

Product Manual

Track Motion

IRBT 4003S/6003S
IRC5, M2004

3HEA 800 970-001, March 2005



ABB

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1 Description

1.1 General

Track Motion IRBT6003S/4003S expands the movement pattern of the robot with an extra degree of programmable freedom.

High performance - High precision

The IRBT6003S/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 the robot models IRB 6600 or IRB 4400 and 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 equipment in the same way as the robot's other axes.

Two types of cable chains

IRBT6003S/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 meter modules makes it very flexible. There is also possible to add one or more modules at a later date.

Fully enclosing cover plates

The track motion's cover plates are fully enclosing. This means that 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

1.2 Principle layout

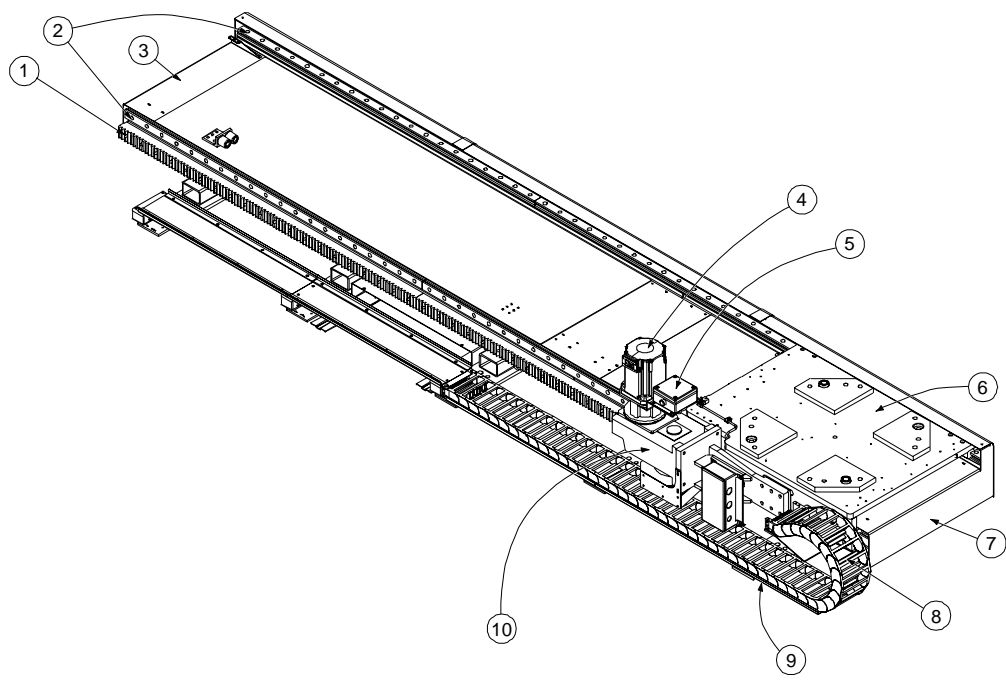
Track Motion IRBT6003S/4003S is available in two basic designs, Compact and Covered.

Compact Compact has an open cable tray adapted for materials handling.

Covered 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.



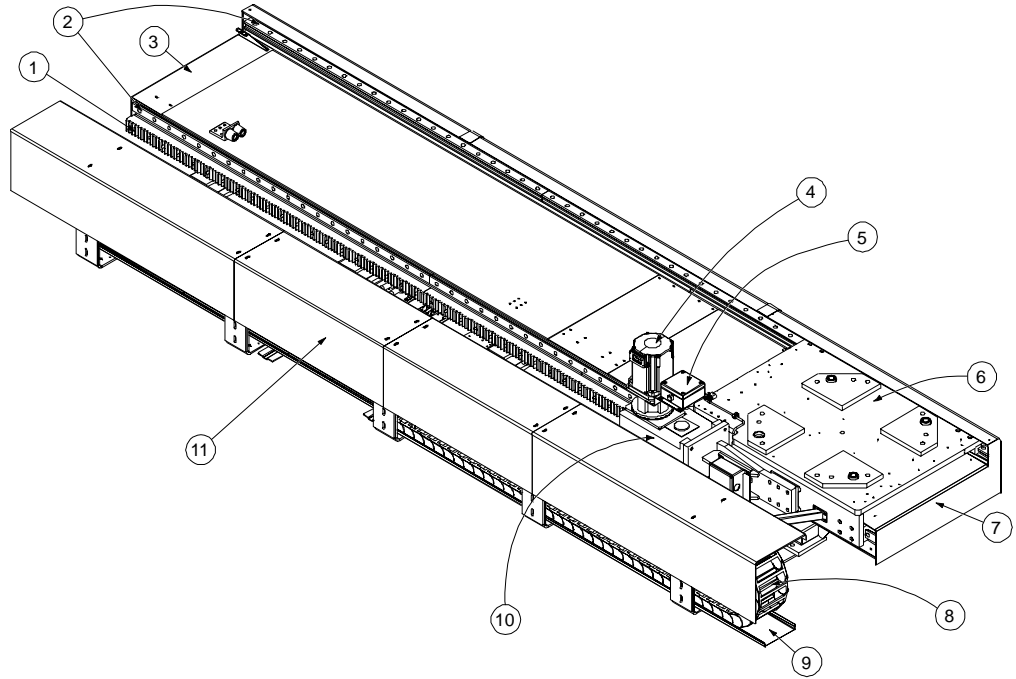
Principiell uppbyggnad compact IRC5.wmf

Figure 1 IRBT 6003S/4003S Compact

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

IRBT 6003S/4003S Covered

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



principle layout covered IRC5

Figure 2 IRBT 6003S/4003S Covered

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

Description

Terms and concepts

1.3 Terms and concepts

1.3.1 Definitions

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

Name	Definition
Robot system	Robot and track motion together.
Robot	Manipulator and controller together (IRB 4400/IRB 6600).
Manipulator	The mechanical, moving part of the robot.
Controller	Control equipment of type IRC5
Track motion	Carriage, stand and cable chain as well as associated parts, assembled (IRBT 6003S/4003S).
Carriage	The moving part, on which the manipulator is mounted.
Stand	The assembled framework for the track motion.
Stand module	Track motion systems with a travel length greater than 4.7 meters are supplied with the stand in modules that are interconnected according to the instructions in <i>"Mechanical installation" on page 2 - 5.</i>
Travel length	The carriage's maximum movement range.
SMB	Serial measurement box
BRB	Brake release box

2 Safety instructions








2.1 Description

This chapter contains safety instructions for all steps that involve risk of personal injury or material damage. In addition, they are written out by the instruction for each step.

General warnings, where the intention is to avoid problems, are only included in the pertinent instructions.

Symbol explanations

The different types of warnings are indicated with symbols according to the table below:

Symbol	Name	Meaning
	Danger	Warning that serious or life-threatening personal injury and/or serious damage to the product will occur if the instructions are not followed.
	Warning	Warns of the risk of personal injury or serious damage to the product. Always follow the instructions that accompany this symbol.
	Electric shock	Warns of possible electric shock that can cause life-threatening or serious personal injury. Always follow the instructions that accompany this symbol.
	Caution	Draws your attention to the fact that damage to the product may occur if an action is not performed or is performed incorrectly.
	Static electricity ESD	The ESD symbol indicates a risk for static electricity that may cause serious damage to the product.
	Note:	Information about important parts.
	Tip	This symbol refers to an instruction providing further information on a particular step.

Safety instructions

Unpacking and handling safety

2.2 Unpacking and handling safety

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

Lifting instructions

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

2.3 Mechanical installation safety

Adjusting the level

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

2.3.1 Assembly of cable tray and manipulator safety

Fitting the manipulator

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

2.3.2 Electrical installation safety

Robot cable harness

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

2.3.3 Commissioning safety

Calibration

Make sure no one is on the track motion when the carriage moves. Also make sure that the track motion's cover plates are free from foreign objects; these can otherwise become trapped between the carriage and the plates.

Checking the work area

The track motion's work area must be inspected before the system is put into service.

2.3.4 Mechanical maintenance safety

Refilling lubricant

Only use grease injectors with 3-month or less capacities.

Safety instructions

Mechanical maintenance safety

3 Technical specifications and requirements

3.1 Technical data

3.1.1 Performance

IRBT 4003S

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

Function	Performance
Travel length	0.7–43.7 meters in increments of 1 meter.
Travel speed IRBT 4003	1.6 m/s
Stand length	travel length + 1.3 meters
Acceleration	1.4 m/s ²
Retardation	1.9 m/s ²
Repeater accuracy ¹	± 0.1 mm
Maximum load IRB 4400	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 a travel direction, at the same point.

Technical specifications and requirements

Performance

IRBT 6003S

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 meters in increments of 1 meter.
Travel speed IRBT 6003	1.0 m/s
Stand length	travel length + 1.3 meters
Acceleration	1.5 m/s ²
Retardation	1.6 m/s ²
Repeater accuracy ¹	± 0.1 mm
Maximum load IRB 6600	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 a travel direction, at the same point.

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 meters in increments of 1 meter.
Travel speed IRBT 6003	1.5 m/s
Stand length	travel length + 1.3 meters
Acceleration	1.5 m/s ²
Retardation	1.6 m/s ²
Repeater accuracy ¹	± 0.1 mm
Maximum load IRB 6600	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 a travel direction, at the same point.

3.1.2 Dimensions

Length measurement

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

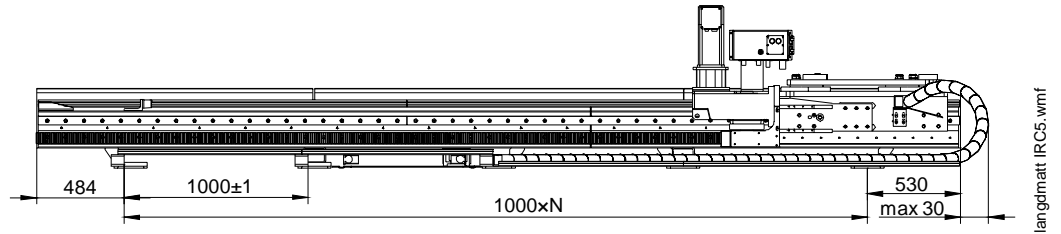


Figure 3 IRBT 6003S/4003S, length measurement

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.		

Technical specifications and requirements

Width and height measurements

3.1.3 Width and height measurements

IRBT 6003S/4003S Compact

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

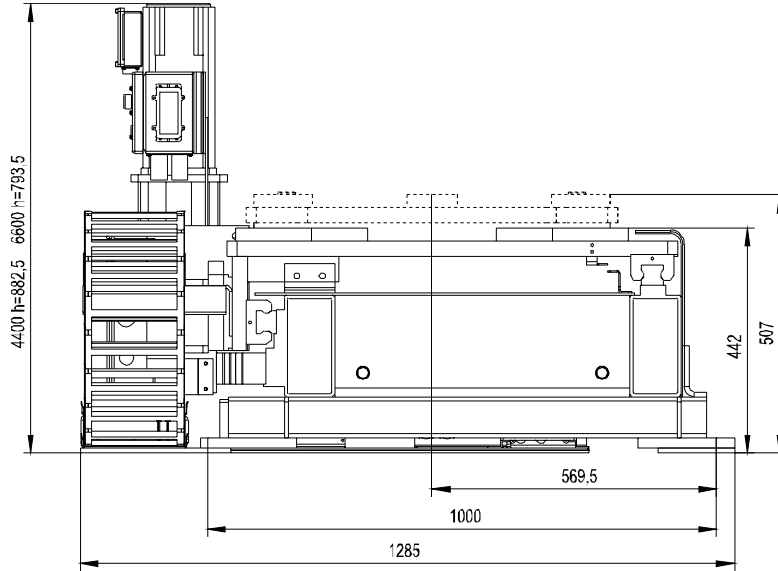


Figure 4 IRBT 6003S/4003S Compact, width and height measurements

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IRBT 6003S/4003S Covered In-line

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

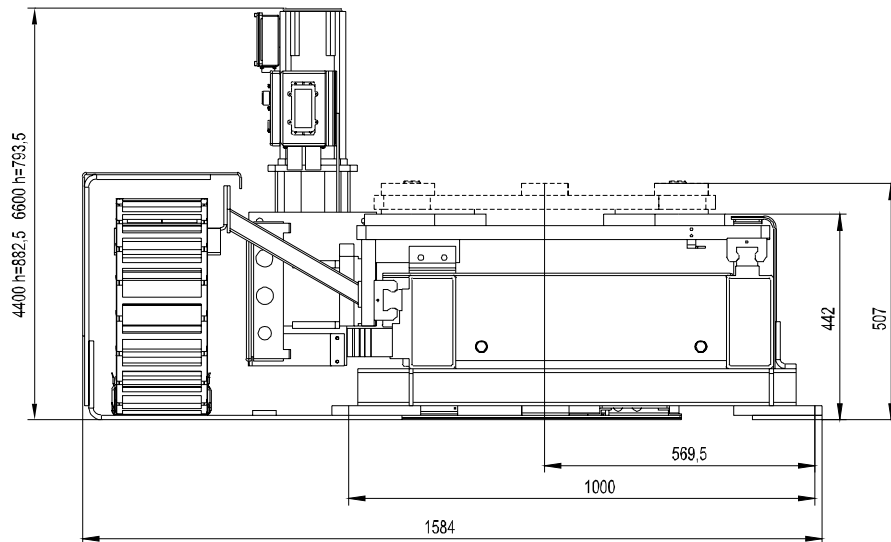
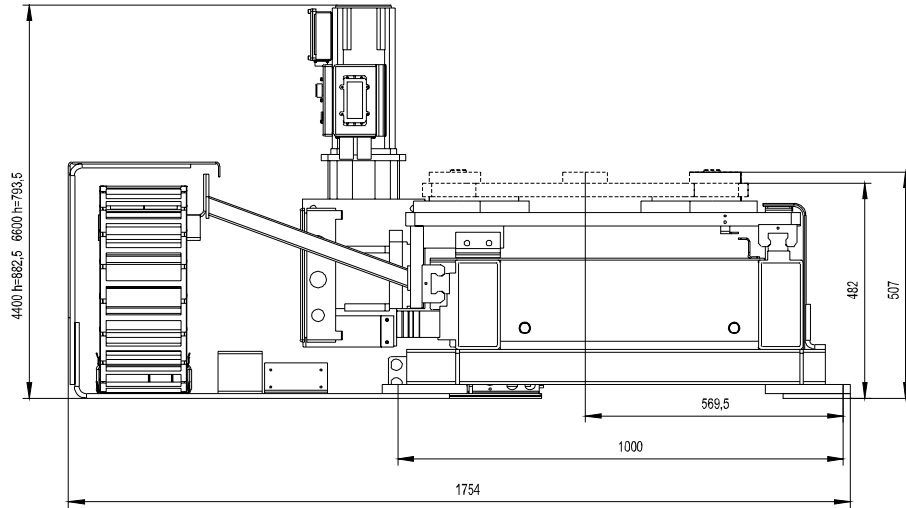


Figure 5 IRBT 6003S/4003S In-line, width and height measurements

bredd hojdmatt inline IRC5.wmf

IRBT 6003S/4003S Covered 90°

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



bredd höjdmatt covered IRC5.wmf

Figure 6 IRBT 6003S/4003S Covered, width and height measurements

3.1.4 Technical requirements for the robot

For robots of type IRB 6600/IRB 4400, 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 IRC5 controller; please contact ABB for information about compatibility with other control systems.

Hardware requirements

The robot hardware must be equipped with the following options to drive an external axis 7 (track motion).

Unit	Option	Notes
IRB 4400 (7 axes)	770-3	Drive unit T
IRB 6600 (7 axes)	770-4	Drive unit W
IRB 6600 (8 axes)	770-4, 771-4	Drive unit W
IRC5 control system	Floppy disk drive	If the operating parameters are to be downloaded directly from the parameter floppy, the controller must be equipped with a floppy disk drive. See the robot documentation for other transfer methods.

Technical specifications and requirements

Technical requirements for the robot

4 Variants and options

4.1 Variants and options for the 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 30 meters long, measured from the connection point in the center of the track motion.

Double carriages

When ordering rail-bound 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 for the carriage.

Variants and options

Ordering list

4.1.1 Ordering list

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

Symbol explanations

"x" Where the last number of the article number is replaced by **x**, the track motion's **travel length is specified, rounded upwards** to the nearest meter. Accordingly, a track motion with a travel length of 2.7 meters has the article number 3HXD1546-**3**, with a travel length of 3.7 meters the article number will be 3HXD 1546-**4**, etc.

"**" Where the last number of the article number is replaced by "**", the track motion's length is specified, **rounded downwards** to the nearest meter with 2 digits. A track motion with a travel length of 2.7 meters is thus receives article number 3HEA 800 779-**002**. With travel length 3.7 meters, the article number is 3HEA 800 779-**003**, etc.

"yy" When the last numbers of an article number are replaced by "yy", the cable length is stated in decimeters (-70 for 7 meters, -150 for 15 meters and -220 for 22 meters).

"z" When the last number of an article number is replaced with "z", it is indicated as in the following table.

Cable length	z
5 meters	001
6 meters	002
7 meters	003
8 meters	004
9 meters	005
10 meters	006

Variants

Variants	Art. no.
Track motion IRBT 6003S/4003S	3HXD 1567-x
Cable chain for IRBT 6003S/4003S, Compact	
IRB 4400	3HEA 800 763-0**
IRB 6600 MH	3HEA 800 749-0**
IRB 6600 RSG	3HEA 800 750-0**
Cable chain for IRBT 6003S/4003S, Covered In-line	
IRB 4400	3HEA 800 764-0**
IRB 6600 MH	3HEA 800 739-0**
IRB 6600 RSG	3HEA 800 743-0**
Cable chain for IRBT 6003S/4003S, Covered 90°	
IRB 4400	3HEA 800 761-0**
IRB 6600 MH	3HEA 800 746-0**
IRB 6600 RSG	3HEA 800 747-0**
Carriage, IRB 4400	3HEA 800 734-001
Carriage, IRB 6600, MH	3HEA 800 694-001
Carriage, IRB 6600 RSG	3HEA 800 697-001
Floor power cable axis 7, IRB 4400	
7m	3HEA 800 896-001
15m	3HEA 800 896-002
22 m	3HEA 800 896-003
30 m	3HEA 800 896-004
Floor power cable axis 7, IRB 6600	
7 m	3HEA 800 824-001
15 m	3HEA 800 824-002
22 m	3HEA 800 824-003
30 m	3HEA 800 824-004

Variants and options

Ordering list

Options

Options	Art. no.
Extra carriage	
Compact, IRB 4400	3HEA 800 939-0**
Compact, IRB 6600, MH	3HEA 800 933-0**
Compact, IRB 6600, RSG	3HEA 800 935-0**
In-line Covered, IRB 4400	3HEA 800 946-0**
In-line Covered, IRB 6600, MH	3HEA 800 944-0**
In-line Covered, IRB 6600, RSG	3HEA 800 940-0**
Covered 90°, IRB 4400	3HEA 800 953-0**
Covered 90°, IRB 6600, MH	3HEA 800 951-0**
Covered 90°, IRB 6600, RSG	3HEA 800 947-0**
Side plate	
Electric collision guard for two carriages	3HXD 0100-308
Automatic lubrication system, (5 grease injectors)	3HXD 0100-323
Automatic lubrication system, (5 grease injectors), mirrored	3HXD 0100-326
Central lubrication system with timer, low voltage	3HEA 800 985-001
Central lubrication system with timer, high voltage	3HEA 800 986-001
Central lubrication system with timer, mirrored, low voltage	3HEA 800 987-001
Central lubrication system with timer, mirrored, high voltage	3HEA 800 989-001
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 30 m)	3HXD 1382-yy
Cable, position switch, axis 1 /IRB 4400	3HXD 1433-yy
Cable, position switch, axis 1 IRB 6600	3HXD 1638-yy
Cable, position switch, axes 2–3 IRB 6600	3HXD 1691-yy
Customer cable, IRB 6600	
CP/CS Canbus/DeviceNet	3HEA 801 279-z
CP/CS Interbus	3HEA 801 278-z
CP/CS Profibus	3HEA 801 280-z
CP/CS Parallel	3HEA 801 277-z
Spot welding media with 25 mm ² power cable	3HXD 1490-x
Spot welding media with 35 mm ² power cable	3HXD 1479-x

Supplementary pack

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

Description	Art. no.
Supplementary pack, IRBT 4003S	506 342-880
Supplementary pack, IRBT 4003S, high voltage	3HXD 0100-339
4 Ball elements	
1 Motor flange	
1 Motor	
1 Gearbox	
10 Cable chain links	

Variants and options

Ordering list

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1 Unpacking and handling



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

1.1 Lift

Lifting instructions

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



Only units that are 6 meters 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 center of the track motion as possible.	
2.	Position the forks along the rail module in the lifting zone in accordance with 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 in accordance with position (Y) in the figure below.

Lifting zones

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

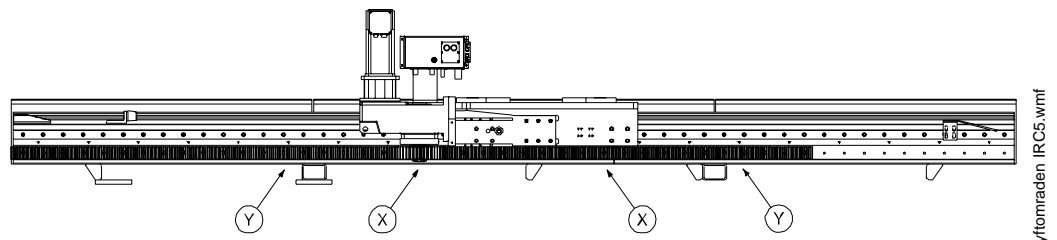


Figure 1 The lifting zones for a fork lift truck (X) and an overhead crane (Y).

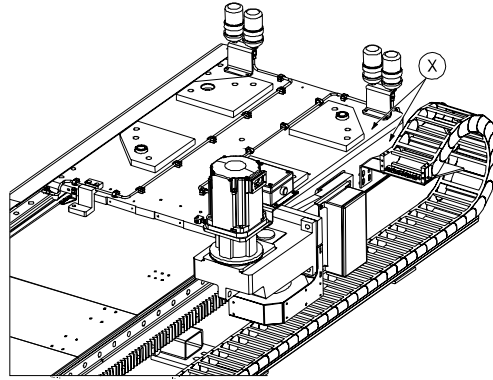
Unpacking and handling

Lift

Acceptance inspection

Identification

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



identifleringsplatar IRC5.wmf

Figure 2 Identification plates (X)

Contents

As standard the track motion includes the following on delivery:

- One carriage (with adaptor when applicable) with drive unit
The carriage weighs approximately: 600 kg. (+ possible adaptor, 160/193 kg)
- Stand modules and cable chain
The track motions 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 must be wiped away before installation.

	Action
1.	Wipe off any surplus oil using a lintless cloth.

Moving the carriage manually

Release the brake from the BRB

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

Action	
1.	Press the brake release button.

Release the brake when connecting the motor

If there is no power to the motor, 24 VDC can be connected to the motor's power cable.

Low voltage motors

The following instructions apply to low voltage motors.

Action	
1.	Connect 24 VDC to pins M and L on connector MP.M7 (power cable, 3HXD 1249).
2.	Press the brake release button.

High voltage motor

The following instructions apply to high voltage motors.

Action	
1.	Connect 24 VDC to pins V and W on connector MP.M7/M8.
2.	Press the brake release button.

Power cable	Art. no.
BRB	3HEA 800 803
SMB, carriage	3HEA 800,827
SMB, floor	3HEA 800,813

Lift

2 Mechanical installation

2.1 Foundation

2.1.1 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 manipulator.

2.1.2 Incline

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

2.1.3 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	
Manipulator	2400 kg
Carriage	600 kg
Adaptor, IRB 4400	160 kg
Permitted extra load	
IRB 4400	100 kg
IRB 6600	400 kg

2.1.4 Dynamic loads

The dynamic loads from the movement of the track motion and manipulator can change direction independent of each other. If 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:

- (Weight, carriage + Weight, manipulator + Weight, extra load) × 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 arm should be at a standstill or moving in the opposite direction.

2.2 Preparations

2.2.1 Recommendations for mounting

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

Mounting bolts

Choose mounting bolts so that they:

- Are suitable for the foundation.
- Can withstand the dynamic loads.
- The bolts must be able to bear the combined dynamic loads that can occur when the manipulator and carriage move .
- Fit the holes in the stand, $\text{Ø}24$ mm

Hole configuration

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

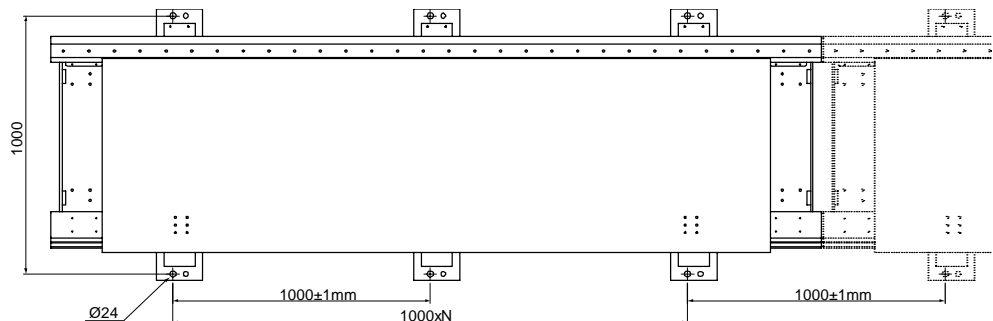


Figure 3 Hole configuration

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 show the stand's base seen from the front.

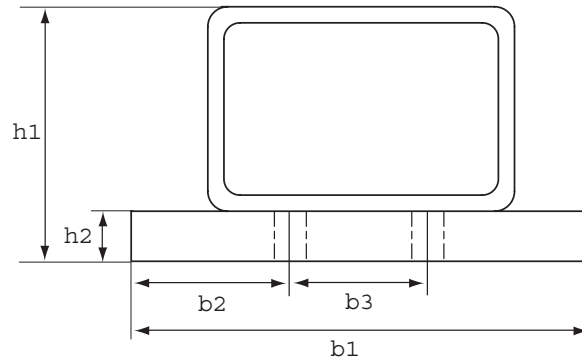


Figure 4 Base dimensions

The table below shows the values of h1-2 and b1-3 in the illustration above.

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

2.3 Stand assembly

2.3.1 Procedure

The track motion should be assembled as described in the procedure below. Detailed descriptions of each stage can be found further on in the manual.

	Action
1.	Assemble the stand modules according to <i>"Positioning the stand" on page 2 - 9.</i>
2.	Assemble the linear guides according to <i>"Fitting the linear guides" on page 2 - 11.</i>
3.	Assemble the gear racks according to <i>"Installing gear racks" on page 2 - 18.</i>
4.	Secure the stand to the foundation according to <i>"Securing the stand to the foundation" on page 2 - 19.</i>
5.	Fit the protective guards and cover plates according to <i>"Fitting the cover plates" on page 2 - 19.</i>
6.	Fit the cable tray according to <i>"Fitting the cable tray and manipulator" on page 2 - 21.</i>



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

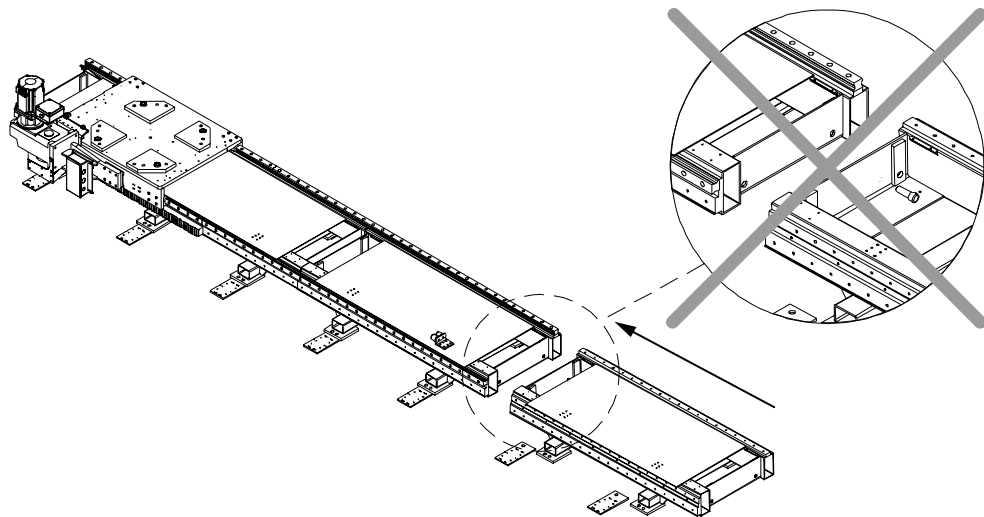
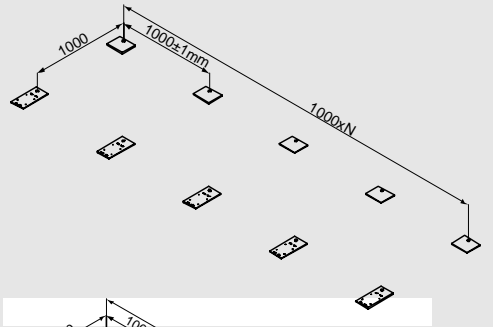

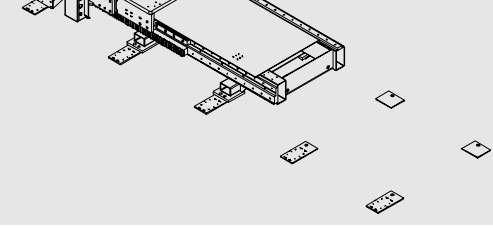

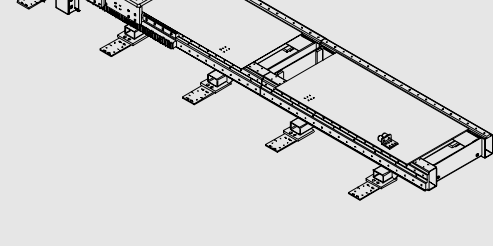


Figure 5 Stand module

stativmodul_IRC5.wmf

2.3.2 Positioning the stand

Follow the directions below to position the stand modules:

Action	Info/Illustration
<p>1. Position the leveling plates on one side of the intended installation location. Position the bottom plates for the cable tray modules on the other side of the installation location. The spacing between the centers of the plates should be 1000 mm.</p>	
<p>2. Position the first stand module, with carriage, precisely at the intended installation location.</p>	
<p>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 continue with "Fitting the linear guides" on page 2 - 11.</p>	
<p>4. Position the next module in the direction of travel adjacent to the newly aligned module.</p>	
<p>5. Adjust according to "Adjusting the level" on page 2 - 10 so that this and the previous module's machined surfaces (for linear guide and gear rack) are flat and level with each other. If more modules are to be fit, repeat steps 3 and 4. Otherwise continue with "Fitting the linear guides" on page 2 - 11.</p>	

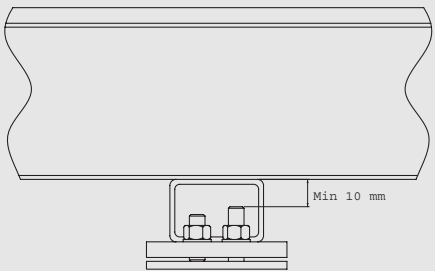
2.3.3 Adjusting the level



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

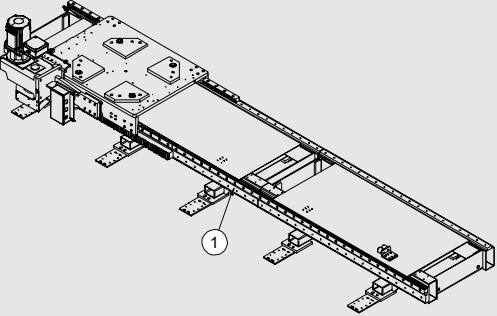
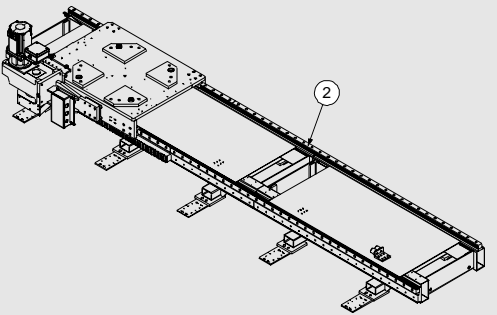
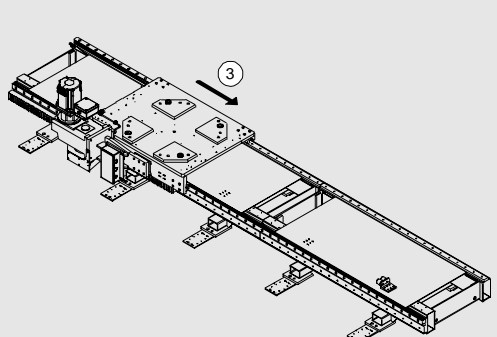
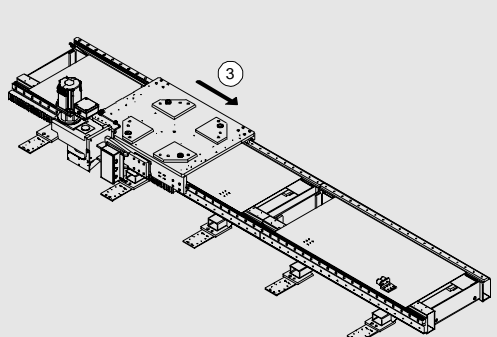
It is recommended that a laser level be used in the track motion's direction of travel and a spirit level across this to obtain satisfactory adjustment. Always measure on a machined surface, for example, for the linear guide or gear rack.

Follow the instructions below to adjust the level of the beam units.

	Action	Info/Illustration
1.	Turn the leveling bolts to raise or lower the ground plates. The distance between the leveling 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.	

2.3.4 Fitting the linear guides

Follow the instructions below to fit the linear guide.

Action	Info/Illustration
<p>1. Secure the part of the linear guide to be fitted at the side.</p>	
<p>2. Position the part that is to be fitted on top, without securing it.</p>	
<p>3. Push the carriage forward so that the first ball element overlaps half of the joint. The carriage can be moved manually if 24 VDC is connected to the motor; see "Moving the carriage manually" on page 2 - 3.</p>	
<p>4. Push the carriage forwards and successively bolt the linear guides on the top. <i>Tightening torque: 50Nm.</i> If more sections are to be assembled, repeat step 1. Otherwise continue with "Installing gear racks" on page 2 - 18.</p>	

2.3.5 Geometric adjustment of track motion

Geometric adjustment of track motion can be performed in accordance with three methods.

Method	Description
Method 1	Adjustment of the track motion with a spirit level for adjustment of the carriage horizontally along the entire travel length.
Method 2	Adjustment of the track motion with position measurement equipment for adjustment of the carriage horizontally along the entire travel length.
Method 3	Adjustment of the track motion with laser adjustment instrument based on the available geometric system layout.



Note that the origin of coordinates is located in the manipulator's base zero.

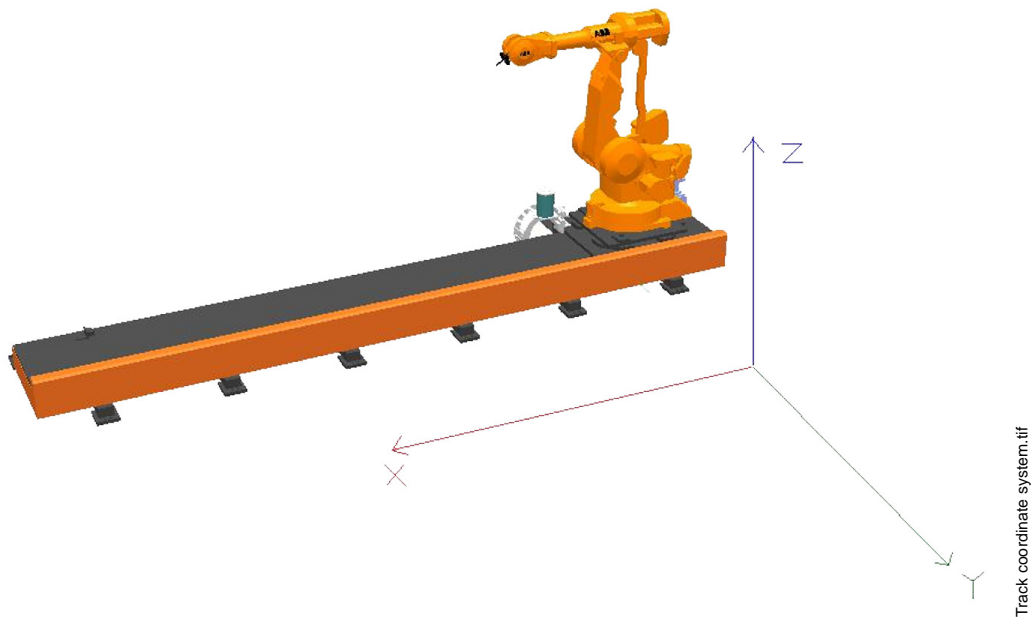


Figure 6 Geometric adjustment of track motion

Method 1



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

Adjustment of the track motion with a spirit level for adjustment of the carriage horizontally along the entire travel length.

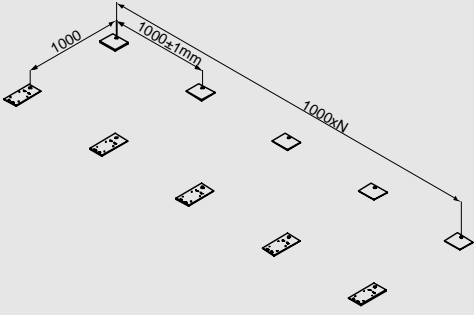
	Action	Info/Illustration
1.	Position the track motion at the desired position on the adjustment plates. <ul style="list-style-type: none"> Position the leveling plates on one side of the intended installation location. Position the bottom plates for the cable tray modules on the other side of the installation location. The spacing between the centers of the plates should be 1000 mm. 	
2.	Start adjustment by placing the carriage against one end of the motion.	
3.	Use a spirit level and adjust the horizontal position along the X- and Y-axes using the adjustment bolts. X-zero is at the synchronization point, with the value increasing along the track motion.	Accuracy must be at least ± 0.5 mm along the travel length and ± 0.1 mm in height between the sides.
4.	Move the carriage in steps of 1 meter and repeat the procedure along the entire length of the track motion.	
5.	After adjusting the level of the entire track motion, the mounting bolts must be tightened.	

Mechanical installation

Geometric adjustment of track motion

Method 2

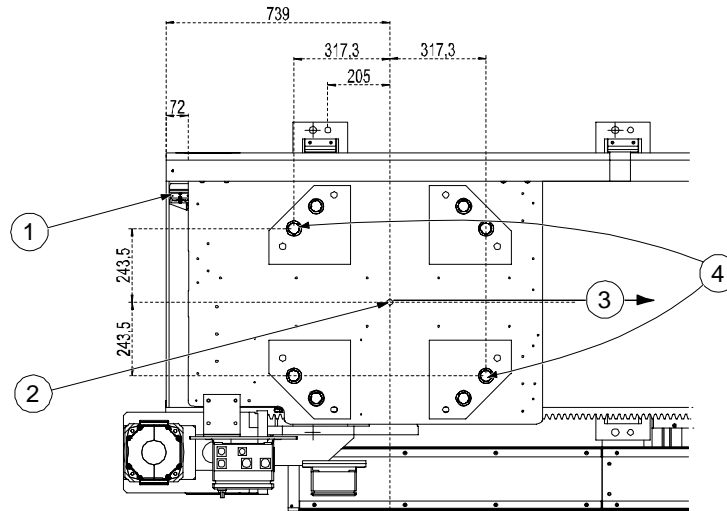
Adjustment of the track motion with position measurement equipment for adjustment of the carriage horizontally along the entire travel length.

	Action	Info/Illustration
1.	Position the track motion at the desired position on the adjustment plates. <ul style="list-style-type: none"> • Position the leveling plates on one side of the intended installation location. • Position the bottom plates for the cable tray modules on the other side of the installation location. • The spacing between the centers of the plates should be 1000 mm. 	
2.	Place the prism in one of the mounting holes. See Figure 7 .	
3.	Move the carriage to position X-zero.	Vernier scales against one another.
4.	Move the entire track motion to the correct X-zero and Y-zero position.	
5.	Use a spirit level to attain the horizontal level (Z-value) by adjusting the adjustment bolts.	
6.	Mounting hole measurement from robot center.	Same center-point for in-line and 90° robot position

Installation and operation



Due to the end cover plates and the tolerance chain, the dimension (739 mm) varies by ± 8 mm when the track motion is at position X-zero.



layout akvagn.wmf

Figure 7 Carriage layout

Item	Description	Item	Description
1	Vernier scale	3	X positive direction
2	Robot center when track motion is at position X-zero	4	Mounting hole

	Action	Info/Illustration
7.	When the start position has been reached for X-, Y- and Z-zero: Continue to move the carriage along the motion to adjust level horizontally using a spirit level and to adjust the motion so that it follows the Y-axis.	Accuracy must be at least ± 0.5 mm along the travel length and ± 0.1 mm in height between the sides.
8.	After adjusting the level of the entire track motion, the mounting bolts must be tightened.	

Method 3



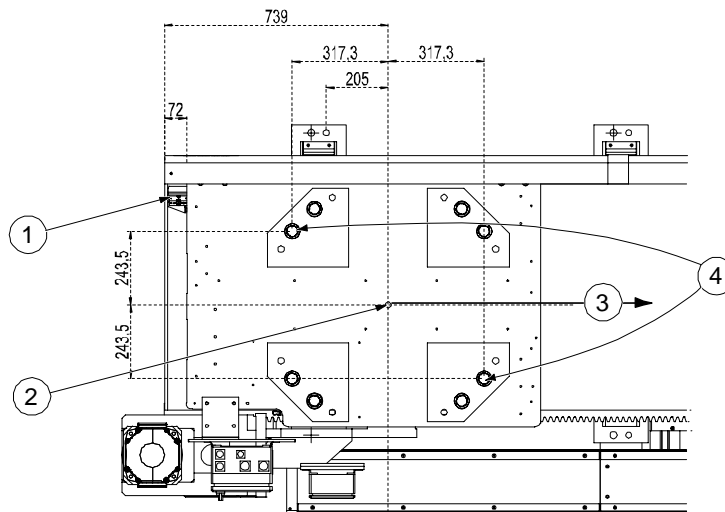
Method 3 should be used if the robot is already installed on the track motion.

Method 3 is based on the available geometric system layout. This requires a laser adjustment instrument for installation.

	Action	Info/Illustration
1.	Determine coordinate system at installation location for the track motion. Place the track motion on the adjustment plates at the position provided by the simulation. Use the track motion's zero-point on the X-axis as reference. The value on the X-axis increases from the zero-point along the motion.	Figure 8 shows the zero-point with the vernier scale placed on the opposite side of the cable chain.



Due to the end cover plates and the tolerance chain, the dimension (739 mm) varies by ± 8 mm when the track motion is at position X-zero.



layout_åkvagn.wmf

Figure 8 Carriage layout

Item	Description	Item	Description
1	Vernier scale	3	X positive direction
2	Robot center when track motion is at position X-zero	4	Mounting hole

	Action	Info/Illustration
2.	The values taken from the virtual layout must be transferred and implemented on the track motion by placing the prism along the motion in steps of 1 m to obtain X-, Y- and Z-values that correspond to the virtual values.	
3.	The prism is placed at the edge of the vertically mounted linear guide and above the horizontally mounted linear guide; see Figure 9 .	Begin by adjusting the level of the vertical linear guide.
4.	When the vertical linear guide is measured, the prism should have an angle bracket so that both the Y- and Z-values can be adjusted.	
5.	When the vertical linear guide matches the virtual layout, the horizontal linear guide can be adjusted either through further measurement or by using a spirit level on the robot's mounting surface on the carriage.	

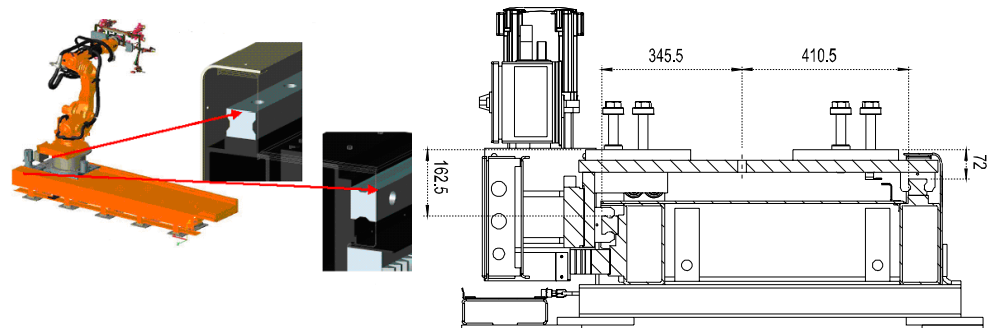
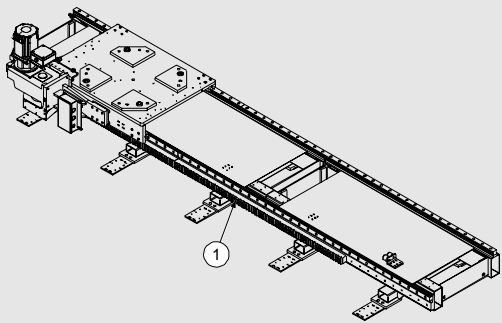
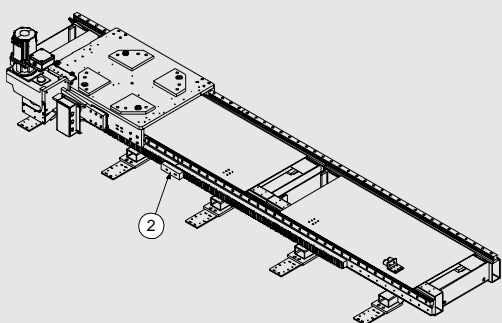


Figure 9 Placement of the prism on the linear guides

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

2.3.6 Installing gear racks

Follow the instructions below to assemble the gear racks.

	Action	Info/Illustration
1.	Lay out the section of the gear rack to be installed 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 section and the gear rack do not mesh, continue with step 3; otherwise go directly to step 6.	
3.	If the teeth on the test section 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: 50 Nm.</i>	
6.	Secure the assembled gear rack section. <i>Tightening torque: 50 Nm.</i> If more sections are to be fitted, repeat step 1; otherwise continue with "Securing the stand to the foundation" on page 2 - 19.	

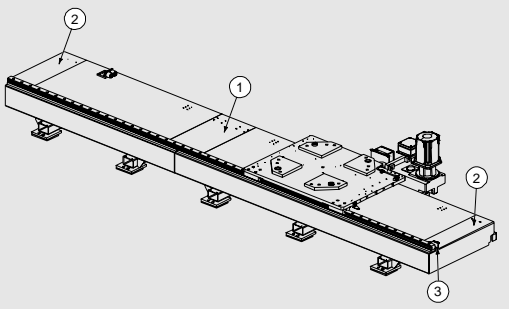
2.3.7 Securing the stand to the foundation

Follow the instructions below to secure the stand to the foundation.

	Action
1.	Check that none of the leveling bolts on the track motion's ground plates are hanging in the air or that the distance between the leveling 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 travel length, both in the direction of travel and across it. The carriage can be moved manually if 24 VDC is connected to the motor; see page 1- 4. 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 with "Fitting the cover plates" on page 2 - 19.

2.3.8 Fitting the cover plates

Follow the instructions below to fit the cover plates.

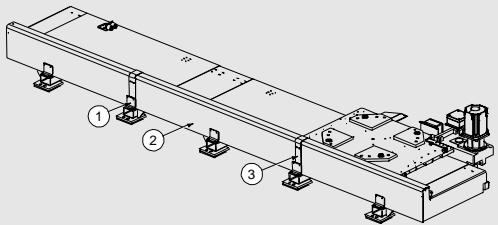
	Action	Info/Illustration
1.	Fit cover plates over all joints.	
2.	Fit end plates on the track motion's ends.	
3.	Mount the calibration sign according to position 3.	

Mechanical installation

Fit the side plates

2.3.9 Fit the side plates

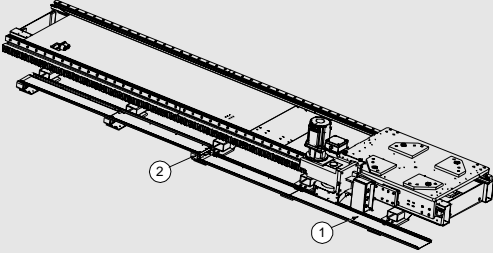
Follow the instructions below to fit the side plates.

	Action	Info/Illustration
1.	Fit the angle brackets on the ground plates.	
2.	Fit the side covers by pushing them down between the beam and angle bracket. Tighten the retaining screws in the angle brackets.	
3.	Apply tape over all joints in the side guard.	
4.	Continue with "Fitting the cable tray" on page 2 - 21	

2.4 Fitting the cable tray and manipulator

2.4.1 Fitting the cable tray

Follow the instructions below to position the cable tray and leveling plates.

Action	Info/Illustration
<p>1. Bolt the cable tray's guide plates to the plates. Tap the side gently if the holes do not align.</p>	
<p>2. If the travel length of the completed track motion is 5.7 meters 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 middle ground plate (with an odd number of ground plates), or on one of the closest subsequent ground plates in the direction of travel (with an even number).</p>	
<p>3. Only for IRBT 6003S/4003S Covered: Attach the guard plates for the cable tray by first fitting the angle bracket on the cable tray and then fitting the plates.</p>	

2.4.2 Fitting the manipulator

Depending on the order, the manipulator should be fitted in one of the following two positions:

- Inline
Neutral position for axis 1 aligned with the track motion's direction of travel.
- 90°
Neutral position for axis 1 aligned 90° with the track motion's direction of travel.

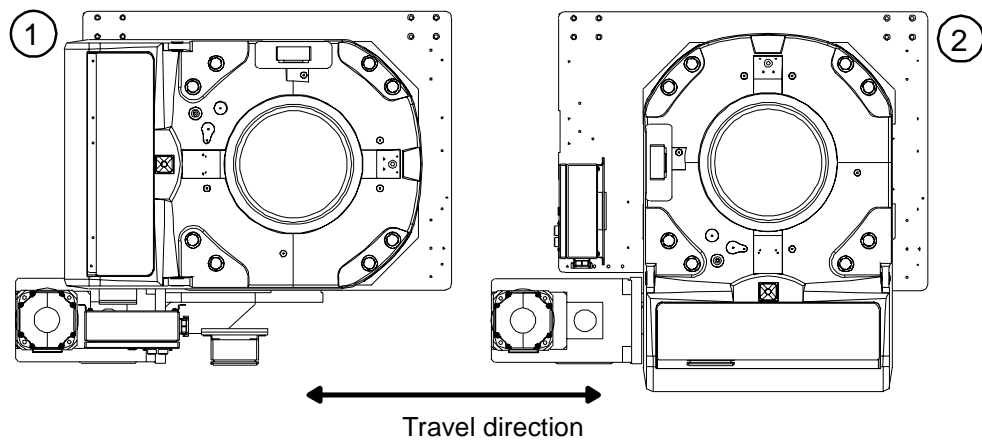


Figure 10 Manipulator mounting positions, Inline (1) and 90° (2).

manipulatorns monteringslagen IRC5.wmf

3 Electrical installation

3.1 Robot cable harness

The robot's cable harness is sufficiently long for installation in one of the two possible positions on the carriage. Any surplus length 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 control gear with the manipulator and carriage is connected to the track motion's connection point, J1.

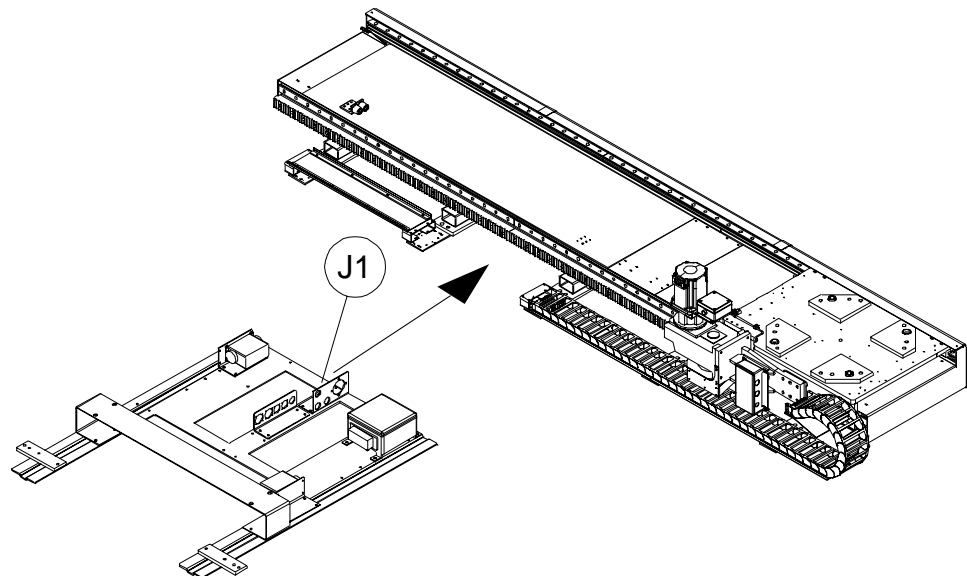


Figure 11 Connection point J1

Kopplingspunkt J1 IRC5.wmf

3.2 Connections/Wiring diagrams

Introduction

The following wiring diagrams show the connections between the control gear, manipulator and track motion.

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

"yy"

When the last numbers of an article number are replaced by "yy" in the table, the cable length is stated in decimeters (-70 for 7 meters, -150 for 15 meters and -220 for 22 meters).

"z"

When the last number of an article number is replaced with "z", it is indicated as in the following table.

Cable length	z
5 meters	001
6 meters	002
7 meters	003
8 meters	004
9 meters	005
10 meters	006



For other numbers replaced with letters in article numbers, see [page 1- 16](#).



The abbreviations SSG, RSG and MH in the following sections stand for: Stationary Servo Gun (SSG), Robot Servo Gun (RSG) and Material Handling (MH).

3.3 IRB 6600 M2004, MH, high voltage

3.3.1 Wiring diagram

MH, (Option 770-4, 7 axes).

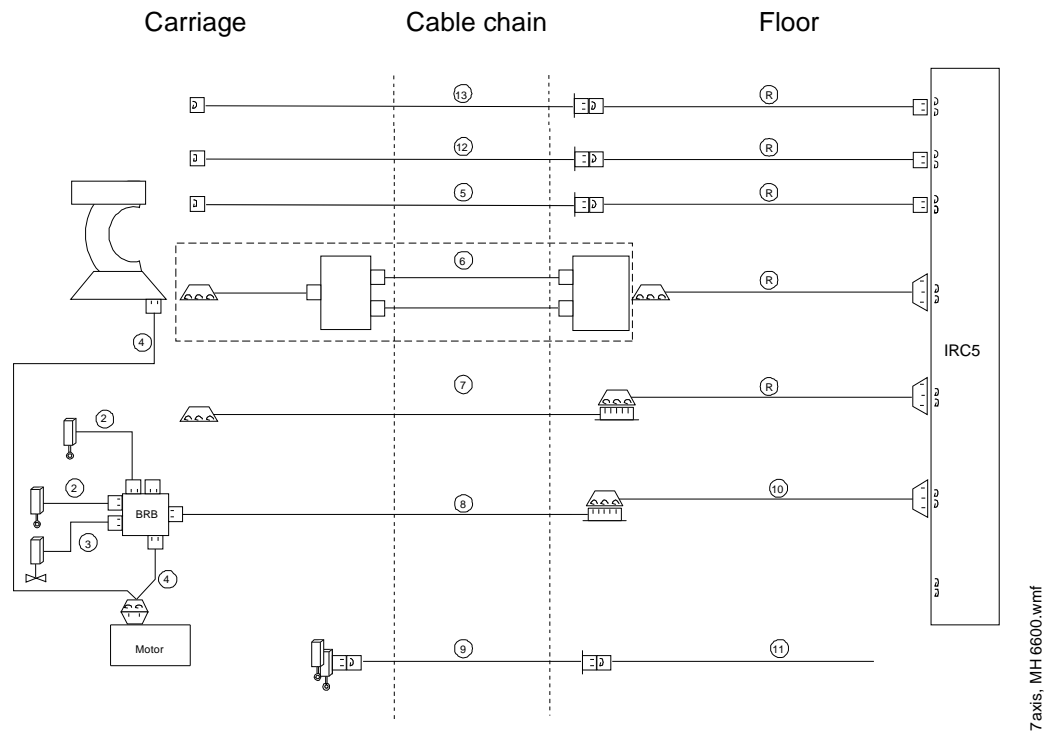


Figure 12 Wiring diagram, IRB 6600 M2004, MH

3.3.2 Standard cables

Standard cables	Art no	Item
Power/resolver cable axis 7, Inline	3HEA 800 803-001	4
Power/resolver cable axis 7, 90°	3HEA 800 803-002	4
Serial measurement cable axes 1–7	3HXD 1455-yy	5
Power cable axes 1–6	3HXD 1519-x	6
Power cable axis 7	3HEA 800 826-z	8
Floor power cable axis 7, 7 m	3HEA 800 824-001	10
Floor power cable axis 7, 15 m	3HEA 800 824-002	10
Floor power cable axis 7, 22 m	3HEA 800 824-003	10
Floor power cable axis 7, 30 m	3HEA 800 824-004	10

3.3.3 Option cables

Accessory cables	Art no	Item
Limit switch cable	3HEA 801 125-001	2
Cable, central lubrication, 2 m	3HEA 800 675-001	3
Cable, central lubrication, 20 m	3HEA 800 675-002	3
Cable, central lubrication, 22 m	3HEA 800 675-003	3
Cable, central lubrication, 24 m	3HEA 800 675-004	3
Robot customer cable harness		
CP/CS Canbus/DeviceNet	3HEA 801 279-z	7
CP/CS Interbus	3HEA 801 278-z	7
CP/CS Profibus	3HEA 801 280-z	7
CP/CS Parallel	3HEA 801 277-z	7
Position switch cable	3HXD 1381-yy	9
Position switch cable, floor	3HXD 1382-yy	11
Position switch cable axis 1	3HXD 1638-yy	12
Position switch cable axes 2–3	3HXD 1691-yy	13

3.4 IRB 6600 M2004, SSG, high voltage

3.4.1 Wiring diagram

SSG (Option 785-4, 770-4, 771-4, 787-1, -2, -3, -4, 635-1 8 axes).

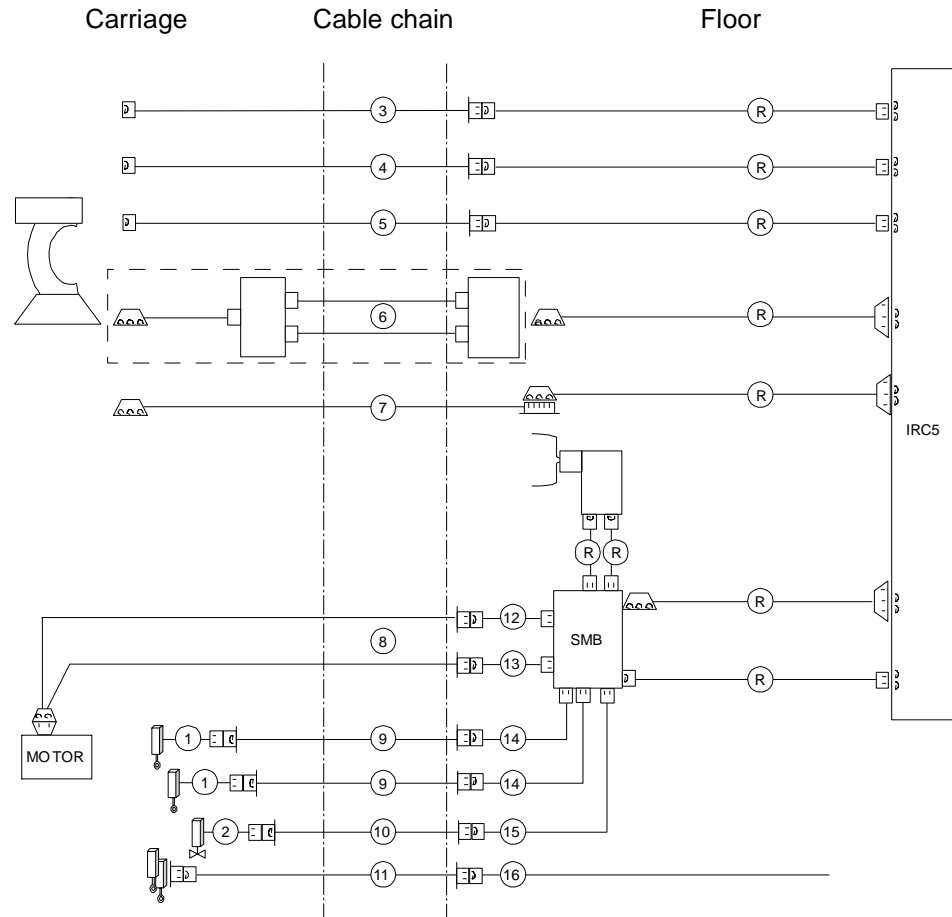


Figure 13 Wiring diagram, IRB 6600 M2004, SSG

8axis,SG 6600.wmf

3.4.2 Standard cables

Standard cables	Art. no.	Item
Signal cable	3HEA 801 125-001	1
Signal cable, 2 m	3HEA 800 675-001	2
Signal cable, 20 m	3HEA 800 675-002	2
Signal cable, 22 m	3HEA 800 675-003	2
Signal cable, 24 m	3HEA 800 675-004	2
Signal cable axes 1-6	3HXD 1455-yy	5
Power cable axes 1-6	3HXD 1519-x	6
Power/resolver cable axis 8	3HEA 800 813-z	8
Signal cable	3HEA 801 358-z	10
Floor power cable axis 8	3HXD 1249-15	12
Resolver cable axis 8	3HXD 1250-15	13
Floor signal cable	3HEA 801 357-001	15

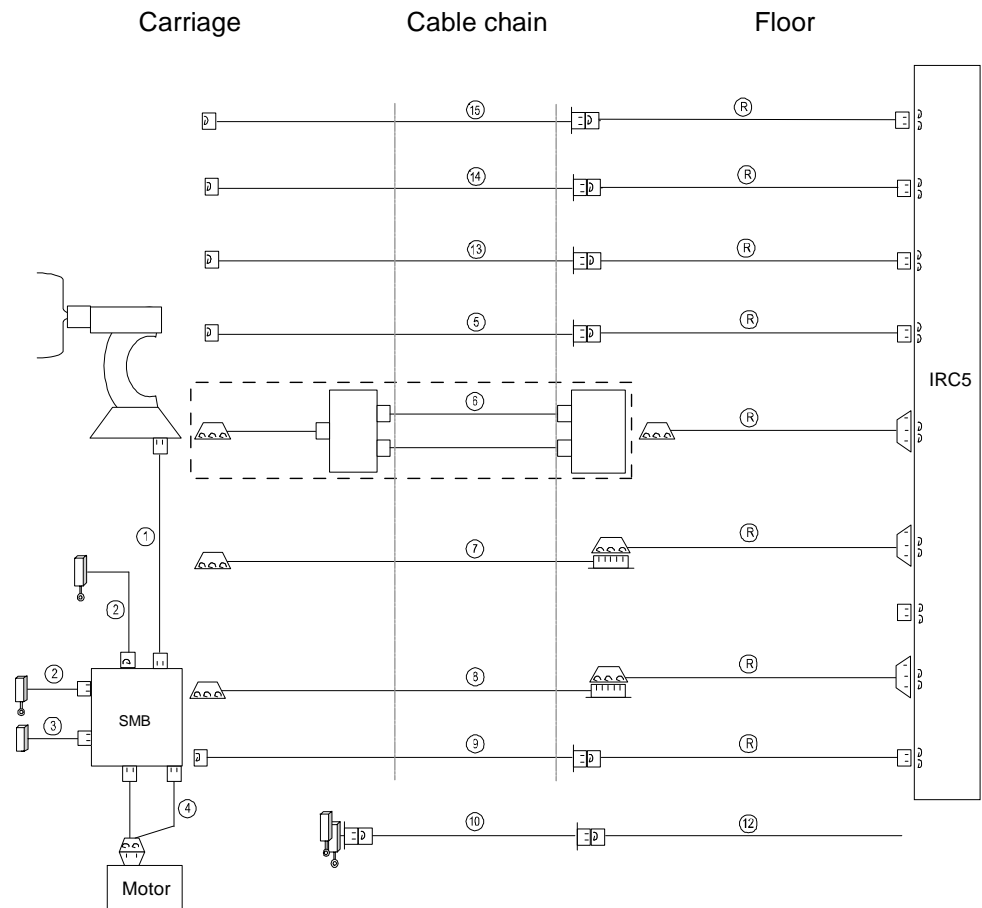
3.4.3 Option cables

Option cables	Art. no.	Item
Position switch cable axes 2-3	3HXD 1691-yy	3
Position switch cable axis 1	3HXD 1638-yy	4
Robot customer cable harness		
CP/CS Canbus/DeviceNet	3HEA 801 279-z	7
CP/CS Interbus	3HEA 801 278-z	7
CP/CS Profibus	3HEA 801 280-z	7
CP/CS Parallel	3HEA 801 277-z	7
Limit switch cable	3HEA 801 348-z	9
Position switch cable	3HXD 1381-yy	11
Floor limit switch cable	3HEA 801 347-001	14
Floor position switch cable	3HXD 1382-yy	16

3.5 IRB 6600 M2004, RSG, high voltage

3.5.1 Wiring diagram

SSG, (Option 785-2, 770-4, 771-4, 787-1, -2, -3, -4, 635-1 8 axes).



8axis, RG 6600.wmf

Figure 14 Wiring diagram, IRB 6600 M2004, RSG

3.5.2 Standard cables

Standard cables	Art. no.	Item
Power cable axis 7, 90°	3HXD 1249-10	1
Power cable axis 7, Inline	3HXD 1249-15	1
Resolver and power cable axis 8, 0.5 m	3HEA 800 827-001	4
Resolver and power cable axis 8, 1 m	3HEA 800 827-002	4
Signal cable axes 1–6	3HXD 1455-yy	5
Power cable axes 1–6	3HXD 1519-x	6
Power cable axis 8	3HEA 800 678-z	8
Signal cable axes 7–8	3HXD 1410-yy	9

Electrical installation

Option cables

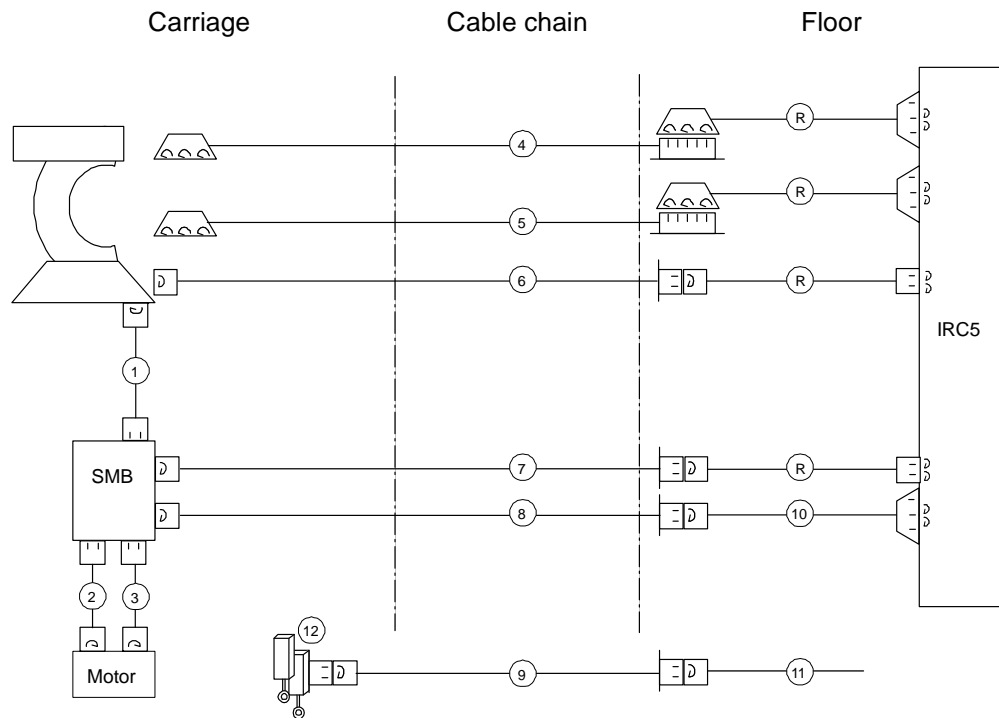
3.5.3 Option cables

Option cables	Art. no.	Item
Limit switch cable	3HEA 801 125-001	2
Cable, central lubrication, 2 m	3HEA 800 675-001	3
Cable, central lubrication, 20 m	3HEA 800 675-002	3
Cable, central lubrication, 22 m	3HEA 800 675-003	3
Cable, central lubrication, 24 m	3HEA 800 675-004	3
Robot customer cable harness		
CP/CS Canbus/DeviceNet	3HEA 801 279-z	7
CP/CS Interbus	3HEA 801 278-z	7
CP/CS Profibus	3HEA 801 280-z	7
CP/CS Parallel	3HEA 801 277-z	7
Position switch cable axis 8	3HXD 1381-yy	10
Floor position switch cable axis 8	3HXD 1382-yy	12
Position switch cable axis 1	3HXD 1638-yy	13
Position switch cable axes 2–3	3HXD 1691-yy	14
Power cable welding 35 mm ²	3HXD 1474-yy	15

3.6 IRB 4400

3.6.1 Wiring diagram

(Option 770-3)



kopplungsschema_4400.wmf

Figure 15 Wiring diagram, IRB 4400

3.6.2 Standard cables

Standard cables	Art. no.	Item
Serial measurement cable axes 1–6	3HXD 1432-yy	1
Motor cable axis 7 (1.5 m)	3HXD 1249-15	2
Resolver cable (1.5 m)	3HXD 1250-15	3
Power cable axes 1–6	3HXD 1295-yy	5
Serial measurement cable axes 1–7	3HXD 1443-yy	7
Power cable axis 7	3HXD 1252-yy	8
Power cable, floor, 7 m	3HEA 800 896-001	10
Power cable, floor, 15 m	3HEA 800 896-002	10
Power cable, floor, 22 m	3HEA 800 896-003	10
Power cable, floor, 30 m	3HEA 800 896-004	10

Option cables

3.6.3 Option cables

Option cables	Art. no.	Item
Customer cable	3HXD 1296-yy	4
Position switch cable axis 1	3HXD 1433-yy	6
Position switch cable axis 7	3HXD 1381-yy	9
Floor position switch cable axis 7	3HXD 1382-yy	11
Zone switch axis 7 (incl. cable)	3HXD 0100-320	12

4 Commissioning

4.1 Preparations

Before the track motion is put in service the system must be prepared. The following steps must be carried out before starting the track motion.

	Action	Info/Illustration
1.	Configure the control gear	Load the operating parameters and configure the control gear according to "Load the operating parameters" on page 2 - 33.
2.	Activate the lubrication system	Activate the automatic lubrication system according to "Activating the automatic lubrication system" on page 2 - 35.
3.	Calibrate	Calibrate the track motion according to "Calibration" on page 2 - 38

4.2 Configure the control gear

4.2.1 Load the operating parameters

Before starting, the track motion must be defined in the system with the operating parameters, which can be found on the supplied floppy disk.

A description of how to load parameters from the floppy to the control gear can be found in the robot documentation.

Proceed as follows to load the operating parameters.



x in the filename varies depending on the drive module and drive unit that the track motion is connected to.

	Action
1.	Select the file: Add New Parameters
2.	Load the file MOC_T6003_DMx_Mx.cfg or MOC_T6003_DMx_Mx.cfg

4.2.2 Commutation offset

The IRBT commutation offset is a fixed value that is entered at the factory. All IRBT 6003S/4003S track motions have the same offset value and do not need to be changed.

4.2.3 Travel length

The various 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.

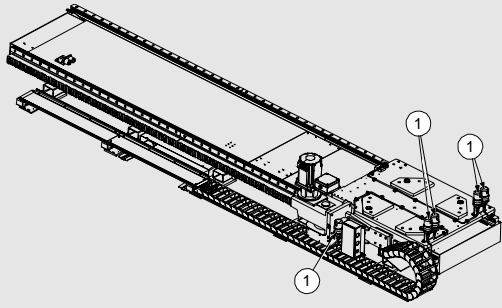
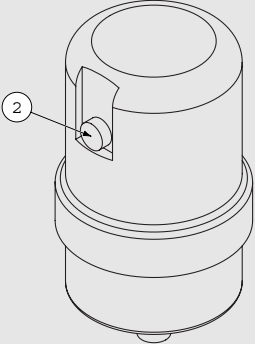
4.3 Activating the automatic lubrication system

If the track motion is equipped with an automatic lubrication system, it must be activated. These may be of different types – automatic lubrication systems with grease injectors or central lubrication systems with timers. These are activated in different ways.

4.3.1 Activating 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 automatically apply the correct amount of grease for three months.

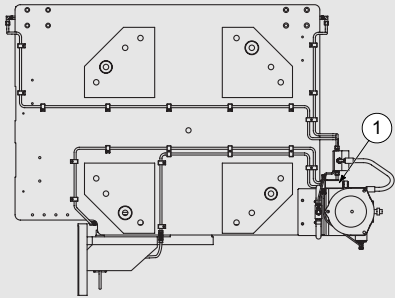

Activate the grease injectors as follows:





Action	Info/Illustration
<ol style="list-style-type: none"> 1. Locate the grease injectors (5 units). 	
<ol style="list-style-type: none"> 2. Press the activation pin fully on each grease injector. 3. Listen for the injector's grease motor to start (it takes about 10 seconds after the pin has been pressed in). 	


4.3.2 Setting timer for 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. This setting may need to be changed if too much lubricant is pumped out or if lubrication is unsatisfactory.

Set the timer as follows:

Action	Info/Illustration
1. Locate the central lubrication system. The control panel is behind the small hatch on the lubrication system at position 1.	
2. Set the function using DIP switches 4 and 5 as shown in the table below.	

Function	DIP switch
Cyclic lubrication interval: The lubrication valve opens for t_{on} (see step 3), closes for t_{off} and opens 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} and then closes for 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. The valve remains open until the power is turned off.	

3. Set the interval for t_{on} using DIP switches 1–3 and the interval for t_{off} using DIP switches 6–8 as shown in the table below.	
--	---

Time interval	DIP switch
0.5–10 s	
1.5–30 s	
5.0–100 s	
0.5–10 min	

Time interval	DIP switch
1.5–30 min	
5.0–100 min	
12.0–240 min	
0.5–10 h	

Action	Info/Illustration
<p>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.</p>	
<p>5 Recommended by ABB.</p>	

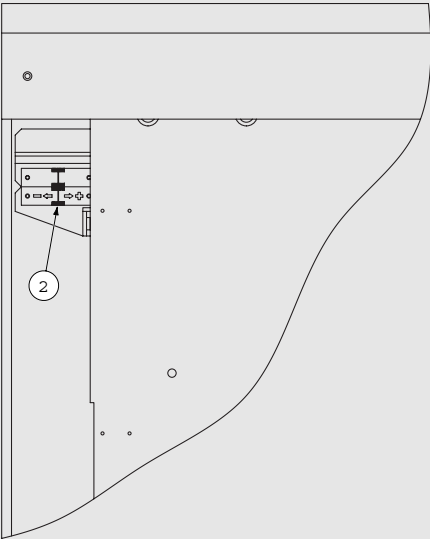
4.4 Calibration



Make sure no one is on the track motion when the carriage moves. Also make sure that the track motion's cover plates are free from foreign objects; these can otherwise become trapped between the carriage and the plates.

4.4.1 Calibrating the track motion

Before the robot system can be used, the resolvers must be calibrated. Calibrate according to the instructions below.

	Action	Info/Illustration
1.	Calibrate according to the instructions in the robot's documentation.	
2.	Check that the carriage stops exactly at the calibration mark.	
3.	Save the system parameters according to the instructions in the robot's documentation.	

4.4.2 Calibrating at 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 either at restart. The resolvers only need to be calibrated when commissioning the system.

4.4.3 Checking the work space



The track motion's work space must be inspected before the system is put in service.

Checking the work space

Run the system manually using the joystick and check that:

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

4.4.4 There is no abnormal wear and noise.

Abnormal noise when the track motion is put in service may be due to incorrect assembly of the linear guides or gear racks, or because the gear play meshing pressure needs adjustment.

Linear guide joints

Check and adjust the linear guides joints as required according to *"Fitting the linear guides" on page 2 - 11*.

Gear rack joints

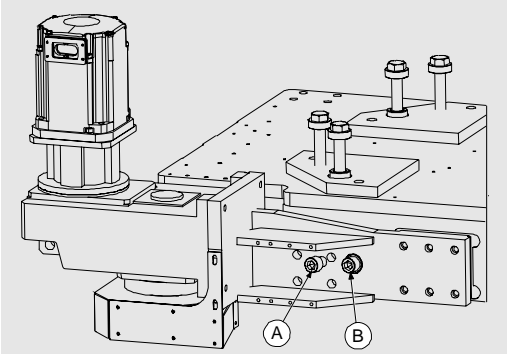
Check and adjust the gear racks joints as required according to *"Installing gear racks" on page 2 - 18*.

Commissioning

There is no abnormal wear and noise.

Gear play

Gear play is adjusted with two adjuster screws on the motor mount as follows:

	Action	Info/Illustration
1.	Push the motor mount outwards by turning screw A. Pull the motor mount inwards by turning screw B.	
2.	Check the play by pushing the carriage back and forth. Permitted play: <ul style="list-style-type: none">• static ± 0.2 mm• dynamic (Please contact ABB for information.)	

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1 Maintenance intervals

1.1 Routine checks and preventive maintenance

1.1.1 Maintenance chart

The track motion is designed for a minimum of maintenance. However, routine checks and preventive maintenance must always be performed 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 - 7
	Cables and connectors	Check visible cables	page 3 - 7
	Cable chain	Check the visible cable chain	page 3 - 7
	Junction boxes	Check	page 3 - 8
	Drive motor	Check	page 3 - 8
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 - 5
	Ball element	Check torque	page 3 - 6
Every 5000 operating hours	Gearbox	Change the oil	page 3 - 6
Every 5 years	Back-up battery	Change the battery for signs of discharge	page 3 - 8

Maintenance intervals

Maintenance chart

2 Maintenance instructions

2.1 Mechanical maintenance

2.1.1 Lubrication of ball element and gear rack

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

Apply grease to the ball until the grease is forced out of the end seals, approximately 4.7 cm³ (1.85 in³).

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

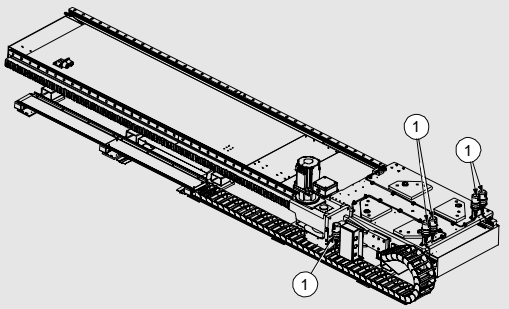
Manufacturer	Lubricant
OPTIMOL	Longtime PD2
Shell	Alvania WR2

2.1.2 Checking 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.

2.1.3 Checking the grease injectors

Check the lubricant level in the grease injectors as follows.

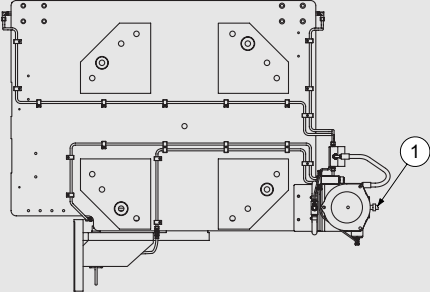
Action	Info/Illustration
<ol style="list-style-type: none"> 1. Locate the lubrication system. 2. Check the lubricant level on the transparent scale. If low, fill according to "Changing grease injectors" on page 3 - 5. 	

Maintenance instructions

Checking the central lubrication system

2.1.4 Checking the central lubrication system

Check the lubricant level in the grease injectors as follows.

	Action	Info/Illustration
1.	Locate the lubrication system.	
2.	Check the level in the transparent lubricant tank. If low, fill according to <i>"Refilling the lubricant" on page 3 - 5.</i>	

2.1.5 Cleaning and lubrication of 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

2.1.6 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

2.1.7 Cleaning the linear guides

Inspect and clean the linear guides if necessary.

2.1.8 Refilling the lubricant

If the track motion is equipped with an automatic lubrication system, the system must be refilled every third month or when empty.

Refilling is accomplished by changing the grease injector.

Changing grease injectors

If an electromechanical grease injector is empty, the entire grease injector is replaced as follows:



Only use grease injectors with 3-month or less capacities.

Action	Info/Illustration
1. Remove the empty grease injector.	
2. Remove the protective cover on the new grease injector.	
3. Press the activation pin fully; see position 2.	
4. Fit the new grease injector.	

2.1.9 Filling the central lubrication system

If the central lubrication system is empty, new lubricant is added as follows:

Action	Info/Illustration
1. Connect the supplied filling nipple at position 1.	
2. Fill with lubricant as specified below.	

- The tank holds 2.71 kg (6 Lb Cyl)

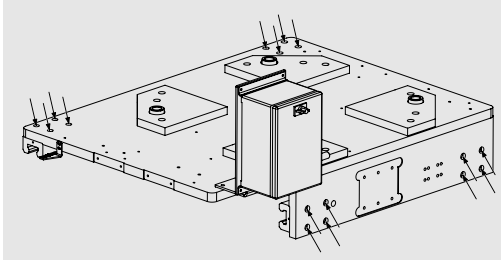
Use ball element grease as specified in NLGI 1, for example:

Manufacturer	Lubricant
Q8	Q8 Rembrandt EP1
Mobil	Mobilux EP1

Maintenance instructions

Check torque ball element

2.1.10 Check torque ball element

	Action	Info/Illustration
1.	Tighten the 16 screws to 70 Nm.	

2.1.11 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 liters
- The oil must comply with the standards for high pressure oil under CLP198-242 mm²/s/40°C.

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

2.2 Electrical maintenance

2.2.1 Inspection of electrical operations

The track motion should be checked monthly with regard to:

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

2.2.2 Checking the emergency stop

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

	Action
1.	Stop the carriage.
2.	Press the emergency stop.
3.	Try to start the track motion.

2.2.3 Checking wiring

Check monthly:

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

2.2.4 Checking connectors

Check monthly:

- That all connectors are secure and there is no risk for play

2.2.5 Inspecting the cable chain

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

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

2.2.6 Checking junction boxes

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

- Damage
- Connections
- Tightness

2.2.7 Checking the drive motor

Check the drive motor monthly with regard to:

- Abnormal bearing noise
- Connections

2.2.8 Backup battery

The track motion's serial measurement board (SMB) uses a battery for memory backup to retain position data.

The battery is a rechargeable lithium battery.

The battery should be replaced:

- Every five years

or

- When the battery is nearly discharged.

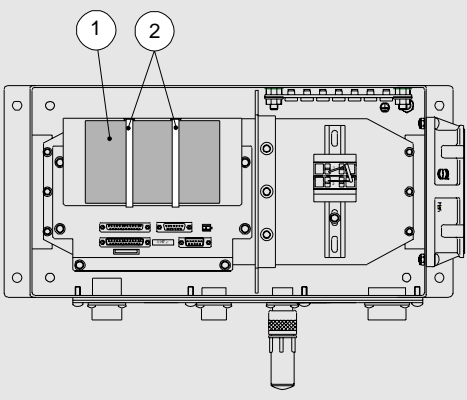
This is generally shown by an error code on the FlexPendant's display.

Information on error codes can be found in the FlexPendant documentation.



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

Replace the battery as follows:

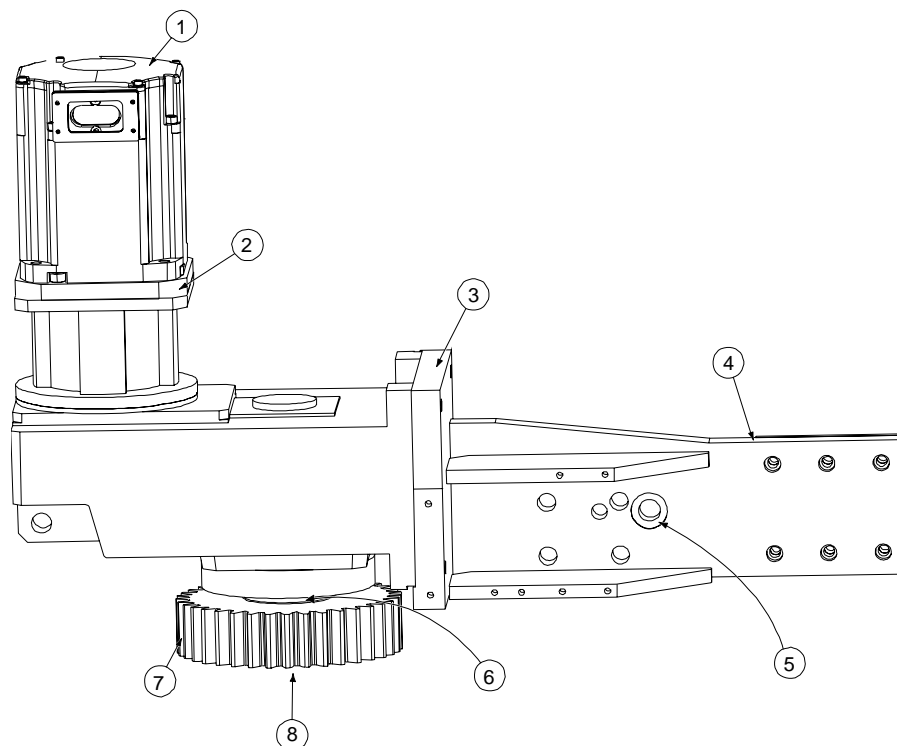
	Action	Info/Illustration
1.	Open the box and locate the battery (1).	
2.	Cut off the cable tie holding the battery.	
3.	Disconnect the two-wire cable and remove the battery.	
4.	Fit the new battery in the reverse order.	

3 Spare parts

3.1 Spare parts independent of length

3.1.1 Low voltage drive unit

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



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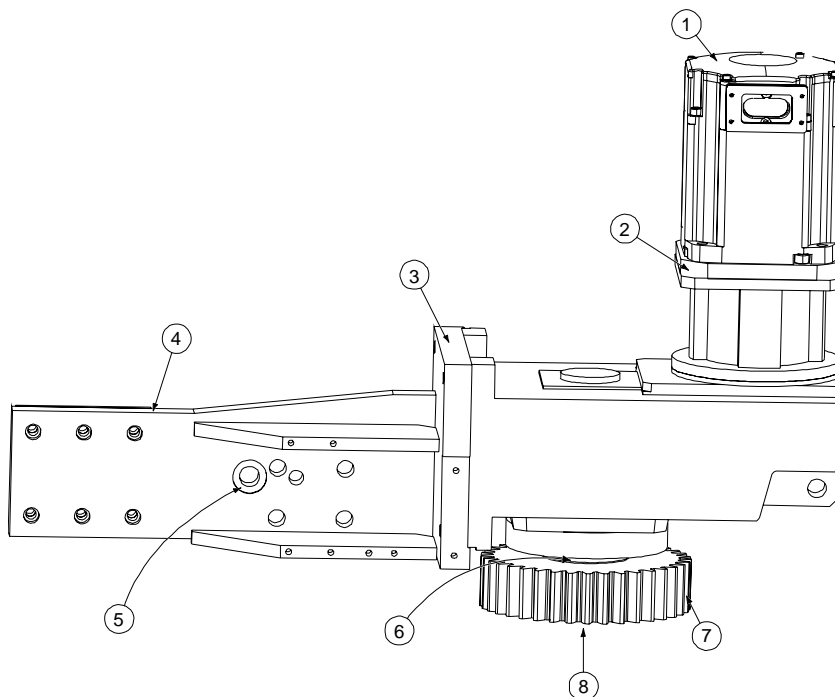
Quantity	Description	Art. no.	Item
1	Drive unit, IRB 4400	3HEA 801 287-001	-
1	Motor IRB 4400	506 262-880	1
1	Motor flange for motor	3HXD 1000-459	2
1	Gear unit, IRB 4400	3HXG 1141-1	3
1	Motor mount	3HEA 801 171-001	4
2	Socket head cap screw	3HXG 1138-3	5
1	Spacer	3HXD 1000-492	6
1	Gear wheel	3HXD 1000-490	7
1	Retainer sleeve	3HXG 1000-506	8
1	Gear wheel guard (not shown)	3HXD 0100-348	-

Spare parts

Low voltage drive unit, mirrored

3.1.2 Low voltage drive unit, mirrored

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

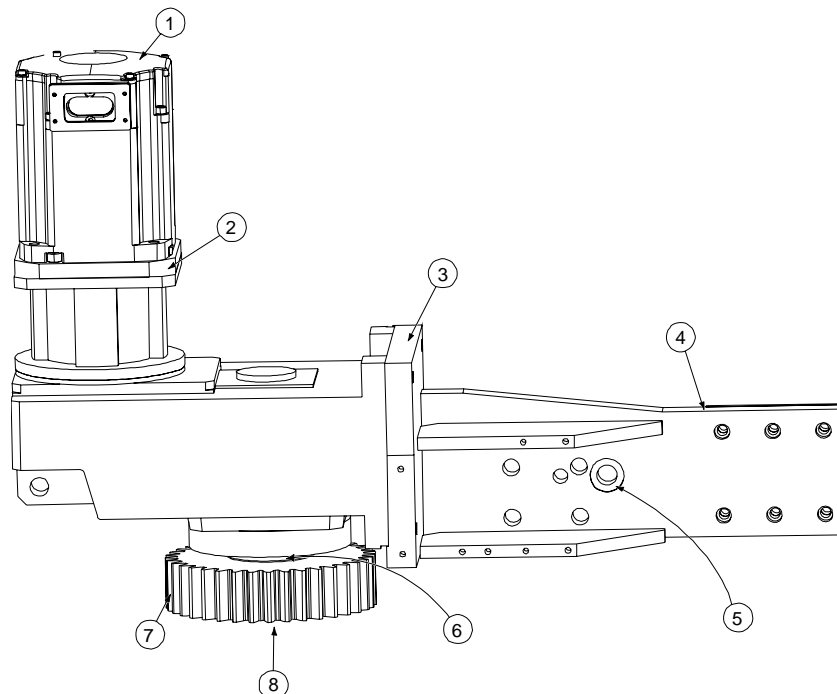


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Quantity	Description	Art. no.	Item
1	Drive unit, IRB 4400	3HEA 801 288-001	-
1	Motor	506 262-880	1
1	Motor flange for motor	3HXD 1000-459	2
1	Gear unit, IRB 4400	3HXG 1147-1	3
1	Motor mount	3HEA 801 185-001	4
2	Socket head cap screw	3HXG 1138-3	5
1	Spacer	3HXD 1000-492	6
1	Gear wheel	3HXD 1000-490	7
1	Retainer sleeve	3HXG 1000-506	8
1	Gear wheel guard (not shown)	3HXD 0100-348	-

3.1.3 High voltage drive unit 1.0 m/s

Spare parts for mirrored drive unit for IRBT 6003S:



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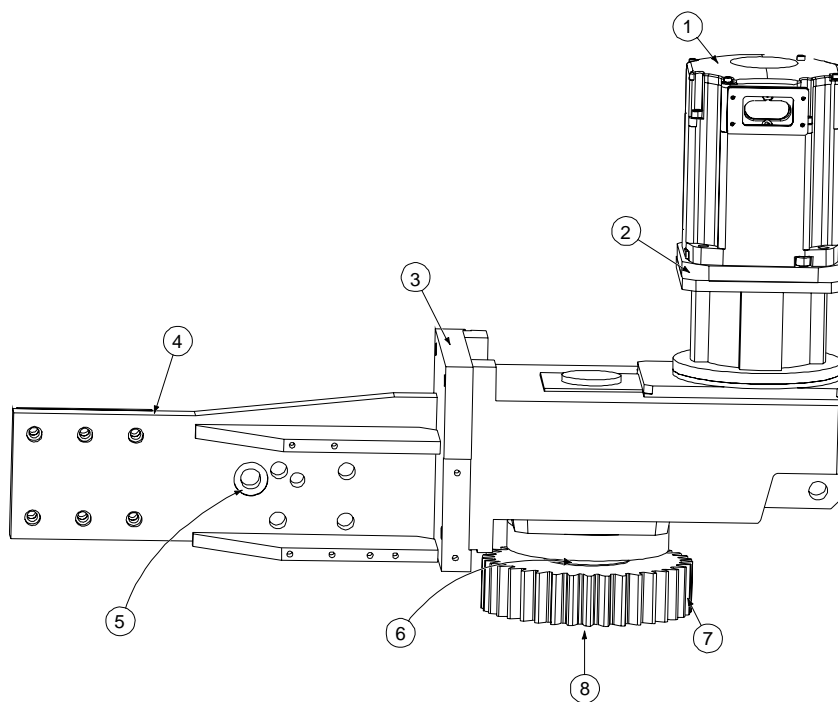
Quantity	Description	Art. no.	Item
1	Drive unit, IRB 6600	3HEA 800 684-001	-
1	Motor	3HXD 0100-355	1
1	Motor flange for motor	3HXD 1000-459	2
1	Gear unit	3HXG 1141-2	3
1	Motor mount	3HEA 801 171-001	4
2	Socket head cap screw	3HXG 1138-3	5
1	Spacer	3HXD 1000-492	6
1	Gear wheel	3HXD 1000-490	7
1	Retainer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

Spare parts

High voltage mirrored drive unit 1.0 m/s

3.1.4 High voltage mirrored drive unit 1.0 m/s

Spare parts for mirrored drive unit for IRBT 6003S:

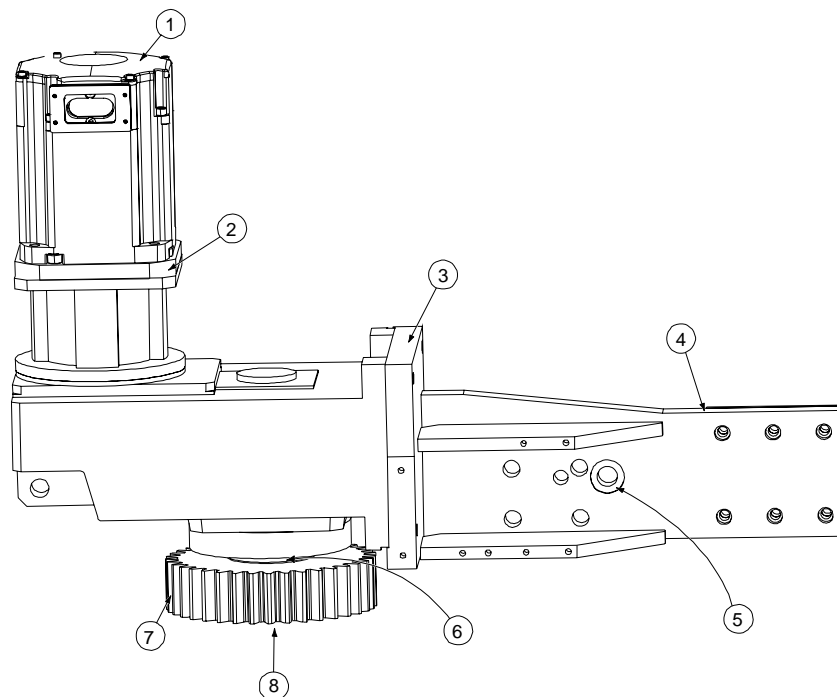


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Quantity	Description	Art. no.	Item
1	Drive unit, IRB 6600	3HEA 800 690-001	-
1	Motor	3HXD 0100-355	1
1	Motor flange for motor	3HXD 1000-459	2
1	Gear unit	3HXG 1141-2	3
1	Motor mount	3HEA 801,185-001	4
2	Socket head cap screw	3HXG 1138-3	5
1	Spacer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

3.1.5 High voltage drive unit 1.5 m/s

Spare parts for drive unit for IRBT 6003S:



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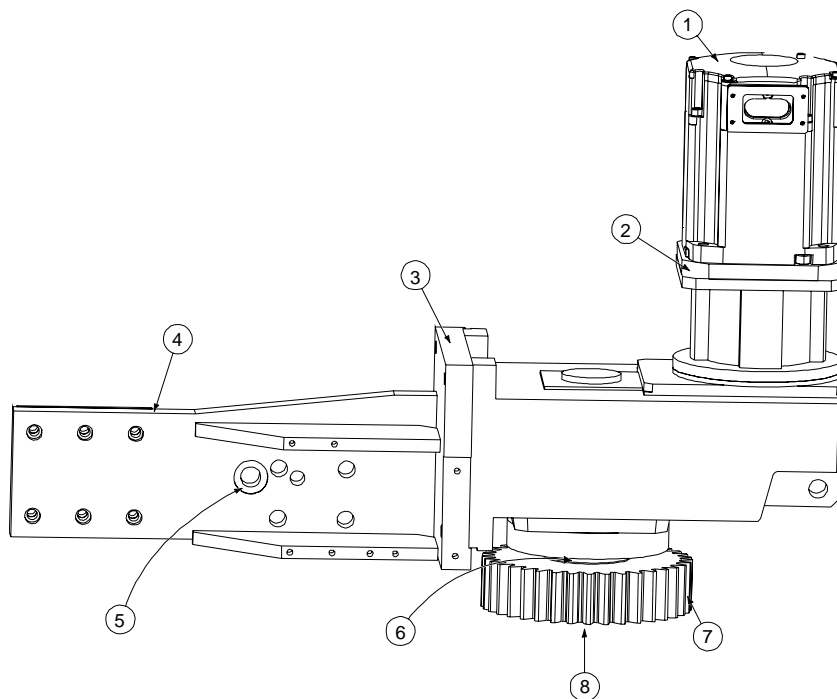
Quantity	Description	Art. no.	Item
1	Drive unit	3HEA 800 687-001	-
1	Motor	3HXD 0100-355	1
1	Motor flange for motor	3HXD 1000-459	2
1	Gear unit	3HXG 1141-1	3
1	Motor mount	3HEA 801 175-001	4
2	Socket head cap screw	3HXG 1138-3	5
1	Spacer	3HXD 1000-492	6
1	Gear wheel	3HXD 1000-490	7
1	Retainer sleeve	3HXG 1000-506	8
1	Gear wheel guard (not shown)	3HXD 0100-348	-

Spare parts

High voltage mirrored drive unit 1.5 m/s

3.1.6 High voltage mirrored drive unit 1.5 m/s

Spare parts for mirrored drive unit for IRBT 6003S:

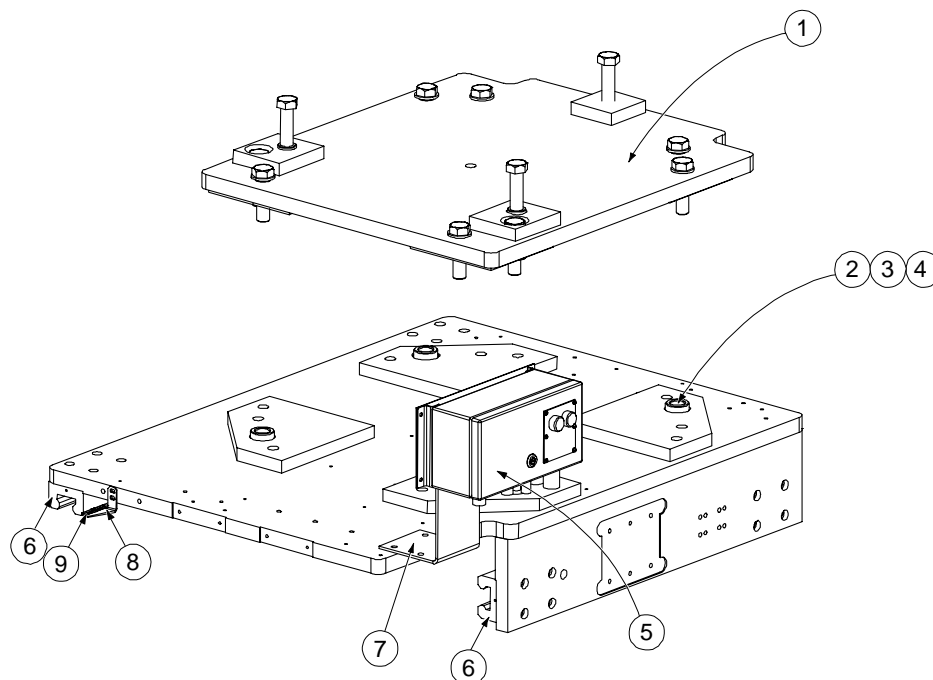


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Quantity	Description	Art. no.	Item
1	Drive unit	3HEA 800 689-001	-
1	Motor	3HXD 0100-355	1
1	Motor flange for motor	3HXD 1000-459	2
1	Gear unit	3HXG 1141-1	3
1	Motor mount	3HEA 801 185-001	4
2	Socket head cap screw	3HXG 1138-3	5
1	Spacer	3HXD 1000-492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

3.1.7 Carriage

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

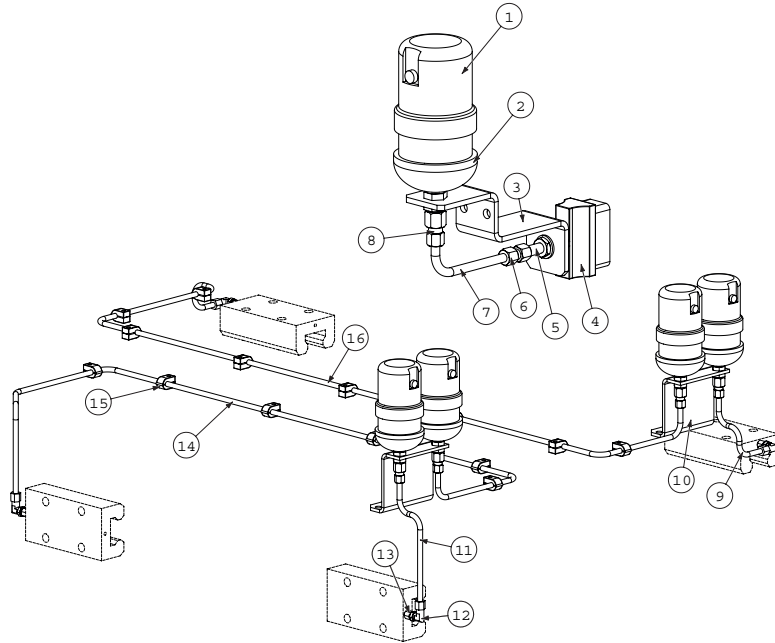


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Quantity	Description	Art. no.	Item
Adaptors for robots			
	Adaptor for IRB 4400	3HXD 1566-1	1
4	Guide sleeve	3HXD 1000-273	2
8	Washer	3HXD 1000-274	3
8	Bolt	2121 2017-733	4
1	Serial measurement box axis 7	3HXD 0100-89	5
1	Brake release box, IRB 6600 MH	3HEA 800 805-001	5
4	Ball element	2185 0445-4	6
2	Bracket SMB	3HXD 0100-357	7
1	Bracket vernier scale	3HXD 1000-471	8
1	Sign vernier scale	2948 3216-2	9
1	Bracket junction box	3HXD 1000-505	-

3.1.8 Automatic lubrication system with grease injectors

Spare parts for automatic lubrication system with grease injectors:

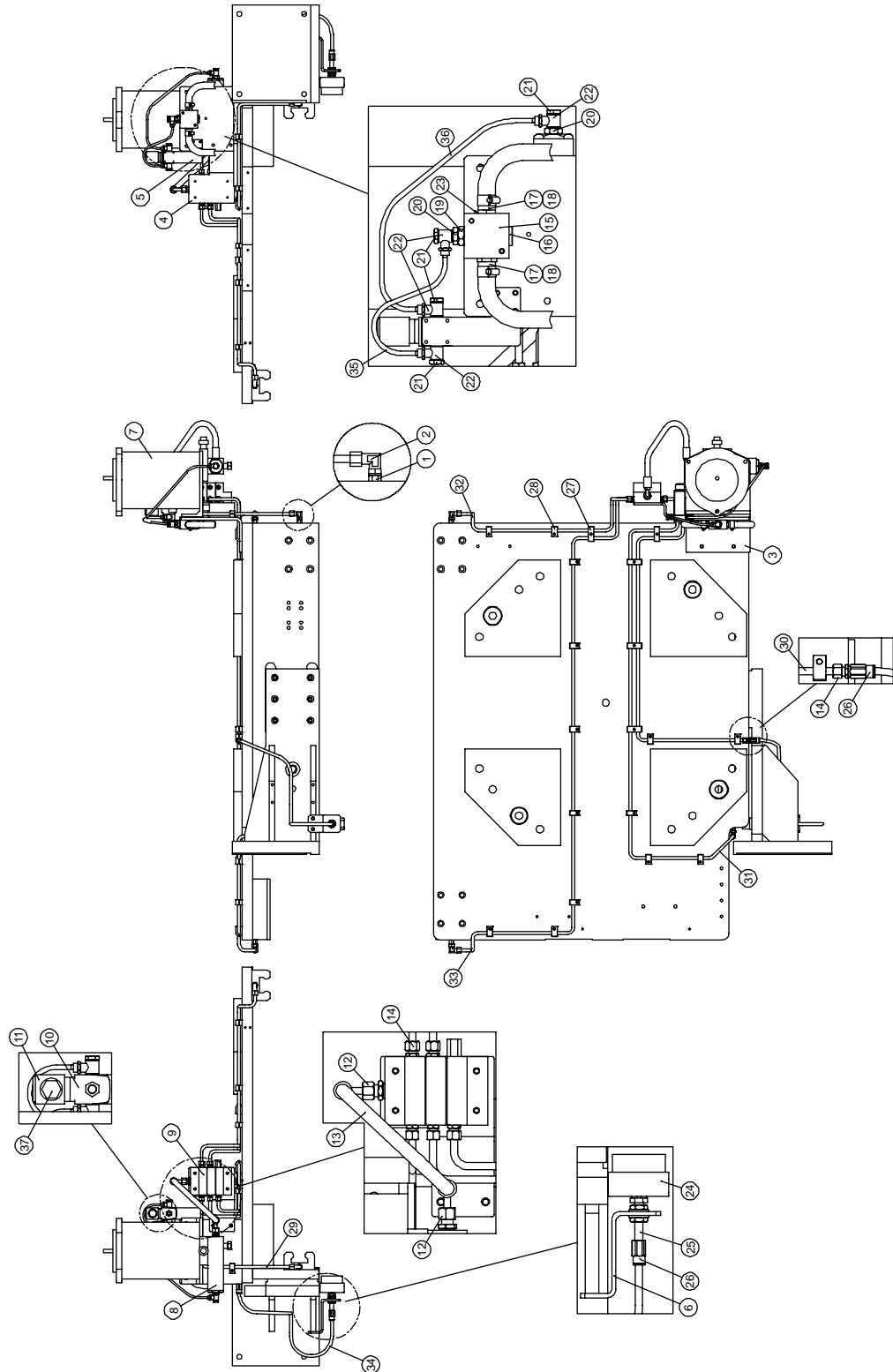


globalube.eps

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

3.1.9 Central lubrication system with timer

Spare parts for central lubrication system with timer



Spare parts

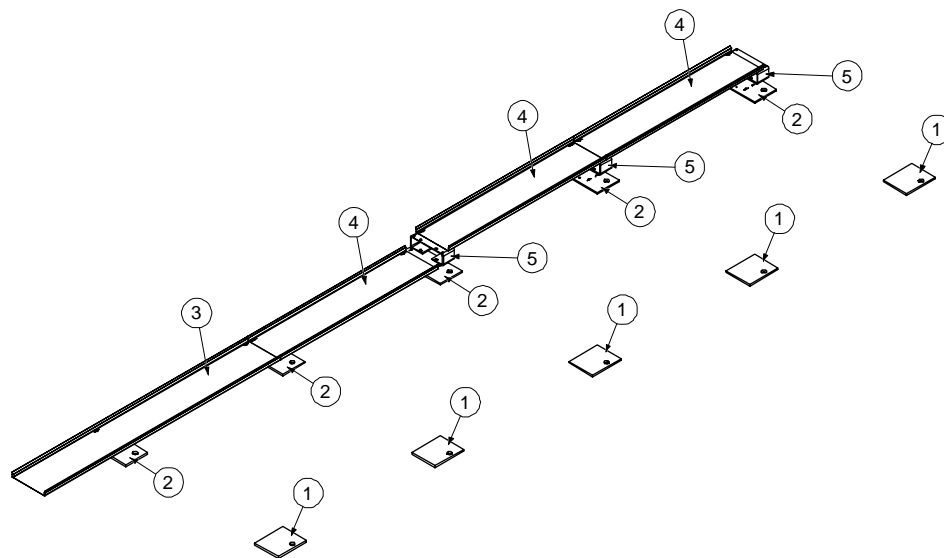
Central lubrication system with timer

Quantity	Description	Art. no.	Item
4	Reducing nipple	3HXG 1000-556	1
4	Threaded 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	Blind plug	2529 1920-4	16
2	Hose nipple	2529 2084-33	17
2	Hose clamp	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 holder	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 mirrored design for 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 low voltage	3HXD 1318-20	37
1	Central lubrication cable high voltage	3HEA 800 675-001	37

3.2 Spare parts dependent on length

3.2.1 Cable tray compact

Spare parts for cable tray for IRBT 6003S/4003S compact:



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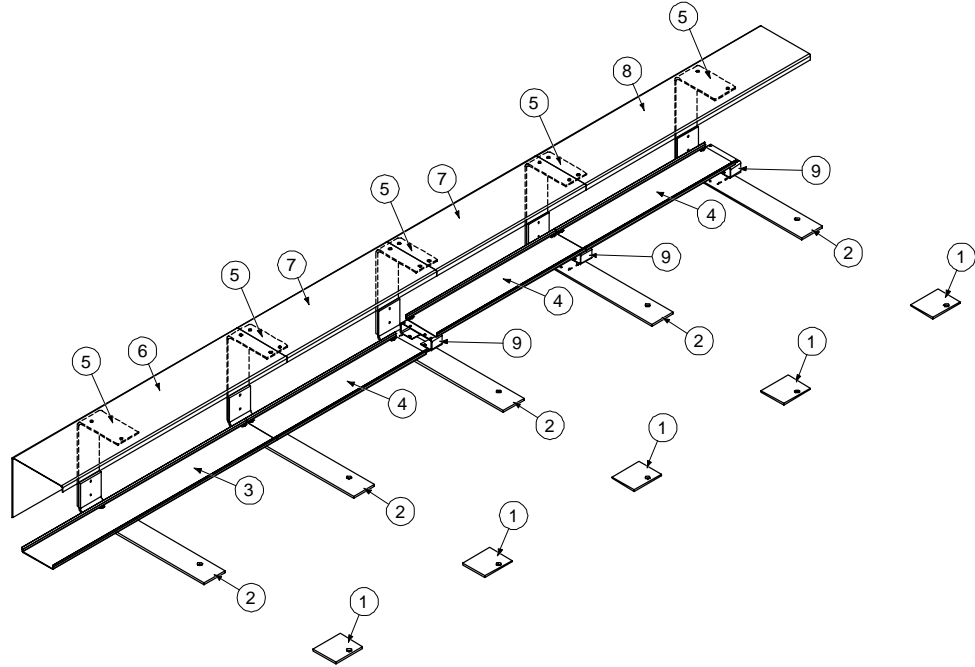
Description	Quantity for different travel lengths										Art. no.	Item
	1.7	2.7	3.7	4.7	5.7	6.7	7.7	8.7	9.7	10.7		
Leveling plates	4	5	7	8	8	9	10	11	12	13	3HXD 1000-414	1
Lower bracket for cable chain	2	3	3	4	6	7	8	9	10	11	3HXD 1000-410	2
Guide plate for cable chain	1	1	1	1	1	1	1	1	1	1	3HXD 1000-488	3
Guide plate for 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 cable chain	-	-	-	-	3	3	4	4	5	5	3HXD 1000-473	5

Spare parts

Cable tray covered

3.2.2 Cable tray covered

Spare parts for cable tray for IRBT 6003S/4003S covered:

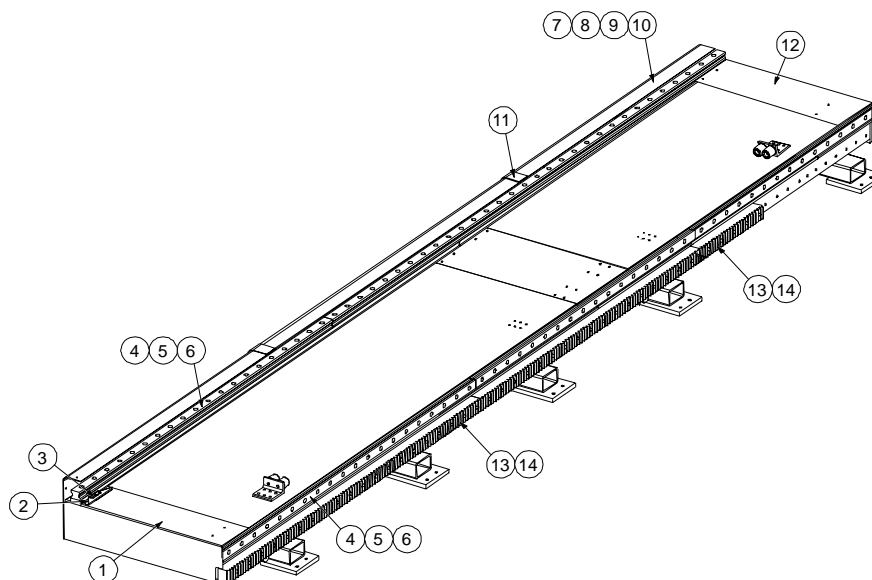


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Description	Quantity for different travel lengths										Art. no.	Item
	1.7	2.7	3.7	4.7	5.7	6.7	7.7	8.7	9.7	10.7		
Leveling plate	3	4	5	6	7	8	9	10	11	12	3HXD 1000-414	1
Lower bracket for cable chain	3	4	5	6	7	8	9	10	11	12	3HXD 1000-415	2
Guide plate for cable chain	1	1	1	1	1	1	1	1	1	1	3HXD 1000-488	3
Guide plate for 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 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 cable chain	-	-	-	-	3	3	4	4	5	5	3HXD 1000-473	9

3.2.3 Stand

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



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Description	Quantity for 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	13
Gear rack L=2000	1	1	2	2	3	3	3	4	4	4	3HXC 1557-2	14
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	12
Bracket vernier scale	1	1	1	1	1	1	1	1	1	1	3HXC 1000-472	3
Sign vernier scale	1	1	1	1	1	1	1	1	1	1	2948 3216-1	2
Side cover L=1000	-	1	-	-	-	-	-	1	-	-	3HXC 1472-1	7
Side cover L=1500	2	2	2	2	2	2	2	2	2	2	3HXC 1472-2	8
Side cover L=2000	-	-	1	-	2	1	-	-	1	-	3HXC 1472-3	9
Side cover L=3000	-	-	-	1	-	1	2	2	2	3	3HXC 1472-4	10
Tape protective cover	1	2	2	2	3	3	3	4	4	4	3HXC 1000-436	11

Spare parts

Cables

3.2.4 Cables

Cable lengths

The tables show the cable lengths required for the different connections with various travel lengths. The article numbers for the cables can be found in "*Electrical installation*" on page 2 - 23.

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 manipulator	5	6	6	7	7	8	8	9	9	10	page 2 - 24
Cables for SMB	5	6	6	7	7	8	8	9	9	10	page 2 - 24
Cables between SMB and motor	1	1	1	1	1	1	1	1	1	1	page 2 - 24
Cable between SMB and manipulator	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	page 2 - 24
Number of links in cable chain	33	48	48	63	63	78	78	93	93	108	page 2 - 24

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 manipulator	6	7	7	8	8	9	9	10	10	11	page 2 - 24
Cables for SMB	6	7	7	8	8	9	9	10	10	11	page 2 - 24
Cables between SMB and motor	1	1	1	1	1	1	1	1	1	1	page 2 - 24
Cable between SMB and manipulator	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	page 2 - 24
Number of links in cable chain	33	48	48	63	63	78	78	93	93	108	page 2 - 24

