

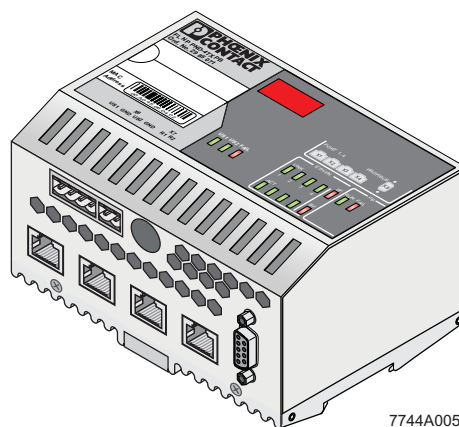
FL NP PND-4TX PB

PROFINET IO proxy for PROFIBUS DP with integrated switch with four RJ45 ports

AUTOMATION

Data sheet
7744_en_04

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7744A005

1 Description

PROFINET IO/PROFIBUS proxy

1.1 Features

- PROFINET IO device
- 10/100Base-T(X) Ethernet twisted pair interface
- Integrated PROFINET IO proxy for PROFIBUS
- Supports PROFINET conformance class B
- Integrated managed switch with four ports
- PROFIBUS DP Class 1 master
- PROFIBUS DP protocol (IEC 61158 Type 3 and IEC 61784)
- PROFIBUS DP master connection up to 12 Mbps (RS-485 copper technology)
- Complete configuration using PC WorX

1.2 Application

- Connection of a PROFIBUS DP system to a PROFINET IO controller from Phoenix Contact
- Use in small control boxes in order to seamlessly integrate existing PROFIBUS DP solutions in PROFINET



A quick start guide for PC WorX can be found in the Download Center at www.phoenixcontact.net/catalog (see "Ordering data" on page 2).



Make sure you always use the latest documentation for the proxy. This documentation can be downloaded at www.phoenixcontact.net/catalog.



This data sheet is valid for the products listed on the following page:

2 Ordering data

Products

| Description | Type | Order No. | Pcs./Pkt. |
|---|------------------|-----------|-----------|
| PROFINET IO proxy for PROFIBUS DP with integrated switch with four RJ45 ports | FL NP PND-4TX PB | 2985071 | 1 |

Documentation

| Description | Type | Order No. | Pcs./Pkt. |
|-------------------------------|------------------|-----------|-----------|
| Quick start guide for PC WorX | UM QS EN PC WORX | 2699862 | 1 |

3 Technical data

General data

| | |
|--|--|
| Function | PROFINET IO proxy for PROFIBUS DP/switch |
| Housing dimensions (width x height x depth) | 128 mm x 95 mm x 69 mm (without connectors, memory card not inserted) |
| Weight | 650 g |
| Permissible temperature (operation) | 0°C to +55°C |
| Permissible temperature (storage/transport) | -25°C to +70°C |
| Humidity (operation) | 10% to 75%, no condensation |
| Humidity (storage/transport) | 10% to 75%, no condensation |
| Air pressure (operation) | 80 kPa to 108 kPa, 2000 m above sea level |
| Air pressure (storage/transport) | 66 kPa to 108 kPa, 3000 m above sea level |
| Degree of protection | IP20, IEC 60529 |
| Protection class | Class 3 according to EN 61131-2, IEC 61131-2; PELV with preconnected power supply unit with safe isolation |
| Pollution degree (installation in housing with \geq IP54 protection) | 2 |
| Air and creepage distances | According to IEC 60439-1 |
| Preferred mounting position | On a standard DIN rail; For the mounting position, see Figure 8 on page 8. |
| Connection to functional earth ground | Snapped onto a grounded DIN rail |
| Indication elements | Local diagnostic and status LEDs |

Supply voltage (U_{S1}/U_{S2} redundant)

| | |
|---------------------------|---|
| Connection | Via COMBICON; conductor cross-section = 2.5 mm ² , maximum |
| Nominal value | 24 V DC |
| Permissible ripple | 3.6 V _{PP} within the permissible voltage range |
| Permissible voltage range | 19.5 V DC to 30 V DC |
| Current consumption | 350 mA, typical |
| Typical power consumption | 8.5 W |

Interfaces

Ethernet (RJ45 ports)

| | |
|-----------------------------------|---|
| Number | 4 |
| Connection format | 8-pos. RJ45 female connector |
| Connection medium | Twisted pair cable with a conductor cross-section of 0.14 mm ² to 0.22 mm ² |
| Cable impedance | 100 Ω |
| Transmission Speed | 10/100 Mbps |
| Maximum network segment expansion | 100 m |
| Function | 10/100Base-T(X) |

PROFIBUS DP

| | |
|--------------------|--|
| Connection format | 9-pos. D-SUB female connector (RS-485) |
| Transmission speed | 9.6 kbps to 12 Mbps |

Interfaces (continued)**Floating alarm contact**

| | |
|---------------------------|-----------------|
| Voltage | 24 V DC |
| Current carrying capacity | 100 mA, maximum |

PROFIBUS DP functions

| | |
|-------------------------------|------------------------------|
| Master class | DP/V0 Class 1 master |
| Number of PROFIBUS DP devices | Up to 125 PROFIBUS DP slaves |
| Maximum length of I/O data | Up to 1400 bytes |

Software

| | |
|-----------------------|---|
| Software requirements | PC WorX Version 5.20 Service Pack 3 or later Firmware 3.0 or later on PC WorX-based control system |
| Device description | None |

PROFINET

| | |
|-------------------|----------------------------|
| Type | Modular PROFINET IO device |
| Specification | 2.1 |
| Conformance class | B |
| Update rate | ≥ 1 ms |

Mechanical tests

| | |
|---|--|
| Shock test according to IEC 60068-2-27 | Operation: 15g Storage/transport: 15g |
| Vibration resistance according to IEC 60068-2-6 | Operation/storage/transport: 2g |
| Free fall according to IEC 60068-2-32 | 1 m |

Conformance with EMC Directive 2004/108/EC**Noise immunity test according to EN 61000-6-2**

| | | |
|-------------------------------|-------------------------------|---|
| Electrostatic discharge (ESD) | EN 61000-4-2 IEC 61000-4-2 | Criterion B 6 kV contact discharge 8 kV air discharge |
| Electromagnetic HF field | EN 61000-4-3 IEC 61000-4-3 | Criterion A Field strength: 10 V/m |
| Fast transients (burst) | EN 61000-4-4 IEC 61000-4-4 | Criterion B Signal/data lines: 2.2 kV |
| Surge current load (surge) | EN 61000-4-5 IEC 61000-4-5 | Criterion B Signal/data lines: 1.1 kV |
| Conducted interference | EN 61000-4-6 IEC 61000-4-6 | Criterion A Test voltage: 10 V |

Noise emission test according to EN 61000-6-4

| | | |
|---------------------------|----------|---------|
| Noise emission of housing | EN 55011 | Class A |
|---------------------------|----------|---------|

Approvals

For the latest approvals, please visit www.phoenixcontact.com or www.phoenixcontact.net/catalog.

4 Safety notes



WARNING: Disregarding this warning may result in damage to equipment and/or serious personal injury. Only qualified personnel may start up and operate this device. According to the safety instructions in this text, qualified personnel are persons who are authorized to start up, to ground, and to mark devices, systems, and equipment according to the standards of safety technology. In addition, these persons must be familiar with all warning instructions and maintenance measures in this text.



WARNING: Only use PELV

The FL NP PND-4TX PB proxy is designed exclusively for protective extra-low voltage (PELV) operation according to EN 60204-1. Only protective extra-low voltages according to the defined standard may be used to supply and connect the alarm contact.



Shielding

The shielding ground of the connectable twisted pair cables is electrically connected to the female connector. When connecting network segments, avoid ground loops, potential transfers, and voltage equalization currents via the braided shield.



NOTE: Electrostatic discharge

The device contains components that can be damaged or destroyed by electrostatic discharge. When handling the device, observe the necessary safety precautions against electrostatic discharge (ESD) according to EN 61340-5-1.



Housing

Only personnel authorized by Phoenix Contact are permitted to open the housing.

5 Front view of the FL NP PND-4TX PB proxy

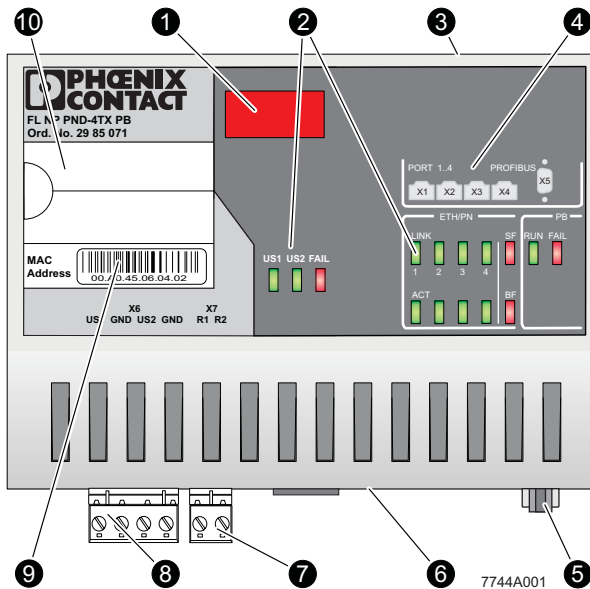


Figure 1 Front view of the FL NP PND-4TX PB

The following components are located on the proxy:

- 1 7-segment display
- 2 Diagnostic and status indicators
- 3 Slot for the parameterization memory
- 4 Diagram of Ethernet port numbering and the PROFIBUS DP connection
- 5 PROFIBUS DP connection
- 6 Ethernet ports
- 7 COMBICON alarm contact
- 8 Supply voltage
- 9 MAC address
- 10 Labeling field

6 Interfaces of the FL NP PND-4TX PB proxy

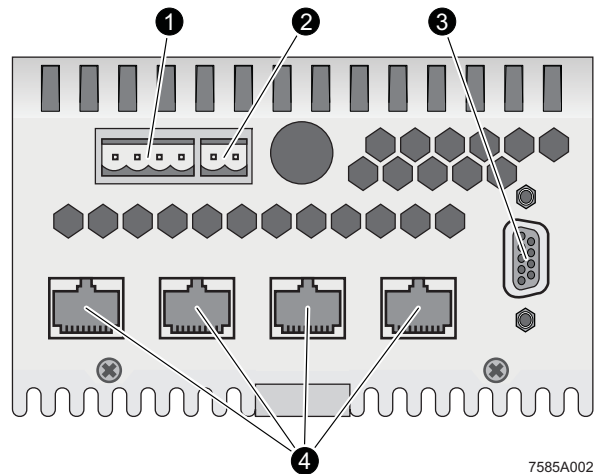


Figure 2 Interfaces of the FL NP PND-4TX PB

The following interfaces are located on the proxy:

- 1 Supply voltage
- 2 COMBICON alarm contact
- 3 PROFIBUS DP connection (RS-485, 9-pos. D-SUB female connector)
- 4 Ethernet ports

7 Slot for the parameterization memory

The slot for the optional parameterization memory is located on the top of the housing (3 in Figure 1)

8 Housing dimensions of the proxy

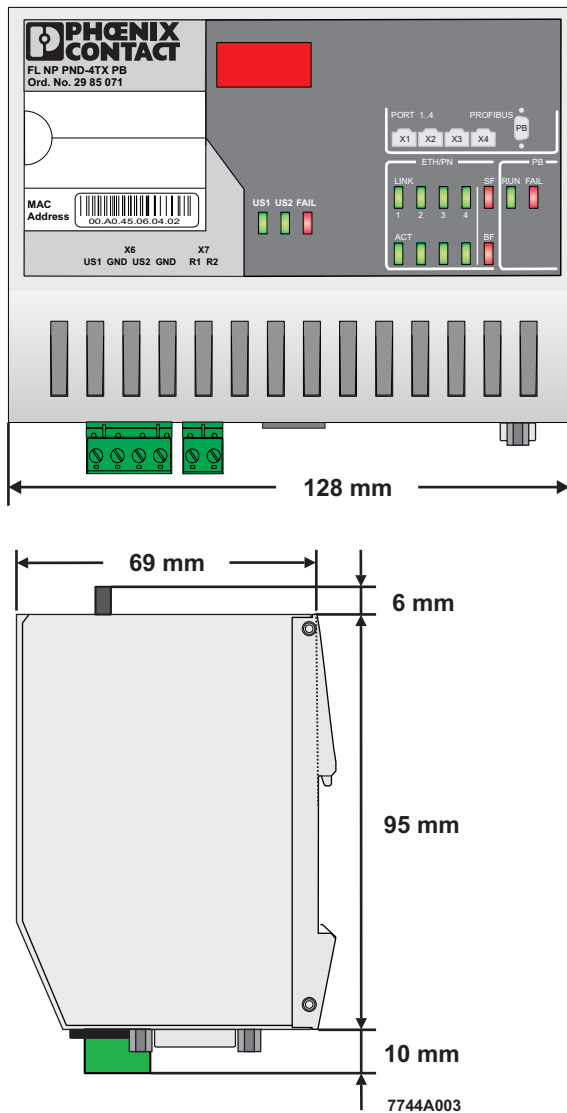


Figure 3 Housing dimensions of the proxy
 FL NP PND-4TX PB
 Depth: 69 mm/71 mm from the top edge of the DIN rail

9 Mounting and removing the proxy

Mount the proxy on a clean DIN rail according to DIN EN 50022 (e.g., NS 35 ... from Phoenix Contact). To avoid contact resistance only use clean, corrosion-free DIN rails. Before mounting the modules, an end clamp (E/NS 35N, Order No. 0800886) should be mounted on the left-hand side next to the proxy to stop the modules from slipping on the DIN rail. The end clamp should only be mounted on the right-hand side once the proxy has been mounted.

10 Assignment of Ethernet ports

The proxy has four Ethernet ports in RJ45 format (4 in Figure 2 on page 5). Only one twisted pair cable with an impedance of 100Ω may be connected to a port. Depending on the Ethernet network used, the data transmission rate is 10 Mbps or 100 Mbps. The Ethernet ports of the proxy can detect a pair of incorrectly connected receive cables (RD+/RD-) and correct them using the auto polarity correction function.¹⁰

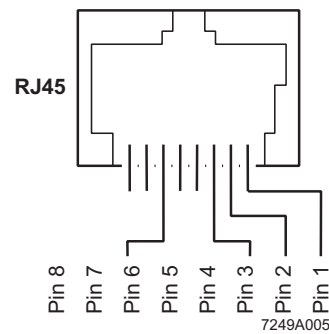


Figure 4 Pin assignment of the Ethernet port in RJ45 format

| PIN | Assignment | Meaning |
|-----|------------|-----------------|
| 8 | res. | Reserved |
| 7 | res. | Reserved |
| 6 | TD- | Transmit data - |
| 5 | res. | Reserved |
| 4 | res. | Reserved |
| 3 | TD+ | Transmit data + |
| 2 | RD- | Receive data - |
| 1 | RD+ | Receive data + |

11 Assignment of the D-SUB female connector (PROFIBUS connection)

Connect the device to the PROFIBUS DP master via a 9-pos. D-SUB female connector.

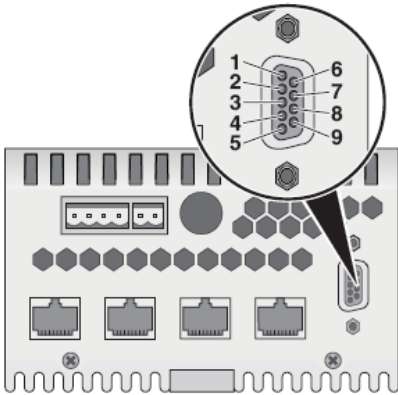


Figure 5 Assignment of the D-SUB female connector (PROFIBUS connection)

| PIN | Assignment |
|---------|---|
| 1 | Braided shield, functional earth ground |
| 2 | Not used |
| 3 | RxD/TxD-P (cable B) |
| 4 | Not used |
| 5 | DGND |
| 6 | VP (+5 V DC) |
| 7 | Not used |
| 8 | RxD/TxD-N (cable A) |
| 9 | Not used |
| Housing | Functional earth ground |

12 Status and diagnostic indicators (LEDs)

| Des. | Color | Status | Meaning |
|---|-------|---------------|--|
| Power supply | | | |
| US1 | Green | ON | Supply voltage 1 present |
| | | OFF | Supply voltage 1 too low |
| US2 | Green | ON | Supply voltage 2 present |
| | | OFF | Supply voltage 2 too low |
| FAIL | Red | ON | Alarm contact open → an error has occurred |
| | | OFF | Alarm contact closed → no error has occurred |
| Port 1 ... 4/Ethernet | | | |
| A LINK LED (link) for each port is located on the proxy (2 in Figure 1 on page 5). | | | |
| LINK | Green | ON | Physical network connection ready to operate |
| | | Flash- ing | Flashing function of the configuration and parameterization software active/ device search |
| | | OFF | Physical network connection interrupted or not present |
| An ACT LED (activity) for each port is located below the LINK LED on the proxy (2 in Figure 1 on page 5). | | | |
| ACT | Green | ON | Sending/receiving data telegrams |
| | | OFF | Not sending/receiving data telegrams |
| SF | Red | ON | Group error message: PROFIBUS DP master fault due to faulty parameterization, bus error, I/O error. |
| | | OFF | Group error message not present. |
| BF | Red | ON | No PROFINET IO communication. |
| | | Flash- ing | No communication connection to the PROFINET IO controller, connection is being established. |
| | | OFF | The PROFINET IO controller has established an active communication connection to the PROFINET IO device. |
| PROFIBUS | | | |
| RUN state | Green | ON | PROFIBUS DP master has started. |
| | | OFF | PROFIBUS DP master has not started. |
| FAIL | Red | ON | PROFIBUS DP faulty parameterization, bus error, I/O error, individual slave diagnostics present. |
| | | OFF | PROFIBUS DP running without any errors. |

13 Installation

13.1 Connecting the supply voltage/grounding

The 24 V supply voltage (8 in Figure 1 on page 5) and the alarm contact (7 in Figure 1 on page 5) are connected via two COMBICON terminal block bases. To connect the cables, remove the relevant terminal block base.

13.2 Connecting the supply voltage

The 24 V supply voltage can be connected redundantly. Both voltage inputs (U_{S1} and U_{S2}) each are electrically isolated from one another and the housing.

In the event of redundant voltage supply the higher of the two voltages supplies the device. The load is not distributed.



In the event of non-redundant power supply, the proxy indicates a supply voltage failure via the alarm contact and the FAIL LED. This error message can be prevented, as shown in Figure 6, version 1, by connecting the supply voltage to both terminal blocks in parallel.

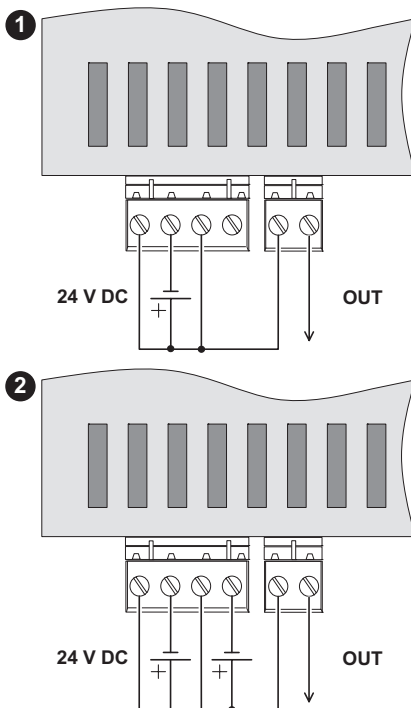


Figure 6 Typical connection of supply voltage and alarm contact

13.3 Connecting the alarm contact

The proxy has a floating alarm contact. This alarm contact monitors the operation of the proxy and thus enables remote diagnostics. The alarm contact is floating and is closed during correct operation of the proxy. An error is indicated if the contact is interrupted. The alarm contact can be connected as shown in Figure 6 or it can be supplied from an independent voltage source.

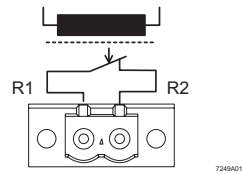


Figure 7 Basic circuit diagram for the alarm contact

13.4 Connecting functional earth ground

Snapping the proxy onto a grounded DIN rail connects it to the ground potential.



WARNING: Ensure correct grounding

Grounding protects people and machines against hazardous voltages. Correct grounding, taking the local conditions into account, is vital.

All Factoryline devices must be grounded so that any possible interference is shielded from the data telegram and discharged to ground potential.

A conductor of at least 2.5 mm² must be used for grounding. When mounting on a DIN rail, the DIN rail must be connected with protective earth ground using grounding terminal blocks. The module is connected to protective earth ground via the metal base element.

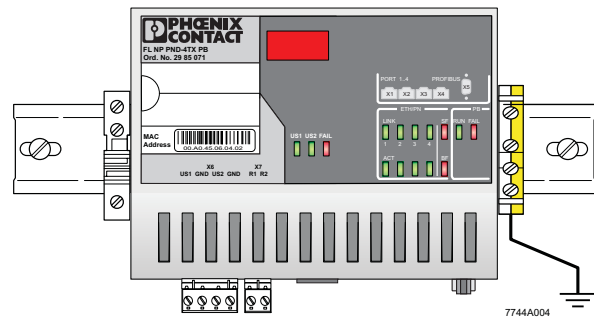





Figure 8 Proxy on a grounded DIN rail






13.5 Connecting PROFIBUS DP



Connect the bus cable, which goes to the first PROFIBUS DP device, to the PROFIBUS DP connection (RS-485, 9-pos. D-SUB female connector) on the proxy (3 (PROFIBUS) in Figure 2 on page 5).

14 Meaning of the 7-segment display

14.1 On startup/during operation

| Display | Meaning |
|---|--|
| Pxx | Boot phases in the firmware |
| - - | PROFINET communication has been interrupted or not initialized (see BF LED). |
| - - - | PROFINET communication has been initialized, data is being exchanged. |
|  | Operating (no errors present, PROFIBUS is in RUN mode (see RUN LED)). |
| "0-0", alternating with an error indication or RUN line; the LINK LED flashes during the device search. | PROFINET device identification |
| "bUS" alternating with "xxx" | <p>PROFIBUS DP bus error message</p> <p>xxx_{dec} = Faulty PROFIBUS DP slave address</p> <p>In the event of a group error message (SF), the PROFIBUS address is indicated on the 7-segment display.</p> <p>Example: Addressing in Table 15 on page 12</p> <p>"bUS" alternating with "5" using a second clock cycle.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p> NOTE:</p> <p>The output PROFIBUS address does not match the slot address in PC WorX. As a rule: PROFIBUS address + 2 = Slot address</p> </div> <p>The error cause can be decoded from the corresponding slave diagnostic data.</p> |
| "Err" alternating with "xxx" "xxx" between "0xx" and "1xx" | <p>Error in the PROFIBUS firmware.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p> Remedy: Reset the proxy.</p> <ul style="list-style-type: none"> Switch the supply voltage off and on again. <p>If the error occurs again, please contact Phoenix Contact and state the error number that is displayed.</p> </div> |

| Display (continued) | Meaning |
|------------------------------|--|
| "Err" alternating with "3xx" | <p>301_{dec} = The device has problems with the configuration received from the control system at module level.</p> <div data-bbox="499 369 560 432" style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center; width: 20px; height: 20px; margin-bottom: 5px;">  </div> <div data-bbox="587 369 1433 573" style="border: 1px solid black; padding: 5px;"> <p>Remedy:</p> <ul style="list-style-type: none"> • Check the configuration in the control system. The modules and submodules must comply with PNO standards. • Reset the proxy. To do this, switch the supply voltage off and on again. <p>If the error occurs again, please contact Phoenix Contact and state the error number that is displayed.</p> </div> <p>303_{dec} = The parameterization memory was removed during operation.</p> <div data-bbox="499 667 560 730" style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center; width: 20px; height: 20px; margin-bottom: 5px;">  </div> <div data-bbox="587 667 1433 810" style="border: 1px solid black; padding: 5px;"> <p>Remedy: Only use compatible parameterization memories.</p> <ul style="list-style-type: none"> • Switch off the supply voltage. • Insert the parameterization memory in the card holder. • Switch on the supply voltage. </div> |
| "Err" alternating with "3xx" | <p>304_{dec} = Error in the startup parameterization.</p> <div data-bbox="499 863 560 926" style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center; width: 20px; height: 20px; margin-bottom: 5px;">  </div> <div data-bbox="587 863 1433 1066" style="border: 1px solid black; padding: 5px;"> <p>Remedy:</p> <ul style="list-style-type: none"> • Check the device firmware. • Check the version of the device integration in PC WorX. • Reset the proxy. To do this, switch the supply voltage off and on again. <p>If the error occurs again, please contact Phoenix Contact and state the error number that is displayed.</p> </div> <p>305_{dec} = Error during firmware update via TFTP connection.</p> <div data-bbox="499 1178 560 1241" style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center; width: 20px; height: 20px; margin-bottom: 5px;">  </div> <div data-bbox="587 1178 1433 1320" style="border: 1px solid black; padding: 5px;"> <p>Remedy:</p> <ul style="list-style-type: none"> • Check the Ethernet connection. • Check the TFTP server configuration. • Confirm the BootP server. </div> <p>306_{dec} = Faulty firmware. Device waiting for BootP response with new firmware reference.</p> <div data-bbox="499 1398 560 1461" style="border: 1px solid black; padding: 2px; display: inline-block; text-align: center; width: 20px; height: 20px; margin-bottom: 5px;">  </div> <div data-bbox="587 1398 1433 1541" style="border: 1px solid black; padding: 5px;"> <p>Remedy:</p> <ul style="list-style-type: none"> • Reset the proxy. To do this, switch the supply voltage off and on again. <p>If the error occurs again, please contact Phoenix Contact and state the error number that is displayed.</p> </div> |

| Display (continued) | Meaning |
|--|--|
| "Err" alternating with "4xx" | <p>402_{dec} = The parameterization memory was removed during operation. 403_{dec} = The parameterization memory is not a compatible memory card. 404_{dec} = The parameterization memory was inserted while the supply voltage was switched on. The parameterization memory can only be written again once the supply voltage has been switched on and off (reset).</p> <div style="border: 1px solid black; padding: 5px;">  <p>Remedy: Only use compatible parameterization memories from Phoenix Contact.</p> <ul style="list-style-type: none"> • Switch off the supply voltage. • Insert the parameterization memory in the card holder. • Switch on the supply voltage. </div> |
| "Err" alternating with "xxx" All other error codes: | <p>These are error codes that cannot be attributed to a specific error cause.</p> <div style="border: 1px solid black; padding: 5px;">  <p>Remedy: Reset the proxy.</p> <ul style="list-style-type: none"> • Switch the supply voltage off and on again. <p>If the error occurs again, please contact Phoenix Contact and state the error number that is displayed.</p> </div> |

14.2 During firmware update



An application note for firmware update via TFTP (AH EN TFTP FIRMWARE UPDATE) can be found at www.phoenixcontact.net/catalog.

| Display | Meaning |
|---------|---|
| 03 | The TFTP server is receiving a request for a firmware download. |
| 04 | The firmware is being downloaded to the memory. |
| 05 | The firmware transfer to the memory is complete. |

15 Diagnostic indicators (LEDs) during operation and in the event of an error

| LED | | Meaning | Measure/remedy in the event of an error |
|---|----------|---|--|
| States during operation: | | | |
| SF | OFF | The PROFINET IO device is waiting for communication with the PROFINET IO controller. PROFIBUS has not started. | |
| BF | Flashing | | |
| RUN state | OFF | | |
| FAIL | OFF | | |
| SF | OFF | The PROFINET IO controller was able to establish communication without errors. PROFIBUS has been started and does not indicate any errors. | |
| BF | OFF | | |
| RUN state | ON | | |
| FAIL | OFF | | |
| States in the event of an error: | | | |
| SF | ON | The PROFIBUS configuration that was sent by the PROFINET IO controller to the PROFINET IO device could not be executed, as not all PROFIBUS DP slaves entered the "Data exchange" state. Refer to the diagnostic indicator on the 7-segment display ("bUS"). | Check and correct the PROFIBUS parameterization created. Analyze the slave diagnostic data of the PROFIBUS DP slave indicated as being faulty. Check the electrical connection of the slave indicated as being faulty. |
| BF | OFF | | |
| RUN state | ON | | |
| FAIL | ON | | |
| SF | ON | One or more slaves transmitting external, manufacturer-specific error messages. Refer to the diagnostic indicator on the 7-segment display ("bUS"). | Check the PROFIBUS DP slaves for errors such as open circuit at the inputs or outputs, or for possible manufacturer-specific error messages. |
| BF | OFF | | |
| RUN state | ON | | |
| FAIL | OFF | | |
| SF | OFF | The physical communication connection was interrupted, the PROFINET IO controller can no longer be accessed. No link. | Restore the physical connection. |
| BF | ON | | |
| RUN state | OFF | | |
| FAIL | OFF | | |
| ACT | OFF | | |
| LINK | OFF | | |

16 Properties of the PROFINET IO proxy

The PROFIBUS DP proxy can only be configured using PC WorX. Once the device has been integrated in the PROFINET project tree, the following appears:

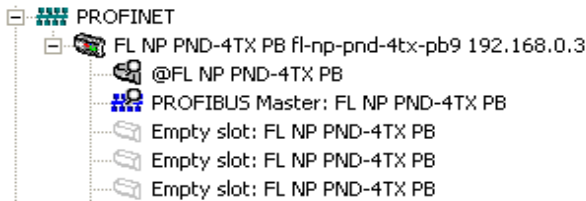


Figure 9 Integrating the device in the PROFINET project tree under PC WorX

| PROFIBUS address | Slot | Text | Description | Data length |
|------------------|------|-------------------|--|-------------|
| | 0 | @FL NP PND-4TX PB | Device proxy with PDEV parameters for topology detection | 0 DW |
| | 1 | PROFIBUS master | Device parameters for the master | 0 DW |
| 0 | 2 | Empty slot | Empty slot which cannot be used. | 0 DW |
| 1 | 3 | Empty slot | Empty slot which can be filled with modules (PROFIBUS devices). | 0 DW |
| 2 | 4 | Empty slot | Empty slot which cannot be used when the master is in the default setting. | 0 DW |
| 3 | 5 | ... | First free slot that can be used | ... |
| x | x+2 | ... | | ... |

Fill the entire bus configuration with additional empty slots and with the PROFIBUS devices.

i The device slot clearly specifies the PROFIBUS DP address, e.g., a PROFIBUS device occupying slot 9 automatically uses PROFIBUS address 7.

Parameterization of the PROFIBUS DP master

The PROFIBUS master is parameterized at slot 1.

| | |
|--------------------------------|--|
| Baudrate | 9.6 kbaud to 12 Mbaud |
| PROFIBUS master address | Usually: 2 |
| | i From the point of view of PROFINET, the PROFIBUS master is always at slot 1, regardless of how the PROFIBUS address is set. |

i The following bus parameters for timing should only be modified if you are familiar with the meaning of the individual parameters.

16.1 Adjustable bus parameters:

| Parameter | Meaning |
|--|---|
| Tslot (Slot time) | Specifies the maximum waiting time the sender should wait for a response from the partner. $\text{Maximum Tsdr} + 15 \leq \text{Tslot} \leq 16,383 \text{ t_bit}$ |
| Max Tsdr (Maximum station delay responder) | Specifies the maximum time within which the partner must send the response. $35 + 2 \times \text{Tset} + \text{Tqui} \leq \text{Max Tsdr} \leq 1023 \text{ t_bit}$ |
| Min Tsdr (Minimum station delay responder) | Specifies the minimum time that must elapse before the partner sends the response. $11 \text{ t_bit} \leq \text{Min Tsdr} \leq \text{Max Tsdr} - 1$ |
| Tset | Specifies the time the partner requires to generate the response after receiving a frame. $1 \text{ t_bit} \leq \text{Tset} \leq 494 \text{ t_bit}$ |
| Tqui | Specifies the time a repeater requires to change data direction. $0 \text{ t_bit} \leq \text{Tqui} \leq \text{Minimum} (31 \text{ t_bit}, \text{Minimum Tsdr} - 1)$ |
| Gap Factor | Specifies the number of token rotations before a new active device (master) is added to the ring. $1 \leq \text{Gap Factor} \leq 100$ |
| Retry Limit | Specifies the number of attempts to resend a telegram if a device does not respond. $1 \leq \text{Retry Limit} \leq 15$ |
| Delta_Ttr (Target rotation time) | Added to the calculated Ttr in order to operate networks with multiple masters. $256 \text{ t_bit} \leq \text{Ttr} \leq 16,776,960 \text{ t_bit}$ |
| Ttr (Target rotation time) | Specifies the maximum time for a token rotation. During this time, the active devices receive the token for sending data once. $256 \text{ t_bit} \leq \text{Ttr} \leq 16,776,960 \text{ t_bit}$ The user interface calculates an optimum Ttr for the various bus profiles. If user-defined bus parameters are set, the Ttr can be entered directly. In this case, the Delta_Ttr parameter is not taken into consideration. |
| Watchdog | Specifies the watchdog time that is to be transmitted to the slaves. The slaves must be addressed by the master within this time, otherwise they switch to the safe state. $10 \text{ ms} \leq \text{Watchdog} \leq 650 \text{ s}$ |

Non-adjustable bus parameters:

| Parameter | Meaning |
|------------------------------|---|
| Tid2 (Idle time 2) | Specifies the maximum waiting time between two consecutive transmit telegrams. Tid2 = Maximum Tsdr |
| Tid1 (Idle time 2) | Specifies the minimum waiting time between two consecutive transmit telegrams. Tid1 = $35 + 2 \times \text{Tset} + \text{Tqui}$ |
| Trdy (Ready time) | Specifies the minimum time that must elapse before a sender can receive a response. Trdy = Minimum Tsdr |

17 Startup of the PROFIBUS proxy

17.1 Offline configuration

- Drag the device from the "FL NP PND-4TX PB 01/1.1.1/01" device catalog under "FL/Gateway" and drop it in the structure. The following appears:

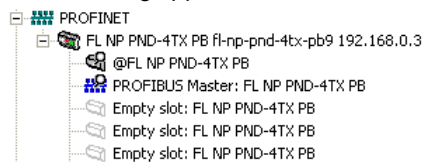


Figure 10 PROFINET project tree

- Open the device details assigned to the slot 1 "PROFIBUS Master" under the "PROFIBUS Parameters" tab and modify these as necessary.
 - Set the baud rate to the desired value.
 - The PROFIBUS master address should usually be set to 2.
 - Adjust the other timing settings only if necessary.
- For all PROFIBUS DP devices that are to be connected below the proxy, import the GSD file by right-clicking in the "Device Dialog" window and selecting "Import GSD". For each device, these files can be downloaded from the manufacturer websites.
- Select "View" and "Open Module Catalog". With the focus on the project tree at slot level, all the modules, i.e., PROFIBUS devices, that have been imported are displayed in the module catalog, e.g., FLM BK PB...

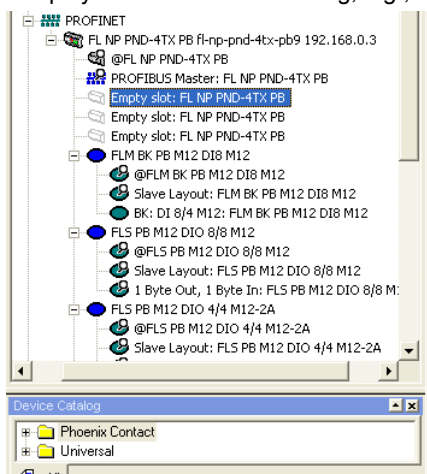


Figure 11 Module catalog

- These PROFIBUS DP devices can be inserted as devices directly below the proxy using drag and drop. The insertion position also directly specifies the PROFIBUS DP address, as illustrated below: Slot number -2 = PROFIBUS DP address
- Fill unused PROFIBUS DP addresses with empty slots. For reasons of clarity, we recommend using slot 5 and onwards, i.e., PROFIBUS address 3.

For modular PROFIBUS DP devices, with the focus on the device in the "Bus Structure" in the "Module Catalog" window, the modules that can be inserted (subslots from the point of view of PROFINET) are automatically displayed.

- For modular devices, select the correct module in the corresponding order and drag and drop it in the bus topology.

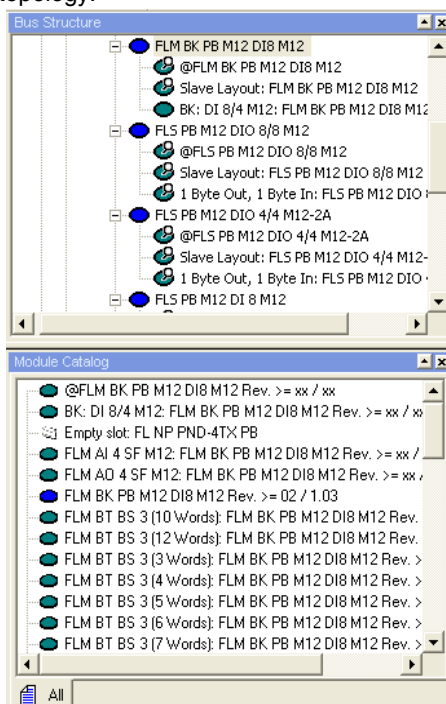


Figure 12 Module catalog for modular devices

17.2 Diagnostics

In PC WorX, the PROFIBUS diagnostics are displayed in the Diag+ window via the PROFINET diagnostics.



NOTE: The familiar PROFIBUS slot address is mapped to subslots in PROFINET. Here, the following applies: PROFINET address + 1 = PROFINET subslot address.

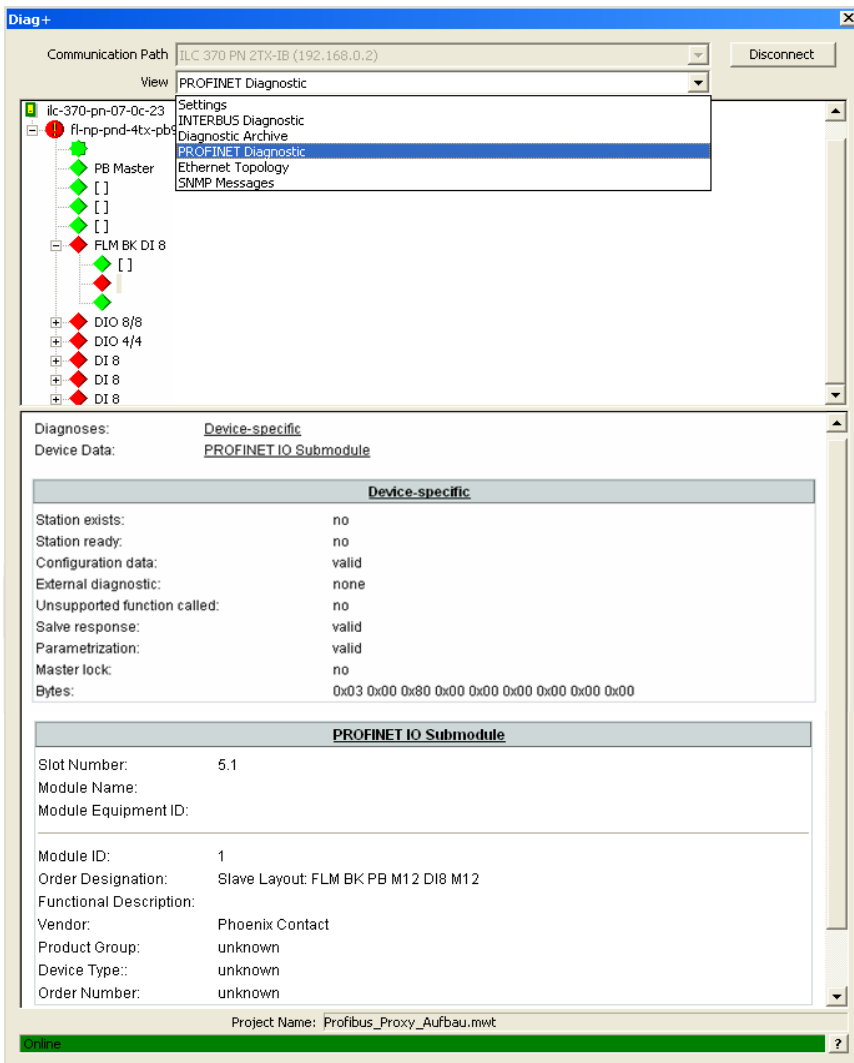


Figure 13 Diagnostics

18 Parameterization memory

The parameterization memory simplifies the replacement of devices if the PROFINET IO controller does not support automatic, topology-based device identification.

i Only insert or remove the parameterization memory when the power is switched off.

i First insert the parameterization memory in the device and then name the device. If this procedure is reversed, the device name will not be stored on the parameterization memory. In this case, the device name is lost and you must carry out device naming again.