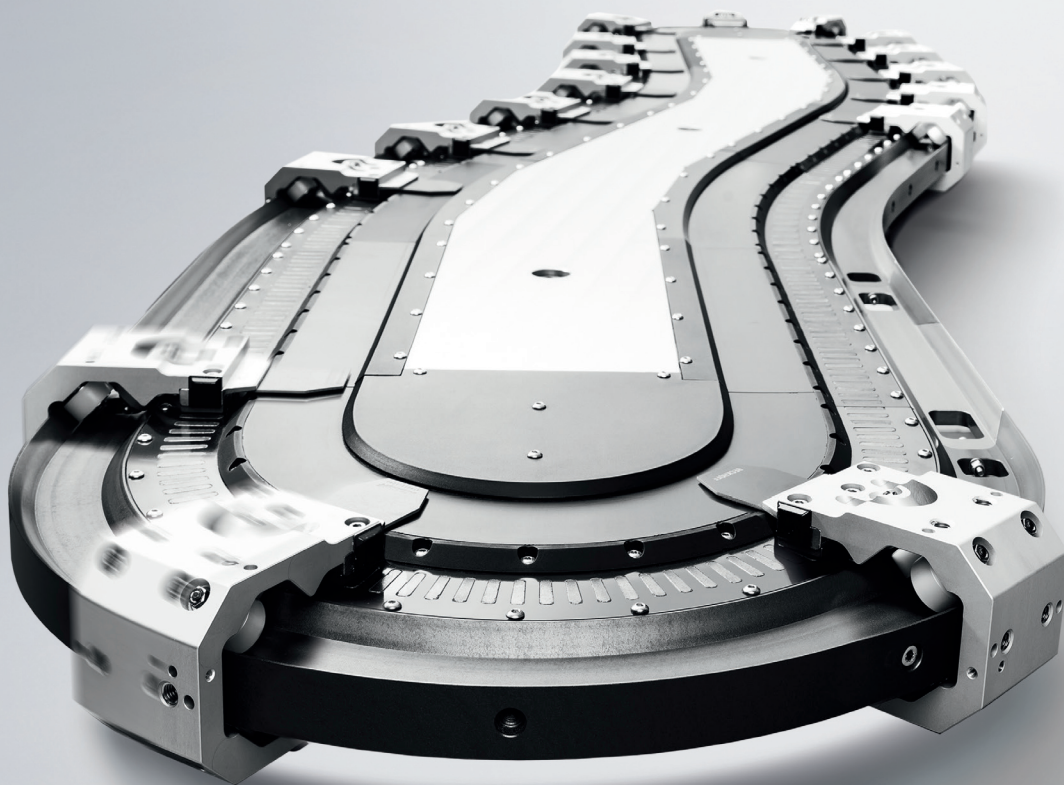


Operating Instructions | EN

**XTS**

Linear product transport







# Table of contents

<b>1 Documentation notes</b>	8
1.1 Disclaimer	8
1.1.1 Trademarks	8
1.1.2 Patents	8
1.1.3 Limitation of liability	9
1.1.4 Copyright	9
1.2 Version numbers	10
1.3 Scope of the documentation	10
1.4 Staff qualification	11
1.5 Safety and instruction	13
1.6 Explanation of symbols	13
1.7 Beckhoff Services	15
1.7.1 Support services	15
1.7.2 Training offerings	15
1.7.3 Service offerings	15
1.7.4 Headquarters Germany	16
1.7.5 Downloadfinder	16
<b>2 For your safety</b>	17
2.1 General safety instructions	17
2.1.1 Before operation	17
2.1.2 During operation	18
2.1.3 After operation	18
<b>3 Product overview</b>	19
3.1 NCT electronics	20
3.1.1 For mover AT9014-1070-x550	20
3.1.2 For third-party movers	21
3.2 Name plate	23
3.2.1 Motor module	23
3.2.2 Motor module with integrated NCT functionality	24
3.2.3 NCT electronics	25
3.3 BIC   Beckhoff Identification Code	26
3.3.1 BIC as DataMatrix code	26
3.3.2 Scanning the DataMatrix code	27
3.3.3 Coded information on the BIC	28
3.4 Type key	29
3.4.1 Motor modules	29
3.4.2 Guide rails	30
3.4.3 Mover	31
3.4.4 NCT electronics	31
3.5 Product characteristics	32
3.6 Components	33
3.6.1 Motor modules	33
3.6.2 Motor modules for parallel guide rails	40
3.6.3 Guide rails	47

3.6.4	Mover .....	50
3.6.5	NCT electronics .....	53
3.7	Special geometries .....	54
3.8	Track Management .....	56
3.8.1	Requirements .....	56
3.8.2	Technical data .....	59
3.8.3	Application examples .....	60
3.9	NCT   No Cable Technology .....	61
3.9.1	Requirements .....	62
3.9.2	Application examples .....	63
3.10	EcoLine motor module .....	64
3.10.1	Requirements .....	64
3.10.2	Application examples .....	65
3.11	Motor module with lubrication channel .....	66
3.11.1	Number of lubrication points .....	66
3.11.2	Position of the lubrication points .....	67
3.11.3	Lubricant .....	68
3.11.4	Intervals .....	69
3.11.5	Guide rail .....	69
3.11.6	Machine bed .....	70
3.11.7	Lubrication pump .....	70
3.11.8	Lubricant line .....	70
3.12	Intended use .....	71
3.12.1	Improper use .....	71
<b>4</b>	<b>Technical data .....</b>	<b>72</b>
4.1	Definition .....	72
4.1.1	Technical terms .....	72
4.2	Data for operation and environment .....	73
4.3	Electrical data and system properties .....	74
4.3.1	Motor module with integrated NCT functionality .....	75
4.4	Mechanical data .....	78
4.4.1	Modules .....	78
4.4.2	Mover .....	81
4.4.3	Guide rails .....	83
4.4.4	Cables .....	84
4.4.5	NCT electronics connector .....	84
4.5	Dimensional drawings .....	86
4.5.1	Modules .....	86
4.5.2	Guide rails .....	111
4.5.3	Mover .....	117
4.5.4	NCT electronics .....	131
4.5.5	Magnetic plate sets [+] .....	133
<b>5</b>	<b>Packaging .....</b>	<b>136</b>
5.1	ESD conductivity .....	137
<b>6</b>	<b>Scope of supply .....</b>	<b>138</b>

6.1	Modules.....	138
6.2	Guide rails .....	138
6.3	Mover .....	140
6.4	NCT electronics.....	140
<b>7</b>	<b>Transport and storage .....</b>	<b>141</b>
7.1	Conditions .....	141
7.2	Long-term storage.....	141
<b>8</b>	<b>Mechanical installation .....</b>	<b>142</b>
8.1	Preparation.....	142
8.1.1	Maintenance concept .....	143
8.1.2	Modules.....	146
8.1.3	Guide rails, 180° curved segment .....	164
8.1.4	Last module of an infeed line .....	165
8.2	Mounting the modules.....	166
8.2.1	Straight modules with connection cables .....	166
8.2.2	Straight modules with connector .....	167
8.2.3	Straight EcoLine modules with plug connector .....	168
8.2.4	Motor module with lubrication channel .....	169
8.2.5	Straight modules, top .....	170
8.2.6	Straight EcoLine modules top .....	173
8.2.7	Straight modules, bottom .....	174
8.2.8	Straight EcoLine modules bottom .....	175
8.2.9	Curved segments .....	176
8.3	System test .....	180
8.4	Mounting the guide rails on the modules .....	182
8.4.1	Straight guide rails.....	182
8.4.2	Guide rails, 180° curved segment .....	187
8.4.3	Completion of the mounting .....	189
8.4.4	Dismantling the guide rails, 180° curved segment .....	190
8.5	Mounting the movers.....	191
8.5.1	Rail on support [+] .....	191
8.5.2	Mover alignment.....	192
8.5.3	Mover, length 50 mm.....	195
8.5.4	Mover, length 70 mm.....	197
8.5.5	Mover, length 55 mm and 70 mm, with spring-loaded rollers.....	199
8.5.6	Third-party movers .....	206
<b>9</b>	<b>Electrical installation .....</b>	<b>210</b>
9.1	Connection technology.....	210
9.1.1	Cables .....	210
9.1.2	Brake chopper terminal .....	211
9.1.3	2-channel contactor switch-off for one module.....	212
9.2	Pin assignment of the power cable .....	214
9.3	Earthing of the supply .....	220
9.3.1	Module with connection cables for infeed .....	220
9.3.2	Module with connector for infeed .....	220
9.3.3	Control circuit and load circuit .....	221

9.4	Grounding of the machine beds .....	222
9.4.1	Painted surfaces .....	223
9.4.2	Unpainted surfaces .....	223
9.5	Fuse protection .....	223
<b>10</b>	<b>Commissioning and operation .....</b>	<b>226</b>
10.1	Requirements .....	226
10.2	Commissioning .....	227
10.3	During operation .....	227
<b>11</b>	<b>Maintenance and cleaning .....</b>	<b>228</b>
11.1	Cleaning agents .....	228
11.2	Intervals .....	229
<b>12</b>	<b>Maintenance work on the mover .....</b>	<b>232</b>
12.1	Roller replacement at AT9011-0050-x550 .....	233
12.1.1	Scope of supply .....	235
12.1.2	Preparation .....	236
12.1.3	Arrangement of the guide rollers on the mover .....	236
12.1.4	Disassembly .....	237
12.1.5	Mounting .....	240
12.2	Roller replacement at AT9012-0050-x550 .....	243
12.2.1	Scope of supply .....	245
12.2.2	Preparation .....	246
12.2.3	Arrangement of the guide rollers on the mover .....	246
12.2.4	Disassembly .....	247
12.2.5	Mounting .....	250
12.3	Roller replacement at AT9014-0055-x550 .....	253
12.3.1	Scope of supply .....	254
12.3.2	Preparation .....	255
12.3.3	Roller wear on AT9014-0055 .....	256
12.3.4	Arrangement of the guide rollers on the mover .....	258
12.3.5	Disassembly .....	259
12.3.6	Mounting .....	262
12.4	Roller replacement at AT9011-0070-x550 .....	266
12.4.1	Scope of supply .....	268
12.4.2	Preparation .....	269
12.4.3	Arrangement of the guide rollers on the mover .....	269
12.4.4	Disassembly .....	270
12.4.5	Mounting .....	273
12.5	Role swap on AT9014-x070-x550 and AT8300-1x00-0100 .....	276
12.5.1	Scope of supply .....	277
12.5.2	Preparation .....	278
12.5.3	Roller wear on AT9014-x070 and AT8300-1x00 .....	278
12.5.4	Arrangement of the guide rollers on the mover .....	280
12.5.5	Disassembly .....	281
12.5.6	Mounting .....	285
12.6	Replacing the magnetic plates .....	289



12.6.1	Preparation .....	291
12.6.2	Disassembly .....	291
12.6.3	Mounting .....	292
12.7	Replacing the encoder flag .....	295
12.7.1	Preparation .....	295
12.7.2	Disassembly .....	295
12.7.3	Mounting .....	296
12.8	Replacing NCT electronics .....	297
12.8.1	Disassembly .....	297
12.8.2	Installation .....	298
<b>13</b>	<b>Accessories .....</b>	<b>299</b>
13.1	Cables .....	299
13.2	Adapter for cables .....	300
13.3	Module connector cards .....	300
13.4	Alignment gauge .....	301
13.5	Rail on support .....	301
13.6	End caps .....	301
13.7	ESD brushes .....	302
13.8	Roller set .....	302
13.9	Base body with rollers .....	304
13.10	Torx key T20 .....	304
13.11	Tool set for roller replacement on movers AT9014-x0xx .....	304
13.12	Assembly tool for B23 connectors .....	305
13.13	Magnetic plate set .....	306
<b>14</b>	<b>Fault correction .....</b>	<b>309</b>
14.1	Motor modules .....	309
14.1.1	Warning .....	309
14.1.2	Error .....	310
14.1.3	Cause and solution .....	311
14.2	TcloXts object .....	312
14.2.1	Warning .....	312
14.2.2	Error .....	314
14.2.3	Solution .....	316
14.3	SoftDrive object .....	317
14.3.1	Error .....	317
14.3.2	Solution .....	318
<b>15</b>	<b>Decommissioning .....</b>	<b>319</b>
15.1	Disassembly .....	319
15.2	Disposal .....	320

## 1 Documentation notes

### 1.1 Disclaimer

Beckhoff products are subject to continuous further development. We reserve the right to revise the documentation at any time and without notice. No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams, and descriptions in this documentation.

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The EtherCAT technology is protected by patent rights through the following registrations and patents with the relevant applications and registrations in various other countries:

- EP1590927
- EP1789857
- EP1456722
- EP2137893
- DE102015105702



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### 1.1.3 Limitation of liability

All components of this product described in the original operating instructions are delivered in a hardware and software configuration, depending on the application requirements. Modifications and changes to the hardware or software configuration that go beyond the documented options are prohibited and nullify the liability of Beckhoff Automation GmbH & Co. KG.

**The following is excluded from the liability:**

- Failure to comply with this documentation
- Improper use
- Use of untrained personnel
- Use of unauthorized spare parts

### 1.1.4 Copyright

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The copying, distribution and utilization of this document as well as the communication of its contents to others without express authorization is prohibited. Offenders will be held liable for the payment of damages.

We reserve all rights in the event of registration of patents, utility models and designs.

## 1.2 Version numbers

On request we can send you a list of revision levels for changes to the documentation. Please send your request to:

✉ [motion-documentation@beckhoff.com](mailto:motion-documentation@beckhoff.com)

### Origin of the document

This documentation was originally written in German. All other languages are derived from the German original.

### Product features

The valid product features are always those specified in the current documentation. Further information given on the product pages of the Beckhoff homepage, in emails or in other publications is not authoritative.

## 1.3 Scope of the documentation

In addition to this documentation, the following documents are part of the complete documentation:

### Manual | TF5850

Description of the basic software package for the use and integration of the XTS in the TwinCAT 3 environment.

🌐 [Direct link to the documentation TF5850 | TwinCAT 3 XTS](#)

### Manual | TF5410

Description of the optional package for collision avoidance when operating multiple axes.

🌐 [Direct link to the documentation TF5410 | TwinCAT 3 Motion Collision Avoidance](#)



## 1.4 Staff qualification

This documentation is aimed at trained specialists working in control technology and automation who have knowledge of the applicable and required standards and directives.

Specialists must have knowledge of drive technology and electrical equipment as well as knowledge of safe working on electrical systems and machines. This includes knowledge of proper setup and preparation of the workplace as well as securing the working environment for other persons.

The documentation published at the time must be used for each installation and commissioning. The products must be used in compliance with all safety requirements, including all applicable laws, regulations, provisions and standards.

### Instructed person

Instructed persons have a clearly defined task area and have been informed about the work to be carried out. Instructed persons are familiar with:

- the necessary protective measures and protective devices
- the intended use and risks that can arise from use other than for the intended purpose

### Trained person

Trained persons meet the requirements for instructed persons. Trained persons have additionally received training from the machine builder or vendor:

- machine-specific or
- plant-specific

### Trained specialists

Trained specialists have received specific technical training and have specific technical knowledge and experience. Trained specialists can:

- apply relevant standards and directives
- assess tasks that they have been assigned
- recognize possible hazards
- prepare and set up workplaces

## **Qualified electricians**

Qualified electricians have comprehensive technical knowledge gained from a course of study, an apprenticeship or technical training. They have an understanding of control technology and automation. They are familiar with relevant standards and directives. Qualified electricians can:

- independently recognize, avoid and eliminate sources of danger
- implement specifications from the accident prevention regulations
- assess the work environment
- independently optimize and carry out their work

## 1.5 Safety and instruction

Read the contents that are related to the activities you will perform with the product. Always read the For your safety chapter in the documentation. Observe the warning notes in the chapters so that you can handle the product and work with it properly and safely.

## 1.6 Explanation of symbols

Various symbols are used for a clear arrangement:

- The triangle indicates instructions that you should execute.
- The bullet point indicates an enumeration.
- [...] The square brackets indicate cross-references to other text passages in the document.
- [1] The number in the square brackets refers to the position in the adjacent figure.
- [+] The plus sign in square brackets indicates ordering options and accessories.

In order to make it easier for you to find text passages, pictograms and signal words are used in warning notices:

### **DANGER**

Failure to comply will result in serious or fatal injuries.

### **WARNING**

Failure to comply may result in serious or fatal injuries.

### **CAUTION**

Failure to comply may result in minor or moderate injuries.

### **NOTICE**

Notes are used for important information on the product. The possible consequences of failure to observe these include:

- product malfunctions
- damage to the product
- damage to the environment



#### **Information**

This symbol indicates information, tips, and notes for handling the product or the software.



#### **Examples**

This symbol shows examples of how to use the product or software.



#### **Required tool**

This symbol indicates a tool that is required for the following steps.

**Required accessories [ + ]**

This symbol shows the accessories required for the following steps. The accessories are not included in the scope of delivery and can be ordered from Beckhoff.

**Assembly material required**

This symbol shows the assembly material required for the following steps. The assembly material is not included in the scope of delivery and must be purchased separately.

**Permitted cleaning agents**

This symbol indicates the permitted cleaning agents that the components may be cleaned with. The permitted cleaning agents are not included in the scope of delivery and must be purchased separately.

**QR codes**

This symbol shows a QR code that you can scan to watch videos or animations. Internet access is required in order to use it.

**Permitted lubricants**

This symbol indicates the permitted lubricants with which the components may be lubricated. The permitted lubricants are not included in the scope of delivery and must be procured separately.

**Recommended purchased parts**

This symbol indicates recommended purchased parts that are required for the following steps. The recommended purchased parts are not included in the scope of delivery and must be procured separately.


**Intervals**

This symbol indicates the intervals at which the components must be serviced and maintained.




## 1.7 Beckhoff Services

Beckhoff and its international partner companies offer comprehensive support and service.

 [www.beckhoff.com/en-en/support/global-availability/](http://www.beckhoff.com/en-en/support/global-availability/)

### 1.7.1 Support services

The Beckhoff Support offers technical advice on the use of individual Beckhoff products and system planning. The support engineers offer you competent assistance, for comprehension questions as well as for commissioning.

 +49 5246 963-157

 [support@beckhoff.com](mailto:support@beckhoff.com)

 [www.beckhoff.com/en-en/support/our-support-services/](http://www.beckhoff.com/en-en/support/our-support-services/)

### 1.7.2 Training offerings

Training in Germany takes place at the Beckhoff branches or, after consultation, at the customer's premises. Beckhoff offers both face-to-face and online training courses.

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 [training@beckhoff.com](mailto:training@beckhoff.com)

 [www.beckhoff.com/en-en/support/training-offerings/](http://www.beckhoff.com/en-en/support/training-offerings/)

### 1.7.3 Service offerings

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 +49 5246 963-460

 [service@beckhoff.com](mailto:service@beckhoff.com)

 [www.beckhoff.com/en-en/support/our-service-offerings/](http://www.beckhoff.com/en-en/support/our-service-offerings/)

## 1.7.4 Headquarters Germany

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☎ +49 5246 963-0

✉ [info@beckhoff.com](mailto:info@beckhoff.com)

🌐 [www.beckhoff.com/en-en/](http://www.beckhoff.com/en-en/)

A detailed overview of the Beckhoff locations worldwide can be found at:

🌐 [www.beckhoff.com/en-en/company/global-presence/](http://www.beckhoff.com/en-en/company/global-presence/)

## 1.7.5 Downloadfinder

In the Download finder you will find configuration files, technical documentation and application reports to download.

🌐 [www.beckhoff.com/documentations](http://www.beckhoff.com/documentations)

## 2 For your safety

Read this chapter containing general safety information. The chapters in these operating instructions also contain warning notices. Always observe the safety instructions for your own safety, the safety of other persons and the safety of the product.

When working with control and automation products, many dangers can result from careless or incorrect use. Work particularly thoroughly, not under time pressure and responsibly towards other people.

### 2.1 General safety instructions

This chapter contains safety instructions for handling the product. This product cannot be run independently. The product must be installed in a machine or system by the machine builder. Read the documentation prepared by the machine builder.

#### 2.1.1 Before operation

##### **Hazard resulting from magnetic fields**

The magnetic fields of some of the components are dangerous to:

- People fitted with cardiac pacemakers
- People with magnetically conducting implants
- Implanted and external defibrillators
- Magnetic data storage devices, chip cards with magnetic strips and other electronic devices

Maintain a safety distance to all magnetic parts and prevent direct contact between magnetic parts and parts that are sensitive to interference.

Observe the requirements of BGV B 11 for electromagnetic fields (Germany) and applicable national regulations in other countries.

##### **Use output voltages SELV / PELV**

Operate all electronic modules and components in the drive system only with a SELV (Safety Extra Low Voltage) or PELV (Protective Extra Low Voltage) output voltage.

##### **Keep the surroundings clean**

Keep your workplace and the surrounding area clean. Ensure safe working.

##### **Secure the control cabinet**

When working on machines, secure the control cabinet against inadvertent power-up.

##### **Do not use damaged components**

Observe the specifications in the technical data during storage, transport, and operation. Do not use damaged components.

##### **Check safety pictograms**

Check whether the designated pictograms are on the product. Replace missing or illegible stickers.

##### **Observe tightening torques**

Install connections and components in compliance with the specified tightening torques and check them regularly.

**Ground electrical components or modules correctly**

Do not touch electrical components or modules unless you are wearing protective ESD clothing. Only walk on conductive floors.

**Only use original packaging for further processing**

When shipping, transporting, storing, and packing, use the original packaging or conductive materials.

## 2.1.2 During operation

**Observe the GND concept**

Special conditions need to be observed for the grounding of the XTS. For more information, see chapter "Grounding of infeed", [Page 220].

**Do not work on live electrical parts**

Ensure that the protective conductor is properly connected. Never disconnect electrical connections while they are live. Only work on the XTS when the voltage has dropped to < 10 V. Disconnect all components from the mains and secure against reconnection.

**Do not touch hot surfaces**

Check cooling of the surfaces with a thermometer. Do not touch the components during operation. Allow the components to cool down for at least 15 minutes after switching off.

**Avoid overheating**

Operate the components according to the technical specifications. Further information can be found in chapter "Technical data", [Page 72]. Ensure sufficient cooling and switch off the components immediately if the temperature is too high.

**Do not touch any moving or rotating components**

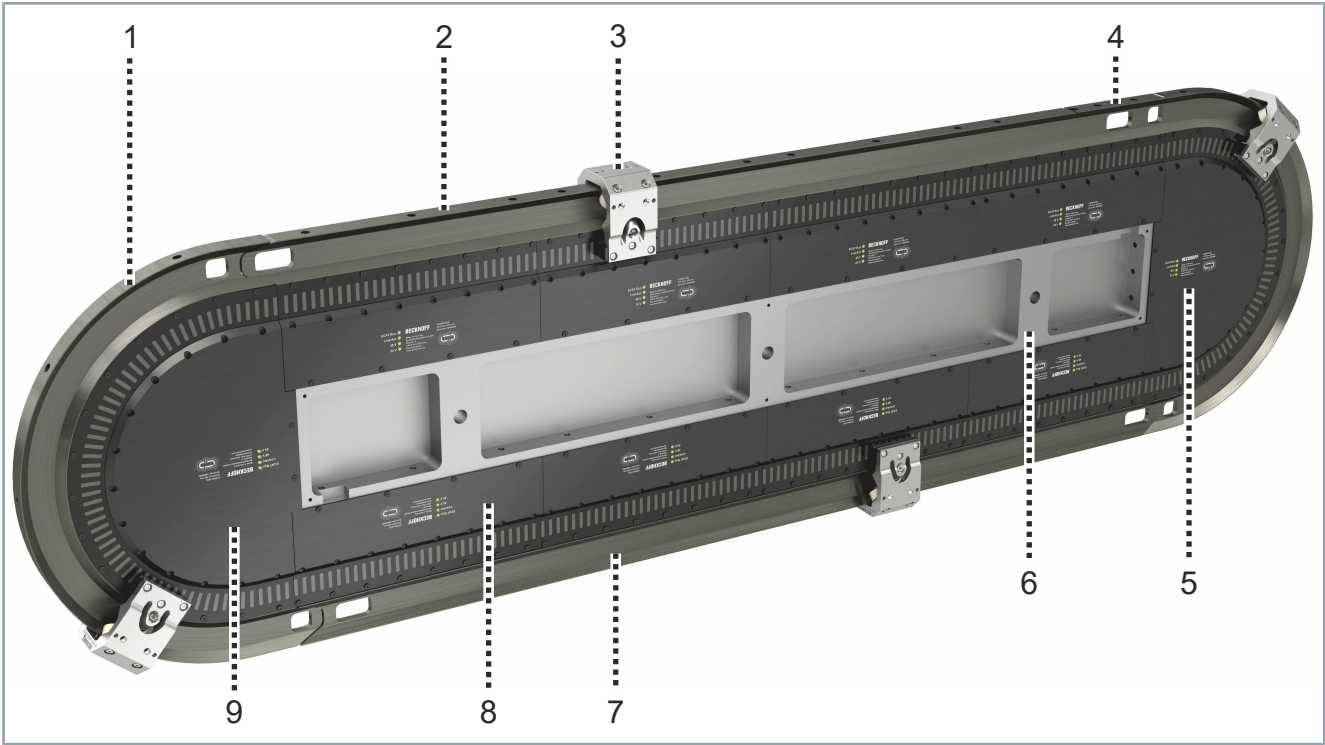
Do not touch any moving or rotating components. Fasten all parts or components on the machine or plant.

## 2.1.3 After operation

**De-energize and switch off components before working on them**

Carry out a voltage test and check all safety-relevant devices for functionality. Secure the working environment and the control cabinet against inadvertent power-up. For more information, see the chapters "Decommissioning", [Page 319].

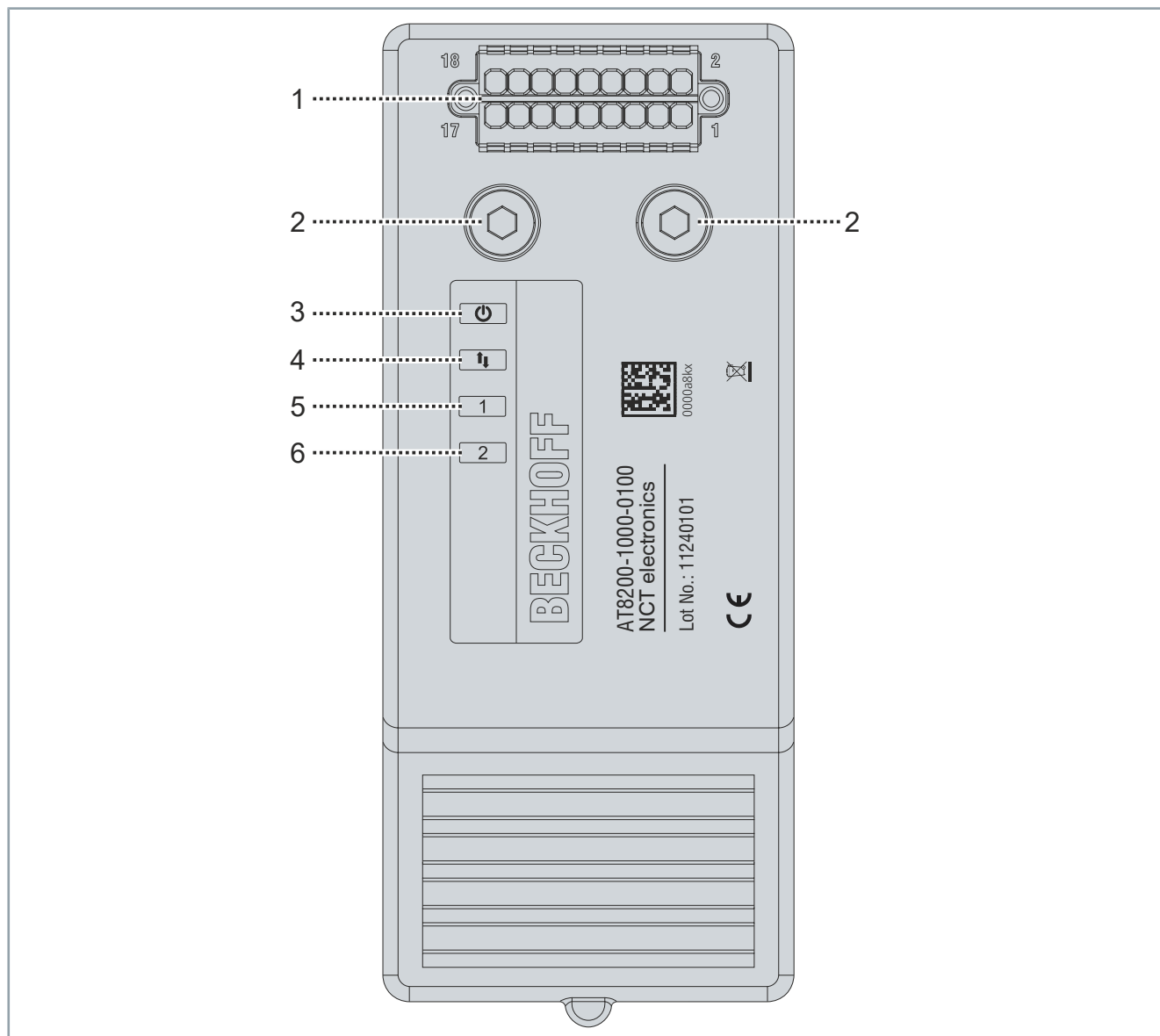
3 Product overview



Position	Name
1	Curved rail
2	Straight guide rail with lock
3	Mover
4	Lock
5	Name plate
6	Machine bed
7	Straight guide rail without lock
8	Straight module
9	Curved segment

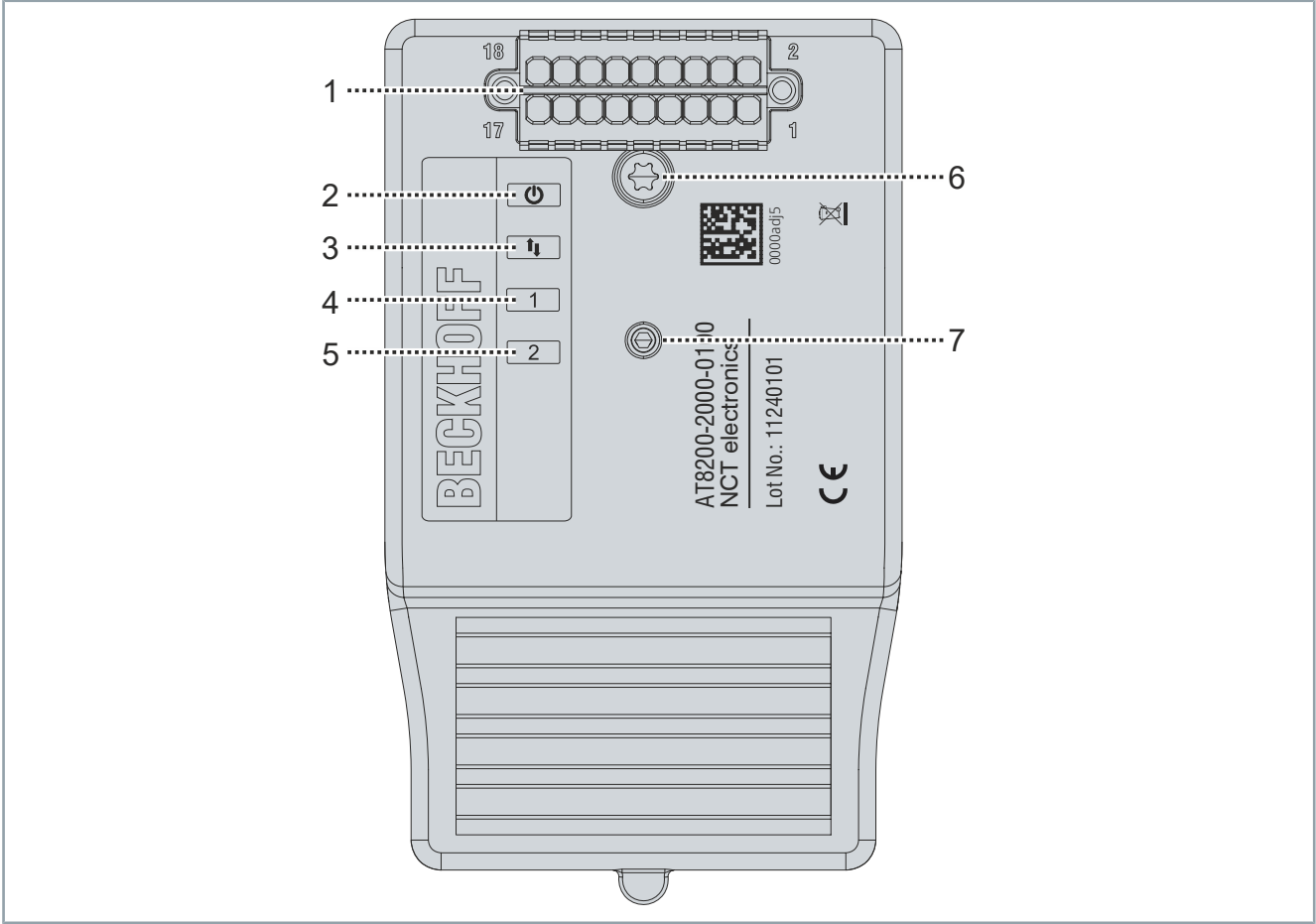
## 3.1 NCT electronics

### 3.1.1 For mover AT9014-1070-x550



Position	Name
1	2 x 9 NCT electronics connection strip
2	Fastening screw M6 x 25
3	Power LED
4	Communication LED
5	LED 1 Use input and output, adjustable
6	LED 2 Diagnostic data available, adjustable

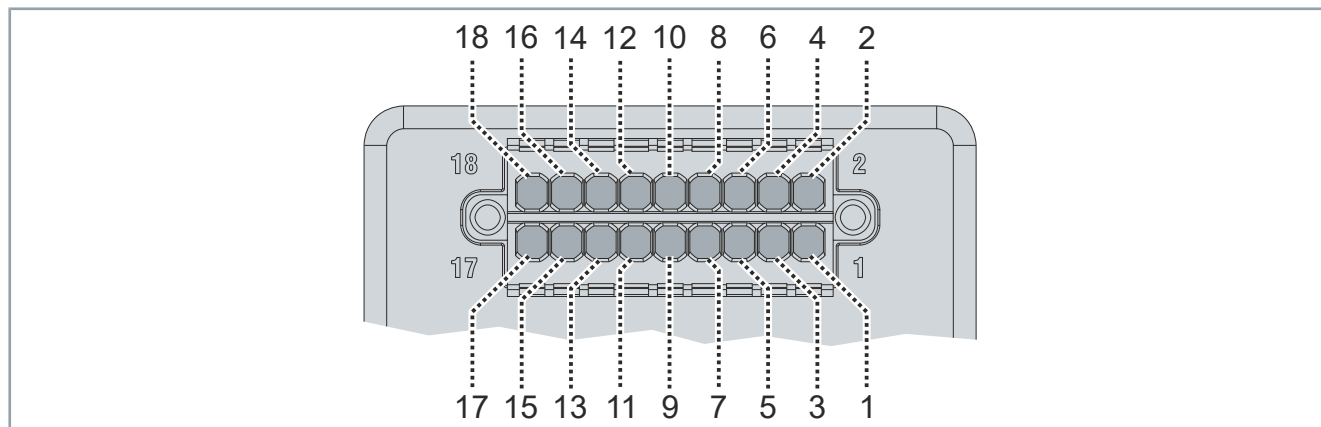
3.1.2 For third-party movers



Position	Name
1	2 x 9 NCT electronics connection strip
2	Power LED
3	Communication LED
4	LED 1 Use input and output, adjustable
5	LED 2 Diagnostic data available, adjustable
6	Fastening screw M4 x 25
7	Adjusting screw for the air gap

## 2 x 9 NCT electronics connection strip

The NCT electronics for mover *AT9014-1070-x550* and for third-party movers has a 2 x 9 connector strip.

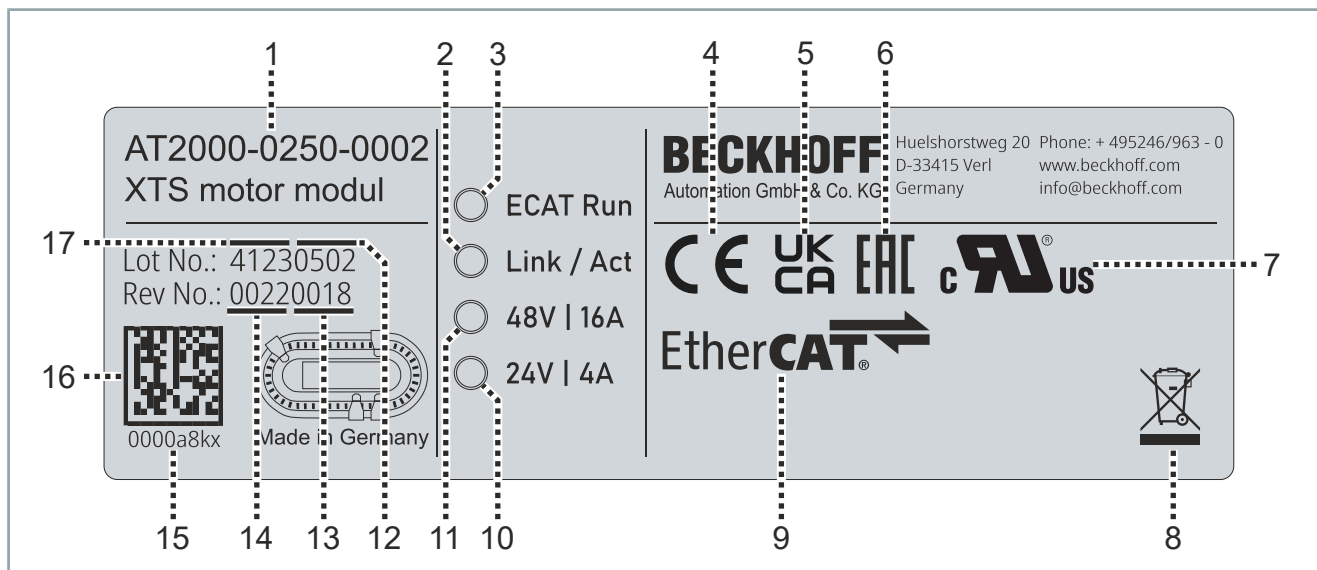


Position	Name
1	Digital input 1
2	Digital input 3 / analog input 1
3	Digital input 2
4	Digital input 4 / analog input 2
5	Digital output 1
6	Digital output 3
7	Digital output 2
8	Digital output 4
9	<i>Not yet occupied.</i>
10	<i>Not yet occupied.</i>
11	<i>Not yet occupied.</i>
12	<i>Not yet occupied.</i>
13	Ground
14	24 V
15	PWM output 1
16	Ground
17	PWM output 2
18	PWM output 3



## 3.2 Name plate

### 3.2.1 Motor module



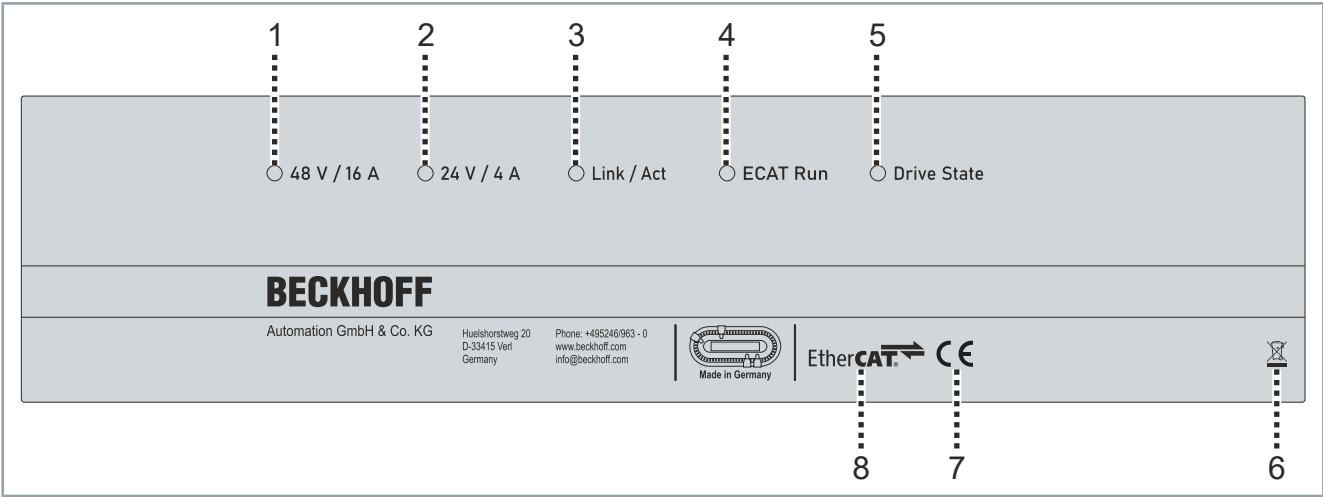
Position	Name
1	Product designation
2	Link / Act status LED
3	Status LED ECAT Run
4	CE conformity
5	UKCA marking
6	EAC marking
7	cURus approval
8	WEEE compliance
9	EtherCAT marking
10	Status LEDs control voltage 24 V   4 A
11	Status LEDs supply voltage 48 V   16 A
12	Firmware and hardware revision
13	XML sensor PCB revision number
14	XML motor PCB revision number
15	BTN - Beckhoff Traceability Number
16	DataMatrix code
17	Date of manufacture - week/year

3.2.2 Motor module with integrated NCT functionality

The name plate of motor modules with integrated NCT functionality is divided into two parts.

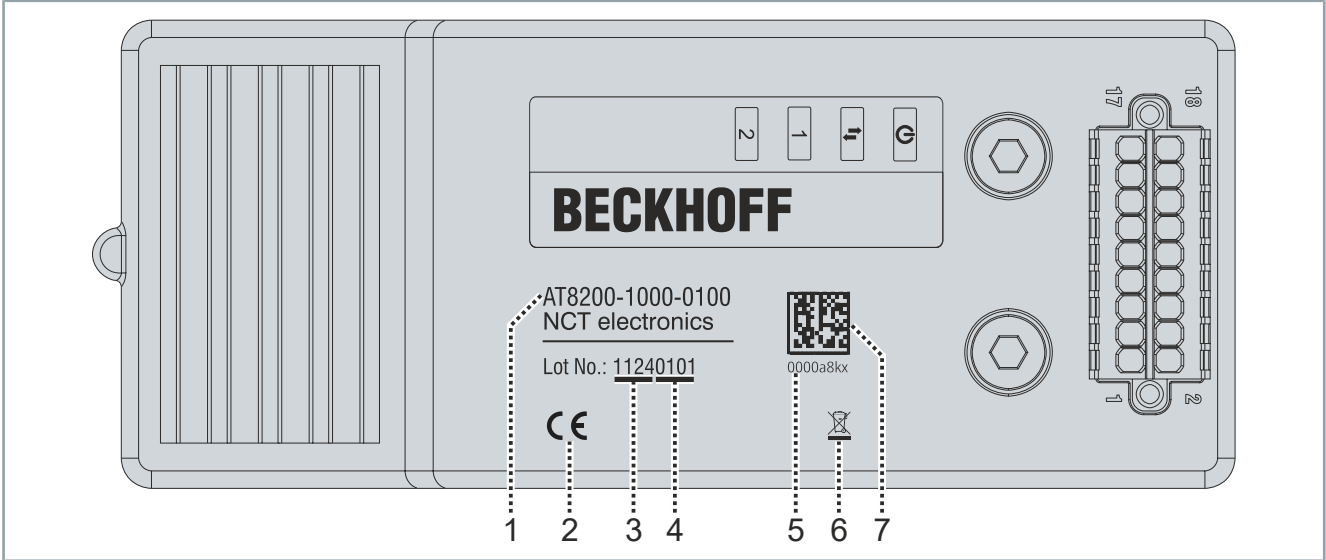


Position	Designation
1	Date of manufacture - week/year
2	Product designation
3	Firmware and hardware revision
4	DataMatrix code
5	EtherCAT marking
6	CE conformity
7	WEEE compliance
8	BTN - Beckhoff Traceability Number
9	XML sensor PCB revision number
10	XML revision number NCT board
11	XML motor PCB revision number



Position	Designation
1	Status LEDs supply voltage 48 V   16 A
2	Status LEDs control voltage 24 V   4 A
3	Link / Act status LED
4	Status LED ECAT Run
5	Drive State status LED
6	WEEE compliance
7	CE conformity
8	EtherCAT marking

3.2.3 NCT electronics



Position	Name
1	Product designation
2	CE conformity
3	Date of manufacture - week/year
4	Firmware and hardware revision
5	BTN - Beckhoff Traceability Number
6	WEEE compliance
7	DataMatrix code

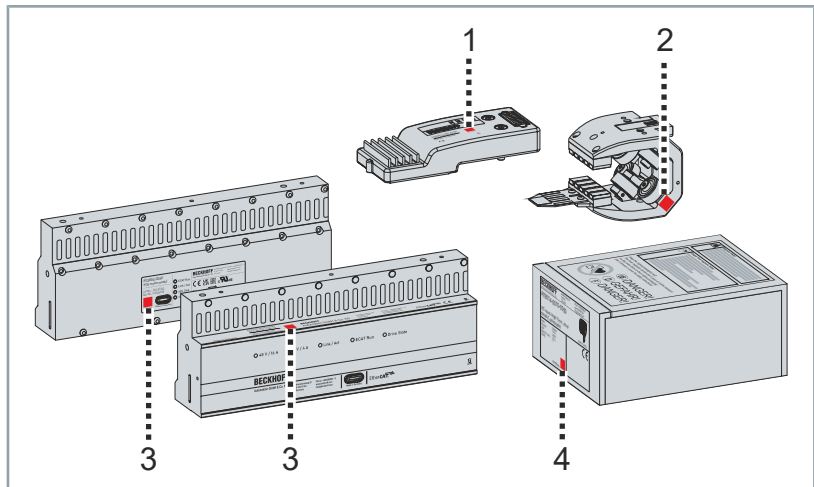
### 3.3 BIC | Beckhoff Identification Code

The *Beckhoff Identification Code*, BIC for short, is used to uniquely identify the component. The BIC is represented as a DataMatrix code, or DMC for short, according to code scheme *ECC200*. The content of the DataMatrix code is based on the ANSI standard *MH10.8.2-2016*.

The BIC and its information can be scanned and read. You can use this information for your internal handling and administration of the products.

#### 3.3.1 BIC as DataMatrix code

The Beckhoff Identification Code is displayed in the form of a DataMatrix code and can be read with a scanner or smartphone.



The DataMatrix code can be found on the NCT electronics [1], all movers [2], modules [3] and packaging [4]. If there is no BTN under the DataMatrix code, you can read it via the DataMatrix code.

### 3.3.2 Scanning the DataMatrix code

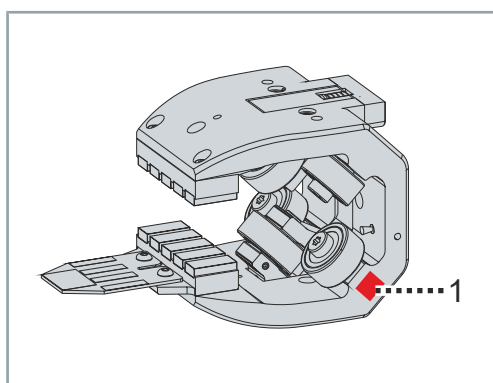
A scanner or smartphone is required to scan the DataMatrix code. Some smartphones support scanning the DataMatrix code with the camera. If scanning is not supported by your camera, Beckhoff recommends the following reader apps:

- *Qrafter* for IOS
- *QR Code Scanner* for Android

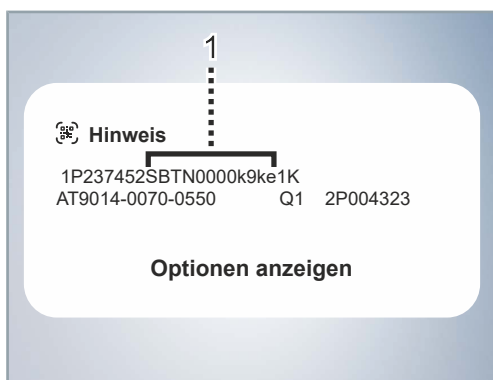


#### Example scan on a mover

The scanning of the BTN is shown as an example on a mover AT9014-0070-0550.



- Scan the DataMatrix code [1]

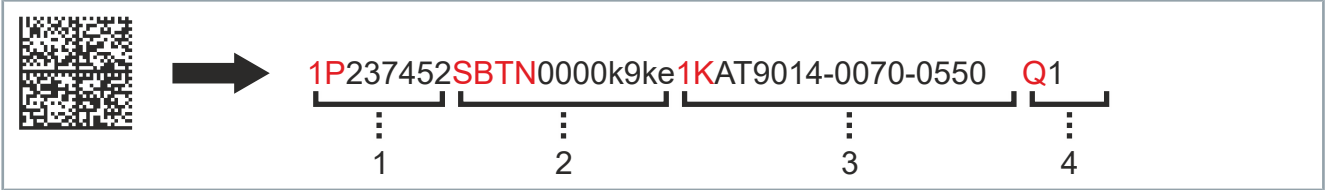


- Read the BTN [1] from the screen of your end device via the camera or the reader app

Further information can be found in chapter "Coded information on the BIC", [Page 28].

3.3.3 Coded information on the BIC

Various information about the component is stored in the BIC. The example shows what information can be stored behind a DataMatrix code. For better clarity, the data identifiers of the BIC are shown in red.



Position	Explanation	Data identifier	Maximum digits	Example
1	Beckhoff order number	1P	8	1P237452
2	BTN   Beckhoff Traceability Number Unique serial number	SBTN	12	SBTN0000k9ke
3	Article name	1K	32	1KAT9014-0070-0550
4	Quantity Quantity in sales unit	Q	6	Q1

## 3.4 Type key

### 3.4.1 Motor modules

AT2abb-0ccc-000d	Explanation
AT	<i>Product area</i> • AT = drive technology
2a	<i>Product type</i> • 20 = Standard motor module • 21 = Motor module with integrated NCT functionality • 22 = motor module EcoLine
bb	<i>Module variant</i> • 00 = straight • 01 = straight with connection cables for infeed • 02 = straight, with connector for infeed • 20 = 22.5° curved segment • 21 = 22.5° curved segment with connection cables for infeed • 25 = - 22.5° curved segment • 26 = - 22.5° curved segment with connection cables for infeed • 40 = 45.0° curved segment • 41 = 45.0° curved segment with connection cables for infeed • 50 = 180.0° curved segment, clothoid
0ccc	<i>Product length module</i> • 233 = 233 mm • 249 = 249 mm • 250 = 250 mm • 500 = 500 mm
000d	<i>Extended ordering option, except for standard motor modules</i> • 1 = with option for additional cooling*** • 2 = upper profile without holes • 3 = standard with UL-certified infeed*** • 4 = upper profile without holes, with UL-certified infeed*** • 5 = upper profile without holes, with option for additional cooling** • 6 = with lubrication channel****

\* The connector can be rotated on the name plate side by default. The connector with ordering option ZX2002-0001 can be rotated on the feedback side of the module.

\*\* Only available for motor modules AT2050-0500.

\*\*\* Only available for motor modules AT2001-0250, AT2021-0250, AT2026-0250 and AT2041-0250.

\*\*\*\* Only available for motor modules AT2000-0250.

## 3.4.2 Guide rails

AT 9abb-cccc-00dd	Explanation
AT	<i>Product area</i> <ul style="list-style-type: none"> <li>• AT = drive technology</li> </ul>
9a	<i>Product type</i> <ul style="list-style-type: none"> <li>• 0 = without lock</li> <li>• 1 = with lock</li> </ul>
bb	<i>Rail variants</i> <ul style="list-style-type: none"> <li>• 00 = straight</li> <li>• 20 = 22.5° curved segment</li> <li>• 25 = - 22.5° curved segment</li> <li>• 40 = 45.0° curved segment</li> <li>• 50 = 180.0° curved segment, clothoid</li> </ul>
cccc	<i>Product length rail</i> <ul style="list-style-type: none"> <li>• 0249 = 249 mm</li> <li>• 0250 = 250 mm</li> <li>• 0500 = 500 mm</li> <li>• 0750 = 750 mm</li> <li>...</li> <li>• 2250 = 2250 mm</li> <li>• 2500 = 2500 mm</li> </ul>
00dd	<i>Extended ordering option, except for standard guide rails</i> <ul style="list-style-type: none"> <li>• 0006 = for mounting on motor modules with lubrication channel AT2000-0250-0006</li> <li>• 0055 = when using 55 mm movers AT9014-0055-x550</li> <li>• 0070 = when using 70 mm movers AT9011-0070-x550</li> <li>• 0170 = when using 70 mm movers AT9014-0070-x550</li> </ul>



### 3.4.3 Mover

AT 901a-b0cc-en50	Explanation
AT	<i>Product area</i> • AT = drive technology
901	<i>Product type</i> • 901 = mover
a	<i>Roller variants</i> • 1 = mover, 6 rollers • 2 = mover, 12 rollers • 4 = mover, 6 rollers, 2 of which are spring-loaded
b	<i>Design</i> • 0 = standard • 1 = suitable for NCT electronics*
0cc	<i>Product length mover</i> • 50 = 50 mm** • 55 = 55 mm • 70 = 70 mm
d	<i>Magnetic plate set</i> • 0 = standard • 1 = mover 1
e	<i>Magnetic poles of the magnetic plate set</i> • 4 = 4 poles • 5 = 5 poles
50	<i>Length of the magnetic plate set</i> • 50 = 50 mm

\* The design suitable for NCT electronics is only available for movers with a product length of 70 mm with spring-loaded rollers

\*\* Only available until Q3/2022

### 3.4.4 NCT electronics

AT 8a00-bb00-0100	Explanation
AT	<i>Product area</i> • AT = drive technology
8a00	<i>Product type</i> • 2 = NCT electronics without mover • 3 = NCT electronics mounted on mover
bb00	<i>Mover type</i> • 10 = without mover • 11 = mover with magnetic plate set <i>Standard</i> • 12 = mover with magnetic plate set <i>Mover 1</i> • 20 = third-party movers

## 3.5 Product characteristics

<b>Permanent magnets</b>	The permanent magnets used are made of a hard magnetic material. The permanent magnets develop high forces even in small designs. They enable the precise and highly dynamic positioning of the movers.
<b>Scalable travel path</b>	The number of installed modules is variable. The length of the travel path can be adapted to any application.
<b>Rail system</b>	The best combination of several rail systems and movers can be selected for each application.
<b>Armature short circuit brake</b>	In the case of an emergency stop the movers can optionally be decelerated by means of an armature short-circuit.
<b>Integrated power electronics</b>	The entire power electronics is integrated in the modules. A 24 V <sub>DC</sub> control voltage and a 48 V <sub>DC</sub> load voltage are required to supply the modules.
<b>Software-based control</b>	The XTS is controlled by a software-based cascade control. The control loop structure is stored in the XTS drivers and is calculated cyclically on the control IPC. No additional drive software is required.
<b>Programming according to IEC 61131-3</b>	The standardized <i>Motion Control</i> function blocks according to the PLC Open standard <i>IEC 61131-3</i> are available for the programming of the XTS.

## 3.6 Components

A complete XTS system consists of:

- Motor modules
- Guide rails
- Movers

The individual components are defined by the type key and can be ordered separately or pre-configured as a kit for a complete system.

### 3.6.1 Motor modules



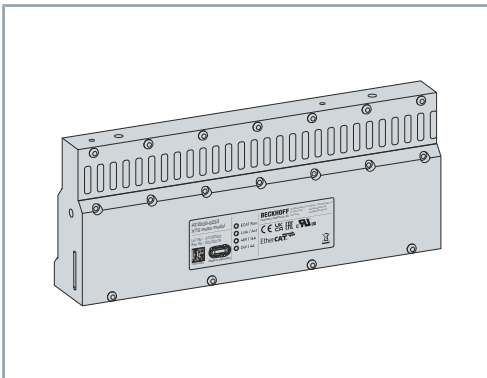
#### Use cables with a high number of bending cycles

For moving track sections, cables with a high number of bending cycles must be used. Beckhoff recommends the use of the following cables:

- ZK7A14-3155-Axxx
- ZK7A14-3031-Axxx

A system consists of individual motor modules that can be combined to form a complete drivetrain. The straight modules and the curved segments are each available in different versions.

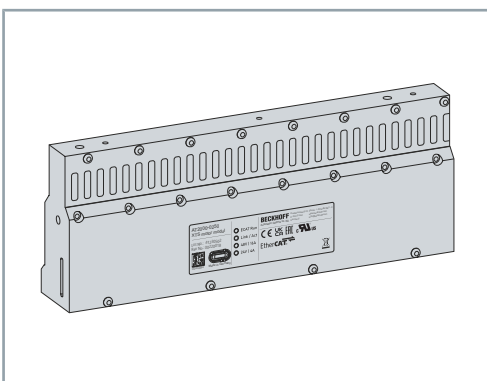
#### Straight, without infeed



#### AT2000-0233

The straight module *AT2000-0233* has a length of 233 mm and is suitable for building a straight track section. The shortened design enables individual track layouts.

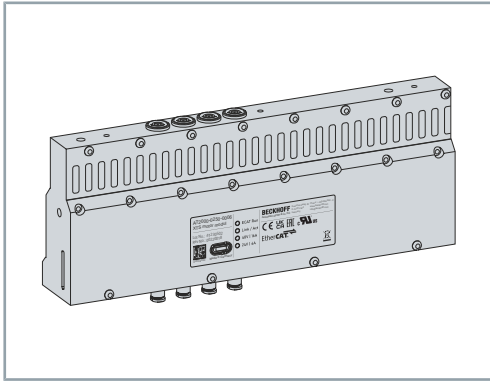
- UL-certified



#### AT2000-0250

The straight module *AT2000-0250* has a length of 250 mm and is suitable for building a straight track section.

- UL-certified



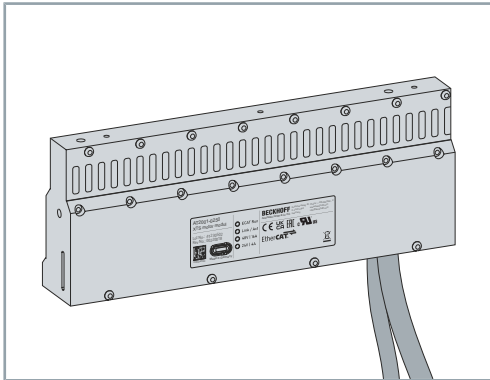
## AT2000-0250-0006

The straight module *AT2000-0250-0006* has a length of 250 mm and is suitable for building a straight track section.

In combination with the guide rail *AT9000-0250-0006* with lubrication channel and a grease pump, the guide rails and the rollers of the mover are automatically lubricated during operation.

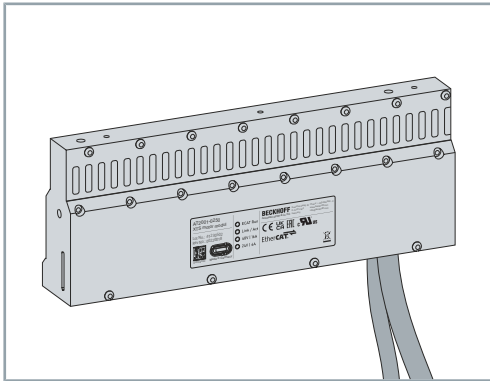
- UL-certified

## Straight, with connection cables for infeed



## AT2001-0250

The straight module *AT2001-0250* has a length of 250 mm and connection cables for infeed. It is suitable for building a straight track section.

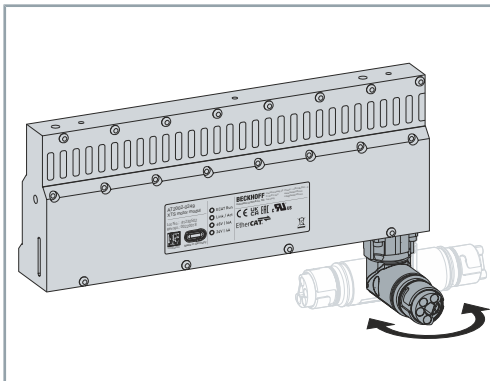


## AT2001-0250-0003

The straight module *AT2001-0250-0003* has a length of 250 mm and connection cables for infeed. It is suitable for building a straight track section.

- UL-certified

## Straight, with connector for infeed



## AT2002-0249

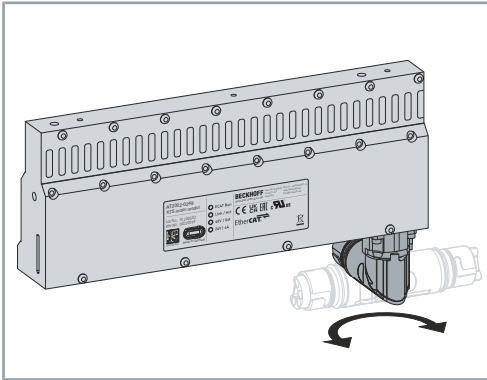
The straight module *AT2002-0249* has a length of 249 mm and a 180° rotatable connector for infeed. Cables with drag chain capability [+] in variable lengths can be connected to the connector. It is suitable for moving track sections.

- UL-certified

Direction of rotation of the connector:

- towards the name plate

Standard version without additional ordering option.



## AT2002-0249

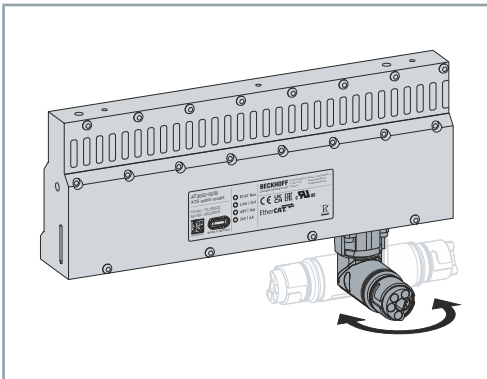
The straight module *AT2002-0249* has a length of 249 mm and a 180° rotatable connector for infeed. Cables with drag chain capability [+] in variable lengths can be connected to the connector. It is suitable for moving track sections

- UL-certified

Direction of rotation of the connector:

- towards the feedback system

Required ordering option: *ZX2002-0001*



## AT2002-0250

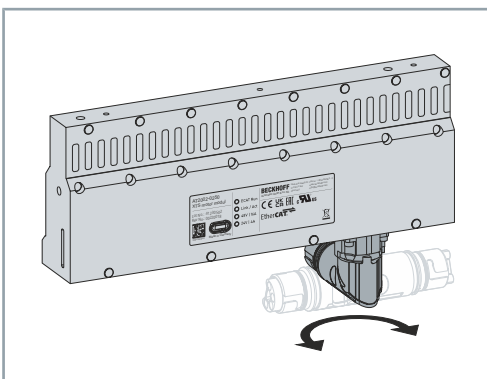
The straight module *AT2002-0250* has a length of 250 mm and a 180° rotatable connector for infeed. Cables with drag chain capability [+] in variable lengths can be connected to the connector.

- UL-certified

Direction of rotation of the connector:

- towards the name plate

Standard version without additional ordering option.



## AT2002-0250

The straight module *AT2002-0250* has a length of 250 mm and a 180° rotatable connector for infeed. Cables with drag chain capability [+] in variable lengths can be connected to the connector.

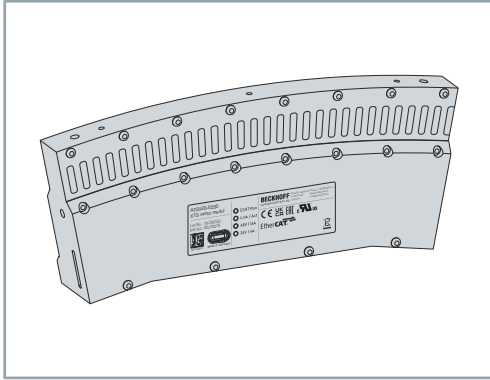
- UL-certified

Direction of rotation of the connector:

- towards the feedback system

Required ordering option: *ZX2002-0001*

## 22.5° curved segment, without infeed



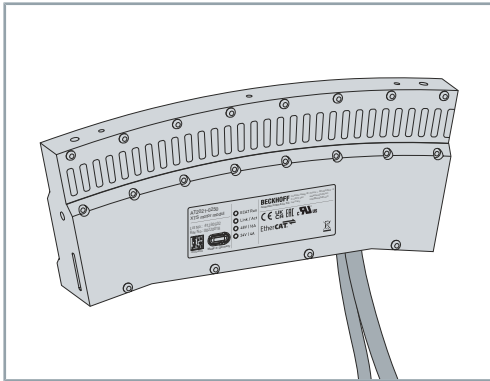
### AT2020-0250

The module AT2020-0250 has a length of 250 mm. It represents a +22.5° curved segment of a circle with a diameter of 1273 mm.

- UL-certified

It is not possible to install two 22.5° curved segments one behind the other.

## 22.5° curved segment, with connection cables for infeed



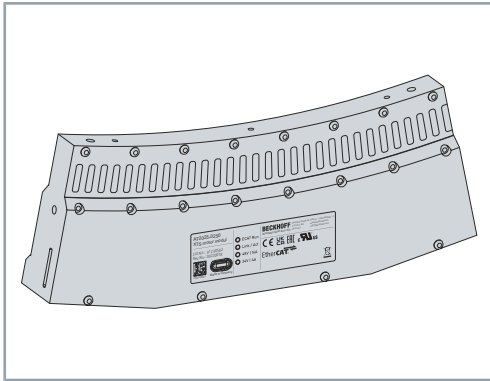
### AT2021-0250-0003

The module AT2021-0250-0003 has a length of 250 mm and an infeed. It represents a +22.5° curved segment of a circle with a diameter of 1273 mm.

- UL-certified

It is not possible to install two 22.5° curved segments one behind the other.

## -22.5° curved segment, without infeed



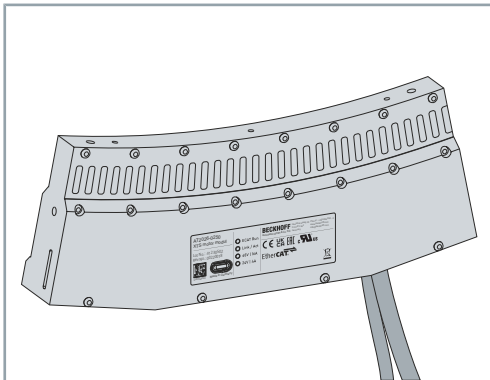
### AT2025-0250

The module AT2025-0250 has a length of 250 mm. It represents a -22.5° curved segment of a circle with a diameter of 1273 mm.

- UL-certified

It is not possible to install two 22.5° curved segments one behind the other.

## -22.5° curved segment, with connection cables for infeed



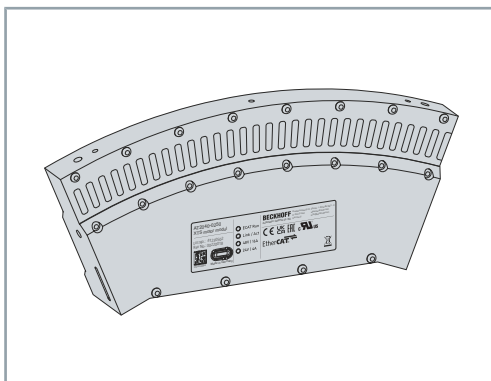
### AT2026-0250-0003

The module AT2026-0250 has a length of 250 mm and an infeed. It represents a -22.5° curved segment of a circle with a diameter of 1273 mm.

- UL-certified

It is not possible to install two 22.5° curved segments one behind the other.

## 45° curved segment, without infeed

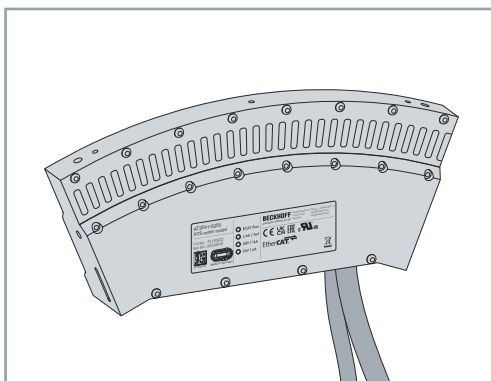


### AT2040-0250

The module AT2040-0250 has a length of 250 mm. It represents a +45° curved segment of a circle with a diameter of 637 mm.

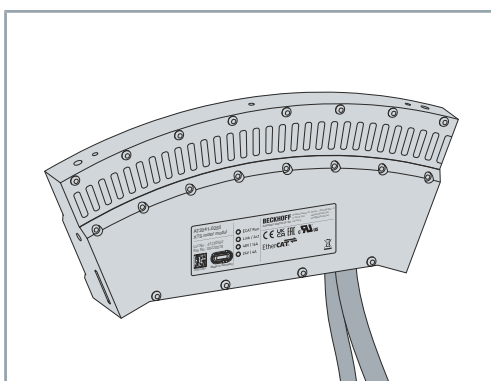
- UL-certified

## 45° curved segment, with connection cables for infeed



### AT2041-0250

The module AT2041-0250 has a length of 250 mm. It represents a +45° curved segment of a circle with a diameter of 637 mm.

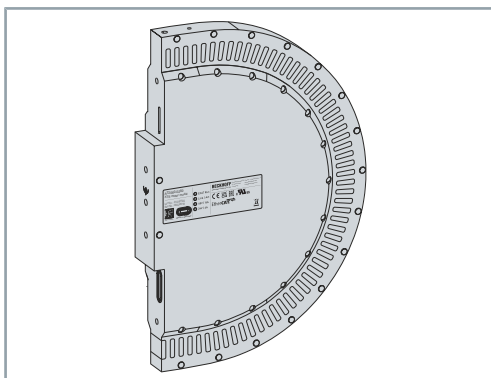


### AT2041-0250-0003

The module AT2041-0250-0003 has a length of 250 mm. It represents a +45° curved segment of a circle with a diameter of 637 mm.

- UL-certified

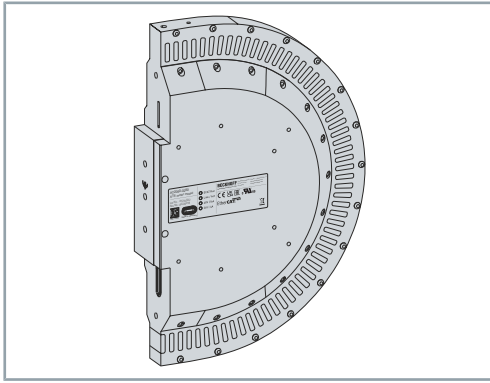
## 180° curved segment, without infeed



### AT2050-0500

The module AT2050-0500 has a length of 500 mm. It represents a 180° curved segment of a clothoid geometry.

- UL-certified



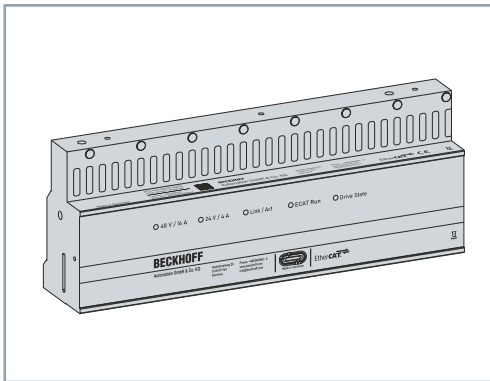
## AT2050-0500-0001

The module *AT2050-0500-0001* has a length of 500 mm and the option for additional cooling. It represents a 180° curved segment of a clothoid geometry.

- UL-certified

Cannot be combined with modules *AT210x-0250* with integrated NCT functionality.

## Straight, with integrated NCT functionality, without infeed

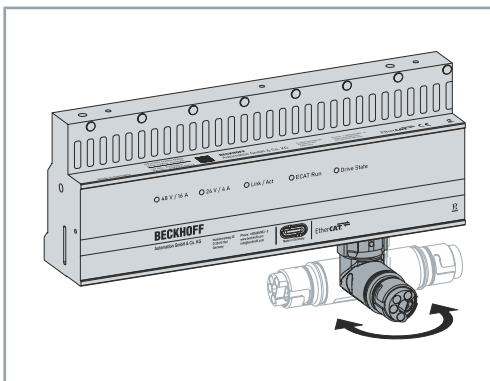


## AT2100-0250

The straight module *AT2100-0250* has a length of 250 mm and integrated NCT functionality.

Cannot be combined with 180° curved segments *AT2050-0500-0001* with option for additional cooling.

## Straight, with integrated NCT functionality, with connector for infeed



## AT2102-0250

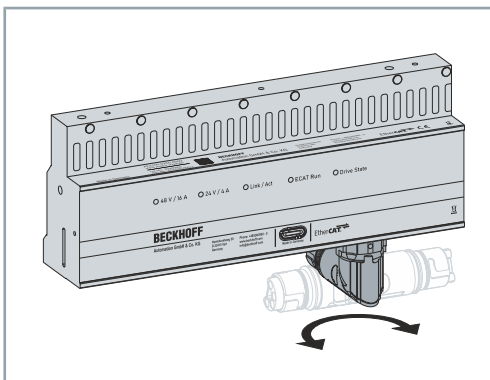
The straight module *AT2102-0250* has a length of 250 mm, integrated NCT functionality and a 180° rotatable connector. Cables with drag chain capability [+] in variable lengths can be connected to the connector.

Direction of rotation of the connector:

- towards the name plate

Standard version without additional ordering option.

Cannot be combined with 180° curved segments *AT2050-0500-0001* with option for additional cooling.



## AT2102-0250

The straight module *AT2102-0250* has a length of 250 mm, integrated NCT functionality and a 180° rotatable connector. Cables with drag chain capability [+] in variable lengths can be connected to the connector.

Direction of rotation of the connector:

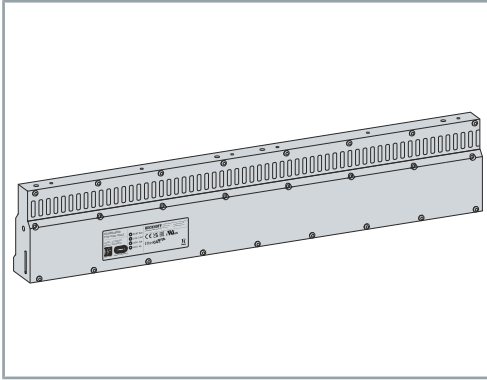
- towards the feedback system

Required ordering option: *ZX2002-0001*

Cannot be combined with 180° curved segments *AT2050-0500-0001* with option for additional cooling.



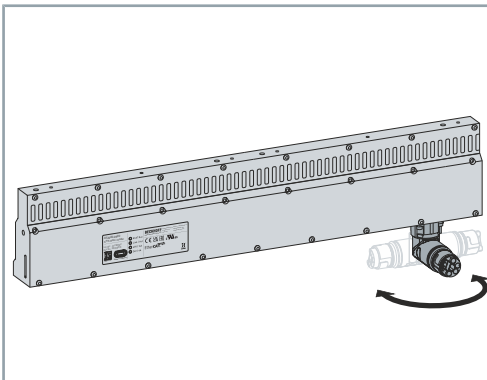
## Straight, EcoLine, without infeed



### AT2200-0500

The EcoLine AT2200-0500 straight module has a length of 500 mm and is suitable for building a straight track section.

## Straight, EcoLine, with plug connector for infeed



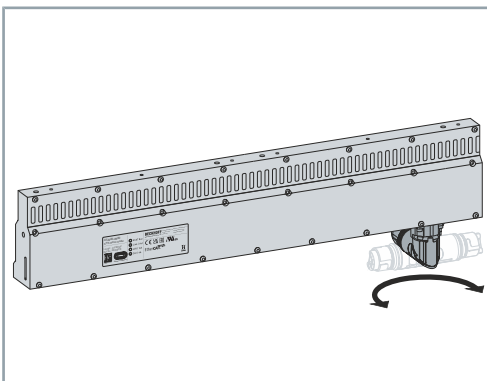
### AT2202-0500

The EcoLine AT2200-0500 straight module has a length of 500 mm and a 180° rotatable plug connector for infeed. Cables with drag-chain capability [+] in variable lengths can be connected to the connector.

Direction of rotation of the connector:

- towards the name plate

Standard version without additional ordering option.



### AT2202-0500

The straight module AT2200-0500 has a length of 500 mm and a 180° rotatable plug connector for infeed. Cables with drag-chain capability [+] in variable lengths can be connected to the connector.

Direction of rotation of the connector:

- towards the feedback system

Required ordering option: ZX2002-0001

## 3.6.2 Motor modules for parallel guide rails



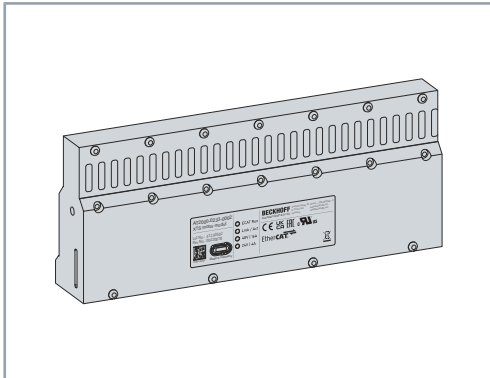
### Use cables with a high number of bending cycles

For moving track sections, cables with a high number of bending cycles must be used. Beckhoff recommends the use of the following cables:

- ZK7A14-3155-Axxx
- ZK7A14-3031-Axxx

A system with parallel guide rails consists of individual modules, which are combined to form a complete drivetrain. The straight modules and the curved segments are each available in different versions:

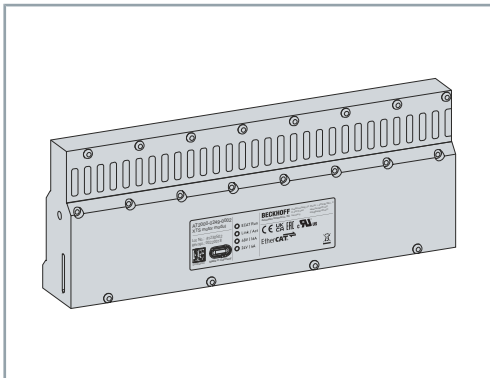
### Straight, without infeed



#### AT2000-0233-0002

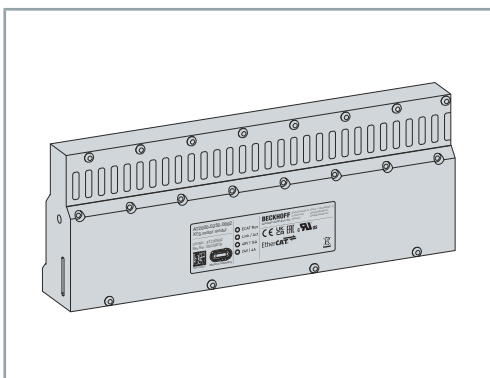
The straight module *AT2000-0233-0002* has a length of 233 mm and is suitable for building a straight track section. The shortened design enables individual track layouts.

- UL-certified



#### AT2000-0249-0002

The straight module *AT2000-0249-0002* has a length of 249 mm and is suitable for building a straight track section. The shortened design enables individual track layouts.

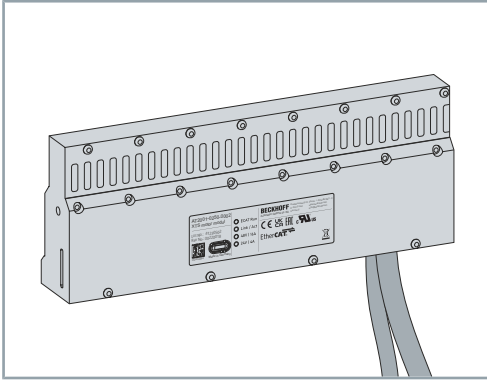


#### AT2000-0250-0002

The straight module *AT2000-0250-0002* has a length of 250 mm and is suitable for building a straight track section.

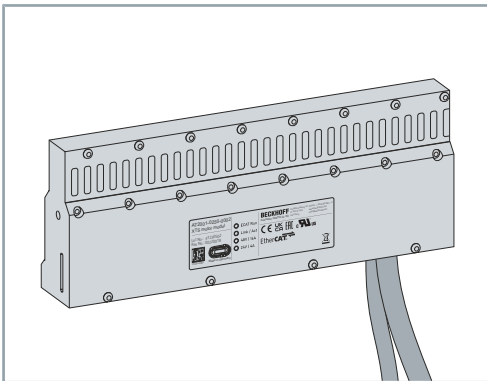
- UL-certified

## Straight, with connection cables for infeed



### AT2001-0250-0002

The straight module AT2001-0250-0002 has a length of 250 mm and connection cables for infeed. It is suitable for building a straight track section.

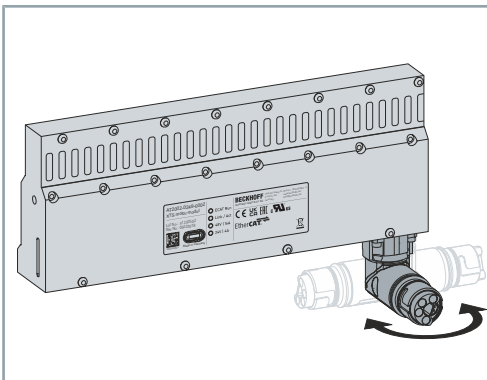


### AT2001-0250-0004

The straight module AT2001-0250-0004 has a length of 250 mm and connection cables for infeed. It is suitable for building a straight track section.

- UL-certified

## Straight, with connector for infeed



### AT2002-0249-0002

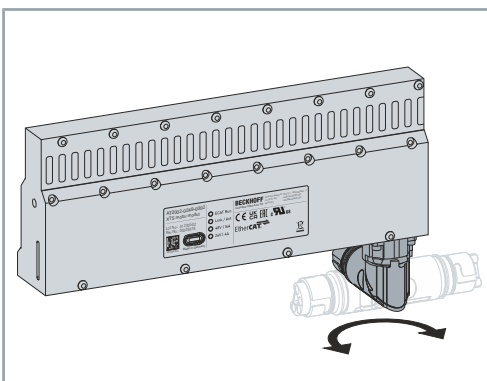
The straight module AT2002-0249-0002 has a length of 249 mm and a 180° rotatable connector for infeed. Cables with drag chain capability [+] in variable lengths can be connected to the connector. It is suitable for moving track sections.

- UL-certified

Direction of rotation of the connector:

- towards the name plate

Standard version without additional ordering option.



### AT2002-0249-0002

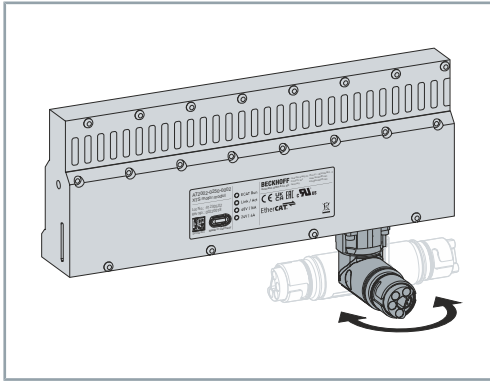
The straight module AT2002-0249-0002 has a length of 249 mm and a 180° rotatable connector for infeed. Cables with drag chain capability [+] in variable lengths can be connected to the connector. It is suitable for moving track sections.

- UL-certified

Direction of rotation of the connector:

- towards the feedback system

Required ordering option: ZX2002-0001



## AT2002-0250-0002

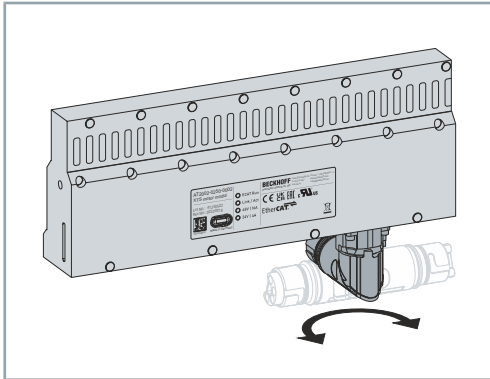
The straight module *AT2002-0250-0002* has a length of 250 mm and a 180° rotatable connector for infeed. Cables with drag chain capability [+] in variable lengths can be connected to the connector.

- UL-certified

Direction of rotation of the connector:

- towards the name plate

Standard version without additional ordering option.



## AT2002-0250-0002

The straight module *AT2002-0250-0002* has a length of 250 mm and a 180° rotatable connector for infeed. Cables with drag chain capability [+] in variable lengths can be connected to the connector.

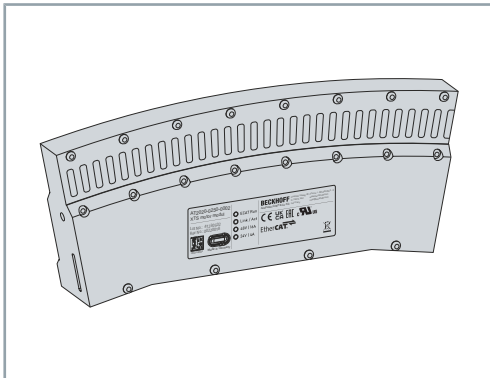
- UL-certified

Direction of rotation of the connector:

- towards the feedback system

Required ordering option: *ZX2002-0001*

## 22.5° curved segment, without infeed

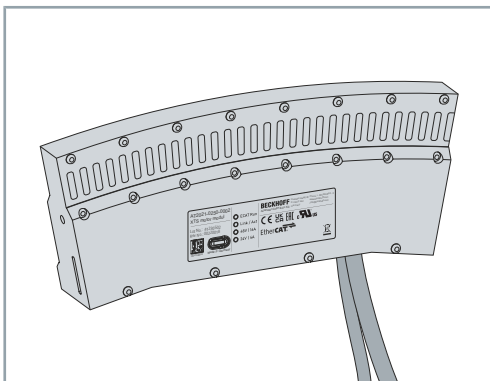


## AT2020-0250-0002

The module *AT2020-0250-0002* has a length of 250 mm. It represents a +22.5° curved segment of a circle with a diameter of 1273 mm.

- UL-certified

## 22.5° curved segment, with connection cables for infeed

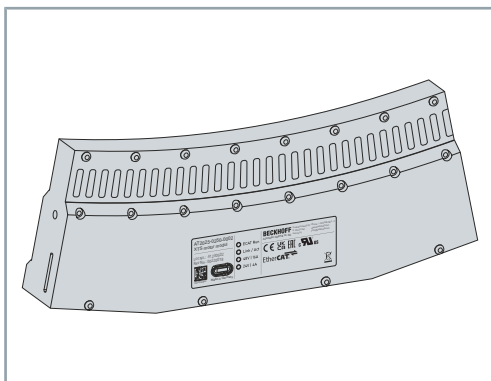


## AT2021-0250-0004

The module *AT2021-0250-0004* has a length of 250 mm and an in-feed. It represents a +22.5° curved segment of a circle with a diameter of 1273 mm.

- UL-certified

## -22.5° curved segment, without infeed

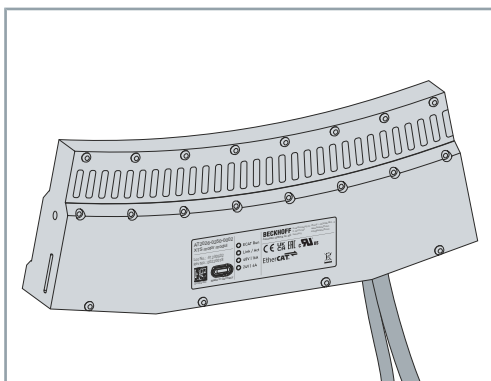


### AT2025-0250-0002

The module AT2025-0250-0002 has a length of 250 mm. It represents a -22.5° curved segment of a circle with a diameter of 1273 mm.

- UL-certified

## -22.5° curved segment, with connection cables for infeed

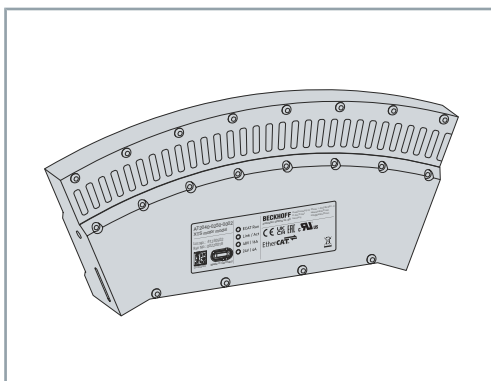


### AT2026-0250-0004

The module AT2026-0250-0004 has a length of 250 mm and an infeed. It represents a -22.5° curved segment of a circle with a diameter of 1273 mm.

- UL-certified

## 45° curved segment, without infeed

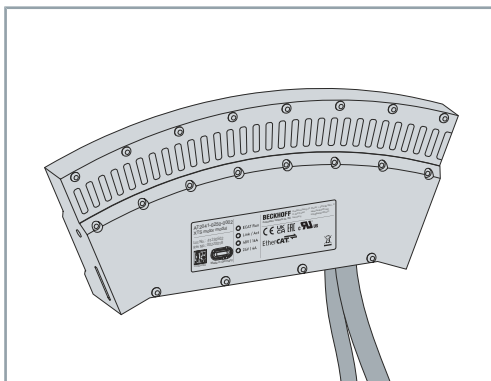


### AT2040-0250-0002

The module AT2040-0250-0002 has a length of 250 mm. It represents a +45° curved segment of a circle with a diameter of 637 mm.

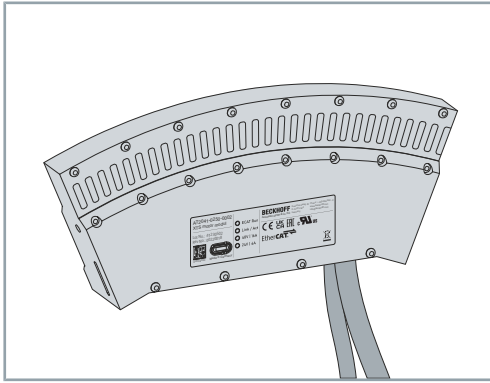
- UL-certified

## 45° curved segment, with connection cables for infeed



### AT2041-0250-0002

The module AT2041-0250-0002 has a length of 250 mm. It represents a +45° curved segment of a circle with a diameter of 637 mm.

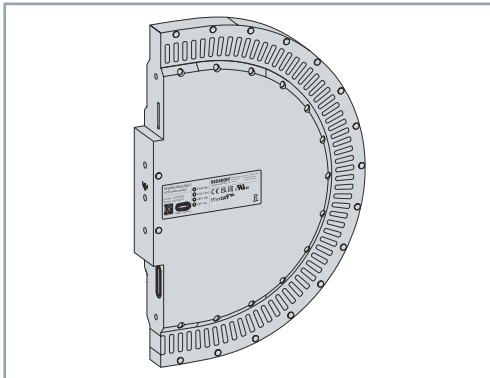


## AT2041-0250-0004

The module *AT2041-0250-0004* has a length of 250 mm. It represents a +45° curved segment of a circle with a diameter of 637 mm.

- UL-certified

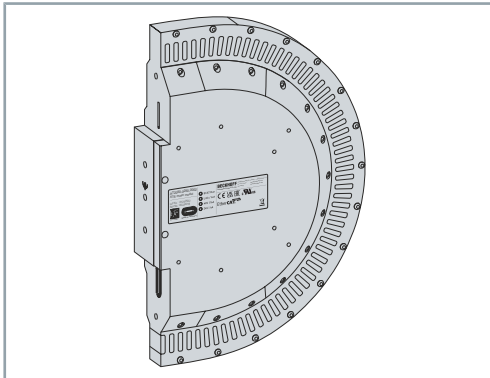
## 180° curved segment, without infeed



## AT2050-0500-0002

The module *AT2050-0500-0002* has a length of 500 mm. It represents a 180° curved segment of a clothoid geometry.

- UL-certified



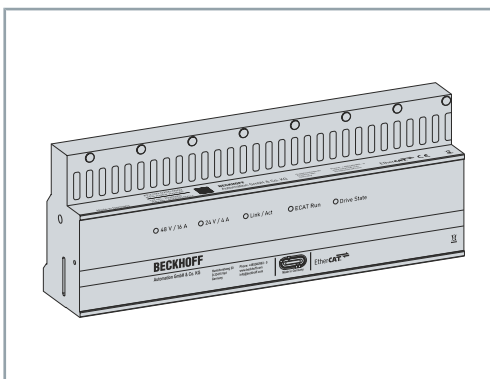
## AT2050-0500-0005

The module *AT2050-0500-0005* has a length of 500 mm and the option for additional cooling. It represents a 180° curved segment of a clothoid geometry.

- UL-certified

Cannot be combined with modules *AT210x-0250-0002* with integrated NCT functionality.

## Straight, with integrated NCT functionality, without infeed

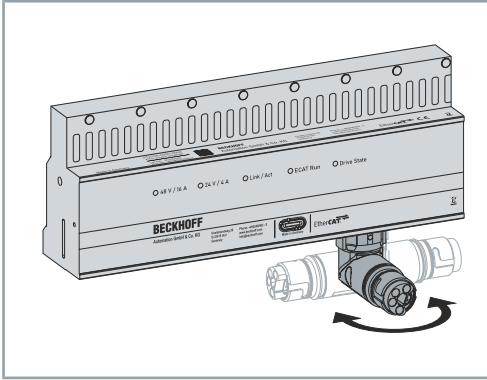


## AT2100-0250-0002

The straight module *AT2100-0250-0002* has a length of 250 mm and integrated NCT functionality.

Cannot be combined with 180° curved segments *AT2050-0500-0005* with option for additional cooling.

## Straight, with integrated NCT functionality, with connector for infeed



### AT2102-0250-0002

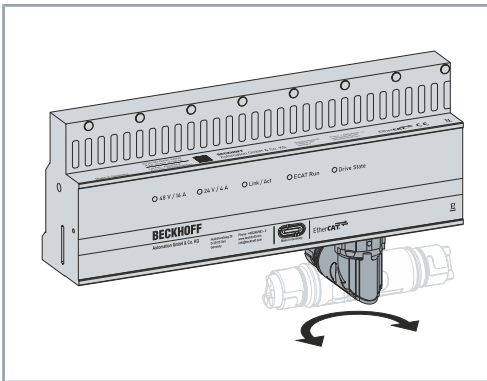
The straight module AT2102-0250-0002 has a length of 250 mm, integrated NCT functionality and a 180° rotatable connector. Cables with drag chain capability [+] in variable lengths can be connected to the connector.

Direction of rotation of the connector:

- towards the name plate

Standard version without additional ordering option.

Cannot be combined with 180° curved segments AT2050-0500-0005 with option for additional cooling.



### AT2102-0250-0002

The straight module AT2102-0250-0002 has a length of 250 mm, integrated NCT functionality and a 180° rotatable connector. Cables with drag chain capability [+] in variable lengths can be connected to the connector.

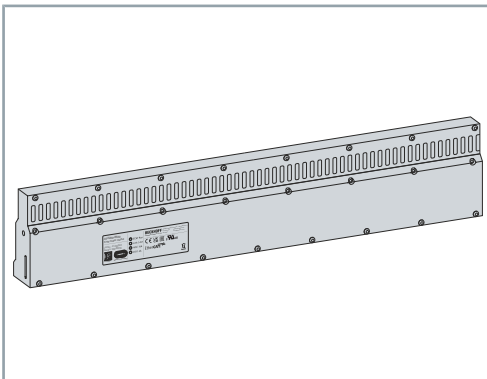
Direction of rotation of the connector:

- towards the feedback system

Required ordering option: ZX2002-0001

Cannot be combined with 180° curved segments AT2050-0500-0005 with option for additional cooling.

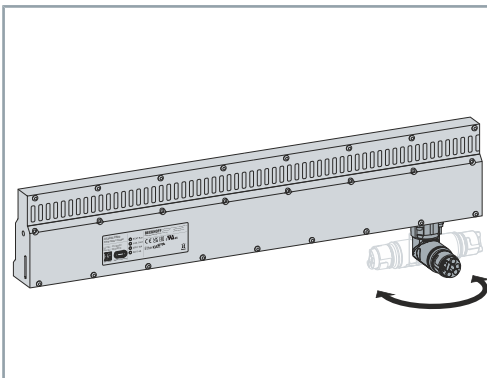
## Straight, EcoLine, without infeed



### AT2200-0500-0002

The EcoLine AT2200-0500-0002 straight module has a length of 500 mm and is suitable for building a straight track section.

## Straight, EcoLine, with plug connector for infeed



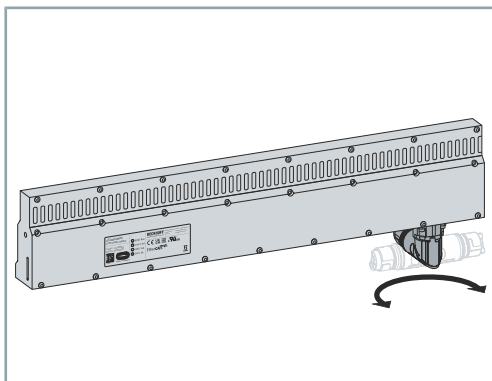
### AT2202-0500-0002

The EcoLine AT2200-0500-0002 straight module has a length of 500 mm and a 180° rotatable plug connector for infeed. Cables with drag-chain capability [+] in variable lengths can be connected to the connector. It is suitable for moving track sections.

Direction of rotation of the connector:

- towards the name plate

Standard version without additional ordering option.



## **AT2202-0500-0002**

The EcoLine AT2200-0500-0002 straight module has a length of 500 mm and a 180° rotatable plug connector for infeed. Cables with drag-chain capability [+] in variable lengths can be connected to the connector.

Direction of rotation of the connector:

- towards the feedback system

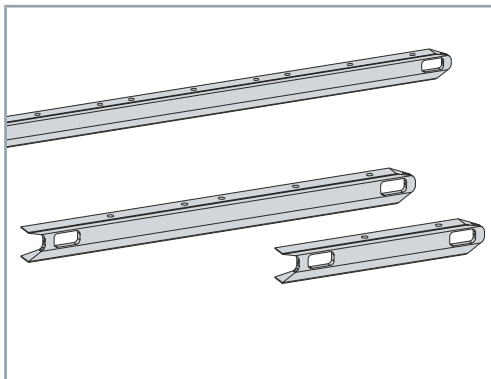
Required ordering option: ZX2002-0001



### 3.6.3 Guide rails

In addition to the motor modules you need a rail system, which consists of various guide rails. The guide rails for mounting on the modules are available in different versions:

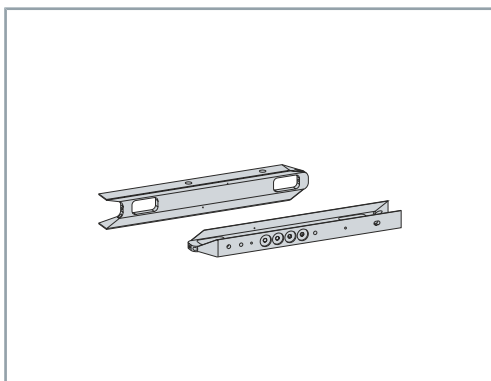
#### Straight, without lock



##### **AT9000-xxxx**

Straight guide rails without lock are available in eleven lengths:

- 249 mm
- 250 mm
- 500 mm
- 750 mm
- ...
- 2250 mm
- 2500 mm

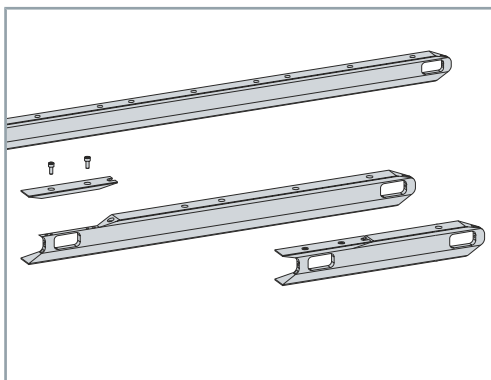


##### **AT9000-0250-0006**

The straight guide rail is only available in 250 mm lengths. An opening in each running surface enables even lubrication of all running surfaces and movers.

This guide rail was specially designed for motor modules with lubrication channel *AT2000-0250-0006*.

#### Straight, with lock

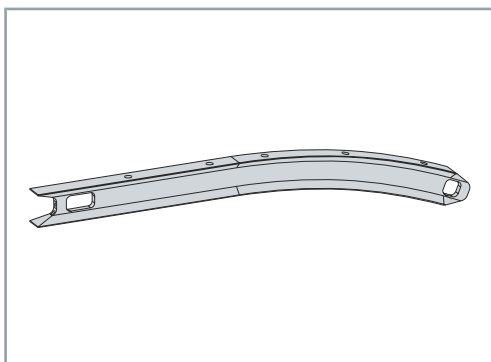


##### **AT9100-xxxx**

Straight guide rails with lock are available in ten lengths:

- 250 mm
- 500 mm
- 750 mm
- ...
- 2250 mm
- 2500 mm

#### 22.5° curved segment

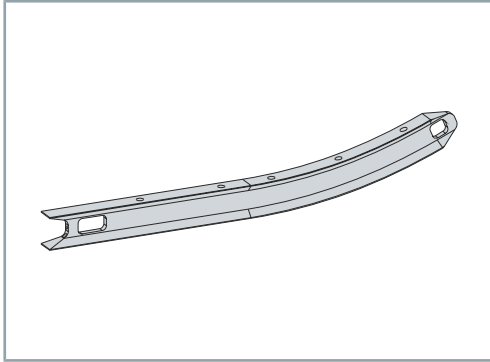


##### **AT9020-1250-0xxx**

The guide rail *AT9020-1250-0xxx* is available with a +22.5° angle.

The assembly of this rail is possible with a combination of a straight module with a 22.5° curved segment *AT2020-0250* or *AT2021-0250*.

## -22.5° curved segment

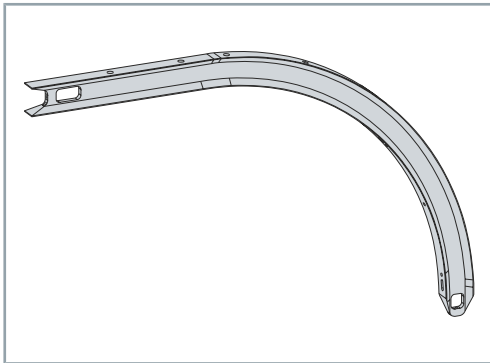


### **AT9025-1466-0xxx**

The guide rail *AT9025-1466-0xxx* is available with a -22.5° angle.

The assembly of this rail is possible with a combination of a straight module with a -22.5° curved segment *AT2025-0250* or *AT2026-0250*.

## 45° curved segment, 90° curve

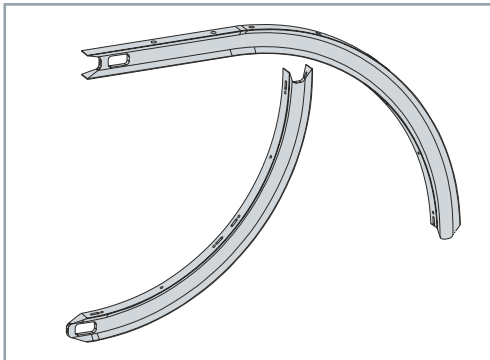


### **AT9040-0750-00xx**

The guide rail *AT9040-0750-00xx* is suitable for the combination of a straight module with two consecutive 45° curved segments *AT2041-0250*.

A 90° angle can be realized with this guide rail set.

## 45° curved segment, 180° curve set

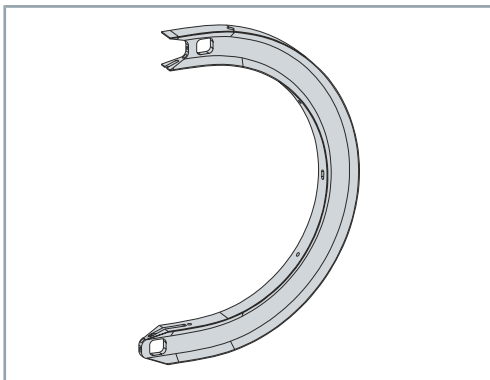


### **AT9040-1250-0070**

The guide rail *AT9040-1250-00xx* is suitable for the combination of a straight module with four consecutive 45° curved segments *AT2041-0250*.

A 180° angle can be realized with this guide rail set.

## 180° curved segment, without lock

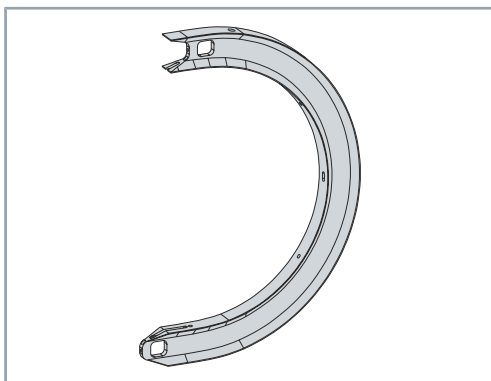


### **AT9050-0500**

The guide rail *AT9050-0500* enables a tight 180° curve and is available to match the motor module *AT2050-0500*.

This guide rail has been specially designed for the movers *AT9011-0050* and *AT9012-0050*.

180° curved segment, without lock

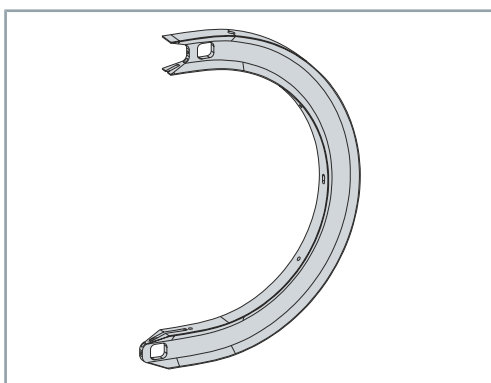


## **AT9050-0500-0055**

The guide rail *AT9050-0500-0055* enables a tight 180° curve and is available to match the motor module *AT2050-0500*.

This guide rail was specially designed for the mover *AT9014-0055-x550* with 2 spring-loaded rollers.

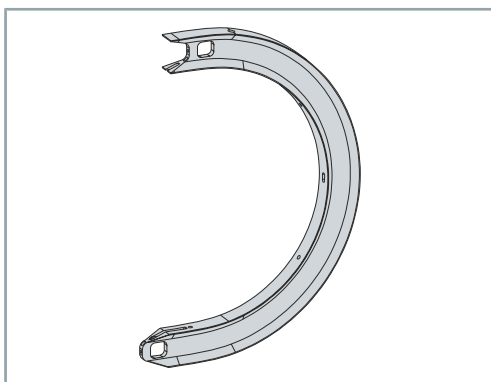
180° curved segment, without lock



## **AT9050-0500-0070**

The guide rail *AT9050-0500-0070* enables a tight 180° curve and is available to match the motor module *AT2050-0500*.

180° curved segment, without lock



## **AT9050-0500-0170**

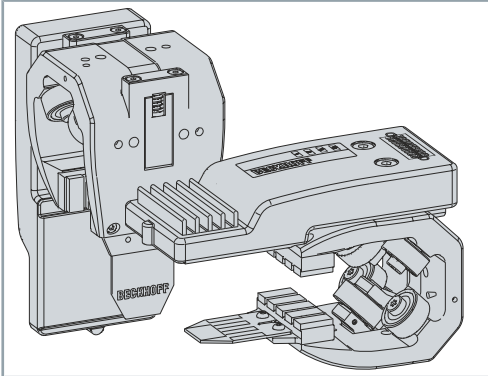
The guide rail *AT9050-0500-0170* enables a tight 180° curve and is available to match the motor module *AT2050-0500*.

This guide rail was specially designed for the mover *AT9014-0070-x550* with 2 spring-loaded rollers.

## 3.6.4 Mover

The movers are mounted on the guide rails and are available in the following variants:

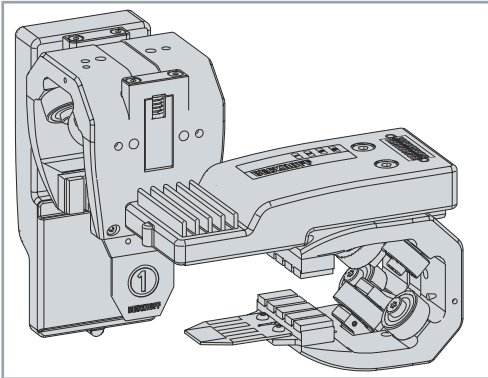
### Mover, length 70 mm, with mounted NCT electronics



#### **AT8300-1100-0100**

The mover *AT8300-1100-0100* with a length of 70 mm has mounted NCT electronics and has four guide rollers and two spring-loaded guide rollers.

The magnetic plate set *AT9001-0550* is mounted

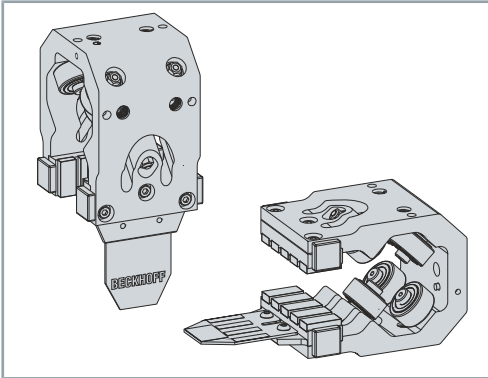


#### **AT8300-1200-0100**

The mover *AT8300-1200-0100* with a length of 70 mm has mounted NCT electronics and has four guide rollers and two spring-loaded guide rollers.

The magnetic plate set *AT9001-1550* is mounted

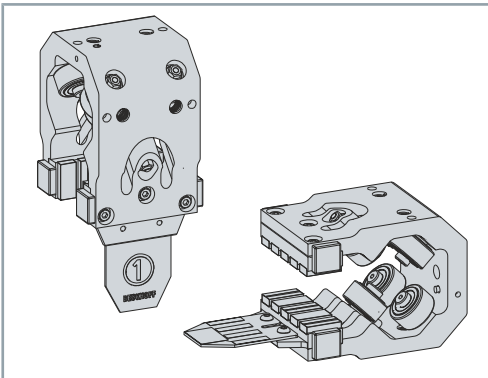
### Mover, length 50 mm



#### **AT9011-0050-0550**

The mover *AT9011-0050-0550* with a length of 50 mm has six guide rollers.

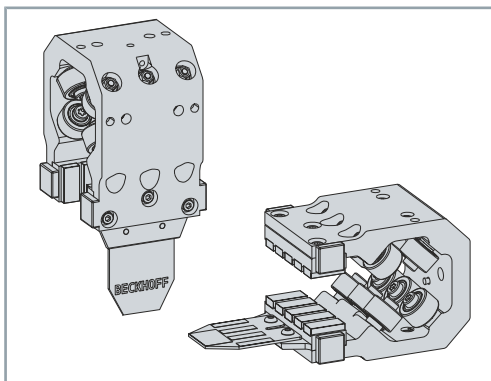
The magnetic plate set *AT9001-0550* is mounted.



#### **AT9011-0050-1550**

The mover *AT9011-0050-1550* with a length of 50 mm has six guide rollers.

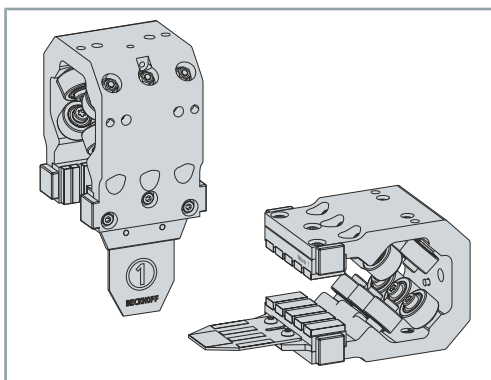
The magnetic plate set *AT9001-1550* is mounted.



## **AT9012-0050-0550**

The mover *AT9012-0050-0550* with a length of 50 mm has twelve guide rollers.

The magnetic plate set *AT9001-0550* is mounted.

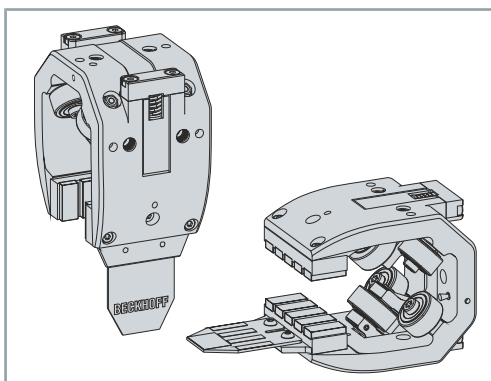


## **AT9012-0050-1550**

The mover *AT9012-0050-1550* with a length of 50 mm has twelve guide rollers.

The magnetic plate set *AT9001-1550* is mounted.

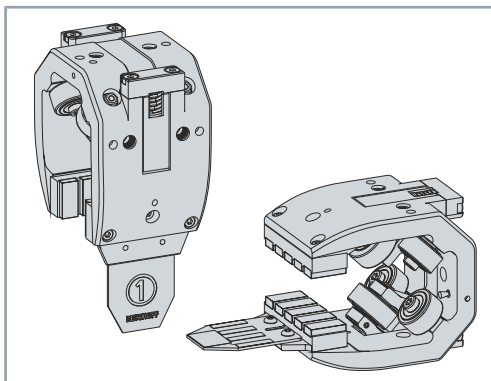
## Mover, length 55 mm



## **AT9014-0055-0550**

The mover *AT9014-0055-0550* with a length of 55 mm has four guide rollers and two spring-loaded guide rollers.

The magnetic plate set *AT9001-0550* is mounted.

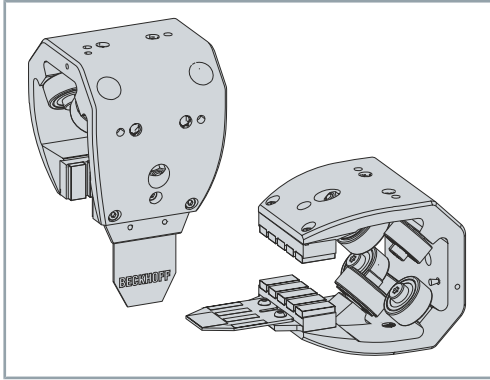


## **AT9014-0055-1550**

The mover *AT9014-0055-1550* with a length of 55 mm has four guide rollers and two spring-loaded guide rollers.

The magnetic plate set *AT9001-1550* is mounted.

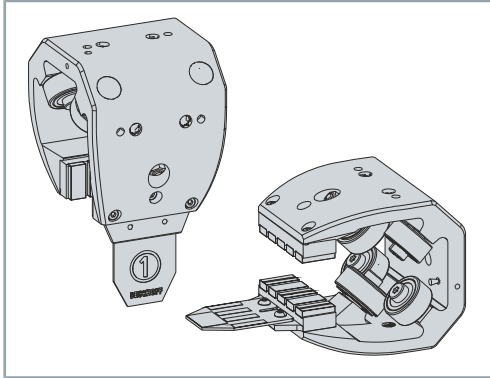
## Mover, length 70 mm



### **AT9011-0070-0550**

The mover *AT9011-0070-0550* with a length of 70 mm has six guide rollers.

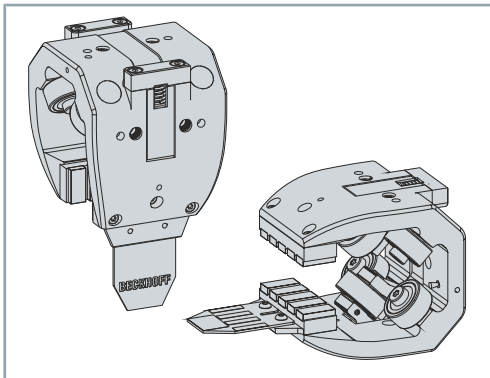
The magnetic plate set *AT9001-0550* is mounted.



### **AT9011-0070-1550**

The mover *AT9011-0070-1550* with a length of 70 mm has six guide rollers.

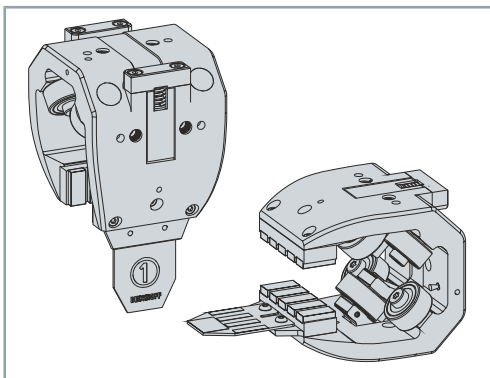
The magnetic plate set *AT9001-1550* is mounted.



### **AT9014-0070-0550**

The mover *AT9014-0070-0550* with a length of 70 mm has four guide rollers and two spring-loaded guide rollers.

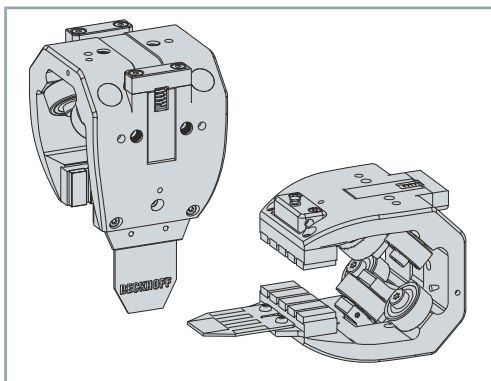
The magnetic plate set *AT9001-0550* is mounted.



### **AT9014-0070-1550**

The mover *AT9014-0070-1550* with a length of 70 mm has four guide rollers and two spring-loaded guide rollers.

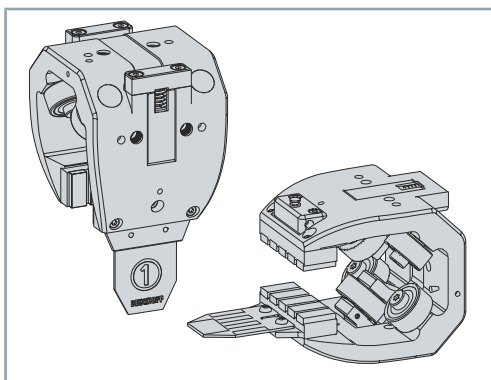
The magnetic plate set *AT9001-1550* is mounted.



## **AT9014-1070-0550**

The mover *AT9014-1070-0550* with a length of 70 mm is suitable for mounting the NCT electronics *AT8200-1000-0100* [+] and has four guide rollers and two spring-loaded guide rollers.

The magnetic plate set *AT9001-0550* is mounted.

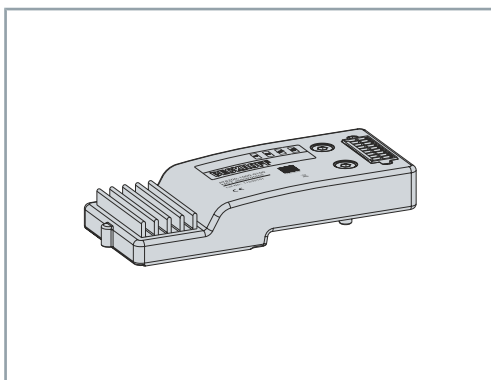


## **AT9014-1070-1550**

The mover *AT9014-1070-1550* with a length of 70 mm is suitable for mounting the NCT electronics *AT8200-1000-0100* [+] and has four guide rollers and two spring-loaded guide rollers.

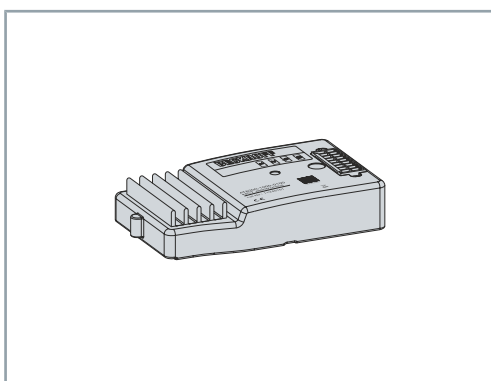
The magnetic plate set *AT9001-1550* is mounted.

## 3.6.5 NCT electronics



### **AT8200-1000-0100**

The NCT electronics are suitable for mounting on the mover *AT9014-1070-x550*.



### **AT8200-2000-0100**

The NCT electronics are suitable for mounting on third-party movers.

## 3.7 Special geometries

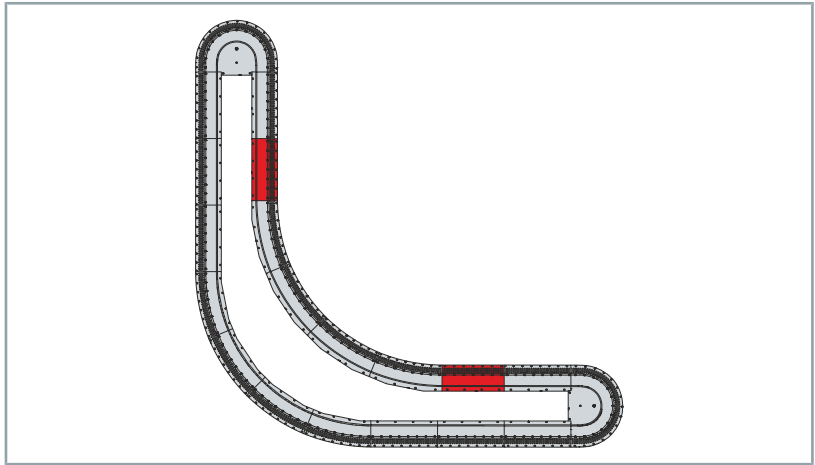
Special geometries can be realized with the XTS system by using the 233 mm and 249 mm long motor modules. Systems with moving sections can be configured in the shape of an L, U, O or Z by combining curved segments with different radii and straight modules with different lengths. In this way, the travel path of the movers can be adapted more flexibly to the existing system.

For applications with moving sections or questions about other possible arrangements, please contact the product specialist responsible for your region or Beckhoff Support:

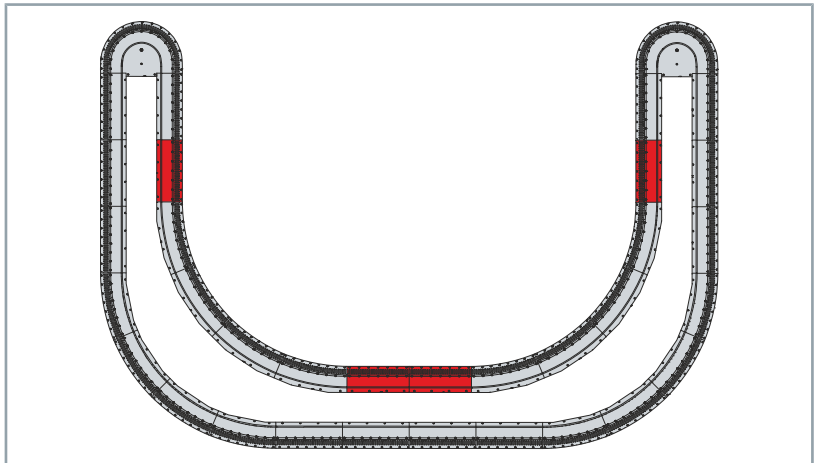
✉ [support@beckhoff.com](mailto:support@beckhoff.com)

The following figures show possible configurations of the 233 mm long modules. The positions of the 233 mm modules are marked in red.

### L shape

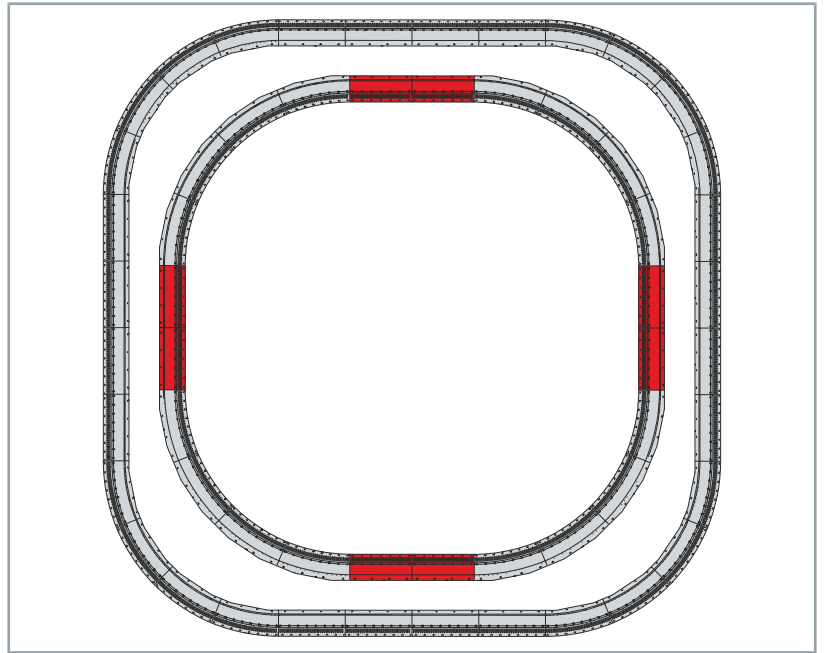


### U shape

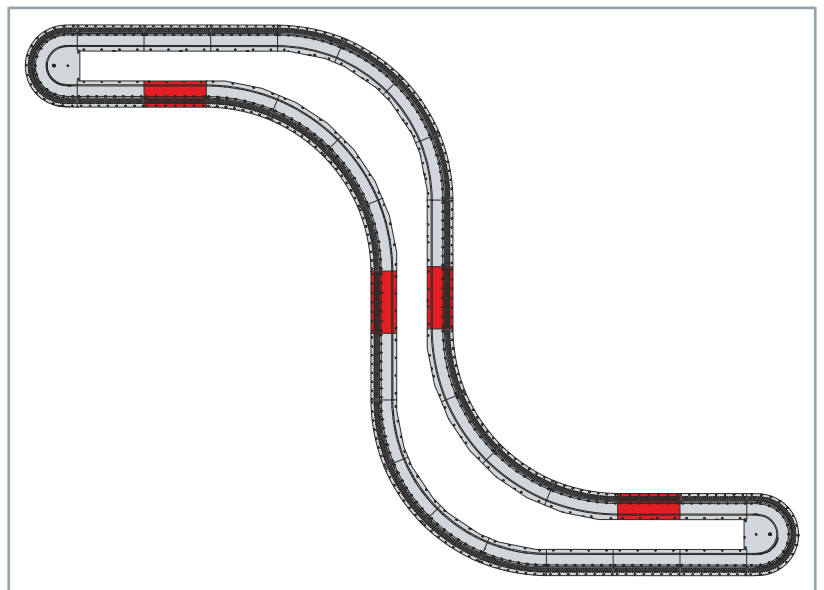




## O shape



## Z shape



## 3.8 Track Management



XTS Track Management is part of the XTS software package *TF5850 | TwinCAT 3 XTS*.

With *XTS Track Management*, track sections and the movers on them can be exchanged between different XTS systems. An XTS setup can thus be divided into individual, spatially separated track sections. The motor modules and movers retain their full functionality at all times, so that even the moving track sections remain fully usable sections.

XTS Tracks

An XTS Track is a route that can be used by movers and consists of one or more parts. A part can also occur more than once in a particular track or be inserted in several different tracks.

XTS Parts

An XTS part is a contiguous track section into which all motor modules are divided when configuring a system. The smallest possible track section is a motor module. Normally, a part consists of one in-feed line, but multiple supplies within a part are also possible.

Further information can be found in the manual *TF5850 | TwinCAT 3 XTS*:



[Direct link to the documentation TF5850 | TwinCAT 3 XTS](#)

### 3.8.1 Requirements

To implement XTS Track Management, you need at least one motor module *AT2002-0249* with a connector for infeed in addition to several motor modules to enable an air gap between the modules for the moving track section. In addition, one or more *AT901x-0070* movers and a suitable mechanical system for the moving track section, such as a spindle axis or linear motor, are required.

Mover



#### **Only use 70 mm movers**

Only movers with a length of 70 mm may be used for XTS Track Management.

The following Beckhoff movers are approved for XTS Track Management:

- AT9011-0070
- AT9014-x070

Further information can be found in chapter "Mover", [Page 50].

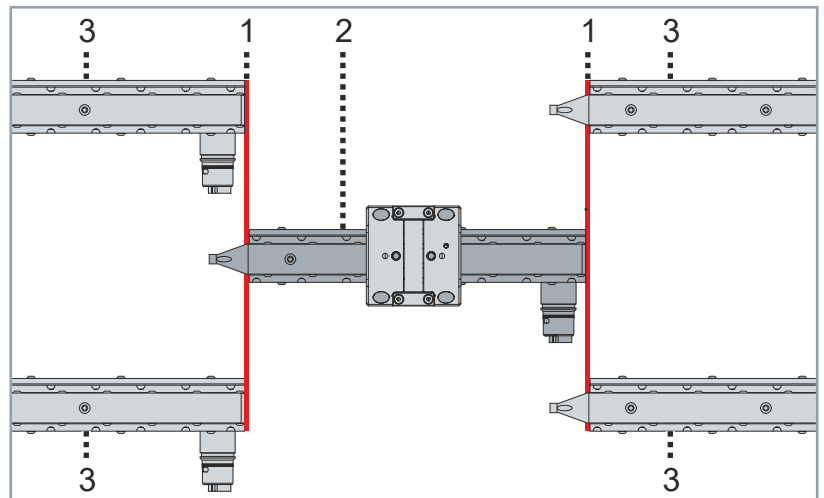
Modules

In order to be able to implement the required air gap for moving a track section, at least one motor module with *AT2002-0249* connector is required.

Further information can be found in chapter "Motor modules", [Page 33] and "Straight modules with connector", [Page 167].

## Air gap

A track section cannot be moved without an air gap between the motor modules of a fixed and a moving section.

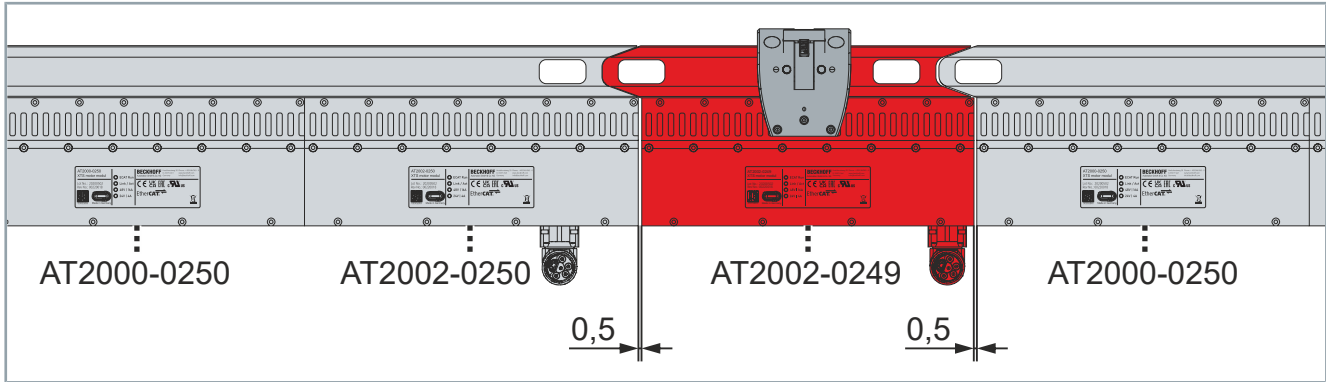


An air gap [1] on both sides between moving track sections [2] and fixed track sections [3] is required. The nominal air gap is 1.0 mm and must not be larger than 3.0 mm.

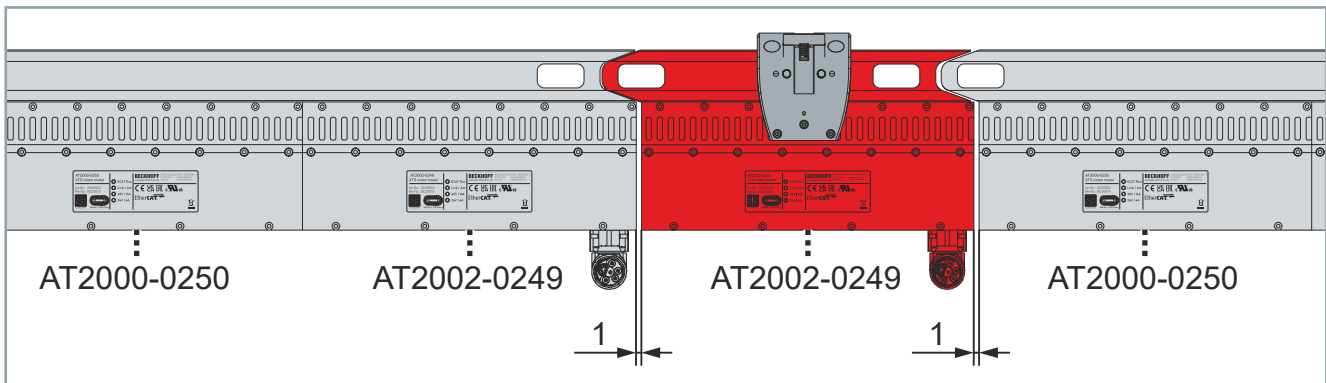
The encoder system is extended so that a continuous position of the mover is defined in the air gap between the modules.

# Product overview

## Examples of the air gap

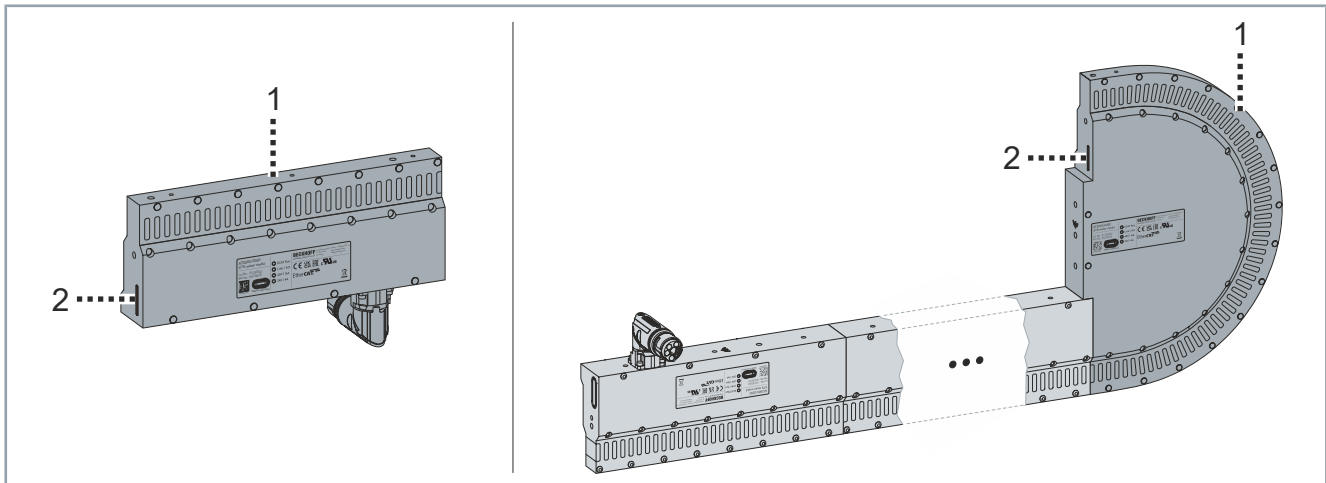


When using a motor module AT2002-0249 with connector for a moving track section, the air gap is 0.5 mm on both sides.



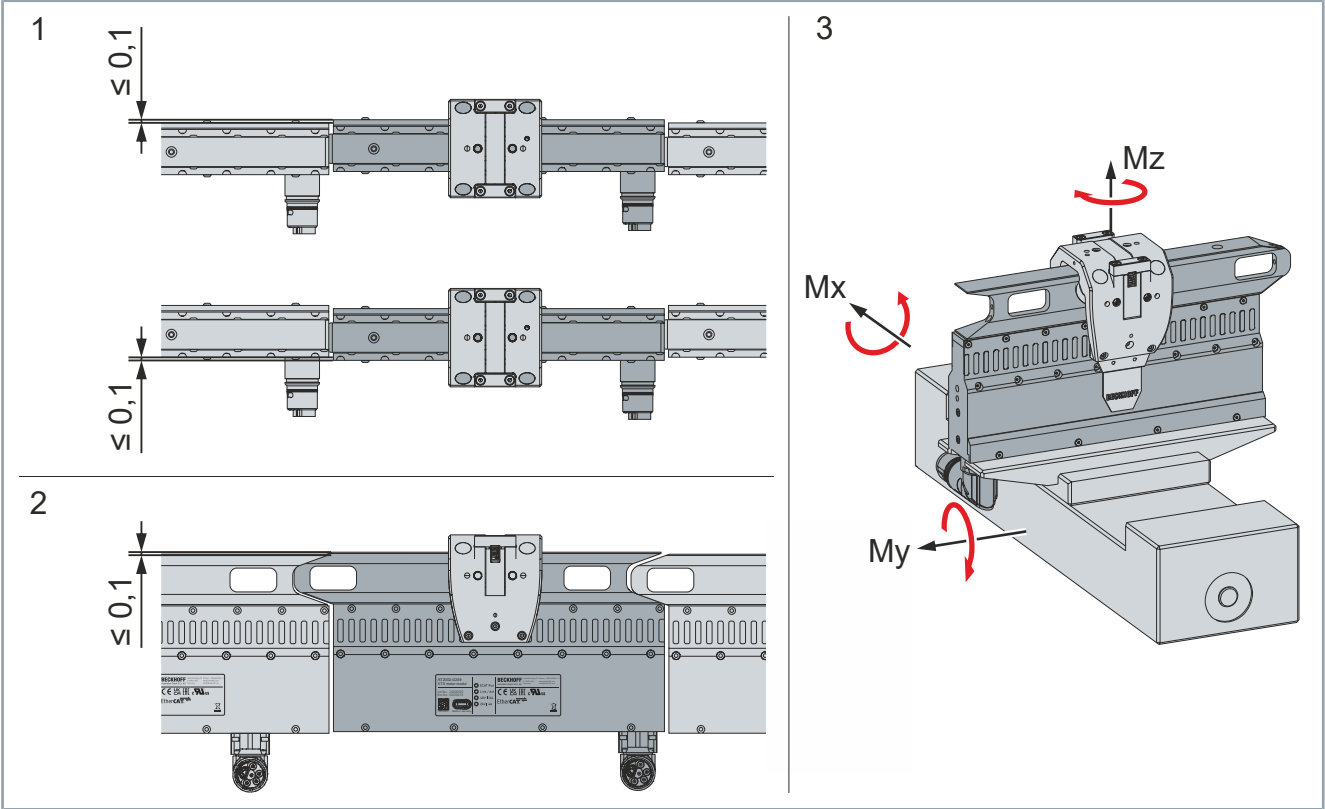
When using two motor modules AT2002-0249 with connector for a moving section, the air gap on both sides is 1 mm.

## End plugs



An end plug [2] must be inserted into the last module [1] of an infeed line to prevent the ingress of dust and liquids. Further information can be found in chapter "Last module of an infeed line", [Page 165].

3.8.2 Technical data



Position	Explanation
1	Lateral offset to the direction of travel [mm]
2	Height offset to direction of travel [mm]
3	Torques of the linear axes [Nm]

Offset to direction of travel* [mm]	
Lateral	$\leq 0.1$
In height	$\leq 0.1$

\* When using a Beckhoff guide rail

Maximum linear axis torque* [Nm]	
X-axis Mx	50
Y-axis My	15
Z-axis Mz	10
Drive axis	6

\* When using a Beckhoff guide rail

Air gap in the direction of travel [mm]	
Minimum	0.5
Nominal value	1
Maximum	3

## 3.8.3 Application examples

*XTS Track Management* can be used for the following applications, for example:

- Input and removal of movers without interrupting the product flow
- Product buffer through the arrangement of several track sections above one another
- Secondary product flow: work stations can be passed through several times without changing direction using a closed travel path

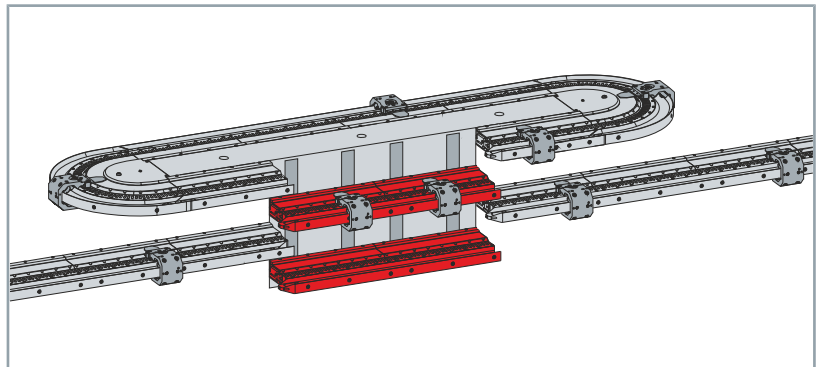
### NOTICE

#### Avoid damage

Do not change the position of moving track sections if movers are located in the transition area between fixed and moving track sections.

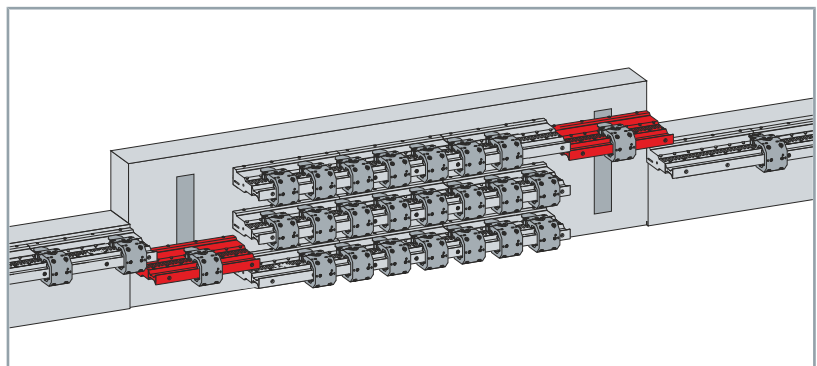
*If movers are located in the transition area between fixed and moving track sections, damage to movers and motor modules may result.*

#### Input and output of movers



Moving a track section allows movers to be inserted and removed from the primary production process, as well as more time-intensive processing operations in a second production process.

#### Product buffer



Track sections arranged on top of each other, in combination with two moving track sections, allow for a product buffer within the system.

### 3.9 NCT | No Cable Technology



The XTS function extension with No Cable Technology is part of the XTS software package *TF5850* | *TwinCAT 3 XTS*.

Special motor modules with NCT functionality provide a contactless, continuous power supply and synchronous real-time data transmission to the movers with NCT electronics installed, enabling the integration of sensors and actuators on the movers. Events can be triggered with high precision throughout the system.

The installation of electric motor-driven grippers, electric magnetic cylinders or vacuum suction units enables a mover to pick up, place, transfer, align and stack products.

#### **Motor module with integrated NCT functionality**

The hardware required for the transmission technology is fully integrated into the motor module, so that the existing functionalities and compact design are retained. No additional connections or supply lines are required. The module can be integrated into an infeed line with a connector card and positioned in the track section as required.

#### **Mover with NCT electronics fitted**

The NCT electronics enable the integration of sensors and actuators on the movers with digital inputs and outputs, analog inputs and PWM outputs. All functions can be controlled centrally with TwinCAT.

Further information can be found in the manual *TF5850* | *TwinCAT 3 XTS*:



[Direct link to the documentation TF5850 | TwinCAT 3 XTS](#)

## 3.9.1 Requirements

For NCT, you need at least one motor module with integrated NCT functionality and a mover with NCT electronics installed to enable data transmission between the motor module and the mover. A suitable tool is also required on the mover.

### Modules

#### NOTICE

**Do not combine 180° curved segments with option for additional cooling and modules with NCT functionality**

Modules with NCT functionality and movers with NCT electronics must not be used together with 180° curved segments with the option for additional cooling.

*If you use movers with NCT electronics and 180° curved segments with option for additional cooling, the modules, movers and NCT electronics will be damaged.*

- Do not mount 180° curved segments with option for additional cooling and modules with NCT functionality together in one system.

At least one motor module with integrated NCT functionality *AT210x-0250* is required to be able to actively carry out processes on the movers.

Further information can be found in chapter "Curved segments", [Page 176], "Motor modules", [Page 33] and "Straight modules with connector", [Page 167].

### Mover

The following Beckhoff movers are approved for NCT:

- AT8300-1x00
- AT9014-1070 with mounted NCT electronics *AT8200-1000-0100*

Further information can be found in chapter "Mover", [Page 50].

### NCT electronics

At least one mover with NCT electronics mounted is required to actively perform processes on the movers:

- AT8300-1x00-0100
- AT8200-1000-0100 mounted on mover *AT9014-1070-x550*

Further information can be found in chapter "NCT electronics", [Page 53] and "Mover", [Page 50].

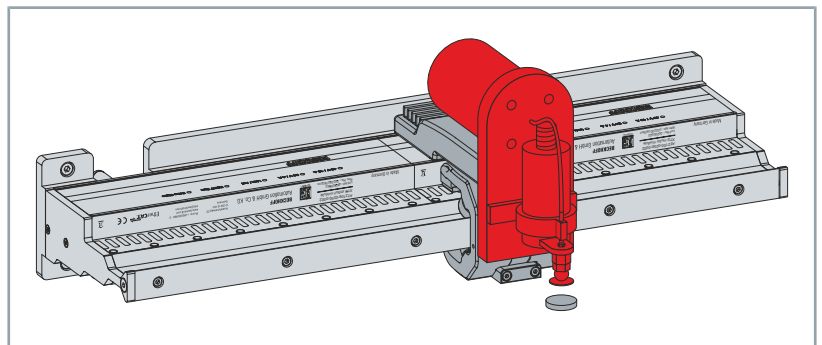


### 3.9.2 Application examples

NCT can be used for the following applications, for example:

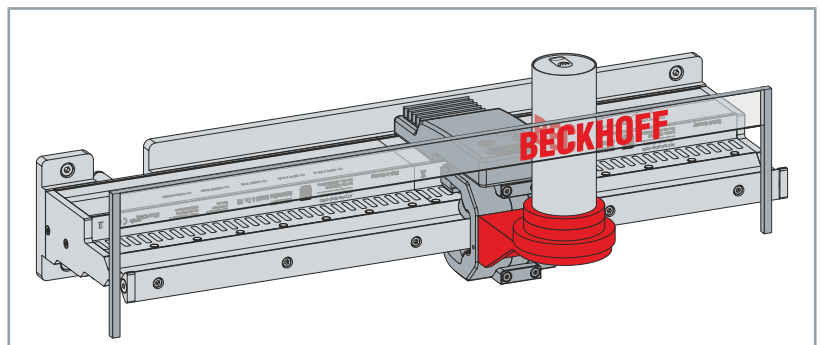
- Aligning, picking up, placing and processing products
- Sorting out faulty products with the help of mounted sliders
- Weight determination, measurement and condition monitoring of products
- Digital printing using mounted print heads on the movers
- Rotation and mixing of products
- Temperature control of products during transportation
- Monitored and controlled dosing processes

#### Picking up and placing products



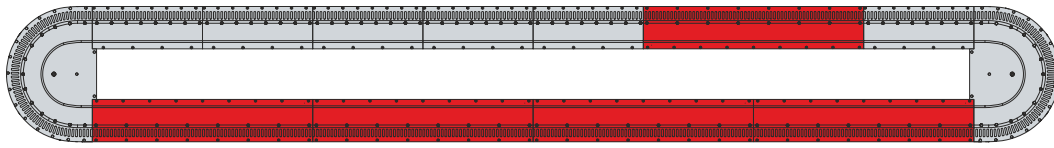
Mounting a vacuum suction unit on the mover enables a product to be picked up and placed.

#### Rotation of products



The mounting of a turning device enables the product to be mixed, precisely aligned and lettering to be applied to the product.

### 3.10 EcoLine motor module



The EcoLine *AT2200-0500* and *AT2202-0500* motor modules are compatible with the high-precision standard motor modules and motor modules with integrated NCT functionality. In this way, the EcoLine motor modules can be used in a sophisticated system for pure transport sections without process stations.

#### 3.10.1 Requirements

To use the EcoLine *AT220x-0500* motor modules in your system, you need a section with a length of at least 500 mm. The EcoLine *AT2200-0500* and *AT2202-0500* motor modules are suitable for processes with lower accuracy and peak force requirements. The minimum product distance is currently limited to 70 mm.

#### Modules

The EcoLine motor modules can be combined with all Beckhoff motor modules.



#### **Note the requirements for *No Cable Technology***

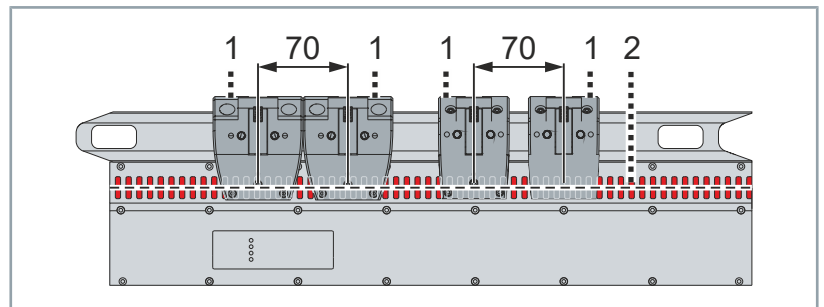
If you use modules with integrated NCT electronics, you must observe the requirements for *No Cable Technology*. Further information can be found in chapter "NCT | No Cable Technology", [Page 61].

## Mover

The following Beckhoff movers are approved for EcoLine motor modules:

- AT8300-1x00-0100
- AT9011-0050-x550
- AT9011-0070-x550
- AT9012-0050-x550
- AT9014-0055-x550
- AT9014-x070-x550

A 5-pin magnetic plate set AT9001-x550 or a 7-pin magnetic plate set AT9001-x775 must be fitted to the mover.



The distance between two movers [1] must be 70 mm on straight EcoLine modules, regardless of the mover type. The distance is measured at the center of the coils [2].



#### Note the requirements for *No Cable Technology*

If you are using movers with NCT electronics fitted, you must observe the requirements for *No Cable Technology*. Further information can be found in chapter "NCT | No Cable Technology", [Page 61].

### 3.10.2 Application examples

EcoLine motor modules can be used for the following applications, for example:

- Processes that require neither a small product distance nor high accuracy
- Pure transport sections without process stations

## 3.11 Motor module with lubrication channel

The guide rails and rollers of the mover must be lubricated regularly to increase the service life of the rollers on the mover. Automatic lubrication reduces the system's maintenance requirements. There is no need to dismantle the system for lubrication and the corresponding downtimes are eliminated. Lubrication control with *TwinCAT* enables precise adjustment and monitoring of the lubricant quantity and interval.



### Required accessories [ + ]

- EtherCAT Terminal *EL2042*
- EtherCAT Terminal *EL1002*



### Recommended purchased parts

- Grease pump *BEKA MAX PICO* with four built-in pump elements *PE-10*
- Lubricant line, outer diameter 4 mm
- Lubricant:
  - *TotalEnergies Nevastane XS 80*, density 0.9 mg/mm<sup>3</sup>
- Push-in fittings *Festo QSM M5-4-I*
- Machine bed with recesses for connecting the lubricant lines to the push-in fittings

### 3.11.1 Number of lubrication points



#### Lubrication point consisting of a motor module with lubrication channel and corresponding guide rail

One motor module with lubrication channel *AT2000-0250-0006* and one guide rail *AT9000-0250-0006* are required for each lubrication point.

### NOTICE

#### Even distribution of the lubrication points

The lubrication points of the entire track must be evenly distributed every three meters.



#### Round up decimal places

The decimal places of the result must be rounded up to the nearest integer.

The number of lubrication points depends on the length of the track and can be calculated as follows:

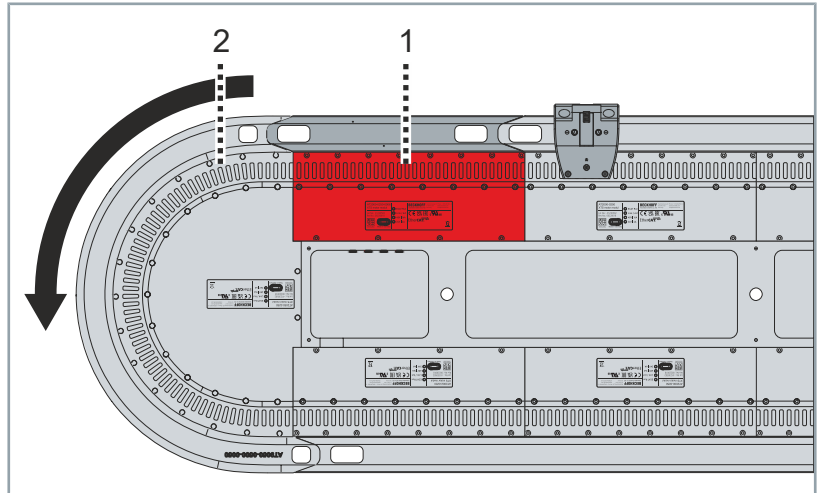
$$\frac{\text{Length of the Track in m}}{3 \text{ m}} = \text{Number of lubrication ports}$$

For more information, please contact the product specialist responsible for your region or Beckhoff Support:

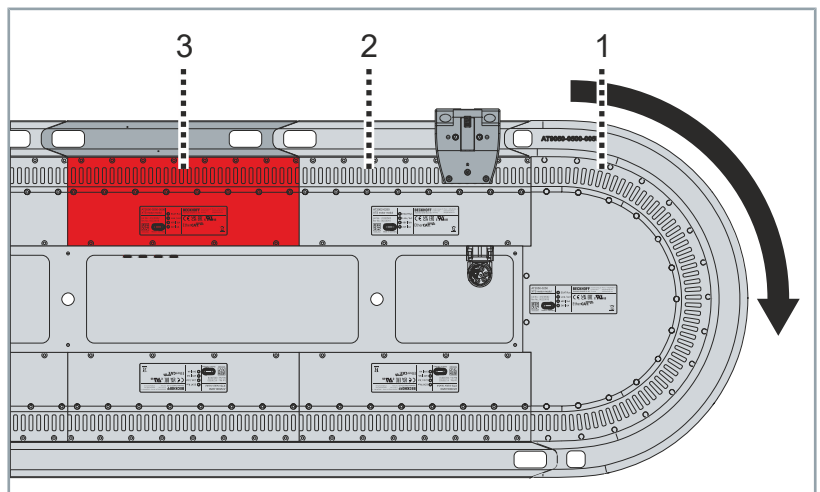
✉ [support@beckhoff.com](mailto:support@beckhoff.com)

### 3.11.2 Position of the lubrication points

Beckhoff recommends that the lubrication points be positioned as close as possible to a curved segment in order to provide sufficient lubricant to the curved segments. The positioning of the lubrication points is therefore dependent on the direction of travel of the movers.



The motor module with lubrication channel AT2000-0250-0006 [1] should be mounted directly in front of a curved segment [2].



If a motor module with infeed [2] is already installed in front of the curved segment [1], the motor module with lubrication channel [3] can also be installed as a second module before the mover enters the curve.

## 3.11.3 Lubricant

### NOTICE

#### Only use approved lubricants

The automatic lubrication system may only be used with lubricants approved by Beckhoff. The use of other lubricants can cause unexpected faults and invalidate the warranty.

### NOTICE

#### Avoid damage caused by the use of non-permitted lubricants

The components can be damaged by the use of non-permitted lubricants.

*Non-permitted lubricants can damage the components and significantly reduce the service life of the components.*



#### Permitted lubricants

- TotalEnergies Nevastane XS 80, density 0.9 mg/mm<sup>3</sup>

## Quantity

### NOTICE

#### Avoid contact corrosion on the guide rail

Too little lubricant on the guide rail can lead to contact corrosion and damage to the guide rails and the guide rollers of the movers. Automatic lubrication can prevent contact corrosion and damage to the guide rails and guide rollers of the movers.

*Ensure that there is sufficient lubricant on the guide rails and the guide rollers of the movers.*

The quantity of lubricant can be calculated as follows:

$$\frac{\text{Number of Movers}}{15} \times \frac{250 \text{ mm}^3}{75 \text{ km}} \times \text{Lubrication interval [km]} = \text{Quantity of lubricant}$$

Beckhoff recommends dividing the required amount of lubricant into several, shorter intervals to ensure a more even distribution of the lubricant. The quantity of lubricant depends on your application and the ambient conditions. If necessary, the quantity of lubricant must be adjusted.

For more information, please contact the product specialist responsible for your region or Beckhoff Support:

✉ [support@beckhoff.com](mailto:support@beckhoff.com)

### 3.11.4 Intervals



#### Intervals

- $\leq 200$  km

Lubrication is required after 200 km maximum to prevent damage to the guide rails and guide rollers of the movers.

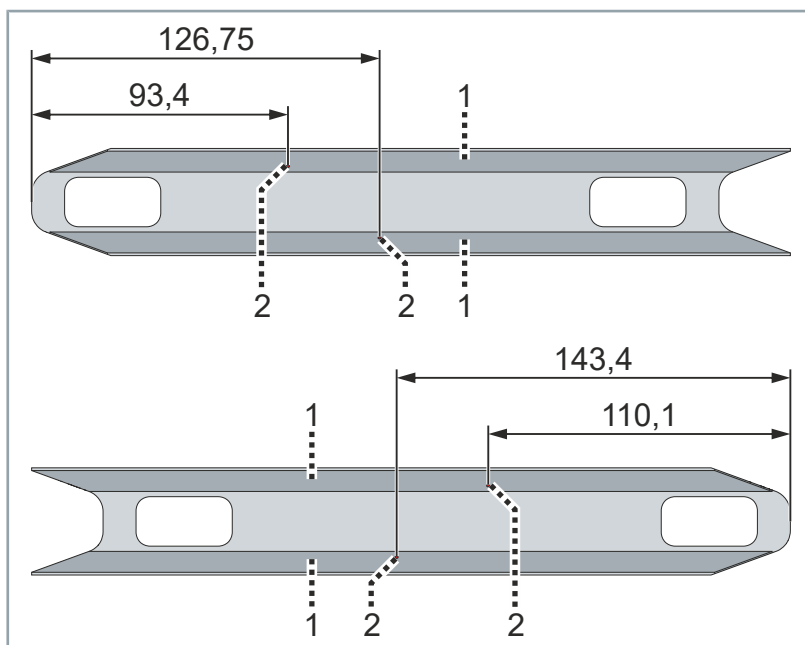
Beckhoff recommends dividing the required amount of lubricant into several, shorter intervals to ensure a more even distribution of the lubricant.

### 3.11.5 Guide rail

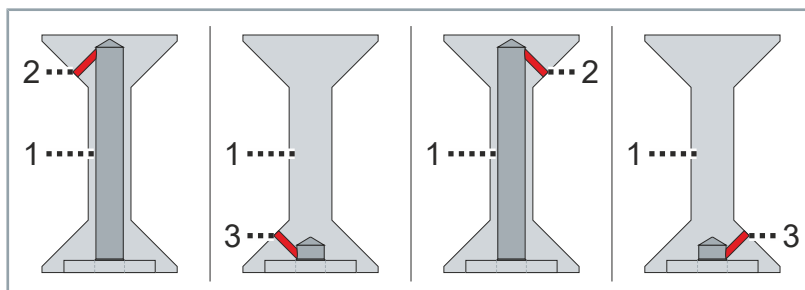


#### Special guide rail for the motor module with lubrication channel

The short guide rail *AT9000-0250-0006* must be mounted on a motor module with lubrication channel *AT2000-0250-0006*, as only this has lubrication channels and recesses for the threaded sockets of the module.

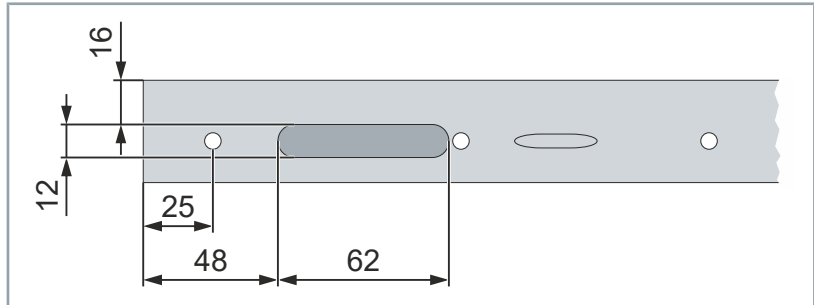


There is an opening [2] in each running surface [1] of the guide rail *AT9000-0250-0006* for the lubricant to escape.



The lubricant is guided on both sides through the guide rail to the upper running surface [2] and to the lower running surface [3].

### 3.11.6 Machine bed



To install the motor module with lubrication channel AT2000-0250-0006, there must be a corresponding recess in the machine bed to position the connections for the lubricant lines.

### 3.11.7 Lubrication pump

#### NOTICE

##### Ensure correct positioning of the lubrication pump

The lubrication pump may be installed a maximum of 6 m from the motor module with lubrication channel.

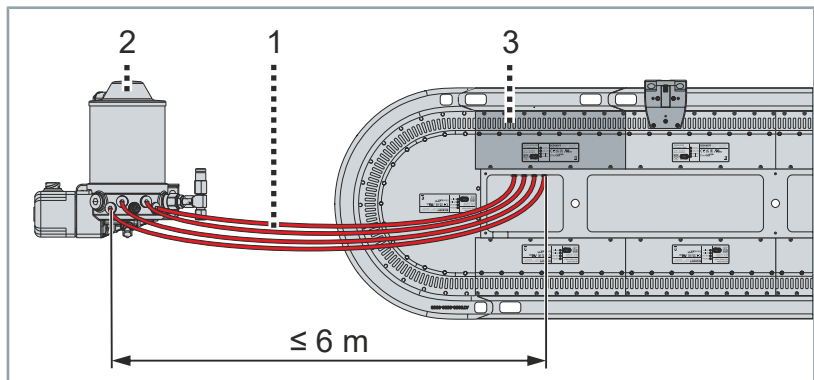
Beckhoff recommends the following lubrication pump:

- BEKA MAX PICO with four installed pump elements *PE-10*

For more information, please contact the product specialist responsible for your region or Beckhoff Support:

✉ [support@beckhoff.com](mailto:support@beckhoff.com)

### 3.11.8 Lubricant line



The lubricant lines [1] between the lubrication pump [2] and the motor module with lubrication channel [3] must not exceed 6 m in length. The outer diameter of the lubricant lines must be 4 mm.

Beckhoff recommends positioning the lubrication pump as close as possible to the motor module in order to install the shortest possible lubricant line.

For more information, please contact the product specialist responsible for your region or Beckhoff Support:

✉ [support@beckhoff.com](mailto:support@beckhoff.com)



## 3.12 Intended use

The XTS may be operated exclusively for the activities foreseen and defined in this documentation, taking into account the prescribed environmental conditions.

The components must be installed in electrical systems or machines and may only be put into operation as integrated components of the system or machine.

All components of the XTS are intended only to be programmed and commissioned with the help of the Beckhoff TwinCAT automation software.



### **Read the entire drive system documentation:**

- This translation of the original instructions
- Translation of the original instructions for the control computer
- Complete machine documentation provided by the machine manufacturer

### 3.12.1 Improper use

Any use exceeding the permissible values specified in the Technical data is considered improper and therefore prohibited.

The Standard XTS is not suitable for use in the following areas:

- in ATEX zones without a suitable housing
- in areas with aggressive environments, for example aggressive gases or chemicals

The relevant standards and directives for EMC interference emissions must be complied with in residential areas.

## 4 Technical data

Below you will find definitions of terms, environmental conditions and operating specifications as well as technical data.

### 4.1 Definition

All details relate to an ambient temperature of 25 °C. The data can have a tolerance of +/- 10 %.

#### 4.1.1 Technical terms

##### Nominal force $F_0$ [N]

Nominal force that a mover can continuously apply.

##### Force constant $K_F$ [N/A]

Specification of how much force [N] the mover generates with a certain mover current.

$$F_0 = I_{0\text{Mover}} \cdot K_F$$

##### Voltage constant $K_E$ [Vs/m]

Induced motor EMF related to 1 m/s as a peak sine value on a motor coil.

##### Thermal time constant $t_{TH}$ [min]

Specification of the heating time of the cold module when loaded with the nominal force until 63 % of the maximum overtemperature is reached. This temperature rise happens in a much shorter time when the motor is loaded with the peak current.

##### Absolute accuracy [mm]

Specification of the difference between an expected set position and the mean value of the actual position resulting from approaching the set position from different directions (multi-directional). The absolute accuracy is valid within a module and is defined as the difference between the set position and the actual position of the positioning system.

##### Standstill repeatability [mm]

Specification of how accurately the system positions when approaching a position from the same direction (unidirectional). The standstill repeatability is to be evaluated as the average difference between the actual position and the set position and is the most important measure for the assessment of a positioning system. It defines the variance around the mean value with a large number of positionings.

The variance of the positions is illustrated by the Gauss distribution or normal distribution. The standstill repeatability is defined by three standard deviations ( $3\sigma$ ) with a probability of 99.74 %.

##### Synchronization accuracy [mm]

Specification of the fluctuations that the system exhibits in the position / following error during a position-controlled movement at a constant set velocity. The synchronization accuracy depends on the mechanical rigidity, the applied load on the movers, the controller settings, the set velocity and also any mechanical offset between the modules.

## 4.2 Data for operation and environment

Beckhoff products are designed for operation under certain environmental conditions, which vary according to the product. The following specifications must be observed for operation and environment in order to achieve the optimum service life of the products.



### Operate the XTS only under the specified environmental conditions

Operate the Beckhoff XTS only in accordance with the specifications for operation and the environment listed in this chapter. This ensures a long service life and proper operation.

*The service life of the system may be shortened at temperatures above 40 °C. Speak to our Applications Department in case of deviating environmental conditions and operating states of your machine or plant.*

Specifications for intended use	
Power derating, currents and torques	For site altitudes higher than 1000 to 2500 m above sea level and 40 °C: 1.5 % per 100 m
Insulation material class	F according to IEC 60085; UL1446 class F
Protection rating	IP65
Vibration resistance	Conforms to EN 60068-2-6
Shock resistance	Conforms to EN 60068-2-27
EMC requirements	Conforms to EN 61000-6-2 / EN 61000-6-4
Approvals	CE, cURus, EAC, UKCA
Environmental requirements	
Climate category	2K3 according to EN 60721
Ambient temperature during operation	+5 °C ... +40 °C
Ambient temperature for transport and storage	-25 °C ... +85 °C
Permissible humidity in operation	15% to 95% relative humidity, no condensation, non-condensing
Contamination level	EN 60204 / EN 50178 Level 2
Ventilation	<ul style="list-style-type: none"> <li>• Via convection</li> <li>• Via fan when using the 180° curved segment with option for additional cooling</li> </ul>

## 4.3 Electrical data and system properties

Electrical data	
Control voltage [V <sub>DC</sub> ]	24 -15 %/+20 %
Supply voltage [V <sub>DC</sub> ]	24 to 48* ±4 %
Current consumption - power supply nominal current [A]	16
Current consumption power supply short-term peak current [A]	< 48
Power consumption control voltage motor modules [W/m]	30
Power consumption control voltage motor modules with integrated NCT functionality [W/m]	40
Maximum segment length per motor module with infeed [m]	≤ 3
Nominal output P <sub>n</sub> per infeed [W]	768
Power consumption per mover, 48 V <sub>DC</sub> [W] <i>At a constant velocity of 2 m/s</i>	30
Power consumption per mover, 48 V <sub>DC</sub> [W] <i>At a constant velocity of 4 m/s</i>	60
Power consumption per mover, 48 V <sub>DC</sub> [W] <i>With a mass of 1 kg and peak acceleration of 10 m/s<sup>2</sup></i>	60
Power consumption per mover, 48 V <sub>DC</sub> [W] <i>With a mass of 1 kg and peak acceleration of 50 m/s<sup>2</sup></i>	300

\* At values below 48 V<sub>DC</sub> not all nominal data can be achieved. Beckhoff recommends a power supply of 48 V<sub>DC</sub>.

System properties		
Typical thermal time constant t <sub>TH</sub> [min]	24	
Force constant K <sub>F</sub> at standstill [N/A]	8	
Maximum force at 2 m/s [N]	80	
Velocity at 48 V <sub>DC</sub> [m/s]	4	
Acceleration without payload [m/s <sup>2</sup> ]	≥ 100	
Nominal force F <sub>0</sub> [N]	30	
Voltage constant K <sub>E</sub> [Vs/m]	7.1	
Winding resistance of a phase R <sub>20</sub> [Ω]	1.1	
Maximum force at standstill [N] <i>Dependent on the air gap between stator and drive magnet</i>	100	80*
Synchronization accuracy at 1.5 m/s within a straight motor module [mm] <i>Dependent on the mechanical rigidity and applied load on the mover</i>	≤ ±0.15	**
Absolute accuracy within a straight motor module [mm] <i>Can be exceeded in the case of high thermal warming of the motor module or lack of parallelism / orthogonality of the encoder flag to the motor module</i>	≤ ±0.25	≤ ±0.7*
Unidirectional repeatability at standstill [mm] <i>Can be exceeded with larger temperature differences of the motor module</i>	≤ ±0.01	≤ ±0.075*

\* for EcoLine

\*\* for EcoLine: For further information, please contact your local Beckhoff branch or [support@beckhoff.com](mailto:support@beckhoff.com).

### 4.3.1 Motor module with integrated NCT functionality

#### NCT energy transfer

System properties	
Nominal output [W]	≤ 35, depending on the position and distance of the movers
Peak power [W]	≤ 75, depending on the position and distance of the movers
Output voltage [V <sub>DC</sub> ]	24
Energy transfer	continuous

#### NCT data transmission

System properties	
Communication cycle [μs]	250
Communication direction	bidirectional
Time behavior	μs-accurate DC synchronization
Communication devices	no system limits
Communication types	cyclic and acyclic
Data transmission	continuously, even across module limits and in motion

#### Digital input

System properties	
Number of digital inputs	2*
Connection technology	1-wire
Nominal voltage [V <sub>DC</sub> ]	24 -15 % / +20 %
Signal voltage "0" [V]	-3 to +5
Signal voltage "1" [V]	11 to 30
Input filter	configurable
Standard [ms]	3
minimum [μs]	10
Counter function	1 x up counter/down counter 1 x up counter or down counter
Counter depth	32-bit
Counter property	Set counter Switching outputs Reset counter
Latch function [V <sub>DC</sub> ]	24 Latch input
Latch resolution [μs]	4 32-bit time value

\* plus two additional analog inputs that can be used as digital inputs

## Digital output

System properties	
Number of digital outputs	4*
Connection technology	1-wire
Nominal voltage [ $V_{DC}$ ]	24 -15 % / +20 %
Load type	ohmic inductive Lamp load
Changeover times $T_{ON}$ [ $\mu s$ ]	20 typ.
Changeover times $T_{OFF}$ [ $\mu s$ ]	10
Short-circuit current [A]	< 2 typ.
Breaking energy (ind.) maximum [mJ/channel]	< 50

\* plys three additional PWM outputs that can be used as digital outputs

## Analog input

System properties	
Number of analog inputs	2
Technology	single-ended
Signal voltage [V]	0 to 10
Internal resistance [k $\Omega$ ]	500
Input filter cut-off frequency [kHz]	2
Resolution	12-bit
Measuring error, relative to the full scale value	< $\pm 0.3$ %

## Analog output

System properties	
Number of outputs	3 x half bridge with 2 x current measurement OR 1 x full bridge and 1 x half bridge with 1 x current measurement each
Nominal voltage [ $V_{DC}$ ]	24 -15 % / +20 %
Load type	ohmic inductive Lamp load
Maximum output current [A]	2
Maximum switching frequency [kHz]	128
Duty cycle	0 to 100 % ( $T_{ON} > 20$ ns, $T_{OFF} > 200$ ns)

## Pulse width modulation output

System properties	
Number of outputs	3 x half bridge with 2 x current measurement OR 1 x full bridge and 1 x half bridge with 1 x current measurement each
Nominal voltage [V <sub>DC</sub> ]	24 -15 % / +20 %
Load type	ohmic inductive Lamp load
Maximum output current [A]	2
Maximum switching frequency [kHz]	128
Duty cycle	0 to 100 % (T <sub>ON</sub> > 20 ns, T <sub>OFF</sub> > 200 ns)

## 4.4 Mechanical data

### 4.4.1 Modules

General housing properties

Modules	AT2xxx-0xxx
IP protection rating <i>In the assembled state for a closed system, only water-proof for a short time, not corrosion-resistant.</i>	IP65
Aluminum components	anodized
Board elements	painted
Color	matt black

Straight, without infeed

Modules	AT2000-0233	AT2000-0250
Height [mm]	96	96
Length [mm]	233.1	250
Weight without attachments [kg]	1.9	2.0
Width on the machine bed [mm]	39.1	39.1
Upper width on the motor / guide [mm]	22.1	22.1

Straight, with connection cables for infeed

Modules	AT2001-0250
Height [mm]	96
Length [mm]	250
Weight without attachments [kg]	3.1
Width on the machine bed [mm]	39.1
Upper width on the motor / guide [mm]	22.1

Straight, with connector for infeed

Straight, without infeed	AT2002-0249	AT2002-0250
Height [mm]	96	96
Length [mm]	249	250
Weight without attachments [kg]	2.2	2.2
Width on the machine bed [mm]	39.1	39.1
Upper width on the motor / guide [mm]	22.1	22.1

22.5° curved segment, without infeed

Modules	AT2020-0250
Height [mm]	106.8
Length [mm]	256.2
Weight without attachments [kg]	2.2
Width on the machine bed [mm]	39.1
Upper width on the motor / guide [mm]	22.1



## 22.5° curved segment, with connection cables for infeed

Modules	AT2021-0250
Height [mm]	106.8
Length [mm]	256.2
Weight without attachments [kg]	3.3
Width on the machine bed [mm]	39.1
Upper width on the motor / guide [mm]	22.1

## -22.5° curved segment, without infeed

Modules	AT2025-0250
Height [mm]	107.8
Length [mm]	278.1
Weight without attachments [kg]	2.2
Width on the machine bed [mm]	39.1
Upper width on the motor / guide [mm]	22.1

## -22.5° curved segment, with connection cables for infeed

Modules	AT2026-0250
Height [mm]	107.8
Length [mm]	278.1
Weight without attachments [kg]	3.3
Width on the machine bed [mm]	39.1
Upper width on the motor / guide [mm]	22.1

## 45° curved segment, without infeed

Modules	AT2040-0250
Height [mm]	114.4
Length [mm]	258.9
Weight without attachments [kg]	1.9
Width on the machine bed [mm]	39.1
Upper width on the motor / guide [mm]	22.1

## 45° curved segment, with connection cables for infeed

Modules	AT2041-0250
Height [mm]	114.4
Length [mm]	258.9
Weight without attachments [kg]	3.0
Width on the machine bed [mm]	39.1
Upper width on the motor / guide [mm]	22.1

# Technical data

180° curved segment, without infeed

Modules	AT2050-0500	AT2050-0500-0001
Height [mm]	194.5	194.5
Length [mm]	306.7	306.7
Weight without attachments [kg]	4.1	4.1
Width on the machine bed [mm]	39.1	52.1
Upper width on the motor / guide [mm]	22.1	22.1

Straight, with integrated NCT functionality, without infeed

Modules	AT2100-0250
Height [mm]	96
Length [mm]	250
Weight without attachments [kg]	2.4
Width on the machine bed [mm]	51.7
Upper width on the motor / guide [mm]	22.1

Straight, with integrated NCT functionality, with connector for infeed

Modules	AT2102-0250
Height [mm]	96
Length [mm]	250
Weight without attachments [kg]	2.7
Width on the machine bed [mm]	51.7
Upper width on the motor / guide [mm]	22.1

Straight, EcoLine, without infeed

Modules	AT2200-0500
Height [mm]	96
Length [mm]	500
Weight without attachments [kg]	4.0
Width on the machine bed [mm]	39.1
Upper width on the motor / guide [mm]	22.1

Straight, EcoLine, with plug connector for infeed

Modules	AT2202-0500
Height [mm]	96
Length [mm]	500
Weight without attachments [kg]	4.3
Width on the machine bed [mm]	39.1
Upper width on the motor / guide [mm]	22.1

## 4.4.2 Mover

Mover, length 70 mm, with mounted NCT electronics

Mover	AT8300-1x00
Length [mm]	70
Number of rollers	6
Weight [g] <i>Without magnetic plate set.</i>	739
Weight [g] <i>With mounted magnetic plate set AT9001-0550.</i>	871
Distance between the feedback flag and the motor module [mm]	0.5 to 1.4
Distance between NCT electronics and motor module [mm]	0.7 to 1.0

Mover, length 50 mm

Mover	AT9011-0050
Length [mm]	50
Number of rollers	6
Weight [g] <i>Without magnetic plate set.</i>	278
Weight [g] <i>With mounted magnetic plate set AT9001-0550.</i>	410
Distance between the feedback flag and the motor module [mm]	0.5 to 1.4

Mover	AT9012-0050
Length [mm]	51
Number of rollers	12
Weight [g] <i>Without magnetic plate set.</i>	328
Weight [g] <i>With mounted magnetic plate set AT9001-0550.</i>	460
Distance between the feedback flag and the motor module [mm]	0.5 to 1.4

Mover, length 55 mm

Mover	AT9014-0055
Length [mm]	55
Number of rollers	6
Weight [g] <i>Without magnetic plate set.</i>	403
Weight [g] <i>With mounted magnetic plate set AT9001-0550.</i>	535
Distance between the feedback flag and the motor module [mm]	0.5 to 1.4

Mover, length 70 mm

Mover	AT9011-0070
Length [mm]	70
Number of rollers	6
Weight [g] <i>Without magnetic plate set.</i>	463
Weight [g] <i>With mounted magnetic plate set AT9001-0550.</i>	595
Distance between the feedback flag and the motor module [mm]	0.5 to 1.4

Mover	AT9014-x070
Length [mm]	70
Number of rollers	6
Weight [g] <i>Without magnetic plate set.</i>	519
Weight [g] <i>With mounted magnetic plate set AT9001-0550.</i>	651
Distance between the feedback flag and the motor module [mm]	0.5 to 1.4

### 4.4.3 Guide rails

#### Straight

<b>AT9x00-</b>	<b>0250</b>	<b>0500</b>	<b>...</b>	<b>2500</b>
Length of travel distance [mm]	250	500	+ 250	2500
Length [mm]	276.5	526.5	+ 250	2526.5
Height [mm]	39	39	39	39
Height on the module [mm]	39	39	39	39
Depth [mm]	22.2	22.2	22.2	22.2
Weight [g]	260	540	+ 280	2780

#### 22.5° curved segment

<b>AT9020-</b>	<b>1250-0055</b>	<b>1250-0170</b>
Length of travel distance [mm]	1250	1250
Length [mm]	943	943
Total height [mm]	724.5	724.5
Height on the module [mm]	39	39
Depth [mm]	22.2	22.2
Weight [g]	1400	1410

#### -22.5° curved segment

<b>AT9025-</b>	<b>1466-0055</b>	<b>1466-0170</b>
Length of travel distance [mm]	1466	1466
Length [mm]	847.3	847.3
Total height [mm]	878.7	878.7
Height on the module [mm]	39	39
Depth [mm]	22.2	22.2
Weight [g]	1520	1520

# Technical data

## 45° curved segment, 90° curve

<b>AT9040-</b>	<b>0750-0055</b>	<b>0750-0170</b>
Length of travel distance [mm]	750	750
Length [mm]	625.4	625.4
Total height [mm]	406.1	406.1
Height on the module [mm]	39	39
Depth [mm]	22.2	22.2
Weight [g]	870	875

## 45° curved segment, 180° curve

<b>AT9040-</b>	<b>1250-0070</b>
Length of travel distance [mm]	1250
Length [mm]	625.4
Total height [mm]	754.6
Height on the module [mm]	39
Depth [mm]	22.2
Weight [g]	1485

## 180° curved segment

<b>AT9050-</b>	<b>0500-0050</b>	<b>0500-0x70</b>
Length of travel distance [mm]	500	500
Length [mm]	263.8	263.8
Total height [mm]	384.7	384.7
Height on the module [mm]	39	39
Depth [mm]	22.2	22.2
Weight [g]	680	730

## 4.4.4 Cables

	<b>ZK7A30-3155</b>	<b>ZK7A30-3031</b>
Connector	B23 to RJ45 and open end	B23 to B23
Drag-chain suitable	no	no
Bending cycles [million]	0.1	0.1
Suitable for Track Management	—	—

	<b>ZK7A14-3155</b>	<b>ZK7A14-3031</b>
Connector	B23 to RJ45 and open end	B23 to B23
Drag-chain suitable	yes	yes
Bending cycles [million]	5	5
Suitable for Track Management	yes	yes

## 4.4.5 NCT electronics connector

<b>System properties</b>	
Connection technology	Cage Clamp®
Protection rating	IP20

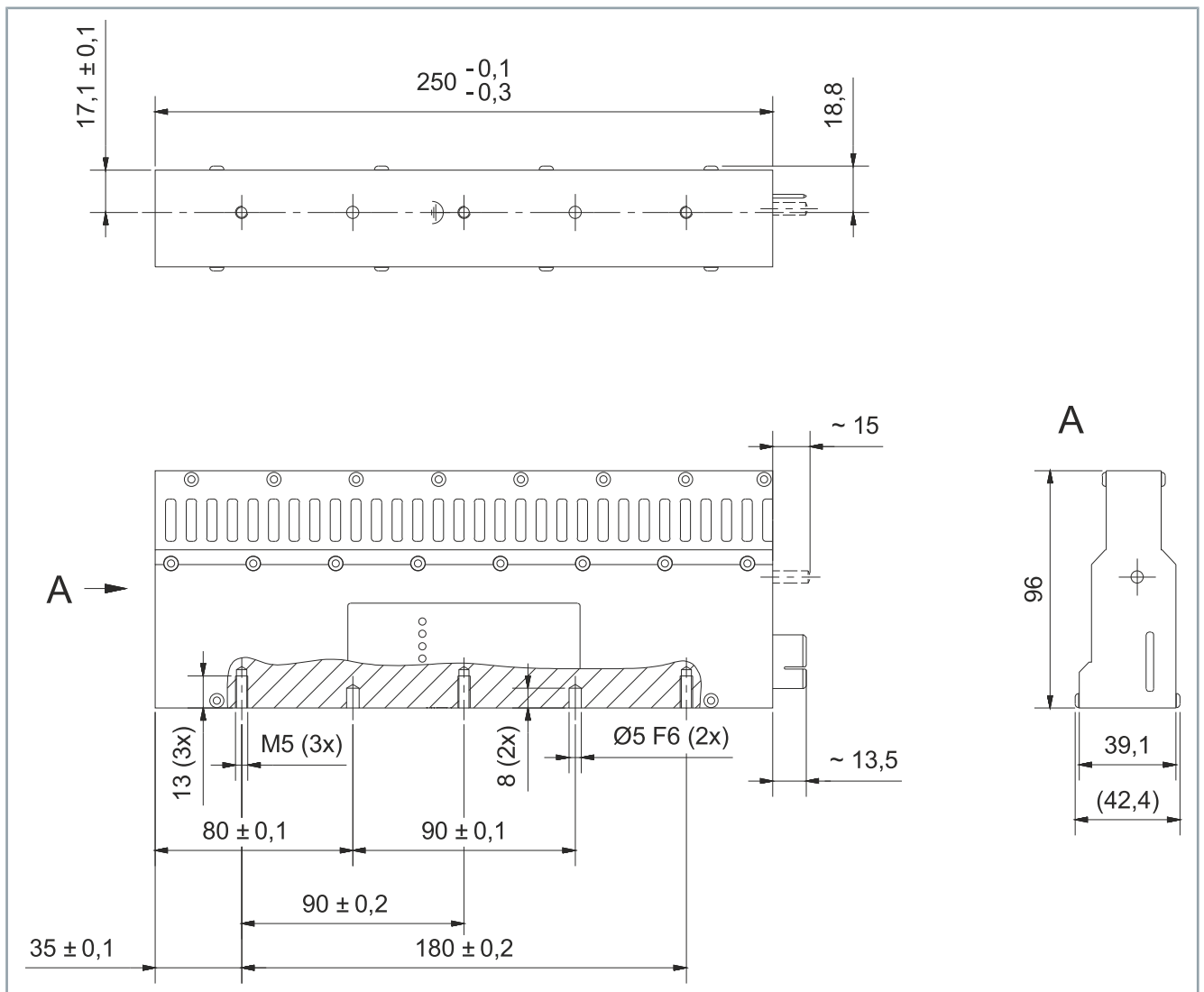
System properties	
Connection cross-section mm <sup>2</sup>	
solid wire [mm <sup>2</sup> ]	0.08...1.5
stranded wire [mm <sup>2</sup> ]	0.08 to 1.5
ferrule [mm <sup>2</sup> ]	0.25 to 1
Connection cross section AWG	
solid wire [AWG]	28 to 16
stranded wire [AWG]	28 to 16
ferrule [AWG]	28 to 18
Strip length [mm]	6 to 7





AT2000-0250

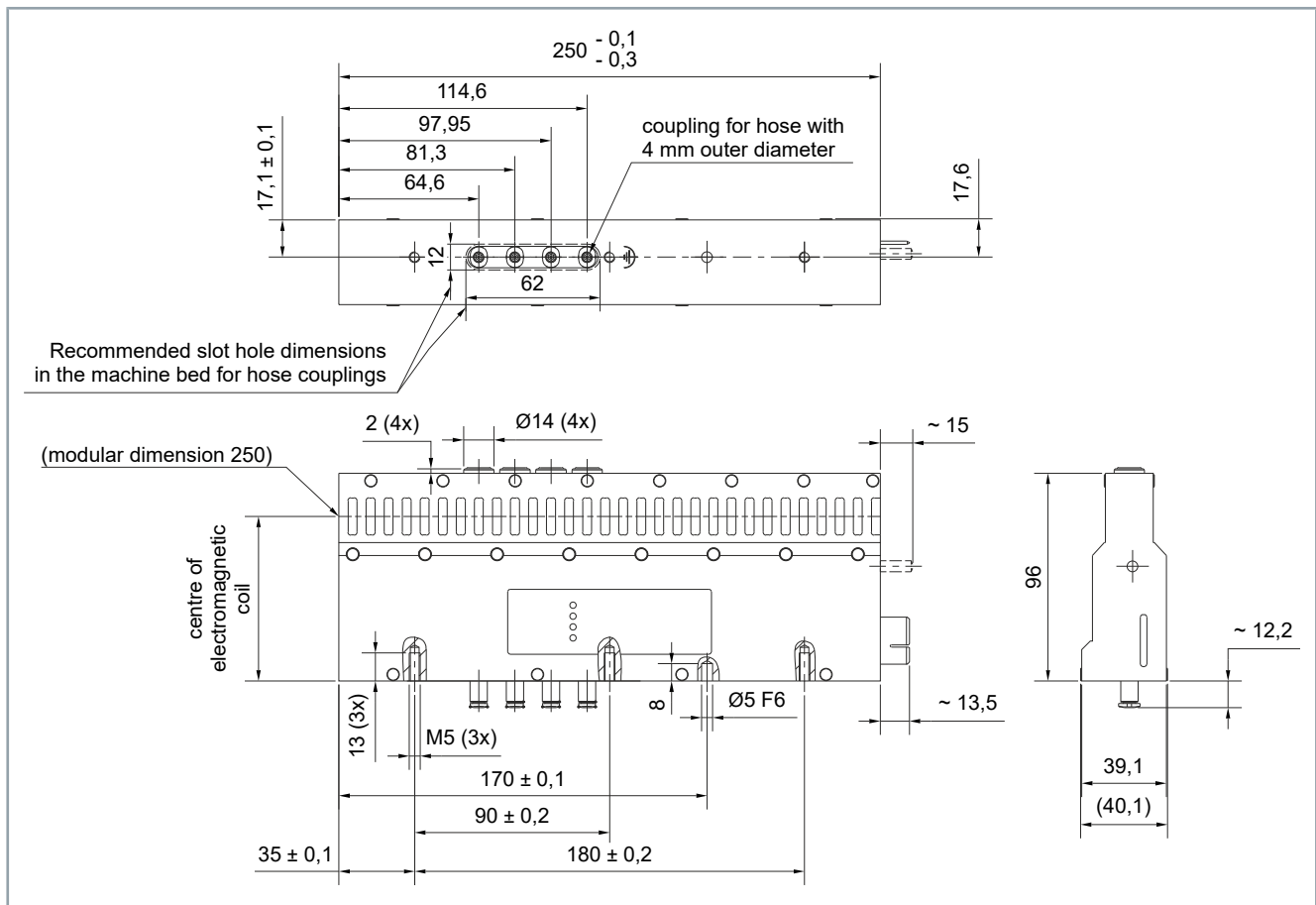
- 250 mm
- UL-certified



## Straight, with lubrication channel

AT2000-0250-0006

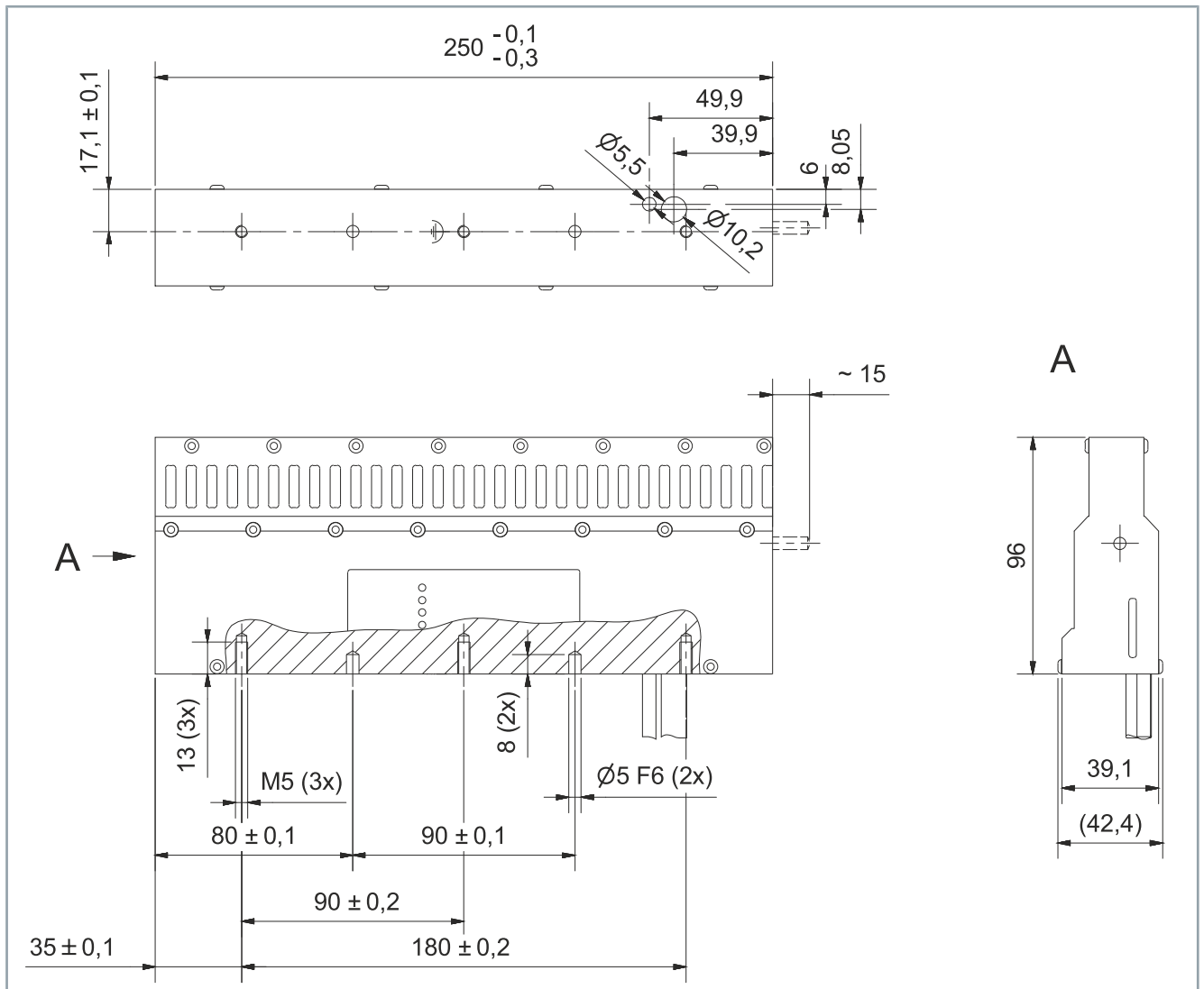
- 250 mm
- with lubrication channel
- UL-certified



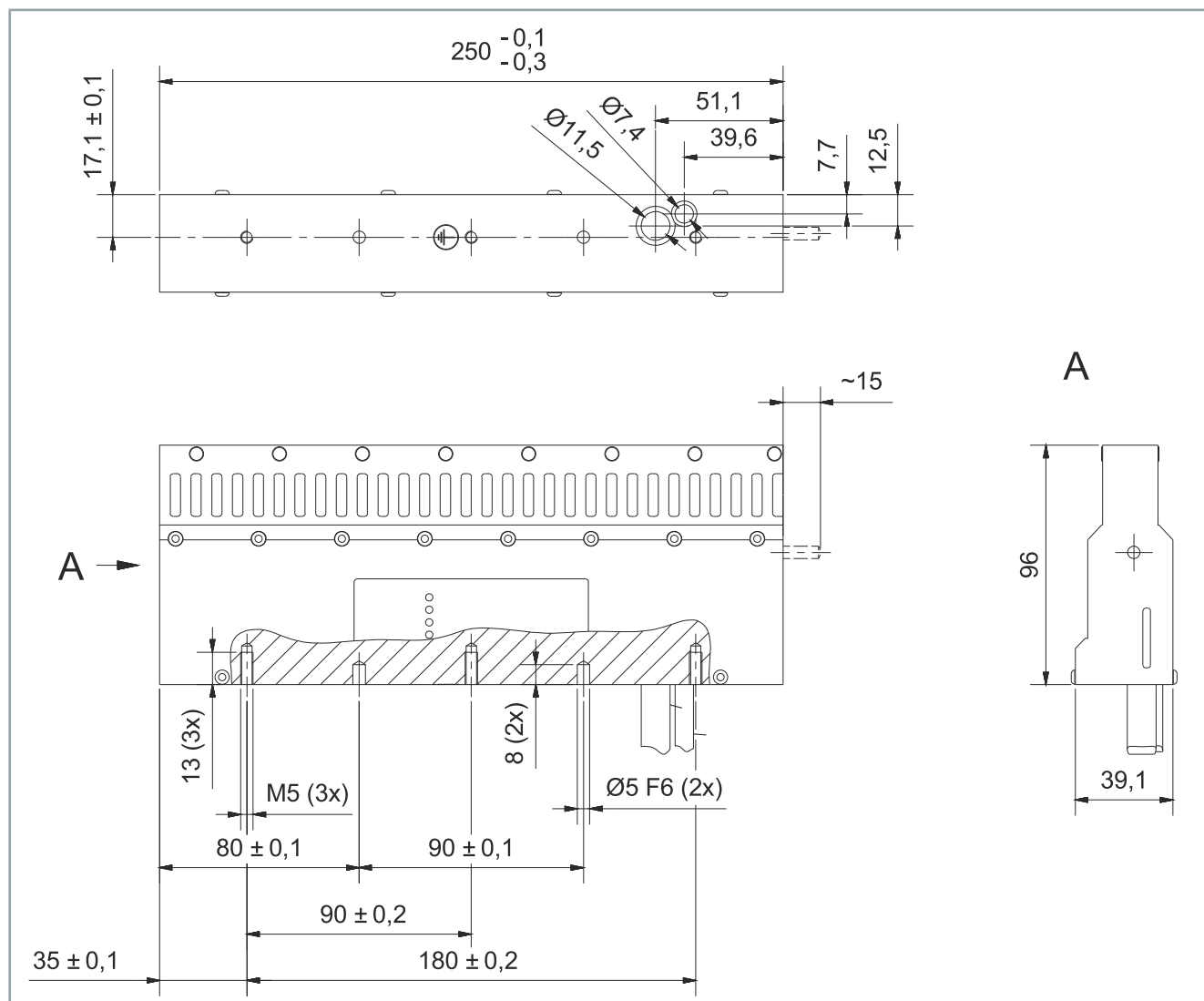
Straight, with connection cables for infeed

AT2001-0250

• 250 mm



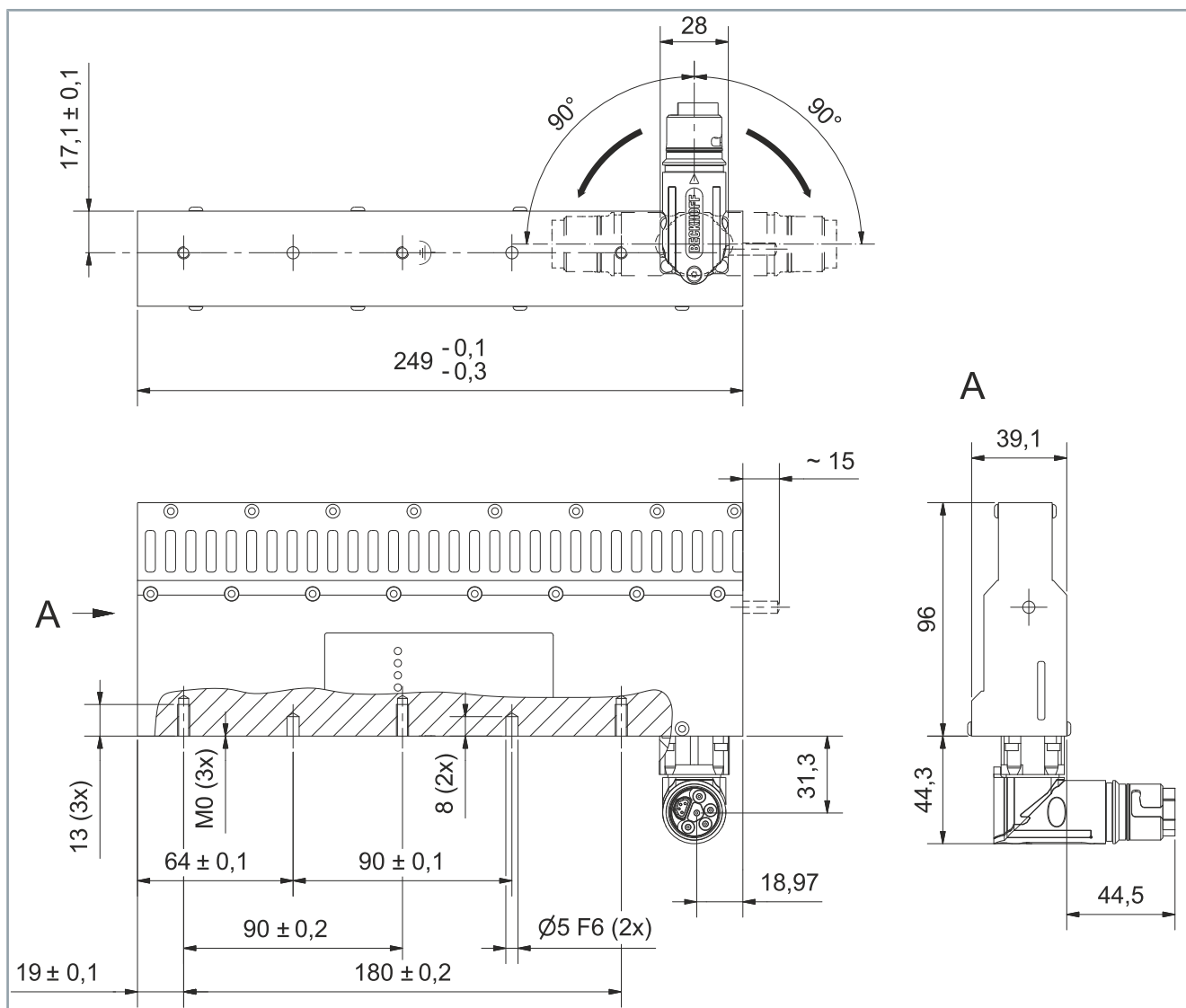
- 250 mm
- UL-certified



## Straight, with connector for infeed

AT2002-0249, option  
ZX2002-0002

- with connector for infeed, direction of rotation to name plate
- 249 mm
- UL-certified

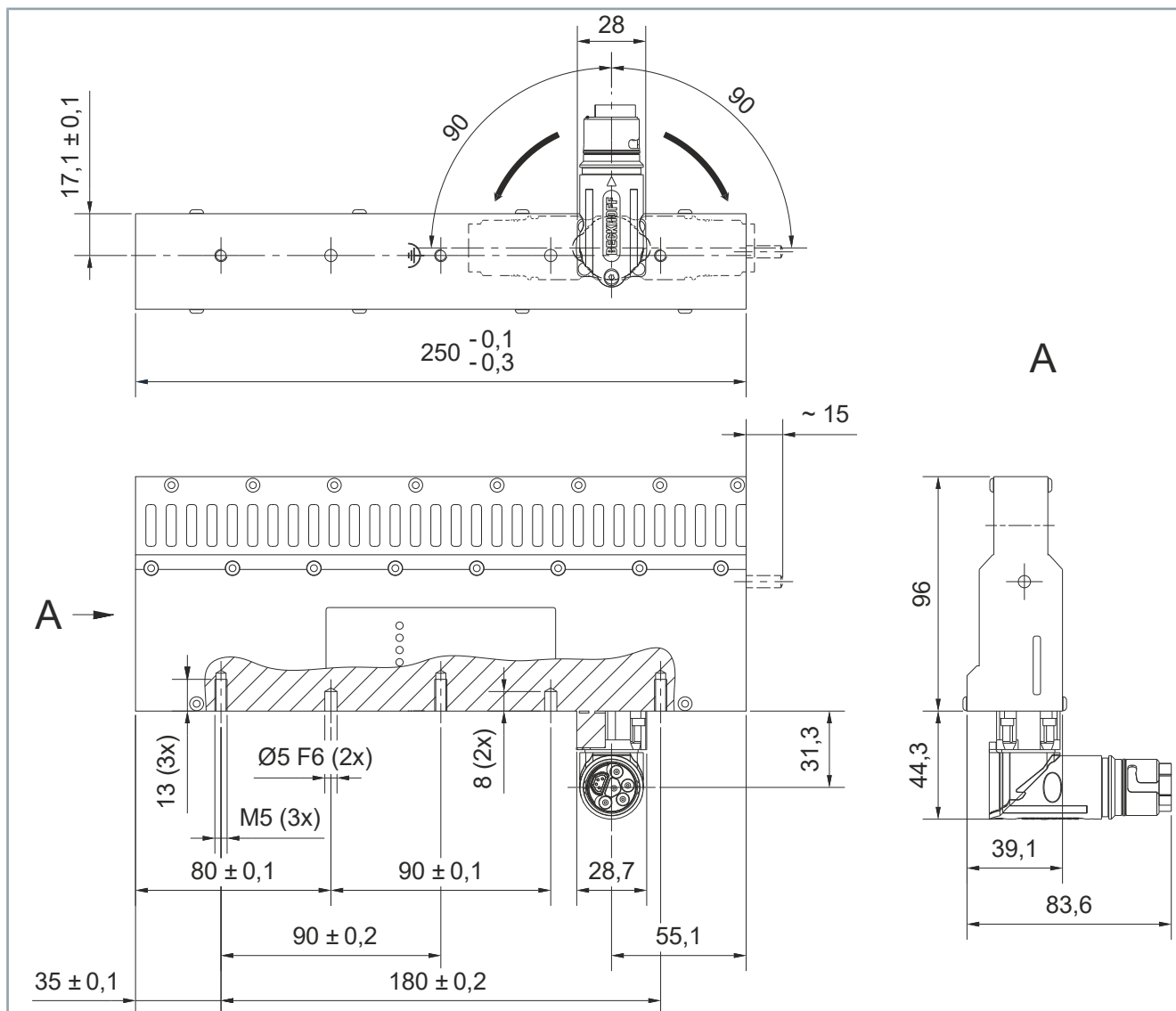


AT2002-0249, option  
ZX2002-0001

- [illegible]

AT2002-0250, option  
ZX2002-0002

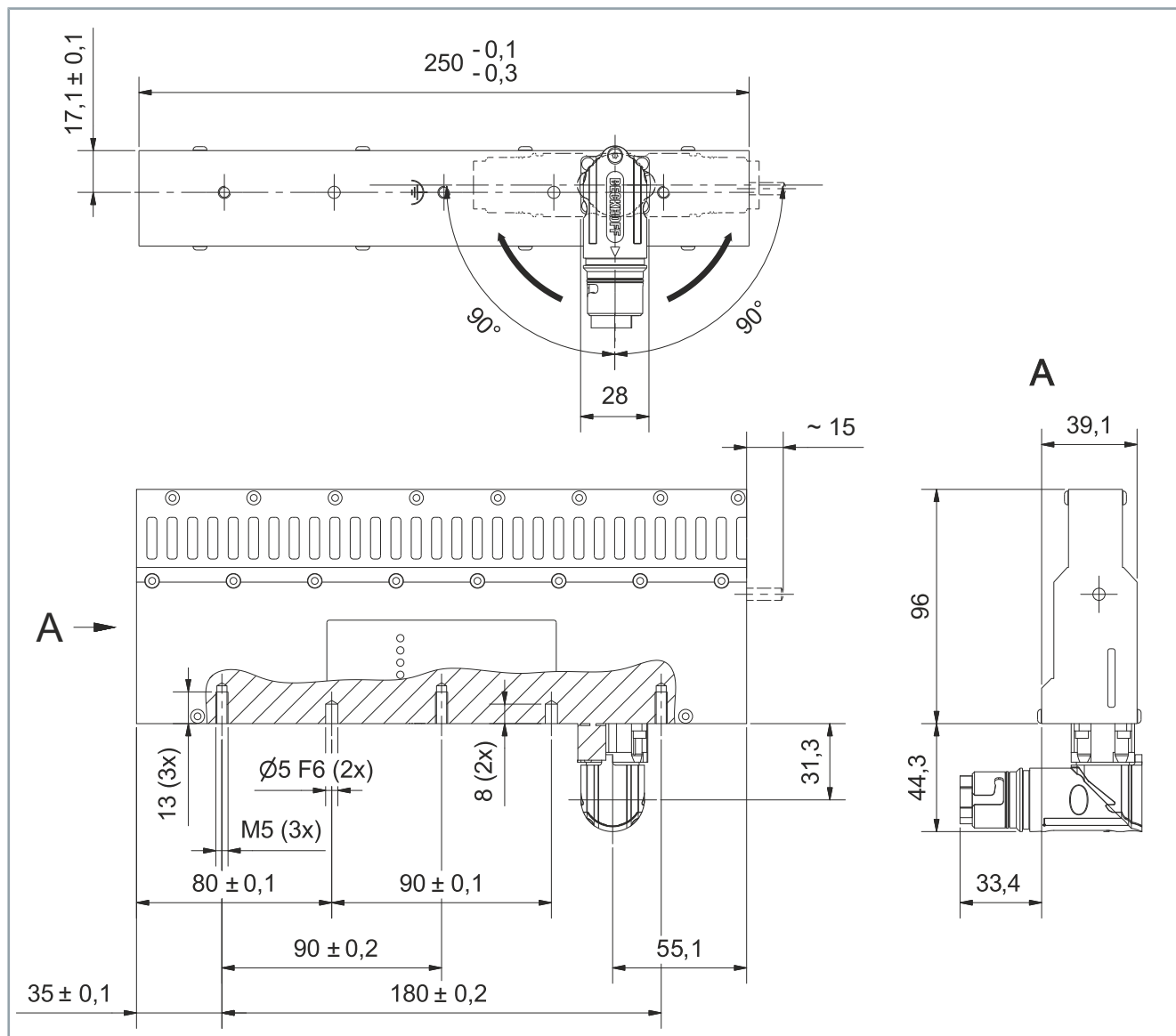
- with connector for infeed, direction of rotation to name plate
- 250 mm
- UL-certified



# Technical data

AT2002-0250, option  
ZX2002-0001

- with connector for infeed, direction of rotation to feedback system
- 250 mm
- UL-certified

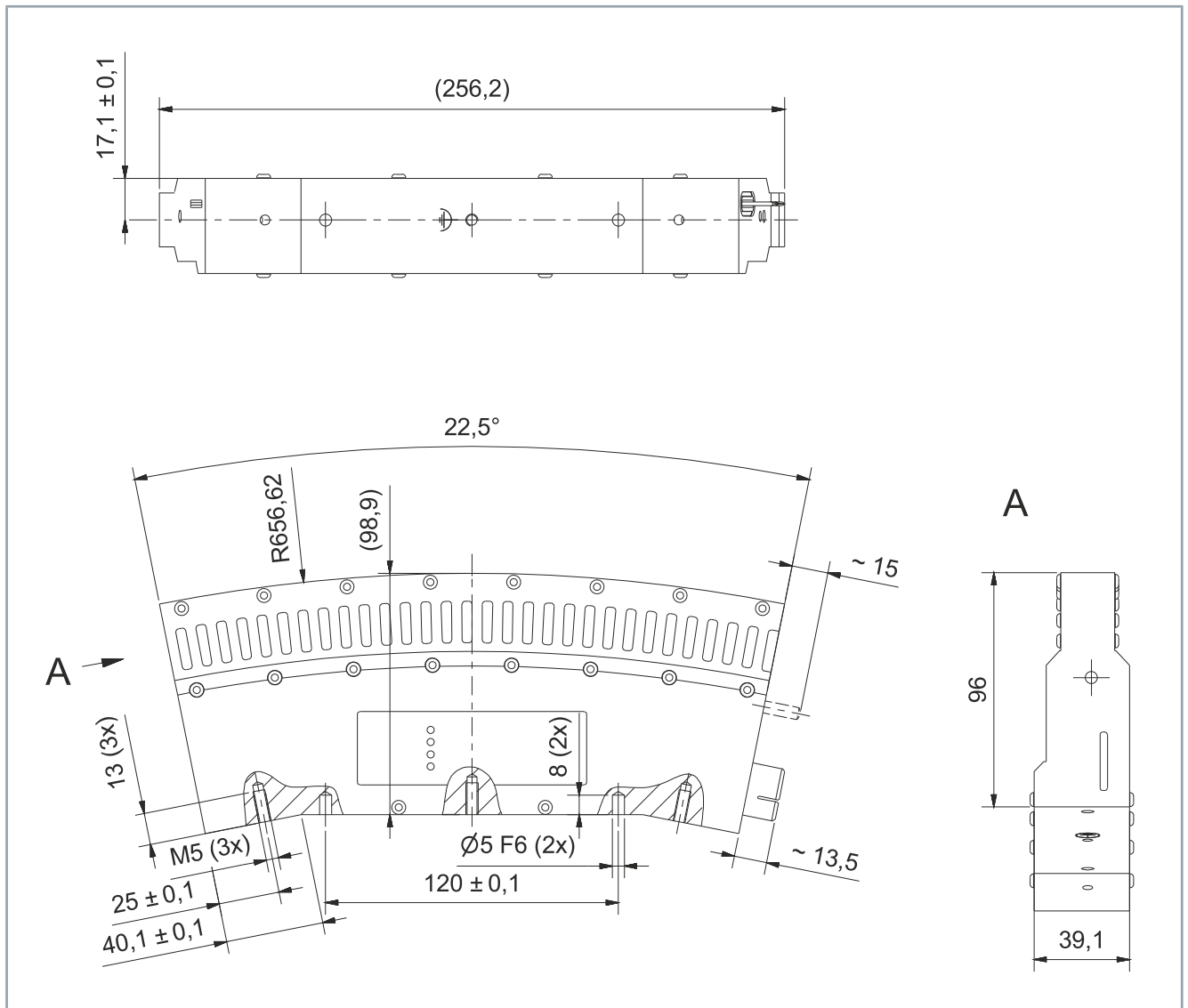




22.5° curved segment, without infeed

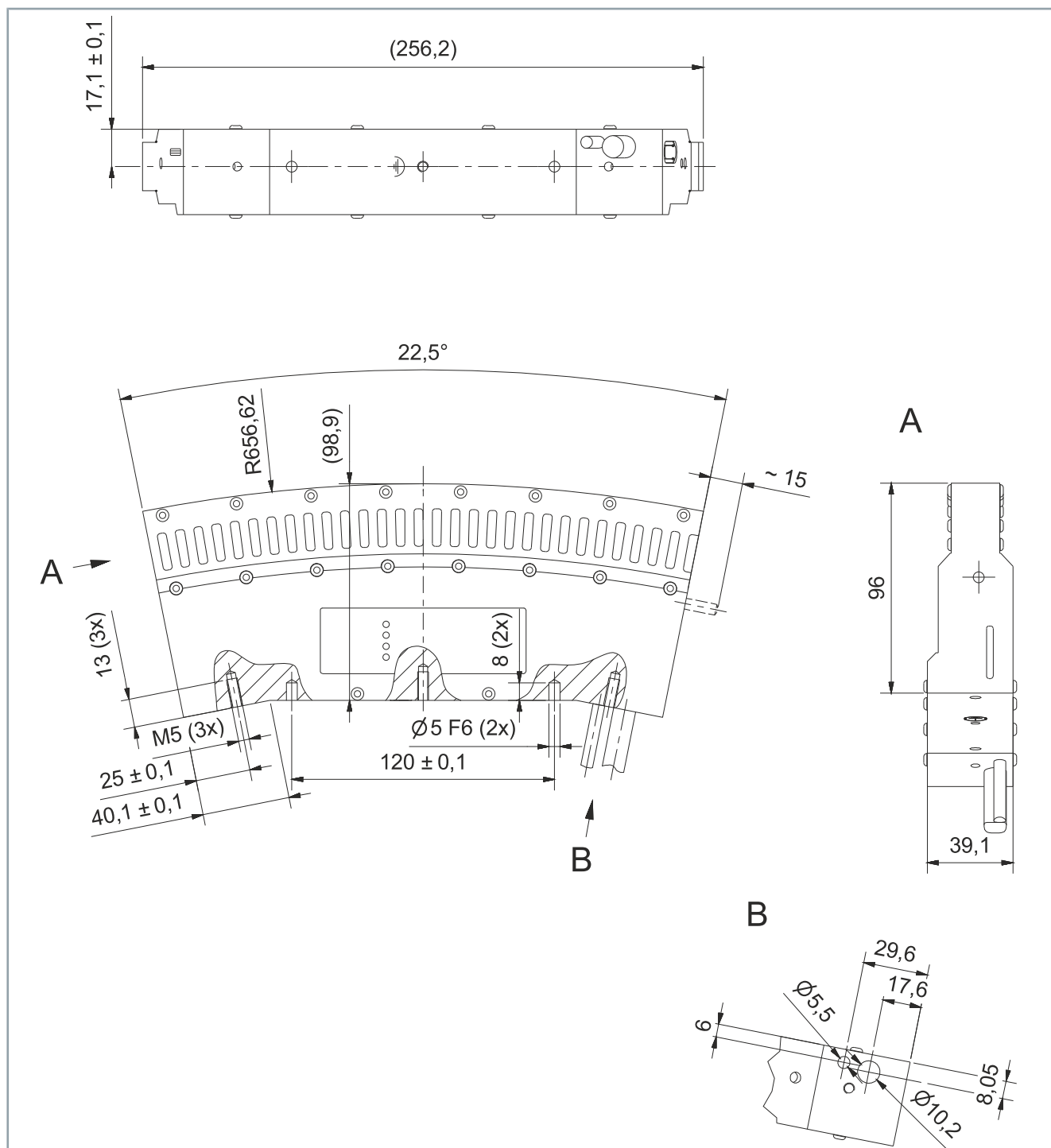
AT2020-0250

• UL-certified



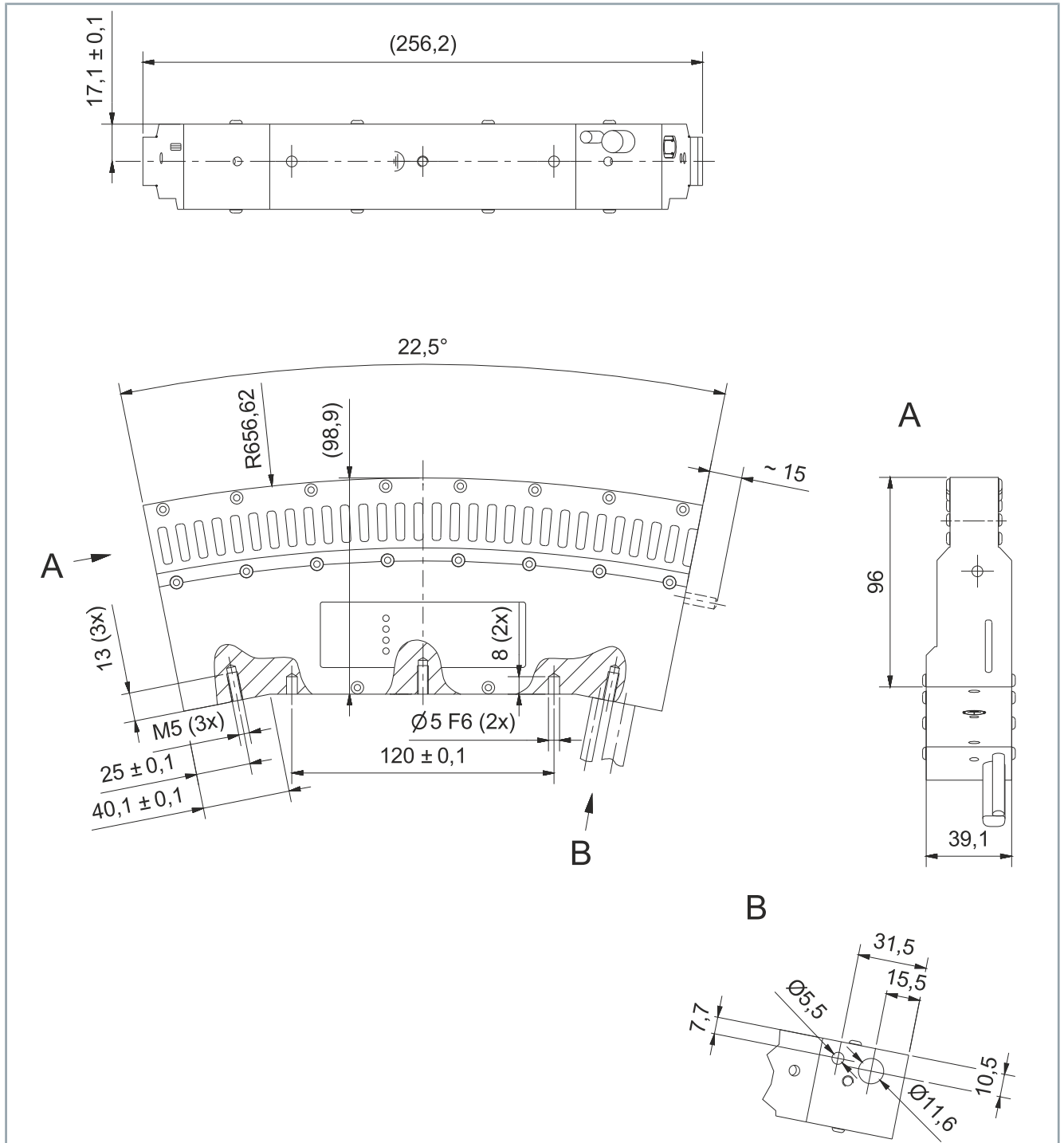
22.5° curved segment, with connection cables for infeed

AT2021-0250



AT2021-0250-0003

• UL-certified

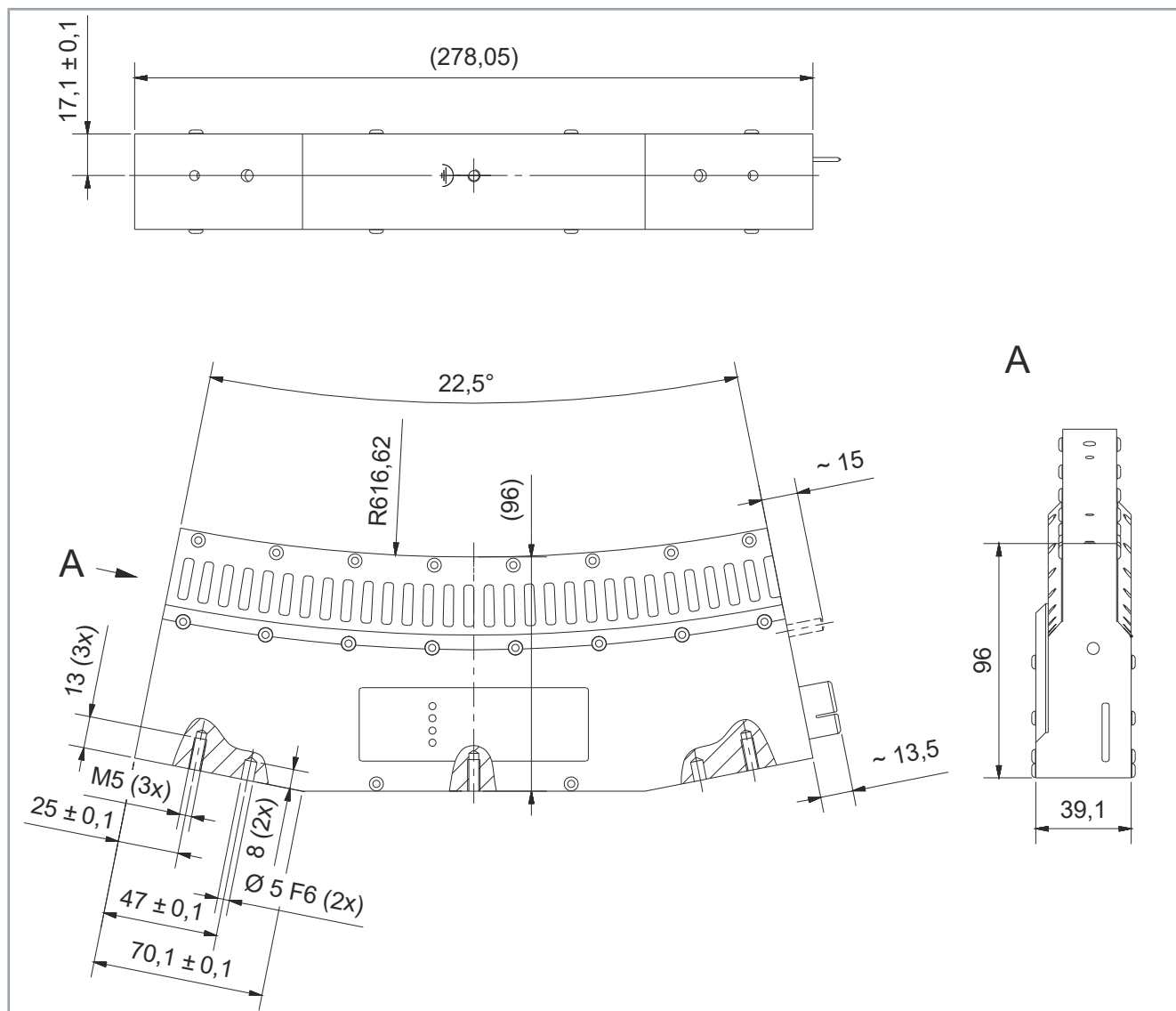


# Technical data

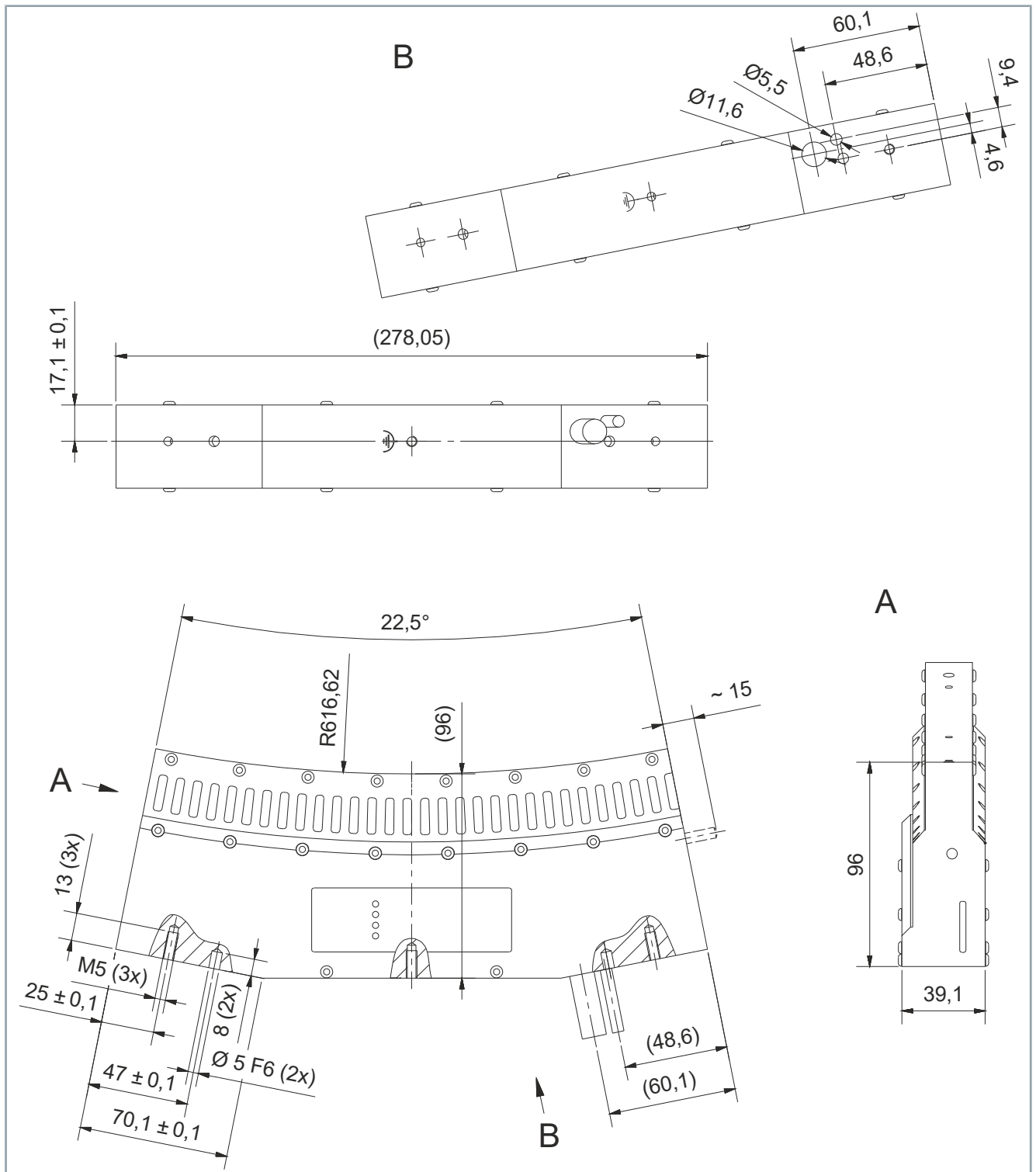
-22.5° curved segment, without infeed

AT2025-0250

• UL-certified



AT2026-0250-0003

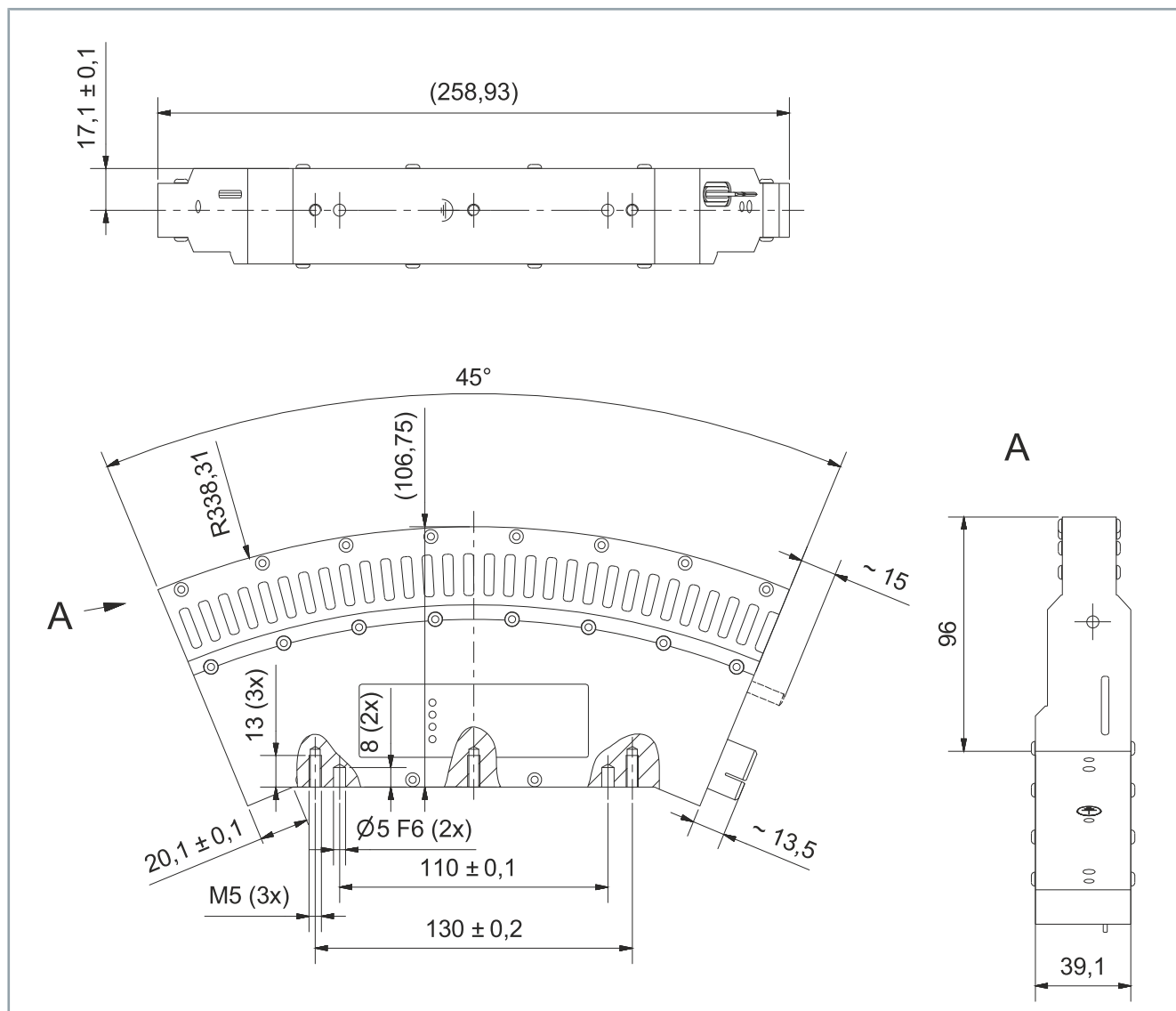


# Technical data

45° curved segment, without infeed

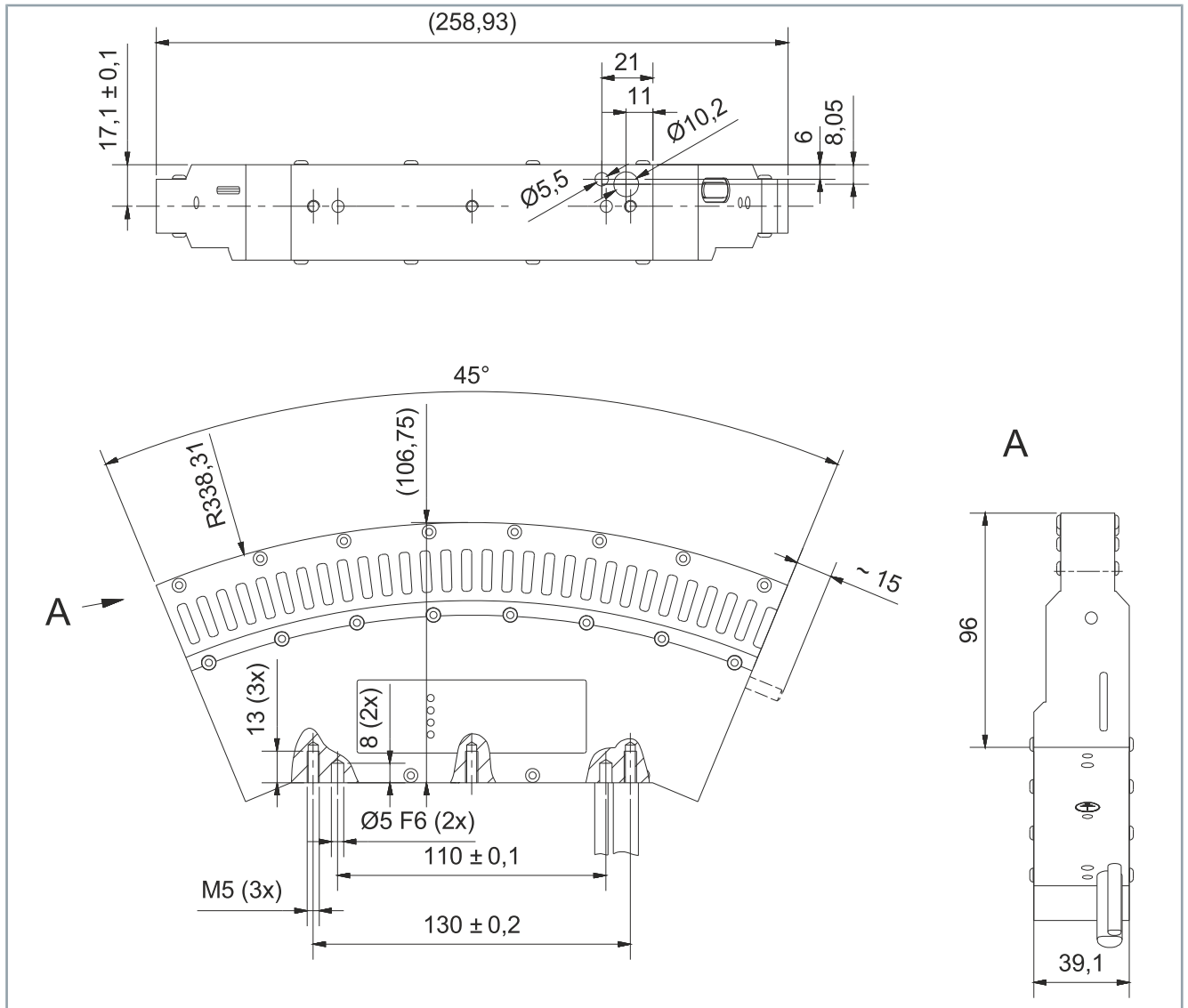
AT2040-0250

• UL-certified



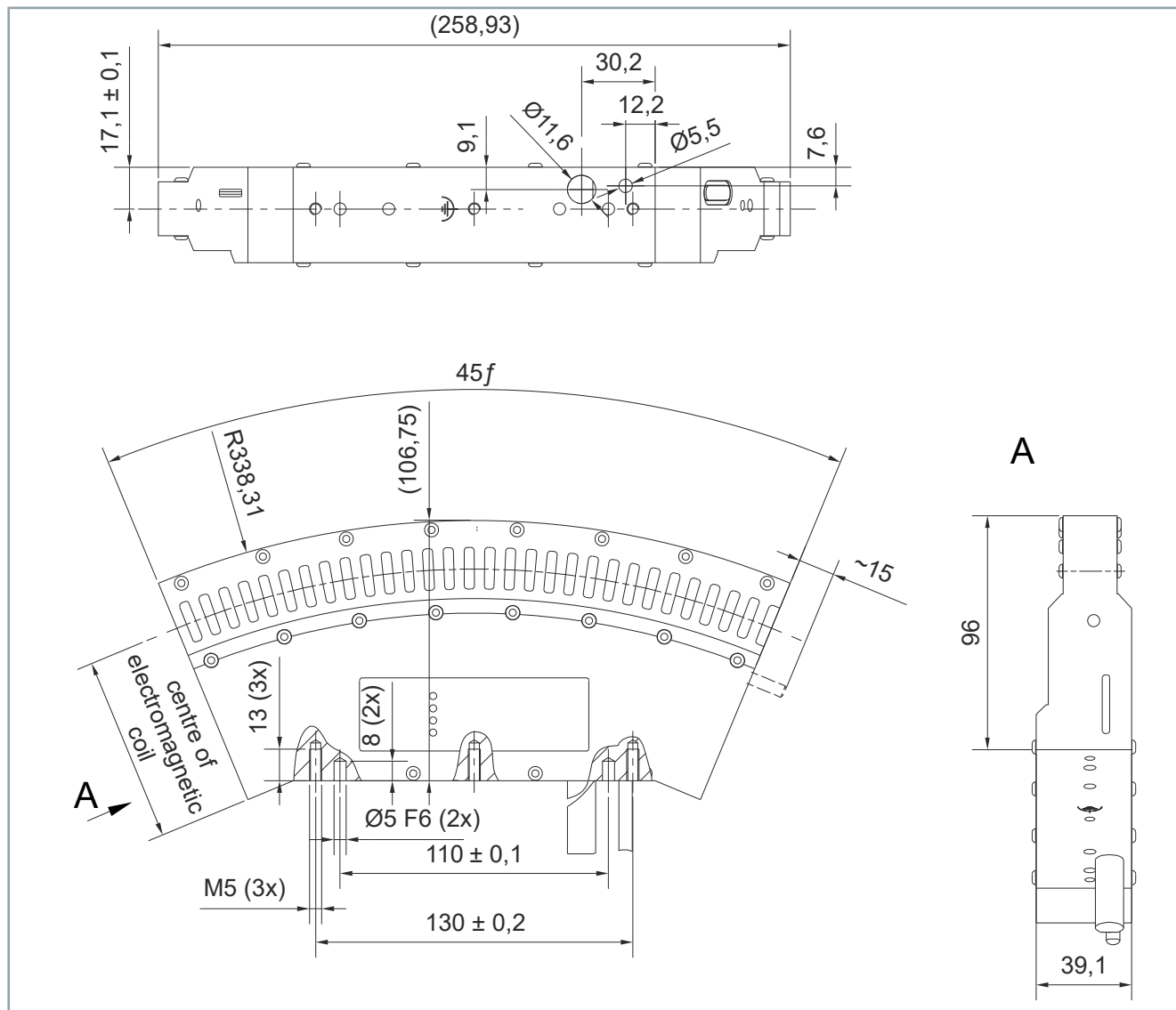
45° curved segment, with connection cables for infeed

AT2041-0250



AT2041-0250-0003

• UL-certified

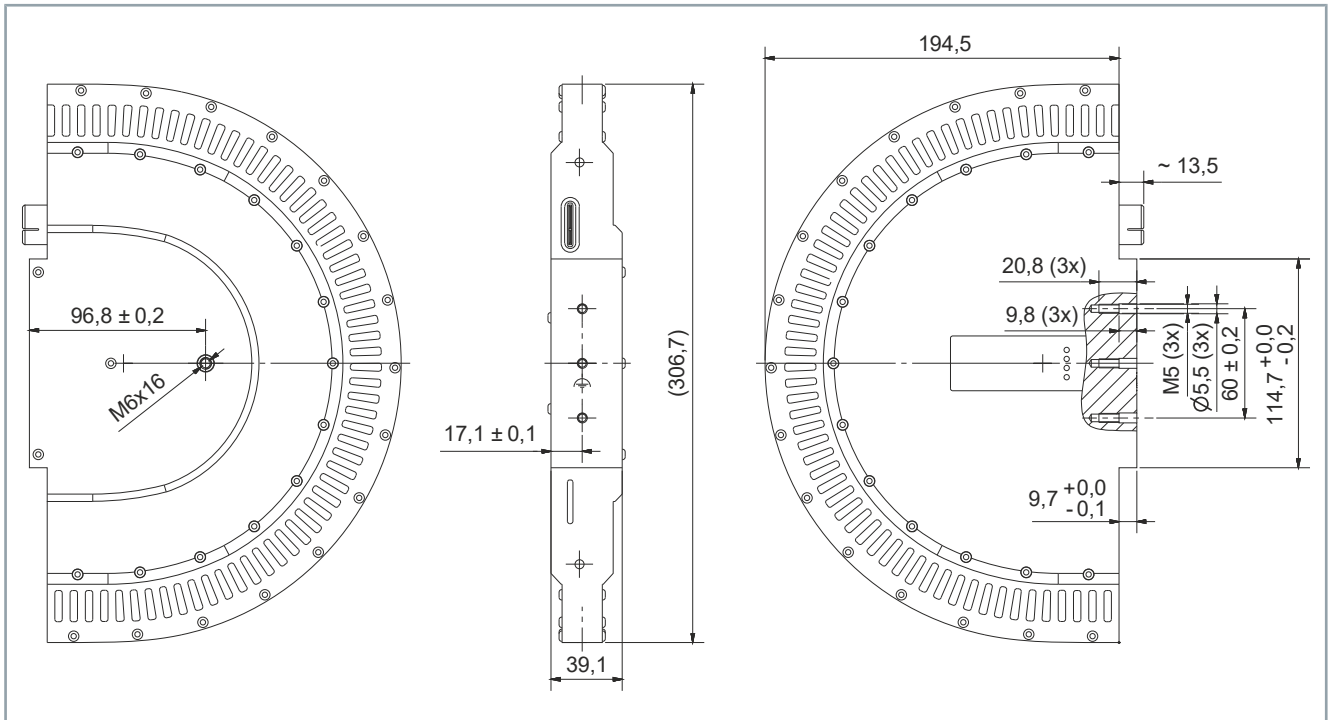




180° curved segment, without infeed

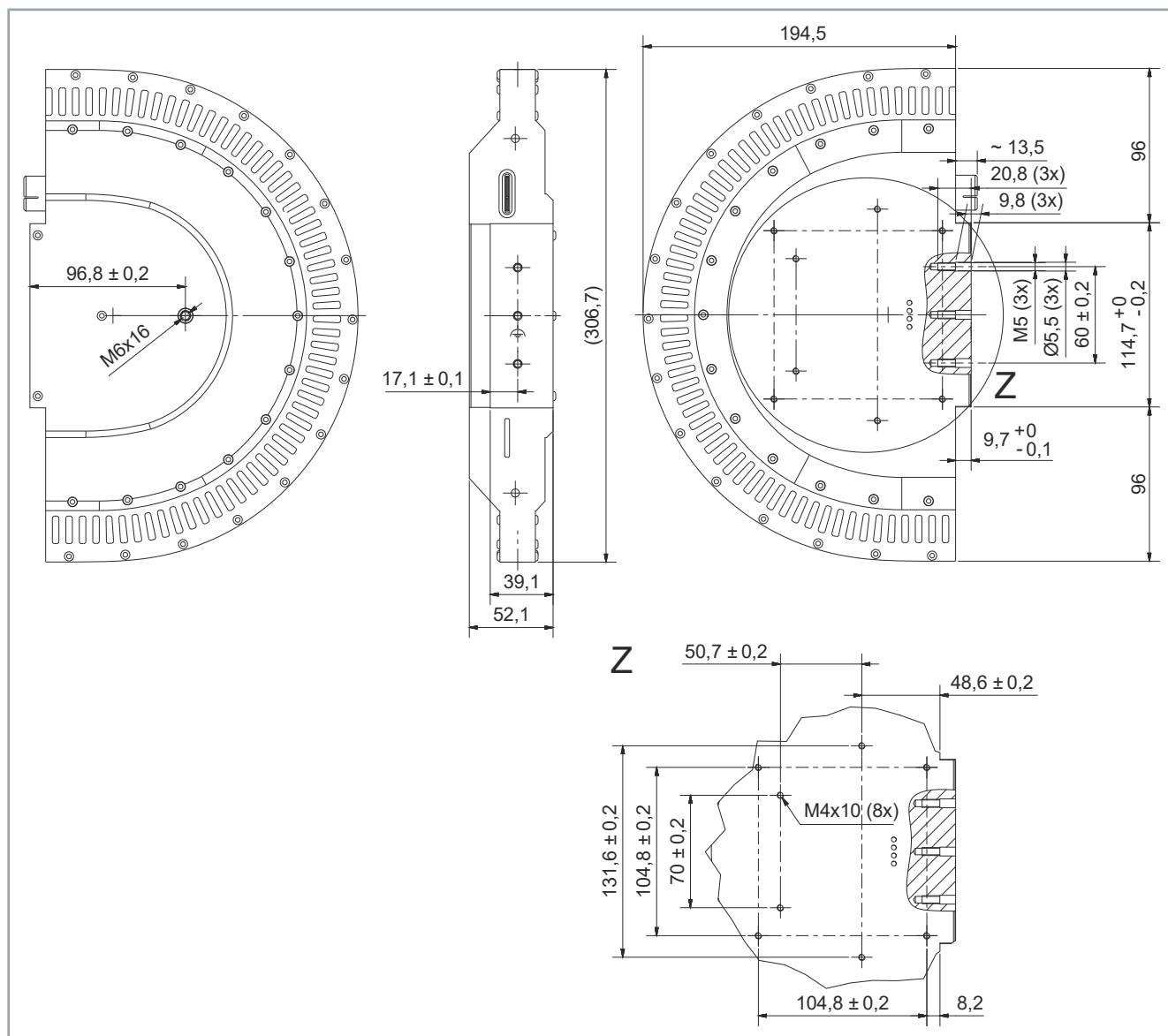
AT2050-0500

• UL-certified



AT2050-0500-0001

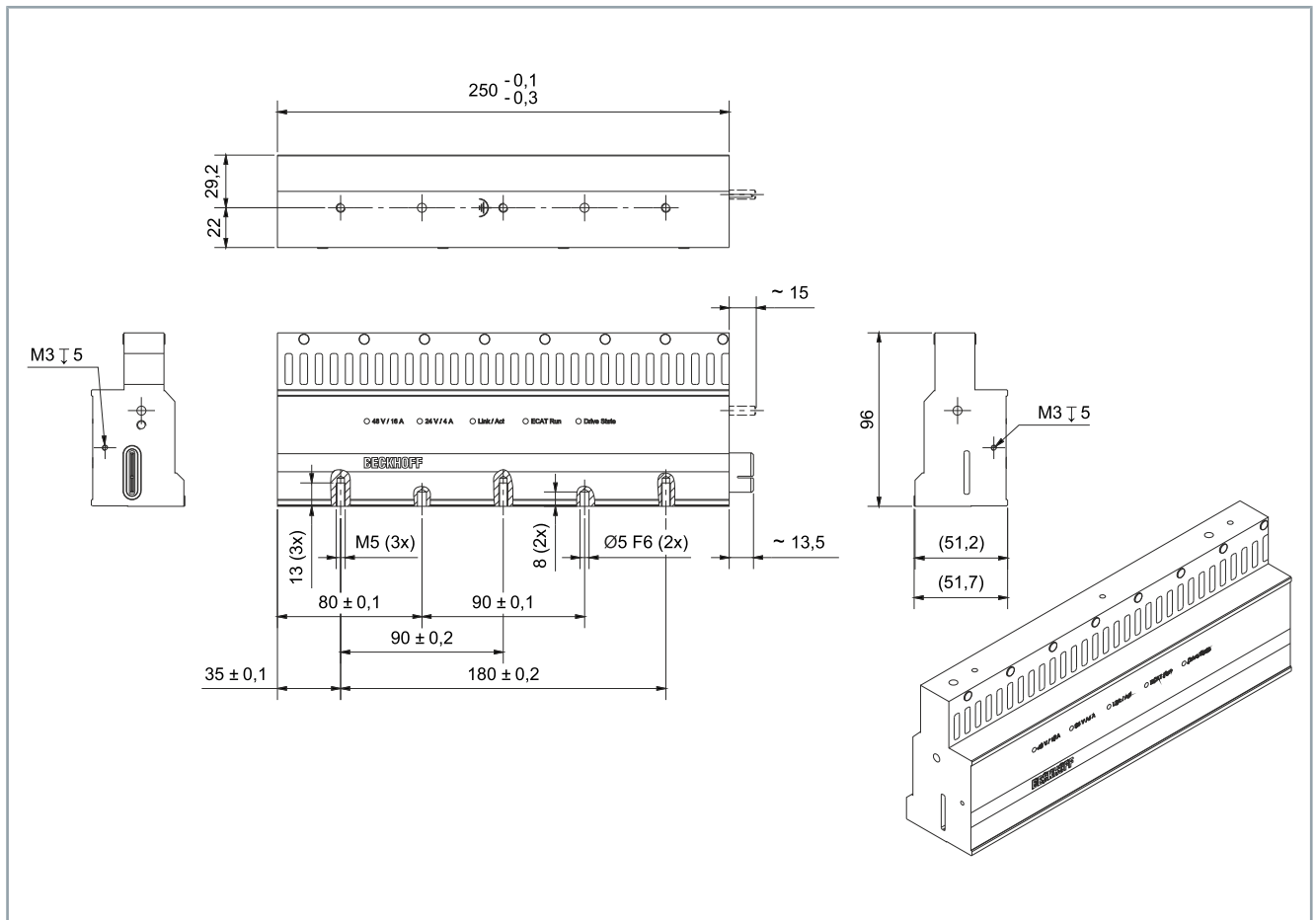
- UL-certified
- with option for additional cooling



Straight, with integrated NCT functionality, without infeed

AT2100-0250

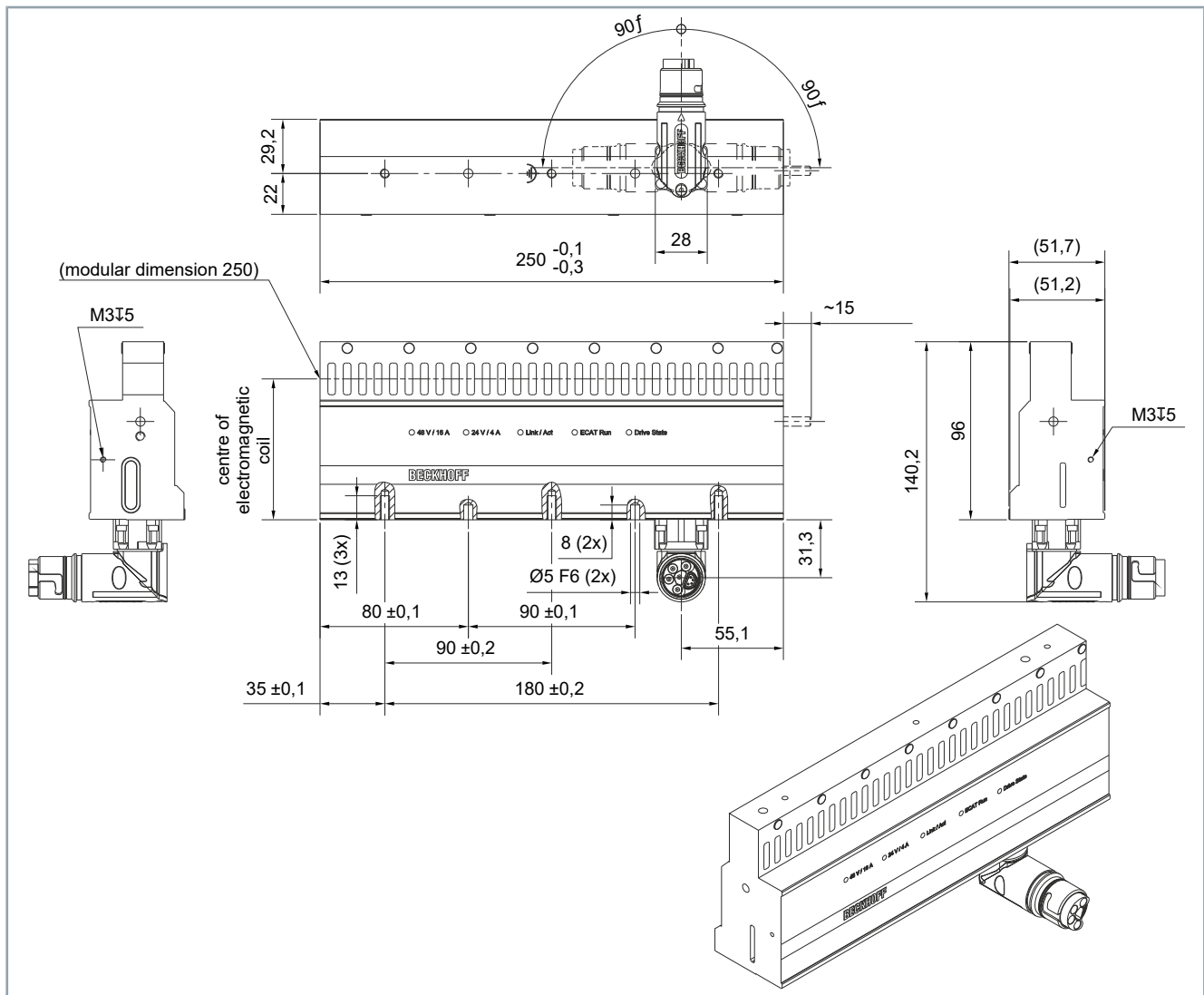
- 250 mm
- with integrated NCT functionality



Straight, with integrated NCT functionality, with connector for infeed

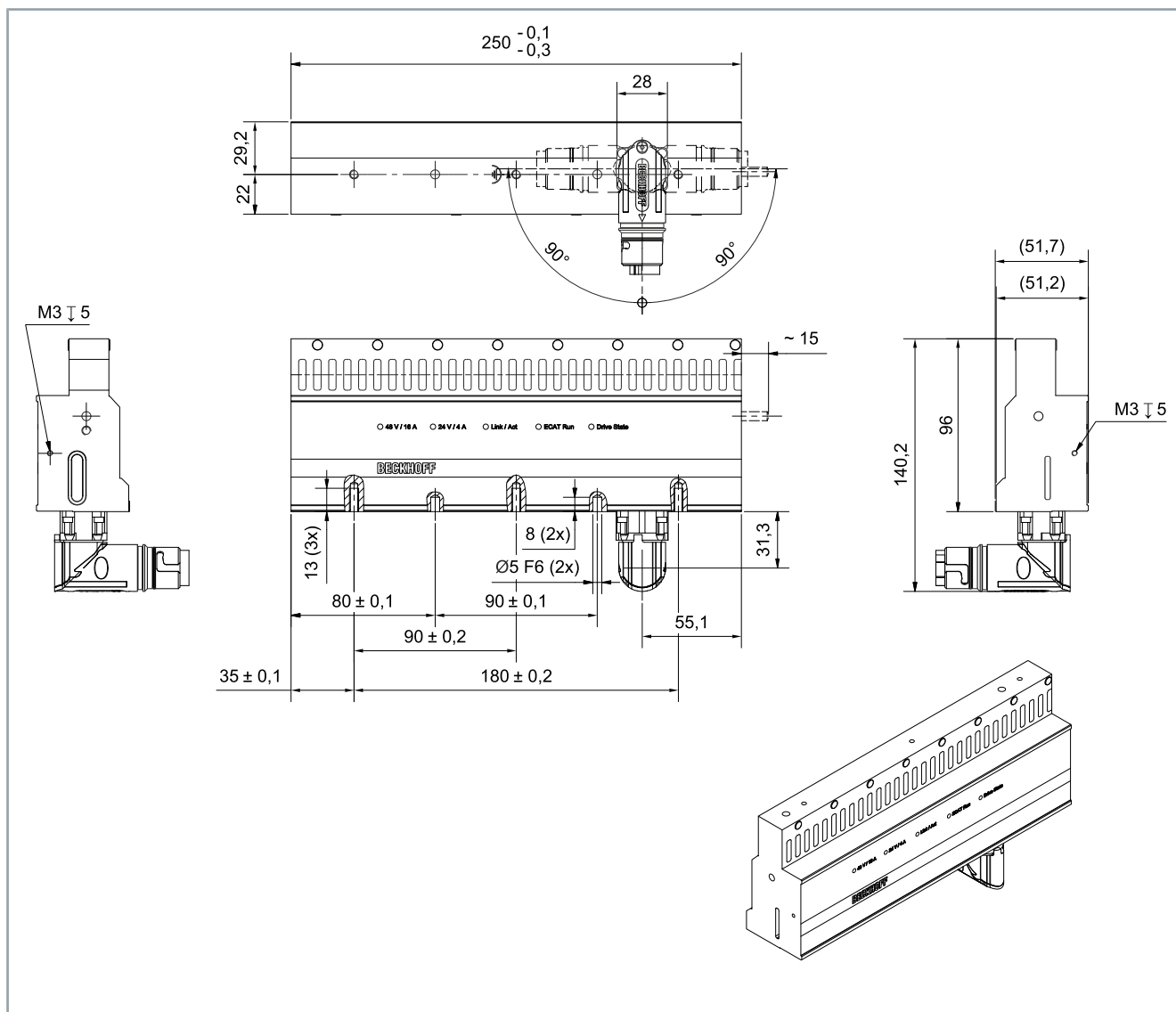
AT2102-0250, option  
ZX2002-0002

- with connector for infeed, direction of rotation to name plate
- 250 mm



AT2102-0250, option  
ZX2002-0001

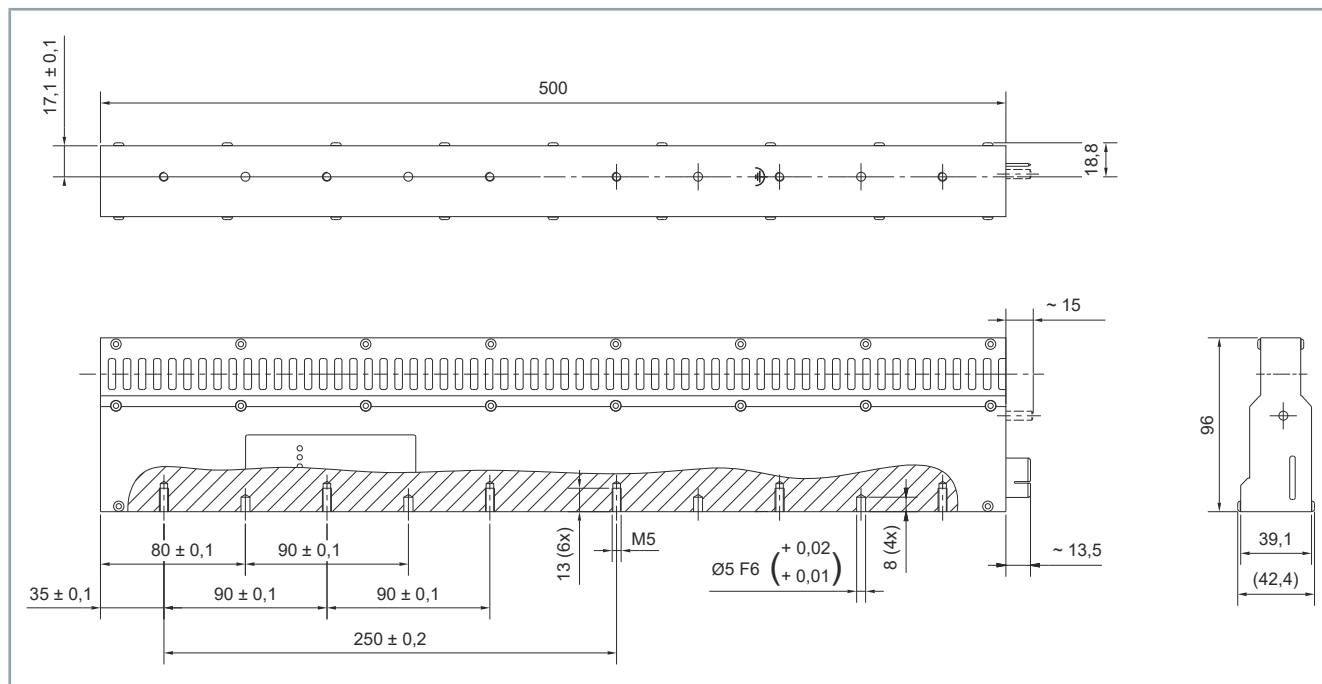
- with connector for infeed, direction of rotation to feedback system
- 250 mm



## 4.5.1.1 Straight, EcoLine, without infeed

AT2200-0500

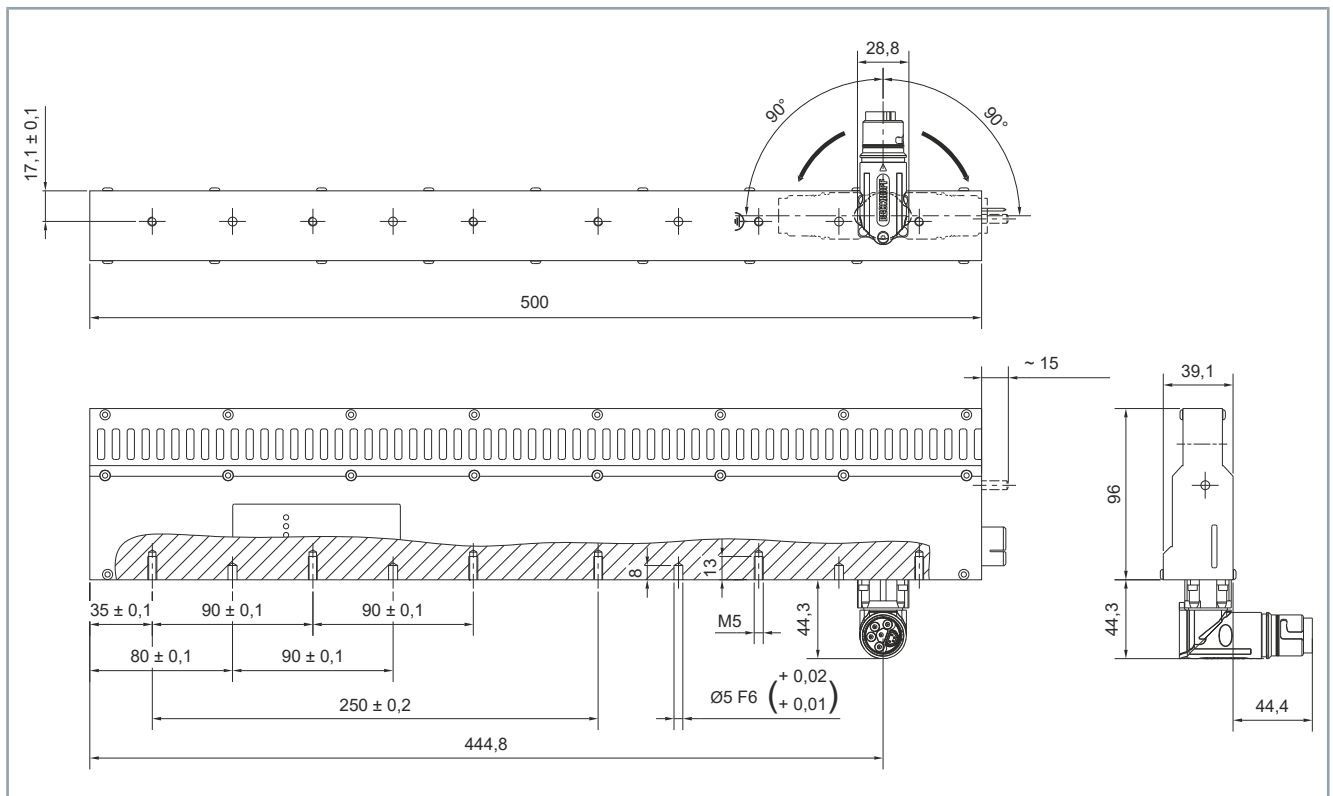
- 500 mm
- EcoLine



#### 4.5.1.2 Straight, EcoLine, with plug connector for infeed

AT2202-0500, option  
ZX2002-0002

- with connector for infeed, direction of rotation to name plate
- 500 mm
- EcoLine



AT2202-0500, option  
ZX2002-0001

- 
- Technical drawing of a 500mm long LED strip light assembly, showing three views: top, side, and end view.
- Top View:** Shows the overall length of 500mm and a mounting bracket at one end. The bracket has a width of 28,8mm and is designed for 90° rotation. The mounting holes are spaced at 17,1 ± 0,1mm.
- Side View:** Shows the profile of the LED strip with a total length of 444,8mm. The mounting bracket is attached to the bottom. The distance from the left edge to the start of the bracket is 35 ± 0,1mm. The bracket has a width of 80 ± 0,1mm and a height of 250 ± 0,2mm. The LED strip is 13mm high and 8mm wide. The mounting holes are M5 and spaced at 90 ± 0,1mm. The distance from the left edge to the first mounting hole is 80 ± 0,1mm. The distance between the first and second mounting holes is 90 ± 0,1mm. The distance between the second and third mounting holes is 90 ± 0,1mm. The distance from the third mounting hole to the end of the bracket is 250 ± 0,2mm. The distance from the end of the bracket to the right edge is 44,3mm. The mounting holes are Ø5 F6 (+0,02 / +0,01).
- End View:** Shows the profile of the LED strip with a total width of 39,1mm. The LED strip is 96mm high and 33,4mm wide. The mounting bracket is 44,3mm high.



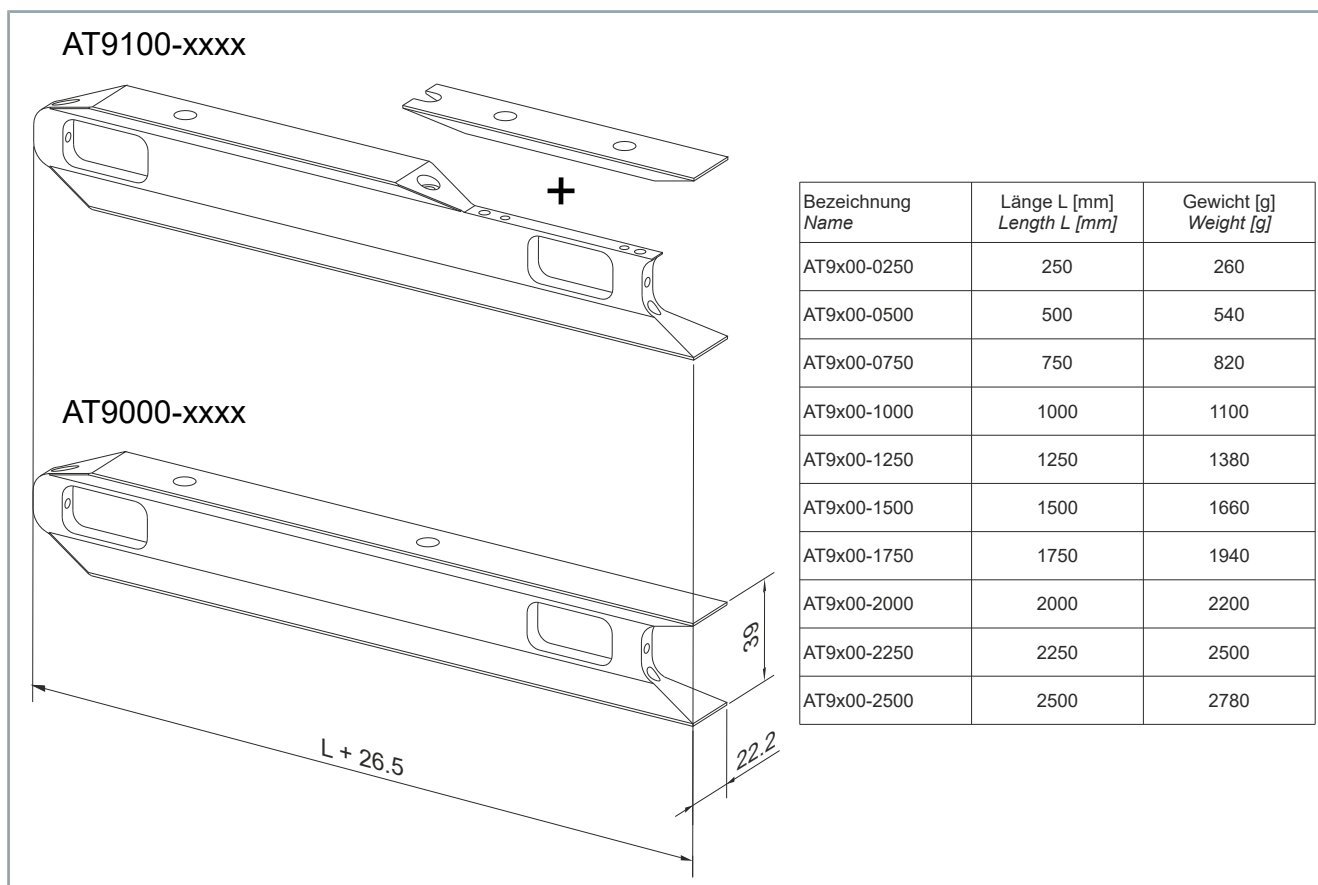
## 4.5.2 Guide rails

*All figures in millimeters*

Straight

AT9x00-xxxx

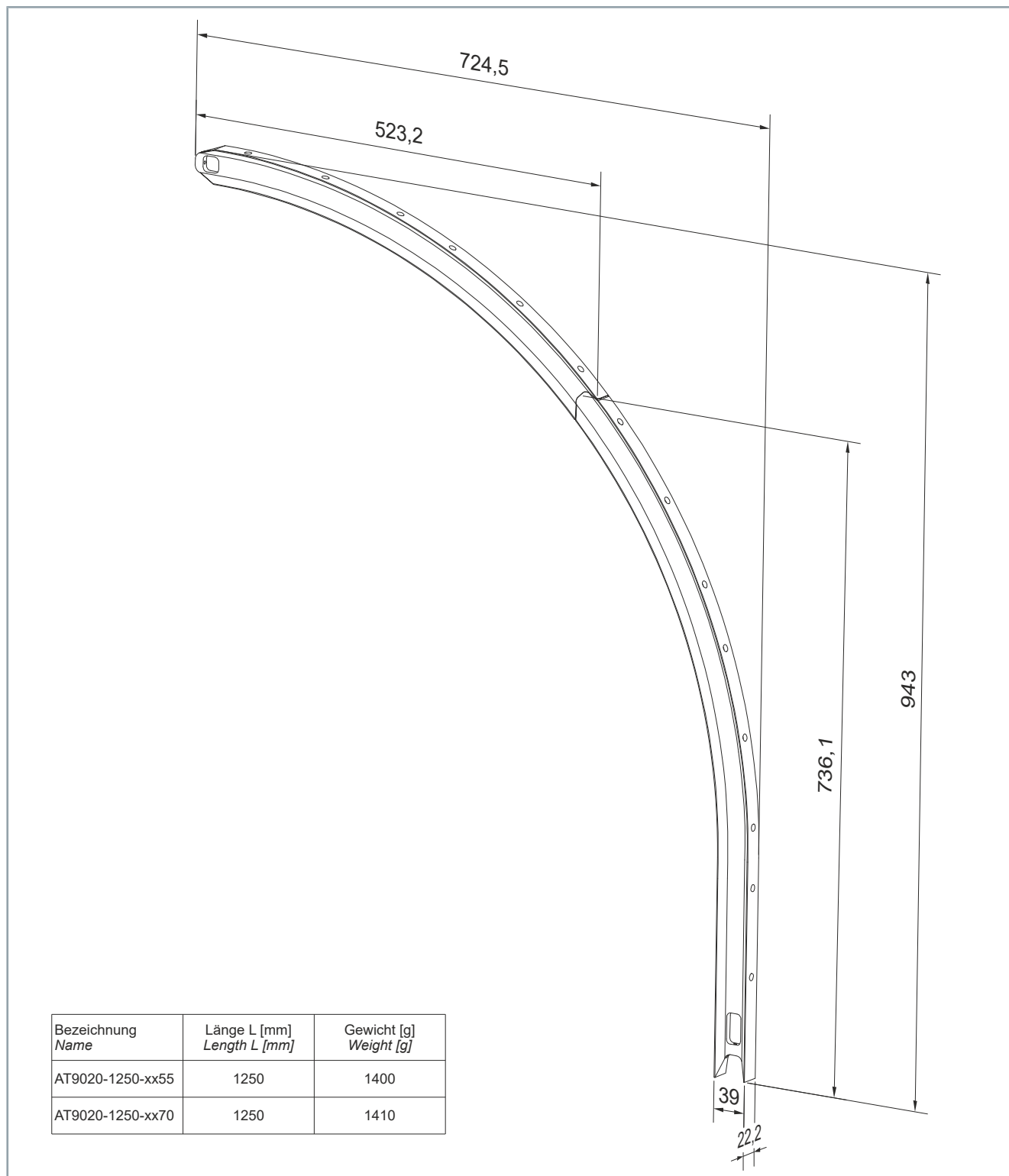
- different lengths from 249 to 2500 mm
- for all Beckhoff movers



## 22.5° curved segment

AT9020-1250-0xxx

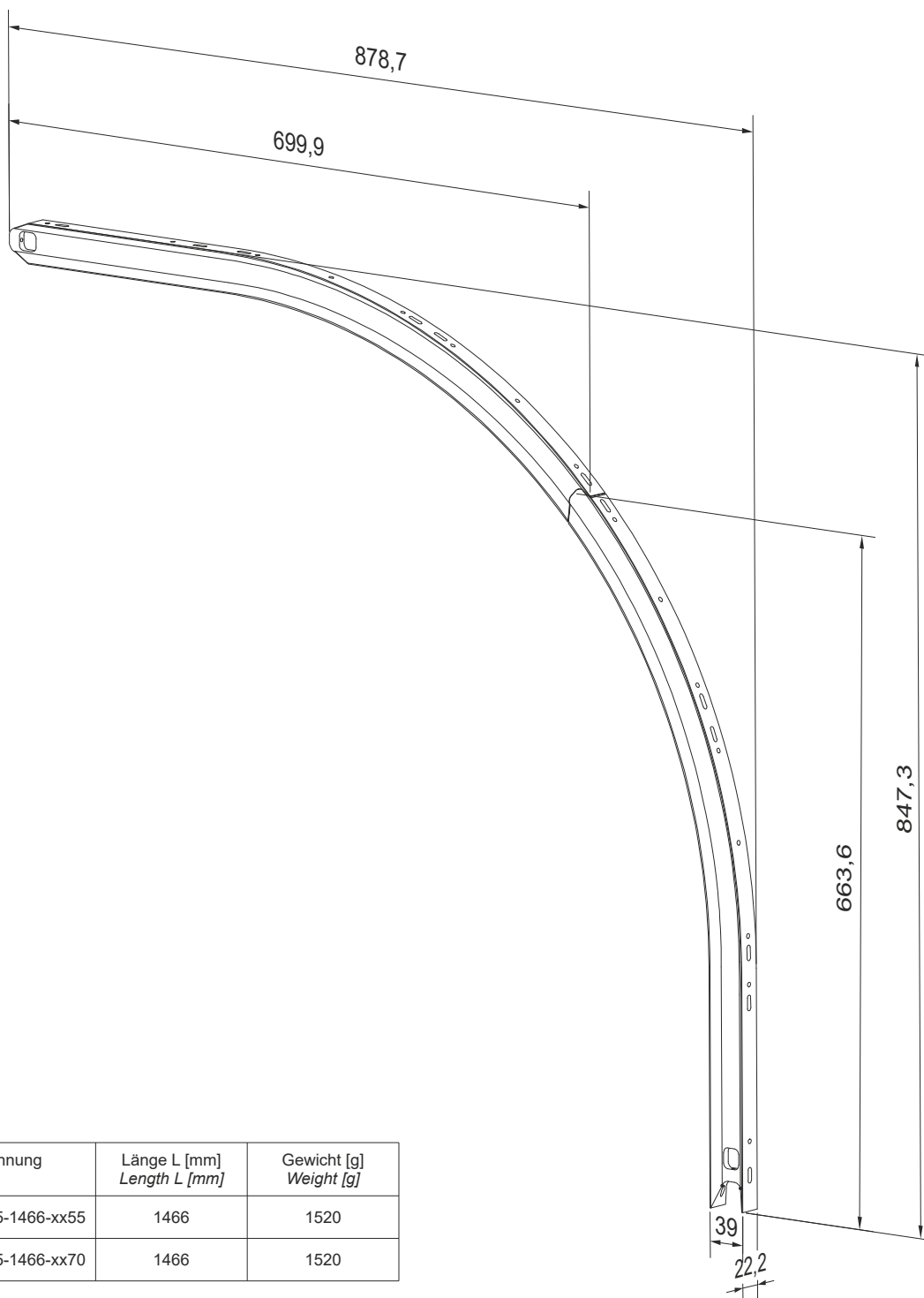
- Guide rail set, 1250 mm
- for AT9014-00xx-x550
- consisting of:
  - 1 x AT9020-1250-1055 guide rail, suitable for 1 x straight motor module AT200x-0250 and 2 x 22.5° motor module AT202x-0250
  - 1 x AT9020-1250-2055 guide rail, suitable for 2 x 22.5° motor module AT202x-0250



## -22.5° curved segment

AT9025-1466-0xxx

- Guide rail set, 1466 mm
- for AT9014-00xx-x550
- consisting of:
  - 1 x guide rail AT9025-1466-1170, suitable for 1 x straight motor module AT200x-0233 and 2 x -22.5° motor module AT202x-0250
  - 1 x AT9025-1466-2170 guide rail, suitable for 1 x straight motor module AT200x-0233 and 2 x -22.5° motor module AT202x-0250

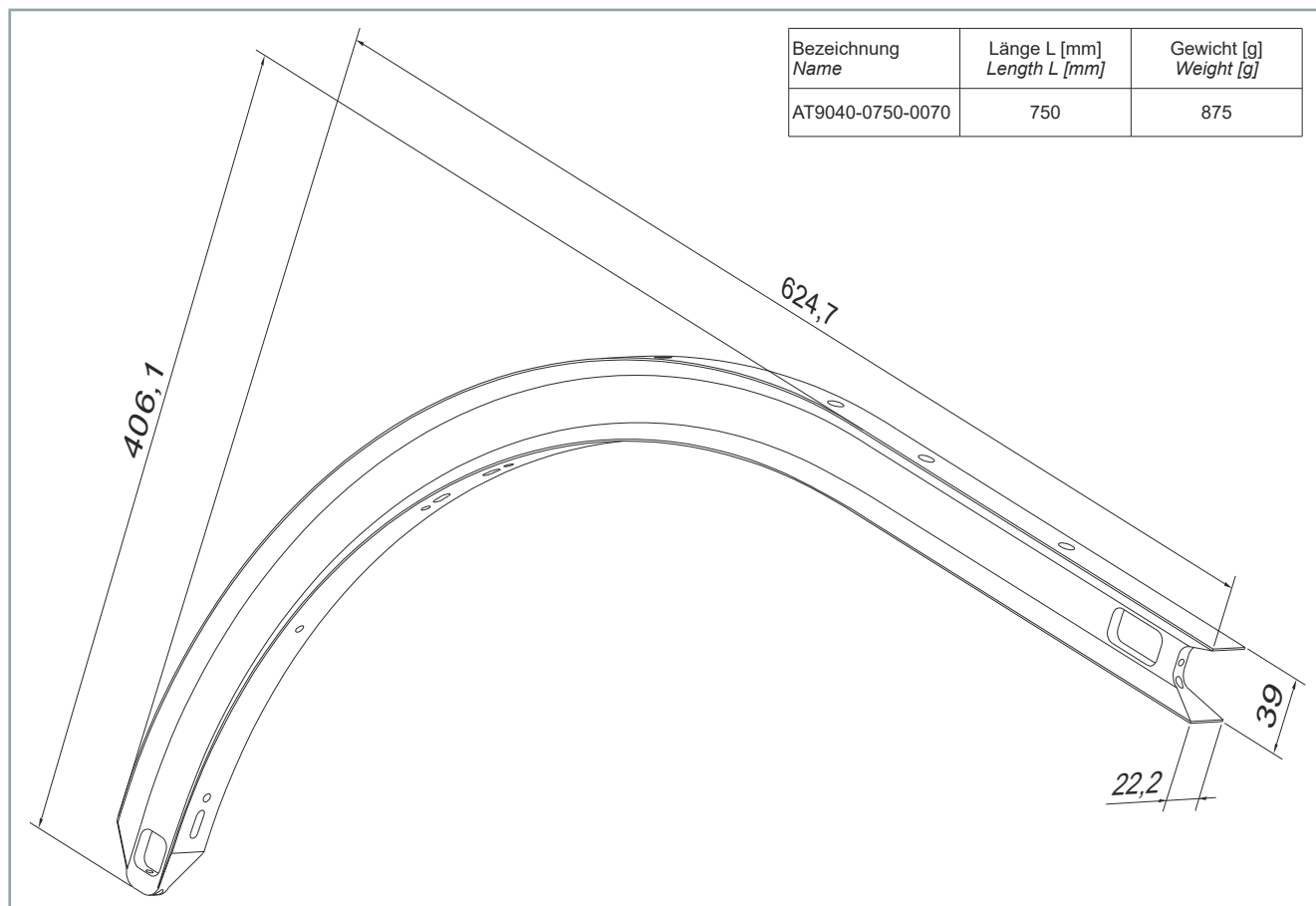


Bezeichnung Name	Länge L [mm] Length L [mm]	Gewicht [g] Weight [g]
AT9025-1466-xx55	1466	1520
AT9025-1466-xx70	1466	1520

## 45° curved segment

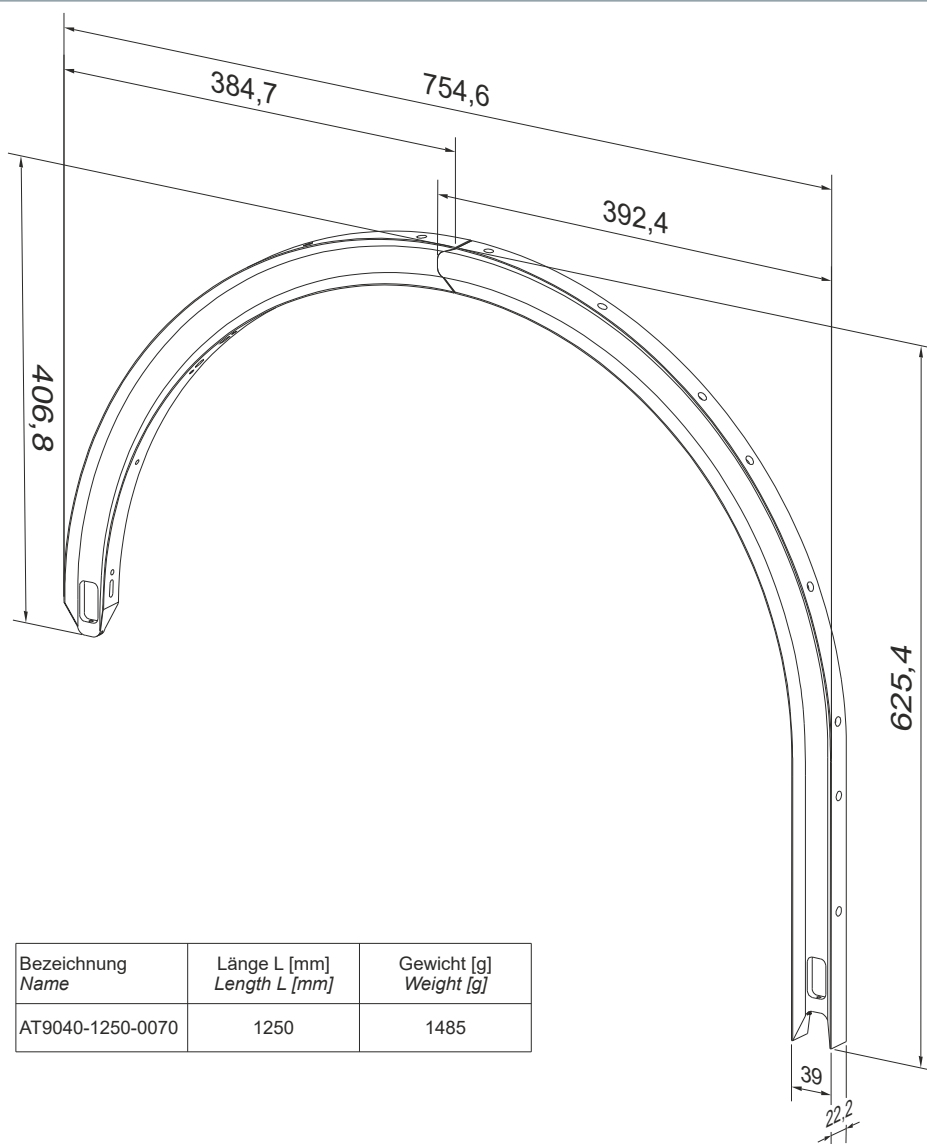
AT9040-0750-00xx

- Guide rail, 750 mm
- for movers *AT9011-0070-x550 and AT9014-0055*
- suitable for 1 x straight motor module *AT200x-0250* and 2 x 45° motor module *AT204x-0250*



AT9040-1250-0070

- Guide rail set, 1250 mm
- for mover AT9011-0070-x550
- consisting of:
  - 1 x guide rail AT9040-1250-1070, suitable for 1 x motor module AT200x-0250 and 2 x 45° motor module AT204x-0250
  - 1 x guide rail AT9040-1250-2070, suitable for 2 x 45° motor module AT204x-0250

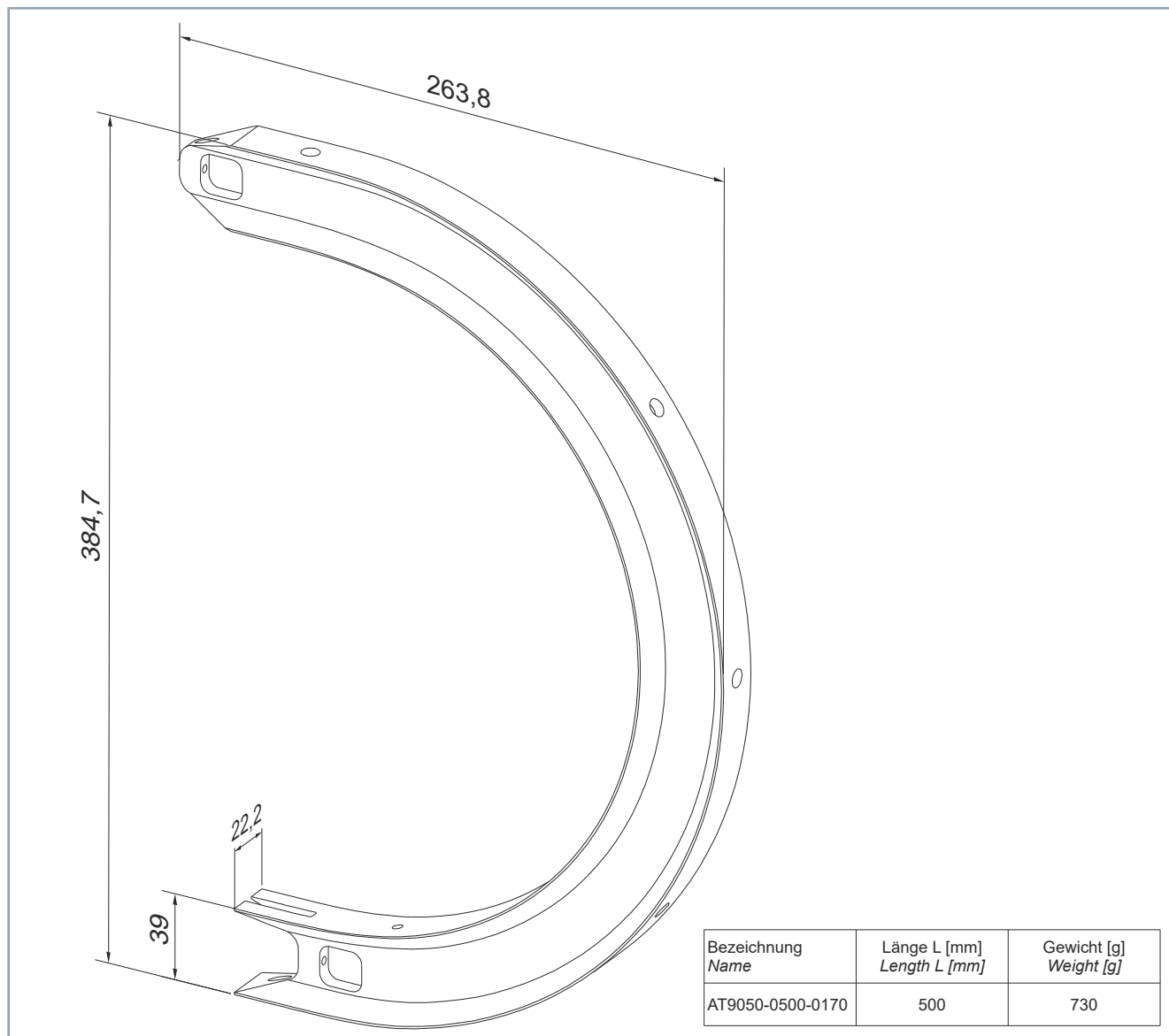


# Technical data

180° curved segment

AT9050-0500-0xxx

- for AT9011-0070 and AT9014-0055
- suitable for 1 x 180° motor module AT2050-0500



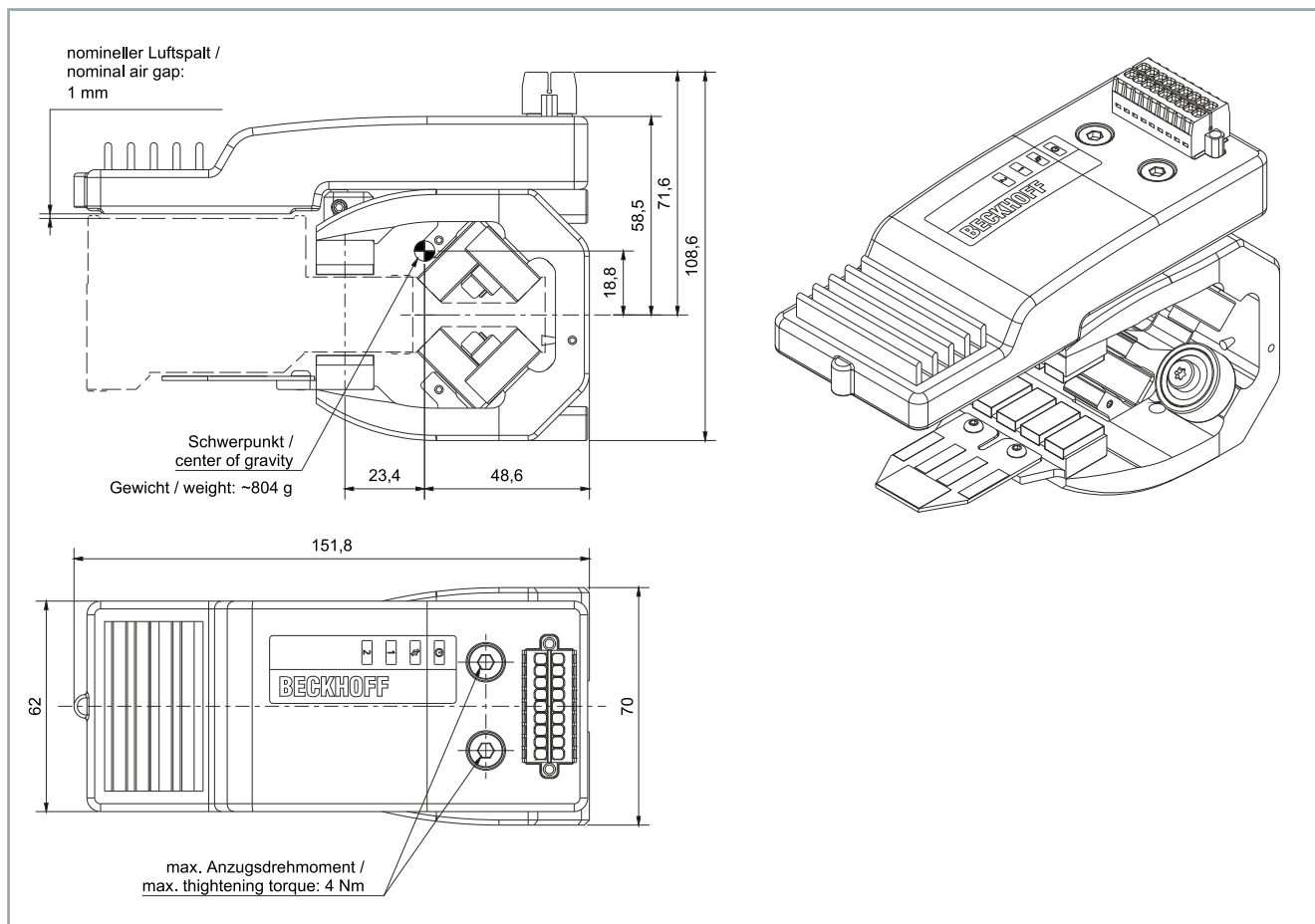
### 4.5.3 Mover

*All figures in millimeters*

Mover, length 70 mm, with mounted NCT electronics

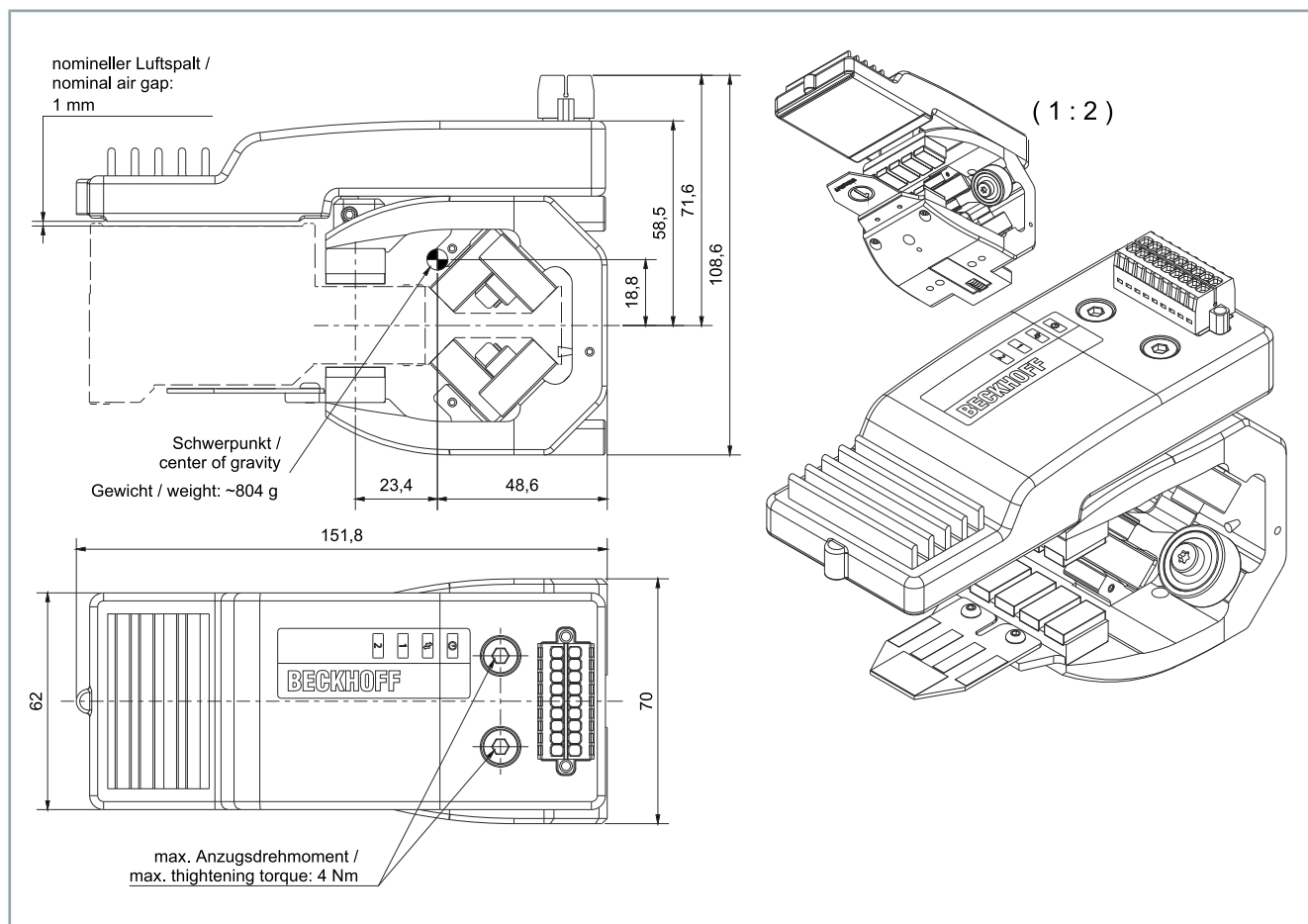
AT8300-1100-0100

- 6 guide rollers
- Standard magnetic plate set



AT8300-1200-0100

- 6 guide rollers
- Magnetic plate set Mover 1

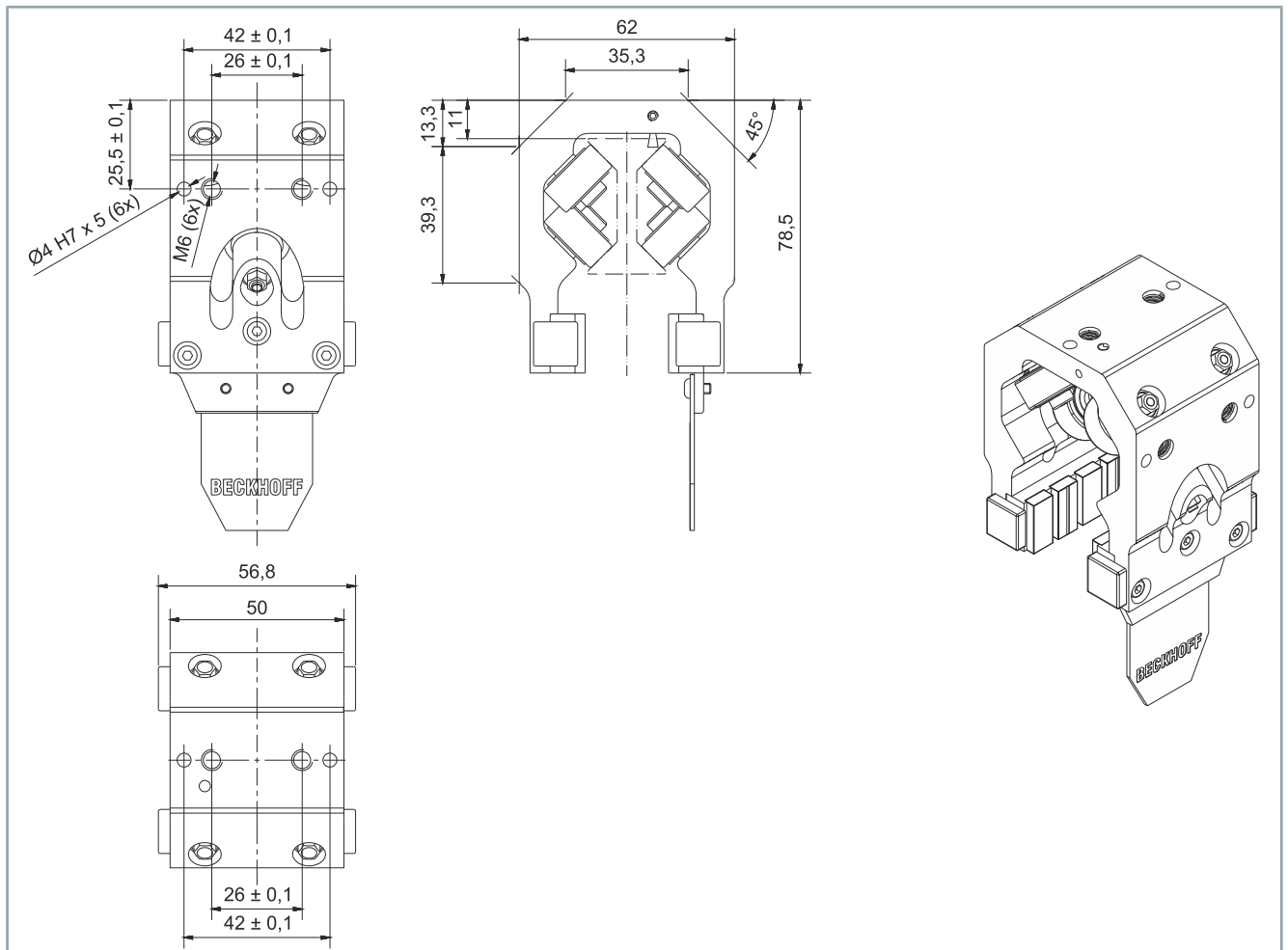




Mover, length 50 mm

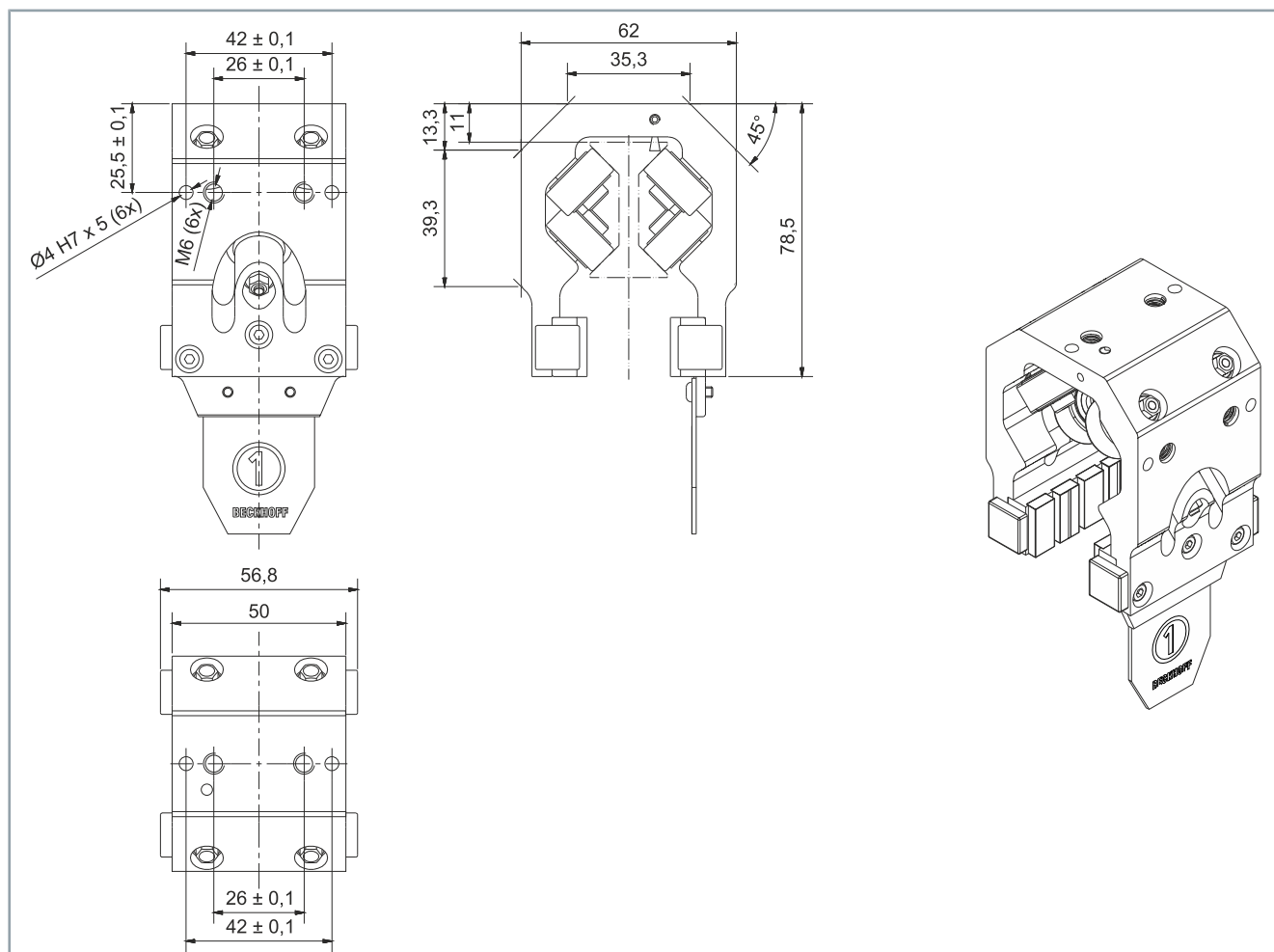
AT9011-0050-0550

- 6 guide rollers
- Standard magnetic plate set



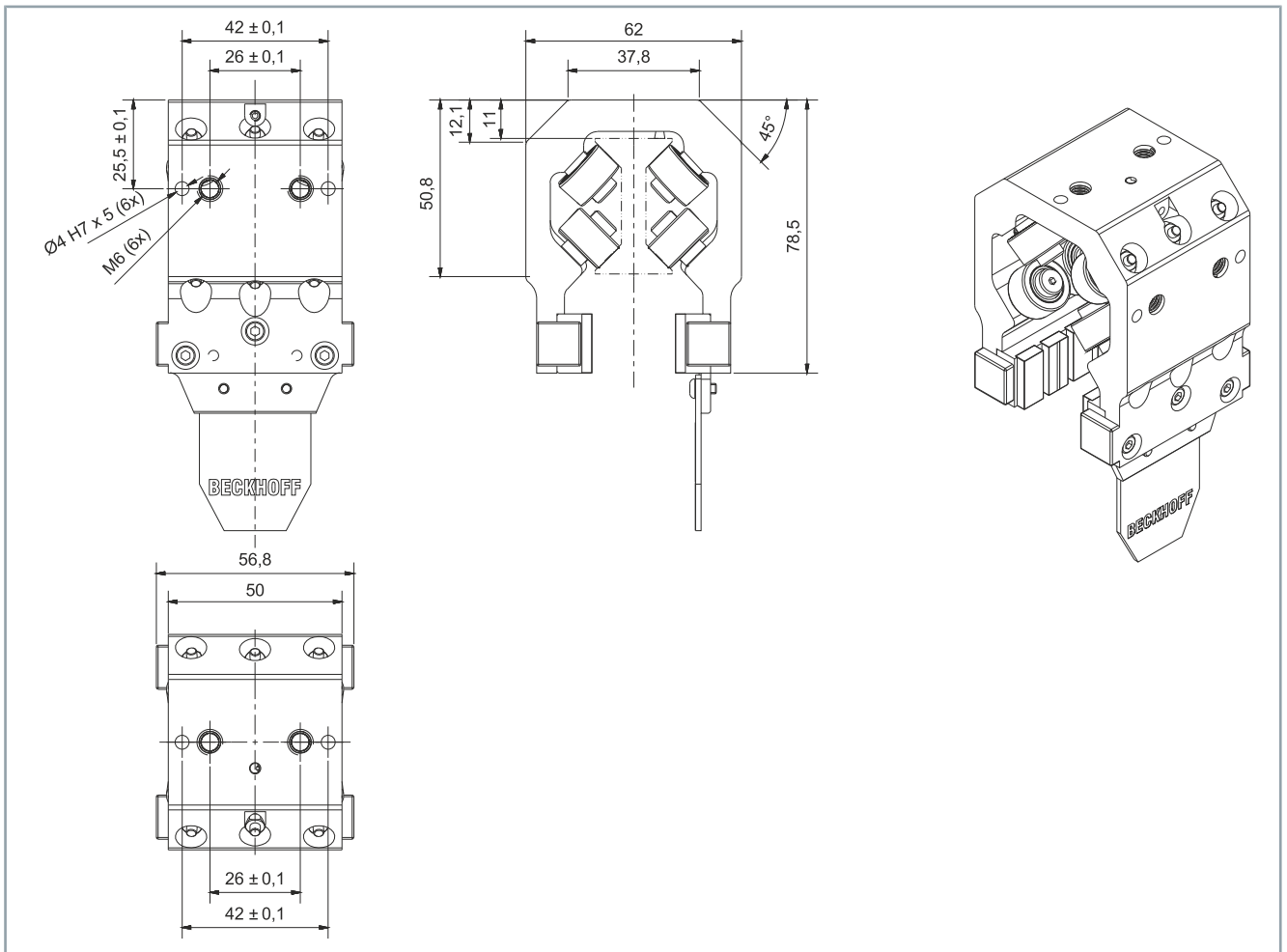
AT9011-0050-1550

- 6 guide rollers
- Magnetic plate set Mover 1



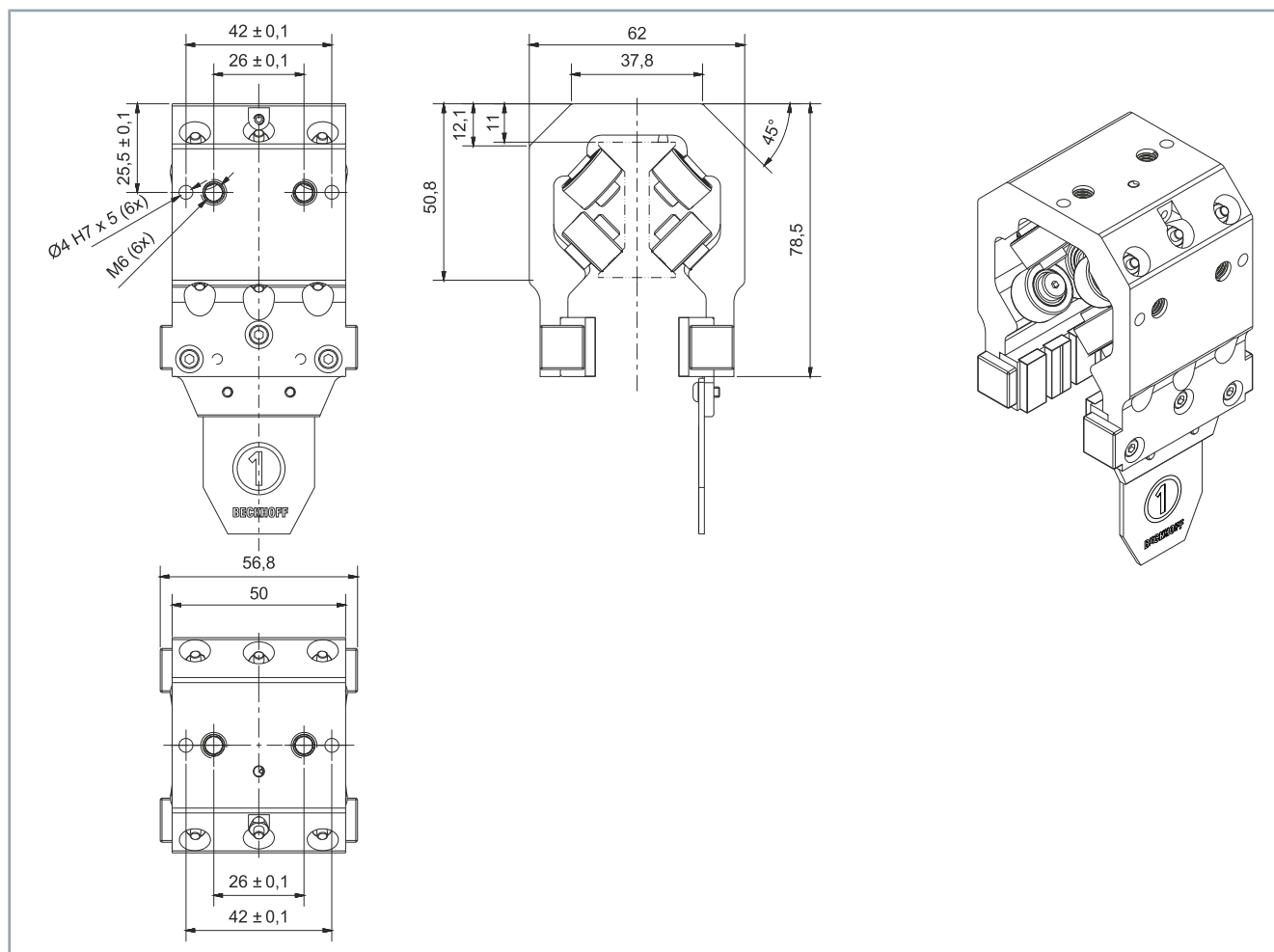
AT9012-0050-0550

- 12 guide rollers
- Standard magnetic plate set



AT9012-0050-1550

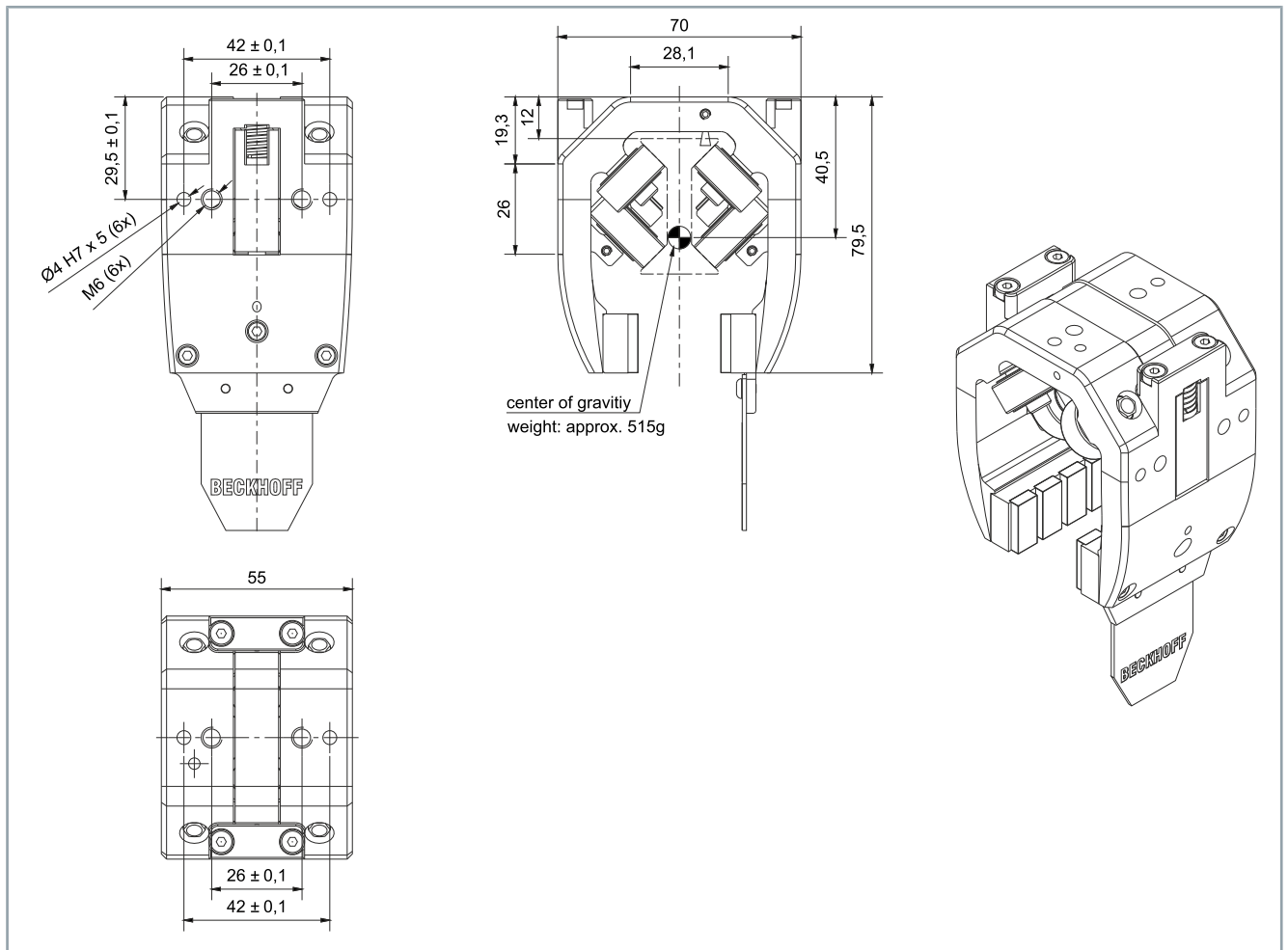
- 12 guide rollers
- Magnetic plate set Mover 1



Mover, length 55 mm

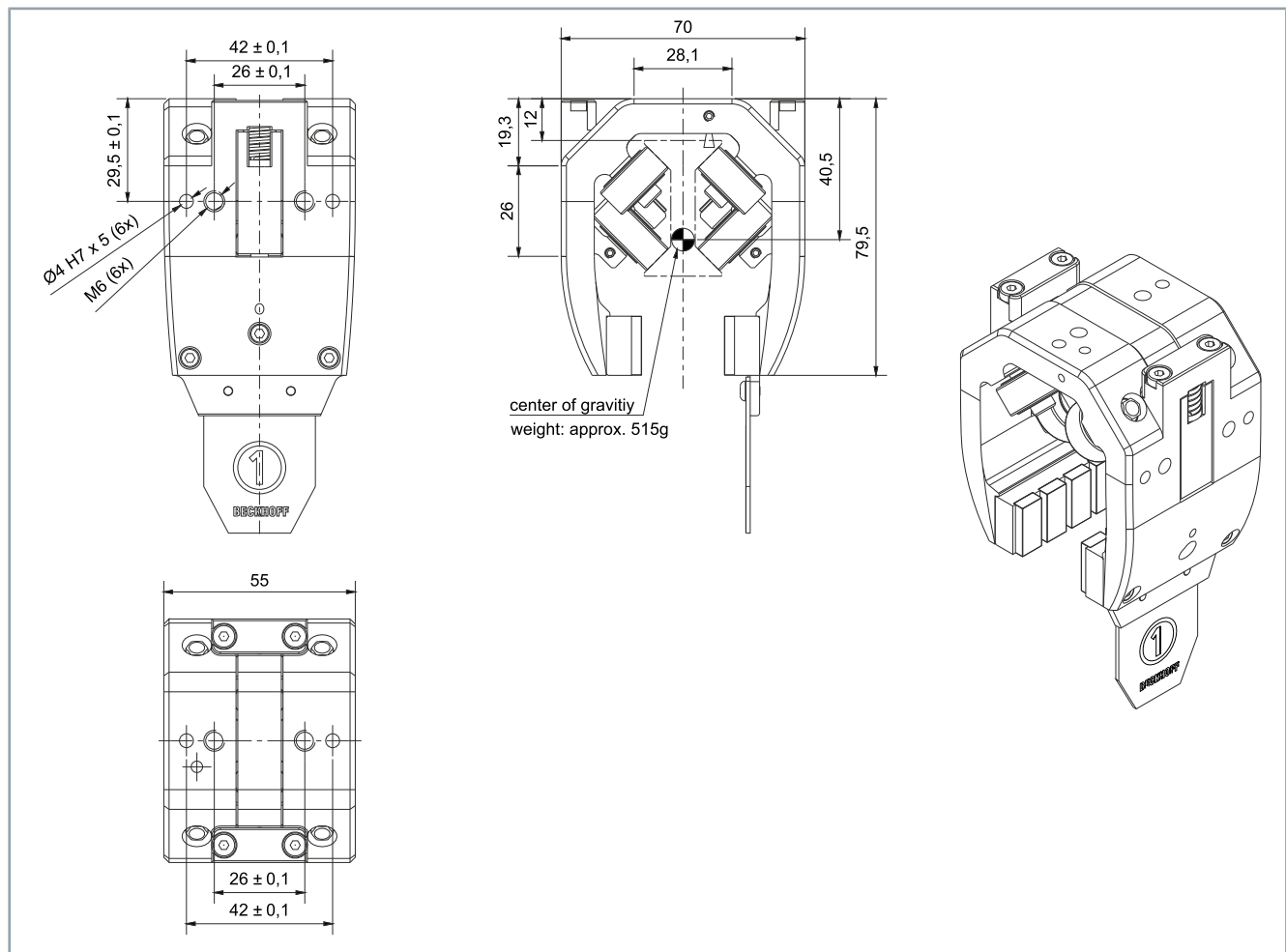
AT9014-0055-0550

- 6 guide rollers, 2 of which are spring-loaded
- Standard magnetic plate set



AT9014-0055-1550

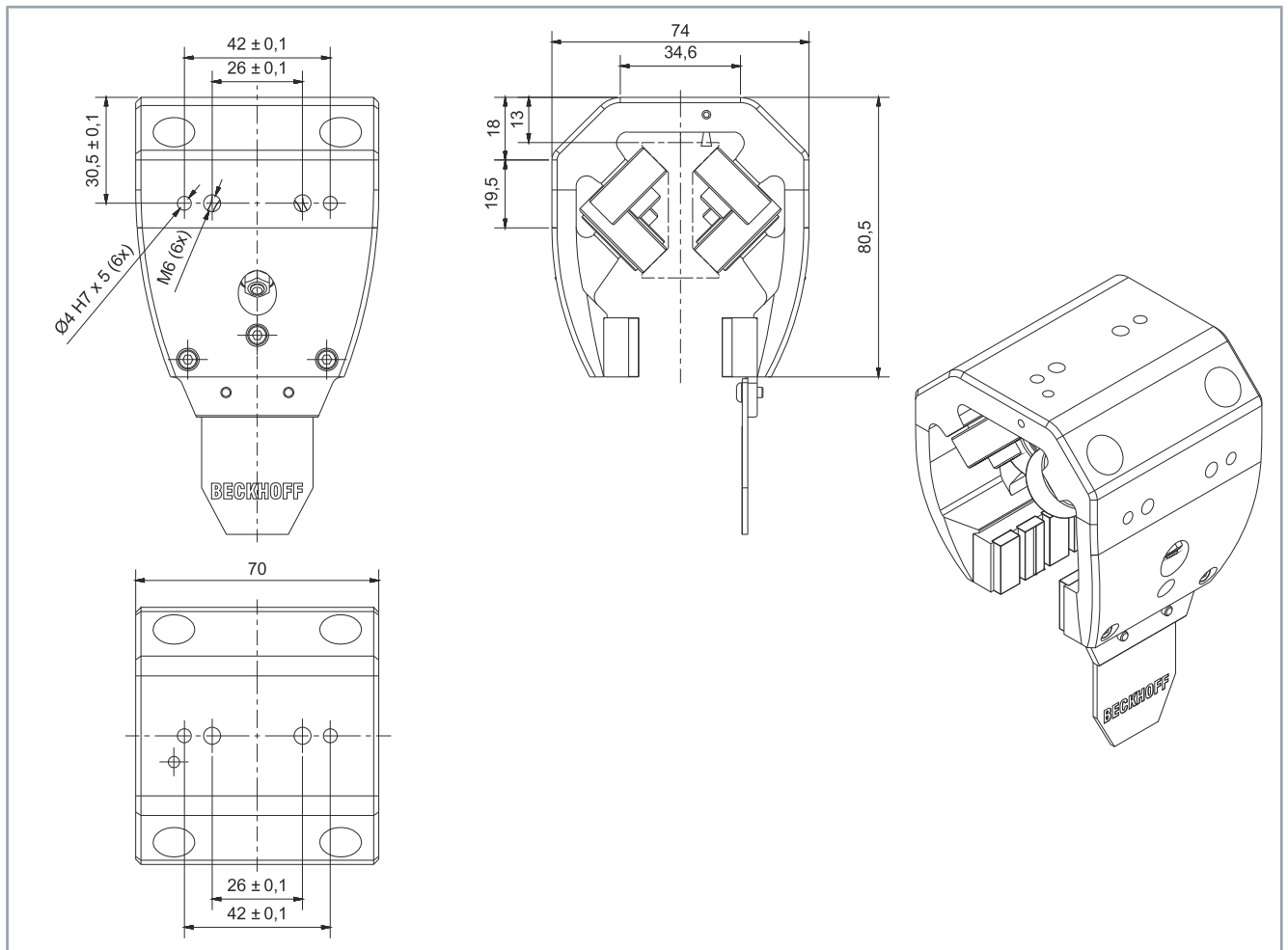
- 6 guide rollers, 2 of which are spring-loaded
- Magnetic plate set Mover 1



Mover, length 70 mm

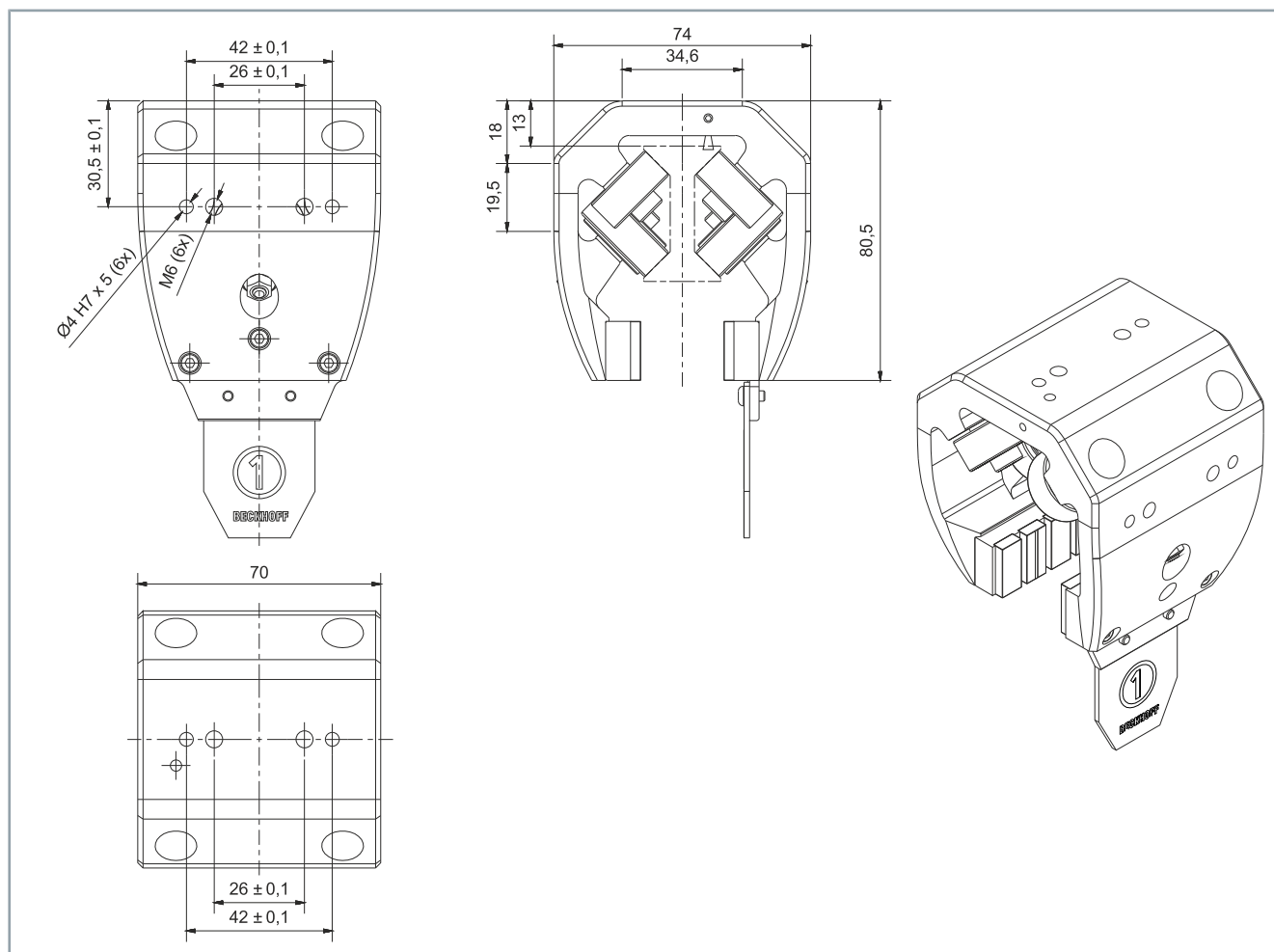
AT9011-0070-0550

- 6 guide rollers
- Standard magnetic plate set



AT9011-0070-1550

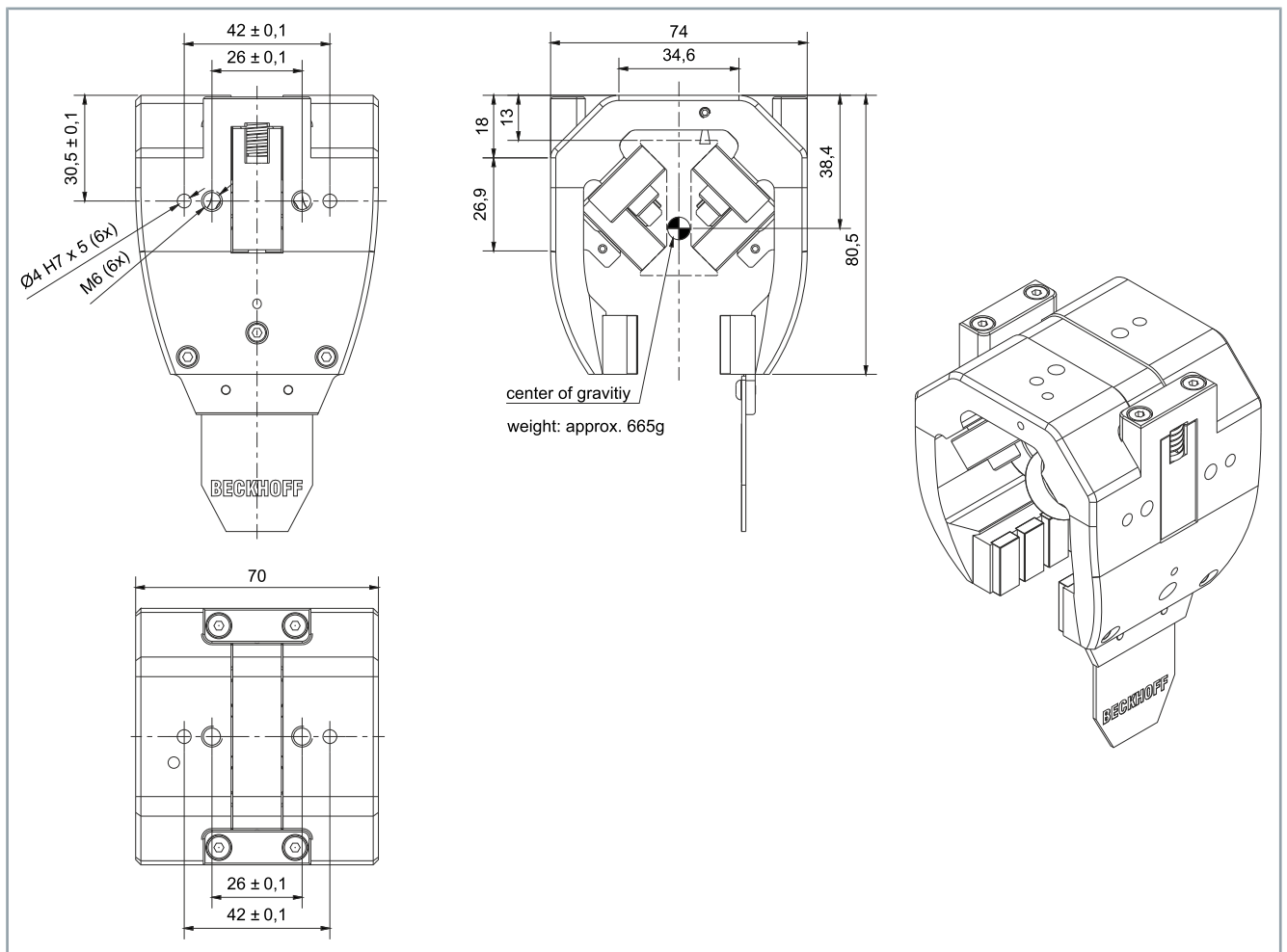
- 6 guide rollers
- Magnetic plate set Mover 1





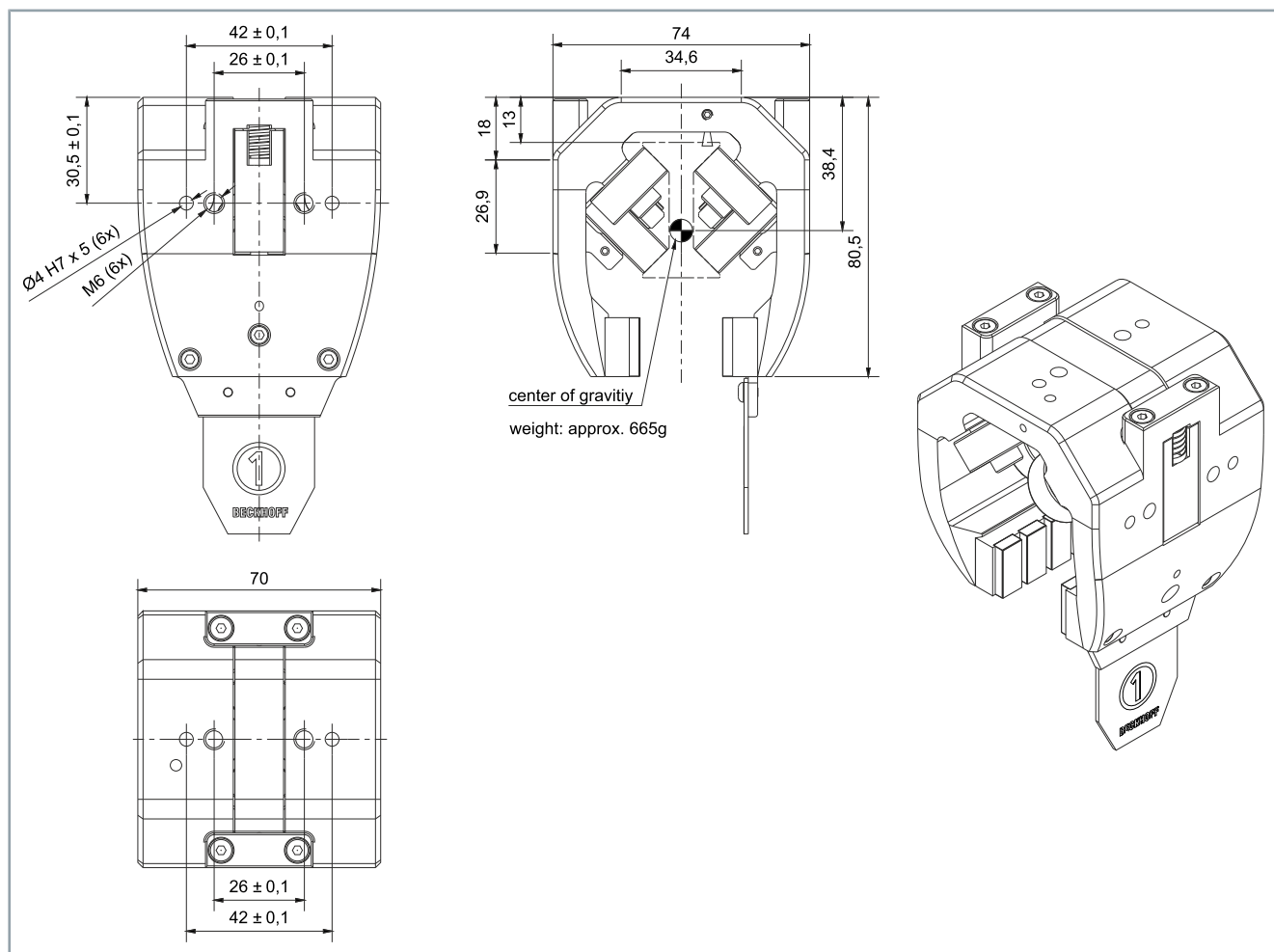
AT9014-0070-0550

- 6 guide rollers, 2 of which are spring-loaded
- Standard magnetic plate set



AT9014-0070-1550

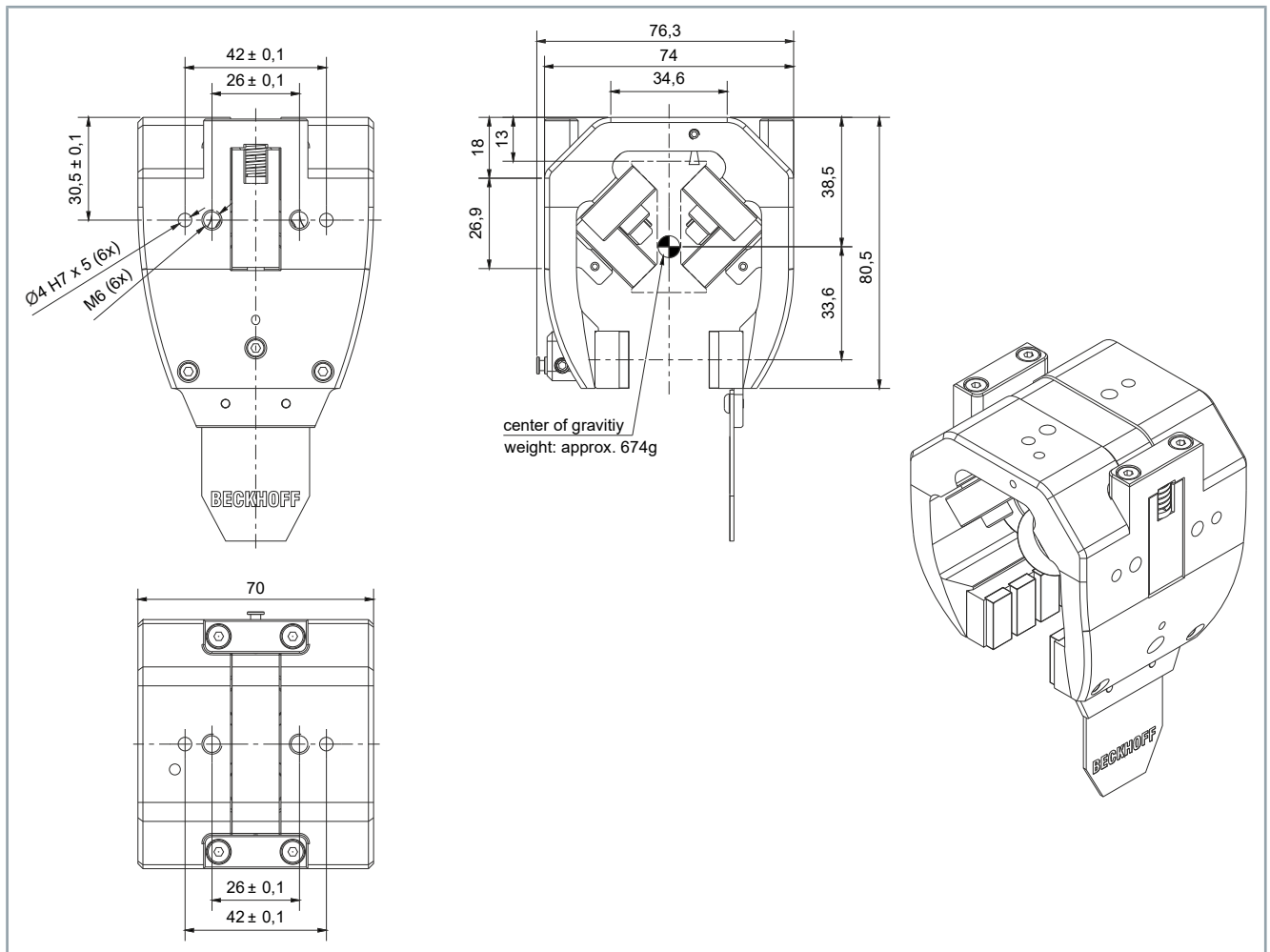
- 6 guide rollers, 2 of which are spring-loaded
- Magnetic plate set Mover 1



Mover, length 70 mm, suitable for NCT electronics

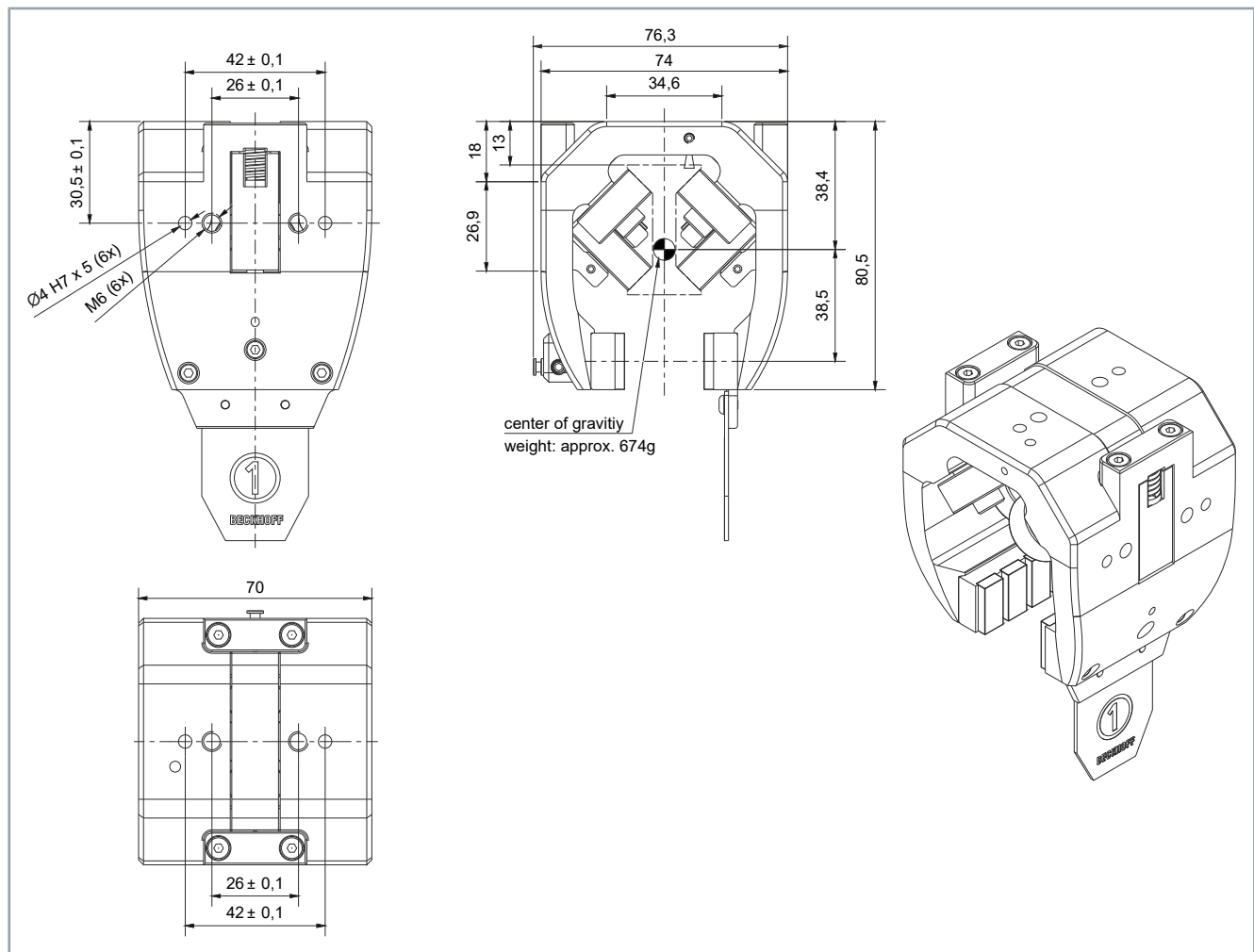
AT9014-1070-0550

- 6 guide rollers
- Standard magnetic plate set



AT9014-1070-1550

- 6 guide rollers
- Magnetic plate set Mover 1

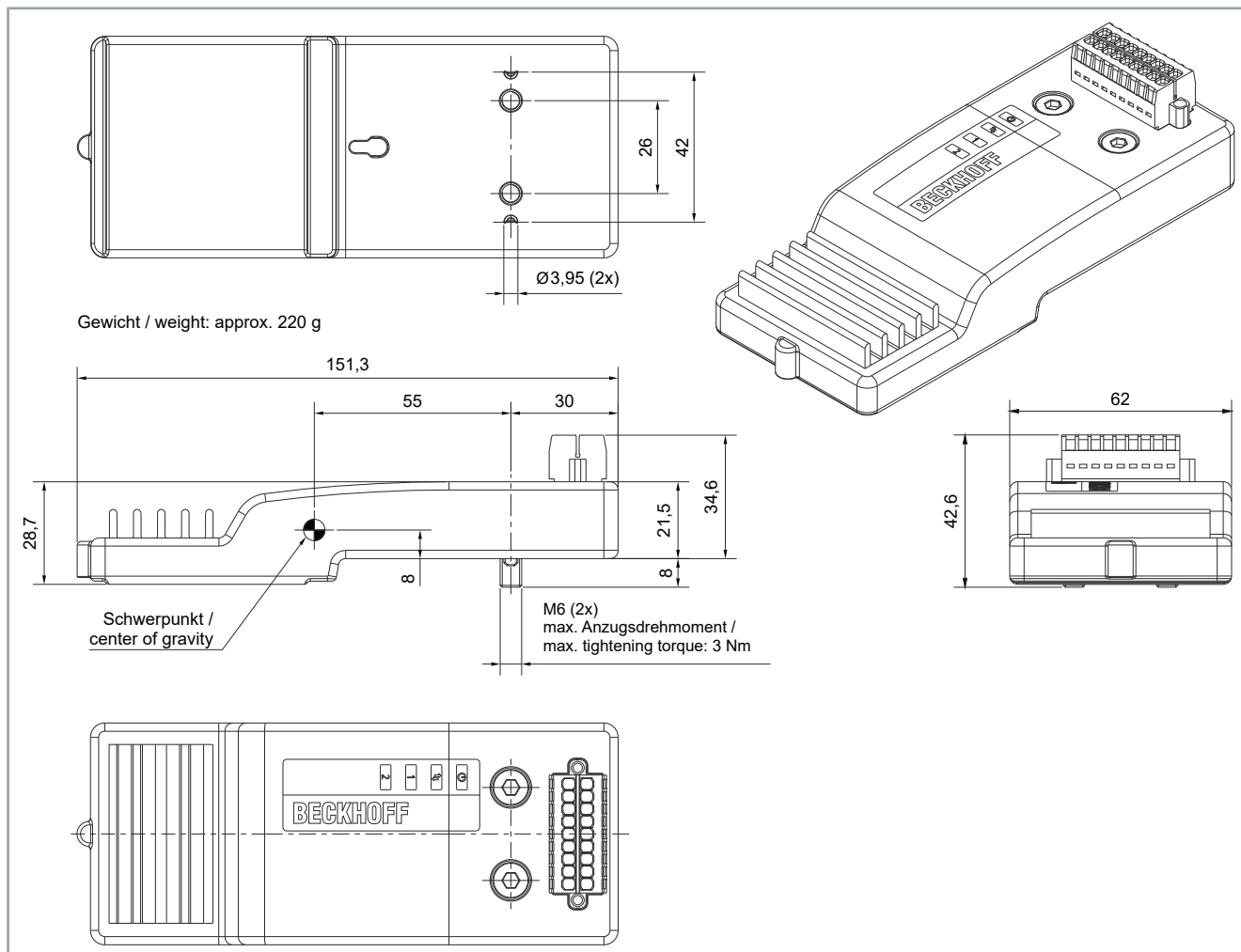


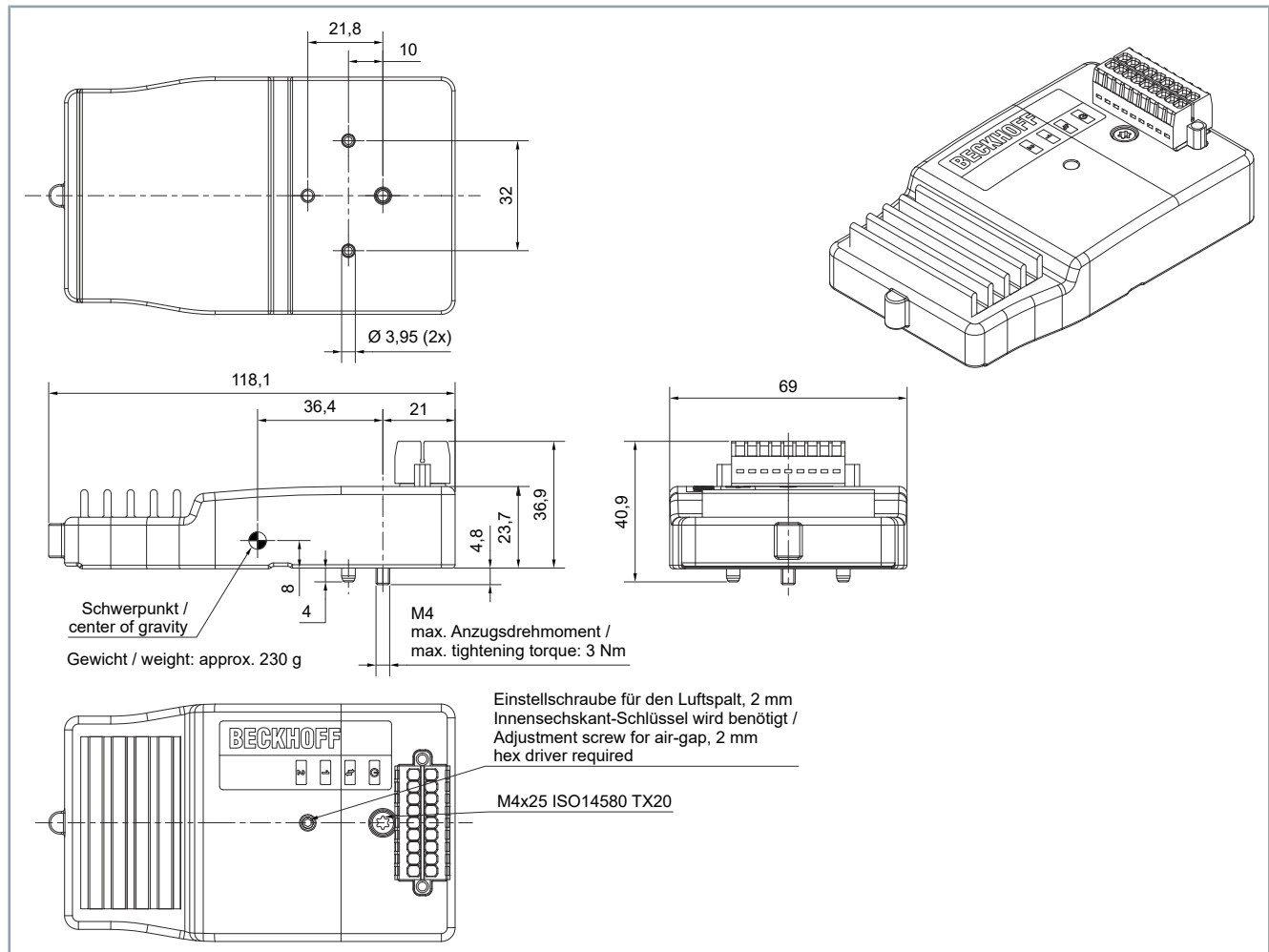
## 4.5.4 NCT electronics

*All figures in millimeters*

AT8200-1000-0100

- for mover AT9014-1070-x550



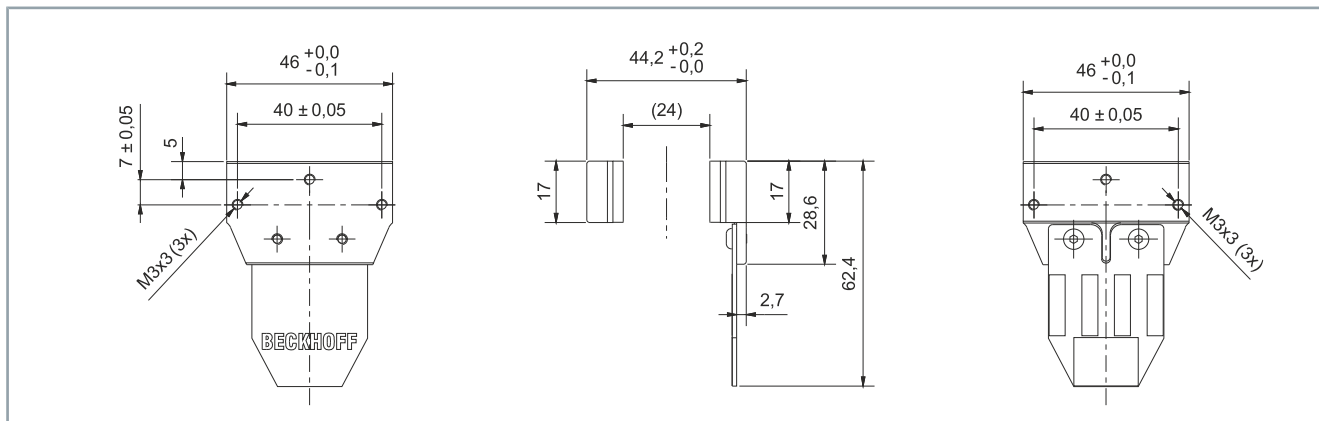


## 4.5.5 Magnetic plate sets [+]

All figures in millimeters

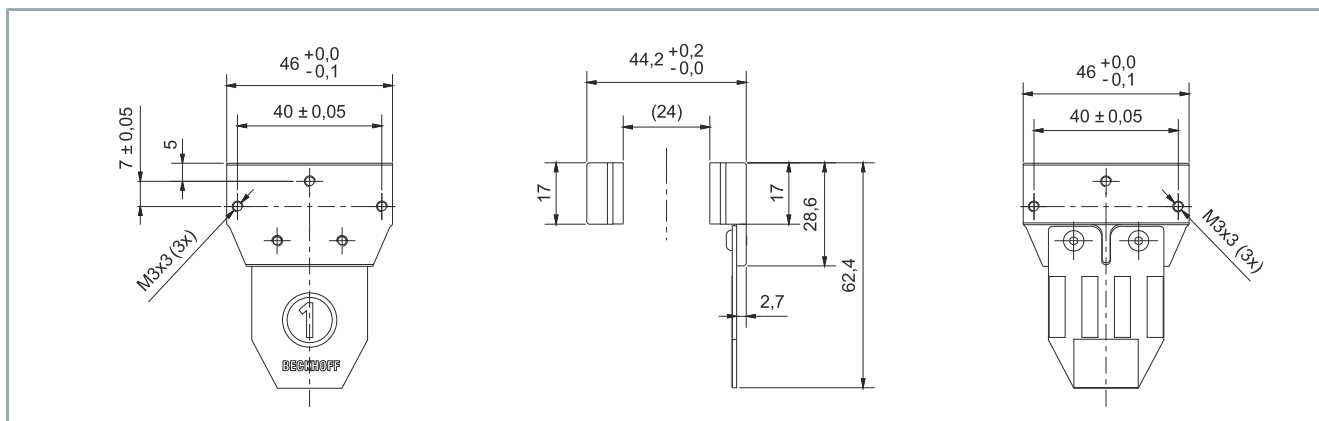
AT9001-0450-1640

- Standard magnetic plate set
- 4-pin, 50 mm
- for XTS movers and third-party movers



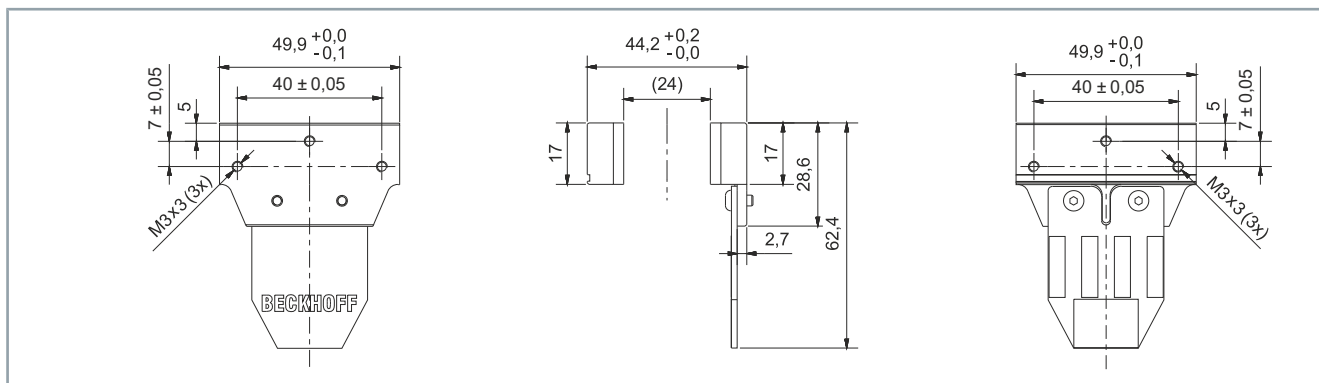
AT9001-1450-1640

- Magnetic plate set Mover 1
- 4-pin, 50 mm
- for XTS movers and third-party movers



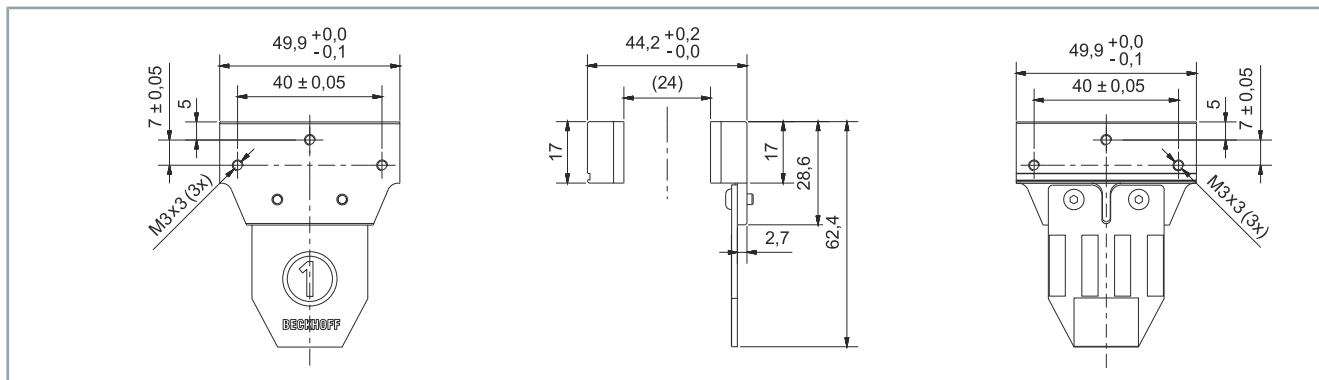
AT9001-0550-1640

- Standard magnetic plate set
- 5-pin, 50 mm
- for XTS movers and third-party movers



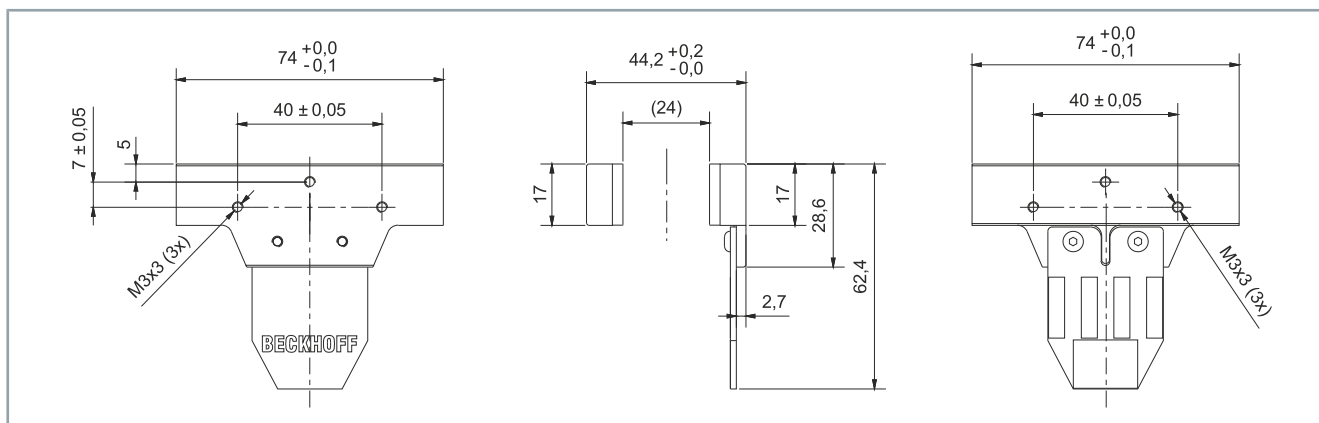
## AT9001-1550-1640

- Magnetic plate set Mover 1
- 5-pin, 50 mm
- for XTS movers and third-party movers



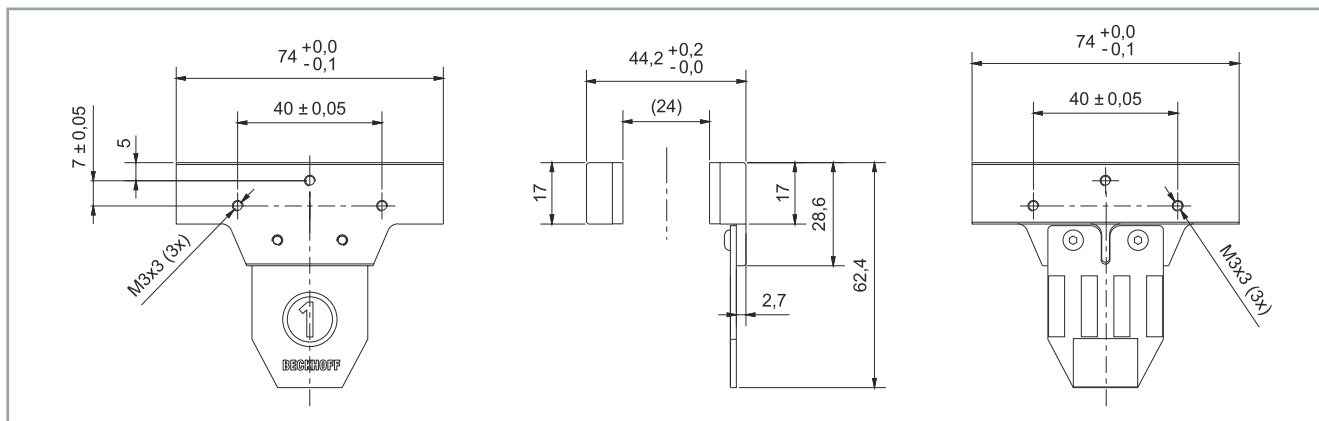
## AT9001-0775-1640

- Standard magnetic plate set
- 7-pin, 75 mm
- for third-party movers



## AT9001-1775-1640

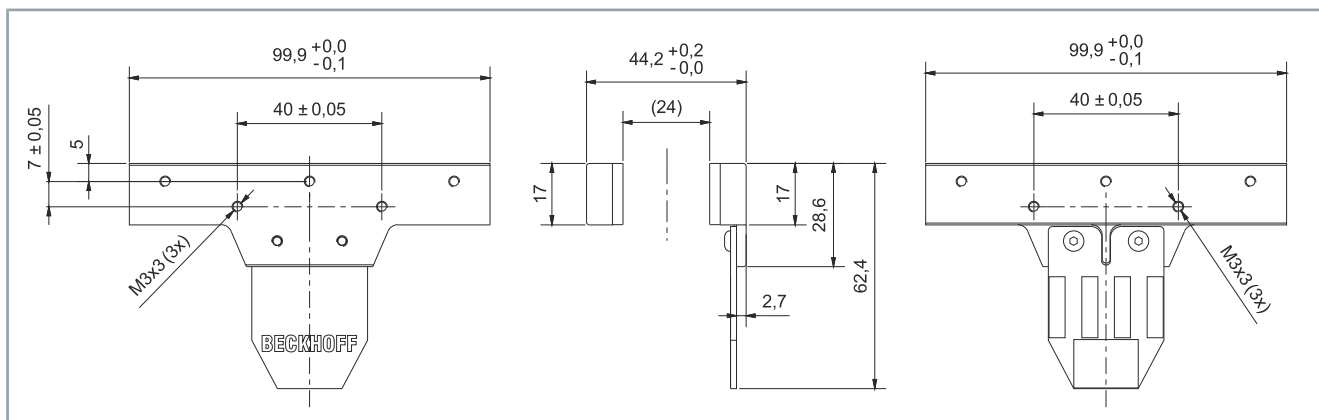
- Magnetic plate set Mover 1
- 7-pin, 75 mm
- for third-party movers





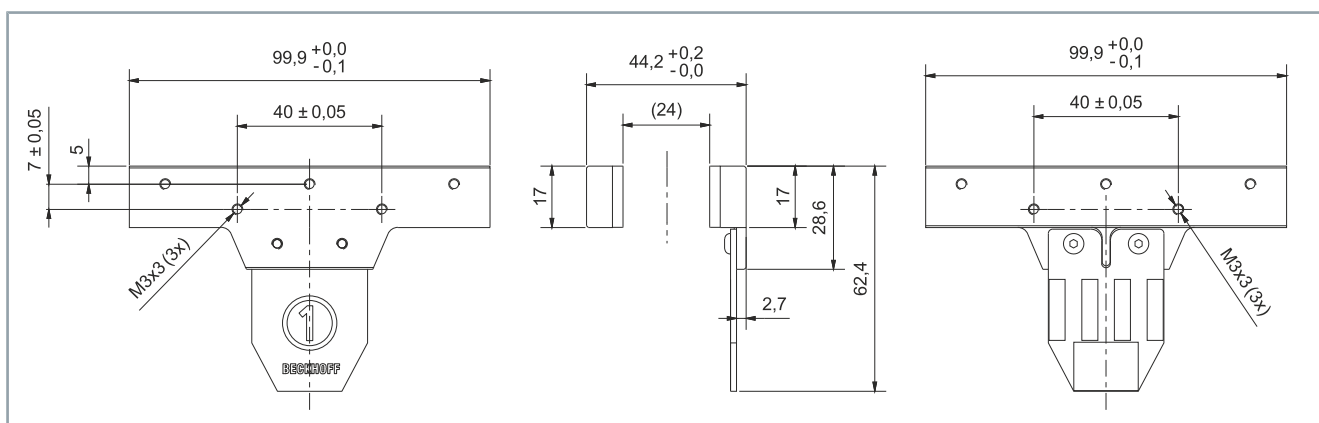
## AT9001-0AA0-1640

- Standard magnetic plate set
- 10-pin, 100 mm
- for third-party movers



## AT9001-1AA0-1640

- Magnetic plate set Mover 1
- 10-pin, 100 mm
- for third-party movers



## 5 Packaging

The packaging contains the following handling instructions:



### Top

The packaging and components must be transported, handled and stored in such a way that the arrows point upwards at all times.



### Protect from moisture

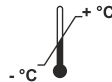
The packaging and the components must be protected from high air humidity and must be stored under cover.



### Fragile packaged goods

The components in the packaging are fragile. The packaging and components must be handled with care.

Storage temp.:



### Temperature limitation

The packaging and components must be stored and transported in such a way that the lower and upper temperature limits are maintained. The temperature limit can be displayed as text or a symbol.



### ESD protection component

The packaging contains electrostatically sensitive components.



### Prohibited for people with pacemakers

The packaging contains components with magnetic fields. There is a risk for:

- People fitted with cardiac pacemakers
- People with magnetically conducting implants
- People with internal and external defibrillators

A safety distance of 250 mm from all magnetic parts applies.

No direct contact with magnetic components in the vicinity of parts susceptible to interference is permitted.



### Magnetic field warning

The packaging contains components with magnetic fields. There is a risk for:

- Magnetic data storage devices
- Chip cards with magnetic strips
- Electronic devices

A limit range of < 0.5 mT is achieved at a distance of 150 mm in the switched-on state and at a distance of 130 mm in the switched-off state. The magnetic field poses a hazard to people and the environment.

The regulations for magnetic fields in air transportation apply (IATA Packing Instruction 902).



### Do not use sharp objects

Do not use knives or other sharp objects to unpack the component in order to avoid damaging the fixing packaging.



### Release fixation

To unpack the component, fold down the wings of the fixing packaging and remove the component.

**Prohibited for people with metal implants**

The packaging contains components with magnetic fields. There is a risk for:

- People with magnetically conducting implants

Metal implants can be heated by magnetic fields.

A safety distance of 250 mm from all magnetic parts applies.

No direct contact with magnetic components in the vicinity of parts susceptible to interference is permitted.

## 5.1 ESD conductivity

ESD conductive packaging is necessary for the safe delivery of some components. The foam inserts used, in which the components are supplied, have the following properties depending on the color:

**Foam inserts pink**

This foam is ESD conductive.

**Foam inserts white**

This foam is not ESD conductive.

## 6 Scope of supply



### **Check the scope of supply for missing or damaged parts**

Check your delivery for completeness. If any parts are missing or became damaged during transport, contact the carrier, manufacturer or Beckhoff Service immediately:

✉ [service@beckhoff.com](mailto:service@beckhoff.com)

Depending on the order, the scope of delivery may consist of different components.

### 6.1 Modules

#### **AT2x0x-0xxx**

- 1 x module
- 1 x end plug
- 1 x molded seal
- 1 x connector card
- 1 x locating pin D5 x 30

#### **AT2000-0250-0006**

- 1 x module
- 1 x end plug
- 1 x molded seal
- 1 x connector card
- 1 x locating pin D5 x 30
- 4 x O-ring 8 x 1.8

### 6.2 Guide rails

#### **AT9000-xxxx**

Scope of delivery of the guide rail *AT9000-0249* | *AT9000-0250*:

- 1 x guide rail
- 1 x nut M3
- 2 x locating pin D4 x 16
- 2 x locating pin M6 x 10
- 1 x screw M3 x 30
- 2 x screw M4 x 40
- 2 x washer

For each additional 250 mm length of guide rail:

- 2 x locating pin M6 x 10
- 3 x screw M4 x 40

#### **AT9100-xxxx**

Scope of delivery of the guide rail *AT9100-0250*:

- 1 x guide rail
- 1 x lock cover
- 1 x nut M3
- 2 x locating pin D4 x 12
- 2 x locating pin D4 x 16

- 2 x locating pin M6 x 10
- 1 x screw M3 x 30
- 2 x screw M4 x 10
- 2 x screw M4 x 40
- 2 x washer

Each 250 mm additional length of guide rail:

- 2 x locating pin M6 x 10
- 3 x screw M4 x 40

## **AT9020-1250-0xxx**

- 2 x guide rail
- 2 x nut M3
- 4 x locating pin D4 x 16
- 10 x locating pin D5 x 10
- 2 x screw M3 x 30
- 14 x screw M4 x 40
- 2 x washer

## **AT9025-1466-0xxx**

- 2 x guide rail
- 2 x nut M3
- 4 x locating pin D4 x 16
- 12 x locating pin D5 x 10
- 2 x screw M3 x 30
- 16 x screw M4 x 40
- 2 x washer

## **AT9040-0750**

- 1 x guide rail
- 1 x nut M3
- 2 x locating pin D4 x 16
- 6 x locating pin M6 x 10
- 1 x screw M3 x 30
- 8 x screw M4 x 40
- 2 x washer

## **AT9040-1250**

- 1 x guide rail
- 2 x nut M3
- 4 x locating pin D4 x 16
- 10 x locating pin M6 x 10
- 2 x screw M3 x 30
- 15 x screw M4 x 40
- 4 x washer

## **AT9050-0500**

- 1 x guide rail
- 1 x nut M3

- 2 x locating pin D4 x 16
- 3 x locating pin M6 x 10
- 1 x screw M3 x 30
- 4 x screw M4 x 40
- 2 x washer

### 6.3 Mover

#### **AT901x-x0xx-x550**

- 1 x mover mounted with encoder flag 1.2 mm
- 1 x encoder flag 1.0 mm
- 1 x encoder flag 1.4 mm
- 1 x encoder flag 1.6 mm
- 1 x encoder flag 1.8 mm

#### **AT8300-1x00-0100**

- 1 x mover mounted with encoder flag 1.2 mm
- 1 x encoder flag 1.0 mm
- 1 x encoder flag 1.4 mm
- 1 x encoder flag 1.6 mm
- 1 x encoder flag 1.8 mm
- 1 x NCT electronics mounted on mover
- 1 x plug connector 2 x 9-pin RM3.5 10 A 160 V

### 6.4 NCT electronics

#### **AT8200-x000**

- 1 x NCT electronics
- 1 x plug connector 2 x 9-pin RM3.5 10 A 160 V
- 2 x screw M6 x 25

## 7 Transport and storage

### NOTICE

**Avoid damage due to improper transportation and storage**

Observe the conditions for transportation and storage to prevent damage to the components.

### 7.1 Conditions

Take care during transport and storage to avoid damage to individual components. Observe the following chapters and maintain the following conditions:

- Climate category: 2K3 according to EN 60721
- Temperature: -25 °C to +85 °C, maximum fluctuation 20 K per hour
- Use the vendor's original packaging

### 7.2 Long-term storage

### NOTICE

**Perform recurring inspections**

Check components for proper condition every six months.

*Damage to the components or failure to carry out maintenance can shorten the service life of the installed components and parts.*

### NOTICE

**Prevent the formation of condensation**

Keep the ambient temperature constant. Avoid solar radiation and high air humidity.

*Condensation water can lead to damage during subsequent operation or to rust formation.*

You have the option of storing components over a short or long period. Beckhoff recommends always using the original packaging for storage.

## 8 Mechanical installation



### Note system view

The name plate in the figures is used for orientation in the following instructions. It helps you to be sure of the view from which you have to mount the components.

### 8.1 Preparation



### Required tools

- Hexagon bit size 2.5
- Hexagon bit size 3
- Allen key size 4
- Suitable torque wrench
- Liquid threadlocker

If the modules are mounted without an alignment gauge:

- Vernier caliper



### Required accessories [ + ]

- Alignment gauge
- Rail on support

If modules with connectors are used for the infeed:

- Cables
- Assembly tool for B23 connectors

Further information can be found in chapter "Accessories", [Page 299].



### Screw length depends on the machine bed used

The length of the screws depends on the machine bed used. The screws must protrude between 10 and 13 mm into the motor module.



### Assembly material required

- 3x screws M5, per module



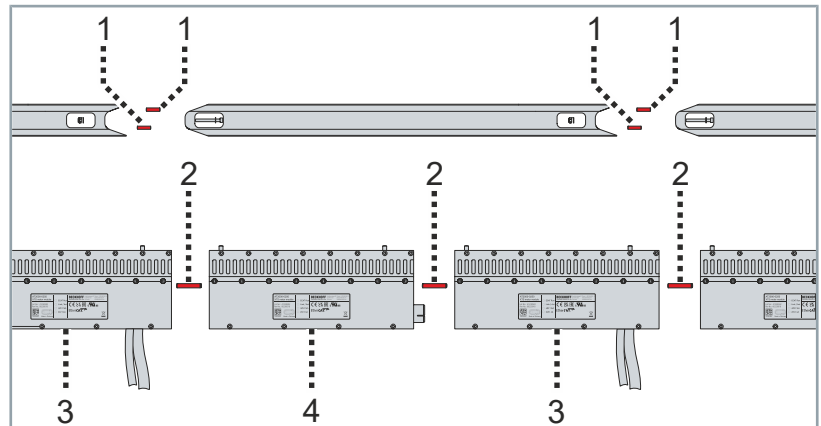
### 8.1.1 Maintenance concept



#### Fast reaction in case of a module failure

You have the option to assemble the XTS in such a way that you can replace individual infeed lines in case of a failure. As a result you do not have to dismantle the entire XTS system and you can minimize the downtime and maintenance work.

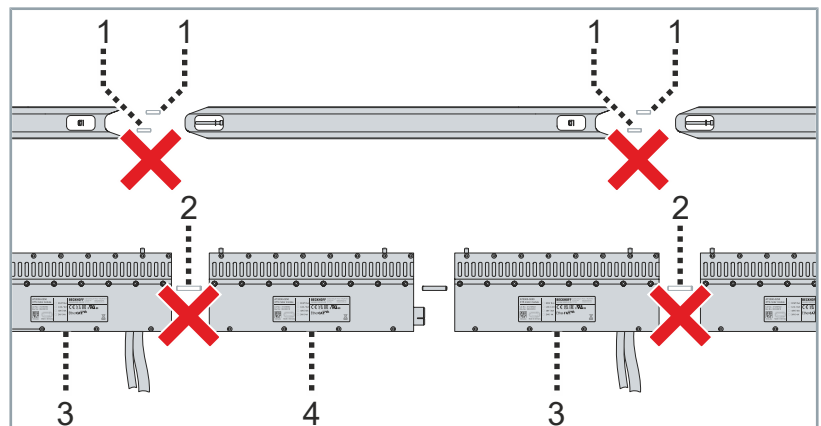
With locating pins



With standard assembly, all guide rails are connected with locating pins [1] and all modules with locating pins [2].

The aim of the maintenance concept is to generate individual exchangeable infeed lines between modules with infeed [3] and modules without infeed [4], so that each infeed line can be removed individually from the overall system.

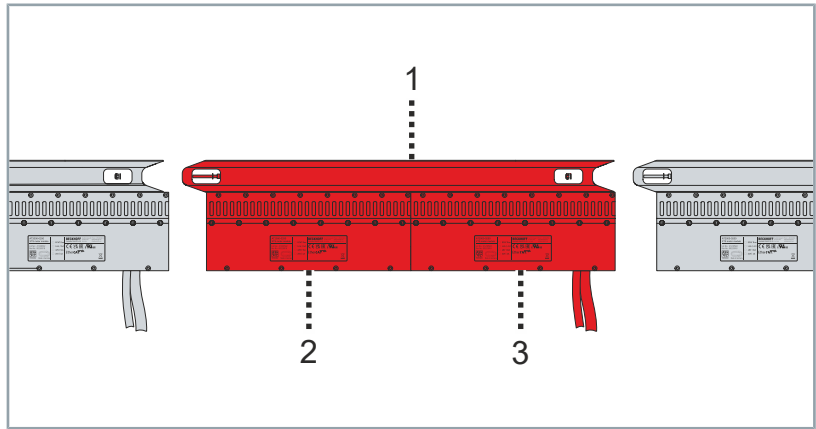
Without locating pins



You have the option of generating exchangeable module segments by not inserting the locating pins [1] between the guide rails and the locating pins [2] on the cable-side end faces of the modules with infeed [3].

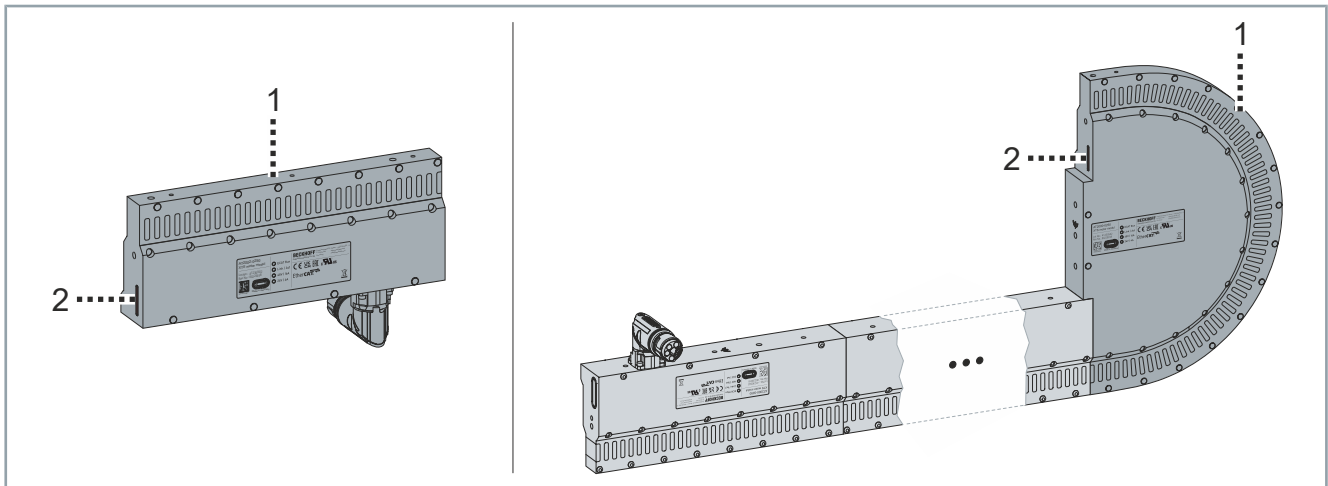
Due to the lack of locating pins on the cable-side end face of the modules with infeed, an individual module segment can be completely removed from the XTS system.

## Module segment



Without the locating pins, this module segment consists of a guide rail [1], a module without infeed [2] and a module with infeed [3]. You can remove the module segment from the XTS system.

The guide rails are connected to one another at the connectors and the modules are fixed to the machine bed. Detailed information on the assembly of a complete XTS system can be found in the following chapters of the mechanical installation.



An end plug [2] must be inserted into the last module [1] of an infeed line to prevent the ingress of dust and liquids. Further information can be found in chapter "Last module of an infeed line", [Page 165].

## Further videos

**Observe Privacy Policy**

The video portal *Vimeo* is a third-party provider. Please note the Beckhoff Privacy Policy on *Vimeo* before opening the following videos:



[www.beckhoff.com/en-en/data-privacy-policy/](http://www.beckhoff.com/en-en/data-privacy-policy/)

The following videos are available on *Vimeo*:

**Guide rail on the modules**

For detailed step-by-step instructions on how to replace the modules, scan the QR code or visit the following website:



<https://vimeo.com/913641522>

**Guide rail parallel to the modules**

For detailed step-by-step instructions on how to replace the modules, scan the QR code or visit the following website:



<https://vimeo.com/913641582>

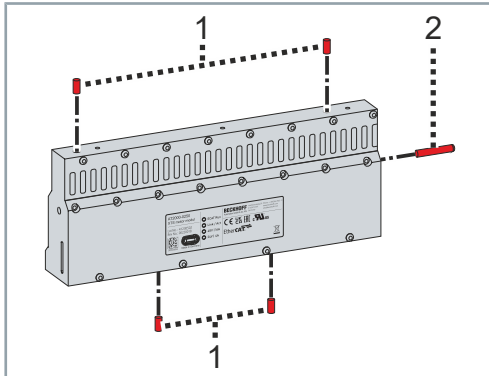
**Observe the order of assembly**

Assemble the XTS from the inside outwards. Insert straight modules first. Then insert curved segments and close the system. In this way, you avoid complications when positioning and mounting individual modules at the end of the mechanical installation.

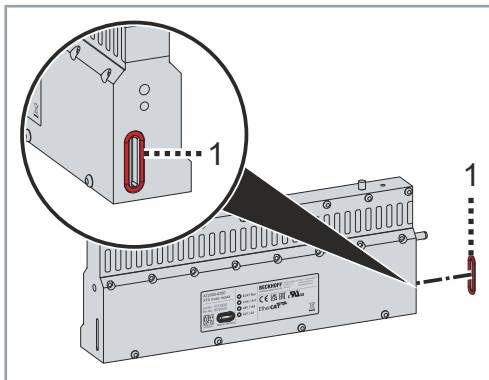
## 8.1.2 Modules

Before you start mounting the modules on the machine bed, each module must be suitably prepared.

### 8.1.2.1 Straight



- Insert short locating pins [1] and a long locating pin [2] into the module

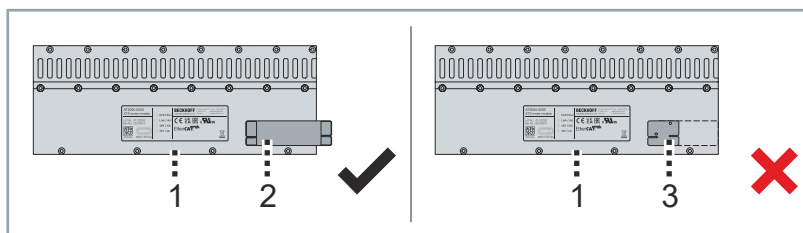


- Insert the seal [1]

## Connector card

With a connector card, one or more modules without infeed are connected with a module with infeed to form an infeed line. Each module without infeed must be connected to an infeed line via a connector card.

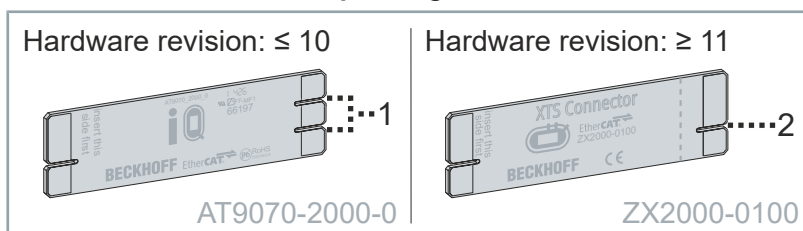
### Correct connector card for AT20xx-0xxx modules



A connector card ZX2000-0100 [2] must be inserted into the modules AT20xx-0xxx [1] to establish the connection between the modules.

The short connector card ZX2000-0200 [3] must not be inserted into the modules AT20xx-0xxx [1], as it does not protrude from the module and cannot establish a connection between the modules.

### Correct connector card depending on the hardware version



A connector card AT9070-2000-0 with two slots [1] must be used in modules AT20xx-0xxx with a hardware version up to and including 10. A ZX2000-0100 connector card with one slot [2] must be used in AT20xx-0xxx modules with a hardware version of 11 or higher.

For connector cards AT9070-2000-0, please contact Beckhoff Service:

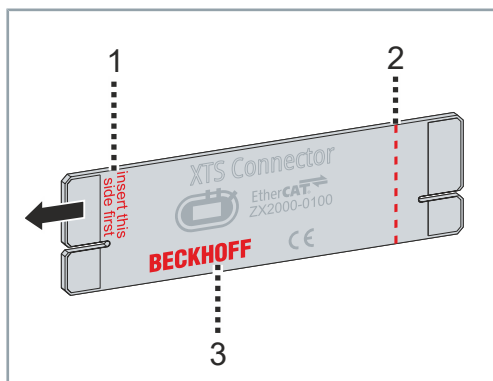
✉ [service@beckhoff.com](mailto:service@beckhoff.com)

## NOTICE

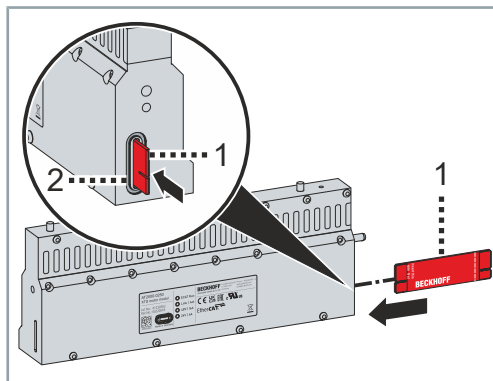
### Insert connector card correctly

The connector card only fits into the module in one position.

*If you insert the connector card incorrectly into the module, the contacts on the connector card or the contacts in the module may be damaged.*

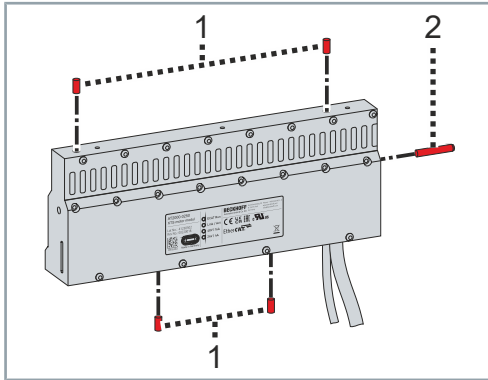


The lettering *insert this side first* [1] must be inserted into the module at the position of the seal. Push the connector card into the module up to the marking [2]. The lettering [3] must be on the side of the name plate.

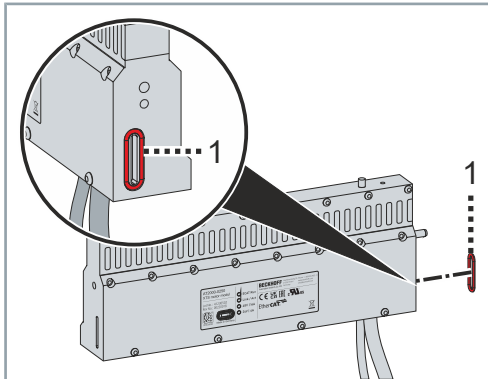


► Insert connector card [1] at the position of the seal [2]

## 8.1.2.2 Straight, with connection cables for infeed

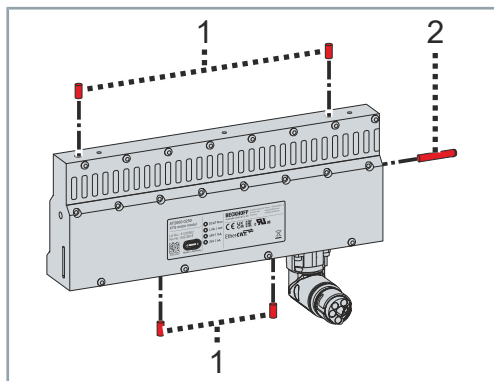


- Insert short locating pins [1] and a long locating pin [2] into module

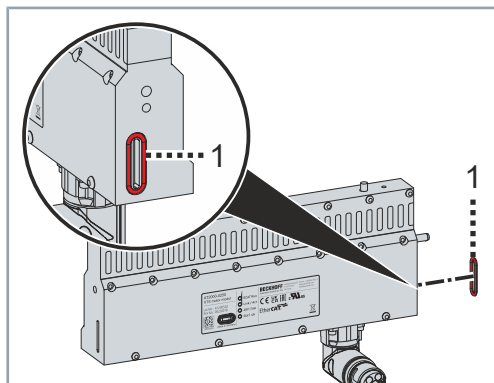


- Insert the seal [1]

## 8.1.2.3 Straight, with connector for infeed



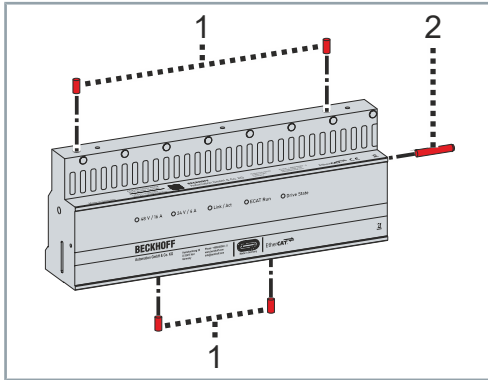
- Insert short locating pins [1] and a long locating pin [2] into module



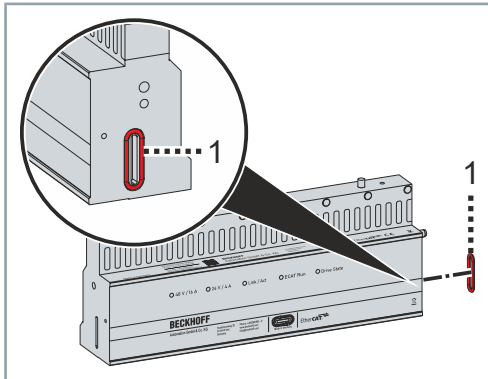
- Insert the seal [1]



## 8.1.2.4 Straight, with integrated NCT functionality, without infeed



- Insert short locating pins [1] and a long locating pin [2] into the module

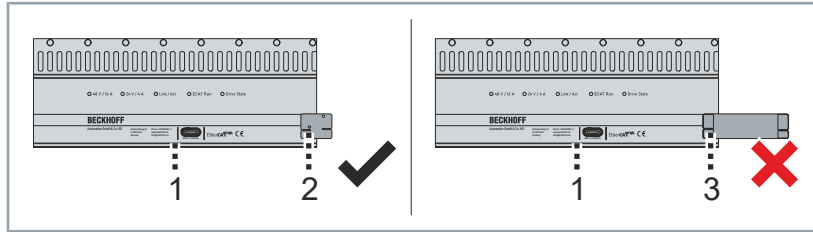


- Insert the seal [1]

## Connector card

With a connector card, one or more modules without infeed are connected with a module with infeed to form an infeed line. Each module without infeed must be connected to an infeed line via a connector card.

### Correct connector card for modules AT2100-0xxx



The short connector card ZX2000-0200 [2] must be inserted into the modules AT2100-0xxx [1] with integrated NCT functionality in order to establish the connection between the modules.

The connector card ZX2000-0100 [3] must not be inserted into the modules with integrated NCT functionality [1], as it protrudes too far out of the module and cannot be inserted far enough into the next module. The modules cannot be connected to each other and the distance between the modules is too large.

## NOTICE

### Insert connector card without tools

The connector card must be easy to insert into the module. Do not use any additional tools to knock the connector card into the module.

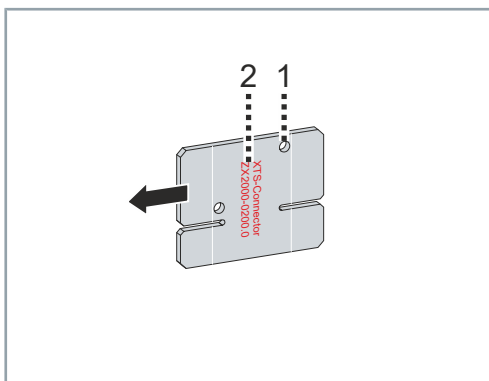
*If an incorrect connector card is inserted into the module or if a connector card that is too long is inserted into the module, the contacts on the connector card or the contacts in the module may be damaged.*

## NOTICE

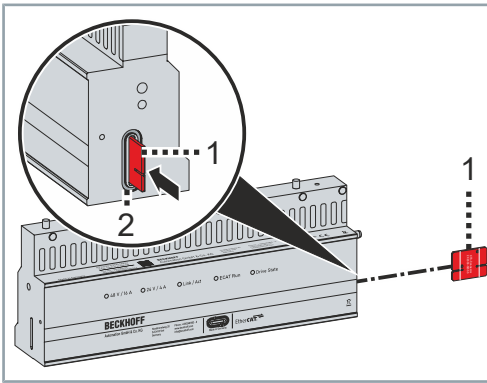
### Insert connector card correctly

The connector card only fits into the module in one position.

*If you insert the connector card incorrectly into the module, the contacts on the connector card or the contacts in the module may be damaged.*



The cut-out [1] must be located on the upper, outer edge of the connector card. The lettering XTS-Connector [2] must be on the side of the name plate.



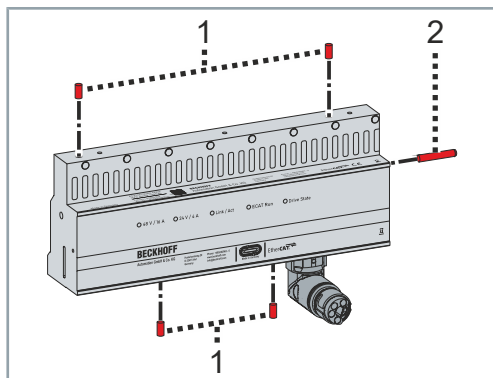
- Insert connector card [1] at the position of the seal [2]

## 8.1.2.5 Straight, with integrated NCT functionality, with connector for infeed

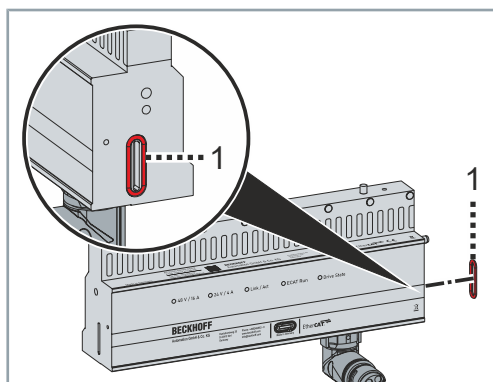


### Example presentation

The preparation of a module with integrated NCT functionality and connector for infeed is shown as an example on a module with connector in the direction of the name plate. The procedure also applies to modules with connectors in the direction of the feedback system.

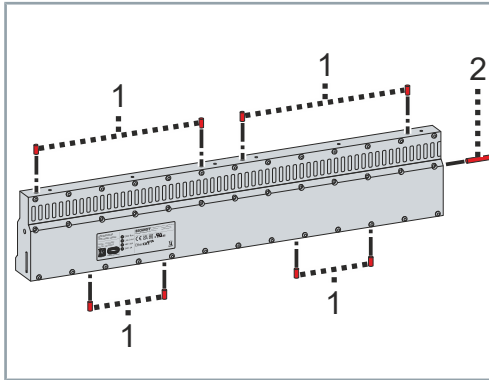


- Insert short locating pins [1] and a long locating pin [2] into the module

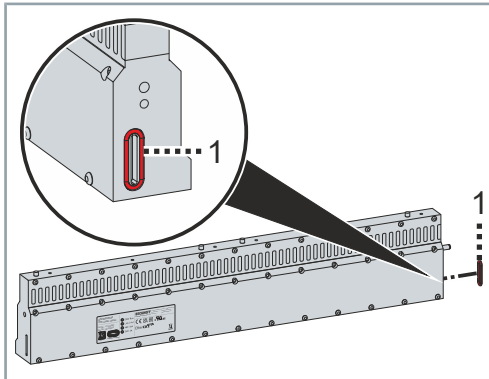


- Insert the seal [1]

## 8.1.2.6 Straight, EcoLine, without infeed



- Insert short locating pins [1] and a long locating pin [2] into the module

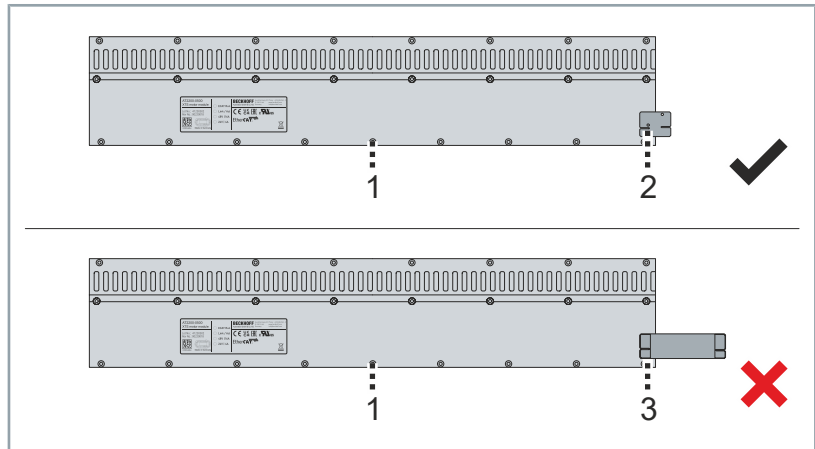


- Insert the seal [1]

## Connector card

With a connector card, one or more modules without infeed are connected with a module with infeed to form an infeed line. Each module without infeed must be connected to an infeed line via a connector card.

### Correct connector card for modules AT2200-0xxx



The short ZX2000-0200 [2] connector card must be inserted into the EcoLine AT2200-0500 [1] modules to establish the connection between the modules.

The ZX2000-0100 [3] connector card must not be inserted into the EcoLine [1] modules, as it protrudes too far out of the module and cannot be inserted far enough into the next module. The modules cannot be connected to each other and the distance between the modules is too large.

## NOTICE

### Insert connector card without tools

The connector card must be easy to insert into the module. Do not use any additional tools to knock the connector card into the module.

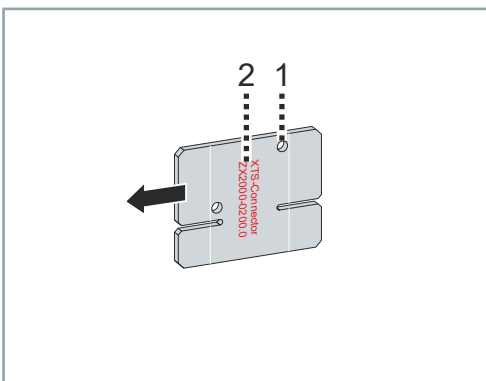
*If an incorrect connector card is inserted into the module or if a connector card that is too long is inserted into the module, the contacts on the connector card or the contacts in the module may be damaged.*

## NOTICE

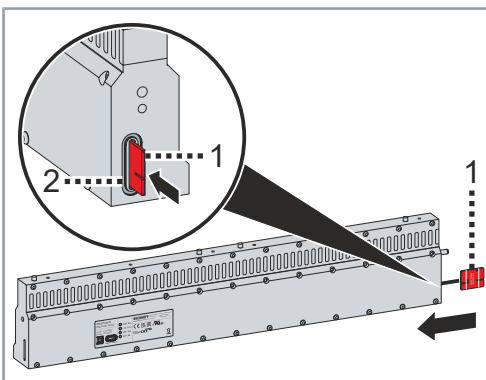
### Insert connector card correctly

The connector card only fits into the module in one position.

*If you insert the connector card incorrectly into the module, the contacts on the connector card or the contacts in the module may be damaged.*

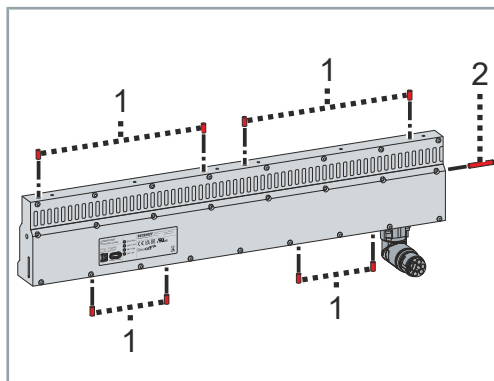


The cut-out [1] must be located on the upper, outer edge of the connector card. The lettering *XTS-Connector* [2] must be on the side of the name plate.

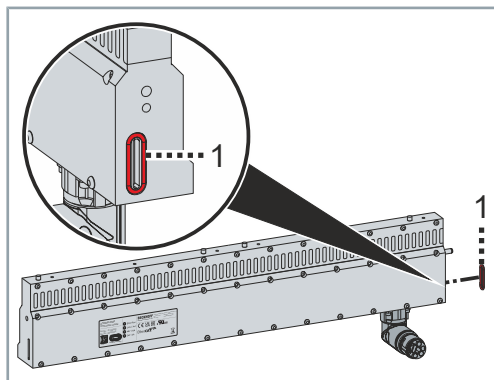


- Insert connector card [1] at the position of the seal [2]

## 8.1.2.7 Straight, EcoLine, with plug connector for infeed



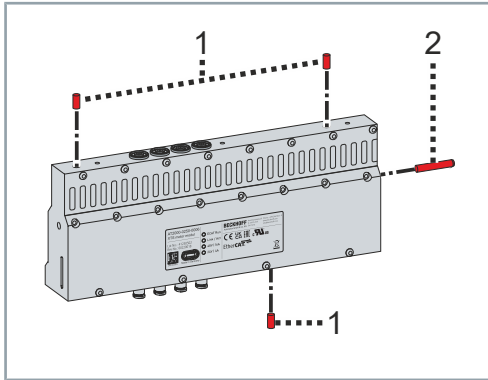
- Insert short locating pins [1] and a long locating pin [2] into module



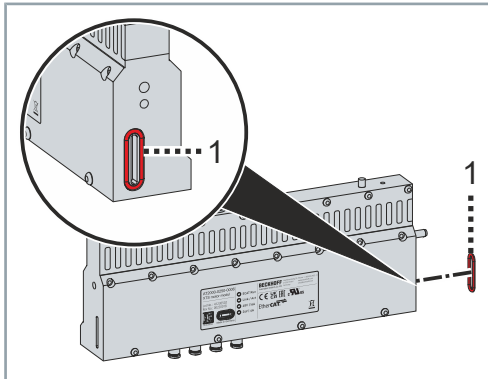
- Insert the seal [1]



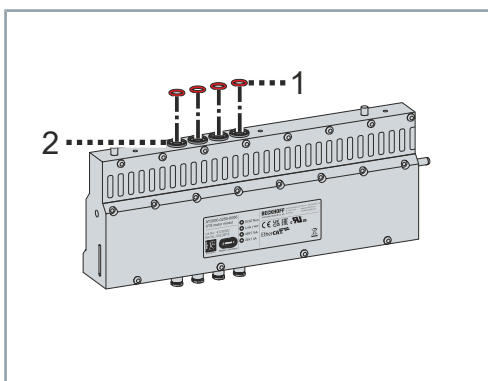
## 8.1.2.8 Straight, with lubrication channel



- Insert short locating pins [1] and a long locating pin [2] into the module



- Insert the seal [1]

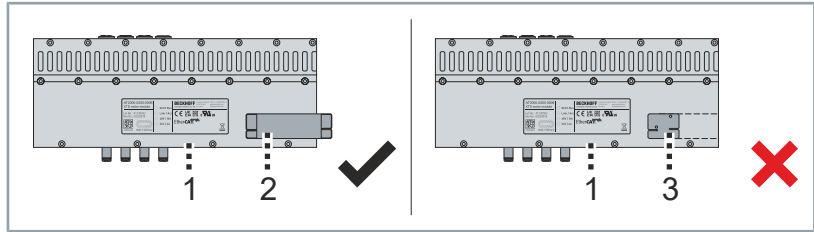


- Insert the O-rings [1] into the threaded sockets [2]

## Connector card

With a connector card, one or more modules without infeed are connected with a module with infeed to form an infeed line. Each module without infeed must be connected to an infeed line via a connector card.

### Correct connector card for modules AT2000-0250-0006



A connector card ZX2000-0100 [2] must be inserted into the modules AT2000-0250-0006 [1] to establish the connection between the modules.

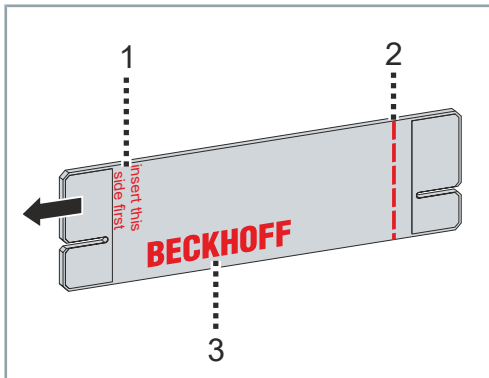
The short connector card ZX2000-0200 [3] must not be inserted into the modules AT2000-0250-0006 [1], as it does not protrude from the module and cannot establish a connection between the modules.

## NOTICE

### Insert connector card correctly

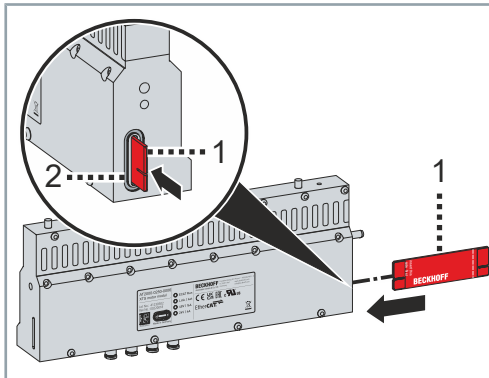
The connector card only fits into the module in one position.

*If you insert the connector card incorrectly into the module, the contacts on the connector card or the contacts in the module may be damaged.*



The lettering *insert this side first* [1] must be inserted into the module at the position of the seal. Push the connector card into the module up to the marking [2]. The lettering [3] must be on the side of the name plate.

- Insert connector card [1] at the position of the seal [2]

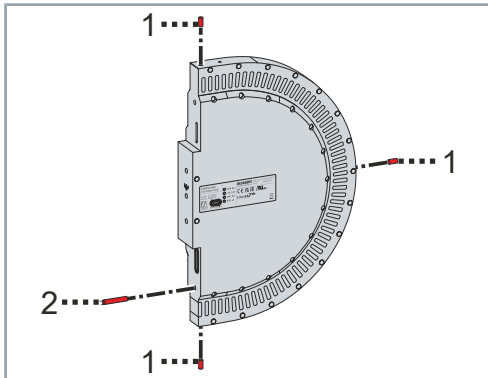


## 8.1.2.9 180° curved segments

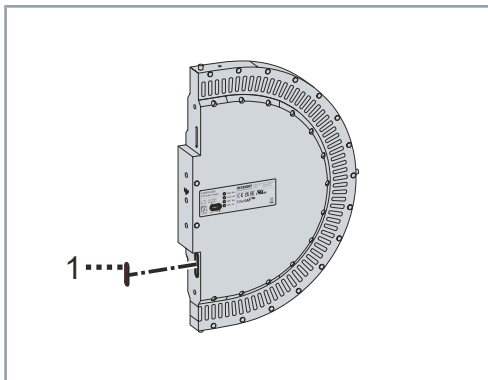


### Mounting example

For the mounting example of a simple symmetrical system with 180° curved segments, two curved segments must be prepared in the same way.



- Insert short locating pins [1] and a long locating pin [2] into module

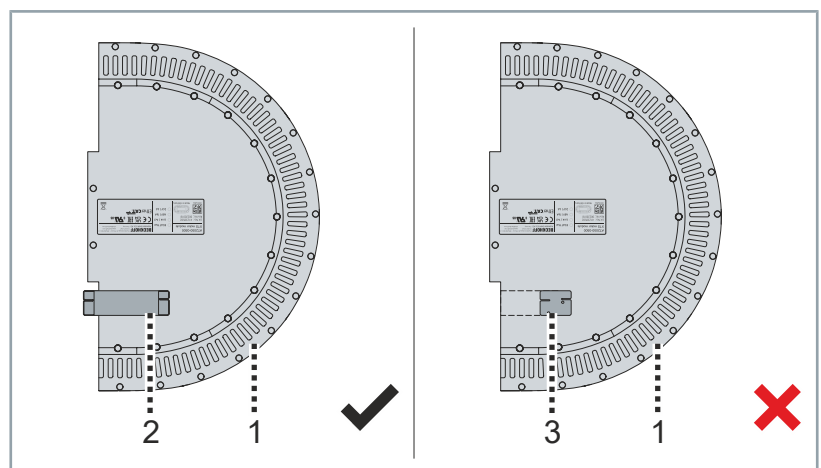


- Insert the seal [1]

Connector card

A connector card is used to connect one or more modules without infeed to a module with infeed to form an infeed line. Each module without infeed must be connected to an infeed line via a connector card.

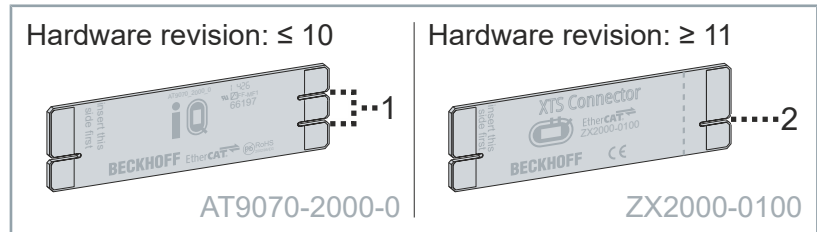
### Correct connector card for modules AT2050-0500



A connector card ZX2000-0100 [2] must be inserted into the modules AT2050-0500 [1] to establish the connection between the modules.

The short connector card ZX2000-0200 [3] must not be inserted into the modules AT2050-0500 [1], as it does not protrude from the module and cannot establish a connection between the modules.

## Correct connector card depending on the hardware version



A connector card AT9070-2000-0 with two slots [1] must be used in modules AT20xx-0xxx with a hardware version up to and including 10. A ZX2000-0100 connector card with one slot [2] must be used in AT20xx-0xxx modules with a hardware version of 11 or higher.

For connector cards AT9070-2000-0, please contact Beckhoff Service:

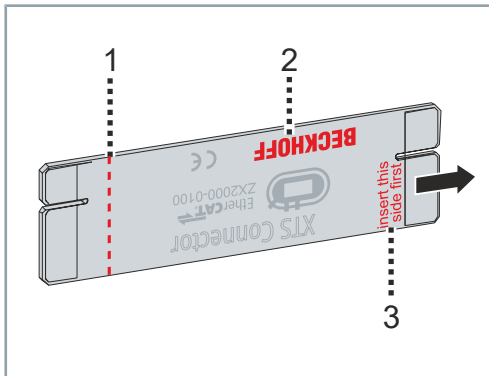
✉ [service@beckhoff.com](mailto:service@beckhoff.com)

## NOTICE

### Insert connector card correctly

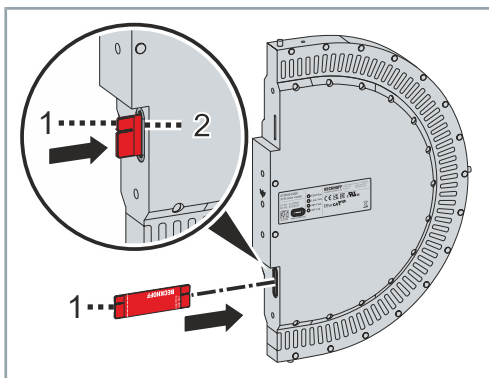
The connector card only fits into the module in one position.

*If you insert the connector card incorrectly into the module, the contacts on the connector card or the contacts in the module may be damaged.*

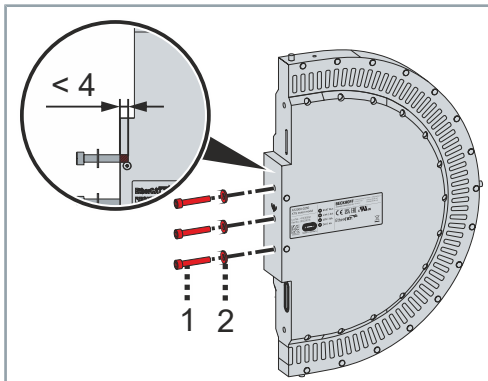


Push the connector card into the module up to the marking [1]. The lettering [2] must be on the side of the name plate. The lettering *insert this side first* [3] must be inserted into the module at the position of the seal.

► Insert connector card [1] at the position of the seal [2]

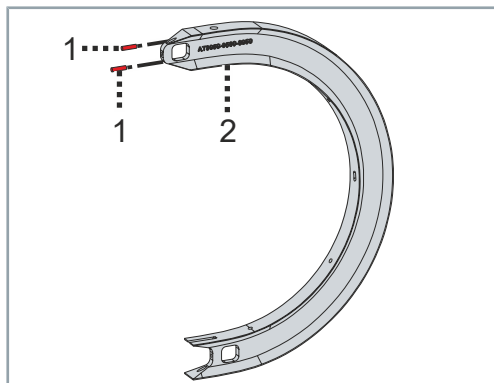


## Screws



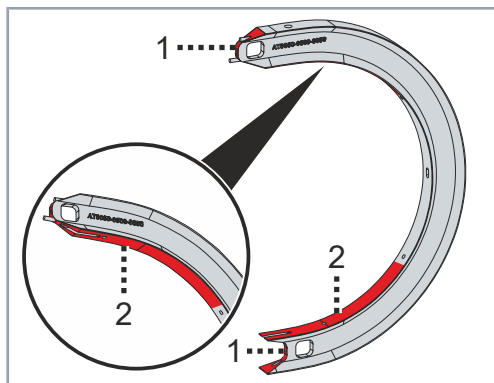
- Insert the screws [1] with washers [2] into the curved segment to a maximum depth of 4 mm

## 8.1.3 Guide rails, 180° curved segment



- Insert locating pins [1] into the curved rail [2]

### Grease

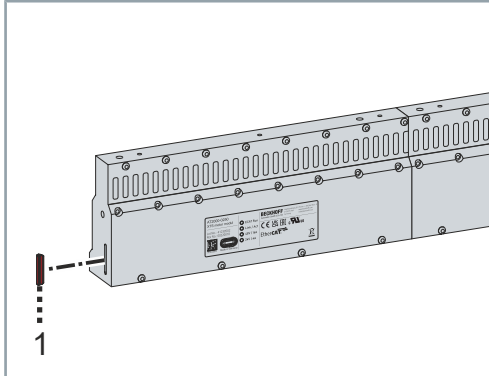


- Grease the connecting surfaces [1] and inner running surfaces [2] with petrolatum

### 8.1.4 Last module of an infeed line

An end plug must be inserted into the opening for the connector card in the last module of an infeed line to prevent dust and liquids from entering the module.

#### Mounting the end plugs



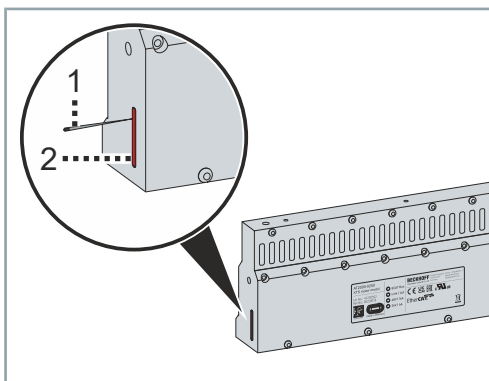
- Insert the end plug [1] flush into the last module of an infeed line
- Make sure that the end plug is not pushed into the module

#### Disassembly of the end plug

#### NOTICE

##### Avoid damage to the module

As the end plug is flush with the module, the end plug must be carefully removed with a needle. When removing the end plug, make sure that the module is not damaged and that the end plug is not pushed into the module.



- Carefully pierce the end plug [2] with a needle [1]
- Remove the end plug from the module
- Make sure that the end plug is not pushed into the module

#### NOTICE

##### Do not reuse removed end plugs

If the end plug has been removed with a needle, it will no longer seal the module correctly when it is refitted. A removed end plug must not be reused. Only fit new and undamaged end plugs.

## 8.2 Mounting the modules



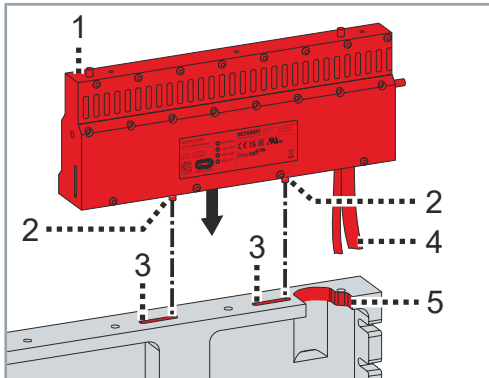
### Mounting example

This chapter contains information on the mounting of straight modules and 180° curved segments. The mounting is described using a simple symmetrical system as an example.

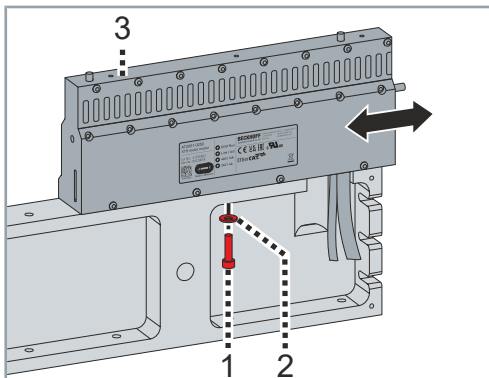
Once all modules have been prepared, they are mounted on the machine bed in the following order.

The mounting of the first module depends on whether you are using a module with connection cables or with a connector.

### 8.2.1 Straight modules with connection cables



- Position module [1] with the locating pins [2] in the elongated holes in the machine bed [3]
- Make sure that the cables [4] are positioned in the recess [5] of the machine bed



- Hand-tighten the screw [1] with the washer [2] in the center of the module [3]
- Make sure that the module [3] is slightly movable in the elongated holes



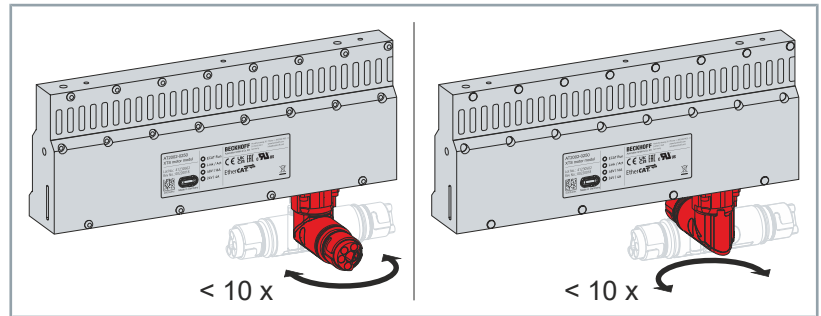
## 8.2.2 Straight modules with connector

### NOTICE

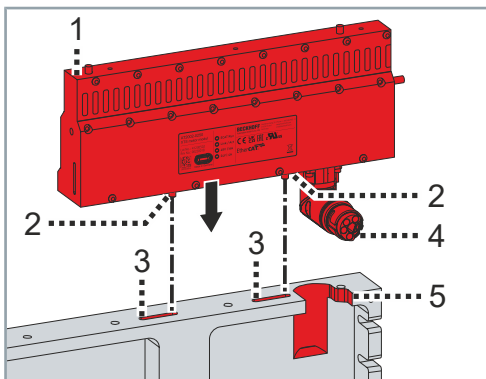
#### Limited number of turns

The connector may be rotated up to ten times through 180° to bring it into a safe latching position.

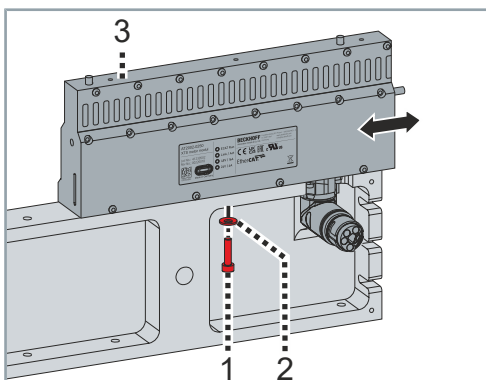
*If you turn the connector more than ten times, the cables inside and the latching mechanism of the connector may be damaged and the connector may no longer be placed in a safe latching position.*



The module connector may be turned a maximum of ten times by 180°.



- Position module [1] with the locating pins [2] in the elongated holes in the machine bed [3]
- Ensure that the connector [4] is positioned in the recess [5] of the machine bed



- Hand-tighten the screw [1] with the washer [2] in the center of the module [3]
- Make sure that the module [3] is slightly movable in the elongated holes

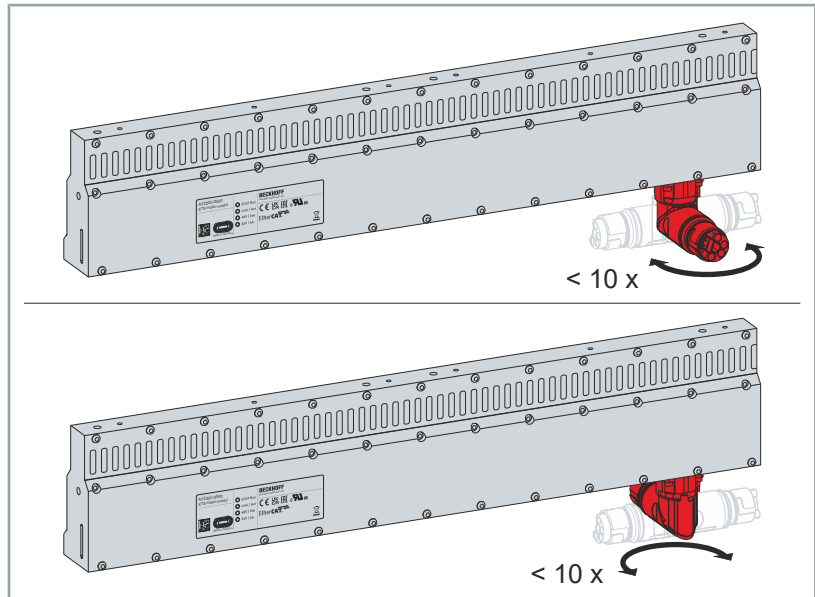
## 8.2.3 Straight EcoLine modules with plug connector

### NOTICE

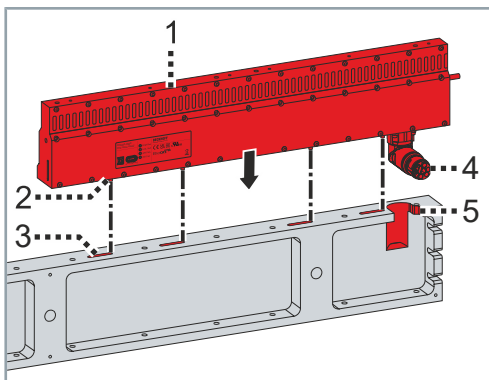
#### Limited number of turns

The connector may be rotated up to ten times through 180° to bring it into a safe latching position.

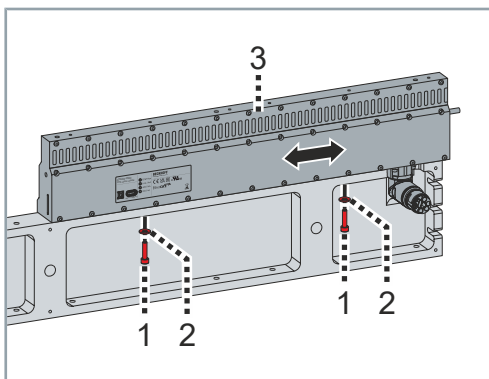
*If you turn the connector more than ten times, the cables inside and the latching mechanism of the connector may be damaged and the connector may no longer be placed in a safe latching position.*



The module connector may be turned a maximum of ten times by 180°.

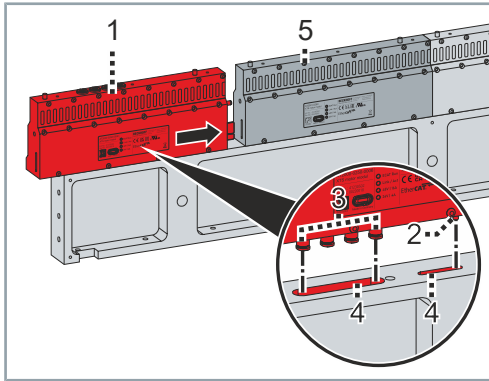


- Position module [1] with the locating pins [2] in the elongated holes in the machine bed [3]
- Ensure that the connector [4] is positioned in the recess [5] of the machine bed



- Hand-tighten the screw [1] with the washer [2] in the module [3]
- Make sure that the module [3] is slightly movable in the elongated holes

## 8.2.4 Motor module with lubrication channel

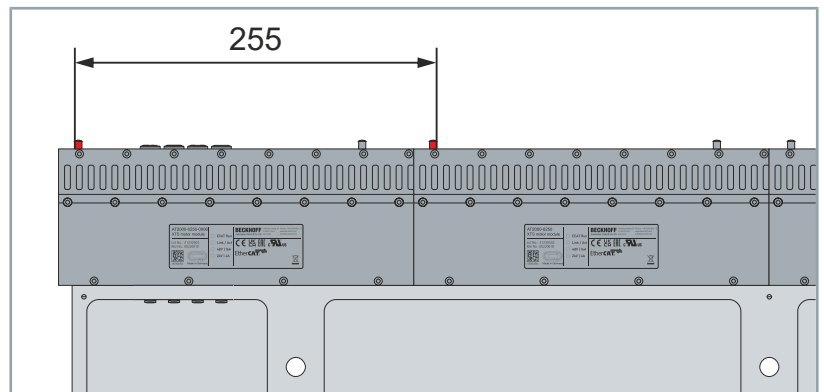


- ▶ Position the module [1] with the locating pin [2] and the push-in fittings [3] in the elongated holes of the machine bed [5]
- ▶ Carefully push module [1] into module [5]
- ▶ Make sure that the connector card engages

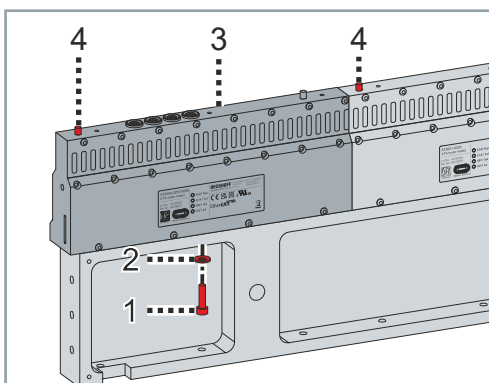


### Mounting motor module with vernier caliper

A vernier caliper must be used to align the motor module AT2000-0250-0006 correctly. Mounting with the alignment gauge [+] is not possible as the alignment gauge cannot be positioned flush on the module due to the threaded socket of the motor module AT2000-0250-0006.

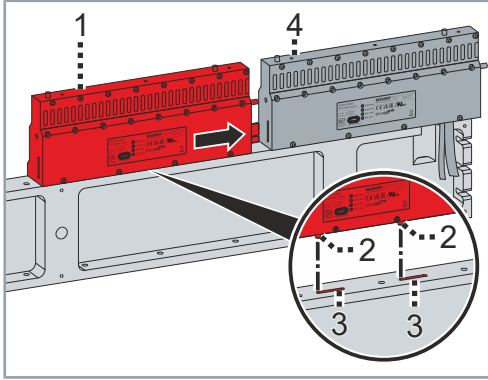


If a vernier caliper is used, the distance from the outer edge of the first locating pin to the opposite edge of the first locating pin in the aligned module is 255 mm.



- ▶ Hand-tighten the screw [1] with the washer [2] in the center of the module [3]
- ▶ Check the distance between the outer edges of the locating pins [4] with a vernier caliper
- ▶ Ensure that the distance is 255 mm

## 8.2.5 Straight modules, top



Mounting with alignment gauge [+]   
 gauge [ + ]

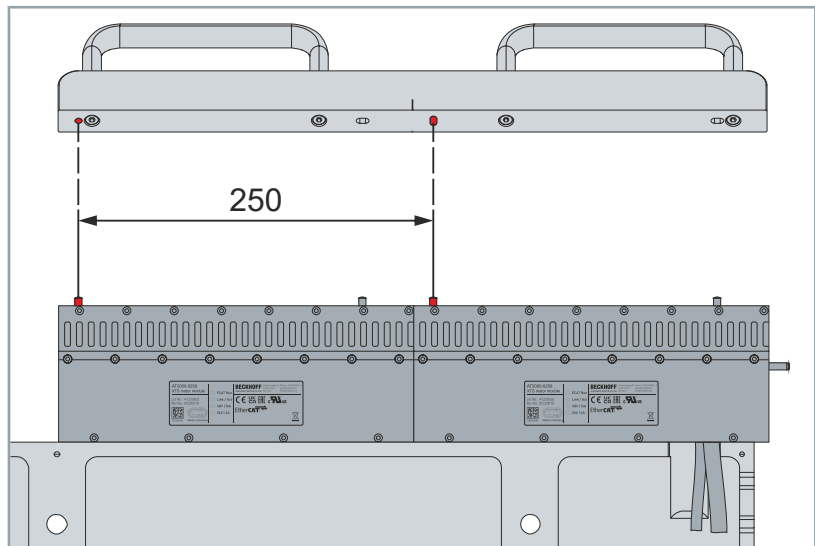
- ▶ Position module [1] with the locating pins [2] in the elongated holes in the machine bed [3]
- ▶ Carefully push module [1] into module [4]
- ▶ Make sure that the connector card engages



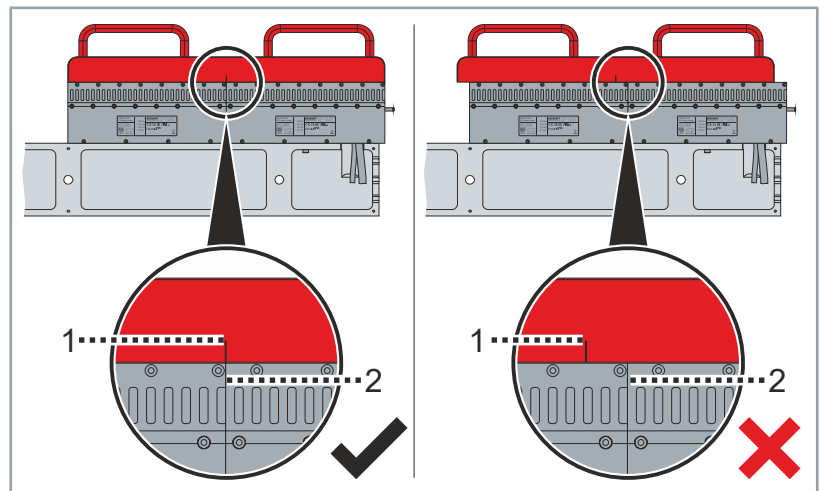
### Mount modules with alignment gauge [ + ]

Beckhoff recommends using the optional alignment gauge for mounting the straight modules AT2x0x-0250.

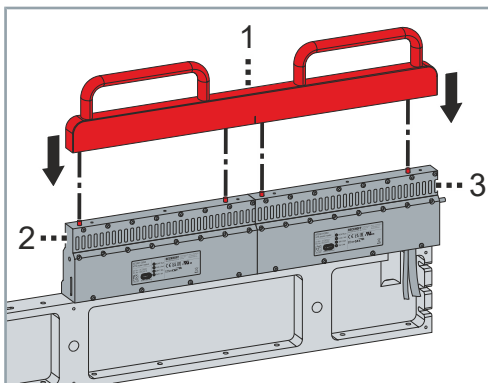
*If you are not using an alignment gauge, you can use a vernier caliper, for example.*



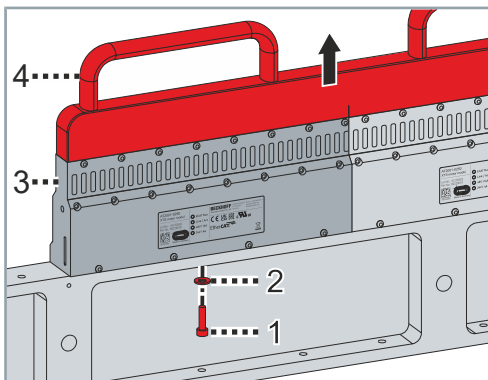
The distance from the center of the first locating pin of a module to the center of the first locating pin in the aligned module must be 250 mm. The modules are aligned at the specified distance using the alignment gauge.



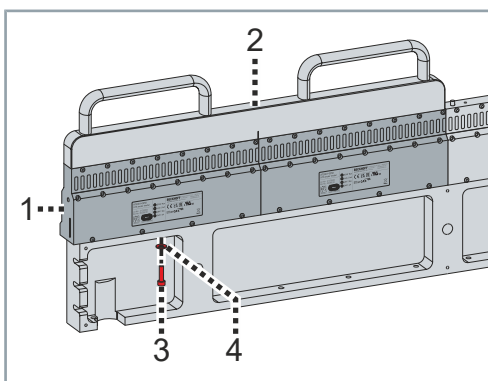
Make sure that you place the alignment gauge correctly on the modules. The alignment gauge must be flush with the outer edges of the modules and the marking [1] of the alignment gauge must be in the middle [2] above two modules.



- Place the alignment gauge [1] on the locating pins of two adjacent modules [2] and [3]



- Hand-tighten the screw [1] with the washer [2] in the center of the module [3]
- Remove alignment gauge [4]



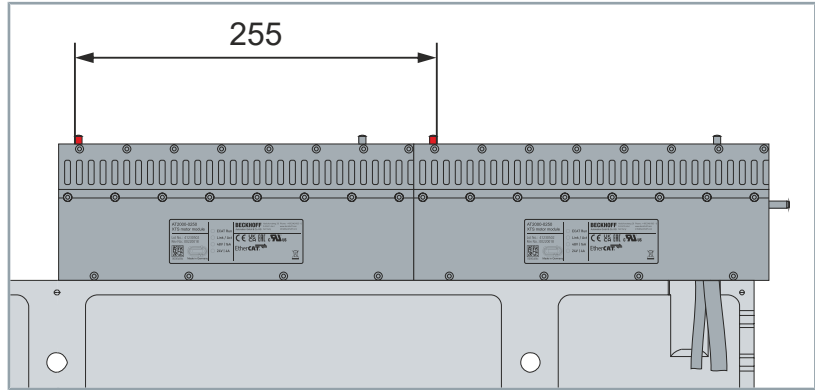
- Add further modules [1], depending on the length of the infeed line, with or without connector card
- Position alignment gauge [2]
- Hand-tighten the screw [3] with washer [4] in the center of the module



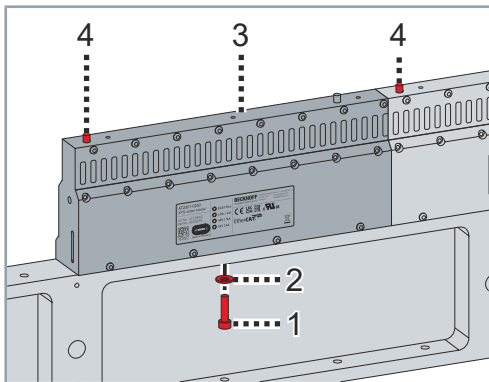
### Mounting modules with vernier caliper

You can also mount the straight modules AT2x0x-0250 without an alignment gauge [+].

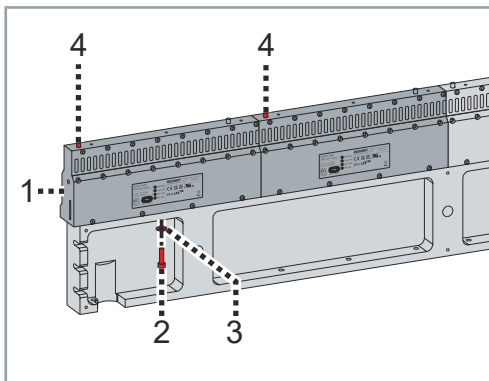
*Beckhoff recommends using a vernier caliper for mounting the straight modules if you do not use the optional alignment gauge.*



If a vernier caliper is used, the distance from the outer edge of the first locating pin to the opposite edge of the first locating pin in the aligned module is 255 mm.

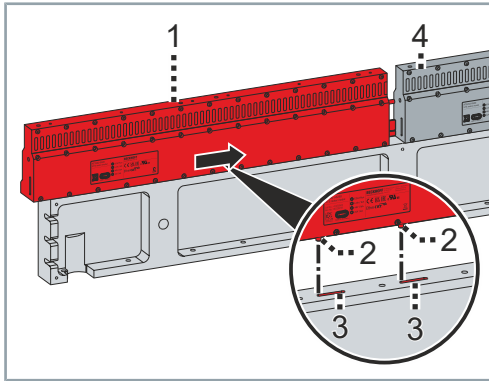


- ▶ Hand-tighten the screw [1] with the washer [2] in the center of the module [3]
- ▶ Check the distance between the outer edges of the locating pins [4] with a vernier caliper
- ▶ Ensure that the distance is 255 mm

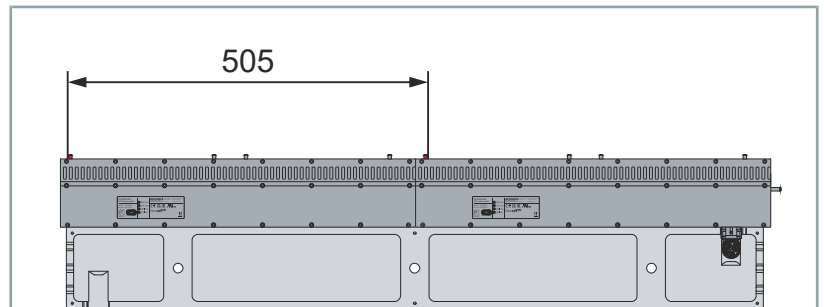


- ▶ Add further modules [1], depending on the length of the infeed line or module type, with or without connector card
- ▶ Hand-tighten the screw [3] with washer [4] in the center of the module
- ▶ Check the distance between the outer edges of the locating pins [4] with a vernier caliper
- ▶ Ensure that the distance is 255 mm

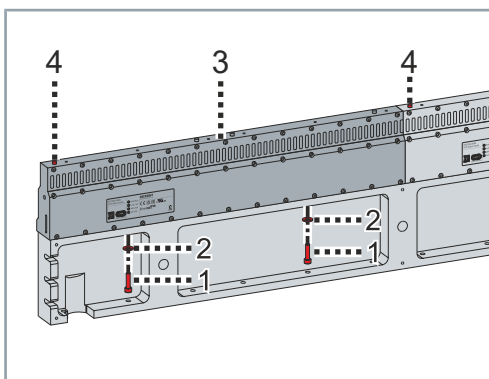
## 8.2.6 Straight EcoLine modules top



- ▶ Position module [1] with the locating pins [2] in the elongated holes in the machine bed [3]
- ▶ Carefully push module [1] into module [4]
- ▶ Make sure that the connector card engages

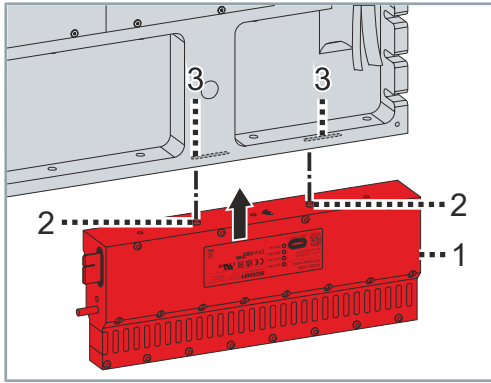


The distance from the outer edge of the first locating pin to the opposite edge of the first locating pin in the adjacent EcoLine module is 505 mm.

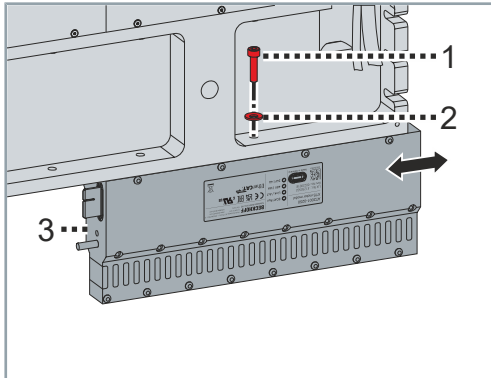


- ▶ Hand-tighten the screw [1] with the washer [2] in the module [3]
- ▶ Check the distance between the outer edges of the locating pins [4] with a vernier caliper
- ▶ Ensure that the distance is 505 mm
- ▶ Install all other modules in the same way

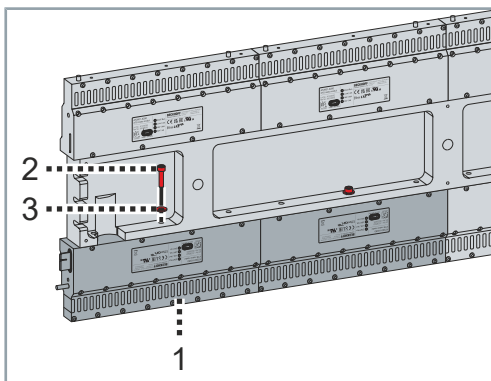
## 8.2.7 Straight modules, bottom



- Position the module [1] with the locating pins [2] in the elongated holes of the machine bed [3] and secure it against falling out



- Hand-tighten the screw [1] with the washer [2] in the center of the module [3]
- Make sure that the module [3] is slightly movable in the elongated holes



- Add further modules [1], depending on the length of the infeed line or module type, with or without connector card
- Position the modules with the alignment gauge [+] or a vernier caliper and secure them against falling out
- Ensure that the distance between the locating pins is maintained:

### For mounting with alignment gauge

250 mm from the center of the first locating pin of a module to the center of the first locating pin in the aligned module.

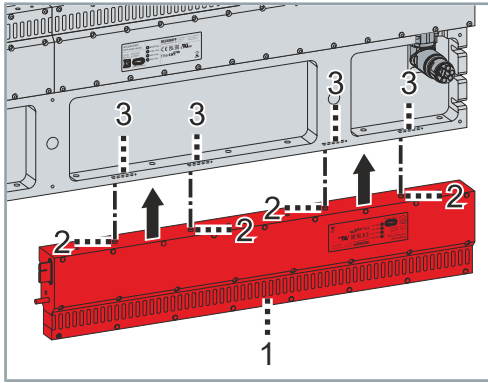
### For mounting with vernier caliper

255 mm from the outer edge of the first locating pin of one module to the outer, opposite edge of the first locating pin in the aligned module.

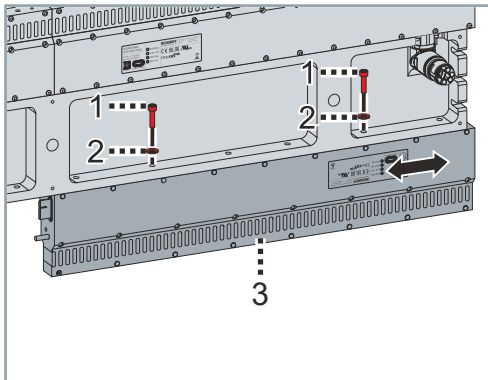
- Hand-tighten the screw [2] with washer [3] in the center of the module



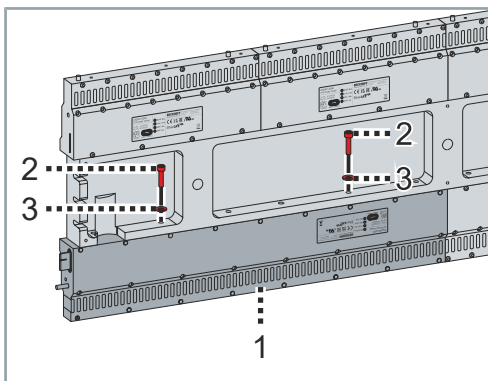
## 8.2.8 Straight EcoLine modules bottom



- Position the module [1] with the locating pins [2] in the elongated holes of the machine bed [3] and secure it against falling out



- Hand-tighten the screw [1] with the washer [2] in the module [3]
- Make sure that the module [3] is slightly movable in the elongated holes



- Add further modules [1], depending on the length of the infeed line or module type, with or without connector card
- Position the modules with a vernier caliper and secure against falling out
- Ensure that the distance between the locating pins is maintained:

505 mm from the outer edge of the first locating pin of one module to the outer, opposite edge of the first locating pin in the adjacent module.

- Hand-tighten the screw [2] with washer [3] in the module

## 8.2.9 Curved segments

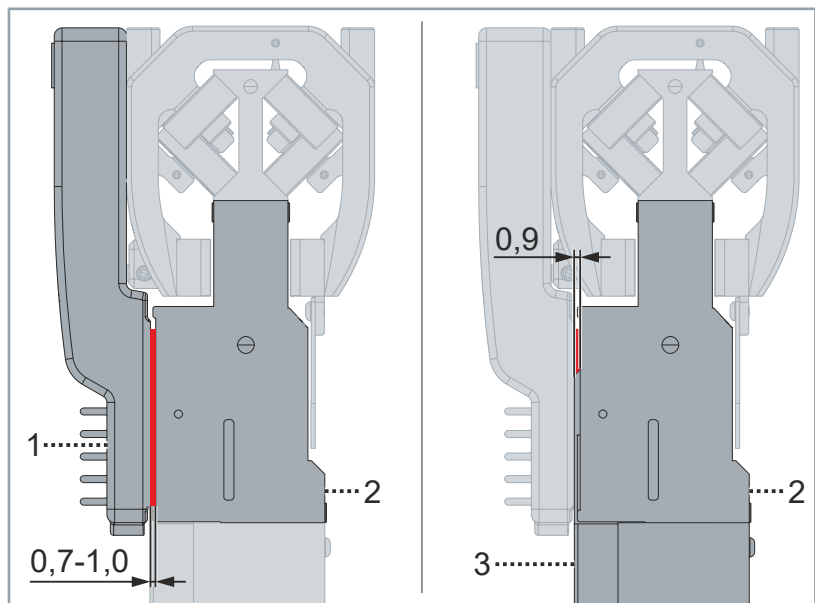
### NOTICE

**Do not combine 180° curved segments with option for additional cooling and modules with NCT functionality**

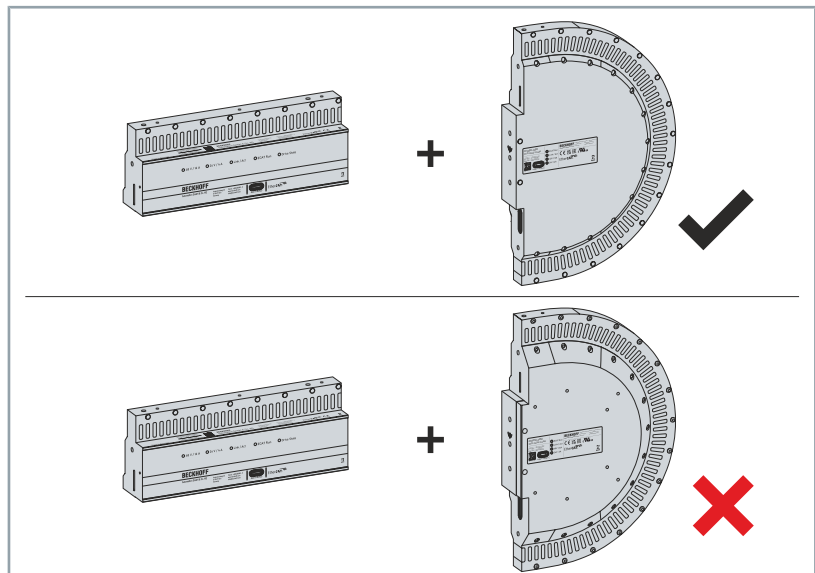
Modules with NCT functionality and movers with NCT electronics must not be used together with 180° curved segments with the option for additional cooling.

*If you use movers with NCT electronics and 180° curved segments with option for additional cooling, the modules, movers and NCT electronics will be damaged.*

- Do not mount 180° curved segments with option for additional cooling and modules with NCT functionality together in one system.



As the air gap between the NCT electronics [1] and a motor module [2] must be between 0.7 and 1 mm and a 180° curved segment [3] with option for additional cooling is 0.9 mm wider than a straight module with NCT functionality, the modules cannot be used together in a system.

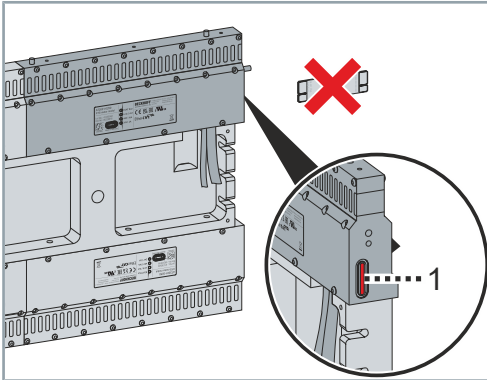




## Only mount the curved segments once the straight modules have been installed

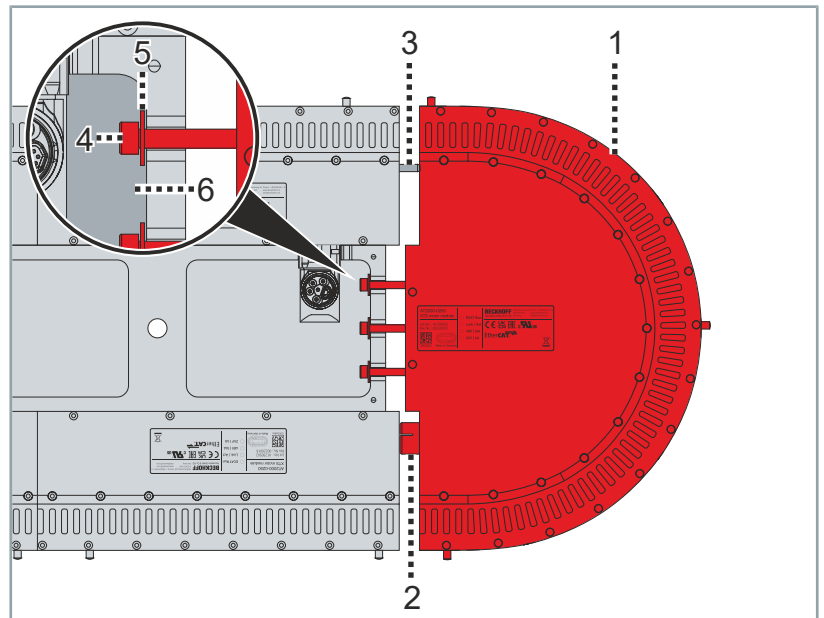
Make sure that you mount the curved segments only after having mounted the upper and lower straight modules.

*You cannot mechanically close the system if you have not fully mounted the straight modules. Straight modules cannot subsequently be inserted without removing the curved segments.*

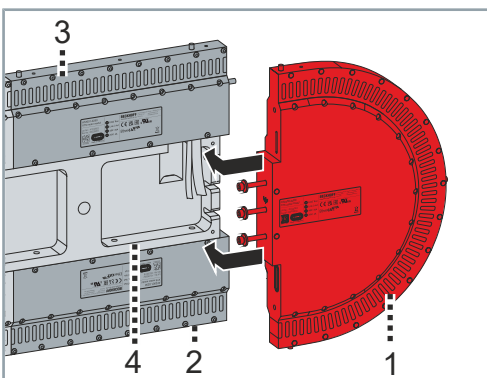


## Connector card on one side only

For modules with infeed, no connector card is used on the side of the connection cables and the connector. There is sealing compound [1] at this point and no opening.



When inserting the curved segment [1], make sure that the connector card [2] engages in the lower straight module and that the locating pin [3] of the upper straight module is positioned in the curved segment. The screw head [4] and the washer [5] must be located inside the recess [6] on the machine bed.



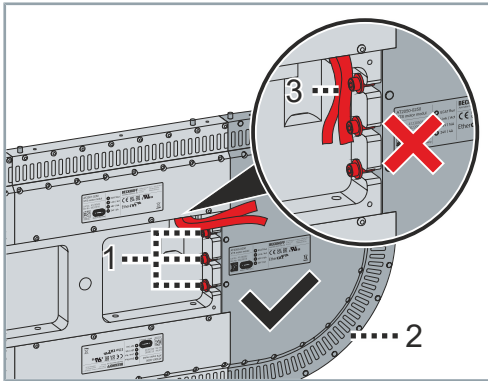
- Carefully insert the prepared curved segment [1] into the straight modules [2] and [3] and into the machine bed [4]

## NOTICE

### Avoid damaging the cables

Make sure when mounting the curved segments that you insert and fasten the screws behind the cables on the machine bed.

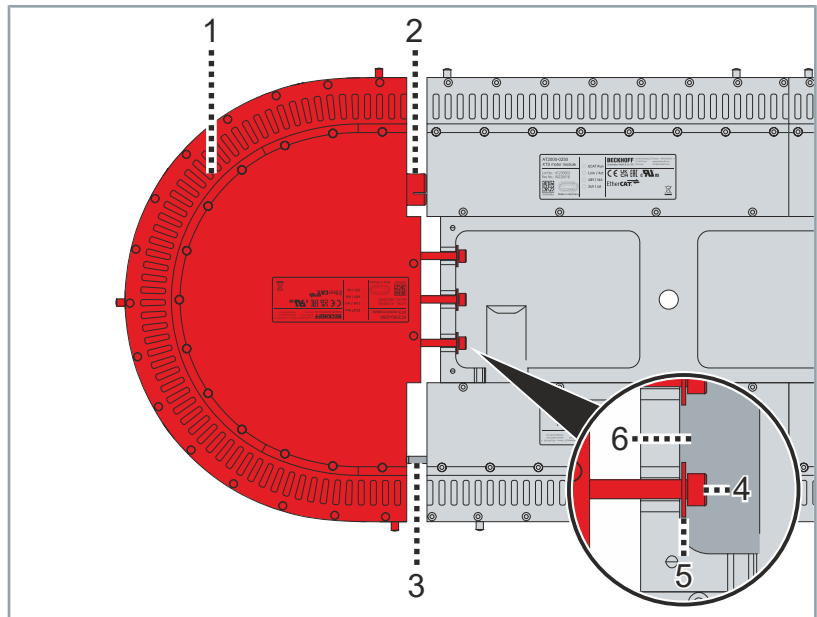
*If you insert the screws in front of the cables, the cables could be crushed and damaged when fastening.*



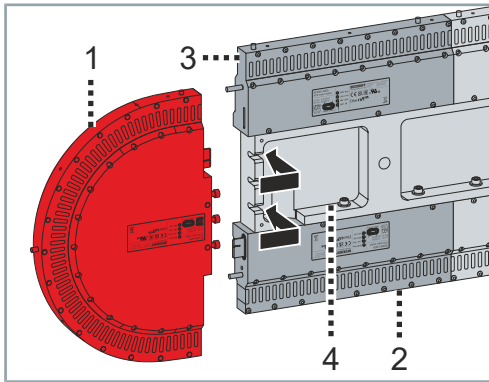
- Hand-tighten the screws [1] in the curved segment [2]

### For modules with connection cables

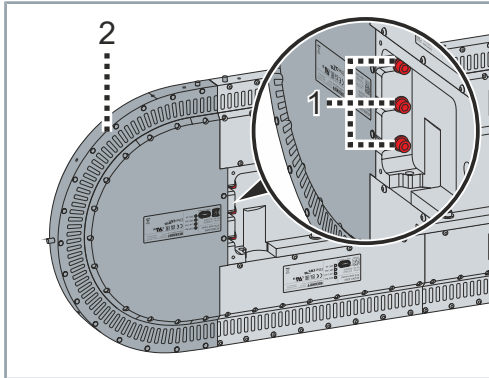
- Ensure that the connection cables [3] are not crushed or damaged by the screw



When inserting the curved segment [1], make sure that the connector card [2] engages in the upper straight module and that the locating pin [3] of the lower straight module is positioned in the curved segment. The screw head [4] and the washer [5] must be located inside the recess [6] on the machine bed.



- Carefully insert the curved segment [1] into the straight modules [2] and [3] and into the machine bed [4]



- Hand-tighten the screws [1] in the curved segment [2]

## 8.3 System test

Before beginning with the assembly of the guide rails, check the functionality of the modules. You can determine whether you have installed the modules correctly and completely and identify any defects.

### Power supply



#### Connecting the connection cable to the connector

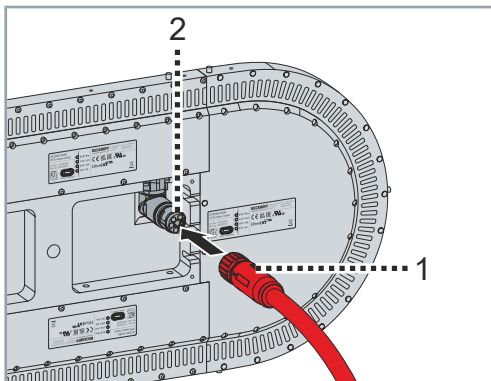
Once modules with connectors are mounted, the connection cables must first be plugged into the connectors before the system is connected to the power supply.

#### NOTICE

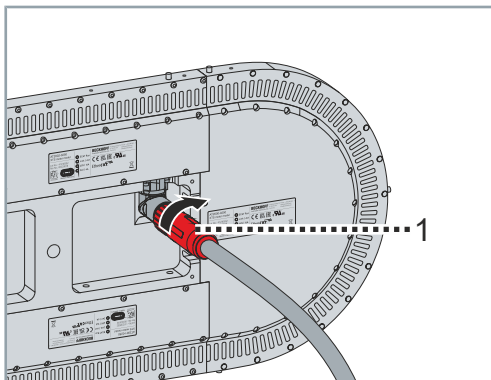
##### Use cables with a high number of bending cycles

For moving track sections, cables with a high number of bending cycles must be used. Beckhoff recommends the use of the following cables:

- ZK7A14-3155-Axxx
- ZK7A14-3031-Axxx



- Plug the connector [1] of the connection cable into the connector [2] of the module

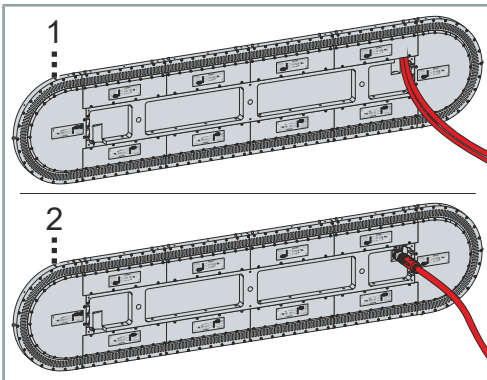


- Tighten the connector [1] with assembly tool [+]



## Adapter in the control cabinet

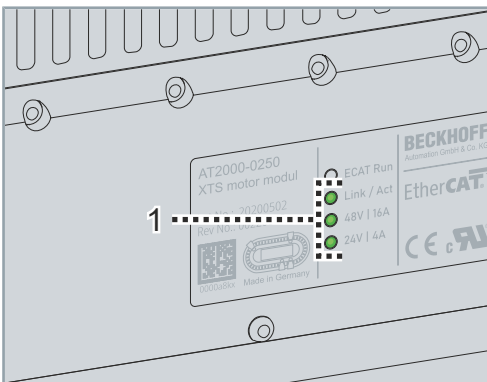
When using modules with connectors and cables with B23 connector ends, make sure that there is a corresponding ENP power adapter [+] in your control cabinet.



- ▶ Connect the entire system with connection cables [1] or connector [2] without guide rails to the power supply

The following sequence must be observed when connecting:

- ▶ switch on 24 V control voltage
- ▶ switch on 48 V supply voltage



The following LEDs [1] must light up:

- Link / Act
- 48 V / 16 A
- 24 V / 4 A

## If the LEDs do not light up:

- Check the power supply units and fuses for voltage
- Check whether the connector card is inserted correctly
- Contact Beckhoff Support:

✉ [support@beckhoff.com](mailto:support@beckhoff.com)

## TwinCAT

Beckhoff also recommends checking the modules using the TwinCAT software:

- Start a TwinCAT project
- Scan the modules
- Check the modules for functionality

Further information can be found in the manual *TF5850 | TwinCAT 3 XTS*:

🌐 [Direct link to the documentation TF5850 | TwinCAT 3 XTS](#)

## 8.4 Mounting the guide rails on the modules

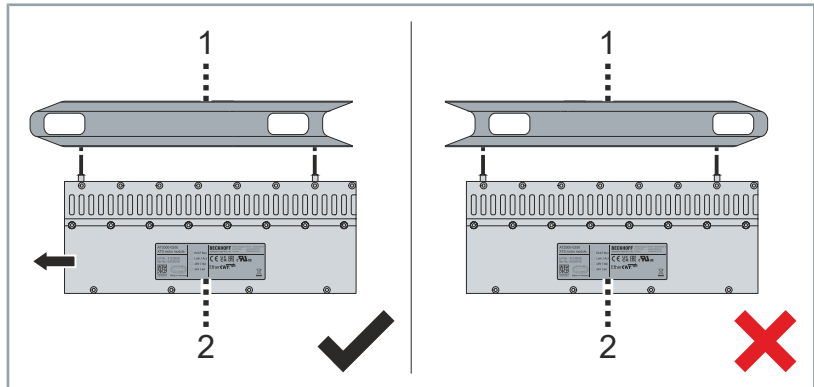


### Mounting example

This chapter contains information on mounting the guide rails.

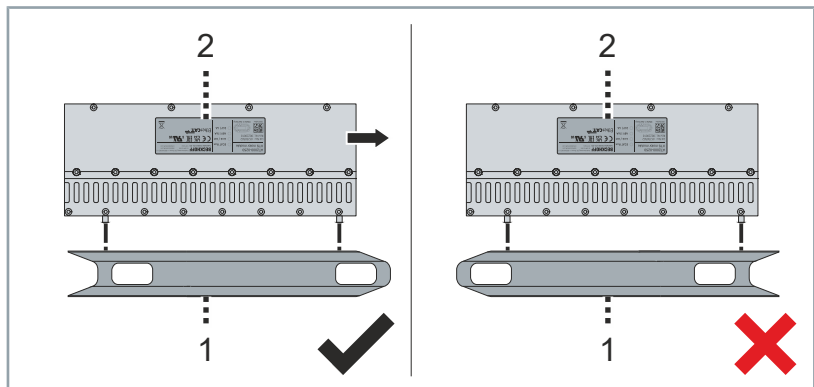
### 8.4.1 Straight guide rails

When mounting the straight guide rails, ensure that the guide rails are correctly aligned and that the lock is in the correct position:



### Alignment of the upper guide rails

The guide rail [1] may only protrude on one side of the module. The side of the module with the name plate [2] is used for orientation.



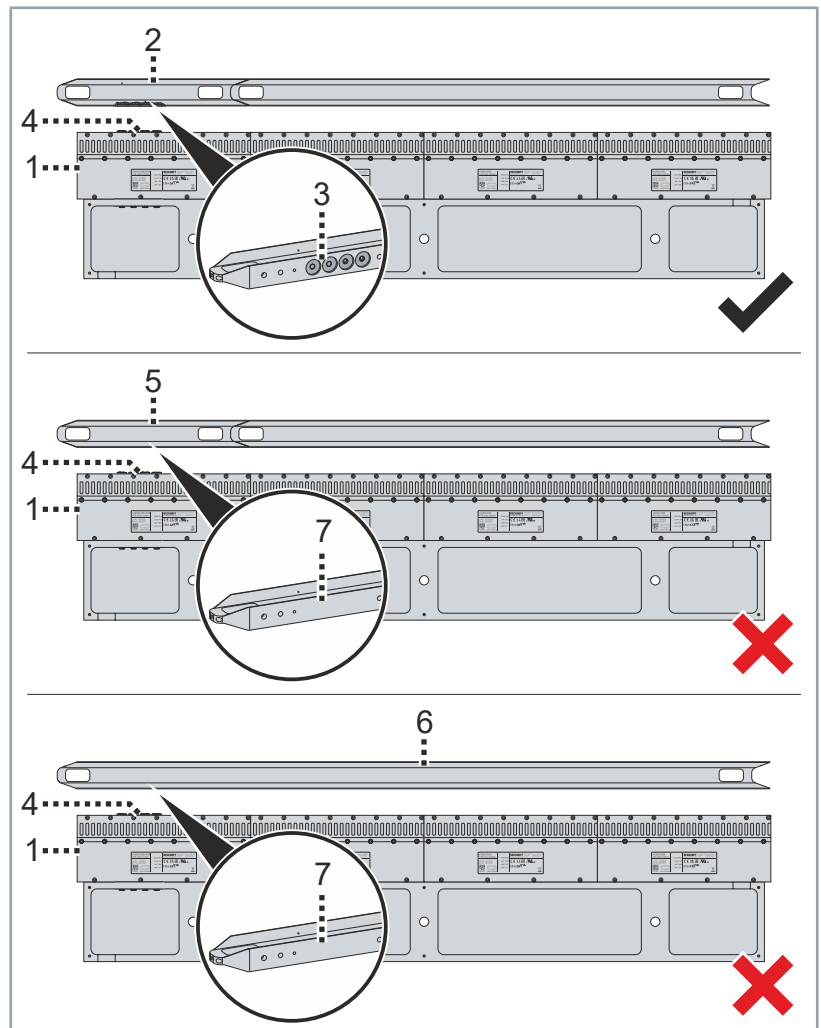
### Alignment of the lower guide rails

The guide rail [1] may only protrude on one side of the module. The side of the module with the name plate [2] is used for orientation.



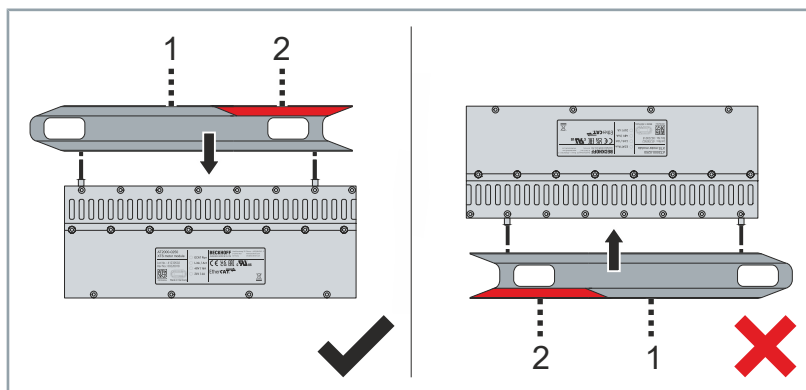
## Guide rail with lubrication channel

If you have integrated automatic lubrication into your system, you must ensure that you use the correct guide rail during installation.



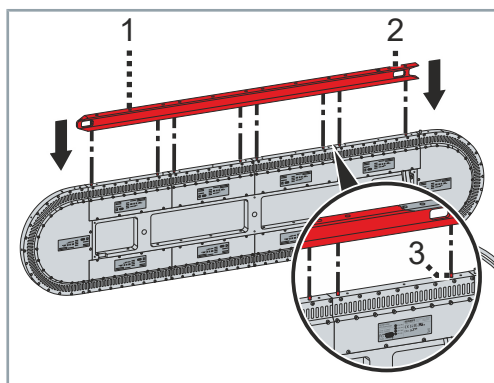
The short guide rail AT9000-0250-0006 [2] must be mounted on a motor module with lubrication channel AT2000-0250-0006 [1], as only this has lubrication channels and recesses [3] for the threaded sockets [4] of the module.

Neither the short guide rail AT9x00-0250 [5] nor long guide rails AT9x00-xxxx [6] may be fitted, as they do not have any lubrication channels or recesses [7] for the threaded sockets [4] of the module.



## Position of the lock

The guide rail [1] with pre-mounted lock [2] must always be mounted at the top of the system. The lock must be removed to install the mover and can be replaced by the optional rail on support [+]. Further information can be found in chapter "Mover", [Page 191].



- Insert guide rail [1] with lock [2] straight onto the locating pins [3] of the upper modules



## Subsequent movement

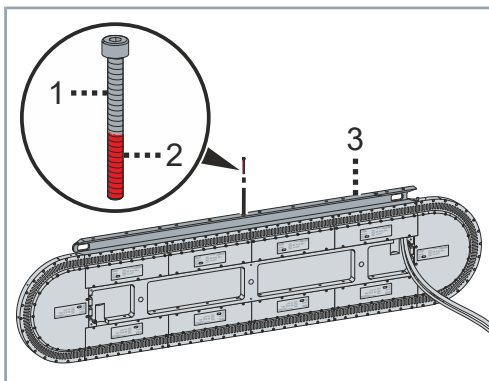
Beckhoff recommends initially fixing all guide rails hand tight with a screw in the center. This allows you to compensate unequal distances later on.

## NOTICE

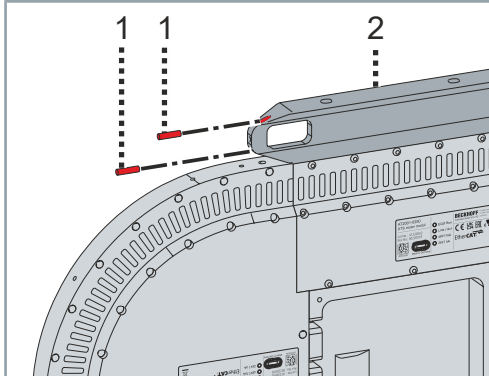
### Use liquid threadlocker

Use liquid threadlocker on the screw thread to fix the guide rails to the modules.

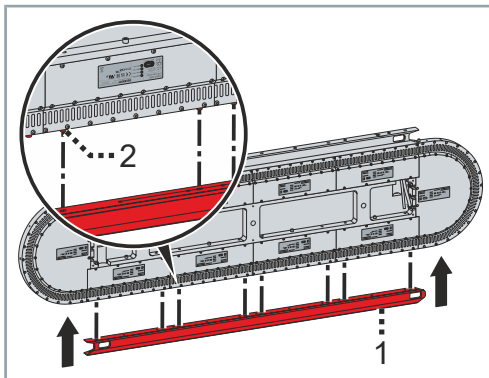
*If you do not use liquid threadlocker, the guide rails can work loose in case of unusual operating conditions such as vibration and lead to damage to other components of the XTS.*



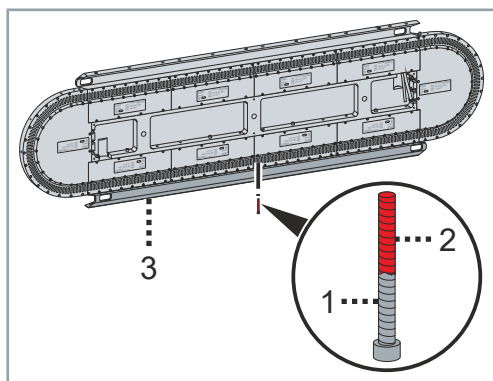
- Hand-tighten the screw [1] with liquid threadlocker [2] in the center of the guide rail [3]



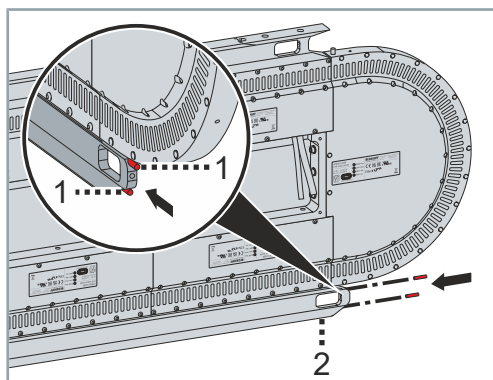
- Insert locating pins [1] into the guide rail [2]



- Insert the guide rail [1] straight onto the locating pins [2] of the lower modules and secure against falling out
- Make sure that the guide rail is correctly aligned



- Hand-tighten the screw [1] with liquid threadlocker [2] in the center of the guide rail [3]



- Insert locating pins [1] into the guide rail [2]

## 8.4.2 Guide rails, 180° curved segment

The curved segments must be prepared for mounting on the modules. Further information can be found in chapter "Guide rails, 180° curved segment", [Page 164].

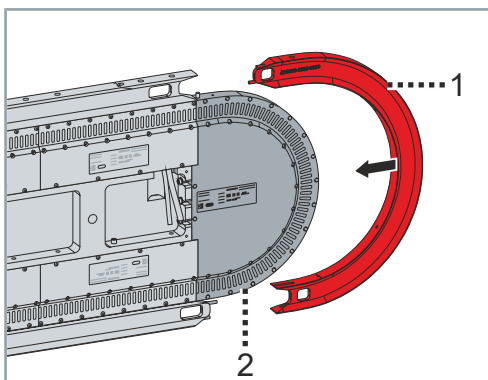


### Simplified mounting

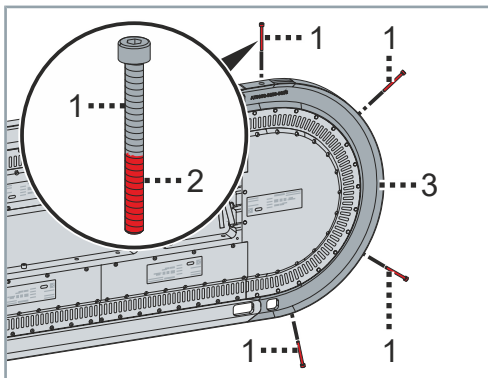
Beckhoff recommends applying a small amount of lubricant to the connecting surfaces and the inner running surfaces of the 180° curved segments before mounting. Greasing the curved segments facilitates mounting on the straight guide rails.

Beckhoff recommends the following lubricants:

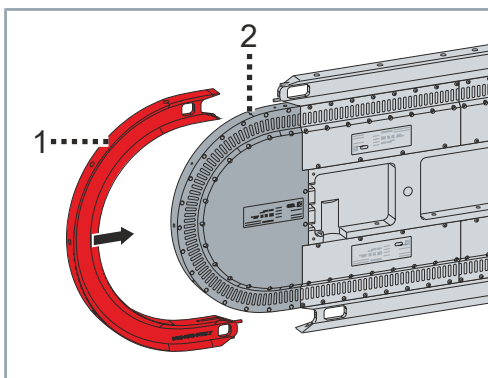
- Petrolatum when using movers without spring-loaded rollers
- Food grade grease NSF-H1 when using movers with spring-loaded rollers



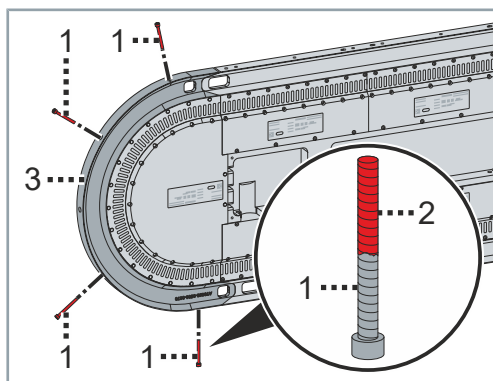
- Push the curved segment [1] onto the module [2]



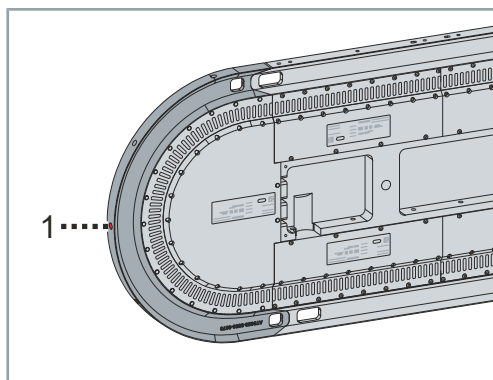
- Insert screws [1] with liquid threadlocker [2] into the curved segment [3] and hand-tighten



- Push the curved segment [1] onto the module [2] and close the system



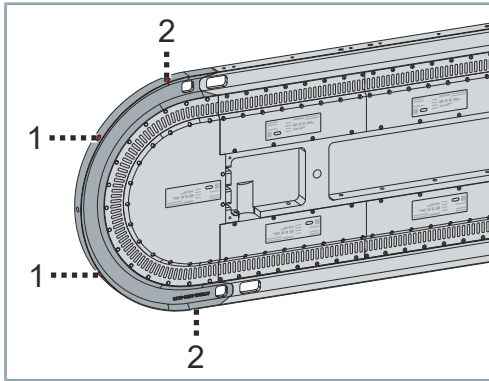
- Insert screws [1] with liquid threadlocker [2] into the curved segment [3] and hand-tighten



The hole [1] in the center of the guide rail is not used for fixing. The hole can be used to dismantle the curved segment.

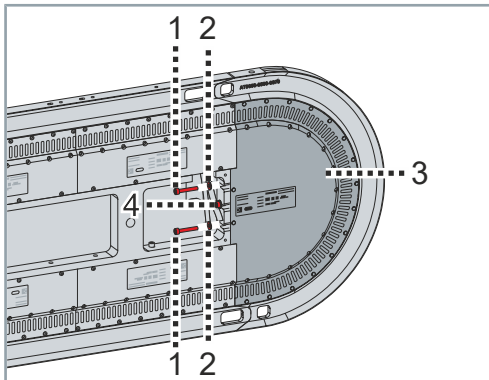
Further information can be found in chapter "Dismantling the guide rails, 180° curved segment", [Page 190].

## 8.4.3 Completion of the mounting



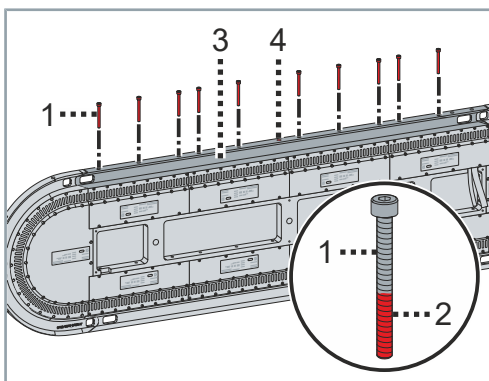
- ▶ Tighten the screws [1] in the curved segments
- ▶ Tighten the screws [2] in the curved segments
- ▶ Observe tightening torques:

Components	Tightening torque [Nm]
Screws, M4 x 40	4



- ▶ Tighten the screws [1] in the module [2]
- ▶ Observe tightening torques:

Components	Tightening torque [Nm]
Screws, M5 x 20	6



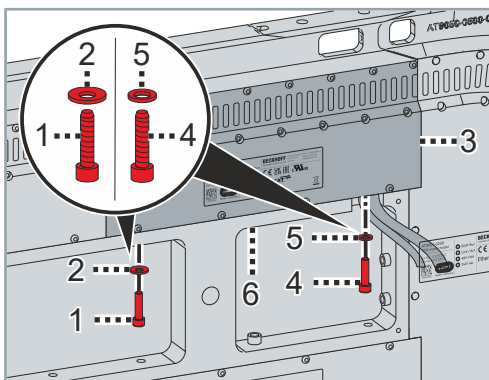
- ▶ Apply liquid threadlocker [2] to the screws [1], insert them into the straight guide rails [3] and tighten them
- ▶ Observe tightening torques:

Components	Tightening torque [Nm]
Screws, M4 x 40	4



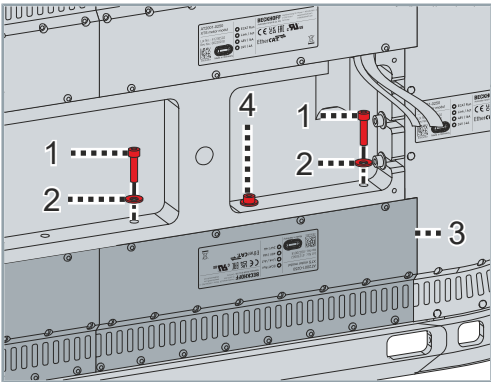
### Smaller washer for modules with connection cables

Beckhoff recommends using a washer with a smaller diameter at the recesses for the connection cables in the machine bed to prevent damage to the connection cables.



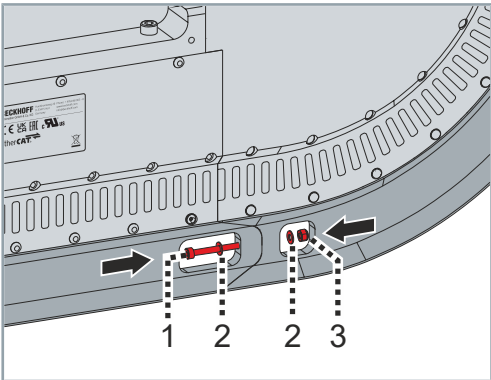
- ▶ Insert screw [1] with washer [2] into the module with connection cables [3] and tighten
- ▶ Insert screw [1] with small washer [4] into the module with connection cables [3] and tighten
- ▶ Tighten screw [5]
- ▶ Observe tightening torques:

Components	Tightening torque [Nm]
Screws, M5 x 20	6



- ▶ Insert screws [1] with washers [2] into all straight modules [3] and tighten them
- ▶ Tighten screw [4]
- ▶ Observe tightening torques:

Components	Tightening torque [Nm]
Screws, M5 x 20	6



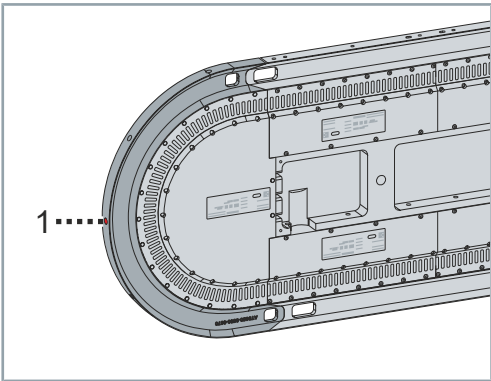
The guide rails must be connected to each other at the connectors:

- ▶ Insert screw [1] with washers [2] and nut [3] through the recesses on the guide rails and tighten them
- ▶ Observe tightening torques:

Components	Tightening torque [Nm]
Screws, M3 x 30	2
Nuts, M3	

- ▶ Connect all other connectors of the guide rails in the same way

## 8.4.4 Dismantling the guide rails, 180° curved segment



The hole [1] in the center of the guide rail can be used for disassembly.

If you have loosened all the screws on the curved rail and the guide rail cannot be detached from the curved segment and the locating pins, you can screw a screw through the hole and carefully push the guide rail away from the module.



## 8.5 Mounting the movers



### Mounting example

This chapter provides information on mounting the mover.

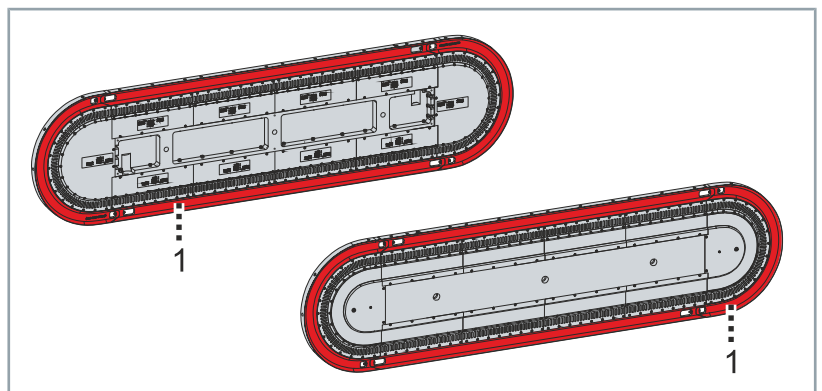


### Better running characteristics

Beckhoff recommends greasing the running surface on the guide rails of the entire system with a small amount of lubricant before mounting the movers and commissioning the system.

Beckhoff recommends the following lubricants:

- Petrolatum when using movers without spring-loaded rollers
- Food grade grease NSF-H1 when using movers with spring-loaded rollers

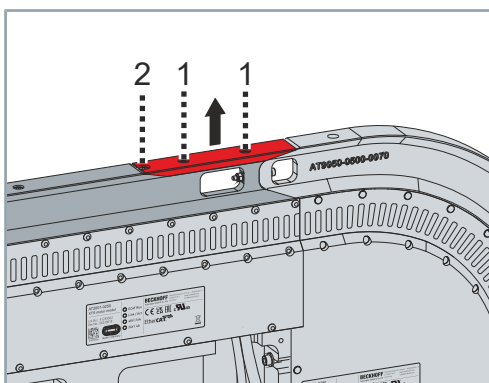


- Grease the running surfaces [1] of the guide rails on both sides of the entire system with a small amount of lubricant

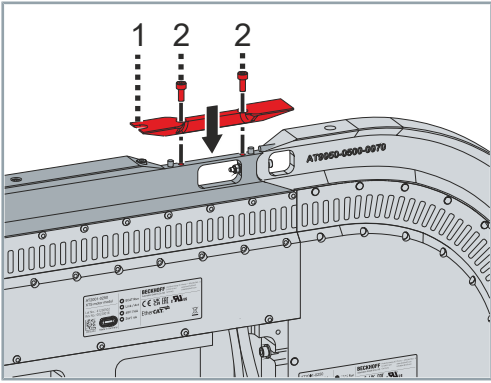
### 8.5.1 Rail on support [+]

A pre-assembled lock is available for installing the movers on the guide rails. The lock must be removed before installing the movers and replaced with the rail on support [+].

#### Installation



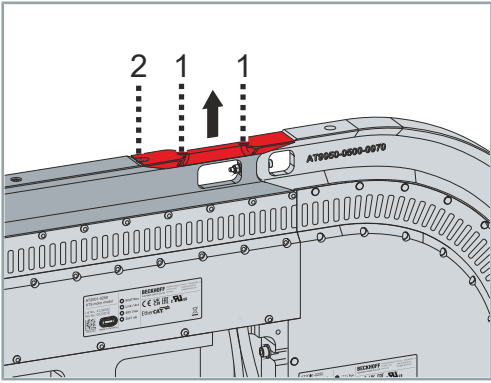
- Remove screws [1]
- Remove lock [2]



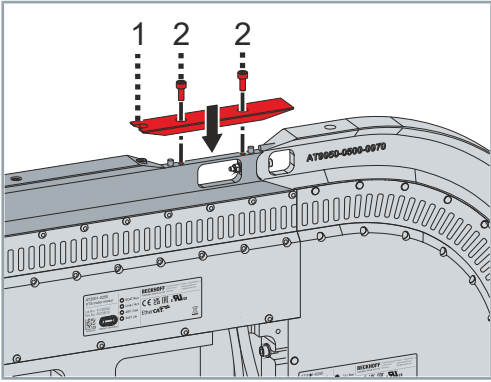
Disassembly

- ▶ Insert rail on support [1]
  - ▶ Insert screws [2] and hand-tighten them
- Once the rail on support has been fitted, the movers can be installed.

Once the movers have been installed, the rail on support must be removed and the lock mounted.



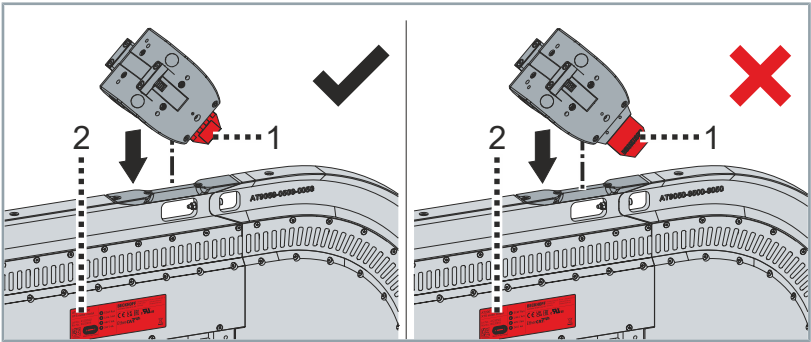
- ▶ Remove screws [1]
- ▶ Remove rail on support [2]



- ▶ Insert lock [1]
- ▶ Insert and tighten the screws [2]
- ▶ Observe tightening torques:

Components	Tightening torque [Nm]
Screws, M4 x 10	3

8.5.2 Mover alignment



The encoder flag [1] of the mover must be on the opposite side of the name plate [2] when rerailing.

## Required distance between the movers

To avoid collisions, a distance must be set between two movers in *TwinCAT*. Further information can be found in the documentation *TF5410 | Motion Collision Avoidance*:

🌐 [Direct link to the documentation TF5410 | TwinCAT 3 Motion Collision Avoidance](#)

### NOTICE

#### Removing the NCT electronics

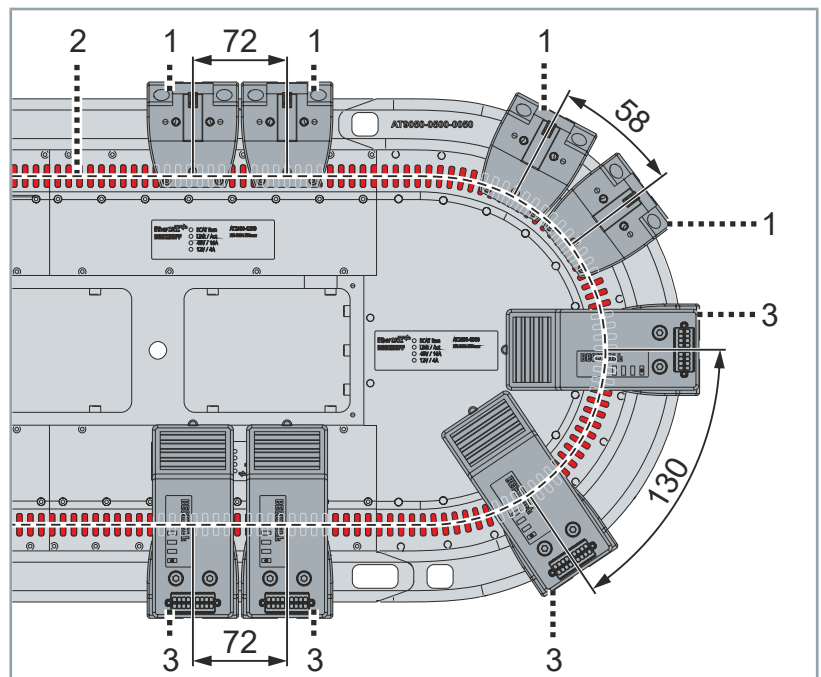
Before commissioning a system with No Cable Technology for the first time and before commissioning new motion profiles, the NCT electronics must be removed from the movers to avoid collisions. The NCT electronics can only be mounted on the movers once all the motion profiles are working in operation.

*Remove the NCT electronics from the movers before initial commissioning and before commissioning new motion profiles.*

*Test all movement profiles of the movers without the NCT electronics mounted.*

*Only mount the NCT electronics after all motion profiles are working.*

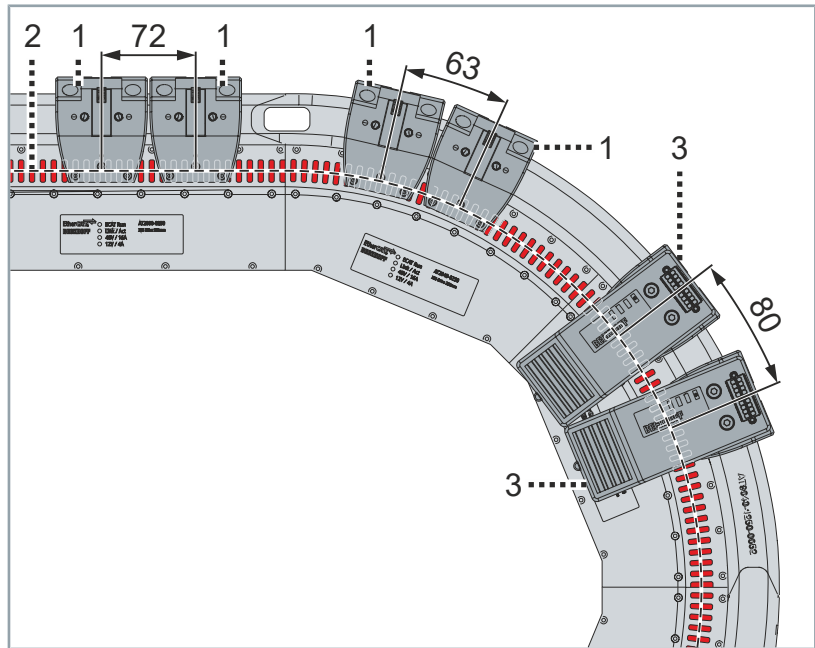
#### 180° curved segment



The distance between two movers [1] is 72 mm on straight modules. On curved modules AT2050-0500, the distance between two movers is 58 mm. The distance is measured at the center of the coils [2].

If you are using movers with NCT electronics [3], a distance of 130 mm is required on the curved modules AT2050-0500.

## 45° curved segment



The distance between two movers [1] is 72 mm on straight modules. On curved modules AT2050-0500, the distance between two movers is 63 mm. The distance is measured at the center of the coils [2].

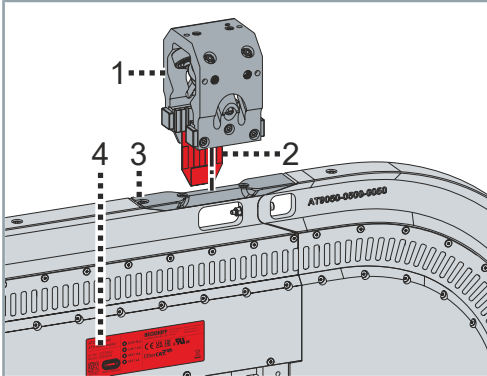
If you are using movers with NCT electronics [3], a distance of 80 mm is required on the curved modules AT2050-0500.

## 8.5.3 Mover, length 50 mm

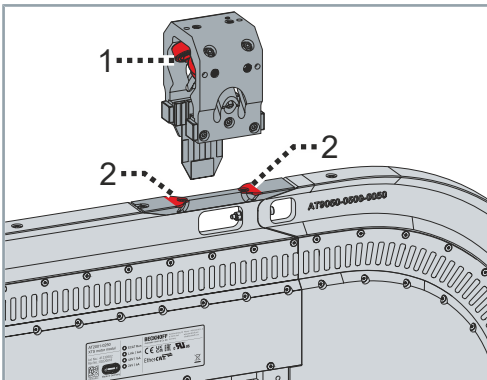


### Mounting example

The mounting is described using a mover AT9011-0050-0550 as an example.



- Position the mover [1] with the encoder flag [2] centrally above the rail on support [3]
- Ensure that the encoder flag [2] is correctly aligned with the name plate [4]



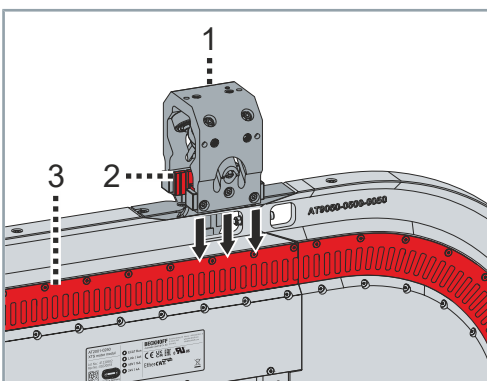
- Make sure the guide rollers [1] of the mover are not pressed onto the edges [2] of the rail on support during mounting

### ⚠ WARNING

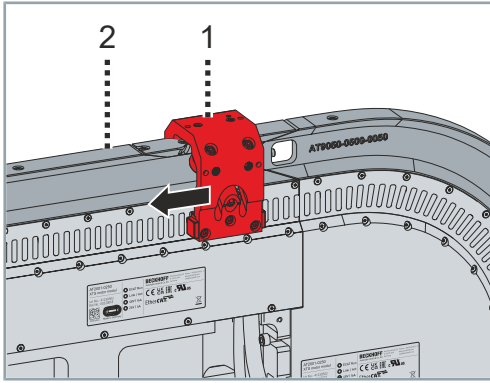
#### Risk of crushing due to strong magnetic attraction

When mounting the movers on the rails, always hold them tight with both hands. The magnetic plate set of the mover and the modules strongly attract one another magnetically.

*If you do not hold the movers tight with both hands in a controlled manner, the magnetic forces can attract the movers in an uncontrolled manner to the motor modules and cause serious crushing injuries to the hands and fingers or damage to the system.*



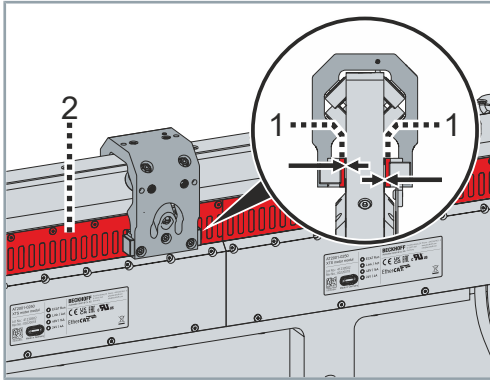
- Place mover [1] carefully with both hands centrally onto the rail on support
- Ensure that the magnetic plate set [2] and the module [3] attract each other magnetically as soon as the magnetic plate set of the mover comes close to the module



- ▶ Carefully push the mover [1] by hand along the guide rail [2] and out of the rail on support

The mover is now mounted on the guide rail.

- ▶ Mount all further movers in the same way



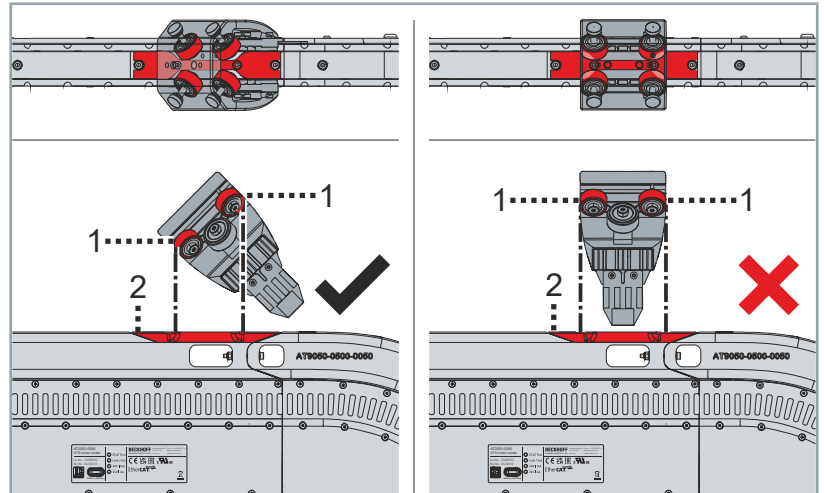
## When all movers are mounted:

- ▶ Check all round that the air gap between the magnetic plates [1] of the movers and the modules [2] is symmetrical on both sides of the system and is approximately 0.85 mm
- ▶ Check all around that the air gap between the encoder flag and the modules is approximately 0.90 mm
- ▶ Check that the magnetic plates and the encoder flag are positioned parallel to the modules
- ▶ Remove the rail on support [+]
- ▶ Mount the lock

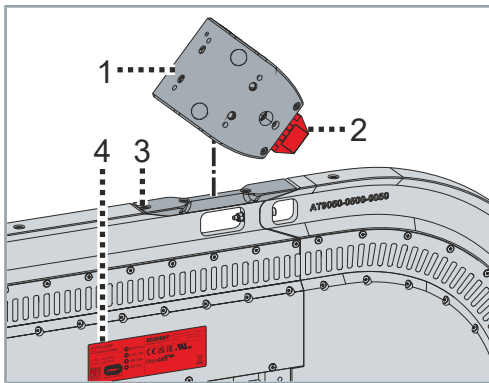
Further information can be found in chapter "Rail on support [+]", [Page 191].

## 8.5.4 Mover, length 70 mm

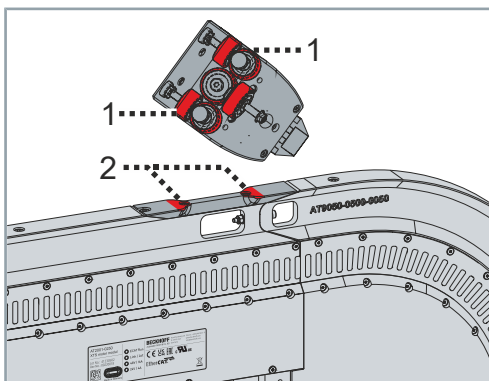
Mover position during mounting



The design-related distance between the guide rollers [1] means that the movers must be mounted rotated over the rail on support [2].



- Position the mover [1] with the encoder flag [2] centrally above the rail on support [3]
- Ensure that the encoder flag [2] is correctly aligned with the name plate [4]



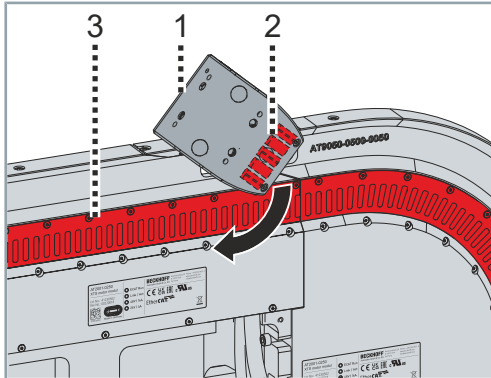
- Make sure the guide rollers [1] of the mover are not pressed onto the edges [2] of the rail on support during mounting

## ⚠ WARNING

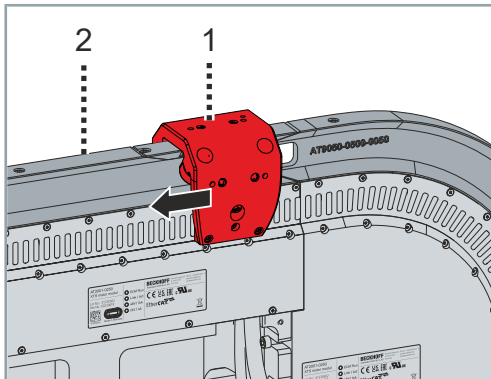
### Risk of crushing due to strong magnetic attraction

When mounting the movers on the rails, always hold them tight with both hands. The magnetic plate set of the mover and the modules strongly attract one another magnetically.

*If you do not hold the movers tight with both hands in a controlled manner, the magnetic forces can attract the movers in an uncontrolled manner to the motor modules and cause serious crushing injuries to the hands and fingers or damage to the system.*



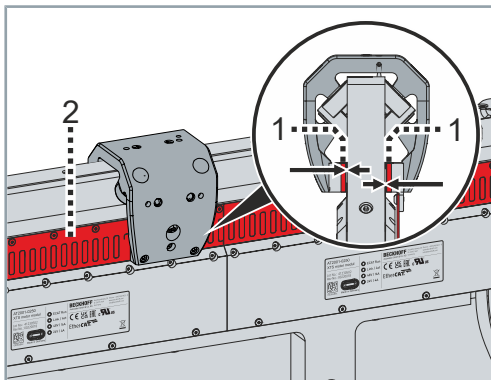
- ▶ Place mover [1] carefully with both hands centrally onto the rail on support
- ▶ Note the rotated position when mounting
- ▶ Ensure that the magnetic plate set [2] and the module [3] attract each other magnetically as soon as the magnetic plate set of the mover comes close to the module
- ▶ Move the mover to a straight position



- ▶ Carefully push the mover [1] by hand along the guide rail [2] and out of the rail on support

The mover is now mounted on the guide rail.

- ▶ Mount all further movers in the same way



### When all remaining movers have been mounted:

- ▶ Check all round that the air gap between the magnetic plates [1] of the movers and the modules [2] is symmetrical on both sides of the system and is approximately 0.85 mm
- ▶ Check all around that the air gap between the encoder flag and the modules is approximately 0.90 mm
- ▶ Check that the magnetic plates and the encoder flag are positioned parallel to the modules
- ▶ Remove the rail on support [+]
- ▶ Mount the lock

Further information can be found in chapter "Rail on support [+]", [Page 191].



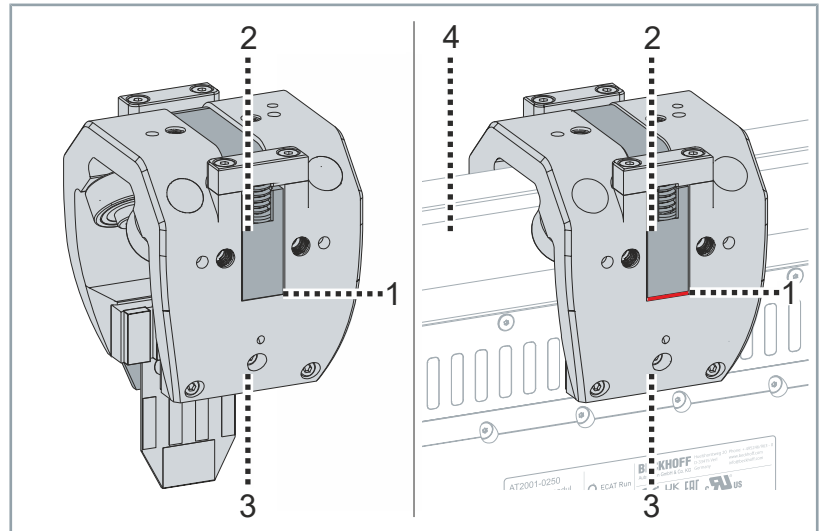
### 8.5.5 Mover, length 55 mm and 70 mm, with spring-loaded rollers



#### Mounting example

The mounting is described using a mover *AT9014-0070-0550* as an example.

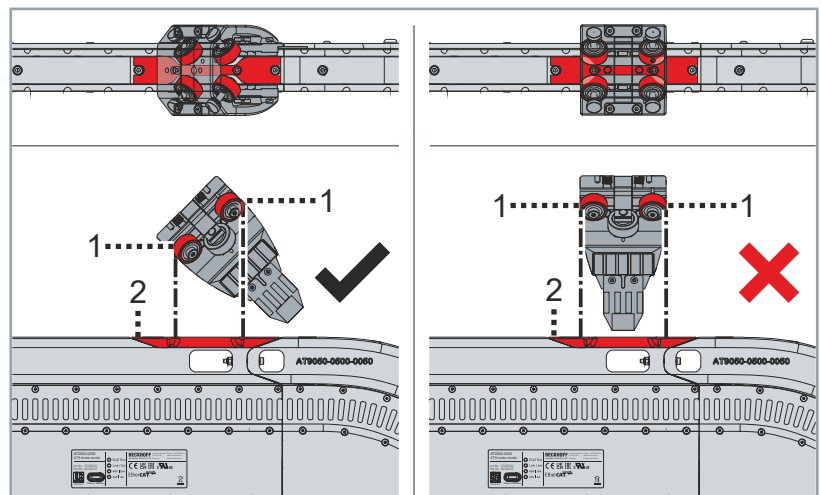
#### Pretensioning



In delivery state the suspension strut is pretensioned by a spring vis-à-vis the base body on the mover *AT9011-0070*, so that the air gap [1] between the suspension strut [2] and the base body [3] is zero when removed. Only when the mover is mounted on the guide rails [4] does the pretensioning create an air gap.

Due to their design, the rollers readjust themselves in the event of wear as a result of the pretensioning of the spring. For more information, see the chapters "Roller wear on *AT9014-0055*", [Page 256] and "Roller wear on *AT9014-x070* and *AT8300-1x00*", [Page 278].

#### Mover position during mounting



The guide rollers [1] have a greater distance to each other on the 70 mm mover due to its design. In order to be able to install the mover over the rail on support [2], the mover must be rotated and placed on the rail on support.

## NOTICE

### Removing the NCT electronics

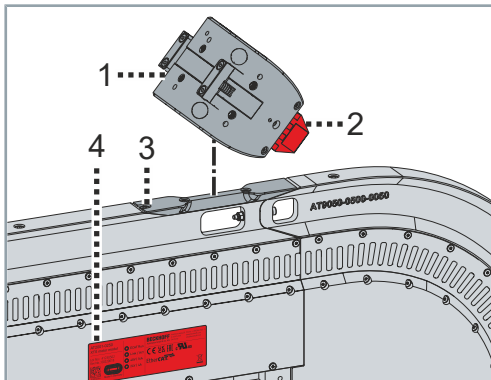
Before commissioning a system with No Cable Technology for the first time and before commissioning new motion profiles, the NCT electronics must be removed from the movers to avoid collisions. The NCT electronics can only be mounted on the movers once all the motion profiles are working in operation.

*Remove the NCT electronics from the movers before initial commissioning and before commissioning new motion profiles.*

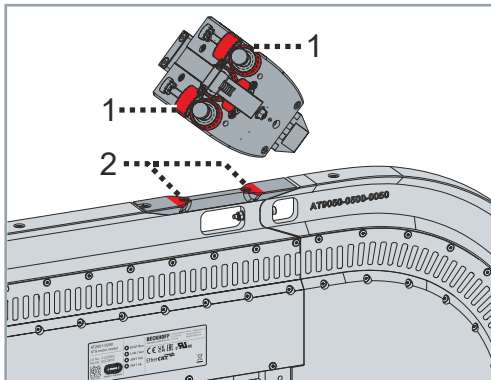
*Test all movement profiles of the movers without the NCT electronics mounted.*

*Only mount the NCT electronics after all motion profiles are working.*

If you are using movers with NCT electronics mounted, you must remove the NCT electronics before installing the movers on the rails. Further information can be found in chapter "Replacing NCT electronics", [Page 297].



- Position the mover [1] with the encoder flag [2] centrally above the rail on support [3]
- Ensure that the encoder flag [2] is correctly aligned with the name plate [4]



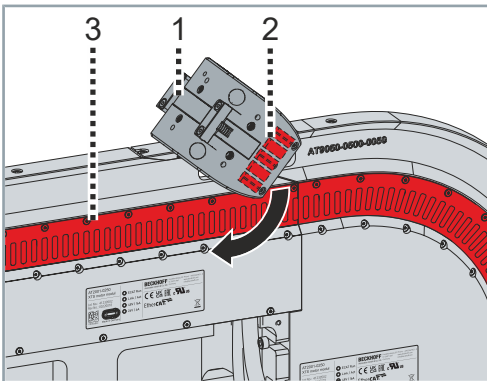
- Make sure the guide rollers [1] of the mover are not pressed onto the edges [2] of the rail on support during mounting

## ⚠ WARNING

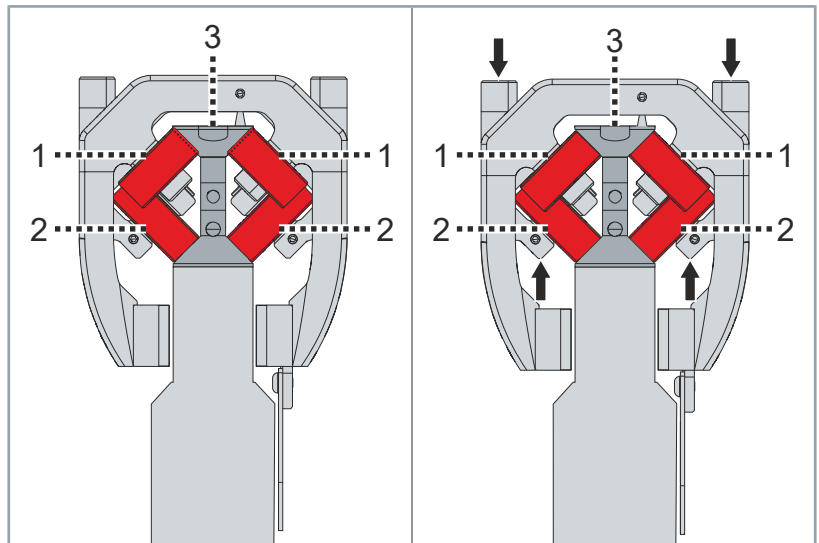
### Risk of crushing due to strong magnetic attraction

When mounting the movers on the rails, always hold them tight with both hands. The magnetic plate set of the mover and the modules strongly attract one another magnetically.

*If you do not hold the movers tight with both hands in a controlled manner, the magnetic forces can attract the movers in an uncontrolled manner to the motor modules and cause serious crushing injuries to the hands and fingers or damage to the system.*

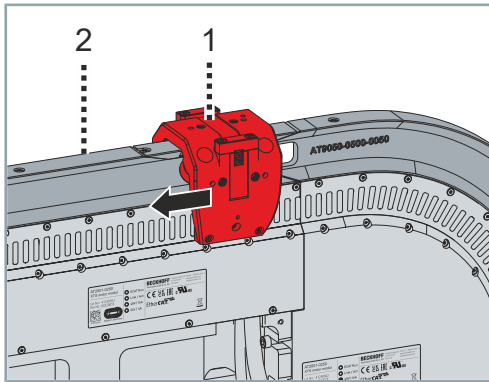


- Carefully place the mover [1] in the center of the rail on support using light pressure and both hands
- Note the rotated position when mounting
- Ensure that the magnetic plate set [2] and the module [3] attract each other magnetically as soon as the magnetic plate set of the mover comes close to the module
- Move the mover to a straight position



The mover must be pressed downwards when it is rerouted out of the rail on support onto the guide rail, as the upper guide rollers [1] and the lower guide rollers [2] are too far apart due to the suspension strut and the upper guide rollers will otherwise collide with the edges of the rail on support [3].

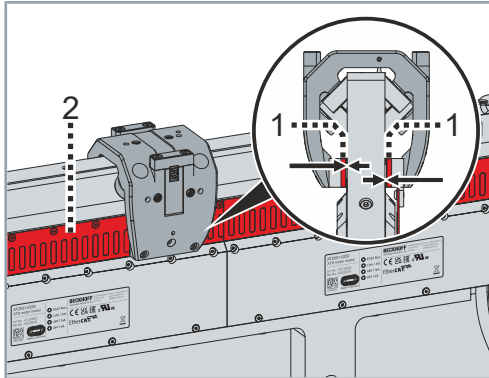
The pressure on the base body [4] moves the suspension strut [5] with the lower guide rollers upwards. The distance between the upper and lower guide rollers is reduced and an air gap [6] is created between the base body and the suspension strut.



- ▶ Carefully push the mover [1] out of the rail on support by hand with light pressure along the guide rail [2]

The mover is now mounted on the guide rail.

- ▶ Mount all further movers in the same way

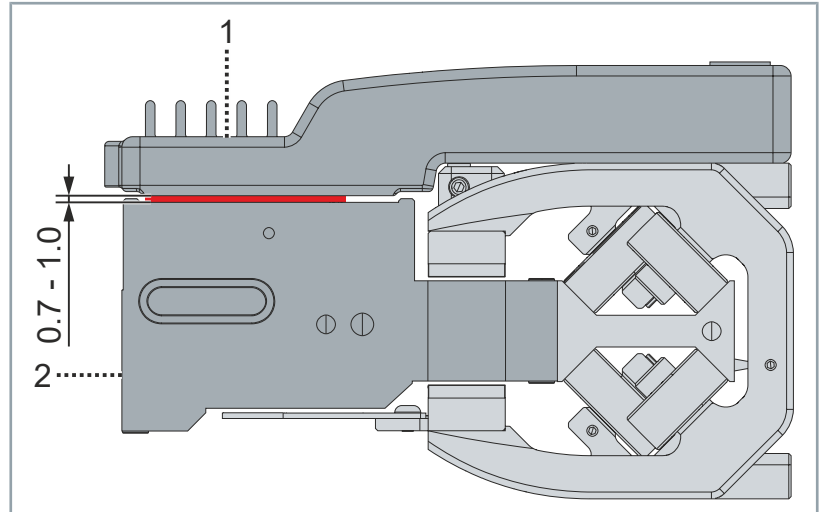


## When all remaining movers have been mounted:

- ▶ Check all round that the air gap between the magnetic plates [1] of the movers and the modules [2] is symmetrical on both sides of the system and is approximately 0.85 mm
- ▶ Check all around that the air gap between the encoder flag and the modules is approximately 0.90 mm
- ▶ Check that the magnetic plates and the encoder flag are positioned parallel to the modules
- ▶ Remove the rail on support [+] and mount the lock

Further information can be found in chapter "Rail on support [+]", [Page 191].

## 8.5.5.1 Mover with NCT electronics fitted



The NCT electronics are pre-mounted on the mover with two screws. The air gap between the mounted NCT electronics [1] and the motor module [2] is preset to 1 mm ex factory. The air gap may be reduced to a minimum of 0.7 mm.

### NOTICE

#### **Do not combine 180° curved segments with option for additional cooling and modules with NCT functionality**

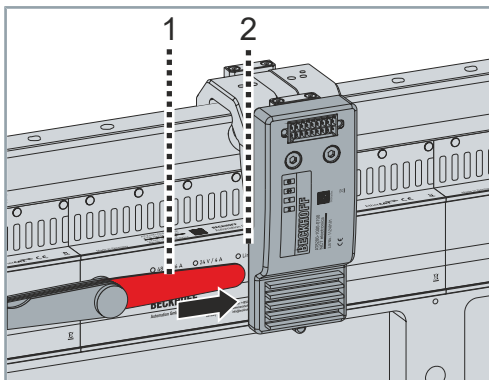
Modules with NCT functionality and movers with NCT electronics must not be used together with 180° curved segments with the option for additional cooling.

*If you use movers with NCT electronics and 180° curved segments with option for additional cooling, the modules, movers and NCT electronics will be damaged.*

- Do not mount 180° curved segments with option for additional cooling and modules with NCT functionality together in one system.

Further information can be found in chapter "Curved segments", [Page 176].

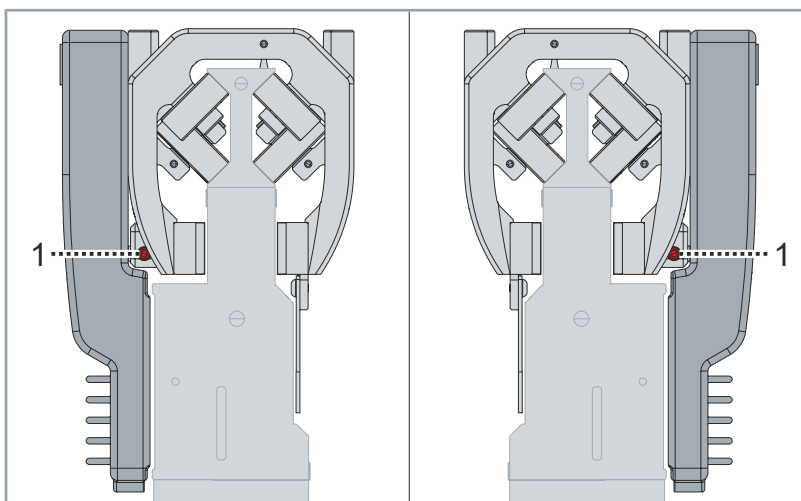
### Checking the air gap



- Insert the feeler gauge blade [1] into the air gap [2] between the NCT electronics and the module

The air gap must be adjusted if the feeler gauge blade cannot be inserted into the air gap.

## Adjust air gap



On both sides of the mover there is a set screw [1] for adjusting the position of the NCT electronics. The air gap between the NCT electronics and the module can be adjusted using the two set screws.

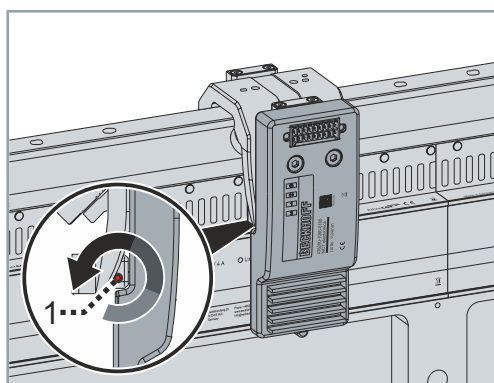
## Reduce air gap

### NOTICE

#### Air gap must be at least 0.7 mm

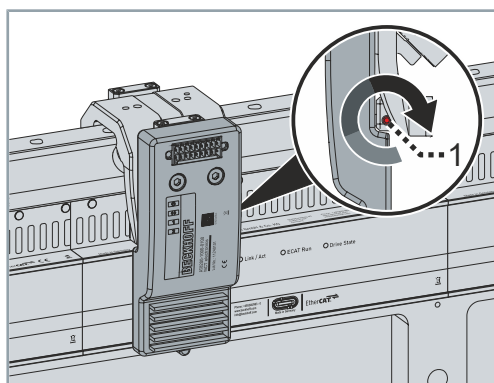
To check the air gap, the mover must be on the guide rail. The air gap must be at least 0.7 mm.

*If the air gap is too small, damage to the mover and the system may result.*



- Loosen set screw [1]

Rotation	Changing the air gap [mm]
1/4	0.1



- Tighten set screw [1] on the opposite side accordingly
- Check the air gap

If the air gap is not yet set correctly:

- Loosen and tighten the set screws again

OR

- Increasing the air gap

Further information can be found in chapter "Increasing the air gap", [Page 205].

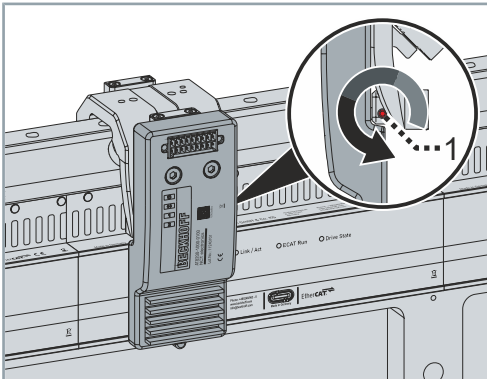
## Increasing the air gap

### NOTICE

#### The air gap must not exceed 1 mm

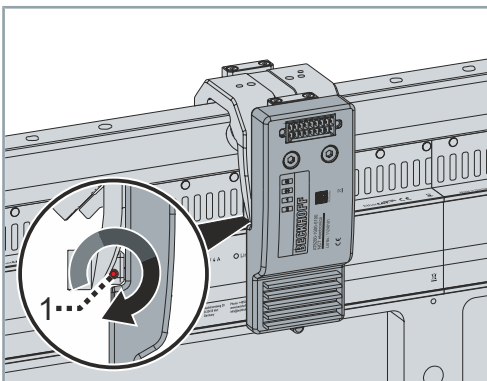
To check the air gap, the mover must be on the guide rail. The air gap must not exceed 1 mm.

*If the air gap is too large, the data transmission between the NCT electronics on the mover and the motor modules may be disturbed and the functions may not be executed correctly.*



- Loosen set screw [1]

Rotation	Changing the air gap [mm]
1/4	0.1



- Tighten set screw [1] on the opposite side accordingly
- Check the air gap

If the air gap is not yet set correctly:

- Loosen and tighten the set screws again

OR

- Reduce the air gap

Further information can be found in chapter "Reduce air gap", [Page 204].

## 8.5.6 Third-party movers



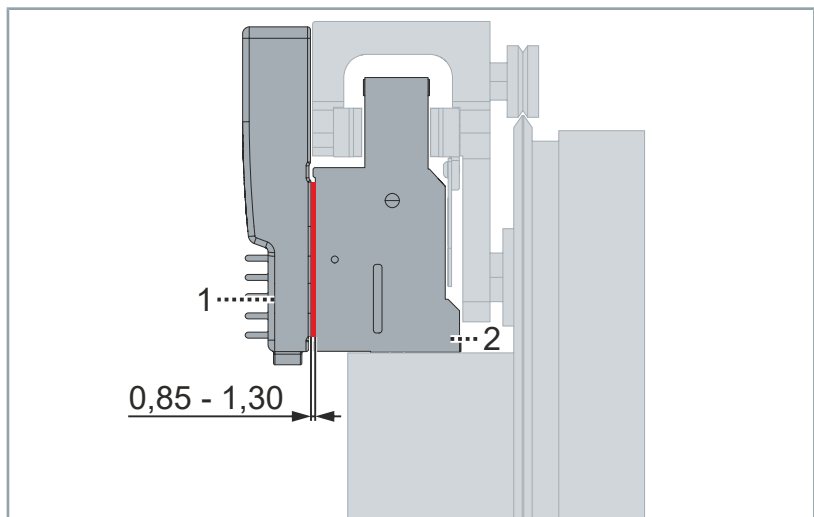
### Only mount third-party movers on parallel guide rail system

Third-party movers may only be mounted on a parallel guide rail system. If the NCT electronics AT8200-2000 is mounted on a mover from a third-party manufacturer, the air gap between the mounted NCT electronics and motor module must be set as small as possible in order to utilize the maximum available energy. The NCT electronics must have an air gap to the modules at every point and must not touch the modules.



### Example of a parallel guide rail system

This chapter provides information on setting the air gap between the NCT electronics and the motor modules. The illustration is based on the example of a parallel guide rail system from a third-party manufacturer with motor modules and NCT electronics from Beckhoff Automation. Third-party components are shaded gray in the figures.



The NCT electronics are mounted on the third-party mover with a screw. The air gap between the mounted NCT electronics [1] and the motor module [2] must be set to the smallest possible value that is possible for your system depending on the tolerance. The air gap must be at least 0.85 mm and must not exceed 1.3 mm.

## NOTICE

### Do not combine 180° curved segments with option for additional cooling and modules with NCT functionality

Modules with NCT functionality and movers with NCT electronics must not be used together with 180° curved segments with the option for additional cooling.

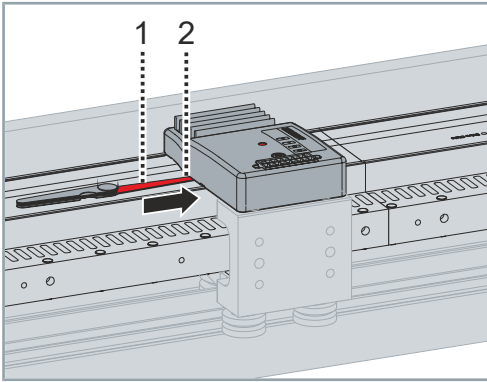
*If you use movers with NCT electronics and 180° curved segments with option for additional cooling, the modules, movers and NCT electronics will be damaged.*

- Do not mount 180° curved segments with option for additional cooling and modules with NCT functionality together in one system.

Further information can be found in chapter "Curved segments", [Page 176].



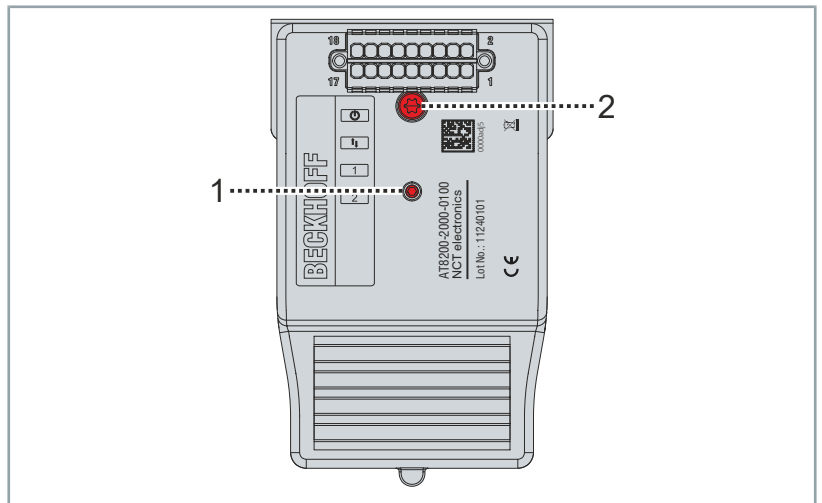
## Checking the air gap



- Insert the feeler gauge blade [1] into the air gap [2] between the NCT electronics and the module

The air gap must be adjusted if the feeler gauge blade cannot be inserted into the air gap.

## Adjust air gap



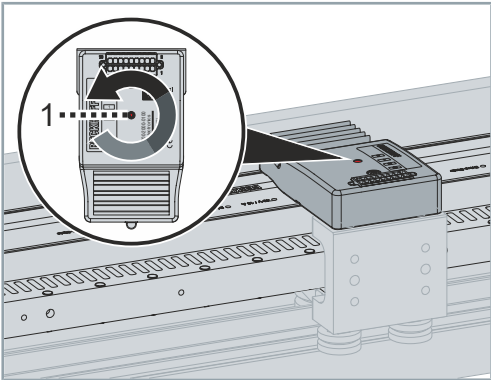
There is a set screw [1] on the NCT electronics for adjusting the position of the NCT electronics. The set screw can be used to adjust the air gap between the NCT electronics and the module. The NCT electronics are attached to the mover with a fastening screw [2].

Reduce air gap

NOTICE

Air gap must be at least 0.85 mm

To check the air gap, the mover must be on the guide rail. The air gap must be at least 0.85 mm.  
*If the air gap is too small, damage to the mover and the system may result.*



- ▶ Turn the set screw [1] counterclockwise

Rotation	Change in air gap [mm]
1/4	0.2

- ▶ Check the air gap

If the air gap is not yet set correctly:

- ▶ Turn the set screw counterclockwise again

OR

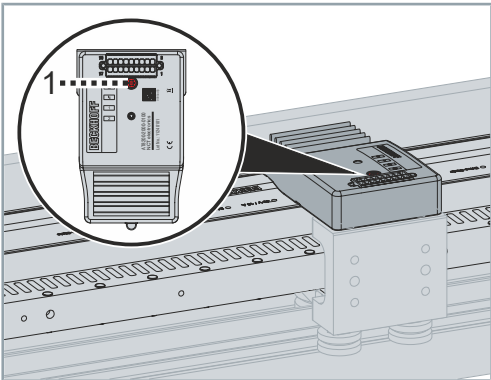
- ▶ Increasing the air gap

Further information can be found in chapter "Increasing the air gap", [Page 209].

When the air gap is set correctly, the fastening screw must be tightened.

- ▶ Tighten the fastening screw [1]
- ▶ Observe tightening torques:

Components	Tightening torque [Nm]
Screws, M4 x 25	3



Increasing the air gap

NOTICE

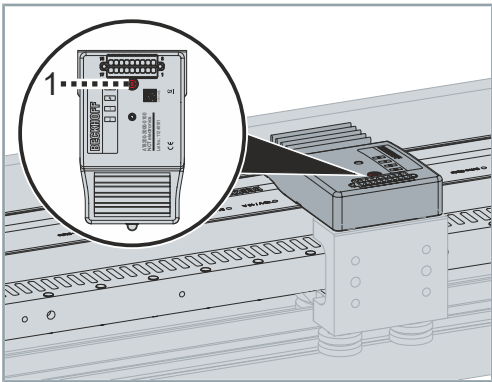
The air gap must not exceed 1.3 mm

To check the air gap, the mover must be on the guide rail. The air gap must not exceed 1.3 mm.  
*If the air gap is too large, the data transmission between the NCT electronics on the mover and the motor modules may be disturbed and the functions may not be executed correctly.*

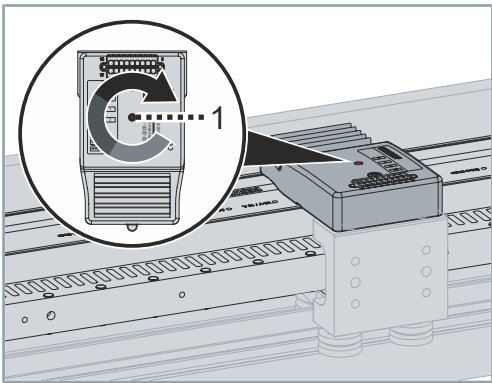
NOTICE

Loosen the fastening screw

To increase the air gap, the fastening screw of the NCT electronics must be loosened.  
*If the fastening screw is not loosened, the housing may be damaged.*



► Loosen the fastening screw [1]



► Turn set screw [1] clockwise

Rotation	Change in air gap [mm]
1/4	0.2

► Check the air gap

If the air gap is not yet set correctly:

► Turn the set screw clockwise again

OR

► Reduce the air gap

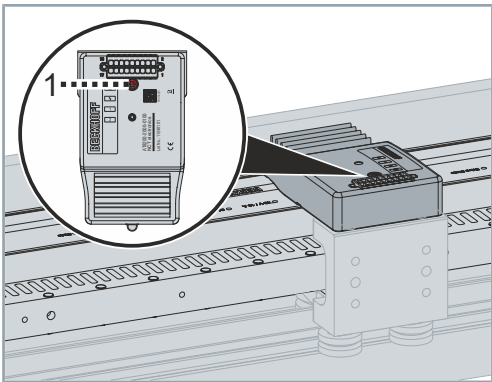
Further information can be found in chapter "Reduce air gap", [Page 208]

When the air gap is set correctly, the fastening screw must be tightened.

► Tighten the fastening screw [1]

► Observe tightening torques:

Components	Tightening torque [Nm]
Screws, M4 x 25	3



## 9 Electrical installation

### 9.1 Connection technology

Beckhoff delivers modules with infeed and integrated and pre-assembled power cables and EtherCAT cables. Mating connectors are not included in the scope of supply. The cable end of the power supply is pre-assembled with ferrules. The EtherCAT cable is supplied with an RJ45 plug, pin assignment TSB568A.

Modules with connectors are supplied without power cables and EtherCAT cables. Power cables and EtherCAT cables as well as the required adapters must be ordered separately. Further information can be found in chapter "Accessories", [Page 299].

#### 9.1.1 Cables

#### WARNING

##### **Do not extend cables**

The power cable of the module with connection cables is designed with a length of 5 m and the optional power cables for modules with connector are designed with a length of up to 25 m to match the 16 A "B" circuit breaker of the power supply unit. Never extend the power cables, since correct tripping of the circuit breaker cannot be guaranteed with an extended power cable. *Extending the power cables can cause irreparable damage to the modules or result in electrocution causing serious injury or death.*

Beckhoff cables have been tested with regard to the materials, shielding and connection method used. They ensure proper functioning and compliance with statutory regulations such as EMC and UL. The use of other cables may lead to unexpected interference and invalidate the warranty.



#### **Beckhoff recommendation for correct application and assembly:**

- Wiring in accordance with applicable regulations and standards
- Use the pre-assembled and shielded Beckhoff cables for power and EtherCAT connections

The following cables are integrated in modules with connection cables:

- 5 m orange power cable:  
Lapp cable 3 x 2.5 mm<sup>2</sup> + 2 x 0.75 mm<sup>2</sup>
- 5 m green EtherCAT cable:  
ZK1090-9191-0050

For modules with connectors, the following cables can be connected for fixed installation:

- ZK7A30-3155-Bxxx black with yellow stripes:  
ENP cable 3 x 4 mm<sup>2</sup> + 2 x 1.5 mm<sup>2</sup> + 1 x 4 x AWG22 EtherCAT
- ZK7A30-3031-Bxxx black with yellow stripes:  
ENP cable 3 x 4mm<sup>2</sup> + 2 x 1.5 mm<sup>2</sup> + 1 x 4 x AWG22 EtherCAT

For modules with connectors, the following cables can be connected for track sections with drag chain:

- ZK7A14-3155-Axxx black with yellow stripes:  
ENP cable 5 x 4 mm<sup>2</sup> + 1 x 4 x AWG22 EtherCAT

Laying

- **ZK7A14-3031-Axxx** black with yellow stripes:  
ENP cable 5 x 4mm<sup>2</sup> + 1 x 4 x AWG22 EtherCAT

The cables **ZK7Axx-3031-xxxx** require the following adapter:

- **ZK7A30-AS00-Axxx**:  
ENP cable 3 x 4mm<sup>2</sup> + 2 x 1.5 mm<sup>2</sup> + 1 x 4 x AWG22 EtherCAT

Lay the cables so that they are protected against external damage. Make sure that the cables lie in a position where they are protected against moving machine parts and their acceleration forces.

Note the specified bending radii and bending cycles with different laying for the power cables and EtherCAT cables in the table:

Cable	Bending radii for fixed cables	Bending radii for cables that are moved occasionally	Bending cycles [million]
<b>Module with infeed</b>			
• Power cable	69.6 mm, 6 x outer diameter	174 mm, 15 x outer diameter	
• EtherCAT cable	52.5 mm, 5 x outer diameter	78.75 mm, 7.5 x outer diameter	
<b>Module with connector and cable ...</b>			
• <b>ZK7A30-3155-Bxxx</b>	76.3 mm, 7 x outer diameter	163.5 mm, 15 x outer diameter	0.1
• <b>ZK7A30-3031-Bxxx</b>	76.3 mm, 7 x outer diameter	163.5 mm, 15 x outer diameter	0.1
• <b>ZK7A14-3155-Axxx</b>	60 mm, 4 x outer diameter	105 mm, 7 x outer diameter	5
• <b>ZK7A14-3031-Axxx</b>	60 mm, 4 x outer diameter	105 mm, 7 x outer diameter	5
• Adapter <b>ZK7A30-AS00-Axxx</b>	32.5 mm, 5 x outer diameter	48.75 mm, 7.5 x outer diameter	3

## 9.1.2 Brake chopper terminal

### NOTICE

#### Use brake chopper terminal version 0.4

Only use the current modules in combination with the EL9576 brake chopper terminal version 0.4.

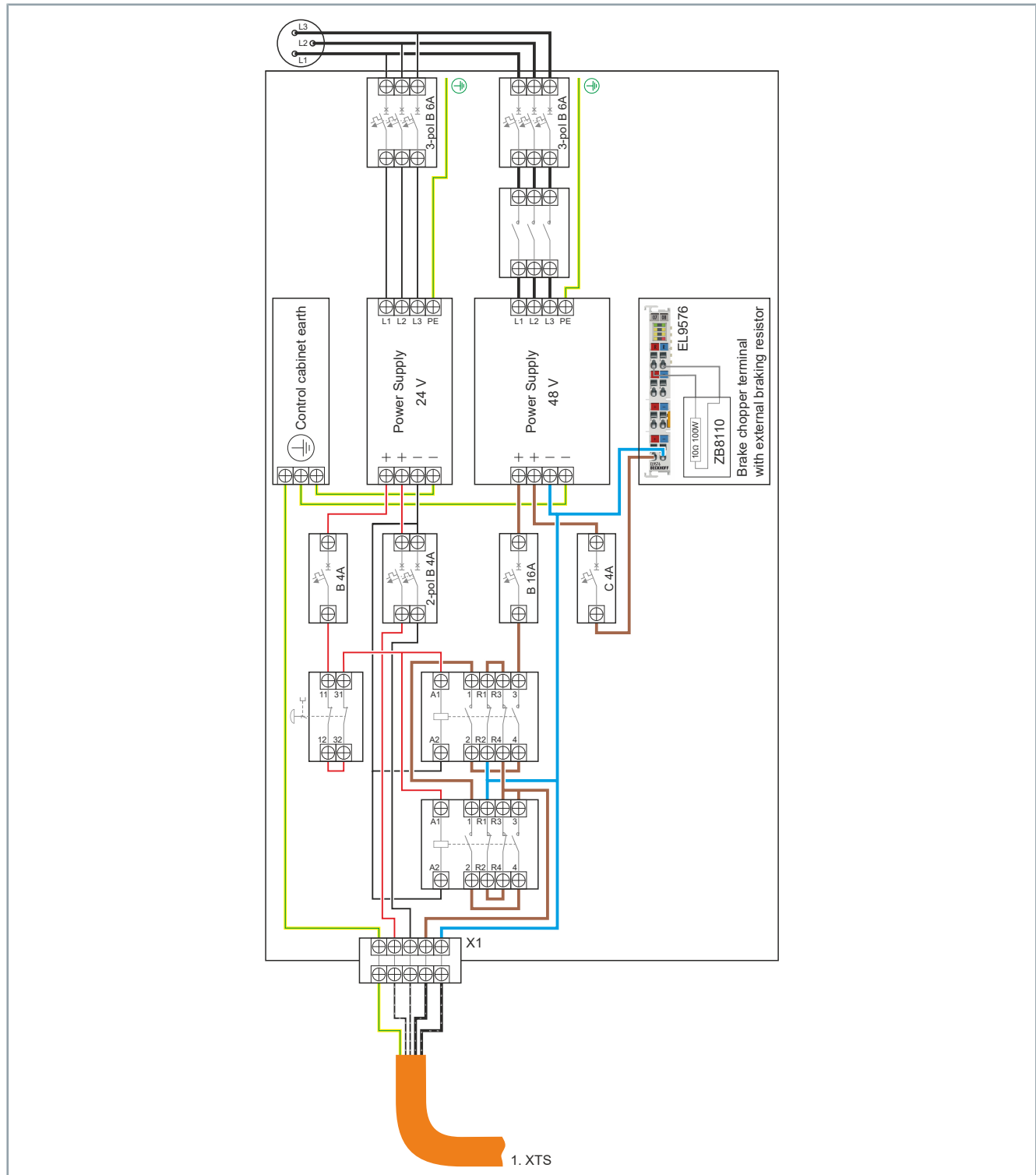
*If this is not complied with, the system may be damaged by overload.*

## 9.1.3 2-channel contactor switch-off for one module



### Beckhoff always recommends using a 2-channel contactor switch-off

Depending on the risk analysis, it is also possible to use a 1-channel contactor switch-off in individual cases, for example if the system has a complete enclosure.



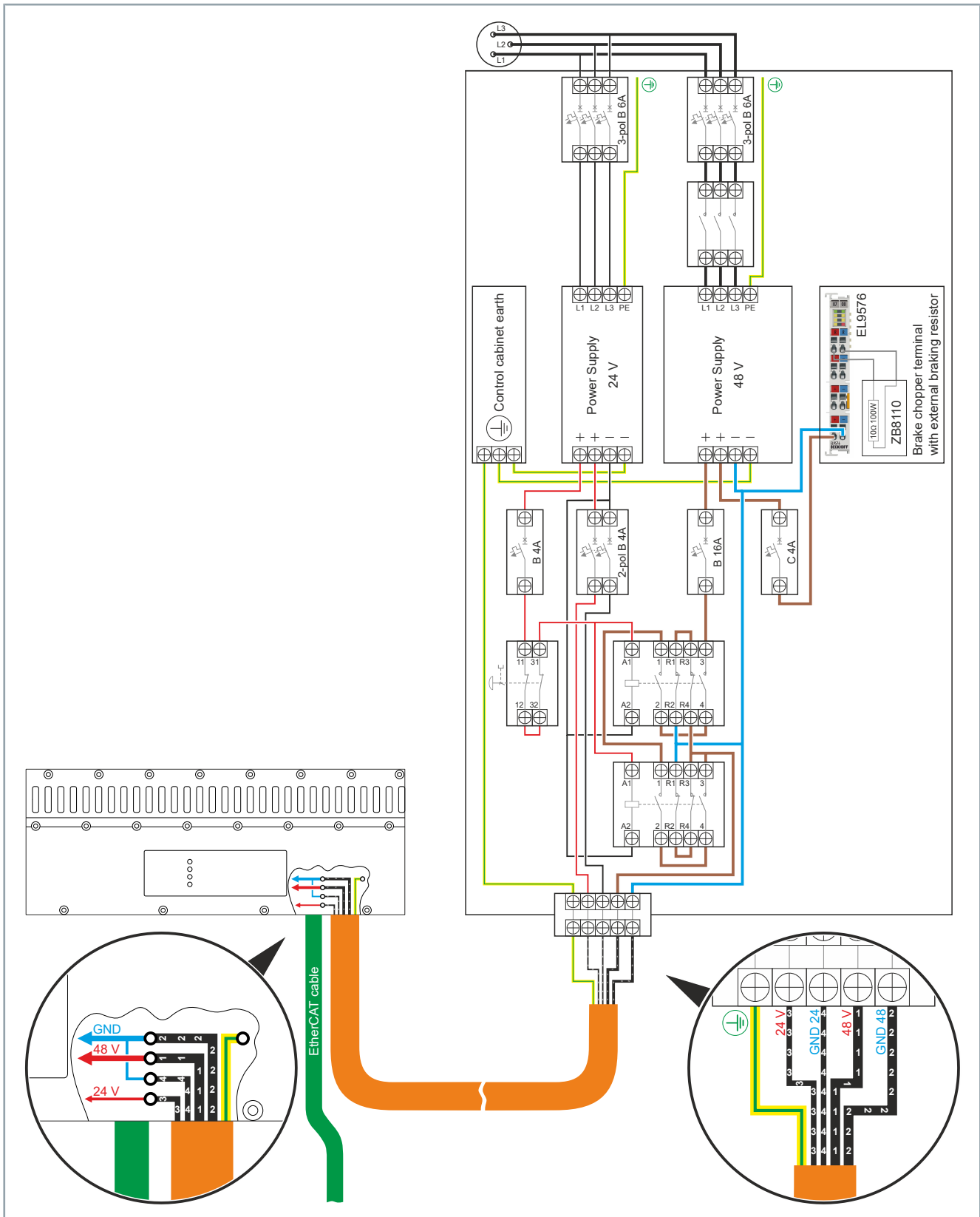
	24 V <sub>DC</sub> circuit	48 V <sub>DC</sub> circuit
Power supply	3-phase power supply with sufficient power according to the number of connected modules  Beckhoff recommends: Beckhoff PS3001-2420-0001 <a href="#">direct link</a> Beckhoff PS3031-2420-0001 <a href="#">direct link</a>	3-phase power supply with sufficient power according to the number of connected modules  Beckhoff recommends: Beckhoff PS3011-4820-0000 <a href="#">direct link</a> Beckhoff PS3031-4820-0000 <a href="#">direct link</a>
Primary protection	For the recommended power supply: 3-pin 6 A circuit breaker with B characteristic	For the recommended power supply: 3-pin 6 A circuit breaker with B characteristic
Secondary protection	2-pin 4 A circuit breaker with B characteristic  Beckhoff recommends: Siemens 5SY4204-6	
Output to module with in-feed		16 A circuit breaker with B characteristic Beckhoff recommends: Siemens 5SY6116-6
Output to brake chopper terminal		4 A circuit breaker with C characteristic Beckhoff recommends: Siemens 5SY6104-7
Contactor switch-off	1-channel contactor switch-off	2-channel contactor switch-off*  Beckhoff recommends: Siemens 3RT2526-2BB40 + Siemens 3RT2926-1CB00

\* for self-locking the mover according to the armature short-circuit principle

## 9.2 Pin assignment of the power cable

Here are overviews of the cable configuration for the establishment of the power supply:

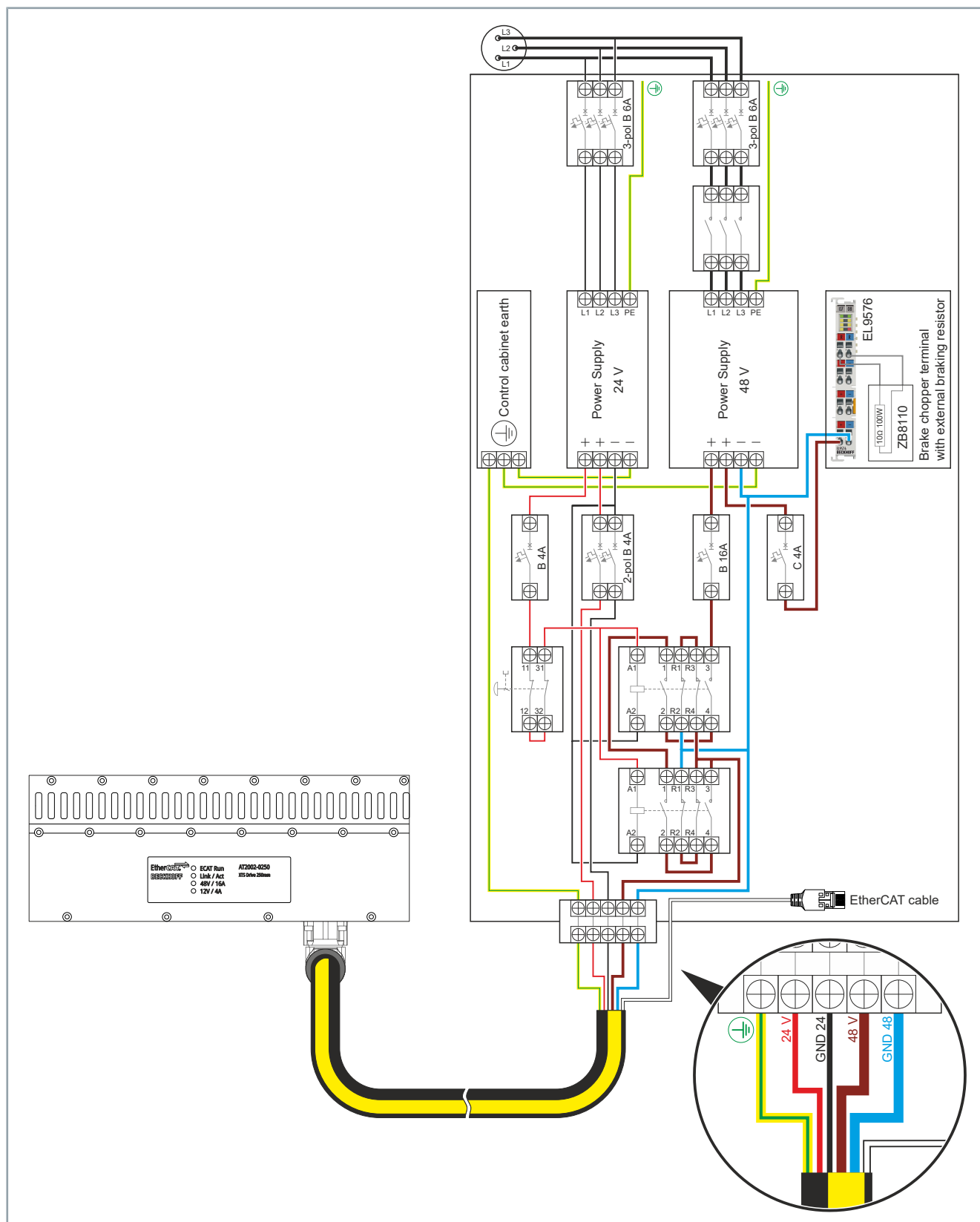
### Module with connection cables for infeed





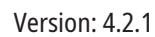
Identification	Signal	Wire cross-section
Core 1	+48 V	2.50 mm <sup>2</sup>
Core 2	GND, 48 V	2.50 mm <sup>2</sup>
Core 3	+24 V	0.75 mm <sup>2</sup>
Core 4	GND, 24 V	0.75 mm <sup>2</sup>
Green/yellow PE	Functional Earth	2.50 mm <sup>2</sup>

## Module with connector and cable ZK7A30-3155-Bxxx



Identification	Signal	Wire cross-section
Brown	+48 V	4.0 mm <sup>2</sup>
Blue	GND, 48 V	4.0 mm <sup>2</sup>
Red	+24 V	1.5 mm <sup>2</sup>
Black	GND, 24 V	1.5 mm <sup>2</sup>
Green/yellow PE	Functional Earth	4.0 mm <sup>2</sup>

## XTS



Identification	Signal	Wire cross-section
Blue	+48 V	4.0 mm <sup>2</sup>
Black	GND, 48 V	4.0 mm <sup>2</sup>
Gray	+24 V	4.0 mm <sup>2</sup>
Brown	GND, 24 V	4.0 mm <sup>2</sup>
Green/yellow PE	Functional Earth	4.0 mm <sup>2</sup>

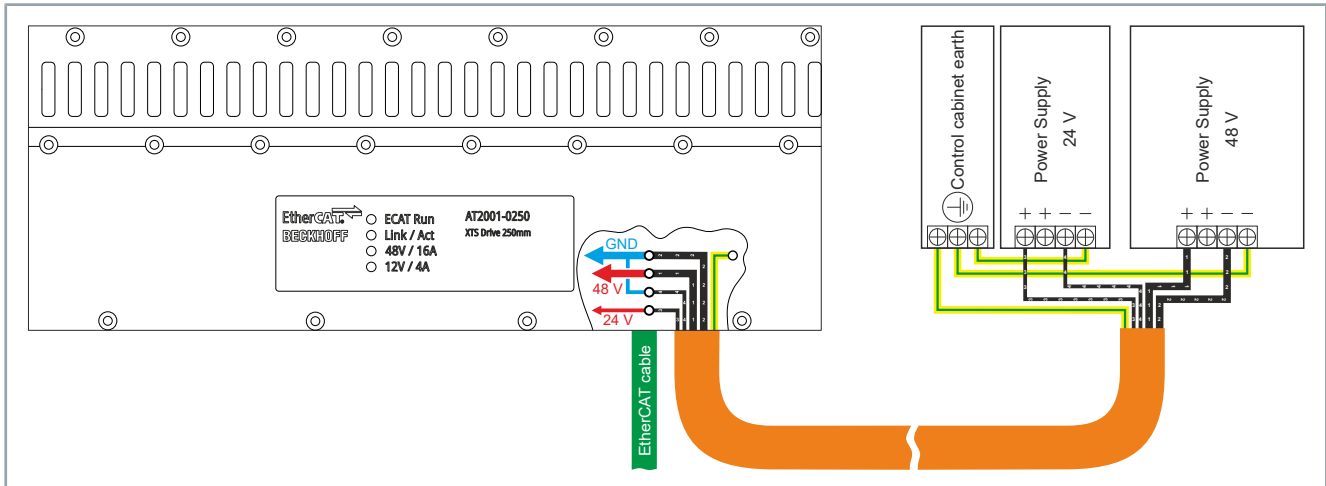
## 9.3 Earthing of the supply



### No fuses present

The following figures are for illustration only. No necessary fuses exist or are pictured in the simplified illustration.

### 9.3.1 Module with connection cables for infeed



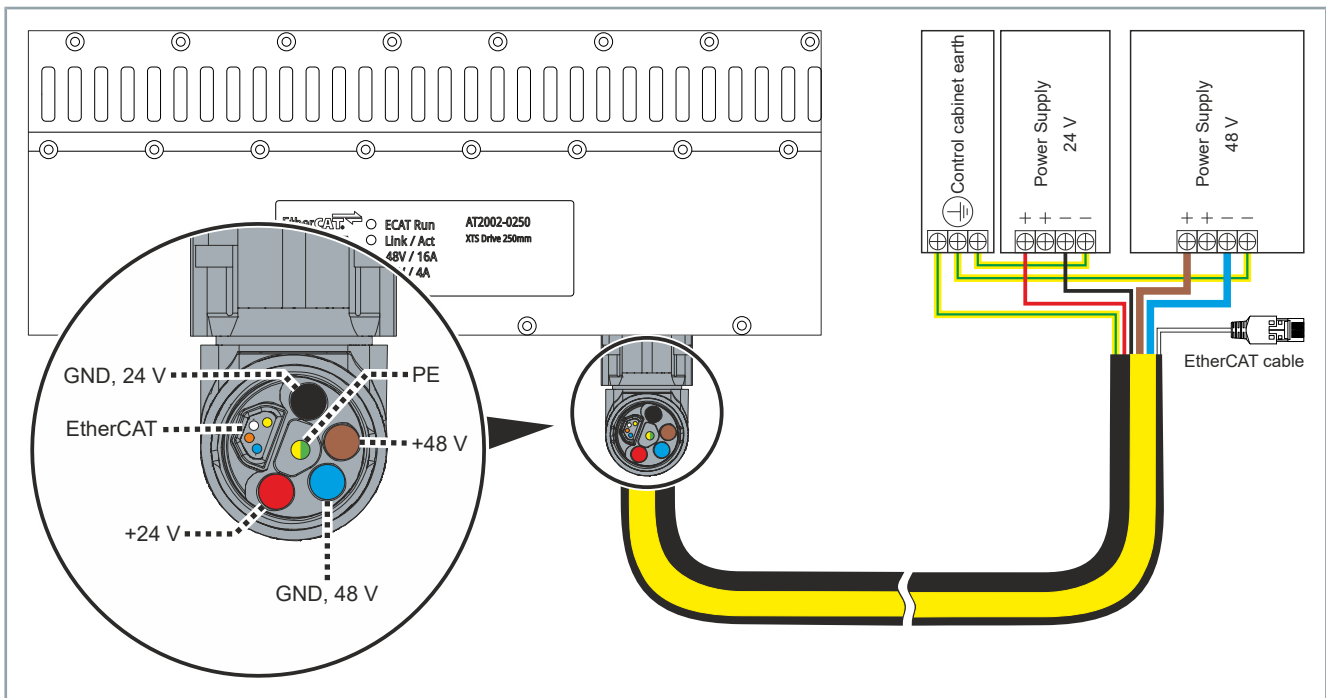
### 9.3.2 Module with connector for infeed



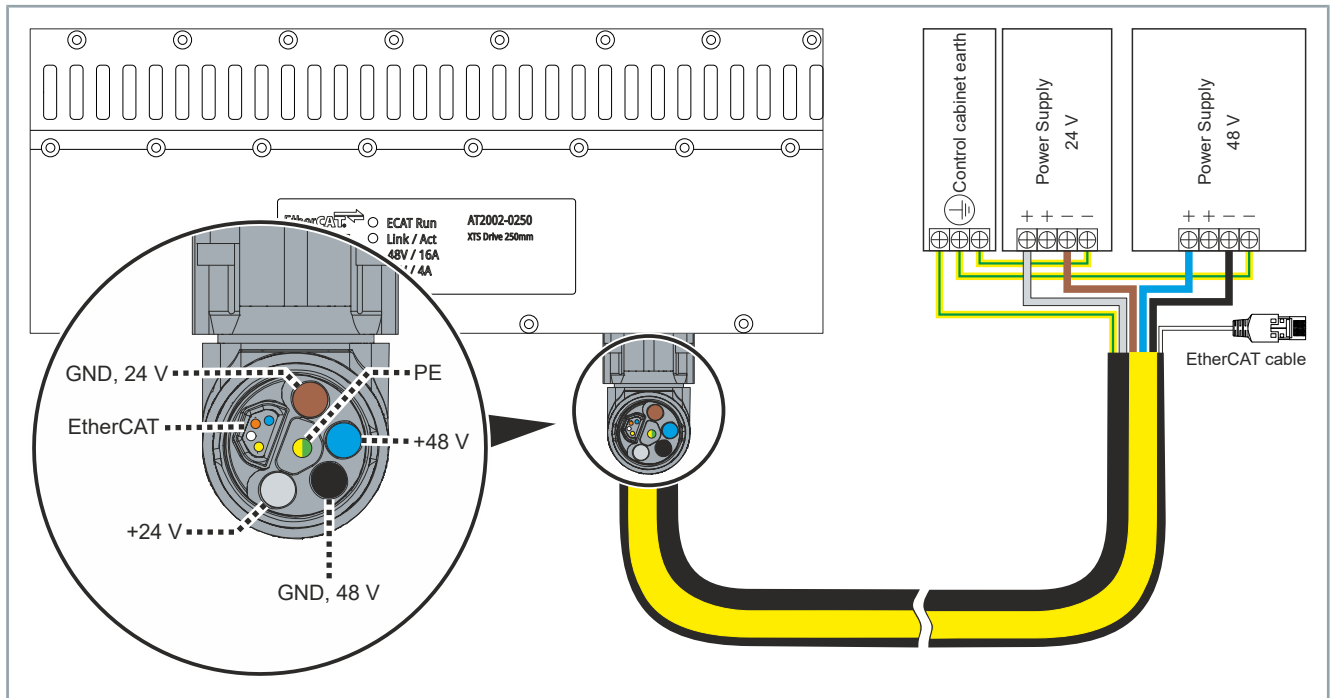
### Different core colors

Fixed and drag-chain suitable cables have different core colors.

#### 9.3.2.1 Fixed cable ZK7A30-3155-Bxxx



## 9.3.2.2 Cable with drag chain capability ZK7A14-3155-Axxx



## 9.3.3 Control circuit and load circuit



### Ground 24 V power supply and 48 V power supply

Protect the control circuit and the load circuit with PELV, as described in the UL 61800-5-1 standard, by grounding both the 24 V power supply and the 48 V power supply.

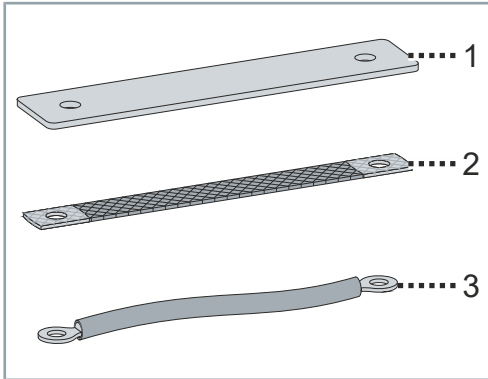
## 9.4 Grounding of the machine beds

The ground connection must be made with the largest possible cross-section, with a low impedance, over a large area and via a short connection to large conductive fastenings. Beckhoff recommends the use of wide connections with large contact surfaces, for example wide ground straps.

### Suitable connectors

Suitable for grounding machine beds:

- Copper rails [1]
- Ground straps with cable lugs [2]
- Cable with cable lugs [3]



### ⚠ WARNING

#### **Risk of injury through electric shock**

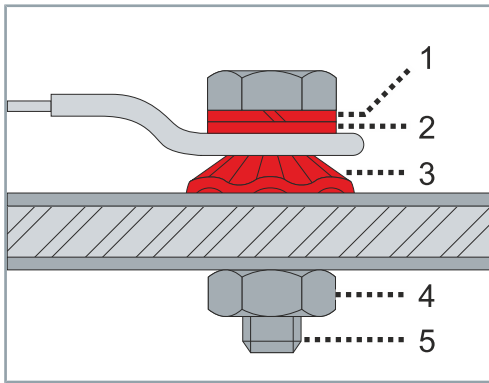
There must be an optimally conductive connection for the protective conductor at the connection point. The machine bed must be grounded in accordance with the statutory regulations.

*Carefully remove paint, dirt, corrosion and all insulating components.*

*Use galvanized stud bolts and washers.*

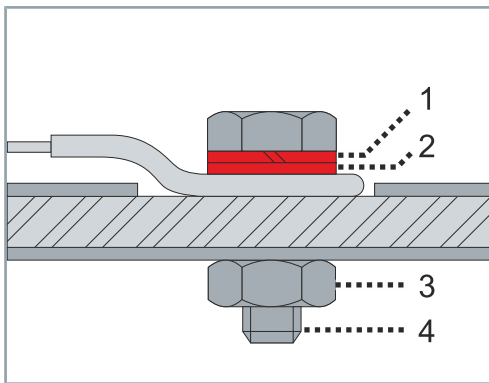


### 9.4.1 Painted surfaces



- Ground the painted surface with spring washer [1], washer [2], contact washer [3], nut [4] and bolt [5]

### 9.4.2 Unpainted surfaces



- Ground the unpainted surface with spring washer [1], washer [2], nut [3] and bolt [4]

## 9.5 Fuse protection

### NOTICE

#### Adequately protect power supply units

Always use the components recommended by Beckhoff for optimum design and operation of your system.

If you use components other than those recommended in this chapter, the protection must be designed separately. Note that the selected circuit breaker can be triggered at a higher current than 16 A with the power supply used. Please refer to the power supply manufacturer's documentation.

*Failure to do so may damage the system in the event of a short circuit.*



#### Avoid false tripping of the circuit breaker

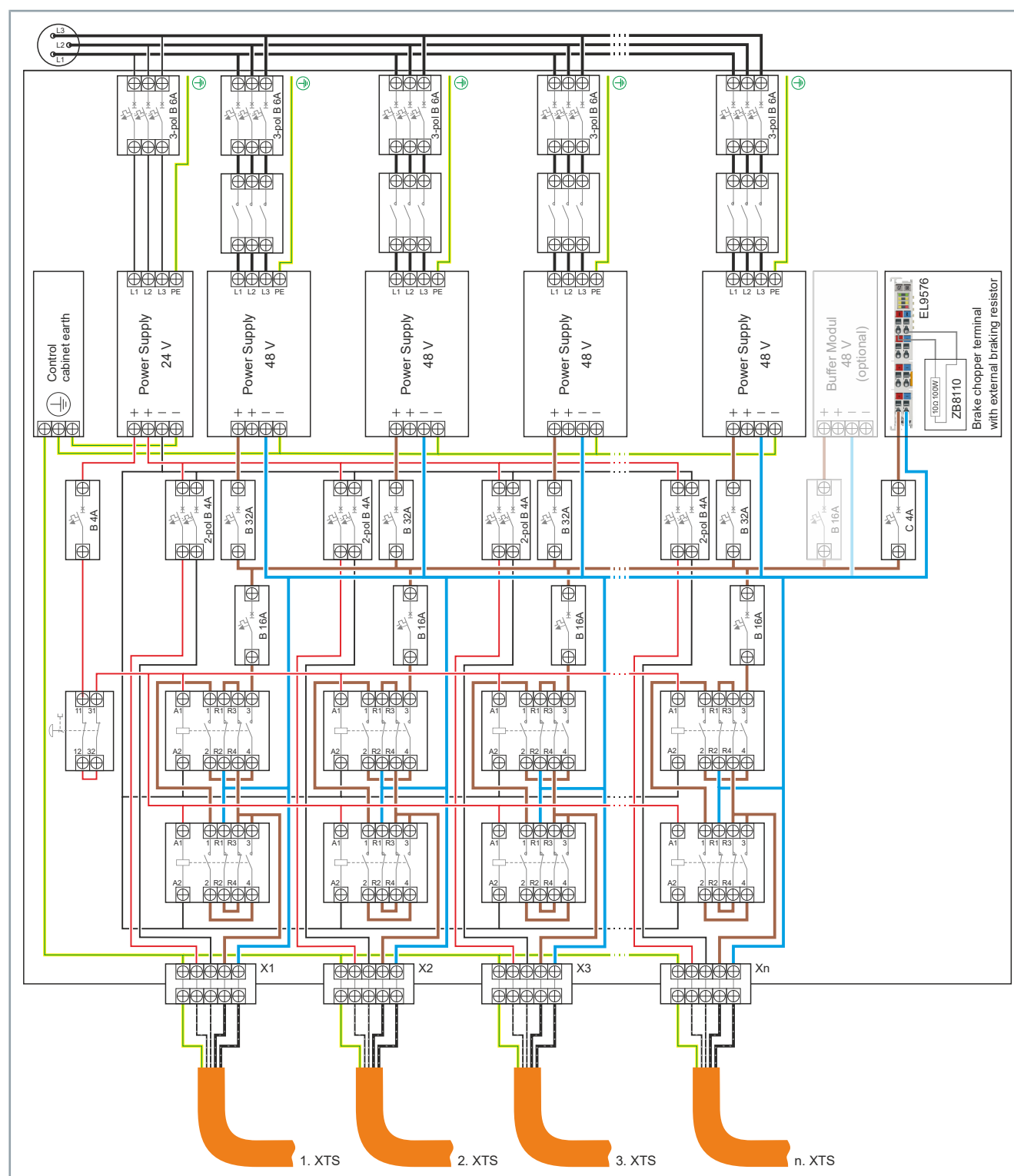
Use a circuit breaker with a minimum value of 6 A with B characteristic or 3 A with C characteristic to avoid false tripping of the circuit breaker.



#### Self-locking of the mover according to the armature short-circuit principle

The modules have no *Safe Torque Off* | STO function and no *Safe Limited Speed* | SLS function.

## Parallel connection of the power supply of several modules



	24 V <sub>DC</sub> circuit	48 V <sub>DC</sub> circuit
Power supply	3-phase power supply with sufficient power according to the number of connected modules  Beckhoff recommends: Beckhoff PS3001-2420-0001 <a href="#">direct link</a> Beckhoff PS3031-2420-0001 <a href="#">direct link</a>	3-phase power supply with sufficient power according to the number of connected modules  Beckhoff recommends: Beckhoff PS3011-4820-0000 <a href="#">direct link</a> Beckhoff PS3031-4820-0000 <a href="#">direct link</a>
Primary protection	For the recommended power supply: 3-pin 6 A circuit breaker with B characteristic	For the recommended power supply: 3-pin 6 A circuit breaker with B characteristic
Secondary protection	2-pin 4 A circuit breaker with B characteristic  Beckhoff recommends: Siemens 5SY4204-6	32 A circuit breaker with B characteristic  Beckhoff recommends: Siemens 5SY6132-6
Optional: Buffer module		Beckhoff recommends: Beckhoff PS9031-4820-0001
Output to module with in-feed		16 A circuit breaker with B characteristic  Beckhoff recommends: Siemens 5SY6116-6
Output to brake chopper terminal		4 A circuit breaker with C characteristic  Beckhoff recommends: Siemens 5SY6104-7
Contactor switch-off	1-channel contactor switch-off	2-channel contactor switch-off*  Beckhoff recommends: Siemens 3RT2526-2BB40 + Siemens 3RT2926-1CB00

\* for self-locking the mover according to the armature short-circuit principle

## 10 Commissioning and operation



### Exemplary commissioning

The procedure for commissioning is described as an example.

### 10.1 Requirements

- Components show no signs of damage
- System is correctly aligned
- The magnetic plates and encoder flag of the mover are correctly aligned with the modules
- Pretension of the mover with spring-loaded rollers is set correctly
- Screw connections of the components are correctly tightened
- Mechanical protective equipment is correctly installed
- Electrical protective equipment is correctly installed
- Wiring and cables are installed correctly
- Machine bed is correctly grounded
- Number of movers with magnetic plate set *Mover 1* is correct
- Tools and attachments are functional
- Protection against moving and live parts is correctly installed
- Current version of TwinCAT XAE and TF5850 software is installed on an IPC
- 24 V control voltage is connected
- 48 V supply voltage is connected

If movers with mounted NCT electronics are used:

- NCT electronics are removed before initial commissioning
- NCT electronics are removed before commissioning new motion profiles

Further information on the requirements can be found in chapter "Mechanical installation", [Page 142], "Electrical installation", [Page 210] and "Replacing NCT electronics", [Page 297].

## 10.2 Commissioning

- Creating a TwinCAT project
- Choose Target System
- Add modules to the I/O devices via the Scan function
- Open *XTS Tool Window*
- Create XTS configuration using the *XTS Configurator*

Further information can be found in the manual *TF5850 | TwinCAT 3 XTS*:



[Direct link to the documentation TF5850 | TwinCAT 3 XTS](#)

### If movers are used with the magnetic plate set *Mover 1*

- Detect mover with magnetic plate set *Mover 1*
- Activate and move the mover using the NC user interface
- Check motion profiles

### If the motion profiles work correctly

After initial commissioning and whenever new motion profiles work correctly:

- Mount the NCT electronics to the movers

Further information can be found in chapter "Replacing NCT electronics", [Page 297].

## 10.3 During operation

### WARNING

#### Uncontrolled movers can cause serious injuries

After removing the controller enable or switching off the supply voltage, movers can move in an uncontrolled manner on a vertical path and cause serious injuries to fingers due to crushing and to eyes due to splinters.

- Establish a safe state of the system.
- Make sure that all movers have come to a complete standstill.

- Observe information for environment and operation
- Observe maintenance intervals
- Switch off the system if
  - unusual noise occurs
  - smoke develops
  - an atypical temperature development occurs

## 11 Maintenance and cleaning

### ⚠ WARNING

#### Ensure safe state for cleaning work

Carrying cleaning work during operation can lead to serious or fatal injuries.

*Bring the connected motors and the machine into a safe, de-energized state for cleaning.*

### NOTICE

#### Do not immerse components and do not clean with running water

Water and other liquids can damage the components and lead to leakage problems in the system.

*Clean the components only with a clean, lint-free cloth or brush. Only use approved cleaning agents.*

### NOTICE

#### Avoid damage due to the use of aggressive substances

The components can be damaged if aggressive substances are used. Apply detergent to a clean, lint-free cloth. The cleaning agent must not be applied to the components.

*Unsuitable cleaning agents can damage the components and considerably reduce the service life of the components.*

Beckhoff prescribes maintenance intervals to prevent permanent damage to the components. Dirt, dust or swarf can have a negative impact on the function of the components and cause the system to fail. Therefore, clean and maintain the components at the prescribed intervals. Further information can be found in chapter "Intervals", [Page 229].

## 11.1 Cleaning agents



### Permitted cleaning agents

- Isopropanol

Carefully clean the components with a clean, lint-free cloth or brush.

Apply a small amount of the approved cleaning agent to a clean, lint-free cloth. The approved cleaning agent must not be applied directly to the components.

## 11.2 Intervals

Operation outside the permissible environmental conditions and operating states shortens the intervals. The service life of consumables may be shortened depending on the mechanical dynamics due to mounted devices and movements.

We have provided you with a list of maintenance work and intervals for the associated components below. The intervals are based on the total operating time of the system and not on the operating time of individual components. The data apply to laboratory conditions and a relative humidity of 50 % at 25 °C.

### Modules

Components	Interval	Maintenance
Coil cores	6 months	Check coil cores for abrasion
Feedback Sensor System	6 months	Check sensor surfaces for abrasion
Machine bed	6 months	Check that the modules are correctly attached to the machine bed

### Mover

Components	Interval	Maintenance
Base body	60,000 km*	Replace base body and guide rollers
Guide rollers	3 months	Check guide rollers for wear and damage
	30,000 km*	Replace guide rollers
	60,000 km*	Replace guide rollers and base body
Magnetic plates	6 months	Check the magnetic plates for abrasion and damage
Encoder flag	6 months	Check encoder flag for correct attachment
	6 months	Check that the encoder flag is not rubbing against the module sensors
ESD brush	6 months	Check ESD brush for correct attachment
	6 months	Check the distance between the ESD brush and the guide rail. The ESD brush must touch the guide rail.
Air gap*	As required	Check the air gap between the suspension strut and base body. The air gap must be at least 0.1 mm.

\* only for movers AT9014-x0xx-x550

After checking the components, it may be necessary to replace them. Further information can be found in chapter "Maintenance work on the mover", [Page 232].

## Guide rails

Components	Interval	Maintenance
Straight guide rails	6 months	Check all connections for correct fastening and damage
	Every month	Clean the running surfaces Permitted cleaning agent: Isopropanol
	As required	Apply a small quantity of lubricant to the running surfaces Recommended lubricants: Food grade grease NSF-H1* or petrolatum
	6 months	Check the fastening of the guide rails to the modules
	Every 2000 km*	Apply a small quantity of lubricant to the running surfaces Recommended lubricants: Food grade grease NSF-H1*
Curved rails	6 months	Check all connections for correct fastening and damage
	Every month	Clean the running surfaces Permitted cleaning agent: Isopropanol
	As required	Apply a small quantity of lubricant to the running surfaces Recommended lubricants: Food grade grease NSF-H1* or petrolatum
	6 months	Check the fastening of the curved rails to the modules
	Every 2000 km*	Apply a small quantity of lubricant to the running surfaces Recommended lubricants: Food grade grease NSF-H1*
Lock	6 months	Check the lock for damage
	Every month	Clean the running surfaces Permitted cleaning agent: Isopropanol
	As required	Apply a small quantity of lubricant to the running surfaces Recommended lubricants: Food grade grease NSF-H1* or petrolatum
	6 months	Check the lock for correct fastening
	If it has been opened and remounted	Check the lock for correct fastening

\* only for movers AT9014-x0xx-x550



## Cables

Components	Interval	Maintenance
Cables on motor modules with connection cables for infeed	3 months	Check for damage
ZK7A30-3155-Bxxx	3 months	Check connectors for correct fastening
		Check for damage
ZK7A30-3031-Bxxx	3 months	Check connectors for correct fastening
		Check for damage
ZK7A14-3155-Axxx	3 months	Check connectors for correct fastening
		Check for damage
ZK7A14-3031-Axxx	3 months	Check connectors for correct fastening
		Check for damage
ZK7A30-AS00-Axxx	3 months	Check adapter for correct fastening
		Check for damage

### 12 Maintenance work on the mover

#### **WARNING**

##### **Uncontrolled movers can cause serious injuries**

After removing the controller enable or switching off the supply voltage, movers can move in an uncontrolled manner on a vertical path and cause serious injuries to fingers due to crushing and to eyes due to splinters.

- Establish a safe state of the system.
- Make sure that all movers have come to a complete standstill.

The movers must be removed from the system for maintenance work. A rail on support [+] is available for removing the movers. Further information can be found in chapter "Rail on support [+]", [Page 191].

#### **NOTICE**

##### **Damage caused by third-party accessories**

The use of accessories that were not ordered via Beckhoff Service may result in damage to the components.

- Only use accessories that you have ordered from Beckhoff Service.

## 12.1 Roller replacement at AT9011-0050-x550

Dedicated roller sets are available for maintenance of the movers AT9011-0050-x550. A roller set contains all the components required for replacement.

### Order number and index version

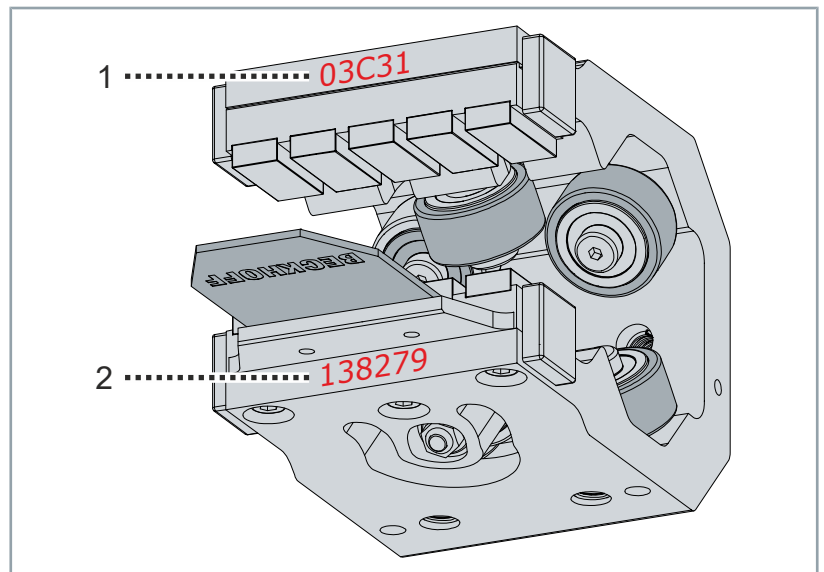


#### Check the mover design

The roller set and the mover are matched to each other. Check in advance which mover version is present.

*You can determine the present version by means of the order number of the base body.*

On the underside of the mover there are two numbers, which are structured as follows:



Position	Name
1	5-digit internal product code, of which the first two digits indicate the index version
2	6-digit order number of the mover

Based on the 6-digit order number [2] you can determine whether a roller set can be used to replace the rollers on the mover or whether the mover must be completely replaced or sent in.



### Check the order numbers on the base body

If the mover can only be serviced in the factory, the complete mover has to be returned to Beckhoff Automation GmbH & Co. KG.

If there is no order number on the underside of the mover, the mover has to be returned to Beckhoff Automation GmbH & Co. KG. In this case, it is not possible to replace the rollers with a roller set. For factory service, send the mover to:

### Service

Beckhoff Automation GmbH & CO. KG  
Stahlstraße 31  
33415 Verl  
Germany

### Order number and serviceability of the mover

by the customer	at the factory	Service number
• 138279	• 112540 • none	ZX9999-0000

## 12.1.1 Scope of supply

To replace the guide rollers on the AT9011-0050-0550, you will need a roller set with order number ZX9011-0050.

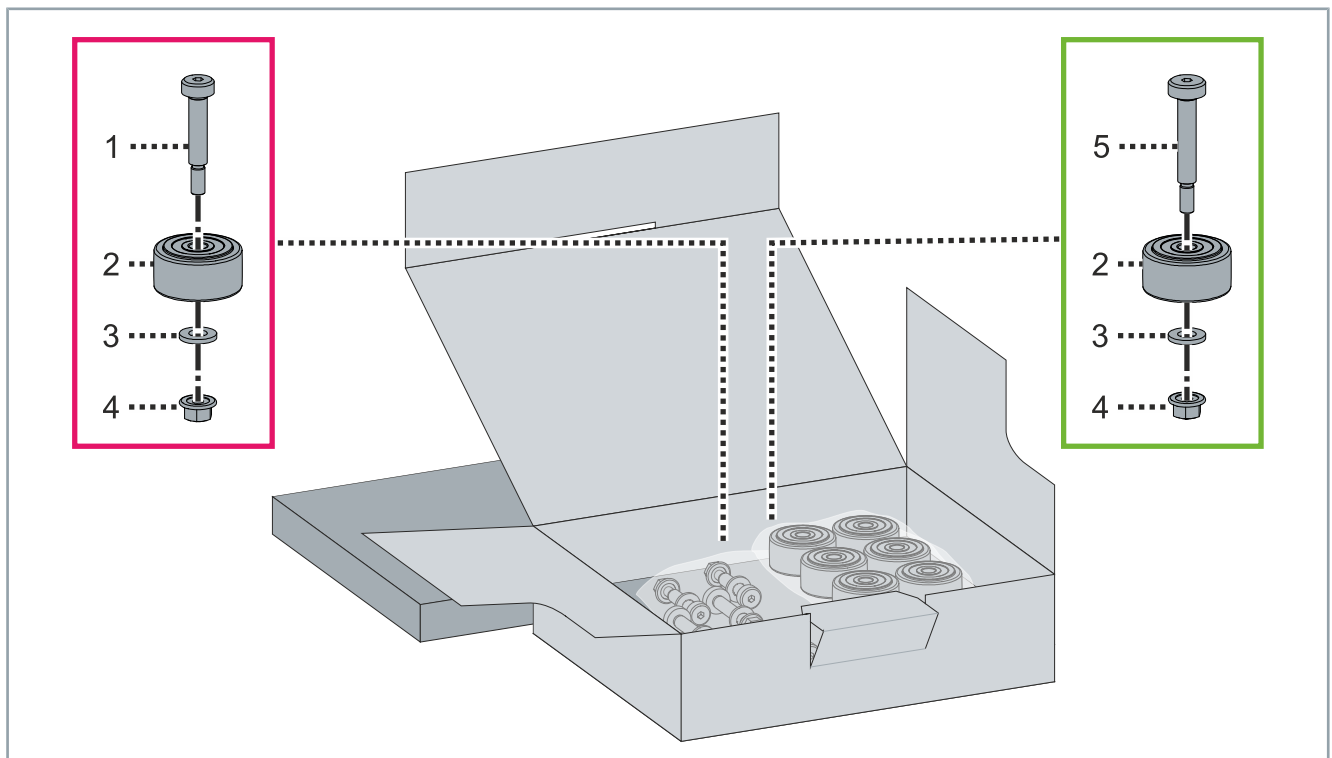


### Check missing or damaged parts

Check your delivery for completeness. If any parts are missing or became damaged during transport, contact the carrier, vendor or our service department immediately:

✉ [service@beckhoff.com](mailto:service@beckhoff.com)

In roller set ZX9011-0050 the guide rollers are not pre-assembled and must be sorted according to their color assignment and position before assembly in accordance with the following figure:



Position	Name	Number of items
1	Shoulder bolt M3 x 16	4
2	Cylindrical roller* 19 mm	6
3	Adjusting washers 4 x 8 x 1 A2 DIN-988	6
4	Nut M3 A2 DIN-6923	6
5	Shoulder bolt M3 x 20	2

\* The rollers [2] each consist of two ball bearings and a roller lining

12.1.2 Preparation



Required tools

- Torx key T20
- Socket wrench, size 5.5
- Clean, lint-free cloth
- Cleaning agent: Isopropanol

If the ESD brush is to be replaced:

- Hexagon bit 2 mm
- Suitable torque wrench for hexagon bit

Dedicated roller sets are available for maintenance of the movers *AT9011-0050-x550*. A roller set contains all the components required for replacement.



Required accessories [ + ]

- Roller set *ZX9011-0050*
- Rail on support *ZX9001-0000*

If the ESD brush is to be replaced:

- ESD brushes *ZX9016-0000*

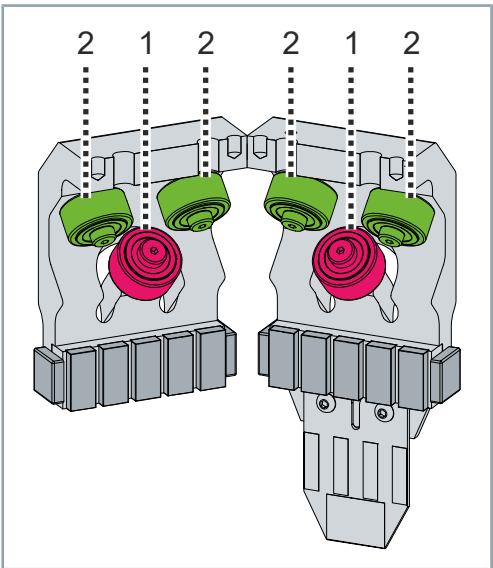
12.1.3 Arrangement of the guide rollers on the mover



Better illustration

The following figure shows a centrally split mover and is only intended to provide a better illustration of the guide roller arrangement. The movers cannot be moved into this position.

The guide rollers are color-coded in the figure, analogous to the figure of the scope of delivery.



Position	Name	Number of items
1	Cylindrical guide roller 19 mm, with shoulder bolt M3 x 20	2
2	Cylindrical guide roller 19 mm, with shoulder bolt M3 x 16	4

## 12.1.4 Disassembly

### Removing the tool

Beckhoff recommends removing the tool mounted on the mover for better access to the fastening screws of the guide rollers.

### Removing the guide rollers

#### NOTICE

##### Follow the correct sequence when removing the guide rollers

Disassemble the guide rollers from the outside to the inside as described below.

*If you disassemble the guide rollers in a different sequence, this may result in damage to the mover and additional time expenditure.*

#### Disassembly sequence of the guide rollers

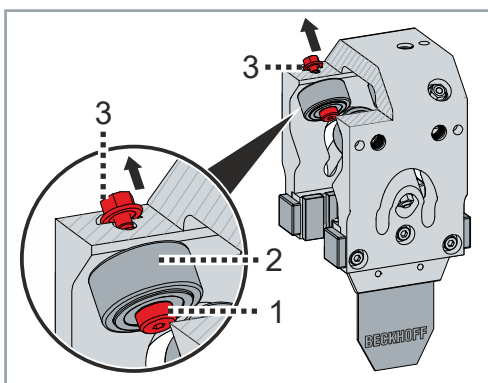
Sequence	Name	Number of items
A	Cylindrical guide roller 19 mm, with shoulder bolt M3 x 16 [2]	4
B	Cylindrical guide roller 19 mm, with shoulder bolt M3 x 20 [1]	2

For more information on the position of the guide rollers, see the chapter "Arrangement of the guide rollers on the mover", [Page 236].



#### Disassembly example

Disassembly is described using the example of a cylindrical guide roller 19 mm with M3 x 16 shoulder bolt [2]. All other guide rollers are disassembled in the same way.



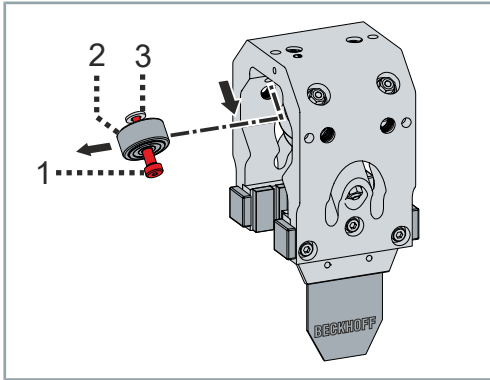
- Hold the shoulder bolt [1] of the roller [2] with the Torx key
- Remove nut [3]

## NOTICE

### Avoid jamming the shoulder bolt in the base body

Pull the shoulder bolt straight out of the base body to avoid jamming.

*Jamming of the shoulder bolt can result in damage to the base body and additional time requirement.*



- ▶ Pull the shoulder bolt [1] with roller [2] and adjusting washer [3] straight out of the base body and remove to the side
- ▶ Disassemble all other guide rollers in the same way

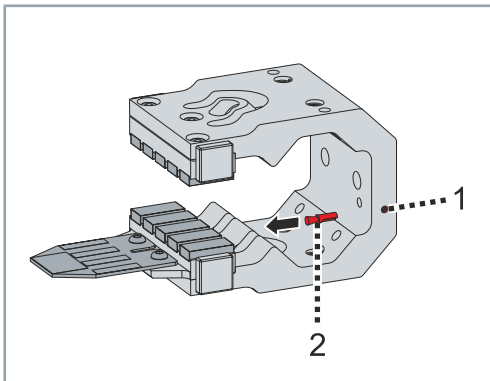
## Disassembling the ESD brush



### Required or optional replacement of the ESD brush

Beckhoff recommends replacing the ESD brush after removing the guide rollers. The ESD brush must be replaced if the ESD brush does not touch the guide rails. To replace the ESD brush, you need the ESD brushes [+] ZX9016-0000.

- ▶ Loosen set screw [1]
- ▶ Remove ESD brush [2]





## Cleaning the base body

### NOTICE

#### **Avoid damage due to the use of aggressive substances**

The guide rollers and the base body can be damaged if aggressive substances are used. Apply detergent to a clean, lint-free cloth. Never apply the cleaning agent directly to the components. *Unsuitable cleaning agents can damage the components and considerably reduce the service life of the guide rollers.*

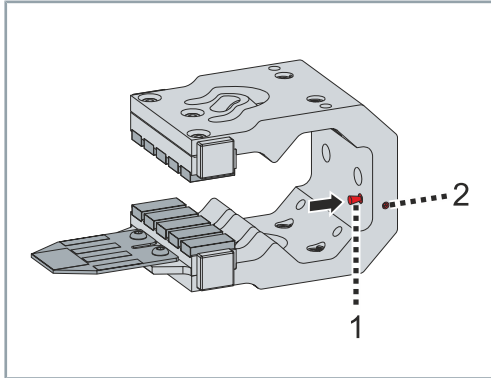
For heavy soiling, cleaning agent can be applied to a clean, lint-free cloth. Further information can be found in chapter "Cleaning agents", [Page 228].

- Clean the base body with a clean, lint-free cloth

## 12.1.5 Mounting

### Mounting the ESD brush

If you have removed the ESD brush, you must mount a new ESD brush before mounting the rollers. To replace the ESD brush, you need the ESD brushes [+] ZX9016-0000.



- ▶ Insert ESD brush [1]
- ▶ Ensure that the sleeve of the ESD brush is flush with the base body
- ▶ Tighten the set screw [2]

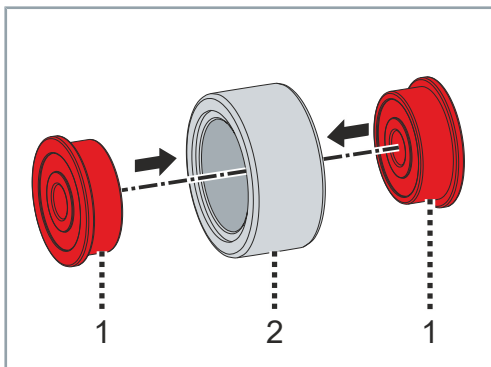
### Checking the roller

When transporting the roller set, the ball bearings may come loose from the roller lining. In this case proceed as described below.

#### NOTICE

##### **Incorrect position of the ball bearings in the roller**

Tilted ball bearings inside the roller can cause the shoulder bolt not to pass smoothly through the roller during mounting, damaging the roller lining and affecting the running quality of the mover. *Bring the ball bearings into the correct position.*



- ▶ Manually push the ball bearing [1] centrally into the roller lining [2]
- ▶ Insert the shoulder bolt through the roller again
- ▶ Check for tight fit

## Mounting the guide rollers

### NOTICE

#### Follow the correct sequence when mounting the guide rollers

Mount the guide rollers from the inside to the outside as described below.

*Installing the guide rollers in a different sequence may result in extra time requirement, damage to the mover and damage during operation.*

#### Mounting sequence of the guide rollers

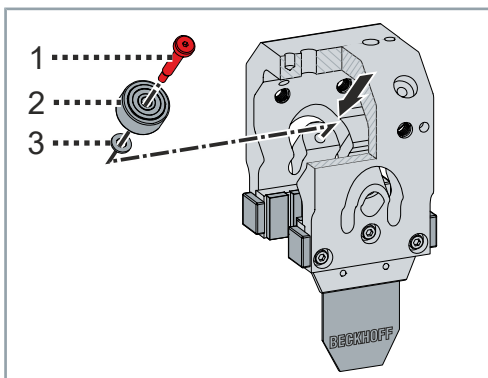
Sequence	Name	Number of items
A	Cylindrical guide roller 19 mm, with shoulder bolt M3 x 20 [1]	2
B	Cylindrical guide roller 19 mm, with shoulder bolt M3 x 16 [2]	4

For more information on the position of the guide rollers, see the chapter "Arrangement of the guide rollers on the mover", [Page 236].



#### Installation example

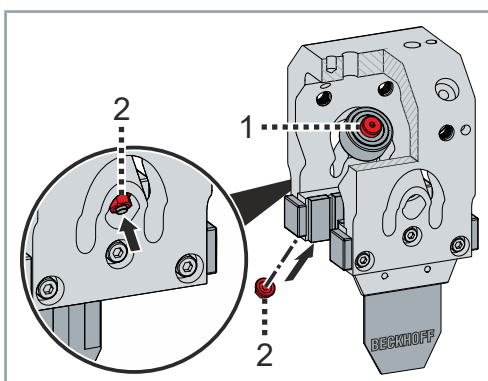
Mounting is described using the example of a 19 mm cylindrical guide roller [1]. All other guide rollers are mounted in the same way.



- Insert the shoulder bolt [1] with the roller [2] and the adjusting washer [3] into the base body

If the shoulder bolt does not pass smoothly through the roller, check the roller. Further information can be found in chapter "Checking the roller", [Page 240].

- Secure the shoulder bolt [1] against falling out



- Hold the shoulder bolt [1] with the Torx key
- Screw nut [2] onto shoulder bolt [1]
- Tighten nut [2]
- Observe tightening torques:

Components	Tightening torque [Nm]
Nuts, M3	3

- Mount all other guide rollers in the same way

## Cleaning the base body

### NOTICE

#### **Avoid damage due to the use of aggressive substances**

The guide rollers and the base body can be damaged if aggressive substances are used. Apply detergent to a clean, lint-free cloth. Never apply the cleaning agent directly to the components. *Unsuitable cleaning agents can damage the components and considerably reduce the service life of the guide rollers.*

For heavy soiling, cleaning agent can be applied to a clean, lint-free cloth. Further information can be found in chapter "Cleaning agents", [Page 228].

- Clean the base body with a clean, lint-free cloth

## Mounting tools

If you have removed your tool from the mover before replacing the rollers, remount your tool to the mover before installing the mover on the system.

## 12.2 Roller replacement at AT9012-0050-x550

Ready-made roller sets are available for maintaining the movers AT9012-0050-x550. A roller set contains all the components required for replacement.

### Order number and index version

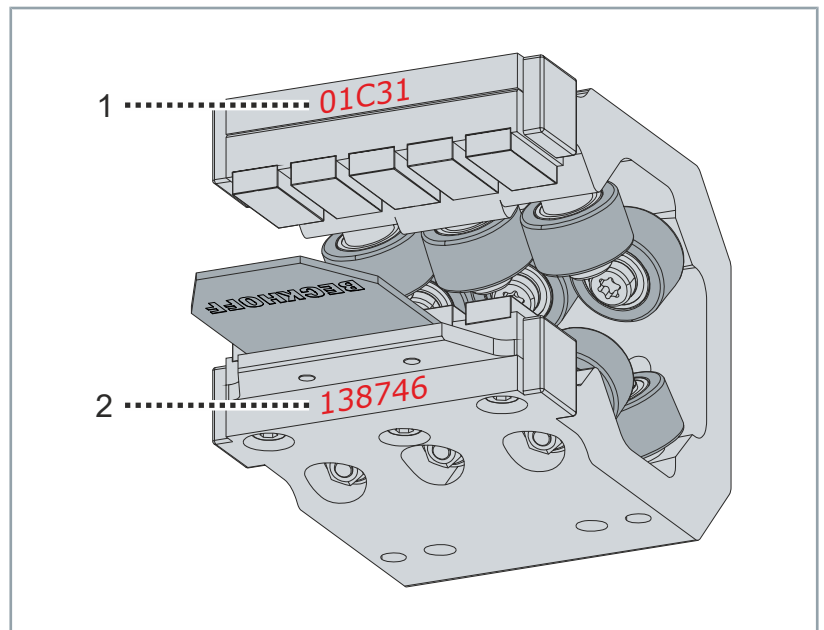


#### Check the mover design

The roller set and the mover are matched to each other. Check in advance which mover version is present.

*You can determine the present version by means of the order number of the base body.*

On the underside of the mover there are two numbers, which are structured as follows:



Position	Name
1	5-digit internal product code, of which the first two digits indicate the index version
2	6-digit order number of the mover

Based on the 6-digit order number [2] you can determine whether a roller set can be used to replace the rollers on the mover or whether the mover must be completely replaced or sent in.



## Check the order numbers on the base body

If the mover can only be serviced in the factory, the complete mover has to be returned to Beckhoff Automation GmbH & Co. KG.

If there is no order number on the underside of the mover, the mover has to be returned to Beckhoff Automation GmbH & Co. KG. In this case, it is not possible to replace the rollers with a roller set. For factory service, send the mover to:

### Service

Beckhoff Automation GmbH & CO. KG  
Stahlstraße 31  
33415 Verl  
Germany

### Order number and serviceability of the mover

by the customer	at the factory	Service number
• 138746 from index 01	• 138746 with index 00 • 128550 • none	ZX9999-0001*

\* For the case of service ZX9999-0001 it is mandatory to consult the Beckhoff XTS product management. to check whether the curved rail has to be replaced together with the movers.

## 12.2.1 Scope of supply

To replace the guide rollers on the AT9012-0050-0550, you will need a roller set with order number ZX9012-0050.

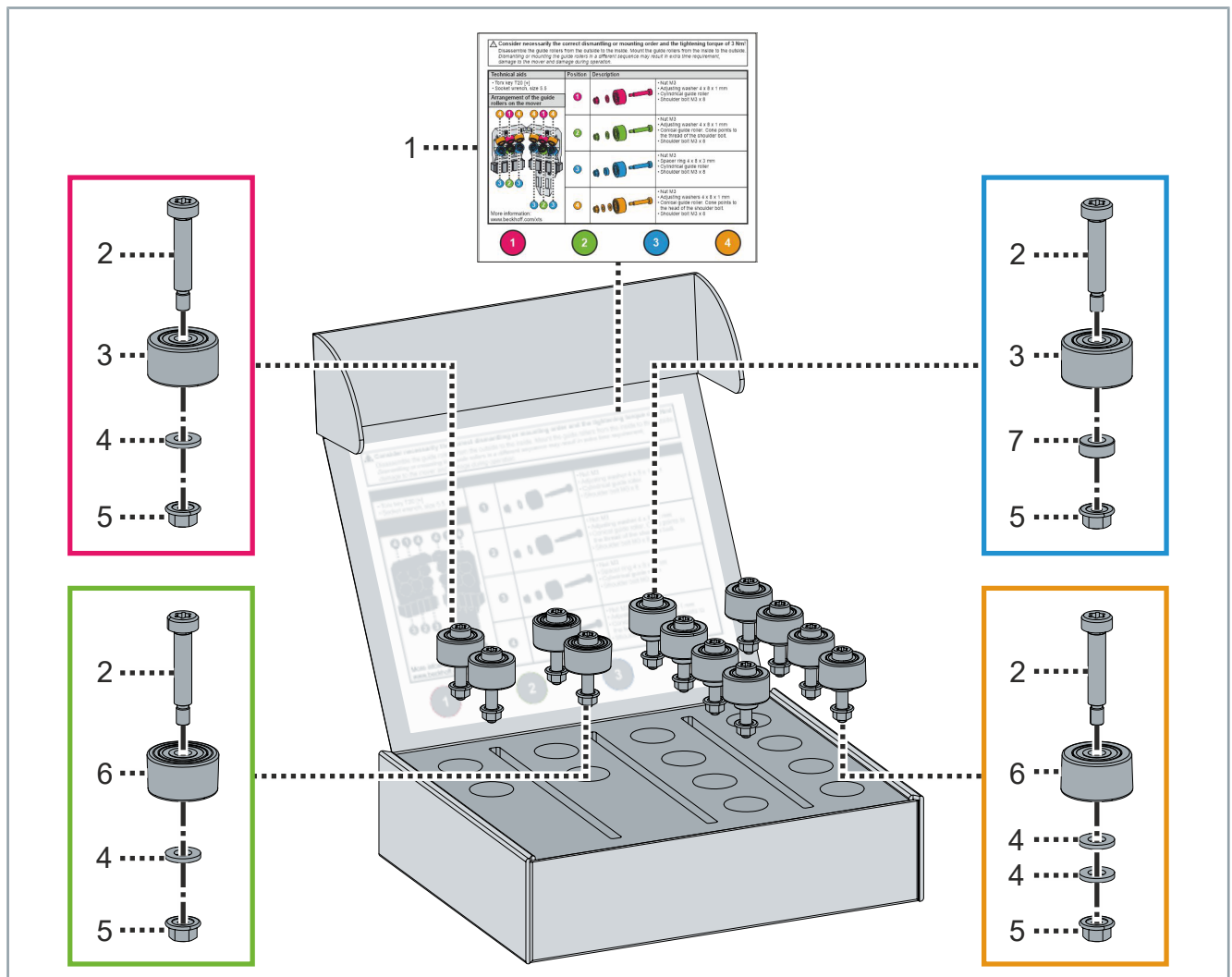


### Check missing or damaged parts

Check your delivery for completeness. If any parts are missing or became damaged during transport, contact the carrier, vendor or our service department immediately:

✉ service@beckhoff.com

The guide rollers are pre-assembled in roller set ZX9012-0050. The following figure shows the components of the assembly and the position of the rollers according to the color coding on the label on the inside of the packaging.



Position	Name	Number of items
1	Sticker on the inside of the packaging	1
2	Shoulder bolt M3 x 18	12
3	Cylindrical rollers*	6
4	Adjusting washers 4 x 8 x1 A2 DIN-988	12
5	Nut M3 A2 DIN-6923	12
6	Conical roller*	6
7	Spacer rings 4 x 8 x 3 A2	4

\* Rollers [3] and [6] each consist of two ball bearings, an adjusting washer and a roller lining

12.2.2 Preparation



Required tools

- Socket wrench, size 5.5
- Clean, lint-free cloth
- Cleaning agent: Isopropanol

If the ESD brush is to be replaced:

- Hexagon bit 2 mm
- Suitable torque wrench for hexagon bit

Dedicated roller sets are available for maintenance of the movers AT9012-0050-x550. A roller set contains all the components required for replacement.



Required accessories [ + ]

- Torx key T20 with short section [ + ]
- Roller set ZX9012-0050
- Rail on support ZX9001-0000

If the ESD brush is to be replaced:

- ESD brush ZX9016-0000

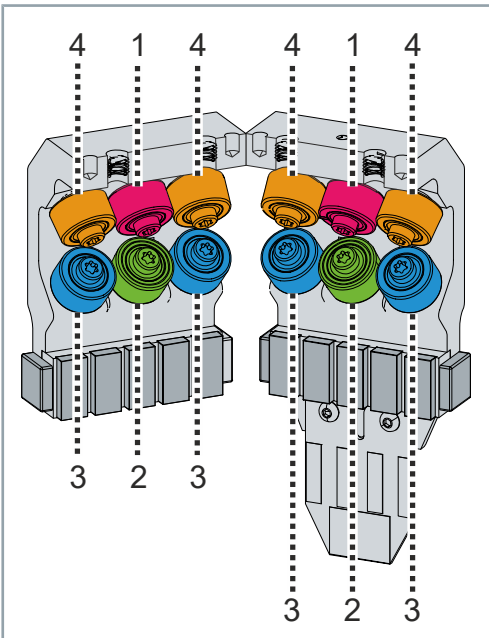
12.2.3 Arrangement of the guide rollers on the mover



Better illustration

The following figure shows a centrally split mover and is only intended to provide a better illustration of the guide roller arrangement. The movers cannot be moved into this position.

The guide rollers are color-coded and numbered in the figure, analogous to the sticker on the inside of the box lid.



Position	Name	Number of items
1	Cylindrical guide roller	2
2	Conical guide roller, cone points to the thread of the shoulder bolt	2
3	Cylindrical guide roller	4
4	Conical guide roller, cone points to the head of the shoulder bolt	4



## 12.2.4 Disassembly

### Removing the tool

Beckhoff recommends removing the tool mounted on the mover for better access to the fastening screws of the guide rollers.

### Removing the guide rollers

#### NOTICE

##### Follow the correct sequence when removing the guide rollers

Disassemble the guide rollers from the outside to the inside as described below.

*If you disassemble the guide rollers in a different sequence, this may result in damage to the mover and additional time expenditure.*

#### Disassembly sequence of the guide rollers

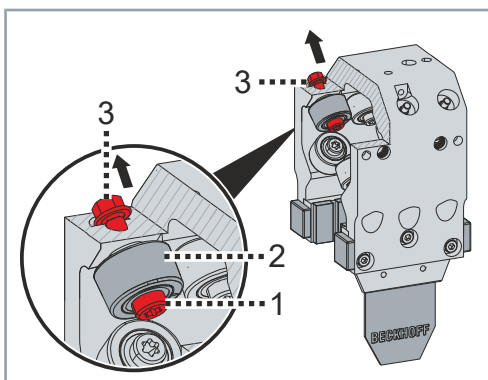
Sequence	Name	Number of items
A	Cylindrical guide roller [3]	4
B	Conical guide roller [4]	4
C	Cylindrical guide roller [1]	2
D	Conical guide roller [2]	2

For more information on the position of the guide rollers, see the chapter "Arrangement of the guide rollers on the mover", [Page 246].



#### Disassembly example

Disassembly is described using the example of a cylindrical guide roller [3]. All other guide rollers are disassembled in the same way.



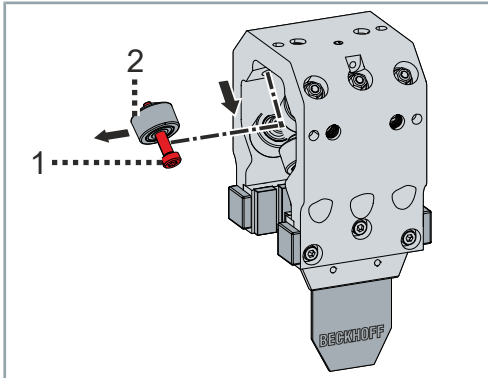
- Hold the shoulder bolt [1] of the roller [2] with the Torx key [+]
- Remove nut [3]

## NOTICE

### Avoid jamming the shoulder bolt in the base body

Pull the shoulder bolt straight out of the base body to avoid jamming.

*Jamming of the shoulder bolt can result in damage to the base body and additional time requirement.*



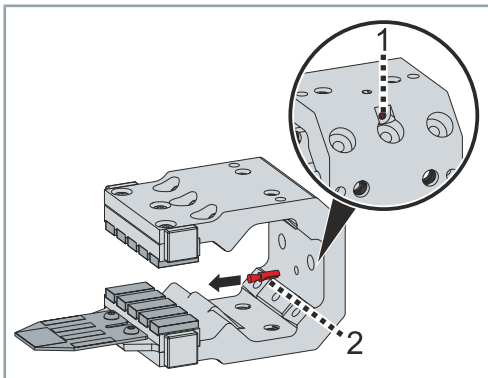
- Pull the shoulder bolt [1] with roller [2] and adjusting washers or spacer ring straight out of the base body and remove to the side
- Disassemble all other guide rollers in the same way

## Disassembling the ESD brush



### Required or optional replacement of the ESD brush

Beckhoff recommends replacing the ESD brush after removing the guide rollers. The ESD brush must be replaced if the ESD brush does not touch the guide rails. To replace the ESD brush, you need the ESD brushes [+] ZX9016-0000.



- Loosen set screw [1]
- Remove ESD brush [2]

## Cleaning the base body

### NOTICE

#### **Avoid damage due to the use of aggressive substances**

The guide rollers and the base body can be damaged if aggressive substances are used. Apply detergent to a clean, lint-free cloth. Never apply the cleaning agent directly to the components. *Unsuitable cleaning agents can damage the components and considerably reduce the service life of the guide rollers.*

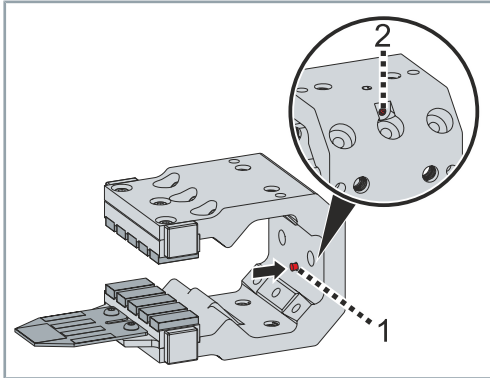
For heavy soiling, cleaning agent can be applied to a clean, lint-free cloth. Further information can be found in chapter "Cleaning agents", [Page 228].

- Clean the base body with a clean, lint-free cloth

## 12.2.5 Mounting

### Mounting the ESD brush

If you have removed the ESD brush, you must mount a new ESD brush before mounting the rollers. To replace the ESD brush, you need an ESD brush set [+] ZX9016-0000.



- ▶ Insert ESD brush [1]
- ▶ Ensure that the sleeve of the ESD brush is flush with the base body
- ▶ Tighten the set screw [2]

### Checking the roller

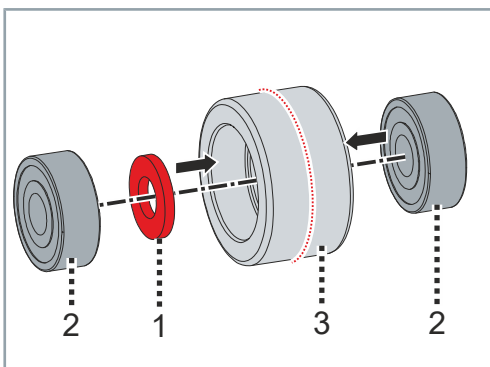
When transporting the roller set, the adjusting washer may move in the roller. In this case proceed as described below.

#### NOTICE

##### **Incorrect position of the adjusting washer in the roller**

A slipped adjusting washer inside the roller can cause the shoulder bolt not to pass smoothly through the roller during mounting, damaging the roller lining and affecting the running characteristics of the mover.

*Bring the adjusting washer into the correct position.*



- ▶ Use a slot screwdriver to push the adjusting washer [1] centrally between the two ball bearings [2] of the roller lining [3]
- ▶ Insert the shoulder bolt through the roller again
- ▶ Check for tight fit

## Mounting the guide rollers

### NOTICE

#### Follow the correct sequence when mounting the guide rollers

Mount the guide rollers from the inside to the outside as described below.

*Installing the guide rollers in a different sequence may result in extra time requirement, damage to the mover and damage during operation.*

#### Mounting sequence of the guide rollers

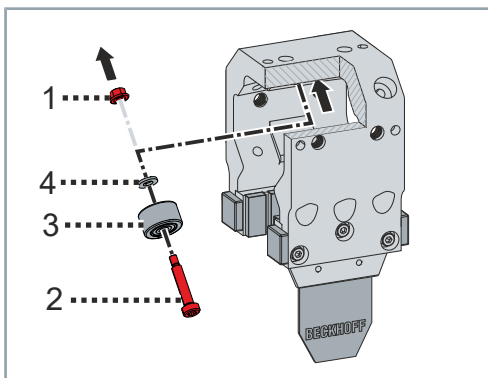
Sequence	Name	Number of items
A	Cylindrical guide roller [1]	2
B	Conical guide roller [2]	2
C	Cylindrical guide roller [3]	4
D	Conical guide roller [4]	4

For more information on the position of the guide rollers, see the chapter "Arrangement of the guide rollers on the mover", [Page 246].



#### Installation example

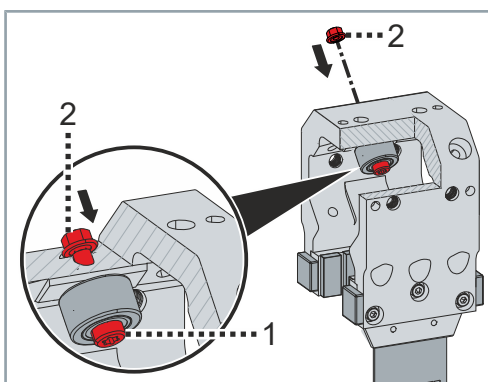
Mounting is described using the example of a cylindrical guide roller [1]. All other guide rollers are mounted in the same way.



- ▶ Remove the nut [1] from the shoulder bolt [2] of the pre-assembled guide roller
- ▶ Insert the shoulder bolt [2] with the roller [3] and the required adjusting washers [4] or the spacer ring into the base body

If the shoulder bolt does not pass smoothly through the roller, check the roller. Further information can be found in chapter "Checking the roller", [Page 250].

- ▶ Secure the shoulder bolt [2] against falling out



- ▶ Hold the shoulder bolt [1] with the Torx key [+]
- ▶ Screw nut [2] onto shoulder bolt [1]
- ▶ Tighten nut [2]
- ▶ Observe tightening torques:

Components	Tightening torque [Nm]
Nuts, M3	3

- ▶ Mount all other guide rollers in the same way

## Cleaning the base body

### NOTICE

#### **Avoid damage due to the use of aggressive substances**

The guide rollers and the base body can be damaged if aggressive substances are used. Apply detergent to a clean, lint-free cloth. Never apply the cleaning agent directly to the components. *Unsuitable cleaning agents can damage the components and considerably reduce the service life of the guide rollers.*

For heavy soiling, cleaning agent can be applied to a clean, lint-free cloth. Further information can be found in chapter "Cleaning agents", [Page 228].

- Clean the base body with a clean, lint-free cloth

## Mounting tools

If you have removed your tool from the mover before replacing the rollers, remount your tool to the mover before installing the mover on the system.

## 12.3 Roller replacement at AT9014-0055-x550

Dedicated roller sets are available for maintenance of the movers *AT9014-0055-x550*. A roller set contains all the components required for replacement.



### **One time roller replacement**

To ensure high availability of the system, the rollers on this mover may only be replaced once every 30,000 km. After another 30,000 km, the base body and the rollers must be replaced. The previously installed magnetic plate set can continue to be used.

The following accessories are available for replacing the base body with the rollers after 60,000 km:

- ZX9014-0155

If the magnetic plate set of the previous mover is to be reused, the magnetic plate set on the previous mover must be removed and fitted to the new base body. Further information can be found in chapter "Replacing the magnetic plates", [Page 289].



### **ESD brush replacement**

The ESD brush of the mover must be replaced after disassembling the rollers.

## 12.3.1 Scope of supply

To replace the guide rollers on the AT9014-0055-x550, you will need a roller set with order number ZX9014-0055.

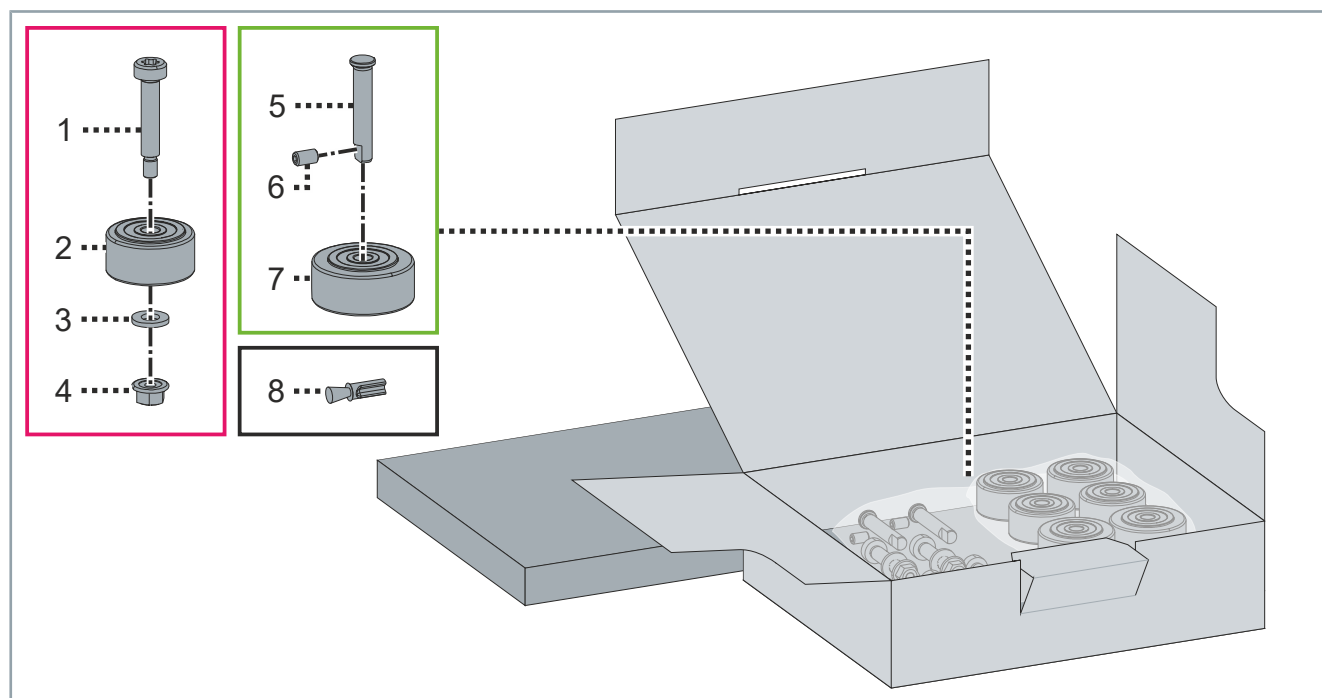


### Check missing or damaged parts

Check your delivery for completeness. If any parts are missing or became damaged during transport, contact the carrier, vendor or our service department immediately:

✉ [service@beckhoff.com](mailto:service@beckhoff.com)

In roller set ZX9014-0055 the guide rollers are not pre-assembled and must be sorted according to their color assignment and position before assembly in accordance with the following figure:



Position	Name	Number of items
1	Shoulder bolt M3 x 16	4
2	Cylindrical roller* 19 mm	6
3	Adjusting washers 4 x 8 x 1 A2 DIN-988	6
4	Nut M3 A2 DIN-6923	6
5	Bolt	2
6	Set screw M3 x 6	2
7	Cylindrical roller 21 mm	2
8	ESD brush	1

\* The rollers [2] each consist of two ball bearings and a roller lining



## 12.3.2 Preparation



### Required tools

- Feeler gauge with 0.1 mm feeler gauge blade
- Torx key T20
- Socket wrench, size 5.5
- Hexagon bit 2 mm
- Suitable torque wrench for hexagon bit
- Clean, lint-free cloth
- Cleaning agent: Isopropanol

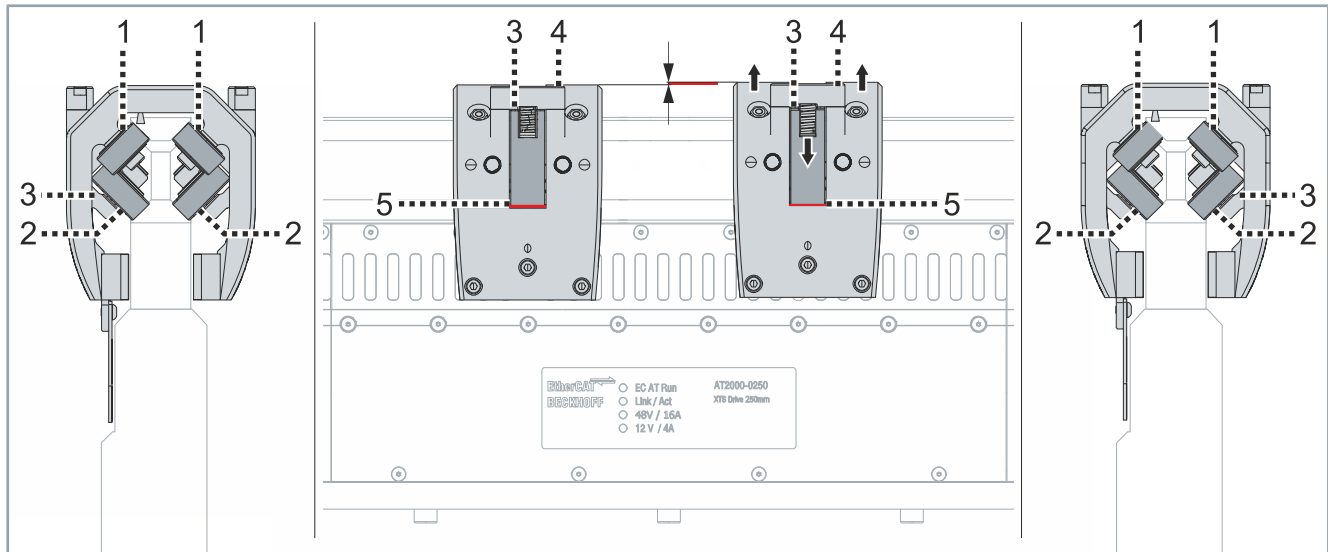
Dedicated roller sets are available for maintenance of the movers *AT9014-0055-x550*. A roller set contains all the components required for replacement.



### Required accessories [ + ]

- Roller set *ZX9014-0055*
- Tool set for roller replacement on mover *AT9014-00xx*:
  - Hexagon bit 1.5 x 50 mm
  - Pin punch 150 x 2 mm
- Rail on support *ZX9001-0000*

## 12.3.3 Roller wear on AT9014-0055



During operation, the upper rollers [1] and lower rollers [2] of the mover wear out. The suspension strut [3] presses the lower rollers further against the guide rail so that the base body [4] moves outwards and the air gap [5] between the suspension strut and the base body is reduced.

The movers maintain their pretension constantly over a longer period of time, but change their position in the lower to middle tenths of a mm range due to their design. Depending on the requirements, it is necessary to check the position tactilely or visually for changes and to replace the rollers if necessary. If the height position of the mover in relation to the guide rail is only allowed to change within a small range, it is necessary to check the air gap and the position of the mover at short intervals and replace the rollers at an early stage.

If the air gap between the suspension strut and the base body falls below 0.1 mm or the desired height position on the rail is no longer available:

- Replace the rollers on the mover *AT9014-0055* once

OR

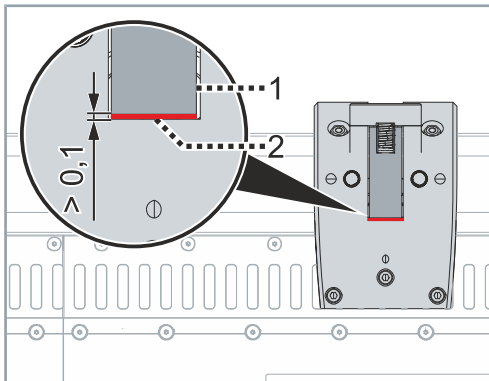
- Replace the entire mover *AT9014-0055* if the rollers have already been replaced once

## Checking the air gap

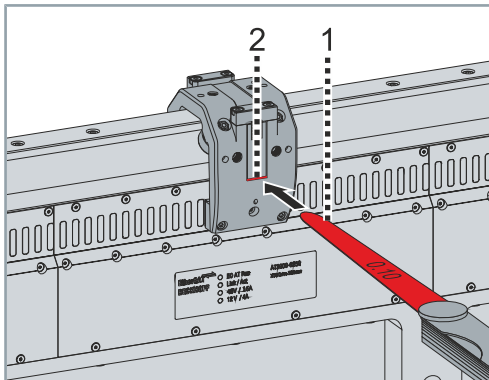


### Checking the mover on the guide rail

To check the air gap, the movers must be on the guide rail. The air gap of dismantled movers with spring-loaded rollers is always zero due to their design.



The air gap between the suspension strut [1] and the base body [2] must be at least 0.1 mm.



- Insert a 0.1 mm feeler gauge blade [1] into the air gap [2] between the suspension strut and the base body

If the 0.1 mm feeler gauge blade cannot be inserted into the air gap, the rollers must be replaced.

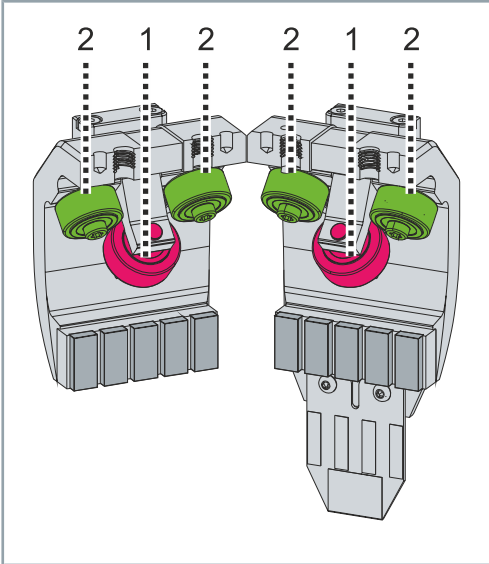
12.3.4 Arrangement of the guide rollers on the mover



**Better illustration**

The following figure shows a centrally split mover and is only intended to provide a better illustration of the guide roller arrangement. The movers cannot be moved into this position.

The guide rollers are color-coded in the figure, analogous to the figure of the scope of delivery.



Position	Name	Number of items
1	Cylindrical guide roller 22 mm, with bearing pin D4 x 22	2
2	Cylindrical guide roller 19 mm, with shoulder bolt M3 x 18	4

## 12.3.5 Disassembly

### Removing the tool

Beckhoff recommends removing the tool mounted on the mover for better access to the fastening screws of the guide rollers.

### Removing the guide rollers

#### NOTICE

##### Follow the correct sequence when removing the guide rollers

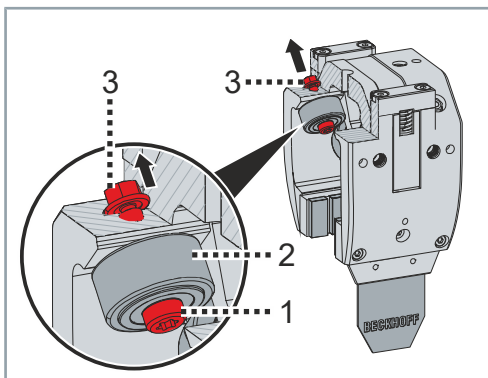
Disassemble the guide rollers from the outside to the inside as described below.

*If you disassemble the guide rollers in a different sequence, this may result in damage to the mover and additional time expenditure.*

#### Disassembly sequence of the guide rollers

Sequence	Name	Number of items
A	Cylindrical guide roller 19 mm, with shoulder bolt M3 x 18 [2]	4
B	Cylindrical guide roller 22 mm, with bearing pin D4 x 22 [1]	2

For more information on the position of the guide rollers, see the chapter "Arrangement of the guide rollers on the mover", [Page 258].



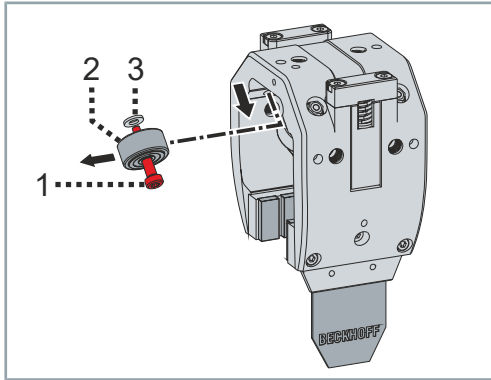
- Hold the shoulder bolt [1] of the roller [2] with the Torx key
- Remove nut [3]

## NOTICE

### Avoid jamming the shoulder bolt in the base body

Pull the shoulder bolt straight out of the base body to avoid jamming.

*Jamming of the shoulder bolt can result in damage to the base body and additional time requirement.*



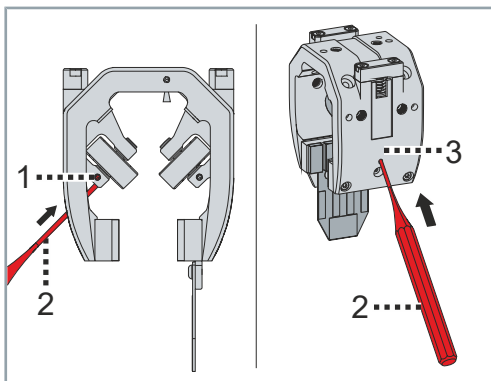
- ▶ Pull the shoulder bolt [1] with roller [2] and adjusting washer [3] straight out of the base body and remove to the side
- ▶ Disassemble the upper guide rollers in the same way

## NOTICE

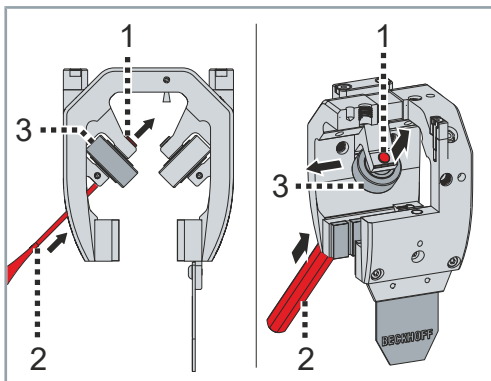
### Avoid jamming the bearing pin in the base body

Use a pin punch [+] to push the bearing pin straight out of the base body to prevent it from jamming.

*Jamming of the bearing pin can result in damage to the base body and additional expenditure of time.*

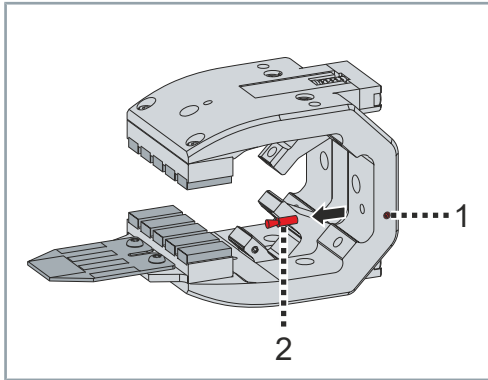


- ▶ Loosen the set screw [1] with a hexagon bit [+]
- ▶ Insert the pin punch [2] through the opening [3] in the base body



- ▶ Push the bearing pin [1] straight out of the base body by pressing the pin punch [2] and remove it to the side
- ▶ Remove the roller [3] from the base body to the side
- ▶ Disassemble the second lower roller in the same way

## Disassembling the ESD brush



- Loosen set screw [1]
- Remove ESD brush [2]

## Cleaning the base body

### NOTICE

#### **Avoid damage due to the use of aggressive substances**

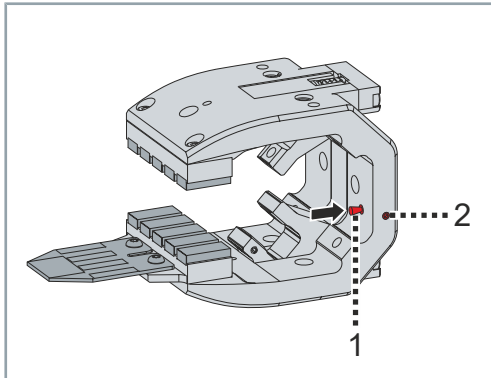
The guide rollers and the base body can be damaged if aggressive substances are used. Apply detergent to a clean, lint-free cloth. Never apply the cleaning agent directly to the components. *Unsuitable cleaning agents can damage the components and considerably reduce the service life of the guide rollers.*

For heavy soiling, cleaning agent can be applied to a clean, lint-free cloth. Further information can be found in chapter "Cleaning agents", [Page 228].

- Clean the base body with a clean, lint-free cloth

## 12.3.6 Mounting

### Mounting the ESD brush



Before you start mounting the guide rollers, the ESD brush must be mounted.

- ▶ Insert ESD brush [1]
- ▶ Ensure that the sleeve of the ESD brush is flush with the base body
- ▶ Tighten the set screw [2]

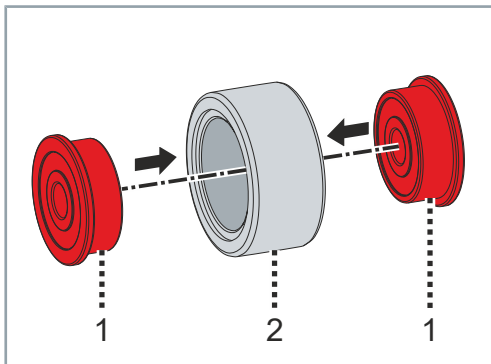
### Checking the roller

When transporting the roller set, the ball bearings may come loose from the roller lining. In this case proceed as described below.

#### NOTICE

##### **Incorrect position of the ball bearings in the roller**

Tilted ball bearings inside the roller can cause the shoulder bolt not to pass smoothly through the roller during mounting, damaging the roller lining and affecting the running quality of the mover. *Bring the ball bearings into the correct position.*



- ▶ Manually push the ball bearing [1] centrally into the roller lining [2]
- ▶ Insert the shoulder bolt through the roller again
- ▶ Check for tight fit



## Mounting the guide rollers

### NOTICE

#### Follow the correct sequence when mounting the guide rollers

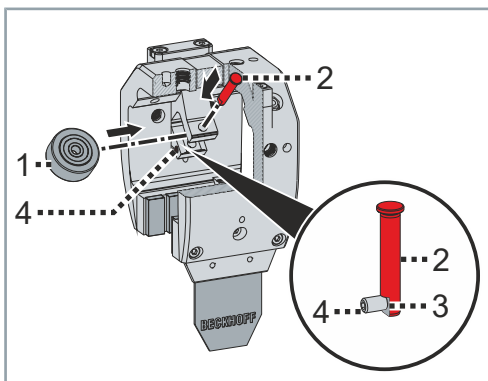
Mount the guide rollers from the inside to the outside as described below.

*Installing the guide rollers in a different sequence may result in extra time requirement, damage to the mover and damage during operation.*

#### Mounting sequence of the guide rollers

Sequence	Name	Number of items
A	Cylindrical guide roller 22 mm, with bearing pin D4 x 22 [1]	2
B	Cylindrical guide roller 19 mm, with shoulder bolt M3 x 18 [2]	4

For more information on the position of the guide rollers, see the chapter "Arrangement of the guide rollers on the mover", [Page 258].



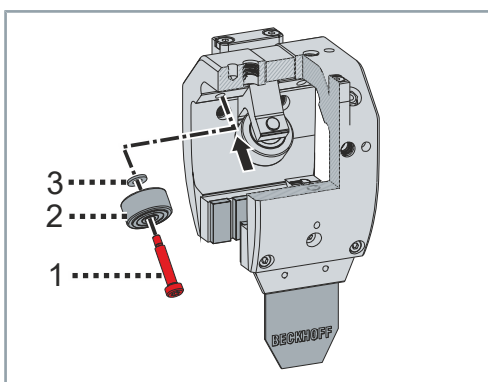
- Insert the roller [1] and secure it against falling out with the bearing pin [2]

The flat section [3] of the bearing pin [2] must be on the side of the set screw [4].

- Tighten the set screw [4]
- Observe tightening torques:

Components	Tightening torque [Nm]
Set screw, M3 x 5	0.5

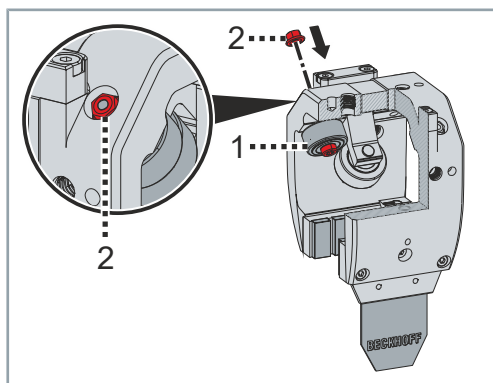
- Mount the second lower roller in the same way



- Insert the shoulder bolt [1] with the roller [2] and the adjusting washer [3] into the base body

If the shoulder bolt does not pass smoothly through the roller, check the roller. Further information can be found in chapter "Checking the roller", [Page 262].

- Secure the shoulder bolt [1] against falling out



- ▶ Hold the shoulder bolt [1] with the Torx key
- ▶ Screw nut [2] onto shoulder bolt [1]
- ▶ Tighten nut [2]
- ▶ Observe tightening torques:

Components	Tightening torque [Nm]
Nuts, M3	3

- ▶ Mount the upper guide rollers in the same way

## Cleaning the base body

### NOTICE

#### **Avoid damage due to the use of aggressive substances**

The guide rollers and the base body can be damaged if aggressive substances are used. Apply detergent to a clean, lint-free cloth. Never apply the cleaning agent directly to the components. *Unsuitable cleaning agents can damage the components and considerably reduce the service life of the guide rollers.*

For heavy soiling, cleaning agent can be applied to a clean, lint-free cloth. Further information can be found in chapter "Cleaning agents", [Page 228].

- Clean the base body with a clean, lint-free cloth

## Mounting tools

If you have removed your tool from the mover before replacing the rollers, remount your tool to the mover before installing the mover on the system.

12.4 Roller replacement at AT9011-0070-x550

Dedicated roller sets are available for maintenance of the movers AT9011-0070-x550. A roller set contains all the components required for replacement.

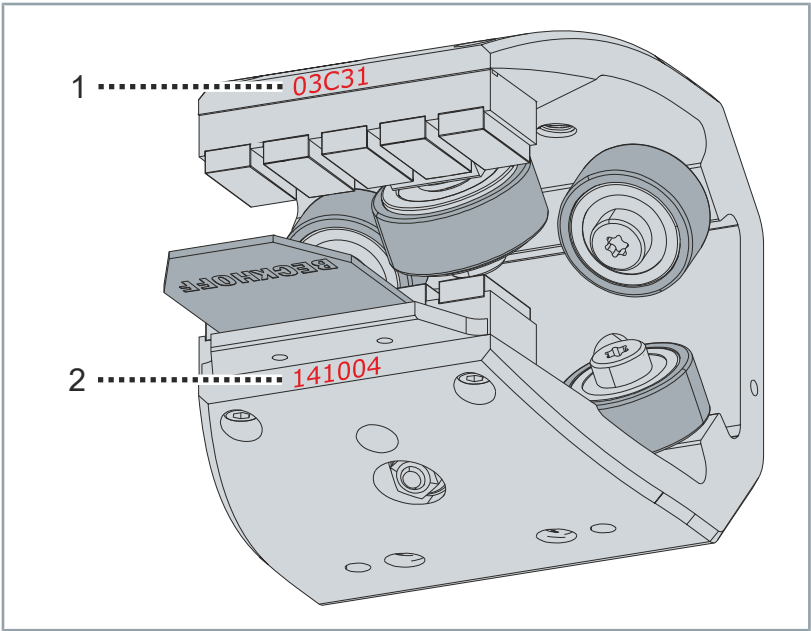
Order number and index version



Check the mover design

The roller set and the mover are matched to each other. Check in advance which mover version is present. *You can determine the present version by means of the order number of the base body.*

On the underside of the mover there are two numbers, which are structured as follows:



Position	Name
1	5-digit internal product code, of which the first two digits indicate the index version
2	6-digit order number of the mover

Based on the 6-digit order number [2] you can determine whether a roller set can be used to replace the rollers on the mover or whether the mover must be completely replaced or sent in.



## Check the order numbers on the base body

If the mover can only be serviced in the factory, the complete mover has to be returned to Beckhoff Automation GmbH & Co. KG.

If there is no order number on the underside of the mover, the mover has to be returned to Beckhoff Automation GmbH & Co. KG. In this case, it is not possible to replace the rollers with a roller set. For factory service, send the mover to:

## Service

Beckhoff Automation GmbH & CO. KG  
Stahlstraße 31  
33415 Verl  
Germany

## Order number and serviceability of the mover

by the customer	at the factory	Service number
• 141005	—	ZX9999-0002

## 12.4.1 Scope of supply

To replace the guide rollers on the AT9011-0070-0550, you will need a roller set with order number ZX9011-0070.

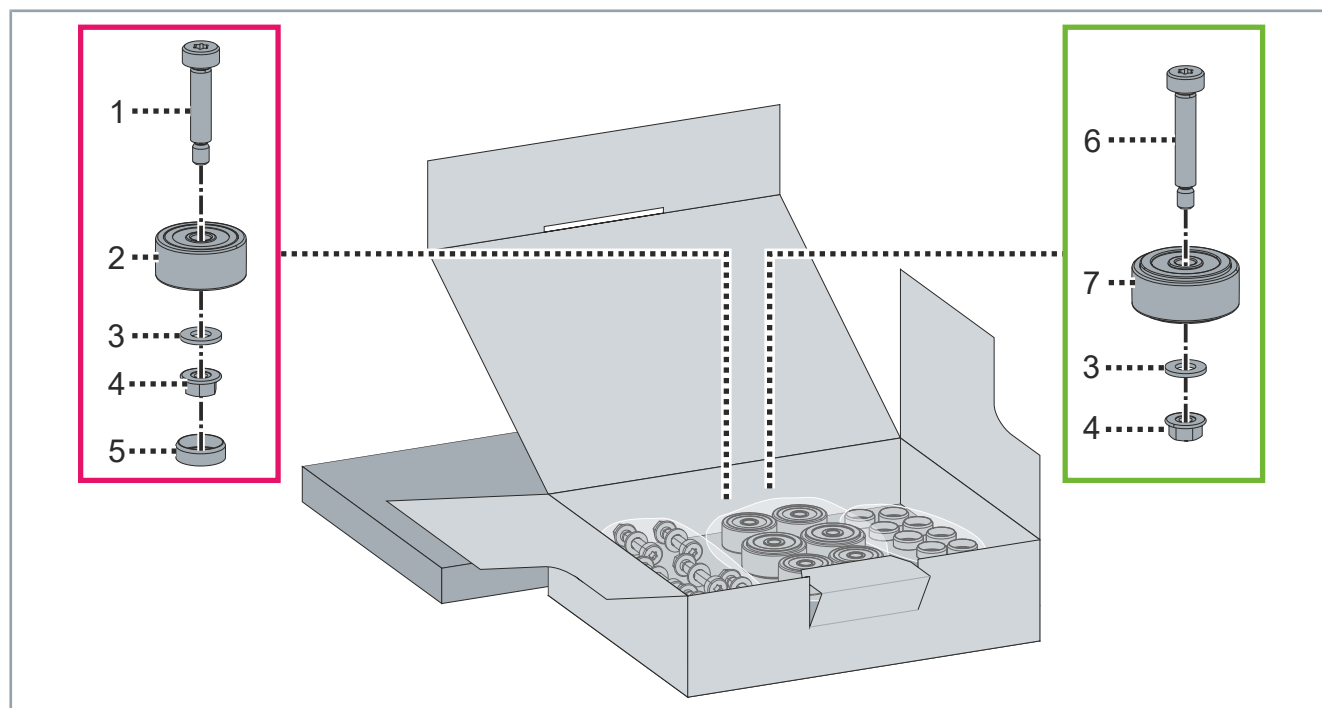


### Check missing or damaged parts

Check your delivery for completeness. If any parts are missing or became damaged during transport, contact the carrier, vendor or our service department immediately:

✉ service@beckhoff.com

In roller set ZX9011-0070 the guide rollers are not pre-assembled and must be sorted according to their color assignment and position before assembly in accordance with the following figure:



Position	Name	Number of items
1	Shoulder bolt M4 x 20	4
2	Cylindrical roller* 22 mm	4
3	Adjusting washers 5 x 10 x 1 A2 DIN-988	6
4	Nut M4 A2 DIN-6923	6
5	Sealing plug D12 T4	8
6	Shoulder bolt M4 x 25	2
7	Cylindrical roller* 26 mm	2

\* The rollers [2] and [7] each consist of two ball bearings and a roller lining

## 12.4.2 Preparation



### Required tools

- Torx key T20
- Socket wrench, size 7
- Clean, lint-free cloth
- Cleaning agent: Isopropanol

If the ESD brush is to be replaced:

- Hexagon bit 2 mm
- Suitable torque wrench for hexagon bit

Dedicated roller sets are available for maintenance of the movers *AT9011-0070-x550*. A roller set contains all the components required for replacement.



### Required accessories [ + ]

- Roller set *ZX9011-0070*
- Rail on support *ZX9001-0000*

If the ESD brush is to be replaced:

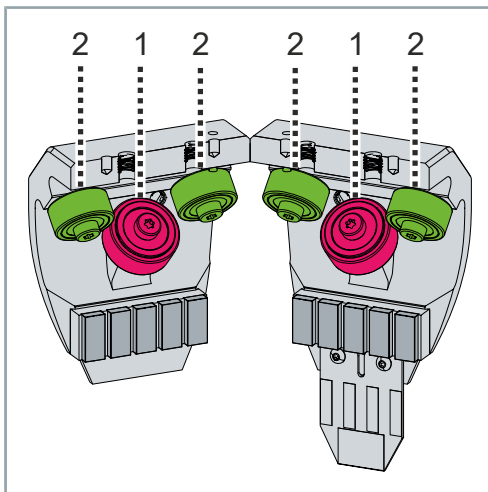
- ESD brush *ZX9016-0000*

## 12.4.3 Arrangement of the guide rollers on the mover



### Better illustration

The following figure shows a centrally split mover and is only intended to provide a better illustration of the guide roller arrangement. The movers cannot be moved into this position.



The guide rollers are color-coded in the figure, analogous to the figure of the scope of delivery.

Position	Name	Number of items
1	Cylindrical guide roller 26 mm	2
2	Cylindrical guide roller 22 mm	4

## 12.4.4 Disassembly

### Removing the tool

Beckhoff recommends removing the tool mounted on the mover for better access to the fastening screws of the guide rollers.

### Removing the guide rollers

#### NOTICE

##### Follow the correct sequence when removing the guide rollers

Disassemble the guide rollers from the outside to the inside as described below.

*If you disassemble the guide rollers in a different sequence, this may result in damage to the mover and additional time expenditure.*

#### Disassembly sequence of the guide rollers

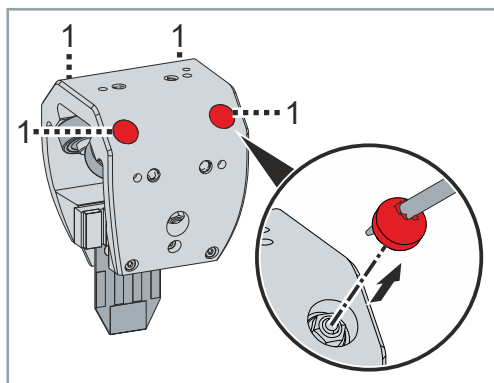
Sequence	Name	Number of items
A	Cylindrical guide roller 22 mm [2]	4
B	Cylindrical guide roller 26 mm [1]	2

For more information on the position of the guide rollers, see the chapter "Arrangement of the guide rollers on the mover", [Page 269].

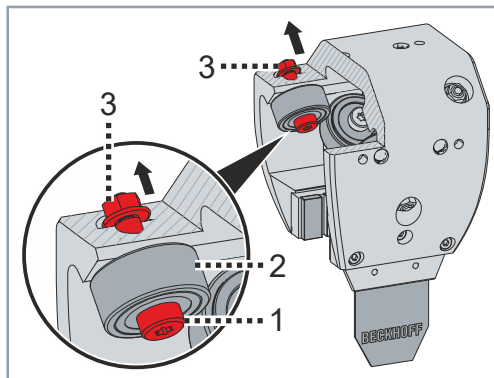


#### Disassembly example

Disassembly is described using the example of a 22 mm cylindrical guide roller [2]. All other guide rollers are disassembled in the same way.



- Pierce the sealing plug [1] and lever it out of the base body



- Hold the shoulder bolt [1] of the roller [2] with the Torx key
- Remove nut [3]

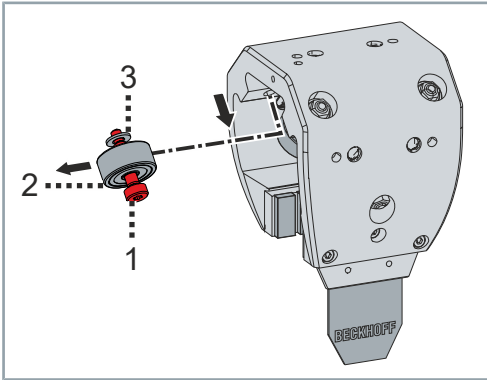


## NOTICE

### Avoid jamming the shoulder bolt in the base body

Pull the shoulder bolt straight out of the base body to avoid jamming.

*Jamming of the shoulder bolt can result in damage to the base body and additional time requirement.*



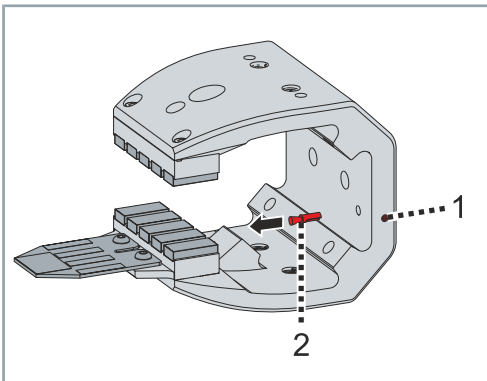
- Pull the shoulder bolt [1] with roller [2] and adjusting washer [3] straight out of the base body and remove to the side
- Disassemble all other guide rollers in the same way

## Disassembling the ESD brush



### Required or optional replacement of the ESD brush

Beckhoff recommends replacing the ESD brush after removing the guide rollers. The ESD brush must be replaced if the ESD brush does not touch the guide rails. To replace the ESD brush, you need the ESD brushes [+] ZX9016-0000.



- Loosen set screw [1]
- Remove ESD brush [2]

## Cleaning the base body

### **NOTICE**

#### **Avoid damage due to the use of aggressive substances**

The guide rollers and the base body can be damaged if aggressive substances are used. Apply detergent to a clean, lint-free cloth. Never apply the cleaning agent directly to the components. *Unsuitable cleaning agents can damage the components and considerably reduce the service life of the guide rollers.*

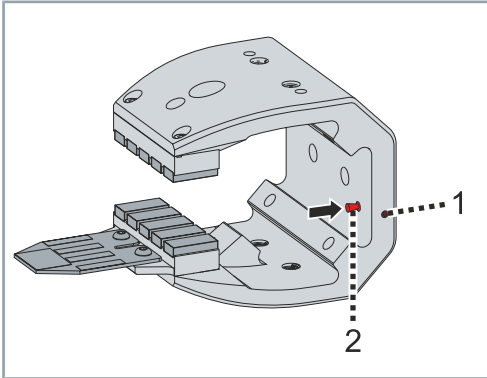
For heavy soiling, cleaning agent can be applied to a clean, lint-free cloth. Further information can be found in chapter "Cleaning agents", [Page 228].

- Clean the base body with a clean, lint-free cloth

## 12.4.5 Mounting

### Mounting the ESD brush

If you have removed the ESD brush, you must mount a new ESD brush before mounting the rollers. To replace the ESD brush, you need the ESD brushes [+] ZX9016-0000.



- ▶ Insert ESD brush [1]
- ▶ Ensure that the sleeve of the ESD brush is flush with the base body
- ▶ Tighten the set screw [2]

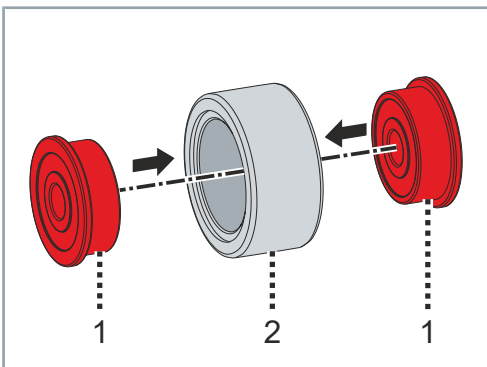
### Checking the roller

When transporting the roller set, the ball bearings may come loose from the roller lining. In this case proceed as described below.

#### NOTICE

##### **Incorrect position of the ball bearings in the roller**

Tilted ball bearings inside the roller can cause the shoulder bolt not to pass smoothly through the roller during mounting, damaging the roller lining and affecting the running quality of the mover. *Bring the ball bearings into the correct position.*



- ▶ Manually push the ball bearing [1] centrally into the roller lining [2]
- ▶ Insert the shoulder bolt through the roller again
- ▶ Check for tight fit

## Mounting the guide rollers

### NOTICE

**Follow the correct sequence when mounting the guide rollers**

Mount the guide rollers from the inside to the outside as described below.

*Installing the guide rollers in a different sequence may result in extra time requirement, damage to the mover and damage during operation.*

### Mounting sequence of the guide rollers

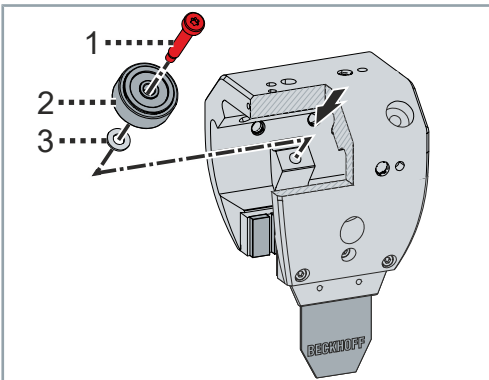
Sequence	Name	Number of items
A	Cylindrical guide roller 26 mm [1]	2
B	Cylindrical guide roller 22 mm [2]	4

For more information on the position of the guide rollers, see the chapter "Arrangement of the guide rollers on the mover", [Page 269].



### Installation example

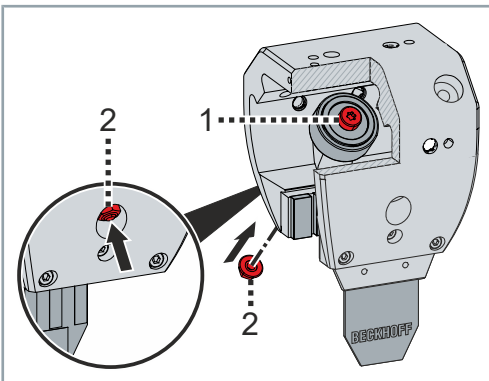
Mounting is described using the example of a 26 mm cylindrical guide roller [1]. All other guide rollers are mounted in the same way.



- Insert the shoulder bolt [1] with the roller [2] and the adjusting washer [3] into the base body

If the shoulder bolt does not pass smoothly through the roller, check the roller. Further information can be found in chapter "Checking the roller", [Page 273].

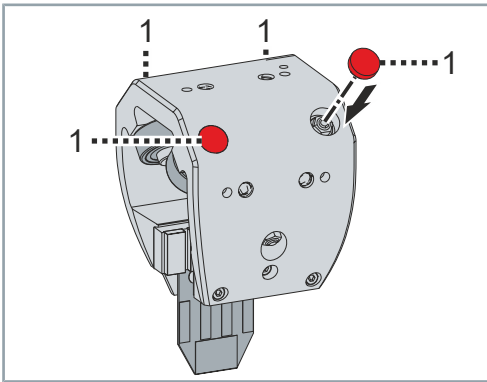
- Secure the shoulder bolt [1] against falling out



- Hold the shoulder bolt [1] with the Torx key
- Screw nut [2] onto shoulder bolt [1]
- Tighten nut [2]
- Observe tightening torques:

Components	Tightening torque [Nm]
Nuts, M4	5

- Mount all other guide rollers in the same way



- Insert the sealing plug [1] into the base body

## Cleaning the base body

### NOTICE

#### **Avoid damage due to the use of aggressive substances**

The guide rollers and the base body can be damaged if aggressive substances are used. Apply detergent to a clean, lint-free cloth. Never apply the cleaning agent directly to the components. *Unsuitable cleaning agents can damage the components and considerably reduce the service life of the guide rollers.*

For heavy soiling, cleaning agent can be applied to a clean, lint-free cloth. Further information can be found in chapter "Cleaning agents", [Page 228].

- Clean the base body with a clean, lint-free cloth

## Mounting tools

If you have removed your tool from the mover before replacing the rollers, remount your tool to the mover before installing the mover on the system.

## 12.5 Role swap on AT9014-x070-x550 and AT8300-1x00-0100

Appropriate roller sets are available for the maintenance of the movers *AT9014-x070-x550* and *AT8300-1x00-0100*. A roller set contains all the components required for replacement.



### **One time roller replacement**

To ensure high availability of the system, the rollers on this mover may only be replaced once every 30,000 km. After another 30,000 km, the base body and the rollers must be replaced. The previously installed magnetic plate set can continue to be used.

The following accessories are available for replacing the base body with the rollers after 60,000 km:

- ZX9014-0170

If the magnetic plate set of the previous mover is to be reused, the magnetic plate set on the previous mover must be removed and fitted to the new base body. Further information can be found in chapter "Replacing the magnetic plates", [Page 289].



### **ESD brush replacement**

The ESD brush of the mover must be replaced after disassembling the rollers.



### **Required removal of the NCT electronics**

If NCT electronics are mounted on the movers, the NCT electronics must be removed to replace the rollers.

### 12.5.1 Scope of supply

To replace the guide rollers on the *AT9014-x070-x550* and *AT8300-1x00-0100*, you will need a roller set with order number *ZX9014-0070*.

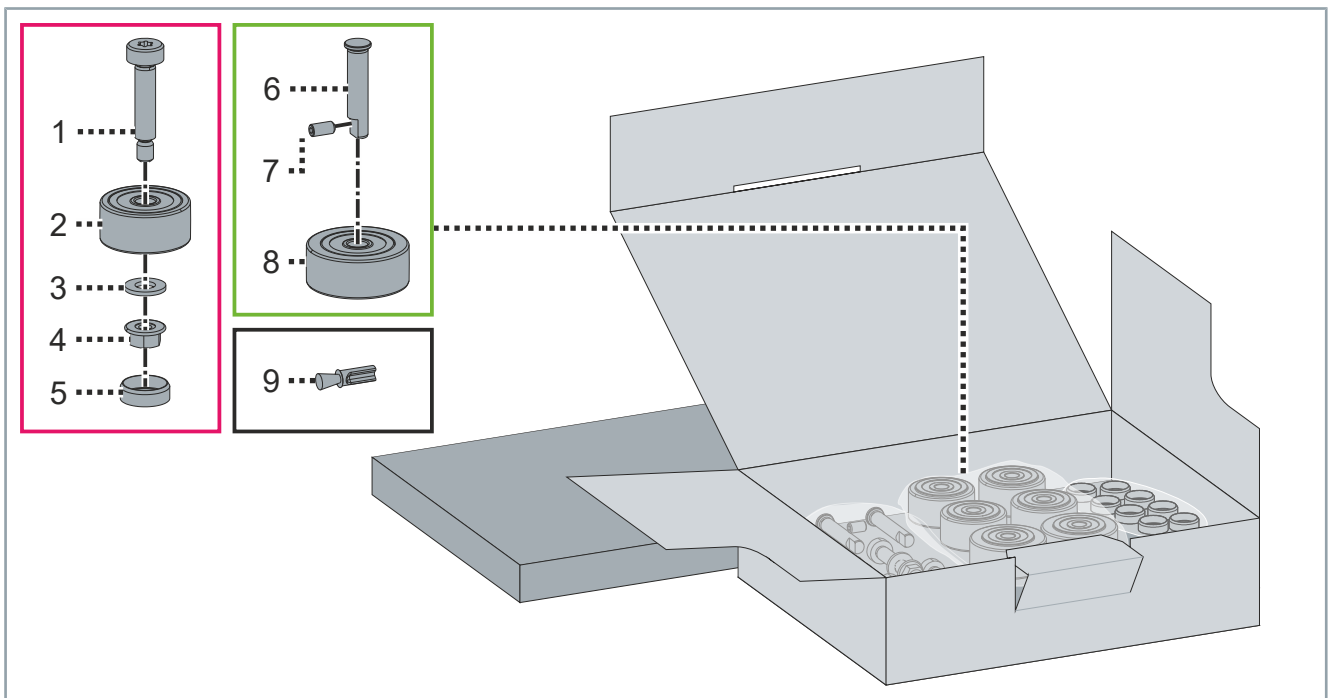


#### Check missing or damaged parts

Check your delivery for completeness. If any parts are missing or became damaged during transport, contact the carrier, vendor or our service department immediately:

✉ [service@beckhoff.com](mailto:service@beckhoff.com)

In roller set *ZX9014-0070* the guide rollers are not pre-assembled and must be sorted according to their color assignment and position before assembly in accordance with the following figure:



Position	Name	Number of items
1	Shoulder bolt M4 x 20	4
2	Cylindrical roller* 22 mm	4
3	Adjusting washers 4 x 8 x 1 A2 DIN-988	4
4	Nut M4 A2 DIN-6923	4
5	Cover cap	8
6	Bearing pin D5 x 23	2
7	Set screw M3 x 6	2
8	Cylindrical roller* 25 mm	2
9	ESD brush	1

\* The rollers [2] and [8] each consist of two ball bearings and a roller lining

## 12.5.2 Preparation



### Required tools

- Feeler gauge with 0.1 mm feeler gauge blade
- Torx key T20
- Socket wrench, size 7
- Hexagon bit 5 mm
- Hexagon bit 2 mm
- Suitable torque wrench for hexagon bit
- Clean, lint-free cloth
- Cleaning agent: Isopropanol

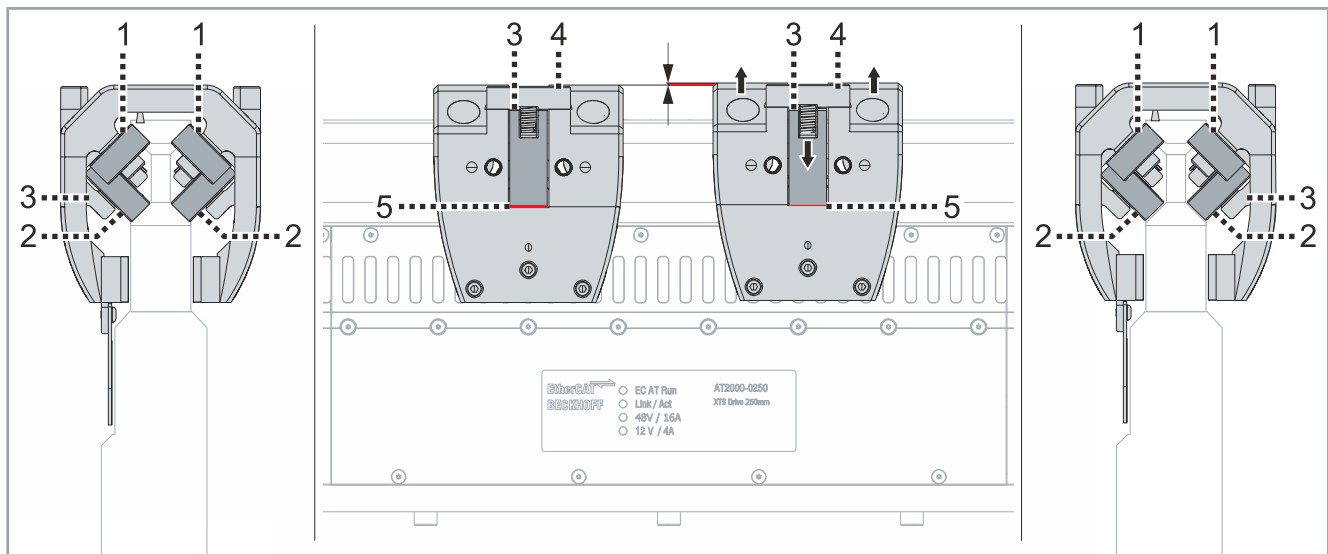
Appropriate roller sets are available for the maintenance of the movers AT9014-x070-x550 and AT8300-1x00-0100. A roller set contains all the components required for replacement.



### Required accessories [ + ]

- Roller set ZX9014-0055
- Tool set for roller replacement on mover AT9014-00xx:
  - Hexagon bit 1.5 x 50 mm
  - Pin punch 150 x 2 mm
- Rail on support ZX9001-0000

## 12.5.3 Roller wear on AT9014-x070 and AT8300-1x00



During operation, the upper rollers [1] and lower rollers [2] of the mover wear out. The suspension strut [3] presses the lower rollers further against the guide rail so that the base body [4] moves outwards and the air gap [5] between the suspension strut and the base body is reduced.

The movers maintain their pretension constantly over a longer period of time, but change their position in the lower to middle tenths of a mm range due to their design. Depending on the requirements, it is necessary to check the position tactilely or visually for changes and to replace the rollers if necessary. If the height position of the mover in relation to the guide rail is only allowed to change within a small range, it is necessary to check the air gap and the position of the mover at short intervals and replace the rollers at an early stage.



If the air gap between the suspension strut and the base body falls below 0.1 mm or the desired height position of the mover on the rail is no longer available:

- Replace the rollers on the movers *AT9014-x070* and *AT8300-1x00* once

OR

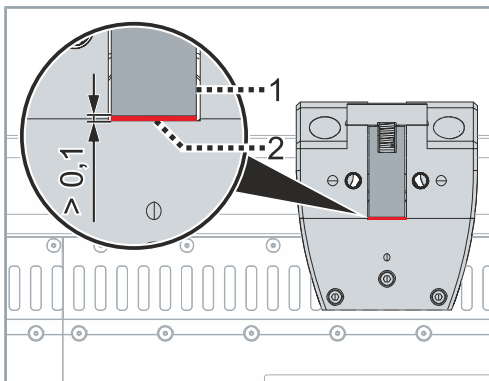
- Replace the entire mover *AT9014-x070* and *AT8300-1x00* if the rollers have already been replaced once

## Checking the air gap

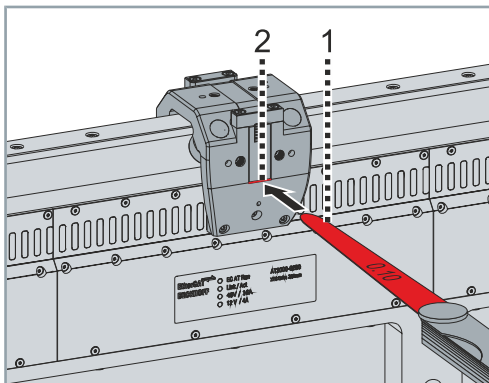


### Checking the mover on the guide rail

To check the air gap, the movers must be on the guide rail. The air gap of dismantled movers with spring-loaded rollers is always zero due to their design.



The air gap between the suspension strut [1] and the base body [2] must be at least 0.1 mm.



- Insert a 0.1 mm feeler gauge blade [1] into the air gap [2] between the suspension strut and the base body

If the 0.1 mm feeler gauge blade cannot be inserted into the air gap, the rollers must be replaced.

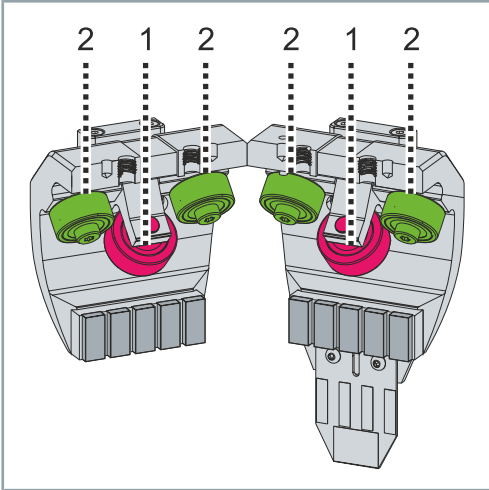
12.5.4 Arrangement of the guide rollers on the mover



**Better illustration**

The following figure shows a centrally split mover and is only intended to provide a better illustration of the guide roller arrangement. The movers cannot be moved into this position.

The guide rollers are color-coded in the figure, analogous to the figure of the scope of delivery.



Position	Name	Number of items
1	Cylindrical guide roller 25 mm, with bearing pin D5 x 23	2
2	Cylindrical guide roller 22 mm, with shoulder bolt M4 x 20	4

## 12.5.5 Disassembly

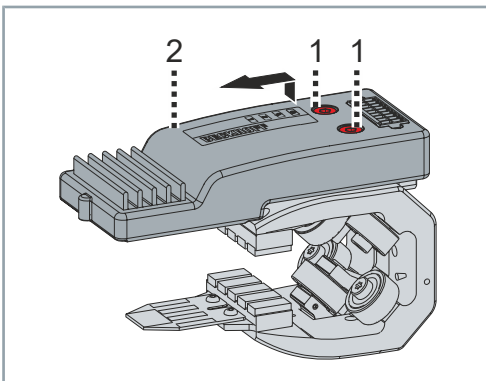
### Removing the tool

Beckhoff recommends removing the tool mounted on the mover for better access to the fastening screws of the guide rollers.

### Removing the NCT electronics

If NCT electronics are mounted on your movers, they must be removed before the guide rollers are dismantled.

If no NCT electronics are mounted on your mover, you can continue with the chapter "Removing the guide rollers", [Page 281].



- ▶ Remove screws [1]
- ▶ Lift and remove the NCT electronics [2] in the area of the connector

### Removing the guide rollers

#### NOTICE

##### Follow the correct sequence when removing the guide rollers

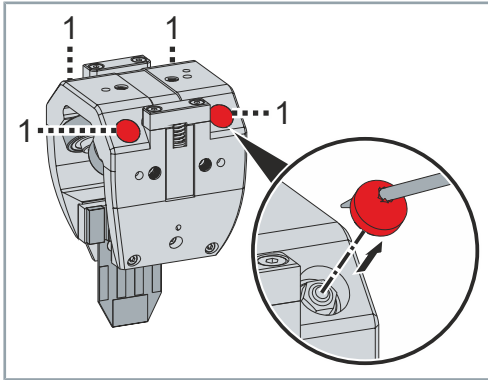
Disassemble the guide rollers from the outside to the inside as described below.

*If you disassemble the guide rollers in a different sequence, this may result in damage to the mover and additional time expenditure.*

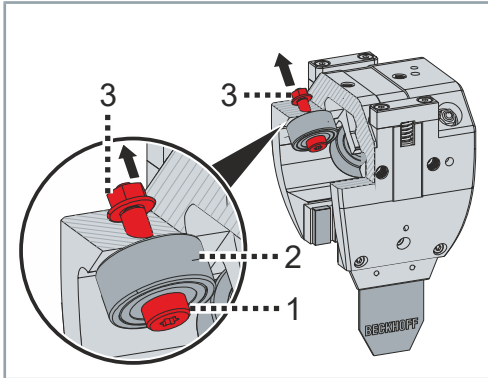
#### Disassembly sequence of the guide rollers

Sequence	Name	Number of items
A	Cylindrical guide roller 22 mm, with shoulder bolt M4 x 20 [2]	4
B	Cylindrical guide roller 25 mm, with bearing pin D5 x 23 [1]	2

For more information on the position of the guide rollers, see the chapter "Arrangement of the guide rollers on the mover", [Page 280].



- Pierce the sealing plug [1] and lever it out of the base body



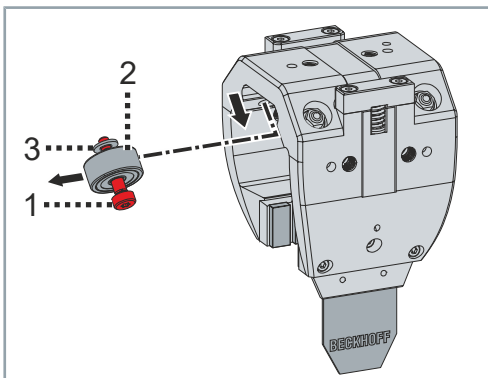
- Hold the shoulder bolt [1] of the roller [2] with the Torx key
- Remove nut [3]

## NOTICE

### **Avoid jamming the shoulder bolt in the base body**

Pull the shoulder bolt straight out of the base body to avoid jamming.

*Jamming of the shoulder bolt can result in damage to the base body and additional time requirement.*



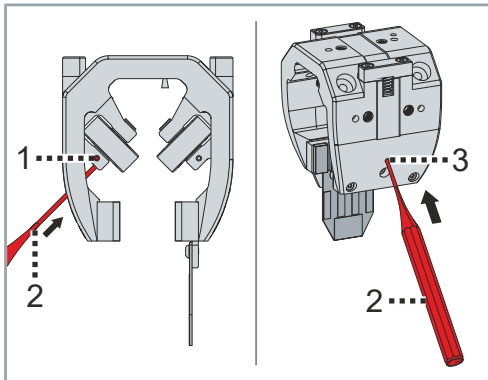
- Pull the shoulder bolt [1] with roller [2] and adjusting washer [3] straight out of the base body and remove to the side
- Disassemble the upper guide rollers in the same way

## NOTICE

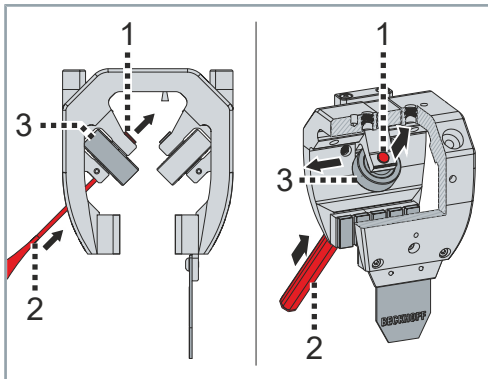
### Avoid jamming the bearing pin in the base body

Use a pin punch [+] to push the bearing pin straight out of the base body to prevent it from jamming.

*Jamming of the bearing pin can result in damage to the base body and additional expenditure of time.*

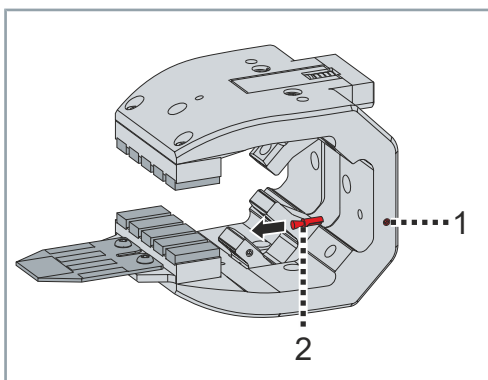


- ▶ Loosen the set screw [1] with a hexagon bit [+]
- ▶ Insert the pin punch [2] through the opening [3] in the base body



- ▶ Push the bearing pin [1] straight out of the base body by pressing the pin punch [2] and remove it to the side
- ▶ Remove the roller [3] from the base body to the side
- ▶ Disassemble the second lower roller in the same way

### Disassembling the ESD brush



- ▶ Loosen set screw [1]
- ▶ Remove ESD brush [2]

## Cleaning the base body

### NOTICE

#### **Avoid damage due to the use of aggressive substances**

The guide rollers and the base body can be damaged if aggressive substances are used. Apply detergent to a clean, lint-free cloth. Never apply the cleaning agent directly to the components. *Unsuitable cleaning agents can damage the components and considerably reduce the service life of the guide rollers.*

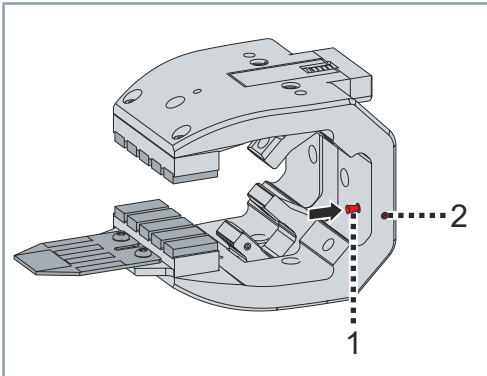
For heavy soiling, cleaning agent can be applied to a clean, lint-free cloth. Further information can be found in chapter "Cleaning agents", [Page 228].

- Clean the base body with a clean, lint-free cloth

## 12.5.6 Mounting

Before you start mounting the guide rollers, the ESD brush must be mounted.

### Mounting the ESD brush



- ▶ Insert ESD brush [1]
- ▶ Ensure that the sleeve of the ESD brush is flush with the base body
- ▶ Tighten the set screw [2]

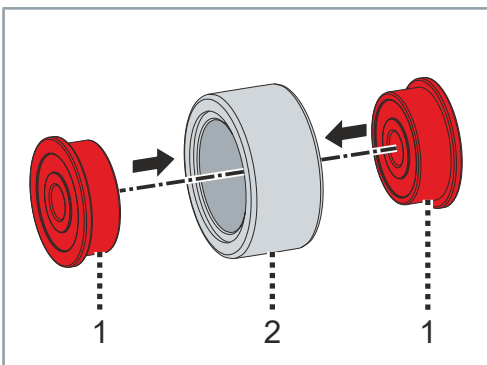
### Checking the roller

When transporting the roller set, the ball bearings may come loose from the roller lining. In this case proceed as described below.

### NOTICE

#### **Incorrect position of the ball bearings in the roller**

Tilted ball bearings inside the roller can cause the shoulder bolt not to pass smoothly through the roller during mounting, damaging the roller lining and affecting the running quality of the mover. *Bring the ball bearings into the correct position.*



- ▶ Manually push the ball bearing [1] centrally into the roller lining [2]
- ▶ Insert the shoulder bolt through the roller again
- ▶ Check for tight fit

## Mounting the guide rollers

### NOTICE

**Follow the correct sequence when mounting the guide rollers**

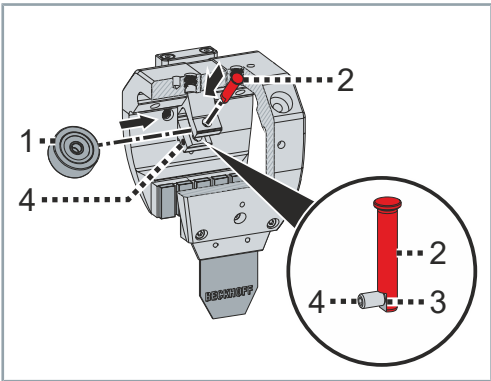
Mount the guide rollers from the inside to the outside as described below.

*Installing the guide rollers in a different sequence may result in extra time requirement, damage to the mover and damage during operation.*

### Mounting sequence of the guide rollers

Sequence	Name	Number of items
A	Cylindrical guide roller 25 mm, with bearing pin D5 x 23 [1]	2
B	Cylindrical guide roller 22 mm, with shoulder bolt M4 x 20 [2]	4

For more information on the position of the guide rollers, see the chapter "Arrangement of the guide rollers on the mover", [Page 280].



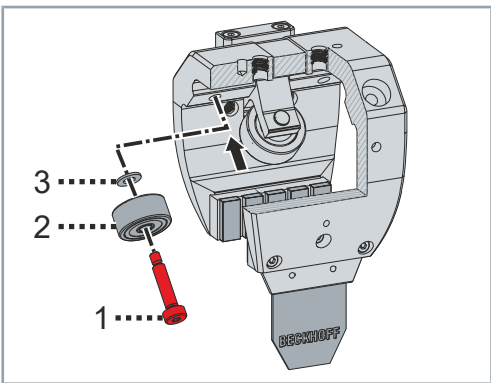
- Insert the roller [1] and secure it against falling out with the bearing pin [2]

The flat section [3] of the bearing pin [2] must be on the side of the set screw [4].

- Tighten the set screw [4]
- Observe tightening torques:

Components	Tightening torque [Nm]
Set screw, M3 x 6	0.5

- Mount the second lower roller in the same way

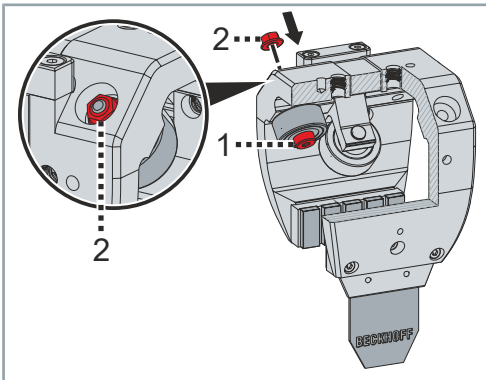


- Insert the shoulder bolt [1] with the roller [2] and the adjusting washer [3] into the base body

If the shoulder bolt [1] does not pass smoothly through the roller [2], check the roller. Further information can be found in chapter "Checking the roller", [Page 285].

- Secure the shoulder bolt [1] against falling out

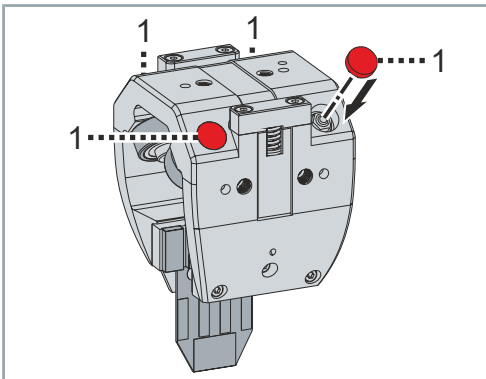




- Hold the shoulder bolt [1] with the Torx key
- Screw nut [2] onto shoulder bolt [1]
- Tighten nut [2]
- Observe tightening torques:

Components	Tightening torque [Nm]
Nuts, M4	3

- Mount the upper guide rollers in the same way



- Insert the sealing plug [1] into the base body

## Cleaning the base body

### NOTICE

#### Avoid damage due to the use of aggressive substances

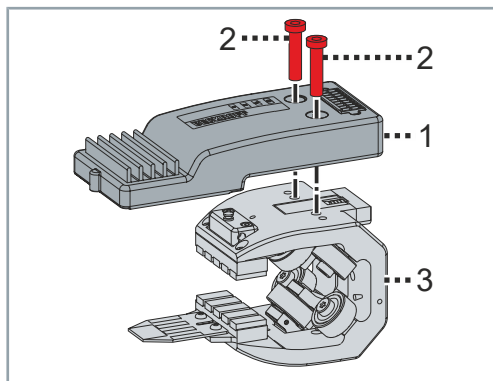
The guide rollers and the base body can be damaged if aggressive substances are used. Apply detergent to a clean, lint-free cloth. Never apply the cleaning agent directly to the components. *Unsuitable cleaning agents can damage the components and considerably reduce the service life of the guide rollers.*

For heavy soiling, cleaning agent can be applied to a clean, lint-free cloth. Further information can be found in chapter "Cleaning agents", [Page 228].

- Clean the base body with a clean, lint-free cloth

# Maintenance work on the mover

## Mounting NCT electronics



- Tighten the NCT electronics [1] to the mover [3] with screws [2]
- Observe tightening torques:

Components	Tightening torque [Nm]
Screws, M6 x 25	4

## Mounting tools

If you have removed your tool from the mover before replacing the rollers, remount your tool to the mover before installing the mover on the system.

## 12.6 Replacing the magnetic plates

Magnetic plates are components of the Beckhoff movers. The following magnetic plate sets [+] are available for replacement and for third-party movers.

### Magnetic plate set Mover Standard

Magnetic plate set	Number of magnets	Suitable mover types	Mover type after mounting the magnetic plate set
AT9001-0450-1640	4	AT901x-x0xx-0450	AT901x-x0xx-0450
		AT901x-x0xx-1450*	AT901x-x0xx-0450
		AT901x-x0xx-0550	AT901x-x0xx-0450
		AT901x-x0xx-1550*	AT901x-x0xx-0450
		Mover Standard from third-party manufacturers	Mover Standard from third-party manufacturers
		Mover 1* from third-party manufacturers	Mover Standard from third-party manufacturers
AT9001-0550-1640	5	AT901x-x0xx-0450	AT901x-x0xx-0550
		AT901x-x0xx-1450*	AT901x-x0xx-0550
		AT901x-x0xx-0550	AT901x-x0xx-0550
		AT901x-x0xx-1550*	AT901x-x0xx-0550
		Mover Standard from third-party manufacturers	Mover Standard from third-party manufacturers
		Mover 1* from third-party manufacturers	Mover Standard from third-party manufacturers
AT9001-0775-1640	7	Mover Standard from third-party manufacturers	Mover Standard from third-party manufacturers
		Mover 1* from third-party manufacturers	Mover Standard from third-party manufacturers
AT9001-0AA0-1640	10	Mover Standard from third-party manufacturers	Mover Standard from third-party manufacturers
		Mover 1* from third-party manufacturers	Mover Standard from third-party manufacturers

\* After mounting a magnetic plate set Mover Standard, Mover 1 loses its Mover 1 functionality and is no longer recognized as servo axis 1.

## Magnetic plate set Mover 1

Magnetic plate set	Number of magnets	Suitable mover types	Mover type after mounting the magnetic plate set
AT9001-1450-1640	4	AT901x-x0xx-0450**	AT901x-x0xx-1450
		AT901x-x0xx-1450	AT901x-x0xx-1450
		AT901x-x0xx-0550**	AT901x-x0xx-1450
		AT901x-x0xx-1550	AT901x-x0xx-1450
		Mover Standard* from third-party manufacturers	Mover 1* from third-party manufacturers
		Mover 1* from third-party manufacturers	Mover 1* from third-party manufacturers
AT9001-1550-1640	5	AT901x-x0xx-0450**	AT901x-x0xx-1550
		AT901x-x0xx-1450	AT901x-x0xx-1550
		AT901x-x0xx-0550**	AT901x-x0xx-1550
		AT901x-x0xx-1550	AT901x-x0xx-1550
		Mover Standard* from third-party manufacturers	Mover 1 from third-party manufacturers
		Mover 1 from third-party manufacturers	Mover 1 from third-party manufacturers
AT9001-1775-1640	7	Mover Standard* from third-party manufacturers	Mover 1 from third-party manufacturers
		Mover 1 from third-party manufacturers	Mover 1 from third-party manufacturers
AT9001-1AA0-1640	10	Mover Standard* from third-party manufacturers	Mover 1 from third-party manufacturers
		Mover 1 from third-party manufacturers	Mover 1 from third-party manufacturers

\* After mounting a magnetic plate set Mover 1, the Mover Standard assumes Mover 1 functionality and is recognized as servo axis 1.

A 1.6 mm thick encoder flag is mounted on a magnetic plate of the magnetic plate set. If necessary, this must be replaced with a thicker or thinner encoder flag. Further information can be found in chapter "Replacing the encoder flag", [Page 295].

## 12.6.1 Preparation



### Required tools

- Allen key 2.5 mm



### Mounting example

The mounting of a magnetic plate set Mover 1 AT9001-1550-1640 is described as an example. After mounting, the previous Mover Standard has Mover 1 functionality and is recognized as servo axes 1.

## 12.6.2 Disassembly

### ⚠ WARNING

#### Keep the workplace free of metallic and magnetic materials

Make sure that your workplace is free of metallic and magnetic materials before positioning the mover. The permanent magnets of the movers can attract tools used to replace the magnetic plates.

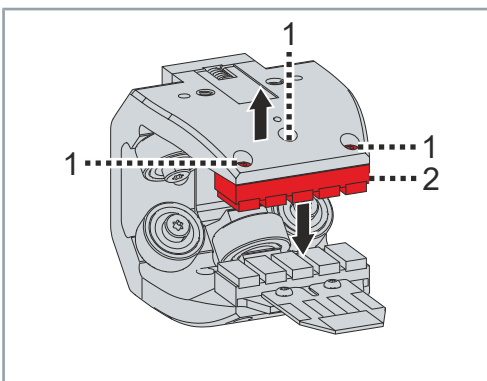
*If movers are attracted by metallic and magnetic parts, serious injuries to the fingers from crushing and in the eyes from splinters can result.*

### ⚠ WARNING

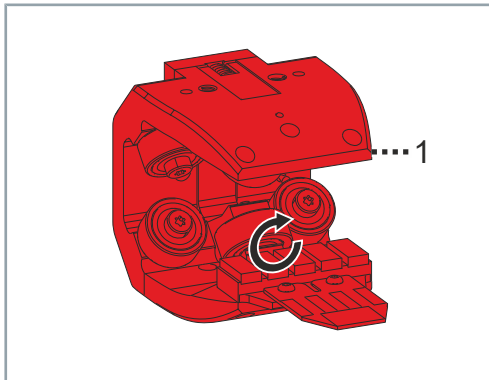
#### Risk of injury during disassembly of the magnetic plates

Permanent magnets are installed in the magnetic plate sets of the movers. Be careful when disassembling the magnetic plate sets. Make sure that the magnetic plate sets do not magnetically attract one another with your hands in-between.

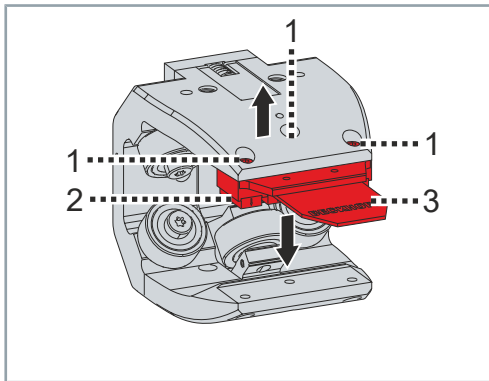
*If you don't take care during the disassembly, opposite magnetic plate sets may attract each other without warning and injure your hands.*



- Remove screws [1]
- Remove magnetic plate [2]



- Rotate mover [1] by 180 degrees



- Remove screws [1]
- Remove magnetic plate [2] with encoder flag [3]

### 12.6.3 Mounting

#### ⚠ WARNING

##### **Keep the workplace free of metallic and magnetic materials**

Make sure that your workplace is free of metallic and magnetic materials before positioning the mover. The permanent magnets of the movers can attract tools used to replace the magnetic plates.

*If movers are attracted by metallic and magnetic parts, serious injuries to the fingers from crushing and in the eyes from splinters can result.*

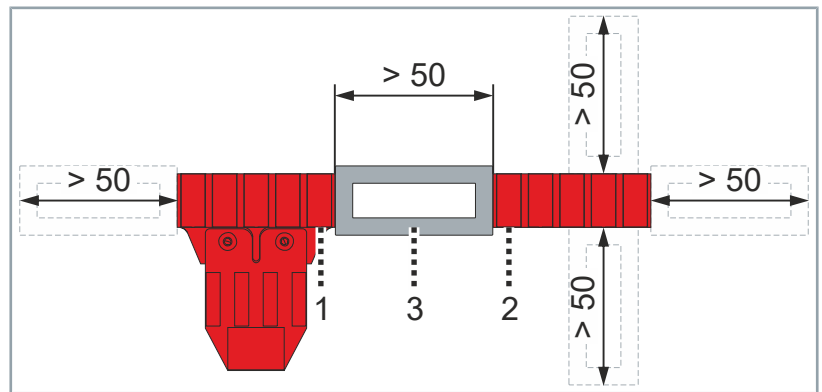
#### ⚠ WARNING

##### **Risk of injury when mounting the magnetic plates**

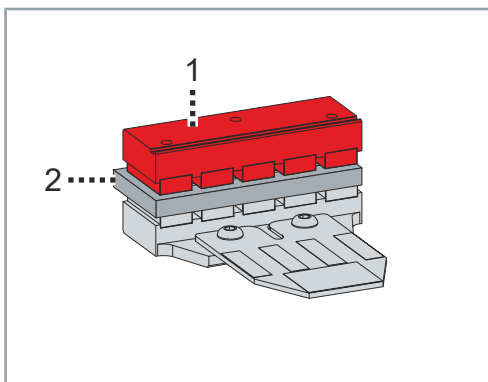
Permanent magnets are installed in the magnetic plates of the movers. Mount the magnetic plates carefully. Make sure that the magnetic plates do not magnetically attract one another with your hands in-between.

*If you don't take care during mounting, opposite magnetic plate sets may attract each other without warning and injure your hands.*

The magnetic plates are supplied together with a plastic spacer between the magnetic poles.



The distance between the magnetic plates [1] and [2] and to other magnetic objects must be at least 50 mm. The spacer [3] is 50 mm long and can be used to maintain and check the distances.



- Carefully remove the magnetic plate [1] and spacer [2]
- Observe the distance between the magnetic plates and other magnetic objects

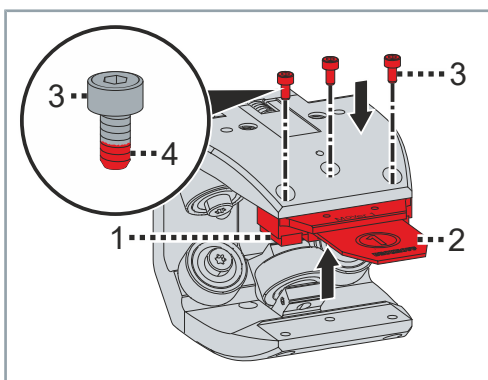
The distance must be at least 50 mm.

## NOTICE

### Use liquid threadlocker

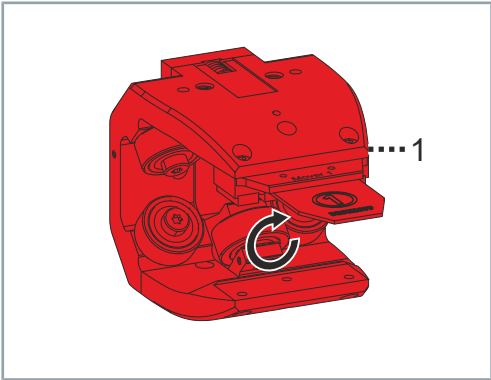
Use liquid threadlocker on the screw thread to fix the magnetic plates to the movers.

*If you do not use liquid threadlocker, the magnetic plates may loosen due to vibration under unusual operating conditions and cause damage to the mover and other components of the XTS.*

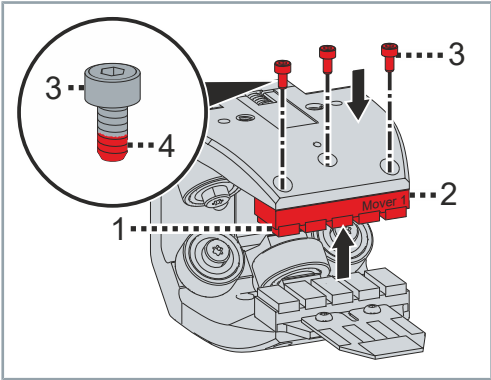


- Insert magnetic plate [1] with encoder flag Mover 1 [2] and secure against falling out
- Screw in screws [3] with liquid threadlocker [4] and tighten
- Observe tightening torques:

Components	Tightening torque [Nm]
Screws, M3 x 6	1.5



- ▶ Rotate mover [1] by 180 degrees



- ▶ Insert magnetic plate *Mover 1* [1] and secure against falling out
- ▶ Make sure that the lettering *Mover 1* [2] is on the outside of the mover
- ▶ Screw in screws [3] with liquid threadlocker [4] and tighten
- ▶ Observe tightening torques:

Components	Tightening torque [Nm]
Screws, M3 x 6	1.5



## 12.7 Replacing the encoder flag

The encoder flags are part of the magnetic plate sets [+] and are included in the following thicknesses:

- 1.0 mm
- 1.2 mm, mounted ex factory on movers *AT901x-x0xx-x550*
- 1.4 mm
- 1.6 mm, mounted ex factory on magnetic plate sets *AT9001-xxxx-1640*
- 1.8 mm

The mounted encoder flag can be replaced with one of the enclosed encoder flags if required.



### Mounting example

The replacement of an encoder flag is described using a mover *AT9014-0070-0550* as an example.

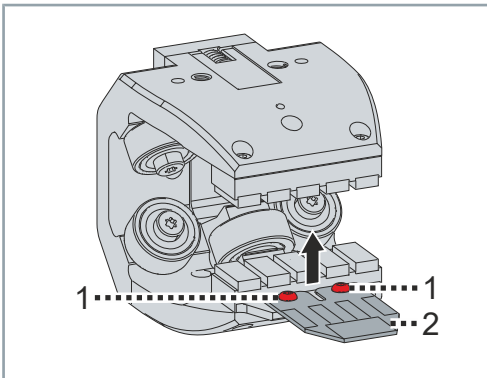
### 12.7.1 Preparation



### Required tools

- Allen key 2 mm

### 12.7.2 Disassembly



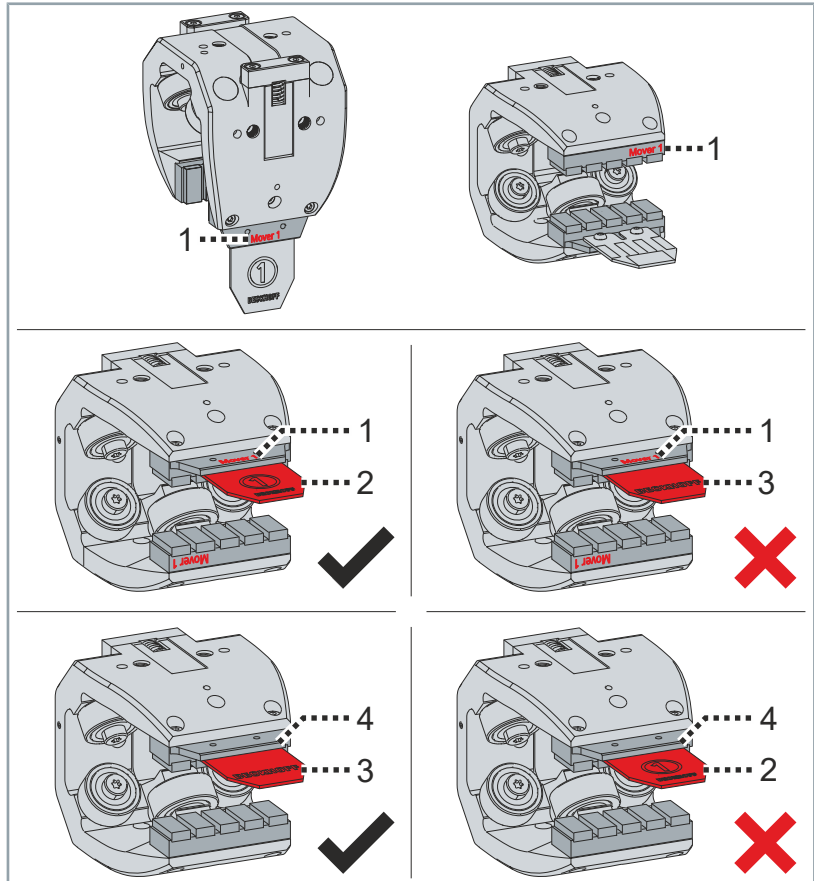
- Remove screws [1]
- Remove encoder flag [2]

## 12.7.3 Mounting

### NOTICE

#### Mounting the correct encoder flag

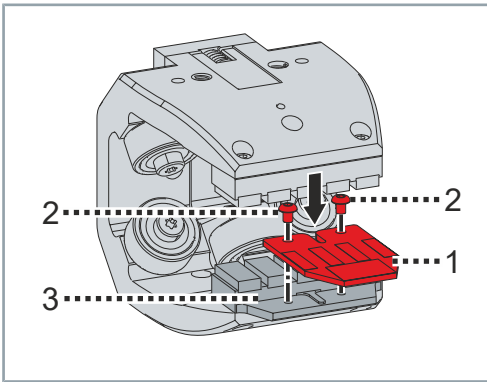
The imprint on the encoder flag makes it easier to identify Mover Standard and Mover 1. When fitting the encoder flag, make sure that you fit the appropriate encoder flag for the relevant magnetic plate set.



Each magnetic plate set Mover 1 has a *Mover 1* [1] engraving on the magnetic plate. When mounting the encoder flag, make sure that the correct encoder flag is mounted on the corresponding magnetic plate.

An encoder flag with *Mover 1* [2] imprint must be mounted on a magnetic plate with *Mover 1* [2] engraving. An encoder flag Mover Standard [3] must not be mounted on a magnetic plate with *Mover 1* [1] engraving.

An encoder flag Mover Standard [3] must be mounted on a magnetic plate Mover Standard [4]. An encoder flag with *Mover 1* [2] imprint must not be installed on a magnetic plate Standard Mover [4].



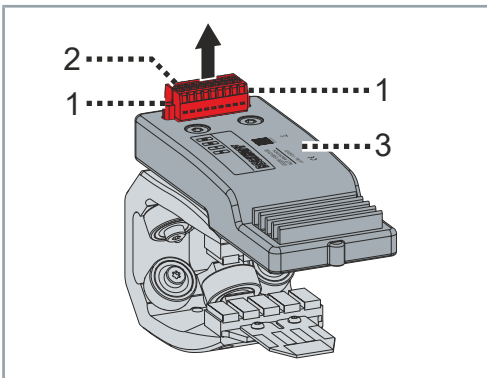
- Screw the encoder flag [1] to the magnetic plate with screws [2]
- Observe tightening torques:

Components	Tightening torque [Nm]
Screws, M3 x 4	0.8

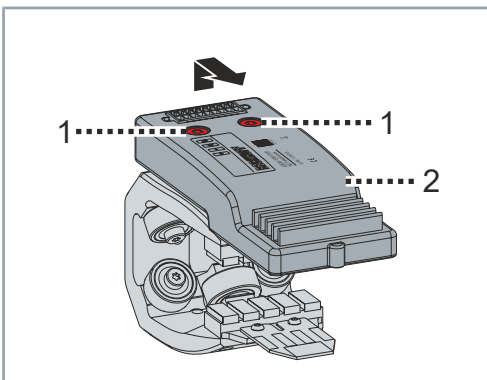
## 12.8 Replacing NCT electronics

Beckhoff recommends removing the NCT electronics from the movers before initial commissioning of the system.

### 12.8.1 Disassembly



- Loosen screws [1] on the connector [2] of the cable bridge
- Pull off the connector of the cable bridge from the NCT electronics [3]



- Remove screws [1]
- Lift and remove the NCT electronics [2] in the area of the connector

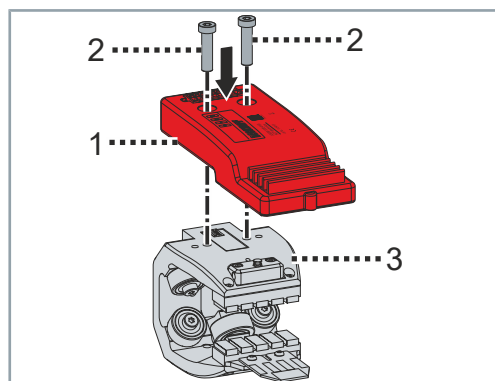
## 12.8.2 Installation

### NOTICE

#### Note mover type

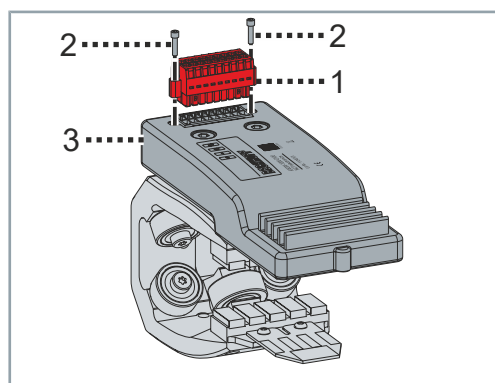
The NCT electronics may only be attached to mover AT9014-1070-x550. All other movers are not suitable for mounting the NCT electronics.

*If you mount the NCT electronics on other movers, damage to movers and modules may result.*



- Tighten the NCT electronics [1] to the mover [3] with screws [2]
- Observe tightening torques:

Components	Tightening torque [Nm]
Screws, M6 x 25	4



- Plug the connector [1] of the cable bridge into the connection strip of the NCT electronics [2]
- Tighten screws [3] on the cable bridge

## 13 Accessories

### 13.1 Cables

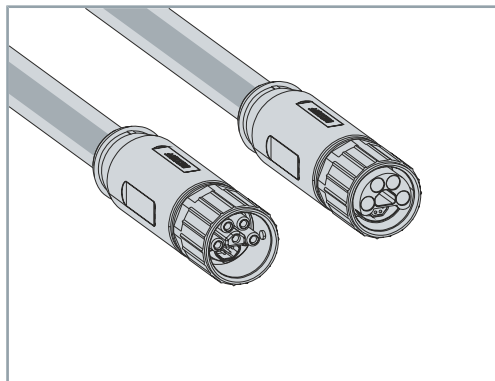
Different cables are available for the motor modules with connectors.



#### Longer power cables possible after consultation

Other cable lengths on request. For the use of longer power cables, please contact the product specialist responsible for your region or Beckhoff Support:

✉ [support@beckhoff.com](mailto:support@beckhoff.com)



#### ZK7A30-3031-Bxxx

The ENP cable for fixed installation is available in different lengths.

**Connector:** B23 to B23, EtherCAT coded

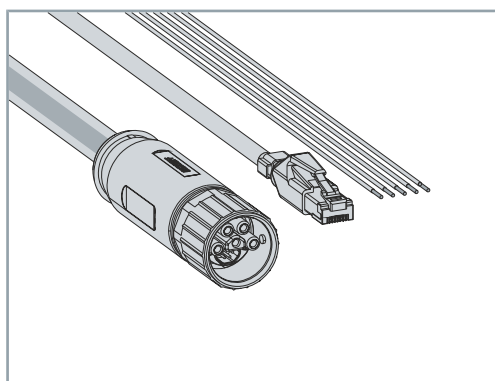
**Bending cycles:** 0.1 million

#### Bxxx – cable length

B005 – 0.5 m

...

B250 – 25 m



#### ZK7A30-3155-Bxxx

The ENP cable for fixed installation is available in different lengths.

**Connector:** B23 EtherCAT coded to RJ45 and open end

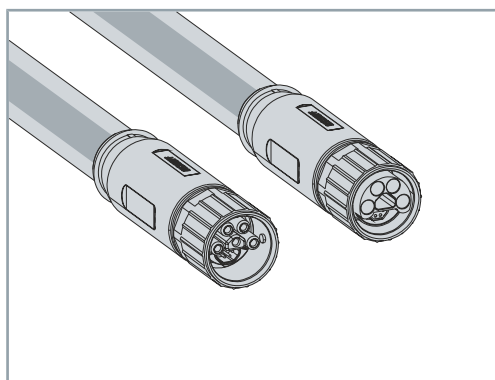
**Bending cycles:** 0.1 million

#### Bxxx – cable length

B010 – 1 m

...

B250 – 25 m



#### ZK7A14-3031-Axxx

The ENP cable suitable for drag chains is available in different lengths.

**Connector:** B23 to B23, EtherCAT coded

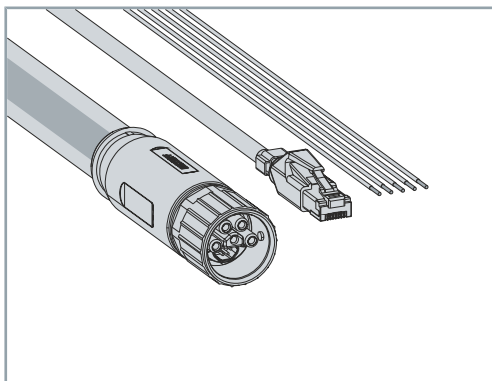
**Bending cycles:** 5 million

#### Axxx – cable length

A010 – 1 m

...

A100 – 10 m



## ZK7A14-3155-Axxx

The ENP cable suitable for drag chains is available in different lengths.

**Connector:** B23 EtherCAT coded to RJ45 and open end

**Bending cycles:** 5 million

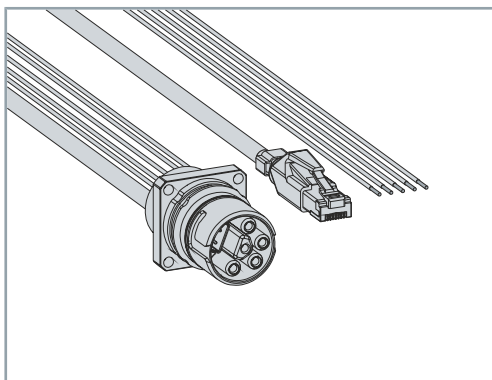
### Axxx – cable length

A010 – 1 m

...

A250 – 25 m

## 13.2 Adapter for cables



## ZK7A30-AS00-Axxx

The ENP cable adapter suitable for drag chains is available in two lengths and is required for connecting the ZK7A30-3031-Bxxx cable to the control cabinet.

**Connector:** B23 square flange EtherCAT coded to RJ45 and open end

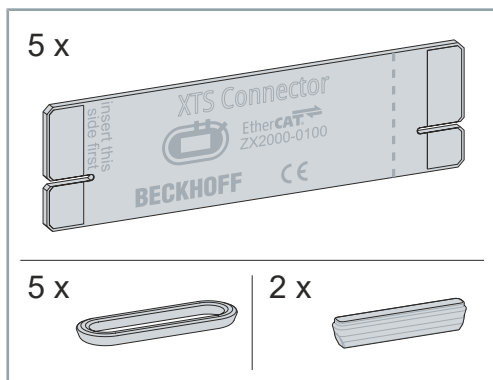
**Bending cycles:** 3 million

### Axxx – cable length

A005 – 0.5 m

A001 – 1 m

## 13.3 Module connector cards



## ZX2000-0100

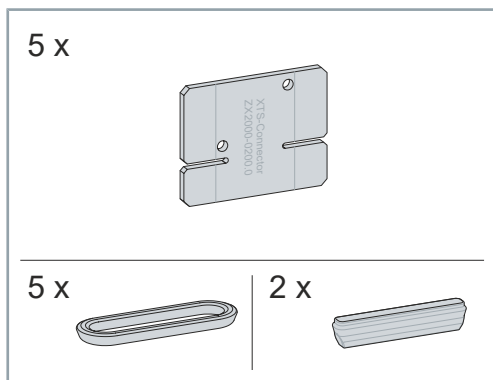
The connector cards and seals are available for exchange or as replacements for modules with a hardware status of 11 or higher. The end plugs are available for the last module of an infeed line.

### Scope of supply

- 5 x connector card ZX2000-0100
- 5 x seals
- 2 x end plug

For modules with a hardware status up to 10, please contact Beckhoff Service:

✉ [service@beckhoff.com](mailto:service@beckhoff.com)



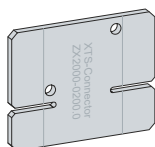
## ZX2000-0110

The connector cards and seals are available for exchange or as replacements for EcoLine modules. The end plugs are available for the last module of an infeed line.

### Scope of supply

- 5 x connector card ZX2000-0200
- 5 x seals
- 2 x end plug

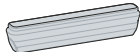
5 x



5 x



2 x



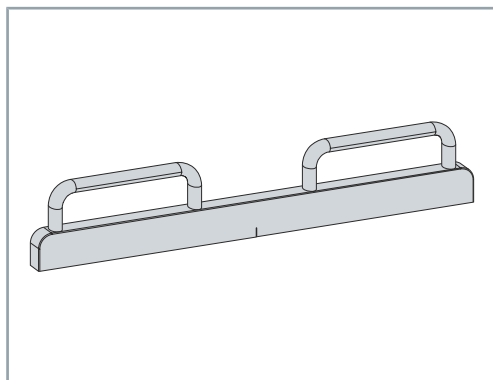
#### ZX2000-0120

The connector cards and seals are available for exchange or as replacements for EcoLine modules. The end plugs are available for the last module of an infeed line.

#### Scope of supply

- 5 x connector card ZX2000-0200
- 5 x seals
- 2 x end plug

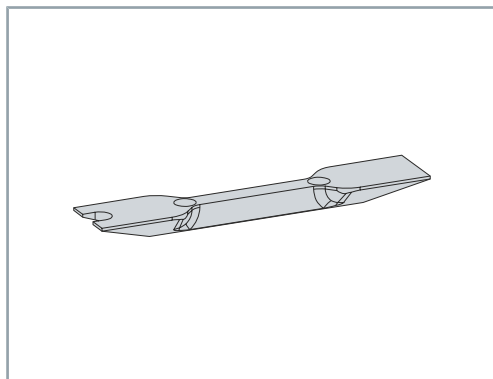
### 13.4 Alignment gauge



#### ZX2000-0500

The alignment gauge is available for aligning straight modules AT200x-0250 with holes for mounting guide rails on the modules.

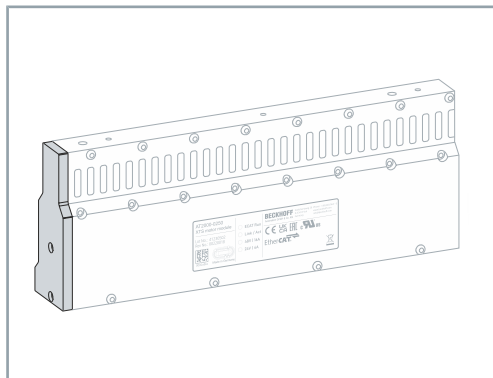
### 13.5 Rail on support



#### ZX9001-0000

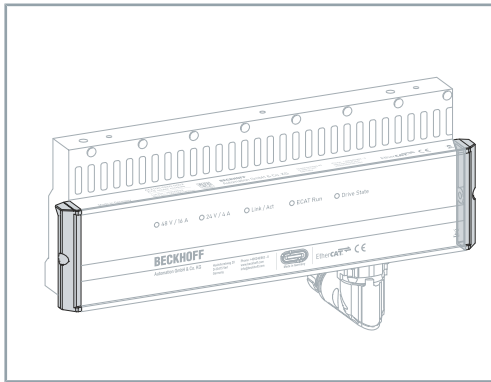
The rail on support is available for mounting the movers on the guide rails.

### 13.6 End caps



#### ZX2000-0000

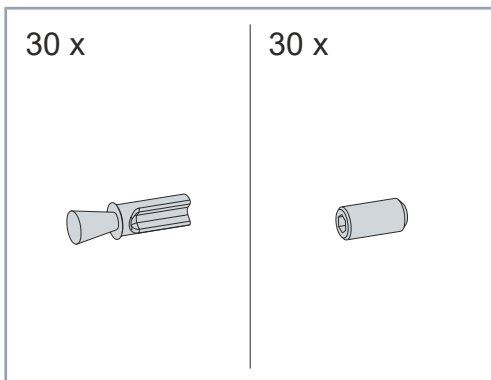
The end cap is available for motor modules.



## ZX2100-0000

The end caps are available for motor modules with integrated NCT functionality.

## 13.7 ESD brushes



## ZX9016-0000

The ESD brushes are available for replacing worn ESD brushes on the mover.

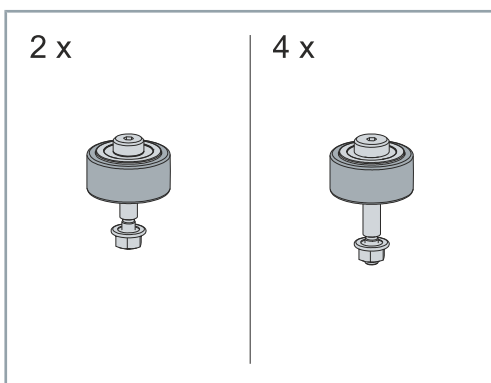
### Scope of supply

- 30 x ESD brushes mover
- 30 x set screw M3 x 6

## 13.8 Roller set

The roller sets are available for replacing worn or damaged guide rollers of the movers. For more information on replacing the guide rollers, see chapter "Maintenance work on the mover", [Page 232].

### 50 mm



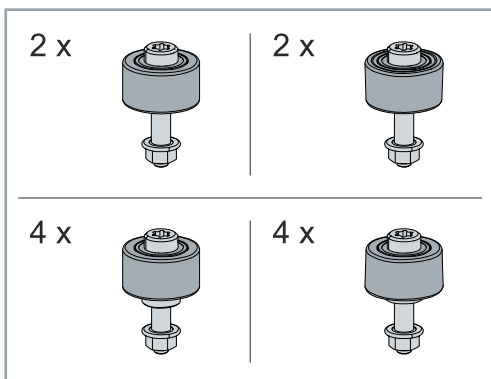
## ZX9011-0050

The roller set is available for the following movers with 6 guide rollers:

- AT9011-0050-0550
- AT9011-0050-1550

### Scope of supply

- 2 x cylindrical roller with short shoulder bolt
- 4 x cylindrical roller with long shoulder bolt
- Adjusting washers and nuts



## ZX9012-0050

The pre-assembled roller set is available for the following movers with 12 guide rollers:

- AT9012-0050-0550
- AT9012-0050-1550

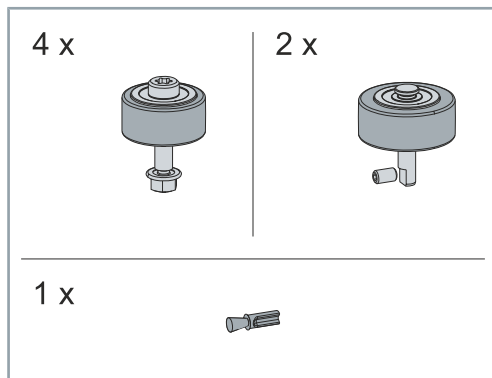
### Scope of supply

- 2 x cylindrical roller
- 2 x conical roller
- 4 x cylindrical roller with spacer ring



- 4 x conical roller with cone to the bolt head
- Shoulder bolts, adjusting washers and nuts

## 55 mm



### ZX9014-0055

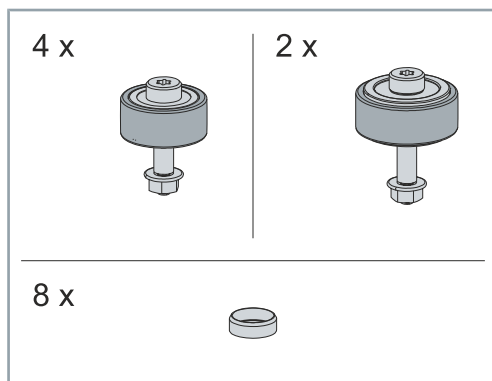
The roller set is available for the following movers with 4 guide rollers and 2 spring-loaded guide rollers:

- AT9014-0055-0550
- AT9014-0055-1550

### Scope of supply

- 2 x cylindrical roller with bearing pin and set screw
- 4 x cylindrical roller with shoulder bolt
- 1 x ESD brush
- Adjusting washers and nuts

## 70 mm



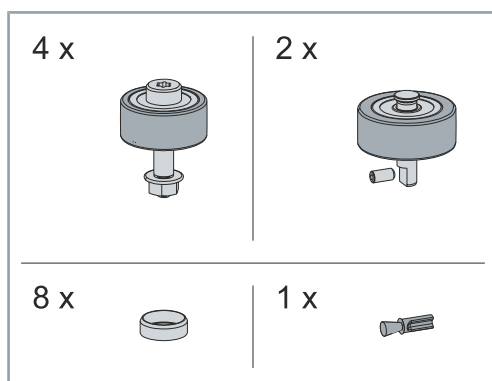
### ZX9011-0070

The roller set is available for the following movers with 6 guide rollers:

- AT9011-0070-0550
- AT9011-0070-1550

### Scope of supply

- 4 x cylindrical roller with short shoulder bolt
- 2 x cylindrical roller with long shoulder bolt
- 8 x sealing plugs
- Adjusting washers and nuts



### ZX9014-0070

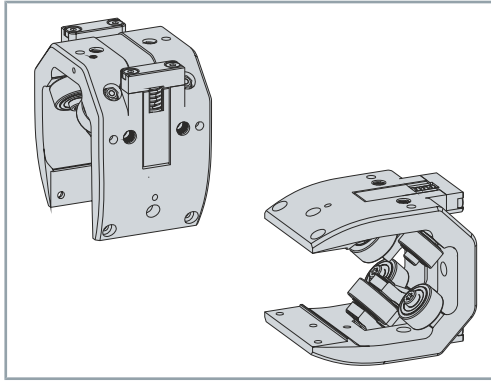
The roller set is available for the following movers with 4 guide rollers and 2 spring-loaded guide rollers:

- AT9014-0070-0550
- AT9014-0070-1550

### Scope of supply

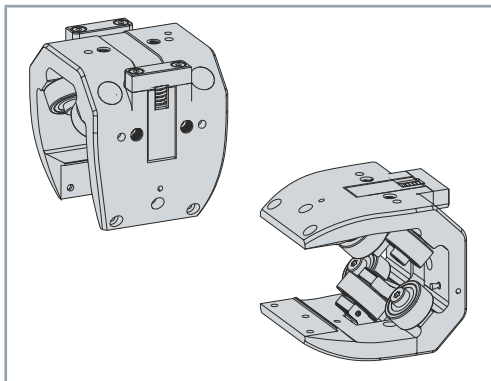
- 4 x cylindrical roller with shoulder bolt
- 2 x cylindrical roller with bearing pin and set screw
- 8 x sealing plugs
- 1 x ESD brush
- Adjusting washers and nuts

## 13.9 Base body with rollers



### ZX9014-0155

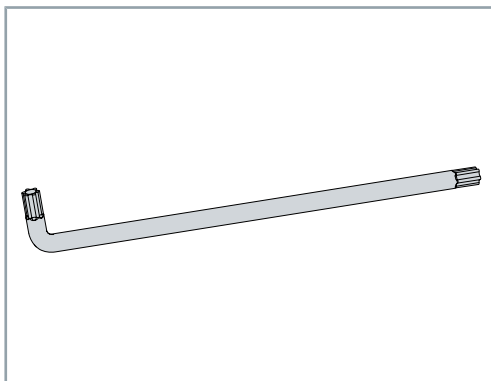
The base body with mounted roller set is available for replacing mover *AT9014-0055* after 60,000 km. The previously used magnetic plate set must be mounted on the base body.



### ZX9014-0170

The base body with mounted roller set is available for replacing mover *AT9014-0070* after 60,000 km. The previously used magnetic plate set must be mounted on the base body.

## 13.10 Torx key T20



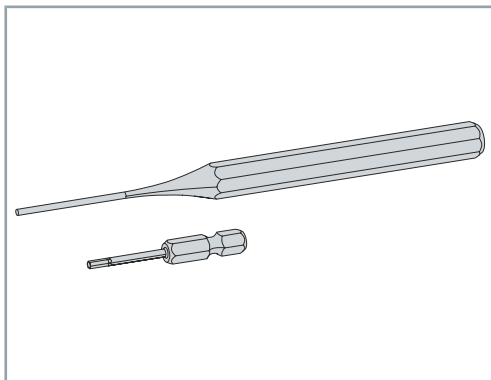
### ZX9017-0000

The Torx key T20 with short section is available for replacing the guide rollers on mover *AT9012-0050-x550*.

#### Suitable for:

- Torx® screws

## 13.11 Tool set for roller replacement on movers AT9014-x0xx



### ZX9017-0001

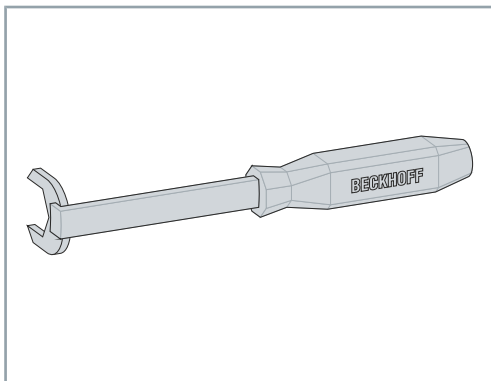
The tool set is available for replacing the rollers on movers with spring-loaded rollers:

- AT9014-0055-x550
- AT9014-0070-x550

#### Scope of supply

- Hexagon bit 1.5 x 50 mm
- Pin punch 150 x 2 mm

### 13.12 Assembly tool for B23 connectors

**ZB8802-0003**

The assembly tool is available for closing the bayonet lock of the B23 connectors.

## 13.13 Magnetic plate set

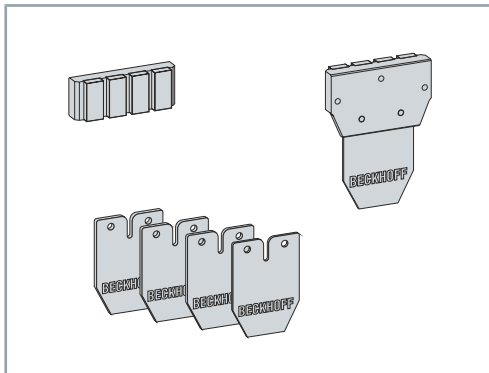
The magnetic plate set for movers and Mover 1 consists of two magnetic plates. A 1.6 mm thick encoder flag is mounted on a magnetic plate.

### Scope of supply

- Magnetic plate
- Magnetic plate, pre-assembled with a 1.6 mm thick encoder flag
- Encoder flags
  - 1.0 mm
  - 1.2 mm
  - 1.4 mm
  - 1.8 mm

Beckhoff recommends using the 1.6 mm thick encoder flag for third-party movers. 1.2 mm thick encoder flags are installed to the Beckhoff mover and Mover 1 ex factory.

### Standard

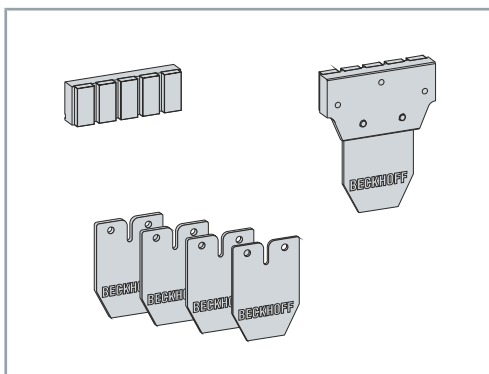


#### AT9001-0450-1640, 4-pin

The magnetic plate set consists of two magnetic plates with four magnets.

The magnetic plate set is available for all Beckhoff movers and third-party movers.

The distance from the center of the mover to the center of the mover is 50 mm.

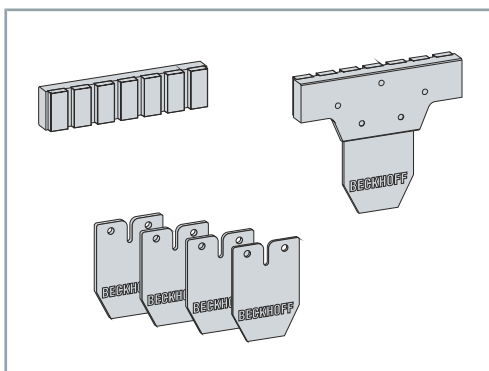


#### AT9001-0050-1640, 5-pin

The magnetic plate set consists of two magnetic plates with five magnets.

The magnetic plate set is available for all Beckhoff movers and third-party movers.

The distance from the center of the mover to the center of the mover is 60 mm.

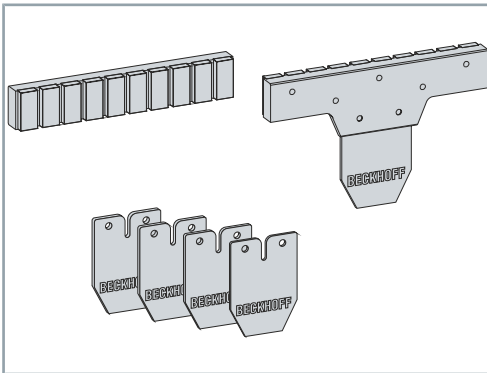


#### AT9001-0775-1640, 7-pin

The magnetic plate set consists of two magnetic plates with seven magnets.

The magnetic plate set is available for third-party movers.

The distance from the center of the mover to the center of the mover is 85 mm.



## **AT9001-0AA0-1640, 10-pin**

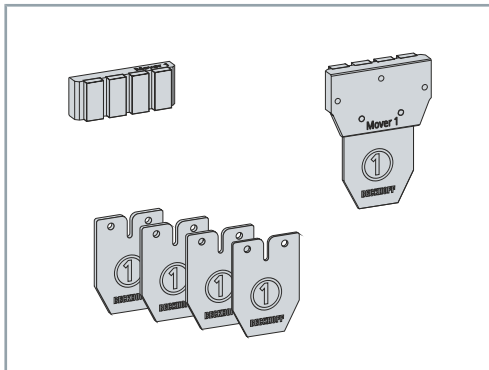
The magnetic plate set consists of two magnetic plates with ten magnets.

The magnetic plate set is available for third-party movers.

The distance from the center of the mover to the center of the mover is 110 mm.

## Mover 1

The special magnetic plate set Mover 1 is identified by an engraving on the set itself and a logo on the encoder flag. The Mover 1 functionality is used for the unambiguous identification of the individual movers.

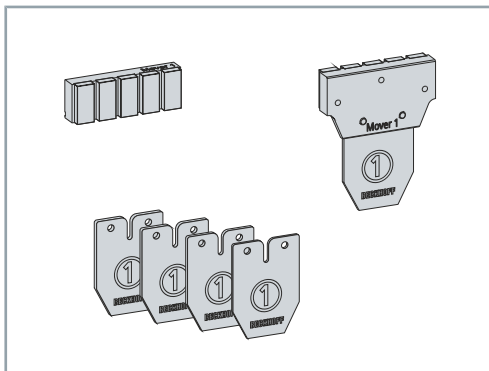


### AT9001-1450-1640, 4-pin

The magnetic plate set Mover 1 consists of two magnetic plates with four magnets.

The magnetic plate set is available for all Beckhoff movers and third-party movers.

The distance from the center of the mover to the center of the mover is 50 mm.

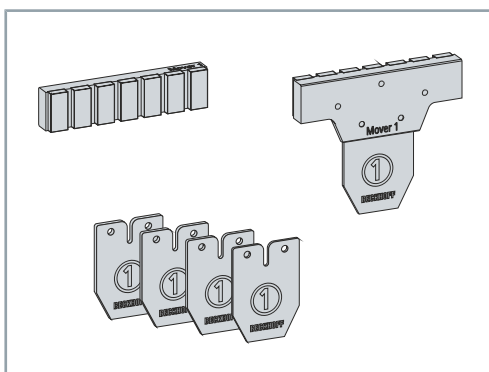


### AT9001-1550-1640, 5-pin

The magnetic plate set Mover 1 consists of two magnetic plates with five magnets.

The magnetic plate set is available for all Beckhoff movers and third-party movers.

The distance from the center of the mover to the center of the mover is 60 mm.

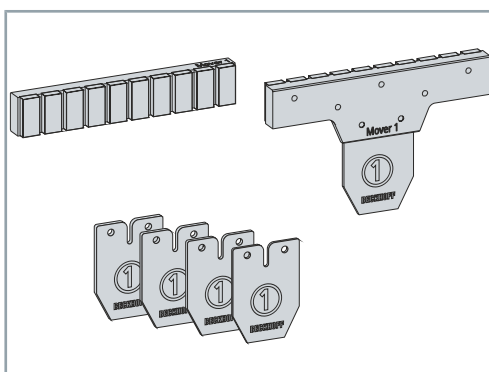


### AT9001-1775-1640, 7-pin

The magnetic plate set Mover 1 consists of two magnetic plates with seven magnets.

The magnetic plate set is available for third-party movers.

The distance from the center of the mover to the center of the mover is 85 mm.



### AT9001-1AA0-1640, 10-pin

The magnetic plate set Mover 1 consists of two magnetic plates with ten magnets.

The magnetic plate set is available for third-party movers.

The distance from the center of the mover to the center of the mover is 110 mm.

## 14 Fault correction

The following tables describe a selection of errors that are displayed either as *warning* or *error* messages. Depending on the application, other causes may be responsible for the fault.

### 14.1 Motor modules

#### Changes from firmware version 15

ID	Up to firmware version 14	From firmware version 15
0x4101	Terminal-Overtemperature	Module overtemperature
0x8109		New from firmware version 15
0x810A		
0x8403		
0x840C	Omitted after firmware version 14	
0x840B	Peak module overall current threshold exceeded	Peak overall current threshold exceeded

#### 14.1.1 Warning

ID	Message	Error	Number of the cause													
0x4101	Module overtemperature	Motor module temperature exceeds 65 °C, see: COE 9000:19...9000:1C	1													
0x4103	Undervoltage control voltage	24 V control voltage lower than 20.4 V	2	3												
0x4411	Undervoltage DC-Link	48 V power supply is lower than 20 V although the movers are not yet enabled	2	3	4											
0x4412	Overvoltage DC-Link	48 V power supply is higher than 56 V although the movers are not yet enabled	2			5										
0x4414	I2T Motor overload	I2T utilization rate of the motor module at over 80 %					6									

## 14.1.2 Error

ID	Message	Error	Number of the cause															
0x8103	Undervoltage control voltage	24 V control voltage lower than 18.8 V		2	3													
0x8104	Module overtemperature	Motor module temperature exceeds 75 °C, see: COE 9000:19...9000:1C	1															
0x8105	PD-Watchdog	Process Data Watchdog: XTS task does not send any new data over three cycles							7									
0x8109	Overvoltage control voltage	24 V control voltage higher than 28.8 V							8									
0x810A	Peak overall backflow power threshold exceeded	Calculated energy recovery power of the motor module is too high								9								
0x8403	ADC Error	ADC error									10							
0x8404	Overcurrent Coil "x"	Current on coil "x" too high										11	12					
0x8406	Undervoltage DC-Link	48 V power supply lower than 20 V		2	3	4												
0x8407	Overvoltage DC-Link	48 V power supply higher than 56 V		2			5											
0x8409	I2T - Motor module overload	Overload of the motor module at 105 % I2T load: 105 % I2T load not reached When 100 % I2T load is reached: Current limited to nominal current						6										
0x840A	Overall current threshold exceeded	Nominal sum current of 16 A for the infeed line exceeded for too long: Short current peaks of up to 48 A possible															13	
0x840B	Peak overall current threshold exceeded	48 A peak current of an infeed line exceeded																14
0x840C	Peak module overall backflow current threshold exceeded	Current at the module sum current measurement point changed too quickly in the recovery direction																14



## 14.1.3 Cause and solution

Number	Cause	Solution
1	Too much power required	Reduce the dynamics of the movers in order to reduce the power consumption
	Insufficient cooling of the system	Use external cooling
	Ambient temperature too high in combination with the two previous points	See preceding points
2	Power supply unit incorrectly adjusted	Adjust the power supply unit settings
3	Too little power in the power supply unit, voltage drop	Use a power supply unit with a higher power rating
	Cables too long	Check and adjust cable lengths
	Circuit breaker tripped	Check circuit breaker
4	Contactor has not switched	Check contactor
5	Feedback energy too high	Use brake chopper terminal
		Use more braking resistors
		Reduce the dynamics of the movers in order to reduce the power consumption
6	Excessive load on individual coils of the motor module	Reduce clock rate
	Excessive acceleration of the movers without corresponding pause times	Reduce the mover dynamics
7	XTS task overflow	Add further XTS task, distribute movers and motor modules to both tasks
	Incorrect Distributed Clock settings	Adjust the Distributed Clocks settings
	No optimum real-time settings	Distribute processor cores and adjust task priorities
	EtherCAT frame disturbed by external influences	Check EtherCAT cable for damage and connect shield properly Check ESD effects
8	48 V supply voltage confused with 24 V control voltage	Check wiring
9	Emergency ramp too steep	Adjust the emergency ramp
		Reduce the dynamics of the movers in order to reduce the power consumption
10	Discharge brushes on the movers defective or missing	Replace the discharge brushes
11	Short-circuit in coil "x" of the motor module	Contact Beckhoff Support
12	Excessively heavy braking on coil "x" of the motor module	Adjust the braking ramp
		Reduce the load weight on the movers
13	Movers on the infeed line require too much power	Reduce mover dynamics
		Move movers with a time offset
		Add additional infeed module
14	Movement of too many movers at the same time with high dynamics	Move movers with a time offset
		Reduce mover dynamics

## 14.2 TcIoXts object

### 14.2.1 Warning

ID	Message	Cause	Number of the solution									
5000	The XTS is designed to run with a cycle time of 250 $\mu$ s. Other cycle times are not supported	Cycle time of the XTS task is not equal to 250 $\mu$ s: A cycle time of 375 $\mu$ s is also possible, but leads to losses of performance	1									
5001	Too few movers are detected. Expected = "x", Detected = "y"	Fewer movers on the XTS than configured in the TcIoXtsDrv object EtherCAT Distributed Clocks settings incorrect Use of wrong teaching data	2		4							
5002	Too many movers are detected. Expected = "x", Detected = "y"	More movers on the XTS than configured in the TcIoXtsDrv object EtherCAT Distributed Clocks settings incorrect Use of wrong teaching data	2		4							
5003	Teaching file "Bezeichnungsstring" ("Designation string") is missing	Teaching file "Designation string" missing		3	4							
5004	Teaching file of XTS module "x" is invalid	Damaged or missing teaching file in the folder: "C:\TwinCAT\3.1\Target\Config\TcIoXts"			4							
5005	Abnormal behavior is detected. All values of XTS module "x" are zero	All values in the teaching file are 0 Teaching file is probably corrupt			4							
5006	Abnormal behavior is detected. All values of XTS module "x" are negative.	All values on the sensor side of the XTS motor module are negative				5						
5007	Abnormal behavior is detected. All values of XTS module "x" are positive.	All values are positive on the sensor side of the XTS motor module				5						
5008	Abnormal behavior is detected. Some values of XTS module "x" are not in the expected range (-400, 400)	Offset values too high with some sensors of the XTS motor module					6					
5009	Is waiting for EtherCAT device "x" to start up.	EtherCAT Master Device "x" not ready to operate, or no connection to the slaves						7				
5010	Mover "x" is frozen at position "y"	EtherCAT connection interrupted, position "y" is at the transition from a motor module to a power supply module Incorrectly order of power supply modules when configuring the XTS							8			

ID	Message	Cause	Number of the solution									
5011	The Mover1 Detection has already been started. Do not start it again.	Mover 1 detection already carried out or restarted during running search: The Mover 1 detection requires a certain time, depending on the number of movers								9		
5012	Wait for Mover Detection before starting MoverIdDetection	MoverID detection started before completion of the standard mover detection									10	
5013	The system is waiting for triggering the MoverIdDetection (via PLC or manually)	Mover 1 function configured in the parameters (Init), but no mover 1 found										11

## 14.2.2 Error

ID	Message	Cause	Number of the solution															
9000	Xts task cannot be accessed. Is the context of the TcloXts driver set correctly?	Context setting in the "TcloXtsDrv" object incorrect				12												
9001	Cycle time "x" us of XTS task is not supported! Set cycle time to 250 us.	The cycle time of the XTS task is not 250 µs: A cycle time of 375 µs is also possible, but results in losses of performance and dynamics	1															
9002	A XTS mover is lost at "y"mm. Please restart TwinCAT to perform a new detection.	Position "y" is at the transition from a motor module to an infeed module: Incorrectly created sequence of infeed modules when configuring the XTS or no response or defect in the motor module at position "y"		8														
9003	The motor terminal "x" with name "y" has an error	Error on motor module "x"				13												
9004	Out of memory. XTS mover count is not supported.	Number of movers in use not supported					14											
9005	TcloXts driver has failed to start up. Please check the configuration and bootdata files!	Driver cannot start						15										
9006	Teaching data is invalid.	The stored teaching file does not match the XTS system Teaching file originates from a different system						16										
9007	Teaching data file "y" is corrupt	The teaching file in the directory "C:\TwinCAT\3.1\Target\Config\TcloXts" is corrupt or missing	4															
9008	Teaching data of XTS module "x" is invalid	Damaged or missing teaching file in the directory: "C:\TwinCAT\3.1\Target\Config\TcloXts" Or motor module "x" not correctly taught	4															
9009	Saving of teaching data "Bezeichnungsstring" has failed	The teaching file "Bezeichnungsstring" ("Designation string") could not be saved on the system							17									
9010	Mover "x" is frozen at position "y" mm	EtherCAT connection interrupted, position "y" is at the transition from a motor module to an infeed module Incorrectly order of infeed modules when configuring the XTS		8														

ID	Message	Cause	Number of the solution											
9011	"..." cannot be loaded. Please check that the installation is correct	Driver cannot start								15				
9012	Mover1 cannot be detected. A general error occurs on mover "x" during the detection process.	Mover 1 detection faulty, no Mover 1 identified										18		
9013	The SoftDrive "x" is not responding. Please check the axis configuration or the SoftDrive version.	SoftDrive incorrectly linked or no suitable version of the SoftDrive driver for the TwinCAT configuration											19	

ID	Message	Cause	Number of the solution											
9014	No Mover1 has been detected! Check if there is a "Mover1" on the system and restart the detection.	No mover with Mover 1 magnetic plate set on the system											20	
9015	Too Many Mover1 has been detected! Make sure that there is only one mover with Mover1 magnet plate set on the System	More than one mover with Mover 1 magnetic plate set on the system											20	
9016	The Axis "x" gets an enable command before "Mover1" has been detected. If there's no Mover1 on the XTS set 'MoverIdDetection-Mode' to 'Standard'	Controller enable for a mover before Mover 1 was found												21
9017	MoverIdDetection was interrupted by changing the 'MoverIdDetection-Mode'	Change of the 'MoverIdDetectionMode' while MoverID detection is running												22

## 14.2.3 Solution

Number	Solution
1	Adjust cycle time If necessary, adjust Base Time
2	Check number of movers on the system. If necessary, adjust the number of mover objects in the TcloXtsDrv object Adjust the Distributed Clocks settings Repeat the teaching if necessary
3	Check whether the "Designation string" file exists on the target system via the path: "C:\TwinCAT\3.1\Target\Config\TcloXts" If there is a teaching file with a different "Bezeichnungsstring" (designation string), adjust the "PermanentDataConfiguration.FileNumber" in the parameters (Init) to the existing designation string
4	Repeat the teaching Check the motor module for valid signals
5	Check the status of the motor module hardware and the installation situation of the motor module: For example, check for the presence of further metallic components close to the sensor side of the motor module
6	Repeat the teaching. Set the parameter "IsAbortOnTeachingWarningsEnabled" in the TcloXts driver to FALSE
7	Check that the EtherCAT cables have been laid properly Check the adapter settings of the CU2508, check whether the EtherCAT cable is connected to the configured port
8	Reconfigure the path with the manager of the TcloXtsDrv object
9	After starting the Mover 1 detection, wait until a TRUE is displayed in the parameters (online) for: • "IsMoverIdDetectionValid" • or "HasMoverIdDetectionError"
10	At the start of the MoverID detection, wait until the following results are achieved in the parameters (online): • "AreAllMoverPositionsValid" = TRUE • "ExpectedMoverCount" = "DetectedMoverCount"
11	Start the Mover 1 detection
12	Check the context setting in the "TcloXtsDrv" object in the TwinCAT configuration
13	Look up the error ID in the "DiagHistory" of the motor module Solution on the basis of the error ID in the "Motor module" table in this chapter
14	Adjust the number of movers or use the Multi Core driver
15	Check the system for corrupt or missing files. If necessary, reinstall the TF5850   TwinCAT 3 XTS
16	Delete the teaching file. Repeat the teaching
17	Check the access rights on the target system Check for administrator rights
18	Check TwinCAT "Error Output Window" for additional "Warnings". These provide you with information about why the Mover 1 detection failed.
19	Check the configuration and version of the SoftDrive driver
20	Check the number of movers with a Mover 1 magnetic plate set. Reduce to one Mover 1 if necessary
21	Start the Mover 1 detection and wait until "IsMoverIdDetectionValid" is TRUE
22	Do not change the "MoverIdDetectionMode" via PLC

## 14.3 SoftDrive object

### 14.3.1 Error

ID	Message	Cause	Number of the solution															
10000	Interpolator Object is missing	Damaged TcSoftDrive configuration within the TwinCAT configuration	1															
10000	PositionCtrl Object is missing	Damaged TcSoftDrive configuration within the TwinCAT configuration	1															
10000	VelocityCtrl Object is missing	Damaged TcSoftDrive configuration within the TwinCAT configuration	1															
10000	Encoder Object is missing	Damaged TcSoftDrive configuration within the TwinCAT configuration	1															
10000	Filter Object is missing	Damaged TcSoftDrive configuration within the TwinCAT configuration	1															
10000	Feedforward Object is missing	Damaged TcSoftDrive configuration within the TwinCAT configuration	1															
10001	Velocity difference too big for emergency ramp down	Triggering of an emergency ramp by TcSoftDrive Difference between the setpoint and actual value of the velocity is more than 250 mm/s	2	3														
10001	Emergency ramp take too long	Emergency ramp triggered by TcSoftDrive requires more time than the time of 0.5 sec configured in the parameter "EmergencyRamp"			4	5												
10002	Velocity following error - check setpoint generation & commutation (actual velocity != command velocity)	Different sign to the setpoint velocity and actual velocity, deviation from one another by more than the velocity of 1000 mm/s set in the parameter "CommutationErrorVelocity"					6	7	8	9								
10003	New mover re-sort while axis is enabled	New mover search activated during the enabling of the axis by the NC control system	2															
10004	New mover 1 detection while axis is enabled	New Mover 1 detection started during the enabling of the axis by the NC control system	2															
10005	HW error occur after mover 1 detection is started	HW error during running Mover 1 detection												10				
10006	Both movements while mover 1 detection do not fit together	Each mover performs two small movements during the Mover 1 detection: These movements must take place in different directions														11	12	
10007	Time out while mover 1 detection is running	No ending of the Mover 1 detection possible within the specified time																13

## 14.3.2 Solution

Number	Solution
1	Check the TcSoftDrive configuration. If necessary, delete the damaged TcSoftDrive object and create a new TcSoftDrive object
2	Check the application program within the PLC project
3	Check the velocity setpoint
4	Check the application program within the PLC project to ascertain the conditions under which the NC control system switches an axis off
5	Check the settings of the parameters "EmergencyRamp" and "EmergencyTimeOut" Factory setting: <ul style="list-style-type: none"> <li>• "EmergencyRamp": 10 m/s<sup>2</sup></li> <li>• "EmergencyTimeOut": 0.5 s</li> </ul>
6	Check whether a Mover 1 magnetic plate exists on the system, but the Mover 1 detection is not set
7	Check whether a mover is mechanically affected, for example by a collision with the tool on another mover
8	Check whether the mover was correctly detected when starting up and that no metallic components are affecting the sensor signal
9	Increase parameter "CommutationErrorVelocity" or switch it off with the value 0
10	Check HW module for errors Check the error ID in the "DiagHistory" of the motor module For the solution based on error ID, see: Motor module table in this chapter
11	Check the position of Mover 1: For example, the mover in a vertical system only moves in one direction inside the curve
12	Mover 1 could be affected by the movement of another mover. Check the parameters of the Mover 1 detection, referring to the Mover 1 documentation.
13	Check the parameters of the Mover 1 detection, referring to the Mover 1 documentation. If necessary, increase each of the following parameters by the same percentage in comparison with the factory settings: <ul style="list-style-type: none"> <li>• DetectionMinMovement</li> <li>• DetectionStandstillVelocityLimit</li> <li>• DetectionStandstillSwitchTime</li> </ul>



## 15 Decommissioning

Disassembly may only be carried out by qualified and trained personnel.

Further information can be found in chapter "Documentation notes", [Page 8].

### 15.1 Disassembly

#### WARNING

##### **Uncontrolled movers can cause serious injuries**

After removing the controller enable or switching off the supply voltage, movers can move in an uncontrolled manner on a vertical path and cause serious injuries to fingers due to crushing and to eyes due to splinters.

- Establish a safe state of the system.
- Make sure that all movers have come to a complete standstill.

#### WARNING

##### **Risk of injury when disassembling the movers**

Permanent magnets are installed in the magnetic plate sets of the movers. Be careful when disassembling the magnetic plate sets. Make sure that the magnetic plate sets do not magnetically attract one another with your hands in-between.

*If you don't take care during the disassembly, opposite magnetic plate sets may attract each other without warning and injure your hands.*



##### **Do not remove components from the products**

Only Beckhoff Automation GmbH & Co. KG is permitted to remove components.

Contact Beckhoff Service for further information.

##### **Removing the components from the machine**

- Remove cables and electrical connections
- Loosen the fixing screws of the guide rails and the modules
- Remove the modules from the machine one after the other
- Transport the components to the workplace or storage place

Further information can be found in chapter "Transport and storage", [Page 141].

## 15.2 Disposal

The components used must be disposed of properly, in accordance with regulations and, if possible, sorted according to the country-specific and locally applicable guidelines and regulations.

### **Batteries and rechargeable batteries**

Batteries and rechargeable batteries must be separated from waste. You are legally obliged to return used batteries and rechargeable batteries within the EU. Observe the relevant provisions outside the area of validity of the EU Directive *2006/66/EC*. Batteries and rechargeable batteries may also be marked with the crossed-out trash can symbol.



### **Electrical and electronic appliances**

Products marked with a crossed-out waste bin must not be disposed of with general waste. The device is considered waste electrical and electronic equipment when it is disposed of. The national regulations for the disposal of waste electrical and electronic equipment must be complied with.

## **Trademark statements**

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