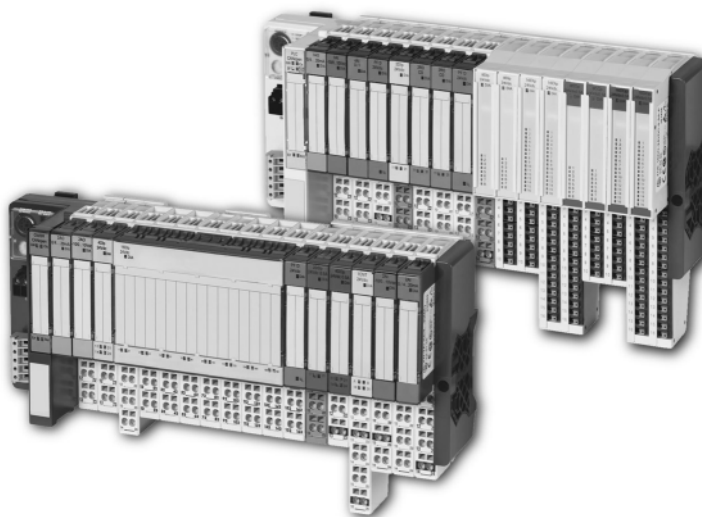


Gateways for PROFIBUS-DP



EATON

Powering Business Worldwide

Imprint

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Original manual

The German version of this document is the original manual.

Translations of the original manual

All non-German editions of this document are translations of the original manual.

Editorial department

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Subject to modifications.

**Warning!**

Dangerous electrical voltage!

Before commencing the installation

- Disconnect the power supply of the device.
- Ensure that the device cannot be accidentally restarted.
- Verify isolation from the supply.
- Earth and short circuit.
- Cover or enclose neighbouring units that are live.
- Follow the engineering instructions of the device concerned.
- Only suitably qualified personnel in accordance with EN 50110-1/-2 (DIN VDE 0105 Part 100) may work on this device.
- Before installation and before touching the device ensure that you are free of electrostatic charge.
- The functional earth (FE) must be connected to the protective earth (PE) or to the potential equalisation. The system installer is responsible for implementing this connection.
- Connecting cables and signal lines should be installed so that inductive or capacitive interference do not impair the automation functions.
- Install automation devices and related operating elements in such a way that they are well protected against unintentional operation.
- Suitable safety hardware and software measures should be implemented for the I/O interface so that a line or wire breakage on the signal side does not result in undefined states in the automation devices.
- Ensure a reliable electrical isolation of the low voltage for the 24 volt supply. Only use power supply units complying with IEC/HD 60364-4-41 (DIN VDE 0100 Part 410).
- Deviations of the mains voltage from the rated value must not exceed the tolerance limits given in the specifications, otherwise this may cause malfunction and dangerous operation.
- Emergency stop devices complying with IEC/EN 60204-1 must be effective in all operating modes of the automation devices. Unlatching the emergency-stop devices must not cause uncontrolled operation or restart.
- Measures should be taken to ensure the proper restart of programs interrupted after a voltage dip or failure. This should not cause dangerous operating states even for a short time. If necessary, emergency-stop devices should be implemented.
- Wherever faults in the automation system may cause damage to persons or property, external measures must be implemented to ensure a safe operating state in the event of a fault or malfunction (for example, by means of separate limit switches, mechanical interlocks etc.).

Safety regulations

- The electrical installation must be carried out in accordance with the relevant regulations (e.g. with regard to cable cross sections, fuses, PE).
- All work relating to transport, installation, commissioning and maintenance must only be carried out by qualified personnel. (IEC/HD 60364 (DIN VDE 0100) and national work safety regulations).

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1 XI/ON gateways for PROFIBUS-DP

Function

XI/ON gateways for PROFIBUS-DP enable the operation of XI/ON modules on PROFIBUS-DP. The gateway is the connecting device between the XI/ON modules and the PROFIBUS-DP master. It handles the entire process data traffic between the I/O level and the field bus, and generates the necessary diagnostics data for the supervisory master. The service interface is used to provide information for the *I/Oassistant* software.



- XI/ON gateways can only be used as slaves.
- DPV0 gateways support exclusively the PROFIBUS-DPV0 services.
- In addition to the PROFIBUS-DPV0 services, the DPV1 gateways support the PROFIBUS-DPV1 services in the here described scope.

In the "WAIT_PRM" state of the XI/ON gateway, the numerous module combinations and variations mean that it is not possible to check the parameters by using the Parameter Telegram of the PROFIBUS-DP master. Such a checking of the parameters is made by the PROFIBUS-DP master in the context of a configuration, after successfully completing the configuration.

1 XI/ON gateways for PROFIBUS-DP

Versions

Versions

The XI/ON gateways for the PROFIBUS field bus system are available as XN standard and XNE ECO gateways.



The following modules can only be used with the DPV1 gateways and protocol DPV1:

- XNE-8AI-U/I-4PT/NI
- XNE-2CNT-2PWM

XN standard gateways

XN-GW-PBDP-1.5MB and XN-GW-PBDP-1.5MB-S:



XN-GW-PBDP-12MB:



XN-GWBR-PBDP and XN-GWBR-DPV1:



Figure 1: Versions of XN standard gateways

Table 1: XN standard gateways

	XN-GW-PBDP-1.5MB	XN-GW-PBDP-1.5MB-S	XN-GW-PBDP-12MB	XN-GWBR-PBDP	XN-GWBR-DPV1
Gateway for PROFIBUS	DPV0	DPV0	DPV0	DPV0	DPV0 and DPV1
Power supply module	–	–	–	Integrated	Integrated
Maximum system extension	74 modules (XN) ¹⁾ in slice design	74 modules (XN) ¹⁾ in slice design	74 modules (XN) ¹⁾ in slice design	74 modules (XN, XNE) in slice design	64 modules (XN, XNE) in slice design
Maximum transmission rate	1.5 MBit/s	1.5 MBit/s	12 MBit/s	12 MBit/s	12 MBit/s

	XN-GW-PBDP-1.5MB	XN-GW-PBDP-1.5MB-S	XN-GW-PBDP-12MB	XN-GWBR-PBDP	XN-GWBR-DPV1
Connection to the PROFIBUS-DP field bus via	SUB-D connection or tension spring conn.	SUB-D connection or screw terminals	SUB-D connection	SUB-D connection	SUB-D connection

1) XI/ON stations with XN standard gateway without integrated power supply module (XN-GW-...) can only be combined with XN standard modules.



Gateway types XN-GW-PBDP-1.5MB, XN-GW-PBDP-1.5MB-S and XN-GW-PBDP-12MB do not have an internal power supply module! Install a bus refreshing module with the corresponding base module as the first module after the gateway!

1 XI/ON gateways for PROFIBUS-DP

Versions

XNE ECO gateway

XNE-GWBR-PBDP:



Figure 2: Versions of XNE ECO gateways

Table 2: XNE ECO gateway

XNE-GWBR-PBDP	
Gateway for PROFIBUS	DPV0 and DPV1
Power supply module	Integrated
Maximum system extension	48 modules (XN, XNE)
Maximum transmission rate	12 MBit/s
Connection to the PROFIBUS-DP field bus via	Push-in tension clamp terminals

2 XN standard gateways

Gateway XN-GW-PBDP-1.5MB and XN-GW-PBDP-1.5MB-S

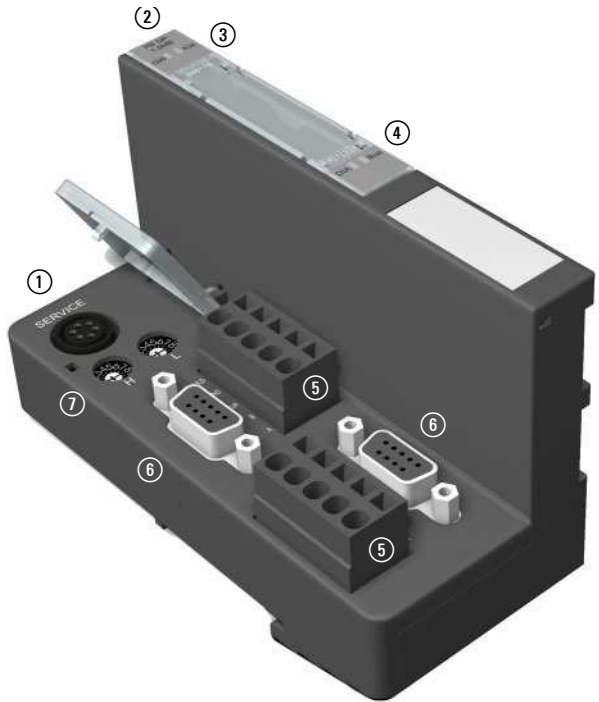


Figure 3: XN-GW-PBDP-1.5MB and XN-GW-PBDP-1.5MB-S

- ① Service interface
- ② Type designation
- ③ LEDs for XI/ON station
- ④ LEDs for PROFIBUS-DP
- ⑤ PROFIBUS-DP, direct wiring
(XN-GW-PBDP-1.5MB: tension spring connector;
XN-GW-PBDP-1.5MB-S: screw terminals)
- ⑥ PROFIBUS-DP, SUB-D socket
- ⑦ Rotary hex encoding switch for the field bus address

2 XN standard gateways
Gateway XN-GW-PBDP-12MB

Gateway
XN-GW-PBDP-12MB

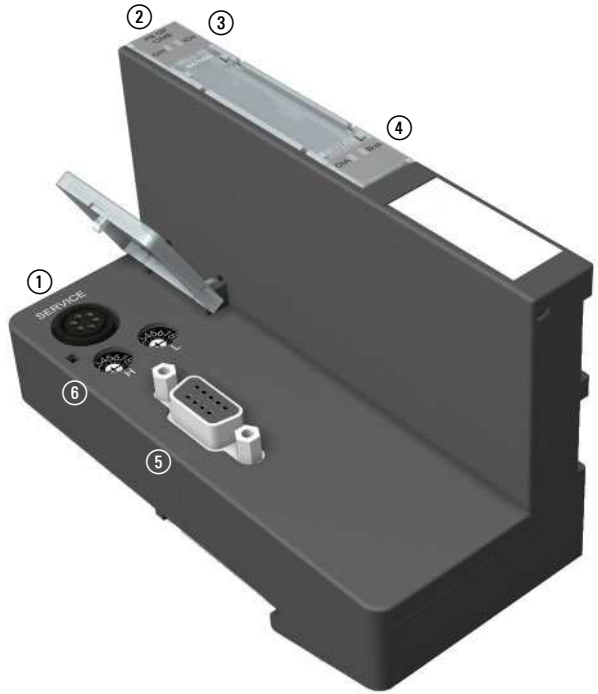


Figure 4: XN-GW-PBDP-12MB

- ① Service interface
- ② Type designation
- ③ LEDs for XI/ON station
- ④ LEDs for PROFIBUS-DP
- ⑤ PROFIBUS-DP, SUB-D socket
- ⑥ Rotary hex encoding switch for the field bus address

**Gateway XN-GWBR-PBDP
and XN-GWBR-DPV1**

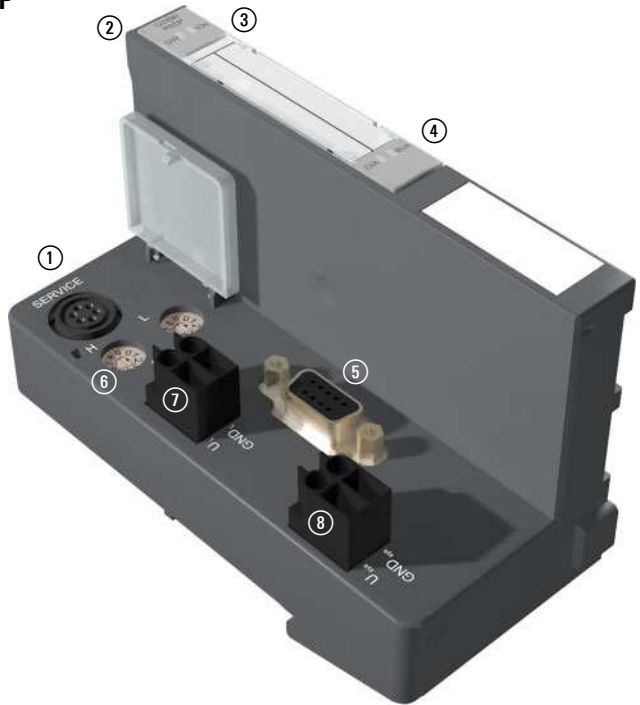


Figure 5: XN-GWBR-PBDP and XN-GWBR-DPV1

- ① Service interface
- ② Type designation
- ③ LEDs for XI/ON station
- ④ LEDs for PROFIBUS-DP
- ⑤ PROFIBUS-DP, SUB-D socket
- ⑥ Rotary decimal encoding switch for the field bus address
- ⑦ Screw connections for the field bus supply voltage
- ⑧ Screw connections for the system supply voltage

2 XN standard gateways

Technical data

Technical data

Structure of a XN standard gateway

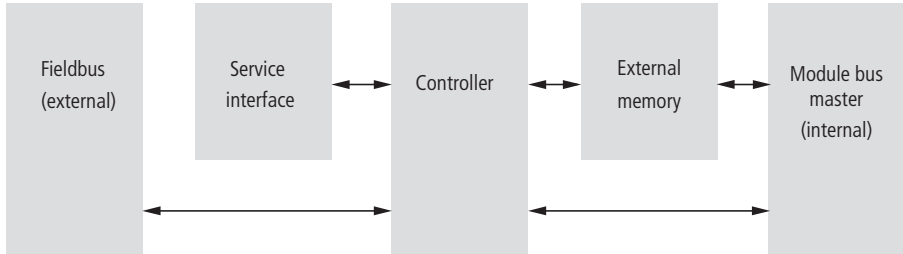


Figure 6: Gateway structure

Technical data for the XN station



Attention!

The auxiliary supply must meet the requirements for SELV (= Safety Extra Low Voltage) according to IEC 60364-4-41.

Table 3: Technical data for the XN station

Designation	Value
Supply voltage/auxiliary supply	
Nominal value (provided for other modules)	24 V DC
Residual ripple	according to IEC/EN 61131-2
Electrical isolation (U_L to U_{SYS} / U_L to field bus / U_{SYS} to field bus)	yes, through optocoupler
Environment/temperature	
Operating temperature, mounted horizontally	0 to +55 °C
Operating temperature, mounted vertically	0 to +55 °C
Storage temperature	-25 to +85 °C
Relative humidity according to IEC/EN 60068-2-30	5 to 95 % (indoor), Level RH-2, no condensation (storage at 45 °C, no functional test)

Designation	Value
Corrosive gases	
SO ₂	10 ppm (rel. humidity < 75 %, no condensation)
H ₂ S	1.0 ppm (rel. humidity < 75 %, no condensation)
Vibration resistance	
10 to 57 Hz, constant amplitude 0.075 mm, 1 g	yes
57 to 150 Hz, constant acceleration 1 g	yes
Vibration type	Variable frequency runs at a rate of change of 1 octave/min
Vibration duration	20 variable frequency runs per coordinate axis
Shock resistance according to IEC/EN 60068-2-27	18 shocks, half-sine 15 g peak value/11 ms, for both ± directions per spatial coordinate
Repeated shock resistance according to IEC/EN 60068-2-29	1000 shocks, half-sine 25 g peak value/6 ms, for both ± directions per spatial coordinate
Drop and topple	
Fall height (weight < 10 kg)	1.0 m
Fall height (weight 10 to 40 kg)	0.5 m
Test runs	7
Instrument with packaging, electronics boards electrically tested	
Electromagnetic compatibility (EMC) according to IEC/EN 61000-6-2 (industrial)	
Static electricity according to IEC/EN 61000-4-2	
Air discharge (direct)	8 kV
Relay discharge (indirect)	4 kV

2 XN standard gateways

Technical data

Designation	Value
Electromagnetic HF fields according to IEC/EN 61000-4-3	10 V/m
Conducted interference, induced by HF fields according to IEC/EN 61000-4-6	10 V
Fast transients (burst) according to IEC/EN 61000-4-4	1 kV / 2 kV
Radiated interference according to IEC/EN 61000-6-4 (industrial)	according to IEC/CISPR 11 / EN 55011, Class A ¹⁾

- 1) The use in residential areas may lead to functional errors. Additional suppression measures are necessary!

Table 4: Approvals and tests for a XI/ON station

Designation	Value
Approvals ¹⁾	CE, cULus
Tests (IEC/EN 61131-2)	
Cold	IEC/EN 60068-2-1
Dry heat	IEC/EN 60068-2-2
Damp heat, cyclical	IEC/EN 60068-2-30
Temperature changes	IEC/EN 60068-2-14
Operating life MTBF	120 000 h ²⁾
Removal/insertion cycles for electronics modules	20
Pollution level according to IEC/EN 60664 (IEC/EN 61131-2)	2
Degree of protection according to IEC/EN 60529	IP 20

- 1) The approvals of newer XI/ON modules can still be pending
- 2) The lifespan of the relay module is not stated in hours. The number of operating cycles is relevant for the lifespan.

2 XN standard gateways

Technical data

Technical data for the terminals of XN standard gateways and base modules

Table 5: Technical data for the terminals of XN standard gateways and base modules

Designation	Value
Measurement data	according to VDE 0611 Part 1/8.92 / IEC/EN 60947-7-1
TOP connection technology	Tension clamp or screw connection
Protection class	IP20
Insulation stripping length	8.0 to 9.0 mm / 0.32 to 0.36 inch
Max. wire range	0.5 to 2.5 mm ² / 0.0008 to 0.0039 inch ² / AWG 24 to AWG 14
Crimpable wire	
"e" solid core H 07V-U	0.5 to 2.5 mm ² / 0.0008 to 0.0039 inch ²
"f" flexible core H 07V-K	0.5 to 1.5 mm ² / 0.0008 to 0.0023 inch ²
"f" with ferrules according to DIN 46228-1 (ferrules crimped gas-tight)	0.5 to 1.5 mm ² / 0.0008 to 0.0023 inch ²
Test finger according to IEC/EN 60947-1	A1

**Technical data for XN-GW-PBDP-1.5MB,
 XN-GW-PBDP-1.5MB-S and XN-GW-PBDP-12MB**

Table 6: XN-GW-PBDP-1.5MB, XN-GW-PBDP-1.5MB-S and XN-GW-PBDP-12MB

Designation	Value
Maximum system extension	74 modules (XN) in slice design or max. length of station: 1 m
Supply voltage (according to IEC/EN 61131-2)	
Nominal value (supply from bus refreshing module)	5 V DC (4.7 to 5.3 V DC)
Restriction on IEC/EN 61131-2	The supply energy required to bridge a supply interruption up to 10 ms is not stored. Please secure the U_{SYS} for XN-BR-24VDC-D modules by using an appropriate power supply unit!
Current consumption from module bus I_{MB}	
Without service/without field bus	~ 280 mA
Without service/with field bus (9.6 kBit/s)	~ 360 mA
Without service/with field bus (1.5 Mbps)	~ 380 mA
Without service/with field bus (12 Mbps)	~ 410 mA
With service/without field bus	~ 300 mA
Maximum	~ 430 mA
Dimensions	
Width/length/height (mm)	50.6 x 114.8 x 74.4 mm
Service	
Connections	PS/2 socket

2 XN standard gateways

Technical data

Table 7: XN-GW-PBDP-1.5MB and
XN-GW-PBDP-1.5MB-S

Designation	Value
Field bus connections	2 x 9-pole SUB-D socket, 2 x tension spring connector type LPZF, 5.08, 5-pole, or 2 x screw connection
Field bus shielding connection	2 KLBÜ
Transfer rate	9.6 kbps to 1.5 Mbps
Field bus termination	SUB-D plug
Passive opt.-fiber adapters connectable	Current drawn: max. 100 mA
2 rotary hex encoding switches with labeling, for setting the address.	

Table 8: XN-GW-PBDP-12MB

Designation	Value
Field bus connections	1 x 9-pole SUB-D socket
Field bus shielding connection	via SUB-D plug
Transfer rate	9.6 kbps to 12 Mbps
Field bus termination	SUB-D plug
Passive optical-fiber adapters can be connected	Current drawn: max. 100 mA
2 rotary hex encoding switches with labeling, for setting the address.	

**Technical data for XN-GWBR-PBDP and
 XN-GWBR-DPV1**

Table 9: XN-GWBR-PBDP and XN-GWBR-DPV1

Designation	Value
Maximum system extension	
XN-GWBR-PBDP	74 modules (XN, XNE) in slice design or max. length of station: 1 m
XN-GWBR-DPV1	64 modules (XN, XNE) in slice design or max. length of station: 1 m
Supply	
Field supply	
U_L nominal value (range)	24 V DC (18 to 30 V DC)
I_L max. field current	10 A
Insulation voltage (U_L to U_{SYS} / U_L to field bus / U_L to FE)	500 V_{rms}
Connections	2-pole screw terminal
System supply	
U_{SYS} nominal value (range)	24 V DC (18 to 30 V DC)
I_{SYS} (for $I_{MB} = 1.2$ A / $U_{SYS} = 18$ V DC)	max. 900 mA
I_{MB} (supply to the module bus partici- pants)	1.2 A
Insulation voltage (U_{SYS} to U_L / U_{SYS} to field bus / U_{SYS} to FE)	500 V_{rms}
Connections	2-pole screw terminal
Physical interfaces	
Field bus	
Transfer rate	9.6 kbps to 12 Mbps
Passive optical-fiber adapters can be connected	Current drawn: max. 100 mA
Insulation voltage (field bus to U_{SYS} / field bus to U_L / field bus to FE)	500 V_{rms}

2 XN standard gateways

Technical data

Designation	Value
Field bus connections	1 x 9-pole SUB-D socket connector → Chapter "Field bus connection via SUB-D sockets", Page 29
Field bus shielding connection	via SUB-D plug
Address setting	2 rotary decimal encoding switches
Service	
Connections	PS/2 socket
Logical interfaces	→ Chapter "Parameterization", Page 78 → Chapter "Description of the gateway diagnostics", Page 142

Connections at the XN standard gateway

Power supply

XN standard gateways with integrated power supply module (XN-GWBR-...) include additional terminals for connecting the:

- field supply voltage (U_L , GND_L) and
- system supply voltage (U_{SYS} , GND_{SYS})

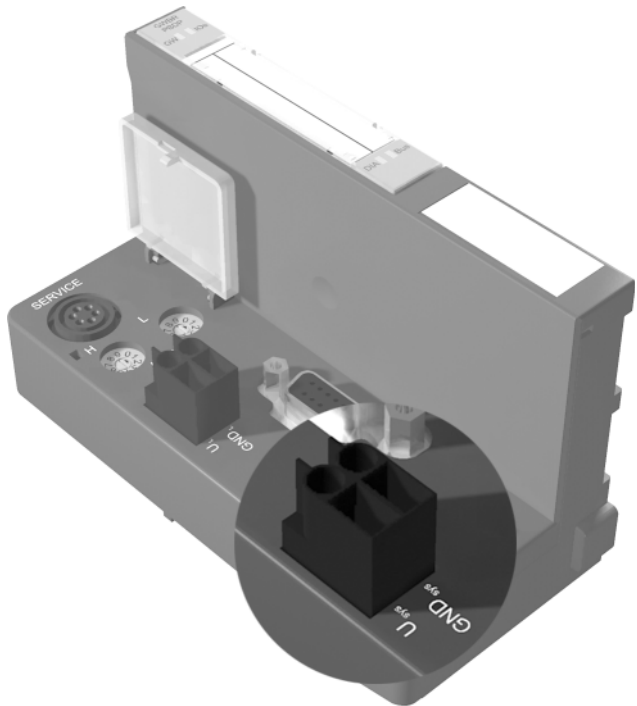


Figure 7: Terminals for the system supply voltage of XN-GWBR-PBDP and XN-GWBR-DPV1

Gateways without integrated power supply module must be supplied from a neighboring power supply module (XN-BR-24VDC-D)!

2 XN standard gateways

Connections at the XN standard gateway

Field bus connections

The XN standard gateways can be connected at the PROFIBUS-DP field bus via the following interfaces:

- SUB-D socket (all XN standard gateways)
→ Chapter "Field bus connection via SUB-D sockets", Page 29
- Terminal blocks (only XN-GW-PBDP-1.5MB and XN-GW-PBDP-1.5MB-S)
→ Chapter "Field bus connection through direct wiring", Page 31



The bus termination must be applied externally if the XI/ON gateway is the first or last station in the bus structure. This external application can be implemented either through separate termination resistors or through a special SUB-D plug which has an integrated bus termination. The precise function and method of operation of the individual bus connection options are explained in detail in Chapter "Coupling with automation equipment", Page 193.

Field bus connection via SUB-D sockets

SUB-D sockets are provided for gateway communication via the PROFIBUS-DP field bus.

XN-GW-PBDP-1.5MB	= 2 x SUB-D
XN-GW-PBDP-1.5MB-S	
XN-GW-PBDP-12MB	= 1 x SUB-D
XN-GWBR-PBDP	
XN-GWBR-DPV1	



Caution!

Use only SUB-D connectors which are certified according to PROFIBUS standard.



Please note that the special SUB-D connector should include 4 inductors (each 100 nH to 110 nH) in the P and N leads (recommendation from the PROFIBUS user organization). The termination of a field bus cable type A or type B is also made only in the connector. The XI/ON gateway itself has no provision for a field bus termination.

The pin assignment for the sockets is shown here as an example:

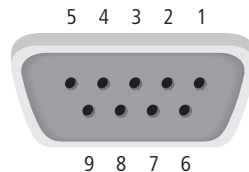


Figure 8: SUB-D socket on the gateway (top view of the socket)

2 XN standard gateways

Connections at the XN standard gateway

Table 10: Pin assignment for SUB-D socket on the gateway

Pin No.	Signal name	Designation
1	PE	Shielding connection/functional ground
2	not used	
3	RxD/TxD-P	Receive/transmit data positive
4	not used	
5	DGND	Data ground reference
6	VP	+ 5V DC for external bus termination
7	not used	
8	RxD/TxD-N	Receive/transmit data negative
9	not used	



The shielding for the field bus is contacted through the housing for SUB-D connectors with a metal housing.

Field bus connection through direct wiring

As an alternative to the field bus connection via SUB-D socket, the gateways XN-GW-PBDP-1.5MB and XN-GW-PBDP-1.5MB-S can also be connected via terminal blocks.

For direct wiring to the PROFIBUS-DP field bus, two terminal blocks are provided:

- At XN-GW-PBDP-1.5MB:
Terminal blocks with tension spring connectors.
- At XN-GW-PBDP-1.5MB-S:
Terminal blocks with screw terminals.

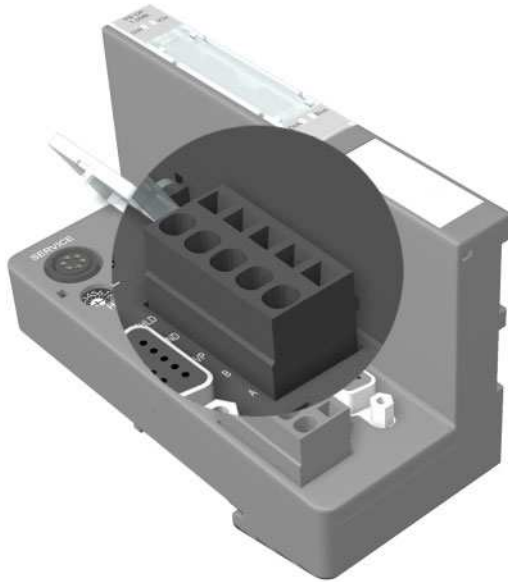


Figure 9: Gateway 1.5 MB – direct wiring to PROFIBUS-DP

2 XN standard gateways

Connections at the XN standard gateway

Table 11: Connections for direct wiring

Designation	Meaning
SHLD	Shielding connection/functional ground
B	Receive/transmit data positive
DGND	Data ground reference
VP	+ 5V DC for external bus termination
A	Receive/transmit data negative

If the gateway is wired up directly, then the bus connection must be shielded (e.g. with the help of a SCH-1-WINBLOC clamp).



Equipotential bonding impedance $\leq 1/10$ shielding impedance

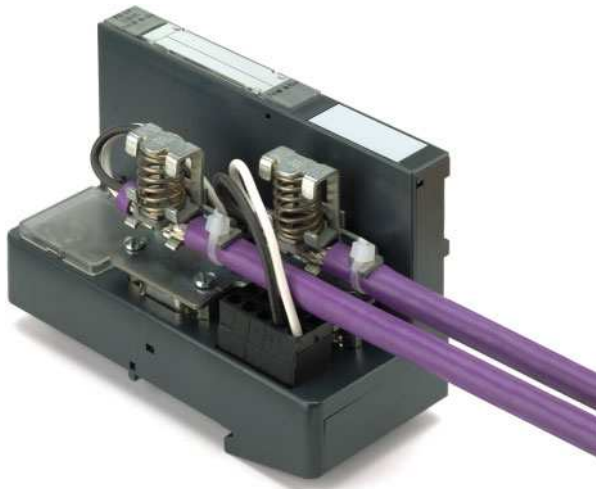


Figure 10: Shielding connection for PROFIBUS-DP



Caution!

Never allow compensating current to flow through the shielding.

To achieve this, a reliable system of equipotential bonding must be installed.

2 XN standard gateways

Connections at the XN standard gateway

Service interface connection

In order to be able to use the service interface of the gateway to connect to a PC with the tool *I/Oassistant* (engineering and diagnostics software), you will have to use a cable with pin assignments that are different from the PS2 standard:

- XI/ON connecting cable (XN-PS2-CABLE)



Caution!

Standard commercial cables will have to be rewired!

Connection through an XI/ON cable

The XI/ON cable is fitted with a PS/2 plug (connection to the socket on the gateway) and a SUB-D socket (connection to the plug on the PC).



Figure 11: PS/2 plug on connecting cable to the gateway (plan view)

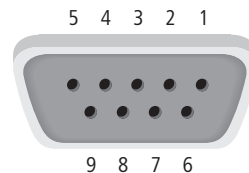


Figure 12: 9-pole SUB-D socket on connecting cable to PC (plan view)

2 XN standard gateways

Connections at the XN standard gateway

Table 12: Pin assignments for PS/2 and SUB-D interfaces

Pin	XI/ON gateway PS/2 socket	SUB-D interface on PC	Pin
1	+5V Gw	DTR, DSR	4, 6
2	GND	GND	5
3	–	–	–
4	TxD	RxD	2
5	/CtrlMode	RTS	7
6	RxD	TxD	3

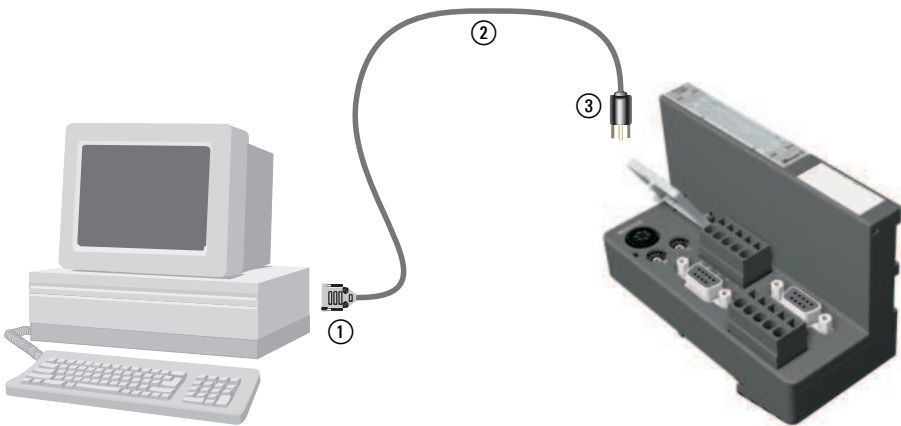


Figure 13: Connection between PC and XI/ON gateway via the XI/ON connecting cable

- ① SUB-D socket
- ② XI/ON connecting cable
- ③ PS/2 plug

2 XN standard gateways Addressing

Addressing

The address setting for the XN standard gateways in a PROFIBUS structure is made through:

- Two rotary hex encoding switches at:
 - XN-GW-PBDP-1.5MB
 - XN-GW-PBDP-1.5MB-S
 - XN-GW-PBDP-12MB
- Two rotary decimal encoding switches:
 - XN-GWBR-PBDP
 - XN-GWBR-DPV1

The switches can be found beneath a cover, below the service interface.

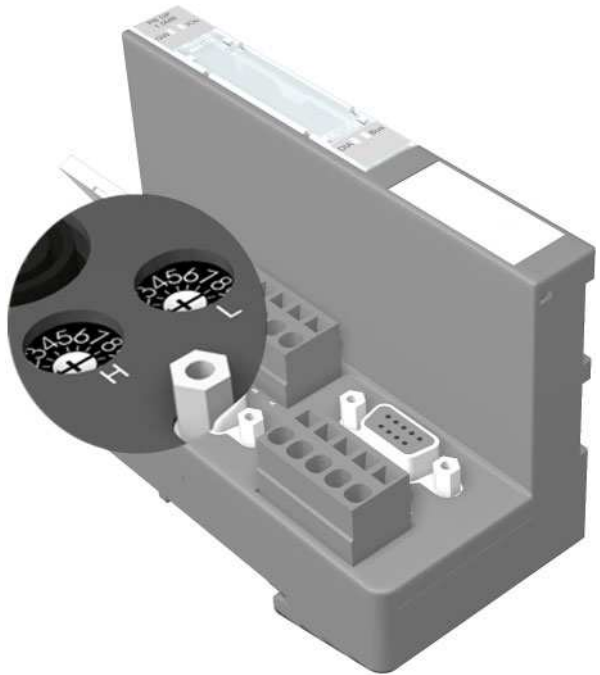


Figure 14: Rotary hex encoding switch for address setting with PROFIBUS-DP



Caution!

A maximum of 125 addresses (001 to 125) can be assigned. Each address can only be assigned once in the entire bus structure.

Bus addresses 000, 126 and 127 must not be used.

The rotary encoding switches are marked with H for High (more significant digit) and L für Low (less significant digit).

XN-GW-...:

The L switch is used to set $L \times 16^0$ (L = 0 to F).

The H switch is used to set $L \times 16^1$ (H = 0 to F).

XN-GWBR-...:

The L switch is used to set $L \times 10^0$ (L = 0 to 9).

The H switch is used to set $L \times 10^1$ (H = 0 to 9).



The ADDRESS switch on the XN-GWBR-... can be used to assign addresses from 1 to 99.



After setting the address, the protective cover over the hex switches must be closed again.

The internal module bus does not require any addressing.

→ Chapter "Maximum system configuration",
Page 186

The XI/ON gateway can be used as a PROFIBUS station at any point in the bus structure. If the gateway is used as the first or last station, then a termination (through an active termination resistor) is required for the PROFIBUS, to ensure error-free communication over the entire bus.



Caution!



If the XI/ON gateway is used as the first or last station in the bus communication, then a special bus connector with a built-in or switched-in termination resistor is absolutely necessary.

Diagnostics indications through the LEDs

Each XI/ON gateway is fitted with the following LED status indicators:

- 2 LEDs for module bus communication (module bus LEDs): **GW** and **IOs**
- 2 LEDs for PROFIBUS-DP communication (field bus LEDs): **DIA** and **Bus**

Table 13: LED indicators

LED	Status	Meaning	Remedy
	green	5 V DC operating voltage is present; firmware is active; gateway is ready for operation and transfer	–
	green flashing, 1 Hz	Firmware not active	<ul style="list-style-type: none"> • Reload the firmware, or contact your Eaton representative.
	green flashing, 4 Hz	Firmware active, gateway hardware is faulty.	<ul style="list-style-type: none"> • Replace the gateway.
	GW: green flashing, 1 Hz IOs: red	Firmware not active	<ul style="list-style-type: none"> • Reload the firmware!
Additional diagnosis indication for XN-GWBR-PBDP and XN-GWBR-DPV1			
GW	green flashing, 1 Hz	U_{SYS} : undervoltage or overvoltage U_L : undervoltage	<ul style="list-style-type: none"> • Check that the supply voltage is within the permissible range. → Chapter “Technical data for XN-GWBR-PBDP and XN-GWBR-DPV1”, Page 25.


2 XN standard gateways

Diagnostics indications through the LEDs

LED	Status	Meaning	Remedy
IOs	green	The configured arrangement of the module bus participants matches the actual configuration; communication is active.	–
	green flashing, 1 Hz	Station is in the Force Mode of the <i>I/Oassistant</i> .	<ul style="list-style-type: none"> Deactivate the Force Mode of the <i>I/Oassistant</i>.
	red and "GW" LED is OFF	Controller is not ready for operation, or the U_{SYS} level is not within the required limits.	<ul style="list-style-type: none"> Check the wiring of the gateway and, if existing, the wiring of the bus refreshing module. If the applied supply voltage is correct, please contact your Eaton partner.
	red	Module bus is not ready for operation.	<ul style="list-style-type: none"> Check that the individual XI/ON modules are correctly installed.
	red flashing, 1 Hz	There is a non-adaptable alteration of the actual arrangement of the module bus participants.	<ul style="list-style-type: none"> Compare the engineering plans of your XI/ON station with the actual layout. Check the layout of your XI/ON station for faulty or wrongly inserted electronics modules.
	red/green flashing, 1 Hz	Adaptable alteration of the actual layout of the module bus participants.	<ul style="list-style-type: none"> Check the XI/ON station for missing or new, unplanned modules.
	red flashing, 4 Hz	No communication via the module bus.	<ul style="list-style-type: none"> Check that the rules for the application of power supply modules have been observed.

2 XN standard gateways

Diagnostics indications through the LEDs

LED	Status	Meaning	Remedy
DIA 	OFF	Gateway does not transmit a diagnosis.	–
	red flashing, 1 Hz	Gateway transmits extended diagnosis.	<ul style="list-style-type: none"> • Check the individual electronics modules of your XI/ON station for diagnostics messages. • Use your PLC software to check the diagnostics messages.
	red	Gateway generates a static diagnosis.	<ul style="list-style-type: none"> • Check the individual electronics modules of your XI/ON station for diagnostics messages. • Use your PLC software to check the diagnostics messages.
Bus	OFF	Field bus is not operating.	<ul style="list-style-type: none"> • Wait until the firmware download is finished. • If the download is finished: hardware error; replace the gateway.
	green	Communication between the gateway and PROFIBUS-DP master is error-free.	–

2 XN standard gateways

Diagnostics indications through the LEDs

LED	Status	Meaning	Remedy
Bus	red	Bus fault in the gateway.	<ul style="list-style-type: none">• Check whether the PROFIBUS-DP ends with a termination resistor, if the XI/ON gateway is the last station in the bus topology.• Check the seating of the PROFIBUS-DP connector (or the joints in the case of direct wiring). All connections must be correct and properly seated.• Check the cable to the PROFIBUS-DP master for correct connection and possible damage.• Check that the correct bit transmission rate is set in the PLC master.• Compare the project engineering plan for the station with the list of modules present.
	red flashing, 4 Hz	Invalid station address has been set.	Use the rotary hex or decimal encoding switches to set up the correct station address.

3 XNE ECO gateway

Gateway XNE-GWBR-PBDP

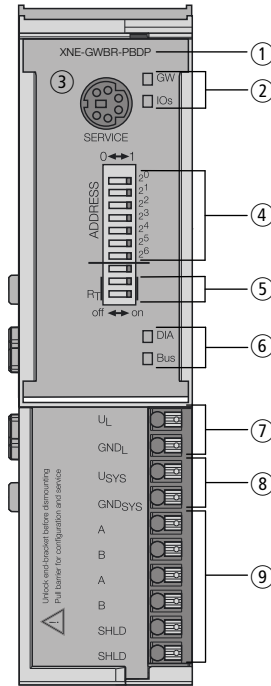


Figure 15: XNE-GWBR-PBDP

- ① Type designation
- ② LEDs for XI/ON station
- ③ Service interface
- ④ DIP switches for the field bus address setting
- ⑤ DIP switches for the terminating resistor
- ⑥ LEDs for PROFIBUS-DP
- ⑦ Push-in tension clamp terminals for field supply
- ⑧ Push-in tension clamp terminals for System supply
- ⑨ Push-in tension clamp terminals for PROFIBUS-DP

3 XNE ECO gateway

Technical data

Technical data

Structure of a XNE ECO gateway

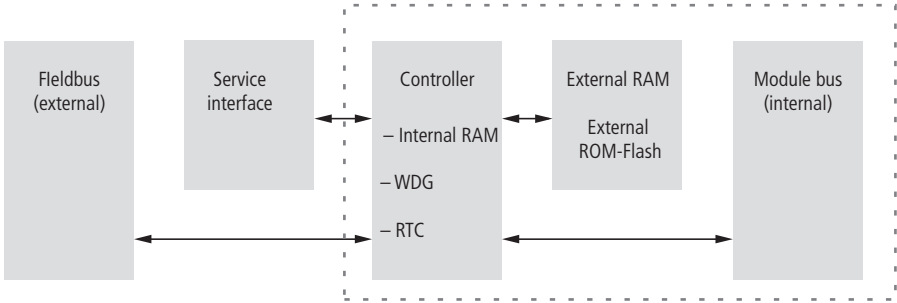


Figure 16: Structure of a XNE-GWBR-PBDP

Technical data of a XNE station



Attention!

The auxiliary supply must meet the requirements for SELV (= Safety Extra Low Voltage) according to IEC 60364-4-41.

Table 14: General technical data of a XNE station

Designation	Value
Maximum system extension	48 modules (XN, XNE) in slice design or max. length of station: 1 m
Supply voltage/ auxiliary voltage	
Field supply	
U_L nominal value (range)	24 V DC (18 to 30 V DC)
I_L max. field current	10 A
Insulation voltage (U_L to U_{SYS} / U_L to field bus / U_L to FE)	$500 V_{rms}$
System supply	
U_{SYS} nominal value (range)	24 V DC (18 to 30 V DC)

Designation	Value
I_{SYS} (at maximum station extension → Chapter "Maximum station extension", Page 61)	max. 600 mA
I_{MB} (supply to the module bus participants)	1 A
Insulation voltage (U_{SYS} to U_L / U_{SYS} to field bus / U_{SYS} to FE)	500 V _{rms}
Residual ripple	according to IEC/EN 61131-2
Voltage anomalies	according to IEC/EN 61131-2
Connection technology	Push-in tension clamp terminals
Physical interfaces	
Field bus	
Protocol	PROFIBUS-DPV0/PROFIBUS-DPV1
Transmission rate	9.6 kBit/s to 12 Mbit/s
Terminating resistor	activation via DIP-switch on the gateway
Insulation voltage (field bus to U_{SYS} / field bus to U_L / field bus to FE)	500 V _{rms}
Field bus connection	Push-in tension clamp terminals
Address setting	via DIP-switch (addresses 1 to 125)
Service interface	
Connection	PS/2 socket
Ambient conditions	
Ambient temperature	
Operating temperature	0 to +55 °C / 32 to 131 °F
Storage temperature	-25 to +85 °C / 13 to 185 °F
Relative humidity according to IEC/EN 60068-2-30	5 to 95 % (indoor), Level RH-2, no condensation (storage at 45 °C, no function test)
Climatic tests	according to IEC/EN 61131-2

3 XNE ECO gateway

Technical data

Designation	Value
Resistance to vibration	
10 to 57 Hz, constant amplitude 0.075 mm / 0.003 inch, 1g	Yes
57 to 150 Hz, constant acceleration 1 g	Yes
Mode of vibration	Frequency sweeps with a change in speed of 1 Octave/min
Period of oscillation	20 frequency sweeps per axis of coordinate
Shock resistant according to IEC/EN 60068-2-27	18 shocks, sinusoidal half-wave 15 g peak value/11 ms, in each case in \pm direction per space coordinate
Resistance to repetitive shock according to IEC/EN 60068-2-29	1 000 shocks, half-sinus 25 g peak value/6 ms, in each case in \pm direction per space coordinate
Drop and topple	
Height of fall (weight < 10 kg)	1.0 m
Height of fall (weight 10 to 40 kg)	0.5 m
Test runs	7
Device with packaging, electrically tested printed-circuit board.	yes
Electromagnetic compatibility (EMC) according to IEC/EN 61000-6-2 (Industry)	
Static electricity according to IEC/EN 61000-4-2	
Discharge through air (direct)	8 kV
Relay discharge (indirect)	4 kV
Electromagnetic HF fields according to IEC/EN 61000-4-3	10 V/m
Conducted interferences induced by HF fields according to IEC/EN 61000-4-6	10 V

Designation	Value
Fast transients (Burst) according to IEC/EN 61000-4-4	1 kV / 2 kV
Emitted interference according to IEC/EN 61000-6-4 (Industry)	according to IEC/CISPR 11 / EN 55011 Class A ¹⁾

- 1) This device can cause radio disturbances in residential areas. Additional measures to suppress the disturbance are necessary.

Approvals and tests for an XI/ON station

Table 15: Approvals and tests for a XI/ON station

Designation	Value
Approvals ¹⁾	CE, cULus
Tests (IEC/EN 61131-2)	
Cold	IEC/EN 60068-2-1
Dry heat	IEC/EN 60068-2-2
Damp heat, cyclical	IEC/EN 60068-2-30
Temperature changes	IEC/EN 60068-2-14
Operating life MTBF	120 000 h ²⁾
Removal/insertion cycles for electronics modules	20
Pollution level according to IEC/EN 60664 (IEC/EN 61131-2)	2
Degree of protection according to IEC/EN 60529	IP 20

- 1) The approvals of newer XI/ON modules can still be pending
- 2) The lifespan of the relay module is not stated in hours. The number of operating cycles is relevant for the lifespan.

Technical Data for the Push-in tension clamp terminals

Table 16: Technical data for the Push-in tension clamp terminals

Designation	Value
Measurement data	according to VDE 0611 Part 1/8.92 / IEC/EN 60947-7-1
Protection class	IP20
Insulation stripping length	8.0 to 9.0 mm / 0.32 to 0.36 inch
Max. wire range	0.14 to 1.5 mm ² / 0.0002 to 0.0023 inch ² / AWG 24 to AWG 16
Crimpable wire	
"e" solid core H 07V-U	0.25 to 1.5 mm ² / 0.0004 to 0.0023 inch ²
"f" flexible core H 07V-K	0.25 to 1.5 mm ² / 0.0004 to 0.0023 inch ²
"f" with ferrules without plastic collar according to DIN 46228-1 (ferrules crimped gas-tight)	0.25 to 1.5 mm ² / 0.0004 to 0.0023 inch ²
"f" with ferrules with plastic collar according to DIN 46228-1 (ferrules crimped gas-tight)	0.25 to 0.75 mm ² / 0.0004 to 0.0012 inch ²
Test finger according to IEC/EN 60947-1	A1

Connections at XNE-GWBR-PBDP

Push-in tension clamp terminals

The field bus connection as well as the power supply connection are realized via Push-in tension clamp terminals.

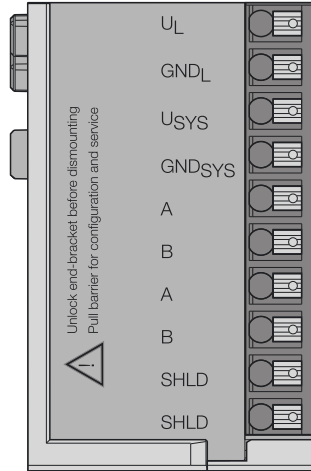


Figure 17: Push-in tension clamp terminals at XNE-GWBR-PBDP



Attention!

Mixing-up the connectors for power supply and bus connection can lead to the destruction of the gateway electronics!

Voltage Supply

The XNE-GWBR-PBDP provides an integrated power supply module and has connectors for:

- field supply voltage (U_L , GND_L) and
- system supply voltage (U_{SYS} , GND_{SYS})

Field bus connection via Push-in tension clamp terminals

Push-in tension clamp terminals are also used for the gateway's connection to PROFIBUS-DP.

The pin assignment for the tension clamp terminals is as follows:

Table 17: Pin assignment for the Push-in tension clamp terminals for the bus connection

Designation	Description
B	Receive-/transmit data -P
A	Receive-/transmit data -N
SHLD	Shield/ functional earth



The shielding of the field bus cable is established directly on the mounting rail using a SHLD terminal.



Figure 18: Shielding the bus cable via shielding brackets on the mounting rail



Equipotential bonding impedance $\leq 1/10$ shielding impedance.

Service interface connection

In order to be able to use the service interface of the gateway to connect to a PC with the "I/O *assistant*" (engineering and diagnostics software), you will have to use a cable with pin assignments that are different from the PS2 standard:

- XI/ON connection cable (XN-PS2-CABLE)



Attention!

Standard commercial cables will have to be rewired!

Connection with XI/ON cable

The XI/ON cable is fitted with a PS/2 plug (connection to the socket on the gateway) and a SUB-D socket (connection to the plug on the PC).



The service interface can be found under the upper label of the gateway. Pull the label upwards out of the housing in order to reach the service interface.

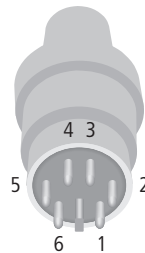


Figure 19: PS/2 plug on connecting cable to the gateway (top view)

3 XNE ECO gateway Connections at XNE-GWBR-PBDP

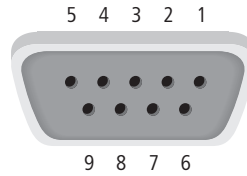


Figure 20: 9-pole SUB-D socket on connecting cable to PC (top view)

Table 18: Pin assignment for PS/2 and SUB-D interfaces

Pin	XI/ON gateway PS/2 socket	Sub-D interface on PC	Pin
1	+5V Gw	DTR, DSR	4, 6
2	GND	GND	5
3	–	–	–
4	TxD	RxD	2
5	/CtrlMode	RTS	7
6	RxD	TxD	3

3 XNE ECO gateway

Addressing at the field bus

Addressing at the field bus Addressing the XNE ECO gateways on PROFIBUS-DP is done via the DIP-switches on the gateway.

These DIP switches can be found under the gateway's upper label.

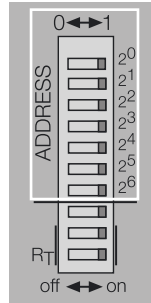


Figure 21: DIP-switches on the gateway



Pull the label upwards out of the housing in order to reach the DIP-switches.



Attention!

A maximum of 125 addresses (001 to 125) can be assigned. Each address can only be assigned once in the entire bus structure. Bus addresses 000, 126 and 127 must not be used.

The gateway's bus address results from the addition of the valences (2^0 to 2^5) of the switched DIP-switches (position = 1).

Example:

Bus address 50 = $0 \times 32 = 0110010$

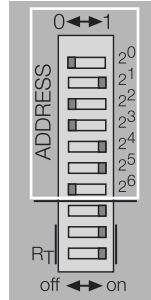


Figure 22: Bus address 50

The internal module bus does not require any addressing.

Setting the baud rate

The gateway XNE-GWBR-PBDP offers an automatic baud rate detection.

The baudrate set on the PROFIBUS-DP is automatically detected by the gateway as soon as the device is connected to the PROFIBUS-DP and is started.

3 XNE ECO gateway

Activating the bus terminating resistor

Activating the bus terminating resistor

If the XNE ECO gateway is used as the first or the last station in the bus communication, the field bus line has to be terminated using a terminating resistor.

The XNE-GWBR-PBDP allows the activation of the resistors R_T using the last two DIP-switches.



Both DIP-switches have to be in the same position in order to activate or deactivate the bus terminating resistor.

Bus terminating resistor switched off:

Bus terminating resistor switched on:

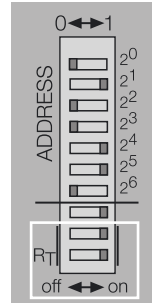
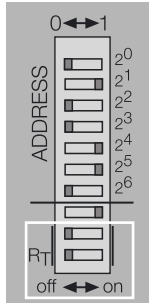


Figure 23: Bus terminating resistor R_T

Diagnostics indications through the LEDs

Each XI/ON gateway is fitted with the following LED status indicators:

- 2 LEDs for module bus communication (module bus LEDs): **GW** and **IOs**
- 2 LEDs for PROFIBUS-DP communication (field bus LEDs): **DIA** and **Bus**

Table 19: LED indicators

LED	Status	Meaning	Remedy
GW	green	5 V DC operating voltage is present; firmware is active; gateway is ready for operation and transfer	–
	green flashing, 1 Hz	U _{sys} : undervoltage or overvoltage U _L : undervoltage	• Check that the supply voltage is within the permissible range. → Chapter “Technical data of a XNE station”, Page 44.
	green flashing, 4 Hz	Firmware active, gateway hardware is faulty.	• Replace the gateway.
GW & IOs	GW: green flashing, 1 Hz IOs: red	Firmware not active	• Reload the firmware! Contact your Eaton representative.

3 XNE ECO gateway

Diagnostics indications through the LEDs

LED	Status	Meaning	Remedy
IOs	green	The configured arrangement of the module bus participants matches the actual configuration; communication is active.	–
	green flashing, 1 Hz	Station is in the Force Mode of the <i>I/Oassistant</i> .	<ul style="list-style-type: none"> Deactivate the Force Mode of the <i>I/Oassistant</i>.
	red and "GW" LED is OFF	Controller is not ready for operation, or the U_{SYS} level is not within the required limits.	<ul style="list-style-type: none"> Check the wiring at the gateway. If the applied supply voltage is correct, please contact your Eaton representative.
	red	Module bus is not ready for operation.	<ul style="list-style-type: none"> Check that the individual XI/ON modules are correctly installed.
	red flashing, 1 Hz	There is a non-adaptable alteration of the actual arrangement of the module bus participants.	<ul style="list-style-type: none"> Compare the engineering plans of your XI/ON station with the actual layout. Check the layout of your XI/ON station for faulty or wrongly inserted electronics modules.
	red/green flashing, 1 Hz	Adaptable alteration of the actual layout of the module bus participants.	<ul style="list-style-type: none"> Check the XI/ON station for missing or new, unplanned modules.
	red flashing, 4 Hz	No communication via the module bus.	<ul style="list-style-type: none"> Check the power supply at the gateway.

3 XNE ECO gateway

Diagnostics indications through the LEDs

LED	Status	Meaning	Remedy
DIA	OFF	Gateway does not transmit a diagnosis.	–
	red flashing, 1 Hz	Gateway transmits extended diagnosis.	<ul style="list-style-type: none"> • Check the individual electronics modules of your XI/ON station for diagnostics messages. • Use your PLC software to check the diagnostics messages.
	red	Gateway generates a static diagnosis.	<ul style="list-style-type: none"> • Check the individual electronics modules of your XI/ON station for diagnostics messages. • Use your PLC software to check the diagnostics messages.
Bus	OFF	Field bus is not operating.	<ul style="list-style-type: none"> • Wait until the firmware download is finished. • If the download is finished: hardware error; replace the gateway.
	green	Communication between the gateway and PROFIBUS-DP master is error-free.	–

3 XNE ECO gateway

Diagnostics indications through the LEDs

LED	Status	Meaning	Remedy
Bus	red	Bus fault in the gateway.	<ul style="list-style-type: none">• Check whether the PROFIBUS-DP ends with a termination resistor, if the XI/ON gateway is the last station in the bus topology.• Check the seating of the PROFIBUS-DP connector (or the joints in the case of direct wiring). All connections must be correct and properly seated.• Check the cable to the PROFIBUS-DP master for correct connection and possible damage.• Check that the correct bit transmission rate is set in the PLC master.• Compare the project engineering plan for the station with the list of modules present.
	red, flashing, 4 Hz	Invalid station address has been set.	<ul style="list-style-type: none">• Use the DIP-switches to set up the correct station address.

Maximum station extension

A XI/ON station with the gateway XNE-GWBR-PBDP can contain max. **48 modules**. However, if one or more of the following listed limit values is exceeded, the allowed number of modules is reduced.

The preconditions for the maximum station extension with 48 modules are:

- Max. **244** configuration bytes per station on PROFIBUS-DP
- Max. **235** parameter bytes per station on PROFIBUS-DP
- Max. **252** communication bytes which are transmitted via the module bus from the modules to the gateway
- The maximum permissible sum for the nominal current consumptions ($\Sigma I_{MB} = 1 \text{ A}$) of all modules in a station (without gateway) on the module bus may not be exceeded.



Attention!

The use of Bus Refreshing module in combination with the XNE-GWBR-PBDP is not possible!



Attention!

Ensure that a sufficient number of Power Feeding modules are used if the system is extended to its maximum.



If the system limits are exceeded, the software *I/Oassistant* generates an error message when the user activates the command [Station] > [Verify].

For the calculation of the maximum system extension, the following table contains an overview of configuration, parameter and communication bytes as well as of the modules' nominal current consumptions:

3 XNE ECO gateway

Maximum station extension

Table 20: Configuration, parameter and communication bytes and nominal current consumptions of the XI/ON modules

Module	Number of bytes:			
	configura- tion bytes	param- eter bytes	communi- cation bytes	nom. current consumption from module bus I _{MB}
XN-PF-24VDC-D	4	1	2	≤ 28 mA
XN-PF-120/230VAC-D	4	1	2	≤ 25 mA
XN-2DI-24VDC-P	5	1	1	≤ 28 mA
XN-2DI-24VDC-N	5	1	1	≤ 28 mA
XN-2DI-120/230VAC	5	1	1	≤ 28 mA
XN-4DI-24VDC-P	5	1	1	≤ 29 mA
XN-4DI-24VDC-N	5	1	1	≤ 28 mA
XN-16DI-24VDC-P	5	1	2	≤ 45 mA
XN-32DI-24VDC-P	5	1	4	≤ 30 mA
XNE-8DI-24VDC-P	5	1	1	≤ 15 mA
XNE-16DI-24VDC-P	5	1	2	≤ 15 mA
XN-1AI-I(0/4...20MA)	5	2	3	≤ 41 mA
XN-2AI-I(0/4...20MA)	5	3	5	≤ 35 mA
XN-1AI-U(-10/0...+10VDC)	5	2	3	≤ 41 mA
XN-2AI-U(-10/0...+10VDC)	5	3	5	≤ 35 mA
XN-2AI-PT/NI-2/3	5	5	5	≤ 45 mA
XN-2AI-THERMO-PI	5	3	5	≤ 45 mA
XN-4AI-U/I	5	5	9	≤ 20 mA
XNE-8AI-U/I-4PT/NI	5	9	9	≤ 30 mA
XN-2DO-24VDC-0.5A-P	5	1	2	≤ 32 mA
XN-2DO-24VDC-0.5A-N	5	1	2	≤ 32 mA
XN-2DO-24VDC-2A-P	5	1	2	≤ 33 mA
XN-2DO-120/230VAC-0.5A	5	1	2	≤ 35 mA
XN-4DO-24VDC-0.5A-P	5	1	2	≤ 30 mA

Module	Number of bytes:			
	configura- tion bytes	param- eter bytes	communi- cation bytes	nom. current consumption from module bus I _{MB}
XN-16DO-24VDC-0.5A-P	5	1	3	≅ 120 mA
XN-32DO-24VDC-0.5A-P	5	1	5	≅ 30 mA
XNE-8DO-24VDC-0.5A-P	5	1	2	≅ 15 mA
XNE-16DO-24VDC-0.5A-P	5	1	2	≅ 25 mA
XN-1AO-I(0/4...20MA)	5	4	4	≅ 39 mA
XN-2AO-I(0/4...20MA)	5	7	7	≅ 40 mA
XN-2AO-U(-10/0...+10VDC)	5	7	7	≅ 43 mA
XNE-4AO-U/I	5	13	9	≅ 40 mA
XN-2DO-R-NC	5	1	1	≅ 28 mA
XN-2DO-R-NO	5	1	1	≅ 28 mA
XN-2DO-R-CO	5	1	1	≅ 28 mA
XN-1CNT-24VDC	6	17	9	≅ 40 mA
XNE-2CNT-2PWM	6	17	9	≅ 30 mA
XN-1RS232	6	5	9	≅ 140 mA
XN-1RS485/422	6	5	9	≅ 60 mA
XN-1SSI	6	5	9	≅ 50 mA
XNE-1SWIRE	6	25	9	≅ 60 mA

3 XNE ECO gateway
Maximum station extension

4 Communication in PROFIBUS-DP

System overview PROFIBUS DP

PROFIBUS is a manufacturer-independent and open field bus standard for a wide area of applications in factory and process automation. Manufacturer independence and openness are guaranteed by the international standards IEC/EN 61158 and IEC/EN 61784. PROFIBUS enables communication of devices of various manufacturers without requiring particular interface adaptations.

PROFIBUS-DP (Decentral Periphery) is designed for data transfer between the control and the input/output level.

PROFIBUS-DP is the speed-optimized PROFIBUS version, specially designed for communication between automation devices and decentralized peripheral devices. PROFIBUS-DP is suited to replace cost-intensive parallel signal transmission via digital and analogue sensors and actuators.

Master/slave system

PROFIBUS-DP is a master/slave system, which consists of a master (usually integrated in the PLC) and up to 31 slaves per segment. During operation, the master constantly scans the connected slave stations. Several masters may be connected within a single network; this would then be classified as a multi-master system. In this case they pass on their transmission permission (Token Passing).

PROFIBUS-DP uses a bit transmission layer (Physical Layer) based on the industrially proven RS485 standard.

System configuration and device types

PROFIBUS-DP is suited for both mono-master or multi-master system configuration. Thus a high level of flexibility in system configuration is guaranteed. The network comprises 126 devices max. (master or slaves).

Configurable system parameters include the number of stations, the assignment of the station address to the I/O addresses, data consistency of I/O data, format of diagnostic messages and the bus parameters used. Every PROFIBUS-DP system consists of different types of devices.

One distinguishes between three device types:

- DP master class 1 (DPM1):
This is a central control, which exchanges data in a defined message cycle with the remote stations (slaves). Typical devices are, for instance, programmable logic controllers (PLCs) or PCs.
- DP master class 2 (DPM2):
Devices of this type are engineering, configuration or operating devices. They are used during set-up, maintenance and diagnosis, to configure

the connected devices, to evaluate parameters and to scan the device status.

- DP slave:
A PROFIBUS-DP slave is a peripheral device (I/Os, drives, transducers), which reads input data and provides output data to the periphery. Of course, there are also devices which provide only input or only output data. The input and output data volume depends on the specific device and may comprise up to 244 bytes input data and 244 bytes output data.

Single-master systems

With mono-master systems merely a single master on the bus is active during bus operation. The PLC is the central control component. The slaves are coupled decentrally to the PLC via the transmission medium. With this type of system configuration the shortest bus cycle times are achieved.

Multi-master systems

In multi-master operation there are several masters on the bus. These form independent sub-systems, consisting of one DPM1 each and the associated slaves, or additional configuration and diagnostic devices. The slave input and output data can be read by all DP masters. Writing of outputs is reserved to a single DP master (the assigned DPM1 during configuration). Multi-Master systems achieve an average bus cycle time. In time-critical applications you should monitor the bus cycle time via a connected diagnostic tool.

Topology

PROFIBUS-DP communicates via a shielded 2-wire cable according to the RS485 standard. The network topology accords to a line structure with active bus terminators on both ends.

Diagnostic functions

The comprehensive diagnostic functions of PROFIBUS-DP allow fast error localization.

The PROFIBUS-DP diagnosis is divided into three levels:

Table 21: PROFIBUS-DP diagnosis

Type of diagnosis	Description
Station-related diagnostics	Messages concerning the general operational readiness of a bus node.
Module-related diagnostics	These messages indicate that there is a diagnostic message within the a certain I/O area (e.g. 8 bit output module) of a bus node.
Channel-related diagnostics	Here the error cause of a single input/output bit, i.e. relating to a single channel, is indicated. Example: "Short-circuit at output 2"

The PROFIBUS slaves of the XI/ON series support the diagnostic functions of PROFIBUS-DP.

The evaluation of the diagnostic data via the control depends on the support of the master.



Further information on diagnostics can be taken from the device descriptions of the master interfaces of the various manufacturers.

Sync and freeze mode

In addition to the node-specific user data traffic, which is automatically controlled by the DPM1, the DP master has the possibility to send control commands to a slave, a group of slaves, or simultaneously to all DP slaves. These control commands are transmitted as multicast messages.

The sync and freeze mode for synchronization of the DP slaves can be determined via the control commands. They enable event-controlled synchronization of the DP slaves.

Sync mode

The DP slaves initiate the sync mode upon receipt of a sync control command from the assigned DP master. In this mode, all addressed DP slaves "freeze" their present output status.

During the following user data transfer cycles, the output data are stored by the DP slaves, while the output states are retained. Only after receipt of the next sync control command from the master, the stored output data are switched through to the outputs.

The sync mode is terminated upon an Unsync control command.

Freeze mode

The freeze control command induces the addressed DP slaves to assume the freeze mode. In this mode, the momentary values of the input states are "frozen". Input data will only be updated upon receipt of the next freeze command from the DP master by the affected devices.

The freeze mode is terminated upon an unfreeze control command.

System performance

In order to achieve a relatively high level of device interchangeability, the PROFIBUS-DP system performance has also been standardized. It is largely determined by the operating status of the DPM1. This can be either controlled locally or via the bus from the configuration device.

One distinguishes between three major conditions:

Table 22: Operating modes

Operating mode	Description
Stop	There is no data transfer between the DPM1 and the DP slaves. The coupling module merely addresses the modules once after power-up (none of the I/O LEDs illuminate).
Clear	The DPM1 reads the input data of the DP slaves and retains the outputs of the DP slaves in the safe state (depending on the reaction to field bus errors, the green I/O LED illuminates and the outputs are set).
Operate	The DPM1 is in the data transfer phase. During cyclic data exchange the inputs of the DP slaves are read and the output information is transferred to the DP slaves (the green I/O LED illuminates).

The DPM1 sends its local status within a configurable time interval via a multi-master command to all assigned DP slaves. The system response to an error in the data transfer phase of the DPM1, e.g. a failure of a DP slave, is determined by the operating parameter "Auto-Clear". If this parameter is set to "True", then the DPM1 switches all outputs of the assigned DP slaves to the safe status, as soon as a DP slave is no longer capable of user data transfer. Then the DPM1 changes to the "Clear" state. If this parameter is set to "False", then the DPM1 will retain its operating condition also in the event of an error and the user can determine the system response.

Data transfer between DPM1 and the DP slaves

Data exchange between the DPM1 and the assigned DP slaves is automatically controlled by the DPM1 in a determined fixed order. During configuration of the bus system, the user assigns the DP slaves to the DPM1. It is also defined which DP slaves are to be included in or excluded from cyclic user data transfer.

Data exchange between DPM1 and the DP slaves can be divided into the phases parameterization, configuration and data transfer.

Prior to including a DP slave in the data transfer phase, the DPM1 checks during the parameterization and configuration phase, whether the programmed required configuration complies with the actual device configuration. This check is used to verify that the device type, the format and length information as well as the number of inputs and outputs accord. The user thus is securely protected against parameterization errors. Additionally to the user data transfer, which is automatically effected by the DPM1, it is also possible to send new parameters to the DP slaves upon request of the user.

Protective mechanisms

In the decentralized periphery it is required to provide the system with highly effective protective functions against faulty parameterization or failure of the transmission devices. PROFIBUS-DP applies certain mechanisms to monitor the DP master and the DP slaves. These can be described as time monitoring functions. The monitoring interval is determined during system configuration.

Table 23: Protective mechanisms

Protective mechanisms	Description
Of the DP master	The DPM1 controls the user data transfer of the slaves via the Data_Control_Timer. Each assigned slaves has a monitoring timer of its own. The timer actuates if no user data are transferred correctly during a certain time interval. In this case the user is informed on this condition. If automatic error response (Auto_Clear = True) is enabled, the DPM1 terminates the "Operate" status, switches the outputs of the assigned slaves into the safe status and returns to the operating status "Clear".
Of the DP slave	The slave carries out response monitoring to detect master or transmission errors. If there is no data exchange during the response monitoring interval with the associated master, the slave automatically switches the outputs into the safe status. In multi-master system operation, an additional access protection is required for the inputs and outputs of the slaves, in order to ensure that only the authorized master has direct access. The slaves provide an input and output image for all other masters so that this map can be read by any master, even without access token.

Ident. number

Each DP slave and each DPM1 must have an individual ident. number. It is needed so that the DP master can identify the connected devices directly without creating significant protocol overhead. The master compares the ident. numbers of the connected DP devices with the ident. numbers registered in the configuration data of the DPM2. User data transfer will only be started, if the right device types with the right station addresses are connected to the bus. This provides additional protection against configuration errors. The manufacturer specific ident. nos. are determined and assigned by the PROFIBUS user organization (PNO). The PNO governs the ident. nos. together with the GSD files.

GSD files

Each PROFIBUS-DP module has a so-called GSD file (German abbr. for device data base file) that comprises detailed information on the module: I/O data volume, transmission rates, revision status etc. This GSD file is needed to configure the station within the PROFIBUS-DP system.

You can find the latest GSD files on our home page (www.eaton-automation.com), under "DOWNLOADS".

Short description of PROFIBUS-DPV1

General

PROFIBUS-DPV1 is an enhancement of PROFIBUS-DP which provides the possibility of acyclic data communication.

A cyclic and centrally directed data transfer between master and slaves is characteristic for the standard functions of PROFIBUS-DP. A DPM1 (PLC) controls the cyclic exchange of process data with the slaves. The data exchange is carried out in rotation and in a defined order. The data which have to be transmitted are projected beforehand.

Via acyclic communication functions, PROFIBUS-DPV1 now offers the possibility to transmit data to the slave in addition to the cyclic process data.

Acyclic data transfer

The need for acyclic data transfer exists wherever slave devices which provide several parameterization options have to be parameterized during operation.

Typical examples are the parameters of a drive, like limit values, rotational speed or torque, operation mode and the generation of an error list.

Acyclic services are handled with low priority, parallelly and additionally to the cyclic process data transfer. The negative influence on the speed of the high-priority process data transfer, shall thus be minimized.

DPV1-functions

The DPV1-functions consist basically of the services "Read" and "Write". The master uses these services for read or write access to data blocks in PROFIBUS.

In addition to that, the following services have been defined:

- an "initiate" and "abort"-service for the connection management,
- a "data-transport"-service for the exchange of large data packages and
- the "alarm"- and "status"-services for the transmission of alarm messages.



At present, the XI/ON-gateways for DPV1 only support the services "Read" and "Write".

DPM1 versus DPM2

PROFIBUS-DPV1 differentiates between two master classes.

An automation system (PLC), which generally controls the basic cyclic process data transfer with standard DP-functions, is defined as DP master class 1. A Class1-master can use DPV1-functions optionally.

The new DP master class 2 (DPM2) is generally an engineering tool which is used for the acyclic data transfer.

The protocol cycle of the DPV1-functions on the field bus depends on the use of a Class1- or a Class2-master.

Addressing the data in DPV1

The data-addressing is done per module by means of the following details:

- slot
- index
- length

The slot-number addresses the module and the index addresses the module's parameters. Each data block can have a maximum size of 240 bytes.

In case of a successful data access, the slave sends a positive answer. If the data access failed, a negative answer which classifies the problem precisely is sent.

4 Communication in PROFIBUS-DP

Parameterization

Parameterization

Overview gateway parameters

All XI/ON gateways for the PROFIBUS-DP require 5 parameter bytes, which are used exclusive to describe the behavior of the gateway itself. The first 3 parameters are not used, for reasons of compatibility.

The structure of the data byte (parameters) depends on the gateway type:

Table 24: DPV0 gateways

	B7	B6	B5	B4	B3	B2	B1	B0
Byte 0	reserved							
Byte 1	reserved							
Byte 2	reserved							
Byte 3			Outputs fieldbus error		Outputs module change error		Outputs module alteration	
Byte 4			Gate-way diagnosis	I/O <i>assistant</i> Force Mode	Station configuration		Diag-nosis of all mo-dules	Integer data format

Table 25: DPV1 gateways

	B7	B6	B5	B4	B3	B2	B1	B0
Byte 0	reserved							
Byte 1	reserved							Startup when expected / actual config. differ
Byte 2	reserved							
Byte 3			Outputs fieldbus error		Outputs module sequence error		Outputs module sequence deviation	
Byte 4	res.	Static configuration	res.	I/O <i>assistant</i> Force Mode	res.	U _L diagnostics	Diagnostics from modules	Integer data format

Gateway parameters of the DPV0 gateways

The texts in the "Parameter name" and "Value" columns correspond to the definitions in the Basic Device Data files (GSD files). These texts are also identically included in the configuration software of the DP master.

To help with parameter setting through a hexadecimal number, two tables are attached to this manual. The hexadecimal values can be taken from these tables.

→ Chapter "Byte 3 of the gateway parameter data", Page 253

→ Chapter "Byte 4 of the gateway parameter data", Page 256

Table 26: Gateway parameters of the DPV0 gateways

Byte/ parameter name	Value	Value designation	Meaning
Byte 3			
Bit 0 and 1: Outputs module change	00 ¹⁾	Output a 0	The gateway switches the outputs of the modules to 0. No error information is transmitted.
	01	Output substitute value	The gateway switches the outputs of non-commandable modules to 0. An error information is transmitted to command-enabled modules. These modules decide whether to set their outputs to 0 or a substitute value, or to retain the values, depending on the configuration. The command-enabled modules without a configuration switch their outputs to 0.
	10	Hold present value	The gateway retains the present data states at the outputs of non-commandable modules. An error information is transmitted to command-enabled modules. These modules decide whether to set their outputs to 0 or a substitute value, or to retain the values, depending on the configuration. Command-enabled modules without a configuration retain the present output states.
	11	Exchange process data	The gateway continues to exchange process data with the other module bus participants. No error information is transmitted.

4 Communication in PROFIBUS-DP Parameterization

Byte/ parameter name	Value	Value designation	Meaning
Bit 2 and 3: Outputs module change error	00 ¹⁾	Output a 0	The gateway switches the outputs of the modules to 0. No error information is transmitted.
	01	Output substitute value	The gateway switches the outputs of non-commandable modules to 0. An error information is transmitted to command-enabled modules. These modules decide whether to set their outputs to 0 or a substitute value, or to retain the values, depending on the configuration. The command-enabled modules without a configuration switch their outputs to 0.
	10	Hold present value	The gateway retains the present data states at the outputs of non-commandable modules. An error information is transmitted to command-enabled modules. These modules decide whether to set their outputs to 0 or a substitute value, or to retain the values, depending on the configuration. Command-enabled modules without a configuration retain the present output states.
	11	Exchange process data	The gateway continues to exchange process data with the other module bus participants. No error information is transmitted.

4 Communication in PROFIBUS-DP Parameterization

Byte/ parameter name	Value	Value designation	Meaning
Bit 4 and 5: Outputs fieldbus error	00 ¹⁾	Output a 0	The gateway switches the outputs of the modules to 0. No error information is transmitted.
	01	Output substitute value	The gateway switches the outputs of non-commandable modules to 0. An error information is transmitted to command-enabled modules. These modules decide whether to set their outputs to 0 or a substitute value, or to retain the values, depending on the configuration. The command-enabled modules without a configuration switch their outputs to 0.
	10	Hold present value	The gateway retains the present data states at the outputs of non-commandable modules. An error information is transmitted to command-enabled modules. These modules decide whether to set their outputs to 0 or a substitute value, or to retain the values, depending on the configuration. Command-enabled modules without a configuration retain the present output states.
	11		reserved

4 Communication in PROFIBUS-DP Parameterization

Byte/ parameter name	Value	Value designation	Meaning
Byte 4			
Bit 0: Integer data format	0 ¹⁾	LSB first	Data are converted to the INTEL format (standard format).
	1	MSB first	16-Bit data are transmitted with the low and high bytes in the reversed order. The parameter affects the process data!
Bit 1: Diagnosis of all modules	0 ¹⁾	activate	Diagnostics messages from the module bus participants are passed to the field bus master as extended diagnoses.
	1	deactivate	Diagnostics messages from the module bus participants are not displayed. A module diagnosis does not automatically trigger a station diagnosis.
Bit 3: Station configuration	0 ¹⁾	Do not permit deviations	When the field bus master starts up the XI/ON station, the list of actual modules must precisely match the module list that has been planned into the configuration software of the master.
	1	Adapt deviations	When the field bus master starts up the XI/ON station, the list of actual modules is permitted to deviate from the module list that has been planned into the configuration software of the master: If planned module slots are empty in the configuration as implemented, these empty slots are allocated to the planned modules. If planned empty slots have modules installed in the configuration as implemented, these modules will be ignored by the gateway.

Byte/ parameter name	Value	Value designation	Meaning
Bit 4: <i>I/Oassistant</i> - ForceMode	0 ¹⁾	Enable	The Force Mode can be set up by the <i>I/Oassistant</i> .
	1	Inhibit	The Force Mode cannot be set up by the <i>I/Oassistant</i> if the DP master has parameterized the station.
Bit 5: Gateway diagnosis	0 ¹⁾	Device-specific diagnosis	The selection of "Device-specific diagnosis" generates a shortened diagnosis display that only shows the gateway diagnosis (device-specific diagnosis). The diagnostics bytes from all the diagnostics-enabled modules in the station are attached.
	1	Device/identifier/channel diagnosis	Selecting this type of display means that a channel-specific diagnosis can be generated. The error type can be displayed as text (e.g. "Parameterization error") when commissioning with configurators that access the XI/ON GSD-file. This comprehensive type of display can be presented for a maximum of 15 channels. The diagnosis telegram has the following structure: 2 bytes of gateway diagnostics (device-specific diagnostics) 64 bits of identifier-specific diagnostics n x 3 bytes of channel-specific diagnostics (n = no. of channels with active diagnosis)

1) Default setting

Gateway parameters of the DPV1 gateways

The texts in the columns “Parameter name” and “Meaning” correspond to those determined in the Basic Device Data files (GSD files).

Table 27: Gateway parameters of the DPV1 gateways

Byte/ parameter name	Value	Value designation	Meaning
General parameters			
Byte 0		reserved	
Byte 1			
Bit 0: Startup when expected/actual config. differ	0 ¹⁾	activated	Reaction depending on the parameter byte 4, bit 6 “Static configuration”. → If the parameter “Static configuration” is deactivated, the process data exchange is not disturbed in case of module sequence error.
	1	deactivated	Reaction depending on the parameter byte 4, bit 6 “Static configuration”. → If the parameter “Static configuration” is activated, the process data exchange is not disturbed in case of module sequence error.
Bit 1 to 7		reserved	
Byte 2			
Bit 0 to 5		reserved	
Bit 6		reserved (depending on the configuration tool)	
Bit 7		reserved	

Byte/ parameter name	Value	Value designation	Meaning
Device specific parameters			
Byte 3			
Bit 0 and 1: Outputs module sequence deviation	00 ¹⁾	Output 0	The gateway switches the outputs of the modules to "0". No error information is transmitted.
	01	Output substitute value	The gateway switches the outputs of all modules (with the exception of analog output modules) to "0". Error information is transmitted to the analog output modules. Depending on their configuration, these modules decide to set their outputs either to "0" or to a default value, or to maintain the original values. The non-configured analog output modules set their outputs to "0".
	10	Hold current value	The gateway maintains the actual output settings of all modules, (with the exception of analog output modules). Error information is transmitted to the analog output modules. Depending on their configuration, these modules decide to set their outputs either to "0" or to a default value, or to maintain the original values. The non-configured analog output modules maintain their current output settings.
	11	Exchange process data	The gateway carries on exchanging process data with the other module bus stations. No error information is transmitted.

4 Communication in PROFIBUS-DP Parameterization

Byte/ parameter name	Value	Value designation	Meaning
Bit 2 and 3: Outputs module sequence error	00 ¹⁾	Output 0	The gateway switches the outputs of the modules to "0". No error information is transmitted.
	01	Output substitute value	The gateway switches the outputs of all modules (with the exception of analog output modules) to "0". Error information is transmitted to the analog output modules. Depending on their configuration, these modules decide to set their outputs either to "0" or to a default value, or to maintain the original values. The non-configured analog output modules set their outputs to "0".
	10	Hold current value	The gateway maintains the actual output settings of all modules, (with the exception of analog output modules). Error information is transmitted to the analog output modules. Depending on their configuration, these modules decide to set their outputs either to "0" or to a default value, or to maintain the original values. The non-configured analog output modules maintain their current output settings.
	11	Exchange process data	The gateway carries on exchanging process data with the other module bus stations. No error information is transmitted.

4 Communication in PROFIBUS-DP Parameterization

Byte/ parameter name	Value	Value designation	Meaning
Bit 4 and 5: Outputs fieldbus error	00 ¹⁾	Output 0	The gateway switches the outputs of the modules to "0". No error information is transmitted.
	01	Output substitute value	The gateway switches the outputs of all modules (with the exception of analog output modules) to "0". Error information is transmitted to the analog output modules. Depending on their configuration, these modules set their outputs either to "0" or to a default value, or maintain the original values. The non-configured analog output modules set their outputs to "0".
	10	Hold current value	The gateway maintains the actual output settings of all modules (with the exception of analog output modules). Error information is transmitted to the analog output modules. Depending on their configuration, these modules set their outputs either to "0" or to a default value, or maintain the original values. The non-configured analog output modules maintain their current output settings.
	11		reserved

4 Communication in PROFIBUS-DP

Parameterization

Byte/ parameter name	Value	Value designation	Meaning
Byte 4			
Bit 0: Integer data format	0 ¹⁾	LSB first	Data is converted to INTEL format (standard format).
	1	MSB first	16-bit data are transmitted with the high and low bytes reversed (MOTOROLA format). This parameter influences the process data!
Bit 1: Diagnostics from modules	0 ¹⁾	activate	Diagnostic messages from the module bus stations are made known to the field bus master as extended diagnostics.
	1	deactivate	Diagnostic messages from the module bus stations will not be displayed. A station diagnostic is not automatically generated along with module diagnostics.
Bit 2: U _L diagnostics	0 ¹⁾	activate	The monitoring function for the field supply U _L (from gateway and power feeding modules) is activated. If this parameter is set but the parameter "Diagnostics from modules" (see bit 1) deactivated, then only the voltage supply at the gateway is monitored. A monitoring of the voltage supply at the power feeding module is not realized.
	1	deactivate	A possible over- or undervoltage at U _L will not be detected.
Bit 3		reserved	
Bit 4: I/Oassistant Force Mode	0 ¹⁾	release	I/Oassistant can set the force mode.
	1	block	I/Oassistant cannot set the force mode, if the station was parameterized by the DP master.
Bit 5		reserved	

Byte/ parameter name	Value	Value designation	Meaning
Bit 6: Static configuration	0 ¹⁾	activate	Changes in the station configuration are stored in the gateway following a power-on reset. In case of a module sequence error, a process data exchange is still possible.
	1	deactivate	If the static configuration is deactivated, a dynamic configuration takeover is realized directly following station configuration changes (important for acyclic parameterization). The station stops the process data exchange and the bus communication as soon as a module sequence error appears, ignoring the parameterization for error handling. But, the communication is not interrupted, if the gateway-parameter byte 1, bit 0 "startup when expected/actual config. differ" (→ Page 86) is activated.
Bit 7		reserved	

1) Default setting

Module parameters

Table 28: Module parameters

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
XN-1AI-I(0/4...20MA)					
0	0	0	Current mode	0 ¹⁾ 1	0..20mA 4..20mA
		1	Value representation	0 ¹⁾ 1	Integer (15bit + sign) 12bit (left-justified)
		2	Diagnostics	0 ¹⁾ 1	release block
XN-2AI-I(0/4...20 MA)					
0/1	0/1	0	Current mode	0 ¹⁾ 1	0..20mA 4..20mA
		1	Value representation	0 ¹⁾ 1	Integer (15bit + sign) 12bit (left-justified)
		2	Diagnostics	0 ¹⁾ 1	release block
		3	Channel Kx	0 ¹⁾ 1	activate deactivate
XN-1AI-U(-10/0...+10VDC)					
1		0	Voltage mode	0 ¹⁾ 1	0..10V -10...+10V
		1	Value representation	0 ¹⁾ 1	Integer (15bit + sign) 12bit (left-justified)
		2	Diagnostics	0 ¹⁾ 1	release block

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
XN-2AI-U(-10/0...+10VDC)					
0/1	0/1	0	Voltage mode	0 ¹⁾ 1	0..10V -10..+10V
		1	Value representation	0 ¹⁾ 1	Integer (15bit + sign) 12bit (left-justified)
		2	Diagnostics	0 ¹⁾ 1	release block
		3	Channel Kx	0 ¹⁾ 1	activate deactivate

4 Communication in PROFIBUS-DP Parameterization

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
XN-2AI-PT/NI-2/3					
0	0	0	Measurement mode K1	0 ¹⁾ 1	2-wire 3-wire
	1	0	Mains suppression K1	0 ¹⁾ 1	50 Hz 60 Hz
		1	Value representation K1	0 ¹⁾ 1	Integer (15bit + sign) 12bit (left-justified)
		2	Diagnostics K1	0 ¹⁾ 1	release block
		3	Channel K1	0 ¹⁾ 1	activate deactivate
	4 to 7		Element K1	0000 ¹⁾ 0001 0010 0011 0100 0101 0110 0111 1000 1001 1010 1011 1100 1101 1110 1111	PT100, -200..850°C PT100, -200..150°C NI100, -60..250°C NI100, -60..150°C PT200, -200..850°C PT200, -200..150°C PT500, -200..850°C PT500, -200..150°C PT1000, -200..850°C PT1000, -200..150°C NI1000, -60..250°C NI1000, -60..150°C resistance, 0..100 Ohm resistance, 0..200 Ohm resistance, 0..400 Ohm resistance, 0..1000 Ohm

4 Communication in PROFIBUS-DP Parameterization

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
1	2	0	Measurement mode K2	0 ¹⁾	2-wire
				1	3-wire
	3	0	Mains suppression K2	0 ¹⁾	50 Hz
				1	60 Hz
		1	Value representation K2	0 ¹⁾	Integer (15bit + sign)
		1		1	12bit (left-justified)
2	Diagnostics K2	0 ¹⁾	release		
1		1	block		
3	Channel K2	0 ¹⁾	activate		
		1	deactivate		
4 to 7	Element K2		0000 ¹⁾	PT100, -200..850°C	
			0001	PT100, -200..150°C	
			0010	NI100, -60..250°C	
			0011	NI100, -60..150°C	
			0100	PT200, -200..850°C	
			0101	PT200, -200..150°C	
			0110	PT500, -200..850°C	
			0111	PT500, -200..150°C	
			1000	PT1000, -200..850°C	
			1001	PT1000, -200..150°C	
			1010	NI1000, -60..250°C	
			1001	NI1000, -60..150°C	
			1100	resistance, 0..100 Ohm	
			1101	resistance, 0..200 Ohm	
			1110	resistance, 0..400 Ohm	
	1111	resistance, 0..1000 Ohm			

4 Communication in PROFIBUS-DP Parameterization

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
XN-2AI-THERMO-PI					
0	0	0	Mains suppression K1	0 ¹⁾ 1	50 Hz 60 Hz
		1	Value representation K1	0 ¹⁾ 1	Integer (15bit + sign) 12bit (left-justified)
		2	Diagnostics K1	0 ¹⁾ 1	release block
		3	Channel K1	0 ¹⁾ 1	activate deactivate
	4 to 7		Element K1	0000 ¹⁾ 0001 0010 0011 0100 0101 0110 0111 1000 1001 1010 1011	Type K, -270..1370°C Type B, +100..1820°C Type E, -270..1000°C Type J, -210..1200°C Type N, -270..1300°C Type R, -50..1760°C Type S, -50..1540°C Type T, -270..400°C +/-50mV +/-100mV +/-500mV +/-1000mV

4 Communication in PROFIBUS-DP Parameterization

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
1	1	0	Mains suppression K2	0 ¹⁾ 1	50 Hz 60 Hz
		1	Value representation K2	0 ¹⁾ 1	Integer (15bit + sign) 12bit (left-justified)
		2	Diagnostics K2	0 ¹⁾ 1	release block
		3	Channel K2	0 ¹⁾ 1	activate deactivate
		4 to 7	Element K2	0000 ¹⁾ 0001 0010 0011 0100 0101 0110 0111 1000 1001 1010 1011	Type K, -270..1370°C Type B, +100..1820°C Type E, -270..1000°C Type J, -210..1200°C Type N, -270..1300°C Type R, -50..1760°C Type S, -50..1540°C Type T, -270..400°C +/-50mV +/-100mV +/-500mV +/-1000mV

4 Communication in PROFIBUS-DP Parameterization

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
XN-4AI-U/I					
0 to 3	0 to 3	0	Range	0 ¹⁾ 1	0..10V/ 0..20mA -10..10V/ 4..20mA
		1	Value representation	0 ¹⁾ 1	Integer (15bit + sign) 12bit (left-justified)
		2	Diagnostics	0 ¹⁾ 1	release block
		3	Channel Kx	0 ¹⁾ 1	activate deactivate
		4	Operation mode	0 ¹⁾ 1	voltage current
XNE-8AI-U/I-4PT/NI					
0 to 7	0 to 7	0 to 5	Operation mode Kx	000000 ¹⁾ 000001 000010 000011 000100 000101 000110 000111 001000 001001 001010 001011 001100 001101 001110 001111 010000 010001 010010 010011 010100 010101	voltage -10V..10V standard voltage 0..10V standard voltage -10V..10V NE43 voltage 0..10V NE43 voltage -10V..10V ext. range voltage 0..10V ext. range reserved reserved current 0..20mA standard current 4..20mA standard current 0..20mA NE43 current 4..20mA NE43 current 0..20mA ext. range current 4..20mA ext. range reserved reserved PT100, -200..850°C 2-wire PT100, -200..150°C 2-wire PT200, -200..850°C 2-wire PT200, -200..150°C 2-wire PT500, -200..850°C 2-wire PT500, -200..150°C 2-wire

4 Communication in PROFIBUS-DP Parameterization

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
0 to 7	0 to 7	0 to 5	Operation mode Kx	010110	PT1000, -200..850°C 2-wire
				010111	PT1000, -200..150°C 2-wire
				011000	PT100, -200..850°C 3-wire
				011001	PT100, -200..150°C 3-wire
				011010	PT200, -200..850°C 3-wire
				011011	PT200, -200..150°C 3-wire
				011100	PT500, -200..850°C 3-wire
				011101	PT500, -200..150°C 3-wire
				011110	PT1000, -200..850°C 3-wire
				011111	PT1000, -200..150°C 3-wire
				100000	NI100, -60..250°C 2-wire
				100001	NI100, -60..150°C 2-wire
				100010	NI1000, -60..250°C 2-wire
				100011	NI1000, -60..150°C 2-wire
				100100	NI1000TK5000, -60..250°C 2-wire
				100101	reserved
				100110	reserved
				100111	reserved
				101000	NI100, -60..250°C 3-wire
				101001	NI100, -60..150°C 3-wire
				101010	NI1000, -60..250°C 3-wire
				101011	NI1000, -60..150°C 3-wire
				101100	NI1000TK5000, -60..250°C 3-wire
				101101	reserved
				101110	reserved
				101111	reserved
				110000	resistance, 0..250 Ohm
				110001	resistance, 0..400 Ohm
				110010	resistance, 0..800 Ohm
				110011	resistance, 0..2000 Ohm
			110100	resistance, 0..4000 Ohm	
			110101 bis	reserved	
			111110		
			111111	deactivate	
	6		Value representation Kx	0 ¹⁾ 1	Integer (15bit + sign) 12bit (left-justified)

4 Communication in PROFIBUS-DP Parameterization

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
0 to 7	0 to 7	7	Diagnostics Kx	0 ¹⁾ 1	release block
XN-1AO-I(0/4...20MA)					
0	0	0	Current mode	0 ¹⁾ 1	0..20mA 4..20mA
		1	Value representation	0 ¹⁾ 1	Integer (15bit + sign) 12bit (left-justified)
	1 to 2		Substitute value A1		The substitute value defined here will be output if one of the specific events occurs which are parameterized in the gateway.

4 Communication in PROFIBUS-DP Parameterization

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
XN-2AO-I(0/4...20MA)					
0	0	0	Current mode	0 ¹⁾ 1	0..20mA 4..20mA
		1	Value representation	0 ¹⁾ 1	Integer (15bit + sign) 12bit (left-justified)
		3	Channel K1	0 ¹⁾ 1	activate deactivate
	1 to 2	Substitute value A1		The substitute value defined here for the channel will be output if one of the specific events occurs which are parameterized in the gateway.	
1	3	0	Current mode	0 ¹⁾ 1	0..20mA 4..20mA
		1	Value representation	0 ¹⁾ 1	Integer (15bit + sign) 12bit (left-justified)
		3	Channel K2	0 ¹⁾ 1	activate deactivate
	4 to 5	Substitute value A2		The substitute value defined here for the channel will be output if one of the specific events occurs which are parameterized in the gateway.	

4 Communication in PROFIBUS-DP Parameterization

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
XN-2AO-U(-10/0...+10VDC)					
0	0	1	Value representation (channel 1)	0 ¹⁾ 1	Integer (15bit + sign) 12bit (left-justified)
		0	Voltage mode (channel 1)	0 ¹⁾ 1	0..10V -10..+10V
	1 to 2	Substitute value A1		The substitute value defined here for the channel will be output if one of the specific events occurs which are parameterized in the gateway.	
1	3	1	Value representation (channel 2)	0 ¹⁾ 1	Integer (15bit + sign) 12bit (left-justified)
		0	Voltage mode (channel 2)	0 ¹⁾ 1	0..10V -10..+10V
	4 to 5	Substitute value A2		The substitute value defined here for the channel will be output if one of the specific events occurs which are parameterized in the gateway.	

4 Communication in PROFIBUS-DP Parameterization

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
XNE-4AO-U/I					
0	0	0 to 3	Operation mode K1	0000 ¹⁾	voltage -10V..10V standard
				0001	voltage 0..10V standard
				0010	voltage -10V..10V NE43
				0011	voltage 0..10V NE43
				0100	voltage -10V..10V ext. range
				0101	voltage 0..10V ext. range
				0110	reserved
				0111	reserved
				1000	current 0..20mA standard
				1001	current 4..20mA standard
				1010	current 0..20mA NE43
				1011	current 4..20mA NE43
				1100	current 0..20mA ext. range
				1101	current 4..20mA ext. range
				1110	reserved
1111	deactivate				
	4		Value representation K1	0 ¹⁾ 1	Integer (15bit + sign) 12bit (left-justified)
	5		Diagnostics K1	0 ¹⁾ 1	release block
	6 to 7		Behaviour module bus error A1	00 ¹⁾ 01 10 11	output substitute value hold current value reserved reserved
1 to 2			Substitute value A1	–	The substitute value defined here for the channel will be output in the following cases: <ul style="list-style-type: none"> • if one of the specific events occurs which are parameterized in the gateway or • in the event of a module bus error: if the module parameter "behaviour module bus error A1" is set to "output substitute value".

4 Communication in PROFIBUS-DP

Parameterization

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
1	3	0 to 3	Operation mode K2	0000 ¹⁾	voltage -10V..10V standard
				0001	voltage 0..10V standard
				0010	voltage -10V..10V NE43
				0011	voltage 0..10V NE43
				0100	voltage -10V..10V ext. range
				0101	voltage 0..10V ext. range
				0110	reserved
				0111	reserved
				1000	current 0..20mA standard
				1001	current 4..20mA standard
				1010	current 0..20mA NE43
				1011	current 4..20mA NE43
				1100	current 0..20mA ext. range
				1101	current 4..20mA ext. range
				1110	reserved
1111	deactivate				
	4		Value representation K2	0 ¹⁾ 1	Integer (15bit + sign) 12bit (left-justified)
	5		Diagnostics K2	0 ¹⁾ 1	release block
	6 to 7		Behaviour module bus error A2	00 ¹⁾ 01 10 11	output substitute value hold current value reserved reserved
4 to 5			Substitute value A2	–	The substitute value defined here for the channel will be output in the following cases: <ul style="list-style-type: none"> • if one of the specific events occurs which are parameterized in the gateway or • in the event of a module bus error: if the module parameter "behaviour module bus error A2" is set to "output substitute value".

4 Communication in PROFIBUS-DP Parameterization

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
2	6	0 to 3	Operation mode K3	0000 ¹⁾	voltage -10V..10V standard
				0001	voltage 0..10V standard
				0010	voltage -10V..10V NE43
				0011	voltage 0..10V NE43
				0100	voltage -10V..10V ext. range
				0101	voltage 0..10V ext. range
				0110	reserved
				0111	reserved
				1000	current 0..20mA standard
				1001	current 4..20mA standard
				1010	current 0..20mA NE43
				1011	current 4..20mA NE43
				1100	current 0..20mA ext. range
				1101	current 4..20mA ext. range
				1110	reserved
1111	deactivate				
	4		Value representation K3	0 ¹⁾ 1	Integer (15bit + sign) 12bit (left-justified)
	5		Diagnostics K3	0 ¹⁾ 1	release block
	6 to 7		Behaviour module bus error A3	00 ¹⁾	output substitute value
01				hold current value	
10				reserved	
11				reserved	
	7 to 8		Substitute value A3	–	The substitute value defined here for the channel will be output in the following cases: <ul style="list-style-type: none"> • if one of the specific events occurs which are parameterized in the gateway or • in the event of a module bus error: if the module parameter "behaviour module bus error A3" is set to "output substitute value".

4 Communication in PROFIBUS-DP Parameterization

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
3	9	0 to 3	Operation mode K4	0000 ¹⁾	voltage -10V..10V standard
				0001	voltage 0..10V standard
				0010	voltage -10V..10V NE43
				0011	voltage 0..10V NE43
				0100	voltage -10V..10V ext. range
				0101	voltage 0..10V ext. range
				0110	reserved
				0111	reserved
				1000	current 0..20mA standard
				1001	current 4..20mA standard
				1010	current 0..20mA NE43
				1011	current 4..20mA NE43
				1100	current 0..20mA ext. range
				1101	current 4..20mA ext. range
				1110	reserved
1111	deactivate				
	4		Value representation K4	0 ¹⁾ 1	Integer (15bit + sign) 12bit (left-justified)
	5		Diagnostics K4	0 ¹⁾ 1	release block
	6 to 7		Behaviour module bus error A4	00 ¹⁾ 01 10 11	output substitute value hold current value reserved reserved
10 to 11			Substitute value A4	–	The substitute value defined here for the channel will be output in the following cases: <ul style="list-style-type: none"> • if one of the specific events occurs which are parameterized in the gateway or • in the event of a module bus error: if the module parameter "behaviour module bus error A4" is set to "output substitute value".

4 Communication in PROFIBUS-DP Parameterization

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
XN-1CNT-24VDC, counter mode					
0	0	0 to 5	Counter mode	000000 ¹⁾	Endless count
				000001	Single count
				000010	Periodic count
	1	0	Gate function	0 ¹⁾	Cancel count procedure
				1	Interrupt count procedure
		1	Digital input DI	0 ¹⁾	Normal
				1	Inverted
		2 to 3	Function DI	00 ¹⁾	Input
				01	HW gate
				10	Latch-retrigger on pos. edge
			11	Synchronization on pos. edge	
	4	Synchroniza- tion	0 ¹⁾	Single	
			1	Periodic	
	5 to 6	Main count direction	00 ¹⁾	None	
			01	Forwards	
			10	Backwards	
2 to 5		Lower count limit	-		
			214748364		
			8 (-2 ³¹) to 0		
		Lower count limit (HWORD)	-32768 ¹⁾ to 0	(signed16)	
		Lower count limit (LWORD)	-32768 to 32767	(signed16); 0 ¹⁾	

4 Communication in PROFIBUS-DP Parameterization

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
0	6 to 9		Upper count limit	0 to +2147483647 ($2^{31}-1$)	
			Upper count limit (HWORD)	0 to 32767 ¹⁾ (unsigned 16)	
			Upper count limit (LWORD)	0 to 65535 ¹⁾ (unsigned 16)	
10			Hysteresis	0 ¹⁾ to 255 (unsigned8)	
11	0 to 7		Pulse duration DO1, DO2 [n*2ms]	0 ¹⁾ to 255 (unsigned8)	
12	0		Substitute value DO1	0 ¹⁾ 1	0 1
		1	Diagnosis DO1	0 ¹⁾ 1	ON OFF
	2 to 3		Function DO1	00 ¹⁾	Output
				01	ON for count value \geq comp. value
				10	ON for count value \leq comp. value
	11	Pulse for count value = comp. val.			
5 to 6		Function DO2	00 ¹⁾	Output	
			01	ON for count value \geq comp. value	
			10	ON for count value \leq comp. value	
			11	Pulse for count value = comp. val.	

4 Communication in PROFIBUS-DP Parameterization

Assignment			Parameter name	Value	Meaning	
Chn.	Byte	Bit				
0	13	0 to 1	Signal evaluation (A,B)	00 ¹⁾ 01 10 11	Pulse and direction Single encoder Double encoder Quadruple encoder	
			2	Gen./input filter (A)	0 ¹⁾ 1	2.5 μs (200kHz) 25 μs (20kHz)
			3	Gen./input filter (B)	0 ¹⁾ 1	2.5 μs (200kHz) 25 μs (20kHz)
			4	Gen./input filter (DI)	0 ¹⁾ 1	2.5 μs (200kHz) 25 μs (20kHz)
		5	Sensor (A)	0 ¹⁾ 1	Normal Inverted	
		7	Direction input (B)	0 ¹⁾ 1	Normal Inverted	
		14	0	4 to 5	Combined diagnosis	0 ¹⁾ 1
Response CPU/master STOP	00 ¹⁾ 01 10 11				Switch off DO Continue operating mode Switch DO1 substitute value Retain DO1 last value	

4 Communication in PROFIBUS-DP Parameterization

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
XN-1CNT-24VDC, measurement mode					
0	0	0 to 5	Measurement mode	100000 ¹⁾	Frequency measurement
				100001	Speed measurement
				100010	Period measurement
1	1	2	Digital input DI	0 ¹⁾	Normal
				1	Inverted
2 to 4			Function DI	0 ¹⁾	Input
				1	HW gate
5 to 7			Lower limit	0 to 16777214 $\times 10^{-3}$	
				0 ¹⁾ to 255 (unsigned8)	
				0 ¹⁾ to 65535	
8 to 9			Upper limit	1 to 16777215 $\times 10^{-3}$	
				0 ¹⁾ to 255 (unsigned8)	
				0 ¹⁾ to 65535	
10 to 11			Integration time [n*10ms]	1 to 1000; 10 ¹⁾	
			Sensor pulses per turn	1 ¹⁾ to 65535	

4 Communication in PROFIBUS-DP Parameterization

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
0	12	0	Substitute value DO1	0 ¹⁾ 1	0 1
		1	Diagnosis DO1	0 ¹⁾ 1	ON OFF
		2 to 4	Function DO1	00 ¹⁾ 01 10 11	Output Outside the limits Below the lower limit Above the upper limit
13	0 to 1		Signal evaluation (A,B)	00 ¹⁾ 01	Pulse and direction Single encoder
		2	Gen./input filter (A)	0 ¹⁾ 1	2.5 µs (200kHz) 25 µs (20kHz)
		3	Gen./input filter (B)	0 ¹⁾ 1	2.5 µs (200kHz) 25 µs (20kHz)
		4	Gen./input filter (DI)	0 ¹⁾ 1	2.5 µs (200kHz) 25 µs (20kHz)
		5	Sensor (A)	0 ¹⁾ 1	Normal Inverted
		7	Direction input (B)	0 ¹⁾ 1	Normal Inverted
14	0		Combined diagnosis	0 ¹⁾ 1	Release Block
		4 to 5	Response CPU/master STOP	00 ¹⁾ 01 10 11	Switch off DO1 Continue operating mode Switch DO1 substitute value Retain DO1 last value

4 Communication in PROFIBUS-DP

Parameterization

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
XN-1RS232					
0	0	0 to 4	Bit transfer rate	0	reserved
				1	300 Bit/s
				2	600 Bit/s
				3	1200 Bit/s
				4	2400 Bit/s
				5	4800 Bit/s
				6 ¹⁾	9600 Bit/s
				7	14400 Bit/s
				8	19200 Bit/s
				9	28800 Bit/s
				10	38400 Bit/s
				11	57600 Bit/s
				12	115200 Bit/s
				13	reserved
				14	reserved
			15	reserved	
	6		Disable Reduced Ctrl	1	Constant setting: The diagnostic messages are shown in Byte 6 of the process input data (independently from "Diagnosis"). Byte 6 of the process output data contains 2 bits, with which the receive or transmit buffer can be cleared. Byte 7 contains the status or control byte. User data are represented in Bytes 0 to 5.
	7		Diagnostics	0 1 ¹⁾	Release Block Diagnostics activated / diagnostics deactivated: This affects the separate field bus specific diagnostic message – not the diagnostics embedded in the process input data.

4 Communication in PROFIBUS-DP Parameterization

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
0	1	0	Stop bits	0	1 stop bit
				1 ¹⁾	2 stop bits
	1 to 2	Parity	0	None	
			1 ¹⁾	Odd: The parity bit is set so that the total number of bits (data bits plus parity bit) set to 1 is odd.	
			2	Even: The parity bit is set so that the total number of bits (data bits plus parity bit) set to 1 is even.	
			3	Data bits	
	4 to 5	Flow control	0 ¹⁾	The number of data bits is 7. The number of data bits is 8.	
			1	None: Data flow control is switched off.	
			2	"XON/XOFF": Software handshake (XON/XOFF) is switched on.	
			3	"RTS/CTS": Hardware handshake (RTS/CTS) is switched on.	
2	0 to 7	XON character	0 – 255 (17 ¹⁾)	reserved	
			0 – 255 (19 ¹⁾)	XON character: This character is used to start the transmission of data from the data terminal device if the software handshake is active.	
3	0 to 7	XOFF character	0 – 255 (19 ¹⁾)	XOFF character: This character is used to stop the transmission of data from the data terminal device if the software handshake is active.	
			0 – 255 (17 ¹⁾)	XOFF character: This character is used to stop the transmission of data from the data terminal device if the software handshake is active.	

4 Communication in PROFIBUS-DP

Parameterization

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
XN-1RS485/422					
0	0	0 to 4	Bit transfer rate	0	reserved
				1	300 Bit/s
				2	600 Bit/s
				3	1200 Bit/s
				4	2400 Bit/s
				5	4800 Bit/s
				6 ¹⁾	9600 Bit/s
				7	14400 Bit/s
				8	19200 Bit/s
				9	28800 Bit/s
				10	38400 Bit/s
				11	57600 Bit/s
				12	115200 Bit/s
				13	reserved
				14	reserved
			15	reserved	
	6		Disable ReducedCtrl	1	Constant setting: The diagnostic messages are shown in Byte 6 of the process input data (independently from "Diagnosis"). Byte 6 of the process output data contains 2 bits, with which the receive or transmit buffer can be cleared. Byte 7 contains the status or control byte. User data are represented in Bytes 0 to 5.
	7		Diagnostics	0 1 ¹⁾	Release Block Diagnostics activated / diagnostics deactivated: This affects the separate field bus specific diagnostic message – not the diagnostics embedded in the process input data.

4 Communication in PROFIBUS-DP Parameterization

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
0	1	0	Stop bits	0	1 stop bit
				1 ¹⁾	2 stop bits
		1 to 2	Parity	0	None
	1 ¹⁾			Odd: The parity bit is set so that the total number of bits (data bits plus parity bit) set to 1 is odd.	
	2			Even: The parity bit is set so that the total number of bits (data bits plus parity bit) set to 1 is even.	
	3	Data bits	0 ¹⁾	The number of data bits is 7. The number of data bits is 8.	
			1		
			4 to 5	Flow control	0 ¹⁾
	1	“XON/XOFF”: Software handshake (XON/XOFF) is switched on. (This function is only available for RS422 operation.)			
	2 to 3	reserved			
2	0 to 7	XON character	0 – 255 (17 ¹⁾)	XON character for RS422 operation: This character is used to start the transmission of data from the data terminal device if the software handshake is active.	
			3	0 to 7	XOFF character

4 Communication in PROFIBUS-DP Parameterization

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
XN-1SSI					
0	0	5	Sensor data cable test	0 ¹⁾	activate: Data cable is checked for ZERO.
				1	deactivate: After the last valid bit, there will be no check that the data cable is at ZERO.
1	0 to 3		Number of invalid bits (LSB)	0 to 15 (0 ¹⁾ = 0 _{hex})	<p>The number of invalid bits in the position value delivered by the SSI-encoder at the LSB end.</p> <p>The significant word length of the position value transmitted to the module bus master is thus:</p> <p>SSI_FRAME_LEN - INVALID_BITS_MSB - INVALID_BITS_LSB.</p> <p>The invalid bits at the LSB end are removed by shifting the position value to the right, starting with the LSB.</p> <p>Basically, INVALID_BITS_MSB + INVALID_BITS_LSB must be smaller than SSI_FRAME_LEN.</p>

4 Communication in PROFIBUS-DP Parameterization

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
0	1	4 to 6	Number of invalid bits (MSB)	0 to 7 (0 ¹) = 0 _{hex})	<p>The number of invalid bits in the position value delivered by the SSI-encoder at the MSB end.</p> <p>The significant word length of the position value transmitted to the module bus master is thus: SSI_FRAME_LEN - INVALID_BITS_MSB - INVALID_BITS_LSB.</p> <p>The invalid bits at the MSB end are set to zero by masking the position value. Basically, INVALID_BITS_MSB + INVALID_BITS_LSB must be smaller than SSI_FRAME_LEN.</p>
2	0 to 3		Bit transmission rate	0 1 ¹⁾ 2 3 4 5 6 7 8 to 15	1000000 Bit/s 500000 Bit/s 250000 Bit/s 125000 Bit/s 100000 Bit/s 83000 Bit/s 71000 Bit/s 62500 Bit/s reserved

4 Communication in PROFIBUS-DP Parameterization

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
0	3	0 to 5	Number of data frame bits	1 to 32 (25 ¹) = 19 _{hex})	Number of bits in the SSI data frame. Basically, SSI_FRAME_LEN must be larger than INVALID_BITS.
		7	Data format	0 ¹⁾	Binary coded The SSI-encoder transmits data in binary code
				1	GRAY coded The SSI-encoder transmits data in Gray code

1) Default setting

XNE-2CNT-2PWM

Table 29: Data structure of the module parameters
XNE-2CNT-2PWM

Byte	B7	B6	B5	B4	B3	B2	B1	B0
	input A1	input B1	input Z1	reserved	diag- nostic CNT1	measure- ment mode CNT1	main count direc- tion CNT1	
1	filter Z1		filter A1, B1		reserved	pull up Z1	reserved	threshold input A,B,Z CNT1
2	mode Z1				mode CNT1			
3	input A2	input B2	input Z2	reserved	diag- nostic	measure- ment mode CNT2	main count direc- tion CNT2	
4	filter Z2		filter A2, B2		reserved	pull up Z2	reserved	threshold input A,B,Z CNT2
5	mode Z2				mode CNT2			
6	diag- nostic PWM1	reserved	mode D1					
7	DBP1 STS MODE		substi- tute value P1	substi- tute value D1	mode PWM1			
8	diag- nostic PWM2	reserved	mode D2					
9	DBP2 STS MODE		substi- tute value P2	substi- tute value D2	mode PWM2			
10	reserved	ADR AUX REG1 RD DATA						
11	reserved	ADR AUX REG2 RD DATA						

4 Communication in PROFIBUS-DP

Parameterization

Byte	B7	B6	B5	B4	B3	B2	B1	B0
12	reserved	ADR AUX REG2 RD DATA						
13	reserved	ADR AUX REG1 WR DATA						
14	reserved	ADR AUX REG2 WR DATA						
15	reserved	ADR AUX REG3 WR DATA						

The following table shows the meaning of the parameter bits:

Table 30: Module parameters XNE-2CNT-2PWM

Byte	Parameter name	Value	Meaning	
0,3	Main count direction CNTx	00 ¹⁾	Basic function	
		01	None	
		10	Up	
		11	Down	
	Measurement mode CNTx	0 ¹⁾	Frequency measurement	
		1	Period duration measurement	
	Diagnostic CNTx	0 ¹⁾	Diagnostic messages of the function unit activated in diagnostic interface	
		1	Diagnostic messages of the function unit deactivated in diagnostic interface	
Input Zx, Input Bx, Input Ax	0 ¹⁾	Signal logic remains (LOW = 0 / HIGH = 1)		
	1	Invert signal before processing		
1,4	Threshold input A,B,Z CNTx	0 ¹⁾	Threshold 7.5V (only valid for Ax, Bx, Zx)	
		1	Threshold 2.5V (only valid for Ax, Bx, Zx)	
	Pull Up Zx	0 ¹⁾	Pull Up resistance 20 kΩ off	
		1	Pull Up resistance 20 kΩ on	
	Filter Ax, Bx	00 ¹⁾	2 μs	Irrespective of the setting for the filter property, the maximum input frequency of the channel has to be considered
		01	16 μs	
		10	reserved	
		11		

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Byte	Parameter name	Value	Meaning
1,4	Filter Zx	00 ¹⁾	2 μ s
		01	16 μ s
		10	reserved
		11	
2,5	Mode CNTx	0000 ¹⁾	Pulse direction, single sample
		0001	Pulse direction, double sample
		0010	AB mode, single sample
		0011	AB mode, double sample
		0100	AB mode, four samples
		0101 to 1110	reserved
		1111	AB only input
	Mode Zx (CNTx, PWMx)	0000	Alarm input CNT
		0001 ¹⁾	HW gate CNT
		0010	Single Latch-Retrigger CNT
		0011	Continuous latch retrigger CNT
		0100	Single L.-R. and HW gate CNT
		0101	Continuous L.-R. and HW gate CNT
		0110	reserved
		0111	Alarm input PWM
		1000	HW gate PWM
		1001	Retrigger PWM
		1010 to 1110	reserved
		1111	Z just input
6,8	Mode Dx		Definition of the function for Dx (default = 11 1111 → single output, can be controlled via process data)

4 Communication in PROFIBUS-DP Parameterization

Byte	Parameter name	Value	Meaning
6,8	Diagnostic PWMx	0 ¹⁾	Diagnostic messages of the function unit activated in diagnostic interface
		1	Diagnostic messages of the function unit deactivated in diagnostic interface
7,9	Mode PWMx	0000 ¹⁾	PD DC Definition:
		0001	HT LT Definition
		0010 to 0111	reserved
		1111	P just output
Substitute value Px, Dx	0 ¹⁾	1	The substitute value defined for the module will be output if the parameter "output substitute value" is set in the gateway.
		0	
DBPx STS MODE	00 ¹⁾	01	STS_DBPx = 1 with (REG_CNTx_CMP0) ≤ (REG_CNTx_CNT) < (REG_CNTx_CMP1)
		10	reserved
		11	STS_DBPx = Px
10 to 12	ADR AUX REGx WR DATA		Address of the basic write registers (Default ADR AUX REG1 WR DATA = 0x60, ADR AUX REG2 WR DATA = 0x61, ADR AUX REG3 WR DATA = 0x70)
13 to 15	ADR AUX REGx RD DATA		Address of the basic read registers (Default ADR AUX REG1 RD DATA = 0x20, ADR AUX REG2 RD DATA = 0x21, ADR AUX REG3 RD DATA = 0x40)

1) Default setting

XNE-1SWIRE

Table 31: Data structure of the module parameters
XNE-1SWIRE

	B7	B6	B5	B4	B3	B2	B1	B0
Byte 1	reserved	free	free	MC	MNA	Configu- ration	Disable Cfg	free
Byte 2	free	U _{AUXERR}	TYP _{ERR}	TYP _{INFO}	PKZ _{ERR}	PKZ _{INFO}	SD _{ERR}	SD _{INFO}
Byte 3	reserved							
Byte 4	reserved (lifeguarding time up to version VN 01-03)							
Byte 5	SC _{DIAG} S8	SC _{DIAG} S7	SC _{DIAG} S6	SC _{DIAG} S5	SC _{DIAG} S4	SC _{DIAG} S3	SC _{DIAG} S2	SC _{DIAG} S1
Byte 6	SC _{DIAG} S16	SC _{DIAG} S15	SC _{DIAG} S14	SC _{DIAG} S13	SC _{DIAG} S12	SC _{DIAG} S11	SC _{DIAG} S10	SC _{DIAG} S9
Byte 7	reserved							
Byte 8	reserved							
Byte 9 to 24	Type designation slave 1 - 16							

4 Communication in PROFIBUS-DP Parameterization

The following table shows the meaning of the parameter bits:

Table 32: Module parameters XNE-1SWIRE

Byte	Designation	Status	Comment
1	Disable Cfg		Automatic SWIRE configuration If the physical structure of the SWIRE bus does not match the configuration stored in the XNE-1SWIRE on power up (SW LED flashing), the physical structure of the SWIRE bus must be stored in the XNE-1SWIRE.
		0 ¹⁾	Inactive Manual SWIRE configuration: To store the physical structure of the SWIRE bus in the XNE-1SWIRE, the CFG button of the XNE-1SWIRE must be pressed manually (only functions if the SW LED is flashing).
		1	Active Automatic SWIRE configuration: If the physical structure of the SWIRE bus does not match the configuration stored in the XNE-1SWIRE on power up, the physical structure is stored automatically in the XNE-1SWIRE.
Configura- tion			PLC configuration check If the PLC configuration check is activated, the configuration stored in the XNE-1SWIRE is compared with the SET configuration stored in the PLC.
		0 ¹⁾	Active The configuration stored in XNE-1SWIRE is compared with the SET configuration stored in the PLC. Only SWIRE slaves in the SWIRE bus are accepted that have a device ID completely matching the SET configuration.
		1	Inactive All slaves are mapped in 4Bit INPUT / 4Bit OUTPUT without checking the device ID.

Byte	Designation	Status	Comment
1	MNA	active / passive	Configuration check Bus or slave-oriented configuration check (without function if MC = 1)
		0 ¹⁾	Bus-oriented If the PLC configuration check is activated, data exchange is only started if the configuration stored in the XNE-1SWIRE fully matches the SET configuration stored in the PLC. Modifying the bus during operation causes the system to be aborted.
		1	Slave-oriented If the PLC configuration check is activated, data exchange is started with all SWIRE slaves that match the SET configuration stored in the PLC. The SWIRE slaves that do not match the SET configuration stored in the PLC do not perform any data exchange.
		MC	Moeller conformance (from version VN 01-04) Behavior of the XNE-1SWIRE in accordance with SWIRE Conformance criteria (see manual MN05002016Z).
		0 ¹⁾	Inactive Default behavior
		1	Active The XNE-1SWIRE master responds according to the Moeller SWIRE Conformance criteria.

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Byte	Designation	Status	Comment	
2	SD _{INFO}		Field -Slave error-	
			Activate slave diagnostics info field SD _{ERR} Sx. As soon as a slave on the bus sets its error bit, this is indicated as an individual error depending on the parameter setting.	
		0 ¹⁾	Active	Single diagnostics is activated.
	1	Inactive	Single diagnostics is not activated.	
	SD _{ERR}			Group error -Slave error-
				Activate slave diagnostics SD _{ERR} . As soon as only one slave on the bus sets its error bit, this is indicated as a group error depending on the parameter setting.
0 ¹⁾		Active	Group diagnostics is activated.	
1	Inactive	Group diagnostics is not activated.		
PKZ _{INFO}			Field -PKZ error-	
			Activate slave diagnostics info field PKZ _{ERR} Sx. As soon as an SWIRE-DIL slave on the bus clears its PKZ bit, this is indicated as an individual error depending on the parameter setting.	
	0 ¹⁾	Active	Single diagnostics is activated.	
1	Inactive	Single diagnostics is not activated.		
PKZ _{ERR}			Group error -PKZ error-	
			Activate slave diagnostics PKZ _{ERR} . As soon as only one SWIRE-DIL slave on the bus clears its PKZ bit, this is indicated as a group error depending on the parameter setting.	
	0 ¹⁾	Active	Group diagnostics is activated.	
1	Inactive	Group diagnostics is not activated.		

4 Communication in PROFIBUS-DP Parameterization

Byte	Designation	Status	Comment	
2	TYP _{INFO}		Field -Configuration error-	
			Activate slave diagnostics info field TYP _{ERR} Sx. As soon as a slave on the bus does not match the set configuration and therefore cannot be started, this is indicated as an individual error depending on the parameter setting.	
		0 ¹⁾	Active	Single diagnostics is activated.
		1	Inactive	Single diagnostics is not activated.
	TYP _{ERR}			Group error -Configuration error-
				Activate slave diagnostics TYP _{ERR} . As soon as only one slave on the bus is incorrectly configured, this is indicated as a group error depending on the parameter setting.
		0 ¹⁾	Active	Group diagnostics is activated.
		1	Inactive	Group diagnostics is not activated.
U _{AUXERR}			Error message -U _{AUX} -	
			Activate system diagnostics U _{AUXERR} . U _{AUXERR} will generate an error message as soon as the power supply goes below a level at which the function of the relays is not guaranteed.	
	0 ¹⁾	Active	Error message U _{AUXERR} activated.	
	1	Inactive	Error message U _{AUXERR} not activated.	
3	reserved			
4	reserved (lifeguarding time up to version VN 01-03)		Was up to version VN 01-03: Lifeguarding time of the SWIRE slaves.	
		0x02-0xFF 0x64 ¹⁾	Setting of lifeguarding time, timeout time up to automatic reset of the slaves in the event of communication failure. (n × 10 ms) (Default 1s) 0xFF: Lifeguarding off	

4 Communication in PROFIBUS-DP Parameterization

Byte	Designation	Status	Comment	
5,6	SC _{DIAGSx}		Input bit communication error, slave x	
			Slave diagnostics message from Byte 1 / Bit 7 is accepted in the feedback interface as Bit 4.	
		0 ¹⁾	Active	SC _{DIAGSx} is accepted.
		1	Inactive	SC _{DIAGSx} is not accepted.
7,8	reserved			
9 to 24	Device ID, slave x		TYPE setting for the SWIRE slave at position x on the SWIRE bus.	
		0x20	SWIRE-DIL (Moeller)	
		0x21	SWIRE-4DI-2DO-R (Moeller)	
		0x01	PH9285.91 (Dold)	
		0x02	PH9285.91/001 (Dold)	
		0x03	PH9285.91/002 (Dold)	
		0xFF	Basic setting (no slave)	

Module representation in the Basic Device Data (GSD)

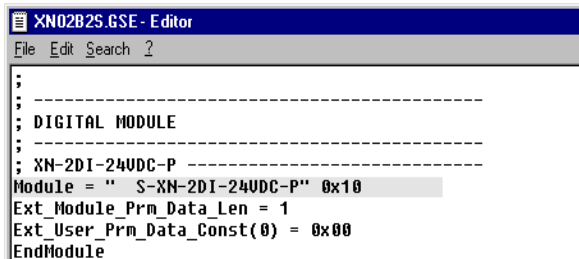
The XI/ON gateway is embedded in the PROFIBUS structure with the aid of the GSD.

In the GSD-files for the DPV0 gateways, the individual modules are labeled by identifiers that make it possible to identify the modules in various ways:

- **Standard module representation:**

The configured module list is shown with standard identifiers in the General Identifier Format (exception: empty slots and modules without process data are represented by a special identifier format). Modules cannot be uniquely identified through these identifiers.

Advantage: Replacement modules do not have to be of the identical type in order to be accepted by the XI/ON gateway. This means that similar types with identical process data lengths can be used. For instance, a 2 DO 24 V DC **0.5A** module could be replaced by a 2 DO 24 V DC **2A** module. This way of representing the modules thus permits increased flexibility for process, parameterization and diagnostics data.



```
XN02B25.GSE - Editor
File Edit Search ?
;
; -----
; DIGITAL MODULE
; -----
; XN-2DI-24VDC-P -----
Module = " S-XN-2DI-24VDC-P" 0x10
Ext_Module_Prm_Data_Len = 1
Ext_User_Prm_Data_Const(0) = 0x00
EndModule
```

Figure 24: Digital input module XN-2DI-24VDC-P in the standard representation

• **Typified module representation:**

The configured module list is presented with extended identifiers (Special Identifier Format), that enable a precise identification of the modules. The XI/ON gateway will only accept replacement modules of the identical type.

```
;  
-----  
; DIGITAL MODULE  
-----  
; XN-2DI-24VDC-P -----  
Module = " S-XN-2DI-24VDC-P" 0x10  
Ext_Module_Prm_Data_Len = 1  
Ext_User_Prm_Data_Const(0) = 0x00  
EndModule  
Module = " T-XN-2DI-24VDC-P" 0x43, 0x00, 0x20, 0x00, 0x01  
EndModule
```

Figure 25: Digital input module XN-2DI-24VDC-P in the typified representation



In the DPV1 gateways, the modules are identified by means of their indent-number. The GSD-files for DPV1 gateways do **not** allow the module representation according to type. Only the standard module representation is possible.

Options for module representation

Table 33: Optional module representation

	Typified module representation Special Identifier Format: 3 manufacturer-specific bytes	Standard module representation Standard Identifier: length identifier in GSD-file
Identification of the individual module by the PROFIBUS-DP master and the gateway	✓	
Insert/remove identical modules	✓	✓
Insert/remove module variations with identical process data lengths as described by the PROFIBUS-DP identifier		✓
Insert/remove module variations with varying process data lengths as described by the PROFIBUS-DP identifier		

Example of a PROFIBUS-DP configuration

In the following description of the process, configuration and parameterization data, the typified module representation of the module bus participants will be used.

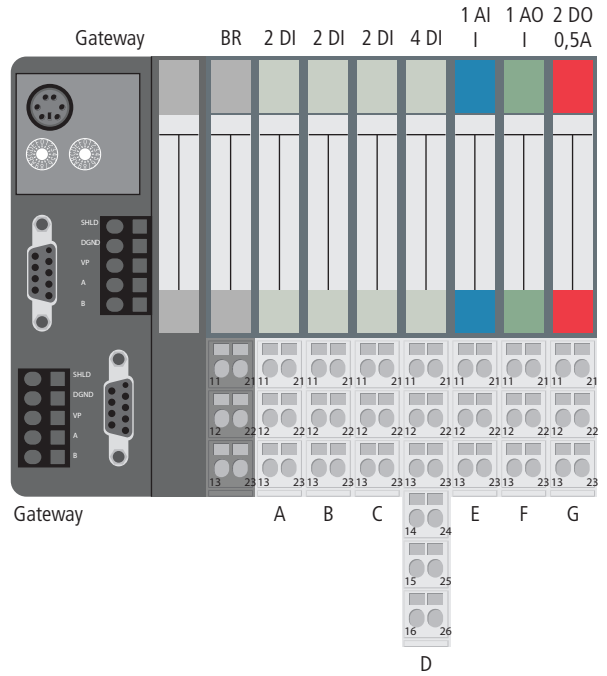


Figure 26: Station example

System description

The process data are shown in the INTEL format. The Motorola format can be set up through the gateway parameters.

Table 34: Parameterization data

Module	Input Byte address	Output Byte address	Byte (Bit 7 to Bit 0)
A	0		A1, A0
B	1		B1, B0
C	2		C1, C0
D	3		D3, D2, D1, D0
E_1	4		E7, E6, ... E1, E0
E_2	5		E15, E14, ... E9, E8
F_1		0	F7, F6, ... F1, F0
F_2		1	F15, F14, ... F9, F8
G		2	G1, G0

4 Communication in PROFIBUS-DP

Parameterization

Parameterization data

Module bus station A:	not parameterizable
Module bus station B:	not parameterizable
Module bus station C:	not parameterizable
Module bus station D:	not parameterizable
Module bus station E:	Bit 0 = 0: Current mode: 0..20mA Bit 0 = 1: Current mode: 4..20mA Bit 1 = 0: Value format: (15bit + sign) Bit 1 = 1: Value format: 12bit (left-justified)
Module bus station F:	Bit 0 = 0: Current mode: 0..20mA Bit 0 = 1: Current mode: 4..20mA Bit 1 = 0: Value format: (15bit + sign) Bit 1 = 1: Value format: 12bit (left-justified) SignedInteger: Substitute value A1
Module bus station G:	not parameterizable

Configuration data

Module bus station A:	2 DI
Module bus station B:	2 DI
Module bus station C:	2 DI
Module bus station D:	4 DI
Module bus station E:	1 AI I
Module bus station F:	1 AO I
Module bus station G:	2 DO 0.5 A

Configuration Byte offset address	Value	Remarks
–		Gateway
0	0x43 0x00 0x20 0x00 0x01 	1. module bus station: 2 DI 3. manufacturer-specific byte 2. manufacturer-specific byte 1. manufacturer-specific byte I/O length, consistency Special Identifier Format: I-length follows, 3 manufacturer-specific bytes follow (Process data: 1 Byte DI for module bus station A)

4 Communication in PROFIBUS-DP Parameterization

Configuration Byte offset address	Value	Remarks
1	0x43 0x00 0x20 0x00 0x01 <p>Special Identifier Format: I-length follows, 3 manufacturer-specific bytes follow (Process data: 1 Byte DI for module bus station B)</p>	2. module bus station: 2 DI
2	0x43 0x00 0x20 0x00 0x01 <p>Special Identifier Format: I-length follows, 3 manufacturer-specific bytes follow (Process data: 1 Byte DI for module bus station C)</p>	3. module bus station: 2 DI

Configuration Byte offset address	Value	Remarks
3	0x43 0x00 0x30 0x00 0x01 <p>3. manufacturer-specific byte 2. manufacturer-specific byte 1. manufacturer-specific byte I/O length, consistency</p> <p>Special Identifier Format: I-length follows, 3 manufacturer-specific bytes follow (Process data: 1 Byte DI for module bus station C)</p>	4. module bus station: 4 DI
4	0x43 0x40 0x50 0x22 0x01 <p>3. manufacturer-specific byte 2. manufacturer-specific byte 1. manufacturer-specific byte I/O length, consistency</p> <p>Special Identifier Format: I-length follows, 3 manufacturer-specific bytes follow (Process data: 2 Byte AI for module bus station E)</p>	5. module bus station: 1 DI

4 Communication in PROFIBUS-DP Parameterization

Configuration Byte offset address	Value	Remarks
6	0x83 0x40 0x05 0x06 0x01 <p>3. manufacturer-specific byte 2. manufacturer-specific byte 1. manufacturer-specific byte I/O length, consistency</p> <p>Special Identifier Format: O-length follows, 3 manufacturer-specific bytes follow (Process data: 2 Byte AO for module bus station F)</p>	6. module bus station: 1 AO I
8	0x83 0x00 0x02 0x20 0x01 <p>3. manufacturer-specific byte 2. manufacturer-specific byte 1. manufacturer-specific byte I/O length, consistency</p> <p>Special Identifier Format: O-length follows, 3 manufacturer-specific bytes follow (Process data: 2 Byte DO for module bus station G)</p>	7. module bus station: 2 DO 0.5 A

Diagnostics data

Module bus station A:	no diagnostics data available
Module bus station B:	no diagnostics data available
Module bus station C:	no diagnostics data available
Module bus station D:	no diagnostics data available
Module bus station E:	Bit 0: Measurement range fields Bit 1: Wire break
Module bus station F:	no diagnostics data available
Module bus station G:	Bit 0: Overcurrent

4 Communication in PROFIBUS-DP

Diagnostics messages DPV0 gateways

Diagnostics messages DPV0 gateways

The gateway transmits the following diagnostics:

- Checking the status of the XI/ON station
- Checking the communication via the internal module bus
- Checking the communication to PROFIBUS-DP
- Checking the status of the gateway

Diagnostics messages are indicated in two different ways:

- via the individual LEDs:
→ Chapter "Diagnostics indications through the LEDs", Page 39
- via the software of the particular field bus master (for instance, PLC)
→ Chapter "Diagnostics messages via software", Page 141

Diagnostics messages via software

The diagnostics messages are shown as diagnostics bytes in the software of the corresponding PROFIBUS-DP master. For the meaning of the individual diagnostics bits for the DPV0 gateways → Chapter “Description of the gateway diagnostics”, Page 142.

During parameterization of the PROFIBUS-DP gateway, the parameter Gateway Diagnostics can be used to choose between two settings for the diagnostics display:

- Use **Devices, Identifier, Channel diagnostics** to select a detailed diagnostics display. This representation can support a maximum of 15 channels.
- Selecting **Device-specific Diagnostics** generates an abbreviated diagnostics display that only shows the gateway diagnostics (device-specific diagnostics). The diagnostics bytes from all the diagnostics-enabled modules in the station are attached.
→ Parameter “Bit 5: Gateway diagnosis”, Page 85.

An example of diagnostics messages via a PLC:
→ Chapter “Fault diagnostics (station diagnostics) for coupling to a Moeller PS416 controller”, Page 201

Description of the gateway diagnostics

The gateway uses 3 bytes for the diagnostics. Byte **0** defines the diagnostics type and the total number of diagnostics bytes (maximum 64 diagnostics bytes in the diagnostics block). Bytes **1** and **2** contain the diagnostics messages from the gateway. The format used is the Station-specific Diagnostics Format according to PROFIBUS-DP standard.

In the following table, the texts in the Designation column correspond to the definitions in the Basic Device Data files (GSD-files). These texts are also identically included in the configuration software of the DP master.

Table 35: Gateway diagnostics bits

Diagnostics data set	Bit	Designation	Meaning
Diagnostics Byte 0:		PROFIBUS	
0	0 to 5	DP diagnostics length identifier (1 to 64 bytes)	Predefined by the PROFIBUS-DP standard.
	6 to 7	DP diagnostics type	Predefined by the PROFIBUS-DP standard.

4 Communication in PROFIBUS-DP

Diagnostics messages DPV0 gateways

Diagnostics data set	Bit	Designation	Meaning
Diagnostics Byte 1:		Gateway Warning	
1	0	Module diagnostics available	0 No module bus station reporting a diagnosis.
			1 At least one module bus with diagnostics function is reporting a diagnosis.
	1	reserved	
	2	Parameterization incomplete	
			1 At least one module bus station with parameters has not been completely parameterized, and has set the appropriate bit in its status byte.
3	Deviating configuration		0 The list of physically implemented modules matches the configuration that was created in the configuration software of the corresponding field bus master.
			1 The list of physically implemented modules has been altered, so that process data can still be exchanged with the module bus participants that are on the module bus at present. The reference is the module bus station arrangement that was created in the configuration software of the corresponding field bus master.

4 Communication in PROFIBUS-DP

Diagnostics messages DPV0 gateways

Diagnostics data set	Bit	Designation	Meaning
Diagnostics Byte 2:		Gateway Error	
2	0 to 1	reserved	
	2	Module bus error	0 Communication is possible with the stations on the module bus.
			1 No communication is possible with the stations on the module bus.
	3	Master configuration error	0 The current module list matches the configuration that was created in the configuration software of the corresponding field bus master.
			1 The list of physically implemented modules has been altered, so that no process data can be exchanged with the module bus participants that are on the module bus at present. The reference is the module bus station arrangement that was created in the configuration software of the corresponding field bus master.
	4	reserved	
5	Station configuration error	0 The station configuration has been made available by the gateway for reading out.	
		1 The station configuration could not be made available by the gateway for reading out.	

4 Communication in PROFIBUS-DP

Diagnostics messages DPV0 gateways

Diagnostics data set	Bit	Designation	Meaning
2	6	I/Oassistant Force Mode active	<p>0 The field bus master can access the parameters, diagnostics and process data of the module bus participants.</p> <hr/> <p>1 Force Mode is activated through the Service interface (by the I/Oassistant software). This disconnects the field bus master from the outputs of the module bus participants. There is no exchange of process data between the field bus master and the output modules.</p>
	7	Module bus failure	<p>0 Error-free communication with the module bus.</p> <hr/> <p>1 Communication with the module bus cannot be configured, or a functional error has only been detected after configuration.</p>

Up to 61 bytes of module-specific diagnostics messages may follow.

Description of the module diagnostics



Please pay also attention to the information about the module diagnostics in the manual of the corresponding module.

Table 36: Module diagnostics

Module	Chn.	Bit	Diagnostics
XN-BR-24VDC-D		0	Module bus voltage warning: <ul style="list-style-type: none"> Monitoring of the externally provided system supply voltage ($U_{SYS} = 24 \text{ V DC}$). The system supply is converted ($24 \text{ V DC} \Rightarrow 5 \text{ V}$).
		1	reserved
		2	Field voltage missing: <ul style="list-style-type: none"> Monitoring of the externally provided field supply voltage. $U_L = 24 \text{ V DC}$.
		3	reserved
XN-PF-24VDC-D XN-PF-120/230-VAC-D		0	reserved
		1	reserved
		2	Field voltage missing: <ul style="list-style-type: none"> Monitoring of the externally provided field supply voltage. <ul style="list-style-type: none"> XN-PF-24VDC-D: $U_L = 24 \text{ V DC}$ XN-PF-120/230-VAC-D: $U_L = 120 \text{ or } 230 \text{ V AC}$
		3	reserved
XN-1AI-(0/4...20MA) XN-2AI-(0/4...20MA)	n	0	Measurement value range error: Indication of overcurrent or undercurrent of 1 % of the set current range. <ul style="list-style-type: none"> Current 0...20 mA: <ul style="list-style-type: none"> Overcurrent: I_{max} ($I > 20.2 \text{ mA}$); Undercurrent is not detected. Current 4...20 mA: <ul style="list-style-type: none"> Overcurrent: I_{max} ($I > 20.2 \text{ mA}$); Undercurrent: I_{min} ($I < 3.8 \text{ mA}$)

4 Communication in PROFIBUS-DP

Diagnostics messages DPV0 gateways

Module	Chn.	Bit	Diagnostics
XN-1AI-I(0/4...20MA) XN-2AI-I(0/4...20MA)	n	1	Wire break: <ul style="list-style-type: none"> • Indication of a wire break in the signal cable for operating mode 4...20 mA with a threshold of 3 mA.
XN-1AI-U(-10/0...+10VDC) XN-2AI-U(-10/0...+10VDC)	n	0	Measurement value range error: Indication of overvoltage or undervoltage of 1% of the set voltage range. <ul style="list-style-type: none"> • Voltage -10...+10 V DC: <ul style="list-style-type: none"> – Overvoltage: U_{max} ($U > 10.1$ V DC) – Undervoltage: U_{min} ($U < -10.1$ V DC) • Voltage 0...+10 V DC: <ul style="list-style-type: none"> – Overvoltage: U_{max} ($U > 10.1$ V DC) – Undervoltage: U_{min} ($U < 0.1$ V DC)
XN-2AI-PT/NI-2/3	n	0	Measurement value range error: <ul style="list-style-type: none"> • Unterflow diagnostics only in temperature measurements • Threshold: 1 % of the positive measurement range limit value
		1	Wire break
		2	Short-circuit (only in temperature measurements): <ul style="list-style-type: none"> • Threshold: 5 Ω (loop resistance) • With 3-wire measurements with PT100 sensors, no distinction is made between short-circuit and wire break at a temperature below -177 °C. In this case, the "Short-circuit" diagnostic signal is generated.
		3 to 7	reserved
XN-2AI-THERMO-PI	n	0	Measurement value range error: <ul style="list-style-type: none"> • Threshold: 1 % of the positive measurement range limit value • With type K, N and T sensors, the "Underflow" diagnostic signal is generated on temperatures below -271.6 °C.
		1	Wire break (only in temperature measurements)

4 Communication in PROFIBUS-DP

Diagnostics messages DPV0 gateways

Module	Chn.	Bit	Diagnostics
XN-2AI-THERMO-PI	n	2 to 7	reserved
XN-4AI-U/I	n	0	<p>Measurement value range error: Indication of overvoltage or undervoltage of 1% of the set voltage range or indication of overcurrent or undercurrent of 1 % of the set current range.</p> <ul style="list-style-type: none"> • Voltage -10...+10 V DC: <ul style="list-style-type: none"> – Overvoltage: U_{\max} ($U > 10.1$ V DC) – Undervoltage: U_{\min} ($U < -10.1$ V DC) • Voltage 0...+10 V DC: <ul style="list-style-type: none"> – Overvoltage: U_{\max} ($U > 10.1$ V DC) – Undervoltage: U_{\min} ($U < 0.1$ V DC) • Current 0...20 mA: <ul style="list-style-type: none"> – Overcurrent: I_{\max} ($I > 20.2$ mA); – Undercurrent is not detected. • Current 4...20 mA: <ul style="list-style-type: none"> – Overcurrent: I_{\max} ($I > 20.2$ mA); – Undercurrent: I_{\min} ($I < 3.8$ mA)
		1	<p>Wire break:</p> <ul style="list-style-type: none"> • Indication of a wire brake in the signal cable for operating mode 4...20 mA with a threshold of 3 mA.
XNE-8AI-U/I-4PT/NI	n	0	<p>Measurement value range error "Out of Range" (OoR):</p> <ul style="list-style-type: none"> • The measured value oversteps or undercuts the limit of the nominal range (limit values according to parameterization). PB_„UPPER_LIMIT_VALUE, LOWER_LIMIT_VALUE“

4 Communication in PROFIBUS-DP

Diagnostics messages DPV0 gateways

Module	Chn.	Bit	Diagnostics
XNE-8AI-U/I-4PT/NI	n	1	Wire break (WB): <ul style="list-style-type: none"> • The measured value is in the range which is assumed that there is a wire break in the signal cable. <ul style="list-style-type: none"> – In temperature measurements – In resistance measurements – In current measurements in the range of 4...20 mA PB_„LINE_BREAK“
		2	Short-circuit (SC): <ul style="list-style-type: none"> • The measured value is in the range which is assumed that there is a short-circuit. <ul style="list-style-type: none"> – In temperature measurements: Threshold: 5 Ω (loop resistance) – 3-wire measurements with PT100 sensors cannot differentiate between a short-circuit and a wire break at temperatures below -177 °C. In this case, the diagnostic "shortcircuit" is generated. PB_„OVER_LOAD“
		3	Overflow / Underflow (OUFL): <ul style="list-style-type: none"> • The measured value exceeds the measurement range (limit values according to parameterization). The module cannot measure this value. The return value is the maximum or minimum value which can be measured. PB_„ERROR“
		7	Hardware error (HW Error): <ul style="list-style-type: none"> • Exampels: CRC error, calibration errors... • The return value of the measured value is "0". PB_„HW_ERROR“
XN-2DO-24VDC-0.5A-P XN-2DO-24VDC-0.5A-N XN-2DO-24VDC-2A-P	n	0	Overcurrent (short-circuit), channel 1
		1	Overcurrent (short-circuit), channel 2
XN-4DO-24VDC-0.5A-P	n	0	Overcurrent (short-circuit), at lest 1 channel

4 Communication in PROFIBUS-DP

Diagnostics messages DPV0 gateways

Module	Chn.	Bit	Diagnostics
XN-16DO-24VDC-0.5A-P		0	Overcurrent (short-circuit), channel 1–4
		1	Overcurrent (short-circuit), channel 5–8
		2	Overcurrent (short-circuit), channel 9–12
		3	Overcurrent (short-circuit), channel 13–16
XN-32DO-24VDC-0.5A-P		0	Overcurrent (short-circuit), channel 1–4
		1	Overcurrent (short-circuit), channel 5–8
		2	Overcurrent (short-circuit), channel 9–12
		3	Overcurrent (short-circuit), channel 13–16
		4	Overcurrent (short-circuit), channel 17–20
		5	Overcurrent (short-circuit), channel 21–24
		6	Overcurrent (short-circuit), channel 25–28
		7	Overcurrent (short-circuit), channel 29–32
XNE-4AO-U/I	n	0	Output value range error "Out of Range" (OoR): <ul style="list-style-type: none"> The set output value oversteps or undercuts the limit of the nominal range (limit values according to parameterization). PB_„UPPER_LIMIT_VALUE, LOWER_LIMIT_VALUE“
		3	Overflow / Underflow (OUFL): <ul style="list-style-type: none"> The set output value exceeds the output range (limit values according to parameterization). The module cannot transmit this value. The output value is the maximum or minimum value which can be outputted. PB_„ERROR“
		7	Hardware error (HW Error): <ul style="list-style-type: none"> Exampels: CRC error, calibration errors... The output value of the analog value is "0". PB_„HW_ERROR“

4 Communication in PROFIBUS-DP

Diagnostics messages DPV0 gateways

Module	Chn.	Bit	Diagnostics
XN-1CNT-24VDC if Bit 7 = 0 (counter mode)		0	Short-circuit/wire break ERR_DO ¹⁾
		1	Short-circuit: sensor supply ERR-24VDC ¹⁾
		2	Wrong count range end
		3	Wrong count range start
		4	Inverting the digital input level is not permissible for the "Latch-Retrigger" function
		5	Wrong main count direction
		6	Wrong mode
		7	Bit = 0, count mode active
if Bit 7 = 1 (measurement mode)		0	Short-circuit/wire break ERR_DO ¹⁾
		1	Short-circuit: sensor supply ERR-24VDC ¹⁾
		2	Wrong sensor pulses
		3	Wrong integration time
		4	Wrong upper limit
		5	Wrong lower limit
		6	Wrong mode
		7	Bit = 1, measurement mode active
XN-1RS232		3	Parameterization error
		4	Hardware error
		5	Error in data flow control
		6	Frame error
		7	Buffer overflow
XN-1RS485/422		3	Parameterization error
		4	Hardware error
		5	Error in data flow control (only in RS422 mode)
		6	Frame error
		7	Buffer overflow

4 Communication in PROFIBUS-DP

Diagnostics messages DPV0 gateways

Module	Chn.	Bit	Diagnostics
XN-1SSI		0	SSI general diagnostics
		1	Wire break
		2	Sensor value overflow
		3	Sensor value underflow
		4	Parameterization error

1) Designation in answering interface

XNE-2CNT-2PWM

Table 37: Structure of the diagnostics bytes for XNE-2CNT-2PWM

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 1	HW_ERR	CNT1_ PAR_ERR	X	X	X	X	X	X
Byte 2	HW_ERR	CNT2_ PAR_ERR	X	X	X	X	X	X
Byte 3	HW_ERR	PWM1_ PAR_ERR	X	X	X	X	P1_DIAG	D1_DIAG
Byte 4	HW_ERR	PWM2_ PAR_ERR	X	X	X	X	P2_DIAG	D2_DIAG

The following table shows the meaning of the diagnostics bits:

Table 38: Diagnostics bits XNE-2CNT-2PWM

Diagnostic message	Values	Meaning
CNT1_PAR_ERR, CNT2_PAR_ERR, PWM1_PAR_ERR, PWM2_PAR_ERR	0	Parameter set of function unit correct
	1	Faulty / inconsistent parameters, wrong parameterization
P1_DIAG, P2_DIAG, D1_DIAG, D2_DIAG	0	No diagnostic message
	1	Diagnosis pending at channel (short circuit)
HW_ERR	0	No diagnostic message
	1	Hardware error: <ul style="list-style-type: none"> • Display of common errors of the module's hardware (e.g. CRC-error, adjustment error...). • Change of device necessary.

XNE-1SWIRE

Table 39: Structure of the diagnostics bytes for XNE-1SWIRE

	B7	B6	B5	B4	B3	B2	B1	B0
Byte 1	GENERAL ERR	U _{SWERR}	free	COM _{ERR}	free	RDY _{ERR}	free	SW _{ERR}
Byte 2	free	U _{AUXERR}	TYP _{ERR}	free	PKZ _{ERR}	free	SD _{ERR}	free
TYP_{ERR} field								
Byte 3	TYP _{ERR} S8	TYP _{ERR} S7	TYP _{ERR} S6	TYP _{ERR} S5	TYP _{ERR} S4	TYP _{ERR} S3	TYP _{ERR} S2	TYP _{ERR} S1
Byte 4	TYP _{ERR} S16	TYP _{ERR} S15	TYP _{ERR} S14	TYP _{ERR} S13	TYP _{ERR} S12	TYP _{ERR} S11	TYP _{ERR} S10	TYP _{ERR} S9
Slave diagnostics bit field								
Byte 5	SD _{ERR} S8	SD _{ERR} S7	SD _{ERR} S6	SD _{ERR} S5	SD _{ERR} S4	SD _{ERR} S3	SD _{ERR} S2	SD _{ERR} S1
Byte 6	SD _{ERR} S16	SD _{ERR} S15	SD _{ERR} S14	SD _{ERR} S13	SD _{ERR} S12	SD _{ERR} S11	SD _{ERR} S10	SD _{ERR} S9
PKZ field								
Byte 7	PKZ _{ERR} S8	PKZ _{ERR} S7	PKZ _{ERR} S6	PKZ _{ERR} S5	PKZ _{ERR} S4	PKZ _{ERR} S3	PKZ _{ERR} S2	PKZ _{ERR} S1
Byte 8	PKZ _{ERR} S16	PKZ _{ERR} S15	PKZ _{ERR} S14	PKZ _{ERR} S13	PKZ _{ERR} S12	PKZ _{ERR} S11	PKZ _{ERR} S10	PKZ _{ERR} S9

4 Communication in PROFIBUS-DP

Diagnostics messages DPV0 gateways

The following table shows the meaning of the diagnostics bits:

Table 40: Diagnostics bits XNE-1SWIRE

Byte	Designation	Status	Comment	
1	SW _{ERR}		SWIRE MASTER	
			If the physical structure of the SWIRE bus does not match the configuration stored in the XNE-1SWIRE, this bit indicates an error.	
		0	Data exchange	The physical structure of the SWIRE bus was accepted and the SWIRE bus is in operation.
		1	Offline	The physical structure was not accepted, the SWIRE bus does not start operation (SW LED flashing).
	RDY _{ERR}		PLC SLAVE	
			This bit indicates an error if the configuration stored in the XNE-1SWIRE does not match the SET configuration stored in the PLC.	
		0	OK	No error present. The SWIRE bus is ready for data exchange.
		1	Offline	The configuration stored in the XNE-1SWIRE was not accepted. The data exchange is prevented (RDY LED flashing).
	COM _{ERR}		Communication SWIRE	
			A communication error is present, such as a slave is no longer reached, its internal timeout has elapsed or communication is faulty. The master cannot carry out data exchange with at least one slave.	
		0	OK	No error present.
		1	faulty	An error is present

4 Communication in PROFIBUS-DP

Diagnostics messages DPV0 gateways

Byte	Designation	Status	Comment	
1	U _{SWERR}		Voltage U _{SW}	
			Voltage fault in U _{SW} , voltage U (17 VDC) for supplying the SWIRE slaves	
		0	OK	No error present.
		1	Undervoltage	An error is present
	GENERAL ERR			Error message
				The creation of a function block shows that systems / function blocks for the general checking of a slave for any diagnostics messages present only check the first byte.
		0	None	No diagnostics message present.
1	Present	One/several diagnostics messages present.		
2	SD _{ERR}		Communication SWIRE slave	
			If the parameter SD _{ERR} is set for group diagnostics, this bit indicates an error as soon as only one slave on the bus sets its SD _{ERR} error bit.	
		0	OK	No error is present or diagnostics function has been deactivated via the parameter setting.
		1	faulty	An error is present
	PKZ _{ERR}			Overcurrent protective circuit-breaker
				If the parameter PKZ _{ERR} is set for group diagnostics, this bit indicates an error as soon as only one PKZ of a slave has tripped.
		0	OK	No PKZ has tripped or diagnostics function has been deactivated via the parameter setting.
1	Tripping	At least one PKZ has tripped.		

4 Communication in PROFIBUS-DP

Diagnostics messages DPV0 gateways

Byte	Designation	Status	Comment
2	TYP _{ERR}		Configuration If the TYP _{ERR} parameter is set with group diagnostics in the parameter setting, this bit indicates an error as soon as a PLC configuration check detects differing slave numbers, types or position of an SWIRE slave.
		0	OK The PLC configuration check was positive (the configuration stored in the XNE-1SWIRE matches the SET configuration stored in the PLC) or the diagnostics function is deactivated via the parameter setting.
		1	faulty A mismatch was determined in the PLC configuration check.
	U _{AUXERR}		Voltage U _{AUX} If the U _{AUXERR} parameter is activated, U _{AUXERR} will generate an error message as soon as the power supply goes below the level at which the function of the relays is not guaranteed.
		0	OK Contactor supply voltage is o.k. (> 20 VDC) or diagnostics function has been deactivated via this parameter.
		1	Undervoltage Contactor supply voltage is not o.k. (< 18 VDC).

4 Communication in PROFIBUS-DP

Diagnostics messages DPV0 gateways

Byte	Designation	Status	Comment
3,4	TYP _{ERR} Sx		Device configuration, slave x Info field for the individual indication of a configuration error as error message. If the TYP _{INFO} parameter is set with individual diagnostics, the error is indicated in this bit field as soon as a PLC configuration check detects differing slave numbers, types or position of an SWIRE slave.
		0	OK No error is present and the slave is in data exchange mode or diagnostics function has been deactivated via the parameter setting.
		1	Incorrect No error is present and the slave is not in data exchange mode.
5,6	SD _{ERR} Sx		Communication, slave x Info field for the individual indication of slave offline or slave diagnostics as error message. The fault is indicated in this bit field if the parameter setting SD _{INFO} is set with individual diagnostics.
		0	OK No error is present or diagnostics function has been deactivated via the parameter setting.
		1	Offline The slave has set its diagnostics bit or the slave was in data exchange with the SWIRE master but is not any longer.

4 Communication in PROFIBUS-DP

Diagnostics messages DPV0 gateways

Byte	Designation	Status	Comment	
7,8	PKZ _{ERR} S _x		Only SWIRE-DIL: Overcurrent protective circuit-breaker slave x	
			Info field for the individual indication of the tripping a motor-protective circuit-breaker (PKZ) as error message. If the PKZ _{INFO} is set for single diagnostics, this bit field indicates the error as soon as the PKZ of the slave S _x has tripped.	
		0	OK	The PKZ of the slave has not tripped or diagnostics function has been deactivated via the parameter setting.
		1	Tripped	The PKZ of the slave has tripped.



The error messages U_{AUXERR}, TYP_{ERR}, TYP_{ERR}S_x, PKZ_{ERR}, PKZ_{ERR}S_x, SD_{ERR} and SD_{ERR}S_x can be deactivated via the parameter setting.

Diagnostics messages DPV1 gateways

The gateway transmits the following diagnostics:

- Undervoltage detection for system and field supply
- Checking the status of the XI/ON station
- Checking the communication via the internal module bus
- Checking the communication to PROFIBUS-DP
- Checking the status of the gateway

Diagnostics messages are indicated in two different ways:

- via the individual LEDs:
→ Chapter "Diagnostics indications through the LEDs", Page 57
- via the software of the particular field bus master (for instance, PLC):
→ Chapter "Diagnostics messages via software", Page 160

Diagnostics messages via software

The diagnostics messages are shown as diagnostics bytes in the software of the corresponding PROFIBUS-DP master.

For the meaning of the individual diagnostic bits of the DPV1 gateways, refer to the following chapters.

The diagnosis telegram

The diagnosis telegram of the DPV1 gateways is structured as follows:

Standard diagnosis	Byte 0	PROFIBUS-DP diagnosis
	...	
	Byte 5	
Extended Diagnosis	Byte 0	Status message (Including manufacturer specific gateway and module diagnosis)
	...	
	Byte 13	
	Byte 0	Module status (2 bits per module show the module status)
	...	
	Byte 19	
	Byte 0	Channel specific diagnosis module 0
	...	
	Byte 2	
	...	
	Byte 2	Channel specific diagnosis module n
	...	
Byte 2		

Figure 27: Diagnosis telegram of the DPV1 gateways

Status message

Table 41: Structure of a status message

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4/5	Byte 6 to 13
Block header byte	Status type	Slot-no.	Specifier	Gateway diagnosis	Common module diagnosis

Table 42: Structure of a status message

Byte 0	<p>Block header byte: This header byte defines status- and alarm-PDUs (bit 6 and bit 7 = "00"). In addition to that, it contains information about the length of the diagnosis telegram (length = 14 bytes). The header byte is included in the length indicator.</p>
Byte 1	<p>Status type: bit 7 = 1 (defines, that the message is a status-PDU). bit 0 to 6: define the type of the status-PDU: bit 0 = 1 → <i>status message</i></p>
Byte 2	<p>Slot number: Always "0", because the gateway is the first module of the station.</p>
Byte 3	<p>Specifier: "0" = no further differentiation</p>
Byte 4 and Byte 5	<p>Gateway diagnosis (→ Chapter "Description of the gateway diagnostic bytes", Page 167): Byte 4, bit 0 shows, if a module within the station sends a diagnosis (bit 0 = 1) or not (bit 0 = 0).</p>
Byte 6 to 13	<p>Common module diagnosis (1 bit per module): Shows, which module sends a diagnosis, if a wrong module is plugged or if a module is missing).</p>



In the 8 byte-common module diagnostics (bytes 6 to 13), 1 bit is reserved for every module. A status message can thus display diagnostic messages of at most 64 modules.

These 8 bytes are always sent. So, it is not relevant, if the modules within the station send diagnostic messages or not. Additionally, the status message is independent of the actual number of modules in the station.

Pending diagnostic messages are indicated by "1".

"0" indicates no active diagnostic message.

Module status

Table 43: Structure of a modul status

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4 to 19
Block header byte	Status type	Slot-no.	Specifier	Module diagnosis (2 bits per module)

Table 44: Structure of a modul status

Byte 0	<p>Block header byte: This header byte defines status- and alarm-PDUs (bit 6 and bit 7 = "00"). In addition to that, it contains information about the length of the diagnosis telegram (length = 14 bytes). The header byte is included in the length indicator.</p>
Byte 1	<p>Status type: bit 7 = 1 (defines, that the message is a status-PDU). bit 0 to 6: define the type of the status-PDU: bit 1 = 1 → <i>module status</i></p>
Byte 2	<p>Slot number: Always "0", because the gateway is the first module of the station.</p>
Byte 3	<p>Specifier: "0" = no further differentiation</p>
Byte 4 to 19	<p>Module status (2 bits per module): 00 = data valid, ok. 01 = module sends a diagnosis; data not valid, for example "short-circuit". 10 = wrong module in slot (the plugged module does not correspond to the module planned in the reference module list of the gateway); data not valid. 11 = module missing (no module is plugged, although it is planned in the reference module list of the gateway); data not valid.</p>



In the 16 byte-module status (bytes 4 to 19), 2 bits are reserved for every module. A module status can thus display diagnostic messages of at most 64 modules.

These 16 bytes are always sent. So, it is not relevant, if the modules within the station send diagnostic messages or not. Additionally, the module status is independent of the actual number of modules in the station.

Please refer to Table 44, Page 164 for the meaning of the diagnostic message. "0" indicates no active diagnostic message.

Channel-specific diagnosis

The channel-specific diagnosis consists of 3 bytes **per module**:

- 1 byte Header
- + 1 byte channel description
- + 1 byte error-codes

Table 45: Structure of a channel-specific diagnosis

Byte 1	<p>Header: Defines the channel specific diagnosis via bit 6 and bit 7 = "10". In addition to that, it contains the number of the module which sends the diagnosis message (bit 0 to bit 5).</p>
Byte 2	<p>Module: Bit 0 to bit 5 contain the channel number. Bit 6 and bit 7 define, if the channel is an input or an output channel: 01 = input 10 = output 11 = input and output</p>
Byte 3	<p>Diagnosis message: Bit 5 to bit 7 define, if the module is a bit-, byte- or word-oriented module: 001 = bit-oriented 010 = 2 bit-oriented 011 = 4 bit-oriented 110 = word-oriented 111 = double word-oriented</p> <p>Bit 0 to bit 4 contain an error code (decimal), which specifies the diagnostic message (→ Chapter "Channel-specific diagnostic messages of the modules", Page 169).</p>



The channel-specific diagnosis is generated for every channel of a module within a station, which is actually present and which sends active diagnosis.

Description of the gateway diagnostic bytes

Table 46: Gateway diagnostic bytes

Diagnostic byte	Bit	Description
Byte 1	Gateway warnings	
	0	Module diagnostics available 0 = No module bus station is signaling a diagnostic. 1 = At least one module bus station with diagnostic function is signaling a diagnostic.
	1	reserved
	2	reserved
	3	Station configuration changed 0 = The actual list of modules matches the configuration set in the configuration software of the corresponding field bus master. 1 = The actual list of modules is different to the configuration set in such a manner, that process data can still be exchanged with the module bus stations which are at present connected to the module bus. The constellation of the module bus station that is set in the configuration software (CheckConfig-Cmd) of the corresponding field bus master serves as a reference.
	4	Undervoltage field supply U_L 0 = U_L is within the permissible range 1 = U_L is not within the permissible range
	5 to 7	reserved

4 Communication in PROFIBUS-DP

Diagnostics messages DPV1 gateways

Diagnostic byte	Bit	Description
Byte 2	Gateway errors	
	0...1	reserved
	2	Module bus error 0 = Communication with the module bus station on the module bus is possible. 1 = Communication with the module bus station on the module bus is not possible.
	3	Master configuration error 0 = The actual list of modules matches the configuration set in the configuration software of the corresponding field bus master. 1 = The actual list of modules has been altered in such a manner, that no process data can be exchanged with the module bus stations which are at present connected to the module bus. The constellation of the module bus station, set in the configuration software of the corresponding field bus master serves as a reference.
	4	reserved
	5	Station configuration error 0 = The gateway has prepared the station's configuration to be read out. 1 = The gateway could not prepare the station's configuration to be read out.
	6	I/Oassistant Force Mode active 0 = The field bus master can access the parameter, diagnostics and process data of the module bus stations. 1 = The force mode has been activated via the service interface (by the I/Oassistant software). This separates the field bus master from the outputs of the module bus stations. No process data exchange is taking place from the field bus master to the output modules.
	7	reserved

Channel-specific diagnostic messages of the modules

The channel-specific diagnostic messages are defined as follows:

Table 47: Channel-specific diagnosis

Value (dec.)	Diagnostics
Error-Codes (1 to 9 according to DP-spec.)	
1	Short-circuit
2	Undervoltage
3	Overvoltage
4	Overload
5	Overtemperature
6	Wire-break
7	Upper limit value exceeded
8	Lower limit value exceeded
9	Error
Error-Codes (16 to 31, manufacturer-specific)	
16	Parameterization error After a validity check, the parameter data are (partially) rejected by the module. Check the context of parameters.
21	Hardware failure The module detected a hardware failure. Exchange the module.
22	Communication failure The module detected a communication problem at its ports, e. g. RS232/485/422, SSI or other interface. Check the connection or the function of the attached devices.
23	Direction error The direction is detected to be wrong. Check the parameterization or the control interface versus use case.
24	User software error The module detected an user application software error. Check the interoperability of the user application software revisions. Reinitialize the user application software of the module.

4 Communication in PROFIBUS-DP

Diagnostics messages DPV1 gateways

Value (dec.)	Diagnostics
25	Cold-junction compensation error The module detected a defect or missing cold-junction compensation.
26	Sensor supply load dump The module detected a load dump at the sensor supply.
27	Unknown Error An error bit which is not known by the gateway is set. The gateway received an unknown module error message.
28	Common Error The module detected an error. Refer to the I/O-module manuals for a more detailed description of possible errors. Error types can depend on the operation mode and the parameterization.
29	Configuration Error After the validity check, the configuration data is (possibly partially) rejected. Check the context.

4 Communication in PROFIBUS-DP

Description of user data for acyclic services

Description of user data for acyclic services

The following instances are defined for the DPV1-gateways:

- Gateway application instance (Slot 0)
- Module application instance (Slot 1 to n)



Acyclic data transfer is only possible with DPV1 gateways.

Gateway application instance

Table 48: Gateway application instance

Index (dec.)	Name	Data type	r/w	Remark
1	Gateway-parameters	WORD	r/w	Parameter data of the gateway
2	Gateway-name	STRING	r	Name of the gateway
3	Gateway-revision	STRING	r	Firmware-revision of the gateway
4	Gateway-ID	DWORD	r	IDENT number of the gateway
5 to 23	reserved			
24	Gateway-diagnosis	WORD	r	Diagnostics data of the gateway
25 to 31	reserved			
32	Module-input-list	Array of BYTE	r	List of all input channels in the station
33	Module-output-list	Array of BYTE	r	List of all output channels in the station
34	Modul-diag.-list	Array of BYTE	r	List of all module diagnostic messages
35	Module-parameter-list	Array of BYTE	r	List of all module parameters
36 to 244	reserved			
255	I&M-functions		r/w	Identification & Maintaining-services, I&M0 according to PROFIBUS-DP specification

4 Communication in PROFIBUS-DP

Description of user data for acyclic services

Module application instance

Table 49: Module application instance

Index (dec.)	Name	Data type	r/w	Remark
1	Modul-ID	DWORD	r	Indent number of the module
2	Modul-type	ENUM UINT8	r	Module type
3	Modul-revision	UINT8	r	Firmware-Revision of the module
4 to 18	reserved			
19	Input-data	specific	r	Input data of the respective module
20 to 22	reserved			
23	Output-data	specific	r/w	Output data of the respective module
24 to 30	reserved			
31	Module-parameters	specific	r/w	Parameters of the respective modules
32 to 255	Profile-specific	These indices are reserved for the data of several module profiles. The definitions of the profile indices can be found in the respective module descriptions.		

Data volume in a XI/ON station with DPV0 gateway

Maximum data volumes

A XI/ON station with DPV0 gateway consist of the DPV0 gateway and max. 74 modules in the slice versions (equivalent to about 1 m mounting rail length, including the end brackets and end plate).

The limit on the maximum possible number of channels is determined by the number of process data, diagnostics, parameter and configuration bytes of the XI/ON modules, which is limited by the field controller that is used in XI/ON. A XI/ON system can handle the following maximum possible data volumes:

Process data bytes	176 bytes
Diagnostics bytes	64 bytes (61 of module diagnosis + 3 bytes of gateway diagnostics)
Parameter bytes	117 bytes
Configuration bytes	176 bytes



61 diagnostics bytes are transmitted across the PROFIBUS-DP field bus. If there are additional modules in the station, the diagnostics for these modules will not be transmitted. The station is operable!

Packing of modules (standard/typified)

The Packing of modules of the same (typified module representation) or identical types (standard module representation) is primarily used to reduce the number of configuration bytes as well as to compress the process data to be transmitted, and so achieve faster communication between the field bus master and the individual XI/ON modules.

4 Communication in PROFIBUS-DP

Data volume in a XI/ON station with DPV0 gateway

The process data are transmitted byte-wise (8-Bit) across the PROFIBUS. Since the digital module types only require 1-Bit process data for each channel, the data for several modules can be collected together.

Packed modules are implemented in the project engineering as multiple blocks or sequential modules:

- Multiple blocks
 - only typified module representation, identified by
2*T-XN... to 4*T-XN... in the GSD-file
 - Only 1 process data byte per multiple block.



Caution!

The application of multiple blocks that exceed the limit of 1 byte of process data (3*T-XN... or 4*T-XN... for modules with 4 DI or 4 DO) is not covered.

- Sequential modules
 - Standard or typified module representation, identified by ..S-XN... or ..T-XN... in the GSD-file
 - The process data bits are added on to the process data for the 1st module in the particular block, until the 1-byte limit has been reached.



Caution!

The sum of the process data lengths for all the modules included in a module block must not exceed the limit of

1 byte.

The number of process data bytes required is given by the quantity of process data for the individual modules and the type of representation.

4 Communication in PROFIBUS-DP

Data volume in a XI/ON station with DPV0 gateway

Example 1:

Table 50: Number of process or data bytes for 3 modules XN-2DI-24VDC-P

Module representation	Module 1	Module 2	Module 3	Total no. of process data bytes
Unpacked	1 Byte	1 Byte	1 Byte	3 Bytes
Packed; standard representation	2 Bit	2 Bit	2 Bit	1 Byte
Packed; typified representation	2 Bit	2 Bit	2 Bit	1 Byte

Example 2:

Table 51: Number of process or data bytes for 5 modules XN-2DI-24VDC-P

Module representation	Module 1	Module 2	Module 3	Module 4	Module 5	Total no. of process data bytes
Unpacked	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	5 Bytes
Packed; standard representation	2 Bit	2 Bit	2 Bit	2 Bit	2 Bit	2 Bytes
Packed; typified representation	2 Bit	2 Bit	2 Bit	2 Bit	2 Bit	2 Bytes
Packed; typified representation, multiple blocks	1 Byte				2 Bit	2 Bytes

4 Communication in PROFIBUS-DP

Data volume in a XI/ON station with DPV0 gateway

Example of process data volume

When use is made of packed modules in module blocks, certain conditions must be observed, as explained in the following example:

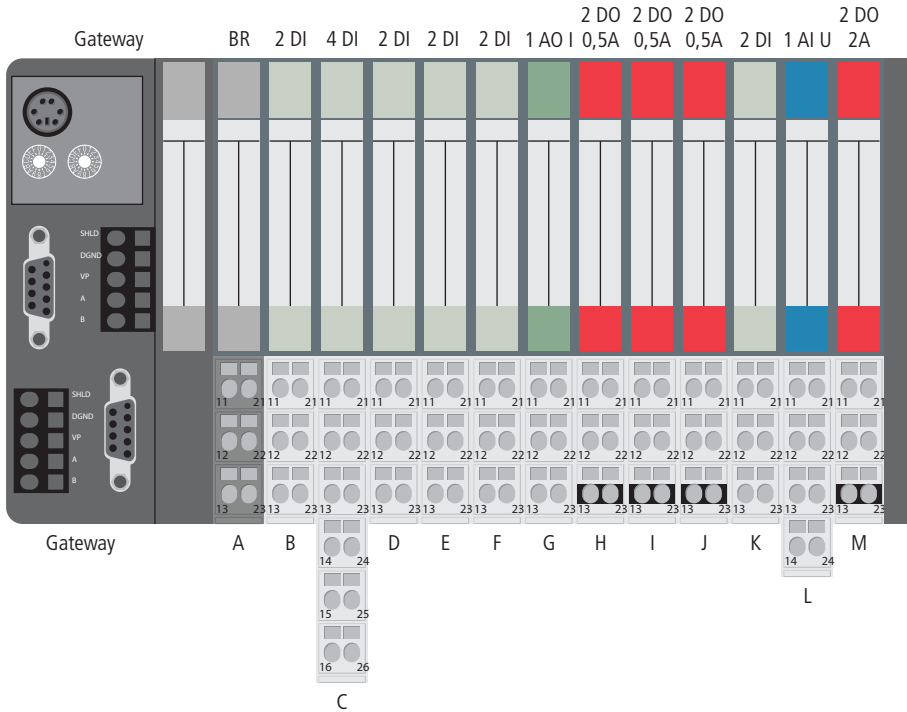


Figure 28: Example of a XI/ON station

The following shows the configuration possibilities and the effects on the number of process data bytes for the XI/ON station that is illustrated.

4 Communication in PROFIBUS-DP

Data volume in a XI/ON station with DPV0 gateway

Block-building with standard module representation

During configuration, the individual process data elements for the various modules in a block are assigned to fixed bit positions in the corresponding process data byte.

Table 52: Example of block-building for I/O modules with standard module representation (associated modules are indicated by matching shades of gray).

Module sequence	No. of process data elements	Standard module representation	Packed process data bytes	
→ Figure 28 Page 176		Identification of the GSD-file	Example: address input	Example: address output
GW				
A (BR)				
B	2 Bit	S-XN-2DI-24VDC-P	0.0 to 0.1	
C	4 Bit	S-XN-4DI-24VDC-P	1.0 to 1.3	
D	2 Bit	S-XN-2DI-24VDC-P	2.0 to 2.1	
E	2 Bit	..S-XN-2DI-24VDC-P	2.2 to 2.3	
F	2 Bit	..S-XN-2DI-24VDC-P	2.4 to 2.5	
G	2 Byte	S-XN-1AO-I(0/4...20MA)		256.0 to 257.7
H	2 Bit	S-XN-2DO-24VDC-0.5A-P		0.0 to 0.1
I	2 Bit	..S-XN-2DO-24VDC-0.5A-P		0.2 to 0.3
J	2 Bit	..S-XN-2DO-24VDC-0.5A-P		0.4 to 0.5
K	2 Bit	..S-XN-2DI-24VDC-P	2.6 to 2.7	
L	2 Byte	S-XN-1AI-U(-10/0...+10VDC)	256.0 to 257.7	
M	2 Bit	..S-XN-2DO-24VDC-2A-P		0.6 to 0.7

4 Communication in PROFIBUS-DP

Data volume in a XI/ON station with DPV0 gateway

After the process data have been packed, the process input data are represented by 5 bytes and the process output data by 3 bytes. That is, 8 bytes overall.

The unpacked process data occupy 14 bytes. 8 input addresses and 6 output addresses are assigned. In some cases, only 2 or 4 bits of a byte are used.

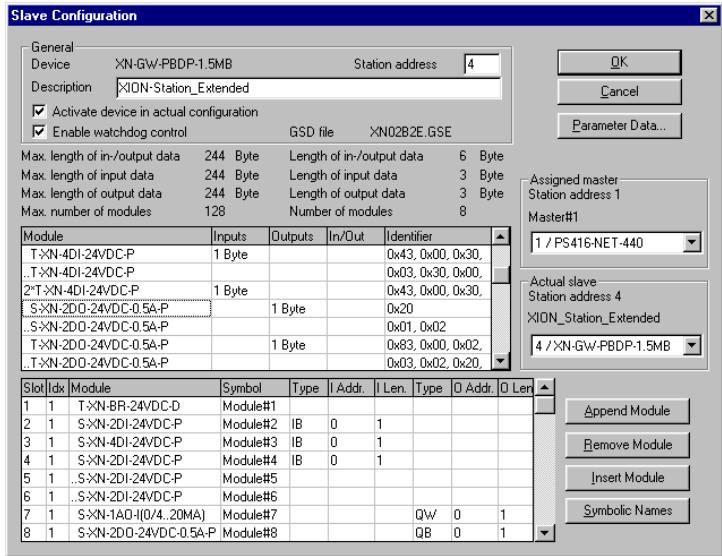


Figure 29: Using the standard module representation in a Moeller control system

The following table shows the bit structure of a process data byte for 4 packed XN-2DI-24VDC-P modules:

Table 53: Bit structure

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
DI 2	DI 1	DI 2	DI 1	DI 2	DI 1	DI 2	DI 1
Module K		Module F		Module E		Module D	

4 Communication in PROFIBUS-DP

Data volume in a XI/ON station with DPV0 gateway

As a result of this layout, only modules with identical process data lengths can be used if the electronics modules are replaced.

The next module in the sequence must have the same process data length as the original module.

Example:

Module B cannot be packed together with Module C, because the two modules have different process data lengths (2 DI and 4 DI respectively).

Module D cannot be packed together with Module B, because there is a module of the same type (input module) but with a different process data length (4 DI) located between the two modules.



So the feasibility of building module blocks in an XI/ON stations can already be decisively influenced at the configuration stage.

4 Communication in PROFIBUS-DP

Data volume in a XI/ON station with DPV0 gateway

Block-building with typified module representation

If the original module is available in the typified representation, then all the following modules in the sequence can have different process data lengths. The typified representation ensures an unambiguous identification of the electronics modules.

Table 54: Example of block-building for I/O modules with typified module representation (associated modules are indicated by matching shades of gray).

Module sequence	No. of process data elements	Typified module representation Identification of the GSD-file	Packed process data bytes Example: address input	Example: address output
→ Figure 28 Page 176				
GW				
A				
B	2 Bit	T-XN-2DI-24VDC-P	0.0 to 0.1	
C	4 Bit	..T-XN-4DI-24VDC-P	0.2 to 0.5	
D	2 Bit	..T-XN-2DI -24VDC-P	0.6 to 0.7	
E	2 Bit	T-XN-2DI-24VDC-P	1.0 to 1.1	
F	2 Bit	..T-XN-2DI-24VDC-P	1.2 to 1.3	
G	2 Bytes	T-XN-1AO-I(0/4...20MA)		256.0 to 257.7
H	2 Bit	3* T-XN-2DO-24VDC-0.5A-P		0.0 to 0.1
I	2 Bit			0.2 to 0.3
J	2 Bit			0.4 to 0.5
K	2 Bit	..T-XN-2DI-24VDC-P	1.4 to 1.5	
L	2 Bytes	T-XN-1AI-U(-10/0...+10VDC)	256.0 to 257.7	
M	2 Bit	T-XN-2DO-24VDC-2A-P		1.0 to 1.1

4 Communication in PROFIBUS-DP

Data volume in a XI/ON station with DPV0 gateway

After the process data have been packed, the process input data are represented by 4 bytes and the process output data by 4 bytes. That is, 8 bytes overall.

The unpacked process data occupy 14 bytes. 8 input addresses and 6 output addresses are assigned. In some cases, only 2 or 4 bits of a byte are used.

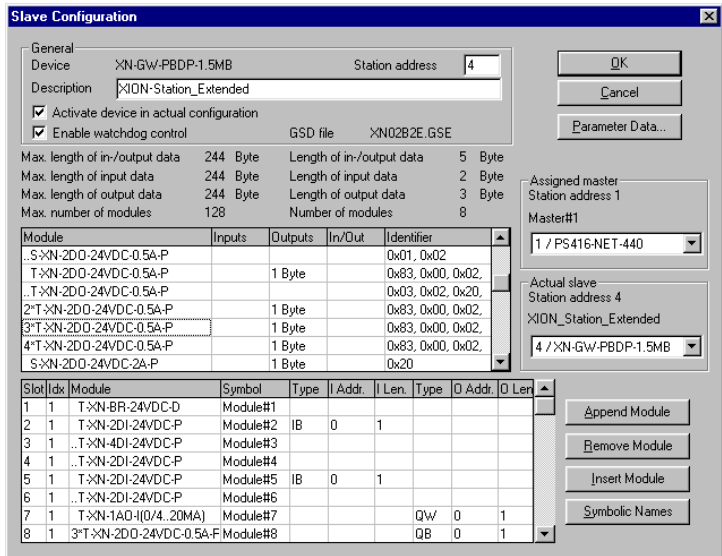


Figure 30: Using the typified module representation in a Moeller control system



When using multiple modules, it must be noted that this option is only available if the modules are contiguous. Input and output modules that are physically separated cannot form a multiple block.

General notes



The sequence of the modules in the process data blocks does not always match the physical sequence of the modules in the station.



Caution!

The sum of the process data lengths for all the modules included in a module block must not exceed the limit of **1 byte**.

The sequential modules can be used in the standard as well as in the typified module representation.



Exception: multiple modules (2*T-XN... up to 4*T-XN...) can not be used as sequential modules.

Relay modules are treated like digital output modules for the packing of the process data.

If modules are inserted into slots that are empty (as per project planning) then the communication of the field bus master will depend on the gateway parameter "Station configuration" (→ Chapter "Overview gateway parameters", Page 78):

- Parameter value: "Do not permit deviations" (default setting):
The station will not go online. An error message will be generated.
- Parameter value: "Adapt deviations":
The modules will be ignored by the field bus master. They can only be accessed through the *I/Oassistant* software.

The maximum expansion of the station (up to 128 modules) can only be achieved by using the unpacked standard module representation. The reason for this is the limitation on the maximum number of configuration bytes.

Number of configuration bytes

Sequential modules (e.g. ..T-XN-2DI-24VDC-P) in the typified module representation each have 1 configuration byte less than the first module in the module block (e.g. T-XN-2DI-24VDC-P).

Sequential modules (e.g. ..S-XN-2DI-24VDC-P) in the standard module representation each have 1 configuration byte more.

A multiple block (e.g 3* T-XN-2DI-24VDC-P) only requires one configuration data set. Forming blocks by using multiple modules thus leads to a saving in configuration bytes.

The following table shows the possibilities for different packing arrangements:

Table 55: Number of configuration bytes, depending on the packing arrangement, using example → Figure 28 Page 176

Packing arrangement	Module representation	Module H	Module I	Module J	Configuration bytes
Standard representation	S-XN.../ ..S-XN...	1 Byte	2 Bytes	2 Bytes	5 Bytes
Typified representation	T-XN.../ ..T-XN...	5 Bytes	4 Bytes	4 Bytes	13 Bytes
Typified representation, multiple block	3*T-XN...		5 Bytes		5 Bytes

Number of parameter bytes

When using the standard module representation, all modules require an additional parameter byte. This additional parameter byte is an item of information for the gateway, and represents the number of bytes for the parameterization of the module.

So it must also be taken into account, that even modules that cannot be parameterized (e.g XN-2DI-24VDC-P) will occupy 1 parameter byte! This parameter byte will then have the numerical value 00_{hex}.



Modules that provide supply voltages can only be shown in the typified representation!

Information about the number of parameter bytes for XI/ON modules can be found in the user manuals!

Data volume in a XI/ON station with DPV1 gateway

Maximum data volumes

The DPV1 gateway can transfer the following data volumes:

- Via cyclic data transfer:

Configuration bytes	max. 244 bytes
Parameter bytes	max. 235 bytes
Process data bytes	max. 244 bytes
- Via acyclic data transfer:

Telegram length	max. 244 bytes
-----------------	----------------



Within a XI/ON station with the XNE ECO gateway XNE-GWBR-PBDP, the maximum number of modules is limited. Please note Chapter "Maximum station extension", Page 61.

4 Communication in PROFIBUS-DP

Maximum system configuration

Maximum system configuration

A bus line consists of at least a PLC or PC and a XI/ON gateway:

- The PLC or PC takes on the PROFIBUS-DP master function.
- The XI/ON gateway acts as a field bus slave. It communicates with the PROFIBUS-DP master and controls the communication with the modules of the XI/ON station.

Incoming and outgoing cables can be connected at the gateway as follows:

- XN standard gateways:
 - by SUB-D socket (all XN standard gateways)
→ Chapter "Field bus connection via SUB-D sockets", Page 29.
 - by terminal blocks (only XN-GW-PBDP-1.5MB and XN-GW-PBDP-1.5MB-S)
→ Chapter "Field bus connection through direct wiring", Page 31.
- XNE ECO gateway:
 - by Push-in tension clamp Terminals
→ Chapter "Field bus connection via Push-in tension clamp terminals", Page 51.

Each XI/ON gateway behaves as a passive station (slave) for PROFIBUS-DP, and occupies one bus address.

Maximum system build level without repeaters

Without repeaters, a PROFIBUS-DP bus line can consist of a maximum of 31 XI/ON stations and one master.



Caution!

The maximum number of 32 bus participants (stations + master) must not be exceeded without using a repeater.

The way to set the bus address depends on the gateway type:

- On the standard gateways, the bus address is set through the two rotary encoding switches (→ Chapter "Addressing", Page 36). Adjustable addresses:
 - 1 to 125 through the rotary hex encoding switches at:
 - XN-GW-PBDP-1.5MB
 - XN-GW-PBDP-1.5MB-S
 - XN-GW-PBDP-12MB
 - 1 to 99 through the rotary decimal encoding switches at:
 - XN-GWBR-PBDP
 - XN-GWBR-DPV1
- On the XNE ECO gateways, the bus address is set through DIP switches (→ Chapter "Addressing at the field bus", Page 54). Adjustable addresses: 1 to 125.

4 Communication in PROFIBUS-DP

Maximum system configuration

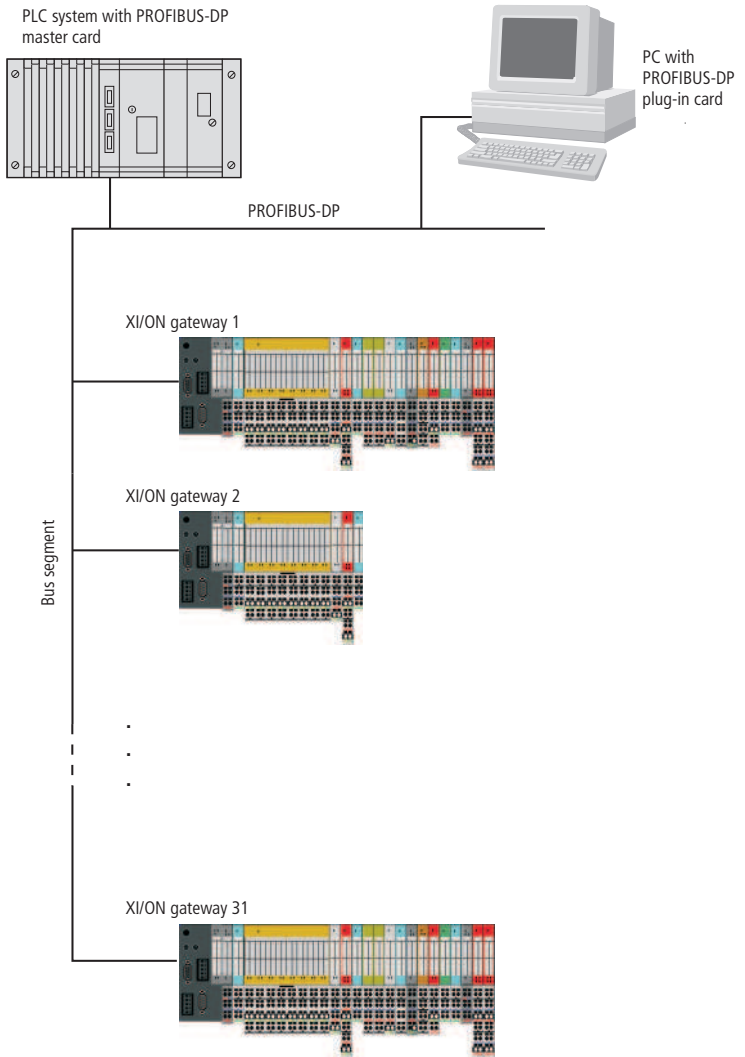


Figure 31: Maximum system build level without repeaters

Maximum system build level with repeaters

The maximum bus length lies between 100 meters (for a transmission rate of 12 MBit/s) and 1200 meters (for a transmission rate of 9600 Bit/s). This length can be extended by using repeaters.



Caution!

When using repeaters, a PROFIBUS-DP system can consist of the master (PLC or PC) and a maximum of 30 gateways per bus segment. The maximum number of all possible bus participants is manufacturer-specific, and is reached, for example, with 122 XI/ON gateways and three repeaters. The maximum total of 125 participants must always be observed.

The way to set the bus address depends on the gateway type, see Chapter "Maximum system build level without repeaters", Page 187.

4 Communication in PROFIBUS-DP

Maximum system configuration

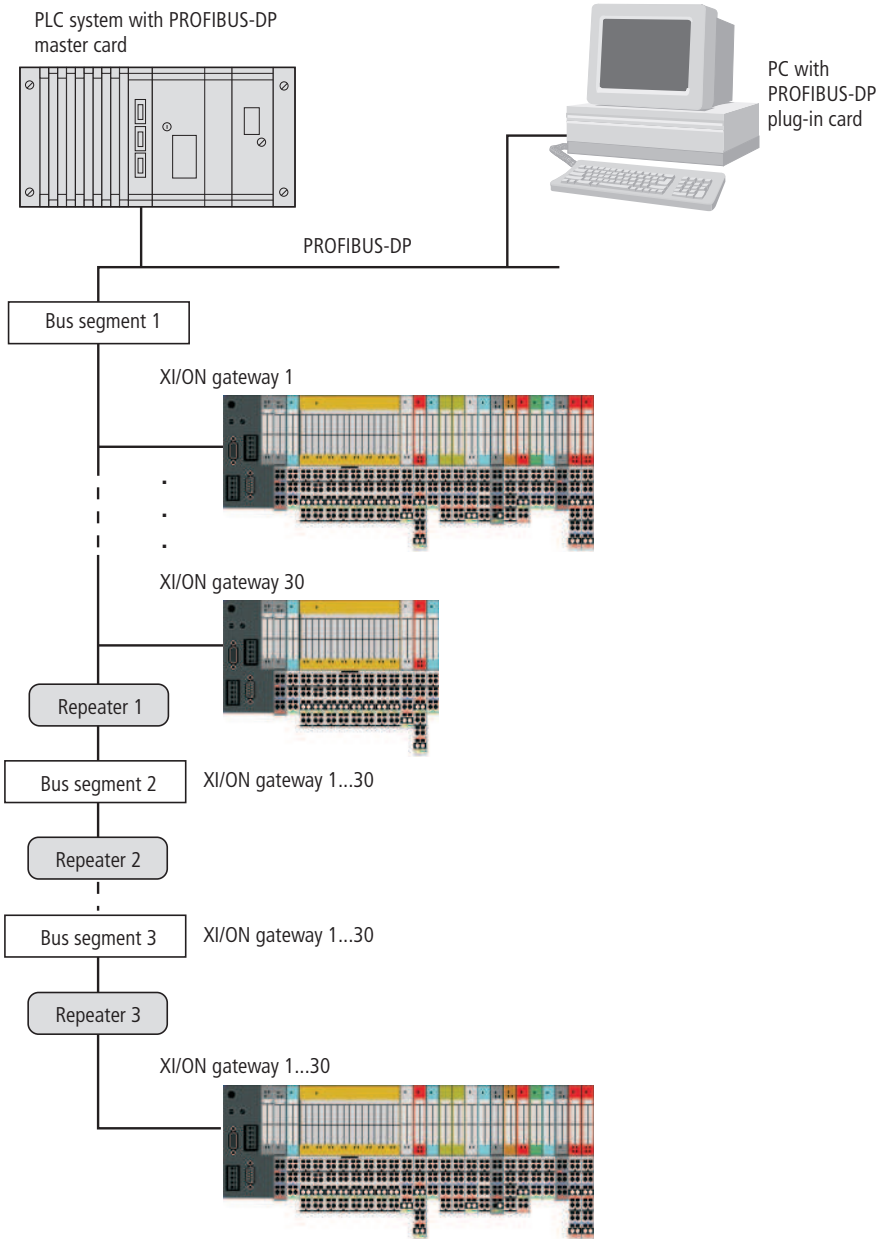


Figure 32: Max. system build level with repeaters

Maximum distances/bus lengths with or without repeaters

Table 56: Maximum distance between two participants/bus length; cable type A

Bit/s	Maximum distance between two participants/bus length; cable type A	
	Max. length of a bus line without repeater	Max. bus length with 3 repeaters
9.6	1200 m	4800 m
19.2	1200 m	4800 m
93.75	1200 m	4800 m
187.5	1000 m	4000 m
500	400 m	1600 m
1 500	200 m	800 m
3000	100 m	400 m
6000	100 m	400 m
12000	100 m	400 m

Table 57: Maximum distance between two participants/bus length; cable type B

kBit/s	Maximum distance between two participants/bus length; cable type B	
	Max. length of a bus line without repeater	Max. bus length with 3 repeaters
9.6	1200 m	4800 m
19.2	1200 m	4800 m
93.75	1200 m	4800 m
187.5	600 m	2400 m
500	200 m	800 m
1500	–	–

4 Communication in PROFIBUS-DP

Mixed operation with other types of station

Mixed operation with other types of station

In addition to the XI/ON gateways, other stations (e.g. other station types and modules from the *WIN*bloc series, or third-party devices that are certified to DIN 19245, Part 3) can be integrated into the field bus system, so that mixed operation is possible. The PROFIBUS-DP system is thus extremely flexible, and can be applied even in the most difficult industrial situations.

5 Coupling with automation equipment

General

This chapter contains detailed information on the connection of an XI/ON station to supervisory automation equipment, such as PLCs (PLC), on PROFIBUS-DP.

PROFIBUS was defined in DIN 19245 transferred to EN 50170 and is now fixed in IEC/EN 61158 and IEC/EN 61784.



The XI/ON gateway can only be used as a PROFIBUS-DP slave. The gateway does not have a master functionality.

Each control system manufacturer offers master modules for their PLC. The XI/ON gateway can be connected to such master modules without any problems. It is also possible to use a PC as the master, if it is fitted with an appropriate PC-PROFIBUS card.



DPV1 gateways can be operated at a DPV0- or at a DPV1-master. Only the offered services are different:

- DPV1 gateways at a DPV1-master offer cyclic and acyclic services,
- at a DPV0-master, they offer only cyclic services.

Parameterization and diagnostics depend exclusively on the gateway type (DPV0 or DPV1 gateway).

Detailed information about the individual control systems and automation equipment can be found in the manuals from the manufacturers concerned.

5 Coupling with automation equipment

General

The description here covers the coupling to the following automation equipment and PLCs:

- Moeller PS416 controller
- Hilscher Card
- SIMATIC S7 from Siemens
- SS Tech DP Master for Allen Bradley - SLC500
- MITSUBISHI A1S



Caution!

The master modules and PC cards must comply with the PROFIBUS-DP standard.

The designations for PLCs and software programs that are used in this manual are registered and protected trademarks of the individual manufacturers.

Connection to a Moeller PS416 controller

To configure the coupling of an XI/ON gateway to a Moeller PS416 controller, the software package used is "CFG-DP" Version 1.30 from Moeller.

Reading in the GSD-file

Before you can start the configuration, the GSD-files for XI/ON must be read in by the software. There are two possible methods:

Before starting the system configurator

- ▶ Copy the GSD-files into the directory "...\\Fieldbus\\PROFIBUS\\Gsd".
- ▶ Copy the icon files (*.bmp) into the directory "...\\Fieldbus\\PROFIBUS\\Bitmaps".
- ▶ Start the CFG-DP software. All the GSD-files will now be automatically read from the directory "...\\Fieldbus\\PROFIBUS\\Gsd" into the system configurator.

After starting the system configurator

If you have already started the system configurator, proceed as follows in order to read in the GSD-files mentioned above:

- ▶ Open a new or existing project.
- ▶ Copy the appropriate GSD-file, by using the menu item <File → Copy GSD>.

5 Coupling with automation equipment

Connection to a Moeller PS416 controller

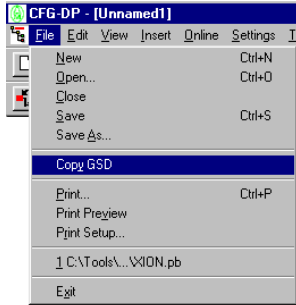


Figure 33: Inserting a GSD-file above the menu item “Copy GSD”

or

- ▶ Use the Windows Explorer to copy the GSD-file into the directory “...\\Fieldbus\\PROFIBUS\\Gsd”.
- ▶ Use the menu item ‹Settings → Path› to read the GSD-file into the configurator.

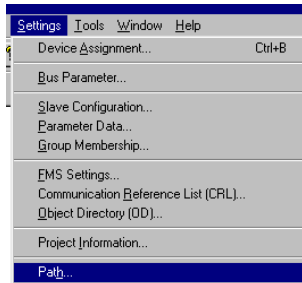


Figure 34: Using the menu item “Path” to read in a GSD-file.

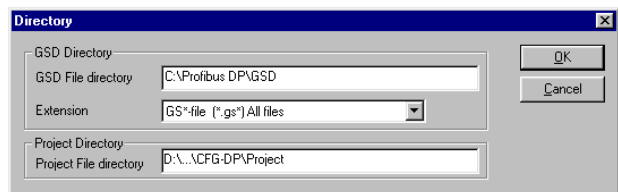


Figure 35: Correct path settings to read in a GSD-file.

5 Coupling with automation equipment

Connection to a Moeller PS416 controller

After the GSD-files have been read in correctly, they are shown as separate entries in the list of insertable slaves.



The precise procedure for configuration can be found in the operating manual that is supplied with the software.

Selection of the XI/ON gateway as a slave

To insert an XI/ON gateway, select the required GSD-file in the "Insert" window, enter a station name, and confirm by pressing "OK".

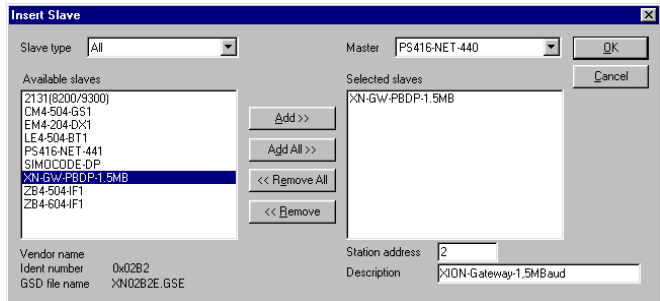


Figure 36: Inserting an XI/ON gateway 1.5 MB as a slave

Example of a configuration (mixed operation)

You can extend your field bus structure as far as you need by using the method described above. In this way, it is also possible to implement mixed structures with PROFIBUS devices from other manufacturers.

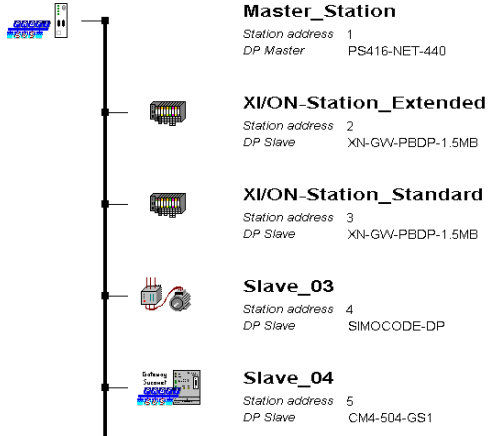


Figure 37: Field bus structure for mixed operation

Setting the gateway parameters

To set the gateway parameters, double-click on the corresponding slave station. In the window that now opens, click on the “Parameter Data” button to access the entry window for setting the gateway parameters:

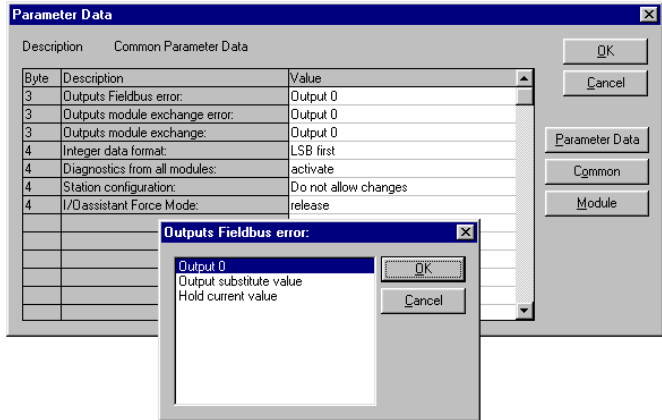


Figure 38: Parameterization of the XI/ON gateway

A double-click on a parameter provides access to the window with the corresponding setting options.

You can use the “Parameter Data” and “Common” buttons to switch between the hexadecimal (Parameter Data) and text representation (Common) of the parameters.

Conversion tables Text A hexadecimal representation, see:

- Chap. “Byte 3 of the gateway parameter data”, Page 253
- Chap. “Byte 4 of the gateway parameter data”, Page 256

5 Coupling with automation equipment

Connection to a Moeller PS416 controller

Meaning of the gateway parameters, see:

- DPV0 gateways:
Chapter "Gateway parameters of the DPV0 gateways", Page 80
- DPV1 gateways:
Chapter "Gateway parameters of the DPV1 gateways", Page 86

Description of the XI/ON module parameters, see Chapter "Module parameters", Page 92.

Configuration of the XI/ON station

The configuration of your XI/ON station is carried out in the window that opens up when you double-click on the corresponding XI/ON station:

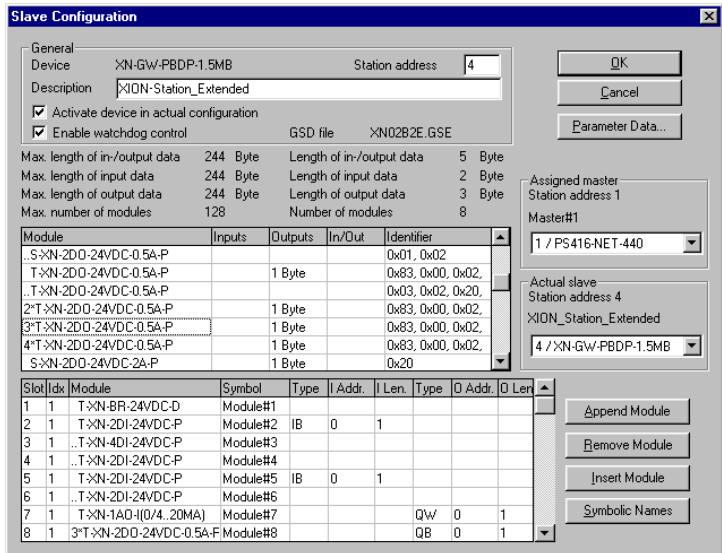


Figure 39: Selection of the XI/ON modules

**Fault diagnostics (station diagnostics) for
coupling to a Moeller PS416 controller**

The diagnostics functions of the software are described in the manual for the "CFG-DP" software from Moeller.

Details on diagnostics for the modules, see:

- Modules within XI/ON station with DPV0 gateway:
Chapter "Description of the module diagnostics", Page 146
- Modules within XI/ON station with DPV1 gateway:
Chapter "The diagnosis telegram", Page 161 (in particular Chapter "Channel-specific diagnostic messages of the modules", Page 169)

Diagnostics options for the gateway, see:

- DPV0 gateways:
Chapter "Description of the gateway diagnostics", Page 142
- DPV1 gateways:
Chapter "The diagnosis telegram", Page 161 (in particular Chapter "Description of the gateway diagnostic bytes", Page 167)

5 Coupling with automation equipment

Connection to Hilscher PROFIBUS cards

Connection to Hilscher PROFIBUS cards

To configure the coupling of an XI/ON gateway to a Hilscher-PROFIBUS card, the software package used is "SyCon" Version 2.0.5.0 from Hilscher.

Reading in the GSD-file

Before the first configuration of the coupling to an XI/ON gateway, it is necessary to read the GSD-files for XI/ON into the configuration software. There are two possible methods:

Before starting the system configurator

- ▶ Copy the GSD-files into the directory "SyCon\Fieldbus\PROFIBUS\GSD".
- ▶ Copy the icon files (*.bmp) into the directory "SyCon\Fieldbus\PROFIBUS\ Bitmaps".
- ▶ Then start the "SyCon" software. All the GSD-files will now be automatically read from the directory "...\SyCon\Fieldbus\PROFIBUS\GSD" into the system configurator.

After starting the system configurator

If you have already started the software, proceed as follows in order to read in the GSD-files mentioned above:

- ▶ Open a new or existing project.
- ▶ Copy the appropriate GSD-file, by using the menu item <File → Copy GSD>.

5 Coupling with automation equipment

Connection to Hilscher PROFIBUS cards

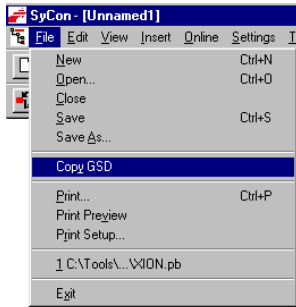


Figure 40: Inserting a GSD-file above the menu item “Copy GSD”

or

- ▶ Use the Windows Explorer to copy the GSD-file into the directory
“...\\SyCon\\Fieldbus\\PROFIBUS\\GSD”
- ▶ Use the menu item ‹Settings → Search path› to read the GSD-file into the system configurator.



Figure 41: Using the menu item “Search path” to read in a GSD-file

5 Coupling with automation equipment

Connection to Hilscher PROFIBUS cards

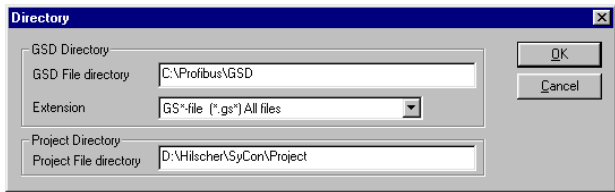


Figure 42: Correct path setting to read in a GSD-file.

After the GSD-files have been read in correctly, they are shown as separate entries in the list of insertable slaves.



The precise procedure for configuration can be found in the operating manual that is supplied with the software.

Selection of the XI/ON gateway as a slave

To insert an XI/ON gateway as a slave, proceed as follows:

- ▶ In the “Insert slave” window, select the required GSD-file.
- ▶ Enter a station name.
- ▶ Confirm with “OK”.

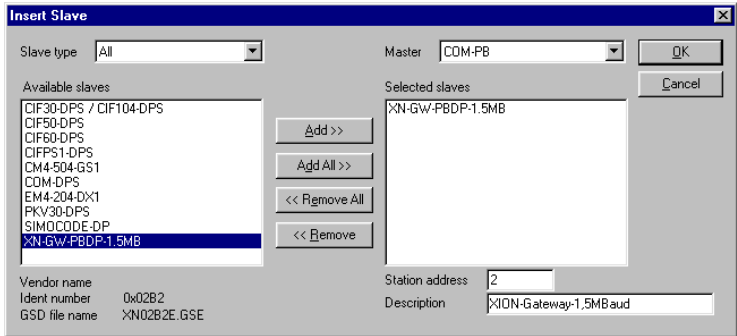


Figure 43: Inserting an XI/ON gateway 1.5 MB as a slave

Example of a mixed configuration

You can extend your field bus structure as far as you need by using the method described above. In this way, it is also possible to implement mixed structures with PROFIBUS devices from other manufacturers.

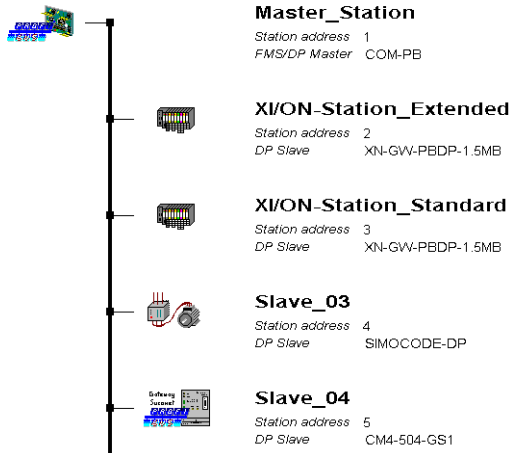


Figure 44: Field bus structure for mixed operation

Setting the gateway parameters

To set the gateway parameters, double-click on the corresponding slave station. In the window that now opens, click on the “Parameter Data” button to access the entry window for setting the gateway parameters.

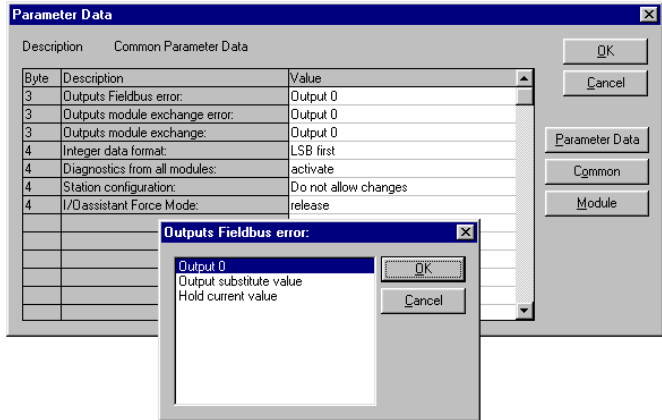


Figure 45: Parameterization of the XI/ON gateway

A double-click on a parameter provides access to the window with the corresponding setting options.

You can use the “Parameter Data” and “Common” buttons to switch between the hexadecimal (Parameter Data) and text representation (Texts) of the parameters.

Conversion tables Text A hexadecimal representation, see:

- Chap. “Byte 3 of the gateway parameter data”, Page 253
- Chap. “Byte 4 of the gateway parameter data”, Page 256

5 Coupling with automation equipment

Connection to Hilscher PROFIBUS cards

Meaning of the gateway parameters, see:

- DPV0 gateways:
Chapter "Gateway parameters of the DPV0 gateways", Page 80
- DPV1 gateways:
Chapter "Gateway parameters of the DPV1 gateways", Page 86

Description of the XI/ON module parameters, see Chapter "Module parameters", Page 92.

Configuration of the XI/ON station

The configuration of your XI/ON station is carried out in the window that opens up when you double-click on the corresponding station in the structure overview:

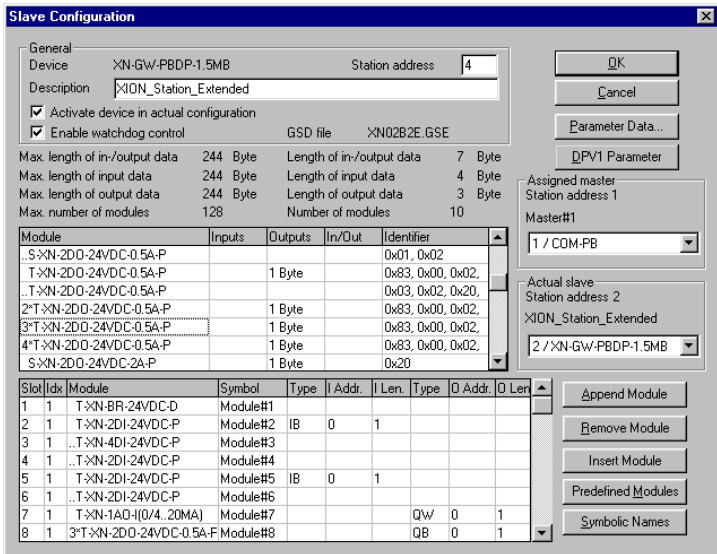


Figure 46: Selection of the XI/ON modules

Fault diagnostics (station diagnostics) for coupling to Hilscher PROFIBUS cards

The diagnostics functions of the software are described in the manual for the "SyCon" software package from Hilscher.

Details on diagnostics for the modules, see:

- Modules within XI/ON station with DPV0 gateway:
Chapter "Description of the module diagnostics", Page 146
- Modules within XI/ON station with DPV1 gateway:
Chapter "The diagnosis telegram", Page 161 (in particular Chapter "Channel-specific diagnostic messages of the modules", Page 169)

Diagnostics options for the gateway, see:

- DPV0 gateways:
Chapter "Description of the gateway diagnostics", Page 142
- DPV1 gateways:
Chapter "The diagnosis telegram", Page 161 (in particular Chapter "Description of the gateway diagnostic bytes", Page 167)

5 Coupling with automation equipment

Connection to SIMATIC S7

Connection to SIMATIC S7 To configure the coupling of an XI/ON gateway to a SIMATIC S7, the software package used is "SIMATIC Manager" Version 5.0.2.0 from Siemens.

Reading in the GSD-file

Before the first configuration of the coupling to an XI/ON gateway, it is necessary to read the GSD-files for XI/ON into the software. There are two possible methods:

Before starting the software

- ▶ Copy the GSD-files into the directory "...\\Step7\\S7data\\GSD".
- ▶ Copy the icon files (*.bmp) into the directory "...\\Step7\\S7data\\NSBMP".
- ▶ Start the "SIMATIC Manager" software.
- ▶ If the files have been correctly installed, the XI/ON gateways will automatically be entered in the hardware overview, which can be called up through the menu item «Insert → Hardware catalog».

After starting the software

If you have already started the software, proceed as follows in order to read in the GSD-files mentioned above:

- ▶ Open a new or existing project.
- ▶ Open the hardware configurator.
- ▶ Copy the required GSD-file by using the menu item «Extras → Install new GSD-file...».

5 Coupling with automation equipment

Connection to SIMATIC S7

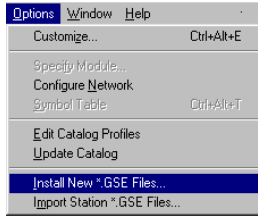


Figure 47: Inserting a GSD-file through the menu item "Install new GSD-file..."

- ▶ Select the GSD-file from the corresponding source directory.

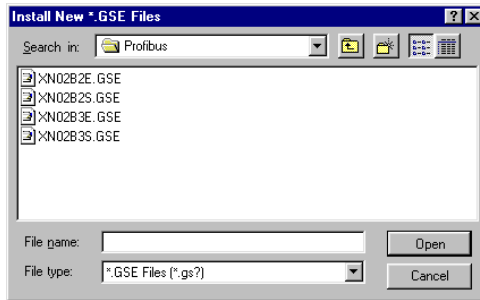


Figure 48: Selecting the GSD-file from the corresponding directory

When they have been read in correctly, the GSD-files will be listed as separate entries in the hardware catalog.

In some cases it might additionally be necessary to update the Hardware Catalog using the "Options → Install GSD file..."-option.



The precise procedure for configuration can be found in the operating manual that is supplied with the software.

Selection of the XI/ON gateway as a slave

To insert an XI/ON station as a slave, select the required entry in the hardware catalog.

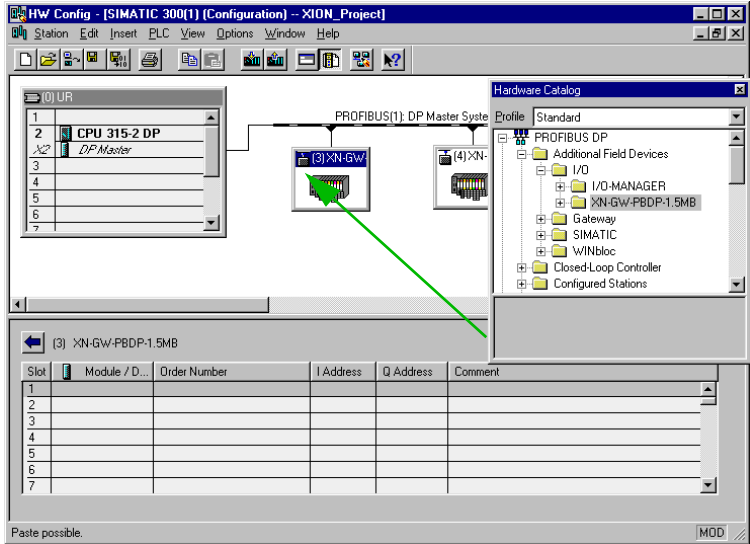


Figure 49: Inserting an XI/ON gateway 1.5 MB as a slave

Example of a mixed configuration

You can extend your field bus structure as far as you need by using the method described above. In this way, it is also possible to implement mixed structures with PROFIBUS devices from other manufacturers.

5 Coupling with automation equipment

Connection to SIMATIC S7

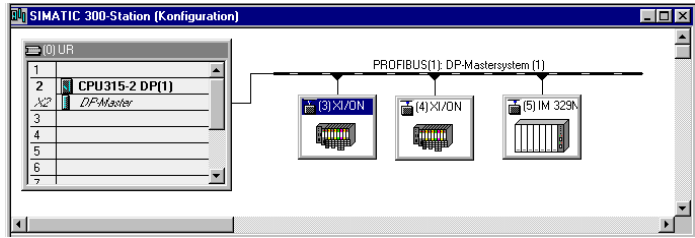


Figure 50: Field bus structure for mixed operation

Setting the gateway parameters

To set the gateway parameters, double-click on the corresponding XI/ON station. In the window that now opens, you can set up the gateway parameters by using the menu item “Parameterization”.

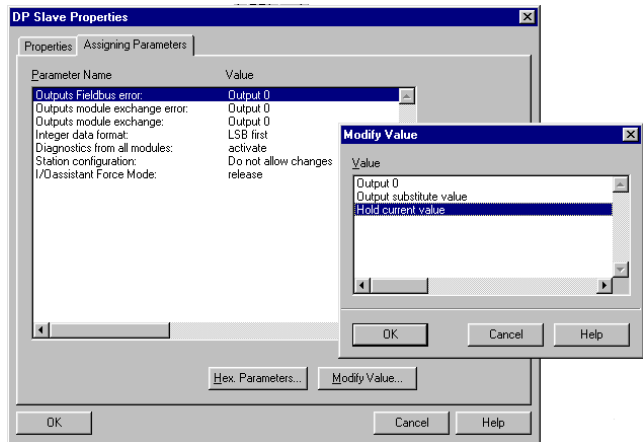


Figure 51: Parameterization of the XI/ON gateway

As a default setting, the parameters are displayed in text form. The “Hex-parameter...” button is used to change over to the hexadecimal representation.

5 Coupling with automation equipment

Connection to SIMATIC S7

Conversion tables Text A hexadecimal representation, see:

- Chap. "Byte 3 of the gateway parameter data", Page 253
- Chap. "Byte 4 of the gateway parameter data", Page 256

A double-click on a parameter or activating the "Alter value..." button accesses the window with the corresponding adjustment options.

Meaning of the gateway parameters, see:

- DPV0 gateways:
Chapter "Gateway parameters of the DPV0 gateways", Page 80
- DPV1 gateways:
Chapter "Gateway parameters of the DPV1 gateways", Page 86

Configuration of the XI/ON station

To configure your XI/ON station, drag the required modules from the hardware catalog into the list for the relevant XI/ON station. This list can be opened by simply clicking on the XI/ON station.

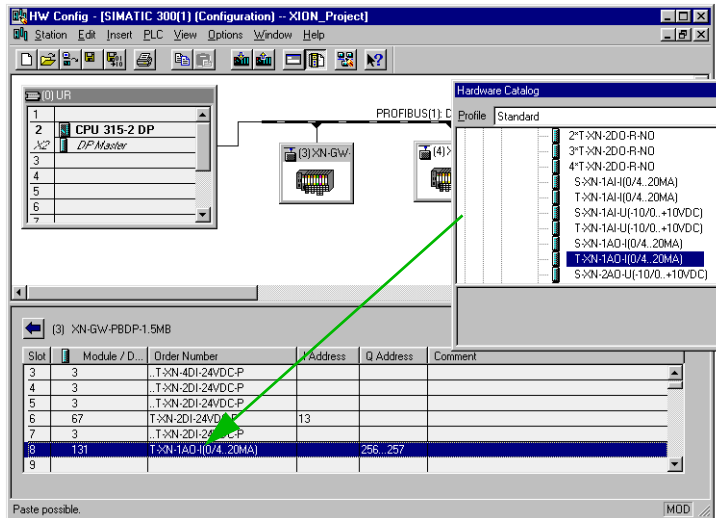


Figure 52: Selection of the XI/ON modules

Setting the parameters for XI/ON modules

If parameterizable XI/ON modules are entered, a double-click on a particular module opens the window with the corresponding adjustment options.

Description of the XI/ON module parameters, see Chapter "Module parameters", Page 92.

Fault diagnostics (station diagnostics) for coupling to a SIMATIC S7

The diagnostics functions of the software are described in the manual for the "SIMATIC Manager" software from Siemens.

Details on diagnostics for the modules, see:

- Modules within XI/ON station with DPV0 gateway:
Chapter "Description of the module diagnostics", Page 146
- Modules within XI/ON station with DPV1 gateway:
Chapter "The diagnosis telegram", Page 161 (in particular Chapter "Channel-specific diagnostic messages of the modules", Page 169)

Diagnostics options for the gateway, see:

- DPV0 gateways:
Chapter "Description of the gateway diagnostics", Page 142
- DPV1 gateways:
Chapter "The diagnosis telegram", Page 161 (in particular Chapter "Description of the gateway diagnostic bytes", Page 167)

Function blocks

Function blocks are available for the normalization of analog values, if the analog modules concerned have been parameterized for 12-Bit left-justified numerical representation.

5 Coupling with automation equipment

Connection to an SS Tech DP-Master AB SLC 500

Connection to an SS Tech DP-Master AB SLC 500

In order to configure the coupling of an XI/ON gateway with an SS Tech DP-Master for SLC 500 from Allen Bradley, the software package used is "SST PROFIBUS Configuration Tool" Version 0.15 from SST.

Reading in the GSD-file

Before you can start the first configuration of the coupling to an XI/ON gateway, it is necessary to read the GSD-files for XI/ON into the software. There are two possible methods:

Before starting the software

- ▶ Copy the GSD-files into the directory "...\\link32\\5136-PFB\\pbox".
- ▶ Start the "SST PROFIBUS Configuration Tool" software.

If the file has been correctly installed, the XI/ON gateway will appear in the list of slaves.

After starting the software

If you have already started the software, follow these steps in order to read in the GSD-files mentioned above:

- ▶ Select the required GSD-file in the menu item <Device → Add Device>.

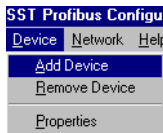


Figure 53: Use the menu item "Add Device" to read in the GSD-file

5 Coupling with automation equipment

Connection to an SS Tech DP-Master AB SLC 500

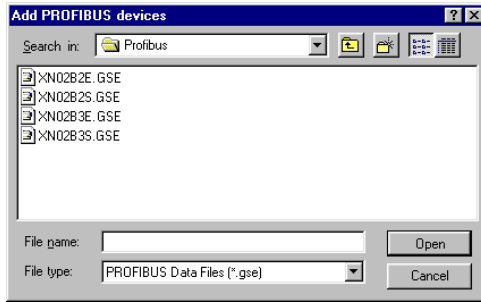


Figure 54: Selecting the required GSD-file

After it has been read in correctly, XI/ON will be displayed in the list of slaves.



The precise procedure for configuration can be found in the operating manual that is supplied with the software.

Selection of the XI/ON gateway as a slave

To insert a XI/ON gateway as a slave, select the required gateway from the slave list and use the mouse to drag it into the right area of the window.

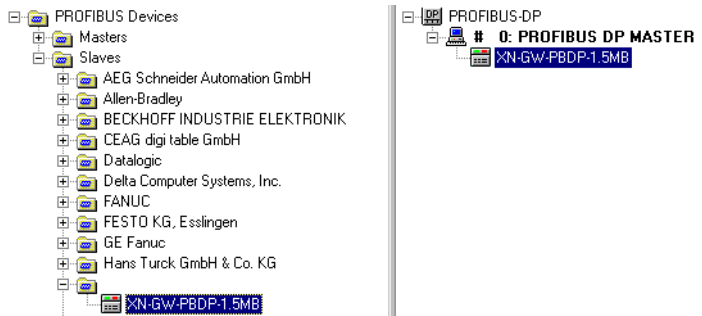


Figure 55: Inserting an XI/ON gateway as a slave

Example of a configuration (mixed operation)

You can extend your field bus structure as far as you need by using the method described above. In this way, it is also possible to implement mixed structures with PROFIBUS devices from other manufacturers.

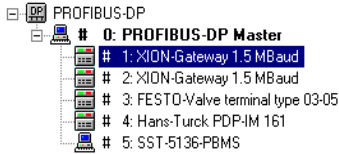


Figure 56: Field bus structure for mixed operation

Setting the gateway parameters

To set up the gateway parameters, use the right mouse button to click on the corresponding slave entry. Use the “Properties” command to open a window in which you can set up the gateway properties.

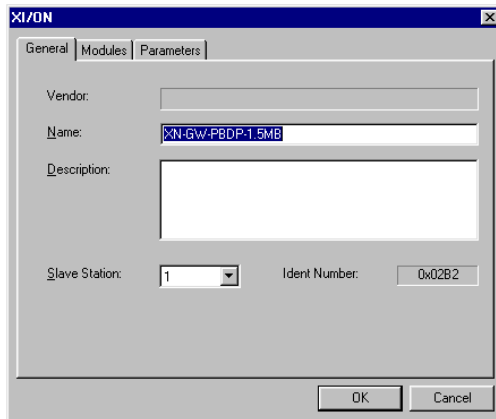


Figure 57: Window for entering the gateway properties

5 Coupling with automation equipment

Connection to an SS Tech DP-Master AB SLC 500

You can use the “Parameters” register to set the parameters for the XI/ON gateways as hexadecimal code.

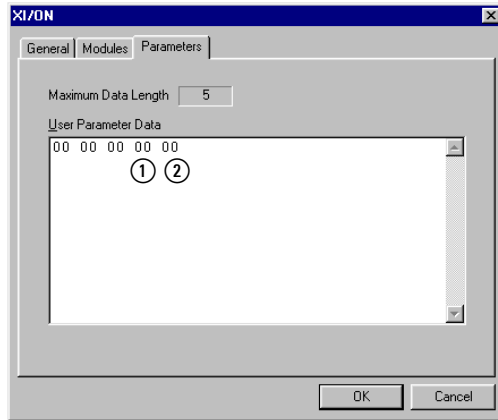


Figure 58: Parameters for the XI/ON gateway

- ① Parameter Byte 3
- ② Parameter Byte 4

Only Parameter Bytes 3 and 4 can be adjusted.

Structure of the parameter bytes:

→ Table 24, Page 78 and Table 25, Page 79

Meaning of the gateway parameters, see:

- DPV0 gateways:
Chapter “Gateway parameters of the DPV0 gateways”, Page 80
- DPV1 gateways:
Chapter “Gateway parameters of the DPV1 gateways”, Page 86

Conversion tables Text A hexadecimal representation, see:

- Chap. “Byte 3 of the gateway parameter data”, Page 253
- Chap. “Byte 4 of the gateway parameter data”, Page 256

Configuration of the XI/ON station

You can use the “Modules” register to insert the XI/ON modules you need, by marking them and clicking on the “Add->” button.

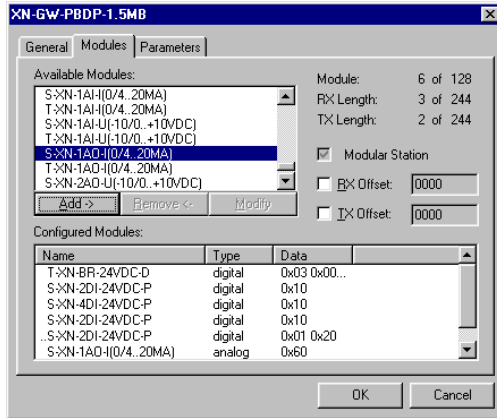


Figure 59: Selection of the XI/ON modules

In the right area of the main window, the selected XI/ON modules are shown as sub-directories of the XI/ON gateway:

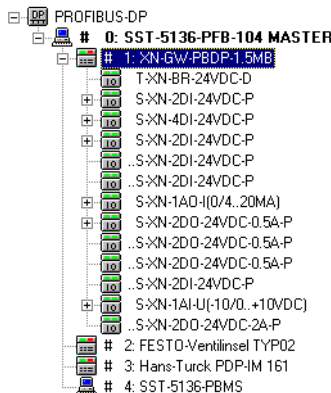


Figure 60: Structure of the XI/ON gateway, with the planned XI/ON modules

5 Coupling with automation equipment

Connection to an SS Tech DP-Master AB SLC 500

Fault diagnostics (station diagnostics) for coupling to an SS Tech DP-Master for SLC 500

The diagnostics functions of the "SST PROFIBUS Configuration" software from SS Tech are described in the software manual.

Details on diagnostics for the modules, see:

- Modules within XI/ON station with DPV0 gateway:
Chapter "Description of the module diagnostics", Page 146
- Modules within XI/ON station with DPV1 gateway:
Chapter "The diagnosis telegram", Page 161 (in particular Chapter "Channel-specific diagnostic messages of the modules", Page 169)

Diagnostics options for the gateway, see:

- DPV0 gateways:
Chapter "Description of the gateway diagnostics", Page 142
- DPV1 gateways:
Chapter "The diagnosis telegram", Page 161 (in particular Chapter "Description of the gateway diagnostic bytes", Page 167)

Connection to MITSUBISHI A1S

To configure the coupling of an XI/ON gateway to a Mitsubishi A1S controller, the software package used is “ProfiMap Version 2.0m” from MITSUBISHI.

Reading in the GSD-file

Before you can start the initial configuration, the GSD-files for XI/ON must be read in by the software. There are two possible methods:

Before starting the software

- ▶ Copy the GSD-files into the directory “...\\ProfiM200\\gsd”.
- ▶ Copy the icon files (*.bmp) into the directory “...\\ProfiM200\\bmp”.
- ▶ Start the “ProfiMap” software.

After starting the software

- ▶ Extend the database by using the menu item <Setup → Device-Database>.

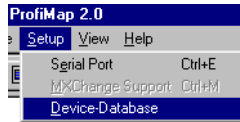


Figure 61: Extending the database

5 Coupling with automation equipment

Connection to MITSUBISHI A1S

- ▶ In the following window, first use the “Add” button to select the required GSD-file and then confirm with the “Open” button.

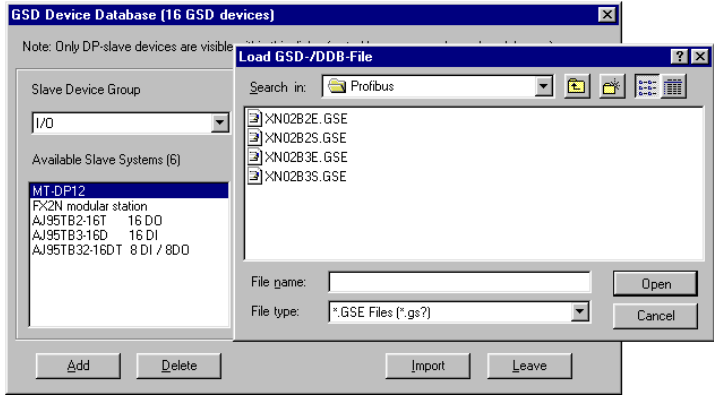


Figure 62: Selecting the GSD-file for the XI/ON gateway 1.5 MB

- ▶ Next, select the corresponding icon files.

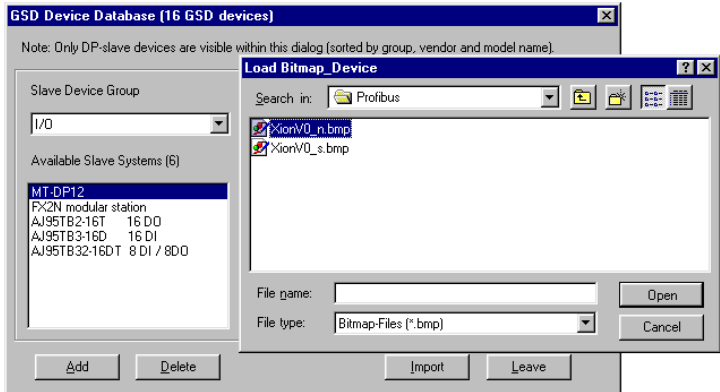


Figure 63: Selecting the corresponding icon files

5 Coupling with automation equipment

Connection to MITSUBISHI A1S

After the GSD-files and icon files have been read in correctly, they are shown as separate entries in the list of available slaves.

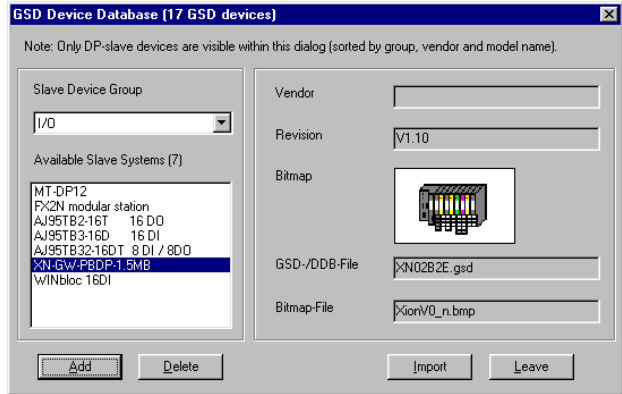


Figure 64: Overview of the available slaves, including the XI/ON gateway



The precise procedure for configuration can be found in the operating manual that is supplied with the software.

Selection of the XI/ON gateway as a slave

To insert an XI/ON gateway, carry out the following steps:

- ▶ Open a new or existing project.
- ▶ Use the right mouse button to mark a bus network node in the Network Configuration window, which is opened by the “Define I/O-Slaves” button.
- ▶ Select the required XI/ON gateway in the “GSD Device Database” window. This window is opened through the menu item “Insert DP-Slave”.

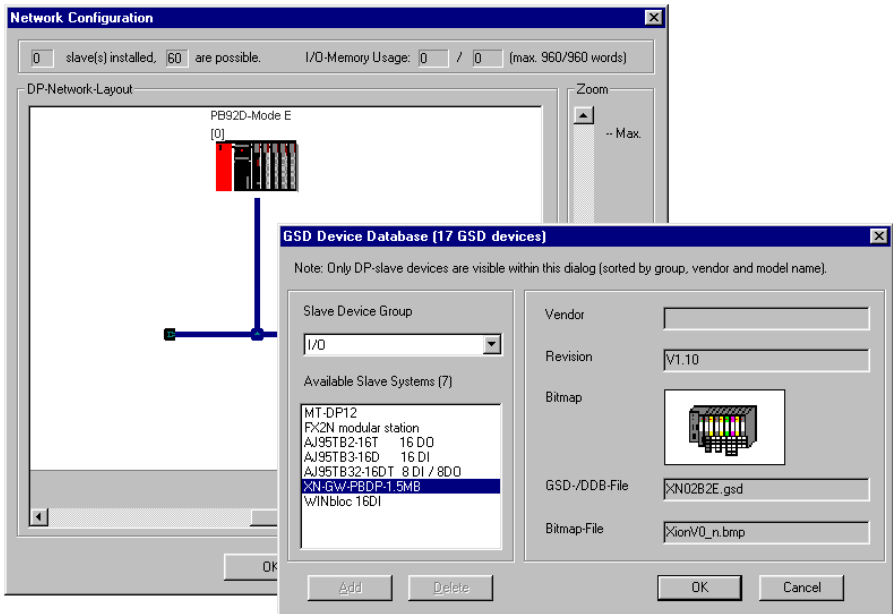


Figure 65: Selection of the XI/ON gateway as a slave

- ▶ Confirm with “OK”.

Example of a mixed configuration

You can extend your field bus structure as far as you need by using the method described above. In this way, it is also possible to implement mixed structures with PROFIBUS devices from other manufacturers.

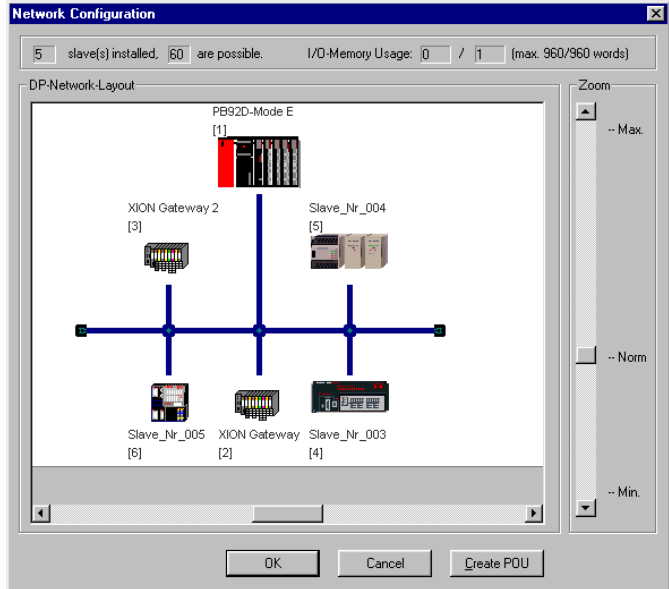


Figure 66: Field bus structure for mixed operation

Setting the gateway parameters

You can access the “Slave Parameter Settings” window, for the setting of the gateway parameters, either directly (on entering a new XI/ON station) or by double-clicking on the required XI/ON station in the bus structure.

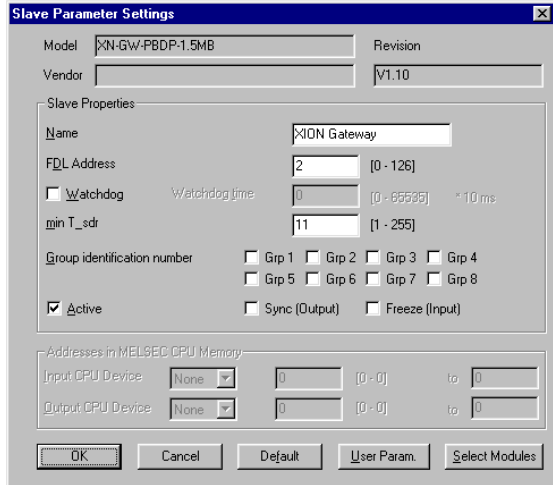


Figure 67: General parameters for the XI/ON gateway

Use the “User Param.” button in this window to access the entry window for setting up the individual gateway parameters.

5 Coupling with automation equipment Connection to MITSUBISHI A1S

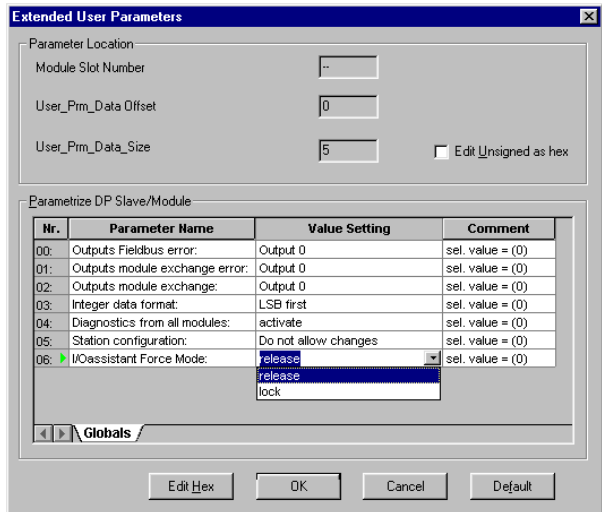


Figure 68: Parameterization of the XI/ON gateway

Use the “Edit Hex” button to switch over to hexadecimal representation of the gateway parameters.

Conversion tables Text A hexadecimal representation, see:

- Chap. “Byte 3 of the gateway parameter data”, Page 253
- Chap. “Byte 4 of the gateway parameter data”, Page 256

Meaning of the gateway parameters, see:

- DPV0 gateways:
Chapter “Gateway parameters of the DPV0 gateways”, Page 80
- DPV1 gateways:
Chapter “Gateway parameters of the DPV1 gateways”, Page 86

Configuration of the XI/ON station

For configuration, click on the “Select Modules” button in the “Slave Parameter Settings” window. In the following window, you can insert the required XI/ON modules into your XI/ON station.

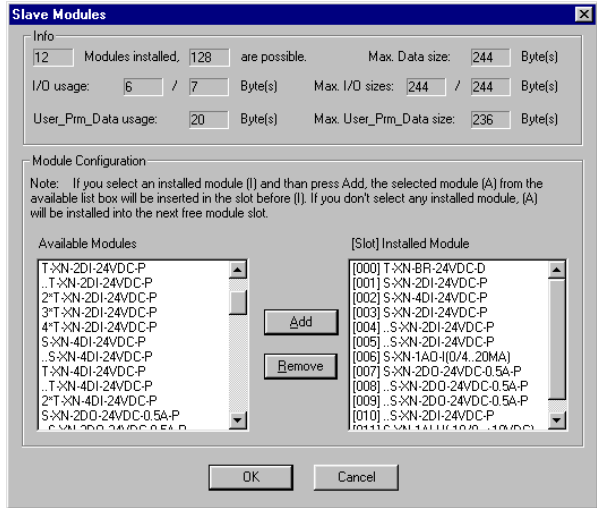


Figure 69: Selection of the XI/ON modules

Setting the parameters for XI/ON modules

If parameterizable XI/ON modules are selected, their parameters can be set up through the "Param." button.

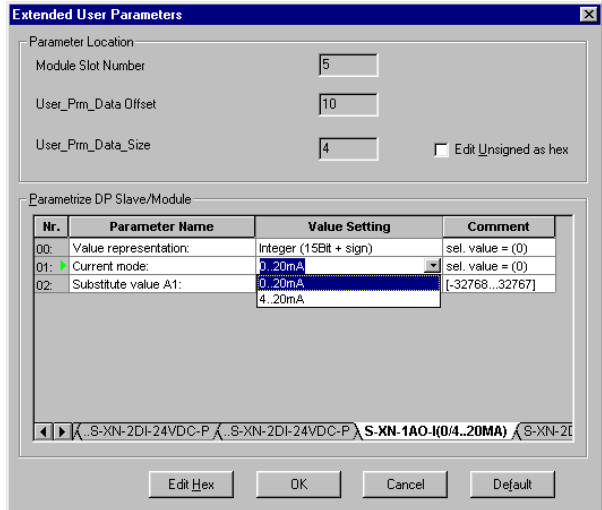


Figure 70: Setting up the parameters for an analog output module

Description of the XI/ON module parameters, see Chapter "Module parameters", Page 92.

**Fault diagnostics (station diagnostics) for
coupling to a MITSUBISHI A1S**

The diagnostics functions of the software are described in the manual for the "ProfiMap" software package from MITSUBISHI.

Details on diagnostics for the modules, see:

- Modules within XI/ON station with DPV0 gateway:
Chapter "Description of the module diagnostics", Page 146
- Modules within XI/ON station with DPV1 gateway:
Chapter "The diagnosis telegram", Page 161 (in particular Chapter "Channel-specific diagnostic messages of the modules", Page 169)

Diagnostics options for the gateway, see:

- DPV0 gateways:
Chapter "Description of the gateway diagnostics", Page 142
- DPV1 gateways:
Chapter "The diagnosis telegram", Page 161 (in particular Chapter "Description of the gateway diagnostic bytes", Page 167)

Diagnostics in PROFIBUS-DP

Diagnostics messages in the PLC

The diagnostics messages are shown as diagnostics bytes in the software of the corresponding PROFIBUS-DP master.

Details on diagnostics for the modules, see:

- Modules within XI/ON station with DPV0 gateway:
Chapter "Description of the module diagnostics", Page 146
- Modules within XI/ON station with DPV1 gateway:
Chapter "The diagnosis telegram", Page 161 (in particular Chapter "Channel-specific diagnostic messages of the modules", Page 169)

Diagnostics options for the gateway, see:

- DPV0 gateways:
Chapter "Description of the gateway diagnostics", Page 142
- DPV1 gateways:
Chapter "The diagnosis telegram", Page 161 (in particular Chapter "Description of the gateway diagnostic bytes", Page 167)

In the following, the station example is used to illustrate how the diagnostics bytes from the modules are represented in the control software.

5 Coupling with automation equipment

Diagnostics in PROFIBUS-DP

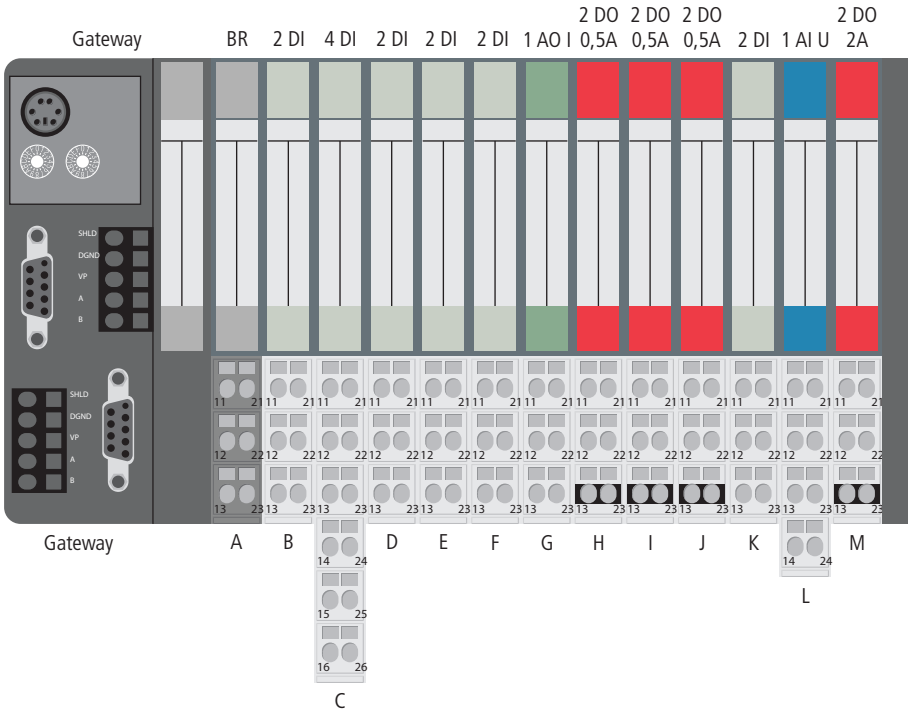


Figure 71: Example of a XI/ON station

Table 58: Diagnostics bytes from the station (example)

	Module	Number of diagnostics bytes	Diagnostics bytes in PROFIBUS-DP
GW	XN-GW-PBDP-1.5MB	3	7 to 9
A	XN-BR-24VDC-D	1	10
B	XN-2DI-24VDC-P	–	–
C	XN-4DI-24VDC-P	–	–
D	XN-2DI-24VDC-P	–	–
E	XN-2DI-24VDC-P	–	–
F	XN-2DI-24VDC-P	–	–
G	XN-1AO-I(0/4...20MA)	–	–
H	XN-2DO-24VDC-0.5A-P	1	11
I	XN-2DO-24VDC-0.5A-P	1	12
J	XN-2DO-24VDC-0.5A-P	1	13
K	XN-2DI-24VDC-P	–	–
L	XN-1AI-U(-10/0...+10VDC)	1	14
M	XN-2DO-24VDC-2A-P	1	15

The modules that do not transmit diagnostics bytes will not be shown in the diagnostics evaluation for the PROFIBUS-DP master. The diagnostics-enabled modules will appear in the sequence in which they are plugged into the station.

5 Coupling with automation equipment

Diagnostics in PROFIBUS-DP

Table 59: Display and meaning of the diagnostics bytes

	Module	Meaning	Diagnostics byte
		Station status (Header as per PROFIBUS-DP standard)	Byte 1
		Station status (Header as per PROFIBUS-DP standard)	Byte 2
		Station status (Header as per PROFIBUS-DP standard)	Byte 3
		Diagnostics Master Address (Header as per PROFIBUS-DP standard)	Byte 4
		Ident-Number High-Byte (Header as per PROFIBUS-DP standard)	Byte 5
		Ident-Number Low-Byte (Header as per PROFIBUS-DP standard)	Byte 6
GW	XN-GW-PBDP-1.5MB	Gateway Diagnostics Byte 0 (Length ID and type of DP-diagnostics)	Byte 7
GW	XN-GW-PBDP-1.5MB	Gateway Diagnostics Byte 1 (Gateway Warning)	Byte 8
GW	XN-GW-PBDP-1.5MB	Gateway Diagnostics Byte 2 (Gateway Error)	Byte 9
A	XN-BR-24VDC-D	Module diagnostics	Byte 10
H	XN-2DO-24VDC-0.5A-P	Module diagnostics	Byte 11
I	XN-2DO-24VDC-0.5A-P	Module diagnostics	Byte 12
J	XN-2DO-24VDC-0.5A-P	Module diagnostics	Byte 13
L	XN-1AI-U(-10/0...+10VDC)	Module diagnostics	Byte 14
M	XN-2DO-24VDC-2A-P	Module diagnostics	Byte 15

5 Coupling with automation equipment

Diagnostics in PROFIBUS-DP

The diagnostics information can be called up for evaluation either by specific configuration tools or by special, manufacturer-specific function blocks.

For Example:

In the modular Moeller PS 416 controller (PROFIBUS-DP master module PS 416-NET-440), the evaluation of the diagnostics information from the PROFIBUS-DP slave is carried out with the help of:

- the function block “PdpStationDiag” in the Sucasoft S40 control software (see manual for the PS416 master and slave modules from Moeller) or
- the configuration tool CFG-DP (→ Chapter “Example diagnosis according to DPV0 for Moeller PS416 controller”, Page 238).

**Example diagnosis according to DPV0
for Moeller PS416 controller**

In this example, the software "CFG-DP", Version 1.30, from Moeller, is used to show diagnostics messages in the PLC. The layout corresponds to the XI/ON-Station described in Figure 71, Page 234.

The diagnosis is performed through coupling to a Moeller PROFIBUS-DP master module PS416-Net 440.

If diagnostic information is present, the station that is reporting diagnostic information is marked in the structure display.



Figure 72: Identification of a station with a diagnostics message

A double-click on this station opens a window in which the station status is displayed.

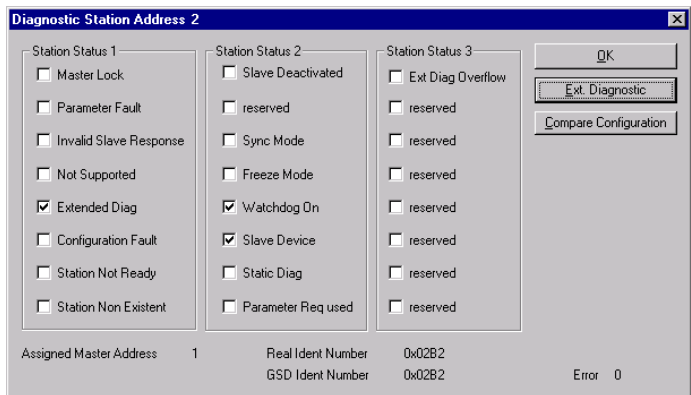


Figure 73: Display of the types of diagnostics messages

5 Coupling with automation equipment

Diagnostics in PROFIBUS-DP

Use the "Ext. Diagnostic" button to access the window that shows the diagnostics bytes for the extended diagnosis. In this window you can see the individual diagnostics-enabled modules and the diagnostics messages. A description of the hexadecimal data is given in the following table.

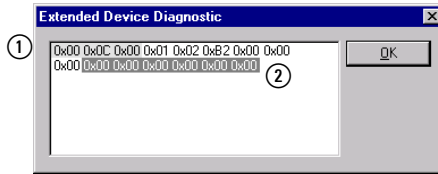


Figure 74: Diagnostics display for an XI/ON station

- ① Diagnostics Bytes 0 to 2
- ② Diagnostics Bytes 9 to 14

The hexadecimal data in the screen shot shown above have the following meanings:

Table 60: Diagnostics bytes

Diagnostics byte	Meaning	Remarks
0	Status Area 1 of the station	
1	Status Area 2 of the station	
2	Status Area 3 of the station	
3	Address of the master that configured the slave	as per DP standard
4...5	Identifier for the slave	as per DP standard
6...8	Diagnostics Bytes 0 to 2 for the gateway	→ Chapter "Description of the gateway diagnostics", Page 142
9...14	Diagnostics Bytes for the diagnostics-enabled modules in the XI/ON station	→ Chapter "Description of the module diagnostics", Page 146

5 Coupling with automation equipment

Diagnostics in PROFIBUS-DP

In the following examples, the following diagnostics messages were triggered:

- A planned I/O-module is not plugged in
- Interruption of the field voltage
- Short-circuit of an output module (the gateway parameter "Outputs: Module change" have been set to "Hold present value")

A planned I/O-module is not plugged in

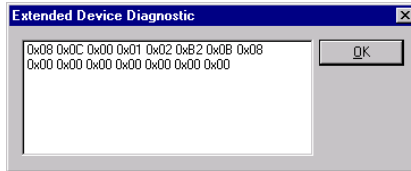


Figure 75: Diagnostics for an missing XI/ON I/O-module

In this example, a planned XI/ON I/O-module has been removed. This causes the gateway "IOs" LED to flash (alternately red/green), thus indicating an adaptable change in the present arrangement of the module bus participants. The red-flashing LED "DIA" indicates that the gateway has generated an extended diagnosis.

After plugging in the electronics module that had been removed, the LED indicators will be reset to the normal condition.

Interruption of the field voltage

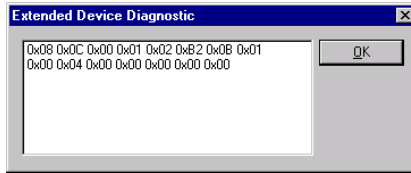


Figure 76: Diagnostics for an interruption of the field voltage

In this example, the connection between the bus refreshing module and the voltage source for the field supply has been interrupted. The red-flashing gateway LED "DIA" indicates that an extended diagnosis is available. At the same time, the "U_L" LED goes out on the bus refreshing module, and the red-flashing "DIA" LED of this module indicates an extended diagnosis.

When the connection to the supply voltage has been restored, the LEDs will be reset to their normal condition.

Short-circuit in an output module

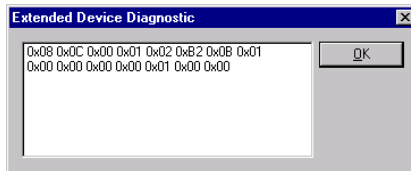


Figure 77: Diagnostics for a short-circuit in an output module

In the example, there is a short-circuit in Channel 1 of a digital output module. As a result, the gateway LED "DIA" (red) flashes to indicate that the gateway has generated an extended diagnosis. The "DIA" LED and the channel LED "11" of the digital output module light up red.

5 Coupling with automation equipment

Diagnostics in PROFIBUS-DP

After removing the short-circuit, the LED indicators will be reset to the normal condition.



The default settings of the gateway parameters set all the outputs to zero (→ Chapter “Overview gateway parameters”, Page 78). If I/O-modules that were planned into a station are not plugged in (empty slots), then it is not possible to diagnose any short-circuit that may be present in one of the output modules. So it is therefore recommended that the corresponding gateway parameters are set to “Hold present value”.

Example diagnosis according to DPV1 for Siemens SIMATIC S7 controller

In addition to the device related diagnosis according to DPV0 and DPV1, the XI/ON gateways for PROFIBUS-DPV1 also show channel related diagnosis.

Furthermore, a special help text, which clearly specifies the error is defined for each diagnostic message.

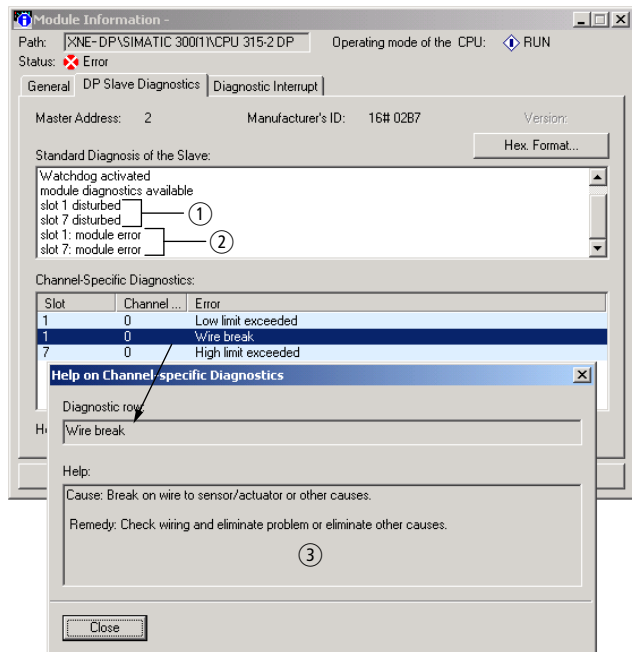


Figure 78: Diagnosis of the DPV1-gateways

- ① Device related diagnosis according to DPV0
- ② Device related diagnosis according to DPV1
- ③ Manufacturer specific help texts

5 Coupling with automation equipment

Acyclic data transfer with system function blocks (SFBs) by Siemens

Acyclic data transfer with system function blocks (SFBs) by Siemens

The need for acyclic data transfer exists wherever slave devices which provide several parameterization options have to be parameterized during operation.

In the Siemens PLC, the acyclic services are executed via the system function blocks SFB52 "RDREC" and SFB53 "WRREC".

The access to the process data of the gateway and the connected I/O-modules in a station is realized via the indices of the "Gateway application instance" and the "Module application instance", see Chapter "Description of user data for acyclic services", Page 171.



Acyclic data transfer is only possible with DPV1 gateways.

Acyclic reading with SFB52

```
CALL "RDREC" , DB52
REQ   :=TRUE
ID    :=DW#16#3
INDEX :=19
MLEN  :=8
VALID :="VALID"
BUSY  :="Busy"
ERROR :="Error"
STATUS:="Status"
LEN   :="Length"
RECORD:=DB10.DBBO
```

Figure 79: SFB52 (RDREC)

5 Coupling with automation equipment

Acyclic data transfer with system function blocks (SFBs) by Siemens

Table 61: Input data SFB52

Parameter name	Meaning
REQ	REQ = 1, starts the data transmission
ID	<p>Logical address of the respective XI/ON-I/O-module, taken from the hardware configuration.</p> <p>When establishing a connection to the gateway, the logical address is the "Diagnostic Address" assigned in the hardware configuration.</p> <p>Note:</p> <p>If the module to be addressed is an output module, bit 15 has to be set (e.g. for address 5: ID:=DW#16#8005). If the module concerned is a combination module, the lowest address has to be chosen.</p>
INDEX	Number of the module's index to be read (→ Chapter "Description of user data for acyclic services", Page 171).
MLEN	Maximum length of the data to be read.

Table 62: Output data SFB52

Parameter name	Meaning
VALID	New data set was received and valid.
BUSY	BUSY = 1: The read process is not yet terminated.
ERROR	ERROR = 1:Error occurred while reading.
STATUS	Error code of the function block (see Siemens-online help for SFB54 "RALRAM")
LEN	Length of the read data.
RECORD	Target area for the read data record. (in this example DB10).

Example

Acyclic reading of input data for module no.3, XN-16DI-24VDC-P of the example station (→ Figure 80 Page 246).

The access to the module input data is carried out via module index no. 19 from the module application instance

5 Coupling with automation equipment

Acyclic data transfer with system function blocks (SFBs) by Siemens

Table 63: Module application instance (excerpt)

Index (dec.)	Name	Data type	r/w	Remark
...				
19	Input data	specific	r	Input data of the respective module.
...				



A detailed description of the module application instance can be found in Chapter "Module application instance", Page 172.

Slot	DP ID	Order Number / Designation	I Address	Q Address	C...
1	67	XNE-8DI-24VDC-P	2		
2	67	XN-4DI-24VDC-P	1		
3	67	XN-16DI-24VDC-P	3..4		
4	131	XN-2DO-24VDC-2A-P		0	
5	131	XN-2DO-R-NC		1	
6	67	XN-2AI-PT/NI-2/3	256...259		
7	67	XN-4AI-U/I	260...267		
8					
9					

Figure 80: Station structure in the hardware configuration

```
CALL "RDREC" , DB52
REQ :=TRUE
ID :=DW#16#3
INDEX :=19
MLEN :=1
VALID :="VALID"
BUSY :="Busy"
ERROR :="Error"
STATUS:= "Status"
LEN := "Length"
RECORD:=DB10.DBBO
```

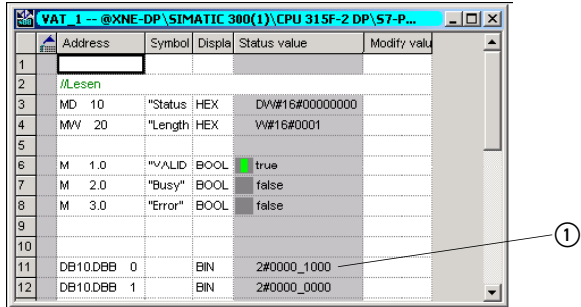
Figure 81: Access via SFB52

- ① Logical address of channel 1 from module no.3
- ② Index no.

5 Coupling with automation equipment

Acyclic data transfer with system function blocks (SFBs) by Siemens

The module's input data are shown in DB10:



	Address	Symbol	Displa	Status value	Modify val
1					
2		/Lesen			
3	MD 10	"Status"	HEX	DW#16#00000000	
4	MW 20	"Length"	HEX	W#16#0001	
5					
6	M 1.0	"VALID"	BOOL	true	
7	M 2.0	"Busy"	BOOL	false	
8	M 3.0	"Error"	BOOL	false	
9					
10					
11	DB10.DBB 0		BIN	2#0000_1000	
12	DB10.DBB 1		BIN	2#0000_0000	

Figure 82: DB10 in VAT1

① Channel 3 is active



As the PLC always accesses the bus and the connected stations even during the acyclic data traffic, the transmitted values are permanently updated.

Acyclic writing with SFB53

```
CALL "WRREC" , DB53
REQ := TRUE
ID := DW#16#1E
INDEX := 31
LEN := 4
DONE := "VALID"
BUSY := "Busy"
ERROR := "Error"
STATUS := "Status"
RECORD := DB11.DBB0
```

Figure 83: SFB53 (WRREC)

5 Coupling with automation equipment

Acyclic data transfer with system function blocks (SFBs) by Siemens

Table 64: Input data SFB53

Parameter name	Meaning
REQ	REQ = 1, starts the data transmission
ID	Logical address of the respective XI/ON-I/O-module, taken from the hardware configuration. When establishing a connection to the gateway, the logical address is the "Diagnostic Address" assigned in the hardware configuration. Note: If the module to be addressed is an output module, bit 15 has to be set (e.g. for address 5: ID:=DW#16#8005). If the module concerned is a combination module, the lowest address has to be chosen.
INDEX	Number of the module's index to be written (→ Chapter "Description of user data for acyclic services", Page 171).
MLEN	Maximum length of the data to be written.

Table 65: Output data SFB53

Parameter name	Meaning
VALID	New data set was written and valid.
BUSY	BUSY = 1: The write process is not yet terminated.
ERROR	ERROR = 1:Error occurred while writing.
STATUS	Error code of the function block (see Siemens-online help for SFB54 "RALRAM").
LEN	Length of the written data.
RECORD	Target area for the written data record. (here in this example DB11).

Example

Acyclic writing of parameters to module no. 7, XN-4AI-U/I of the example station (→ Figure 84 Page 249).

The access to the module input data is done via module index no. 31 from the module application instance:

5 Coupling with automation equipment

Acyclic data transfer with system function blocks (SFBs) by Siemens

Table 66: Module application instance (excerpt)

Index (dec.)	Name	Data type	r/w	Remark
...				
31	Module parameters	specific	r/w	Parameters of the respective module
...				



A detailed description of the module application instance can be found in Chapter "Module application instance", Page 172.

Slot	DP ID	Order Number / Designation	I Address	Q Address	C...
1	67	XNE-8DI-24VDC-P	2		
2	67	XN-4DI-24VDC-P	1		
3	67	XN-16DI-24VDC-P	3..4		
4	131	XN-2DO-24VDC-2A-P		0	
5	131	XN-2DO-R-NC		1	
6	67	XN-2AI-PT/NI-2/3	256..259		
7	67	XN-4AI-U/I	260..267		
8					
9					

Figure 84: Station structure in the hardware configuration

```

CALL "WRREC" , DB53
  REQ  :=TRUE
  ID   :=DW#16#104
  INDEX :=31
  LEN  :=4
  DONE :="VALID"
  BUSY :="Busy"
  ERROR :="Error"
  STATUS:="Status"
  RECORD:=DB11.DBBO
  
```

Figure 85: Access via SFB53

- ① Logical address of channel 1 from module no.7 (260 dec. = 104 hex.)
- ② Index no.

5 Coupling with automation equipment

Acyclic data transfer with system function blocks (SFBs) by Siemens

Changing the parameters

Table 67: Parameters XN-4AI-U/I

Assignment			Parameter name	Value	Meaning
Chn.	Byte	Bit			
0 to 3	0 to 3	0	Range x	0 ¹⁾ 1	0...10 V/ 0...20 mA -10...10 V/ 4...20 mA
		1	Value representation x	0 ¹⁾ 1	Integer (15bit + sign) 12Bit (left-justified)
		2	Diagnostic x	0 ¹⁾ 1	release block
		3	Channel x	0 ¹⁾ 1	activate deactivate
		4	Operation mode x	0 ¹⁾ 1	voltage current

1) Default setting

The following parameters have to be changed:

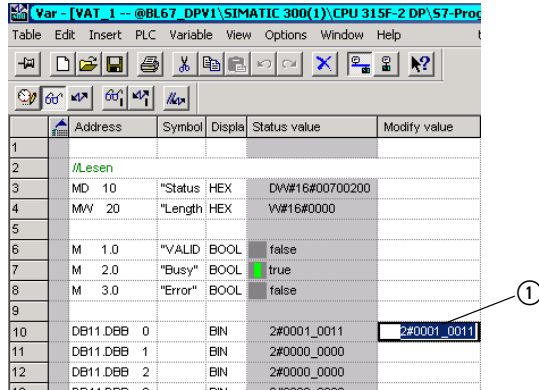
- "range" → "-10...10V/ 4...20 mA"
- "value representation" → "12bit (left-justified)"
- "operation mode" → "current".

To achieve this, bit 0, bit 1 and bit 4 of byte 0 have to be set to "1" in DB11.

5 Coupling with automation equipment

Acyclic data transfer with system function blocks (SFBs) by Siemens

The module's parameter data are written to byte 1 via DB11:



	Address	Symbol	Displa	Status value	Modify value
1					
2		//Lesen			
3	MD 10	"Status"	HEX	DW#16#00700200	
4	MW 20	"Length"	HEX	VW#16#0000	
5					
6	M 1.0	"VALID"	BOOL	false	
7	M 2.0	"Busy"	BOOL	true	
8	M 3.0	"Error"	BOOL	false	
9					
10	DB11.DBB 0		BIN	2#0001_0011	2#0001_0011
11	DB11.DBB 1		BIN	2#0000_0000	
12	DB11.DBB 2		BIN	2#0000_0000	

Figure 86: DB11 in VAT1

① Channel 0, bit 0 = 1, bit 1 = 1 and bit 4 = 1

5 Coupling with automation equipment

Acyclic data transfer with system function blocks (SFBs) by Siemens

Appendix

Hexadecimal parameter representation

Byte 3 of the gateway parameter data

In the following table, you can read out the hexadecimal value for a selection of parameters from Byte 3 of the gateway parameter data.

Start by selecting the “Outputs: Fieldbus error” parameter, then “Outputs: Module change error” and finally “Outputs: Module change”.

Table 68: Hexadecimal representation of Byte 3 of the gateway parameter data

Parameters in hexadecimal format	Outputs: Module change				Outputs: Module change error				Outputs: Fieldbus error		
	Output a 0 ¹⁾	Output substitute value	Hold present value	Exchange process data	Output a 0 ¹⁾	Output substitute value	Hold present value	Exchange process data	Output a 0 ¹⁾	Output substitute value	Hold present value
00	X				X				X		
01		X			X				X		
02			X		X				X		
03				X	X				X		
04	X					X			X		
05		X				X			X		
06			X			X			X		
07				X		X			X		
08	X						X		X		
09		X					X		X		

Appendix

Hexadecimal parameter representation

Parameters in hexadecimal format	Outputs: Module change				Outputs: Module change error				Outputs: Fieldbus error		
	Output a 0 ¹⁾	Output substitute value	Hold present value	Exchange process data	Output a 0 ¹⁾	Output substitute value	Hold present value	Exchange process data	Output a 0 ¹⁾	Output substitute value	Hold present value
0 A			X				X		X		
0B				X			X		X		
0C	X							X	X		
0D		X						X	X		
0E			X					X	X		
0F				X				X	X		
10	X				X					X	
11		X			X					X	
12			X		X					X	
13				X	X					X	
14	X					X				X	
15		X				X				X	
16			X			X				X	
17				X		X				X	
18	X						X			X	
19		X					X			X	
1 A			X				X			X	
1B				X			X			X	
1C	X							X		X	
1D		X						X		X	
1E			X					X		X	

Appendix

Hexadecimal parameter representation

Parameters in hexadecimal format	Outputs: Module change				Outputs: Module change error				Outputs: Fieldbus error		
	Output a 0 ¹⁾	Output substitute value	Hold present value	Exchange process data	Output a 0 ¹⁾	Output substitute value	Hold present value	Exchange process data	Output a 0 ¹⁾	Output substitute value	Hold present value
1F				X				X		X	
20	X				X						X
21		X			X						X
22			X		X						X
23				X	X						X
24	X					X					X
25		X				X					X
26			X			X					X
27				X		X					X
28	X						X				X
29		X					X				X
2A			X				X				X
2B				X			X				X
2C	X							X			X
2D		X						X			X
2E			X					X			X
2F				X				X			X

1) These parameters are default settings

Byte 4 of the gateway parameter data

In the following table, you can read out the hexadecimal value for a selection of parameters from Byte 4 of the gateway parameter data.

Start with the selection of the “I/Oassistant Force Mode” parameter, then “Station configuration”, “Diagnosis of all modules” and finally “Integer data format”.

Parameters in hexadecimal format	Integer data format		Diagnosis of all modules		Station configuration		I/Oassistant Force Mode	
	LSB first ¹⁾	MSB first	activate ¹⁾	deactivate ¹⁾	Do not permit deviations ¹⁾	Adapt deviations	Enable ¹⁾	Inhibit
00	X		X		X		X	
01		X	X		X		X	
02	X			X	X		X	
03		X		X	X		X	
04	X		X		X		X	
05		X	X		X		X	
06	X			X	X		X	
07		X		X	X		X	
08	X		X			X	X	
09		X	X			X	X	
0A	X			X		X	X	
0B		X		X		X	X	
0C	X		X			X	X	
0D		X	X			X	X	

Appendix

Hexadecimal parameter representation

Parameters in hexadecimal format	Integer data format		Diagnosis of all modules		Station configuration		I/O <i>assis-</i> <i>tant</i> Force Mode	
	LSB first ¹⁾	MSB first	activate ¹⁾	deactivate ¹⁾	Do not permit deviations ¹⁾	Adapt deviations	Enable ¹⁾	Inhibit
0E	X			X		X	X	
0F		X		X		X	X	
10	X		X		X			X
11		X	X		X			X
12	X			X	X			X
13		X		X	X			X
14	X		X		X			X
15		X	X		X			X
16	X			X	X			X
17		X		X	X			X
18	X		X			X		X
19		X	X			X		X
1A	X			X		X		X
1B		X		X		X		X
1C	X		X			X		X
1D		X	X			X		X
1E	X			X		X		X
1F		X		X		X		X

1) These parameters are default settings

Appendix

Hexadecimal parameter representation

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