



## Product specification

### Articulated robot

IRB 4400/45  
IRB 4400/60  
IRB 4400/L30  
IRB 4400/L10  
IRB 4400/S  
IRB 4450/S  
M2004/M2000





# Product Specification

Articulated robot

3HAC 9117-1

Rev.7

IRB 4400/45

IRB 4400/60

IRB 4400/L30

IRB 4400/L10

IRB 4400/S

IRB 4450/S

M2004/M2000

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<b>1 Description</b>	<b>5</b>
<b>1.1 Structure</b>	<b>5</b>
1.1.1 Introduction	5
General	5
Different versions	5
Foundry and Wash robot versions	5
Clean Room robots	5
RobotWare and BaseWare OS	5
Illustration	6
1.1.2 Different robot versions	7
General	7
Available robot types	7
1.1.3 Definition of version designation	8
Manipulator weight	8
Other technical data	8
Power consumption	8
Dimensions	11
<b>1.2 Safety/Standards</b>	<b>14</b>
1.2.1 Standards	14
1.2.2 Safety	15
Safety category 3	15
Selecting the operating mode	15
Reduced speed	15
Three position enabling device	15
Safe manual movement	15
Over-speed protection	15
Emergency stop	15
Safeguarded space stop	16
Delayed safeguarded space stop	16
Collision detection (option)	16
Restricting the working space	16
Hold-to-run control	16
Fire safety	16
Safety lamp (option)	16
<b>1.3 Installation</b>	<b>17</b>
1.3.1 Introduction	17
General	17
Other equipment	17
Working range	17
1.3.2 Operating requirements	18
Protection standards	18
Clean room standards	18
Explosive environments	18
Ambient temperature	18
Relative humidity	18
1.3.3 Mounting the manipulator	19
Mounting surface and bushings	20
<b>1.4 Calibration and References</b>	<b>21</b>
1.4.1 Fine calibration	21
General	21
1.4.2 Absolute Accuracy calibration	22
General	22
The calibration concept	22
Calibration data	22
Absolute Accuracy option	22
Production data	23
1.4.3 Load diagrams	24

# Table of Contents

---

IRB 4400/45 .....	24
IRB 4400/60 .....	25
IRB 4400/S, IRB 4400/L30 and IRB 4450/S .....	26
IRB 4400/L10 .....	27
1.4.4 Mounting equipment .....	28
IRB 4400/45 IRB 4400/60 IEB 4400/S IRB 4400/L30 IRB 4450/S .....	28
IRB 4400/L10 .....	30
IRB 4400/45, IRB 4400/60, IRB 4400/S, IRB 4400/L30, IRB 4450/S .....	31
IRB 4400/L10 .....	31
<b>1.5 Maintenance and Troubleshooting .....</b>	<b>32</b>
1.5.1 Introduction .....	32
General .....	32
<b>1.6 Robot Motion .....</b>	<b>33</b>
1.6.1 Introduction .....	33
IRB 4400/45 and IRB 4400/60 .....	33
IRB 4400/S .....	35
IRB 4400/L30 .....	37
IRB 4400/L10 .....	39
IRB 4450/S .....	41
1.6.2 Performance according to ISO 9283 .....	43
General .....	43
1.6.3 Velocity .....	43
Resolution .....	43
1.6.4 Signals .....	44
Signal connections on robot arm .....	44
<b>2 Specification of Variants and Options .....</b>	<b>45</b>
<b>2.1 Introduction .....</b>	<b>45</b>
2.1.1 General .....	45
2.1.2 Manipulator .....	45
Variants .....	45
Manipulator color .....	45
Protection .....	45
Application interface .....	46
Application interface Connection to .....	46
Application equipment cable lengths .....	47
Safety lamp .....	47
Position switch .....	47
Position switches Connection to .....	48
Position switches Cable lengths .....	48
Connector kit .....	49
Working range limit .....	49
IRB 4400/45 IRB 4400/60 IRB 4400/L30 IRB 4400/L10 .....	50
IRB 4450/S .....	50
<b>3 Accessories .....</b>	<b>51</b>
Basic software and software options for robot and PC .....	51
Robot Peripherals .....	51

# 1 Description

## 1.1 Structure

### 1.1.1 Introduction

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**General**

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

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**Different versions**

The IRB 4400 comes in several different versions, with handling capacities of up to 60 kg, a maximum reach of 2.5 m, floor or shelf-mounted manipulators as well as manipulators for harsh environments.

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**Foundry and Wash robot versions**

The robot versions Foundry and Wash are suitable for operating in harsh environments and have special surface treatment and paint for excellent corrosion protection. The connectors are designed for severe environments, and bearings, gears and other sensitive parts are highly protected. The robots have the FoundryPlus protection which means that the whole manipulator is IP67 classified and steam washable.

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**Clean Room robots**

The Clean Room robots are classified for clean room class 100 according to US Federal Standard 209 or class 5 according to ISO 14644-1.

The robot is equipped with the IRC5 controller and robot control software, RobotWare for M2004 and with the S4Cplus controller and robot control software, BaseWare OS for M2000.

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**RobotWare and BaseWare OS**

RobotWare and BaseWare OS supports every aspect of the robot system, such as motion control, development and execution of application programs, communication etc. See Product Specification IRC5 for M2004 and Product Specification S4Cplus for M2000.

Safety standards require a controller to be connected to the robot.

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

# 1 Description

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## 1.1.1 Introduction

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### Illustration

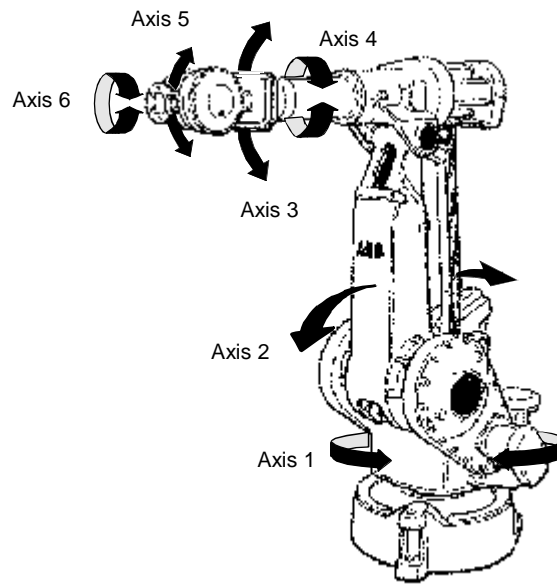


Figure 1 The IRB 4400 manipulator has 6 axes.



### 1.1.2 Different robot versions

#### General

The IRB 4400, as mentioned above, is available in different versions depending on its arm length, handling capacity, environment adaptation or the way it is mounted.

#### Available robot types

The following different robot types are available:

Pay load/ Mounting	Standard
45 kg	IRB 4400/45
60 kg	IRB 4400/60
30 kg	IRB 4400/L30
10 kg	IRB 4400/L10
30 kg/Shelf	IRB 4400/S
30 kg/Shelf	IRB 4450/S

Pay load/ Mounting	Foundry	Wash	Clean Room
45 kg	IRB 4400F/45	IRB 4400CW/45	IRB 4400CR/45
60 kg	IRB 4400F/60	IRB 4400CW/60	IRB 4400CR/60
30 kg	IRB 4400F/L30	IRB 4400CW/L30	IRB 4400CR/L30
10 kg	IRB 4400F/L10	IRB 4400CW/L10	IRB 4400CR/L10
30 kg/Shelf	IRB 4400F/S	IRB 4400CW/S	IRB 4400CR/S
30 kg/Shelf	IRB 4450F/S	IRB 4450CW/S	-

# 1 Description

## 1.1.3 Definition of version designation

### 1.1.3 Definition of version designation

IRB 4400 Protection / Version Handling capacity:

Prefix description	Robot type	Description
Protection	F or CW CR	Manipulator adapted for use in harsh environments (e.g. foundry or washable robot is required). Manipulator is clean room classified
Version	L S	Long arm Shelf mounted manipulator
Handling capacity		Indicates the maximum handling capacity (kg)

### Manipulator weight

Robo type	Weight
IRB 4400/45	985 kg
IRB 4400/60	1040 kg
IRB 4400/L10	1040 kg
IRB 4400/S	1290 kg
IRB 4400/L30	1060 kg
IRB 4450/S	1040 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 89/392 EEC)

### Power consumption

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

IRB 4400/45 (Cube side = 630 mm)

Speed [mm/s]	Power consumption [kW]
Max.	1.36
1000	0.95
500	0.74
100	0.62

IRB 4400/60 (Cube side = 630 mm)

Speed [mm/s]	Power consumption [kW]
Max.	1.33
1000	0.99
500	0.78
100	0.66

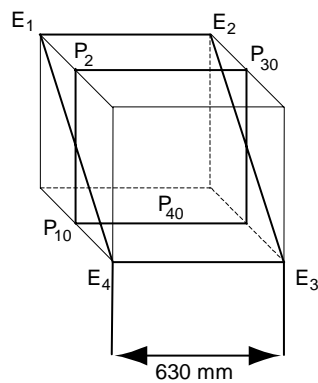


Figure 2 Path E1-E2-E3-E4 in the ISO Cube, maximum load.

IRB 4400/L30 (Cube side = 1000 mm)

Speed [mm/s]	Power consumption [kW]
Max.	1.15
1000	0.86
500	0.73
100	0.64

IRB 4400/L10 (Cube side = 1000 mm)

Speed [mm/s]	Power consumption [kW]
Max.	1.28
1000	0.63
500	0.53
100	0.48

# 1 Description

## 1.1.3 Definition of version designation

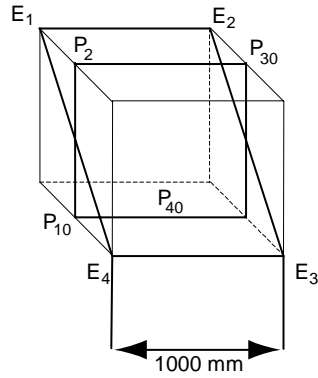


Figure 3 Path E1-E2-E3-E4 in the ISO Cube, maximum load.

IRB 4450/S (Cube side = 1000 mm)

Speed [mm/s]	Power consumption [kW]
Max.	Not yet available
1000	Not yet available
500	Not yet available
100	Not yet available

Dimensions

IRB 4400/45, IRB 4400/60, IRB 4400/S, IRB 4400/L30:

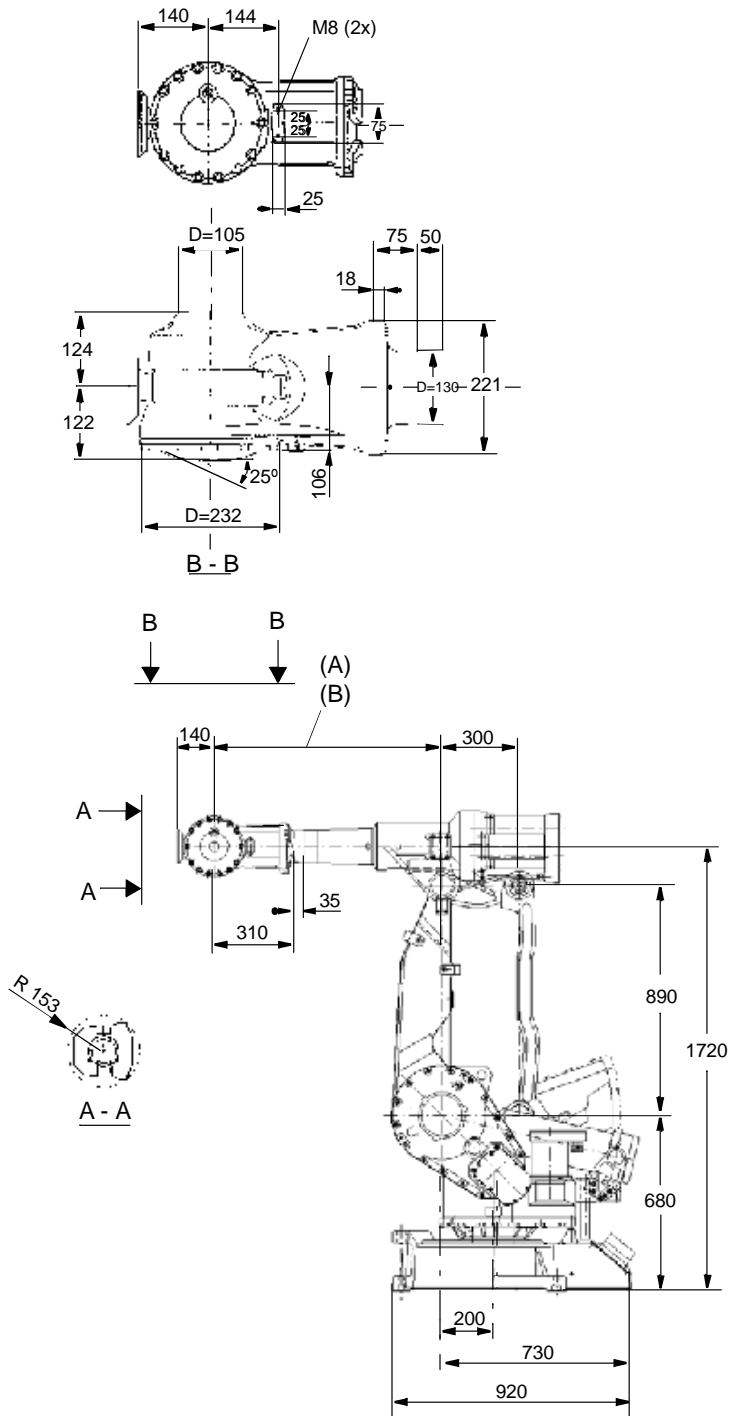


Figure 4 View of the manipulator from the side (dimensions in mm).

Pos	Description
A	880 for 4400/45 and /60
B	1380 for 4400/S and 4400/L30

# 1 Description

## 1.1.3 Definition of version designation

IRB 4400/45, IRB 4400/60, IRB 4400/S and IRB 4400/L30:

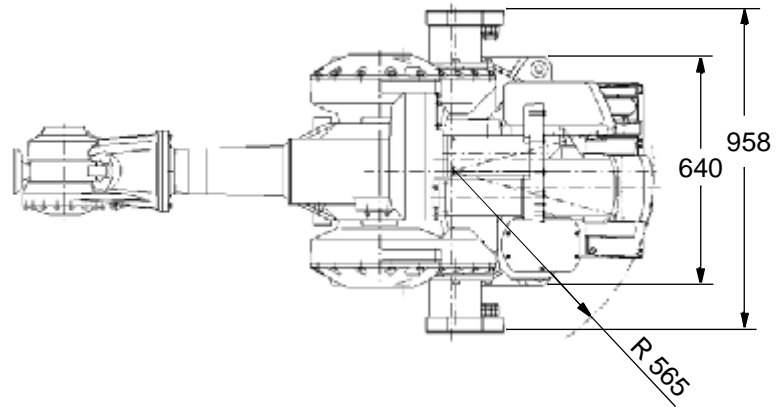


Figure 5 View of the manipulator from above (dimensions in mm).

IRB 4400/L10:

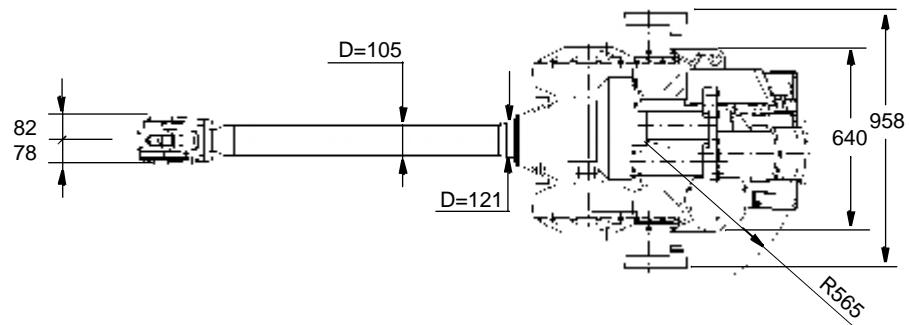
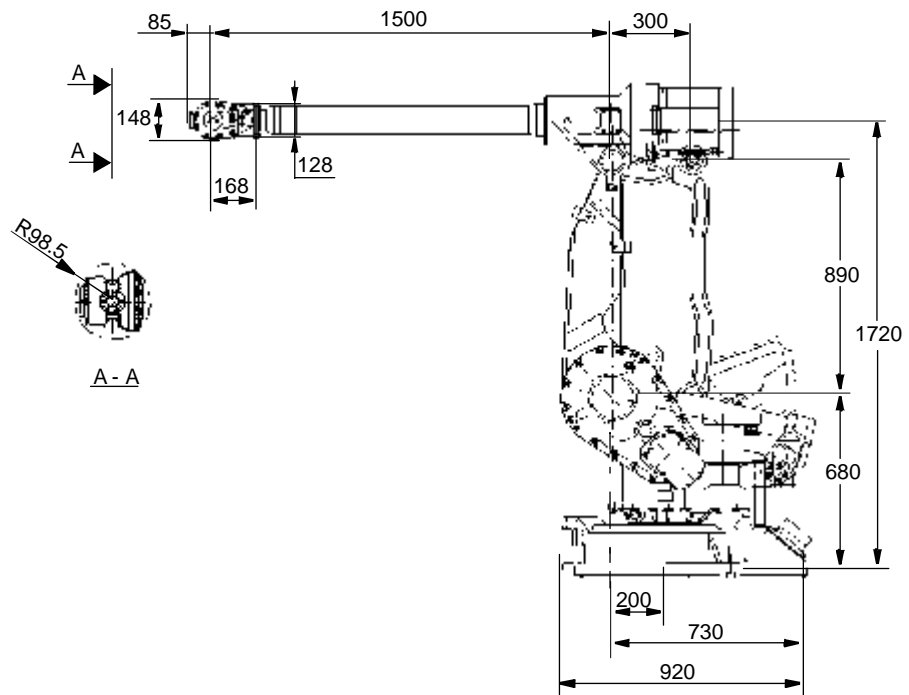


Figure 6 View of the manipulator from the side and above (dimensions in mm).

IRB 4450/S:

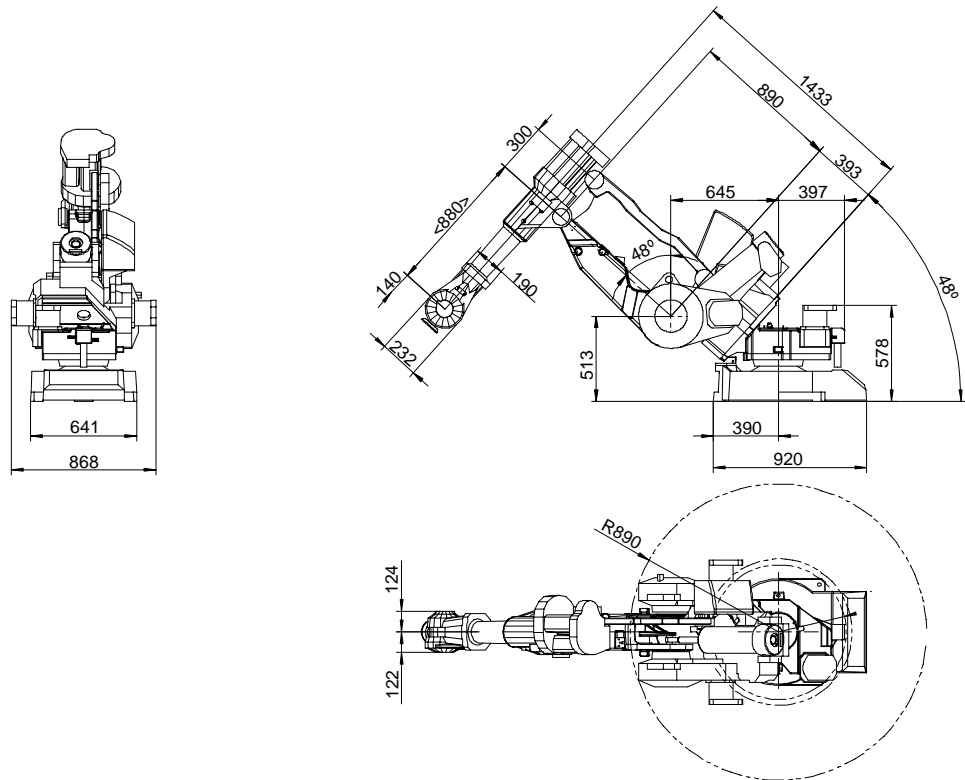


Figure 7 View of the manipulator from the side, behind and above (dimensions in mm).

# 1 Description

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## 1.2.1 Standards

## 1.2 Safety/Standards

### 1.2.1 Standards

The robot conforms to the following standards:

Standard	Description
EN ISO 12100-1	Safety of machinery, terminology
EN ISO 12100-2	Safety of machinery, technical specifications
EN 954-1	Safety of machinery, safety related parts of control systems
EN 60204	Electrical equipment of industrial machines
EN 61000-6-4 (option)	EMC, Generic emission
EN 61000-6-2	EMC, Generic immunity
EN 775	Manipulating industrial robots, safety

Standard	Description
IEC 60204-1	Electrical equipment of industrial machines
IEC 60529-1	Degrees of protection provided by enclosures

Standard	Description
ISO 10218	Manipulating industrial robots, safety
ISO 9787	Manipulating industrial robots, coordinate systems and motions

Standard	Description
ANSI/RIA 15.06/1999	Safety Requirements for Industrial Robots and Robot Systems
ANSI/UL 1740-1998 (option)	Safety Standard for Robots and Robotic Equipment
CAN/CSA Z 434-03 (option)	Industrial Robots and Robot Systems - General Safety Requirements

The robot complies fully with the health and safety standards specified in the EEC's Machinery Directives.



**1.2.2 Safety**

The robot is designed with absolute safety in mind. It has a dedicated safety system based on a two-channel circuit which is monitored continuously. If any component fails, the electrical power supplied to the motors shuts off and the brakes engage.

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**Safety category 3** Malfunction of a single component, such as a sticking relay, will be detected at the next MOTOR OFF/MOTOR ON operation. MOTOR ON is then prevented and the faulty section is indicated. This complies with category 3 of EN 954-1, Safety of machinery - safety related parts of control systems - Part 1.

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**Selecting the operating mode** The robot can be operated either manually or automatically. In manual mode, the robot can only be operated via the teach pendant, i.e. not by any external equipment.

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**Reduced speed** In manual mode, the speed is limited to a maximum of 250 mm/s (600 inch/min.). The speed limitation applies not only to the TCP (Tool Center point), but to all parts of the robot. It is also possible to monitor the speed of equipment mounted on the robot.

---

**Three position enabling device** The enabling device on the teach pendant must be used to move the robot when in manual mode. The enabling device consists of a switch with three positions, meaning that all robot movements stop when either the enabling device is pushed fully in, or when it is released completely. This makes the robot safer to operate.

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**Safe manual movement** The robot is moved using a joystick instead of the operator having to look at the teach pendant to find the right key.

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**Over-speed protection** The speed of the robot is monitored by two independent computers.

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**Emergency stop** There is one emergency stop push button on the controller and another on the teach pendant. Additional emergency stop buttons can be connected to the robot's safety chain circuit.

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# 1 Description

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## 1.2.2 Safety

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<b>Safeguarded space stop</b>	The robot has a number of electrical inputs which can be used to connect external safety equipment, such as safety gates and light curtains. This allows the robot's safety functions to be activated both by peripheral equipment and by the robot itself.
<b>Delayed safeguarded space stop</b>	A delayed stop gives a smooth stop. The robot stops in the same way as at a normal program stop with no deviation from the programmed path. After approx. 1 second the power supplied to the motors shuts off.
<b>Collision detection (option)</b>	In case of an unexpected mechanical disturbance like a collision, electrode sticking etc., the robot will stop and slightly back off from its stop position.
<b>Restricting the working space</b>	The movement of each axis can be restricted using software limits. Axes 1-2 can also be restricted by means of mechanical stops and axis 3 by an electrical switch (option).
<b>Hold-to-run control</b>	“Hold-to-run” means that you must depress the start button in order to move the robot. When the button is released the robot will stop. The hold-to-run function makes program testing safer.
<b>Fire safety</b>	Both the manipulator and control system comply with UL's (Underwriters Laboratories) tough requirements for fire safety.
<b>Safety lamp (option)</b>	The robot can be equipped with a safety lamp mounted on the manipulator. This is activated when the motors are in the MOTORS ON state.

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## 1.3 Installation

### 1.3.1 Introduction

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<b>General</b>	All the versions of IRB 4400 are designed for floor mounting except one version for shelf-mounting. Depending on the robot version an end effector of max. weight 10 to 60 kg, including payload, can be mounted on the mounting flange (axis 6). See section Load diagrams .
<b>Other equipment</b>	Extra loads can be mounted on the upper arm and on the base. There are holes for mounting extra equipment, see section Mounting equipment , Figure 16 and Figure 17.
<b>Working range</b>	The working range of axes 1-2 can be limited by mechanical stops and axis 3 by limit switches. Position switches can be supplied on axis 1 for position indicator of manipulator.

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# 1 Description

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## 1.3.2 Operating requirements

### 1.3.2 Operating requirements

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#### Protection standards

Description	Protection standard IEC 60529
Standard and Clean Room Manipulator	IP54
Foundry and Wash Manipulator	IP67, steam washable

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#### Clean room standards

Clean room manipulator: US Federal Standard 209, class 100 or ISO 14644-1 class 5.

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#### Explosive environments

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

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#### Ambient temperature

Description	Temperature
Manipulator during operation	+5°C (+41°F) to +45°C (+117°F)
Complete robot during transportation and storage	-25°C (-13°F) to +55°C (+131°F)
For short periods (not exceeding 24 hours)	up to +70°C (+158°F)

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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.

	Endurance load in operation all IRB 4400	Max. load at emergency stop all IRB 4400
Force xy	± 7500 N	± 9000 N
Force z	+9500 ± 2000 N	+9500 ± 3000 N
Torque xy	± 14000 Nm	± 16000 Nm
Torque z	± 2000 Nm	± 4000 Nm

	Endurance load in operation all IRB 4450/S	Max. load at emergency stop all IRB 4450/S
Force xy	± 7500 N	± 10000 N
Force z	+9500 ± 2000 N	+9500 ± 4000 N
Torque xy	± 14000 Nm	± 16000 Nm
Torque z	± 2000 Nm	± 4000 Nm

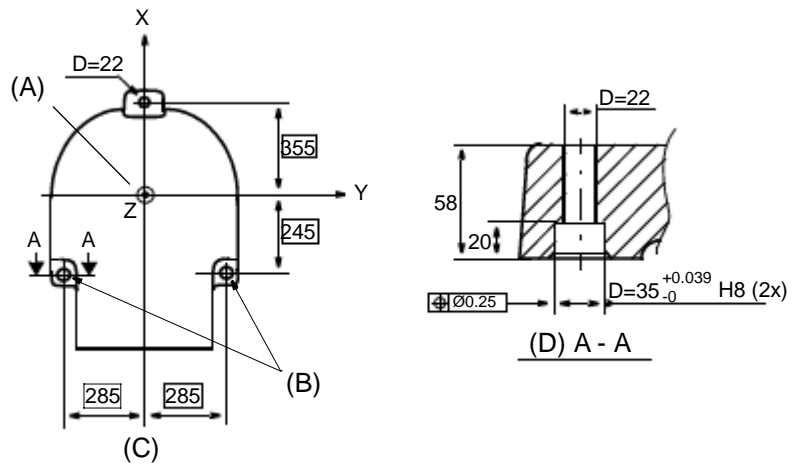


Figure 8 Hole configuration (dimensions in mm).

Pos	Description
A	Z = center line axis 1
B	The same dimensions
C	View from the bottom of the base
D	Section



## 1.4 Calibration and References

### 1.4.1 Fine calibration

#### General

Fine calibration is made using the Calibration Pendulum, please see separate manual Calibration Pendulum instruction.

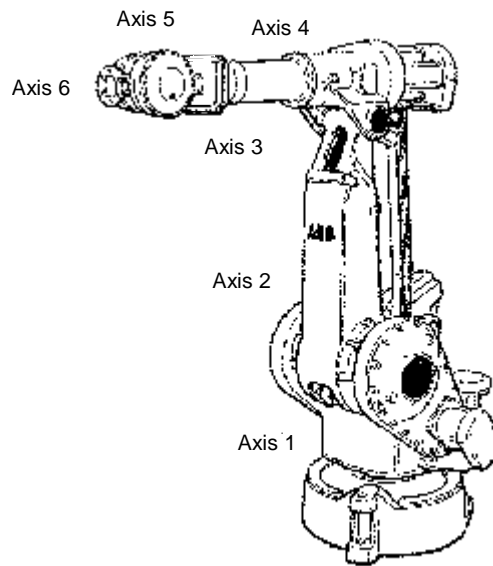


Figure 10 All axes in zero position.

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

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## 1.4.2 Absolute Accuracy calibration

### 1.4.2 Absolute Accuracy calibration

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<b>General</b>	Requires RobotWare option Absolute Accuracy, please see Product Specification RobotWare for more details.
<b>The calibration concept</b>	<p>Absolute Accuracy (AbsAcc) is a calibration concept, which ensures a TCP absolute accuracy of better than <math>\pm 1</math> mm in the entire working range.</p> <p>Absolute accuracy compensates for:</p> <ul style="list-style-type: none"><li>• Mechanical tolerances in the robot structure</li><li>• Deflection due to load</li></ul> <p>Absolute accuracy calibration focuses on positioning accuracy in the cartesian coordinate system for the robot. It also includes load compensation for deflection caused by the tool and equipment. Tool data from robot program is used for this purpose. The positioning will be within specified performance regardless of load.</p>
<b>Calibration data</b>	The user is supplied with robot calibration data (compensation parameter file, absacc.cfg) and a certificate that shows the performance (Birth certificate). The difference between an ideal robot and a real robot without AbsAcc can typically be 8 mm, resulting from mechanical tolerances and deflection in the robot structure.
<b>Absolute Accuracy option</b>	<p>Absolute Accuracy option is integrated in the controller algorithms for compensation of this difference and does not need external equipment or calculation.</p> <p>Absolute Accuracy is a RobotWare option and includes an individual calibration of the robot (mechanical arm).</p> <p>Absolute Accuracy is a TCP calibration in order to Reach (m) a good positioning in the Cartesian coordinate system.</p>

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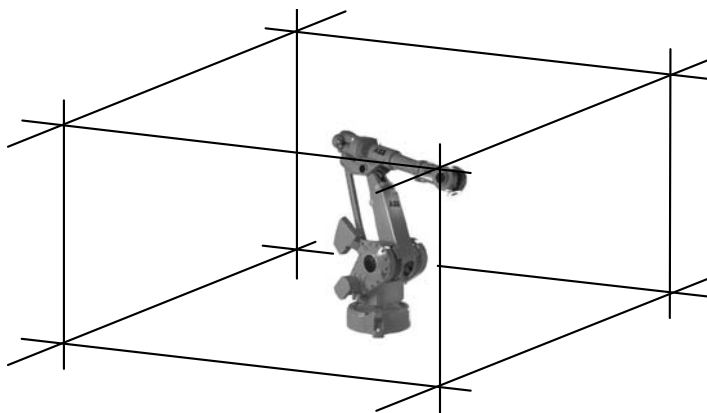


Figure 11 The Cartesian coordinate system.



**Production data**

Typical production data regarding calibration are:

Robot	Positioning accuracy (mm)		
	Average	Max	% Within 1 mm
IRB 4400/45,-/60, -/L30 and -/L10	0.30	0.75	100
IRB 4400/S	not available		
IRB 4450/S	*)	*)	*)

\*) For detailed data and data missing in the table, please contact ABB for more information.

# 1 Description

## 1.4.3 Load diagrams

### 1.4.3 Load diagrams

IRB 4400/45

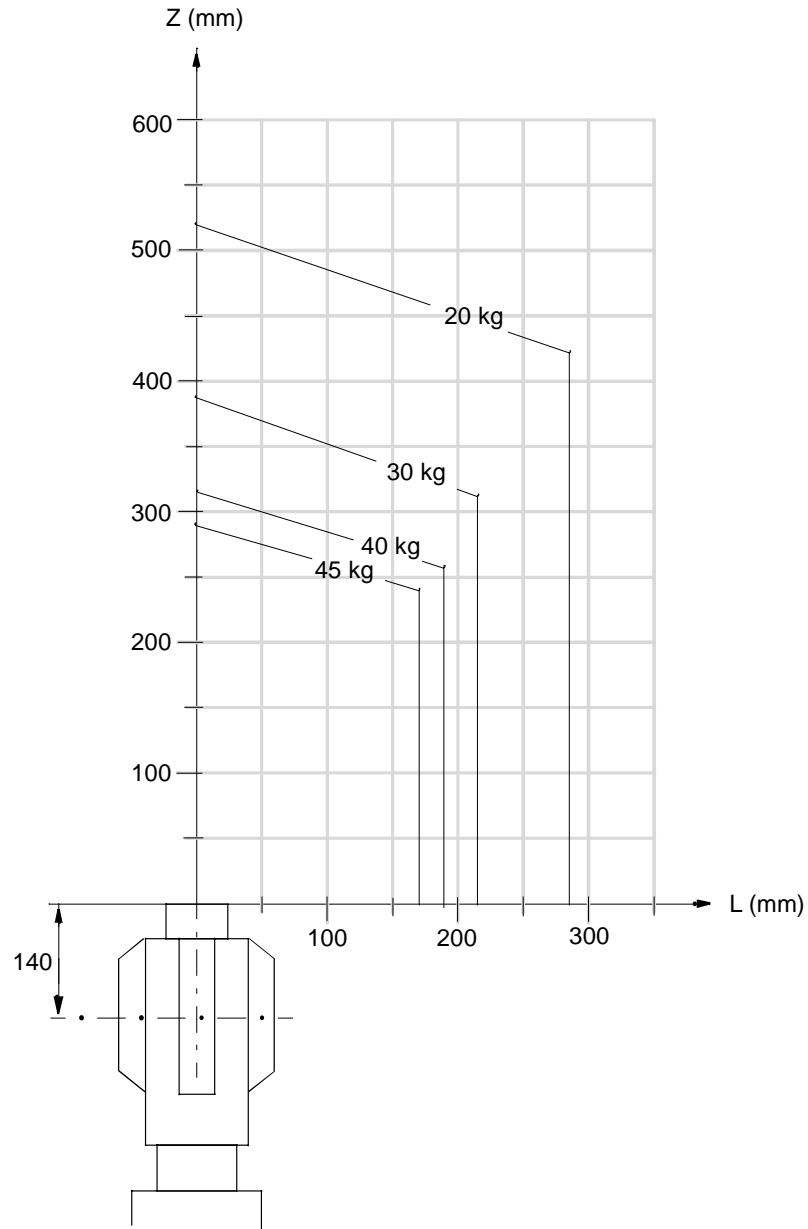


Figure 12 Maximum weight permitted for load mounted on the mounting flange at different positions (center of gravity).

	Description
Z	See the above diagram and the coordinate system in the Product Specification S4Cplus.
L	Distance in X-Y plane from Z-axis to the center of gravity.
J	Maximum own moment of inertia on the total handle weight = max. 2.5 kgm <sup>2</sup> .

IRB 4400/60

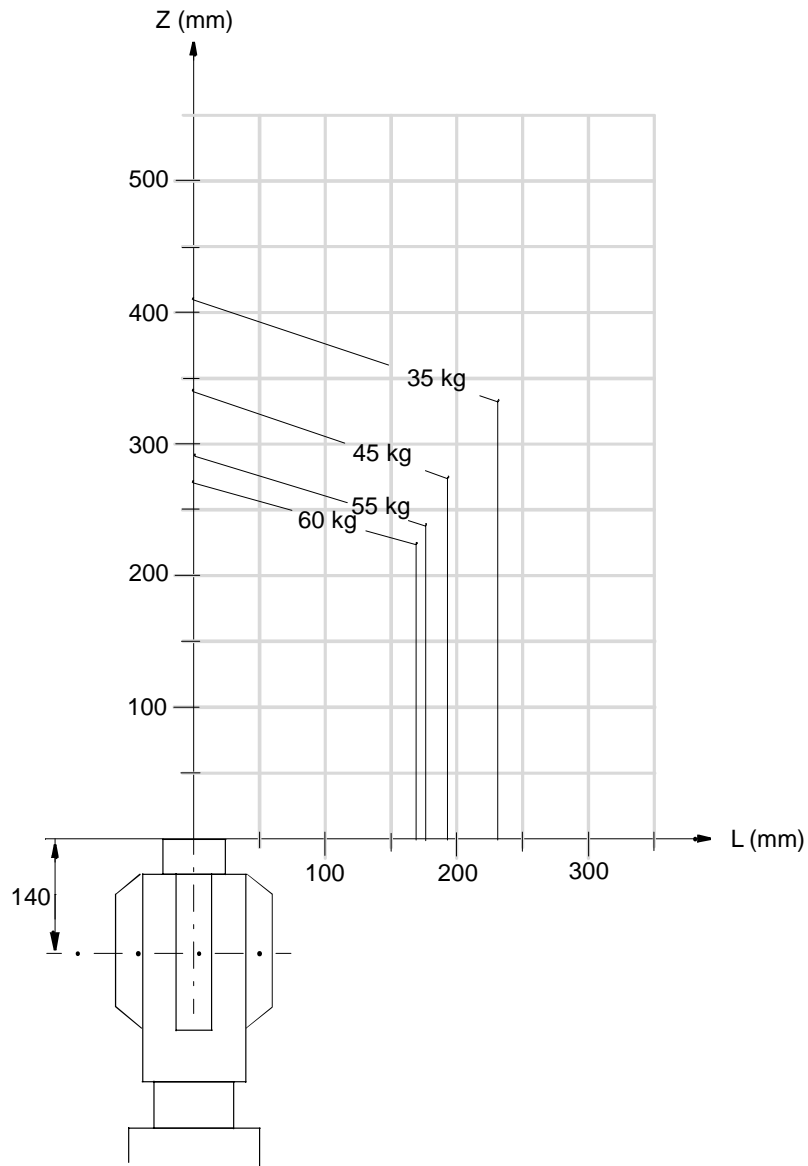


Figure 13 Maximum weight permitted for load mounted on the mounting flange at different positions (center of gravity).

	Description
Z	See the above diagram and the coordinate system in the Product Specification S4Cplus.
L	Distance in X-Y plane from Z-axis to the center of gravity.
J	Maximum own moment of inertia on the total handle weight = max. 2.5 kgm <sup>2</sup> .

# 1 Description

## 1.4.3 Load diagrams

IRB 4400/S,  
IRB 4400/L30 and  
IRB 4450/S

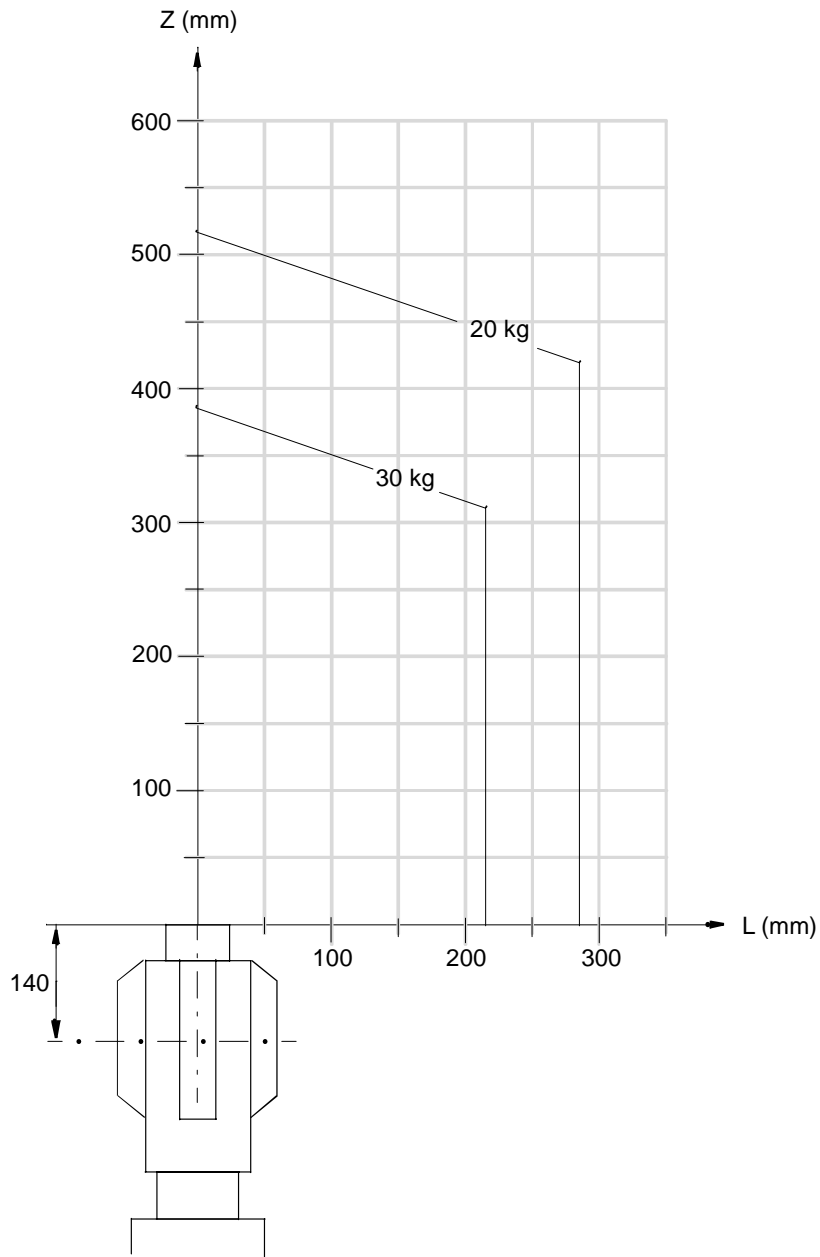


Figure 14 Maximum weight permitted for load mounted on the mounting flange at different positions (center of gravity).

	Description
Z	See the above diagram and the coordinate system in the Product Specification S4Cplus.
L	Distance in X-Y plane from Z-axis to the center of gravity.
J	Maximum own moment of inertia on the total handle weight = max. 1.3 kgm <sup>2</sup> .

IRB 4400/L10

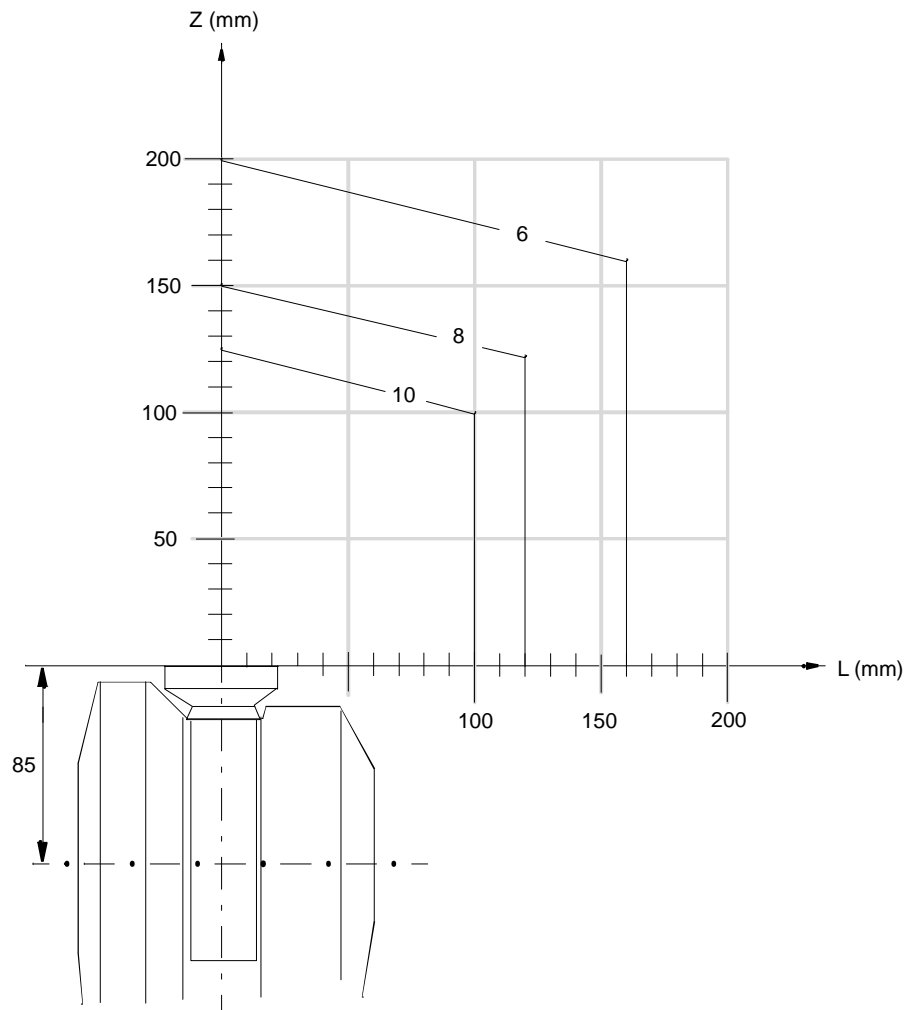


Figure 15 Maximum weight permitted for load mounted on the mounting flange at different positions (center of gravity).

	Description
Z	See the above diagram and the coordinate system in the Product Specification S4Cplus.
L	Distance in X-Y plane from Z-axis to the center of gravity.
J	Maximum own moment of inertia on the total handle weight = max. $\leq 0.040 \text{ kgm}^2$ .

# 1 Description

## 1.4.4 Mounting equipment

### 1.4.4 Mounting equipment

IRB 4400/45  
 IRB 4400/60  
 IEB 4400/S  
 IRB 4400/L30  
 IRB 4450/S

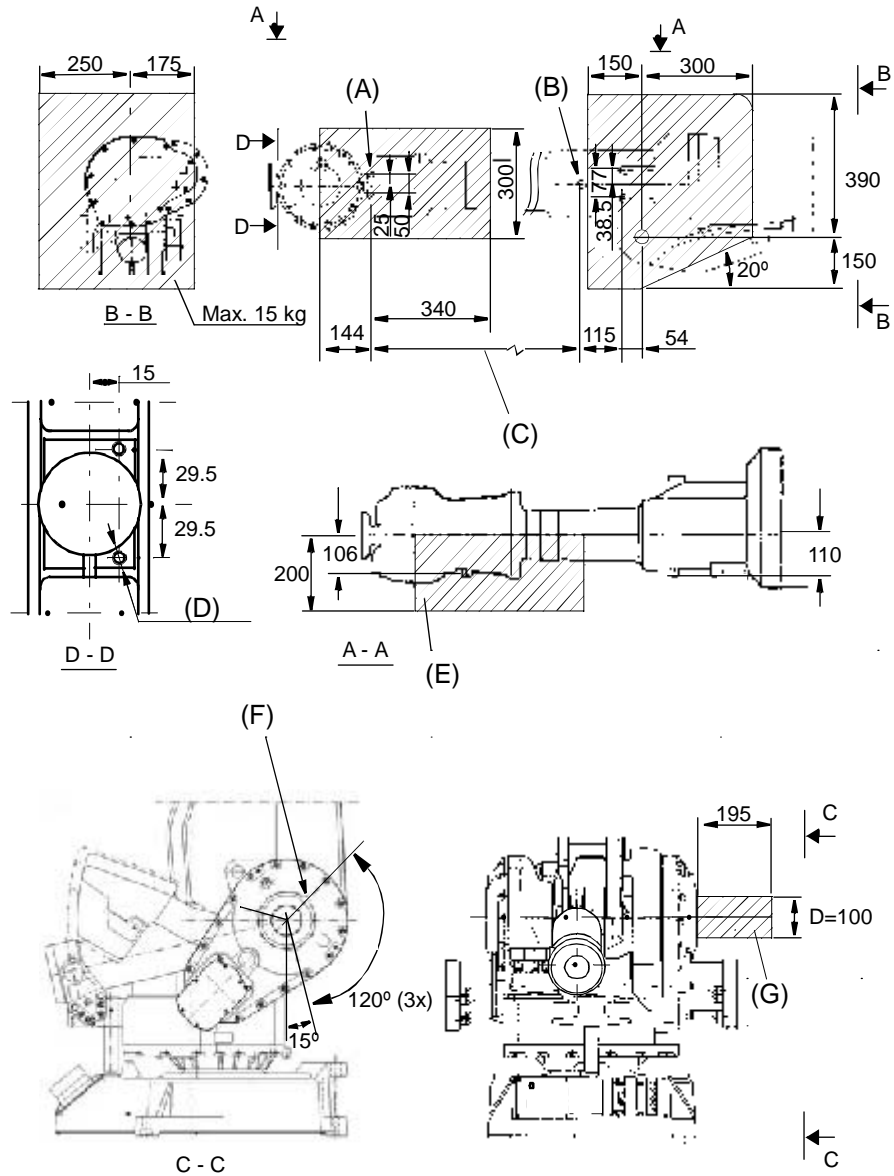


Figure 16 The shaded area indicates the permitted positions (center of gravity) for any extra equipment mounted in the holes (dimensions in mm).

Pos	Description
An	M8 (2x) Used if option 218-6 is chose Depth of thread 9
B	M8 (3x) Depth of thread 14
C	571 for 4400/45, /60 and 4450S 1071 for 4400S and 4400L/30
D	M6 (2x) tapped depth 12

Pos	Description
E	Max. 5 kg for 4400/45 and /60 at max. handling weight 5 kg for 4400S, 4400L/30 and 4450S if handling weight is max. 25 kg 0 kg if handling weight is 30 kg
F	M8 (3x), R = 92 Depht 16 (If option 34-1 is chosen these holes are occupied.)
G	Max. 35 kg except for 4400S (0 kg for 4400S)

# 1 Description

## 1.4.4 Mounting equipment

### IRB 4400/L10

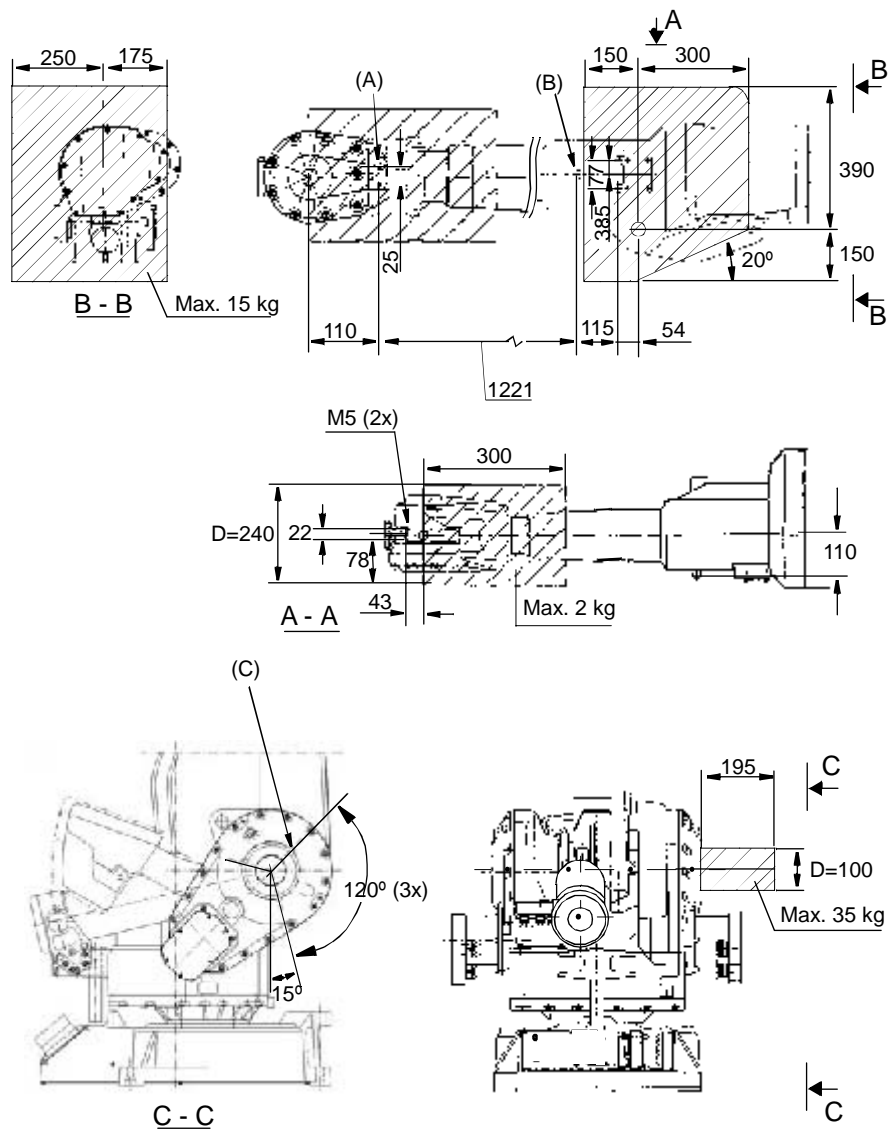


Figure 17 The shaded area indicates the permitted positions (center of gravity) for any extra equipment mounted in the holes (dimensions in mm).

Pos	Description
A	M6 (2x) Depth of thread 9
B	M8 (3x) Depth of thread 14
C	M8 (3x), R=92 Depth 16 (If option 34-1 is chosen these holes are occupied.)



IRB 4400/45,  
IRB 4400/60,  
IRB 4400/S,  
IRB 4400/L30,  
IRB 4450/S

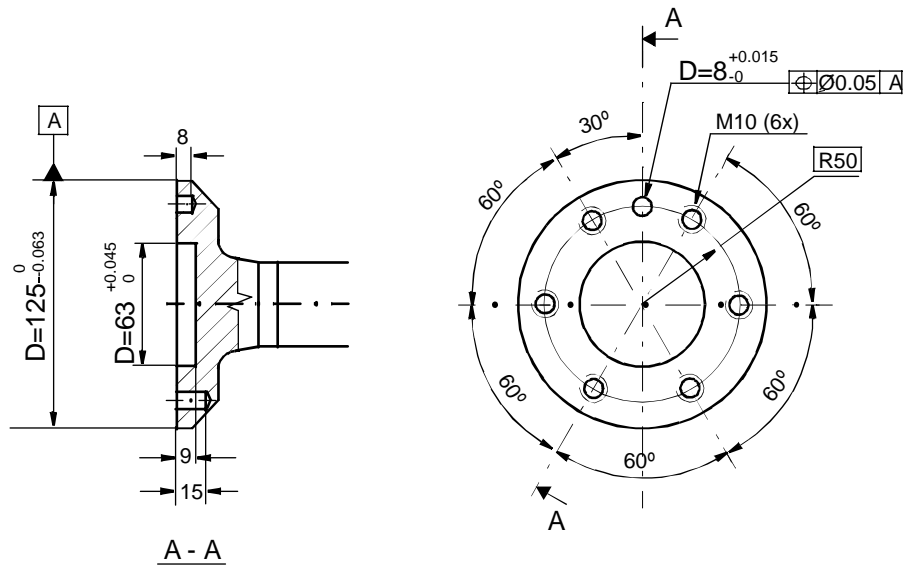


Figure 18 The mechanical interface, mounting flange (dimensions in mm).

IRB 4400/L10

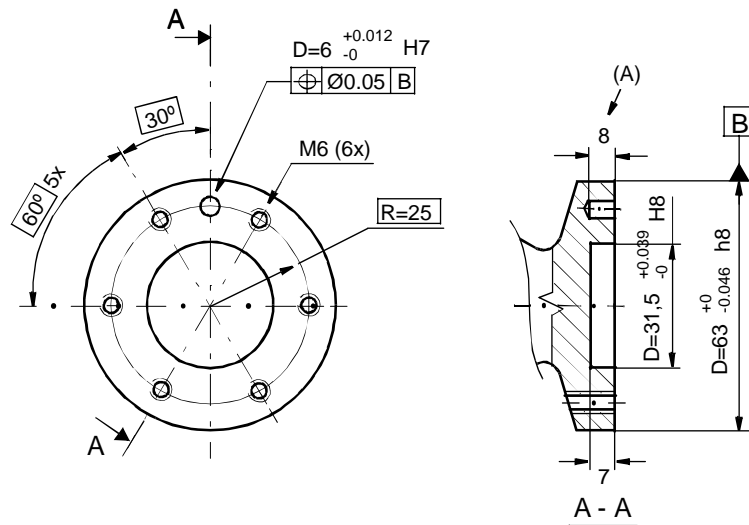


Figure 19 The mechanical interface, mounting flange (dimensions in mm).

Pos	Description
A	The hole can go through.

## 1 Description

---

### 1.5.1 Introduction

## 1.5 Maintenance and Troubleshooting

### 1.5.1 Introduction

---

#### General

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

- Maintenance-free AC motors are used
- 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

The following maintenance is required on the manipulator

- Changing batteries at “Battery low” alarm

The maintenance intervals depend on the use of the robot. For detailed information on maintenance procedures, see Maintenance section in the Product Manual.

## 1.6 Robot Motion

### 1.6.1 Introduction

IRB 4400/45 and  
IRB 4400/60

Type of motion	Range of movement
Axis 1 Rotation motion	+165° to -165°
Axis 2 Arm motion	+95° to -70°
Axis 3 Arm motion	+65° to -60°
Axis 4 Wrist motion	+200° to -200°
Axis 5 Bend motion	+120° to -120°
Axis 6 Turn motion	+400° to -400°

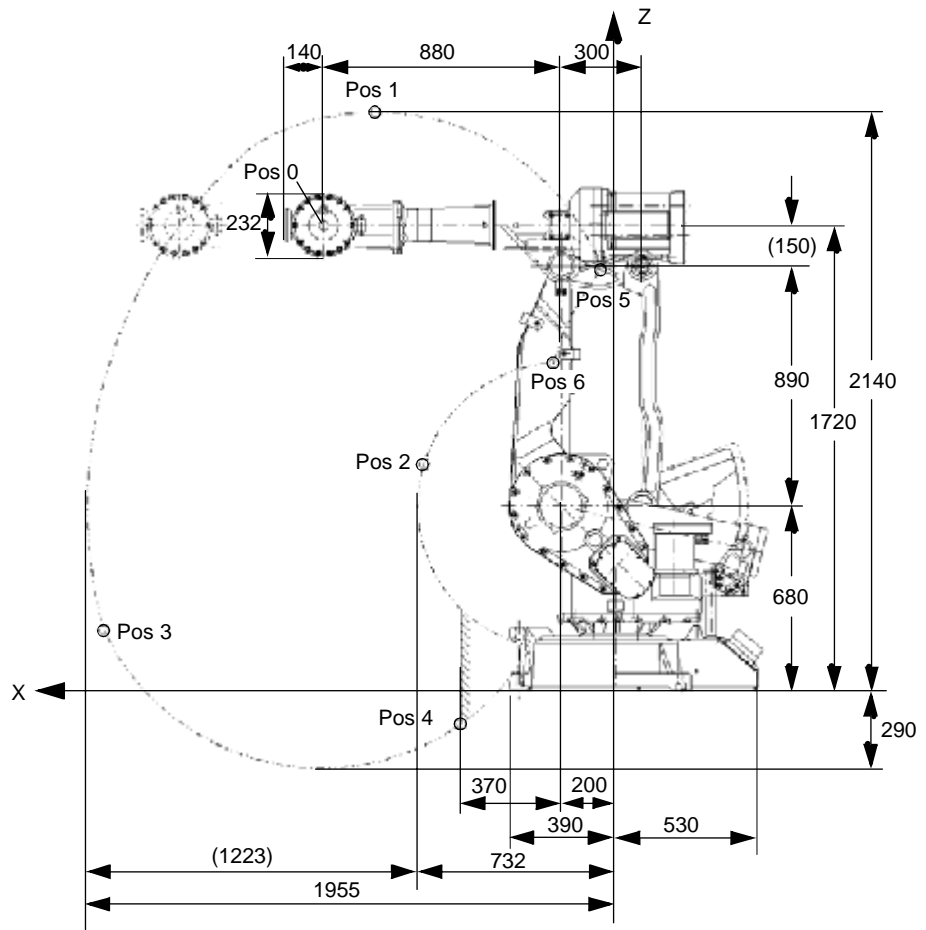


Figure 20 The extreme positions of the robot arm IRB 4400/45 and /60 (dimensions in mm).

# 1 Description

---

## 1.6.1 Introduction

Positions (mm) and Angles (degrees) for IRB 4400/45 and IRB 4400/60:

Position no (see Figure 20)	Position (mm) X	Position (mm) Z	Angle (degrees) Axis 2	Angle (degrees) Axis 3
0	1080	1720	0	0
1	887	2140	0	-30
2	708	836	0	65
3	1894	221	95	-60
4	570	-126	95	40
5	51	1554	-70	40
6	227	1210	-70	65

IRB 4400/S

Type of motion	Range of movement
Axis 1 Rotation motion	+115° to -115°
Axis 2 Arm motion	+90° to -70°
Axis 3 Arm motion	+65° to -60°
Axis 4 Wrist motion	+200° to -200°
Axis 5 Bend motion	+120° to -120°
Axis 6 Turn motion	+400° to -400°

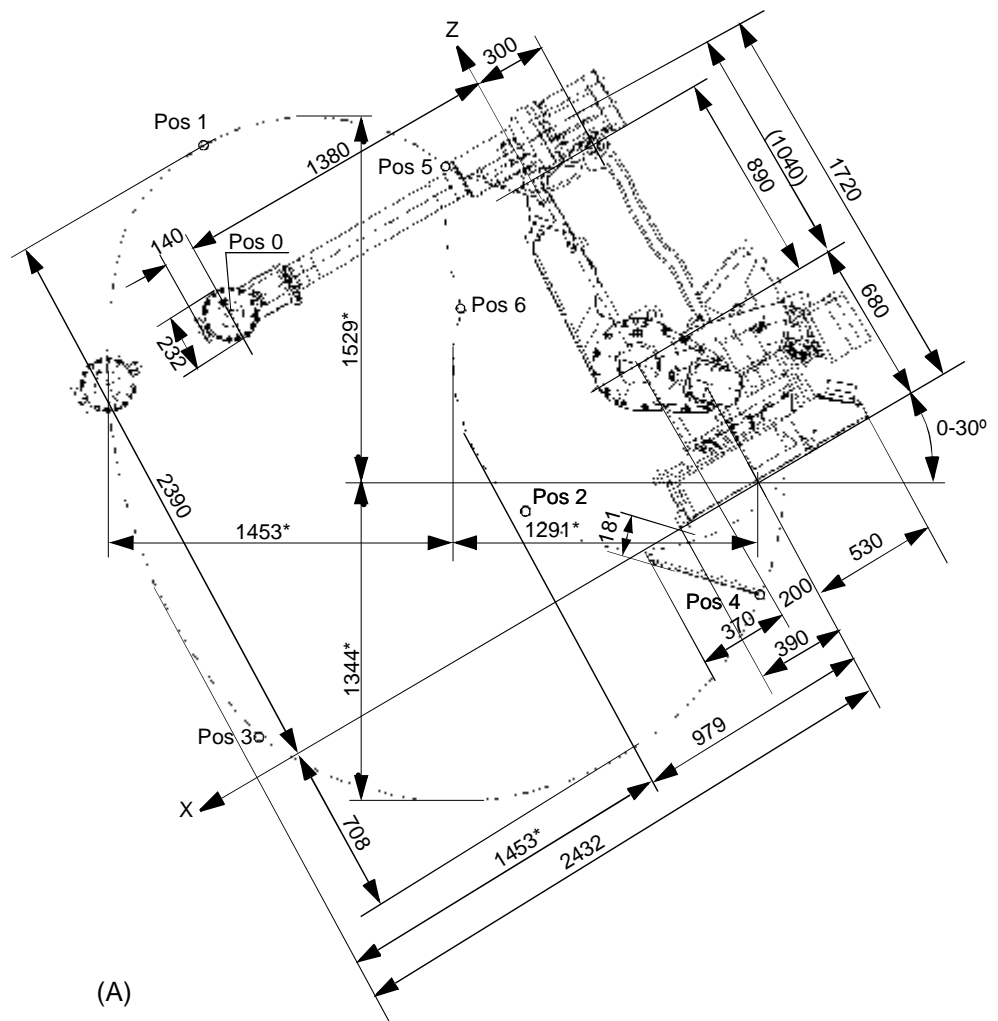


Figure 21 The extreme positions of the robot arm IRB 4400/S (dimensions in mm).

Pos	Description
A	Dimensions marked with * valid at 30°.

# 1 Description

---

## 1.6.1 Introduction

Positions (mm) and Angles (degrees) for IRB 4400/S:

Position no (see Figure 21)	Position (mm) X	Position (mm) Z	Angle (degrees) Axis 2	Angle (degrees) Axis 3
0	1580	1720	0	0
1	1320	2390	0	-30
2	919	383	0	65
3	2360	120	90	-60
4	239	-417	90	44
5	484	1804	-70	40
6	725	1254	-70	65

IRB 4400/L30

Type of motion	Range of movement
Axis 1 Rotation motion	+165° to -165°
Axis 2 Arm motion	+95° to -70°
Axis 3 Arm motion	+65° to -60°
Axis 4 Wrist motion	+200° to -200°
Axis 5 Bend motion	+120° to -120°
Axis 6 Turn motion	+400° to -400°

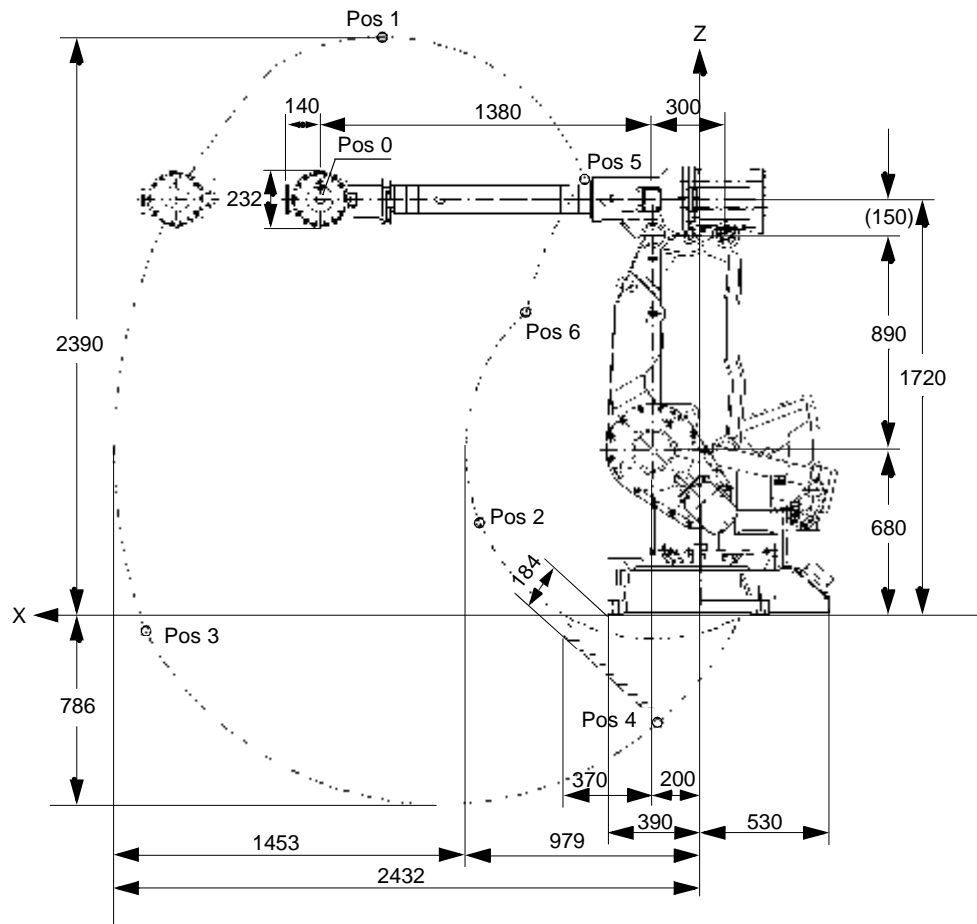


Figure 22 The extreme positions of the robot arm IRB 4400/L30 (dimensions in mm).

# 1 Description

---

## 1.6.1 Introduction

Positions (mm) and Angles (degrees) for IRB 4400/L30:

Position no (see Figure 22)	Position (mm) X	Position (mm) Z	Angle (degrees) Axis 2	Angle (degrees) Axis 3
0	1580	1720	0	0
1	1320	2390	0	-30
2	919	383	0	65
3	2303	-66	95	-60
4	180	-448	95	42
5	484	1804	-70	40
6	725	1254	-70	65



IRB 4400/L10

Type of motion	Range of movement
Axis 1 Rotation motion	+165° to -165°
Axis 2 Arm motion	+95° to -70°
Axis 3 Arm motion	+65° to -60°
Axis 4 Wrist motion	+200° to -200°
Axis 5 Bend motion	+120° to -120°
Axis 6 Turn motion	+400° to -400°

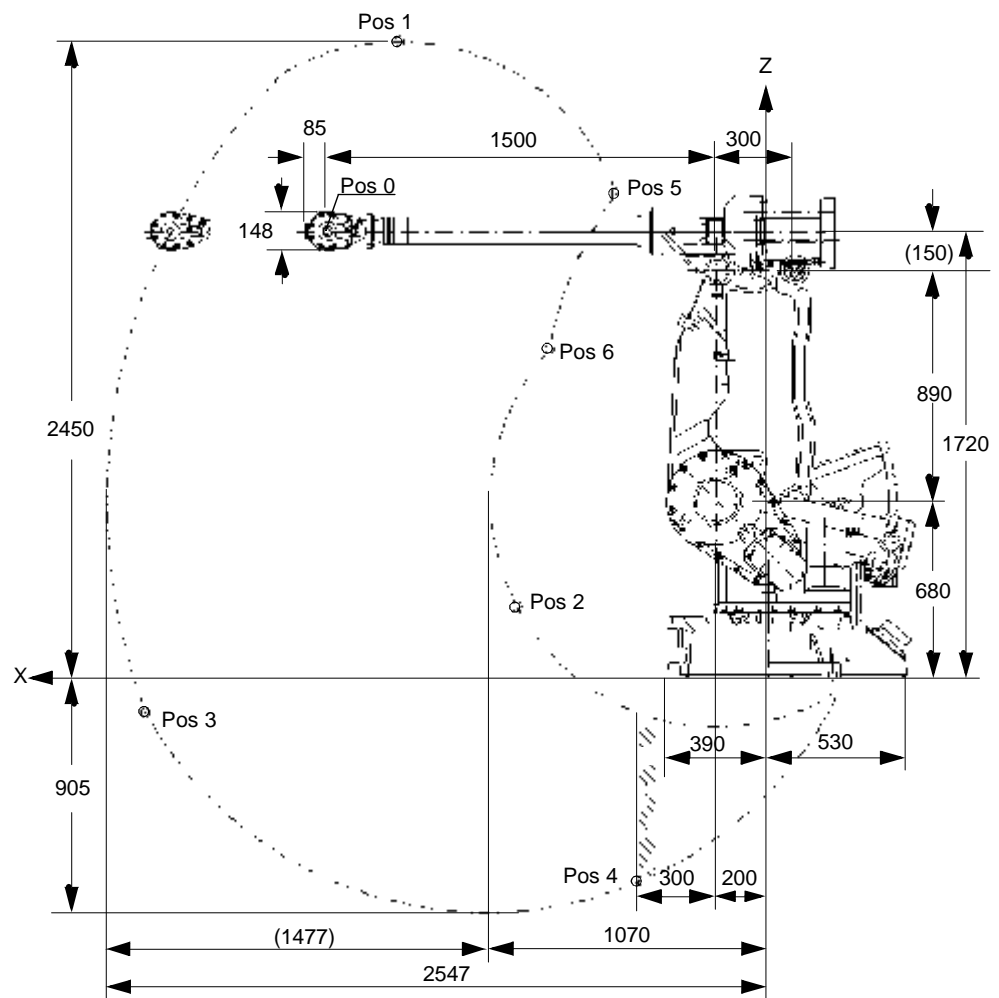


Figure 23 The extreme positions of the robot arm IRB 4400/L10 (dimensions in mm).

# 1 Description

---

## 1.6.1 Introduction

Positions (mm) and Angles (degrees) for IRB 4400/L10:

Position no (see Figure 23)	Position (mm) X	Position (mm) Z	Angle (degrees) Axis 2	Angle (degrees) Axis 3
0	1700	1720	0	0
1	1424	2450	0	-30
2	970	274	0	65
3	2401	-135	95	-60
4	500	-786	95	24
5	588	1864	-70	40
6	845	1265	-70	65

IRB 4450/S

Type of motion	Range of movement
Axis 1 Rotation motion	+165° to -165°
Axis 2 Arm motion	+95° to -70°
Axis 3 Arm motion	+65° to -60°
Axis 4 Wrist motion	+200° to -200°
Axis 5 Bend motion	+120° to -120°
Axis 6 Turn motion	+400° to -400°

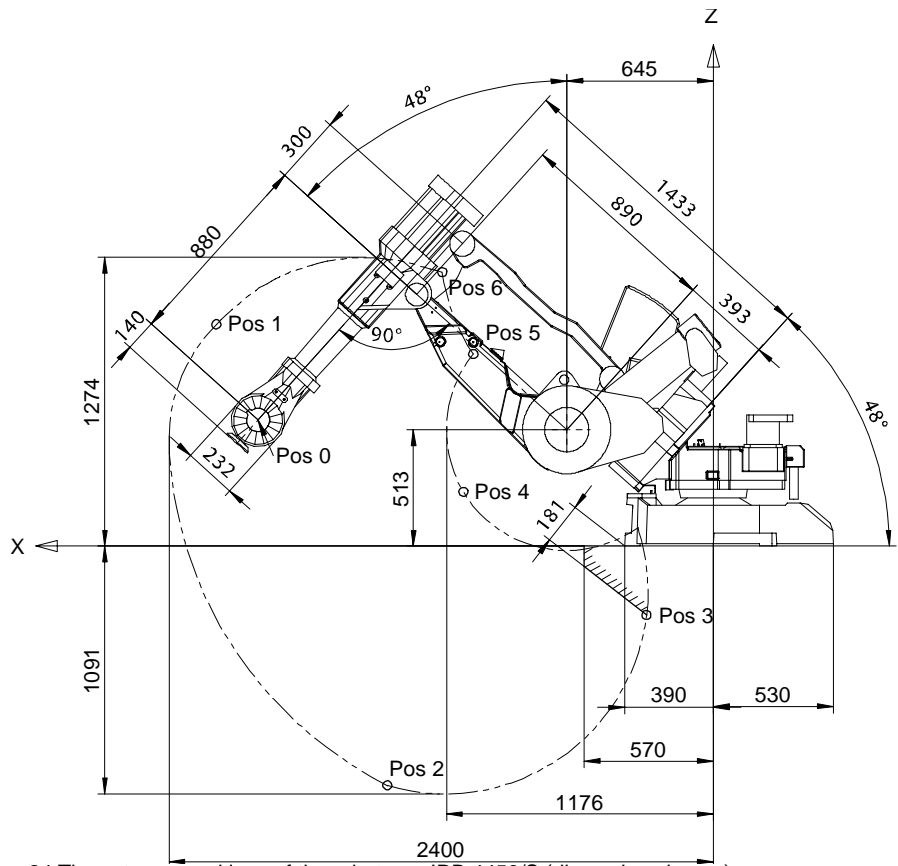


Figure 24 The extreme positions of the robot arm IRB 4450/S (dimensions in mm).

# 1 Description

---

## 1.6.1 Introduction

Positions (mm) and Angles (degrees) for IRB 4450/S:

Position no (see Figure 24)	Position (mm) X	Position (mm) Z	Angle (degrees) Axis 2	Angle (degrees) Axis 3
0	2006	556	0	0
1	2190	978	0	-30
2	1437	-1054	95	-60
3	294	-303	95	40
4	1101	239	0	65
5	1058	847	-70	65
6	1195	1208	-70	40

## 1.6.2 Performance according to ISO 9283

### General

At rated load and 1 m/s velocity on the inclined ISO test plane with all six robot axes in motion.

Unidirectional pose repeatability, IRB 4400/45 and /60	RP = 0.07 mm
Unidirectional pose repeatability, others	RP = 0.1 mm
Linear path accuracy	AT = 0.8 - 1.3 mm
Linear path repeatability	RT = 0.25 - 0.4 mm
Minimum positioning time, to within 0.5 mm of the position	0.2 - 0.35 sec. (on 35 mm linear path) 0.45 - 0.6 sec. (on 350 mm linear path)

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

### 1.6.3 Velocity

Axis no.	IRB 4400/45/60/L30/S and IRB 4450/S	IRB 4400/L10
1	150°/s	150°/s
2	120°/s	150°/s
3	120°/s	150°/s
4	225°/s	370°/s
5	250°/s	330°/s
6	330°/s	381°/s

Supervision is required to prevent overheating in applications with intensive and frequent movements.

### Resolution

Approx. 0.01° on each axis.

# 1 Description

---

## 1.6.4 Signals

### 1.6.4 Signals

---

#### Signal connections on robot arm

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

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

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

## 2 Specification of Variants and Options

### 2.1 Introduction

#### 2.1.1 General

The different variants and options for the IRB 4400 are described below.

The same numbers are used here as in the Specification form. For controller, see Product Specification for the controller and for software options, see Product Specification RobotWare Options.

#### 2.1.2 Manipulator

##### Variants

Option	Standard Option 287-4	Foundry Option 287-3	Wash Option 287-5	Clean Room Option 287-1
435-37	IRB 4400/45	IRB 4400F/45	IRB 4400CW/45	IRB 4400CR/45
435-38	IRB 4400/60	IRB 4400F/60	IRB 4400CW/60	IRB 4400CR/60
435-42	IRB 4400/L30	IRB 4400F/L30	IRB 4400CW/L30	IRB 4400CR/L30
435-41	IRB 4400/L10	IRB 4400F/L10	IRB 4400CW/L10	IRB 4400CR/L10
435-43	IRB 4400/S	IRB 4400F/S	IRB 4400CW/S	IRB 4400CR/S
435-62	IRB 4450/S	IRB 4450F/S	IRB 4450CW/S	-

##### Manipulator color

Option	Description
209-1	Protection Standard and Foundry have color ABB Orange and protection Clean Room and Wash have color white
209-4--192	The manipulator is painted with the chosen RAL-color.

##### Protection

Option	Description
287-4	Standard
287-3	Foundry Robot adapted for foundry or other harsh environments. The robot has the FoundryPlus protection which means that the whole manipulator is IP67 classified and steam washable. An excellent corrosion protection is obtained by a special coating. The connectors are designed for severe environments, and bearings, gears and other sensitive parts are highly protected. The robot is labeled with "Foundry Plus".

## 2 Specification of Variants and Options

### 2.1.2 Manipulator

Option	Description
287-1	Clean Room Robot with clean room class 100 according to US Federal Standard 209 and with the same protection as in option 287-4. Standard color is white. The robot is labeled with "Clean Room".
287-5	Wash Robot with the same protection as in option 287-3. Standard color is white.

#### Application interface

Air supply and signals for extra equipment to upper arm:

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

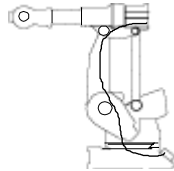


Figure 25

Option	Description
218-6	Hose and cables for connection of extra equipment are continuing to the wrist on the outside of the upper arm. Not available for options 435-41, 435-42, 435-43, 287-3 and 287-5.

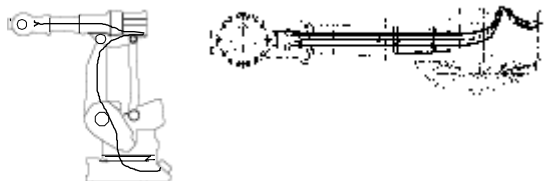


Figure 26

#### Application interface Connection to

Option	Description
16-2	Manipulator The signals are connected directly to the manipulator base to one 40-pins Harting connector.
16-1 <sup>1</sup>	Cabinet The signals are connected to 12-pole screw terminals, Phoenix MSTB 2.5/12-ST-5.08, to the the controller.



1. Note! In a M2004 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, e.g. a PLC cabinet.

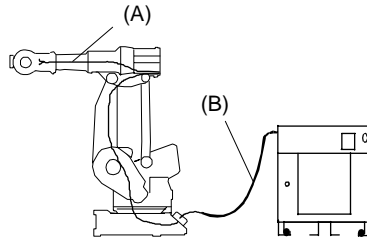


Figure 27

Pos	Description
A	If 218-6
B	If 16-1

#### Application equipment cable lengths

If connection to Cabinet:

Option	Lengths
94-1	7m
94-2	15m
94-3	22m
94-4	30m

#### Safety lamp

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

#### Position switch

Switches indicating the position of axis 1. Designs with 1, 2 or 3 adjustable switches are available. The switches are manufactured by Telemecanique or Bernstein and of forced disconnect type.

The position switch device is delivered as a kit to be assembled when installing the robot. Assembly instructions are included.



Note that these options may require safety arrangements, e.g. light curtains, photocells or contact mats.

## 2 Specification of Variants and Options

### 2.1.2 Manipulator



Note that the switches are not recommended to be used in severe environments with sand or chips.

Option	Description
25-2	One switch
25-4	Two switches
25-3	Three switches

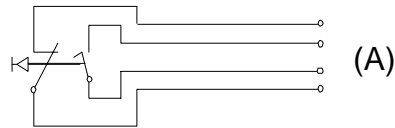


Figure 28 Connection of the switches.

Pos	Description
A	Controller

#### Position switches Connection to

Option	Description
271-2	Manipulator Connection on the manipulator base with one FCI 23-pin connector.
271-1	Cabinet Connection on the cabinet wall. Position switch cables are included. The signals are connected to 12-pole screw terminals, Phoenix MSTB 2.5/12-ST-5.08.

#### Position switches Cable lengths

If connection to Cabinet:

Option	Description
273-1	7m
273-2	15m
273-3	22m
273-4	30m

#### 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.
239-1	For the connectors on the foot if connection to manipulator, option 16-2.
426-1	For connection to position switches and connection to manipulator, option 271-2 and position switch(es).

#### Working range limit

Option	Description
28-1 Axis 1	Two extra stops for restricting the working range. The stops can be mounted within the area from $65^{\circ}$ to $125^{\circ}$ . See Figure 29.

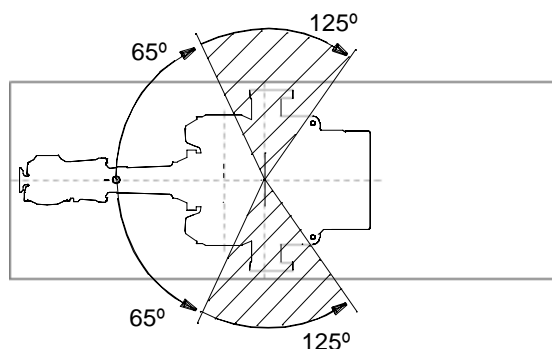


Figure 29

Option	Description
32-1 Axis 2	Stop lugs for restricting the working range. Figure 31 illustrates the mounting positions of the stops. <b>Note!</b> $5^{\circ}$ is not valid for 4400/S.

## 2 Specification of Variants and Options

### 2.1.2 Manipulator

IRB 4400/45  
IRB 4400/60  
IRB 4400/L30  
IRB 4400/L10

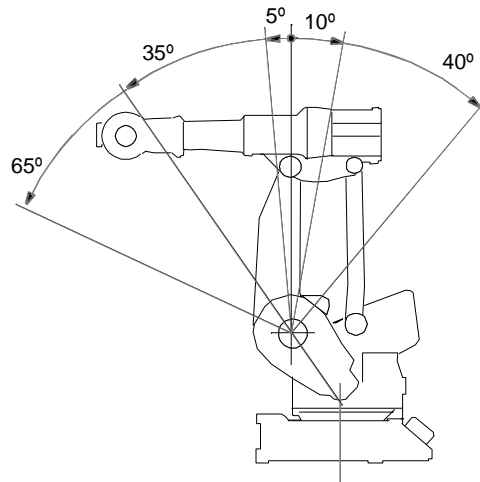


Figure 30

IRB 4450/S

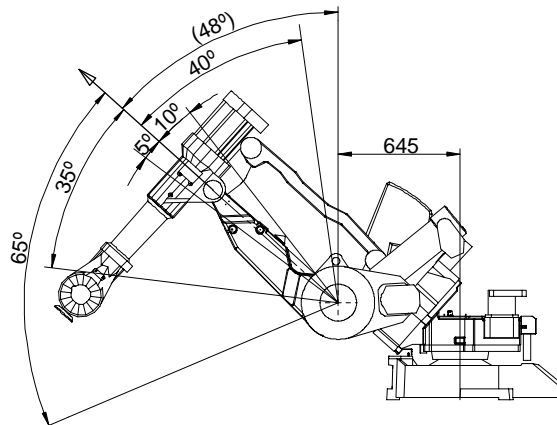


Figure 31

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

## 3 Accessories

---

**Basic software and software options for robot and PC**

For more information, see Product Specification IRC5 for M2004 and S4Cplus for M2000 and Product Specification RobotWare Options.

---

**Robot Peripherals**

- Track Motion
- Motor Units



**A**

accessories, 51  
air supply, 46

**C**

connector kit, 49  
cooling device, 8

**E**

emergency stop, 15  
enabling device, 15  
equipment  
    mounting, 28  
    permitted extra load, 28  
extra equipment  
    connections, 46

**F**

fire safety, 16

**H**

hold-to-run control, 16  
humidity, 18

**I**

installation, 17

**L**

load, 17, 19  
load diagrams, 24

**M**

maintenance, 32  
manipulator colours, 45  
mechanical interface, 31  
motion, 33  
mounting  
    extra equipment, 28  
    robot, 19  
mounting flange, 31

**N**

noise level, 8

**O**

operating requirements, 18  
options, 45  
overspeed protection, 15

**P**

payload, 17  
performance, 43  
protection standards, 18

**R**

range of movement  
    working space, 33, 35, 37, 39, 41  
reduced speed, 15  
repeatability, 43

Robot Peripherals, 51  
robot versions, 7

**S**

safeguarded space stop, 16  
    delayed, 16  
safety, 14  
safety lamp, 16, 47  
service, 32  
service position indicator, 47  
signal connections, 44, 46  
space requirements, 8  
standards, 14  
structure, 5

**T**

temperature, 18  
troubleshooting, 32

**V**

Variants, 45  
variants, 45

**W**

working space  
    restricting, 16, 17









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