ROBOTICS

Product specification

IRB 460

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Product specification
IRB 460-110/2.4

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Original instructions.

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Table of contents

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Overview of this product specification

About this product specification

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

- The structure and dimensional prints
- The fulfilment of standards, safety and operating requirements
- The load diagrams, mounting of extra equipment, the motion and the robot reach
- The specification of variant and options available

Usage

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

Users

It is intended for:

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

References

Reference	Document ID
Product 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 460	*3HAC039842-001*
Product specification - Robot user documentation, IRC5 with RobotWare 6	*3HAC052355-001*

Revisions

Revision	Description
-	New product specification
A	Minor corrections
B	Table for ambient temperature adjusted
C	• Machinery directive updated • Updated load diagram • Minor corrections
D	• Base plate drawing updated

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Revision	Description
E	• Minor corrections/update • Option 87-1 added
F	• Text for ISO test adjusted •
G	• Graphite white color added
H	• Minor corrections/update
J	Published in release R17.1. The following updates are done in this revision: • Axis Calibration method added • Restriction of load diagram added
K	Published in release R17.2. The following updates are done in this revision: • Updated list of applicable standards.
L	Published in release R18.1. The following updates are done in this revision: • TCP acceleration added.
M	Published in release R18.2. The following updates are done in this revision: • TCP acceleration information updated. • Added locating hole position in tool flange view.

1 Description

1.1 Structure

1.1.1 Introduction

Robot family

IRB 460 is ABB Robotics latest generation of, 4-axis palletizing robot, designed with a focus on its high production capacity, short cycle time at a high payload, long reach together with the very high uptime, which is significant for ABB's robots.

It is available in one version with a handling capacity of 110 kg and a reach of 2.4 m.

Customer connections as power, signals, Bus signals and one air are integrated in the robot, from the robot base to connections at the robot tool flange.

IRC5 and RobotWare

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 and so on. For more information, 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 a complete description of optional software, see the *Product specification - Controller software IRC5*.

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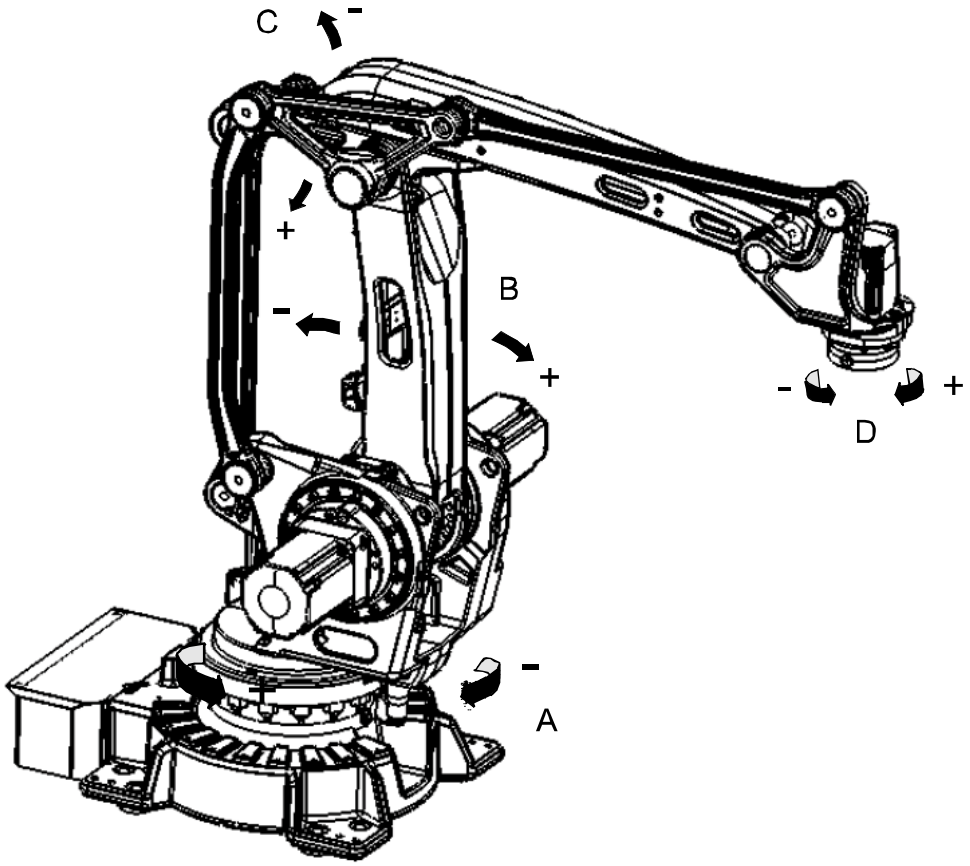
1.1.1 Introduction
Continued

Manipulator axes

The IRB 460 manipulator has 4 axes as shown in the following figure.



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Position	Description
A	Axis 1
B	Axis 2
C	Axis 3
D	Axis 6

1.1.2 Different robot versions

General

The IRB 460 is available in one version, for floor mounting (no tilting allowed around X or Y axis).

Robot type	Handling capacity (kg)	Reach (m)
IRB 460	110 kg	2.4 m

Manipulator weight

Robot type	Weight (kg)
IRB 460	925 kg

Other technical data

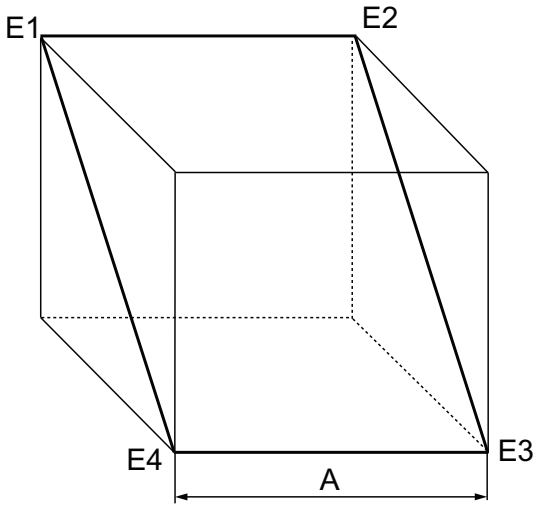
Data	Description	Note
Airborne noise level	The sound pressure level outside the working space	< 70 dB (A) Leq (acc. to Machinery directive 2006/42/EG).

Power consumption at max load

Type of movement	IRB 460-110/2.4
ISO cube Max. velocity	3.67 kW
General palletizing movements	4.31 kW

Robot in calibration position	IRB 460-110/2.4
Brakes engaged	0.31 kW
Brakes disengaged	0.62 kW

The path E1-E2-E3-E4 in the ISO cube is shown in the following figure.



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Position	Description
A	1000 mm

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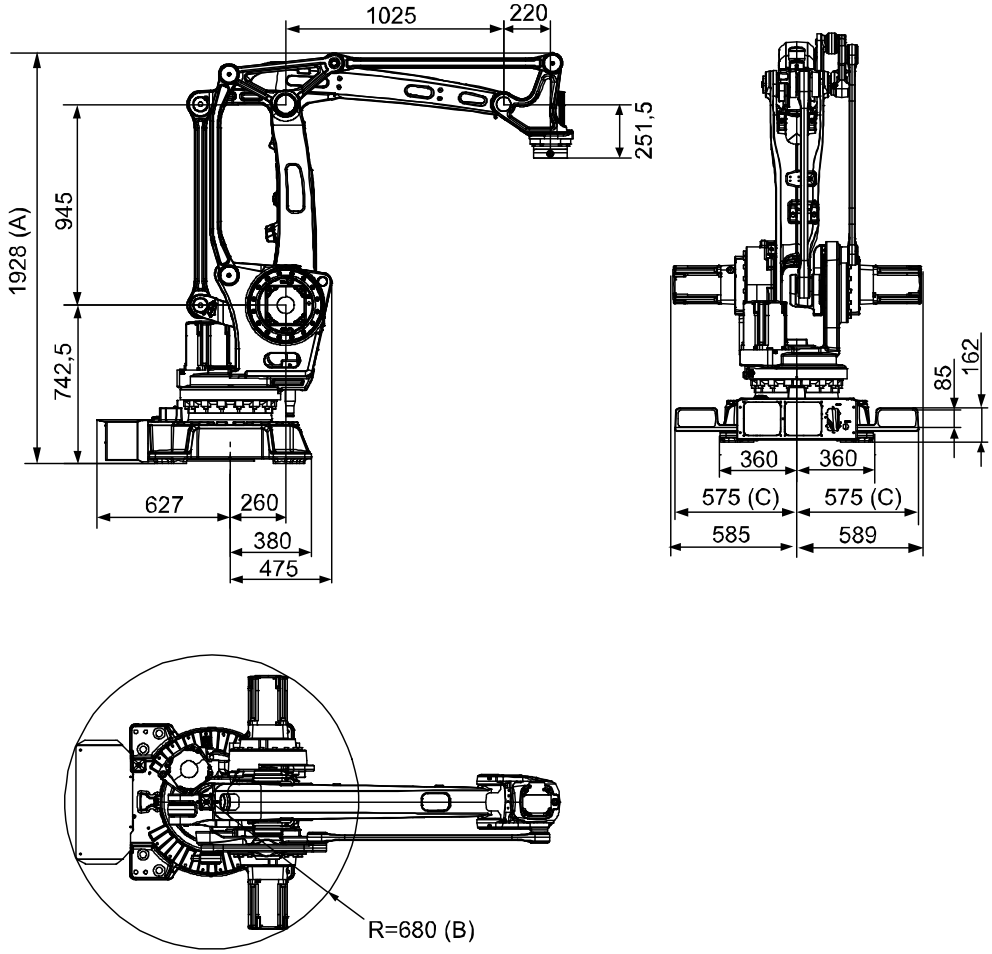
1.1.2 Different robot versions
Continued

Dimensions IRB 460

The following figure shows the rear, side and top view of the IRB 460 manipulator (dimensions in mm). Allow 200 mm behind the manipulator for cables.



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Position	Description
A	2278 mm max working range
B	Radius for axis 3 motor
C	Forklift width 1150 mm

1.2 Safety 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.

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

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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

General

IRB 460 is designed for floor mounting (no tilting allowed around X or Y axis), end effector with max. weight of 110 kg including payload, can be mounted on the mounting flange (axis 6). For more information, see *Load diagrams on page 25*.

Working range

The working range of axis 1 can be limited by mechanical stops. The option *Electronic Position Switches* can be used on all axes, for position indication of the manipulator.

1.3.2 Operating requirements

Protection standards

Manipulator IP67.

Explosive environments

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

Ambient temperature

Description	Standard/Option	Temperature
Manipulator during operation	Standard	0°C [i] (32°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 recommended to be run with the robot. Below 5° C this warm-up phase is mandatory. Otherwise there is a risk that the robot stops or run with lower perfomance due to temperature dependent oil- and grease viscocity.

Relative humidity

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

1.3.3 Mounting the manipulator

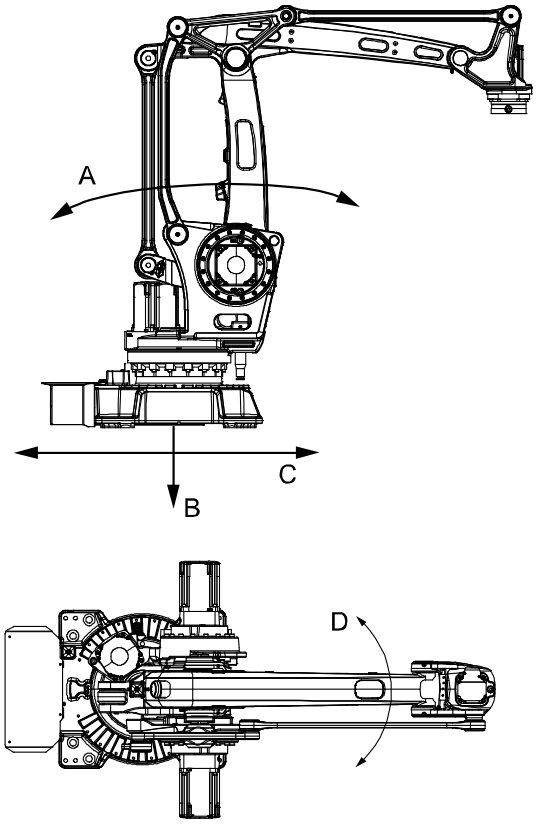
Maximum load

Maximum load in relation to the base coordinate system.

Floor Mounted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	± 6.2 kN	± 10.6 kN
Force z	10 ± 3.8 kN	10 ± 6.5 kN
Torque xy	± 13.7 kNm	± 23 kNm
Torque z	± 5.3 kNm	± 7.9 kNm

The following figure shows the direction of forces.



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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}).

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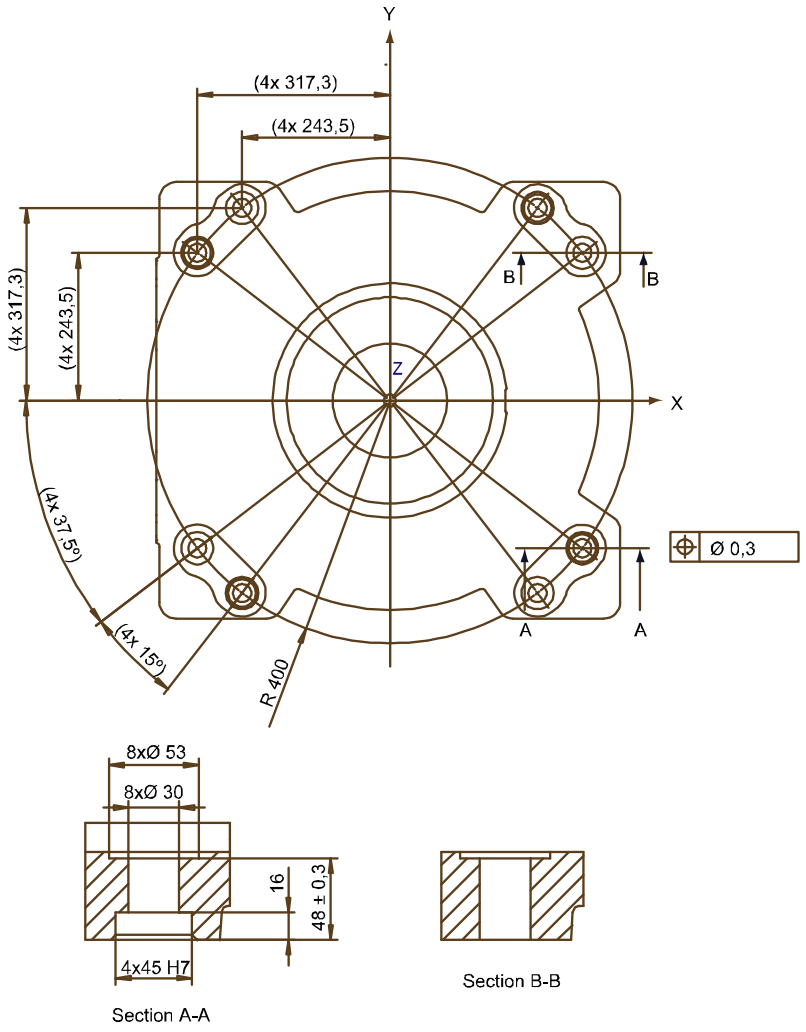
1.3.3 Mounting the manipulator
Continued

Fastening holes robot base

The following figure shows the hole configuration (dimensions in mm).



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Recommended screws for fastening the manipulator to the base	M24 x 100 8.8 with 4 mm flat washer
Torque value	725 Nm

Note

Only two guiding sleeves shall be used. The corresponding holes in the base plate shall be circular and oval according to the following base plate drawing. Regarding AbsAcc performance, the recommended are the chosen guide holes those are according to the following base plate drawing.

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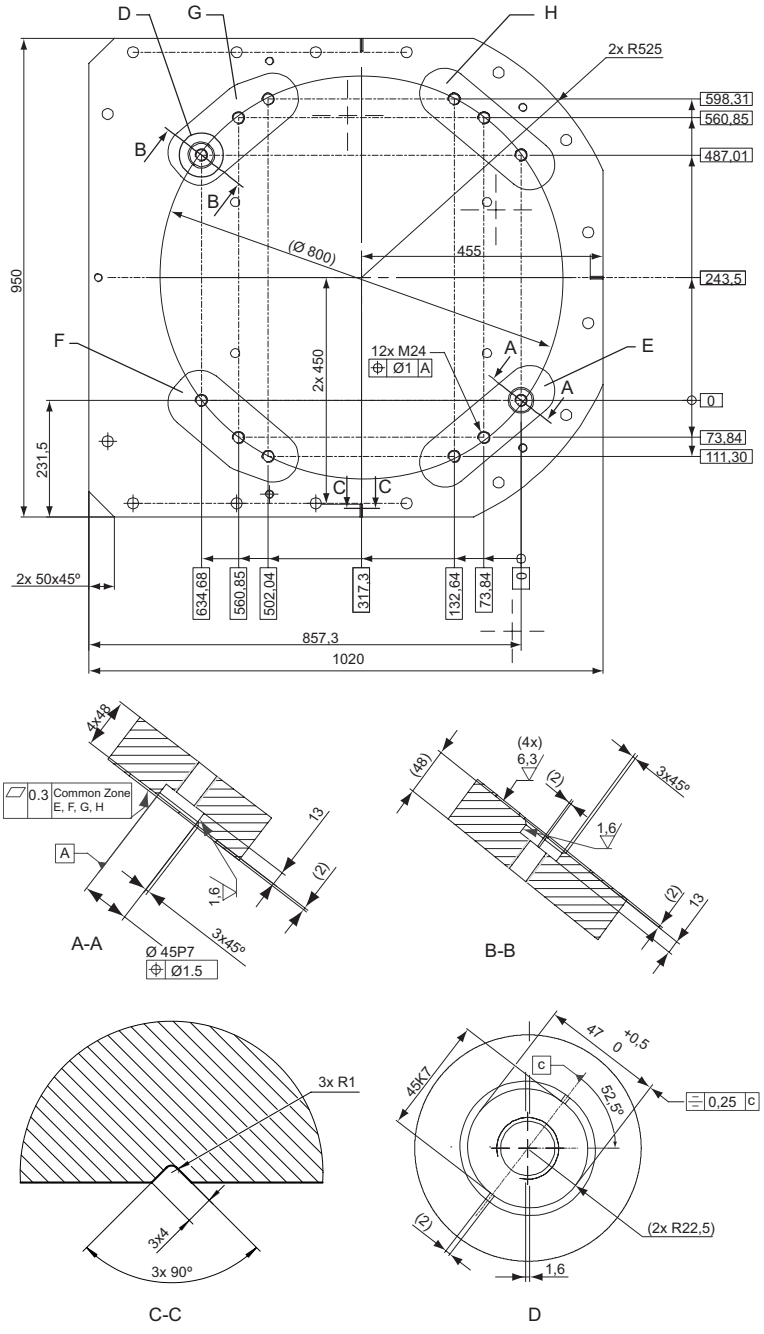
Base plate drawing

The following figure shows the option base plate (dimensions in mm).



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E, F, G, H	Common tolerance zone (accuracy all over the base plate from one contact surface to the other)

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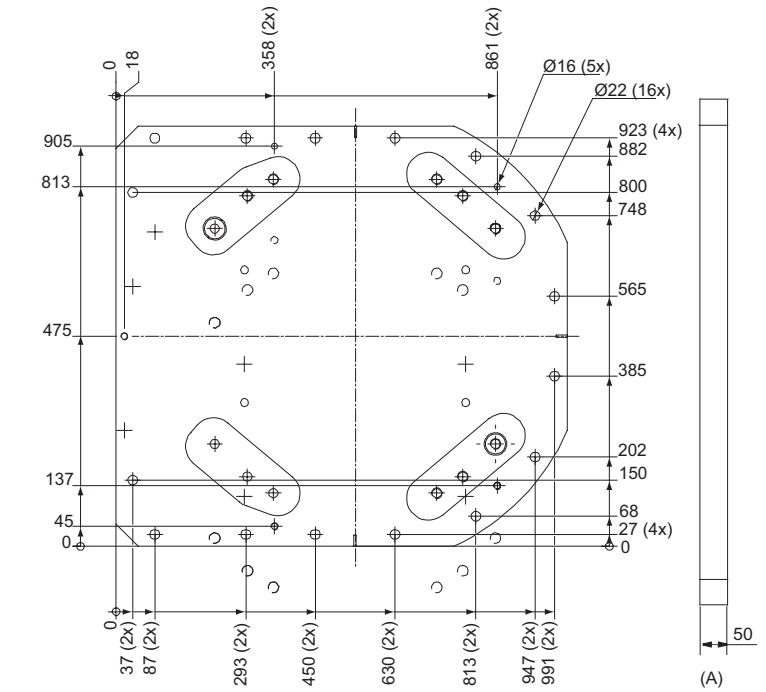
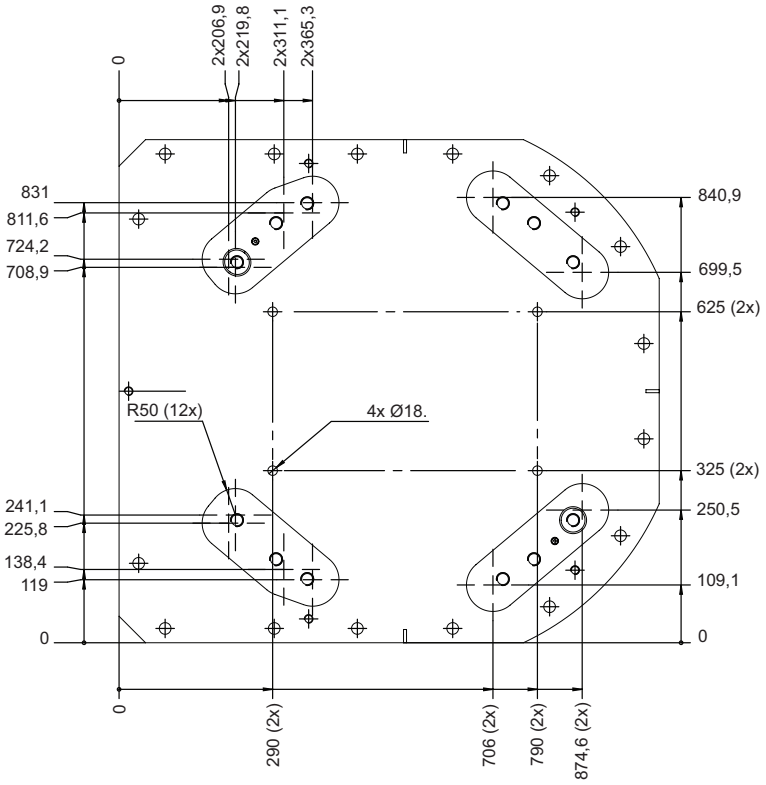
1.3.3 Mounting the manipulator

Continued





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

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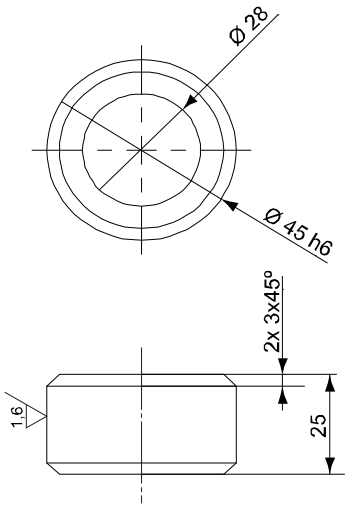

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Position	Description
A	Guide sleeve protected from corrosion

1.4 Calibration and references

1.4.1 Calibration methods

Overview

This section specifies the different types of calibration and the calibration methods that are supplied by ABB.

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 Calibration Pendulum [i]
Absolute accuracy calibration (optional)	Based on standard calibration, and besides positioning the robot at synchronization position, the Absolute accuracy calibration also compensates for: • Mechanical tolerances in the robot structure • Deflection due to load Absolute accuracy calibration focuses on positioning accuracy in the Cartesian coordinate system for the robot. Absolute accuracy calibration data is found on the 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!  xx0400001197	CalibWare

[i] The robot is calibrated by either Calibration Pendulum or Axis Calibration at factory. Always use the same calibration method as used at the factory.
Information about valid calibration method is found on the calibration label or in the calibration menu on the FlexPendant.
If no data is found related to standard calibration, Calibration Pendulum is used as default.

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Brief description of calibration methods

Axis Calibration method

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 calibration is described in the product manual for the robot.

Calibration Pendulum method

Calibration Pendulum is a standard calibration method for calibration of many of ABB robots.

Two different routines are available for the Calibration Pendulum method:

- Calibration Pendulum II
- Reference calibration

The calibration equipment for Calibration Pendulum is delivered as a complete toolkit, including the *Operating manual - Calibration Pendulum*, which describes the method and the different routines further.

CalibWare - Absolute Accuracy calibration

To achieve a good positioning in the Cartesian coordinate system, Absolute Accuracy calibration is used as a TCP calibration. The CalibWare tool guides through the calibration process and calculates new compensation parameters. This is further detailed in the *Application manual - CalibWare Field 5.0*.

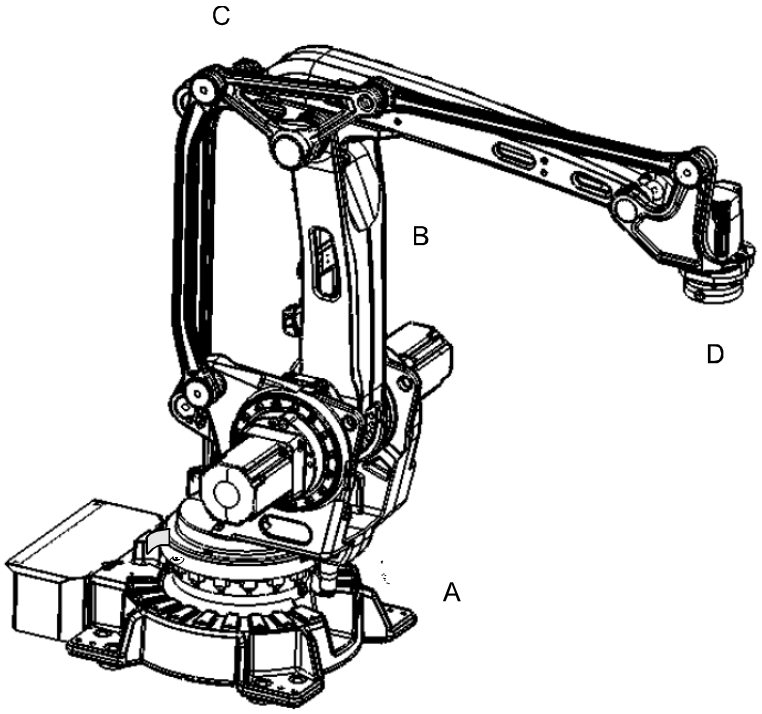
If a service operation is done to a robot with the option Absolute Accuracy, a new absolute accuracy calibration is required in order to establish full performance. For most cases after motor and transmission replacements that do not include taking apart the robot structure, standard calibration is sufficient.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

1.4.2 Fine calibration with Calibration Pendulum

General

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

The following figure shows all axes in zero position.



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Position	Description
A	Axis 1
B	Axis 2
C	Axis 3
D	Axis 6

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

1.5 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

Tip

The service routine *LoadIdentify* is available in RobotWare, which enables automatic definition of the tool and load, to determine correct load parameters. 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 include a nominal payload inertia, J_o of 5 kgm^2. No extra load on upper arm.

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"

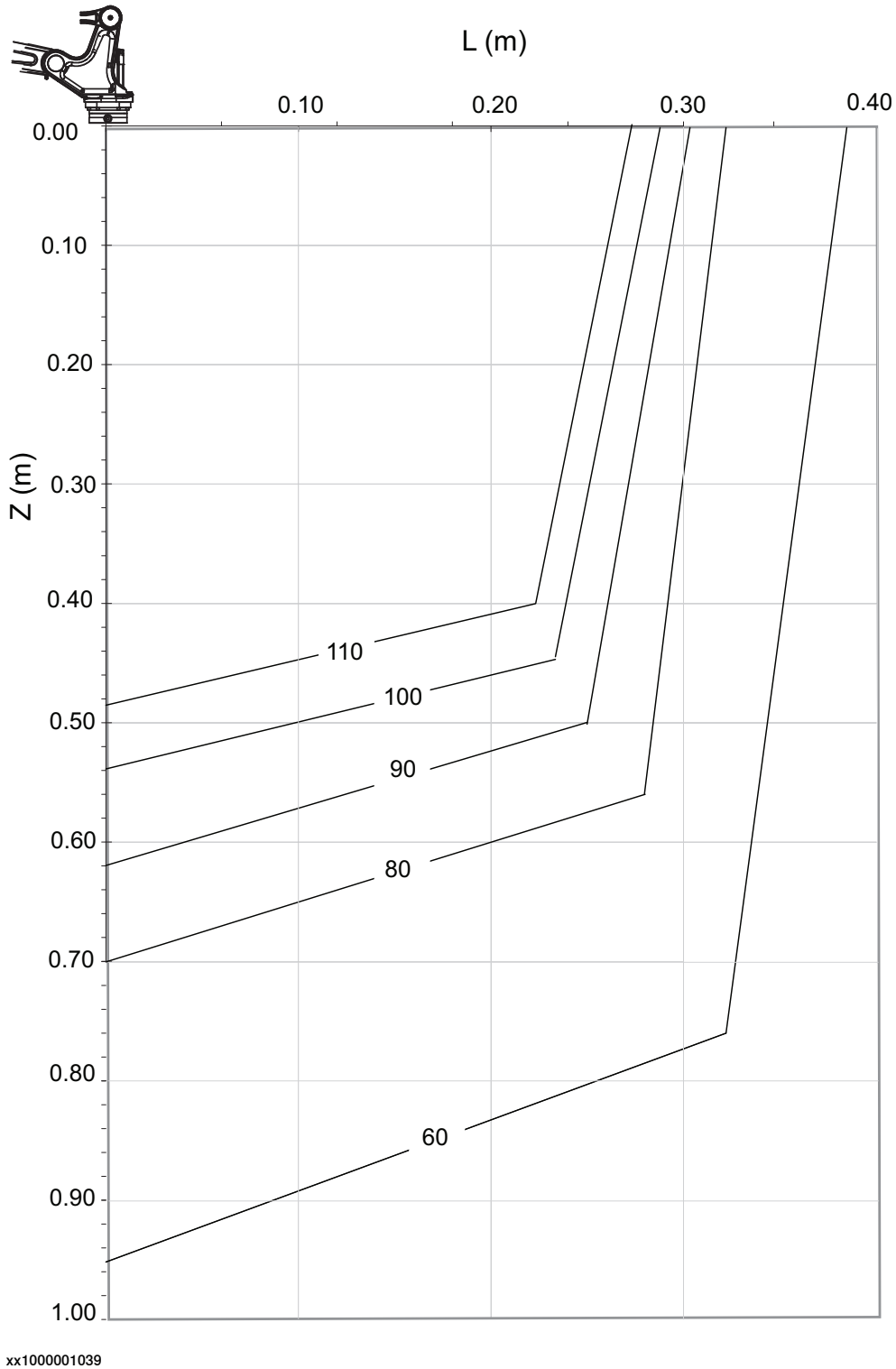
To easily control a specific load case, use the calculation program ABB RobotLoad. Contact your local ABB organization for more information.

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.

1.5.2 Load diagrams

IRB 460-110/2.4

The following figure shows the maximum permitted load mounted on the robot tool flange at different positions (center of gravity).



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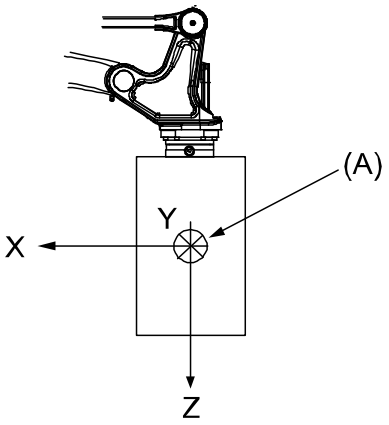
1.5.3 Maximum load and moment of inertia

General

Load in kg, Z and L in m and J in kgm^2

Axis	Maximum moment of inertia
6	Ja_6 = Load x L^2 + $J_{0Z} \leq$ 70 kgm^2



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Position	Description
A	Center of gravity

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

1.5.4 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 460	45	28

Note

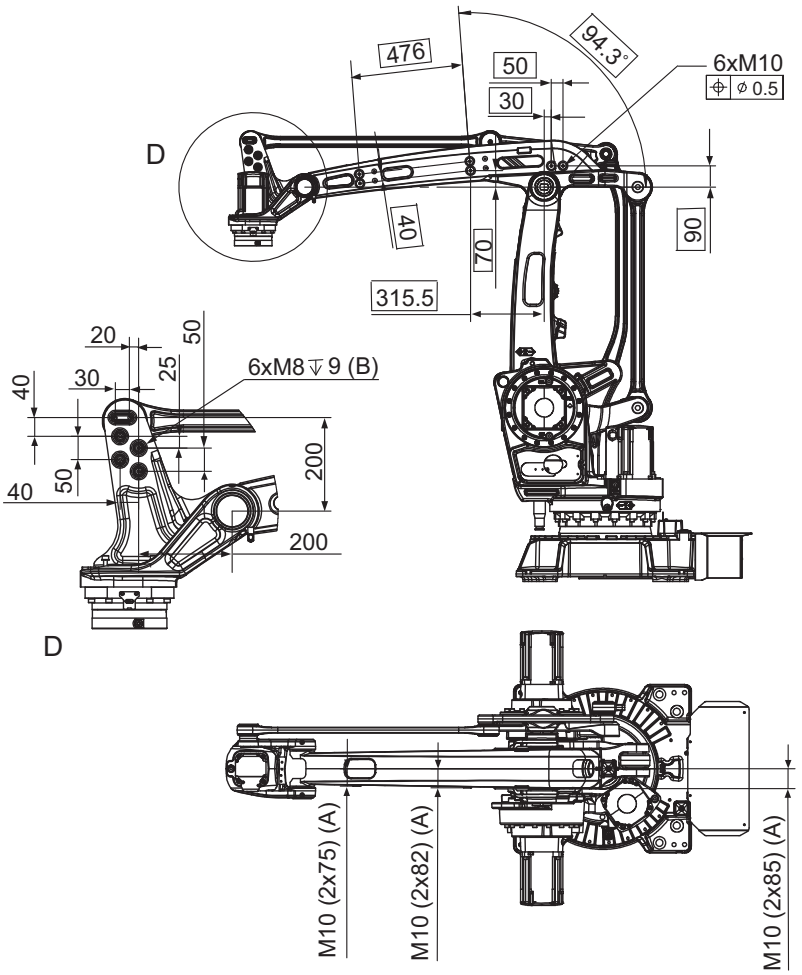
Acceleration levels for E-stop and controlled motion includes acceleration due to gravitational forces. Nominal load is define with nominal mass and cog with max offset in Z and L (see load diagram).

1.6 Mounting of equipment

General

Extra loads can be mounted on to the upper arm. Holes and definitions of masses are shown in the following figures.

For mounting of an external vacuum hose there are six holes on the upper arm. The max. weight for the vacuum hose and fastening device is 35 kg. When using the holes, the weight of the vacuum hose shall be reduced from the max. Handling capacity, for each variant respectively.



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Position	Description
A	Mounting hole on upper arm
B	Drill depth 15 mm

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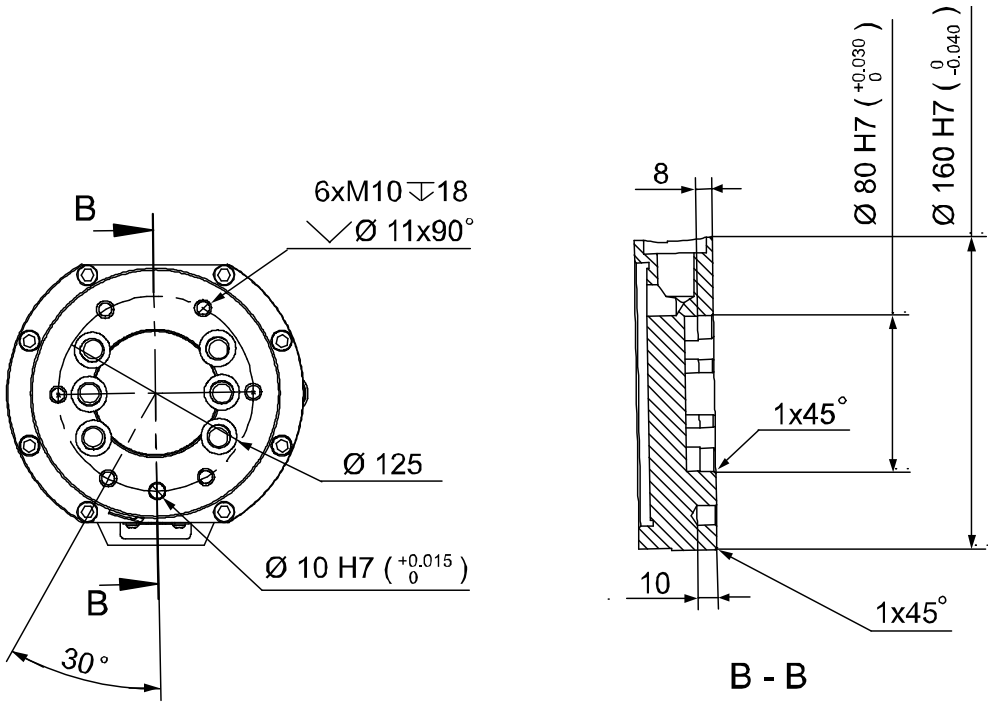
1.6 Mounting of equipment
Continued

Robot tool flange

The following figure shows the robot tool flange SS-EN ISO 9409;2004 (dimensions in mm).



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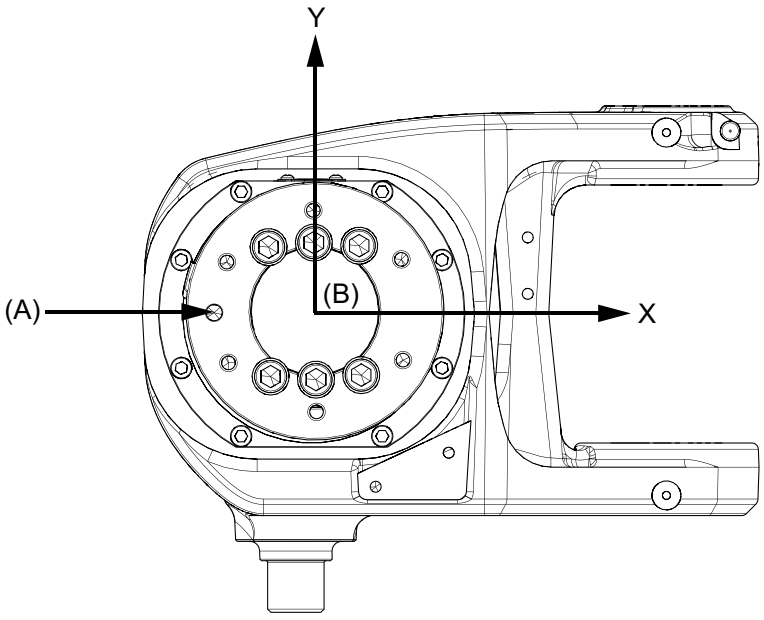

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-	Tool flange in bottom view
A	Locating hole
B	Tool coordinate system

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For fastening of gripper-tool-flange to robot-tool-flange all bolt holes for 6 bolts quality class 12.9 shall be used.

1.7 Robot motion

1.7.1 Introduction

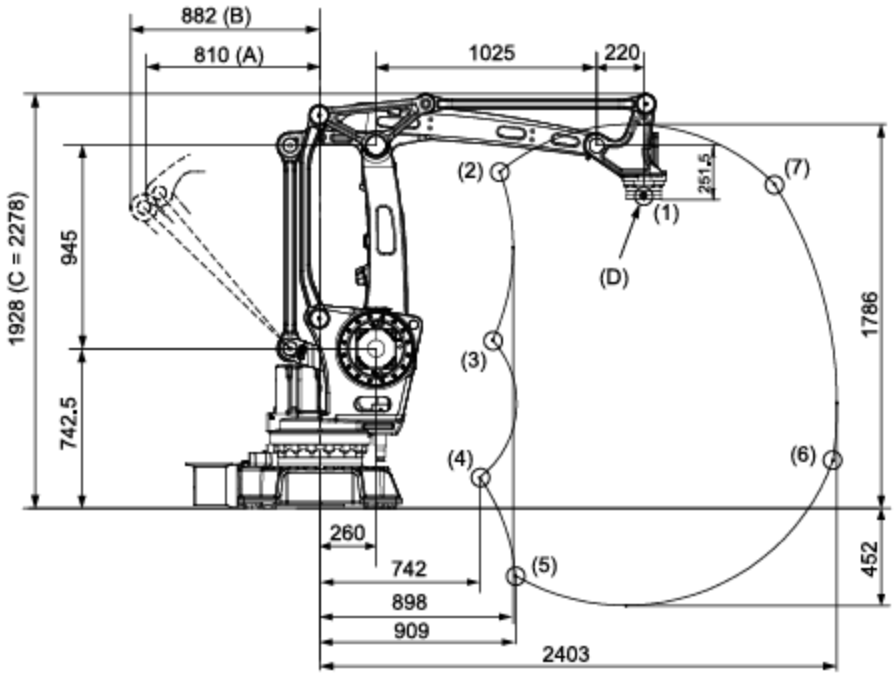
Type of motion

Axis	Type of motion	Range of movement
1	Rotation motion	+165° to -165°
2	Arm motion	+85° to -40°
3	Arm motion	+120° to -20°
6	Turn motion	+300° to -300° Default +150 revolutions to -150 revolutions maximum [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).

Illustration

The following figure shows the extreme positions of the robot arm specified at tool flange center (dimensions in mm).



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Position	Description
A	Max. working range
B	Mechanical stop
C	Max. working range

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Position	Description
D	Tool flange center

Positions at wrist center

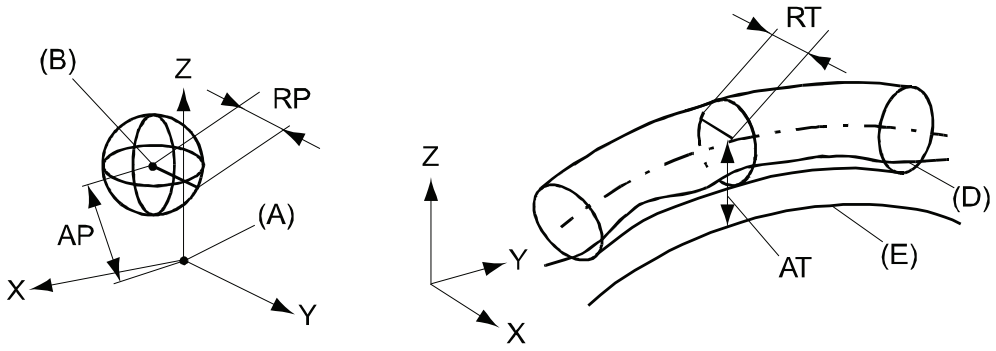
Position number, see figure above	X Position (mm)	Z Position (mm)	Axis 2 Angle (degrees)	Axis 3 Angle (degrees)
0	1505	1437	0	0
1	836	1565	-40	-20
2	802	782	-40	25
3	742	145	55	120
4	909	-314	85	120
5	2385	223	85	20
6	2111	1510	45	-20

1.7.2 Performance according to ISO 9283

General

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

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



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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	IRB 460-110/2.4
Pose accuracy, AP[i] (mm)	0.20
Pose repeatability, RP (mm)	0.20
Linear path repeatability, RT (mm)	0.11
Linear path accuracy, AT (mm)	3.89
Pose stabilization time, PSt (s)	0.65

i AP according to the ISO test above, is the difference between the teached position (position manually modified in the cell) and the average position obtained during program execution.

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

1.7.3 Velocity

Maximum axis speed

Axis number	IRB 460-110/2.4
1	145°/s
2	110°/s
3	120°/s
6	400°/s

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

Axis resolution

Approximately 0.01º on each axis.

1.7.4 Stopping distance/time

General

Stopping distance/time for emergency stop (category 0), program stop (category 1) 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 460-110/2.4	1	25	0.45	38	0.79	37	0.58
	2	10	0.31	13	0.31	14	0.33
	3	10	0.18	12	0.25	10	0.21

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

1.8 Cooling fan for axis 1 motor

Option 87-1

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

Valid protection for cooling fan is IP54.

1.9 Customer connections

General

The Customer connection is an option, the cables and the hose are integrated in the robot and the connectors are placed at axis 6.

- Power, Signals, Bus and 1x Air (CP/CS/BUS/AIR)

For further information of the customer connection, see *Specification of variants and options on page 41*.

Specification

Type	Application	Specification	Connection type	Supplier Article No.	Comment
Power (CP)	Utility power	4x0.75mm^2 (5A/250VAC)	UTOW socket connector 26p, Bulkhead	UTOW 71626SH06	1x0.75mm^2 protective earth
Signals (CS)	Parallel communication	11x AWG24 + 5x2 AWG24	UTOW socket connector 26p, Bulkhead	UTOW 71626SH06	3 Quad twisted, 5 screened pair twisted
Bus communication (BUS)	Profibus	2xAWG26 Z=150 Ohm (1MHz)	UTOW socket connector 10p, Bulkhead	UTOW 71210SH06	
	DeviceNet	2xAWG26 Z=120 Ohm (1MHz)			
	BUS power & BUS utility	2x2 AWG24			
Air (AIR)	Utility air	1x12.7 (1/2”) P_{Nom} = 16 bar	Parker Push-lock,1/2” M22x1,5 Brass 24 degree seal		

1.10 Maintenance and troubleshooting

1.10.1 Introduction

General

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

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

Maintenance

The maintenance intervals depend on the use of the robot, the required maintenance activities also depends on selected options. For detailed information on maintenance procedures, see *Product manual - IRB 460*.

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2 Specification of variants and options

2.1 Introduction to variants and options

General

The different variants and options for the IRB 460 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)
435-107	460	110	2.4

Manipulator color

Option	Description	Note
209-2	ABB White	The robot is painted in white color.
209-201	NCS 2070-Y60R Orange	The robot is painted in orange.
209-202	ABB Graphite white std.	The robot is painted in graphite white color.
209	RAL code	The robot is painted in chosen RAL - color.

Note

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

Protection

Option	Description
287-4	Standard

Media & communication

Air supply and signals for extra equipment upper arm, see *Customer connections on page 38*.

Option	Description	Note
803-1	Parallel communication and air	Includes CP/CS and air.
803-3	DeviceNet, parallel communication and air	Includes CP, CS and DeviceNet + air
803-4	PROFIBUS, parallel communication and air	Includes CP, CS and PROFIBUS + air

Connector kits

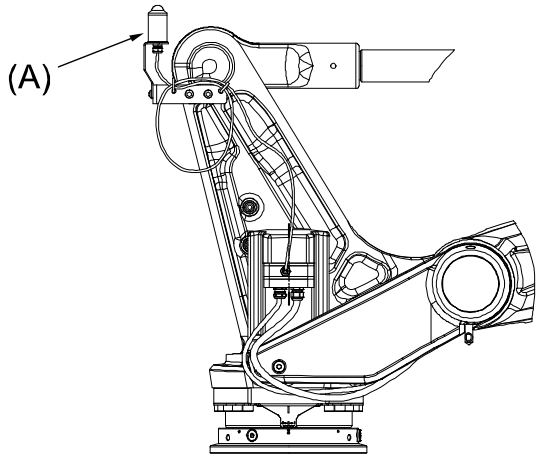
The kit consists of connectors, pins and sockets.

Option	Description
431-1	For the connectors on the upper arm.
239-1	For connectors on foot

Continues on next page

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.



xx1000001163

Position	Description
A	Safety lamp

Cooling fans for axis 1 motor

To be used to avoid overheating of motors and gears in application with intensive motion (high average speed and/or high average torque and/or short wait time) of axis 1. IP54 valid for cooling fan.

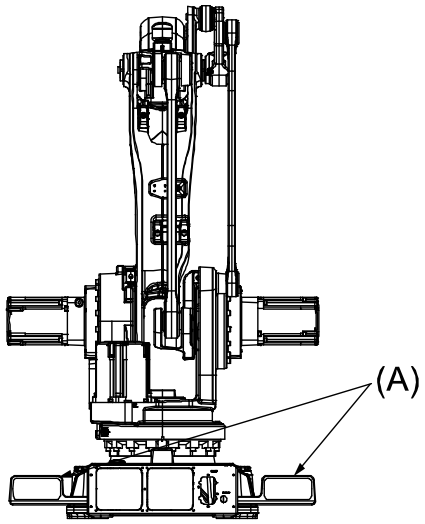
Option	Description
87-1	Cooling fan for axis 1 motor.

Fork lift device

Option	Description
159-1	Lifting device on the manipulator for fork-lift handling.

Continues on next page

2.2 Manipulator
Continued



xx1000001164

Position	Description
A	Fork lift device (x4)

Base plate

Option	Description
37-1	See *Installation on page 15*.

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* 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 restricted by extra mechanical stops.

Option	Type	Description
29-2	Axis 1, 7.5/15 degrees	Two stops which allows the working range to be restricted in increments of 7.5 or 15 degrees.

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.

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

2.3 Floor cables

Manipulator cable length

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

Application interface connection

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

Note

In a MultiMove application, additional robots have no control module. The screw terminal 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.

Connection of Parallel/DeviceNet/Profibus connection

Following information specifies the cable length for Parallel/DeviceNet/Profibus floor cables for connections between cabinets and manipulator.

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

2.4 User documentation

User documentation

The user documentation describes the robot in detail, including service and safety instructions.

All documents can be found via myABB Business Portal, *www.myportal.abb.com*.

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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 *Product specification - Controller software IRC5*.

Robot peripherals

- Motor Units[1]

[1] Not applicable for IRC5 Compact controller.

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Index

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