



TB20 – 2x / 4x Counter Economy 24 V, 1 KHz, 32 bit Manual

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Notes

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1 General

This operating manual applies only to devices, assemblies, software, and services of Helmholtz GmbH & Co. KG.

1.1 Target audience for this manual

This description is only intended for trained personnel qualified in control and automation engineering who are familiar with the applicable national standards. For installation, commissioning, and operation of the components, compliance with the instructions and explanations in this operating manual is essential.



Configuration, execution, and operating errors can interfere with the proper operation of the TB20 devices and result in personal injury, as well as material or environmental damage. Only suitably qualified personnel may operate the TB20 devices!

Qualified personnel must ensure that the application and use of the products described meet all the safety requirements, including all relevant laws, regulations, provisions, and standards.

1.2 Safety instructions

The safety instructions must be observed in order to prevent harm or damage to persons, other living creatures, material goods, and the environment. The safety notes indicate possible hazards and provide information about how hazardous situations can be prevented.

1.3 Note symbols and signal words in the manual



HAZARD

If the hazard warning is ignored, there is an imminent danger to life and health of people from electrical voltage.



WARNING

If the hazard warning is ignored, there is a probable danger to life and health of people from electrical voltage.



CAUTION

If the hazard warning is ignored, people can be injured or harmed.



ATTENTION

Draws attention to sources of error that can damage equipment or the environment.



NOTE

Gives an indication for better understanding or preventing errors.

1.4 Intended use

The TB20 I/O system is an open, modular, and distributed peripheral system designed to be mounted on a 35 mm DIN rail.

Communication with a higher-level control system is via a bus system / network and a TB20 bus coupler. Up to 64 modules from the TB20 range can be set up on a bus coupler. The bus couplers support hot plug for replacing modules during ongoing operation.

All components are supplied with a factory hardware and software configuration. The user must carry out the hardware and software configuration for the conditions of use. Modifications to hardware or software configurations which extend beyond the documented options are not permitted and nullify the liability of Helmholz GmbH & Co. KG.

The TB20 devices should not be used as the only means for preventing hazardous situations on machinery and equipment.

Successful and safe operation of the TB20 devices requires proper transport, storage, installation, assembly, installation, commissioning, operation, and maintenance.

The ambient conditions provided in the technical specifications must be adhered to.

The TB20 systems have protection rating of IP20 and must have a control box/cabinet fitted to protect against environmental influences in an electrical operating room. To prevent unauthorized access, the doors of control boxes/cabinets must be closed and possibly locked during operation.



HAZARD

TB20 devices can be equipped with modules that can carry dangerously high voltages. The voltages connected to the TB20 devices can result in hazards during work on the TB20 devices.

1.5 Improper use



WARNING

The consequences of improper use may include personal injury to the user or third parties, as well as property damage to the control system, the product, or the environment. Use TB20 devices only as intended!

1.6 Installation

1.6.1 Access restriction

The modules are open operating equipment and must only be installed in electrical equipment rooms, cabinets, or housings.

Access to the electrical equipment rooms, cabinets, or housings must only be possible using a tool or key, and access should only be granted to trained or authorized personnel.

1.6.2 Electrical installation

Observe the regional safety regulations.



TB20 devices can be equipped with modules that can carry dangerously high voltages. The voltages connected to the TB20 devices can result in hazards during work on the TB20 devices.

1.6.3 Protection against electrostatic discharges

To prevent damage through electrostatic discharges, the following safety measures are to be followed during assembly and service work:

- Never place components and modules directly on plastic items (such as polystyrene, PE film) or in their vicinity.
- Before starting work, touch the grounded housing to discharge static electricity.
- Only work with discharged tools.
- Do not touch components and assemblies on contacts.

1.6.4 Overcurrent protection

To protect the TB20 and the supply line, a slow-blowing 8 A line protection fuse is required.

1.6.5 EMC protection

To ensure electromagnetic compatibility (EMC) in your control cabinets in electrically harsh environments, the known rules of EMC-compliant configuration are to be observed in the design and construction.

1.6.6 Operation

Operate the TB20 only in flawless condition. The permissible operating conditions and performance limits must be adhered to. Retrofits, changes, or modifications to the device are strictly forbidden.

The TB20 is a piece of operating equipment intended for use in industrial plants. During operation, the TB20 can carry dangerous voltages. During operation, all covers on the unit and the installation must be closed in order to ensure protection against contact.

1.6.7 Liability

The contents of this manual are subject to technical changes resulting from the continuous development of products of Helmholz GmbH & Co. KG. In the event that this manual contains technical or clerical errors, we reserve the right to make changes at any time without notice. No claims for modification of delivered products can be asserted based on the information, illustrations, and descriptions in this documentation. Beyond the instructions contained in the operating manual, the applicable national and international standards and regulations must also be observed in any case.

1.6.8 Disclaimer of liability

Helmholz GmbH & Co. KG is not liable for damages if these were caused by use or application of products that was improper or not as intended.

Helmholz GmbH & Co. KG assumes no liability for any printing errors or other inaccuracies that may appear in the operating manual, unless there are serious errors of which Helmholz GmbH & Co. KG was already demonstrably aware.

Beyond the instructions contained in the operating manual, the applicable national and international standards and regulations must also be observed in any case.

Helmholz GmbH & Co. KG is not liable for damage caused by software that is running on the user's equipment which compromises, damages, or infects additional equipment or processes through the remote maintenance connection, and which triggers or permits unwanted data transfer.

1.6.9 Warranty

Report any defects to the manufacturer immediately after discovery of the defect.

The warranty is not valid in case of:

- Failure to observe these operating instructions
- Use of the device that is not as intended
- Improper work on and with the device
- Operating errors
- Unauthorized modifications to the device

The agreements met upon contract conclusion under "General Terms and Conditions of Helmholz GmbH & Co. KG" apply.

2 System overview

2.1 General

The TB20 I/O system is an open, modular, and distributed peripheral system designed to be mounted on a 35 mm DIN rail.

It is made up of the following components:

- Bus couplers
- Peripheral modules
- Power and isolation modules
- Power modules

By using these components, you can build a custom automation system that is tailored to your specific needs and that can have up to 64 modules connected in series to a bus coupler. All components have a protection rating of IP20.

2.2 The components of the TB20 I/O system

2.2.1 Bus coupler

The system's bus coupler includes a bus interface and a power module. The bus interface is responsible for establishing a connection to the higher-level bus system and is used to exchange I/O signals with the automation system's CPU.

The power module is responsible for powering the coupler's electronics and all connected peripheral modules.

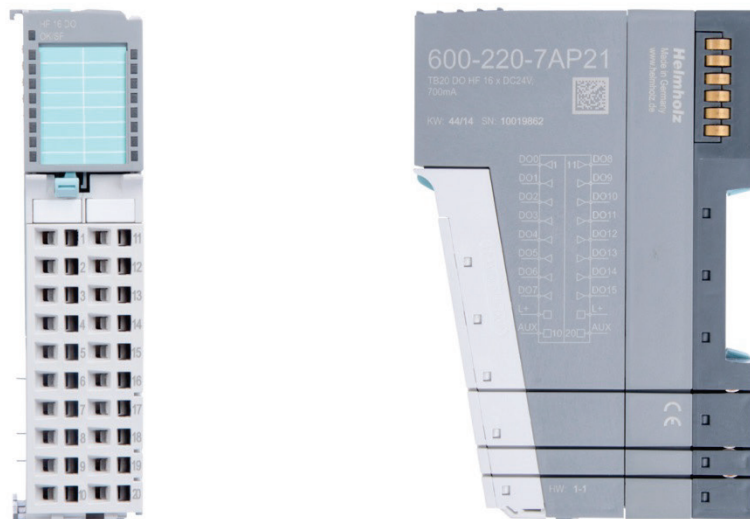
2.2.2 Peripheral modules

The system's peripheral modules are electronic components to which peripheral devices such as sensors and actuators can be connected. A variety of peripheral modules with different tasks and functions are available.

Example: Peripheral module with 10-pin front connector



Example: Peripheral module with 20-pin front connector



2.2.3 Power and isolation module

The system's bus coupler provides the supply voltage for the communications bus (5 V, top) and for external signals (24 V, bottom). These voltages are passed from module to module through the base modules.

Power and isolation modules make it possible to segment the power supply for external signals into individual power supply sections that are powered separately. The communications bus signals and supply voltage for the communications bus are passed through, in contrast to the way they are handled in power modules (see section 2.2.4).



NOTE

Power and insulation modules have a lighter body color.

2.2.4 Power module

The system's bus coupler provides the supply voltage for the communications bus (5 V, top) and for external signals (24 V, bottom). These voltages are passed from module to module through the base modules.

Power modules make it possible to segment the power supply for both external signals and the communication bus into individual power supply sections that are powered separately.

Power modules deliver all necessary power to the peripheral modules connected after them and, if applicable, all the way to the next power module or power and isolation module. A power module is required whenever the power supplied by the coupler alone is not sufficient, e.g., when there are a large number of modules with high power requirements. The "TB20 ToolBox" configuration program can be used to determine whether power modules are needed, as well as how many of them will be needed.

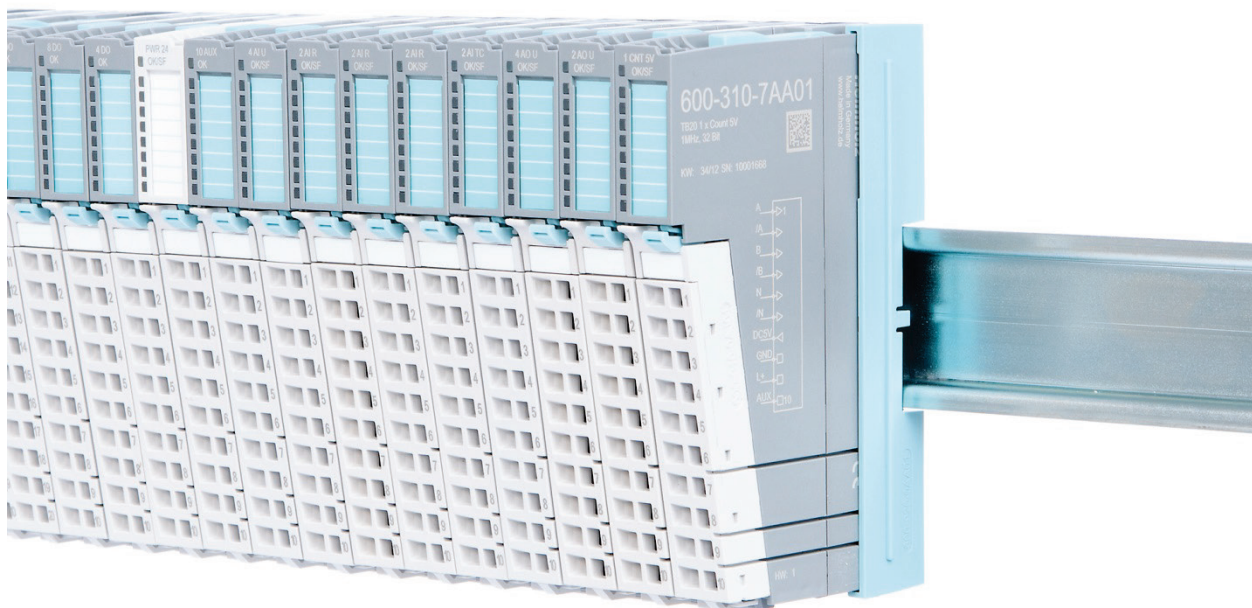


NOTE

Power modules have a lighter body color.

2.2.5 Final cover

The final cover protects the contacts on the last base module from accidental contact by covering its outer right-hand side.



2.2.6 Components in a module

Each module consists of three parts:

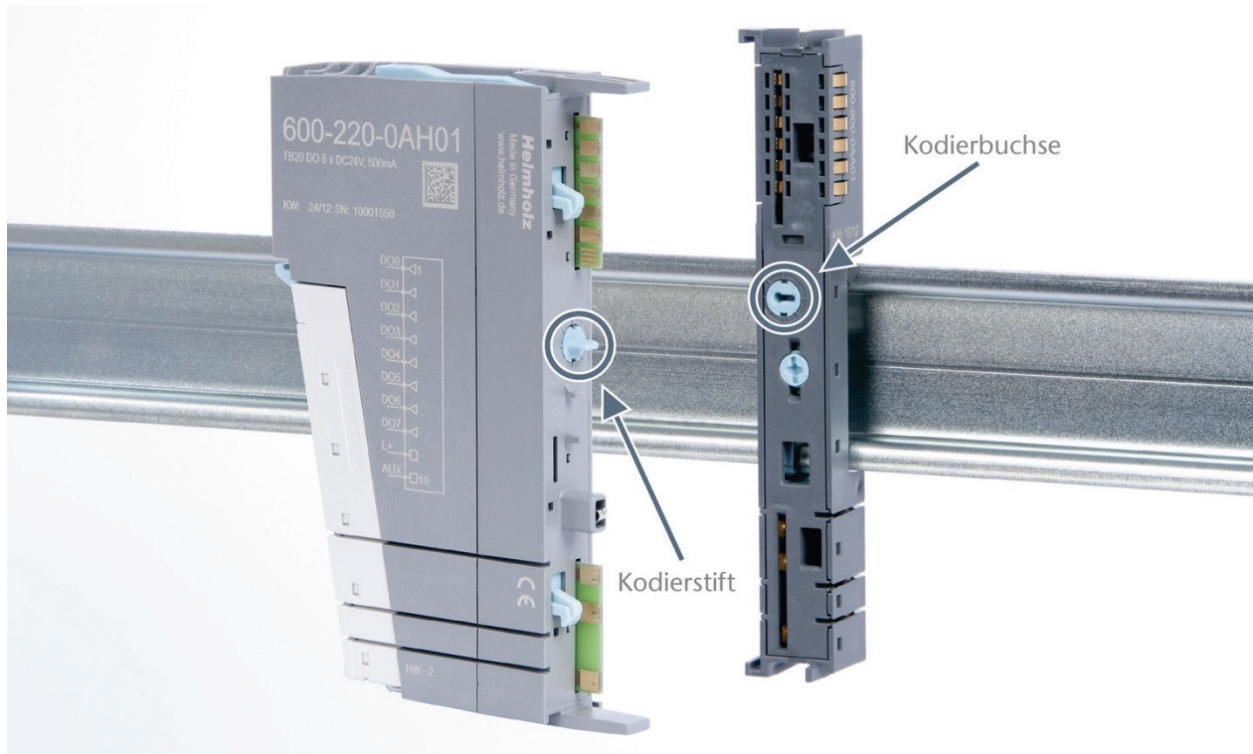
- A base module
- An electronic module
- A front connector



2.2.7 Module Coding

Electronic modules and base modules feature coding elements meant to prevent the wrong spare electronic modules from being plugged in during maintenance and repairs.

These coding elements consist of a coding plug on the electronic module and a coding socket on the base module (see following figure).



The coding plug and coding socket can each be in one of eight different positions. Each of these eight positions is factory-assigned to a specific type of module (Digital In, Digital Out, Analog In, Analog Out, Power) from the TB20 system. It will only be possible to plug an electronic module into a base module if the position of the coding plug and the position of the coding socket match. If the positions differ, the electronic module is mechanically blocked.

3 Installation and removal



TB20 modules can carry lethal voltage.

Before starting any work on TB20 system components, make sure to de-energize all components and the cables supplying them with power! During work when the system is live, there is the risk of fatal electrocution!



ATTENTION

Installation must be carried out according to VDE 0100/IEC 364 or in accordance with applicable national standards. The TB20 IO system has protection rating IP20. If a higher protection rating is required, the system must be installed in a housing or control cabinet. In order to ensure safe operation, the ambient temperature must not exceed 60 °C.

3.1 Installation position

The TB20 I/O system can be installed in any position.

In order to achieve optimum ventilation and be able to use the system at the specified maximum ambient temperature, it will, however, be necessary to use a horizontal installation layout.

3.2 Minimum clearance

It is recommended to adhere to the minimum clearances specified when installing the coupler and modules. Adhering to these minimum clearances will ensure that:

- The modules can be installed and removed without having to remove any other system components
- There will be enough space to make connections to all existing terminals and contacts using standard accessories
- There will be enough space for cable management systems (if needed)

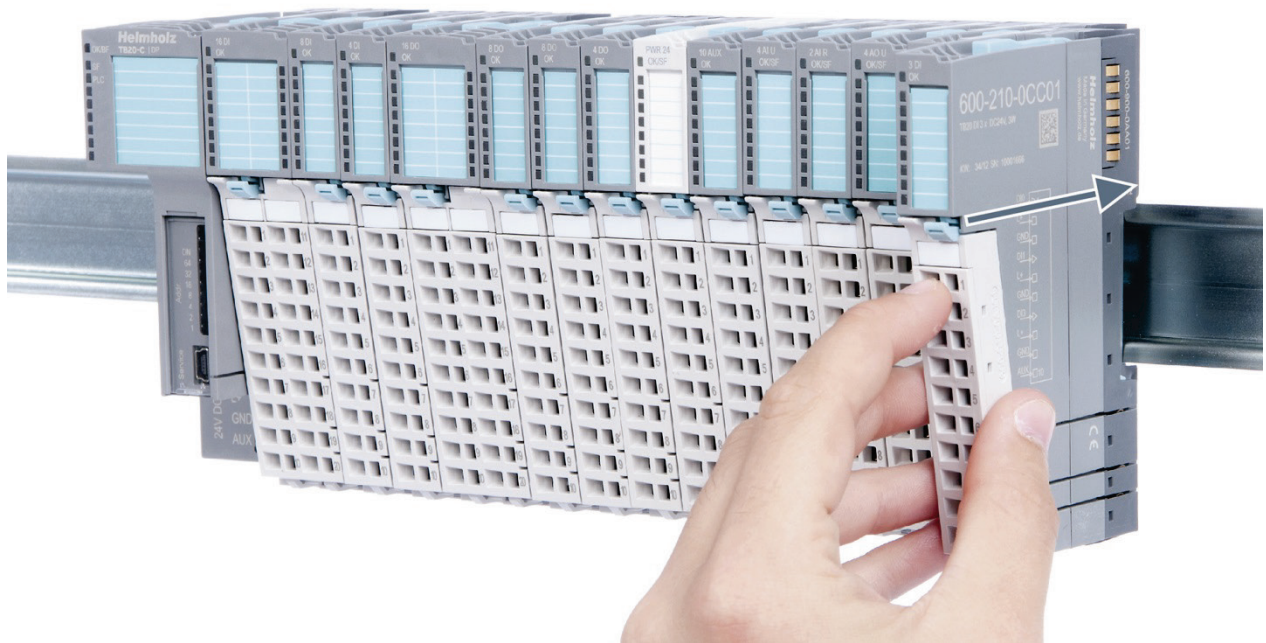
The minimum clearances for mounting TB20 components are: 30 mm on the top and on bottom and 10 mm on each side.

3.3 Installing and removing peripheral modules

3.3.1 Installation

Installing an assembled peripheral module

Place the assembled module on the DIN rail by moving it straight towards the rail. Make sure that the module engages the upper and lower guide elements of the previous module. Then push the upper part of the module towards the DIN rail until the rail fastener inside fastens into place with a soft click.



Installing the individual parts of a peripheral module one after the other:

Place the base module on the DIN rail from below in an inclined position. Then push the upper part of the base module towards the rail until the module is parallel to the rail and the rail fastener on the inside snaps into place with a soft click.

Place an electronic module with matching coding (see the “Module coding” section on page 15) on the base module in a straight line and then gently push it onto the base module until both modules are fully resting on top of one another and the module fastener snaps into place with a soft click.

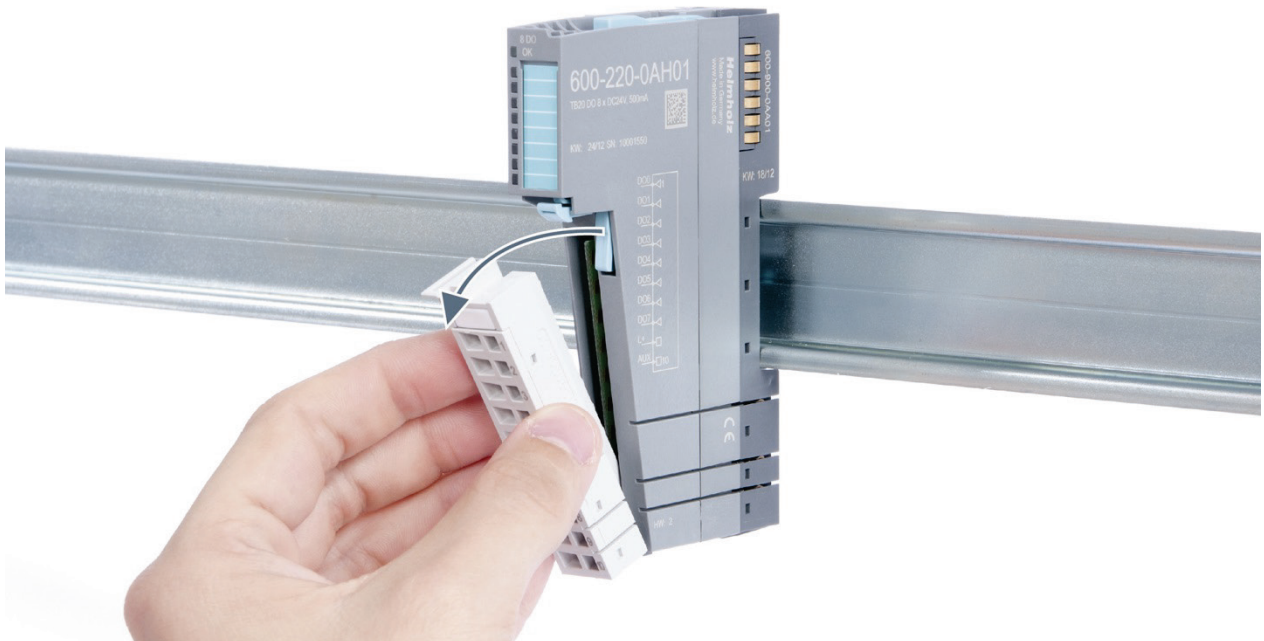
Finally, place the front connector on the electronic module from below in an inclined position and then gently push it onto the electronic module until the front connector fastener snaps into place with a soft click.

3.3.2 Removal

To remove a peripheral module, follow the four steps below:

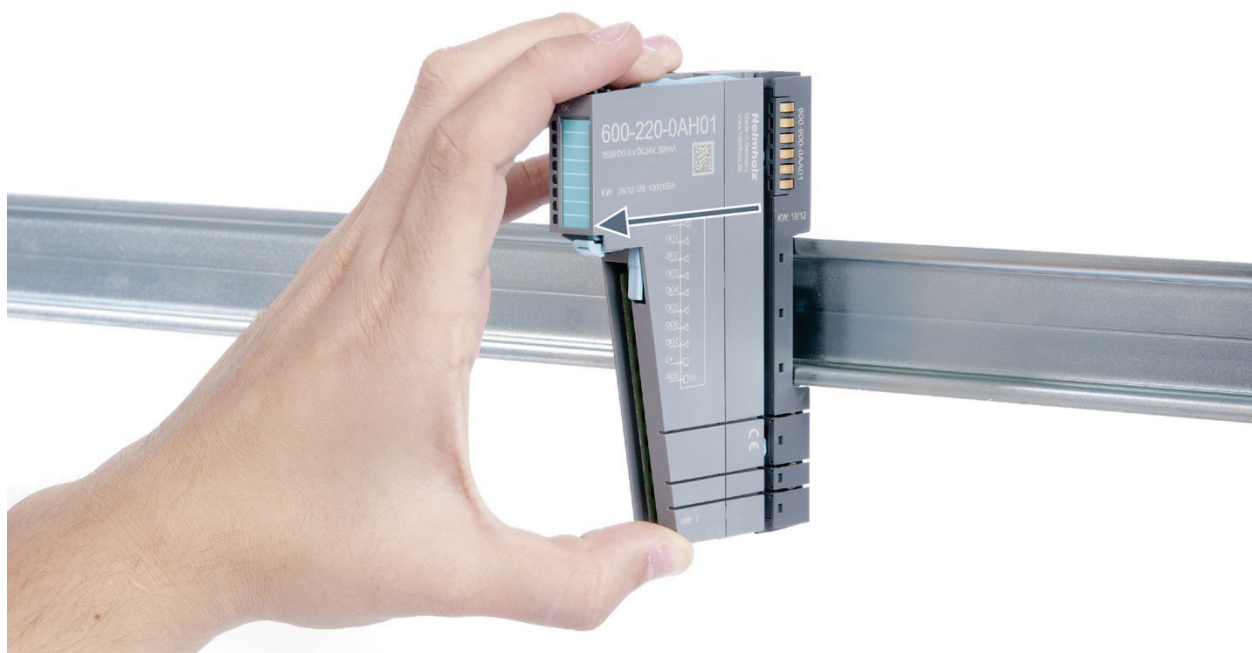
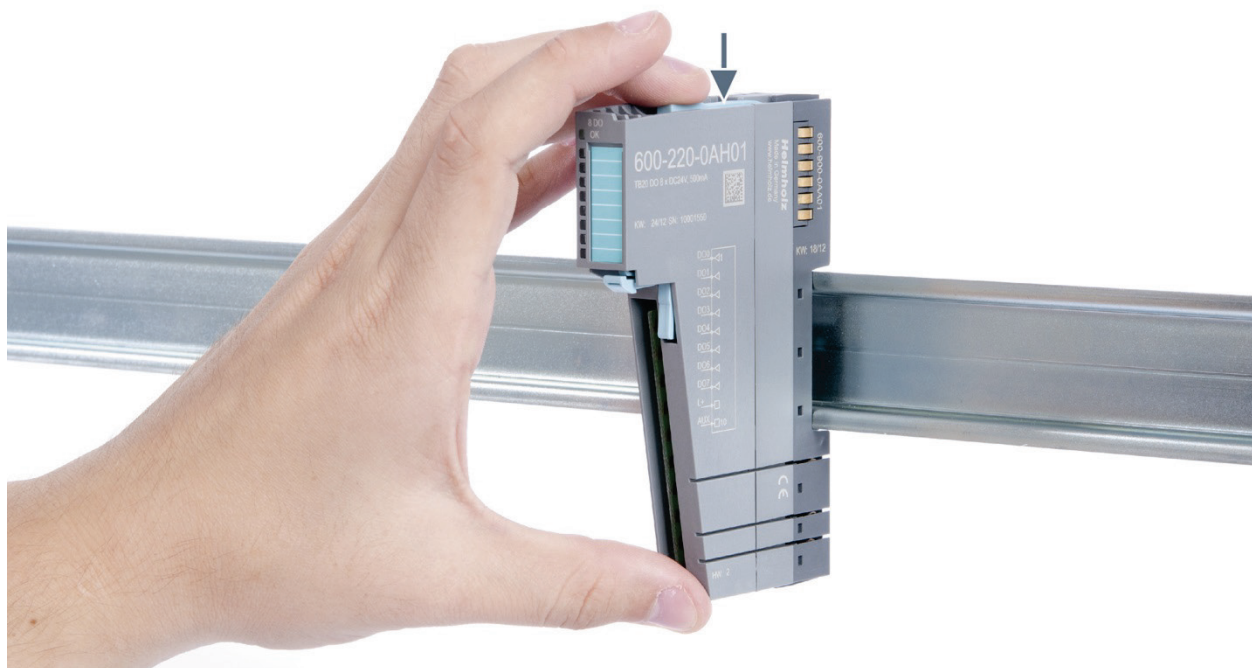
Step 1: Remove the front connector

To remove the front connector, push the tab above the front connector upwards (see the picture below). This will push out the front connector, after which you can pull it out.



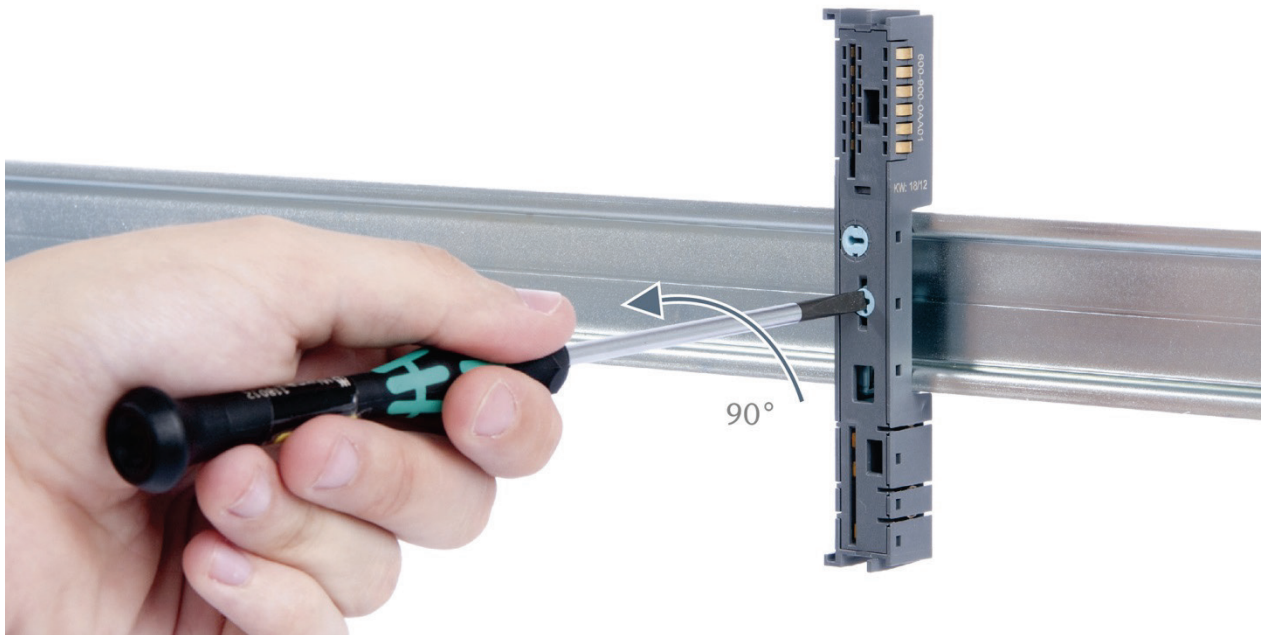
Step 2: Remove the electronic module

To do so, use your middle finger to push on the lever from above and then use your thumb and index finger to pull out the electronic module while holding the lever down (see the picture below).



Step 3: Release the base module

Use a screwdriver to release the base module. Turn the screwdriver 90° counterclockwise to release.



Step 4: Remove the base module

Remove the base module by pulling it towards you.

3.4 Replacing an electronic module

The procedure for replacing the electronic module on a peripheral module consists of four steps.

If you need to replace the electronic module while the system is running, make sure to take into account the general technical specifications for the bus coupler being used.



TB20 modules can carry lethal voltage.

Before starting any work on TB20 system components, make sure to de-energize all components and the cables supplying them with power! During work when the system is live, there is the risk of fatal electrocution!

Note the wiring diagram of the system and switch off dangerous voltages before starting work!

Step 1: Remove the front connector

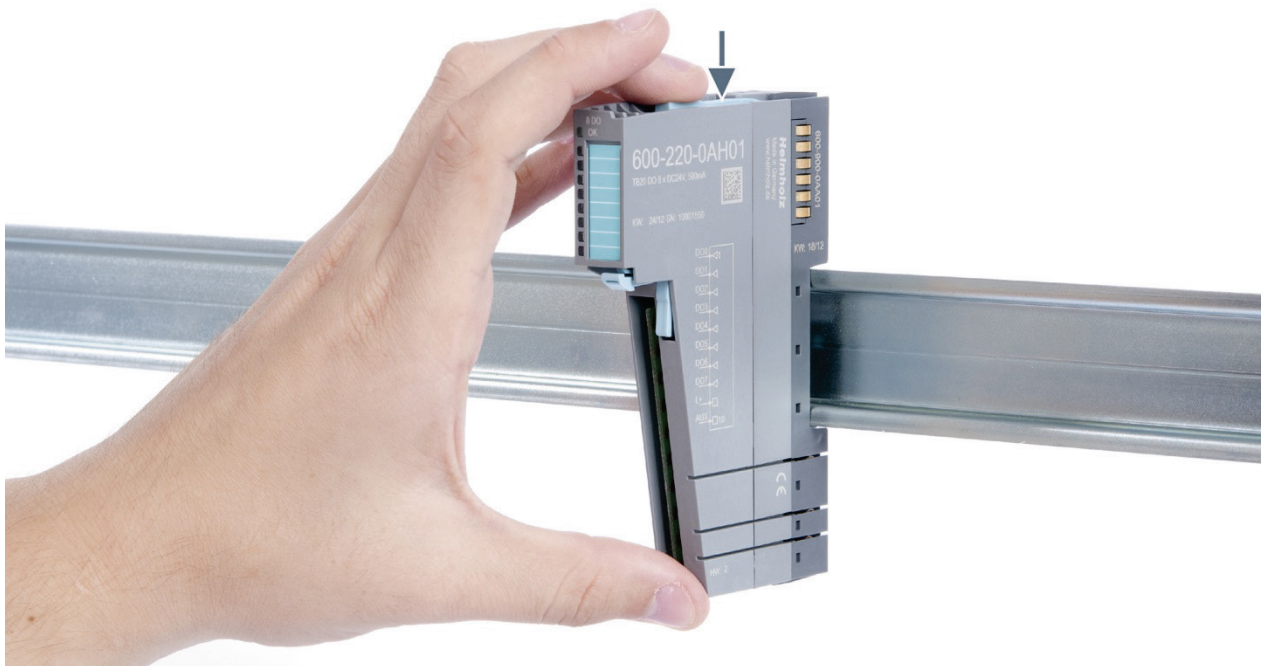
To remove the front connector, push the tab above the front connector upwards (see the picture below). This will push out the front connector, after which you can pull it out.

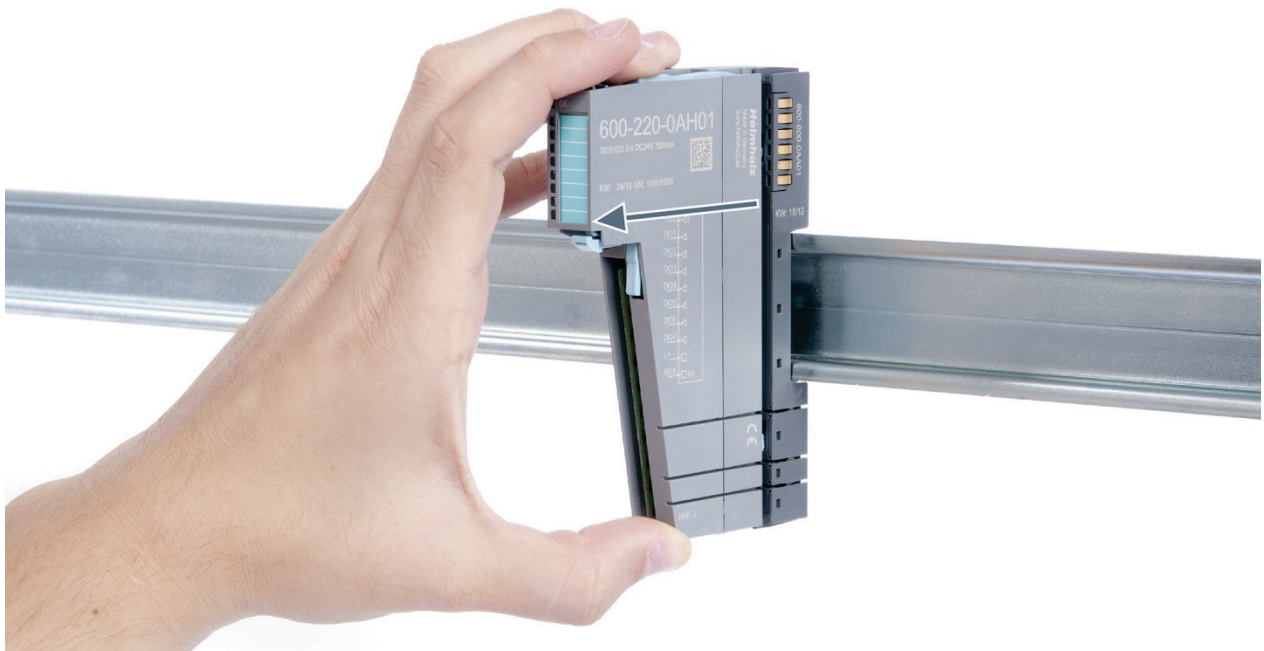




Step 2: Remove the electronic module

To remove the electronic module, use your middle finger to push on the lever from above and then use your thumb and index finger to pull out the electronic module while holding the lever down (see the picture below).





Step 3: Plug in a new electronic module



ATTENTION

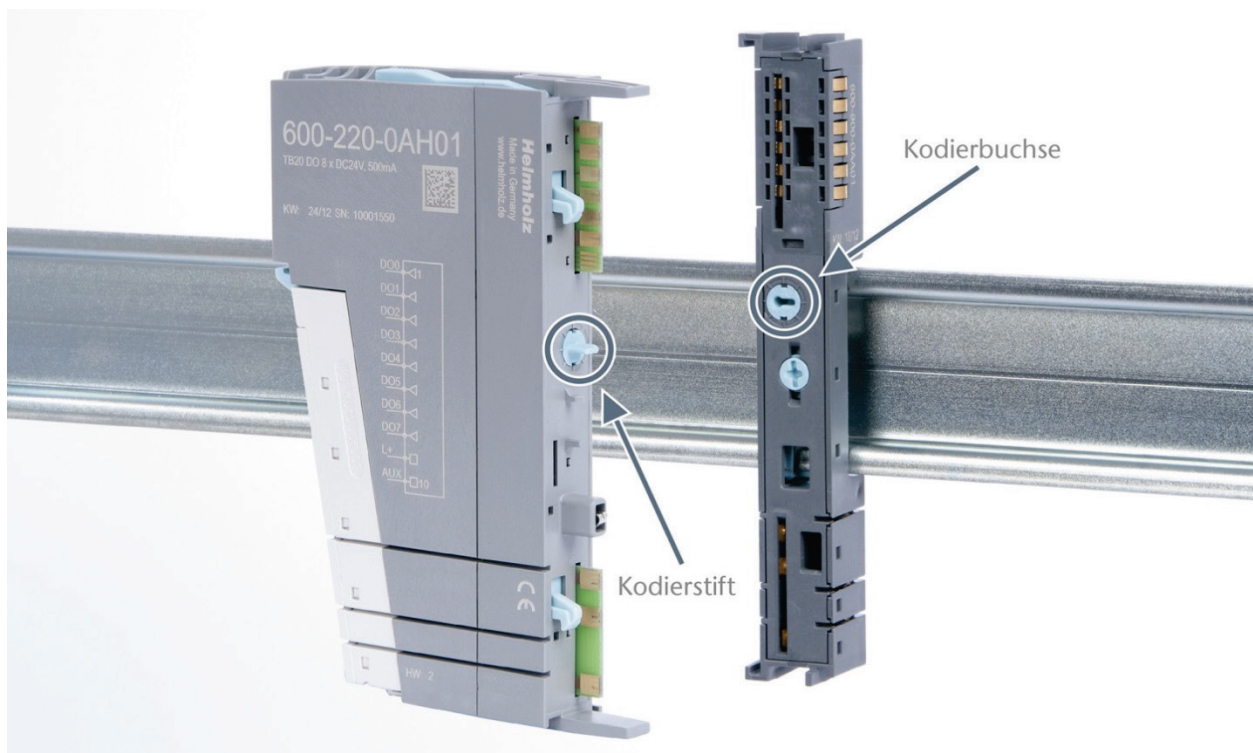
The electronic module must be snapped into place on the base module with a single continuous movement. If the electronic module is not snapped into place firmly and straight on the base module, bus malfunctions may occur.



ATTENTION

If the electronic module cannot be plugged into the base module, check whether the coding elements on the electronic module and base module (see figure below) match. If the coding elements on the electronic module do not match those on the base module, you may be attempting to plug in the wrong electronic module.

For more information on coding elements, please consult section 2.2.7.

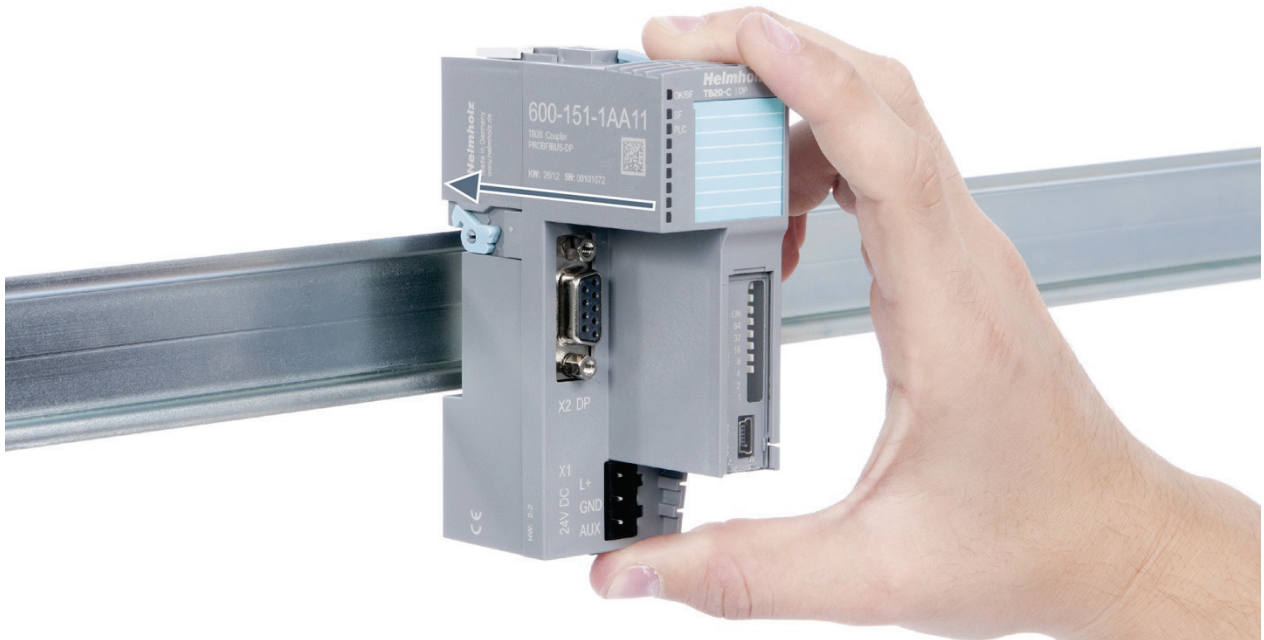


Step 4: Plug in the front connector

3.5 Installing and removing the coupler

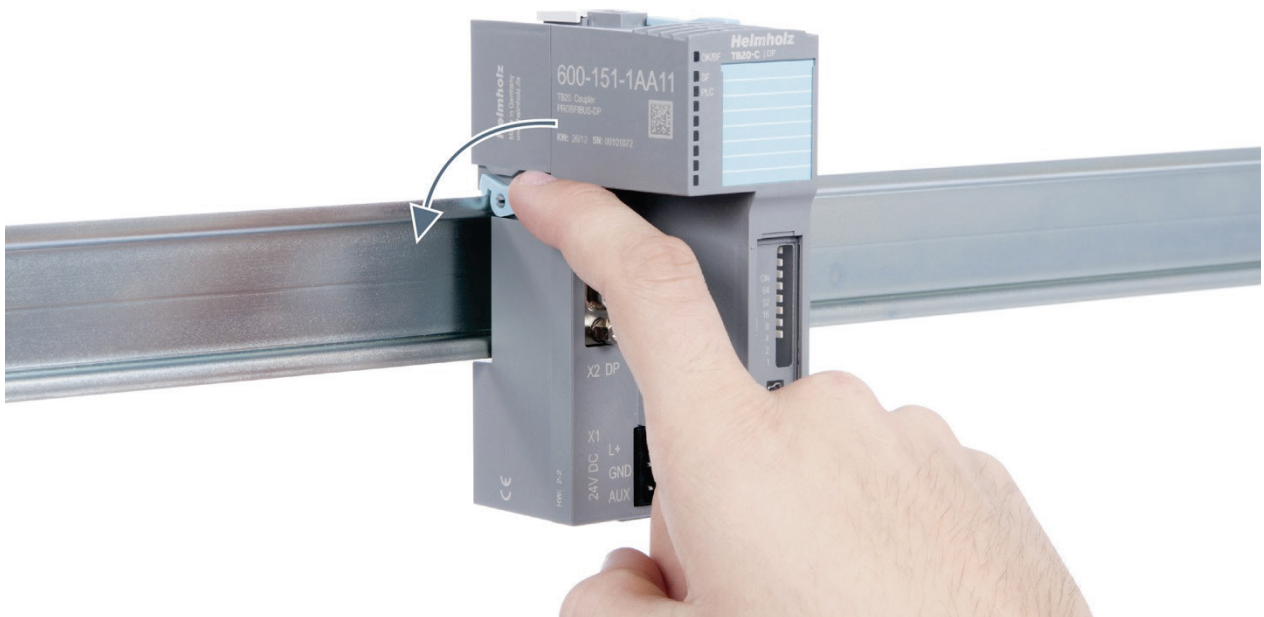
3.5.1 Installation

Place the coupler, together with the attached base module, on the DIN rail by moving it straight towards the rail. Then push the coupler towards the rail until the base module's rail fastener snaps into place with a soft click.



Step 2: Secure the coupler on the DIN rail

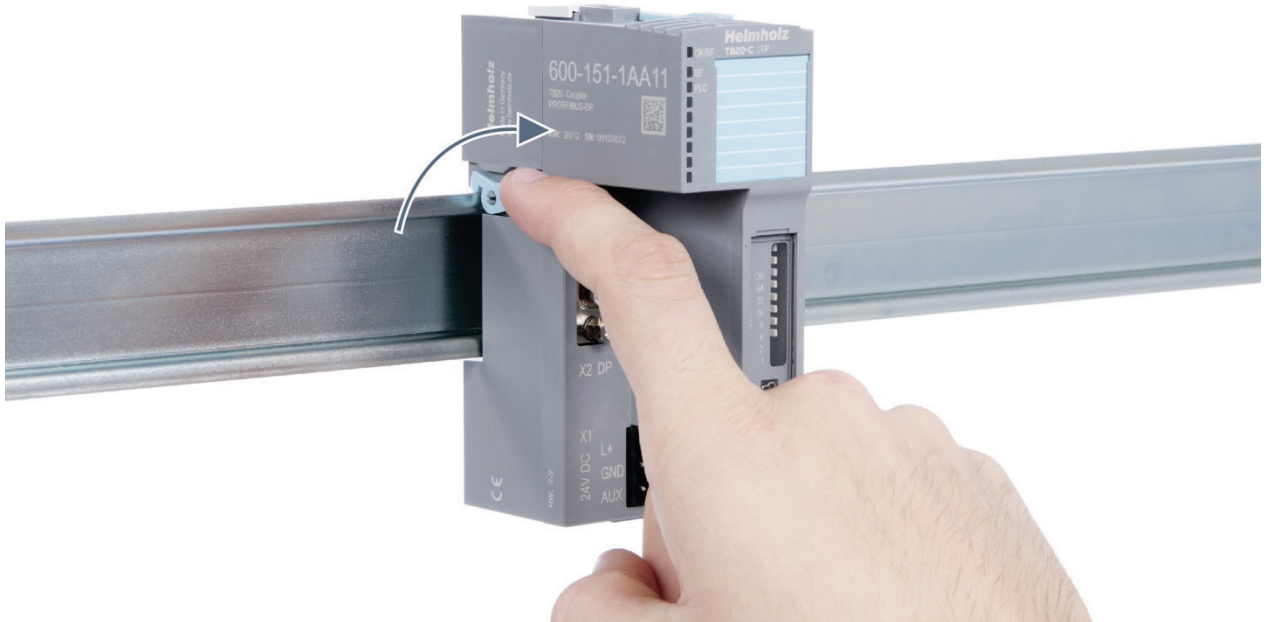
Use the locking lever on the left side of the coupler to lock the coupler into position on the DIN rail.



3.5.2 Removal

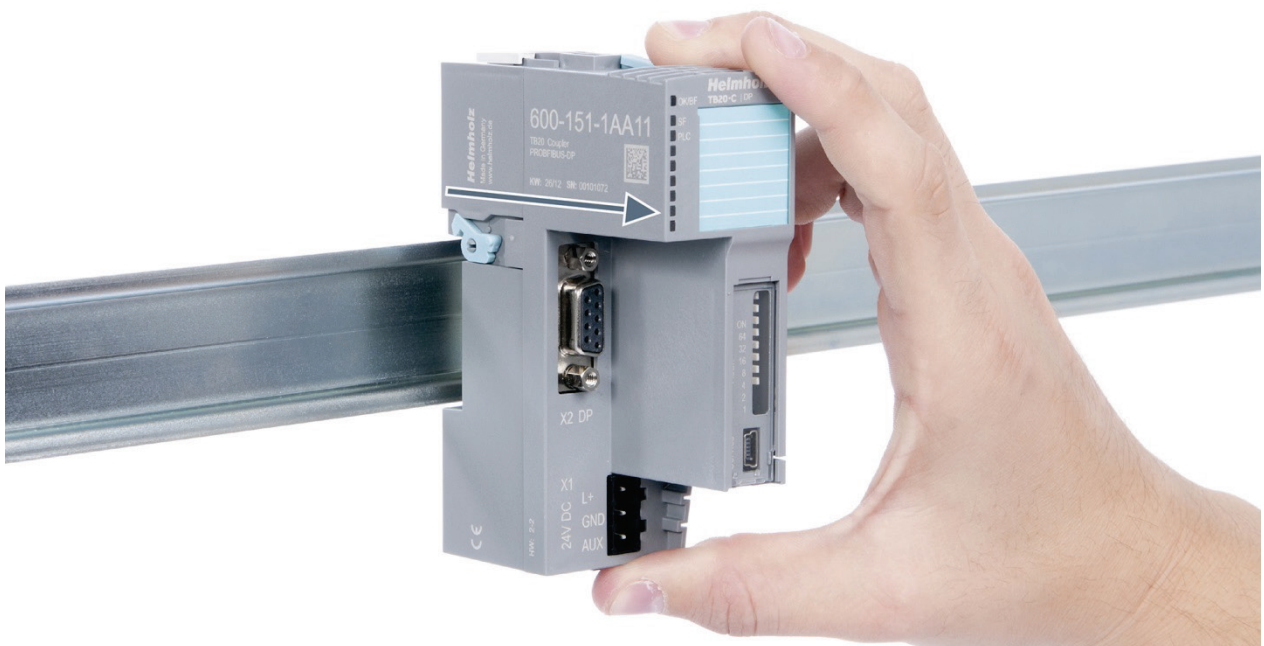
Step 1: Release the locking mechanism

Release the locking lever on the left side of the coupler in order to disengage it from the DIN rail.



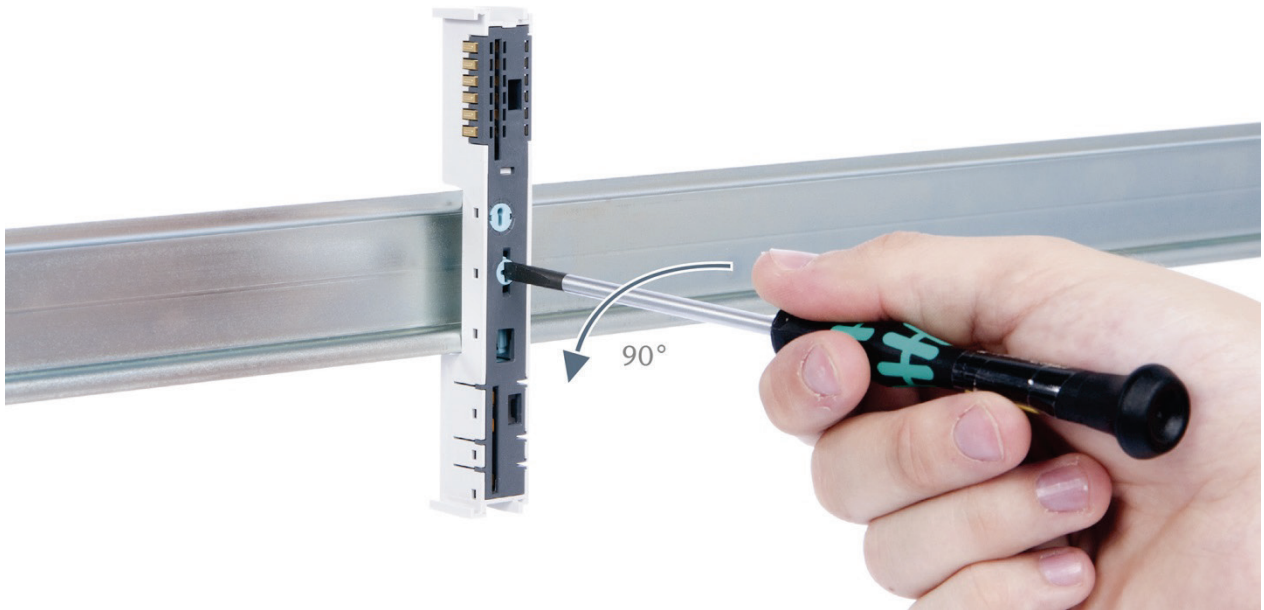
Step 2: Remove the coupler

Use your middle finger to push on the lever from above and use your thumb and index finger to pull out the coupler while holding the lever down.



Step 3: Release the base module

Use a screwdriver to release the base module.



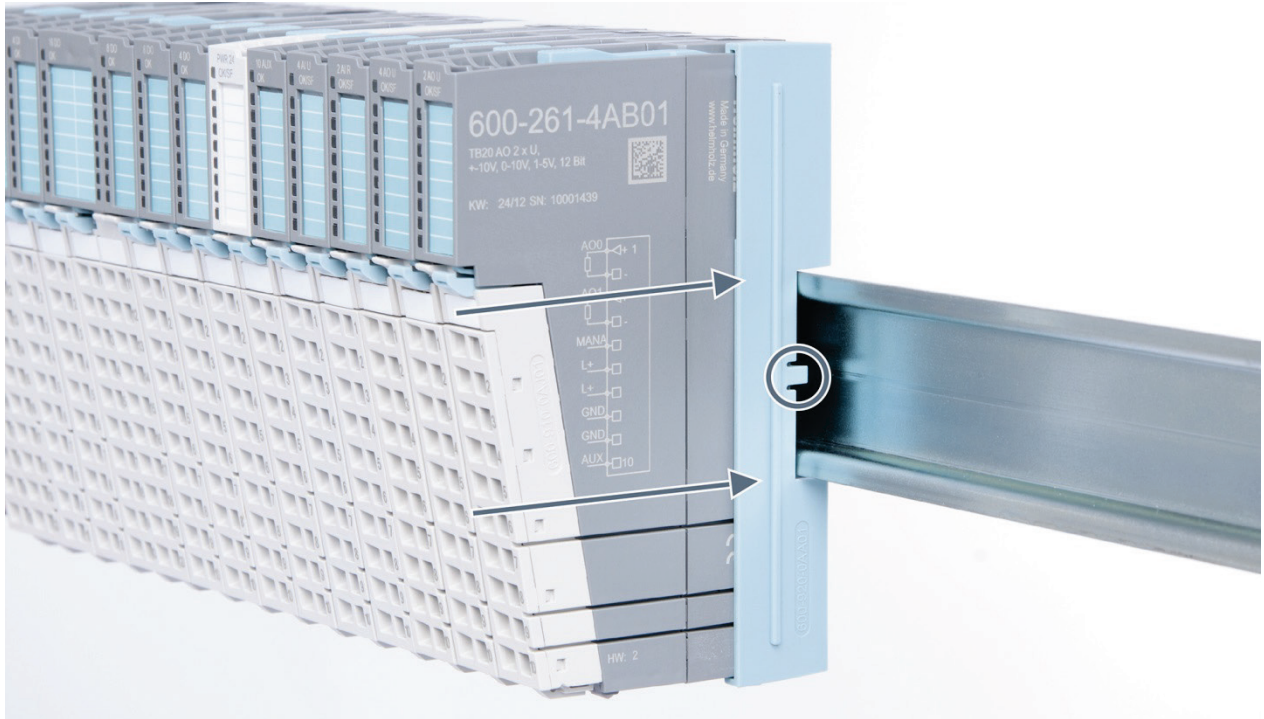
Step 4: Remove the base module

Remove the base module by pulling it towards you.

3.6 Installing and removing the final cover

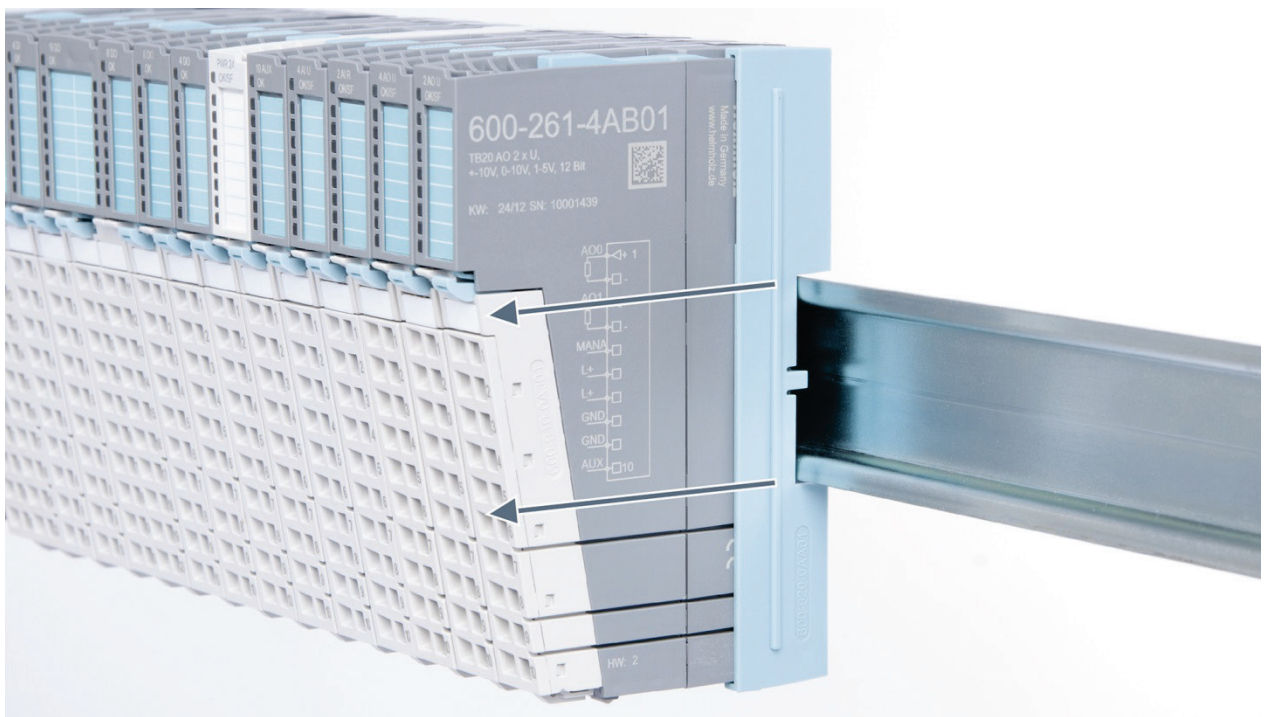
3.6.1 Installation

Slide the final cover onto the last module along the case, starting from the end with the front connector and moving towards the DIN rail, until the cover covers the base module's contacts and the tab snaps into place.



3.6.2 Removal

Pull the final bus cover upward along and off of the module.



4 Setup and wiring

4.1 EMC/safety/shielding

The TB20 IO system complies with EU Directive 2004/108/EC (“Electromagnetic Compatibility”).

One effective way to protect against disturbances caused by electromagnetic interference is to shield electric cables, wires, and components.



ATTENTION

When setting up the system and laying the necessary cables, make sure to fully comply with all standards, regulations, and rules regarding shielding (please also consult the relevant guidelines and documents published by the PROFIBUS User Organization). All work must be done professionally!

Shielding faults can result in serious malfunctions, including the system’s failure.

To ensure electromagnetic compatibility (EMC) in your control cabinets in electrically harsh environments, the following EMC rules are to be observed in the design:

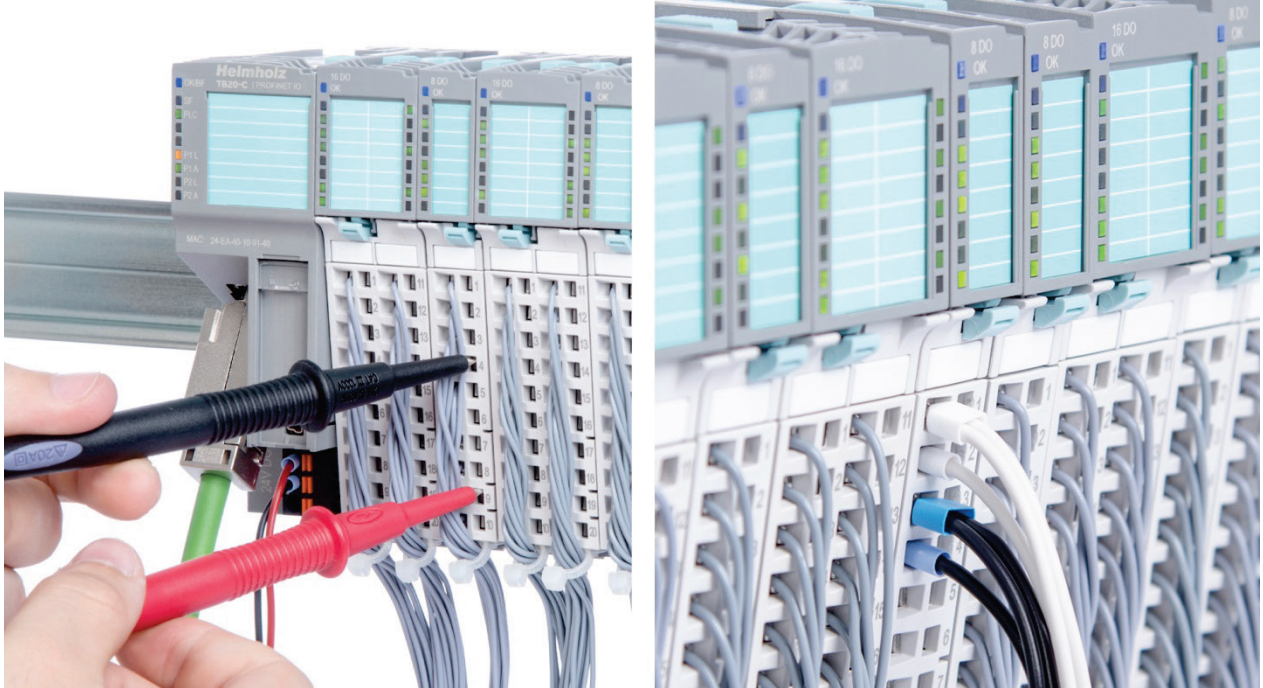
- All metal parts of the cabinet are to be connected with each other over a large area with good conductivity (no paint on paint). Where necessary, use contact washers or serrated washers.
- The cabinet door must be connected to the ground straps (top, middle, bottom) over as short a distance as possible.
- Signal cables and power cables are to be laid separated spatially by a minimum distance of 20 cm from each other in order to avoid coupling paths.
- Run signal lines only from one level into the cabinet if possible.
- Unshielded cables in the same circuit (outgoing and incoming conductors) must be twisted if possible.
- Contactors, relays, and solenoid valves in the cabinet, or in adjacent cabinets if applicable, must be provided with quenching combinations; e.g., with RC elements, varistors, and diodes.
- Do not lay wires freely in the closet; instead, run them as closely as possible to the cabinet housing or mounting panels. This also applies to reserve cables. These must be grounded on at least one end, and it is better if they are grounded at both ends (additional shielding effect).
- Unnecessary line lengths should be avoided. Coupling capacitances and inductances are kept low in this way.
- Analog signal lines and data lines must be shielded.

4.2 Front connectors

The front connector's spring-clamp terminals are designed for a cross-sectional cable area of up to 1.5 mm² (16–22 AWG) with or without ferrules.

It is also possible, for example, to connect two 0.75 mm² wires to a single spring-type terminal, provided the maximum cross-sectional cable area of 1.5 mm² per terminal is not exceeded.

The cables can be attached to the underside of the front connector with a cable tie.



4.3 Wiring the coupler

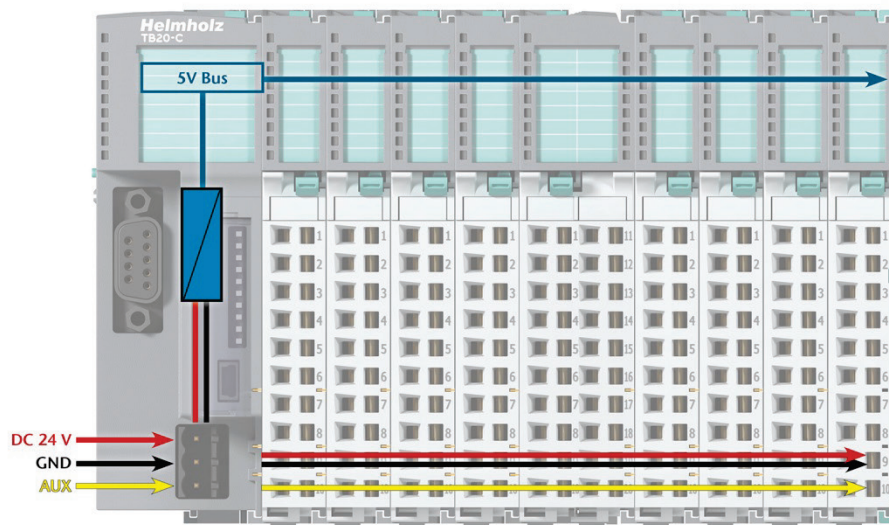
A power supply unit is integrated into the bus coupler. The power supply unit is responsible for powering the peripheral modules connected to the coupler.

The power supply itself draws its power from the three-pin terminal on the front (24 V DC, GND, AUX).

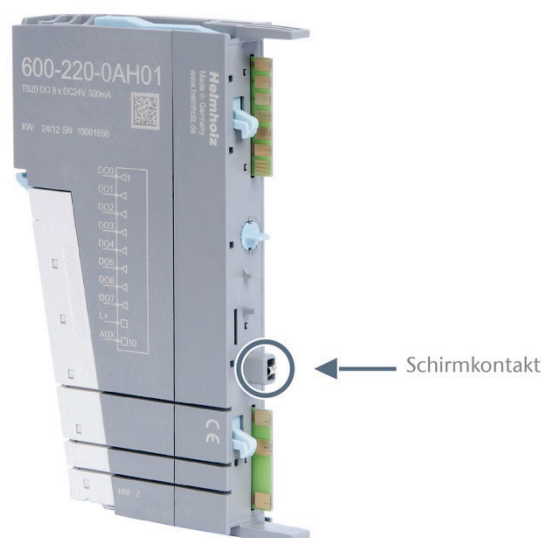
The 24 V connector is used to power two buses:

- The power bus used to power the I/O components (24 VDC, GND, AUX)
- The communications bus used to power the electronics in the peripheral modules

The AUX pin can be used to connect and use an additional voltage potential. Every peripheral module has an AUX terminal on its front connector (the bottommost terminal, i.e., terminals 10 and 20).

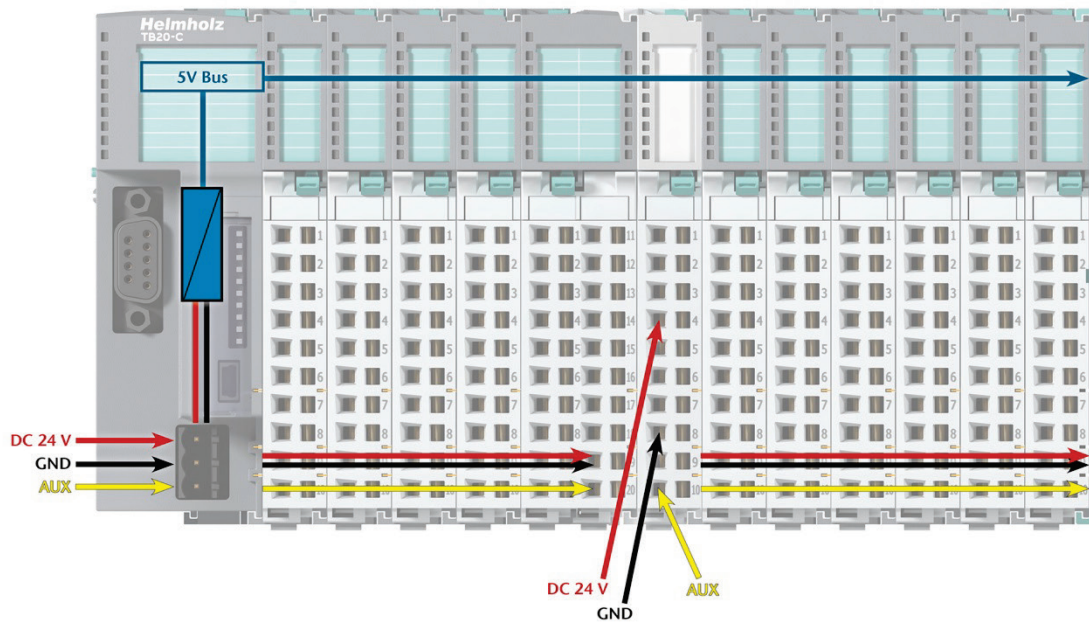


The coupler and the modules are grounded via the shield contact to the DIN rail. The DIN rail must be grounded. The surface of the DIN rail must be clean and conduct electricity well.



4.4 Using power and isolation modules

Power and isolation modules make it possible to segment the power supply for external signals (24 V, GND, AUX) into individual power supply sections that are powered separately.



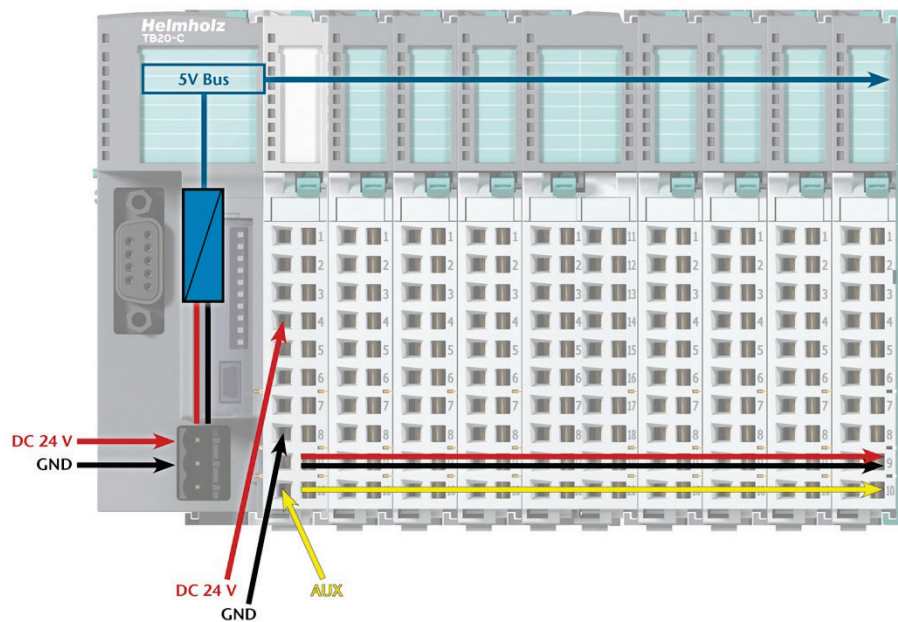
The order no. for the power and isolation module for 24 V signals is 600-710-0AA01.

Its electronic module and base module have the same light gray color as the front connector, ensuring that all power and isolation modules will stand out visually in the system and make it easy to clearly distinguish each individual power supply segment.



4.5 Separate power supply segments for the coupler and the I/O components

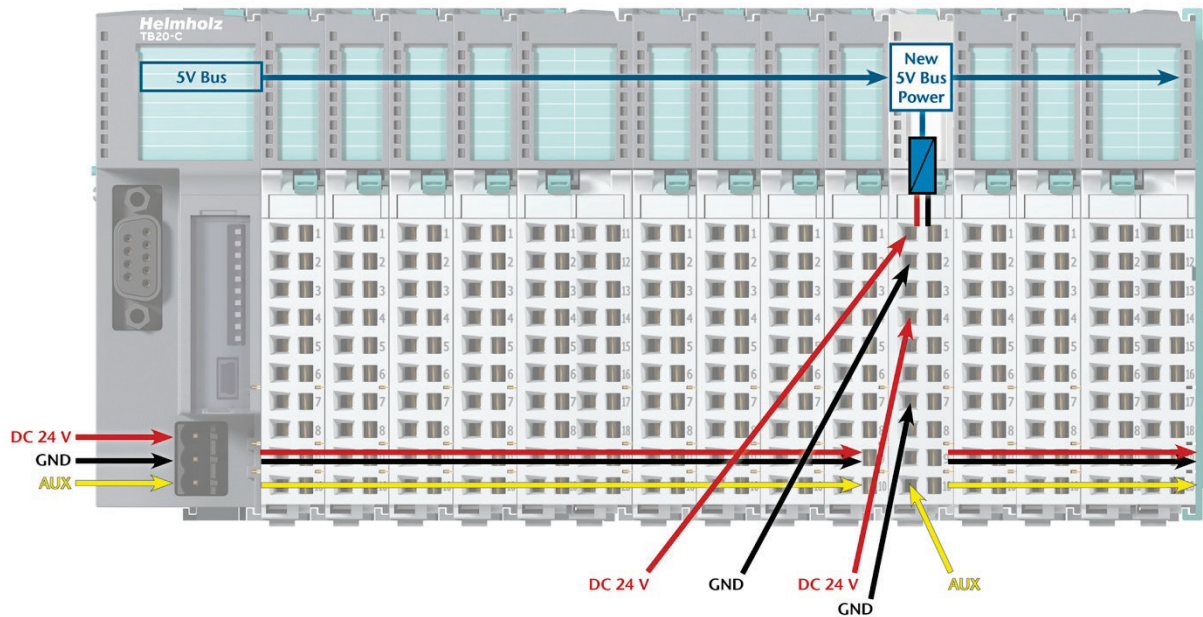
If the power supply for the coupler needs to be separate from the power supply for the I/O modules, a power and isolation module can be used right after the coupler.



4.6 Using power modules

Power modules deliver all necessary power to the connected peripheral modules and, if applicable, all the way to the next power module or power and isolation module. Power modules must be used whenever the power supplied by the coupler alone is not sufficient, that is, when there are a large number of modules on the bus. The "TB20 ToolBox" configuration and diagnostics program can be used to calculate the current draw.

24 V DC, GND, and AUX are fed into the terminals, whereas the supply of the sequenced modules runs via the bus system of the base modules.



The order no. for the power module is 600-700-0AA01. The electronic module of the power module is light gray like the front connector. The base module of the power module is light gray with a dark top part.



4.7 Electronic nameplate

All of a TB20 module's important information can be found on its electronic nameplate. This information includes, for example, the corresponding module ID, module type, order number, unique serial number, hardware version, firmware version, and internal functional scope.

This information can be read in a number of ways, one of which is using the "TB20 ToolBox" configuration and diagnostics software. The modules' electronic nameplates not only make it possible to prevent configuration errors (setup), but also make maintenance (servicing) easier.

4.8 Fusing

The TB20 coupler's and power modules' power supply must be externally fused with a slow-blowing fuse, maximum 8 A, appropriate for the required maximum current.

5 Characteristics

Counters are used to detect pulses that are faster than a controller's cycles, i.e., signals that the controller will be unable to detect properly and that therefore need to be pre-processed. The counter module detects the edges of 24 V signals as pulses. The pulses are counted and the count value is always available up to date for the PLC.

The count function can be enabled through PLC control commands.
The counter can be loaded with a value or reset through the PLC.

5.1 2x Counter Economy 24 V, 1 KHz, 32 bit

- 2 counters
- Count depth 32 bit (sign-allocated +/- 2^{31})
- Up to 1 KHz counting frequency per counter
- PLC control functions:
 - Counter enable/disable
 - Reset counter value
 - Load counter value
 - Change count direction
- 24 V voltage supply for counter
- 9 bytes of input data (count and status)
- 10 bytes of output data (preset count and control functions)



5.2 4x Counter Economy 24 V, 1 KHz, 32 bit

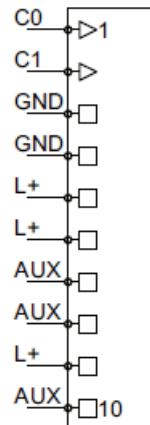
- 4 counters
- Count depth 32 bit (sign-allocated +/- 2^{31})
- Up to 1 KHz counting frequency per counter
- PLC control functions:
 - Counter enable/disable
 - Reset counter value
 - Load counter value
 - Change count direction
- 24 V voltage supply for counter
- 18 bytes of input data (count and status)
- 20 bytes of output data (preset count and control functions)



5.3 Pin assignment

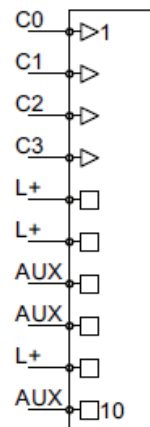
5.3.1 2x Counter Economy 24 V, 1 KHz, 32 bit

Connection	I/O
1	Input counter 0
2	Input counter 1
3	GND
4	GND
5	L+, 24 VDC
6	L+, 24 VDC
7	AUX
8	AUX
9	L+, 24 VDC
10	AUX



5.3.2 4x Counter Economy 24 V, 1 KHz, 32 bit

Connection	I/O
1	Input counter 0
2	Input counter 1
3	Input counter 2
4	Input counter 3
5	L+, 24 VDC
6	L+, 24 VDC
7	AUX
8	AUX
9	L+, 24 VDC
10	AUX



5.4 LEDs

The topmost "OK/SF" LED on every module indicates the module's current system status.

<i>Solid blue light</i>	The module is running (RUN)
<i>Slowly flashing blue light</i>	The module is stopped (STOP); substitute values (if any) are being applied.
<i>Quickly flashing blue light</i>	The module is idle (IDLE); it has not been configured.



NOTE

IDLE mode (quickly flashing blue LED) indicates modules that have not been added to ongoing system operation by the coupler. One of the causes for this can be, for example, an incorrect configuration (wrong module type in this slot).

6 Input and Output Variables

6.1 2x Counter Economy 24 V, 1 KHz, 32 bit

6.1.1 Feedback (Inputs)

Input space length: 9 bytes

Byte/bit	7	6	5	4	3	2	1	0
0-3	value of counter 0							
4-7	value of counter 1							
8	Counter 1 reset	Counter 1 loaded	Counter 1 count direction	Counter 1 enabled	Counter 0 reset	Counter 0 loaded	Counter 0 count direction	Counter 0 enabled

Value of counter the current count (sign-allocated 32 bit value)

Counter enable 1 = counting function running; 0 = counter has stopped

Count direction 0 = forwards (Up); 1 = backwards (Down)

Counter loaded 1 = count value was loaded from control interface

Counter reset 1 = count was reset

6.1.2 Control interface (Outputs)

Output space length: 10 bytes

Byte/bit	7	6	5	4	3	2	1	0
0 - 3	Preset value for counter 0							
4 - 7	Preset value for counter 1							
8	Counter 0 reset	Load counter 0	-	-	-	-	Counter 0 counting direction	Enable counter 0
9	Counter 1 reset	Load counter 1	-	-	-	-	Counter 1 counting direction	Enable counter 1

Counter enable 1 = activate counting function; 0 = stop counter

Count direction 0 = forwards (Up); 1 = backwards (Down)

Load counter 1 = load the count value

Counter reset 1 = reset counter value to 0

Preset value for counter Value for setting the counter (sign-allocated 32 bit value)

6.2 4x Counter Economy 24 V, 1 KHz, 32 bit

6.2.1 Feedback (Inputs)

Input space length: 18 bytes

Byte/bit	7	6	5	4	3	2	1	0
0 - 3	value of counter 0							
4 - 7	value of counter 1							
8 - 11	value of counter 2							
12 - 15	value of counter 3							
16	Counter 1 reset	Counter 1 loaded	Counter 1 count direction	Counter 1 enabled	Counter 0 reset	Counter 0 loaded	Counter 0 count direction	Counter 0 enabled
17	Counter 3 reset	Counter 3 loaded	Counter 3 count direction	Counter 3 enabled	Counter 2 reset	Counter 2 loaded	Counter 2 count direction	Counter 2 enabled

Value of counter the current count (sign-allocated 32 bit value)

Counter enable 1 = counting function running; 0 = counter has stopped

Count direction 0 = forwards (Up); 1 = backwards (Down)

Counter loaded 1 = count value was loaded from control interface

Counter reset 1 = count was reset

6.2.2 Control interface (Outputs)

Output space length: 20 bytes

Byte/bit	7	6	5	4	3	2	1	0
0 - 3	Preset value for counter 0							
4 - 7	Preset value for counter 1							
8 - 11	Preset value for counter 2							
12 - 15	Preset value for counter 3							
16	Counter 0 reset	Load counter 0	-	-	-	-	Counter 0 counting direction	Enable counter 0
17	Counter 1 reset	Load counter 1	-	-	-	-	Counter 1 counting direction	Enable counter 1
18	Counter 2 reset	Load counter 2	-	-	-	-	Counter 2 counting direction	Enable counter 2
19	Counter 3 reset	Load counter 3	-	-	-	-	Counter 3 counting direction	Enable counter 3

Counter enable 1 = activate counting function; 0 = stop counter

Count direction	0 = forwards (Up); 1 = backwards (Down)
Load counter	1 = load the count value
Counter reset	1 = reset counter value to 0
Preset value for counter	Value for setting the counter (sign-allocated 32 bit value)

6.3 Function "Load count"

The value of each counter can be overwritten by the PLC.

The following sequence must be observed in the process:

1. Write counter value into the control interface
2. Set Bit "Load counter X" (1)
3. Wait until bit "Count X loaded" is set (1)
4. Reset bit "Load counter X" (0)
5. Wait until bit "Count X loaded" is reset (0)

6.4 Function "Reset count"

The counter is set to 0 with the function "Reset count".

The following sequence must be observed in the process:

1. Set bit "Reset count X" (1)
2. Wait until bit "Count X reset" (1)
3. Delete bit "Reset count X" (0)
4. Wait until bit "Count X reset" deleted (0)

6.5 Startup and restart behavior

Following a restart of the TB20, all status bits are deleted (0), the counter value is 0 and the counter is not enabled, meaning that it doesn't count pulses.

In order to activate the counting function, the respective enable bit should be set. The counter then counts forwards (Up), unless the counting direction has been changed (Down).

The counter module contains no non-volatile memory. The count value is always reset through a restart of the bus system or the PLC. If the count value has to be stored temporarily, this must be realized in the PLC/in the master. The saved value can then be adopted into counter again with the function "Load count".



NOTE

The counter is always reset following a restart. The counter has no non-volatile memory for the count.

7 Technical data

7.1 2x Counter Economy 24 V, 1 KHz, 32 bit

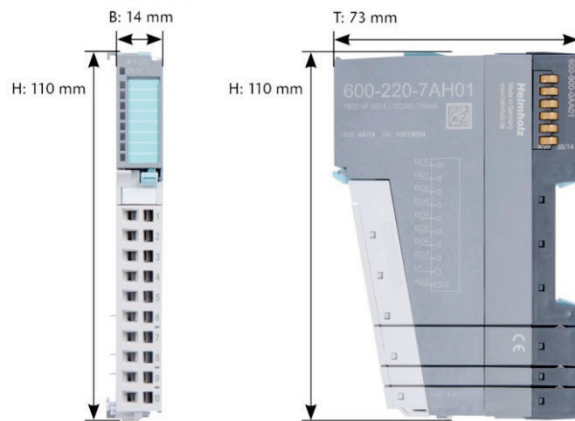
Order no.	600-300-1AB01
Module designation	2x Counter Economy 24 V, 1 KHz, 32 bit
Module ID / module type	11210 / 0x0302
Number of counters	2
Counter bit depth	32 bit ,sign-allocated +/- 2 ³¹
Counting frequency per channel	max. 1 KHz; 1x evaluation; rising edges
Counter functions	Forwards/backwards, load count, reset count
Input voltage	DC 24 V
Electrically isolated from backplane bus	Yes
Inputs electrically isolated from each other	No
Current draw	
External	Max. 0mA
Internal	Max. 22 mA
Power dissipation	Max. 0.5 W
Input characteristic curve	Type 2, EN 61131-2
Hot plug-capable	Yes
Parameterization	none
Dimensions (H x W x D)	110 mm x 14 mm x 73 mm
Weight	70 g
Certifications	CE
Noise immunity	DIN EN 61000-6-2 "EMC Immunity"
Interference emission	DIN EN 61000-6-4 "EMC Emission"
Vibration and shock resistance	DIN EN 60068-2-8:2008 "Vibration" DIN EN 60068-2-7:2010 "Shock"
Protection rating	IP 20
Relative humidity	95% without condensation
Installation position	Any
Permissible ambient temperature	0°C to 60°C
Transport and storage temperature	-20°C to 80°C

7.2 4x Counter Economy 24 V, 1 KHz, 32 bit

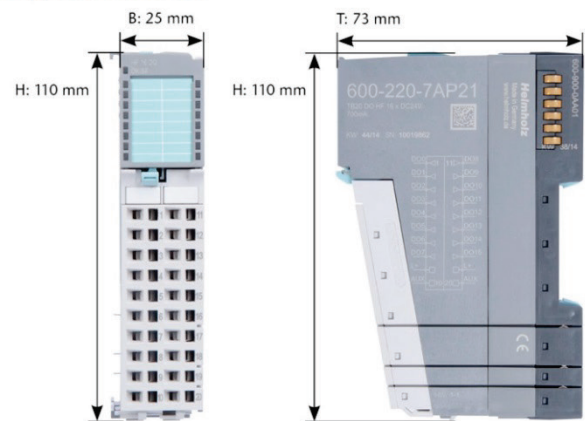
Order no.	600-300-1AD01
Module designation	4x Counter Economy 24 V, 1 KHz, 32 bit
Module ID / module type	11410 / 0x0304
Number of counters	4
Counter bit depth	32 bit ,sign-allocated +/- 2 ³¹
Counting frequency per channel	max. 1 KHz; 1x evaluation; rising edges
Counter functions	Forwards/backwards, load count, reset count
Input voltage	DC 24 V
Electrically isolated from backplane bus	Yes
Inputs electrically isolated from each other	No
Current draw	
External	Max. 0mA
Internal	Max. 22 mA
Power dissipation	Max. 0.95 W
Input characteristic curve	Type 2, EN 61131-2
Hot plug-capable	Yes
Parameterization	none
Dimensions (H x W x D)	110 mm x 14 mm x 73 mm
Weight	70 g
Certifications	CE
Noise immunity	DIN EN 61000-6-2 "EMC Immunity"
Interference emission	DIN EN 61000-6-4 "EMC Emission"
Vibration and shock resistance	DIN EN 60068-2-8:2008 "Vibration" DIN EN 60068-2-7:2010 "Shock"
Protection rating	IP 20
Relative humidity	95% without condensation
Installation position	Any
Permissible ambient temperature	0°C to 60°C
Transport and storage temperature	-20°C to 80°C

8 TB20 System Dimensions

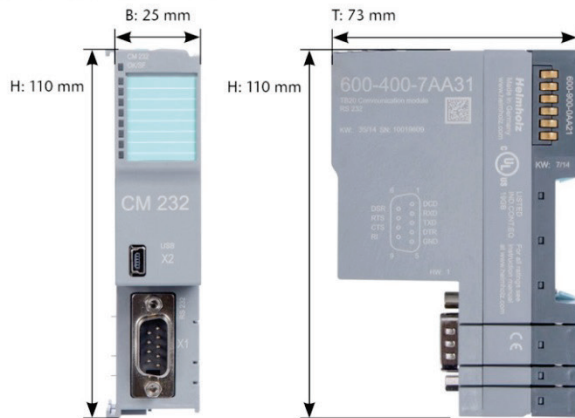
Einfachbreites Modul



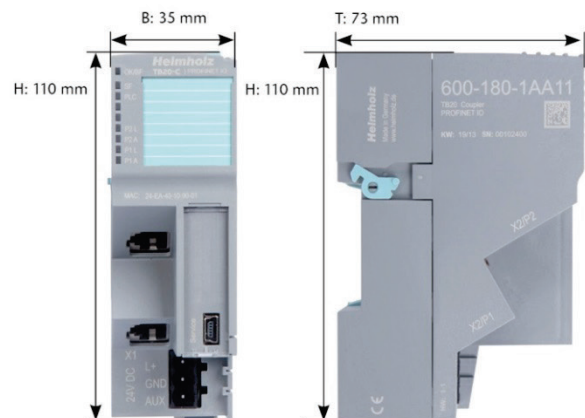
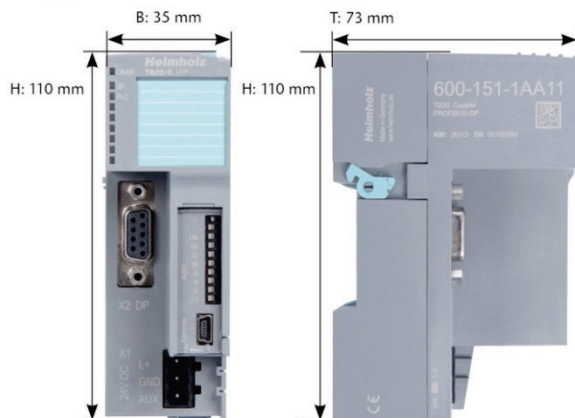
Doppelbreites Modul



Kommunikations-Modul



Buskoppler



9 Spare parts

9.1 Base modules

9.1.1 14 mm width standard base module

The 14 mm standard base module is available in sets of five with order no. 600-900-9AA01.



9.1.2 25 mm width base module

The 25 mm standard base module is available in sets of five with order no. 600-900-9AA21.



9.1.3 Power and isolation base module

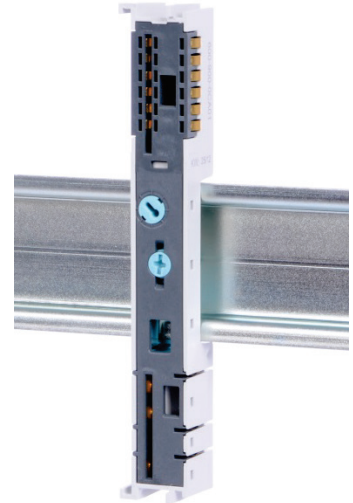
The power and isolation base module is available in sets of five with order no. 600-900-9BA01.



9.1.4 Power base module

The power base module is available in sets of five with order no. 600-900-9CA01.

It can be used with the power module (600-700-0AA01) and with all bus couplers.



9.2 Front connectors

9.2.1 10-terminal front connector

The 10-terminal front connector is available in sets of five with order no. 600-910-9AJ01.



9.2.2 20-terminal front connector

The 20-pin front connector is available in sets of five with order no. 600-910-9AT21.



9.3 Electronic modules

Electronic modules can be ordered as spare parts with the order number of the original product. The entire product is always sent, including the base module and the front connector.

9.4 Final cover

The final cover is available in sets of five with order no. 600-920-9AA01.

