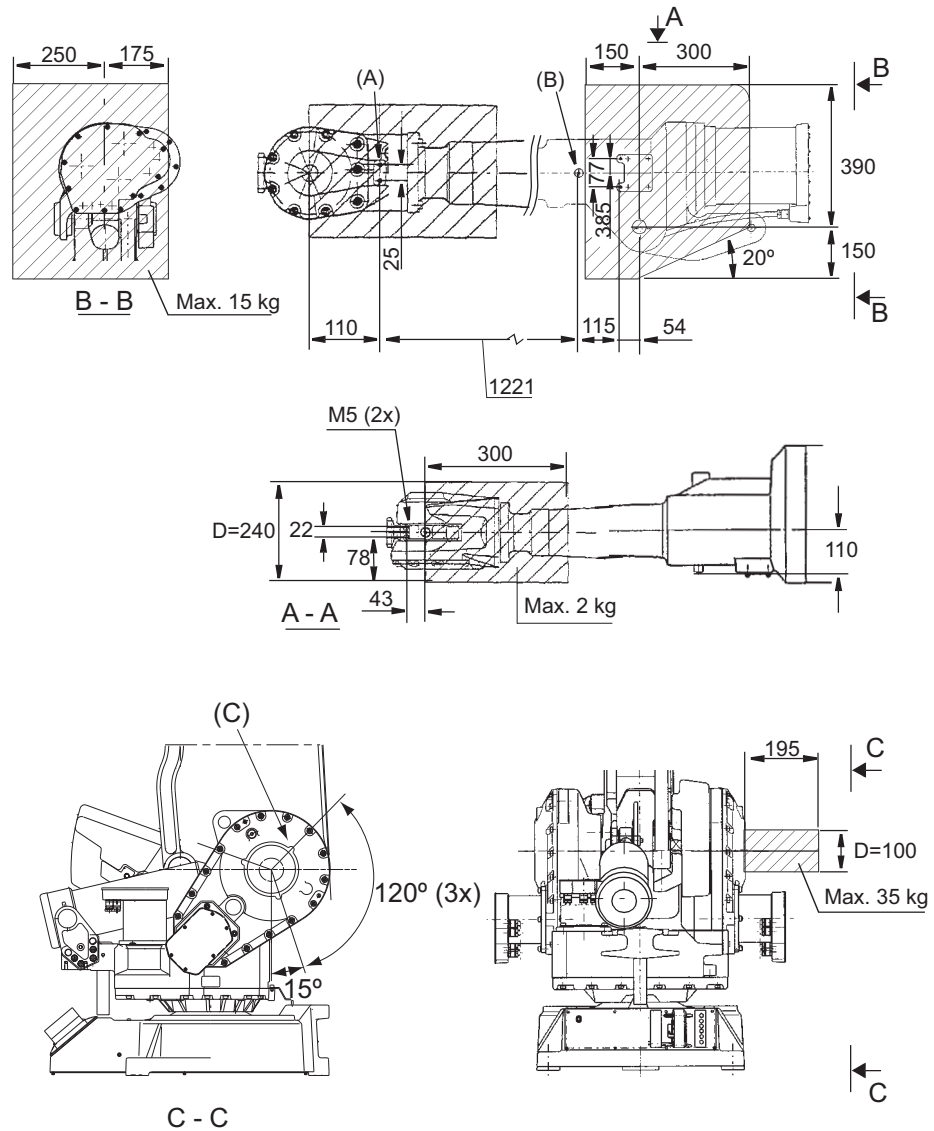
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Pos	Description
A	M8 (x2), depth of thread 9 mm
B	M8 (x3) Depth of thread 14 mm
C	M8 (x3) R= 92 mm, depth of thread 16 mm (If option 34-1 is chosen these holes are occupied)

> **Note**
>
> Maximum loads must never be exceeded!

Tool flange

IRB 4400/60
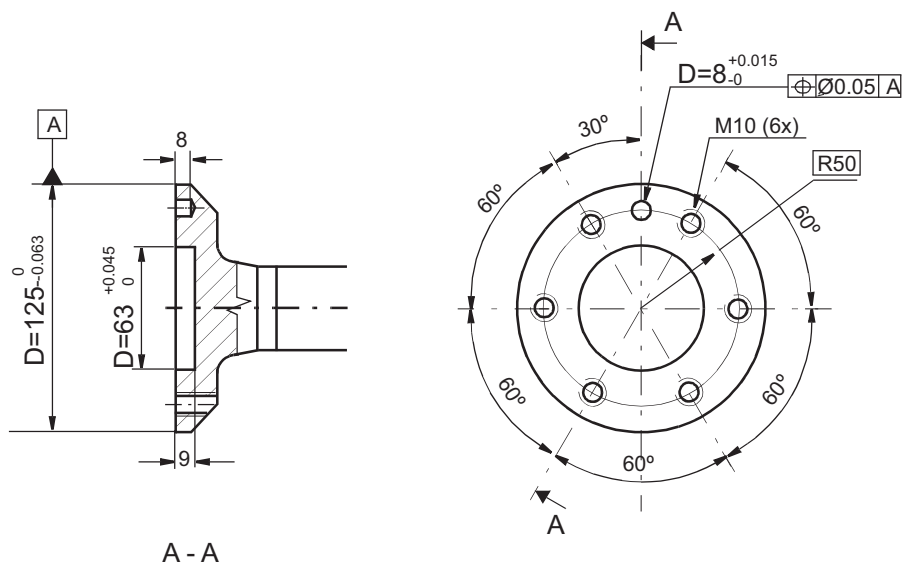
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IRB 4400/L10
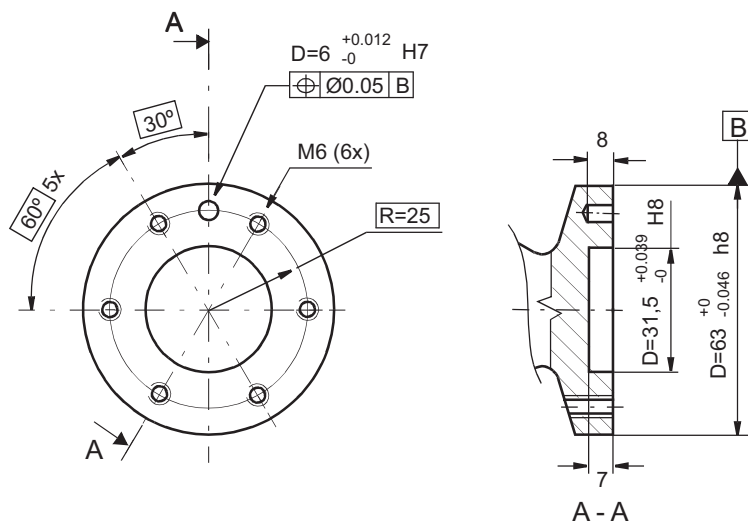
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For fastening of gripper tool flange to Robot tool flange every one of the screw holes for 6 screws, quality class 12.9 shall be used. Min. 10 mm used thread length.

1.7 Maintenance and troubleshooting

General

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

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

Maintenance

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

1.8 Robot motion

Introduction to robot motion

Axis	Type of motion	Range of movement
1	Rotation motion	+ 165° to - 165°
2	Arm motion	+ 95° to - 70°
3	Arm motion	+ 65° to - 60°
4	Rotation motion	+ 200° to - 200°
5	Bend motion	+ 120° to - 120°
6	Turn motion	+ 400° to - 400°
		+ 200 [i] rev. [ii] to - 200 rev. Max. [iii]

[i]   + 183 rev to - 183 rev valid for IRB 4400/L10

[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).

IRB 4400/60
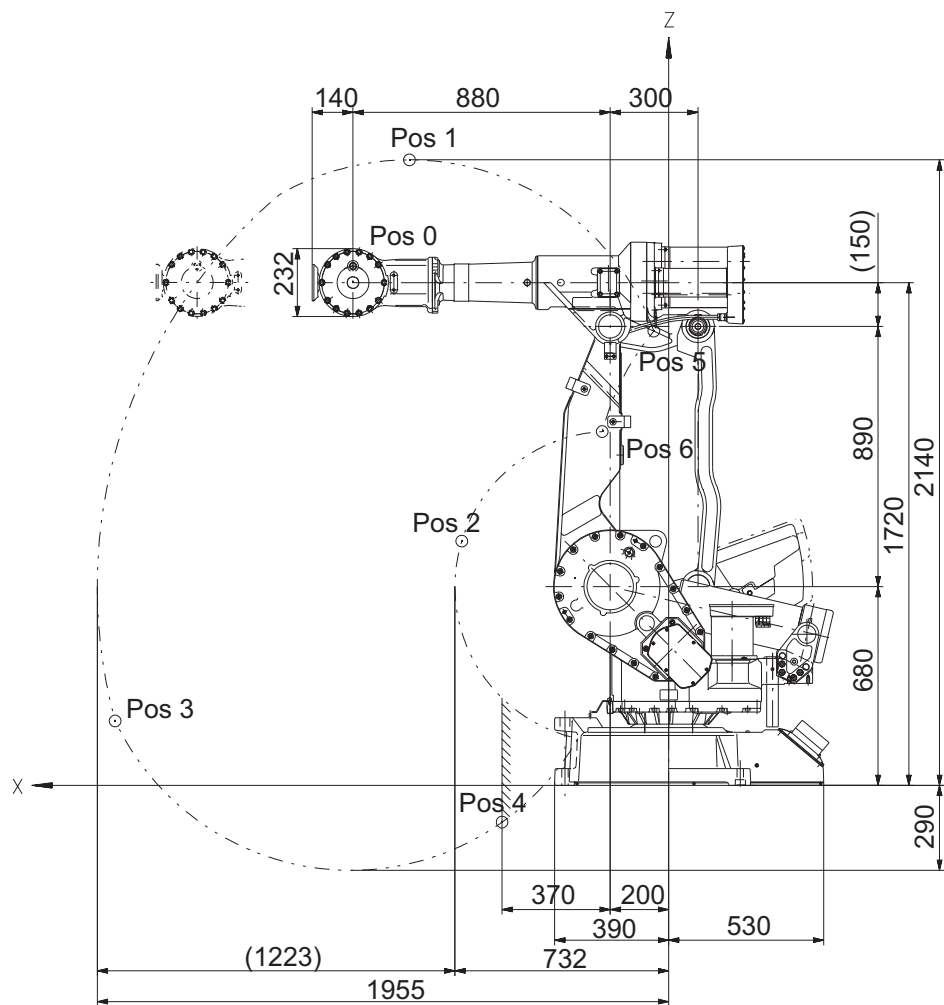
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Positions at wrist center (mm) and angle (degrees):

Position no (see figure above)	Position (mm) X	Position (mm) Z	Angle (degrees) Axis 2	Angle (degrees) Axis 3
0	1080	1720	0	0
1	887	2140	0	-30
2	708	836	0	65
3	1894	221	95	-60
4	570	-126	95	40
5	51	1554	-70	40
6	227	1210	-70	65

IRB 4400/L10

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Positions at wrist center (mm) and angle (degrees):

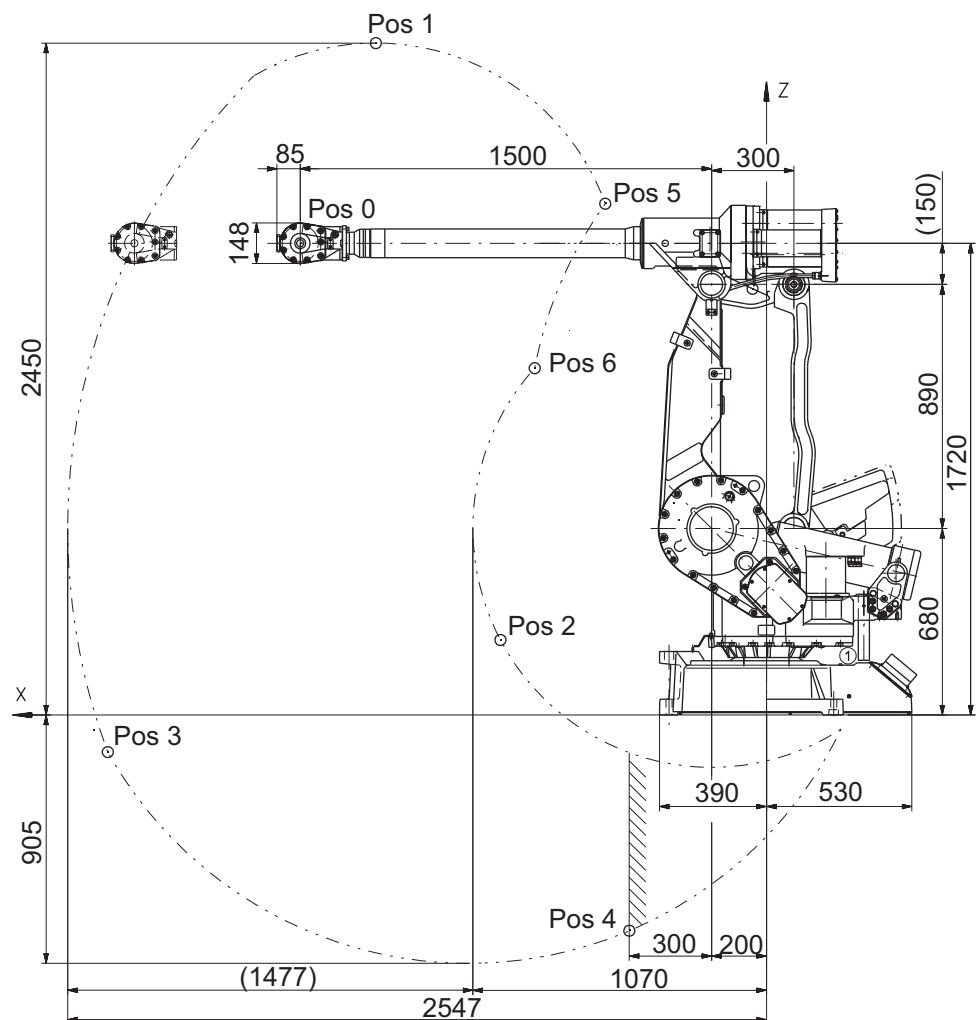| Position no (see figure above)	Position (mm) X	Position (mm) Z	Angle (degrees) Axis 2	Angle (degrees) Axis 3
0	1700	1720	0	0

Position no (see figure above)	Position (mm) X	Position (mm) Z	Angle (degrees) Axis 2	Angle (degrees) Axis 3
1	1424	2450	0	-30
2	970	274	0	65
3	2401	-135	95	-60
4	500	-786	95	24
5	588	1864	-70	40
6	845	1265	-70	65

Performance according to ISO 9283

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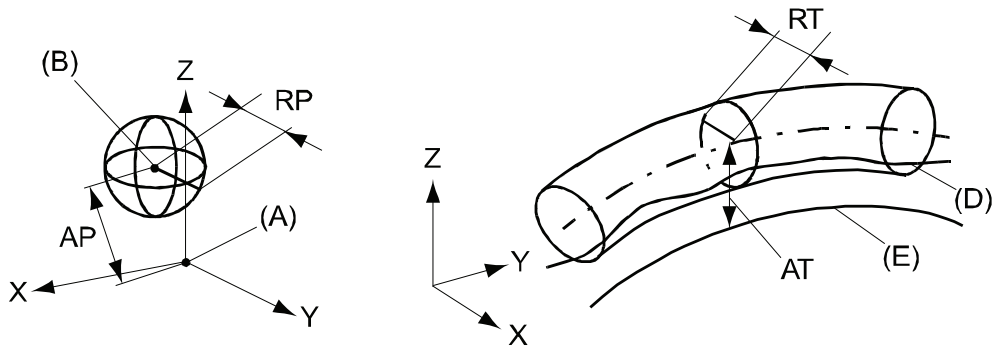
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Pos	Description	Pos	Description
A	Programmed position	E	Programmed path
B	Mean position at program execution	D	Actual path at program execution
AP	Mean distance from programmed position	AT	Max deviation from E to average path
RP	Tolerance of position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

Description	IRB 4400/60	IRB 4400/L10
Pose repeatability, RP (mm)	0.05	0.05
Pose accuracy, AP[i] (mm)	0.03	0.04
Linear path repeatability, RT[ii] (mm)	0.05	0.16
Linear path accuracy, AT[ii] (mm)	0.36	0.34

Continues on next page

Description	IRB 4400/60	IRB 4400/L10
Pose stabilization time, (PSt) to within 0.2 mm of the position (s)	0.27	0.25

[i]   AP according to the ISO teset above, is the difference between the reached position (position manually modified in the cell) and the average potition obtained during program execution

[ii] The values AT and RT, for IRB 4400/60, are measured at a velicity of 250 mm/s

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

Velocity

Maximum axis speed

Robot type	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6
IRB 4400/60	150 °/s	120 °/s	120 °/s	225 °/s	250 °/s	330 °/s
IRB 4400/L10	150 °/s	150 °/s	150 °/s	370 °/s	330 °/s	381 °/s

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

Axis resolution

Approx. 0.01° on each axis.

Stopping distance/time

Stopping distance/time for emergency stop (category 0), program stop (category1) and at mains 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.

Robot type		Category 0		Category 1		Main power failure	
	Axis	A	B	A	B	A	B
IRB 4400/60	1	65	0.9	84	1.0	76	0.9
	2	16	0.3	24	0.4	22	0.3
	3	15	0.3	25	0.4	23	0.3

Robot type		Category 0		Category 1		Main power failure	
	Axis	A	B	A	B	A	B
IRB 4400/L10	1	45	0.6	63	0.8	57	0.7
	2	17	0.2	28	0.3	25	0.3
	3	13	0.2	27	0.3	26	0.3

	Description
A	Stopping distance in degrees
B	Stop time (s)

1.9 Signals

To connect extra equipment on the manipulator, there are cables integrated into the manipulator's cabling, one FCI UT07 14 12SH44N connector and one FCI UT07 18 23SH44N connector on the rear part of the upper arm.

Hose for compressed air is also integrated into the manipulator. There is an inlet (R1/4") at the base and an outlet (R1/4") on the rear part of the upper arm.

Type	Quantity	Value
Signals	23	50 V, 250 mA
Power	10	250 V, 2 A
Air	1	Max. 8 bar, inner hose diameter 8 mm

2 Specification of variants and options

2.1 Introduction to variants and options

General

The different variants and options for the IRB 4400 are described in the following sections. The same option numbers are used here as in the specification form.

Related information

For the controller see *Product specification - Controller IRC5*.

For the software options see *Product specification - Controller software IRC5*.

2.2 Manipulator

Variants

Option	IRB Type	Handling capacity (kg) / Reach (m)
435-38	IRB 4400/60	60/1.96
435-41	IRB 4400/L10	10/2.55

Manipulator color

Option	Description	Note
209-1	ABB Orange standard	
209-2	ABB White standard	
209-202	ABB Graphite White standard	Standard color
209-	The robot is painted with the chosen RAL-color.	

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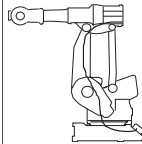> Notice that delivery time for painted spare parts will increase for none standard colors.

Protection

Option	Description
287-4	Standard

Continues on next page

Product specification - IRB 4400
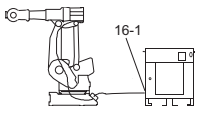3HAC042478-001 Revision: L-ongoing

Option	Description
287-3	**Foundry Plus**
	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 robot. The Foundry Plus robot is painted with two-component epoxy on top of a primer for corrosion protection. To further improve the protection additional preventive measures are applied to exposed and crucial areas. Continuous splashing of water or other similar rust formation fluids may case corrosion 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.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 features:
	- Improved sealing to prevent penetration into cavities to secure IP67
	- Additional protection of cabling and electronics
	- Special covers protecting cavities
	- Well-proven connectors
	- Rust preventives on screws, washers and unpainted/machined surfaces
	- Extended service and maintenance program
	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 protection, for example can rust preventive be washed off with wrong cleaning method.

Media Interface

Air supply and signals for extra equipment to upper arm.

Option	Description	
218-8	Integrated hose and cables for connection of extra equipment on the manipulator to the rear part of the upper arm.	

Application interface connection to

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

[i] Note! In a IRC5 MultiMove application additional robots have no Control Module. The screw terminals with internal cabling are then delivered separately to be mounted in the main robot Control Module or in another encapsulation, for example a PLC cabinet.

Connector kit

Detached connectors, suitable to the connectors for the application interface and position switches.

The kit consists of connectors, pins and sockets.

Option	Description
431-1	For the connectors on the upper arm if application interface, option 218-8 or option 218-6.
239-1	For the connectors on the foot if connection to manipulator, option 16-2.

Safety lamp

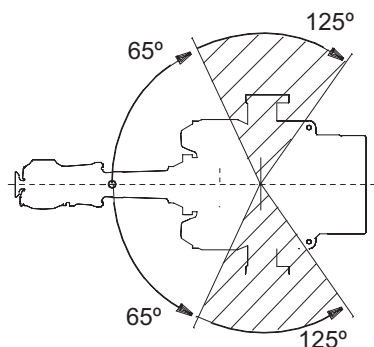| Option	Description
213-1	A safety lamp with an orange fixed light can be mounted on the manipulator. The lamp is active in MOTORS ON mode. The safety lamp is required on a UL/UR approved robot.

Electronic Position Switches (EPS)

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

Working range limit - axis 1

To increase the safety of the robot, the working range of axis 1 can be restriced.

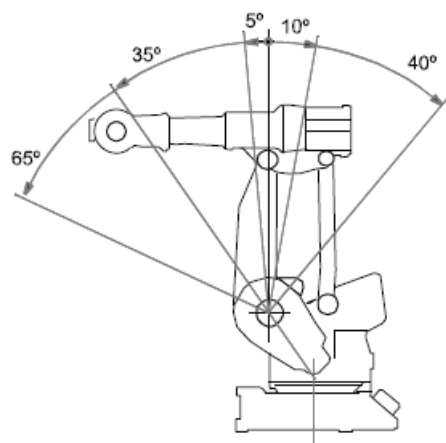| Option	Description
28-1	Axis 1 Two extra stops for restricting the working range. The stops can be mounted within the area from 65° to 125°. See figure below.

xx1100000605

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Working range - axis 2

To increase the safety of the robot, the working range of axis 2 can be restricted.

Option	Description
32-1	Axis 2 Stop lugs for restricting the working area. The figure below illustrates the mounting positions of the stops.

xx1100000597

Working range - axis 3

To increase the safety of the robot, the working range of axis 3 can be restricted.

Option	Description
34-1	Axis 3 Equipment for electrically restricting the working range in increments of 5°.

Warranty

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.

Option	Type	Description
438-6	Standard warranty + 6 months	Standard warranty extended with 6 months from end date of the standard warranty. Warranty terms and conditions apply.
438-7	Standard warranty + 30 months	Standard warranty extended with 30 months from end date of the standard warranty. Warranty terms and conditions apply.
438-8	Stock warranty	Maximum 6 months postponed start of standard warranty, starting from factory shipment date. Note that no claims will be accepted for warranties that occurred before the end of stock warranty. Standard warranty commences automatically after 6 months from *Factory Shipment Date* or from activation date of standard warranty in WebConfig. **Note** Special conditions are applicable, see *Robotics Warranty Directives*.

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2.3 Positioners

General

Regarding positioners, see *Product specification - IRBP /D2009, 3HAC038208-001*.

2.4 Track motion

General

Regarding track motion, see Product Specification 2HEA802965-001.

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2.5 Floor cables

2.5.1 Manipulator

Manipulator cable length

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

Connection of Parallel communication

Option	Lengths
94-1	7 m
94-2	15 m
94-4	30 m

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3 Accessories

3.1 Introduction to accessories

General

There is a range of tools and equipment available, especially designed for the manipulator.

Basic software and software options for robot and PC

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

Robot peripherals

- Track Motion
- Motor Units
- Positioners

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