periSNOOP 4-20mA

Single Pair Ethernet sensor monitoring device

Datasheet

Confidential

Perinet
Seamless IoT Connectivity

Abstract

This datasheet describes the *periSNOOP 4-20mA*, a sensor monitoring device designed for industrial use. This device allows easy remote access and control through a network using Single Pair Ethernet (SPE), a modern network standard. It is designed to be integrated into existing installations without needing to alter those systems.

The periSNOOP 4-20mA is equipped with advanced communication features and state-of-the-art security measures. These features ensure that it can reliably transmit sensor data to digital systems.

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Document Information

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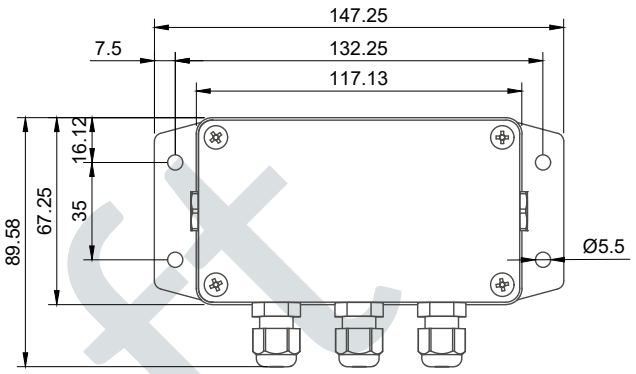
Contents

1 Overview

The *periSNOOP 4-20mA* easily integrates into 4-20mA sensor to PLC loops, digitizing sensor readings without the need for modifying existing installations. This digitization makes sensor data more accessible through Single Pair Ethernet, utilizing the periCORE SPE communication module. Key features of the periSNOOP 4-20mA include state-of-the-art security measures, the ability to update firmware remotely, and IPv6/TCP-based communication capabilities through a RESTful API. Additionally, its hardware is specifically designed for safety, providing protection against overcurrent and similar malfunctions.

Key Features

- Integrable into existing applications
- No influence on sensor current loop
- Converts 4-20mA analog signals to digital format
- 16-bit ADC resolution
- Supports Daisy Chain topology
- Supports remote firmware updates
- Operates on 24V power supplied via hybrid network cable
- Two 100BASE-T1 Single Pair Ethernet interfaces
- Integrated Software Stacks: TCP/IPv6, mTLS, MQTTs, HTTPs, RESTful API
- End-to-end encryption
- Integrated WebUI & RESTful API
- No-Code Firmware, adoptable to multiple sensors



periSNOOP 4-20mA's dimensions in mm.

Operational Parameters

- Operating voltage: 24VDC input
- Supply Voltage: 24V output (2A max)
- Temperature range: -40°C to +85°C
- Power consumption: 1.1W
- Accuracy: 0.2 %

Interfaces

- 2 x 100BASE-T1 Phy (IEEE 802.3bw)
- 1 x 24VDC Power input
- 1 x 24VDC Power output
- 1 x 4-20mA input
- 1 x 4-20mA output
- HTTPs RESTful API, for configuration
- MQTTClient, for data flow
- C++20 library for custom firmware development

Compliance

- RoHS, WEEE, CE, FCC

Security

- NIST compliant TLS implementation
- Role Based Access Control (RBAC)
- Certificate based client authentication
- AES encryption algorithm
- X.509 certificates and PKIX path validation
- Elliptic Curve Cryptography (ECC)

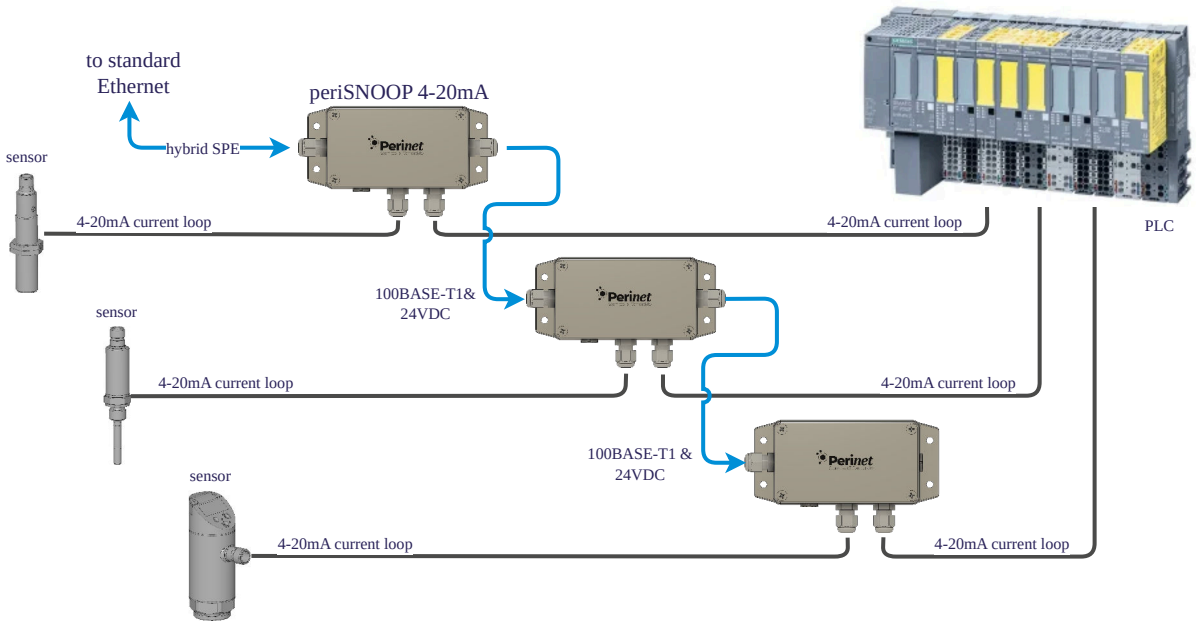
Dimensions

Typical(L/W/H) 147.25 x 89.58 x 52.02 mm

Software Deliverables

- Integrated HTTP server with TLS
- Mutual TLS (mTLS) based Authentication
- Role Based Access Control (RBAC)
- Integrated MQTT-client, with mTLS
- Zero-configuration (mDNS and DNS-SD)
- Full TCP/IPv6 communication stack
- LifeCycle Management, remote firmware update
- Re-branding support
- No-Code Firmware, compatible with different sensors via configuration changes

Typical Application



Typical installation of the periSNOOP 4-20mA

2 Single Pair Ethernet

Single Pair Ethernet (SPE) describes a single twisted pair of wires that is one aspect of the physical layer for an Ethernet based communication. The periSNOOP 4-20mA uses a point-to-point full-duplex communication scheme with 100Mbits/s throughput on the physical layer as specified by the IEEE [17]. Figure 1 shows conventional Ethernet compared to SPE on a simplified overview.

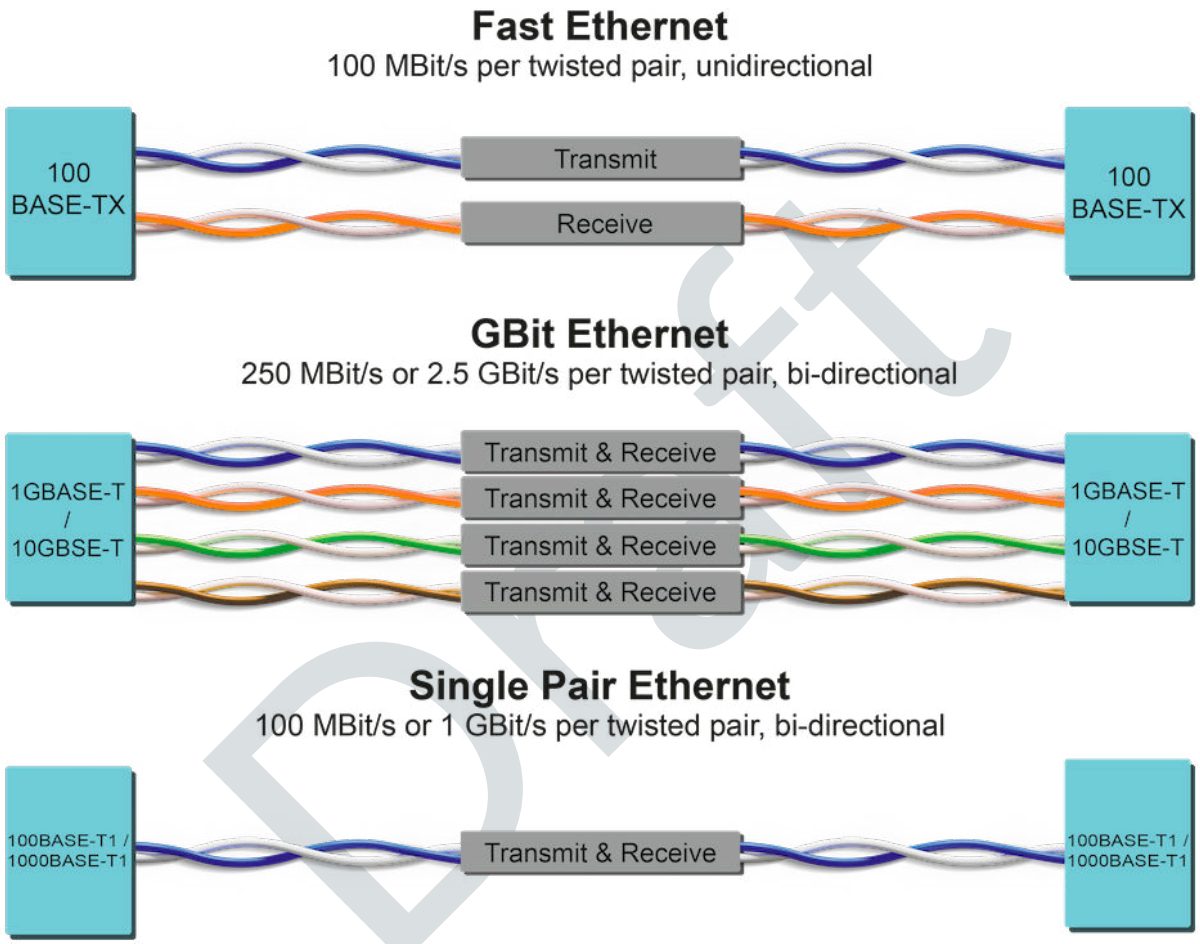


Figure 1: Single Pair Ethernet compared to other Ethernet technologies.

3 Architecture

The periSNOOP 4-20mA's structure is depicted in the block diagram shown in Figure 2. It comprises two main sections that are galvanically isolated from each other: the Network side and the Sensor side. This isolation is crucial as it separates the existing setup on the Sensor side from the newly added components on the Network side. The Network side contains the periCORE, which handles all communications over the SPE network and controls the operations of the periSNOOP 4-20mA. On the Sensor side, the device includes an Analog-to-Digital Converter (ADC) and a normally closed relay (N.C.). The device measures the 4-20mA signal current by detecting the voltage across a 100 Ω shunt resistor, with the voltage being directly proportional to the signal current. An isolation block supplies power to the sensor side and enables the transfer of communication and control signals between the two isolated domains. The relay provides a low-resistance path for the signal current, ensuring continued operation in case of power loss or any malfunction in the periSNOOP 4-20mA.

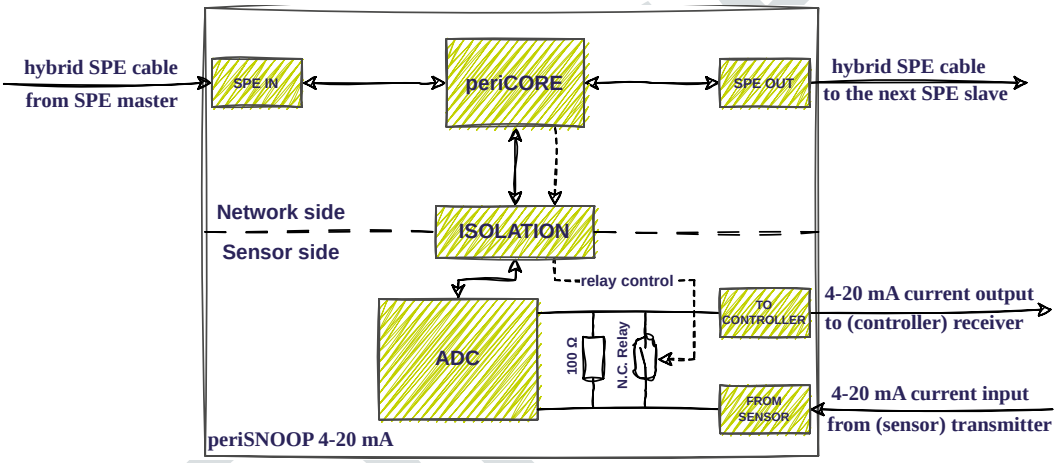


Figure 2: periSNOOP 4-20mA hardware block diagram

periSNOOP 4-20mA blocks description:

`SPE IN` is a 4-pole clamp connector for connecting periSNOOP 4-20mA with the 100BASE-T1 master and the power supply using a hybrid SPE cable. The hybrid SPE cable has 4 wires. 2 wires are used for SPE, and the other 2 wires are for supplying power.

The network interface of the periCORE module associated with this connector implements (100BASE-T1) and is configured in *slave* mode (connects to 100BASE-T1 device with *master* configuration). For further details, see [4].

`SPE OUT` is a 4-pole clamp connector for connecting periSNOOP 4-20mA to a possible remote device on the daisy chain topology with a hybrid SPE cable. This can be used to deliver power and SPE connection to another periSNOOP 4-20mA for example.

The network interface of the periCORE module associated with this connector implements (100BASE-T1) and is configured in *master* mode (connects to 100BASE-T1 device with *slave* configuration). For further details, see [4].

`FROM SENSOR` is a 4-pole clamp connector to connect the signal cable from the sensor (4-20mA transmitter) to periSNOOP 4-20mA. One pole is for 4-20mA signal and the other 3 are fed to the TO CONTROLLER connector through. The must flows into periSNOOP 4-20mA at this point.

`TO CONTROLLER` is a 4-pole clamp connector to connect periSNOOP 4-20mA to the existing controller (4-20mA receiver). One pole is for 4-20mA signal and the other 3 are only fed through. The current must flow out of periSNOOP 4-20mA at this point.

`periCORE` is the Single Pair Ethernet communication module. It implements the SPE communication interfaces and provides a µController, which implements the software stack for communication, security as well as functionality. For further details, see [4].

`ADC` is a 16-bit Analog-to-Digital Converter.

3.1 Typical Application

periSNOOP 4-20mA finds its place in the existing control loops based on 4-20mA current signals. Figure 3 shows a typical periSNOOP 4-20mA application.

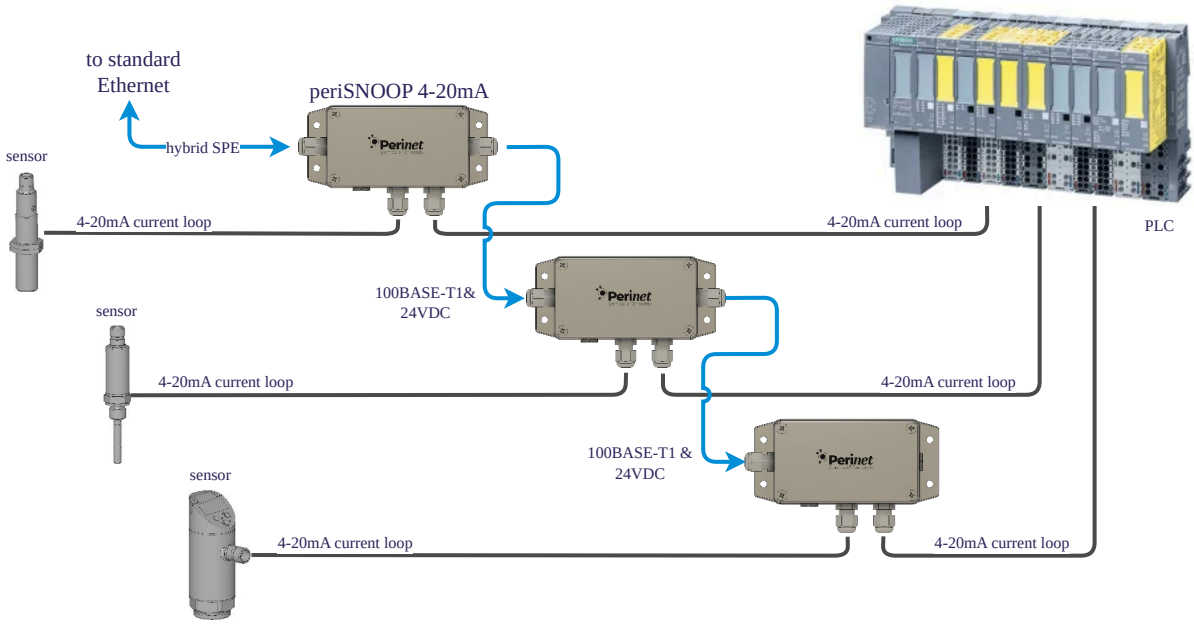


Figure 3: Peripheral connectivity for the periSNOOP 4-20mA with daisy chain network topology.

In the setup depicted in Figure 3, a control loop consists of a Programmable Logic Controller (PLC) and three sensors generating 4-20mA current signals. The periSNOOP 4-20mA, positioned between the sensor and the PLC, digitizes these current signal values, making them accessible over the network without needing any changes to the existing installation.

Further details about the wiring process are available in Section 6.

3.2 Theory of Operation

Upon powering on or restarting, the periSNOOP 4-20mA begins with an initialization phase. Initially, the 4-20mA current signal passes through the closed relay. Once initialization completes, the relay opens, redirecting the current signal through a shunt resistor. The voltage drop across this resistor is measured by a 16-bit ADC, transforming it into digital data. This data is then processed and made available on the network. In case of errors, like overcurrent, the relay closes, disconnecting the shunt resistor from the current loop. Manual intervention (possible through the network) is required to reset the relay.

3.3 Typical Network Topology

The periSNOOP 4-20mA is designed for field implementation using SPE (Single Pair Ethernet), featuring a multiport switch compatible with 100BASE-T1. This allows for the support of daisy chain network topology. As shown in Figure 3, the periSNOOP 4-20mA is deployed within a daisy chain network configuration.

Note: The 100BASE-T1 physical layer establishes a link between master and slave as per [17]. This means, the periSNOOP 4-20mA must be connected from `SPE_out` to `SPE_in`.

4 Electrical Connectivity

4.1 Signal Types

Type Name	Description
DC_PWR	Direct current supply
DC_GND	Common Ground supply
SPE_DATA	Digital differential communication
AnalogSense	4-20mA current signal
AnalogMisc	General purpose, fed through analog signal

Table 1: Signal Type Definitions

4.2 Connectors

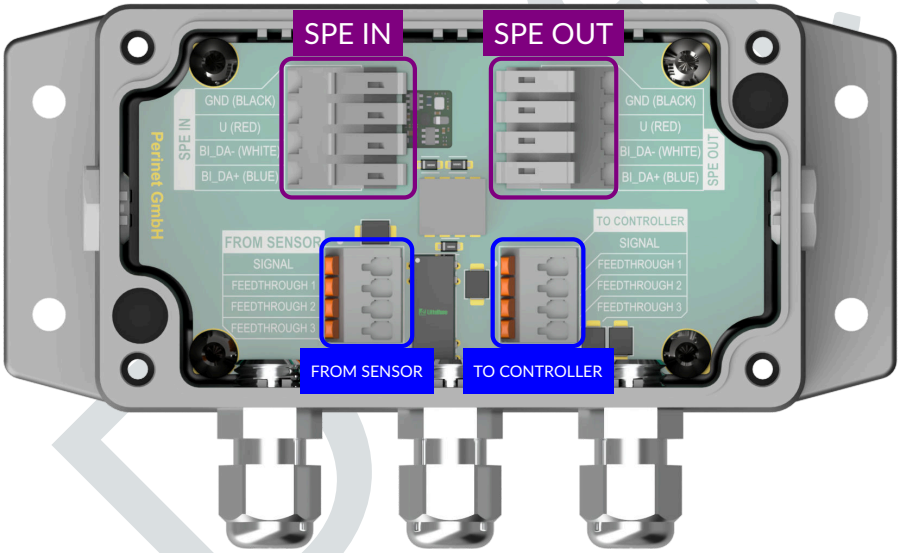


Figure 4: periSNOOP 4-20mA's electrical connectivity.

Pin	Sig	Type	Descr.
1	GND	DC_GND	Power supply (0V) direct current input
2	U	DC_PWR	Power supply (24V) direct current input
3	BI_DA-	SPE_DATA	white, 100BASE-T1 slave mode [17] data pair -
4	BI_DA+	SPE_DATA	blue, 100BASE-T1 slave mode [17] data pair +

Table 2: periSNOOP 4-20mA's electrical connectivity for connector SPE IN.

Pin	Sig	Type	Descr.
1	GND	DC_GND	Power supply (0V) direct current output
2	24VDC	DC_PWR	Power supply (24V) direct current output
3	BI_DA-	SPE_DATA	white, 100BASE-T1 master mode [17] data pair -
4	BI_DA+	SPE_DATA	blue, 100BASE-T1 master mode [17] data pair +

Table 3: periSNOOP 4-20mA's electrical connectivity for connector SPE OUT.

Pin	Sig	Type	Descr.
1	SIGNAL	AnalogSense	4-20mA current signal input from the sensor. The current must flow into periSNOOP 4-20mA at this point
2	FEEDTHROUGH 1	AnalogMisc	Analog input/output, short circuit to FEEDTHROUGH 1 of the TO CONTROLLER connector
3	FEEDTHROUGH 2	AnalogMisc	Analog input/output, short circuit to FEEDTHROUGH 2 of the TO CONTROLLER connector
4	FEEDTHROUGH 3	AnalogMisc	Analog input/output, short circuit to FEEDTHROUGH 3 of the TO CONTROLLER connector

Table 4: periSNOOP 4-20mA's electrical connectivity for connector FROM SENSOR.

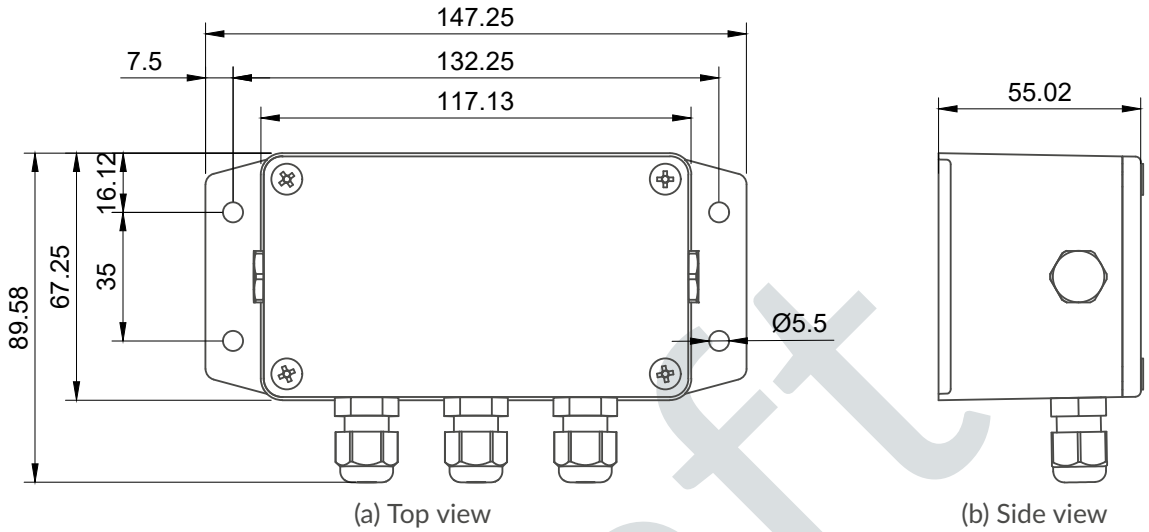
Pin	Sig	Type	Descr.
1	SIGNAL	AnalogSense	4-20mA current signal output to the controller. The current must flow out of periSNOOP 4-20mA at this point
2	FEEDTHROUGH 1	AnalogMisc	Analog input/output, short circuit to FEEDTHROUGH 1 of the FROM SENSOR connector
3	FEEDTHROUGH 2	AnalogMisc	Analog input/output, short circuit to FEEDTHROUGH 2 of the FROM SENSOR connector
4	FEEDTHROUGH 3	AnalogMisc	Analog input/output, short circuit to FEEDTHROUGH 3 of the FROM SENSOR connector

Table 5: periSNOOP 4-20mA's electrical connectivity for connector TO CONTROLLER.

5 Specifications

5.1 Mechanical Specifications

periSNOOP 4-20mA physical dimensions are shown in Figure 5.



(a) Top view (b) Side view

Figure 5: periSNOOP 4-20mA mechanical dimensions drawing.

periSNOOP 4-20mA handling involves tightening of 5 different types of screws: lid screws, cable gland body, cable gland sealing nut and blind gland. For achieving the optimal mechanical connections those screws need to be fastened using a specific torque. The specific torque is given in Table 6.

Screw type	Torque	Unit
Lid screw (M 4)	0.85	Nm
Cable gland body (M 12)	8.5	Nm
Cable gland nut (M 12)	8.5	Nm
Blind cable gland (M 12)	2	Nm

Table 6: Torque for screws used in periSNOOP 4-20mA

More information about the installation and wiring of periSNOOP 4-20mA can be found in Section 6.

5.2 Environmental Specifications

Parameter	Min	Max	Unit
Operating temperature	-40	+70	°C
Storage temperature	-40	+85	°C
Relative storage humidity (non-cond.)	5	90	%
Protection degree		IP65/IP67	

Table 7: Environmental specification

5.3 Electrical specifications

5.3.1 Absolute Maximum Ratings

Parameter	Min	Max	Unit
DC_PWR	0	27	V
DC_GND	0	0	V
SPE_DATA	-30	30	V
AnalogSense	-1.5	1.5	A
AnalogSense	-36	36	V
AnalogMisc	-2	2	A
AnalogMisc	-36	36	V

Table 8: Absolute maximum ratings of the periSNOOP 4-20mA

Warning: Exceeding the specified absolute maximum ratings may damage the periSNOOP 4-20mA.

5.3.2 Common specifications

Parameter	Condition	Min	Typ.	Max	Unit
Supply voltage (U)		21.6	24	26.4	V
Power consumption	Supply voltage U = 24V	-	1.1	-	W
Isolation voltage	1 minute per UL 1577	-	2500	-	V rms

Table 9: Operational conditions

5.3.3 Input specifications

Parameter	Condition	Min	Typ.	Max	Unit
Shunt resistor	Nominal operation, relay opened	-	100	-	Ω
Relay resistance	Initial value	-	-	0.15	Ω
Current measuring range		0	-	25	mA
Surge protection	EN 61000-4-5	-	-	1000	V

Table 10: Input specifications

5.3.4 Output specifications

Parameter	Condition	Min	Typ.	Max	Unit
Conversion resolution		-	16	-	bit
Conversion accuracy		-	0.2	-	%
Conversion rate		-	-	0.1	s

Table 11: Output specifications

6 Installation Instructions

For the installation process, the following periSNOOP 4-20mA parts are relevant (Figure 6 and Figure 7):

1. Lid
2. Lid screws
3. Cable glands
4. Blind cable glands
5. Mounting holes (also used as terminals for the protective earth (P.E.) connection)
6. `SPE IN` and `SPE OUT` connectors
7. `FROM SENSOR` and `TO CONTROLLER` connectors

Figure 6: Installation parts of periSNOOP 4-20mA

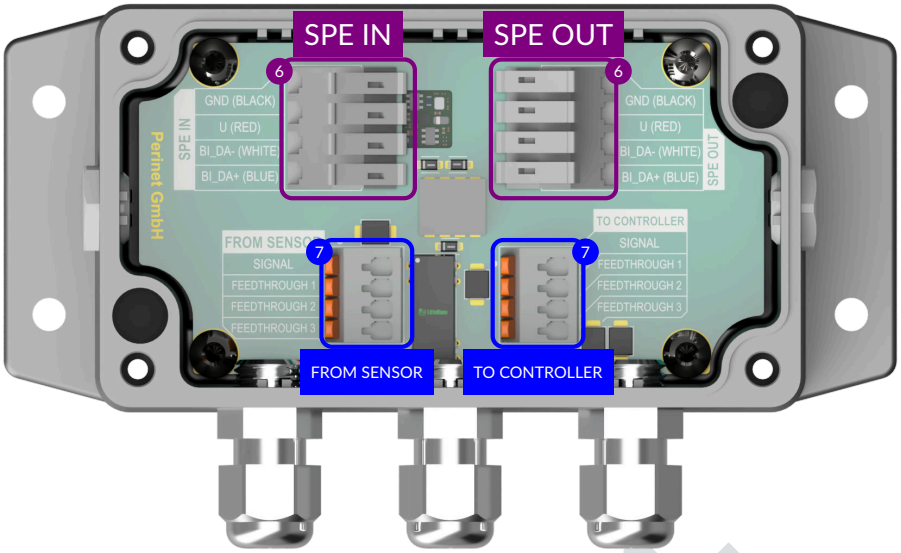


Figure 7: periSNOOP 4-20mA connectors.

The periSNOOP 4-20mA installation process consists of the following steps:

1. Opening the lid
2. Wiring
3. Closing the lid
4. Mounting and earthing

For the installation, the following tools are needed:

- Screw driver, PH-2
- Torque wrench size 14

6.1 Lid Opening/Closing

To open the lid of the periSNOOP 4-20mA, remove the four screws as illustrated in Figure 6. Inside the lid, there's a groove designed for a rubber seal. This seal helps to prevent fluids from entering the device's interior. When reattaching the lid, ensure the screws are tightened to a torque of 0.85 Nm, in accordance with the specifications detailed in Section 5.1.

6.2 Wiring

Wiring the periSNOOP 4-20mA involves two key areas:

- On the Network side, there are two wiring options: one with Daisy Chain and another without it.
- On the Sensor side, it supports various 4-20mA current loop configurations, including 2-wire, 3-wire, and 4-wire topologies.

6.2.1 Network Side Wiring - With Daisy Chain

To set up a Daisy Chain wiring configuration, two hybrid SPE cables are required. This setup necessitates an extra cable gland, as depicted in Figure 8. You'll need to remove the left cable gland located on the broader side of the housing and seal the opening with a blind cable gland.

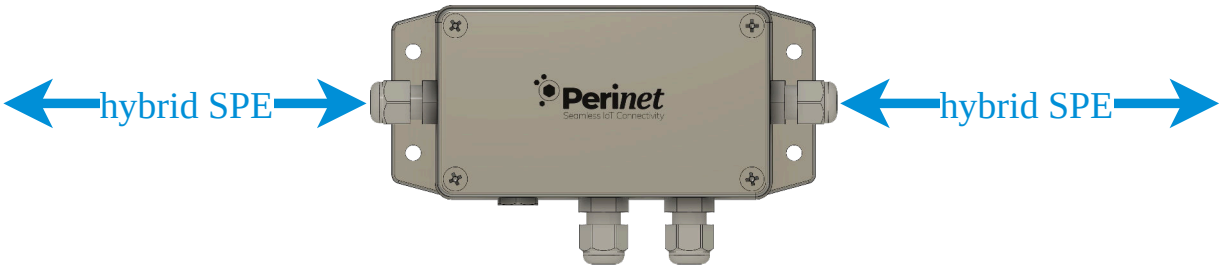


Figure 8: Wiring scheme with Daisy Chain - cable position

The hybrid SPE cables are connected to the `SPE IN` and `SPE OUT` ports on the periSNOOP 4-20mA. Use the `SPE IN` port to attach the cable coming from the 100BASE-T1 master device. The `SPE OUT` port is for the cable leading to the 100BASE-T1 slave device. The wires in the hybrid SPE cable are color-coded as follows:

- Black - Power supply negative terminal
- Red - Power supply positive terminal
- White - [17] data pair negative
- Blue - [17] data pair positive

The wiring is shown below.

render a photo with correct positions of the cable glands.

6.2.2 Network side wiring - without Daisy Chain

In this wiring scheme only one hybrid SPE cable enters the periSNOOP 4-20mA housing. periSNOOP 4-20mA comes with the cable glands already installed to support this use case, which is shown in Figure 9.

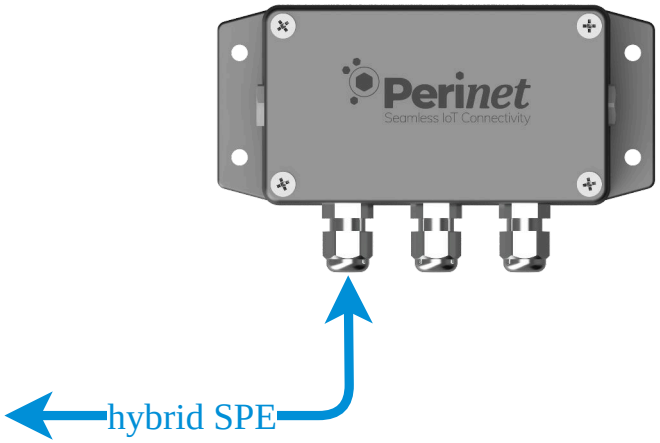


Figure 9: Wiring scheme without Daisy Chain - cable position

The hybrid SPE cable is connected to the `SPE IN` connector. The `SPE IN` connector is used to connect the hybrid SPE cable from the 100BASE-T1 master. The wire colors of the hybrid SPE cable are defined in the following way:

- Black - Power supply negative terminal
- Red - Power supply positive terminal
- White - [17] data pair -
- Blue - [17] data pair +

The wiring is shown in Figure 10.

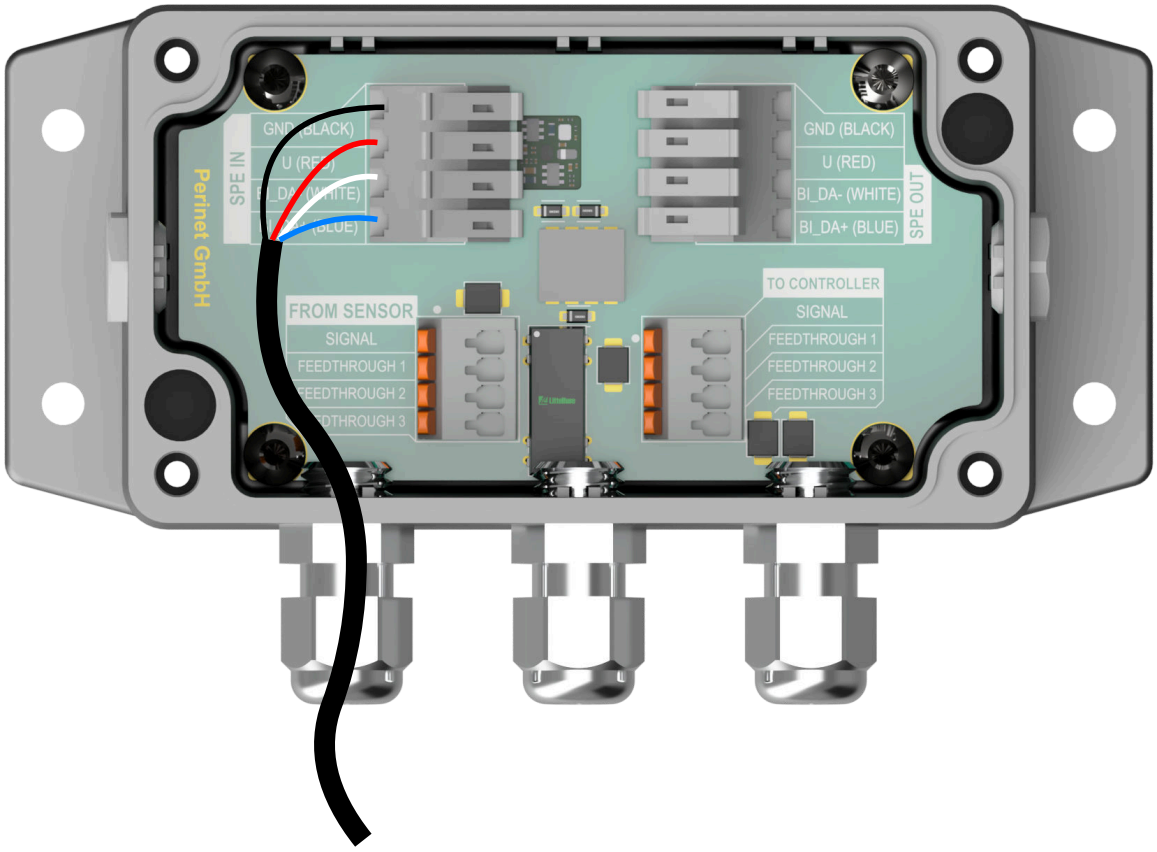


Figure 10: Line topology wiring

6.2.3 Sensor Wiring

periSNOOP 4-20mA supports 4-20mA sensors with 2, 3, and 4 wires. The wiring procedure is identical for all three cases: the existing sensor cable is first cut, and the both newly produced cable ends should be put through the cable glands into the periSNOOP 4-20mA housing. It is important to know the direction of the signal current before clamping the wires into the `FROM SENSOR` and `TO CONTROLLER` connectors. The names of the connectors imply that: the current flows from the sensor into the `FROM SENSOR` connector, and from the `TO CONTROLLER` connector out. Both `FROM SENSOR` and `TO CONTROLLER` sensors have 4 clamps. Only the clamp named `SIGNAL` is relevant for the current signal, the other clamps are only used as feedthroughs. The examples of 2-, 3-, and 4-wire sensor wiring are shown in Figure 11, Figure 12, and Figure 13, respectively.

6.2.4 Sensor Wiring

The periSNOOP 4-20mA is compatible with 4-20mA sensors using 2, 3, or 4 wires. To wire these sensors correctly, follow these steps:

1. Cut the existing sensor cable.
2. Pass the two resulting cable ends through the cable glands into the housing of the periSNOOP 4-20mA.

It's crucial to understand the direction of the signal current before attaching the wires to the connectors. The connectors are named based on the current flow:

- `FROM SENSOR`: Connect the cable coming from the sensor here.
- `TO CONTROLLER`: Connect the cable going to the controller here.

Each of these connectors, `FROM SENSOR` and `TO CONTROLLER`, has four clamps. For the current signal, only the clamp labeled `SIGNAL` is used; the other clamps serve merely as pass-throughs. Visual examples for wiring 2-wire, 3-wire, and 4-wire sensors can be found in Figure 11, Figure 12, and Figure 13, respectively.

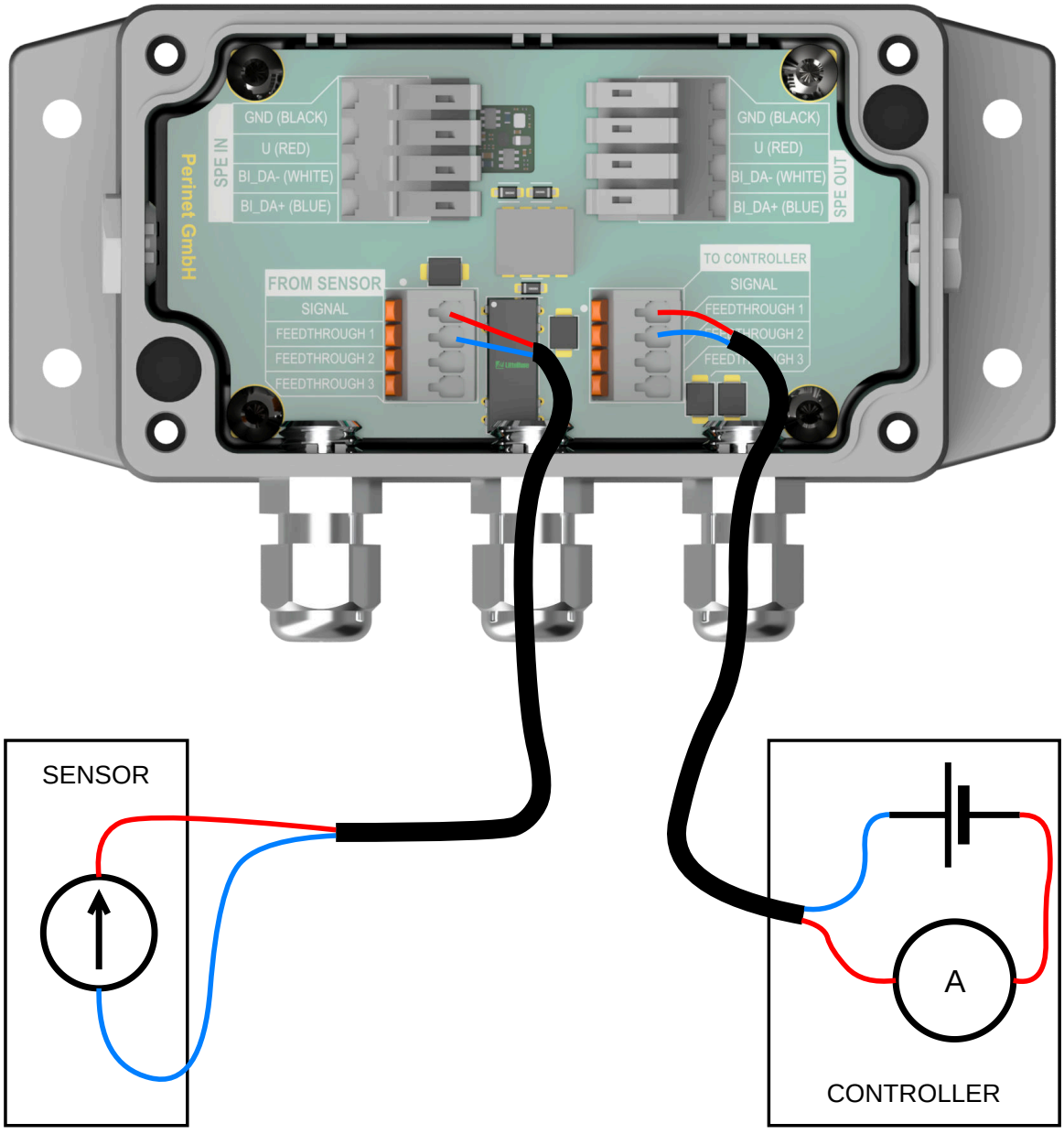


Figure 11: 2-wire sensor wiring

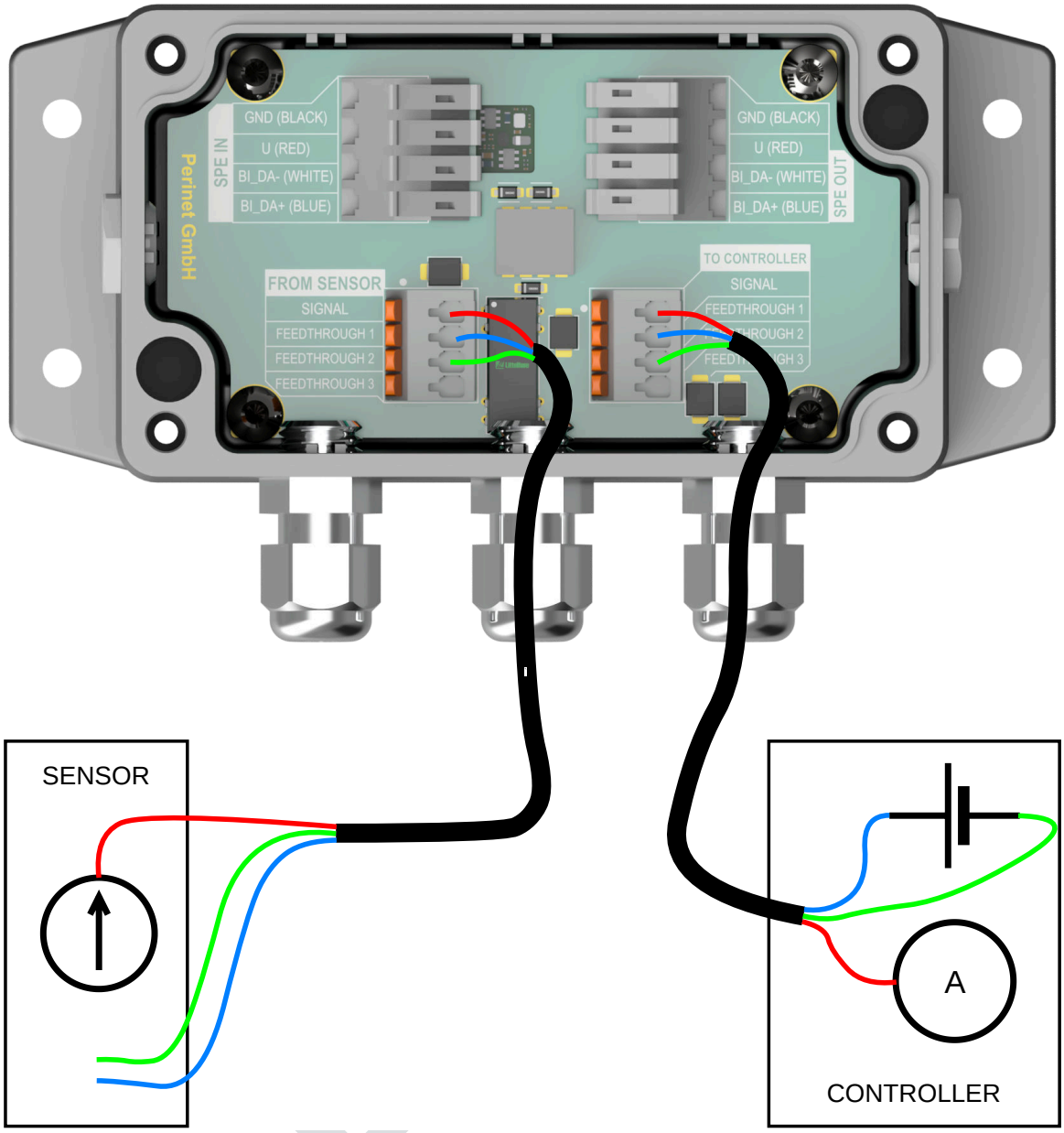


Figure 12: 3-wire sensor wiring

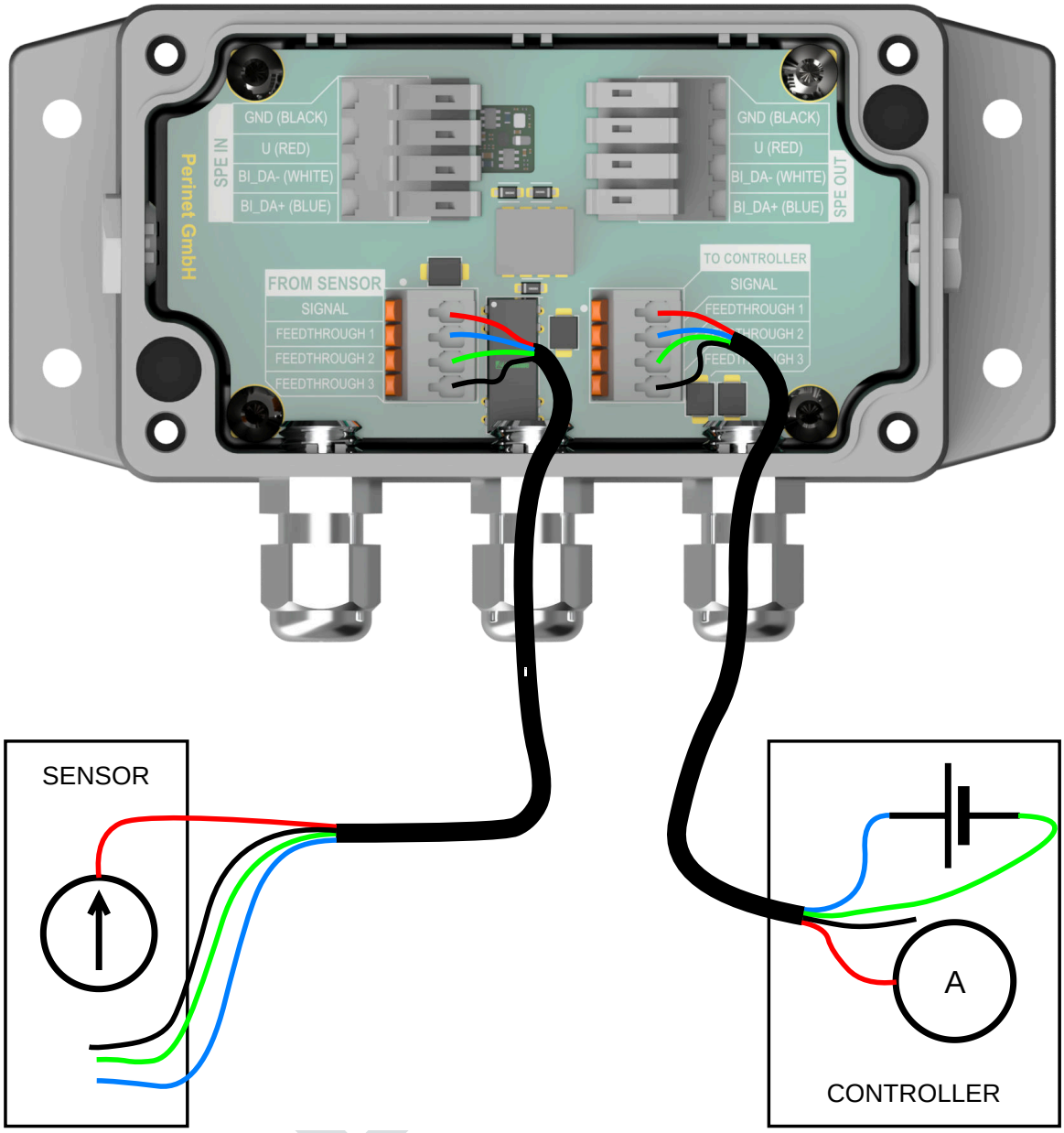


Figure 13: 4-wire sensor wiring

6.3 Mounting and Earthing

The periSNOOP 4-20mA features four holes specifically designed for mounting. When installing the device, it is important to use one of these mounting screws to connect the protective earth (P.E.) conductor. This ensures proper earthing of the periSNOOP 4-20mA for safety and functionality.

7 Factory Reset

A periCORE based product can be reset to factory settings using two different methods. One method is through the RESTful API, as detailed in **??**. The second method is a physical reset, which is necessary if RESTful API access is lost, such as in cases where the admin mTLS certificate is unavailable. The foundational *libperiCORE* library facilitates the factory reset process. To physically initiate a factory reset, ensure that the periCORE based product is powered on (using `24VDC_IN`) but is not connected to any network through its network ports (Port 0, Port 1, and Port 4). The factory reset will automatically occur 20 seconds after the device is powered up, returning the device to its original factory settings. For more details on the Factory Reset process, refer to **??**.

Include RMII port in the list when it is activated.

8 Integrated WebUI

Figure 14: Dashboard homepage of periSNOOP 4-20mA s integrated web server.

9 RESTful API

A periCORE based product features a RESTful [3] API for user access. To connect, use the hostname `periCORE-sernm.local`, where *sernm* is a unique identifier based on the product's serial number as explained in Section 10. The API provides various routes, which are listed in Table 12. These routes and their functions will be detailed in the subsequent subsections.

URL Resource	Description
/info	See Section 9.1
/config	
/config/reset	
/update	See Section 9.2
/reboot	
/reset	
/production/oem-firmware	
/production/reset	
/security	See Section 9.3
/security/host-cert	
/security/root-cert	
/security/client-cert	
/security/reset	

Table 12: RESTful API routes overview

9.1 Info Service

/info periCORE based product information object (see Section 9.1.1).

`GET` expects empty body.

`200` Return `NodeInfo` object.

`204` Return empty body. No data is available.

`401` Unauthorized access, returns empty body

`500` Internal server error on unexpected error, returns empty body.

/config periCORE based product configuration object (see Section 9.1.2).

`GET` expects an empty body.

`200` Return `NodeConfig`.

`204` Return empty body. No data is available.

`401` Unauthorized access, returns empty body

`500` Internal server error on unexpected error, returns empty body.

`PATCH` expects a complete or partial `NodeConfig` object.

204 The Request has been accepted but was not processed yet. The object will be deserialized and merged. Given *keys* will be overwritten. The object will be stored persistently.

401 Unauthorized access, returns empty body

500 Internal server error on unexpected error, returns empty body.

Status Code should be 202

Delete method for /config object

/config/reset periCORE based product configuration object reset (see Section 9.1.2).

`PATCH` expects an empty body.

204 The Request has been accepted but was not processed yet. The default content of the object will be restored and the object will be stored persistently.

401 Unauthorized access, returns empty body

500 Internal server error on unexpected error, returns empty body.

subject for removal, since it is more logical to use DELETE /config

9.1.1 Node Info

```
syntax="proto3";
package perinet.api;

message SwVersion {
  uint32 api = 1; // API compatibility incarnation
  uint32 build = 2; // build iteration
  uint32 version_number = 3; // firmware feature level incarnation
}

message NodeInfo {
    VersionInfo version_info = 1; // firmware version information
    string manufacturer = 2; // manufacturer identifier
    string hostname = 3; // host network identification name, e.g.
   periNODE-<id>.local periCORE-<id>.local
    string mac_address = 4; // unique mac address
    string product_charge = 5; // production batch identifier
    string product_part_number = 6; // product part identifier
    string product_serial = 7; // serial number of the product
    string product_name = 8; // calling name of the product
    string product_version = 9; // version of the product at production
   time
    string pericore_charge = 10; // batch identifier of the included
   periCORE
    string pericore_part_number = 11; // periCORE part identifier
    string pericore_serial = 12; // periCORE serial number
    string pericore_version = 13; // periCORE version identifier
}
```

Listing 1: periCOREs *NodeInfo* object definition

9.1.2 Node Config

```
syntax="proto3";
package perinet.api;
option go_package = "perinet/api";

message NodeConfig {
    message Interface {
        google.protobuf.Any type = 1; //the type of interface, the
   particular interface has been configured to. Implementation specific.
        string element_name = 2; // element name of a particular
   interface, like an sensor source or an actuator sink.
        float period_seconds = 3; // in seconds, 0 means only event based
    (triggered) publishing
        uint32 samples_per_period = 4;  //defines how many values shall
   be sampled within a period,
                                        //the published value will be the
    rounded average
        // repeated Trigger trigger = 5;
    }
    string application_name = 1; // identification of the application the
    periCORE based node is assigned to
    string mqtt_broker_name = 2; // URI of the MQTT broker, the periCORE
   based node shall be connected to
    repeated Interface configs = 3;
}
```

Listing 2: periCOREs *NodeConfig* object definition

9.2 Life Cycle Service

/update periCORE based product *Update Firmware Image* (see Section 9.2.1).

`PUT` expects octet-stream body.

`204` Returns empty body. The Request has been received and is being processed.

Return Code should be 202

`401` Unauthorized access, returns empty body.

`500` Internal server error on unexpected error, returns empty body.

`404` Resource is not available in this life state, e.g for *periCORE Production State* (see **??**).

/reboot periCORE based product configuration object.

`PATCH` expects an empty body.

`204` Returns an empty body. The request is being processed and the device is performing a software reboot.

return code should be 202

`401` Unauthorized access, returns empty body.

`500` Internal server error on unexpected error, returns empty body.

/reset periCORE based product remote factory reset (see **??**).

`PATCH` expects an empty body.

`204` The Request has been accepted and is being processed. All persistent data is reset to its default state. (see **??**)

return code should be 202

`401` Unauthorized access, returns empty body.

`500` Internal server error on unexpected error, returns empty body.

/production/oem-firmware periCORE based product *OEM Firmware Image* (see **??**).

`PUT` expects octet-stream body (see Section 9.2.1).

`204` Returns empty body. The Request has been received and is being processed.

Return Code should be 202

`401` Unauthorized access, returns empty body.

`500` Internal server error on unexpected error, returns empty body.

`404` Resource is not available in this life state, e.g for *OEM Production State* (see **??**).

/production/reset periCORE based product *Production Reset* (see **??**).

`PATCH` expects an empty body.

`204` The Request has been accepted and is being processed. All persistent data is reset to its default state. (see **??**)

return code should be 202

`404` Internal server error on unexpected error, returns empty body.

`401` Unauthorized access, returns empty body.

`500` Internal server error on unexpected error, returns empty body.

9.2.1 Firmware Image

The Life Cycle Service of a periCORE based product requires the *Firmware Image* to be in a signed binary format. For more comprehensive details on this format and related procedures, refer to the periCORE Firmware Development Application Note [8].

9.3 Security Service

/security/host-cert periCORE based product host certificate object (see **??**).

`GET` expects an empty body.

`200` Return the host public certificate.

`401` Unauthorized access, returns empty body.

`500` Internal server error on unexpected error, returns empty body.

`PATCH` expects a text/plain-encoded body containing the certificate.

`204` The request has been accepted and processed. Returns empty bod

`401` Unauthorized access, returns empty body.

`500` Internal server error on unexpected error, returns empty body.

/security/root-cert periCORE based product root certificate object (see **??**).

`GET` expects an empty body.

`200` Return the root public certificate.

`401` Unauthorized access, returns empty body.

`500` Internal server error on unexpected error, returns empty body.

`PATCH` expects a text/plain-encoded body containing the root certificate.

`204` The request has been accepted and processed. Returns empty body.

`401` Unauthorized access, returns empty body.

`500` Internal server error on unexpected error, returns empty body.

/security/client-cert periCORE based product client certificate object (see **??**).

`GET` expects an empty body.

`200` Return the client public certificate.

`401` Unauthorized access, returns empty body.

`500` Internal server error on unexpected error, returns empty body.

`PATCH` expects a text/plain-encoded body containing the certificate.

`204` The request has been accepted and processed. Returns empty body.

`401` Unauthorized access, returns empty body.

`500` Internal server error on unexpected error, returns empty body.

/security/reset periCORE based product security configuration reset object. (see **??**)

`PATCH` expects an empty body.

`204` Security configuration is reset to factory defaults: root and host certificates are replaced with the factory certificates, the client certificate is deleted, and the mTLS feature is disabled.

`401` Unauthorized access, returns empty body.

`500` Internal server error on unexpected error, returns empty body.

/security periCORE based product mTLS configuration object (see **??**).

`GET` expects an empty body.

`200` Returns a JSON-encoded object containing the key `enable_user_role` and it's value.

`401` Unauthorized access, returns empty body.

`500` Internal server error on unexpected error, returns empty body.

`PATCH` Expects a JSON-encoded object containing the key `enable_user_role` and it's value.

`204` The request has been accepted and processed. Returns empty body.

`401` Unauthorized access, returns empty body.

`500` Internal server error on unexpected error, returns empty body.

Add Application Specific API

Add Network Services API

10 Product Marking

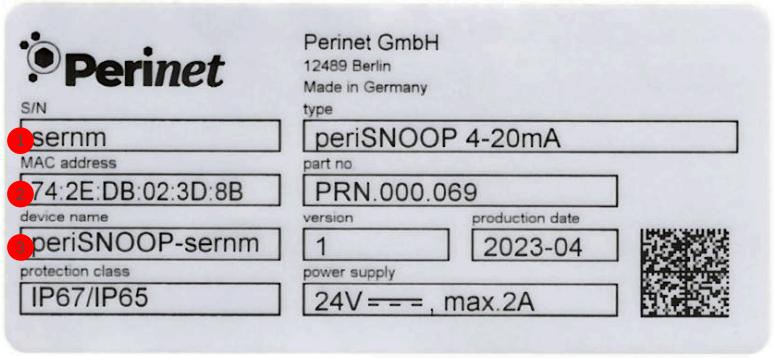


Figure 15: periSNOOP 4-20mA's electrical connectivity.

Pos.	Name	Desciption
1	`serial number`	unique serial number of the product
2	`MAC address`	unique network address
3	`hostname`	unique DNS name of the device

Table 13: periSNOOP 4-20mA's product marking layout.

11 Further Documentation

Document Name	Description
periCORE Product Summary [9]	A product features summary documentation for the product *periCORE*.
periCORE Datasheet [4]	A detailed reference documentation of the product *periCORE*.
periCORE Development Kit Product Summary [5]	A product features summary documentation for the product *periCORE Development Kit*.
periCORE Development Kit Setup Application Note [6]	A setup guide for the product *periCORE Development Kit*. The starting point when you are new to the product which describes how to quickly set up a development environment for firmware development for a periCORE based product.
periCORE Development Kit User Guide [7]	A guide and reference documentation for the product *periCORE Development Kit*.

Document Name	Description
periLINE Product Summary [10]	A product features summary documentation for the product *periLINE*.
periNODE 0-10V Product Summary [11]	A product features summary documentation for the product *periNODE 0-10V*.
periNODE Pt100 Product Summary [13]	A product features summary documentation for the product *periNODE Pt100*.
periNODE GPIO Product Summary [12]	A product features summary documentation for the product *periNODE GPIO*.
periSWITCH 3-port Product Summary [15]	A product features summary documentation for the product *periSWITCH 3-port*.
periSTART Standard Product Summary [14]	A product features summary documentation for the product *periSTART standard*.
Smart Components Datasheet [16]	A detailed reference documentation of the Smart Components products (*periLINE*, *periNODE 0-10V*, *periNODE Pt100*, *periNODE GPIO*, *periSWITCH 3-port*, *periSTART standard*).

12 Ordering Information

Ordering Code	Product Name	Description
PRN.000.069	periSNOOP 4-20mA	Single Pair Ethernet 4-20mA based sensor monitor
Related Products		
PRN.000.008	periSWITCH 3-port	3-port hybrid SPE switch
PRN.000.003	periSTART standard	Media converter from SPE to standard Ethernet
PRN.000.017	periLINE 0.2m	Hybrid SPE cable with M8 connectors
PRN.000.025	periMICA	Open modular edge computer
PRN.000.020	periCORE Development Kit	Full featured firmware development setup

13 Contact & Support

For customer support, please call us at **+49 30 863 206 701** or send an e-mail to *support@perinet.io*.

For complete contact information visit us at www.perinet.io

A List of Figures

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D Glossary

100BASE-T1 A Ethernet Standard where two endpoints are connected by a single twisted pair cable. It is one of the so-called Single Pair Ethernet (SPE) standards. It operates in full-duplex with a data rate of 100 MBit per second. Furthermore, it uses PAM-3 modulation with a voltage level from -1 to +1V, differentially on the two wires. 8, 10, 18, 19

API Application Programming Interface. 26

DNS-SD DNS Service Discovery [1] is a way of using standard DNS programming interfaces, servers and packet formats to browse the network for services. 6

full-duplex In a full-duplex system, both parties can communicate with each other simultaneously. Transmitting or receiving of information is operated independently contrary to a half-duplex scheme.. 7

mDNS multicast Domain Name Service [2], a protocol that implements a local distributed name resolving mechanism. 6

mTLS Mutual TLS extends the TLS protocol by requiring clients to pass certificates, allowing to provide authorization mechanisms of Application services. 6, 24, 30

RBAC Role Based Access Control. 6

SPE Single Pair Ethernet. 1, 7–10

E References

[1] S. Cheshire and M. Krochmal. *DNS-Based Service Discovery*. RFC 6763. http://www.rfc-editor.org/rfc/rfc6763.txt. RFC Editor, Feb. 2013. URL: http://www.rfc-editor.org/rfc/rfc6763.txt.

[2] S. Cheshire and M. Krochmal. *Multicast DNS*. RFC 6762. http://www.rfc-editor.org/rfc/rfc6762.txt. RFC Editor, Feb. 2013. URL: http://www.rfc-editor.org/rfc/rfc6762.txt.

[3] R. Fielding and J. Reschke. *Hypertext Transfer Protocol (HTTP/1.1): Semantics and Content*. RFC 7231. http://www.rfc-editor.org/rfc/rfc7231.txt. RFC Editor, June 2014. URL: http://www.rfc-editor.org/rfc/rfc7231.txt.

[4] Perinet GmbH. periCORE Datasheet. PRN.100.375. https://docs.perinet.io/PRN100375-periCOREDatasheet.pdf.

[5] Perinet GmbH. periCORE Development Kit Product Summary. PRN.100.546. https://docs.perinet.io/PRN100546-periCOREDevelopmentKitProductSummary.pdf.

[6] Perinet GmbH. periCORE Development Kit Setup Application Note. PRN.100.376. https://docs.perinet.io/PRN100376-periCOREDevelopmentKitSetupApplicationNote.pdf.

[7] Perinet GmbH. periCORE Development Kit User Guide. PRN.100.378. https://docs.perinet.io/PRN100378-periCOREDevelopmentKitUserGuide.pdf.

[8] Perinet GmbH. periCORE Firmware Development Application Note. PRN.100.379. https://docs.perinet.io/.

[9] Perinet GmbH. periCORE Product Summary. PRN.100.301. https://docs.perinet.io/PRN100301-periCOREProductSummary.pdf.

[10] Perinet GmbH. periLINE Product Summary. PRN.100.386. https://docs.perinet.io/PRN100386-periLINEProductSummary.pdf.

[11] Perinet GmbH. periNODE 0-10V Product Summary. PRN.100.380. https://docs.perinet.io/PRN100380-periNODE0-10VProductSummary.pdf.

[12] Perinet GmbH. periNODE GPIO Product Summary. PRN.100.382. https://docs.perinet.io/PRN100382-periNODEGPIOProductSummary.pdf.

[13] Perinet GmbH. periNODE Pt100 Product Summary. PRN.100.381. https://docs.perinet.io/PRN100381-periNODEPt100ProductSummary.pdf.

[14] Perinet GmbH. periSTART Standard Product Summary. PRN.100.383. https://docs.perinet.io/PRN100383-periSTARTstandardProductSummary.pdf.

[15] Perinet GmbH. periSWITCH 3-port Product Summary. PRN.100.385. https://docs.perinet.io/PRN100385-periSWITCH3-portProductSummary.pdf.

[16] Perinet GmbH. Smart Components Datasheet. PRN.100.387. https://docs.perinet.io/PRN100387-SmartComponentsDatasheet.pdf.

[17] “ISO/IEC/IEEE International Standard - Part 3: Standard for Ethernet - Amendment 1: Physical Layer Specifications and Management Parameters for 100 Mb/s Operation over a Single Balanced Twisted Pair Cable (100BASE-T1)”. In: *ISO/IEC/IEEE 8802-3:2017/Amd 1:2017(E)* (2018), pp. 1–92. DOI: 10.1109/IEEESTD.2018.8310988.

F Revision History

Revision	Date	Author(s)	Description
1	2023-09-19	shoe	initial release
2	2023-11-15	nsav	engineering samples
3	2024-01-30	clip	editorial rework