Knick

User Manual

Protos II PN4400-095

Communication Unit for PROFINET

Read before installation.
Keep for future use.

www.knick-international.com

Supplemental Directives

READ AND SAVE THIS DOCUMENT FOR FUTURE REFERENCE. BEFORE ATTEMPTING TO ASSEMBLE, INSTALL, OPERATE OR MAINTAIN THE PRODUCT, PLEASE ENSURE A COMPLETE UNDERSTANDING OF THE INSTRUCTIONS AND RISKS DESCRIBED HEREIN. ALWAYS OBSERVE ALL SAFETY INFORMATION. FAILURE TO COMPLY WITH INSTRUCTIONS IN THIS DOCUMENT COULD RESULT IN SERIOUS INJURY AND/OR PROPERTY DAMAGE. THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE.

These supplemental directives explain how safety information is laid out in this document and what content it covers.

Safety Chapter

This document's safety chapter is designed to give the reader a basic understanding of safety. It illustrates general hazards and gives strategies on how to avoid them.

Warnings

This document uses the following warnings to indicate hazardous situations:

Icon	Category	Meaning	Remark
⚠	**WARNING!**	Designates a situation that can lead to death or serious (irreversible) injury.	The warnings contain information on how to avoid the hazard.
⚠	**CAUTION!**	Designates a situation that can lead to slight or moderate (reversible) injury.	
Without	**NOTICE!**	Designates a situation that can lead to property or environmental damage.	

Symbols Used in this Document

Icon	Meaning
→	Reference to additional information
▶	Sequence of figures attached to an instruction for action
①	Item number in a figure
(1)	Item number in text

Table of Contents

1 Safety

This document contains important instructions for the use of the product. Always follow all instructions and operate the product with caution. If you have any questions, please contact Knick Elektronische Messgeräte GmbH & Co. KG (hereinafter sometimes referred to as "Knick") using the information provided on the back page of this document.

Also read the user manuals for the basic unit (Protos II 4400, FRONT and BASE modules) and the corresponding measuring and communication modules. Observe the specifications and follow the safety instructions in the safety guide ("Safety Guide", included in the package contents of the Protos II 4400 basic unit).

1.1 Intended Use

The module is a PROFINET communication unit for Protos II 4400. It has two RJ45 Ethernet sockets and can therefore be connected in a ring or star topology.

The module is intended for use outside potentially explosive atmospheres.

1.2 Commissioning

Users cannot repair the modules. Please direct your repair requests to Knick Elektronische Messgeräte GmbH & Co. KG at www.knick-international.com.

1.3 Personnel Requirements

The operating company shall ensure that any personnel using or otherwise interacting with the product is adequately trained and has been properly instructed.

The operating company shall comply and cause its personnel to comply with all applicable laws, regulations, codes, ordinances, and relevant industry qualification standards related to the product. Failure to comply with the foregoing shall constitute a violation of operating company's obligations concerning the product, including but not limited to an unintended use as described in this document.

2 Product

2.1 Package Contents

- PN4400-095 module
- Installation Guide
- Test Report 2.2 in accordance with EN 10204
- Sticker showing the terminal assignment and MAC address

Note: Check all components for damage upon receipt. Do not use damaged parts.

2.2 Product Identification

2.2.1 Firmware Version

Module Compatibility

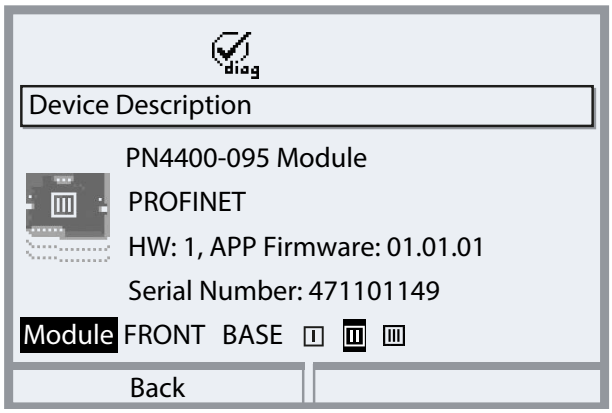
Protos II 4400 as of FRONT firmware version 01.04.00

This user manual describes a module PN4400-095 with firmware version 01.01.xx.

Information on the firmware history → *knick-international.com*

Querying the firmware version

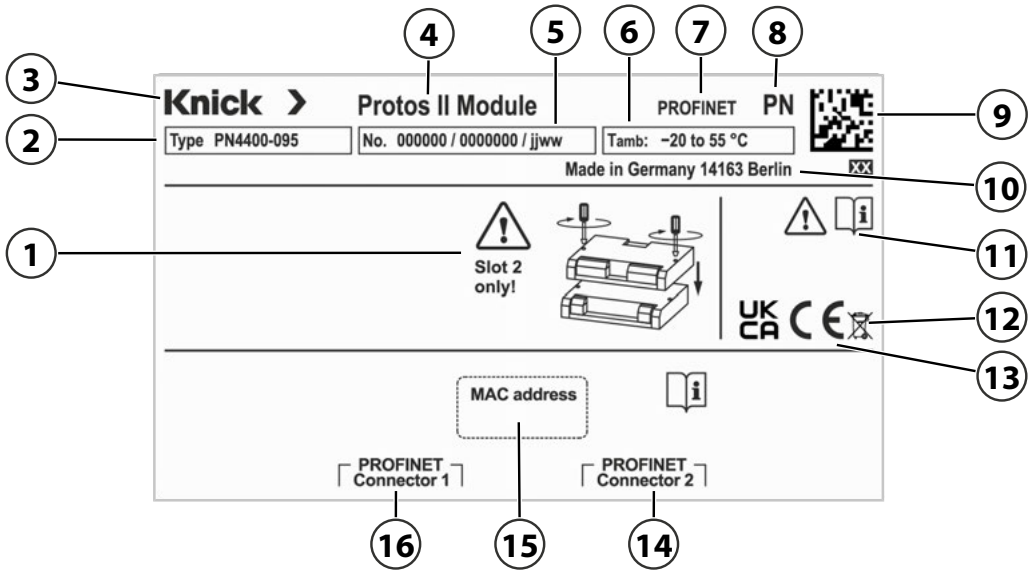
01. Diagnostics ▸ Device Description
02. Use the ***right arrow key*** to select the appropriate module slot.



2.3 Nameplate with Terminal Assignment

Nameplate

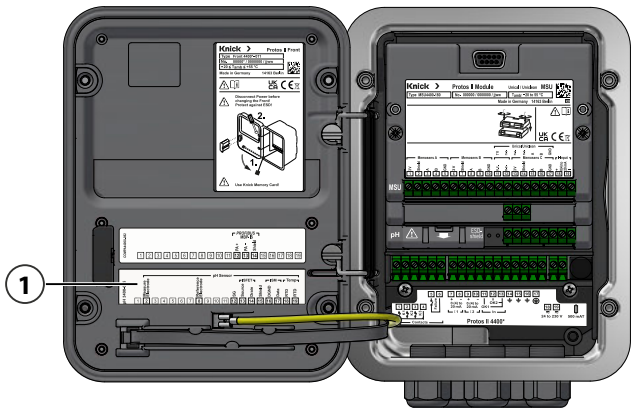
Example:



1	Installation instructions: Install only on slot 2.	9	Data matrix code with item number and serial number
2	Model designation	10	Manufacturer address with designation of origin
3	Manufacturer	11	Special conditions and danger points, reference to product documentation
4	Product family	12	WEEE mark
5	Product description	13	UKCA, CE mark
6	Permitted ambient temperature	14	RJ45 socket 2
7	Industrial Ethernet PROFINET protocol	15	MAC address
8	Abbreviation: PROFINET	16	RJ45 socket 1

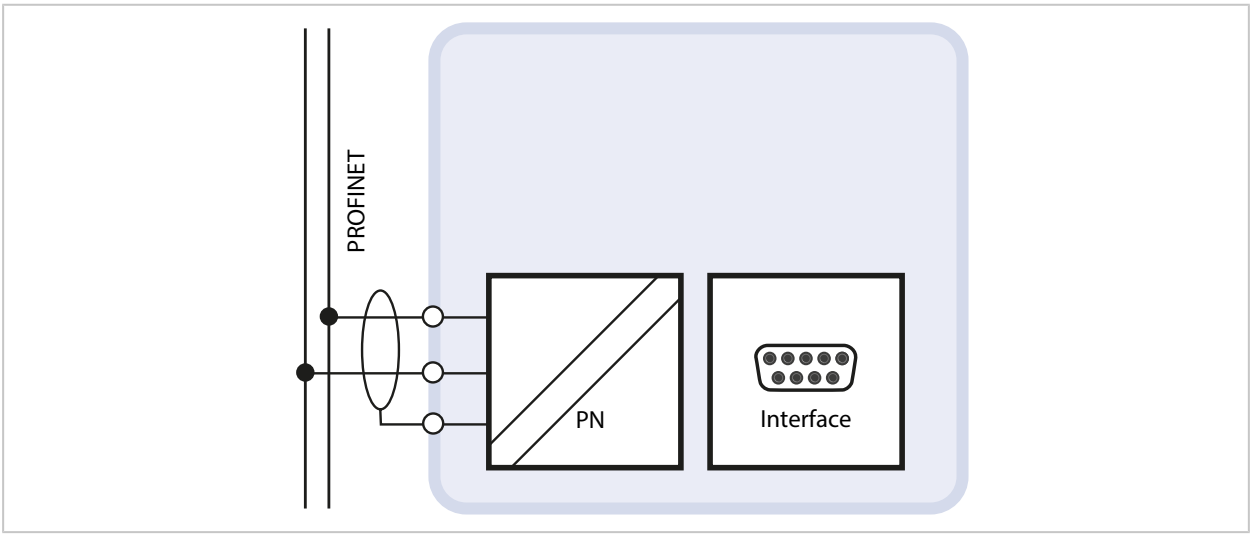
Terminal Plate Sticker

The terminal plate stickers for the concealed, lower-lying modules can be attached to the inner door.



1	Sticker showing the terminal assignment of the concealed modules (slot 1 and 2)

2.4 Block Diagram



3 Installation

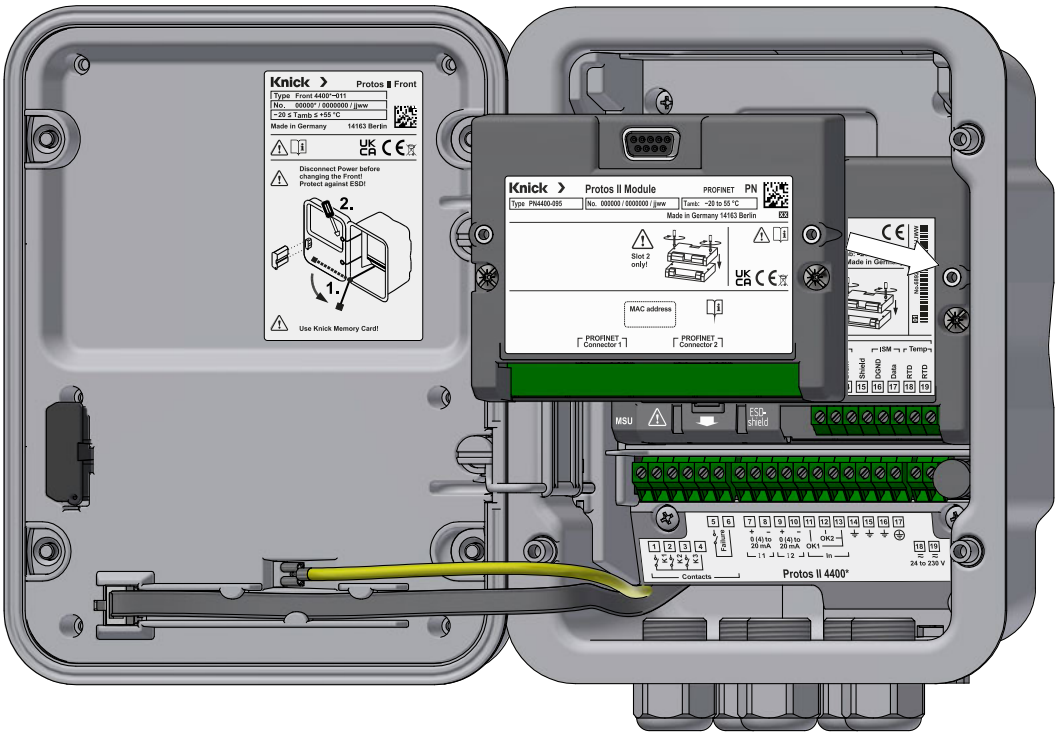
3.1 Inserting the Module

Note: The PN4400-095 module must be installed at slot 2.

01. Switch off the power supply to the device.
02. Use a Phillips head screwdriver to unscrew the enclosure screws of the front unit and open the device.

⚠ **WARNING! Voltages dangerous to touch.** When opening the device, there may be voltages dangerous to touch in the terminal compartment. Ensure that no voltages are present before you reach into the terminal compartment.

⚠ **CAUTION! Electrostatic discharge (ESD).** The modules' signal inputs are sensitive to electrostatic discharge. Take measures to protect against ESD before inserting the module and connecting the inputs.



03. Connect the module to slot 2 (D-SUB plug), see figure.
04. Tighten the fastening screws of the module.

NOTICE! Possible damage to the cables. Strip the wires with a suitable tool. Max. stripping length 7 mm.

05. Connect the signal lines.
06. Verify that all connections are correctly wired.

NOTICE! Ingress of moisture. Cable glands must have a tight fit. If necessary, insert suitable blanking plugs or sealing inserts.

07. Close the device and tighten the enclosure screws in a crosswise pattern. Tightening torque 0.5 ... 2 Nm.
08. Switch on the power supply.

3.2 PROFINET Connection

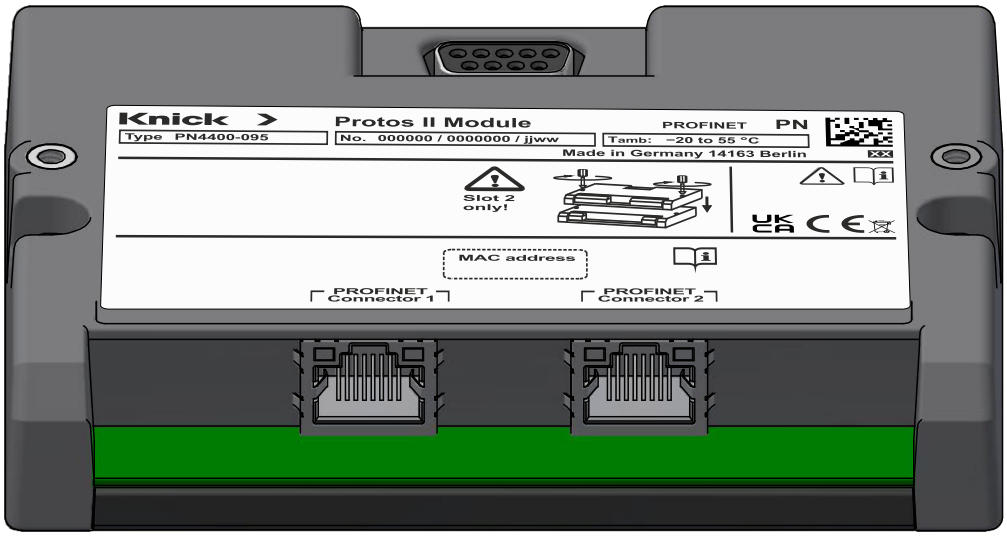
The module can be connected in a ring or star topology.

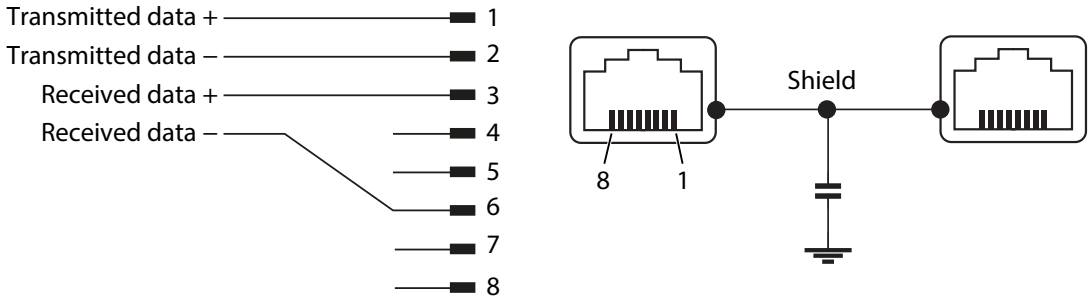
Note: To ensure correct data transmission, suitable PROFINET cables must be connected to the RJ45 sockets.

See also
→ *Accessories, p. 33*

RJ45 Ethernet Sockets 1 and 2

Pin	Name	Description
1	TD+	Transmitted data +
2	TD–	Transmitted data –
3	RD+	Received data +
6	RD–	Received data –





4 Commissioning

For a description of how to commission Protos II 4400, see the user manual of the basic unit.

Description of how to commission PROFINET → *System Integration, p. 12*.

5 PROFINET

5.1 System Integration

Initial Commissioning

PROFINET devices are identified in the network by the following parameters:

IP address, MAC address, and name of station.

- IP address ex factory: 0.0.0.0
- MAC address, see terminal plate.
- Name of station not assigned ex factory (empty).

The IP configuration and name of station must be set using a suitable engineering tool (e.g., TIA Portal).

Installing the GSDML File

The current version of the GSDML file is available in the download section of the Knick website.
→ *www.knick-international.com*

The procedure for installing the GSDML file depends on the engineering tool used. Simatic TIA Portal V15 is used in the example.

01. Open the Extras ▸ Manage device description files (GSD) menu.
02. Search button: Select the directory of the GSDML file to be installed.
03. Select the GSDML file from the list.
04. Install button: The GSDML is installed and added to the hardware catalog.
05. Select the PN4400-095 module in the hardware catalog:
    Other Field Devices ▸ PROFINET IO ▸ Sensors ▸ Knick ▸ Analysis: "Protos II 4400 PN-095"

5.2 Changing the Device

Using the neighborhood detection function, the control system assigns the PROFINET device name and the IP address to the newly added device (PN4400-095).

Note: If only the PN4400-095 module is replaced, all settings will be automatically adopted. If the complete Protos II 4400 device is replaced, the remaining device parameters will not be automatically adopted. In this case, save the parameter settings on a ZU1080-P-N-D data card before replacing the device, see the user manual of the Protos II 4400 basic unit.

5.3 Resetting the Device

Resetting the Device Parameter Settings

In the device menu:

Parameter Setting ▸ System Control ▸ Restore Factory Settings

The reset function in the device menu does not reset the PROFINET network settings.

Resetting the PROFINET Network Settings

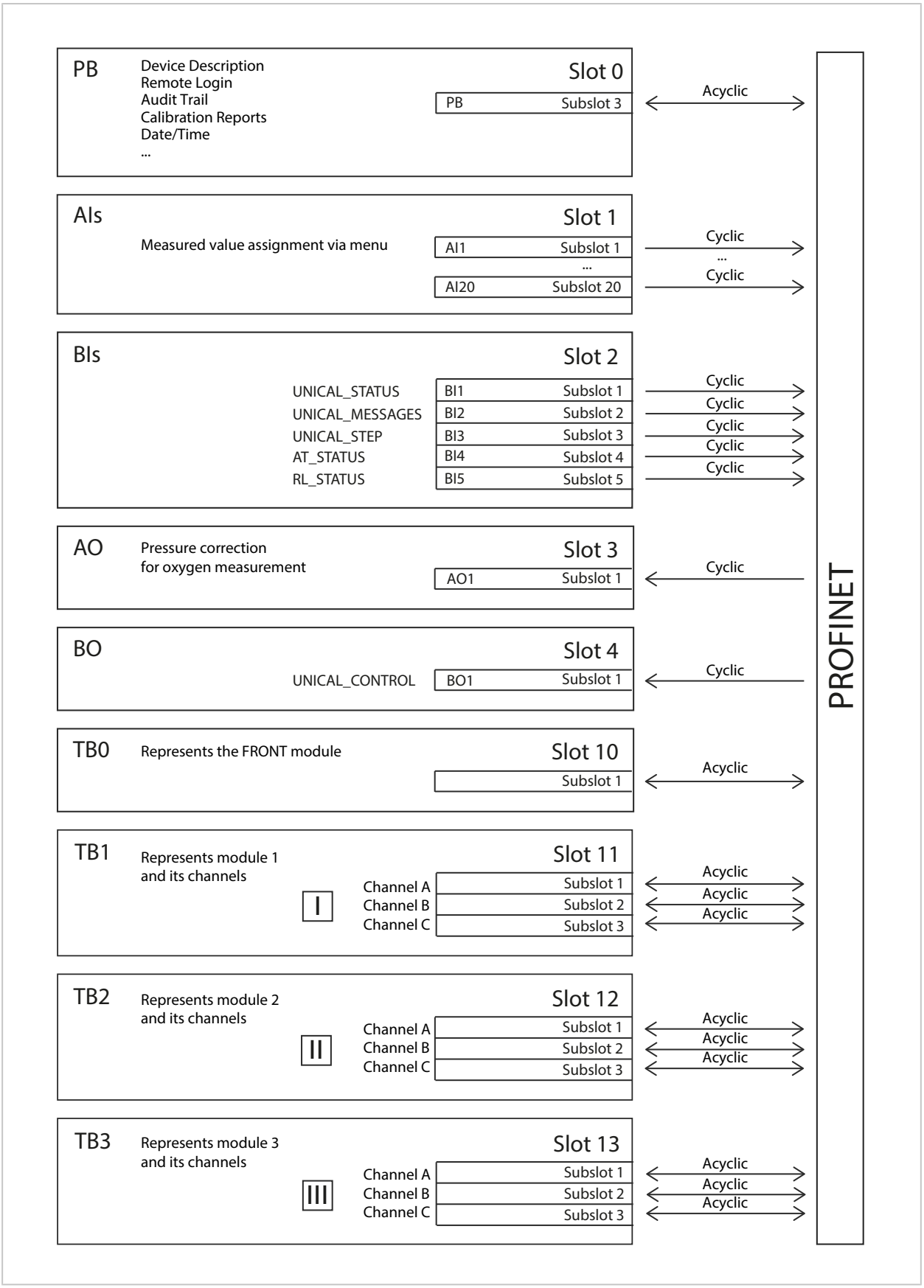
The PROFINET network settings are reset using the engineering tool (e.g., TIA Portal).

The reset function via PROFINET does not reset the factory settings of PN4400-095.

5.4 Communication Model

The device parameters are summarized in three block types:

Physical block (PB), function blocks (AI, BI, BO, AO), transducer blocks (TB).



5.4.1 Physical Block (PB)

The physical block contains the general parameters that apply to the overall device, including the device description and setting the time.

With TAN option 4400-081, the remote login, audit trail, and calibration report functions are also accessible.

5.4.2 Function Blocks (AI, BI, BO, AO)

- AI1 ... AI20 for transmitting measured values
- BI1 ... BI5 for transmitting status messages
- BO1 for transmitting control signals for Unical
- AO1 for transmitting analog compensation signals
  → *Pressure Correction for Oxygen Measurement, p. 21*

The function blocks are responsible for cyclic data communication.

Cyclic data traffic is divided into two transport directions:

Input Data

Data transfer from the field device (device) to the process control system (controller): Input data are provided by analog input and binary input function blocks.

Output Data

Data transfer from the process control system (controller) to the field device (device): Analog output and binary output function blocks process output data.

5.4.3 Transducer Blocks (TB)

The transducer blocks represent the FRONT module (TB0) and module 1 ... 3 with their sensor channels A ... C (TB1 ... 3). They enable access to product calibration, for example.

5.4.4 Coding of Cyclic Commands (I/O data)

Input Frame: (Device → Controller): 165 Bytes

Byte No.	Content			
	AI1 (Meas.Value)		IOPS1	IOCS1
0	Value (Float 32, 4 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte
	AI2 (Meas.Value)		IOPS2	IOCS2
7	Value (Float 32, 4 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte
	AI3 (Meas.Value)		IOPS3	IOCS3
14	Value (Float 32, 4 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte
	AI4 (Meas.Value)		IOPS4	IOCS4
21	Value (Float 32, 4 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte
	AI5 (Meas.Value)		IOPS5	IOCS5
28	Value (Float 32, 4 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte
	AI6 (Meas.Value)		IOPS6	IOCS6
35	Value (Float 32, 4 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte
	AI7 (Meas.Value)		IOPS7	IOCS7
42	Value (Float 32, 4 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte
	AI8 (Meas.Value)		IOPS8	IOCS8
49	Value (Float 32, 4 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte
	AI9 (Meas.Value)		IOPS9	IOCS9
56	Value (Float 32, 4 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte
	AI10 (Meas.Value)		IOPS10	IOCS10

Byte No.	Content			
63	Value (Float 32, 4 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte
	AI11 (Meas.Value)		IOPS11	IOCS11
70	Value (Float 32, 4 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte
	AI12 (Meas.Value)		IOPS12	IOCS12
77	Value (Float 32, 4 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte
	AI13 (Meas.Value)		IOPS13	IOCS13
84	Value (Float 32, 4 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte
	AI14 (Meas.Value)		IOPS14	IOCS14
91	Value (Float 32, 4 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte
	AI15 (Meas.Value)		IOPS15	IOCS15
98	Value (Float 32, 4 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte
	AI16 (Meas.Value)		IOPS16	IOCS16
105	Value (Float 32, 4 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte
	AI17 (Meas.Value)		IOPS17	IOCS17
112	Value (Float 32, 4 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte
	AI18 (Meas.Value)		IOPS18	IOCS18
119	Value (Float 32, 4 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte
	AI19 (Meas.Value)		IOPS19	IOCS19
126	Value (Float 32, 4 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte
	AI20 (Meas.Value)		IOPS20	IOCS20
133	Value (Float 32, 4 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte
	BI1 (UNICAL_STATUS)		IOPS21	IOCS21
140	Value (OctetString, 2 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte
	BI2 (UNICAL_MESSAGES)		IOPS22	IOCS22
145	Value (OctetString, 2 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte
	BI3 (UNICAL_STEP)		IOPS23	IOCS23
150	Value (OctetString, 2 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte
	BI4 (AT_STATUS)		IOPS24	IOCS24
155	Value (OctetString, 2 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte
	BI5 (RL_STATUS)		IOPS25	IOCS25
160	Value (OctetString, 2 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte

Output Frame (Controller → Device): 12 Bytes

Byte No.	Content			
	AO1 (Process Pressure)		IOPS1	IOCS1
0	Value (Float 32, 4 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte
	BO1 (UNICAL_CONTROL)		IOPS2	IOCS2
7	Value (OctetString, 2 Bytes)	Status (Unsigned8,1 Byte)	Unsigned8, 1 Byte	Unsigned8, 1 Byte

5.5 PROFINET Commands

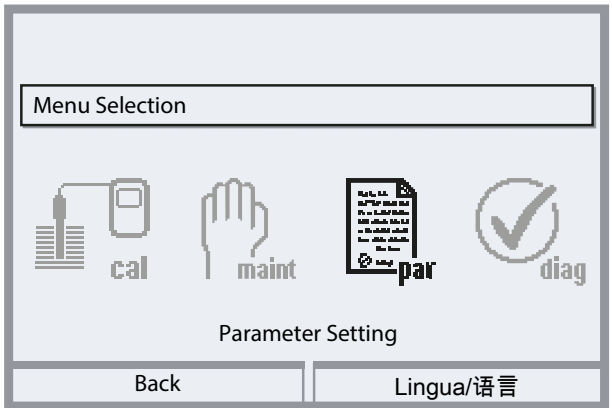
For a description of the PROFINET commands, see the separate interface specification document.

6 Parameter Setting

⚠ CAUTION! Faulty parameter settings or adjustments can result in faulty outputs. A system specialist must therefore commission PN4400-095, set all its parameters, make all necessary adjustments, and protect it from unauthorized modifications.

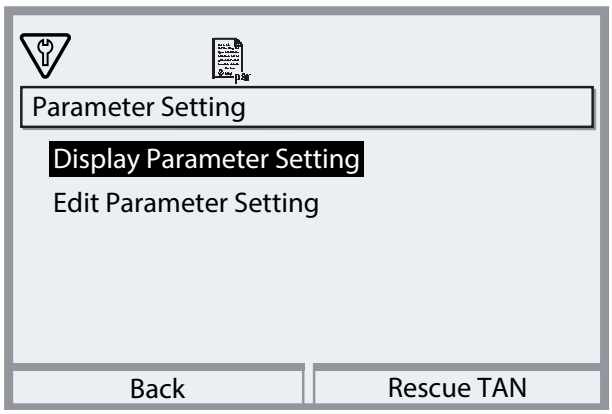
6.1 Opening Parameter Settings

01. While in measuring mode, press the ***menu*** key.
    ✓ Menu Selection opens.



02. Using the right ***arrow key***, select the Parameter Setting menu and confirm with ***enter***.
03. Select Operator Level or Administrator Level.
04. If necessary, enter the passcode (see the user manual of the basic unit).
05. Select the module.

If Audit Trail is activated (TAN option FW4400-081), the selection of the operating level is omitted:



6.2 PN4400-095 Module Parameter Setting

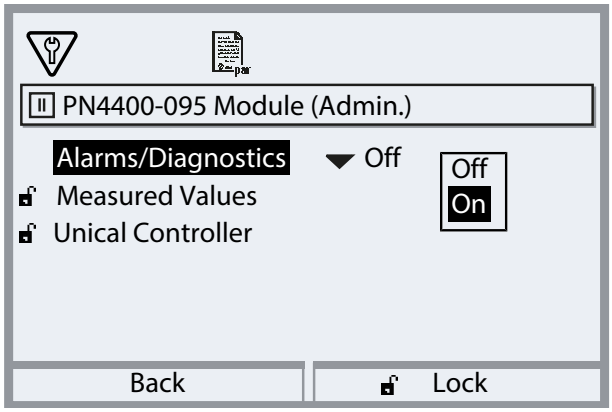
Parameter Setting ▸ PN4400-095 Module

Submenu	Description
Alarms/Diagnostics	→ *Alarms/Diagnostics, p. 17*
Measured Values	→ *Configuring the Measured Values, p. 17*
Unical Controller	→ *Unical Controller, p. 20*

6.2.1 Alarms/Diagnostics

Transmitting PROFINET diagnostics information to the process control system:

01. Parameter Setting ▸ PN4400-095 Module ▸ Alarms/Diagnostics
02. Use the arrow keys and ***enter*** to select "On".



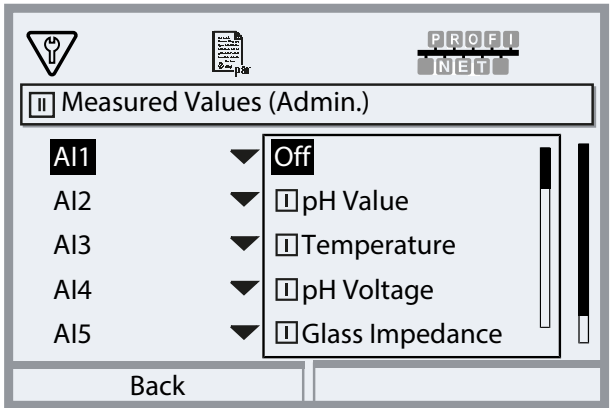
See also
→ *PROFINET Diagnostic Information, p. 27*

6.2.2 Configuring the Measured Values

The PN4400-095 module has 20 analog input blocks (AI1 ... AI20).

The measured value to be transmitted by an AI block is assigned on the device:

01. Parameter Setting ▸ PN 4400-095 Module ▸ Measured Values
02. Select the process variables for AI1 to AI20.



Which measured values are available depends on which modules are installed.

The control system does not automatically detect the process variables. Therefore, the assignment made on the device must be taken into account.

Available Measured Values

Note: This list is valid for FW 01.04.xx of the Protos II 4400 basic unit.

The selection depends on the sensor type used.

The units of measurement can be selected in the system control.

→ *Selecting the Measuring Units, p. 20*

Data Source: pH/ORP Measurement		
Process Variable	**Unit of Measurement**	**Status**
pH Value	pH	Variable
ORP	mV	Variable
Temperature	°C, °F	Variable
pH Voltage	mV	Variable
rH Value	rH	Variable
Glass Impedance	MΩ	Variable
Reference Impedance	kΩ, Ω	Variable
pH Zero Point	pH	Constant
pH Slope	mV/pH	Constant
ISFET Operating Point	mV	Constant
ORP Offset	mV	Constant
Sensoface		Constant
Cal Timer (Remain.)	h, d	Variable
Wear	%	Variable
Remaining Lifetime	h	Variable
TTM Maintenance Timer	h	Constant
DLI Lifetime Indicator	h	Constant
Operating Time	d	Constant
SIP Counter		Constant
CIP Counter		Constant
Autoclaving Counter		Constant

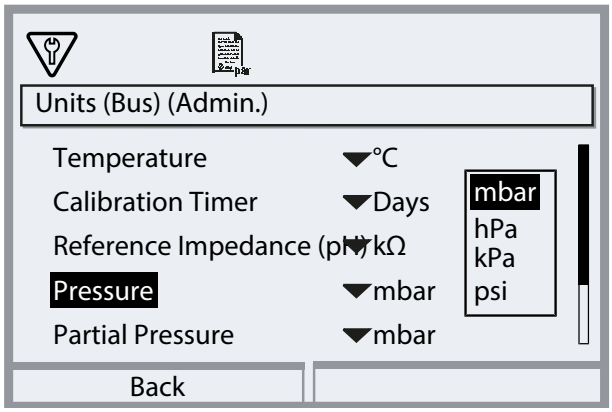
Data Source: Oxygen Measurement		
Process Variable	**Unit of Measurement**	**Status**
Sat. %Air	%	Variable
Saturation %O2	%	Variable
Temperature	°C, °F	Variable
Conc. (Liquid)	mg/l, ppm	Variable
Conc. (Gas)	Vol%	Variable
Sensor Current	nA	Variable
Partial Pressure	mbar, hPa, mmHg	Variable
Sensor Current (25 °C)	nA	Variable
Process Pressure	mbar, hPa, kPa, psi	Variable
Oxy Zero	nA, pA	Constant
Oxy Slope	nA	Constant
Stern-Volmer C.		Constant
Phase Angle	°	Constant
DO Offset	mbar, hPa, mmHg	Constant
Sensoface		Constant
Cal Timer (Rem.)	h, d	Variable
Wear	%	Variable
Membrane Wear	%	Constant
Interior Body Wear	%	Constant
Impedance	kΩ	Variable
TTM Maintenance Timer	h	Constant
DLI Lifetime Indicator	h	Constant
Operating Time	d	Constant
SIP Counter		Constant
CIP Counter		Constant
Autoclaving Counter		Constant

Data Source: Conductivity Measurement		
Process Variable	**Unit of Measurement**	**Status**
Conductivity	µS/cm	Variable
Temperature	°C, °F	Variable
Salinity	g/kg	Variable
Concentration	%	Variable
Resistivity	MΩ·cm	Variable
USP Value	%	Variable
TDS	mg/l	Variable
Conductance	µS	Variable
Effective Resistance	kΩ	Variable
Cell Constant	cm^{-1}	Constant
Installation Factor		Constant
Zero Point	µS	Constant
Sensoface		Constant
Operating Time	d	Constant
SIP Counter		Constant
CIP Counter		Constant
Autoclaving Counter		Constant

6.2.3 Selecting the Measuring Units

For some measured values, it is possible to select the unit of measurement in which they are to be transmitted via the fieldbus.

01. Parameter Setting ▸ Administrator Level ▸ System Control ▸ Units (Bus)

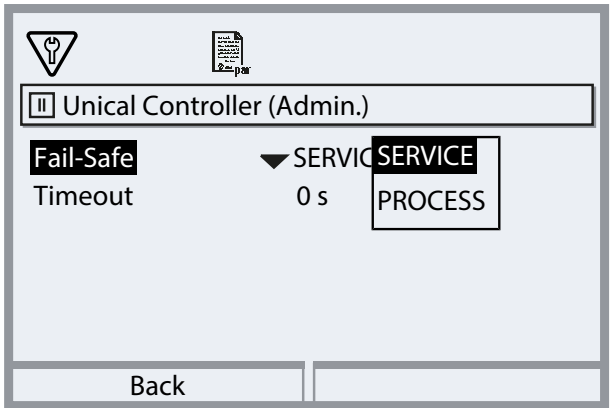


02. Select units of measurement for individual parameters.

6.2.4 Unical Controller

When using a MSU4400-180 module and activated Unical controller, it is possible to select how the retractable fitting behaves if communication with the PROFINET controller is interrupted.

Parameter Setting ▸ PN4400-095 Module ▸ Unical Controller



"Fail-Safe: SERVICE": Retractable fitting travels to the SERVICE position.

"Fail-Safe: PROCESS": Retractable fitting travels to the PROCESS position.

Retractable fitting travel starts after the entered timeout has elapsed.

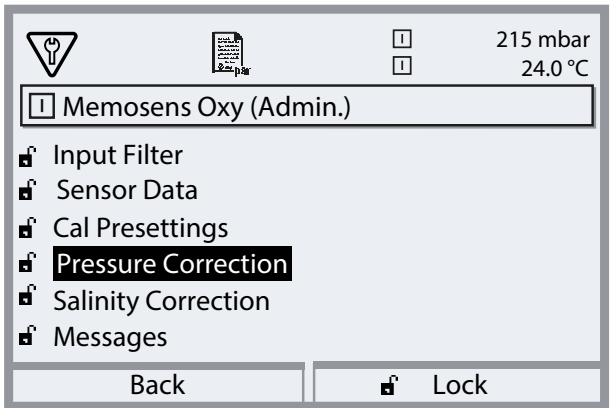
For the Unical controller, the binary input blocks BI1 ... BI5 and the binary output block BO1 are used.

For a description of the PROFINET commands, see the separate interface specification document.

6.2.5 Pressure Correction for Oxygen Measurement

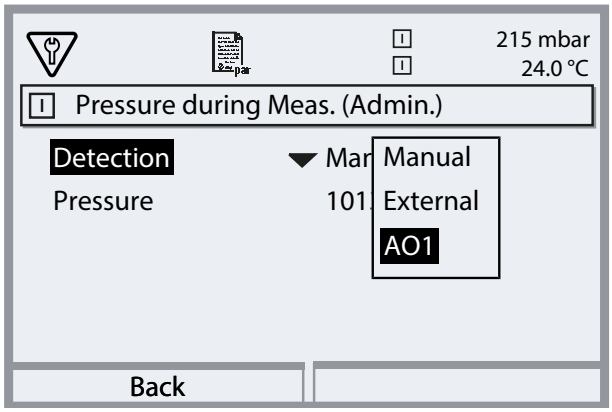
When using an oxygen module, the pressure during measurement or calibration can be corrected using the AO1 function block.

01. Parameter Setting ▸ Module… (▸ Memosens Oxy) ▸ Pressure Correction



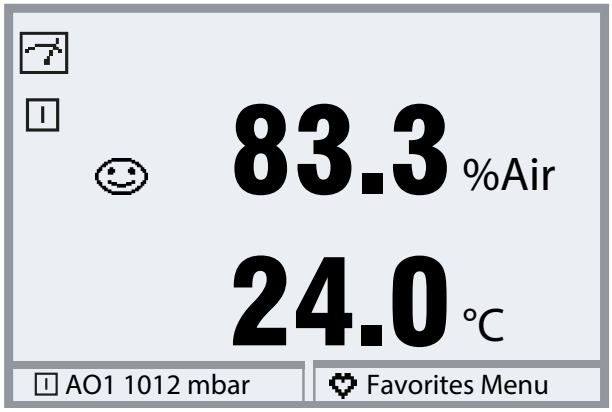
02. Open the menu: Pressure during Meas. or Pressure during Cal

03. Detection : Select "AO1".



04. ***Left softkey: Back***

Press the left softkey multiple times in measuring mode to display the pressure used for the correction:



6.2.6 Key Lock

A key lock activated via the process control system is signaled on the device by the following pop-up window: "Keys Locked via PCS". The "F234 Key Lock is Active" message is also displayed in the message list and in the logbook.

7 Calibration/Adjustment

For a description of calibration/adjustment, see the user manual of the relevant module.

7.1 Product Calibration

If the sensor cannot be removed – e.g., for sterility reasons – it can be calibrated by product calibration.

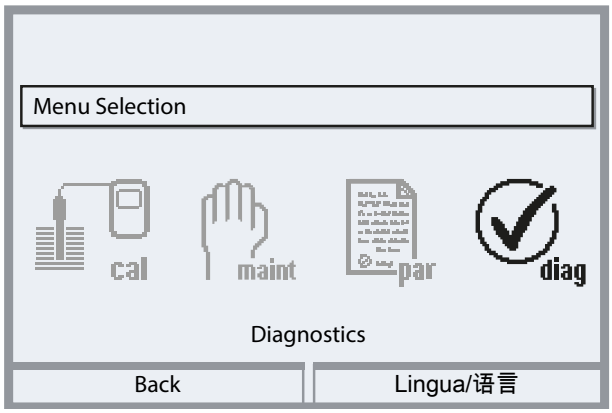
For a description, see the user manual of the corresponding measuring module.

Note: Using acyclic services, product calibration can also be carried out via PROFINET. See the separate interface specification document.

7.2 Calibration Report

When the audit trail is activated (TAN option FW4400-081), it is possible to enable a detailed calibration report to be retrieved.

8 Diagnostics



The diagnostic functions are based on NAMUR Recommendation NE 107.

8.1 Overview of Diagnostic Functions

In diagnostics mode, you can open the following submenus without interrupting the measurement process:

Diagnostics ▸ Module … :

Submenu	Description
Module Diagnostics	→ *Module Diagnostics, p. 23*
Network Information	→ *View Network Information, p. 24*
PROFINET Diagnostics	→ *PROFINET Diagnostics, p. 24*
Function Block Monitor	→ *Function Block Monitor, p. 24*

For a description of the general diagnostics functions, see the user manual of the basic unit.

8.2 Module Diagnostics

PN4400-095 periodically performs a self-test in the background.

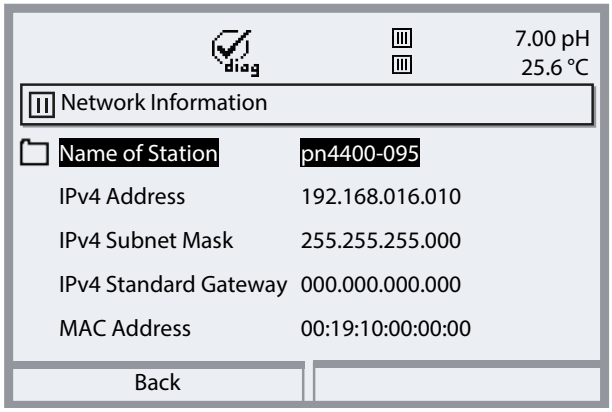
The following is checked:

- Communication
- Flash checksum

8.3 View Network Information

Diagnostics ▸ PN4400-095 Module ▸ Network Information

- Name of Station: For longer texts, display the complete name of station using ***enter*** or the right arrow key.
- IP Address
- IPv4 Subnet Mask
- IPv4 Gateway
- MAC Address[1)]



8.4 PROFINET Diagnostics

Diagnostics ▸ PN4400-095 Module ▸ PROFINET Diagnostics

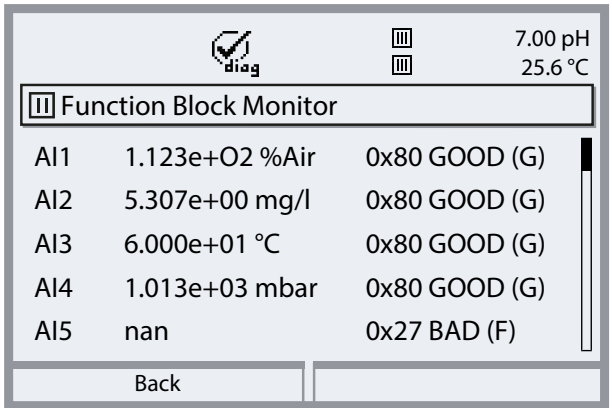
The following values represent correct PROFINET communication:

Stack State	0x000000FB
Last Error	0x00000000
Phy Link State	OK
Config State	Application
Comm State	Operate
Comm Error	0x00000000

8.5 Function Block Monitor

Diagnostics ▸ PN4400-095 Module ▸ Function Block Monitor

Display of the values transferred in cyclic data exchange:



"nan" = "not a number" (no measured value present)

Measured value status overview → *Measured Value Status, p. 25*

1) The unique address assigned to the device, cannot be changed

8.6 Measured Value Status

Description	Hex Value/Display	NE107 Signal	
BAD Maintenance Alarm[1]	0x24 ... 0x27 BAD (F)		Failure
UNCERTAIN Invalid Process Condition	0x79, 0x7A		Out of specification
UNCERTAIN Maintenance Demanded	0x68 ... 0x6B		Maintenance required
BAD Function Check[2]	0x3C		Function check
GOOD ok[3]	0x80 ... 0x83 GOOD (G)		Good

8.7 Communication Status

Display

Active PROFINET communication is indicated by the PROFINET icon in the device's status display.

LEDs

(at Ethernet socket)

LED	Name	Meaning		
Yellow	TX/RX	Receive/Transmit	Off	Device does not transmit/receive any Ethernet frames.
			On (flickers)	Device transmitting/receiving Ethernet frames.
Green	LINK	Connection	Off	Connection not active
			On	Connection active
			Flashing	Data transmission

1) If AI configuration = off: Status 0x27

2) If function check is active.

3) If value is good or message is disabled.

8.8 I&M Functions

I&M functions supply device-specific data in a manufacturer-independent format. Data transmission is acyclic. PN4400-095 support the following standardized I&M functions.

I&M_0: Index 0xAFF0, Access: Read only

Element	Name	Description
1	VendorIDHigh	0
2	VendorIDLow	0x61 (97) = Knick
3	Order ID	Protos II 4400
4	IM_Serial_Number	
5	IM_Hardware_Revision	
6	IM_Software_Revision	
7	IM_RevisionCounter	
8	IM_Profile_ID	
9	IM_Profile_Specific_Type	5 (generic device)
10	IM_Version	
11	IM_Supported	

I&M_1: Index 0xAFF1, Access: Read/Write

Element	Name	Data Type	Description
1	IM_Tag_Function	VisibleString(32)	Device function[1)] Default setting = empty string
2	IM_Tag_Location	VisibleString(22)	Device location

I&M_2: Index 0xAFF2, Access: Read/Write

Element	Name	Data Type	Description
1	IM_Date	VisibleString(16)	Installation date Default setting = empty string

I&M_3: Index 0xAFF3, Access: Read/Write

Element	Name	Data Type	Description
1	IM_Descriptor	VisibleString(54)	Description[2)]

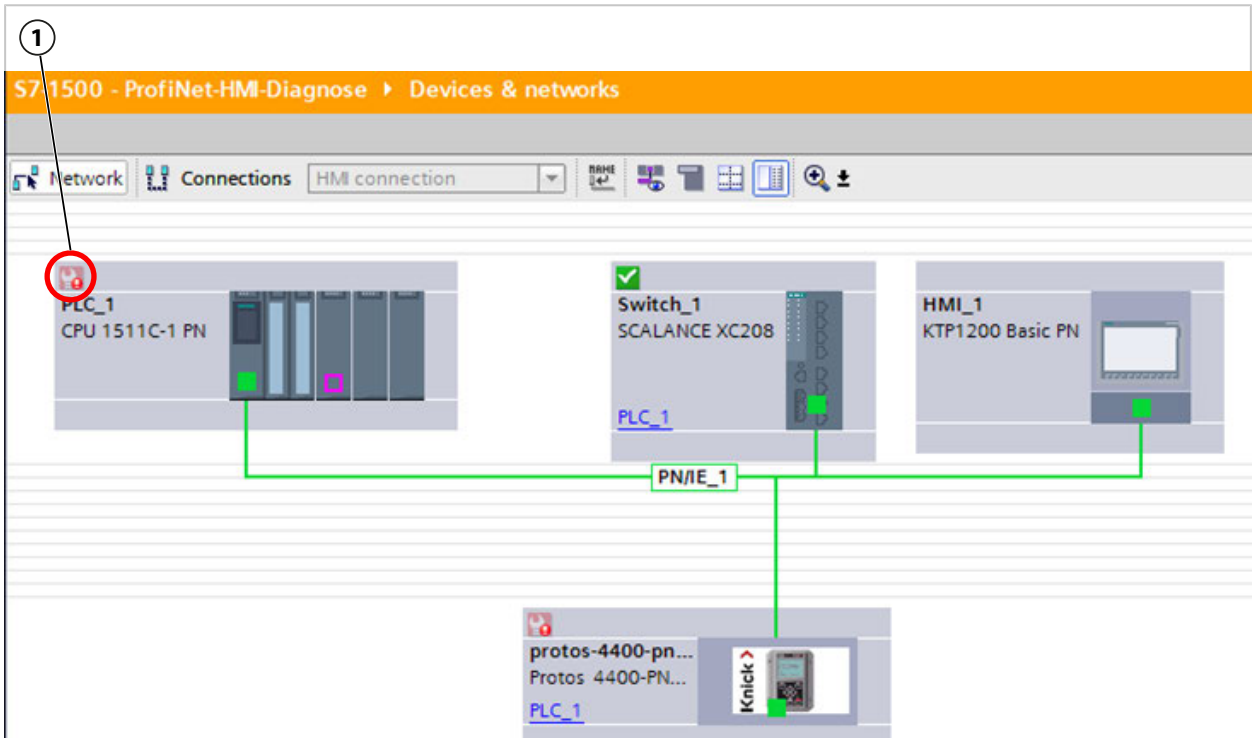
1) Presetting as in device menu:
Parameter Setting ▸ System Control ▸ Meas. Point Description ▸ Meas. Point

2) Presetting as in device menu:
Parameter Setting ▸ System Control ▸ Meas. Point Description ▸ Annotation

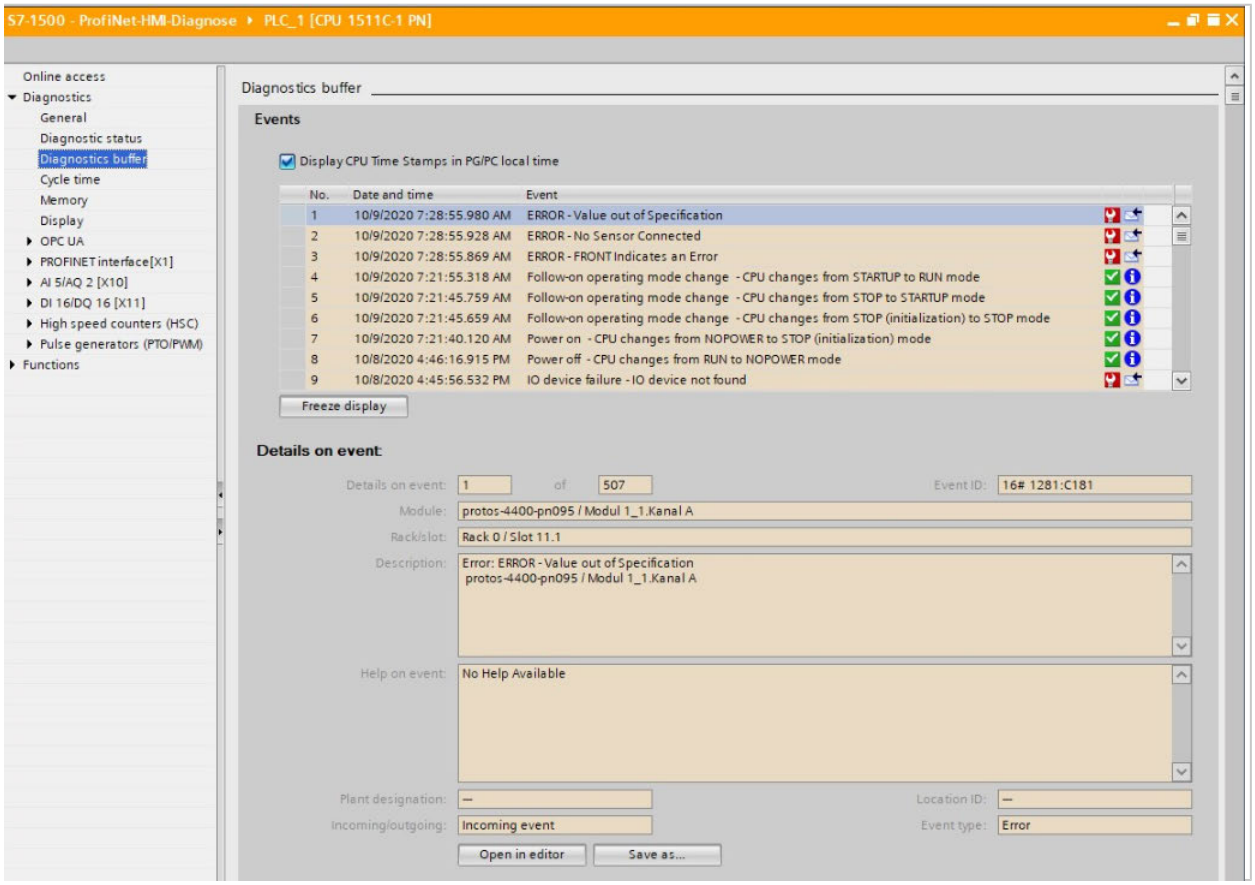
8.9 PROFINET Diagnostic Information

The PROFINET controller is notified of diagnostics events and they are displayed, e.g., in the TIA Portal. Every event generates an entry in the diagnostics buffer.

Double-clicking the red symbol **(1)** on the controller icon displays the details of the event.



8.9.1 Diagnostics Buffer Menu (TIA Portal)



Transmitting the diagnostics information to the process control system can be switched on or off in the Protos device menu:

Parameter Setting ▸ PN4400-095 Module ▸ Alarms/Diagnostics

Source	Error Type	Extended Error Type	State	Maintenance	Error Text
FRONT	300		Error	D	Firmware Error
FRONT	301		Error	D	System Failure
FRONT	303		Error	D	Internal Bus Error
FRONT	304		Error	D	Adjustment Data
FRONT	305		Error	D	Configuration Data Loss
FRONT	311		Warning	MD	Inconsistent Parameter Setting
FRONT	315		Alarm	MR	Memory Card Full
FRONT	318	1	Info	QD	In Function Check
FRONT	322		Alarm	MR	Audit trail: Memory full
FRONT	323		Error	D	Unical: Probe SERVICE Limit Position
FRONT	324		Error	D	Unical: Probe PROCESS Limit Position
FRONT	325		Error	D	Unical: Container I Empty
FRONT	326		Error	D	Unical: Container II Empty
FRONT	327		Error	D	Unical: Container III Empty
FRONT	328		Error	D	Unical: Immersion Lock: Sensor Not Connected
FRONT	329		Error	D	Unical: Sensocheck Glass Electrode
FRONT	330		Error	D	Unical: Compressed Air Sensor
FRONT	331		Error	D	Unical: Immersion Lock
FRONT	332		Error	D	Unical: Leakage Sensor
FRONT	333		Error	D	Unical: Communication Error
FRONT	334		Warning	MD	Unical: Sensor Dismount Guard Defective
FRONT	335		Warning	MD	Unical: Safety Valve Defective
FRONT	336		Warning	MD	Unical: Water Valve Defective
FRONT	337		Alarm	MR	Unical: Probe PROCESS Travel Time
FRONT	338		Alarm	MR	Unical: Probe SERVICE Travel Time
FRONT	339		Alarm	MR	Unical: Container I Almost Empty
FRONT	340		Alarm	MR	Unical: Container II Almost Empty
FRONT	341		Alarm	MR	Unical: Container III Almost Empty
FRONT	342		Alarm	MR	Unical: Water Pressure Sensor
FRONT	343		Alarm	MR	Unical: Calibration Error pH
FRONT	344		Alarm	MR	Unical: Calibration Error ORP
MODULES/ SENSOR	400		Error	D	Firmware Error
MODULES/ SENSOR	401		Error	D	Module Data Loss
MODULES/ SENSOR	403		Error	D	No Sensor Connected
MODULES/ SENSOR	404		Error	D	Wrong Sensor Connected
MODULES/ SENSOR	405		Error	D	Sensor Devaluated
MODULES/ SENSOR	406		Error	D	Sensor Defective

Source	Error Type	Extended Error Type	State	Maintenance	Error Text
MODULES/ SENSOR	407		Error	D	Adjustment Data
MODULES/ SENSOR	408		Error	D	Sensor Memory (Cal Data)
MODULES/ SENSOR	414		Warning	MD	Monitoring: TTM
MODULES/ SENSOR	418		Warning	MR	Monitoring: CIP Counter
MODULES/ SENSOR	419		Warning	MR	Monitoring: SIP Counter
MODULES/ SENSOR	420		Alarm	MR	Autoclaving Counter
MODULES/ SENSOR	422	1	Info	QD	Error in Buffer Table
PN095	500		Error	D	Firmware Error
PN095	501		Error	D	Configuration Data Loss
PN095	502		Error	D	EEPROM Error
PN095	19	1	Error	D	KBUS Error

D = Diagnosis

MD = Maintenance Demanded

MR = Maintenance Required

QD = Qualified Diagnosis

9 Troubleshooting

9.1 Failure Conditions

Messages and errors are displayed with the corresponding NAMUR icon.

The message is recorded in the logbook with the date and time (Diagnostics ▸ Logbook).

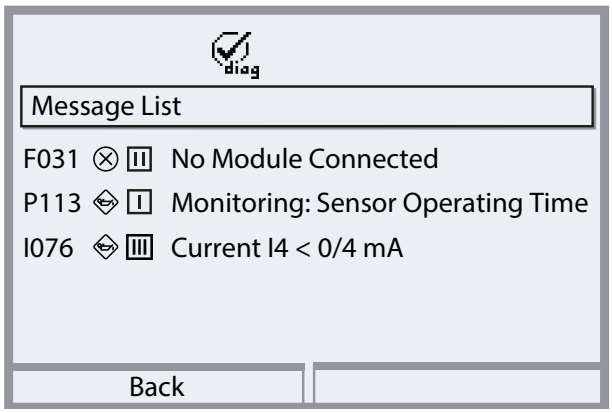
9.1.1 Messages

Message type	NAMUR icon
Maintenance request	
Out of specification	
Failure	
Function check	
Info	Info text; it is displayed directly in the relevant menu.
par	Message type is adjustable: Failure or maintenance request

Signaling via relay contacts, see the user manual of the basic unit.

Displaying Messages

01. If the "Failure" ⊗, "Maintenance Request" ◈, or "Out of Specification" ⚠ icons blink on the display, open the Diagnostics menu:
    Menu Selection ▸ Diagnostics ▸ Message List
    ✓ All active messages are displayed in the Message List menu item with the following information: Error number, type (failure, maintenance request, out of specification), channel, message text.



02. Scroll forward and backward with the ***up/down arrow keys***.

Note: For information on troubleshooting, see the user manual of the corresponding module.

Note: The message is deleted from the message list around 2 s after troubleshooting.

General Errors

Error	Possible Cause	Remedy
No connection via PROFINET	RJ45 plug not plugged in correctly.	Check the connection. Connect the plug correctly.
	Device menu Diagnostics ▸ PN4400-095 Module ▸ PROFINET Diagnostics : “Phy Link State: No Link”	
	Incorrect IP address	Check and correct the IP address.
	Device menu Diagnostics ▸ PN4400-095 Module ▸ PROFINET Diagnostics : “Comm State: Stop”	
	Incorrect name of station or name of station not unique	Check and correct the name of station.
	Device menu Diagnostics ▸ PN4400-095 Module ▸ PROFINET Diagnostics : “Comm State: Stop”	
	Incorrect GSDML used.	Check GSDML, select correct GDSML.
	Device menu Diagnostics ▸ PN4400-095 Module ▸ PROFINET Diagnostics : “Comm State: Stop”	
Device does not respond to key pressure	Key Lock Is Active (F234)	Deactivate key lock via PCS: Slot 1, Subslot 1, Index 1
Measured values were not correctly transmitted via PROFINET.	Measured values were not correctly assigned.	Correct the parameter setting: Parameter Setting ▸ PN4400-095 Module ▸ Measured Values → *Configuring the Measured Values, p. 17*
Measured value with incorrect unit of measurement	Parameters for unit of measurement set incorrectly.	Correct the parameter setting: Parameter Setting ▸ System Control ▸ Units (Bus)
PROFINET diagnostics are not displayed in the control system.	Alarms/Diagnostics display is not activated.	Correct the parameter setting: Parameter Setting ▸ PN4400-095 Module ▸ Alarms/Diagnostics : “On”
Unical cannot be controlled via the process control system.	The PN4400-095 module was not assigned during parameter setting.	Correct the parameter setting: Parameter Setting ▸ MSU4400-180 Module – Unical ▸ Installation ▸ External Control (PCS) ▸ Bus Channel : Select the module used.
Audit trail: Remote login, calibration record, or logging does not work on the process control system.	The PN4400-095 module was not assigned to the corresponding channels in the system control.	Correct the parameter setting: Parameter Setting ▸ System Control ▸ Audit Trail: Assign the PN4400-095 module to the corresponding channels.

10 Decommissioning

10.1 Disposal

To dispose of the product properly, follow the local regulations and laws.

Customers can return their electrical and electronic waste devices.

For details on how to return and dispose of electrical and electronic devices in an environmentally friendly manner, please refer to the manufacturer's declaration on our website. If you have any queries, suggestions, or questions about how Knick recycles electrical and electronic waste devices, please send us an email: → *support@knick.de*

10.2 Return Delivery

If a product must be returned, send it to the responsible local representative in a clean condition and securely packaged. → *knick-international.com*

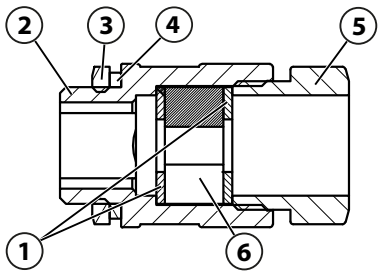
11 Accessories

11.1 ZU1072 RJ45 Socket

Intended Use

The RJ45 socket enables a PROFINET cable to be connected to the PN4400-095 module. It is screwed into the bottom of the housing instead of one of the cable glands.

Sectional View

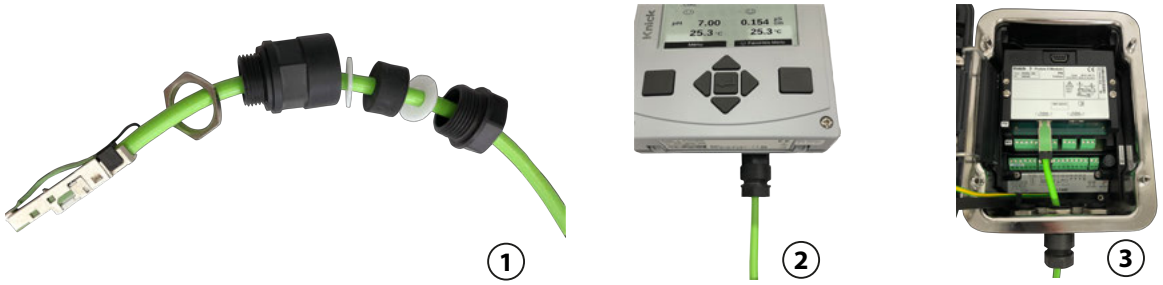


1	Washer	4	Connection thread gasket EADR 20
2	Housing	5	Pressure piece
3	Locknut EMMU 20	6	Split sealing insert GFD 25-01-065

Specifications

Materials	
Housing, pressure piece	PA6.6 – GF30 sw
Washer	POM, natural
Connection thread gasket EADR 20	EPDM, M20
Split sealing insert GFD 25-01-065	EPDM
Locknut EMMU 20	Brass, nickel-plated, M20
Min. cable diameter	4 mm
Max. cable diameter	6.5 mm
Number of cables	1
Max. connector dimensions (W × H)	15 mm × 11.2 mm
Color	Black
Dimensions	28 mm x 28 mm x 49.5 mm
Weight	Approx. 26 g
Ambient temperature	–20 … 55 °C (–4 … 131 °F)
Protection rating	IP67

Typical Applications



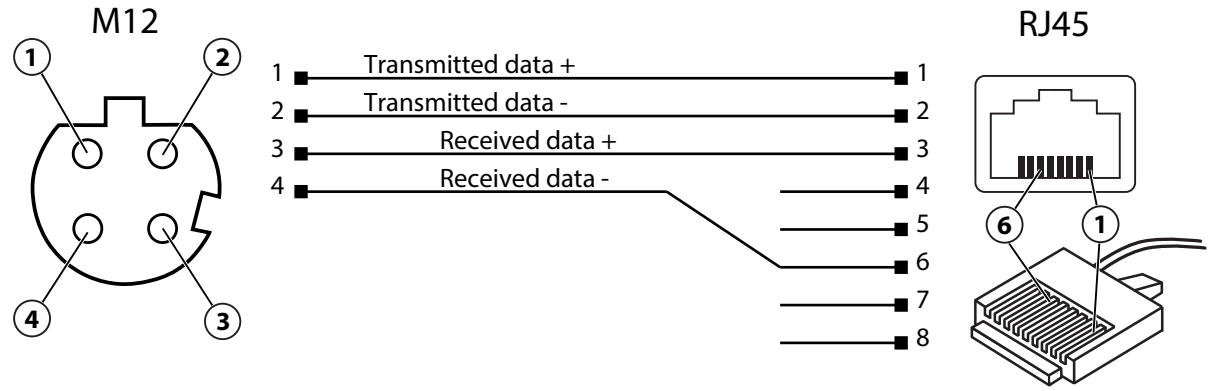
1	Socket with cable	3	Socket on Protos II with PN4400-095
2	Socket on Stratos Multi		

11.2 ZU1073 Adapter Cable RJ45/M12 D-Type

Intended Use

The adapter cable connects a RJ45 socket of the module PN4400-095 to a D-coded M12 socket and is used for data transmission via Ethernet.

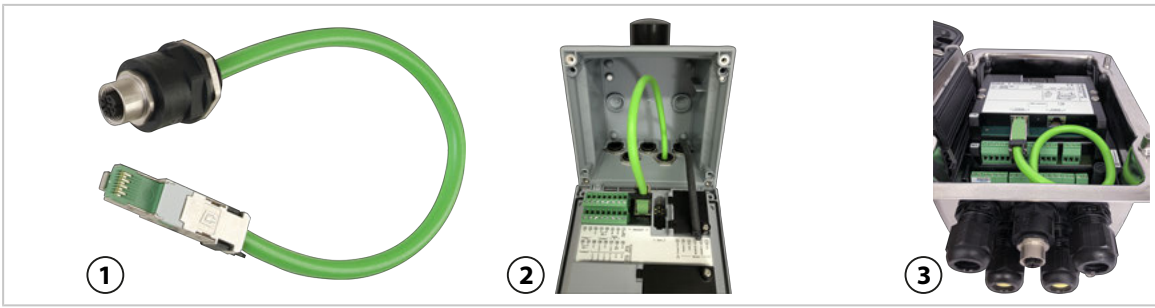
Connection Diagram



Specifications

Category	CAT 5
Material	PUR, polyolefin
Cable diameter	6.7 mm
Length	0.3 m
Ambient temperature	–20 … 55 °C (–4 … 131 °F)
Protection rating	IP67

Typical Applications



1 Adapter cable RJ45/M12 D-type
2 Stratos Multi
3 Protos II 4400 with PN4400-095

12 Specifications

12.1 Module

Enclosure	
Material	PC/ABS blend, black
Dimensions (width × height × depth)	Approx. 118 mm × 21 mm × 91 mm (4.65″ × 0.83″× 3.58″)
Protection rating	IP20
Terminals	
Screw terminals	For single wires and stranded wires 0.2 … 2.5 mm^2
Tightening torque	0.5 … 0.6 Nm
Wiring	
Stripping length	Max. 7 mm
Ferrules	0.25 … 2.5 mm^2
Temperature resistance	> 75 °C (167 °F)
Current consumption	≤ 146 mA

12.2 Ambient Conditions

(with installed module)

Climatic class	3K5 in accordance with EN 60721-3-3
Location class	C1 in accordance with EN 60654-1
Ambient temperature, operation	Non-Ex: –20 … 55 °C (–4 … 131 °F) Ex: –20 … 50 °C (–4 … 122 °F)
Ambient temperature, transport/ storage	–20 … 70 °C (–4 … 158 °F)
Relative humidity	5 … 95%

12.3 Compliance

(with installed module)

EMC	EN 61326-1, EN 61326-2-3, NAMUR NE 21
Emitted interference	Industrial applications[1)] (EN 55011, Group 1, Class A)
Immunity to interference	Industrial applications
Lightning protection	EN 61000-4-5, installation class 2
RoHS compliance	EU Directive 2011/65/EU

[1)] This equipment is not designed for domestic use, and is unable to guarantee adequate protection of the radio reception in such environments.

12.4 PROFINET

IO specification	V2.45
Conformance class	Class B (CC-B)
Network load class	2
Vendor ID	0x61 (= Knick)
Device ID	0x0020
Min. cycle times	1 ms
Identification & maintenance	I&M1-3, 0
Serial interface standard	100BASE-TX (IEEE 802.3, IEC 61158, IEC 61784)
Number of AI	20
Number of AO	1
Number of BI	5
Number of BO	1

100BASE-TX Communication Interface

Connection socket type (1 and 2)	RJ45
Input and output impedance	100 Ω
Serial data rate	125 Mbps
Data coding	4B/5B
Line coding	MLT-3 (Multi Level Transmission — 3 Level)
Galvanic isolation RJ45 connector	MDI and cable shield to earth potential (device housing)
Insulation strength	
MDI (all 8 internal RJ45 connectors)	2250 V DC /1.5 kV AC (50/60 Hz) for 60 s
Cable shield	1000 V DC /700 V AC (50/60 Hz) for 60 s

13 Appendix

13.1 PROFINET Technology

PROFINET is an open industrial standard for secure, fast data transmission via Industrial Ethernet. PROFIBUS and PROFINET International (PI) created and now manage the standard.

The PROFINET standard is an advancement of PROFIBUS – a standard for fieldbus communication for supporting automation.

Even for complex applications, PROFINET ensures correct, prompt data transmission. Alongside the cyclical transmission of application data, PROFINET offers additional functions for transmitting diagnostics, configurations and alerts.

Conformance Classes

There are four successive conformance classes (CC-A, CC-B, CC-C, CC-D) with matched functionality for the various requirements.

PN4400-095 fulfills Class B (CC-B). This means that both the devices used and the network infrastructure include certified products and are structured in accordance with the PROFINET IO guidelines.

Note: The firmware version listed on the certificate corresponds to the APP firmware of the communication micro controller.

Basic functions for Class B:

- RT communication
- Cyclical I/O data traffic
- Parameters
- Alerts
- Network diagnostics
- Topology information

Topology

PROFINET devices can also be networked to each other in different ways. There are different topologies: line, tree, ring and star.

PN4400-095 can be connected in a ring or star topology.

Ring Topology

In this topology, end devices and control systems are connected to each other in series. Further, both the first and last device are connected to the control system to create a ring. The ring topology is redundant and therefore recommended for production environments that rely on high availability.

Two Ethernet sockets are required for this topology.

Star Topology

In the star topology, there is a central station that is connected to all end devices. There is no direct connection between the individual end devices.

14 Abbreviations

ABS	Acrylonitrile butadiene styrene
AI	Analog input
AO	Analog output
AT	Audit trail
BI	Binary input
BO	Binary output
CAT	Category (for network cable)
CC-A/B/C/D	Conformance classes
CIP	Cleaning in place
D	Diagnostics
DCP	Discovery and basic configuration protocol
DLI	Dynamic lifetime indicator
EEPROM	Electrically Erasable Programmable Read-only Memory
EMC	Electromagnetic Compatibility
EN	European standard
EPDM	Ethylene propylene diene monomer rubber
ESD	Electrostatic discharge
EU	European Union
GSD	Generic station description (device master file)
GSDML	GSD markup language
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
I&M	Identification and maintenance
I/O, IO	Input/output
IP	International Protection/Ingress Protection
ISFET	Ion-sensitive field-effect transistor
MAC	Media access control
MD	Maintenance demanded
MDI	Media dependent interface
MR	Maintenance required
NAMUR	User Association of Automation Technology in Process Industries
NE 107	NAMUR recommendation 107: "Monitoring and Diagnosis of Field Devices"
PB	Physical block
PC	Polycarbonate
PCS	Process control system
PI	PROFINET International
PN	PROFINET
POM	Polyoxymethylene
PROFINET	Process field network
PUR	Polyurethane
QD	Qualified diagnosis
RD	Received data
RJ45	Registered jack
RL	Remote login
RT	Real time
SIP	Sterilization in place

TAN	Transaction number (activation code for add-on functions)
TB	Transducer block
TD	Transmitted data
TDS	Total dissolved solids
TIA	Totally Integrated Automation
TTM	Time to maintenance
USP	U.S. Pharmacopeia

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Translation of the original instructions

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The latest documents are available for download on our
website under the corresponding product description.

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