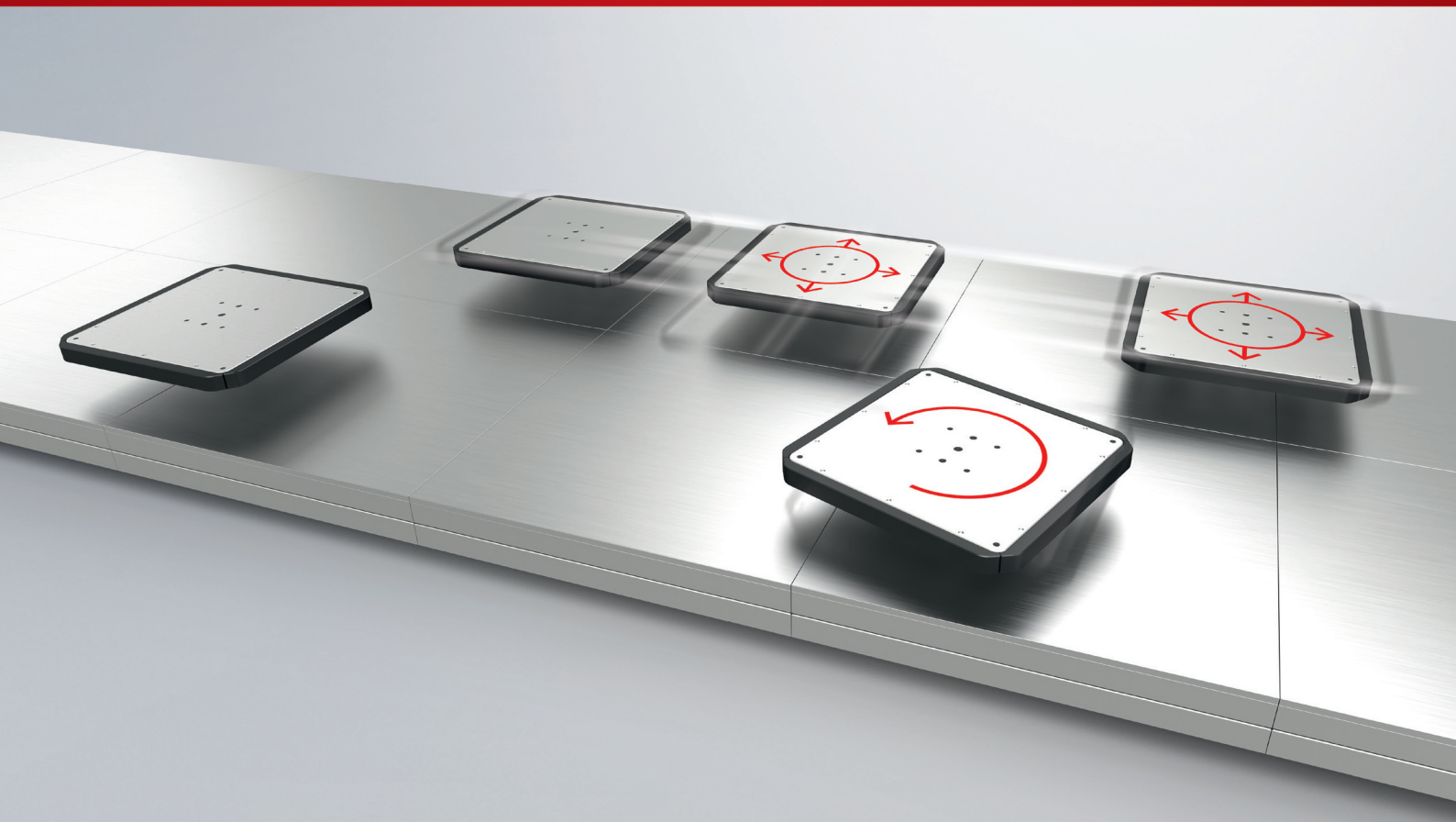
BECKHOFF New Automation Technology

Operating Instructions | EN

XPlanar

APS42xx-1x00 | Planar Motor System



2025-03-28 | Version 1.0.2

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1 Documentation notes

1.1 Disclaimer

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

1.1.1 Trademarks

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The use by third parties of other brand names or trademarks contained in this documentation may lead to an infringement of the rights of the respective trademark owner.

1.1.2 Patents

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

- EP1590927
- EP1789857
- EP1456722
- EP2137893
- DE102015105702

EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH.

1.1.3 Limitation of liability

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

The following is excluded from the liability:

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

1.1.4 Copyright

1.1.5 Third-party brands

Third-party trademarks and wordmarks are used in this documentation. The trademark endorsements can be found at: https://www.beckhoff.com/trademarks

1.2 Version numbers

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

motion-documentation@beckhoff.com

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

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

1.3 Scope of the documentation

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

Manual | TF5430
Description of the package for controlling the XPlanar mover.

Direct link to the documentation TF5430 | TwinCAT 3 Planar Motion

1.4 Staff qualification

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

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

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

Instructed person

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

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

Trained person

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

- machine-specific or
- plant-specific

Trained specialists

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

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

Qualified electricians

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

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

1.5 Safety and instruction

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

1.5.1 Notes on information security

The products of Beckhoff Automation GmbH & Co. KG (Beckhoff), insofar as they can be accessed online, are equipped with security functions that support the secure operation of plants, systems, machines and networks. Despite the security functions, the creation, implementation and constant updating of a holistic security concept for the operation are necessary to protect the respective plant, system, machine and networks against cyber threats. The products sold by Beckhoff are only part of the overall security concept. The customer is responsible for preventing unauthorized access by third parties to its equipment, systems, machines and networks. The latter should be connected to the corporate network or the Internet only if appropriate protective measures have been set up.

In addition, the recommendations from Beckhoff regarding appropriate protective measures should be observed. Further information regarding information security and industrial security can be found in our https://www.beckhoff.com/secguide.

Beckhoff products and solutions undergo continuous further development. This also applies to security functions. In light of this continuous further development, Beckhoff expressly recommends that the products are kept up to date at all times and that updates are installed for the products once they have been made available. Using outdated or unsupported product versions can increase the risk of cyber threats.

To stay informed about information security for Beckhoff products, subscribe to the RSS feed at https://www.beckhoff.com/secinfo.

1.6 Explanation of symbols

Various symbols are used for a clear arrangement:

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

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

⚠ DANGER

Failure to comply will result in serious or fatal injuries.

⚠ WARNING

Failure to comply may result in serious or fatal injuries.

⚠ CAUTION

Failure to comply may result in minor or moderate injuries.

NOTICE

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

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

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

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

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

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

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

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

1.7 Beckhoff Services

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

www.beckhoff.com/en-en/support/global-availability/

1.7.1 Support services

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

+49 5246 963-157
support@beckhoff.com
www.beckhoff.com/en-en/support/our-support-services/

1.7.2 Training offerings

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

+49 5246 963-5000
training@beckhoff.com
www.beckhoff.com/en-en/support/training-offerings/

1.7.3 Service offerings

The Beckhoff service experts support you worldwide in all areas of after-sales service.

+49 5246 963-460
service@beckhoff.com
www.beckhoff.com/en-en/support/our-service-offerings/

1.7.4 Headquarters Germany

Beckhoff Automation GmbH & Co. KG
Hülshorstweg 20
33415 Verl, Germany

+49 5246 963-0
info@beckhoff.com
www.beckhoff.com/en-en/

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

www.beckhoff.com/en-en/company/global-presence/

1.7.5 Downloadfinder

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

www.beckhoff.com/documentations

2 For your safety

Read the general safety instructions in this chapter. Observe the warnings in these operating instructions for your own safety, the safety of others and the safety of the product.

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

2.1 Safety pictograms

You will find safety symbols on Beckhoff products and packaging. The symbols may be glued, printed, or lasered on and may vary depending on the product. They serve to protect people and to prevent damage to the products. Safety pictograms may not be removed and must be legible for the user.

Danger from magnetic fields
Magnetic fields at the individual components can be dangerous for people with cardiac pacemakers or magnetically conductive implants and defibrillators, for example. Data carriers or other electronic devices in the vicinity may also be affected or destroyed.

Warning of hand injuries
The strong magnetic field of the movers can cause hand injuries if you grip and transport the mover incorrectly. For transport outside the system always use the transport securing device provided.

Magnetic field warning
A mover contains strong permanent magnets. These magnets always generate a strong magnetic field, even in de-energized state. Avoid direct contact between movers and ferromagnetic objects, such as assembly trolleys, tools or machine beds.

DANGER!
CAUTION!

General risk warning
Improper handling of movers may result in injury. Observe the safety instructions for handling the components, the safety pictograms and these operating instructions.

2.2 General safety instructions

This chapter contains instructions on how to handle the product safely. This product cannot be run independently. The product must be installed in a machine or system by the machine builder. Read the documentation prepared by the machine builder.

2.2.1 Before operation

Danger from magnetic fields
Magnetic fields on individual components of the XPlanar unit pose a risk 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.

Follow the Mover handling instructions
The risks due to magnetic fields referred to above particularly relate to handling of the movers. The movers can be attracted uncontrollably by contact with magnetic objects. Read the chapter on Mechanical installation before handling the movers.

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.

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.

2.2.2 During operation

Observe the GND concept

During the installation, follow the common guidelines for grounding electrical components. For grounding please refer to the chapter on Grounding the machine bed.

Do not work on live electrical parts

Ensure that the protective conductor and functional conductor are properly connected. Never loosen electrical connections when live. Disconnect all components from the mains and secure them against being switched on again.

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.

2.2.3 After operation

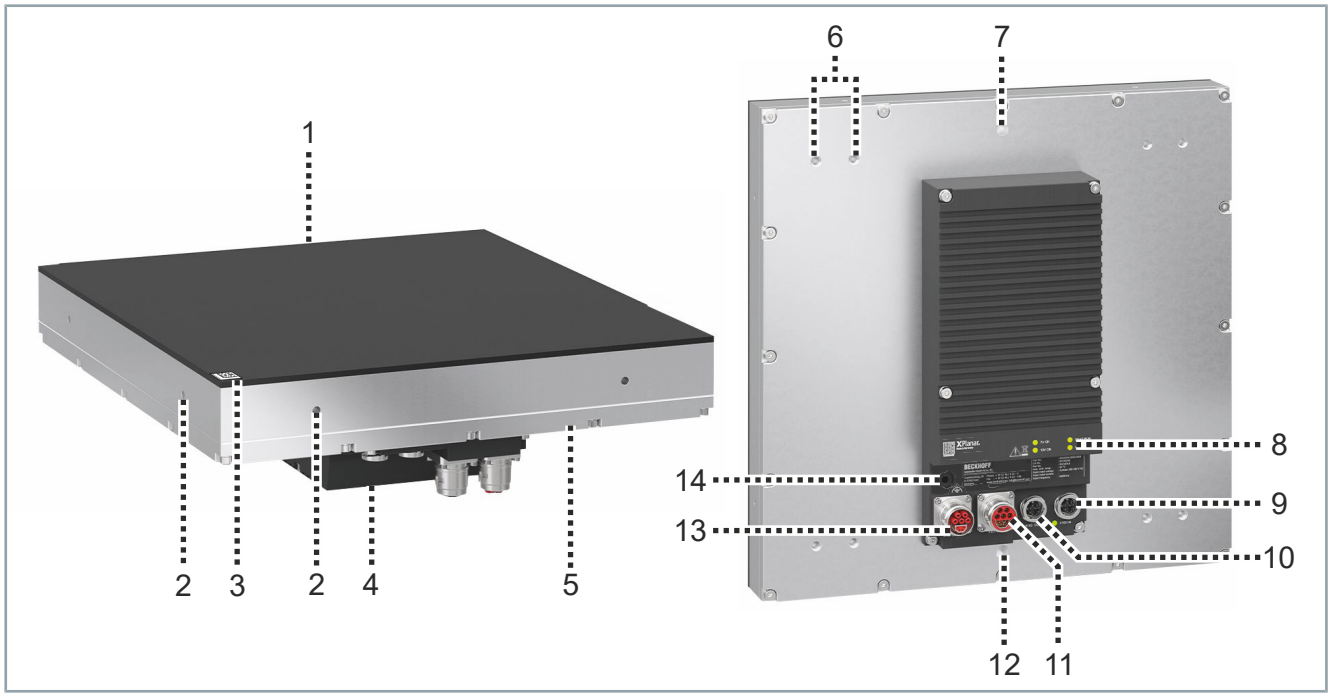
De-energize and switch off components before working on them

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

3 Product overview

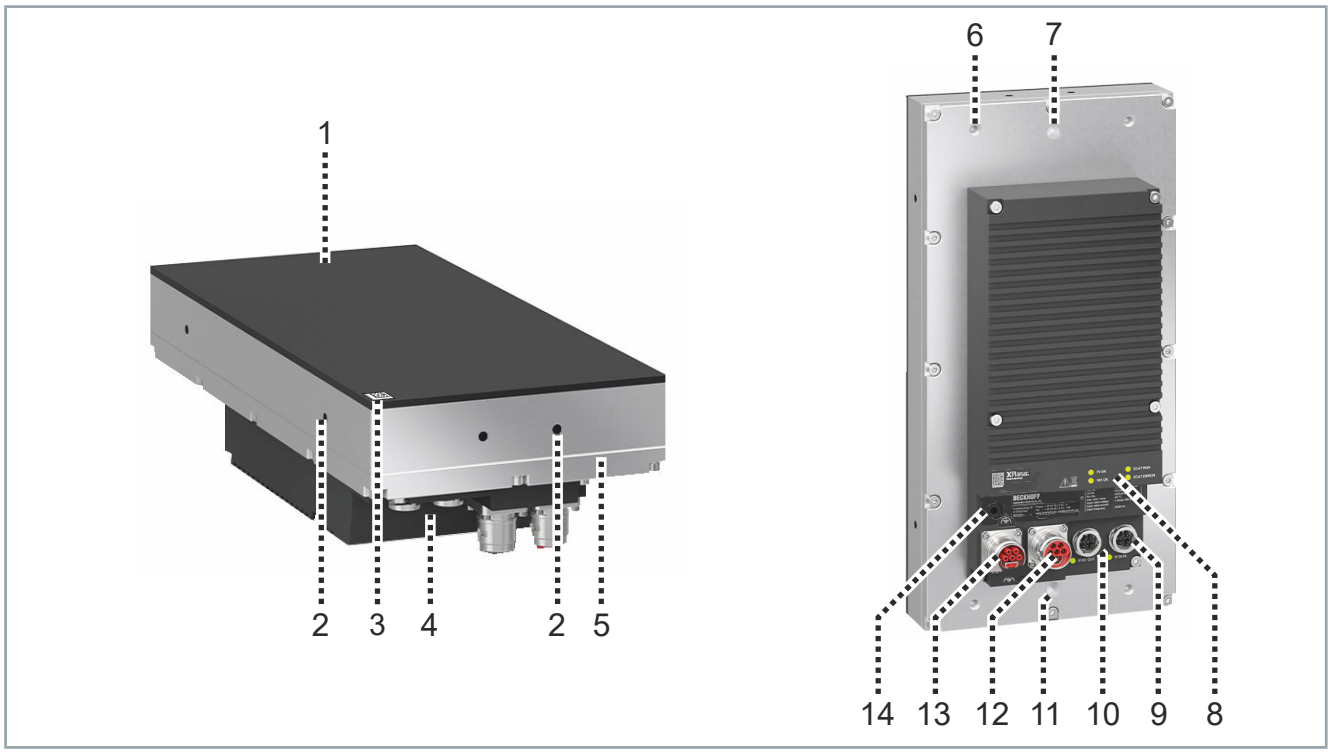
3.1 Tiles

APS4244-1x00



Position	Name
1	Protective film
2	Thread for mounting attachments
3	Sticker with coordinate origin
4	Cover
5	Base body
6	Thread for mounting on the machine bed
7	Hole for positioning with locating pins
8	LED status indicator
9	X103 – EtherCAT IN
10	X102 – EtherCAT OUT
11	X101 – Power IN
12	Elongated hole
13	X100 – Power OUT
14	Functional earth connection

APS4224-1x00 and APS4242-1x00



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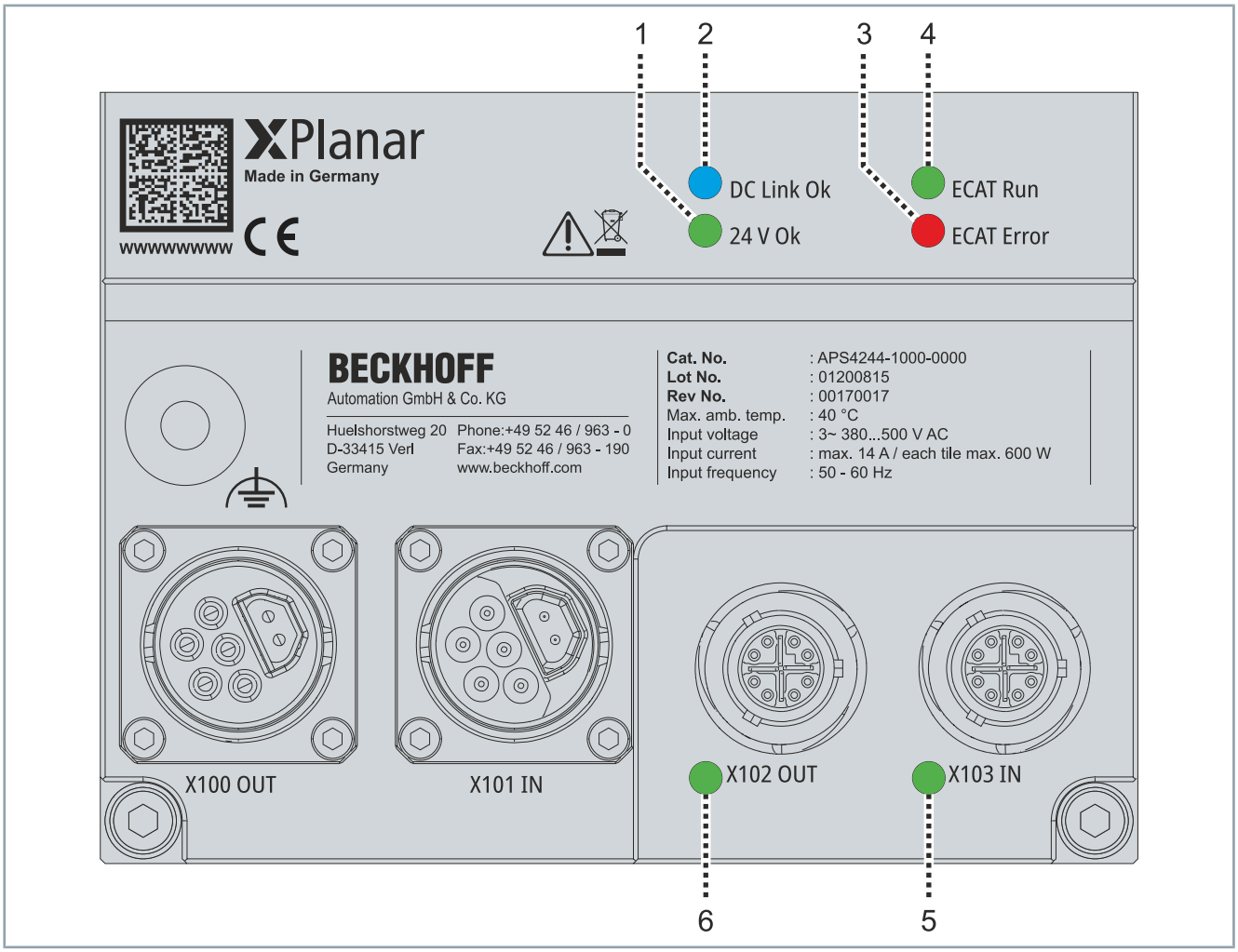
LED status indicator

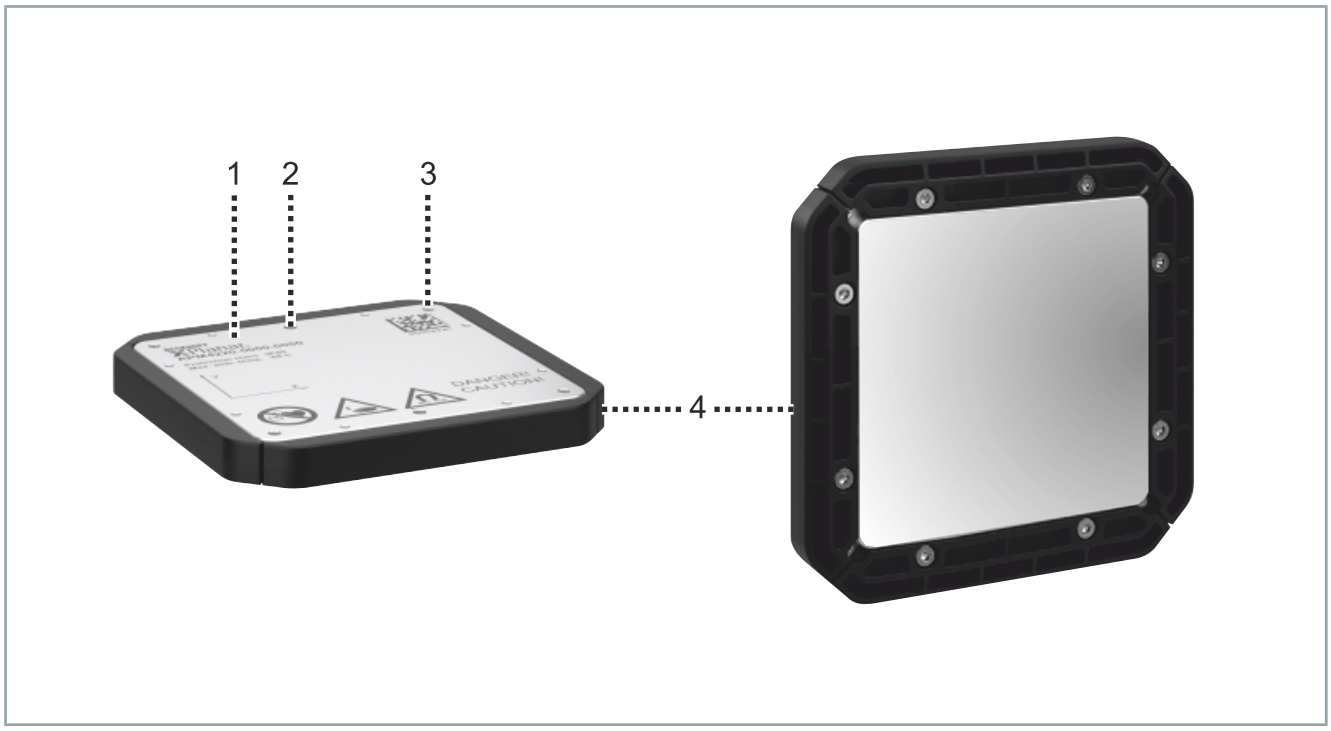
APS42xx-1x00



Position	Status LED	Status	Explanation
1	24 V Ok	Lights up green	Control voltage established
2	DC Link OK	Lights up blue	Power supply established
3	ECAT Error	Lights up red	Error in EtherCat G data connection
4	ECAT Run	Lights up green	EtherCat G data connection established
		off	in ConFig mode in TwinCAT
			Error in EtherCat G data connection
5	X103 IN	Flashing green	Data cable plugged into X103 IN
6	X102 OUT	Flashing green	Data cable plugged into X102 OUT

3.2 Mover

APM4220-0000



Position	Name
1	Base body with magnetic section
2	Locating hole* for mounting tools, 2 x
3	Thread* for mounting tools, 4 x
4	Bumper

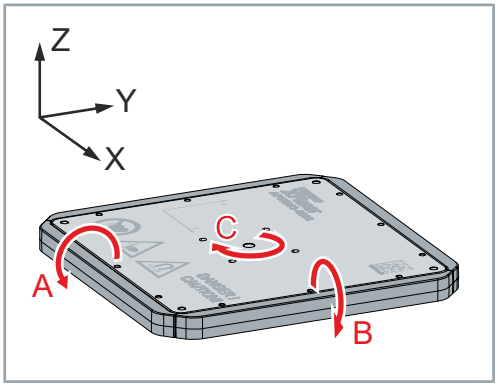
* For more information, see the chapters "Dimensional drawings", [Page 39] and "Fixing points", [Page 89].

APM4330-0000 and APM4550-0000

Position	Name
1	Base body with magnetic section
2	Thread* for mounting tools, 4 x
3	Locating hole* for mounting tools, 2 x
4	Thread* for mounting tools, 4 x
5	Thread* for mounting tools, 1 x
6	Bumper

* For more information, see the chapters "Dimensional drawings", [Page 39] and "Fixing points", [Page 89].

Degrees of freedom



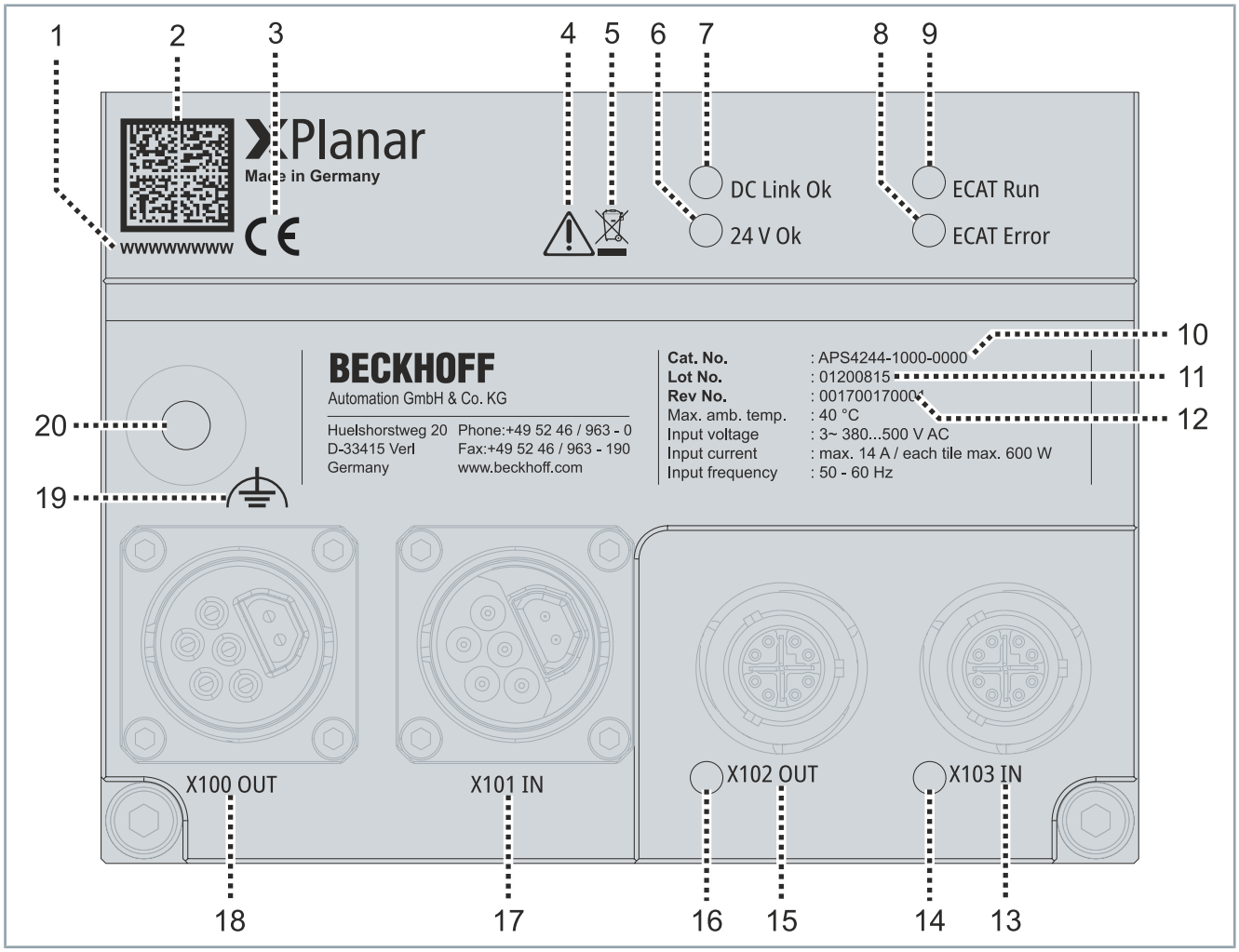
The movers have six degrees of freedom and can be moved along the following axes:

Axis	Movement
X	Procedure
Y	Procedure
Z	Raise / Lower
A	Tilting around x-axis
B	Tilting around Y-axis
C	Rotating around Z-axis

3.3 Name plate

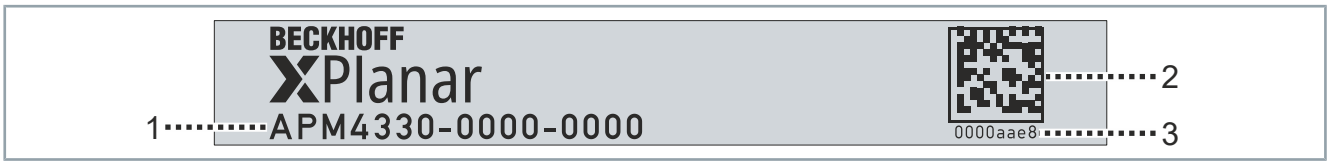
3.3.1 Tiles

APS42xx-1x00



Position	Name
1	BTN – Beckhoff Traceability Number
2	DataMatrix code
3	CE conformity
4	Note: Be sure to read the manual.
5	WEEE compliance
6	Status LED 24 V OK
7	Status LED Power supply OK
8	Status LED EtherCAT Error
9	Status LED EtherCAT Run
10	Product designation
11	First four digits: date of manufacture week / year
	Last four digits: Firmware and hardware version
12	First four digits: XML revision number drive
	Middle four digits: XML revision number Feedback
	Last four digits: XML revision number Tile
13	X103 - EtherCAT IN
14	Status LED X103 – EtherCAT IN
15	X102 - EtherCAT OUT
16	Status LED X102 - EtherCAT OUT
17	X101 - Power IN
18	X100 - Power OUT
19	Functional earth marking
20	Functional earth connection

3.3.2 Mover



Position	Name
1	Product designation
2	DataMatrix code
3	BTN – Beckhoff Traceability Number

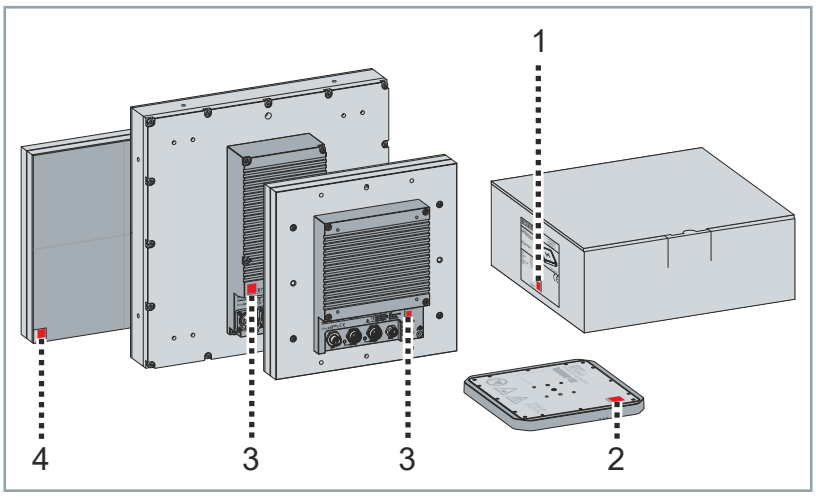
3.4 BIC | Beckhoff Identification Code

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

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

3.4.1 BIC as DataMatrix code

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



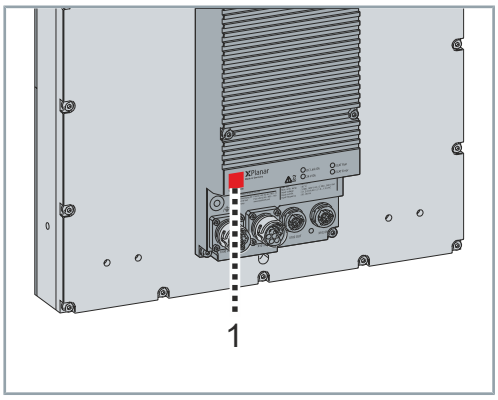
The DataMatrix code can be found on the packaging [1], all movers [2], the underside [3] and on the surface [4] of the tiles. If there is no BTN under the DataMatrix code, you can read it via the DataMatrix code.

3.4.2 Scanning the DataMatrix code

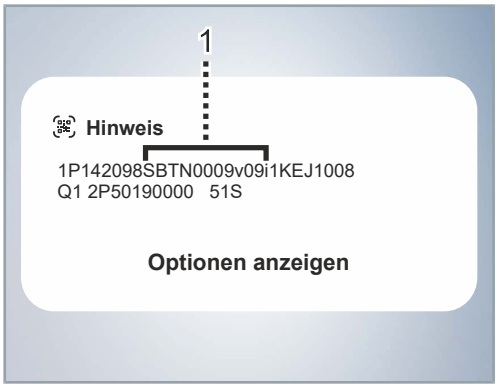
A scanner or smartphone is required to scan the DataMatrix code. Some smartphones support scanning the DataMatrix code with the camera. If scanning is not supported by your camera, Beckhoff recommends the following reader apps:

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

Example scan on a mover
The scanning of the BTN is shown using an APS4244-1000 tile as an example.



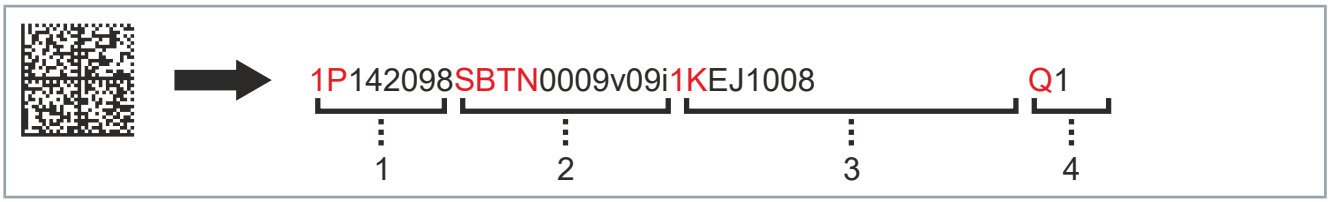
► Scan the DataMatrix code [1]



► Read the BTN [2] from the screen of your end device via the camera app or the reader app

3.4.3 Coded information

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



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

3.5 Type key

3.5.1 Tiles

APS42ab-1c00	Explanation
A	*Product area* • A = Drive Technology
P	*Series* • P = Planar motor technology
S	*Product type* • S = Stator
4	*System* • 4 = 40 mm magnet distance
2	*Quadrant size* (edge length as a multiple of the magnet distance) • 2 = 2 x magnet distance
a	*Number of quadrants in x-direction* • 2 = 2 quadrants in x-direction • 4 = 4 quadrants in x-direction
b	*Number of quadrants in y-direction* • 2 = 2 quadrants in y-direction • 4 = 4 quadrants in y-direction
1c00	*Version* • 1000 = Standard • 1100 = STO variant

3.5.2 Mover

APM4xxx-000x	Explanation
A	*Product area* • A = Drive Technology
P	*Series* • P = Planar motor technology
M	*Product type* • M = Mover
4	*System* • 4 = 40 mm magnet distance
xxx	*Edge length in x and y direction* (as a multiple of the magnet distance) • 220 = 2 x magnet distance • 221 = 2.5 x magnet distance • 330 = 3 x magnet distance • 550 = 5 x magnet distance
000x	*Version* • 0000 = Standard • 0001 = Hygienic

3.6 Product characteristics

Free-floating movers

The free-floating movers can move over arbitrarily arranged tiles without jerking or touching. The movers are kept apart by electromagnetic forces. The movers can be positioned precisely and highly dynamically via traveling magnetic fields.

No impurities

Liquids can be moved without spilling and are not distributed in the plant.

High flexibility

Depending on the need for surface area, you can use the tiles to create different variants in size and geometry. Alternatively, the tiles can be combined to create long travel paths.

Examples of solutions that can be implemented:

- Setting up a waiting zone
- Overtaking sections to avoid congestion
- Combination of outward and return movement
- Circular movements

Permanent magnets

The permanent magnets used are made of a hard magnetic material. The permanent magnets develop high forces even in small designs. They enable the precise and highly dynamic positioning of the movers.

Integrated power electronics

The entire power electronics is integrated into the tiles. A 24 V_{DC} control voltage and a 400 V_{AC} load voltage are required to supply the tiles.

3.7 Components

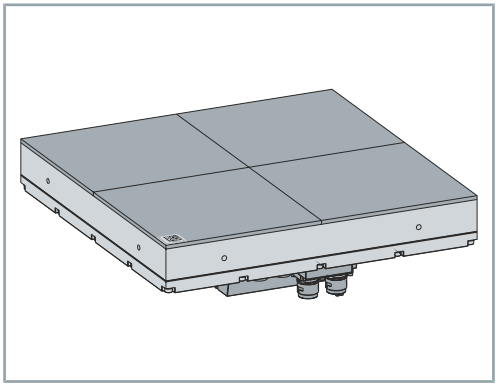
A complete XPlanar system consists of the following Beckhoff components:

- Tiles
- Movers
- Power cables
- EtherCAT G cables
- Industrial PC

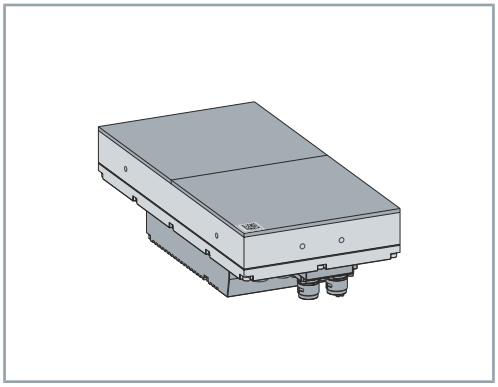
The individual components are defined via the type key and can be ordered separately.

3.7.1 Tiles

A system consists of individual tiles that are combined in a machine bed to form a stator surface. All types of mover can be used on the tiles. The tiles are available in the following design:

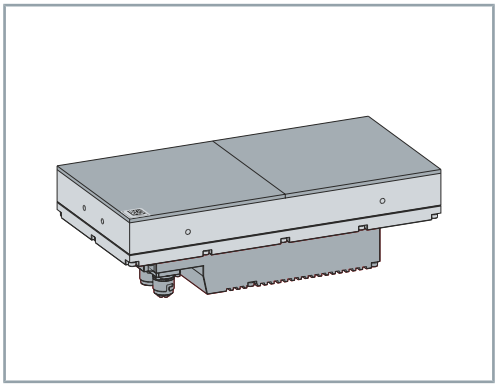


APS4244-1x00
Freely scalable, application-oriented geometries can be implemented by joining 320 mm x 320 mm *APS4244-1x00* tiles.



APS4224-1x00
By joining the 160 mm x 320 mm *APS4224-1x00* tiles, it is possible to achieve one-way operation of the 155 mm wide *APM43x0-0000* movers.

The long side of the tile is installed parallel to the Y-axis of the overall system.

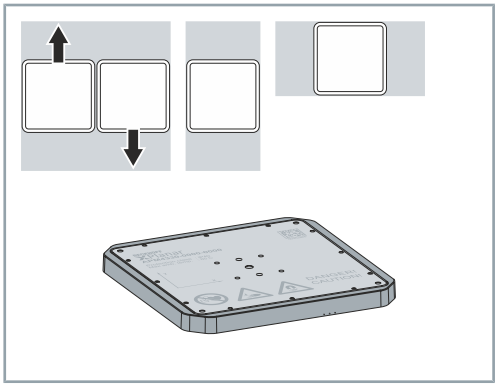


APS4242-1x00
By joining the 320 mm x 160 mm *APS4242-1x00* tiles, it is possible to achieve one-way operation of the 155 mm wide *APM43x0-0000* movers.

The long side of the tile is installed parallel to the X-axis of the overall system.

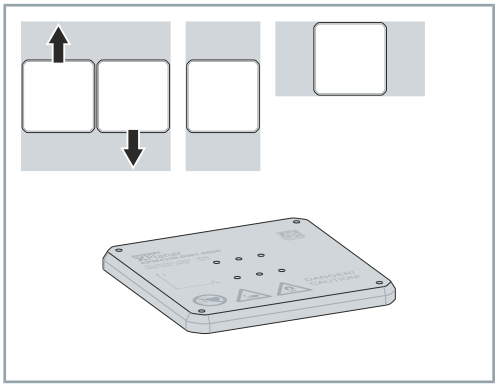
3.7.2 Mover

Once placed on the tiles, the movers move highly dynamically on the top surface of the tiles. Collisions are avoided. Movers can be raised, lowered and tilted while in motion. The movers are available in the following versions:



APM4330-0000

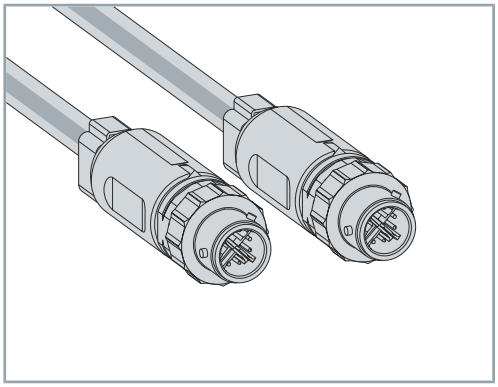
The *APM4330-0000* mover with the dimensions 155 mm x 155 mm has a large number of screw-on points for mounting more complex, individual workpiece carriers and attached parts.



APM4330-0001

The *APM4330-0001* mover with the dimensions 155 mm x 155 mm is suitable for all applications with high hygiene requirements. A large number of screw-on points enable mounting of more complex, individual workpiece carriers and attached parts.

3.7.3 Power cable



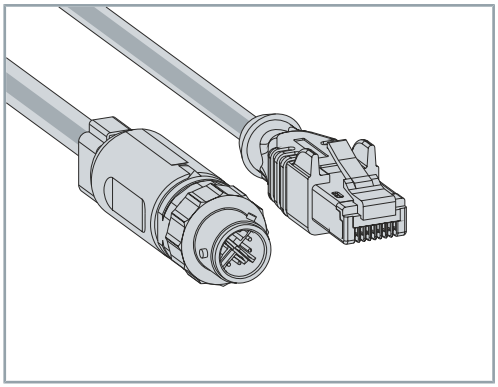
ZK1B96-8181-0xxx

The Industrial Ethernet/EtherCAT G/G10 cable for fixed installation is available in different lengths.

Plug: M12 bayonet straight to M12 bayonet straight, X-coded

0xxx - cable length

0007 – 0.7 m



ZK1B96-8191-0xxx

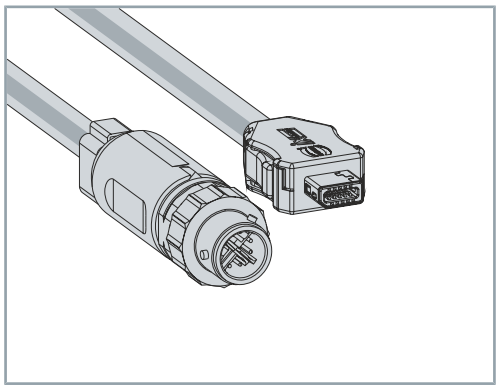
The Industrial Ethernet/EtherCAT G/G10 cable for fixed installation is available in different lengths.

Plug: RJ45 to M12 bayonet straight, X-coded

0xxx - cable length

0030 – 3.0 m

0050 – 5.0 m



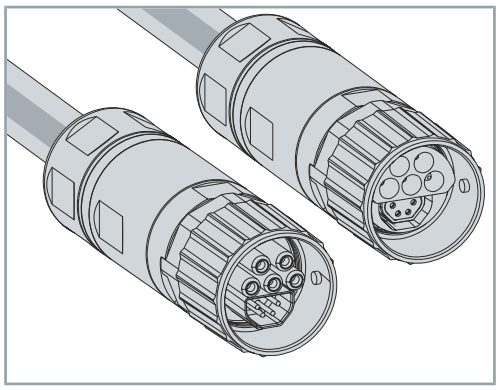
ZK1B96-819A-0xxx
The Industrial Ethernet/EtherCAT G/G10 cable for fixed installation is available in different lengths.

Plug: ix Industrial™ type A to M12 bayonet straight, X-coded

0xxx - cable length

0030 – 3.0m

0050 – 5.0 m



ZK7672-3031-3xxx
The power cable for fixed installation is available in different lengths.

Plug: B17 straight to B17 straight

0xxx - cable length

0002 – 0.2 m

…

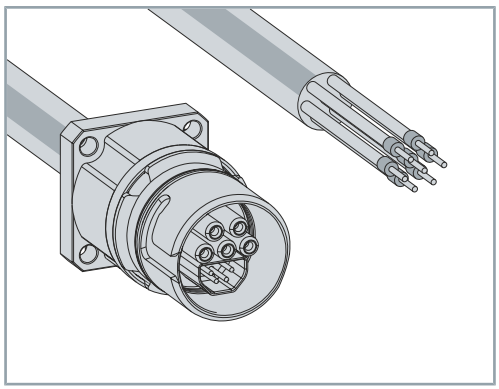
0007 – 0.7 m

0010 – 1.0 m

0020 – 2.0 m

0030 – 3.0 m

0050 – 5.0 m



ZK7672-AS00-0xxx
The power cable with flange for mounting in the control cabinet wall for fixed installation is available in different lengths.

Plug: B17 flange to open end

0xxx - cable length

0005 – 0.5 m

0010 – 1.0 m

0020 – 2.0 m

3.8 Intended use

The XPlanar 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 XPlanar are intended only to be programmed and commissioned with the help of the Beckhoff TwinCAT automation software.

Read the entire drive system documentation:

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

3.8.1 Improper use

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

The XPlanar is not suitable for use in the following areas:

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

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

4 Technical data

4.1 Definition

The following sections contain definitions of terms, boundary conditions, operating data and technical data.

4.2 Boundary conditions

All data are based on 24 °C ambient temperature and constant tile and mover temperature. The data can have a tolerance of +/- 10 %. Deviations between individual movers are possible.

4.2.1 Technical terms

Absolute accuracy [mm or mrad]

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 tile and is defined as the difference between the set position and the actual position of the positioning system.

Standstill repeatability [mm or mrad]

Specification of how accurately the system positions when approaching a position from the two directions (bidirectionally). 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 of the actual positions for 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 or mrad]

Specification of the fluctuations that the system exhibits in the position during a position-controlled movement at a constant set velocity of 200 mm/s. The synchronization accuracy depends on the load on the movers and the associated inertias in all 6 spatial directions, the controller settings, the target velocity and also any mechanical misalignment between the tiles.

4.3 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 XPlanar only under the specified conditions
Operate the Beckhoff XPlanar only under the operating and ambient conditions specified 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.*If you wish to use your system in different ambient conditions and operating states, please contact the product specialist responsible for your region or Beckhoff Support:

support@beckhoff.com

4.4 Environmental conditions

Environmental requirements	
Climate category – operation	2K3 according to EN 60721
Ambient temperature during operation [°C]	+5 ... +40
Ambient temperature during transport [°C]	-25 ... +65
Ambient temperature during storage [°C]	-25 ... +65
Power *derating*	For site altitudes higher than 1000 to 2000 m above sea level and 40 °C: 1.5 % per 100 m
Installation altitude [m]	≤ 2000*
Permissible humidity in operation	15 % to 95 % relative humidity, no condensation
Pollution degree	2 according to IEC 60664-1

4.5 Intended use

Specifications for intended use	
Cooling	Convection Optional: Forced cooling via fan or water cooling*
Insulation material class	F according to IEC 60085; UL1446 class F
Protection rating	**
Installation position	Horizontal, stator surface upwards
Vibration resistance, horizontal, stator facing upwards	conforms to EN 60068-2-6
Shock resistance	conforms to EN 60068-2-27
EMC requirements	Conforms to EN61000-6-2 / EN61000-6-4
EMC category	Category C3 – standard Category C2, C1 – auxiliary filter required
Approvals	CE In preparation: cURus, EAC
Overvoltage category	III according to IEC 60664-1

* XPlanar tiles are motors with integrated power electronics and generate heat. Heat flow is predominantly from the top to the bottom of the tile. The more demanding the application, the more heat is generated. For trouble-free operation, appropriate heat dissipation must be ensured on the underside of the tile. For more demanding applications, it may be necessary to implement forced convection by fans or water cooling to prevent overheating.

** For further information contact your local Beckhoff branch or support@beckhoff.com.

4.5.1 Tiles

Tiles	APS4244-1x00
Version	Standard
Maximum angle of rotation C-axis [°]	± 5
Maximum position resolution [µm; °]	1 X, Y, Z; 0.001 A, B, C

4.5.2 Mover

APM4330-0000

Mover	APM4330-0000
Velocity [m/s]	3
Acceleration without payload [m/s^2]	2
Maximum payload at 1 mm flight height [kg]	1.5

4.6 Electrical data

4.6.1 Auxiliary supply

Auxiliary supply		Tolerance
Input voltage [V_{DC}]	24	± 20 %
Current consumption [A]	0.5	-

4.6.2 Power supply

Power supply		Tolerance
Input voltage [V_{AC}]	3~ 380 ... 500	-15 %/+10 %
Input frequency [Hz]	50 to 60	±10%
Input current [A_{AC}]	3~ 1.1 to 0.85	-
Inrush current peak at 380 V_{AC} [A_{AC}]	2	-
Inrush current peak at 500 V [A_{AC}]	2	-

4.6.3 DC link power

DC link power per tile	
Maximum, continuous [W]	600
Maximum, short-term [W]	750

4.6.4 Power consumption

Tiles

Power consumption per tile	
Permanent, at 24 V_{DC} [W]	9
Maximum, continuous, at 3~ 380-500 V_{AC} [VA]	700
Maximum, short-term, at 3~ 380-500 V_{AC} [VA]	890
Tiles per power supply	1 ... 8

Mover

APM4330-0000

Average power consumption per mover at 1 mm flight height	APM4330-0000
Without load, standstill [W]	20
With 1.5 kg load, standstill [W]	60

4.7 Mechanical data

4.7.1 Tiles

APS4244-1x00

Tiles	APS4244-1x00
Width [mm]	320
Height [mm]	320
Depth [mm]	97.3
Weight [g]	13500
Surface	Hard anodized aluminum housing
Maximum number of tiles per EtherCAT G master	4

APS4224-1x00

Tiles	APS4224-1x00
Width [mm]	160
Height [mm]	320
Depth [mm]	97.3
Weight [g]	8000
Surface	Hard anodized aluminum housing
Maximum number of tiles per EtherCAT G master	6

APS4242-1x00

Tiles	APS4242-1x00
Width [mm]	320
Height [mm]	160
Depth [mm]	97.3
Weight [g]	8000
Surface	Hard anodized aluminum housing
Maximum number of tiles per EtherCAT G master	6

4.7.2 Mover

APM4220-0000

Mover	APM4220-0000
Length [mm]	113
Width [mm]	113
Height [mm]	12
Weight [g]	628
Surface	Hard anodized aluminum housing

APM4221-0000

Mover	APM4221-0000
Length [mm]	127
Width [mm]	127
Height [mm]	12
Weight [g]	880
Surface	Hard anodized aluminum housing

APM4330-0000

Mover	APM4330-0000
Length [mm]	155
Width [mm]	155
Height [mm]	12
Weight [g]	1237
Surface	Hard anodized aluminum housing

APM4330-0001

Mover	APM4330-0001
Length [mm]	155
Width [mm]	155
Height [mm]	12
Weight [g]	1550
Surface	Stainless steel 1.4404

APM4550-0000

Mover	APM4550-0000
Length [mm]	235
Width [mm]	235
Height [mm]	12
Weight [g]	3414
Surface	Hard anodized aluminum housing

4.8 Dimensional drawings

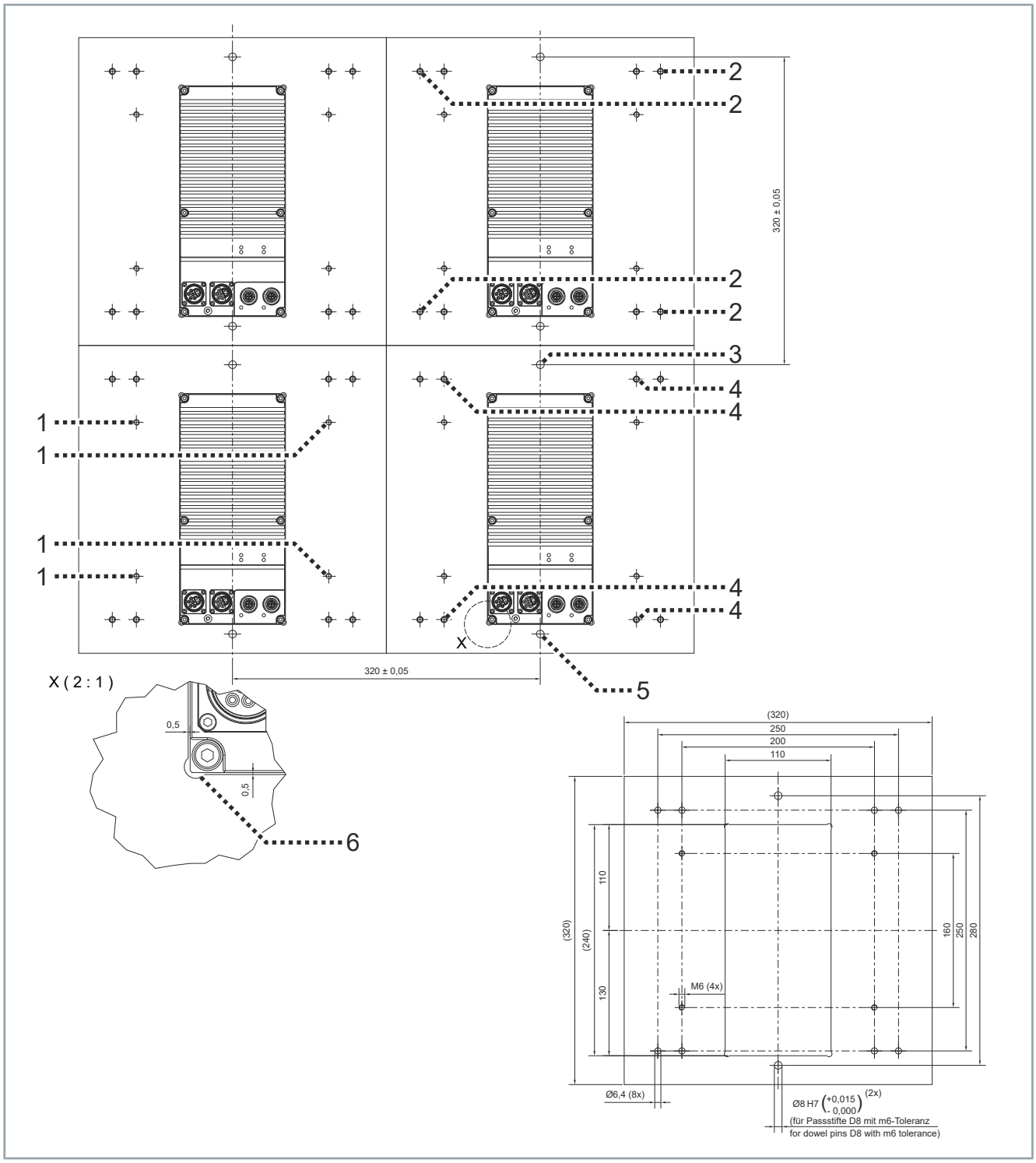
Dimensional drawings and 3D models online
You have the possibility to download the dimensional drawings and 3D models of the individual components from the Beckhoff website:

www.beckhoff.com/de-de/support/downloadfinder

4.8.1 Machine bed sample design

All figures in millimeters

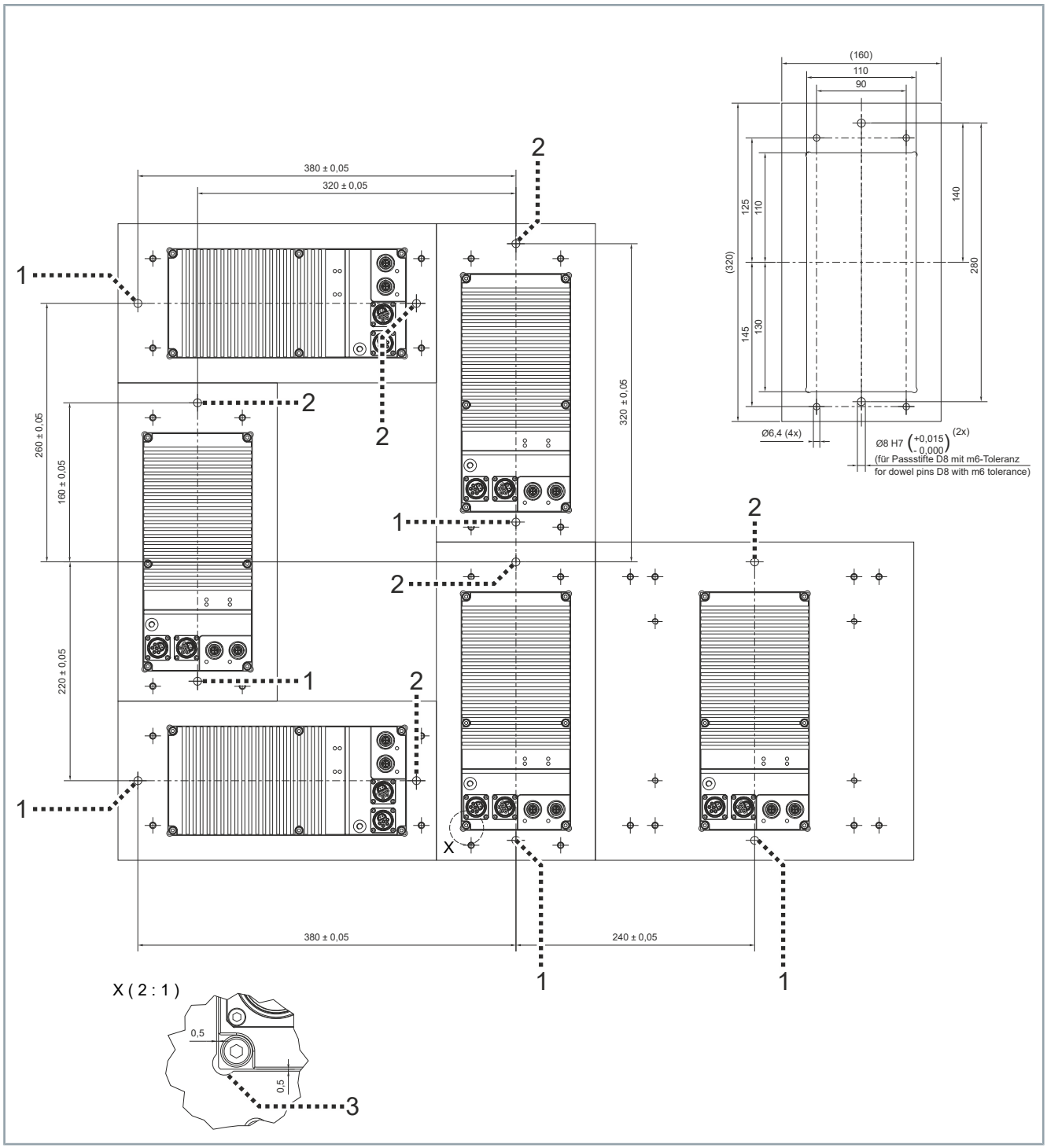
2 x 2



Position	Name
1	Drilling pattern with M6 threads for attaching optional heat sinks
2	Outer drilling pattern for attaching the tile to the machine bed
3	Position of the locating hole in the tile
4	Inner drilling pattern for attaching the tile to the machine bed
5	Position of the elongated hole in the tile
6	Ensure there is sufficient space at the corners

6 segments

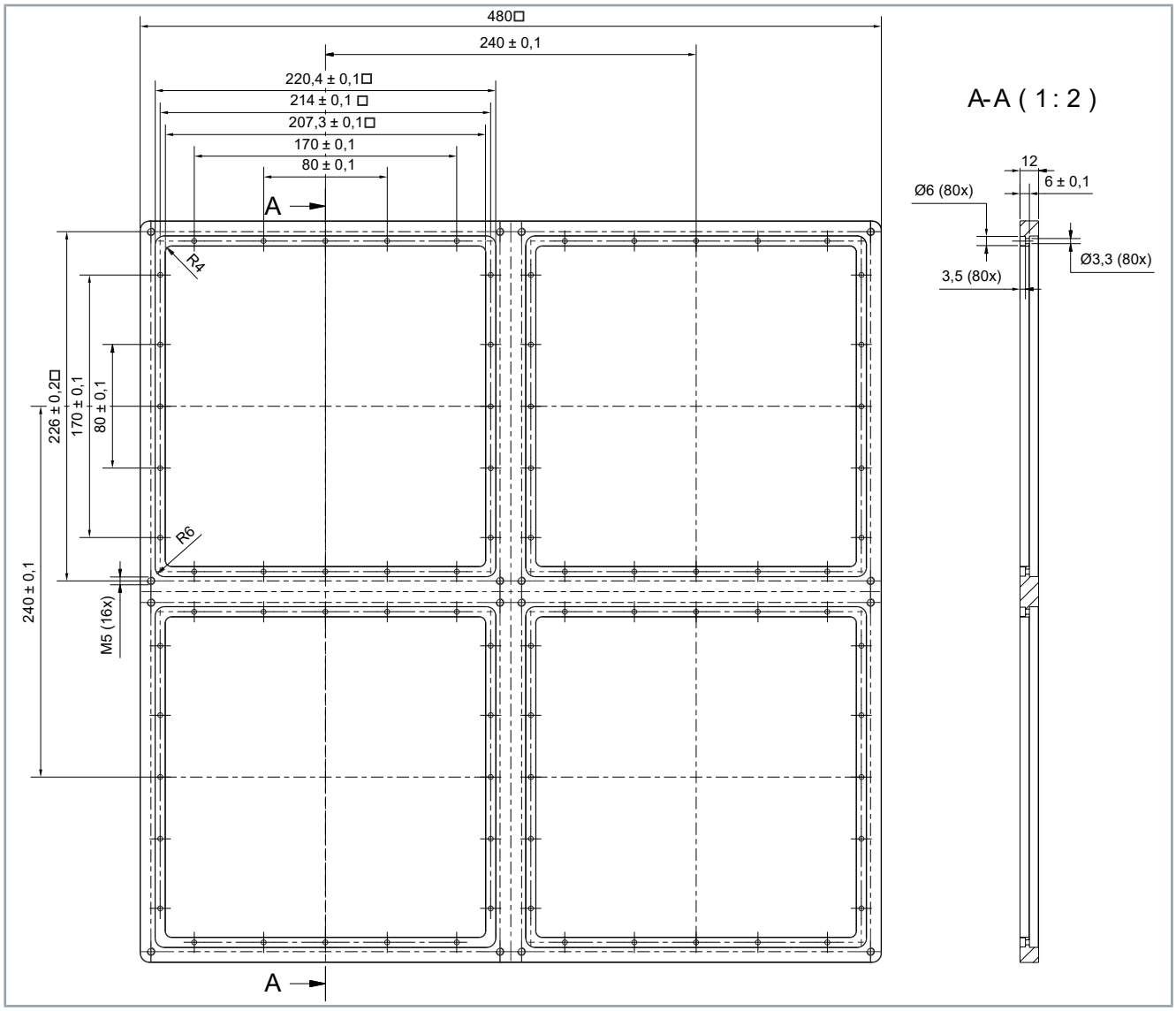
Arrangement of different tiles
The figure shows an example of a machine bed consisting of 6 segments for APS4224, APS4242 and APS4244.



Position	Name
1	Position of the elongated hole in the tile
2	Position of the locating hole Ø8 D10 x 10 in the tile
3	Ensure there is sufficient space at the corners

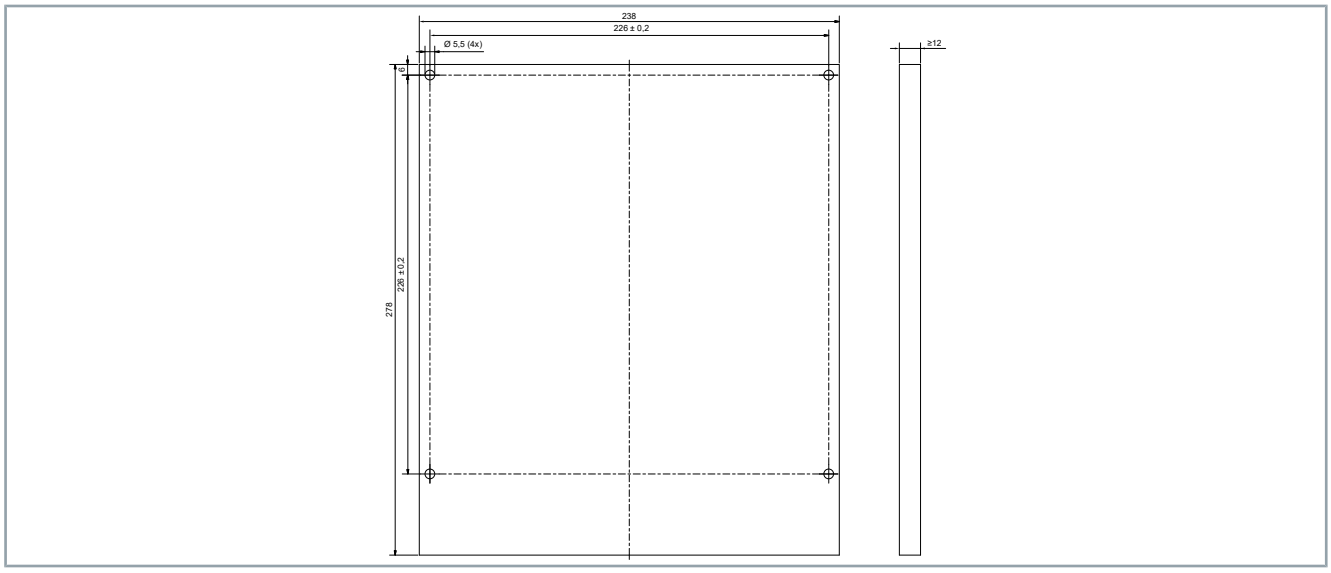
4.8.2 Design proposal frame for mover coupling

All figures in millimeters



4.8.3 Assembly aid sample design

All figures in millimeters



5 Packaging

The packaging contains the following handling instructions:

ESD protection component
The packaging contains electrostatically sensitive components.

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

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

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

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

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

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

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

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

5.1 ESD conductivity

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

Foam inserts pink
This foam is ESD conductive.

Foam inserts white
This foam is not ESD conductive.

6 Scope of supply

Check the scope of supply for missing or damaged parts
Check your delivery for completeness. If any parts are missing or became damaged during transport, contact the carrier, vendor or our service department immediately.

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

6.1 Tile

APS42xx-x000

- 1 x tile
- 1 x ground strap set APS42xx:
  - 2 x contact washer M6
  - 1 x ground strap 6 mm² 150 mm
  - 4 x washer M6
  - 2 x screw M6 x 16
- 2 x protective cap B17
- 2 x protective cap M12

6.2 Mover

APM4xxx-000x

- 1 x mover
- 1 x transport securing device
- 1 x instruction leaflet Safety instructions

7 Transport and storage

NOTICE

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.

7.1 Conditions

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

- Climate category: 2K3 according to EN 60721
- Temperature: -25 °C ... +65 °C
- Using the original packaging

7.2 Long-term storage

NOTICE

Perform recurring inspections
Check components for proper condition every six months.
Damage to the components or failure to carry out maintenance can shorten the service life of the installed components and parts.

NOTICE

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

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

8 Mechanical Installation – Part 1: Tiles

Installation example
This chapter provides information about installing an XPlanar. The installation is described based on a simple symmetrical system with 2 x 3 tiles as an example.

Follow the installation sequence
Install the XPlanar in sequence. Insert the tiles into the machine bed one at a time. This avoids complications with positioning and mounting individual tiles at the end of the first part of the mechanical installation.

8.1 Preparation

Before you begin installing the tiles, you must provide a suitable machine bed and appropriate mechanical protection. For press-in processes on the movers, it is necessary for the tile to be protected by a stainless steel cover or anvil.

Further information can be found in chapter "Machine bed", [Page 54], "Mechanical protection", [Page 55] and "Press-in processes and pressing positions", [Page 56].

Required tools

- Allen key size 5
- Soft-faced hammer
- Lint-free cloth

Required accessories [+]

- Torque wrench

Installation material required for one tile

- 4 x non-magnetic hexagon socket screws M6
- 2 x locating pins D8

Further information can be found in chapter "Screws for installing the tiles", [Page 49] and "Locating pins for installing the tiles", [Page 51].

Installation material required for the mechanical protection on one side of a tile

- 2 x non-magnetic M6 screws

Further information can be found in chapter "Screws for installing the mechanical protection", [Page 52].

8.1.1 Installation material

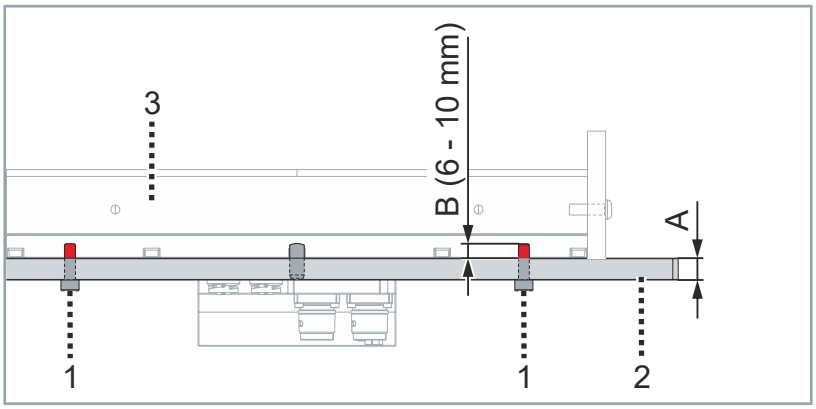
You will need screws and locating pins to install the tiles and the mechanical protection. The length of the screws and locating pins depends on the dimensions of the materials used.

Screws for installing the tiles

NOTICE

Ensure that the screws have the correct length
Ensure that the M6 screws have the correct length in order to obtain a flat surface on the tiles and to avoid damaging the tile.
Screws that are too long can damage the surface of the tile.

Do not use magnetic screws
Only non-magnetic screws may be used to mount the tile on the machine bed.



The length [C] of the M6 screws [1] for fastening the tile depends on the height [A] of the machine bed [2] and the screw depth [B] in the tile [3].

The screws must be screwed between 6 and 10 mm into the tile.

A + B = C

A = height of the machine bed

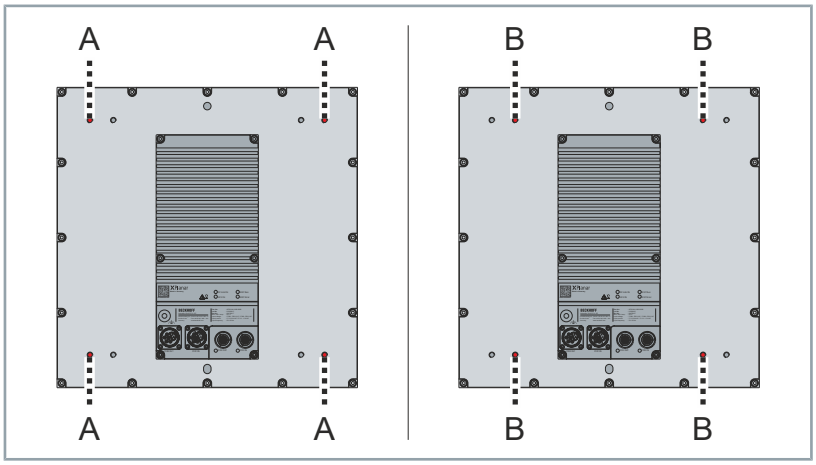
B = screw depth in the tile: 6 to 10 mm

C = length of the screw

Number of screws required

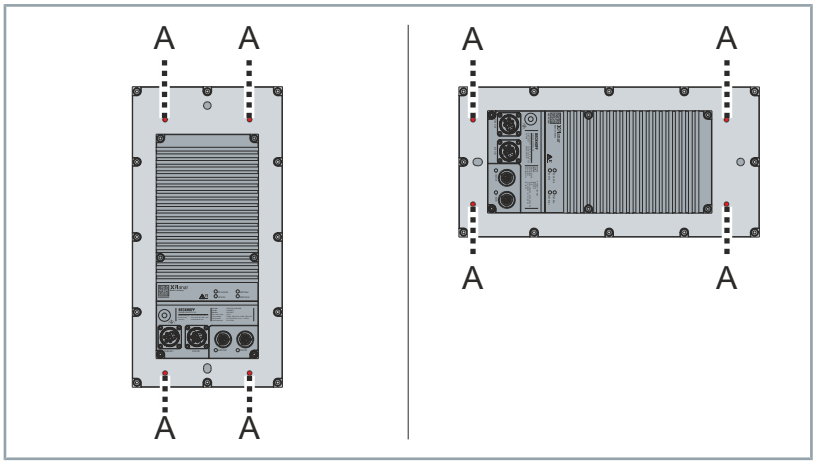
APS4244-1x00

Each tile must be attached to the machine bed with four M6 screws. Each tile has eight threaded holes for fastening. You have the option of using the outer drilling pattern [A] or the inner drilling pattern [B] for fastening.



APS4224-1x00 and APS4242-1x00

Each tile must be attached to the machine bed with four M6 screws. Each tile has four threaded holes [A] for fastening.



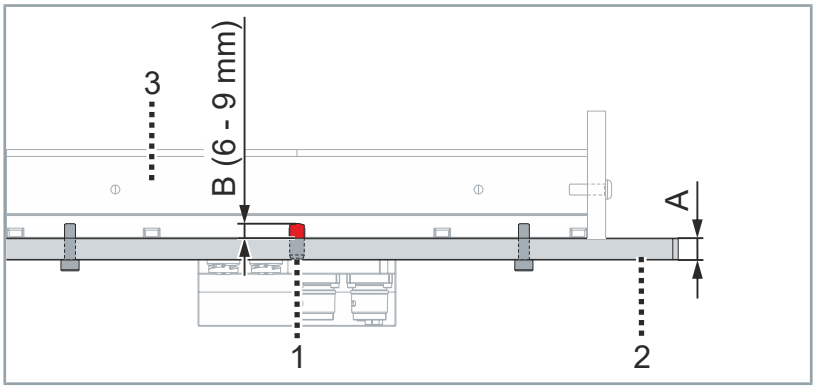
Locating pins for installing the tiles

NOTICE

Ensure that the locating pins have the correct length
Ensure that the D8 locating pins have the correct length in order to obtain an even tile surface and to avoid damaging the tile.
Locating pins that are too long can damage the surface of the tile.

NOTICE

Ensure correct tolerance of the locating pins
The D8 locating pins must have an m6 tolerance.



The length [C] of the D8 locating pins [1] for aligning the tile depends on the height [A] of the machine bed [3] and the projection [B] into the tile [3].

The locating pins must protrude between 6 and 9 mm into the tile.

A + B = C

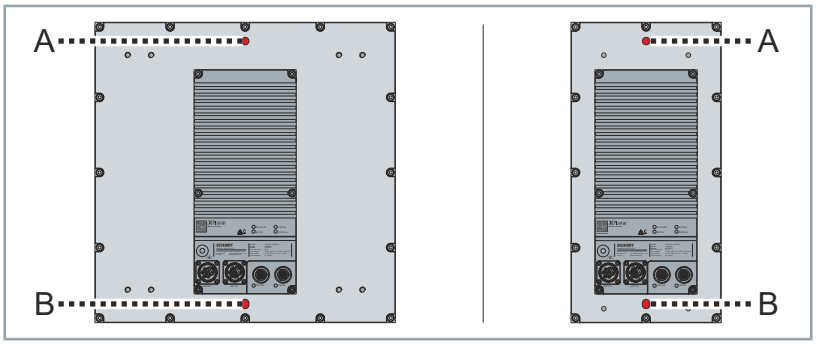
A = height of the machine bed

B = protruding into the tile: 6 to 9 mm

C = length of the locating pins

Number of locating pins required

Each tile must be aligned with two D8 locating pins on the machine bed. Each tile has a hole [A] and an elongated hole [B] for alignment.



Screws for installing the mechanical protection

⚠ WARNING

Ensure that the screws have the correct length
Make sure that the screws have the correct length to ensure that the mechanical protection is securely fastened.
If you use screws that are too short, the mechanical protection may come loose and the mover may leave the system in an uncontrolled manner, causing serious injury.

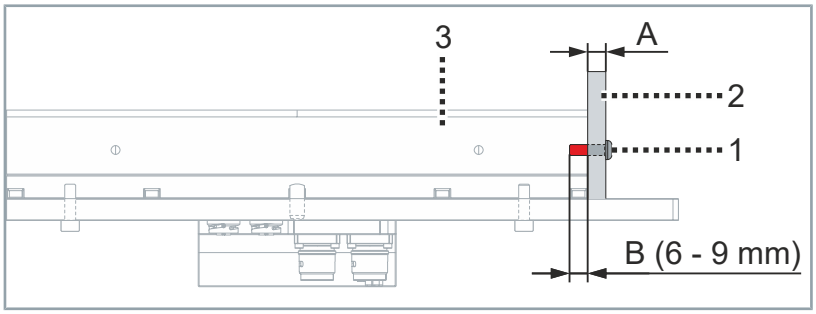
- Only use screws of the correct length to avoid damage and injury.

NOTICE

Ensure that the screws have the correct length
Make sure that the screws have the correct length to avoid damage to the tile.
If you use screws that are too long, the tile may be damaged.

- Only use screws of the correct length to avoid damage.

Do not use magnetic screws
Only non-magnetic screws may be used to install the mechanical protection on the tile.



The length [C] of the M6 screws [1] for fastening the mechanical protection depends on the depth [A] of the safety equipment [2] and the screw depth [B] in the tile [3].

The screws must be screwed between 6 and 9 mm into the tile.

A + B = C

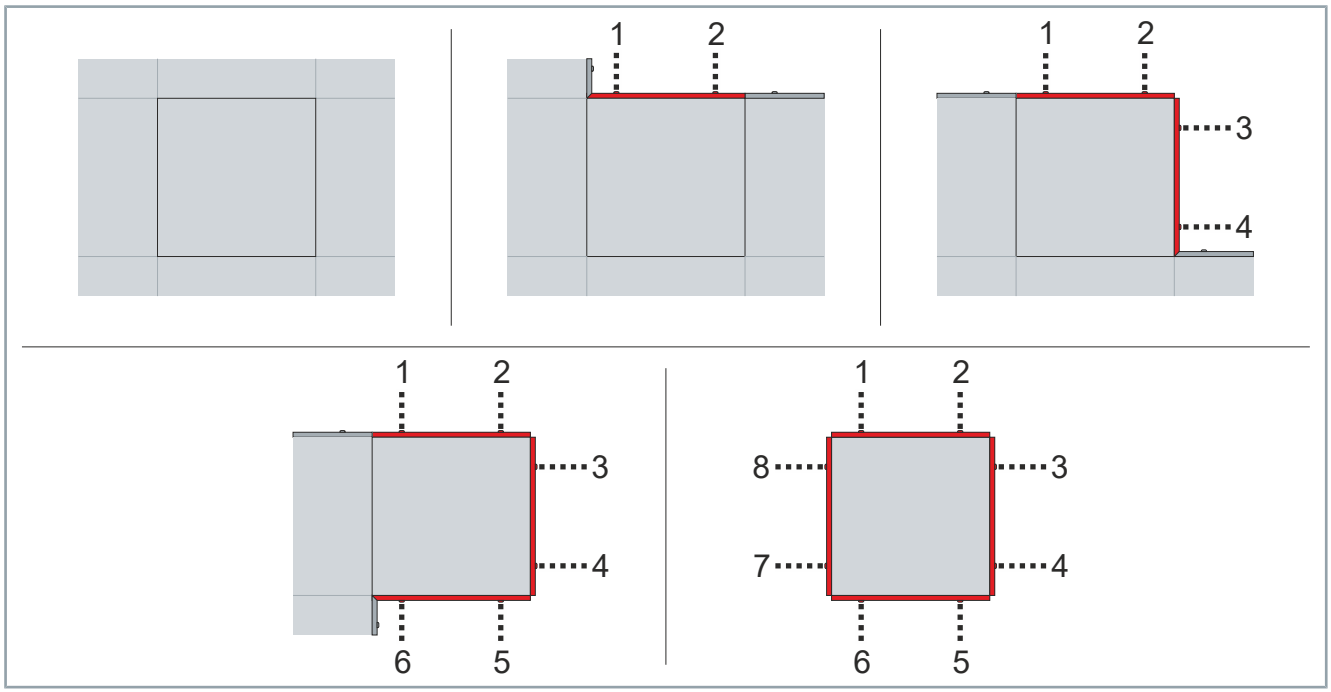
A = depth of the mechanical protection

B = screw depth in the tile: 6 to 10 mm

C = length of the screw

Number of screws required

Depending on the position of the tile in the machine bed, you will need a different number of screws. The mechanical protection can be attached to any exposed outer side of a tile with two screws, resulting in the following number of screws:

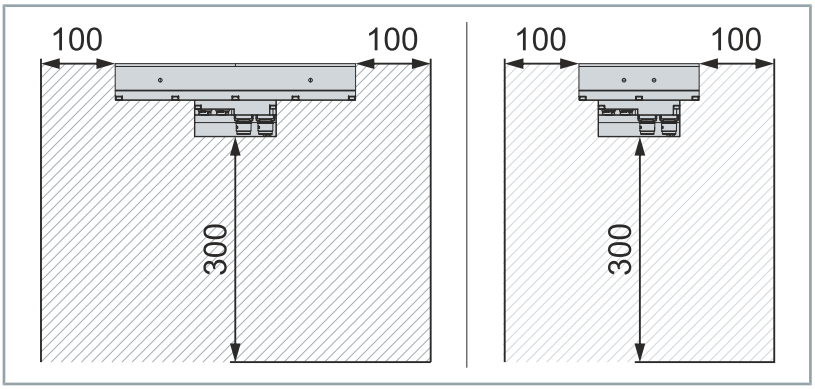


8.1.2 Machine bed

The machine bed is not part of the scope of supply and must be provided by the customer.

Beckhoff recommends the following material for the milled machine bed:

- Aluminum



No magnetic materials may be used within a distance of 100 mm around a tile and 300 mm below a tile.

Dimensional drawings and 3D models online
The dimensional drawings and 3D models for the machine bed are available for download from the Beckhoff website:

www.beckhoff.com/de-de/support/downloadfinder

Distance

In order to facilitate installation and maintenance work, sufficient clearance to the underside of the machine bed is required. Ensure adequate cooling of the tiles by providing sufficient convection space below the tile, installing heat sinks or a water-cooled machine bed.

8.1.3 Underground

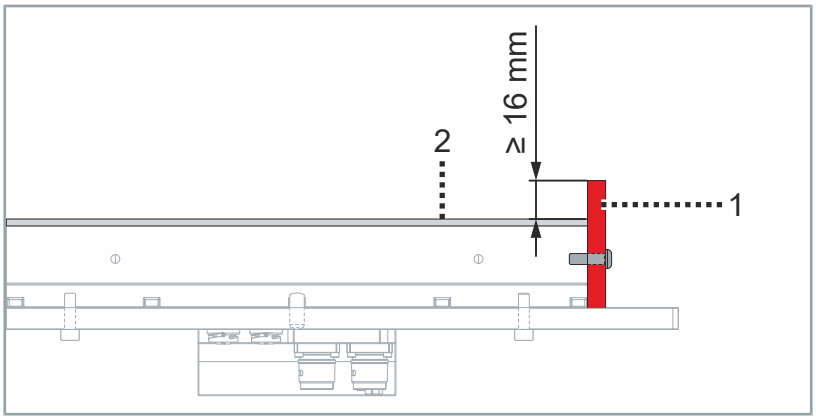
⚠ WARNING

High weight on a small footprint
The total weight of tiles, machine bed and frame of the system adds up to several 100 kg on a small footprint.
Avoid setting up the system on surfaces with insufficient load-bearing capacity and observe the load-bearing capacity of your surface.

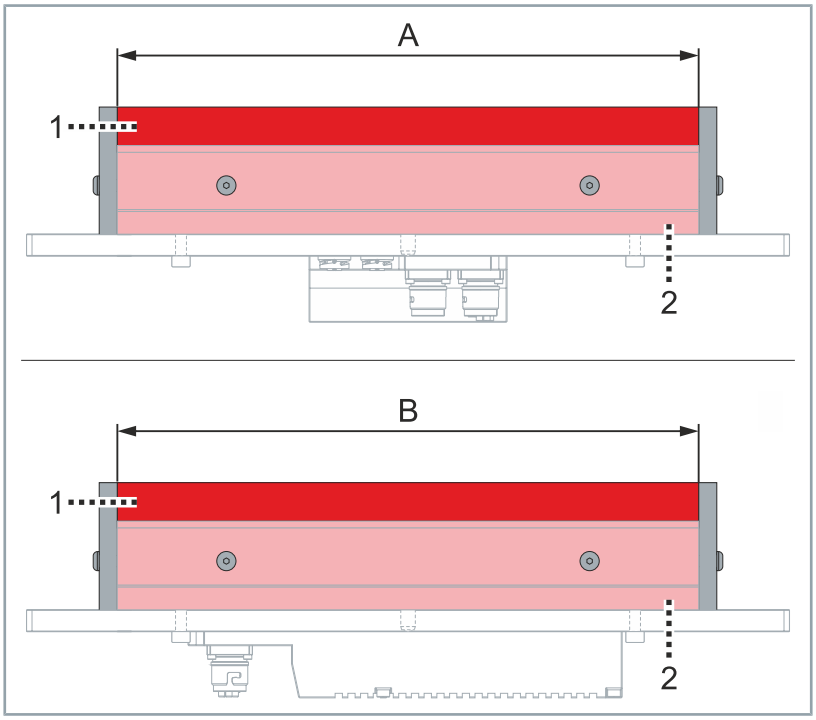
Ensure that the substrate has sufficient load-bearing capacity when choosing a location for your system.

8.1.4 Mechanical protection

Non-magnetic material can be used for the mechanical protection.



The mechanical protection [1] must protrude at least 16 mm beyond the stator surface [2].



APS	4224-1x00	APS4242-1x00	APS4244-1x00
Width [A]	160	320	320
Height [B]	320	160	320

The mechanical protection [1] must cover the entire width [A] and height [B] of the tile [2].

Each tile has a total of eight threaded holes for fastening the mechanical protection, two on each outer side of the tile. Further information can be found in chapter "Screws for installing the mechanical protection", [Page 52].

8.1.5 Press-in processes and pressing positions

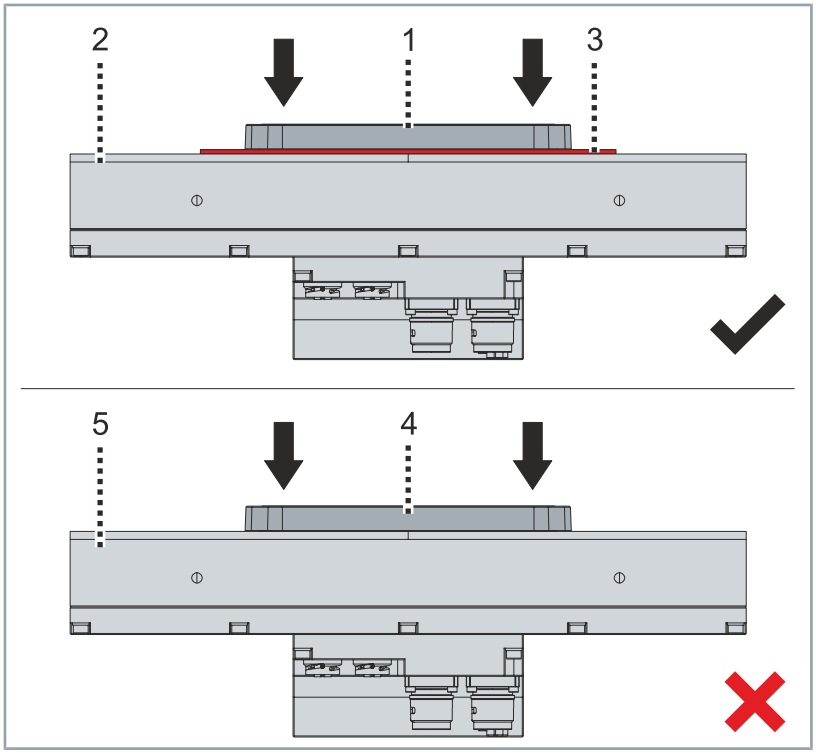
NOTICE

Avoid high forces over 150 N on the mover
Dirt and foreign objects between the mover and the tile as well as press-in processes on movers with high forces can lead to deflection of the mover and damage to the tile.

- Avoid pressing forces exceeding 150 N.
- Support the tool carrier with an anvil or apply stainless steel to the pressing position.
- Allow the mover to rest on the entire surface during press-in processes.
- Check the surface of the tiles and the underside of the mover regularly for dirt and foreign objects.
- Remove any existing dirt and foreign objects from the top of the tiles and the underside of the mover.

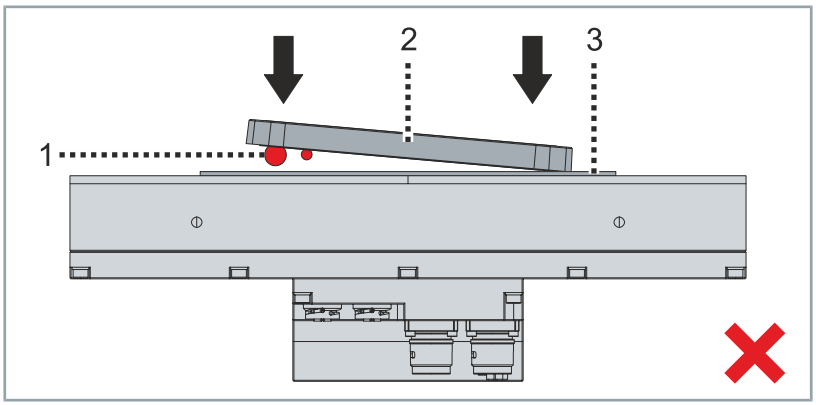
Cover at pressing position

Stainless steel or plastic can be used for the cover at the pressing position.



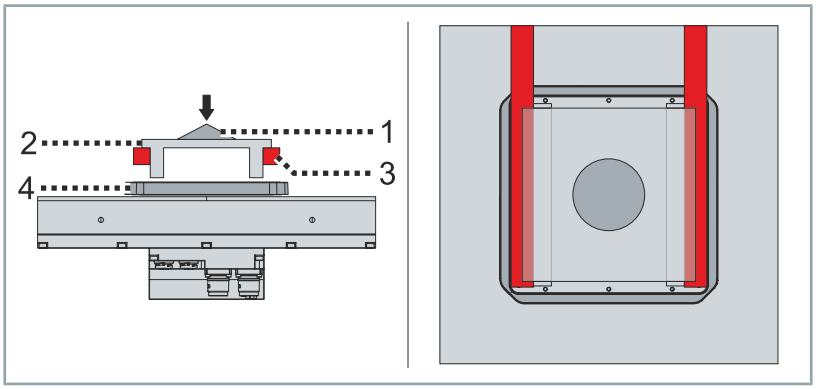
If you want to perform press-in processes on the mover, you must fit a cover [3] between the mover [1] and the tile [2].

A press-in process on the mover without a cover between the mover [4] and the tile [5] is not permitted and can lead to damage to the mover and tiles.



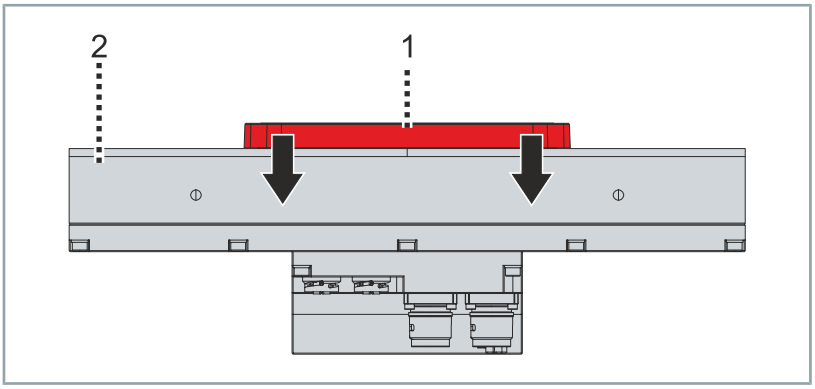
There must be no dirt or foreign objects [1] between the mover [2] and the cover [3] or the tile [4]. All dirt and foreign objects on the underside of the mover and on the surface of the cover or tile must be removed before force is applied to the mover.

8.1.5.1 Anvil at pressing position



If a product [1] is to be applied with force to a workpiece carrier [2], the workpiece carrier must rest on an anvil [3]. While the workpiece carrier is resting on the anvil, the mover [4] can be lowered.

Force limits and temperature peaks



If the movers [1] are actively attracted to the tile [2] by a position specification of ≤ 0 mm, temperature peaks can occur. Monitor the temperature of the tile in the corresponding applications.

To avoid temperature peaks:

- Use force limits in the axes Z, a and b

OR

- Switch off the control of axes Z, a and b.

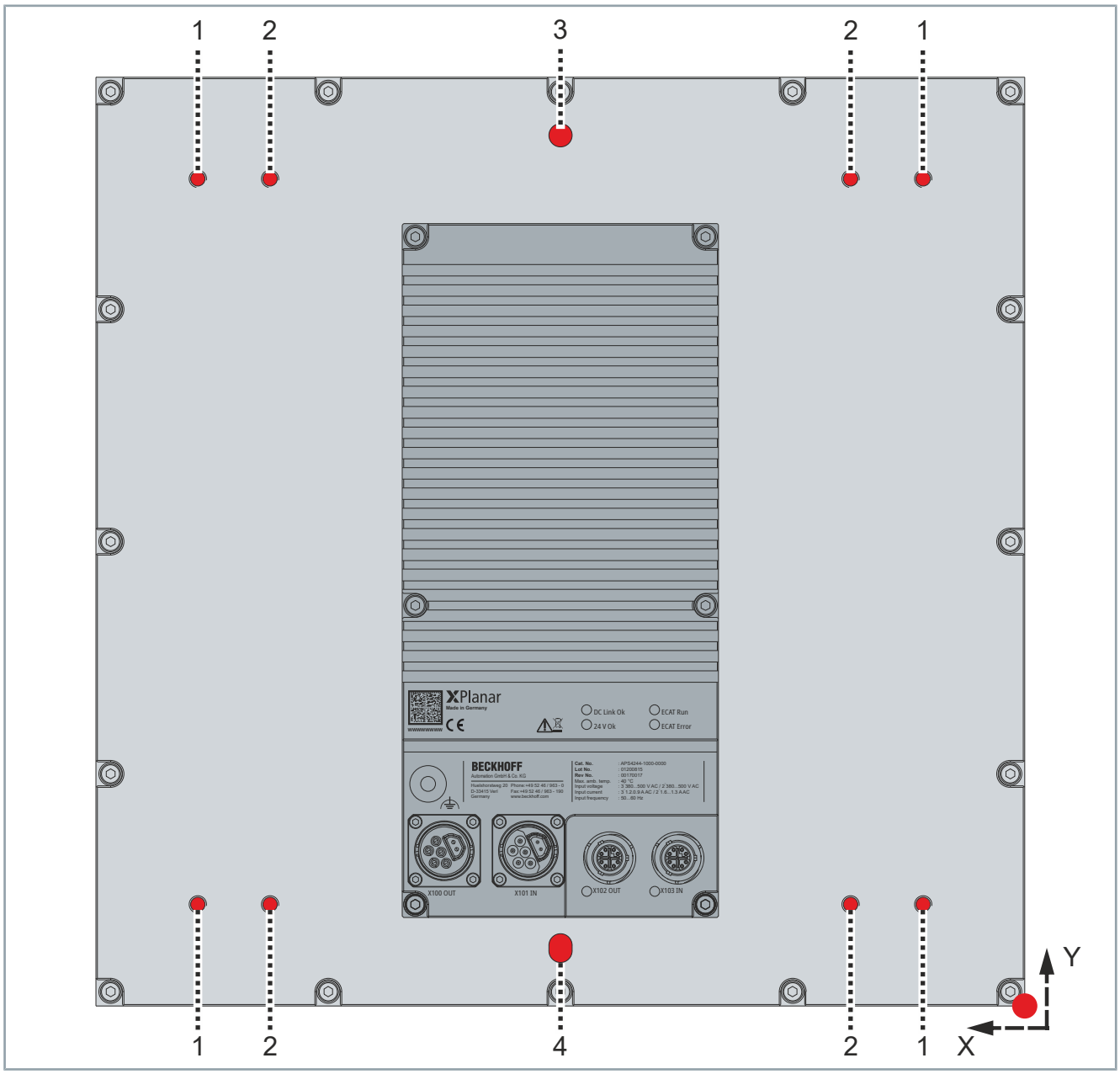
8.2 Installing tiles

Each tile can be installed at any position in the prefabricated machine bed.

8.2.1 Fastening points

APS4244-x000

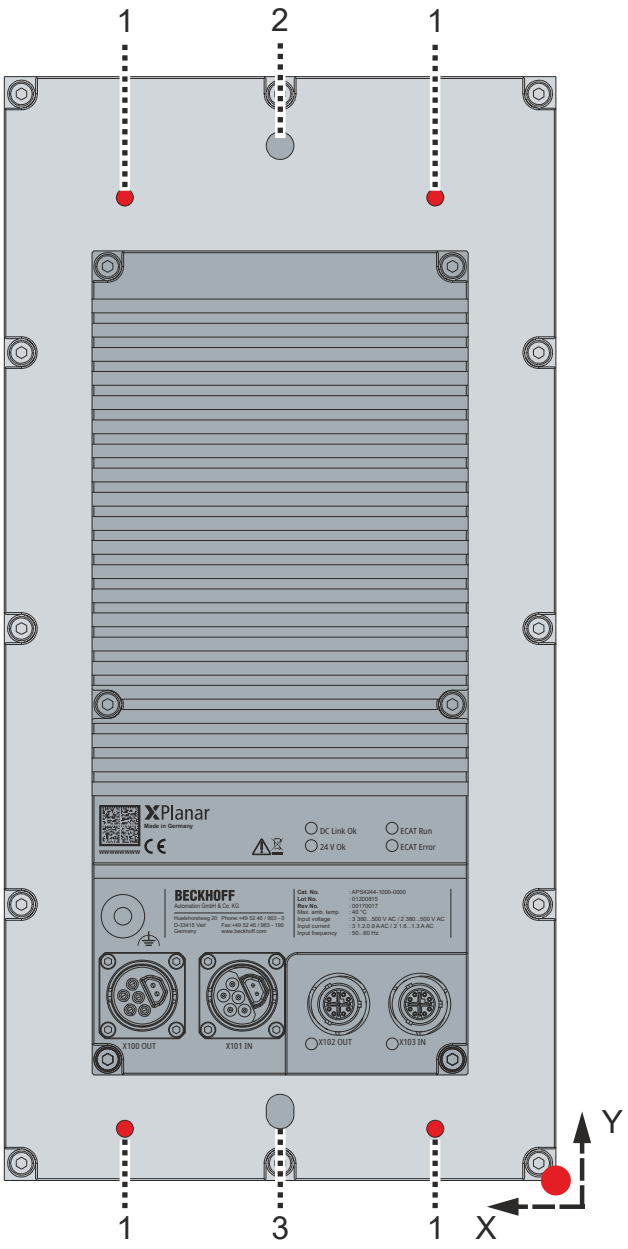
Each tile must be attached to the outer or inner drilling pattern with two locating pins and four screws.



Position	Name
1	M6 x 10 threaded hole for mounting the tile on the machine bed with four screws. Outer drilling pattern.
2	M6 x 10 threaded hole for mounting the tile on the machine bed with four screws. Inner drilling pattern.
3	Hole Ø8 D10 x 10 for locating pin
4	Elongated hole for locating pin

APS4224-x000 and APS4242

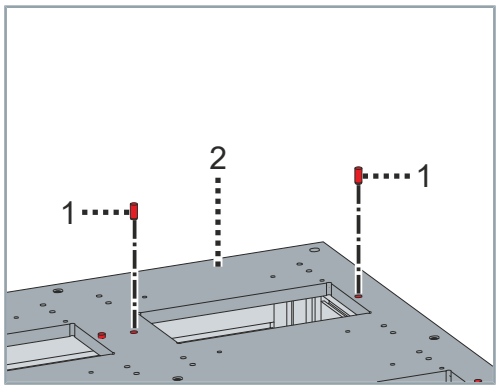
Each tile must be attached to the drilling pattern with two locating pins and four screws.



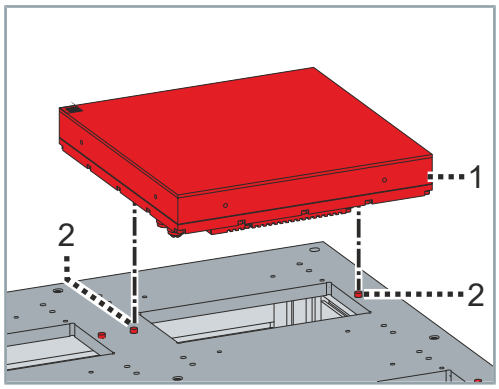
Position	Name
1	M6 x 10 threaded hole for mounting the tile on the machine bed with four screws. Drilling pattern.
2	Hole Ø8 D10 x 10 for locating pin
3	Elongated hole for locating pin

8.2.2 Tile installation

Installation example
The installation of the tiles is described using an *APS4244-x000* tile as an example.

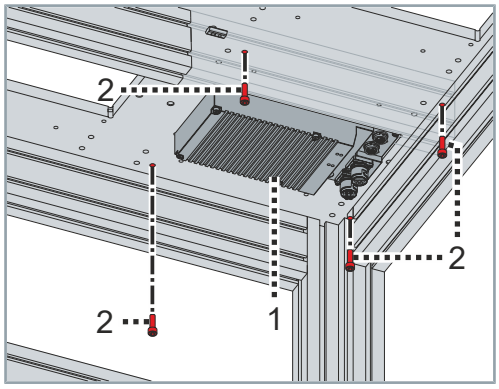


► Insert all locating pins [1] into the machine bed [2]



► Position the tile [1] with the locating pin hole and the elongated hole on the locating pins [2]

Screwing the tiles
Each tile must be attached to the machine bed with four screws. The inner or outer drilling pattern must be used to attach the *APS4244-x000* tile. Further information can be found in chapter "Fastening points", [Page 59].



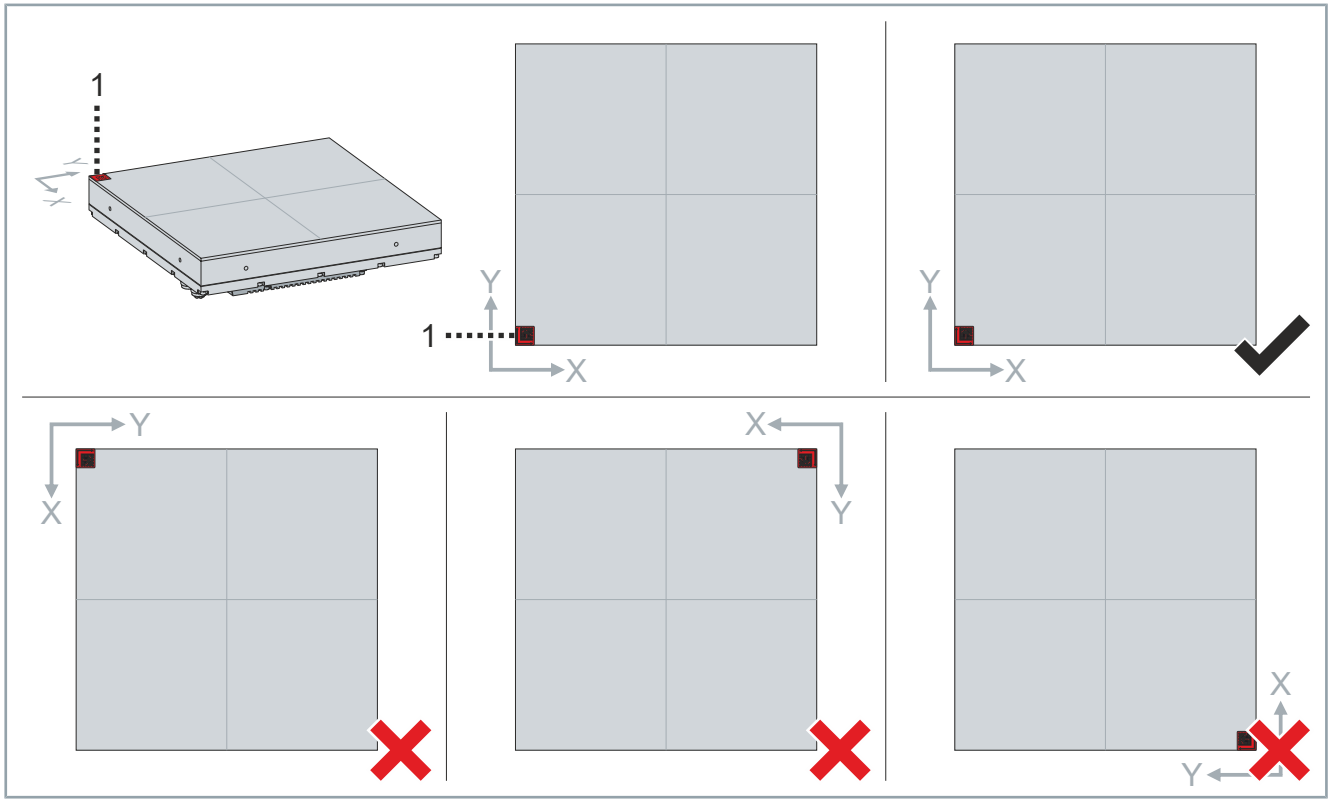
► Fasten the tile [1] with four screws [2]
► Observe tightening torques:

Component	Tightening torque [Nm]
M6 screws	8

8.2.2.1 Tile orientation

NOTICE

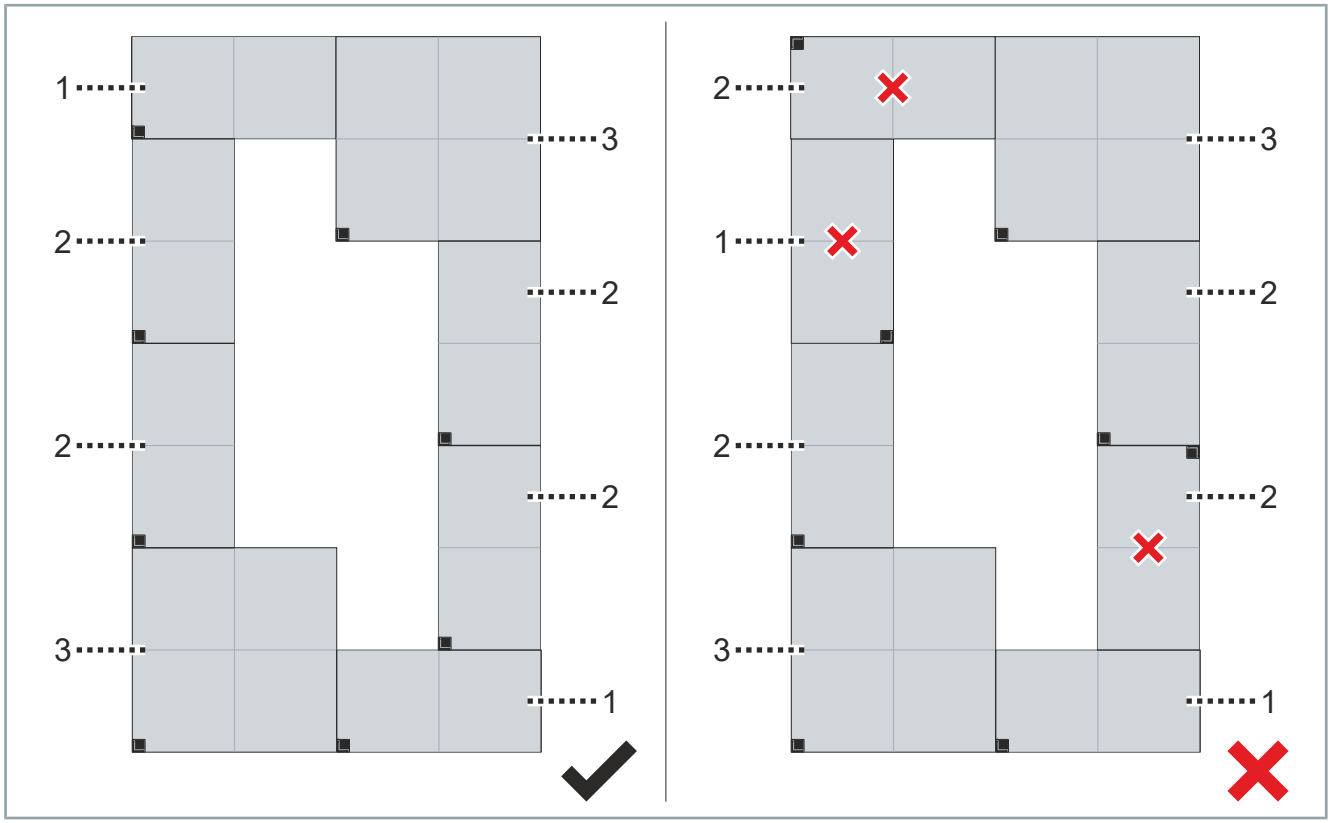
Insert the tile correctly
All tiles must have the same orientation in order to be able to control the movers. The coordinate origin is the same for each tile and is marked with a sticker.
If a tile is not installed correctly, this will result in problems controlling the mover.



Position	Name
1	Sticker with coordinate origin

Make sure that all tiles have the same orientation. Use the coordinate origin [1] as a guide to align the tiles correctly.

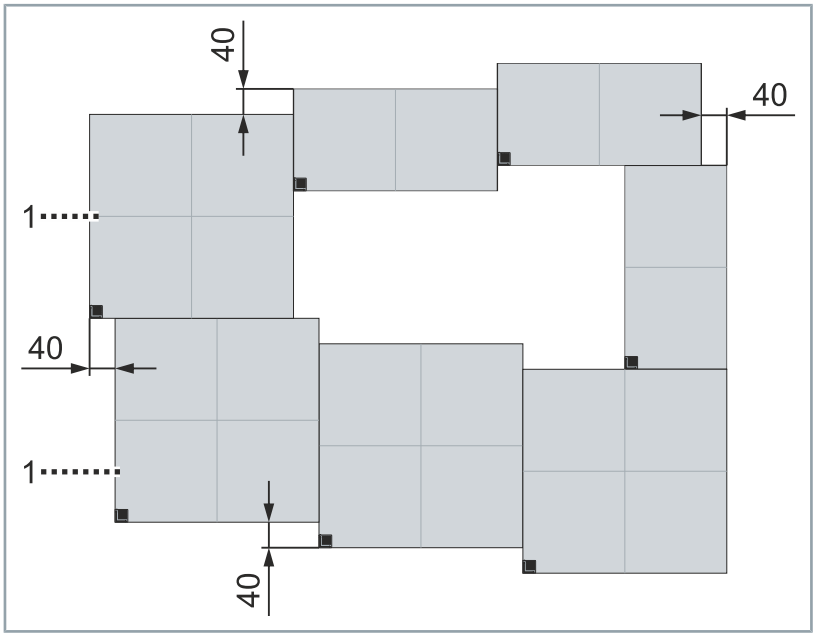
8.2.2.2 Combining tiles



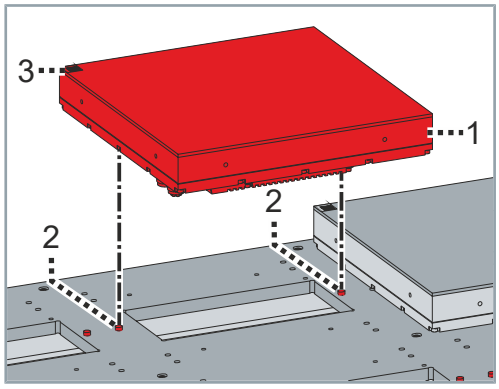
Position	Name
1	APS4242-x000
2	APS4224-x000
3	APS4244-x000

You have the option of combining the three tile types *APS4224-x000*, *APS4242-x000* and *APS4244-x000* in your system. All tiles must be aligned with each other using the tile origin. It is forbidden to install the tiles *APS4242-x000* [1] and *APS4224-x000* [2] rotated by 90°, as the tiles then have different tile origins.

8.2.2.3 Offset of the tiles

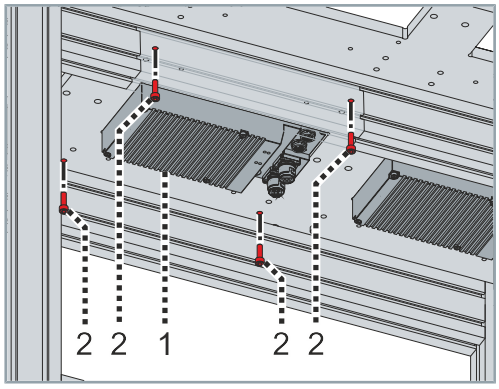


You have the option of arranging the tiles [1] with an offset of 40 mm to each other.



- ► Position another tile [1] with the hole and the elongated hole on the locating pins [2]
- ► Observe coordinate origin [3]

Further information can be found in chapter "Tile orientation", [Page 62].



- ► Fasten additional tile [1] with four screws [2]
- ► Observe tightening torques:

Component	Tightening torque [Nm]
M6 screws	8

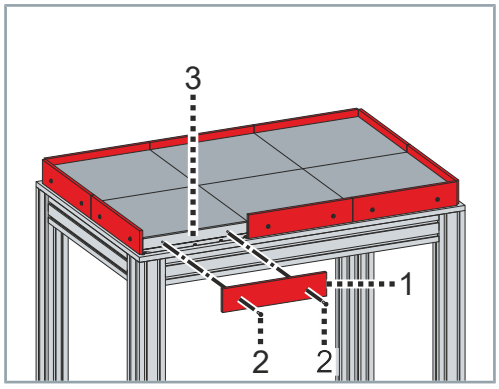
- ► Install additional tiles in the same way

8.2.3 Mechanical protection

⚠ WARNING

Secure the area around the stator surface
Basically, electronic devices are not fail-safe. Movers can become detached from the stator surface in an uncontrolled manner due to power failure or system control faults. Secure the stator surface with a mechanical protection to prevent the mover from leaving in an uncontrolled manner.
If the stator area is not secured, the movers can leave the stator area in the event of a power failure, resulting in serious or even fatal injuries.

Once all tiles have been attached to the machine bed, a mechanical protection can be installed. Holes are provided in the side of the tile for fastening the mechanical protection. Further information can be found in chapter "Tiles", [Page 18] and "Preparation", [Page 48].



► Fasten the mechanical protection [1] to the tile [3] with two screws [2]
► Observe tightening torques:

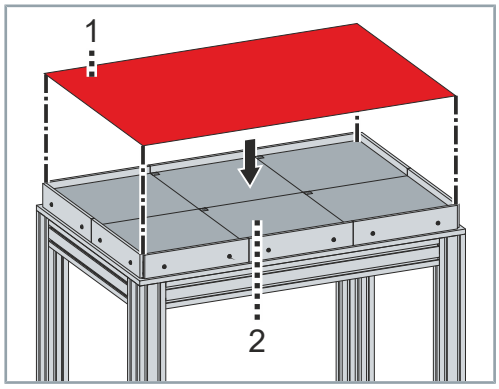
Component	Tightening torque [Nm]
M6 screws	8

8.2.4 Surface

Application of an easy-to-clean surface
The application of an easy-to-clean surface supports the use of the XPlanar in the food industry and pharmaceutical applications.

The surface must not be thicker than 0.5 mm. It must be non-magnetic and have low electrical conductivity. For example, the following surface can be applied to the tiles:

- Up to 0.5 mm thick 1.4404 stainless steel sheet in accordance with *DIN EN ISO 3506-1* and *AISI 316L*



► Apply surface [1] to the stator surface [2]

8.3 Installing the heat sink

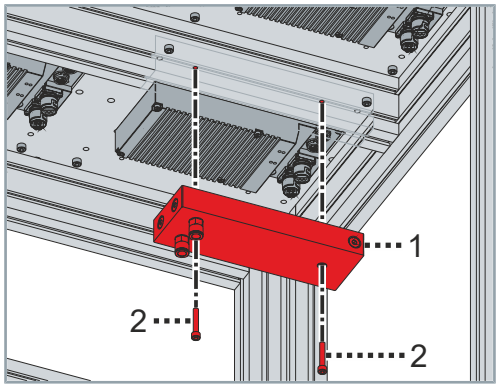
⚠ WARNING

Do not touch tiles without personal protective equipment
Touch hot tiles only with special thermal gloves. Avoid prolonged contact with hot components.
Hot components can cause severe burns to body parts and limbs.

NOTICE

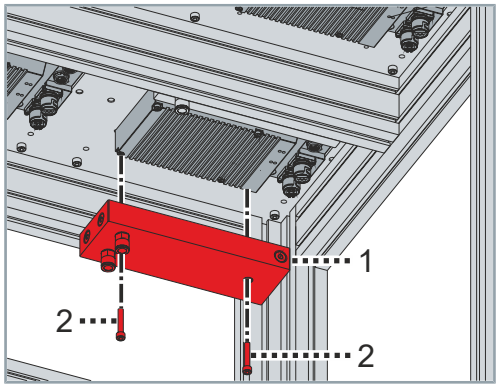
Avoid heat build-up and waste heat on tiles
Observe the specifications for ambient and operating temperatures and tile loads. Ensure sufficient clearance below the machine bed and sufficient cooling of the tiles. Enclosing the substructure can lead to heat build-up, especially with air cooling.
Insufficient cooling can lead to overtemperature shutdown of the system and damage to components due to heat generation.

Heat sinks can be fitted to dissipate waste heat.



- ► Fasten the heat sinks [1] on one side of the cover to the machine bed with two screws [2]
- ► Observe tightening torques:

Components	Tightening torque [Nm]
M6 screws	7



- ► Fasten the additional heat sink [1] on the opposite side of the cover to the machine bed using two screws [2]
- ► Observe tightening torques:

Components	Tightening torque [Nm]
M6 screws	7

- ► Attach additional heat sinks on both sides of each tile

9 Electrical installation

9.1 Cabling

For cabling the tiles please refer to the chapter on electrical installation. The second part of the mechanical installation involving positioning of the movers can take place once the electrical installation is complete.

9.2 Connection technology

All XPlanar tiles have interfaces for connecting the power cable and inputs and outputs for EtherCAT G lines. The cable end of the EtherCAT G cable ZK1B96-8191-0xxx has an RJ45 plug. The end of the power cable is pre-assembled with ferrules. Cables are not included in the scope of supply.

9.2.1 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.

Beckhoff recommendation for correct application and assembly:

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

9.3 Laying

Slots for the following cables are integrated on the tiles:

- Power cables with B17 to B17
  - ZK7672-3031-3xxx
- EtherCAT G/G10 cable with M12 to M12
  - ZK1B96-8181-0xxx
- EtherCAT G/G10 cable with RJ45 to M12
  - ZK1B96-8191-0xxx
- EtherCAT G/G10 cable with ix Industrial™ to M12
  - ZK1B96-819A-0xxx

Route the power cable in a protected manner so that it is not exposed to 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 fixed or occasionally moved power cable:

Power cable

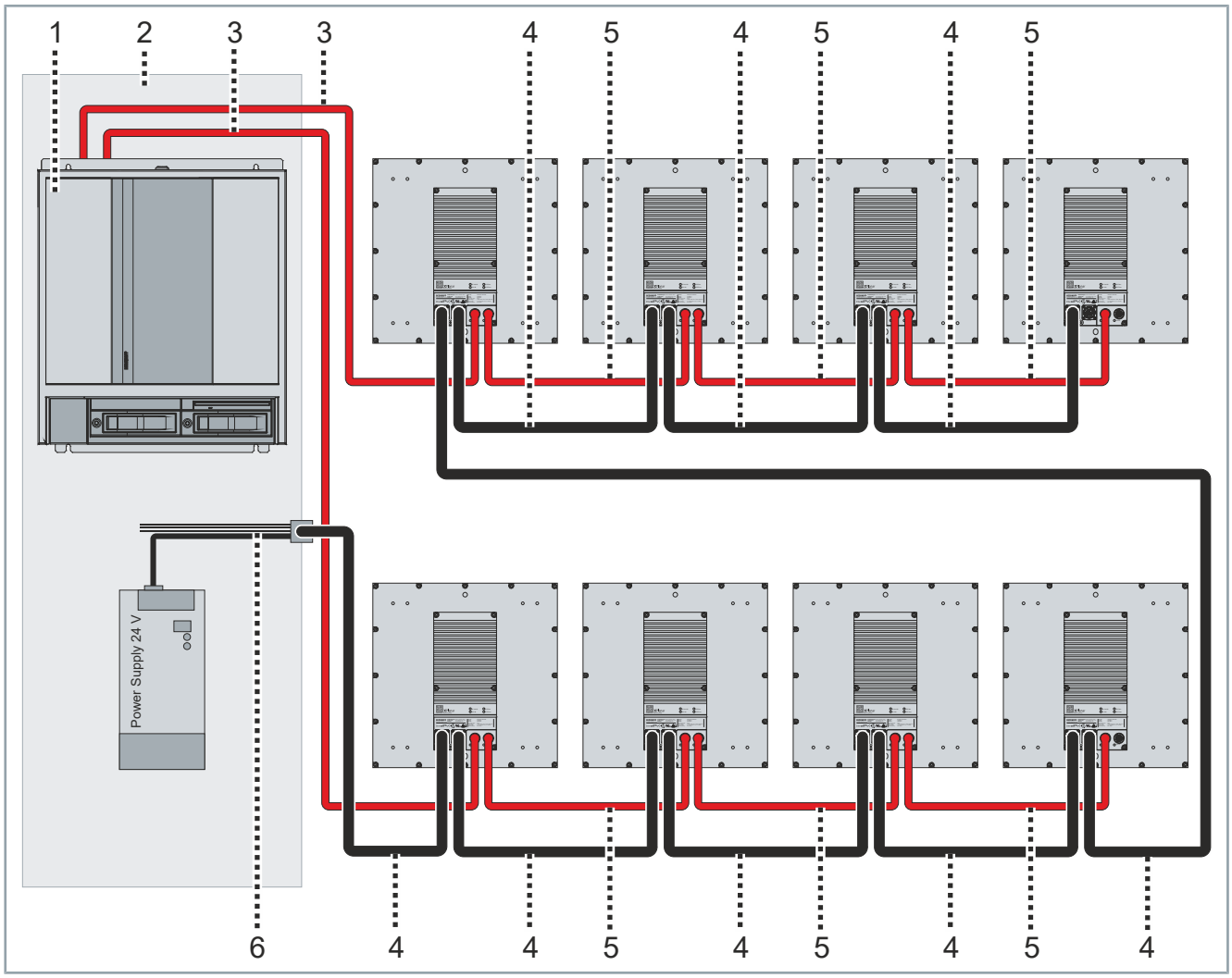
Laying	Minimum bending radius
Fixed	5 x cable diameter

EtherCAT G cable

Laying	Minimum bending radius
Fixed	4 x cable diameter
Occasionally moved	8 x cable diameter

Use the EtherCAT G cable *ZK1B96-819A-0xxx* to establish communication between the tiles and the industrial PC. With the EtherCAT G cables *ZK1B96-8181-0xxx*, up to four tiles can be connected to each other to form a segment according to the Daisy Chain principle.

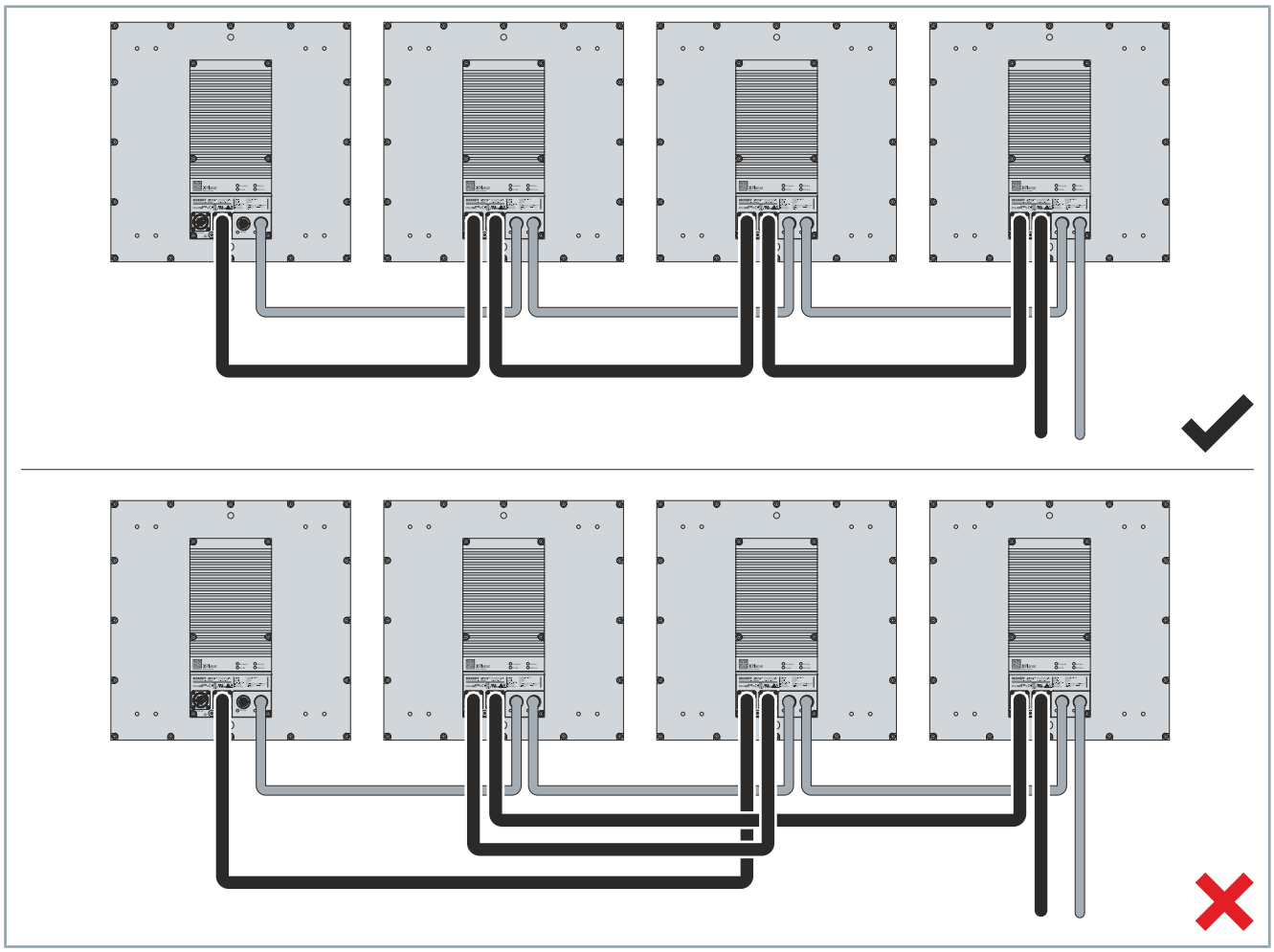
With the power cable *ZK7672-3031-0xxx*, up to eight tiles can be connected to each other to form a segment according to the Daisy Chain principle.



Position	Name	Ordering information
1	Industrial PC	-
2	Control cabinet	-
3	Industrial Ethernet/EtherCAT G/G10 cable, M12 bayonet to ix Industrial™ OR Industrial Ethernet/EtherCAT G/G10 cable, M12 bayonet to RJ45	ZK1B96-819A OR ZK1B96-8191
4	Power cables with B17 to B17**	ZK7672-3031
5	Industrial Ethernet/EtherCAT G/G10 cable, M12 bayonet to M12 bayonet*	ZK1B96-8181
6	Power cables with flange, B17 flange to open end	ZK7672-AS00

* Connect up to four tiles to form a segment.

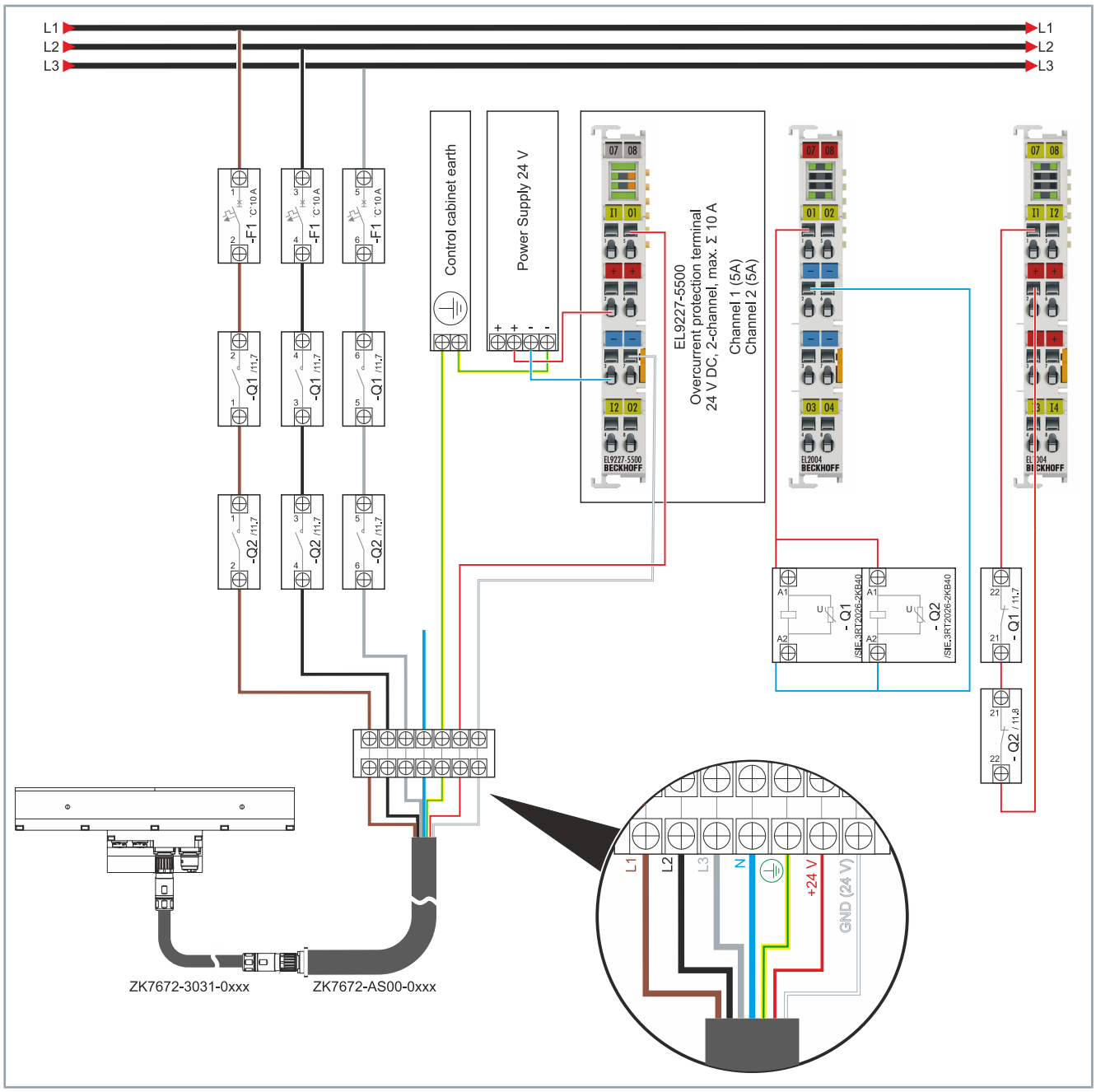
** Connect up to eight tiles to form a segment.



Only connect adjacent tiles with the power cable and the EtherCAT G cable. Ideally, the power cable and the EtherCAT G cable of a tile are connected to the same other tile.

9.4 Example circuit

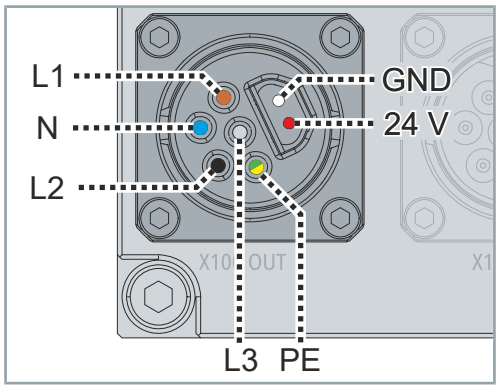
You will receive an example of the cable assignment for establishing the power supply.



The following table shows the assignment for the XPlanar power cable:

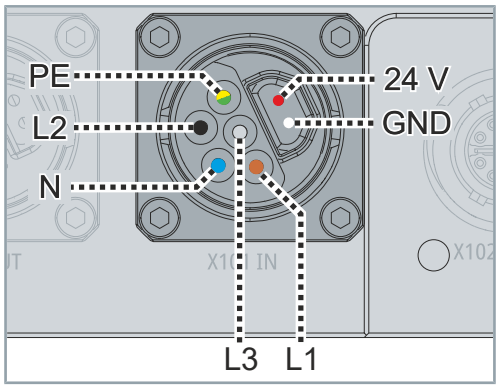
Wire color	Signal	Wire cross-section [mm²]
Brown	L1	1.5
Black	L2	1.5
Gray	L3	1.5
Blue	N	1.5
Green-Yellow	PE	1.5
Red	+ 24 V	0.75
White	GND (24 V)	0.75

9.4.1 Pin assignment X100 OUT



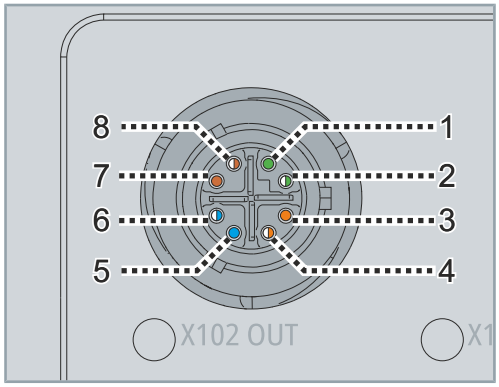
Identification	Signal
Red	24 V
White	GND
Brown	L1
Black	L2
Gray	L3
Blue	N
Green-Yellow	PE, protective earth

9.4.2 Pin assignment X101 IN



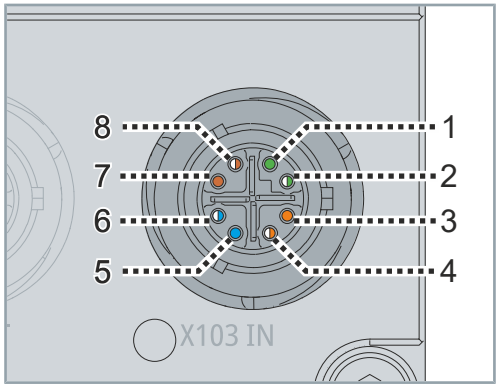
Identification	Signal
Red	24 V
White	GND
Brown	L1
Black	L2
Gray	L3
Blue	N
Green-Yellow	PE, protective earth

9.4.3 Pin assignment X102 OUT



Pin	Identification	Signal
1	Green	A+
2	White-Green	A-
3	Orange	B+
4	White-Orange	B-
5	Blue	D+
6	White-Blue	D-
7	Brown	C-
8	White-Brown	C+

9.4.4 Pin assignment X103 IN



Pin	Identification	Signal
1	Green	A+
2	White-Green	A-
3	Orange	B+
4	White-Orange	B-
5	Blue	D+
6	White-Blue	D-
7	Brown	C-
8	White-Brown	C+

9.5 Installing cables

First connect the power cables to the tiles. Then connect the EtherCAT G cables.

9.5.1 Technical aids

Uniform cabling
Ideally, Beckhoff recommends connecting the same tiles with EtherCAT G cables *ZK1B96-8181*, which are connected to each other via power cables *ZK7672-3031*.

9.5.2 Power cable

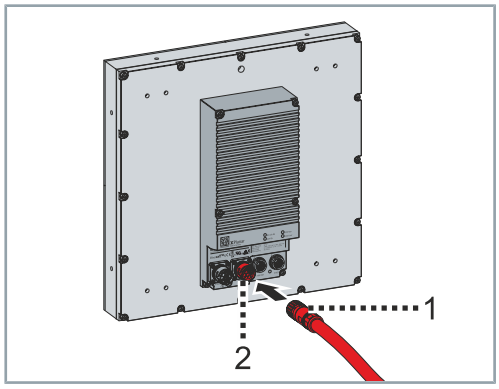
Simplified representation
In the interest of clarity, only the tiles are shown in power cable installation description, not the machine bed.

You have the option of connecting up to eight tiles to each other using the Daisy Chain principle with *ZK7672-3031* power cables.

9.5.2.1 Tile to control cabinet

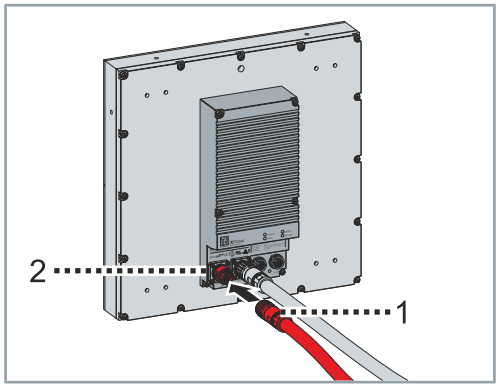
NOTICE

Secure the cables correctly
The cables must be secured to the tile using the bayonet connector.
Cables that are not correctly secured can cause problems with the power supply and communication.

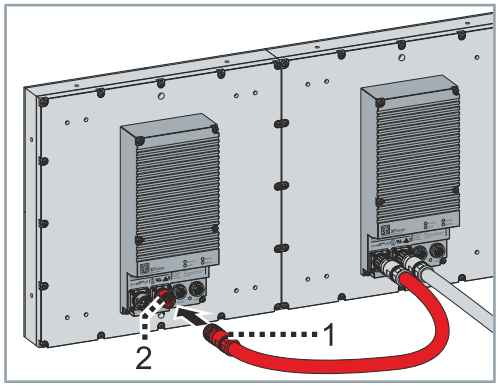


- ► Connect the connector of the power cable *ZK7672-3031* [1] to connection *X101 IN* [2] of the tile
- ► Locking the bayonet connector

9.5.2.2 Tile to tile



- ► Connect the connector of the power cable *ZK7672-3031* [1] to connection *X100 OUT* [2] of the tile
- ► Locking the bayonet connector



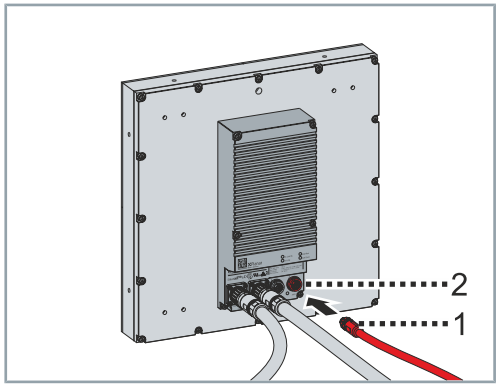
- ► Connect the connector of the power cable *ZK7672-3031* [1] to connection *X101 IN* [2] of the next tile
- ► Locking the bayonet connector
- ► Connect a total of up to eight tiles together in the same way using power cables *ZK7672-3031* to form a segment

9.5.3 EtherCAT G cable

Use the EtherCAT G cable *ZK1B96-8191-0xxx* to establish communication between the tiles and the industrial PC. The EtherCAT G cables *ZK1B96-8181-0xxx* can be used to connect up to three additional tiles according to the Daisy Chain principle.

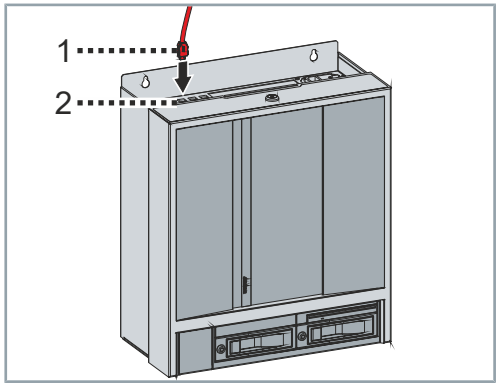
Simplified representation
For a better overview, only the tiles are shown when laying the EtherCAT G cables and the machine bed is not shown.

9.5.3.1 Tile to industrial PC



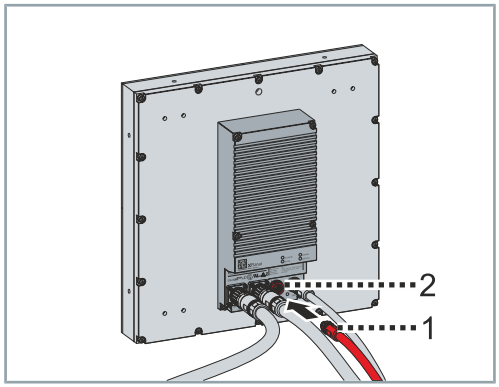
► Connect connector [1] of the EtherCAT G cable *ZK1B96-819A* to connection *X103 IN* [2]

► Locking the bayonet connector

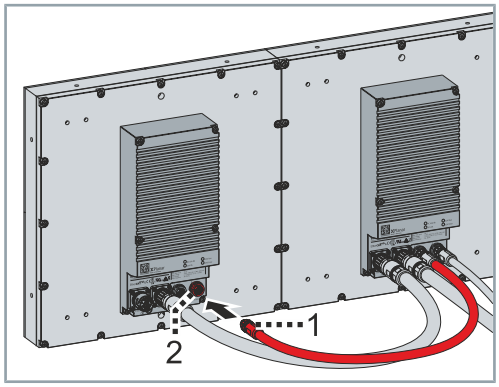


► Connect the connector of the EtherCAT G cable *ZK1B96-819A-0xxx* or *ZK1B96-8191-0xxx* to the industrial PC

9.5.3.2 Tile to tile



- ► Connect connector [1] of the EtherCAT G/G10 cable *ZK1B96-8181* to connection *X102 OUT* [2]
- ► Locking the bayonet connector



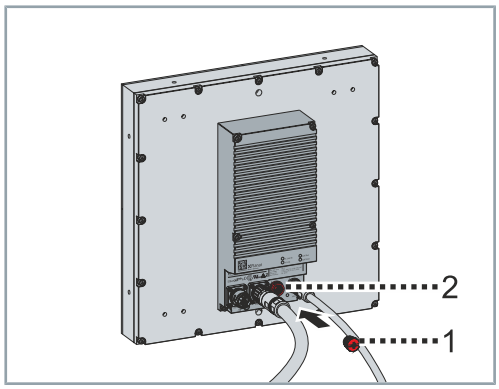
- ► Connect connector [1] of the EtherCAT G/G10 cable *ZK1B96-8181* to connection *X103 IN* [2] of the next tile
- ► Locking the bayonet connector
- ► Connect a total of up to four tiles together in the same way using EtherCAT G cables *ZK1B96-8181* to form a segment
- ► Make sure that the same tiles are connected to each other that are also connected with power cables *ZK7672-3031*

Further information can be found in chapter "Laying", [Page 69].

9.5.4 Cover plugs and protective caps

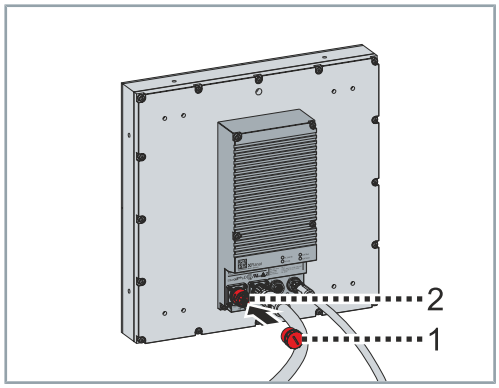
Beckhoff recommends sealing unused connections on the tiles with cover plugs [+] and protective caps [+]. The cover plugs and protective caps included in the scope of delivery can be used for sealing. If the supplied cover plugs and protective caps are no longer available, you can order cover plugs and protective caps from Beckhoff. Further information can be found in chapter "Accessories", [Page 108].

Protective cap M12 [+]



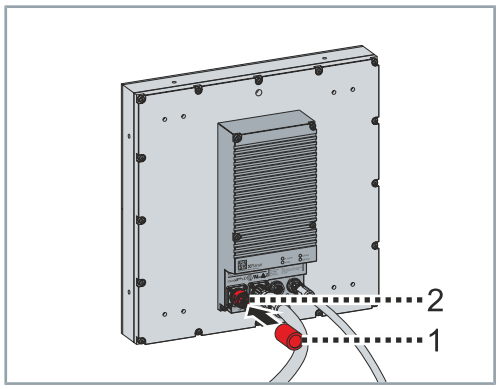
► Insert protective cap M12 [1] into unused connection [2] of the tile

Protective cap B17 [+]



► Insert and lock protective cap B17 [1] into the unused connection [2] of the tile

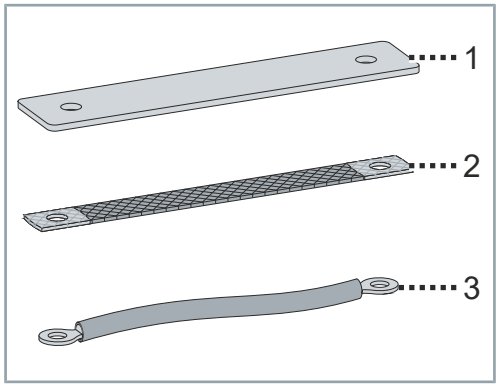
Protective cap B17



► Insert the supplied protective cap B17 [1] into the unused connection [2] of the tile

9.6 Grounding the machine bed

The ground connection must be made with the largest possible cross-section, with a low impedance, over a large area and via a short connection to large conductive fastenings. Beckhoff recommends the use of wide connections with large contact surfaces, for example wide ground straps.



Suitable connectors

Suitable for grounding machine beds:

- Copper rails [1]
- Ground straps with cable lugs [2]
- Cable with cable lugs [3]

⚠ WARNING

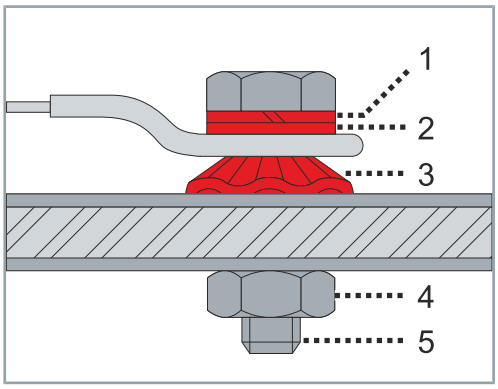
Risk of injury through electric shock

There must be an optimally conductive connection for the protective conductor at the connection point. The machine bed must be grounded in accordance with the statutory regulations.

Carefully remove paint, dirt, corrosion and all insulating components.

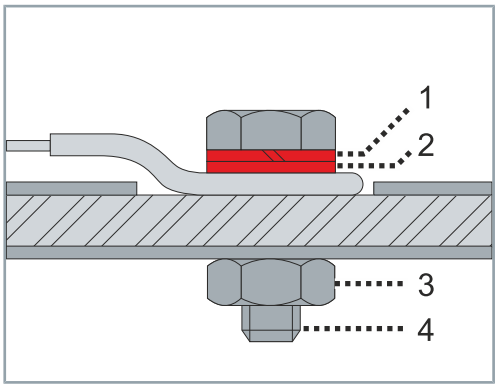
Use galvanized stud bolts and washers.

9.6.1 Painted surfaces



► Ground the painted surface with spring washer [1], washer [2], contact washer [3], nut [4] and bolt [5]

9.6.2 Unpainted surfaces



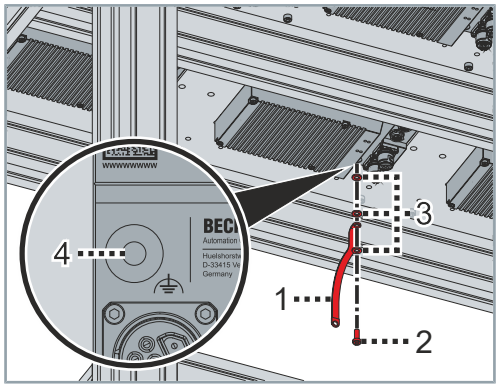
Ground the unpainted surface with spring washer [1], washer [2], nut [3] and bolt [4]

9.7 Functional earth

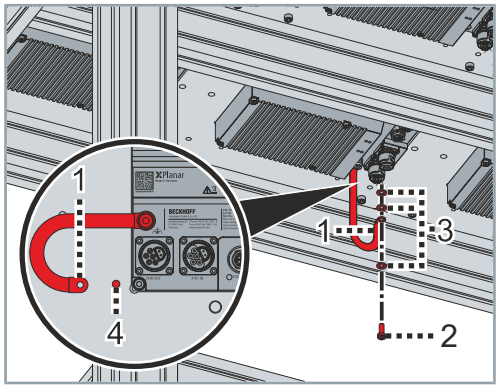
Installation with protective conductor connection
When installing electrical systems and components, the protective conductors must be connected first. They must be disconnected last when uninstalling.
Depending on the magnitude of the leakage currents, observe the following regulations for the implementation of the protective conductor connection:

- Minimum requirement for protective conductor: KU value of 4.5
- The minimum requirement for leakage currents: I_L < 10 mA; KU = 6 for I_L > 10 mA

Value	Explanation
KU	Variable for the classification of safety-related types of failure for protection against dangerous shock current and excessive heating
KU = 4.5	Achieved in relation to interruption: With permanently connected protective conductor connection ≥ 1.5 mm² With protective conductor connections ≥ 2.5 mm² via connector for industrial plants according to IEC 60309-2
KU = 6	Achieved in relation to interruption: With permanently connected conductors ≥ 10 mm²; the type of connection and routing must comply with the standards applicable to PE conductors



► Screw the cable lug of the ground strap [1] to the functional earth connection [4] of the tile using a screw [2] and washers [3]

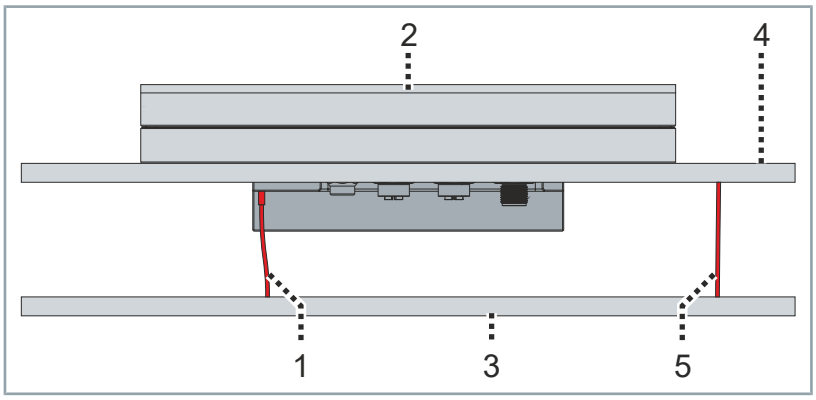


► Screw the cable lug of the ground strap [1] to the machine bed [4] using a screw [2] and washers [3]

There are two options for the functional earthing of your system:

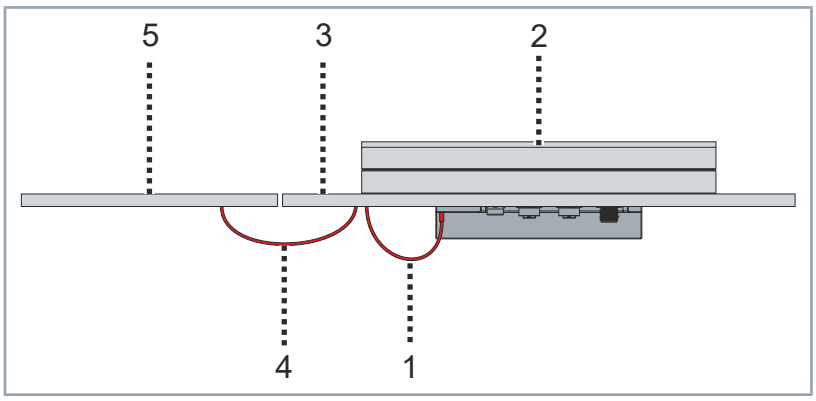
- Connection to a grounding bar
- Connection of several machine beds

9.7.1 Grounding bar



The functional conductor connection [1] of the tile [2] must be connected to the grounding bar [3]. In addition, the machine bed [4] must be connected to the grounding bar [3] with a functional conductor connection [5].

9.7.2 Machine bed



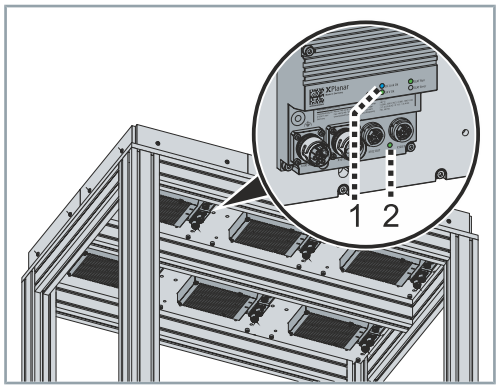
The functional conductor connection [1] of the tile [2] must be connected to the machine bed [3]. In addition, the machine bed [3] must be connected to another machine bed [5] with a functional conductor connection [4].

If required, additional machine beds can be connected with functional conductor connections.

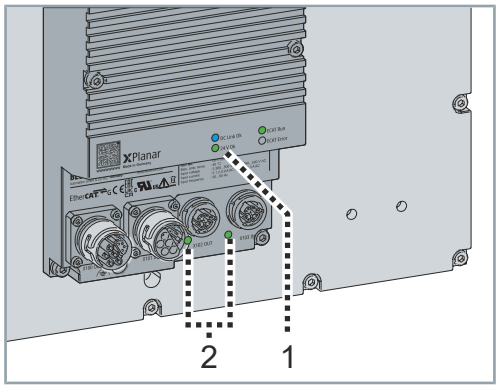
9.8 System test

NOTICE

Avoid wiring faults in the control cabinet
First, only connect the 24 V supply to the tiles and check the tile function.
Accidental connection of 380 - 500 V instead of 24 V can lead to the destruction of all tiles.



- ► Connect the entire system to the power supply
- ► First connect only 24 V
- ► Check the tile function
- ► Make sure that the LEDs [1] and [2] light up



The following LEDs [1] must light up:

- 24 V Ok

The following LEDs [2] must flash if data cables have been plugged in:

- X101 IN
- X102 OUT

If the LEDs do not light up:

- ► Check the power supply units and fuses for voltage
- ► Contact the Support/Applications Department

10 Mechanical Installation – Part 2: Mover

10.1 Placing the mover

⚠ WARNING

Do not place the mover until the system test has been completed
The movers may only be placed once the mechanical installation - part 1, electrical installation and system test have been completed.
Failure to do so may result in serious injury to fingers from crushing or to eyes from splinters.

⚠ WARNING

Wear safety goggles and gloves
The movers can have strong magnetic attraction to each other or other metallic objects. Splinters can form if magnets collide.
Failure to do so may result in serious injury to fingers from crushing or to eyes from splinters.

⚠ WARNING

Remove each mover individually from the box
If you take two movers out of the box at the same time and the distance between the movers is too small, the movers may attract each other.
If the movers attract each other and collide, serious injuries to the fingers from crushing and in the eyes from splinters can result.

⚠ WARNING

Do not reach under the mover with your fingers
When carrying a mover or placing it on the system, do not reach under the mover with your fingers. Only grab the mover by the side of the bumper and carry it.
Failure to do so can result in severe crushing and injury to fingers.

⚠ WARNING

Movers contain strong permanent magnets
The permanent magnets are arranged in so-called Halbach arrays, which ensure that the magnetic field on the underside of the mover is significantly stronger than on the upper side of the mover. The field of the permanent magnets is present even when the power supply is switched off.
If the movers attract each other and collide, serious injuries to the fingers from crushing and in the eyes from splinters can result.

10.1.1 Transport

⚠ WARNING

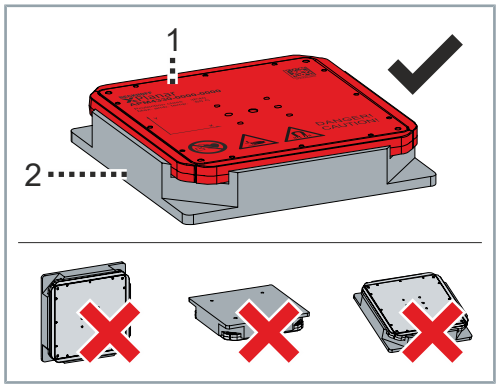
Carry each fixing packaging containing a mover and transport securing device individually
If you carry two fixing packagings with one mover each and the distance between the movers is too small, the movers may attract each other.
If the movers attract each other and collide, serious injuries to the fingers from crushing and in the eyes from splinters can result.

⚠ WARNING

Transport each mover with transport securing device individually
If you transport two movers and the distance between them is too small, the movers may attract each other. The transport securing device weakens the magnetic field of the mover. Transport movers only individually and in the transport securing device.
If the movers attract each other and collide, serious injuries to the fingers from crushing and in the eyes from splinters can result.

⚠ WARNING

Transport the mover with the safety pictogram facing upwards
Always transport the movers with the safety pictograms facing upwards. The underside of the mover must be in the transport securing device. The transport securing device weakens the magnetic field of the mover.
Incorrectly inserted movers can attract magnetic objects or other movers, resulting in serious injuries to fingers from crushing and to eyes from splinters.

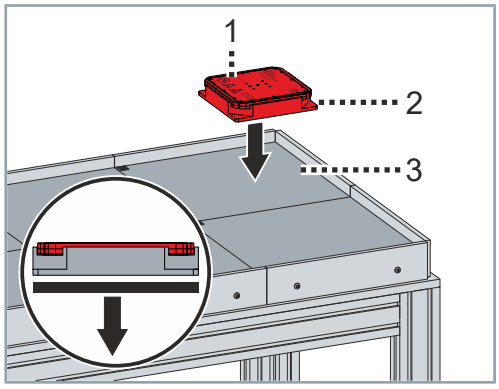


► Transport the individual mover [1] with the safety pictograms facing upwards in the transport securing device [2] straight to the workplace or system

10.1.2 Positioning on a tile

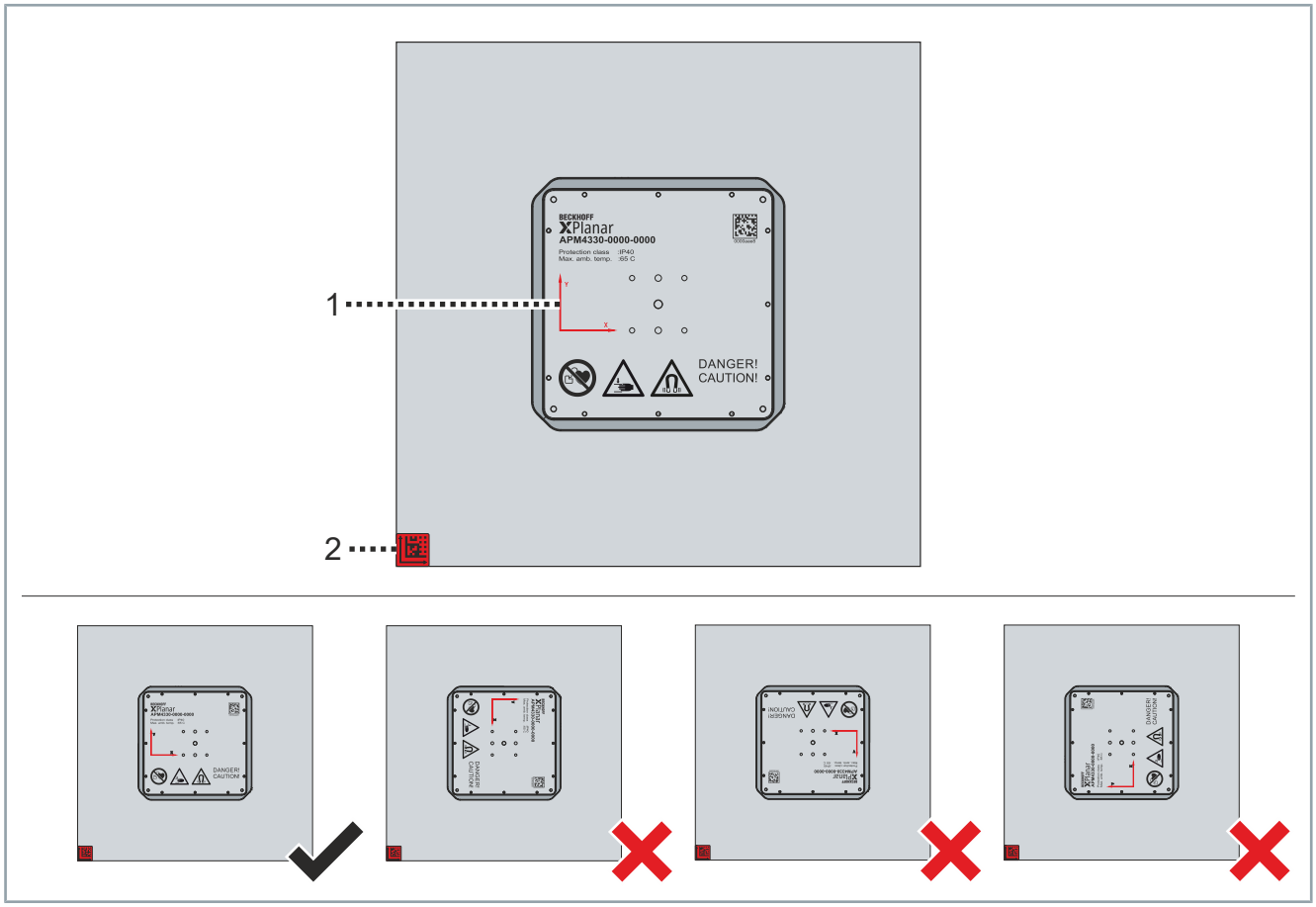
Mount the tool before placing the mover
If you use tools on the movers, mount the tool before placing the movers on the tiles. Further information can be found in chapter "Installing tool carriers and attached parts", [Page 89].

Couple the mover before placing
If you are using a mover coupling, couple the movers before placing them on the tiles. Further information can be found in chapter "Coupling movers", [Page 92].



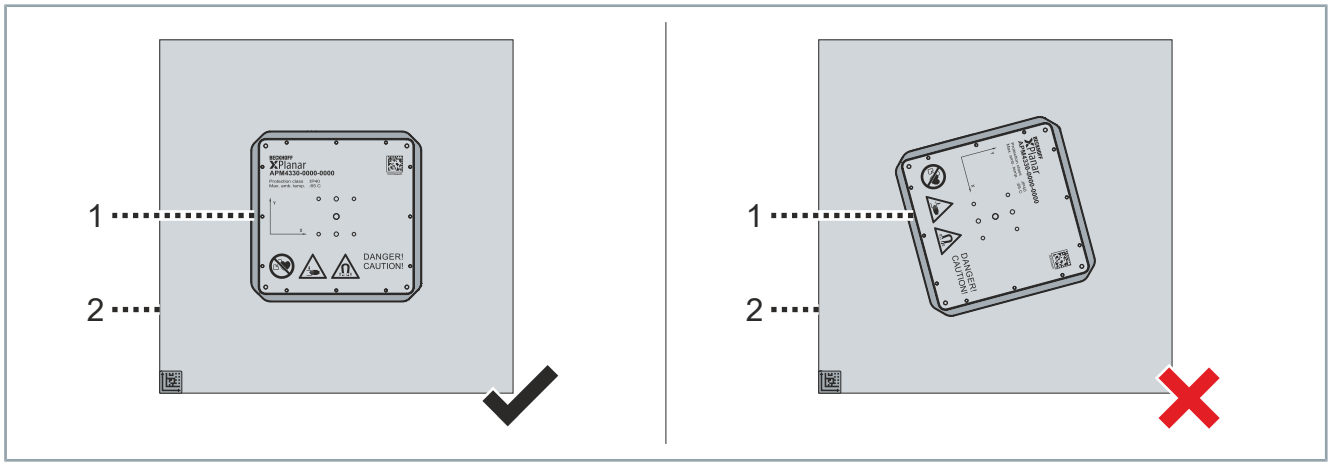
► Position the mover [1] with transport securing device [2] directly on the tile [3]

10.1.2.1 Mover alignment



Position	Name
1	XY axes of the mover
2	Sticker with coordinate origin

When placing the movers, make sure that the XY axes of the mover [1] correspond to the XY axes of the tile. The coordinate origin of the tile is used for orientation. Further information can be found in chapter "Tile orientation", [Page 62].



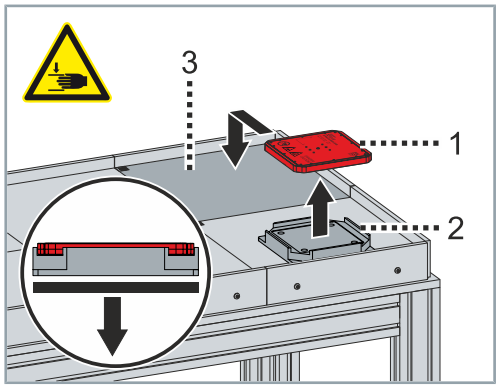
When placing the movers [1], ensure that they are positioned as parallel as possible to the outer edges of the tile [2].

⚠ WARNING

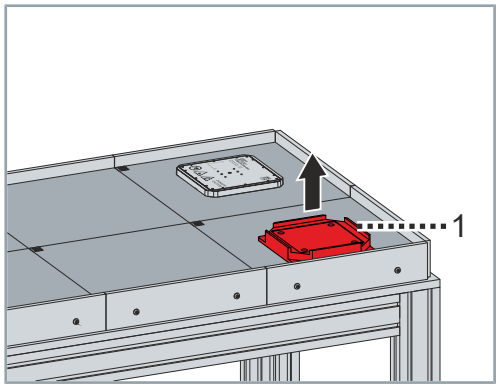
Only grip the mover from the side
When placing a mover on the tiles, only grip the mover from the side.
Magnetic attraction both between the mover and the tile and between two movers can result in serious injury to fingers from crushing and to eyes from splinters.

NOTICE

Check the underside of the mover for adhesions
Check the underside of the mover for adhesions and clean if necessary.
Adhesive deposits can cause damage to the tile surface.



- ► Take the mover [1] out of the transport securing device [2] with a straight upward movement
- ► Position the mover [1] straight in the center of the adjacent tile [3]
- ► Make sure that your fingers are not underneath the mover and that the mover has sufficient distance to other movers



- ► Remove the transport securing device [1]
- ► Position the remaining movers on the tiles in the same way

10.2 Installing tool carriers and attached parts

Depending on the application, the movers can be equipped with the appropriate tool carriers and attached parts. Beckhoff recommends:

- Use non-magnetic material.
- Use non-magnetic screws.
- Keep the tool carrier and attached parts as flat as possible.
- Design the tool carrier and attached parts as light as possible.
- Not to exceed the outer dimensions of the mover.
- Center the weight in the middle of the mover.
- Install the tool carrier and attached parts to the mover free of tension and torsion.

Tools required depending on mover type

- Allen key size 3
- Allen key size 4
- Allen key size 5

Further information can be found in chapter "Fixing points", [Page 89] and "Dimensional drawings", [Page 39].

Mounting material required depending on mover type

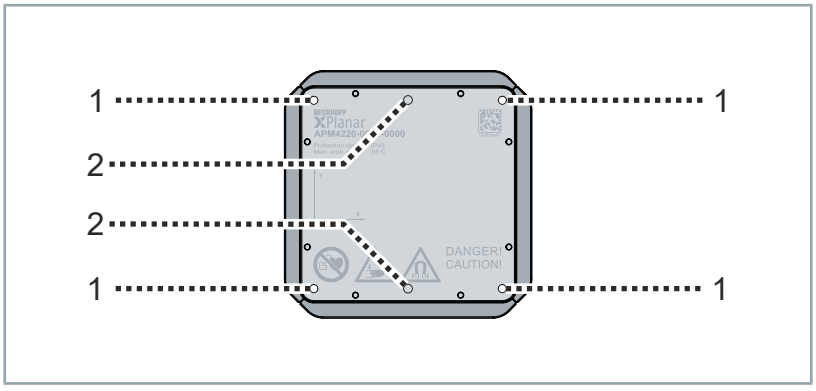
- Locating pins D4
- Non-magnetic hexagon socket screws M4
- Non-magnetic hexagon socket screws M5
- Non-magnetic hexagon socket screws M6

Further information can be found in chapter "Fixing points", [Page 89] and "Dimensional drawings", [Page 39].

10.2.1 Fixing points

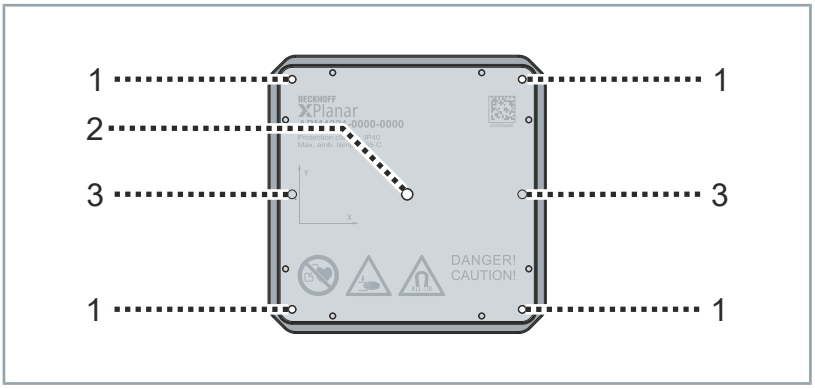
Depending on the mover type, the following fastening points are available for attaching the tool carrier and attached parts.

APM4220-0000



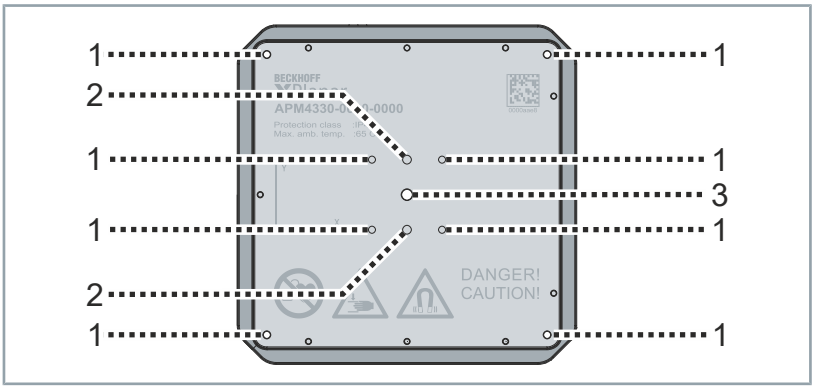
Position	Name
1	Threaded hole M4 x 6
2	Locating hole Ø4 H7 x 4.5

APM4221-0000



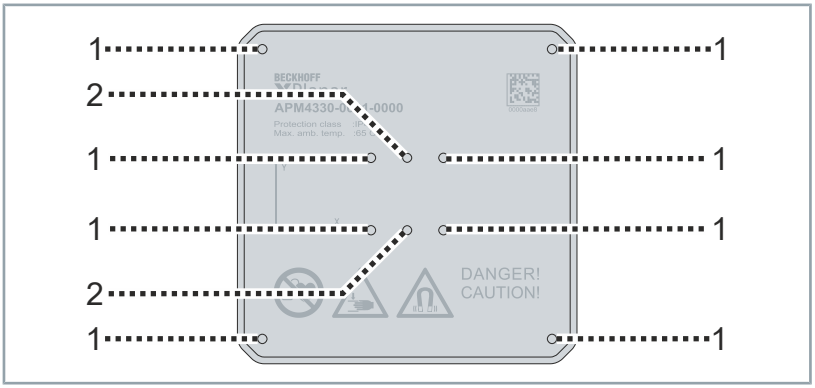
Position	Name
1	Threaded hole M4 x 6
2	Threaded hole M6
3	Locating hole Ø4 H7 x 4.5

APM4330-0000



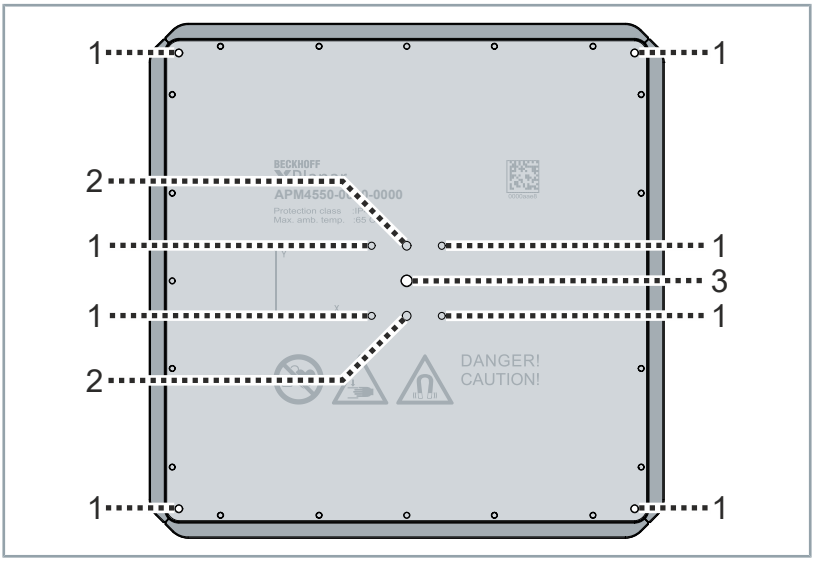
Position	Name
1	Threaded hole M4 x 6
2	Locating hole Ø 4 H7 x 8
3	Threaded hole M6

APM4330-0001



Position	Name
1	Threaded hole M5 x 6
2	Locating hole Ø4 H7 x 10

APM4550-0000



Position	Name
1	Threaded hole M4 x 6
2	Locating hole Ø4 H7 x 8
3	Threaded hole M6

⚠ WARNING

Keep the workplace free of metallic and magnetic materials
Make sure that your workplace is free of metallic and magnetic materials before positioning the mover. Only remove the mover from the transport securing device for essential assembly work on the tool carrier and attached parts. The transport securing device weakens the magnetic field and protects electrical components from magnetic influences.
If movers are attracted by metallic and magnetic parts, serious injuries to the fingers from crushing and in the eyes from splinters can result.

- ► Carry a single mover in its transport securing device directly to the workplace
- ► Mounting the tool carrier and attached parts on the mover
- ► Carry a single mover in its transport securing device directly to the system

⚠ WARNING

Label tool carriers and attached parts with safety pictograms
If the safety pictograms are covered by the tool carrier and the attached parts on the mover for your application, you must affix the safety pictograms visibly to your tool carrier and superstructure.
If the safety pictograms are not visible, other persons may not be aware of possible dangers and may be seriously injured during use.

10.3 Coupling movers

10.3.1 Preparation

Before you start coupling the movers, you must provide a suitable frame and assembly aids.

Dimensional drawings and 3D models online
You have the option of downloading the dimensional drawings and 3D models for the frame and the assembly aid from the Beckhoff website:

www.beckhoff.com/de-de/support/downloadfinder

⚠ WARNING

Do not use magnetic tools
The included permanent magnets can attract used tools. Use non-magnetic tools to remove and install all bumpers.
If magnetic tools are attracted, serious injuries to the fingers from crushing and in the eyes from splinters can result.

Required tools

- Allen key size 2.5
- Allen key size 4

Installation material required

- 8 to 24 non-magnetic hexagon socket screws M5

Further information can be found in chapter "Installation material", [Page 93].

Frame

Beckhoff recommends the following material for the frame:

- Aluminum

Assembly aids

The assembly aid must be made of non-magnetic material. Beckhoff recommends the following material:

- Wood
- Plastics
- Aluminum

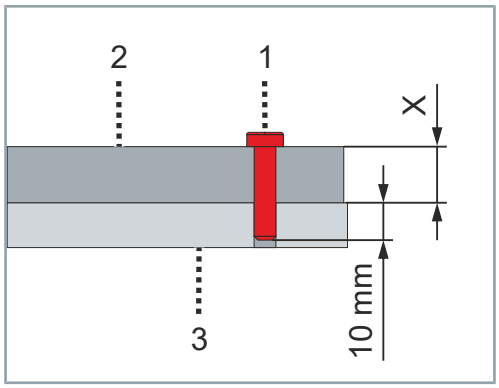
The assembly aid weakens the magnetic field of the movers, but the permanent magnetic field on the underside of the movers is still present.

Installation material

NOTICE

Ensure that the screws have the correct length
Ensure that the screws have the correct length to avoid damage to the workplace and tiles. The screws must not protrude from the frame.

Do not use magnetic screws
Only non-magnetic screws may be used to mount the mover to the frame.



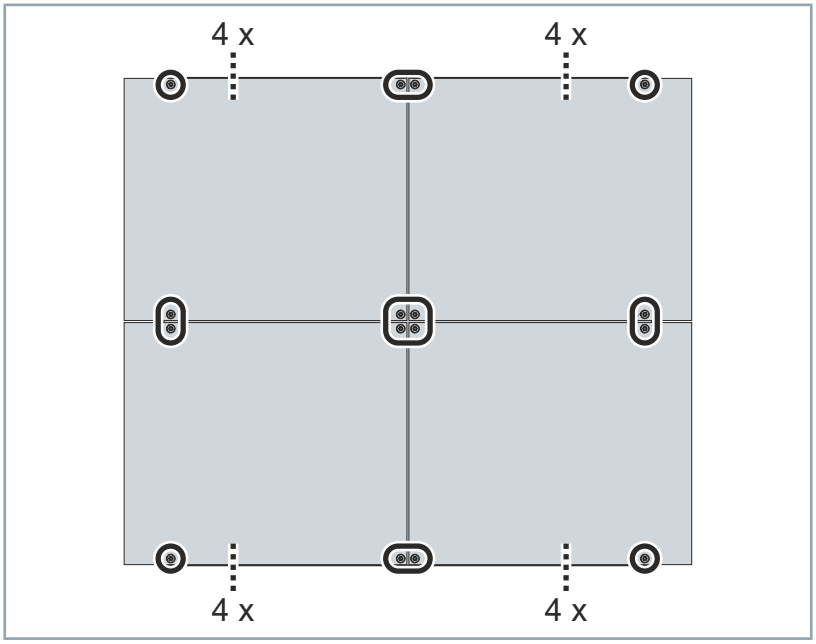
The length of the screws [1] for fastening the assembly aid [2] depends on the height X of the assembly aid. Beckhoff recommends the following screw depth in the frame [3]:

- 10 mm

The M5 screws must not protrude from the frame.

Number of screws required

Each assembly aid must be attached to the frame with four M5 screws.



10.3.2 Installing the movers

Two, four or six movers can be coupled with a frame. To ensure an almost linear increase in the payload, a center-to-center distance of 240 mm must be maintained from mover center to mover center. The total payload can be calculated by multiplying the number of movers by the maximum payload of a mover minus the frame weight:

A x B – C = D

Variable	Explanation
A	Number of movers
B	Maximum load of a mover
C	Frame weight
D	Total payload

For further questions about mover coupling, please contact your local Beckhoff branch or Beckhoff Support:

✉ support@beckhoff.com

The work required for mover coupling should be carried out by two persons. The weight and dimensions require a second person to turn and transport the mover coupling.

Installation example
This chapter describes the mover coupling using a 2 x 2 frame and four movers *APM4550-0000* as an example.

⚠ WARNING

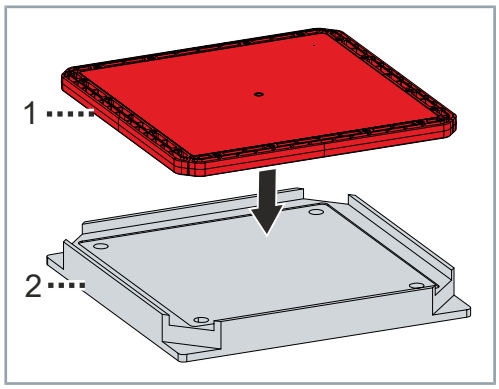
Keep the workplace free of metallic and magnetic materials
Make sure that your workplace is free of metallic and magnetic materials before positioning the mover. Only remove the mover from the transport securing device if absolutely necessary for assembly work. The transport securing device weakens the magnetic field and protects electrical components from magnetic influences.
If movers are attracted by metallic and magnetic parts, serious injuries to the fingers from crushing and in the eyes from splinters can result.

⚠ WARNING

Movers contain strong permanent magnets
The permanent magnets are arranged in so-called Halbach arrays, which ensure that the magnetic field on the underside of the mover is significantly stronger than on the upper side of the mover. The field of the permanent magnets is present even when the power supply is switched off.
If the movers attract each other and collide, serious injuries to the fingers from crushing and in the eyes from splinters can result.

⚠ WARNING

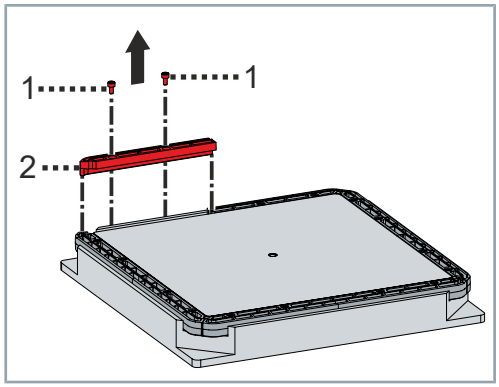
Transport the mover with the safety pictogram facing upwards
Always transport the movers with the safety pictograms facing upwards. The underside of the mover must be in the transport securing device. The transport securing device weakens the magnetic field of the mover.
Incorrectly inserted movers can attract magnetic objects or other movers, resulting in serious injuries to fingers from crushing and to eyes from splinters.



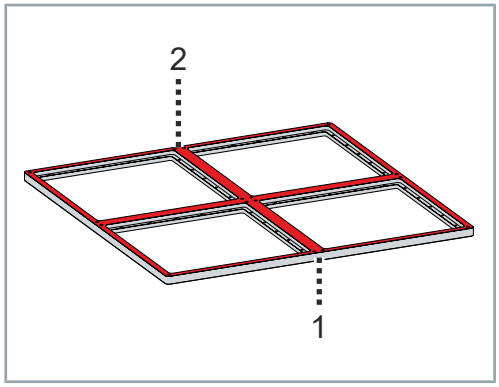
- ► To safely remove the bumpers, remove the mover [1] from the transport securing device [2] and turn it by 180°
- ► Place the mover in the transport securing device [2] with the underside facing upwards

NOTICE

Permanent magnets can attract tools
The permanent magnets on the underside of the movers are now exposed and can attract tools used to remove the bumpers.



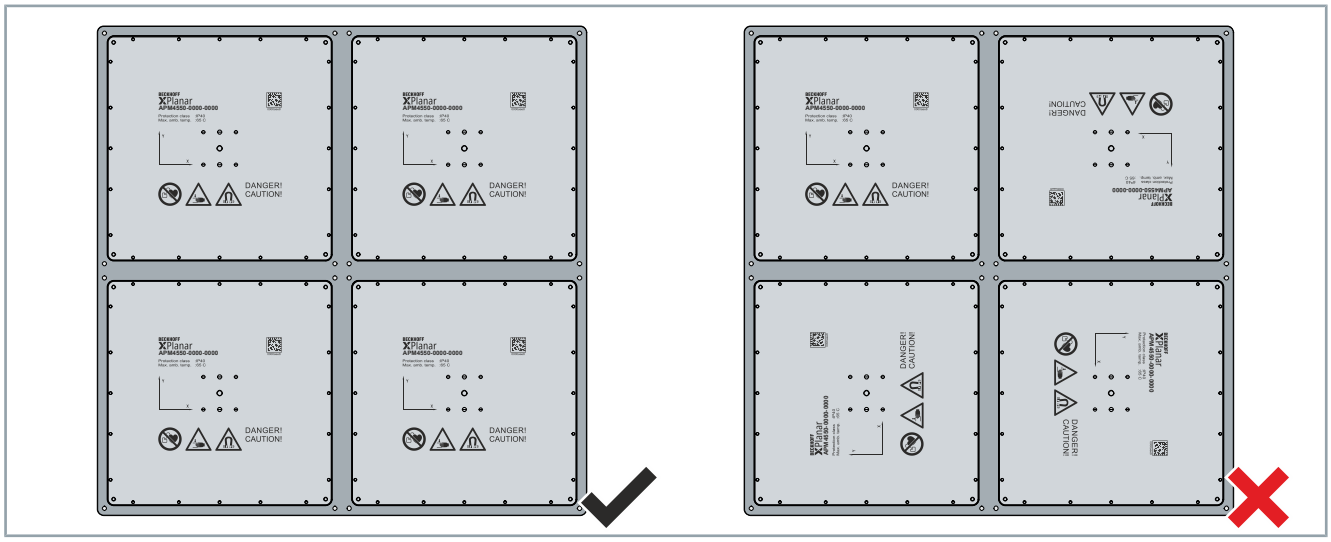
- ► Remove two screws [1]
- ► Remove a bumper [2]
- ► Remove other bumpers in the same way



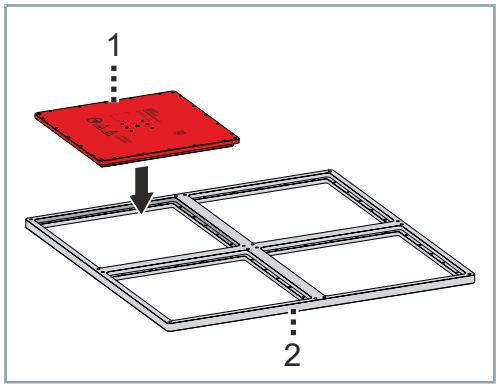
- ► Place the frame [1] on the work surface with the top side [2] facing upwards

Mover alignment

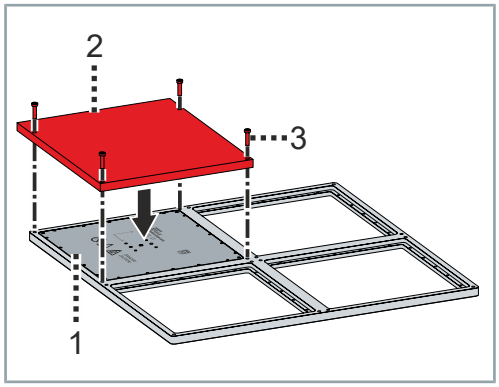
All movers of the mover coupling must have the same orientation; different mover orientations are not permitted:



Note the orientation
Before covering the first mover with an assembly aid, note the orientation of the mover in the frame.

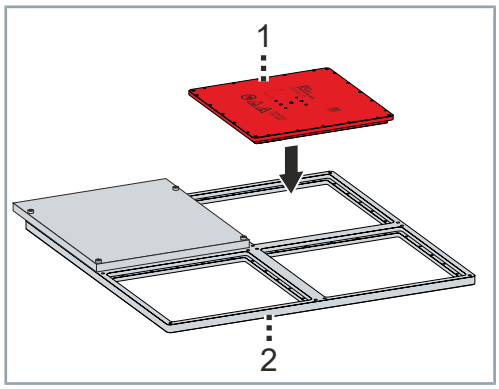


► Place the mover [1] into frame [2]

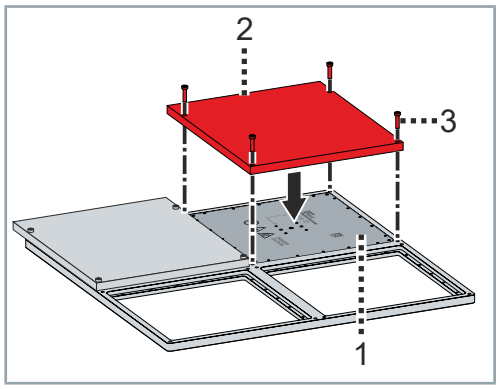


► Secure the mover [1] with the assembly aid [2] and four screws [3] to prevent it from falling out

Once the first mover has been secured with the assembly aid, you can insert the second mover. Make sure that the mover is in the correct position.



► Insert the mover [1] into the frame [2]

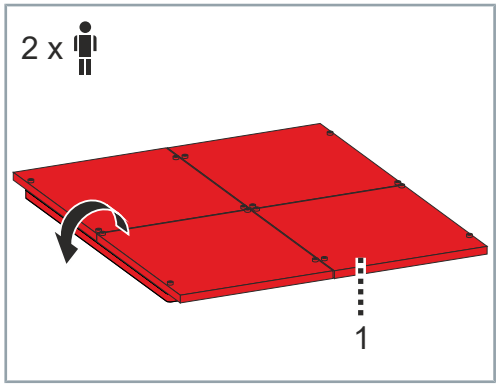


► Secure the mover [1] with the assembly aid [2] and four screws [3] to prevent it from falling out

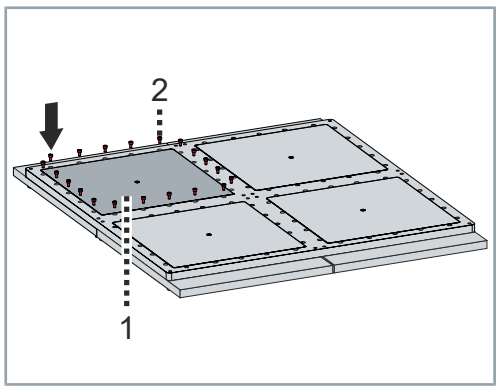
► Insert and secure further movers in the same way

⚠ WARNING

Two persons are required for turning the frame
Two persons are required for turning the frame with the attached assembly aids. The underside of the movers is permanently magnetic and can attract other movers or magnetic parts.
Failure to do so may result in serious injury to fingers from crushing or to eyes from splinters.



► Turn the frame [1] with attached assembly aids by 180°



► Fasten the mover [1] with 20 screws [2]

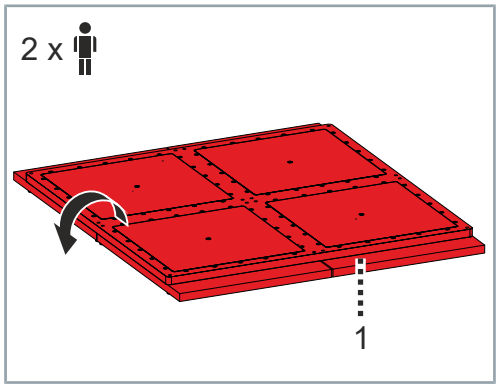
► Observe tightening torques:

Component	Tightening torque [Nm]
Screws, M3 x 6	1.5

► Attach other movers in the same way

⚠ WARNING

Two persons are required for turning and carrying the frame
Two persons are required for turning and carrying the frame with the attached assembly aids. The underside of the movers is permanently magnetic and can attract other movers, mover couplings or magnetic parts. Use the assembly aids to turn and carry the mover coupling.
Failure to do so may result in serious injury to fingers from crushing or to eyes from splinters.



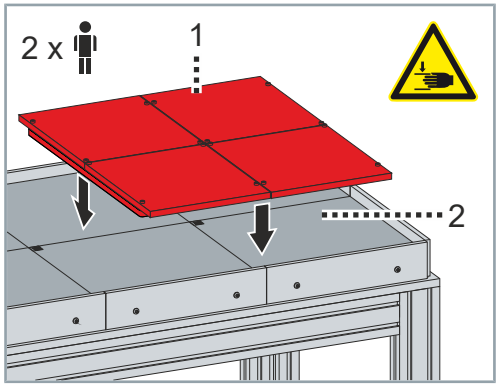
- ► Turn the frame [1] with attached movers [2] by 180°
- ► Carry frame to the system using the assembly aids

⚠ WARNING

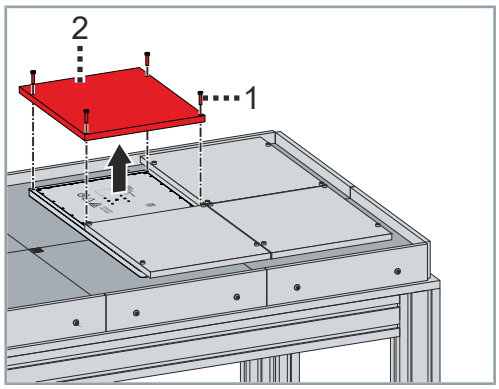
Only hold the mover coupling at the side of the assembly aid
If you place a mover coupling on the stator surface, only hold the mover coupling at the side of the assembly aids.
Failure to do so may result in serious injury to fingers from crushing or to eyes from splinters.

NOTICE

Note the alignment of the mover coupling
When placing the mover coupling, make sure that the XY axes of the movers correspond to the XY axes of the tiles. Further information can be found in chapter "Mover alignment", [Page 87].



- ► Place the mover coupling [1] straight on the stator surface [2]
- ► Make sure that your fingers are not underneath the mover coupling [1] and that the mover coupling has sufficient distance to other mover couplings



- ► Remove the four screws [1]
- ► Remove the assembly aid [2] from the frame
- ► Remove all other assembly aids in the same way

11 Commissioning and operation

Exemplary commissioning
The procedure for commissioning is described as an example.

11.1 Requirements

- Components show no signs of damage
- The undersides of the movers are free from dirt and foreign objects
- Ferromagnetic objects in the vicinity of the movers are removed
- The surface of the tiles is free of dirt and foreign objects
- The surface of the tiles is correctly and evenly aligned
- The surface of the tiles is even
- Screw connections of the components are correctly tightened
- Mechanical protective equipment is correctly installed
- Electrical protective equipment is correctly installed
- Wiring and cables are installed correctly
- Machine bed is correctly grounded
- Tools and attachments are functional
- Protection against moving and live parts is correctly installed
- Current version of TwinCAT XAE, TF5890 and TF5400 software is installed on an IPC
- Control voltage is switched on
- Supply voltage is switched on

Further information on the requirements can be found in chapters Mechanical Installation – Part 1: Tiles, Mechanical Installation – Part 2: Mover and Electrical installation.

11.2 Commissioning

- Creating a TwinCAT project
- Choose Target System
- Add modules to the I/O devices via the Scan function
- Create XPlanar configuration using the *XPlanar Configurator*
- Activating TwinCAT

Further information can be found in the manual *TF5400 | TwinCAT 3 Advanced Motion Pack*:

Direct link to the documentation TF5400 | TwinCAT 3 Advanced Motion Pack

11.3 During operation

⚠ WARNING

Uncontrolled movers can cause serious injuries
After removing the controller enable or switching off the supply voltage, movers can move in an uncontrolled manner and cause serious injuries to fingers due to crushing and to eyes due to splinters.

- Establish a safe state of the system.
- Make sure that all movers have come to a complete standstill.

- Observe information for environment and operation
- Observe maintenance intervals
- Switch off the system if
  - unusual noise occurs
  - smoke develops
  - an atypical temperature development occurs

12 Maintenance work on the mover

12.1 Replace bumper

Depending on the configuration, the bumpers of the mover are equipped with an ID function. Bumpers without ID function can be exchanged for ID bumpers at any time.

Installation example
In this chapter, the bumper replacement is described using an *APM4330-0000* mover as an example.
The *APM9000-0000-4330* bumper is exchanged for an *APM9001-0000-4330* ID bumper.

⚠ WARNING

Keep the workplace free of metallic and magnetic materials
Make sure that your workplace is free of metallic and magnetic materials before positioning the mover. Only remove the mover from the transport securing device if absolutely necessary for assembly work. The transport securing device weakens the magnetic field and protects electrical components from magnetic influences.
If movers are attracted by metallic and magnetic parts, serious injuries to the fingers from crushing and in the eyes from splinters can result.

⚠ WARNING

Movers contain strong permanent magnets
The permanent magnets contained are arranged in so-called Hallbach arrays, which ensure that the magnetic field on the underside of the mover is significantly stronger than on the top of the mover. The field of the permanent magnets is present even when the power supply is switched off.
If the movers attract each other and collide, serious injuries to the fingers from crushing and in the eyes from splinters can result.

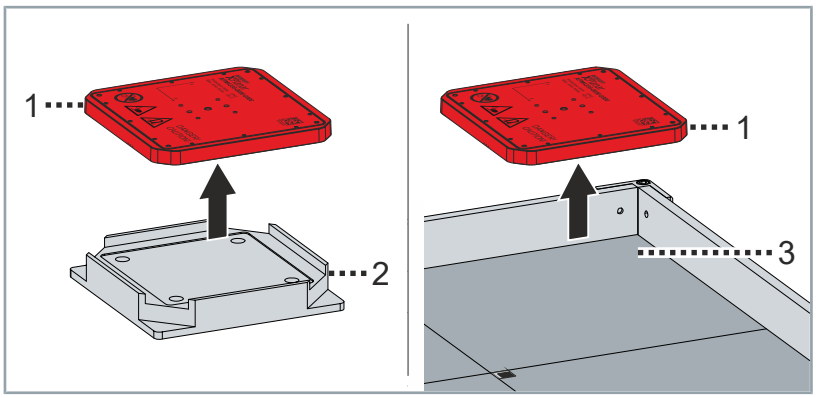
⚠ WARNING

Transport the mover with the safety pictogram facing upwards
Always transport the movers with the safety pictograms facing upwards. The underside of the mover must be in the transport securing device. The transport securing device weakens the magnetic field of the mover.
Incorrectly inserted movers can attract magnetic objects or other movers, resulting in serious injuries to fingers from crushing and to eyes from splinters.

⚠ WARNING

Do not use magnetic tools
The included permanent magnets can attract used tools. Use non-magnetic tools to remove and install all bumpers.
If magnetic tools are attracted, serious injuries to the fingers from crushing and in the eyes from splinters can result.

12.1.1 Disassembly

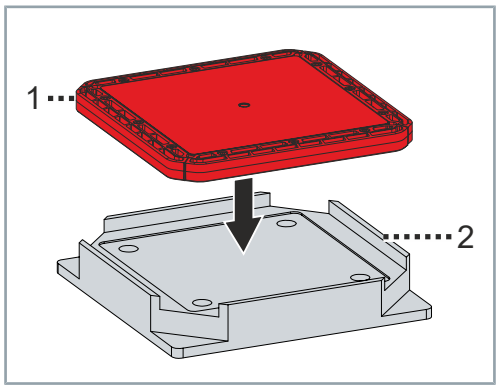


► Remove the mover [1] from the transport securing device [2] and rotate it by 180°

OR

► Remove the mover [1] from the stator surface [3] and rotate it by 180°

Note the orientation
Before placing the mover in the transport securing device, note the orientation of the mover. For correct mounting of the ID bumper, the ID bumper and the mover must have the same orientation.



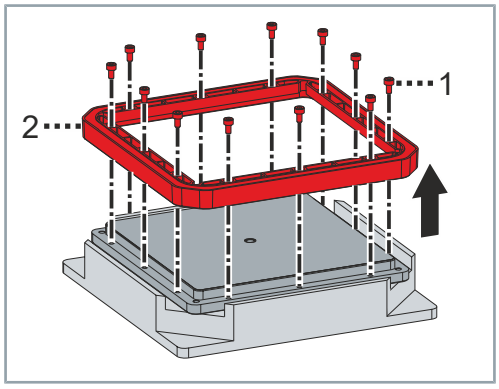
► Place the mover [1] in the transport securing device [2] with the underside facing upwards

NOTICE

Permanent magnets can attract tools
The permanent magnets on the underside of the movers are now exposed and can attract tools used to remove the bumpers.

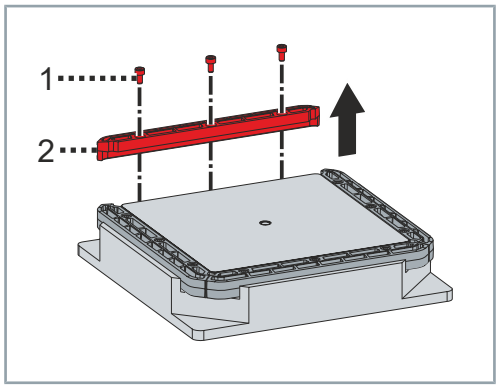
Different bumper design possible
Depending on the production date of your mover, the bumper may consist of one or four parts. However, the number of screws and mounting points are identical.

Bumper 1-piece



► Remove screws [1]
► Remove a bumper [2]

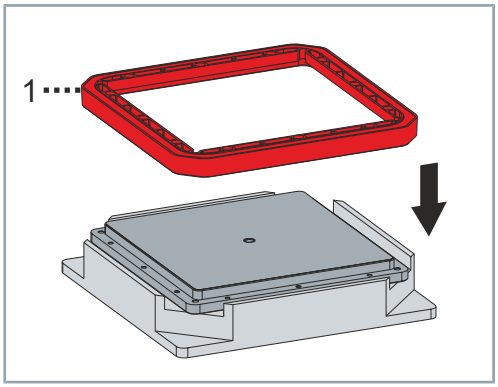
Bumper 4-piece



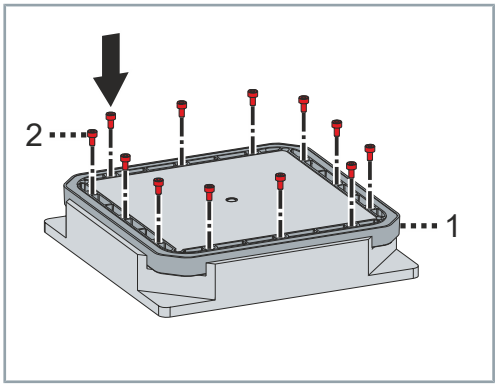
► Remove screws [1]
► Remove a bumper [2]
► Remove other bumpers in the same way

12.1.2 Mounting

Make sure that you align the ID bumper correctly. The labels on the mover and on the ID bumper must have the same orientation. Incorrectly aligned ID bumpers can cause problems when controlling the movers.



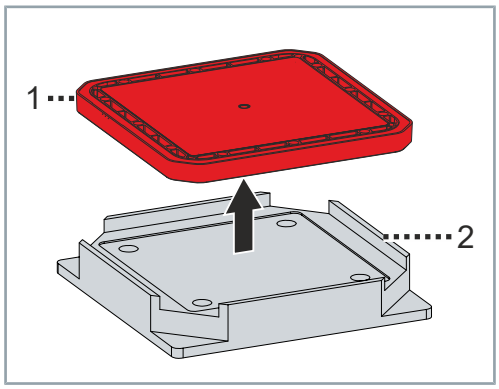
► Insert aligned ID bumper [1]



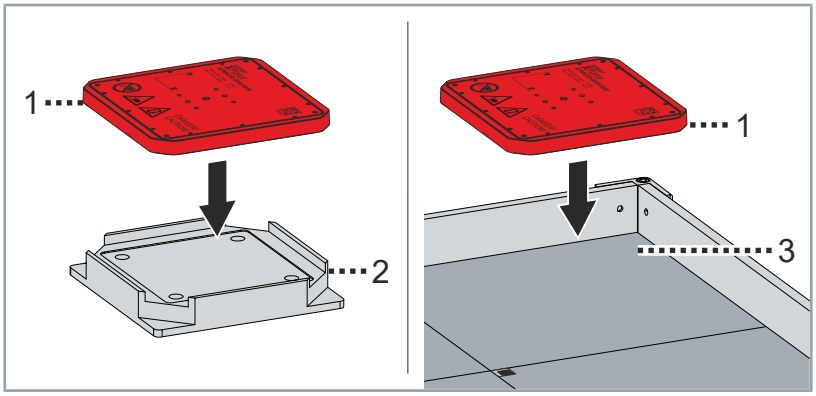
► Fasten ID bumper [1] with screws [2]

► Observe tightening torques:

Component	Tightening torque [Nm]
Screw M3 x 6	1.5



► Remove the mover [1] from the transport securing device [2] and rotate it by 180°



► Place the mover [1] in the transport securing device [2] with the upper side facing upwards

OR

► Place the mover [1] straight on the stator surface [3] with the upper side facing upwards

► Make sure that the mover is correctly aligned

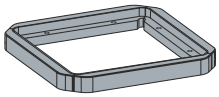
► Make sure that your fingers are not underneath the mover [1] and that the mover is at a sufficient distance from other movers

13 Accessories

13.1 ID bumper

The XPlanar bumpers with ID function enables unique identification of the mover as well as reading out the individual serial number of the mover. The ID bumper is available in different versions:

1 x



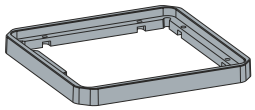
8 x

APM9001-0000-4220
This ID bumper is available for the *APM4220-0000* mover.

Scope of supply:

- ID bumper
- 8 x screws M3 x 6

1 x



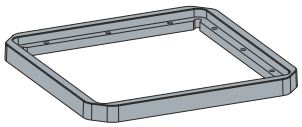
8 x

APM9001-0000-4221
This ID bumper is available for the *APM4221-0000* mover.

Scope of supply:

- ID bumper
- 8 x screws M3 x 6

1 x



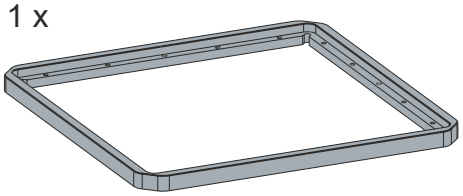
12 x

APM9001-0000-4330
This ID bumper is available for the *APM4330-0000* mover.

Scope of supply:

- ID bumper
- 12 x screws M3 x 6

1 x



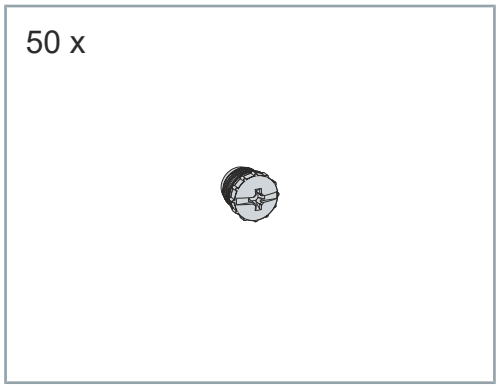
20 x

APM9001-0000-4550
This ID bumper is available for the *APM4550-0000* mover.

Scope of supply:

- ID bumper
- 20 x screws M3 x 6

13.2 Cover plugs and protective caps

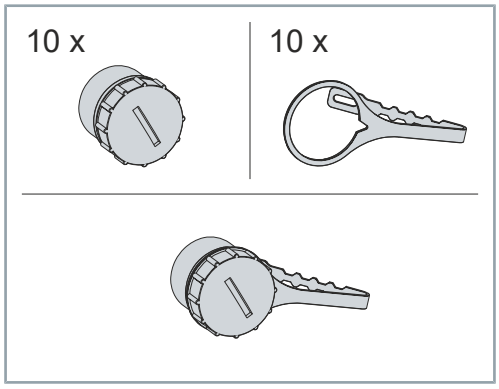


ZS5000-0020

The protective caps for M12 sockets are available for sealing unused connections on the tiles and star distributors.

Scope of supply:

- 50 x protective cap for M12 socket, IP65/67



ZS7200-B001

The B17 protective caps for couplings and flanges are available for sealing unused connections on the tiles.

Scope of supply:

- 10 x protective cap B17 for couplings and flanges, including loss prevention device, IP67

14 Decommissioning

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

Further information can be found in chapter Documentation notes.

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.

14.1 Disassembly

⚠ WARNING

Wear safety goggles and gloves
The movers can have strong magnetic attraction to each other or other metallic objects. Splinters can form if magnets collide.
Failure to do so may result in serious injury to fingers and eyes.

⚠ WARNING

Remove each mover individually from the box
If you take two movers out of the box and the distance between the movers is too small, the movers can attract each other.
If the movers attract each other and collide, serious injuries to the fingers from crushing and in the eyes from splinters can result.

⚠ WARNING

Do not reach under the mover with your fingers
When carrying a mover or placing it on the system, do not reach under the mover with your fingers.
Failure to do so can result in severe crushing and injury to fingers.

Do not remove components from the products
Only Beckhoff Automation GmbH & Co. KG is permitted to remove components.
Contact Beckhoff Service for further information.

Removing the XPlanar from the machine

- Remove cables and electrical connections
- Loosen the fastening screws of the modules
- Remove the modules from the machine one after the other
- Transport XPlanar components to the workplace or store them

14.2 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 device are considered as waste electrical and electronic equipment for disposal. Observe the national regulations for the disposal of old electrical and electronic equipment.

Trademark statements

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