

OPEN 500 EMS



Data sheet revision 2 – Version: 2021-01-19, V3.0

OPEN 500 EMS

Energy Management Station for connection to Ethernet bus systems. It is equipped with 32 integrated inputs and outputs. OPEN 500 EMS is available with and without manual control level. It can be extended, depending on variant, with up to 5 OPEN IO modules.



OPEN 500H EMS
with manual control level

OPEN 500 EMS

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Application / Operational area

The OPEN 500 EMS is designed as a high-power controller for connecting to Ethernet bus systems. OPEN 600 EMS/N is equipped with 32 integrated inputs and outputs and can be extended, depending on variant, with up to 5 OPEN IO modules. For the operation of the integrated outputs types with and without manual control are available. The inputs can optionally be wired with resistance sensors, 10mV/K sensors, 0-10V signals and potentiometers.

Accessories

Article	Type
DS-024095	DS-Bat OPEN EMS Replacement battery for OPEN EMS
DS-350160	DS-PS 24-0.42 Power supply with regulated output voltage
DS-350161	DS-PS 24-1.25 Power supply with regulated output voltage
DS-350162	DS-PS 24-2.50 Power supply with regulated output voltage
DS-350163	DS-PS 24-4.20 Power supply with regulated output voltage

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Safety guidelines

This equipment may only be handled by trained personnel who are authorized to perform work on electrical systems.

The devices may not be used in connection with devices which are designed for directly or indirectly safeguarding human health or for lifesaving purposes or which can present dangers for humans, animals or material assets.

The device must be decommissioned if safe operation (e.g. visible damages) is no longer possible. The warranty claim expires if the device is opened.

Electric connection

The devices are designed exclusively for operation at safety extra-low voltage (SELV) or functional extra-low voltage with electrically safe isolation (PELV). Depending on the intended use of the system, an on-site check must be made regarding whether it is necessary to earth the supply voltage. Earthed control systems must only be grounded at a single point. Multiple earthing can damage the devices.

The technical data must be taken into consideration when establishing the electrical connection of the devices.

The devices must be operated with a constant operating voltage. The customer must take appropriate measures to prevent current/voltage peaks when switching the supply voltage on and off.

Note CSA (North America): Only „Class 2“ power supplies are permitted for the connection.

The supply and signal lines must be connected and installed according to the current state of the art.

In particular, possible interference couplings have to be avoided by parallel running foreign lines with the transfer of sensor lines.

For the transfer of the CAN-bus lines, it is important to pay attention to the adherence of the specifications for the structure of a CAN-bus system.

Assembly information

The assembly must be carried out by trained personnel according to installation standards. The assembly of the devices takes place on a standard DIN rail 35 mm in cabinets.

When determining the assembly location, make sure that the ambient temperature limits are not exceeded.

For the assembly in intermediate ceilings, suitable housings have to be planned. If necessary, inspection openings have to be planned.

During assembly, make sure that the open parts of the device are free of contamination. In particular, the device can be destroyed by metal chips that enter it.



When using screw terminals, the maximum torque of the screw terminals may not exceed 0.4 Nm. Exceeding the max. torque may lead to the destruction of the terminal. As a result, the electrical contact at the terminal can no longer be ensured.

Software

The device is supplied without a loaded program. A suitable program for the purpose must be loaded by trained personnel.

Commissioning

All electrical supply, switching and measuring lines must be installed correctly before the unit may be commissioned. The correct connection must be ensured before switching on the operating voltage. During commissioning, all the sensors connected to the system must be manually adjusted to the local conditions.

Service / Maintenance

The OPEN EMS is maintenance-free.

The configured parameters are saved in the flash memory and are thus also available during a power failures.

The battery used in the OPEN EMS serves to maintain the system time. The battery has to be replaced at regular intervals. To ensure the smooth operation of the control system, the battery must be replaced regularly. The battery life is max. 4 years if the OPEN EMS is stored at room temperature. We recommend replacing the battery every 3 years. The battery must only be replaced by qualified personnel.

Disposal of batteries

Old batteries may not be disposed of in household waste. Take the batteries to an appropriate waste collection center for disposal. Do NOT burn batteries or put them normal waste. They could explode or cause an explosive burst. Carefully store the batteries designated for disposal to avoid short-circuiting, compressing or destroying the battery case.

The local and state regulations must be observed for disposal.

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Connection possibilities

The OPEN EMS is designed for use in the building management sector. It is equipped with 32 integrated inputs and outputs. Industry-standard sensors and actuators can be connected directly to OPEN EMS via these inputs and outputs without additional intermediate devices.

With its extensive features, including standard communication interfaces and protocols, OPEN EMS can connect to a large variety of external devices. These can be OPEN IO modules, OPEN control units or also the Native BACnet BMS OPENweb.

Systems and devices from other manufacturers can be easily integrated into the OPEN system via various integrated standard protocols. The available interface include the serial interfaces (RS232 and RS485) as well as connections for the CAN-bus and Ethernet network.

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Technical data

Housing

- Dimensions (WxDxH): 160 mm x 60 mm x 90 (98) mm
- Material: Plastic
- Assembly: on standard mounting rail 35 mm
- Protection standard: IP 20
- Cooling: no fan; by convection
- Ambient temperature: 0 ... 50°C
- Ambient humidity: 5 ... 90% without condensation
- Connection: removable spring terminals, nominal wire 1.5 mm²
- Display LEDs: Operating display, Error, Run, CAN-bus, COM interface, Ethernet
- Mounting position: Freely selectable

Power supply

- Input voltage: U(nom) = 24 V DC (19 ... 30 V DC)
- Input current: I(nom) = 190 mA
- Power consumption: 4.6 W
- Max. main fuse: 2 A

Microprocessor and memory

- CPU: PowerPC, 220 MHz
- RAM memory: 125 MB
- NV-RAM battery back-up: 2 MB
- Flash memory: 2 GB Micro SD card
- Clock: Battery buffered real-time clock
- Watchdog: Hardware watchdog

Interfaces

- Fast Ethernet: 2x 10/100 BaseT (RJ45) each with LED display, function as a switch
- RS232: 1x RS232, connection via RJ45 with LED display
- RS485: 1x RS485 galvanically decoupled, with LED display
- Connection: removable spring terminals, nominal wire 1.5 mm²

Communication

- CAN-bus: CAN 2.0B, galvanically isolated ISO 11898
- Transfer rates: 10 kbit/s ... 1Mbit/s, preset 50 kbit/s
- Connection: via bridge bus connector
- Bus cable: CAN-bus cable, characteristic resistance R_w = 120 Ω
- Bus terminating resistor: R_w at the beginning and at the end of the bus

Digital inputs

- 8 signaling/counter inputs, 24 V DC, each opto-decoupled with LED display. The LED colors can be individually set to green (standard) or red (signal input) for each input.
- Switching thresholds:
 - At the input
 - Detection "0": <13 V
 - Detection "1": 18 ... 30 V
- Input resistance: R_i = approx. 5 kΩ against "-"
- Debouncing: 30 ms
- Counter input: Pulses up to 80 Hz (debouncing: 4 ms)
- Max. input voltage: 30 V DC

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Digital outputs

- 12 transistor outputs Each opto-decoupled with display LED (yellow)
- Output voltage: 24 V DC, at I_{max.} = 110 mA per transistor output
- Power loss: 3.5 W per 12 transistor outputs
- Short-circuit proof
- Switching voltages:
 - Output "0": terminal off (volt-free), no active voltage will be applied at the output.
 - Output "1": The output voltage will be applied via the terminals "+" and "-" at the module (supply voltage).
- Terminal voltage for the outputs: 19 ... 30 V DC (terminals "+" and "-")
- Load capacity: up to max. 80 mA per output
- Impulse outputs (software)
- PWM outputs (software)

Analog inputs

- 8 analog inputs
- Supported sensors:
 - 0-10 V: Resolution 0.2 mV, input resistance R_i = approx. 100 kΩ against AI GND with 500 Ω resistance
 - 0(4)-20 mA:
 - 10 mV/K: Measuring range: -50 ... +150 °C; resolution 0.02 K
 - Pt1000: Measuring range: -50 ... +650 °C; resolution < 0.1 K
 - Ni1000 DIN: Measuring range: -50 ... +650 °C; resolution < 0.1 K
 - Ni1000 TK5000: Measuring range: -50 ... +650 °C; resolution < 0.1 K
 - Potentiometer: Measuring range: 0.5 ... 10 kΩ; resolution < 1 Ω
 - AD-converter 24 bit resolution

Analog outputs

- 4 analog outputs
- Output signal: 0 ... 10 V DC
- Power loss: 0.6 W per 4 analog outputs
- Resolution: 100 mV
- Load capacity: up to max. 8 mA per output
- DA-converter: Delta-Sigma converter

Spring-type clamps

- Contact type: Socket (female)
- Number of poles: 10
- Connection type: Push-in spring connection
- Rated voltage (III/3): 250 V
- Nominal current I_N: 10 A
- Nominal cross section: 1.5 mm²
- Conductor cross-section rigid min: 0.2 mm²
- Conductor cross section rigid max: 2.5 mm²
- Conductor cross-section flexible min: 0.2 mm²
- Conductor cross-section flexible max.: 2.5 mm²
- Conductor cross-section flexible with wire end ferrule without plastic sleeve min: 0.25 mm²
- Conductor cross-section flexible with wire end ferrule without plastic sleeve max: 1.5 mm²
- Conductor cross-section flexible with wire end ferrule with plastic sleeve min: 0.25 mm²
- Conductor cross-section flexible with wire end ferrule with plastic sleeve max: 1.5 mm²
- Conductor cross-section AWG min: 26
- Conductor cross-section AWG max: 14

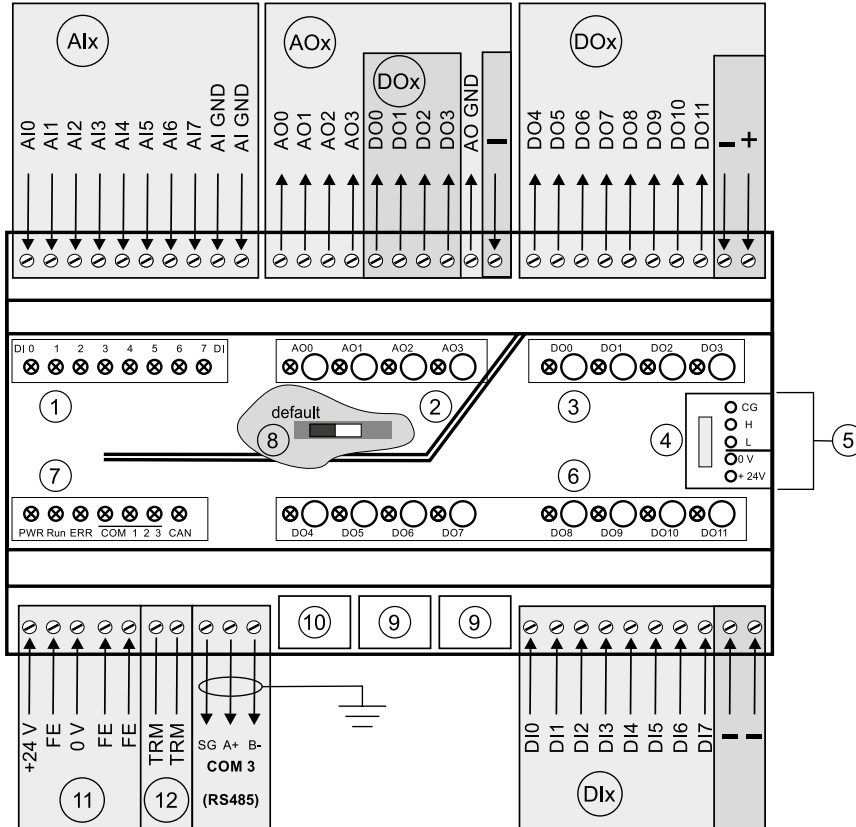
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Terminal configuration / Display and control elements

OPEN 500H EMS with manual control level



- ① LED display digital inputs DI0 ... DI7
- ② LED display and control elements analog outputs AO0 ... AO3
- ③ LED display and control elements digital outputs DO0 ... DO3
- ④ Bus termination resistance (termination) CAN-bus
- ⑤ Connection contacts for bridge bus connectors
- ⑥ LED display and control elements digital outputs DO4 ... DO11
- ⑦ Operating and status LEDs
- ⑧ COM 1 / COM 2 switch
- ⑨ 2x network connection, function as a switch
- ⑩ Connection COM 1 / COM 2, serial interface RS232
- ⑪ Connection of power supply, 24 V DC
- ⑫ Bus termination resistance (termination) COM 3 (RS485)

- AIx Analog inputs
- AOx Analog outputs
- DIx Digital inputs
- DOx Digital outputs

Note COM 3:
 Earth the shield on one end. Do not connect the shield to ground (SG/CG) to prevent interference from coupling directly into the GND of the transceiver.

Unused terminals may not be used as a connecting terminal.

Tightening torque when using the screw terminals – max. 0.4 Nm.

default
 The graphic representation illustrates this default setting.
 COM 2 COM 1

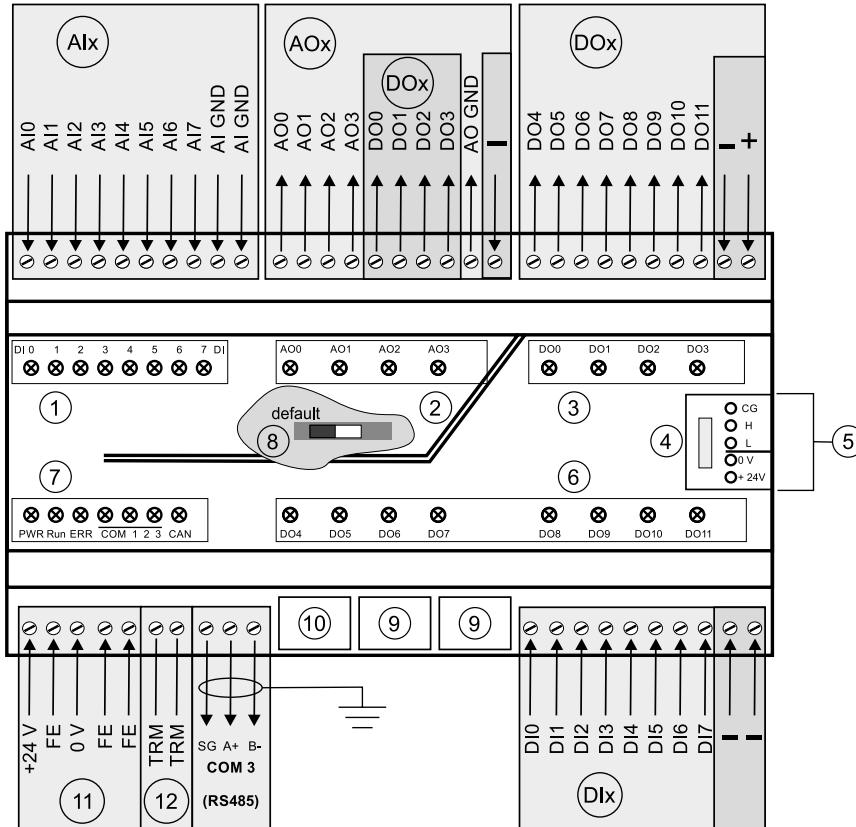
The switch setting is only evaluated when the OPEN EMS system starts. Changing the switch setting while the OPEN EMS is running has no consequences.

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- ① LED display digital inputs DI0 ... DI7
- ② LED display analog outputs AO0 ... AO3
- ③ LED display digital outputs DO0 ... DO3
- ④ Bus termination resistance (termination) CAN-bus
- ⑤ Connection contacts for bridge bus connectors
- ⑥ LED display digital outputs DO4 ... DO11
- ⑦ Operating and status LEDs
- ⑧ COM 1 / COM 2 switch
Switch to determine whether COM 1 or COM 2 on the output connector (10) is active. The switch is located below the cover of the OPEN EMS. When the device is delivered, COM 2 is active.
- ⑨ 2x network connection, function as a switch
- ⑩ Connection COM 1 / COM 2, serial interface RS232
- ⑪ Connection of power supply, 24 V DC
- ⑫ Bus termination resistance (termination) COM 3 (RS485)

- Ⓐ Analog inputs
- Ⓐ Analog outputs
- Ⓐ Digital inputs
- Ⓐ Digital outputs

default
 The graphic representation COM 2 COM 1 illustrates this default setting.

The switch setting is only evaluated when the OPEN EMS system starts. Changing the switch setting while the OPEN EMS is running has no consequences.

Note COM 3:
Earth the shield on one end. Do not connect the shield to ground (SG/CG) to prevent interference from coupling directly into the GND of the transceiver.

Unused terminals may not be used as a connecting terminal.

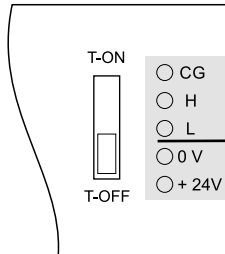
Tightening torque when using the screw terminals – max. 0.4 Nm.

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Contacts layout power supply and CAN-bus



CAN-bus for OPEN IO modules

Connection contacts for bridge bus connectors

PIN	Signal
CG	CAN-ground
H	CAN-high
L	CAN-low

Power supply for OPEN IO modules

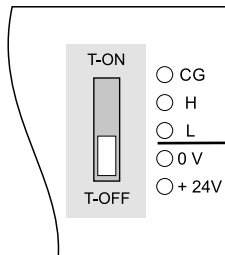
Connection contacts for bridge bus connectors

PIN	Signal
0 V	Ground
+24 V	+24 V DC



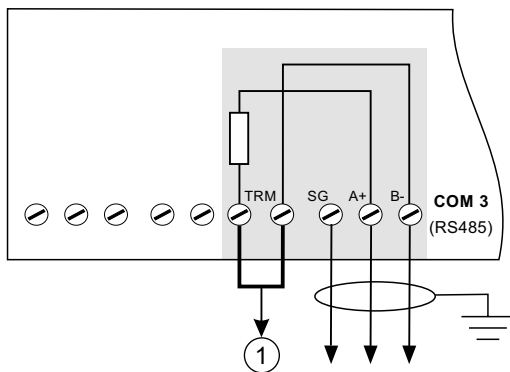
Up to 5 OPEN IO modules can be directly supplied with power via the bridge bus connector of the OPEN EMS.

Bus termination resistance (termination) CAN-bus



Switch setting	Function
T-ON	Bus termination resistance (termination) switched on
T-OFF	Bus termination resistance (termination) switched off

Bus termination resistance (termination) COM 3



Note COM 3:

Earth the shield on one end. Do not connect the shield to ground (SG/CG) to prevent interference from coupling directly into the GND of the transceiver.

	Function
Wire bridges connected	Bus termination resistance (termination) switched on
Without wire bridge	Bus termination resistance (termination) switched off

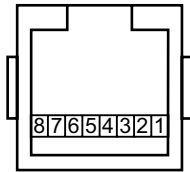
① Wire bridge

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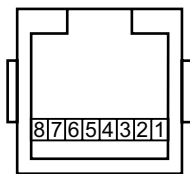
Network (LAN)



RJ45

Plug PIN	Signal
1	Tx+
2	Tx-
3	Rx+
4	-
5	-
6	Rx-
7	-
8	-

Serial interface COM 1 and COM 2 (RS232)



RJ45

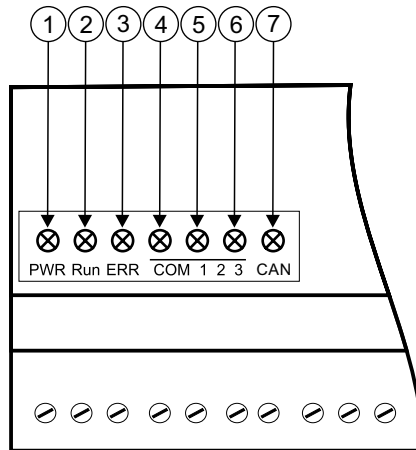
Plug PIN	Signal
1	Secondary RxD (input)
2	CTS (input)
3	RxD (input)
4	-
5	GND (ground)
6	TxD (output)
7	RTS (output)
8	Secondary TxD (output)

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Operating and status LEDs



	Function
① PWR	If the OPEN EMS is connected to the power supply, the LED lights up green.
② Run	The LED begins to flash green (approx. 5 – 10 seconds apart), just before the OPEN EMS system is started. During operation, the LED continues flashing green.
③ ERR	The LED lights up red when the unit is started and restarted.
④ COM 1	The LED flashes green when data is transmitted via the serial interface COM 1.
⑤ COM 2	The LED flashes green when data is transmitted via the serial interface COM 2.
⑥ COM 3	The LED flashes green when data is transmitted via the serial interface COM 3.
⑦ CAN	The LED flashes green when a telegram is transmitted via the CAN-bus.

After switching on the power supply, all LEDs light up for a few seconds.

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Operating and function elements

Meaning of the LED displays

Digital inputs DI0 ... DI7

LED	Meaning
Lights up green or red	The input is +24 V, the input is the signal "1".
Off	The input is 0 V, the input is the signal "0".

Note:

Depending on configuration, the LEDs light up green or red. The default is green. The individual LEDs can also display the status inverted depending on the configuration.

Digital outputs DO0 ... DO11

LED	Meaning
Lights up yellow	The output is switched on. +24 V is at the output.
Off	The output is switched off. 0 V is at the output.

Note:

If an output is in manual operation, the current operating state is displayed. This display is interrupted by flashing a series of very short flash pulses to signal manual operation.

Analog outputs AO0 ... AO4

LED	Meaning
Pulses (yellow)	The number of pulses (flashing status) indicates the value of the output. Each pulse corresponds to approx. 10% (1 volt) of the voltage range. If an output is in automatic operation , there is a short pause before each status flashing; in manual operation there is a sequence of very short flashing pulses before each status flashing.

Functionality of manual control level for OPEN 500H EMS

Digital outputs DO0 ... DO11	Function
Manual ON ↑ (3 sec.)	Press the button up and hold for 3 seconds to activate manual operation. The output is set to "Manual ON".
Manual OFF ↓ (3 sec.)	Press the button down and hold for 3 seconds to activate manual operation. The output is set to "Manual OFF".
AUTO ↑ or ↓ press briefly	Press the button briefly up or down. The output is reset to automatic operation.
Analog outputs AO0 ... AO3	
Activate manual operation ↑ (3 sec.)	Press the button up and hold for 3 seconds to activate manual operation.
Increase output value ↑ press briefly	Press the button up briefly to increase the output value by + 10% (+1 V).
Decrease output value ↓ press briefly	Press the button down briefly to reduce the output value by -10% (-1V).
Deactivate manual operation ↓ (3 sec.)	Press the button down and hold for 3 seconds to exit manual operation and return to automatic operation.

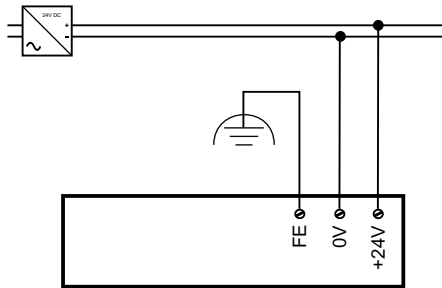
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Connection schemes

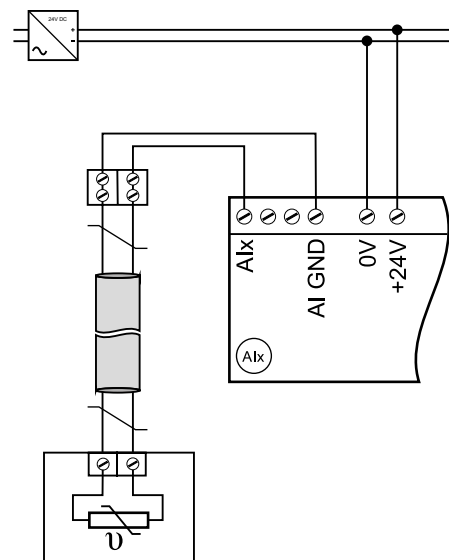
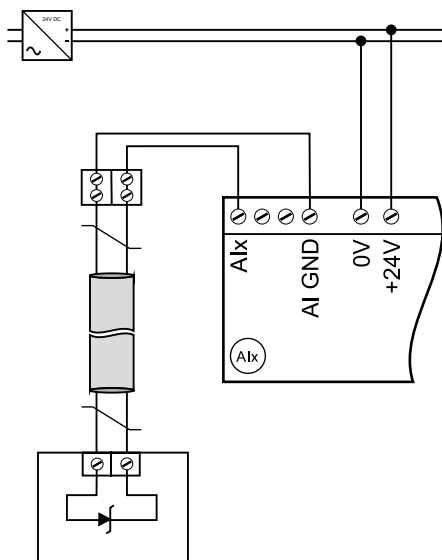
Supply voltage connection diagrams



Analog inputs

Connection of sensors with measuring element 10 mV/K (AI)

Connection resistance sensors (AI)



AIx Analog inputs AIx = AI0 ... AI7

AIx Analog inputs AIx = AI0 ... AI7

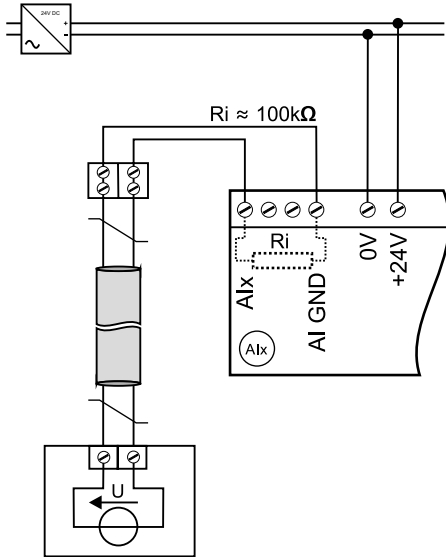
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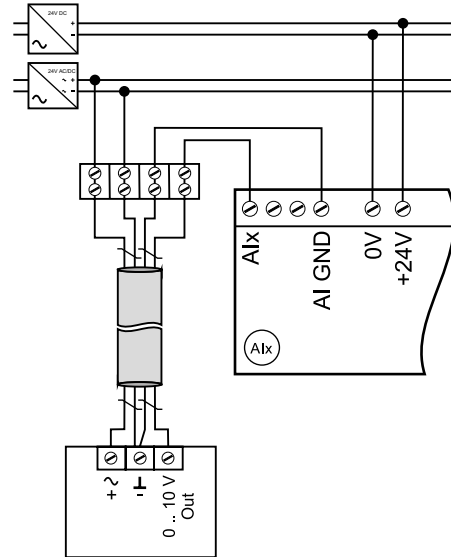
Analog inputs

Connection 0-10V signals (AI)



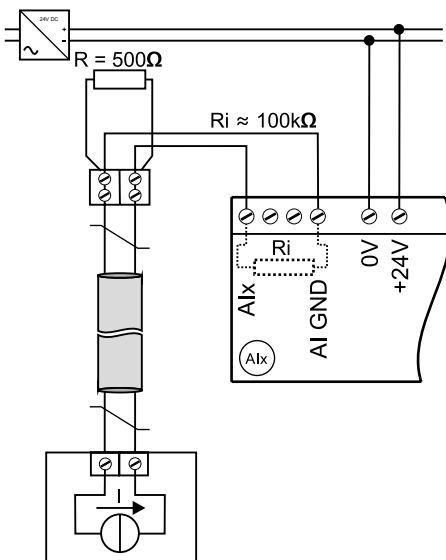
Ⓐ Analog inputs AIx = AI0 ... AI7

Connection 0-10V signals (AI) for connected devices with their own power supply



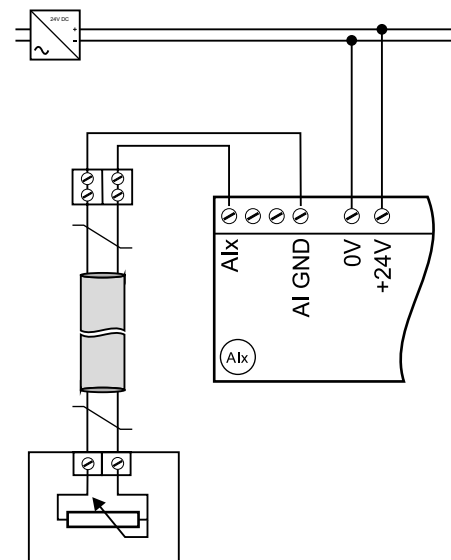
Ⓐ Analog inputs AIx = AI0 ... AI7

Connection 0(4)-20mA signals (AI)



Ⓐ Analog inputs AIx = AI0 ... AI7

Connection potentiometer (AI)



Ⓐ Analog inputs AIx = AI0 ... AI7

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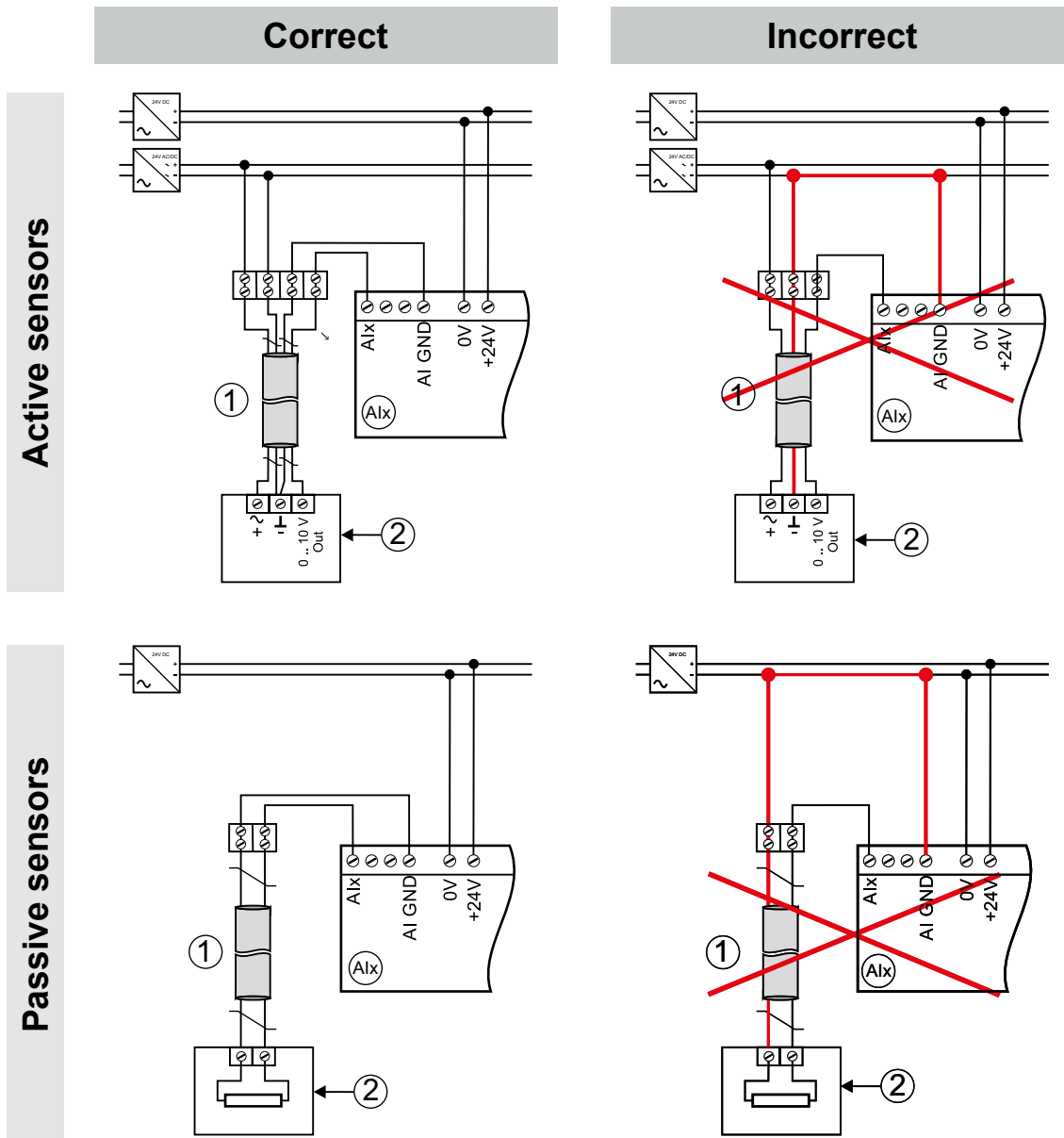
Analog inputs

Note:

The connection between the ground (⊥) of the device and the terminal “AI GND” has to be made directly!

When connecting sensors, please note that measurement errors can occur due to incorrect grounding of the sensor values. These measurement errors can result when a voltage drop occurs on live ground lines.

If both passive sensors and analog 0-10V signals are connected, deviations of the measured values may occur.



- ① Cable type 2 x 2 x 0.8 mm
- ② Sensor
- AIx Analog inputs AI0 ... AI7

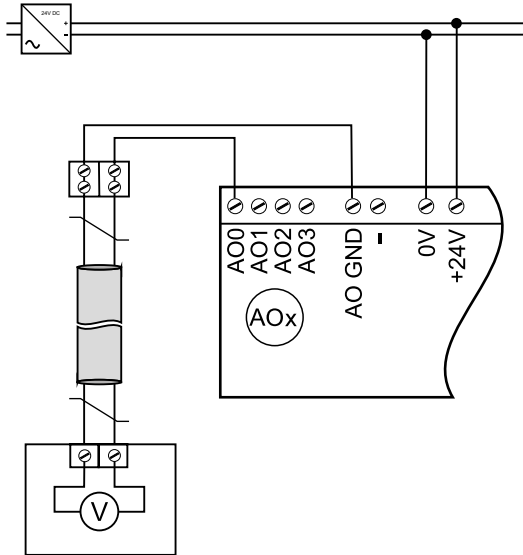
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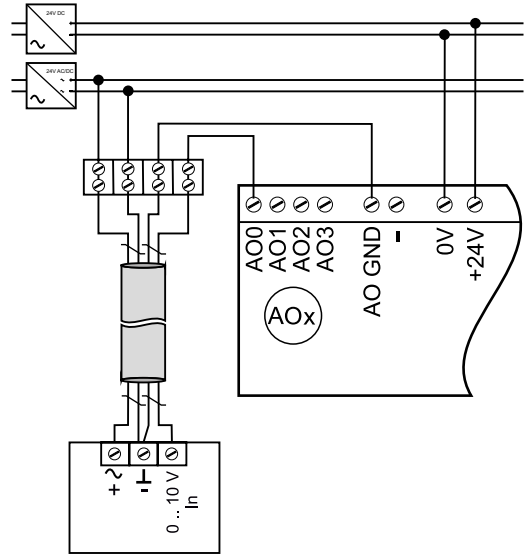
Analog outputs

Connection 0-10V signals (AO)



Ⓐ Analog outputs AOx = AO0 ... AO3

Connection 0-10V signals (AO)
for connected devices with their own power supply



Ⓐ Analog outputs AOx = AO0 ... AO3

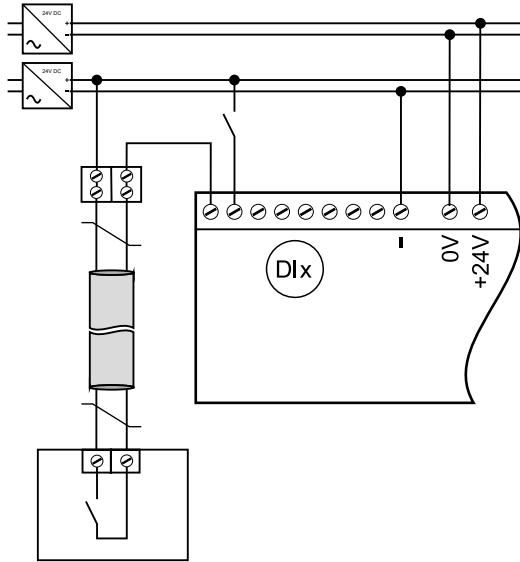
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Digital inputs

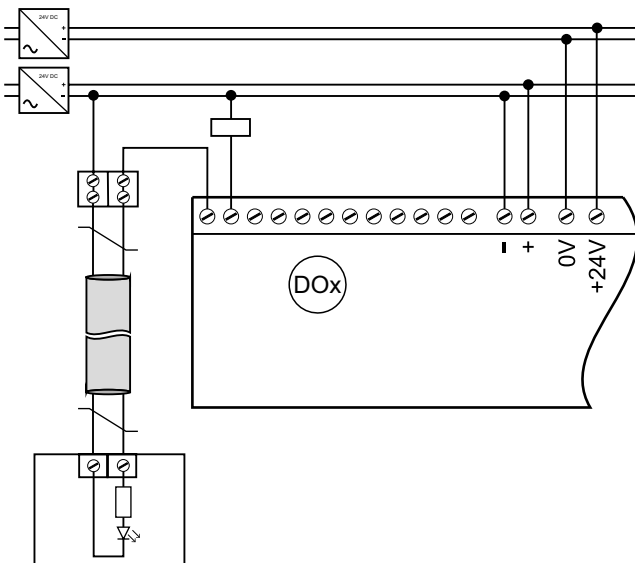
Status inputs / fast counter (DI)



DIx Digital inputs DIx = DI0 ... DI17

Digital outputs

Digital transistor outputs (DO)



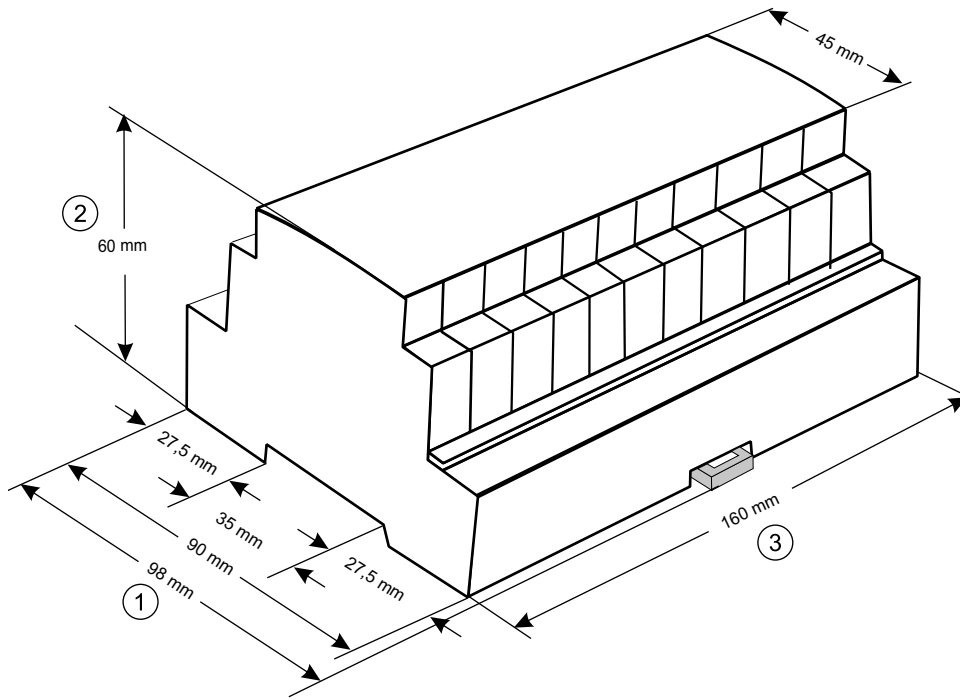
DOx Digital outputs DOx = DO0 ... DO11

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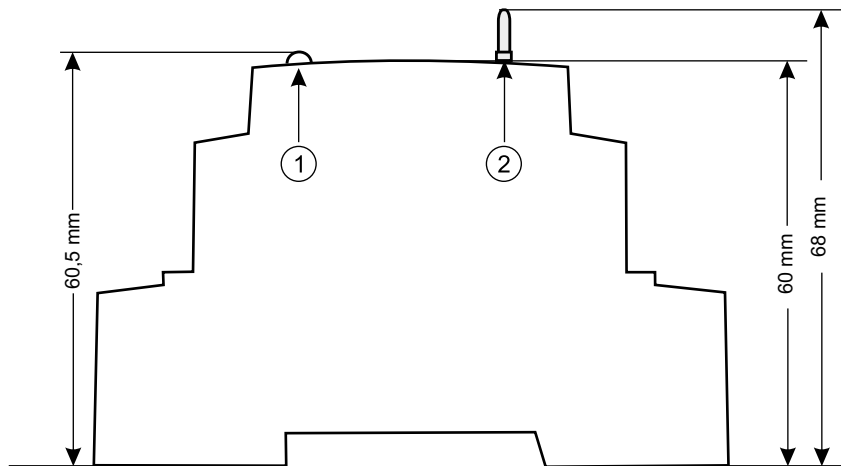


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Dimensional drawing



- ① Height
- ② Depth
- ③ Width



- ① LED
- ② Button

Notes:

- Dimension for button for controllers with manual control level
- Dimension for LED for controller with LED display