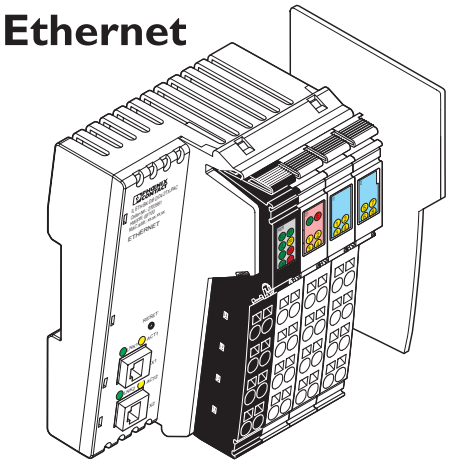
IL ETH BK DI8 DO4 2TX-PAC



Inline bus coupler for Ethernet with eight digital inputs and four digital outputs

AUTOMATION

Data Sheet
7275_en_03

1 Description

The bus coupler is the interface between the Ethernet network and the Inline installation system.

With the help of the bus coupler, 61 Inline devices can be connected at any position within an existing Ethernet system. 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 together form the first and second local bus devices.

Up to 16 PCP devices can be operated on the bus coupler.

Features

- 2 x Ethernet twisted pair according to 802.3 with auto negotiation and auto crossover connected via an integrated 3-port switch (2 external ports, 1 internal port)
- Transmission speeds of 10 Mbps and 100 Mbps
- Ethernet connection via 8-pos. RJ45 female connector
- Electrical isolation of Ethernet interface and logic
- Software interface: Modbus/TCP, Modbus/UDP or DDI (Device Driver Interface)
- Process data access via XML
- Ethernet TCP/IP
  - Management via SNMP
  - Integrated web server
- IP address setting via BootP (can be switched off)
- Automatic baud rate detection on the local bus (500 kbps or 2 Mbps)
- Diagnostic and status LEDs
- Eight digital inputs
- Four digital outputs
- Approved for use in zone 2 potentially explosive areas (observe the notes on page 11)

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 at www.download.phoenixcontact.com.

A conversion table is available on the Internet at www.download.phoenixcontact.com/general/7000_en_00.pdf.

Table of contents

2 Ordering data

Product

Description	Type	Order No.	Pcs./Pkt.
Inline bus coupler for Ethernet with 8 digital inputs and 4 digital outputs, including accessories (Inline connector, labeling fields and end plate)	IL ETH BK DI8 DO4 2TX-PAC	2703981	1

Accessories: Ethernet

Description	Type	Order No.	Pcs./Pkt.
Gray RJ45 connector set for linear cable	FL PLUG RJ45 GR/2	2744856	2
Green RJ45 connector set for crossed cable	FL PLUG RJ45 GN/2	2744571	2
Double sheathed Ethernet cable	FL CAT5 HEAVY	2744814	1
Flexible Ethernet cable	FL CAT5 FLEX	2744830	1
Assembly tool for RJ45 connector	FL CRIMPTOOL	2744869	1

Accessories: Additional system components

Description
FO interface converters for data conversion and data transmission using fiber optics (see INTERFACE catalog)
Power supply units for supplying the bus coupler (see INTERFACE catalog)

Accessories: Connector as replacement item

Description	Type	Order No.	Pcs./Pkt.
Connector set for Inline bus coupler with connected I/Os	IL BKDIO-PLSET	2878599	1

Accessories: Other

Description	Type	Order No.	Pcs./Pkt.
Quick mounting end clamp for securing the module/the Inline station on the DIN rail for a horizontal mounting position; to the right and left of the module/ Inline station	CLIPFIX 35-5	3022276	50
End clamp for securing the module/the Inline station on the DIN rail for a vertical mounting position; above and below the module/Inline station	E/AL-NS 35	1201662	10
Keying profile	IL CP	2742683	100
Zack marker strip to label the terminals	ZB 6 ... see CLIPLINE catalog ZB 12 ... see CLIPLINE catalog		
DIN EN 50022 DIN rail, 2 meters	NS 35/7,5 PERF NS 35/7,5 UNPERF	0801733 0801681	1 1

Documentation

Description	Type	Order No.	Pcs./Pkt.
"Automation Terminals of the Inline Product Range" user manual	IL SYS INST UM E	2698737	1
"I/O Terminals at Bus Couplers" application note	AH IL BK IO LIST	9015358	1
"Inline Terminals for Use in Zone 2 Potentially Explosive Areas" application note	AH EN IL EX ZONE 2	–	
"Driver Reference Manual for G4-Based Controller Boards Using PC Bus and Ethernet" user manual	IBS PC SC SWD UM E	2745172	1
"Firmware Services and Error Messages" user manual	IBS SYS FW G4 UM E	2745185	1
"Peripherals Communication Protocol (PCP)" user manual	IBS SYS PCP G4 UM E	2745169	1

3 Technical data

General data	
Housing dimensions (width x height x depth)	80 mm x 121 mm x 70 mm
Weight	260 g (with connectors)
Ambient temperatures (operation)	-25°C to +55°C
Ambient temperature (storage)	-25°C to +85°C
Humidity (operation/storage/transport)	10% to 95% according to EN 61131-2
Air pressure (operation/storage/transport)	70 kPa to 106 kPa (up to 3000 m above sea level)
Degree of protection	IP20 according to IEC 60529
Class of protection	Class 3 according to EN 61131-2, IEC 61131-2
Connection data for Inline connectors	
Connection type	Spring-cage terminals
Conductor cross-section	0.2 mm^2 to 1.5 mm^2 (solid or stranded), 24 - 16 AWG

System data	
Number of devices per station	63, maximum (including two devices on the bus coupler)
Maximum number of I/O data	512 bytes
Transmission speed on the local bus	500 kbps or 2 Mbps (automatic detection)
Maximum power supply at U_L (7.5 V)	0.8 A, maximum
Maximum power supply at U_{ANA}	0.5 A, maximum
Maximum power supply at U_S	8 A, maximum
Maximum power supply at U_M	8 A, maximum

Interfaces	
Ethernet interface	
Number	Two
	10Base-T and 100Base-TX with auto negotiation and auto crossover
Connection format	8-pos. RJ45 female connector on the bus coupler
Transmission speed	10 Mbps (10Base-T), 100 Mbps (100Base-TX)
	Half duplex, full duplex (automatic detection)
Connection method	Twisted pair cable, CAT 5, RJ45 female connector
Inline local bus	
Connection	Data routing
– Limitation through software	61, maximum
– Limitation through power supply unit	Maximum logic current consumption of the connected local bus modules: $I_{max} \leq 0.8$ A DC

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

Supply voltage for U_{BK}, U_S, and U_M	
Recommended cable lengths	30 m, maximum; routing cables through outdoor areas is not admissible
Continuation	Via potential routing
Nominal value	24 V DC
Permissible range (according to EN 61131-2)	19.2 V to 30 V (ripple included)

NOTE: Module damage due to overload

This 24 V area must be externally protected. The power supply unit must be able to supply 4 times the nominal current of the external fuse, to ensure that it trips in the event of an error.

The bus coupler supply U_{BK} (24 V) generates the communications power U_L (7.5 V) and the analog supply U_{ANA} (24 V).

Current consumption/power consumption

Current consumption from U_{BK} (24 V)	
Current consumption of module electronics	0.08 A, maximum
Current consumption of local bus (800 mA load at 7.5 V)	0.4 A, maximum
Current consumption from U_{ANA} (24 V)	0.5 A, maximum
Total current consumption from U_{BK}	0.98 A, maximum
Current consumption from U_S (24 V)	3 mA +4 mA for each output set + load, typical; 8 A, maximum
Current consumption from U_M (24 V)	3 mA 3 mA for each output set + load, typical; 8 A, maximum
Power dissipation of entire device	3 W, typical

Digital outputs

Number	4
Connection method for actuators	2 and 3-wire technology
Nominal output voltage U_{OUT}	24 V DC
Differential voltage for I_{nom}	< 1 V
Nominal current I_{nom} per channel	0.5 A
Total current	2 A
Nominal load	
Ohmic	12 W
Lamp	12 W
Inductive	12 VA (1.2 H)
Switching frequency with nominal inductive load	0.5 Hz (1.2 H), maximum
Overload response	Auto restart
Response with inductive overload	Output may be damaged
Reverse voltage protection against short pulses	Protected against reverse voltages
Resistance to permanently applied reverse voltages	Protected against reverse voltages, permissible current 2 A, maximum
Response upon power down	The output follows the supply voltage without delay.
Limitation of the voltage induced on circuit interruption	-30 V, approximately
Overcurrent shutdown	0.7 A, minimum
Maximum output current when switched off	10 µA

When not loaded, a voltage can be measured even at an output that is not set.

Digital inputs

Number	8
Connection method for sensors	2 and 3-wire technology
Input design	According to EN 61131-2 Type 1
Definition of switching thresholds	
Maximum low-level voltage	U_{Lmax} < 5 V
Minimum high-level voltage	U_{Hmin} > 15 V
Common potentials	Sensor supply U_M, ground
Nominal input voltage U_{IN}	24 V DC
Permissible range	-30 V < U_{IN} < +30 V DC
Nominal input current for U_{IN}	3 mA, typical
Current flow	Limited to 3 mA, maximum
Delay time	< 500 ms
Permissible cable length to the sensor	100 m
Use of AC sensors	AC sensors in the voltage range < U_{IN} are limited in application

Safety equipment

Supply voltage	
Surge voltage	Yes, suppressor diode 35 V
Polarity reversal	Yes, suppressor diode 35 V
Digital outputs	
Short circuit	Yes, integrated free running circuit in the output chip
Overload	Yes, integrated free running circuit in the output chip
Digital inputs	
Polarity reversal	Yes, diode connected in series as protection against polarity reversal

Error message sent to the higher-level control system

Sensor supply not present	Yes
Actuator supply not present	Yes
Short circuit/overload of an output	Yes

Mechanical requirements

Vibration test; sinusoidal vibrations according to IEC 60068-2-6; EN 60068-2-6	5g load, 2 hours in each direction
Shock test according to IEC 60068-2-27; EN 60068-2-27	25g load for 11 ms, half sinusoidal wave, three shocks in each direction and orientation

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 fields	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 A All interfaces: 1 kV Criterion B All interfaces: 2 kV
Surge voltage	EN 61000-4-5/ IEC 61000-4-5	Criterion B DC supply cables: 0.5 kV / 1 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 according to EN 61000-6-4

Noise emission of housing	EN 55011	Class A

Approvals

For the latest approvals, please visit www.download.phoenixcontact.com or www.eshop.phoenixcontact.com.

4 Circuit diagram

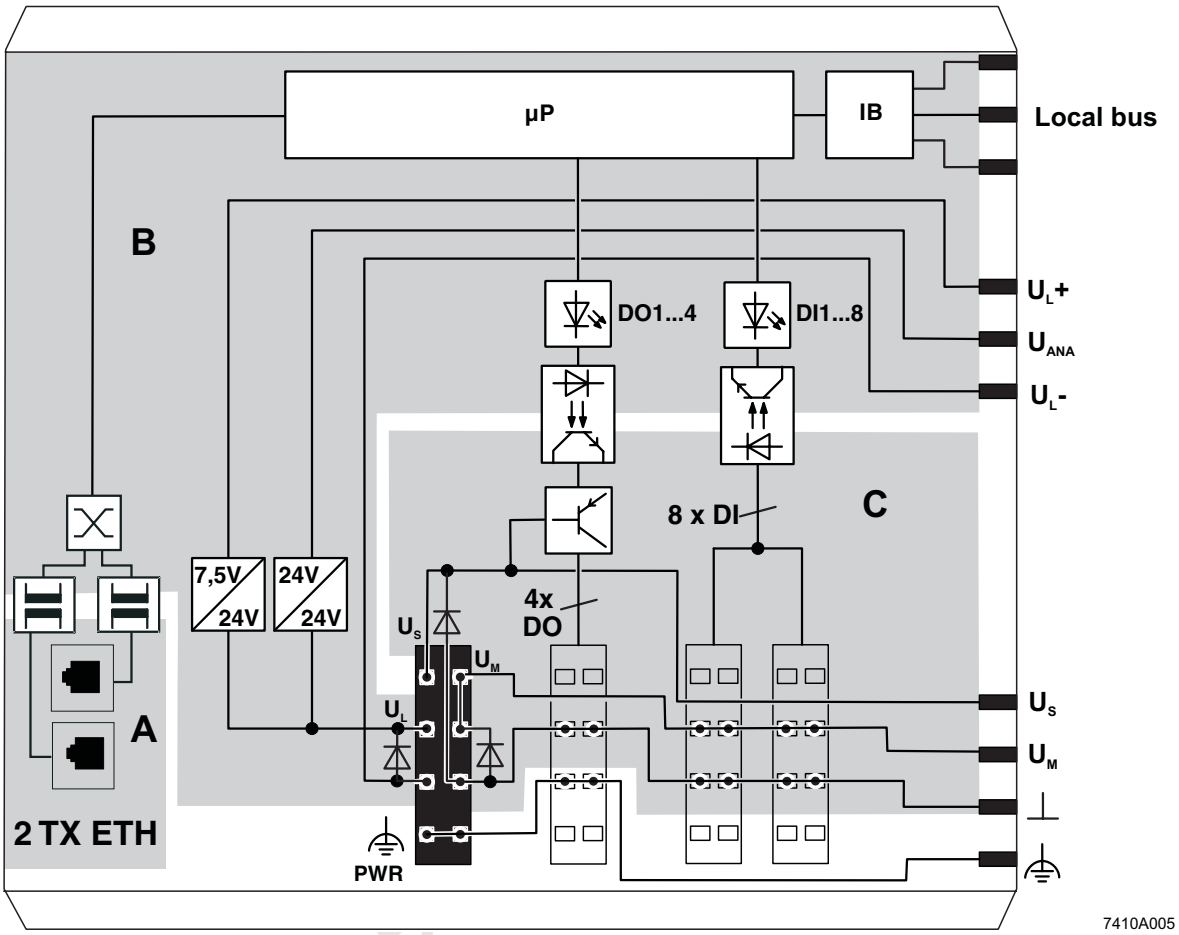


Figure 1 Circuit diagram of the Ethernet bus coupler

Key:

µP	Microprocessor
IB	Protocol chip
	Optocoupler
	Ethernet switch
	PNP transistor
	Transmitter with electrical isolation

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

A: Ethernet interface
B: Logic
C: I/O devices

5 Local diagnostic and status indicators

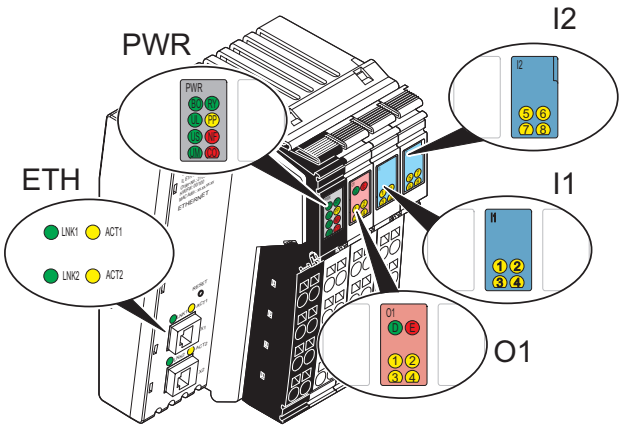


Figure 2 Indicators on the bus coupler

LED	Color	Status	Meaning
ETH/PWR: Ethernet			
LNK 1/2	**Green**		Link of port 1/2
		ON	Connection via Ethernet to a module via port 1/2 established.
		OFF	No connection established via port 1/2
ACT 1/2	**Yellow**		Activity on port 1
		ON	Transmission or reception of Ethernet telegrams at port 1/2
		OFF	No transmission or reception of Ethernet telegrams at port 1/2
BO	**Green**		Bootloader (**Bo**ot)
		ON	Boot loader active, firmware started
		Flashing	Waiting for BootP reply
		OFF	Firmware started successfully
RY	**Green**		**R**ead**y**
		ON	Connection to a process data client (Modbus/TCP (UDP) or DDI) established
		Flashing	Firmware ready to operate
		OFF	Firmware not active
PP	**Yellow**		**P**lug and **P**lay
		ON	Plug and play mode active
		OFF	Plug and play mode not active
NF	**Red**		**N**etwork **F**ailure
		ON	A network error occurred. The monitoring function detected an error or the process data watchdog was activated.
		OFF	No network error, normal state
CO	**Red**		**CO**nfiguration
		ON	The active station configuration differs from the saved configuration
		OFF	The active station configuration matches the saved configuration
PWR: Power			
UL	**Green**		U_{Logic}
		ON	24 V bus coupler supply / internal communications power present
		OFF	24 V bus coupler supply / internal communications power not present
US	**Green**		$U_{Segment}$
		ON	24 V segment circuit supply / internal communications power present
		OFF	24 V segment circuit supply / internal communications power not present
UM	**Green**		U_{Main}
		ON	24 V main circuit supply / internal communications power present
		OFF	24 V I/O supply / internal communications power not present
O1: Diagnostics of the Inline station/diagnostics and status of the outputs			
D	**Green**		**D**iagnostics
		ON	Data transmission within the station active
		Flashing	Data transmission within the station not active
E	**Red**		**E**rror
		ON	Short circuit/overload at one of the outputs
		OFF	No short circuit/overload of outputs
1-4	**Yellow**		**O1**...**O4**
		ON	Output active
		OFF	Output not active

LED	Color	Status	Meaning
I1: Status of the inputs			
1-8	**Yellow**		**I1 ... I8**
		ON	Input active
		OFF	Input not active

6 Reset button

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

It has two functions:

– Restarting the bus coupler

– Restoring the default settings

To restore the default settings (see page 12), hold down the reset button when applying the power supply.

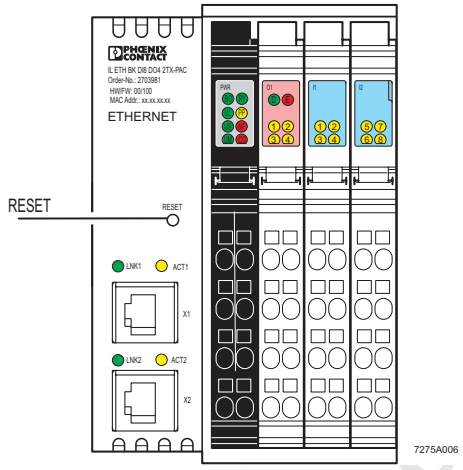


Figure 3 Reset button

7 Connecting Ethernet, the supply, actuators, and sensors

7.1 Ethernet connection

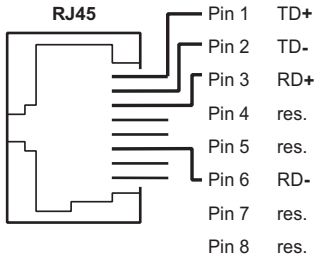


Figure 4 Pin assignment of the 8-pos. RJ45 female connector

Connect Ethernet to the bus coupler via an 8-pos. RJ45 connector. Please refer to the pin assignment in the following table:

Pin	Assignment
1	TxD + (transmit data +)
2	TxD - (transmit data -)
3	RxD + (receive data +)
4	Reserved
5	Reserved
6	RxD - (receive data -)
7	Reserved
8	Reserved

Both Ethernet interfaces have an auto crossover function.

Shield

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

Observe the bending radii

The housing dimensions specified under "General data" on page 4 refer to the bus coupler with Inline connectors without Ethernet connection. When installing the bus coupler in a control box observe the bending radii of the Ethernet cables and the connectors used (e.g., FL CAT5 FLEX: 30 mm for permanent installation and FL CAT5 HEAVY: 30 mm without outer sheath and 45 mm with outer sheath; see also www.interbusclub.com/itc/eth/). To keep these bending radii use angled RJ45 connectors, if required.

7.2 Connecting the supply, actuators, and sensors

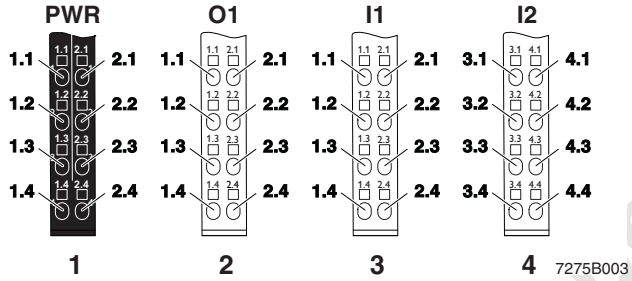


Figure 5 Terminal point assignment of the Inline connectors

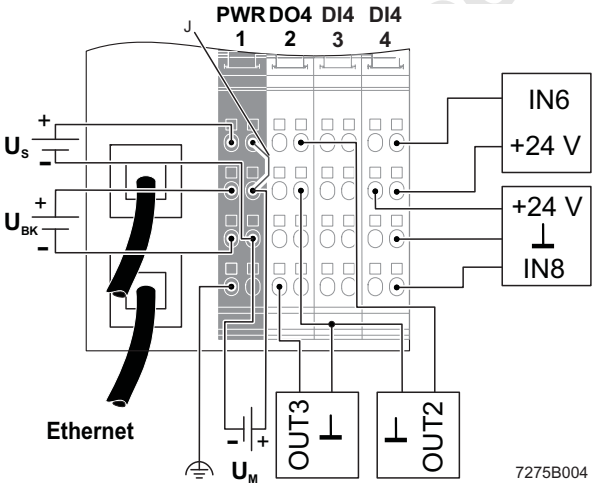


Figure 6 Connection example

J: Internal jumper

Connect the bus coupler according to Figure 6.

Terminal point assignment of the power connector (1)

Terminal points	Assignment	Terminal points	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 connector 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 points	Assignment	Terminal points	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 points	Assignment	Terminal points	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 points	Assignment	Terminal points	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

8 Notes on using the terminal in potentially explosive areas

Approval according to EC Directive 94/9 (ATEX)
II 3G Ex nAC IIC T4 X

This Inline terminal conforms to the requirements of protection type "n" and can be installed in a zone 2 potentially explosive area. This Inline terminal is a category 3G item of electrical equipment.

WARNING: Explosion hazard
Only Inline terminals that are approved for use in potentially explosive areas may be snapped next to this Inline terminal.

Before using an Inline terminal in a zone 2 potentially explosive area, check that the terminal has been approved for installation in this area.

For a list of terminals approved for use in zone 2 potentially explosive areas, please refer to the AH EN IL EX ZONE 2 application note.

Check the labeling on the Inline terminal and the packaging (see Figure 7).

Figure 7 Typical labeling of terminals for use in potentially explosive areas

WARNING: Explosion hazard

Before startup, ensure that the following points and instructions are observed.

1. When working on the Inline terminal, always disconnect the supply voltage.
2. The Inline terminal may only be installed, started up, and maintained by qualified specialist personnel.
3. Install the Inline terminals in a control cabinet or metal housing. The minimum requirement for both items is IP54 protection according to EN 60529.
4. The Inline terminal must not be subject to mechanical strain and thermal loads, which exceed the limits specified in the product documentation.
5. The Inline terminal must not be repaired by the user. Repairs may only be carried out by the manufacturer. The Inline terminal is to be replaced by an approved terminal of the same type.
6. Only category 3G equipment may be connected to Inline terminals in zone 2.
7. Observe all applicable standards and national safety and accident prevention regulations for installing and operating equipment.

Restrictions

WARNING: Explosion hazard

When using terminals in potentially explosive areas, observe the technical data and limit values specified in the corresponding documentation (user manual, data sheet, package slip).

WARNING: Explosion hazard
Restrictions regarding the Inline system

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.

The **supply of U_M and U_S** at the bus coupler must not exceed **4 A**.

9 Startup

9.1 Default upon delivery/default settings

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

- IP Configuration
  - IP Address: 0.0.0.0
  - Subnet Mask: 0.0.0.0
  - Default Gateway: 0.0.0.0
  - BootP Requests: Enable
- Software Update
  - Software Update on Next Reboot: Disable
  - TFTP Server IP Address: 0.0.0.0
  - Downloadable File Name: c2703981.fw
- System Identification
  - Name of Device: IL ETH BK DI8 DO4 2TX-PAC
  - Description: Ethernet bus terminal
  - Physical Location: Unknown
  - Contact: Unknown
- Process Data Monitoring
  - Process Data Watchdog Timeout: 500 ms
  - Fault Response Mode: Reset Fault Mode (Default)
- Plug and Play Mode: Enable
- Expert Mode: Disable

By default upon delivery, the bus coupler has no valid IP parameters.

9.2 Starting the firmware

Once you have connected the power to the bus coupler, the firmware is started. The following LED sequence is shown:

Display	Meaning
BO flashing	Bootloader is started BootP requests are transmitted
BO ON	Extracting firmware
BO OFF	Firmware started
RY flashing	Firmware ready to operate

9.3 Sending BootP requests

Initial startup:

During initial startup, the bus coupler transmits BootP requests without interruption until it receives a valid IP address. The requests are transmitted at varying intervals (2 s, 4 s, 8 s, 2 s, 4 s, etc.) so that the network is not loaded unnecessarily.
If valid IP parameters are received, they are saved as configuration data by the bus coupler.

Further restarts:

If the bus coupler already has valid configuration data and BootP is not disabled, it only transmits three more BootP requests on a restart. If it receives a BootP reply, the new parameters are saved. If the bus coupler does not receive a reply, it starts with the previous configuration. If BootP is disabled and a valid configuration is available, the bus coupler starts immediately.

For the definition of the IP address via BootP, you can use any BootP server available.

To check whether BootP is disabled, refer to the "IP Configuration" menu in WBM, see page 14.

10 Web-Based Management (WBM)

The bus coupler has a web server, which generates the required pages for web-based management and, depending on the requirements of the user, sends them to the Factory Manager or a standard web browser. Web-based management can be used to access static information (e.g., technical data, MAC address) or dynamic information (e.g., IP address, status information) or to change the configuration (password-protected).

10.1 Calling Web-Based Management

The IL ETH BK DI8 DO4 2TX-PAC web server can be addressed using the IP address if configured correspondingly. The bus coupler homepage is accessed by entering the URL "http://*IP address*".

Example: http://172.16.113.38

If you cannot access the WBM pages, check the connection settings in your browser and deactivate the proxy, if set.

Figure 8 WBM homepage

10.2 Structure of the web pages

The web pages for the Ethernet bus coupler are divided into two sections. The left-hand side has the selection menu with the relevant submenus. The right-hand side displays the information related to the menu item. Static and dynamic information about the bus coupler can be found in the following menus.

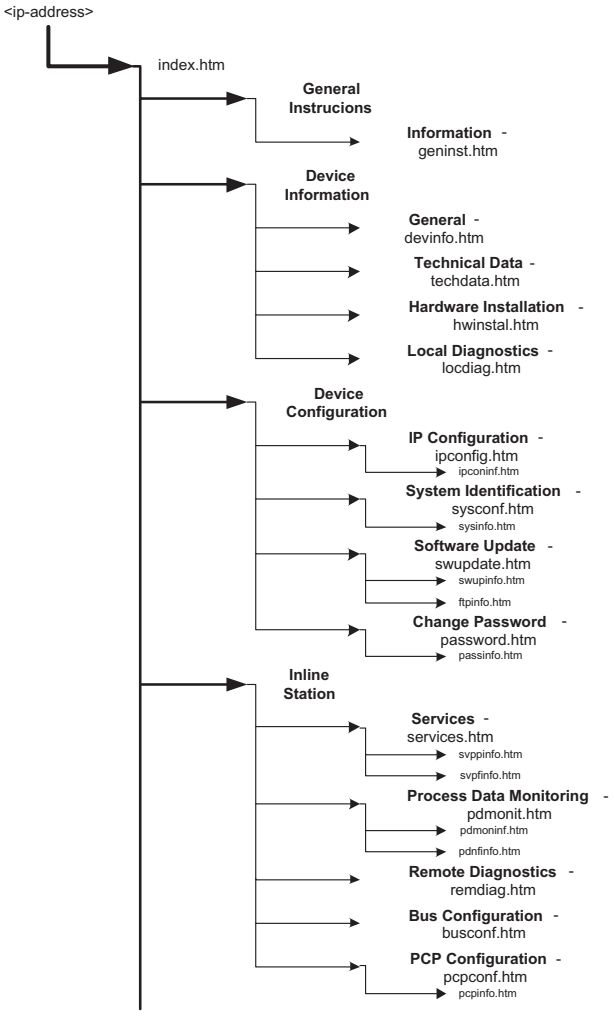


Figure 9 Structure of the web pages

10.3 "IP Configuration" menu

Figure 9 illustrates the set IP parameters and addressing mechanism. To change the IP parameters via WBM, BootP Requests must be set to Disable or BootP requests to the bus coupler must not be answered (no BootP server can be active in the network).

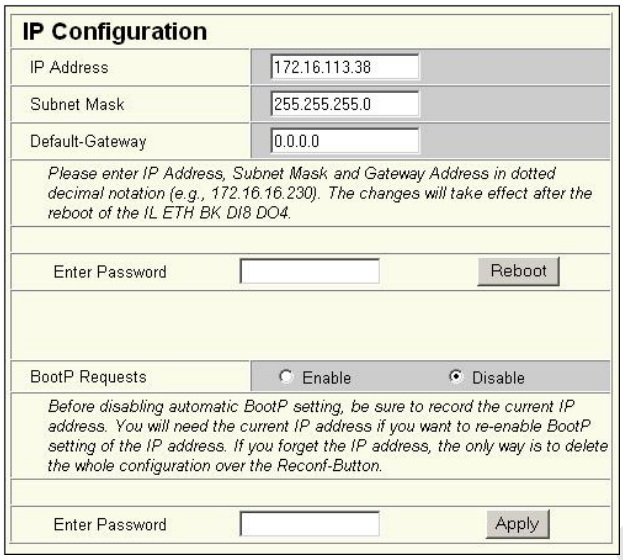


Figure 10 "IP Configuration" menu

10.4 Password protection

All status changes to the bus coupler require the entry of a password. The password can be changed at any time. Your unique password must be between four and twelve characters long (note that the password is case-sensitive). By default upon delivery, the password is "private".

If you forget the password, the only way to access the bus coupler again is to reset the entire configuration using the reset button.

10.5 Firmware update via WBM and TFTP

The following steps must be carried out when executing a firmware update using WBM:

– In WBM click on "Device Configuration" and then "Software Update". Enter the IP address of the TFTP server in the "TFTP Server IP Address" field. Then enter the file name of the firmware and the path name, if necessary, in "Downloadable File Name". In the "Software Update on Next Reboot" field, click on "Enable".

– Enter your password. To wait until later to apply the update with a restart, click "Apply". To start the update immediately, click "Apply and Reboot".

– Check the execution of the update by checking the firmware version under "Device Information/General". In the event of an error during the download, a restart repeats the download. To abort the update, set "Disable" in the "Software Update on Next Reboot" field.

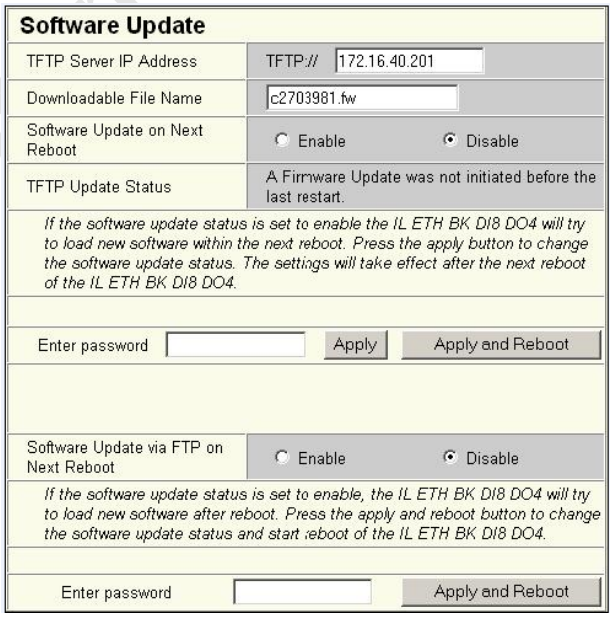


Figure 11 "Software Update" menu

If BootP is set to "Enable" and a reply with values for "TFTP Server IP Address" and "Downloadable File Name" is received, the entries done in WMB are overwritten with these specifications. After restart the values accepted are displayed in WBM.

In the event of an error during Flash programming (e.g., voltage interrupt), the bus coupler can only be restarted by repeating the update. The bus coupler starts the update automatically after a restart. Access to WBM is no longer possible.

10.6 Process data access via XML

The integrated web server of the IL ETH BK DI8 DO4 2TX-PAC offers the option of accessing the process data of the connected Inline terminals via a web page in XML format.

You can access the web pages via a standard web browser. For calling the XML pages with the process data enter the address in the following format in the address line of the browser:

http://<IP address>/procdata.xml

10.7 XML file structure

The XML file contains different data areas:

IL_STATION

Frame for the entire XML file. The mandatory elements of this frame are IL_BUS_TERMINAL and IL_BUS.

IL_BUS_TERMINAL

This data area contains information on the entire Inline station (bus coupler and all connected terminals). This data area includes: TERMINAL_TYPE, the module name NAME, the IP address IP_ADDRESS, the number of connected terminals MODULE_NUMBER, the local bus diagnostic status register DIAGNOSTIC_STATUS_REGISTER, and the local bus diagnostic parameter register DIAGNOSTIC_PARAMETER_REGISTER.

TERMINAL_TYPE

This area contains the name of the bus coupler, which is always IL ETH BK DI8 DO4.

NAME

Contains the user-specific station name. The station name can be modified via WBM.

IP_ADDRESS

Contains the IP address of the station.

MODULE_NUMBER

Contains the number of connected Inline terminals, including local I/Os. In the event of a bus error, the number of the last known operable configuration is indicated.

DIAGNOSTIC_STATUS_REGISTER

Contains the INTERBUS status, represented by all bits of the diagnostic status register. A detailed description can be found in the diagnostic parameter register. Whenever an error bit is set, the diagnostic parameter register is rewritten.

IL_BUS

Frame for the connected Inline terminals.

IL_MODULE

Frame for the data of an individual Inline terminal. The terminals are numbered consecutively from one to a maximum of 63.

MODULE_TYPE

Contains the terminal type. Possible types are DI, DO, DIO, AI, AO, AIO, and PCP.

PD_CHANNELS

Number of process data channels in an Inline terminal. For digital terminals the number of channels is equal to the number of supported bits. For other terminals, the number of process data words is indicated. Example: An IB IL AO 2 has two process data channels and an IB IL 24 DO 8 has eight bits and eight process data channels.

PD_WORDS

Number of process data words in an Inline terminal. Please note that analog terminals always have the same number of output and input words. An IB IL AO 2 therefore also has two input channels and an IB IL AI 2 also has two output channels.

PD_IN

This area is used by all terminals that occupy input data. The number of process data words depends on the terminal type.

Examples:

a) Inline terminal with two active inputs

```
<IL_MODULE number="1">
<MODULE_TYPE>DI</MODULE_TYPE>
<PD_CHANNELS>2</PD_CHANNELS>
<PD_WORDS>1</PD_WORDS>
<PD_IN word="1">3</PD_IN>
</IL_MODULE>
```

b) Inline terminal with two digital inputs and only the second input is active.

```
<IL_MODULE number="3">
<MODULE_TYPE>DI</MODULE_TYPE>
<PD_CHANNELS>2</PD_CHANNELS>
<PD_WORDS>1</PD_WORDS>
<PD_IN word="1">2</PD_IN>
</IL_MODULE>
```

c) Inline terminal with 16 digital inputs and the 13th and the 14th inputs are active.

```
<IL_MODULE number="7">
<MODULE_TYPE>DI</MODULE_TYPE>
<PD_CHANNELS>16</PD_CHANNELS>
<PD_WORDS>1</PD_WORDS>
<PD_IN word="1">12288</PD_IN>
</IL_MODULE>
```

The input word returns the value 12288 ($2^{12} + 2^{13}$).

d) Inline terminal with two analog inputs, only the first channel being active (14970).

```
<IL_MODULE number="10">
<MODULE_TYPE>AI</MODULE_TYPE>
<PD_CHANNELS>2</PD_CHANNELS>
<PD_WORDS>2</PD_WORDS>
<PD_IN word="1">14970</PD_IN>
<PD_IN word="2">8</PD_IN>
<PD_OUT word="1">0</PD_OUT>
<PD_OUT word="2">0</PD_OUT>
</IL_MODULE>
```

PD_OUT

This area is used by all terminals with output data. The use of bits is identical with that in PD_IN.

In the event of an error in the Inline station, this is indicated in the diagnostic registers. The D LED flashes on the bus coupler. The process data is invalid because only internal values are indicated, not the values on the local bus.

In order to make sure that only valid data is displayed, the diagnostic register must also always be requested. The same is true in the event of a faulty configuration. In this case, the local bus does not run and only internal values can be read in the XML file.

In the event of a peripheral fault, all data is valid, except for the data of the faulty terminal.

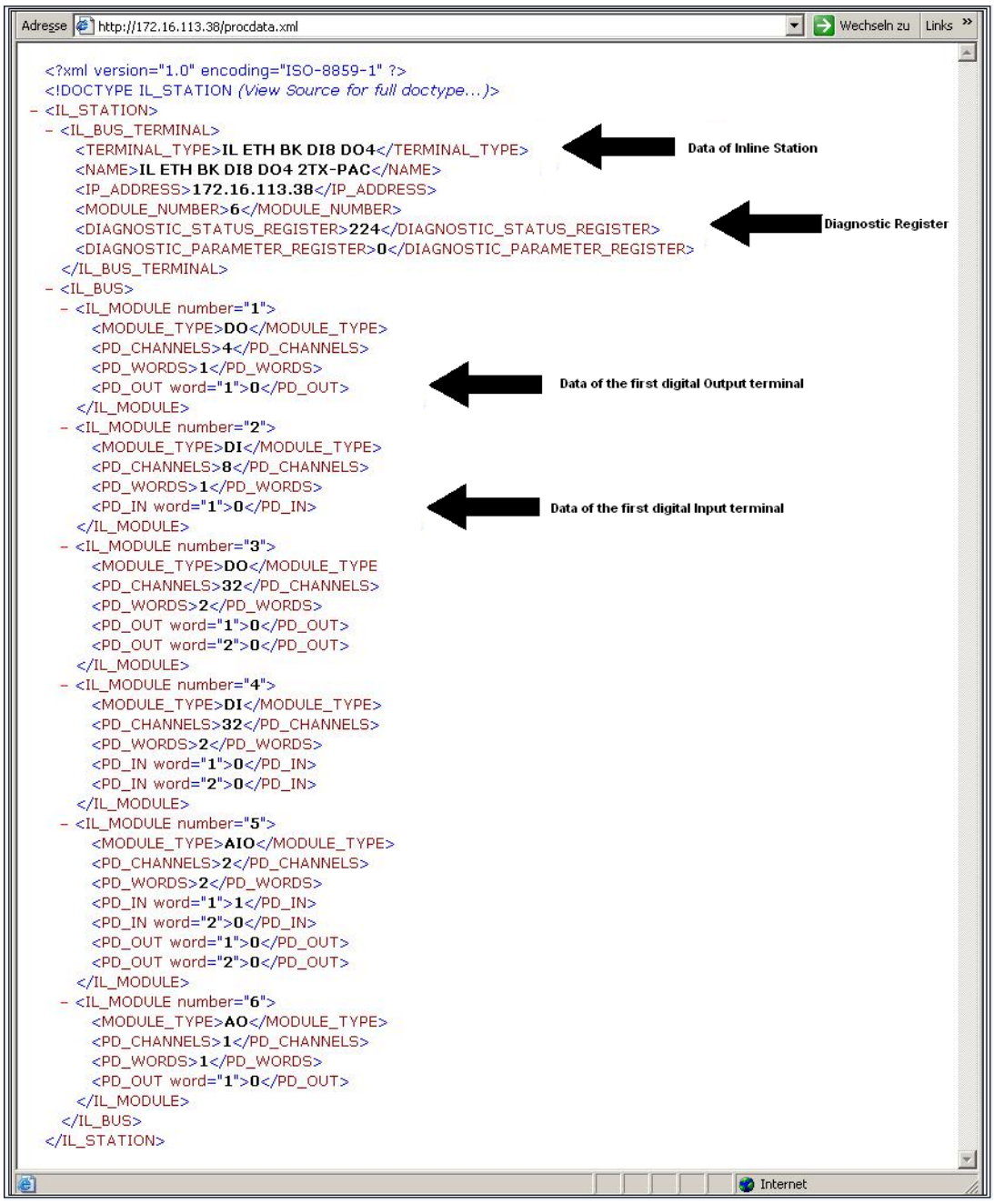


Figure 12 Screen for XML data

11 Startup behavior of the bus coupler

The startup behavior of the bus coupler is specified via two system parameters, plug and play mode (Var ID 2240_{hex}) and expert mode (Var ID 2275_{hex}). By default upon delivery, plug and play mode is activated and expert mode is deactivated.

11.1 Plug and play mode

Please note that the following description is valid when expert mode is deactivated.

Plug and play mode active

The IL ETH BK DI8 DO4 2TX-PAC supports plug and play mode (P&P). This mode enables Inline terminals connected in the field to be started up using the bus coupler without a higher-level computer. The P&P mode status (active or inactive) is stored retentively on the bus coupler. The current mode is displayed via the PP LED. In P&P mode, the connected Inline terminals are detected and their function checked. If this physical configuration is ready to operate, it is started, however writing outputs is not enabled.

To enable writing outputs, P&P mode must be deactivated. The deactivation of P&P mode is also the signal to save the active configuration as the reference configuration.

Plug and play mode inactive

When P&P mode is deactivated, the reference configuration is compared to the physical configuration. If they are the same, the bus coupler is set to the RUN state.

If the reference configuration and the physical configuration differ, the CO LED lights up and process data exchange is no longer possible for safety reasons.

In order to operate the bus you have the following two options:

1. Restore the original configuration so that the reference configuration and the physical configuration are the same again
2. Activate P&P mode and restart the bus coupler so that the active physical configuration is accepted as the reference configuration

11.2 Expert mode

Expert mode inactive

If expert mode is deactivated (default upon delivery), the bus coupler runs as described in 11.1.

Expert mode active

If expert mode is active, the bus is not started automatically. The user must set the station to the RUN state using the appropriate firmware commands such as CREATE_CONFIGURATION, 0710_{hex} and START_DATA_TRANSFER, 0701_{hex}. The PP and CO LEDs are not used.

11.3 Possible combinations of modes

P&P mode	Expert mode	Description/effect	Diagram
Inactive	Inactive	Normal case - the station sets valid configurations to the RUN state. Process data exchange is possible.	Figure 13 on page 19
Active	Inactive	The connected configuration is stored as the reference configuration and the station is set to the RUN state. Process data cannot be written.	Figure 14 on page 19
Any	Active	The bus is not started automatically, instead it waits for firmware commands from the user.	

11.4 Startup diagrams for the bus coupler

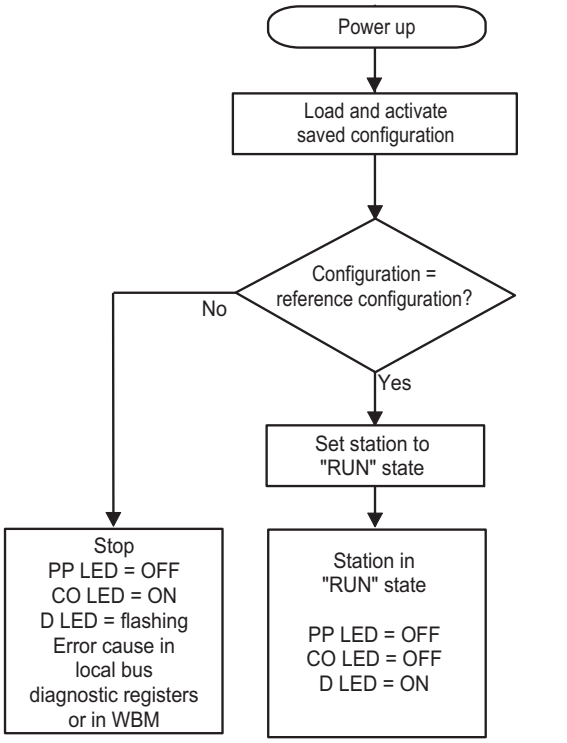


Figure 13 Standard mode/ P&P and expert mode inactive

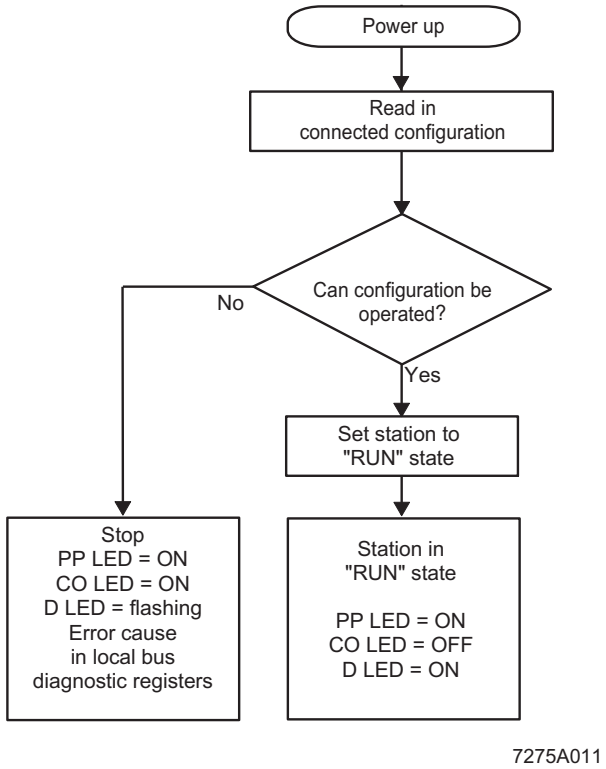


Figure 14 P&P mode active and expert mode inactive

When expert mode is deactivated, the bus coupler must be restarted for the change to take effect.

11.5 Changing and starting a configuration in P&P mode

Ensure that plug and play mode is activated and expert mode is deactivated.

The following steps must be carried out when **changing** an existing configuration:

Switch off the supply voltage.

Change the configuration.

Switch on the supply voltage.

A configuration is **started** as shown in the flowchart (see Figure 13 and Figure 14). During startup, please observe the following:

– Once the bus coupler has been switched on, the previously found configuration is read and started, as long as no errors are present.
– All connected Inline devices are integrated in the active configuration if the DIAG LEDs are continuously lit on all terminals.
– To prevent the accidental use of the wrong configuration, process data can only be accessed when P&P mode has been deactivated.

When P&P mode is active, access to process data is rejected with the error message $00A9_{hex}$ (ERR_PLUG_PLAY). The outputs of the entire Inline station are reset in P&P mode.
P&P mode is activated either using WBM, the Modbus command register or the "Set_Value" command via Ethernet. Once P&P mode has been switched off, the bus is only started if the existing configuration and the reference configuration are the same.

12 Monitoring functions

Monitoring functions with different features are available for monitoring Ethernet communication.

– Process data watchdog (process data monitoring)
– Connection monitoring for Modbus (see "Modbus connection timeout" on page 27) and DTI

The monitoring functions differ according to the features/ functions that need to be monitored. Depending on the application requirements, the appropriate monitoring function can be activated. By default upon delivery, the process data watchdog is activated.

Monitoring mechanism	Monitoring …			
	... the client application	... the individual channels	... the Ethernet connection	... process data exchange
Process data watchdog (process data monitoring)	X	–	X	X
Connection monitoring for Modbus and DTI	X	X	X	–

In the event of an error the system responds with a fault response. The user determines the required fault response mode.

12.1 Setting the required fault response mode

The required fault response mode can be set via web-based management, by writing to Modbus register 2002 or using the "Set_Value" service for variable 2277_{hex}. The following fault response modes are available:

Fault response mode	Value	Function
Standard fault mode	**0**	All outputs are set to "0".
Reset fault mode (default)	**1**	The digital outputs are set to "0". Analog outputs are set to the default value for the terminal.
Hold last state mode	**2**	All outputs keep their last value.

12.2 Process data watchdog/ process data monitoring

By default upon delivery, the process data watchdog is activated with a 500 ms timeout.

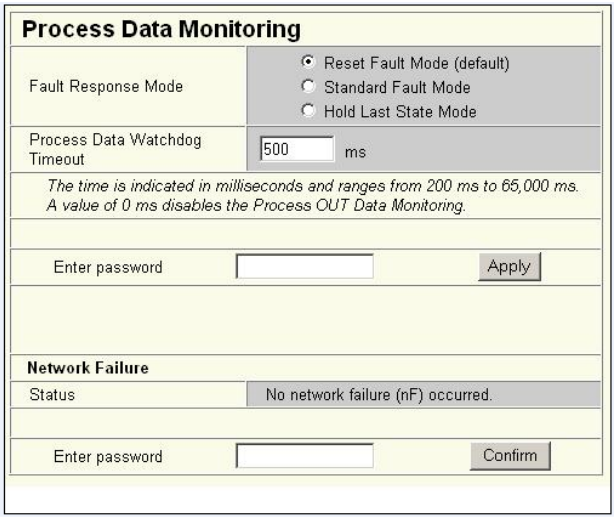


Figure 15 Process data monitoring configuration in WBM

Process data watchdog function

A process data watchdog is integrated into the IL ETH BK DI8 DO4 2TX-PAC to avoid uncontrolled setting/ resetting of the Inline station outputs in the event of an error.

If station outputs are set, the controlling process must be able to access the station. In the event of an error, e.g., network line interrupted or function error in the controlling process, the bus terminal can respond appropriately via the process data watchdog. By default upon delivery, the watchdog is activated with a 500 ms timeout. The first write process activates the process data watchdog. The next write process is expected during the timeout period (default: 500 ms). During error-free operation, the write process is performed during the timeout period and the watchdog is restarted (triggered).

Reading calls do not trigger the process data watchdog.

NET FAIL

If there is no triggering during the timeout period, an error occurred. Two responses follow:

– The selected fault response mode is executed
– The NetFail signal is set (the Net Fail LED is red).

The reason for setting the Net Fail signal is listed in the reason code.

For safety reasons, the user cannot stop the watchdog once it has been activated. If the user terminates the controlling application, there is no watchdog triggering; when the timeout period elapses, the Net Fail signal is set and the selected fault response mode is executed. After the watchdog has performed its task, the outputs are only enabled again after acknowledgment.

When the error is acknowledged, the watchdog is restarted. This means that it must be triggered during the timeout period, otherwise an error is detected again.

Configuration of the process data watchdog

Timeout can only be changed if the watchdog is in INIT state. The INIT state is present:

– After power-up, as long as process data exchange has not taken place

When a timeout has occurred and fault response has been activated, and Net Fail has not yet been acknowledged.

The process data watchdog timeout period can be configured from 200 ms to 65000 ms. Timeout periods can be set via web-based management, by writing to Modbus register 2000 or using the "Set_Value" service for variable 2233_{hex}.

Deactivating the process data watchdog

The process data watchdog can only be deactivated if it is in the INIT state. For deactivation, the timeout value is set to zero.

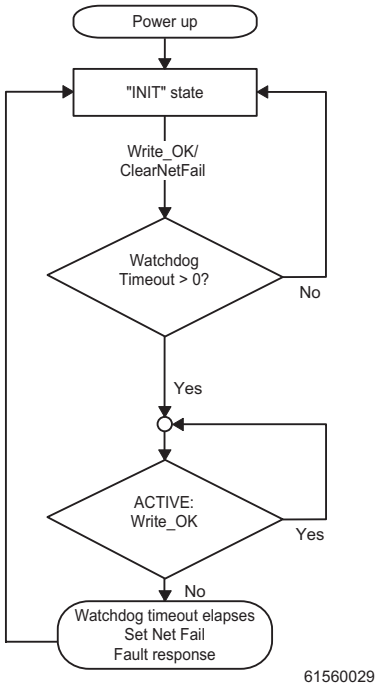


Figure 16 Status diagram of the process data watchdog

Fault response acknowledgment

The Net Fail signal can be acknowledged via web-based management via Modbus, by writing command 0002_{hex} to command register 2006 or using the "ETH_ClrNet FailStatus" function.

Reasons for fault response

The reasons for a fault response and a set Net Fail signal can be accessed via web-based management, Modbus register 2004 or the "ETH_GetNet FailStatus" service.

Possible reasons:

DDI_NF_TASK_CREAT_ERR	0001_{hex}
/* Error when starting a task */	
DDI_NF_LISTENER_ERR	0002_{hex}
/* Listener task error */	
DDI_NF_RECEIVER_ERR	0003_{hex}
/* Receiver task error */	
DDI_NF_ACCEPT_ERR	0004_{hex}
/* Accept function error */	
DDI_NF_ECHO_SERVER_ERR	0005_{hex}
/* Echo server task error */	
DDI_NF_HOST_CONTROLLER_ERR	0006_{hex}
/* Host controller task error */	
DDI_NF_DTI_TIMEOUT	0007_{hex}
/* DTI timeout occurred */	
DDI_NF_HOST_TIMEOUT	0008_{hex}
/* Host timeout occurred */	
DDI_NF_USER_TEST	0009_{hex}
/* NetFail set by user */	
DDI_NF_CONN_ABORT	$000A_{hex}$
/* Connection aborted */	
DDI_NF_INIT_ERR	$000B_{hex}$
/* Initialization error */	
DDI_NF_DTI_WATCHDOG	$000C_{hex}$
/* Process data watchdog triggered */	
DDI_NF_MBUS_TIMEOUT	$000D_{hex}$
/* Modbus timeout occurred */	

13 Modbus protocol

The bus coupler supports a Modbus/TCP server and a Modbus/UDP server with the following features:

13.1 Modbus connections

The bus coupler supports up to eight Modbus/TCP connections at the same time. In this way, a connection can quickly be restored. This means that the client can successfully restore an interrupted Modbus connection. The UDP server is connectionless.

13.2 Modbus interface

The Modbus interface according to standard port 502 supports Modbus communication via the bus coupler.

13.3 Modbus conformance classes

The bus coupler supports Modbus conformance class 0.

13.4 Modbus function codes

The following function codes are supported:

Code no.	Function code
fc3	Read multiple registers
fc4	Read input registers
fc6	Write single register
fc16	Write multiple registers
fc23	Read/write registers

13.5 Modbus tables

Special registers		
Modbus register table (16-bit word)	**Access**	**Function**
1280	Read/ write	Modbus connection monitoring timeout
2000	Read/ write	Process data watchdog timeout
2002	Read/ write	Fault response mode
2004	Read/ write	NetFail reason
2006	Read/ write	Command register

PCP		
Modbus register table (16-bit word)	**Access**	**Function**
6020 - 6173	Read/ write	See Modbus PCP registers on page 28

Diagnostics		
Modbus register table (16-bit word)	**Access**	**Function**
7996	Read only	Status register
7997	Read only	Local bus diagnostic status register
7998	Read only	Local bus diagnostic parameter register 1
7999	Read only	Local bus diagnostic parameter register 2

Process data (dynamic table)		
Modbus register table-(16-bit words)	**Access**	**Function**
8000	Read only	Local digital inputs
8001 - (8000+X)	Read only	Bus inputs (X words)
(8001+X)	Read/ write	Local digital outputs
(8002+X) - (8001+X+Y)	Read/ write	Bus outputs (Y words)

13.6 Assignment of process data

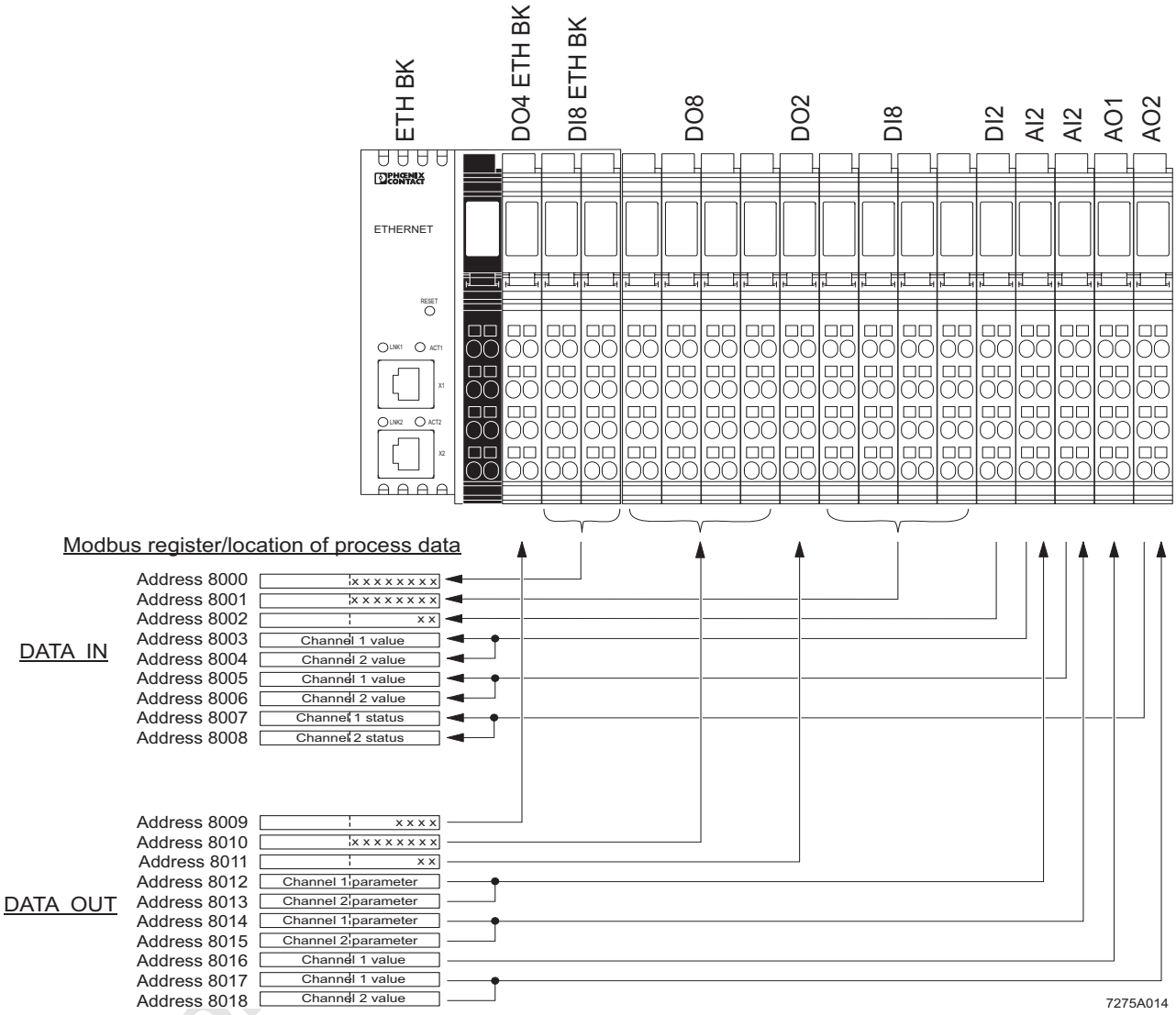


Figure 17 Location of process data for dynamic tables

13.7 Diagnostic registers

Status register

Address:

– Modbus: Register 7996

Using the Ethernet host controller, e.g., PLC, the user can read current diagnostic information from the network interface status word without the need for configuration software.

Only the two least significant bits (bit 0 and bit 1) have a function. Bit 2 to bit 15 are reserved.

– Bit 0 = 0: An error occurred (e.g., a bit in the diagnostic register is set).
– Bit 0 = 1: No error
– Bit 1 = 0: No NetFail
– Bit 1 = 1: NetFail present

This results in the following values for the status word:

Register contents	Status
0000_{hex}	An error occurred (e.g., a bit in the diagnostic register is set).
0001_{hex}	No error occurred.
0002_{hex}	A NetFail occurred.

Local bus diagnostic status register

Address:

– Modbus: Register 7997

Each bit in the local bus diagnostic status register is assigned a state of the local bus master on the bus coupler. The states in the error bits (USER, PF, BUS, CTRL) are described in greater detail using the diagnostic parameter register. Whenever one of the error bits described above is set, the diagnostic parameter register is rewritten. Otherwise, the diagnostic parameter register has the value 0000_{hex}.

Bit	Constant	Meaning
0	USER_BIT	Application program error
1	PF_BIT	Local bus device detected a peripheral fault
2	BUS_BIT	Error on local bus
3	CTRL_BIT	Local bus master has an internal error
4	DETECT_BIT	Error localization ("LOOK FOR FAIL")
5	RUN_BIT	Exchanging data cycles
6	ACTIVE_BIT	Local bus master ACTIVE
7	READY_BIT	Local bus master READY, selftest completed

Operating Indicators: READY, ACTIVE, RUN

The READY, ACTIVE and RUN operating indicators show the current state of the local bus system. The diagnostic parameter register is not used.

After the selftest, the local bus master is ready for operation. The READY indicator bit is set (READY = 1).

If the local bus master has been configured and the configuration frame activated without errors, the system indicates it is active. The READY and ACTIVE indicator bits are set (READY = 1, ACTIVE = 1).

In addition, the RUN indicator bit is set when data exchange is started (READY = 1, ACTIVE = 1 and RUN = 1).

The errors are indicated until they are acknowledged.

Error indicators: DETECT, CTRL, BUS, PF, USER

The DETECT error bit shows that an error is preventing further operation of the local bus (DETECT = 1). The outputs return to the set state, see page 20. The diagnostic routine searches for the error cause.

Once the error cause has been detected, the DETECT error bit will be reset (DETECT = 0) and the error indicated in the USER, PF, BUS and CTRL bits. The diagnostic parameter register and the extended diagnostic parameter register provide a detailed description of the error cause.

Error with local bus shutdown

Error bit/location	Contents of the diagnostic parameter register
CTRL = 1 Probably local bus master/ hardware error.	Error code
BUS = 1 Error on a local bus segment.	Error location

Error without local bus shutdown

Error bit/location	Contents of the diagnostic parameter register
PF = 1 Fault on the peripheral side of a local bus device: – Short circuit at the output – Sensor/actuator supply not present	Error location
USER = 1 User error, e.g., due to incorrect parameters	Error code

Local bus diagnostic parameter register 1

Address:

– Modbus: Register 7998

For detected local bus errors, the local bus diagnostic parameter register contains the error location:

Device number of a device,
e.g., "0.3" for bus segment 0; device 3

Error location, e.g., device number 0.3

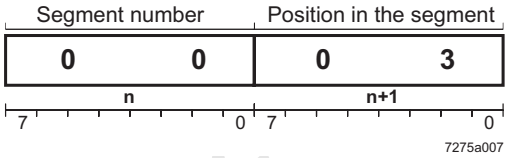


Figure 18 Contents of the local bus diagnostic parameter register (example)

Local bus diagnostic parameter register 2

Address:

– Modbus: Register 7999

Local bus diagnostic parameter register 2 contains additional information about the error codes.

13.8 Special registers

Modbus connection timeout

Modbus: Register 1280

A monitoring mechanism can be activated for every Modbus/TCP connection in order for the bus coupler to detect an error on the network (e.g., faulty cable) or in the client (operating system crash or error in the TCP/IP protocol stack) and respond accordingly. The monitoring mechanism is activated via the relevant TCP connection on the first read or write procedure.

To change the timeout value for the relevant TCP connection, write the new timeout value to the timeout table to the special address 1280 using the functions fc6 or fc16. The value of this entry is the value of the timeout table. The time is specified in milliseconds in the range from 200 ms to 65000 ms.

A timeout value of "0" deactivates the monitoring function. Values between 1 ms and 199 ms, and values greater than 65000 ms generate exception response 3 (ILLEGAL DATA VALUE).

Connection monitoring with the new timeout values is only activated after a Modbus/TCP function has been executed on the relevant TCP connection.

After the first access by a Modbus/TCP function, all other access must be carried out using the entered timeout value. Otherwise, fault response mode is activated and the Modbus/TCP connection is disabled.

Process data watchdog timeout

– Modbus: Register 2000

Setting or reading the timeout value for the process data watchdog. The time is specified in milliseconds in the range from 200 ms to 65000 ms. A timeout value of "0" deactivates the watchdog.

Fault response mode

– Modbus: Register 2002

Setting or reading the fault response mode. For information on fault response mode settings, please refer to Section "Setting the required fault response mode" on page 20.

NetFail reason

Address:

– Modbus: Register 2004

As soon as the NetFail signal is set, the cause can be read out via this register. If there is no NetFail signal, the register is 0.

Command register

– Modbus: Register 2006

The network interface command register can be used to transmit commands with basic functions to the bus coupler using the Ethernet host controller, e.g., PLC.

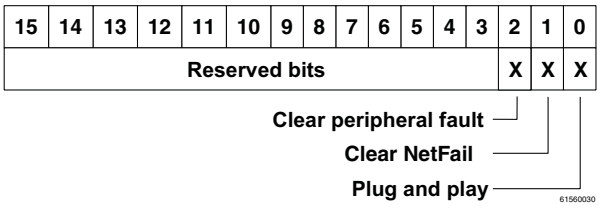


Figure 19 Command word

14 Modbus/TCP PCP registers

The PCP registers are divided into two classes:

– Communication registers for exchanging data with the desired PCP device
– Configuration registers for selecting the invoke ID, index, and subindex of the PCP device

The IL ETH BK DI8 DO4 2TX-PAC supports 16 PCP devices, therefore 16 communication registers and 24 configuration registers are supported.

Example: In order to read object $5FE0_{hex}$ of an IB IL RS 232 terminal with communication reference 4, first set the configuration registers (6041 - 6043) to the desired values with the fc16 command (e.g., 6041 index: $5FE0_{hex}$, 6042 subindex: 0_{hex}, 6043 invoke ID: 0_{hex}). The fc3 command can then be used to read 29 words via communication register 6040.

A Modbus function is only ever used for read/write access to a PCP index. For example, the fc3 command cannot be used to read 20 words from registers 6020 to 6039.

The communication register contains a different value range due to the selected values of the register and the terminal used. Therefore, the IB IL RS 232 terminal, for example, has three different PCP objects: two objects are one word long, but the third is 29 words long. The three configuration registers can be read/written with a single Modbus command. An attempt to access a reserved register generates an exception response.

Communication reference	Communication register	Configuration register	Remark
CR 2	6020		
		6021	Index
		6022	Subindex
		6023	Invoke ID
		6024 - 6029	Reserved
CR 3	6030		
		6031	Index
		6032	Subindex
		6033	Invoke ID
		6034 - 6039	Reserved
CR 4	6040		
		6041	Index
		6042	Subindex
		6043	Invoke ID
		6044 - 6049	Reserved
...	...	...	...
CR 16	6160		
		6161	Index
		6162	Subindex
		6163	Invoke ID
		6164 - 6169	Reserved
CR 17	6170		
		6171	Index
		6172	Subindex
		6173	Invoke ID
		6174 - 6179	Reserved

15 Device Driver Interface (DDI)

The IL ETH BK DI8 DO4 2TX-PAC bus coupler supports access via the Device Driver Interface (DDI).

A driver for Windows NT, Windows 2000, and Windows XP can be downloaded at www.download.phoenixcontact.com under the name "Ethernet Driver 2.0. exe". Drivers for other operating systems are available from Phoenix Contact on request.

Using this interface requires the appropriate driver to be installed on the host. For a detailed description of the services, please refer to the "Driver Reference Manual for G4-Based Controller Boards Using PC Bus and Ethernet", see page 3.

The following services are supported:

15.1 Services for remote access to the DDI

- DDI_DevOpenNode ( )
- DDI_DevCloseNode ( )
- DDI_DTI_ReadData ( )
- DDI_DTI_WriteData ( )
- DDI_DTI_ReadWriteData ( )
- DDI_MXI_SndMessage ( )
- DDI_MXI_RcvMessage ( )
- GetIBSDiagnostic ( )

15.2 Connection and error monitoring

- ETH_SetDTITimeoutCtrl ( )
- ETH_ClearDTITimeoutCtrl ( )
- ETH_SetNet Fail ( )
- ETH_GetNet FailStatus ( )
- ETH_ClrNet FailStatus ( )
- ETH_SetNet FailMode ( )
- ETH_GetNet FailMode ( )

15.3 Services for process data monitoring

- ETH_ActivatePDinMonitoring ( )
- ETH_DeactivatePDinMonitoring ( )

15.4 Assignment of process data

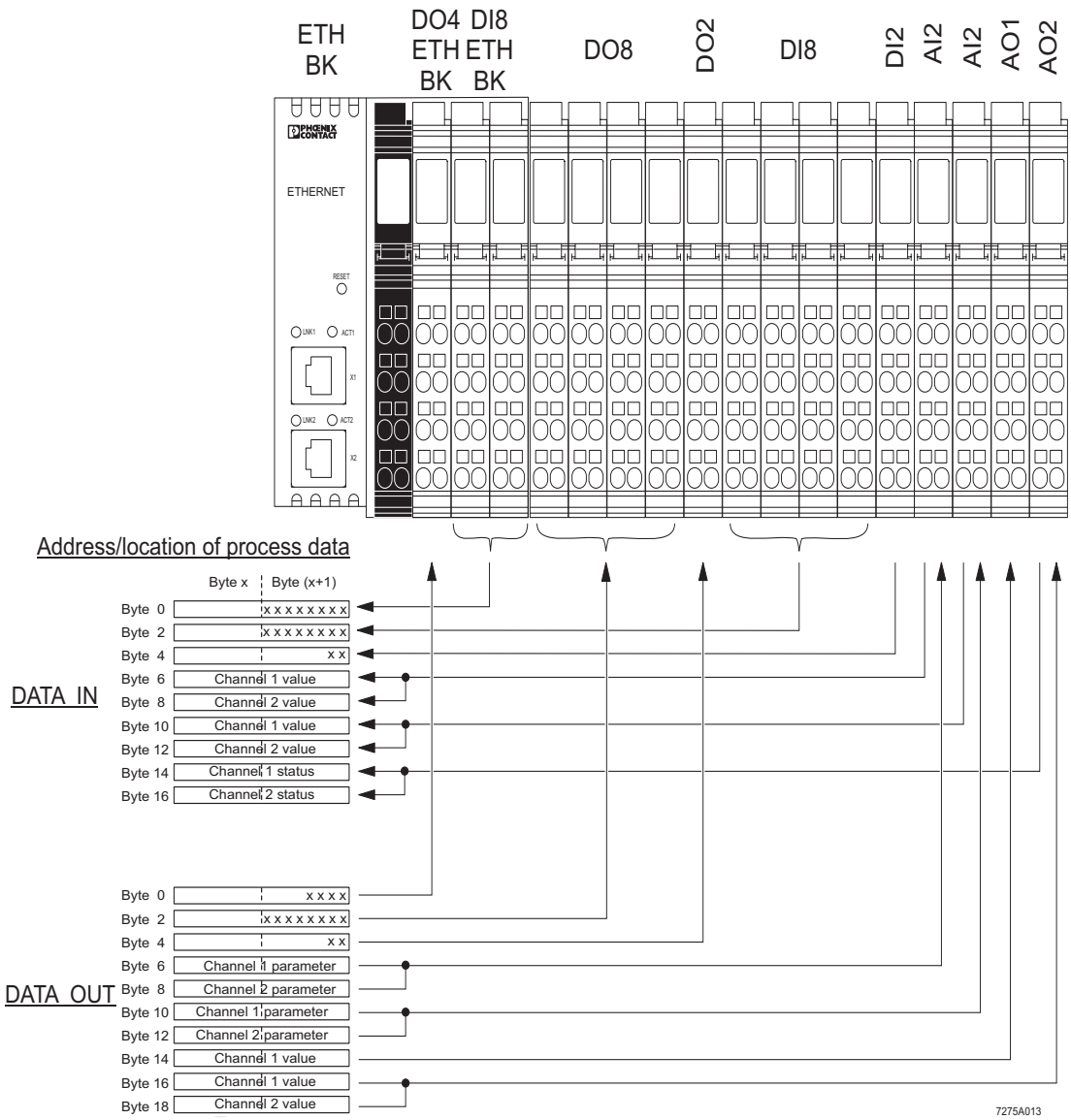


Figure 20 Assignment of process data

16 Firmware services

As it is not necessary to use each firmware service in both operating modes (expert mode active/inactive), the following table indicates the assignment of the services to the operating modes. If the services are not used as specified in the table, this may cause the firmware to behave as follows:

1. The service is not permitted in this mode and is rejected with a negative acknowledgment.
2. The service is executed and terminated with a positive acknowledgment. The effect of this service is removed by the firmware. Supported firmware services that can be used in every operating mode:

Code	Services	Function
0309_{hex}	Read_Configuration	Reads various entries of the configuration directory Used_Attributes: 0002_{hex} = Device code
$030B_{hex}$	Complete_Read_Configuration	Reads all device data for a configuration Used_Attributes: 0002_{hex} = Device code
0315_{hex}	Read_Device_State	Reads status of local bus devices Device_State_Mask: 0008_{hex} = Peripheral fault
0316_{hex}	Get_Error_Info	Requests additional error information
$032A_{hex}$	Get_Version_Info	Reads version information
$032B_{hex}$	Get_Diag_Info	Reads local bus counters Diag_Info_Attr: 0004_{hex} = Global_Count
0351_{hex}	Read_Value	Reads system parameters
0714_{hex}	Control_Device_Function	Sends control commands to local bus devices Device_Function: 0003_{hex} = Conf_Dev_Err 0004_{hex} = Conf_Dev_Err_All
0750_{hex}	Set_Value	Assigns new values to system parameters
0760_{hex}	Confirm_Diagnostics	Updates the diagnostic display and registers
0956_{hex}	Reset_Controller_Board	Resets the controller board

Supported firmware services that are only available in expert mode:

Code	Services	Function
0306_{hex}	Initiate_Load_Configuration	Loads a configuration frame (extension not supported)
0307_{hex}	Load_Configuration	Transmits the device data for a configuration Used_Attributes: 0002_{hex} = Device code
$030A_{hex}$	Complete_Load_Configuration	Transmits all device data for a configuration Used_Attributes: 0002_{hex} = Device code
0308_{hex}	Terminate_Load_Configuration	Terminates the transmission of configuration data only for automatic parameterization
$030C_{hex}$	Delete_Configuration	Deletes a configuration
$030E_{hex}$	Control_Parameterization	Starts or ends the parameterization phase
0701_{hex}	Start_Data_Transfer	Starts data transmission
0710_{hex}	Create_Configuration	Reads in the connected configuration
0711_{hex}	Activate_Configuration	Compares the saved and connected configuration
1303_{hex}	Alarm_Stop	Resets the local bus

For additional information about firmware services, please refer to the IBS SYS FW G4 UM E user manual.

System parameters for the "Set_Value" (750_{hex}) and "Read_Value" (351_{hex}) services

Variable ID	System parameter	Value/Comment
0104_{hex}	Diagnostic status register (16-bit word)	Read only
0105_{hex}	Diagnostic parameter register 1 (16-bit word)	Read only
010Dhex	Diagnostic parameter register 2 (16-bit word)	Read only
2216_{hex}	Current PD cycle time (32-bit word)	Read only
2240_{hex}	Plug and play mode (32-bit word)	0: Plug and play mode inactive 1: Plug and play mode active
2275_{hex}	Expert mode (32-bit word)	0: Expert mode inactive 1: Expert mode active
2277_{hex}	Fault response mode (32-bit word)	See page 20
2293_{hex}	Process data watchdog timeout (32-bit word)	See page 21

17 PCP communication

17.1 Transmission of parameter data

Intelligent devices such as frequency inverters or controllers exchange process data with each other and also exchange larger volumes of data with the control system. Such data can, for example, be used for the startup phase of a machine. This type of parameter data rarely changes and is transmitted when necessary.

The INTERBUS protocol can transmit process data and complex data records (parameter data) at the same time. The comprehensive parameter data is divided into smaller units, transmitted and then recombined.

With INTERBUS, the Peripherals Communication Protocol (PCP) divides the parameter data into individual segments. After the transmission it recombines the data. The protocol software is called PCP. This software provides the necessary services for connection establishment and connection abort, etc.

For detailed information on PCP communication, please refer to the IBS SYS PCP G4 UM E user manual.

Please note that a maximum of 16 PCP terminals can be connected to a bus coupler.

17.2 Supported PCP commands

The MXI interface of the DDI can be used to send the following PCP commands.

Service	Service code
Initiate_Request	$008B_{hex}$
Abort_Request	$088D_{hex}$
Read_Request	0081_{hex}
Write_Request	0082_{hex}
Information_Report_Request	0885_{hex}
Status_Request	0083_{hex}
Identify_Request	0087_{hex}
Load_Kbl_Par_Loc_Request	0264_{hex}
Read_Kbl_Loc_Request	0203_{hex}

17.3 Configuration of the PCP PDU size

The standard PDU size for communication with all Phoenix Contact Inline devices is 64 bytes in the transmit and receive direction.

System couplers such as the ILC 200 UNI have configurable PDU sizes. If another size is configured and an IL ETH BK DI8 DO4 2TX-PAC is used for communication, the bus coupler must also be configured to the values already set on the ILC 200 UNI.

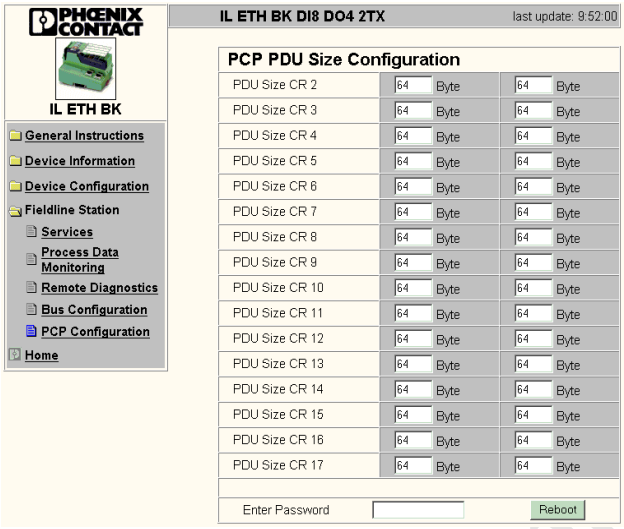


Figure 21 PCP configuration in web-based management

18 Simple Network Management Protocol (SNMP)

The bus coupler supports SNMP v1 and v2c.

Management Information Base - MIB

The latest MIBs can be found on the Internet at www.download.phoenixcontact.com.

For the object descriptions, please refer to the ASN1 descriptions of this product. They can be downloaded from Internet at www.download.phoenixcontact.com.

The password for read access is "public" and cannot be modified. By default upon delivery, the password for read/write access is "private" and can be modified at any time.