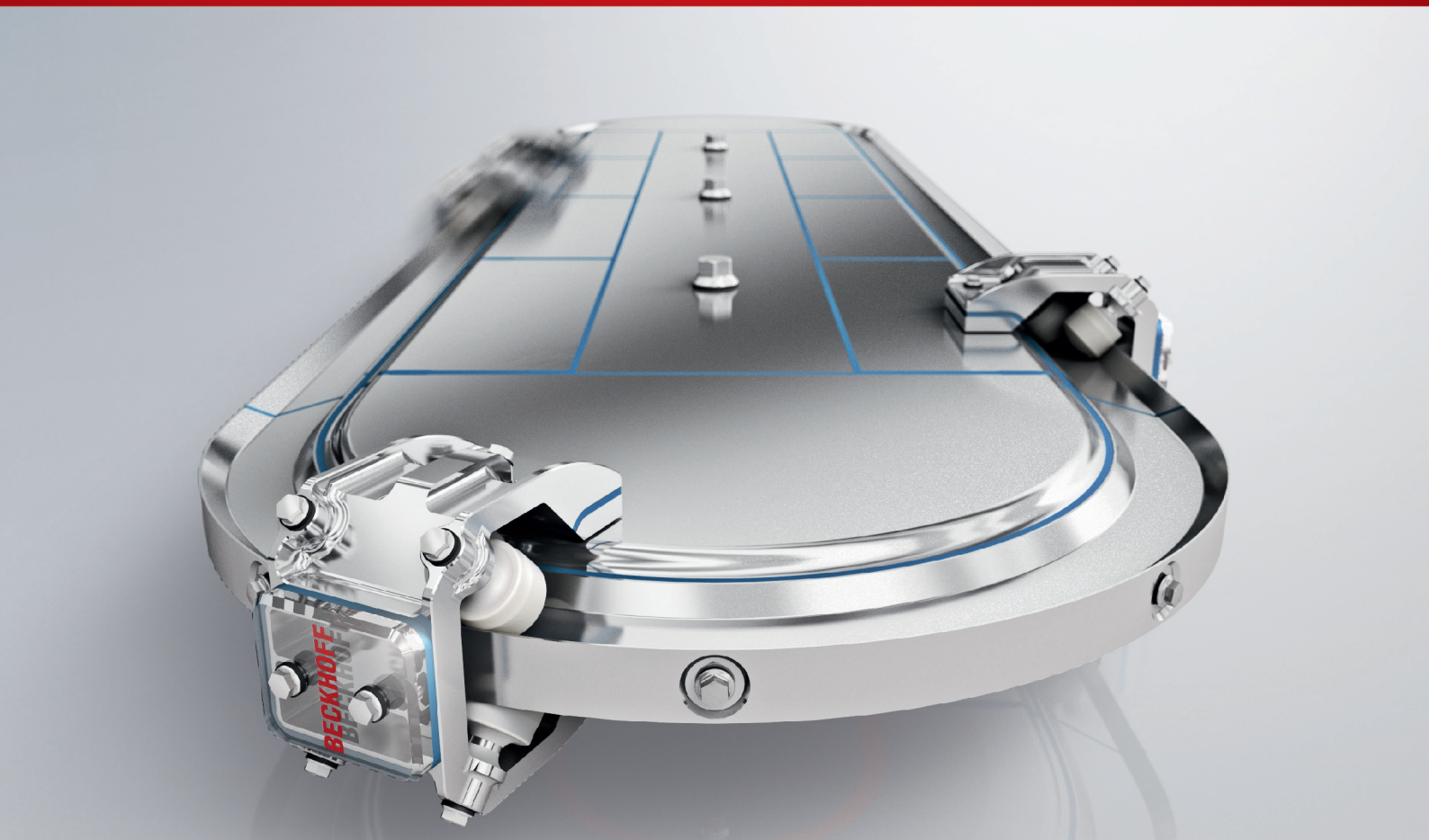
BECKHOFF New Automation Technology

Operating Instructions | EN

XTS Hygienic

eXtended Transport System



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- EP1590927
- EP1789857
- EP1456722
- EP2137893
- DE102015105702

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All components in this product as described in the operating instructions are delivered in a specific configuration of hardware and software, depending on the application regulations. 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 observe these operating instructions
- Improper use
- Use of untrained personnel
- Use of unauthorized spare parts

Copyright

Version numbers

Provision of revision levels
On request, you can obtain a list of revision levels for changes in the operating instructions.

- Send your request to: motion-documentation@beckhoff.de

Origin of the document
These operating instructions were originally written in German. All other languages are derived from the German original.

Product features
Only the product properties specified in the current operating instructions are valid. Further information given on the product pages of the Beckhoff homepage, in emails or in other publications is not authoritative.

Scope of the documentation

Apart from these operating instructions, the following documents are part of the overall documentation:

XTS Hygienic	Definition
Translation of the original instructions (this documentation)	Description of the mechanical and electrical parameters as well as all necessary information for the use of the XTS Hygienic

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

Safety and instruction

Read the contents that refer to the activities you have to perform with the product. Always read the chapter For your safety in the operating instructions. Observe the warning notes in the chapters so that you can handle and work properly and safely with the product.

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 bracket 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 observe will result in serious or fatal injuries.

⚠ WARNING

Failure to observe may result in serious or fatal injuries.

⚠ CAUTION

Failure to observe may result in minor or moderate injuries.

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

- Malfunctions of the product
- Damage to the product
- Damage to the environment

Information
This sign indicates information, tips and notes for dealing with the product or the software.

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

QR-Codes
This symbol shows a QR code, via which you can watch videos or animations. Internet access is required in order to use it.

You can read the QR code, for example, with the camera of your smartphone or tablet. If your camera doesn't support this function you can download a free QR code reader app for your smartphone. Use the Appstore for Apple operating systems or the Google Play Store for Android operating systems.

If you cannot read the QR code on paper, make sure that the lighting is adequate and reduce the distance between the reading device and the paper. In the case of documentation on a monitor screen, use the zoom function to enlarge the QR code and reduce the distance.

Beckhoff Services

Beckhoff and the worldwide partner companies offer comprehensive support and service.

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The Beckhoff Support offers technical advice on the use of individual Beckhoff products and system planning. The employees support you in the programming and commissioning of complex automation systems.

Our support engineers provide competent support whether the customer has general questions or needs help with a specific installation. By creating sample programs or running diagnostics for troubleshooting, we stand ready with technical advice in both the pre-sales and post-sales phases – over the phone, via e-mail or remote access.

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Mail:	support@beckhoff.com
Web:	www.beckhoff.com/en-en/support/our-support-services/

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Our download finder contains all the files that we offer you for downloading: from our application reports and technical documents to the configuration files. The downloads are available in various formats.

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A detailed overview of our worldwide locations is available at global presence.

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.

General safety instructions

This chapter provides you with instructions on safety when handling the product. This product is not capable of stand-alone operation and is therefore categorized as an incomplete machine. The product must be installed in a machine or plant by the machine manufacturer. Read the documentation prepared by the machine manufacturer.

Before operation

Danger from magnetic fields

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

- people fitted with cardiac pacemakers
- persons 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 immediate environment clean

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

Shut down and secure the machine or plant

Shut down the machine or plant. Secure the machine or plant against being inadvertently started up.

Do not use damaged components
Adhere to the specifications from the technical data for storage, transport and operation. Do not use damaged components.

Risk of injury when handling cutting tools
You can sustain cutting or puncturing injuries through careless working with cutting tools.

Ensure safe working. Wear protective gloves if necessary.

Risk of injury when handling adhesives
Adhesive can irritate the eyes, the respiratory organs and the skin. Do not inhale the vapor. Avoid contact of the adhesive with the eyes and skin. If adhesive should get into your eyes, immediately rinse out your eyes thoroughly with water and consult a doctor.

Refer to the manufacturer's documentation when handling adhesives. Wear protective gloves and safety glasses if necessary.

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

Observe tightening torques
Mount and repeatedly check connections and components, complying with the prescribed tightening torques.

Correctly ground electrical components or modules
Avoid electric shocks due to improper grounding of electrical components or modules. Ground all conductive components according to the specifications in the chapters "Electrical Installation" and "Mechanical Installation".

Use the original packaging only
When shipping, transporting, storing and packing, use the original packaging or non-conductive materials.

During operation

Observe the earthing concept
Special conditions need to be observed for the earthing of the XTS. In every case, read the chapter: "Earthing of the supply".

Do not work on live electrical parts
Ensure that the protective conductor is connected properly. 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 the cooling of the surfaces with a thermometer. Do not touch the components during and immediately after operation. Allow the components to cool sufficiently after switching off.

Avoid overheating

Operate the components according to the technical specifications. Refer here to the chapter: "Technical data". Provide for sufficient cooling. Switch the components off immediately if the temperature is too high.

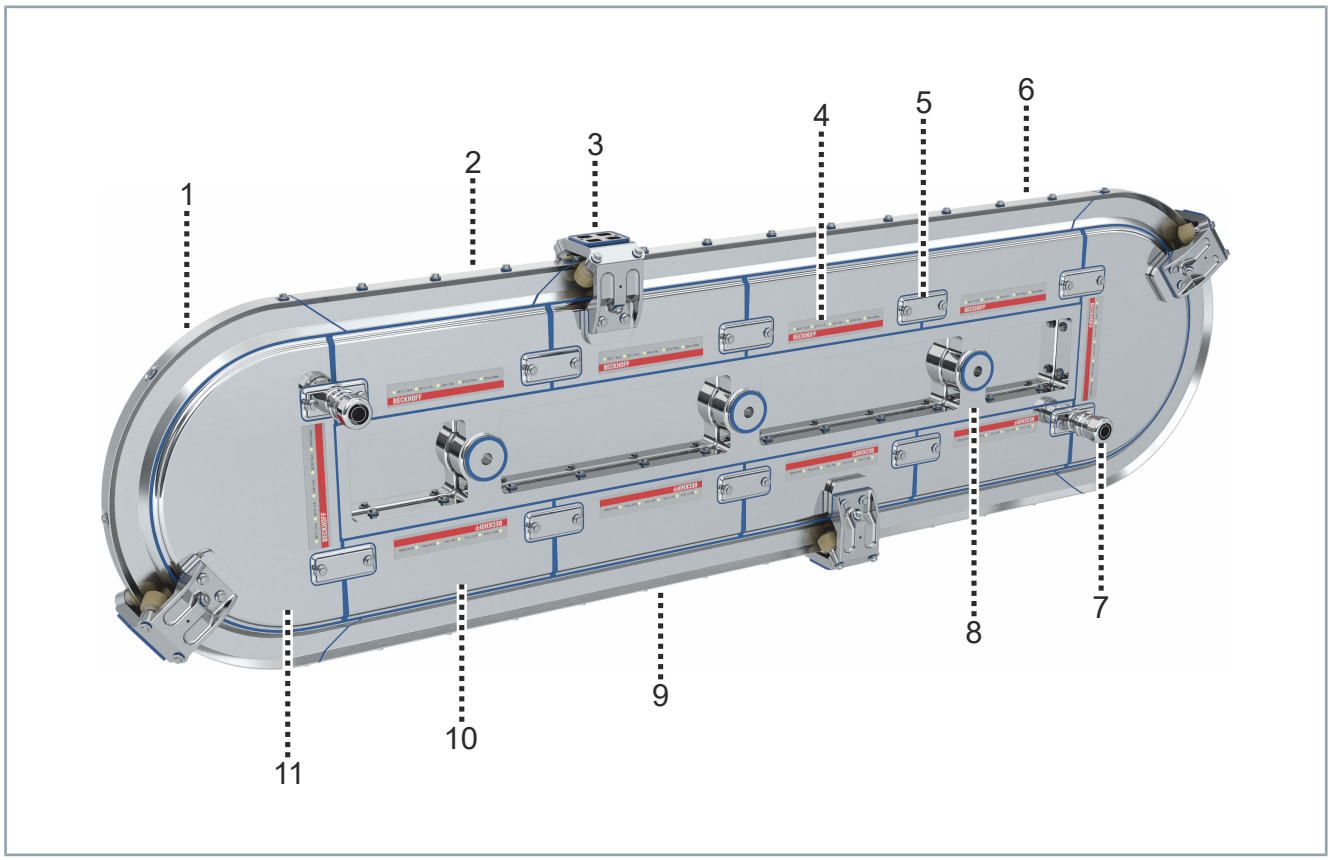
Do not touch any moving or rotating components

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

After operation

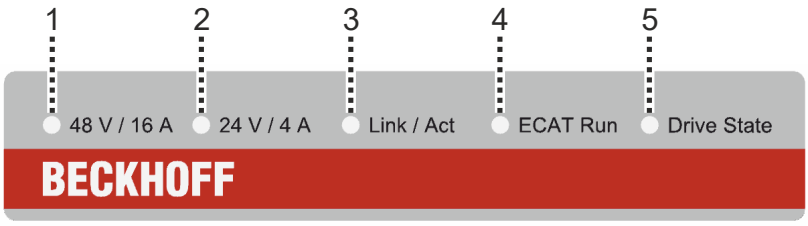
De-energize and switch off components before working on them

Check the functionality of all safety-relevant devices. Secure the working environment. Secure the machine or plant against being inadvertently started up. Observe the chapter: "Decommissioning".



Number	Explanation
1	Curved rail
2	Lock
3	Mover
4	LED status display
5	Cover with connection card
6	Straight guide rail with lock
7	Cover with supply
8	Machine bed
9	Straight guide rail without lock
10	Straight module
11	Curved module

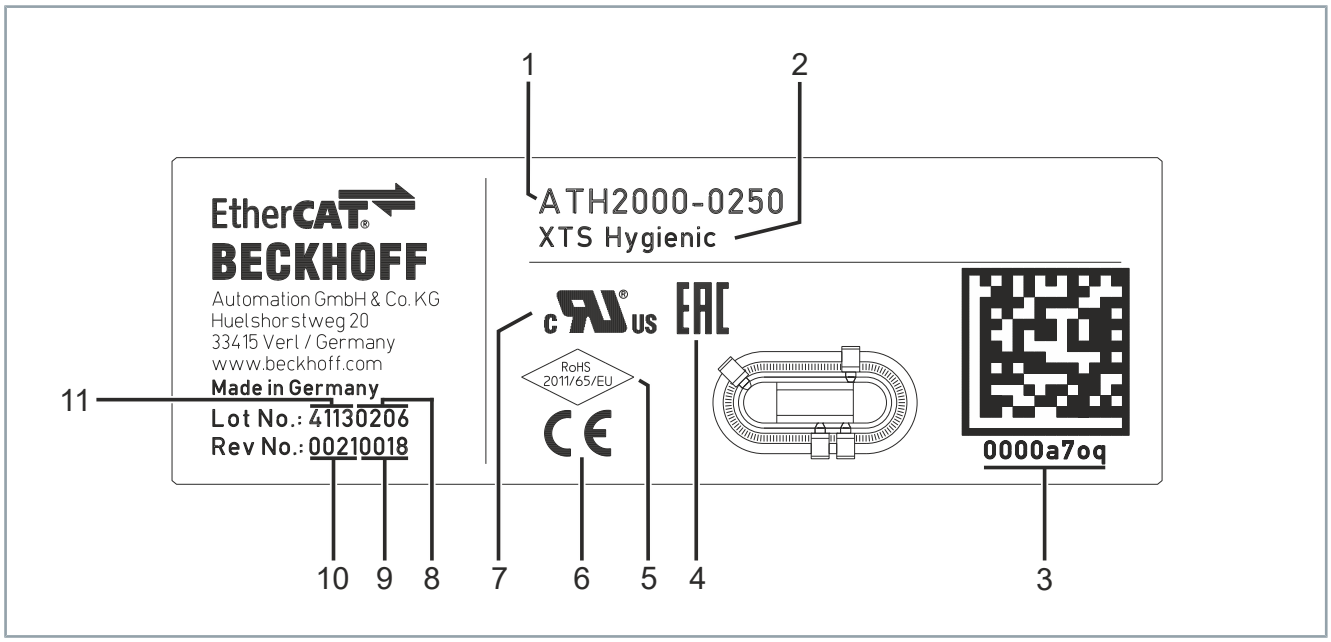
LED status display



Number	Explanation
1	48 V | 16 A power supply status LED
2	24 V | 4 A power supply status LED
3	Link / Act status LED
4	EtherCAT status LED
5	Drive State status LED

Name plate

The name plate is located on the system side opposite the LED status display.



Number	Explanation
1	Product designation
2	Series
3	Serial number
4	EAC conformity
5	RoHS conformity
6	CE conformity
7	cURus approval
8	Firmware and hardware revision
9	XML sensor PCB revision number
10	XML motor PCB revision number
11	Date of manufacture - week/year

Type key

Module

ATH 20xx – xxxx – 000x	Explanation
AT	Product line AT = drive technology
H	Series H = Hygienic Design
20	Product type 20 = module
xx	Module variants 00 = straight 01 = straight with supply 50 = 180° curve, clothoid 51 = 180° curve, clothoid with supply
xxxx	Product length Module length in mm
000x	Execution 2 = modules with rail support cover The ordering detail is not extended with standard modules.

Mover

ATH 901x – 0075 – x550	Explanation
AT	Product line AT = drive technology
H	Series H = Hygienic Design
90	Product type 90 = mover
1x	Housing variants 11 = stainless steel mover, 6 rollers 13 = aluminum mover, 6 rollers
0075	Product length Mover length in mm 75 = 75 mm
x	Magnetic plate set 0 = Standard 1 = mover 1

Guide rail

ATH 9xxx – xxxx – 0075	Explanation
AT	Product line AT = drive technology
H	Series H = Hygienic Design
9x	Product type 0 = without lock 1 = with lock 2 = connector for straight rails
xx	Rail variants 00 = straight 50 = 180° curve, clothoid
xxxx	Product length Rail length in mm
0075	The ordering detail is extended by the mover length for the 180° curve, clothoid.

Product characteristics

Hygienic design
With the help of the gap-free and dead space-free sealing of the fully encapsulated transport system, all requirements for Hygienic Design and the protection classes IP65, IP66 and IP69K are fulfilled. All surfaces are resistant to chemicals and easy to clean.

Permanent magnets
The permanent magnets are made of a hard magnetic material and can develop large forces even in small designs. Due to the permanent magnets, the movers can position themselves precisely and highly dynamically.

Scalable travel path
The number of installed modules is variable. You can adapt the length of the travel path to suit every application.

Mover variants
There is a choice of two materials for the housing of the movers:

- stainless steel
- or aluminum

Armature short circuit brake
In case of an emergency stop, the movers are automatically decelerated by an armature short-circuit brake.

Integrated power electronics
The entire power electronics is integrated in the modules. You can use every module as a power supply. For the supply you need a 24 V control voltage and a 48 V load voltage.

Software-based control
The XTS Hygienic is controlled by a software-based cascade controller. The control loop structure is stored in the XTS drivers and is calculated cyclically on the control IPC. You do not need any additional drive software.

Programming according to IEC61131-3
The standardized "Motion Control function blocks" according to the PLC Open standard IEC61131-3 are available for the programming of the XTS Hygienic.

Components

A complete XTS Hygienic system consists of:

- Motor modules
- Guide rails
- Movers

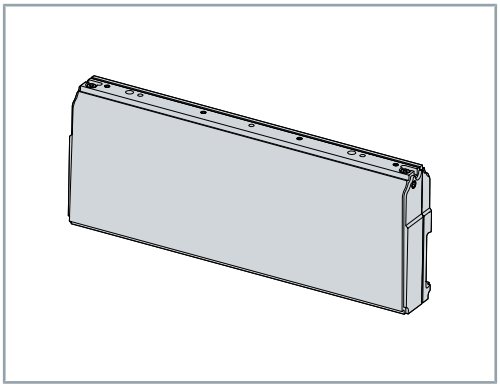
The individual components are defined via the type key and can be ordered separately or preconfigured as a complete system.

Motor modules

A system consists of individual motor modules that can be combined to form a complete drivetrain. The following modules are available for the XTS Hygienic:

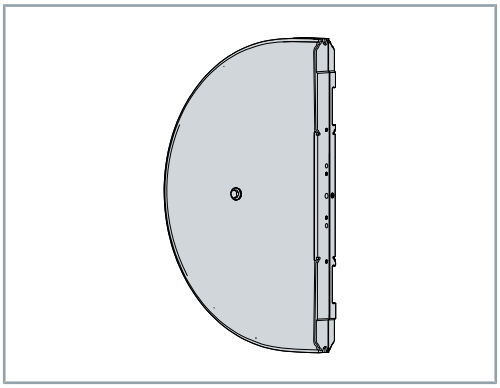
- Straight modules
- Curved modules

Straight motor module



The straight motor module is 250 mm long and is available both with and without power supply.

Curved module

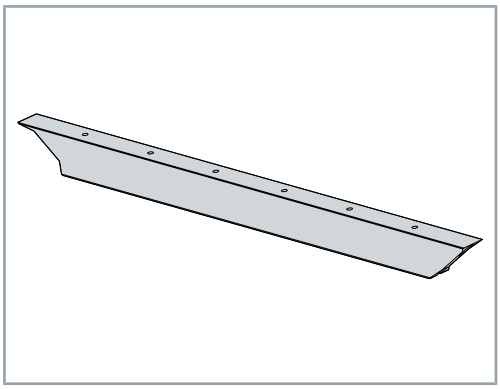


The curved module is available as a 180° clothoid both with and without supply.

Guide rails

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

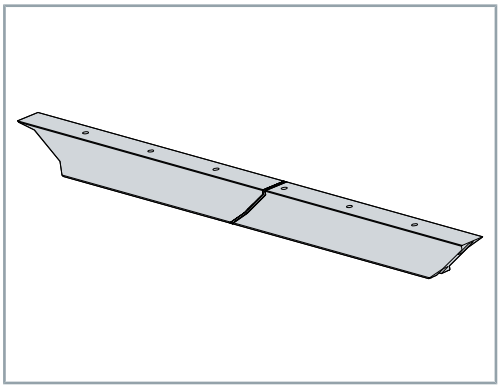
Straight guide rails



Without lock

Straight guide rails are available in the following lengths without lock cover:

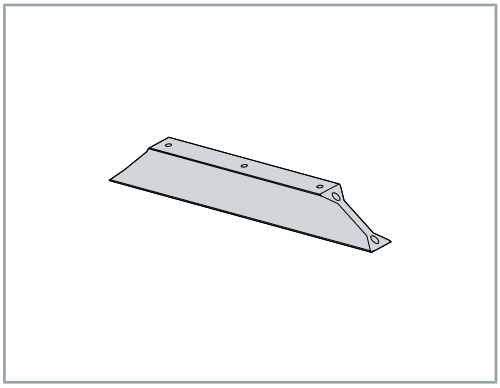
Available lengths	
250 mm	1000 mm
500 mm	1500 mm
750 mm	2000 mm



With lock

Straight guide rails are available in the following lengths with lock cover:

Available lengths	
500 mm	2000 mm
1000 mm	

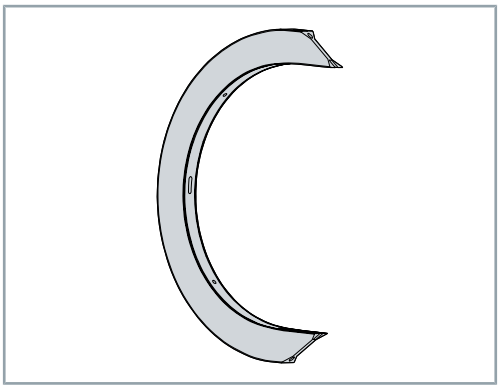


Connector

Connectors for guide rails are available in the following lengths:

Available lengths	
250 mm	2000 mm
1000 mm	

Curved rail



180° clothoid

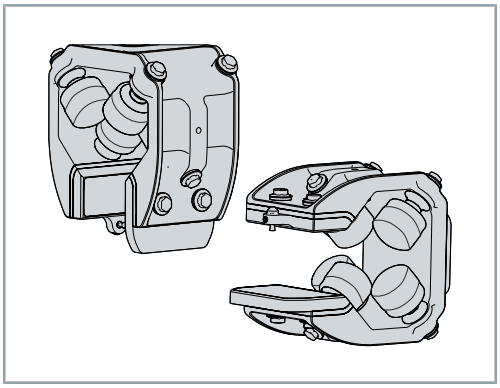
The clothoid is available to suit the 180° curved module.

Mover

The movers are available in the following versions:

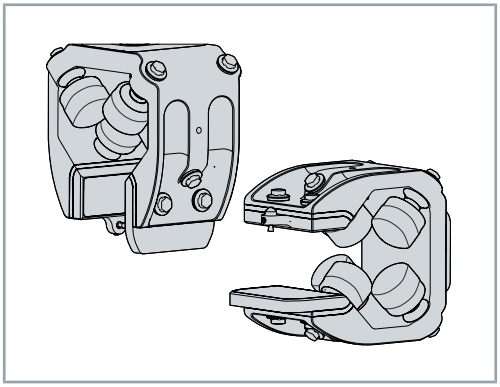
- stainless steel
- or aluminum

Stainless steel



The stainless steel mover is 75 mm long, has 6 rollers and is mounted with a magnetic plate set.

Aluminum



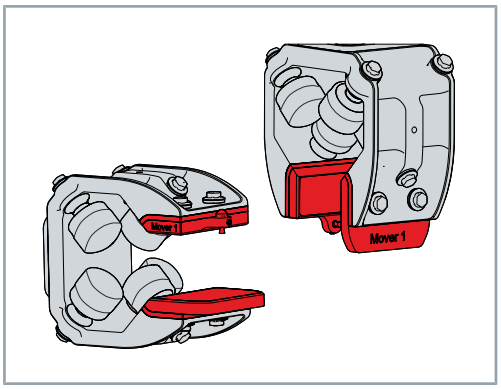
The aluminum mover is 75 mm long, has 6 rollers and is mounted with a magnetic plate set.

Ordering options

Ordering options are defined via the type key. The listed components cannot be retrofitted.

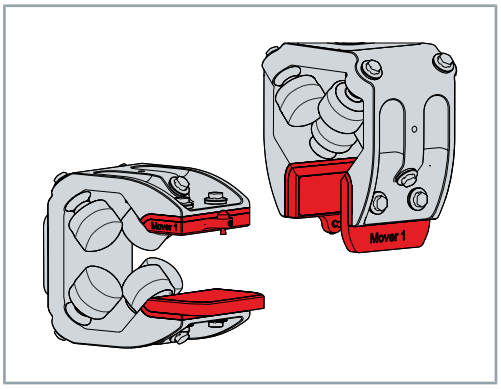
Mover 1

Stainless steel



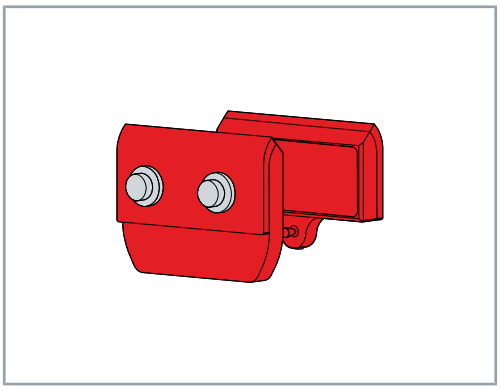
The stainless steel mover with the Mover 1 magnetic plate set is available as a 75 mm mover with 6 guide rollers.

Aluminum

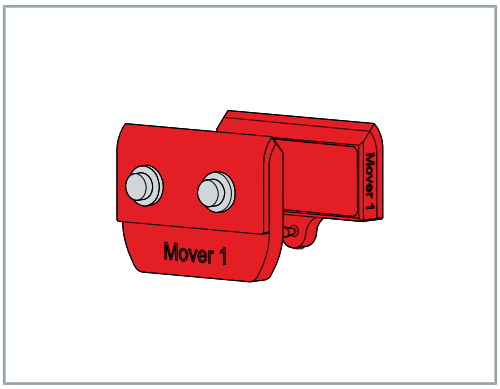


The aluminum mover with the Mover 1 magnetic plate set is available as a 75 mm mover with 6 guide rollers.

Magnetic plate sets



The magnetic plate set is available for Beckhoff 75 mm movers are well as for third-party movers.



The Mover 1 magnetic plate set is available for Beckhoff 75 mm movers are well as for third-party movers.

Intended use

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

The components are to be installed in electrical systems or machines and only 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

Improper use

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

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

- in ATEX zones without a suitable housing

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

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

Definition

All details relate to an ambient temperature of 40 °C. The data can have a tolerance of +/- 10%.

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 in N the mover generates with a certain mover current.

The equation is $F_0 = I_{0Mover} \times K_F$

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 tTH [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 (3σ) 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.

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 Hygienic only under the specified environmental conditions

Operate the Beckhoff XTS Hygienic 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.

Environmental requirements	
Ambient temperature, operation	-10 to +40 °C
Ambient temperature, transport and storage	-25 to +85 °C

Specifications for intended use	
Protection class	IP65 / IP66 / IP69K
Vibration resistance	conforms to EN 60068-2-6
EMC requirements	conforms to EN61000-6-2 / EN61000-6-4
Approvals	CE

XTS Hygienic

Electrical data		
Control voltage [V_{DC}]	24	
Power supply [V_{DC}]	48	
Current consumption - power supply nominal current [A]	16	
Power consumption control voltage module [W/m]	20	
Maximum segment length per power supply module [m]	≤ 3	
At a constant velocity [m/s]	2	4
Power consumption per mover, 48 VDC [W]	90	180
At peak acceleration [m/s2] and mass of 1 kg	10	50
Power consumption per mover, 48 VDC [W]	90	400

Mechanical data				
Mover	**ATH9011-0075-0550**		**ATH9013-0075-0550**	
Length [mm]	75		75	
Number of rollers	6		6	
Weight without magnetic plate set [g]	830		550	
Weight, assembled with magnetic plate set AT9001-0550 [g]	1,060		780	
Weight of magnetic plate set ATH9001-0550 [g]	230		230	
Modules	**ATH20xx**			
	00-0250	**01-0250**	**50-0500**	**51-0500**
Height [mm]	96	96	198	198
Depth [mm]	250	250	315	315
Weight without attachments [kg]	4.0	5.4	8	9.4
Width on the machine bed [mm]	34	34	34	34
Upper width on the motor / guide [mm]	22	22	22	22
Protection class				
Closed system	IP65 / IP66 / IP69K			
Material				
Housing	Stainless steel 1.4404 AISI 316L, Ra < 0.8 µm			
Seals	VMQ silicone			

System properties	
Maximum force at standstill [N] *Dependent on the air gap between stator and drive magnet*	90
Force constant K_F at standstill [N/A]	7.5
Maximum force at 2 m/s [N]	75
Velocity at 48 V_{DC} [m/s]	4
Acceleration without payload [m/s^2]	≥ 75
Nominal force F_0 [N]	30
Winding resistance of a phase R_{20} [Ω]	0.78
Synchronization accuracy at 1.5 m/s within a straight module [mm] *Dependent on the mechanical rigidity and applied load on the mover*	≤± 0.15
Absolute accuracy within a straight module [mm] *Can be exceeded in the case of high thermal warming of the module or lack of parallelism / orthogonality of the encoder magnet to the module*	≤± 0.25
Unidirectional repeatability at standstill [mm] *Can be exceeded in the case of large temperature differences of the module*	≤± 0.01

Dimensional drawings

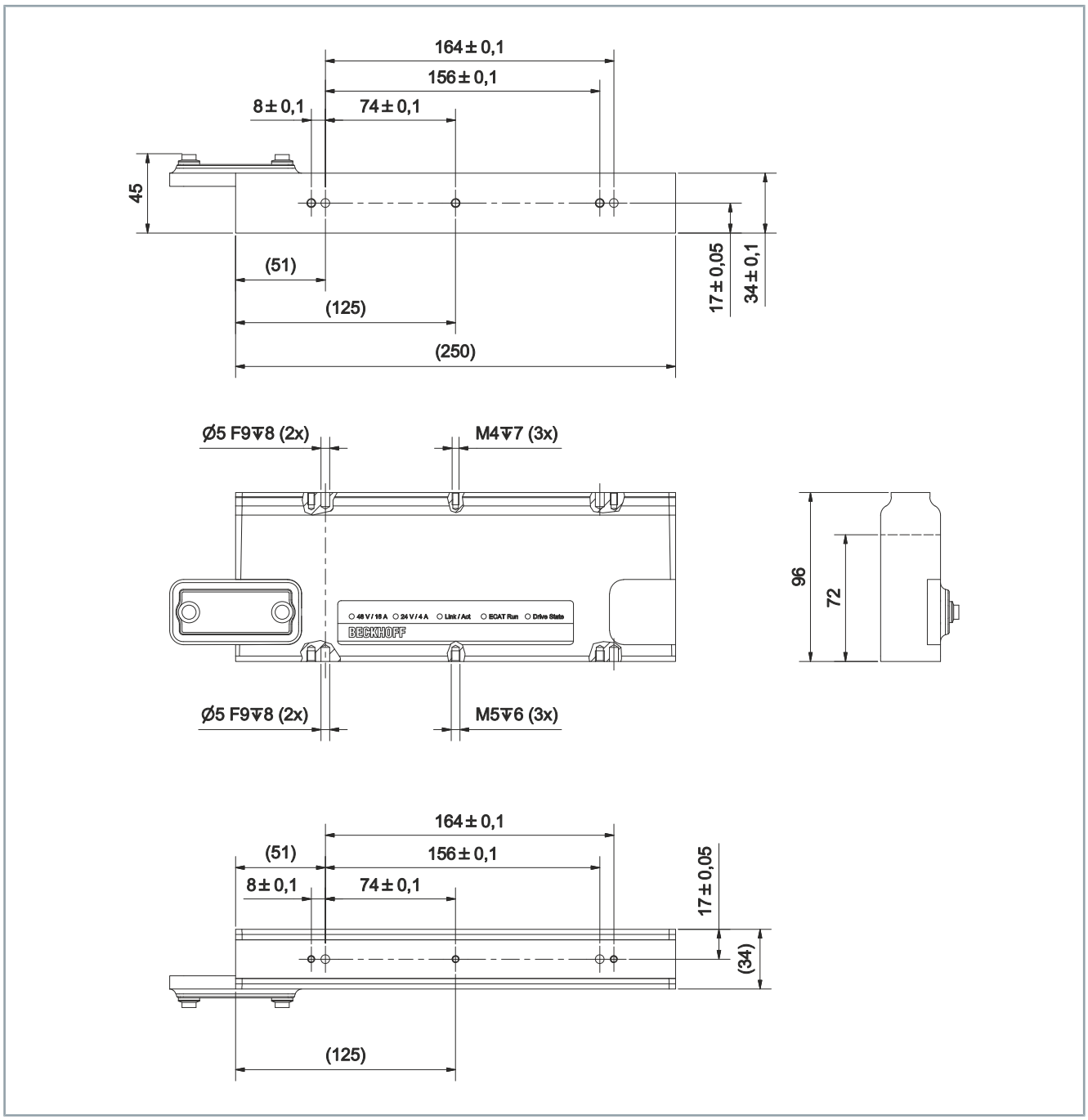
Dimensional drawings and 3D models online
You have the option to download the dimensional drawings and 3D models of the individual components from the Beckhoff website: www.beckhoff.de/download

Modules

ATH2000-0250

Straight module

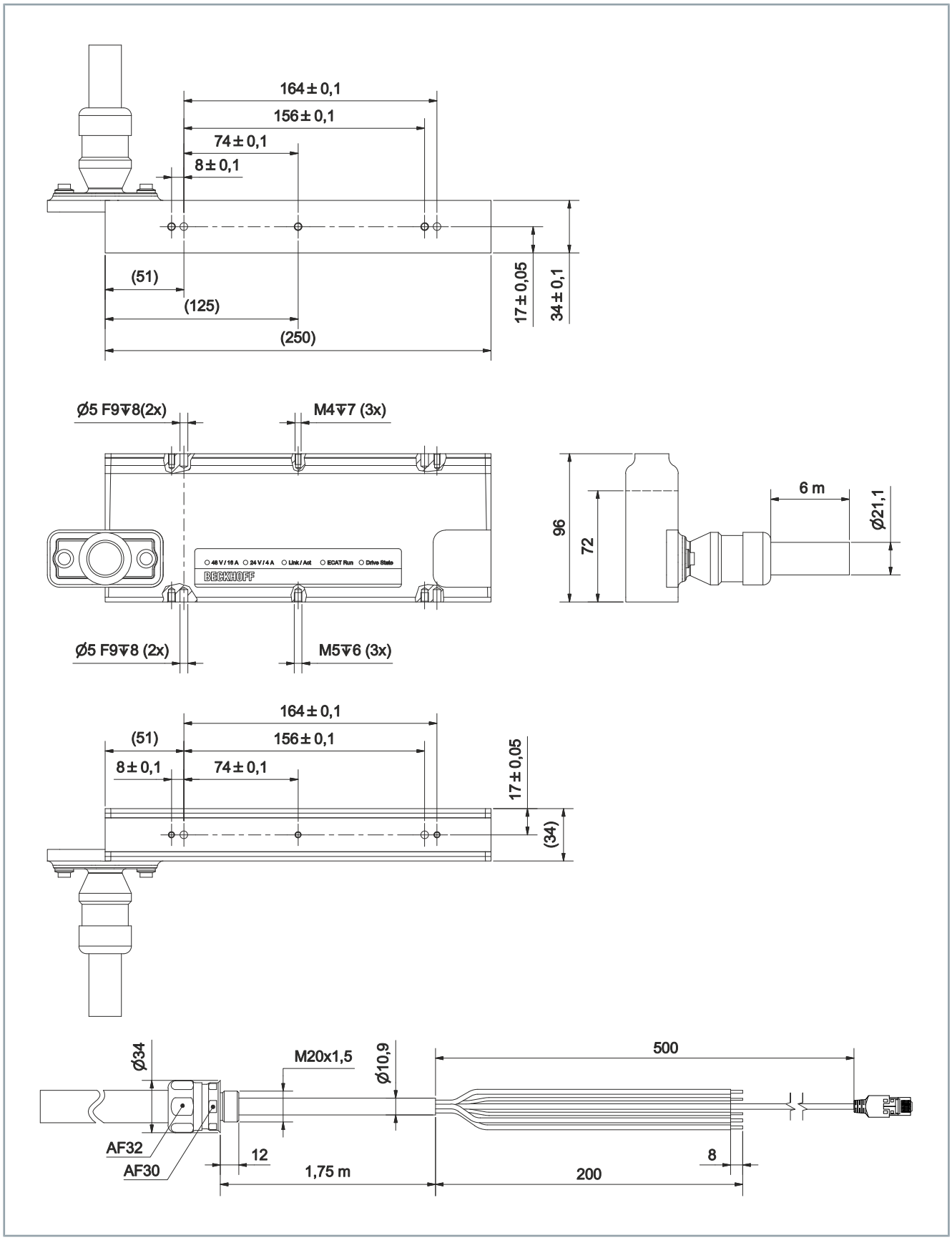
All figures in millimeters



ATH2001-0250

Straight module with supply

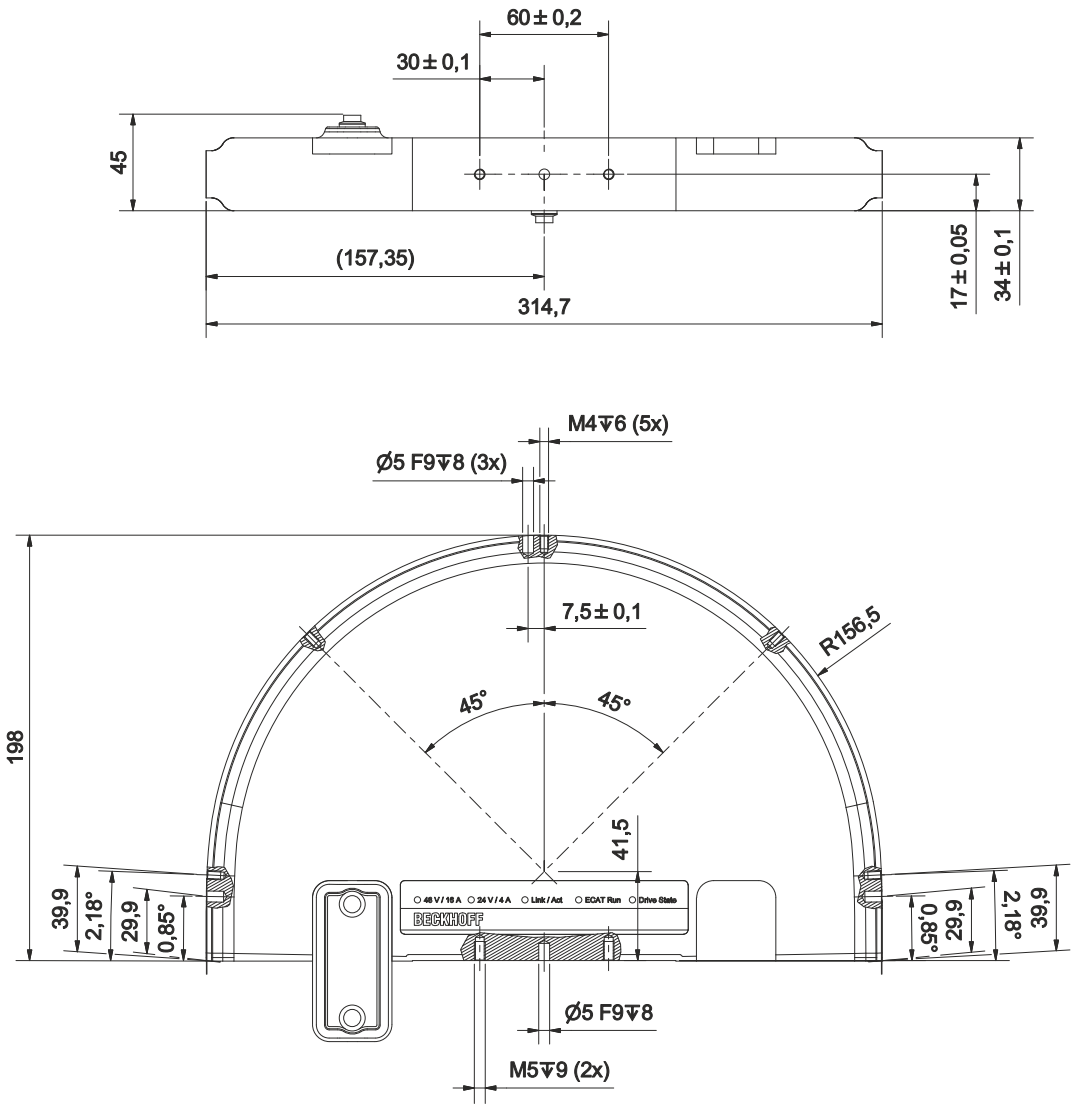
All figures in millimeters



ATH2050-0500

Clothoid module 180° curve

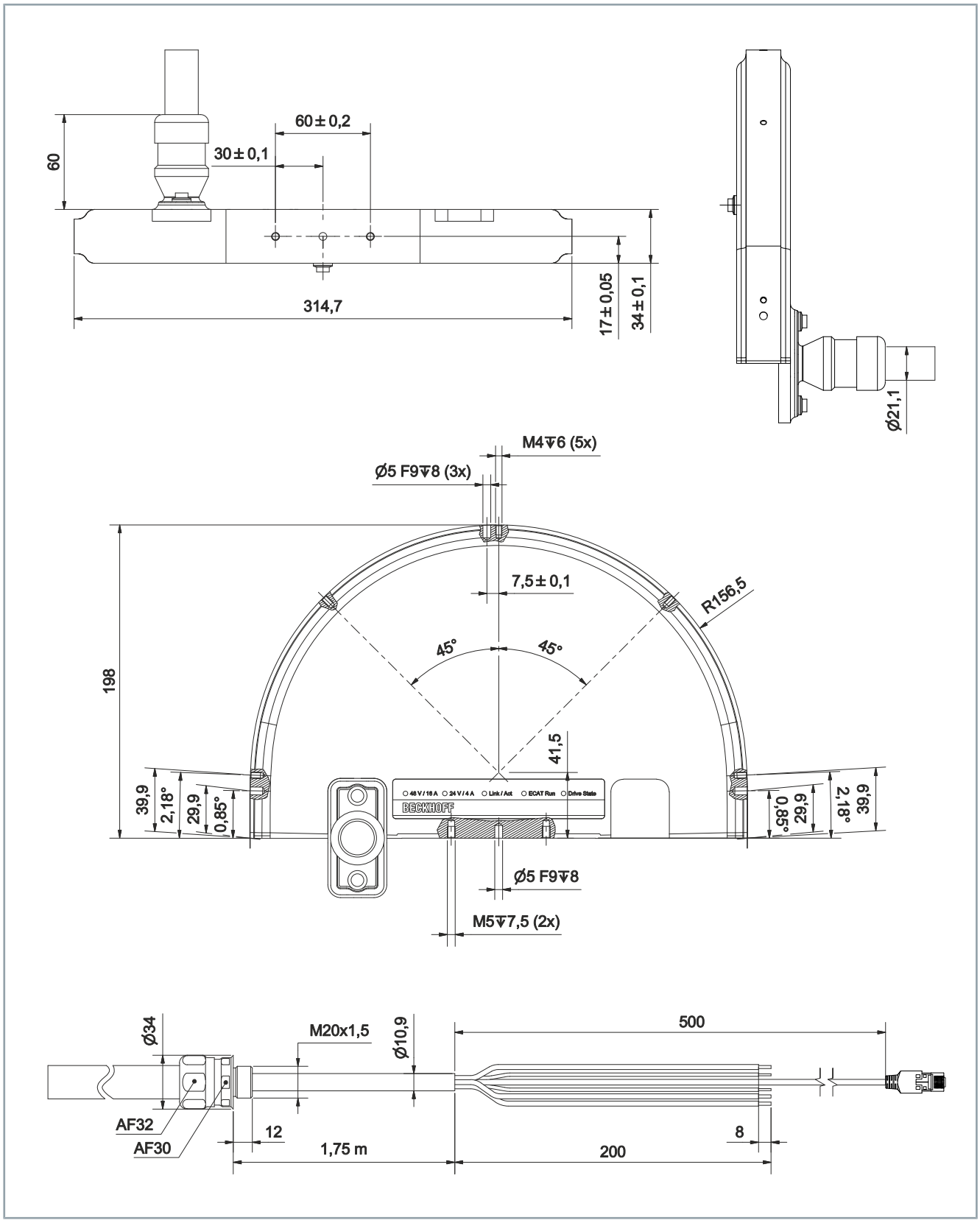
All figures in millimeters



ATH2051-0500

Clothoid module 180° curved with supply

All figures in millimeters



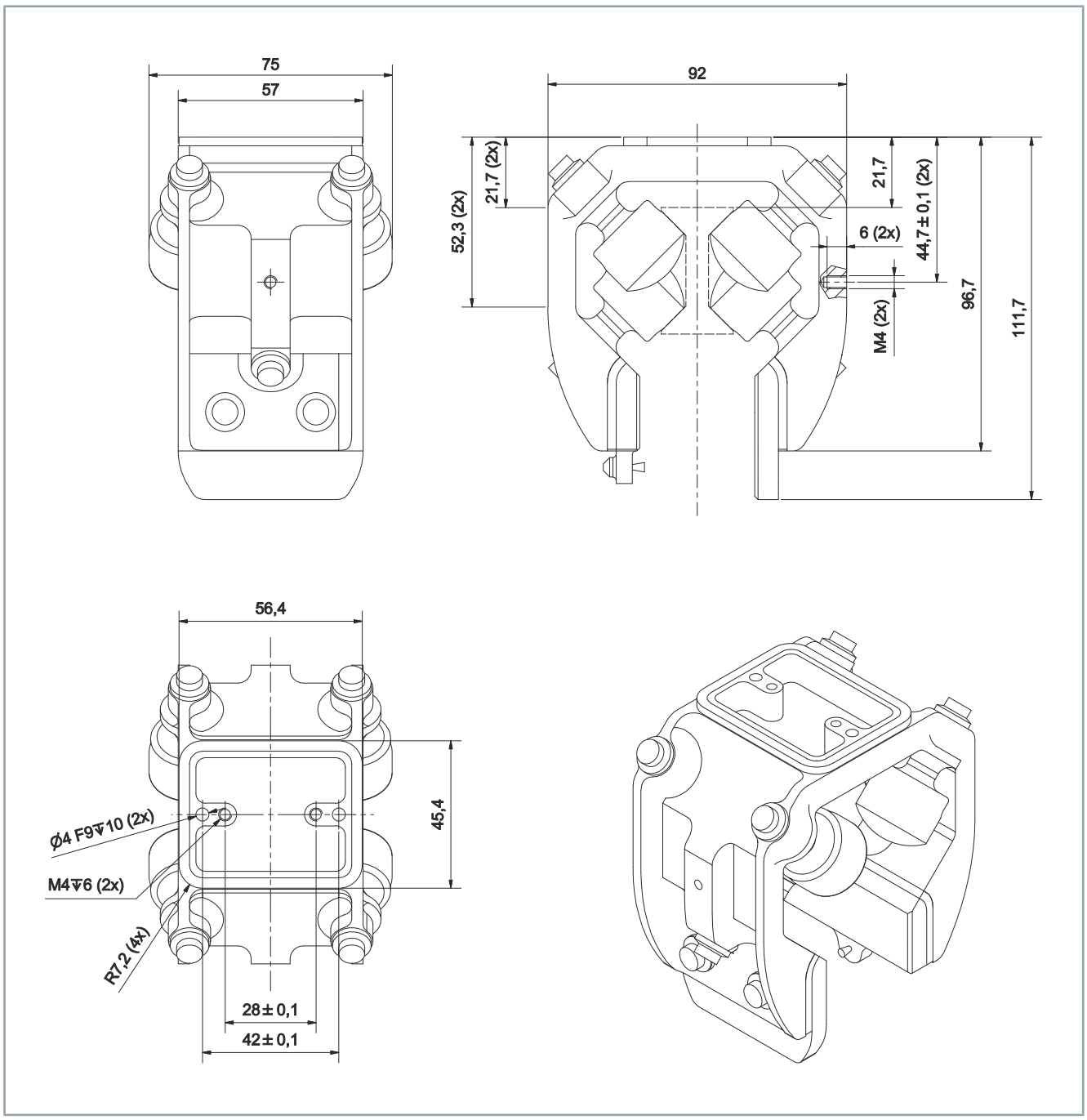
Mover

ATH9011-0075-0550

Stainless steel mover

- Length 75 mm
- 6 guide rollers

All figures in millimeters

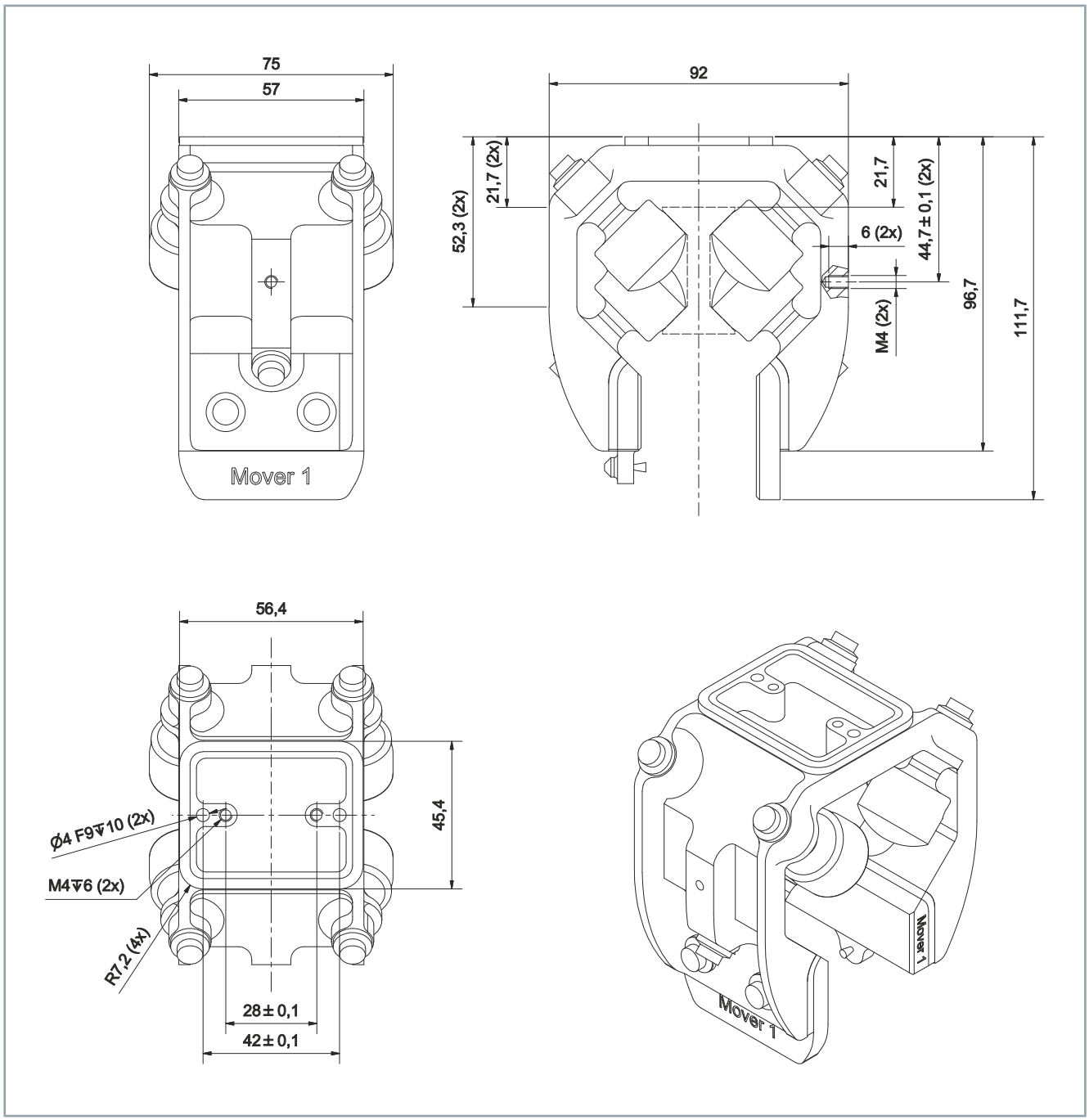


ATH9011-0075-1550

Stainless steel mover 1

- Length 75 mm
- 6 guide rollers

All figures in millimeters

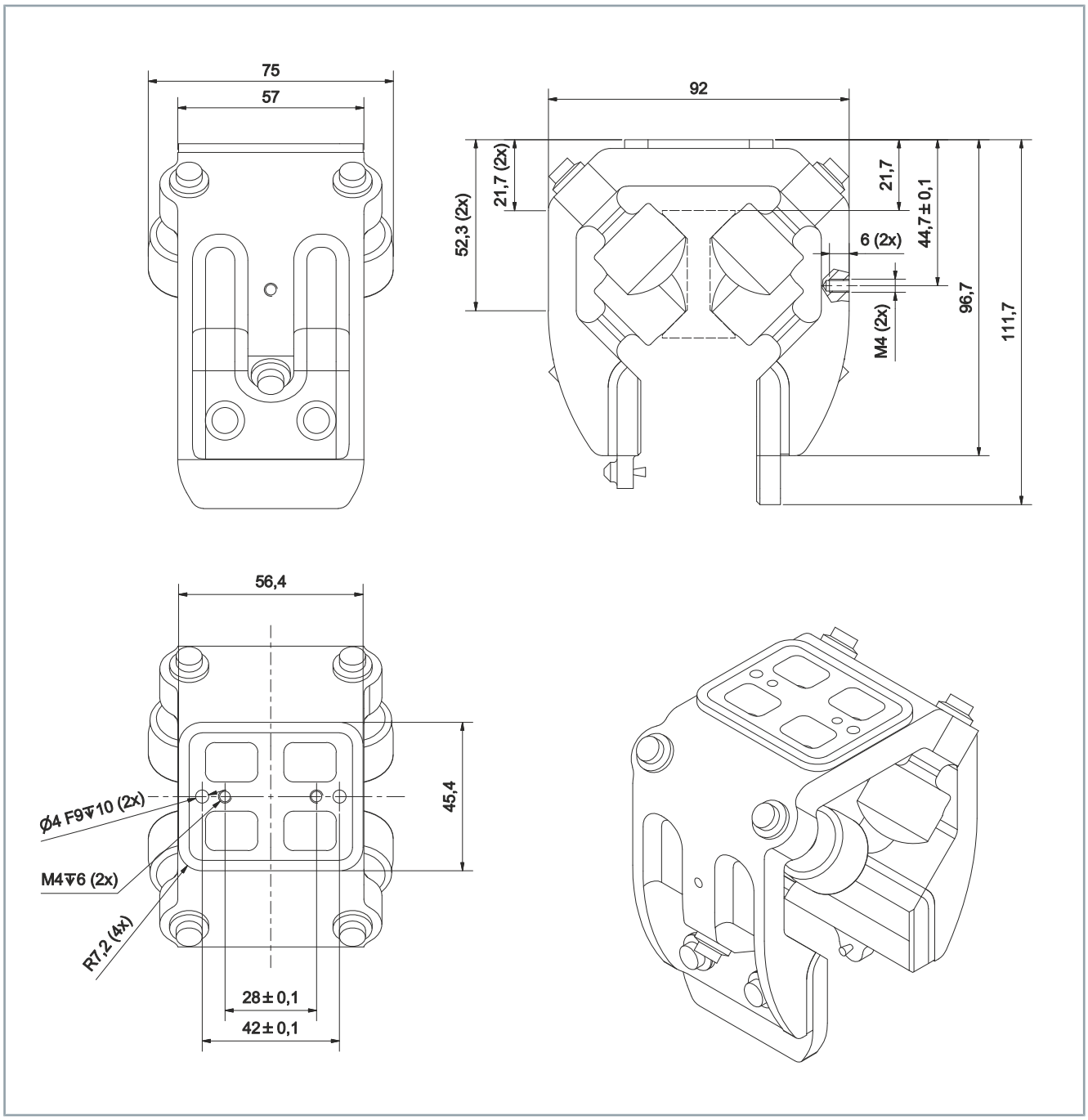


ATH9013-0075-0550

Aluminum mover

- Length 75 mm
- 6 guide rollers

All figures in millimeters

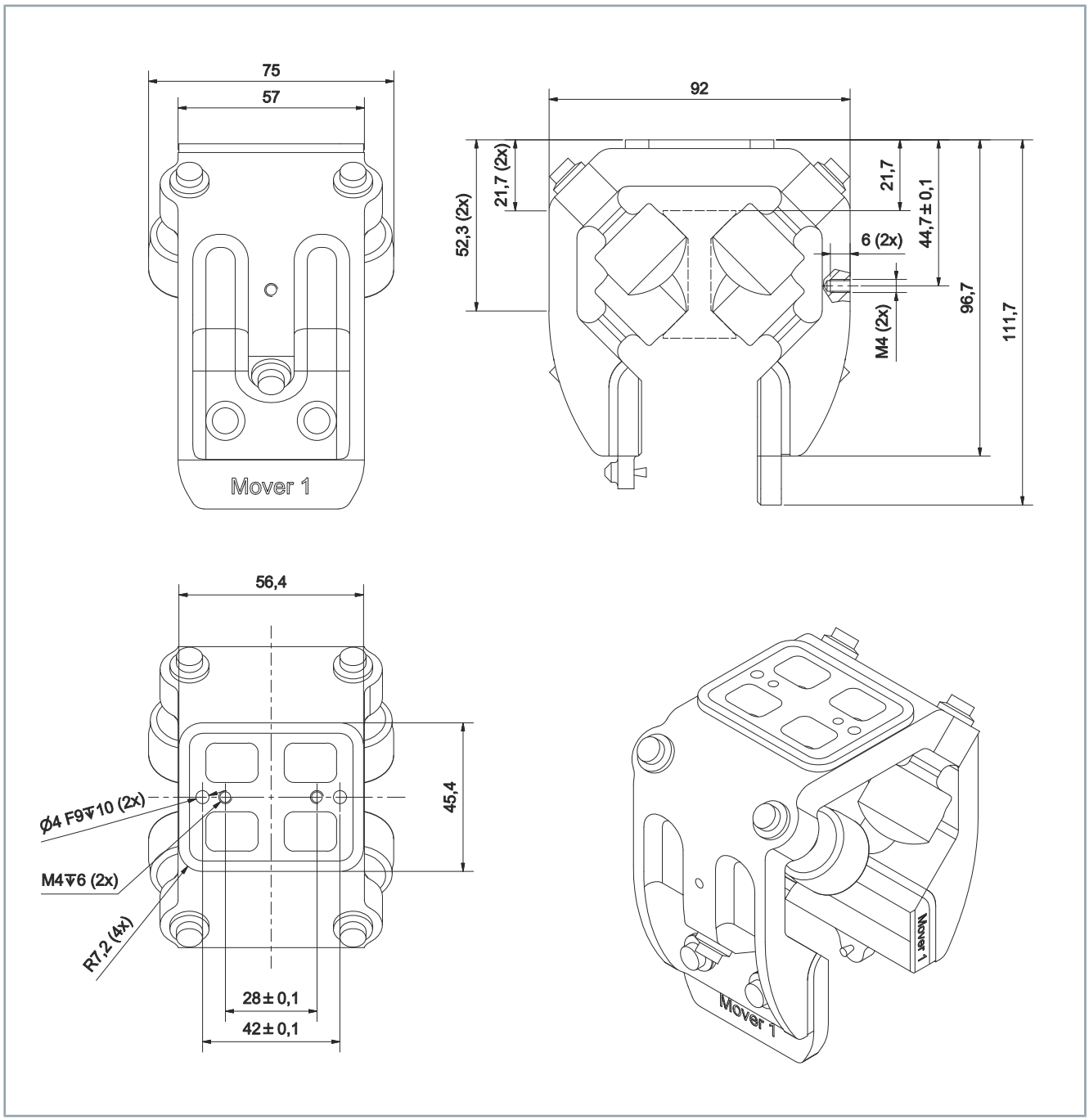


ATH9013-0075-1550

Aluminum mover 1

- Length 75 mm
- 6 guide rollers

All figures in millimeters

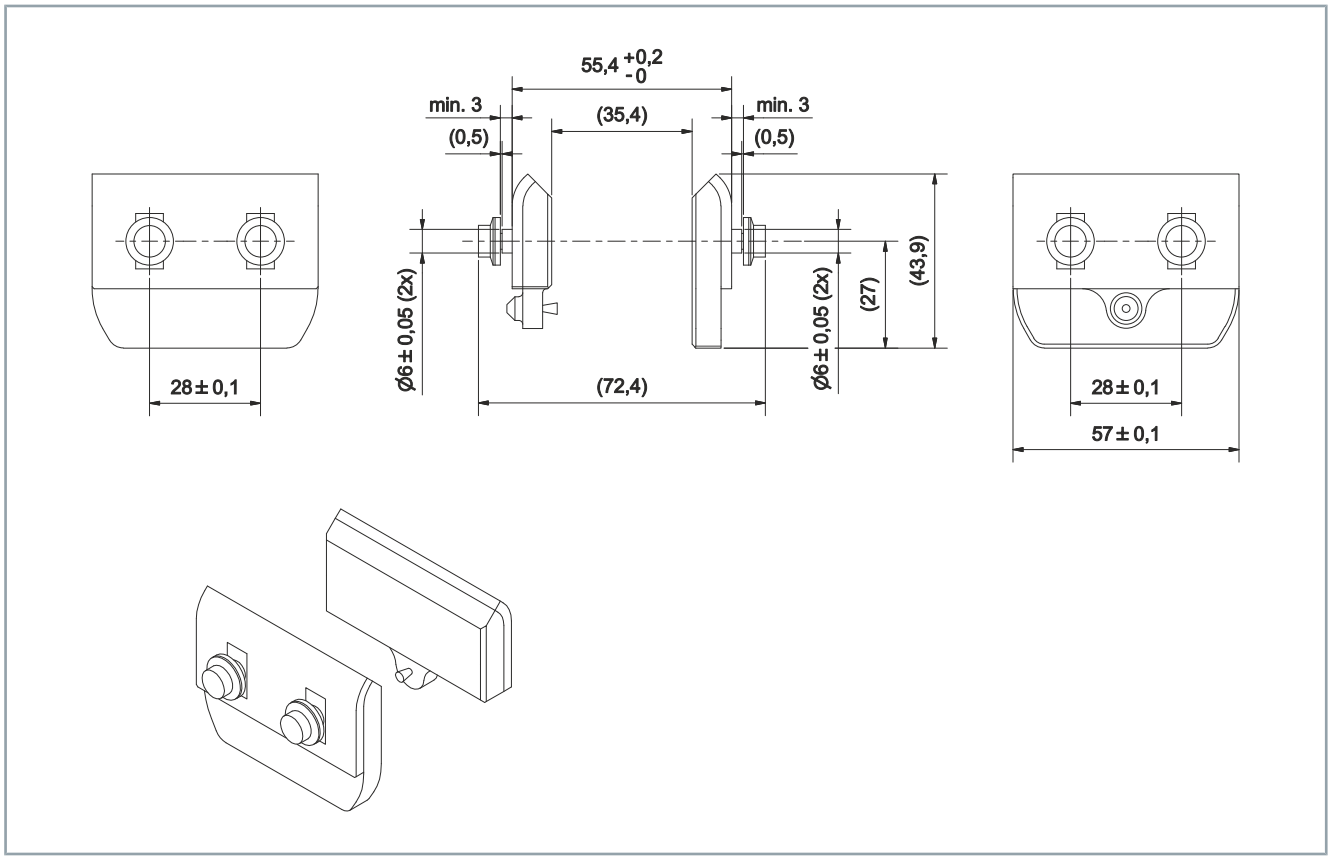


Magnetic plate set

ATH9001-0550-0001

Standard magnetic plate set

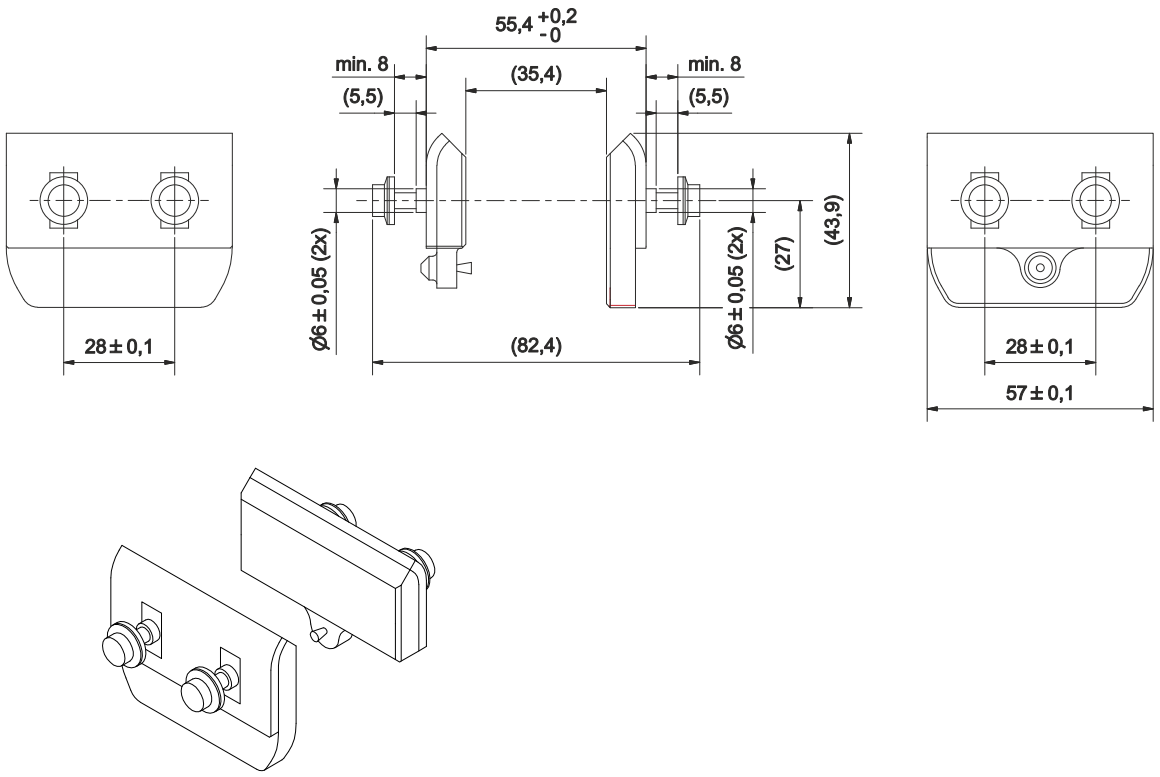
All figures in millimeters



ATH9001-0550

Magnetic plate set for third-party movers

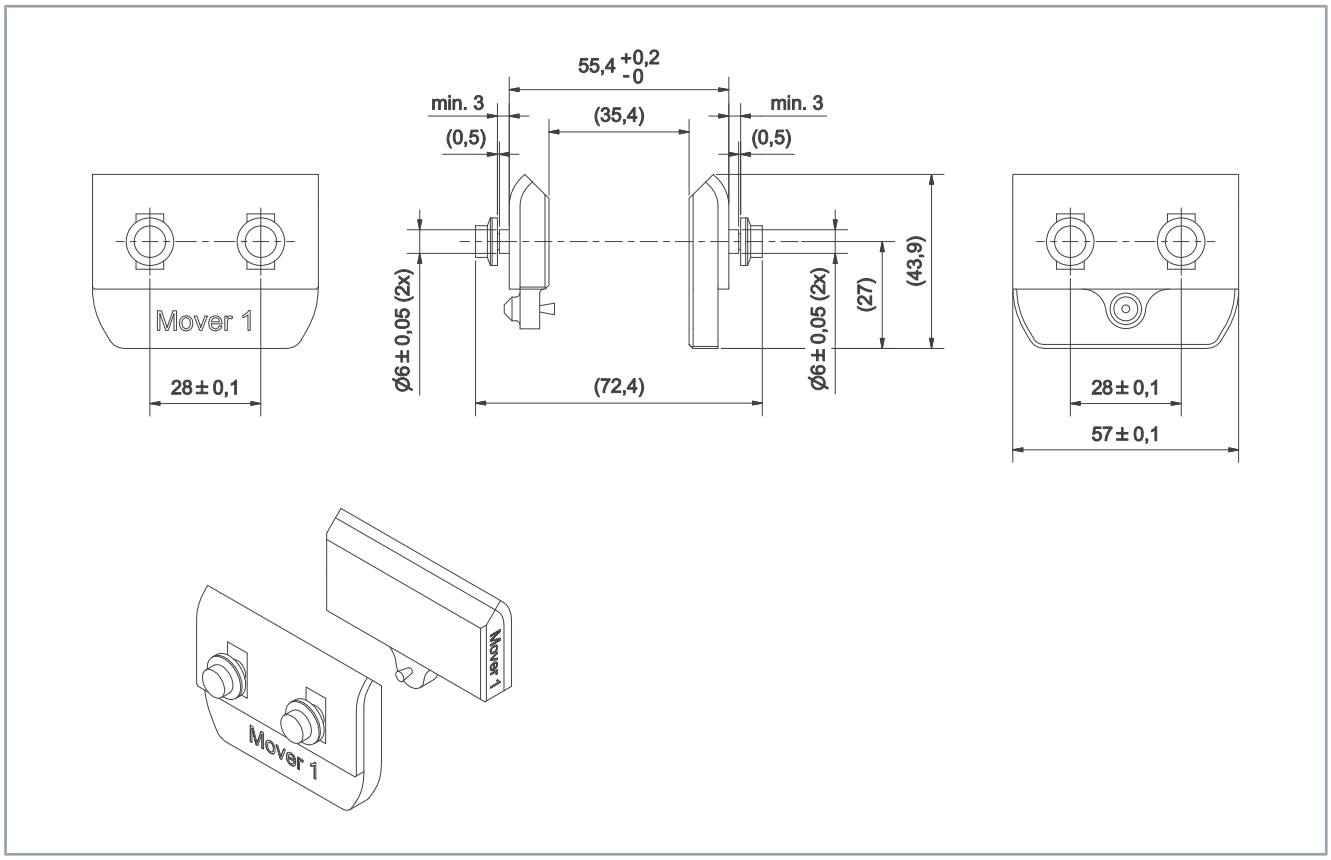
All figures in millimeters



ATH9001-1550-0001

Mover 1 magnetic plate set

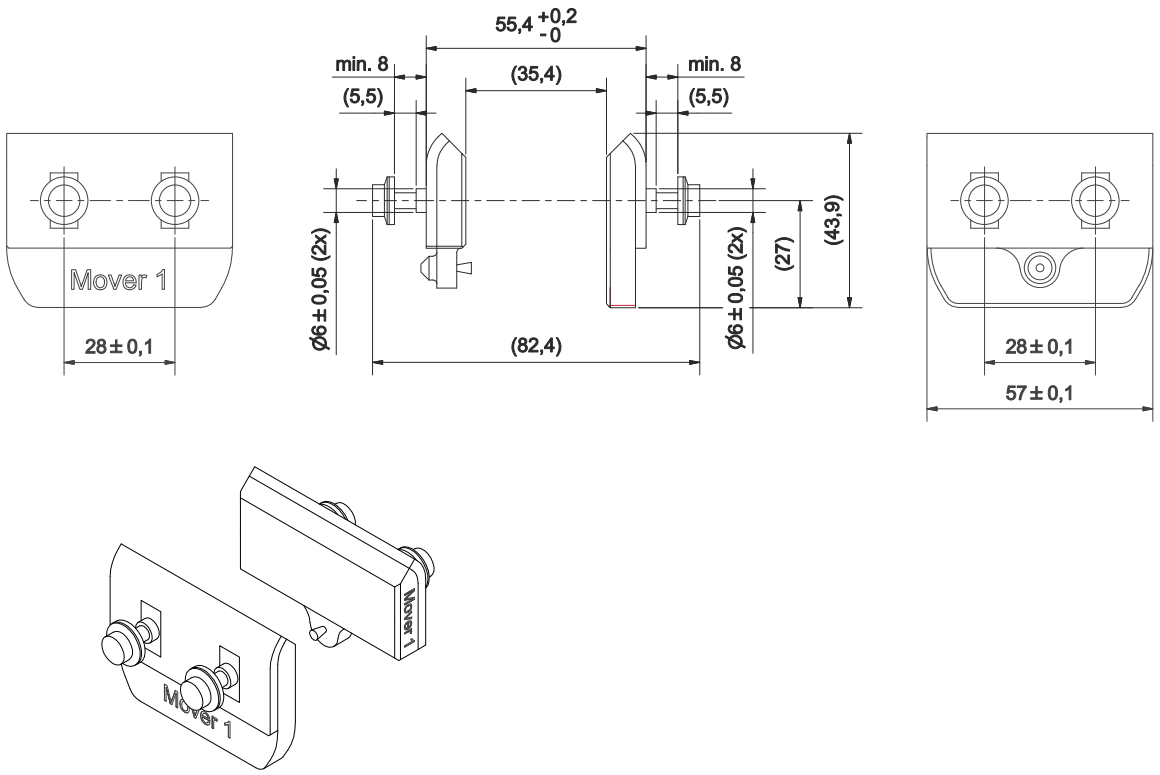
All figures in millimeters



ATH9001-1550

Mover 1 magnetic plate set for third-party movers

All figures in millimeters



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, vendor or our service department immediately.

Packaging

Instructions for handling are printed on the packaging:

Carton	
Symbol	**Explanation**
	This is the correct position for the packaging.
	Protect the packaging against wetness.
	The contents are fragile.

Label	
Symbol	**Explanation**
	The carton contains electrostatically sensitive components.

ESD conductivity

ESD conductive packaging is necessary for the safe delivery of some components. The table below provides information on the foam inserts in which the components are delivered:

Foam color	ESD conductive	Components
pink	yes	Motor modules
white	no	Mover Magnetic plates Rails

Avoid damage to the components and loss of guarantee
Observe the conditions and the following chapters on transport and storage.
Disregarding the conditions can lead to damage to the components and the voiding of the guarantee.

Conditions

Take care during transport and storage that the individual XTS Hygienic components are not damaged. 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/hour
- Use of the vendor's original packaging

Long-term storage

Perform recurring inspections
Check every six months that the XTS Hygienic is in good condition.
Damage to the XTS Hygienic or failure to carry out maintenance work can shorten the service lives of the installed components and parts.

Prevent the formation of condensation
Keep the ambient temperature constant. Avoid solar radiation and high humidity.
Condensation water can lead to damage during subsequent operation or to rust formation.

You have the option to store XTS components over a short or long period. For storage we always recommend the original packaging.

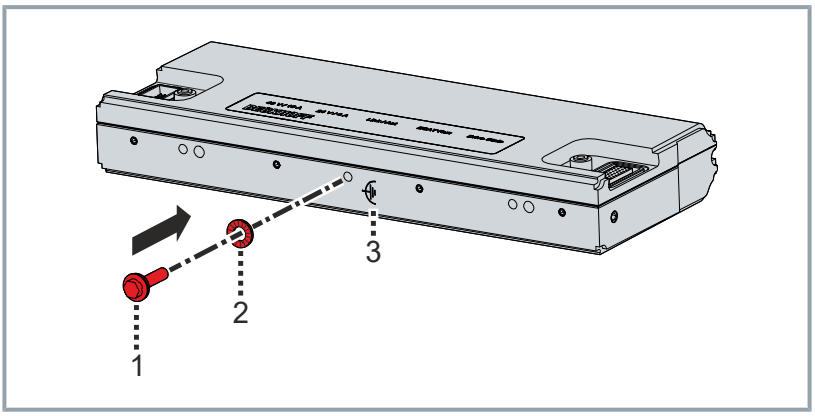
⚠ WARNING

Wear safety shoes
Wear safety shoes when assembling the XTS Hygienic, as components may inadvertently fall down in the working area.
Falling components can lead to serious injuries to the feet.

Handle cutting tools carefully
Use cutting tools with great care. Make sure that nobody in your immediate vicinity can be injured if the tool inadvertently slips. Wear protective gloves if necessary.
Careless handling of tools can lead to puncture wounds and cutting injuries.

Handle adhesives with care
Be careful when using adhesives. Observe the manufacturer's documentation. Wear protective gloves and safety glasses if necessary.
Adhesive can irritate the eyes, the respiratory organs and the skin. Do not inhale the vapor. Avoid contact of the adhesive with the eyes and skin. If adhesive should get into your eyes, immediately rinse out your eyes thoroughly with water and consult a doctor.

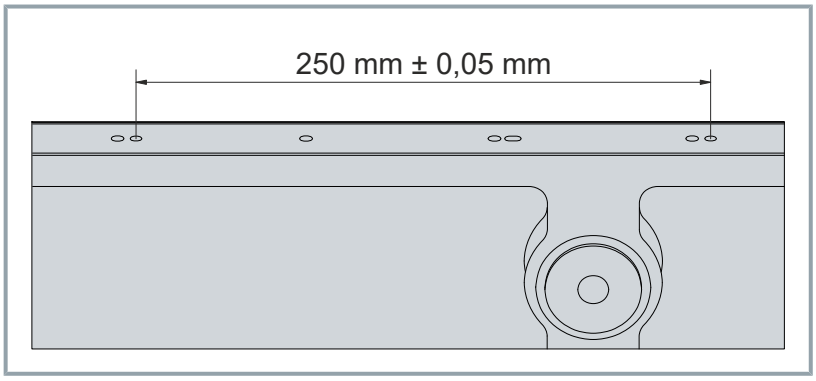
Establish a conductive connection between the module and the machine bed
Establish a conductive connection between every module and the machine bed with the help of a contact washer on the tapped hole with the marking "functional earth".
Non-earthed modules can cause a short-circuit and damage the system.



When screwing the screw with seal 1 into the tapped hole with the marking "functional earth" 3, use a contact washer 2 between the machine bed and the seal.

Avoid dirt
When assembling the XTS Hygienic, make sure that all parts are free from dust and dirt.

Check that the machine bed has been manufactured correctly
Check before assembling whether the distances between the locating pins in the machine bed are correct.

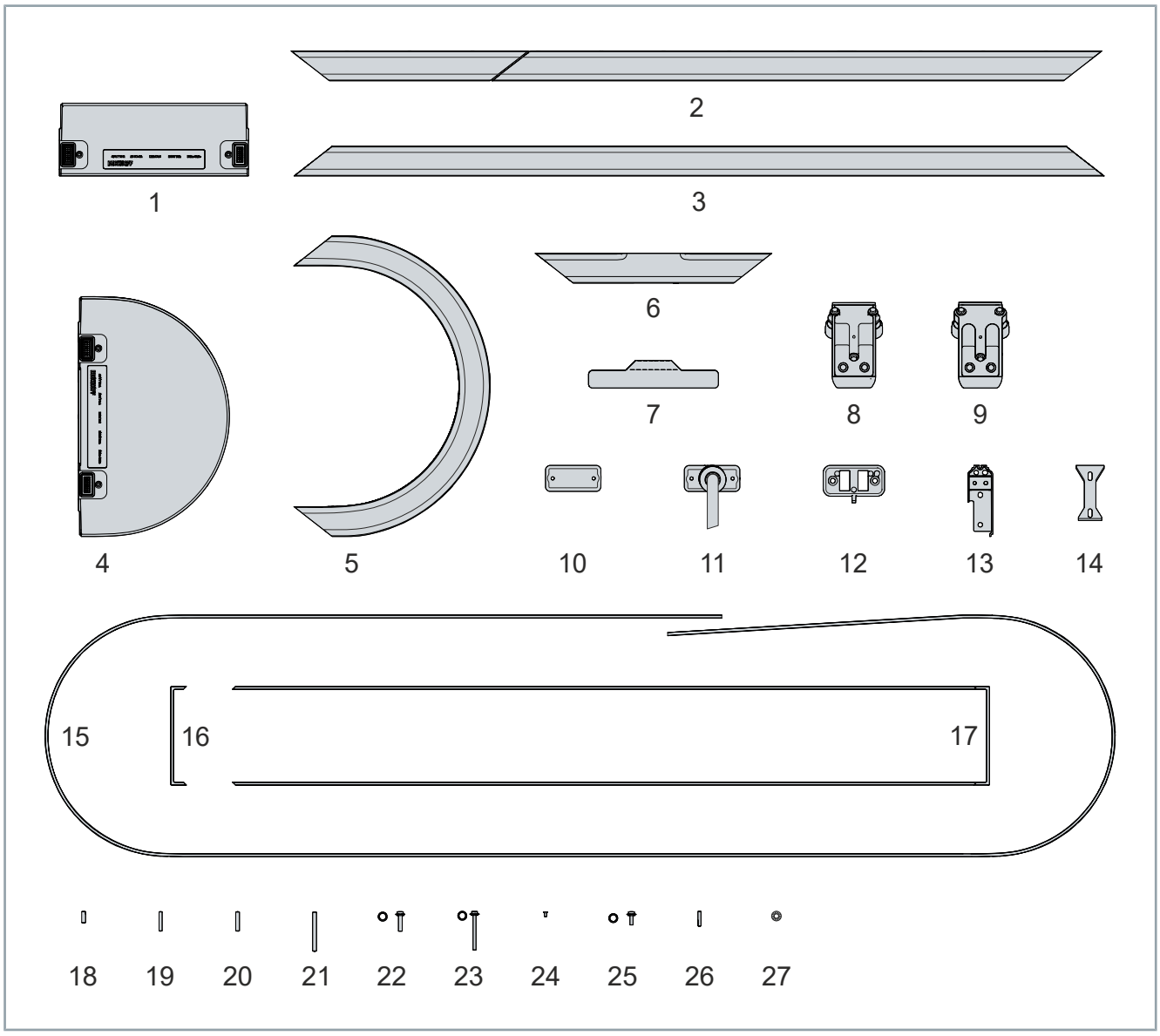


The distance between the center of the first locating pin bore for one module to the center of the first locating pin bore for the next module must be 250 mm. The manufacturing tolerance is ± 0.05 mm.

Assembly example
This chapter contains information on the assembly of an XTS Hygienic with straight modules, curved modules, guide rails and movers. The assembly is described taking the example of a system with a circumferential length of 3 m.

Preparation

The illustration below gives you an initial overview of the components that you need for the mechanical installation of the XTS Hygienic in the configuration described here. Please note that the design and composition of the components can deviate and that not all fastening materials are included in the scope of supply as standard.



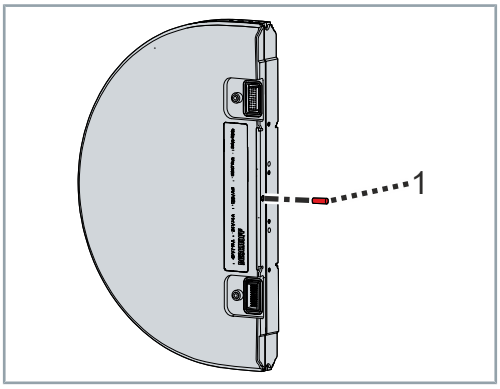
Number	Name
1	Straight modules
2	Straight guide rails with lock
3	Straight guide rails without lock
4	Curved modules
5	Curved rails
6	Rail on support
7	Guard plate for rail on support
8	Stainless steel mover 75 mm, depending on application
9	Aluminum steel mover 75 mm, depending on application
10	Cover with connection card
11	Cover with supply
12	Seals for covers
13	Seals between modules
14	Seals between rails
15	Seals between modules and rails
16	Seals between machine bed and modules, short end
17	Seals between machine bed and modules, long end
18	Locating pins 5 x 14 for modules and rails
19	Locating pins 4 x 24 for seals between modules
20	Short locating pins 5 x 24, outside between straight guide rails and curved rails
21	Long locating pins 5 x 50, inside between straight guide rails and curved rails
22	Screws M5 x 20 with sealing ring for machine bed
23	Screws M4 x 45 with sealing ring for rails
24	Countersunk screws M3 x 6 for locating pins in seals between modules
25	Screws M4 x 12 with sealing ring for covers
26	Set screw M4 x 20 for rail on support
27	Contact washer

Technical aids

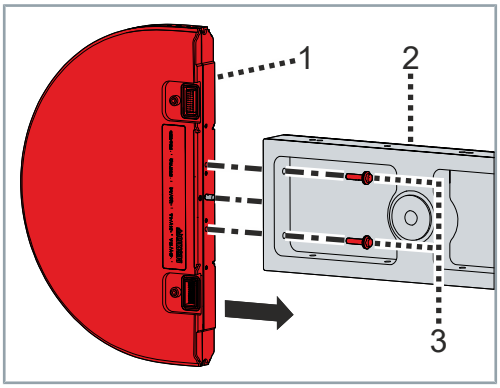
For the mechanical installation you need the following aids:

- Suitable torque wrench
- Suitable screwdrivers
- Cutting tool such as scalpel or hobby knife
- Adhesive: Elastosil E43 N
- Vaseline with brush
- Lint-free cloth

Modules

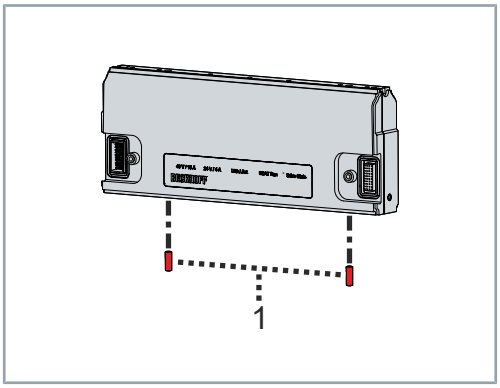


► Insert locating pin 1 in the curved module

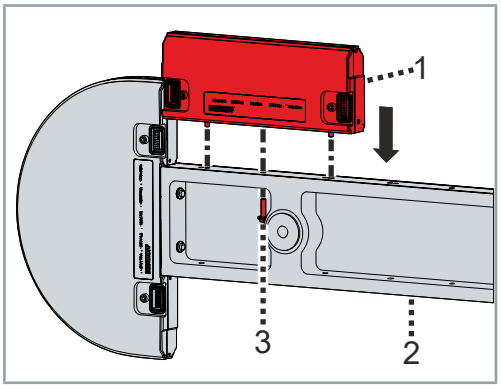


► Position curved module 1 with the locating pin in the bore in the machine bed 2

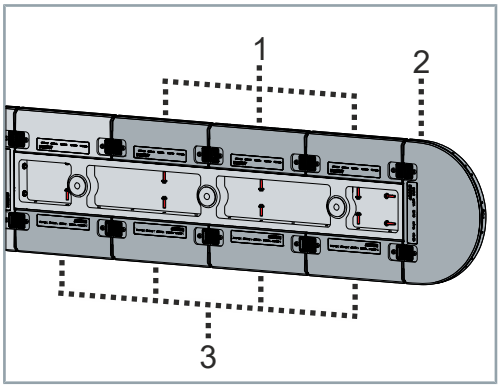
► Screw in the screws with sealing ring 3, leaving only a minimal gap



► Insert locating pin 1 in the module

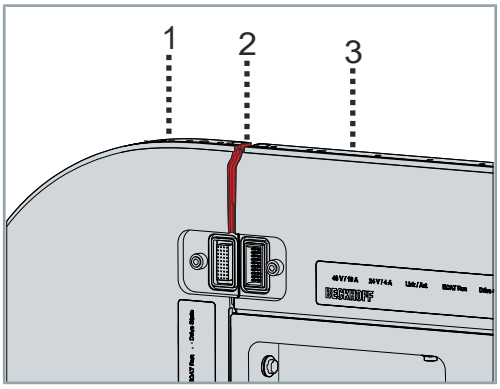


- ► Place module 1 on the machine bed 2
- ► Screw in the screws with sealing ring 3 in the center of the module, leaving only a minimal gap

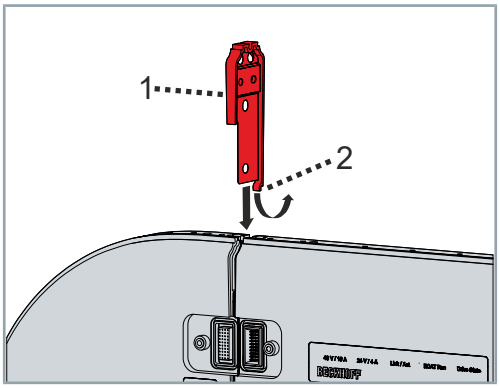


- ► Place further modules 1, the second curved module 2 and further modules on the opposite side 3 in a row, thereby screwing in screws with sealing rings, leaving only a minimal gap in each case

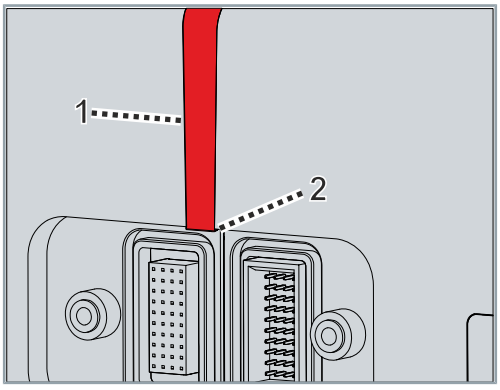
Seals



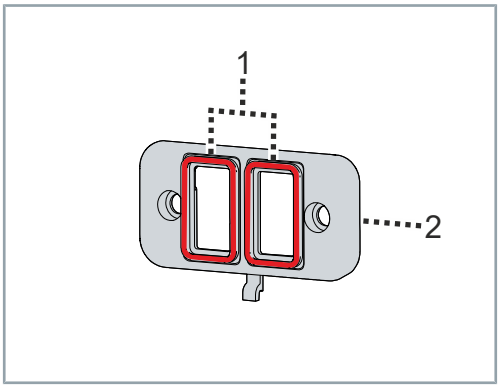
- Grease the gap 2 between modules 1 and 3 with Vaseline



- Push seal 1 between the modules, folding the seal end 2 to the side
- Carefully brush the upper part of the seal downwards with a little pressure
- Fold the seal end 2 back and carefully push it into the groove between the machine bed and the modules

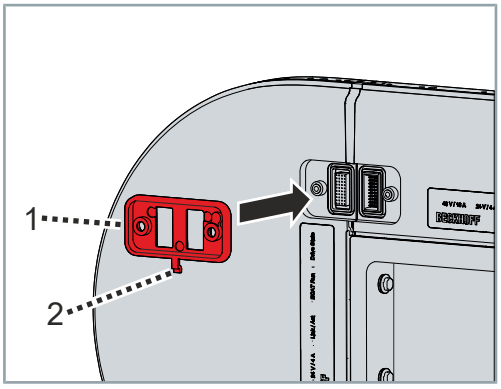


- Following the assembly, brush seal 1 downwards until it overlaps at the electrical interface 2
- Remove the surplus Vaseline with a lint-free cloth
- Mount all further seals between the modules in the same way



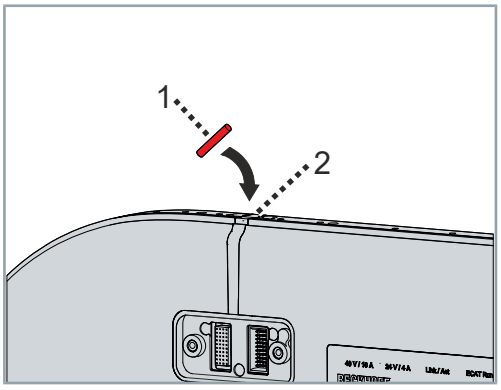
- Grease all O-ring contours 1 of the seal 2 for the electrical interface with Vaseline

Make sure the seals are seated correctly
Make sure that the O-ring contours are seated correctly in the intended grooves.
If seals are mounted improperly, fluid can penetrate into the electrical interfaces and damage the system.

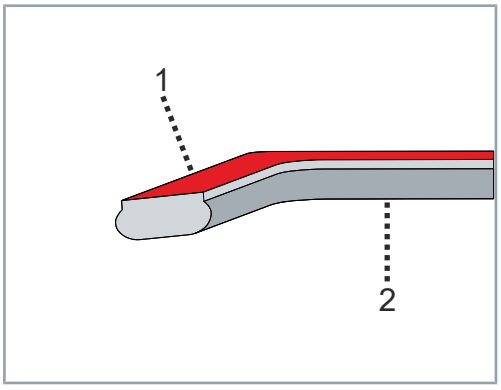


- ► Insert seal 1 at the electrical interface, pressing the O-ring contours fully into the grooves
- ► Press the seal end 2 carefully into the groove between the machine bed and the modules
- ► Remove the surplus Vaseline in the area of the connector with a lint-free cloth
- ► Mount all other seals on the electrical interfaces in the same way

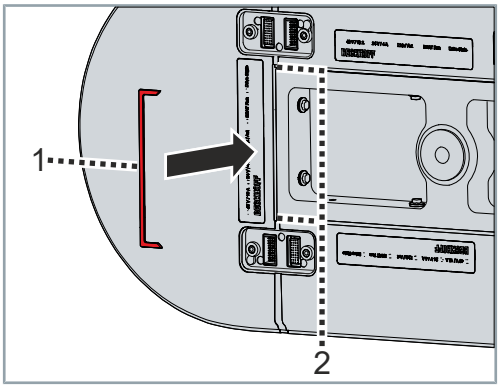
Simplified assembly
Initially insert only the locating pins between the curved modules and straight modules in order to facilitate the mounting of the seals between the machine bed and the modules. The locating pins between the straight modules are mounted later.



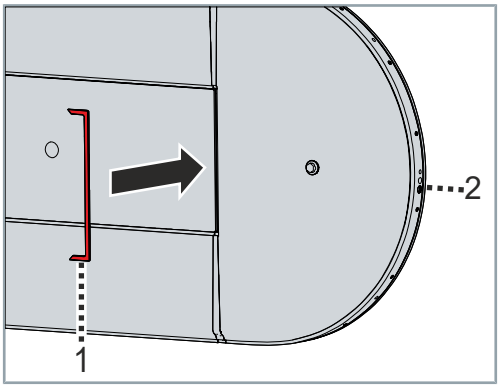
- ► Insert locating pin 1 at an angle between the curved module and the straight module, then swivel it into the groove 2
- ► Mount the three other locating pins between the curved modules and the straight modules in the same way



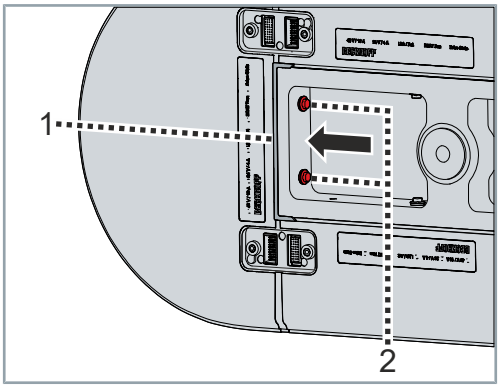
- ► When mounting the seals between the machine bed and the modules, make sure that the flat side 1 faces outwards and the round side 2 inwards
- ► Make sure that all seals are mounted flush with the system components
- ► Avoid tensile stress on the seals



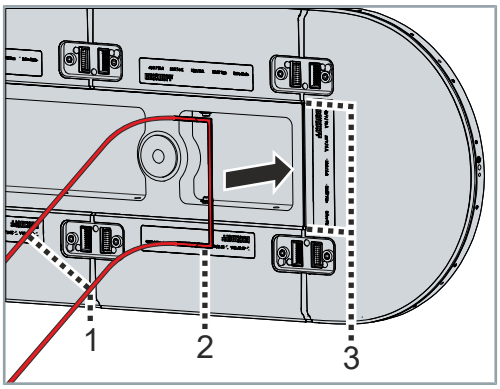
- ▶ Press the short end of the seal 1 into the corners 2 on the curved module with your fingernail, then mount the straight part of the seal in the same way
- ▶ To facilitate mounting, lift or move the modules slightly



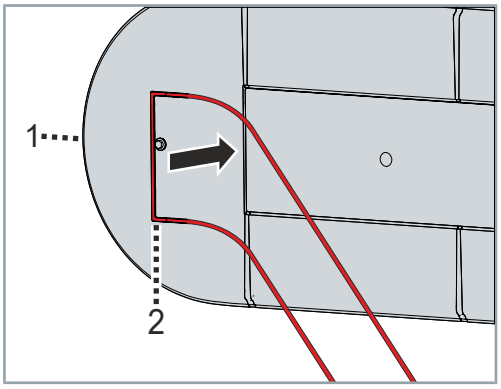
- ▶ Mount the short end of seal 1 on the other side of the curved module 2 in the same way



- ▶ Screw in the screws 2 of the curved module hand tight in order to fix the seals 1 on both sides

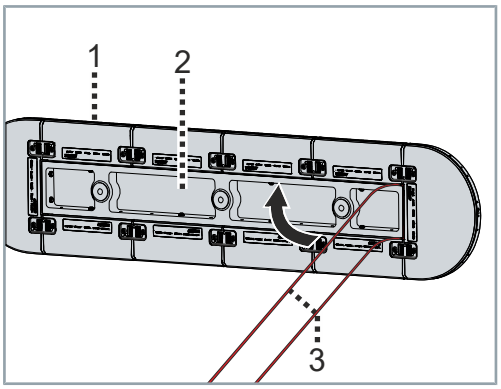


- ▶ Press the long end of the seal 2 into the corners 3 on the curved module with your fingernail, then mount the short part of the seal between the corners in the same way
- ▶ To facilitate mounting, lift or move the modules slightly
- ▶ Leave the long legs 1 of the seal hanging down. Make sure that the seal does not get dirty on the floor



- ► Mount the long end of seal 2 on the other side of the curved module 1 in the same way
- ► Screw in the screws of the curved module hand tight in order to fix the seals on both sides

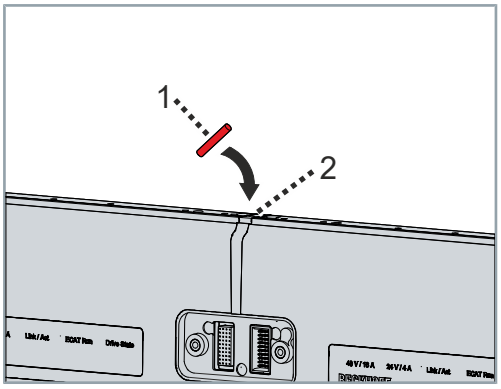
Allow the seal legs to overlap
When assembling, the long legs of the seals must overlap the short end. The seal parts will be shortened and glued at a later time.



- ► Press the long leg 3 of the seal in between the straight modules 1 and the machine bed 2 with your fingernail
- ► To facilitate mounting, lift or move the modules slightly

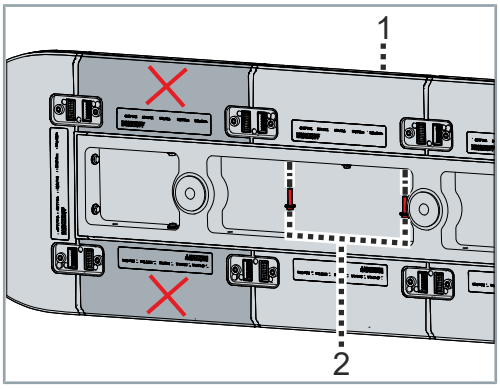
Long legs overlap the short end.

- ► Mount the long legs of the seal on the other side of the system in the same way

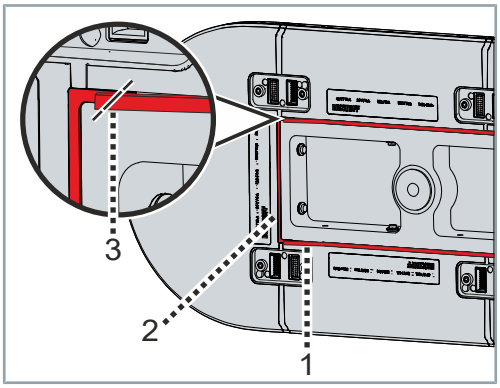


- ► Insert locating pin 1 at an angle between the straight modules, then swivel it into the groove 2
- ► Mount all further locating pins between the straight modules in the same way

Do not fix the modules with overlapping seal
The two straight modules on which the seals overlap on both sides must not be fixed yet.



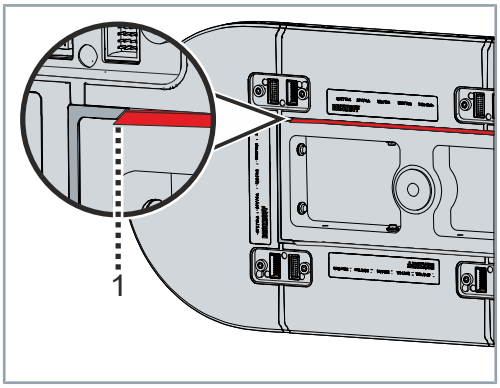
- ► Screw in the screws with sealing rings 2 on the straight module 1 hand tight
- ► Mount the other screws with sealing rings on the straight modules in the same way, except on the two straight modules with overlapping seals
- ► After assembly, check that the screws are seated correctly and flush and correct them if necessary



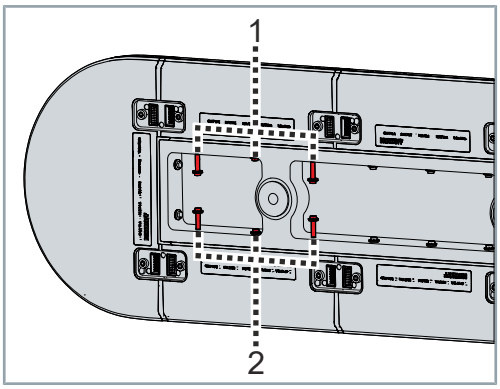
- ► Cut diagonally through both ends 3 of the overlapping seals 1 and 2 with a cutting tool

A scalpel or a hobby knife, for example, is a suitable cutting tool.

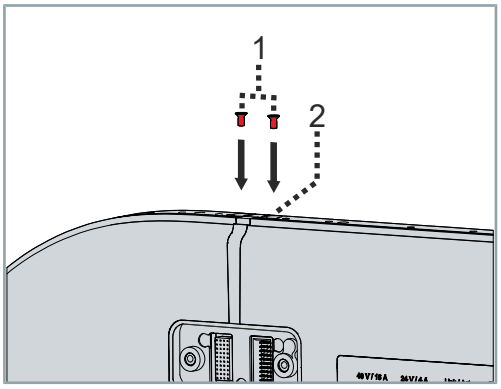
- ► Cut all three further overlapping seals to length in the same way



- ► Apply adhesive to one end 1
- ► Press the end into the groove in order to glue the two ends together
- ► Remove surplus adhesive with a lint-free cloth
- ► Glue all three further cut seals in the same way

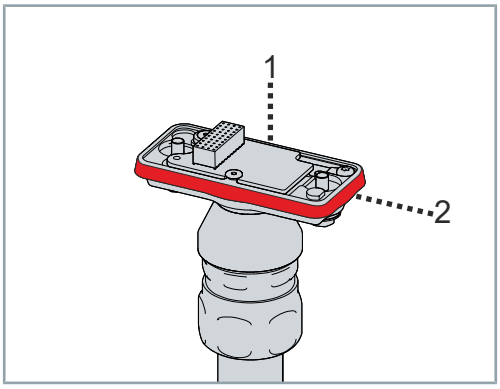


- ► Screw in all screws with sealing rings 1 and 2 on the two remaining modules hand tight

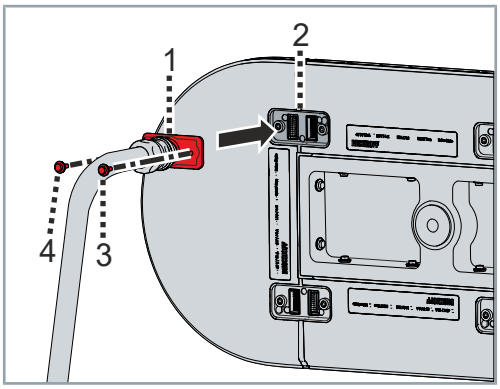


- ► Screw in screws 1 in order to fix the locating pin 2 between the modules
- ► Fix all other locating pins between the modules in the same way with screws

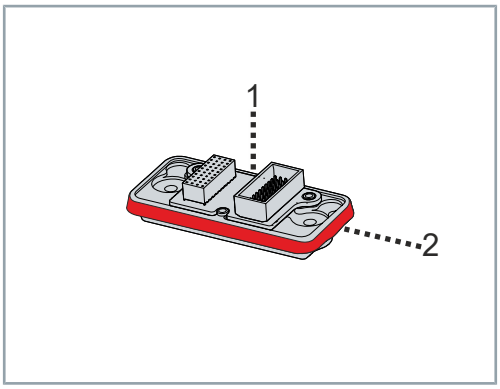
Interfaces



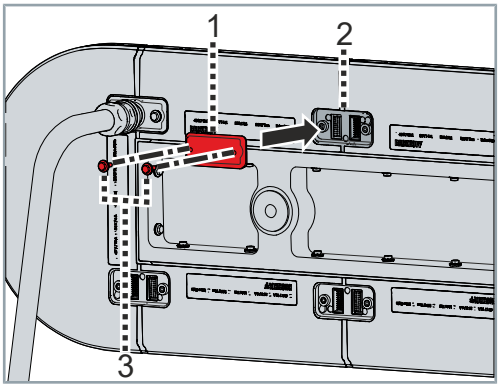
Grease the edge 2 on the cover with power supply 1 with Vaseline



- ► Place the cover 1 on the interface 2, ensuring the correct alignment of the connector
- ► Screw in the screws with sealing rings 3 and 4 tightly
- ► Mount all other covers with supply in the same way



- ► Grease the edge 2 on the cover with connection card 1 with Vaseline

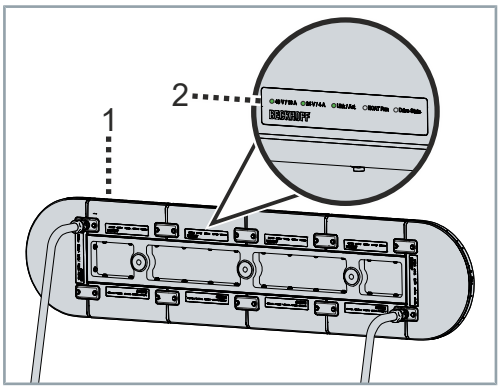


- ► Place the cover 1 on the interface 2, ensuring the correct alignment of the connectors
- ► Screw in the screws with sealing rings 3 tightly
- ► Mount all other covers with connection card in the same way

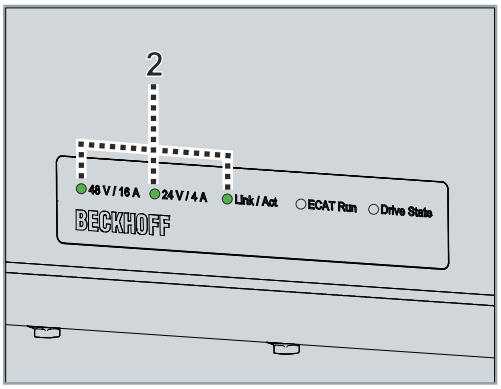
System test

Before beginning with the assembly of the guide rails, check the functionality of the modules. You can determine whether you have assembled the modules properly and fully as well as identifying defects.

Power supply



► Connect the entire system 1 to the power supply without guide rails
► First switch the 24 V on, then the 48 V
► Make sure that the LEDs 2 light up



The following LEDs 2 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 appropriate covers with connection card have been inserted
► Contact the Support/Applications Department

TwinCAT

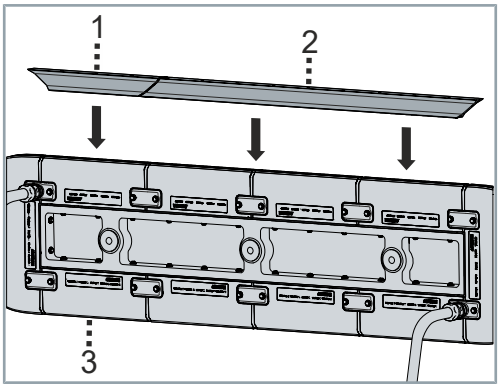
Beckhoff also recommends checking the modules using the TwinCAT software.

► Connect EtherCAT connector to the control computer
► Start a TwinCAT project
► Scan the modules
► Check the modules for functionality

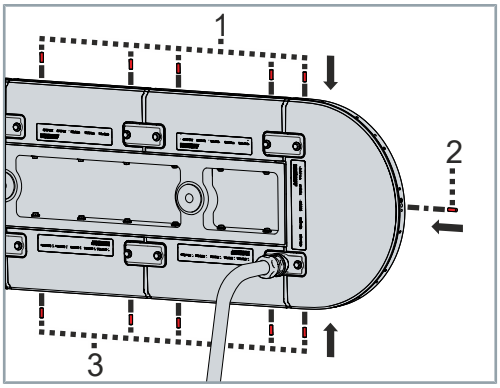
Guide rails

Lock for mounting movers
A 250 mm-long guide rail serves as a lock for mounting the movers on the guide rails. For the assembly, the lock should be replaced by a rail on support.
Further information is given in the course of the mechanical installation in the chapter Mover.

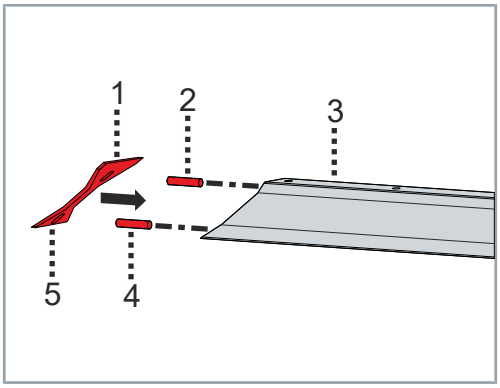
Straight guide rails



- Always use guide rail 2 with lock 1 at the top on the assembled system 3

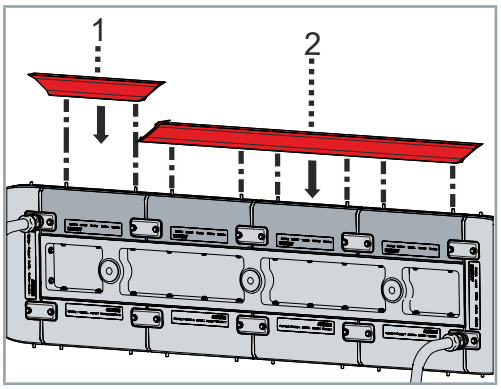


- Insert locating pins 1, 2 and 3 in all straight modules and both curved modules

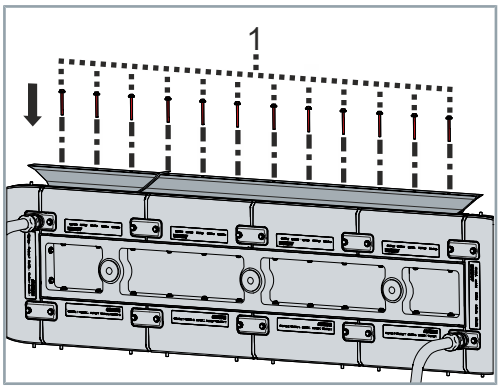


- Insert locating pins 2 and 4 into the guide rail 3
- Push seal 1 with the pre-cut edge 5 downwards onto the locating pins

Align the rails to fit the modules
The guide rails must be mounted on the modules in a certain alignment. To do this, position the bore holes in the rails over the tapped holes in the modules.
If the alignment is wrong, the screws will not mate with the tapped holes in the modules and cannot be screwed in.

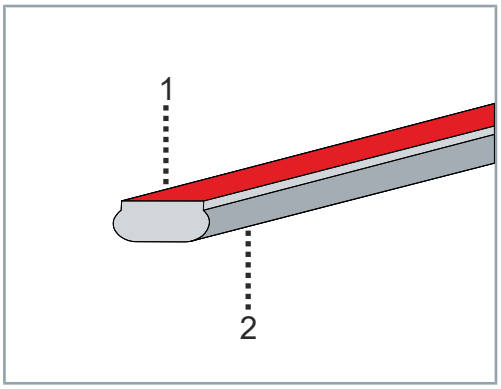


- ► Place the guide rail 2 straight onto the locating pins in the upper modules
- ► Then place the lock 1 straight onto the locating pins

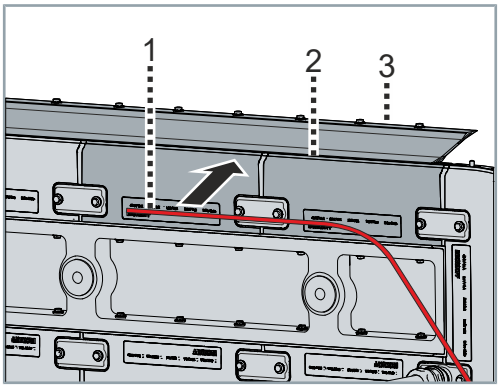


- ► Screw in the screws with sealing rings 1, leaving only a minimal gap, in order to fix guide rail and lock
- ► Assemble the lower guide rail in the same way, securing the guide rail with your hand until the screws have been screwed in

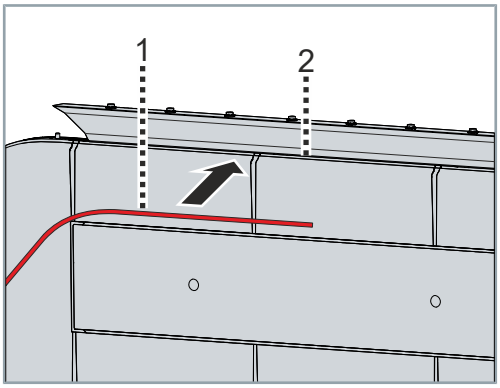
Simple gluing of the seal ends
During the assembly, the ends of the seals between modules and rails must be glued. For simple and exact gluing, begin with the insertion of the seals approximately in the center on a module and the center of a straight guide rail.



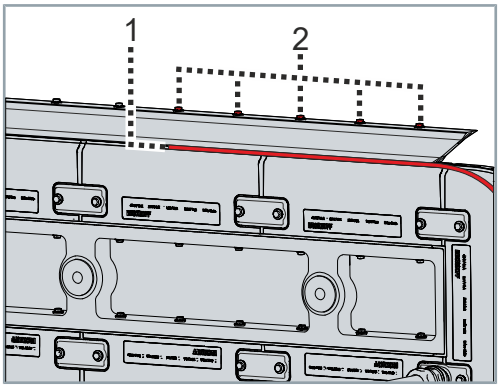
- ► When mounting the seals between modules and rails, make sure that the flat side 1 faces outwards and the round side 2 inwards
- ► Make sure that all seals are mounted flush with the system components
- ► Avoid tensile stress on the seals



- ► Press seal 1 into the groove between module 2 and straight guide rail 3 with your fingernail
- ► To facilitate mounting, lift or move the guide rail slightly
- ► Continue pressing the seal in up to the end of the guide rail

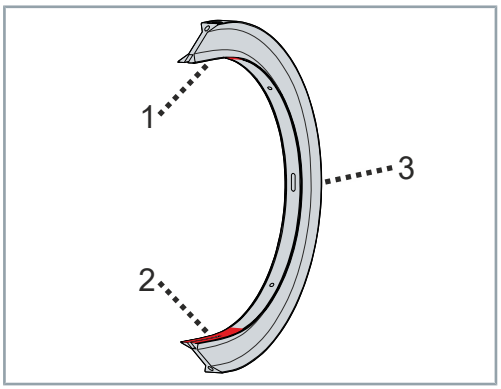


- ► Press seal 1 into the groove 2 on the other side of the system in the same way

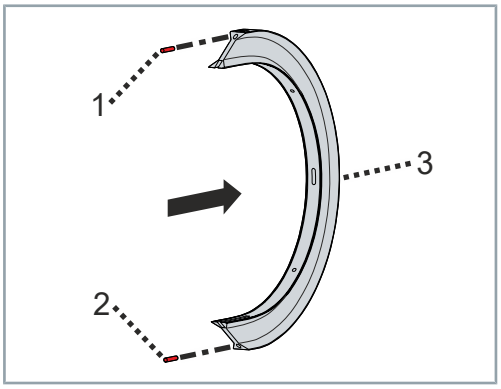


- ► Screw in the screws 2 of the guide rail hand tight in order to fix the seals 1 on both sides of the system

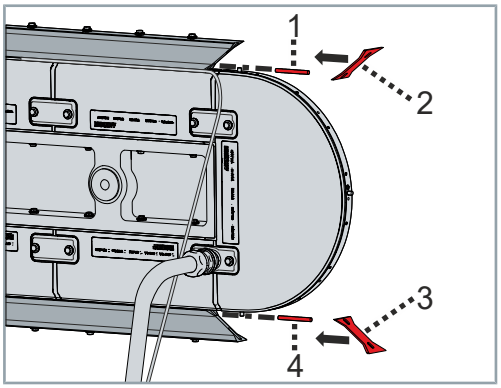
Curved rails



► Grease the support surfaces 1 and 2 of the curved rail 3 with Vaseline

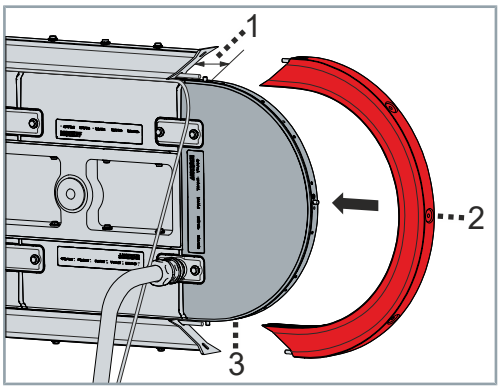


► Insert locating pins 1 and 2 into the curved rail 3

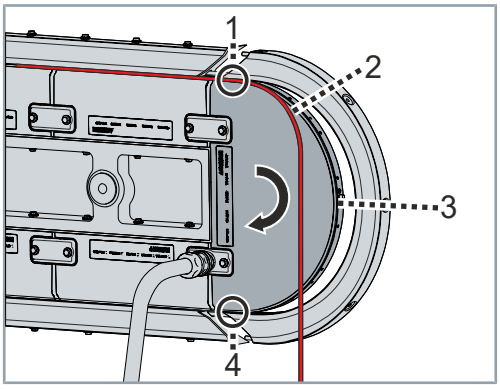


► Insert locating pins 1 and 4 into the guide rails

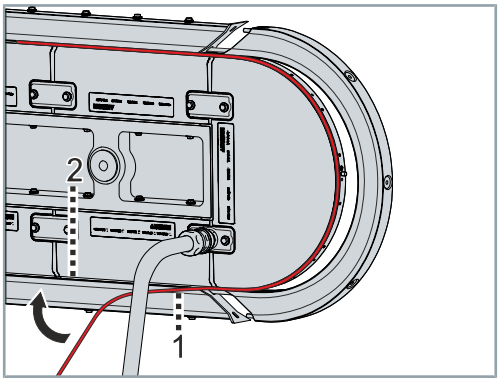
► Push seals 2 and 3 with the pre-cut edge downwards onto the locating pins



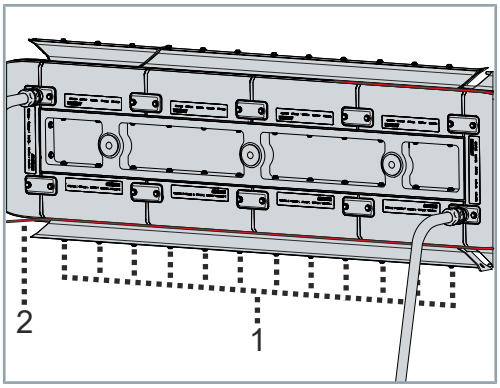
► Push curved rail 2 onto the curved module 3 up to a distance 1 of approx. 30 mm



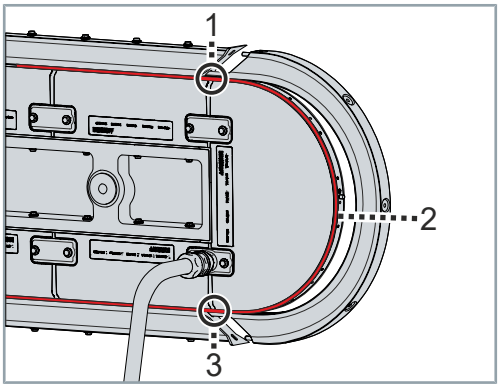
- ► Guide seal 2 around the curved module 3 from top to bottom
- ► Press seal into the groove between curved module and curved rail 1 and 4 with your fingernail
- ► Guide the seal on the other side of the system around the curved module in the same way



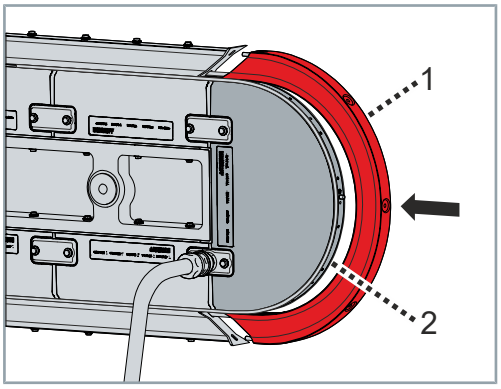
- ► Press seal 1 into the groove 2 between guide rail and the straight modules with your fingernail
- ► To facilitate mounting, lift or move the guide rail slightly
- ► Continue pressing the seal in up to the end of the guide rail
- ► Mount the seal on the other side of the system in the same way



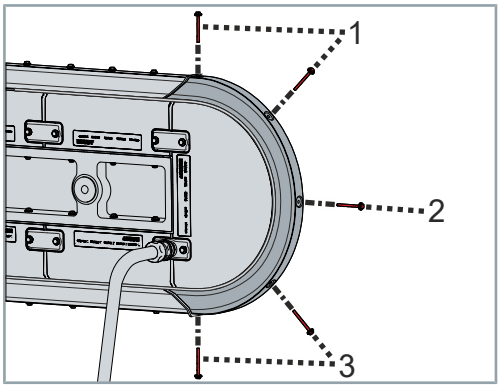
- ► Screw in the screws 1 of the guide rail hand tight in order to fix the seals 2 on both sides of the system



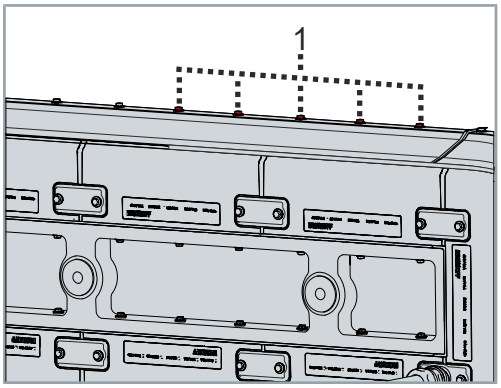
- ► Grease seals 2 between guide rail and curved rail 1 and 3 on both sides of the system with Vaseline



- ► Push curved rail 1 carefully onto curved module 2
- ► Make sure that the seal remains in place

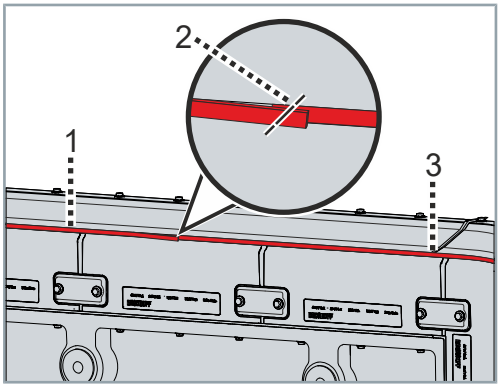


- ► Screw the screw with sealing ring 2 in the center of the curved rail hand tight in order to press the curved rail completely against the curved module
- ► Then screw in the other screws with sealing rings 1 and 3 hand tight



- ► Loosen the fixed screws 1 in the upper guide rail somewhat in order to mount the ends of the seals
- ► Mount the second curved rail with seals in the same way

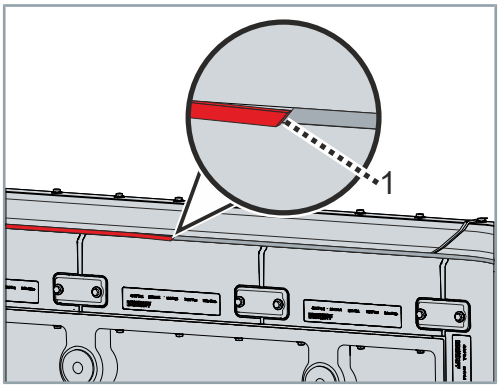
The ends of the seals overlap at the starting points.



- ► Cut diagonally through both ends 2 of the overlapping seals 1 and 3 with a cutting tool

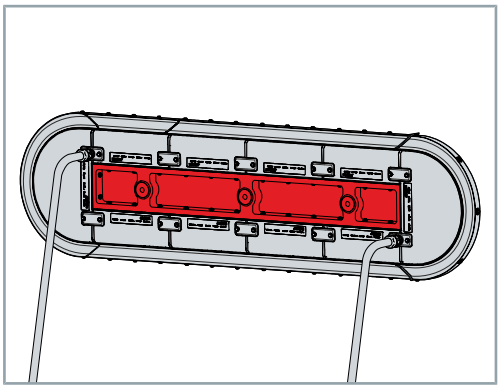
A scalpel or a hobby knife, for example, is a suitable cutting tool.

- ► Cut the seal on the other side of the system to length in the same way
- ► Loosen the screws in the upper guide rail somewhat in order to glue the seals



- ► Apply adhesive to one end 1
- ► Press the end into the groove in order to glue the two ends together
- ► Remove surplus adhesive with a lint-free cloth
- ► Glue the seal on the other side of the system in the same way
- ► Tighten the screws in the upper guide rail hand tight again

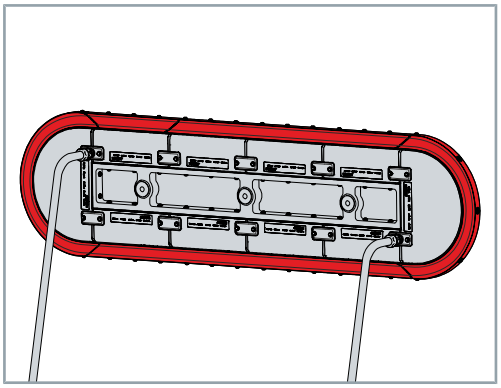
Completion of the assembly



► Screw all screws in the machine bed tight

► Observe tightening torques:

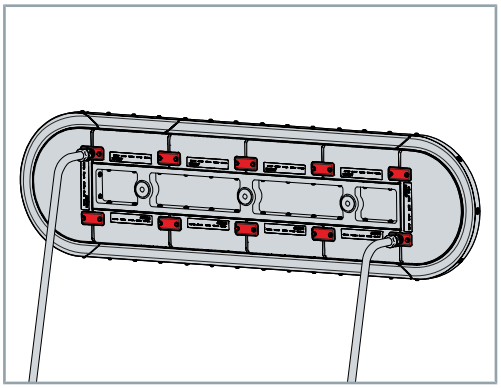
Components	Tightening torque [Nm]
Screws, M5 x 20	8



► Screw all screws on the guide rails of the entire system tight

► Observe tightening torques:

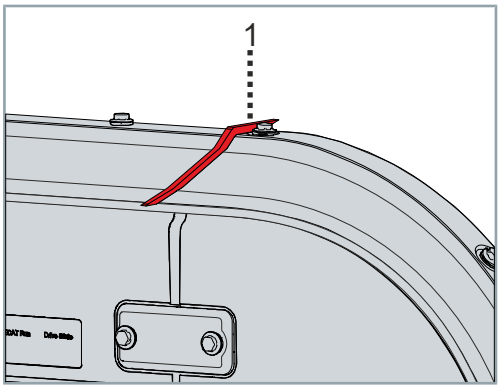
Components	Tightening torque [Nm]
Screws, M4 x 45	6



► Screw all screws on the electrical interfaces of the entire system tight

► Observe tightening torques:

Components	Tightening torque [Nm]
Screws, M4 x 12	3



► Cut off the overhanging part of the seal 1 flush to the rail with a cutting tool

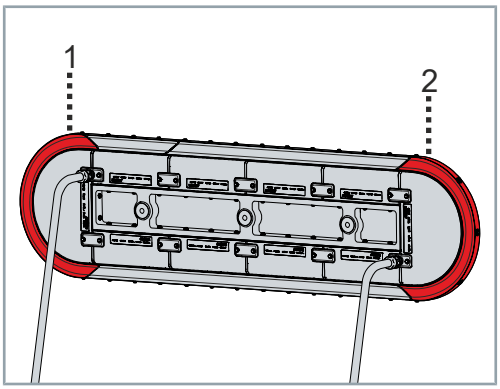
A scalpel or a hobby knife, for example, is a suitable cutting tool.

► a scalpel or hobby knife

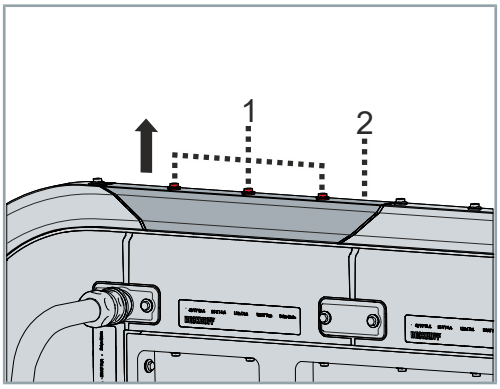
► Cut all further seals to length in the same way

Mover

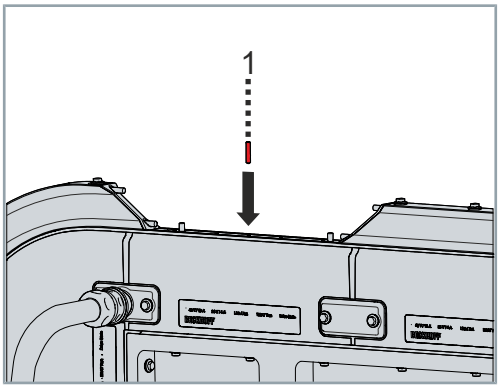
Better running characteristics
Beckhoff recommends greasing the running surfaces on the curved rails with Vaseline before mounting the movers and commissioning the XTS Hygienic.



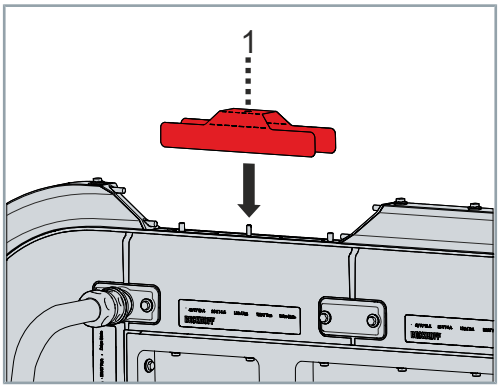
▶ Grease the running surfaces on both sides of the curved rails 1 and 2 with Vaseline



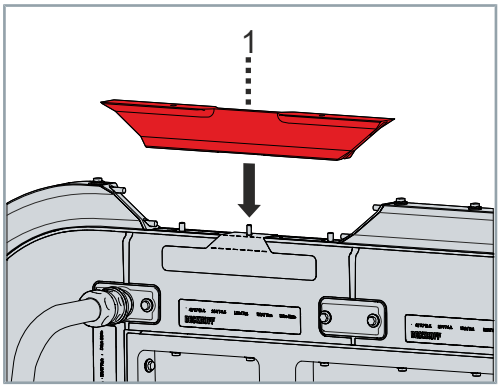
▶ Loosen and remove screws 1
▶ Remove lock 2



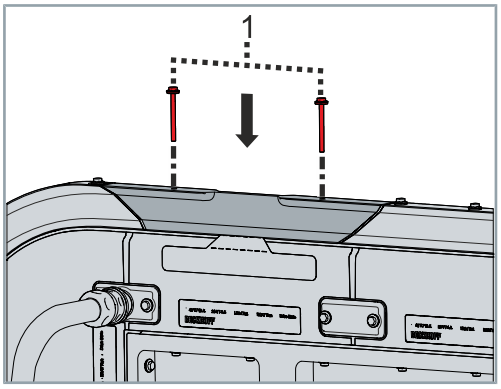
▶ Screw set screw 1 into the module



▶ Push guard plate 1 over the set screw onto the module



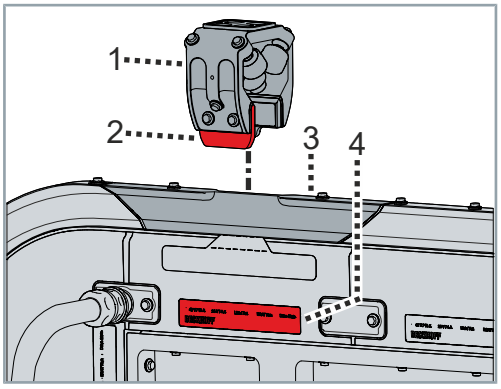
► Place rail on support 1 on the module



► Tighten screws with sealing rings 1 hand tight to fix the rail on support

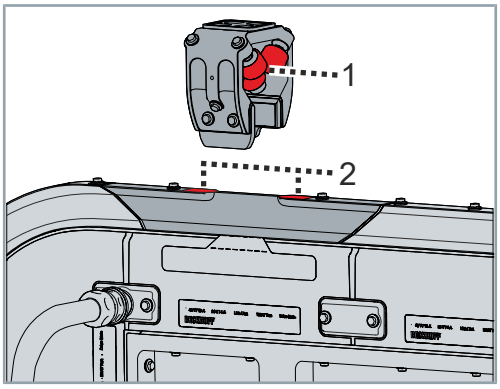
⚠ WARNING

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 XTS Hygienic and cause serious crushing injuries to the hands and fingers or damage to the system.

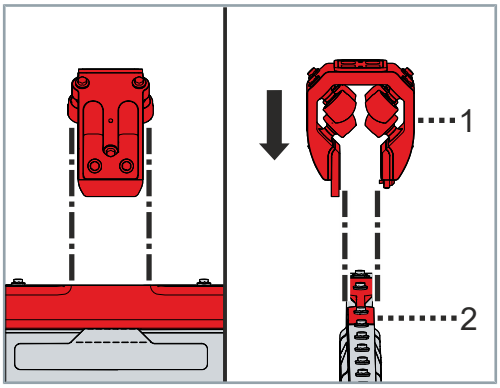


► For the alignment, note that encoder magnet 2 and LED status display 4 are on the same side of the system when railing-on

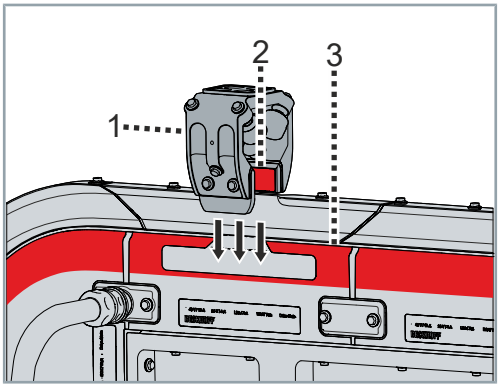
► Position mover 1 with encoder magnet 2 centrally over the rail on support 3



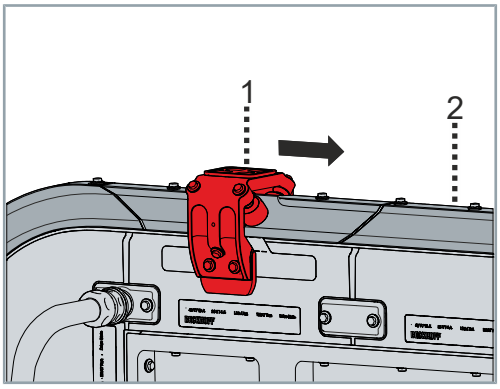
► Make sure when mounting the movers that the guide rollers 1 of the movers do not press against the edges 2 of the rail on support



► Place mover 1 carefully with both hands centrally onto the rail on support 2



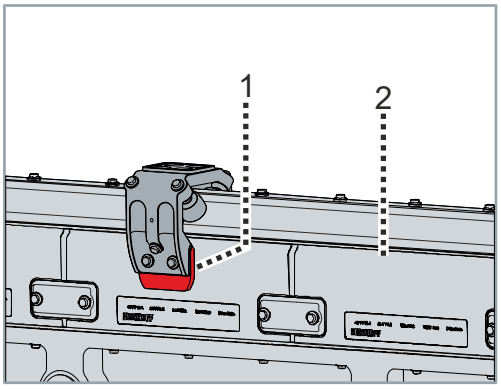
As soon as you place the magnetic plate set 2 of the mover 1 in the vicinity of the module 3, the magnetic plate set and the module attract each other magnetically.



► 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.

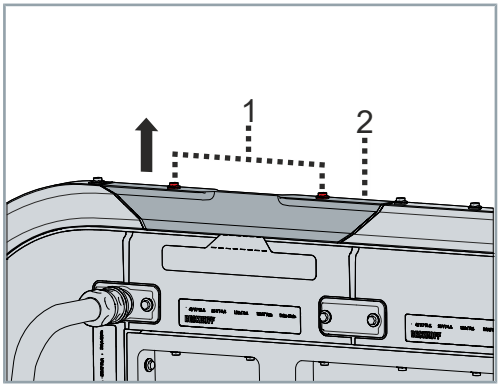
► Mount all further movers in the same way



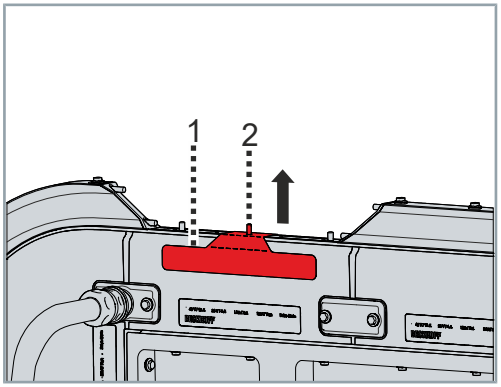
When all remaining movers have been mounted:

- ► 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 0.70 mm
- ► Check that the magnetic plates are positioned parallel to the modules

Remove rail on support



- ► Loosen and remove screws 1
- ► Remove rail on support 2



- ► Remove guard plate 1 and set screw 2
- ► Fit the lock again
- ► Observe tightening torques:

Components	Tightening torque [Nm]
Screws, M4 x 45	6

Connection technology

All modules of the XTS Hygienic have variable interfaces. Mounted on these interfaces are either covers with a connection card for electrically connecting modules together or covers with a supply.

The covers with supply are delivered with an integrated and pre-assembled hybrid cable that combines the power cable with the EtherCAT cable. The end of the EtherCAT cable has an RJ45 connector with the TSB568A configuration. The end of the power cable is pre-assembled with ferrules. Mating connectors are not included in the scope of supply.

Cables

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.

For proper application and assembly we recommend:

- Wiring in accordance with applicable regulations and standards
- Use the pre-assembled and shielded Beckhoff cables for power and EtherCAT connections

Laying

In the case of the covers with supply, an 8 m-long black/yellow hybrid cable is integrated inside a 6 m-long blue protective sleeve. This hybrid cable consists of a power cable and an EtherCAT cable:

- Power cable: 3G 4 mm^2 + 2 x 1.5 mm^2
- white EtherCAT cable with RJ45 connection

You may shorten the sleeve and the power cable, but not the white EtherCAT cable.

Lay the hybrid cable in such a way that it is 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. Beckhoff recommends "fixed installation", because the cable is not suitable for drag chains.

Observe the specified bending radii for a permanently laid or occasionally moved hybrid cable with protective sleeve in the table:

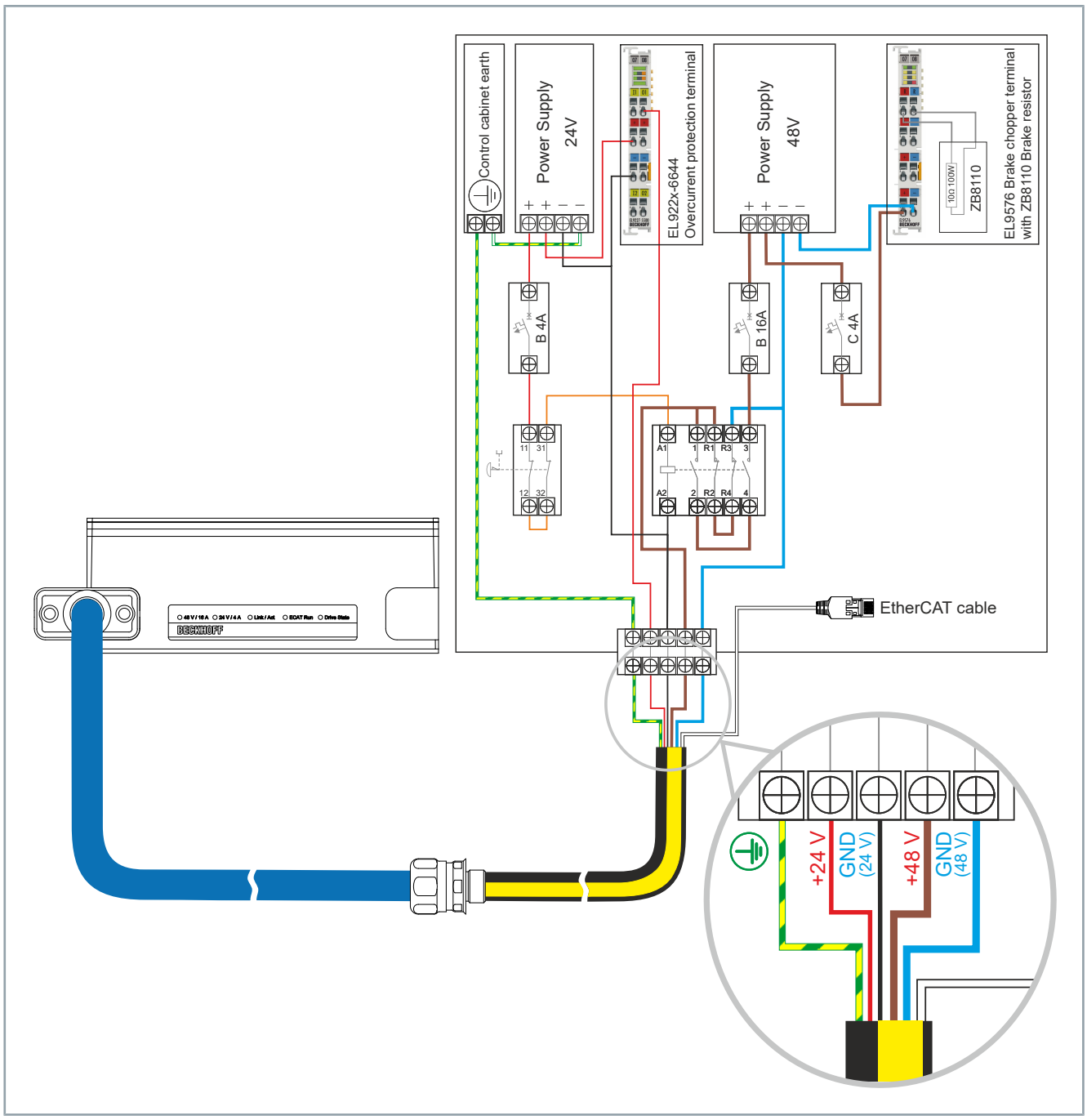
Laying	Bending radius	
	Protective sleeve	**Hybrid cable**
Permanently laid cable	100 mm	80 mm
Occasionally moved cable	135 mm	165 mm

Brake chopper terminal

Use brake chopper terminal version 0.4
Only use the 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.

Pin assignment of the power cable

Here is an overview of the cable configuration for the establishment of the power supply:

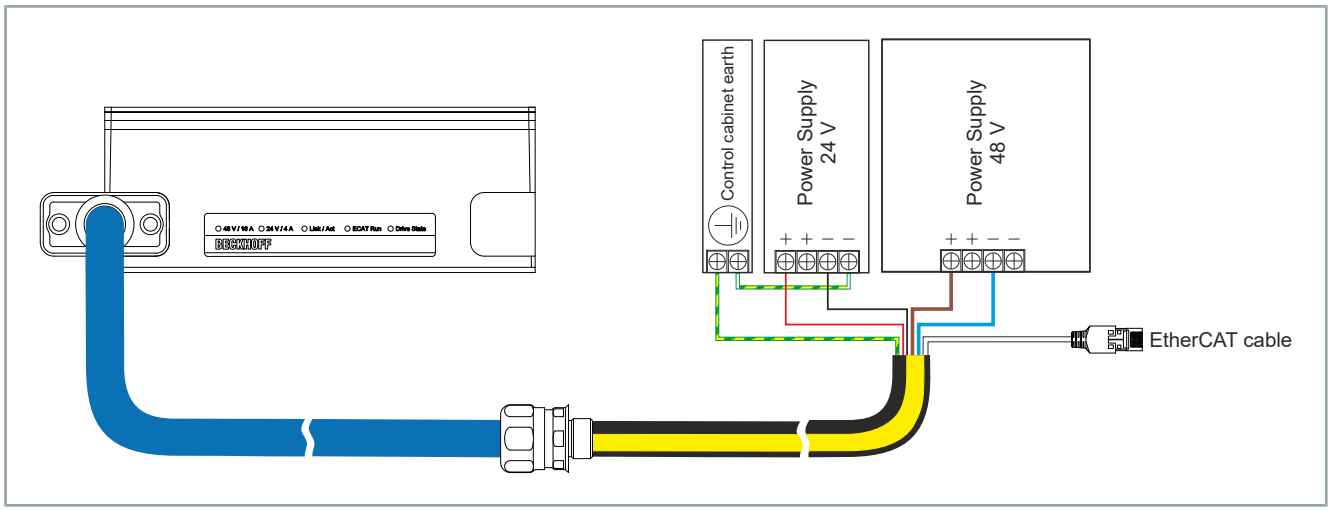


The following table shows the cable configuration for the power cable of the XTS Hygienic:

Wire color	Signal	Wire cross-section
brown	+48 V	4 mm²
blue	GND, 48 V	4 mm²
red	+24 V	1.5 mm²
black	GND, 24 V	1.5 mm²
Green/yellow PE	Functional earth	4 mm²

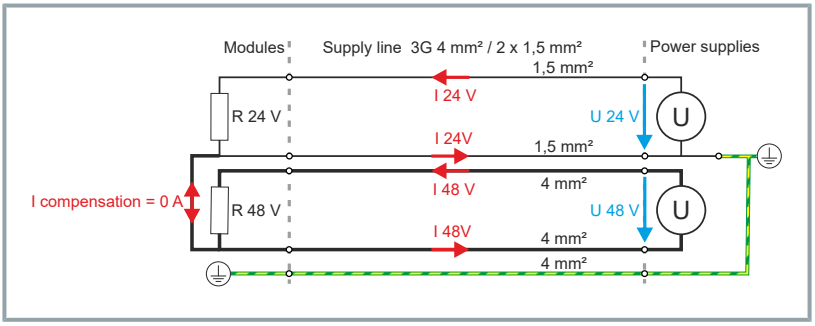
Earthing of the supply

No fuses exist
The figure below is for illustration purposes only. No necessary fuses exist or are pictured in the simplified illustration.



Control circuit

The EN60204-1 standard, clause 9.4.3.1. Earth faults stipulates that 24 V_{DC} control circuits must be earthed. The earthing prevents the automatic start-up of a machine in the case of a cross-circuit.



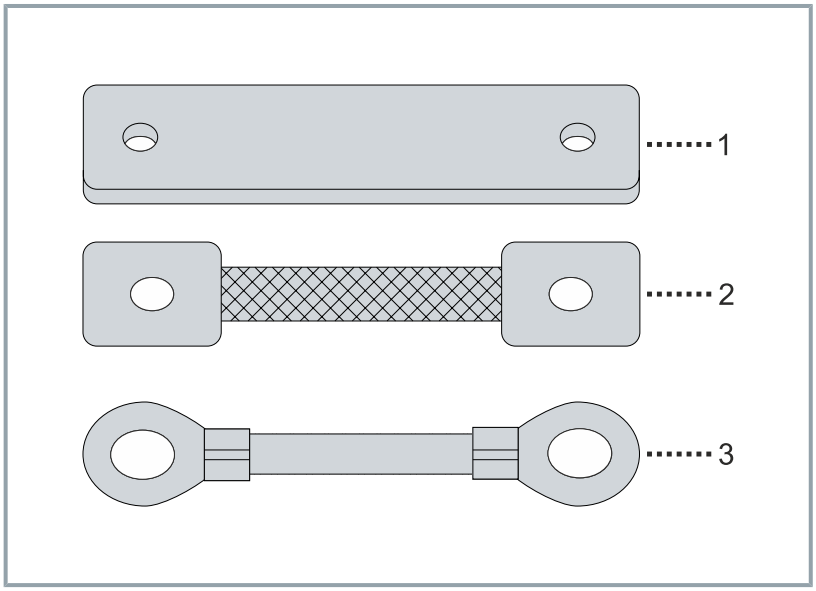
Load current circuit

Beckhoff recommends that you don't earth the 48 V power supply unit
The 24 V_{DC} return line (1.5 mm^2) could be overloaded.

If the 48 V power supply unit is earthed, the currents will be distributed to the 48 V_{DC} and 24 V_{DC} back wires in accordance with the impedances. Equalizing currents will then flow via the earth on the power supply unit, as a result of which the 24 V_{DC} return line (1.5 mm^2) could be overloaded.

Earthing of the machine beds

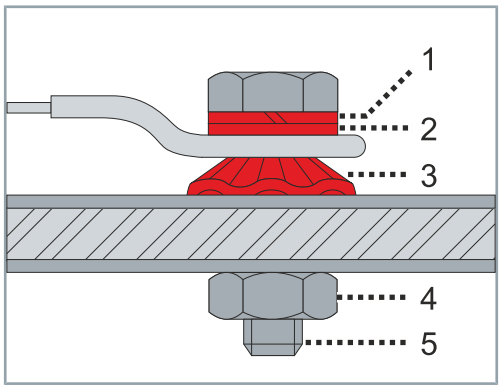
The earth connection must be made with the largest possible cross-section, with a low impedance, over a large area and via a short connection to large conductive fastenings. Beckhoff recommends the use of wide connections with large contact surfaces. Wide earth straps are suitable for this. The table below illustrates typical suitable connectors:



Number	Connector
1	Copper rail
2	Earth strap with cable lugs
3	Cable with cable lugs

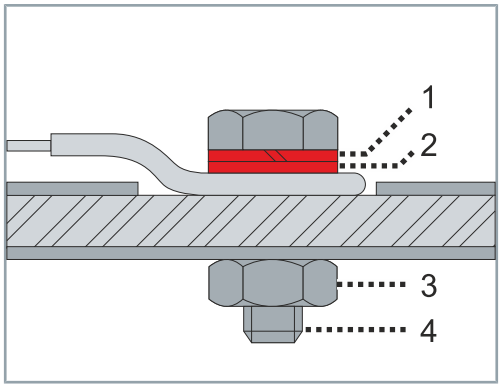
Make sure that an optimally conductive connection is available at the connection point for the protective conductor. To ensure this, carefully remove paint, dirt, corrosion and all insulating components. Use galvanized stud bolts and washers.

Painted surfaces



► Earth painted surface as shown in the figure with spring washer 1, washer 2, contact washer 3, nut 4 and bolt 5

Unpainted surfaces

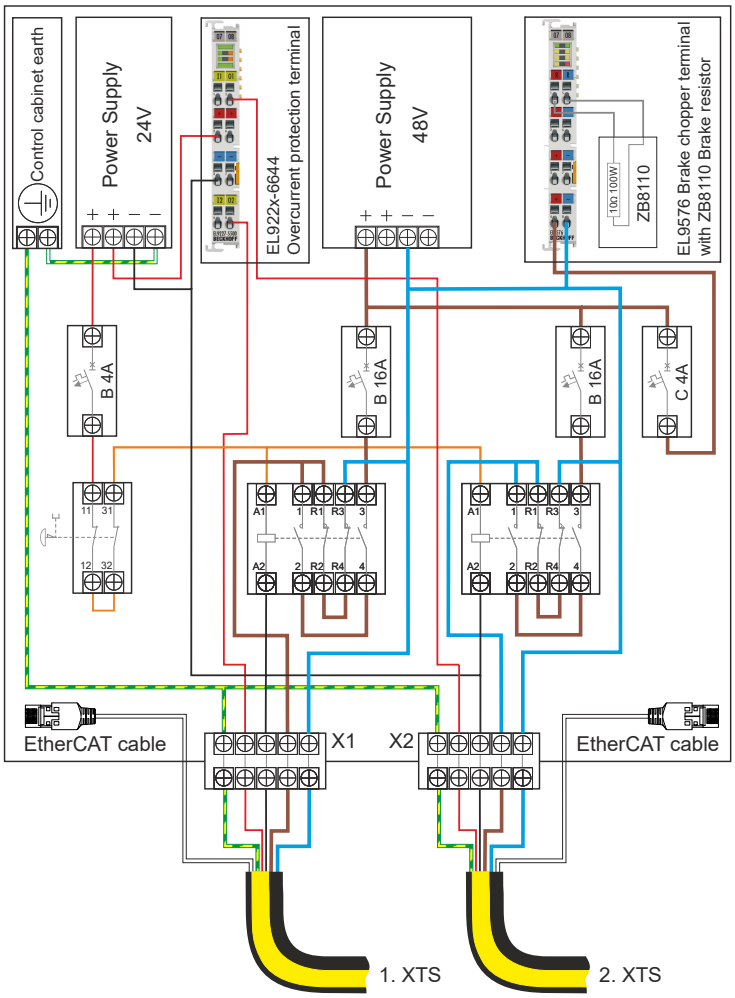


► Earth unpainted surface as shown in the figure with spring washer 1, washer 2, nut 3 and bolt 4

Parallel connection of the modules

Single-channel contactor switch-off

The figure below shows a wiring example of a single-channel contactor switch-off for a maximum of two modules:

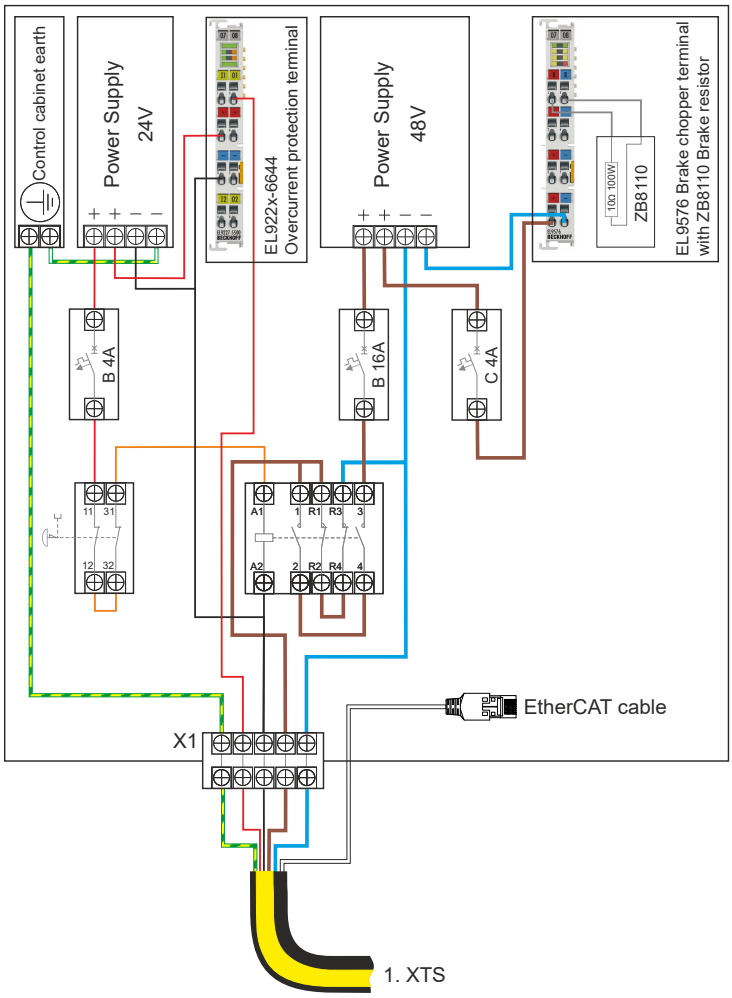


	24 V_{DC} power supply unit	**48 V_{DC} power supply unit**
Beckhoff power supply unit	PS3001-2420-0001 PS3031-2420-0001	PS3011-4820-0000 PS3031-4820-0000
Primary fusing	See documentation for power supply unit on www.beckhoff.com	See documentation for power supply unit on www.beckhoff.com
Secondary fusing	Overcurrent protection terminal 24 V DC, 2-channel, 4 A/4 A, Beckhoff EL9222-6644 or EL9227-6644 with extended functions	Outlet to module with supply 16 A "B" circuit breaker, Siemens 5SY6116-6 Outlet to brake chopper terminal 4 A "C" circuit breaker, Siemens 5SY6104-7 Single-channel contactor switch-off Siemens 3RT2526-2BB40 + 3RT2926-1CB00 Self-locking of the movers according to the armature short-circuit principle **Modules have no "Safe Torque Off" STO and no "Safe Limited Speed" SLS function**

Control

Single-channel contactor switch-off

The figure below shows a wiring example of a single-channel contactor switch-off:

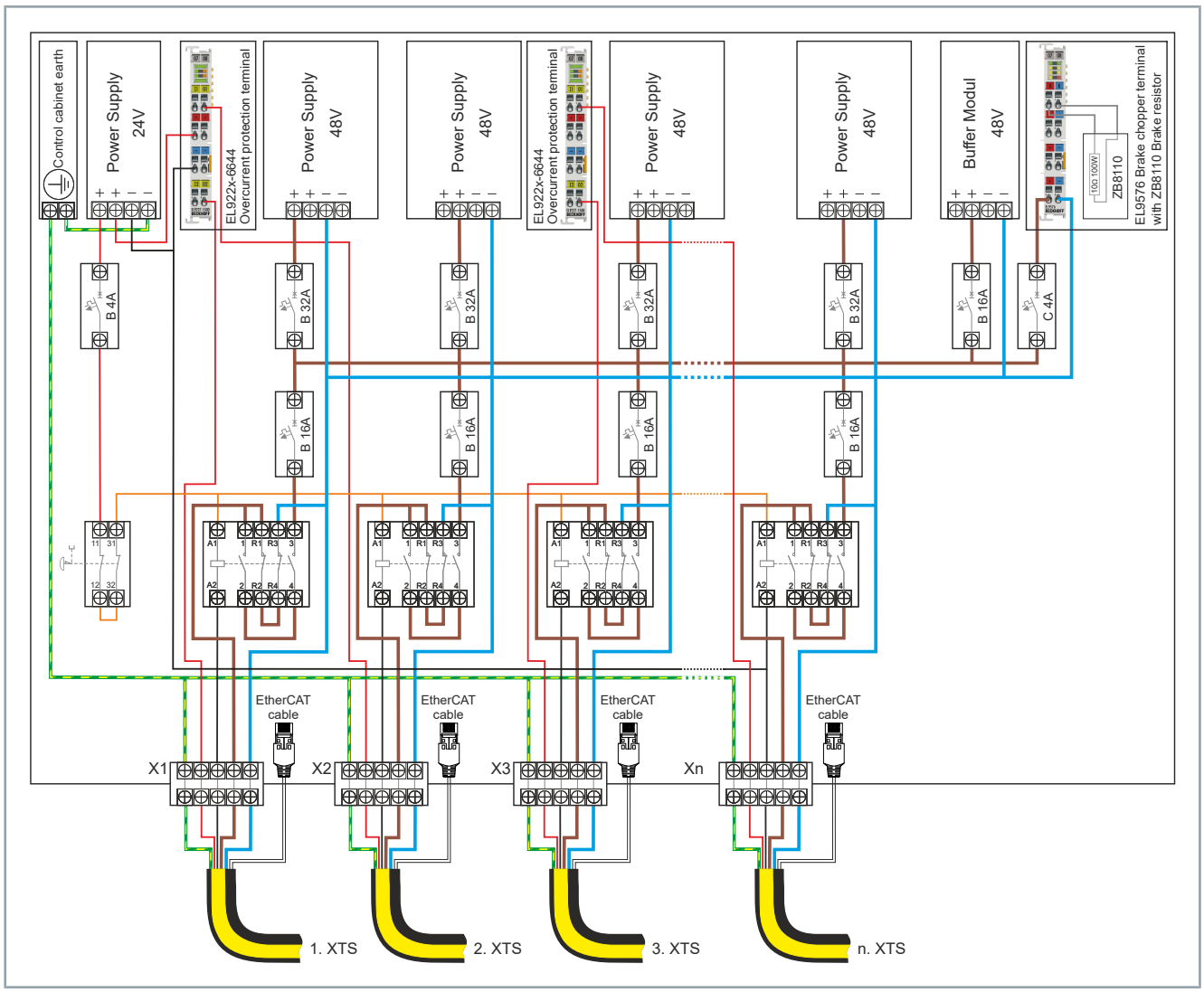


	24 V_{DC} power supply unit	48 V_{DC} power supply unit
Beckhoff power supply unit	PS3001-2420-0001 PS3031-2420-0001	PS3011-4820-0000 PS3031-4820-0000
Primary fusing	See documentation for power supply unit on www.beckhoff.com	See documentation for power supply unit on www.beckhoff.com
Secondary fusing	Overcurrent protection terminal 24 V DC, 2-channel, 4 A/4 A, Beckhoff EL9222-6644 or EL9227-6644 with extended functions	Outlet to module with supply 16 A "B" circuit breaker, Siemens 5SY6116-6 Outlet to brake chopper terminal 4 A "C" circuit breaker, Siemens 5SY6104-7 Single-channel contactor switch-off Siemens 3RT2526-2BB40 + 3RT2926-1CB00 Self-locking of the movers according to the armature short-circuit principle **Modules have no "Safe Torque Off" STO and no "Safe Limited Speed" SLS function**

Parallel connection of the power supply

Single-channel contactor switch-off

The figure below shows a wiring example of a single-channel contactor switch-off:

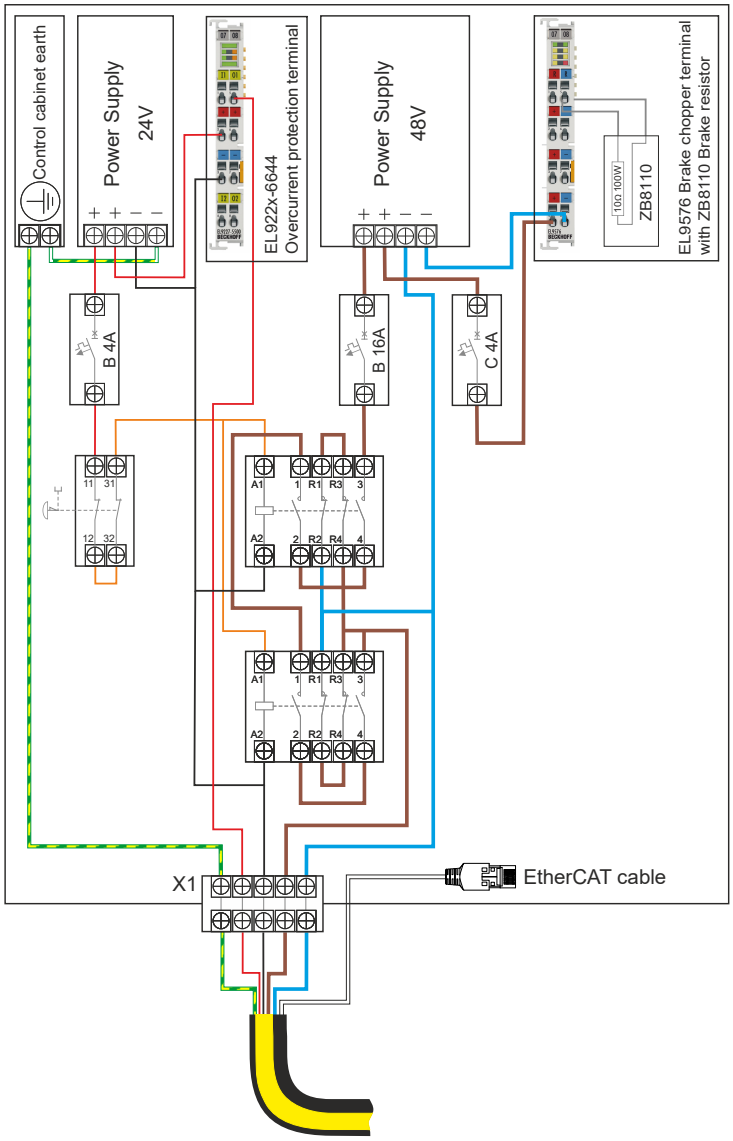


	48 V_{DC} power supply unit
Beckhoff power supply unit	PS3011-4820-0000 PS3031-4820-0000
Primary fusing	See documentation for power supply unit on www.beckhoff.com
Secondary fusing	32 A "B" circuit breaker, Siemens 5SY6132-6, on the 48 V_{DC} busbar Outlet to module with supply 16 A "B" circuit breaker, Siemens 5SY6116-6 Outlet to brake chopper terminal 4 A "C" circuit breaker, Siemens 5SY6104-7 Single-channel contactor switch-off, Siemens 3RT2526-2BB40 + Siemens 3RT2926-1CB00 Self-locking of the movers according to the armature short-circuit principle **Modules have no "Safe Torque Off" STO and no "Safe Limited Speed" SLS function**

Control

Two-channel contactor switch-off

The figure below shows a wiring example of a two-channel contactor switch-off:



	24 V_{DC} power supply unit	48 V_{DC} power supply unit
Beckhoff power supply unit	PS3001-2420-0001 PS3031-2420-0001	PS3011-4820-0000 PS3031-4820-0000
Primary fusing	See documentation for power supply unit on www.beckhoff.com	See documentation for power supply unit on www.beckhoff.com
Secondary fusing	Overcurrent protection terminal 24 V DC, 2-channel, 4 A/4 A, Beckhoff EL9222-6644 or EL9227-6644 with extended functions	Outlet to module with supply 16 A "B" circuit breaker, Siemens 5SY6116-6 Two-channel contactor switch-off Siemens 3RT2526-2BB40 + 3RT2926-1CB00 Self-locking of the movers according to the armature short-circuit principle **Modules have no "Safe Torque Off" STO and no "Safe Limited Speed" SLS function**

Exemplary commissioning
The procedure for commissioning is described as an example. A different method may be appropriate or necessary, depending on the application of the components.

Before commissioning

- Check modules, guide rails and seals for damage
- Check installation and alignment
- Check the distance from the magnetic plates and encoder magnets to the modules
- Check the pretension of the movers
- Tighten screw connections correctly
- Mount mechanical and electrical protective devices
- Check the wiring, connection and proper earthing

During commissioning

- Make sure that all fittings were checked for function and adjustment
- Observe information for environment and operation
- Check protective measures against moving and live parts

Configuration
Beckhoff recommends the use of the latest TwinCAT XAE and TF5850 for the configuration of new projects

- Create a new TwinCAT project and select the target system
- Add modules to the I/O devices via the Scan function
- Open the XTS Tool window
- Start the XTS configurator and carry out the setup in order to create the necessary objects and links
- Check the settings for real-time and Distributed Clocks
- Check the state and activate TwinCAT

Prerequisites during operation

- Pay attention to atypical noise development
- Pay attention to smoke development
- Always check drive surfaces, cables and seals for dirt, leaks, moisture or dust
- Check temperature development
- Observe recommended maintenance intervals
- Check function of safety devices

After operation

⚠ WARNING

Ensure safe condition of the machine / system
Make sure that all movers come completely to a standstill.
If the controller enable is canceled or the 48 V power supply is switched off, movers on a vertical section can move uncontrollably and cause serious injuries.

⚠ WARNING

Ensure safe condition for cleaning work
Basically, electronic devices are not fail-safe. The condition is always safe when the unit is switched off and not energized. For cleaning work, bring the connected motors and the machine into a safe state.
Carrying cleaning work during operation can lead to serious or fatal injuries.

Beckhoff recommends regular maintenance in order to prevent permanent damage to the system. Contamination, dust or chips can have a negative effect on the function of the components. In the worst case, contamination can lead to failure. Therefore, clean and maintain the components at regular and necessary intervals.

Cleaning

Avoid damaging the seals
When using cleaning agents, make sure that they are compatible with the material of the guide rollers and the VMQ silicone sealing material.
Unsuitable cleaning agents can damage the guide rollers and seals.

All XTS Hygienic components are chemically resistant and can be cleaned with a high-pressure cleaner.

Please note the following rules for high-pressure cleaning:

- Minimum distance 30 cm
- Maximum water temperature 80 °C
- Maximum water pressure 80-100 bar
- No rotary jet

In addition, it is possible to clean the XTS Hygienic movers in a dishwasher.

Intervals

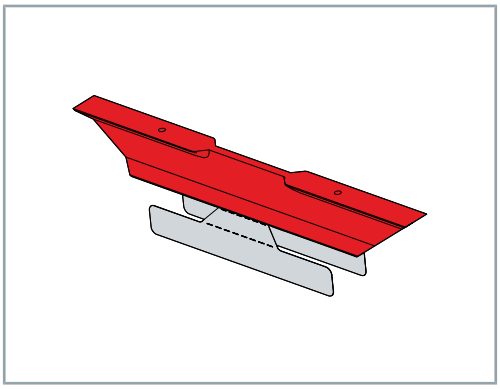
Adapt the maintenance cycles in case of higher loads
Operation at the limits of the permissible environmental conditions and operating states will shorten the intervals. Depending on the mechanical dynamics due to mounted devices and movements, the service life of the mover rollers may be shortened. Therefore, adapt the maintenance cycles to the respective load on the system.

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:

Component	Interval	Maintenance
Complete system		
Seals	6 months and after each high-pressure cleaning	Visual inspection to ensure seals are seated correctly
Modules		
Module side surfaces	2 weeks	Visual inspection for abrasion marks on the magnet carriers
Interface cover	6 months	Unscrew the cover Check the interface for moisture Replace the seal if necessary
Feedback Sensor System	6 months	Visual inspection of the sensor surfaces for abrasion
Machine bed	6 months	Check the fastening of the modules to the machine bed
Guide rails		
Straight guide rails	Every month	Clean the running surfaces Recommended cleaner: Isopropanol
	6 months	Check all connections for firm seating, abrasion marks, corrosion and wear
		Check the fastening of the guide rails to the modules
	As required	Lubricate the running surfaces of the curves Recommended lubricant: Vaseline
Curved rails	Every month	Clean the running surfaces Recommended cleaner: Isopropanol
	6 months	Check all connections for firm seating, abrasion marks, corrosion and wear
		Check the fastening of the curved rails to the modules
	As required	Lubricate the running surfaces Recommended lubricant: Vaseline

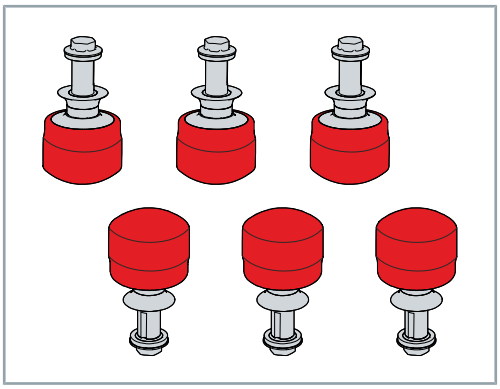
Component	Interval	Maintenance
Lock	Every month	Clean the running surfaces Recommended cleaner: Isopropanol
	6 months	Check the mover lock for wear and break outs
		Check the fastening of the lock
	6 months and whenever it is opened	Check that the lock is seated correctly
	As required	Lubricate the running surfaces Recommended lubricant: Vaseline
Mover		
Guide rollers	3 months	Check the seating of the guide rollers on the rail
Magnetic plates	6 months	Check the magnetic plates for abrasion and damage
Encoder magnet	6 months	Check whether the encoder magnet is secure
		Check that the encoder magnet is not rubbing against the module sensors
Carbon fiber brush	6 months	Check whether the brush exists
		Check that the brush is firmly seated
		Check whether the distance between the brush and the guide rail is less than 1 mm.

Rail on support



The XTS Hygienic movers are mounted on the guide rail by means of the rail on support.

6-roller 75 mm mover



The roller set is available for the replacement of worn or damaged guide rollers in the 75 mm-long stainless steel or aluminum movers with 6 guide rollers:

- ZXH9011-0075

Scope:

- 6 cylindrical guide rollers

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 malfunction.

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

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									

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 has not sent 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 utilization rate: 105 % I2T utilization rate not reached If 100 % I2T utilization rate is reached: Current limited to nominal current						6								
0x840A	Overall current threshold exceeded	Total rated current of 16 A for the power supply segment exceeded for too long: Short current peaks up to 48 A possible													13	
0x840B	Peak overall current threshold exceeded	48 A peak current of a power supply segment 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

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 brake 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 motor voltage and 24 V control voltage mixed up	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 power supply segment require too much power	Reduce mover dynamics
		Move movers with a time offset
		Add additional power supply module
14	Movement of too many movers at the same time with high dynamics	Move movers with a time offset
		Reduce mover dynamics

TcIoXts object

Warning

ID	Message	Cause	Number of the solution										
5000	The XTS is designed to run with a cycle time of 250 us. Other cycle times are not supported	Cycle time of the XTS task is not equal to 250 µs: A cycle time of 375 µs 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			
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

Error

ID	Message	Cause	Number of the solution													
9000	Xts task cannot be accessed. Is the context of the TcIoXts driver set correctly?	Context setting in the "TcIoXtsDrv" object incorrect				12										
9001	Cycle time "x" µs of XTS task is not supported! Set cycle time to 250 µs.	Cycle time of the XTS task is not equal to 250 µs: A cycle time of 375 µs is also possible, but leads to 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 a power supply module: Incorrect order of the power supply modules when configuring the XTS or no reaction or defect of the motor module at position "y"			8											
9003	The motor module "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	TcIoXts driver has failed to start up. Please check the configuration and bootdata files!	Driver cannot start							15							
9006	Teaching file 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\TcIoXts" is corrupt or missing		4												
9008	Teaching file of XTS module "x" is invalid	Damaged or missing teaching file in the directory: "C:\TwinCAT\3.1\Target\Config\TcIoXts" Or motor module "x" not correctly taught		4												
9009	Saving of teaching file "Bezeichnungsstring" ("Designation string") 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 a power supply module Incorrectly order of power supply modules when configuring the XTS			8											
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's have been detected! Make sure that there is only one mover with Mover 1 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 'MoverIdDetectionMode' to 'Standard'	Controller enable for a mover before mover 1 was found												21	
9017	MoverIdDetection was interrupted by changing the 'MoverIdDetectionMode'	Change of the 'MoverIdDetection-Mode' while MoverID detection is running													22

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 TcIoXtsDrv 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\TcIoXts" If a teaching file with a different "Designation string" exists: change 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 TcIoXts 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 TcIoXtsDrv 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 "TcIoXtsDrv" 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. Reinstall the XTS Extension if necessary
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

SoftDrive object

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 takes 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 controller		2											
10004	New Mover 1 detection while axis is enabled	New Mover 1 detection started during the enabling of the axis by the NC controller		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

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 controller switches an axis off
5	Check the settings of the parameters "EmergencyRamp" and "EmergencyTimeOut" Factory setting: • "EmergencyRamp": 10 m/s² • "EmergencyTimeOut": 0.5 s
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 on the basis of the error ID, see: Motor modules 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: • DetectionMinMovement • DetectionStandstillVelocityLimit • DetectionStandstillSwitchTime

For more information please refer to Chapter: Documentation notes.

Disassembly may only be carried out by qualified and trained personnel.

When disposing of electronic waste, make sure that you dispose of it in accordance with the regulations applicable in your country. Read and follow the instructions for proper disposal.

Disassembly

⚠ 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 if you have any questions.

Removal of the XTS Hygienic 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 XTS Hygienic components to the workplace or put them into storage

Disposal

Depending on your application and the products used, ensure the professional disposal of the respective components:

Cast iron and metal
Dispose of cast and metal parts as scrap metal for recycling.

Cardboard, wood and foam polystyrene
Dispose of packaging materials made of cardboard, wood or foam polystyrene in accordance with the regulations.

Plastics and hard plastics
You can recycle parts made of plastic and hard plastic via the recycling depot or re-use them depending on the component designations and markings.

Oils and lubricants
Dispose of oils and lubricants in separate containers. Hand over the containers at the used oil collection station.

Batteries and rechargeable batteries
Batteries and rechargeable batteries may also be marked with the crossed-out trash can symbol. You must separate these components from the waste and 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.

Electronic components
Products marked with a crossed-out waste bin must not be disposed of with general waste. Electronic components and equipment must be disposed of properly. The national regulations for the disposal of electrical and electronic equipment must be observed.

Returning to the vendor

In accordance with the WEEE-2012/19/EU directives, you can return used devices and accessories for professional disposal. The transport costs are borne by the sender.

Send the used devices with the note "For disposal" to:

Beckhoff Automation GmbH & Co. KG
"Service" Building
Stahlstrasse 31
D-33415 Verl

In addition, you have the option to contact a local certified specialist company for the disposal of used electrical and electronic appliances. Dispose of the old components in accordance with the regulations applicable in your country.

More Information:
www.beckhoff.com/xts

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