Product specification

IRB 2400

Product specification

IRB 2400/10
IRB 2400/16

Document ID: 3HAC042195-001

Revision: S

Table of contents

This page is intentionally left blank

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.	3HAC050945-001
Product specification - Controller software IRC5 IRC5 with main computer DSQC1000 and RobotWare 6.	3HAC050945-001
Product manual - IRB 2400	3HAC022031-001
Product specification - Robot user documentation, IRC5 with RobotWare 6	3HAC052355-001

Revisions

Revision	Description
-	- Replaces 3HAC9112-1 (English), 3HAC10766-1 (French), 3HAC10393-1 (German), 3HAC10759-1 (Spanish), and 3HAC10780-1 (Italian)
A	- Machinery directive updated - IRB 2400L removed - General corrections/update
B	- General updates and minor corrections
C	- General updates and minor corrections

Overview of this product specification

Continued

Revision	Description
D	• Minor corrections and updates
E	• Text for ISO test adjusted
F	• Text for Foundry Plus updated. • Minor corrections/update
G	• Minor corrections/update
H	• Minor corrections/update
J	• Section Track motion with options 1001-1, 1000-5 and 1000-6 removed from manual.
K	• Unit changed from N to Nm for Torque in section "*Maximum load IRB 2400/10/16*".
L	Published in release R17.1. The following updates are done in this revision: • Restriction of load diagram added.
M	Published in release R17.2 The following updates are done in this revision: • Updated list of applicable standards.
N	Published in release R18.1 The following updates are done in this revision: • Minor changes on load diagrams general description.
P	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. See *Calibration methods on page 20* • Updated information about *Absolute Accuracy*.
Q	Published in release 20D. The following updates are done in this revision: • Warranty section updated.
R	Published in release 21B. The following updates are done in this revision: • Text regarding fastener quality is updated. • Added information, see *Information for replacement of manipulator on page 12*. • Removed Axis resolution.
S	Published in release 23B. The following updates are done in this revision: • Correction regarding WeldGuide options • Added RAL code in manipulator color

1 Description

1.1 Structure

1.1.1 Introduction to structure

Robot family

The IRB 2400 is a 6-axis industrial robot, designed specifically for manufacturing industries that use flexible robot-based automation. The robot has an open stucture 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.. 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 corrosion protection additional rust preventive are applied to exposed and crucial areas, e.g. has the tool flange a special preventive coating. Although, continuous splashing of water or other similar rust formation fluids may case rust attach on the robots unpainted areas, joints, or other unprotected surfaces. Under these circumstances it is recommended to add rust inhibitor to the fluid or take other measures to prevent potential rust formation on the mentioned.The entire robot is IP67 compliant according to IEC 60529 - from

base to wrist (except IRB 2400L, IP67 only on wrist and connectors), 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.

The robot is labeled with "Foundry" (IRB 2400F/L) or "Foundry Plus" (IRB 2400F/10 and F/16).

Manipulator axes
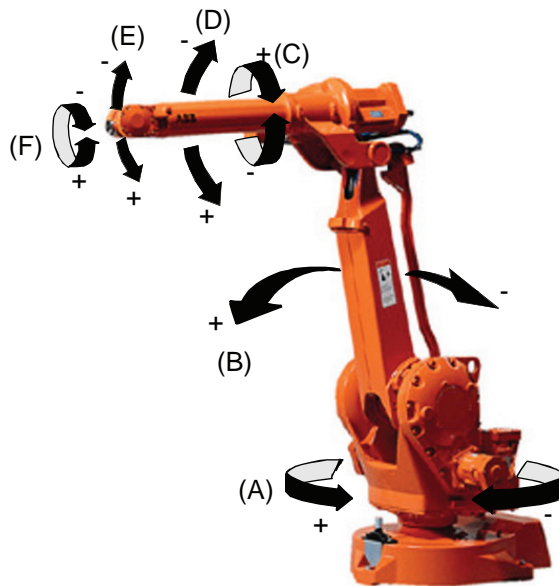
xx1100000569

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

1.1.2 Different robot versions

General

The IRB 2400 is available in two variants and they can be mounted inverted (no tilting allowed around X-axis or Y-axis).

Robot type	Handling capacity (kg)	Reach (m)
IRB 2400/10	10	1.55
IRB 2400/16	16 (20 kg with some limitations, see *Load diagrams on page 25*)	1.55

Manipulator weight

Robot type	Weight
IRB 2400/10(/16)	380 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 2400/10 (/16)
ISO Cube Max. velocity	0.61 - 0.67 kW
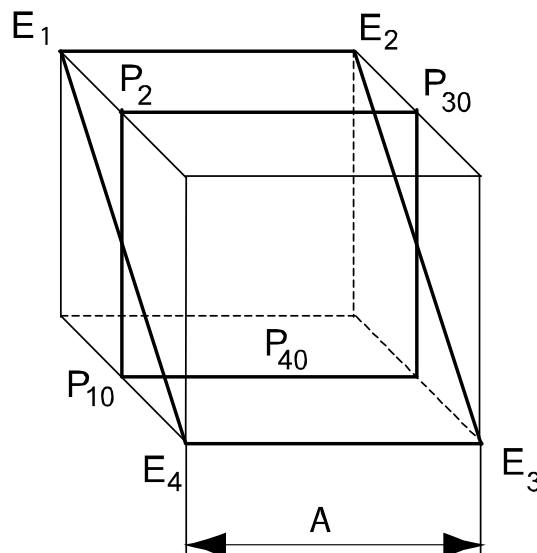
xx0900001012

Pos	Description
A	630 mm

Dimensions IRB 2400/10 and IRB 2400/16
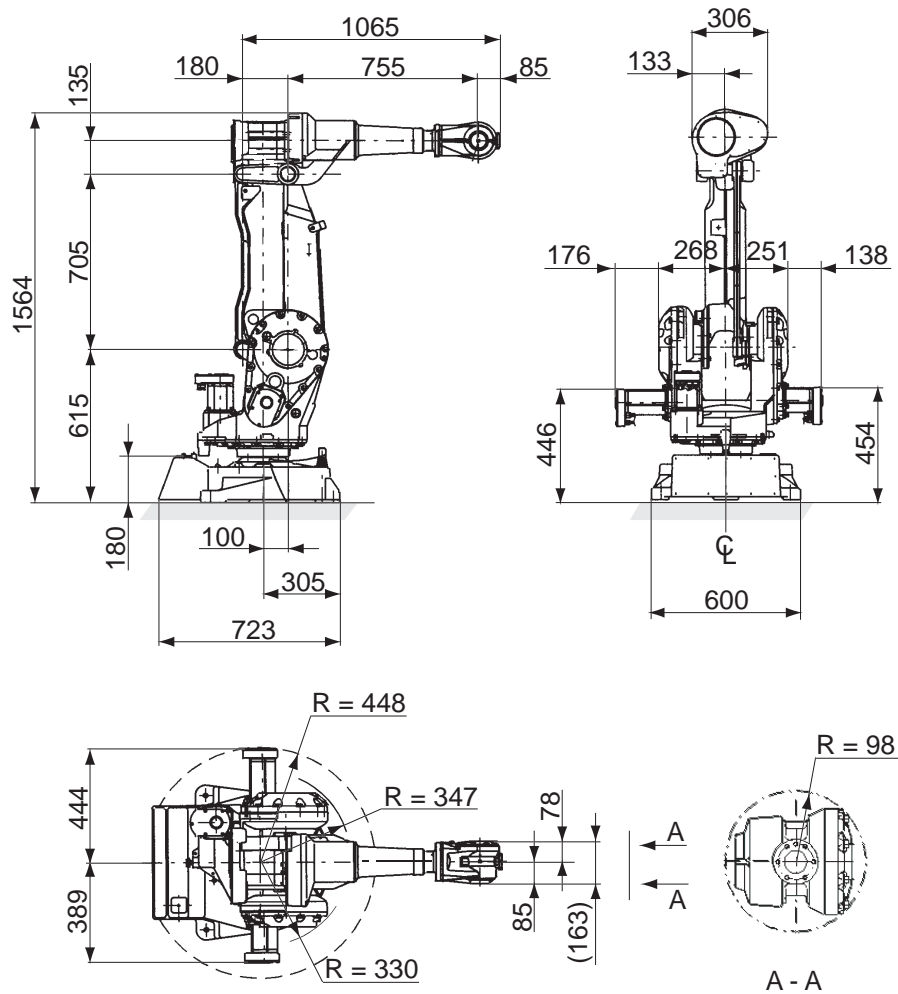
xx1100000546

Information for replacement of manipulator

> The R1.MP and R1.CP/CS connectors on the manipulator on protection type *Standard* were changed in May 2018, from clamp locking connections to screw locking connections. So if a new manipulator will replace an older manipulator then new floor cables are needed (power cable and CP/CS, same as for protection type *Foundry Plus*).

> More details are available in *Product manual - IRB 2400*.

1.2 Standards

1.2.1 Applicable standards

> **Note**
>
> The listed standards are valid at the time of the release of this document. Phased out or replaced standards are removed from the list when needed.

General

The product is designed in accordance with ISO 10218-1:2011, Robots for industrial environments - Safety requirements -Part 1 Robots, and applicable parts in the normative references, as referred to from ISO 10218-1:2011. In case of deviations from ISO 10218-1:2011, these are listed in the declaration of incorporation which is part of the product delivery.

Normative standards as referred to from ISO 10218-1

Standard	Description
ISO 9283:1998	Manipulating industrial robots - Performance criteria and related test methods
ISO 10218-2	Robots and robotic devices - Safety requirements for industrial robots - Part 2: Robot systems and integration
ISO 12100	Safety of machinery - General principles for design - Risk assessment and risk reduction
ISO 13849-1:2006	Safety of machinery - Safety related parts of control systems - Part 1: General principles for design
ISO 13850	Safety of machinery - Emergency stop - Principles for design
IEC 60204-1	Safety of machinery - Electrical equipment of machines - Part 1: General requirements

Region specific standards and regulations

Standard	Description
ANSI/RIA R15.06	Safety requirements for industrial robots and robot systems
ANSI/UL 1740	Safety standard for robots and robotic equipment
CAN/CSA Z 434-03	Industrial robots and robot Systems - General safety requirements

Other standards used in design

Standard	Description
ISO 9787:2013	Robots and robotic devices -- Coordinate systems and motion nomenclatures
IEC 61000-6-2	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments
IEC 61000-6-4	Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments

Continues on next page

1 Description

1.2.1 Applicable standards
Continued

Standard	Description
ISO 13732-1:2006	Ergonomics of the thermal environment - Part 1
IEC 60974-1:2012 [i]	Arc welding equipment - Part 1: Welding power sources
IEC 60974-10:2014 [i]	Arc welding equipment - Part 10: EMC requirements
ISO 14644-1:2015 [ii]	Classification of air cleanliness
IEC 60529:1989 + A2:2013	Degrees of protection provided by enclosures (IP code)

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

1.3 Installation

1.3.1 Introduction to installation

General

The same version of the robot can either be mounted on the floor or inverted (no tilting allowed around X-axis or Y-axis). An end effector, max. weight 10 or 16 kg including payload, can be mounted on the robot's mounting flange (axis 6) depending on the robot version.

See *Load diagrams on page 25*.

Extra loads

Other equipment can be mounted on the upper arm, max. weight 11 kg or 12 kg, and on the base, max. weight 35 kg. Holes for mounting extra equipment, see *Mounting equipment on page 31*.

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
IRB 2400/10, /16 Foundry Plus	IP67, Steam washable

Explosive environments

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 IRB 2400/10/16

Maximum load in relation to the base coordinate system

Floor Mounted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	±2000 N	±2600 N
Force z	+4100 ±1400 N	+4100 ±1900 N
Torque xy	±3400 Nm	±4000 Nm
Torque z	±550 Nm	±900 Nm

Suspended

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	±2000 N	±2600 N
Force z	-4100 ±1400 N	-4100 ±1900 N
Torque xy	±3400 Nm	±4000 Nm
Torque z	±550 Nm	±900 Nm

xx1100000547

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
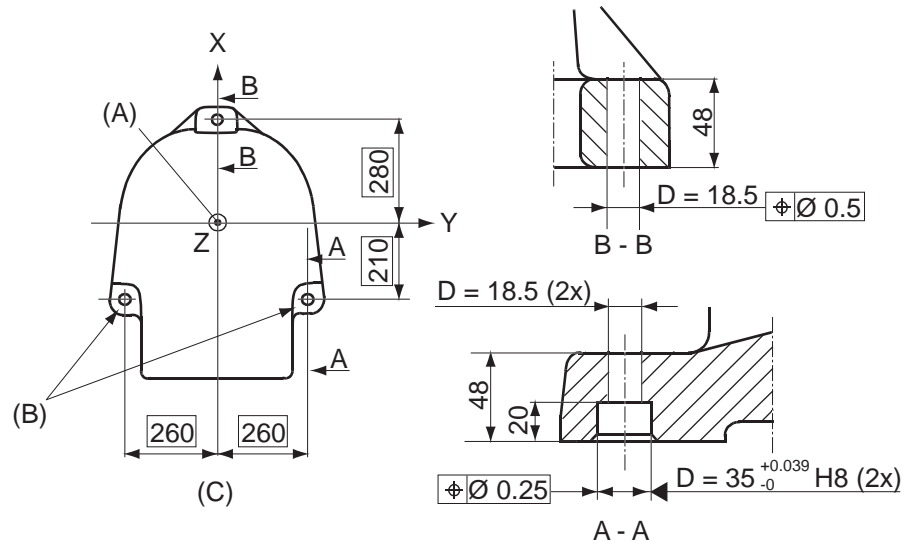
xx1400002065

1.4 Calibration and references

1.4.1 Calibration methods

Overview

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

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

More information is available in the product manual.

Types of calibration

Type of calibration	Description	Calibration method
Standard calibration	The calibrated robot is positioned at calibration position. Standard calibration data is found on the SMB (serial measurement board) or EIB in the robot. 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.	Calibration Pendulum Levelmeter calibration (alternative method)
Absolute accuracy calibration (optional)	Based on standard calibration, and besides positioning the robot at synchronization position, the Absolute accuracy calibration also compensates for: • Mechanical tolerances in the robot structure • Deflection due to load Absolute accuracy calibration focuses on positioning accuracy in the Cartesian coordinate system for the robot. Absolute accuracy calibration data is found on the serial measurement board (SMB) or other robot memory. For 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 (IRC5). 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

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

Brief description of calibration methods

Calibration Pendulum method

Calibration Pendulum is a standard calibration method for calibration of many of ABB robots (except IRB 6400R, IRB 640, IRB 1400H, and IRB 4400S).

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.

Wrist Optimization method

Wrist Optimization is a method for improving reorientation accuracy for continuous processes like welding and gluing and is a complement to the standard calibration method.

The actual instructions of how to perform the wrist optimization procedure is given on the FlexPendant.

CalibWare - Absolute Accuracy calibration

The CalibWare tool guides through the calibration process and calculates new compensation parameters. This is further detailed in the *Application manual - CalibWare Field*.

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

1.4.2 Fine calibration

General

Fine calibration is made using the Calibration Pendulum, see *Operating manual - Calibration Pendulum*.
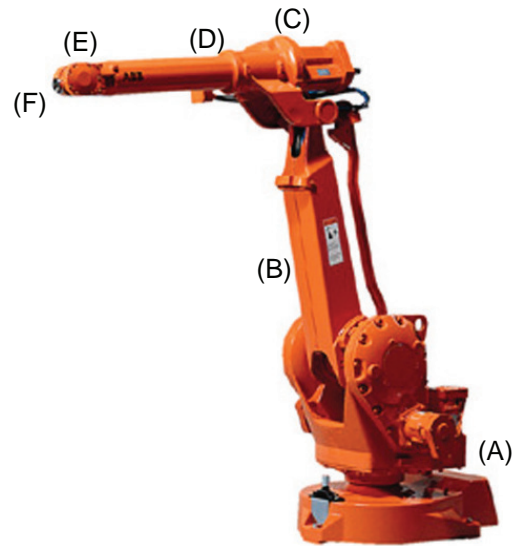
xx1100000570

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

Calibration

Calibration	Position
Calibration of all axes	All axes are in zero position
Calibration of axis 1 and 2	Axis 1 and 2 in zero position
	Axis 3 to 6 in any position
Calibration of axis 1	Axis 1 in zero position
	Axis 2 to 6 in any position

1.4.3 Absolute Accuracy calibration

Purpose

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

Here are some examples of when this accuracy is important:

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

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

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

What is included

Every *Absolute Accuracy* robot is delivered with:

- compensation parameters saved in the robot memory
- a birth certificate representing the *Absolute Accuracy* measurement protocol for the calibration and verification sequence.

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

Absolute Accuracy supports floor mounted, wall mounted, and ceiling mounted installations. The compensation parameters that are saved in the robot memory differ depending on which Absolute Accuracy option is selected.

When is *Absolute Accuracy* being used

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

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

Continues on next page

- Linear jogging
- Tool definition (4, 5, 6 point tool definition, room fixed TCP, stationary tool)
- Work object definition

Absolute Accuracy not active

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

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

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

RAPID instructions

There are no RAPID instructions included in this option.

Production data

Typical production data regarding calibration are:

Robot	Positioning accuracy (mm)		
	Average	**Max**	**% Within 1 mm**
IRB 2400/10 IRB 2400/16	0.30	0.70	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 is used, and/or if loads outside the load diagram are used, the following parts can be damaged due to overload:
> - motors
> - gearboxes
> - mechanical structure

> ⚠️ **WARNING**
>
> In RobotWare, the service routine LoadIdentify can be used to determine correct load parameters. The routine automatically defines the tool and the load.
>
> See *Operating manual - IRC5 with FlexPendant*, for detailed information.

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

General

The load diagrams include a nominal payload inertia, J_0 of 0.040 kgm^2 for IRB 2400/10 and 0.060 kgm^2 for IRB 2400/16 (also with extended load diagram). At different moment of inertia the load diagram will be changed. For robots that are allowed tilted, wall or inverted mounted, the load diagrams as given are valid and thus it is also possible to use RobotLoad within those tilt and axis limits.

Control of load case with RobotLoad

To verify a specific load case, use the RobotStudio add-in RobotLoad.

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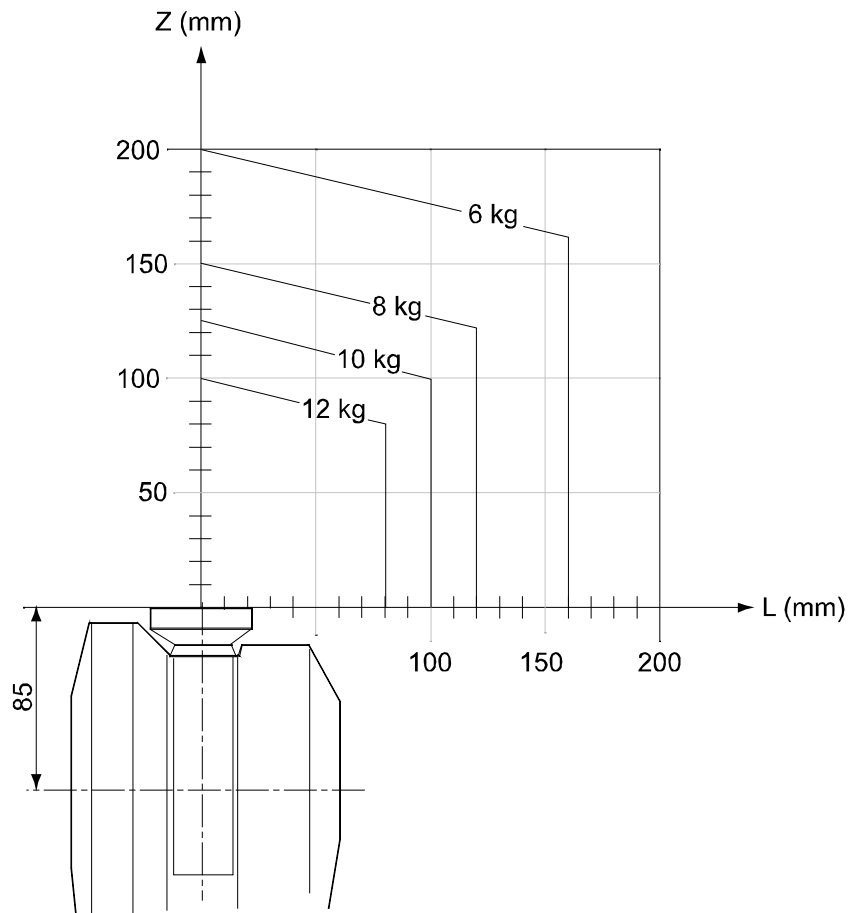
Load diagrams

IRB 2400/10

IRB 2400/16

1 Description

IRB 2400/16 Extended load diagram

Below is a extended load diagram for IRB 2400/16, payload 20 kg.

No extra load on wrist.
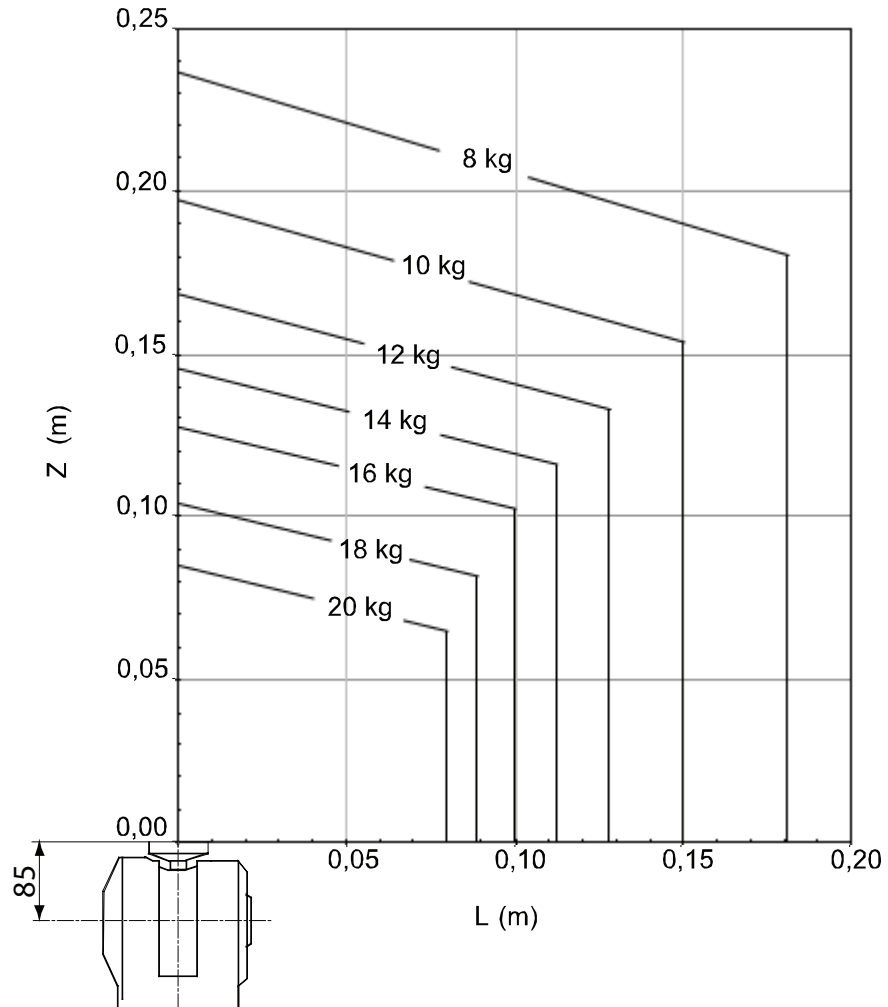
1.5.2 Maximum load and moment of inertia for full and limited axis 5 movement

> **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 (±115°)

Axis	Robot type	Maximum moment of interia
5	IRB 2400/10	$Ja5 = Load \times ((Z + 0,085^2 + L^2) + max(J_{0x}, J_{0y}) \leq 1.15\ kgm^2$
6	IRB 2400/10	$Ja6 = Load \times L^2 + J_{0Z} \leq 0.70\ kgm^2$

Axis	Robot type	Maximum moment of interia
5	IRB 2400/16	$Ja5 = Load \times ((Z + 0,085^2 + L^2) + max(J_{0x}, J_{0y}) \leq 1.85\ kgm^2$
6	IRB 2400/16	$Ja6 = Load \times L^2 + J_{0Z} \leq 1.05\ kgm^2$

1.5.3 Wrist torque

Maximum torque due to payload

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

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

Robot type	Max wrist torque axis 4 and 5	Max wrist torque axis 6	Max torque valid at load
IRB 2400/10	20.6 Nm	9.81 Nm	10 kg
IRB 2400/16	33.0 Nm	15.7 Nm	16 kg

1.6 Mounting equipment

1.6.1 Information about mounting equipment

Mounting equipment

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

IRB 2400/10 and IRB 2400/16
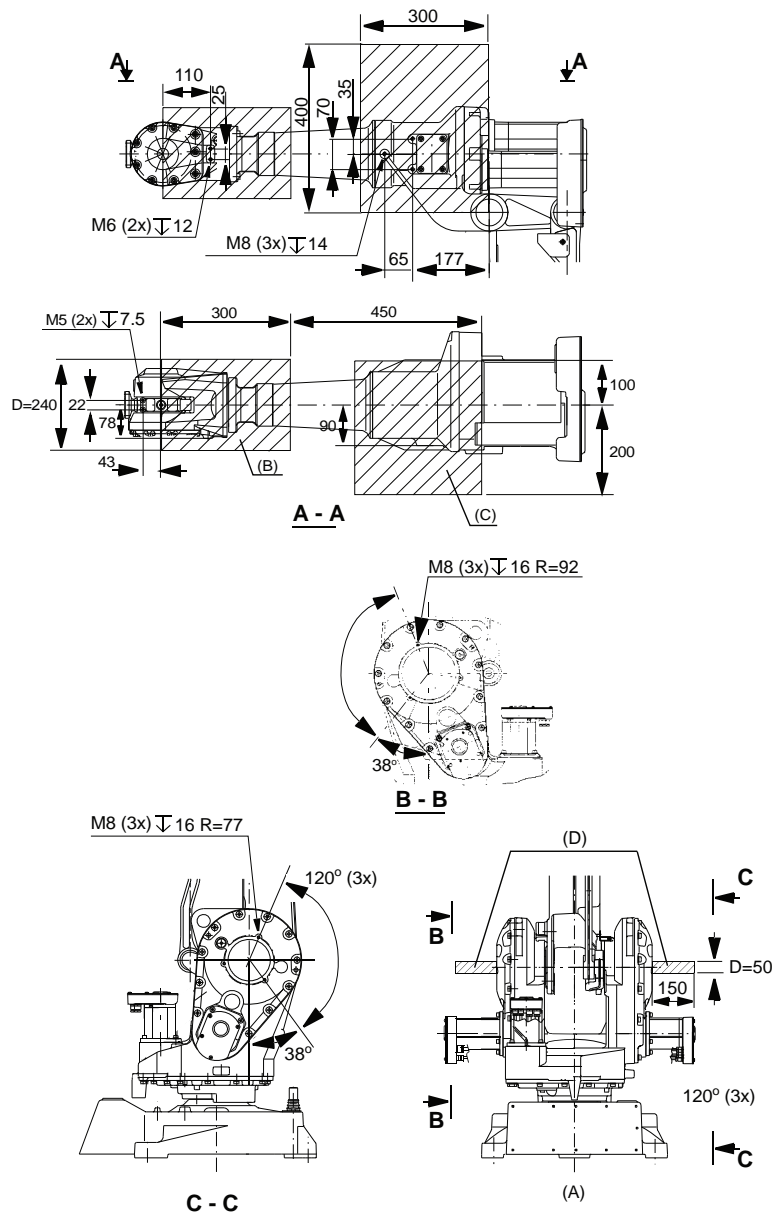
xx1100000577

Pos	Max load
A	The rear side of the manipulator

Pos	Max load
B	Max. 2 kg
C	Max. 10 kg
D	Max. 35 kg total

IRB 2400/16 with payload 20 kg
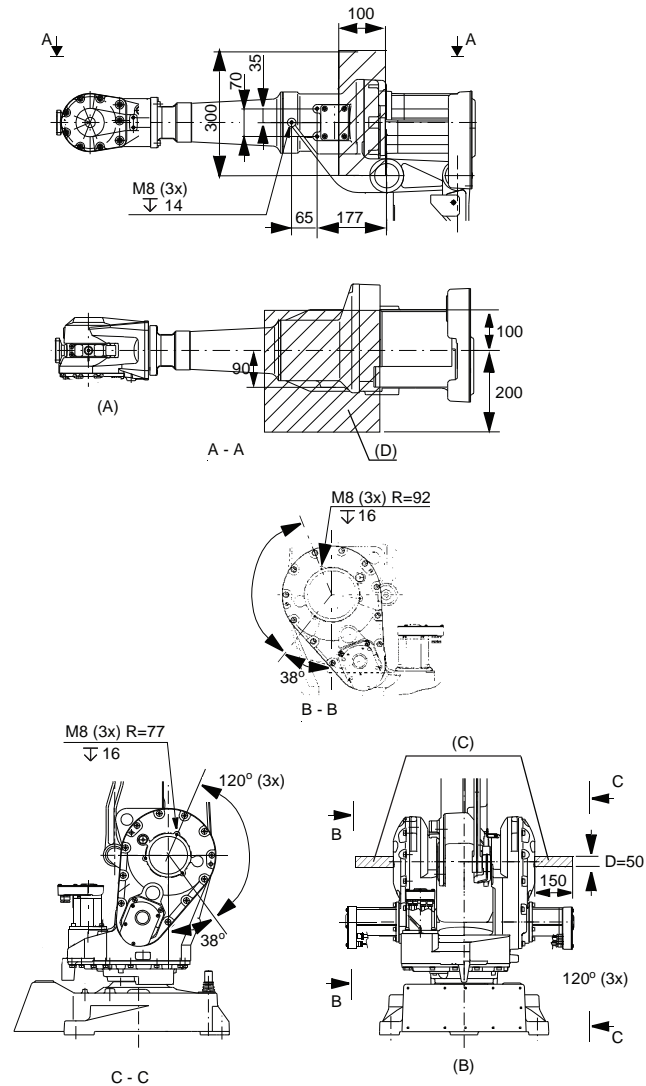
Pos	Description
A	No extra load on wrist
B	The rear side of the manipulator
C	Max. 35 kg total
D	Max. 10 kg

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

Fastener quality

When fitting tools on the tool flange, only use screws with quality 12.9. For other equipment use suitable screws and tightening torque for your application.

IRB 2400/10 and IRB 2400/16
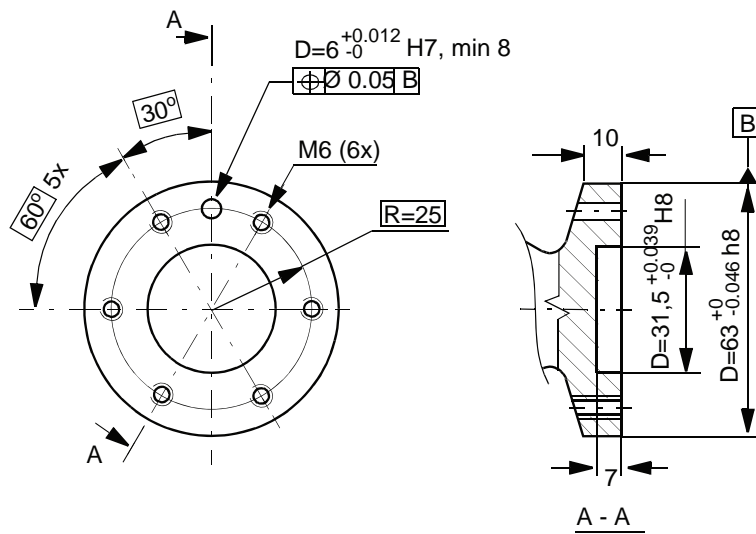
xx1100000580

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

IRB 2400/10 and IRB 2400/16

The working area is the same for both floor and inverted mounting.

For wall mounted 10 kg version axis 1 is limited to ±30°.

Axis	Type of motion	Range of movement
1	Rotation Motion	+ 180° to - 180°
2	Arm motion	+ 110° to - 100°
3	Arm motion	+ 65° to - 60°
4	Rotation Motion	+ 200° to - 200° (Unlimited as optional)
5	Bend motion	+ 120° to - 120°
6	Turn motion	+ 400° to - 400° + 250 rev. [i] to - 250 rev. Max. [ii]

[i] rev. = Revolutions

[ii] 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).
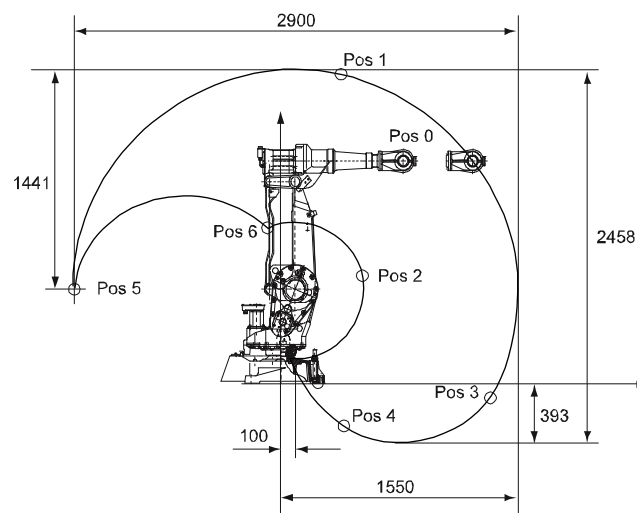
xx0200000160

Positions at wrist center (mm) and angle (degrees) for IRB 2400/10 and IRB 2400/16:

Position no (see figure above)	Position (mm) X	Position (mm) Z	Angle (degrees) Axis 2	Angle (degrees) Axis 3
0	855	1455	0	0
1	360	2041	0	-60
2	541	693	0	65
3	1351	-118	110	-60
4	400	-302	110	18.3
5	-1350	624	-100	-60
6	-53	1036	-100	65

Continues on next page

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.
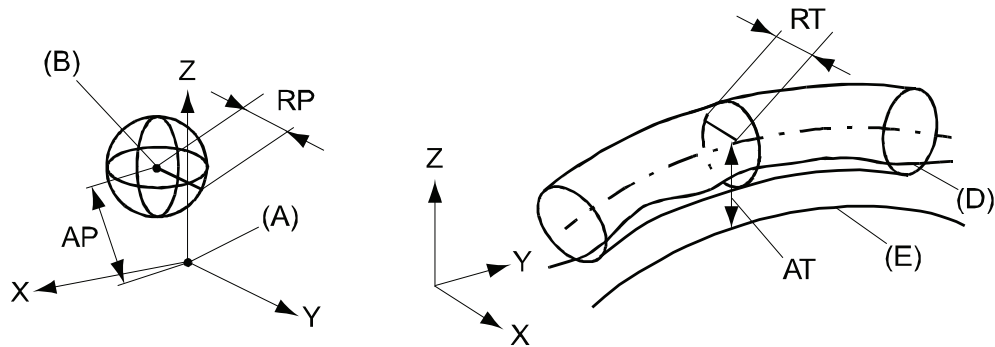
xx0800000424

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

Description	IRB 2400/10	IRB 2400/16
Pose repeatability, RP (mm)	0.03	0.03
Pose accuracy, AP[i] (mm)	0.03	0.03
Linear path repeatability, RT (mm)	0.11	0.15
Linear path accuracy, AT (mm)	0.33	0.41
Pose stabilization time, (PSt) to within 0.4 mm of the position (s)	0.15	0.22

[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

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 2400/10	150 °/s 90 °/s [i]	150 °/s 90 °/s [ii]	150 °/s 90 °/s [iii]	360 °/s	360 °/s	450 °/s

Robot type	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6
IRB 2400/16	150 °/s	150 °/s	150 °/s	360 °/s	360 °/s	450 °/s

i   For wall mounted 10 kg version.

ii   For wall mounted 10 kg version.

iii   For wall mounted 10 kg version.

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

1.8.1 Robot stopping distances and times

Introduction

The stopping distances and times for category 0 and category 1 stops, as required by EN ISO 10218-1 Annex B, are listed in *Product specification - Robot stopping distances according to ISO 10218-1* (*3HAC048645-001*).

1.9 Signals

> **ℹ Note**
>
> For more information of air and signals for extra equipment to upper arm, see *Application interface on page 43*.

This page is intentionally left blank

2 Specification of variants and options

2.1 Introduction to variants and options

General

The different variants and options for the IRB 2400 are described in the following sections. The same option numbers are used here as in the specification form.

The variants and options related to the robot controller are described in the product specification for the controller.

2.2 Manipulator

Variants

Option	IRB Type	Handling capacity (kg) / Reach (m)
435-7	IRB 2400/10	10/1.55
435-8	IRB 2400/16	16/1.55

Manipulator color

Option	Color[i]	RAL code[ii]
209-1	ABB orange standard	RAL7032
209-2	ABB white standard	RAL 9003
209-202	ABB Graphite White std Standard color	RAL7035
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

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

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

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

Protection

Option	Description
287-4	Standard

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 corrosion protection additional rust preventive are applied to exposed and crucial areas, e.g. has the tool flange a special preventive coating. Although, continuous splashing of water or other similar rust formation fluids may case rust attach on the robots unpainted areas, joints, or other unprotected surfaces. Under these circumstances it is recommended to add rust inhibitor to the fluid or take other measures to prevent potential rust formation on the mentioned.The entire robot is IP67 compliant according to IEC 60529 - from base to wrist (except IRB 2400L, IP67 only on wrist and connectors), 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. The robot is labeled with "Foundry Plus" (IRB 2400F/10 and F/16).

Mounting position

Option	Description
224-1	Floor mounted
224-2	Inverted

Application interface

Air supply and signals for extra equipment to upper arm.

For connection of 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.

A 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 upper arm.
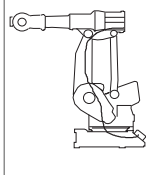
Type		Description
Signals	23	50 V, 250mA
Power	10	250 V, 2 A
Air	1	Max. 8 bar, inner hose diameter 8 mm
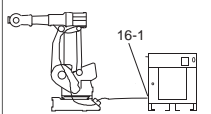
2 Specification of variants and options

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)

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

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 50° to 140°. See figure below.
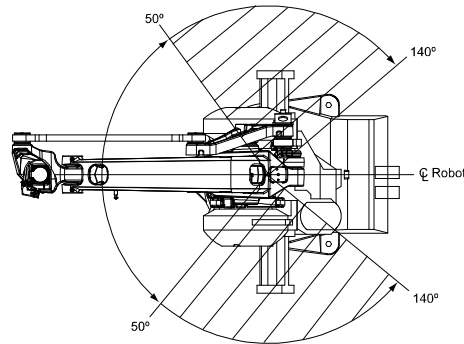
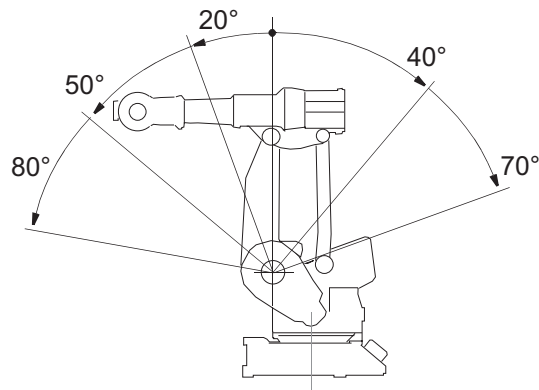

xx0500002105

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.

xx1100000586

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

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.

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

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

2.3 Positioners

General

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

2.4 Track motion

Track motion type

Option	Type	Description
1000-5	Not for AW	For IRB 1600/2400 robot, with a travel length of 1.7 m. For for example material handling robot.
1000-6	For AW	For IRB 1600/2400 robot, with a travel length of 1.7 m. For AW robot with Marthon-pac or Bobbin holder.

Additional travel length

Option	Description	Description
1001-1	(1-18) Add travel length	Chose additional travel length in meter, above the min. length under Track Motion Type. The selection 1 adds 1m travel length, 2 adds 2m travel length and so on.......

Example of ordering a track motion RTT, with a requested travel length of 7.5 m:

Track Motion Type

☒ 1000-5 RTT with Bobbin

[6] 1001-1 Add travel length

xx1100000587

In this case, option 1000-5 specify a track motion with a travel length of 1.7 m, option 1000-5 adds 6 meters to that, ending up with total travel length of 7.7 m.

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

2.5.2 Positioner

Positioner cable 1

Option	Lengths
1067-1	7 m
1067-2	10 m (Standard length)
1067-3	15 m

Positioner cable 2

Option	Lengths
1068-1	7 m
1068-2	10 m (Standard length)
1068-3	15 m

Positioner cable type

Option	Type	Description
1048-1	Flexible	Only available with one or two MTC 250/500/750/2000/5000

Weld return cable

Option	Lengths
1056-1	7 m
1056-2	7 m x 2
1056-3	10 m
1056-4	10 m x 2
1056-5	15 m
1056-6	15 m x 2

Return cable

Option	Type	Description
1057-1	OKC T-connection	Choose quantity, 1-2

2.6 Process

2.6.1 Process

Process module

Option	Type	Description
768-1	Empty cabinet small	See *Product specification - Controller IRC5 with FlexPendant*, see chapter 2.2.1
768-2	Empty cabinet large	See *Product specification - Controller IRC5 with FlexPendant*, chapter 2.2.1

Installation kit

Option	Type	Description
715-1	Installation kit	See *Product specification - Controller IRC5 with FlexPendant*, chapter 2.2.1

WeldGuide IV

Weldguide IV provides tracking functionality by reading the true impedance values close to the arc at 25 kHz then guides the robot to the correct path. Weldguide IV is designed to track difficult welding joint variations resulting from cast components or other pre-process problems.

Option	Type	Description
992-1	Basic	Occupies one slot and one Ethernet port. Digital I/O or AD Combi I/O is needed for WeldGuide functions. Requires options WG Sensor [994-1] or [995-1], and WeldGuide Multipass [815-2]. Not together with option UL/CSA [429-1].
992-2	Advanced	Includes all *Basic* functionality and adaptive fill. This feature allows the robot to adjust to the changes in joint width, the weave stroke will increase or decrease, and the travel speed will be adjusted accordingly. Occupies one slot and one Ethernet port. Digital I/O or AD Combi I/O is needed for WeldGuide functions. Requires options WG Sensor [994-1] or [995-1], and WeldGuide Multipass [815-2]. Not together with option UL/CSA [429-1].
994-1	WG Solid core sensor	
995-1	WG Split core sensor	

2 Specification of variants and options

2.6.2 Process equipment

Torch service

Option	Type	Description
1037-1	ABB TSC 2013	ABB Torch Service Center. Including: Cleaner, cutter and BullsEye. Occupies I/O signals Dig. 5In/2Out. Requires option Base Dig. 16in/16Out [1541-1].
1037-5	BullsEye	BullsEye stand alone. Requires options RW Arc [633-4], and BullsEye [652-1] or RW Cutting [951-1].

Torch service options

Option	Type	Description
1038-1	Extension pedestal	Extension pedestal for TSC/TC/BullsEye

2.7 User documentation

User documentation

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

> 💡 **Tip**
>
> All documents can be found via myABB Business Portal, *www.abb.com/myABB*.

This page is intentionally left blank

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* .

Robot peripherals

- Track Motion
- Motor Units
- Positioners

This page is intentionally left blank

Index

ABB AB

Robotics & Discrete Automation

S-721 68 VÄSTERÅS, Sweden

Telephone +46 10-732 50 00

ABB AS

Robotics & Discrete Automation

Nordlysvegen 7, N-4340 BRYNE, Norway

Box 265, N-4349 BRYNE, Norway

Telephone: +47 22 87 2000

ABB Engineering (Shanghai) Ltd.

Robotics & Discrete Automation

No. 4528 Kangxin Highway

PuDong New District

SHANGHAI 201319, China

Telephone: +86 21 6105 6666

ABB Inc.

Robotics & Discrete Automation

1250 Brown Road

Auburn Hills, MI 48326

USA

Telephone: +1 248 391 9000

abb.com/robotics