Product Manual

Manipulator
IRBP 250B90/750B90
S4Cplus

503 741-102
2000-11-28

ABB Flexible Automation AB
Welding Systems

Article number: 503 741-102

Date: 2000-11-28

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1 Manipulator IRBP

1.1 IRBP 250B90

Manipulator IRBP 250B90 is intended for handling workpieces up to 250 kg (fixture included) in combination with robot welding using the MIG/MAG method.

The manipulator offers a twin station solution where the robot welds on one side while the operator loads and unloads on the other side

The modular design, few and heavy-duty moving parts as well as minimum maintenance requirements make the manipulator very service friendly.
The manipulator is made up of the following units, (Figur 1)

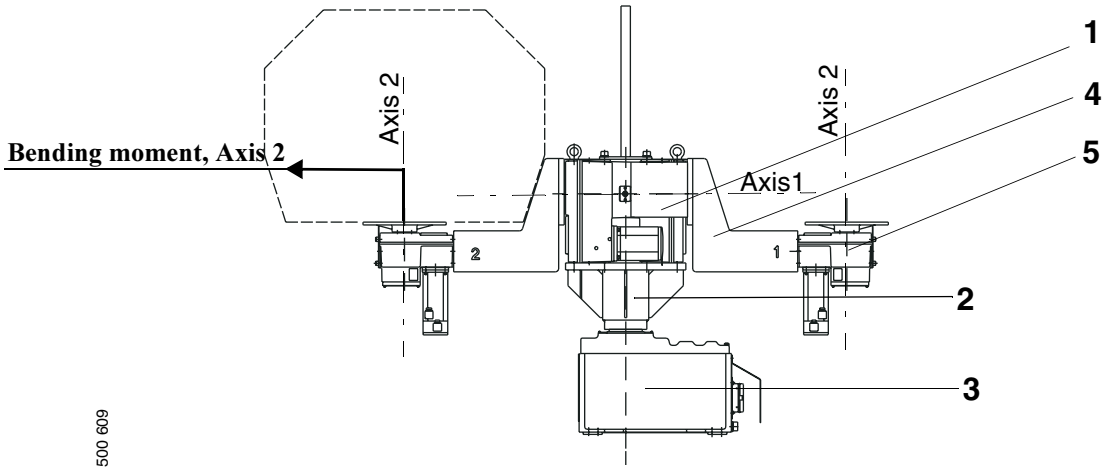
1 Rotary unit **MTB**

2 Stand

3 Station switching unit **MIB**

4 Arm

5 Rotary unit **MTB**



Figur 1 Manipulator, main components.

On the output shaft on the station switching unit **MIB** (3) there is a frame (2) to which two rotary units **MTB** (1) are mounted.

A rotary unit **MTB** (5) is fitted on arm (4) on the output shaft of **MTB** (1).

On the output shaft of the rotary unit (5, axis 2) a faceplate is fitted. The faceplate has tapped holes, plain holes and guide holes for securing fixtures.
A screen between the two welding stations protects the operator from arc-eye.

To obtain an electrical connection between the work piece and the power source, the rotary units are fitted with a current collector in the form of a slip ring.

1.1.1 Technical data

Max. handling capacity	250 kg	
Max. load difference between sides 1 and 2 (work piece and fixture)	175 kg	
Max. continuous torque	350 Nm	
Centre of gravity	See chapter Loading table	
Max. bending moment	600 Nm	
Positioning time 90 degrees	**Axis 1** 1,9 s	**Axis 2** 1,4
Positioning time 180 degrees	**Axis 1** 2,5 s	**Axis 2** 1,9 s
Positioning time 360 degrees	**Axis 1** 3,8 s	**Axis 2** 2,9 s
Repetition accuracy with equal loads and radii 500 mm	±0,1 mm	
Max. rotation speed	**Axis 1** 27 rpm	**Axis 2** 30 rpm
Station switching time	< 4,5 s	
Stop time with an emergency stop	< 0,5 s	
Max. peak welding current	500 Amp	
Max. continuous welding current	250 Amp	

Manipulator IRBP 250B90 is intended for handling workpieces up to 250 kg (fixture included) in combination with robot welding using the MIG/MAG method.

1.2 IRBP 750B90

Manipulator IRBP 750B90 is intended for handling workpieces up to 750 kg (fixture included) in combination with robot welding using the MIG/MAG method.

The manipulator offers a twin station solution where the robot welds on one side while the operator loads and unloads on the other side

The modular design, few and heavy-duty moving parts as well as minimum maintenance requirements make the manipulator very service friendly.

The manipulator is made up of the following units, (Figur 2).

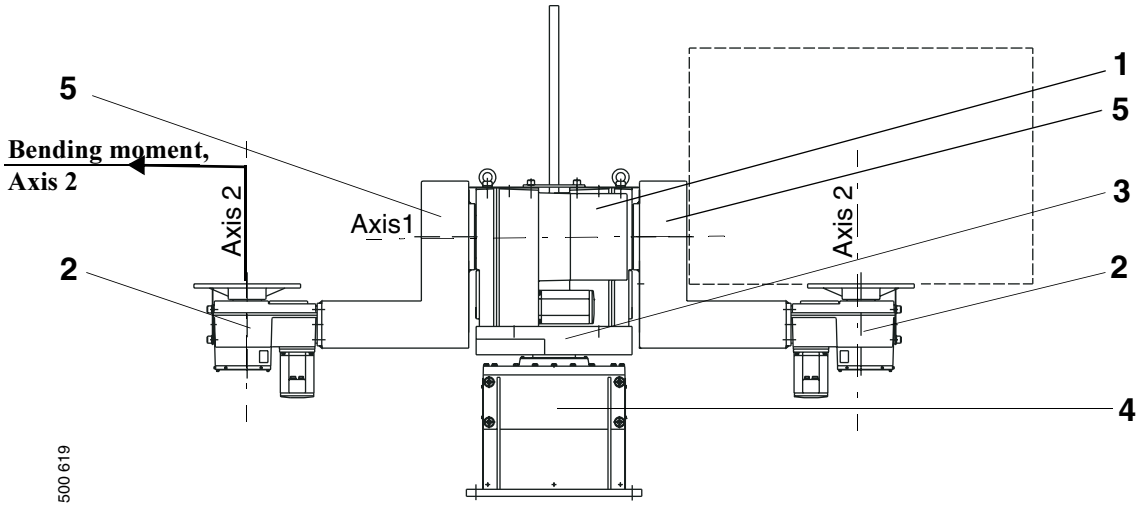
1 Rotary unit **MTB**

2 Rotary unit **MTB**

3 Stand

4 Station switching unit **MIB**

5 Arm



Figur 2 Manipulator, main components.

On the output shaft on the station switching unit **MIB** (4) there is a frame (3) to which two rotary units **MTB** (1) are mounted.

On the **MTB** (1) output shaft there is an arm (5) with a rotary unit **MTB** (2) fitted.

On the output shaft of the rotary unit (2, axis 2) a faceplate is fitted. The faceplate has tapped holes, plain holes and guide holes for securing fixtures.

A screen between the two welding stations protects the operator from arc-eye.

To obtain an electrical connection between the work piece and the power source, the rotary units are fitted with a current collector in the form of a slip ring.

1.2.1 Technical data

Max. handling capacity	750 kg	
Max. load difference between sides 1 and 2 (work piece and fixture)	350 kg	
Max. continuous torque	900 Nm	
Centre of gravity	See chapter Loading table	
Max. bending moment	3300 Nm	
Positioning time 90 degrees	**Axis 1** 2,8 s	**Axis 2** 1,9 s
Positioning time 180 degrees	**Axis 1** 3,9 s	**Axis 2** 2,5 s
Positioning time 360 degrees	**Axis 1** 5,9 s	**Axis 2** 3,8 s
Repetition accuracy with equal loads and radii 500 mm	±0,1 mm	
Max. rotation speed	**Axis 1** 15 rpm	**Axis 2** 27 rpm
Station switching time	< 6 s	
Stop time with an emergency stop	< 0,7 s	
Max. peak welding current	500 Amp	
Max. continuous welding current	250 Amp	

1.3 Slip-ring device with swivel

1.3.1 Option slip-ring device

The function is to transfer electrical signals between a fixed and a movable part.

Technical specification slip-ring device

Channels	12 or 24 [a]
Current	5 A /channel
Voltage	230 V
Cable cross section	1,5 mm²

a. One channel for the screening.

1.3.2 Option swivel

The function is to transfer air between a fixed and a movable part.

Technical specification swivel

Channels	1
Dimension	1 / 4"
Medium	Air
Pressure	8 Bar

Installation

The slip-ring device is avaiable with either 12 or 24 channels. One of the channels is for screening and is always connected to number 1 on the terminal block. The minus pole of the welding power source and the frame of the manipulator are to be separated from the earthing of the system, e.g. the cable screen.

Connection of the cable to the terminal box, see Figure 10. For circuit diagram, see separate flap.

The air is to be connected to the existing 1/4" nipple..

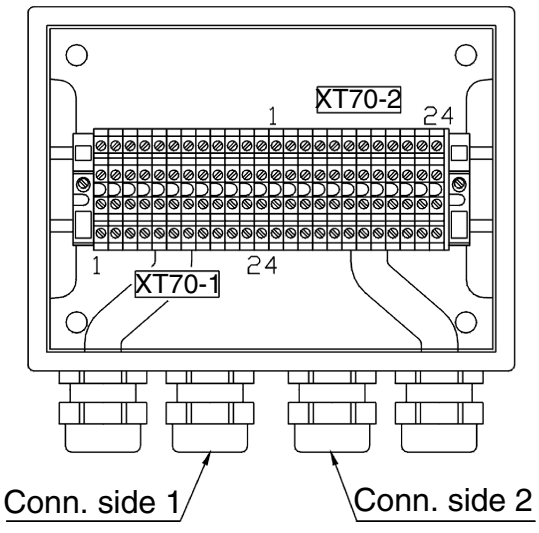


Figure 3 Terminal box

1.4 Optional swivel connectors

Medium	Air
Max. pressure	8 bar
Connection	See loading diagram

1.5 Control system

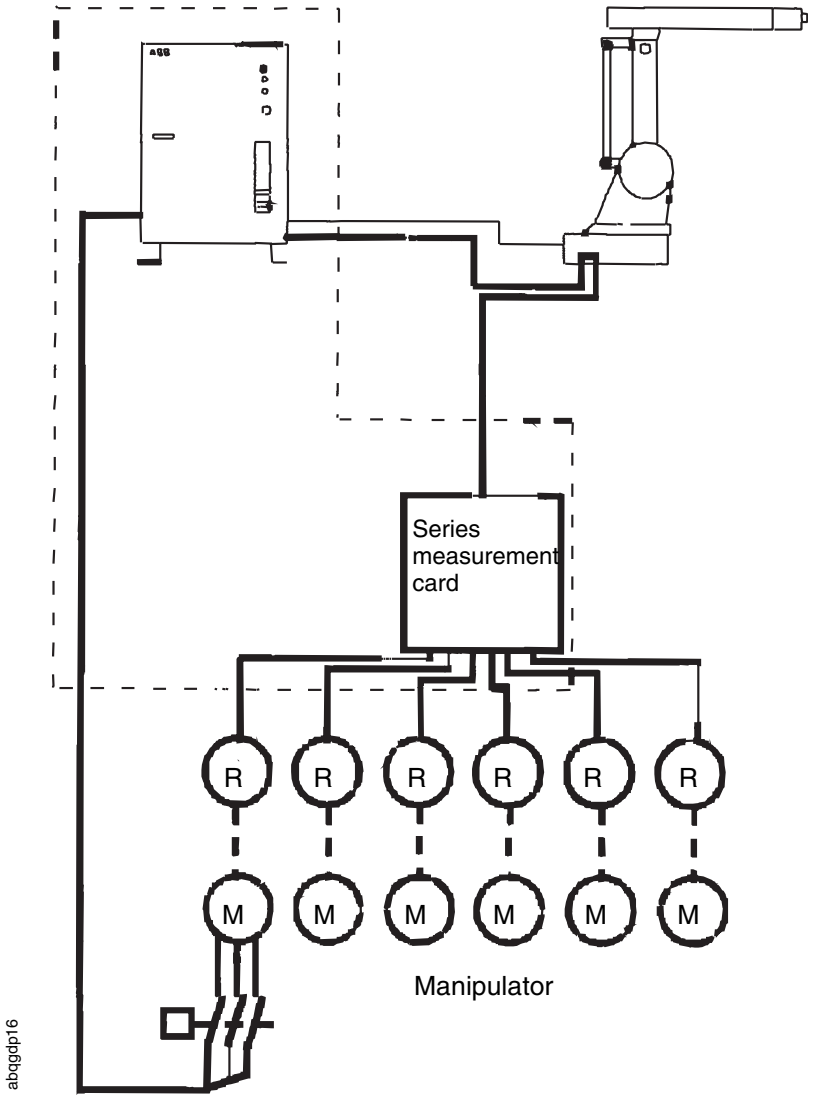


Figure 4 Diagram, control system.

1.6 Rotary unit

The station switching unit **MTB** is a modular unit specially developed for robot applications and is intended for welding in optional position.

The rotary unit consists of:

1 Gearbox

2 AC-motor with integrated brake and resolver

3 Current collector

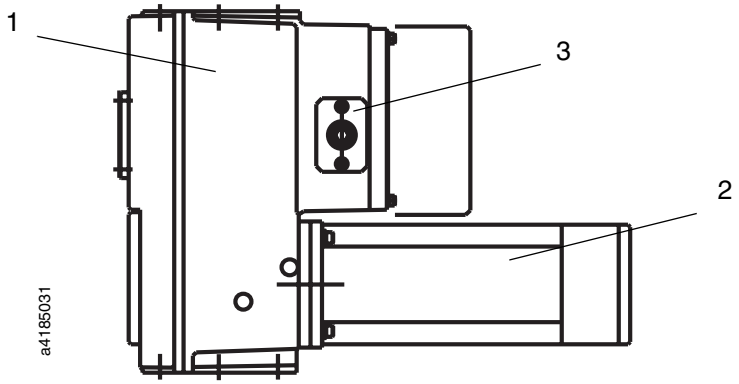


Figure 5 Rotary unit MTB.

1.6.1 Components

Below follows a more detailed description of the components.

Gearbox

The gearbox is a precision gear drive especially developed to meet the high demands of robot applications, i.e. flexibility, stability, speed and accuracy. The gearbox is virtually play-free and requires no post adjustment but continues to meet requirements throughout its service life.

The gearbox is maintenance free and is supplied with oil that never needs to be changed, (corresponding to 40 000 operating hours).

AC-servo motor

The AC-servo motor is a permanent magnetised 3-phase AC motor that provides smooth operations in all speed ranges.

The armature is fitted with high-value permanent magnets that are marginally affected by temperature.

The motor has a thermal cut-out (Klixon thermostat), and a resolver for speed signal feedback and position indication.

The motor is equipped with a brake for positioning when the rotary unit is not active and to provide braking with an emergency stop and working stop.
NOTE: This brake is not a working brake.
This means that for normal running the programming unit or the operator's panel is to be used for stopping.

The motor is electrically isolated from all other parts to prevent the welding current from being led through the motor's protective earth.

The motor is maintenance free.

Current collector

The function of the current collector is to lead over the welding current from the work piece to the power source. This occurs through a contact bar, which is spring loaded against the shaft.

The contact bar needs to be lubricated after some 400 operating hours using a special lubricating material, our article no. 501 869-001.

1.7 Station switching unit MIB

The station switching unit **MIB** is a modular unit specially developed for robot applications and is intended for indexed movement through 180 degrees.

The station switching unit consists of the following:

1 Shock absorber

2 End limit switch

3 Arm

4 AC-servo motor with integrated resolver and brake

5 Gear drive

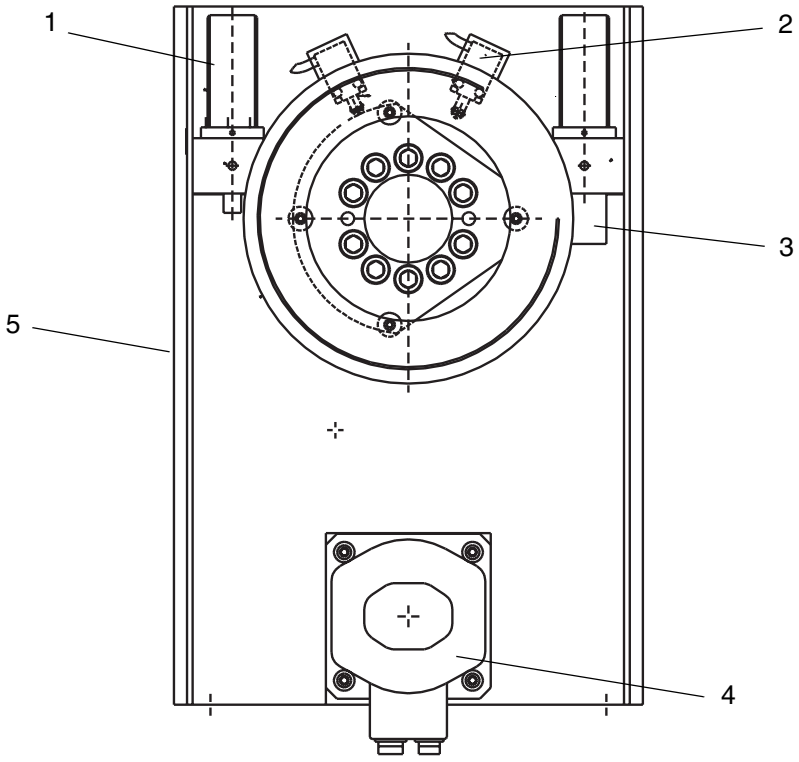


Figure 6 Station switching unit MIB.

1.7.1 Components

Below follows a more detailed description of the components.

Shock absorber

The two hydraulic shock absorbers are located so that the arm hits them in the movement's end position. This gives the station switching unit gentle movement in the end position and reduces impact loads.

End limit switch

The station switching unit is fitted with two forced switching end limit switches to indicate a completed station change and to monitor the position of the station switching unit.

AC-servo motor

The AC-servo motor is a permanent magnetised 3-phase AC motor that provides smooth operations in all speed ranges.

The armature is fitted with high-value permanent magnets that are marginally affected by temperature.

The motor has a thermal cut-out (Klixon thermostat), and a resolver for speed signal feedback and position indication.

The motor is equipped with a brake for positioning when the rotary unit is not active and to provide braking with an emergency stop and working stop.
NOTE: **This brake is not a working brake.**
This means that for normal running the programming unit or the operator's panel is to be used for stopping.

The motor is electrically isolated from all other parts to prevent the welding current from being led through the motor's protective earth.

The motor is maintenance free.

Gearbox

The gearbox is a gear drive especially developed to meet the high demands of robot applications, i.e. bending stiffness, torsional stiffness, stability and speed.

The gearbox is maintenance free and is supplied with oil that never needs to be changed.

1.8 Support collar

The support collar consists of two parts:

1 Shaft with mounting flange.

2 Flange bearing with spherical bearing position.

The support collar permits both spherical and axial motion during rotation.

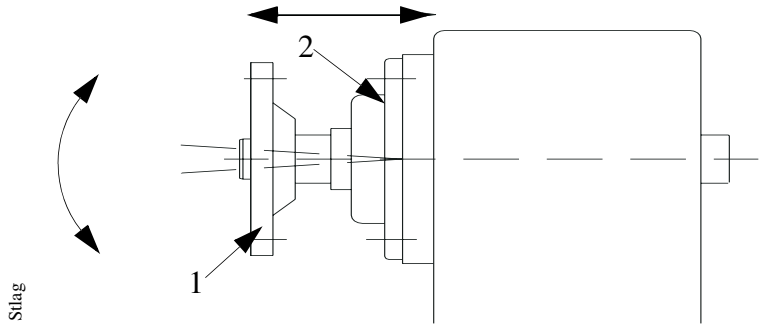


Figure 7 Support collar

2 Maintenance

The welding robot station is intended for use in demanding working conditions with a minimum of maintenance. However, to minimise downtimes a certain degree of preventive maintenance is required with checks spread out over different time periods (see the table below).

The station should be cleaned when necessary using a vacuum cleaner or cloth. Compressed air and/or strong solvents can damage seals and bearings, etc.

Maintenance	**Daily**	**400h**	**Every 6 months (1000h)**	**Every year (2000 h)**	**Every 5 years**	**Notes**
Cables			X1			
Gearboxes, oil leakage	X2					Manipulator
Return cables	X3					
Current collector		X7	X4			Manipulator
Shock absorbers, oil leakage			X5			Manipulator
Series measurement card, battery replacement					X6	Manipulator

X1	Ocular control of cables. Replace if damaged.
X2	With leakage, call for service personnel.
X3	Check that there is good contact between connections.
X4	Check that no damage has been caused by sparks during the start of welding and that the shaft surface is not rough.
X5	With leakage, call for service personnel.
X6	See *Product manual* for IRB 1400/2400.
X7	For lubrication of the current collector, use a special lubricating material, our article no. 501 869-001

3 Loading table

The tables shows max. permitted centre of gravity shift from the rotation centre and the rotary unit's faceplate at different loads.

3.1 IRBP 250B90

Example: If the load is 225 kg the centre of gravity must be located between the marked area in Figure 15, (ØD=317 mm, H= 271 mm). Figure 8.

If the load is 235 kg, see the column for 250 kg load.

Each side can be loaded with different weights as long as the load difference between side 1 and side 2 is less than 175 kg.

Weight of workpiece including fixture (kg)	250	225	200	175	150	125	100	75
ØD (mm)	285	317	356	407	475	570	713	951
H (mm)	244	271	305	349	407	489	611	815

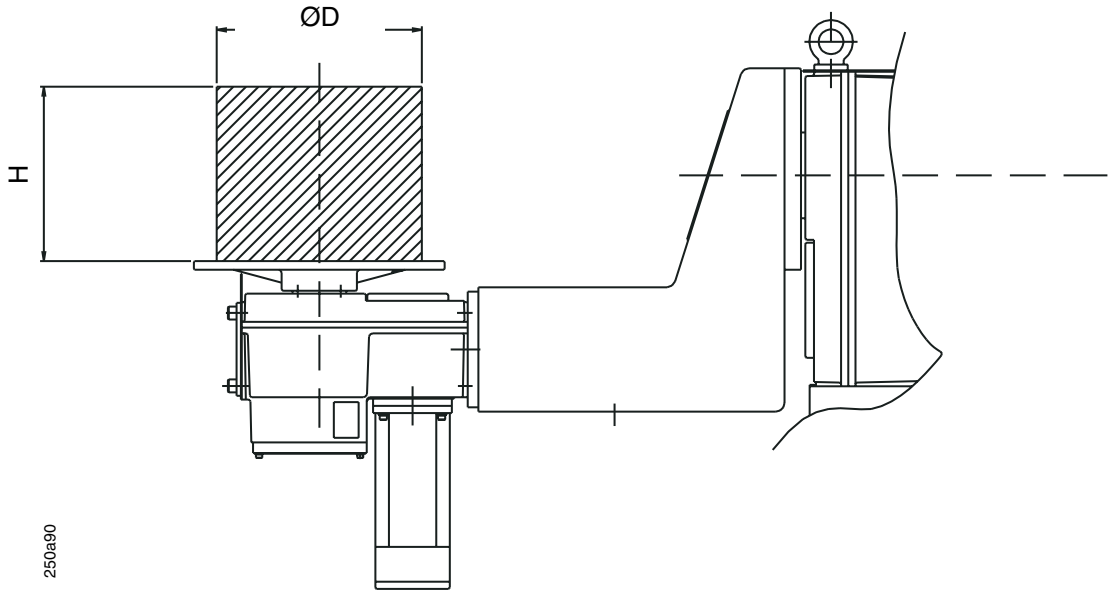


Figure 8

3.2 IRBP 750B90

Example: If the load is 700 kg the centre of gravity must be located between the marked area in Figure 15, (ØD=262 mm, H= 480 mm).

If the load is 685 kg, see the column for 700 kg load.

Each side can be loaded with different weights as long as the load difference between side 1 and side 2 is less than 350 kg.

Weight of workpiece including fixture (kg)	750	700	650	600	550	500	450	400
ØD (mm)	244	262	282	305	333	367	407	458
H (mm)	448	480	517	560	611	672	747	840

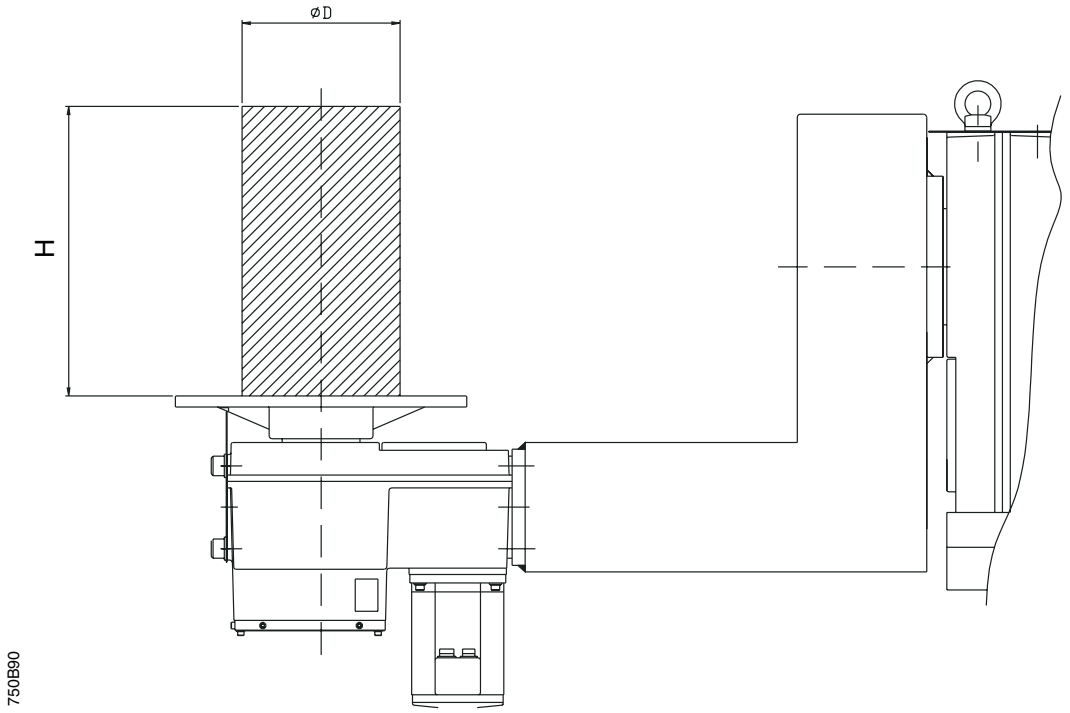


Figure 9

4 Integrated fixtures

4.1 IRBP 250R/750R/250K/750K/250L/750L/2000L and 250D90

An attempt should be made, when designing fixtures, that the centre of gravity of the fixture and work piece coincide with the rotation centre.

First calculate the position of the centre of gravity, where after the moment of gravity can be calculated. The latter must not exceed the specified value for continuous torque.

See the measurement diagrams for the manipulator, rotary unit's faceplate and support collar for the integration measurements when fastening. The strength class for the bolts in the fixture ought to be 12.9 or equivalent.

The fixture must conform to some tolerances for squareness and casting to prevent clamping forces from occurring. See Figure 10.

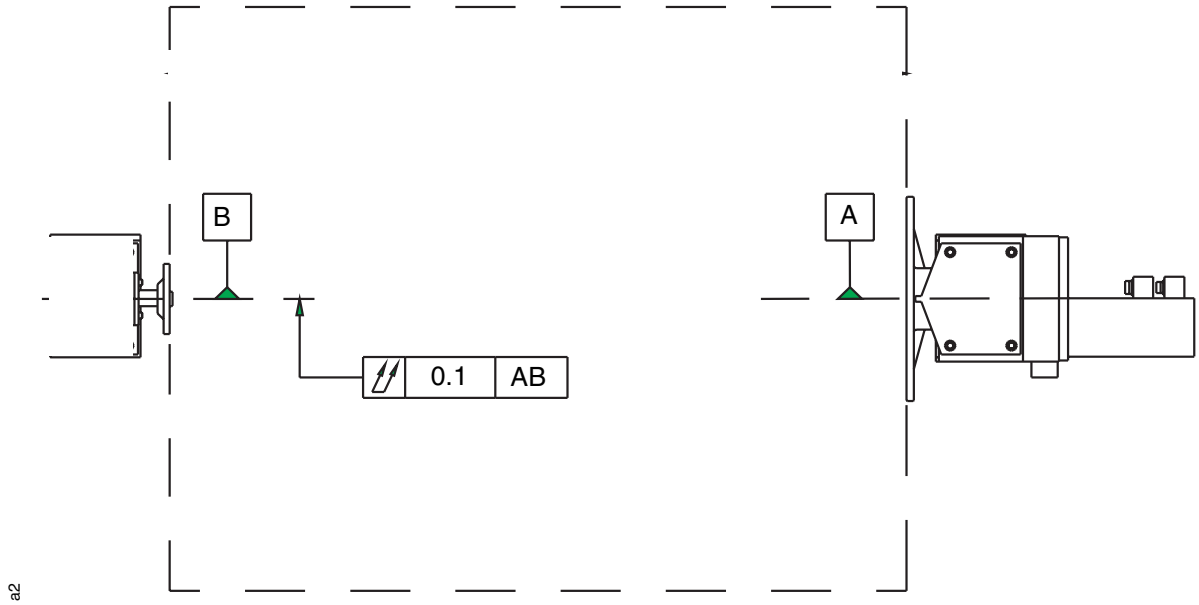


Figure 10

4.1.1 Mounting/dismounting of fixtures for 250K/750K

When mounting or dismounting fixtures for the K manipulators it is important to do this in the right order.

If this is done in the wrong order the station switching unit can be overloaded and the unit can start moving, which involves considerable risks to people near by.

Correct order when **mounting** the fixtures:
- First mount side 2, then side 1.

Correct order when **dismounting** the fixtures:
- First dismount side 1, then side 2.

In the event the mounting/dismounting cannot be done in this order, the switching unit frame must be locked by way of external means, e.g. a traverse crane.

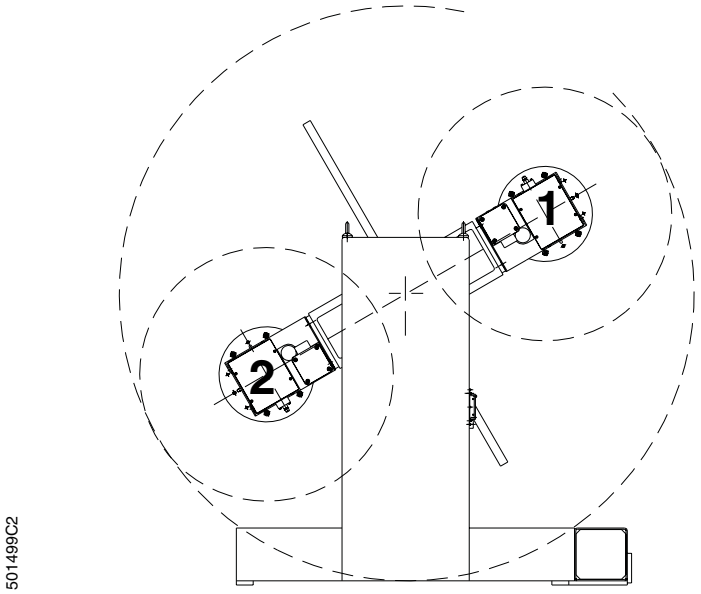


Figure 11

4.2 IRBP 500C and 250A90/750A90/250B90/750B90

When designing fixtures, the position of the centre of gravity must be calculated. Then make sure the centre of gravity is within the permitted area (see the section *Loading Diagram*).

See the measurement diagrams for the manipulator for the integration measurements when fastening.

The strength class for the bolts in the fixture ought to be 12.9 or equivalent.

5 Foundation

The station requires a good foundation and a concrete floor with double reinforcement and a bearing capacity of at least 1000 kg/m2 is recommended.

The bolts require a cast steel plate of at least 150x150x10 mm. Other solutions, e.g. cast steel section, are also possible.

Note any surface unevenness, a flatness of 0.5 mm is necessary. If necessary, use schims under the foundation on the robot and the manipulator.

5.1 Fitting the floor stand

1 Position the stand as set out in the chapter *Station layout*.

2 Drill holes for the foundation bolts. For dimensions, see section *Station layout*.

3 Use the level bolts to adjust the height if necessary.

4 **Use schims if necessary.**

5 Fit the foundation bolts.

6 Remove the level bolts.

7 Tighten all nuts and bolts.

6 Measurement diagrams

6.1 IRBP 250B90

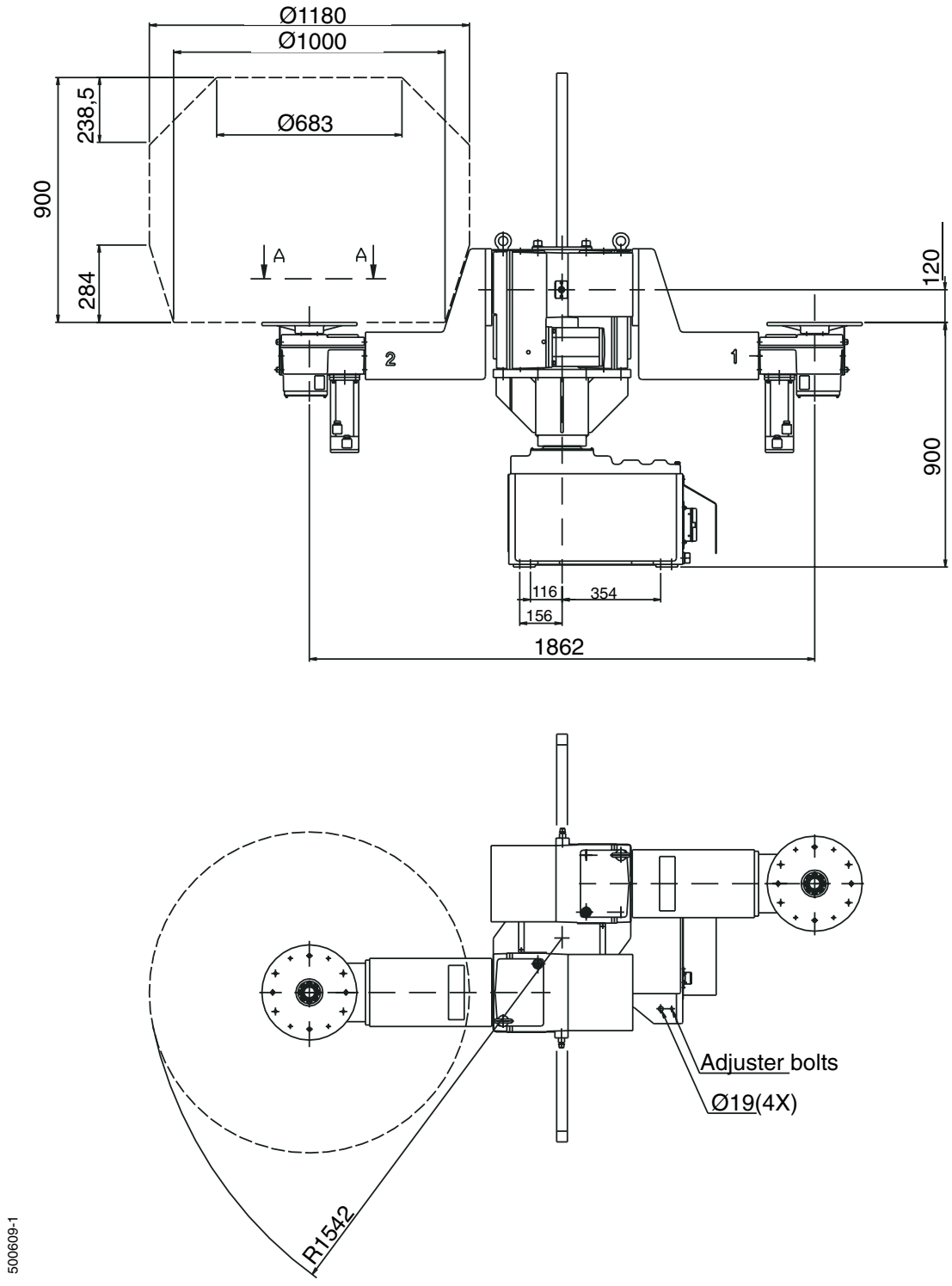


Figure 12 Manipulator IRBP 250B90.

Measurement diagrams

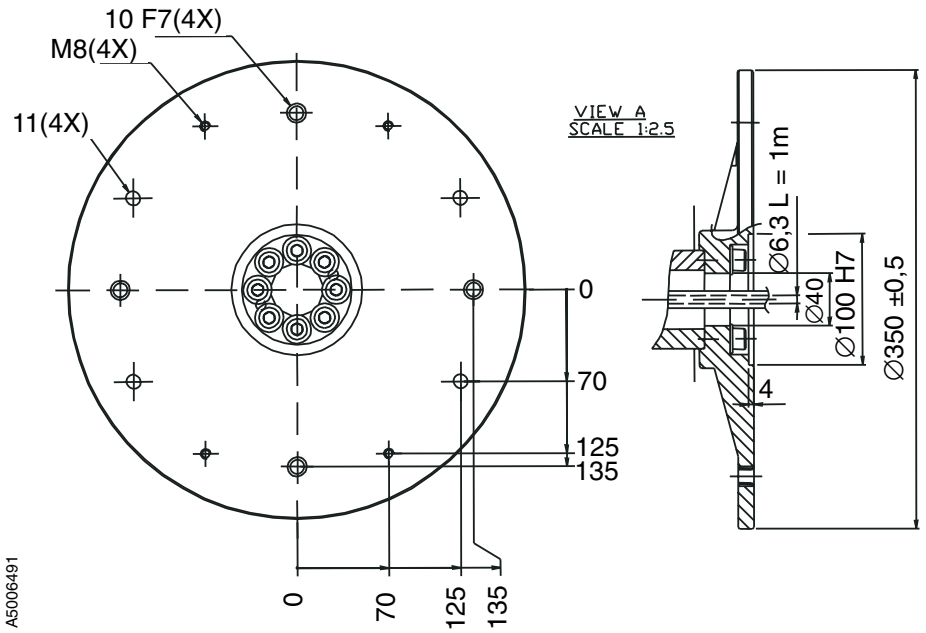
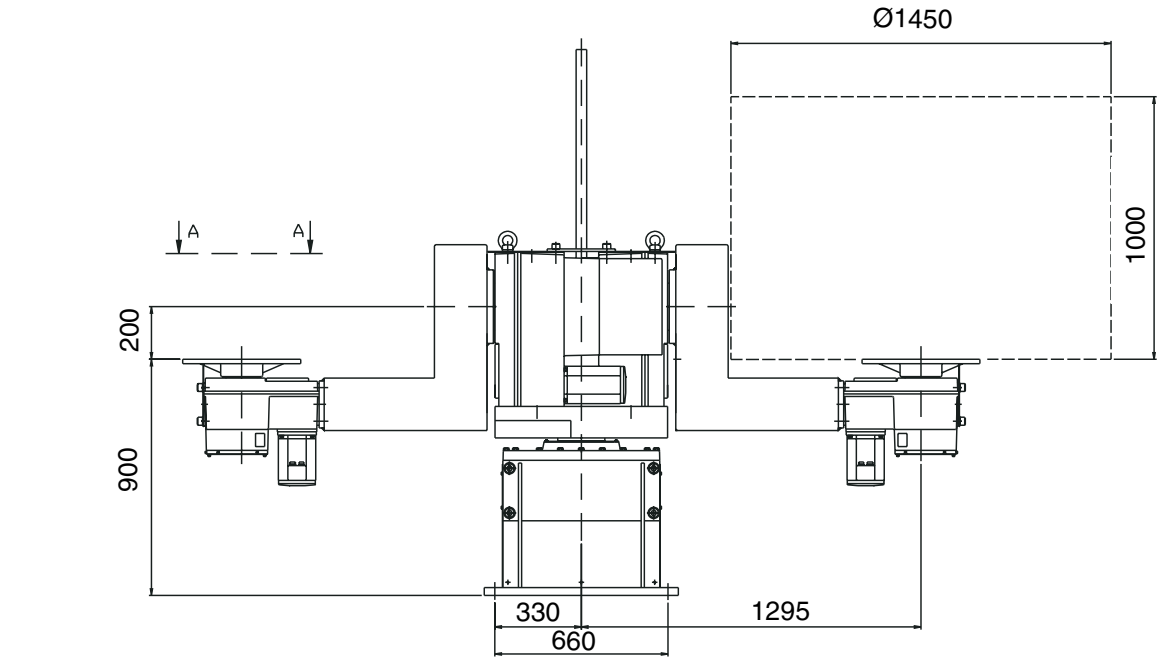


Figure 13 Faceplate.

6.2 IRBP 750B90



Control panel

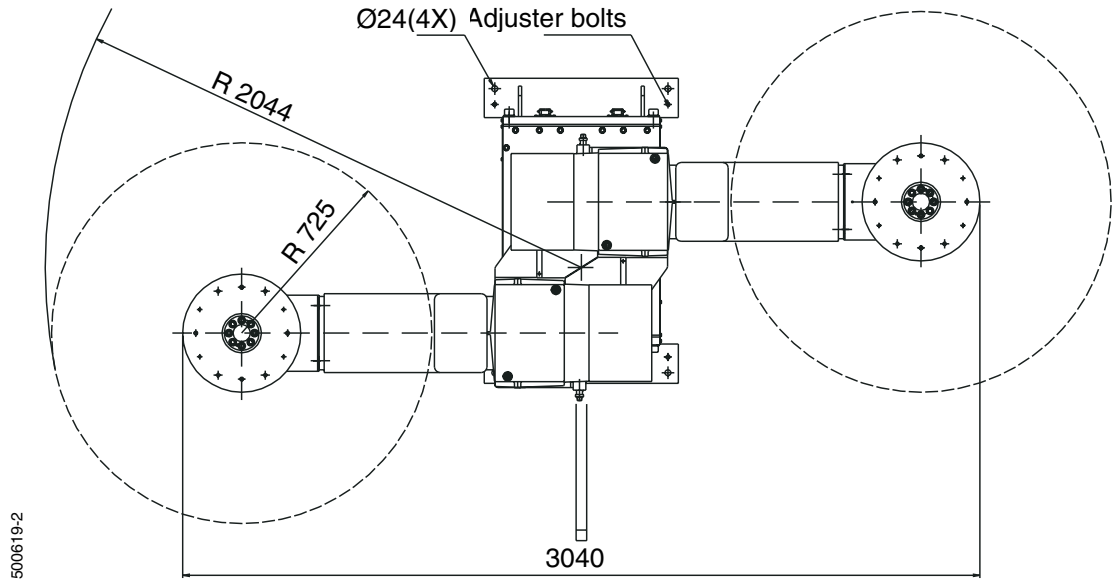
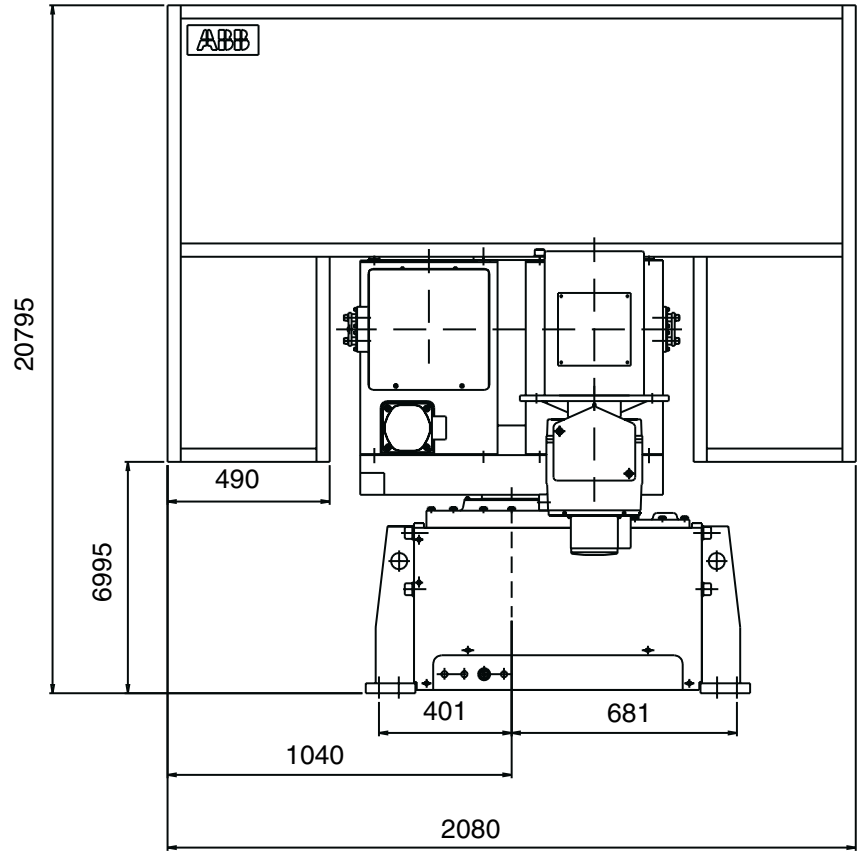


Figure 14 Manipulator IRBP 750B90.



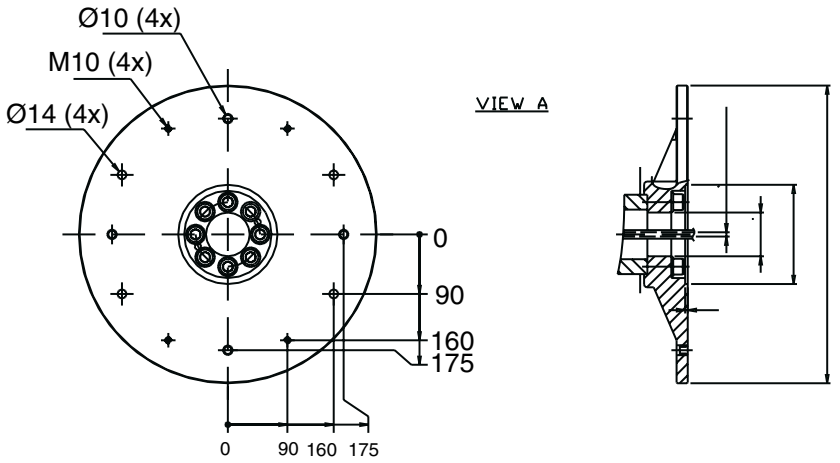


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Figure 15 Faceplate

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