

TB20 – Digital, Analog and System Modules

Manual

Version 3 – 16.11.2012 for HW 1 & FW 1.02 and higher

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Notes

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Revision Record

Version	Date	Change
2	10/26/2012	First version
3	11/16/2012	AO I & AO U parameters corrected; Module Identifier & module type

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1. General Information

This manual explains how to use the TB20 I/O system's analog and digital modules and goes over their components. In addition, it provides technicians with all the information required to install these modules.

1.1. Target Group for This Manual

This manual is intended for all project engineers, design engineers, technicians (skilled workers with electrical training), and users who work with the TB20 I/O system.

1.2. Symbols Used Throughout This Manual

The following symbols are used throughout this manual:



Used for tips and general information, e.g., to point out potential sources of error.



CAUTION!

Risk of property damage or malfunction.



WARNING!

Risk of bodily injury, e.g., due to electric shock.

1.3. Safety Instructions

For your own safety, and for the safety of others in the vicinity of the equipment, please follow the safety instructions below.



WARNING!

All applicable accident prevention and safety regulations must be complied with when planning the use of, installing, and operating this equipment! The company operating the equipment is responsible for ensuring compliance with these regulations!



WARNING!

Any processes in the equipment that have the potential of resulting in property damage or bodily injury must be safeguarded with the use of additional external devices. These devices must ensure that the equipment will remain in a safe operating state even in the event of a fault or malfunction. These devices include, but are not limited to, electromechanical safety switches, mechanical interlocks, etc. (please refer to EN 954-1, Risk Assessment!).



WARNING!

TB20 modules should only be used for the functions characteristic of a communications and signaling system. Safety-relevant functions should not be controlled solely with the coupler or with an operating terminal.

Emergency stop devices as per EN 60204/IEC 204 must remain fully functional and effective in all of the equipment's operating modes.

The equipment must not be able to restart in an uncontrolled or undefined manner!

Uncontrolled restarts must be rendered impossible by means of appropriate programming!

2. System Overview

2.1. General Information

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

It is made up of the following components:

1. A bus coupler
2. One or more peripheral modules
3. Optionally, one or more power and isolation modules
4. Optionally, one or more 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 IP 20.

2.2. The Components That Make Up 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 this way.

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

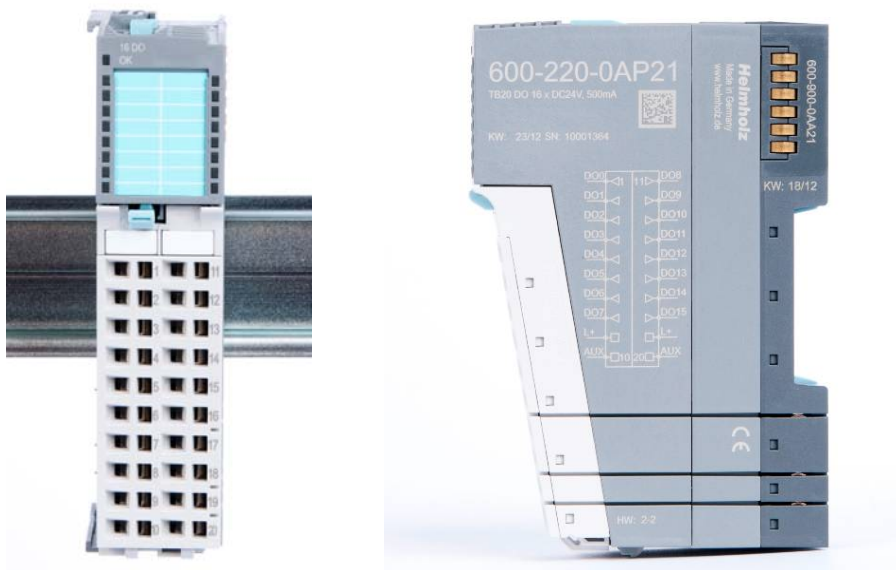
2.2.2. Peripheral Modules

The system's peripheral modules are electronic components to which peripheral devices such as sensors and actuators are connected. This is why there is a variety of peripheral modules with different tasks and functions available.

Example: peripheral module with 10-terminal front connector



Example: peripheral module with 20-terminal front connector



2.2.3. Power and Isolation Modules

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. Meanwhile, the communications bus' signals and supply voltage simply continue to be passed through, in contrast to the way they are handled by power modules (see below).



Power and isolation modules can be recognized by the bright color of their case.

2.2.4. Power Modules

The system's bus coupler provides the supply voltage for external signals (24 V, below) and for the communications bus (5 V, top). 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.

In other words, 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. This is required whenever the power supplied by the coupler alone is not sufficient, e.g., when there are a large number of modules on the bus.

The configuration software "TB20 ToolBox" can be used to determine whether a power module is needed.



Power modules can be recognized by the bright color of their case.

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:

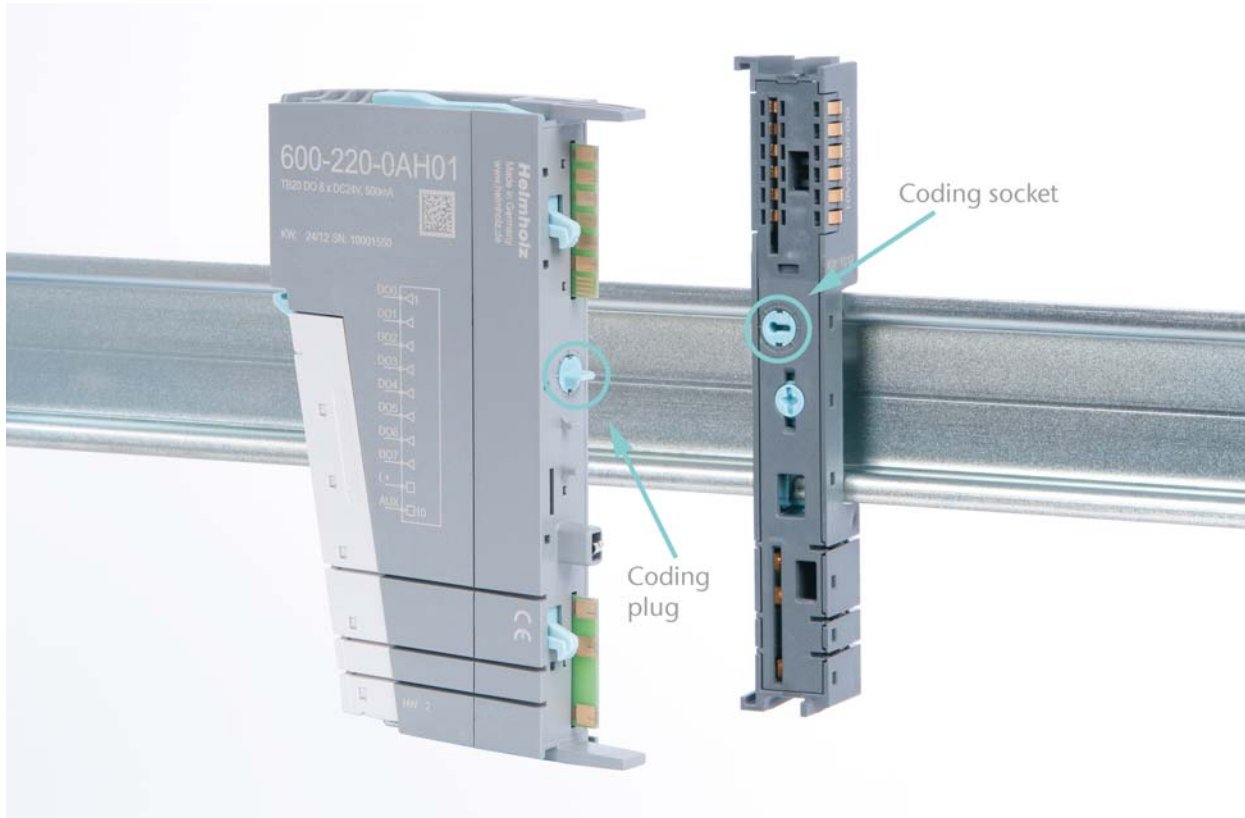
- The base module
- The electronic module
- The front connector



2.2.7. Module Coding

Electronic modules and base modules feature coding elements meant to prevent spare electronic modules from being plugged in incorrectly 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 figure below).



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, etc.) 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. Otherwise, the electronic module will be mechanically prevented from being plugged in.

3. Installation and Removal



WARNING!

Before starting any work on TB20 system components, make sure to de-energize all components, as well as the cables supplying them with power! Failure to do so will pose a life-threatening electric shock hazard!



CAUTION!

Installation must be carried out as per VDE 0100/IEC 364. Since the coupler and segments are modules with a protection rating of IP 20, they must be installed inside an enclosure. In order to ensure safe operation, make sure the ambient temperature does 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 below 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)

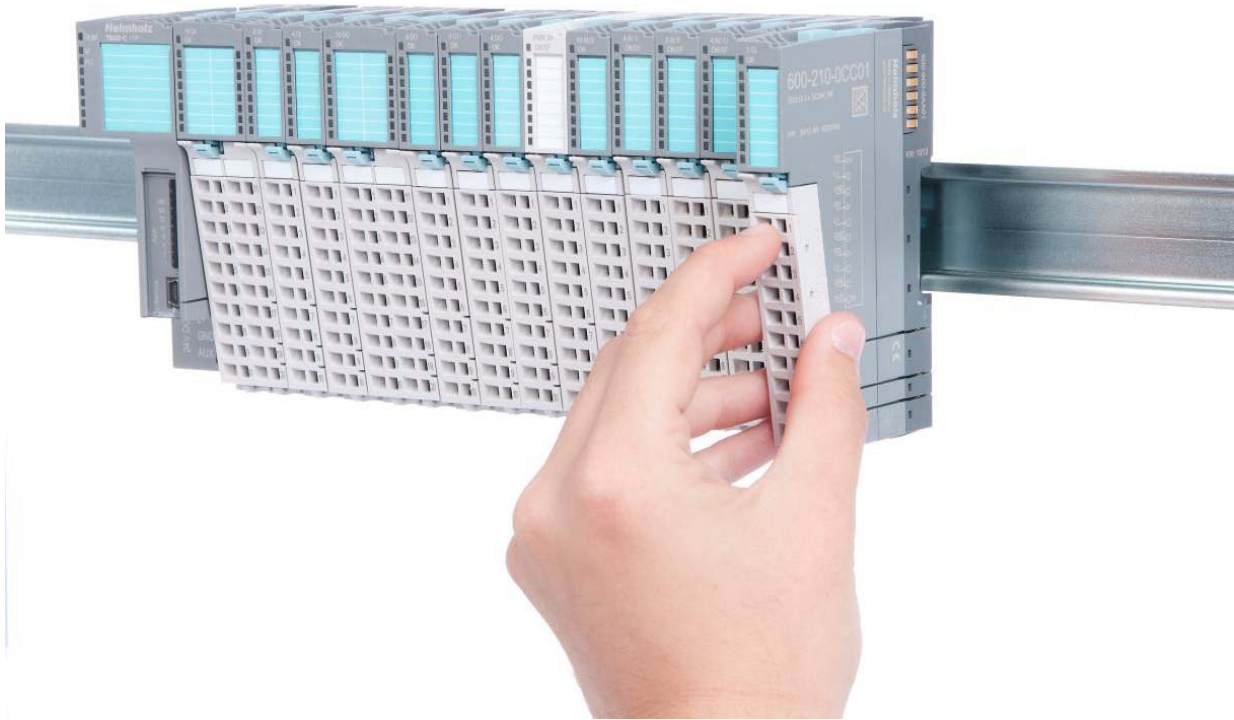
The minimum clearances for TB20 components are: 30 mm on top and on the bottom and 10 mm on each side.

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 on the inside snaps 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 8) on the base module in a straight line from above and then gently push it into the base module until both modules are fully resting against each other 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 do so, push the tab above the front connector upwards (see the figure 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 figure below).



Step 3: Release the base module

Use a screwdriver to release the base module by turning the locking mechanism 90° clockwise.



Step 4: Remove the base module

Remove the base module by pulling it towards you.

Step 2: Remove the electronic module

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



Step 3: Plug in a new electronic module



CAUTION!

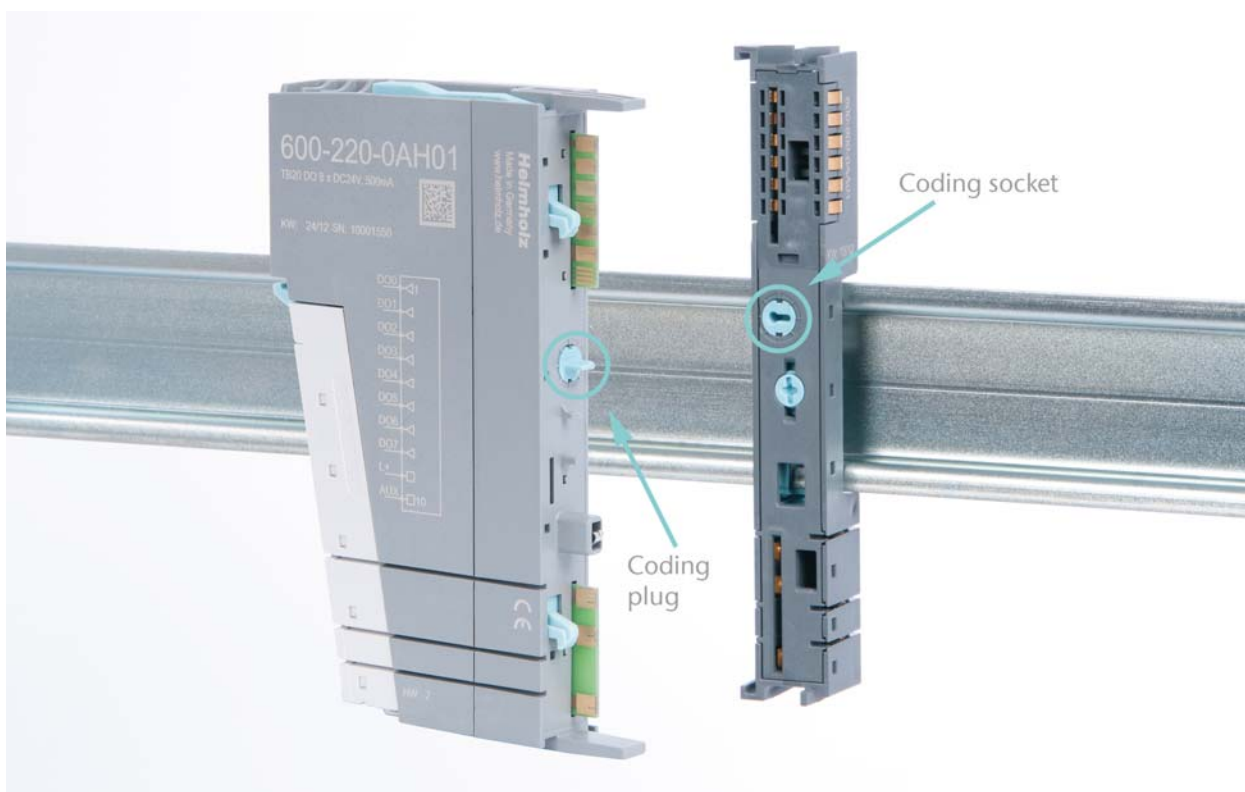
The electronic module must be snapped into place on the base module with a single continuous movement. If the electronic module is not snapped into place firmly and straight on the base module, bus malfunctions may occur.



CAUTION!

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.



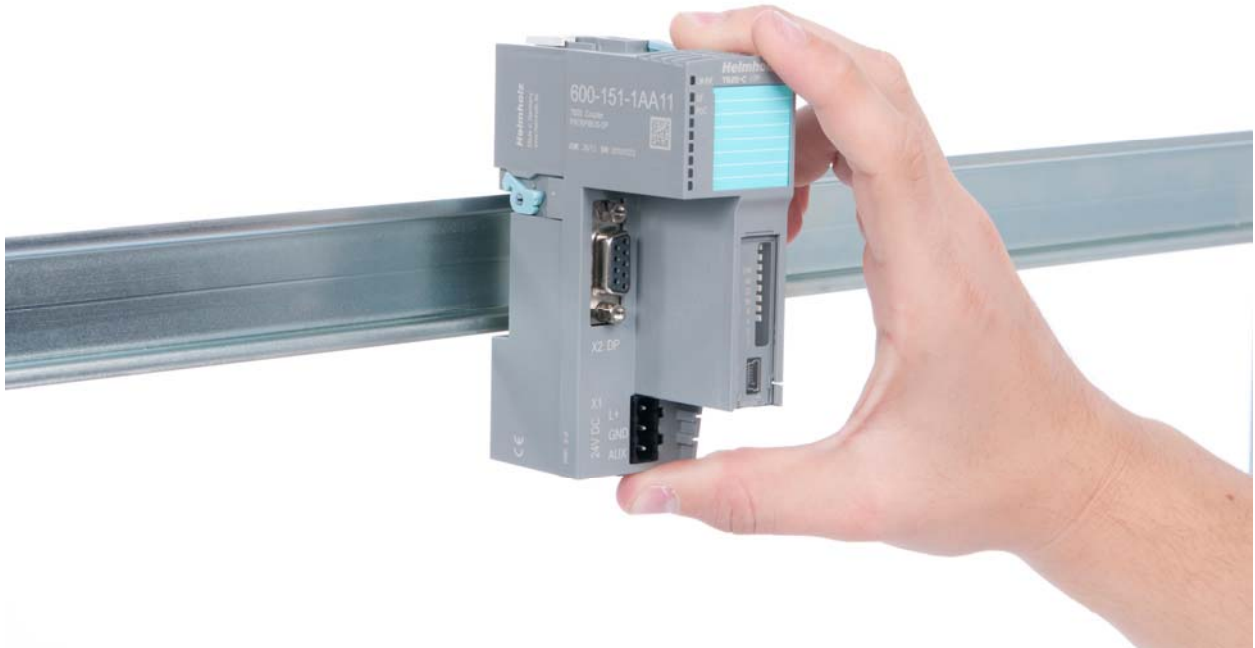
Step 4: Plug in the front connector

3.5. Installing and Removing the Coupler

3.5.1. Installation

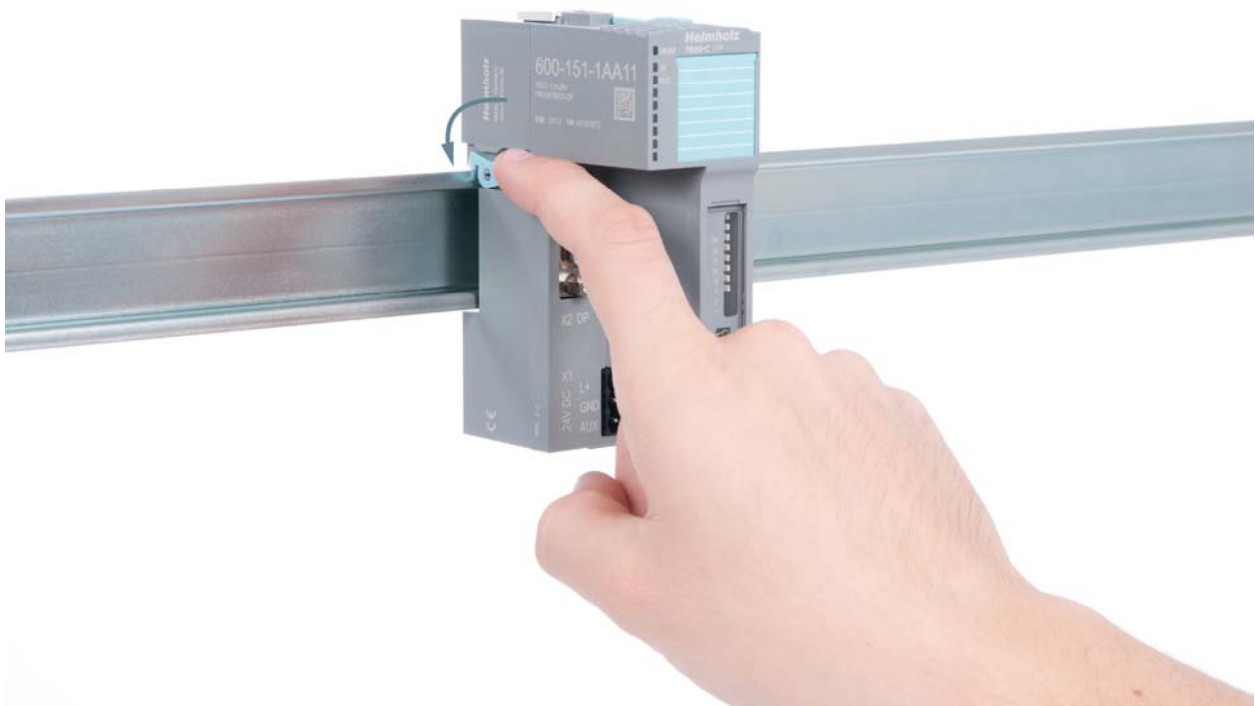
Step 1: Place the coupler on the DIN rail

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 to lock the coupler into position on the DIN rail.



3.5.2. Removal

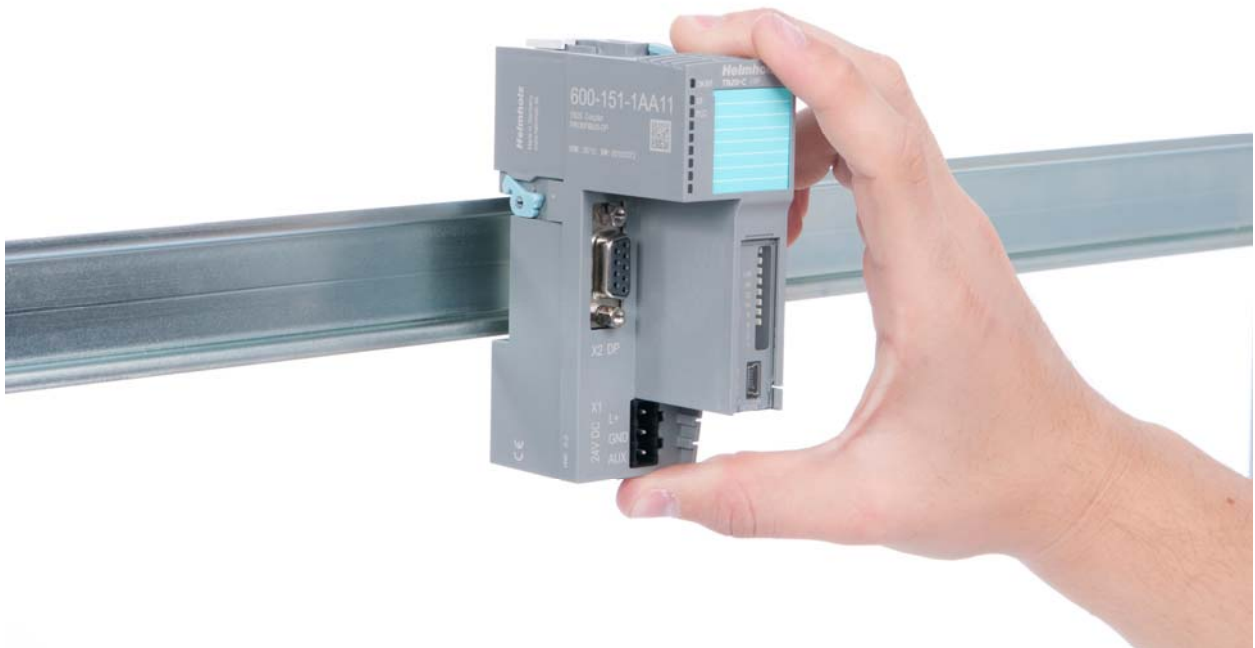
Step 1: Release the locking mechanism

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



Step 2: Remove the coupler

Use your middle finger to push on the release lever from above and then 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.



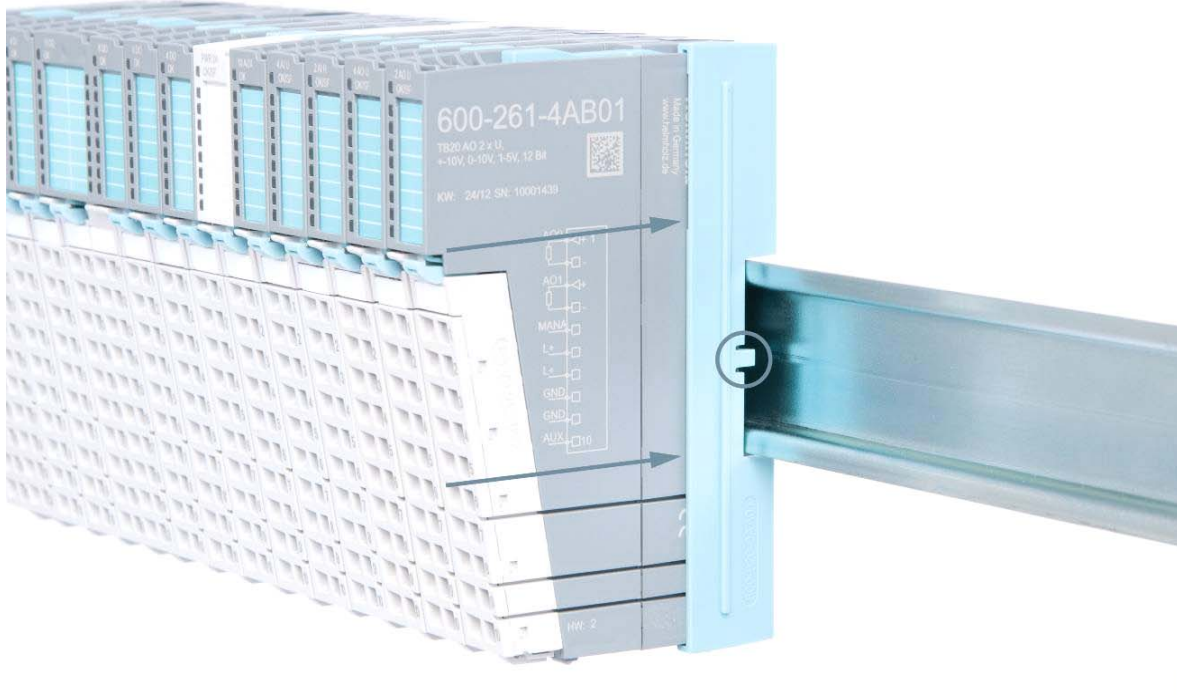
Step 4: Remove the base module

Remove the base module by pulling it towards you.

3.6. Installing and Removing the Final Cover

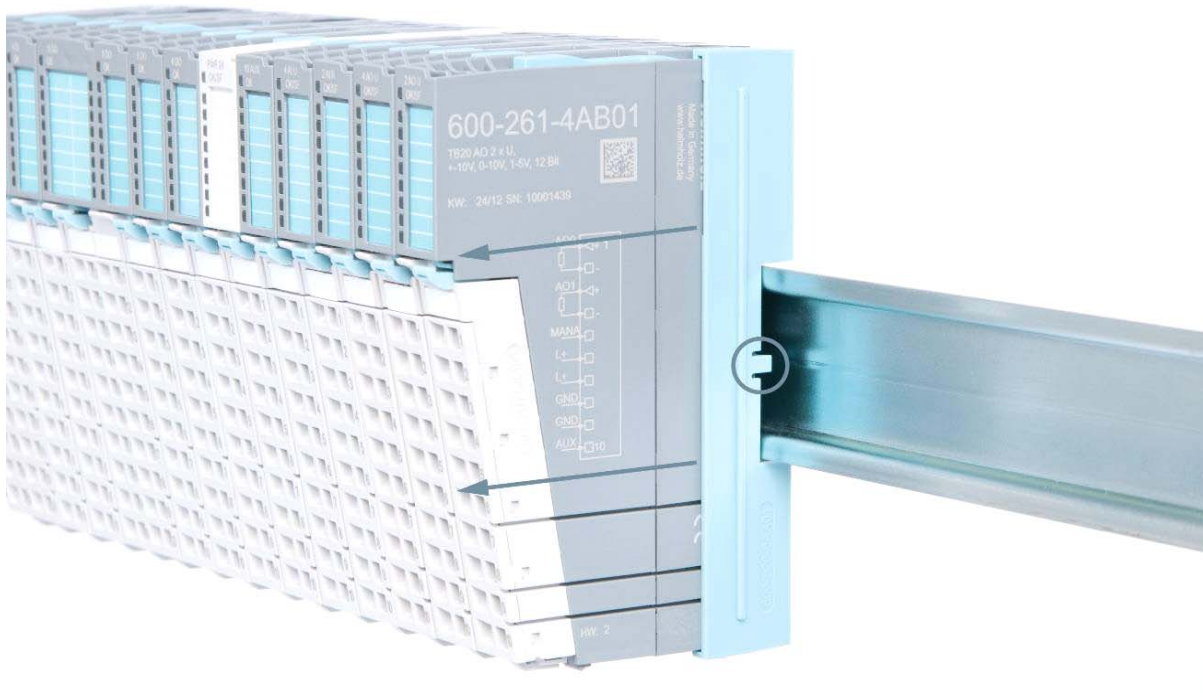
3.6.1. Installation

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 cover along the module's case and away from the DIN rail in order to remove it from the module.



4. Wiring

4.1. EMC / Safety / Shielding

EU Directive 2004/108/EC (“Electromagnetic Compatibility”) defines which electrical devices and equipment must be designed in such a way as to not inevitably affect other neighboring devices and/or equipment with electromagnetic radiation. Within this context, the term “electromagnetic compatibility” refers to all electromagnetic factors that are relevant to the simultaneous operation of various electrical devices and/or equipment in close proximity to each other.

The directive requires, on one hand, for electrical devices and equipment to function flawlessly in an existing environment that exerts an electromagnetic influence within its area, and, on the other, for said devices and equipment to not produce impermissible levels of electromagnetic interference within said environment.

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



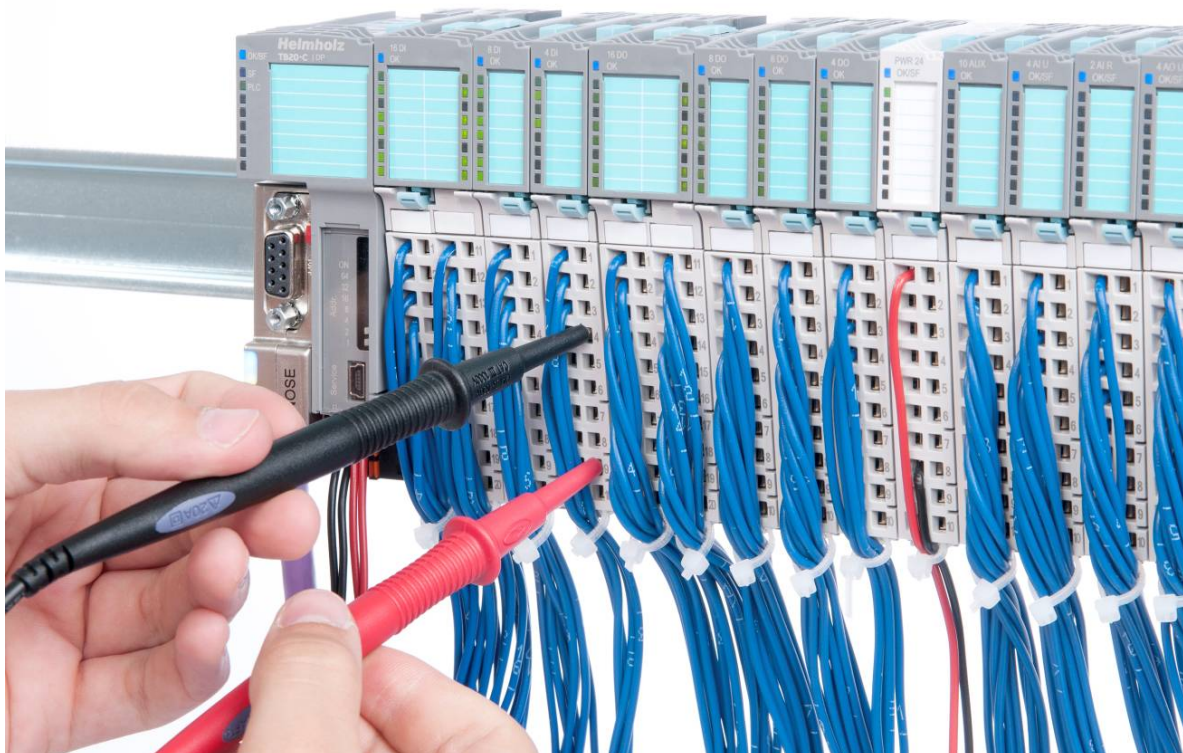
CAUTION!

When putting together the system and routing the required cables, make sure to fully comply with all standards, regulations, and rules regarding shielding (please consult the relevant guidelines and documents published by the PROFIBUS User Organization as well). All work must be done professionally!

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

4.2. Front Connector

The front connector's spring-clamp terminals are designed for a cross-sectional cable area of up to 1.5 mm² with and without ferrules.



4.3. Wiring the Coupler

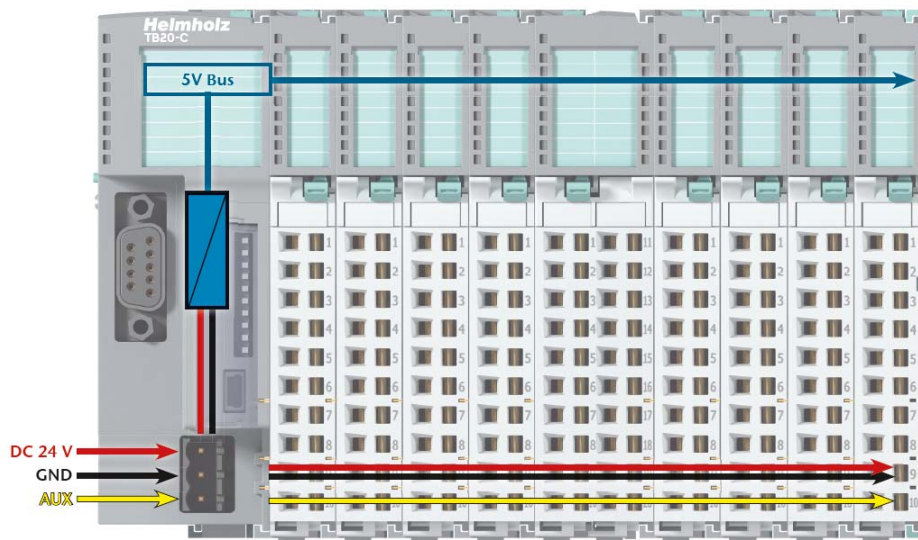
A power supply unit is integrated into the bus coupler. This unit is responsible for powering the peripheral modules connected to the coupler.

In turn, it draws its own power from the three-pin connector on the front (24 VDC, GND, AUX).

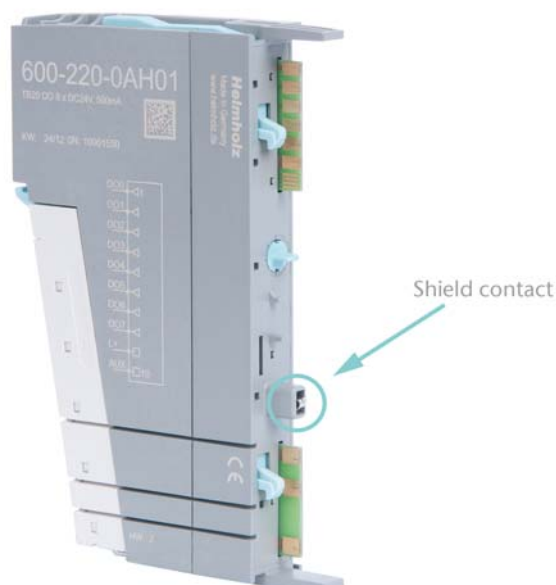
The 24-V connector is used to power two buses:

- 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 set up and use an additional wiring channel. Every peripheral module has an AUX terminal on its front connector (the bottommost terminal, i.e., terminals 10 and 20).

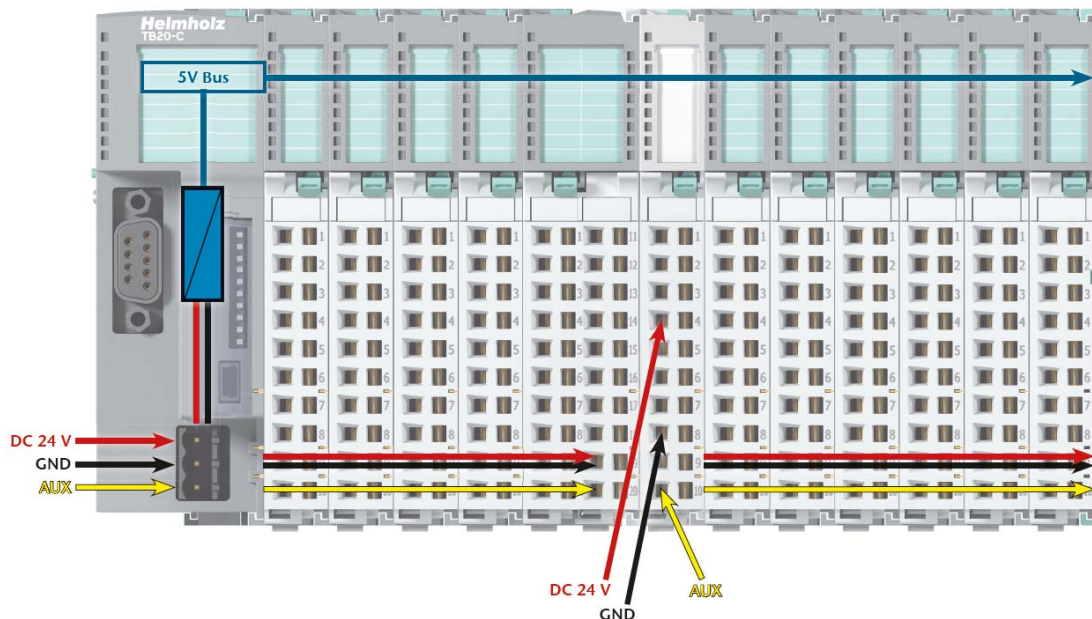


Shielding/grounding is achieved with a corresponding shield contact on the DIN rail:



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.



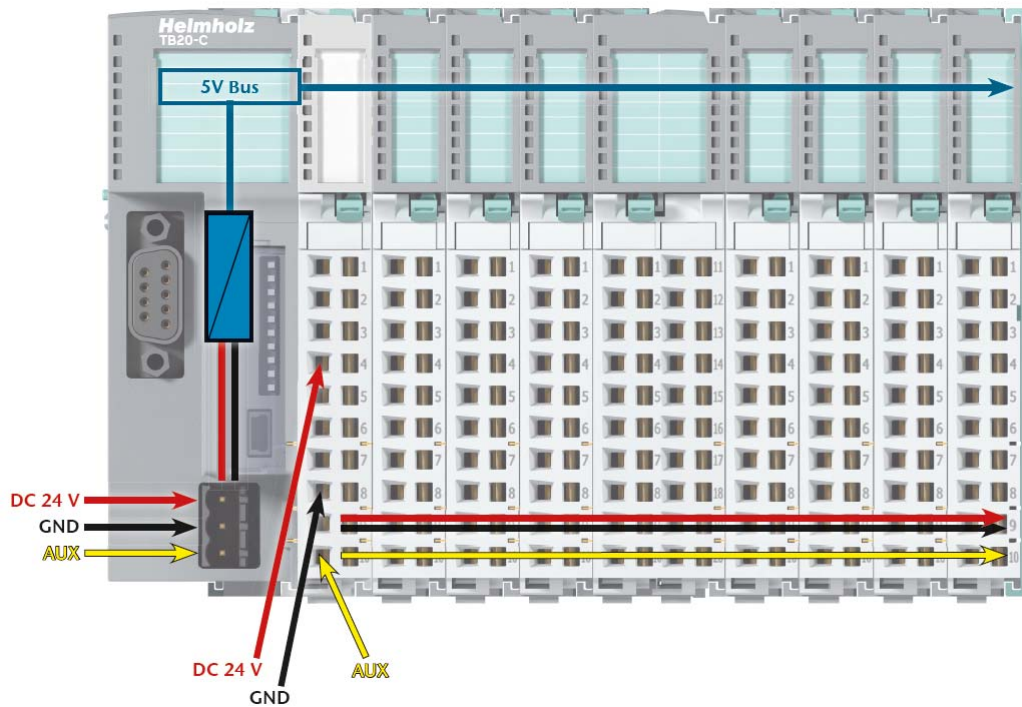
The power and isolation module for 24-V signals has Order No. 600-710-0AA01.

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 distinguish each individual power supply segment.



4.5. Separate Power Supply Segments for the Coupler and the I/O Components

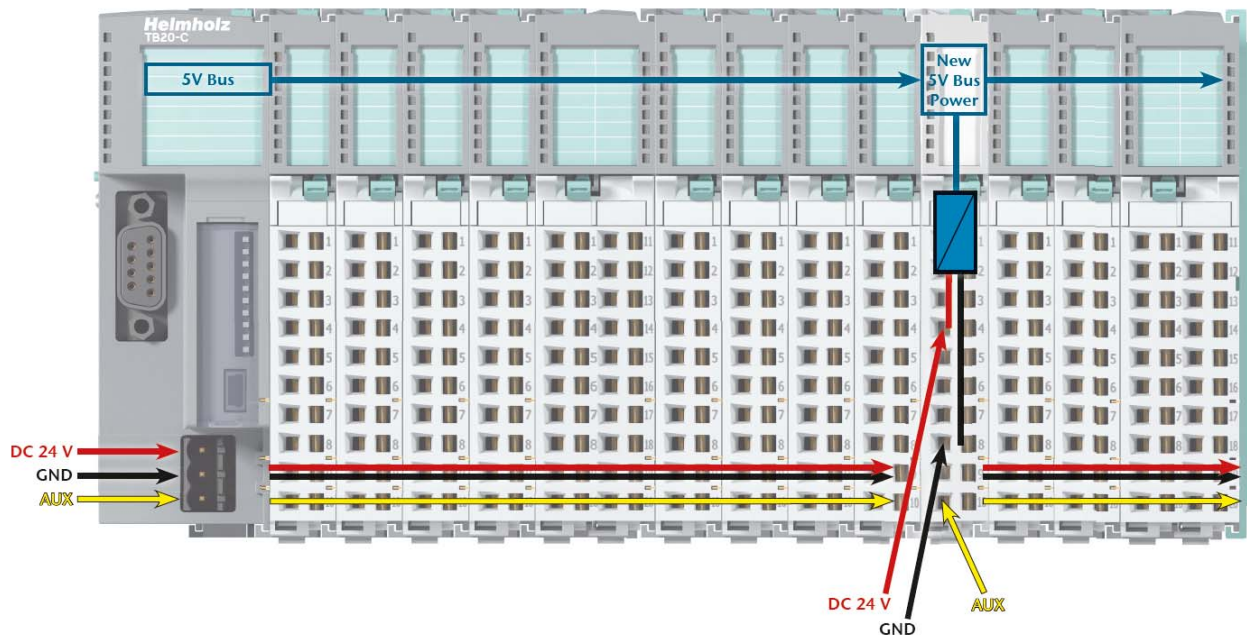
If the power supply for the coupler needs to be separate from the power supply for the I/O modules, a power and isolation module can be used right after the coupler.



4.6. Using Power Modules

Power modules deliver all necessary power to the peripheral modules connected after them 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, e.g., when there are a large number of modules on the bus. The “TB20 ToolBox” parameter configuration and diagnosis program can be used to calculate a system’s total current draw.

24 VDC, GND, and AUX are fed into the terminals on the front, while the connected modules are powered through the base modules’ bus system.



The power module has Order No. 600-700-0AA01. Its electronic module has the same light gray color as the front connector, while its base module is light gray with a dark upper part.



4.7. LED Indicators

The topmost LED (**OK 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); its parameters have not been configured yet
<i>Solid red light:</i>	The module is indicating a diagnostic error
<i>Flashing red light:</i>	The module is indicating a parameter assignment error

The red LED lights will only be shown on modules with configurable parameters or diagnosis capabilities.



4.8. Electronic nameplate

All of a TB20 module's important information can be found on its electronic nameplate. For example the corresponding module ID, module model, order number, unique serial number, hardware version, firmware version, and internal range of functionalities. This information can be read in a number of ways, one of which is using the "TB20 ToolBox" configuration and diagnosis program. The modules' electronic nameplates not only make it possible to prevent configuration errors (setup), but also make maintenance (servicing) easier.

4.9. Fuse protection

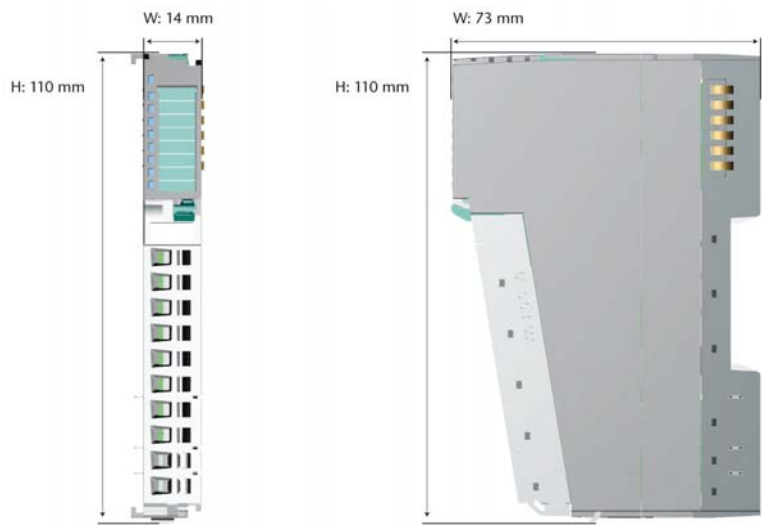
The coupler's and power modules' power supply must be externally fused with a fast-blow fuse appropriate for the required maximum current.

4.10. General Technical Specifications

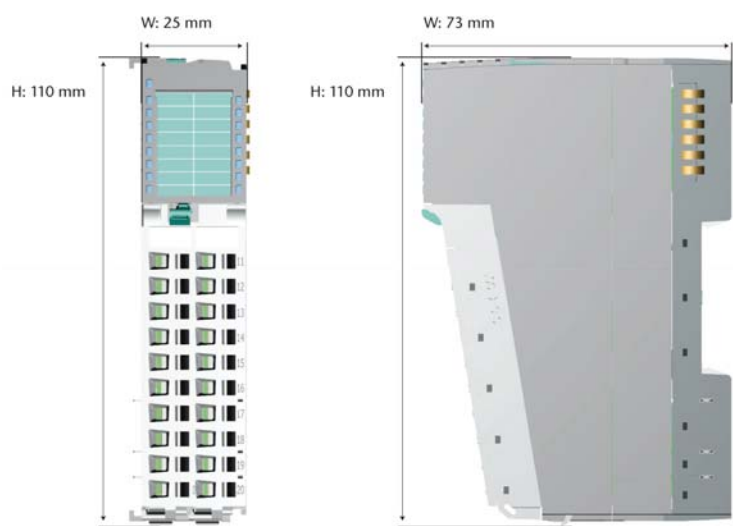
Certifications	CE, <i>UL pending</i>
Noise immunity	DIN EN 61000-6-2 "EMC Immunity"
Interference emission	DIN EN 61000-6-4 "EMC Emission"
Vibration and shock resistance	DIN EN 60068-2-8:2008 "Vibration" DIN EN 60068-2-7:2010 "Shock"
Isolation voltage	1.5 kV
Protection rating	IP 20
Relative humidity	95% without condensation
Installation position	Any
Permissible ambient temperature	0 °C to 60 °C
Transport and storage temperature	-20 °C to 80 °C

4.11. Dimensions

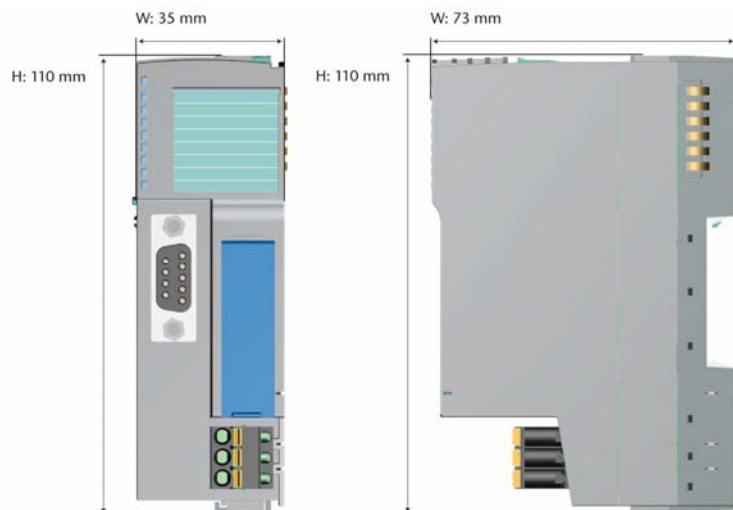
4.11.1. 14-mm Module



4.11.2. 25-mm Module



4.11.3. Coupler



5. Digital Modules

5.1. Digital Input Modules

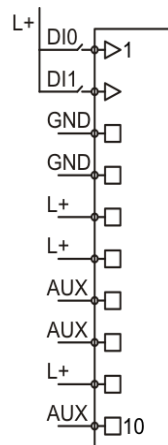
5.1.1. 600-210-0AB01, 2 DI x 24 VDC

General characteristics

- 2 inputs (electrically isolated from the backplane bus)
- 24 VDC input voltage
- Can accommodate two-wire proximity sensors
- A blue LED indicates the module's operating status
- Green LEDs (one for each input) indicate the inputs' states

Connector terminal assignment

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



Technical specifications

Order No.	600-210-0AB01
Notation	DI 2 x DC 24 V
Identifier / Type	1200 / 0102
Number of inputs	2
Electrically isolated from backplane bus	Yes
Channels electrically isolated from each other	No
Current draw	
External	Max. 0 mA
Internal	Max. 22 mA
Power dissipation	Max. 0.5 W
Input characteristic curve	Type 2, EN 61131-2
Reverse polarity protection for inputs	Yes
Input voltage	
For low signal ("0")	-3 V to 9 V
For high signal ("1")	12 V to 30 V
Hot-pluggable	Yes
Weight	Approx. 70 g

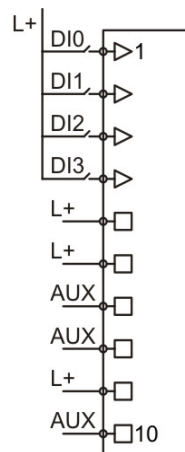
5.1.2. 600-210-0AD01, 4 DI x 24 VDC

General characteristics

- 4 inputs (electrically isolated from the backplane bus)
- 24 VDC input voltage
- Can accommodate two-wire proximity sensors
- A blue LED indicates the module's operating status
- Green LEDs (one for each input) indicate the inputs' states

Connector terminal assignment

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



Technical specifications

Order No.	600-210-0AD01
Notation	DI 4 x DC 24 V
Identifier / Type	1400 / 0104
Number of inputs	4
Electrically isolated from backplane bus	Yes
Channels electrically isolated from each other	No
Current draw	
External	Max. 0 mA
Internal	Max. 22 mA
Power dissipation	Max. 0.95 W
Input characteristic curve	Type 2, EN 61131-2
Reverse polarity protection for inputs	Yes
Input voltage	
For low signal ("0")	-3 V to 9 V
For high signal ("1")	12 V to 30 V
Hot-pluggable	Yes
Weight	Approx. 70 g

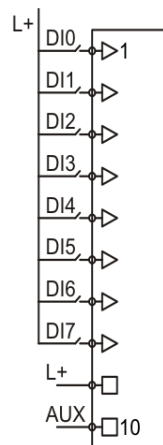
5.1.3. 600-210-0AH01, 8 DI x 24 VDC

General characteristics

- 8 inputs (electrically isolated from the backplane bus)
- 24 VDC input voltage
- Can accommodate two-wire proximity sensors
- A blue LED indicates the module's operating status
- Green LEDs (one for each input) indicate the inputs' states

Connector terminal assignment

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



Technical specifications

Order No.	600-210-0AH01
Notation	DI 8 x DC 24 V
Identifier / Type	1800 / 0108
Number of inputs	8
Electrically isolated from backplane bus	Yes
Channels electrically isolated from each other	No
Current draw	
External	Max. 0 mA
Internal	Max. 22 mA
Power dissipation	Max. 1.85 W
Input characteristic curve	Type 2, EN 61131-2
Reverse polarity protection for inputs	Yes
Input voltage	
For low signal ("0")	-3 V to 9 V
For high signal ("1")	12 V to 30 V
Hot-pluggable	Yes
Weight	Approx. 70 g

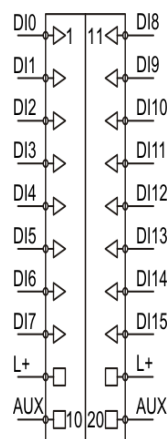
5.1.4. 600-210-0AP21, 16 DI x 24 VDC

General characteristics

- 16 inputs (electrically isolated from the backplane bus)
- 24 VDC input voltage
- Can accommodate two-wire proximity sensors
- A blue LED indicates the module's operating status
- Green LEDs (one for each input) indicate the inputs' states

Connector terminal assignment

Terminal	I/O	Terminal	I/O
1	Input 0	11	Input 8
2	Input 1	12	Input 9
3	Input 2	13	Input 10
4	Input 3	14	Input 11
5	Input 4	15	Input 12
6	Input 5	16	Input 13
7	Input 6	17	Input 14
8	Input 7	18	Input 15
9	L+, 24 VDC	19	L+, 24 VDC
10	AUX	20	AUX



Technical specifications

Order No.	600-210-0AP21
Notation	DI 16 x DC 24 V
Identifier / Type	1900 / 0109
Number of inputs	16
Electrically isolated from backplane bus	Yes
Channels electrically isolated from each other	No
Current draw	
External	Max. 0 mA
Internal	Max. 23 mA
Power dissipation	Max. 3.7 W
Input characteristic curve	Type 2, EN 61131-2
Reverse polarity protection for inputs	Yes
Input voltage	
For low signal ("0")	-3 V to 9 V
For high signal ("1")	12 V to 30 V
Hot-pluggable	Yes
Weight	Approx. 110 g

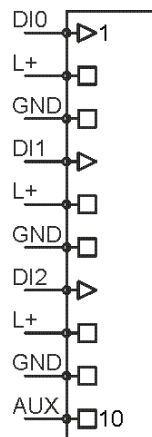
5.1.5. 600-210-0CC01, 3 DI x 24 VDC, Three-Wire

General characteristics

- 3 inputs (electrically isolated from the backplane bus)
- 24 VDC input voltage
- Can accommodate three-wire sensors
- Fuse for 24 VDC
- A blue LED indicates the module's operating status
- Green LEDs (one for each input) indicate the inputs' states

Connector terminal assignment

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



Technical specifications

Order No.	600-210-0CC01
Notation	DI 3 x DC 24 V, 3-wire
Identifier / Type	1300 / 0103
Number of inputs	3
Electrically isolated from backplane bus	Yes
Channels electrically isolated from each other	No
Current draw	
External	Max. 0 mA
Internal	Max. 22 mA
Power dissipation	Max. 0.7 W
Input characteristic curve	Type 2, EN 61131-2
Reverse polarity protection for inputs	Yes
Input voltage	
For low signal ("0")	-3 V to 9 V
For high signal ("1")	12 V to 30 V
L+ fuse	4 A per group. Group 1: terminals 2, 5, and 8
Hot-pluggable	Yes
Weight	Approx. 70 g

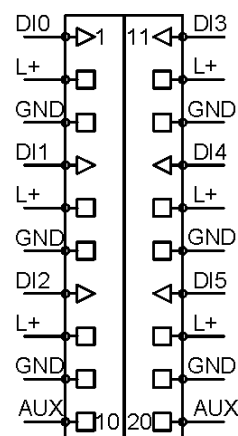
5.1.6. 600-210-0CF21, 6 DI x 24 VDC, Three-Wire

General characteristics

- 6 inputs (electrically isolated from the backplane bus)
- 24 VDC input voltage
- Can accommodate three-wire sensors
- Fuse for 24 VDC
- A blue LED indicates the module's operating status
- Green LEDs (one for each input) indicate the inputs' states

Connector terminal assignment

Terminal	I/O	Terminal	I/O
1	Input 0	11	Input 3
2	L+, 24 VDC	12	L+, 24 VDC
3	GND	13	GND
4	Input 1	14	Input 4
5	L+, 24 VDC	15	L+, 24 VDC
6	GND	16	GND
7	Input 2	17	Input 5
8	L+, 24 VDC	18	L+, 24 VDC
9	GND	19	GND
10	AUX	20	AUX



Technical specifications

Order No.	600-210-0CF21
Notation	DI 6 x DC 24 V, 3-wire
Identifier / Type	1600 / 0106
Number of inputs	6
Electrically isolated from backplane bus	Yes
Channels electrically isolated from each other	No
Current draw	
External	Max. 0 mA
Internal	Max. 22 mA
Power dissipation	Max. 1.4 W
Input characteristic curve	Type 2, EN 61131-2
Reverse polarity protection for inputs	Yes
Input voltage	
For low signal ("0")	-3 V to 9 V
For high signal ("1")	12 V to 30 V
L+ fuse	4 A per group. Group 1: terminals 2, 5, and 8. Group 2: terminals 12, 15, and 18.
Hot-pluggable	Yes
Weight	Approx. 110 g

5.2. Digital Output Modules

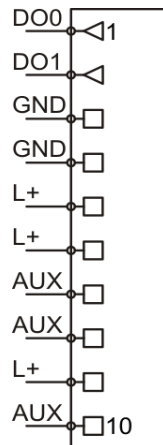
5.2.1. 600-220-0AB01, 2 DO x 24 VDC, 500 mA

General characteristics

- 2 outputs (electrically isolated from the backplane bus)
- 24 VDC output voltage
- Output current of 500 mA per channel
- Works with solenoid valves, contactors, small motors, etc.
- A blue LED indicates the module's operating status
- Green LEDs (one for each input) indicate the outputs' states

Connector terminal assignment

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



Technical specifications

Order No.	600-220-0AB01
Notation	DO 2 x DC 24 V, 500 mA
Identifier / Type	2200 / 0120
Number of outputs	2
Electrically isolated from backplane bus	Yes
Channels electrically isolated from each other	No
Supply voltage U_p , U_s	
Rated	24 VDC
Ripple U_{ss}	Max. 3.6 V
Permissible range (with ripple)	20–30 V
Voltage for $t < 10$ ms	50 V
Output current	
Rated	500 mA
Leakage current	Max. 0.5 mA
Current draw	
External	Max. 10 mA + load
Internal	Max. 27.5 mA
Power dissipation	Max. 0.7 W
Short-circuit protection of outputs	Electronic, for each channel

Inductive cutoff voltage limit	-48 V
Hot-pluggable	Yes
Weight	Approx. 70 g

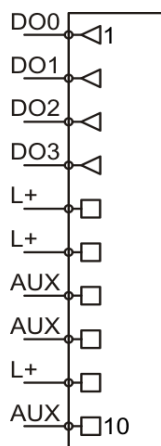
5.2.2. 600-220-0AD01, 4 DO x 24 VDC, 500 mA

General characteristics

- 4 outputs (electrically isolated from the backplane bus)
- 24 VDC output voltage
- Output current of 500 mA per channel
- Outputs work with solenoid valves, contactors, small motors
- A blue LED indicates the module's operating status
- Green LEDs (one for each input) indicate the outputs' states

Connector terminal assignment

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



Technical specifications

Order No.	600-220-0AD01
Notation	DO 4 x DC 24 V, 500 mA
Identifier / Type	2400 / 0140
Number of outputs	4
Electrically isolated from backplane bus	Yes
Channels electrically isolated from each other	No
Supply voltage U_p , U_s	
Rated	24 VDC
Ripple U_{ss}	Max. 3.6 V
Permissible range (with ripple)	20–30 V
Voltage for $t < 10$ ms	50 V
Output current	
Rated	500 mA
Leakage current	Max. 0.5 mA
Current draw	
External	Max. 20 mA + load
Internal	Max. 30 mA
Power dissipation	Max. 1.0 W
Short-circuit protection of outputs	Electronic, for each channel
Inductive cutoff voltage limit	–48 V
Hot-pluggable	Yes
Weight	Approx. 70 g

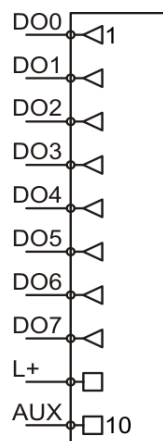
5.2.3. 600-220-0AH01, 8 DO x 24 VDC, 500 mA

General characteristics

- 8 outputs (electrically isolated from the backplane bus)
- 24 VDC output voltage
- Output current of 500 mA per channel
- Outputs work with solenoid valves, contactors, small motors
- A blue LED indicates the module's operating status
- Green LEDs (one for each input) indicate the outputs' states

Connector terminal assignment

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



Technical specifications

Order No.	600-220-0AH01
Notation	DO 8 x DC 24 V, 500 mA
Identifier / Type	2800 / 0180
Number of outputs	8
Electrically isolated from backplane bus	Yes
Channels electrically isolated from each other	No
Supply voltage U_p , U_s	
Rated	24 VDC
Ripple U_{ss}	Max. 3.6 V
Permissible range (with ripple)	20 ... 30 V
Voltage for $t < 10$ ms	50 V
Output current	
Rated	500 mA
Leakage current	Max. 0.5 mA
Current draw	
External	Max. 40 mA + load
Internal	Max. 35 mA
Power dissipation	Max. 2.5 W
Short-circuit protection of outputs	Electronic, for each channel
Inductive cutoff voltage limit	-48 V
Hot-pluggable	Yes
Weight	Approx. 70 g

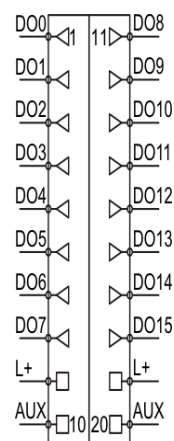
5.2.4. 600-220-0AP21, 16 DO x 24 VDC, 500 mA

General characteristics

- 16 outputs (electrically isolated from the backplane bus)
- 24 VDC output voltage
- Output current of 500 mA per channel
- Outputs work with solenoid valves, contactors, small motors
- A blue LED indicates the module's operating status
- Green LEDs (one for each input) indicate the outputs' states

Connector terminal assignment

Terminal	I/O	Terminal	I/O
1	Output 0	11	Output 8
2	Output 1	12	Output 9
3	Output 2	13	Output 10
4	Output 3	14	Output 11
5	Output 4	15	Output 12
6	Output 5	16	Output 13
7	Output 6	17	Output 14
8	Output 7	18	Output 15
9	L+, 24 VDC	19	L+, 24 VDC
10	AUX	20	AUX



Technical specifications

Order No.	600-220-0AP21
Notation	DO 16 x DC 24 V, 500 mA
Identifier / Type	2900 / 0190
Number of outputs	16
Electrically isolated from backplane bus	Yes
Channels electrically isolated from each other	No
Supply voltage U_p , U_s	
Rated	24 VDC
Ripple U_{ss}	Max. 3.6 V
Permissible range (with ripple)	20–30 V
Voltage for $t < 10$ ms	50 V
Output current	
Rated	500 mA
Leakage current	Max. 0.5 mA
Current draw	
External	Max. 80 mA + load
Internal	Max. 47 mA
Power dissipation	Max. 2.5 W
Short-circuit protection of outputs	Electronic, for each channel
Inductive cutoff voltage limit	-48 V
Hot-pluggable	Yes
Weight	Approx. 110 g

5.3. Digital Input/Output Modules

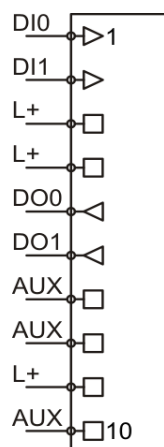
5.3.1. 600-230-0AD01, 2 x In / 2 x Out DIO 24 VDC, 500 mA

General characteristics

- 2 inputs (electrically isolated from the backplane bus)
- 24 VDC input voltage
- Can accommodate two-wire proximity sensors
- 2 outputs (electrically isolated from the backplane bus)
- 24 VDC output voltage
- Output current of 500 mA per channel
- Outputs work with solenoid valves, contactors, small motors
- A blue LED indicates the module's operating status
- Green LEDs (one for each input) indicate the inputs' and outputs' states

Connector terminal assignment

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



Technical specifications

Order No.	600-230-0AD01
Notation	DIO 2 x In / 2 x Out DC 24 V, 500 mA
Identifier / Type	3200 / 0122
Number of inputs	2
Input characteristic curve	Type 2, EN 61131-2
Reverse polarity protection for inputs	Yes
Input voltage	
For low signal ("0")	-3 V to 9 V
For high signal ("1")	12 V to 30 V
Number of outputs	2
Supply voltage U_p , U_s	
Rated	24 VDC
Ripple U_{ss}	Max. 3.6 V
Permissible range (with ripple)	20–30 V
Voltage for $t < 10$ ms	50 V
Output current	

Rated	500 mA
Leakage current	Max. 0.5 mA
Short-circuit protection of outputs	Electronic, for each channel
Inductive cutoff voltage limit	-48 V
Current draw	
External	Max. 10 mA + load
Internal	Max. 25 mA
Power dissipation	Max. 1.2 W
Electrically isolated from backplane bus	Yes
Channels electrically isolated from each other	No
Hot-pluggable	Yes
Weight	Approx. 70 g

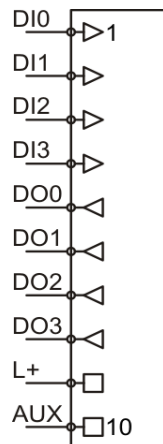
5.3.2. 600-230-0AH01, 4 x In / 4 x Out DIO 24 VDC, 500 mA

General characteristics

- 4 inputs (electrically isolated from the backplane bus)
- 24 VDC input voltage
- Can accommodate two-wire proximity sensors
- 4 outputs (electrically isolated from the backplane bus)
- 24 VDC output voltage
- Output current of 500 mA per channel
- Outputs work with solenoid valves, contactors, small motors
- A blue LED indicates the module's operating status
- Green LEDs (one for each input) indicate the inputs' and outputs' states

Connector terminal assignment

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



Technical specifications

Order No.	600-230-0AH01
Notation	DIO 4 x In / 4 x Out DC 24 V, 500 mA
Identifier / Type	3400 / 0144
Number of inputs	4
Input characteristic curve	Type 2, EN 61131-2
Reverse polarity protection for inputs	Yes
Input voltage	
For low signal ("0")	-3 V to 9 V
For high signal ("1")	12 V to 30 V
Number of outputs	4
Supply voltage U_p , U_s	
Rated	24 VDC
Ripple U_{ss}	Max. 3.6 V
Permissible range (with ripple)	20 ... 30 V
Voltage for $t < 10$ ms	50 V
Output current	
Rated	500 mA

Leakage current	Max. 0.5 mA
Short-circuit protection of outputs	Electronic, for each channel
Inductive cutoff voltage limit	-48 V
Current draw	
External	Max. 20 mA + load
Internal	Max. 28 mA
Power dissipation	Max. 1.95 W
Electrically isolated from backplane bus	Yes
Channels electrically isolated from each other	No
Hot-pluggable	Yes
Weight	Approx. 70 g

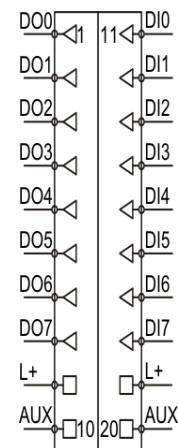
5.3.3. 600-230-0AP21, 8 x Out / 8 x In DIO 24 VDC, 500 mA

General characteristics

- 8 inputs (electrically isolated from the backplane bus)
- 24 VDC input voltage
- Can accommodate two-wire proximity sensors
- 8 outputs (electrically isolated from the backplane bus)
- 24 VDC output voltage
- Output current of 500 mA per channel
- Outputs work with solenoid valves, contactors, small motors
- A blue LED indicates the module's operating status
- Green LEDs (one for each input) indicate the inputs' and outputs' states

Connector terminal assignment

Terminal	I/O	Terminal	I/O
1	Output 0	11	Input 0
2	Output 1	12	Input 1
3	Output 2	13	Input 2
4	Output 3	14	Input 3
5	Output 4	15	Input 4
6	Output 5	16	Input 5
7	Output 6	17	Input 6
8	Output 7	18	Input 7
9	L+, 24 VDC	19	L+, 24 VDC
10	AUX	20	AUX



Technical specifications

Order No.	600-230-0AP21
Notation	DIO 8 x Out / 8 x In DC 24 V, 500 mA
Identifier / Type	3800 / 0188
Number of inputs	8
Input characteristic curve	Type 2, EN 61131-2
Reverse polarity protection for inputs	Yes
Input voltage	
For low signal ("0")	-3 V to 9 V
For high signal ("1")	12 V to 30 V
Number of outputs	8
Supply voltage U_p , U_s	
Rated	24 VDC
Ripple U_{ss}	Max. 3.6 V
Permissible range (with ripple)	20–30 V
Magnitude for $t < 10$ ms	50 V
Output current	
Rated	500 mA

Leakage current	Max. 0.5 mA
Short-circuit protection of outputs	Electronic, for each channel
Inductive cutoff voltage limit	-48 V
Current draw	
External	Max. 40 mA + load
Internal	Max. 35 mA
Power dissipation	Max. 4.35 W
Electrically isolated from backplane bus	Yes
Channels electrically isolated from each other	No
Hot-pluggable	Yes
Weight	Approx. 110 g

6. Analog Modules

6.1. Analog Input Modules

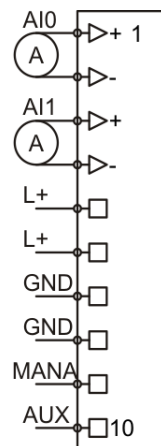
6.1.1. 600-250-4AB01, AI 2 x I, 0/4–20 mA, ±20 mA, 12-Bit

General characteristics

- 2 analog inputs for measuring current (electrically isolated from the backplane bus)
- 2 process input words
- Measuring ranges of 0–20 mA, 4–20 mA, ±20 mA, individually configurable for each channel
- Measurement resolution of up to 12 bits + sign
- Diagnostic messages
- Wire break detection (for 4–20 mA)
- Limit value alarms for each channel
- A bi-color LED (blue/red) indicates the module's operating status and any malfunctions

Connector terminal assignment

Terminal	I/O
1	AI0 +
2	AI0 -
3	AI1 +
4	AI1 -
5	L+, 24 VDC
6	L+, 24 VDC
7	L-, GND
8	L-, GND
9	Mana
10	AUX



Module parameters

Diagnostic alarm: ON / OFF

Overflow / underflow diagnosis: ON / OFF

Representation values: Simatic S7 / Simatic S5

Parameters for each channel

Wire break detection (*for 4–20 mA only*): ON / OFF

Interference frequency suppression: None / 10 Hz / 50 Hz / 60 Hz / 400 Hz

Measuring range: Disabled / 0–20 mA / 4–20 mA / ±20 mA

Limit value alarms enabled: ON / OFF

Upper / lower limit: 16-bit analog value (±27648)

Technical specifications

Order No.	600-250-4AB01
Notation	AI 2 x I, 0/4–20 mA, ± 20 mA, 12-bit
Identifier / Type	4200 / 0202
Number of inputs	2
Electrically isolated from backplane bus	Yes
Channels electrically isolated from each other	No
Current draw	
External	Not required
Internal	Max. 95 mA
Power dissipation	Max. 0.7 W
Measuring ranges / load resistance	0–20 mA / 50 ohms 4–20 mA / 50 ohms ± 20 mA / 50 ohms
Resolution	12 bit + sign
Measuring method	Integration
Interf. frequency suppression (configurable):	None / 10 Hz / 50 Hz / 60 Hz / 400 Hz
Diagnoses	Upper measuring range limit exceeded (overflow) Lower measuring range limit fallen below (underflow) Wire break (for 4–20 mA only) Parameter assignment error
Process alarms	Upper and lower limit per channel
Error limits	
Operational error limit	$\pm 0.5\%$ within the entire temperature range, relative to the nominal range
Basic error limit	$\pm 0.3\%$, operational error limit at 25 °C, relative to the nominal range
Temperature error	$\pm 0.005\%$ / K relative to the nominal range
Linearity error	$\pm 0.05\%$ / K relative to the nominal range
Repeating accuracy in steady-state condition at 25 °C	$\pm 0.05\%$ / K relative to the nominal range
Parameter configuration length	12 bytes
Group error indicator	Red LED
Hot-pluggable	Yes
Weight	Approx. 70 g

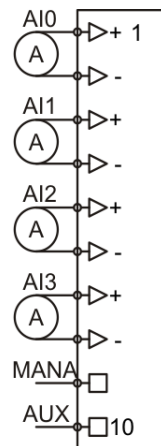
6.1.2. 600-250-4AD01, AI 4 x I, 0/4–20 mA, ±20 mA, 12-Bit

General characteristics

- 4 analog inputs for measuring current (electrically isolated from the backplane bus)
- 4 process input words
- Measuring ranges of 0–20 mA, 4–20 mA, ±20 mA, individually configurable for each channel
- Measurement resolution of up to 12 bits + sign
- Diagnostic messages
- Wire break detection (for 4–20 mA)
- Limit value alarms for each channel
- A bi-color LED (blue/red) indicates the module's operating status and any malfunctions

Connector terminal assignment

Terminal	I/O
1	AI0 +
2	AI0 -
3	AI1 +
4	AI1 -
5	AI2 +
6	AI2 -
7	AI3 +
8	AI3 -
9	Mana
10	AUX



Module parameters

Diagnostic alarm: ON / OFF

Overflow / underflow diagnosis: ON / OFF

Representation values: Simatic S7 / Simatic S5

Parameters for each channel

Wire break detection (*for 4–20 mA only*): ON / OFF

Interference frequency suppression: None / 10 Hz / 50 Hz / 60 Hz / 400 Hz

Measuring range: Disabled / 0–20 mA / 4–20 mA / ±20 mA

Limit value alarms enabled: ON / OFF

Upper / lower limit: 16-bit analog value (±27648)

Technical specifications

Order No.	600-250-4AD01
Notation	AI 4 x I, 0/4–20 mA, ± 20 mA, 12-bit
Identifier / Type	4400 / 0204
Number of inputs	4
Electrically isolated from backplane bus	Yes
Channels electrically isolated from each other	No
Current draw	
External	Not required
Internal	Max. 95 mA
Power dissipation	Max. 0.7 W
Measuring ranges / load resistance	0–20 mA / 50 ohms 4–20 mA / 50 ohms ± 20 mA / 50 ohms
Resolution	12 bit + sign
Measuring method	Integration
Interference frequency suppression	None / 10 Hz / 50 Hz / 60 Hz / 400 Hz
Diagnoses	Upper measuring range limit exceeded (overflow) Lower measuring range limit fallen below (underflow) Wire break (<i>for 4–20 mA only</i>) Parameter assignment error
Process alarms	Upper and lower limit per channel
Error limits	
Operational error limit	$\pm 0.5\%$ within the entire temperature range, relative to the nominal range
Basic error limit	$\pm 0.3\%$, operational error limit at 25 °C, relative to the nominal range
Temperature error	$\pm 0.005\%$ / K relative to the nominal range
Linearity error	$\pm 0.05\%$ / K relative to the nominal range
Repeating accuracy in steady-state condition at 25 °C	$\pm 0.05\%$ / K relative to the nominal range
Parameter configuration length	22 bytes
Group error indicator	Red LED
Hot-pluggable	Yes
Weight	Approx. 70 g

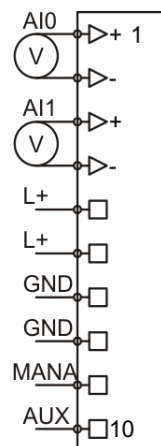
6.1.3. 600-252-4AB01, AI 2 x U, ± 10 V, 0–10 V, 1–5 V, 12-Bit

General characteristics

- 2 analog inputs for measuring voltage (electrically isolated from the backplane bus)
- 2 process input words
- Measuring ranges of 0–10 V, 1–5 V, ± 10 V, ± 5 V, ± 2.5 V, individually configurable for each channel
- Measurement resolution of up to 12 bits + sign
- Diagnostic messages
- Wire break detection (for 1–5 V)
- Limit value alarms for each channel
- A bi-color LED (blue/red) indicates the module's operating status and any malfunctions

Connector terminal assignment

Terminal	I/O
1	AI0 +
2	AI0 -
3	AI1 +
4	AI1 -
5	L+, 24 VDC
6	L+, 24 VDC
7	L-, GND
8	L-, GND
9	Mana
10	AUX



Module parameters

Diagnostic alarm: ON / OFF

Overflow / underflow diagnosis: ON / OFF

Representation values: Simatic S7 / Simatic S5

Parameters for each channel

Wire break detection (*for 1–5 V only*): ON / OFF

Interference frequency suppression: None / 10 Hz / 50 Hz / 60 Hz / 400 Hz

Measuring range: Disabled / 0–10 V / 1–5 V / ± 10 V / ± 5 V / ± 2.5 V

Limit value alarms enabled: ON / OFF

Upper / lower limit: 16-bit analog value (± 27648)

Technical specifications

Order No.	600-252-4AB01
Notation	AI 2 x U, ± 10 V, 0–10 V, 1–5 V, 12-bit
Identifier / Type	5200 / 0202
Number of inputs	2
Electrically isolated from backplane bus	Yes
Channels electrically isolated from each other	No
Current draw	
External	Not required
Internal	Max. 95 mA
Power dissipation	Max. 0.7 W
Measuring ranges / load resistance	0–10 V / 10 Mohms 1–5 V / 10 Mohms ± 10 V / 10 Mohms ± 5 V / 10 Mohms ± 2.5 V / 10 Mohms
Resolution	12 bit + sign
Measuring method	Integration
Interference frequency suppression	None / 10 Hz / 50 Hz / 60 Hz / 400 Hz
Diagnoses	Upper measuring range limit exceeded (overflow) Lower measuring range limit fallen below (underflow) Wire break (for 1–5 V only) Parameter assignment error
Process alarms	Upper and lower limit per channel
Error limits	
Operational error limit	$\pm 0.5\%$ within the entire temperature range, relative to the nominal range
Basic error limit	$\pm 0.3\%$, operational error limit at 25 °C, relative to the nominal range
Temperature error	$\pm 0.005\%$ / K relative to the nominal range
Linearity error	$\pm 0.05\%$ / K relative to the nominal range
Repeating accuracy in steady-state condition at 25 °C	$\pm 0.05\%$ / K relative to the nominal range
Parameter configuration length	12 bytes
Group error indicator	Red LED
Hot-pluggable	Yes
Weight	Approx. 70 g

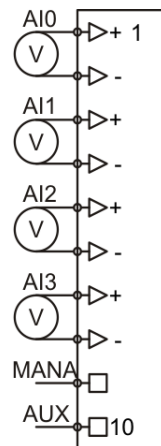
6.1.4. 600-252-4AD01, AI 4 x U, ± 10 V, 0–10 V, 1–5 V, 12-Bit

General characteristics

- 4 analog inputs for measuring voltage (electrically isolated from the backplane bus)
- 4 process input words
- Measuring ranges of 0–10 V, 1–5 V, ± 10 V, ± 5 V, ± 2.5 V, individually configurable for each channel
- Measurement resolution of up to 12 bits + sign
- Diagnostic messages
- Wire break detection (for 1–5 V)
- Limit value alarms for each channel
- A bi-color LED (blue/red) indicates the module's operating status and any malfunctions

Connector terminal assignment

Terminal	I/O
1	AI0 +
2	AI0 -
3	AI1 +
4	AI1 -
5	AI2 +
6	AI2 -
7	AI3 +
8	AI3 -
9	Mana
10	AUX



Module parameters

Diagnostic alarm: ON / OFF

Overflow / underflow diagnosis: ON / OFF

Representation values: Simatic S7 / Simatic S5

Parameters for each channel

Wire break detection (*for 1–5 V only*): ON / OFF

Interference frequency suppression: None / 10 Hz / 50 Hz / 60 Hz / 400 Hz

Measuring range: Disabled / 0–10 V / 1–5 V / ± 10 V / ± 5 V / ± 2.5 V

Limit value alarms enabled: ON / OFF

Upper / lower limit: 16-bit analog value (± 27648)

Technical specifications

Order No.	600-252-4AD01
Notation	AI 4 x U, ± 10 V, 0–10 V, 1–5 V, 12-bit
Identifier / Type	5400 / 0204
Number of inputs	4
Electrically isolated from backplane bus	Yes
Channels electrically isolated from each other	No
Current draw	
External	Not required
Internal	Max. 95 mA
Power dissipation	Max. 0.7 W
Measuring ranges / load resistance	0–10 V / 10 Mohms 1–5 V / 10 Mohms ± 10 V / 10 Mohms ± 5 V / 10 Mohms ± 2.5 V / 10 Mohms
Resolution	12 bit + sign
Measuring method	Integration
Interference frequency suppression	None / 10 Hz / 50 Hz / 60 Hz / 400 Hz
Diagnoses	Upper measuring range limit exceeded (overflow) Lower measuring range limit fallen below (underflow) Wire break (for 1–5 V only) Parameter assignment error
Process alarms	Upper and lower limit per channel
Error limits	
Operational error limit	$\pm 0.5\%$ within the entire temperature range, relative to the nominal range
Basic error limit	$\pm 0.3\%$, operational error limit at 25 °C, relative to the nominal range
Temperature error	$\pm 0.005\%$ / K relative to the nominal range
Linearity error	$\pm 0.05\%$ / K relative to the nominal range
Repeating accuracy in steady-state condition at 25 °C	$\pm 0.05\%$ / K relative to the nominal range
Parameter configuration length	22 bytes
Group error indicator	Red LED
Hot-pluggable	Yes
Weight	Approx. 70 g

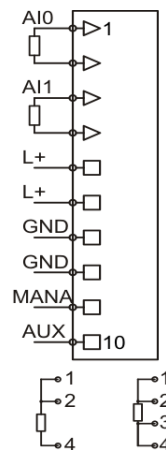
6.1.5. 600-253-4AB01, AI 1/2 x R, RTD, 16-Bit, 2/3/4-wire

General characteristics

- 1/2 inputs for measuring resistance (electrically isolated from the backplane bus)
- 2 process input words
- Measuring ranges: 150 ohms, 300 ohms, 600 ohms, 3000 ohms, 6000 ohms, PT100, PT1000, Ni100, Ni1000, LG-Ni1000, individually configurable for each channel
- 2/3/4-wire sensors
- Measurement resolution of up to 15 bits + sign
- Diagnostic messages
- Wire break detection
- Limit value alarms for each channel
- A bi-color LED (blue/red) indicates the module's operating status and any malfunctions

Connector terminal assignment

Terminal	I/O
1	AI0 +
2	AI0 -
3	AI1 +
4	AI1 -
5	L+, 24 VDC
6	L+, 24 VDC
7	L-, GND
8	L-, GND
9	Mana
10	AUX



Module parameters

Diagnostic alarm: ON / OFF

Overflow / underflow diagnosis: ON / OFF

Representation values: Simatic S7 / Simatic S5

Temperature unit: Celsius x 10 / Fahrenheit x 10 / Kelvin x 10

Parameters for each channel

Wire break detection: ON / OFF

Interference frequency suppression: None / 10 Hz / 50 Hz / 60 Hz / 400 Hz

Measuring range: 150 ohms / 300 ohms / 600 ohms / 3000 ohms / 6000 ohms / PT100 / PT1000 / Ni100 / Ni1000 / LG-Ni1000

Sensor type: Disabled / 2-wire / 3-wire (*channel 0 only*) / 4-wire (*channel 0 only*)

Limit value alarms enabled: ON / OFF

Upper / lower limit: 16-bit analog value (± 27648)

Technical specifications

Order No.	600-253-4AB01
Notation	AI 1/2 x R, RTD, 16-bit, 2/3/4-wire
Identifier / Type	6200 / 0202
Number of inputs	1 / 2
Electrically isolated from backplane bus	Yes
Channels electrically isolated from each other	No
Current draw	
External	Not required
Internal	Max. 140 mA
Power dissipation	Max. 1.0 W
Measuring ranges	150 ohms 300 ohms 600 ohms 3000 ohms 6000 ohms PT100 PT1000 Ni100 Ni1000 LG-Ni1000
Resolution	15 bit + sign
Measuring method	Integration
Interference frequency suppression	None / 10 Hz / 50 Hz / 60 Hz / 400 Hz
Diagnoses	Upper measuring range limit exceeded (overflow) Lower measuring range limit fallen below (underflow) Wire break Parameter assignment error
Process alarms	Upper and lower limit per channel
Error limits	
Operational error limit	± 0.5% within the entire temperature range, relative to the nominal range
Basic error limit	± 0.3%, operational error limit at 25 °C, relative to the nominal range
Temperature error	± 0.005% / K relative to the nominal range
Linearity error	± 0.05% / K relative to the nominal range
Repeating accuracy in steady-state condition at 25 °C	± 0.05% / K relative to the nominal range
Parameter configuration length	14 bytes
Group error indicator	Red LED
Hot-pluggable	Yes
Weight	Approx. 70 g

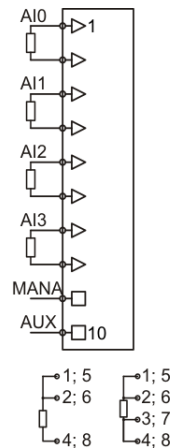
6.1.6. 600-253-4AD01, AI 2/4 x R, RTD, 16-Bit, 2/3/4-wire

General characteristics

- 2/4 inputs for measuring resistance (electrically isolated from the backplane bus)
- 4 process input words
- Measuring ranges: 150 ohms, 300 ohms, 600 ohms, 3000 ohms, 6000 ohms, PT100, PT1000, Ni100, Ni1000, LG-Ni1000, individually configurable for each channel
- 2/3/4-wire sensors
- Measurement resolution of up to 15 bits + sign
- Diagnostic messages
- Wire break detection
- Limit value alarms for each channel
- A bi-color LED (blue/red) indicates the module's operating status and any malfunctions

Connector terminal assignment

Terminal	I/O
1	AI0 +
2	AI0 -
3	AI1 +
4	AI1 -
5	AI2 +
6	AI2 -
7	AI3 +
8	AI3 -
9	Mana
10	AUX



Module parameters

Diagnostic alarm: ON / OFF

Overflow / underflow diagnosis: ON / OFF

Representation values: Simatic S7 / Simatic S5

Temperature unit: Celsius x 10 / Fahrenheit x 10 / Kelvin x 10

Parameters for each channel

Wire break detection: ON / OFF

Interference frequency suppression: None / 10 Hz / 50 Hz / 60 Hz / 400 Hz

Measuring range: 150 ohms / 300 ohms / 600 ohms / 3000 ohms / 6000 ohms / PT100 / PT1000 / Ni100 / Ni1000 / LG-Ni1000

Sensor type: Disabled / 2-wire / 3-wire (*channels 0 & 2 only*) / 4-wire (*channels 0 & 2 only*)

Limit value alarms enabled: ON / OFF

Upper / lower limit: 16-bit analog value (± 27648)

Technical specifications

Order No.	600-253-4AD01
Notation	AI 2/4 x R, RTD, 16-bit, 2/3/4-wire
Identifier / Type	6400 / 0204
Number of inputs	2 / 4
Electrically isolated from backplane bus	Yes
Channels electrically isolated from each other	No
Current draw	
External	Not required
Internal	Max. 140 mA
Power dissipation	Max. 1.0 W
Measuring ranges	150 ohms 300 ohms 600 ohms 3000 ohms 6000 ohms PT100 PT1000 Ni100 Ni1000 LG-Ni1000
Resolution	15 bit + sign
Measuring method	Integration
Interference frequency suppression	None / 10 Hz / 50 Hz / 60 Hz / 400 Hz
Diagnoses	Upper measuring range limit exceeded (overflow) Lower measuring range limit fallen below (underflow) Wire break Parameter assignment error
Process alarms	Upper and lower limit per channel
Error limits	
Operational error limit	± 0.5% within the entire temperature range, relative to the nominal range
Basic error limit	± 0.3%, operational error limit at 25 °C, relative to the nominal range
Temperature error	± 0.005% / K relative to the nominal range
Linearity error	± 0.05% / K relative to the nominal range
Repeating accuracy in steady-state condition at 25 °C	± 0.05% / K relative to the nominal range
Parameter configuration length	26 bytes
Group error indicator	Red LED
Hot-pluggable	Yes
Weight	Approx. 70 g

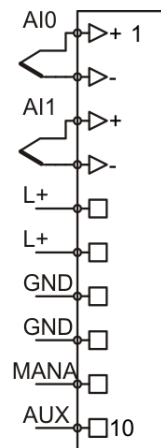
6.1.7. 600-254-4AB01, AI 2 x TC, 16-Bit

General characteristics

- 2 inputs (electrically isolated from the backplane bus)
- 2 process input words
- 2 process output words (for temperature compensation)
- Measuring range of ± 80 mV
- Supported thermocouples: E, J, K, N, R, S, T, B, C, L
- Measurement resolution of up to 15 bits + sign
- External or internal temperature compensation
- Diagnostic messages
- Limit value alarms for each channel
- A bi-color LED (blue/red) indicates the module's operating status and any malfunctions

Connector terminal assignment

Terminal	I/O
1	AI0 +
2	AI0 -
3	AI1 +
4	AI1 -
5	L+, 24 VDC
6	L+, 24 VDC
7	L-, GND
8	L-, GND
9	Mana
10	AUX



Module parameters

Diagnostic alarm: ON / OFF

Overflow / underflow diagnosis: ON / OFF

Representation values: Simatic S7 / Simatic S5 (*for ± 80 mV only*)

Temperature unit: Celsius x 10 / Fahrenheit x 10 / Kelvin x 10

Parameters for each channel

Wire break detection: ON / OFF

Interference frequency suppression: None / 10 Hz / 50 Hz / 60 Hz / 400 Hz

Measuring range: ± 80 mV

Thermocouples: E / J / K / N / R / S / T / B / C / L

Temperature compensation: Internal / External / Process data-based

Limit value alarms enabled: ON / OFF

Upper / lower limit: 16-bit analog value (± 27648)

Technical specifications

Order No.	600-254-4AB01
Notation	AI 2 x TC, 16-bit
Identifier / Type	7200 / 0222
Number of inputs	2
Electrically isolated from backplane bus	Yes
Channels electrically isolated from each other	No
Current draw	
External	Not required
Internal	Max. 95 mA
Power dissipation	Max. 0.7 W
Measuring ranges	±80 mV
Thermocouples	E (-270 °C to 990 °C) J (-210 °C to 1,200 °C) K (-270 °C to 1,380 °C) N (-270 °C to 1,320 °C) R (-50 °C to 1,775 °C) S (-50 °C to 1,775 °C) T (-270 °C to 405 °C) B (0 °C to 1,800 °C) C (0 °C to 2,320 °C) L (0 °C to 900 °C)
Resolution	15 bit + sign
Measuring method	Integration
Interference frequency suppression	None / 10 Hz / 50 Hz / 60 Hz / 400 Hz
Diagnoses	Upper measuring range limit exceeded (overflow) Lower measuring range limit fallen below (underflow) Parameter assignment error
Process alarms	Upper and lower limit per channel
Error limits	
Operational error limit	± 0.5% within the entire temperature range, relative to the nominal range
Basic error limit	± 0.3%, operational error limit at 25 °C, relative to the nominal range
Temperature error	± 0.005% / K relative to the nominal range
Linearity error	± 0.05% / K relative to the nominal range
Repeating accuracy in steady-state condition at 25 °C	± 0.05% / K relative to the nominal range
Parameter configuration length	26 bytes
Group error indicator	Red LED
Hot-pluggable	Yes
Weight	Approx. 70 g

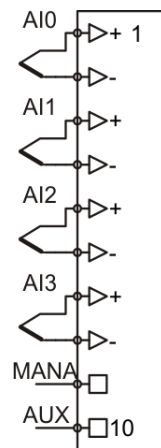
6.1.8. 600-254-4AD01, AI 4 x TC, 16-Bit

General characteristics

- 4 inputs (electrically isolated from the backplane bus)
- 4 process input words
- 4 process output words (for temperature compensation)
- Measuring range of ± 80 mV
- Supported thermocouples: E, J, K, N, R, S, T, B, C, L
- Measurement resolution of up to 15 bits + sign
- External or internal temperature compensation
- Diagnostic messages
- Limit value alarms for each channel
- A bi-color LED (blue/red) indicates the module's operating status and any malfunctions

Connector terminal assignment

Terminal	I/O
1	AI0 +
2	AI0 -
3	AI1 +
4	AI1 -
5	AI2 +
6	AI2 -
7	AI3 +
8	AI3 -
9	Mana
10	AUX



Module parameters

Diagnostic alarm: ON / OFF

Overflow / underflow diagnosis: ON / OFF

Representation values: Simatic S7 / Simatic S5 (*for ± 80 mV only*)

Temperature unit: Celsius x 10 / Fahrenheit x 10 / Kelvin x 10

Parameters for each channel

Wire break detection: ON / OFF

Interference frequency suppression: None / 10 Hz / 50 Hz / 60 Hz / 400 Hz

Measuring range: ± 80 mV

Thermocouples: E / J / K / N / R / S / T / B / C / L

Temperature compensation: Internal / External / Process data-based

Limit value alarms enabled: ON / OFF

Upper / lower limit: 16-bit analog value (± 27648)

Technical specifications

Order No.	600-254-4AD01
Notation	AI 4 x TC, 16-bit
Identifier / Type	7400 / 0244
Number of inputs	4
Electrically isolated from backplane bus	Yes
Channels electrically isolated from each other	No
Current draw	
External	Not required
Internal	Max. 95 mA
Power dissipation	Max. 0.7 W
Measuring ranges	±80 mV
Thermocouples	E (-270 °C to 990 °C) J (-210 °C to 1,200 °C) K (-270 °C to 1,380 °C) N (-270 °C to 1,320 °C) R (-50 °C to 1,775 °C) S (-50 °C to 1,775 °C) T (-270 °C to 405 °C) B (0 °C to 1,800 °C) C (0 °C to 2,320 °C) L (0 °C to 900 °C)
Resolution	15 bit + sign
Measuring method	Integration
Interference frequency suppression	None / 10 Hz / 50 Hz / 60 Hz / 400 Hz
Diagnoses	Upper measuring range limit exceeded (overflow) Lower measuring range limit fallen below (underflow) Parameter assignment error
Process alarms	Upper and lower limit per channel
Error limits	
Operational error limit	± 0.5% within the entire temperature range, relative to the nominal range
Basic error limit	± 0.3%, operational error limit at 25 °C, relative to the nominal range
Temperature error	± 0.005% / K relative to the nominal range
Linearity error	± 0.05% / K relative to the nominal range
Repeating accuracy in steady-state condition at 25 °C	± 0.05% / K relative to the nominal range
Parameter configuration length	26 bytes
Group error indicator	Red LED
Hot-pluggable	Yes
Weight	Approx. 70 g

6.2. Analog Output Modules

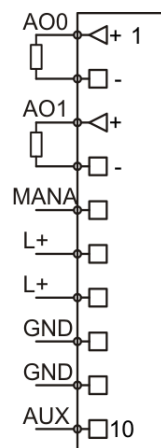
6.2.1. 600-260-4AB01, AO 2 x I, 0/4–20 mA, 12-Bit

General characteristics

- 2 analog outputs (electrically isolated from the backplane bus)
- 2 process output words (4 bytes)
- Output range of 0–20 mA, 4–20 mA
- Resolution of up to 12 bits + sign
- Substitute value functionality
- Diagnostic messages
- A bi-color LED (blue/red) indicates the module's operating status and any malfunctions

Connector terminal assignment

Terminal	I/O
1	AO0 +
2	AO0 -
3	AO1 +
4	AO1 -
5	Mana
6	L+, 24 VDC
7	L+, 24 VDC
8	L-, GND
9	L-, GND
10	AUX



Module parameters

Diagnostic alarm: ON / OFF

Value format: Simatic S7 / Simatic S5

Parameters for each channel

Wire break detection: ON / OFF

Output range: 0–20 mA / 4–20 mA

Available substitute value options: Outputs de-energized / Retain last value / Apply substitute value

Substitute value: 16-bit analog value (± 27648)

Technical specifications

Order No.	600-260-4AB01
Notation	AO 2 x I, 0/4–20 mA, 12-bit
Identifier / Type	8200 / 0220
Number of outputs	2
Output ranges	0–20 mA 4–20 mA
Electrically isolated from backplane bus	Yes
Channels electrically isolated from each other	No
Current draw	
External	Max. 60 mA
Internal	Max. 26 mA
Power dissipation	Max. 1.9 W
Connection for actuators	2-wire connection
Load resistance	Max. 600 ohms
Inductive load	Max. 100 mH
No-load voltage	Max. 18 V
Resolution	12 bits
Settling time	0.2 ms for resistive loads 2.2 ms for capacitive loads 0.5 ms for inductive loads (≤ 1 mH) 3.3 ms for inductive loads (≤ 3.3 mH)
Diagnoses	No external reference voltage (L+) Wire break Parameter assignment error
Error limits	
Operational error limit	$\pm 0.5\%$ within the entire temperature range, relative to the nominal range
Basic error limit	$\pm 0.3\%$, operational error limit at 25 °C, relative to the nominal range
Temperature error	$\pm 0.005\%$ / K relative to the nominal range
Linearity error	$\pm 0.05\%$ / K relative to the nominal range
Repeating accuracy in steady-state condition at 25 °C	$\pm 0.05\%$ / K relative to the nominal range
Parameter configuration length	7 bytes
Group error indicator	Red LED
Hot-pluggable	Yes
Weight	Approx. 70 g

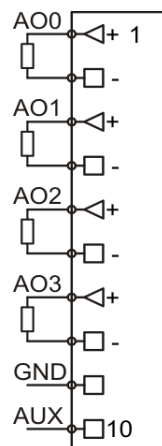
6.2.2. 600-260-4AD01, AO 4 x I, 0/4–20 mA, 12-Bit

General characteristics

- 4 analog outputs (electrically isolated from the backplane bus)
- 4 process output words (8 bytes)
- Output range of 0–20 mA, 4–20 mA
- Resolution of up to 12 bits
- Substitute value functionality
- Diagnostic messages
- A bi-color LED (blue/red) indicates the module's operating status and any malfunctions

Connector terminal assignment

Terminal	I/O
1	AO0 +
2	AO0 -
3	AO1 +
4	AO1 -
5	AO2 +
6	AO2 -
7	AO3 +
8	AO3 -
9	GND
10	AUX



Module parameters

Diagnostic alarm: ON / OFF

Value format: Simatic S7 / Simatic S5

Parameters for each channel

Wire break detection: ON / OFF

Output range of 0–20 mA, 4–20 mA

Available substitute value options: Outputs de-energized / Retain last value / Apply substitute value

Substitute value: 16-bit analog value (± 27648)

Technical specifications

Order No.	600-260-4AD01
Notation	AO 4 x I, 0/4–20 mA, 12-bit
Identifier / Type	8400 / 0240
Number of outputs	4
Output ranges	0–20 mA 4–20 mA
Electrically isolated from backplane bus	Yes
Channels electrically isolated from each other	No
Current draw	
External	Max. 100 mA
Internal	Max. 26 mA
Power dissipation	Max. 3 W
Connection for actuators	2-wire connection
Load resistance	Max. 600 ohms
Inductive load	Max. 100 mH
No-load voltage	Max. 18 V
Resolution	12 bits
Settling time	0.2 ms for resistive loads 2.2 ms for capacitive loads 0.5 ms for inductive loads (≤ 1 mH) 3.3 ms for inductive loads (≤ 3.3 mH)
Diagnoses	No external reference voltage (L+) Wire break Parameter assignment error
Error limits	
Operational error limit	$\pm 0.5\%$ within the entire temperature range, relative to the nominal range
Basic error limit	$\pm 0.3\%$, operational error limit at 25 °C, relative to the nominal range
Temperature error	$\pm 0.005\%$ / K relative to the nominal range
Linearity error	$\pm 0.05\%$ / K relative to the nominal range
Repeating accuracy in steady-state condition at 25 °C	$\pm 0.05\%$ / K relative to the nominal range
Parameter configuration length	13 bytes
Group error indicator	Red LED
Hot-pluggable	Yes
Weight	Approx. 70 g

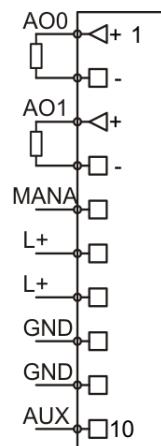
6.2.3. 600-261-4AB01, AO 2 x U, ± 10 V, 0–10 V, 1–5 V, 12-Bit

General characteristics

- 2 analog outputs (electrically isolated from the backplane bus)
- 2 process output words (4 bytes)
- Output range of ± 10 V, 0–10 V, 1–5 V
- Resolution of up to 12 bits + sign
- Substitute value functionality
- Diagnostic messages
- A bi-color LED (blue/red) indicates the module's operating status and any malfunctions

Connector terminal assignment

Terminal	I/O
1	AO0 +
2	AO0 -
3	AO1 +
4	AO1 -
5	Mana
6	L+, 24 VDC
7	L+, 24 VDC
8	L-, GND
9	L-, GND
10	AUX



Module parameters

Diagnostic alarm: ON / OFF

Value format: Simatic S7 / Simatic S5

Parameters for each channel

Wire break detection: ON / OFF

Output range of ± 10 V, 0–10 V, 1–5 V

Available substitute value options: Outputs de-energized / Retain last value / Apply substitute value

Substitute value: 16-bit analog value (± 27648)

Technical specifications

Order No.	600-261-4AB01
Notation	AO 2 x U, ± 10 V, 0–10 V, 1–5 V, 12-bit
Identifier / Type	9200 / 0220
Number of outputs	2
Output ranges	± 10 V 0–10 V 1–5 V
Electrically isolated from backplane bus	Yes
Channels electrically isolated from each other	No
Current draw	
External	Max. 45 mA
Internal	Max. 24 mA
Power dissipation	Max. 1.6 W
Connection for actuators	2-wire connection
Load resistance	Min. 1 kohm
Capacitive load	Max. 1 μ F
Short-circuit protection	Yes
Short-circuit current	Max. 25 mA
Resolution	12 bits + sign
Settling time	0.2 ms for resistive loads 2.2 ms for capacitive loads 0.5 ms for inductive loads (≤ 1 mH) 3.3 ms for inductive loads (≤ 3.3 mH)
Diagnoses	No external reference voltage (L+) Short circuit to GND Parameter assignment error
Error limits	
Operational error limit	$\pm 0.5\%$ within the entire temperature range, relative to the nominal range
Basic error limit	$\pm 0.3\%$, operational error limit at 25 °C, relative to the nominal range
Temperature error	$\pm 0.005\%$ / K relative to the nominal range
Linearity error	$\pm 0.05\%$ / K relative to the nominal range
Repeating accuracy in steady-state condition at 25 °C	$\pm 0.05\%$ / K relative to the nominal range
Parameter configuration length	7 bytes
Group error indicator	Red LED
Hot-pluggable	Yes
Weight	Approx. 70 g

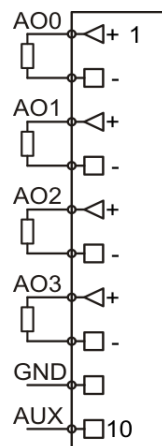
6.2.4. 600-261-4AD01, AO 4 x U, ± 10 V, 0–10 V, 1–5 V, 12-Bit

General characteristics

- 4 analog outputs (electrically isolated from the backplane bus)
- 4 process output words (8 bytes)
- Output range of ± 10 V, 0–10 V, 1–5 V
- Resolution of up to 12 bits + sign
- Substitute value functionality
- Diagnostic messages
- A bi-color LED (blue/red) indicates the module's operating status and any malfunctions

Connector terminal assignment

Terminal	I/O
1	AO0 +
2	AO0 -
3	AO1 +
4	AO1 -
5	AO2 +
6	AO2 -
7	AO3 +
8	AO3 -
9	GND
10	AUX



Module parameters

Diagnostic alarm: ON / OFF

Value format: Simatic S7 / Simatic S5

Parameters for each channel

Wire break detection: ON / OFF

Output range of ± 10 V, 0–10 V, 1–5 V

Available substitute value options: Outputs de-energized / Retain last value / Apply substitute value

Substitute value: 16-bit analog value (± 27648)

Technical specifications

Order No.	600-261-4AD01
Notation	AO 4 x U, ± 10 V, 0–10 V, 1–5 V, 12-bit
Identifier / Type	9400 / 0240
Number of outputs	4
Output range	± 10 V 0–10 V 1–5 V
Electrically isolated from backplane bus	Yes
Channels electrically isolated from each other	No
Current draw	
External	Max. 75 mA
Internal	Max. 24 mA
Power dissipation	Max. 2.4 W
Connection for actuators	2-wire connection
Load resistance	Min. 1 kohm
Capacitive load	Max. 1 μ F
Short-circuit protection	Yes
Short-circuit current	Max. 25 mA
Resolution	12 bits + sign
Settling time	0.2 ms for resistive loads 2.2 ms for capacitive loads 0.5 ms for inductive loads (≤ 1 mH) 3.3 ms for inductive loads (≤ 3.3 mH)
Diagnoses	No external reference voltage (L+) Short circuit to GND Parameter assignment error
Error limits	
Operational error limit	$\pm 0.5\%$ within the entire temperature range, relative to the nominal range
Basic error limit	$\pm 0.3\%$, operational error limit at 25 °C, relative to the nominal range
Temperature error	$\pm 0.005\%$ / K relative to the nominal range
Linearity error	$\pm 0.05\%$ / K relative to the nominal range
Repeating accuracy in steady-state condition at 25 °C	$\pm 0.05\%$ / K relative to the nominal range
Parameter configuration length	13 bytes
Group error indicator	Red LED
Hot-pluggable	Yes
Weight	Approx. 70 g

6.3. Basic Analog Value Representation Principles

6.3.1. General Information

CPUs are only able to process analog values as binary values. Analog input modules convert analog input values into binary numbers with a resolution of 16 bits.

6.3.2. Analog Value Representation with 16-Bit Resolution

Analog values are represented as two's complement fixed-point numbers. Each analog value's sign is always represented by bit 15, i.e., if bit 15 = 1, the value is negative.

	Sig n	High byte								Low byte							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Value of bit	2 ¹⁵	2 ¹⁴	2 ¹³	2 ¹²	2 ¹¹	2 ¹⁰	2 ⁹	2 ⁸	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰	

6.3.3. Reading Resolution

In certain analog input modules, the analog values' resolution may be lower than 15 bits. When the resolution is lower than 15 bits, the "x" bits are set to "0" starting from the bit with the lowest value.

Resolution in bits (+ sign)	Units		Analog value	
	Decimal	Hexadecimal	High byte	Low byte
10	32	20h	Sign 0 0 0 0 0 0 0	0 0 1 x x x x x
11	16	10h	Sign 0 0 0 0 0 0 0	0 0 0 1 x x x x
12	8	8h	Sign 0 0 0 0 0 0 0	0 0 0 0 1 x x x
13	4	4h	Sign 0 0 0 0 0 0 0	0 0 0 0 0 1 x x
14	2	2h	Sign 0 0 0 0 0 0 0	0 0 0 0 0 0 1 x
15	1	1h	Sign 0 0 0 0 0 0 0	0 0 0 0 0 0 0 1

6.4. Analog Value Representation in SIMATIC S7 Format

6.4.1. Simatic S7 Analog Value Representation for Voltage Measuring Ranges

System		Voltage measuring range				Range
Dec.	Hex.	±10 V	±5 V	±2.5 V	±80 mV	
32767	7FFF					Overflow
30720	7800					
30719	77FF	11.111 V	5.555 V	2.778 V		Over-range
27649	6C01					
27648	6C00	10.000 V	5.000 V	2.500 V	80 mV	Nominal range
20736	5100	7.500 V	3.75 V	1.875 V		
1	1	361.7 μV	180.8 μV	90.4 μV		
0	0	0 V	0 V	0 V	0 mV	
-1	FFFF	-361.7 μV	-180.8 μV	-90.4 μV		
-20736	AF00	-7.500 V	-3.750 V	-1.875 V		
-27648	9400	-10.000 V	-5.000 V	-2.500 V	-80 mV	Under-range
-27649	93FF					
-30719	8801	-11.111 V	-5.555 V	-2.778 V		Underflow
-30720	8800					
-32768	8000					

System		Voltage measuring range		Range
Dec.	Hex.	1 to 5 V	0 to 10 V	
32767	7FFF			Overflow
30720	7800			
30719	77FF	5.704 V	11.759 V	Over-range
27649	6C01			
27648	6C00	5 V	10 V	Nominal range
20736	5100	4 V	7.5 V	
1	1	1 V + 144.7 µV	361.7 µV	
0	0	1 V	0 V	
-1	FFFF	1 V - 144.7 µV	Negative values not allowed	Under-range
-4864	ED00	0.296 V		Underflow
-4865	ECFF			
-32768	8000			

6.4.2. Simatic S7 Analog Value Representation for Current Measuring Ranges

System		Current measuring range		Range
Dec.	Hex.	±20 mA	0–20 mA	
32767	7FFF			Overflow
30720	7800			
30719	77FF			Over-range
27649	6C01			
27648	6C00	20 mA	20 mA	Nominal range
20736	5100	15 mA	15 mA	
1	1	723.3 µA	723.3 µA	
0	0	0 mA	0 mA	
-1	FFFF	-723.3 µA	Negative values not allowed	
-4864	ED00	-3.52 mA		
-20736	AF00	-15 mA		
-27648	9400	-20 mA		
-27649	93FF			
-30719	8801			
-30720	8800			Under-range
-32768	8000			Underflow

System		Current measuring range	Range
Dec.	Hex.	4–20 mA	
32767	7FFF		Overflow
30720	7800		
30719	77FF		Over-range
27649	6C01		
27648	6C00	20 mA	Nominal range
20736	5100	16 mA	
1	1	4 mA + 723.3 μ A	
0	0	4 mA	
-1	FFFF	4 mA - 723.3 μ A	Under-range
-4864	ED00	1.185 mA	
-4865	AF00		Underflow
-32768	8000		

6.4.3. Simatic S7 Analog Value Representation for Resistance Measuring Range

System		Resistance measuring range					Range
Dec.	Hex.	150 Ω	300 Ω	600 Ω	3000 Ω	6000 Ω	
32767	7FFF						Overflow
30720	7800						
30719	77FF	166.66 Ω	333.32 Ω	666.64 Ω	3333 Ω	6666 Ω	Over-range
27649	6C01						
27648	6C00	150 Ω	300 Ω	600 Ω	3000 Ω	6000 Ω	Nominal range
20736	5100	112,5 Ω	225 Ω	450 Ω	2250 Ω	4500 Ω	
13824	3600	75 Ω	150 Ω	300 Ω	1500 Ω	3000 Ω	
1	1	5.43 m Ω	10.85 m Ω	21.70 m Ω	108.5 m Ω	217.0 m Ω	
0	0	0 Ω	0 Ω	0 Ω	0 Ω	0 Ω	
(Negative values are physically impossible)							Under-range

6.4.4. Analog Value Representation for PT100/PT1000

Temperature in °C	Units		Temperature in °F	Units		Temperature in °K	Units	
	Dec.	Hex.		Dec.	Hex.		Dec.	Hex.
> 1000.0	32767	7FFF	>1832.0	32767	7FFF	>1273.2	32767	7FFF
1000.0	10000	2710	1832.0	18320	4790	1273.2	12732	31BC
500.0	5000	1388	932.0	9320	2468	773.2	7732	1E34
1.0	10	000A	33.8	338	0152	274.2	2742	0AB6
0.1	1	0001	32.2	322	0142	273.3	2733	0AAD
0.0	0	0000	32.0	320	0140	273.2	2732	0AAC
-200.0	-2000	F830	-328.0	-3280	F330	73.2	732	2DC
-200.1	-2001	F82F	-328.1	-3281	F32F	73.1	731	2DB
-243.0	-2430	F682	-405.4	-4054	F02A	30.2	302	012E

6.4.5. Analog Value Representation for Ni100/Ni1000/LG-Ni1000

Temperature in °C	Units		Temperature in °F	Units		Temperature in °K	Units	
	Dec.	Hex.		Dec.	Hex.		Dec.	Hex.
> 295.0	32767	7FFF	> 563.1	32767	7FFF	> 568.2	32767	7FFF
295.0	2950	0B86	563.0	5630	15FE	568.2	5682	1632
200.0	2000	07D0	392.0	3920	0F50	473.2	4732	127C
1.0	10	000A	33.8	338	0152	274.2	2742	0AB6
0.1	1	0001	32.2	322	0142	273.3	2733	0AAD
0.0	0	0000	32.0	320	0140	273.2	2732	0AAC
-110.0	-1100	FBB4	-166.0	-1660	F984	163.2	1632	0660
< -110.0	-32768	8000	< -166.0	-32768	8000	< 163.2	-32768	8000

6.4.6. Analog Value Representation for TC

The way in which analog values for thermocouples are represented is the same as that used for RTD sensors (e.g., PT100). However, the actual temperature ranges depend on the thermocouple type being used:

Type B	0 to +1,800 °C
Type E	-27 to +990 °C
Type J	-210 to +1,200 °C
Type L	0 to +900 °C
Type K	-270 to +1,380 °C
Type N	-270 to +1,320 °C
Type R	-50 to +1,775 °C
Type S	-50 to +1,775 °C
Type T	-270 to +405 °C
Type C	0 to +2,320 °C

6.5. Analog Value Representation in SIMATIC S5 Format

6.5.1. Simatic S5 Analog Value Representation for Voltage Measuring Ranges

System		Voltage measuring range				Range
Dec.	Hex.	±10 V	±5 V	±2.5 V	±80 mV	
32767	7FFF					Overflow
18432	4800					
18431	47FF	11.25 V	5.62 V	2.81 V	90 mV	Over-range
16385	4001					
16384	4000	10.000 V	5.000 V	2.500 V	80 mV	Nominal range
12288	3000	7.500 V	3.75 V	1.875 V		
1	1	610.4 μV	305.2 μV	152.6 μV		
0	0	0 V	0 V	0 V	0 mV	
-1	FFFF	-610.4 μV	-305.2 μV	-152.6 μV		
-12228	D000	-7.500 V	-3.750 V	-1.875 V		
-16384	C000	-10.000 V	-5.000 V	-2.500 V	-80 mV	Under-range
-16385	BFFF					
-18431	B801	-11.25 V	-5.62 V	-2.81 V	-90 mV	Underflow
-18432	B800					
-32768	8000					

System		Voltage measuring range		Range
Dec.	Hex.	1 to 5 V	0 to 10 V	
32767	7FFF			Overflow
30720	7800			
30719	77FF	5.5 V	11.25 V	Over-range
16385	4001			
16384	4000	5 V	10 V	Nominal range
12288	3000	4 V	7.5 V	
1	1	1 V + 244.1 µV	610.4 µV	
0	0	1 V	0 V	
-1	FFFF	1 V - 244.1 µV	Negative values not allowed	Under-range
-2048	F800	0.5 V		Underflow
-2049	F7FF			
-32768	8000			

6.5.2. Simatic S5 Analog Value Representation for Current Measuring Ranges

System		Current measuring range		Range
Dec.	Hex.	±20 mA	0–20 mA	
32767	7FFF			Overflow
18432	4800			
18431	47FF			Over-range
16385	4001			
16384	4000	20 mA	20 mA	Nominal range
12288	3000	15 mA	15 mA	
1	1	723.3 µA	723.3 µA	
0	0	0 mA	0 mA	
-1	FFFF	-723.3 µA	Negative values not allowed	
-12228	D000	-15 mA		
-16384	C000	-20 mA		
-16385	BFFF			Under-range
-18431	B801			
-18432	B800			Underflow
-32768	8000			

System		Current measuring range	Range
Dec.	Hex.	4–20 mA	
32767	7FFF		Overflow
30720	7800		
30719	77FF		Over-range
16385	4001		
16384	4000	20 mA	Nominal range
12288	3000	16 mA	
1	1	4 mA + 723.3 μ A	
0	0	4 mA	
-1	FFFF	4 mA - 723.3 μ A	Under-range
-2048	F800	1.185 mA	
-2049	F7FF		Underflow
-32768	8000		

6.5.3. Simatic S5 Analog Value Representation for Resistance Measuring Range

System		Resistance measuring range					Range
Dec.	Hex.	150 Ω	300 Ω	600 Ω	3000 Ω	6000 Ω	
32767	7FFF						Overflow
18432	4800						
18431	47FF	168.74 Ω	337.48 Ω	674.96 Ω	3374 Ω	6749 Ω	Over-range
16385	4001						
16384	4000	150 Ω	300 Ω	600 Ω	3000 Ω	6000 Ω	Nominal range
12288	3000	112,5 Ω	225 Ω	450 Ω	2250 Ω	4500 Ω	
8192	2000	75 Ω	150 Ω	300 Ω	1500 Ω	3000 Ω	
1	1	9.15 m Ω	18.3 m Ω	27.3 m Ω	183 m Ω	366 m Ω	
0	0	0 Ω	0 Ω	0 Ω	0 Ω	0 Ω	
(Negative values are physically impossible)							Under-range

6.6. Definition of Operational Error Limit and Basic Error Limit

6.6.1. Operational Error Limit

“Operational error limit” is the analog input module’s error in measurement, within the entire permissible temperature range, relative to the module’s nominal range.

6.6.2. Basic Error Limit

“Basic error limit” is the operational error limit at 25 °C, relative to the module’s nominal range.

6.6.3. Example Showing How to Calculate the Input Error for an Analog Input Module

For this example, assume that a 600-252-4AD01 analog input module is being used with a “0 to 10 V” input range. The module will be operated at an ambient temperature of 30 °C. This is why the input error must be calculated on the basis of the operational error limit.

The relevant technical specifications indicate the following:

Operational error limit: $\pm 0.5\%$

The input error for the module’s entire nominal range is:

$\pm 0.5\%$ at 10 V = ± 0.05 V

Input error	± 0.05 V	± 0.05 V	± 0.05 V	± 0.05 V	± 0.05 V
Input value	1 V	2.5 V	5 V	8 V	10 V
Reading	0.95–1.05 V	2.45–2.55 V	4.95–5.05 V	7.95–8.05 V	9.95–10.05 V
Relative error	5%	2%	1%	0.625 %	$\pm 0.5\%$

6.7. Connecting Sensors to Analog Inputs

6.7.1. Abbreviations Used

M+	Measuring line (positive)
M-	Measuring line (negative)
M _{Ana}	Reference potential of analog circuit
L+	24 VDC power supply terminal
GND	Ground terminal

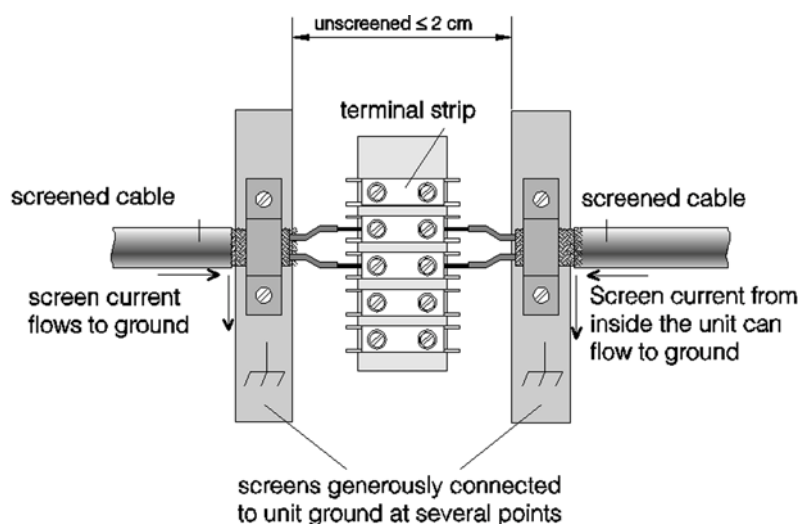
6.7.2. Signal Cables

Shielded twisted pair cables should be used for the analog signals. The analog cables' shielding should be grounded at both ends of the cable.

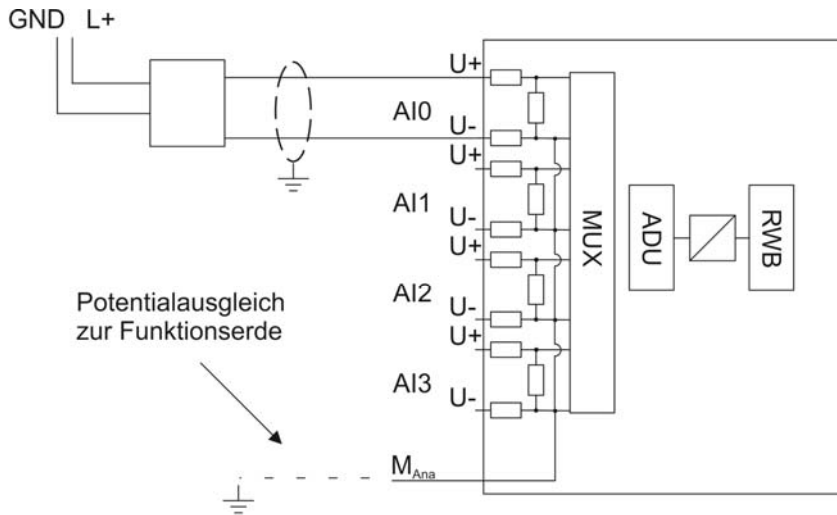
Signal cables should not run parallel to power cables. In addition, signal and data cables must be routed in conduits or bundles separate from those for power cables. Make sure to route signal and data cables as close as possible to grounding surfaces, e.g., on stringers, metal rails, mounting plates, or the metal sheets making up a cabinet or enclosure.

Motor cables, power supply cables connected to the power grid, and IT cables must be routed with a distance of at least 0.2 m between each other within the equipment cabinet. If there are any crossings, there can be a smaller distance between them. Outside the equipment cabinet, motor cables must be routed in separate bundles at a distance of at least 0.3 m from other cables. This will reduce the amount of interference caused by induction.

If a joint is necessary, no more than 2 cm should be unshielded. The shielding on both cable ends must be connected with the shielding bus, not with a terminal. The cable's shielding should not be connected to analog ground M_{Ana}.

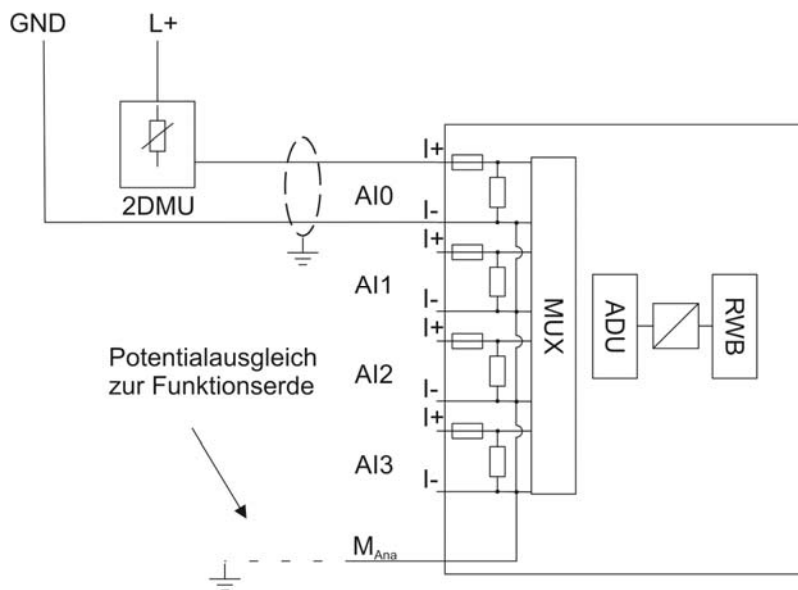


6.7.3. Connecting Voltage Transmitters



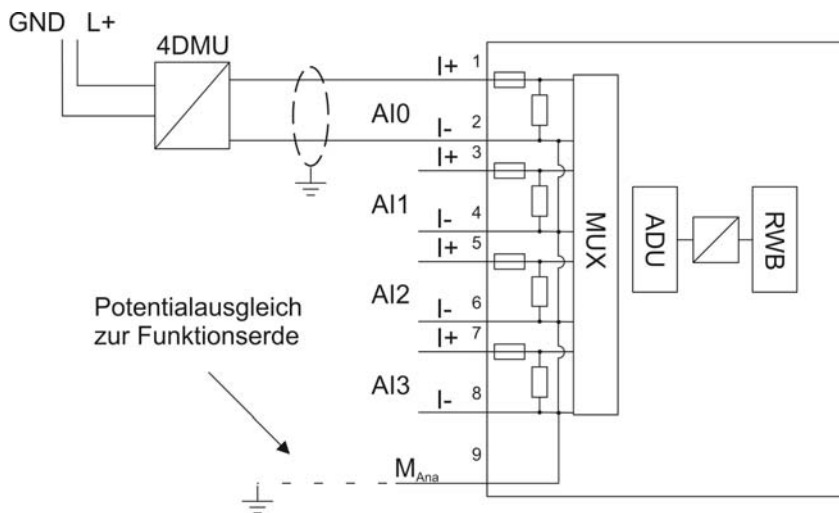
6.7.4. Connecting Current Transmitters

2-wire transmitter:



4-wire transmitter:

4-wire transmitters have a separate supply voltage.

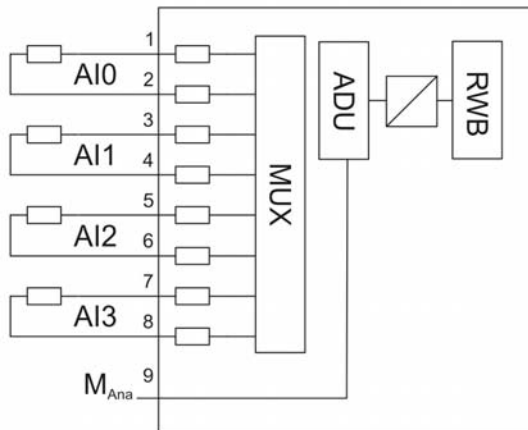


6.7.5. Connecting Resistance Thermometers and Resistors

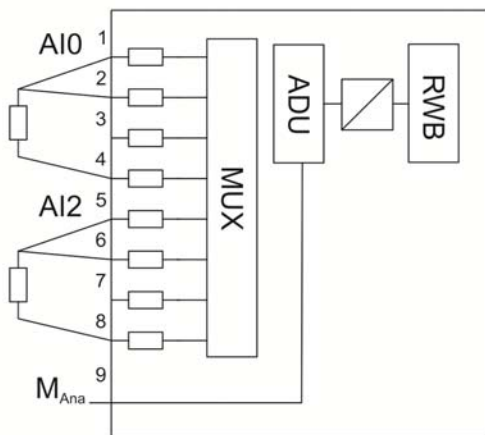
Resistance thermometers and resistors are wired with a 4-wire, 3-wire, or 2-wire configuration.

When a 4-wire or 3-wire configuration is used, the module will deliver a constant current so that the voltage drop that occurs on the measuring lines will be compensated for. It is important for the connected constant current cables to be connected directly to the resistance thermometer/resistor! Measurements performed with a 4-wire or 3-wire configuration will yield more accurate readings than measurements performed with a 2-wire configuration.

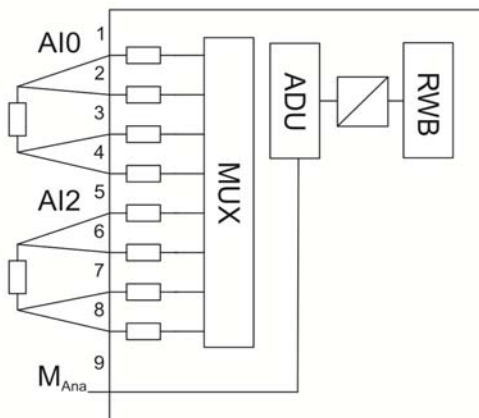
2-wire measurement:



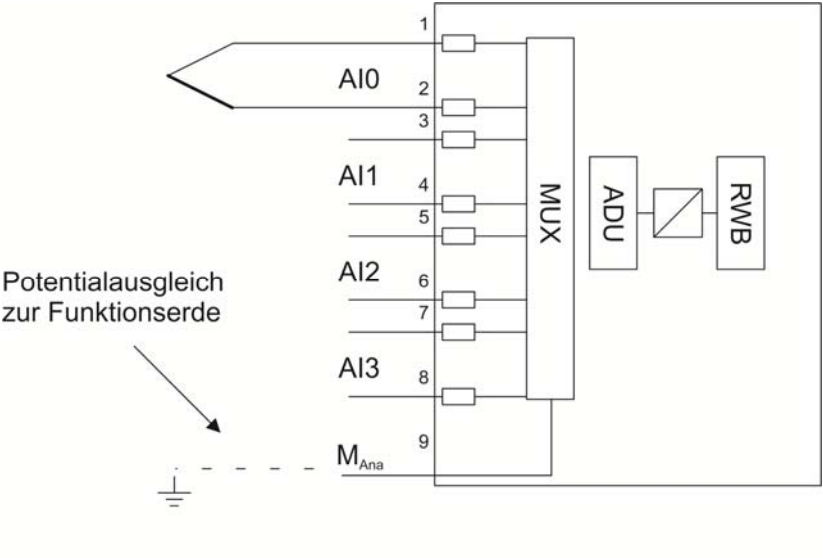
3-wire measurement:



4-wire measurement:



6.7.6. Connecting Thermocouples



6.8. Connecting Loads and Actuators to Analog Outputs

6.8.1. Abbreviations Used

U Analog voltage output

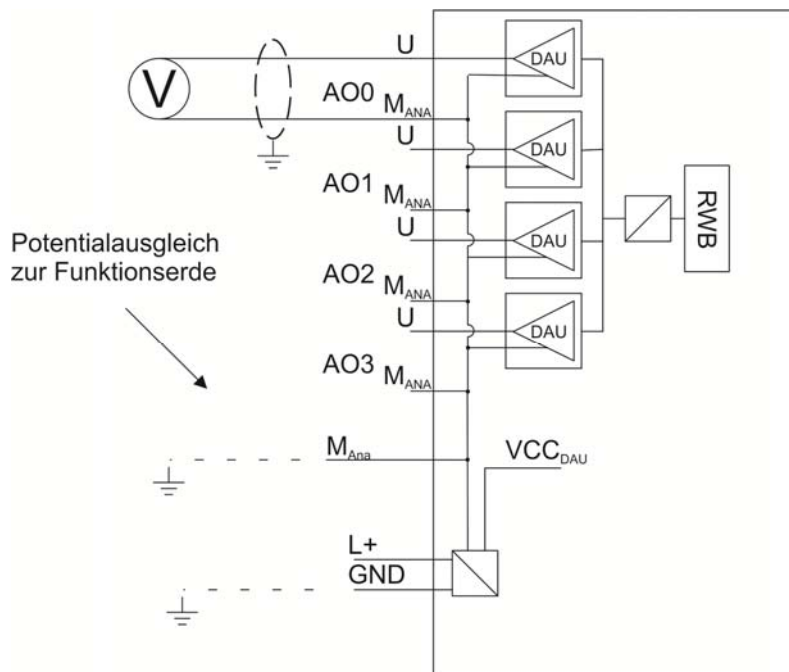
I+ Analog current output

M_{Ana} Reference potential of analog circuit

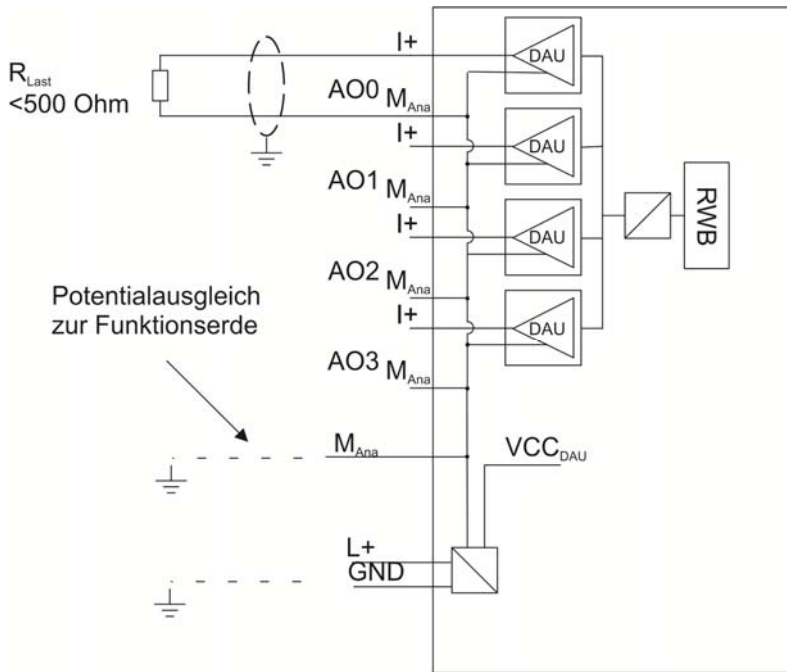
L+ 24 VDC power supply terminal

GND Ground terminal

6.8.2. Connecting Loads/Actuators to Voltage Outputs



6.8.3. Connecting Loads/Actuators to Current Outputs



7. System Components

7.1. Power Supply

7.1.1. 600-700-0AA01, 24 VDC Power Module

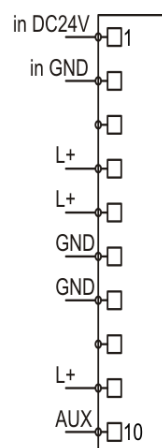
The 24 VDC power module provides a new supply voltage for the backplane bus and also serves as a power and isolation module for the power bus' 24 VDC, GND, and AUX.

General characteristics

- New supply voltage for the backplane bus
- 2.5 A, 5 VDC output current for the backplane bus
- Powers the power bus to the right
- Segments the power bus on the left
- A green LED indicates the 24 VDC status
- Diagnostic messages in the event of a loss of voltage or short circuit on the backplane bus
- A bi-color LED (blue/red) indicates the module's operating status and any malfunctions

Connector terminal assignment

Terminal	I/O
1	24 VDC IN
2	GND IN
3	-
4	L+, 24 VDC
5	L+, 24 VDC
6	GND
7	GND
8	-
9	L+, 24 VDC
10	AUX



Module parameters

Diagnostic alarms: Disabled / Enabled

Technical specifications

Order No.	600-700-0AA01
Notation	Powermodule DC 24 V
Identifier / Type	30000 / 2000
Electrically isolated from backplane bus	No
Current draw	
External	Max. 10 mA + load
Internal	Max. 35 mA
24 VDC supply	18–30 VDC
Rated input current	Max. 8 A, overcurrent protection device

Reverse polarity protection	Up to 60 V, electronic
Power dissipation	Max. 0.7 W
Load	
Per contact	8 A
Total load, 24 VDC	8 A
Total load, GND	8 A
Total load, AUX	8 A
Group error indicator	Red LED
Hot-pluggable	No
Weight	Approx. 70 g

The power module's power supply must be externally fused with a fast-blow fuse appropriate for the required maximum current.

7.2. Power and Isolation Modules

7.2.1. 600-710-0AA01, 24 VDC, 8 A Power and Isolation Module

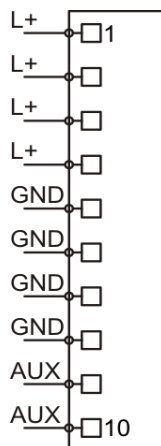
The 24 VDC, 8 A power and isolation module serves as a power supply module for the power bus' 24 VDC, GND, and AUX to the right, while segmenting the power bus on the left. This module can be used to subdivide a power bus into individual segments.

General characteristics

- Powers the power bus to the right
- Segments the power bus on the left
- A green LED indicates the 24 VDC status
- A blue LED indicates the module's operating status

Connector terminal assignment

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



Technical specifications

Order No.	600-710-0AA01
Notation	DC 24 V supply
Identifier / Type	30050 / 1000
Load	
Per contact	8 A
Total 24 VDC supply	8 A
Total GND supply	8 A
Total AUX supply	8 A
Current draw	
External	Max. 22 mA
Internal	Max. 5 mA
Power dissipation	Max. 0.3 W
Electrically isolated from backplane bus	Yes
Hot-pluggable	Yes
Weight	Approx. 70 g

The power and isolation module's power supply must be externally fused with a fast-blow fuse appropriate for the required maximum current.

7.3. Potential Distributors

7.3.1. 600-720-0AH01, 9 x 24 VDC Potential Distributor

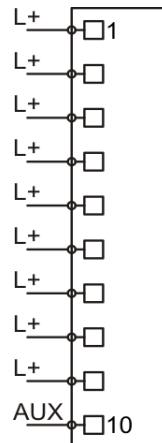
The 9 x 24 VDC potential distributor makes the 24 VDC supply from the power bus available on the front connector.

General characteristics

- Max. 8 A supply load
- Supplies its outputs using the power bus
- A blue LED indicates the module's operating status

Connector terminal assignment

Terminal	I/O
1	L+, 24 VDC
2	L+, 24 VDC
3	L+, 24 VDC
4	L+, 24 VDC
5	L+, 24 VDC
6	L+, 24 VDC
7	L+, 24 VDC
8	L+, 24 VDC
9	L+, 24 VDC
10	AUX



Technical specifications

Order No.	600-720-0AH01
Notation	9 x DC 24 V distribution module
Identifier / Type	31000 / 3000
Number of outputs	9
Electrically isolated from backplane bus	Yes
Current draw	
External	0 mA
Internal	Max. 22 mA
Power dissipation	Max. 0.1 W
Load	
Per contact	8 A
Total load	8 A
Hot-pluggable	Yes
Weight	Approx. 70 g

7.3.2. 600-720-0BH01, 9 x GND Potential Distributor


The 9 x GND potential distributor makes the GND connection from the power bus available on the front connector.

General characteristics

- Max. 8 A supply load
- Supplies its outputs using the power bus
- A blue LED indicates the module's operating status

Connector terminal assignment

Terminal	I/O
1	GND
2	GND
3	GND
4	GND
5	GND
6	GND
7	GND
8	GND
9	GND
10	AUX



Technical specifications

Order No.	600-720-0BH01
Notation	9 x GND distribution module
Identifier / Type	31010 / 3000
Number of outputs	9
Electrically isolated from backplane bus	Yes
Current draw	
External	0 mA
Internal	Max. 22 mA
Power dissipation	Max. 0.1 W
Load	
Per contact	8 A
Total load	8 A
Hot-pluggable	Yes
Weight	Approx. 70 g

7.3.3. 600-720-0CH01, 10 x AUX Potential Distributor


The 10 x AUX potential distributor makes the AUX connection from the power bus available on the front connector.

General characteristics

- Max. 8 A supply load
- Supplies its outputs using the power bus
- A blue LED indicates the module's operating status

Connector terminal assignment

Terminal	I/O
1	AUX
2	AUX
3	AUX
4	AUX
5	AUX
6	AUX
7	AUX
8	AUX
9	AUX
10	AUX



Technical specifications

Order No.	600-720-0CH01
Notation	10 x AUX distribution module
Identifier / Type	31020 / 3000
Number of outputs	10
Electrically isolated from backplane bus	Yes
Current draw	
External	0 mA
Internal	Max. 22 mA
Power dissipation	Max. 0.1 W
Load	
Per contact	8 A
Total load	8 A
Hot-pluggable	Yes
Weight	Approx. 70 g

7.3.4. 600-720-0DH01, 4 x 24 VDC + 4 x GND Potential Distributor

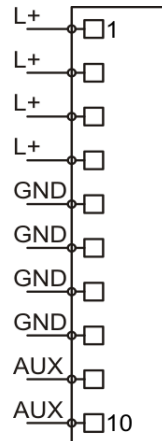
The 4 x 24 VDC + 4 x GND potential distributor makes the 24 VDC supply and the GND connection from the power bus available on the front connector.

General characteristics

- Max. 8 A supply load
- Supplies its outputs using the power bus
- A blue LED indicates the module's operating status

Connector terminal assignment

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



Technical specifications

Order No.	600-720-0DH01
Notation	4 x DC 24 V + 4 x GND distribution module
Identifier / Type	31030 / 3000
Number of outputs	10, in three groups: 4 x 24 VDC, 4 x GND, 2 x AUX
Electrically isolated from backplane bus	Yes
Current draw	
External	0 mA
Internal	Max. 22 mA
Power dissipation	Max. 0.1 W
Load	
Per contact	8 A
Total load, 24 VDC	8 A
Total load, GND	8 A
Total load, AUX	8 A
Hot-pluggable	Yes
Weight	Approx. 60 g

7.3.5. 600-720-0XH01, 9 x Free Potential Distributor

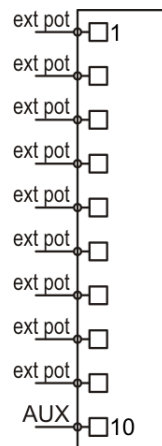
The “9 x Free Pot.” potential distributor makes 9 contacts that are connected to each other available on the front connector. The potential distributed through these contacts can be freely chosen.

General characteristics

- Max. 8 A supply load
- Can accommodate any supply potential
- A blue LED indicates the module’s operating status

Connector terminal assignment

Terminal	I/O
1	External pot.
2	External pot.
3	External pot.
4	External pot.
5	External pot.
6	External pot.
7	External pot.
8	External pot.
9	External pot.
10	AUX



Technical specifications

Order No.	600-720-0XH01
Notation	9 x free potential distribution module
Identifier / Type	31040 / 3000
Number of outputs	9
Electrically isolated from backplane bus	Yes
Current draw	
External	0 mA
Internal	Max. 22 mA
Power dissipation	Max. 0.1 W
Load	
Per contact	8 A
Total load	8 A
Permissible potential difference relative to GND	48 VAC
Hot-pluggable	Yes
Weight	Approx. 60 g

8. Configuring the Modules' Parameters

8.1. General Information

All configurable modules come with a default parameter configuration. Depending on the bus system being used, the bus coupler will automatically load the desired operating parameter configuration into the modules when starting up or the user will have to transfer the configuration from the PLC by using the relevant methods.

When using bus couplers with project storage capabilities (e.g., CANopen couplers), the parameters can be configured in advance with the "TB20 ToolBox" program.

Modules can also be reconfigured at any time—even during operation. The methods that have to be used for this purpose will vary depending on the bus system and PLC being used.

The following section goes over the structure of the relevant parameter data sets. The corresponding default settings are underlined.

Note: All word and double word parameters are in big-endian format.

8.2. Analog Input Modules

8.2.1. 600-250-4AB01, AI 2 x I, 0/4–20 mA, ± 20 mA, 12-Bit

Parameter set length: 12 bytes

Byte/ Bit	7	6	5	4	3	2	1	0
0	Diagnostic alarm	-	Overflow / underflow diagnosis	1	-	-	Representation values	
1	0	0	Channel 1 limit value alarm	Channel 0 limit value alarm	0	0	Channel 1 wire break detection	Channel 0 wire break detection
2	Channel 0 interf. frequency suppression			-	Channel 0 measuring range			
3	Channel 0 upper limit							
4								
5								
6	Channel 0 lower limit							
7	Channel 1 interf. frequency suppression			-	Channel 1 measuring range			
8	Channel 1 upper limit							
9								
10	Channel 1 lower limit							
11								

Diagnostic alarm: 1 = ON / 0 = OFF

Overflow / underflow diagnosis: 1 = ON / 0 = OFF

Representation values: 0 = Simatic S7; 1 = Simatic S5

Wire break detection (*for 4–20 mA only*): 1 = ON / 0 = OFF

Interference frequency suppression: 0 = None / 1 = 10 Hz / 2 = 50 Hz / 3 = 60 Hz / 4 = 400 Hz

Measuring range: 0 = Disabled / 1 = ± 20 mA current / 2 = 0–20 mA current / 3 = 4–20 mA current

Limit value alarm: 1 = ON / 0 = OFF

Upper / lower limit: 16-bit analog value (± 27648)

8.2.2. 600-250-4AD01, AI 4 x I, 0/4–20 mA, ±20 mA, 12-Bit

Parameter set length: 22 bytes

Byte/ Bit	7	6	5	4	3	2	1	0
0	Diagnostic alarm	-	Overflow / underflow diagnosis	1	-	-	Representation values	
1	Channel 3 limit value alarm	Channel 2 limit value alarm	Channel 1 limit value alarm	Channel 0 limit value alarm	Channel 3 wire break detection	Channel 2 wire break detection	Channel 1 wire break detection	Channel 0 wire break detection
2	Channel 0 interf. frequency suppression			-	Channel 0 measuring range			
3	Channel 0 upper limit							
4								
5								
6								
7	Channel 1 interf. frequency suppression			-	Channel 1 measuring range			
8	Channel 1 upper limit							
9								
10								
11								
12	Channel 2 interf. frequency suppression			-	Channel 2 measuring range			
13	Channel 2 upper limit							
14								
15								
16								
17	Channel 3 interf. frequency suppression			-	Channel 3 measuring range			
18	Channel 3 upper limit							
19								
20								
21								

Diagnostic alarm: 1 = ON / 0 = OFF

Overflow / underflow diagnosis: 1 = ON / 0 = OFF

Representation values: 0 = Simatic S7; 1 = Simatic S5

Wire break detection (*for 4–20 mA only*): 1 = ON / 0 = OFF

Interference frequency suppression: 0 = None / 1 = 10 Hz / 2 = 50 Hz / 3 = 60 Hz / 4 = 400 Hz

Measuring range: 0 = Disabled / 1 = ±20 mA current / 2 = 0–20 mA current / 3 = 4–20 mA current

Limit value alarm: 1 = ON / 0 = OFF

Upper / lower limit: 16-bit analog value (±27648)

8.2.3. 600-252-4AB01, AI 2 x U, ± 10 V, 0–10 V, 1–5 V, 12-Bit

Parameter set length: 12 bytes

Byte/ Bit	7	6	5	4	3	2	1	0
0	Diagnostic alarm	-	Overflow / underflow diagnosis	0	-	-	Representation values	
1	0	0	Channel 1 limit value alarm	Channel 0 limit value alarm	0	0	Channel 1 wire break detection	Channel 0 wire break detection
2	Channel 0 interf. frequency suppression			-	Channel 0 measuring range			
3	Channel 0 upper limit							
4								
5								
6	Channel 0 lower limit							
7	Channel 1 interf. frequency suppression			-	Channel 1 measuring range			
8	Channel 1 upper limit							
9								
10								
11	Channel 1 lower limit							

Diagnostic alarm: ON / OFF

Overflow / underflow diagnosis: ON / OFF

Representation values: 0 = Simatic S7; 1 = Simatic S5

Wire break detection (*for 1–5 V only*): ON / OFF

Interference frequency suppression: 0 = OFF / 1 = 10 Hz / 2 = 50 Hz / 3 = 60 Hz / 4 = 400 Hz

Measuring range: 0 = Disabled / 1 = ± 10 V voltage / 2 = 0–10 V voltage /
3 = 1–5 V voltage / 4 = ± 5 V / 5 = ± 2.5 V

Limit value alarm: ON / OFF

Upper / lower limit: 16-bit analog value (± 27648)

8.2.4. 600-252-4AD01, AI 4 x U, ±10 V, 0–10 V, 1–5 V, 12-Bit

Parameter set length: 22 bytes

Byte/ Bit	7	6	5	4	3	2	1	0
0	Diagnostic alarm	-	Overflow / underflow diagnosis	0	-	-	Representation values	
1	Channel 3 limit value alarm	Channel 2 limit value alarm	Channel 1 limit value alarm	Channel 0 limit value alarm	Channel 3 wire break detection	Channel 2 wire break detection	Channel 1 wire break detection	Channel 0 wire break detection
2	Channel 0 interf. frequency suppression			-	Channel 0 measuring range			
3	Channel 0 upper limit							
4								
5								
6								
7	Channel 1 interf. frequency suppression			-	Channel 1 measuring range			
8	Channel 1 upper limit							
9								
10								
11								
12	Channel 2 interf. frequency suppression			-	Channel 2 measuring range			
13	Channel 2 upper limit							
14								
15								
16								
17	Channel 3 interf. frequency suppression			-	Channel 3 measuring range			
18	Channel 3 upper limit							
19								
20								
21								

Diagnostic alarm: 1 = ON / 0 = OFF

Overflow / underflow diagnosis: 1 = ON / 0 = OFF

Representation values: 0 = Simatic S7; 1 = Simatic S5

Wire break detection (*for 1–5 V only*): ON / OFF

Interference frequency suppression: 0 = None / 1 = 10 Hz / 2 = 50 Hz / 3 = 60 Hz / 4 = 400 Hz

Measuring range: 0 = Disabled / 1 = ±10 V voltage / 2 = 0–10 V voltage /
3 = 1–5 V voltage / 4 = ±5 V / 5 = ±2.5 V

Limit value alarm: 1 = ON / 0 = OFF

Upper / lower limit: 16-bit analog value (±27648)

8.2.5. 600-253-4AB01, AI 1/2 x R, RTD, 16-Bit, 2/3/4-wire

Byte/ Bit	7	6	5	4	3	2	1	0
0	Diagnostic alarm	-	Overflow / underflow diagnosis	-	Temperature unit		0 0	
1	-	-	Channel 1 limit value alarm	Channel 0 limit value alarm	-	-	Channel 1 wire break detection	Channel 0 wire break detection
2	Channel 0 interf. frequency suppression			-	Channel 0 measuring range			
3	-	-	-	-	-	Channel 0 sensor type		
4	Channel 0 upper limit							
5								
6	Channel 0 lower limit							
7								
8	Channel 1 interf. frequency suppression			-	Channel 1 measuring range			
9	-	-	-	-	-	Channel 0 sensor type <i>2-wire or disabled</i>		
10	Channel 1 upper limit							
11								
12	Channel 1 lower limit							
13								

Diagnostic alarm: 1 = ON / 0 = OFF

Overflow / underflow diagnosis: 1 = ON / 0 = OFF

Temperature unit: 0 = °C x 10 / 1 = °F x 10 / 2 = °K x 10 (*for all temperature measuring ranges*)

Wire break detection: ON / OFF

Interference frequency suppression: 0 = None / 1 = 10 Hz / 2 = 50 Hz / 3 = 60 Hz / 4 = 400 Hz

Measuring range: 1 = PT100 (-240 to 1,000 °C) /
 2 = PT1000 (-240 to 1,000 °C) /
 3 = Ni100 (-110 to 295 °C) /
 4 = Ni1000 (-110 to 295 °C) /
 5 = LG-Ni1000 (-110 to 295 °C) /
 6 = 0 to 150 Ω /
 7 = 0 to 300 Ω /
 8 = 0 to 600 Ω /
 9 = 0 to 3000 Ω /
 10 = 0 to 6000 Ω

Sensor type: 0 = Disabled / 1= 2-wire / 2 = 3-wire / 3 = 4-wire
 → 3-wire and 4-wire can only be selected on channel 0!

Limit value alarm: 1 = ON / 0 = OFF

Upper / lower limit: 16-bit analog value (±27648)

8.2.6. 600-253-4AD01, AI 2/4 x R, RTD, 16-Bit, 2/3/4-wire

Byte/ Bit	7	6	5	4	3	2	1	0
0	Diagnostic alarm	-	Overflow / underflow diagnosis	-	Temperature unit		0 0	
1	Channel 3 limit value alarm	Channel 2 limit value alarm	Channel 1 limit value alarm	Channel 0 limit value alarm	Channel 3 wire break detection	Channel 2 wire break detection	Channel 1 wire break detection	Channel 0 wire break detection
2	Channel 0 interf. frequency suppression			-	Channel 0 measuring range			
3	-	-	-	-	-	Channel 0 sensor type		
4	Channel 0 upper limit							
5								
6								
7	Channel 0 lower limit							
8	Channel 1 interf. frequency suppression			-	Channel 1 measuring range			
9	-	-	-	-	-	Channel 0 sensor type 2-wire or disabled		
10	Channel 1 upper limit							
11								
12								
13	Channel 1 lower limit							
14	Channel 2 interf. frequency suppression			-	Channel 2 measuring range			
15	-	-	-	-	-	Channel 2 sensor type		
16	Channel 2 upper limit							
17								
18								
19	Channel 2 lower limit							
20	Channel 3 interf. frequency suppression			-	Channel 3 measuring range			
21	-	-	-	-	-	Channel 3 sensor type 2-wire or disabled		
22	Channel 3 upper limit							
23								
24								
25	Channel 3 lower limit							

Diagnostic alarm: 1 = ON / 0 = OFF

Overflow / underflow diagnosis: 1 = ON / 0 = OFF

Temperature unit: 0 = °C x 10 / 1 = °F x 10 / 2 = °K x 10 (*for all temperature measuring ranges*)

Wire break detection: ON / OFF

Interf. frequency suppression: 0 = None / 1 = 10 Hz / 2 = 50 Hz / 3 = 60 Hz / 4 = 400 Hz

Measuring range: 1 = PT100 (-240 to 1,000 °C) /
 2 = PT1000 (-240 to 1,000 °C) /
 3 = Ni100 (-110 to 295 °C) /
 4 = Ni1000 (-110 to 295 °C) /
 5 = LG-Ni1000 (-110 to 295 °C) /
 6 = 0 to 150 Ω /
 7 = 0 to 300 Ω /
 8 = 0 to 600 Ω /
 9 = 0 to 3000 Ω /
 10 = 0 to 6000 Ω

Sensor type: 0 = Disabled / 1 = 2-wire / 2 = 3-wire / 3 = 4-wire
 → 3-wire and 4-wire can only be selected on channel 0 and channel 2!

Limit value alarm: 1 = ON / 0 = OFF

Upper / lower limit: 16-bit analog value (±27648)

8.2.7. 600-254-4AB01, AI 2 x TC, 16-Bit

Byte/ Bit	7	6	5	4	3	2	1	0
0	Diagnostic alarm	-	Overflow / underflow diagnosis	-	Temperature unit		Representation values	
1	0	0	Channel 1 limit value alarm	Channel 0 limit value alarm	0	0	0	0
2	Channel 0 interf. frequency suppression			-	Channel 0 measuring range			
3	-	-	-	-	-	Channel 0 temperature compensation		
4	Channel 0 upper limit							
5								
6	Channel 0 lower limit							
7								
8	Channel 1 interf. frequency suppression			-	Channel 1 measuring range			
9	-	-	-	-	-	Channel 1 temperature compensation		
10	Channel 1 upper limit							
11								
12	Channel 1 lower limit							
13								

Diagnostic alarm: 1 = On / 0 = Off

Overflow / underflow diagnosis: 1 = On / 0 = Off

Representation values: 0 = Simatic S7 / 1 = Simatic S5 (for +-80 mV only)

Temperature unit: 0 = °C x 10 / 1 = °F x 10 / 2 = °K x 10 (for all temperature measuring ranges)

Interf. frequency suppression: 0 = None / 1 = 10 Hz / 2 = 50 Hz / 3 = 60 Hz / 4 = 400 Hz

Measuring range: 0 = Disabled

1 = -80 mV to +80 mV

2 = TC_E (-270 °C to 990 °C)

3 = TC_J (-210 °C to 1,200 °C)

4 = TC_K (-270 °C to 1,380 °C)

5 = TC_N (-270 °C to 1,320 °C)

6 = TC_R (-50 °C to 1,775 °C)

7 = TC_S (-50 °C to 1,775 °C)

8 = TC_T (-270 °C to 405 °C)

9 = TC_B (0 °C to 1,800 °C)

10 = TC_C (0 °C to 2,320 °C)

11 = TC_L (0 °C to 900 °C)

Temperature compensation: 1= Internal / 2 = External or none /
3 = Via process data outputs

Limit value alarm: 1 = On / 0 = Off

Upper / lower limit: 16-bit analog value (±27648)

8.2.8. 600-254-4AD01, AI 4 x TC, 16-Bit

Byte/ Bit	7	6	5	4	3	2	1	0
0	Diagnostic alarm	-	Overflow / underflow diagnosis	-	Temperature unit		Representation values	
1	0	0	Channel 1 limit value alarm	Channel 0 limit value alarm	0	0	0	0
2	Channel 0 interf. frequency suppression			-	Channel 0 measuring range			
3	-	-	-	-	-	Channel 0 temperature compensation		
4	Channel 0 upper limit							
5								
6								
7	Channel 0 lower limit							
8	Channel 1 interf. frequency suppression			-	Channel 1 measuring range			
9	-	-	-	-	-	Channel 1 temperature compensation		
10	Channel 1 upper limit							
11								
12								
13	Channel 1 lower limit							
14	Channel 2 interf. frequency suppression			-	Channel 2 measuring range			
15	-	-	-	-	-	Channel 2 temperature compensation		
16	Channel 2 upper limit							
17								
18								
19	Channel 2 lower limit							
20	Channel 3 interf. frequency suppression			-	Channel 3 measuring range			
21	-	-	-	-	-	Channel 3 temperature compensation		
22	Channel 3 upper limit							
23								
24								
25	Channel 3 lower limit							

Diagnostic alarm: 1 = On / 0 = Off

Overflow / underflow diagnosis: 1 = On / 0 = Off

Representation values: 0 = Simatic S7 / 1 = Simatic S5 (for +-80 mV only)

Temperature unit: 0 = °C x 10 / 1 = °F x 10 / 2 = °K x 10 (for all temperature measuring ranges)

Interf. frequency suppression: 0 = None / 1 = 10 Hz / 2 = 50 Hz / 3 = 60 Hz / 4 = 400 Hz

Measuring range: 0 = Disabled

1 = -80 mV to +80 mV

2 = TC_E (-270 °C to 990 °C)

3 = TC_J (-210 °C to 1,200 °C)

4 = TC_K (-270 °C to 1,380 °C)

5 = TC_N (-270 °C to 1,320 °C)

6 = TC_R (-50 °C to 1,775 °C)

7 = TC_S (-50 °C to 1,775 °C)

8 = TC_T (-270 °C to 405 °C)

9 = TC_B (0 °C to 1,800 °C)

10 = TC_C (0 °C to 2,320 °C)

11 = TC_L (0 °C to 900 °C)

Temperature compensation: 1= Internal / 2 = External or none /
3 = Via process data outputs

Limit value alarm: 1 = On / 0 = Off

Upper / lower limit: 16-bit analog value (±27648)

8.3. Analog Output Modules

8.3.1. 600-260-4AB01, AO 2 x I, 0/4–20 mA, 12-Bit

Byte/ Bit	7	6	5	4	3	2	1	0
0	Diagnostic alarm	-	-	1	-	-	Representation values	
2	Channel 0 wire break detection	Channel 0 behavior at CPU-STOP			Channel 0 output range			
4	Channel 0 substitute value							
5								
6	Channel 1 wire break detection	Channel 1 behavior at CPU-STOP			Channel 1 output range			
7	Channel 1 substitute value							
8								

Diagnostic alarm: 1 = ON / 0 = OFF

Representation values: 0 = Simatic S7; 1 = Simatic S5

Wire break detection: 1 = ON / 0 = OFF

Output range: 0 = Disabled / 1 = 0–20 mA current / 2 = 4–20 mA current

Behavior at CPU-STOP 0 = Outputs de-energized / 1 = Retain last value /
2 = Apply substitute value

Substitute value: 16-bit analog value (±27648)

8.3.2. 600-260-4AD01, AO 4 x I, 0/4–20 mA, 12-Bit

Byte/ Bit	7	6	5	4	3	2	1	0
0	Diagnostic alarm	-	-	1	-	-	Representation values	
2	Channel 0 wire break detection	Channel 0 behavior at CPU-STOP			Channel 0 output range			
4	Channel 0 substitute value							
5								
6	Channel 1 wire break detection	Channel 1 behavior at CPU-STOP			Channel 1 output range			
7	Channel 1 substitute value							
8								
2	Channel 2 wire break detection	Channel 2 behavior at CPU-STOP			Channel 2 output range			
4	Channel 2 substitute value							
5								
6	Channel 3 wire break detection	Channel 3 behavior at CPU-STOP			Channel 3 output range			
7	Channel 3 substitute value							
8								

Diagnostic alarm: 1 = ON / 0 = OFF

Representation values: 0 = Simatic S7; 1 = Simatic S5

Wire break detection: 1 = ON / 0 = OFF

Output range: 0 = Disabled / 1 = 0–20 mA current / 2 = 4–20 mA current

Behavior at CPU-STOP 0 = Outputs de-energized / 1 = Retain last value /
2 = Apply substitute value

Substitute value: 16-bit analog value (±27648)

8.3.3. 600-261-4AB01, AO 2 x U, ±10 V, 0–10 V, 1–5 V, 12-Bit

Byte/ Bit	7	6	5	4	3	2	1	0
0	Diagnostic alarm	-	-	0	-	-	Representation values	
2	Channel 0 short circuit to GND	Channel 0 behavior at CPU-STOP			Channel 0 output range			
4	Channel 0 substitute value							
5								
6	Channel 1 short circuit to GND	Channel 1 behavior at CPU-STOP			Channel 1 output range			
7	Channel 1 substitute value							
8								

Diagnostic alarm: 1 = ON / 0 = OFF

Representation values: 0 = Simatic S7; 1 = Simatic S5

Short circuit to GND monitoring: 1 = ON / 0 = OFF

Output range: 0 = Disabled / 1 = ±10 V voltage / 2 = 0–10 V voltage /
3 = 1–5 V voltage

Behavior at CPU-STOP 0 = Outputs de-energized / 1 = Retain last value /
2 = Apply substitute value

Substitute value: 16-bit analog value (±27648)

8.3.4. 600-261-4AD01, AO 4 x U, ±10 V, 0–10 V, 1–5 V, 12-Bit

Byte/ Bit	7	6	5	4	3	2	1	0
0	Diagnostic alarm	-	-	0	-	-	Representation values	
2	Channel 0 short circuit to GND	Channel 0 behavior at CPU-STOP			Channel 0 output range			
4	Channel 0 substitute value							
5								
6	Channel 1 short circuit to GND	Channel 1 behavior at CPU-STOP			Channel 1 output range			
7	Channel 1 substitute value							
8								
2	Channel 2 short circuit to GND	Channel 2 behavior at CPU-STOP			Channel 2 output range			
4	Channel 2 substitute value							
5								
6	Channel 3 short circuit to GND	Channel 3 behavior at CPU-STOP			Channel 3 output range			
7	Channel 3 substitute value							
8								

Diagnostic alarm: 1 = ON / 0 = OFF

Representation values: 0 = Simatic S7; 1 = Simatic S5

Short circuit to GND monitoring: 1 = ON / 0 = OFF

Output range: 0 = Disabled / 1 = ±10 V voltage / 2 = 0–10 V voltage /
3 = 1–5 V voltage

Behavior at CPU-STOP 0 = Outputs de-energized / 1 = Retain last value /
2 = Apply substitute value

Substitute value: 16-bit analog value (±27648)

9. Process Alarms

9.1. Analog Input Modules

Process alarm data length: 2 bytes

Byte/ Bit	7	6	5	4	3	2	1	0
0	0	0	0	0	Channel 3 upper limit exceeded	Channel 2 upper limit exceeded	Channel 1 upper limit exceeded	Channel 0 upper limit exceeded
1	0	0	0	0	Channel 3 lower limit fallen below	Channel 2 lower limit fallen below	Channel 1 lower limit fallen below	Channel 0 lower limit fallen below

10. Spare Parts

10.1. Base Modules

10.1.1. 14 mm-Width Standard Base Module

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



10.1.2. 25 mm-Width Base Module

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



10.1.3. Power and Isolation Base Module

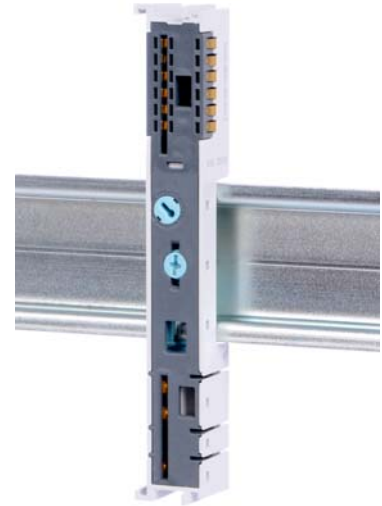
The power and isolation base module is available in sets of five with Order No. 600-900-9BA01.



10.1.4. 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.



10.2. Front Connector

10.2.1. 10-Terminal Front Connector

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



No.

10.2.2. 20-Terminal Front Connector

The 20-terminal front connector is available in sets of five with Order No. 600-910-9AT21.



10.3. Electronic Modules

To order spare electronic modules, simply use the Order No. for the original product. Electronic modules are always sent as a complete assembly, including the corresponding base module and front connector.

10.4. Final Cover

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

