ROBOTICS

# Product manual

## FlexTrack IRT501

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# Product manual

# FlexTrack IRT501-66
# FlexTrack IRT501-66R
# FlexTrack IRT501-90
# FlexTrack IRT501-90R
# FlexTrack IRT501-90RE
# FlexTrack IRT501-90RS

IRC5

Document ID: 3HAW050008590-001

Revision: E

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Additional copies of this manual may be obtained from ABB.

Original instructions.

# Table of contents

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# Overview

## About this manual

This manual contains instructions for:

- mechanical and electrical installation instructions for the FlexTrack
- maintenance instructions for the FlexTrack
- spare parts

## Usage

This manual should be used when working during;

- installation, from lifting the robot to its work site and securing it to the foundation, to making it ready for operation
- maintenance work
- repair work

## Who should read this manual?

This manual is intended for:

- installation personnel
- maintenance personnel
- repair personnel

## Prerequisites

A maintenance/repair/installation craftsman working with an ABB Robot must:

- be trained by ABB and have the required knowledge of mechanical and electrical installation/repair/maintenance work.

## Organization of chapters

The manual is organized in the following chapters:

| Chapter | Contents |
|---|---|
| Safety | Safety information that must be read through before performing any installation or service work on the FlexTrack. Contains general safety aspects as well as more specific information about how to avoid personal injuries and damage to the product. |
| Installation and commissioning | Required information about lifting and installation of the FlexTrack. |
| Maintenance | Step-by-step procedures that describe how to perform maintenance of the FlexTrack. Based on a maintenance schedule that may be used in the work of planning periodical maintenance. |
| Calibration information | Procedures that does not require specific calibration equipment. |

## References

| Document name | Document ID |
|---|---|
| Product specification - IRT 501 - 66/66R/90/90R | 3HAW050008591 |
| Product manual - IRC5 Robot Controller | 3HAC021313-001 |

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| Document name | Document ID |
|---|---|
| Operating manual - IRC5 with FlexPendant | 3HAC16590-1 |
| Operating manual - Calibration Pendulum | 3HAC16578-1 |
| Service Information System - IRC5 | 3HAC025709-001 |
| Application manual - Additional axes and stand alone controller | 3HAC021395-001 |
| System Parameters | 3HAC17076-1 |
| Application manual - Functional safety and SafeMove | 3HAC052610-001 |
| FlexTrack Lubrication Unit Feedback | 3HAW107710207 |

## Revisions

| Revision | Description |
|---|---|
| - | First edition. |
| A | Changes made in:<br>• Clarity improved and pictures added in *Disassemble the bracket from the carriage on page 160*. Instructions for the coupling of the motor and the gearbox updated, see *Motor and gearbox assembly on page 168*.<br>• Names of spare cables updated, see *Electrical spare parts and cables on page 204*. |
| B | Changes made in:<br>• Standard top plate drawings are updated in *Standard top plate on page 52*<br>• Robot capacities updated in *Static loads on page 57*<br>• FlexTrack on site installation procedures updated in *Procedure of assembly on page 64*<br>• Add more detailed information about 1, 2 and 4 position switch in *Zone Division on page 112*<br>• Change the verification step of the tightening torque in *Verification of the tightening torque on page 142*<br>• Procedures about how to change a cable in the cable chain is added in*Replace cables on page 176*<br>• Spare parts updated in *Spare parts on page 195*<br>• Electrical diagrams added in *Appendix on page 209* |

*Continues on next page*

| Revision | Description |
|---|---|
| C | Changes made in:<br>• Expected life of ball bearing blocks updated in *Expected life on page 122*<br>• Different suppliers of linear rails added in*Linear rail of different supplier on page 148* and different suppliers of cable chain added in *Cable chain of different supplier on page 173*<br>• Spare parts updated in *Spare parts on page 195*<br>• Robot capacities about IRB 6650/6650s/6660 removed in *Robot capabilities on page 57*<br>• Adjustment of the FlexTrack using a laser tracker updated in *Instruction on page 75*<br>• Expected life of cables updated in *Expected life on page 122*<br>• Limits for expected life of cable chains updated in *Expected life on page 122*<br>• Additional Function Support added in *Additional Safety Function Support on page 115*<br>• Added material disposing symbol and related description in *Environmental information on page 188*.<br>• Re-described the method of geometric alignment, and removed the table in *Geometric alignment of FlexTrack IRT 501 on page 75*<br>• Replace the paint related reference manual to SafeMove2. |
| D | Changes made in:<br>• Removed grease KLÜBER Microlube GB0 and added grease Shell Gadus S2 V220 00.<br>• Updated the supplier information of linear rails. See *Linear rail of different supplier on page 148*.<br>• Added information of six bearings 90RE variant.<br>• Added information of six bearings 90RS variant.<br>• Updated specification information.<br>• Minor updates from product manual to product specification. |
| E | Changes made in:<br>• Updated specification information.<br>• Minor updates from product manual to product specification. |

# Product documentation, M2004

### Categories for manipulator documentation

The manipulator documentation is divided into a number of categories. This listing is based on the type of information in the documents, regardless of whether the products are standard or optional.

All documents listed can be ordered from ABB on a DVD. The documents listed are valid for M2004 manipulator systems.

### Product manuals

All hardware, manipulators and controllers will be delivered with a **Product manual** that contains:

- Safety information.
- Installation and commissioning (descriptions of mechanical installation, electrical connections).
- Maintenance (descriptions of all required preventive maintenance procedures including intervals).
- Repair (descriptions of all recommended repair procedures including spare parts).
- Additional procedures, if any (calibration, decommissioning).
- Reference information (article numbers for documentation referred to in Product manual, procedures, lists of tools, safety standards).
- Parts list.
- Foldouts or exploded views.
- Circuit diagrams (or references to circuit diagrams).

### Technical reference manuals

The technical reference manuals describe the manipulator software in general and contain relevant reference information.

- **RAPID Overview**: An overview of the RAPID programming language.
- **RAPID Instructions, Functions and Data types**: Description and syntax for all RAPID instructions, functions, and data types.
- **RAPID Kernel**: A formal description of the RAPID programming language.
- **System parameters**: Description of system parameters and configuration workflows.

### Application manuals

Specific applications (for example software or hardware options) are described in **Application manuals**. An application manual can describe one or several applications.

An application manual generally contains information about:

- The purpose of the application (what it does and when it is useful).
- What is included (for example cables, I/O boards, RAPID instructions, system parameters, CD with PC software).

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- How to use the application.
- Examples of how to use the application.

**Operating manuals**

The operating manuals describe hands-on handling of the products. The manuals are aimed at those having first-hand operational contact with the product, that is production cell operators, programmers, and trouble shooters.

The group of manuals includes:

- **Emergency safety information**
- **General safety information**
- **Getting started, IRC5 and RobotStudio**
- **IRC5 with FlexPendant**
- **RobotStudio**
- **Introduction to RAPID**
- **Trouble shooting**, for the controller and manipulator.

# How to read the product manual

## Reading the procedures

The procedures contain references to figures, tools, material etc. The references are read as described below.

## References to figures

The procedures often include references to components or attachment points located on the robot/controller. The components or attachment points are marked with italic text in the procedures and completed with a reference to the figure where the current component or attachment point is shown.

The denomination in the procedure for the component or attachment point corresponds to the denomination in the referenced figure.

The table below shows an example of a reference to a figure from a step in a procedure.

| | Action | Note/Illustration |
|---|---|---|
| 8 | Remove the rear attachment screws, gearbox. | Shown in the figure *FlexTrack Carriage Overview on page 50*. |

## Reference to required equipment

The procedures often include references to equipment (spare parts, tools etc.) required for the different actions in the procedure. The equipment is marked with italic text in the procedures and completed with a reference to the section where the equipment is listed with further information, i.e. article number, dimension.

The denomination in the procedure for the component or attachment point corresponds to the denomination in the referenced list.

The table below shows an example of a reference to a list of required equipment, from a step in a procedure.

| | Action | Note |
|---|---|---|
| 3 | Fit a new sealing, axis 2 to the gearbox. | Art. no. is specified in *Required equipment on page 64*. |

## Safety information

The manual includes a separate safety chapter that must be read through before proceeding with any service or installation procedures. All procedures also include specific safety information when dangerous steps are to be performed.

Read more in *Safety on page 15*.

# 1 Safety

## 1.1 Introduction

**Overview**

The safety information in this manual is divided in two categories:

- general safety aspects, important to attend to before performing any service work on the robot. These are applicable for all service work and are found in *General safety information on page 16*
- specific safety information, pointed out in the procedure at the moment of the danger. How to avoid and eliminate the danger is either detailed directly in the procedure, or further detailed in separate instructions, found in *Safety related instructions on page 31*.

## 1.2 General safety information

### 1.2.1 Safety in the robot system

**Validity and responsibility**

The information does not cover how to design, install and operate a complete system, nor does it cover all peripheral equipment, which can influence the safety of the total system. To protect personnel, the complete system must be designed and installed in accordance with the safety requirements set forth in the standards and regulations of the country where the robot is installed.

The users of ABB industrial robots are responsible for ensuring that the applicable safety laws and regulations in the country concerned are observed and that the safety devices necessary to protect people working with the robot system are designed and installed correctly. Personnel working with robots must be familiar with the operation and handling of the industrial robot, described in the applicable documents, e.g. User's Guide and Product Manual.

**Connection of external safety devices**

Apart from the built-in safety functions, the robot is also supplied with an interface for the connection of external safety devices. Via this interface, an external safety function can interact with other machines and peripheral equipment. This means that control signals can act on safety signals received from the peripheral equipment as well as from the robot.

**Limitation of liability**

Any information given in this manual regarding safety, must not be construed as a warranty by ABB that the industrial robot will not cause injury or damage even if all safety instructions are complied with.

**Related information**

| Type of information | Detailed in document | Section |
|---|---|---|
| Installation of safety devices | Product manual for the robot | Installation and commissioning |
| Changing robot modes | Operators manual (RobotWare 5.0) | Operating modes |
| Restricting the working space | Product manual for the robot | Installation and commissioning |

## 1.3 Safety risks

### 1.3.1 Safety risks during installation and service work on robot

**Overview**

This section includes information of general safety risks to be considered when performing installation and service work on the robot.

**General risks during installation and service**

- The instructions in the Product Manual - Installation and Commissioning must always be followed.
- Emergency stop buttons must be positioned in easily accessible places so that the robot can be stopped quickly.
- Those in charge of operations must make sure that safety instructions are available for the installation in question.
- Those who install the robot must have the appropriate training for the robot system in question and in any safety matters associated with it.

**Nation/region specific regulations**

To prevent injuries and damage during the installation of the robot system, the regulations applicable in the country concerned and the instructions of ABB robotics must be complied with.

**Non-voltage related risks**

- Safety zones, which have to be crossed before admittance, must be set up in front of the robot's working space. Light beams or sensitive mats are suitable devices.
- Turntables or the like should be used to keep the operator out of the robot's working space.
- The axes are affected by the force of gravity when the brakes are released. In addition to the risk of being hit by moving robot parts, you run the risk of being crushed by the parallel arm.
- Energy, stored in the robot for the purpose of counterbalancing certain axes, may be released if the robot, or parts thereof, are dismantled.
- When dismantling/assembling mechanical units, watch out for falling objects.
- Be aware of stored heat energy in the controller.
- Never use the robot as a ladder, i.e. do not climb on the robot motors or other part during service work. There is a serious risk of slipping because of the high temperature of the motors or oil spills that can occur on the robot.

**To be observed by the supplier of the complete system**

- The supplier of the complete system must ensure that all circuits used in the safety function are interlocked in accordance with the applicable standards for that function.

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1.3.1 Safety risks during installation and service work on robot
*Continued*

- The supplier of the complete system must ensure that all circuits used in the emergency stop function are interlocked in a safe manner, in accordance with the applicable standards for the emergency stop function.

### Complete robot

| Safety risk | Description |
|---|---|
| Hot components!<br>Removed parts may result in collapse of robot! | **CAUTION**<br>Motors and gearboxes are HOT after running the robot! Touching the motors and gearboxes may result in burns!<br>**WARNING**<br>Take any necessary measures to ensure that the robot does not collapse as parts are removed, e.g. secure the lower arm with fixtures if removing motor, axis 2. |

### Cabling

| Safety risk | Description |
|---|---|
| Cable packs are sensitive to mechanical damage! | **CAUTION**<br>The cable packs are sensitive to mechanical damage! They must be handled with care, especially the connectors, in order to avoid damaging them! |

### Gearboxes and motors

| Safety risk | Description |
|---|---|
| Gears may be damaged if excessive force is used! | **CAUTION**<br>Whenever parting/mating motor and gearbox, the gearboxes may be damaged if excessive force is used! |

## 1.3.2 Safety risks related to tools/workpieces

**Safe handling**

It must be possible to safely turn off tools, such as milling cutters, etc. Make sure that guards remain closed until the cutters stop rotating.

It should be possible to release parts by manual operation (valves).

**Safe design**

Grippers/end effectors must be designed so that they retain workpieces in the event of a power failure or a disturbance of the controller.

**CAUTION**

Ensure that a gripper is prevented from dropping a workpiece, if such is used.

## 1.3.3 Safety risks related to pneumatic/hydraulic systems

**General**

Special safety regulations apply to pneumatic and hydraulic systems.

**Residual energy**

- Residual energy may be present in these systems. After shutdown, particular care must be taken.
- The pressure in pneumatic and hydraulic systems must be released before starting to repair them.

**Safe design**

- Gravity may cause any parts or objects held by these systems to drop.
- Dump valves should be used in case of emergency.
- Shot bolts should be used to prevent tools, etc., from falling due to gravity.

## 1.3.4 Safety risks during operational disturbances

**General**

- The industrial robot is a flexible tool which can be used in many different industrial applications.
- All work must be carried out professionally and in accordance with the applicable safety regulations.
- Care must be taken at all times.

**Qualified personnel**

- Corrective maintenance must only be carried out by qualified personnel who are familiar with the entire installation as well as the special risks associated with its different parts.

**Extraordinary risks**

If the working process is interrupted, extra care must be taken due to risks other than those associated with regular operation. Such an interruption may have to be rectified manually.

## 1.3.5 Risks associated with live electric parts

**Voltage related risks, general**

- Although troubleshooting may, on occasion, have to be carried out while the power supply is turned on, the robot must be turned off (by setting the mains switch to OFF) when repairing faults, disconnecting electric leads and disconnecting or connecting units.
- The mains supply to the robot must be connected in such a way that it can be turned off outside the robot's working space.

**Voltage related risks, controller IRC5**

A danger of high voltage is associated with the following parts:

- Be aware of stored electrical energy (DC link, Ultra Cap unit) in the controller.
- Units inside the controller, e.g. I/O modules, can be supplied with power from an external source.
- The mains supply/mains switch
- The transformers
- The power unit
- The control power supply (230 VAC)
- The rectifier unit (400-480 VAC and 700 VDC. Note: Capacitors!)
- The drive unit (700 VDC)
- The drive system power supply (230 VAC)
- The service outlets (115/230 VAC)
- The customer power supply (230 VAC)
- The power supply unit for tools, or special power supply units for the machining process.
- The external voltage connected to the control cabinet remains live even when the robot is disconnected from the mains.
- Additional connections.

**Voltage related risks, robot**

A danger of high voltage is associated with the robot in:

- The power supply for the motors (up to 800 VDC).
- The user connections for tools or other parts of the installation (max. 230 VAC, see chapter Installation and commissioning in the Product manual).

**Voltage related risks, tools, material handling devices, etc.**

Tools, material handling devices, etc., may be live even if the robot system is in the OFF position. Power supply cables which are in motion during the working process may be damaged.

## 1.4 Safety actions

### 1.4.1 Safety fence dimensions

**General**

Install a safety cell around the robot to ensure safe robot installation and operation.

**Dimensioning**

Dimension the fence or enclosure to enable it to withstand the force created if the load being handled by the robot is dropped or released at maximum speed. Determine the maximum speed from the maximum velocities of the robot axes and from the position at which the robot is working in the work cell (see *Product Specification - Description, Robot Motion*).

Also consider the maximum possible impact caused by a breaking or malfunctioning rotating tool or other device fitted to the manipulator.

## 1.4.2 Fire extinguishing

**Note**

Use a CARBON DIOXIDE ($CO_2$) extinguisher in the event of a fire in the robot (manipulator or controller)!

## 1.4.3 Emergency release of the robots/manipulators axes

**Description**

In an emergency situation, any of the robot's/manipulators axes may be released manually by pushing the brake release buttons on the robot.

How to release the brakes is detailed in section:

- *Moving the carriage manually on page 54*. The robot arm may be moved manually on smaller robot models, but larger models may require using an overhead crane or similar.

**Increased injury**

Before releasing the brakes, make sure that the weight of the arms does not increase the pressure on the trapped person, further increasing any injury!

## 1.4.4 Brake testing

### When to test

During operation the holding brakes of each axis motor wear normally. A test may be per-formed to determine whether the brake can still perform its function.

### How to test

The function of each axis' motor holding brakes may be checked as detailed below:

| | Action |
|---|---|
| 1 | Run each manipulator axis to a position where the combined weight of the manipulator arm and any load is maximized (max. static load). |
| 2 | Switch the motor to the MOTORS OFF position with the Operating mode selector on the controller. |
| 3 | Check that the axis maintains its position. |

If the manipulator does not change position as the motors are switched off, then the brake function is adequate.

## 1.4.5 Risk of disabling function "Reduced speed 250 mm/s"

**Note**

Do not change *Transm. gearbox ratio* or other kinematic parameters from the Teach Pendant Unit or a PC. This will affect the safety function Reduced speed 250 mm/s.

## 1.4.6 Safe use of the Teach Pendant Unit

**Note**

The enabling device is a push button located on the side of the Teach Pendant Unit (TPU) which, when pressed halfway in, takes the system to MOTORS ON. When the enabling device is released or pushed all the way in, the robot is taken to the MOTORS OFF state. To ensure safe use of the Teach Pendant Unit, the following must be implemented:

- The enabling device must never be rendered inoperative in any way.
- During programming and testing, the enabling device must be released as soon as there is no need for the robot to move.
- The programmer must always bring the Teach Pendant Unit with him/her, when entering the robot's working space. This is to prevent anyone else taking control of the robot without the programmer knowing.

## 1.4.7 Work inside the manipulator's working range

**WARNING**

If work must be carried out within the robot's work envelope, the following points must be observed:

- The operating mode selector on the controller must be in the manual mode position to render the enabling device operative and to block operation from a computer link or remote control panel.
- The robot's speed is limited to max. 250 mm/s when the operating mode selector is in position < 250 mm/s. This should be the normal position when entering the working space. The position 100% "full speed" may only be used by trained personnel who are aware of the risks that this entails.
- Pay attention to the rotating axes of the manipulator! Keep a distance to the axes in order not to get entangled with hair or clothing. Also be aware of any danger that may be caused by rotating tools or other devices mounted on the manipulator or inside the cell.

## 1.4.8 Translate the information on safety and information labels

### Labels on the product

Both the manipulator and the controller are marked with several safety and information labels, containing important information about the product. The information is useful for all personnel handling the robot system, e.g. during installation, service or operation.

### Translation possibilities

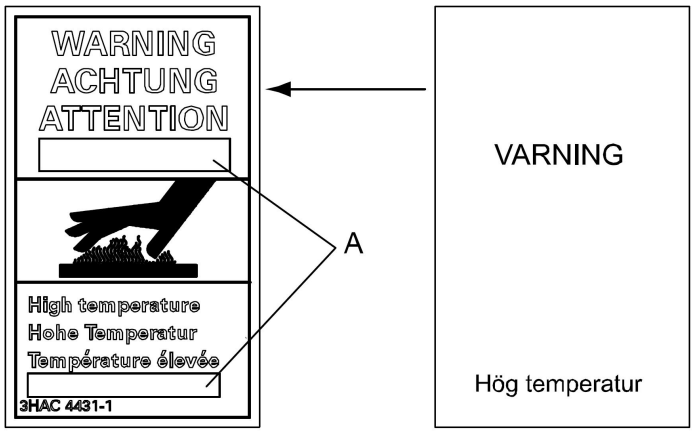
The labels fitted to the product contain space for adding a fourth language underneath the three standard languages (English, German and French).

Add a local language to the label by:

- Using a transparent sticker over the standard label with text added in a fourth language. Drawings detailing the design (text, figure, dimensions) of the standard labels can be ordered from ABB. Notice that each label is identified according to the article number located in the lower corner of the label.

### Example of transparent sticker

The figure below shows the location of the free space on one of the labels on the robot, where the fourth language can be added. The figure also shows a transparent sticker, containing the text in Swedish.

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| | |
|---|---|
| A | Free space for adding a fourth language |

## 1.5 Safety related instructions

### 1.5.1 Safety signals, general

**General**

This section specifies all dangers that may arise from performing the work detailed in the manual. Each danger is detailed in its own section consisting of:

- A caption specifying the danger level (DANGER, WARNING or CAUTION) and the type of danger.
- A brief description of what will happen if the operator/service personnel do not eliminate the danger.
- An instruction of how to eliminate the danger to facilitate performing the activity at hand.

The table below defines the captions specifying the danger levels used throughout this manual.

| Symbol | Designation | Significance |
|---|---|---|
|  | DANGER | Warns that an accident *will* occur if the instructions are not followed, resulting in a serious or fatal injury and/or severe damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical units, explosion or fire risk, risk of poisonous gases, risk of crushing, impact, fall from height etc. |
|  | WARNING | Warns that an accident *may* occur if the instructions are not followed, that can lead to serious injury, possibly fatal, and/or great damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical units, explosion or fire risk, risk of poisonous gases, risk of crushing, impact, fall from height etc. |
|  | ELECTRICAL SHOCK | The electrocution or electrical shock symbol indicates electrical hazards which could result in severe personal injury or death. |
|  | CAUTION | Warns that an accident may occur if the instructions are not followed that can result in injury and/or damage to the product. It also applies to warnings of risks that include burns, eye injury, skin injury, hearing damage, crushing or slipping, tripping, impact, fall from height, etc. Furthermore, it applies to warnings that include function requirements when fitting and removing equipment, where there is a risk of damaging the product or causing a breakdown. |
|  | ELECTROSTATIC DISCHARGE (ESD) | The electrostatic discharge (ESD) symbol indicates electrostatic hazards which could result in severe damage to the product. |

*Continues on next page*

1.5.1 Safety signals, general
*Continued*

| Symbol | Designation | Significance |
|---|---|---|
|  | NOTE | Note symbols alert you to important facts and conditions. |
|  | TIP | Tip symbols direct you to specific instructions, where to find additional information or how to perform a certain operation in an easier way. |

## 1.5.2 DANGER - Moving manipulators are potentially lethal!

**Description**

Any moving manipulator is a potentially lethal machine.

When running the manipulator, it may perform unexpected and sometimes irrational movements. However, all movements are performed with great force and may seriously injure any personnel and/or damage any piece of equipment located within the manipulator working range.

**Elimination**

| | Action | Note/Illustration |
|---|---|---|
| 1 | Before attempting to run the manipulator, make sure all emergency stop equipment is correctly installed and connected. | Emergency stop equipment such as gates, tread mats, light curtains, etc. |
| 2 | If possible, use the hold-to-run button whenever possible.<br>The hold-to-run button is used in manual mode, not in automatic mode. | How to use the hold-to-run control in RobotWare 5.0 is detailed in section How to use the hold-to-run function in the*Operating manual - IRC5 with FlexPendant* |
| 3 | Make sure no personnel are present within the manipulator working range before pressing the start button. | |

## 1.5.3 DANGER - First test run may cause injury or damage!

**Description**

Since performing a service activity often requires disassembly of the robot there are several safety risks to take into consideration before the first test run.

**Elimination**

Follow the procedure below when performing the first test run after a service activity (repair, installation or maintenance):

| | Action |
|---|---|
| 1 | Remove all service tools and foreign objects from the robot and its working area! |
| 2 | Install all safety equipment properly! |
| 3 | Make sure all personnel are standing at a safe distance from the robot, i.e. out of its reach behind safety fences, etc.! |
| 4 | Pay special attention to the function of the part previously serviced! |

## 1.5.4 WARNING - The unit is sensitive to ESD!

### Description

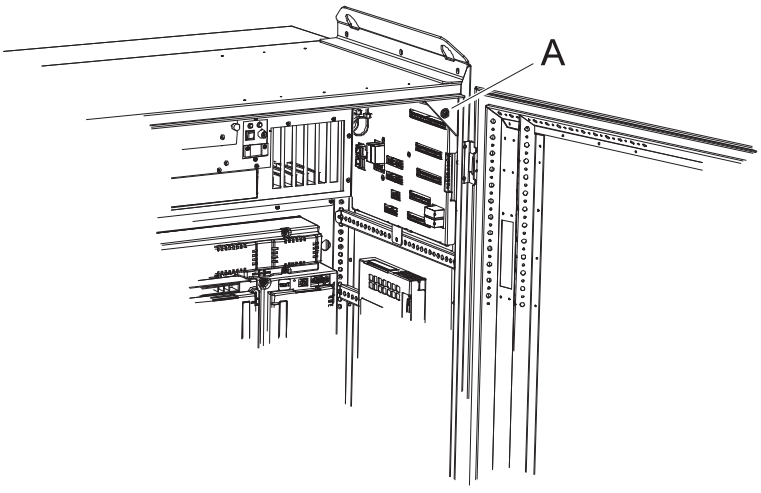
ESD (electro static discharge) is the transfer of electrical static charge between two bodies at different potentials, either through direct contact or through an induced electrical field. When handling parts or their containers, personnel not grounded may potentially transfer high static charges. This discharge may destroy sensitive electronics.

### Elimination

| | Action | Note |
|---|---|---|
| 1 | Use a wrist strap | Wrist straps must be tested frequently to ensure that they are not damaged and are operating correctly. |
| 2 | Use an ESD protective floor mat. | The mat must be grounded through a current-limiting resistor. |
| 3 | Use a dissipative table mat. | The mat should provide a controlled discharge of static voltages and must be grounded. |

### Location of wrist strap button

The wrist strap button is located in the top right corner as shown in the illustration below.

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| | |
|---|---|
| A | Wrist strap button |

## 1.5.5 WARNING - Safety risks during work with gearbox oil

### Description

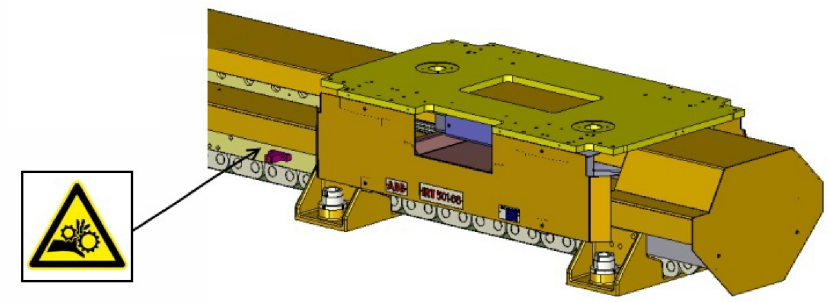
When handling the gearbox oil, there are several dangers to both personal injuries and product damages! Following safety information must be regarded before performing any work with the oil in the gearboxes!

### Warning and elimination

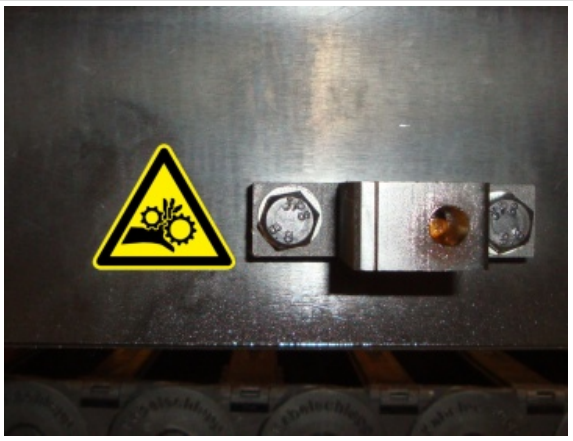
| Warning | Description | Elimination/Action |
|---|---|---|
|  Hot oil! | Changing and draining gearbox oil may require handling hot oil of up to 90 °C! | Make sure that protective gearbox like goggles and gloves are always worn during this activity. |
|  Possible pressure build in gearbox | When opening the oil plug, there may be pressure present in the gearbox, causing oil to spray from the opening! | Open oil plug carefully and keep away from the opening. Do not overfill the gearbox when filling. |
|  Don not overfill! | Overfilling of gearbox oil can lead to internal over-pressure inside the gearbox which in turn may: damage seals and gaskets completely press out seals and gaskets prevent the manipulator from moving freely. | Make sure not to overfill the gearbox when filling with oil! After filling, check the correct oil level. |
|  Do not mix types of oil! | Mixing types of oil may cause severe damage to the gearbox! | When filling gearbox oil, do not mix different types of oil unless specified in the instruction. Always use the type of oil specified by the manufacturer! |
|  Heat up the oil! | Warm oil drains quicker than cold oil. | When changing gearbox oil, first run the robot for a time to heat up the oil. |
|  Specified amount depends on drained volume! | The specified amount of oil is based on the total volume of the gearbox. When changing the oil, the amount of refilled oil may differ from the specified amount, depending on how much oil has previously been drained from the gearbox. | After refilling, check the oil level. |

## 1.5.6 Location of safety pictograms

### Location of safety pictograms



xx1800002087

| Symbol | Description | Position |
|---|---|---|
|  xx1800002100 | **DANGER!** **Risk of severe injury to hands!** This pictogram must be positioned close to the timing mark. |  xx1800002088 |

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# 2 Installation and commissioning

## 2.1 Introduction

### General

The FlexTrack IRT 501-66 /66R /90 /90R includes one or more carriages moving on a modular track made of crossmembers, sidemembers, rack, and covers. This unit can be either installed on a concrete floor, or on a FlexiCell platform.

For detailed information regarding mechanical installation requirement for concrete floor and FlexiCell platform, see *Preparation for setup on page 95*.

### Protection standards

Standard FlexTrack IP54.

### Explosive environments

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

### Terminology

| Designation | Definition |
|---|---|
| Robotic system | The robot and the FlexTrack. |
| Robot | The manipulator and the controller. |
| Manipulator | The 6 axis mechanical unit of the robot. |
| Controller | The motion system used to control the manipulator & FlexTrack (i.e. ABB IRC5). |
| Translation unit | The complete carriage assembly including all moving parts (cable track, lubrication system, sensors, and so on). |
| Carriage | The moving part of the FlexTrack. The top plate receives the tooling / robot. |
| Track | The static part of the FlexTrack.<br>The track is delivered as modules to be assembled by the customer, as described in *Assembly of the track on page 64*. |
| Travel length | Maximum stroke of the carriage. |
| SMB Box | The Serial Measurement Board Box, a control box which includes the SMB card for the FlexTrack axis as well as the resolver position backup battery. |
| SMB | The Serial Measurement Board is a integrated circuit board used to measure and store the position of each robot axes. |
| Recirculating ball bearing linear guide system | Is the system of both the linear rail and the ball bearing blocks which achieve high precision linear motion. |
| Linear rail | Is the lubricated rail (steel beam) on which the ball bearing block slides. |
| Ball bearing block | Is the sliding block which translates on the linear rail. Also known as linear block or linear guide block.<br>The ball bearing block contains the recirculating balls which roll on the linear rail. |

*Continues on next page*

| Description | Standard/Option | Temperature |
|---|---|---|
| FlexTrack during operation | Standard | + 5°C (41°F) to + 50°C (122°F) |
| For the controller | Standard | + 5°C (41°F) to + 45°C (113°F) |
| For the controller | Option | +5°C (41°F) to + 52°C (126°F) |
| For short periods (not exceeding 24 hours) | Standard | up to + 70°C (158°F) |

### Relative humidity

| Description | Relative humidity |
|---|---|
| Complete track during transportation and storage | Max. 95% at constant temperature |
| Complete track during operation | Max. 95% at constant temperature |

### Preparations

The following steps should be carried out before starting the FlexTrack IRT 501.

| | Action | Note |
|---|---|---|
| 1 | Unpacking and acceptance. | Compare the delivery check to the identification plate and verify for acceptance according to *Acceptance inspection on page 42*. |
| 2 | Lifting. | Lifting FlexTrack IRT 501 using lifting slings, see *Acceptance inspection on page 42*. |
| 3 | Preparation for assembly. | |
| 4 | Assemble the track. | |
| 5 | Assemble the manipulator. | |
| 6 | Electrical installation. | |
| 7 | Software installation. | |

## 2.2 Unpacking and acceptance

### 2.2.1 Unpacking

**Inspection**

The FlexTrack IRT 501 is wrapped in plastic. Unpack the track and check for any visible transport damage. If the FlexTrack IRT 501 is damaged, contact ABB.

**Contents**

If the complete track contains more than 5 modules, it would be separated to more than 1 sections for packing's convenience. As standard the FlexTrack IRT 501 includes the following on delivery (not including options):

- One or more preassembled track sections, depending on the complete track length. The carriage is mounted on one track section no less than 2 m long.
- Cable chain. The cable chain has been preassembled on the track when delivered.
- Memolub auto lubrication system. The Memolub auto lubrication system has been installed on the carriage and preset when delivered, but it is not yet activated.

**Cleaning**

Before transport the FlexTrack IRT 501 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, at the exception of the pre-lubricated parts such as the rack and the linear rails.

**Note**

Wipe off any surplus oil using a lint-free cloth.

## 2.2.2 Acceptance inspection

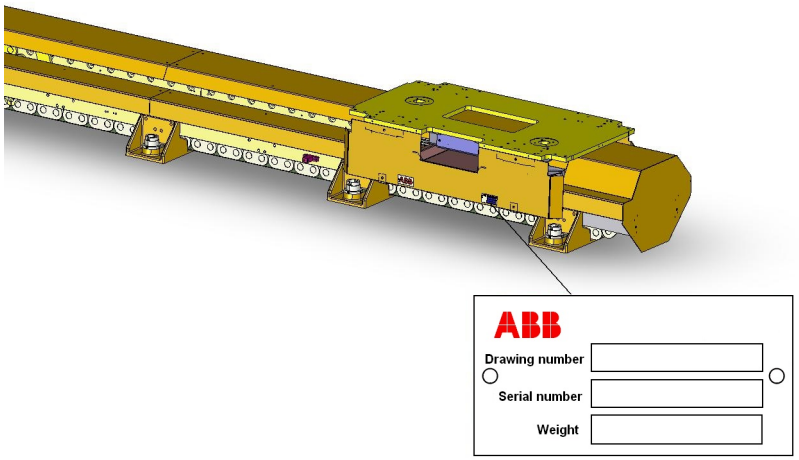
**Tip**

Always try to determine if the goods are as ordered, and that the package is not damaged before unpacking the complete track.

### Identification plate

To identify the delivery, check the identification plate and compare it to the delivery note.

The identification plate is located on the carriage side (see figure below) and indicates the FlexTrack type, the serial number and the weight of the complete track.

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## 2.3 Handling

### 2.3.1 Lifting FlexTrack IRT 501

**Action before lifting**

**CAUTION**

Read through the safety instructions carefully, before the FlexTrack IRT 501 is installed.

**WARNING**

After assembly, the FlexTrack IRT 501 must not be handled using a forklift truck or a crane.

**Handling equipment for FlexTrack modules without a mounted carriage**

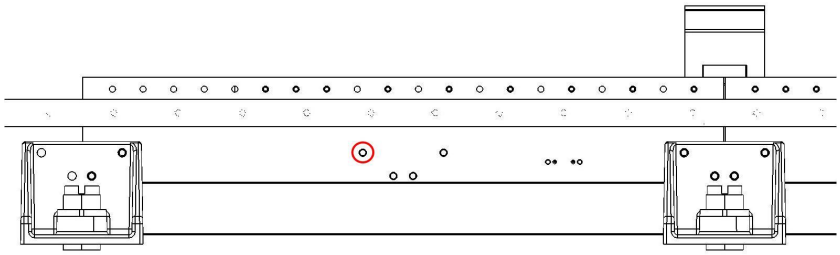
| Type | Recommended equipment |
|---|---|
| IRT 501 - 66 and 90 | 4 U-shackles (shackle has to fit into the bail)<br>  <br>xx1800002090 |
| | 4 Lifting I-bolts with a M12 thread<br>  <br>xx1800002091 |
| | 2 lifting straps (min. 5 m) with a load capacity of 1 tonne each |
| IRT 501 - 66 and 90 | 2 lifting straps (min. 5 m ) with a load capacity of 1 tonne each |

*Continues on next page*

2.3.1 Lifting FlexTrack IRT 501
*Continued*

**Lifting FlexTrack IRT 501 - 66 and 90 without a mounted carriage**

Unmount all covers and screw the I-bolt in the outer holes located between the crossmembers and connect the shackle with the I-bolts.



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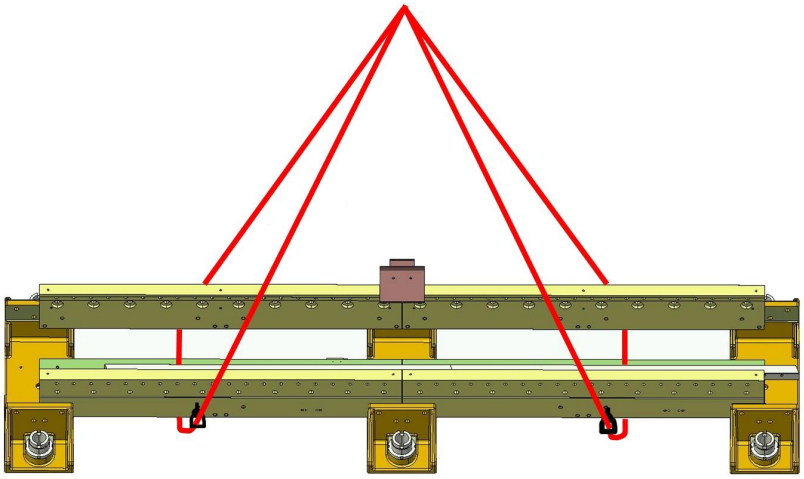
In the following step one end of a lifting strap should be guided through the shackle, below the sidemembers at both sides and through the second shackle. The second strap should be used for the other side.

The shackle should act as a guidance only to prevent the straps from slipping. The weight of the FlexTrack should be carried by the sidemembers.



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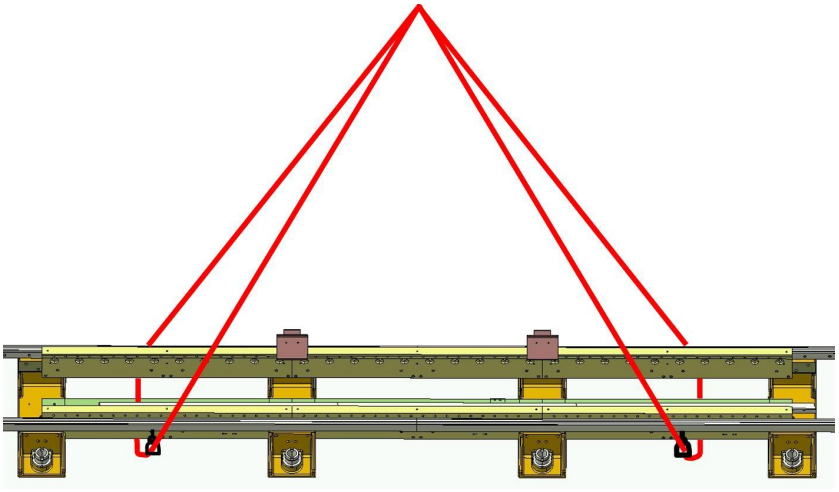

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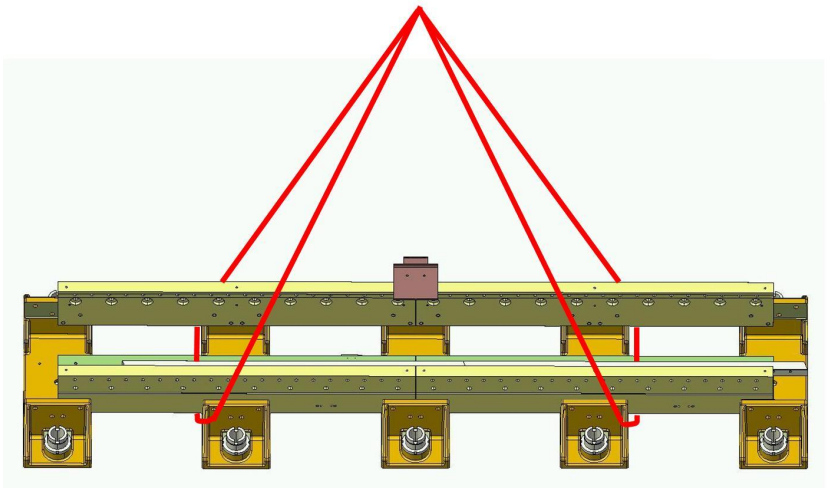
**Lifting FlexTrack IRT 501 - 66R and 90R without a mounted carriage**

The lifting strap should be guided behind the second to last crossmembers below the sidemembers at both sides and through the second shackle. The second strap should be used for the other side.



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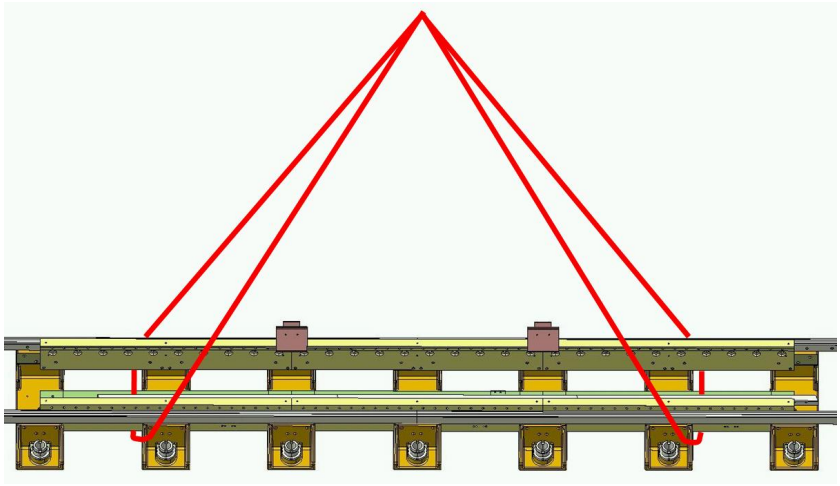
2.3.1 Lifting FlexTrack IRT 501
*Continued*



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**WARNING**

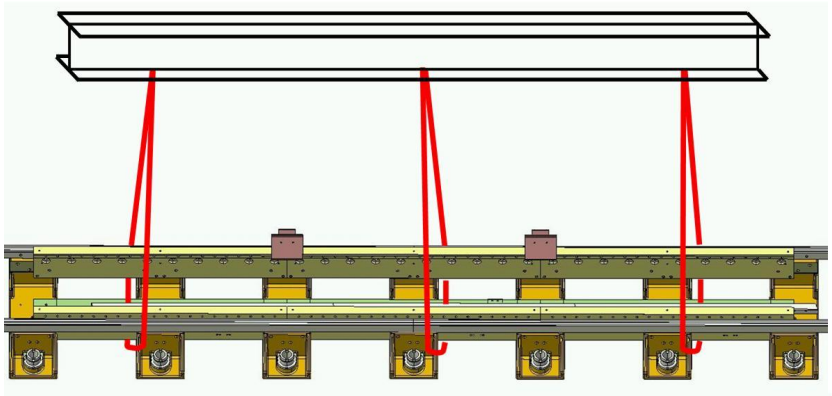
Never place lifting straps wider than a combined angle of max. 60°.

Never lift a track longer than 3 m at once. If the track is longer, the track has to be disassembled into smaller sections.

**Lifting FlexTrack with a lifting beam**

If there is a lifting beam available, the strap should always be located at the middle of the sidemembers.

The picture shows 66 / 90 with a length of 3 m.



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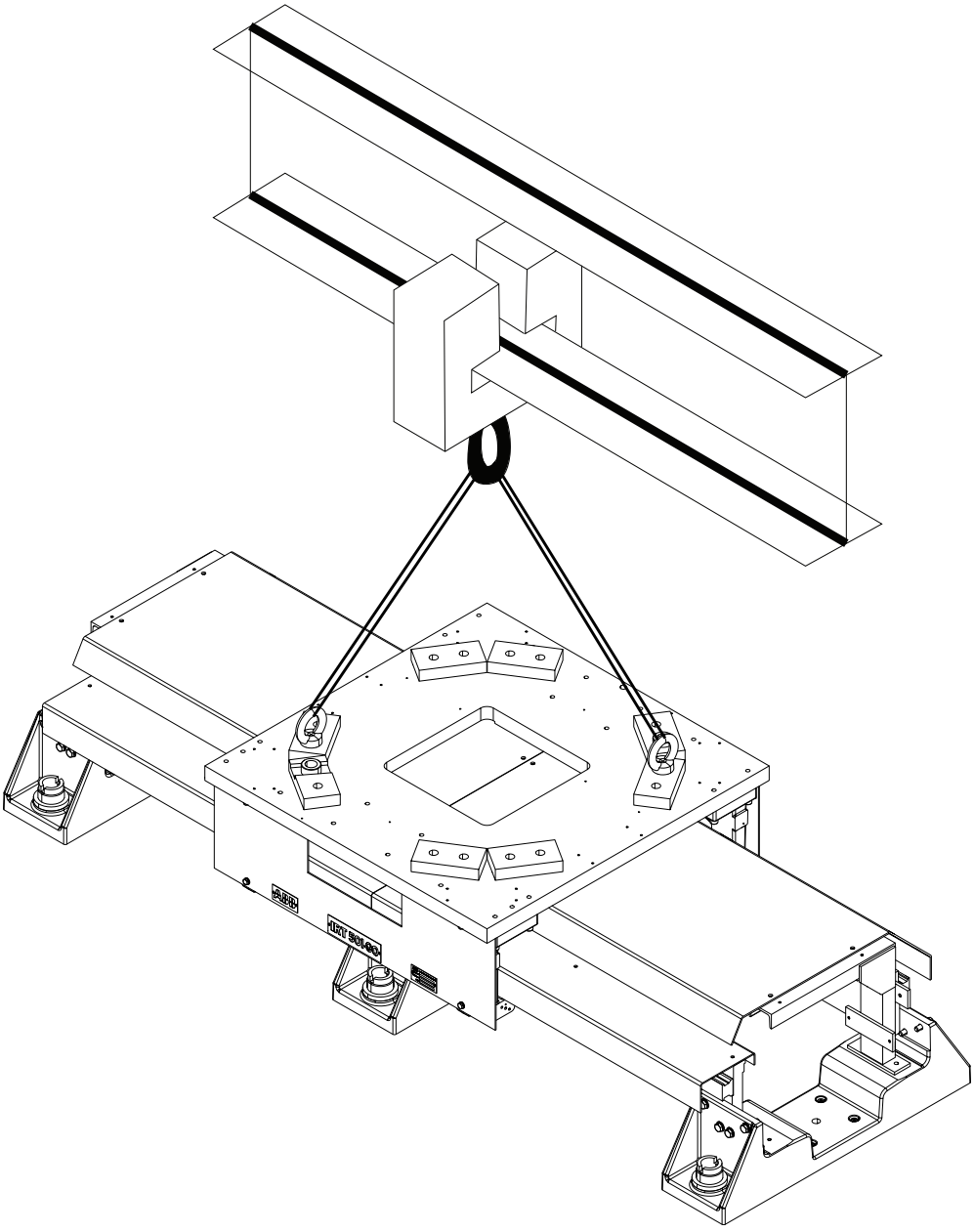
**Lifting 2 m FlexTrack with carriage**

The carriage comes assembled on a 2 m track section which can be handled using appropriate straps and M24 handling I-bolts.



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## 2.3.2 Lifting weight

**FlexTrack IRT 501 weight**

For accurate weight of the whole track, read the identification plates on the FlexTrack IRT 501. The position of the identification plates are described in *Identification plate on page 42*.

The weight of the FlexTrack depends on its type, length, and number of carriages. The total weight can be determined with the following formulas:

| Type | Weight (kg) |
|---|---|
| IRT 501-66 | W = 595 + M x 195 + C x 327 |
| IRT 501-66R | W = 637 + M x 237 + C x 327 |
| IRT 501-90 | W = 710 + M x 222 + C x 393 |
| IRT 501-90R | W = 752 + M x 264 + C x 393 |
| IRT 501-90RE/RS | W = 805 + M x 264 + C x 446 |

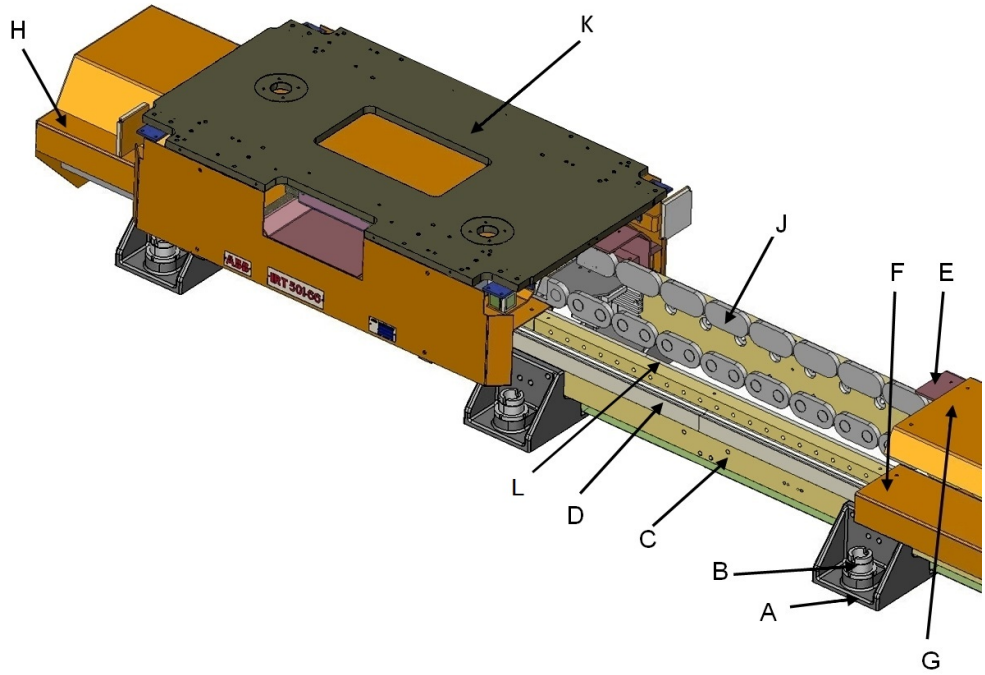
with:

M = Number of modules

C = Number of additional carriages (first carriage already included, C = 0 if only one carriage)

## 2.3.3 FlexTrack IRT 501 size and dimensions

### FlexTrack overview

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| | |
|---|---|
| A | Cross member |
| B | Levelling screw |
| C | Side member |
| D | Linear rail |
| E | Cover bracket |
| F | Rack cover |
| G | Cover |
| H | End cover |
| J | Cable chain |
| K | Carriage |
| L | Rack |

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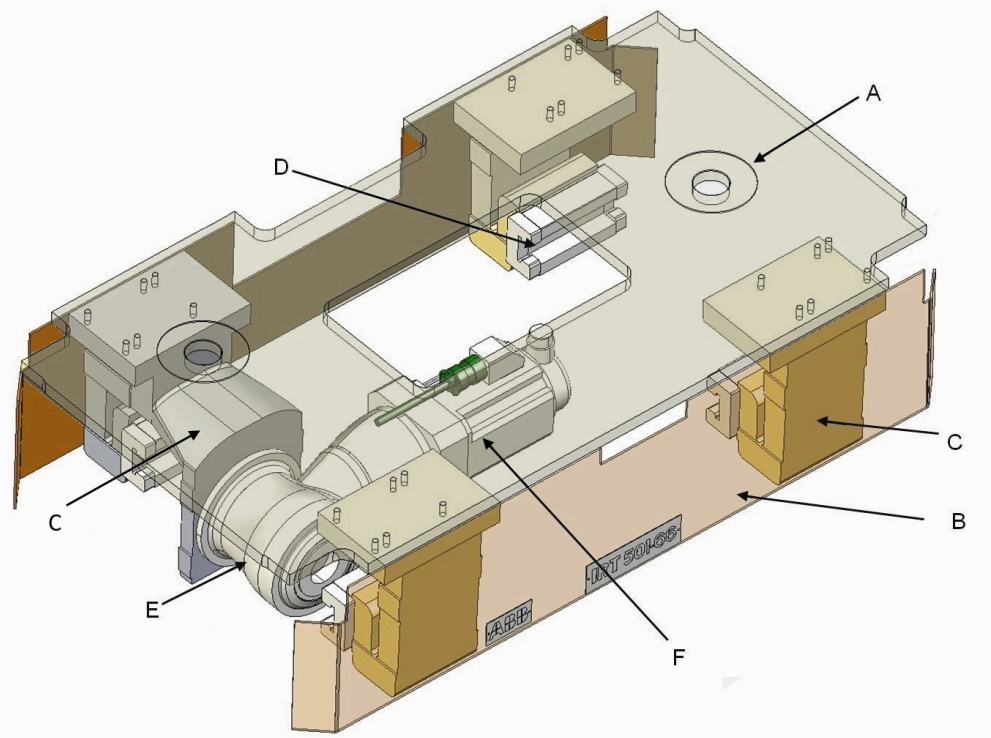
2.3.3 FlexTrack IRT 501 size and dimensions
*Continued*

**FlexTrack Carriage Overview**

With four bearings

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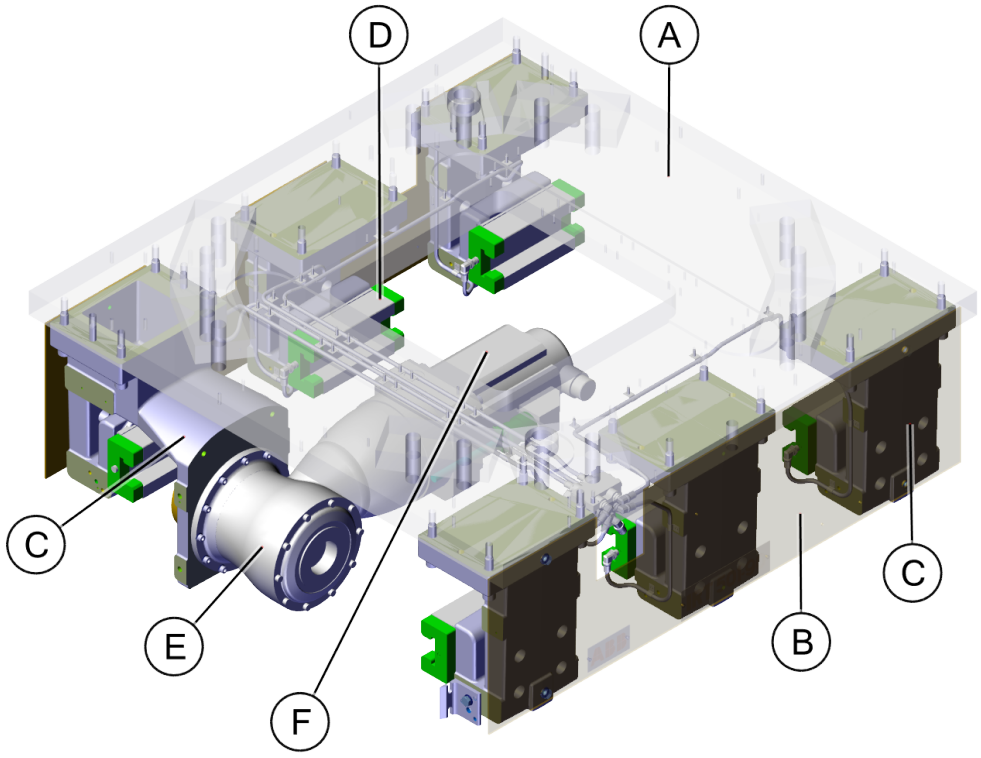
| | |
|---|---|
| A | Top plate |
| B | Side cover |
| C | 3 carriage bracket |
| | 1 carriage bracket with gearbox motor support |
| D | Ball bearing block |
| E | Gearbox |
| F | Motor |

*Continues on next page*

With six bearings

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| | |
|---|---|
| A | Top plate |
| B | Side cover |
| C | 5 carriage bracket |
| | 1 carriage bracket with gearbox motor support |
| D | Ball bearing block |
| E | Gearbox |
| F | Motor |

## Dimensions of the FlexTrack

| Data | IRT 501-66 | IRT 501-66R | IRT 501-90 | IRT 501-90R/90RE/90RS |
|---|---|---|---|---|
| A | 660 | 660 | 900 | 900 |
| B | 500 | 500 | 680 | 680 |
| C | 435 | 435 | 495 | 495 |
| D | 1050 | 525 | 1050 | 525 |
| E | 1150 | 1150 | 900 | 900 |
| L | 738+N×1050 | | | |

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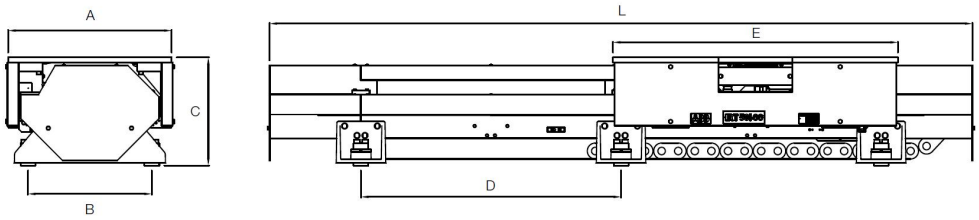
2.3.3 FlexTrack IRT 501 size and dimensions
*Continued*

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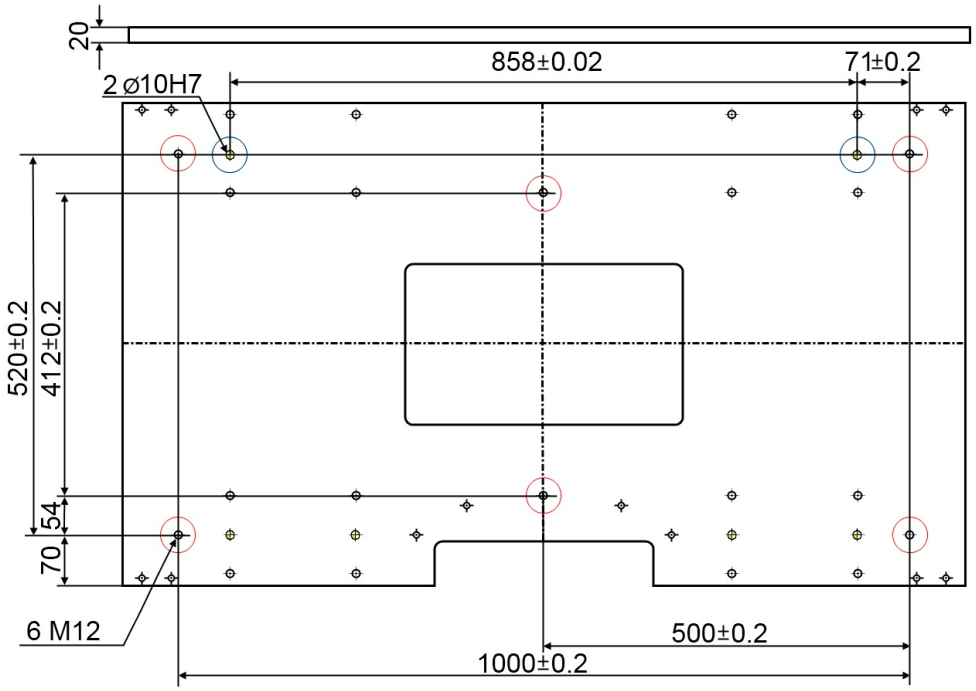
**Standard top plate**

For material handling applications with FlexTrack, six M12 holes are prepared for fastening of the fixture on top, two Ø10 d dowels for the locating.

The opening in the middle of the plate is for easy access to the motor connection box.

Dimensions for IRT501-66 / IRT501-66R

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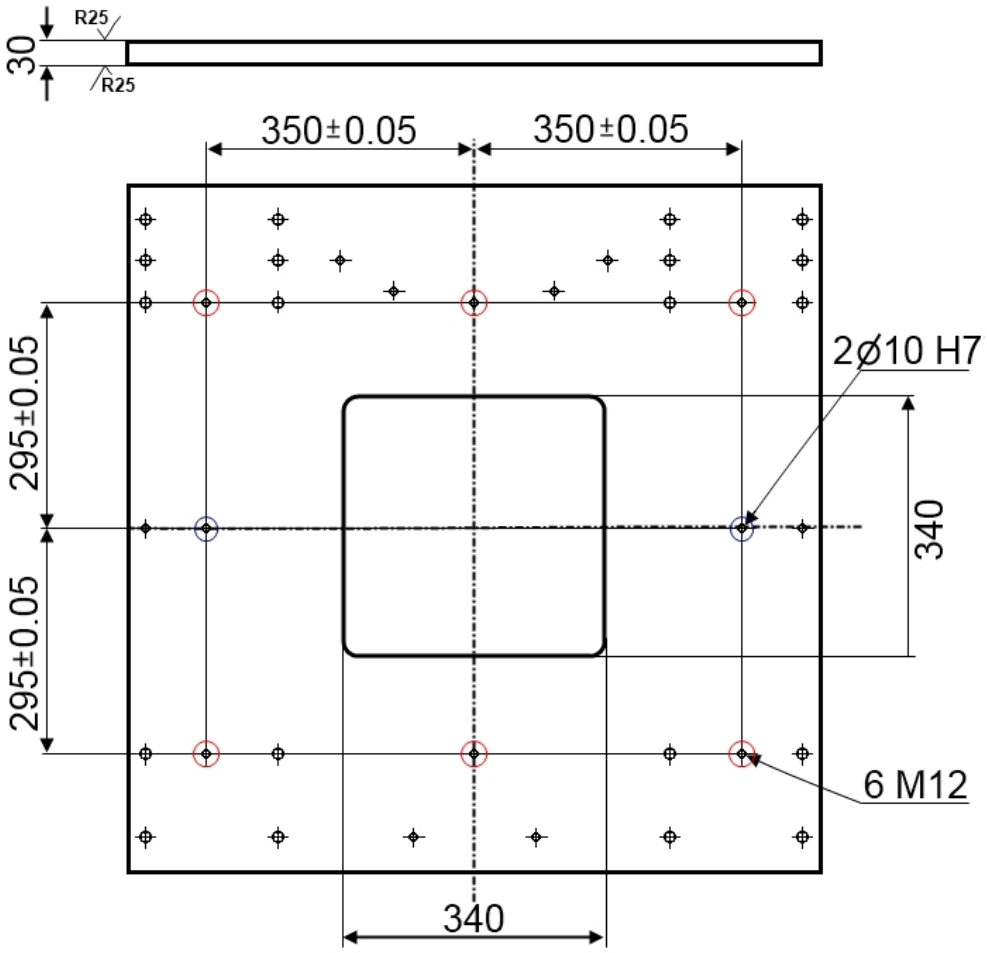
Dimensions for IRT501-90 / IRT501-90R / IRT501-90RE / IRT501-90RS

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**Robot Plate**

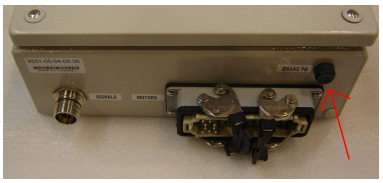
Robot plates exist for various robot models and their bolting patterns match that of the robot.

## 2.3.4 Moving the carriage manually

### Release the brake

The carriage can be pushed manually to another position on the track.

It is recommended that the carriage is manually pushed along its complete stroke after being installed and before running the track using the IRC5. This is to ensure that there is no risk of collision other equipment in the vicinity of the track.

| | Action | Note/Illustration |
|---|---|---|
| 1 | Connect all cables to the controller as described in *Cables connections on page 88*. | |
| 2 | Start up the controller as described in *Connectors on IRC5 controller on page 90* on page. | |
| 3 | Press in the brake release button (A) shows in the figure. |  <br>xx1800001866<br>Release the brake |
| 4 | Push the carriage by hand to the desired location. | |

*Continues on next page*

**Note**

Care should be taken when moving the track manually. There is a risk of severe injury to hands near the calibration pin, as well as at the location where the rack and pinion mesh.

Users should remain clear of these locations when moving the track.

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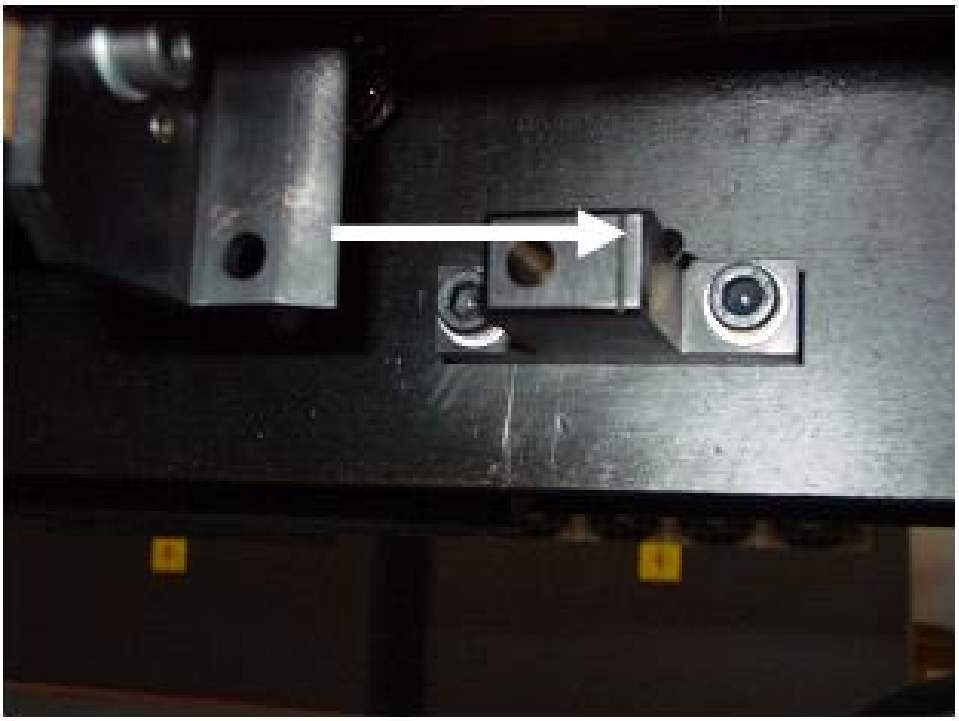

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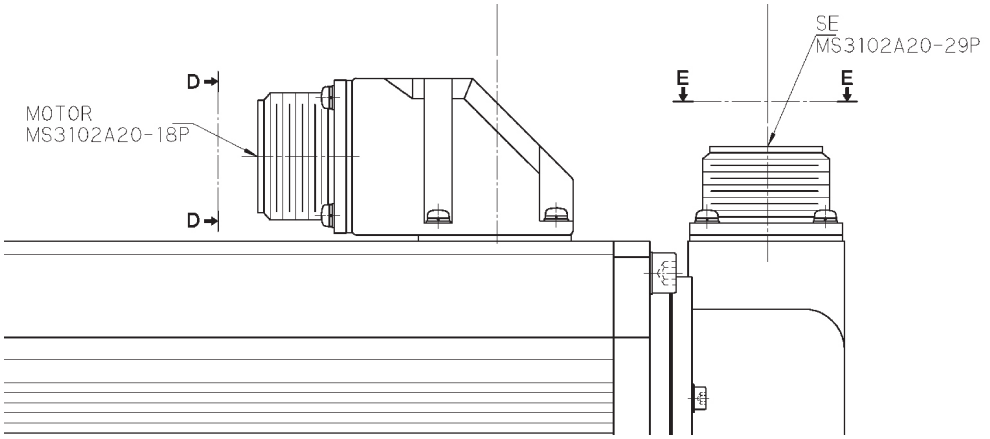
### Release the brake (external 24V DC)

If there is no voltage to the motor, 24V DC can be connected direct to the SMB box.

| | Action |
|---|---|
| 1 | Unplug the Motor power cable from the SMB box that runs to the FlexTrack motor. |
| 2 | Using pins, connect the +24VCC to the G pin (see fig). |
| 3 | Connect the 0VCC to the H pin |

*Continues on next page*

### 2.3.4 Moving the carriage manually
*Continued*

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**Note**

Painting: Half black color. Except the mounting surface.

**Note**

Mating connectors are not offered.

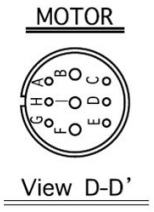
Motor Connection

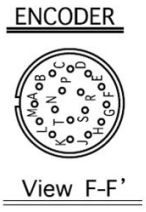
| PIN | FUNCTION |
|---|---|
| A | ——— |
| B | W-phase |
| C | ——— |
| D | ——— |
| E | Frame GND |
| F | U-phase |
| G | (brake) |
| H | (brake) |
| I | V-phase |

Encoder Connection

| PIN No. | FUNCTION | PIN No. | FUNCTION |
|---|---|---|---|
| A | NC | K | NC |
| B | NC | L | NC |
| C | NC | M | NC |
| D | NC | N | NC |
| E | SD | P | NC |
| F | $\overline{SD}$ | R | NC |
| G | GND | S | GND |
| H | VCC | T | VB |
| J | CASE GND | | |

(In case of 17/33bit abs.encoder)

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**WARNING**

The motor breaks on the FlexTrack IRT 501 are phase dependent. Fault connection can cause damage to vital parts.

## 2.4 Preparations for assembly

### 2.4.1 Foundation

**Robustness**

The foundation must with stand the static loads caused by the weight of the equipment and the dynamic loads generated by the movement of the carriage and the manipulator. The minimum thickness of the concrete floor is 175 mm.

The concrete quality class must be at least C20/25 (or B25) to insure a good resistance of the anchor. Class C30/37 (or B35) is advisable.

The concrete compressive strength can be tested according to the European norm EN 206-1.

When FlexTrack is mounted on the steel platform of FlexiCell, M16x40 class 12.9 screws and DIN6796 M16 washers are required, and pre-tightening torque is 280 Nm. Depth of thread must be min. 25 mm. Notice that it MUST do tightening for chemical screw again after tightening this M16x40 screw. For the pre-tightening torque, see *Recommendation for anchors on page 60*.

**Inclination and flatness**

The levelling of the track is done by screwing / unscrewing the M60 screws. However, in order to insure a good levelling, the concrete floor inclination must not exceed 1mm / meter in the translation direction, and 0.5mm / meter cross section. The levelling screws can also compensate a poor flatness of the slab and small bumps up to 10 mm. However, the surface under the levelling screw must be flat. A concrete surfacing grinder should be used to correct the flatness locally if necessary.

**Static loads**

The following table shows the maximum payload of all FlexTrack carriage variants, and the corresponding load distributed to each levelling screw.

| Load | IRT 501-66 | IRT 501-66R | IRT 501-90 | IRT 501-90R/90RE/90RS |
|---|---|---|---|---|
| Max. Load | 900 kg | 2,000 kg | 2,000 kg | 3,000 kg |
| Load on each levelling screw | 320 kg | 450 kg | 800 kg | 1,050 kg |

**Note**

The payloads listed above are estimated for a wide range of FlexTrack applications. For ModulFlex payload, please refer to ModulFlex specifications.

For higher weight of transfer application, please contact ABB.

**Robot capabilities**

The following table shows the robot capabilities of the FlexTrack.

*Continues on next page*

### 2.4.1 Foundation
*Continued*

Standard risers are generally allowed between the FlexTrack carriage and the robot but their height is limited and dependent on the type of FlexTrack and the type of robot.

**Note**

If the riser is too high, it may vibrate.

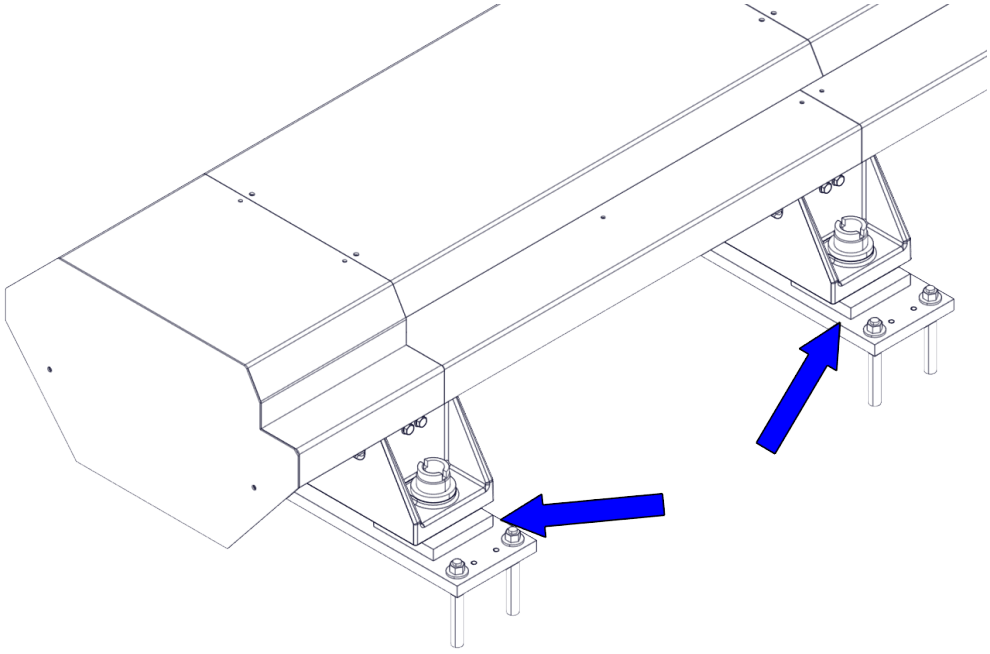
For higher riser application, please contact ABB.

| Robot | IRT 501-66 | IRT 501-66R | IRT 501-90 | IRT 501-90R | IRT 501-90RE | IRT 501-90RS |
|---|---|---|---|---|---|---|
| IRB 1410 | √ Riser 1,000 mm max | √ Riser 1,000 mm max | X | X | X | X |
| IRB 1600 | √ Riser 1,000 mm max | √ Riser 1,000 mm max | X | X | X | X |
| IRB 52 | √ Riser 1,000 mm max | √ Riser 1,000 mm max | X | X | X | X |
| IRB 2400/2600 | √ Riser 1,000 mm max | √ Riser 1,000 mm max | X | X | X | X |
| IRB 4400 | X | X | √ Riser 1,000 mm max | √ Riser 1,000 mm max | √ Riser 1,000 mm max | √ Riser 1,000 mm max |
| IRB 4600 | X | X | √ Riser 1,000 mm max | √ Riser 1,000 mm max | √ Riser 1,000 mm max | √ Riser 1,000 mm max |
| IRB 460 | X | √ Riser 500 mm max | √ Riser 500 mm max | √ Riser 1,000 mm max | √ Riser 1,000 mm max | √ Riser 1,000 mm max |
| IRB 6620/6640 | X | X | √ No riser allowed | √ Riser 500 mm max | √ Riser 500 mm max | √ Riser 500 mm max |
| IRB 6700-200/2.6-235/2.65-205/2.8-155/2.85-175/3.05-150/3.2 | X | X | √ No riser allowed | √ Riser 500 mm max | √ Riser 500 mm max | √ Riser 500 mm max |
| IRB 6700-300/3.7-245/3.0 | X | X | X | X | √ Riser 500 mm max | √ Riser 500 mm max |
| IRB 660 | X | X | X | X | √ Riser 250 mm max | √ Riser 250 mm max |
| IRB 6650 | X | X | X | X | √ No riser allowed | √ No riser allowed |
| IRB 6650S | X | X | X | X | √ No riser allowed | √ No riser allowed |

*Continues on next page*

| Robot | IRT 501-66 | IRT 501-66R | IRT 501-90 | IRT 501-90R | IRT 501-90RE | IRT 501-90RS |
|---|---|---|---|---|---|---|
| IRB 760 | X | X | X | X | √<br>No riser allowed | √<br>No riser allowed |
| IRB 7600 | X | X | X | X | √<br>No riser allowed | √<br>No riser allowed |

For these robots application, it is better to not put track on ground straightly, put one plate as interface surface to make it more stable.



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## 2.4.2 Recommendation for anchors

### Recommended anchor

The recommended anchor bolts are HILTI M16x125 as shown below:

| Anchor size | | | M8 | M10 | M12 | M16 | M20 | M24 | M27 | M30 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Foil capsule HVU2** | | | **8x80** | **10x90** | **12x110** | **16x125** | **20x170** | **24x210** | **27x240** | **30x270** |
| Diameter of element | $d_1=d_{nom}$ | [mm] | 8 | 10 | 12 | 16 | 20 | 24 | 27 | 30 |
| Nom. diameter of drill | $d_0$ | [mm] | 10 | 12 | 14 | 18 | 22 | 28 | 30 | 35 |
| Eff. Embedment depth and drill hole in the fixture | $h_{ef}=h_0$ | [mm] | 80 | 90 | 110 | 125 | 170 | 210 | 240 | 270 |
| Max. diameter of clearance hole in the fixture | $d_f$ | [mm] | 9 | 12 | 14 | 18 | 22 | 26 | 30 | 33 |
| Min. thickness of concrete member | $h_{min}$ | [mm] | 110 | 120 | 140 | 160 | 220 | 270 | 300 | 340 |
| Max. torque moment [a] | $T_{max}$ | [Nm] | 10 | 20 | 40 | 80 | 150 | 200 | 270 | 300 |

xx1800001873

### Curing time

| Temperature of the base material | Minimum curing time $t_{cure}$ |
|---|---|
| -10 °C to -6 °C | 5 hours |
| -5 °C to -1 °C | 3 hours |
| 0 °C to 4 °C | 40 min |
| 5 °C to 9 °C | 20 min |
| 10 °C to 19 °C | 10 min |
| 20 °C to 40 °C | 5 min |

xx2200001153

**Note**

It is recommended to use chemical anchors with M16 threaded rods to secure the unit to the floor. See *Recommendations for floor mounting on page 71*.

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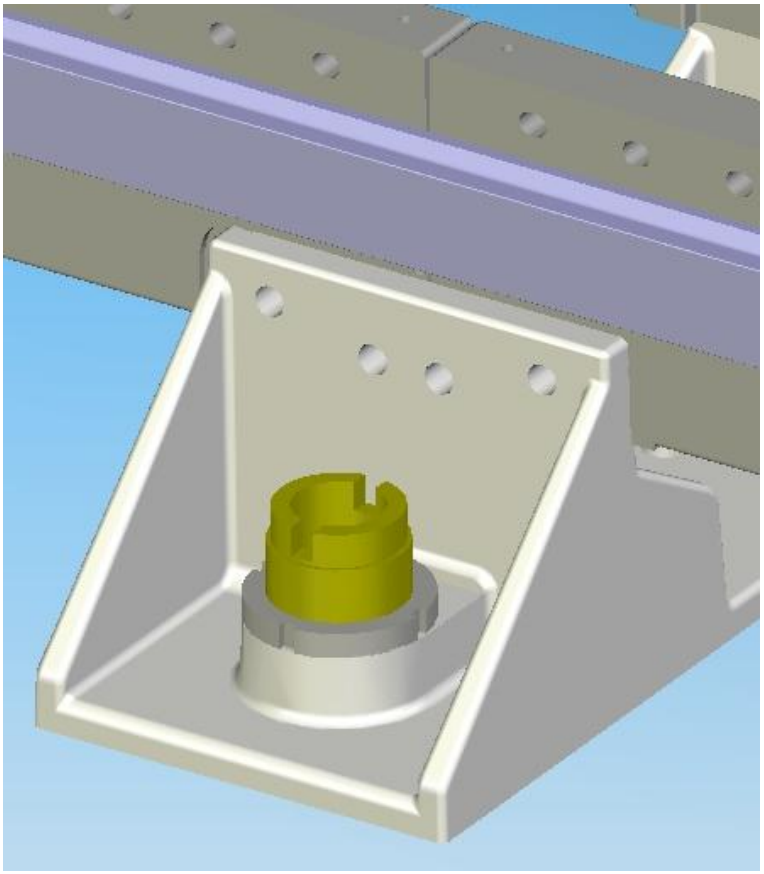

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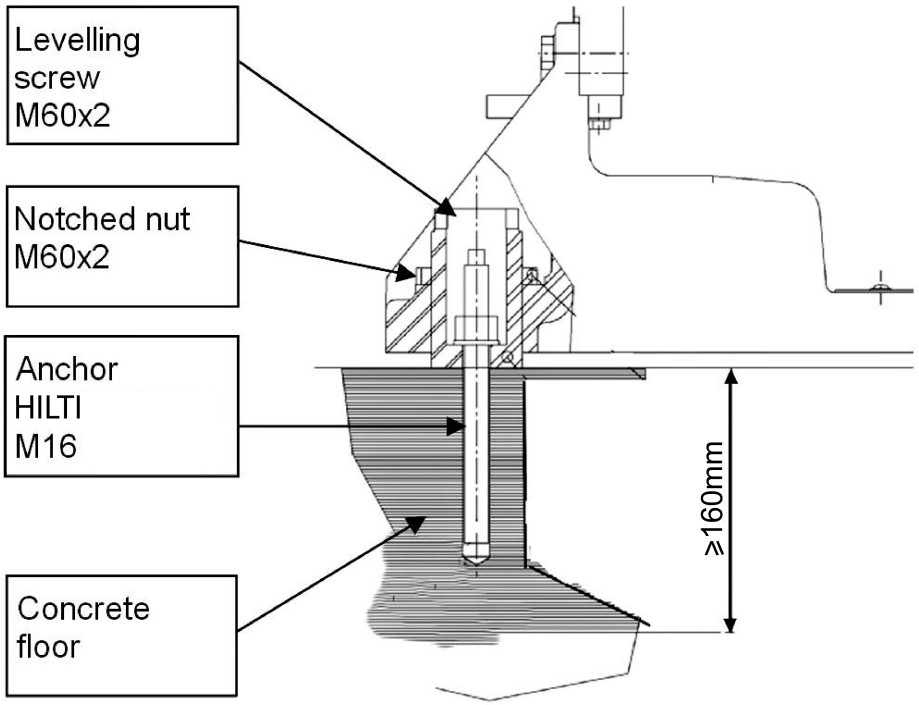
2.4.2 Recommendation for anchors
*Continued*

**Section view of the FlexTrack anchor**




xx1800001875

## 2.4.3 Screw joints

### General

This section details how to tighten the various types of screw joints on the robot and the FlexTrack.

The instructions and torque values are valid for screw joints comprised of metallic materials and do not apply to soft or brittle materials.

### Screw class

Class 12.9 screw is recommended by ABB for certain screw joints. These screws are high grade quality and extremely resistant to fatigue. Whenever used, this is specified in the instructions, and in such cases, no other type of replacement screw is allowed! Using other types of screws will void any warranty and may potentially cause serious damage or injury!

### Loctite 243

A thread lock should be used on all screws that have a specified torque and only where stated. This is required to prevent the risk of the screw loosening due to vibrations over the lifetime of the product. Loctite 243 is the recommended thread lock and should be applied to the screws before assembly and tightening to their recommend torque.

### Tightening torque

Before tightening any screw, note the following:

- Determine whether a standard tightening torque or special torque is to be applied. The standard torques is specified in the tables below. Any special torques is specified in the *Repair on page 147*, *Maintenance on page 119* or Installation procedure description. Any special torque specified overrides the standard value.
- Use the *correct tightening torque* for each type of screw joint.
- Only use *correctly calibrated torque* keys.
- Always *tighten the joint by hand*, and never use pneumatic tools.

Use the *correct tightening technique*, i.e. do not jerk. Tighten the screw in a slow, flowing motion.

- Maximum allowed total deviation from the specified value is 10%!

The table below specifies the recommended standard tightening torque for class 12.9 screws.

| Dimension | Tightening torque (Nm) Class 12.9 |
|---|---|
| M6 | 16.4 |
| M8 | 40 |
| M10 | 79 |
| M12 | 136 |

## 2.5 Assembly of the track

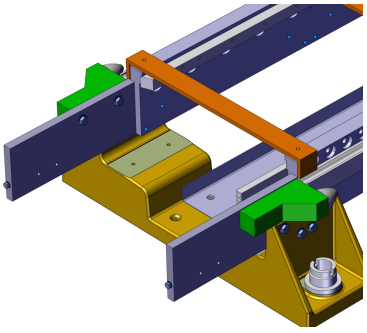
### 2.5.1 Procedure of assembly

**General**

The FlexTrack IRT 501 should be assembled as set out in the procedure below. Detailed descriptions of each stage can be found in the following sections.

**Required equipment**

| Qty | Tool |
|---|---|
| 1 | Ring-open-end spanner 8-22 mm |
| 1 | Socket head cap 2.5 mm, 4 mm, 5 mm, 6 mm, 8 mm and 10 mm |
| 1 | Small flat tip screwdriver |
| 1 | Plastic mallet |
| 1 | Torque wrench 10 Nm -140 Nm |
| 1 | Ratchet head for torque wrench 1/2 |
| 2 | Socket head cap 5 mm, 8 mm, 10 mm socket 1/2” bit L 20 mm |
| 2 | Hex head cap 13 mm, 19 mm socket 1/2”bit L 20 mm |

| Qty | Specific FlexTrack tools | Picture |
|---|---|---|
| 3 | Rail Pressing Tool<br>IRT501-66 & 66R: 3HAW107700358<br>IRT501-90 & 90R: 3HAW107700456 |  <br>xx1800001876 |
| 3 | Rack clamps (3HAW107700357) |  <br>xx1800001877 |

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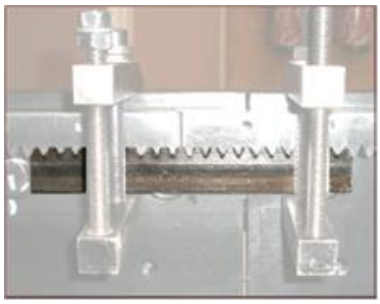
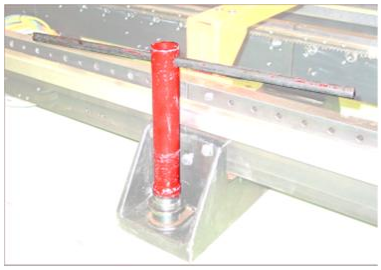
| Qty | Specific FlexTrack tools | Picture |
|---|---|---|
| 1 | Rack Mounting block (3HAWL000011) |  xx1800001878 |
| 1 | Leveling Tool (3HAW107700360) |  xx1800001879 |
| 1 | Calibration pin (3HAW107700354) |  xx1800001880 |
| 1 | Tool for levelling screw nut tightening (3HAW107700361) |  xx1800001881 |

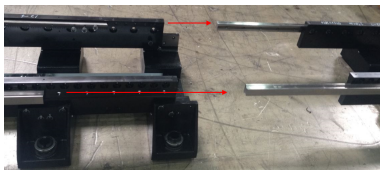
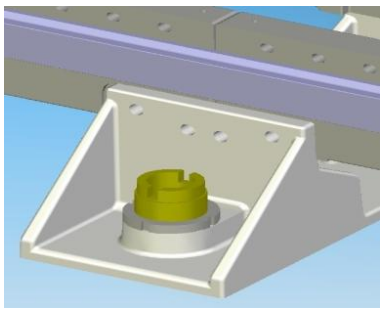
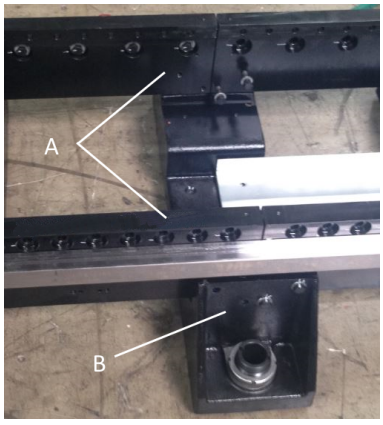
## Procedure of assembly

The following table describes all necessary steps to achieve a correct assembly of the IRT501 track:

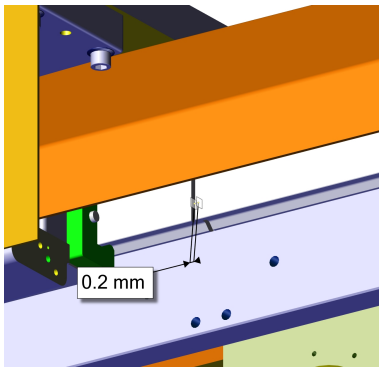
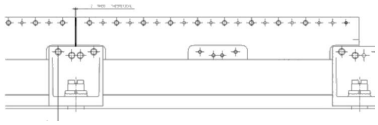
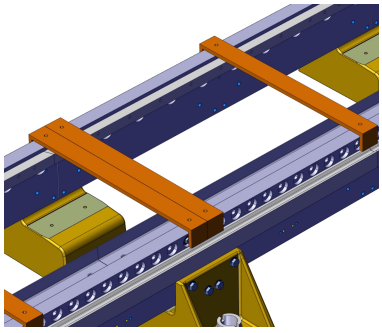
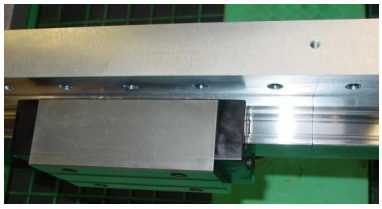
| | Action | Note/Illustration |
|---|---|---|
| 1 | Markup on a clean floor the FlexTrack axis.<br>Markup also the position of each cross member, with the following intervals:<br>IRT 501-66/90: 1,050 mm steps<br>IRT 501-66R/90R/90RE/90RS: 525 mm steps | |
| 2 | Position the preassembled carriage & track section on the floor at the predetermined position. | |

*Continues on next page*

2.5.1 Procedure of assembly
*Continued*

| | Action | Note/Illustration |
|---|---|---|
| 3 | Linearly position the other preassembled section beside the section above. | |
| 4 | Connect the preassembled sections with screws not mounted. |  <br>xx1800001882 |
| 5 | Level the track module with the M60 screws. See *Geometric alignment of FlexTrack IRT 501 on page 75*.<br><br>**Note**<br><br>Ensure the geometric alignment of the FlexTrack with an optical level or a laser tracker. Note that, at this stage, you can only check the horizontal alignment based on the sidemember upper surface. The final alignment will be given by the measurements done based on the linear rails position. |  <br>xx1800001883 |
| 6 | Adjust the leveling screws until all leveling screws touch the ground. | |
| 7 | Slightly tighten screws connecting the sidemember and the crossmember. |  <br>xx1800001884<br><br>A Sidemember<br>B Crossmember |

*Continues on next page*

| | Action | Note/Illustration |
|---|---|---|
| 8 | Visually check if the rails are seamlessly connected. If there is seam existed, push to adjust track sections and ensure that the gap of seam is 0.2 mm.<br>The distance between the two adjacent side members should be approximately 2 mm. |  <br>xx1800001885<br>  <br>xx1800001886 |
| 9 | When the levelling is satisfying, tighten all the screws connecting the sidemember and the crossmember after applying Loctite 243 on their thread.<br>**Tightening torque: 136 Nm** | |
| 10 | Slightly tighten the rail screws and finalize the horizontal alignment of the FlexTrack as described in *Geometric alignment of FlexTrack IRT 501 on page 75*.<br>**Tip**<br>All linear rails are preassembled on track sections.<br>**Note**<br>Use the rail pressing tool to make sure that the rails are pushed against the side member mounting surface. |  <br>xx1800001887 |
| 11 | Unscrew one block from the carriage and use it to check the rails alignment: if the rails are correctly aligned, you should sense no “step” while passing the rails junction. If so then push downward the rail against the side member shoulder and verify the 0.2 mm gap between rails. |  <br>xx1800001888 |

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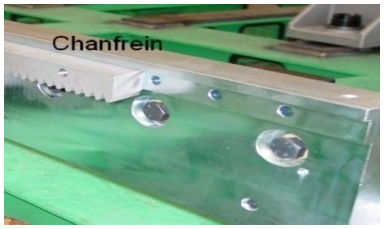
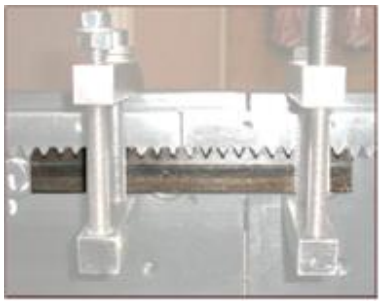
2.5.1 Procedure of assembly
*Continued*

| | Action | Note/Illustration |
|---|---|---|
| 12 | When the alignment is correct, tighten the rail screws one by one, after applying Loctite 243 on their thread.<br>(**Tightening torque: 132 Nm**)<br>If necessary, re-assemble the block in the carriage bracket and tighten its 4 pcs hexagon socket head cap M10x30 class 12.9 screws and narrow contact-lock washers M10-16.<br>(**Tightening torque: 77 Nm**) | |
| 13 | Use a brush to lubricate the linear rails. | |
| 14 | Assemble the rack by slightly tighten hexagon head M8x55 screws class 12.9 with contact-lock washers M8-18 and plain washers 8x25x3.<br>**Note**<br>Clean the sidemember mounting before installing the rack.<br>Check that the **chamfer is located in front of the side member step** (check on preassembled section if you are not sure).<br>**Note**<br>Use the clamping and mounting racks at the ends of the rack section to make sure that the racks are pushed against the side member mounting surface and perfectly aligned with each other. |  <br>xx1800001889<br>  <br>xx1800001890<br>  <br>xx1800001891 |
| 15 | When the alignment is correct, tighten the screws one by one, after applying Loctite 243 on their thread (**Tightening torque: 40 Nm**).<br>Use a brush to lubricate the racks. | |

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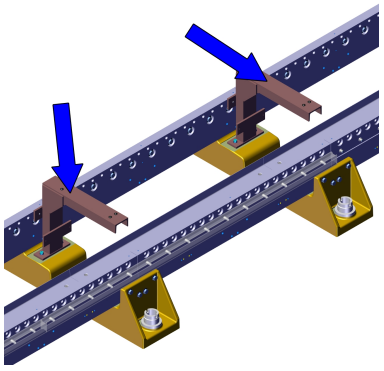
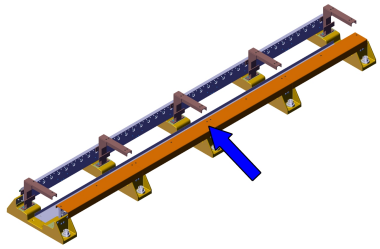
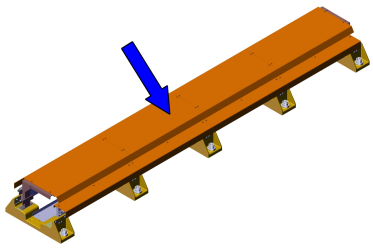
| | Action | Note/Illustration |
|---|---|---|
| 16 | Install the cable tray. |  <br>xx1800001892 |
| 17 | Install the cover brackets. |  <br>xx1800001893 |
| 18 | **CAUTION**<br>Release the carriage brake and push the carriage manually along the length of its stroke.<br>Check that the cable chain lies in the centre of the track and does not collide with any other fixed parts.<br>See section *Release the brake on page 54* for instructions on how to release the motor brake. | |
| 19 | Fix the small covers on top of the side members. Fix the large cover's brackets on the opposite side members. |  <br>xx1800001894 |
| 20 | Fix the large covers on top of the cover brackets. |  <br>xx1800001895 |

*Continues on next page*

2.5.1 Procedure of assembly
*Continued*

| | Action | Note/Illustration |
|---|---|---|
| 21 | **CAUTION**<br>Once again, release the carriage brake and push the carriage manually along the length of its stroke. Check that there is no interference between the covers and the carriage. | |

## 2.5.2 Recommendations for floor mounting

### 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 manipulator and carriage move.

### Securing the assembled track to the floor

| | Action |
|---|---|
| 1 | After assembly, all the levelling screws should touch the floor. Adjust if necessary and tighten the locking nut. |
| 2 | Move the carriage all along the track way, and check the levelling with a levelling device or a laser tracker. The levelness of the top plate must be satisfying in the translational direction, but also cross section. If you have moved the carriage manually, you probably need to initialize the resolver position, see *Update revolution counters on page 185*. |
| 3 | Drill the holes in the floor through the levelling screws opening, see the following section. |
| 4 | Install the anchors and secure the cross members to the floor.<br>If the recommended anchors are not used, you should check that the floor resistance and the selected anchors are compatible with the dynamic forces generated by the FlexTrack and the manipulator, see *Recommendation for anchors on page 60*. |

### Securing a crossmember

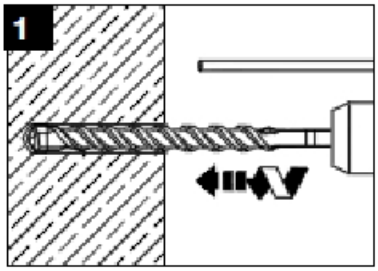
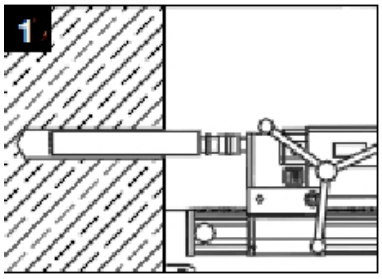
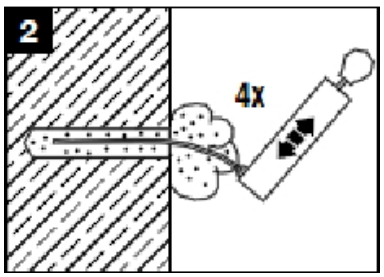
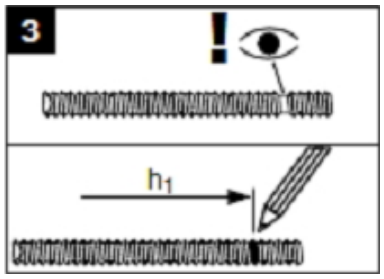
| | Action | Note/Illustration |
|---|---|---|
| 1 | Position the crossmembers on the floor. |  <br>xx1800001896 |
| 2 | Adjust the horizontality of the FlexTrack with the M60 levelling screw. | |
| 3 | Check that all the levelling screws are touching the floor. | |
| 4 | Tighten the M60 nuts. | |

*Continues on next page*

2.5.2 Recommendations for floor mounting
*Continued*

**Installation of chemical anchors**

Please respect the following procedure for chemical anchors installation. No mechanical anchors allowed. Chemical anchors used in FlexTrack IRT501-66/66R/90/90R/90RE/90RS is HILTI M16x125 anchors.

| | Action | Note |
|---|---|---|
| 1 | Drill the hole with rotary hammer and set the depth gauge to the correct drilling depth.<br>Diamond coring: Mark the correct drilling depth on the height adjustment mechanism. |  <br>xx1700001665<br>  <br>xx1700001666 |
| 2 | Clean the hole immediately before setting the anchor. Remove drilling dust and standing water from the base of the hole by blowing out well with at least 4 strokes of the blow-out pump, or using compressed air or an industrial vacuum cleaner.<br>The anchor holes must be free of dust, water, ice, oil, bitumen, chemicals or any other foreign matter or contaminants. Poorly-cleaned holes leads to poor hold. |  <br>xx1700001667 |
| 3 | Ensure that the specified setting depth is marked on the anchor rod. If not, add an embedment mark, for example with tape or marker. |  <br>xx1700001668 |

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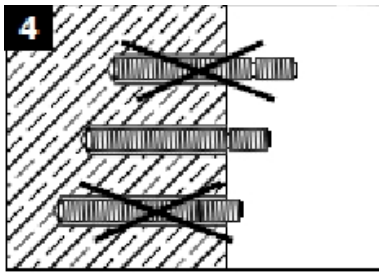
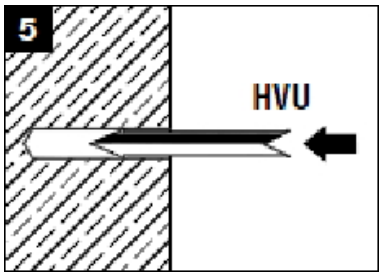
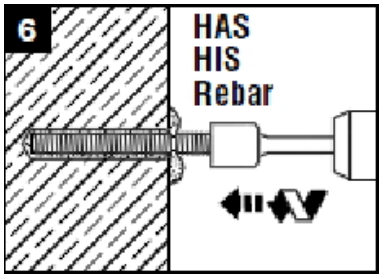
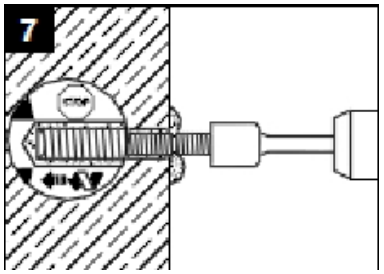
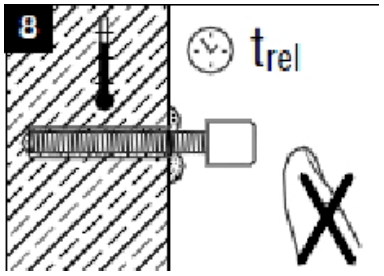
| | Action | Note |
|---|---|---|
| 4 | Check that the hole is drilled to the correct depth before setting the anchor, hole depth is correct when the anchor rod contacts the base of the hole and the setting depth mark coincides with the concrete surface. |  xx1700001669 |
| 5 | Push the anchor rod into the drilled hole. |  xx1700001670 |
| 6 | Use the setting tool at a speed of 250-1000 r.p.m to drive the anchor rod into the hole, applying moderate pressure and with the hammering action switched on. |  xx1700001671 |
| 7 | Switch off the rotary hammer drill immediately when the specified setting depth is reached (refer to mark on the anchor rod). After setting, adhesive mortar must fill the annular gap completely right up to the concrete surface.<br>**CAUTION**<br>Prolonged rotary action may cause mortar to be forced out of the hole. resulting in reduced anchor loading capacity. |  xx1700001672 |
| 8 | The working time '$t_{rel}$' which depends on base material temperature, must be observed. The screwed-on setting tool may be removed only after the time '$t_{rel}$' has elapsed. |  xx1700001673 |

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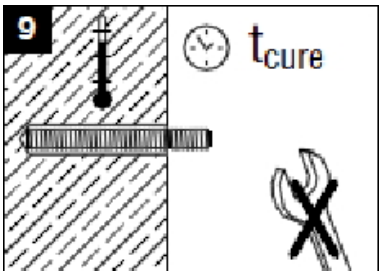
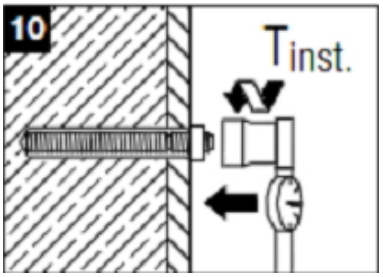
## 2.5.2 Recommendations for floor mounting

*Continued*

| | Action | Note |
|---|---|---|
| 9 | After reaching the end of the working time '$t_{rel}$' do not manipulate or disturb the anchor rod in any way until the curing time '$t_{cure}$' has elapsed. |  xx1700001674 |
| 10 | A load may be applied to the anchor only after the curing time '$t_{cure}$' has elapsed.<br>Torque: 80 |  xx1700001675 |
| 11 | Curing time '$t_{cure}$' which depend on base material temperature must be observed! | Curing time<br>Temperature of the base material / Minimum curing time $t_{cure}$<br>-10 °C to -6 °C: 5 hours<br>-5 °C to -1 °C: 3 hours<br>0 °C to 4 °C: 40 min<br>5 °C to 9 °C: 20 min<br>10 °C to 19 °C: 10 min<br>20 °C to 40 °C: 5 min<br>xx1700001676 |

**WARNING**

It is of the utmost importance that all screw joints be tightened with the correct torque. Failure to do so may result in damage to the equipment or personal.

## 2.5.3 Geometric alignment of FlexTrack IRT 501

**Instruction**

The geometric alignment of the FlexTrack should be done based on the position of the linear rails. This section details how to adjust the FlexTrack using a laser tracker.

**Tool list**

| Tool | Illustration |
|---|---|
| Absolute Tracker.<br>Reading must allow estimating 0.1 mm.<br>Example: Leica AT960 Absolute Tracker |  <br>xx1800001905 |
| Reflector<br>Example: Leica Reflector |  <br>xx1800001906 |
| Magnetic block<br>Example: Leica Magnetic block |  <br>xx1800001907 |
| ABB levelling tool (3HAW107700360) | |

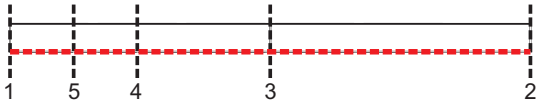
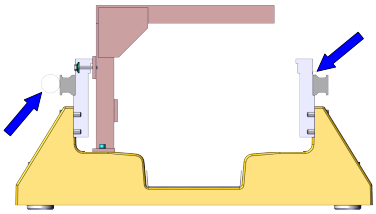
*Continues on next page*

2.5.3 Geometric alignment of FlexTrack IRT 501
*Continued*

**Procedure**

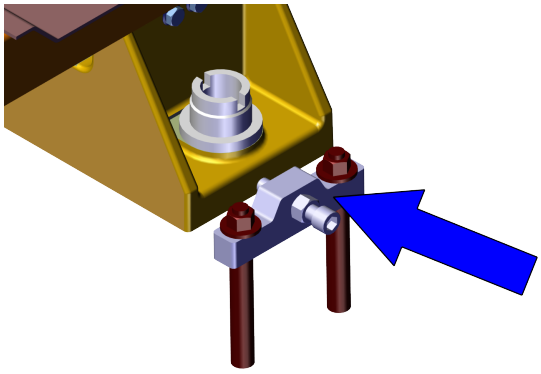
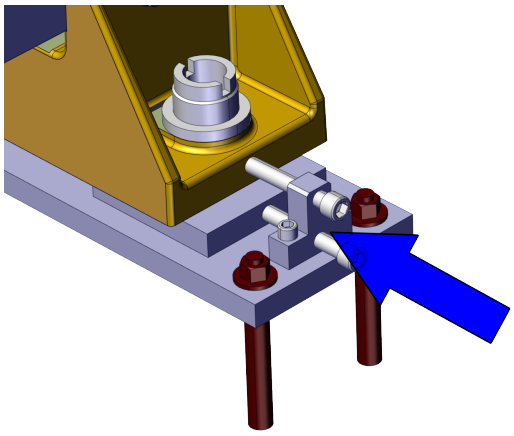
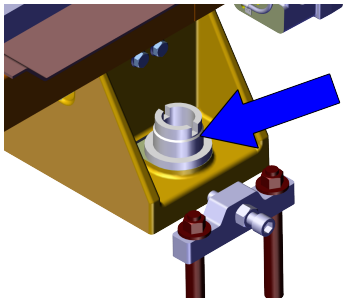
| | Action | Note/Illustration |
|---|---|---|
| 1 | On the foundation where the track will be placed, use a laser line drawing instrument to draw the approximate position of the installation position. Place the track on the drawing position without installing the anchor bolts. | |
| 2 | If the FlexTrack is already assembled, remove the covers, the cover supports, and slightly loosen all the screws of the linear rails. | |
| 3 | Position the absolute tracker such as you will be able to measure the reflector position on the linear rails. | |
| 4 | Make sure that the absolute tracker is parallel to the sea level. | |

*Continues on next page*

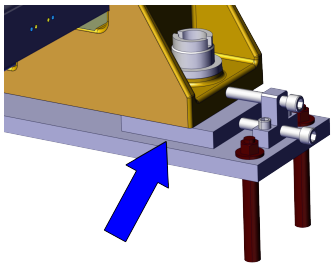
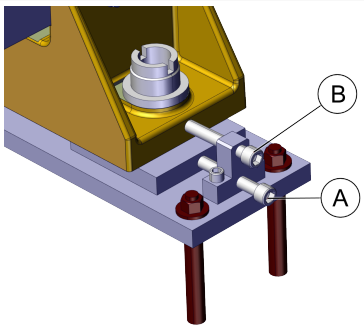
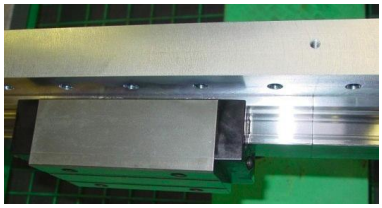
| | Action | Note/Illustration |
|---|---|---|
| 5 | Measure the level of the FlexTrack linear rails at different locations of the FlexTrack. Measurements should be made on both sides of each crossmembers.<br><br>**Tip**<br><br>Divide the track into two parts.<br>Make sure that the side surface of the rail at the first, middle, and end (Example points: 1, 3, 2) are on the same straight line. Then secure the track.<br>Then make sure that the straightness of the half in one part (Example points: 1, 4, 3) is consistent. By analogy (Example points: 1, 5, 4), adjust all the side surfaces to the same straight line.<br><br>  <br><br>xx2000002601 | The magnetic base attached to the reflector must be in contact with the rail upper surface or side surface.<br>See the contact surfaces in red on the picture below:<br><br>  <br>xx1800001908<br><br>A Reflector & Magnetic block<br>B Linear Rail<br>C Levelling Screw |

*Continues on next page*

2.5.3 Geometric alignment of FlexTrack IRT 501
*Continued*

| | Action | Note/Illustration |
|---|---|---|
| | **Tip**<br>Two special tools are used in adjusting the linear rails on linear movement direction.<br>For track without base plate:<br>  <br>xx2000002602<br>For track with base plate:<br>  <br>xx2000002604 | |
| 6 | Use the ABB levelling tool 3HAW107700360 to adjust the levelling screws until all the measured points, on both sides of the FlexTrack, are at the same level. | It is recommended to use one of the highest points of the FlexTrack as reference: It is easier to bring the crossmember to a higher level rather than to bring it to a lower level.<br>  <br>xx2000002603 |

*Continues on next page*

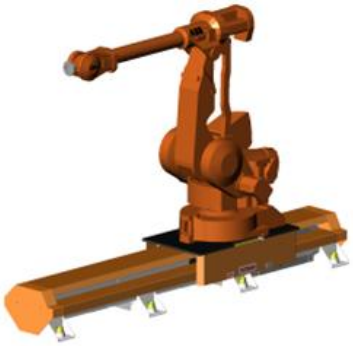
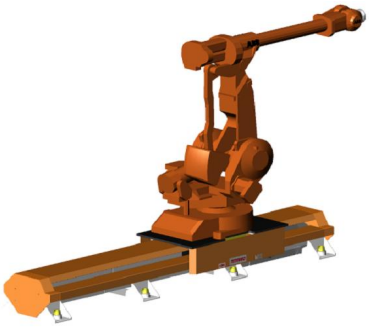
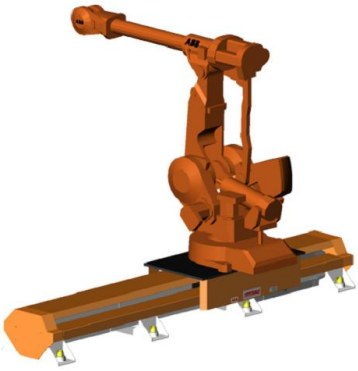
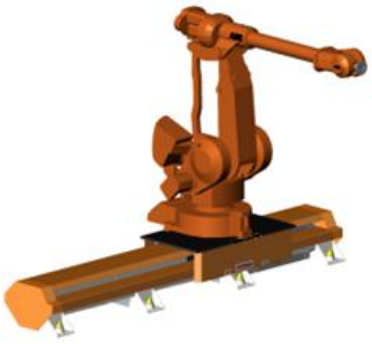
| | Action | Note/Illustration |
|---|---|---|
| 7 | If the base plate is used under the track, weld the adjustment plate to the base plate. |  <br>xx2000002606 |
| 8 | Do a fine adjustment of the linear rails in both lateral and transverse.<br>The planarity tolerance is 0.1mm/m, in lateral and transverse. |  <br>xx2000002605<br>A: Adjustment screw (Cannot be used after the adjustment plate is welded to the base plate.)<br>B: Fine adjustment screw |
| 9 | Check the rails alignment:<br>Use a ball bearing block or a square ruler; if you do not have a spare block or a square ruler, disassemble one from the carriage.<br>If the linear rails are correctly aligned, you should sense no " step " while passing the rail junction points. If you do, then push the rail against the side member step and make sure that there is 0.2 mm gap between adjacent rails. When the alignment is correct, tighten the screws one by one, after applying Loctite 243 on its thread. |  <br>xx1800001909 |
| 10 | Use a brush to lubricate the linear rails. | |
| 11 | Re-assemble all the cover support brackets and covers, if necessary. | |

## 2.6 Assembly of the manipulator

### Overview

When the FlexTrack is carrying an IRB robot it behaves like an integrated 7th axis. The robot should be ordered with an additional drive unit (907-1) for the FlexTrack motor, and optionally a resolver connection for 7th axis on the robot base (864-1).

The FlexTrack unit is designed to be controlled with ABB IRC5 controller. For compatibility with other control systems please contact ABB.

| Robot position on the carriage - 4 possibilities: | | |
|---|---|---|
| 0° (right) or 180° (left) |  xx1800001910 |  xx1800001911 |
| 90° (left) or 270° (right) |  xx1800001912 |  xx1800001913 |

See *Robot orientation on the track on page 101* for details on how to link the robot to the track.

## 2.7 Cables, SMB box and cable chain

### 2.7.1 Cabling of the FlexTrack

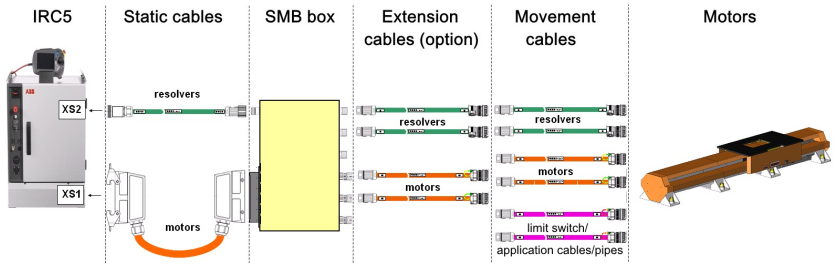
**Description**

The FlexTrack has an internal cable chain which carries flexible movement cables. The FlexTrack motor can be controlled though an external SMB box, or through the integrated SMB card of a manipulator.

Static cables connect to the IRC5 controller.

**Schema**

The schema below shows the typical control architecture of a FlexTrack controlled through external SMB box:




xx1800001914

The flexible movement cables exit the track at the middle of the stroke of the carriage and are selected from standard lengths based on the travel length of the carriage based on the total stroke of the carriage.

**FlexTrack cables lengths**

The FlexTrack flexible and static cables (power & resolver) are available in standard lengths of 5 m, 10 m and 15 m lengths.

**Robot cables**

If the FlexTrack is ordered prepared for a manipulator, the cable chain should contain the suitable flexible movement cables. Robot floor cables should be ordered with the robot.

**Tip**

It is important to indicate the robot mounting orientation in the order form in order to get the correct robot cable length.

## 2.7.2 Specifications of the movement cables

**Movement cables diameter and weight**

The internal cable chain usually contains the FlexTrack motor power and resolver cables. When additional cables are used, it is important to ensure that they can all fit in. In particular, if a number n of cables are used, you must make sure that:

- The total width of all the cables added together, as well as the width of n-1 separators (5 mm each), does not exceed the internal width of the cable chain (175 mm).
- The total weight of all cables does not exceed 10 kg/m.

For more detailed information, see chapter *Movement cables specifications* in *FlexTrack IRT501 product specification (3HAW050008591-001)*.

## 2.7.3 Specifications of the internal cable chain

**Cable chain specifications**

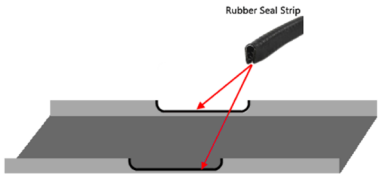
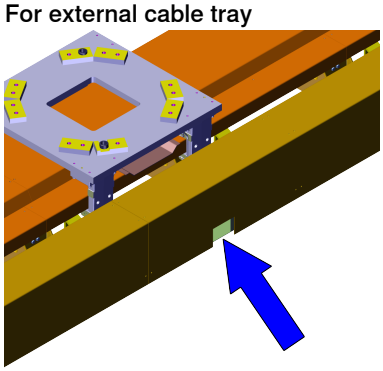
For more detailed information on , see chapter *Internal cable chain* in *FlexTrack IRT501 product specification (3HAW050008591-001)*.

## 2.7.4 Installation of the cable chain

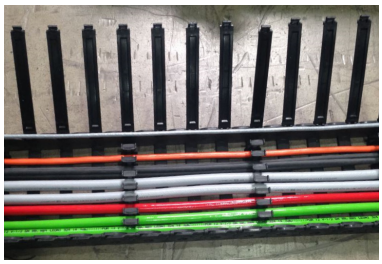
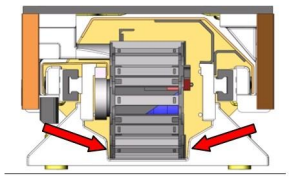
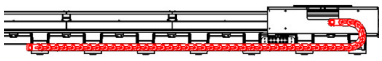
**WARNING**

The FlexTrack cable chain is delivered assembled in the FlexTrack. If the cable chain and/or its content must be modified upon installation, make sure that the following recommendations are strictly followed. Improper installation of the cable chain will result in premature wear or damages of the chain and the flexible cables.

**Checklist**

| | Action | Note/Illustration |
|---|---|---|
| 1 | An opening should be made in the internal cable tray to let all the cables exit the FlexTrack. All cables should exit the FlexTrack immediately at the end of the chain.<br>An opening should be made in the external cable tray to let all the cables exit the FlexTrack. All cables should exit the FlexTrack immediately at the end of the chain.<br>If necessary, the edges of the cut tray area should be covered with rubber seal strip. | For internal cable tray<br>  <br>xx1800001918<br>For external cable tray<br>  <br>xx2000002592 |
| 2 | The cable tray should be absolutely free of any object (cable, screw, etc.). The bottom of the cable tray must be perfectly flat, without bump. |  <br>xx1800001892 |

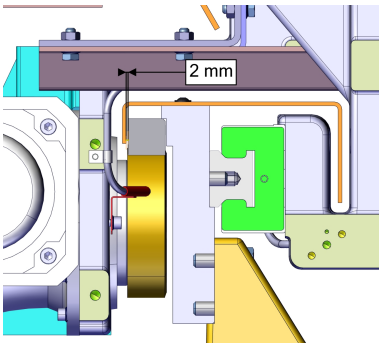
*Continues on next page*

| | Action | Note/Illustration |
|---|---|---|
| 3 | In the cable chain, the cables should be separated by the "separators", at least every 8 links.<br>That the mass of the cables and pipes inside the chain should be balanced. Having all heavy cables on the same side of the chain could cause premature wear. |  <br>xx1800001920 |
| 4 | The cables should be firmly attached on the tie-wrap plate at the end of the cable chain on the carriage side. |  <br>xx1800001921 |
| 5 | The cable chain should be perfectly aligned with the FlexTrack chain tray. In order to achieve a correct alignment, it is recommended to fix both ends of the chain when the carriage is at the end of its stroke, and the chain is entirely unrolled in the duct. |  <br>xx1800001922<br>  <br>xx1800001919 |
| 6 | For very long chains, a ramp should be used to prevent the chain from running on the cables exiting the cable chain. If the cable chain appears to be rubbing the cables and no ramp is installed, please order the following from ABB:<br>• The internal cable tray ramp up: 1pc 3HAW107700646 and 1pc 3HAW107700647.<br>• The external cable tray ramp up: 1pc 3HAW107700646. |  <br>xx1800001924 |

*Continues on next page*

## 2.7.4 Installation of the cable chain

*Continued*

| | Action | Note/Illustration |
|---|---|---|
| 7 | Verify that there is a clearance of approximately 2 mm between the rack covers and the rack (see figure).<br>If not, unscrew the cover screws and push the cover away from the rack. Tighten the cover screws. |  <br>xx1800001925 |
| 8 | Move the carriage to both ends in manual mode at low speed. Verify that the cable chain is not rubbing on the covers during the carriage movement, and that no moving part shows abnormal wear. Check also that the stationary cables are not interfering with moving elements. |  <br>xx1800001926 |
| 9 | Check that the cable chain is long enough to reach the ends of the stroke without damage. At least 1 chain link should remain horizontal to avoid unnecessary pulling on the chain fixing element. Verify again that the chain is parallel with the cable tray when unwind. If not, adjust the orientation of the fixed point of the chain as described in *step5*. | |

## 2.7.5 SMB box

**Description**

The FlexTrack motor is controlled by IRC5 controller through an ABB Serial Measurement Board. For FlexTrack used to move a manipulator, it is possible to connect the motor resolver to the manipulator's integrated SMB board (robot option). If there is no robot, or if the robot is not equipped with a resolver socket for external axis on its base, it is necessary to use an external SMB box:

xx1800001927

**Note**

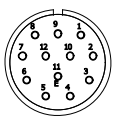
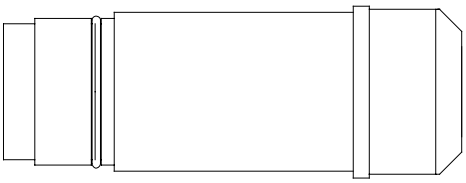
Check that there is enough space to install the SMB box during layout design.

## 2.7.6 Cables connections

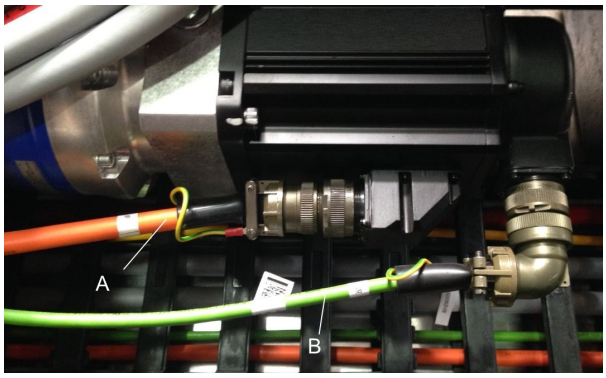
**Instruction**

If the FlexTrack motor is controlled through a robot integrated SMB card, the FlexTrack resolver cable should be connected to the robot base, the FlexTrack movement power cable should be connected to the FlexTrack static power cable and the FlexTrack static power cable should be connected to the XS7 socket on the IRC5 controller.

If the system is controlled through an external SMB box, the connections should be made as shown below:

| Description | Note/Illustration |
|---|---|
| Connect the static resolver and power cables from the IRC5 to the SMB box. |  xx1800001928 |
| Connect the movement resolver and power cables from the carriage to the SMB Box. |  xx1800001929 |
| For all signal sockets on the SMB box that are unused, a PTC plug is required. This plug bridges pin 7 and 8. |   xx2000002544 |

*Continues on next page*

| Description | Note/Illustration |
|---|---|
| Ensure that the movement cables are properly connected to the motor. |  <br>xx1800001930<br>A – Power cable<br>B – Signal cable |

## 2.7.7 Connectors on IRC5 controller

### General

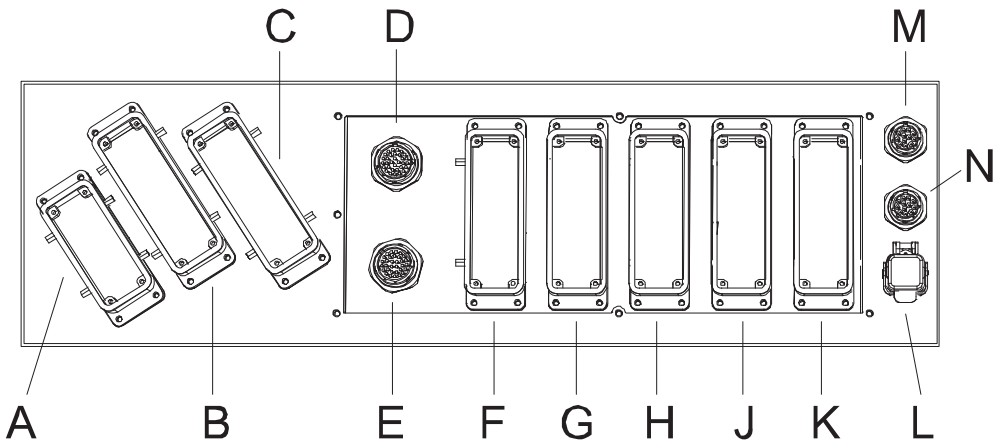
The following section describes the connectors on the respective front panels of the IRC5 controller. These are described below, and detailed in section, Connectors on controller IRC5 in *Product Manual IRC5*.

### Single Cabinet Controller

The following details the connection interface on the Single Cabinet Controller.

### Small robots

The following details the connection interface for small robots.



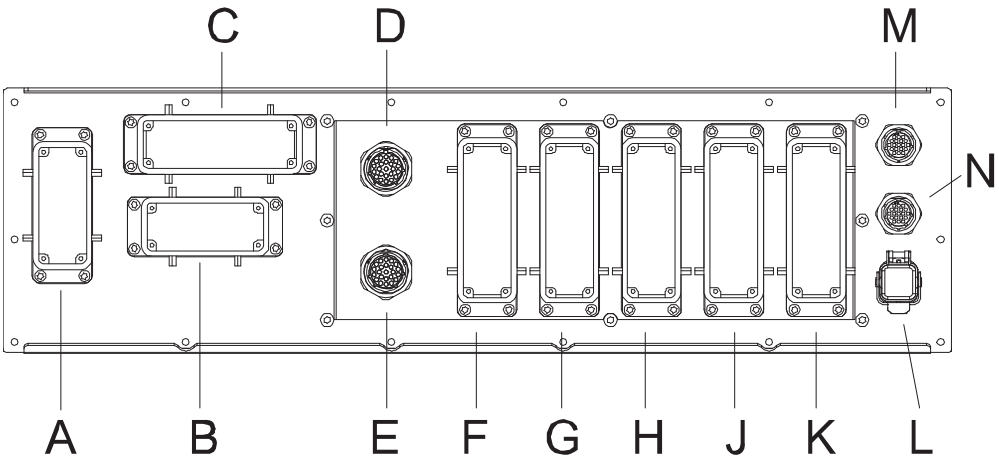

xx1800001931

| | |
|---|---|
| A | XP.0 Mains connection |
| B | XS.1 Robot power connection |
| C | XS.7 Additional axes power connection |
| D | XS.58 Position switches |
| E | XS.8 Position switches |
| F | XS.13/XS.5 Customer power/signals external connection |
| G | XS.10 Customer options |
| H | XS.11 Customer options |
| J | XS.12 Customer options |
| K | X3 Customer safety signals |
| L | XS.28 Network connection |
| M | XS.41 Additional axes SMB connection |
| N | XS.2 Robot SMB connection |

*Continues on next page*

### Large robots

The following details the connection interface for large robots.




xx1800001932

| | |
|---|---|
| A | XP.0 Mains connection |
| B | XS.1 Robot power connection |
| C | XS.7 Additional axes power connection |
| D | XS.58 Position switches |
| E | XS.8 Position switches |
| F | XS.13/XS.5 Customer power/signals external connection |
| G | XS.10 Customer options |
| H | XS.11 Customer options |
| J | XS.12 Customer options |
| K | X3 Customer safety signals |
| L | XS.28 Network connection |
| M | XS.41 Additional axes SMB connection |
| N | XS.2 Robot SMB connection |

*Continues on next page*

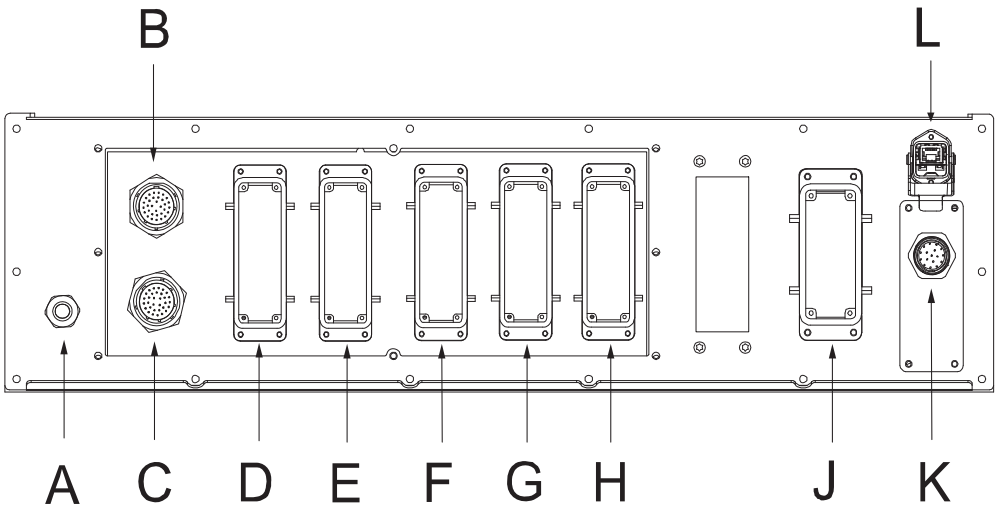
2.7.7 Connectors on IRC5 controller
*Continued*

**Dual cabinet controller**

The following details the connectors on the frontpanel of the Dual Cabinet Controller, that is the Control Module and the Drive Module.

Control Module

The following details the connectors on the frontpanel of the Control Module.




xx1800001933

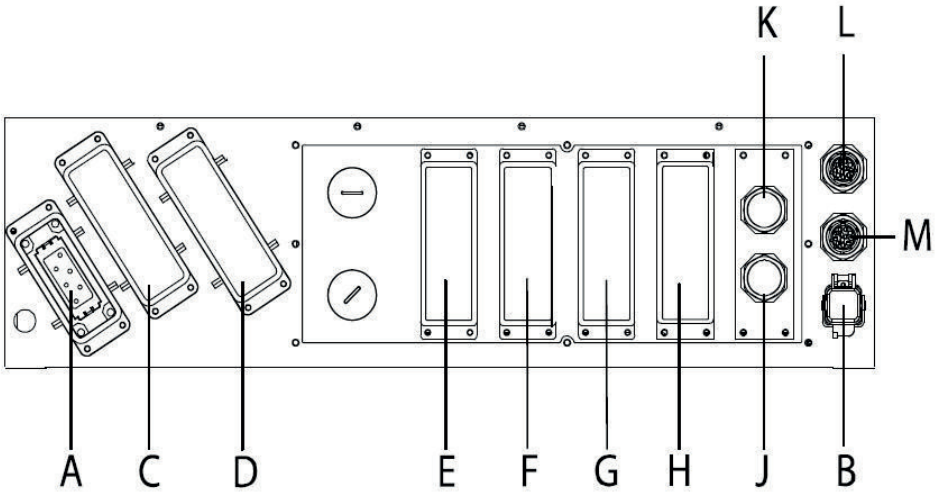
| | |
|---|---|
| A | Power connection |
| B | A5.X8: Position switches |
| C | A5.X58: Position switches |
| D | A5.X5: Customer power/signals external connection |
| E | A5.X 11: Customer options |
| F | A5.X 12: Customer options |
| G | A5.X 13: Customer options |
| H | A5.X 14: Customer options |
| J | A5.X3: Customer safety signals |
| K | A22.X1: FlexPendant connection |
| L | A5.X28: Network connection |

*Continues on next page*

### Drive Module

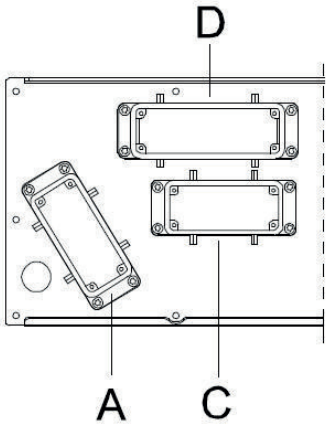
The following details the connectors on the frontpanel of the Drive Module.

Small robots:




xx1800001934

Large robots:




xx1800001935

| | Description |
|---|---|
| A | A4.X0: Mains connection to transformer |
| B | A4.XS25: Power to Control Module |
| C | A4.X1: Robot power connection |
| D | A4.X7: External axes power connection |
| E | A4.XX: Customer options |
| F | A4.XX: Customer options |
| G | A4.XX: Customer options |
| H | A4.XX: Customer options |
| J | Communication cabling between Control/Drive Module |

*Continues on next page*

2.7.7 Connectors on IRC5 controller
*Continued*

| | Description |
|---|---|
| K | Communication cabling between Control/Drive Module |
| L | A4.XS41: Additional axes SMB connection |
| M | A4.XS2: Robot SMB connection |

## 2.8 Software installation

### 2.8.1 Preparation for setup

**General**

How to get the system running is described in Getting started, IRC5 and in Robot Studio. This chapter contains instructions for starting up the IRC5 robot controller for the very first time after the physical installation has been completed.

**Procedure**

List of the required operations before starting up the FlexTrack setup:

| | Action | Note/Illustration |
|---|---|---|
| 1 | Configure the controller. | Load the FlexTrack parameters and configure the controller as described in the section below. |
| 2 | Installation of the FlexTrack. | Check that the FlexTrack is installed and leveled as described in *Assembly of the track on page 64*. |
| 3 | Lubrication system. | If the FlexTrack is equipped with an automatic lubrication system, it must be activated as described in *Lubrication on page 108*. |
| 4 | Manual lubrication. | If the FlexTrack is not equipped with an automatic lubrication system, you need to manually lubricate the blocks and the rack, see *Racks and pinion on page 124*. |
| 5 | Revolution counter update. | Like any other robot axis, the FlexTrack revolution counter must be updated using the FlexPendant, see *Update revolution counters on page 185*. |

**Loading the FlexTrack parameters**

It is necessary to load the FlexTrack parameters in the controller. These can be found on the CD supplied in the delivery package. This procedure is described in details in the robot controller operation manual. Hereunder are listed the actions related to the FlexTrack specifics:

| | Action |
|---|---|
| 1 | Select the menu option: **Add new parameters**. |
| 2 | Load the file *MOC.cfg*. |

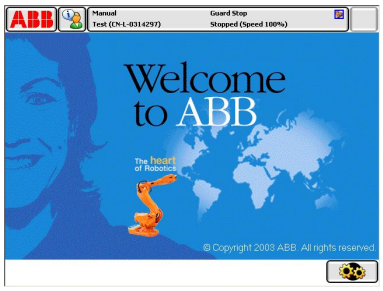
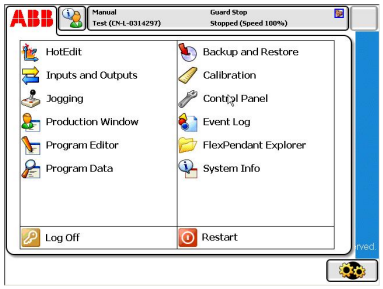
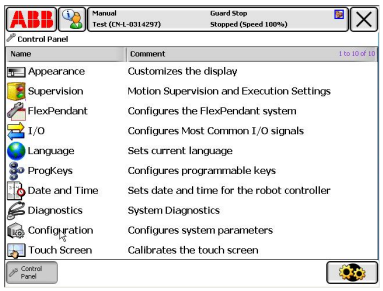
## 2.8.2 Load configuration files

**Procedure**

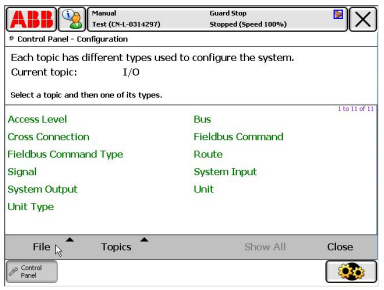
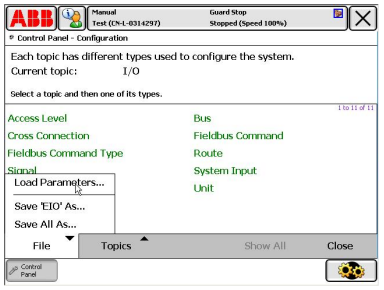
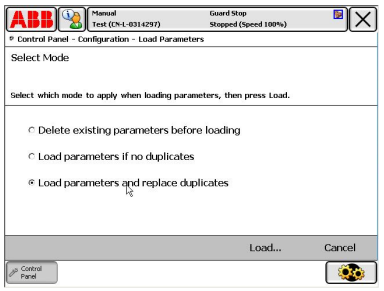
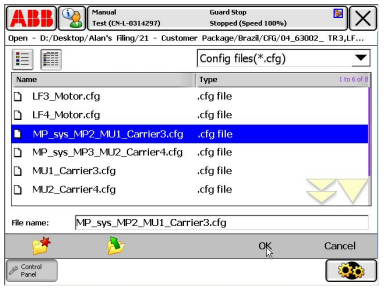
When the track is delivered, it will be delivered with the configuration files for the track. These files include the information for the IRC5 to recognize the track, as well as required parameters for the track motor. The files are specific to the system layout and configuration.

If these files were not received, contact ABB.

To load the files, there are two methods, load the MOC files onto a USB stick and load then directly on the IRC5 or use Robot Studio Online. Below described only the USB method.

| | Action | Note/Illustration |
|---|---|---|
| 1 | Make a System Backup before beginning. | |
| 2 | Start the IRC5 and tap **ABB**. |  xx1800001936 |
| 3 | From the ABB menu, tap **Control Panel**. |  xx1800001937 |
| 4 | Tap **Configuration**. |  xx1800001938 |

*Continues on next page*

| | Action | Note/Illustration |
|---|---|---|
| 5 | Tap **File**. |  <br>xx1800001939 |
| 6 | From the File menu, tap **Load Parameters**. |  <br>xx1800001940 |
| 7 | Tap to select the **Load parameters and replace duplicates** option. |  <br>xx1800001941 |
| 8 | Browse for the appropriate *.CFG files to add, and tap **OK**. Do not restart the controller yet. |  <br>xx1800001942 |
| 9 | Repeat the steps for all *.CFG files that need to be loaded, and then warm restart the controller. | |

*Continues on next page*

2.8.2 Load configuration files
*Continued*

**Tip**

If the IRC5 reboots without error, then the *.CFG files have been loaded correctly. If an error occurs, record the error message and error number and send the back up of the original system, system layout and error information to the *After-Sales support* to get help.

If the system enters **System failure state** it is necessary to perform a cold start. This will restore the system to a default settings with no mechanical units or programs. Then restore the original backup taken before loading the *.CFG files. Then retry loading the *.CFG files.

## 2.8.3 Modification of the Travel Direction of the track

**Instruction**

To change the travel direction, contact ABB for support.

## 2.8.4 Link robot and track

**Note**

If no robot is mounted on the track, this set can be skipped.

**Instruction**

If a robot is mounted in the track, it is necessary to link the robot to the track. This effectively increases the work frame of the robot, allowing the robot to reach desired targets along the length of the track, by moving the robot on the track.

The declaration is in the `MOC` under the theme `ROBOT` in `base_frame_coordinated`.

In the example below, we declare that the robot `ROB1` is mounted on the Track `TR1`.

**ROBOT: -base_frame_coordinated "TR1"**

## 2.8.5 Robot orientation on the track

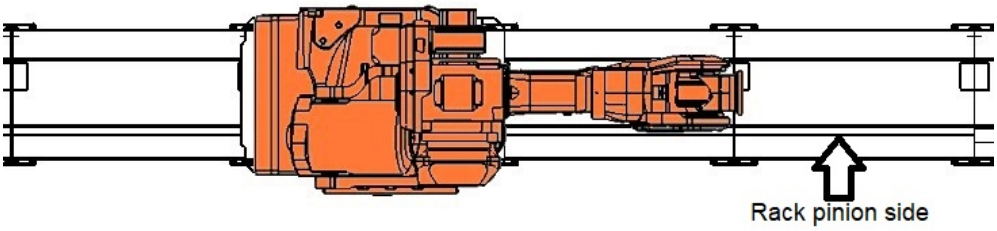
### Introduction

To ensure that the robot works properly in linear on its track, it is necessary to declare the robots orientation relative to the track.

The declaration of the orientation is in the MOC under the theme `ROBOT` in:

- `base_frame_orient_u0` which corresponds to the quaternion Q1
- `base_frame_orient_u1` which corresponds to the quaternion Q2
- `base_frame_orient_u2` which corresponds to the quaternion Q3
- `base_frame_orient_u3` which corresponds to the quaternion Q4

### Robot with a 0° rotation around Z on the Track (Robot aligned with the Track)




xx1800001945

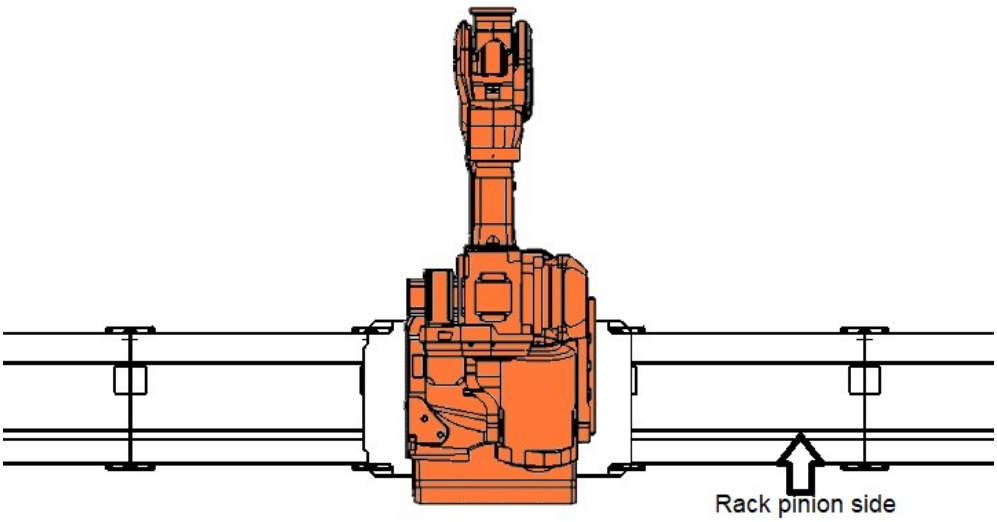
base_frame_orient_u0 = 1

base_frame_orient_u1 = 0

base_frame_orient_u2 = 0

base_frame_orient_u3 = 0

### Robot with a 90° rotation around Z on the Track




xx1800001944

base_frame_orient_u0 = 0.70710678

*Continues on next page*

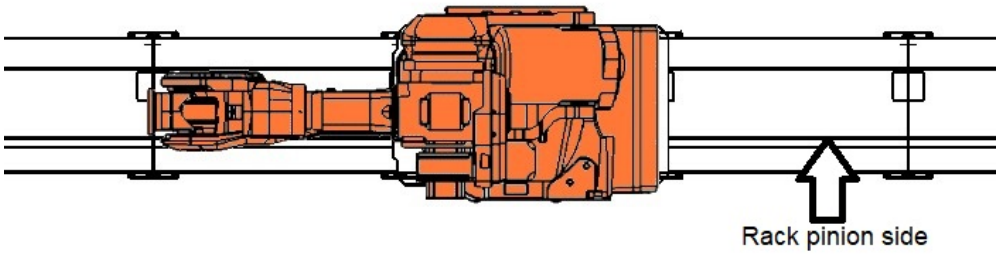
2.8.5 Robot orientation on the track
*Continued*

base_frame_orient_u1 = 0

base_frame_orient_u2 = 0

base_frame_orient_u3 = 0.70710678

**Robot with a 180° rotation around Z on the Track**




xx1800001943

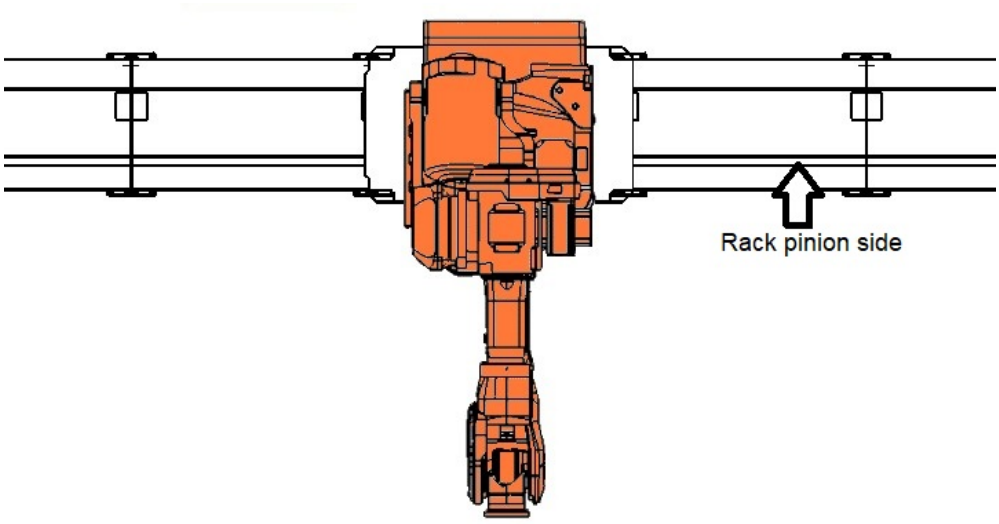
base_frame_orient_u0 = 0

base_frame_orient_u1 = 0

base_frame_orient_u2 = 0

base_frame_orient_u3 = 1

**Robot with a 270° rotation around Z on the Track**




xx1800001946

base_frame_orient_u0 = 0.70710678

base_frame_orient_u1 = 0

base_frame_orient_u2 = 0

base_frame_orient_u3 = -0.70710678

## 2.8.6 Set Upper and Lower Limits Software Limits for track

### Introduction

The Upper and Lower software limit of the track are software limits that prevent the track from being jogged beyond the mechanical limit of the track.

> **WARNING**
>
> This is an important safety feature to prevent damage to the track. Ensure that the track direction has first been set and the track has been calibrated before performing this step.

### Example

An example of the error message that is generated when the track is jogged beyond its software limit is shown below:


xx1800001947

The Upper and Lower Limit of the track is the physical displacement distance from the zero position to the limit position in meters. This depends on the length of the track, and the location of the calibration pin (Also referred to as the Zero position of the track).

The limits are in `MOC.CFG`, under the theme `ARM`.

The upper limit is called `upper_joint_bound` , and the lower limit is called `lower_joint_bound`. Both are expressed in meters.

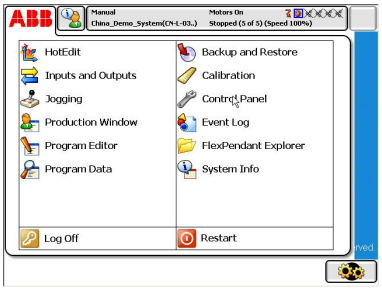
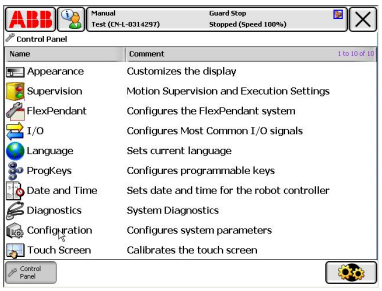
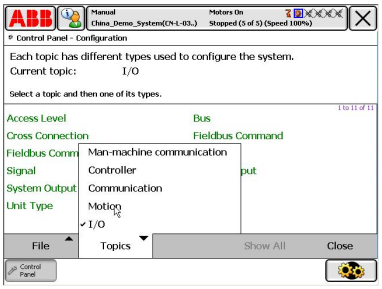
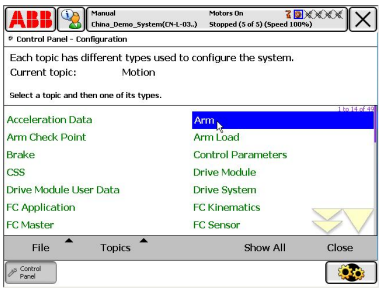
In the example below the upper limit is set to 6 m and the lower limit is set to -0.005 m.

*Continues on next page*

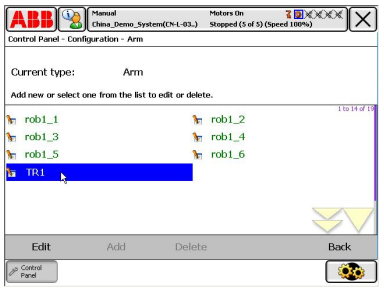
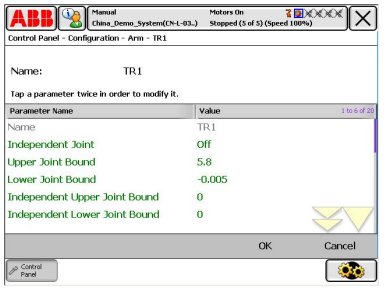
## 2.8.6 Set Upper and Lower Limits Software Limits for track
*Continued*

```
ARM : -upper_joint_bound 6 -lower_joint_bound -0.005
```

To change the limits using the teach pendent, do the following:

| | Action | Note/Illustration |
|---|---|---|
| 1 | From the ABB menu, tap **Control Panel**. |  xx1800001948 |
| 2 | Tap **Configuration**. |  xx1800001938 |
| 3 | Under **Topics**, tap **Motion**. |  xx1800001949 |
| 4 | Select **Arm**. |  xx1800001950 |

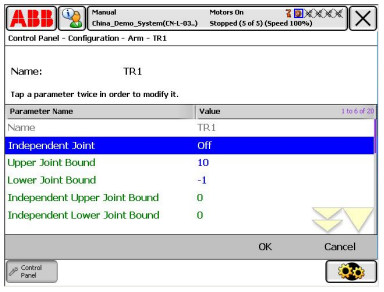
*Continues on next page*

| | Action | Note/Illustration |
|---|---|---|
| 5 | Select the appropriate Mechanical unit. |  <br>xx1800001951 |
| 6 | Change the **Upper joint bound** and **Lower Joint bound** limits. |  <br>xx1800001952 |
| 7 | Tap **OK** to save the change and perform a warm start. | |

## Identifying the upper and lower limits by experiment

If the actual value of the limit is not know, it is possible to jog the track to the desired limit position, and then read the limit value off of the teach pendent.

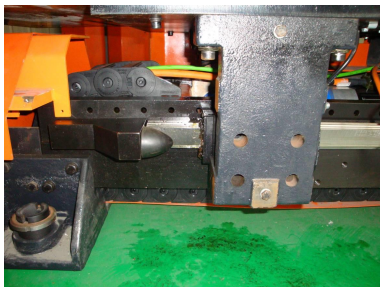
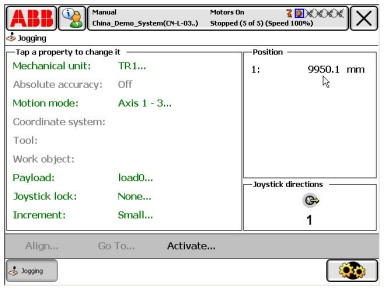
Below is the process to identify the limits by experiment:

| | Action | Note/Illustration |
|---|---|---|
| 1 | Before beginning, ensure that the FlexTrack's revolution counter is calibrated. | |
| 2 | The Upper and Lower Limit monitoring is active when in manual mode, thus it is first necessary increase the current limit to beyond the mechanical stop. This will then allow the track to be jogging without error up to the desired limit position.<br>**ARM : -upper_joint_bound 11 -lower_-joint_bound -1** |  <br>xx1800001956<br>*Figure 2.1:*<br>**WARNING**<br>If the actual track length is 10 m in the positive direction of movement, and -0.060 m in the negative direction, then first set the Set the upper bound to 11 m and the lower bound to -1 m. |

*Continues on next page*

## 2.8.6 Set Upper and Lower Limits Software Limits for track

*Continued*

| | Action | Note/Illustration |
|---|---|---|
| 3 | Perform a warm restart. | |
| 4 | Jog the mechanical unit to the limit position as shown in the figure.<br>A minimum distance of 50 mm should be used between where the software limit is set and the actual mechanical stop.<br>In the jogging window, read of the tracks current position. Note that the distance is shown in millimeters, and not meters. In this example it is 9,950.1 mm.<br>Update the limit in the MOC file<br>**ARM: -upper_joint_bound 9.950 -lower_joint_bound -1** |  <br>xx1800001957<br>  <br>xx1800001958<br>**WARNING**<br>This step should be carried out with great care. If the software limit has not been set correctly the mechanical unit may hit the mechanical hard stop. |
| 5 | Perform a warm restart. | |
| 6 | Set the Jogging speed to 20% and test the software limit.<br>If the software limit has been set correctly, the following error should be generated, see the figure. |  <br>xx1800001959<br>**WARNING**<br>This step should be carried out with great care. If the software limit has not been set correctly the mechanical unit may hit the mechanical hard stop. |
| 7 | Repeat the previous steps for the other limit. | |

*Continues on next page*

**Offset parameters**

The offset parameters for the FlexTrack IRT 501 are manufacturer parameters, and must not be modified on site.

**Travel length**

The travel length of each carriage are defined starting from the zero indicator (see figure).

In the parameter file, the travel length value is set to the maximum stroke.

xx1800001960

Use a Ø8 mm pin or the calibration tool to accurately setup the FlexTrack zero position, then follow the instruction in *Fine calibration on page 184*.

## 2.9 Lubrication

### 2.9.1 Activating the automatic lubrication system

There are two types of automatic lubrication system can be used in FlexTrack. One is HPS, and the other is EPS.

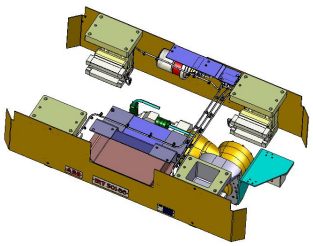
| | HPS | EPS |
|---|---|---|
| Power supply | 4.5 battery | External 24 power |
| Control method | After setting the use period, install the time loop oil pump to work once, and then work independently according to the set use period until the oil bag is used up. | A The same as the HPS time setting, except that the battery power supply is changed to an external power supply; but the oil pump works once when it is powered on, and then works according to the previously set time period under the condition of uninterrupted power, so it can be synchronized with the equipment (in shutdown Or the oil pump does not work during maintenance)<br>B The working frequency of the oil pump is controlled by the equipment PLC. Because the oil pump works once when it is powered on, the customer can control the working frequency of the oil pump by controlling the power on and off frequency of the oil pump with the PLC. |

*Continues on next page*

**HPS**

The automatic lubrication system needs to be activated before using the FlexTrack. Once the system has been activated, it delivers the exact quantity of grease to each port at required time interval, during one year.

Follow the instructions below to activate the cartridge:

| | Action | Note/Illustration |
|---|---|---|
| 1 | Introduce the battery and the cartridge LONGTIME PD 0 in the port. The timer is activated once the battery is inserted.<br>See *Memolub manual on page 134* for instructions about MEMOLUB. |  <br>xx1800001961 |
| 2 | The grease is pushed in the piping by the pump; a valve is sequencing the distribution to each port. |  <br>xx1800001962 |

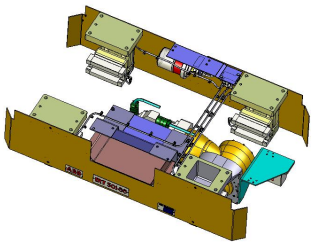
*Continues on next page*

2.9.1 Activating the automatic lubrication system
*Continued*

## EPS

The automatic lubrication system needs to be activated before using the FlexTrack. Once the system has been activated, it delivers the exact quantity of grease to each port at required time interval, during one year.

Follow the instructions below to activate the cartridge:

| | Action | Note/Illustration |
|---|---|---|
| 1 | Introduce the external 24 power and the cartridge LONGTIME PD 0 in the port. The timer is activated once the 24 power is on.<br>See *Memolub manual on page 134* for instructions about MEMOLUB. |  <br>xx2000002593 |
| 2 | The grease is pushed in the piping by the pump; a valve is sequencing the distribution to each port. |  <br>xx1800001962 |

## 2.9.2 Lubrication feedback (optional)

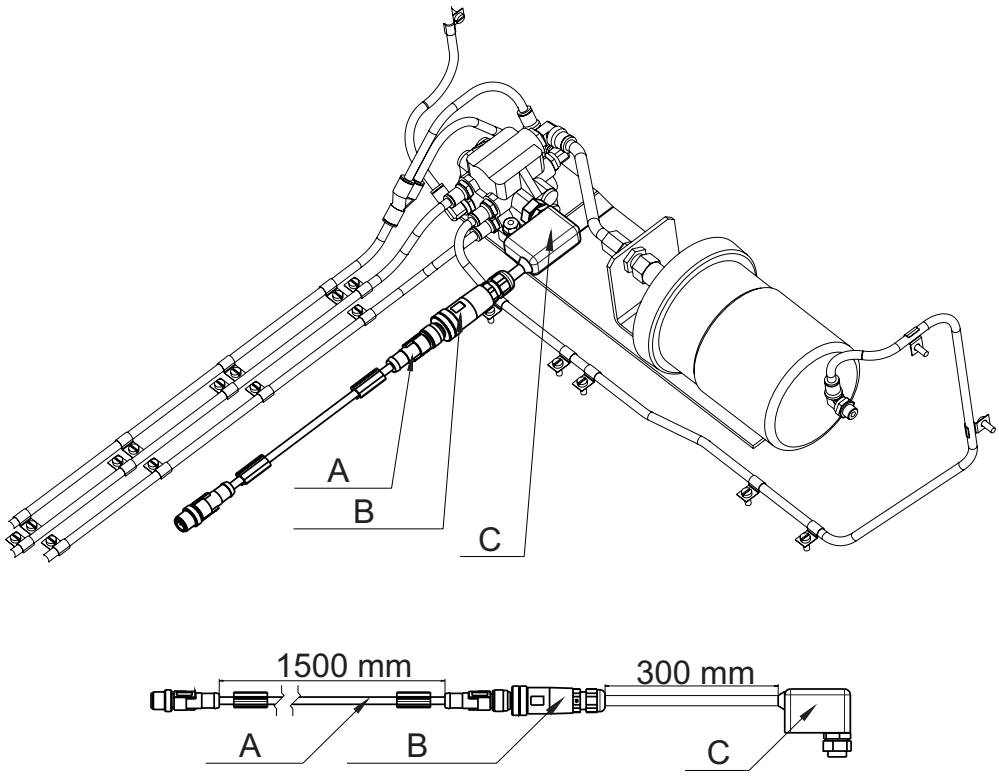
**Overview**

To check if the lubrication system works well, it is viable to take use of lubrication feedback system with FlexTrack.

**Content**

The principle of Switch detection of lubrication:

If it ends in a complete working cycle (Normal working cycle: 1 in 4 out distributor cycle for 4 days, 1 in 6 out cycle for 6 days, 1 in 8 out cycle for 8 days. If other working cycle is used , please contact ABB for the cycle), the switch will show a 0-1-0 or 1-0-1 signal as feedback, which indicates that the lubrication is normal, if not, it indicates that the lubrication is abnormal. Lubrication abnormal alarm can be set according to this signal difference.




xx2000002594

| | |
|---|---|
| A | M12 Cable |
| B | M12 Connector |
| C | Switch |

**Reference**

For more detail, see *FlexTrack Lubrication Unit Feedback, 3HAW107710207*.

## 2.10 Zone Division

**Overview**

For more detailed information, see chapter *Position switch/ zone division* in *FlexTrack IRT501 product specification (3HAW050008591-001)*.

## 2.11 Setting up the FlexTrack limit switch for additional safety

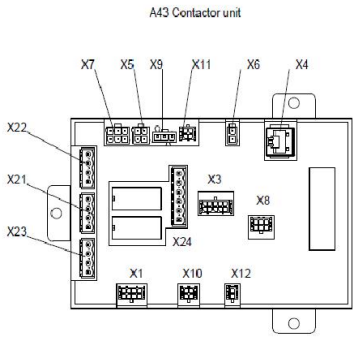
### Option 1 - Wiring the limit switch into the safety link of the IRC5

**Note**

This option should be used in simple systems where there is no safety PLC however additional safety is required to guarantee that the carriage does not go beyond the software limits set in the controller.

Operating principle

When the limit switch is triggered, it will open a circuit that is constantly monitored by the robot controller. As soon as this open circuit is detected, the IRC safety chain is opened and the drive module turns off the motors immediately stopping all motion. At the same time **Error 20209 - External Contactor Open** is generated on the FlexPendant.

| | Action | Note/Illustration |
|---|---|---|
| 1 | Connect the signal cable from the limit switch to the IRC5 cabinets "Contactor Board" to A43:X22. This connection is described below.<br>The board is located as shown: |  <br>xx1800001970<br>  <br>xx1800001969 |
| 2 | Remove the terminal connector A43:X22. There should normally be a jumper between Pins 1 & 2 (Jumper between Pins 3 & 4 or Pin 5 & 6 can be used for each limit switch) |  <br>xx1800001971 |

*Continues on next page*

2.11 Setting up the FlexTrack limit switch for additional safety
*Continued*

| | Action | Note/Illustration |
|---|---|---|
| 3 | Remove the jumper between Pin 1 & 2 and place one cable from the limit switch into pin 1 and the other into pin 2. | |
| 4 | Start the IRC5 controller. If the "Error 20209 - External Contactor Open" is generated, check the cable connection between A43:X22 and the limit switch. Ensure that the limit switch is normally closed. | |
| 5 | Repeat the above step for the limit switch at the other end of the FlexTrack. | If all the pairs of Pins in A43:X22 are used, then place the limit switch 1 and limit switch 2 in series to an existing chain. |

**Note**

The limit switch has 1 normally open contact and 1 normally closed contact. The normally closed circuit should be connected to the A43:X24 terminal.

**Tip**

- If the limit switch is triggered by the carriage, it will not be possible to jog the carriage away from the limit switch. In this case, release the brake and manually push the carriage away from the sensor. Then update the revolution counters before attempting to run the track when necessary.
- For more information, please see *Product manual - IRC5*.

**Option 2 - Wiring the limit switch into the safety PLC**

**Note**

This option should be used for more complex systems where a safety PLC is controlling the complete station and additional safety to guarantee that the carriage does not go beyond the software limits set in the controller.

Operating Principle

When the limit switch is triggered, it will open a circuit that is constantly monitored by the safety PLC. Additional logic should be programmed in the PLC react appropriately, such as shutting off the power to the motors.

**Tip**

For details on how to connect to the safety PLC, please review the *Product specification - PLC robot controller*.

## 2.12 Additional Safety Function Support

**Overview**

To implement advanced safety control, it is viable to take use of SafeMove2 with FlexTrack.

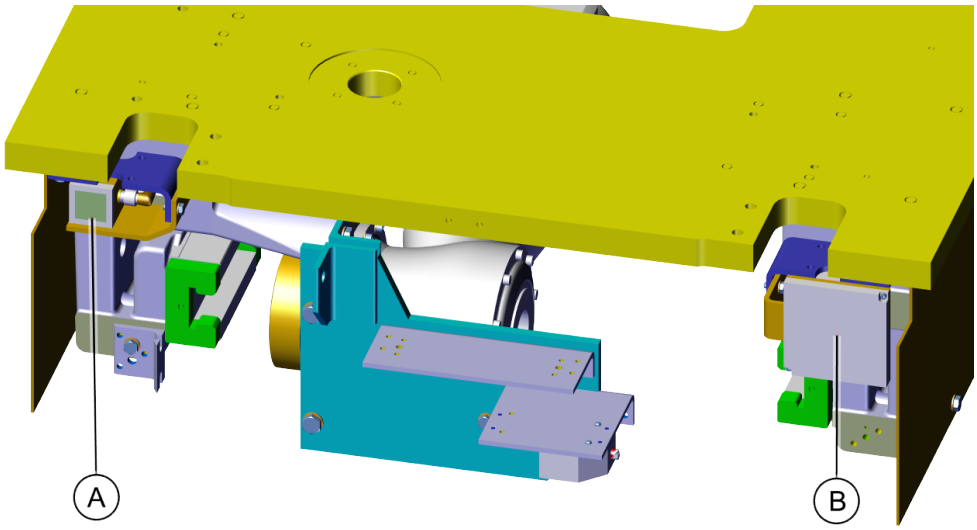
Regarding software and hardware options, installation and commissioning, safety etc., please follow the instructions in *Application manual - Functional safety and SafeMove2* (*3HAC052610-001*).

For more detailed information, see chapter *Safety* in *FlexTrack IRT501 product specification (3HAW050008591-001)*.

## 2.13 Anti-collision system (optional)

### Overview

To prevent carriages from colliding during the movement (especially when multiple carriages are on one track), anti-collision system (optional) can be installed on carriages with FlexTrack.

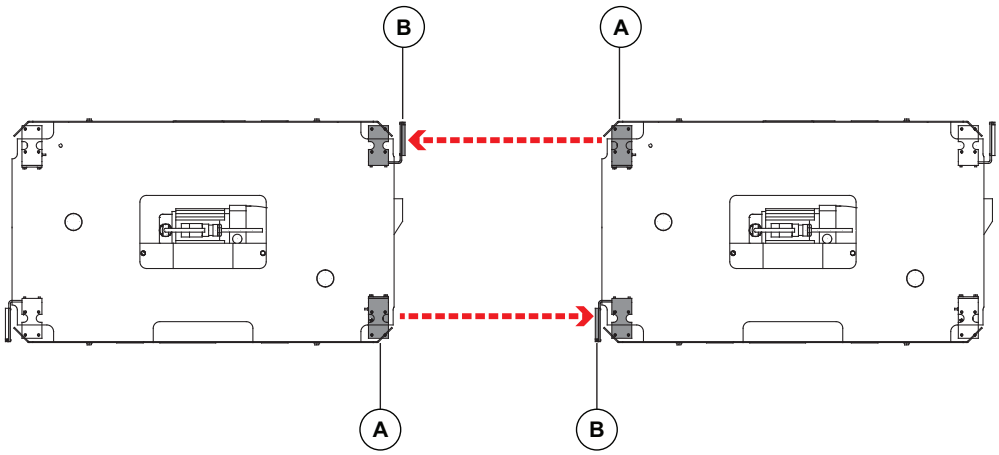



xx2000002595

| | ABB part reference no. | Description |
|---|---|---|
| A | 3HAW107710201 | Laser scanner |
| B | 3HAWC116985 | Laser reflector |

### Content

The stopping distance is specifically set by the customer according to the specific situation (the minimum distance is 200mm).




xx2000002596

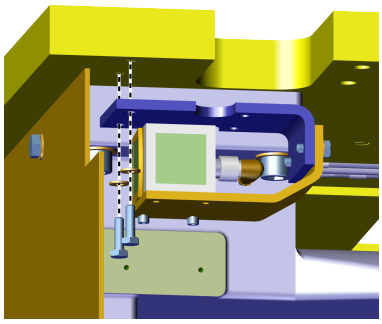
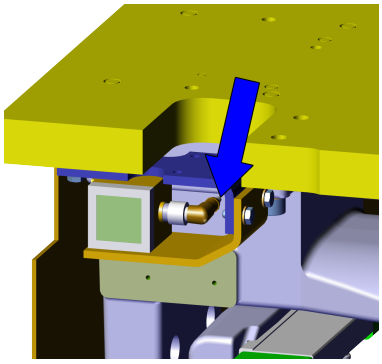
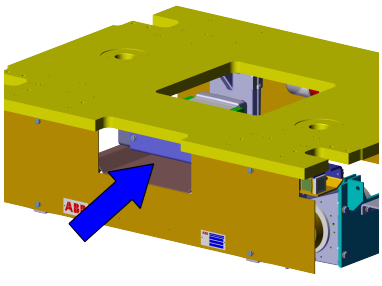
| | |
|---|---|
| A | Laser scanner |

*Continues on next page*

| | |
|---|---|
| B | Laser reflector |

## Installation

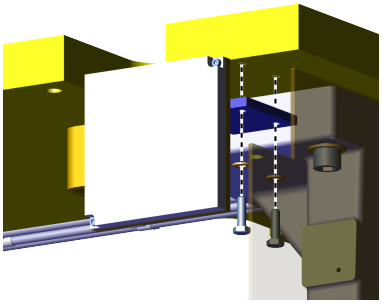
The following table describes all necessary steps to achieve a correct installation of the anti-collision system to a carriage:

| | Action | Note/Illustration |
|---|---|---|
| 1 | Install the laser scanner with the bracket to the carriage. | Screws: 2 pcs x M6x20<br>Washers: 2 pcs x φ6<br>Tightening torque: 10 Nm |
| 2 | Secure with washers and screws. |  <br>xx2000002597 |
| 3 | Connect the movement cable to the scanner connection point. |  <br>xx2000002599 |
| 4 | Route the movement cable from the drawer on the carriage to the track. |  <br>xx2000002600 |
| 5 | Connect the other end of the movement cable to the static cable. | |
| 6 | Connect the other end of the static cable to the IRC5 controller. | |

*Continues on next page*

## 2.13 Anti-collision system (optional)

*Continued*

| | Action | Note/Illustration |
|---|---|---|
| 7 | Install the laser reflector with the bracket to the nearby carriage.<br><br>**WARNING**<br><br>The reflector should be installed aligned with the scanner.<br>Or the reflector cannot reflect the laser signal from the scanner. | Screws: 2 pcs x M6x20<br>Washers: 2 pcs x φ6<br>Tightening torque: 10 Nm<br><br>  <br>xx2000002598 |
| 8 | Secure with washers and screws. | |

# 3 Maintenance

## 3.1 Introduction

**Structure of this chapter**

This chapter details all maintenance activities recommended for the FlexTrack IRT 501-66/66R/90/90R/90RE/90RS.

It is based on the maintenance schedule, located in the beginning of the chapter. The schedule contains information about required maintenance activities including intervals and refers to procedures for the activities. Each procedure contains all information required to perform the activity, e.g. required tools and materials. The procedures are gathered in different sections, divided according to the maintenance activity.

**Safety information**

Before any service work is commenced, it is extremely important that all safety information is observed! There are general safety aspects that must be read through, as well as more specific safety information that describe danger and safety risks when performing the procedures. Read *Safety on page 15* before performing any service work.

## 3.2 Standard toolkit

### General

All service (repairs, maintenance and installation) procedures contain lists of tools required to perform the specified activity. All special tools required are listed directly in the procedures while all the tools that are considered standard are gathered in the standard toolkit and defined in the table below. This way, the tools required are the sum of the standard toolkit and any tools listed in the instruction.

### Contents, standard toolkit

| Qty | Tool |
|---|---|
| 1 | Ring-open-end spanner 8--22 mm |
| 1 | Socket head cap 2.5 mm, 4 mm, 5 mm, 6 mm, 8 mm and 10 mm |
| 1 | Small flat tip screwdriver |
| 1 | Plastic mallet |
| 1 | Torque wrench 10 Nm-140 Nm |
| 1 | Ratchet head for torque wrench 1/2 |
| 2 | Socket head cap 5 mm, 8 mm, 10 mm socket 1/2" bit L 20 mm |
| 2 | Hex head cap 13 mm, 19 mm socket 1/2" bit L 20 mm |

## 3.3 Maintenance schedule and expected component life

### 3.3.1 Specification of maintenance intervals

**Description**

The intervals may be specified in different ways depending on the type of maintenance activity to be carried out and the working conditions of the FlexTrack IRT 501-66/66R/90/90R//90RE/90RS:

- Calendar time: specified in months regardless of whether the FlexTrack system is run or not.
- Operating time: specified in operating hours/meters/cycles. More frequent running of the FlexTrack means more frequent maintenance activities.

## 3.3.2 Expected component life

### General

The expected life of a component can vary greatly depending on how intensively the FlexTrack IRT 501 is run.

Regarding the life of the product, under typical application condition, most use cases or typical use cases can achieve the 1M cycle mark. Under certain extreme application conditions, the life of bearing block and rails may be reduced by more than 50%.

### Expected life

| Component | Expected life | Note |
|---|---|---|
| Cables | 1,000,000 cycles | The expected life can also be affected by assemblage of cabling other than standard options. |
| Cable chain | 10.000.000 m | 1) Different working environment 2) the weight of the internal cables and tubes 3) the actual travel length 4) the speed and acceleration, will have a great impact on the actual life. |
| Ball bearing blocks | 1,000,000 cycles | The expected life is given for the ball bearings of a six-meter-longstroke FlexTrack (12 meters per cycle) operating 1,000 maximum load cycles a day. |
| Gearbox | Over 20000 hours | |
| Rack and pinion | Over 10 years | |
| Rail | 12 meters per cycle x 1,000,000 cycles | |

## 3.3.3 Maintenance schedule

### General

The FlexTrack IRT 501-66/66R/90/90R/90RE/90RS must be maintained regularly to ensure proper function. The maintenance activities and intervals are specified in the table below.

Unexpected situation may arise during the inspections of the FlexTrack. Any damage must be attended immediately!

The inspection intervals do not specify the life of each component.

Values for these are specified in the previous chapter.

### Activities and interval, standard equipment

The table below specifies the required maintenance activities and intervals:

| Maintenance activity | Equipment | Interval | Further information |
|---|---|---|---|
| Inspection and cleaning if necessary | Racks and pinion | Every 100 km or every week | See *Racks and pinion on page 124* |
| Lubricate<br>(If no automatic lubrication) | Racks and pinion | Every 100 km or every week | See *Racks and pinion on page 124* |
| Inspection and cleaning if necessary | linear rails | 1 month | See *Racks and pinion on page 124* for cleaning linear guides. |
| Lubricate<br>(If no automatic lubrication) | Ball bearing blocks | 1 month | See *Ball bearing blocks on page 128* |
| Inspect and re-fill if necessary<br>(If automatic lubrication) | Automatic lubrication system | 1 month | See *Automatic lubrication system on page 130* |
| Inspection | Emergency stop and stroke limit system | 1 month | See *Emergency stop and stroke limit system on page 137* |
| Inspection | Zone division system | 1 month | See *Zone division system on page 138* |
| Inspection | Cables, connectors and electrical cabinets | 1 month | See *Cables and connectors on page 140* |
| Inspection | Cable chain | 1 month | See *Cables and connectors on page 140* |
| Inspection (visual) | Gearbox | 3 months | See *Gearbox on page 141* |
| Inspection (tightening) | Gearbox | 1 year | See *Gearbox on page 141* |
| Replacement | SMB Battery pack | Battery low alert [i] | See *Replacement, SMB Battery pack on page 144* |
| Function test | Anti-collision system | 6 months | See*Anti-collision system function test on page 143* |

[i] SMB Battery low alert (38213 Battery charge low) is displayed when remaining backup capacity (robot powered off) is less than two months. Typical lifetime of a new battery is 36 months if the robot is powered off 2 days/week or 18 months if the robot is powered off 16 h/day. The lifetime can be extended (approx. 3 times) for longer production breaks by a battery shutdown service routine. See Operating manual - IRC5 with FlexPendant for instructions.

## 3.4 Activities 100 Km or one week

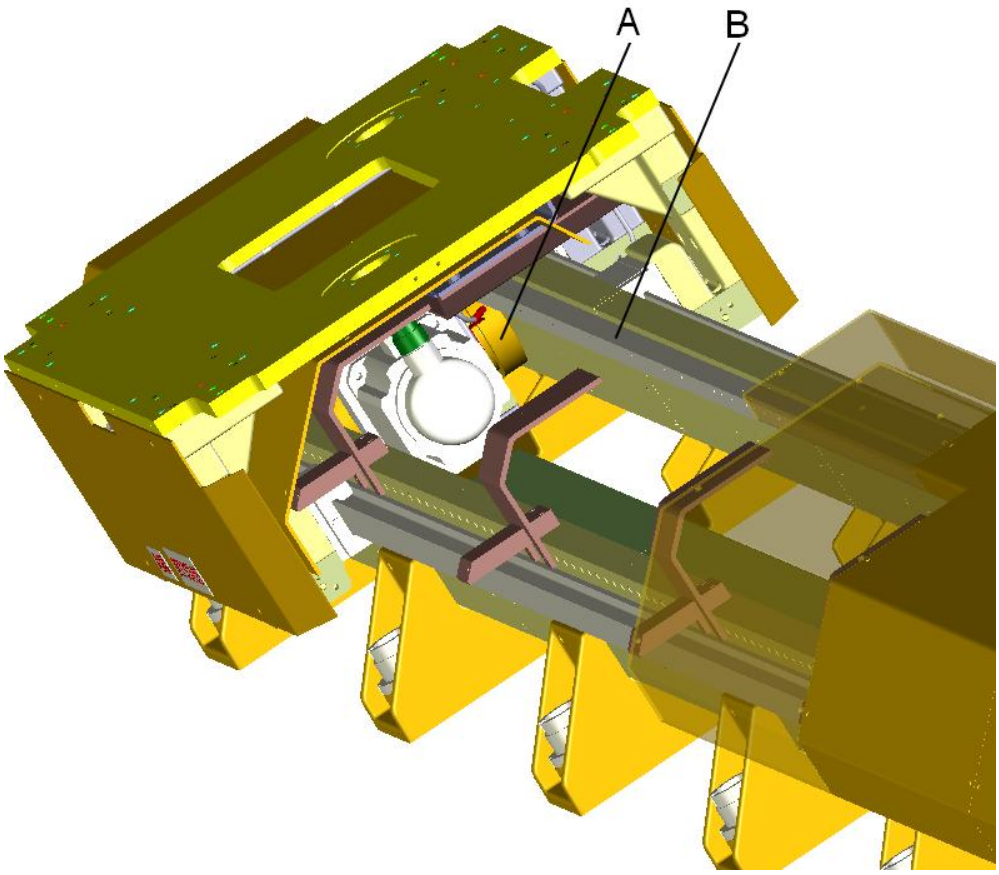
### 3.4.1 Racks and pinion

**General**

It is recommended to inspect and, if necessary, clean the racks and the pinion every 100 km or every week. If the FlexTrack IRT 501-66/66R/90/90R/90RE/90RS is not equipped with an automatic lubrication system, it is necessary to lubricate the racks and the pinion manually every 100 km or every week.

**Location**

The figure below shows the location of the gearbox racks and pinion:




xx1800001972

| | |
|---|---|
| A | Pinion |
| B | Rack |

*Continues on next page*

## Required equipment

When you clean the racks and the pinion, or if the FlexTrack IRT 501-66/66R/90/90R/90RE/90RS is not equipped with an automatic lubrication system, it is necessary to lubricate the racks and pinion manually. Use one of the recommended lubricants:

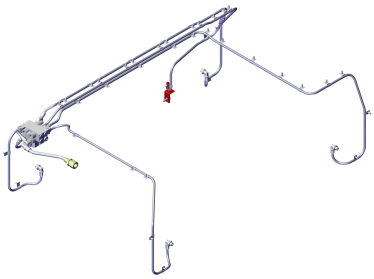
| Equipment | Note |
|---|---|
| Lubricant | CASTROL Longtime PD0 |
| Lubricant | Shell Gadus S2 V220 00 |
| Lubricant | TOTAL Multis EP 0 |
| Lint free cloth | |
| Lubrication gun (if no automatic lubrication system). | |

## Lubrication of the racks and pinion

The procedure below details how to perform manual cleaning and lubrication of the racks and pinion of FlexTracks that are not equipped with an automatic lubrication system.

**Note**

Use lint free cloth.

| | Action | Note/Illustration |
|---|---|---|
| 1 | Remove the FlexTrack upper covers and rack covers. | |
| 2 | Inspect the racks and the pinion, clean them if necessary. | |
| 3 | If you have cleaned them, use a brush to lubricate the racks and the pinion. | |
| 4 | Move the carriage back and forth and repeat *step3*. | |
| 5 | Re-attach the covers. | |
| 6 | Every week or 100 km, if the FlexTrack is not equipped with an automatic lubrication system, connect the pump to the rack & pinion grease port on the manifold. Check that no pipe has been damaged. |  xx1800001973 |
| 7 | Pump to inject the grease in the piping. Inject 3 grams of lubricant for rack & pinion per week or 100 km. | |

## 3.5 Activities 1 Month

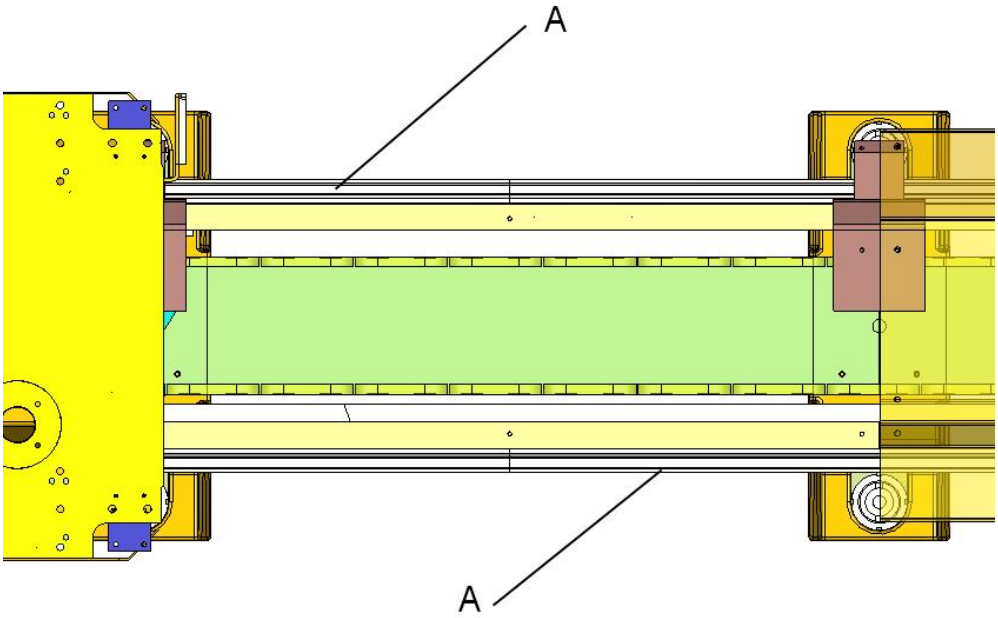
### 3.5.1 Linear rails

**General**

It is recommended to inspect and, if necessary, clean the linear rails every month.

**Location**

The figure below shows the location of the linear rails:




xx1800001974

| | |
|---|---|
| A | Linear rails |

**Required equipment**

When you clean the linear rails, it is necessary to lubricate them manually. Use one of the recommended lubricants:

| Equipment | Note |
|---|---|
| Lubricant | CASTROL Longtime PD0 |
| Lubricant | Shell Gadus S2 V220 00 |
| Lubricant | TOTAL Multis EP 0 |
| Lint free cloth | |

*Continues on next page*

### Lubrication of the linear rails

The procedure below details how to perform cleaning and, if necessary, lubrication of the linear rails.

**Note**

Use lint free cloth.

| | Action | Note/Illustration |
|---|---|---|
| 1 | Remove the FlexTrack upper covers and rack covers. | |
| 2 | Inspect the linear rails, clean them if necessary. | |
| 3 | If you have cleaned them, use a brush to lubricate the linear rails. | |
| 4 | Move the carriage back and forth and repeat *step 3*. | |
| 5 | Re-attach the covers. | |

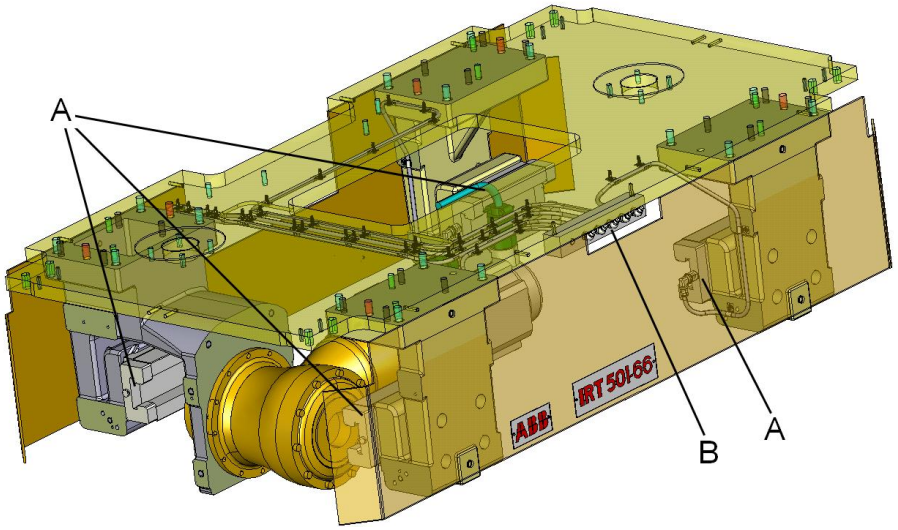
## 3.5.2 Ball bearing blocks

### General

If the FlexTrack IRT 501-66/66R/90/90R/90RE/90RS is not equipped with an automatic lubrication system, it is necessary to lubricate the ball bearing blocks manually every month.

### Location

The figure below shows the location of the ball bearing blocks:




xx1800001975

| | |
|---|---|
| A | Ball bearing blocks |
| B | Grease manifold |

### Required equipment

Use one of the recommended lubricants:

| Equipment | Note |
|---|---|
| Lubricant | CASTROL Longtime PD0 |
| Lubricant | Shell Gadus S2 V220 00 |
| Lubricant | TOTAL Multis EP 0 |
| Lint free cloth | |

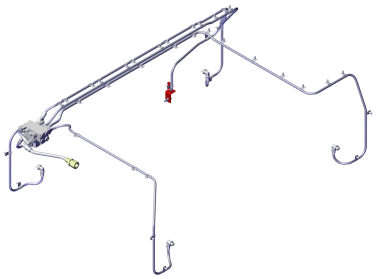
### Lubricate the ball bearing blocks

The procedure below details how to lubricate the ball bearing blocks.

**Note**

Use lint free cloth.

*Continues on next page*

| | Action | Note |
|---|---|---|
| 1 | Connect the pump to a block grease port on the manifold. Check that no pipe has been damaged. |  xx1800001973 |
| 2 | Pump to inject the grease in the piping. During the operation, watch the seals at the ball bearing block: when you see the grease pouring out, you have applied enough grease. In average, one should inject 1 gram of lubricant per block and per month. | |
| 3 | Repeat the *step1* and *step2* for each block port on the manifold. | |

## 3.5.3 Automatic lubrication system

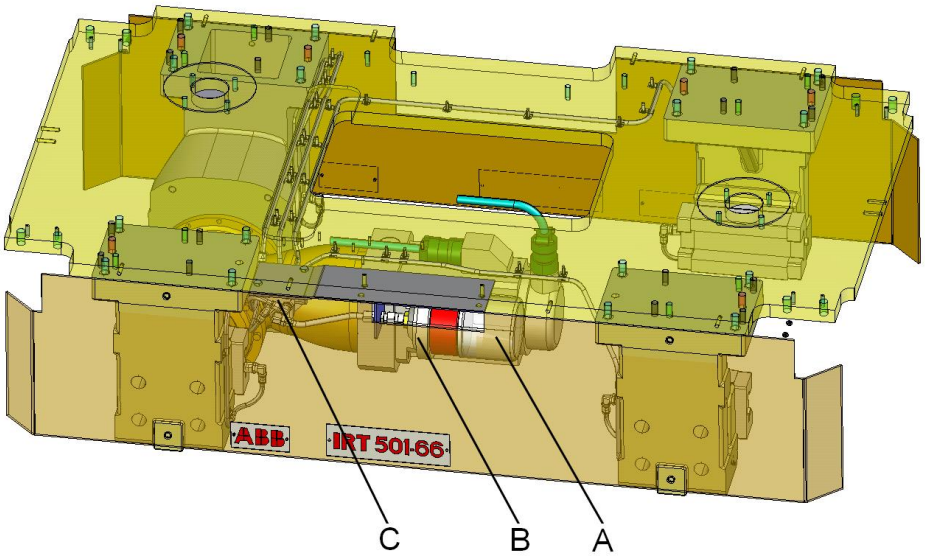
### General

If the FlexTrack is equipped with an automatic lubrication system, an electric pump will deliver the correct quantity of grease from a cartridge to the ball bearing blocks and to the pinion at required time intervals (one cycle per day). The grease is pushed in the piping by the pump; a valve is sequencing the distribution to each port.

The level of the lubricant should be checked once a month, even though the system should apply the lubricant equally over a longer period.

### Location

The figure below shows the location of the lubrication system.




xx1800001977

| | |
|---|---|
| A | Grease cartridge |
| B | Control unit grease pump |
| C | Oil dispatcher |

*Continues on next page*

### Required equipment

**WARNING**

Use lithium soap flowable grease, class NLGI 0, with a mineral oil base, doped with EP (extreme pressure) additives. The base oil viscosity must be ISO VG68 to ISO VG 100.

Grease doped with EP additives is absolutely necessary, due to high loads on blocks.

Customers must use the following lubrication suggested by ABB or malfunction of the lubrication system may occur.

| Equipment | Note |
|---|---|
| Lubricant | CASTROL Longtime PD0 |
| Lubricant | Shell Gadus S2 V220 00 |
| Lubricant | TOTAL Multis EP 0 |

**WARNING**

Battery packs should be changed every time the lubricant cartridge is replaced to assure proper voltage to the system, and each battery pack should only be used once only. A new battery pack should be supplied with each replacement cartridge purchased.

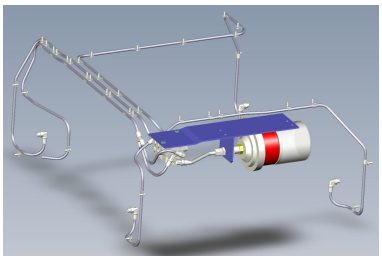
### Checking grease level and inspect the pipes without lubrication feedback system

The procedure below details how to check the grease level and inspect the pipes when the FlexTrack is installed without lubrication feedback system.

| | Action | Note/Illustration |
|---|---|---|
| 1 | Locate the cartridge. | |

*Continues on next page*

3.5.3 Automatic lubrication system
*Continued*

| | Action | Note/Illustration |
|---|---|---|
| 2 | Check the level of lubricant. If the lubricant is used up, change with a new one. |  <br>xx1800001978<br>For cartridge replacement, see the memolub manual on the next page. |
| 3 | Check if the lubrication pump is working normally. If not, check:<br>• The battery is low or not. If yes, replace the battery. (Although the replacement battery should be delivered with the replacement cartridge, note that it is possible to use a set of 3 pcs standard AA batteries).<br>• The EPS system is working normally or not. If no, replace the cartridge. | |
| 4 | Check that no pipe has been damaged, and that the grease is distributed to each block and on the pinion. |  <br>xx1800001979 |

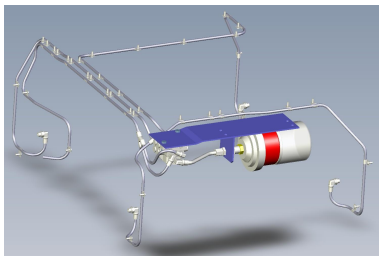
**Checking grease level and inspect the pipes with lubrication feedback system**

When lubrication feedback system is used, there will be an abnormal alarm on the FlexPendant if anything is not ok in the lubrication system.

The procedure below details how to troubleshoot the lubrication system when the lubrication feedback system .

| | Action | Note/Illustration |
|---|---|---|
| 1 | Locate the cartridge. | |

*Continues on next page*

| | Action | Note/Illustration |
|---|---|---|
| 2 | Check the level of lubricant. If the lubricant is used up, change with a new one. |  <br>xx1800001978<br>For cartridge replacement, see the memolub manual on the next page. |
| 3 | Check if the lubrication pump is working normally. If not, check:<br>• The battery is low or not. If yes, replace the battery. (Although the replacement battery should be delivered with the replacement cartridge, note that it is possible to use a set of 3 pcs standard AA batteries).<br>• The EPS system is working normally or not. If no, replace the cartridge. | |
| 4 | Check that no pipe has been damaged, and that the grease is distributed to each block and on the pinion. |  <br>xx1800001979 |
| 5 | After installing the lubrication feedback system, check the lubrication status regularly (at least for three months) to avoid incorrect feedback. | |

*Continues on next page*

**Memolub manual**

The procedure below is based on the Memolub HPS user manual. It details how to replace the grease cartridge.

Opening and closing the Memolub

| | Action | Note |
|---|---|---|
| 1 | Opening the Memolub.<br>First place the Memolub on a flat and clean surface. Push firmly with one hand on top of the Memolub. With the other hand, hold the black base and turn counterclockwise. Pull the transparent bell to open. |  <br>xx1800001980 |
| 2 | Closing the Memolub.<br>Use the same technique: hold the cranked black base, put the transparent bell and turn it clockwise. When the closed position is reached you should hear a "click". |  <br>xx1800001981 |

Installing a new grease cartridge

Respect the following instructions to replace the grease cartridge:

| | Action | Note |
|---|---|---|
| 1 | Open the Memolub® as described before. | |
| 2 | Pull-up the black rubber seal. Fill-in the Memolub® with a manual grease pump. This manual operation is required only if the Memolub has been used without a cartridge, if the previous cartridge has run out of grease. Place the pump nipple at the entry of the Memolub, and pump until you see grease coming out at the outlet. Two strokes of the manual pump are usually enough. |  <br>xx1800001982 |

*Continues on next page*

| | Action | Note |
|---|---|---|
| 3 | Pull-up the black strap to reveal the battery case. Insert a new Memolub battery: hold it by the black plastic strap & insert it in the Memolub respecting the instructions on the label. If the battery is correctly inserted the motor is activated during 1 sec. to check that the motor is working properly. Put the black rubber seal back in place. |  xx1800001983 |
| 4 | Remove the paper disc from the replacement cartridge. Fill-in the required dates: "Started" and "Replace before". The "replace before" date is depending on the Memolub program. Put the paper disc back in place in order to see the instructions when the Memolub is closed. |  xx1800001984 |
| 5 | Press softly on the cartridge until the grease comes out, to avoid injecting air into the pump. |  xx1800001985 |
| 6 | Place the cartridge at the inlet of the pump. Check that the cartridge is correctly inserted in the inlet of the pump. |   xx1800001986 |
| 7 | Place the spring and the compression disc inside the transparent bell. Put the bell back in place and check that the compression disc is correctly lying on the top of the cartridge surface. |   xx1800001987 |
| 8 | Close the Memolub as described before. | |

*Continues on next page*

### 3.5.3 Automatic lubrication system
*Continued*

## Test the Memolub® (Check Function)

| | Action | Note |
|---|---|---|
| 1 | To check that the Memolub is working well after a maintenance operation, press one of the 3 connectors located on the base during a few seconds. The Memolub is starting a dispensing cycle. The completion of the cycle means that the battery & control board of the Memolub are working well.<br>*It is important that you run this test cycle only if a cartridge is in place, otherwise you'll fill-in the pump with air.* |  <br>xx1800001988 |

## 3.5.4 Emergency stop and stroke limit system

### General

It is recommended to ensure the emergency stop and stroke limit system effectiveness every month.

### Motor brake

The procedure below details how to ensure the effectiveness of the motor brake in case of emergency stop.

| | Action | Note/Illustration |
|---|---|---|
| 1 | The FlexTrack is powered, but not moving. | |
| 2 | Press the emergency stop button. | |
| 3 | The brake is applied; you should hear the noise in the motor area. | |
| 4 | Try to push the carriage manually. | |
| 5 | If the brake is correctly applied, it is not possible to move the carriage manually. | |
| 6 | Proceed with the required validations in the control system to switch back to auto mode. | |

### Verification of the effectiveness of the stroke limit system

A software limit prevents the carriage from moving beyond its acceptable upper and lower stroke limits.

The procedure below details how to ensure the software stroke limit is working correctly:

| | Action | Note/Illustration |
|---|---|---|
| 1 | Switch the IRC5 to manual mode. | |
| 2 | With the teach pendant, try to jog the carriage to both ends. | |
| 3 | If the software limits are functional, it should not be possible to go beyond the defined upper or lower end position, and it should not be possible to reach the hard stops. | |

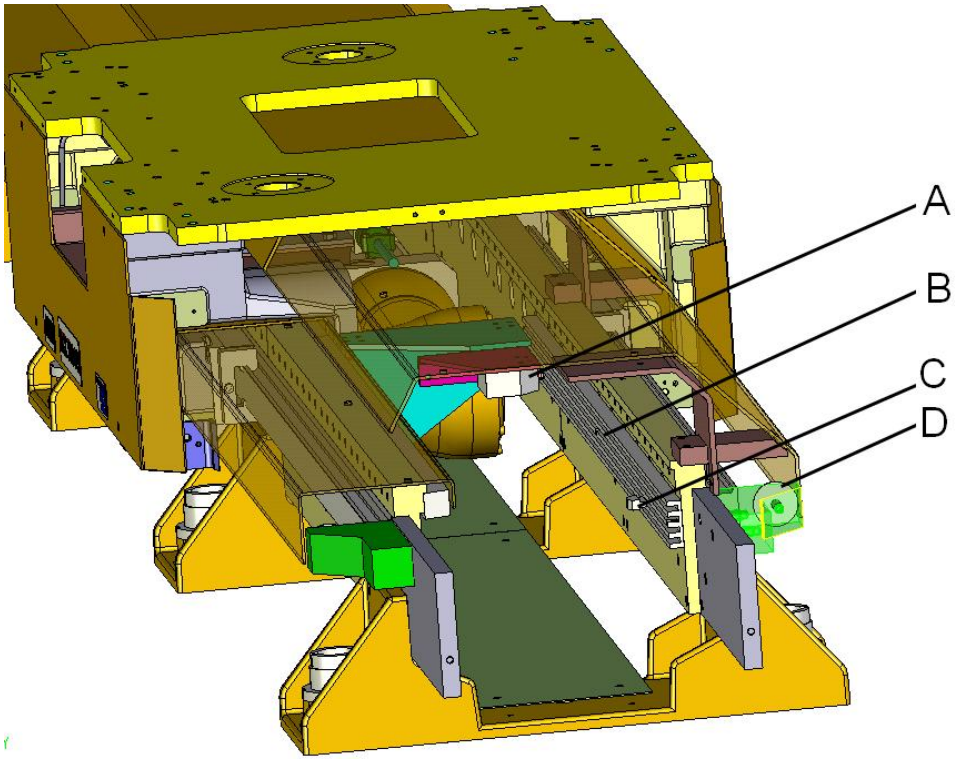
## 3.5.5 Zone division system

### General

It is recommended to ensure the zone division is working properly every month.

### Zone division system

The figure below shows the location of the position switch:




xx1800001989

Inspect monthly the following parts:

| | |
|---|---|
| A | Limit switch |
| B | Cam guide (on both ends of the FlexTrack) |
| C | Cam (on both ends of the FlexTrack) |
| D | Hard stop (bumper) (on both ends of the FlexTrack) |

### Verification of the effectiveness of the zone division sensor

If a 1 position, 2 position or 4 position limit switch is used to divide the track into zones, then the following procedure should be followed to ensure it is functioning correctly:

| | Action | Note/Illustration |
|---|---|---|
| 1 | Power off the IRC5 and activate the E-Stop. | |
| 2 | Activate the limit switch sensor using an adhesive tape. | |
| 3 | Reset the E-Stop button and power on the IRC5 in manual mode. | |

*Continues on next page*

| | Action | Note/Illustration |
|---|---|---|
| 4 | Check if the reaction / error from the IRC5 or PLC are as expected while the limit switch is triggered. | This depends on how the limits switch has been wired and the function it is being used for.<br>For example, if the limit switch is wired to a lamp, then the lamp should be illuminated. |
| 5 | Power off the IRC5 and activate the E-Stop. | |
| | Remove the adhesive tape and reset the E-Stop button and power on the IRC5. | |

## 3.5.6 Cables and connectors

### Inspection of electrical operations

**WARNING**

Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot and for the FlexTrack IRT 501-66/66R/90/90R/90RE/90RS.

### Check the cabling

Check monthly:

| If any cables ... | then ... |
|---|---|
| have been damaged trough wear or pinching | replace the cable |
| run against sharp edges | Replace the cable, remove the cause of the wear, or route the cable in a different way. |

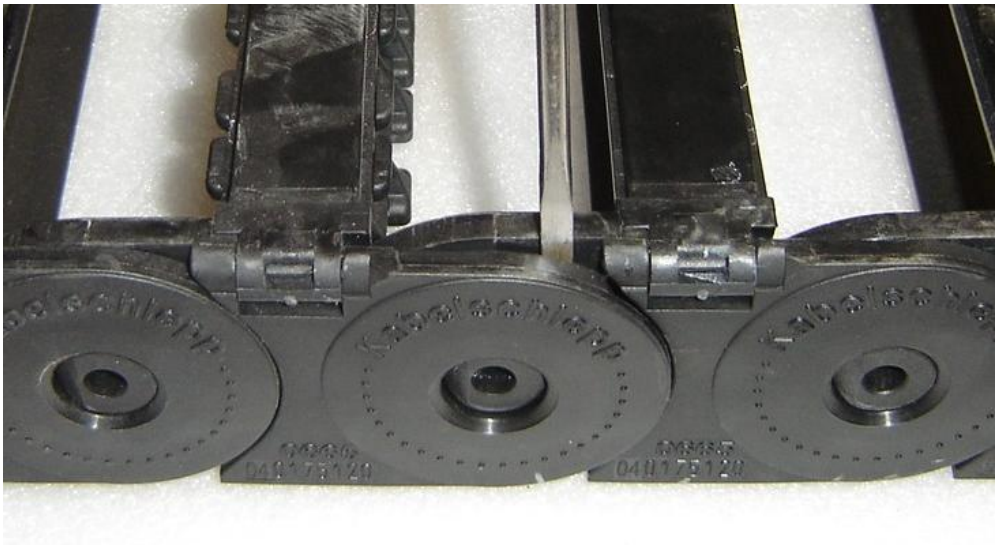
### Check the connector

Check monthly:

- All the connectors on the controller, the SMB box and the motor are firmly tighten, and that there’s no damage to the cable outlet.

### Inspection of the cable chain

Once a month check that the cable track shows no trace of excessive wear due to rub on a fixed part. If one element is damaged, it is possible to replace it without removing the whole chain from the FlexTrack.



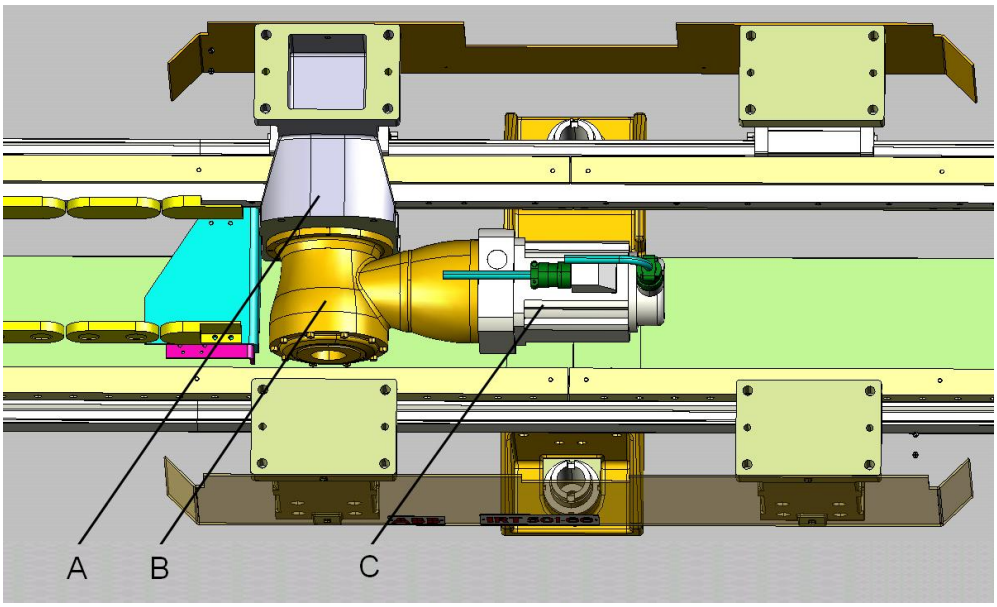
xx1800001990

## 3.6 Activity 3 and 12 months

### 3.6.1 Gearbox

**Location**

The figure below shows the location of the gearbox:




xx1800001991

| | |
|---|---|
| A | Bracket |
| B | Gearbox |
| C | Motor |

**Oil**

The FlexTrack IRT 501 gearbox is filled with synthetic oil for the internal lubrication. The quantity of oil in the gearbox is planned for the gearbox's lifetime. However, if you need to refill the gearbox with oil for any reason, you must use one of the recommended oil below (ISO VG 220):

| Supplier | Reference |
|---|---|
| MOBIL | SHC 630 |
| SHELL | Omala HD 220 |
| TOTAL | Carter SH 220 |

**Note**

The oil in the gearbox does not need to be changed during life of the gearbox.

*Continues on next page*

3.6.1 Gearbox
*Continued*

### Maintenance schedule

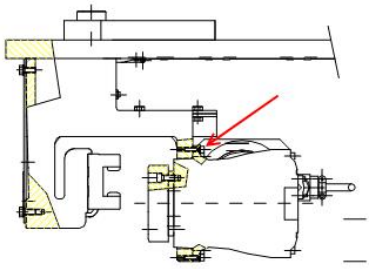
| Interval | Maintenance activity |
|---|---|
| First use | Visual inspection<br>Verification of the tightening torque |
| After the first 500 hours / 3 months | Visual inspection<br>Verification of the tightening torque |
| Every 3 months | Visual inspection |
| Every year | Verification of the tightening torque |

### Visual Inspection

Every 3 months, remove the necessary FlexTrack and carriage side covers and inspect the gearbox. Make sure that there is no mark of wear or damages to the gearbox, and that there is no oil leak.

### Verification of the tightening torque

Every year, make sure that the tightening torque of the hexagon socket head cap M6x25 class 12.9 screws that secure the gearbox to the bracket is 16.5 Nm:

| | Action | Note/Illustration |
|---|---|---|
| 1 | Separate the carriage bracket holding the gearbox and motor from the carriage, and move the carriage away. For the procedure about how to move the carriage away, see *Disassemble the bracket from the carriage on page 160*. | |
| 2 | The tightening torque of the hexagon socket head cap M6x25 class 12.9 screws that secure the gearbox to the bracket is 16.5 Nm. | Section view:<br>  <br>xx1800001992 |

## 3.7 Activities 6 Months

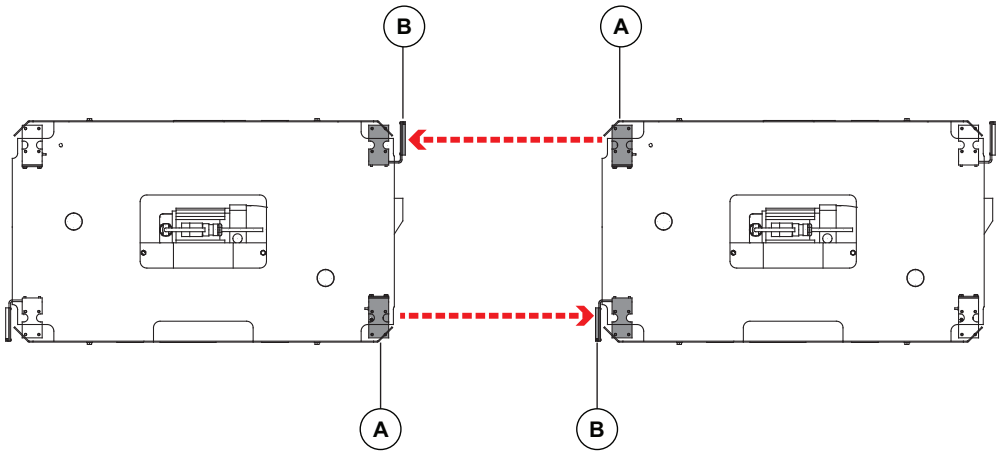
### 3.7.1 Anti-collision system function test

**General**

It is recommended to do the function test on the anti-collision system every six months.

**Location**

The figure below shows the location of the anti-collision system on the carriage:




xx2000002596

| | |
|---|---|
| A | Laser scanner |
| B | Laser reflector |

**Function test on anti-collision system**

The procedure below details how to perform cleaning and, if necessary, lubrication of the linear rails.

**Note**

Use lint free cloth.

| | Action | Note/Illustration |
|---|---|---|
| 1 | Jog and move the carriage to get close to the other carriage. | |
| 2 | Inspect if the moved carriage have a collision with the other carriage or not. | |
| 3 | If there is a collision, check that:<br>• Is there any damage on the laser scanner. If yes, replace it.<br>• Are the laser scanner and reflector installed on the correct location. If not, reinstall them to make sure that the laser scanner and reflector are in a line. | |

## 3.8 Activities 36 Months

### 3.8.1 Replacement, SMB Battery pack

**General**

The SMB box contains a main board and a battery for the memory backup in order to maintain position data.

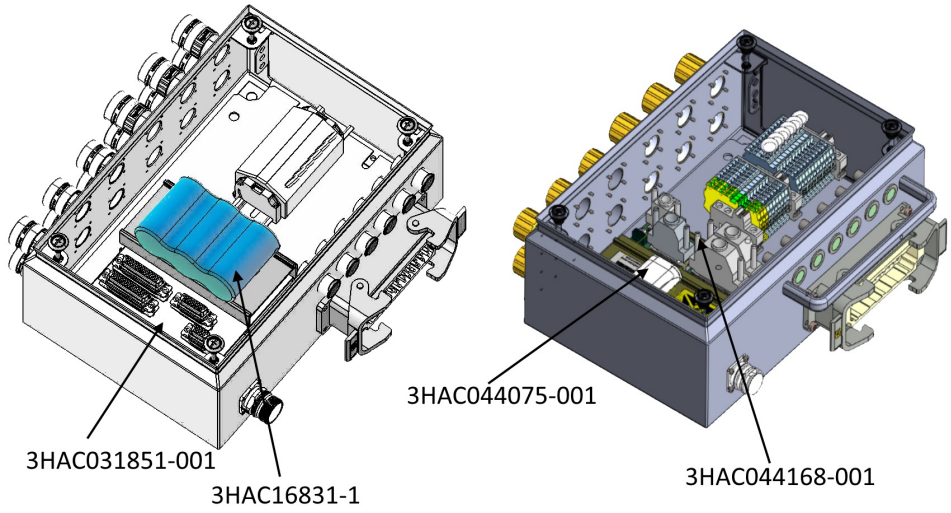
SMB boxes manufactured before 2015 are equipped with a SMB board DSQC633 (Ref. 3HAC031851-001) and a SMB battery (Ref. 3HAC16831-1).

SMB boxes manufactured after 2015 are equipped with a SMB board RMU101 (Ref. 3HAC044168-001) and a Battery pack RMU (Ref. 3HAC044075-001).

The battery should be replaced every three years or when the battery is going flat. This is generally shown by an error code on the FlexPendant screen (38213). Information about error codes can be found in the FlexPendant documentation.

**Note**

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

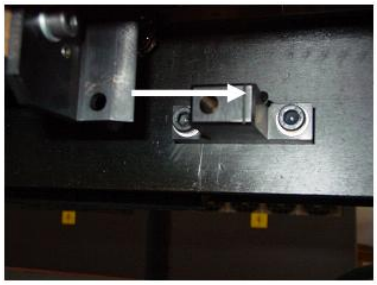



xx1800001993

*Continues on next page*

## Instructions

Replace the SMB battery as follows:

| | Action | Note |
|---|---|---|
| 1 | Position first the carriage in the calibration position (align the synchronization gauges). |  xx1800001994 |
| 2 | Switch off the power on the SMB box. | **WARNING** Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot and for the FlexTrack IRT 501. |
| 3 | Open the SMB box and locate the battery. | |
| 4 | Cut the plastic straps. | |
| 5 | Unplug the 2 wires cable from the board and remove the battery pack. | |
| 6 | Place the new battery pack, plug the connector on the board, and secure the pack with straps. | |
| 7 | Close the SMB box, switch on the power. | |
| 8 | Update the revolution counters of the axis. | |

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# 4 Repair

## 4.1 Instruction

**Structure of the this chapter**

This chapter details all repair activities recommended for the FlexTrack IRT 501-66/66R/90/90R/90RE/90RS and any external unit. Each procedure contains all information required to perform the activity, e.g. required tools and materials.

**Safety information**

Before any service work is commenced, it is extremely important that all safety information is observed! There are general safety aspects that must be read through, as well as more specific safety information that describe danger and safety risks when performing the procedures. Read *Safety on page 15* before performing any service work.

**WARNING**

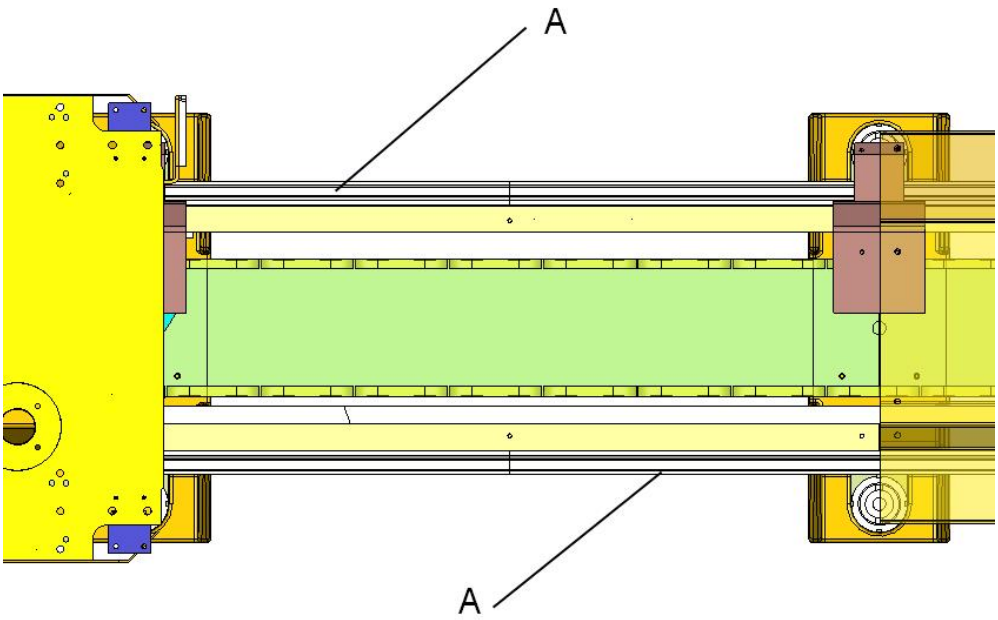
Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot and FlexTrack IRT 501 before doing any repairing work.

## 4.2 Replace the linear rails

### Location

There are 3 different lengths of linear rail sections, depending on its position on the FlexTrack. If you need to replace one or more sections of linear rail, make sure that you order the right parts.See *Spare parts on page 195* at the end of this manual to find the correct part number.

The figure below shows the location of the linear rails:



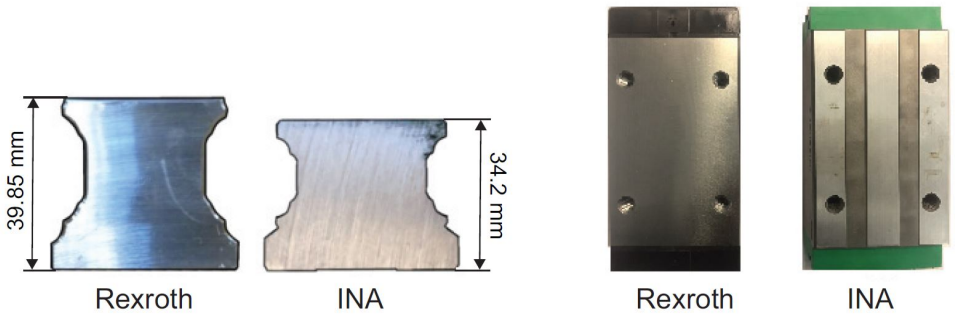

xx1800001995

| | |
|---|---|
| A | Linear rails |

### Linear rail of different supplier

Linear rail of ABB FlexTrack has two suppliers, Rexroth and INA, and these two types are not compatible with each other.

The figure below shows the differences of two different suppliers:




xx1800001996

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| | Linear rails | Bearing blocks |
|---|---|---|
| **Contrast points** | **INA** | **Rexroth** |
| Marking of the brand on the linear rails | No | Yes |
| Chamfers at the ends of each piece of linear rail | No | Yes |
| Chamfers at the ends of the FlexTrack | Yes | Yes |
| Color of the side casing of the ball block | Green | Black |

## Required equipment

| Equipment | Note |
|---|---|
| Standard toolkit | The content is defined in *Standard toolkit on page 120*. |
| Rail pressing tool<br>IRT501-66/66R: 3HAW107700358<br>IRT501-90/90R: 3HAW107700456 | The rail pressing tool is part of the kit of tools necessary to assemble the FlexTrack.<br>See *Procedure of assembly on page 64*. |
| Ball bearings block | It is recommended to use one spare ball bearing block to verify the alignment of the rails. |
| Loctite 243 | Apply Loctite 243 on the screws that hold the linear rails. |

When you install new linear rails, it is necessary to lubricate them manually.

Use one of the recommended lubricants:

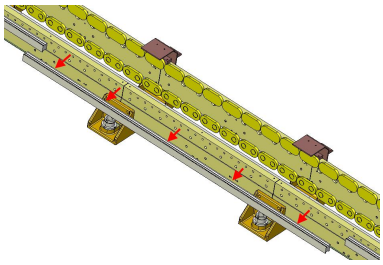
| Equipment | Note |
|---|---|
| Lubricant | CASTROL Longtime PD0 |
| Lubricant | Shell Gadus S2 V220 00 |
| Lubricant | TOTAL Multis EP 0 |
| Lint free cloth | |

## Disassemble

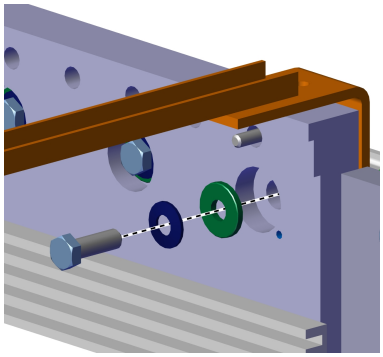
Follow the directions below to disassemble the linear rail:

| | Action | Note |
|---|---|---|
| 1 | **WARNING**<br>Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot and FlexTrack IRT 501 before doing any repairing work. | |
| 2 | Remove all necessary FlexTrack covers and disassemble all hexagon head M12x35 class 12.9 screws with contactlock washers M12-27 and plain washers 12x32x4 which hold the linear rail to the sidemember. | As the linear rail screws should have been tightened with Loctite 243, you may have to apply high force on the wrench. |

*Continues on next page*

| | Action | Note |
|---|---|---|
| 3 | Remove the linear rail. |  xx1800001997 |

## Assemble

| | Action | Note/Illustration |
|---|---|---|
| 1 | **WARNING**<br>Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot and FlexTrack IRT 501 before doing any repairing work. | |
| 2 | Assemble linear rails using the all the hexagon head M12x35 class 12.9 screws with contact-lock washers M12-27 and plain washers 12x32x4.<br>Use the rail pressing tool to make sure that the rails are pushed against the sidemember mounting surface.<br>Use standard tools to slightly tighten the screws. |  xx1800001998 |

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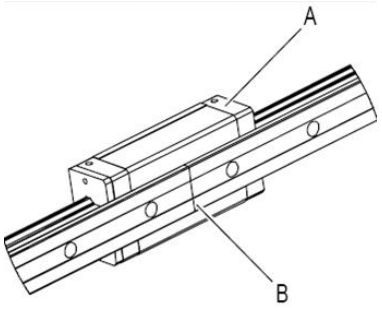
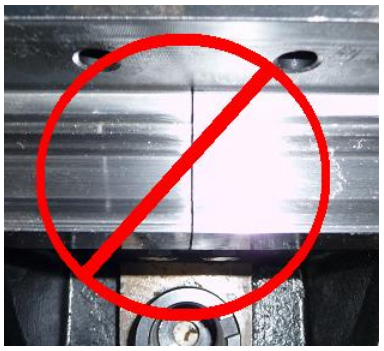
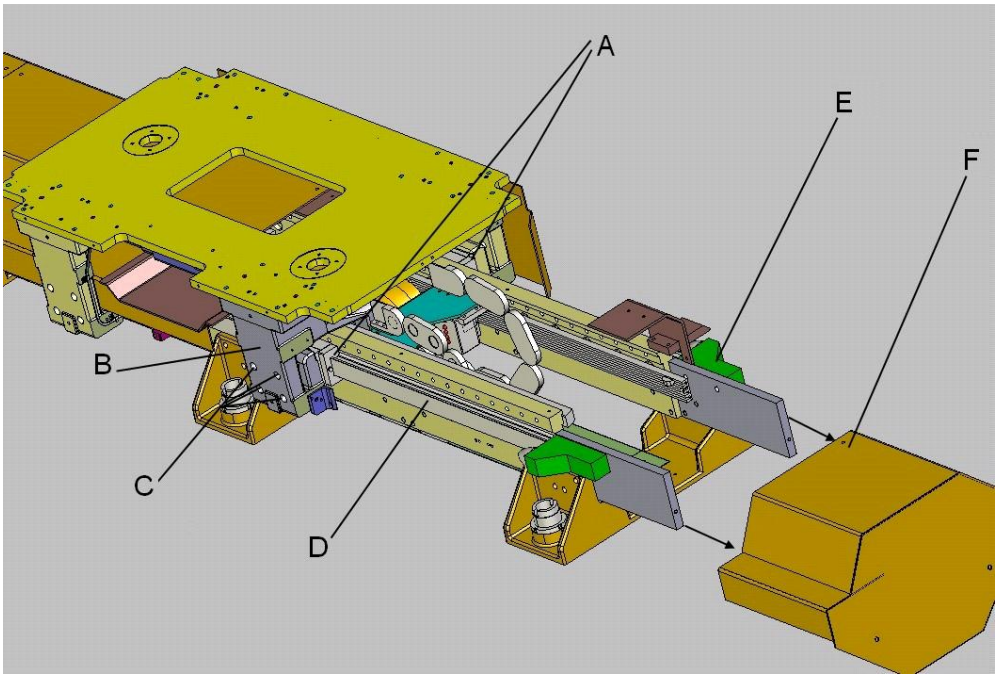
| | Action | Note/Illustration |
|---|---|---|
| 3 | Check the rails alignment:<br>Use a ball bearing block or a square ruler; if you do not have a spare block or a square ruler, disassemble one from the carriage (remove the 4 pcs hexagon head M10X30 class 12.9 screws).<br>If the linear rails are correctly aligned, you should sense no " step " while passing the rail junction points. If you do, then push the rail against the side member step, using the rail pressing tool, and make sure that there is 0.2 mm gap between adjacent rails. When the alignment is correct, tighten the screws one by one, after applying Loctite 243 on its thread.<br>(**Tightening torque: 132 Nm**)<br>If necessary, re-assemble the block in the carriage bracket and tighten its 4 pcs screws<br>(**Tightening torque: 77 Nm.**) |  <br>xx1800001999<br>  <br>xx1800002000<br>**WARNING**<br>If you need to remove the block out of the rails, make sure you use the bearing protection to prevent the balls from falling out. |
| 4 | Once you have tightened a screw, mark the screw head with a white marker. |  <br>xx1800002021 |
| 5 | Use a brush to lubricate the linear rails. | |
| 6 | Re-assemble the FlexTrack covers. | |

## 4.3 Replace the ball bearing blocks

### Location

The figure below shows the location of the ball bearing blocks and other key parts:




xx1800002022

| | |
|---|---|
| A | Ball bearing blocks |
| B | Carriage bracket |
| C | 4 pcs hexagon head M10x30 class 12.9 screws and 4x M10-16 narrow contact-lock washers |
| D | Linear rail |
| E | Mechanical stop (supports + rubber hard stop) |
| F | End cover |

### Required equipment

| Equipment | Note |
|---|---|
| Standard toolkit | The content is defined in *Standard toolkit*. |
| Lubrication gun | |
| Jack >2t | |

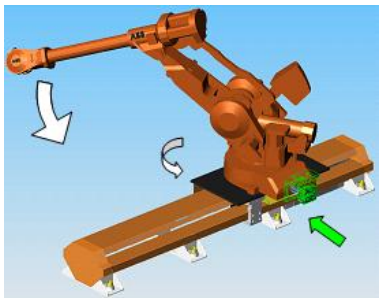
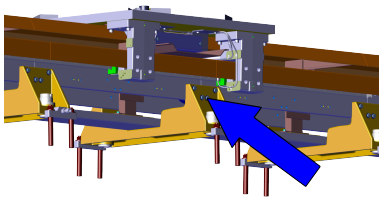
Use one of the recommended lubricants:

| Equipment | Note |
|---|---|
| Lubricant | CASTROL Longtime PD0 |
| Lubricant | Shell Gadus S2 V220 00 |
| Lubricant | TOTAL Multis EP 0 |
| Lint free cloth | |

*Continues on next page*

## Disassemble

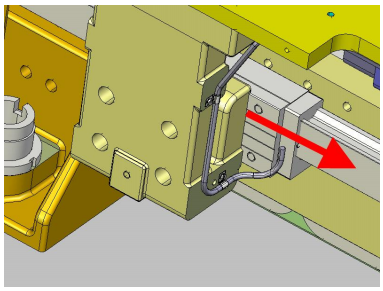
Follow the instructions below to disassemble the bearing block:

| | Action | Note/Illustration |
|---|---|---|
| 1 | **WARNING**<br>When doing manual jogging with power and pneumatic on inside the cell (Max at 10%), the maintenance personnel should stay away from motion unit in safe area. | |
| 2 | If there is a robot on the track, move the robot in the opposite direction from the bracket in order to unload it. |  <br>xx1800002023 |
| 3 | **WARNING**<br>Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot and FlexTrack IRT 501 before doing any repairing work. | |
| 4 | Disassemble the necessary carriage side cover, the FlexTrack end cover (if present) and the mechanical stop. | |
| 5 | If there is no robot on the track, loose the screws connecting the bearing support and mounting plate more than 1 mm.<br>Use a jack to secure the height of the carriage plate (don't rise it more than 1 mm).<br>**WARNING**<br>Rising the carriage more then 1 mm can seriously damage the remaining three ball bearing blocks. |  <br>xx2000002609 |
| 6 | Unplug the lubrication pipe from the bearing block. | |
| 7 | Remove the 4 pcs hexagon head M10X30 class 12.9 screws and 4 pcs M10-16 narrow contact-lock washers. | |

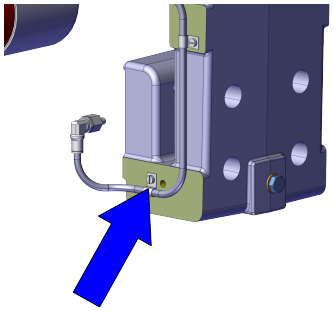
*Continues on next page*

## 4.3 Replace the ball bearing blocks

*Continued*

| | Action | Note/Illustration |
|---|---|---|
| 8 | Let the block slide out of the bracket and linear rail.<br><br>**Note**<br><br>If the block can be slid out from the end of the track, slide it out from the end of the track.<br>Otherwise, disassemble a nearby rail and slide out the block.<br>For detail procedures, see *Disassemble on page 149*. |  <br>xx1800002024 |

### Assemble

| | Action | Note/Illustration |
|---|---|---|
| 1 | **WARNING**<br><br>Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot and FlexTrack IRT 501 before doing any repairing work. | |
| 2 | Remove one standard screw on the new block for the grease pipe. | |
| 3 | Insert the grease pipe fitting to the screw hole. | |
| 4 | The fitting must be on the inside of the carriage, and the reference surface (with no marking) on the upper face of the block.<br><br>**Tip**<br><br>For the middle block on six bearing track, both sides can be used for the fitting. |  <br>xx2000002610 |

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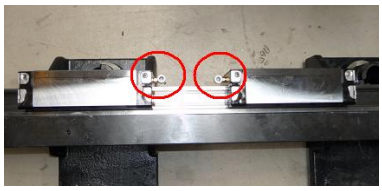
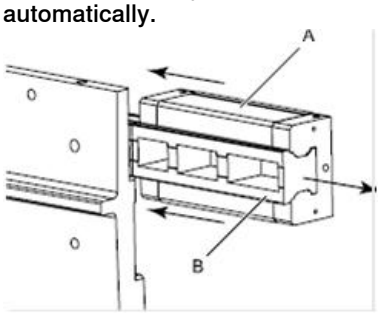
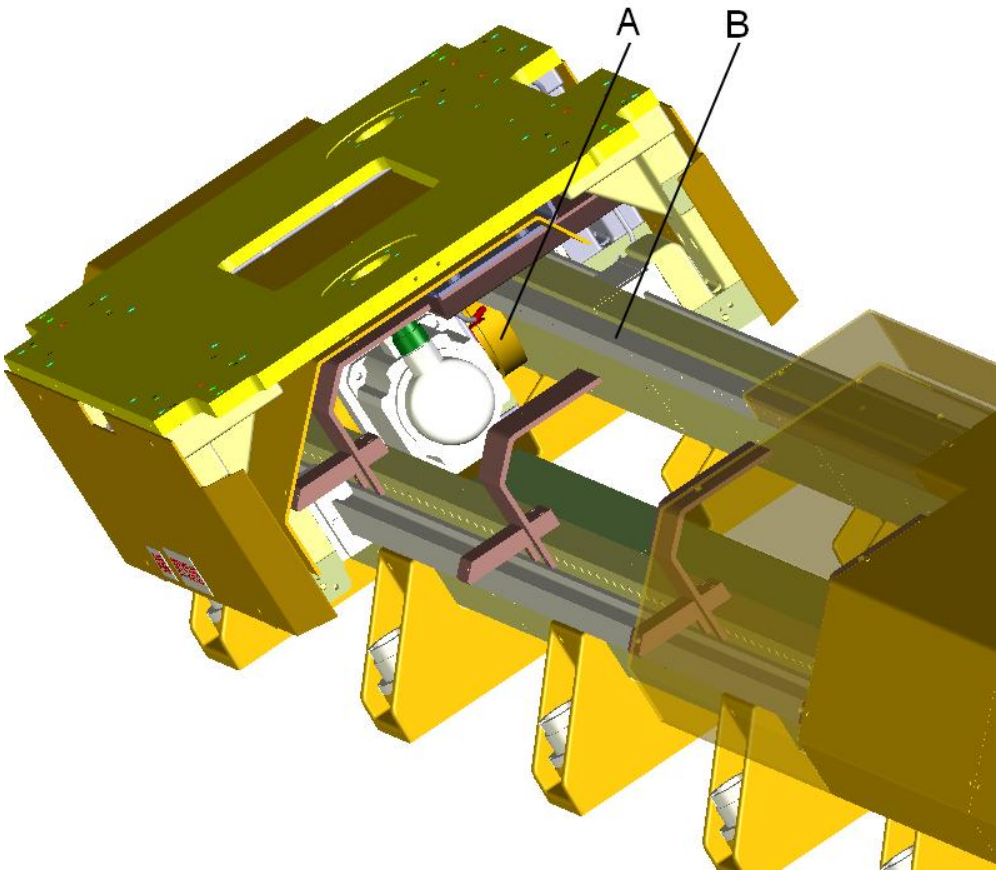
| | Action | Note/Illustration |
|---|---|---|
| 5 | Insert it onto the rail. Pay attention to the position of the fittings which must be on the inside of the carriage. |  <br>xx1800002026<br>**ATTENTION**: Do not remove the black plastic protection of the bearings until you slide the block onto the rail. They will come out automatically.<br>  <br>xx1800002027<br>A: Ball bearing block<br>B: Plastic bearing protection |
| 6 | Inject grease in the block. During the operation, watch the seals at the ball bearing block: when you see the grease pouring out, you have applied enough grease. | |
| 7 | Let the bearings block slide into the bracket and tighten the 4 pcs hexagon head M10X30 class 12.9 screws and 4 pcs M10-16 narrow contact-lock washers, applying Loctite 243 on their thread.<br>(**Tightening torque: 77 Nm**) | |
| 8 | Remove the jack. | |
| 9 | Re-connect the lubrication pipe. | |
| 10 | Re-assemble the mechanical stop and the covers. | |

## 4.4 Replace the racks

### Location

The figure below shows the location of the gearbox racks and pinion:




xx1800002028

| | |
|---|---|
| A | Pinion |
| B | Rack |

### Required equipment

| Equipment | Note |
|---|---|
| Standard toolkit | The content is defined in *Standard toolkit on page 120*. |
| Rack clamps 3HAW107700357 | The rack clamps are part of the kit of tools necessary to assemble the FlexTrack.<br>See *Procedure of assembly on page 64*. |
| Mounting rack 3HAWL000011 | The mounting rack is part of the kit of tools necessary to assemble the FlexTrack.<br>See *Procedure of assembly on page 64*. |
| Loctite 243 | Apply Loctite 243 on the screws that hold the racks. |

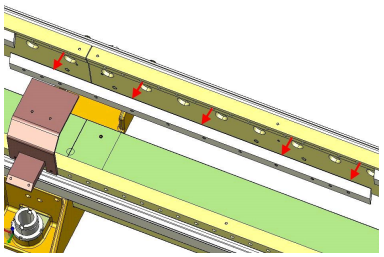
*Continues on next page*

When you install new racks, it is necessary to lubricate them manually. Use one of the recommended lubricants:

| Equipment | Note |
|---|---|
| Lubricant | CASTROL Longtime PD0 |
| Lubricant | Shell Gadus S2 V220 00 |
| Lubricant | TOTAL Multis EP 0 |
| Lint free cloth | |

## Disassemble

Follow the directions below to disassemble the racks:

| | Action | Note/Illustration |
|---|---|---|
| 1 | **WARNING**<br>Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot and FlexTrack IRT 501 before doing any repairing work. | |
| 2 | Remove all necessary FlexTrack covers and disassemble all hexagon head M8x55 screws class 12.9 with contact-lock washers M8-18 and flat washers 8x25x3 that hold the rack to the sidemember. | As the rack screws should have been tightened with Loctite 243, you may have to apply high force on the wrench. |
| 3 | Remove the rack. |  <br>xx1800002029 |

## Assemble

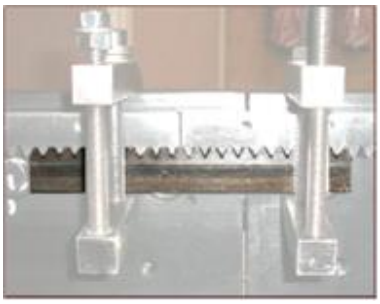
Follow the directions below to assemble the racks:

| | Action | Note |
|---|---|---|
| 1 | **WARNING**<br>Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot and FlexTrack IRT 501 before doing any repairing work. | |

*Continues on next page*

## 4.4 Replace the racks

*Continued*

| | Action | Note |
|---|---|---|
| 2 | Assemble the racks using the hexagon head M8x55 screws class 12.9 with contact-lock washers M8-18 and flat washers 8x25x3.<br>Use the clamping and mounting racks at the ends of the rack section to make sure that the racks are pushed against the sidemember mounting surface and perfectly aligned with each other.<br>Use standard tools, slightly tighten. |  <br>xx1800002030<br>  <br>xx1800002031 |
| 3 | When you are confident that the alignment is correct, tighten the screws one by one, after applying Loctite 243 on their thread.<br>(**Tightening torque: 40 Nm**) | |
| 4 | Once you have tightened a screw, mark it with a white marker. |  <br>xx1800002032 |
| 5 | Use a brush to lubricate the racks. | |
| 6 | Re-assemble the FlexTrack covers. | |

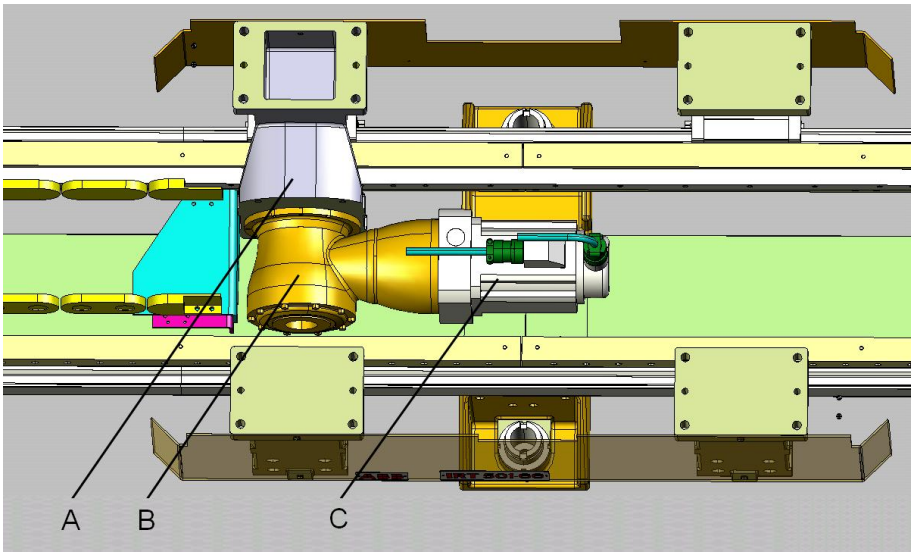
## 4.5 Motor and gearbox

### 4.5.1 Overview

It is possible to remove the motor and /or the gearbox what ever the position of the carriage or the tooling/robot on top. It is recommended to have 2 technicians to work together.

**Location**

The figure below shows the location of the motor and the gearbox:




xx1800002033

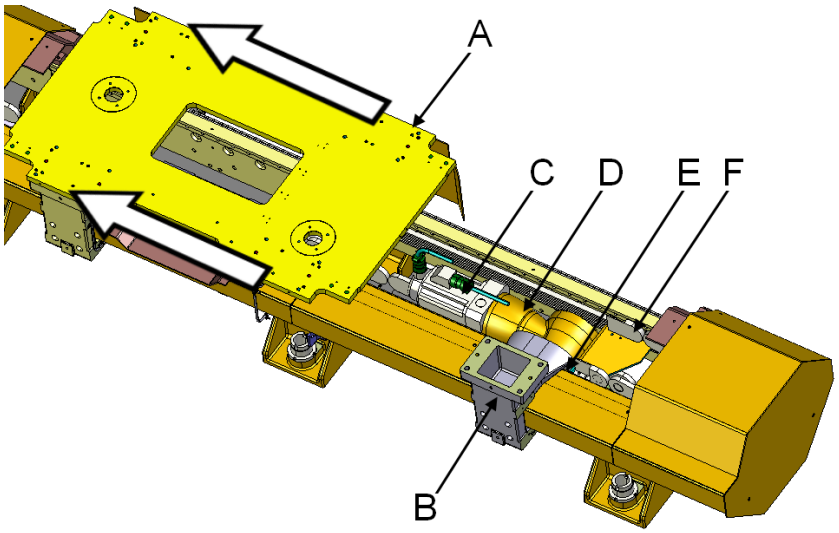
| | |
|---|---|
| A | Bracket |
| B | Gear |
| C | Motor |

## 4.5.2 Disassemble the bracket from the carriage

### Overview

To replace the motor and/or the gearbox, it is possible to disassemble the motor bracket from the top plate and then push the carriage away. It is recommended to have 2 technicians to work together.

The figure below shows how pushing the carriage away from the motor bracket exposes the motor, gearbox and cable chain connection point. This makes the following components accessible for maintenance:




xx1800002034

| | |
|---|---|
| A | Carriage - pushed away |
| B | Motor bracket - remains stationery |
| C | Motor - remains stationery |
| D | Gearbox - remains stationery |
| E | Pinion - remains stationery |
| F | Cable chain - remains stationery |

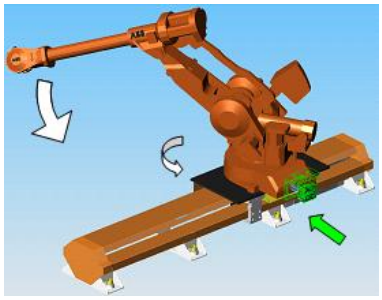
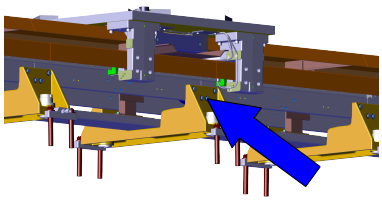
### Required equipment

| Equipment | Note |
|---|---|
| Standard toolkit | The content is defined in *Standard toolkit on page 120*. |
| Torque wrench | The tightening torque of the hexagon socket head cap M6x25 class 12.9 screws that secure the gearbox to the bracket is 16.5 Nm.<br>There are also specific tightening torques for the motor shaft and gearbox assembly. See the details in maintenance instructions. |

*Continues on next page*

| Equipment | Note |
|---|---|
| For the dowel pin extraction, you will need:<br>M6 screws of different lengths. For example: M6x10, M6x15, M6x35<br>1 thick washer inside diameter 6mm<br>1 spacer 30 mm long, inside diameter no smaller than the dowel pin diameter (10 mm), and outside diameter no bigger that the thick washer outside diameter. | |

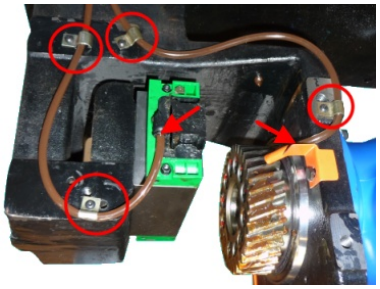
## Instructions

| | Action | Note |
|---|---|---|
| 1 | **WARNING**<br>When doing manual jogging with power and pneumatic on inside the cell (Max at 10%), the maintenance personnel should stay away from motion unit in safe area. | |
| 2 | If a robot is mounted on the carriage, move its arm to the opposite side of the motor bracket in order to unload it. |  <br>xx1800002035 |
| 3 | **WARNING**<br>Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot and FlexTrack IRT 501 before doing any repairing work. | |
| 4 | Disassemble the necessary carriage side cover, the FlexTrack end cover (if present) and the mechanical stop. | |
| 5 | If there is no robot on the track, loose the screws connecting the bearing support and mounting plate more than 1 mm.<br>Use a jack to secure the height of the carriage plate (don't rise it more than 1 mm).<br>**WARNING**<br>Rising the carriage more then 1 mm can seriously damage the remaining three ball bearing blocks. |  <br>xx2000002609 |

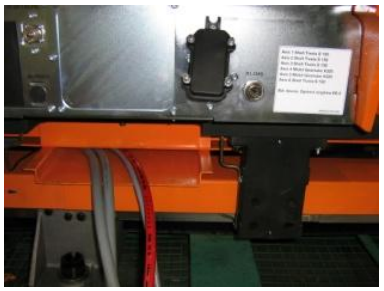
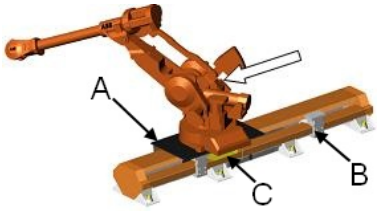
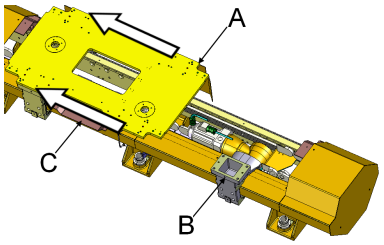
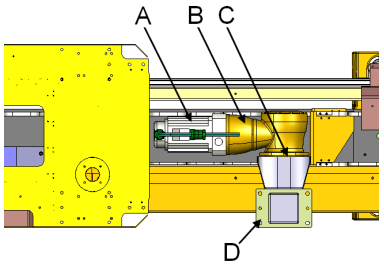
*Continues on next page*

## 4.5.2 Disassemble the bracket from the carriage

*Continued*

| | Action | Note |
|---|---|---|
| 6 | Loosen the 4 pcs M12x55 class 12.9 screws.<br>Use a ratchet wrench. |  <br>xx1800002036 |
| 7 | Extraction of the dowel:<br>Place the spacer on the dowel pin, insert the longest screw with the thick washer and screw it to start extracting the dowel. Use shorter screws when necessary. |  <br>xx1800002037 |
| 8 | Stop when the dowel pin is extracted from the top plate. It is not necessary to extract it from the bracket. |  <br>xx1800002038 |
| 9 | Remove the 4 pcs M12x55 class 12.9 screws and contact-lock washers M12-24. Use a ratchet wrench. |  <br>xx1800002036 |
| 10 | Disconnect the 2 lubrication tubes from the fitting of the ball bearing block and from the support located near the pinion.<br>Loosen all the clamps (circled in red on the picture) to release the tubes from the bracket (the tubes will be pushed away along with the carriage). |  <br>xx1800002039 |

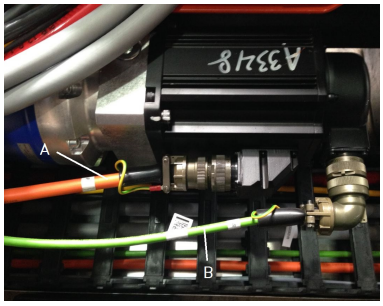
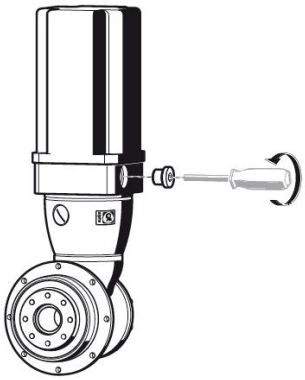
*Continues on next page*

| | Action | Note |
|---|---|---|
| 11 | If present, disconnect the cables from the tooling or robot mounted on the carriage. Remove the upper part of the cable tray so that the connectors can pass through. |  <br>xx1800002040 |
| 12 | Push the carriage away from the bracket.<br>The bracket, gearbox and pinion, motor, cable chain support and cable chain, stay stationery.<br>If present, pay attention to the cables and their connectors: You must guide them through the cable tray while you push the carriage away. |  <br>xx1800002041<br>  <br>xx1800002042<br>A Carriage<br>B Motor bracket<br>C Cable tray |
| 13 | Remove the covers. The drive unit is now accessible. |  <br>xx1800002043<br>A Motor<br>B Gearbox<br>C Pinion<br>D Motor bracket |

## 4.5.3 Replace motor

### Instructions

Follow the directions below to disassemble the motor:

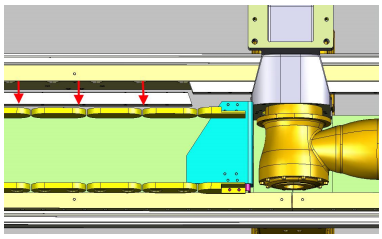
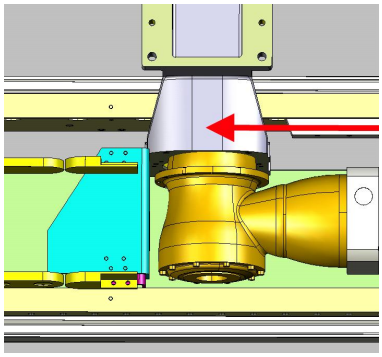
| | Action | Note |
|---|---|---|
| 1 | **WARNING**<br>Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot and FlexTrack IRT 501 before doing any repairing work. | |
| 2 | Unplug the power and resolver plugs from the motor. Guide the cables in the tray area. |  <br>xx1800002044<br>A: Power cable<br>B: signal cable |
| 3 | Remove the threaded cover plug to access the motor coupling screw.<br>If you do not see the coupling screw, remove the 4 screws that attach the motor to the gearbox, and rotate the motor until you can see the coupling screw. Untight it (without removing it) and separate the motor from the gearbox. |  <br>xx1800002045 |
| 4 | Replace the motor.<br>For instructions about how to reassemble the motor to the gearbox and issues that need attention, see *Motor and gearbox assembly on page 168* | |
| 5 | Re-assemble the bracket with the carriage.<br>(**Tightening torque: 132 Nm**)<br>Re-connect the lubrication pipe to the block and secure it to the bracket with the flanges. | Use hexagon socket head cap M12x55 class 12.9 screws and contact-lock washers M12- 24 tightened at 132 Nm to secure the bracket. |
| 6 | Turn the power on and perform a fine calibration. | |

## 4.5.4 Replace gearbox

### Instructions

If you need to replace the gearbox, you must first remove the motor such as described in *Replace motor on page 164*, *step2* and *step3* of the disassembly instructions.

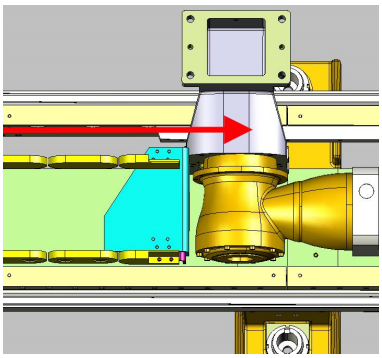
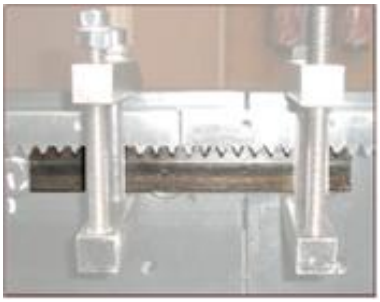
Follow the directions below to disassemble the gearbox:

| | Action | Note/Illustration |
|---|---|---|
| 1 | **WARNING**<br>Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot and FlexTrack IRT 501 before doing any repairing work. | |
| 2 | Remove the section of rack that is next to the section of rack with which the gearbox pinion is meshing. | Unscrew all the hexagon head M8x55 screws with contact-lock washers M8-18 and flat washers 8x25x3 to remove the rack from the sidemember.<br>  <br>xx1800002046 |
| 3 | Push the bracket and gearbox out of the rack section. |  <br>xx1800002047 |
| 4 | Remove the hexagon socket head cap M6x25 class 12.9 screws that secure the gearbox to the bracket and remove the gearbox. | **CAUTION**<br>The complete gearbox weighs about 30 kg! All lifting equipment used must be sized accordingly! |
| 5 | Replace the gearbox and tighten the hexagon socket head cap M6x25 class 12.9 screws and contact-lock washers M6-12 with a torque wrench.<br>(**Tightening torque: 16.5 Nm**) | |

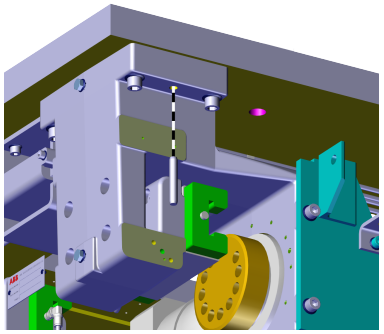
*Continues on next page*

## 4.5.4 Replace gearbox

*Continued*

| | Action | Note/Illustration |
|---|---|---|
| 6 | Push the bracket and gearbox back to the rack section. |  <br>xx1800002048 |
| 7 | Re-assemble the rack with the sidemember.<br>(**Tightening torque: 40 Nm**) | Before tightening all the hexagon head M8x55 class 12.9 screws with contact-lock washers M8-18 and flat washers 8x25x3, ensure that the rack section is completely pushed again its mounting surface, using on both of its ends the mounting rack section 3HAWL000011:<br>  <br>xx1800002049<br>and the clamps 3HAW107700357:<br>  <br>xx1800002050 |
| 8 | Follow the instructions see *Motor and gearbox assembly on page 168*. | |

*Continues on next page*

| | Action | Note/Illustration |
|---|---|---|
| 9 | If there is pin used to support the bracket, reassemble the pin first. |  <br>xx2000002663 |
| 10 | Re-assemble the bracket with the carriage.<br>(**Tightening torque: 132 Nm**)<br>Re-connect the lubrication pipe to the block and secure it to the bracket with the flanges. | Use hexagon socket head cap M12x55 class 12.9 screws and contact-lock washers M12-24 tightened at 132 Nm to secure the bracket.<br>**Tip**<br>If there is no pin, pre-install the screws and move the carriage to make sure that the bracket is installed well. Then fasten the screws to secure the bracket. |
| 11 | Turn the power on and perform a fine calibration. | See *Fine calibration on page 184*. |

## 4.5.5 Motor and gearbox assembly

**FlexTrack IRT 501- 66, gearbox ratio i=10**

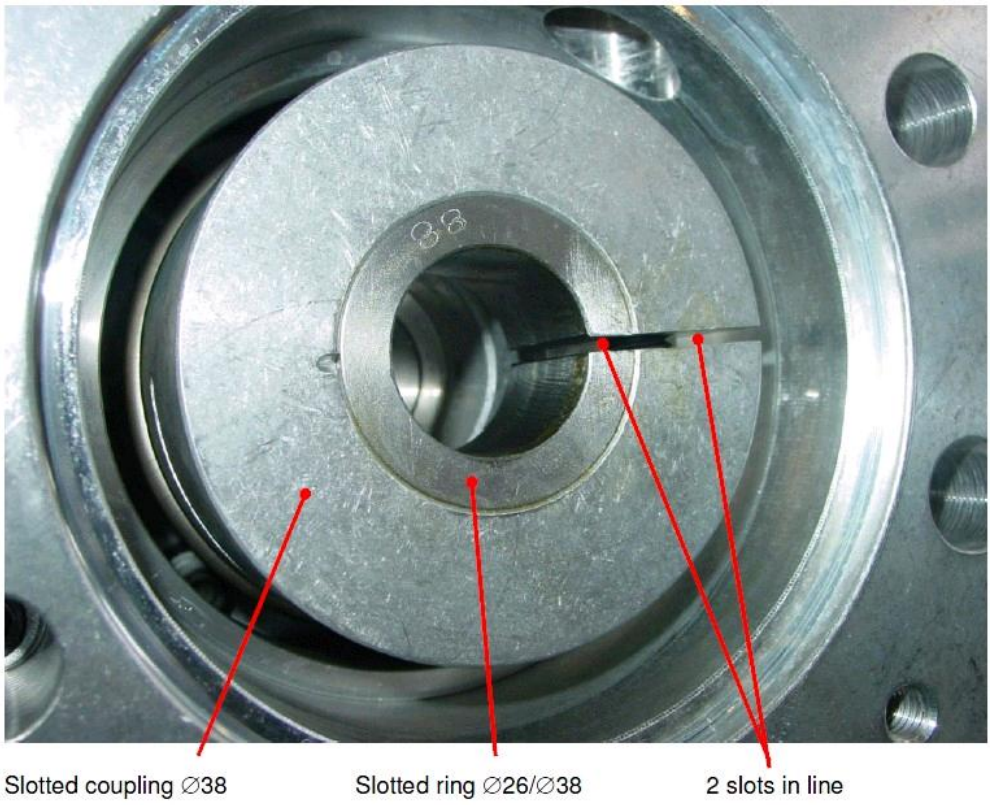
The motor for the IRT 501-66 has a shaft diameter = Ø26.

The gearbox for the IRT 501-66 has a slotted coupling diameter = Ø38.

A slotted ring Ø26/Ø38 is mounted into the coupling to tighten the motor shaft.

**Note**

Slots of both parts must be in line for a maximum tightening force:




xx1800002051

The tightening screw of slotted coupling, SW1 = 8 mm, must be tightened to **TA1 =69 Nm**.

The plug, SW2 =10 mm, must be tightened to **TA2 = 50 Nm**.

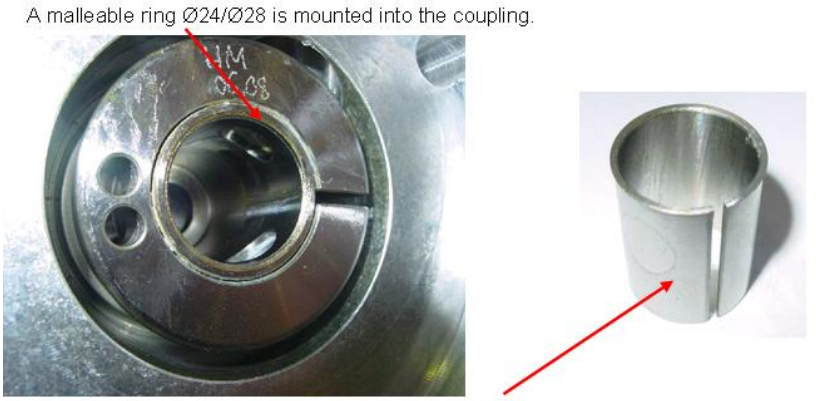
(SW: width across flats. See motor mounting instructions below for details)

*Continues on next page*

**FlexTrack IRT 501- 66R, 90 90R, gearbox ratio i=16 or i=20**

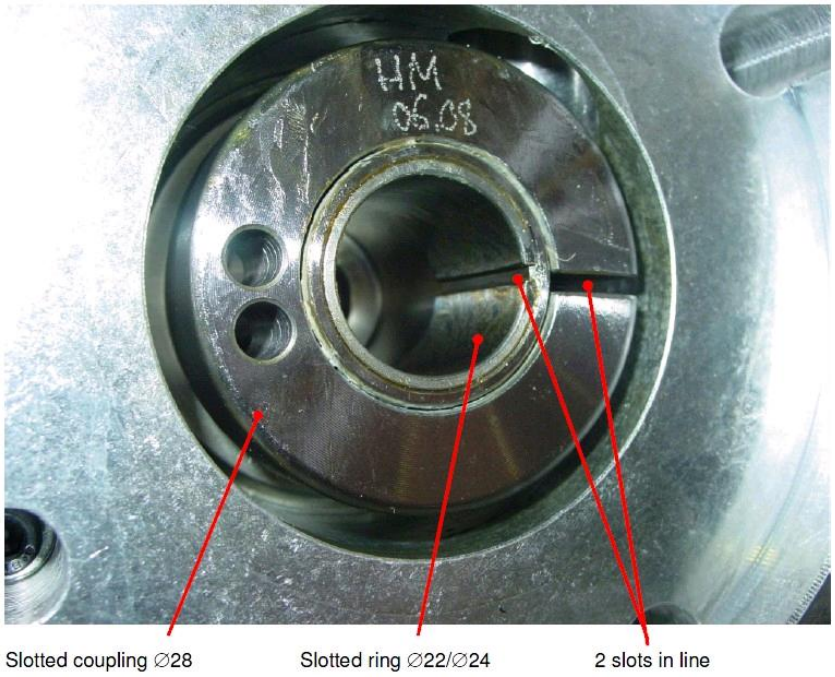
The motor for the IRT 501-66R, 90 & 90R has a shaft diameter = Ø22.

Gears for the IRT 501-66R, 90 & 90R have a slotted coupling diameter = Ø28.




xx1800002052

Slots of both parts must be in line for a maximum tightening force:




xx1800002053

The tightening screw of slotted coupling, SW1 = 6 mm, must be tightened to **TA1 =35 Nm**.

The plug, SW2 = 10 mm, must be tightened to **TA2 = 50 Nm**.

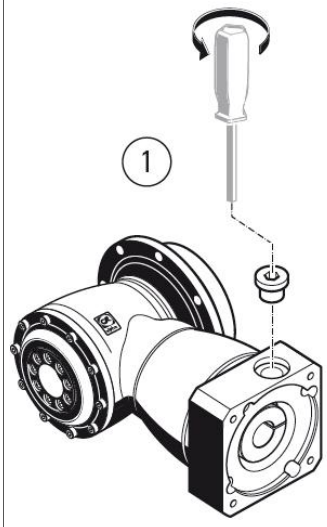
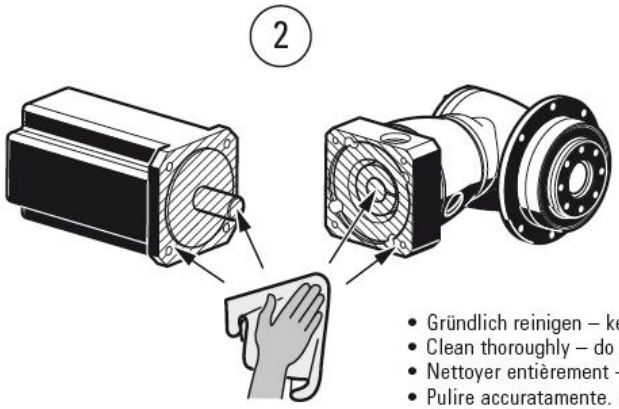
(SW: width across flats. See motor mounting instructions below for details)

*Continues on next page*

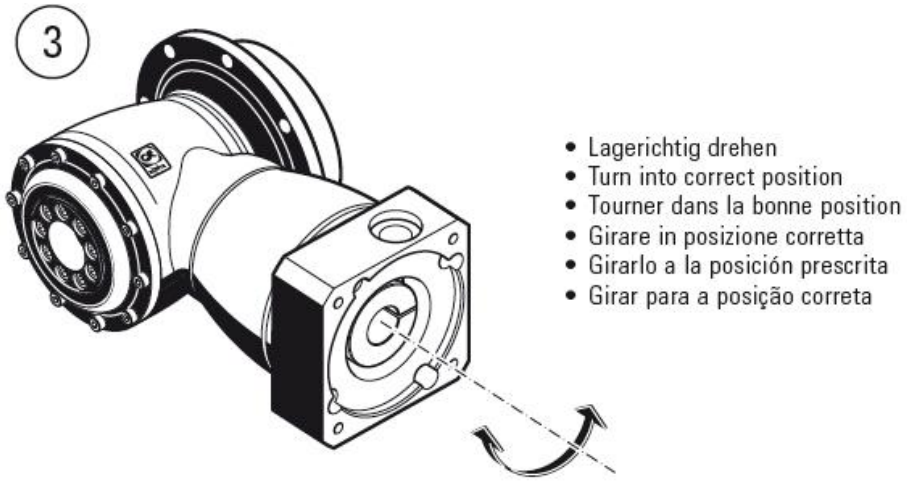
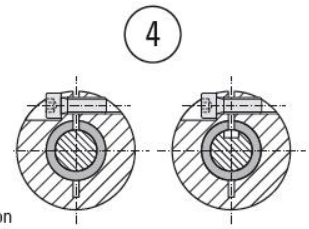
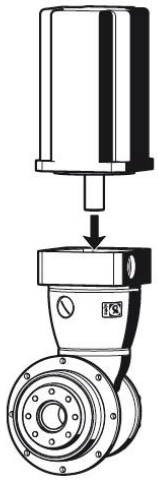
4.5.5 Motor and gearbox assembly
*Continued*

**Motor assembly**

The following instructions are based on the Alpha gearbox and motor assembly manual:

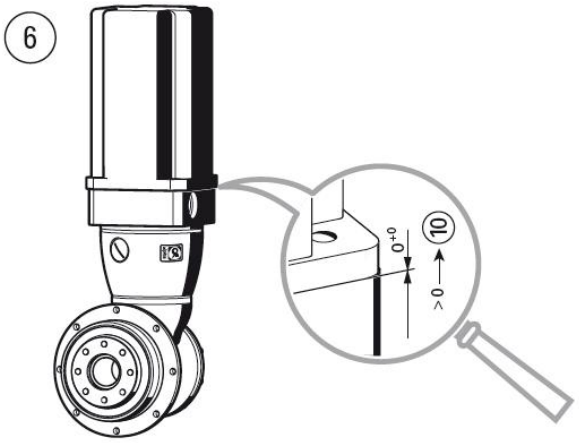
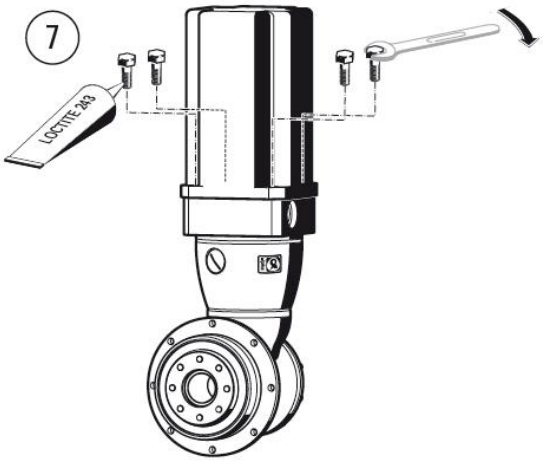
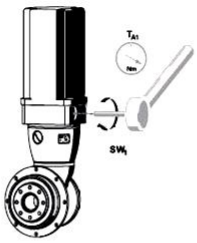
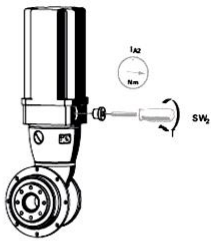
| | Action/Note/Illustration |
|---|---|
| 1 |  • Verschlussschraube lösen und aufbewahren • Release plug and reserve • Desserrer le bouchon obturateur et le conserver • Allentare e riporre il tappo a vite • Soltar el tornillo de cierre y conservarlo • Soltar parafuso de fechamento e guardá-lo<br>xx1800002054 |
| 2 |  • Gründlich reinigen – keine Pressluft verwenden • Clean thoroughly – do not use compressed air • Nettoyer entièrement – ne pas utiliser d'air comprimé • Pulire accuratamente. Non usare aria compressa • Limpiar a fondo – No usar aire comprimido • Limpar criteriosamente – não usar ar comprimido<br>xx1800002055 |

*Continues on next page*

| | Action/Note/Illustration |
|---|---|
| 3 |  <br>xx1800002056 |
| 4 |  <br>• Bei genuteter Motorwelle: Passfeder entfernen.<br>Schlitz, Distanzhülse und Passfedernut lagerichtig montieren.<br>• With grooved shaft: remove feather key.<br>Mount slot, spacer sleeve and feather key groove in the correct position<br>• Pour les arbres de moteur cannelés: retirer la clavette.<br>Monter la fente, la bague et la rainure pour clavette de manière à ce qu'elles se trouvent dans la bonne position.<br>• Per alberi motore con chiavetta: rimuovere la chiavetta.<br>Montare una mezza chiavetta, la bussola distanziale e posizionare la mezza chiavetta nella posizione corretta.<br>• Si se trata de un eje de motor ranurado: saque la chaveta.<br>Montar de acuerdo a la posición prescrita la entalladura, el casquillo y la ranura de la chaveta.<br>• No caso de eixo do motor com ranhura: Remover chaveta.<br>Montar fenda, manga distanciadora e chaveta na posição correta.<br>xx1800002057 |
| 5 |  <br>• ACHTUNG!<br>Wenn Sie den Motor nicht leicht aufschieben können:<br>Die Schraube in Bild 4 um eine Umdrehung lösen<br>• CAUTION!<br>If the motor does not move into position easily:<br>Loosen the screw in fig. 4 by one rotation<br>• ATTENTION !!<br>Si le moteur ne peut pas être légèrement poussé:<br>desserrer d'un tour la vis illustrée sur la figure 4<br>• ATTENZIONE!<br>Se risultasse difficoltoso portare il motore in posizione:<br>allentare di un giro la vite in figura 4<br>• ¡ATENCIÓN!<br>Si al montar el motor no puede deslizarlo con facilidad:<br>suelte una vuelta el tornillo de la figura 4<br>• ATENÇÃO!<br>Caso não consiga colocar o motor facilmente:<br>Soltar o parafuso da figura 4 por um giro<br>xx1800002058 |

*Continues on next page*

### 4.5.5 Motor and gearbox assembly
*Continued*

| | Action/Note/Illustration |
|---|---|
| 6 |  <br>xx1800002059 |
| 7 |  <br>xx1800002060 |
| 8 | SW: Width across flats<br>$T_A$ Tightening torque<br>  <br>  <br>xx1800002061 |

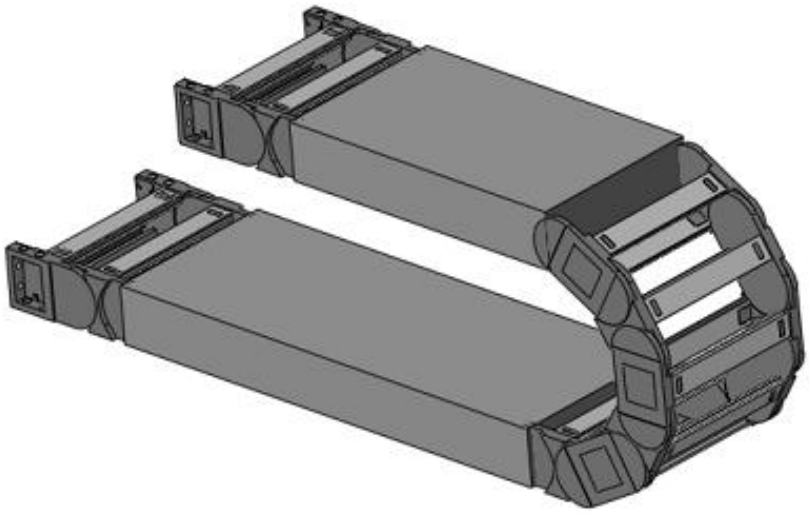
| | $SW_1$ [mm] | $T_{A1}$ [Nm] |
|---|---|---|
| FlexTrack IRT 501- 66, Ratio i=10 | 6 | 39 |
| FlexTrack IRT 501-66R / 90 / 90R, Ratio i=16 or 20 | 8 | 49 |

| $SW_2$ [mm] | $T_{A2}$ [Nm] |
|---|---|
| 10 | 50 |

## 4.6 Replace the cable chain or the cable

### Overview

It is possible to remove the complete cable chain in order to replace it. It is recommended to have 2 technicians to work together.



xx1800002062

### Cable chain of different supplier

Cable chain of ABB FlexTrack has two suppliers, Kabelschlepp and IGUS, which are not compatible with each other.

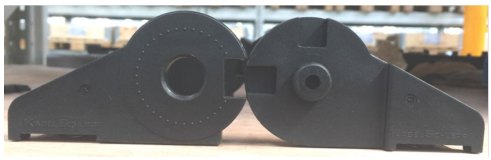
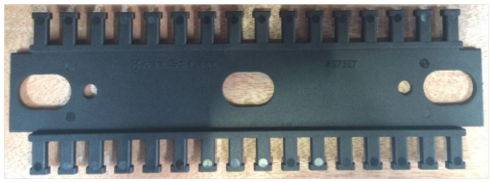
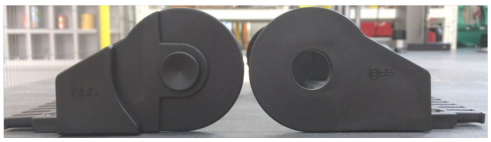
The following table shows you the difference between two different suppliers:

| Kabelschlepp | IGUS |
|---|---|
| Cable chain link unit | |
|  xx1800002063 |  xx1800002064 |
| Cable separator | |

*Continues on next page*

## 4.6 Replace the cable chain or the cable

*Continued*

| Kabelschlepp | IGUS |
|---|---|
|  xx1800002065 |  xx1800002066 |
| Cable chain end units, Tiewrap plate | |
|  xx1800002067<br>  xx1800002068 |  xx1800002069 |

### Required equipment

| Equipment | Note |
|---|---|
| Standard toolkit | The content is defined in section 3.2, *standard toolkit*. |
| Cables | |
| Cable chain parts | |

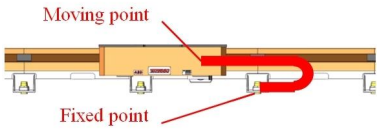
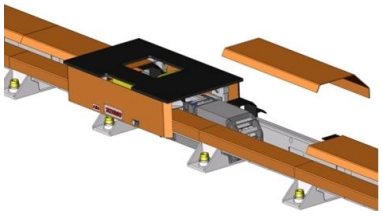
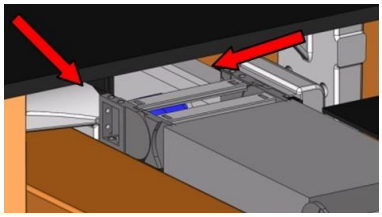
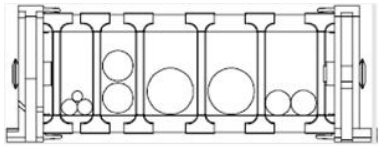
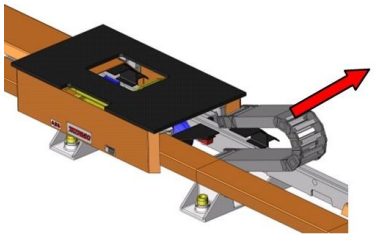
### Replace cable chain

**Tip**

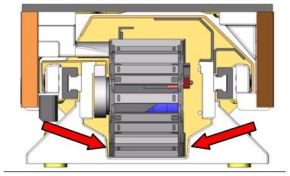
Remove all cover plates before turning off all electric power. Without 24V DC the carriage can not be moved.

| | Action | Note/Illustration |
|---|---|---|
| 1 | **WARNING**<br>When doing manual jogging with power and pneumatic on inside the cell (Max at 10%), the maintenance personnel should stay away from motion unit in safe area. | |

*Continues on next page*

| | Action | Note/Illustration |
|---|---|---|
| 2 | Jog and move the track carriage in order to have it positioned just above the fixed point of the cable chain. Doing so you just have to remove two covers in the same zone to access both fixed & moving points of the cable chain. |  xx1800002070 |
| 3 | **WARNING**<br>Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot and FlexTrack IRT 501 before doing any repairing work. | |
| 4 | Remove two covers. |  xx1800002071 |
| 5 | Open the cable chain opening and separate the cables from cable chain. | |
| 6 | Remove screws at fixed point, pull-out cable chain, help the cables through the carriage opening. |  xx1800002072 |
| 7 | **Tip**<br>To facilitate assembly, take a picture of the placement in the cable chain before removing cables. |  xx1800002073 |
| 8 | Remove screws at fixed point, pull the complete chain out. |  xx1800002074 |

*Continues on next page*

| | Action | Note/Illustration |
|---|---|---|
| 9 | Install the new cable chain, and ensure the correct installation as described in *Installation of the cable chain on page 84*. |  xx1800001922 |

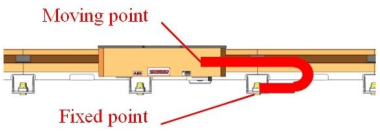
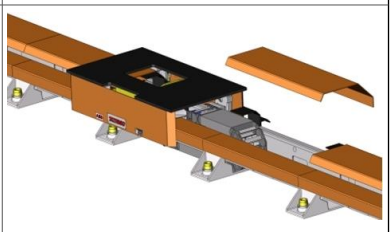
## Replace cables

**Tip**

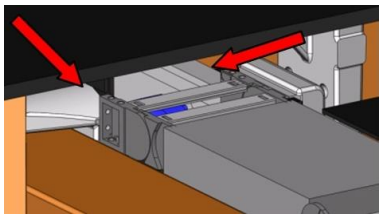
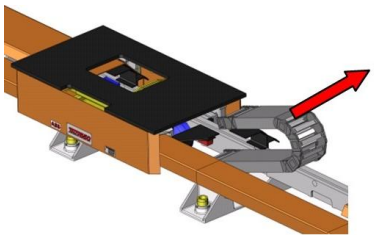
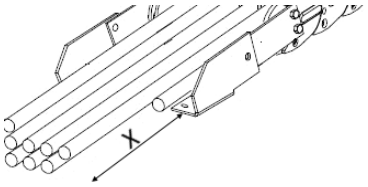
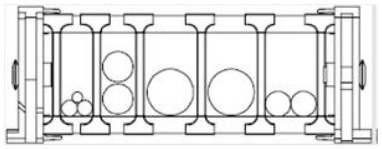
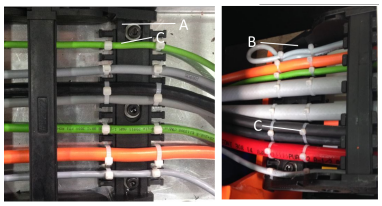
Remove all cover plates before turning off all electric power. Without 24V DC the carriage can not be moved.

**WARNING**

When doing manual jogging with power and pneumatic on inside the cell (Max at 10%), the maintenance personnel should stay away from motion unit in safe area.

| | Action | Note/Illustration |
|---|---|---|
| 1 | **WARNING**<br>When doing manual jogging with power and pneumatic on inside the cell (Max at 10%), the maintenance personnel should stay away from motion unit in safe area. | |
| 2 | Move the track carriage in order to have it positioned just above the fixed point of the cable chain. Doing so you just have to remove two covers in the same zone to access both fixed & moving points of the cable chain. |  xx1800002070 |
| 3 | **WARNING**<br>Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot and FlexTrack IRT 501 before doing any repairing work. | |
| 4 | Remove two covers. |  xx1800002071 |

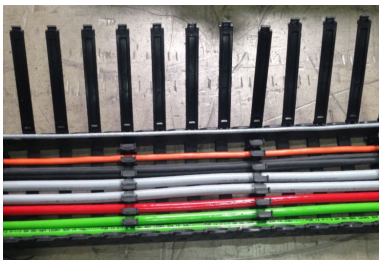
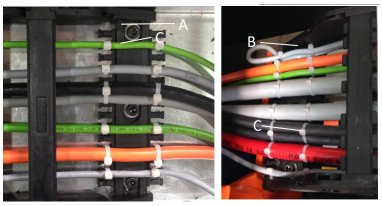
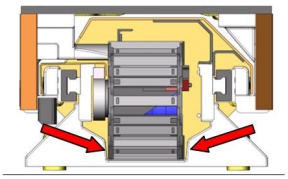
*Continues on next page*

| | Action | Note/Illustration |
|---|---|---|
| 5 | Open the cable chain opening and separate the cables from cable chain. | |
| 6 | Remove screws at the fixed point on the carriage, pull-out cable chain, help the cables through the carriage opening. |  <br>xx1800002072 |
| 7 | Remove screws at the opposite fixed point on the ground, pull the complete chain out. |  <br>xx1800002074 |
| 8 | **Tip**<br><br>Before removing damaged cables, take a picture of the placement of the cables on the connect plate. This will facilitate reassembly. |  <br>xx1800002075<br><br>X — Cable length projecting from the cable chain<br><br>  <br>xx1800002073 |
| 9 | Cut off the ties that fix the cables to the tiewrap plate and cable chain end unit at the fix end and moving end of the cable chain. |  <br>xx1800002076<br><br>A — Tiewrap plate of the fix end cable chain<br>B — End unit of the move end cable chain<br>C — Ties fixing cables |

*Continues on next page*

## 4.6 Replace the cable chain or the cable

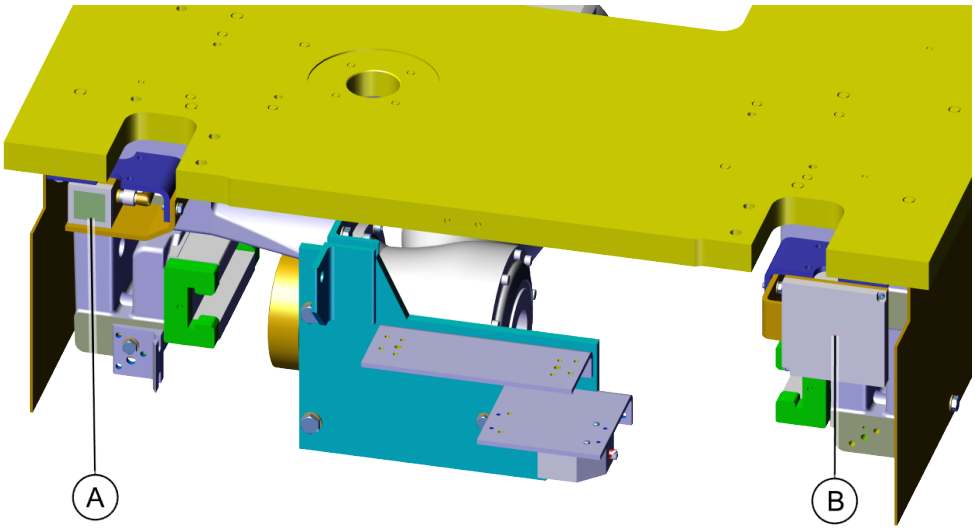
*Continued*

| | Action | Note/Illustration |
|---|---|---|
| 10 | Open the cover strips of the cable chain. |  <br>xx1800001920 |
| 11 | Remove the cables. | |
| 12 | Install the new cables. Make sure the replacement cable is at the same position and is projecting the same length with the old one. | |
| 13 | Close the cover of the cable chain. | |
| 14 | Fix the cable on the tiewrap plate and the cable chain end unit with ties. |  <br>xx1800002076<br>A – Tiewrap plate of the fix end cable chain<br>B – End unit of the move end cable chain<br>C – Ties fixing cables |
| 15 | Reinstall the new cable chain, and ensure the correct installation as described in *Installation of the cable chain on page 84*. |  <br>xx1800001922 |

## 4.7 Replace the laser scanner and reflector

### Location

The figure below shows the location of the laser scanner and reflector:




xx2000002595

| | Description |
|---|---|
| A | Laser scanner |
| B | Laser reflector |

### Required equipment

| Equipment | Note |
|---|---|
| Standard toolkit | The content is defined in *Standard toolkit on page 120*. |
| Loctite 243 | Apply Loctite 243 on the screws that hold the linear rails. |

### Disassemble

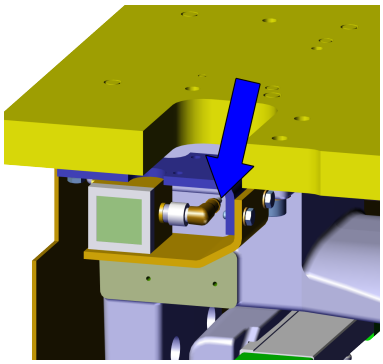
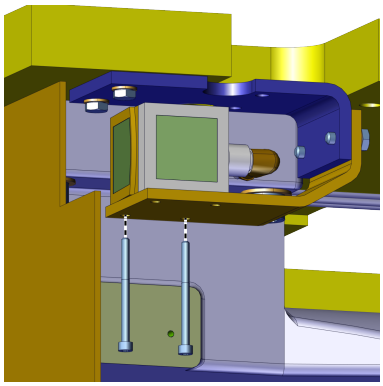
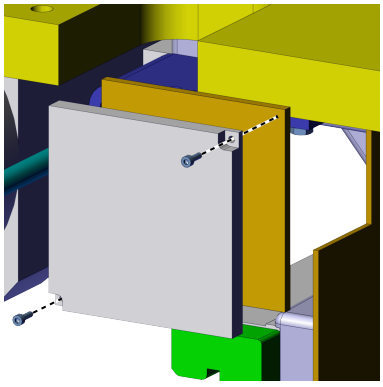
Follow the directions below to disassemble the laser scanner and the reflector:

| | Action | Note |
|---|---|---|
| 1 | **WARNING**<br>Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot and FlexTrack IRT 501 before doing any repairing work. | |

*Continues on next page*

## 4.7 Replace the laser scanner and reflector

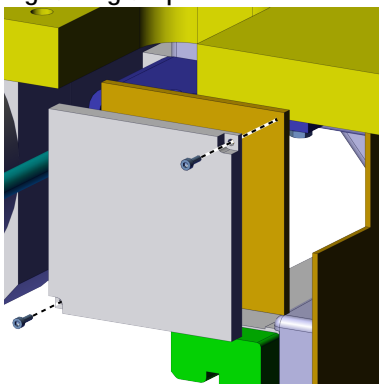
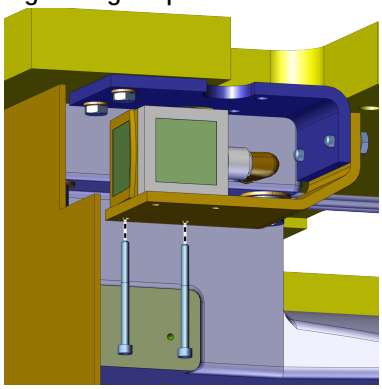
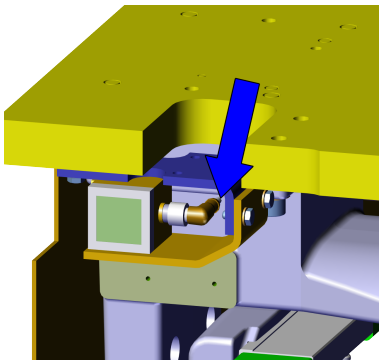
*Continued*

| | Action | Note |
|---|---|---|
| 2 | Disconnect the movement cable from the laser scanner. |  xx2000002599 |
| 3 | Remove the screws locking the laser scanner to the bracket. |  xx2000002607 |
| 4 | Remove the laser scanner. | |
| 5 | Remove the screws locking the laser reflector to the bracket. |  xx2000002608 |
| 6 | Remove the laser reflector. | |

### Assemble

| | Action | Note/Illustration |
|---|---|---|
| 1 | **WARNING**<br>Turn off all electric power, hydraulic and pneumatic pressure supplies to the robot and FlexTrack IRT 501 before doing any repairing work. | |

*Continues on next page*

| | Action | Note/Illustration |
|---|---|---|
| 2 | Refit the laser reflector to the bracket and secure with screws. | Screws: 2 pcs x M3x10<br>Tightening torque: 1.3 Nm<br>  <br>xx2000002608 |
| 3 | Refit the laser scanner to the bracket and secure with screws. | Screws: 2 pcs x M4x50<br>Tightening torque: 3 Nm<br>  <br>xx2000002607 |
| 4 | Reconnect the movement cable to the laser scanner. |  <br>xx2000002599 |

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# 5 Calibration

## 5.1 Overview

### General

This chapter includes general information about different calibration methods and detailed procedures that do not require specific calibration equipment.

When the robot system must be recalibrated, it is done according to the documentation enclosed with the calibration tools.

**WARNING**

Make sure no persons are on the FlexTrack when the carriage is in motion. Also make sure that the FlexTrack's cover plates are free from loose objects, otherwise they can get trapped between the carriage and the plates.

**Note**

The FlexTrack does not need to be calibrated during restart. The resolvers only need to be calibrated when commissioning the system.

### When to calibrate

The system must be calibrated if any of the below occurs.

The resolver values are changed

If resolver values are changed, the robot must be recalibrated using the calibration methods supplied from ABB. Calibrate the FlexTrack IRT 501 carefully with standard calibration. The resolver values will change when parts affecting the calibration position are replaced on the FlexTrack IRT 501, e.g. motor, or part of transmission. This is detailed in *Fine calibration on page 184*.

Contents of the revolution counter memory are lost

If the contents of the revolution counter memory are lost, the counters must be updated as detailed in *Update revolution counters on page 185*. This will occur when:

- the battery is discharged
- a resolver error occurs
- the signal between a resolver and measurement board is interrupted
- a robot axis is moved with the control system disconnected

The revolution counters must also be updated after the robot and controller are connected at the first installation.

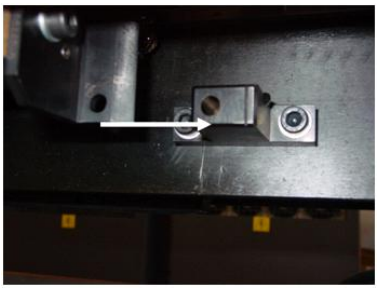
The FlexTrack IRT 501 is rebuilt

If the track has been rebuilt, e.g. after a crash or when the track has been changed for other reachability, it needs to be recalibrated for new resolver values. This is detailed in *Fine calibration on page 184*.

## 5.2 Fine calibration

### General

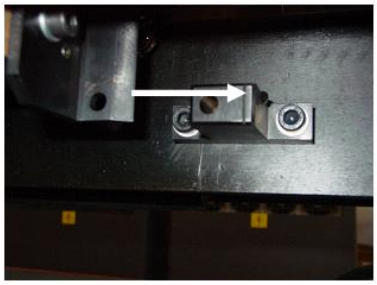
This procedure must be applied at the first start or after mechanical intervention (motor change, gearbox).

| | Action | Note/Illustration |
|---|---|---|
| 1 | Using the FlexPendant, jog the carriage close to the calibration gauge position. | |
| 2 | Jog the carriage to move it until the calibration holes line up. |  xx1800002077 |
| 3 | Insert the calibration pin (3HAW107700354).<br>A dowel pin diameter 8 mm can also be used. |  xx1800001960 |
| 4 | Tap **ABB** on the top left of the FlexPendant | |
| 5 | Tap **Calibration**. | |
| 6 | Select the desired mechanical unit. | |
| 7 | Tap **Fine calibration**. | |
| 8 | Select the desired axis. | |
| 9 | Tap **Calibrate**. | |

## 5.3 Update revolution counters

### Procedure

This procedure must be applied if revolution counter value is loss for the Track.

| | Action | Note/Illustration |
|---|---|---|
| 1 | Align the sharp edge of the moving part of the calibration marker with the line of the fixed part calibration marker. |  xx1800002078 |
| 2 | Tap **ABB** on the top left of the FlexPendant. | |
| 3 | Tap **Calibration**. | |
| 4 | Select the desired mechanical unit. | |
| 5 | Tap **Update revolution counters**. | |
| 6 | Select the desired axis. | |
| 7 | Tap **Update**. | |

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# 6 Decommissioning

## 6.1 Introduction

**Introduction**

This chapter contains information to consider when taking a product, robot or controller, out of operation.

It details with how to handle potentially dangerous components and potentially hazardous material.

**General**

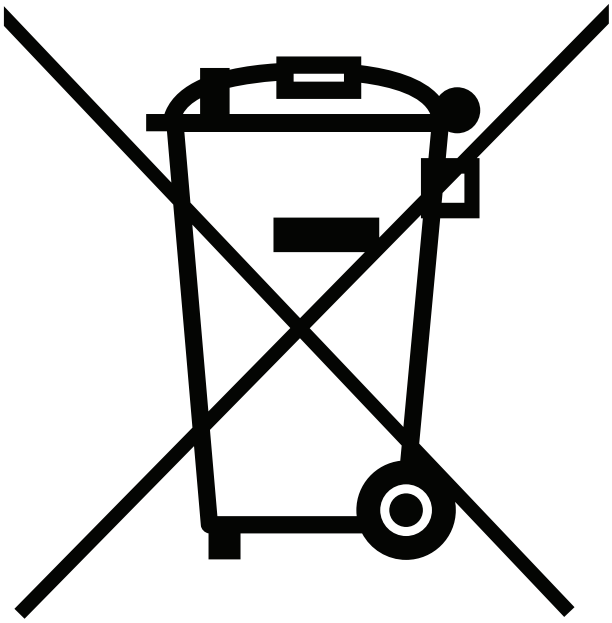
All used grease/oils and dead batteries must be disposed of in accordance with the current legislation of the country in which the robot and the control unit are installed.

If the robot or the control unit is partially or completely disposed of, the various parts must be grouped together according to their nature (that is, all iron together and all plastic together), and disposed of accordingly. These parts must also be disposed of in accordance with the current legislation of the country in which the robot and control unit are installed.

## 6.2 Environmental information

### Symbol

The following symbol indicates that the product must not be disposed of as common garbage. Handle each product according to local regulations for the respective content (see table below).



xx1800000058

### Hazardous material

The table specifies some of the materials in the product and their respective use throughout the product.

Dispose components properly to prevent health or environmental hazards.

| Material | Example application |
|---|---|
| Batteries, NiCad or Lithium | Serial measurement board |
| Copper | Cables, motors |
| Cast iron/nodular iron | Crossmembers, linear carriage brackets |
| Steel | Covers, sidemembers, carriage top plate, screws |
| Neodymium | Brakes, motors |
| Plastic/rubber (PVC) | Cables, connectors, hard stop bumper |
| Oil, grease | Lubrication system, gearbox |
| Aluminium | Motor and gearbox housing |

*Continues on next page*

**Oil and grease**

Where possible, arrange for oil and grease to be recycled. Dispose of via an authorized person/contractor in accordance with local regulations. Do not dispose of oil and grease near lakes, ponds, ditches, down drains, or onto soil. Incineration must be carried out under controlled conditions in accordance with local regulations.

Also note that:

- Spills can form a film on water surfaces causing damage to organisms. Oxygen transfer could also be impaired.
- Spillage can penetrate the soil causing ground water contamination.

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# 7 Reference information

## 7.1 Introduction

**General**

This chapter includes general information, complementing the more specific information in the different procedures in the manual.

## 7.2 Applicable safety standards

### Standards, EN ISO

The robot system is designed in accordance with the requirements of:

| Standard | Description |
|---|---|
| EN ISO 12100-1 | Safety of machinery - Basic terminology |
| EN ISO 12100-2 | Safety of machinery - Technical principles/specifications - Emergency stop |
| EN ISO 13850 | Safety of machinery - Emergency stop - Principles for design |
| EN ISO 13851: 2019-11 | Safety of machinery, two hand control device |
| EN ISO 13732 | Ergonomics of the thermal environment - Part 1 |
| EN ISO 10218-1 | Robots for industrial environments - Safety requirements - Part 1 Robot |
| EN ISO 60204-1 | Safety of machinery - Electrical equipment of machines - Part 1 General requirement |
| EN ISO 13849-2 | Safety of machinery, safety related parts of the control system - Part 2 Validation |
| EN ISO 13857 | Safety of machinery -- Safety distances to prevent hazard zones being reached by upper and lower limbs |
| EN ISO 14010 | Guidelines for environmental auditing - General principles |
| EN ISO 14120: 2016-05 | Safety of machinery, fixed/movable guards |
| EN ISO 14121-2 | Safety of machinery -- Risk assessment -- Part 2: Practical guidance and examples of methods |
| EN ISO 14122 | Safety of machinery -- Permanent means of access to machinery |

### European standards

| Standard | Description |
|---|---|
| EN 614-1 | Safety of machinery, ergonomic design principles |
| EN 61000-6-4: 2007 + A1: 2011<br>IEC 61000-6-4: 2006 + A1: 2010<br>(option 129-1) | EMC, Generic emission |
| EN 61000-6-2: 2005<br>IEC 61000-6-2: 2005 | EMC, Generic immunity |

## 7.3 Unit conversion

### Converter table

Use the following table to convert units used in this manual.

| Quantity | Units | | |
|---|---|---|---|
| Length | 1 m | 3.28 ft. | 39.37 in |
| Weight | 1 kg | 2.21 lb. | |
| Weight | 1 g | 0.035 ounces | |
| Pressure | 1 bar | 100 kPa | 14.5 psi |
| Force | 1 N | 0.225 lbf | |
| Moment | 1 Nm | 0.738 lbf-ft | |
| Volume | 1 L | 0.264 US gal | |

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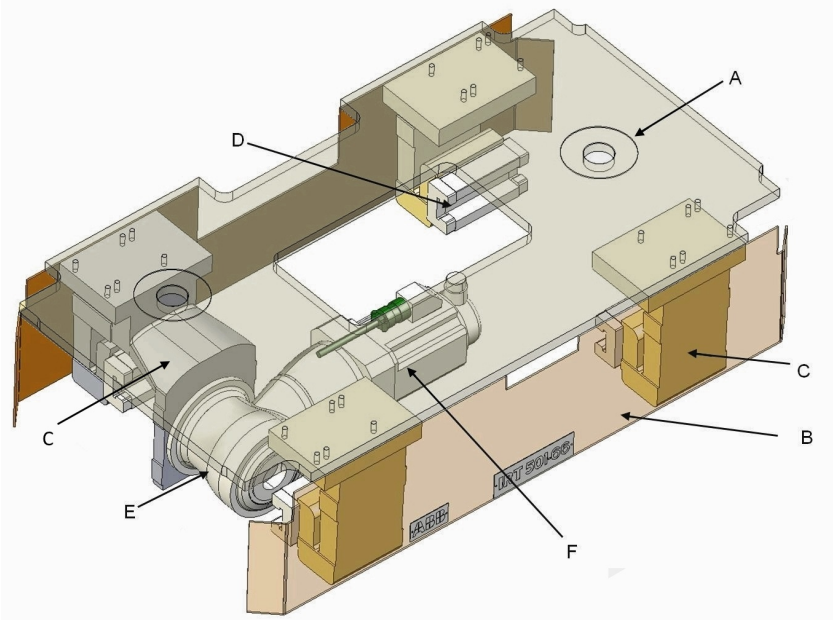
# 8 Spare parts

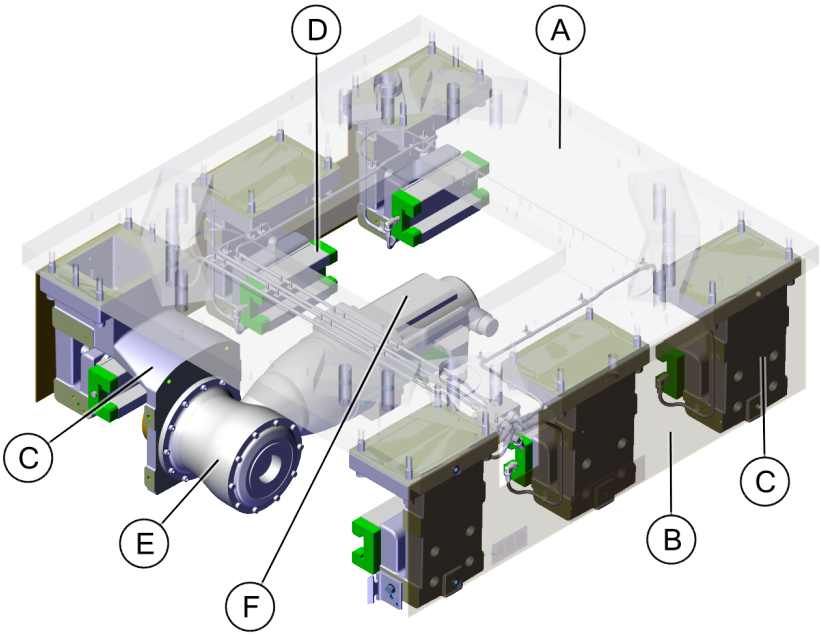
## 8.1 Carriage IRT501

With four bearings




xx1800001862

With six bearings




xx2000002590

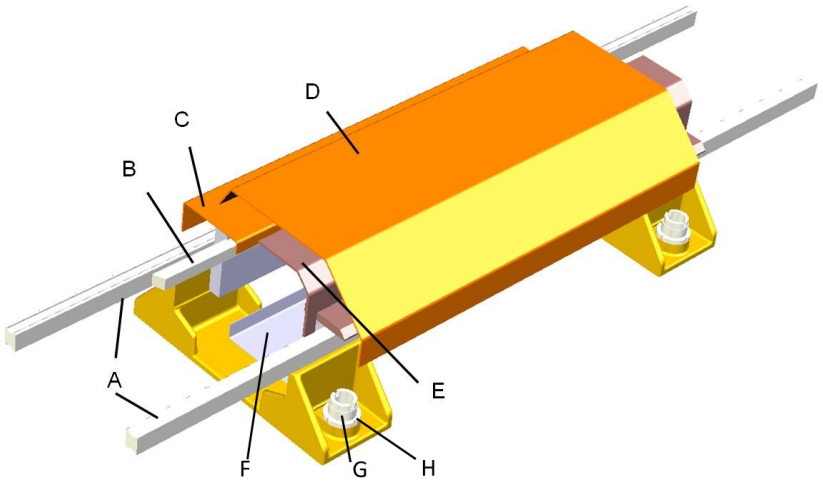
*Continues on next page*

## 8.1 Carriage IRT501

*Continued*

| Item | Quantity | ABB part reference no. | Description | IRT501-66 | IRT501-66R | IRT501-90 | IRT501-90R | IRT501-90RE | IRT501-90RS |
|---|---|---|---|---|---|---|---|---|---|
| A | 1 | 3HAWC116592 | Motor | 1 | | | | | 1 |
| | | 3HAWC116593 | Motor | | 1 | 1 | 1 | 1 | |
| | | 3HAW107710190 | Motor | | 1 | 1 | 1 | 1 | |
| B | 1 | 3HAWC116589 | Gearbox + pinion | 1 | | | | | |
| | | 3HAWC116590 | Gearbox + pinion | | 1 | 1 | | | |
| | | 3HAWC116596 | Gearbox + pinion | | | | 1 | 1 | |
| | | 3HAW107710281 | Gearbox + pinion | | | | | | 1 |
| C | 4 | 3HAWL000021 | Ball bearing block (Rexroth) | 4 | 4 | 4 | 4 | 6 | 6 |
| | | 3HAWC116594 | Ball bearing block (INA) | 4 | 4 | 4 | 4 | 6 | 6 |
| D | 4 | 3HAWL000049 | D6-M6 lubrication elbow fitting | 4 | 4 | 4 | 4 | 6 | 6 |

## 8.2 Track



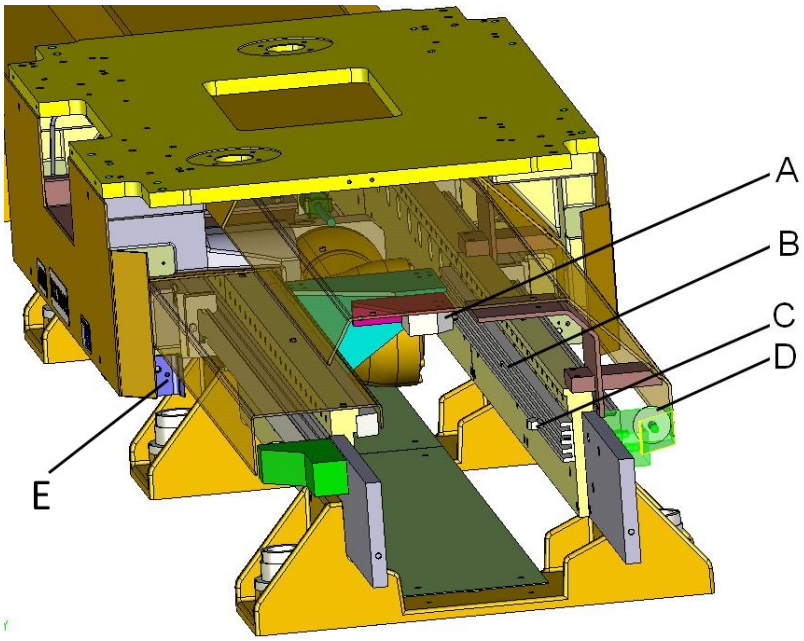

xx1800002080

| Item | ABB part reference no. | Description |
|---|---|---|
| A | 3HAWL000016 | Linear rail 2,625 mm (Rexroth) |
| | 3HAWL000015 | Linear rail 2,100 mm (Rexroth) |
| | 3HAWL000014 | Linear rail 1,575 mm (Rexroth) |
| | 3HAWC116829 | Linear rail 2,625 mm (INA) |
| | 3HAWC116827 | Linear rail 2,100 mm (INA) |
| | 3HAWC116828 | Linear rail 1,575 mm (INA) |
| B | 3HAW107700347 | Toothed rack 1,000 mm |
| | 3HAW107720000 | Toothed rack 1,000 mm |
| C | 3HAW107700342 | Rack cover |
| D | 3HAW107700343 | Upper cover for FlexTrack IRT 501-66 & 66R |
| | 3HAW107700431 | Upper cover for FlexTrack IRT 501-90 & 90R |
| E | 3HAW107700337 | Bracket for cover for FlexTrack IRT 501-66 & 66R |
| | 3HAW107700430 | Bracket for cover for FlexTrack IRT 501-90 & 90R |
| F | 3HAW107700359 | Cable tray L=1,050 mm |
| G | 3HAW108201422 | Levelling screw M60 x 2 |
| H | 3HAWC100857 | Slotted round nut KM 12 |

**Note**

For how to identify cable chain from different supplier, see *Linear rail of different supplier on page 148*.

## 8.3 Limit switch and calibration

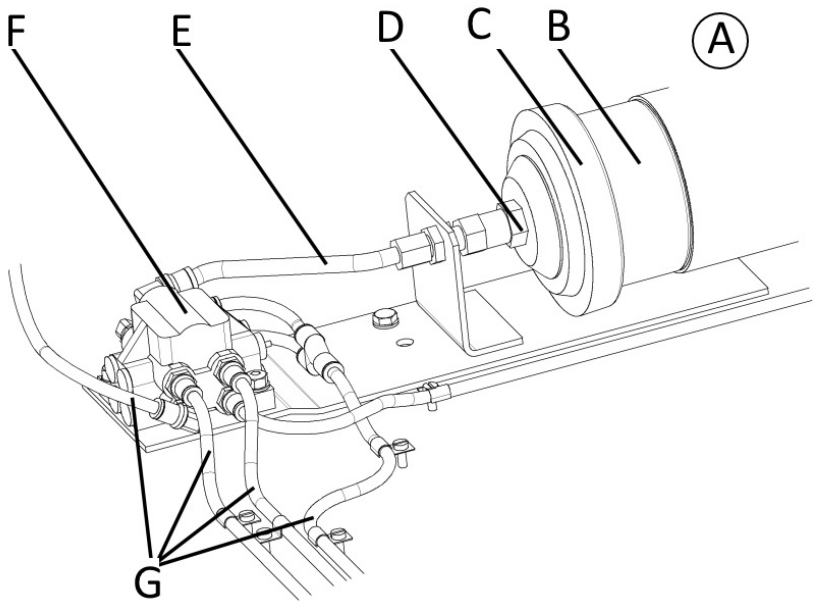



xx1800002081

| Item | Quantity | ABB part reference no. | Description |
|---|---|---|---|
| A | 1 | 3HAWC116586 | Limit switch 1 sensor |
| | | 3HAW107710206 | Limit switch 2 sensor |
| | | 3HAWL000022 | Limit switch 4 sensor |
| B | 1 | 3HAWC116599 | Limit switch cam tray L=1,000 mm |
| | | 3HAW107700657 | Limit switch cam tray L=1,200 mm |
| C | 2(min) | 3HAWC116600 | Cam (on both ends of the FlexTrack) |
| D | 4 | 3HAWC106195 | Hard stop bumper (a pair on both ends of the FlexTrack) |
| E | 1 | 3HAW107700344 | Calibration gauge (fixed, on FlexTrack) |
| | | 3HAW107700540 | Calibration gauge (mobile, on carriage) |
| - | 1 | 3HAW107700354 | Calibration pin |

## 8.4 Automatic lubrication system

### Lubrication system



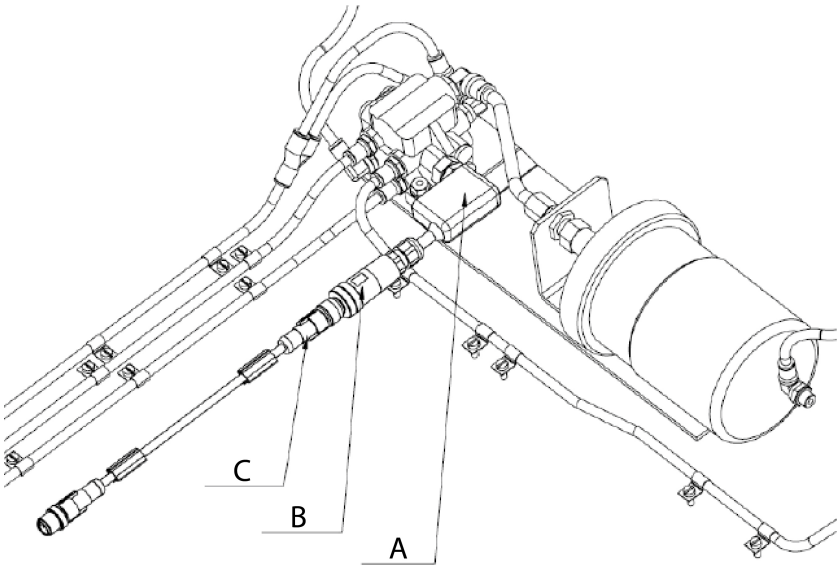

xx1800002082

| Item | Quantity | ABB part reference no. | Description |
|---|---|---|---|
| A | 1 | 3HAW107700590-004 | Automatic lubrication, complete kit for 1 carriage.<br>Contain all items below. |
| B | 1 | 3HAWC116978 | 240cc HPS Mega grease cartridge + battery |
| C | 1 | 3HAWC114278 | Automatic grease dispenser Memolub HPSMEGA |
| | 1 | 3HAW060012002 | Grease dispenser Memolub Pump EPS |
| D | 1 | 3HAWL000050 | Set of washers for automatic oil dispenser output volume setting |
| E | 0.2 m | 3HAWC116980 | Tube D8x6 (from dispenser to splitter only) |
| F | 1 | 3HAWC116979 | Grease splitter 6 outputs |
| | | 3HAW050040462 | Grease splitter 8 outputs |
| G | 25 m | 3HAWL000032 | Tube D6x4.<br>5 m are required in one carriage. |

*Continues on next page*

8.4 Automatic lubrication system
*Continued*

**Feedback**




xx2200000627

| Item | Quantity | ABB part reference no. | Description |
|---|---|---|---|
| A | 1 | 3HAW107710204 | Switch |
| B | 1 | 3HAW107710205 | M12 Connector |
| C | 1 | 3HAWC116988 | M12 Cable |
| | 1 | 3HAWC116987 | M12 Cable |
| | 1 | 3HAWC116986 | M12 Cable |
| | 1 | 3HAW050059800 | M12 Cable |
| | 1 | 3HAW050059801 | M12 Cable |

## 8.5 Cable chains

### Formula

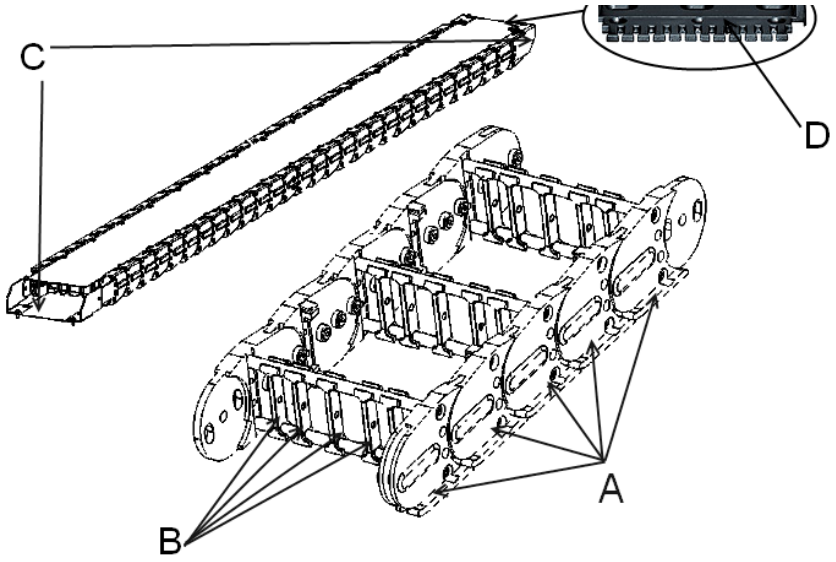
If you need to replace elements of the cable chain, please calculate your needs: The cable chain is made of modular elements which quantity depends on the stroke of your FlexTrack.

S is the Stroke of the FlexTrack in mm (from hard stop to hard stop)

L is the length of the cable chain in mm

L = S/2 + 510

### Internal chain spare parts




xx1800002083

| Item | Quantity | ABB part reference no. | Description |
|---|---|---|---|
| A | 1 m chain requires 15 pcs | 3HAWL000017 | Cable chain link unit (Kabelschlepp) |
| | | 3HAWL000051 | Cable chain link unit (IGUS) |
| B | 1 m chain requires 28 pcs | 3HAWL000018 | Cable chain link unit (Kabelschlepp) |
| | | 3HAWL000053 | Cable chain link unit (IGUS) |
| C | 1 | 3HAWL000019 | Cable chain end units (1 mobile + 1 fixed) (Kabelschlepp) |
| D | 1 | 3HAWL000020 | Tiewrap plate (1 per cable chain) (Kabelschlepp) |
| C & D | 1 | 3HAWL000052 | Cable chain end units (1 mobile + 1 fixed), Tiewrap plate (1 per cable chain) (IGUS) |

**Note**

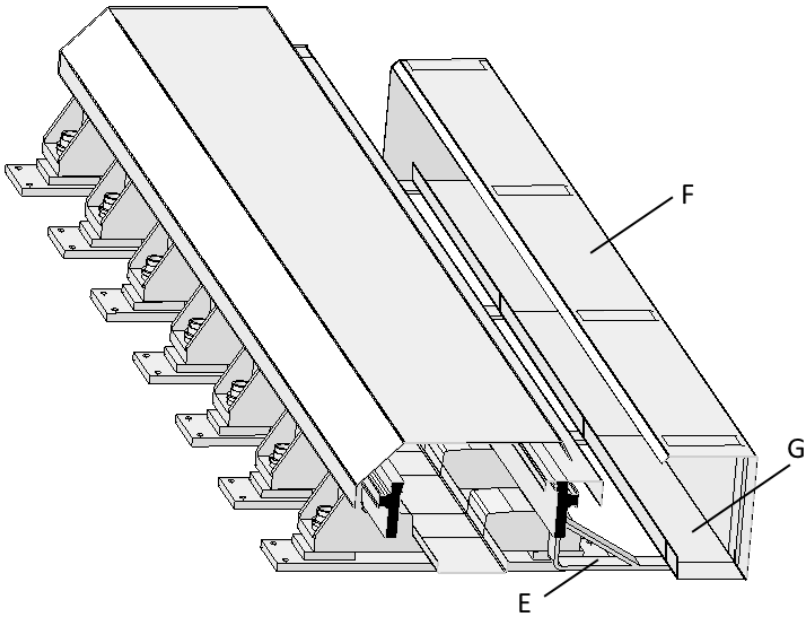
For how to identify cable chain from different supplier, see *Cable chain of different supplier on page 173*.

*Continues on next page*

**External chain spare parts**

If the internal cable chain is not wide enough to fit all the required cables, a wider external cable chain, assembled in a complete housing for optimal protection, may be used.

This option is used only on FlexTrack types IRT 501-90 and IRT 501-90R.




xx1800002084

| Item | Quantity | ABB part reference no. | Description |
|---|---|---|---|
| A | 1 m of chain requires 15 pcs | 3HAWL000042 | External cable chain link unit (Kabelschlepp) |
| | | 3HAW107710233 | External cable chain link unit (IGUS) |
| B | 1 m chain requires 28 pcs | 3HAWL000018 | Cable separator (Kabelschlepp) |
| | | 3HAWL000053 | Cable separator (IGUS) |
| C | 1 mobile + 1 fixed | 3HAWL000043 | External cable chain end units (Kabelschlepp) |
| D | 1plate per cable chain | 3HAWL000041 | External cable chain end tiewrap plate (Kabelschlepp) |
| C & D | 1 mobile + 1 fixed | 3HAW107710234 | Cable chain end units (1 mobile + 1 fixed), Tiewrap plate (1 per cable chain) (IGUS) |
| E | 1 m chain requires 1 pcs | 3HAW107700442 | External cable chain bow |
| F | 1 m chain requires 1 pcs | 3HAW107700443 | External cable chain cover module |
| G | 1 m chain requires 1 pcs | 3HAW107700449 | External cable chain floor guide |

*Continues on next page*

**Note**

For how to identify cable chain from different supplier, see *Cable chain of different supplier on page 173*.

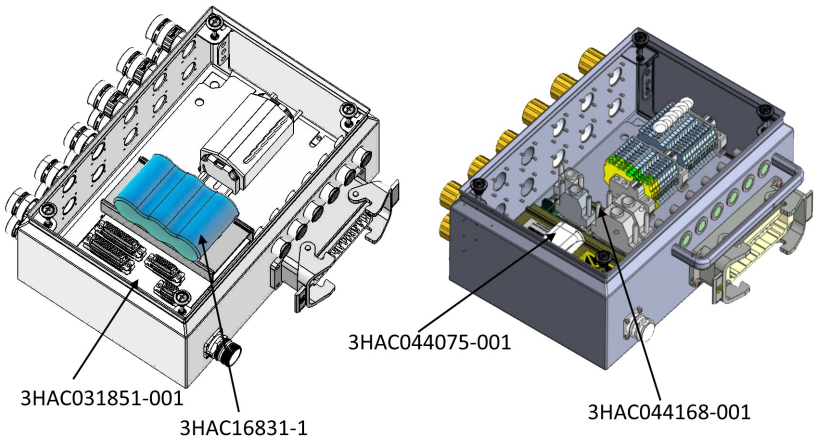
## 8.6 Electrical spare parts and cables

### SMB box and battery

**NOTE:** The SMB box contains a main board and a battery for the memory backup in order to maintain position data.

SMB boxes manufactured before 2015 are equipped with a SMB board DSQC633 Ref. 3HAC031851-001 and a SMB battery Ref. 3HAC16831-1.

SMB boxes manufactured after 2015 are equipped with a SMB board RMU101 Ref. 3HAC044168-001 and a Battery pack RMU Ref. 3HAC044075-001.



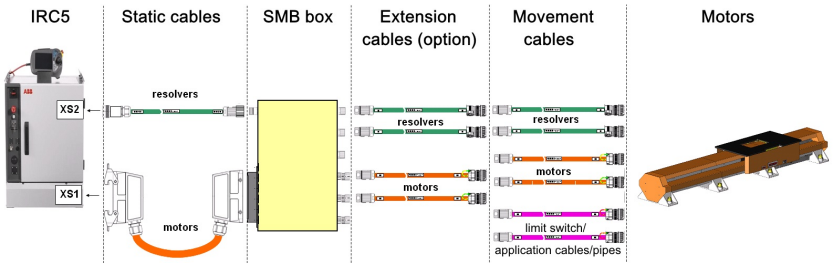

xx1800001993

| ABB part reference no. | Description |
|---|---|
| 3HAW050008604 | SMB box 1 axis M2008 |
| 3HAW050008605 | SMB box 3 axis M2008 |
| 3HAW050008651 | SMB box 6 axis M2011 |
| 3HAC031851-001 | SMB Main board DSQC633.<br>Phased out!<br>Order instead the set 3HAC046686-001 (board RMU101 + battery pack RMU) |
| 3HAC16831-1 | Battery pack for SMB board DSQC633.<br>For SMB boxes manufactured before 2015 only. |
| 3HAC044168-001 | SMB Main board RMU101 |
| 3HAC044075-001 | Battery pack for SMB board RMU101 |
| 3HAW050008607 | PTC shunt M2008 |

*Continues on next page*

## Motor cables and resolver cables

Following is a typical cabling layout of FlexTrack. Please refer to the layout to confirm what kind of motor cables and resolver cables are needed.




xx1800001914

| Type | ABB part reference no. | Description |
|---|---|---|
| Static cable - motor | 3HAW050008613-005 | 1 axis motor static cable 5 m |
| | 3HAW050008613-010 | 1 axis motor static cable 10 m |
| | 3HAW050008613-015 | 1 axis motor static cable 15 m |
| | 3HAW050008614-005 | 3 axis motor static cable 5 m |
| | 3HAW050008614-010 | 3 axis motor static cable 10 m |
| | 3HAW050008614-015 | 3 axis motor static cable 15 m |
| | 3HAW050008614-025 | 3 axis motor static cable 25 m |
| | 3HAW050008615-005 | 6 axis motor static cable 5 m |
| | 3HAW050008615-010 | 6 axis motor static cable 10 m |
| | 3HAW050008615-015 | 6 axis motor static cable 15 m |
| | 3HAW050008615-025 | 6 axis motor static cable 25 m |
| | 3HAW050008635-005 | 1 Motor Static XP7 M2008 5 m, for FlexTrack controlled without external SMB box |
| | 3HAW050008635-010 | 1 Motor Static XP7 M2008 10 m, for FlexTrack controlled without external SMB box |
| | 3HAW050008635-015 | 1 Motor Static XP7 M2008 15 m, for FlexTrack controlled without external SMB box |
| Static cable - resolver | 3HAW050008612-005 | 6 axis motor static cable 5 m |
| | 3HAW050008612-010 | 6 axis motor static cable 10 m |
| | 3HAW050008612-015 | 6 axis motor static cable 15 m |
| | 3HAW050008612-025 | 6 axis motor static cable 25 m |
| Static/Extension cable - motor | 3HAW050008624-005 | 1 Motor Static or Extension M2008 5 m |
| | 3HAW050008624-010 | 1 Motor Static or Extension M2008 10 m |
| | 3HAW050008624-015 | 1 Motor Static or Extension M2008 15 m |
| Static/Extension cable-resolver | 3HAW050008625-005 | 1 Resolver M2008 5 m |
| | 3HAW050008625-010 | 1 Resolver M2008 10 m |
| | 3HAW050008625-015 | 1 Resolver M2008 15 m |

*Continues on next page*

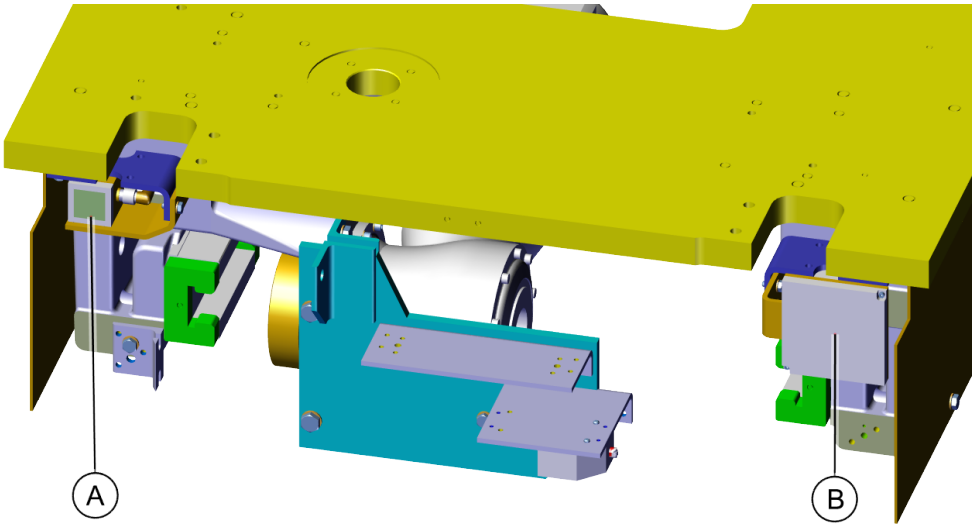
| Type | ABB part reference no. | Description |
|---|---|---|
| Movement cable - motor | 3HAW050008608-005 | 1 axis motor movement cable 5 m |
| | 3HAW050008608-007 | 1 axis motor movement cable 7.5 m |
| | 3HAW050008608-010 | 1 axis motor movement cable 10 m |
| | 3HAW050008608-015 | 1 axis motor movement cable 15 m |
| Movement cable - re-solver | 3HAW050008609-005 | 1 axis motor movement cable 5 m |
| | 3HAW050008609-007 | 1 axis motor movement cable 7.5 m |
| | 3HAW050008609-010 | 1 axis motor movement cable 10 m |
| | 3HAW050008609-015 | 1 axis motor movement cable 15 m |
| | 3HAW050008637-001 | 1 Resolver Track M2008 1.2 m, connects to robot base |
| | 3HAW050008637-002 | 1 Resolver Track M2008 2 m, connects to robot base |
| | 3HAW050008637-003 | 1 Resolver Track M2008 3 m, connects to robot base |
| | 3HAW050008637-005 | 1 Resolver Track M2008 5 m, connects to robot base |
| | 3HAW050008637-010 | 1 Resolver Track M2008 10 m, connects to robot base |
| | 3HAW050008637-015 | 1 Resolver Track M2008 15 m, connects to robot base |
| Limit switch cable | 3HAW050008610-005 | Limit switch cable 1 position 5 m |
| | 3HAW050008610-010 | Limit switch cable 1 position 10 m |
| | 3HAW050008610-015 | Limit switch cable 1 position 15 m |
| | 3HAW050008654-005 | Limit switch cable 2 position 5 m |
| | 3HAW050008654-010 | Limit switch cable 2 position 10 m |
| | 3HAW050008654-015 | Limit switch cable 2 position 15 m |
| | 3HAW050008611-005 | Limit switch cable 4 position 5 m |
| | 3HAW050008611-010 | Limit switch cable 4 position 10 m |
| | 3HAW050008611-015 | Limit switch cable 4 position 15 m |

### Robot cable & pipe

| Type | ABB part reference no. | Description |
|---|---|---|
| Application cable | 3HAW050008628-005 | Welding Power cable of robot 5 m |
| | 3HAW050008628-010 | Welding Power cable of robot 10 m |
| | 3HAW050008628-015 | Welding Power cable of robot 15 m |
| Air pipe | 3HAW050008638-005 | Air pipe DN12 5 m |
| | 3HAW050008638-010 | Air pipe DN12 10 m |
| | 3HAW050008638-015 | Air pipe DN12 15 m |

## 8.7 Anti collision

### Anti collision spare parts




xx2000002595

| | ABB part reference no. | Description |
|---|---|---|
| - | 3HAW107700581 | Collision system assembly (Including the laser scanner, reflector and the brackets) |
| A | 3HAW107710201 | Laser scanner |
| B | 3HAWC116985 | Laser reflector |

### Collision system cable & panel

| Type | ABB part reference no. | Description |
|---|---|---|
| Movement cable | 3HAWC116986 | Movement cable 5 m |
| | 3HAWC116987 | Movement cable 10 m |
| | 3HAWC116988 | Movement cable 15 m |
| | 3HAWC116989 | Movement cable 20 m |
| Static cable | 3HAWC116990 | Static cable 5 m |
| | 3HAWC116991 | Static cable 10 m |
| | 3HAWC116992 | Static cable 15 m |
| | 3HAWC116993 | Static cable 20 m |
| Internal static | 3HAWC116994 | Internal static |
| Wall panel | 3HAWC116983 | Wall panel |

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# 9 Appendix

## 9.1 Wiring diagrams

**Table**

This table contains the following wiring diagrams:

| Document | Article number |
|---|---|
| SMB box for 1 axis M2008 | 3HAW050008604 |
| SMB box for 3 axis M2008 | 3HAW050008605 |
| SMB box for 6 axis M2011 | 3HAW050008651 |
| PTC Shunt M2008 | 3HAW050008607 |
| 6 axis resolver static cable XS41-2, XP2 to SMB | 3HAW050008612 |
| 1 axis motor static cable XP7 400-600V | 3HAW050008613 |
| 3 axis motor static cable XP7 400-600V | 3HAW050008614 |
| 6 axis motor static cable high voltage XP1 to SMB 600V | 3HAW050008615 |
| 1 Motor static extension M2008 | 3HAW050008624 |
| 1 Resolver static extension M2008 | 3HAW050008625 |
| 1 Motor Static XP7 M2008 (No SMB box) | 3HAW050008635 |
| 1 Resolver Static M2008 (No SMB box) | 3HAW050008636 |
| Extension welding power cable | 3HAW050008628 |
| 1 Motor power flex cable- Electrical Spot Gun, from SMB.MP&SMB.MR to R1.SP | 3HAW050008631 |
| 1 axis motor movement cable | 3HAW050008608 |
| 1 axis resolver movement cable | 3HAW050008609 |
| Limit switch cable 1 position | 3HAW050008610 |
| Limit switch cable 2 positions | 3HAW050008654 |
| Limit switch cable 4 positions | 3HAW050008611 |
| Power supply 24V DC output & communication flexible cable | 3HAW050008633 |
| 1 Resolver, Robot Axis 7 Feedback- motor resolver, Track M2008 No SMB | 3HAW050008637 |

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