

IL PN BK DI8 DO4 2SCRJ-PAC

PROFINET bus coupler, 8 inputs, 24 V DC, 4 outputs, 24 V DC, 500 mA, complete with I/O connectors



Data sheet
7649_en_04

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1 Description

The bus coupler is the link between a PROFINET network and the Inline installation system. In addition, it is used to acquire and output digital signals.

Up to 61 Inline devices can be connected at any point to an existing PROFINET network using the bus coupler.

The bus coupler and the Inline devices form one station with a maximum of 63 local bus devices. Here, the inputs and outputs of the bus coupler form the first and second local bus devices.

Features

- 2 x fiber optic connection according to SCRJ standard for polymer and HCS (PCF) fibers
- Connection to PROFINET network via SCRJ socket
- Transmission speed of 100 Mbps
- Range for 100 Mbps: 50 m with polymer fiber, 100 m with HCS fiber
- IP parameter setting using the PROFINET controller
- Electrical isolation between Ethernet interface and logic
- Ethernet TCP/IP (management via SNMP)
- Connection of up to 61 other Inline devices
- Connection of a maximum of 16 PCP devices
- Supported protocols: SNMPv1, TFTP, PROFINET, LLDP and MRP (from firmware 3.20)
- 8 digital inputs, 4 digital outputs
- Automatic baud rate detection on the local bus (500 kbps or 2 Mbps)
- Diagnostic and status indicators
- From hardware revision 03:
Approved for use in zone 2 potentially explosive areas



WARNING: Explosion hazard when used in potentially explosive areas

When using the terminal in potentially explosive areas, observe the corresponding notes.



This data sheet is only valid in association with the IL SYS INST UM E user manual.



Make sure you always use the latest documentation.
It can be downloaded from the product at phoenixcontact.net/products.
Here you will also find the current GSDML file.

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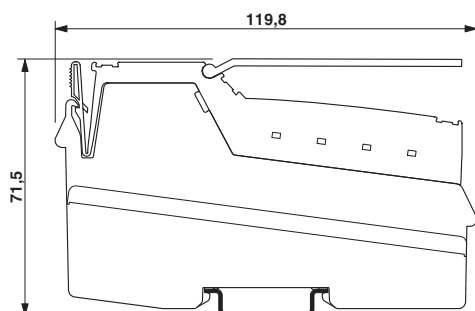
3 Ordering data

| Description | Type | Order No. | Pcs. / Pkt. |
|---|-----------------------------|-----------|-------------|
| PROFINET bus coupler, 8 inputs, 24 V DC, 4 outputs, 24 V DC, 500 mA, complete with I/O connectors | IL PN BK DI8 DO4 2SCRJ-PAC | 2878379 | 1 |
| Accessories | Type | Order No. | Pcs. / Pkt. |
| Quick mounting end clamp for NS 35/7,5 DIN rail or NS 35/15 DIN rail, with marking option, width: 9.5 mm, color: gray (Assembly) | CLIPFIX 35 | 3022218 | 50 |
| Insert strip, Sheet, white, Unlabeled, Can be labeled with: Office printing systems, Plotter: Laser printer, Mounting type: Insert, Lettering field: 62 x 46 mm (Marking) | ESL 62X46 | 0809502 | 5 |
| Labeling field, width: 48.8 mm (Marking) | IB IL FIELD 8 | 2727515 | 10 |
| Insert strip, Sheet, white, Unlabeled, Can be labeled with: Office printing systems, Plotter: Laser printer, Mounting type: Insert, Lettering field: 62 x 10 mm (Marking) | ESL 62X10 | 0809492 | 1 |
| Labeling field, width: 12.2 mm (Marking) | IB IL FIELD 2 | 2727501 | 10 |
| End clamp, for assembly on NS 32 or NS 35/7.5 DIN rail (Assembly) | E/UK | 1201442 | 50 |
| Connector set, for Inline bus coupler with I/Os mounted in rows (Plug/Adapter) | IL BKDIO-PLSET | 2878599 | 1 |
| Inline power terminal or boost terminal, complete with accessories (plug and labeling field), 24 V DC, without fuse | IB IL 24 PWR IN/R-PAC | 2861674 | 1 |
| SCRJ fiber optic connector, IP20, duplex, with fast connection technology, for polymer fiber 980/1000 µm, for individual wire diameter 2.2 mm | VS-SCRJ-POF-FA-IP20 | 1654879 | 1 |
| SCRJ fiber optic connector, IP20, duplex, with fast connection technology, for HCS fiber 200/230 µm, for individual wire diameter 2.9 mm | VS-SCRJ-HCS-FA-IP20 | 1654866 | 1 |
| Fiber optic connector SCRJ, IP20, duplex, with fast connection technology, for PROFINET, for HCS fiber 200/230 µm, for individual wire diameter 2.2 mm | VS-SCRJ-HCS-FA-IP20-PN | 1404087 | 1 |
| Assembled fiber optic cable, break-out cable, HCS fiber 200/230 µm, SCRJ/IP20 on SCRJ/IP20, for installation inside control cabinets, length: 1 m | VS-PC-2XHCS-200-SCRJ/SCRJ-1 | 1654934 | 1 |
| Assembled fiber optic cable, break-out cable, HCS fiber 200/230 µm, SCRJ/IP20 on SCRJ/IP20, for installation inside control cabinets, length: 2 m | VS-PC-2XHCS-200-SCRJ/SCRJ-2 | 1654947 | 1 |
| Assembled fiber optic cable, break-out cable, HCS fiber 200/230 µm, SCRJ/IP20 on SCRJ/IP20, for installation inside control cabinets, length: 5 m | VS-PC-2XHCS-200-SCRJ/SCRJ-5 | 1654950 | 1 |
| SCRJ cutting tool set, for polymer fiber, for field assembly of SCRJ/IP20 and SCRJ/IP67 Push-Pull connectors with fast connection technology, consisting of stripping tool, aramid scissors, SCRJ cutting tool, microscope, 2x SCRJ connectors IP20 (Tools) | VS-SCRJ-POF-KONFTOOL-CUT | 1657096 | 1 |
| SCRJ polishing tool set, for polymer fiber, for field assembly of the SCRJ connector (IP20/IP67) with fast connection technology, with stripping tool, diagonal cutter, aramid scissors, polishing materials, microscope, 2x SCRJ connector IP20 (Tools) | VS-SCRJ-POF-KONFTOOL-POLISH | 1658820 | 1 |
| Refilling set for VS-SCRJ-POF-KONFTOOL-POLISH, consisting of two polishing discs and a polisher (Tools) | VS-SCRJ-POF-POLISH | 1656673 | 1 |
| SCRJ connector set for polymer fiber, for self assembly, consisting of 2 duplex quick mounting connectors with bending protection (Plug/Adapter) | PSM-SET-SCRJ-DUP/2-POF | 2708656 | 1 |
| HCS assembly kit for SCRJ quick mounting connectors, including stripping blade, stripping pliers, aramide yarn scissors, fiber stripper, microscope, fiber cleaving tool for standard HCS and HCS GI fibers, and documentation (Tools) | PSM-HCS-KONFTOOL/SC-RJ | 2708876 | 1 |

| Documentation | Type | Order No. | Pcs. / Pkt. |
|---|----------------------------|-----------|-------------|
| User manual, English, Automation terminals of the Inline product range | IL SYS INST UM E | - | - |
| Quick Start Guide, English, for PC Worx | UM QS EN PC WORX | - | - |
| Quick Start Guide, English, for planning INTERBUS devices in a PROFINET network | UM QS EN PROFINET PROXY IB | - | - |
| User manual, English, for the Modular Managed Switch System | FL SWITCH MM HS UM E | - | - |
| Application note, English, Inline terminals for use in zone 2 potentially explosive areas | AH EN IL EX ZONE 2 | - | - |
| Application note, German/English, I/O modules at bus couplers | AH IL BK IO LIST | - | - |
| Application note, English, Firmware update for devices supporting a TFTP firmware update | AH EN TFTP FIRMWARE UPDATE | - | - |
| User manual, English, PROFINET basics | UM EN PROFINET SYS | - | - |

4 Technical data

Dimensions (nominal sizes in mm)



| | |
|--------------------|-------------------------------------|
| Width | 80 mm |
| Height | 119.8 mm |
| Depth | 71.5 mm |
| Note on dimensions | Specifications with male connectors |

General data

| | |
|--|---|
| Color | green |
| Weight | 280 g (with male connectors) |
| Ambient temperature (operation) | -25 °C ... 55 °C (observe derating) |
| Ambient temperature (storage/transport) | -40 °C ... 85 °C |
| Permissible humidity (operation) | 10 % ... 95 % (according to DIN EN 61131-2) |
| Permissible humidity (storage/transport) | 10 % ... 95 % (according to DIN EN 61131-2) |
| Air pressure (operation) | 80 kPa ... 106 kPa (up to 3000 m above sea level) |
| Air pressure (storage/transport) | 70 kPa ... 106 kPa (up to 3000 m above sea level) |
| Degree of protection | IP20 |
| Protection class | III, IEC 61140, EN 61140, VDE 0140-1 |

Connection data

| | |
|--|---|
| Name | Inline connectors |
| Connection method | Spring-cage connection |
| Conductor cross section solid / stranded | 0.08 mm ² ... 1.5 mm ² / 0.08 mm ² ... 1.5 mm ² |
| Conductor cross section [AWG] | 28 ... 16 |

Interface PROFINET

| | |
|---|---|
| Number | 2 |
| Connection method | SCRJ socket |
| Transmission speed | 100 MBit/s (acc. to PROFINET standard) |
| Wavelength | 660 nm |
| Laser protection | Class 1 according to DIN EN 60825-1 |
| Transmission length incl. 3 dB system reserve | min. 50 m (Polymer fiber with F-K 980/1000 230 dB/km at 100 Mbps) |

Interface Inline local bus

| | |
|--------------------|---|
| Connection method | Inline data jumper |
| Transmission speed | 500 kBit/s / 2 MBit/s (Automatic detection, no combined system) |

System limits

| | |
|--|--|
| Amount of process data | max. 488 Byte (Max. 244 bytes IN - max. 244 bytes OUT) |
| IN process data for I/O modules that can be aligned | 244 Byte |
| OUT process data for I/O modules that can be aligned | 244 Byte |
| Number of supported devices | max. 63 (per station) |
| Number of local bus devices that can be connected | max. 61 (On board I/Os are two devices) |
| Number of devices with parameter channel | max. 16 |



Observe the logic current consumption of each device when configuring an Inline station! It is specified in every terminal-specific data sheet. The current consumption can differ depending on the individual terminal. The permissible number of devices that can be connected therefore depends on the specific station structure.

PROFINET

| | |
|-------------------|---|
| Device function | PROFINET device |
| Conformance class | B |
| Update rate | min. 1 ms (depending on the size of the bus system) |

Power supply for module electronics

| | |
|----------------------|--|
| Connection method | Spring-cage connection |
| Name | Bus coupler supply U_{BC} ; Communications power U_L (7.5 V) and the analog supply U_{ANA} (24 V) are generated from the bus coupler supply. |
| Supply voltage | 24 V DC (via Inline plug) |
| Supply voltage range | 19.2 V DC ... 30 V DC (including all tolerances, including ripple) |
| Current consumption | typ. 250 mA (from U_{BK}) max. 0.83 A DC (from U_{BK}) |
| Power loss | typ. 3 W (Entire device) |

Power consumption



NOTE: Electronics may be damaged when overloaded

Provide external fuses for the 24 V areas U_{BK} , U_M , and U_S . The power supply unit must be able to supply four times the nominal current of the external fuse, to ensure that it trips in the event of an error.

| | |
|--------------------------------|--|
| Main circuit supply U_M | 24 V DC |
| Supply voltage range U_M | 19.2 V DC ... 30 V DC (including all tolerances, including ripple) |
| Power supply at U_M | max. 8 A DC (Sum of $U_M + U_S$; 4 A, maximum, when used in potentially explosive areas.) |
| Current consumption from U_M | max. 8 A DC |
| Segment supply voltage U_S | 24 V DC |
| Supply voltage range U_S | 19.2 V DC ... 30 V DC (including all tolerances, including ripple) |
| Power supply at U_S | max. 8 A DC (Sum of $U_M + U_S$; 4 A, maximum, when used in potentially explosive areas.) |
| Current consumption from U_S | max. 8 A DC |

Power consumption

| | |
|--------------------------------|--|
| Communications power U_L | 7.5 V DC $\pm 5\%$ |
| Power supply at U_L | max. 0.8 A DC |
| I/O supply voltage U_{ANA} | 24 V DC |
| Supply voltage range U_{ANA} | 19.2 V DC ... 30 V DC (including all tolerances, including ripple) |
| Power supply at U_{ANA} | max. 0.5 A DC |

Digital inputs

| | |
|--|--------------------------|
| Number of inputs | 8 (EN 61131-2 type 1) |
| Connection method | Inline plugs |
| Connection method | 2, 3-wire |
| Input characteristic curve | IEC 61131-2 type 1 |
| Nominal input voltage | 24 V DC |
| Nominal input current | typ. 3 mA |
| Current flow | Limited to 3 mA, maximum |
| Input voltage range "0" signal | -30 V DC ... 5 V DC |
| Input voltage range "1" signal | 15 V DC ... 30 V DC |
| Delay at signal change from 0 to 1 | typ. 5 ms |
| Delay at signal change from 1 to 0 | typ. 5 ms |
| Permissible conductor length to the sensor | 100 m |
| Protection against polarity reversal | Suppressor diode |

Digital outputs

| | |
|---|---|
| Number of outputs | 4 |
| Connection method | Inline plugs |
| Connection method | 2, 3-wire |
| Nominal output voltage | 24 V DC |
| Maximum output current per channel | 500 mA |
| Nominal load, ohmic | 12 W |
| Nominal load, inductive | 12 VA (1.2 H; 48 Ω) |
| Nominal load, lamp | 12 W |
| Signal delay | typ. 1.2 ms |
| Signal delay when switching on an ohmic nominal load | max. 50 μ s (In the case of 0.5 A load) |
| Signal delay when switching off an ohmic nominal load | max. 250 μ s (In the case of 0.5 A load) |
| Maximum operating frequency with inductive nominal load | 0.5 Hz (1.2 H; 48 Ω) |
| Reaction time with short-circuit | 1,2 ms |
| Behavior at voltage switch-off | The output follows the power supply without delay |
| Limitation of the voltage induced on circuit interruption | approx. -30 V |
| Output current when switched off | max. 10 μ A (When not loaded, a voltage can be measured even at an output that is not set.) |
| Behavior with overload | Auto restart |
| Behavior with inductive overload | Output can be destroyed |
| Reverse voltage resistance to short pulses | Reverse voltage proof |
| Resistance to permanent reverse voltage | max. 2 A |
| Overcurrent shut-down | min. 0.7 A |
| Short-circuit and overload protection | Free running circuit In output driver |

Fieldbus data telegram

| | |
|--|----------|
| IN process data for I/O modules that can be aligned | 244 Byte |
| OUT process data for I/O modules that can be aligned | 244 Byte |

Error messages to the higher level control or computer system

| | |
|---|-----|
| Short-circuit / overload of the digital outputs | Yes |
| Sensor supply failure | Yes |
| Failure of the actuator supply | Yes |

Mechanical tests

| | |
|--|--|
| Vibration resistance in acc. with EN 60068-2-6/IEC 60068-2-6 | 5 g |
| Shock in acc. with EN 60068-2-27/IEC 60068-2-27 | Operation: 25 g, 11 ms duration, semi-sinusoidal shock impulse |

Conformance with EMC Directive 2004/108/EC**Noise immunity test in accordance with 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 fields EN 61000-4-3/IEC 61000-4-3 | Criterion A; Field intensity: 10 V/m |
| Fast transients (burst) EN 61000-4-4/IEC 61000-4-4 | Criterion A; all interfaces 1 kV Criterion B; all interfaces 2 kV |
| Transient surge voltage (surge) EN 61000-4-5/IEC 61000-4-5 | Criterion B; supply lines DC: 0.5 kV/0.5 kV (symmetrical/asymmetrical); fieldbus cable shield 1 kV |
| Conducted interference EN 61000-4-6/IEC 61000-4-6 | Criterion A; Test voltage 10 V |

Noise emission test as per EN 61000-6-4

| | |
|----------|---------|
| EN 55011 | Class A |
|----------|---------|

Approvals

For the latest approvals, please visit phoenixcontact.net/products.

4.1 Mounting position and derating

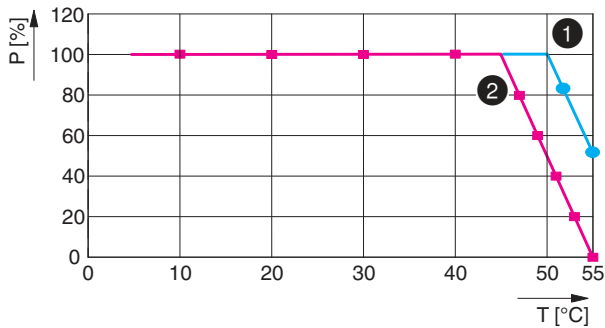


Figure 1 Derating with different mounting positions

Key:

- ① Mounting on a horizontal DIN rail
- ② Different mounting position
- P [%] Power dissipation in percent
- T [°C] Ambient temperature in °C

The specifications refer to a supply voltage of 24 V.

When you are working with a voltage from the upper voltage range (e.g., 30 V), the percentage values increase. In this case, multiply the percentage values with 1.25 (30 V/24 V = 1.25).

The various bus coupler functions have different percentage shares of the power dissipation.

Please refer to the percentage shares in the following table.

| Function | Percentage shares of power dissipation in % |
|------------------|---|
| Inputs | 25 |
| Outputs | 16 |
| U _M | 24 |
| U _{ANA} | 3 |
| U _L | 32 |

The following results from the information given above:

- When used at 55 °C (on horizontal DIN rail)
The bus coupler can be operated at 55 °C and 24 V when it is mounted horizontally on the DIN rail and with a maximum load 50 %.
- When used at 55 °C (different mounting position)
The bus coupler can be operated at 55 °C and 24 V in a different mounting position, if the inputs and outputs of the bus coupler are not connected and the IB IL PWR IN/R-PAC Inline power terminal is installed directly behind the bus coupler.

4.2 Optical output power

| Type of fiber | Optical output power | | |
|--------------------------|----------------------|----------|---------|
| | Min. | Typ. | Max. |
| 980/1000, NA = 0.5 (POF) | -8 dBm | -4.5 dBm | -2 dBm |
| 200/230, NA = 0.37 (HCS) | -19 dBm | -15 dBm | -11 dBm |

| Type of fiber | Optical receiver sensitivity | |
|--------------------------|------------------------------|-----------|
| | Min. | Typ. |
| 980/1000, NA = 0.5 (POF) | -23 dBm | -25 dBm |
| 200/230, NA = 0.37 (HCS) | -26.8 dBm | -29.3 dBm |

5 Internal circuit diagram

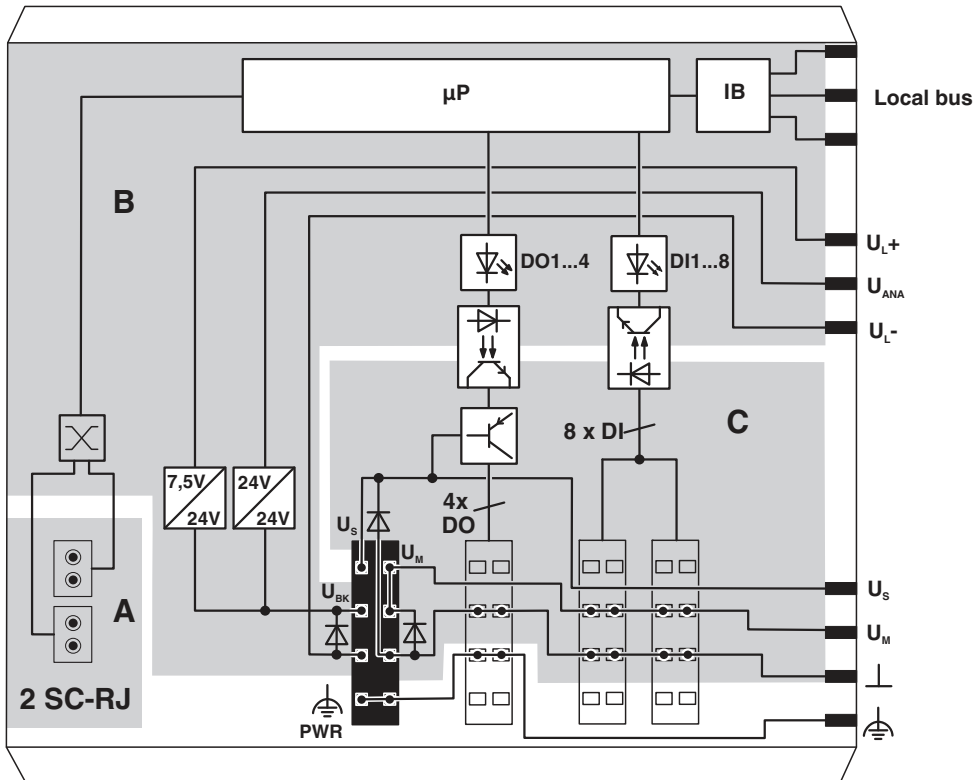








Figure 2 Internal wiring of connections

Key:

-  Microprocessor
-  Protocol chip
-  LED
-  Optocoupler
-  PNP transistor
-  Ethernet switch

The gray areas in the basic circuit diagram represent the electrically isolated areas:

A: Ethernet interface

B: Logic

C: I/O



Explanation for other used symbols has been provided in the IL SYS INST UM E user manual.

6 Local status and diagnostic indicators

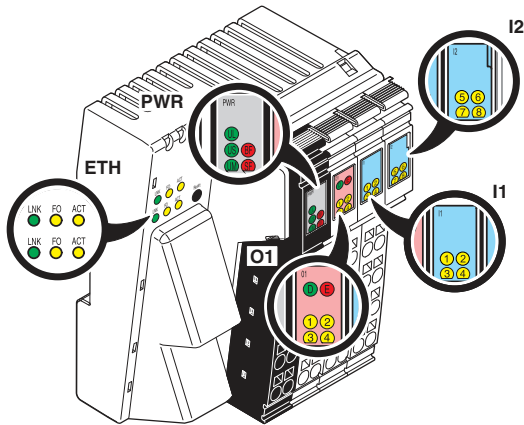


Figure 3 Local status and diagnostic indicators

| Designation | Color | Meaning | State | Description |
|-------------|--------|---|----------|--|
| LNK 1/2 | green | Link port 1/2 | ON | Connection via Ethernet to a module via port 1/2 established |
| | | | Flashing | PROFINET module identification ("flashing") |
| | | | OFF | No connection established via port 1/2 |
| FO 1/2 | yellow | Status of the fiber optic path: | ON | Receiving power under 0 dB; the "Maintenance demanded" message is triggered. |
| | | | Flashing | Borderline receiving power; the "Maintenance required" message is triggered. |
| | | | OFF | Receiving power is OK |
| ACT 1/2 | yellow | Activity port 1/2 | ON | Transmission or reception of Ethernet telegrams at port 1/2 |
| | | | OFF | No transmission or reception of Ethernet telegrams at port 1/2 |
| BF | red | Communication error (B us F ail) | ON | No link status available |
| | | | Flashing | Link status available, no communication connection to the PROFINET controller |
| | | | OFF | A PROFINET controller has established an active communication connection to the PROFINET device. |
| SF | red | System failure (PROFINET) | ON | PROFINET diagnostics available |
| | | | OFF | PROFINET diagnostics not available |
| UL | green | U _{Logic} | ON | 24 V bus coupler supply/7.5 V communications power present |
| | | | OFF | 24 V bus coupler supply/7.5 V communications power not present |
| US | green | U _{Segment} | ON | 24 V segment circuit supply present |
| | | | OFF | 24 V segment circuit supply not present |
| UM | green | U _{Main} | ON | 24 V main circuit supply/internal communications power present |
| | | | OFF | 24 V main circuit supply/internal communications power present |
| D | green | Diagnostics | ON | Data transmission active within the station |
| | | | Flashing | Data transmission not active within the station |

| Designation | Color | Meaning | State | Description |
|-------------|--------|---------|--------|--|
| E | red | Error | ON | I/O error, short-circuit/overload of outputs |
| | | | OFF | No I/O error |
| 1 ... 4 | yellow | O1 | ON/OFF | Output is set/not set. |
| 1 ... 8 | yellow | I1, I2 | ON/OFF | Input is set/not set. |

7 Diagnostic indicators for PROFINET

States during operation

| LED | Meaning |
|---------------|---|
| SF OFF/BF OFF | PROFINET controller was able to establish communication without errors. |

States in the event of an error

| LED | Meaning | Measure/remedy in the event of an error |
|--------------------------|---|---|
| SF OFF/BF flashing | The logic communication connection has been interrupted. The PROFINET controller can no longer be accessed. | Check the connection between the PROFINET controller and the PROFINET device. Make sure that the PROFINET device name of the PROFINET device is identical with the configuration. |
| SF OFF/BF flashing | The PROFINET device is not assigned a PROFINET device name. | Assign the PROFINET device name using the relevant tool. |
| SF OFF/BF ON | The physical communication path has been interrupted. The PROFINET controller can no longer be accessed. | Restore the physical connection between the PROFINET controller and the PROFINET device. |
| SF ON/BF OFF | Diagnostic data is available. | Read the diagnostic message using the relevant tool. |
| SF flashing/ BF flashing | Hardware watchdog has been triggered. | |

8 Connection of PROFINET, power supply, actuators, and sensors

8.1 Connecting PROFINET

Connect PROFINET to the bus coupler via an SCRJ plug.

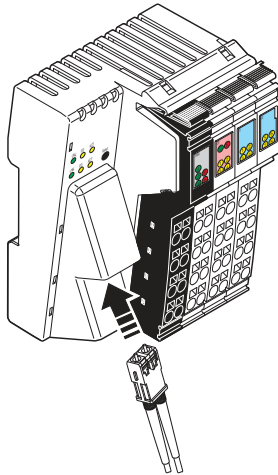


Figure 4 Connecting PROFINET via SCRJ plug



Observe bending radii
The housing dimensions specified under "Dimensions" refer to the bus coupler with I/O connectors without Ethernet connection. When installing the bus coupler in a control box, observe the bending radii of the cables and the connectors used.

8.2 Terminal point assignment of the Inline plugs

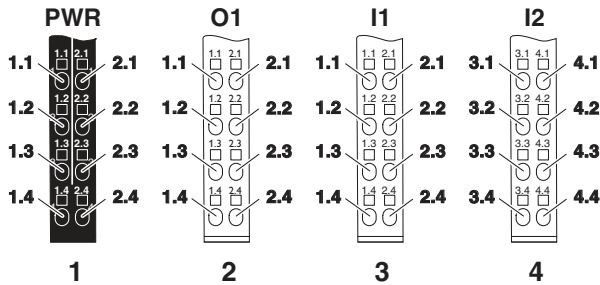


Figure 5 Terminal point assignment

Terminal point assignment of the power connector (1)

| Terminal point | Assignment | Terminal point | Assignment |
|----------------|------------------------------|----------------|-------------------------------------|
| 1.1 | U _S | 2.1 | U _M |
| 1.2 | U _{BK} | 2.2 | U _M |
| 1.3 | GND U _{BK} | 2.3 | GND U _M , U _S |
| 1.4 | Functional earth ground (FE) | 2.4 | Functional earth ground (FE) |



NOTE: Malfunction

The module is designed exclusively for SELV operation according to IEC 950/EN 60950/VDE 0805.



For information on the power supplies, please refer to the IL SYS INST UM E user manual.



Terminal points 1.3 and 2.3 on the plug can be jumpered if the same reference potential is to be used for the communications power and the segment voltage.

Terminal point assignment of the output connector (2)

| Terminal point | Assignment | Terminal point | Assignment |
|----------------|------------|----------------|------------|
| 1.1 | OUT1 | 2.1 | OUT2 |
| 1.2 | GND | 2.2 | GND |
| 1.3 | FE | 2.3 | FE |
| 1.4 | OUT3 | 2.4 | OUT4 |

Terminal point assignment of the input connector (3)

| Terminal point | Assignment | Terminal point | Assignment |
|----------------|----------------|----------------|----------------|
| 1.1 | IN1 | 2.1 | IN2 |
| 1.2 | U _M | 2.2 | U _M |
| 1.3 | GND | 2.3 | GND |
| 1.4 | IN3 | 2.4 | IN4 |

Terminal point assignment of the input connector (4)

| Terminal point | Assignment | Terminal point | Assignment |
|----------------|----------------|----------------|----------------|
| 3.1 | IN5 | 4.1 | IN6 |
| 3.2 | U _M | 4.2 | U _M |
| 3.3 | GND | 4.3 | GND |
| 3.4 | IN7 | 4.4 | IN8 |

9 Connection example

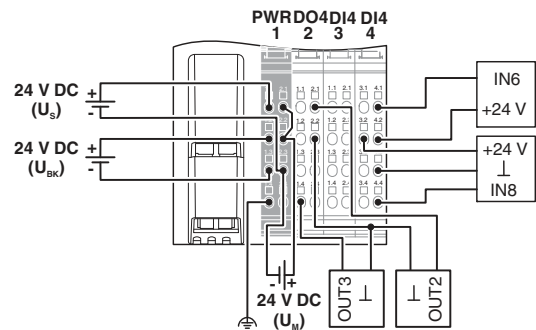


Figure 6 Connection example

10 Connection note

The bus coupler does not support auto negotiation. The bus coupler is set to 100 Mbps and full duplex. If the FL SWITCH MM HS switch is to be used with the FL IF 2POF SCRJ-D plug-in module, please observe: that communication can take place, configure the port on the switch that is used for the bus coupler to 100 Mbps and full duplex only.

11 Notes on using the terminal block in potentially explosive areas



WARNING: Explosion hazard

Please make sure that the following notes and instructions are observed.

Approval according to EC directive 94/9/EC

Ⓢ II 3 G Ex nA IIC T4 Gc X

Installation notes

- This Inline terminal is a category 3 device and is suitable for installation in the potentially explosive areas of zone 2.
The device meets the requirements of EN 60079-0:2009 and EN 60079-15:2010.
- The Inline terminal must only be installed, operated, and maintained by qualified personnel.
- Please follow the installation instructions given in the IL SYS INST UM E user manual and the package slip.
- When installing and operating the device, the applicable safety directives (including national safety directives), accident prevention regulations, as well as general technical regulations, must be observed.
- For the safety data, please refer to the corresponding documentation (user manual, data sheet, package slip) and the certificates (declaration of conformity and other approvals, if applicable).
- Access to the circuits inside the Inline terminal is not permitted. Do not repair the Inline terminal by yourself but replace it with a terminal of the same type. Repairs may only be performed by the manufacturer. The manufacturer is not liable for damage resulting from noncompliance.
- The IP20 degree of protection (EN 60529) of the device is intended for a clean and dry environment.
- Do not subject the Inline terminal to mechanical strain and/or thermal loads, which exceed the limits specified in the product documentation.
- The Inline terminal is not designed for use in atmospheres with a danger of dust explosions. If dust is present, install the device in suitable, approved housing. Please note the surface temperature of the housing.

Installation in zone 2

- Observe the specified conditions for use in potentially explosive areas.
- Install the device in a suitable approved housing (with at least IP54 degree of protection) that meets the requirements of EN 60079-15. Observe the requirements of EN 60079-14.
- In potentially explosive areas, only snap the Inline terminal onto or off the rail and connect the cables when the power is switched off.
- Connect the DIN rail to the protective earth ground.
- In zone 2, only connect devices to the supply and signal circuits that are suitable for operation in potentially explosive areas of zone 2 and the conditions at the installation location.

Restrictions/limit values

- Only Inline terminals that are approved for use in potentially explosive areas may be assembled on this Inline terminal.**
Before using an Inline terminal in a zone 2 potentially explosive area, check whether it has been approved for installation within this area.
For a list of terminals that are approved for the potentially explosive areas of zone 2, please refer to the AH EN IL EX ZONE 2 application note.
- Please ensure that the **supplies of U_M and U_S** at the bus coupler do not exceed **4 A**.
- Please make sure that the **maximum permissible current of 4 A** flowing through potential jumpers U_M and U_S (total current) is not exceeded when using the Inline terminals in potentially explosive areas.
- Also ensure that the **maximum permissible current of 0.8 A** flowing through potential jumper U_L is not exceeded.

12 Mapping inputs and outputs to PROFINET

The module uses the following input and output data words:

| Slot | Data length |
|--------|---|
| Slot 0 | - |
| Slot 1 | 4 words IN/4 words OUT (local bus master) |
| Slot 2 | 1 byte OUT (DO4) |
| Slot 3 | 1 byte IN (DI8) |

13 Process data

13.1 Terminal point assignment of local outputs to the OUT process data

| Byte | 0 | | | | | | | |
|-------------------------|----------|---|---|---|--------|-----|-----|-----|
| Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Slot | Not used | | | | 2 (O1) | | | |
| Terminal point (signal) | | | | | 2.4 | 1.4 | 2.1 | 1.1 |
| Terminal point (GND) | | | | | 2.2 | 1.2 | 2.2 | 1.2 |
| Terminal point (FE) | | | | | 2.3 | 1.3 | 2.3 | 1.3 |
| Status indicator, LED | | | | | 4 | 3 | 2 | 1 |

13.2 Terminal point assignment of the local inputs to the IN process data

| Byte | 0 | | | | | | | |
|-------------------------|--------|-----|-----|-----|--------|-----|-----|-----|
| Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Slot | 4 (I2) | | | | 3 (I1) | | | |
| Terminal point (signal) | 4.4 | 3.4 | 4.1 | 3.1 | 2.4 | 1.4 | 2.1 | 1.1 |
| Terminal point (GND) | 4.3 | 3.3 | 4.3 | 3.3 | 2.3 | 1.3 | 2.3 | 1.3 |
| Terminal point (24 V) | 4.2 | 3.2 | 4.2 | 3.2 | 2.2 | 1.2 | 2.2 | 1.2 |
| Status indicator, LED | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |

14 Startup

Default upon delivery/default settings

By default upon delivery, the following functions and features are available:

| | |
|---------------------|------------------------|
| PROFINET name: | No name assigned |
| IP parameters: | None |
| Module designation: | IL PN BK DI8 DO4 2SCRJ |
| Vendor ID: | 00B0 _{hex} |
| Device ID: | 000E _{hex} |

Reset button

The reset button is on the front of the bus coupler.

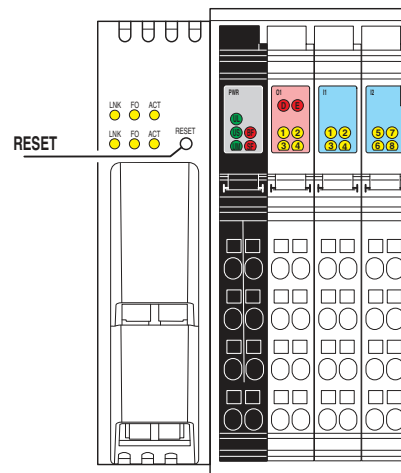


Figure 7 Reset button

The bus coupler is restarted by pressing the reset button. The outputs of the Inline station are reset. The process image of the inputs is not re-read.

Firmware started

Once you have supplied the bus coupler with power or pressed the reset button, the firmware is started. After completion of the firmware boot process the BF LED is either on or flashing.

Documentation



How to assign the PROFINET names and the IP address as well as how to startup a device within a PROFINET system is described in the following documents:

- "PC WORX" quick start guide
- "Configuring INTERBUS devices in a PROFINET network using the example of STEP 7" quick start guide

For the order designations, please refer to the ordering data.

The documentation can be found on the Internet at phoenixcontact.net/products.

15 Parameterization

PC Worx

Parameterization of the PROFINET devices in PC Worx requires at least PC Worx version 5.0. An online data sheet of the device with important technical data and a configuration file are integrated into PC Worx. If several versions of the configuration file are available, make sure that you are working with the file version that corresponds to the firmware/hardware version being used.

Other tools

The PROFINET device is parameterized using the configuration tool of the PROFINET controller. Please integrate the corresponding GSDML file of the bus coupler into the relevant software tool (STEP 7/HW Config, ...).



Make sure you always use the latest version of the FDCML/GSDML file and the latest documentation for the bus coupler. The latest files and documentation can be found on the Internet at phoenixcontact.net/products.

Parameter

Slot 0: Diagnostic alarms

- PROFINET alarm behavior
 - Local bus diagnostics
 - I/O diagnostics
 - Indicate return of local module
- Local bus settings
 - Automatic start after local bus error
 - Automatic start delay

Slot 1: -

PC Worx: All registers are mapped to system variables.

Step 7: There are four words of input data and four words of output data.

| Word | Input data | Output data |
|------|--|--------------------------------------|
| 1 | Diagnostic status register | Standard function start register |
| 2 | Diagnostic parameter register | Standard function parameter register |
| 3 | Extended diagnostic parameter register | Reserved |
| 4 | Standard function status register | Reserved |

Diagnostic alarms

PROFINET enables the PROFINET device to store diagnostic information together with the error location and error type. An incoming alarm informs the PROFINET controller that diagnostic information has been stored. The alarms are only transmitted if they have been enabled via parameters during startup.

When the diagnostic information has been removed, an outgoing alarm is transmitted to the controller.

If at least one piece of diagnostic information is stored, the SF LED is on. If no diagnostic information is present, the SF LED is off.

Substitute value behavior

In the event of a local bus error or a device error of the bus coupler, all Inline station outputs (including analog outputs) are set to "0".

16 Firmware update

In order to update the firmware of the bus coupler, the device must be provided with a firmware container via a TFTP server. You can use any TFTP server, e.g., Factory Manager.



The TFTP FIRMWARE UPDATE application note describes how to update the firmware using the Factory Manager. This document can be found on the Internet at phoenixcontact.net/products.



When updating to firmware version 3.20, the device name and all IP addresses stored in the retentive memory will be lost.

17 Device replacement

Devices can be replaced without having to reconfigure them within the PROFINET network. The station name and address are assigned by the control system to the newly added PROFINET bus coupler using the neighborhood detection function.



Device replacement is possible for Phoenix Contact PROFINET controllers from firmware version 3.0 onwards.

18 Applicative system redundancy for process data



Applicative system redundancy is only provided for process data but not for parameter data.

Acyclic communication allows two IO controllers (primary and backup) to communicate with the same bus coupler.

Parallel PCP services are not supported. This means, if a second IO controller tries to access a PCP device while there is another IO controller with a service pending, the second service request is rejected by the bus coupler.

With regard to communication, no distinction is made between the "primary" (process controlling) and the "backup" controller.

19 Failsafe behavior

If PROFINET communication fails, all output process data is set to zero. The local bus continues to run using these values.



Substitute values are not parameterized.

20 Dynamic configuration on the local bus

Dynamic configuration is the specification and configuration of a maximum configuration. Any subgroup of this maximum configuration can be operated.

A maximum local bus configuration can be specified here. In this configuration, individual local bus devices can be inactivated in the configuration frame (switch code 0004_{hex}) using the "Control Active Configuration" firmware service (0713_{hex}). The device may not remain in the data ring and must be jumpered manually.

Jumpering the devices does not change the position of process data.

Dynamic configuration is only possible through the application.

21 Byte rotation for 16 and 32-channel Inline terminals with a SIMATIC® S7 controller

To adapt the data format of the 16 and 32-channel Inline terminals to the data format of a SIMATIC® S7 controller, you can rotate the I/O data arrangement with device parameters.

This adaptation can only be made once and is then valid for all DI16/DO16 and all DI32/DO32 terminals.

21.1 Byte rotation for IB IL 24 DI 16... and IB IL 24 DO 16... terminals

Default

| | | | | | | | | | | | | | | | | | |
|-----------------|------|--------|-----|-----|-----|-----|-----|-----|-----|--------|-----|-----|-----|-----|-----|-----|-----|
| (Word.bit) view | Word | Word 0 | | | | | | | | | | | | | | | |
| | Bit | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| (Byte.Bit) view | Byte | Byte 0 | | | | | | | | Byte 1 | | | | | | | |
| | Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Slot | | 4 | | | | 3 | | | | 2 | | | | 1 | | | |
| Terminal point | | 8.4 | 7.4 | 8.1 | 7.1 | 6.4 | 5.4 | 6.1 | 5.1 | 4.4 | 3.4 | 4.1 | 3.1 | 2.4 | 1.4 | 2.1 | 1.1 |

Rotated

| | | | | | | | | | | | | | | | | | |
|-----------------|------|--------|-----|-----|-----|-----|-----|-----|-----|--------|-----|-----|-----|-----|-----|-----|-----|
| (Word.bit) view | Word | Word 0 | | | | | | | | | | | | | | | |
| | Bit | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| (Byte.Bit) view | Byte | Byte 0 | | | | | | | | Byte 1 | | | | | | | |
| | Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Slot | | 2 | | | | 1 | | | | 4 | | | | 3 | | | |
| Terminal point | | 4.4 | 3.4 | 4.1 | 3.1 | 2.4 | 1.4 | 2.1 | 1.1 | 8.4 | 7.4 | 8.1 | 7.1 | 6.4 | 5.4 | 6.1 | 5.1 |

**21.2 Byte rotation for IB IL 24 DI 32... and
IB IL 24 DO 32... terminals**

Default

| | | | | | | | | | | | | | | | | | |
|-----------------|------|--------|-----|-----|-----|-----|-----|-----|-----|--------|-----|-----|-----|-----|-----|-----|-----|
| (Word.bit) view | Word | Word 0 | | | | | | | | | | | | | | | |
| | Bit | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| (Byte.Bit) view | Byte | Byte 0 | | | | | | | | Byte 1 | | | | | | | |
| | Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Slot | | 4 | | | | | | | | 3 | | | | | | | |
| Terminal point | | 8.4 | 7.4 | 8.3 | 7.3 | 8.2 | 7.2 | 8.1 | 7.1 | 6.4 | 5.4 | 6.3 | 5.3 | 6.2 | 5.2 | 6.1 | 5.1 |

| | | | | | | | | | | | | | | | | | |
|-----------------|------|--------|-----|-----|-----|-----|-----|-----|-----|--------|-----|-----|-----|-----|-----|-----|-----|
| (Word.bit) view | Word | Word 1 | | | | | | | | | | | | | | | |
| | Bit | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| (Byte.Bit) view | Byte | Byte 2 | | | | | | | | Byte 3 | | | | | | | |
| | Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Slot | | 2 | | | | | | | | 1 | | | | | | | |
| Terminal point | | 4.4 | 3.4 | 4.3 | 3.3 | 4.2 | 3.2 | 4.1 | 3.1 | 2.4 | 1.4 | 2.3 | 1.3 | 2.2 | 1.2 | 2.1 | 1.1 |

Rotated

| | | | | | | | | | | | | | | | | | |
|-----------------|------|--------|-----|-----|-----|-----|-----|-----|-----|--------|-----|-----|-----|-----|-----|-----|-----|
| (Word.bit) view | Word | Word 0 | | | | | | | | | | | | | | | |
| | Bit | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| (Byte.Bit) view | Byte | Byte 0 | | | | | | | | Byte 1 | | | | | | | |
| | Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Slot | | 1 | | | | | | | | 2 | | | | | | | |
| Terminal point | | 2.4 | 1.4 | 2.3 | 1.3 | 2.2 | 1.2 | 2.1 | 1.1 | 4.4 | 3.4 | 4.3 | 3.3 | 4.2 | 3.2 | 4.1 | 3.1 |

| | | | | | | | | | | | | | | | | | |
|-----------------|------|--------|-----|-----|-----|-----|-----|-----|-----|--------|-----|-----|-----|-----|-----|-----|-----|
| (Word.bit) view | Word | Word 1 | | | | | | | | | | | | | | | |
| | Bit | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| (Byte.Bit) view | Byte | Byte 2 | | | | | | | | Byte 3 | | | | | | | |
| | Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Slot | | 3 | | | | | | | | 4 | | | | | | | |
| Terminal point | | 6.4 | 5.4 | 6.3 | 5.3 | 6.2 | 5.2 | 6.1 | 5.1 | 8.4 | 7.4 | 8.3 | 7.3 | 8.2 | 7.2 | 8.1 | 7.1 |