

ROBOTICS

# Product specification

IRB 1410



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## **Product specification**

**IRB 1410**

**Document ID: 3HAC026366-001**

**Revision: F**

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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
<i>Product specification - Controller IRC5</i> IRC5 with main computer DSQC1000.	3HAC047400-001
<i>Product specification - Controller software IRC5</i> IRC5 with main computer DSQC1000 and RobotWare 5.6x.	3HAC050945-001
<i>Product specification - Controller software IRC5</i> IRC5 with main computer DSQC1000 and RobotWare 6.	3HAC050945-001
<i>Product manual - IRB 1410</i>	3HAC026320-001
<i>Product specification - Robot user documentation, IRC5 with RobotWare 6</i>	3HAC052355-001

## Revisions

Revision	Description
-	<ul style="list-style-type: none"> <li>• Replaces 3HAC9112-1 (English), 3HAC10766-1 (French), 3HAC10393-1 (German), 3HAC10759-1 (Spanish) and 3HAC10780-1 (Italian)</li> <li>• Minor corrections/update</li> </ul>
A	<ul style="list-style-type: none"> <li>• Minor corrections/update</li> </ul>
B	<ul style="list-style-type: none"> <li>• Text for ISO test adjusted</li> </ul>
C	<ul style="list-style-type: none"> <li>• Minor corrections/update</li> </ul>

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## Overview of this product specification

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*Continued*

Revision	Description
D	Published in release R17.1. The following updates are done in this revision: <ul style="list-style-type: none"><li>• Restriction of load diagram added.</li></ul>
E	Published in release R17.2. The following updates are done in this revision: <ul style="list-style-type: none"><li>• Updated list of applicable standards.</li></ul>
F	Published in release R17.2. The following updates are done in this revision: <ul style="list-style-type: none"><li>• Removed the phased out options: option RPC S-400 [1029-15], option Bobin [1033-3] and option PSF315 [1069-1]</li></ul>



# 1 Description

## 1.1 Structure

### 1.1.1 Introduction to structure

---

#### Robot family

The IRB 1410 is a 6-axis industrial robot, designed specifically for manufacturing industries that use flexible robot-based automation. The robot has an open structure that is specially adapted for flexible use, and can communicate extensively with external systems. It is ideal for Arc Welding and Material Handling applications.

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#### 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.

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#### Safety

Safety standards valid for complete robot, manipulator and controller.

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#### 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.

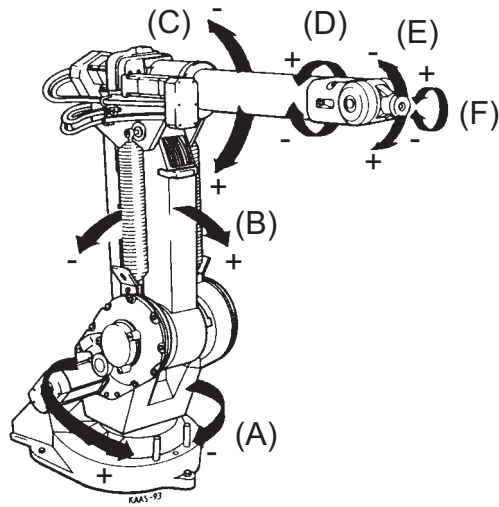
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# 1 Description

## 1.1.1 Introduction to structure

*Continued*

### Manipulator axes



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

### 1.1.2 Different robot versions

#### General

The IRB 1410 is available in one variant, designed for floor mounting (no tilting around X or Y axis allowed).

Robot type	Handling capacity (kg)	Reach (m)
IRB 1410	5	1.45

#### Manipulator weight

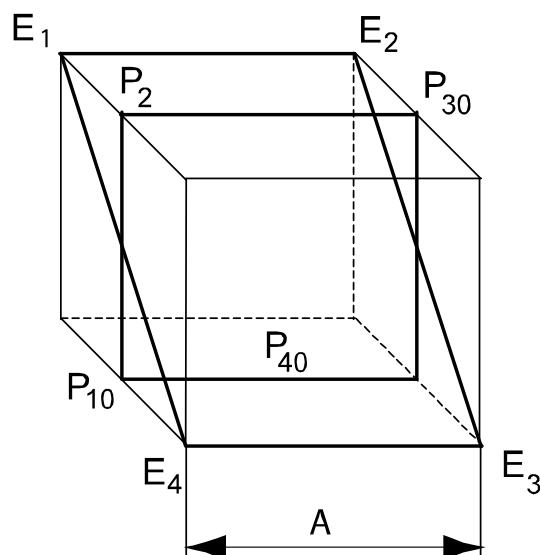
Robot	Weight
Manipulator	225 kg

#### 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 1410
ISO Cube Max. velocity	0.44 kW



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Pos	Description
A	400 mm

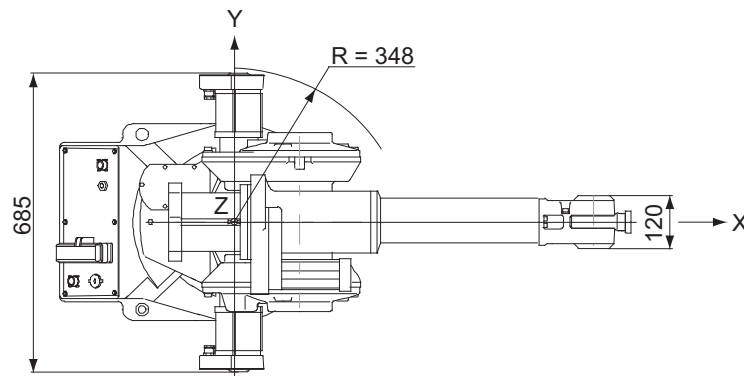
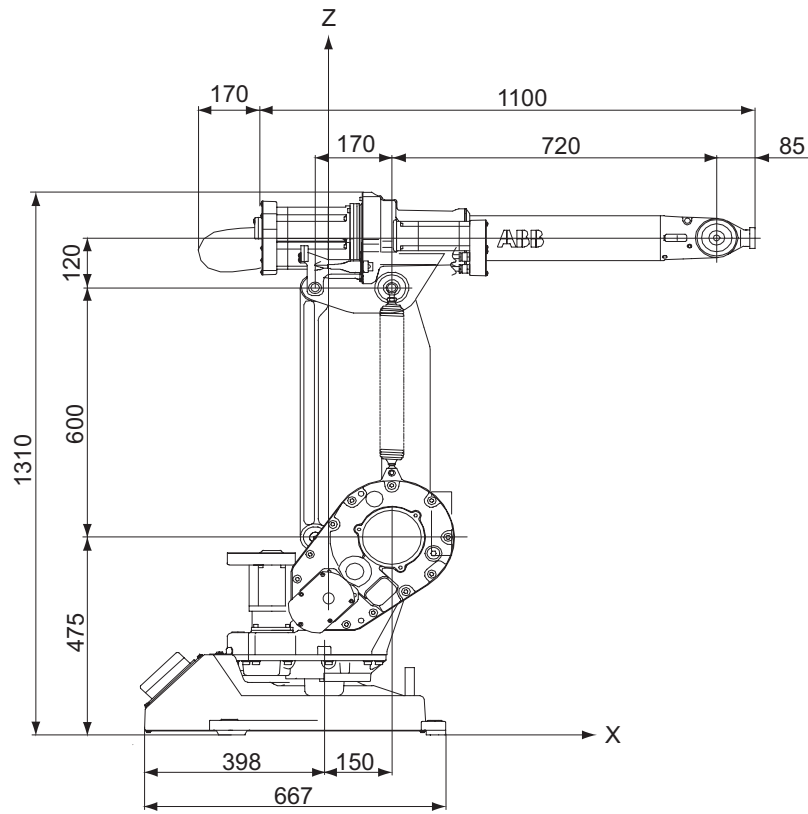
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# 1 Description

## 1.1.2 Different robot versions

Continued

### Dimensions IRB 1410



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## 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.

#### 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 <sup>i</sup>	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 <sup>ii</sup>	Arc welding equipment - Part 1: Welding power sources
EN IEC 60974-10:2014 <sup>ii</sup>	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)

<sup>i</sup> Only robots with protection Clean Room.

<sup>ii</sup> 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

*Continues on next page*

# 1 Description

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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 to installation

---

#### General

On to the IRB 1410, designed for floor mounting (no tilting around X or Y axis allowed), an end effector 5 kg including payload can be mounted on to the robot tool flange (axis 6), see [Load diagrams on page 20](#).

#### Extra loads

Other equipment of 18 kg can be mounted on to the rear of the upper arm. Holes for mounting extra equipment, see [Mounting equipment on page 22](#)

#### Working range limitations

The working range of axes 1 can be limited by mechanical stops.

# 1 Description

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## 1.3.2 Operating requirements

### 1.3.2 Operating requirements

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#### 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 <sup>i</sup> (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)

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

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#### Relative humidity

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



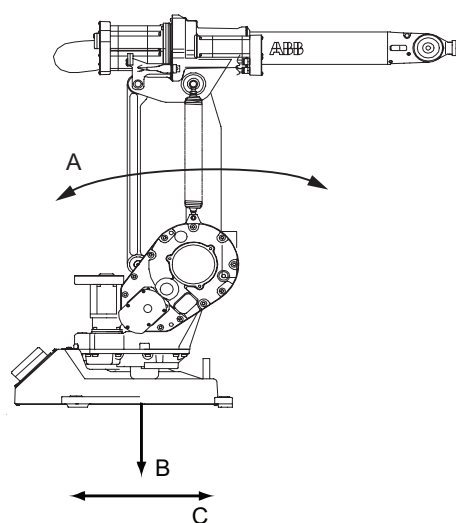
1.3.3 Mounting the manipulator

Maximum load in relation to the base coordinate system

IRB 1410

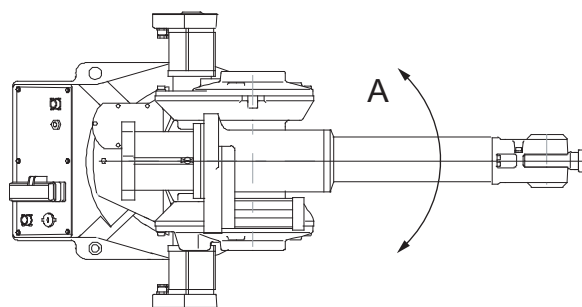
Floor Mounted

Force	Endurance load (in operation)	Max. load (emergency stop)
Force xy	±1500 N	±2000 N
Force z	+2800 ±500 N	+2800 ±700 N
Torque xy	±1800 N	±2000 N
Torque z	±400 N	±500 N



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A	Torque <sub>xy</sub> (T <sub>xy</sub> )
B	Force <sub>z</sub> (F <sub>z</sub> )
C	Force <sub>xy</sub> (F <sub>xy</sub> )



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A	Torque <sub>z</sub> (T <sub>z</sub> )
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# 1 Description

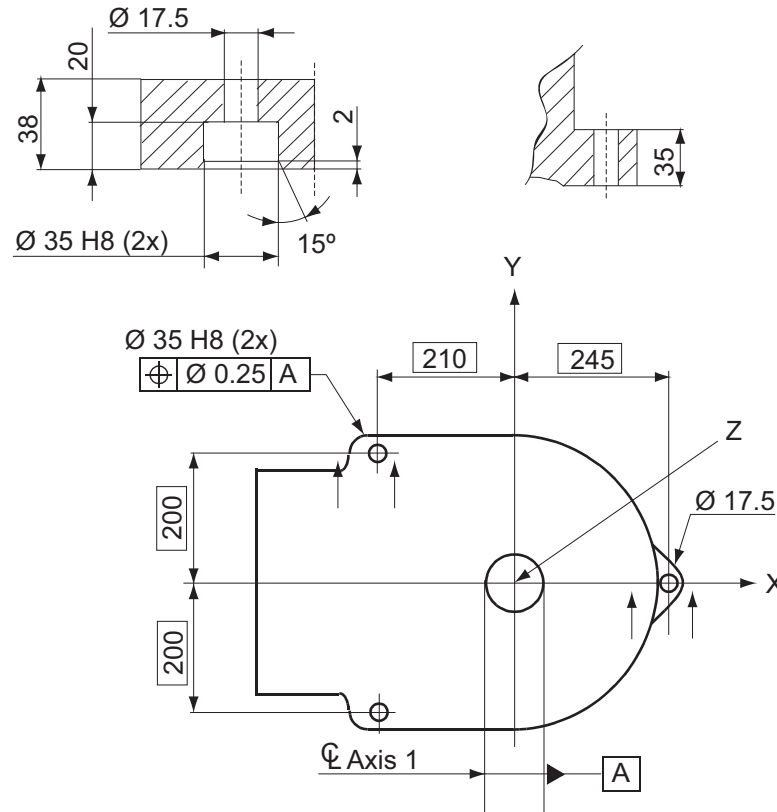
## 1.3.3 Mounting the manipulator

*Continued*

### 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



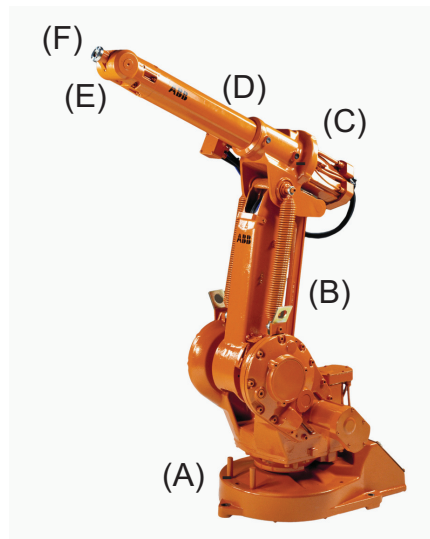
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1.4 Calibration and references

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 Description

---

## 1.5.1 Introduction to load diagrams

## 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

The load diagram include a nominal payload inertia,  $J_0$  of  $0.012 \text{ kgm}^2$ . 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.

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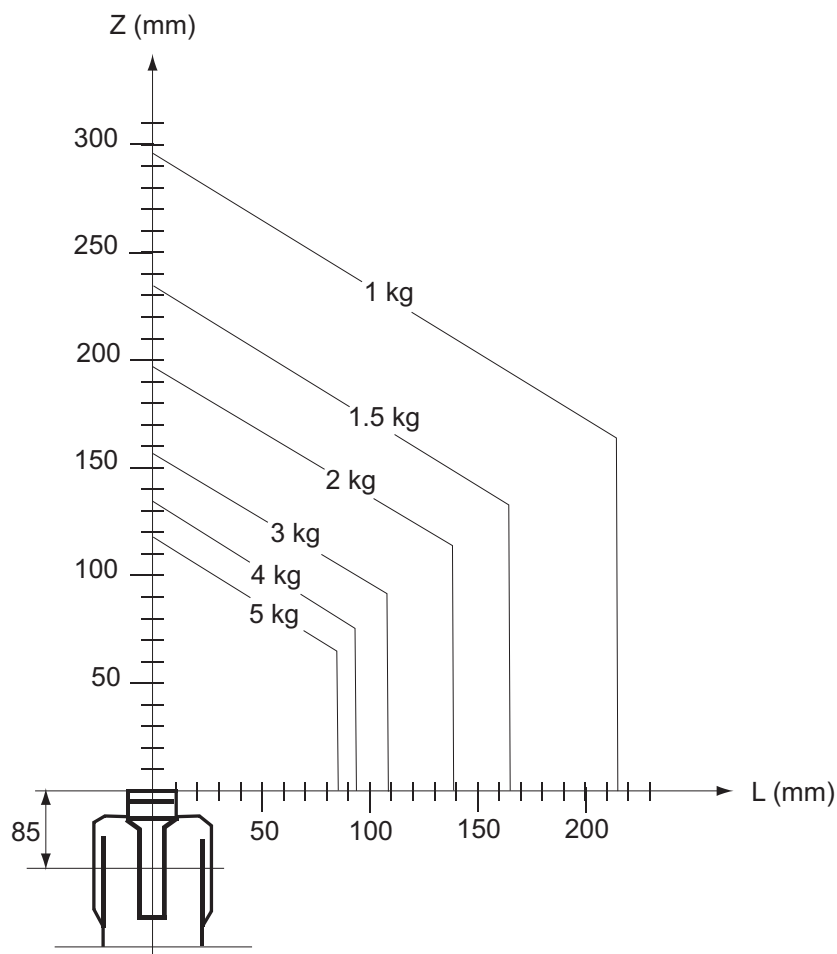
#### Control of load case by "RobotLoad"

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.

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Diagram



# 1 Description

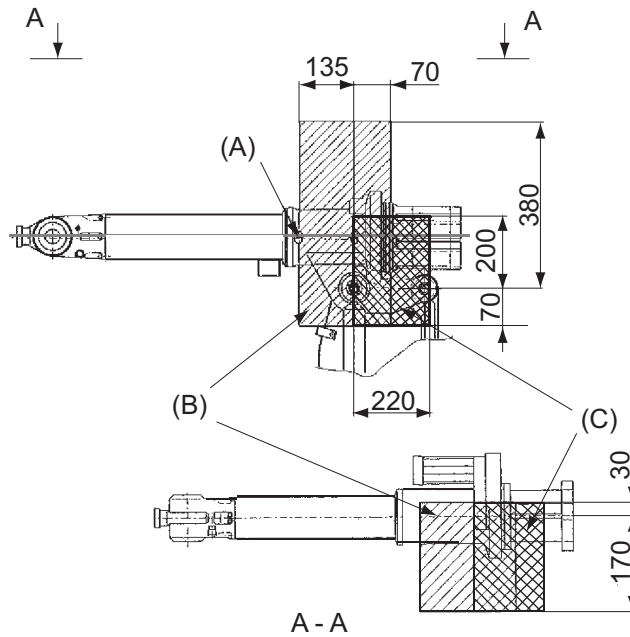
## 1.6.1 Information about mounting equipment

## 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.



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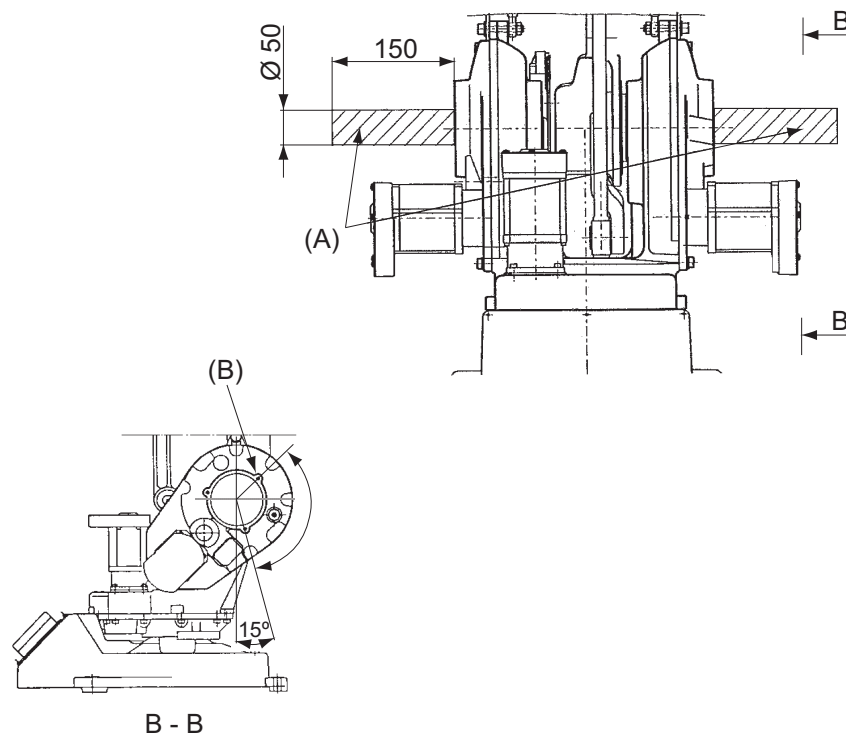
Pos	Description
A	Mounting holes for equipment, M8 (2x) depth 16 mm
B	Max. 10 kg total
C	Max. 18 kg total

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# 1 Description

## 1.6.1 Information about mounting equipment

*Continued*



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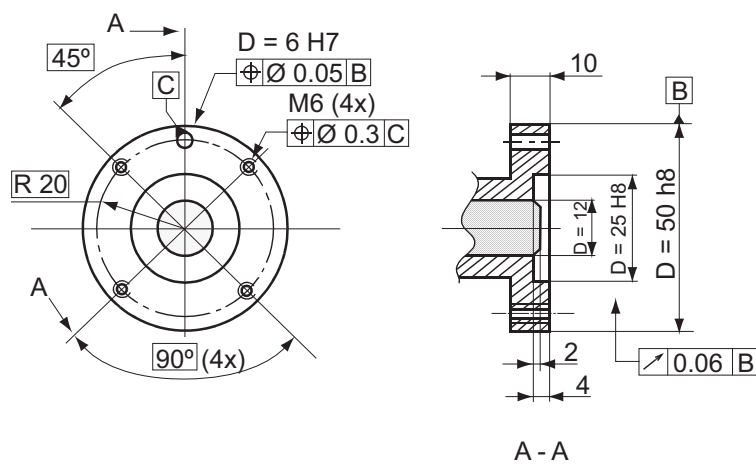
Pos	Max load
A	Max 19 kg total
B	Mounting holes for equipment, both sides, M8 (3x) R= 75 mm, depth 16 mm



### Note

Maximum loads must never be exceeded!

## Tool flange



xx110000806

*Continues on next page*

# 1 Description

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## 1.6.1 Information about mounting equipment

*Continued*

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.

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#### 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 the maintenance section in *Product manual - IRB 1410*.

# 1 Description

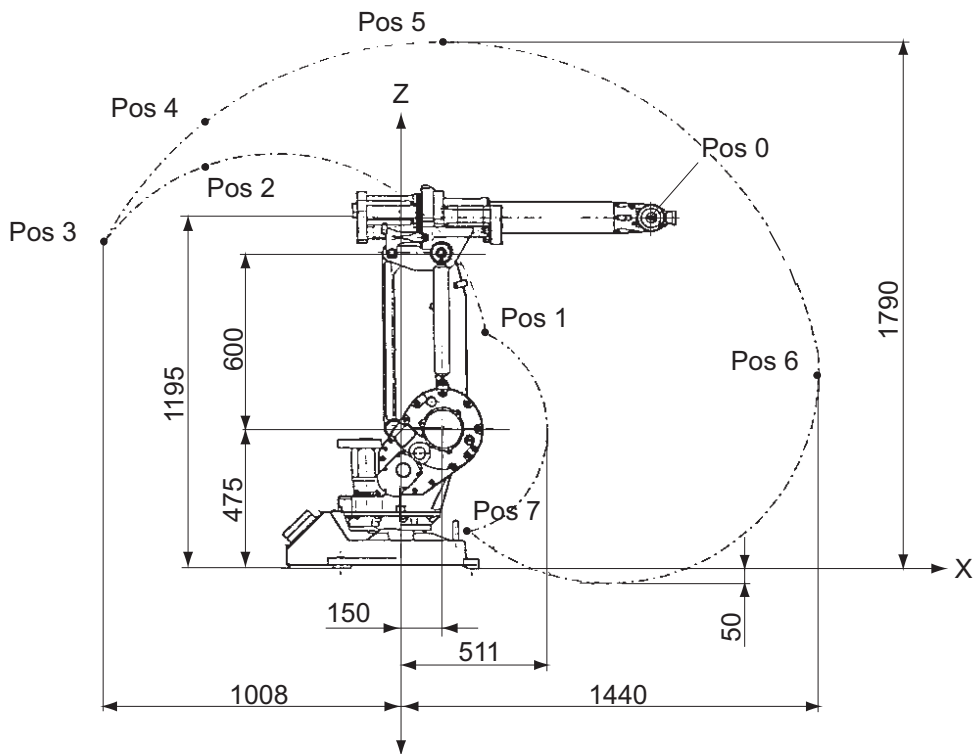
## 1.8 Robot motion

## 1.8 Robot motion

### Introduction to robot motion

The working area.

Axis	Type of motion	Range of movement
1	Rotation motion	+ 170° to - 170°
2	Arm motion	+ 70° to - 70°
3	Arm motion	+ 70° to - 65°
4	Rotation motion	+ 150° to - 150°
5	Bend motion	+ 115° to - 115°
6	Turn motion	+ 300° to - 300°



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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	870	1195	0	0
1	306	800	-70	70
2	-716	1345	-70	-35
3	-1008	1104	-70	-65
4	-596	1561	-43	-65
5	208	1792	-6	-65
6	1442	737	70	-65

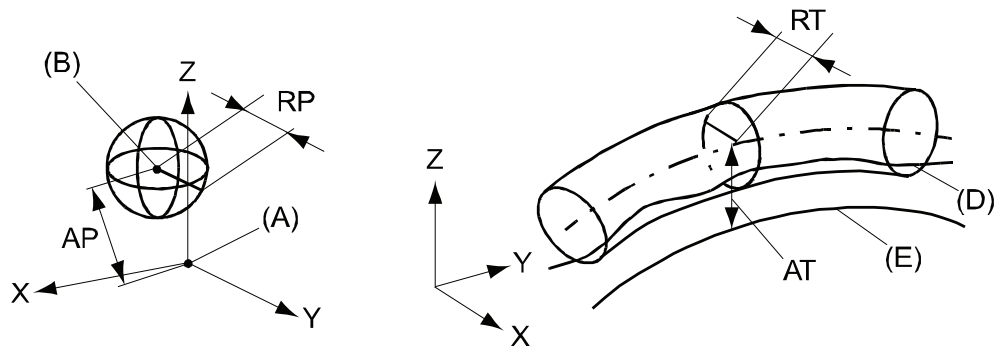
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Position no (see figure above)	Position (mm) X	Position (mm) Z	Angle (degrees) Axis 2	Angle (degrees) Axis 3
7	239	125	70	70

### 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 1410
Pose repeatability, RP (mm)	0.025
Pose accuracy, AP <sup>i</sup> (mm)	0.037
Linear path repeatability, RT (mm)	0.12
Linear path accuracy, AT (mm)	0.60
Pose stabilization time, PSt (s)	0.23

<sup>i</sup> AP according to the ISO test above, is the difference between the reached 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.

Continues on next page

# 1 Description

## 1.8 Robot motion

Continued

### Velocity

#### 3-phase power supply

Robot Type	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6
IRB 1410	120 °/s	120 °/s	120 °/s	280 °/s	280 °/s	280 °/s

#### 1-phase power supply

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

Note that the robot acceleration is not affected by the single phase power supply. Thus the cycle time may not be affected at all. RobotStudio can be used to test the cycle, and to modify the system parameter (*Main tolerance min*).

Robot type	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6
IRB 1410	105 °/s	105 °/s	105 °/s	280 °/s	280 °/s	280 °/s

#### Axis resolution

Approx. 0.01° on each axis.

### Stopping distance/time

Stopping distance/time for emergency stop (category 0), program stop (category 1) and at mains power supply failure at max speed, max stretched out, max payload and no arm 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	Axis	Category 0		Category 1		Main power failure	
		A	B	A	B	A	B
IRB 1410	1	20	0.33	30	0.44	29	0.40
	2	11	0.17	14	0.21	15	0.21
	3	8	0.13	18	0.24	17	0.21

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

### 1.9 Signals

---

#### General

Customer connection in terms of Integrated wire feed cabling for signals and power is integrated in the manipulator and the connections start at the base and end on the upper arm housing.

For the Specification of the customer connections, see chapter 2 Specification of Variants and Options, Application interface Connection type.

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## 2 Specification of variants and options

### 2.1 Introduction to variants and options

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#### General

The different variants and options for the IRB 1410 are described in the following sections. The same option numbers are used here as in the specification form.

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#### Related information

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

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

## 2 Specification of variants and options

### 2.2 Manipulator

### 2.2 Manipulator

#### Variants

Option	IRB Type	Handling capacity (kg) / Reach (m)
435-70	IRB 1410	5/1.45

#### Manipulator color

Option	Description	Note
209-1	ABB Orange standard	
209-202	ABB Graphite White standard	Standard color



#### Note

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

#### Protection

Option	Description
287-4	Standard

#### Mounting position

Option	Description
224-1	Floor mounted

#### 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 UT0014-12PHT connector and one FCI UT0014-12SHT 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.

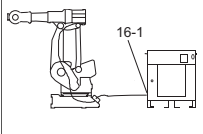
Type		Description
Signals	12	49 V, 500mA
Power	10	250 V, 2 A
Air	1	Max. 8 bar, inner hose diameter 6.5 mm

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

Continues on next page



### Application interface connection to

Option	Description	
16-1 Cabinet <sup>i</sup>	The signals are connected to 12-pole screw terminals, Phoenix MSTB 2.5/12-ST-5.08, to the the controller. Not together with option 218-8.	

<sup>i</sup> 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

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.

### 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.

### Working range limit - axis 1

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

Option	Description
28-1	Axis 1 Two extra stops for restricting the working range. The working range can be limited from $\pm 150^\circ$ to the smallest working range which is $\pm 50^\circ$ . The restriction between $50^\circ$ and $150^\circ$ can be performed at any position by drilling M10 holes and mounting the stops. The kit contain stops, screws and instruction.

### Warranty


Option	Type	Description
438-1	Standard warranty	Standard warranty is 12 months from <i>Customer Delivery Date</i> or latest 18 months after <i>Factory Shipment Date</i> , 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.

*Continues on next page*

## 2 Specification of variants and options

### 2.2 Manipulator

*Continued*

Option	Type	Description
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	<p>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 <i>Factory Shipment Date</i> or from activation date of standard warranty in WebConfig.</p> <p> <b>Note</b></p> <p>Special conditions are applicable, see <i>Robotics Warranty Directives</i>.</p>

## 2.3 Positioners

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### General

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

## 2 Specification of variants and options

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### 2.4.1 Manipulator

## 2.4 Floor cables

### 2.4.1 Manipulator

---

#### Manipulator cable length

Option	Lengths
210-2	7 m
210-3	15 m

---

#### Connection of Parallel communication

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

## 2.5 Process

### 2.5.1 DressPack

#### Process module

Option	Type	Description
768-1	Empty cabinet small	See Product Specification - Controller IRC5 with Flex-Pendant, chapter 2.2.1.

#### WeldGuide III

Option	Type	Description
958-1	Basic	Only together with Arsitomig 4000i/5000i, MigRob and TPS power sources. Digital I/O or AD Combi I/O is needed for WeldGuide functions. Requires option WeldGuide MultiPass [815-2].
958-2	Advanced	Only together with Arsitomig 4000i/5000i, MigRob and TPS power sources. Digital I/O or AD Combi I/O is needed for WeldGuide functions. Requires option WeldGuide MultiPass [815-2].

#### Installation kit

Option	Type	Description
715-1	Installation kit	See Product Specification - Controller IRC5 with Flex-Pendant, chapter 2.2.1.

#### Calibration plate

Option	Type	Description
1250-1	Calibration plate	Calibration plate for optical tracking.

## 2 Specification of variants and options

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### 2.5.2 Process equipment

#### 2.5.2 Process equipment

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##### Welding torch kit

Consisting of: torch neck, hose bundle, torch holder.

Option	Type	Description
1034-1	PSF315	25 degrees. Only available for power source ABB RPC, option 1029-15.

##### Torch service

Option	Type	Description
1037-1	ABB TSC	ABB Torch Service Center. Including: Cleaner, cutter and BullsEye. Requires option 716-1 or 717-2, Internal I/O.
1037-2	ABB TC96	ABB Torch cleaner. Requires option 716-1 or 717-2, Internal I/O.
1037-5	BullsEye	BullsEye stand alone.

## 2.6 User documentation

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### 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](http://www.myportal.abb.com).

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## 3 Accessories

### 3.1 Introduction to accessories

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#### General

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

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#### 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*.

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#### Robot peripherals

- Track Motion
- Motor Units
- Positioners

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