

Product Manual

Track Motion

IRBT 6003S

IRBT 4003S

3HXD 7111-1 Rev.6, February 2005



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Chapter 1: Description

General

Track Motion IRBT 6003S/4003S expands the movement pattern of the robot with an extra degree of programmable freedom.

High performance - High precision

IRBT 6003S/4003S has a powerful motor and an advanced gearbox. Together they give the track motion good acceleration and speed performance at the same time as precision is extremely high.

Function

The track motion is supplied with carriage and adapter plate for robot models: IRB 6600, IRB 6400R, IRB 6400, IRB 4400 or IRB 640. No further adaptation is necessary, which means easy installation. The design of the track motion has also been adapted to give the shortest possible installation time.

Movement on the track motion is programmed using the robot controller in the same way as the robot's other axes.

Two types of cable chains

IRBT 6003S/4003S is available in two designs, Compact and Covered. Compact, adapted for materials handling, where the overall width is less than for the spot welding variant. Covered is adapted for spot welding and the cable chain is then protected by cover plates.

Nevertheless, the cable chain is easy to access for cleaning and other maintenance on both models.

Flexibility

As the track motion is based on two and three metre modules makes it very flexible. There is also a possibility to add one or more modules at a later date.

Fully-fitted cover plates

The travel motion's cover plates are fully-fitting. This means the IRBT 6003S/4003S is sealed and easy to keep clean. In addition, it is equipped with an anti-slip surface coating, which makes it safe to walk on.

Description

Principle layout

Principle layout

Track Motion IRBT 6003S/4003S is available in two basic designs, Compact and Covered. Compact has an open cable tray adapted for materials handling. Covered has a protected, covered cable tray adapted for spot welding.

IRBT 6003S/
4003S Compact

The illustration shows the principle layout of the track motion in the Compact design.

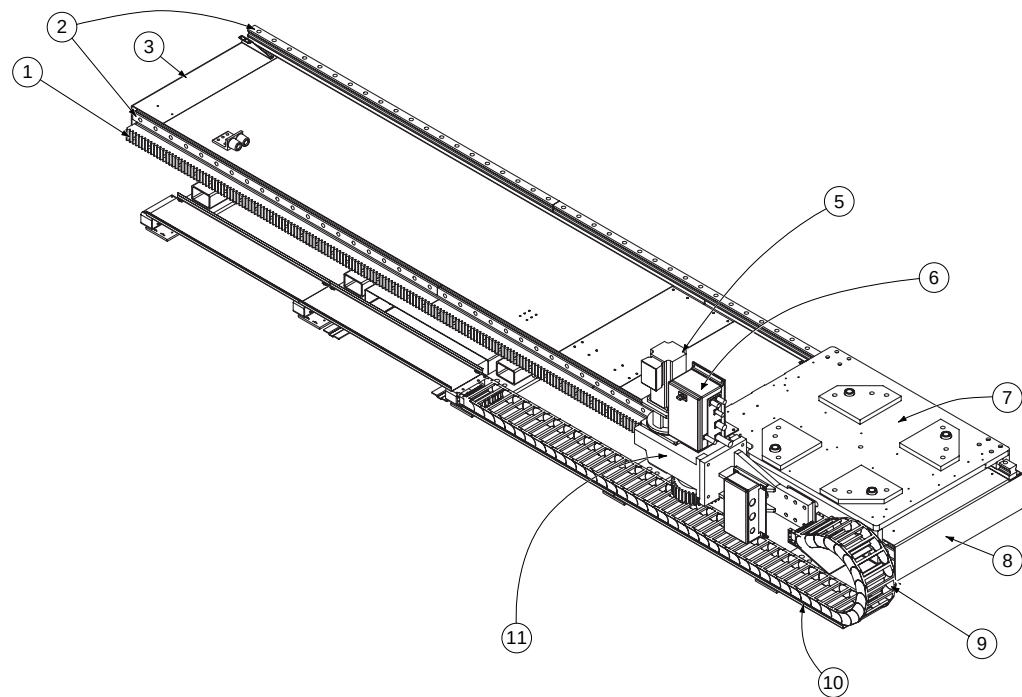


Fig. 1: IRBT 6003S/4003S Compact

Component parts

The table refers to the positions in the illustration above.

Description	Item
Carriage	7
Cable chain	9
Cable tray	10
Motor	5
Gearbox	11
Serial Measurement Box / Brake release box	6
Gear rack	1
Linear guides	2
End plates	3 and 8

IRBT 6003S/ 4003S Covered

The illustration shows the principle layout of the track motion in the protected design.

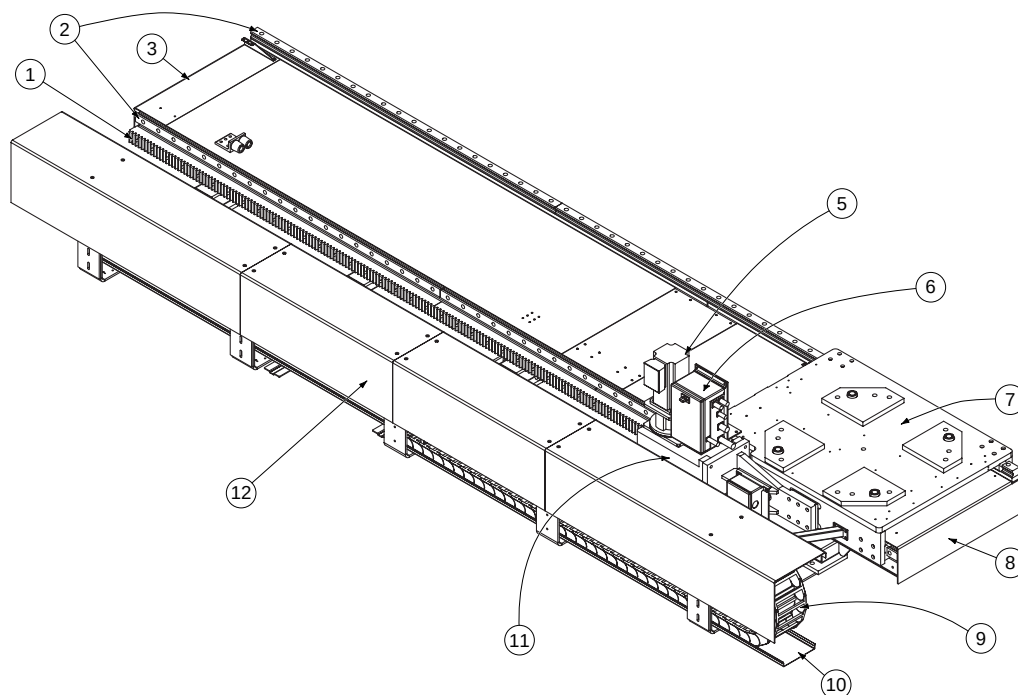


Fig. 2: IRBT 6003S/4003S Covered

Component parts

The table refers to the positions in the illustration above.

Description	Item
Carriage	7
Cable chain	9
Cable tray	10
Motor	5
Gearbox	11
Serial Measurement Box / Brake release box	6
Gear rack	1
Linear guides	2
End plates	3 and 8
Protective covers for the cable chain	12

Description

Terms and concepts

Terms and concepts

Definitions

The table below lists terms and concepts used in the documentation.

Name	Definition
Robot system	Robot and Track Motion together.
Robot	Positioner and controller together (IRB 6400R/IRB 6400/IRB 4400/IRB 640/IRB 6600).
Positioner	The mechanical, moving part of the robot.
Controller	Controller of the type S4Cplus.
Track Motion	Carriage, stand and cable chain as well as associated parts, assembled (IRBT 6003S/4003S).
Carriage	The moving part, on which the positioner is mounted.
Stand	The assembled framework for the track motion.
Stand module	Track motion systems with a travel length greater than 4.7 metres are supplied with the stand in modules that are interconnected according to the instructions in <i>“Mechanical installation” på sid 2-5.</i>
Travel length	The carriage's maximum movement range.

Chapter 2: Safety instructions

Description

There are safety instructions in this chapter for all steps that involve a risk of personal injury or material damage. In addition, they are written out by the instructions for each step.

General warnings where the intention is to avoid difficulties are only set out by the instruction in question.

Key to symbols

The different types of warnings are set out in the following chapters according to the table below:

Symbol	Importance
	Warns for the risk of personal injury or serious damage to the product. Always follow the instructions expressed in association with this symbol.
	Draws your attention to the fact that damage to the product can occur if a measure is not performed or is performed incorrectly.
	Information about important details.

Safety with Unpacking and handling

Read carefully through the safety instructions, before the track motion is unpacked and installed.

Lifting instructions

Only units that are 6 metres or shorter may be lifted. If the units are joined, the joints must be prefitted on delivery.

Safety with mechanical installation

Adjusting the level

The distance between the levelling bolts and the top edge of the ground plates must be at least 10 mm.

Safety with Assembling the cable channel and robot

Assemble the robot

Always refer to the documentation for the positioner when the positioner is to be lifted.

Safety instructions

Safety with Electrical installation

Safety with Electrical installation

The robot's cable harness	Make sure that the cable harness cannot come into contact with any moving parts.
----------------------------------	--

Safety with Commissioning

Calibration	Make sure no persons are on the track motion when the carriage moves. Also make sure that the travel motion's cover plates are free from loose objects, otherwise these can become trapped between the carriage and the plates.
--------------------	---

Checking the working area	The travel motion's working area must be inspected before the system is commissioned.
----------------------------------	---

Safety with Mechanical maintenance

Refilling the lubricant	Only use grease injectors with 3 months supply or shorter.
--------------------------------	--

Chapter 3: Technical specifications and requirements

Performance

IRBT 4003

The table below contains important technical data for the performance of the track motion.

Function	Performance
Travel length	0.7–43.7 metres in increments of 1 metre.
Travel speed IRBT 4003	1.6 m/s
Stand length	travel length + 1.3 metres
Acceleration	1.4 m/s ²
Retardation	1.9 m/s ²
Repeater accuracy ¹	± 0.1 mm
Maximum load IRB 4400	the robot weight + 100 kg
Weight carriage	600 kg
stand	270 kg/m
adaptor for IRB 4400	160 kg
Degree of protection	IP 54
Static play	Contact ABB for information
Dynamic play	Contact ABB for information

1. Repeated stopping in the travel direction, at the same point.

IRBT 6003

1.0 m/s

The table below contains important technical data for the performance of Track Motion IRBT 6003.

Function	Performance
Travel length	0.7–43.7 metres in increments of 1 metre.
Travel speed IRB 6003	1.0 m/s
Stand length	travel length + 1.3 metres
Acceleration	1.5 m/s ²
Retardation	1.6 m/s ²
Repeater accuracy ¹	± 0.1 mm
Maximum load IRB 6600	the robot weight + 400 kg
Weight carriage	600 kg
stand	270 kg/m
adaptor for IRB 6400	193 kg
Degree of protection	IP 54
Static play	Contact ABB for information
Dynamic play	Contact ABB for information

1. Repeated stopping in the travel direction, at the same point.

Technical specifications and requirements

Performance

1.5 m/s The table below contains important technical data for the performance of Track Motion IRBT 6003.

Function	Performance
Travel length	0.7–43.7 metres in increments of 1 metre.
Travel speed IRB 6003	1.5 m/s
Stand length	travel length + 1.3 metres
Acceleration	1.5 m/s ²
Retardation	1.6 m/s ²
Repeater accuracy ¹	± 0.1 mm
Maximum load IRB 6600	the robot weight + 400 kg
Weight carriage	600 kg
stand	270 kg/m
Degree of protection	IP 54
Static play	Contact ABB for information
Dynamic play	Contact ABB for information

1. Repeated stopping in the travel direction, at the same point.

Dimensions

Length measurement

The illustration shows the IRBT 6003S/4003S from the front.

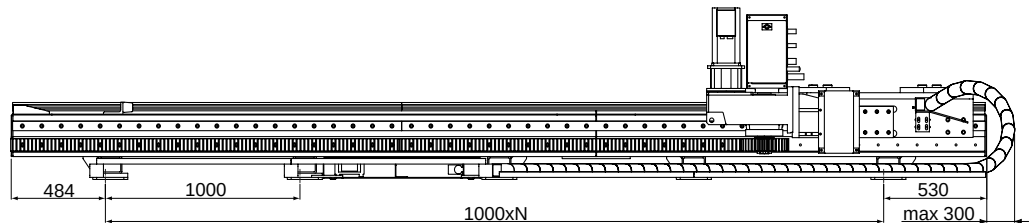


Fig. 3: IRBT 6003S/4003S, length measurement

The table shows the value of N in the figure above with different travel lengths.

Travel length	Total length of the stand	Quantity N
1.7 m	3 m	2
2.7 m	4 m	3
3.7 m	5 m	4
4.7 m	6 m	5
etc.		

Width and height measurements

IRBT 6003/4003S Compact

The illustration shows IRBT 6003S/4003S Compact from the end.

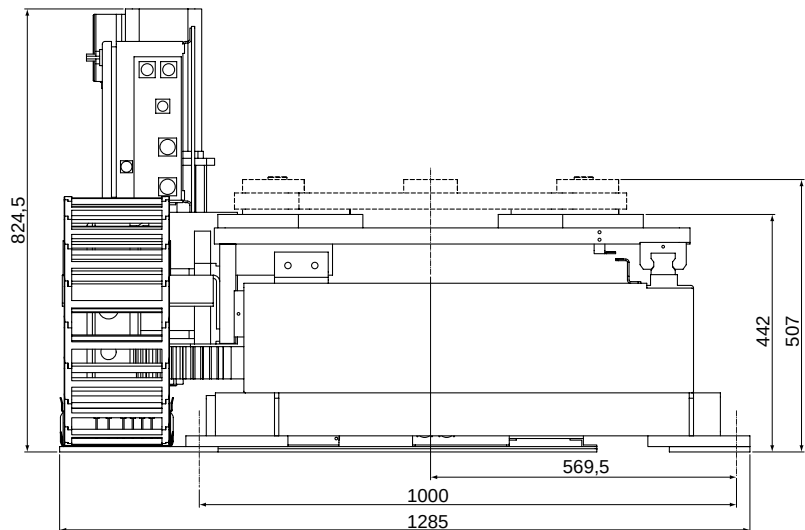


Fig. 4: IRBT 6003S/4003S Compact, width and height measurements

Technical specifications and requirements

Width and height measurements

IRBT 6003/4003S Covered In-line

The illustration shows IRBT 6003S/4003S Covered In-line from the end.

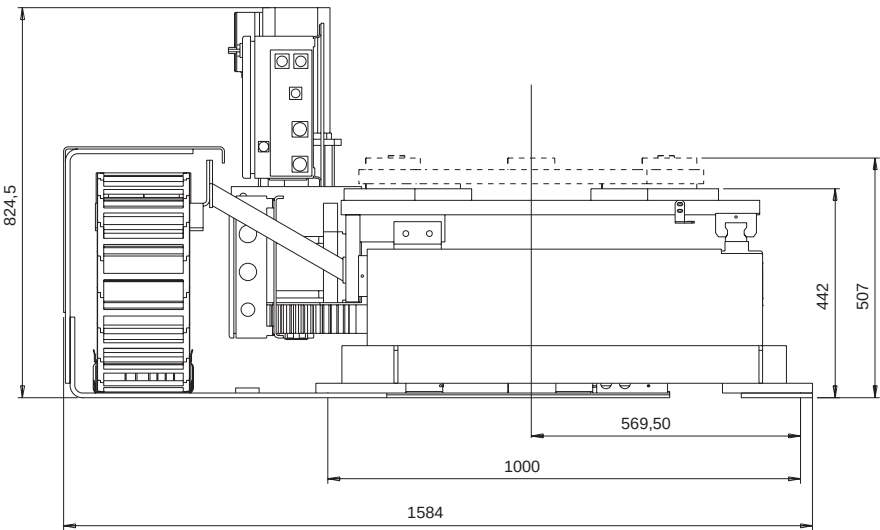


Fig. 5: IRBT 6003S/4003S In-line, width and height measurements

IRBT 6003/4003S Covered 90°

The illustration shows the IRBT 6003S/4003S Covered 90° from the end.

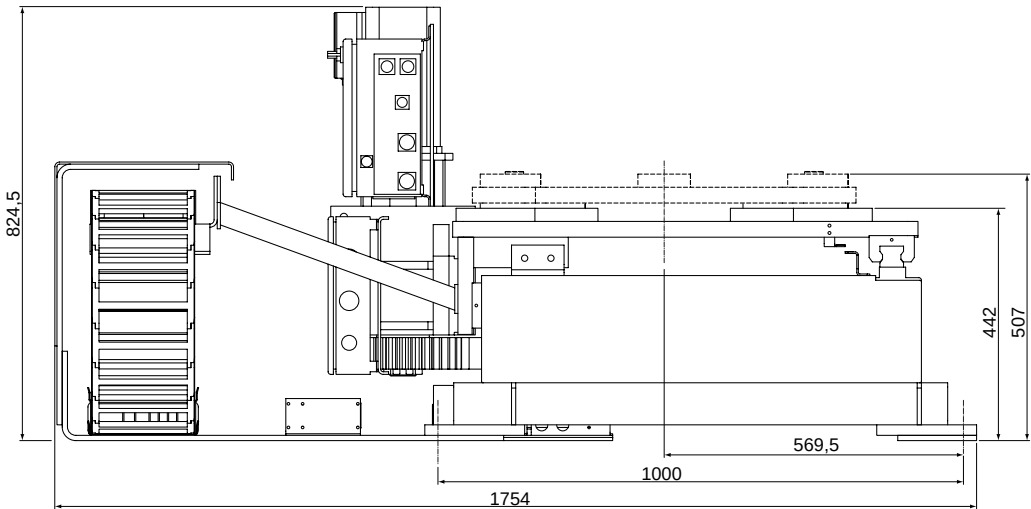


Fig. 6: IRBT 6003S/4003S Covered, width and height measurements

Technical requirements for the robot

On robots of the type IRB 6400R/IRB 6400/IRB 4400/IRB 640 the track motion acts as an integrated seventh axis. In order for it to work satisfactorily the robot's equipment must comply with a number of minimum requirements.

The track motion is designed to work together with the controller of the type S4Cplus, please contact ABB for information about compatibility with other controllers.

Hardware requirements

The robot hardware must be equipped with the following options in order to drive an external axis 7 (Track Motion).

Unit	Option	Notes
IRB 4400/6400/640	392	Drive unit T
IRB 6400R	397	Drive unit U
IRB 6600	383 (7 axes)	Drive unit W
IRB 6600	382 (8 axes)	Drive unit (V) W
Control system S4Cplus	Diskette station	If the operating parameters are to be downloaded directly from the parameter diskette the controller must be equipped with a diskette station. See the robot documentation for other transfer methods.

Technical specifications and requirements

Technical requirements for the robot

Chapter 4: Variants and options

Variants and options for IRBT 6003S/4003S

Connection cable The robot's standard cables can be used to connect the track motion to the controller.

Power cable The power cable to the seventh axis is 7, 15 or 22 metres long, measured from the connection point in the centre of the track motion.

Double carriages When ordering railbound movement of two carriages all options are automatically doubled.



It is important to state on the specification form (order form) whether the robot is mounted inline with the installation or at 90 degrees, in order to get the right cable lengths on the carriage.

Ordering list The tables describe the variants and options that can be order for IRBT 6003S/4003S. Please contact ABB for further specialisations.

Where the last number of the article number is replaced by “x” this defines the travel motion's travel length rounded upwards to the nearest metre. Accordingly, a Track Motion with a travel length of 2.7 metres has the article number 3HxD 1546-3, with a travel length of 3.7 metres the article number will be 3HxD 1546-4, etc.

For cables the last numbers are replaced by “yy” and where the cable length is stated in decimetres.

On length dependent options "zzz" should be replaced with numbers according to the following table:

Length	No.
1,7 m	882
2,7 m	883
3,7 m	884
4,7 m	885
5,7 m	886
6,7 m	887
7,7 m	888
8,7 m	889
9,7 m	890
10,7 m	891

Variants and options

Variants and options for IRBT 6003S/4003S

Variants

Variants	Art. no.
Track Motion IRBT 6003S/4003S	3HXD 1567-x
Cable chain for IRBT 6003S/4003S, Compact	
IRB 6400 M98-M2000/IRB 4400 M98/IRB 640	3HXD 1562-1x
IRB 4400 M99-M2000	3HXD 1562-2x
IRB 6400R M2000	3HXD 1562-3x
IRB 6600 MH	3HXD 1622-5x
IRB 6600 RG	3HXD 1623-5x
Cable chain for IRBT 6003S/4003S, Covered In-line	
IRB 6400 M98-M2000/IRB 4400 M98/IRB 640	3HXD 1563-1x
IRB 4400 M99-M2000	3HXD 1563-2x
IRB 6400R M2000	3HXD 1563-3x
IRB 6600 MH	3HXD 1622-6x
IRB 6600 RG	3HXD 1623-6x
Cable chain for IRBT 6003S/4003S, Covered 90°	
IRB 6400 M98-M2000/IRB 4400 M98/IRB 640	3HXD 1596-1x
IRB 4400 M99-M2000	3HXD 1596-2x
IRB 6400R M2000	3HXD 1596-3x
IRB 6600 MH	3HXD 1622-7x
IRB 6600 RG	3HXD 1623-7x
Carriage, IRB 4400	3HXD 1674-1
Carriage, IRB 6400/IRB 640	3HXD 1674-2
Carriage, IRB 6400R	3HXD 1674-3
Carriage, IRB 6600 MH	3HXD 1621-1
Carriage, IRB 6600 RG	3HXD 1621-3
Axis 7 Power cable floor, IRB 6400R, IRB 6400, IRB 4400, IRB 640	3HXD 1253-yy
Axis 7 Power cable floor, IRB 6600	3HXD 1601-yy

Variants and options

Variants and options for IRBT 6003S/4003S

Options

Options	Art. no.
Extra carriage	
Compact, IRB 6400/IRB 640	506 345-zzz
Compact, IRB 4400 M99-M2000	506 344-zzz
Compact, IRB 6400R M2000	506 346-zzz
Compact, IRB 6600, MH	3HXD 1547-4x
Compact, IRB 6600, RG	3HXD 1547-6x
In-line Covered, IRB 6400/IRB 640	506 348-zzz
In-line Covered, IRB 4400 M99-M2000	506 347-zzz
In-line Covered, IRB 6400R	506 349-zzz
In-line Covered, IRB 6600, MH	3HXD 1548-4x
In-line Covered, IRB 6600, RG	3HXD 1548-6x
Covered 90°, IRB 6400/IRB 640	506 351-zzz
Covered 90°, IRB 4400 M99-M2000	506 350-zzz
Covered 90°, IRB 6400R	506 352-zzz
Covered 90°, IRB 6600, MH	3HXD 1599-4x
Covered 90°, IRB 6600, RG	3HXD 1692-6x
Side cover	
Electric collision guard for two carriages	3HXD 0100-308
Automatic lubrication system, (5 x grease injectors) NOT IRB 6400	3HXD 0100-323
Automatic lubrication system, (5 x grease injectors) NOT IRB 6400, mirrored	3HXD 0100-326
Automatic lubrication system, ONLY IRB 6400	3HXD 0100-321
Central lubrication system with timer, low voltage	3HXD 0100-306
Central lubrication system with timer, high voltage	506 321-880
Central lubrication system with timer, mirrored	3HXD 0100-333
Electric limit switch	3HXD 0100-307
Zone Division Axis 7, 2 zones	3HXD 1549-x
Zone Division Axis 7, 4 zones	3HXD 1550-x
Zone Division Cable floor Axis 7 (7, 15 or 22 m)	3HXD 1382-yy
Zone Division Cable axis 1, IRB 6400/IRB 640	3HXD 1314-yy
Cable Position Switch axis 1, IRB 6400R M2000/IRB 4400 M99-M2000	3HXD 1433-yy
Cable Position Switch axis 1, IRB 6600	3HXD 1638-yy
Cable Position Switch axis 2-3, IRB 6600	3HXD 1691-yy
Customer Cable, IRB 6400R	3HXD 1369-yy
Customer Cable, IRB 6600	
CP/CS CANBUS/DeviceNet.	3HXD 1551-yy
CP/CS INTERBUS	3HXD 1617-yy
CP/CS PROFIBUS	3HXD 1637-yy
CP/CS Parallel	3HXD 1672-yy
RG, CP/CS CANBUS/DeviceNet	3HXD 1603-yy
RG, CP/CS INTERBUS	3HXD 1639-yy
RG, CP/CS PROFIBUS	3HXD 1600-yy
Spot welding media with 25 mm ² power cable	3HXD 1490-x
Spot welding media with 35 mm ² power cable	3HXD 1479-x

Variants and options

Variants and options for IRBT 6003S/4003S

Supplementary pack

There are two types of supplement packs for IRBT 6003S/4003S to further shorten the time for action in the event of downtime. These supplement packs are described in the table below.

Name	Art. no.
Small supplement pack	3HXD 0100-309
4 Ball element	
1 Serial Measurement Card	
1 Battery	
Large supplement pack, IRBT 4003S Covered	506 342-880
Large supplement pack, IRBT 6003S, low voltage	506 343-880
Large supplement pack, IRBT 6003S, high voltage Compact	3HXD 0100-338
Large supplement pack, IRBT 6003S, high voltage Covered	3HXD 0100-339
1 Small supplement pack	
1 Serial Measurement Box	
1 Motor	
Gearbox1	
10 Cable chain links	

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Chapter 1: Unpacking and handling



Read carefully through the safety instructions, before the track motion is unpacked and installed.

Lift

Lifting instructions



Stand modules can be moved using a fork lift truck or an overhead crane.

Only units that are 6 metres or shorter may be lifted. If the units are joined, the joints must be prefitted on delivery.

Lifting the track motion

Proceed as follows to lift the track motion:

	Lifting using a fork lift truck	Lifting using an overhead crane
1	Move the carriage as close to the centre of the travel motion as possible.	
2	Position the forks along the rail module in the lifting zone as according to position (X) in the figure below.	Dismantle the side covers from the track motion if these are prefitted.
3		Wrap two lifting straps around each side of the carriage according to position (Y) in the figure below.

The lifting zone

The illustration shows the zone on the track motion where the forks can be placed.

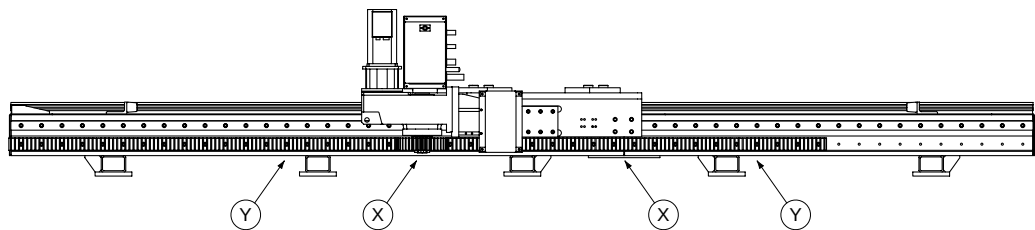


Fig. 1: The lifting zone for a fork lift truck (X) and an overhead crane (Y).

Acceptance inspection

Identification

The identification plates, located by (X), state the carriage type, serial number, delivery date, etc.

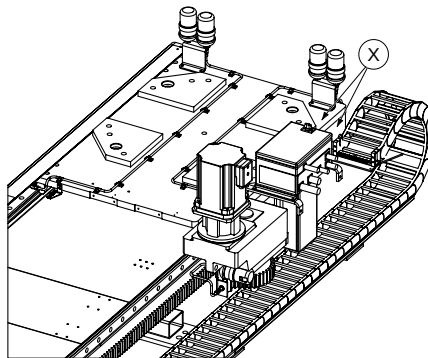


Fig. 2: Identification plates (X)

Contents

As standard the track motion includes the following on delivery:

- One carriage (with possible adaptor) with the drive unit
The carriage weighs approx.: 600 kg. (+ possible adaptor, 160/193 kg)
- Stand modules and cable chain
The track motion with a travel length greater than 4.7 m are designed with several stand modules interconnected during installation.
- Mounting bolts and guide sleeves
Mounting bolts with washers and guide sleeves for the robot.

Inspection

Unpack the equipment and check for any visible transport damage. If this is the case, contact ABB.

Cleaning

Before transport the equipment has been protected against rust by a thin film of oil that has been applied before packing. This film of oil must be wiped off before installation.

- 1 Wipe off any surplus oil using a lintless cloth

Moving the carriage manually

Release the brake from the BRBcase.

The carriage can be moved manually if necessary by connecting the power and releasing the brake.

- 1 Open the cover on the SMB case.
- 2 Press in the brake release button.

Release the brake using 24 V DC.

If there is no voltage to the motor, (24V DC) can be connected to the motor's power cable.

Connections low voltage

The following instruction show how to connect 24V DC to a low voltage motor

- 1 Connect 24V DC to pins M and L on the cable connection MP.M7 (power cable, 3HXD 1249).
- 2 Press in the brake release button.

Connections high voltage

The following instruction show how to connect 24V DC to a high voltage motor

- 1 Connect 24V DC to pins V and W on the cable connection MP.M7/M8 (power cable, 3HXD 1615).
- 2 Press in the brake release button.

Chapter 2: Mechanical installation

Foundation

Robustness

The foundation must withstand the static loads caused by the weight of the equipment and the dynamic loads generated by the movement of the carriage and positioner, see *“Foundation”* on page 2-5.

Incline

The foundation must be designed so that the track motion can be mounted without the incline exceeding 0.5 mm/m in the direction of travel and 0.1 mm/m across this.

Static loads

The table shows the static loads that the foundation must be able to bear.

Load	Value
Distributed load, stand	270 kg/M
Movable, in the direction of travel	
Positioner	2400 kg
Carriage	600 kg
Adaptor, IRB 6400	193 kg
Adaptor, IRB 4400	160 kg
Permitted extra load	
IRB4400	100 kg
IRB 6400R	300 kg
IRB 6600	400 kg

Dynamic loads

The dynamic loads from the movement of the travel motion and positioner can change direction independent of each other. In these instances where loads are added to each other the foundation must be able to bear these combined loads.

The maximum dynamic loads for the track motion are:

$$(\text{Weight, carriage} + \text{Weight, positioner} + \text{Weight extra load}) \times \text{Acceleration}$$

See the robot documentation with regard to dynamic loads for the robot.



The track motion should not be used so that the maximum loads from the robot and conveyor are added to each other. If, for example, the carriage is used at maximum speed in one direction the robot should be at a standstill or move in the opposite direction.

Preparations

Recommendations for mounting Chemical anchor bolts are recommended to secure the track motion to the floor. However, the mounting bolts are not supplied as these must be selected based on the material the foundation is made of.

Mounting bolts Choose mounting bolts so that they:

- Are suitable for the foundation
- Can bear the dynamic loads
- The bolts must be able to bear the combined dynamic loads that can occur when the positioner and carriage move, see [Foundation](#).
- Fit in the holes in the stand, Ø24 mm

Hole configuration The stand's ground plates have holes with a diameter of 24 mm.

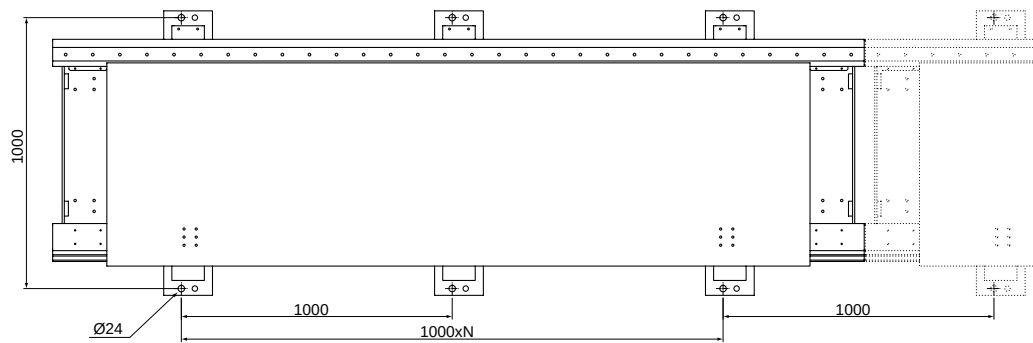


Fig. 3: Hole configuration

The table shows the value of N in the figure above with different travel lengths.

Travel length	Total length of the stand	Quantity N
1.7 m	3 m	2
2.7 m	4 m	3
3.7 m	5 m	4
4.7 m	6 m	5
etc.		

Base dimensions The illustration shows the stand's base seen from the front.

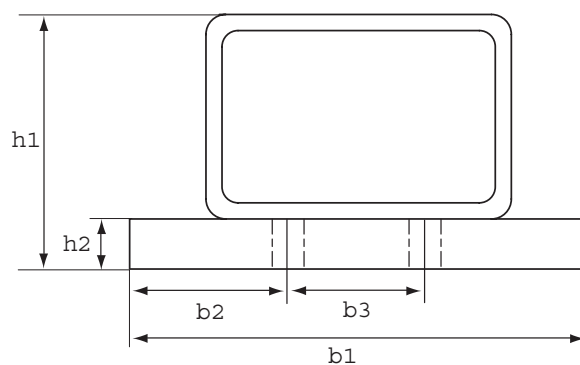


Fig. 4: Base dimensions.

The table below shows the values of h1-2 and h1-3 in the illustration above.

Height measurements	
h1	100 mm
h2	20 mm
Width measurement	
b1	180 mm
b2	65 mm
b3	50 mm

Stand assembly

Procedure

The track motion should be assembled as set out in the procedure below. A detailed description of each stage can be found in further on in the manual.

1	Assemble the stand modules according to <i>"Positioning the stand"</i> on page 2-9.
2	Assemble the linear guides according to <i>"Assemble the linear guides"</i> on page 2-11.
3	Assemble the gear racks according to <i>"Assemble the gear racks"</i> on page 2-18.
4	Anchor the stand to the foundation according to <i>"Securing the stand to the foundation"</i> on page 2-18.
5	Assemble the protective guards and cover plates according to <i>"Assemble the cover plates"</i> on page 2-19.
6	Assemble the cable tray according to <i>"Assembling the cable channel and robot"</i> on page 2-20.



The module's fish bolts are only required on prefitted modules up to six metres that are to be lifted as a single unit. If the track motion consists of more modules, these should not be assembled using fish bolts, see the illustration below.

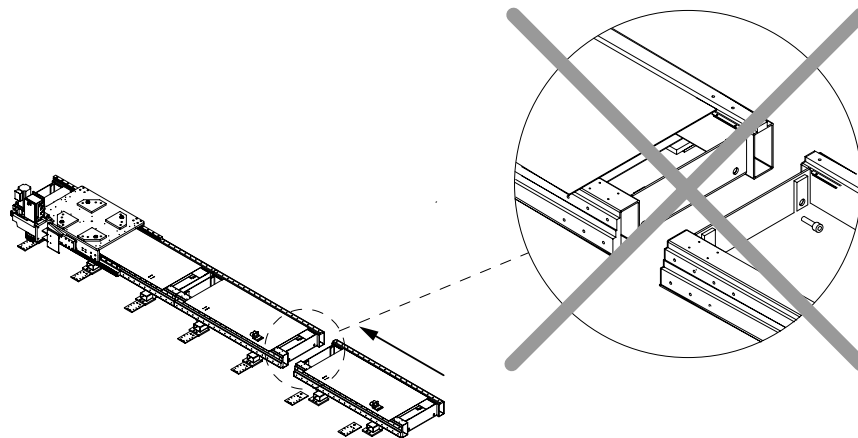
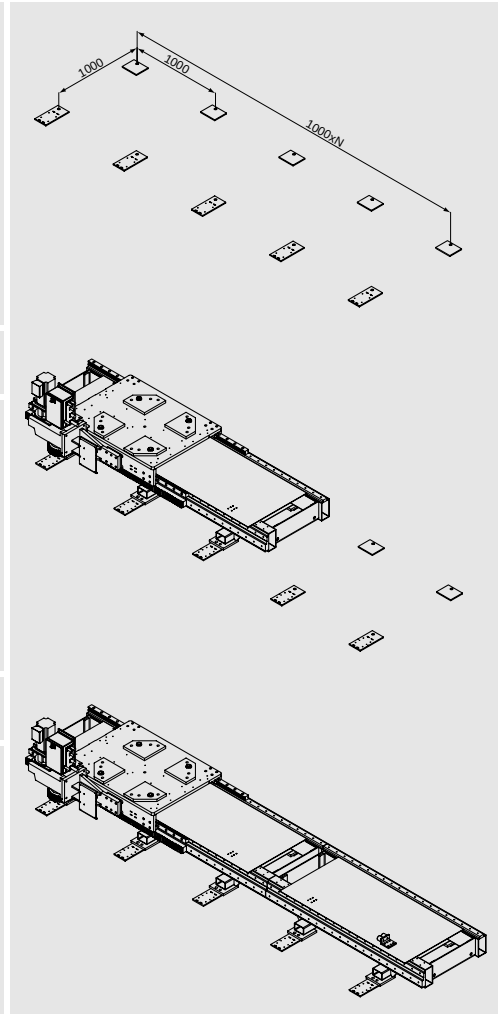


Fig. 5: Assembly without fish bolts.

Positioning the stand

Follow the directions below to position the stand modules:

- 1 Position the levelling plates on one side of the intended installation site.
Position the bottom plates for the cable tray modules on the other side of the installation site.
The spacing between the centres of the plates should be 1000 mm.
- 2 Position the first stand module, with carriage, precisely on the intended installation site.
- 3 Adjust the module according to [“Adjusting the level” on page 2-10](#) so that it is aligned within the given tolerance
If the track motion is to consist of several modules, continue to step 4. Otherwise move to [“Assemble the linear guides” on page 2-11](#).
- 4 Position the next module in the direction of travel adjacent to the newly aligned module.
- 5 Adjust according to [“Adjusting the level” on page 2-10](#) so that the machined surfaces (for linear guide and gear rack) of this and the previous module are flat and level with each other.
If more modules are to be assembled, repeat steps 3 and 4. Otherwise move to [“Assemble the linear guides” on page 2-11](#).



Adjusting the level

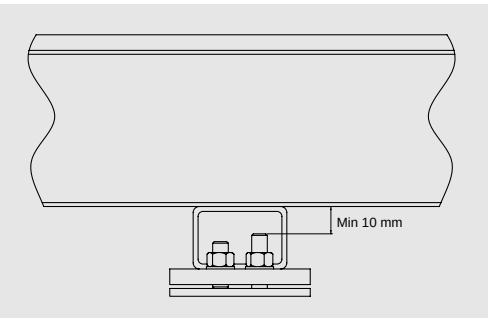


The distance between the levelling bolts and the top edge of the ground plates must be at least 10 mm.

It is recommended to use a laser level in the travel motion's direction of travel and a spirit level across this in order to obtain satisfactory adjustment. Always measure on a machined surface, for example, for the linear guide or gear rack.

Follow the directions below to position the beam units:

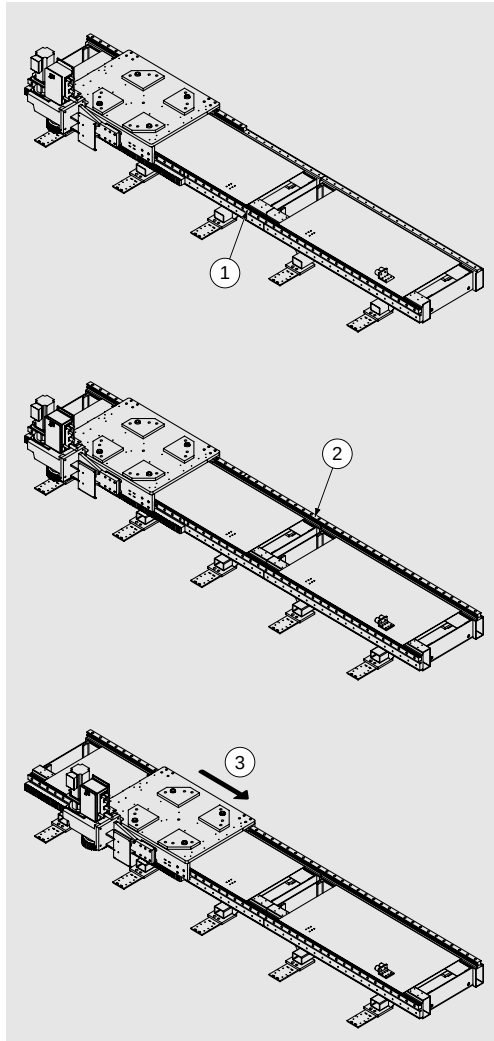
- | | |
|---|---|
| 1 | Screw the levelling bolts in or out to raise or lower the ground plate in question.
The distance between the levelling bolts and the top edge of the ground plates must be at least 10 mm. |
| 2 | Repeat all round until the module is aligned within the given tolerance. |



Assemble the linear guides

Follow the directions below to assemble the linear guide:

- 1 Secure the part of the linear guide to be fitted on the side.
- 2 Position the part that is to be fitted on top, without securing it.
- 3 Push forward the carriage so that the first ball element overlaps half of the joint.
- 4 Push the carriage forwards and successively bolt the linear guides on the top.
Tightening torque: 50Nm.
If more sections are to be assembled, repeat step 1. Otherwise move to ["Assemble the gear racks" on page 2-18.](#)



Geometric levelling of Track Motion

Geometric levelling of track motion may be performed according to three different methods.

Method	Description
Method 1	Levelling the track motion by using a spirit leveller for levelling the carriage horizontally along the complete travel length.
Method 2	Levelling the track motion by using position measurement equipment for levelling the carriage horizontally along the complete travel length.
Method 3	Levelling the track motion by using a laser levelling instrument based on available geometric system layout.



Note that origo is located in the manipulators baseframe zero.

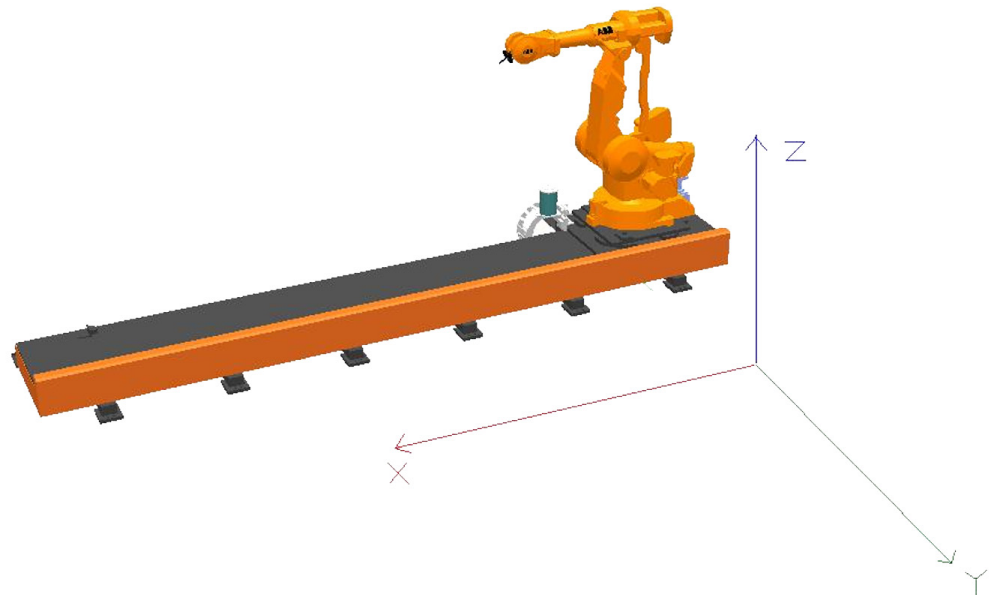


Fig. 6: Geometric levelling of track motion

Method 1

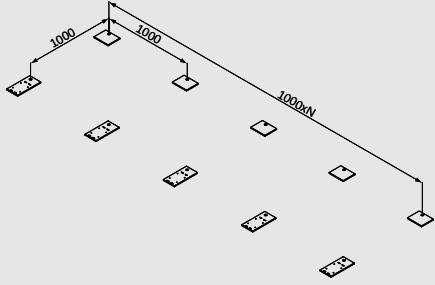


Note that X-direction is the same as the travel direction.

Levelling the track motion by using a spirit leveller for levelling the carriage horizontally along the complete travel length.

	Action	Info/Illustration
1	Place the track motion in the requested position on the levelling plates. (See "Positioning the stand" on page 2-9) - Position the levelling plates on one side of the intended installation site. - Position the bottom plates for the cable tray modules on the other side of the installation site. - The spacing between the centres of the plates should be 1000 mm.	
2	Start the levelling by placing the carriage towards one end of the track.	
3	Use a spirit leveller to adjust the horizontal position in both X- and Y-direction by using the levelling bolts. X-zero is at the synchronization point and then moving along the track.	The accuracy must at least be $\pm 0,5$ mm along the track length and $\pm 0,1$ mm in height between side to side.
4	Move the carriage in steps of 1 m and make this procedure along the whole length of the track motion.	
5	After levelling the complete track motion the attachment bolts need to be tightened.	

Method 2 Levelling the track motion by using position measurement equipment for levelling the carriage horizontally along the complete travel length.

	Action	Info/Illustration
1	Place the track motion in the requested position on the levelling plates. (See <i>"Positioning the stand"</i> on page 2-9) • Position the levelling plates on one side of the intended installation site. • Position the bottom plates for the cable tray modules on the other side of the installation site. • The spacing between the centres of the plates should be 1000 mm.	
2	Place the prisma in one of the fixation holes. See <i>Fig. 7:</i> .	
3	Move the carriage into X-zero.	Nonie scales facing each other.
4	Push the complete track into correct X- and Y-zero position.	
5	Use a spirit leveller to reach the horizontal level (Z-value) by adjusting the levelling bolts.	
6	Fixation hole measuring from robot center.	Same center point for in-line and 90° robot position.



Due to end cover plates and tolerance chain the dimension (793 mm) has a variation of $\pm 8\text{mm}$ when the track is in X-zero.

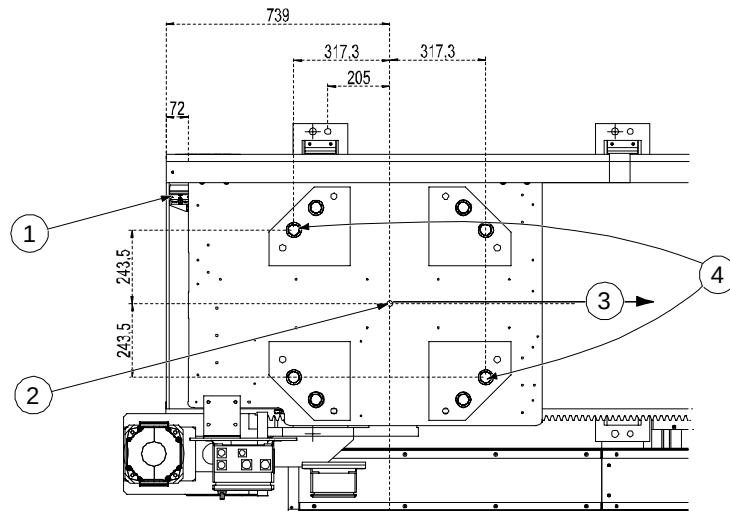


Fig. 7: Layout carriage

Pos	Description	Pos	Description
1	Nonie scale	3	X positive direction
2	Robot center, when the track is in position X-zero.	4	Fixation holes

	Action	Info/Illustration
7	When the start position is reached for X-, Y- and Z-zero: Continue to move the carriage along the track to level it horizontally by using a spirit leveller to adjust the track so that it follows the Y-axis.	The accuracy must at least be $\pm 0,5 \text{ mm}$ along the track length and $\pm 0,1 \text{ mm}$ in height between side to side.
8	After levelling the complete track motion the attachment bolts needs to be tightened.	

Method 3 is based on the available geometric system layout. A laser levelling instrument is needed for the installation.

	Action	Info/Illustration
1	Decide the coordinate system at the installation location for the track motion. Position the track motion on the levelling plates in the simulation given position. See “Mechanical installation” on page 2-5. Use the zero point of the track motion as reference in X-direction. X-direction is growing from the zero point along the track.	<i>Fig. 8:</i> shows the zero point with the nonie scale placed on the opposite side of the cable chain.



Due to end cover plates and tolerance chain the dimension (793 mm) has a variation of $\pm 8\text{mm}$ when the track is in X-zero.

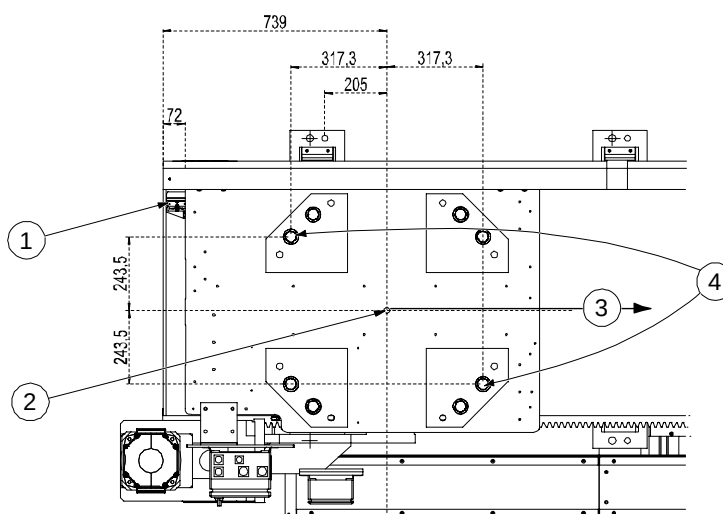


Fig. 8: Layout carriage

Pos	Description	Pos	Description
1	Nonie scale	3	X positive direction
2	Robot center, when the track is in position X-zero.	4	Fixation holes

	Action	Info/Illustration
2	Values taken out of the virtual layout needs to be transferred and implemented to the track by placing the prisma along the track in steps of 1 m to get the X-, Y- and Z-values corresponding to the virtual values.	
3	The prisma should be placed on the edge of the vertically mounted linear guide and on top of the horizontally mounted linear guide, see Fig. 9: .	Begin to level the vertical linear guide.
4	When measuring the vertical linear guide, the prisma should have an angle fixture bracket so that both Y- and Z-values can be adjusted.	
5	When the vertical linear guide is corresponding to the virtual layout it is time to level the horizontal guide with either further measuring or by using a spirit leveller on the robot mounting surface of the carriage.	

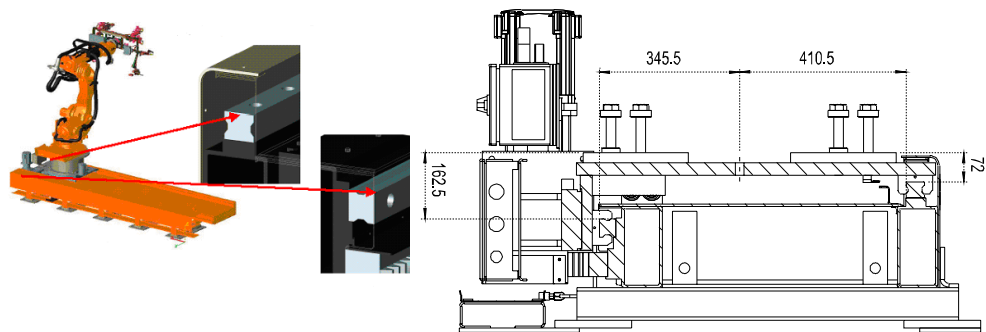
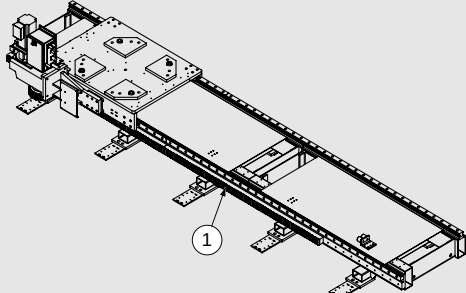


Fig. 9: Placement of the prisma on the linear guides

	Action	Info/Illustration
6	Place the measuring prisma on top of the horizontal linear guide and on the upper edge of the vertical linear guide with an angle fixture bracket. Values from robot center point and robot Z-zero.	With this measuring method the track motion can be installed into ± 0.05 mm accuracy compared to the virtual geometry.

Assemble the gear racks

Follow the directions below to assemble the gear racks:

1	Lay out the section of the gear rack to be assembled against the support edge, and bolt loosely in position.	
2	Check using the supplied teeth-meshing gauge that the joints on the laid gear rack proved a smooth transition. If the teeth on the test piece and the gear rack do not mesh, continue with step 3. Otherwise go directly to step 6.	
3	If the teeth on the test piece and the gear rack do not mesh, loosen the bolts on the prefitted gear racks.	
4	Adjust the transition by using the play on the mountings on the prefitted gear racks.	
5	Secure the prefitted gear racks. <i>Tightening torque: 50Nm.</i>	
6	Secure the assembled gear rack section. <i>Tightening torque: 50Nm.</i> If more sections are to be assembled, repeat step 1. Otherwise move to “Securing the stand to the foundation” on page 2-18.	

Securing the stand to the foundation

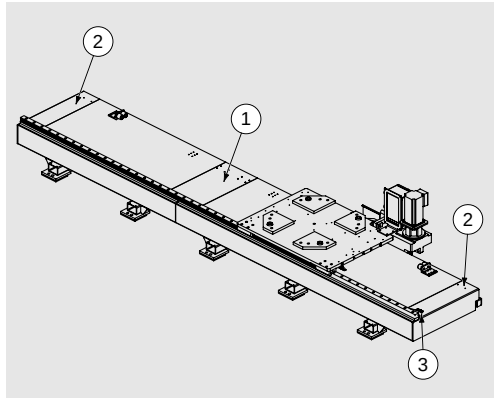
Follow the directions below to secure the track motion to the foundation:

1	Check that none of the levelling bolts on the track's ground plates are hanging in the air or that the distance between the levelling bolts and the top edge of the ground plates is at least 10 mm. Adjust if necessary according to “Adjusting the level” on page 2-10.
2	Move the carriage manually and check using the spirit level along the entire track, both in the direction of travel and across it. The carriage can be moved manually if 24 VDC is connected to the motor, see section . Adjust if necessary according to “Adjusting the level” on page 2-10.
3	Drill holes for the mounting bolts through the ground plates' mounting holes (max. Ø24). The holes vary depending on the chosen mounting method, see “Recommendations for mounting” on page 2-6
4	Secure the track motion to the foundation using an appropriate anchoring method. The anchoring method must be adapted to the foundation and the dynamic loads that the track motion generates, see “Foundation” on page 2-5 and “Recommendations for mounting” on page 2-6.
5	Continue to “Assemble the cover plates” on page 2-19.

Assemble the cover plates

Follow the directions below to assemble the cover plates:

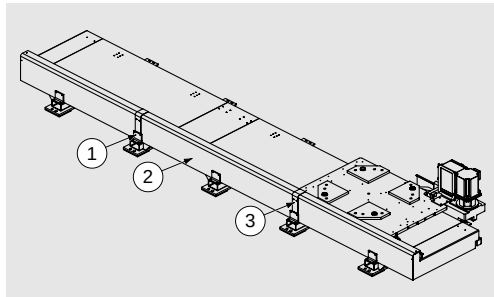
- 1 Assemble cover plates over all joints.
- 2 Assemble the end plates on the travel motion's short ends.
- 3 Assemble the calibration sign according to position 3.



Assemble the side plates

Follow the directions below to assemble the side plates:

- 1 Assemble the angle bracket on the ground plates.
- 2 Assemble the side covers by pushing then down between the beam and angle bracket. Tighten the fixing bolts in angle bracket.
- 3 Apply tape over all joints in the side guard.
- 4 Continue to ["Assemble the cable tray" on page 2-20](#)

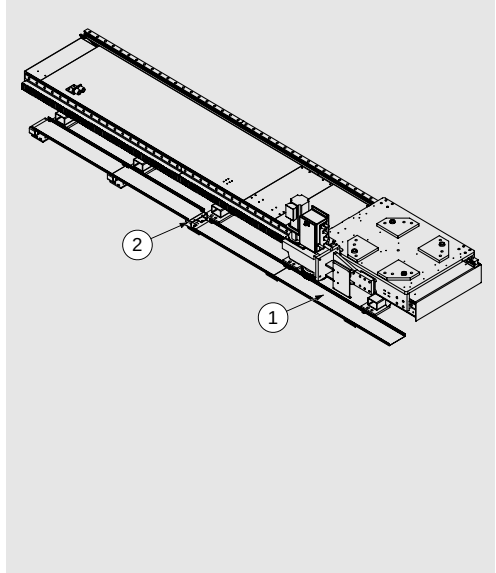


Assembling the cable channel and robot

Assemble the cable tray

Follow the directions below to position the cable tray and levelling plates:

- 1 Bolt the cable tray's guide plates on to the plates.
Knock gently on the side if the position of the holes do not align.
- 2 If the travel length of the completed track motion is 5.7 metres or more a raised support for the cable chain should be placed in the last cable tray.
The raised support should be fitted on the midmost ground plates (with an odd number of ground plates), or one the closest subsequent ground plate in the direction of travel (with an even number).
- 3 Only for IRBT 6003S/4003S Covered:
Assemble the protective plates for the cable tray by first fitting the angle bracket on the cable tray and then fitting the side covers on these.



Assemble the robot

Depending on how the order was made the positioner should be assembled in one of following two positions:

- InLine
Neutral position for axis 1 aligned with the travel motion's direction of travel (1).
- 90°
Neutral position for axis 1 aligned 90° with the travel motion's direction of travel (2)

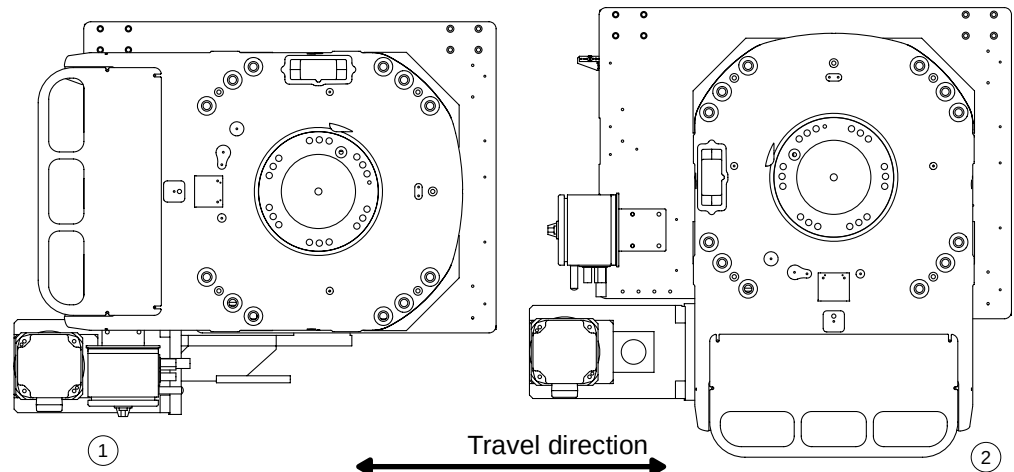


Fig. 10: Positioner assembly positions, InLine (1) and 90° (2).

Chapter 3: Electrical installation

The robot's cable harness

The robot's cable harness is sufficiently long for installation in one of the two possible positions on the carriage. Any surplus should be placed in a coil on the floor, depending on the local conditions.



Make sure that the cable harness cannot come into contact with any moving parts.

Connection point J1

The cable harness that normally connects the controller with the positioner and carriage is connected to the travel motion's connection point, J1.

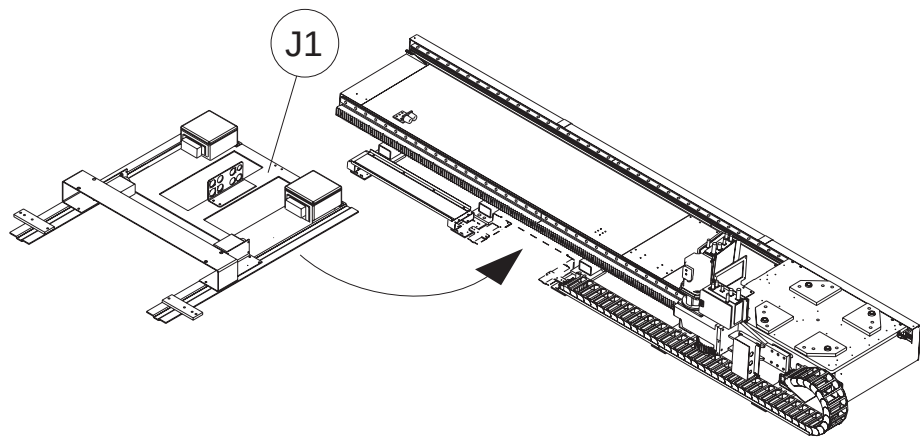


Fig. 11: Connection point J1

Terminations on J1

The following terminations can be found on the travel motion's connection point, J1:

- Axis 7 Power Cable
A Harting connector for the track motion's power supply.
- Power Cable axis 1–6
A Harting connector for the Positioner's power supply.
- Signal Cable
A Burndy connector for the Positioner's control signals.
- Customer Cable
Terminal post for connection of option cables.
- Signal cable axis 7
Burndy connector for the track motion's signals.

Terminations/Wiring diagram

Introduction

The wiring diagram below describes the connections between the controller, positioner and Track Motion.

The position numbers in the table refer to the positions in the illustration above. Cables marked with (R) in the illustration are supplied with the robot.

Where the last numbers of the article number are replaced by “yy” in the table, the cable length should be stated in decimetres (-70 for 7 metres, -150 for 15 metres and -220 for 22 metres)



The abbreviations **RG** and **MH** in the following sections stand for: **Robot Gun (RG)** and **Material Handling (MH)**.

IRB 6600 M2000 Robot Cabinet

Wiring diagram

.MH, external axle cabinet for low voltage conveyer.

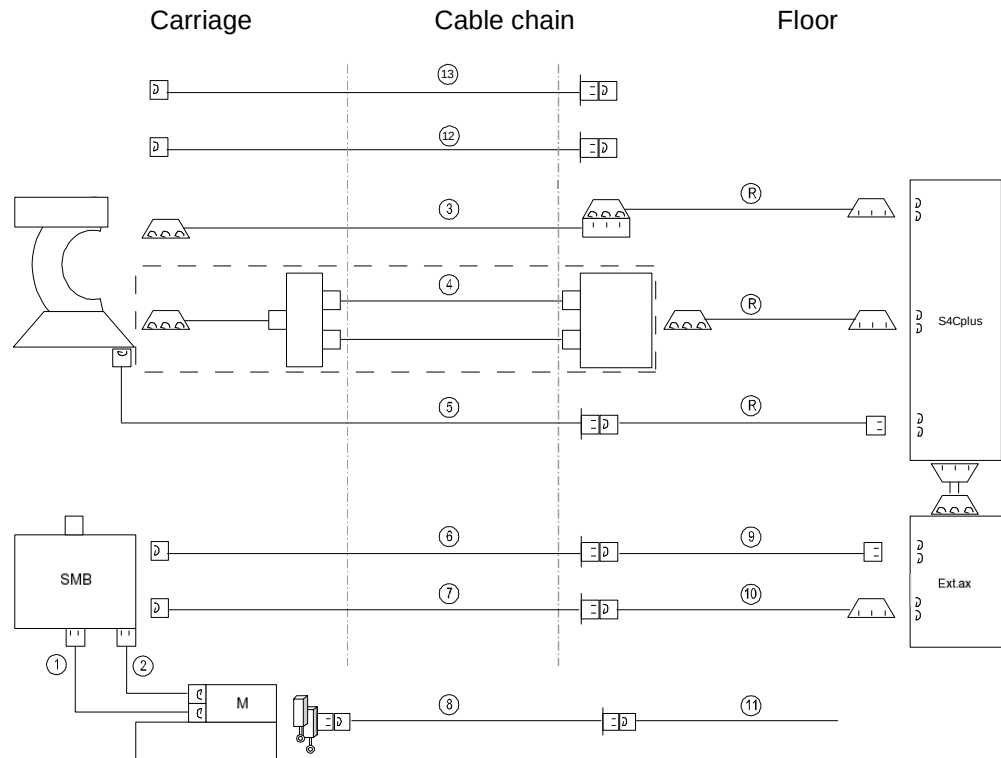


Fig. 12: Wiring diagram IRB 6600, M2000 Low voltage.

Standard cables

Standard cables	Art no	Item
Power Cable axis 1–6	3HXD 1519-xx	4
Serial measurement cable axis 1-6	3HXD 1455-yy	5
Serial measurement cable axis 7	3HXD 1443-yy	6
Serial measurement cable floor axis 7	3HXD 1432-yy	9
Power Cable axis 7	3HXD 1252-yy	7
Power Cable floor axis 7	3HXD 1253-yy	10
Motor cable axis 7 (1,5 m)	3HXD 1249-15	1
Resolver cable (1,5 m)	3HXD 1250-15	2

Optional cables

Optional cables	Art. no.	Item
Zone divided cable	3HXD 1381-yy	8
Zone divided cable floor	3HXD 1382-yy	11
Robot customer cable		
CANBUS/DeviceNet	3HXD 1551-yy	3
INTERBUS	3HXD 1617-yy	3
PROFIBUS	3HXD 1637-yy	3
Parallel	3HXD 1672-yy	3
Position switch cable axis 1	3HXD 1638-yy	12
Position switch cable axis 2-3	3HXD 1691-yy	13

IRB 6600 M2000, Robot Cabinet

Wiring diagram

MH, DDU W (ATRP Option 383, 7 axes)

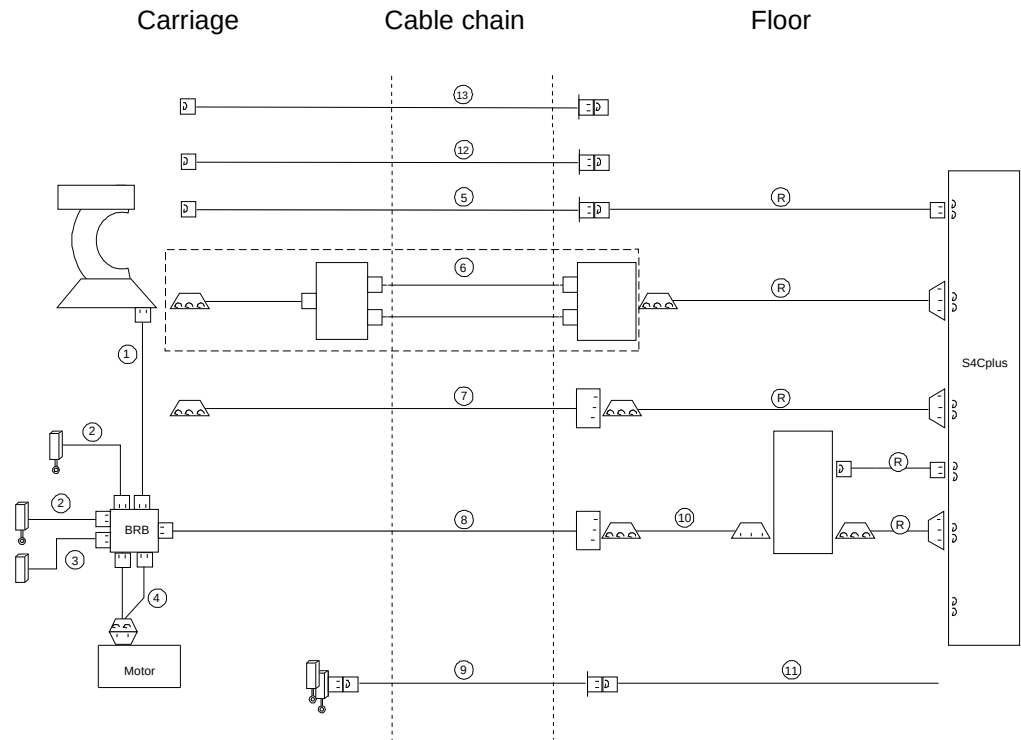


Fig. 13: Wiring diagram, IRB 6600 M2000, MH, DDU W.

Standard cables

Standard cables	Art no	Item
Resolver Cable axis 7	3HXD 1640-yy	1
Serial measurement cable axis 1-7	3HXD 1455-yy	5
Power Cable axis 1-6	3HXD 1519-xx	6
Power/Signal cable axis 7	3HXD 1615-yy	4
Power Cable axis 7	3HXD 1602-yy	8
Power Cable floor axis 7	3HXD 1601-yy	10

Optional cables

Optional cables	Art. no.	Item
Zone dividing cable	3HXD 1381-yy	9
Zone dividing cable floor	3HXD 1382-yy	11
Limit switch	3HXD 1568-1	2
Cable, central greasing	3HXD 1628-yy	3
Robot customer cable		
CANBUS/DeviceNet	3HXD 1551-yy	7
INTERBUS	3HXD 1617-yy	7
PROFIBUS	3HXD 1637-yy	7
Parallel	3HXD 1672-yy	7
Position switch cable axis 1	3HXD 1638-yy	12
Position switch cable axis 2-3	3HXD 1691-yy	13

IRB 6600 M2000, Robot Cabinet

Wiring diagram

SG, DDU VW (ATRP Option 705, 382, 8 axes)

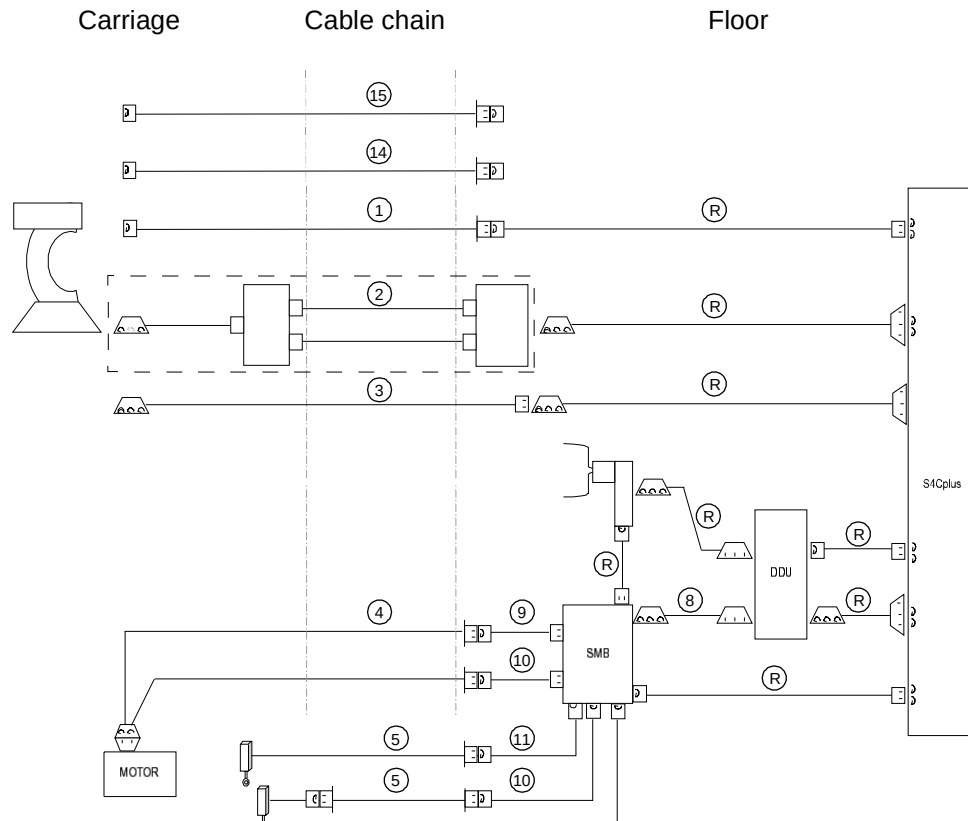


Fig. 14: Wiring diagram, IRB 6600 M2000, SG, DDU VW

Standard cables

Standard cables	Art no	Item
Power Cable axis 1–6	3HXD 1519-xx	2
Serial measurement cable axis 1-6	3HXD 1455-yy	1
Power Cable floor axis 8	3HXD 1601-yy	8
Power Cable floor axis 8	3HXD 1634-yy	9
Resolver/power cable axis 8	3HXD 1635-yy	4
Resolver cable axis 8	3HXD 1640-yy	10
Signal cable	3HXD 1651-yy	6
Signal cable floor	3HXD 1650-yy	12

Optional cables

Optional cables	Art. no.	Item
Limit switch cable	3HXD 1642-yy	5
Limit switch cable floor	3HXD 1636-yy	11
Zone dividing cable	3HXD 1381-yy	7
Zone dividing cable floor	3HXD 1382-yy	13
Robot customer cable		
CANBUS/DeviceNet	3HXD 1551-yy	3
INTERBUS	3HXD 1617-yy	3
PROFIBUS	3HXD 1637-yy	3
Parallel	3HXD 1672-yy	3
Position switch cable axis 1	3HXD 1638-yy	14
Position switch cable axis 2-3	3HXD 1691-yy	15

IRB 6600 M2000, Robot Cabinet

Wiring diagram

RG, DDU VW ATRP Option 706, 382 (8 axes)

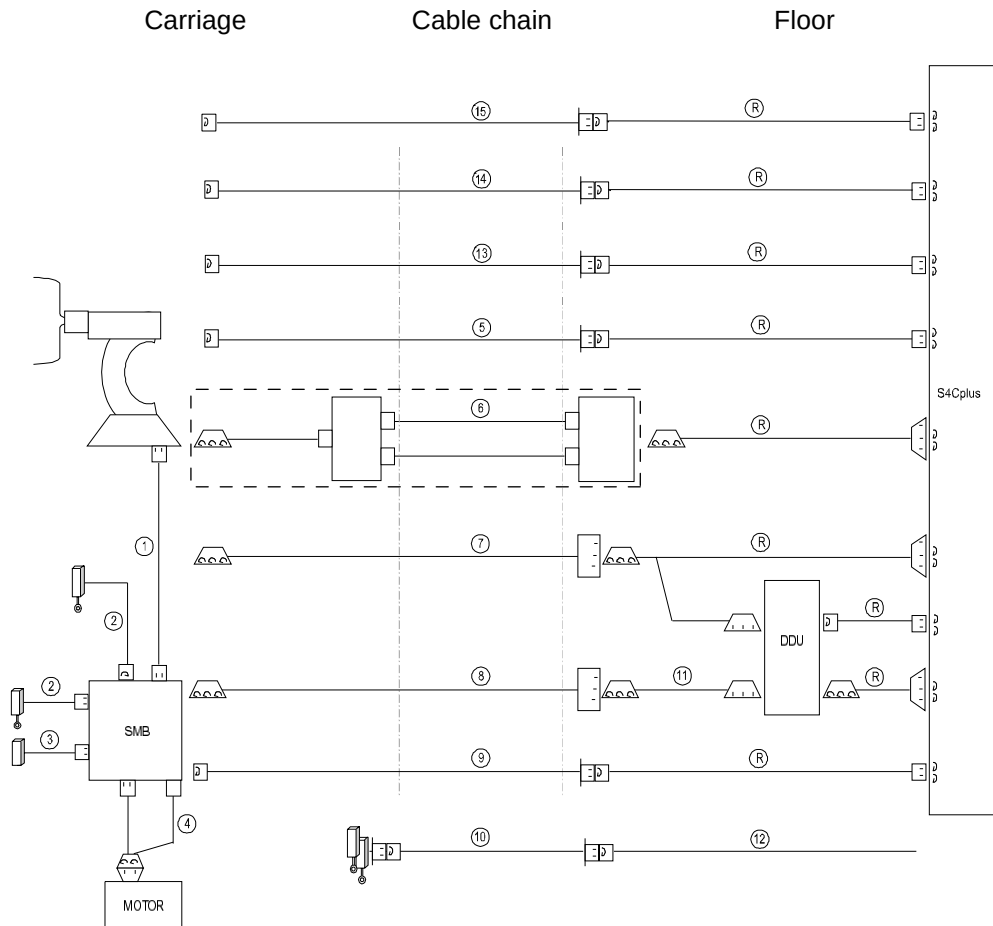


Fig. 15: Wiring diagram, IRB 6600 M2000, RG, DDU VW

Standard cables

Standard cables	Art no	Item
Power Cable axis 1–6	3HXD 1519-xx	6
Serial measurement Cable axis 1-6	3HXD 1455-yy	5
Power Cable floor axis 8	3HXD 1601-yy	11
Power Cable axis 8	3HXD 1602-yy	8
Serial measurement cable axis 7-8	3HXD 1455-yy	9
Resolver/power Cable axis 8	3HXD 1615-yy	4
Resolver Cable axis 7	3HXD 1643-yy	1

Optional cables

Optional cables	Art no	Item
Zone dividing cable axis 8	3HXD 1381-yy	10
Zone dividing cable floor axis 8	3HXD 1382-yy	12
Robot customer cable, power cable axis 7		
CANBUS/DeviceNet	3HXD 1603-yy	7
INTERBUS	3HXD 1639-yy	7
PROFIBUS	3HXD 1600-yy	7
Limit switch	3HXD 1568-1	2
Cable, central greasing	3HXD 1628-yy	3
Position switch cable axis 1	3HXD 1638-yy	13
Position switch cable axis 2-3	3HXD 1691-yy	14
Power cable, welding 35mm ²	3HXD 1474-yy	15

IRB 6400R M2000

Wiring diagram

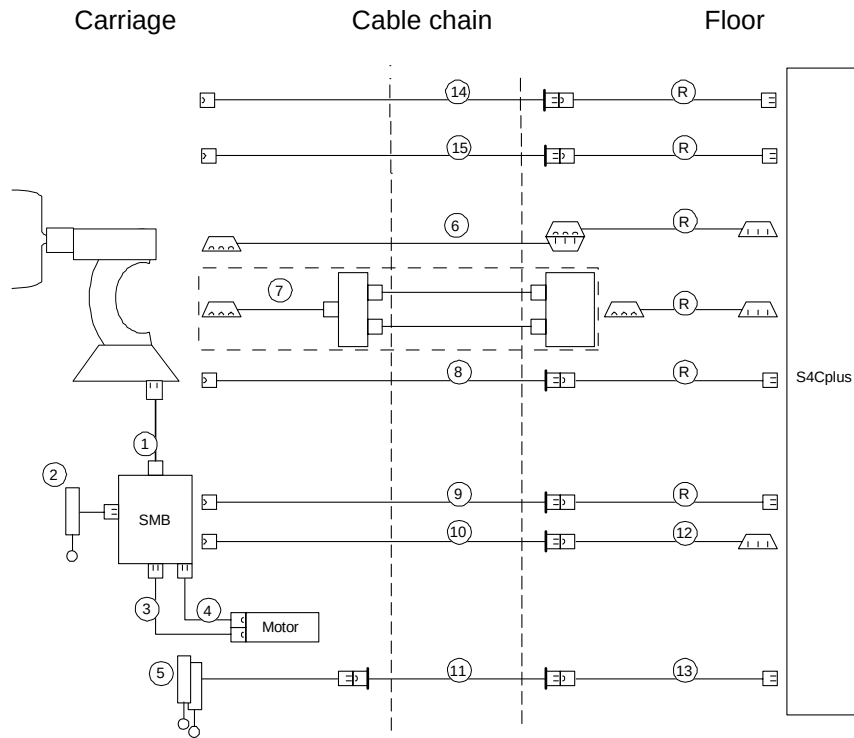


Fig. 16: Wiring diagram, IRB 6400R M2000.

Standard cables

Standard cables	Art no	Item
Signal Cable axis 1-7	3HXD 1443-yy	9
Serial measurement Cable axis 1-7I	3HXD 1432-yy	1
Power Cable axis 1-6	3HXD 1439-yy	7
Power Cable golv axis 7	3HXD 1253-yy	12
Power Cable axis 7	3HXD 1252-yy	10
Motor Cable axis 7 (1,5 m)	3HXD 1249-15	3
Resolver Cable axis 7 (1,5 m)	3HXD 1250-15	4

Optional cables

Optional cables	Art no	Item
Electrical Limit Switch (incl. cable)	3HXD 1568-1	2
Zone dividing cable floor axis 7	3HXD 1382-yy	13
Zone dividing cable axis 7	3HXD 1381-yy	11
Zone breaker axis 7 (incl. cable)	3HXD 0100-320	5
Position switch cable axis 1	3HXD 1433-yy	8
Customer Cable	3HXD 1369-yy	6
Power cable, welding 25mm ²	3HXD 1465-yy	14
Power cable, welding 35mm ²	3HXD 1474-yy	15

IRB 6400R M98A/IRB 4400 M99-M2000/IRB 6400

Wiring diagram

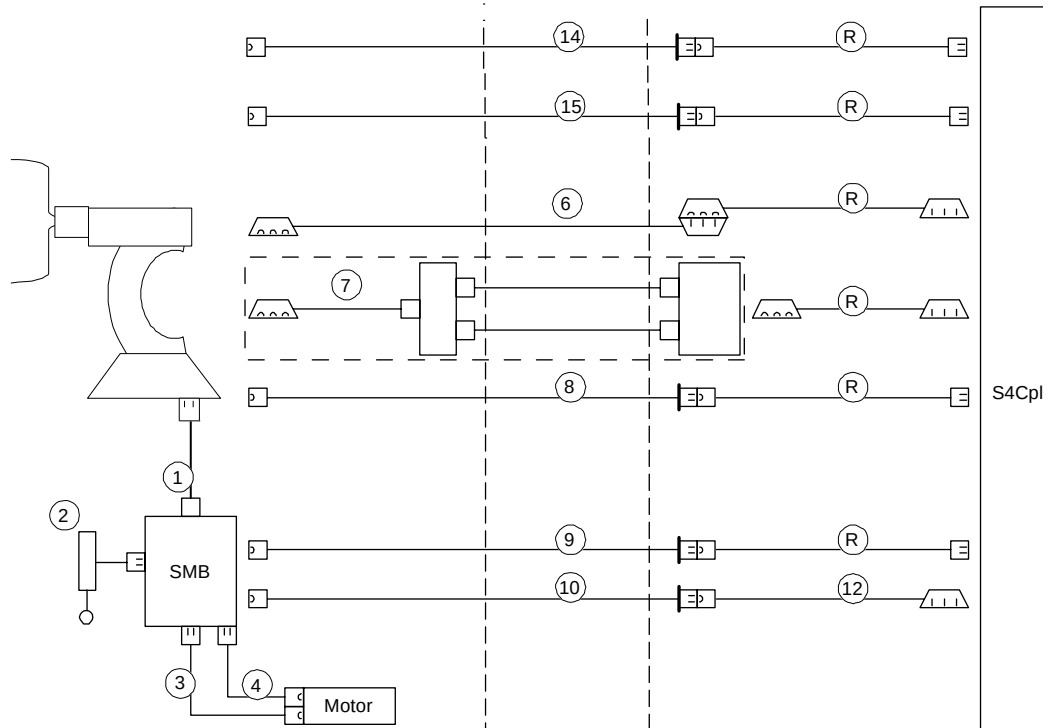


Fig. 17: Wiring diagram, IRB 6400 M98A/IRB 4400 M99-M2000

Standard cables
IRB 6400 M98/
IRB 640

Standard Cables	Art no	Item
Signal Cable axis 1-7	3HXD 1410-yy	9
Serial measurement Cable axis 1-7I	3HXD 1251-yy	1
Power Cable axis 1-6	3HXD 1295-yy	7
Power Cable go/v axis 7	3HXD 1253-yy	12
Power Cable axis 7	3HXD 1252-yy	10
Motor Cable axis 7 (1,5 m)	3HXD 1249-15	3
Resolver Cable axis 7 (1,5 m)	3HXD 1250-15	4

Electrical installation

IRB 6400R M98A/IRB 4400 M99-M2000/IRB 6400

Optional cables IRB 6400 M98/ IRB 640

Optional cables	Art no	Item
Electric limit switch (incl. cable)	3HXD 1568-1	2
Zone Divide Cable floor axis 7	3HXD 1382-yy	13
Zone Divide Cable axis 7	3HXD 1381-yy	11
Zone switch axis 7 (incl. cable)	3HXD 0100-320	5
Position switch axis 1	3HXD 1314-yy	8
Customer Cable	3HXD 1296-yy	6

Standard cables IRB 4400 M99– M2000

Standard cables	Art no	Item
Serial measurement Cable axis1-7	3HXD 1443-yy	9
Serial measurement Cable axis 1-6	3HXD 1432-yy	1
Power Cable axis 1–6	3HXD 1295-yy	7
Power Cable golv axis 7	3HXD 1253-yy	12
Power Cable axis 7	3HXD 1252-yy	10
Motor Cable axis 7 (1,5 m)	3HXD 1249-15	3
Resolver Cable (1,5 m)	3HXD 1250-15	4

Optional cables IRB 4400 M99– M2000

Optional cables	Art no	Item
Electric limit switch (incl. cable)	3HXD 1568-1	2
Zone Divide Cable floor axis 7	3HXD 1382-yy	13
Zone Divide Cable axis 7	3HXD 1381-yy	11
Zone switch axis 7 (incl. cable)	3HXD 0100-320	5
Position switch axis 1	3HXD 1433-yy	8
Customer Cable	3HXD 1296-yy	6

Chapter 4: Commissioning

Preparations

Before the track motion is commissioned the system must be prepared. The following steps should be carried out before starting the track motion.

1. Configure the controller	Load the operating parameters and configure the controller according to “Load the operating parameters” on page 2-35 .
2. Activate the lubrication system	Activate the automatic lubrication system according to “Activating the automatic lubrication system” on page 2-36 .
3. Calibrate	Calibrate the track motion according to “Calibration” on page 2-39

Configuration of the controller

Load the operating parameters

The track motion must be defined in the system before starting with the operating parameters, which can be found on the supplied diskette.

A description of how to load parameters from diskette to the controller can be found in the robot documentation.

Proceed as follows to load the operating parameters:

1	Select the file: Add New Parameters
2	Load the files T6003S.cfg and T4003S.cfg

Commutation offset

The IRBT commutation offset is a fixed value that is read at the factory. All IRBT 6003S/4003S track motion units have the same offset value and this does not need to be changed.

Travel length

The different travel lengths' working areas are defined based on the calibration mark. The travel length is set to maximum in the parameter file for the ordered travel length.

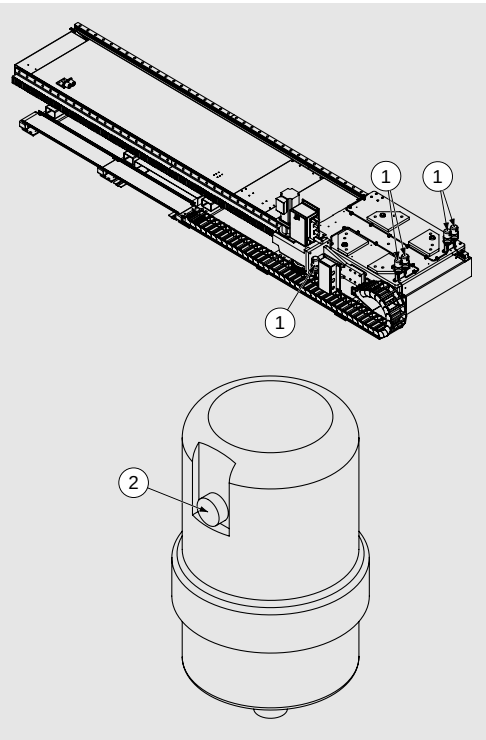
Activating the automatic lubrication system

If the track motion is equipped with an automatic lubrication system this needs to be activated. These may be of different types, automatic lubrication system with grease injectors or central lubrication system with a timer. These are activated in different ways.

Activate the grease injectors

The grease injectors in the automatic lubrication system are not activated on delivery. When the grease injectors are activated, they will continuously and fully automatically apply the correct amount of grease for three months.

Activate the grease injectors as follows:

1	Localise the grease injectors (5 units).	
2	Press in the activation pin fully on each grease injector.	
3	Listen so you hear the injector's grease motor start (it takes about 10 seconds after the pin has been pressed in).	

Set the timer for the central lubrication system

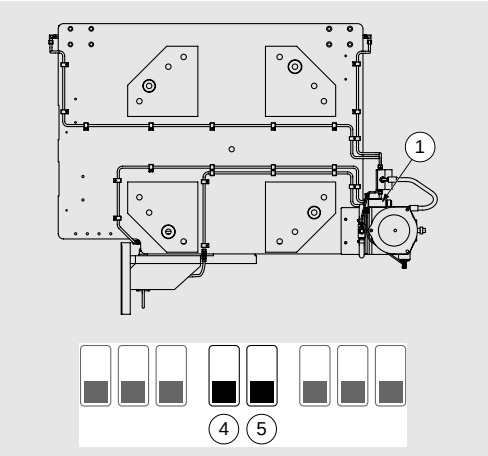
On delivery the timer on the central lubrication system is set to lubricate in cyclic intervals of 0.5-10 s and with an equivalent waiting time between lubrication periods. This setting may need to be changed if too much lubricant is pumped out or if lubrication is unsatisfactory.

Set the timer as follows:

- 1

Localise the central lubrication system. The control panel is located behind the small hatch on the lubrication system by pos. 1.
- 2

Set the function using the dipswitches 4 and 5 as set out in the table below.



Function	Dipswitch
Cyclic lubrication interval: The lubrication valve opens for t_{on} (see step 3) to then close for t_{off} and open again for t_{on} , etc.	
Inverted cyclic lubrication interval: The same as above but with the difference that the cycle starts with the valve closed, i.e. $t_{off} - t_{on} - t_{off}$, etc.	
Switch-on impulse: When the power is switched on the lubrication valve opens for t_{on} to then close as long as the power is on.	
Switch-on delay: When the power is switched on a delay is activated for t_{off} before the lubrication valve opens to then remain open as long as the power is switched on.	

- 3

Set the interval for t_{on} using the dipswitches 1-3 and the interval for t_{off} using the dipswitches 6-8 as set out in the table below.

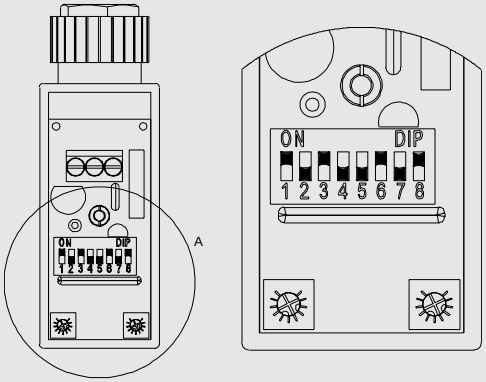
Commissioning

Activating the automatic lubrication system

Time interval	Dipswitch	Time interval	Dipswitch
0.5 s – 10 s		1.5 min. - 30 min.	
1.5 s – 30 s		5.0 min. - 100 min.	
5.0 s – 100 s		12.0 min. - 240 min.	
0.5 min. - 10 min.		0.5 h – 10 h	

- 4 Set the time using the potentiometer.
The scale on the potentiometer is proportional to the interval setting. For example, the value 8 on the potentiometer changes from 8 seconds to 8 hours if the interval setting is changed from 0.5-10 s to 0.5-10 h.

- 5 Recommended by ABB.



Calibration

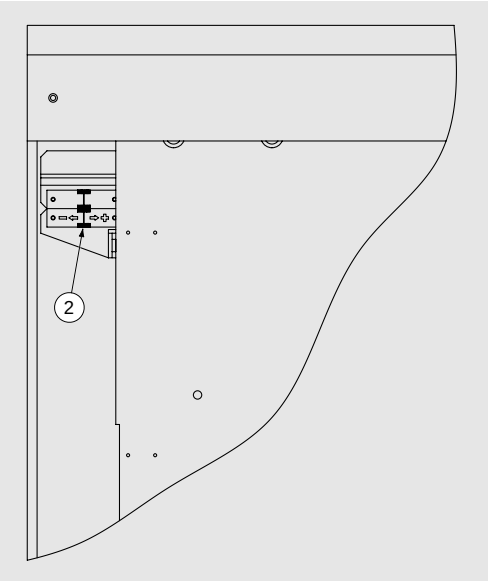


Make sure no persons are on the track motion when the carriage moves. Also make sure that the travel motion's cover plates are free from loose objects, otherwise these can become trapped between the carriage and the plates.

Calibrate the track motion

Before the robot system can be used the resolvers need to be calibrated.
Perform calibrations according to the instruction below.

- | | |
|---|--|
| 1 | Calibrate according to the instructions in the robot documentation. |
| 2 | Check that the carriage stops exactly on the calibration mark. |
| 3 | Save the system parameters according to the instructions in the robot documentation. |



Calibration with a restart

A robot system that uses a serial measurement system does not need to be calibrated before a restart, as the robot system automatically monitors the position of the robot in the working area.



The track motion does not need to be calibrated with a restart. The resolvers only need to be calibrated when commissioning the system.



The travel motion's working area must be inspected before the system is commissioned.

Check the working area

Run the system manually using the joystick and check that:

- It can be run in both directions
- Both end positions are reached

Check for abnormal wear and noise

In the event of abnormal noise when the track motion is commissioned this may be due to incorrect assembly of the linear guides or gear racks or the gear play's meshing pressure needs to be adjusted.

Linear guide joints

Check and adjust the linear guides joints if necessary according to [“Assemble the linear guides”](#) on page 2-11.

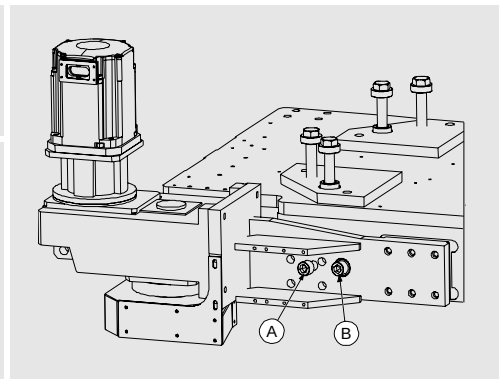
Gear rack joints

Check and adjust the gear racks joints if necessary according to [“Assemble the gear racks”](#) on page 2-18.

Gear play

Gear play is adjusted by two adjuster screws on the motor mounting that are adjusted as follows:

- 1 Press the motor mounting outwards by turning screw A.
Pull the motor mounting inwards by turning bolt B.
- 2 Check the play using a dial indicator by pushing the carriage back and forth.
Permitted play:
static: $\pm 0,2$ mm
dynamic (Contact ABB for info.)



Commissioning

Check for abnormal wear and noise

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Chapter 1: Maintenance intervals

Routine checks and preventive maintenance

Maintenance chart

The track motion is designed to need a minimum of maintenance. However, routine checks and preventive maintenance always need to be carried out at regular intervals.

The maintenance chart describes the routine maintenance and routine checks in chronological order.

Interval	Part	Maintenance	More info.
Every 250 km (150 miles)	Ball element	Lubricate	page 3-3
Each month	Automatic lubrication system	Check the level	page 3-3
	Electrical operation	Check all electrical operations	page 3-6
	Cables and connectors	Check visible cables	page 3-6
	Cable chain	Check the visible cable chain	page 3-6
	Junction boxes	Check	page 3-6
	Drive motor	Check	page 3-6
Every other month	Gear racks	Clean and lubricate (if there is no automatic lubrication system)	page 3-4
Every third month	Linear guides	Clean if necessary.	page 3-4
	Automatic lubrication system	Replace the grease injector	page 3-4
	Ball element	Check tightening torque	page 3-5
Every 5000 operating hours	Gearbox	Change the oil	page 3-5
Every 5 years	Backup battery	Change the battery with signs of discharge	page 3-7

Maintenance intervals

Routine checks and preventive maintenance

Chapter 2: Maintenance instructions

Mechanical maintenance

Lubrication of the ball element and rack

If there is no automatic lubrication system on the track motion the ball element must be lubricated manually.

Lubricate the ball element until the grease is forced out of the end seals, approx.: 4.7 cm³ (1.85 in³).

Use ball element grease as set out in NLGI 2, for example:

Manufacturer	Lubricant
OPTIMOL	Longtime PD2
Shell	Alvania WR2

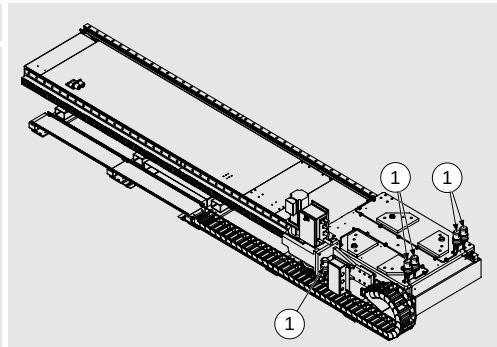
Inspection of the lubrication system

If the track motion is equipped with an automatic lubrication system the level of the lubricant should be checked once a month, even if the system should apply the lubricant equally over a longer period. The lubrication system can be of two different types, with grease injectors or central with a timer.

Checking the grease injectors

Check the lubricant level in the grease injectors as follows:

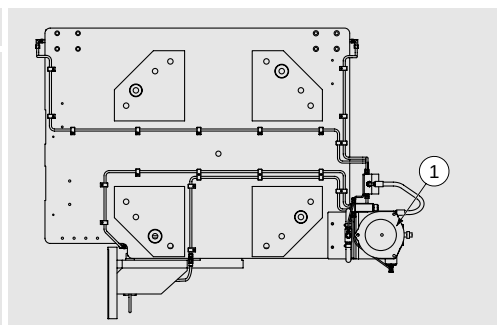
- 1 Localise the lubrication system.
- 2 Read the lubricant level on the transparent scale. If the lubricant has been used, fill according to *"Replacing the grease injector"* on page 3-4.



Inspection of the central lubrication system

Check the lubricant level in the central system as follows:

- 1 Localise the lubrication system.
- 2 Check the level in the transparent lubricant tank. If the lubricant has been used, fill according to *"Filling the central lubrication system"* on page 3-5.



Maintenance instructions

Mechanical maintenance

Cleaning and lubrication of the gear racks

Clean the gear racks every other month.

If there is no automatic lubrication system on the track motion the gear racks must be lubricated manually using one of the following lubricants:

Manufacturer	Lubricant
OPTIMOL	VISCOGEN 4
BP	MOG
Statoil	ESL10
Mobiloil	Mobiltac 81
Texaco	Texclade

Lubrication in extremely dirty environments

A special dust and dirt-repelling lubricant is recommended if there is a risk of welding sparks or other airborne particle becoming attached to the lubricated gear rack:

Manufacturer	Lubricant
OPTIMOL	VISCOGEN EPL

Cleaning the linear guides

Inspect and clean the linear guides if necessary.

Refilling the lubricant

If the track motion is equipped with an automatic lubrication system, the system must be refilled every third month or when the lubricant has been used up.

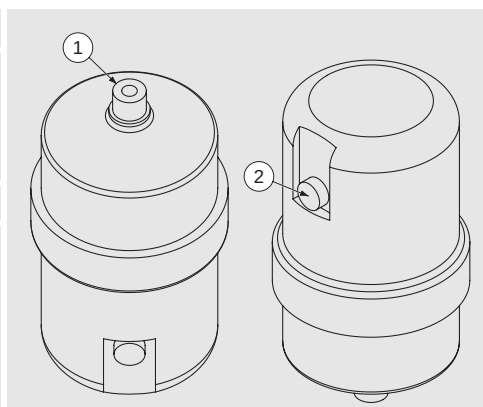
Replacing the grease injector

When the lubricant in the electromechanical grease injectors has been used up the entire grease injector should be replaced as follows:

Only use grease injectors with 3 months supply or shorter.



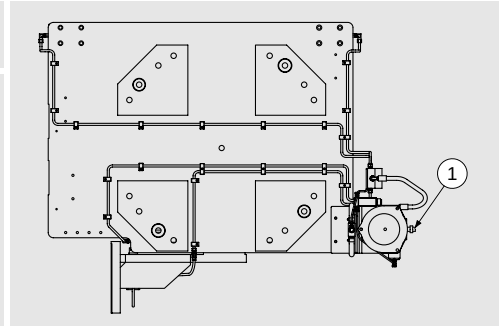
- 1 Remove the empty grease injector.
- 2 Remove the protective cover on the new grease injector, see pos.1.
Only use grease injectors with 3 months supply or shorter.
- 3 Press in the activation pin fully, see pos.2.
- 4 Assemble the new grease injector.



Filling the central lubrication system

When the lubricant in the central lubrication system has run out, new lubricant should be added as follows:

- 1 Connect the supplied filling nipple at position 1.
- 2 Fill with lubricant as set out in the specification below.



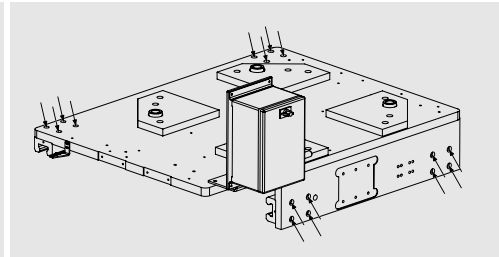
- The tank holds 2.71 kg (6 Lb Cyl)

Use ball element grease as set out in NLGI 1, for example:

Manufacturer	Lubricant
Q8	Q8 Rembrandt EP1

Check ball element tightening torque

- 1 Tighten the screws (16 pcs.) with 70 Nm.



Gearbox

The gearbox is filled with oil on delivery. After every 5000 hours of operation the gearbox should be emptied and filled with new oil.

- The gearbox holds 7.8 litres

The oil must comply with the standards for high pressure oil under CLP 198-242 mm²/s/ 40°C.

Manufacturer	Lubricant
MOBIL	Mobilgear 630
Shell	Omala Oil 220
Statoil	Loadway EP 220

Electrical maintenance

Inspection of electrical operations

The track motion should be checked monthly with regard to:

- All electrical operations
- End position operations
Run the carriage and check that both end positions are reached.

Check the emergency stop

The operation of the emergency stop should be checked monthly as follows:

1	Let the carriage be still.
2	Press in the emergency stop.
3	Try to start the track motion.

Inspection of cables and connectors

Check monthly:

If any cables...	then...
have been damaged through wear or pinching	replace the cable.
rub against sharp edges	route the cable so that it runs freely.

Check the connectors

Check monthly:

- that all connectors are made correctly and there is no risk for loose contact.

Inspection of the cable chain

Check monthly the visible part of the cable chain with regard to:

- The link system, replace if necessary.
- Points of attachment, replace if necessary.

Inspection of the junction boxes

Check, and rectify, if necessary, the junction boxes monthly with regard to:

- Damage
- Connections
- Tightness

Inspection of the drive motor

Check the drive motor monthly with regard to:

- Abnormal bearing noise
- Connections

Backup battery

The track motions serial measurement box (SMB) contains a serial measurement card and use a battery for the memory backup in order to maintain position data.

The battery is a rechargeable lithium battery.

The battery should be replaced:

- Every five years

or

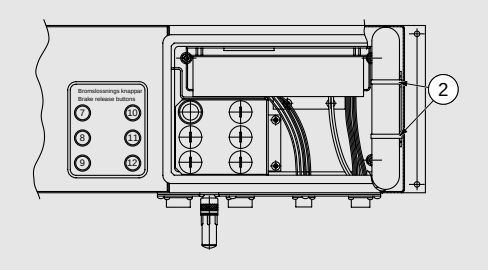
- When the battery is about to be spent.
This is generally shown by an error code on the teach pendant's character display.
Information about error codes can be found in the controller documentation.

In a new system the batteries are charged to full capacity after a few hours in STANDBY mode.



Replace the battery as follows:

1	Localise the battery inside the junction box.
2	Cut off the cable tie holding the battery.
3	Disconnect the two-wire cable and remove the battery.
4	Fit the battery in the reverse order.



Chapter 3: Spare parts

Spare parts independent of length

Drive unit,
low voltage

Spare parts for the drive unit for IRBT 6003S/4003S:

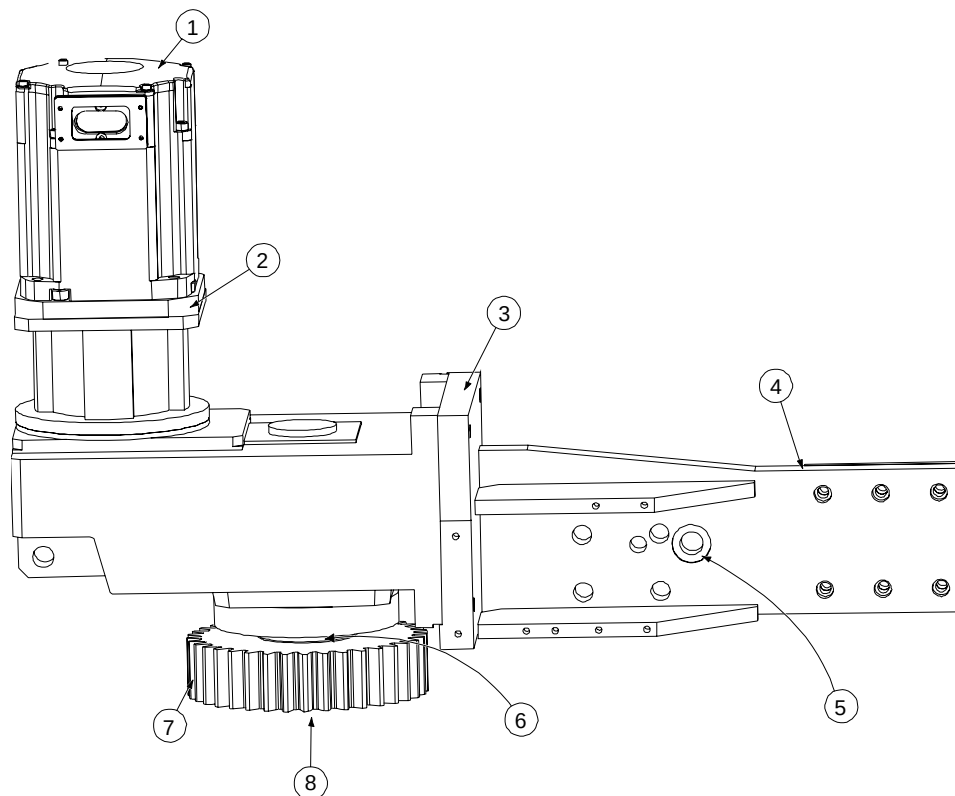


Fig. 1: Drive unit IRBT 6003S/4003S

Quantity	Description	Art. no.	Item
1	Drive unit, IRB 4400	3HEA 801 287-001	-
1	Drive unit, IRB 6400, IRB 6400R, IRB 640	3HEA 801 372-001	-
1	Motor mounting	3HEA 801 171-001	4
2	Socket head cap screw	3HXG 1138-3	5
1	Motor IRB 4400, IRB 6400, IRB 6400R, IRB 640	506 262-880	1
1	Motor flange	3HXD 1000-459	2
1	Gear drive, IRB 4400	3HXG 1141-1	3
1	Gear drive IRB 6400, IRB 6400R, IRB 640	3HXG 1141-2	3
1	Spacer	3HXD 1000-492	6
1	Gear wheel	3HXD 1000-490	7
1	Retainer sleeve	3HXG 1000-506	8
1	Gear wheel cover (not in fig.)	3HXD 0100-348	-

Spare parts

Spare parts independent of length

Drive unit,
low voltage
mirrored

Spare parts for the drive unit for IRBT 6003S/4003S:

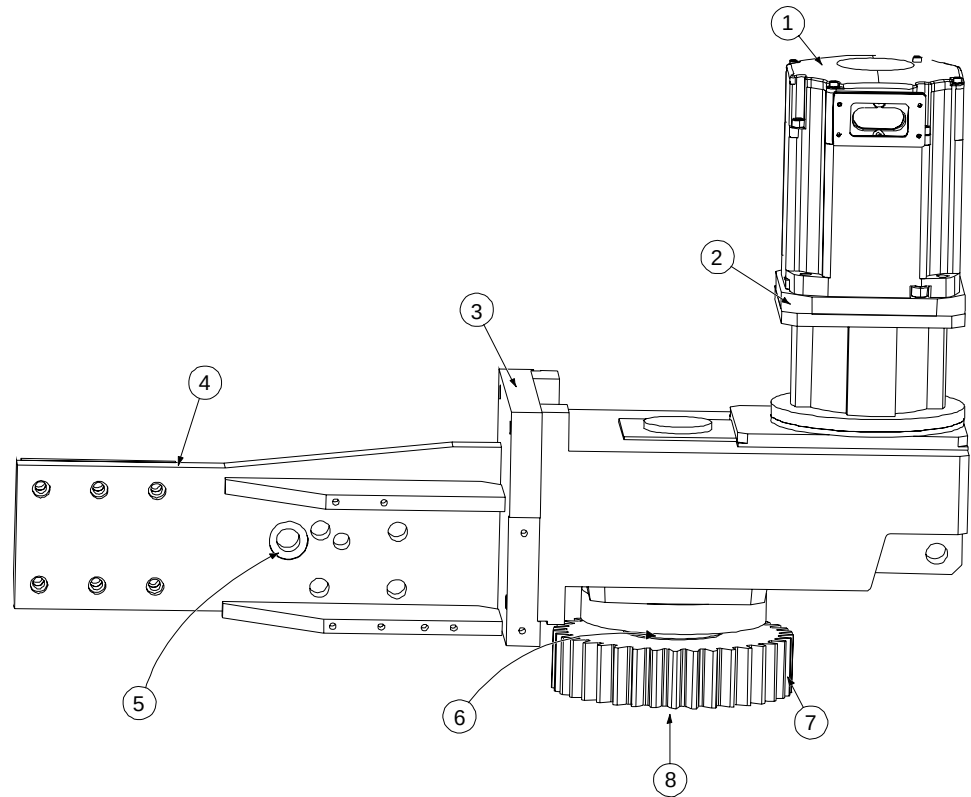


Fig. 2: Drive unit IRBT 6003S/4003S

Quantity	Description	Art. no.	Item
1	Drive unit, IRB 4400	3HEA 801 288-001	-
1	Drive unit, IRB 6400, IRB 6400R, IRB 640	3HEA 801 366-001	-
1	Motor mounting	3HEA 801 185-001	4
2	Socket head cap screw	3HXG 1138-3	5
1	Motor	506 262-880	1
1	Motor flange	3HXD 1000-459	2
1	Gear drive, IRB 4400	3HXG 1147-1	3
1	Gear drive IRB 6400, IRB 6400R, IRB 640	3HXG 1147-2	3
1	Spacer	3HXD 1000-492	6
1	Gear wheel	3HXD 1000-490	7
1	Retainer sleeve	3HXG 1000-506	8
1	Gear wheel cover (not in fig.)	3HXD 0100-348	-

**Drive unit,
high voltage
1.0 m/s**

Spare parts for the drive unit for IRBT 6003S:

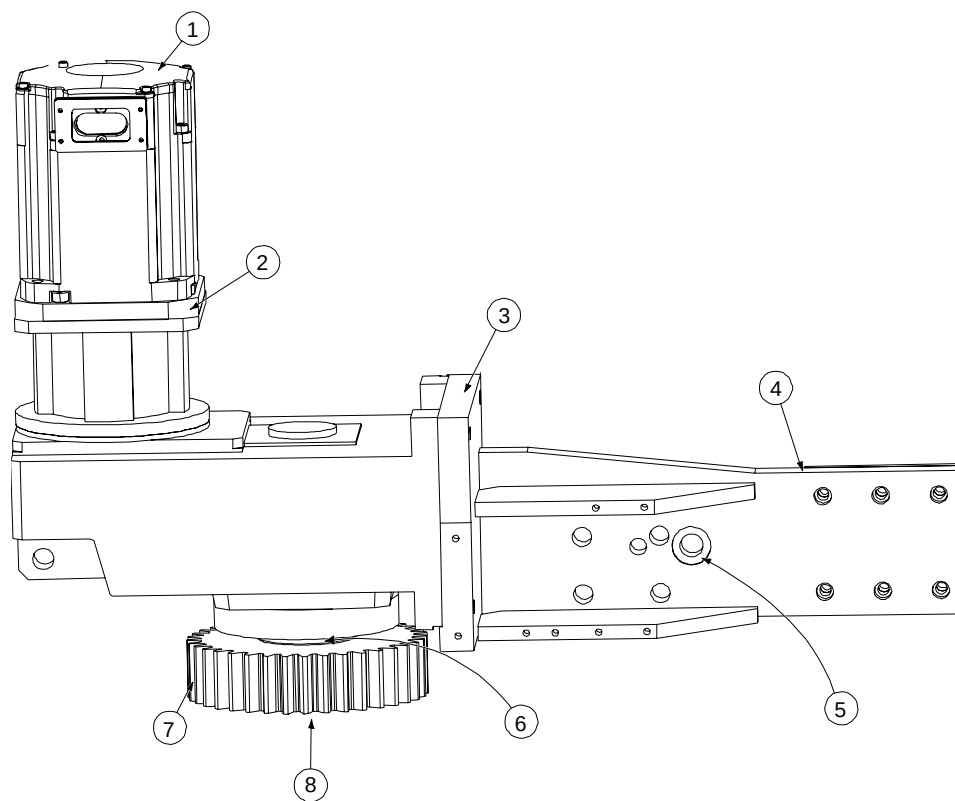


Fig. 3: Drive unit IRBT 6003S

Quantity	Description	Art. no.	Item
1	Drive unit, IRB 6600	3HEA 800 684-001	-
1	Motor mounting	3HEA 801 171-001	4
2	Socket head cap screw	3HXG 1138-3	5
1	Motor	3HXD 0100-355	1
	Motor flange	3HXD 1000-459	2
1	Gear drive	3HXG 1141-2	3
1	Spacer	3HXD 1000-492	6
1	Gear wheel	3HXD 1000-490	7
1	Retainer sleeve	3HXG 1000-506	8
1	Gear wheel cover (not in fig.)	3HXD 0100-348	-

Spare parts

Spare parts independent of length

Drive unit,
high voltage
mirrored 1.0 m/s

Spare parts for the drive unit for IRBT 6003S:

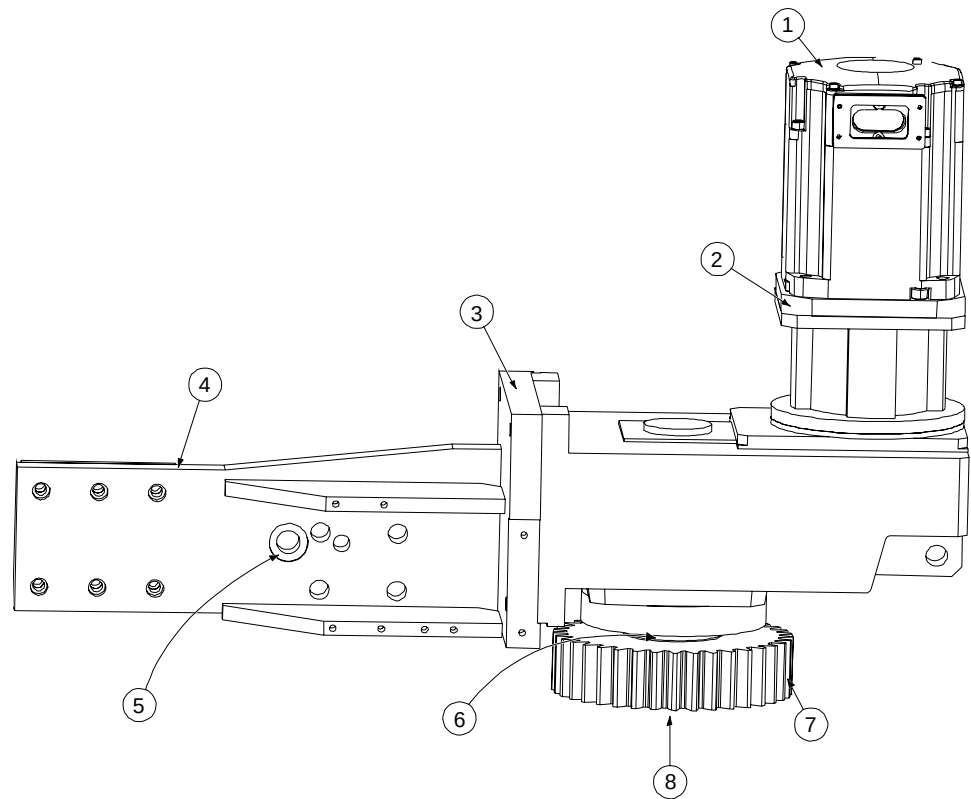


Fig. 4: Drive unit IRBT 6003S

Quantity	Description	Art. no.	Item
1	Drive unit, IRB 6600	3HEA 800 690-001	-
1	Motor mounting	3HEA 801 185-001	4
2	Socket head cap screw	3HXG 1138-3	5
1	Motor	3HXD 0100-355	1
1	Motor flange	3HXD 1000-459	2
1	Gear drive	3HXG 1141-2	3
1	Spacer	3HXD 1000-492	6
1	Gear wheel	3HXD 1000-490	7
1	Retainer sleeve	3HXG 1000-506	8
1	Gear wheel cover (not in fig.)	3HXD 0100-348	-

**Drive unit,
high voltage
1.5 m/s**

Spare parts for the drive unit for IRBT 6003S:

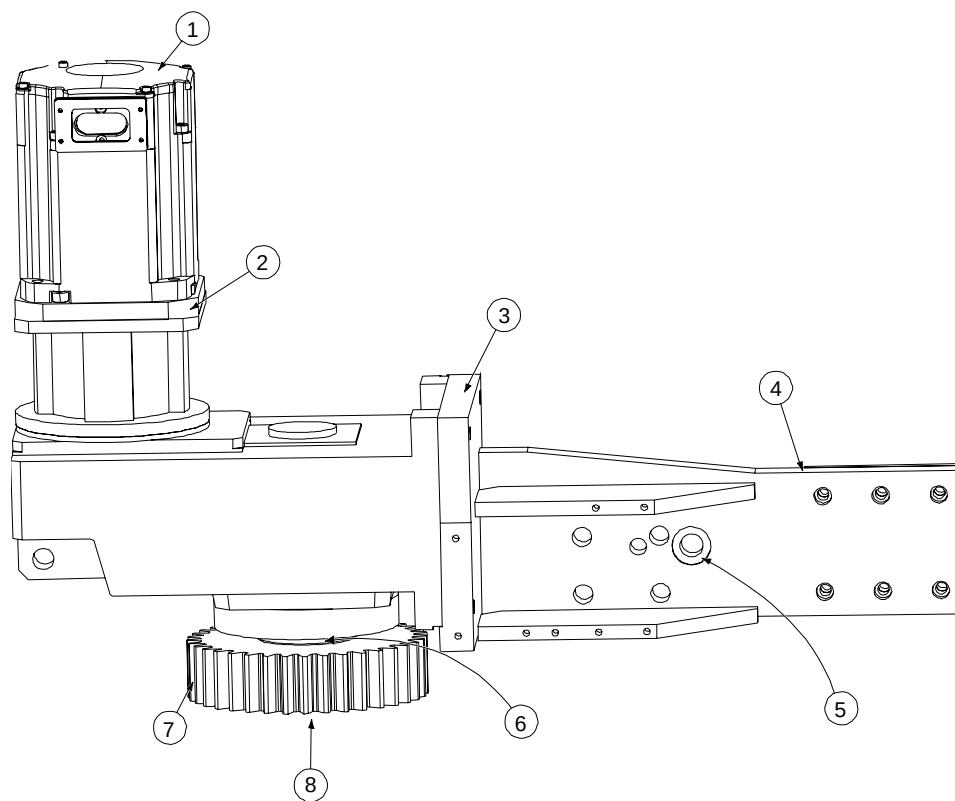


Fig. 5: Drive unit IRBT 6003S

Quantity	Description	Art. no.	Item
1	Drive unit	3HEA 800 687-001	-
1	Motor mounting	3HEA 801 171-001	4
2	Socket head cap screw	3HXG 1138-3	5
1	Motor	3HXD 0100-355	1
	Motor flange	3HXD 1000-459	2
1	Gear drive	3HXG 1141-1	3
1	Spacer	3HXD 1000-492	6
1	Gear wheel	3HXD 1000-490	7
1	Retainer sleeve	3HXG 1000-506	8
1	Gear wheel cover (not in fig.)	3HXD 0100-348	-

Spare parts

Spare parts independent of length

Drive unit,
high voltage
mirrored 1.5 m/s

Spare parts for the drive unit for IRBT 6003S:

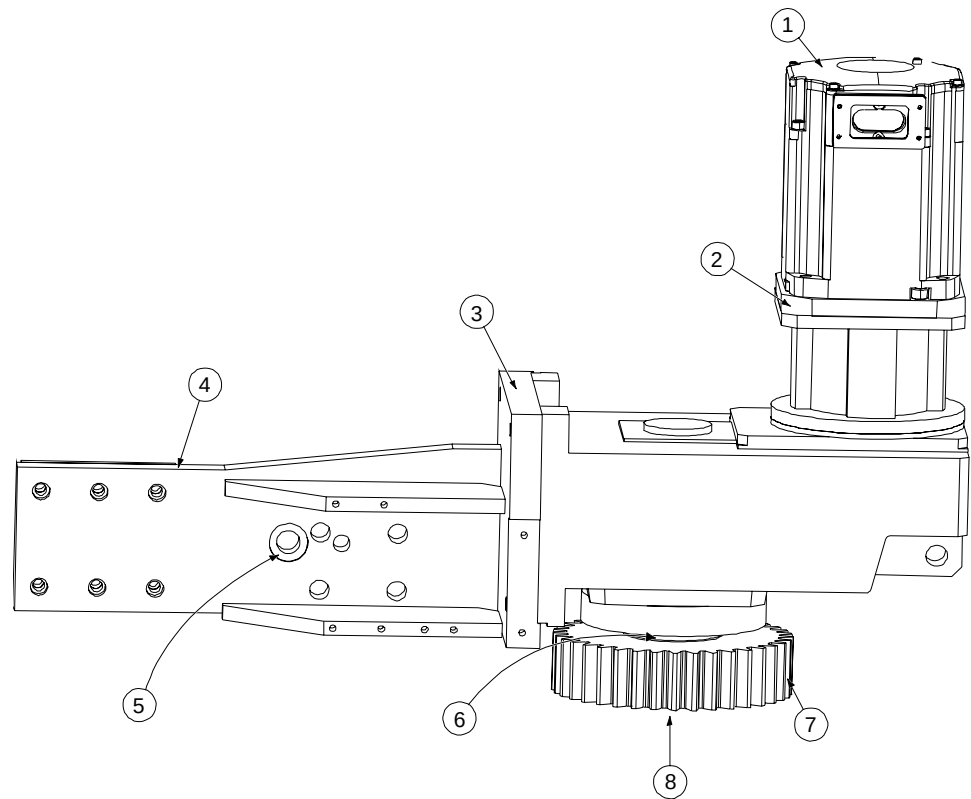


Fig. 6: Drive unit IRBT 6003S

Quantity	Description	Art. no.	Item
1	Drive unit	3HEA 800 689-001	-
1	Motor mounting	3HEA 801 185-001	4
2	Socket head cap screw	3HXG 1138-3	5
1	Motor	3HXD 0100-355	1
1	Motor flange	3HXD 1000-459	2
1	Gear drive	3HXG 1141-1	3
1	Spacer	3HXD 1000-492	6
1	Gear wheel	3HXD 1000-490	7
1	Retainer sleeve	3HXG 1000-506	8
1	Gear wheel cover (not in fig.)	3HXD 0100-348	-

Carriage

Spare parts to the carriage for IRBT 6003S/4003S:

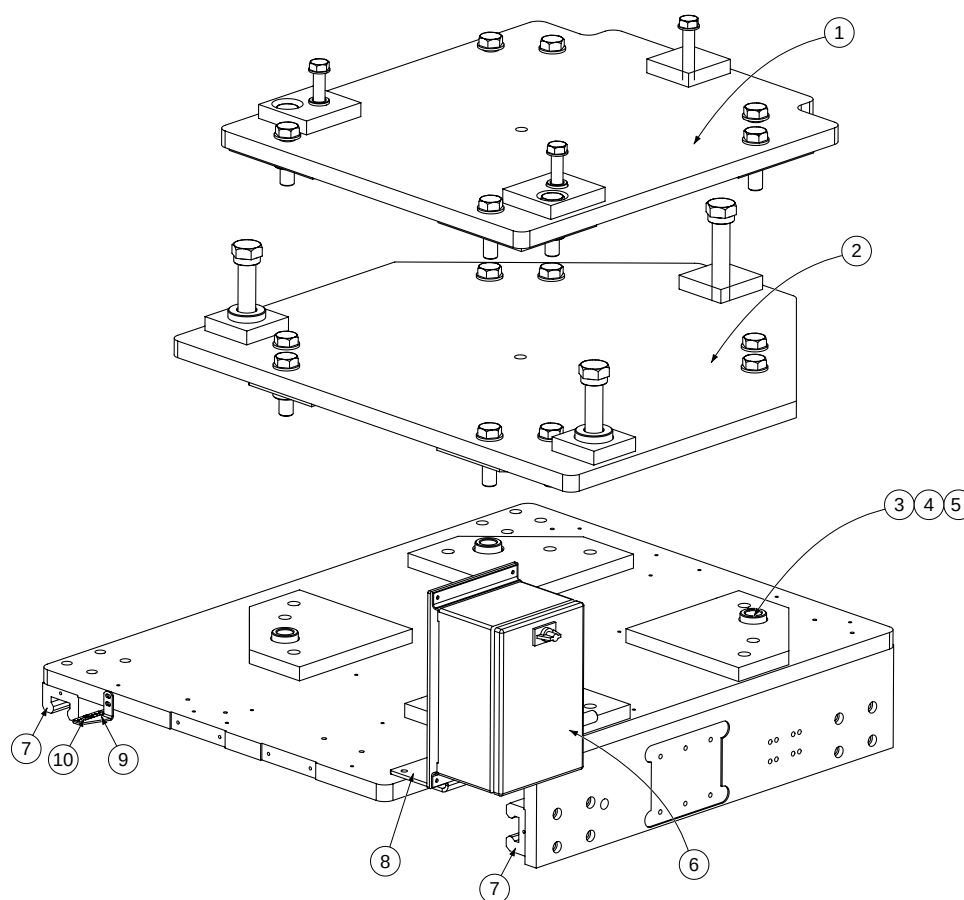


Fig. 7: Carriage IRBT 6003S/4003S

Quantity	Description	Art. no.	Item
Adaptors for robots			
	Adaptor for IRB 4400	3HXD 1566-1	1
	Adaptor for IRB 6400	3HXD 1566-2	2
2	Guide sleeve	3HXD 1000-273	3
8	Washer	3HXD 1000-274	4
8	Bolt	2121 2017-733	5
4	Ball element	2185 0445-4	7
2	Bracket SMB	3HXD 0100-357	8
1	Serial measurement box axis 7, low voltage	3HXD 0100-89	6
1	Serial measurement box axis 7, high voltage, IRB 6600R	3HXD 1616-1	6
1	Brake release box, IRB 6600R, MH	3HXD 0100-363	6
1	Bracket Nonie-scale	3HXD 1000-471	9
1	Sign Nonie-scale	2948 3216-2	10
1	Bracket junction box	3HXD 1000-505	-

Spare parts

Spare parts independent of length

Automatic lubrication system with grease injectors

Spare parts for the automatic lubrication system with grease injectors:

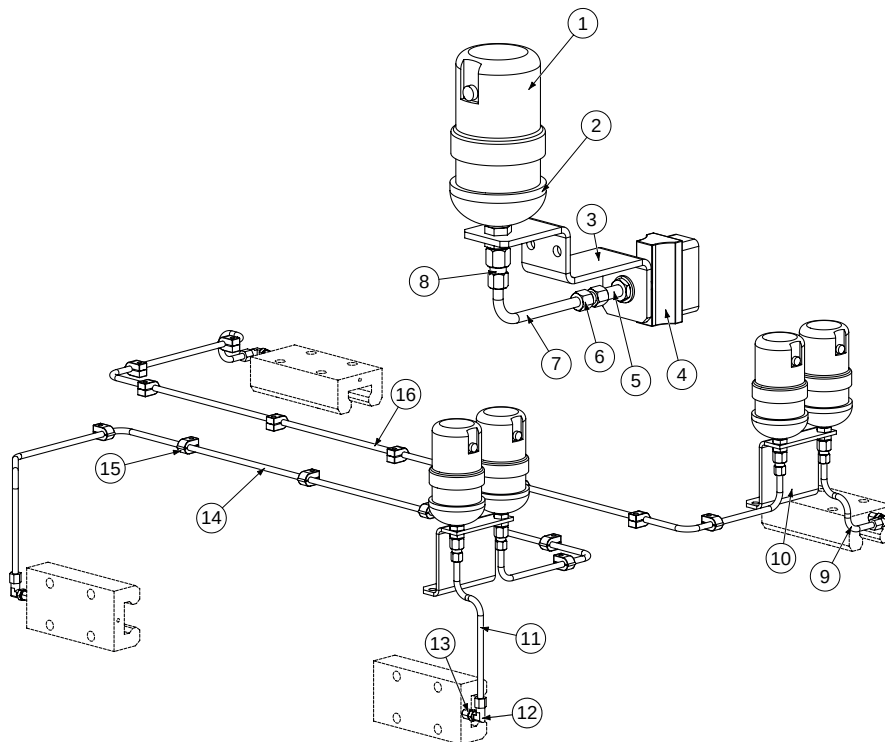


Fig. 8: Automatic lubrication system with grease injectors,

Quantity	Description	Art. no.	Item
2	Bracket	3HXD 1000-493	10
1	Bracket oil brush	3HXD 1000-494	3
1	Oil brush	3HXG 1000-562	4
5	Stabiliser	3HXG 1000-563	2
5	Single pipe clamp	3HXG 1145-1	15
1	Straight threaded coupling	3HXG 1000-558	6
4	Reducing nipple	3HXG 1000-556	13
4	Thread elbow coupling	3HXG 1000-561	12
15	Pipe clamp	3HXG 1145-1	8
1	Hydraulic pipe	3HXD 1559-9	7
1	Hydraulic pipe	3HXD 1559-2	11
	Standard design pipes		
1	Hydraulic pipe	3HXD 1559-3	14
1	Hydraulic pipe	3HXD 1559-4	9
1	Hydraulic pipe	3HXD 1559-5	16
	Pipes in a mirrored design intended for an extra carriage		
1	Hydraulic pipe	3HXD 1559-10	14
1	Hydraulic pipe	3HXD 1559-11	9
1	Hydraulic pipe	3HXD 1559-12	16
5	Grease injector	3HXG 1000-513	1
1	Brush	3HXG 1000-516	5

Central lubrication system with timer

Spare parts for the central lubrication system with timer:

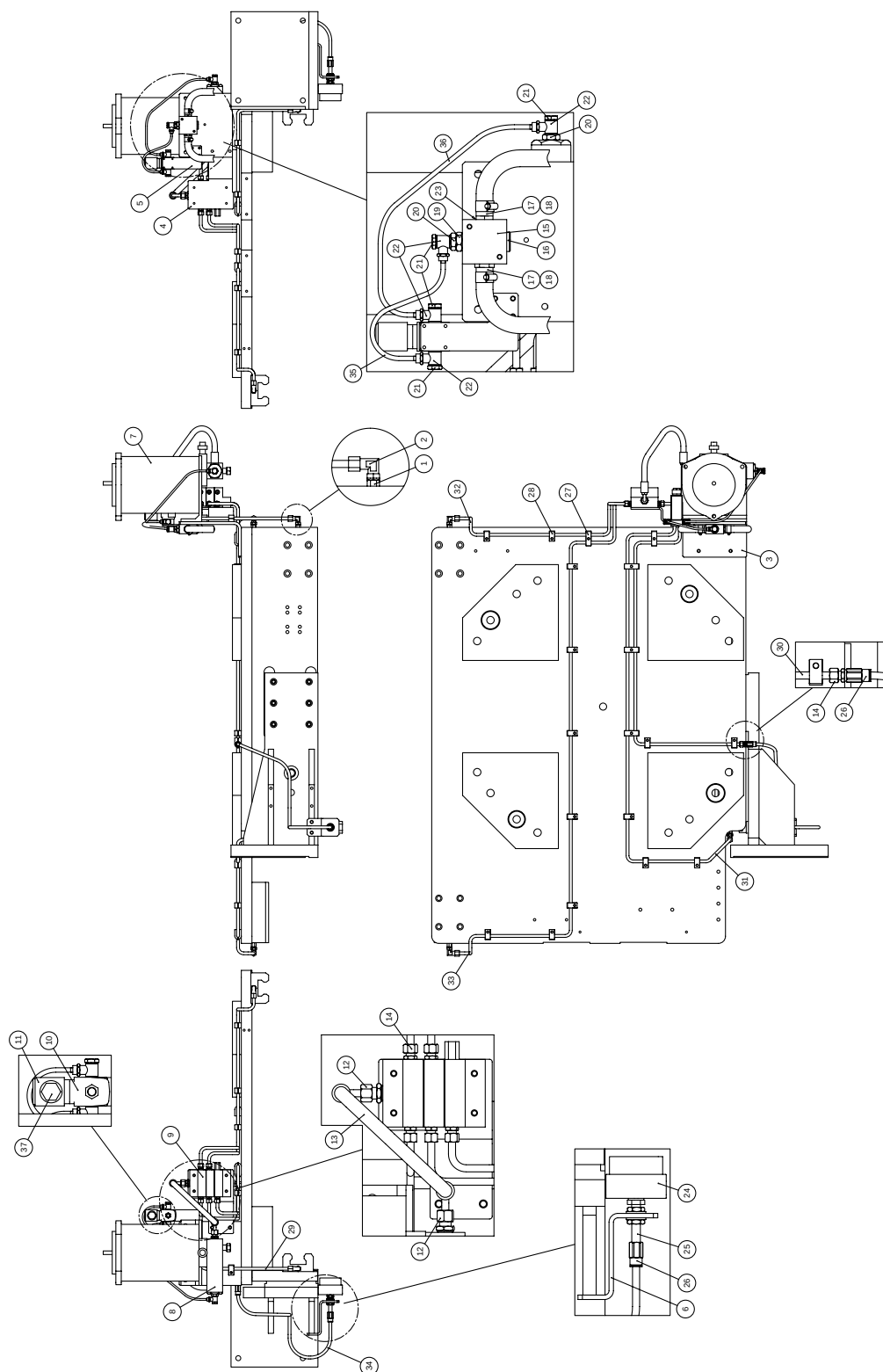


Fig. 9: Central lubrication system with timer.

Spare parts

Spare parts independent of length

Quantity	Description	Art. no.	Item
4	Reducing nipple	3HXG 1000-556	1
4	Thread elbow coupling	3HXG 1000-561	2
1	Grease tank bracket	3HXD 1000-525	3
1	Distribution block bracket	3HXD 1000-524	4
1	Timer bracket	3HXD 1000-522	5
1	Bracket oil brush	3HXD 1000-523	6
1	Grease tank	3HXG 1000-587	7
1	E-pump	3HXG 1000-588	8
1	Distribution block	3HXG 1000-589	9
1	Solenoid valve	3HXG 1000-585	10
1	Timer	3HXG 1000-586	11
2	Straight coupling	3HXG 1000-590	12
1	Hose	3HXG 1000-598	13
6	Straight threaded coupling	3HXG 1000-591	14
1	Distribution piece air	2529 1928-3	15
1	Blanking plug	2529 1920-4	16
2	Hose nipple	2529 2084-33	17
2	Hose clip	0252 9004 05	18
1	Reducing nipple	2529 1921-3	19
2	Reducing nipple	2529 1921-2	20
4	Banjo bolt	2529 1926-2	21
4	Single banjo coupling	2529 1008-2	22
4	Sealing washer	2152 0417-5	23
1	Oil brush	3HXG 1000-562	24
1	Brush	3HXG 1000-516	25
2	Straight coupling	3HXG 1000-615	26
5	Double pipe clamp	3HXG 1145-2	27
16	Single pipe clamp	3HXG 1145-3	28
Standard design pipes			
1	Hydraulic pipe	3HXD 1559-13	29
1	Hydraulic pipe	3HXD 1559-14	30
1	Hydraulic pipe	3HXD 1559-15	31
1	Hydraulic pipe	3HXD 1559-16	32
1	Hydraulic pipe	3HXD 1559-17	33
1	Polyamide hose	3HXD 1583-1	34
1	Polyamide hose	3HXD 1583-2	35
1	Polyamide hose	3HXD 1583-3	36
Pipes in a mirrored design intended for an extra carriage			
1	Hydraulic pipe	3HXD 1559-20	29
1	Hydraulic pipe	3HXD 1559-19	30
1	Hydraulic pipe	3HXD 1559-22	31
1	Hydraulic pipe	3HXD 1559-18	32
1	Hydraulic pipe	3HXD 1559-21	33
1	Central lubrication cable	3HXD 1318-20	37

Spare parts dependent on length

Cable tray

Spare parts for the cable tray for IRBT 6003S/4003S Compact:

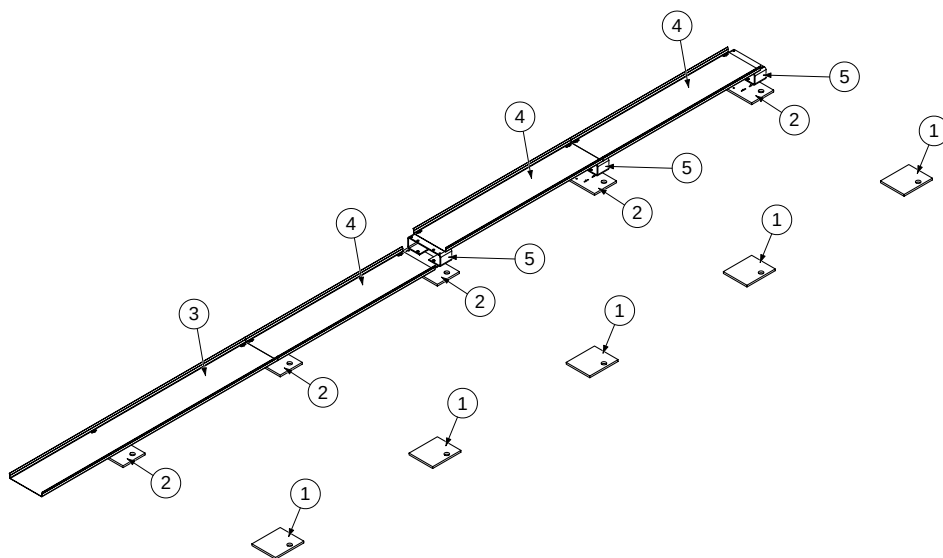


Fig. 10: Cable tray IRBT 6003S/4003S Compact

Description	Quantity with different travel lengths										Art. no.	Item
	1,7	2,7	3,7	4,7	5,7	6,7	7,7	8,7	9,7	10,7		
Levelling plates	4	5	7	8	8	9	10	11	12	13	3HXD 1000-414	1
Lower bracket for the cable chain	2	3	3	4	6	7	8	9	10	11	3HXD 1000-410	2
Guide plate for the cable chain	1	1	1	1	1	1	1	1	1	1	3HXD 1000-488	3
Guide plate for the cable chain	-	1	1	2	3	4	5	6	7	8	3HXD 1000-489	4
Guide plate, angled	-	-	-	-	1	1	1	1	1	1	3HXD 1000-540	-
Slide strip, angled	-	-	-	-	2	2	2	2	2	2	3HXD 1000-539	-
Slide strip, angled	-	-	-	-	6	8	10	12	14	16	3HXD 1000-538	-
Spacer for the cable chain	-	-	-	-	3	3	4	4	5	5	3HXD 1000-473	5

Spare parts

Spare parts dependent on length

Spare parts for the cable tray for IRBT 6003S/4003S Covered:

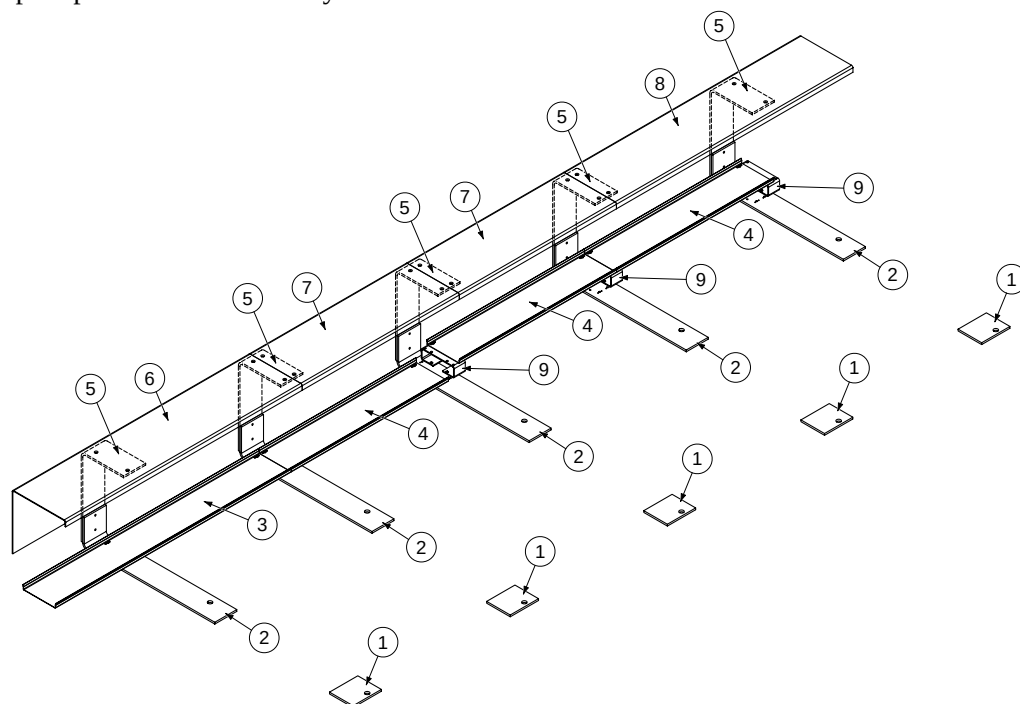


Fig. 11: Cable tray IRBT 6003S/4003S Covered

Description	Quantity with different travel lengths										Art. no.	Item
	1,7	2,7	3,7	4,7	5,7	6,7	7,7	8,7	9,7	10,7		
Levelling plates	3	4	5	6	7	8	9	10	11	12	3HXD 1000-414	1
Lower bracket for the cable chain	3	4	5	6	7	8	9	10	11	12	3HXD 1000-415	2
Guide plate for the cable chain	1	1	1	1	1	1	1	1	1	1	3HXD 1000-488	3
Guide plate for the cable chain	-	1	1	2	4	5	6	7	8	9	3HXD 1000-489	4
Guide plate, angled	-	-	-	-	1	1	1	1	1	1	3HXD 1000-540	-
Slide strip, angled	-	-	-	-	2	2	2	2	2	2	3HXD 1000-539	-
Slide strip, angled	-	-	-	-	6	8	10	12	14	16	3HXD 1000-538	-
Upper bracket for the cable chain	3	4	5	6	7	8	9	10	11	12	3HXD 1000-416	5
Cover plate L=1505	1	1	1	1	1	1	1	1	1	1	3HXD 1000-419	6
Cover plate L=1000	-	1	2	3	4	5	6	7	8	9	3HXD 1000-420	7
Cover plate L=1505	1	1	1	1	1	1	1	1	1	1	3HXD 1000-421	8
Spacer for the cable chain	-	-	-	-	3	3	4	4	5	5	3HXD 1000-473	9

Stand

Spare parts for the stand for IRBT 6003S/4003S.

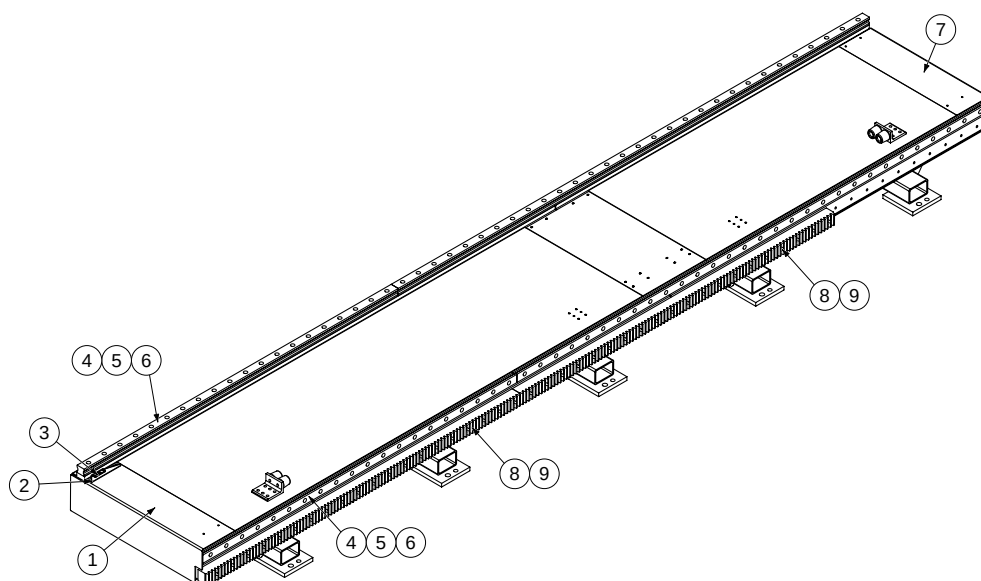


Fig. 12: Stand IRBT 6003S/4003S

Description	Quantity with different travel lengths										Art. no.	Item
	1,7	2,7	3,7	4,7	5,7	6,7	7,7	8,7	9,7	10,7		
Linear guide 45 L=1000	-	2	-	-	2	-	-	-	-	-	3HXC 1127-1	6
Linear guide 45 L=2000	-	-	2	6	6	2	6	4	2	6	3HXC 1127-2	4
Linear guide 45 L=3000	2	2	2	-	-	4	2	4	6	4	3HXC 1127-3	5
Gear rack L=1000	-	1	-	1	-	1	2	1	2	3	3HXC 1557-1	8
Gear rack L=2000	1	1	2	2	3	3	3	4	4	4	3HXC 1557-2	9
Cover plate end	1	1	1	1	1	1	1	1	1	1	3HXC 1000-393	1
Cover plate end	1	1	1	1	1	1	1	1	1	1	3HXC 1000-394	7
Bracket Nonie-scale	1	1	1	1	1	1	1	1	1	1	3HXC 1000-472	2
Sign Nonie-scale	1	1	1	1	1	1	1	1	1	1	2948 3216-1	3
Side cover L=1000 (opt.)	-	1	-	-	-	-	-	1	-	-	3HXC 1472-1	-
Side cover L=1500 (opt.)	2	2	2	2	2	2	2	2	2	2	3HXC 1472-2	-
Side cover L=2000 (opt.)	-	-	1	-	2	1	-	-	1	-	3HXC 1472-3	-
Side cover L=3000 (opt.)	-	-	-	1	-	1	2	2	2	3	3HXC 1472-4	-

Cables

Cable lengths

The table shows the cable lengths required for the different connections with different travel lengths. The article numbers for the cables can be found in *“Electrical installation”* on page 2-21.

Cable lengths for IRBT 6003S/4003S Compact:

Description	Cable lengths with different travel lengths										Art. no.
	1,7	2,7	3,7	4,7	5,7	6,7	7,7	8,7	9,7	10,7	
Cables for the positioner	5	6	6	7	7	8	8	9	9	10	see page 2-22
Cables for the SMB	5	6	6	7	7	8	8	9	9	10	see page 2-22
Cables between the SMB and Motor	1	1	1	1	1	1	1	1	1	1	see page 2-22
Cable between the SMB and positioner	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	see page 2-22
Number of links in the cable chain	33	48	48	63	63	78	78	93	93	108	see page 2-22

Cable lengths for IRBT 6003S/4003S Covered:

Description	Cable lengths with different travel lengths										Art. no.
	1,7	2,7	3,7	4,7	5,7	6,7	7,7	8,7	9,7	10,7	
Cables for the positioner	6	6	7	7	8	8	9	9	10	10	see page 2-22
Cables for the SMB	6	6	7	7	8	8	9	9	10	10	see page 2-22
Cables between the SMB and Motor	1	1	1	1	1	1	1	1	1	1	see page 2-22
Cable between the SMB and positioner	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	see page 2-22
Number of links in the cable chain	33	48	48	63	63	78	78	93	93	108	see page 3-19

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