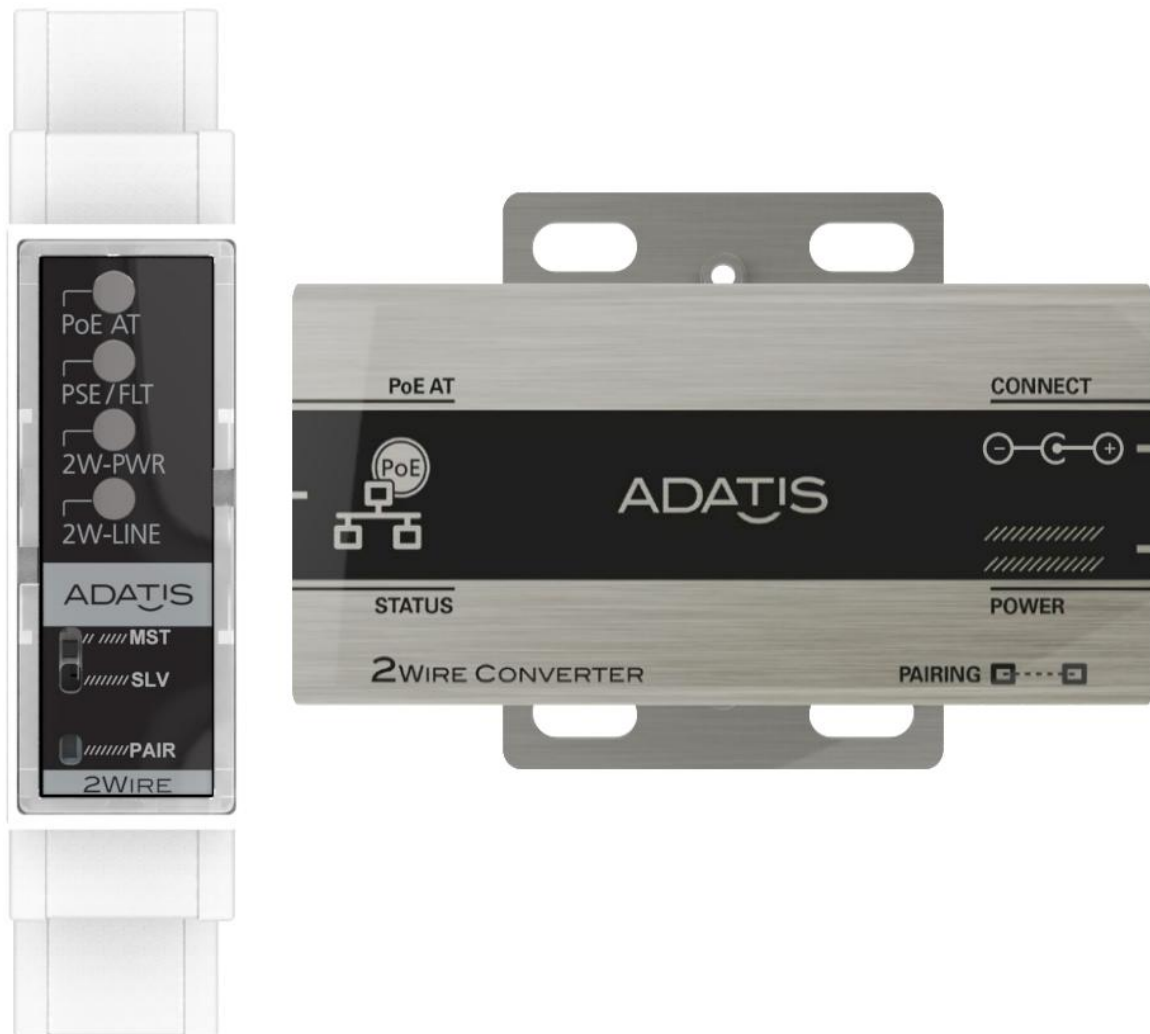


Manual 2-wire

PLC converter 5.2 and 5.3



Version	1.5
Author	lbittner
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1 About this product

1.1 Features

Ethernet connection for remote devices: The Adatis 2Wire converter provides a 100Mbit/s Ethernet connection at locations where no structured cabling exists. The connection is made via any unused wire pair of an existing cabling. Distances of up to 1000 m can be bridged. The use of the 2Wire converter is therefore also appropriate when distances have to be bridged that exceed the permissible cable length of structured cabling, which is typically limited to 100 meters. Since power is supplied to the converter and connected devices via the same pair of wires, the wires must be voltage-free.

Use as PD or PSE: Depending on which type is selected, the Ethernet port of the converter box behaves in terms of Power-over-Ethernet (PoE) either as a "Powered Device (PD)" which is supplied with PoE by an Ethernet switch or power injector, or as "Power Sourcing Equipment (PSE)" which provides Power-over-Ethernet with up to 20 W for connected devices.

AES encryption: Another advantage of connecting devices via the 2Wire converter is the built-in encryption technology according to the AES standard with 128 bit.

1.2 Scope of delivery

- 1x 2Wire Box - Type PD
- 1x 2Wire Box - type PSE

1.3 Type distinction PD and PSE box

1.3.1 PD Box:

The PD box is either connected to a PoE switch or used in conjunction with a 48-56VDC plug-in power supply and a non-PoE switch.

On the output side, both the data and the power supply are transmitted from the PD box via the 2-wire line to the PSE box or an Adatis door station with 2Wire option.

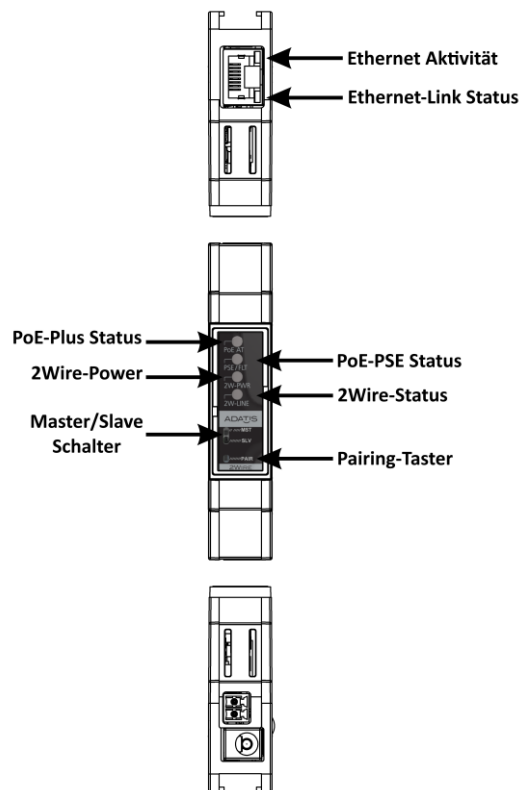
1.3.2 PSE Box:

On the input side, the PSE box is supplied with power via the 2-wire line from the PD box.

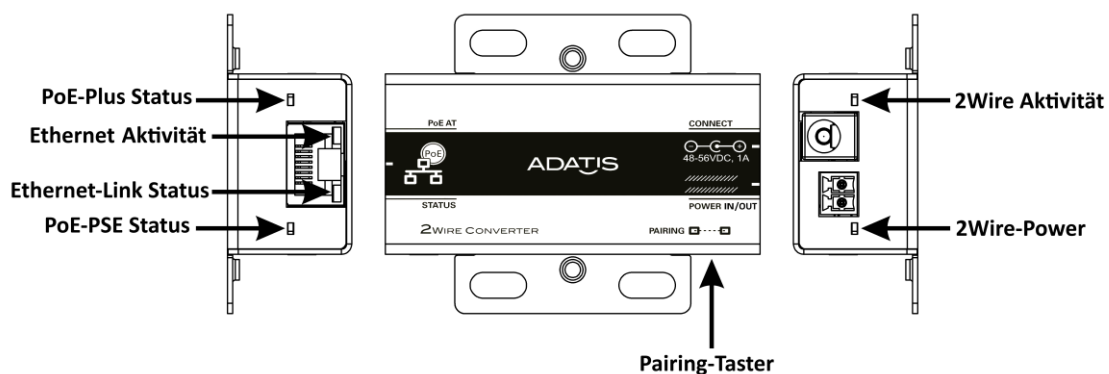
The PSE box provides both PoE and 12VDC (max. 0.8A) on the output side at a hollow connector for the supply of the end devices.

1.4 Device overview

1.4.1 PLC converter 5.2



1.4.2 PLC converter 5.3




1.5 Version distinction 5.2 and 5.3

The functional range of the PLC converter version 5.2 and 5.3 is almost identical:

These differ in the mounting method: While the V5.2 is designed for DIN rail mounting, the V5.3 is intended for table or wall mounting.

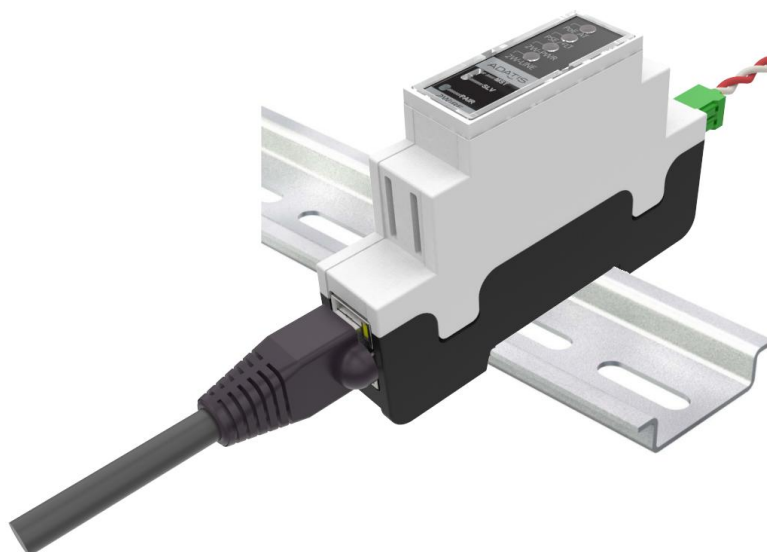
The V5.2 also has a master/slave switch - see section 5.2.

2 Mechanical assembly

 When selecting the installation location, ensure that the device is sufficiently ventilated via the ventilation slots in the side of the box. If the installation location is difficult to access, pairing must be carried out before final installation.

2.1 Version 5.2

DIN rail mounting: The converter box (V5.2) is designed for mounting on a DIN carrier rail and can either be slid onto the rail from the side or clipped onto the rail from the front.



2.2 Version 5.3

Setting up or screwing on the device: The converter box (v5.3) does not require any special mounting. The housing is designed in such a way that the device can either be placed on a flat surface as a desktop housing or screwed onto a wall or other surface using the side lugs. When screwing, make sure that the housing is not mechanically damaged and, in particular, that it is not distorted by excessive forces during screwing. Distortion could damage the circuit board inside.



3 Electrical connection

3.1 2-wire connection

The 2-wire connection is made via a plug-in terminal with a pitch of 3.5 mm. This allows a convenient installation to be carried out. The terminal is suitable for wires and stranded wires and is designed for wire cross-sections of 0.13-1.5 mm² (corresponding to AWG 26-16). Cables should be stripped to a length of approximately 6-7 mm. The M2 screw of the clamp may only be tightened by hand. The maximum torque is 0.34 Nm.

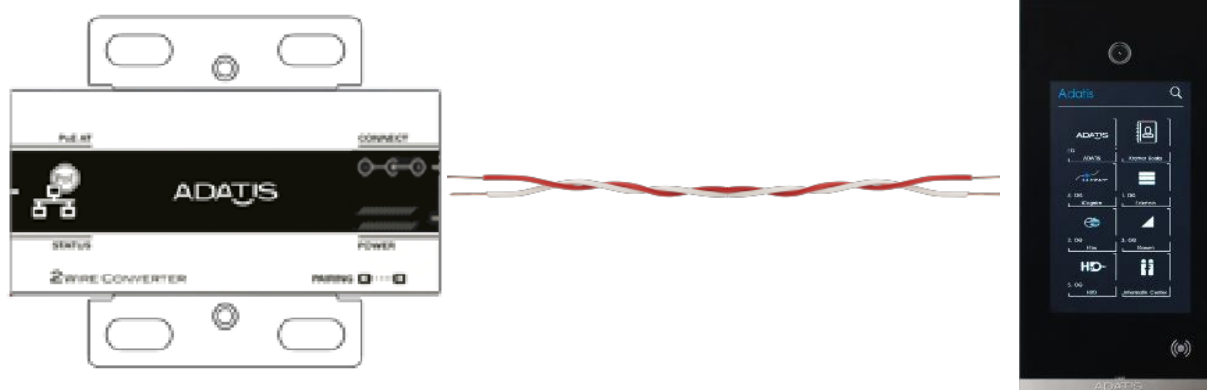


It is essential to ensure that the lines used are voltage-free. Connecting live lines to the 2-wire connection can destroy the device.

Polarity: The 2-wire line is polarity-free, i.e. the transmission and power supply works with any polarity of the lines.

3.2 2-wire connection at the ADATIS terminal

If the device was ordered as a 2Wire option for an ADATIS terminal, the 2-wire line coming from the PD box is connected directly to the 2Wire socket of the terminal. In this case, the technology of the PSE box is already present in the terminal, so that only one PD box is required.



The Ethernet interface in the Adatis terminal has no function if the 2Wire option is present and is sealed with a plastic plug to prevent incorrect connection.

3.3 Ethernet connection

The Ethernet connection is made at the RJ45 socket of the 2Wire converter. The Ethernet interface has a so-called Auto-MDIX function. This guarantees a functioning connection in any case, even if a so-called crossover cable with reversed polarity (consciously or unconsciously) is used instead of a normal Ethernet cable.

Furthermore, the interface has an automatic detection of the transmission speed 10/100 Base-T and supports both half- and full-duplex communication.

4 Power supply

The 2Wire set is two converter boxes that can be used completely independently of other ADATIS products to provide an Ethernet connection even without the presence of structured cabling.

For illustration purposes, the side to which the network switch is connected is referred to as the local side and the converter box on the other side of the 2-wire connection is referred to as the remote side in the following:

(For a better overview version 5.3 is used - but these connection possibilities are also valid for version 5.2).

4.1 2Wire set Power supply via a PoE switch



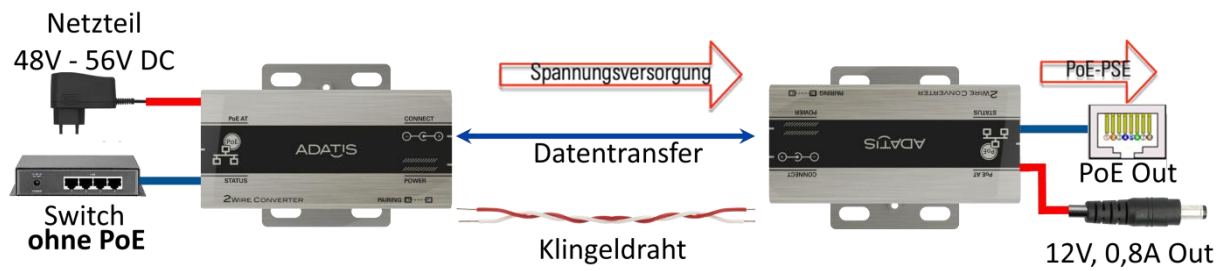
Connection on the local side:

As shown in the figure, power is supplied via the PoE network switch. From the point of view of the PoE switch, the converter box is a "Powered Device" (PD), which is supplied with 12.5W (802.3af) or 25W (802.3at) of electrical power.

The power supply is used on the one hand for the PD converter box, which requires approx. 1.5 W of its own power. The remaining power is passed on via the 2-wire connection to the remote PSE converter box, which is supplied with it and also requires approx. 1.5 W of its own power.

After subtracting the self-consumption of the two converter boxes, the remaining power is available to supply a connected device (via PoE or 12V hollow plug) on the remote side.

4.2 2Wire set Power supply via power supply unit



Connection on the local side:

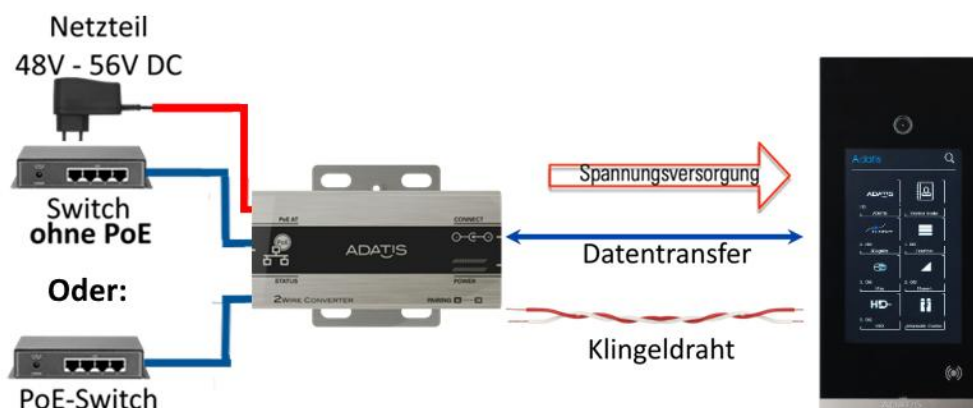
As shown in the figure, the power supply is realized via a plug-in power supply (48 - 56VDC). For the network connection, the PD box is connected to an Ethernet switch without PoE.

The power supply is used on the one hand for the PD converter box, which requires approx. 1.5 W of its own power. The remaining power is fed via the 2-wire connection to the remote PSE converter box, which is supplied with it and also requires approx. 1.5 W of its own power.

After subtracting the self-consumption of the two converter boxes, the remaining power is available to supply a connected device (via PoE or 12V hollow plug) on the remote side.

4.3 2Wire option Power supply

The 2Wire option is an ordering option for Adatis terminals so that these devices can be operated via any 2-wire lines. For this purpose, a plug-on board is mounted inside the housing of the respective device, which takes over the functionality of a converter box. The plug-on board must be mounted ex works. Subsequent installation by the customer is not provided for. Either a PoE-capable switch (see point 4.1) or a power supply unit with a non-PoE switch (see point 4.2) can be used as power supply for the PD box.



5 Configuration

5.1 Pairing

Pairing is the process of setting up a transmission link by matching the two converter boards involved and establishing an encrypted connection between the two converters.

No password entry: The transmission of data via the 2-wire line is AES-128 encrypted. In order to secure a transmission path with encryption, it is usually necessary to enter a password on both sides. So that the converters do not have to be parameterized or configured separately, a possibility of establishing an encrypted connection via a so-called "pairing" button has been provided.

Position of the button in a converter box: The pairing button can be reached via the hole in the lid below the "Pairing" lettering using a paper clip.



When operating the pushbutton in the converter box, care must be taken to ensure that no small metal parts enter the interior of the device. The paper clip used should be inserted as straight as possible to hit the button. Under no circumstances should a longer thin wire be used.

Pairing procedure: The pairing buttons in both boxes or in one box and on the back of the Adatis terminal are pressed in quick succession so that the respective green 2Wire power LED flashes. This is best done before mounting the boxes. The flashing of the LEDs indicates that the devices are performing a pairing procedure, during which an exchange of the password takes place. After the pairing process is completed, this LED will light up constantly again. The devices are now connected to each other and the data transfer is encrypted.

Retaining the password: The pairing process only has to be performed once during installation. Even after the supply voltage is removed, the two boxes or the box and Adatis device remain assigned to each other, i.e. they retain the password once configured. If it is necessary to replace a box, or - in the case of the 2Wire option - the device equipped with a 2Wire option, pairing must be performed again to enable communication and connect the devices. Pairing can be repeated as often as required.

5.2 Master/slave - switch (version 5.2 only)

Unlike version 5.3, where the PD box is automatically the master in the 2Wire network, you have to set this in version 5.2.

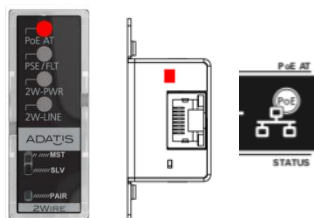
For this purpose, there is a small switch in the lid, which can be set to the values Master and Slave.



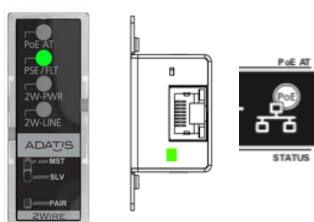
There may only ever be one master in the network. All other devices must be configured as slaves.

6 LED indicators

6.1 LED indicators for Power-over-Ethernet Plus (PoE+) and Ethernet communication



The PoE+ LED lights up red when there is a connection via PoE+.

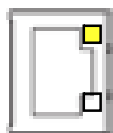


The Ethernet port can also be used as a power source for connected PoE-capable devices according to the 802.3af standard. The PSE LED provides information about the status of the supply of connected devices and possible error states by means of various flashing sequences. The LED is always off when there is no power supply to a connected device. Conversely, this LED lights up when the connected device is actively supplied with power via PoE. The possible error states are signaled via the blink codes listed in the table:

PSE status	LED code	Blink pattern
No PD connected	OFF	LED off
PSE port active	AN	LED permanently on
Short circuit on PoE port	1 x flash	LED flashes 1 x for 100 ms
Overload	2 x flash	LED flashes 2 x for 100 ms

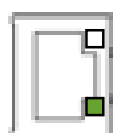
6.2 LEDs of the Ethernet socket

The Ethernet socket in the RJ45 design is used to connect the network cable. There are 2 LEDs built into the socket.



LED - yellow

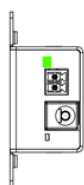
The LED lights up when a link is active, i.e. the connection is established.



LED - green

The LED flashes when data is transmitted (Receive and Transmit) via the Ethernet interface.

6.3 LED indicators for the 2-wire interface



Power - green

The illumination of this LED signals that the converter section within the device is supplied with power. If this LED does not light up, although the device is supplied with power and the PoE+ LED lights up, there is a device error and the device must be sent in.



Connection - green/yellow/red

The quality of the 2-wire line and the connection status via the 2-wire line are signaled via traffic light colors:

Connection status	LED
No connection	OFF
Active connection - good line quality	AN green
Active connection - medium line quality	AN yellow

Active connection - poor line quality	AN red
Data transmission	flashes green or yellow

Poor line quality: If poor line quality is signaled, either the cable is too long or the device may not have been connected correctly. In these cases, the installation must be checked, otherwise the connection and thus the data transmission will be aborted.

7 Glossary

10Base-T	Older Ethernet standard according to IEEE standard 802.3 since 1991 for transmission over one twisted pair each for sending and receiving at a speed of 10 Mbits/s.
100Base-TX	Standard Ethernet via so-called structured cabling according to Cat-5 (one twisted pair of wires per transmission direction) with a speed of 100 Mbits/s.
1000Base-T	Ethernet with 1 Gigabit/s over copper cables, which must correspond to the category Cat-5 UTP or better Cat-5e or Cat-6. The distance is limited to 100m as with 10Base-T and 100Base-TX.
802.3af	The extension of the Ethernet standard to include a power supply for the devices. Power-over-Ethernet (PoE) refers to a method by which network-capable devices can be supplied with power via the 8-core Ethernet cable. The maximum power is 12.5 W.
802.3at	Newer Power-over-Ethernet standard, also known as PoE+ or PoE plus, with increased power up to 25 W.
AES	The Advanced Encryption Standard is currently the most secure encryption method, which has been announced as a standard by the National Institute of Standards and Technology (NIST) since 2000 as the successor to the older DES and 3DES methods.
Auto-MDIX	Devices with Auto-MDIX function have the ability to independently detect the transmit and receive lines of the connected device and adjust to them. Here, the use of the cable type (crossed or uncrossed) is irrelevant.
AWG	American Wire Gauge is a coding for wire diameter and is mainly used in North America. It identifies stranded and solid wire electrical conductors and is used primarily in electrical engineering to designate the cross-section of cores.
Crossover cable	In computer network technology, a crossover cable is an eight-core cable in which certain cable wires are interchanged in one of the two RJ45 connectors (to cross). While a non-crossed (straight through) network cable connects computers to switches, a crossover cable can be used to connect two computers (or two switches) directly to each other. With the spread of Auto-MDIX, crossover cables are no longer necessary, as network devices can automatically cross wires electronically as needed.

Full-Duplex	Today's Ethernet standards have one wire pair each for the send and receive direction. This allows independent and simultaneous transmission and reception. This is referred to as full-duplex operation.
Half-Duplex	Early Ethernet networks used only one cable for both transmitting and receiving. This meant that it was not possible to send and receive simultaneously. This alternating sending and receiving is called half-duplex in communications engineering. For compatibility reasons with any existing technology, this form is still supported today if required.
Pairing	Pairing is the process of assigning two devices to each other. During the pairing process, keys are exchanged so that an encrypted connection can then be established between the devices involved without having to enter a password on each device.
PD	A Powered Device is an end device that is supplied with power via the Ethernet.
PoE Plus	see 802.3at
Power Injector	A Power Injector or PoE Injector is a so-called midspan device that is inserted between the network switch and the PD and which supplies power to the respective wires. This may be necessary if switches without PoE function are used.
PSE	The Power Sourcing Equipment is a component of the PoE architecture that determines whether a PoE-compatible device, a PoweredDevice (PD), is connected and needs to be supplied with power. If the PSE device detects such a device, it supplies power to it over the existing data line. For the determination, the PSE device regularly sends out a short pulse via which a signature resistor is searched for.
RJ45	RJ45 is the name of a standardized 8-pin modular connector that is used worldwide for Ethernet networks. Shielded sockets and plugs are used in the Ethernet sector. The unshielded variant is also used for ISDN.
Signature Resistance	In the PoE architecture, the signature resistor designates the characteristic impedance for the devices to be supplied. The PSE device uses the signature resistor to determine whether a device connected to the network is a PD and which power class this PD corresponds to.