Product Specification

IRB 2400

ABB Flexible Automation

1 Description

IRB 2400 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.

The robots with Foundry protection are designed for harsh environment and have special surface treatment and paint for excellent corrosion protection. The connectors are designed for severe environment, and bearings, gears and other sensitive parts are high protected. The high degree of tightness makes the IRB 2400/10 and /16 steam washable.

The robot is equipped with the operating system BaseWare OS. BaseWare OS controls every aspect of the robot, like motion control, development and execution of application programs communication etc. See Product Specification S4Cplus.

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.

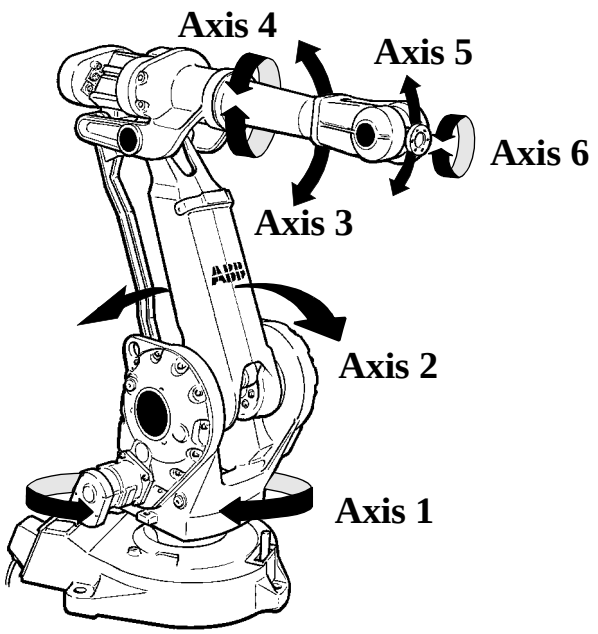


Figure 1 The IRB 2400 manipulator has 6 axes.

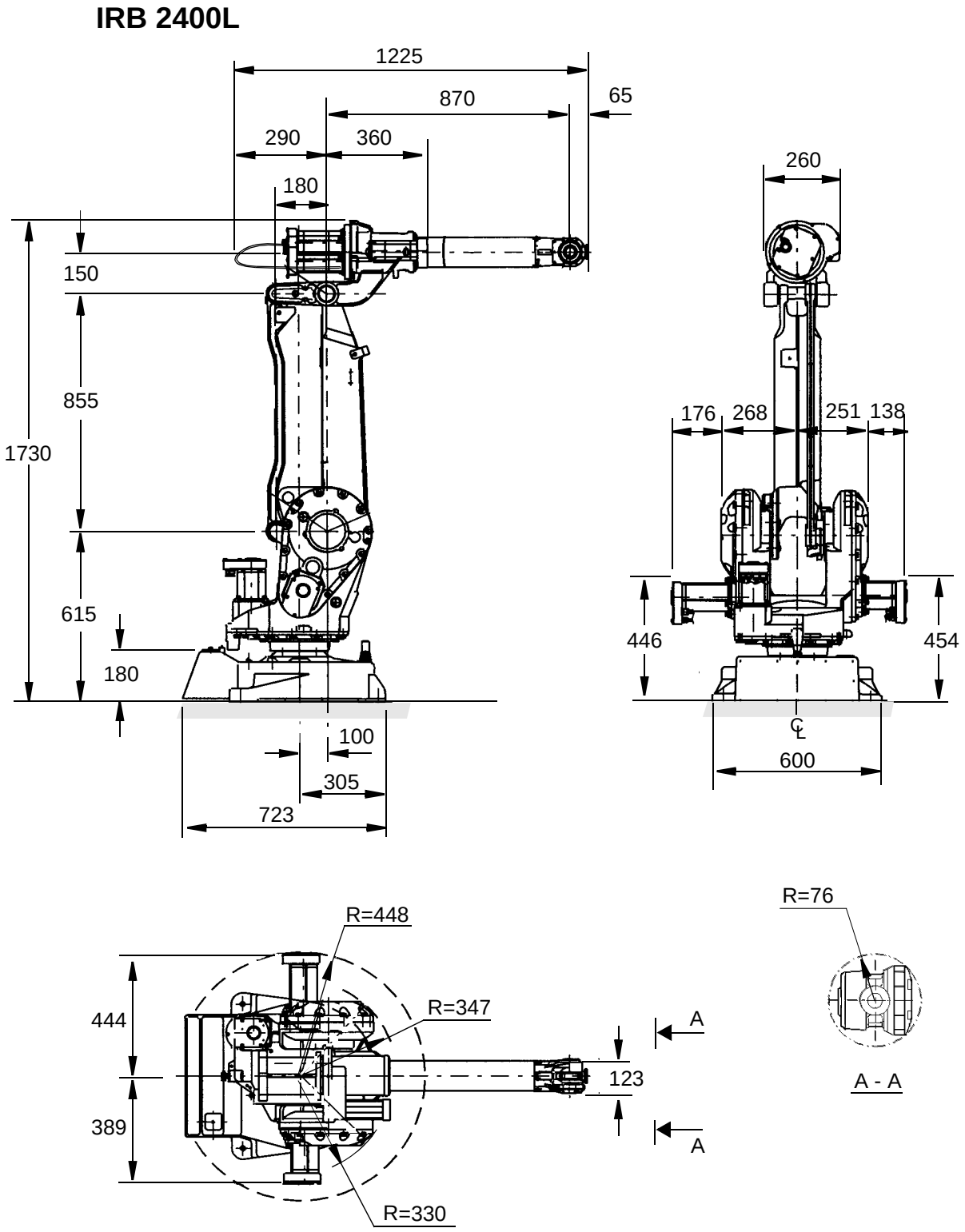


Figure 2 View of the manipulator from the side, rear and above (dimensions in mm).

Installation

The same version of the robot can either be mounted on the floor or inverted. An end effector, max. weight 7, 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 11.
Other equipment can be mounted on the upper arm, max. weight 11 or 12 kg, and on the base, max. weight 35 kg. Holes for mounting extra equipment, see page 15.

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.

Operating requirements

Protection standards		IEC529
Standard	Manipulator	IP54
IRB 2400FL	Manipulator	IP55
	Wrist	IP67
	Connectors	IP67

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

Ambient temperature

Manipulator during operation	+5°C (41°F) to +45°C (113°F)
Complete robot during transportation and storage, for short periods (not exceeding 24 hours)	-25°C (13°F) to +55°C (131°F) up to +70°C (158°F)

Relative humidity

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

Mounting the manipulator

Maximum load in relation to the base coordinate system.

		Endurance load in operation	Max. load at emergency stop
IRB 2400L	Force xy	±1700 N	±2100 N
	Force z floor mounting	+4100 ±1100 N	+4100 ±1400 N
	Force z inverted mounting	-4100 ±1100 N	-4100 ±1400 N
	Torque xy	±3000 Nm	±3400 Nm
	Torque z	±450 Nm	±900 Nm

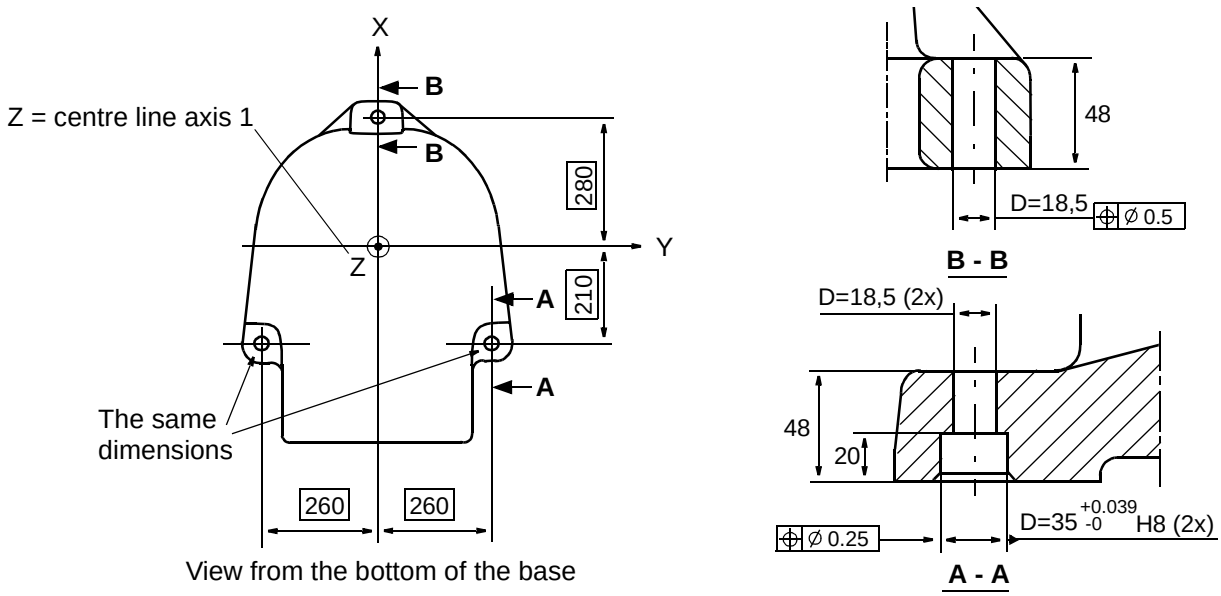
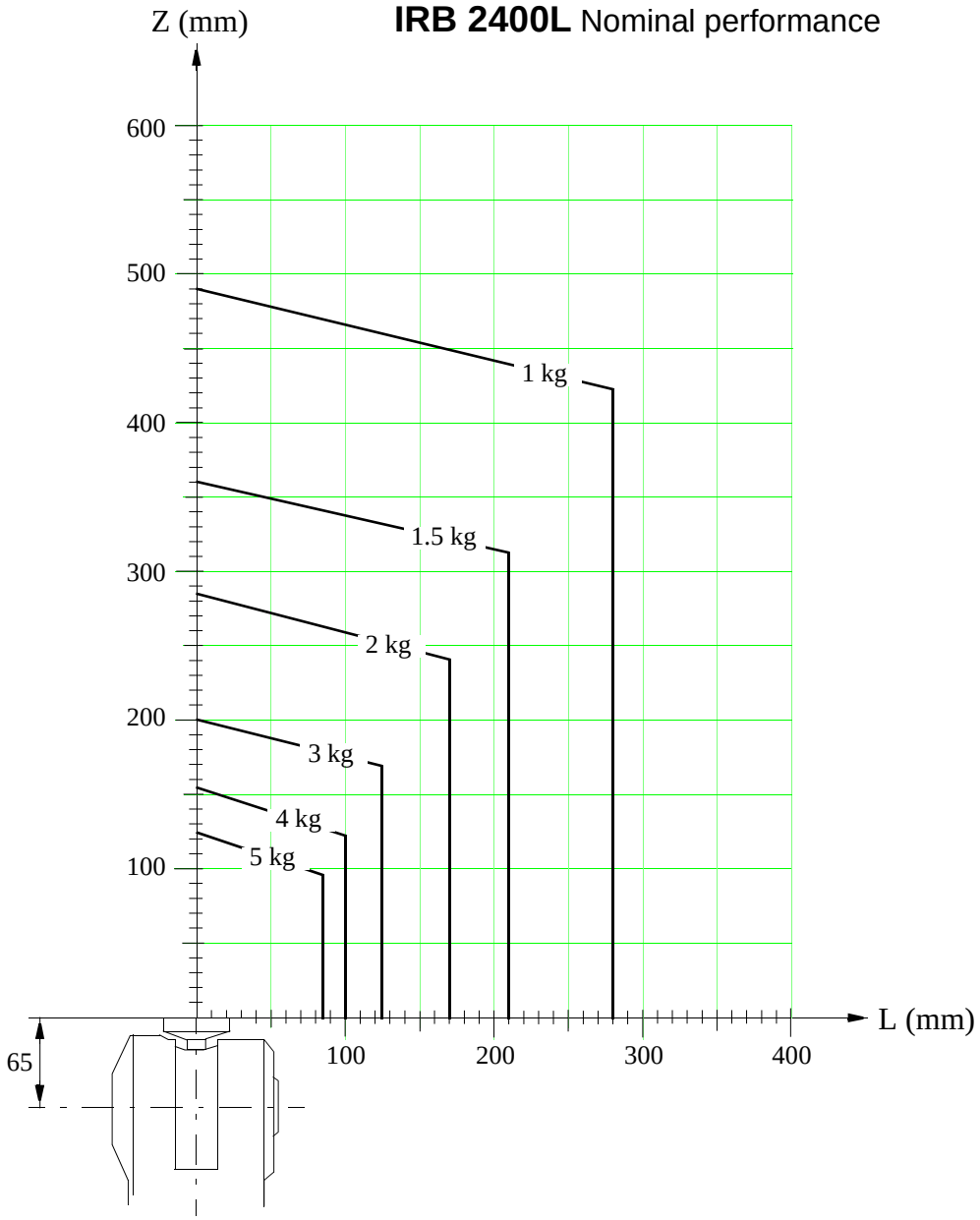


Figure 4 Hole configuration (dimensions in mm).

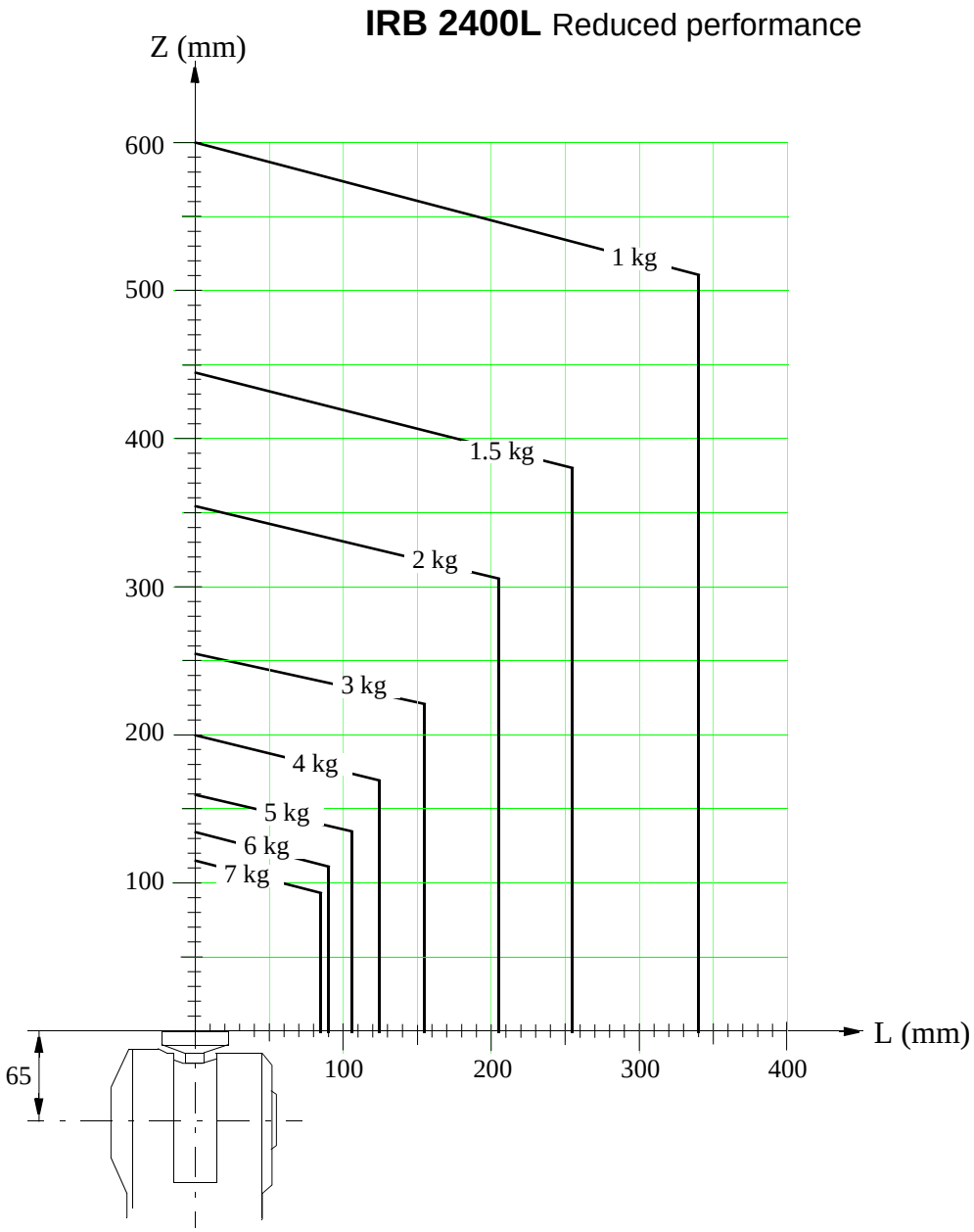
Load diagrams



Z = see the above diagram and the coordinate system in Product Specification S4Cplus
L = distance in X-Y plane from Z-axis to the centre of gravity

J = maximum own moment of inertia on the total handling weight = ≤ 0.012 kgm^2

Figure 5 Maximum weight permitted for load mounting on the mounting flange at different positions (centre of gravity).



Z = see the above diagram and the coordinate system in Product Specification S4Cplus
L = distance in X-Y plane from Z-axis to the centre of gravity

J = maximum own moment of inertia on the total handling weight = ≤ 0.012 kgm^2

Figure 6 Maximum weight permitted for load mounting on the mounting flange at different positions (centre of gravity).

Mounting equipment

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

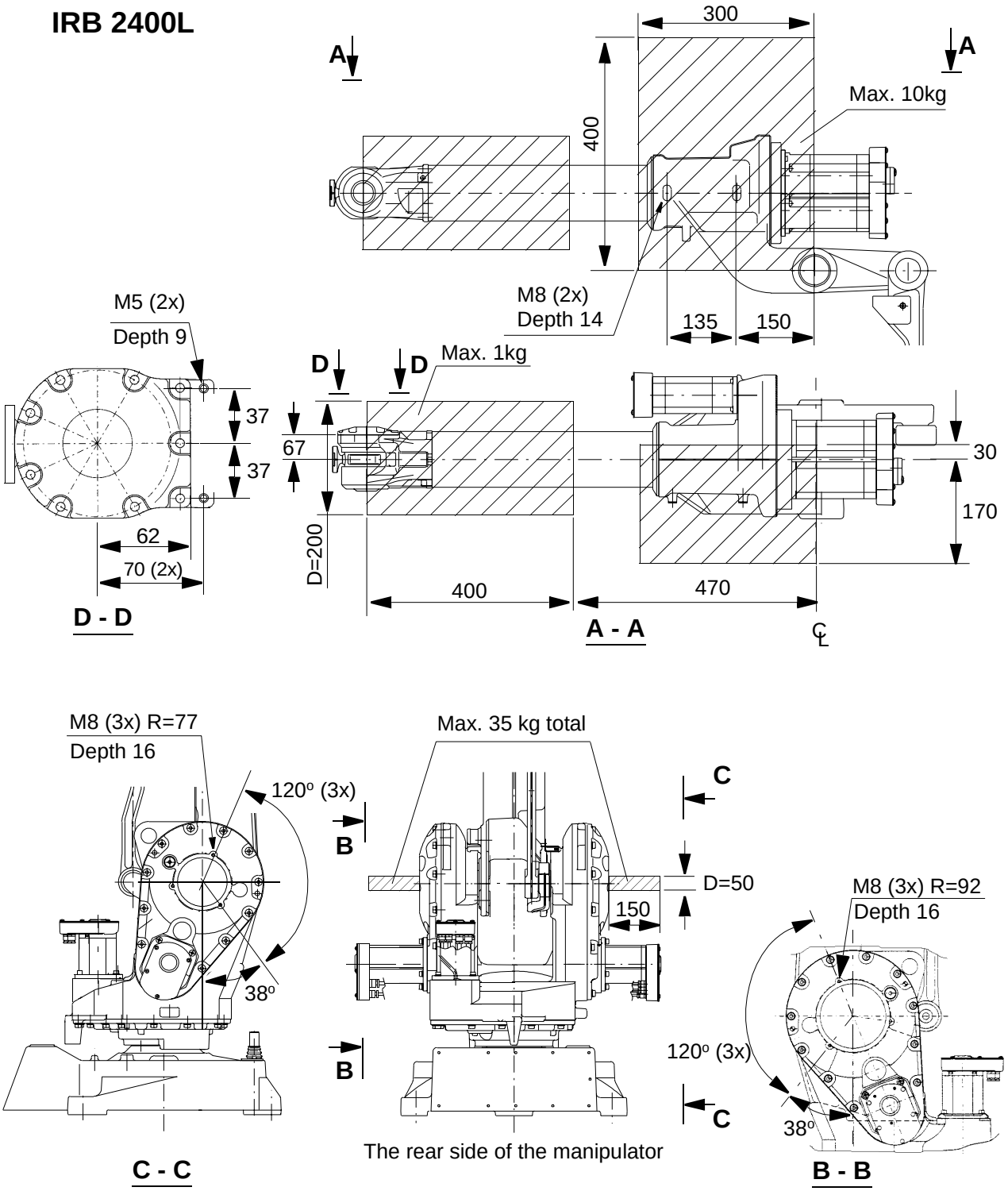
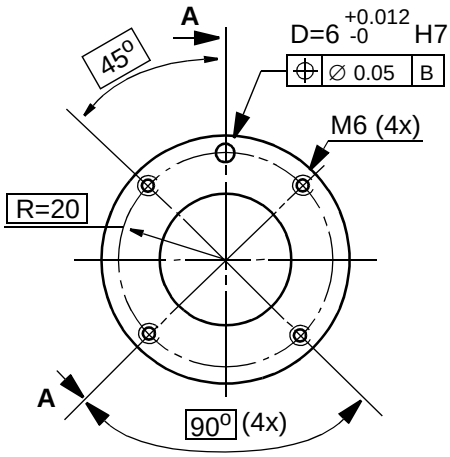
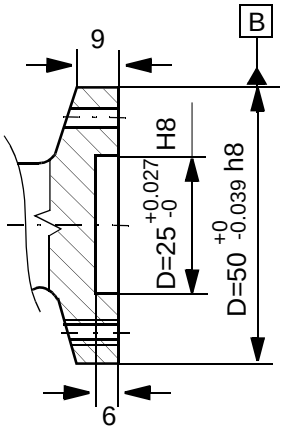


Figure 9 The shaded area indicates the permitted positions (centre of gravity) for any extra equipment mounted in the holes (dimensions in mm).

IRB 2400L


A
D=6 +0.012 -0 H7
45°
⌀ 0.05 B
M6 (4x)
R=20
A
90° (4x)

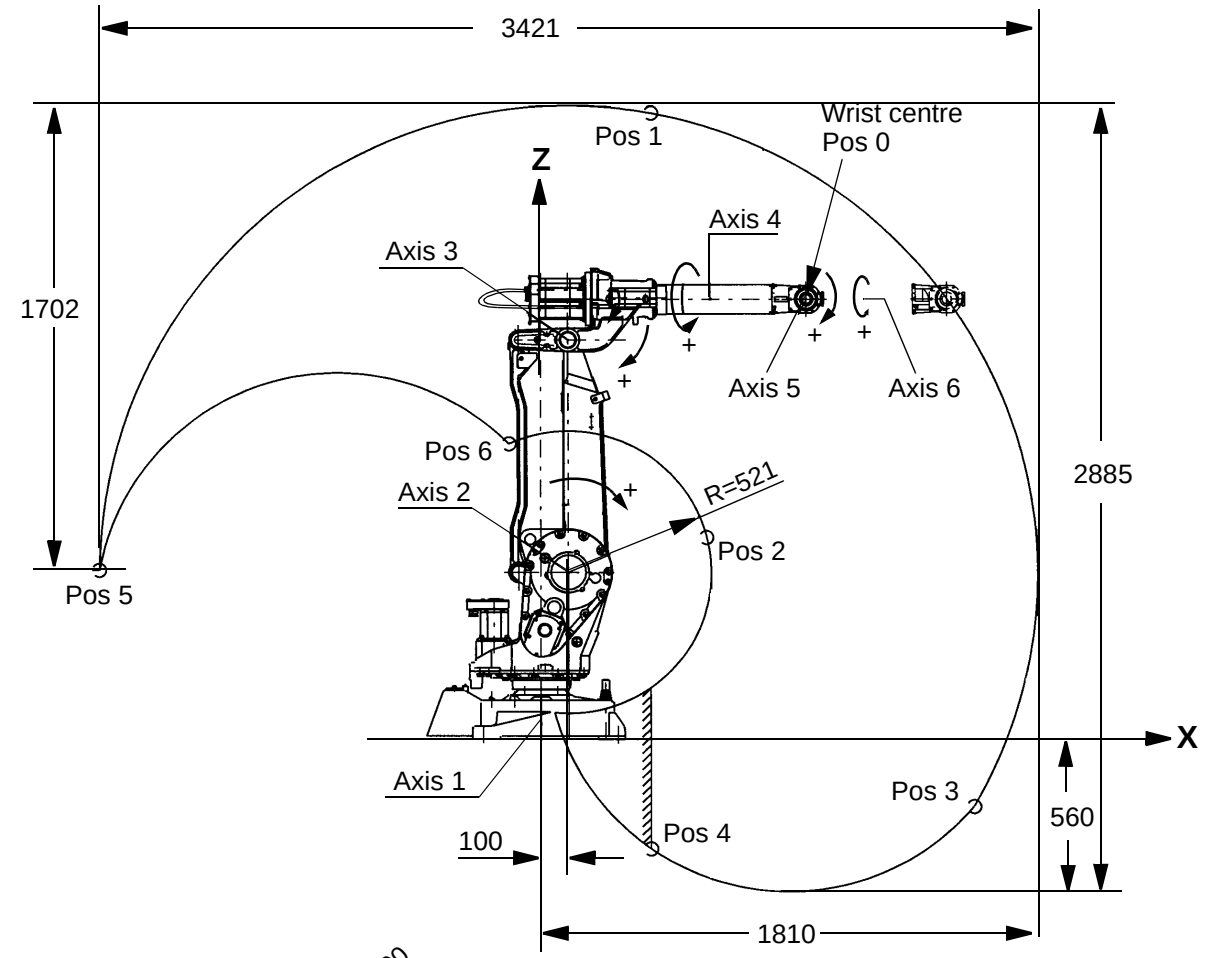

9
B
H8
D=25 +0.027 -0
h8
D=50 +0 -0.039
6

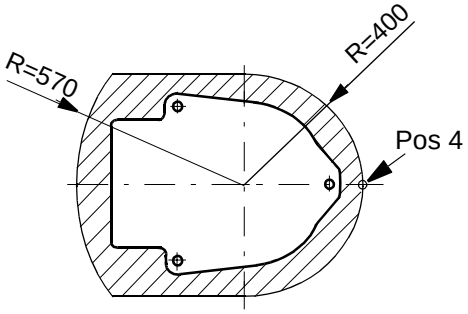
A - A

1.5 Robot Motion

IRB 2400L
The working area is the same for both floor and inverted mounting

Type of motion		Range of movement		
Axis 1	Rotation motion	+180°	to	-180°
Axis 2	Arm motion	+110°	to	-100°
Axis 3	Arm motion	+65°	to	-60°
Axis 4	Wrist motion	+185°	to	-185°
Axis 5	Bend motion	+115°	to	-115°
Axis 6	Turn motion	+400°	to	-400° (Unlimited as optional)





Positions at wrist centre (mm)

pos.	x	z
0	970	1620
1	404	2298
2	602	745
3	1577	-246
4	400	-403
5	-1611	623
6	-115	1088

Angle (degrees)

pos.	axis 2	axis 3
0	0	0
1	0	-60
2	0	65
3	110	-60
4	110	24.5
5	-100	-60
6	-100	65

Figure 12 The extreme positions of the robot arm (dimensions in mm).

Performance according to ISO 9283

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

Unidirectional pose repeatability:
RP = 0.06 mm

Linear path accuracy:
AT = 0.45 - 1.0 mm

Linear path repeatability:
RT = 0.14 - 0.25 mm

Minimum positioning time, to within 0.2 mm of the position:
0.2 - 0.35 sec. (on 35 mm linear path)
0.4 - 0.6 sec. (on 350 mm linear path)

The above values are the range of average test-results from a number of robots. If guaranteed values are required, please contact your nearest ABB Flexible Automation Centre.

Velocity

Versions:		IRB 2400L
Axis no.	1	150º/s
	2	150º/s
	3	150º/s
	4	360º/s
	5	360º/s
	6	450º/s

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

Resolution

Approx. 0.01º on each axis.

1.6 Signals

For more information of air and signals for extra equipment to upper arm, see Application Interface in chapter 2 Specification of Variants and Options.

2 Specification of Variants and Options

The different variants and options for the IRB 2400 are described below.
The same numbers are used here as in the Specification form. For controller options, see Product Specification S4Cplus, and for software options, see Product Specification RobotWare Options.

1 MANIPULATOR

VARIANTS

	Standard (requires option 035)	**Foundry** (requires option 036)
021	IRB 2400L	IRB 2400FL

IRB 2400 *Application Version - Handling capacity*

Application:	F	Robot adapted for foundry environments. Degree of protection as in chapter 1.3. The manipulator is finished with a special coating.
Reach:		Specifies the max. reach at the wrist centre.
Handling capacity:		Specifies the nominal handling capacity.

Manipulator colour

330 The manipulator is painted with ABB orange.

353 The manipulator is painted with ABB orange Foundry.

331-348 Colours according to RAL-codes. Not available for Foundry protection

Protection

035 Standard

036 Foundry
Robot adapted for foundry environments. Degree of protection as in Chapter 1.3.
The manipulator is specially painted and finished.
Only available colour is ABB orange Foundry.

APPLICATION INTERFACE

Air supply and signals for extra equipment to upper arm

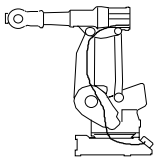
For connection of extra equipment on the manipulator, there are cables integrated into the manipulator's cabling, one FCI UT07 14 12SH44N connector and one FCI UT07 18 23SH44N connector on the rear part of the upper arm.
A hose for compressed air is also integrated into the manipulator. There is an inlet

(R1/4”) at the base and an outlet (R1/4”) on the upper arm.

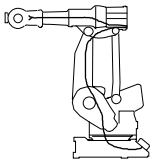
Signals	23	50 V, 250 mA
Power	10	250 V, 2 A
Air	1	Max. 8 bar, inner hose diameter 8 mm

(Available for options 041 and 042)

041 Integrated hose and cables for connection of extra equipment on the manipulator to the rear part of the upper arm.



042 Hose and cables for connection of extra equipment are extended to the wrist on the outside of the upper arm. Not possible on IRB 2400L, option 021.

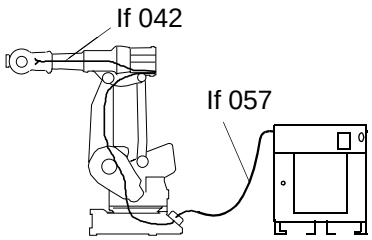


043 Integrated wire feed cabling
Control signals:
16 signals, 49 V, 500 mA
Connector on upper arm housing: Burndy 23-pin UTG 618-23PN
Connector on robot base: Burndy 23-pin socket UT001823SHT
Power signals:
12 signals, 300 V, 4 A
Connector on upper arm housing: Burndy 12-pin socket UTG 614-12SN
Connector on robot base: Burndy 12-pin UT001412PHT
Not possible on IRB 2400/10 and /16.

Connection to

056 Manipulator
The signals are connected directly to the manipulator base to one 40-pins Harting connector.

057 Cabinet
The signals are connected to 12-pole screw terminals, Phoenix MSTB 2.5/12-ST-5.08, to the the controller.



Connection to cabinet (Cable lengths)

675 7m
676 15m
677 22m
678 30m

EQUIPMENT

691 Safety lamp
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.

058 Dressing
Mounting of extra equipment, e.g. tool system on robot before delivery, ordered from ABB Flexible Automation/*Department U*.

POSITION SWITCH

Switches indicating the position of axis 1.
A design with two stationary or 1, 2 or 3 adjustable switches is available. The switches are manufactured by Telemecanique or Burnstein, and of type forced disconnect.

Note The switches are <u>not</u> recommended to be used in severe environment with sand or chips.

Switches axis 1 (see Figure 14)

069 One switch

070 Two switches

071 Three switches

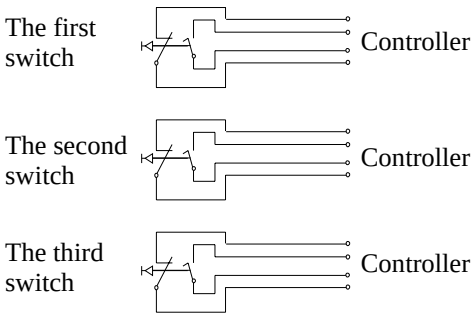


Figure 14 Connections of the switches

072 Two switches, axis 1, stationary (see Figure 15)
The two switches divide the working area of axis 1 into two fixed working zones, approx. 175° each. Together with external safety arrangement, this option allows access to one working zone at the same time as the robot is working in the other one.

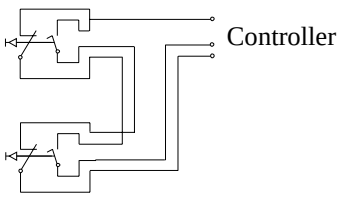


Figure 15 Connections of the switches.

Connection to

075 Manipulator
Connection on the manipulator base with one FCI 23-pin connector.

076 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

Cable lengths
078 7m
079 15m

080 22m
081 30m

WORKING RANGE LIMIT

To increase the safety of the robot, the working range of axes 1, 2 and 3 can be restricted

061 Axis 1
Two extra stops for restricting the working range. The stops can be mounted within the area from 50º to 140º. See Figure 16.

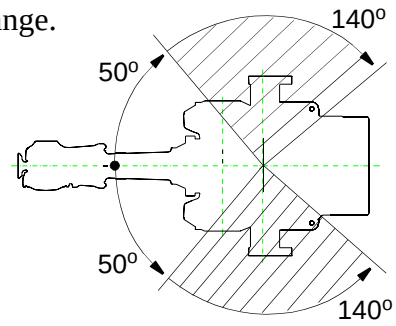


Figure 16

062 Axis 2
Stop lugs for restricting the working range. Figure 17 illustrates the mounting positions of the stops.

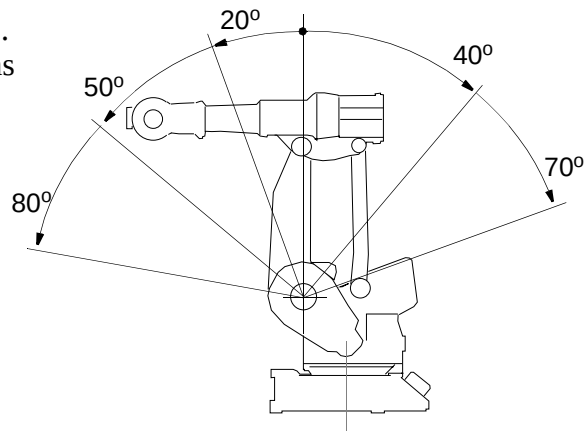


Figure 17

063 Axis 3
Equipment for electrically restricting the working range in increments of 5º.

3 Accessories

There is a range of tools and equipment available, specially designed for the robot.

Basic software and software options for robot and PC

For more information, see Product Specification S4Cplus, and Product Specification RobotWare Options.

Robot Peripherals

- Track Motion
- Tool System
- Motor Units