

KUNBUS

■ industrial communication

ETHERNET 
POWERLINK



User Manual Gateway component for POWERLINK

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1 General Information

1.1 Disclaimer

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1.2 Notes Regarding this User Manual

This user manual provides important technical information that can enable you as a user to integrate the Gateways into your applications and systems efficiently, safely and conveniently. It is intended for trained, qualified personnel, whose sound knowledge in the field of electronic circuits and expertise in POWERLINK is assumed.

As an integral part of the module, the information provided here should be kept and made available to the user.

1.3 Validity

This document describes the application of the KUNBUS Gateway with the product number:

- PR100095, release 00

1.4 Limitation of Liability

Warranty and liability claims will lapse if:

- the product has been used incorrectly,
- damage is due to non-observance of the operating manual,
- damage is caused by inadequately qualified personnel,
- damage is caused by technical modification to the product (e.g. soldering).

1.5 Customer Service

If you have any questions or suggestions concerning this product, please do not hesitate to contact us:

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+49 (0)711 3409 7077
support@kunbus.de
www.kunbus.de

2 Safe Use

2.1 User

The Gateway may only be assembled, installed and put into operation by trained, qualified personnel. Before assembly, it is absolutely essential that this documentation has been read carefully and understood. Expertise in the following fields is assumed:

- electronic circuits,
- basic knowledge of POWERLINK,
- work in electrostatic protected areas,
- locally applicable rules and regulations for occupational safety.

2.2 Symbols

The symbols used have the following meaning:

DANGER

Danger

Always observe this information!

There is a safety hazard that can lead to serious injuries and death.

CAUTION

Caution

There is a safety hazard that can result in minor injuries and material damage.

NOTICE

Note

There is a safety hazard that can result in material damage.

3 Overview

3.1 Functionality

The KUNBUS Gateway is a protocol converter. It allows communication between networks with different protocols.

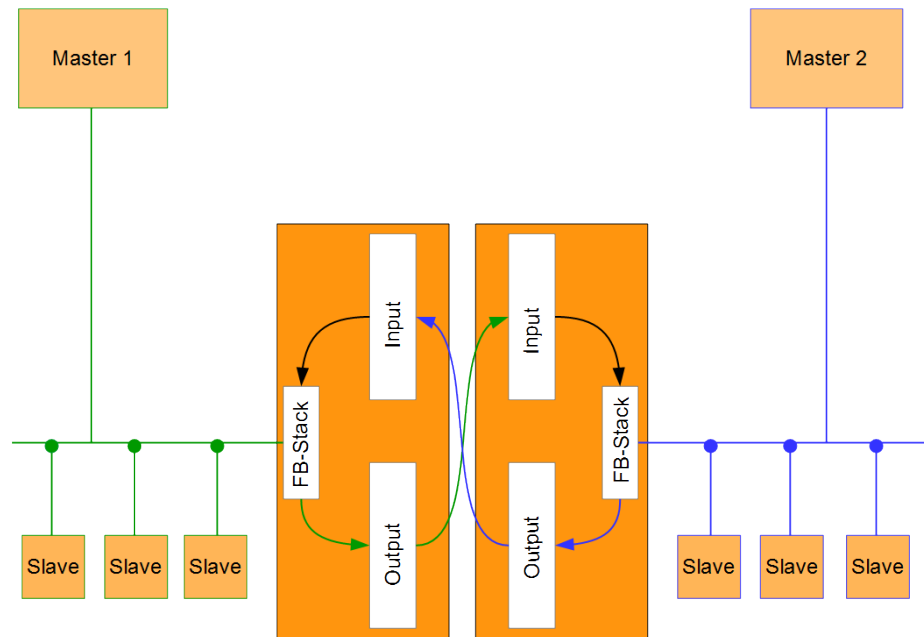


Illustration 1: Functionality

A Gateway consists of 2 gateway components that master one specific protocol each. You can combine these gateway components as you wish. This design offers you a high degree of flexibility, since you can exchange the individual gateway components at any time. The following gateway components are currently available as slaves:

- CANopen
- CC-Link
- DeviceNet
- EtherCAT
- EtherNet/IP
- Modbus RTU
- Modbus TCP
- POWERLINK
- PROFIBUS
- PROFINET
- Sercos III

Features

The gateway component supports the following functions:

- Adaptable PDO mapping
- "Multiplexed Station" mode
- "PollResponse Chaining" mode

3.2 Control Elements

Front view

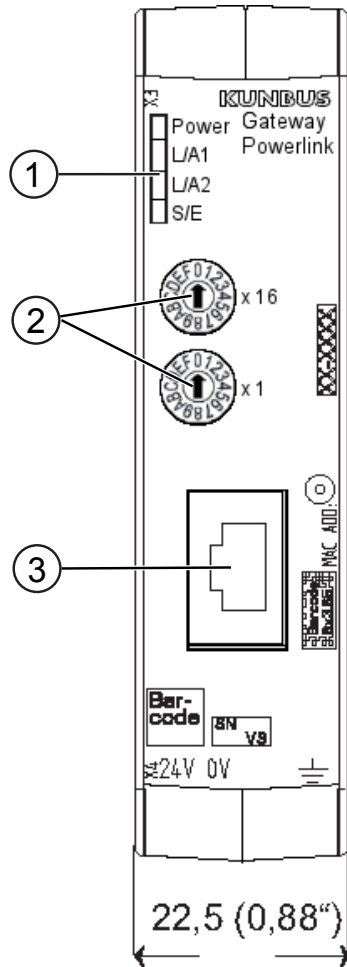


Illustration 2: Front view

1	Status LEDs for signal display.
2	2 rotary coding switches for setting the station number.
3	Fieldbus connection RJ45 socket for connection to POWERLINK (2 pcs., see bottom figure)

Top

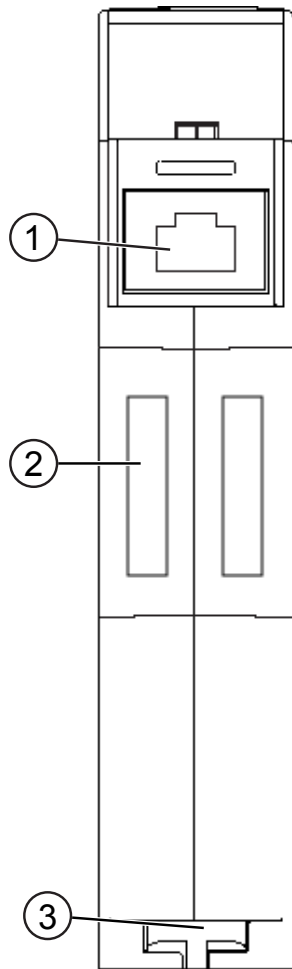


Illustration 3: Top

1	Fieldbus connection RJ45 socket for connection to the fieldbus (2 pcs, see figure front view).
2	Interconnect ports for interconnecting the gateway components.
3	Locking clamps for securely attaching the gateway component to the DIN rail.

Bottom

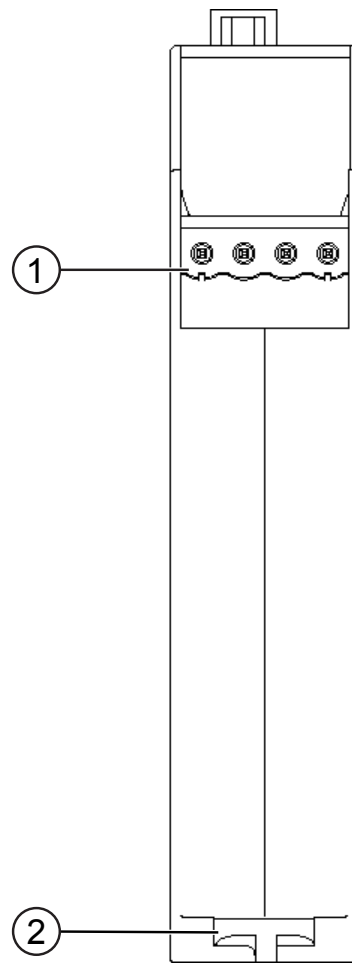


Illustration 4: Bottom

- | | |
|---|--|
| 1 | Mains connection with 24 V power supply |
| 2 | Locking clamps for securely attaching the gateway component to the DIN rail. |

3.3 Status LEDs

The signals of the status LEDs for POWERLINK have the following meaning:

LED designation	Signal	Meaning
Power	off	Gateway not running
	blinks, green	Initialization phase not yet completed
	on, green	All system components are functioning perfectly
	flashes, red	Correctable error (e.g. second gateway component missing)
	on, red	Serious error/defect in the gateway
L/A 1 + L/A 2	on, green	Connection to another device. No data exchange takes place.
	blinks, green	Connection established. Data exchange takes place.
	off	No connection.
S/E	on, red	The bus controller is in an error state (e.g. failure of Ethernet frames, collisions on the network etc.).
	on, green	The bus controller is in operating mode.
	off	The bus controller is either not connected to the power supply or is in the NOT_ACTIVE state.
	flickers, green	The bus controller has not detected any POWERLINK communication. If a POWERLINK communication is detected in this state, the bus controller changes to the PRE_OPERATIONAL_1 state.
	flashes (1x), green	The bus controller is in the PRE_OPERATIONAL_1 state. The gateway component waits for the receipt of an SoC frame and then changes to the PRE_OPERATIONAL_2 state.
	flashes (2x), green	The bus controller is in the PRE_OPERATIONAL_2 state. In this state, the bus controller is normally configured by the POWERLINK manager. After that, it switches to the READY_TO_OPERATE state.
	flashes (3x), green	The bus controller is in the READY_TO_OPERATE state. The POWERLINK manager switches to the OPERATIONAL state by command.

LED designation	Signal	Meaning
	blinks, green	<p>The bus controller is in the STOPPED state.</p> <p>Output data is not output and no input data is delivered. This state can only be reached and exited again by a corresponding command from the POWERLINK manager.</p>

4 Installation

4.1 Preparations for Trouble-free Operation

In the following section we have compiled some general information for you that is important for trouble-free operation. If you are already acquainted with this topic, you can skip to the next section. There, you will learn about which conditions are necessary for installing the gateway.

Cable routing

Route your cables separately in cable groups. This will protect your gateway from any unintended electromagnetic interferences.

The following groups should be routed separately from each other:

Group	Line
A	Data and power supply lines for: DC voltage below 60 V AC voltage below 25 V
B	Data and power supply lines for: DC voltage between 60 V and 400 V AC voltage between 25 and 400 V
C	Power supply lines above 400 V

- You can route cables of the same group together in cable ducts or bundles.
- Cables of group A and B:
 - Route the groups in separate bundles or
 - in cable ducts at a minimum distance of 10 cm from each other.
- Cables of group C
 - Route the groups in separate bundles or
 - in cable ducts at a minimum distance of 50 cm from the other groups.

Shielding

Shield your cables. This will reduce any unintended electromagnetic interferences.

Potential equalization

Potential differences occur when devices are connected to different earths. These potential differences cause malfunctions.

To prevent malfunctions, you have to route an equipotential equalization conductor.

When doing so, bear in mind the following points:

- Select an equipotential equalization conductor with low impedance.
- Select the following as a reference value for the cross-section of the potential equalization cable:
 - 16 mm² for potential equalization cables of up to 200 m in length
 - 25 mm² for potential equalization cables of more than 200 m in length
- Use potential equalization cables made of copper or galvanized steel.
- Connect potential equalization cables extensively with the earth rail.
- The smallest surfaces possible should be sandwiched between potential equalization cables and signal cables.

If the devices of the control system are connected by shielded signal cables that are earthed on both sides, the impedance must be 10% of the shielding impedance.

4.2 Requirements

The Gateway was designed for use in a control cabinet.

- ✓ The protection class of the control cabinet must be equivalent to at least IP54.
- ✓ For installation in the control cabinet you need a DIN rail 35 x 7.5 mm (EN50022).
 - Install the DIN rail horizontally in the control cabinet according to the manufacturers' specifications. When doing so, make sure that the Gateway is at a sufficient distance from other devices.

NOTICE

Your gateway could be damaged if temperatures are too high.

- ➔ Make sure that the ambient temperature in the control cabinet is less than 60 °C.
- ➔ Keep the ventilation slots unobstructed. These must not be covered by cables etc.
- ➔ Maintain sufficient distance from other devices.

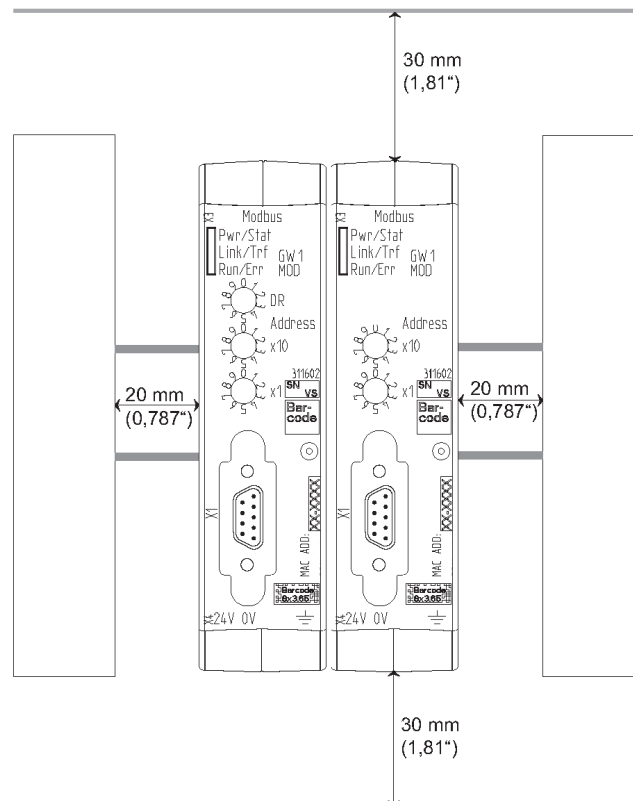


Illustration 5: Distances for installation

- Connect each gateway component individually to functional earth. When doing so, make sure that both voltages have the same ground.
- ⇒ Your control cabinet now meets all requirements for installing the gateway.

4.3 Connecting Gateway Components

In order to attain a fully functional gateway, you have to interconnect both gateway components.

- Connect an interconnect port to each gateway component using the plug-in jumper provided.

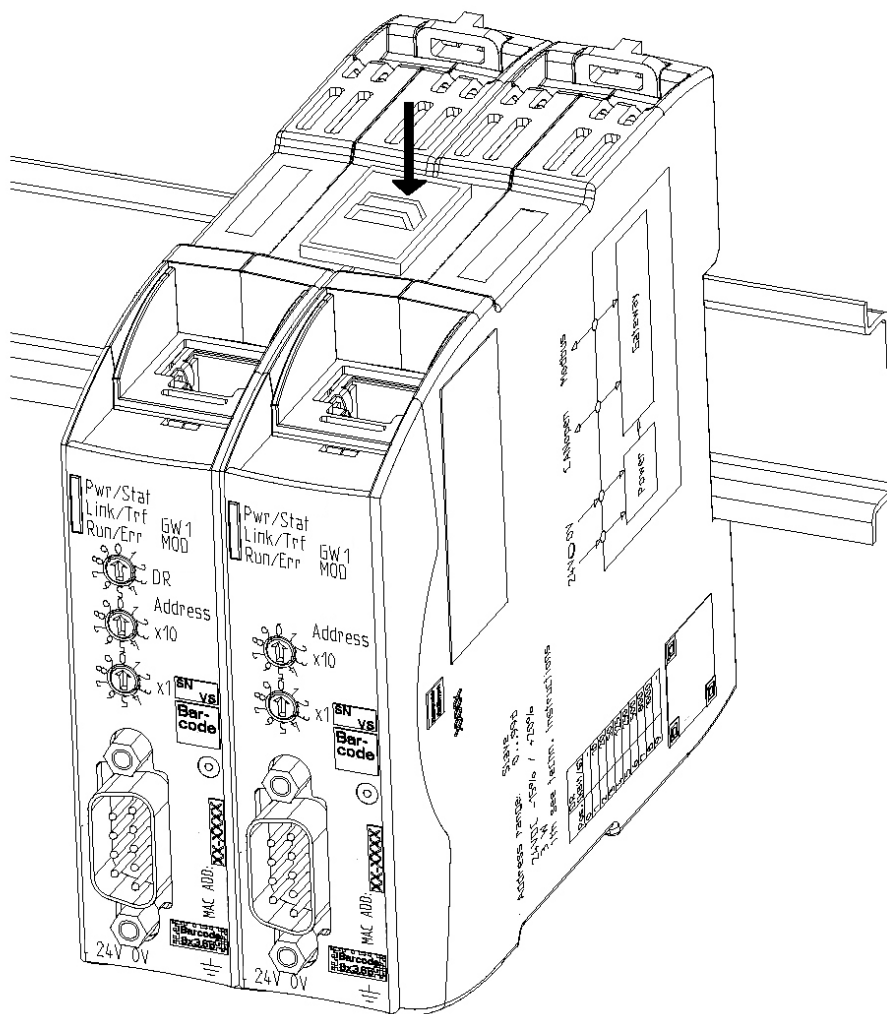


Illustration 6: Connecting gateway components

⇒ You can now install the gateway in the control cabinet.

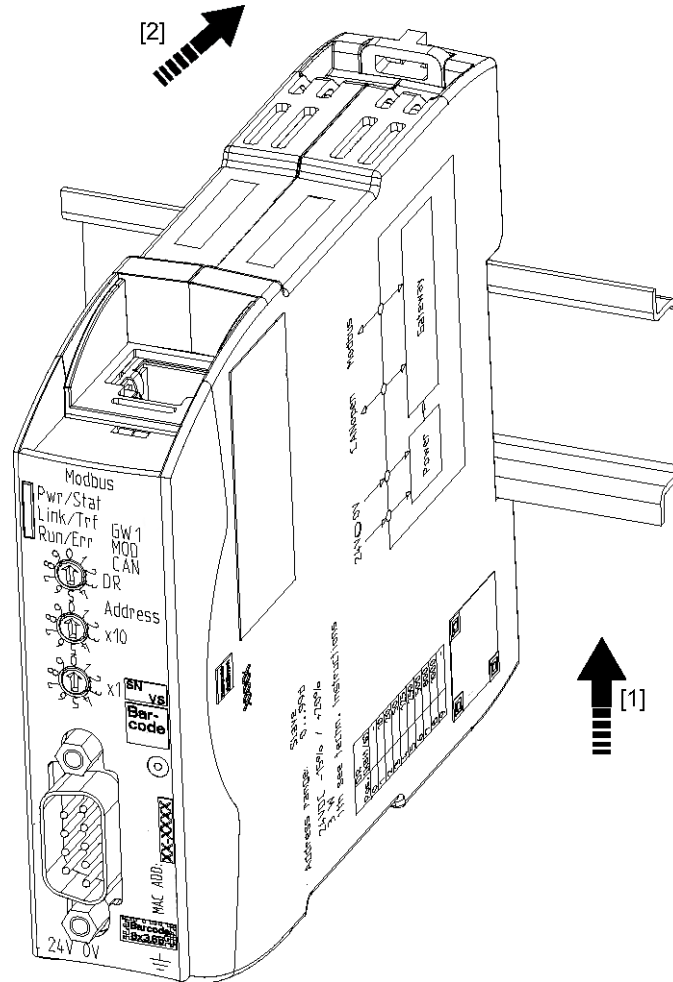
NOTICE

Only ever interconnect 2 gateway components.

If you connect additional components, severe defects could result on all devices.

4.4 Installing a Gateway in the Control Cabinet

- Hold the raster element of the gateway on the DIN rail.
- Press down the locking elements towards the gateway.
- Make sure that the gateway is firmly attached to the DIN rail.



4.5 Connecting a Power Supply

To connect the gateway component to the power supply, you need a spring-loaded terminal (e.g. Metz-Connect SP995xxVBNC).

You have to connect each gateway component separately to a power supply. Never interconnect functional earth and GND, otherwise the galvanic isolation between gateway GND and fieldbus ground will be removed. Instead, connect the functional earth with low impedance to the potential equalization. You can then dispense with this connection if the shield of the fieldbus cable is connected to the potential equalization with lower impedance when entering the control cabinet.

NOTICE

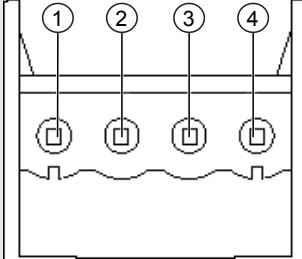
Use the same power supply for both gateway components.

Different power supplies could cause a defect in both module components and result in malfunctions.

→ Ensure in particular that no potential differences occur between the GND pins (2).

Pin assignment:

Pin	Assignment
1	24 V for module supply
2	GND
3	Do not connect!
4	Functional earth



NOTICE

Do not connect GND to PE

This connection could cause unintended malfunctions.

4.6 Connecting a Gateway to the Fieldbus

To connect the gateway component to POWERLINK, you need Two RJ45 connectors.

The pin assignment complies with the specifications of the EPSG.

Pin	Assignment
1	RXD
2	RXD\
3	TXD
4	Termination
5	Termination
6	TXD\
7	Termination
8	Termination

5 Configuration

5.1 Supported Size of the Process Data

The gateway component for POWERLINK supports process data of a length up to 400 bytes.

NOTICE

Bear in mind that the maximum length of the process data is always determined by the fieldbus with the shorter data length.

5.2 Setting the Station Address

You can set a station address for the gateway component using the two rotary switches. The station number can be assigned in the range of 01-239.

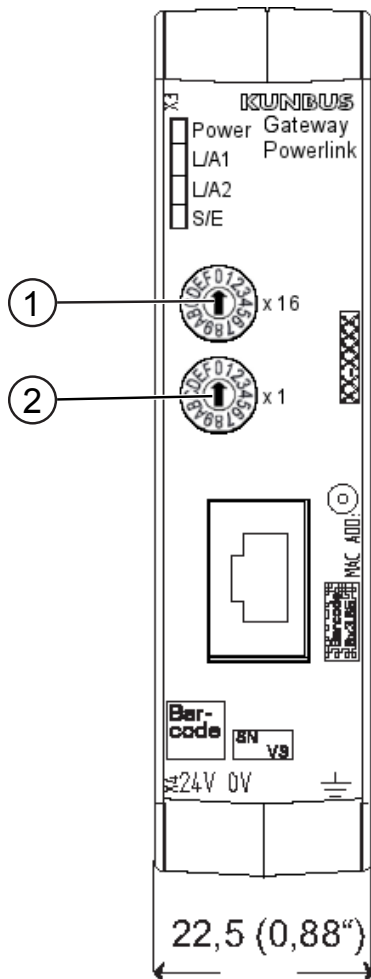


Illustration 7: Rotary coding switch

The station address is set as a hexadecimal.

Example: Setting the station number 18.

Set switch x16 (1) to position "1".

Set switch x1 (2) to position "2".

The settings yield the hexadecimal value 0x12 and the decimal value 18.

5.3 POWERLINK Configuration

To configure the gateway component, you have to make the appropriate settings in the standard objects with the configuration software of your POWERLINK master.

You can structure process data exchanged between the gateways in an application-specific way for POWERLINK using the process data object (PDO). For this purpose, POWERLINK uses mapping objects addressed via index and subindex

The process data is divided into input process data (RPDO) and output process data (TPDO). The size of the process data varies according to the cycle time used:

Cycle time	PDO(RPDO + TPDO)
Minimum cycle time 200 µs	12 byte PDO
400 µs	100 byte PDO
700 µs	RPDO 200 bytes + TPDO 200 bytes
Maximum cycle time 60 ms	RPDO 200 bytes + TPDO 200 bytes

The gateway component supports the objects listed below. They comply with the specification DS302 (Version 4.02) of the CiA.

You can access the data byte-by-byte.

Fieldbus Output Data (Master Direction)

Index	Object name	Sub-index	Description	Data type	Access
2000 h	IN_I2000_S01	00 h	Number of entries	U8	Read only
	IN_I2000_S02	01 h	In byte #0		
		
	IN_I2000_S80	80 h	In byte #127		
2001 h	IN_I2001_S01	00 h	Number of entries	U8	Read only
	IN_I2001_S02	01 h	In byte #128		
		
	IN_I2001_S80	80 h	In byte #255		

Fieldbus input data (from the master)

Index	Object name	Sub-index	Description	Data type	Access
2100 h	OUT_I2100_S01	00 h	Number of entries	U8	Read only
	OUT_I2100_S02	01 h	In byte #0	U8	Read/write
		
	OUT_I2100_S80	80 h	In byte #127		
2101 h	OUT_I2101_S01	00 h	Number of entries	U8	Read only
	OUT_I2101_S02	01 h	In byte #128	U8	Read/write
		
	OUT_I2101_S80	80 h	In byte #255		

6 Technical Data

6.1 Technical Data

Dimensions	
Width	22.5 mm
Height	96 mm
Depth	110.4 mm
Weight	90 g

Electrical data	
Power supply	24 V DC
Power consumption during operation (cyclical data exchange)	100 mA
Status display	LED

Environmental conditions	
Ambient temperature	0 – 60 °C
Storage temperature	- 25 – 60 °C
Humidity	93 % (at 40 °C)
Condensing	Not allowed
Protection class	
Control cabinet	IP54
Housing	IP20
Terminal area	IP20

Assembly data	
DIN rail	35 x 7.5 mm
Height	96 mm
Depth	110.4 mm

POWERLINK interface	
Device type	Slave
Protocol	V2
Station address	1-239
Maximum data length	
Total	400 bytes
Input data	200 bytes
Output data	200 bytes

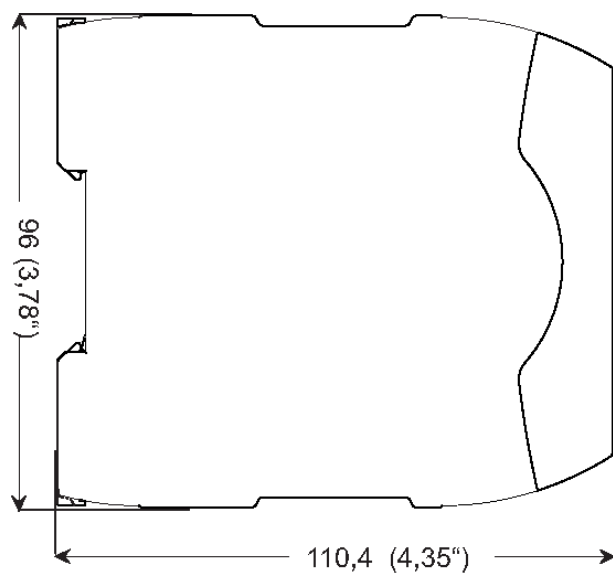


Illustration 8: Side dimensions

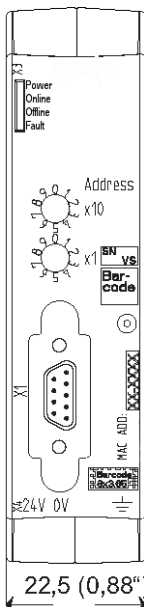


Illustration 9: Front dimensions