Hardware and Engineering

XI/ON PROFIBUS-DP

05/01 AWB2700-1394GB

MOELLER
Think future. Switch to green.

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Translator: Scriptor GmbH

Printed on bleached cellulose.
100 % free from chlorine and acid.

Warning!
Dangerous electrical voltage!

Before commencing the installation

- Disconnect the power supply of the device.
- Ensure that devices 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 (AWA) of the device concerned.
- Only suitably qualified personnel in accordance with EN 50110-1/-2 (VDE 0105 Part 100) may work on this device/system.
- 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 60364-4-41 (VDE 0100 Part 410) or HD 384.4.41 S2.
- 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 restart.
- Devices that are designed for mounting in housings or control cabinets must only be operated and controlled after they have been installed with the housing closed. Desktop or portable units must only be operated and controlled in enclosed housings.

- 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.).
- According to their degree of protection frequency inverters may feature during operation live, bright metal, or possibly moving, rotating parts or hot surfaces.
- The impermissible removal of the necessary covers, improper installation or incorrect operation of motor or frequency inverter may cause the failure of the device and may lead to serious injury or damage.
- The relevant national regulations apply to all work carried on live frequency inverters.
- 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 60364 and HD 384 and national work safety regulations).
- Installations fitted with frequency inverters must be provided with additional monitoring and protective devices in accordance with the relevant safety regulations etc. Modifications to the frequency inverters using the operating software are permitted.
- All shrouds and doors must be kept closed during operation.
- In order to reduce hazards to persons or equipment, the user must include in the machine design measures that restrict the consequences of a malfunction or failure of the drive (increased motor speed or sudden standstill of motor). These measures include:
  – Other independent devices for monitoring safety-related variables (speed, travel, end positions etc.).
  – Electrical or non-electrical system related measures (interlocks or mechanical interlocks).
  – Live parts or cable connections of the frequency inverter must not be touched after it has been disconnected from the power supply due to the charge in capacitors. Appropriate warning signs must be provided.

Contents

About this Manual

List of Revisions

Publication Date	Page/ Chap.	Subject	New	Change	Deleted
05/01	Chap. 2	Fieldbus-specific representation of parameters and diagnostics	×		
	Chap. 3	Diagnostics on PROFIBUS-DP	×		
	Chap. 4	Technical data		×	
		Description of new modules: • XN-PF-120/230VAC-D • XN-2DI-24VDC-N • XN-2DI-120/230VAC • XN-4DI-24VDC-N • XN-16DI-24VDC-P • XN-2AI-PT/NI-2/3 • XN-2AI-THERMO-PI • XN-2DO-24VDC-0.5A-N • XN-16DO-24VDC-0.5A-P • XN-1CNT-24VDC	×		
	Chap. 5	Maximum system extension		×	
	Chap. 6	Mounting and dismounting of modules in block design	×		
	Appendix	Nominal current consumptions of modules	×		
		Overview of modules		×	
		Glossary		×	
		Index		×	

→ The publication of this manual renders all previous editions invalid. This applies equally to the supplement manual XI/ON, 01/01 AWB2700-1404.

Overview

Attention!
Please read this section carefully. Safety aspects cannot be left to chance when dealing with electrical equipment.

This manual includes all information necessary for the prescribed use of XI/ON products. It has been specially conceived for personnel with the necessary qualifications.

Prescribed Use

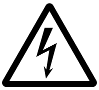
Warning!
The devices described in this manual must be used only in applications prescribed in this manual or in the respective technical descriptions, and only with certified components and devices from third party manufacturers.

Appropriate transport, storage, deployment and mounting as well as careful operating and thorough maintenance guarantee the trouble-free and safe operation of these devices.

Notes Concerning Planning / Installation of this Product

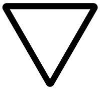
Warning!
All respective safety measures and accident protection guidelines must be considered carefully and without exception.

Description of Symbols Used



Warning!
This sign can be found next to all notes that indicate a source of hazards. This can refer to danger to personnel or damage to the system (hardware and software) and to the facility.

This sign means for the operator: work with extreme caution.



Attention!
This sign can be found next to all notes that indicate a potential hazard.

This can refer to possible danger to personnel and damages to the system (hardware and software) and to the facility.

→ This sign can be found next to all general notes that supply important information about one or more operating steps. These specific notes are intended to make operation easier and avoid unnecessary work due to incorrect operation.

1 XI/ON Philosophy

Chapter Overview

This chapter describes the fundamental features and benefits of XI/ON. It also contains an overview of the individual XI/ON components.

The Basic Concept

XI/ON is a modular I/O system for use in industrial automation. It connects the sensors and actuators in the field with the higher-level master.

XI/ON offers modules for practically all applications:

- Digital input and output modules
- Analog input and output modules
- Technology modules (counters, RS232 interface...)

A complete XI/ON station counts as **one** station on the bus and therefore occupies **one** fieldbus address in any given fieldbus structure. A XI/ON station consists of a gateway, power distribution modules and I/O modules.

The connection to the relevant fieldbus is made via the bus-specific gateway, which is responsible for the communication between the XI/ON station and the other fieldbus stations.

The communication within the XI/ON station between the gateway and the individual XI/ON modules is regulated via an internal module bus.

→ The gateway is the only fieldbus-dependent module on a XI/ON station. All other XI/ON modules are not dependent on the fieldbus used.

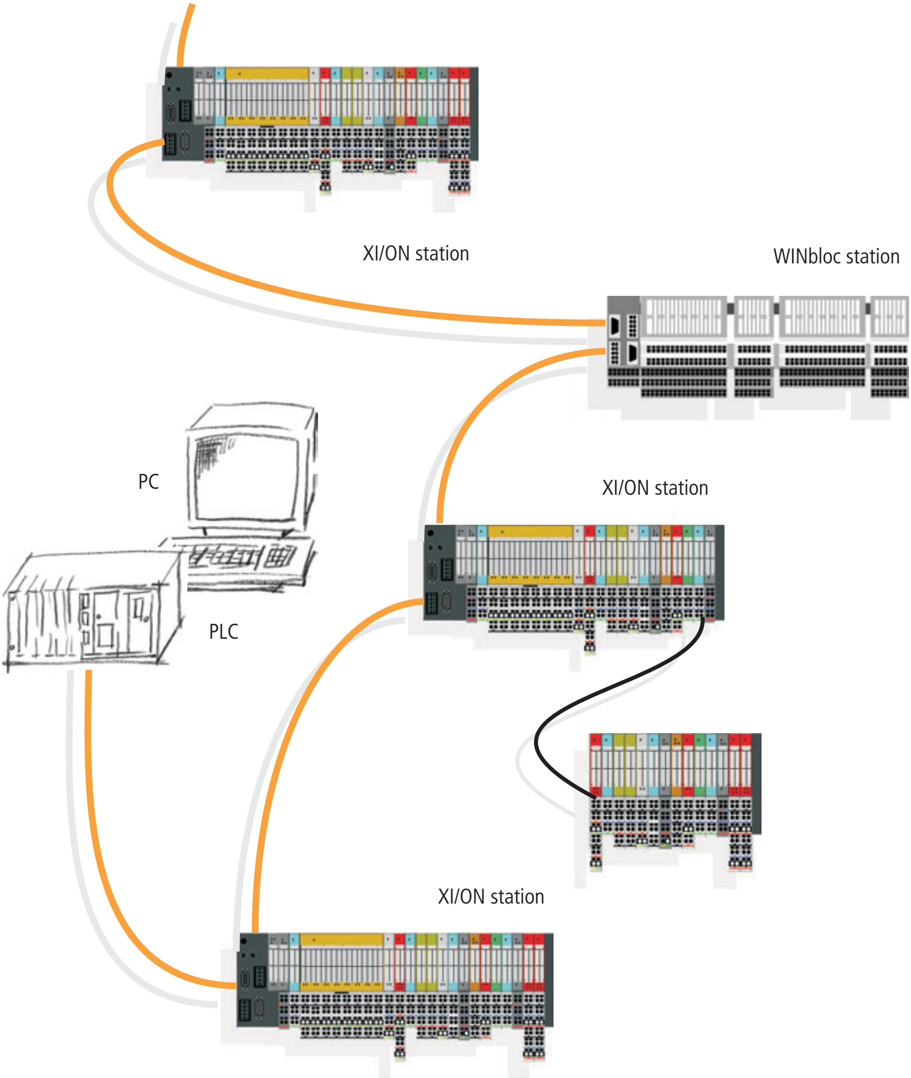


Figure 1: Example of a fieldbus structure

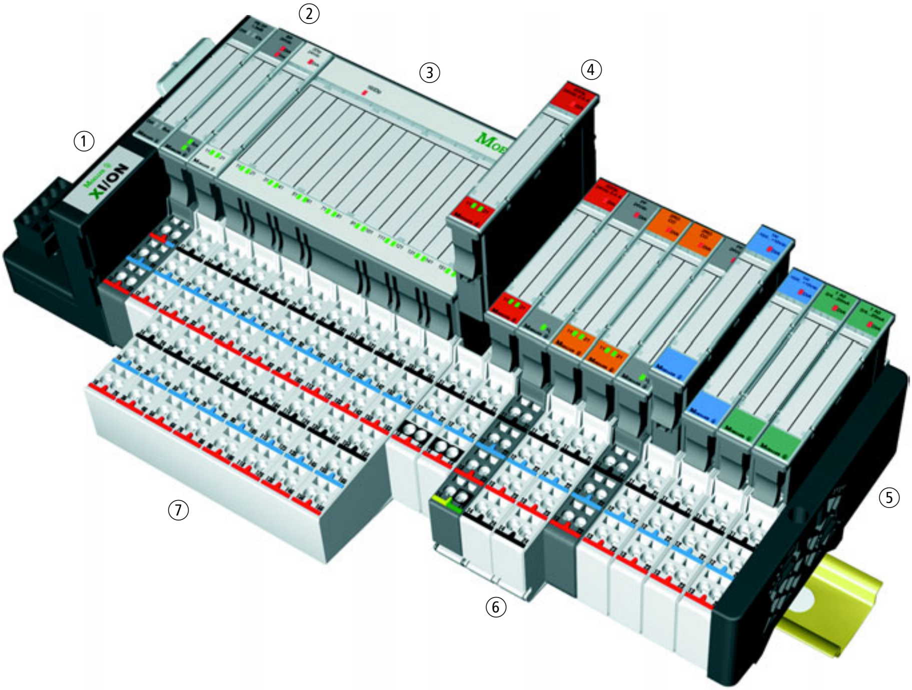


Figure 2: Example of a XI/ON station

① Gateway
② Power distribution module
③ Electronics module in block design
④ Electronics module in slice design
⑤ End plate
⑥ Base module in slice design
⑦ Base module in block design

Flexibility

All XI/ON stations can be planned to accommodate the exact number of channels to suit your needs, because the modules are available in block and slice design.

A XI/ON station can contain modules in any combination, which means it is possible to adapt the system to practically all applications in automated industry.

Compactness

The slim design of the XI/ON modules (gateway 50.4 mm (1.98 inch), slice 12.6 mm (0.49 inch) and block 100.8 mm (3.97 inch) and their low overall height favor the installation of this system in confined spaces.

Easy to handle

All XI/ON modules, with the exception of the gateway, consist of a base module and an electronics module.

The gateway and the base modules are snapped onto a mounting rail. The electronics modules are plugged onto the appropriate base modules.

The base modules are designed as terminal blocks. The wiring is secured by tension clamp or screw connection. The electronics modules can be plugged or pulled when the station is being commissioned or for maintenance purposes, without having to disconnect the field wiring from the base modules.

XI/ON Components

→ For a detailed explanation of the individual XI/ON components, please refer to chapter 2 and chapter 4. The "Appendix" to this manual contains (amongst others) a list of all XI/ON components and the assignment of electronics modules to base modules.

Gateways

The gateway connects the fieldbus to the I/O modules. It is responsible for handling the entire process data and generates diagnostic information for the higher-level master and the software tool I/O*assistant*.

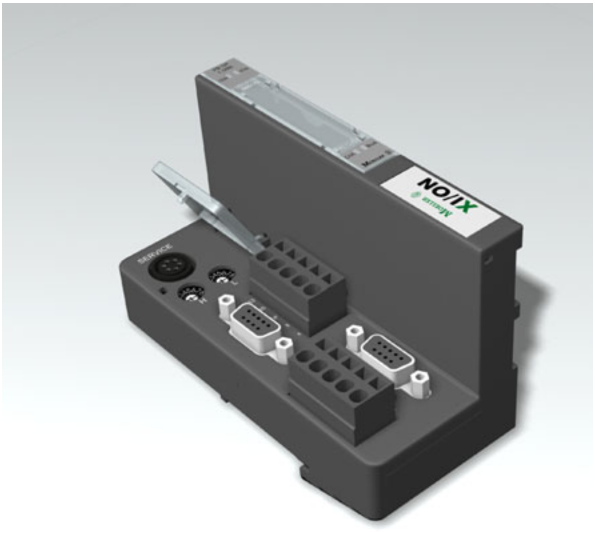


Figure 3: Gateway

Power Distribution Modules

The power supply for gateways and I/O modules is fed to the power distribution modules; therefore, it is not necessary to supply each individual module with a separate voltage.

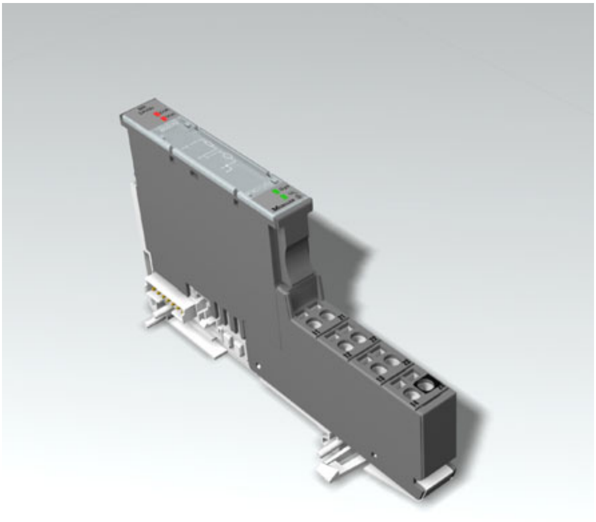


Figure 4: Power distribution module

Electronics Modules

Electronics modules contain the functions of the XI/ON modules (power distribution modules, digital and analog input/output modules, and technology modules).

Electronics modules are plugged onto the base modules and are not directly connected to the wiring. The assignment table in the Section "Ordering Information" of the "Appendix" shows the possible combinations of electronics and base modules. They can be plugged or pulled when the station is being commissioned or for maintenance purposes, without having to disconnect the field wiring from the base modules.

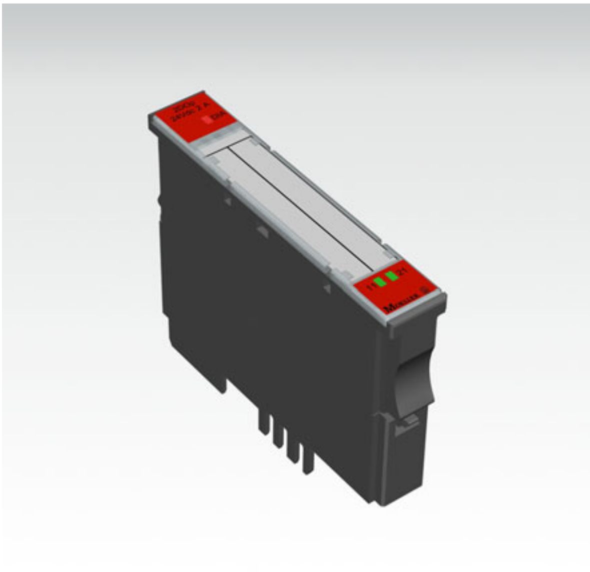


Figure 5: Electronics module in slice design

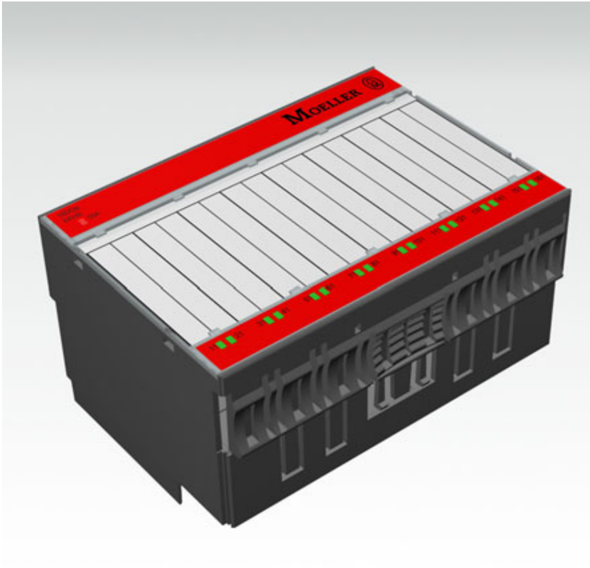


Figure 6: Electronics module in block design

Base Modules

The field wiring is connected to the base modules. These are constructed as terminals in block and slice designs and are available in the following variations with either tension clamp or screw connections: 2-/3-wire (2-channel), 4-wire (2-channel) and 4x 2-/3-wire (4-channel).

The assignment table in the Section "Ordering Information" of the "Appendix" shows the possible combinations of electronics and base modules.

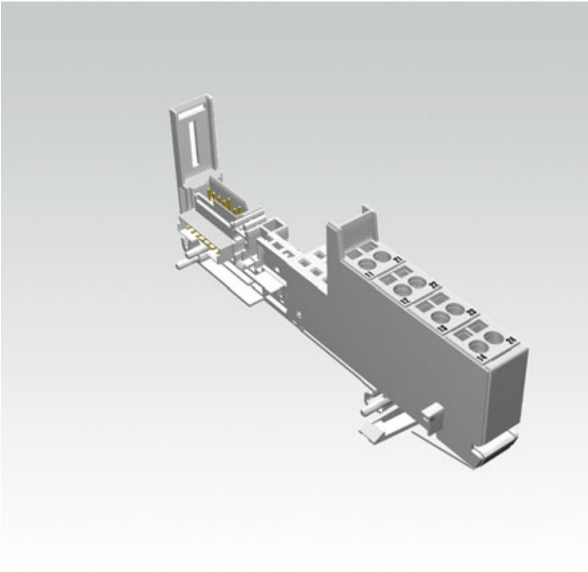


Figure 7: Base module with tension clamp connection

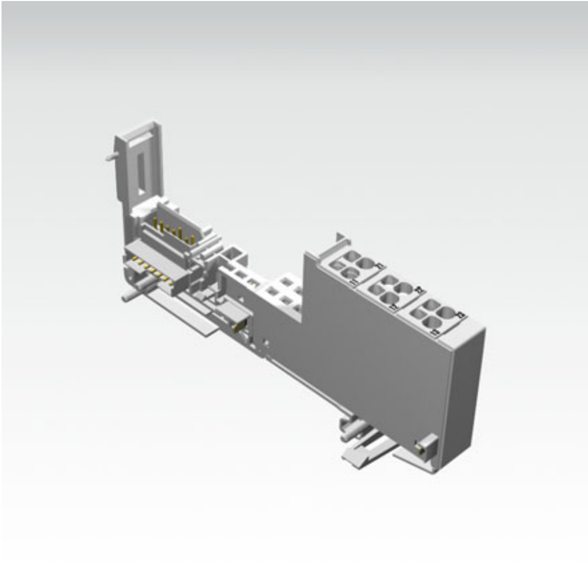


Figure 8: Base module with screw connection

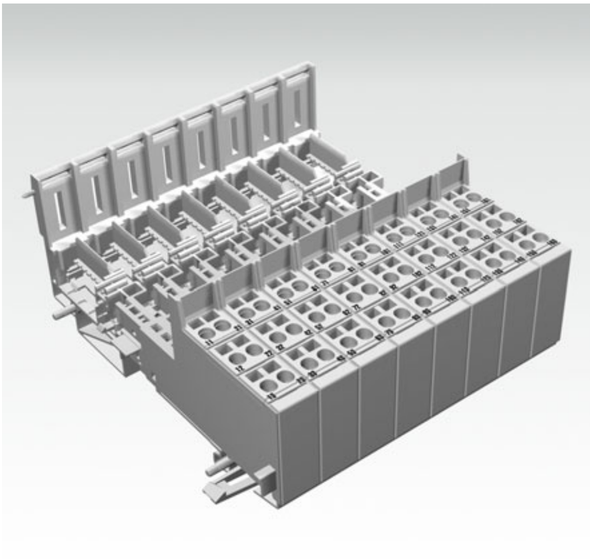


Figure 9: Base module in block design

End Plate

An end plate on the right-hand side physically completes the XI/ON station. An end bracket mounted into the end plate ensures that the XI/ON station remains secure on the mounting rail even when subjected to vibration.

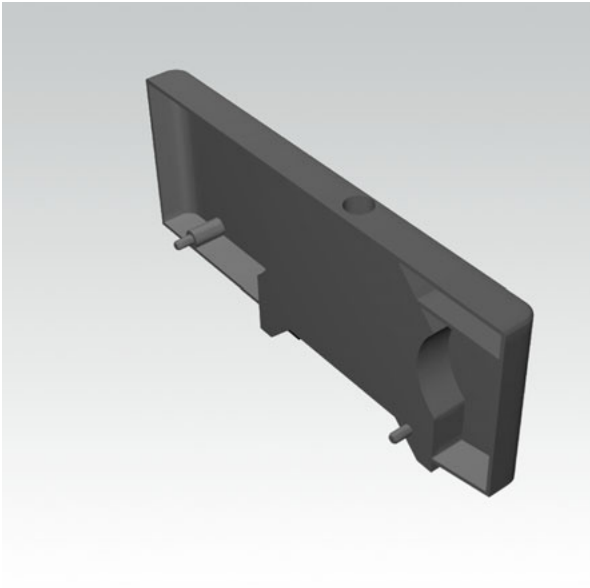


Figure 10: End plate

End Bracket

A second end bracket to the left of the gateway is necessary, as well as the one mounted into the end plate to secure the station.

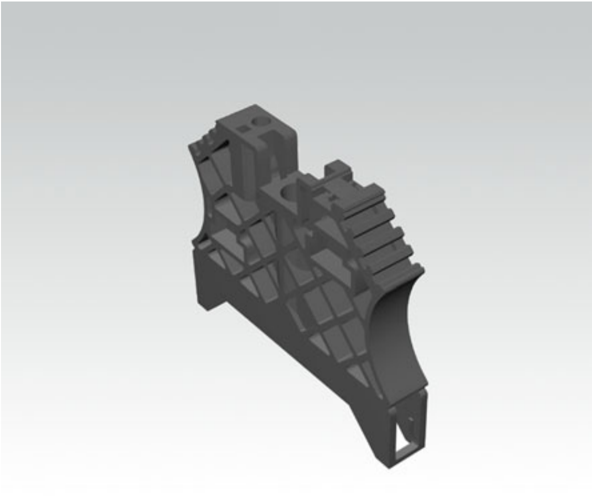


Figure 11: End bracket

Jumpers

Jumpers (QVRs) are used to bridge a connection level of a 4-wire base module. They can be used to connect potentials in relay modules (bridging the relay roots); thus considerably reducing the amount of wiring.

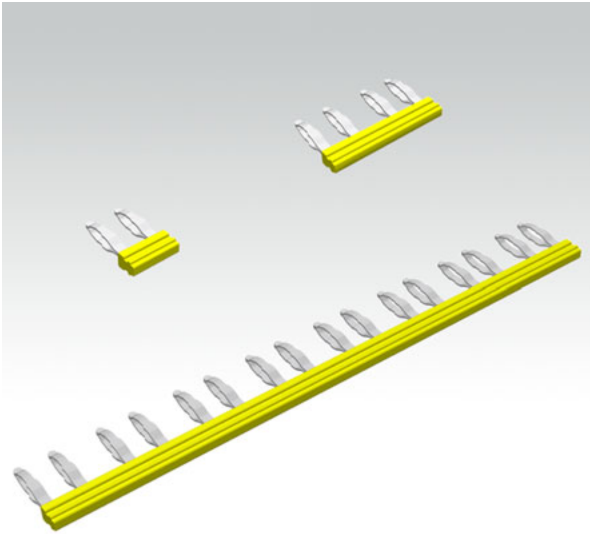


Figure 12: Jumpers

Shield Connection (Gateway)

If the gateway is wired directly to the fieldbus, it is possible to shield the connection using an attachment on the gateway.

Figure 13: Shield connection (gateway)

Marking Material

Labels: for labeling XI/ON electronics modules.

Markers: for colored identification of connection levels of XI/ON base modules.

Dekafix connector markers: for numbering the mounting slots on XI/ON base modules.

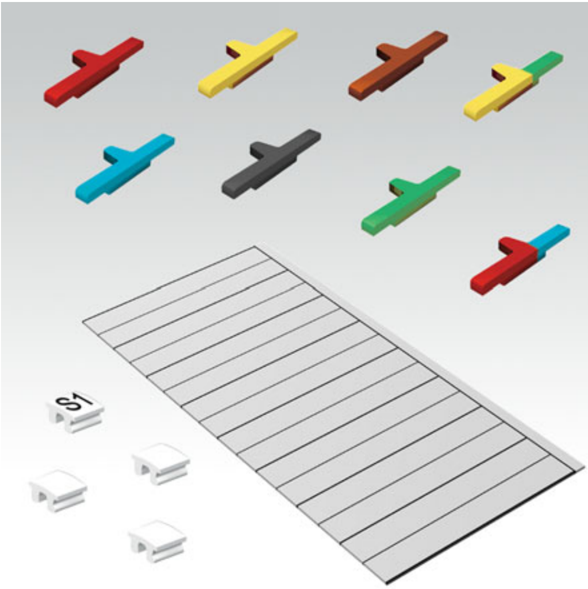


Figure 14: Marking material

Shield Connection, 2-Pole for Analog Modules

The 2-pole shield connection can be used to connect signal-cable shielding to the base modules of analog input and output modules. A special tension-clamp operating tool (XN-ZBW2) is required to mount the shield connection onto the base module.

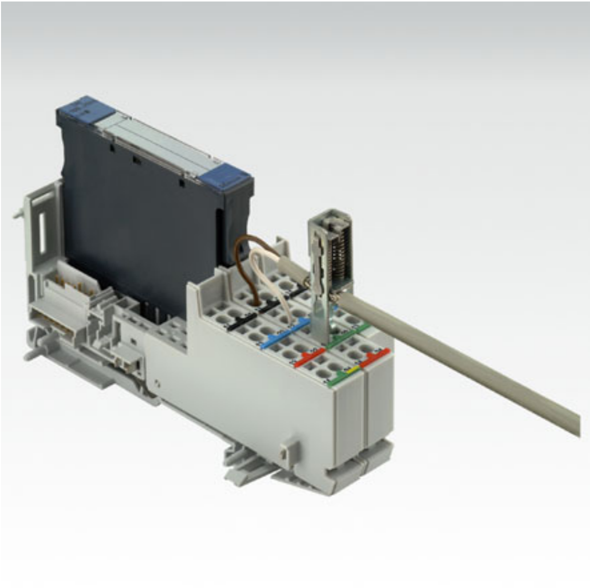


Figure 15: Shield connection

2 Gateways for PROFIBUS-DP

Chapter Overview

You can find the following subjects in this chapter:

Introduction

This chapter contains a description of XI/ON gateways for the standardized fieldbus PROFIBUS-DP. The chapter is divided up as follows: a description of functions, general and specific technical data, a description of addressing and status displays, and parameter assignment.

Function

XI/ON gateways enable XI/ON modules to operate on PROFIBUS-DP. A gateway is the connection between the XI/ON modules and the PROFIBUS-DP master. It regulates the process data between the I/O level and the fieldbus, and generates diagnostics data for the higher-level master. Information is made available to the software tool I/O*assistant* via the service interface.

→ XI/ON gateways can only be used as slaves.

Gateways are available in two different fieldbus versions: with maximum transmission speed of either 1.5 MBaud (Mbit/s) or 12 MBaud (Mbit/s).

When the XI/ON gateway has the "WAIT_PRM" status, it is not possible to check the parameters in the parameter telegram of the PROFIBUS-DP master due to the large number of module combinations and module variants. This check is performed after successful configuration by the PROFIBUS-DP master in the context of the configuration.

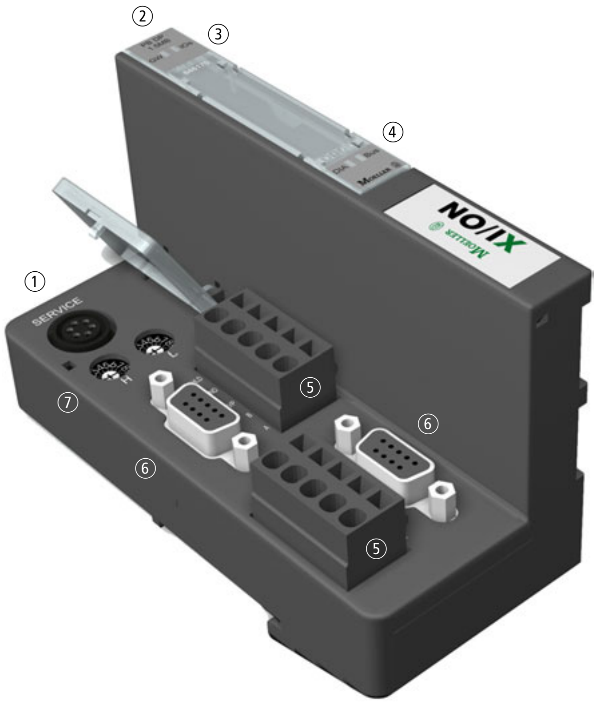


Figure 16: 1.5 MBaud Gateway

① Service interface
② Type designation
③ LEDs for XI/ON module bus
④ LEDs for PROFIBUS-DP
⑤ PROFIBUS-DP, direct wiring (tension clamp connection)
⑥ PROFIBUS-DP, SUB-D female connectors
⑦ Hexadecimal rotary coding-switch for fieldbus addressing

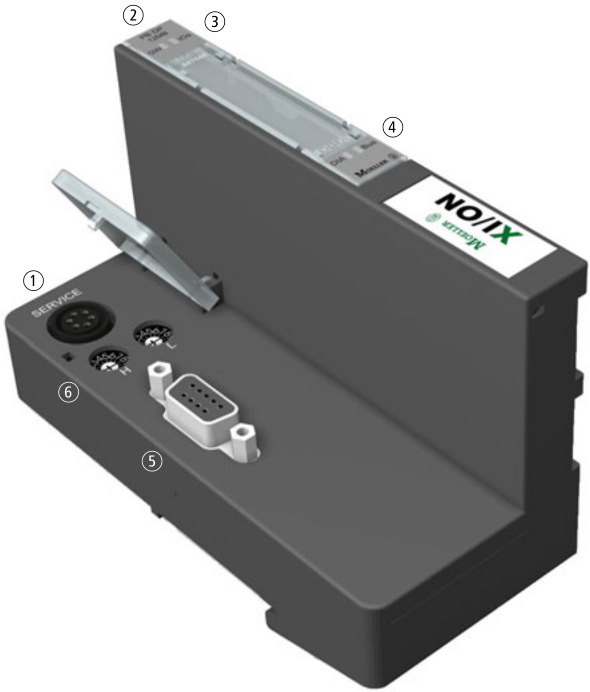


Figure 17: 12 MBaud Gateway

① Service interface
② Type designation
③ LEDs for XI/ON module bus
④ LEDs for PROFIBUS DP
⑤ PROFIBUS-DP, SUB-D female connector
⑥ Hexadecimal rotary coding-switch for fieldbus addressing

Connection Options

Gateways have the following connection and setting options:

PS/2 female connector: This is the service interface for connecting the gateway to the software tool I/O*assistant*. With I/O*assistant*, the user can configure and set XI/ON station parameters and carry out diagnostic functions. The interface is a mini 6-pole DIN female connector. Moeller connection cables or commercially available keyboard and adapter cables can be used for connecting to a PC serial interface.

Two hexadecimal rotary coding-switches used for setting the station's address.

Gateway 12 MBaud:
9-pole SUB-D female connector: direct plug-in connection between the gateway and PROFIBUS-DP; a special SUB-D male connector (Moeller ZB4-209-DS2) must be used to realize the subsequent fieldbus.

→ Please note, the special SUB-D connector should have 4 inductances (pro 100 nH to 110 nH) in the P and the N supply wires (recommended by the PROFIBUS User Organization). The fieldbus termination of type A or type B cables can also only be realized in the connector. The XI/ON gateway itself offers no possibility of terminating the fieldbus.

Gateway 1.5 MBaud:
Two 9-pole SUB-D female connectors connect the gateway with the PROFIBUS-DP fieldbus in accordance with DIN 19245 Part 3.
Two terminal blocks optionally available with tension clamp or screw connections are used to wire the fieldbus directly to the gateway.

→ If the XI/ON gateway is the last station in the bus structure, the bus termination must be connected externally. This external connection can be either realized by a separate terminating resistor or by a special SUB-D connector with an integrated bus termination. The exact function and mode of operation of the possible individual bus connections are explained in detail in chapter 3.

I/O*assistant* functions and operating options are described in chapter 9.

Technical Data

Structure Diagram

The XI/ON gateway has the following structure:

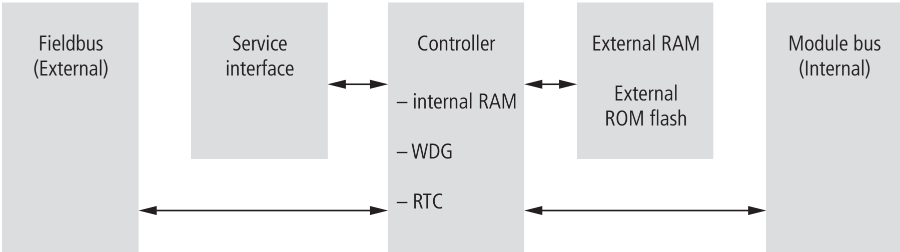


Figure 18: Gateway structure

General Technical Data

Supply voltage	
Nominal value	5 V DC (distribution by the Bus Refreshing module)
Permissible range	4.7 to 5.3 V DC
Residual ripple	according to EN 61 131-2
Current consumption on the module bus	
Without service/without fieldbus	~ 280 mA
Without service/with fieldbus (9.6 kBaud)	~ 360 mA
Without service/with fieldbus (1.5 MBaud)	~ 380 mA
Without service/with fieldbus (12 MBaud)	~ 410 mA
With service/without fieldbus	~ 300 mA
Maximum	~ 430 mA
Dimensions	
Width/length/height (mm/inch)	50.6 x 114.8 x 74.4 / 1.99 x 4.52 x 2.93

Diagnostics interface	
Diagnostics interface	PS/2 female connector

Gateway 1.5 MBaud (XN-GW-PBDP-1.5MB)

Fieldbus connection technology	2 x 9-pole SUB-D female connectors, 2 x LPZF tension clamp terminal blocks, 5.08, 5-pole or 2 x screw connections
Fieldbus shield connection	2 KLBÜ (shield clamp)
Transmission speed	9.6 kBit/s to 1.5 Mbit/s
Fieldbus termination	SUB-D connector
Passive LWL adapters can be connected	Current consumption max. 100 mA
2 hexadecimal rotary coding-switches with labeling for addressing.	

Gateway 12 MBaud (XN-GW-PBDP-12MB)

Fieldbus connection technology	1 x 9-pole SUB-D female connector
Fieldbus shield connection	via SUB-D male connector
Transmission speed	9.6 kBit/s to 12 Mbit/s
Fieldbus termination	SUB-D connector
Passive LWL adapters can be connected	Current consumption max. 100 mA
2 hexadecimal rotary coding-switches with labeling for addressing.	

Fieldbus Connections

Fieldbus Connection via SUB-D Female Connectors

SUB-D female connectors are provided for gateway communication via the PROFIBUS-DP fieldbus.

Gateway 1.5 MBaud (XN-GW-PBDP-1.5MB) = 2 x SUB-D

Gateway 12 MBaud (XN-GW-PBDP-12MB) = 1 x SUB-D

Attention!
The 12 MBaud gateway needs a special SUB-D connector (see Section "XI/ON Accessories" in the "Appendix") to establish the fieldbus connection.

The pin assignment of the female connectors is identical. The following is an example:

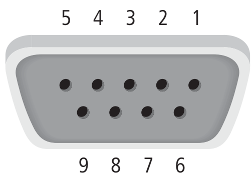


Figure 19: SUB-D female connector on the gateway (top view)

Table 1: Pin assignment of SUB-D female connector on gateway

Pin No.	Signal name	Labeling when wiring directly	Description
1	PE	SHLD	Shield connection/protective earth
2	not assigned		
3	RxD/TxD-P	B	Reception/transmission-data-P
4	CNTR-P/RTS		Request to send
5	DGND	DGND	Data reference potential
6	VP	VP	+ 5 V DC for external bus termination
7	not assigned		
8	RxD/TxD-N	A	Reception/transmission-data-N
9	not assigned		

→ The fieldbus shielding is established via the metal hood of the male SUB-D connector.

Fieldbus Connection via Direct Wiring (only for 1.5 MBaud Gateway)

The 1.5 MBaud gateway can be connected to the fieldbus by using either a SUB-D connection or by direct wiring. Two terminal strips are optionally available with tension clamp or screw connections for direct wiring.

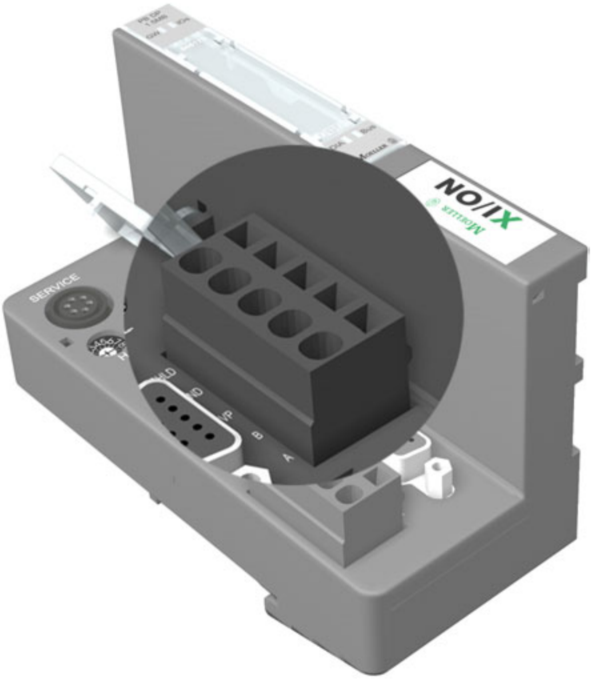


Figure 20: Gateway 1.5 MBaud – direct wiring to PROFIBUS-DP

When connecting to PROFIBUS-DP via direct wiring, the shield can be connected using a shield connection. The installation of the shield connection is described in chapter 7.

Service Interface Connection

Two types of cable can be used to connect the service interface to a PC for the purpose of using I/O*assistant* (project planning and diagnostics software).

- XI/ON connection cable (XN-PS2-Cable)
- Commercially available PS/2 cable with adapter cable

The pin assignments differ in these two options.

Connection Using a XI/ON Cable

XI/ON cables have a PS/2 male connector (connection for female connector on gateway) and a SUB-D female connector (connection for male connector on PC).

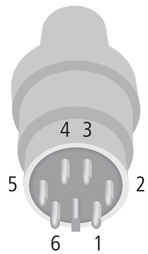


Figure 21: PS/2 male connector on the connection cable to the gateway (top view)

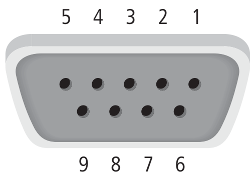


Figure 22: 9-pole SUB-D female connector on the cable for connecting to PC (top view)

The table below shows the pin assignment when using a PS/2 cable and adapter:

Table 2: Pin assignment when using PS/2 cable and adapter

	PS/2			**9-pole serial interface on PC**
Pin	Standard PS/2 male connector	XI/ON Gateway PS/2 female connector	Pin	Male connector
1	CLK	+5V Gw	4, 6[1)]	DTR, DSR
2	GND	GND	5	GND
3	DATA	–	–	–
4	n.c. (DATA2)	TxD	2	RxD
5	+5V	/CtrlMode	7	RTS
6	n.c. (CLK2)	RxD	3	TxD

1) This connection is not supported by all adapter cables.

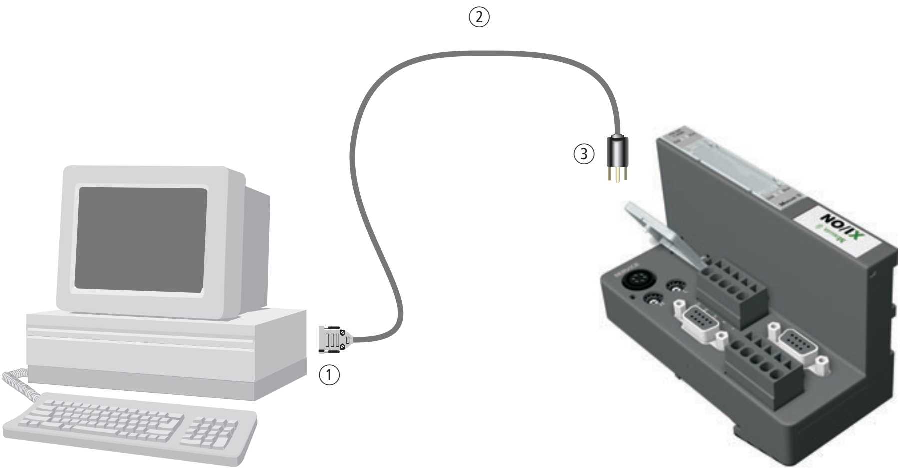


Figure 23: XI/ON connection cable connecting a PC and a XI/ON gateway

1 SUB-D female connector
2 XI/ON connection cable
3 PS/2 male connector

Connection Using Commercially Available Cables

A further possibility to connect PC and XI/ON gateway is to use a commercially available connection and adapter cable.

The following two cables are necessary:

- 1 x PS/2 cable (PS/2 male connector/PS/2 male connector) (commercially available keyboard extension cable)
- 1 x adapter cable (PS/2 female connector/SUB-D female connector) (commercially available extension cable for a PC mouse)

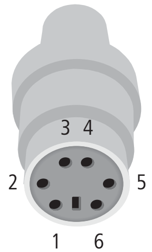


Figure 24: PS/2 female connector on the gateway (top view)

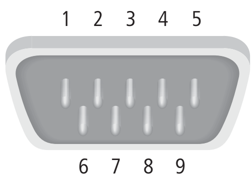


Figure 25: 9-pole SUB-D male connector on PC (top view)

The following graphic of a PS/2 male connector / PS/2 male connector connection is a 6-wire 1:1 connection.

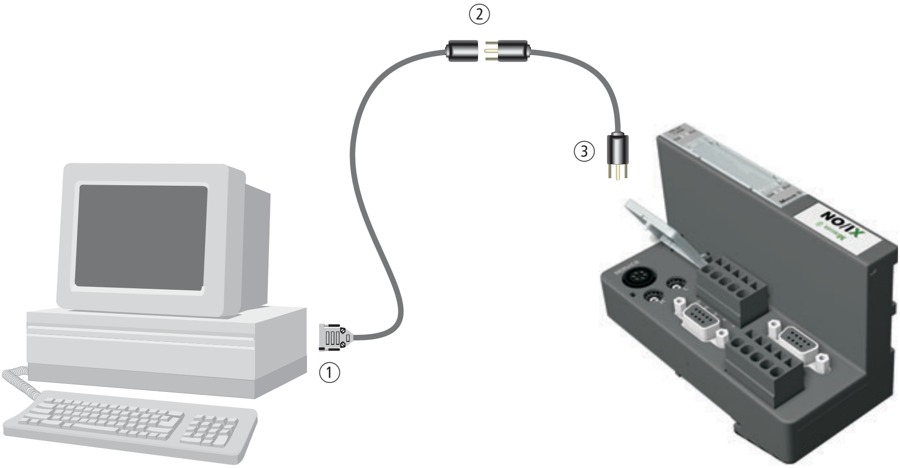


Figure 26: Connection between PC and XI/ON gateway using a commercially available cable

① SUB-D female connector

② PS/2 female connector <–> PS/2 male connector

③ PS/2 male connector

Address Setting

XI/ON gateway addressing on PROFIBUS-DP is performed via the two hexadecimal rotary coding-switches. These switches are positioned under a cover just below the service interface.

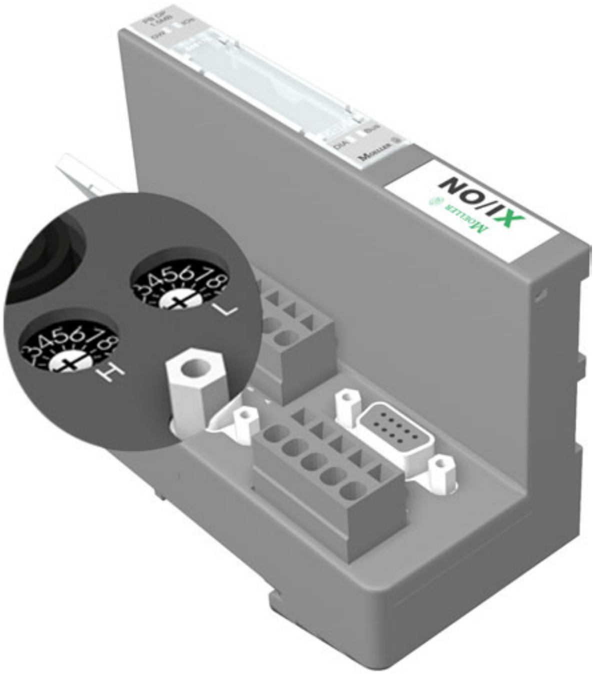


Figure 27: Hexadecimal rotary coding-switches for address setting on PROFIBUS-DP

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

The bus addresses 000, 126 and 127 must not be allocated.

The rotary coding-switches are marked with H for high (most significant digit) and L for low (least significant digit). This means, the switch marked L sets the positions 0 to F (L x 16^0) and the switch marked H equally sets the positions from 0 to F (H x 16^1) in hexadecimal format.

A conversion table for converting station addresses from decimal to hexadecimal can be found in the “Appendix”.

→ The cover of the hexadecimal rotary coding-switches must be closed after use.

It is not necessary to address the internal module bus.

The maximum bus structure for PROFIBUS-DP as well as detailed data for connecting gateways to PROFIBUS-DP are described in chapter 3.

Setting Parameters

Gateway Parameters

XI/ON gateways for PROFIBUS-DP require five parameter bytes. These describe exclusively the behavior of the gateway itself. The first three parameters are defined by the PROFIBUS-DP standard.

Description and allocation of gateway parameters:
The texts in the columns "Parameter name" and "Meaning" correspond to those determined in the German version of the GSD files (Electronic Device Data Sheets), which are described in chapter 3. The English translation of the German parameter texts is included in the "Appendix".

Table 3: Gateway parameters

Parameter name	Value	Meaning
Parameter 1 - 3:	**Reserved**	**0x00, 0x00, 0x00,** 0x00, 0x00
Parameter 4:	**Module bus station**	0x00, 0x00, 0x00, **0x00**, 0x00
Ausgaenge Modulwechsel:	0 ausgeben[1)]	The gateway switches the outputs of modules to "0". No error information is transmitted.
	Ersatzwert ausgeben	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 to maintain the original values. The non-configured analog output modules set their outputs to "0".
	Momentanwert halten	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.
	Prozessdaten austauschen	The gateway carries on exchanging process data with the other module bus stations. No error information is transmitted.

Parameter name	Value	Meaning
Ausgaenge Modulwechsel-Fehler:	0 ausgeben[1)]	The gateway switches the outputs of the modules to "0". No error information is transmitted.
	Ersatzwert ausgeben	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".
	Momentanwert halten	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.
	Prozessdaten austauschen	The gateway carries on exchanging process data with the other module bus stations. No error information is transmitted.
Ausgaenge Feldbusfehler:	0 ausgeben[1)]	The gateway switches the outputs of the modules to "0". No error information is transmitted.
	Ersatzwert ausgeben	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".
	Momentanwert halten	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.

Parameter name	Value	Meaning
Parameter 5:	**Gateway**	0x00, 0x00, 0x00, 0x00, **0x00**
Integer-Datenformat	LSB zuerst[1)]	Data is converted to INTEL format (standard format).
	MSB zuerst	16-bit data are transmitted with the high and low bytes reversed. This parameter influences the process data!
Diagnosen aller Module	aktivieren[1)]	Diagnostic messages from the module bus stations are made known to the fieldbus master as extended diagnostics.
	deaktivieren	Diagnostic messages from the module bus stations will not be displayed. A station diagnostic is not automatically generated along with module diagnostics.
Stations-konfiguration	Abweichungen nicht zulassen[1)]	When commissioning the XI/ON station, the actual list of modules must match exactly the module list planned in the configuration software of the master.
	Abweichungen adaptieren	When the XI/ON station is put into operation by the fieldbus master, the actual list of modules can differ slightly from the list of modules planned in the configuration software of the master: – Free slots exist in the actual configuration where modules have been planned. These free slots are reserved for the planned modules. – Modules are mounted in the actual configuration where free slots have been planned. These modules will be ignored by the gateway.
I/O*assistant*-ForceMode	freigeben[1)]	I/O*assistant* can set the force mode.
	sperren	I/O*assistant* cannot set the force mode, if the station was parameterized by the DP master.

1) Standard default settings

Module parameters

The texts in the columns “Parameter names“ and “Value“ correspond to those determined in the German version of the GSD files (Electronic Device Data Sheets), which are described in chapter 3. The English translation of the German parameter texts is included in the “Appendix“.

Table 4: Module parameters

Assignment			Parameter name	Value	Meaning
Channel	**Byte**	**Bit**			
XN-1AI-I(0/4...20MA)					
1		0	Strom-Modus	0 1	0...20mA[1)] 4...20mA
		1	Werte-Darstellung	0 1	Integer (15Bit + Vorzeichen)[1)] 12Bit (linksbuendig)
		2	Diagnose	0 1	freigeben[1)] sperren
XN-1AI-U(-10/0...+10VDC)					
1		0	Spannungs-Modus	0 1	0...10V[1)] -10...+10V
		1	Werte-Darstellung	0 1	Integer (15Bit + Vorzeichen)[1)] 12Bit (linksbuendig)
		2	Diagnose		freigeben[1)] sperren
XN-2AI-PT/NI-2/3					
1	0	0	Netzunter- drueckung K1	0 1	50Hz[1)] 60Hz
		1	Werte-Darstellung K1	0 1	Integer (15Bit + Vorzeichen)[1)] 12Bit (linksbuendig)
		2	Diagnose K1	0 1	freigeben[1)] sperren
		3	Kanal K1	0 1	aktivieren[1)] deaktivieren

Assignment			Parameter name	Value	Meaning
Channel	Byte	Bit			
		4 to 7	Element K1	0000	PT100, -200..850°C[1)]
				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	Widerstand, 0..100Ω
				1101	Widerstand, 0..200Ω
				1110	Widerstand, 0..400Ω
				1111	Widerstand, 0..1000Ω
	1	0	Messbetriebsart K1	0	2-Leiter[1)]
				1	3-Leiter
2	2	0	Netzunter-drueckung K2	0	50Hz[1)]
				1	60Hz
		1	Werte-Darstellung K2	0	Integer (15Bit + Vorzeichen)[1)]
				1	12Bit (linksbuendig)
		2	Diagnose K2	0	freigeben[1)]
				1	sperren
		3	Kanal K2	0	aktivieren[1)]
				1	deaktivieren

Assignment Channel	Byte	Bit	Parameter name	Value	Meaning
		4 to 7	Element K2	0000	PT100, -200..850°C[1)]
				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	Widerstand, 0..100Ω
				1101	Widerstand, 0..200Ω
				1110	Widerstand, 0..400Ω
				1111	Widerstand, 0..1000Ω
	3	0	Messbetriebsart K2	0	2-Leiter[1)]
				1	3-Leiter
XN-2AI-THERMO-PI					
1	0	0	Netzunter-drueckung K1	0	50Hz[1)]
				1	60Hz
		1	Werte-Darstellung K1	0	Integer (15Bit + Vorzeichen)[1)]
				1	12Bit (linksbuendig)
		2	Diagnose K1	0	freigeben[1)]
				1	sperren
		3	Kanal K1	0	aktivieren[1)]
				1	deaktivieren

Assignment Channel	Byte	Bit	Parameter name	Value	Meaning
		4 to 7	Element K1	0000 0001 0010 0011 0100 0101 0110 0111 1000 1001 1010 1011	Typ K, -270..1370°C[1)] Typ B, +100...1820°C Typ E, -270..1000°C Typ J, -210..1200°C Typ N, -270..1300°C Typ R, -50..1760°C Typ S, -50..1540°C Typ T, -270..400°C +/-50mV +/-100mV +/-500mV +/-1000mV
2	1	0	Netzunter-drueckung K2	0 1	50Hz[1)] 60Hz
		1	Werte-Darstellung K2	0 1	Integer (15Bit + Vorzeichen)[1)] 12Bit (linksbuendig)
		2	Diagnose K2	0 1	freigeben[1)] sperren
		3	Kanal K2	0 1	aktivieren[1)] deaktivieren
		4 to 7	Element K2	0000 0001 0010 0011 0100 0101 0110 0111 1000 1001 1010 1011	Typ K, -270..1370°C[1)] Typ B, +100...1820°C Typ E, -270..1000°C Typ J, -210..1200°C Typ N, -270..1300°C Typ R, -50..1760°C Typ S, -50..1540°C Typ T, -270..400°C +/-50mV +/-100mV +/-500mV +/-1000mV

Assignment			Parameter name	Value	Meaning
Channel	Byte	Bit			
XN-1AO-I(0/4...20MA)					
1	0	0	Strom-Modus	0 1	0...20mA[1)] 4...20mA
		1	Werte-Darstellung	0 1	Integer (15Bit + Vorzeichen)[1)] 12Bit (linksbuendig)
	1+2		Ersatzwert A1		The substitute value allocated to the module will be transmitted if the parameter “Ersatzwert ausgeben“ has been set on the gateway.
XN-2AO-U(-10/0...+10VDC)					
1	0	1	Werte-Darstellung (channel 1)	0 1	Integer (15Bit + Vorzeichen)[1)] 12Bit (linksbuendig)
		0	Spannungs-Modus (channel 1)	0 1	0...10V[1)] -10...+10V
	1+2		Ersatzwert A1		The substitute value allocated to channel 1 will be transmitted if the parameter “Ersatzwert ausgeben“ has been set on the gateway.
2	3	1	Werte-Darstellung (channel 2)	0 1	Integer (15Bit + Vorzeichen)[1)] 12Bit (linksbuendig)
		0	Spannungs-Modus (channel 2)	0 1	0...10V[1)] -10...+10V
	4+5		Ersatzwert A2		The substitute value allocated to channel 2 will be transmitted if the parameter “Ersatzwert ausgeben“ has been set on the gateway.

Assignment			Parameter name	Value	Meaning
Channel	Byte	Bit			
XN-1CNT-24VDC, counter mode					
1	0	0 to 5	Zaehlbetriebsart	000000 000001 000010	endlos zaehlen[1)] einmalig zaehlen periodisch zaehlen
	1	0	Torfunktion	0 1	Zaehlvorgang abbrechen[1)] Zaehlvorgang unterbrechen
		1	Digitaleingang DI	0 1	normal[1)] invertiert
		2 to 3	Funktion DI	00 01 10 11	Eingang[1)] HW-Tor Latch-Retrigger bei pos. Flanke Synchronisation bei pos. Flanke
		4	Synchronisation	0 1	einmalig[1)] periodisch
		5 to 6	Hauptzaehlrichtung	00 01 10	keine[1)] vorwaerts rueckwaerts
	2 to 5		Untere Zaehlgrenze	-2 147 483 648 (-2^{31}) to 0	
			Untere Zaehlgrenze (HWORD)	-32768[1)] to 0 (Signed16)	
			Untere Zaehlgrenze (LWORD)	-32 768 to 32 767 (Signed16); 0[1)]	
	6 to 9		Obere Zaehlgrenze	0 to +2 147 483 647 ($2^{31}-1$)	
			Obere Zaehlgrenze (HWORD)	0 to 32767[1)] (Unsigned16)	
			Obere Zaehlgrenze (LWORD)	0 to 65535[1)] (Unsigned16)	
	10		Hysterese	0[1)] to 255 (Unsigned8)	

Assignment			Parameter name	Value	Meaning
Channel	Byte	Bit			
	11	0 to 7	Impulsdauer DO1, DO2 [n*2ms]	0[1)] to 255 (Unsigned8)	
	12	0	Ersatzwert DO1	0 1	0[1)] 1
		1	Diagnose DO1	0 1	ein[1)] aus
		2 to 3	Funktion DO1	00 01 10 11	Ausgang[1)] ein bei Zaehlwert >= Vergl.-Wert ein bei Zaehlwert <= Vergl.-Wert Impuls bei Zaehlwert = Vergl.-Wt
		5 to 6	Funktion DO2	00 01 10 11	Ausgang[1)] ein bei Zaehlwert >= Vergl.-Wert ein bei Zaehlwert <= Vergl.-Wert Impuls bei Zaehlwert = Vergl.-Wt
	13	0 to 1	Signalauswertung (A,B)	00 01 10 11	Impuls und Richtung[1)] Drehgeber einfach Drehgeber zweifach Drehgeber vierfach
		2	Geber-/Eing.-Filter (A)	0 1	2,5µs (200kHz)[1)] 25µs (20kHz)
		3	Geber-/Eing.-Filter (B)	0 1	2,5µs (200kHz)[1)] 25µs (20kHz)
		4	Geber-/Eing.-Filter (DI)	0 1	2,5µs (200kHz)[1)] 25µs (20kHz)
		5	Sensor (A)	0 1	normal[1)] invertiert
		7	Richtungseingang (B)	0 1	normal[1)] invertiert

Assignment			Parameter name	Value	Meaning
Channel	Byte	Bit			
	14	0	Sammeldiagnose	0 1	freigeben[1)] sperren
		4 to 5	Verhalten CPU/ Master STOP	00 01 10 11	DO1 abschalten[1)] Betriebsart weiterarbeiten DO1 Ersatzwert schalten DO1 letzten Wert halten
XN-1CNT-24VDC, measurement mode					
1	0	0 to 5	Messbetriebsart	100000 100001 100010	Frequenzmessung[1)] Drehzahlmessung Periodendauermessung
	1	1	Digitaleingang DI	0 1	normal[1)] invertiert
		2	Funktion DI	0 1	Eingang[1)] HW-Tor
	2 to 4		Untergrenze	0 to 16777214 $x\ 10^{-3}$	
			Untergrenze (HWORD)	0[1)] to 255 (Unsigned8)	
			Untergrenze (LWORD)	0[1)] to 65535	
	5 to 7		Obergrenze	1 to 16777215 $x\ 10^{-3}$	
			Obergrenze (HWORD)	0[1)] to 255 (Unsigned8)	
			Obergrenze (LWORD)	0[1)] to 65535	
	8 to 9		Integrationszeit [n*10ms]	1 to 1000; 10[1)]	
	10 to 11		Geberimpulse pro Umdrehung	1[1)] to 65535	
	12	0	Ersatzwert DO1	0 1	0[1)] 1

Assignment			Parameter name	Value	Meaning
Channel	Byte	Bit			
		1	Diagnose DO1	0 1	ein[1)] aus
		2 to 4	Funktion DO1	00 01 10 11	Ausgang[1)] ausserhalb der Grenzen unterhalb der Untergrenze oberhalb der Obergrenze
	13	0 to 1	Signalauswertung (A,B)	00 01	Impuls und Richtung[1)] Drehgeber einfach
		2	Geber-/Eing.-Filter (A)	0 1	2,5µs (200kHz)[1)] 25µs (20kHz)
		3	Geber-/Eing.-Filter (B)	0 1	2,5µs (200kHz)[1)] 25µs (20kHz)
		4	Geber-/Eing.-Filter (DI)	0 1	2,5µs (200kHz)[1)] 25µs (20kHz)
		5	Sensor (A)	0 1	normal[1)] invertiert
		7	Richtungseingang (B)	0 1	normal[1)] invertiert
	14	0	Sammeldiagnose	0 1	freigeben[1)] sperren
		4 to 5	Verhalten CPU/ Master STOP	00 01 10 11	DO1 abschalten[1)] Betriebsart weiterarbeiten DO1 Ersatzwert schalten DO1 letzten Wert halten

1) Standard default settings

Module Description in the Electronic Device Data Sheets (GSD)

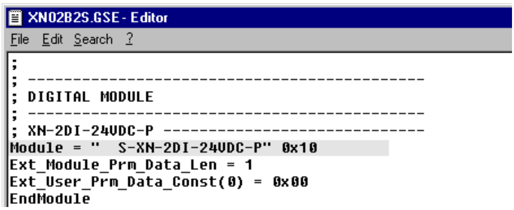
XI/ON gateways are integrated into PROFIBUS structures using electronic device data sheets (GSD).

Each individual module is supplied with a means of identification in the standard electronic device data sheet, making various forms of identification possible.

Standard module description

The configured module list is displayed with standard identification (general identification format), exception: empty slots and modules without process data are displayed in a special identification format. Modules cannot be unmistakably identified using this identification.

Advantage: Replacement modules need not be of an identical type to be accepted by the XI/ON gateway. This means that "related" modules with identical process data lengths can be used. Thus, it is possible to exchange a 2 DO 24 V DC module with **0.5A** with a 2 DO 24 V DC module with **2A**. This form of module identification achieves, amongst other things, a higher measure of flexibility for process, parameter and diagnostic data.

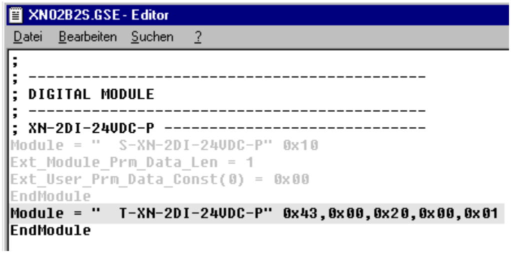

XN02B2S.GSE - Editor
File Edit Search ?

```
;
; -------------------------------------------
; 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 28: Standard description of the digital input module XN-2DI-24VDC-P

Module description according to type

The configured module list is displayed with extended identification (special identification format), which makes an exact identification of modules possible. The XI/ON gateway accepts replacement modules only of an identical type.



```
XN02B2S.GSE - Editor
Datei  Bearbeiten  Suchen  ?
;
; --------------------------------------------
; 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 29: Description according to type of the digital input module XN-2DI-24VDC-P

Options by the descriptions of modules:

Table 5: Optional module description

	Typified module description	**Standard module description**
	Special identification format: 3 manufacturer-specific bytes	Standard identification: length identification in the GSD file
Identification of individual modules by PROFIBUS-DP master and gateway	✓	
Plug/pull of identical modules	✓	✓
Plug/pull of module types with identical process data lengths, described by means of PROFIBUS-DP identification		✓
Plug/pull of module types with differing process data lengths, described by means of PROFIBUS-DP identification		

Example of a PROFIBUS-DP Configuration

The module description according to type is used in the following description of the process, configuration and parameter setting data.

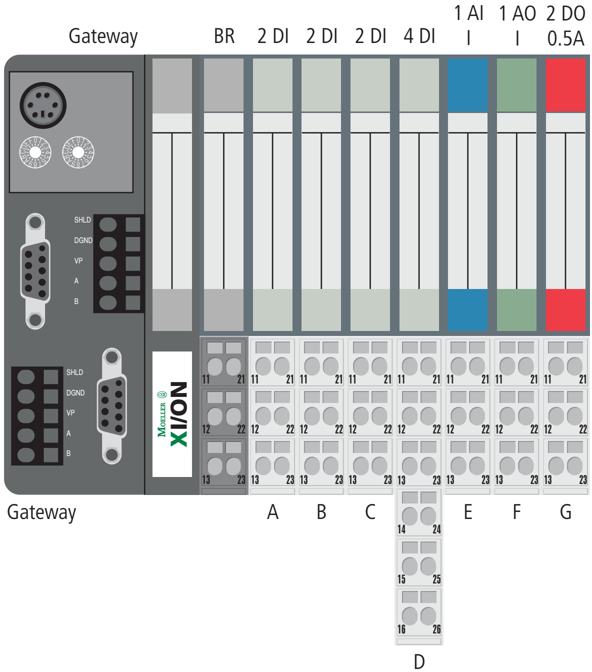


Figure 30: Example of a station

System description

Process data are displayed in INTEL format. The Motorola representation can be set using the gateway parameters.

Table 6: Parameter configuration data

Module	Input byte address	Output byte address	Byte (Bit 7...→ ...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

Parameter Configuration Data

Module bus station A: Not configurable

Module bus station B: Not configurable

Module bus station C: Not configurable

Module bus station D: Not configurable

Module bus station E:
Bit 0 = 0: Current mode: 0...20 mA
Bit 0 = 1: Current mode: 4...20 mA
Bit 1 = 0: Value representation: integer (15 Bit + sign)
Bit 1 = 1: Value representation: 12 Bit (left-justified)

Module bus station F:
Bit 0 = 0: Current mode: 0...20 mA
Bit 0 = 1: Current mode: 4...20 mA
Bit 1 = 0: Value representation: integer (15 Bit + sign)
Bit 1 = 1: Value representation: 12 Bit (left-justified)
SignedInteger: Default value A1

Module bus station G: Not configurable

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	Remark
–		Gateway
0	0x43 0x00 0x20 0x00 0x01 3. manufacturer-specific byte 2. manufacturer-specific byte 1. manufacturer-specific byte IO length, consistency special identification format: I-length follows, 3 manufacturer-specific bytes to follow → (Process data: 1 byte DI for module bus station A)	1. Module bus station: 2 DI
1	0x43 0x00 0x20 0x00 0x01 3. manufacturer-specific byte 2. manufacturer-specific byte 1. manufacturer-specific byte IO length, consistency special identification format: I-length follows, 3 manufacturer-specific bytes to follow → (Process data: 1 byte DI for module bus station B)	2. Module bus station: 2 DI
2	0x43 0x00 0x20 0x00 0x01 3. manufacturer-specific byte 2. manufacturer-specific byte 1. manufacturer-specific byte IO length, consistency special identification format: I-length follows, 3 manufacturer-specific bytes to follow → (Process data: 1 byte DI for module bus station C)	3. Module bus station: 2 DI

Configuration byte Offset address	Value	Remark
3	0x43 0x00 0x30 0x00 0x01 3. manufacturer-specific byte 2. manufacturer-specific byte 1. manufacturer-specific byte IO length, consistency special identification format: I-length follows, 3 manufacturer-specific bytes to follow → (Process data: 1 byte DI for module bus station C)	4. Module bus station: 4 DI
4	0x43 0x40 0x50 0x22 0x01 3. manufacturer-specific byte 2. manufacturer-specific byte 1. manufacturer-specific byte IO length, consistency special identification format: I-length follows, 3 manufacturer-specific bytes to follow → (Process data: 2 bytes AI for module bus station E)	5. Module bus station: 1 AI
6	0x83 0x40 0x05 0x06 0x01 3. manufacturer-specific byte 2. manufacturer-specific byte 1. manufacturer-specific byte IO length, consistency special identification format: O-length follows, 3 manufacturer-specific bytes to follow → (Process data: 2 bytes AO for module bus station F)	6. Module bus station: 1 AO I

Configuration byte Offset address	Value	Remark
8	0x83 0x00 0x02 0x20 0x01 3. manufacturer-specific byte 2. manufacturer-specific byte 1. manufacturer-specific byte IO length, consistency special identification format: O-length follows, 3 manufacturer-specific bytes to follow → (Process data: 2 bytes DI for module bus station G)	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 value range-error
	Bit 1:	Open-circuit
Module bus station F:	No diagnostics data available	
Module bus station G:	No diagnostics data available	

Status Indicators/Diagnostic Messages Gateway

The gateway transmits the following diagnostics: the status of the XI/ON station, the communication via the internal module bus, the communication to PROFIBUS-DP and the status of the gateway.

Diagnostic messages are displayed in two ways:

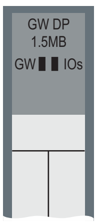
- via individual LEDs
- via the software of the respective fieldbus master (for example, PLC)

Diagnostic Messages via LEDs

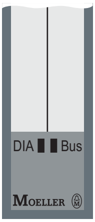
Every XI/ON gateway displays the following statuses via LEDs:

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

Table 7: LED indicators

LED	Status	Meaning	Remedy
GW 	Green	5 V DC operating voltage present; firmware active; gateway ready to operate and transmit.	–
	Green, flashing, 1 Hz	Firmware not active.	Re-install the firmware or contact your Moeller representative.
	Green, flashing, 4 Hz	Firmware active, gateway hardware defect.	Replace the gateway.

LED	Status	Meaning	Remedy
IOs	Green	The configured module bus station corresponds to the physically connected station, communication is active.	–
	Green, flashing 1 Hz	Station is in the I/O*assistant* Force Mode.	Deactivate the I/O*assistant* Force Mode.
	Red and LED "GW" off	Controller is not ready or Vcc level is not within the required range.	– Check the Bus Refreshing module to the right of the gateway and its wiring. – If the mains voltage is correctly connected, contact your Moeller representative.
	Red	Module bus is not ready.	Check the individual XI/ON modules for correct mounting.
	Red flashing, 1 Hz	Non-adaptable modification of the physically connected station.	– Compare the planned XI/ON station with the physical station. – Check the physical station for defective or incorrectly fitted electronics modules.
	Red/green flashing, 1 Hz	Adaptable modification of the physically connected station.	Check the physical station for pulled or new but not planned modules.
	Red flashing, 4 Hz	No communication via the module bus.	– Ensure that the guidelines for the use of power distribution modules have been observed.

LED	Status	Meaning	Remedy
DIA 	Off	Gateway not transmitting diagnostic.	–
	Red flashing, 1 Hz	Gateway transmitting extended diagnostic.	– Check the individual electronics modules on the station for diagnostic messages. – Check the diagnostic messages using the PLC software.
	Red	Gateway is generating statistical diagnostic.	– Check the individual electronics modules on the station for diagnostic messages. – Check the diagnostic messages using the PLC software.
Bus	Off	Fieldbus not in operation.	– Wait until firmware has been completely downloaded. – After completion of download: hardware error; replace the gateway.
	Green	Communication between gateway and PROFIBUS-DP master is error free.	–
	Red	Bus error on the gateway.	– If the gateway is the last module in the bus topology, check that the PROFIBUS-DP has been terminated with a terminating resistor. – Check if the PROFIBUS-DP connector or the direct wiring connections are fitted correctly. All connections must be correctly and securely fitted. – Check the cable to the PROFIBUS-DP master for damage and correct fitting. – Check if the correct baud rate has been set in the PLC master. – Compare the station engineering with the existing list of modules.
	Red flashing, 4 Hz	Invalid station address set.	Set the correct station address via the hexadecimal rotary coding-switches.

Diagnostic Messages via the Software

The diagnostic messages are displayed in the corresponding software of the PROFIBUS-DP master as diagnostic bytes. For the meaning of the individual diagnostic bits, please refer to the Section "Diagnostics" in this chapter.

You can find an example of diagnostic messages via a PLC in the Section "Example of Diagnostics with a Moeller PS416 PLC", chapter 3.

Diagnostics

The gateway uses three bytes for diagnostics. Byte **0** specifies the type of diagnostics and total number of diagnostic bytes (maximum 64 diagnostic bytes in a diagnostic block). Bytes **1** and **2** contain the gateway's diagnostics messages. The "station-specific diagnostic format" is used in accordance with PROFIBUS-DP standards.

Description of Gateway Diagnostic Bits

The texts in the column "Designation" correspond to those determined in the German version of the GSD files (Electronic Device Data Sheets), which are described in chapter 3. The English translation of the German diagnostic texts is included in the "Appendix".

Table 8: Gateway diagnostics bits

Diagnostic data record	Bit	Designation	Meaning
Diagnostic byte 0:		**PROFIBUS**	
0	0...5	Identification of DP diagnostic length (1...64 Byte)	Defined by the PROFIBUS-DP standard.
	6...7	DP diagnostic type	Defined by the PROFIBUS-DP standard.
Diagnostic byte 1:		**Gateway warning**	
1	0	Modul-Diagnose liegt vor	0 No module bus station is signaling a diagnostic.
			1 At least one module bus station with diagnostics function is signaling a diagnostic.
	1	reserved	
	2	Parametrierung unvollstaendig	0 All module bus stations with parameters are configured and have the corresponding bit set in the appropriate status byte.
			1 At least one module bus station with parameters has not been completely configured and sets the corresponding bit in its station byte.

Diagnostic data record	Bit	Designation	Meaning
	3	Abweichende Konfiguration	0 The actual list of modules matches the configuration set in the configuration software of the corresponding fieldbus master.
			1 The actual list of modules has been altered 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 of the corresponding fieldbus master serves as a reference.
Diagnostic byte 2:		**Gateway error**	
2	0...1	reserved	
	2	Modulbusfehler	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-Konfigurations-fehler	0 The actual list of modules matches the configuration set in the configuration software of the corresponding fieldbus 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 fieldbus master serves as a reference.
	4	reserved	
	5	Stations-Konfigurations-fehler	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.

Diagnostic data record	Bit	Designation	Meaning
	6	I/Oassistant-Force Mode aktiv	0 The fieldbus 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 I/O*assistant*). This separates the fieldbus master from the outputs of the module bus stations. No process data exchange is taking place from the fieldbus master to the output modules.
	7	Modulbusausfall	0 The communication to the module bus is functioning correctly.
			1 The communication to the module bus cannot be configured, or a functional error will be recognized after configuration.

Up to 61 bytes of module-specific diagnostic errors can follow.

Description of the Module Diagnostics

The texts in the column "Diagnostics" correspond to those determined in the German version of the GSD files (Electronic Device Data Sheets), which are described in chapter 3. The English translation of the German diagnostic texts is included in the "Appendix".

Table 9: Module diagnostics

Module	Bit	Diagnostics
XN-BR-24VDC-D	0	Modulbus-Spannungs-Warnung
	1	reserved
	2	Feldspannung fehlt
	3	reserved
XN-PF-24VDC-D	0	reserved
	1	reserved
	2	Feldspannung fehlt
	3	reserved

Module	Bit	Diagnostics
XN-PF-120/239VAC-D	0	reserved
	1	rese(short-circuit channelrved
	2	Feldspannung fehlt
	3	reserved
XN-1AI-I(0/4...20MA)	0	Messwert-Bereichsfehler
	1	Drahtbruch
XN-1AI-U(-10/0...+10VDC)	0	Messwert-Bereichsfehler
XN-2AI-PT/NI-2/3		
Channel 1	0	Messwert-Bereichsfehler1) Underflow diagnostics in temperature measurement ranges only
	1	Drahtbruch
	2	Kurzschluss (nur bei Temperaturmessbereichen)2)
	3 to 7	reserved
Channel 2	0	Messwert-Bereichsfehler1) Underflow diagnostics in temperature measurement ranges only
	1	Drahtbruch
	2	Kurzschluss (in temperature measurement ranges only)2)
	3 to 7	reserved
XN-2AI-THERMO-PI		
Channel 1	0	Messwert-Bereichsfehler1)
	1	Drahtbruch (in temperature measurement ranges only)
	2 to 7	reserved
Channel 2	0	Messwert-Bereichsfehler1)
	1	Drahtbruch (in temperature measurement ranges only)
	2 to 7	reserved
XN-2DO-24VDC-0.5A-P	0	Ueberstrom (short-circuit channel 1)
	1	Ueberstrom (short-circuit channel 2)

Module	Bit	Diagnostics	
XN-2DO-24VDC-0.5A-N	0	Ueberstrom (short-circuit channel 1)	
	1	Ueberstrom (short-circuit channel 2)	
XN-2DO-24VDC-2A-P	0	Ueberstrom (short-circuit channel 1)	
	1	Ueberstrom (short-circuit channel 2)	
XN-16DO-24VDC-0.5A-P	0	Ueberstrom (short-circuit channel 1-4)	
	1	Ueberstrom (short-circuit channel 5-8)	
	2	Ueberstrom (short-circuit channel 9-12)	
	3	Ueberstrom (short-circuit channel 13-16)	
XN-1CNT-24VDC			
When bit 7 = 0 (counter mode)	0	Kurzschluss/ Drahtbruch	ERR_DO[3)]
	1	Kurzschluss Geberversorgung	ERR-24VDC[3)]
	2	Zaehlbereichsende falsch	
	3	Zaehlbereichsanfang falsch	
	4	Pegel des Digitaleingangs invertieren ist bei der Latch-Retrigger-Funktion nicht zulaessig	
	5	Hauptzaehlrichtung falsch	
	6	Betriebsart falsch	
	7	Bit = 0 operating mode: counter operation is active	
When bit 7 = 1 (Measurement mode)	0	Kurzschluss/ Drahtbruch	ERR_DO[3)]
	1	Kurzschluss Geberversorgung	ERR-24VDC[3)]
	2	Geberimpulse falsch	
	3	Integrationszeit falsch	
	4	Obergrenze falsch	
	5	Untergrenze falsch	
	6	Betriebsart falsch	
	7	Bit = 1 operating mode: measurement operation is active	

1) Threshold: 1 % of the positive measurement range end value
2) Threshold: 5 Ω (loop resistance)
3) Designation in check-back interface

3 Connections to Automation Devices

Chapter Overview

You can find the following subjects in this chapter:

Introduction

This chapter contains detailed information on how to connect a XI/ON station to higher-level automation devices, for example, programmable logic controllers (PLC) on PROFIBUS-DP.

PROFIBUS-DP is based on DIN 19245 Parts 1 and 3, and has been integrated into the European fieldbus standard EN 50170.

→ XI/ON gateways can only be used as slaves on PROFIBUS-DP. Gateways have no master function.

All manufacturers of control systems offer plug-in network cards for their PLCs, to which XI/ON gateways can easily be connected. Furthermore, it is possible to use a PC as a master if it has an appropriate PC PROFIBUS card.

Please refer to the respective manuals supplied by manufacturers for detailed information concerning individual control systems and automation devices.

Connections to the following automation devices and programmable logic controllers (PLC) are described:

- Moeller PS416
- Hilscher Card
- Siemens S5
- Siemens S7
- SS Tech DP Master for Allen Bradley - SLC500
- MITSUBISHI A1S

Attention!
The network and PC cards must comply with standards defined in PROFIBUS-DP DIN 19245 Part 3.

The designations used in this manual for programmable logic controllers and software programs are registered and protected trademarks belonging to the respective manufacturer.

Addressing

Each XI/ON gateway is assigned an address on PROFIBUS-DP. A maximum of 125 addresses (001 to 125) can be assigned on PROFIBUS-DP. It is not permitted to assign an address more than once in the entire bus structure. The PROFIBUS-DP address is set by using the hexadecimal rotary coding-switches on the gateway.

Attention!
PROFIBUS-DP addresses 000, 126 and 127 are reserved. It is not permitted to assign them.

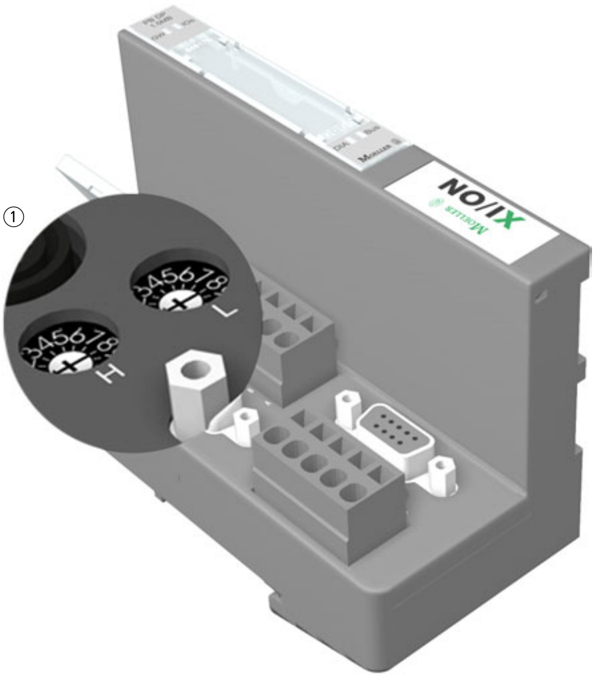


Figure 31: Addressing on PROFIBUS-DP

① Hexadecimal rotary coding-switches

When used as a PROFIBUS-DP station, the XI/ON gateway can be placed at any point in the bus structure. If the XI/ON gateway is the first or last station in the bus structure, then the fieldbus must be terminated using an active terminating resistor. This guarantees trouble-free communication for the entire bus.

Attention!
If a XI/ON gateway is the first or last station in the bus structure, then a special bus connector with either an integrated or switchable bus terminating resistor must be used.

Electronic Device Data Sheets (GSD)

XI/ON gateways are integrated into PROFIBUS structures using electronic device data sheets (GSD).

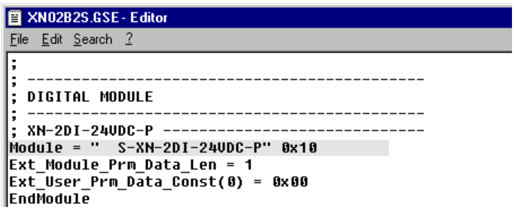
Module Description in the Electronic Device Data Sheets

Each individual module is supplied with a means of identification in the standard electronic device data sheet, which makes various forms of identification possible.

Standard module description

The configured list of modules is displayed with standard identification (general identification format), exception: empty slots and modules without process data are displayed in a special identification format. Modules cannot be unmistakably identified using this identification.

Advantage: Replacement modules need not be of an identical type to be accepted by the XI/ON gateway. This means that "related" modules with identical process data lengths can be used. Thus, it is possible to exchange a 2 DO 24 V DC module with **0.5A** with a 2 DO 24 V DC module with **2A**. This form of module identification achieves, amongst other things, a higher measure of flexibility for process, parameter and diagnostic data.


XN02B2S.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 32: Standard description of the digital input module XN-2DI-24VDC-P

Module description according to type

The configured list of modules is displayed with extended identification (special identification format), which makes an exact identification of modules possible. The XI/ON gateway accepts modules exchanged only with modules of an identical type.

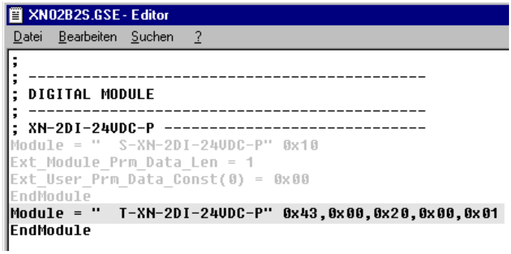


Figure 33: Description according to type of the digital input module XN-2DI-24VDC-P

Electronic Data Sheet File

The device data of all XI/ON modules and gateways is described in two different Electronic Device Data Sheets (GSD files)

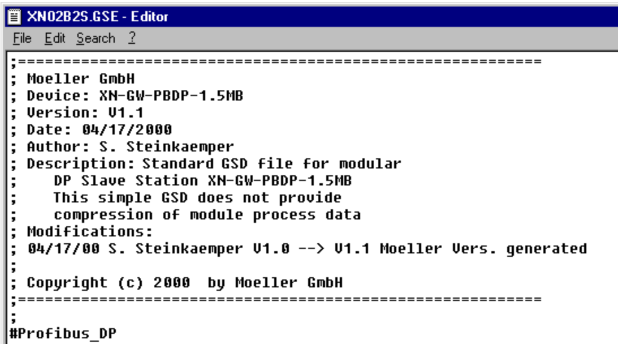
- in the standard GSD file and
- in the extended GSD file

Both versions are available for the XI/ON gateway with a 1.5 Mbaud transmission rate and the XI/ON gateway with a 12 Mbaud transmission rate.

Attention!
It is possible to enter only one GSD file (standard **or** extended GSD file) for each transmission rate (1.5 Mbaud or 12 Mbaud) in the software of the corresponding PROFIBUS-DP master. Otherwise, assignment problems can occur which negatively affect the configuration or parameter settings of the entire XI/ON station.

- **Standard GSD file**
  The GSD file “XN02B2S.gsd” for the 1.5 Mbaud gateway and the GSD file “XN02B3S.gsd” for the 12 Mbaud gateway contain for a multitude of applications sufficient data and options for projecting, configuring, setting parameters and diagnostics of your XI/ON stations.

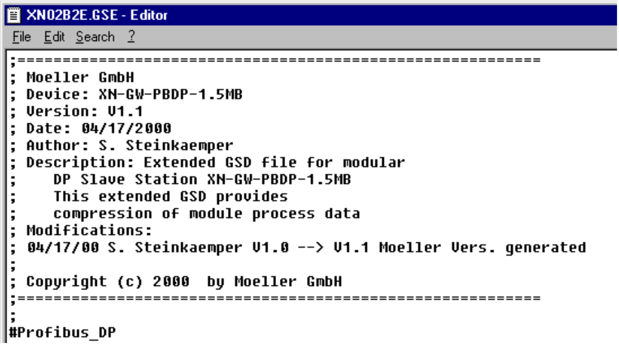
→ The standard GSD files are an element of the respective extended GSD file.


XN02B2S.GSE - Editor
File Edit Search ?

```
;==========================================================
; Moeller GmbH
; Device: XN-GW-PBDP-1.5MB
; Version: V1.1
; Date: 04/17/2000
; Author: S. Steinkaemper
; Description: Standard GSD file for modular
;    DP Slave Station XN-GW-PBDP-1.5MB
;    This simple GSD does not provide
;    compression of module process data
; Modifications:
; 04/17/00 S. Steinkaemper V1.0 --> V1.1 Moeller Vers. generated
;
; Copyright (c) 2000  by Moeller GmbH
;==========================================================
;
#Profibus_DP
```

Figure 34: The heading of the standard GSD file for the 1.5 MBaud gateway

- **Extended GSD file**
  The GSD file “XN02B2E.gsd” for the 1.5 Mbaud gateway and the GSD file “XN02B3E.gsd” for the 12 Mbaud gateway contain, as well as the existing functions and parameters, further functions, for example, the grouping of XI/ON modules of the same type to blocks. The aim of creating these blocks is to save configuration bytes and at the same time increase the amount of parameters and process data transmitted via the internal module bus.



XN02B2E.GSE - Editor

File Edit Search ?

```
;==========================================================
; Moeller GmbH
; Device: XN-GW-PBDP-1.5MB
; Version: V1.1
; Date: 04/17/2000
; Author: S. Steinkaemper
; Description: Extended GSD file for modular
;    DP Slave Station XN-GW-PBDP-1.5MB
;    This extended GSD provides
;    compression of module process data
; Modifications:
; 04/17/00 S. Steinkaemper V1.0 --> V1.1 Moeller Vers. generated
;
; Copyright (c) 2000  by Moeller GmbH
;==========================================================
;
#Profibus_DP
```

Figure 35: The heading of the extended GSD file for the 1.5 MBaud gateway

→ The respective actual versions of the standard GSD file “XN02B2S.gsd” and the extended GSD file “XN02B2E.gsd” for the 1.5 Mbaud gateway as well as the standard GSD file “XN02B3S.gsd” and the extended GSD file “XN02B3E.gsd” for the 12 Mbaud gateway are available directly from Moeller. It is also possible to gain updates by downloading the files from the PROFIBUS User Organization’s homepage: www.profibus.com or from the Moeller homepage: www.moeller.net.

A tailor-made GSD file can be generated for corresponding facility structures with the assistance of I/O*assistant* from Moeller. I/O*assistant* generates on demand an adapted GSD file according to the current structure of the XI/ON station. This GSD file must be subsequently transmitted to the PLC and configuration software of the PROFIBUS-DP master.

You can find a short description of I/O*assistant*'s functions in chapter 9. Please refer to the Online Help supplied with I/O*assistant* for a detailed description of its operation and functions.

Compressing Module Process Data

The compression of process data of modules of the same type (standard module description) or of identical type (module description according to type) serves essentially to reduce the number of configuration bytes as well as to compress data to be transmitted, leading to a more rapid communication between the fieldbus master and the individual XI/ON modules.

Compressed modules are added as multiple blocks or as follow-up modules during the engineering phase:

- Multiple blocks (module description according to type, identified in the GSD file by "2*T-XN..." to "4*T-XN..."):
  only 1 process data byte per multiple block

Attention!
There are no plans for the use of multiple module blocks which exceed the limit of 1 byte process data ("3*T-XN..." and "4*T-XN..." with modules with 4 DI or 4 DO).

- Follow-up modules (module descriptions according to type or standard, identified in the GSD file by ô..S-XN..." or "..T-XN..."); their process data bits are added to the process data of the 1. module in the respective block, until the limit of 1 byte per process data is reached.

Attention!
The total of the process data lengths of all modules grouped to a block must not exceed **1 byte**.

The required number of process data bytes is calculated from the number of process data of the individual modules and the type of description.

Example 1:

Table 10: Number of process data bytes for three XN-2DI-24VDC-P modules

Module description	Module 1	Module 2	Module 3	Total of process data bytes
Not compressed	1 Byte	1 Byte	1 Byte	3 Bytes
Compressed: standard description	2 Bits	2 Bits	2 Bits	1 Byte
Compressed: description according to type	2 Bits	2 Bits	2 Bits	1 Byte

Example 2:

Table 11: Number of process data bytes for five XN-2DI-24VDC-P modules

Module description	Module 1	Module 2	Module 3	Module 4	Module 5	Total of process data bytes
Not compressed	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	5 Bytes
Compressed: standard description	2 Bits	2 Bits	2 Bits	2 Bits	2 Bits	2 Bytes
Compressed: description according to type	2 Bits	2 Bits	2 Bits	2 Bits	2 Bits	2 Bytes
Compressed: description according to type, multiple module blocks	1 Byte				2 Bits	2 Bytes

Example of Compressing Module Process Data

When using modules that are grouped together by the software, certain conditions have to be met. These are explained by the following example:

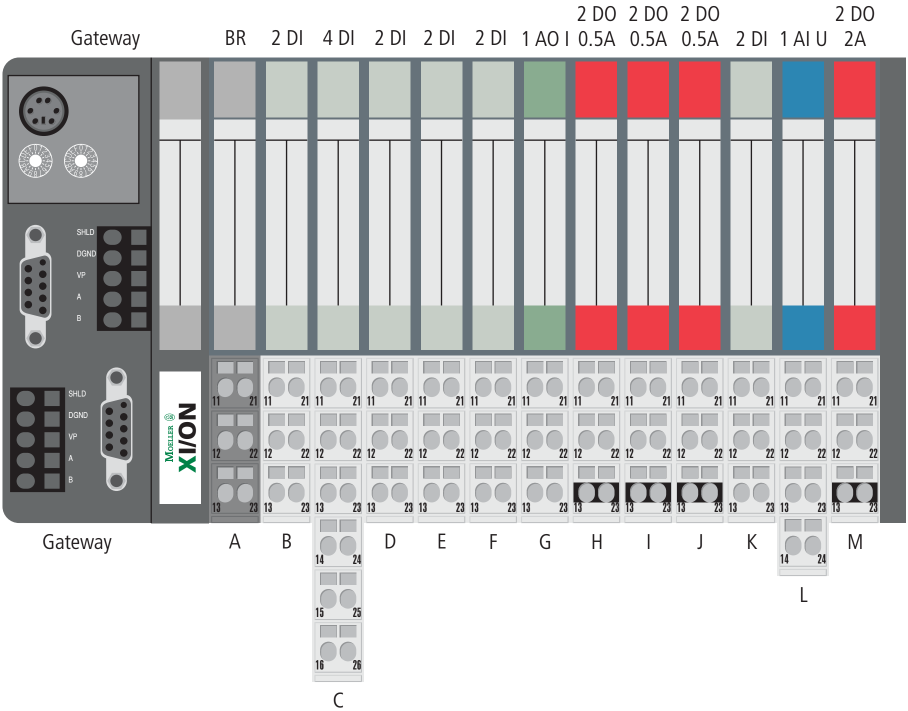


Figure 36: Example of a XI/ON station

An overview of possible configuration options for the depicted XI/ON station are shown in the following tables.

The entries in the columns “Module (*)” and “Module (**)” mean:

Module (*) Order of modules: non compressed/compressed (module block)

Module (**) Order of modules in the module block (when using compressed modules); modules which belong together are colored grey

Table 12: Example of creating a block of I/O modules with standard module description

Module			Standard module description		
Order of non-compressed modules		Type	Designation of GSD file	Module (*)	Module (**)
GW		Gateway			
A	1	Bus Refreshing			
B	2	2 DI	S-XN-2DI-24VDC-P	1	
C	3	4 DI	S-XN-4DI-24VDC-P	2	
D	4	2 DI	S-XN-2DI-24VDC-P	3	1
E	5	2 DI	..S-XN-2DI-24VDC-P	3	2
F	6	2 DI	..S-XN-2DI-24VDC-P	3	3
G	7	1 AO I	S-XN-1AO-I(0/4...20MA)	4	
H	8	2 DO 0.5A	S-XN-2DO-24VDC-0.5A-P	5	1
I	9	2 DO 0.5A	..S-XN-2DO-24VDC-0.5A-P	5	2
J	10	2 DO 0.5A	..S-XN-2DO-24VDC-0.5A-P	5	3
K	11	2 DI	..S-XN-2DI-24VDC-P	3	4
L	12	1 AI	S-XN-1AI-U(-10/0...+10VDC)	6	
M	13	2 DO 2A	..S-XN-2DO-24VDC-2A-P	5	4

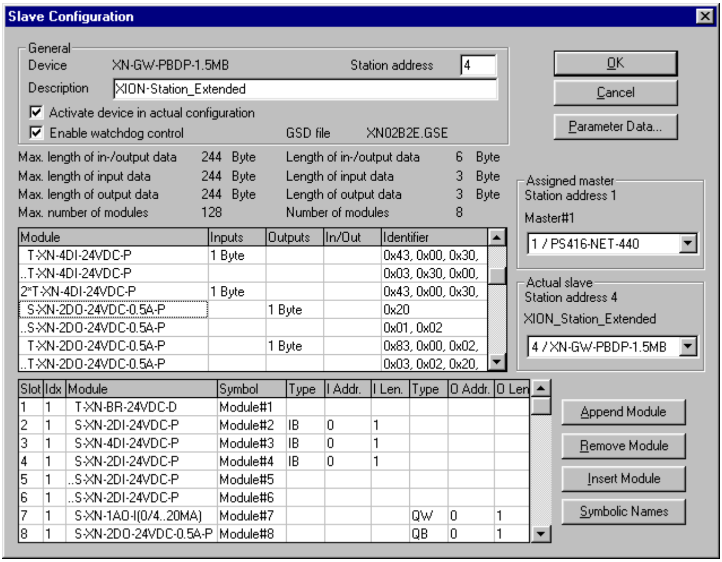


Figure 37: Use of standard module description in a Moeller PLC system

Table 13: Example of creating a block of I/O modules with module description according to type

Module			**Description according to type**		
Order of non-compressed modules		**Type**	**Designation of GSD file**	**Module (*)**	**Module (**)**
GW		Gateway			
A	1	Bus Refreshing			
B	2	2 DI	T-XN-2DI-24VDC-P	1	1
C	3	4 DI	..T-XN-4DI-24VDC-P	1	2
D	4	2 DI	..T-XN-2DI -4VDC-P	1	3
E	5	2 DI	T-XN-2DI-24VDC-P	2	1
F	6	2 DI	..T-XN-2DI-24VDC-P	2	2
G	7	1 AO I	T-XN-1AO-I(0/4...20MA)	3	
H	8	2 DO 0.5A	3* T-XN-2DO-24VDC-0.5A-P	4	1
I	9	2 DO 0.5A		4	2

Module			Description according to type		
Order of non-compressed modules		Type	Designation of GSD file	Module (*)	Module (**)
J	10	2 DO 0.5A		4	3
K	11	2 DI	..T-XN-2DI-24VDC-P	2	3
L	12	1 AI	T-XN-1AI-U(-10/0...+10VDC)	5	
M	13	2 DO 2A	T-XN-2DO-24VDC-2A-P	6	

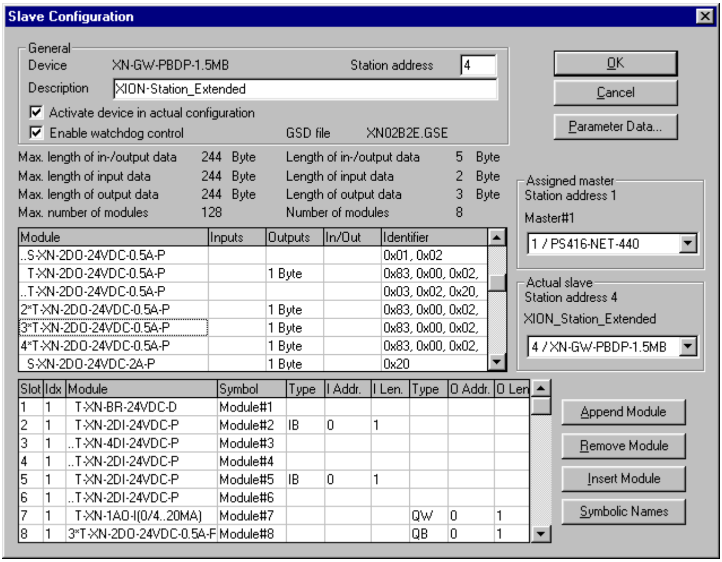


Figure 38: Use of module description according to type in a Moeller PLC system

General Note

Input and output modules are considered separately as blocks. This means, if on the physical station a number of input modules is followed by a number of output modules and these are again followed by more input modules, the software groups the two blocks of input modules into one block of modules.

Example:

On the physical station, a group of 3 digital input modules (modules D to F) is followed by group of output modules (modules G to J), these are followed by a further input module (module K). The software groups module K with the modules D to F into one block of modules.

→ The order of the modules in the process data blocks does not always match the order of the modules on the physical station.

Attention!
It is not permitted for the total of the process data lengths of all the modules grouped to a module block to exceed **1 Byte**.

The follow-up modules can be used in both the standard module description and in the description according to type.

→ Exception: Multiple modules ("2*T-XN..." to "4*T-XN...") cannot be used as follow-up modules.

Relay modules are treated the same as digital output modules when their process data is being compressed.

When modules are plugged onto planned empty slots, the communication of the fieldbus master depends on the gateway parameter "Station configuration" (please refer to the Section "Setting Parameters", chapter 2).

- Parameter value "Do not allow changes" (default):
  The station does not go online. An error message is generated.
- Parameter value "Allow changes":
  The modules are ignored by the fieldbus master. They can only be operated via I/O*assistant* (please refer to chapter 9).

The maximum station extension with up to 128 modules can only be achieved with non-compressed standard module description. The reason being the maximum possible number of configuration bytes.

Standard Module Description

During the configuration process, each process data of the different modules of a block is assigned a specific bit position in the corresponding data byte.

Example:

The following graphic illustrates the bit structure of a process data byte for 4 compressed modules XN-2DI-24VDC-P:

Table 14: 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	

Due to this assignment, electronics modules can only be exchanged with modules with identical process data lengths.

The first follow-up module must have the same process data length as the "original" module.

Example:

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

Module D cannot be grouped together with module B, because a module of the same type (input module), but with a different process data length (4 DI) has been plugged between the two modules.

→ The option of creating blocks of modules can be decisively influenced during configuration of an XI/ON station.

Module Description according to Type

If the original module is identified according to type, all follow-up modules can have different process data lengths. The description according to type guarantees the unmistakable identification of the electronics module.

The grouping into blocks can be carried out with the help of "multiple modules" to save configuration bytes. For example, the modules H to J can be described as the module with the identification "3*T-XN..."

The following overview illustrates the various packing options:

Table 15: Number of configuration bytes, depending upon the method of compression

Compression method	Module description	Module H	Module I	Module J	Configuration bytes
Standard description	S-XN.../ ..S-XN...	1 Byte	2 Bytes	2 Bytes	5 Bytes
Description according to type	T-XN.../ ..T-XN...	5 Bytes	4 Bytes	4 Bytes	13 Bytes
Description according to type, multiple block	3T-XN...		5 Bytes		5 Bytes

→ It should be noted, when using "multiple modules" that this option is only available for modules mounted next to each other. This means, in contrast to the agreements reached above, it is not possible to consider modules that are not mounted next to one another as blocks.

Maximum System Extension

A bus line consists of at least a PLC or PC, which takes on the function of a PROFIBUS-DP master, as well as a gateway, which controls the communication of the various XI/ON modules.

Incoming or outgoing wires are connected via a SUB-D connector or by direct wiring (please refer to chapter 2). Every XI/ON gateway acts as a passive station (slave) and occupies one address.

Maximum System Extension without Repeaters

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

Attention!
A maximum number of 32 stations on the bus must not be exceeded without a repeater.

The bus addresses 001 to 125 can be set using the hexadecimal rotary coding-switches on the gateway. A conversion table for converting decimal values to hexadecimal values can be found in the “Appendix”. A direct allocation of addresses via the bus is not possible.

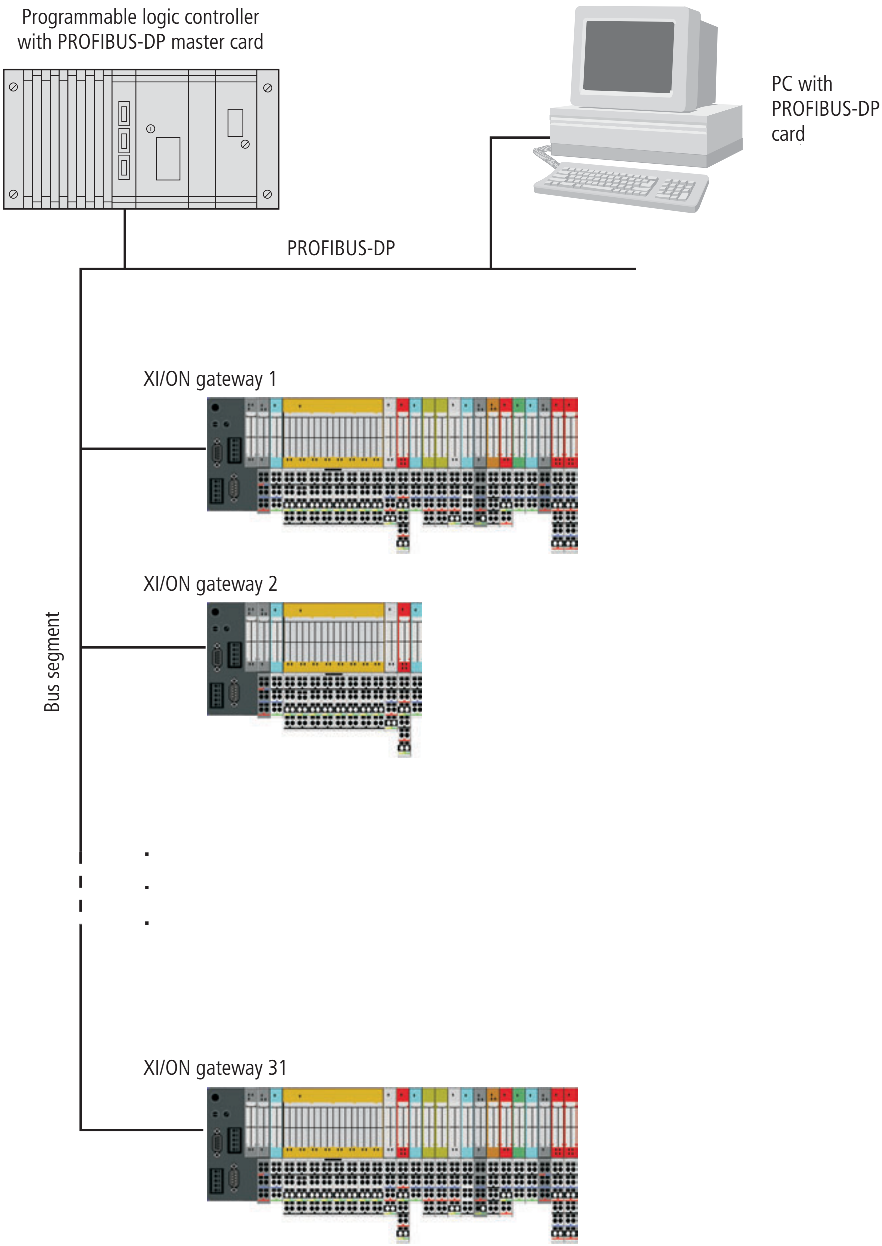


Figure 39: Maximum system extension without repeaters

Maximum System Extension with Repeaters

The maximum bus length lies between 100 meters at a transmission speed of 12 Mbaud and 1200 meters at a transmission speed of 9600 baud. The maximum bus length can be extended by using repeaters.

Attention!
With repeaters, a PROFIBUS-DP system can consist of a master (PLC or PC) plus a maximum of 30 gateways per bus segment. The maximum number of all possible stations is manufacturer specific and is for example, at its limit with 122 XI/ON gateways and three repeaters. The bus address 125 must not be exceeded.

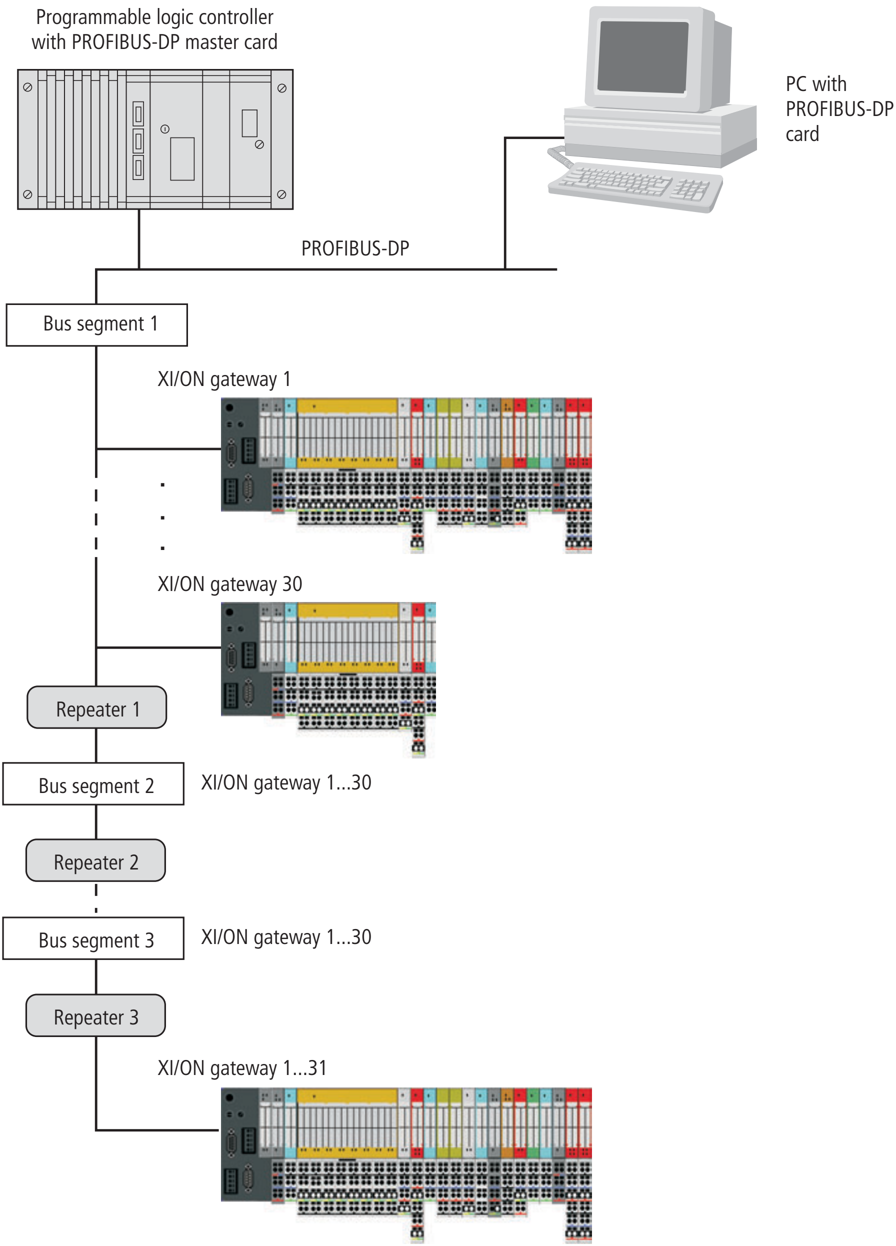


Figure 40: Maximum system extension with repeaters

Maximum Distances / Bus Lengths with and without Repeaters

Table 16: Maximum distance between two stations/bus length; cable type A (DIN 19245, Part 3)

Baud rate (kBit/s)	Max. distance between two stations / cable type A (DIN 19245, Part 3)	
	max. length of a bus line without repeater (m)	max. bus length with 3 repeaters (m)
9.6	1200	4800
19.2	1200	4800
93.75	1200	4800
187.5	1000	4000
500	400	1600
1500	200	800
3000	100	400
6000	100	400
12000	100	400

Table 17: Maximum distance between two stations/bus length; cable type B (DIN 19245, Part 3)

Baud rate (kBit/s)	Max. distance between two stations / cable type B (DIN 19245, Part 3)	
	max. length of a bus line without repeater (m)	max. bus length with 3 repeaters (m)
9.6	1200	4800
19.2	1200	4800
93.75	1200	4800
187.5	600	2400
500	200	800
1500	–	–

Mixed Usage With Other Station Types

In addition to XI/ON gateways, it is possible to integrate other station types (for example, *WIN* bloc stations and modules, or devices from third party manufacturers which have been certified according to DIN 19245 Part 3). This means that PROFIBUS-DP systems are extremely flexible and can be used in the most difficult industrial environments.

Bus Cycle Time PROFIBUS-DP

→ The bus cycle time is the time interval in which a master operates all slaves (stations) in a bus system, meaning, writing their outputs and reading their inputs.

A short bus cycle is a prerequisite for a short total reaction time. Nevertheless, it does not guarantee a short reaction time. The intervals in which the slave-internal refreshing process takes place always depend on the manufacturer and function.

The relationship between the number of slaves on a PROFIBUS-DP system and bus cycle time is shown in the diagram below.

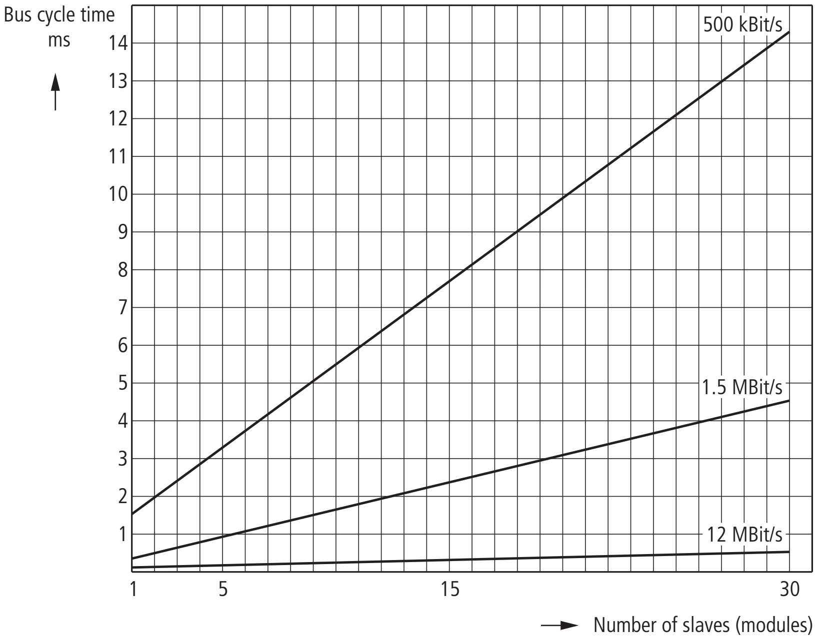


Figure 41: Example for bus cycle times in a PROFIBUS-DP system

Calculation of Bus Cycle Time

The formula for calculating the bus cycle time (TBC) was created according to DIN 19245 Part 3. Basis for the calculation is the assumption that the calculated interface connection is fully operational and reacts with minimum delay. The calculation is standardized to bit times, which means it is independent of baud rates.

$$
\begin{aligned}
T_{BCPB}/t_{bit} &= \text{overhead constant} &&+ \text{sum of slave calls} \\
&= 476 &&+ s_o\,(158 + d_o \times 11) \\
& &&+ s_i\,(213 + d_i \times 11) \\
& &&+ s_{io}\,(246 + d_{io} \times 11)
\end{aligned}
$$

with:

T_{BCPB}	=	bus cycle time for PROFIBUS-DP
s_o	=	number of slaves each with d_o output bytes (output stations only)
s_i	=	number of slaves each with d_i input bytes (input stations only)
s_{io}	=	number of slaves each with d_{io} in- and output bytes (mixed stations)

(taken from DIN 19245 Part 3)

This equation can be used on a PROFIBUS-DP system which has been conceived as a mono-master-system. The overhead results with each bus cycle. The sum of the slave calls results in three different addends, because the duration of a slave call depends on the XI/ON station configuration, that is, dependent upon whether the station is equipped with only inputs or with only outputs, or a combination of both. The number 11 results from the transmission of UART characters by which one byte becomes 11 bits.

Example of a Reaction Time

The following example of an actual PROFIBUS-DP system shows firstly the calculation of the bus cycle time and secondly the calculation of the reaction time resulting from the corresponding configuration.

→ When using the extended GSD file, project planning can be performed so that the process data for digital in- and outputs can be transmitted in a compressed format. This means that adjoining modules are considered together, so that one bit instead of a whole byte is used for each digital in- and output. You can find a comprehensive description of the extended GSD file in the Section “Electronic Device Data Sheets (GSD)” in this chapter.

For the following example, the bytes are listed under the corresponding modules.

Prerequisite
The following example presupposes a XI/ON system with a master (PLC or PC) and the following in- and outputs.

- 3 gateways
- 7 analog inputs
- 4 analog outputs
- 34 digital inputs and
- 10 digital outputs

The transmission speeds are 1.5 Mbaud and 12 Mbaud.

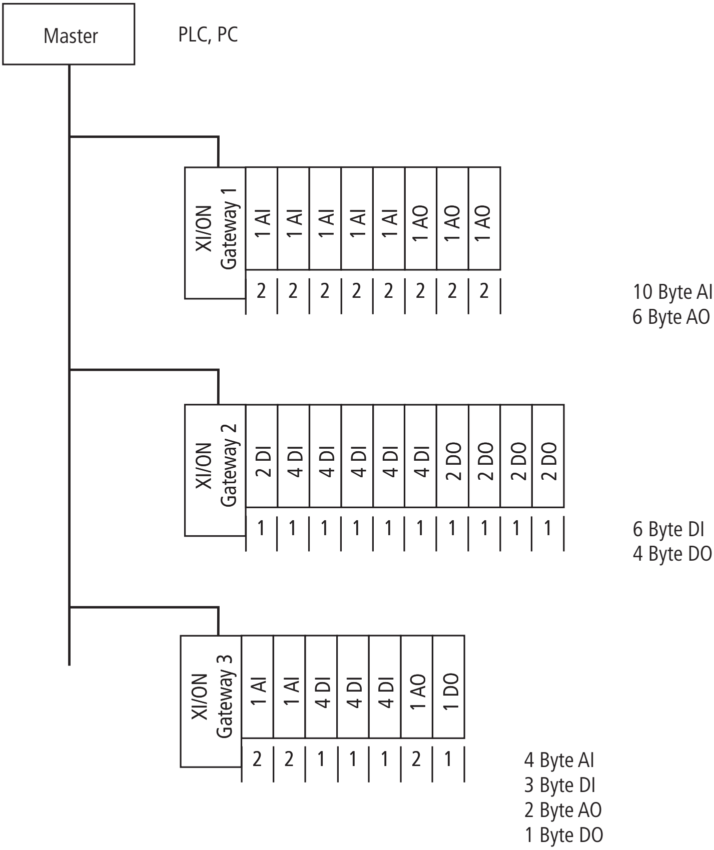


Figure 42: Example of a PROFIBUS-DP system for determining the bus cycle time and the reaction time using the standard GSD file.

PROFIBUS-DP bus cycle time = Overhead constant
+ total number of stations with input modules only
+ total number of stations with output modules only
+ total number of stations with both in- and output modules

$$\frac{T_{BCPB}}{T_{bit}} = 476 + s_i\,(213 + d_i \times 11) + s_o\,(158 + d_o \times 11) + s_{io}\,(246 + d_{io} \times 11)$$

T_{BCPB}	=	Bus cycle time
T_{bit}	=	Time per bit
476 bit times	=	Overhead constant
s_i	=	Total number of stations with input modules only
d_i	=	Total number input bytes per station
213 bit times	=	Input overhead per station
s_o	=	Total number of stations with output modules only
d_o	=	Total number of output bytes per station
158 bit times	=	Output overhead per station
s_{io}	=	Total number of stations with both input and output modules
d_{io}	=	Total number of input and output bytes per station
246 bit times	=	Input and output overhead per station
11 bit times	=	Byte representation

Bus cycle time at 1.5 Mbaud

For 1.5 Mbaud (1.5 Mbit/s) → $T_{bit} = 0.67\ \mu s$

$$\frac{T_{BCPB}}{0.67\ \mu s} = 476 + s_i\,(213 + d_i \times 11) + s_o\,(158 + d_o \times 11) + s_{io}\,(246 + d_{io} \times 11)$$

$$T_{BCPB\ 1.5} = 317\ \mu s + 0\,(142 + 0 \times 7.3)\ \mu s + 0\,(105 + 0 \times 7.3)\ \mu s + 3\,(164 + 36 \times 7.3)\ \mu s$$

$$T_{BCPB\ 1.5} = 1.6\ ms$$

Reaction time at 1.5 Mbaud

XI/ON reaction time

Input/output delay must be added to the bus cycle time.

Delay:

Inputs	t_{rise}	< 200 µs
	t_{fall} (active low)	< 200 µs (3-wire initiator)
	t_{fall} (open switch)	< 2 ms
Outputs	approx. 1 ms $R_L \leqq 1\ k\Omega$	
Reaction time for the input	at “active low“	≙ 1.6 ms + 200 µs = 1.8 ms
	at “open switch“	≙ 1.6 ms + 2 ms = 3.6 ms
Reaction time for the output		≙ 1.6 ms + 1 ms = 2.6 ms

Bus cycle time at 12 Mbaud

For 12 Mbaud (12 Mbit/s) → T_{bit} = 0.0833 µs

$$\frac{T_{BCPB}}{0.0833\ \mu s} = 476 + s_i\,(213 + d_i \times 11) + s_o\,(158 + d_o \times 11) + s_{io}\,(246 + d_{io} \times 11)$$

$$T_{BCPB\ 12} = 40\ \mu s + 0\,(18 + 0 \times 0.9)\ \mu s + 0\,(13 + 0 \times 0.9)\ \mu s + 3\,(21 + 36 \times 0.9)\ \mu s$$

$$T_{BCPB\ 12} = 200\ \mu s$$

Reaction time at 12 Mbaud

XI/ON reaction time

Input/output delay must be added to the bus cycle time.

Delay:

Inputs	t_{rise}	< 200 µs
	t_{fall} (active low)	< 200 µs (3-wire initiator)
	t_{fall} (open switch)	< 2 ms
Outputs	approx. 1 ms $R_L \leqq 1\ k\Omega$	
Reaction time for the input	at “active low“	≙ 200 µs + 200 µs = 400 µs
	at “open switch“	≙ 200 µs + 2 ms = 2.200 ms
Reaction time for the output		≙ 200 µs + 1 ms = 1.200 ms

Connection to a Moeller PS416 PLC

The Moeller configuration software "CFG-DP" Version 1.30 is used to configure a gateway connection to a Moeller PS416 PLC.

Reading-in the GSD File

The GSD files for XI/ON must be read into the software before you can begin with the initial configuration. There are two procedures possible for reading-in the files:

Reading-in the GSD files before starting the "CFG-DP" software

▶ Copy the GSD files "XN02B2S.gsd" or "XN02B2E.gsd" for the XI/ON gateway 1.5 Mbaud, or the "XN02B3S.gsd" or "XN02B3E.gsd" for the XI/ON gateway 12 MBaud into the "...\Fieldbus\Profibus\Gsd" directory.

▶ Copy the icon files (*.bmp) into the "...\Fieldbus\Profibus\Bitmaps" directory.

▶ Start the "CFG-DP" software. All GSD files in the "...\Fieldbus\Profibus\Gsd" directory will automatically be read into the configuration software.

Reading-in the GSD files after starting the "CFG-DP" software

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

▶ Create a new or open an existing project.

▶ Copy the corresponding GSD files using the ‹File → Copy GSD› command.

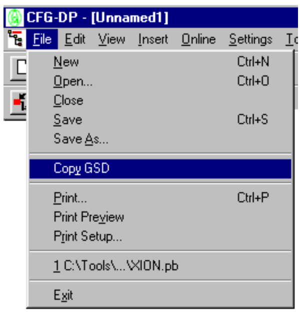


Figure 43: Copying a GSD file using the "Copy GSD" command

or

▶ Copy the GSD file into the "...\Fieldbus\Profibus\Gsd" directory using Windows Explorer.

▶ Read the GSD file into the configuration software using the ‹Settings → Path› command.

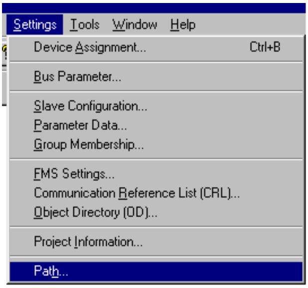


Figure 44: Reading-in a GSD file using the "Path" command

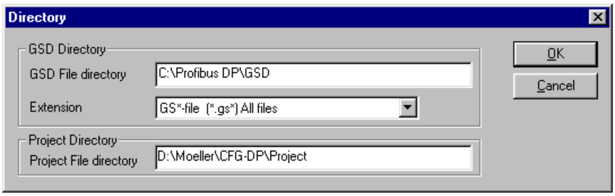


Figure 45: Correct path settings for reading-in a GSD file

Following the correct copying of the GSD files into the configuration software, the corresponding modules are displayed in the list of slaves to be configured.

→ The exact configuration procedure can be found in the operators manual, which is supplied with the software.

Selecting the XI/ON Gateway as a Slave

To insert a XI/ON gateway, select the required GSD file from the “Insert Slave” dialog box, type in a name for the station and confirm by pressing “OK”.

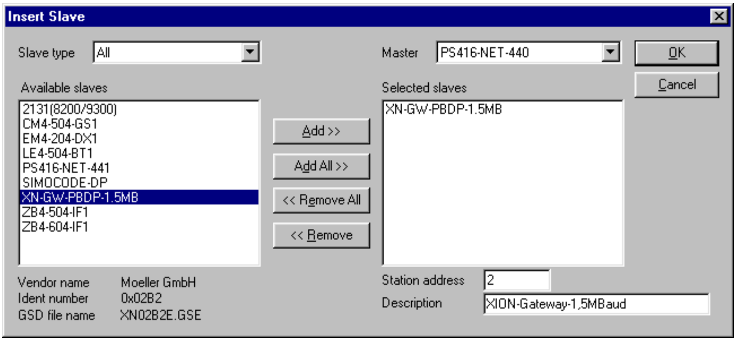


Figure 46: Inserting a XI/ON gateway 1.5 MBaud as a slave

Configuration Example (Mixed Usage)

You can extend the fieldbus structure as you wish in the manner described above; thereby, mixed structures are possible using PROFIBUS devices from third-party manufacturers.

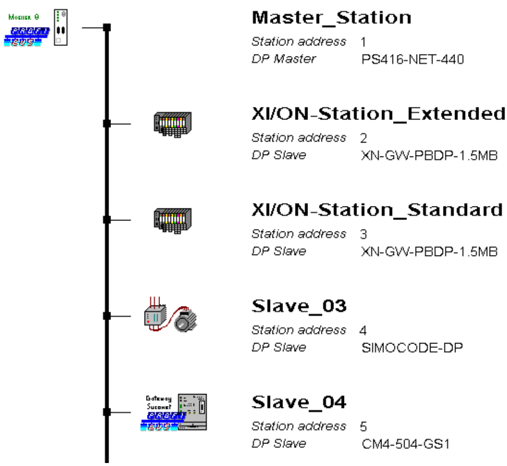


Figure 47: Fieldbus structure with mixed usage

Setting Gateway Parameters

To set the gateway parameters, double-click the corresponding slave station. Click the “Parameter Data” button in the “Parameter Data” dialog box to open the dialog box where you can set the gateway parameters (refer to Figure 48).

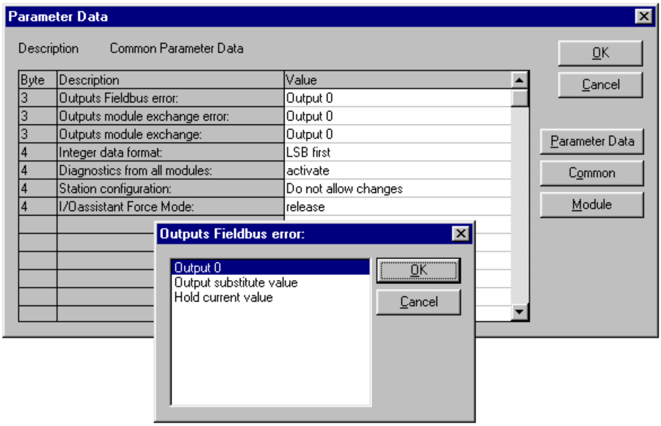


Figure 48: Setting XI/ON gateway parameters

Double-click one of the parameters to open the dialog box with the available settings.

By using the “Parameter Data” and “Common” buttons, you can switch between the hexadecimal and the text description of the parameters respectively. You can find an assignment table for hexadecimal to text descriptions of the individual parameters in the “Appendix”.

The meanings of the gateway parameters are described in the Section “Setting Parameters“, chapter 2. You can find a description of XI/ON parameters in chapter 4.

Configuring the XI/ON Station

Your XI/ON station is configured in the dialog box which is opened by double clicking the corresponding XI/ON station icon.

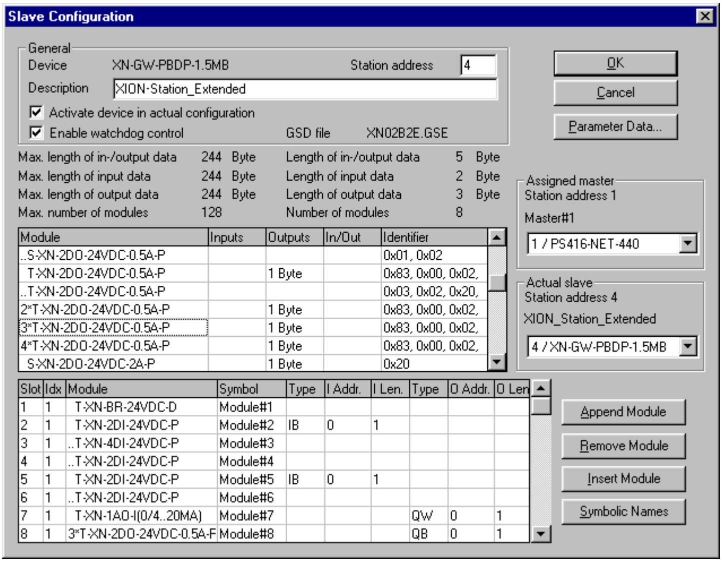


Figure 49: Selecting the XI/ON modules

Error Diagnostics (Station Diagnostics) when Connected to a Moeller S 416 PLC

The software diagnostic functions are described in the manual belonging to the “CFG-DP” software from Moeller.

Details of the diagnostics for the individual modules are contained in chapter 4. The diagnostic options for the gateway are described in chapter 2.

Connection to a Hilscher PROFIBUS Card

The software SyCon 2.0.5.0 from Hilscher is used to configure the connection of a XI/ON gateway with a Hilscher PROFIBUS card.

Reading-in the GSD File

The GSD files for XI/ON must be read into the software before you can begin with the initial configuration. There are two procedures possible for reading-in the files:

Reading-in the GSD files before starting the software

▶ Copy the GSD files "XN02B2S.gsd" or "XN02B2E".gsd for the XI/ON gateway 1.5 Mbaud, or the "XN02B3S.gsd" or "XN02B3E.gsd" for the XI/ON gateway 12 MBaud into the "SyCon\Fieldbus\Profibus\Gsd" directory.

▶ Copy the icon files (*.bmp) into the "SyCon\Fieldbus\Profibus\Bitmaps" directory.

▶ Start the SyCon software. All GSD files in the "SyCon\Fieldbus\Profibus\Gsd" directory will automatically be read into the configuration software.

Reading-in the GSD files after starting the software

If you have already started the configuration software, proceed as follows to read-in the GSD files

▶ Create a new or open an existing project.

▶ Copy the corresponding GSD files by clicking the ‹File → Copy GSD› command.

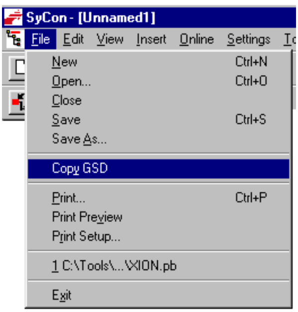


Figure 50: Copying a GSD file using the "Copy GSD" command

or

▶ Copy the GSD file into the “SyCon\Fieldbus\Profibus\Gsd” directory using Windows Explorer.

▶ Read the GSD file into the configuration software using the ‹Settings → Path› command.

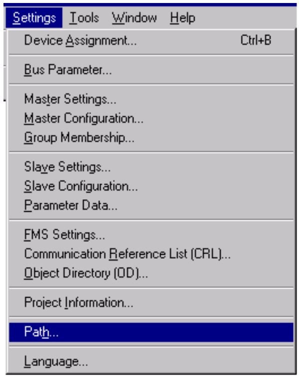


Figure 51: Reading-in a GSD file using the “Path” command

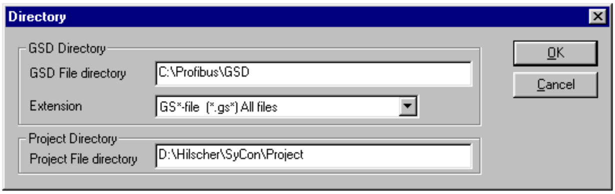


Figure 52: Correct path settings for reading-in a GSD file

Following the correct copying of the GSD files into the configuration software, the corresponding modules are displayed in the list of slaves for insertion.

→ The exact configuration procedure can be found in the operators manual, which is supplied with the software.

Selecting the XI/ON Gateway as a Slave

Proceed as follows to insert a XI/ON gateway as a slave:

▶ Select the required GSD file from the “Insert Slave” dialog box.

▶ Type in a name for the station.

▶ Click “OK” to confirm.

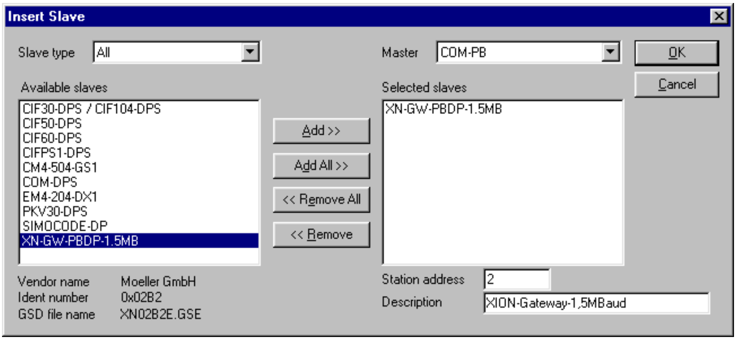


Figure 53: Inserting a XI/ON gateway 1.5MBaud as a slave

Example of a Mixed Usage Configuration

You can extend the fieldbus structure as you wish in the manner described above; thereby, mixed structures are possible using PROFIBUS devices from third-party manufacturers.

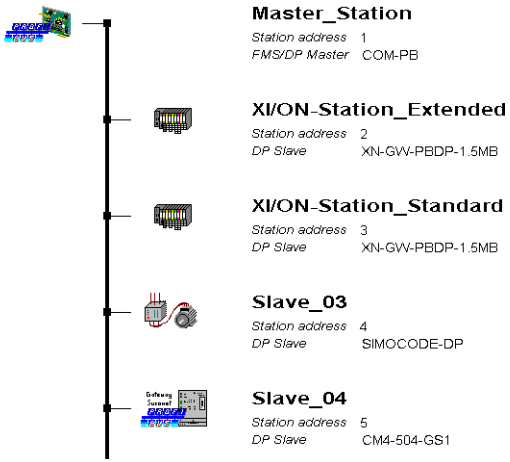


Figure 54: Fieldbus structure with mixed usage

Setting Gateway Parameters

To set the gateway parameters, double-click the corresponding slave station. Click the “Parameter Data” button in the “Parameter Data” dialog box to open a dialog box where you can set the gateway parameters (see Figure 55).

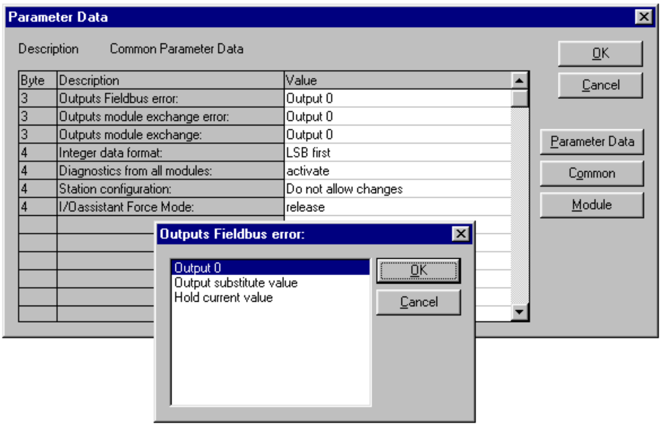


Figure 55: Setting the parameters of the XI/ON-Gateway

Double-click one of the parameters to open the dialog box with the available settings.

By using the “Parameter Data” and “Common” buttons, you can switch between the hexadecimal (parameter data) and the text description (common) of the parameters respectively. You can find an assignment table for hexadecimal to text descriptions of the individual parameters in the “Appendix”.

The meanings of the gateway parameters are described in the Section “Setting Parameters“, chapter 2. You can find a description of XI/ON parameters in chapter 4.

Configuring the XI/ON Station

Your XI/ON station is configured in the “Slave Configuration” dialog box which is opened by clicking the corresponding XI/ON station icon in the structure overview.

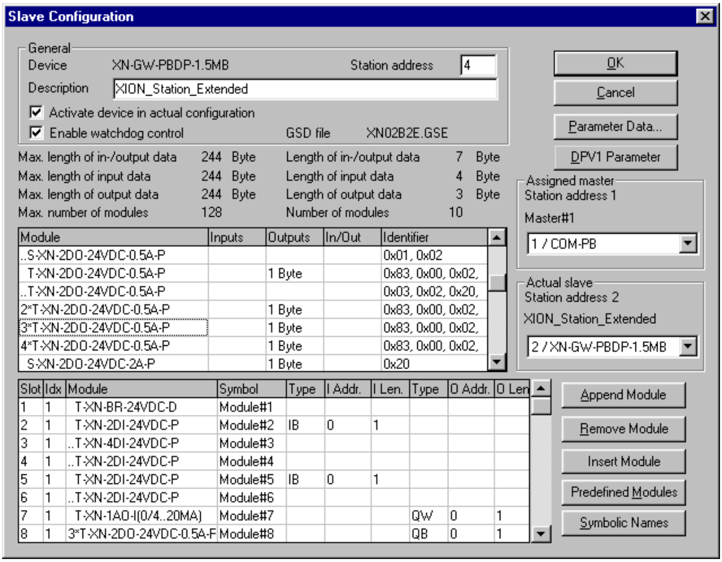


Figure 56: Selecting the XI/ON modules

Error Diagnostics (Station Diagnostics) when Connected to a Hilscher PROFIBUS Card

SyCon’s diagnostic functions are described in the manual supplied with the software by Hilscher.

Information concerning individual module diagnostics can be found in chapter 4. Diagnostic options for gateways are described in chapter 2.

Connection to a Siemens S5 PLC

The software COM PROFIBUS version 3.3 from Siemens is used to configure the connection of a XI/ON gateway with a Siemens Control System S5.

Reading-in the GSD File

The GSD files for XI/ON must be read into the software before you can begin with the initial configuration. There are two procedures possible for reading-in the files:

Reading-in the GSD files before starting the software

▶ Copy the GSD files “XN02B2S.gsd” or “XN02B2E.gsd” for the XI/ON gateway 1.5 Mbaud, or the “XN02B3S.gsd” or “XN02B3E.gsd” for the XI/ON gateway 12 MBaud into the “Compb33\Gsd” directory.

▶ Copy the icon files (*.bmp) into the “Compb33\Bitmaps” directory.

▶ Start the “ComProfibus” software.

▶ Use the ‹Datei → GSD-Dateien einlesen› command to read-in the GSD files. This process takes a few seconds, after which the standard GSD files for the XI/ON station are integrated into the software.

Figure 57: Reading-in new GSD files

Reading-in the GSD files after starting the software

▶ Carry out the steps listed above (with the exception of starting the software).

Following the correct copying of the GSD files into the configuration software, the corresponding modules are displayed in the list of slaves to be configured.

→ The exact configuration procedure can be found in the operators manual, which is supplied with the software.

Selecting the XI/ON Gateways as a Slave

To insert a XI/ON gateway, select the "I/O" item from the "Slaves" dialog box and place it into the configuration window using the drag-and-drop feature.

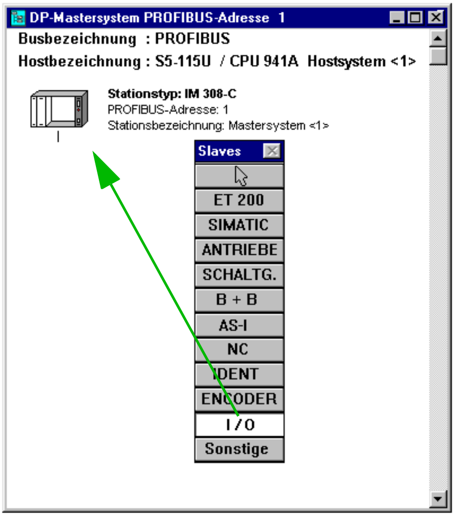


Figure 58: Inserting a slave

After a station address has been allocated, the “Slaveeigenschaften” dialog box opens in which you can select the XI/ON gateway required.

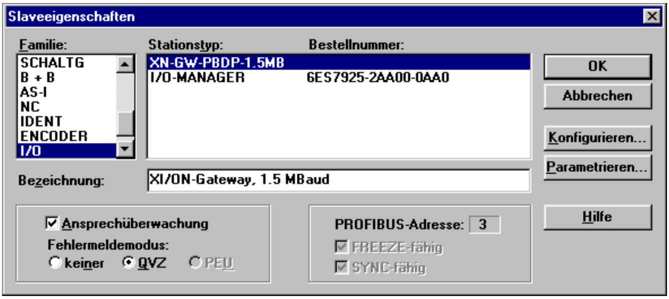


Figure 59: Overview of slaves with a XI/ON gateway

Configuration Example (Mixed Usage)

You can extend the fieldbus structure as you wish in the manner described above; thereby, mixed structures are possible using PROFIBUS devices from third-party manufacturers.

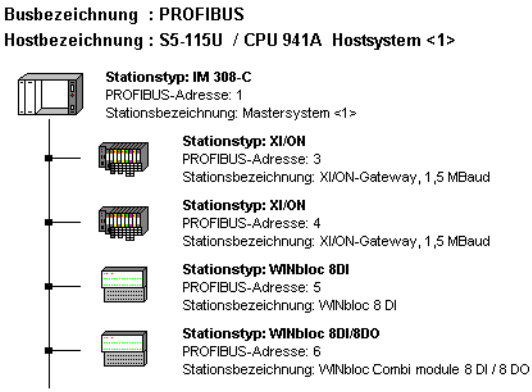


Figure 60: Fieldbus structure with mixed usage

Setting Gateway Parameters

Double-click the corresponding XI/ON station to set the gateway parameters. Click the “Parametrieren” button in the dialog box which opens, to open a further dialog box in which you can set the gateway’s individual parameters.

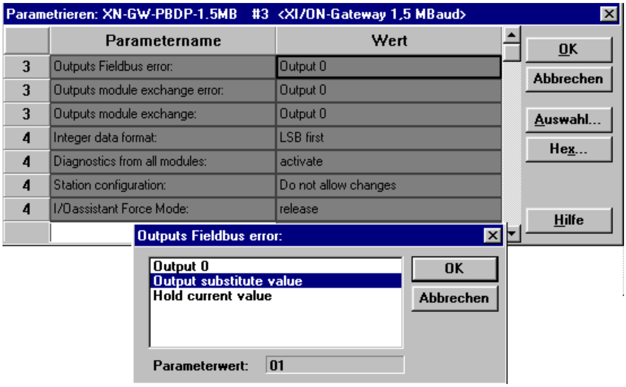


Figure 61: Setting XI/ON gateway parameters

The parameters are displayed in text form by default. You can switch to the hexadecimal form by using the “Hex...” button. You can find an assignment table for hexadecimal to text descriptions of the individual parameters in the “Appendix”.

Double-click a parameter to open the dialog box with the relevant options

The meanings of the gateway parameters are described in the Section “Setting Parameters“, chapter 2.

Configuring the XI/ON Station

Double click the corresponding slave entry to configure your XI/ON station. Click the “Konfigurieren” button in the dialog box which opens to open a further dialog box where you can enter the individual XI/ON modules for your station.

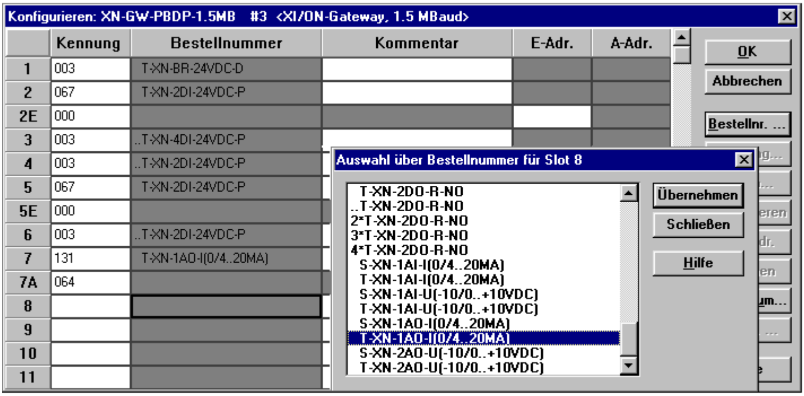


Figure 62: Selecting XI/ON modules by catalog numbers

Setting Parameters for XI/ON modules

If XI/ON modules are entered whose parameters can be set, it is possible to open the dialog box with the corresponding settings options by clicking the activated “Param...” button.

The parameters of the individual XI/ON modules are described in chapter 4.

Error Diagnostics (Station Diagnostics) when Connected to a Siemens S5 PLC

COM PROFIBUS’s diagnostic functions are described in the manual, which is supplied with the software by Siemens.

Information concerning individual module diagnostics can be found in chapter 4. Diagnostic options for gateways are described in chapter 2.

3

Function Block Units

The function block units are used to scale the analog input and output values in the S5 AG 115U to CPU 944 (WINB15ST.S5D) as well as S5 AG 115U from CPU 945, S5 AG 135U and S5 AG 155U.

The function block units and accompanying documentation can be downloaded from the Moeller homepage: www.moeller.net.

→ Function block units are necessary, when using analog modules a 12 Bit left-justified numerical format is configured.

Connection to a Siemens S7 PLC

The software SIMATIC Manager 5.0.2.0 from Siemens is used to configure the connection of a XI/ON gateway with a Siemens S7 PLC.

Reading-in the GSD File

The GSD files for XI/ON must be read into the software before you can begin with the initial configuration. There are two procedures possible for reading-in the files:

Reading-in the GSD files before starting the software

▶ Copy the GSD files “XN02B2S.gsd” or “XN02B2E.gsd” for the XI/ON gateway 1.5 Mbaud, or the “XN02B3S.gsd” or “XN02B3E.gsd” for the XI/ON gateway 12 MBaud into the “Step7\S7data\GSD” directory.

▶ Copy the icon files (*.bmp) into the “Step7\S7data \S7data\NSBMP” directory.

▶ Start the SIMATIC Manager software.

▶ The XI/ON gateways will automatically be entered into the hardware overview following correct installation of the files. The hardware overview can be accessed using the ‹Insert → Hardware Catalog› command

Reading-in the GSD files after starting the software

Proceed as follows to read-in the above GSD files, if you have already started the software.

▶ Create a new or open an existing project.

▶ Open the hardware configuration software.

▶ Copy the required GSD file using the ‹Options → Install New *.GSD Files...› command.

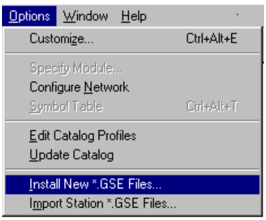


Figure 63: Inserting a new GSD file using the “Install New *.GSE Files...” command

▶ Select the GSD file from the corresponding source directory.

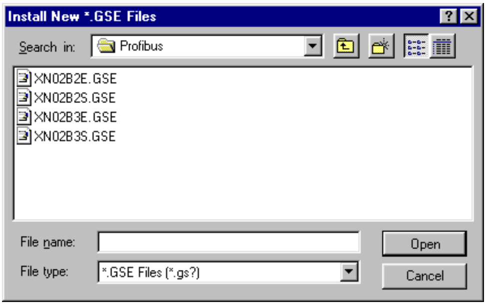


Figure 64: Selecting the GSD file from the corresponding directory

The GSD files are listed as separate entries in the hardware catalog following correct installation.

→ The exact configuration procedure can be found in the operators manual, which is supplied with the software.

Selecting the XI/ON Gateway as a Slave

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

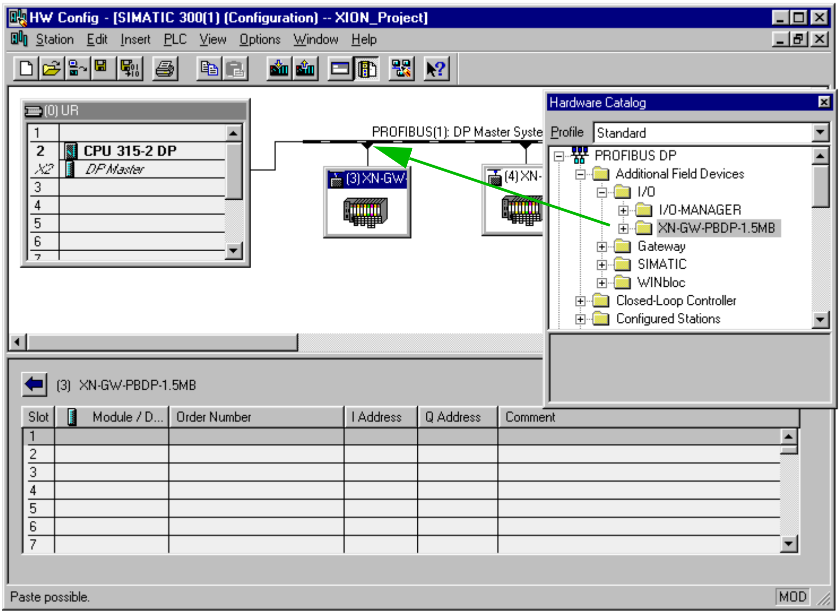


Figure 65: Inserting a XI/ON station 1.5 Mbaud as a slave

Example of a Mixed Usage Configuration

You can extend the fieldbus structure as you wish in the manner described above; thereby, mixed structures are possible using PROFIBUS devices from third-party manufacturers.

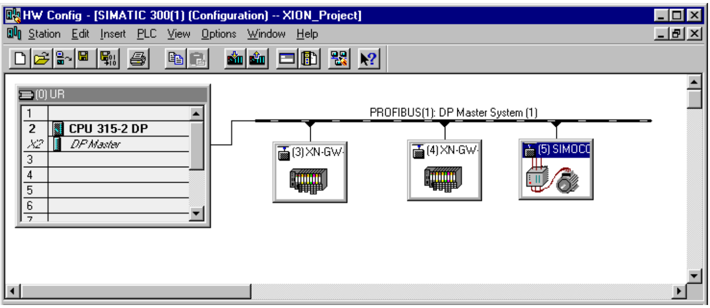


Figure 66: Fieldbus structure with mixed usage

Setting Gateway Parameters

To set the gateway parameters, double-click the corresponding XI/ON station. In the window which opens, click the “Parametrieren...” button to open the “DP Slave Properties” dialog box where you can set the gateway parameters.

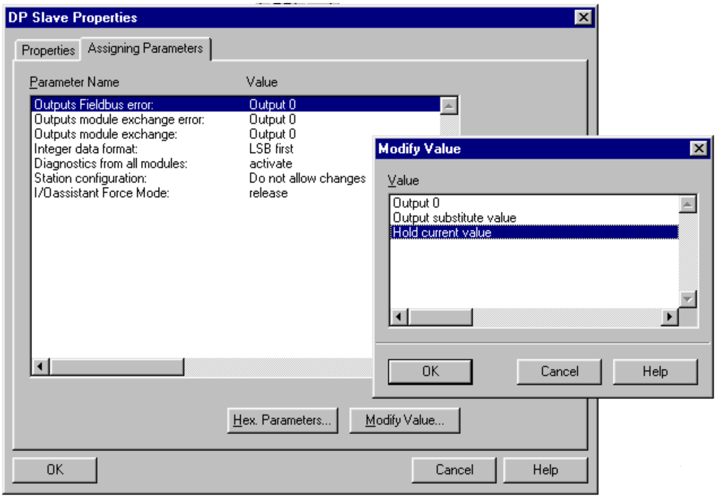


Figure 67: Setting the parameters of the XI/ON gateway

The parameters are displayed in text form by default. You can switch to the hexadecimal form by using the “Hex. Parameters...” button. You can find an assignment table for hexadecimal to text descriptions of the individual parameters in the “Appendix”.

Double-click a parameter or click the “Modify Value...” button to open the dialog box with the relevant options for setting the parameters.

The meaning of the gateway parameters are described in the Section “Setting Parameters“, chapter 2.

Configuring the XI/ON Station

To configure your XI/ON station, place the required module into the list of the corresponding station from the hardware catalog using the drag-and-drop feature. The list is opened by clicking on the appropriate XI/ON station.

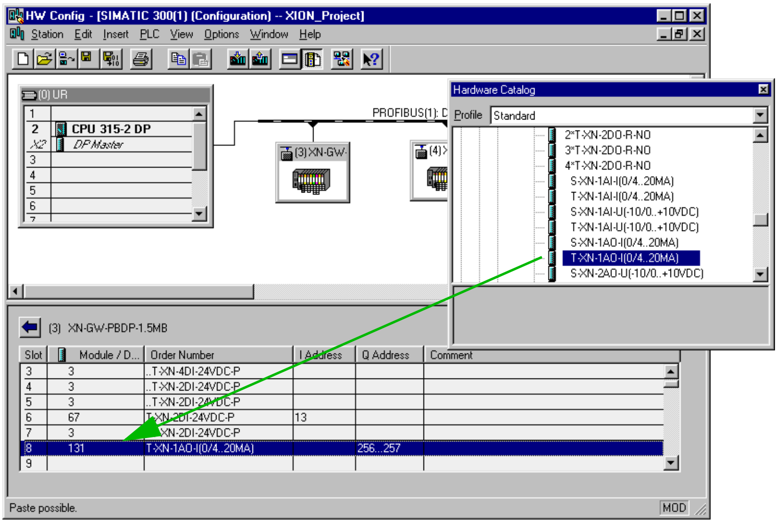


Figure 68: Selecting a XI/ON module

Setting Parameters for XI/ON modules

If XI/ON modules are entered whose parameters can be set, it is possible to open the dialog box with the relevant options by double-clicking the corresponding module.

The parameters of the individual XI/ON modules are described in chapter 4.

Error Diagnostics (Station Diagnostics) when Connected to a Siemens S7 PLC

SIMATIC Manager's diagnostic functions are described in the manual, which is supplied with the software by Siemens.

Information concerning individual module diagnostics can be found in chapter 4. Diagnostic options for gateways are described in chapter 2.

Function Block Units

Function block units are available for the scaling of analog values, when a 12 Bit left-justified numerical format is configured for the relevant analog modules.

Connection to an SS Tech DP Master for Allen Bradley - SLC 500

The software SST PROFIBUS Configuration Tool version 0.15 from SST is used to configure the connection of a XI/ON gateway with a SS Tech DP master for SLC 500.

Reading-in the GSD File

The GSD files for XI/ON must be read into the software before you can begin with the initial configuration. Two procedures are possible for reading-in the files:

Reading-in the GSD files before starting the software

▶ Copy the GSD files “XN02B2S.gsd” or “XN02B2E.gsd” for the XI/ON gateway 1.5 Mbaud, or the “XN02B3S.gsd” or “XN02B3E.gsd” for the XI/ON gateway 12 MBaud into the “Dlink32\5136-PFB\pbx” directory.

▶ Start the SST PROFIBUS Configuration Tool.

Following correct installation of the file, the XI/ON gateway is displayed in the list of slaves.

Reading-in the GSD files after starting the software

If you have already started the configuration software, carry out the following steps to read-in the GSD files:

▶ Select the required GSD file using the ‹Device → Add Device› command.

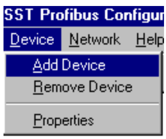


Figure 69: Reading-in the required GSD file using the “Add Device” command

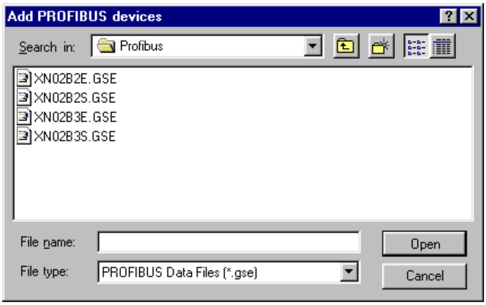


Figure 70: Selecting the required GSD file

Following correct installation of the file, the XI/ON gateway is displayed in the list of slaves.

→ The exact configuration procedure can be found in the operators manual, which is supplied with the software.

Selecting the XI/ON Gateways as a Slave

To insert a XI/ON gateway, select the required gateway from the list of slaves and place it in the right-hand window using the drag-and-drop feature.

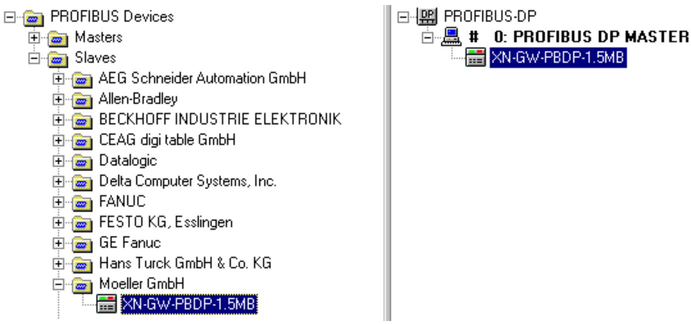


Figure 71: Inserting a XI/ON gateway as a slave

Configuration Example (Mixed Usage)

You can extend the fieldbus structure as you wish in the manner described above; thereby, mixed structures are possible using PROFIBUS devices from third-party manufacturers.

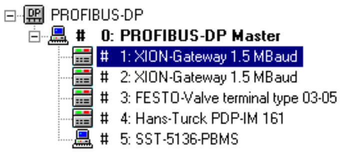


Figure 72: Fieldbus structure with mixed usage

Setting Gateway Parameters

Right-click a corresponding slave entry to display a shortcut menu. Click “Properties” to open the following dialog box in which you can set the gateway properties.

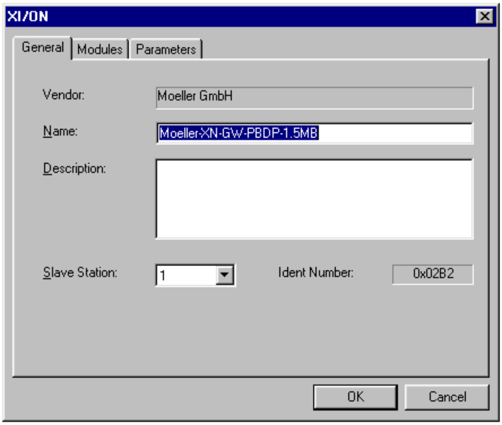


Figure 73: Dialog box for entering gateway properties

You can set the XI/ON gateway parameters to hexadecimal code via the “Parameters” tab.

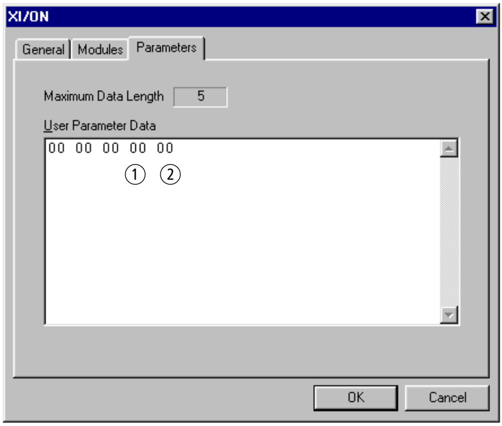


Figure 74: XI/ON gateway parameters

① Parameter 4

② Parameter 5

Only the parameters 4 and 5 can be set. Refer to the table in the "Appendix" for possible parameter values. You can find a description of the parameters in the Section "Setting Parameters", chapter 2.

Configuring the XI/ON Station

Click the “Modules” tab to add a XI/ON module. Select the appropriate module from the list, and then click the “Add ->” button:

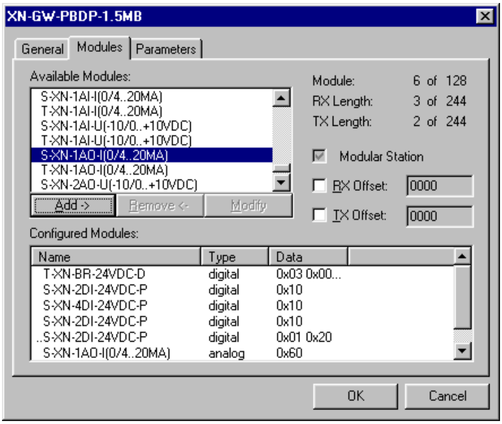


Figure 75: Selecting XI/ON modules

Selected XI/ON modules appear as sub-directories on the right-hand side of the main window:

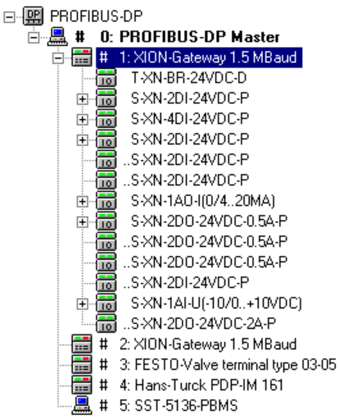


Figure 76: Structure of a XI/ON gateway with planned XI/ON modules

Error Diagnostics (Stations Diagnostics) when Connected to an SS Tech DP Master for SLC 500

The diagnostic functions of SST PROFIBUS Configuration are described in the manual supplied with the software by SS Tech.

Information concerning individual module diagnostics can be found in chapter 4. Diagnostic options for gateways are described in chapter 2.

Connection to a MITSUBISHI A1S

The software ProfiMap 2.0 from Mitsubishi is used to configure the connection of a XI/ON gateway with a Mitsubishi A1S PLC.

Reading-in the GSD File

The GSD files for XI/ON must be read into the software before you can begin with the initial configuration. There are two procedures possible for reading-in the files:

Reading-in the GSD files before starting the software

▶ Copy the GSD files "XN02B2S.gsd" or "XN02B2E.gsd" for the XI/ON gateway 1.5 Mbaud, or the "XN02B3S.gsd" or "XN02B3E.gsd" for the XI/ON gateway 12 MBaud into the "ProfiM200gsd" directory.

▶ Copy the icon files (*.bmp) into the "ProfiM200\bmp" directory.

▶ Start the ProfiMap software.

Reading-in the GSD files after starting the software

▶ Extend the database using the ‹Setup → Device-Database› command.

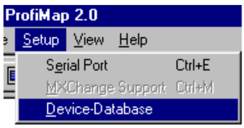


Figure 77: Extending the database

▶ Select the required GSD file from the dialog box, click the "Add" button and confirm by clicking "Open".

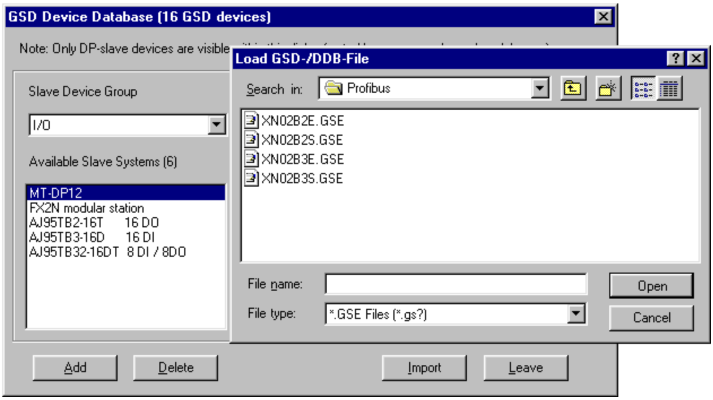


Figure 78: Selecting the GSD file "XN02B2S.gsd" or "XN02B2E.gsd" for the XI/ON gateway 1.5 Mbaud

▶ Select the relevant icon files.

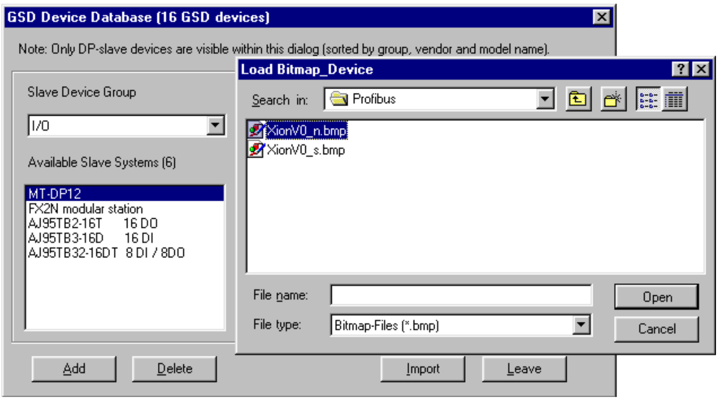


Figure 79: Selecting the relevant icon files

The XI/ON gateway is automatically entered into the list of slaves following correct installation.

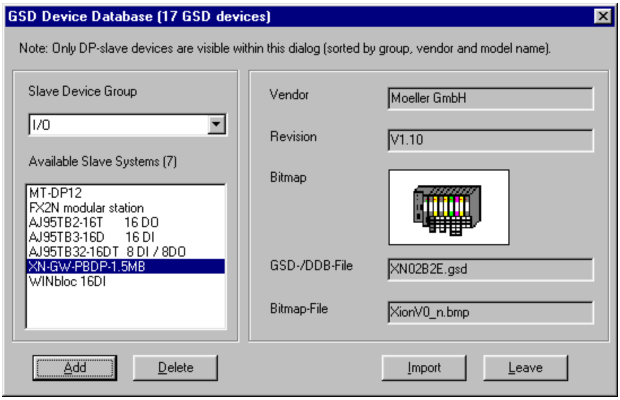


Figure 80: Overview of all existing slaves including the XI/ON gateway

→ The exact configuration procedure can be found in the operators manual, which is supplied with the software.

Selecting the XI/ON Gateway as a Slave

To insert a XI/ON gateway as a slave, carry out the following steps.

▶ Create a new or open an existing project.

▶ Click the "Define I/O Slaves" button to open the "Network Configuration" dialog box. Right-click the relevant fieldbus network node.

▶ Use the "Insert DP Slave" command to open the "GSD Device Database" dialog box, then select the required XI/ON gateway slave.

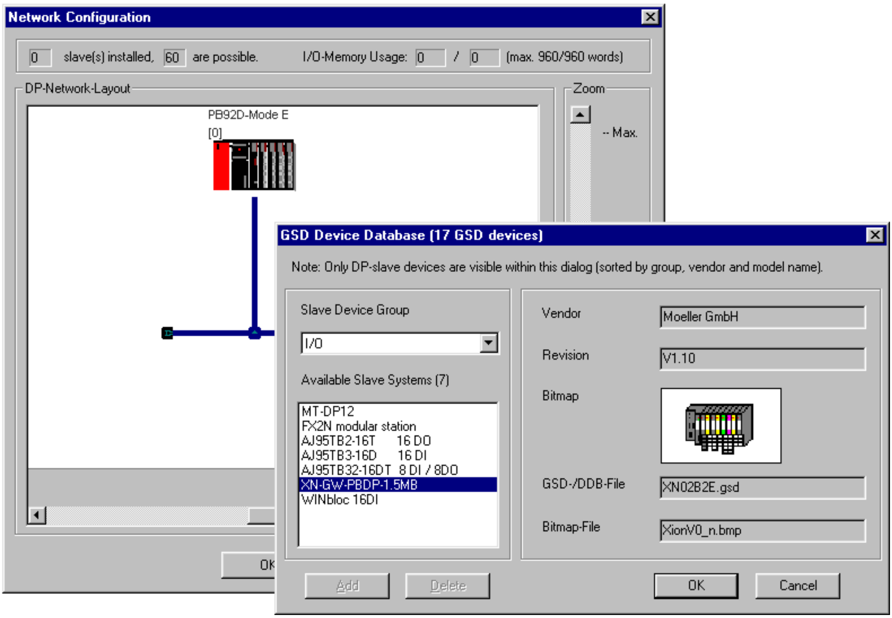


Figure 81: Selecting a XI/ON gateway as a slave

▶ Click "OK" to confirm.

Example of a Mixed Usage Configuration

You can extend the fieldbus structure as you wish in the manner described above; thereby, mixed structures are possible using PROFIBUS devices from third-party manufacturers.

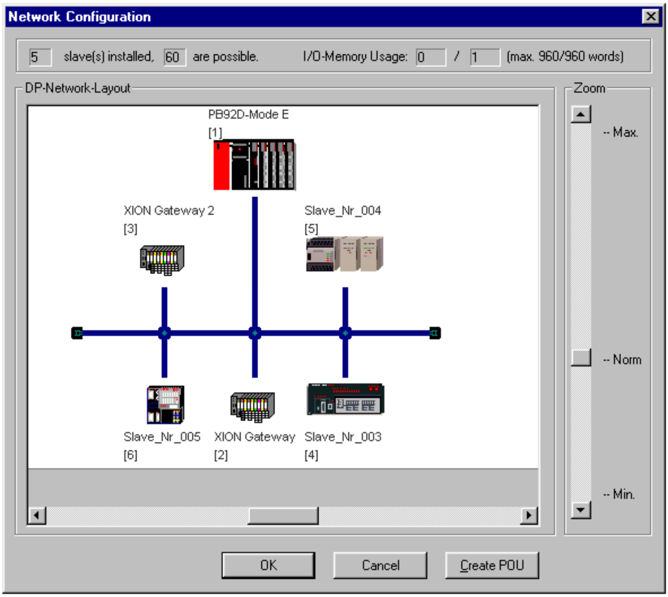


Figure 82: Fieldbus structure with mixed usage

Setting Gateway Parameters

You can open the “Slave Parameter Settings” dialog box to set the gateway parameters either directly when entering a new XI/ON station or by double-clicking the required XI/ON station in the fieldbus structure.

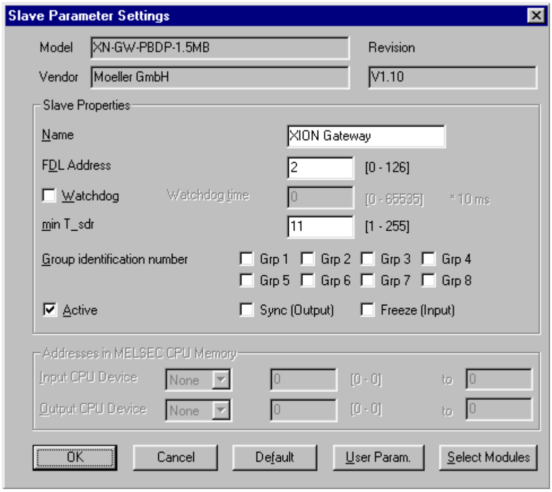


Figure 83: General parameters of the XI/ON gateway

Click the “User Param.” button to open the “Extended User Parameters” dialog box to set the individual gateway parameters.

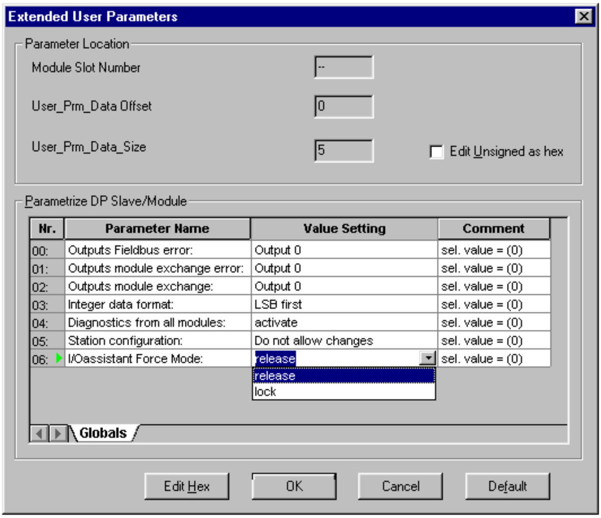


Figure 84: Setting XI/ON gateway parameters

You can switch to the hexadecimal description of the gateway parameters by clicking the “Edit Hex” button.

You can find an assignment table for hexadecimal to text descriptions of the individual parameters in the “Appendix”.

The meaning of the gateway parameters are described in Section “Setting Parameters”, chapter 2.

Configuring the XI/ON Station

Click the “Select Modules” button in the “Slave Parameter Settings” dialog box where individual modules for the required XI/ON station can be selected. You can insert the required XI/ON modules in your XI/ON station in the “Slave Modules” dialog box.

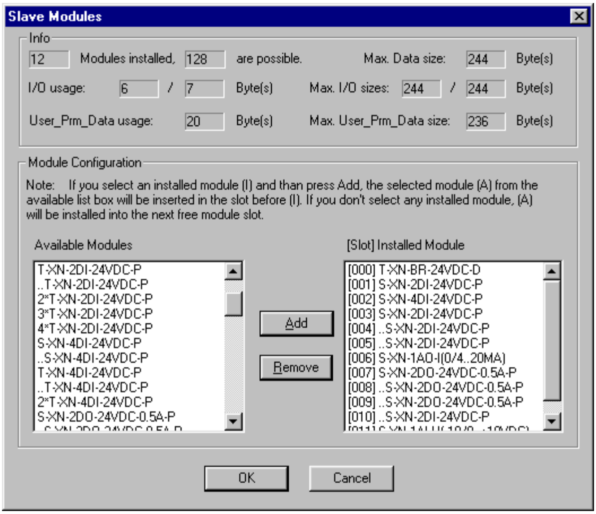


Figure 85: Selecting XI/ON modules

Setting Parameters for XI/ON Modules

If XI/ON modules are selected whose parameters can be set, then their parameters can be set via the “User Param.” button.

The parameters of the individual XI/ON modules are described in chapter 4.

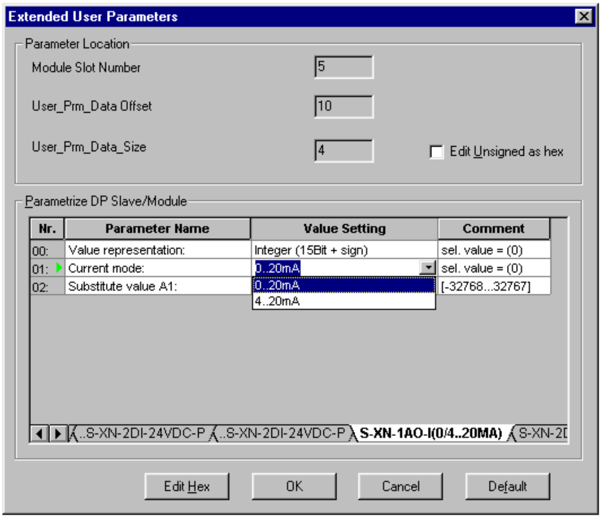


Figure 86: Setting the parameters of an analog output module

Error Diagnostics (Station Diagnostics) when Connected to a MITSUBISHI A1S

ProfiM200’s diagnostic functions are described in the manual supplied with the software “ProfiMap” by MITSUBISHI.

Information concerning individual module diagnostics can be found in chapter 4. Diagnostic options for gateways are described in chapter 2.

Diagnostics on PROFIBUS-DP

Diagnostic messages in the PLC

The diagnostic messages are indicated as diagnostic bytes in the software of the corresponding PROFIBUS-DP master. Please refer to Table 8 and Table 9 in chapter 2 of this manual for the meaning of the gateway's diagnostic bytes and those of the connected modules.

Based on an example station taken from the section "Electronic Device Data Sheets (GSD)", the following will illustrate how the diagnostic bytes of the modules in the controller software are displayed.

Table 18: Diagnostic bytes of the example station

	Module	Number of diagnostic bytes	Diagnostic 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

Those modules that do not transmit diagnostic bytes do not appear in the diagnostic evaluation of the PROFIBUS-DP master. Those modules, which are capable of diagnostics, appear in the order in which they are plugged within the station.

Table 19: Description and meaning of the diagnostic bytes

	Module	Meaning	Diagnostic byte
		Status of station (Header according to PROFIBUS-DP standards)	Byte 1
		Status of station (Header according to PROFIBUS-DP standards)	Byte 2
		Status of station (Header according to PROFIBUS-DP standards)	Byte 3
		Address of diagnostic master (Header according to PROFIBUS-DP standards)	Byte 4
		Identity-number high byte (Header according to PROFIBUS-DP standards)	Byte 5
		Identity-number low byte (Header according to PROFIBUS-DP standards)	Byte 6
GW	XN-GW-PBDP-1.5MB	Gateway diagnostic byte 0 (Length recognition and type of DP diagnostic)	Byte 7
GW	XN-GW-PBDP-1.5MB	Gateway diagnostic byte 1 (gateway warning)	Byte 8
GW	XN-GW-PBDP-1.5MB	Gateway diagnostic byte 2 (gateway error)	Byte 9
A	XN-BR-24VDC-D	Module diagnostic	Byte 10
H	XN-2DO-24VDC-0.5A-P	Module diagnostic	Byte 11
I	XN-2DO-24VDC-0.5A-P	Module diagnostic	Byte 12
J	XN-2DO-24VDC-0.5A-P	Module diagnostic	Byte 13
L	XN-1AI-U(-10/0...+10VDC)	Module diagnostic	Byte 14
M	XN-2DO-24VDC-2A-P	Module diagnostic	Byte 15

The diagnostic information can be queried for diagnostic evaluation by using certain configuration tools or via special manufacturer-specific function block units.

The modular Moeller controller PS 416 (PROFIBUS-DP (Master) PS 416-NET-440) evaluates the diagnostic information from the PROFIBUS-DP slaves with the help of either the function block unit "PdpStationDiag" in the controller software Sucosoft S40 or the configuration tool CFG-DP.

The description of above mentioned function block unit “PdpStationDiag” is contained in the manual to the PS416 Master and Slave modules (AWB2700-1330D/GB).

There follows an explanation of the diagnostic evaluation made by the software “CFG-DP”.

Example of Diagnostics with a Moeller PS416 PLC

The software “CFG-DP”, Version 1.30 from Moeller is used in our example to describe diagnostic messages in the PLC. The make-up of the station corresponds to the XI/ON station described in the Section “Connection to a Moeller PS416 PLC” in this chapter.

The diagnostic is available when connected to a Moeller PROFIBUS-DP Network Card PS416-Net 440.

When a diagnostic is pending, the station sending the diagnostic is highlighted in the overview of stations.

Figure 87: Identifying a station sending diagnostic messages

Double-click the highlighted station to open a dialog box in which the station’s status is displayed.

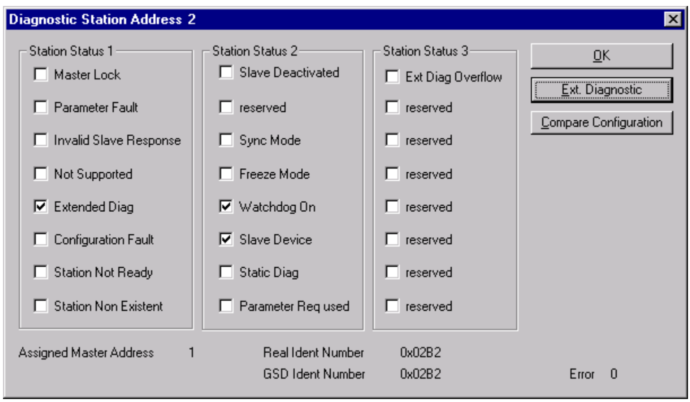


Figure 88: Indicating the type of diagnostic messages

Click the “Ext. Diagnostic” button to open the dialog box with the diagnostic bytes for the extended diagnostics. Here you can identify the individual modules capable of diagnosis and the diagnostic messages. The following table contains a description of the hexadecimal data.

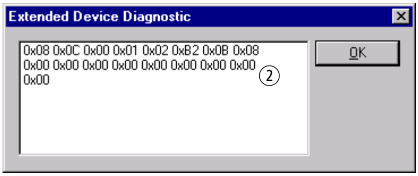


Figure 89: Diagnostic description of a XI/ON station

① Diagnostic bytes 0 to 2

② Diagnostic bytes 9 to 14

The hexadecimal data shown in the figure above have the following meanings:

Table 20: Diagnostic bytes

Diagnostic Byte	Meaning	Remark
0	Status area 1 of the station	
1	Status area 2 of the station	
2	Status area 3 of the station	
3	Master’s address, from where the slave was configured	According to DP standards
4...5	Slave identifier	According to DP standards
6...8	Diagnostic bytes 0...2 of the gateway	Refer to chapter 2
9...14	Diagnostic bytes of the modules capable of diagnosis in the XI/ON station	Refer to chapter 4

Diagnostic messages were provoked for the following examples:

- Planned but not plugged I/O module.
- Interruption of the field voltage.
- Short-circuit of an output module (the gateway parameter “Outputs module replacement” has been set to “Hold current value”.

Planned but Not Plugged I/O Module

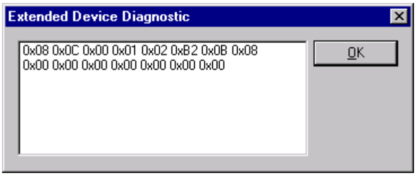


Figure 90: Diagnosis with a not-plugged XI/ON I/O module

In this example, a planned XI/ON module was pulled. As a result, the “IOs” LED on the gateway indicated an acceptable change to the physical constellation of the module bus station by flashing alternately red/green. The flashing red “DIA” LED indicated that the gateway was generating an extended diagnosis.

The normal status was restored by replugging the pulled electronics module.

Interruption of the Field Voltage

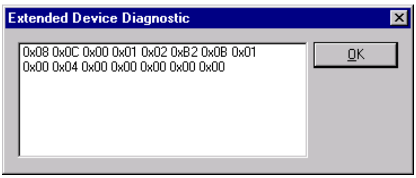


Figure 91: Diagnosis when the power supply to the field is interrupted

In this example the connection between the Bus Refreshing module and the voltage source for the power supply to the field was interrupted. As a result, the gateway “DIA” LED indicated an extended diagnosis by flashing red. At the same time the LED “U_L” on the Bus Refreshing module was extinguished and a pending diagnosis was indicated by the module’s “DIA” LED flashing red.

The normal status was restored by re-establishing the connection to the field voltage.

3

Short-Circuit in an Output Module

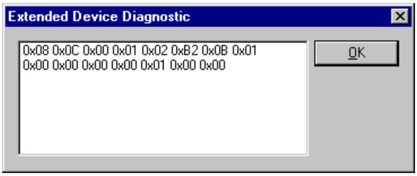


Figure 92: Diagnosis when a short-circuit occurs in an output module

In this example, a short-circuit in channel 1 of a digital output module was provoked. As a result, the “DIA” LED on the gateway indicated that the gateway was generating an extended diagnosis by flashing red. The “DIA” LED and the channel “11” LED of the digital output module lit up red.

The normal status was restored to the LED indicators by repairing the short-circuit.

→ The default settings for the gateway parameters set all outputs to zero (please refer to the Section “Setting Parameters“, chapter 2). It is not possible to diagnose any short-circuits which may arise if modules planned for a station are not plugged. For this reason, it is recommended to set the corresponding gateway parameters to “Hold current value”.

4 Technical Data

Chapter Overview

You can find the following subjects in this chapter:

Introduction

This chapter contains technical data and additional information about the distribution, I/O and relay modules. It comprises general technical data (valid for all modules) taken from the description of the individual modules, connection diagrams for wiring the modules as well as relevant details concerning parameter and diagnostic options.

→ The parameter and diagnostic texts of the individual modules correspond to those determined in the German version of the GSD files (Electronic Device Data Sheets), which are described in chapter 3. In addition, these texts are identical to those in the configuration software of the DP master. The English translation of the German parameter and diagnostic texts is included in the "Appendix".

The following information is given for each I/O module: the block diagram of the electronics module, LED identification, the appropriate base modules and the relevant specific data.

→ The gateway's technical data is described in chapter 2 and the gateway's diagnostic options are described in chapter 3. Please refer to chapter 2 for the fieldbus-specific description of the diagnostic and parameter data of the individual XI/ON modules. An overview of all electronics modules and the appropriate base modules can be found in the "Appendix".

The module designations are explained in the following table:

Table 21: Module abbreviations

Abbr.	Designation	Example
ABPL	End plate for right-sided termination of a XI/ON station	XN-**ABPL**
AI	Analog input module	XN-1**AI**-U(-10/0...+10VDC)
AO	Analog output module	XN-1**AO**-I(0/4...20MA)
B	Designation for base module in block design	XN-**B**3S-SBB
B	Bridge connector: bridged connections on the same connection level in a base module, for applying potentials	XN-S3T-S**BB**
B	Added to designation of base modules for those Bus Refreshing modules used within a XI/ON station but do not supply the gateway with power.	XN-P4T-SBBC-**B**
BR	Bus Refreshing module	XN-**BR**-24VDC-D
C	Designation of a connection level with cross-connection to a C-rail and can, among other things, be used as a PE (only possible with certain base modules).	XN-S4T-SBB**C**
CJ	Base module for XN-2AI-THERMO-PI with integrated PT1000 for cold junction compensation	XN-S4T-SBBS-**CJ**
CNT	Counter	XN-1**CNT**-24VDC
CO	Change over	XN-2DO-R-**CO**
D	Diagnostics	XN-BR-24VDC-**D**
DI	Digital input module	XN-2**DI**-24VDC-P
DO	Digital output module	XN-2**DO**-24VDC-2A-P
GW	Gateway	XN-**GW**-PBDP-1.5MB
KLBU	Terminal clip, shielded connection for analog input modules	XN-**KLBU**/T
KO	Coding element for coding electronics and base module	XN-**KO**/2
MB	Transmission rate MBit/s	XN-GW-PBDP-1.5**MB**
N	Negative switching (sourcing)	XN-2DI-24VDC-**N**
NC	Normally closed	XN-2DO-R-**NC**
NI	For connecting resistance thermometers with sensors Ni100 and NI1000 in 2- or 3-wire measurement type	XN-2AI-PT/**NI**-2/3

Abbr.	Designation	Example
NO	Normally open	XN-2DO-R-**NO**
P	Positive switching	XN-2DI-24VDC-**P**
P	Designation of the base module for Power Feeding and Bus Refreshing modules	XN-**P**3T-SBB
PBDP	XI/ON-Gateway for PROFIBUS-DP	XN-GW-**PBDP**-1.5MB
PF	Power Feeding modules	XN-**PF**-24VDC-D
PI	Potential isolation of analog modules for thermocouples	XN-2AI-THERMO-**PI**
PT	Analog input module for connecting resistance thermometers with sensors PT100, PT200, PT500 and PT1000 in 2- or 3-wire measurement type	XN-2AI-**PT**/NI-2/3
QV	Jumper for relay modules	XN-**QV**/1
R	Relay module	XN-2DO-**R**-NC
S	Designation for base module in slice design	XN-**S**3T-SBB
S	Designation for base modules with screw connection	XN-S3**S**-SBB
S	Designation for gateway with screw connection	XN-GW-PBDB-1.5MB-**S**
S	Single connector: non-bridged connections on the same connection level in a base module, used for connecting the signal	XN-S3T-**S**BB
T	Designation for base modules with tension clamp connection	XN-S3**T**-SBB
x	Partly for "S" or "T" in the designations of base modules with screw or tension clamp connection	XN-S3**x**-SBB

The following abbreviations are used in the technical data and wiring diagrams:

Table 22: Technical abbreviations

Abbr.	Designation
GND	Ground
I_A	Active level current (with negative switching electronics modules)
I_{EI}	Electrical operating supply (field supply)
I_H	High-level current
I_I	Inactive level current (with negative switching electronics modules)
I_L	Low-level current
I_{MB}	Current via the module bus
L-	Neutral conductor
L+	Positive conductor
PE	Protective earth conductor
R_{LI}	Load impedance, inductive
R_{LK}	Load impedance, resistive
R_{LL}	Lamp load
R_{LO}	Resistive load
S	Signal cable
Sh	Shielding
U_A	Active level voltage (with negative switching electronics modules)
U_H	High-level voltage
U_I	AInactive level voltage (with negative switching electronics modules)
U_h	Auxiliary voltage for analog sensor
U_L	Field supply with LEDs
U_L	Low-level voltage
U_{PF}	Voltage that is presently being supplied via the power distribution module
U_{sys}	System supply

Dimensions

Dimensions for electronics modules

Dimensions in mm / inch (w x l x h)	
Slice design	12.6 x 74.1 x 55.4 / 0.49 x 2.92 x 2.18
Block design	100.8 x 74.1 x 55.4 3.97 x 2.92 x 2.18

Dimensions for base modules

Dimensions in mm / inch (w x l x h)	
Slice design	
2-/3-wire connection technology	12.6 x 117.6 x 49.9 / 0.49 x 4.63 x 1.96
4-wire connection technology	12.6 x 128.9 x 49.9 / 0.49 x 5.07 x 1.96
4 x 2-/3-wire connection technology	12.6 x 154.5 x 49.9 / 0.49 x 6.08 x 1.96
Block design	
2-/3-wire connection technology	100.8 x 117.6 x 49.9 3.97 x 4.63 x 1.96
4-wire connection technology	100.8 x 128.9 x 49.9 3.97 x 5.07 x 1.96

Dimensions

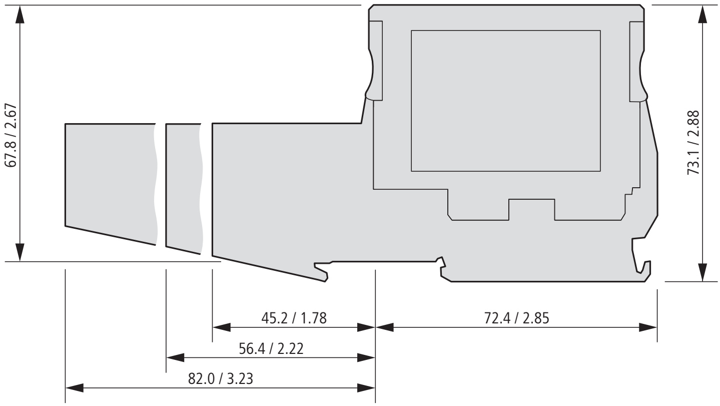


Figure 93: Complete XI/ON module (with tension clamp connection)

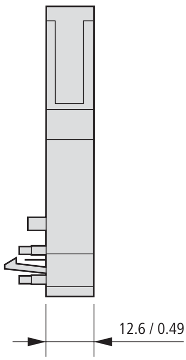


Figure 94: Rear view of complete XI/ON module in slice design

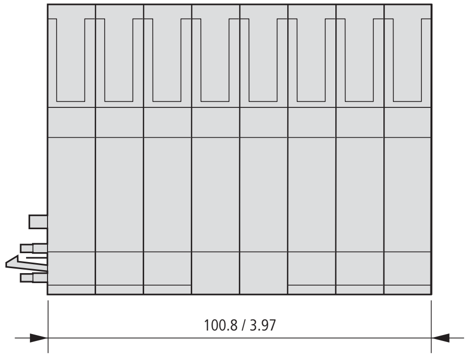


Figure 95: XI/ON module in block design (top view)

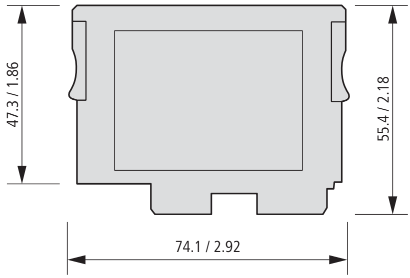


Figure 96: Electronics module

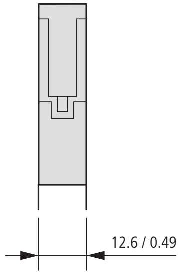


Figure 97: Rear view of electronics module in slice design

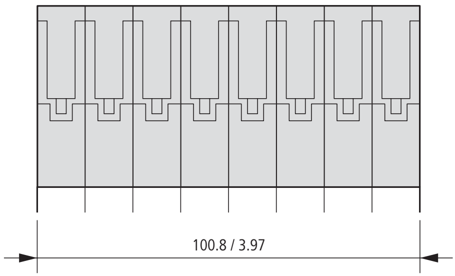


Figure 98: Rear view of electronics module in block design

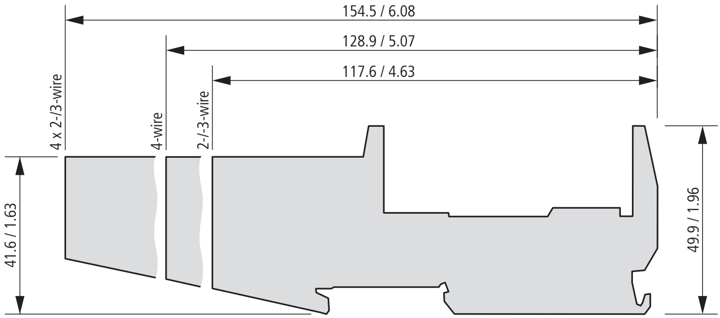


Figure 99: Base module with tension clamp connection

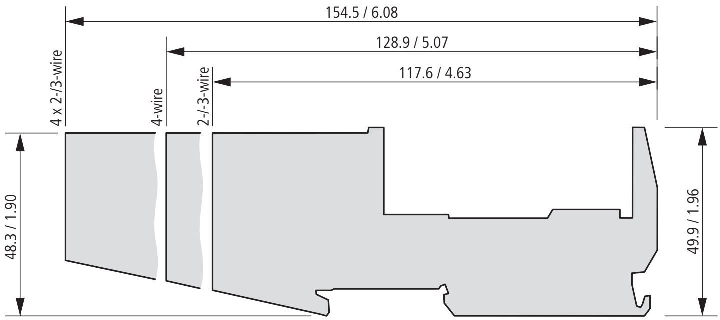


Figure 100: Base module with screw connection

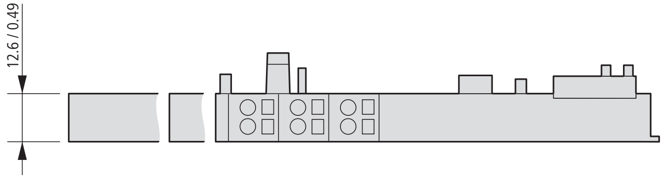


Figure 101: Base module in slice design (top view)

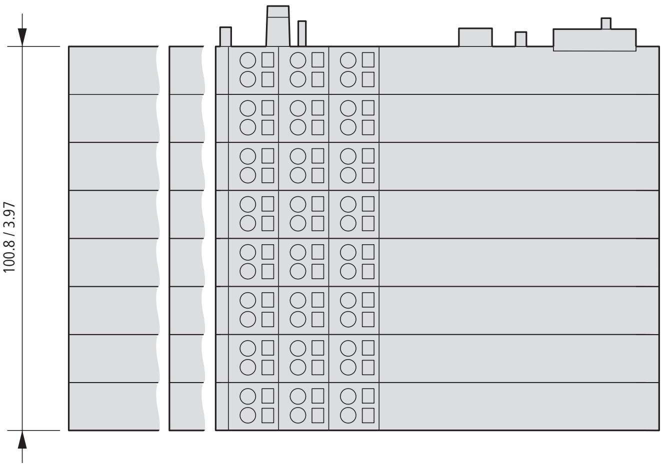


Figure 102: Top view of base module in block design

Dimensions in mm / inch

General Technical Data

Relating to a Station

Supply voltage/auxiliary voltage

Attention!
The auxiliary power supply must comply with the stipulations of SELV (Safety Extra Low Voltage) according to IEC 364-4-41.

Nominal value (provision for other modules)	24 V DC
Permissible range	according to EN 61131-2 (18 to 30 V DC)
Residual ripple	according to EN 61131-2
Potential isolation	Yes, via optocoupler
Between the relay channels	500 V AC
Ambient temperature	
Operating temperature mounted horizontally	0 to +55 °C / 32 to 131 °F
Operating temperature mounted vertically	0 to +55 °C / 32 to 131 °F
Storage temperature	-25 to +85 °C / -13 to 185 °F
Relative humidity according to EN 61131-2/EN 50178	5 to 95 % (indoor), Level RH-2, non-condensing (storage at 45 °C / 113 °F, no functional test)
Noxious gas	
SO_2	10 ppm (rel. humidity < 75 %, non-condensing)
H_2S	1.0 ppm (rel. humidity < 75 %, non-condensing)

Resistance to vibration according to IEC 61131	
10 to 57 Hz, Constant amplitude 0.075 mm / 0.003 inch, 1 g	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 68-2-27	18 shocks, sinusoidal half-wave 15 g peak value/ 11 ms, in each case in +/- direction per space coordinate
Resistance to repetitive shock according to IEC 68-2-29	1000 shocks, half-sinus 25 g peak value/6 ms, in each case in +/- direction per space coordinate
Topple and fall according to IEC 68-2-31 and free fall according to IEC 68-2-32	
Weight	< 10 kg
Height of fall	1.0 m / 39.37 inch
Weight	10 to 40 kg
Height of fall	0.5 m / 19.69 inch
Test runs	7
Device with packaging, electrically tested printed-circuit board	
Electromagnetic compatibility (EMC) according to EN 50082-2 (Industry)	
Static electricity according to EN 61000-4-2	
Discharge through air (direct)	8 kV
Relay discharge (indirect)	4 kV

Electromagnetic HF fields according to EN 61000-4-3 and ENV 50204	10 V/m
Conducted interferences induced by HF fields according to EN 61000-4-6	10 V
Fast transients (Burst) according to EN 61000-4-4	
Interference criteria A: unrestricted operation, normal operating behavior	1 kV
Interference criteria B: temporary interference, normal operation possible	2 kV
Emitted interference according to EN 50081-2 (Industry)	according to EN 55011 Class A, Group 1

Warning!
This device can cause radio disturbances in residential areas and in small industrial areas (residential, business and trading). In this case, the operator can be required to take appropriate measures to suppress the disturbance at his own cost.

Approvals	
CE	
CSA (applied for)	
UL (applied for)	
Tests	
Tests according to EN 61131-2	
Cold	DIN IEC 68-2-1, temperature -25 °C / -13 °F, duration 96 h; not in use
Dry heat	DIN IEC 68-2-2, Temperature +85 °C / 185 °F, duration 96 h; device not in use

Damp heat, cyclic	DIN IEC 68-2-30, temperature +55 °C / 131 °F, duration 2 cycles every 12 h; device in use
Temperature change	DIN IEC 68-2-14, temperature 0 to +55 °C / 32 to 131 °F, duration 2 cycles, temperature change per minute; device in use
Operational life MTBF	20000 h
Electronics modules pull/plug cycles	20
Pollution severity according to IEC 664 (EN 61131-2)	2
Protection class according to IEC 529	IP 20

Relating to Base Modules

Protection class	IP 20
Insulation stripping length	8 mm / 0.32 inch
Max. wire range	0.5 to 2.5 mm^2 / 0.02 to 0.1 $inch^2$ / 20 to 12 AWG
Crimpable wire	
"e" solid core H 07V-U	0.5 to 2.5 mm^2 / 0.02 to 0.1 $inch^2$ / 20 to 12 AWG
"f" flexible core H 07V-K	0.5 to 1.5 mm^2 / 0.02 to 0.06 $inch^2$ / 20 to 16 AWG
"f" with ferrules according to DIN 46228/1 (ferrules crimped gas-tight)	0.5 to 1.5 mm^2 / 0.02 to 0.06 $inch^2$ / 20 to 16 AWG
Plug gauge according to IEC 947-1/1988	A1

Power Distribution Modules

Bus Refreshing Modules

Bus Refreshing modules distribute 5 V DC to the internal XI/ON module bus, as well as distributing a nominal voltage of 24 V DC (permissible range according to EN 61 131-2) to the various XI/ON modules. The adjoining power supply module and modules to the left are potentially isolated.

Attention!
The first Bus Refreshing module in a XI/ON station must be mounted immediately to the right of the gateway. This and a special base module guarantee the 5 V DC supply to the gateway.

Bus Refreshing modules eliminate the necessity to separately distribute the system or field voltage to each XI/ON I/O module. Depending on the planned application, it is possible to build tailor-made groups of modules with different potentials by selecting appropriate Bus Refreshing modules. Bus Refreshing modules are available in slice design. They are mounted on to base modules with tension clamp or screw connections. The dusty grey color of the base modules for Bus Refreshing modules clearly distinguishes them from the base modules designed for XI/ON I/O modules.

LED status indicators
Error signals and diagnostic statuses are indicated via LEDs on the module. The corresponding diagnostic information is transmitted to the gateway via diagnostic bits.

Module overview
XN-BR-24VDC-D

→ The structure of the individual supplies is described in detail in chapter 7.

Bus Refreshing Module with Diagnostics

Figure 103: Electronics module XN-BR-24VDC-D

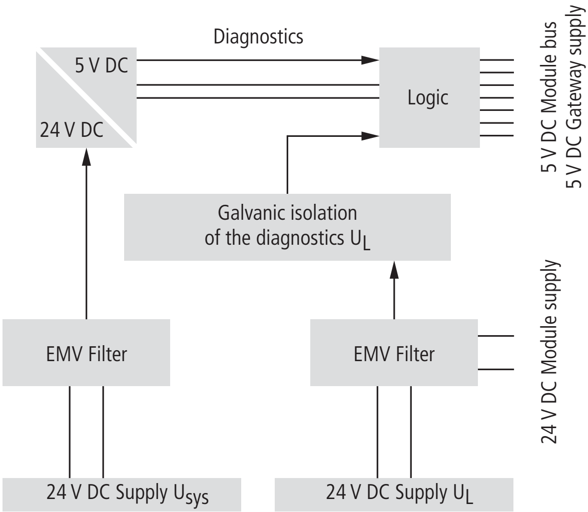


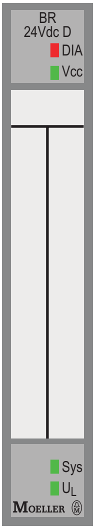
Figure 104: Block diagram

Electronics module

Designation	XN-BR-24VDC-D
Nominal voltage	24 V DC
System supply U_{sys}	24 V DC / 5 V DC
Permissible range for U_{sys} = 24 V DC	18 to 30 V DC
Permissible range for U_{sys} = 5 V DC	4.7 to 5.3 V DC
Field supply U_L	24 V DC
Permissible range	18 to 30 V DC
Ripple	< 5%
Residual ripple	according to EN 61 131-2
Maximum operating current I_{EI}	10 A
Maximum system current supply I_{MB}	1.5 A

Diagnostic messages

The diagnostic functions monitor the supply voltages (system and field supply) supplied by the user for undervoltage. They indicate errors via “DIA” LED and transmit corresponding diagnostic information to the gateway.



LED	Display	Meaning	Remedy
DIA	Red, flashing, 0.5 Hz	Faulty power supply to the field U_L or system U_{sys}	Check the wiring from the module bus to the field power supply and to the system’s power supply. Check the voltages of the field power supply and to the system power supply.
	Red	Module bus communication failure	Check if more than two adjoining electronics modules have been pulled. Check the wiring from the module bus to the system power supply.
	Off	No error messages or diagnostics	–
Vcc	Green	5 Vcc voltage supply to the module bus is OK	–
	Off	5 Vcc voltage supply to the module bus is faulty	When LED “Sys” is off, then check the wiring and voltage of the system power supply.
Sys	Green	System power supply via external power supply unit OK	–
	Off	System power supply via external power supply unit faulty	Check the wiring to the system power supply. Check the external power supply unit.
U_L	Green	Field power supply via external power supply unit OK	–
	Off	Field power supply via external power supply unit faulty	Check the wiring to the field power supply. Check the external power supply unit.

This module has the following diagnostic data:

- "Modulbus-Spannungs-Warnung"[1)]
  Monitoring of the external power supply to the system U_{sys} = 24 V DC.
- "Feldspannung fehlt"[1)]
  Monitoring of the external power supply to the field.

1) See "Appendix" for English translation

Module parameters

None

Base module

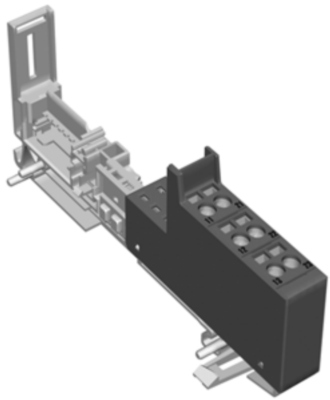


Figure 105: Base module XN-P3T-SBB with XI/ON gateway power supply

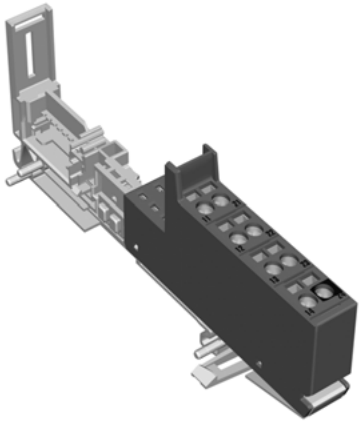


Figure 106: Base module XN-P4T-SBBC-B without XI/ON gateway power supply

Designation: base module with power supply to the gateway	
with tension clamp connection	XN-P3T-SBB XN-P4T-SBBC
with screw connection	XN-P3S-SBB XN-P4S-SBBC
Designation: base module without power supply to the gateway	
with tension clamp connection	XN-P3T-SBB-B XN-P4T-SBBC-B
with screw connection	XN-P3S-SBB-B XN-P4S-SBBC-B

Attention!
Only the modules XN-P3x-SBB or XN-P4x-SBBC (= first module to the right of the gateway) can be used to distribute power to the gateways.

The base modules with or without power distribution to the gateways can be differentiated as follows:

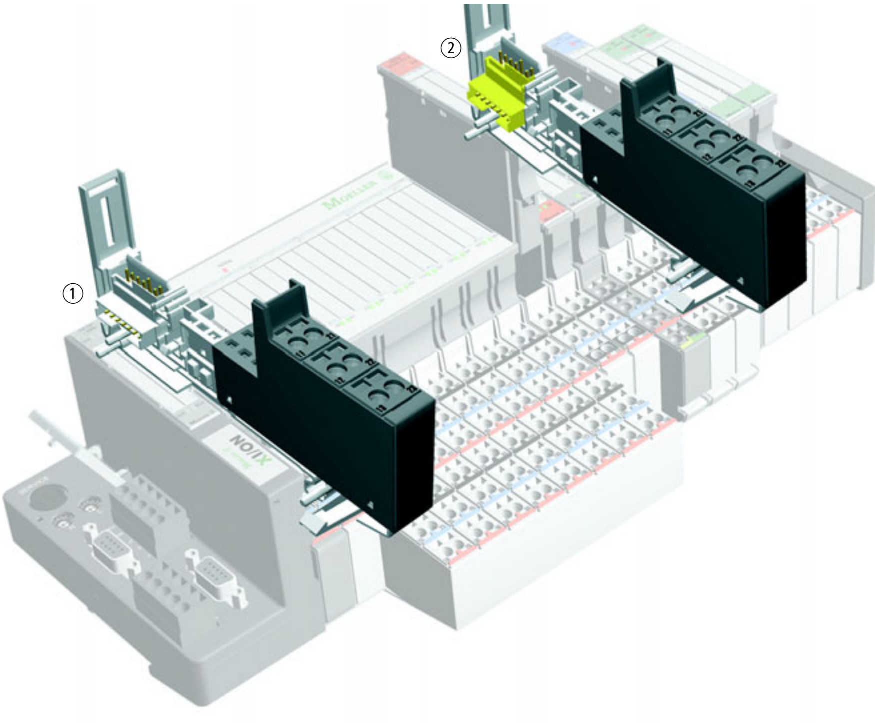


Figure 107: Assiging base modules

① Base module with power distribution to the gateway: light grey connection

② Base module without power distribution to the gateway: yellow connection

Wiring diagrams

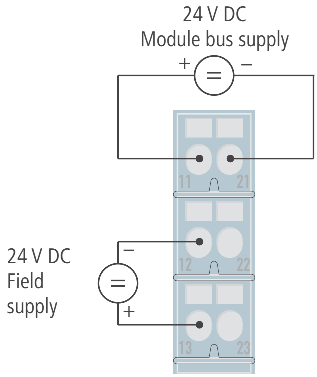


Figure 108: Wiring diagram XN-P3x-SBB with gateway supply
XN-P3x-SBB-B without gateway supply

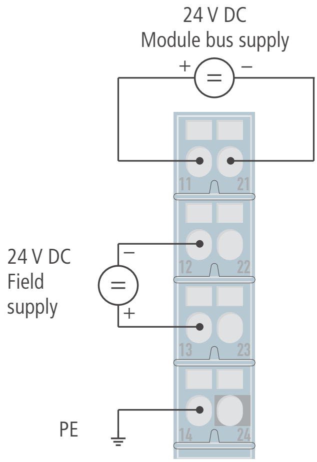


Figure 109: Wiring diagram XN-P4x-SBBC with gateway supply
XN-P4x-SBBC-B without gateway supply

Measurement data according to VDE 0611 Part 1/8.92/ IEC 947-7-1/1989	
Rated voltage	250 V
Rated current	17.5 A
Rated cross-section	1.5 mm^2 / 0.06 $inch^2$ / 16 AWG
Rated surge	4 kV
Pollution severity	2
TOP connection technology	Tension clamp or screw connection

Power Feeding Modules

Power Feeding modules distribute the required 24 V DC or 120/230 V AC field voltage to the I/O modules. They are necessary when groups of modules with different potentials are planned within a XI/ON station, or if the rated supply voltage cannot be guaranteed. Power Feeding modules are potentially isolated from the adjoining power supply module and modules to the left side.

Warning!
Power Feeding modules cannot be used to distribute 5 V DC to XI/ON gateways.

By using Power Feeding modules, it is not necessary to distribute power separately to each XI/ON I/O module.

Power Feeding modules are available in slice design. They are mounted on to base modules with tension clamp or screw connections.

The dusty grey color of the base modules for Power Feeding modules clearly distinguishes them from the base modules designed for XI/ON I/O modules.

LED status indicators

Error signals and diagnostic statuses are indicated via LEDs on the module. The corresponding diagnostic information is transmitted to the gateway via diagnostic bits.

Module overview

XN-PF-24VDC-D
XN-PF-120/230VAC-D

Power Feeding Module 24 V DC with Diagnostics

Figure 110: Electronics module XN-PF-24VDC-D

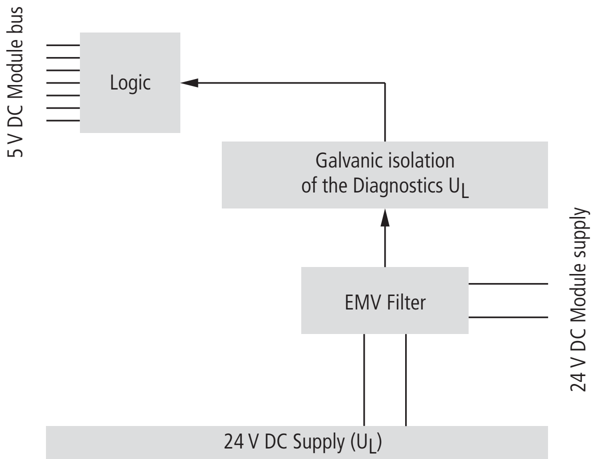


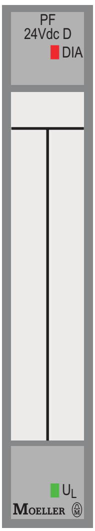
Figure 111: Block diagram

Electronics module

Designation	XN-PF-24VDC-D
Nominal voltage	24 V DC
Permissible range	18 to 30 V DC
Field supply U_L	24 V DC
Permissible range	18 to 30 V DC
Nominal current from module bus I_{MB}	≦ 28 mA
Ripple	< 5%
Residual ripple	according to EN 61 131-2
Maximum operating current I_{EI}	10 A
Voltage anomalies	according to EN 61 000-4-11/ EN 61 131-2

Diagnostic messages

The diagnostic functions monitor the supply voltages (system and field supply) supplied by the user for undervoltage. The diagnostic functions indicate errors via the "DIA" LED and transmit the corresponding diagnostic information to the gateway.



LED	Display	Meaning	Remedy
DIA	Red, flashing, 0.5 Hz	Diagnostics pending	–
	Red	Module bus communication failure	Check if more than two adjoining electronics modules have been pulled. Check the power supply to the module bus.
	Off	No error messages or diagnostics	–
U_L	Green	Field power supply via external power supply unit OK	–
	Off	Field power supply via external power supply unit faulty	Check the wiring to the field power supply. Check the external power supply unit.

This module has the following diagnostic data:

- "Feldspannung fehlt"[1)]
  Monitoring of the external power supply to the field.

1) See "Appendix" for English translation

Module parameters

None

Base module

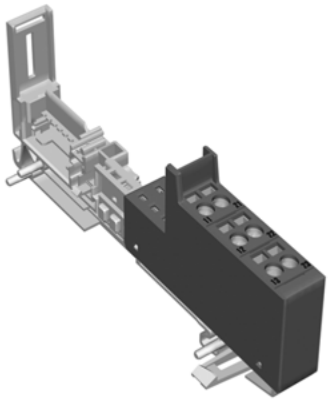


Figure 112: Base module XN-P3T-SBB

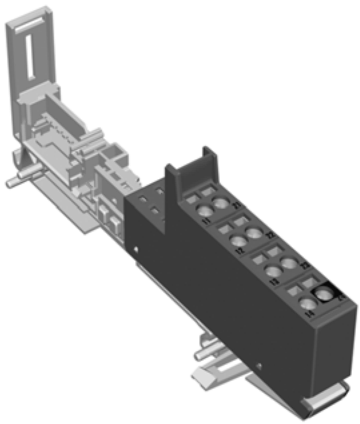


Figure 113: Base module XN-P4T-SBBC

Designation	
with tension clamp connection	XN-P3T-SBB XN-P4T-SBBC
with screw connection	XN-P3S-SBB XN-P4S-SBBC

Wiring diagrams

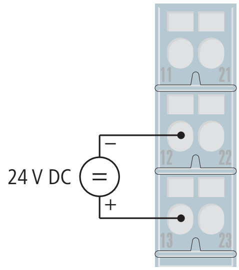


Figure 114: Wiring diagram XN-P3x-SBB

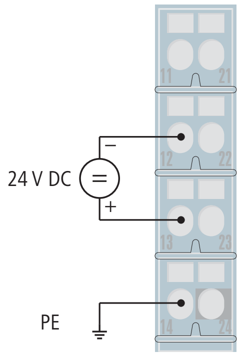


Figure 115: Wiring diagram XN-P4x-SBBC

Measurement data according to VDE 0611 Part 1/8.92/ IEC 947-7-1/1989	
Rated voltage	250 V
Rated current	17.5 A
Rated cross-section	1.5 mm^2 / 0.06 $inch^2$ / 16 AWG
Rated surge	4 kV
Pollution severity	2
TOP connection technology	Tension clamp or screw connection

Power Feeding Module 120/230 V AC with Diagnostics

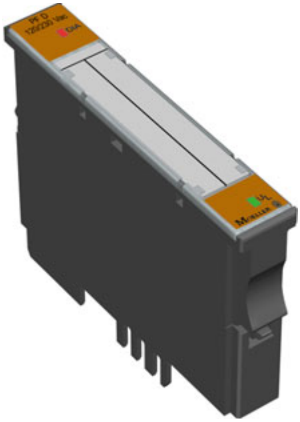


Figure 116: Electronics module XN-PF-120/230VAC-D

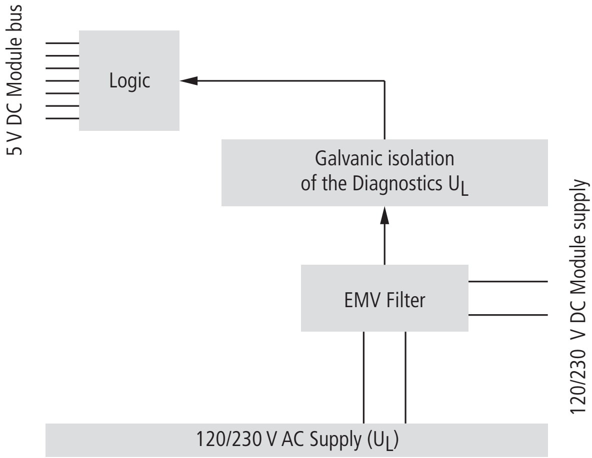


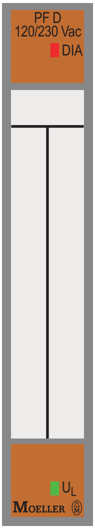
Figure 117: Block diagram

Electronics module

Designation	XN-PF-120/230VAC-D
Nominal voltage	120/230 V AC
Permissible range	according to EN 61 131-2
Field supply U_L	120/230 V AC
Permissible range	according to EN 61 131-2
Nominal current from module bus I_{MB}	≦ 25 mA
Ripple	< 5%
Residual ripple	according to EN 61 131-2
Maximum operating current I_{El}	10 A
Voltage anomalies	according to EN 61 000-4-11/ EN 61 131-2

Diagnostic messages

The diagnostic functions monitor the supply voltages (system and field supply) supplied by the user for undervoltage. The diagnostic functions indicate errors via the “DIA” LED and transmit the corresponding diagnostic information to the gateway.



LED	Display	Meaning	Remedy
DIA	Red, flashing, 0.5 Hz	Diagnostics pending	–
	Red, flashing, 0.5 Hz and LED UL off	The voltage at the terminal < 84 V AC ± 5 V AC	Check the wiring to the field power supply. Check the external power supply unit and external mains unit.
	Red	Module bus communication failure	Check if more than two adjoining electronics modules have been pulled. Check the power supply to the module bus.
	Off	No error messages or diagnostics	–
U_L	Green	Power supply to the field via external mains input is applied	–
	Off	Power supply to the field via external mains input is missing	Check the wiring to the field power supply. Check the external power supply unit and external mains unit.

This module has the following diagnostic data:

- "Feldspannung fehlt"[1)]
  Monitoring the external power supply to the field.

1) See "Appendix" for English translation

Module parameters
None

Base module

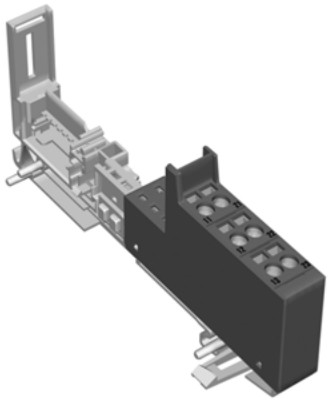


Figure 118: Base module XN-P3T-SBB

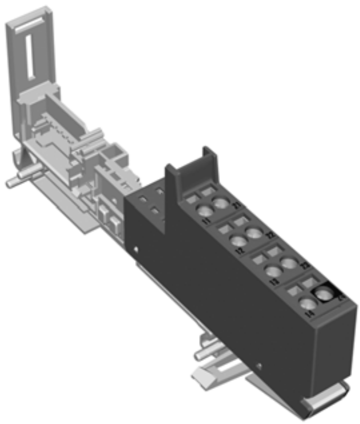


Figure 119: Base module XN-P4T-SBBC

Designation	
with tension clamp connection	XN-P3T-SBB XN-P4T-SBBC
with screw connection	XN-P3S-SBB XN-P4S-SBBC

Wiring diagrams

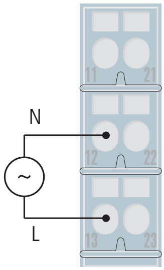


Figure 120: Wiring diagram XN-P3x-SBB

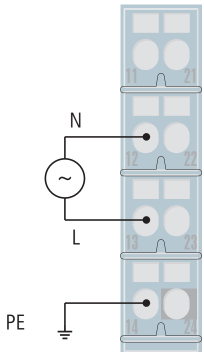


Figure 121: Wiring diagram XN-P4x-SBBC

Measurement data according to VDE 0611 Part 1/8.92/ IEC 947-7-1/1989	
Rated voltage	250 V
Rated current	17.5 A
Rated cross-section	1.5 mm^2 / 0.06 inch^2 / 16 AWG
Rated surge	4 kV
Pollution severity	2
TOP connection technology	Tension clamp or screw connection

Digital Input Modules

Digital input modules (DI) detect electrical high- and low-level values through the base module connections and transmit the corresponding digital value to the gateway via the module bus.

The module bus electronics of the digital input modules are galvanically isolated from the field level via an optocoupler. The module provides reverse polarity protection.

Digital input modules are designed in slice technology. They are mounted on to base modules with tension clamp or screw connections.

LED status indicators

Channel statuses are indicated by LEDs. Error signals from the I/O level are indicated by each module via the “DIA” LED.

A continuously lit up red “DIA” LED indicates the failure of the module bus communication at the digital input module.

Module overview

	Channel number	Positive switching
XN-2DI-24VDC-P	2	✓
XN-2DI-24VDC-N	2	
XN-2DI-120/230VAC	2	
XN-4DI-24VDC-P	4	✓
XN-4DI-24VDC-N	4	
XN-16DI-24VDC-P	16	✓

Digital Input Module, 2DI, 24 V DC, Positive Switching (Sinking)

Figure 122: Electronics module XN-2DI-24VDC-P

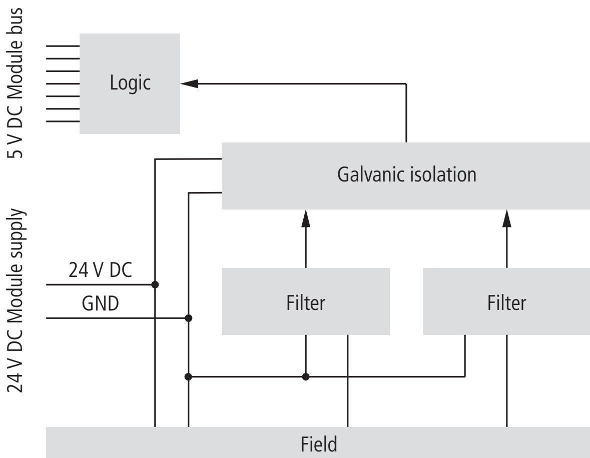
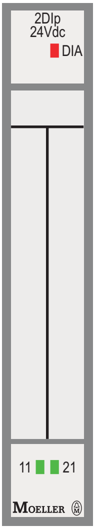


Figure 123: Block diagram

Electronics module

Designation	XN-2DI-24VDC-P
Number of channels	2
Nominal voltage from supply terminal	24 V DC
Nominal current from supply terminal I_{EI}	≦ 20 mA
Nominal current from module bus I_{MB}	≦ 28 mA
Power loss of the module, typical	approx. 0.7 W
Input voltage, nominal value at 24 V DC	
Low level U_L	-30 V to +5 V
High level U_H	11 V to 30 V
Input current	
Low level I_L	0 mA to 1.5 mA
High level I_H	2 mA to 10 mA
Input delay	
t_{rise}	< 200 µs
t_{fall}	< 200 µs
2-wire initiators (Bero®) can be connected with a permissible closed-circuit current of 1.5 mA	



Diagnostic messages

LED	Display	Meaning	Remedy
DIA	Red	Module bus communication failure	Check if more than two adjoining electronics modules have been pulled. Check the power supply to the module bus.
	Off	No error messages	–
11	Green	Status of channel 1 = "1"	–
	Off	Status of channel 1 = "0"	–
21	Green	Status of channel 2 = "1"	–
	Off	Status of channel 2 = "0"	–

Module parameters

None

Base module

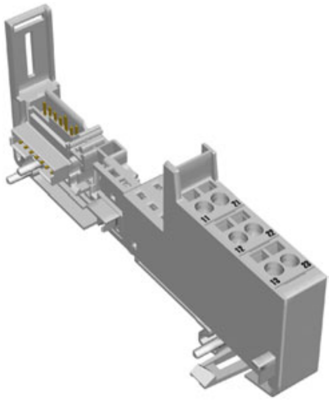


Figure 124: Base module XN-S3T-SBB

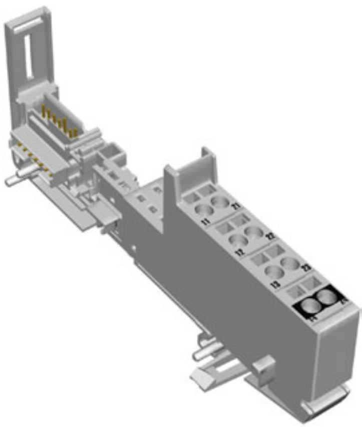


Figure 125: Base module XN-S4T-SBBC

Designation	
with tension clamp connection	XN-S3T-SBB XN-S4T-SBBC
with screw connection	XN-S3S-SBB XN-S4S-SBBC

Wiring diagrams

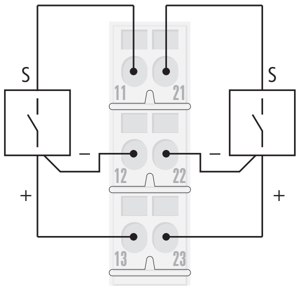


Figure 126: Wiring diagram XN-S3x-SBB

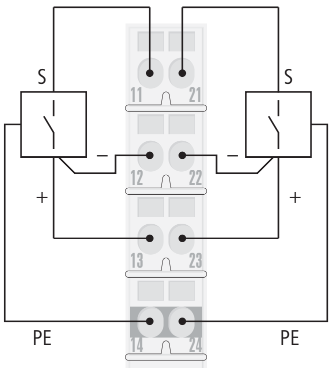


Figure 127: Wiring diagram XN-S4x-SBBC

Measurement data according to VDE 0611 Part 1/8.92/ IEC 947-7-1/1989	
Rated voltage	250 V
Rated current	17.5 A
Rated cross-section	1.5 mm^2 / 0.06 inch^2 / 16 AWG
Rated surge	4 kV
Pollution severity	2
TOP connection technology	Tension clamp or screw connection

Digital Input Module, 2DI, 24 V DC, Negative Switching (Sourcing)

Figure 128: Electronics module XN-2DI-24VDC-N

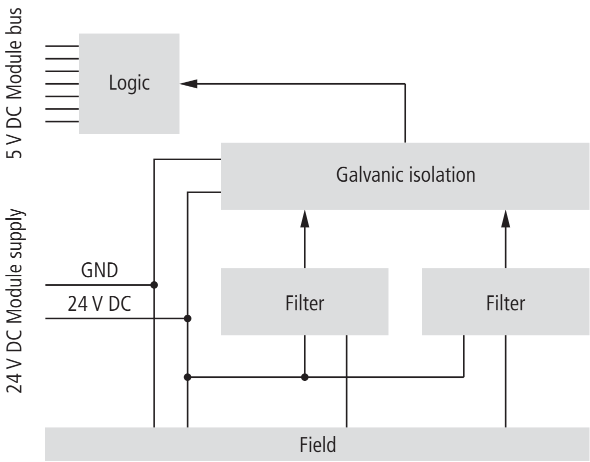
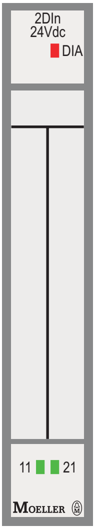


Figure 129: Block diagram

Electronics module

Designation	XN-2DI-24VDC-N
Number of channels	2
Nominal voltage from supply terminal	24 V DC
Nominal current from supply terminal I_{EI}	$\leqq$ 20 mA
Nominal current from module bus I_{MB}	$\leqq$ 28 mA
Power loss of the module, typical	approx. 0.7 W
Input voltage, nominal value at 24 V DC	
Active level U_A	0 V to +5 V
Inactive level U_I	> (U_{PF} - 11 V)
Input current	
Active level I_A	1.8 mA to 10 mA
Inactive level I_I	0 mA to 1.7 mA
Input delay	
t_{rise} (open switch)	< 200 µs
t_{fall} (active low)	< 200 µs
2-wire initiators (Bero®) can be connected with a permissible closed-circuit current of $\leqq$ 1.5 mA	



Diagnostic messages

LED	Display	Meaning	Remedy
DIA	Red	Module bus communication failure	Check if more than two adjoining electronics modules have been pulled. Check reliability of power supply to the module bus.
	Off	No error messages or diagnostics	–
11	Green	Status of channel 1 = “1”	–
	Off	Status of channel 1 = “0”	–
21	Green	Status of channel 2 = “1”	–
	Off	Status of channel 2 = “0”	–

Module parameters

None

Base module

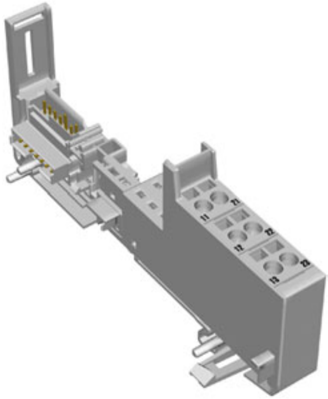


Figure 130: Base module XN-S3T-SBB

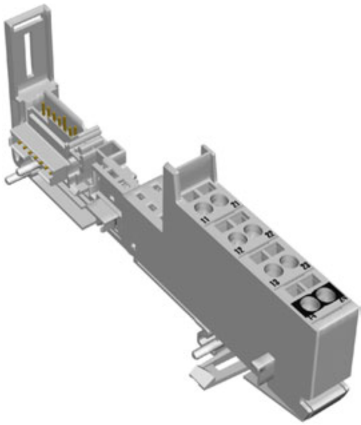


Figure 131: Base module XN-S4T-SBBC

Designation	
with tension clamp connection	XN-S3T-SBB XN-S4T-SBBC
with screw connection	XN-S3S-SBB XN-S4S-SBBC

Wiring diagrams

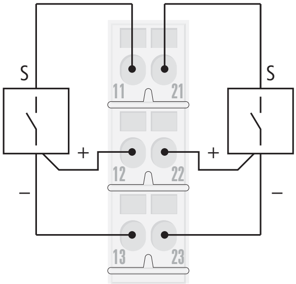


Figure 132: Wiring diagram XN-S3x-SBB

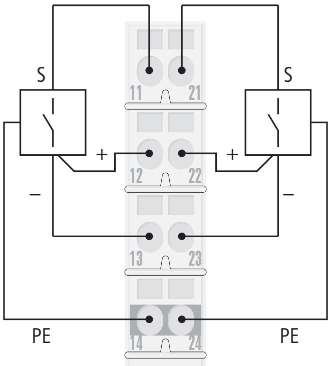


Figure 133: Wiring diagram XN-S4x-SBBC

Measurement data according to VDE 0611 Part 1/8.92/ IEC 947-7-1/1989	
Rated voltage	250 V
Rated current	17.5 A
Rated cross-section	1.5 mm^2 / 0.06 $inch^2$ / 16 AWG
Rated surge	4 kV
Pollution severity	2
TOP connection technology	Tension clamp or screw connection

Digital Input Module, 2DI, 120/230 V AC

Figure 134: Electronics module XN-2DI-120/230VAC

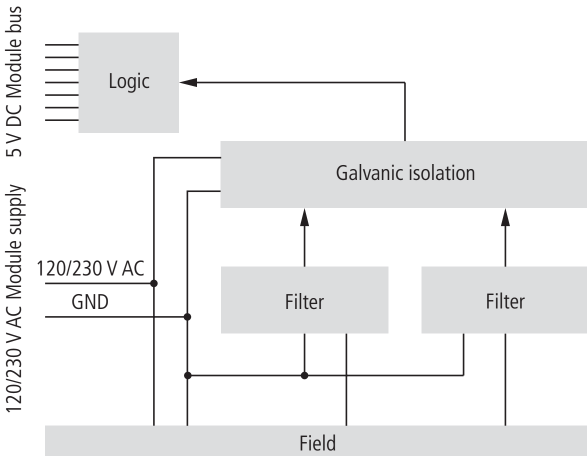
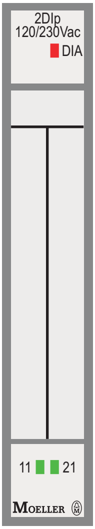


Figure 135: Block diagram

Electronics module

Designation	XN-2DI-120/230VAC
Number of channels	2
Nominal voltage from supply terminal	120/230 V AC
Nominal current from supply terminal I_{EI}	≦ 20 mA
Nominal current from module bus I_{MB}	≦ 28 mA
Power loss of the module, typical	< 1 W
Input voltage, nominal value at 120/230 V AC	
Low level U_L	0 V AC to 20 V AC
High level U_H	79 V AC to 265 V AC
Frequency range	47.5 Hz to 63 Hz
Input current	
Low level I_L	0 mA to 1 mA
High level I_H	3 mA to 8 mA
Input delay	
t_{rise}	< 20 ms
t_{fall}	< 20 ms
Maximum permissible wire capacity	141 nF at 79 V AC/50 Hz 23 nF at 265 V AC/50 Hz



Diagnostic messages

LED	Display	Meaning	Remedy
DIA	Red	Module bus communication failure	Check if more than two adjoining electronics modules have been pulled. Check the power supply to the module bus.
	Off	No error messages or diagnostics	–
11	Green	Status of channel 1 = “1”	–
	Off	Status of channel 1 = “0”	–
21	Green	Status of channel 2 = “1”	–
	Off	Status of channel 2 = “0”	–

Module parameters

None

Base module

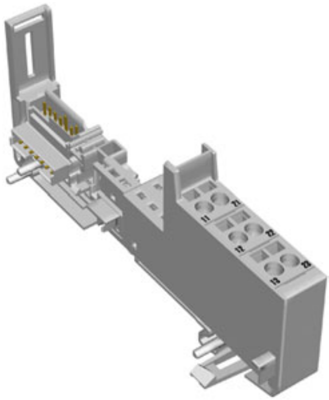


Figure 136: Base module XN-S3T-SBB

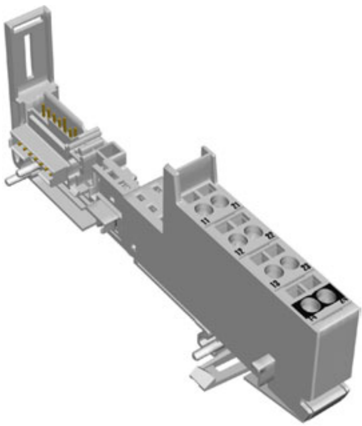


Figure 137: Base module XN-S4T-SBBC

Designation	
with tension clamp connection	XN-S3T-SBB XN-S4T-SBBC
with screw connection	XN-S3S-SBB XN-S4S-SBBC

Wiring diagrams

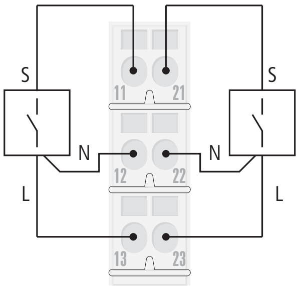


Figure 138: Wiring diagram XN-S3x-SBB

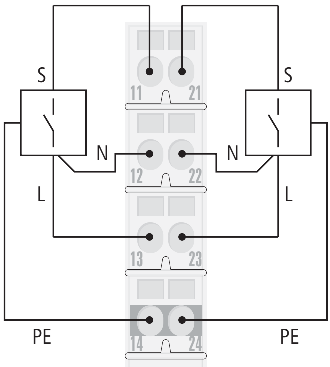


Figure 139: Wiring diagram XN-S4x-SBBC

Measurement data according to VDE 0611 Part 1/8.92/ IEC 947-7-1/1989	
Rated voltage	250 V
Rated current	17.5 A
Rated cross-section	1.5 mm^2 / 0.06 inch^2 / 16 AWG
Rated surge	4 kV
Pollution severity	2
TOP connection technology	Tension clamp or screw connection

Digital Input Module, 4DI, 24 V DC, Positive Switching (Sinking)

Figure 140: Electronics module XN-4DI-24VDC-P

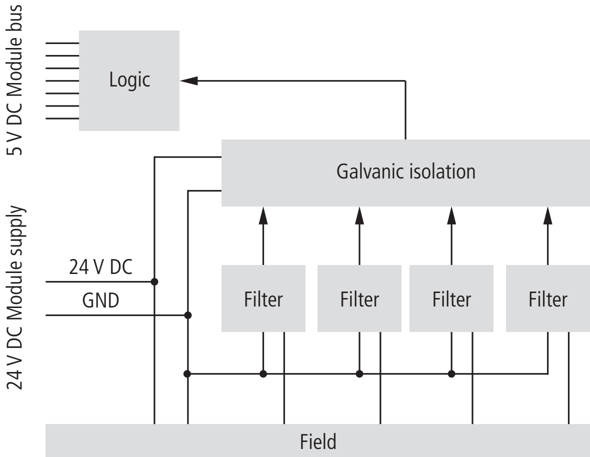
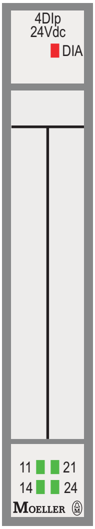


Figure 141: Block diagram

Electronics module

Designation	XN-4DI-24VDC-P
Number of channels	4
Nominal voltage from supply terminal	24 V DC
Nominal current from supply terminal I_{EI}	$\leqq$ 40 mA
Nominal current from module bus I_{MB}	$\leqq$ 29 mA
Power loss of the module, typical	approx. 1 W
Input voltage, nominal value at 24 V DC	
Low level U_L	-30 V to +5 V
High level U_H	15 V to 30 V
Input current	
Low level I_L	0 mA to 1.5 mA
High level I_H	2 mA to 10 mA
Input delay	
t_{rise}	< 200 µs
t_{fall}	< 200 µs

Diagnostic messages



LED	Display	Meaning	Remedy
DIA	Red	Module bus communication failure	Check if more than two adjoining electronics modules have been pulled. Check the power supply to the module bus.
	Off	No error messages	–
11	Green	Status of channel 1 = “1”	–
	Off	Status of channel 1 = “0”	–
21	Green	Status of channel 2 = “1”	–
	Off	Status of channel 2 = “0”	–
14	Green	Status of channel 3 = “1”	–
	Off	Status of channel 3 = “0”	–
24	Green	Status of channel 4 = “1”	–
	Off	Status of channel 4 = “0”	–

Module parameters

None

Base module

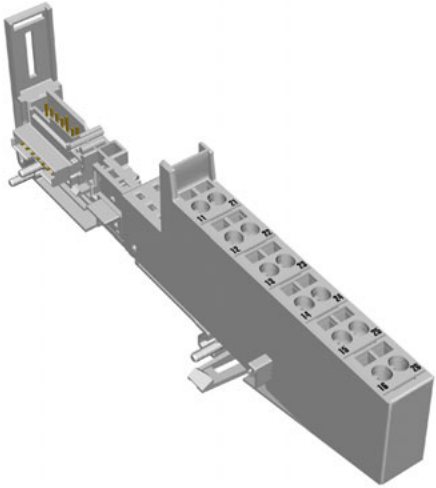


Figure 142: Base module XN-S6T-SBBSBB

Designation	
with tension clamp connection	XN-S6T-SBBSBB
with screw connection	XN-S6S-SBBSBB

Wiring diagram

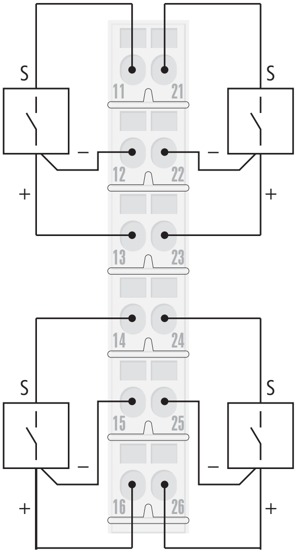


Figure 143: Wiring diagram XN-S6x-SBBSBB

Measurement data according to VDE 0611 Part 1/8.92/ IEC 947-7-1/1989	
Rated voltage	250 V
Rated current	17.5 A
Rated cross-section	1.5 mm^2 / 0.06 $inch^2$ / 16 AWG
Rated surge	4 kV
Pollution severity	2
TOP connection technology	Tension clamp or screw connection

Digital Input Module, 4DI, 24 V DC, Negative Switching (Sourcing)

Figure 144: Electronics module XN-4DI-24VDC-N

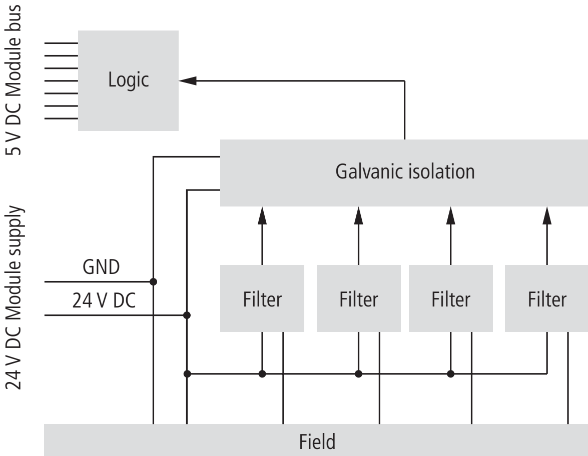
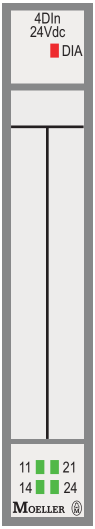


Figure 145: Block diagram

Electronics module

Designation	XN-4DI-24VDC-N
Number of channels	4
Nominal voltage from supply terminal	24 V DC
Nominal current from supply terminal I_{EI}	$\leqq$ 40 mA
Nominal current from module bus I_{MB}	$\leqq$ 28 mA
Power loss of the module, typical	< 1 W
Input voltage, nominal value at 24 V DC	
Active level U_A	0 V to +5 V
Inactive level U_I	> (U_{PF} - 11 V)
Input current	
Active level I_A	1.3 mA to 6 mA
Inactive level I_I	0 mA to 1.2 mA
Input delay	
t_{rise} (open switch)	< 200 µs
t_{fall} (active low)	< 200 µs



Diagnostic messages

LED	Display	Meaning	Remedy
DIA	Red	Module bus communication failure	Check if more than two adjoining electronics modules have been pulled. Check the power supply to the module bus.
	Off	No error messages or diagnostics	–
11	Green	Status of channel 1 = "1"	–
	Off	Status of channel 1 = "0"	–
21	Green	Status of channel 2 = "1"	–
	Off	Status of channel 2 = "0"	–
14	Green	Status of channel 3 = "1"	–
	Off	Status of channel 3 = "0"	–
24	Green	Status of channel 4 = "1"	–
	Off	Status of channel 4 = "0"	–

Module parameters

None

Base module

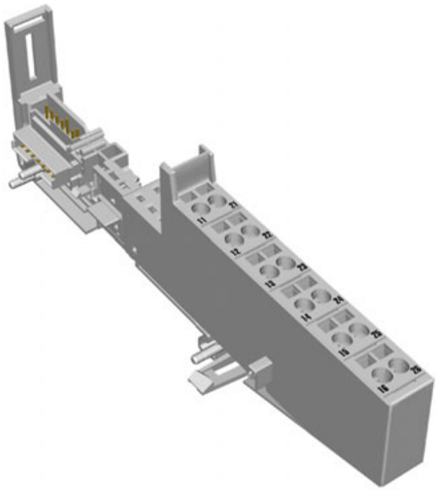


Figure 146: Base module XN-S6T-SBBSBB

Designation	
with tension clamp connection	XN-S6T-SBBSBB
with screw connection	XN-S6S-SBBSBB

Wiring diagram

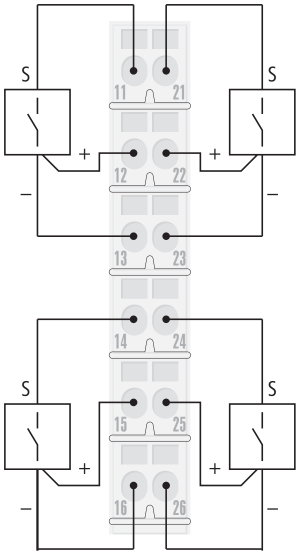


Figure 147: Wiring diagram XN-S6x-SBBSBB

Measurement data according to VDE 0611 Part 1/8.92/ IEC 947-7-1/1989	
Rated voltage	250 V
Rated current	17.5 A
Rated cross-section	1.5 mm^2 / 0.06 inch^2 / 16 AWG
Rated surge	4 kV
Pollution severity	2
TOP connection technology	Tension clamp or screw connection

Digital Input Modul, 16DI, 24 V DC, Positive Switching (Sinking)

Figure 148: Electronics module XN-16DI-24VDC-P

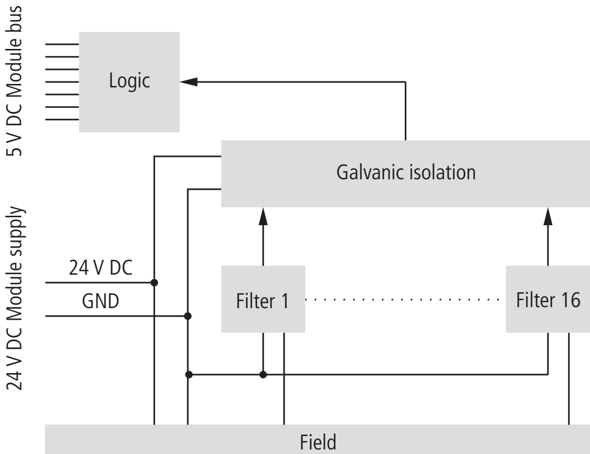
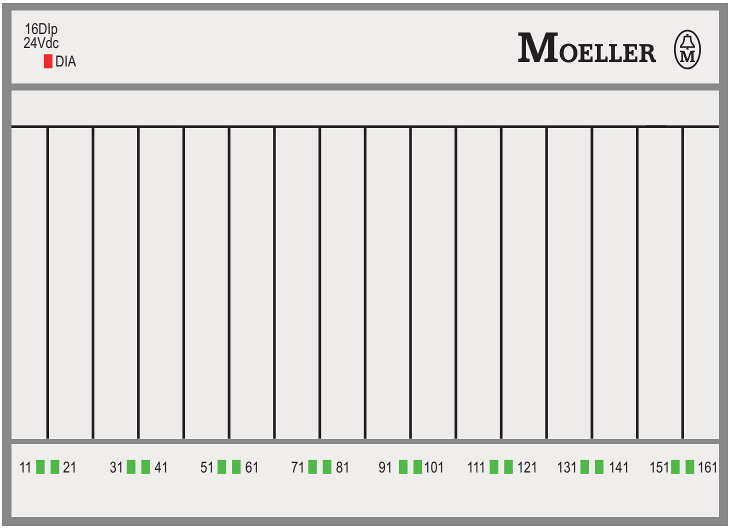


Figure 149: Block diagram

Electronics module

Designation	XN-16DI-24VDC-P
Number of channels	16
Nominal voltage from supply terminal	24 V DC
Nominal current from supply terminal I_{EI}	< 40 mA
Nominal current from module bus I_{MB}	< 45 mA
Power loss of the module, typical	< 2.5 W
Input voltage, nominal value at 24 V DC	
Low level U_L	-30 V to +5 V
High level U_H	15 V to 30 V
Input current	
Low level I_L	0 mA to 1.5 mA
High level I_H	2 mA to 10 mA
Input delay	
t_{rise}	< 200 µs
t_{fall}	< 200 µs

Diagnostic messages



LED	Display	Meaning	Remedy
DIA	Red	Module bus communication failure	Check if more than two adjoining electronics modules have been pulled. Check the power supply to the module bus.
	Off	No error messages or diagnostics	–
11	Green	Status of channel 1 = "1"	–
	Off	Status of channel 1 = "0"	–
21	Green	Status of channel 2 = "1"	–
	Off	Status of channel 2 = "0"	–
31	Green	Status of channel 3 = "1"	–
	Off	Status of channel 3 = "0"	–
. . .			
161	Green	Status of channel 16 = "1"	–
	Off	Status of channel 16 = "0"	–

Module parameters

none

Base module

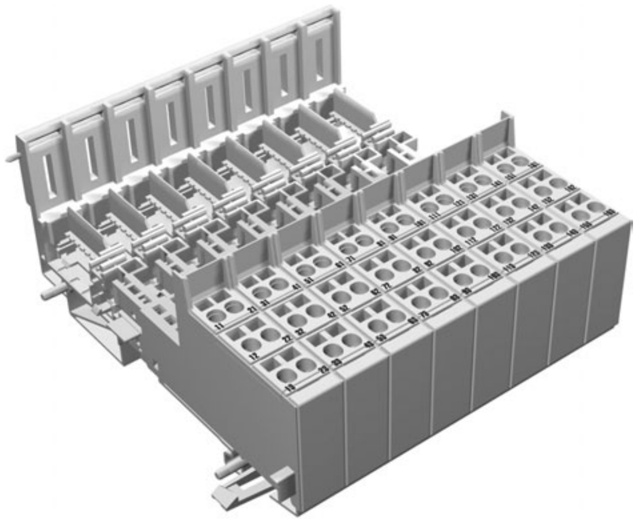


Figure 150: Base module XN-B3T-SBB

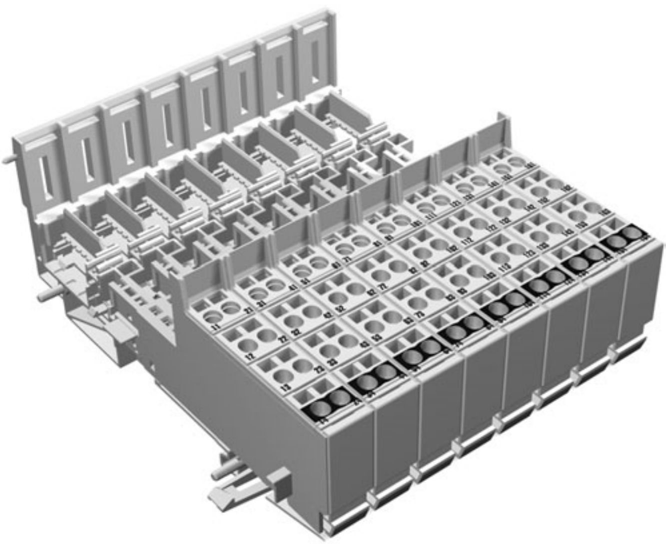


Figure 151: Base module XN-B4T-SBBC

Designation	
with tension clamp connection	XN-B3T-SBB XN-B4T-SBBC
with screw connection	XN-B3S-SBB XN-B4S-SBBC

Wiring diagrams

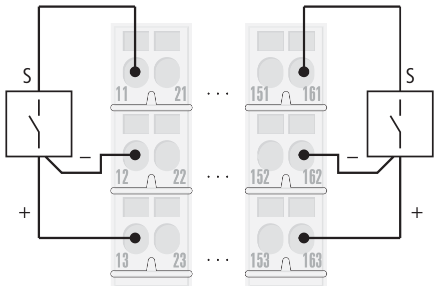


Figure 152: Wiring diagram XN-B3x-SBB

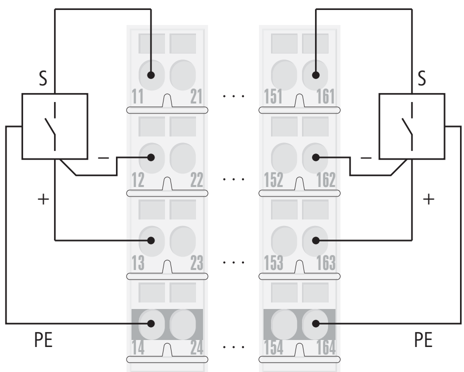


Figure 153: Wiring diagram XN-B4x-SBBC

Measurement data according to VDE 0611 Part 1/8.92/ IEC 947-7-1/1989	
Rated voltage	250 V
Rated current	17.5 A
Rated cross-section	1.5 mm^2 / 0.06 $inch^2$ / 16 AWG
Rated surge	4 kV
Pollution severity	2
TOP connection technology	Tension clamp or screw connection

Analog Input Modules

Analog input modules (AI) detect standard electrical signals at the connections of the base modules, digitalize them and transmit the corresponding measurement values to the gateway via the internal module bus.

The module bus electronics of the analog input modules are galvanically isolated from the field level via an optocoupler. The module provides reverse polarity protection.

Digital input modules are designed in slice technology. They are mounted on to base modules with tension clamp or screw connections.

Supported signal ranges
0 to 20 mA
4 to 20 mA
0 to 10 V DC
-10 to +10 V DC

Connectable sensors
Platinum sensors (PT100, PT200, PT500, PT1000)
Nickel sensors (Ni100, Ni1000)
Thermoelements (types: B, E, J, K, N, R, S, T)

Resolution of analog value representations
In the bipolar operating mode, the digitalized analog values are displayed in the two's-complement representation. A 16 Bit representation (15 Bit plus sign) or a left-justified 12 Bit numerical representation can be set via a parameter bit. The 12 Bit representation covers "Full Range" in the unipolar representation and in the bipolar representation, 11 Bit plus sign.

Resolution	Analog value															
Bit number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
16 Bit representation: signed Integer	VZ	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}
12 Bit representation: signed Integer	VZ	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	X	X	X	X
12 Bit representation: full range	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	X	X	X	X

Sign

The mathematical sign for the analog value is always displayed, if it exists, in 15 Bit representation.

- Bit 15 = "0" → sign = "+"
- Bit 15 = "1" → sign = "-"

Bits marked with an "X" are irrelevant for the representation of analog values.

LED status indicators

Error signals from the I/O level are indicated by each module via the "DIA" LED. The corresponding diagnostic information is transmitted to the gateway via diagnostic bits.

If the "DIA" LED lights up continuously red, it signals the failure of the module bus communication at the digital input module.

Shielding

When using shielded signal cables, the connection between the shield and the base module is made via a two-pole shield connection, which is available as an accessory.

Module overview

	Number of channels
XN-1AI-I(0/4...20MA)	1
XN-1AI-U(-10/0...+10VDC)	1
XN-2AI-PT/NI-2/3	2
XN-2AI-THERMO-PI	2

Analog Input Module, 1AI, 0/4...20 mA

Figure 154: Electronics module XN-1AI-I(0/4...20MA)

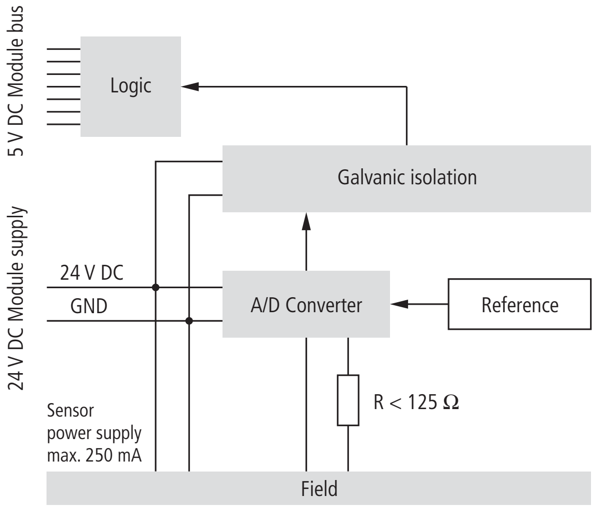
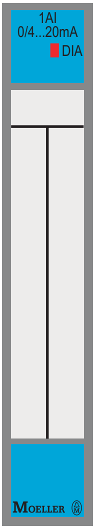


Figure 155: Block diagram

Electronics module

Designation	XN-1AI-I(0/4...20MA)
Number of channels	1
Nominal voltage from supply terminal	24 V DC
Nominal current from supply terminal I_{EI}	$\leqq$ 50 mA
Nominal current from module bus I_{MB}	$\leqq$ 41 mA
Power loss of the module	< 1 W
Input current	0/4 to 20 mA
Max. input current	50 mA
Input resistance (burden)	< 125 Ω
Cutoff frequency (-3 dB)	200 Hz
Offset error	< 0.1 %
Linearity (0.1 mA to 19.9 mA)	0.03 %
Basic error at 23 °C / 73.4 °F	< 0.2 %
Repeat accuracy	0.09 %
Temperature coefficient	$\leqq$ 300 ppm/°C from end value
Resolution of the A/D converter	14 Bit signed integer
Measuring principle	gradual approximation
Measurement value representation	16 Bit signed integer / 12 Bit full range left-justified
Sensor supply	bridged with L+ and L- from the power supply; not short-circuit proof



Diagnostic messages

LED	Display	Meaning	Remedy
DIA	Red, flashing, 0.5 Hz	Diagnostics pending	–
	Red	Module bus communication failure	Check if more than two adjoining electronics modules have been pulled. Check the power supply to the module bus.
	Off	No error messages or diagnostics	–

This module has the following diagnostic data:

- "Messwert-Bereichsfehler"1)
  Indicates an over- or undercurrent of 1 % of the set current range; whereby, undercurrents can only be recognized with those modules that have a set current range of 4 to 20 mA.
  Overcurrent: I_{max} (I > 20.2 mA);
  Undercurrent: I_{min} (I < 3.8 mA)
- "Drahtbruch" 1)
  Indicates an open circuit in the signal line for the operating mode 4 to 20 mA.

1) See "Appendix" for English translation

Module parameters

Parameter name[1]	Value[1]
Werte-Darstellung	Integer (15Bit + Vorzeichen)[2]
	12Bit (linksbuendig)
Strom-Modus	0..20mA[2]
	4..20mA
Diagnose	freigeben[2]
	sperren

1) See “Appendix” for English translation
2) Standard parameter value

Base modules

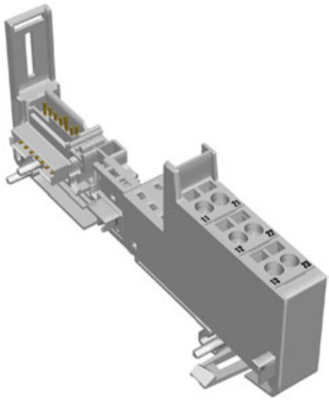


Figure 156: Base module XN-S3T-SBB

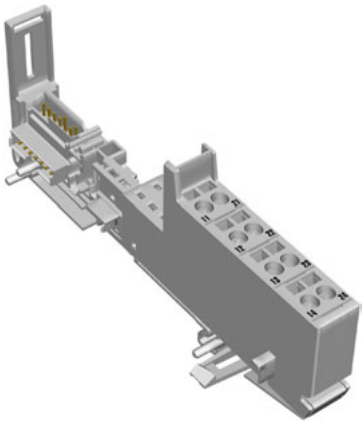


Figure 157: Base module XN-S4T-SBBS

Designation	
with tension clamp connection	XN-S3T-SBB XN-S4T-SBBS
with screw connection	XN-S3S-SBB XN-S4S-SBBS

Wiring diagrams

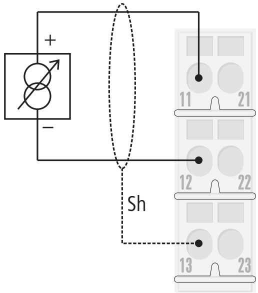


Figure 158: Wiring diagram XN-S3x-SBB analog sensor without sensor supply

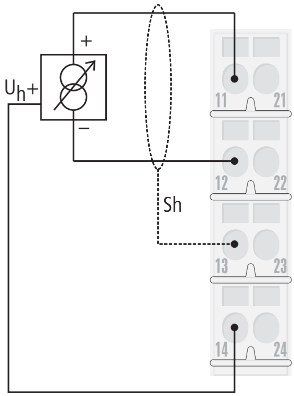


Figure 159: Wiring diagram XN-S4x-SBBS analog sensor with potential-bound sensor supply

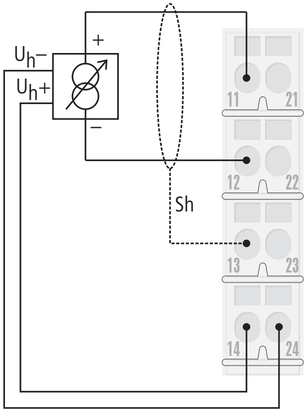


Figure 160: Wiring diagram XN-S4x-SBBS analog sensor with potential-free sensor supply

Measurement data according to VDE 0611 Part 1/8.92/ IEC 947-7-1/1989	
Rated voltage	250 V
Rated current	17.5 A
Rated cross-section	1.5 mm^2 / 0.06 inch^2 / 16 AWG
Rated surge	4 kV
Pollution severity	2
TOP connection technology	Tension clamp or screw connection

Measurement value representation

Table 23: 16 Bit signed integer, full range

Measurement Value		Transmitted Value	
0 to 20 mA	4 to 20 mA	Decimal	Hexadecimal
0.0000 mA	4.0000 mA	0	0000h
0.6104 µA	4.0005 mA	1	0001h
...	...	...	...
9.9997 mA	11.9998 mA	16383	3FFFh
10.0003 mA	12.0002 mA	16384	4000h
10.0009 mA	12.0007 mA	16385	4001h
...	...	...	...
19.9999 mA	19.9999 mA	32766	7FFEh
20.0000 mA	20.0000 mA	32767	7FFFh

Table 24: 12 Bit left-justified

Measurement Value		Transmitted Value	
0 to 20 mA	4 to 20 mA	Decimal	Hexadecimal
0.0000 mA	4.0000 mA	0	0000h
0.00488 mA	4.00391 mA	16	0010h
...	...	...	...
9.9976 mA	11.9981 mA	32752	7FF0h
10.0024 mA	12.0020 mA	32768	8000h
10.0073 mA	12.0059 mA	32784	8010h
...	...	...	...
19.9951 mA	19.9961 mA	65504	FFE0h
20.0000 mA	20.0000 mA	65520	FFF0h

Analog Input Module, 1AI, -10/0...+10V DC

Figure 161: Electronics module XN-1AI-U(-10/0...+10VDC)

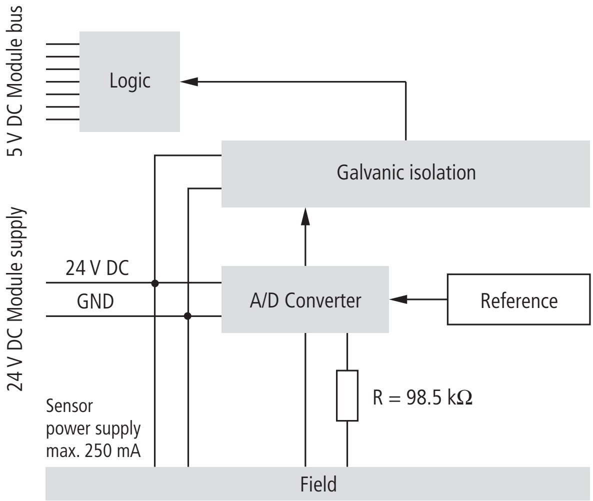
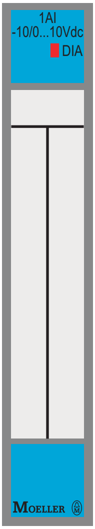


Figure 162: Block diagram

Electronics module

Designation	XN-1AI-U(-10/0...+10V DC)
Number of channels	1
Nominal voltage from supply terminal	24 V DC
Nominal current from supply terminal I_{EI}	≦ 50 mA
Nominal current from module bus I_{MB}	≦ 41 mA
Power loss of the module	< 1 W
Input voltage	-10/0 to +10 V
Maximum input voltage	35 V continuous
Input resistance	98.5 kΩ
Cutoff frequency (-3 dB)	200 Hz
Offset error	< 0.1 %
Linearity	0.03 %
Basic error at 23 °C / 73.4 °F	< 0.2 %
Repeat accuracy	0.05 %
Temperature coefficient	≦ 300 ppm/°C from end value
Resolution of the A/D converter	14 Bit signed integer
Measuring principle	gradual approximation
Measurement value representation	16 Bit signed integer / 12 Bit signed integer left-justified/ 12 Bit full range left-justified
Sensor supply	bridged with L+ and L- from the power supply; not short-circuit proof



Diagnostic messages

LED	Display	Meaning	Remedy
DIA	Red, flashing, 0.5 Hz	Diagnostics pending	–
	Red	Module bus communication failure	Check if more than two adjoining electronics modules have been pulled. Check the power supply to the module bus.
	Off	No error messages or diagnostics	–

This module has the following diagnostic data:

- "Messwert-Bereichsfehler"[1]
  indicates an over- or undervoltage of 1% of the set voltage range.
  Overvoltage: U_{max} (U > 10.1 V);
  Undervoltage: U_{min} (U < -10.1 V) at -10 to +10 V
  U_{min} (U < -0.1 V) at 0 to 10 V

Module parameters

Parameter name[1]	Value[1]
Werte-Darstellung	Integer (15Bit + Vorzeichen)[2]
	12Bit (linksbuendig)
Spannungs-Modus	-10..+10V
	0..10V[2]
Diagnose	freigeben[2]
	sperren

1) See "Appendix" for English translation
2) Standard parameter value

Base modules

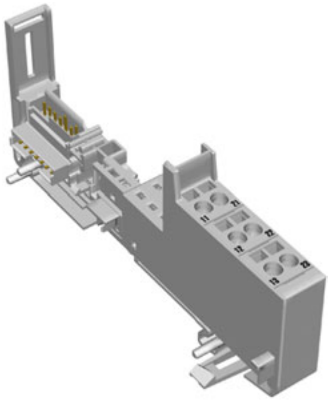


Figure 163: Base module XN-S3T-SBB

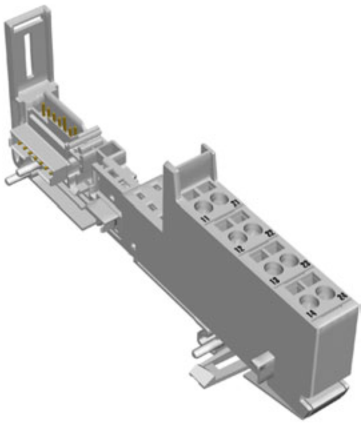


Figure 164: Base module XN-S4T-SBBS

Designation	
with tension clamp connection	XN-S3T-SBB XN-S4T-SBBS
with screw connection	XN-S3S-SBB XN-S4S-SBBS

Wiring diagrams

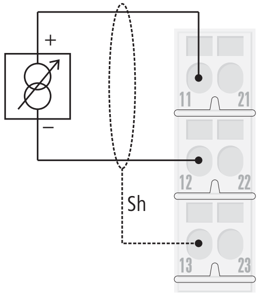


Figure 165: Wiring diagram XN-S3x-SBB analog sensor without sensor supply

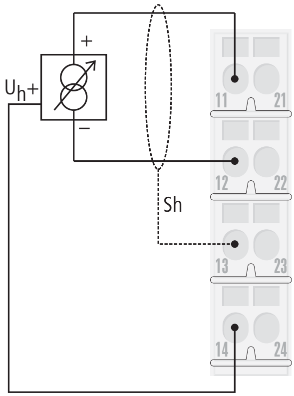


Figure 166: Wiring diagram XN-S4x-SBBS analog sensor with potential-bound sensor supply

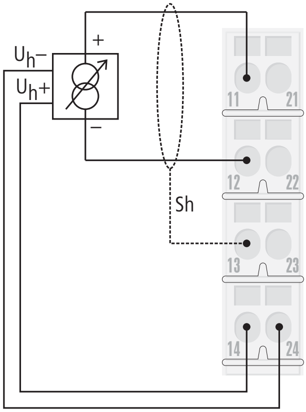


Figure 167: Wiring diagram XN-S4x-SBBS analog sensor with potential-free sensor supply

Measurement data according to VDE 0611 Part 1/8.92/ IEC 947-7-1/1989	
Rated voltage	250 V
Rated current	17.5 A
Rated cross-section	1.5 mm^2 / 0.06 inch^2 / 16 AWG
Rated surge	4 kV
Pollution severity	2
TOP connection technology	Tension clamp or screw connection

Measurement value representation

Table 25: 16 Bit signed integer, full range

Measurement Value	Transmitted Value		Measurement Value	Transmitted Value	
0 to 10 V	Decimal	Hexadecimal	-10 to +10 V	Decimal	Hexadecimal
0.0000 V	0	0000h	-10.0000 V	-32768	8000h
0.3052 mV	1	0001h	-9.9997 V	-32767	8001h
...	...	...	...	...	...
4.9999 V	16383	3FFFh	-305.185 µV	-1	FFFFh
5.0002 V	16384	4000h	0 V	0	0000h
5.0005 V	16385	4001h	305.185 µV	1	0001h
...	...	...	...	...	...
9.9997 V	32766	7FFEh	9.9997 V	32766	7FFEh
10.0000 V	32767	7FFFh	10.0000 V	32767	7FFFh

Table 26: 12 Bit left-justified

Measurement Value	Transmitted Value		Measurement Value	Transmitted Value	
0 to 10 V	Decimal	Hexadecimal	-10 to +10 V	Decimal	Hexadecimal
0.0000 V	0	0000h	-10.0000 V	-32768	8000h
0.00244 V	16	0010h	-9.9951 V	-32752	8010h
...	...	...	...	...	...
4.9988 V	32752	7FF0h	-4.8852 mV	-16	FFF0h
5.0012 V	32753	8000h	0 V	0	0000h
5.0037 V	32754	8010h	4.8852 mV	16	0010h
...	...	...	...	...	...
9.99512 V	65504	FFE0h	9.9951 V	32736	7FE0h
10.0000 V	65520	FFF0h	10.0000 V	32752	7FF0h

Analog Input Module, 2AI, PT-/NI-Sensors

Figure 168: Electronics module XN-2AI-PT/NI-2/3

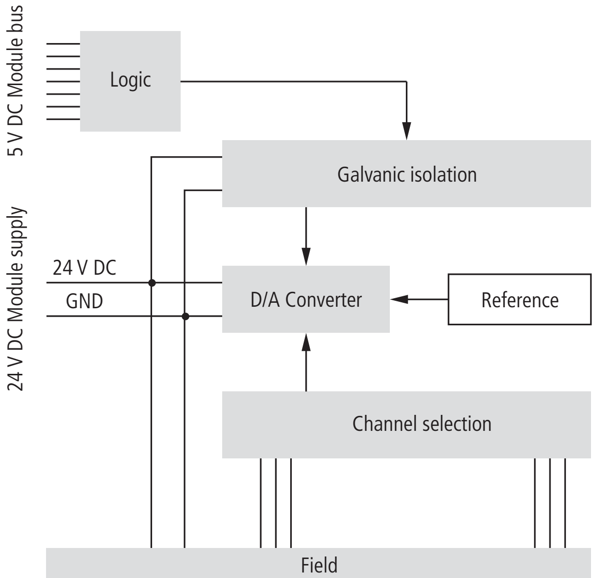
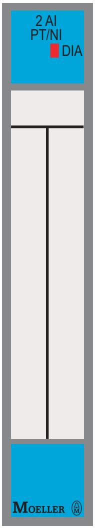


Figure 169: Block diagram

Electronics module

Designation	XN-2AI-PT/NI-2/3
Number of channels	2
Nominal voltage from supply terminal	24 V DC
Nominal current from supply terminal I_{EI}	< 30 mA
Nominal current from module bus I_{MB}	≦ 45 mA
Power loss of the module, typical	< 1 W
Measurement current	< 1 mA
Destruction limit	> 30 V DC
Platinum sensors	according to DIN IEC 751
Nickel sensors	according to DIN 43760
Measurement value representation	16 Bit signed integer / 12 Bit full range left-justified
Offset error	≦ 0.1 %
Linearity	< 0.1 %
Basic error at 23 °C / 73.4 °F	< 0.2 %
Repeat accuracy	0.05 %
Temperature coefficient	≦ 300 ppm/°C from end value
Cycle time	≦ 130 ms per channel
Connectable sensors	
Platinum sensors	PT100, PT200, PT500, PT1000
Nickel sensors	Ni100, Ni1000

Diagnostic messages



LED	Display	Meaning	Remedy
DIA	Red, flashing, 0.5 Hz	Diagnostics pending	–
	Red	Module bus communication failure	Check if more than two adjoining electronics modules have been pulled. Check the power supply to the module bus.
	Off	No error messages or diagnostics	–

This module has the following diagnostic data:

- Messwert-Bereichsfehler[1) 2)]
  Underflow diagnostic in the temperature measurement range only
- Drahtbruch
- Kurzschluss
  (only with temperature measurements)[3)]

1) See “Appendix” for English translation

2) Threshold: 1 % of positve measurement range end value

3) Threshold: 5 Ω (loop resistance)

3-wire measurements with PT100 sensors cannot differentiate between a short-circuit and an open circuit at temperatures below -177 °C. In this case, the diagnostic “short-circuit” is generated.

Module parameters (per channel)

Parameter name[1)]	Value[1)]
Netzunterdrueckung	50Hz[2)] 60Hz
Werte-Darstellung	Integer (15Bit + Vorzeichen)[2)] 12Bit (linksbuendig)
Diagnose	freigeben[2)] sperren
Kanal	aktivieren[2)] deaktivieren
Element	PT100, -200..850°C[2)] 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 Widerstand, 0..100Ω Widerstand, 0..200Ω Widerstand, 0..400Ω Widerstand, 0..1000Ω
Messbetriebsart	2-Leiter[2)] 3-Leiter

1) See “Appendix” for English translation

2) Standard parameter value

Base modules

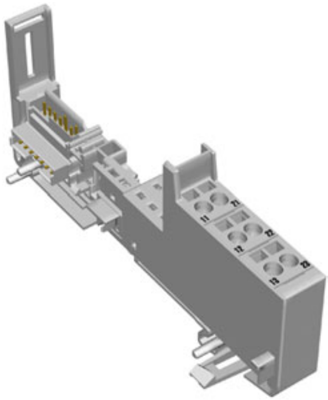


Figure 170: Base module XN-S3T-SBB (only 2-wire measurement possible)

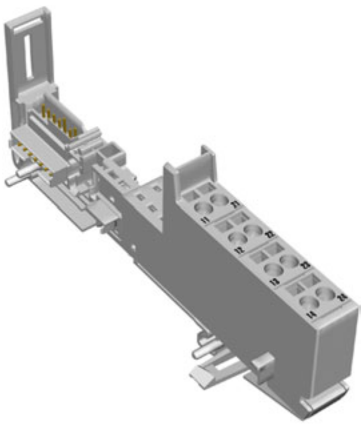


Figure 171: Base module XN-S4T-SBBS (also 3-wire measurment possible)

Designation	
with tension clamp connection	XN-S3T-SBB (2-wire measurement) XN-S4T-SBBS (3-wire measurement)
with screw connection	XN-S3S-SBB (2-wire measurement) XN-S4S-SBBS (also 3-wire measurement)

Wiring diagrams

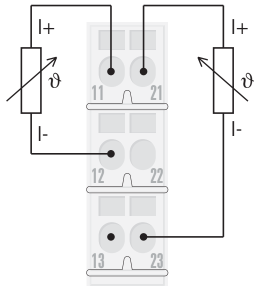


Figure 172: Wiring diagram XN-S3x-SBB (2-wire measurement)

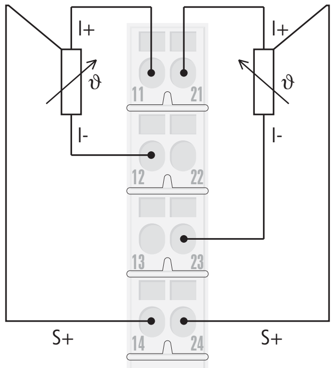


Figure 173: Wiring diagram XN-S4x-SBBS (3-wire measurement)

Measurement data according to VDE 0611 Part 1/8.92/ IEC 947-7-1/1989	
Rated voltage	250 V
Rated current	17.5 A
Rated cross-section	1.5 mm^2 / 0.06 $inch^2$ / 16 AWG
Rated surge	4 kV
Pollution severity	2
TOP connection technology	Tension clamp or screw connection

Measurement value representation
Resistance ranges

Table 27: 16 Bit signed integer, full range

Measurement Value				Transmitted Value	
0 to 100 Ω	**0 to 200 Ω**	**0 to 400 Ω**	**0 to 1000 Ω**	**Decimal**	**Hexadecimal**
0 Ω	0 Ω	0 Ω	0 Ω	0	0000h
0.003 Ω	0.006 Ω	0.012 Ω	0.031	1	0001h
...	...	...	...	...	...
99.997 Ω	199.994 Ω	399.988 Ω	999.969Ω	32766	7FFEh
100 Ω	200 Ω	400 Ω	1000 Ω	32767	7FFFh

Table 28: 12 Bit *WIN* bloc compatible, full range, left-justified

Measurement Value				Transmitted Value	
0 to 100 Ω	**0 to 200 Ω**	**0 to 400 Ω**	**0 to 1000 Ω**	**Decimal**	**Hexadecimal**
0 Ω	0 Ω	0 Ω	0 Ω	0	0000h
0.024 Ω	0.049 Ω	0.098 Ω	0.244	16	0010h
...	...	...	...	...	...
99.976 Ω	199.951 Ω	399.902 Ω	999.756 Ω	65504	FFE0h
100 Ω	200 Ω	400 Ω	1000 Ω	65550	FFF0h

Temperature ranges (NI/PT)

Table 29: 16 Bit signed integer, full range (open), resolution: 0.1°C/digit

Measurement Value°C	Transmitted Value	
	Decimal	Hexadecimal
-200	-2000	F830h
-199.9	-1999	F831h
...	...	...
-60	-600	FDA8h
-59.9	-599	FDA9h
...	...	...
-0.1	-1	FFFFh
0	0	0000h
0.1	1	0001h
...	...	...
249.9	2499	09C3h
250.0	2500	09C4h
...	...	...
849,9	8499	2133h
850	8500	2134h

Table 30: 16 Bit signed integer, full range (climate), resolution: 0.1°C/digit

Measurement Value°C	Transmitted Value	
	Decimal	Hexadecimal
-200	-20000	B1E0h
-199.99	-19999	B1E1h
...	...	...
-60	-6000	E890h
-59.99	-5999	E891h
...	...	...
-0.01	-1	FFFFh

Measurement Value°C	Transmitted Value	
	Decimal	Hexadecimal
0	0	0000h
0.01	1	0001h
...	...	...
149.99	14999	3A97h
150	15000	3A98h

Table 31: 12 Bit *WIN* bloc compatible, full range, left-justified (open), resolution: 0.5°C/digit

Measurement Value°C	Transmitted Value	
	Decimal	Hexadecimal
-200	-6400	E700h
-199.5	-6384	E710h
...	...	...
-60	-1920	F880h
-59.5	-1904	F890h
...	...	...
-0.5	-16	FFF0h
0	0	0000h
0.5	16	0010h
249.5	7984	1F30h
250.0	8000	1F40h
...	...	...
849.5	27184	6A30h
850	27200	6A40h

Table 32: 12 Bit *WIN* bloc compatible, full range, left-justified (climate), resolution: 0.1°C/digit

Measurement Value°C	Transmitted Value	
	Decimal	Hexadecimal
-200	-32000	8300h
-199.9	-31984	8310h
...	...	...
-60	-9600	DA80h
-59.9	-9584	DA90h
...	...	...
-0.1	-16	FFF0h
0	0	0000h
0.1	16	0010h
...	...	...
149.9	23984	5DB0h
150.0	24000	5DC0h

Analog Input Module, 2AI, Thermocouple

Figure 174: Electronics module XN-2AI-THERMO-PI

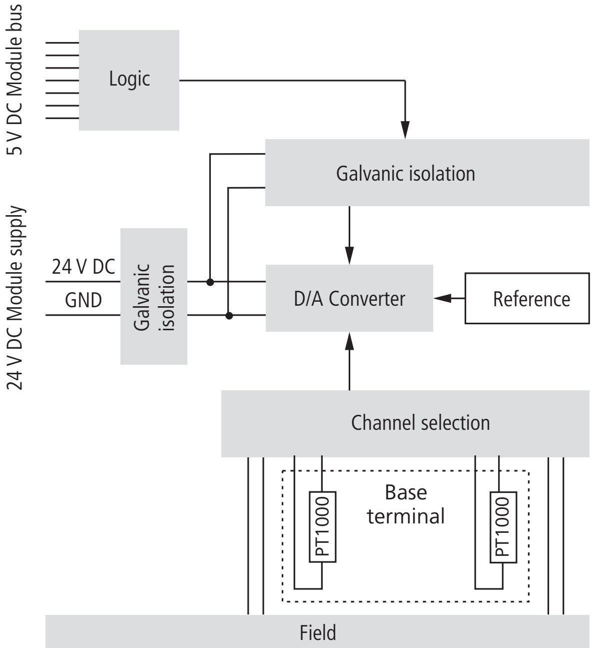


Figure 175: Block diagram

Electronics module

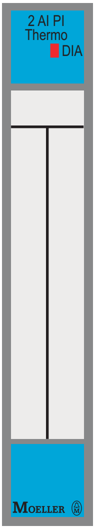
Designation	XN-2AI-THERMO-PI
Number of channels	2
Nominal voltage from supply terminal	24 V DC
Nominal current from supply terminal I_{EI}	< 30 mA
Nominal current from module bus I_{MB}	≦ 45 mA
Power loss of the module	< 1 W
Destruction limit	≧ 10 V DC (continuous)
Sensors	according to DIN IEC 584, class 1, 2, 3
Temperature ranges	
Type B	100 to 1820.0 °C
Type E	-270 to 1000.0 °C
Type J	-210 to 1200.0 °C
Type K	-270 to 1370.0 °C
Type N	-270 to 1300.0 °C
Type R	-50 to 1760.0 °C
Type S	-50 to 1540.0 °C
Type T	-270 to 400.0 °C
Voltage measurements (resolution)	
± 50 mV	< 2 µV
± 100 mV	< 4 µV
± 500 mV	< 20 µV
± 1 V	< 50 µV
Measurement value representation	16 Bit signed integer / 12 Bit full range left-justified
Basic error at 23 °C / 73.4 °F	Please refer to Table 33 below

Crosstalk suppression	≧ 80 dB
Repeat accuracy	Please refer to Table 33 below
Temperature coefficient	≦ 300 ppm/°C from end value
Cycle time	Voltage measurement: 70 ms/channel Temperature measurement: 130 ms/channel

Table 33: Basic errors and repeat accuracies

Thermocouple	**Temperature range / °C**	**Basic error at 23°C / % of positive end value**	**Repeat accuracy/ % of positive end value**	**Error due to cold junction compensation/ % of positive end value**[1)]
Type K	-200...1370	0.2	0.05	0.15
Type J	-210...1200	0.2	0.05	0.17
Type B	300...1820	0.2	0.05	0.11
Type N	-150...1300	0.2	0.05	0.16
Type E	-180...1000	0.2	0.05	0.20
Type R	-50...1760	0.2	0.05	0.12
Type S	-50...1540	0.2	0.05	0.13
Type T	-200...0 0...400	0.6 0.2	0.1 0.075	– 0.50
Voltage measurement	all measurement ranges	0.2	0.05	–

1) Wider deviations of the cold junction comensation are to be expected by negative measurement temperatures.



Diagnostic messages

LED	Display	Meaning	Remedy
DIA	Red, flashing, 0.5 Hz	Diagnostics pending	–
	Red	Module bus communication failure	Check if more than two adjoining electronics modules have been pulled. Check the power supply to the module bus.
	Off	No error messages or diagnostics	–

The module has the following diagnostic data available per channel:

- Messwert-Bereichsfehler[1)] [2)]
- Drahtbruch[1)]
  (only with temperature measurements)

1) See "Appendix" for English translation

2) Threshold: 1 % of positive measurement range end value

→ The diagnostic "Underflow" is generated by the sensor types K, N and T when the temperature falls below -271.6 °C.

Module parameters (per channel)

Parameter name[1]	Value[1]
Netzunterdrueckung	50Hz[2] 60Hz
Diagnose	freigeben[2] sperren
Werte-Darstellung	Integer (15Bit + Vorzeichen)[2] 12Bit (linksbuendig)
Kanal	aktivieren[2] deaktivieren
Element	Typ K, -270..1370°C[2] Typ B, +100...1820°C Typ E, -270..1000°C Typ J, -210..1200°C Typ N, -270..1300°C Typ R, -50..1760°C Typ S, -50..1540°C Typ T, -270..400°C +/-50mV +/-100mV +/-500mV +/-1000mV

1) See "Appendix" for English translation
2) Standard parameter value

Base modules

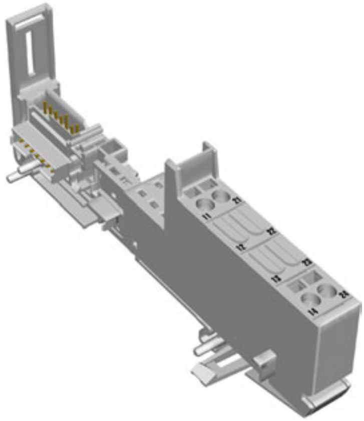


Figure 176: Base module XN-S4T-SBBS-CJ

Designation	
with tension clamp connection	XN-S4T-SBBS-CJ
with screw connection	XN-S4S-SBBS-CJ

Wiring diagram

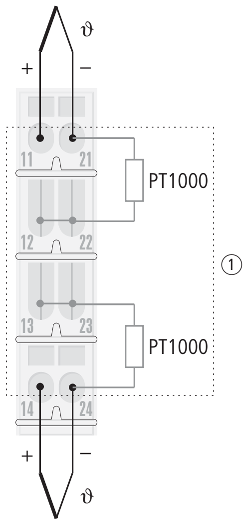


Figure 177: Wiring diagram XN-S4x-SBBS-CJ

① Cold junction compensation in the base module

Measurement data according to VDE 0611 Part 1/8.92/ IEC 947-7-1/1989	
Rated voltage	250 V
Rated current	17.5 A
Rated cross-section	1.5 mm^2 / 0.06 $inch^2$ / 16 AWG
Rated surge	4 kV
Pollution severity	2
TOP connection technology	Tension clamp or screw connection

Measurement value representation

Table 34: Temperature ranges, 16 Bit signed integer, full range, resolution 0.1°C/digit

Measurement Value/ °C	Transmitted Value	
	Decimal	Hexadecimal
-270	-2700	F574
-269.9	-2699	F575
-210	-2100	F7CC
-209.9	-2099	F7CD
-50	-500	FE0C
-0.1	-1	FFFF
0	0	0000
0.1	1	0001
399.9	3999	0F9F
400	4000	0FA0
999.9	9999	270F
1000	10000	2710
1199.9	11999	2EDF
1200	12000	2EE0
1299.9	12999	32C7
1300	13000	32C8
1369.9	13699	3583
1370	13700	3584
1539.9	15399	3C27
1540	15400	3C28
1759.9	17599	44BF
1760	17600	44C0
1819.9	18199	4717
1820	18200	4718

Table 35: 12 Bit left-justified *WIN* bloc compatible, left-justified, resolution 1.0°C/digit

Measurement Value/ °C	Transmitted Value	
	Decimal	Hexadecimal
-270	-4320	EF20
-269	-4304	EF30
-210	-3360	F2E0
-209	-3344	F2F0
-50	-800	FCE0
-49	-784	FCF0
-1	-16	FFF0
0	0	0000
1	16	0010
399	6384	18F0
400	6400	1900
999	15984	3E70
1000	16000	3E80
1199	19184	4AF0
1200	19200	4B00
1299	20784	5130
1300	20800	5140
1369	21904	5590
1370	21920	55A0
1539	24624	6030
1540	24640	6040
1759	28144	6DF0
1760	28160	6E00
1819	29104	71B0
1820	29120	71C0

Voltage measurement ranges

Table 36: 16 Bit signed integer, full range

Measurement Value/ mV				Transmitted Value	
Range / mV: 50	Range / mV: 100	Range / mV: 500	Range / mV: 1000	Decimal	Hexadecimal
-50.000	-100.000	-500.000	-1000.000	-32768	0x8000
-49.998	-99.997	-499.985	-999.969	-32767	0x8001
-0.002	-0.003	-0.015	-0.031	-1	0xFFFF
0.000	0.000	0.000	0.000	0	0x0000
0.002	0.003	0.015	0.031	1	0x0001
49.998	99.997	499.985	999.969	32766	0x7FFE
50.000	100.000	500.000	1000.000	32767	0x7FFF

Table 37: 12 Bit *WIN*bloc compatible, left-justified

Measurement Value/ mV				Transmitted Value	
Range / mV: 50	Range / mV: 100	Range / mV: 500	Range / mV: 1000	Decimal	Hexadecimal
-50.000	-100.000	-500.000	-1000.000	-32768	0x8000
-49.976	-99.951	-499.756	-999.512	-32752	0x8010
-0.024	-0.049	-0.244	-0.488	-16	0xFFF0
0.000	0.000	0.000	0.000	0	0x0000
0.024	0.049	0.244	0.488	16	0x0010
49.976	99.951	499.756	999.511	32736	0x7FE0
50.000	100.000	500.000	1000.000	32752	0x7FF0

Digital Output Modules

Digital output modules (DO) receive output values from the gateway via the internal module bus. The modules convert these values and transmit the corresponding high or low level signals for each channel to the field level via the base modules.

The outputs are rated according to EN 61131-2 Type 2.

The module bus electronics of the digital output modules are galvanically isolated from the field level via an optocoupler.

Digital input modules are designed in slice technology. They are mounted on to base modules with tension clamp or screw connections.

LED status indicators

Channel statuses are indicated by LEDs. Error signals from the I/O level are indicated by each module via the “DIA” LED. The corresponding diagnostic information is transmitted to the gateway via diagnostic bits.

If the “DIA” LED lights up continuously red, it signals the failure of the module bus communication of the digital output module.

Attention!
An external suppressor should be planned for inductive loads.

Module overview

	Number of channels	Positive switching	Output current, max.	Galvanically isolated
XN-2DO-24VDC-0.5A-P	2	✓	0.5 A	✓
XN-2DO-24VDC-0.5A-N	2		0.5 A	✓
XN-2DO-24VDC-2A-P	2	✓	2 A	✓
XN-16DO-24VDC-0.5A-P	16	✓	0.5 A	✓

Digital Output Module, 2DO, 0.5 A, Galvanically Isolated, Positive Switching (Sourcing)

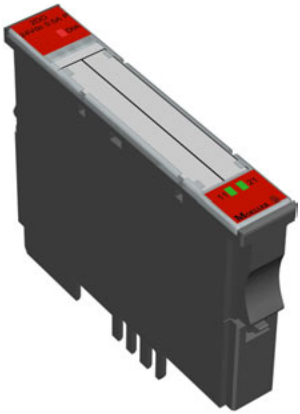


Figure 178: Electronics module XN-2DO-24VDC-0.5A-P

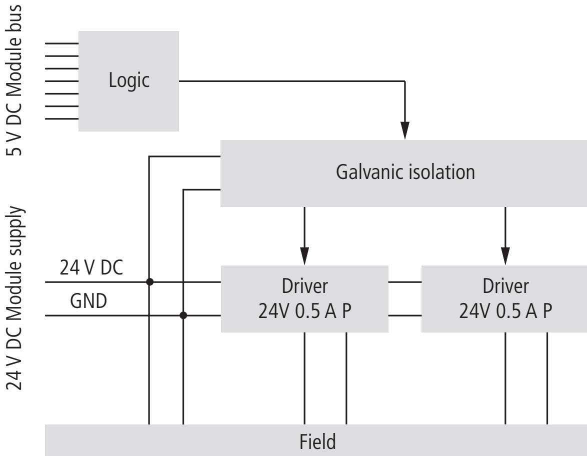
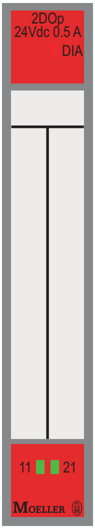


Figure 179: Block diagram

Electronics module

Designation	XN-2DO-24VDC-0.5A-P
Number of channels	2
Nominal voltage from supply terminal	24 V DC
Nominal current from supply terminal I_{EI}	20 mA (when load current = 0)
Nominal current from module bus I_{MB}	$\leqq$ 32 mA
Power loss of the module, typical	< 1 W
Output voltage (loaded)	
High level U_H	min. L+ (-1 V)
Output current	
High level I_H (nominal)	0.5 A
High level I_H (permissible range)	< 0.6 A
Delay at signal change and resistive load	
From low to high level	< 100 µs
From high to low level	< 100 µs
Load impedance range	48 Ω to 1 kΩ
Synchronization factor	100 %
Resistive, inductive and lamp loads can be connected	
Load impedance, resistive R_{LO}	min. 48 Ω
Load impedance , inductive R_{LI}	max. 1.2 H
Lamp load R_{LL}	max. 3 W
Switching frequency	
Resistive load	5 kHz (R_{LO} < 1 kΩ)
Lamp load	10 Hz
Short-circuit proof	according to EN 61131
Overload proof	according to EN 61131



Diagnostic messages

LED	Display	Meaning	Remedy
DIA	Red, flashing, 0.5 Hz	Diagnostics pending	–
	Red	Module bus communication failure	Check if more than two adjoining electronics modules have been pulled. Check the power supply to the module bus.
	Off	No error messages or diagnostics	–
11	Green	Status of channel 1 = "1"	–
	Off	Status of channel 1 = "0"	–
21	Green	Status of channel 2 = "1"	–
	Off	Status of channel 2 = "0"	–

The module has the following diagnostic data available per channel:

- "Ueberstrom"[1)] (short-circuit)

1) See "Appendix" for English translation

Module parameters

None

Base modules

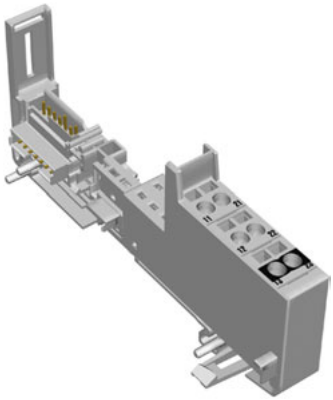


Figure 180: Base module XN-S3T-SBC

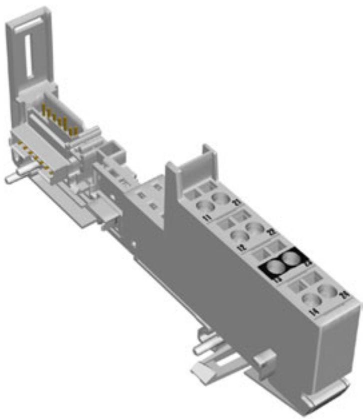


Figure 181: Base module XN-S4T-SBCS

Designation	
with tension clamp connection	XN-S3T-SBC XN-S4T-SBCS
with screw connection	XN-S3S-SBC XN-S4S-SBCS

Wiring diagrams

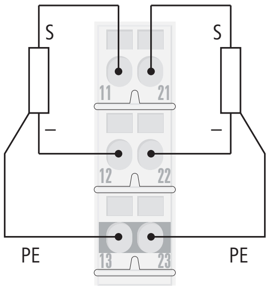


Figure 182: Wiring diagram XN-S3x-SBC

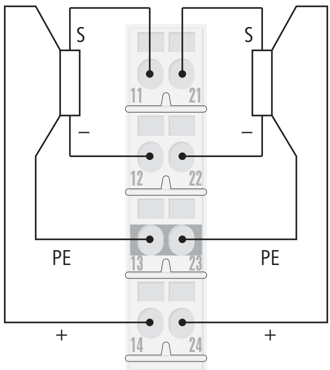


Figure 183: Wiring diagram XN-S4x-SBCS

Measurement data according to VDE 0611 Part 1/8.92/ IEC 947-7-1/1989	
Rated voltage	250 V
Rated current	17.5 A
Rated cross-section	1.5 mm^2 / 0.06 inch^2 / 16 AWG
Rated surge	4 kV
Pollution severity	2
TOP connection technology	Tension clamp or screw connection

Digital Output Module, 2DO, 0.5 A, Galvanically Isolated, Negative Switching (Sinking)

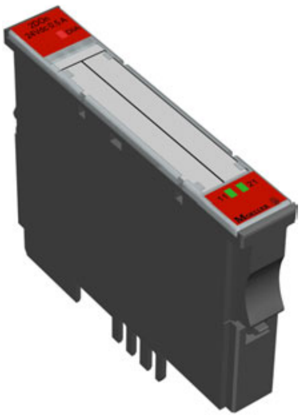


Figure 184: Electronics module XN-2DO-24VDC-0.5A-N

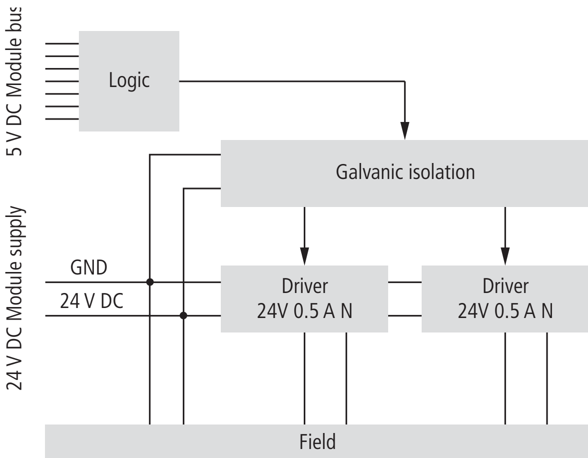
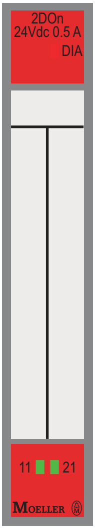


Figure 185: Block diagram

Electronics module

Designation	XN-2DO-24VDC-0.5A-N
Number of channels	2
Nominal voltage from supply terminal	24 V DC
Nominal current from supply terminal I_{EI}	20 mA (when load current = 0)
Nominal current from module bus I_{MB}	≦ 32 mA
Power loss of the module, typical	< 1 W
Output voltage loaded	
Active level U_A	max. GND +1 V
Output current	
Active level I_A (nominal value)	0.5 A
Active level I_A (permissible range)	< 0.6 A
Delay at signal change and resistive load (R_{LO} < 1 kΩ)	
From inactive to active level	< 100 µs
From active to inactive level	< 100 µs
Synchronization factor	100 %
Resistive, inductive and lamp loads can be connected	
Load impedance, resistive R_{LO}	min. 48 Ω
Load impedance , inductive R_{LI}	max. 1.2 H
Lamp load R_{LL}	max. 12 W
Switching frequency	
Resistive load	100 Hz (R_{LO} < 1 kΩ)
Inductive load resistance	2 Hz
Lamp load	10 Hz
Short-circuit proof	according to EN 61 131-2 automatic restart after disconnecting the load and eliminating the reason for the short-circuit



Diagnostic messages

LED	Display	Meaning	Remedy
DIA	Red, flashing, 0.5 Hz	Diagnostics pending	–
	Red	Module bus communication failure	Check if more than two adjoining electronics modules have been pulled. Check the power supply to the module bus.
	Off	No error messages or diagnostics	–
11	Green	Status of channel 1 = "1"	–
	Off	Status of channel 1 = "0"	–
21	Green	Status of channel 2 = "1"	–
	Off	Status of channel 2 = "0"	–

The module has the following diagnostic data available per channel:

- "Ueberstrom"[1)] (short-circuit)

1) See "Appendix" for English translation

Module parameters

None

Base modules

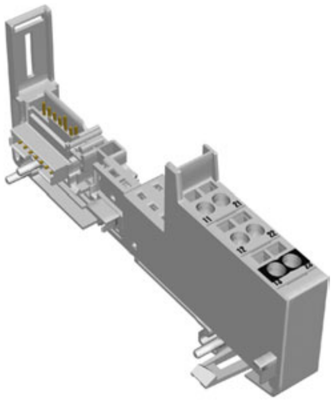


Figure 186: Base module XN-S3T-SBC

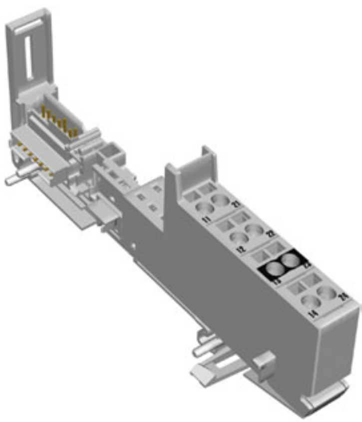


Figure 187: Base module XN-S4T-SBCS

Designation	
with tension clamp connection	XN-S3T-SBC XN-S4T-SBCS
with screw connection	XN-S3S-SBC XN-S4S-SBCS

Wiring diagrams

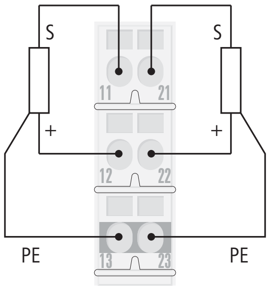


Figure 188: Wiring diagram XN-S3x-SBC

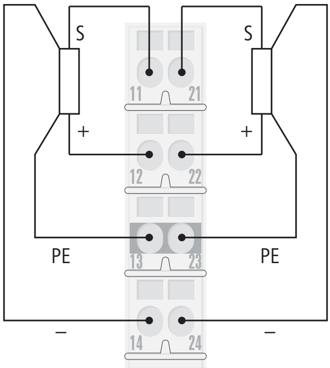


Figure 189: Wiring diagram XN-S4x-SBCS

Measurement data according to VDE 0611 Part 1/8.92/ IEC 947-7-1/1989	
Rated voltage	250 V
Rated current	17.5 A
Rated cross-section	1.5 mm^2 / 0.06 $inch^2$ / 16 AWG
Rated surge	4 kV
Pollution severity	2
TOP connection technology	Tension clamp or screw connection

Digital Output Module, 2DO, 2 A, Galvanically Isolated, Positive Switching (Sourcing)

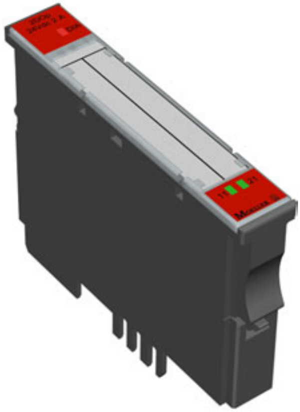


Figure 190: Electronics module XN-2DO-24VDC-2A-P

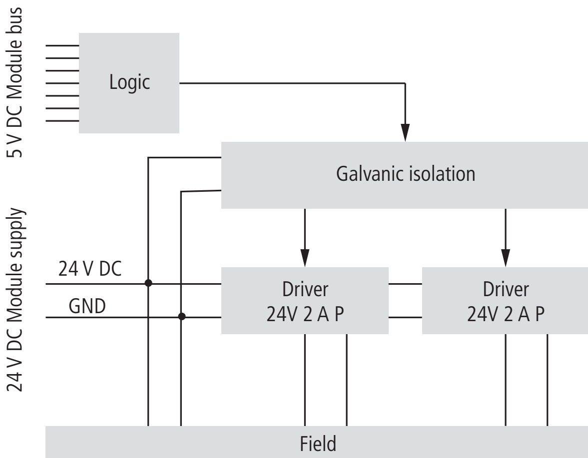
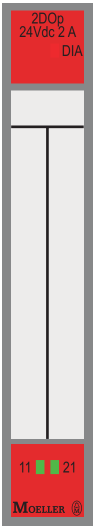


Figure 191: Block diagram

Electronics module

Designation	XN-2DO-24VDC-2A-P
Number of channels	2
Nominal voltage from supply terminal	24 V DC
Nominal current from supply terminal I_{EI}	< 50 mA (when load current = 0)
Nominal current from module bus I_{MB}	≦ 33 mA
Power loss of the module, typical	< 1 W
Output voltage loaded	
High level U_H	min. L+ (-1 V)
Output current	
High level I_H (nominal)	2 A
High level I_H (permissible range)	< 2.4 A
High level (inductive load)	max. 1 A at 1.2 H
Delay at signal change and resisitive load	
From low to high level	< 100 µs
From high to low level	< 100 µs
Load impedance range	12 Ω to 1 kΩ
Synchronization factor	100 %
Resistive, inductive and lamp loads can be connected	
Load impedance, resistive R_{LO}	min. 12 Ω
Load impedance, inductive R_{LI}	max. 1.2 H
Lamp load R_{LL}	max. 6 W
Switching frequency	
Resistive load	5 kHz (R_{LO} < 1 kΩ)
Lamp load	10 Hz
Short-circuit proof	according to EN 61 131
Overload proof	according to EN 61 131

Diagnostic messages



LED	Display	Meaning	Remedy
DIA	Red, flashing, 0.5 Hz	Diagnostics pending	–
	Red	Module bus communication failure	Check if more than two adjoining electronics modules have been pulled. Check the power supply to the module bus.
	Off	No error messages or diagnostics	–
11	Green	Status of channel 1 = "1"	–
	Off	Status of channel 1 = "0"	–
21	Green	Status of channel 2 = "1"	–
	Off	Status of channel 2 = "0"	–

The module has the following diagnostic data available per channel:

- "Ueberstrom"[1)] (short-circuit)

1) See "Appendix" for English translation

Module parameters

None

Base modules

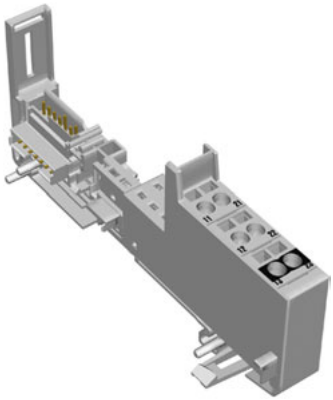


Figure 192: Base module XN-S3T-SBC

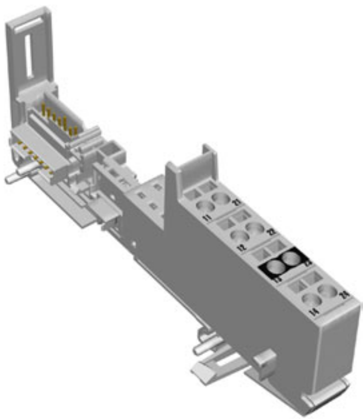


Figure 193: Base module XN-S4T-SBCS

Designation	
with tension clamp connection	XN-S3T-SBC XN-S4T-SBCS
with screw connection	XN-S3S-SBC XN-S4S-SBCS

Wiring diagrams

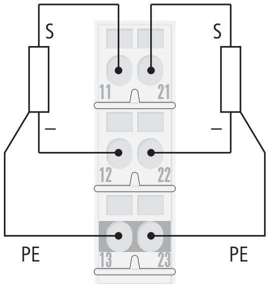


Figure 194: Wiring diagram XN-S3x-SBC

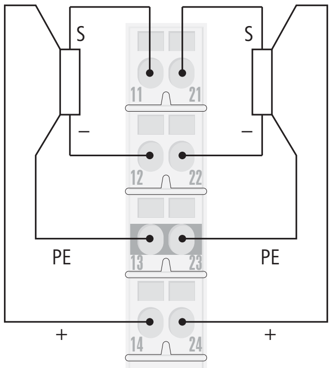


Figure 195: Wiring diagram XN-S4x-SBCS

Measurement data according to VDE 0611 Part 1/8.92/ IEC 947-7-1/1989	
Rated voltage	250 V
Rated current	17.5 A
Rated cross-section	1.5 mm^2 / 0.06 $inch^2$ / 16 AWG
Rated surge	4 kV
Pollution severity	2
TOP connection technology	Tension clamp or screw connection

4

Digital Output Module, 16DO, 0,5 A, Galvanically Isolated, Positve Switching (Sourcing)

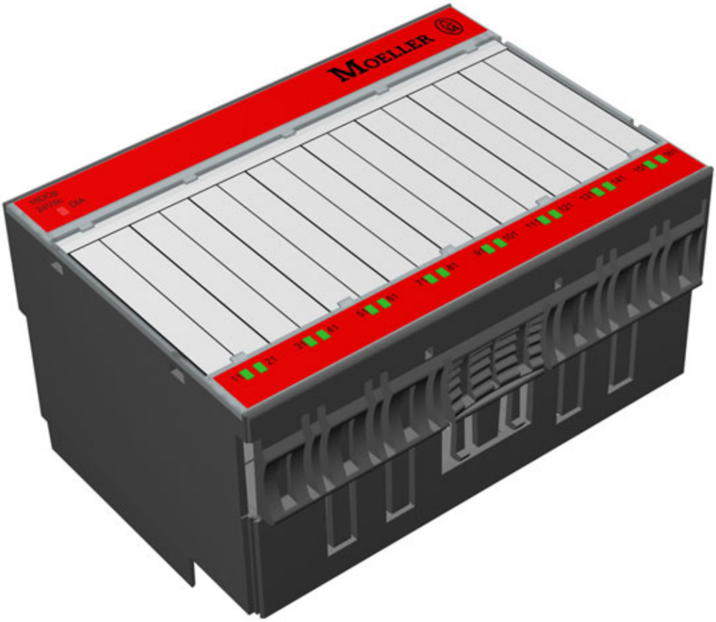


Figure 196: Electronics module XN-16DO-24VDC-0.5A-P

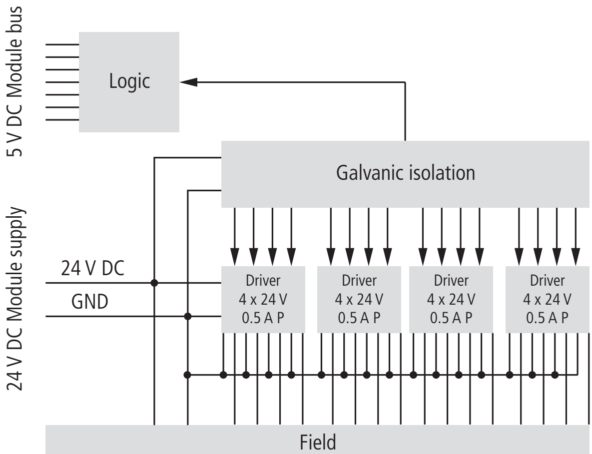
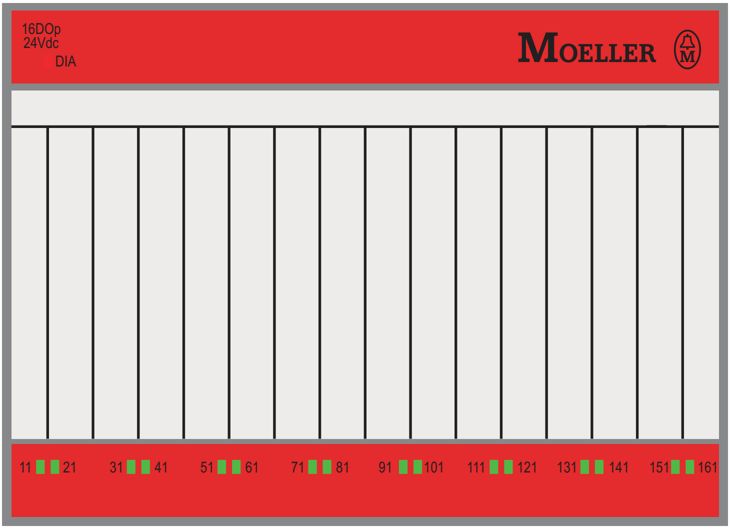


Figure 197: Block diagram

Electronics module

Designation	XN-16DO-24VDC-0.5A-P
Number of channels	16
Nominal voltage from supply terminal	24 V DC
Nominal current from supply terminal I_{EI}	< 30 mA
Nominal current from module bus I_{MB}	< 120 mA
Power loss of the module, typical	< 4 W
Output voltage loaded	
High level U_H	min. L+ (-1V)
Output current	
High level I_H (nominal)	0.5 A
High level I_H (permissible range)	< 0.6 A
Delay at signal change and resisitive load	
From low to high level	typ. 100 μs
From high to low level	typ. 100 μs
Synchronization factor	100 %
Resistive, inductive and lamp loads can be connected	
Load impedance, resistive R_{LO}	≧ 48 Ω
Load impedance, inductive R_{LI}	Category DC 13 according to EN 60 947-5-1
Lamp load R_{LL}	max. 3 W
Switching frequency	
Resistive load	100 Hz (R_{LO} < 1 kΩ)
Short-circuit proof	according to EN 61 131
Overload proof	according to EN 61 131

Diagnostic messages



LED	Display	Meaning	Remedy
DIA	Red	Module bus communication failure	Check if more than two adjoining electronics modules have been pulled. Check the power supply to the module bus.
	Off	No error messages or diagnostics	–
11	Green	Status of channel 1 = "1"	–
	Off	Status of channel 1 = "0"	–
21	Green	Status of channel 2 = "1"	–
	Off	Status of channel 2 = "0"	–
31	Green	Status of channel 3 = "1"	–
	Off	Status of channel 3 = "0"	–
. . .			
161	Green	Status of channel 16 = "1"	–
	Off	Status of channel 16 = "0"	–

The module has the following diagnostic data available (group short-circuit recognition):

- "Ueberstrom"[1)] (short-circuit) channel 1-4
- "Ueberstrom"[1)] (short-circuit) channel 5-8
- "Ueberstrom"[1)] (short-circuit) channel 9-12
- "Ueberstrom"[1)] (short-circuit) channel 13-16

1) See "Appendix" for English translation

Module parameters
None

Base modules

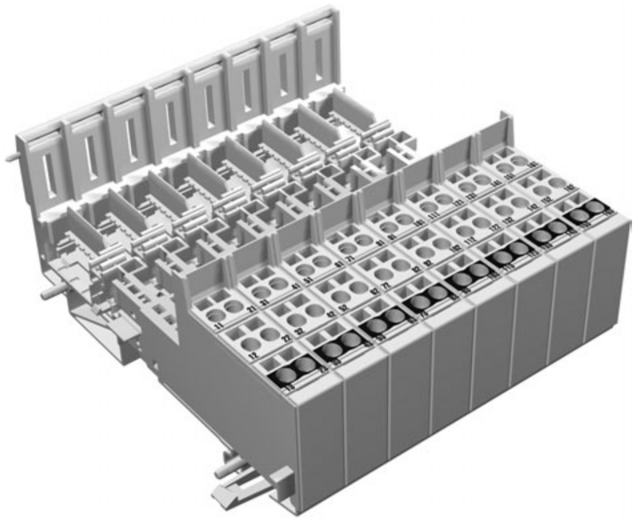


Figure 198: Base module XN-B3T-SBC

Designation	
with tension clamp connection	XN-B3T-SBC
with screw connection	XN-B3S-SBC

Wiring diagram

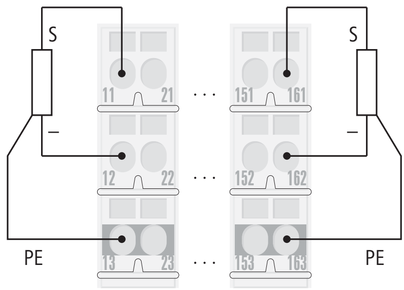


Figure 199: Wiring diagram XN-B3x-SBC

Measurement data according to VDE 0611 Part 1/8.92/ IEC 947-7-1/1989	
Rated voltage	250 V
Rated current	17.5 A
Rated cross-section	1.5 mm² / 0.06 inch² / 16 AWG
Rated surge	4 kV
Pollution severity	2
TOP connection technology	Tension clamp or screw connection

Analog Output Modules

Analog output modules (AO) receive output values from the gateway via the internal module bus. The modules convert these values and transmit the corresponding signals for each channel to the field level via the base modules.

The module bus electronics of the analog input modules are galvanically isolated from the field level via an optocoupler, and provide reverse polarity protection.

The modules are short-circuit proof.

Analog output modules are designed in slice technology. They are mounted on to base modules with tension clamp or screw connections.

Supported signal ranges
0 to 20 mA,
4 to 20 mA,
0 to 10 V DC,
-10 to +10 V DC

Resolution of analog value representations
In the bipolar operating mode, the digitalized analog values are displayed in the two's-complement representation. A 16 Bit representation (15 Bit plus sign) or a left-justified 12 Bit numerical representation can be set via a parameter bit. The 12 Bit representation covers "Full Range" in the unipolar representation and in the bipolar representation, 11 Bit plus sign.

Resolution	**Analog value**															
Bit number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
16 Bit representation: signed Integer	VZ	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^9	2^8	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
12 Bit representation: signed Integer	VZ	2^{10}	2^9	2^8	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	X	X	X	X
12 Bit representation: full range	2^{11}	2^{10}	2^9	2^8	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	X	X	X	X

Sign
The mathematical sign for the analog value is always displayed, if it exists, in 15 Bit representation.

- Bit 15 = "0" → sign = "+"
- Bit 15 = "1" → sign = "-"

Bits marked with an "X" are irrelevant for the representation of analog values.

LED status indicators
Error signals from the I/O level are indicated by each module via the "DIA" LED. The corresponding diagnostic information is transmitted to the gateway via diagnostic bits.

If the "DIA" LED lights up continuously red, it signals the failure of the module bus communication at the analog output module.

Shielding
When using shielded signal cables, the connection between the shield and the base module is made via a two-pole shield connection, which is available as an accessory.

Module overview

	Number of channels	Short-circuit proof
XN-1AO-I(0/4...20MA)	1	✓
XN-2AO-U(-10/0...+10VDC)	2	✓

Analog Output Module, 1AO, 0/4...20mA

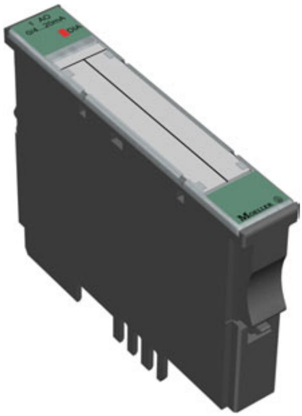


Figure 200: Electronics module XN-1AO-I(0/4...20MA)

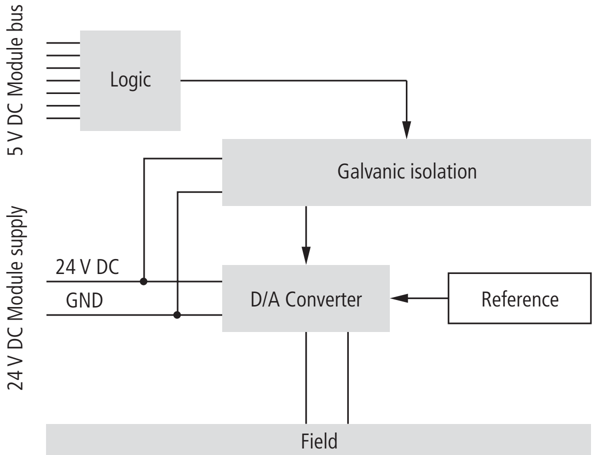
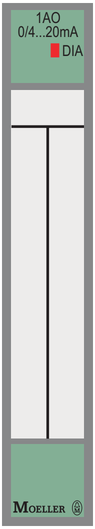


Figure 201: Block diagram

Electronics module

Designation	XN-1AO-I(0/4...20MA)
Number of channels	1
Nominal voltage from supply terminal	24 V DC
Nominal current from supply terminal I_{EI}	≦ 50 mA
Nominal current from module bus I_{MB}	≦ 39 mA
Power loss of the module, typical	< 1 W
Output current	0/4 to 20 mA
Burden resistance	
Resistive load R_{LO}	< 450 Ω
Inductive load R_{LI}	< 1 mH
Transmission frequency	< 200 Hz
Offset error	≦ 0.1 %
Linearity	0.02 %
Basic error at 23 °C / 73.4 °F	0.2 %
Repeat accuracy	0.05 %
Output ripple	0.02 %
Temperature coefficient	≦ 300 ppm/°C from end value
Settling time (maximum)	
Resistive load	0.1 ms
Inductive load	0.5 ms
Capacitive load	0.5 ms
Measurement value representation	16 Bit signed integer / 12 Bit full range left-justified

→ Negative values are automatically displayed as 0 mA or 4 mA, depending on the configured measurement range.



Diagnostic messages

LED	Display	Meaning	Remedy
DIA	Red	Module bus communication failure	Check if more than two adjoining electronics modules have been pulled. Check the power supply to the module bus.
	Off	No error messages	–

Module parameters

Parameter name[1]	Value[1]
Werte-Darstellung	Integer (15Bit + Vorzeichen)[2]
	12Bit (linksbuendig)
Strom-Modus	0..20mA[2]
	4..20mA
Ersatzwert A1	The substitute value for the module will be set when the parameter “Ersatzwert ausgeben” has been set on the gateway.

1) See “Appendix” for English translation

2) Standard parameter value

Base modules

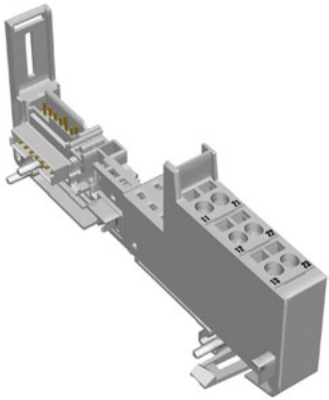


Figure 202: Base module XN-S3T-SBB

Designation	
with tension clamp connection	XN-S3T-SBB
with screw connection	XN-S3S-SBB

Wiring diagram

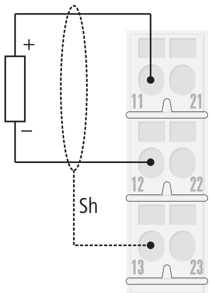


Figure 203: Wiring diagram XN-S3x-SBB

Measurement data according to VDE 0611 Part 1/8.92/ IEC 947-7-1/1989	
Rated voltage	250 V
Rated current	17.5 A
Rated cross-section	1.5 mm^2 / 0.06 $inch^2$ / 16 AWG
Rated surge	4 kV
Pollution severity	2
TOP connection technology	Tension clamp or screw connection

Measurement value representation

Table 38: 16 Bit signed integer, full range

Measurement Value		Transmitted Value	
0 to 20 mA	4 to 20 mA	Decimal	Hexadecimal
0.0000 mA	4.0000 mA	0	0000h
0.6104 μA	4.0005 mA	1	0001h
...	...	...	...
9.9997 mA	11.9998 mA	16383	3FFFh
10.0003 mA	12.0002 mA	16384	4000h
10.0009 mA	12.0007 mA	16385	4001h
...	...	...	...
19.9999 mA	19.9999 mA	32766	7FFEh
20.0000 mA	20.0000 mA	32767	7FFFh

Table 39: 12 Bit left-justified

Measurement Value		Transmitted Value	
0 to 20 mA	4 to 20 mA	Decimal	Hexadecimal
0.0000 mA	4.0000 mA	0	0000h
0.00488 mA	4.00391 mA	16	0010h
...	...	...	...
9.9976 mA	11.9981 mA	32752	7FF0h
10.0024 mA	12.0020 mA	32768	8000h
10.0073 mA	12.0059 mA	32784	8010h
...	...	...	...
19.9951 mA	19.9961 mA	65504	FFE0h
20.0000 mA	20.0000 mA	65520	FFF0h

Analog Output Module, 2AO, -10/0...+10V DC

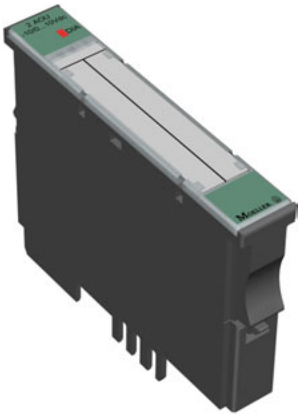


Figure 204: Electronics module XN-2AO-U(-10/0...+10VDC)

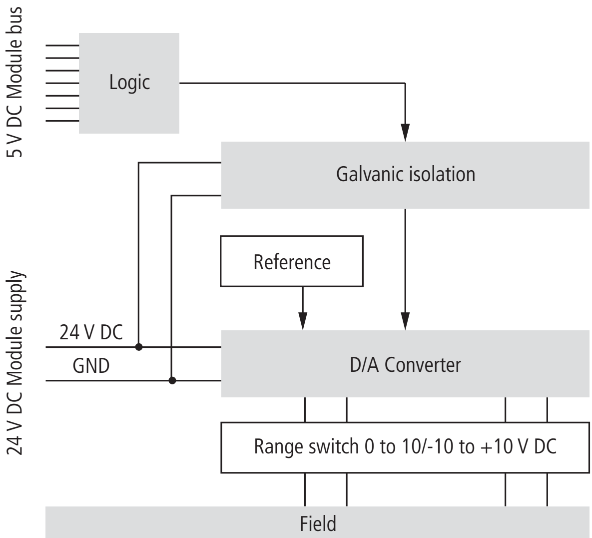


Figure 205: Block diagram

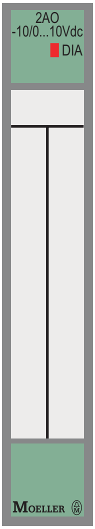
4

Electronics module

Designation	XN-2AO-U(-10/0...+10VDC)
Number of channels	2
Nominal voltage from supply terminal	24 V DC
Nominal current from supply terminal I_{EI}	≦ 50 mA
Nominal current from module bus I_{MB}	≦ 43 mA
Power loss of the module, typical	< 1 W
Output voltage	-10/0 to +10 V
Burden resistance	
Resistive load R_{LO}	> 1 kΩ
Capacitive load R_{LK}	> 1 μF
Short-circuit current	≦ 40 mA
Transmission frequency	< 100 Hz
Offset error	≦ 0.1 %
Linearity	0.1 %
Basic error at 23 °C / 73.4 °F	< 0.2 %
Repeat accuracy	0.05 %
Output ripple	0.02 %
Temperature coefficient	≦ 300 ppm/°C from end value
Settling time (maximum)	
Resistive load	0.1 ms
Inductive load	0.5 ms
Capacitive load	0.5 ms
Interference voltage suppression	
Common-mode	> 90 dB
Normal mode	> 70 dB
Interference between the channels	> -50 dB

Measurement value representation	16 Bit signed integer / 12 Bit signed integer left-justified/ 12 Bit full range left-justified

→ Negative values are automatically displayed as 0 V in a configured measurement range of 0 to 10 V.



Diagnostic messages

LED	Display	Meaning	Remedy
DIA	Red	Module bus communication failure	Check if more than two adjoining electronics modules have been pulled. Check the power supply to the module bus.
	Off	No error messages	–

Module parameters

Parameter name[1]	Value[1]
Werte-Darstellung	Integer (15Bit + Vorzeichen)[2]
	12Bit (linksbuendig)
Spannungs-Modus	-10..+10V
	0..10V[2]
Ersatzwert A1	The substitute value for channel 1 will be set when the parameter "Ersatzwert ausgeben" has been set on the gateway.

Ersatzwert A2	The substitute value for channel 2 will be set when the parameter “Ersatzwert ausgeben“ has been set on the gateway.

1) See “Appendix“ for English translation
2) Standard parameter value

Base modules

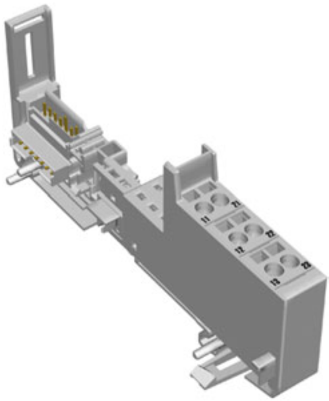


Figure 206: Base module XN-S3T-SBB

Designation	
with tension clamp connection	XN-S3T-SBB
with screw connection	XN-S3S-SBB

Wiring diagram

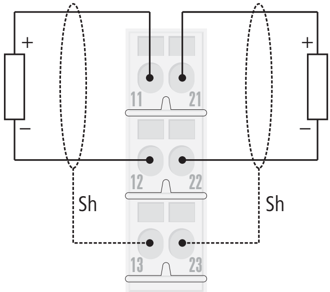


Figure 207: Wiring diagram XN-S3x-SBB

Measurement data according to VDE 0611 Part 1/8.92/ IEC 947-7-1/1989	
Rated voltage	250 V
Rated current	17.5 A
Rated cross-section	1.5 mm^2 / 0.06 inch^2 / 16 AWG
Rated surge	4 kV
Pollution severity	2
TOP connection technology	Tension clamp or screw connection

Measurement value representation

Table 40: 16 Bit signed integer, full range

Measurement Value	Transmitted Value		Measurement Value	Transmitted Value	
0 to 10 V	**Decimal**	**Hexadecimal**	**-10 to +10 V**	**Decimal**	**Hexadecimal**
0.0000 V	0	0000h	-10.0000 V	-32768	8000h
0.3052 mV	1	0001h	-9.9997 V	-32767	8001h
...	...	...	...	...	...
4.9999 V	16383	3FFFh	-305.185 µV	-1	FFFFh
5.0002 V	16384	4000h	0 V	0	0000h
5.0005 V	16385	4001h	305.185 µV	1	0001h
...	...	...	...	...	...
9.9997 V	32766	7FFEh	9.9997 V	32766	7FFEh
10.0000 V	32767	7FFFh	10.0000 V	32767	7FFFh

Table 41: 12 Bit left-justified

Measurement Value	Transmitted Value		Measurement Value	Transmitted Value	
0 to 10 V	**Decimal**	**Hexadecimal**	**-10 to +10 V**	**Decimal**	**Hexadecimal**
0.0000 V	0	0000h	-10.0000 V	-32768	8000h
0.00244 V	16	0010h	-9.9951 V	-32752	8010h
...	...	...	...	...	...
4.9988 V	32752	7FF0h	-4.8852 mV	-16	FFF0h
5.0012 V	32753	8000h	0 V	0	0000h
5.0037 V	32754	8010h	4.8852 mV	16	0010h
...	...	...	...	...	...
9.99512 V	65504	FFE0h	9.9951 V	32736	7FE0h
10.0000 V	65520	FFF0h	10.0000 V	32752	7FF0h

Relay Modules

XI/ON relay modules (R) receive output values from the gateway via the internal module bus. The modules convert these values and transmit the corresponding circuit state for each channel to the field level via the base modules.

Relay modules are suitable for solenoid valves, DC contactors and signal lamps in the nominal-load voltage range 24 V DC/V AC to 230 V AC.

Relay modules have a reverse polarity protection and are potentially isolated from the power supply.

Relay modules are designed in slice technology. They are mounted on to base modules with tension clamp or screw connections.

LED status indicators

Error signals from the I/O level are indicated by each module via the “DIA” LED. The corresponding diagnostic information is transmitted to the gateway. If the “DIA” LED lights up continuously red, it signals the failure of the module bus communication of the relay modules.

Load limit curve with resistive load

At 1000 switching cycles, no sustained arcs with a burning life > 10 ms may occur.

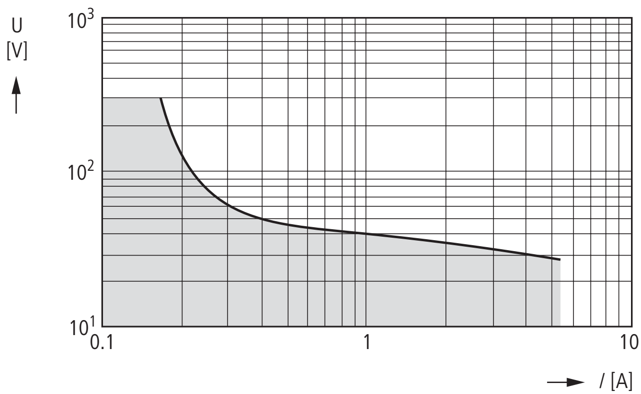


Figure 208: Definition of load limit curve

→ If possible, modules with standard module description should not be used with relay modules. Mistakenly exchanged relay modules (changeover, normally closed, normally open) can cause a short-circuit which could destroy the module.

Attention!
An external suppressor should be planned for inductive loads.

Module overview
XN-2DO-R-NC
XN-2DO-R-NO
XN-2DO-R-CO

Relay Module, 2 Normally-Closed Contacts

Figure 209: Electronics module XN-2DO-R-NC

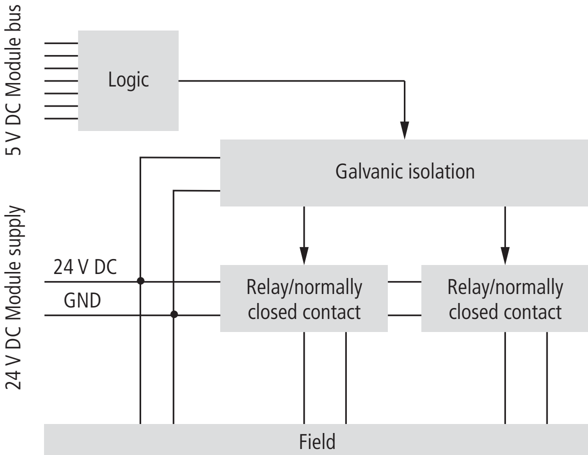
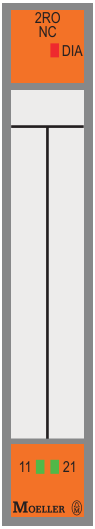


Figure 210: Block diagram

Electronics module

Designation	XN-2DO-R-NC
Number of channels	2, normally-closed contact
Nominal voltage from supply terminal	24 V DC
Nominal current from supply terminal I_{EI}	< 20 mA
Nominal current from module bus I_{MB}	≦ 28 mA
Power loss of the module	< 1 W
Resistive, inductive and lamp loads can be connected	
Nominal load voltage	230 V AC / 30 V DC
Output current with AC voltage (230 V AC)	
Max. continuous current (resistive)	2 A (5 A, depending on load)
Min. load current (recommended)	10 mA at ≧ 12 V DC
Output voltage with DC voltage (resistive)	see load limit curve Page 288
Synchronization factor	100 %
Min. number of switching cycles (230 V AC resistive load)	
5 A	1×10^5
0.5 A	1×10^6



Diagnostic messages

LED	Display	Meaning	Remedy
DIA	Red	Module bus communication failure	Check if more than two adjoining electronics modules have been pulled. Check the power supply to the module bus.
	Off	No error messages	–
11	Green	Status of channel 1 = "1"	–
	Off	Status of channel 1 = "0"	–
21	Green	Status of channel 2 = "1"	–
	Off	Status of channel 2 = "0"	–

Module parameters

None

Base modules

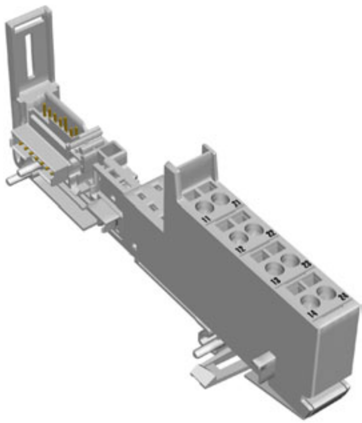


Figure 211: Base module XN-S4T-SBBS

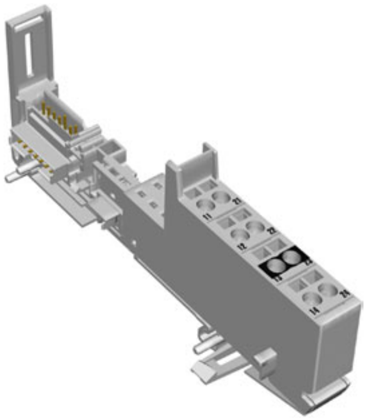


Figure 212: Base module XN-S4T-SBCS

Designation	
with tension clamp connection	XN-S4T-SBBS XN-S4T-SBCS
with screw connection	XN-S4S-SBBS XN-S4S-SBCS

Wiring diagrams

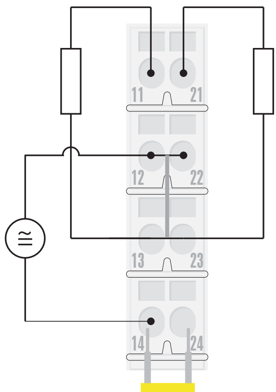


Figure 213: Wiring diagram XN-S4x-SBBS with externally connected supply and cross-connected root

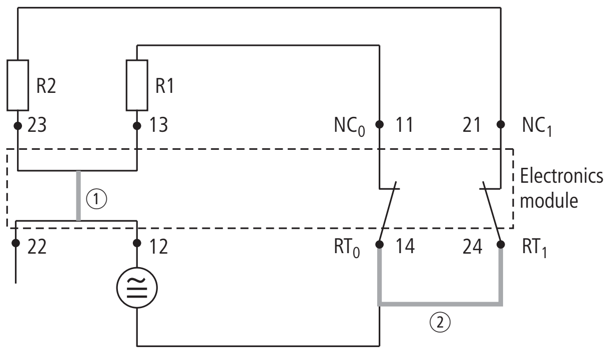


Figure 214: Module circuit diagram XN-S4x-SBBS

① Bridged in the electronics

② Cross-connection via jumper in the base module

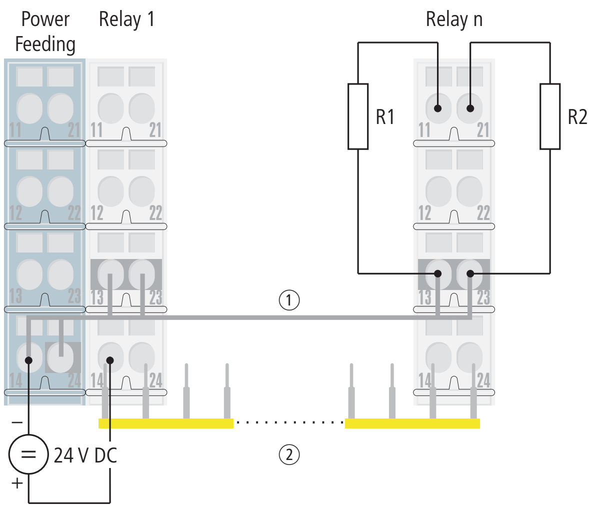


Figure 215: Wiring diagram XN-S4x-SBCS with supply via C-rail and cross-connected root

① Supply via C-rail

② max. 8 relay modules

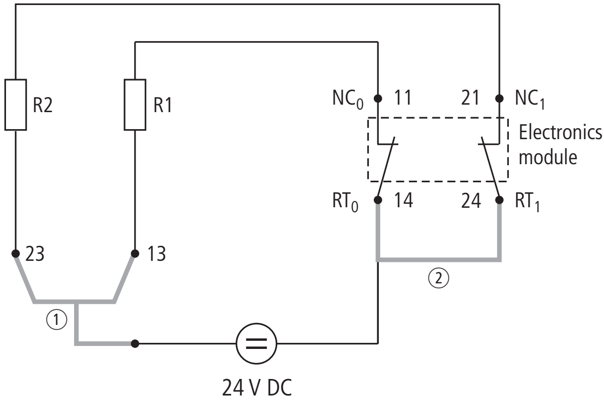


Figure 216: Module circuit diagram XN-S4x-SBCS

1. C-rail
2. Cross-connection via jumper in the base module

Warning!
It is permitted to load the C-rail with a maximum of 24 V. Not 230 V!

Contact designations used for base modules are not designations of relay contacts according to DIN.

Measurement data according to VDE 0611 Part 1/8.92/ IEC 947-7-1/1989	
Rated voltage	250 V
Rated current	17.5 A
Rated cross-section	1.5 mm^2 / 0.06 inch^2 / 16 AWG
Rated surge	4 kV
Pollution severity	2
TOP connection technology	Tension clamp or screw connection

Relay Module, 2 Normally-Open Contacts

Figure 217: Electronics module XN-2DO-R-NO

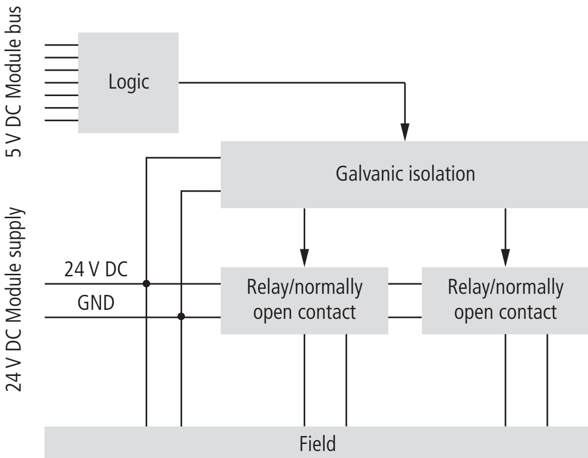
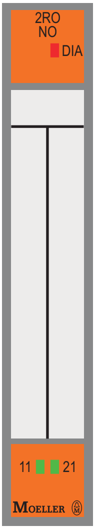


Figure 218: Block diagram

Electronics module

Designation	XN-2DO-R-NO
Number of channels	2, normally-open contact
Nominal voltage from supply terminal	24 V DC
Nominal current from supply terminal I_{EI}	< 20 mA
Nominal current from module bus I_{MB}	≦ 28mA
Power loss of the module, typical	< 1 W
Resistive, inductive and lamp loads can be connected	
Nominal load voltage	230 V AC / 30 V DC
Output current with AC voltage (230 V AC)	
Max. continuous current (resistive)	2 A (5 A, depending on load)
Min. load current (recommended)	10 mA at ≧ 12 V DC
Output voltage with DC voltage (resistive)	see load limit curve Page 288
Synchronization factor	100 %
Min. number of switching cycles (230 V AC resistive load)	
5 A	1×10^5
0.5 A	1×10^6



Diagnostic messages

LED	Display	Meaning	Remedy
DIA	Red	Module bus communication failure	Check if more than two adjoining electronics modules have been pulled. Check the power supply to the module bus.
	Off	No error messages	–
11	Green	Status of channel 1 = "1"	–
	Off	Status of channel 1 = "0"	–
21	Green	Status of channel 2 = "1"	–
	Off	Status of channel 2 = "0"	–

Module parameters

None

Base modules

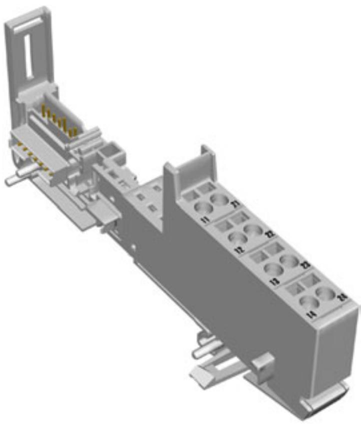


Figure 219: Base module XN-S4T-SBBS

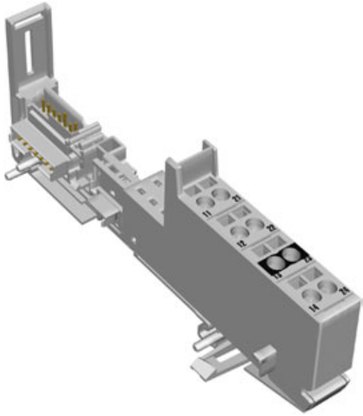


Figure 220: Base module XN-S4T-SBCS

Designation	
with tension clamp connection	XN-S4T-SBBS XN-S4T-SBCS
with screw connection	XN-S4S-SBBS XN-S4S-SBCS

Wiring diagrams

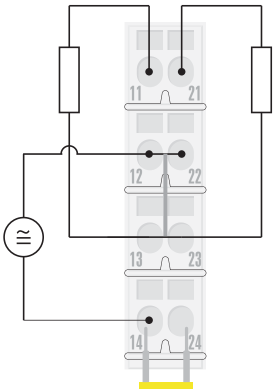


Figure 221: Wiring diagram XN-S4x-SBBS with externally connected supply and cross-connected root

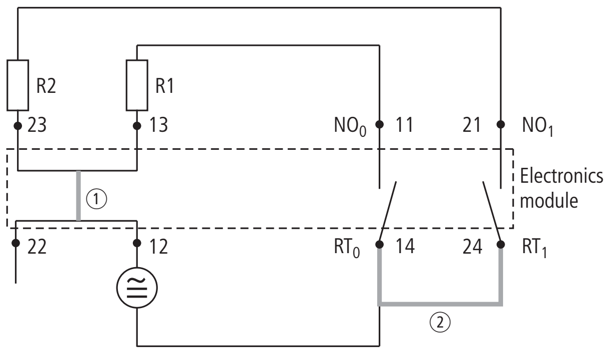


Figure 222: Module circuit diagram XN-S4x-SBBS

① Bridged in the electronics

② Cross-connection via jumper in the base module

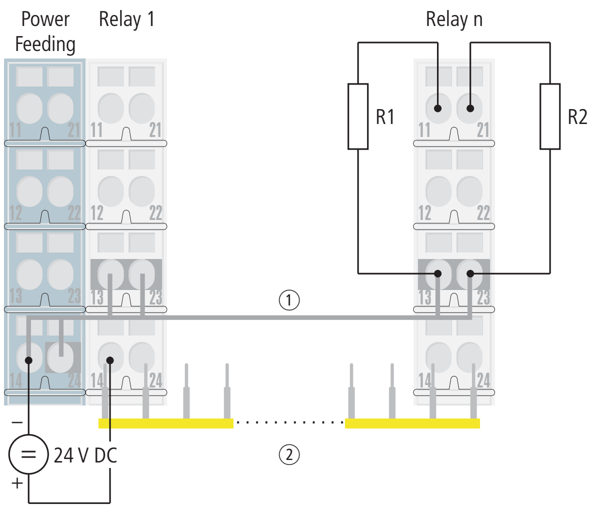


Figure 223: Wiring diagram XN-S4x-SBCS with supply via C-rail and cross-connected root

① Supply via C-rail

② max. 8 relay modules

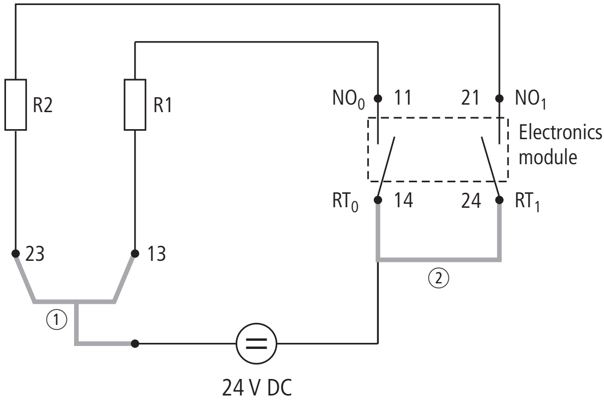


Figure 224: Module circuit diagram XN-S4x-SBCS

① C-rail

② Cross-connection via jumper in the base module

Warning!
It is permitted to load the C-rail with a maximum of 24 V. Not 230 V!

→ Contact designations used for base modules are not designations of relay contacts according to DIN.

Measurement data according to VDE 0611 Part 1/8.92/ IEC 947-7-1/1989	
Rated voltage	250 V
Rated current	17.5 A
Rated cross-section	1.5 mm^2 / 0.06 $inch^2$ / 16 AWG
Rated surge	4 kV
Pollution severity	2
TOP connection technology	Tension clamp or screw connection

Relay Module, 2 Changeover

Figure 225: Electronics module XN-2DO-R-CO

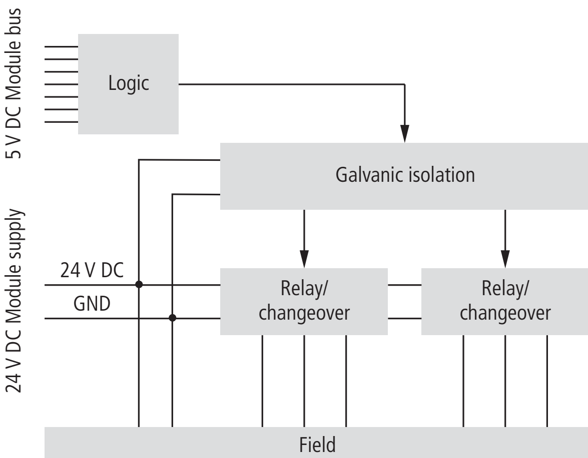
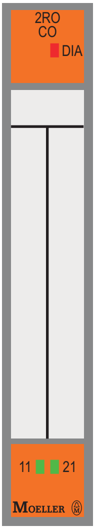


Figure 226: Block diagram

Electronics module

Designation	XN-2DO-R-CO
Number of channels	2, changeover, galvanically isolated
Nominal voltage from supply terminal	24 V DC
Nominal current from supply terminal I_{EI}	< 20 mA
Nominal current from module bus I_{MB}	≦ 28 mA
Power loss of the module, typical	< 1 W
Resistive, inductive and lamp loads can be connected	
Nominal load voltage	230 V AC / 30 V DC
Output current with AC voltage (230 V AC)	
Max. continuous current (resistive)	2 A (5 A, depending on load)
Min. load current (recommended)	10 mA at ≧ 12 V DC
Output voltage with DC voltage (resistive)	see load limit curve Page 288
Synchronization factor	100 %
Min. number of switching cycles (230 V AC, resistive load)	
5 A	1×10^5
0.5 A	1×10^6



Diagnostic messages

LED	Display	Meaning	Remedy
DIA	Red	Module bus communication failure	Check if more than two adjoining electronics modules have been pulled. Check the power supply to the module bus.
	Off	No error messages	–
11	Green	Status of channel 1 = "1"	–
	Off	Status of channel 1 = "0"	–
21	Green	Status of channel 2 = "1"	–
	Off	Status of channel 2 = "0"	–

Module parameters

None

Base module

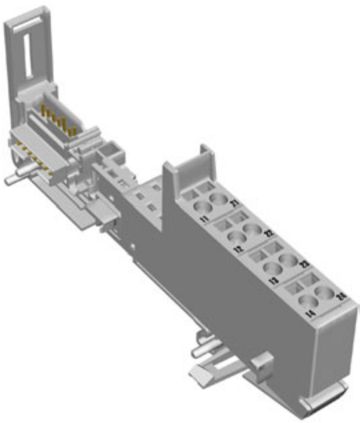


Figure 227: Base module XN-S4T-SBBS

Designation	
with tension clamp connection	XN-S4T-SBBS
with screw connection	XN-S4S-SBBS

Wiring diagrams

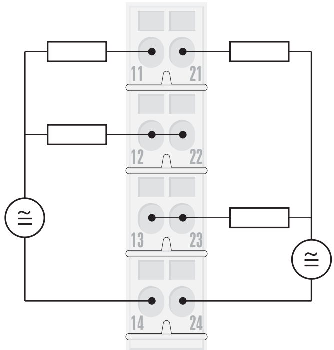


Figure 228: Wiring diagram XN-S4x-SBBS

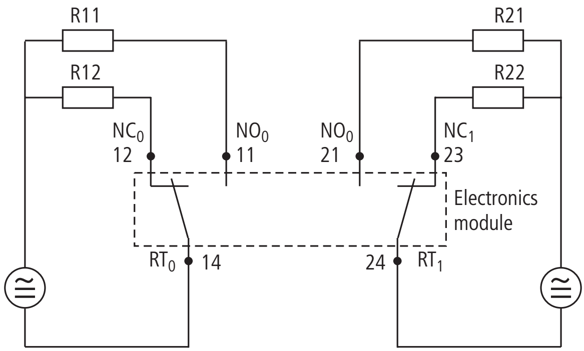


Figure 229: Module circuit diagram XN-S4x-SBBS

→ Contact designations used for base modules are not designations of relay contacts according to DIN.

Measurement data according to VDE 0611 Part 1/8.92/ IEC 947-7-1/1989	
Rated voltage	250 V
Rated current	17.5 A
Rated cross-section	1.5 mm^2 / 0.06 inch^2 / 16 AWG
Rated surge	4 kV
Pollution severity	2
TOP connection technology	Tension clamp or screw connection

Technology modules

Counter module

The XI/ON counter module offers the connection of a pulse generator for measuring 24 V DC signals (11 to 30 V DC), up to a frequency of 200 kHz.

Moreover, the module provides the sensor with 24 V DC.

The electronics module supports the following operating modes:

Counter modes:
- Continuous count
- Single-action count
- Periodical count

Measurement modes:
- Frequency measurement
- Rotational speed measurement
- Period duration measurement

Parameters are assigned to the individual operating modes. The corresponding parameter lists are more closely specified in the descriptions of the operating modes.

The counter module has a digital output, which can be used for direct activation or output of the reference value.

The hardware release, the synchronization or the latch and retrigger function can be initiated via the digital input of the counter module.

The XI/ON counter module is designed to process signals generated by the following sensors:

- Pulse generator 24 V DC with alignment level.
- Pulse generator 24 V DC without alignment level.
- Pulse generator 24 V DC with two 90° offset spur lines (rotary sensor)

Counter modes

The counter modes support counting applications such as, for example, the counting of bulk goods.

The following modes can be selected:

- Continuous count, for example, for position control via 24 V DC incremental sensors
- Single-action counts, for example, counting bulk goods up to a maximum limit.
- Periodical counts, for example, in applications with repeated counting procedures

Maximum counter range

- The upper count limit is +2 147 483 647 (2^{31}-1)
- The lower count limit is -2 147 483 648 (-2^{31})

Load value

A load value can be pre-defined for the counter module. The defined value can be set either via the connected controller or via the software I/O*assistant*. Thereby, the type of pre-defined value is set via a bit in the controller:

- As a **direct** definition, the module accepts this value as the new counter value.
- The load value can also be loaded **in preparation**. In this case, the load value will be used as the new counter value when the following events occur:
  - Either the upper or lower count limit is reached, if no main count direction has been parameterized.
  - The upper count limit is reached when the main count direction is up.
  - The lower count limit is reached when the main count direction is down.

Main count direction

When parameterizing the main count direction, you determine the behavior at the parameterized count limits.

Table 42: Main count direction

Operating mode	Main count direction	Upper count limit	Lower count limit
Continuous count	None Up Down	Step change to lower limit Step change to lower limit Step change to lower limit	Step change to upper limit Step change to upper limit Step change to upper limit
Single-action count	None Up Down	Step change to lower limit Step change to load value Step change to lower limit	Step change to upper limit Step change to upper limit Step change to load value
Periodical count	None Up Down	Step change to load value Step change to load value Step change to lower limit	Step change to load value Step change to upper limit Step change to load value

Reset-statuses after setting parameters:

- Load value: 0
- Count value: 0
- Reference value DO1: 0
- Reference value DO2: 0

Continuous count

Definition

Following release, the counter module counts in this operating mode continuously between the upper and lower counting limits, starting at the load value.

- If the counter module reaches the upper count limit when counting up, and a further count signal is registered, the counter module jumps to the lower count limit and continues counting without loss of signal.
- If the counter module reaches the lower count limit when counting down, and a further count signal is registered, the counter module jumps to the upper count limit and continues counting without loss of signal.
- The upper count limit is preset to +2 147 483 647 (2^{31}-1) (maximum upper count range).
- The lower count limit is preset to -2 147 483 648 (-2^{31}) (maximum lower count range).
- The function in this operating mode is independent of the main count direction.

Behavior of the digital input

The following functions can be selected for the digital input:

- Digital input
- Hardware release (HW gate)
- Latch-retrigger function when edge is positive
- Synchronization when edge is positive

Behavior of the digital output

The following functions can be selected for the digital output:

- Digital output (no switching initiated by comparator)
- Switch on when counter content ≧ reference value
- Switch on when counter content ≦ reference value
- Pulse when the reference value is reached

The following settings are depicted in the diagrams below:

- Counter mode: continuous count
- Main count direction: none, up or down

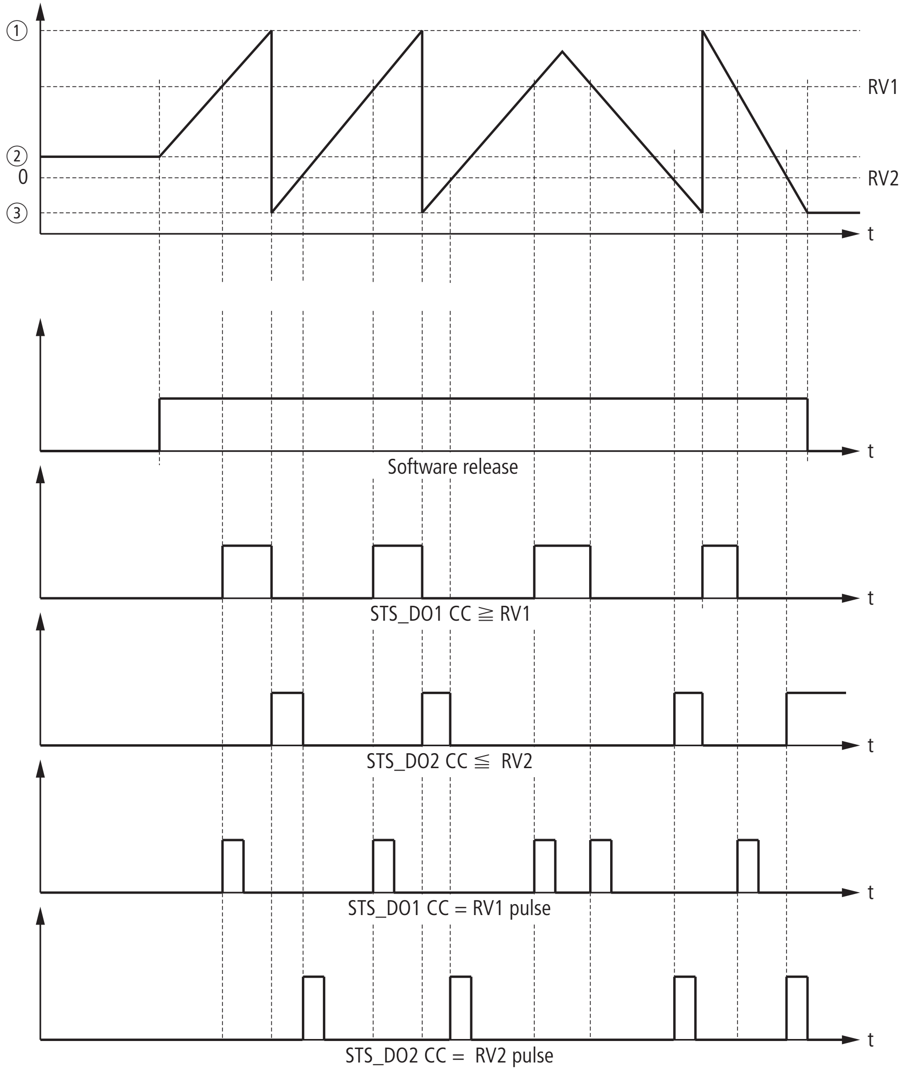


Figure 230: Continuous count with release function

① Upper count limit

② Load value

③ Lower count limit

RV1 = reference value 1
RV2 = reference value 2
CC = counter content

Upper and lower count limits are the parameterized count limits.

The behavior of the digital outputs are influenced by:

- Hysteresis
- Pulse duration

This influencing can be determined via parameterization before starting operations or by means of a control command during operations.

Behavior of the status bit for zero crossing, overflow or underflow
If a zero crossing occurs during a count procedure, an overflow at the upper count limit or an underflow at the lower count limit, then this will be indicated at the check-back interface in the relevant status bits STS_ND, STS_OFLW or STS_UFLW. The bits can only be reset via the RES_STS bit at the control interface.

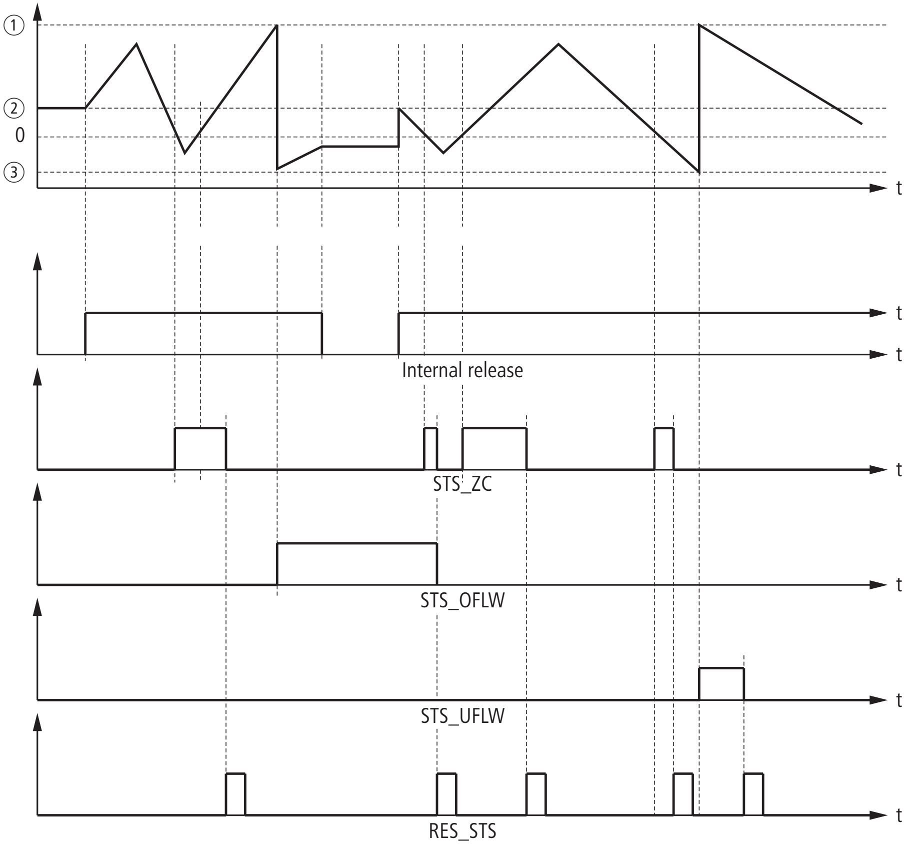


Figure 231: Continuous count with status bit

① Upper count limit
② Load value
③ Lower count limit

The following values can be altered during operations:

- Counter content (LOAD_VAL)
- Load value (LOAD_PREPARE)
- Reference value 1 (CMP_VAL1)
- Reference value 2 (CMP_VAL2)
- Behavior of the digital output (C_DOPARAM)

Caution!
It must be observed that when the behavior of the digital output is changed via the control interface (value C_DOPARAM), the values for the pulse duration and hysteresis will also be changed! These changes are saved to a volatile memory, which means, these values will be overwritten by the values parameterized via the gateway following a reset of the module (pull/plug).

Single-action count
Definition
In this mode and following release, the counter module performs a single-action count from the load value to the upper or lower end value, depending on the parameterized main count direction.

- No main count direction
  - Counts from the load value
  - Counts up or down
  - Should the counter receive a further count signal having reached the upper count limit when counting up, it jumps to the lower count limit. The internal release is automatically reset.
  - Should the counter receive a further count signal having reached the lower count limit when counting down, it jumps to the upper count limit. The internal release is automatically reset.
  - The upper count limit can be parameterized. It is preset to +2 147 483 647 (2^{31}-1) (maximum upper count range).
  - The lower count limit can be parameterized. It is preset to -2 147 483 648 (-2^{31}) (maximum lower count range).
  - The load value has the RESET status 0, and can be altered.

- Main count direction: up
  - Counts from the load value
  - Counts up or down
  - Should the counter receive a further count signal having reached the upper count limit when counting up, it jumps to the load value. The internal release is automatically reset.
  - Should the counter receive a further count signal having reached the lower count limit when counting down, it jumps to the upper count limit. The internal release is automatically reset.
  - The upper count limit can be parameterized. It is preset to +2 147 483 647 (2^{31}-1) (maximum upper count range).
  - The lower count limit can be parameterized. It is preset to -2 147 483 648 (-2^{31}) (maximum lower count range).
  - The load value has the RESET status 0, and can be altered.

- Main count direction: down
  - Counts from the load value
  - Counts up or down
  - Should the counter receive a further count signal having reached the upper count limit when counting up, it jumps to the lower count limit. The internal release is automatically reset.
  - Should the counter receive a further count signal having reached the lower count limit when counting down, it jumps to the load value. The internal release is automatically reset.
  - The upper count limit can be parameterized. It is preset to +2147483647 (2^{31}-1) (maximum upper count range).
  - The lower count limit can be parameterized. It is preset to -2147483648 (-2^{31}) (maximum lower count range).
  - The load value has the RESET status 0, and can be altered.

The internal reset is released automatically by overflow / underflow at the count limits. A rising edge must be achieved to restart the count procedure. This happens either by means of a reset and setting the hardware release (digital input, if this is parameterized as ”HW gate”) or by means of a reset and setting the software release (bit: SW_GATE in the control interface).

Behavior of the digital input
The following functions can be selected for the digital input:

- Digital input
- Hardware release (HW gate)
- Latch-retrigger function when edge is positive
- Synchronization when edge is positive

Behavior of the digital output
The following functions can be selected for the digital output:

- Digital output (no switching initiated by comparator)
- Switch on when counter content ≧ reference value
- Switch on when counter content ≦ reference value
- Pulse when the reference value is reached

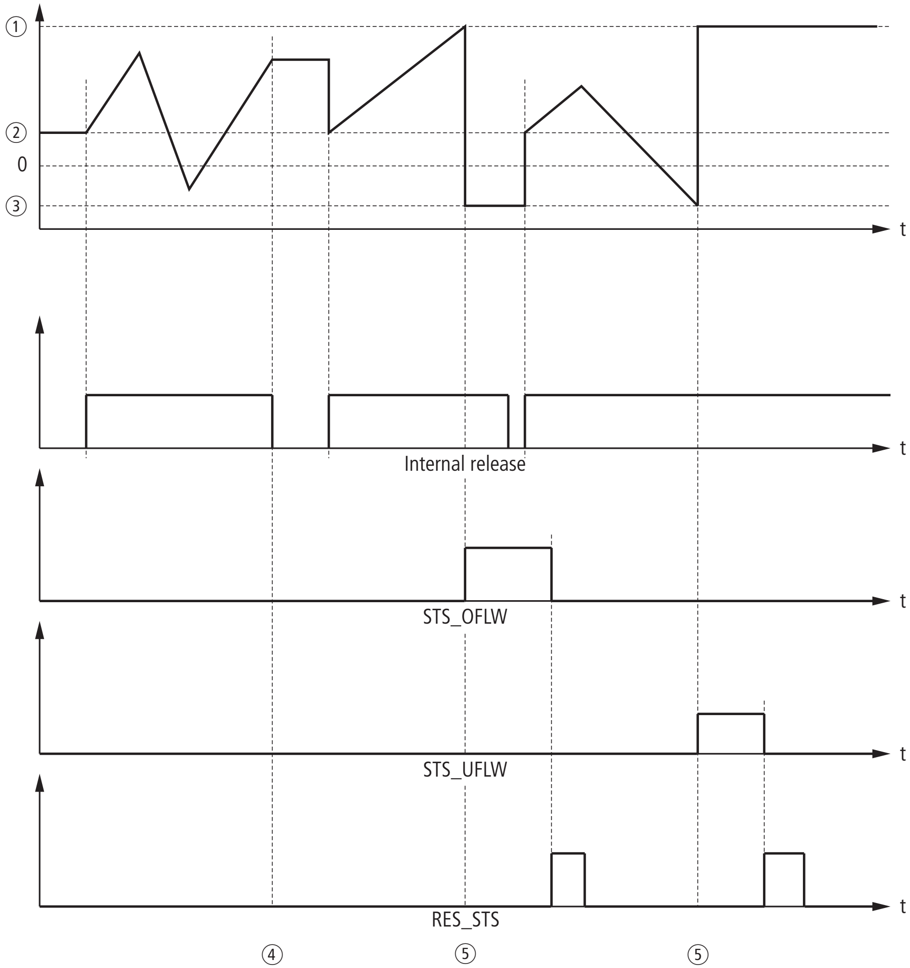


Figure 232: Single-action count without main count direction

1. Upper count limit
2. Load value
3. Lower count limit
4. Internal release stop
5. Automatic release stop

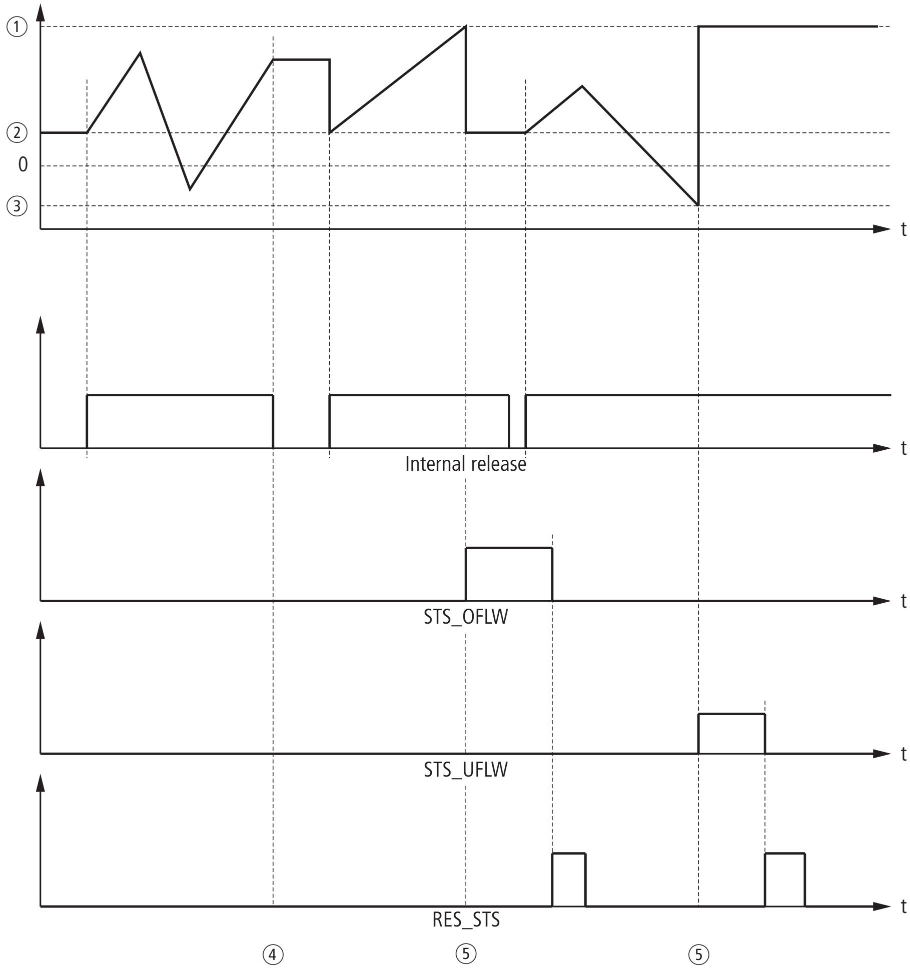


Figure 233: Single-action count with main count direction up

① Upper count limit
② Load value
③ Lower count limit
④ Internal release stop
⑤ Automatic release stop

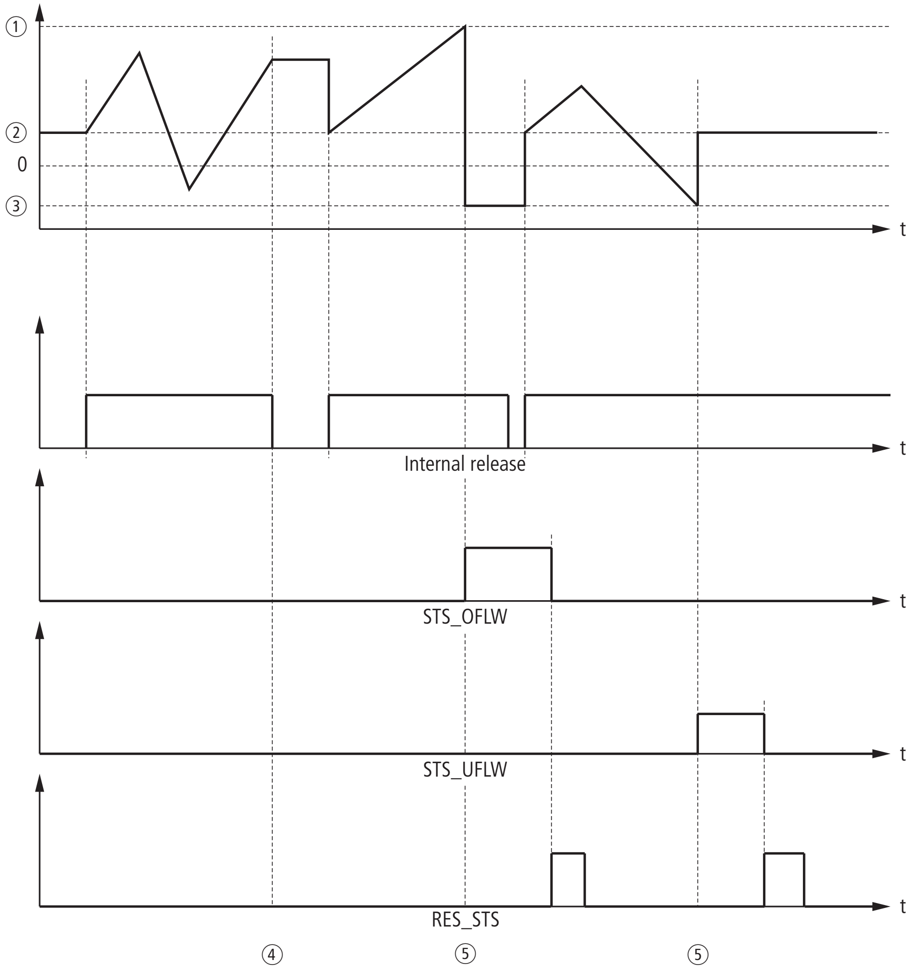


Figure 234: Single-action count with main count direction down

① Upper count limit
② Load value
③ Lower count limit
④ Internal release stop
⑤ Automatic release stop

The behavior of the digital outputs is influenced by:

- Hysteresis
- Pulse duration

The relevant type of influence is set via parameter settings before beginning operations.

The following values can be altered during operations:

- Counter content (LOAD_VAL)
- Load value (LOAD_PREPARE)
- Reference value 1 (CMP_VAL1)
- Reference value 2 (CMP_VAL2)
- Function of the digital output (C_DOPARAM)

Caution!
It must be observed that when the behavior of the digital output is changed via the control interface (value C_DOPARAM), the values for the pulse duration and hysteresis will also be changed! These changes are saved to a volatile memory, which means, these values will be overwritten by the values parameterized via the gateway following a reset of the module (pull/plug).

Periodical counts

Definition

In this mode the electronics module counts periodically, once the release has been set, within the parameterized counter range and in accordance with the main count direction set in the parameters.

- No main count direction
  - Counts from the load value
  - Counts up or down
  - Should the counter receive a further count signal having reached the upper or lower count limit when counting up, it jumps to the load value and continues to count from there.
  - The upper count limit can be parameterized. It is preset to +2147483647 (2^{31}-1) (maximum upper count range).
  - The lower count limit can be parameterized. It is preset to -2147483648 (-2^{31}) (maximum lower count range).
  - The load value has the RESET status 0, and can be altered.

- Main count direction: up
  - Counts from the load value
  - Counts up or down
  - Should the counter receive a further count signal having reached the upper count limit when counting up, it jumps to the load value and continues to count from there.
  - Should the counter receive a further count signal having reached the lower count limit when counting down, it jumps to the upper count limit and continues to count from there.
  - The upper count limit can be parameterized. It is preset to +2147483647 (2^{31}-1) (maximum upper count range).
  - The lower count limit can be parameterized. It is preset to -2147483648 (-2^{31}) (maximum lower count range).
  - The load value has the RESET status 0, and can be altered.

- Main count direction: down
  - Counts from the load value
  - Counts up or down
  - Should the counter receive a further count signal having reached the upper count limit when counting up, it jumps to the lower count limit and continues to count from there.
  - Should the counter receive a further count signal having reached the lower count limit when counting down, it jumps to the load value and continues to count from there.
  - The upper count limit can be parameterized. It is preset to +2 147 483 647 (2^{31}-1) (maximum upper count range).
  - The lower count limit can be parameterized. It is preset to -2 147 483 648 (-2^{31}) (maximum lower count range).
  - The load value has the RESET status 0, and can be altered.

Behavior of the digital input
The following functions can be selected for the digital input:

- Digital input
- Hardware release (HW gate)
- Latch-retrigger function when edge is positive
- Synchronization when edge is positive

Behavior of the digital output
The following functions can be selected for the digital output:

- Digital output (no switching initiated by comparator)
- Switch on when counter content ≧ reference value
- Switch on when counter content ≦ reference value
- Pulse when the reference value is reached

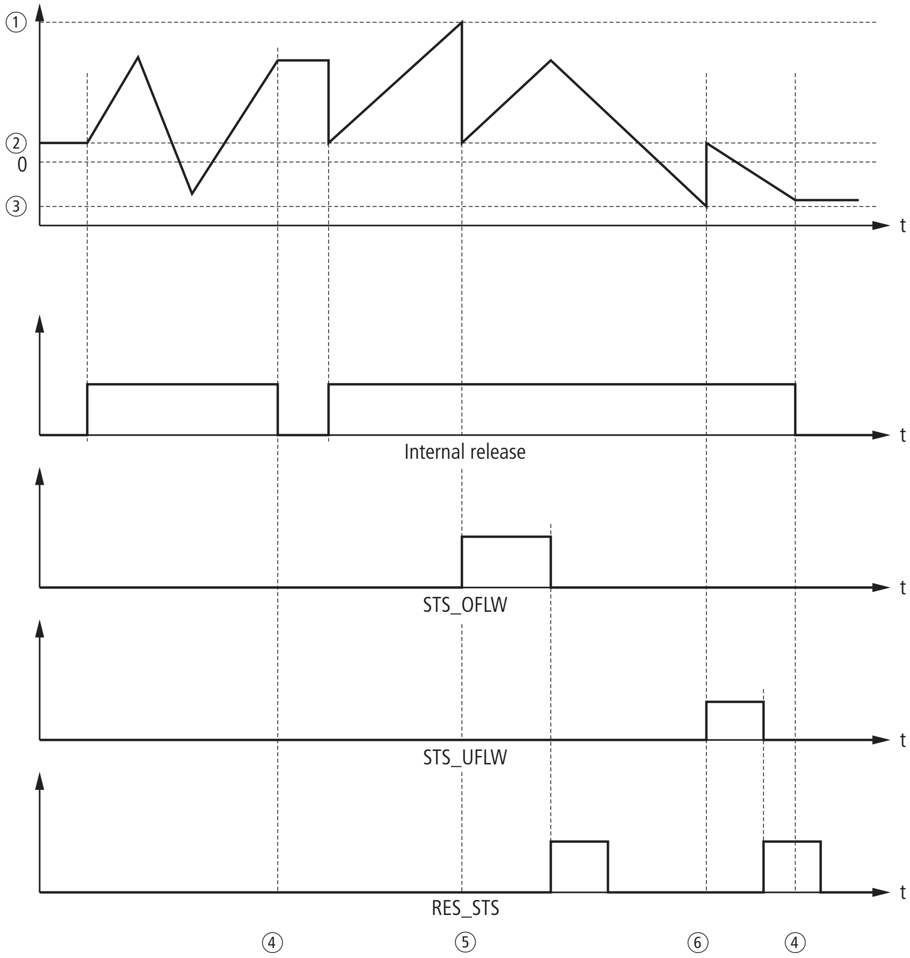


Figure 235: Periodical count without main count direction

① Upper count limit
② Load value
③ Lower count limit
④ Internal release stop
⑤ Overflow
⑥ Underflow

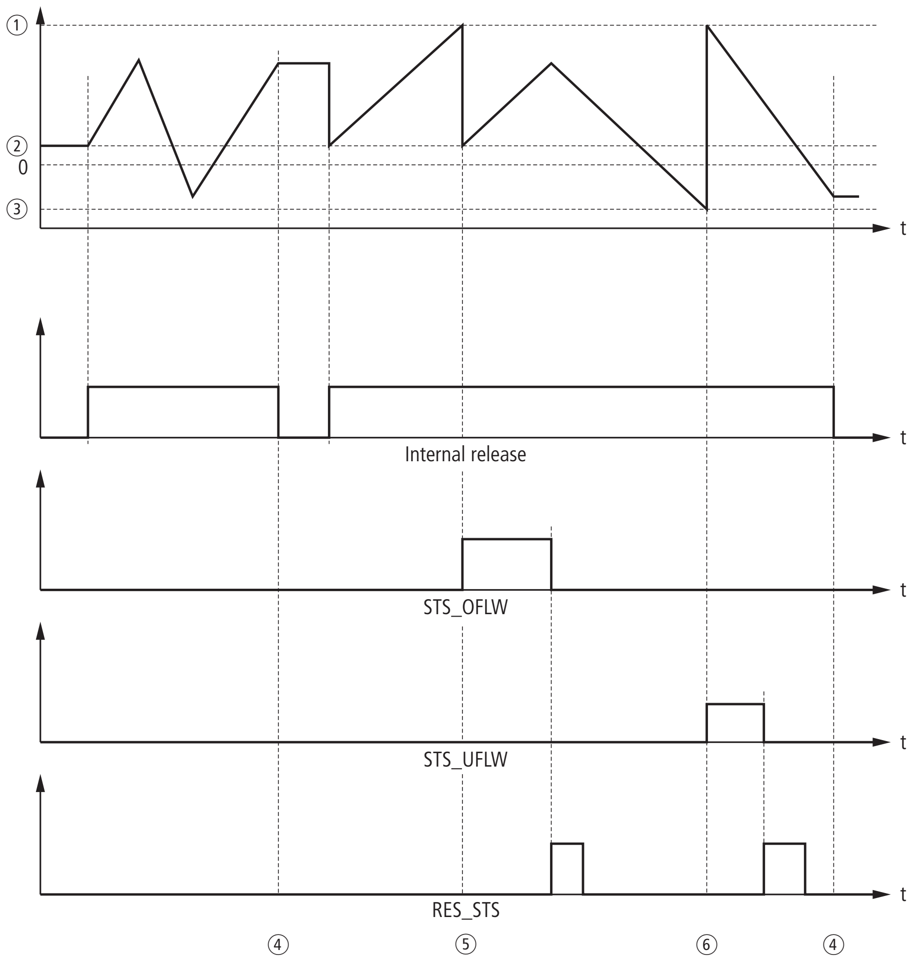


Figure 236: Periodical count with main count direction up

1. Upper count limit
2. Load value
3. Lower count limit
4. Manual release stop
5. Overflow
6. Underflow

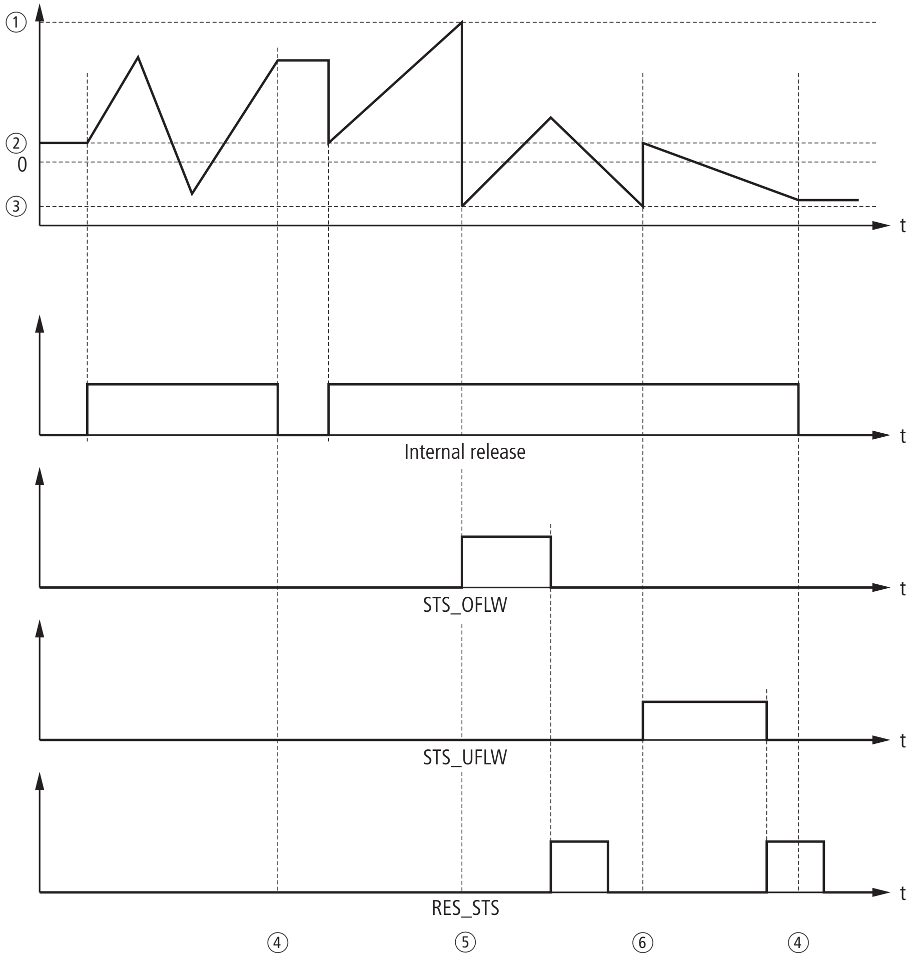


Figure 237: Periodical count with main count direction down

① Upper count limit
② Load value
③ Lower count limit
④ Manual release stop
⑤ Overflow
⑥ Underflow

The behavior of the digital outputs is influenced by:

- Hysteresis
- Pulse duration

The relevant type of influence is set via parameter settings before beginning operations.

The following values can be altered during operations:

- Load value (LOAD_PREPARE)
- Counter content (LOAD_VAL)
- Reference value 1 (CMP_VAL1)
- Reference value 2 (CMP_VAL2)
- Behavior of the digital output (C_DOPARAM)

Caution!
It must be observed that when the behavior of the digital output is changed via the control interface (value C_DOPARAM), the values for the pulse duration and hysteresis will also be changed! These changes are saved to a volatile memory, which means, these values will be overwritten by the values parameterized via the gateway following a reset of the module (pull/plug).

Behavior of the digital input

The digital input can be operated with different sensors (positive switch or push-pull).

The input level can be inverted (exception: in the "latch and retrigger" function).

The check-back bit STS_DI indicates the level of the digital input.

The level of the pulse input for spur A can be inverted.

The level of the alignment bit for spur B can be inverted.

Release

Software and hardware release

The counter module has two types of release:

- A software release, which must be controlled via the control bit SW_GATE.
  The software release can only be set by means of a change of edge (from 0-1) of the control bit SW_GATE. Resetting of this bit resets the software release. The software release is called ”SW gate” in the controller and parameters.
- A hardware release, which is controlled via the digital input on the module.
  This release is parameterized as a function of the digital input. It is set by a change of edge from 0-1 at the input, and reset by a change of edge 1-0. The direction of the edge can be altered by inverting the digital input to ”falling the edge”.
  The hardware release is called ”HW gate” in the controller and parameters.

Internal release

The internal release is the logical AND gate of the hard and software releases. The count procedure is activated only when both release functions have been set. This is indicated by the check-back bit STS_GATE (status: internal release). The setting of the software release alone is definitive if no hardware release is parameterized. The count procedure is activated, interrupted, resumed or aborted via the internal release.

→ If the count procedure is aborted and then restarted, the count procedure begins counting at the load value. Should the count procedure on the other hand be interrupted, the counter continues to count from the actual value when the count procedure recommences.

Latch-retrigger function

This function saves the current internal counter status of the electronics module at the digital input, when there is a change of status, and the count procedure is "retriggered". That means, the current internal counter status is saved at the point in time the change of status occurs. The counter is subsequently reloaded with the load value and continues to count from there.

This enables the counter content to be evaluated in accordance with events.

To be able to perform this function, the counter mode must be released by the software release.

The saved counter content is indicated instead of the current counter content in the check-back interface. The STS_DI bit (status DI) indicates the level of the latch and retrigger signal. It is not possible to invert the edge.

The load value, with which the operating mode begins, is indicated before the first edge once the software release has been set.

A direct loading of the counter module does not cause the indicated, saved counter content to be changed.

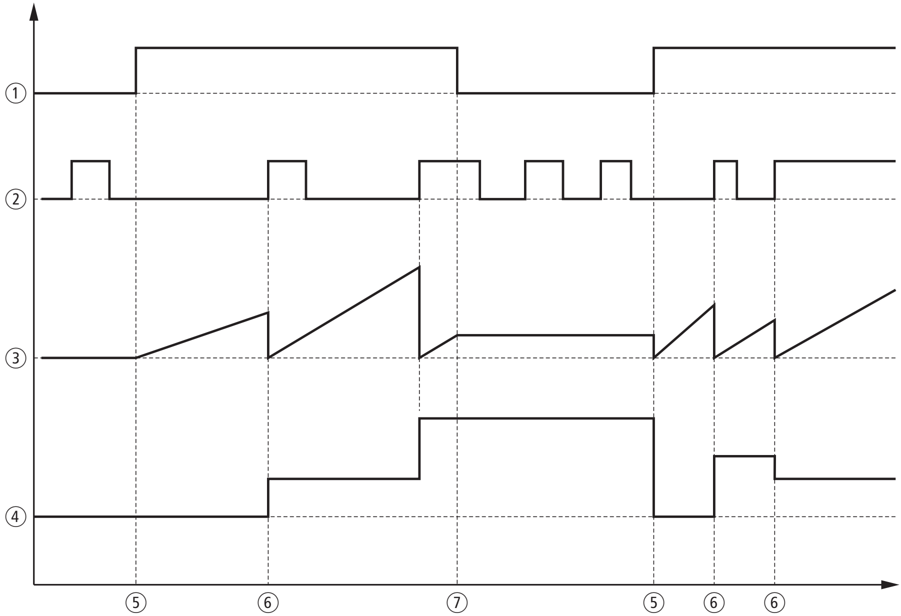


Figure 238: Latch-retrigger function by parameterized abortion of the count procedure

1 Software release
2 Digital input
3 Internal counter content
4 Indicated counter content
5 Manual start
6 Latch
7 Stop

Synchronization

Synchronization must be parameterized before the counter module is put into operation. The rising edge of a reference signal at the input is used to set the counter module to the load value.

It is possible to choose between single-action and periodical synchronization. The following conditions are to be observed:

- The counter mode was started by the software release
- The control bit ”release synchronization” (CRTL_SYN) must be set
- With a single-action synchronization, the first 0 → 1 edge at the digital input loads the counter with the load value, after the release bit has been set.
- With a periodical synchronization, the first rising edge and each further 0 → 1 edge on the digital input, loads the counter module with the load value, after the release bit has been set
- The check-back bit STS_SYN is set following successful synchronization. It can only be reset by the control bit RES_STS
- The check-back bit STS_DI indicates the level of the reference signal at the digital input.

A further synchronization procedure can, with a single-action synchronization, be initiated by resetting and setting the control bit ”release synchronization” (CRTL_SYN). This is performed at the next 0 → 1 edge at the digital input.

A bounce-free switch or the zero reference mark of a rotary sensor can serve as a reference signal.

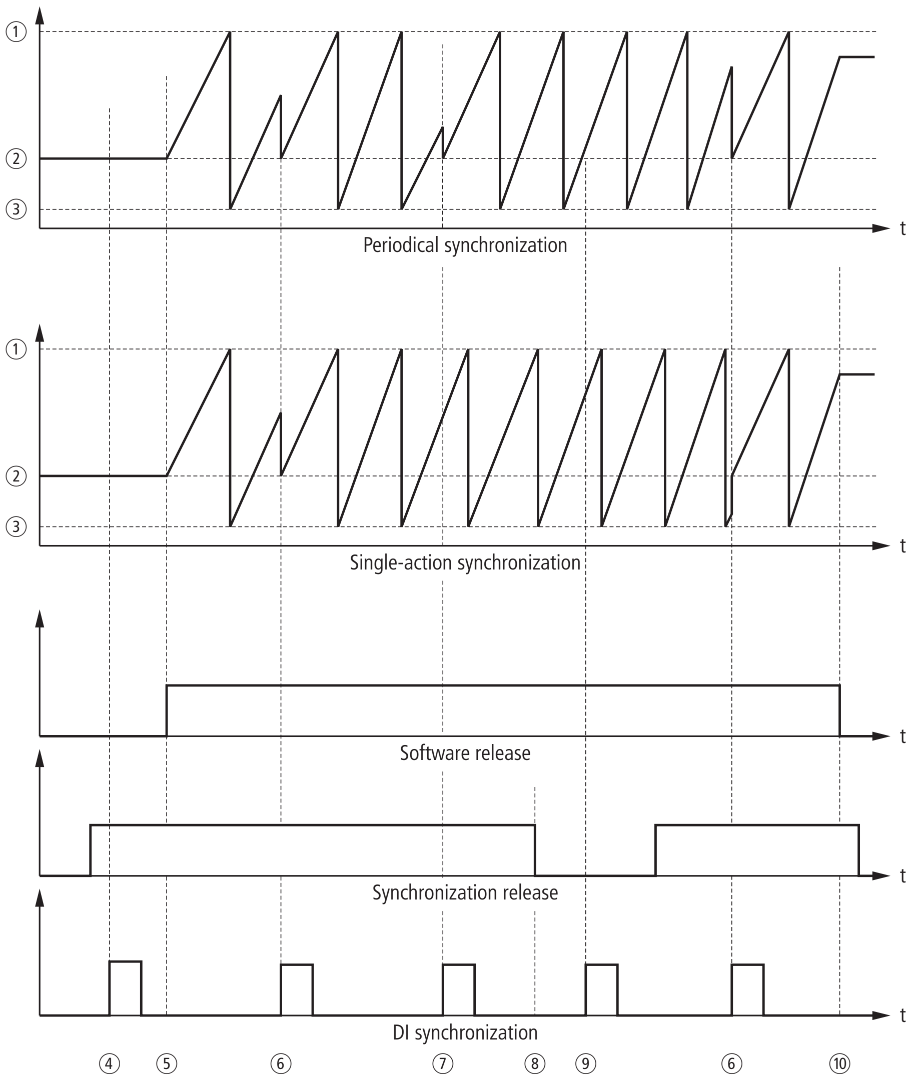


Figure 239: Synchronization

1. Upper count limit
2. Load value
3. Lower count limit
4. Synchronization without release
5. Release set

⑥ 1. Synchronization
⑦ 2. Synchronization
⑧ Stop synchronization
⑨ No synchronization
⑩ Release is reset

Behavior of the outputs

Two reference values that are assigned to the digital outputs can be stored on the counter module. The outputs can be activated based on the counter content and reference values.

As well as a real digital output, the module has a virtual digital output that exists only as a status bit in the check-back interface.

It is possible to choose between the following functions:

- Output (no switching initiated by comparator)
- Set when count value ≧ reference value
- Set when count value ≦ reference value
- Pulse when count value = ref. value

Output

The outputs are released by the control bits CTRL_DO1 and CTRL_DO2.

The outputs are turned on and off by the control bits SET_DO1 and SET_DO2.

The output statuses are stored in the check-back interface and can be queried using the status bits (STS_DO1 and STS_DO2)

Valid value ranges for the two reference values

Table 43: Value ranges

Main count direction: None	Main count direction: Up	Main count direction: Down
Lower count limit to upper count limit	Lower count limit to upper count limit	Lower count limit to upper count limit

Counter content ≧ reference value or counter content ≦ reference value
The appropriate output is switched if one of the reference conditions is met. Additionally they must be released by the status bits CTRL_DO1 and CTRL_DO2 for this purpose. The reference event is indicated via either of the status bits STS_CMP1 or STS_CMP2 and can first be acknowledged if the reference condition is no longer fulfilled.

Pulse duration when the reference value is reached
The pulse duration begins when the respective digital output is set and can be predefined. It determines for how long the output should be set. The pulse duration can be selected in steps of 2 ms between 0 and 510 ms.

If the pulse duration is = 0, the output will be set until the reference conditions is no longer fulfilled.

→ If the count value jumps over the reference value, for example, from the upper limit to the lower limit when counting up, then no pulse is generated.

Hysteresis for digital output DO1
A sensor can get caught up at a certain point, and then waver at this position. This condition results in the counter content fluctuating around a given value. If the reference value VW1 is within this range of fluctuation, then the output DO1 would be turned on and off in rhythm with the fluctuating signal.

To prevent unwanted switching due to small fluctuations, the counter module is equipped with a programmable hysteresis. This hysteresis can be parameterized for a range between 0 and 255 (0 means hysteresis switched off).

In addition, the hysteresis can be altered via the control command C_DOPARAM.

If the output is parameterized ”switch>= reference value” or ”switch<= reference value”, the following behavior will be observed:

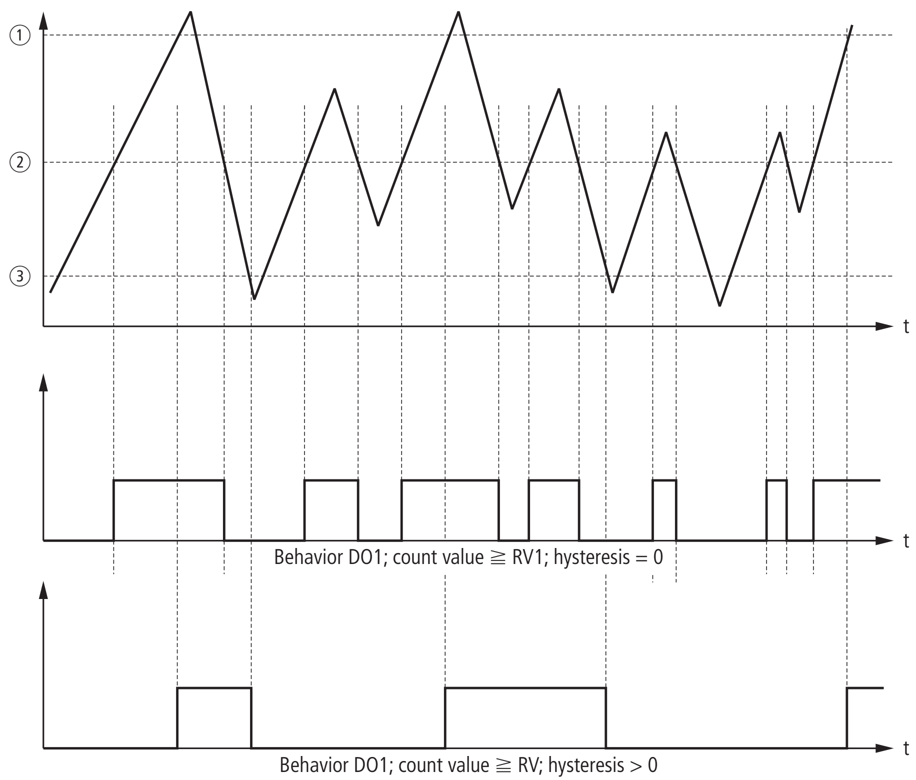


Figure 240: Hysteresis when ”switch >= reference value” or ”switch <= reference value”

① Reference value + hysteresis

② Reference value RV1

③ Reference value - hysteresis

A pulse is generated at the reference value RV1 if the output is parameterized with ”switch at count value = reference value.

Error recognition

The diagnostics ”error digital output” and ”short-circuit sensor supply” must be acknowledged. They are recognized by the counter module and indicated in the check-back interface (see Figure 243)

The parameter-error bit is acknowledged by a correct parameterization.

Check-back interface for counter modes

The check-back interface is the interface from the counter module to the XI/ON's internal module bus. The bits and bytes described in the following are converted by the XI/ON gateway into the respective type of communication applicable to the fieldbus.

Table 44: Assigning inputs: Check-back interface

Address		Assignment	
Bytes 4 to 7		Counter value or stored counter value with latch and retrigger function at the digital input	
Byte 3	Bit 7	Short-circuit sensor supply	ERR_24Vdc
	Bit 6	Short-circuit / open circuit	ERR_DO
	Bit 5	Parameterization error	ERR_PARA
	Bit 4	Reserve = 0	
	Bit 3	Reserve = 0	
	Bit 2	Status-bit reset running	RES_STS_A
	Bit 1	Error with load function	ERR_LOAD
	Bit 0	Load function running	STS_LOAD
Byte 2	Bit 7	Status direction down	STS_C_DN
	Bit 6	Status direction up	STS_C_UP
	Bit 5	Reserve = 0	
	Bit 4	Status DO2	STS_DO2
	Bit 3	Status DO1	STS_DO1
	Bit 2	Reserve = 0	
	Bit 1	Status DI	STS_DI
	Bit 0	Status internal release ("gate")	STS_GATE
Byte 1	Bit 7	Zero crossing in the count range	STS_ND
	Bit 6	Lower count limit	STS_UFLW
	Bit 5	Upper count limit	STS_OFLW
	Bit 4	Status comparator 2	STS_CMP2
	Bit 3	Status comparator 1	STS_CMP1
	Bit 2	Reserve = 0	
	Bit 1	Reserve = 0	
	Bit 0	Status synchronization	STS_SYN
Byte 0		Reserve = 0	

Table 45: Explanatory notes about the check-back bits

Check-back bit	Explanations
ERR_24Vdc	Short-circuit sensor supply (see Figure 243) Diagnostic information must be acknowledged with the control bit EXTF_ACK (see Table 47)
ERR_DO	Short-circuit / wire break / over temperature at the output DO1 (see Figure 243)
ERR_LOAD	Error with load function The control bits LOAD_VAL, LOAD_PREPARE, CMP_VAL1 and CMP_VAL2 must not be set at the same time during the transfer process. This leads, as does the transfer of a false value, to the status bit ERR_LOAD being set (see Figure 242).
ERR_PARA	Parameterization error
RES_STS_A	Status-bit reset running
STS_C_DN	Status direction down
STS_C_UP	Status direction up
STS_CMP1	Status comparator 1 The status bit STS_CMP1 indicates that the output is or was set. It must be acknowledged with the control bit RES_STS. If the check-back bit is acknowledged and the output is still set, it will be set again immediately. This check-back bit will also be set if the control bit SET_DO1 is set when the output DO1 is not released.
STS_CMP2	Status comparator 2 The status bit STS_CMP2 indicates that the output is or was set. It must be acknowledged with the control bit RES_STS. If the check-back bit is acknowledged and the output is still set, it will be set again immediately. This check-back bit will also be set if the control bit SET_DO2 is set when the output DO2 is not released.
STS_DI	Status DI The status of the digital input DI is indicated in all operating modes in the check-back interface by the check-back bit STS_DI.
STS_DO1	Status DO1 The status bit DO1 indicates the status of the digital output DO1.
STS_DO2	Status DO2 The status bit DO2 indicates the status of the digital output DO2.
STS_GATE	Status internal release Count procedure runs if the status bit STS_GATE is set.

Check-back bit	Explanations
STS_LOAD	Status load function Is set if the load function is running.
STS_ND	Status zero crossing Is set by zero crossing in the count range when counting without main direction. This bit must be reset using the control bit RES_STS.
STS_OFLW	Status upper count limit Is set if the upper count limit is exceeded. The bit must be reset.
STS_UFLW	Status lower count limit Is set if the lower count limit is fallen short of. The bit must be reset.
STS_SYN	Status synchronization The check-back bit STS_SYN is set following successful synchronization. It must be reset by the control bit RES_STS.

Control interface for counter modes

The control interface is the interface from the XI/ON's internal module bus to the counter module. The commands and signals directed to the counter module are converted by the XI/ON gateway from the respective type of communication applicable to the fieldbus into the bits and bytes described below.

Table 46: Assigning the outputs: Control interface

Address		Assignment			
Bytes 4 to 7[1)]		Load-value direct, in preparation, reference value 1 or 2			
Bytes 4 to 7[1)]		Function and behavior of DO1, DO2			
		Byte 7:	Bit 0 and bit 1	Function DO1	
			Bit 5 and bit 4	Function DO2	
			0 0 =	Output	
			0 1 =	Switch on when counter content ≧ ref. value	
			1 0 =	Switch on when counter content ≦ ref. value	
			1 1 =	Pulse when the reference value is reached	
		Byte 6:	Hysteresis DO1, DO2 (value range 0 to 255)		
		Byte 5:	Pulse duration [ms] DO1, DO2 (value range 0 to 255)		
		Byte 4:	Reserve = 0		
Byte 3	Bit 7		Diagnostics error acknowledgement		EXTF_ACK
	Bit 6		Release DO2		CTRL_DO2
	Bit 5		Control bit DO2		SET_DO2
	Bit 4		Release DO1		CTRL_DO1
	Bit 3		Control bit DO1		SET_DO1
	Bit 2		Trigger reset of status bits		RES_STS
	Bit 1		Release synchronization		CTRL_SYN
	Bit 0		Control bit software-release ("gate")		SW_GATE
Byte 2	Bit 7		Reserve = 0		
	Bit 6		Reserve = 0		
	Bit 5		Reserve = 0		
	Bit 4		Alter function and behavior of DO1, DO2		C_DOPARAM[2)]
	Bit 3		Load reference value 2		CMP_VAL2
	Bit 2		Load reference value 1		CMP_VAL1
	Bit 1		Load counter in preparation		LOAD_PREPARE
	Bit 0		Load counter direct		LOAD_VAL
Bytes 0 to 1			Reserve = 0		

1) Bytes 4 to 7 have two assignments each: depending on the status of the bits 0 to 4 in byte 2, either the assignment "load value" or the assignment "function and behavior" is valid.
2) The assignment of bit 4, byte 2 C_DOPARAM, leads to changes in the current parameter and therefore to an interruption of the counter operation. Pending counter values become invalid.

Table 47: Explanatory notes about control bits

Control bit	Explanations
C_DOPARAM	Change function and behavior of DO1 and DO2 (see Figure 242) The values from bytes 4 to 7 are accepted as a new function, hysteresis and pulse duration of DO1 and DO2.
CMP_VAL1	Load reference value 1 (see Figure 242) The control bit CMP_VAL1 transfers the value from bytes 4 to 7 to the reference value 1
CMP_VAL2	Load reference value 2 (see Figure 242) The control bit CMP_VAL2 transfers the value from bytes 4 to 7 to the reference value 2
CTRL_DO1	Release DO1 This control bit releases the output DO1.
CTRL_DO2	Release DO2 This control bit releases the output DO2.
CTRL_SYN	This control bit releases the synchronization.
EXTF_ACK	Error acknowledgement The error bits must be acknowledged by the control bit EXTF_ACK once the reason has been eliminated. This control bit must be subsequently reset. No new error messages will be set as long as the control bit EXTF_ACK is set! (see Figure 243)
LOAD_PREPARE	Load counter in preparation (see Figure 242) The value from bytes 4 to 7 is accepted as load value.
LOAD_VAL	Load counter direct (see Figure 242) The value from bytes 4 to 7 is accepted directly as the new count value.
RES_STS	Trigger reset of status bits The reset of the status bits is performed via the acknowledgement process between the bits RES_STS and RES_STS_A (see Figure 241)
SET_DO1	Control bit DO1 The digital output is either set or reset if the status bit CTRL_DO1 is set.

Control bit	Explanations
SET_DO2	Control bit DO2 The digital output is either set or reset if the status bit CTRL_DO2 is set.
SW_GATE	Control bit SW gate The software release (SW gate) is set or reset by the control bit SW_GATE via the control interface.

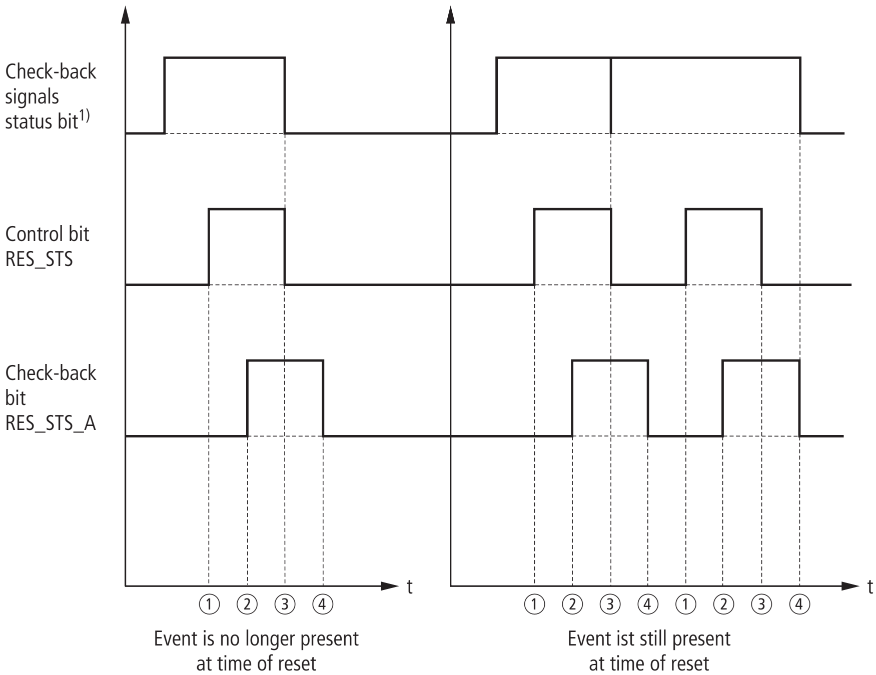


Figure 241: Resetting of status bits[1)]

1) Status bits: STS_SYN, STS_CMP1, STS_CMP2, STS_OFLW, STS_UFLW, STS_ND

① Reset is requested by the controller

② The electronics module performs the reset

③ The controller withdraws reset request.

④ The reset is completed in the electronics module

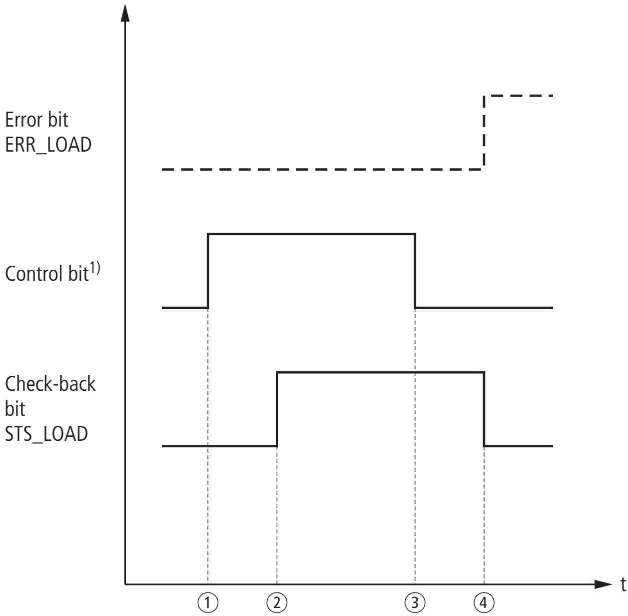


Figure 242: Acceptance of values by the load function

1) Control bits CMP_VAL1, CMP_VAL2, LOAD_VAL, LOAD_PREPARE, C_DOPARAM

① The controller requests the transfer of value. The value is made available.

② The electronics module has understood the request.

③ The controller withdraws reset request. The value remains available.

④ The value is accepted. The transfer is complete.

→ It is allowed to set only one of the named control bits1). Otherwise the error message ERR_LOAD is given until all named control bits are reset.

The status bit ”error digital output” ERR_DO and ”short-circuit sensor supply” ERR_24Vdc must be acknowledged. They are recognized by the counter module and indicated in the check-back interface. In addition, appropriate parameterization triggers a diagnostics message.

The following diagram describes the chronological connection between the occurrence of the error and its acknowledgement.

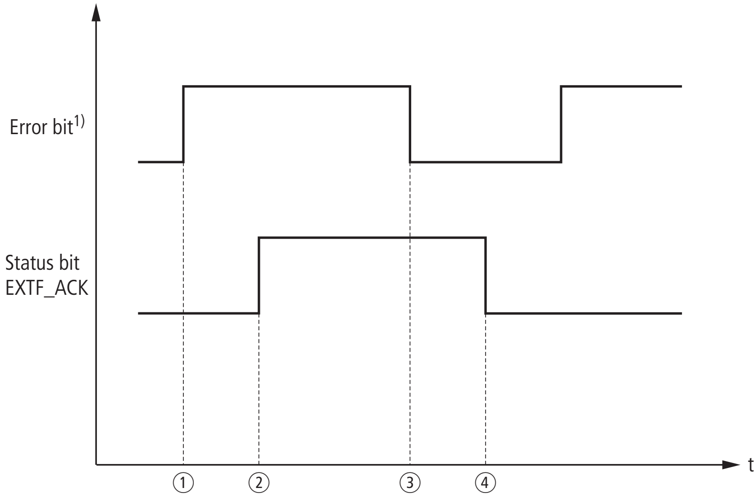


Figure 243: Error recognition

1) Error bit: ERR_DO or ERR_24Vdc

1. The error has occurred. The module sets the error bit and, if necessary, a diagnostic message. Error recognition continues.
2. The error bit is acknowledged. Any diagnostic message will be deleted. A further error recognition is not possible.
3. The error bit is reset. A further error recognition is not possible.
4. The status bit EXTF_ACK is reset. As a result, making further error recognition possible.

Parameter list for counter modes

The parameterization of the parameter lists is carried out either via a fieldbus-specific configuring tool or via the software I/O*assistant*. Some parameters cannot be altered when in online mode. Which means that the parameterization must take place **before** commissioning. Some parameters can be altered via the control interface after commissioning (see Table 46).

Caution!
The current count procedure is terminated when alterations are made to parameters during operations.

A description of the Software tool I/O*assistant* can be found in chapter 9. The English translation of the texts in the "Parameters", "Range of values" and "Preset" columns is in the "Appendix".

Table 48: Parameter for counter modes

Parameters	Range of values	Preset
Release		
Sammeldiagnose	freigeben sperren	freigeben
Behavior when the higher-level controller fails		
Verhalten CPU/Master STOP	DO1 abschalten Betriebsart weiterarbeiten DO1 Ersatzwert schalten DO1 letzten Wert halten	DO1 abschalten
Sensor parameters		
Signalauswertung (A, B)	Impuls und Richtung Drehgeber einfach Drehgeber zweifach Drehgeber vierfach	Impuls und Richtung
Sensor and input filter		
Geber-/Eing.-Filter (A)	2.5µs (200kHz) 25µs (20kHz)	2.5µs (200kHz)
Geber-/Eing.-Filter (B)	2.5µs (200kHz) 25µs (20kHz)	2.5µs (200kHz)
Geber-/Eing.-Filter (DI)	2.5µs (200kHz) 25µs (20kHz)	2.5µs (200kHz)

Parameters	Range of values	Preset
Sensor (A)	normal invertiert	normal
Richtungseingang (B)	normal invertiert	normal
Output parameters		
Funktion DO1	Ausgang ein bei Zaehlwert ≧ Vergl.-Wert ein bei Zaehlwert ≦ Vergl.-Wert Impuls bei Zaehlwert = Vergl.-Wt	Ausgang
Funktion DO2	Ausgang ein bei Zaehlwert ≧ Vergl.-Wert ein bei Zaehlwert ≦ Vergl.-Wert Impuls bei Zaehlwert = Vergl.-Wt	Ausgang
Ersatzwert DO1	0 1	0
Diagnose DO1	ein aus	ein
Hysterese	0 to 255 (UINT)	0
Impulsdauer DO1, DO2 [n*2ms]	0 to 255 (UINT)	0
Operating mode		
Zaehlbetriebsart	endlos zaehlen einmalig zaehlen periodisch zaehlen	endlos zaehlen
Torfunktion	Zaehlvorgang abbrechen Zaehlvorgang unterbrechen	Zaehlvorgang abbrechen
Digitaleingang DI	normal invertiert	normal
Funktion DI	Eingang HW-Tor (Hardware-Freigabe) Latch-Retrigger bei pos. Flanke Synchronisation bei pos. Flanke	Eingang
Synchronisation	einmalig periodisch	einmalig

Parameters	Range of values	Preset
Hauptzaehlrichtung	keine vorwaerts rueckwaerts	keine
Untere Zaehlgrenze[1)] Untere Zaehlgrenze (HWORD) Untere Zaehlgrenze (LWORD)	8000 0000 to 0 (hex) -32768 to 0 (SINT) -32768 to 32767 (SINT)	8000 0000 (hex) -32768 (SINT) 0
Obere Zaehlgrenze[1)] Obere Zaehlgrenze (HWORD) Obere Zaehlgrenze (LWORD)	0 to 7FFF FFFF (hex) 0 to 32767 (SINT) 0 to 65535 (SINT)	7FFF FFFF (hex) 32767 (SINT) 65535 (SINT)

1) In some controllers the count limits (each a double word) are divided respectively in a high word (“HWORD” XXXX ----) and a low word (“LWORD” ---- XXXX). The corresponding ranges are given.

Setting the lower and upper count limits

To divide the lower count limit (range: -2147483648 (-2^{31}) to 0) in a high and low word, proceed as follows:

- convert the decimal count limit into the hexadecimal format.

  Example:
  The lower count limit should be -123456. This decimal value is represented in hexadecimal format (double word) as FFFE 1DC0.
- The hexadecimal value (double word) is divided in a high word (FFFE) and a low word (1DC0). Both these values have to be converted from hexadecimal values to decimal values, because in some controllers only decimal values are suitable for setting parameters.

  Due to the fact that many tools and PCs can only process hexadecimal values in unsigned format during the conversion from hexadecimal in decimal values (which means that bit 15 is interpreted as a value and not as a sign), negative values (bit 15 = 1) must be converted manually.

- The following is valid for the low word:
  If bit 15 is not set, the low word will be converted to the corresponding, positive decimal value.

  In the example:
  Low word (hexadecimal): 1DC0
  Low word (binary): 0001 1101 1100 0000

Bit 0:	2^0	=	1	×	0	=	0
Bit 1:	2^1	=	2	×	0	=	0
Bit 2:	2^2	=	4	×	0	=	0
Bit 3:	2^3	=	8	×	0	=	0
Bit 4:	2^4	=	16	×	0	=	0
Bit 5:	2^5	=	32	×	0	=	0
Bit 6:	2^6	=	64	×	1	=	64
Bit 7:	2^7	=	128	×	1	=	128
Bit 8:	2^8	=	256	×	1	=	256
Bit 9:	2^9	=	512	×	0	=	0
Bit 10:	2^{10}	=	1024	×	1	=	1024
Bit 11:	2^{11}	=	2048	×	1	=	2048
Bit 12:	2^{12}	=	4096	×	1	=	4096
Bit 13:	2^{13}	=	8192	×	0	=	0
Bit 14:	2^{14}	=	16384	×	0	=	0
Bit 15:	2^{15}	=	32768	×	0	=	0

  Low word (decimal): 7616

  If bit 15 is set, the reciprocal value is formed. This procedure is described in the following for the high word.

- The same principle applies to the high word:

  If bit 15 is not set, the high word will be converted to the corresponding, positive decimal value.

  If bit 15 is set, the reciprocal value of the hexadecimal value has to be formed.

  – The high word (hex) is subtracted from the hexadecimal value FFFF. 1 is added to the result.

    In the example:
    FFFF - FFFE = 0001
    0001 + 1 = 0002

– This value is then converted to the corresponding decimal value:

  In the example:
  0002 becomes 2

– The result will be negative, because bit 15 is set in the high word (hex) (FFFE in the signed format).

You receive as a decimal value for FFFE: -2

In the example:
High word (hexadecimal): FFFE
High word (binary): 1111 1111 1111 1110
High word (decimal): -2

- The calculated values are entered in the corresponding input lines of the parameter mask for the XI/ON counter module (counter mode), (see Figure 244).

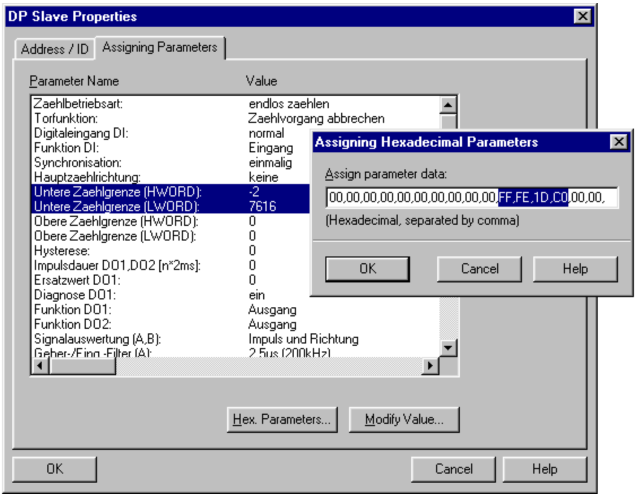


Figure 244: Input of the lower count limit as a high and low word.

You can gain access to the above window via the ‹Hex-Parameters...› button with the calculated hexadecimal values for your count limit, divided up into groups of 8 bits each.

To divide the upper count limit (range: 0 to +2147483647 (2^{31}-1)) in a high and a low word, the procedure is as follows:

- convert the decimal count limit into the hexadecimal format. The upper count limit is always a positive value.

  Example:
  The upper count limit should be 12345678. This decimal value is represented in hexadecimal format (double word) as 00BC 614E.
- The hexadecimal value (double word) is divided in a high word (00BC) and a low word (614E).
- The low word is converted to a decimal value:

  In the example:
  Low word (hexadecimal): 614E
  Low word (binary): 0110 0001 0100 1110

Bit 0:	2^0	=	1	×	0	=	0
Bit 1:	2^1	=	2	×	1	=	2
Bit 2:	2^2	=	4	×	1	=	4
Bit 3:	2^3	=	8	×	1	=	8
Bit 4:	2^4	=	16	×	0	=	0
Bit 5:	2^5	=	32	×	0	=	0
Bit 6:	2^6	=	64	×	1	=	64
Bit 7:	2^7	=	128	×	0	=	0
Bit 8:	2^8	=	256	×	1	=	256
Bit 9:	2^9	=	512	×	0	=	0
Bit 10:	2^{10}	=	1024	×	0	=	0
Bit 11:	2^{11}	=	2048	×	0	=	0
Bit 12:	2^{12}	=	4096	×	0	=	0
Bit 13:	2^{13}	=	8192	×	1	=	8192
Bit 14:	2^{14}	=	16384	×	1	=	16384
Bit 15:	2^{15}	=	32768	×	0	=	0

  Low word (decimal): 24910

- The same principle applies to the high word:

  In the example:
  High word (hexadecimal): 00BC
  High word (binary): 0000 0000 1011 1100
  High word (decimal): 188

- The calculated values are entered in the corresponding input lines of the parameter mask for the XI/ON counter module (counter mode), (see Figure 245).

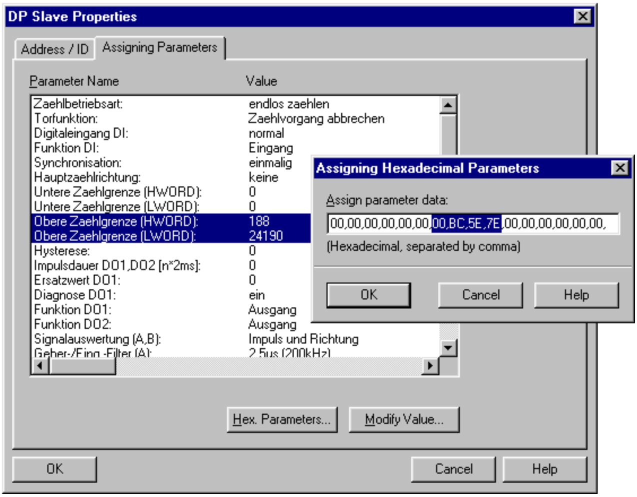


Figure 245: Input of the upper count limit as a high and low word.

You can gain access to the above window via the ‹Hex-Parameters...› button with the calculated hexadecimal values for your count limit, divided up into groups of 8 bits each.

Parameter errors indicated in the diagnostic byte

- Operating mode wrong
- Main count direction wrong
- It is not permitted to invert the level of the digital input when using the latch-retrigger function
- Start or end of counter range wrong

In addition, the status bit ERR_PARA is set in the check-back interface. The status is revoked by a correct parameter setting.

Measurement modes

Sequence of measurement

The measurement procedure is initiated by setting the internal software release or by parameterization of the digital input as a hardware release by setting of hardware and software releases.

The measurement is performed within a parameterized integration time, which can be altered using control commands. The measurement value is subsequently updated.

The completion of a measurement is indicated by the status bit STS_CMP1. This bit must be reset by the status bit RES_STS in the control interface.

Frequency measurement

Definition

In this operating mode, the module counts the pulses that arrive in a predetermined integration time.

The integration time can be determined by a measurement parameter. This can be set in 10 ms increments between 10 ms and 10 s

The value of the established frequency is made available expressed in the unit Hz $\times$ 10^{-3}. The measured frequency value can be viewed in the check-back interface.

An update of the indicated value is made at the earliest once the integration time has expired.

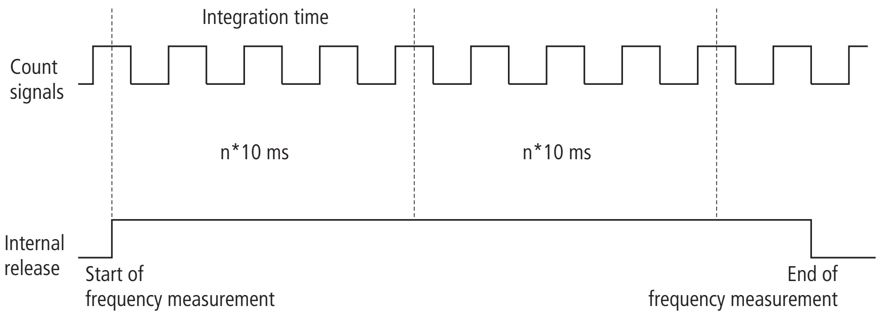


Figure 246: Frequency measurement with release function

Limit value monitoring

The limit values can be altered by parameterization and also determined at a later date via the control interface. The following differences arise in view of the possible limit value ranges:

Presetting values via parameters[1)]

- Lower limit n_u ist 0 to 16777214 × 10^{-3} Hz
- Upper limit n_u is 1 to 16777215 × 10^{-3} Hz

1) The value range is limited by the 3-byte parameter

The upper limit must be greater than the lower limit. An error is indicated with the messages "upper limit wrong" and "lower limit wrong". The diagnostic is deleted by the correct parameterization.

Predefining values via control interface (LOAD_PREPARE/LOAD_VAL)

- Lower limit n_u is 0 to 199999999 ×10^{-3} Hz
- Upper limit n_o is 1 to 200000000 × 10^{-3} Hz

The upper limit must be greater than the lower limit. An error is indicated by the status bit ERR_LOAD via the check-back interface. The status bit is deleted by a correct control command.

Table 49: Possible measurement ranges

Integration time	f_{min}	f_{max}
10 s	0.1 Hz	200000 Hz
1 s	1 Hz	200000 Hz
0.1 s	10 Hz	200000 Hz
0.01 s	100 Hz	200000 Hz

Behavior of the digital input

The following functions can be selected for the digital input:

- Digital input
- Hardware release

Behavior of the digital output

The following functions can be selected for the digital output:

- Digital output
- Measurement value outside of limits
- Measurement value below the lower limit
- Measurement value above the upper limit

The following values can be altered during operations:

- Lower limit (LOAD_PREPARE)
- Upper limit (LOAD_VAL)
- Function of DO1 (C_DOPARAM)
- Integration time (C_INTTIME)

Rotational speed measurement

Definition

In this mode, the counter module counts the pulses sent from a rotary sensor within a predefined integration time and calculates the revolutions of the connected motor.

The integration time is determined by a measurement parameter. This can be set in 10 ms increments between 10 ms and 10 s.

The revolutions are checked-back expressed in the unit 1×10^{-3} rev/min.

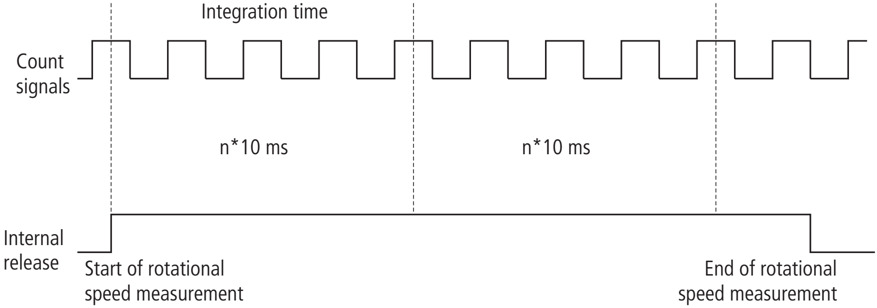


Figure 247: Rotational speed measurement with release function

Limit value monitoring

The limit values can be altered by parameterization and also determined at a later date via the control interface. The following differences arise in view of the possible limit value ranges:

Predefining values via parameters[1)]

- Lower limit n_u is 0 to 16777214 $\times$ 10^{-3} rev/min
- Upper limit n_o is 1 to 16777215 $\times$ 10^{-3} rev/min

1) The value range is limited by the 3-byte parameter

The upper limit must be greater than the lower limit. An error is indicated with the messages ”upper limit wrong” and ”lower limit wrong”. The diagnostic is deleted by the correct parameterization.

Predefining values via control interface (LOAD_PREPARE/LOAD_VAL)

- Lower limit n_u is 0 to 24999999 $\times$ 10^{-3} rev/min
- Upper limit n_o is 1 to 25000000 $\times$ 10^{-3} rev/min

The upper limit must be greater than the lower limit. An error is indicated by the status bit ERR_LOAD via the check-back interface. The status bit is deleted by a correct control command.

Table 50: Possible measurement ranges with the number of pulses per rotation = 60

Integration time	n_{min}	n_{max}
10 s	1 rev/min	200000 rev/min
1 s	1 rev/min	200000 rev/min
0.1 s	10 rev/min	200000 rev/min
0.01 s	100 rev/min	200000 rev/min

Table 51: Possible measurement ranges with the number of pulses per rotation = 60000

Integration time	n_{min}	n_{max}
10 s	1 rev/min	200 rev/min
1 s	1 rev/min	200 rev/min
0.1 s	1 rev/min	200 rev/min
0.01 s	1 rev/min	200 rev/min

Behavior of the digital input

The following functions can be selected for the digital input:

- Digital input
- Hardware release

Behavior of the digital output

The following functions can be selected for the digital output:

- Digital output
- Measurement value outside of limits
- Measurement value below the lower limit
- Measurement value above the upper limit

The following values can be altered during operations:

- Lower limit (LOAD_PREPARE)
- Upper limit (LOAD_VAL)
- Function of DO1 (C_DOPARAM)
- Integration time (C_INTTIME)

Period duration measurement

Definition

In this mode, the counter module measures the exact time, in µs, between two rising edges of the count signal by counting the pulses of an exact, internal quartz crystal reference-frequency (1 MHz). An averaging can take place over 1 to 1 000 periods. This is defined by the integration time parameter or via the status bit C_INTTIME in the control interface.

An update of the indicated measurement result is first made after the parameterized number of periods.
The measurement result is indicated in **µs** in the check-back interface.

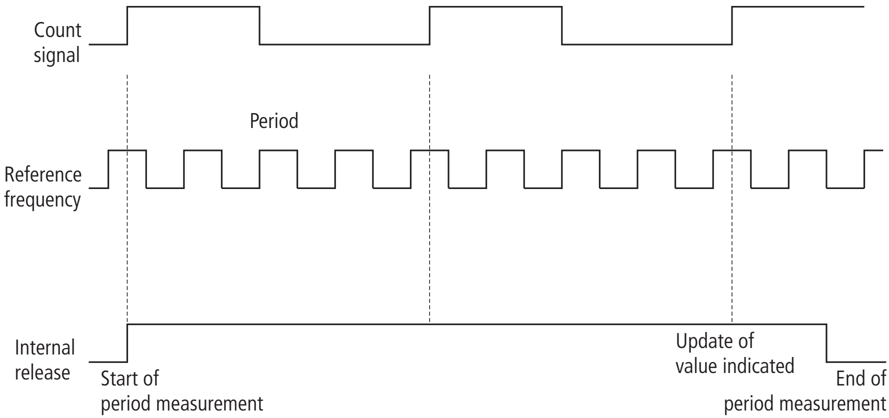


Figure 248: Period duration measurement with release function; number of periods = 2

Limit value monitoring

The limit values can be altered by parameterization and also determined at a later date via the control interface. The following differences arise in view of the possible limit value ranges:

Predefining values via parameters[1)]

- Lower limit n_u 0 to 16 777 214 µs
- Upper limit n_o 1 to 16 777 215 µs

1) The value range is limited by the 3-byte parameter

The upper limit must be greater than the lower limit. An error is indicated with the messages "upper limit wrong" and "lower limit wrong". The diagnostic is deleted by the correct parameterization.

Predefining values via control interface (LOAD_PREPARE/LOAD_VAL)

- Lower limit n_u 0 to 99999999 µs
- Upper limit n_o 1 to 100000000 µs

The upper limit must be greater than the lower limit. An error is indicated by the status bit ERR_LOAD via the check-back interface. The status bit is deleted by a correct control command.

Table 52: Possible measurement ranges

Measurement cycle via number of periods	t_{min} / update after	t_{max} / update after
1000	10 µs / 10 ms	10000 µs / 10 s
100	10 µs / 1 ms	100000 µs / 10 s
10	100 µs / 1 ms	1000000 µs / 10 s
1	1000 µs / 1 ms	10000000 µs / 10 s

The indicated value is updated after a maximum of 10 s in the selected measurement cycle.

The maximum possible period duration is reached with a measurement cycle of 1 period. This is 2^{32} µs (≈ 4295000000 µs). The indicated value is updated every 4295 s (approx. 72 min.).

Behavior of the digital input

The following functions can be selected for the digital input:

- Digital input
- Hardware release

Behavior of the digital output

The following functions can be selected for the digital output:

- Digital output
- Measurement value outside of limits
- Measurement value below the lower limit
- Measurement value above the upper limit

The following values can be altered during operations:

- Lower limit (LOAD_PREPARE)
- Upper limit (LOAD_VAL)
- Function of DO1 (C_DOPARAM)
- Integration time (C_INTTIME)

Error recognition

The diagnostics ”error digital output” and ”short-circuit sensor supply” must be acknowledged. They are recognized by the counter module and indicated in the check-back interface (see Figure 251)

Check-back interface for measurement modes

The check-back interface is the interface from the counter module to the XI/ON's internal module bus. The bits and bytes described in the following are converted by the XI/ON gateway into the respective type of communication applicable to the fieldbus.

Table 53: Assigning the inputs: Check-back interface

Address		Assignment	
Bytes 4 to 7		Measurement value	
Byte 3	Bit 7:	Short-circuit sensor supply	ERR_24Vdc
	Bit 6:	Short-circuit / open circuit	ERR_DO
	Bit 5:	Parameterization error	ERR_PARA
	Bit 4:	Reserve = 0	
	Bit 3:	Reserve = 0	
	Bit 2:	Status-bit reset running	RES_STS_A
	Bit 1:	Error with load function	ERR_LOAD
	Bit 0:	Load function running	STS_LOAD
Byte 2	Bit 7:	Status direction down	STS_C_DN
	Bit 6:	Status direction up	STS_C_UP
	Bit 5:	Reserve = 0	
	Bit 4:	Reserve = 0	
	Bit 3:	Status DO1	STS_DO1
	Bit 2:	Reserve = 0	
	Bit 1:	Status DI	STS_DI
	Bit 0:	Status internal release (”gate”)	STS_GATE
Byte 1	Bit 7:	Reserve = 0	
	Bit 6:	Lower limit measurement range	STS_UFLW
	Bit 5:	Upper limit measurement range	STS_OFLW
	Bit 4:	Reserve = 0	
	Bit 3:	Measurement complete	STS_CMP1
	Bit 2:	Reserve = 0	
	Bit 1:	Reserve = 0	
	Bit 0:	Reserve = 0	
Byte 0		Reserve = 0	

Table 54: Explanatory notes about the check-back bits

Check-back bit	Explanations
ERR_24Vdc	Short-circuit sensor supply (see Figure 251) Diagnostic information must be acknowledged with the control bit EXTF_ACK (see Table 56)
ERR_DO	Short-circuit / wire break / over temperature at the output DO1 (see Figure 251)
ERR_LOAD	Error with load function The control bits LOAD_VAL and LOAD_PREPARE must not be set at the same time during the transfer process. This leads, as does the transfer of a false value, to the status bit ERR_LOAD being set
ERR_PARA	Parameterization error
RES_STS_A	Status-bit reset running
STS_C_DN	Status direction down
STS_C_UP	Status direction up
STS_CMP1	Measurement complete The measurement value is updated following each elapsed time interval. Thereby, the end of a measurement (after completion of the time interval) is notified by the status bit STS_CMP1. This status bit is reset by the control bit RES_STS in the control interface.
STS_DI	Status DI The status of the digital input DI is indicated in all operating modes in the check-back interface by the check-back bit STS_DI.
STS_DO1	Status DO1 The status bit DO1 indicates the status of the digital output DO1.
STS_GATE	Status internal release (”internal gate”) Measurement procedure runs if the status bit is set.
STS_LOAD	Status load function Is set if the load function is running.
STS_OFLW	Status upper measurement limit Is set if the upper measurement limit is exceeded. The bit must be reset.
STS_UFLW	Status lower measurement limit Is set if the lower measurement limit is fallen short of. The bit must be reset.

Control interface for measurement modes

The control interface is the interface from the XI/ON's internal module bus to the counter module. The commands and signals directed to the counter module are converted by the XI/ON gateway from the respective type of communication applicable to the fieldbus into the bits and bytes described below.

Table 55: Assigning the outputs: Control interface

Address		Assignment				
Bytes 4 to 7[1)]		**Lower or upper limit**				
Bytes 4 to 7[1)]		**Function of DO1**				
		Byte 7:	Bit 1	Bit 0	Function DO1	
			0	0	Output	
			0	1	Outside of limit	
			1	0	Below lower limit	
			1	1	Above the upper limit	
		Bytes 4 to 6			Reserve = 0	
Bytes 4 to 7[1)]		**Integration time/number of periods**				
		Bytes 6, 7:	Integration time[n*10 ms]/number of periods [n] (value range 1 to 1000)			
		Bytes 4, 5:	Reserve = 0			
Byte 3	Bit 7:	Diagnostics error acknowledgement				EXTF_ACK
	Bit 6:	Reserve = 0				
	Bit 5:	Reserve = 0				
	Bit 4:	Release DO1				CTRL_DO1
	Bit 3:	Control bit				SET_DO1
	Bit 2:	Trigger reset of status bits				RES_STS
	Bit 1:	Reserve = 0				
	Bit 0:	Control bit software-release ("gate")				SW_GATE
Byte 2	Bit 7:	Reserve = 0				
	Bit 6:	Reserve = 0				
	Bit 5:	Reserve = 0				
	Bit 4:	Alter function of DO1				C_DOPARAM[2)]
	Bit 3:	Reserve = 0				
	Bit 2:	Alter integration time				C_INTTIME
	Bit 1:	Load upper limit				LOAD_PREPARE
	Bit 0:	Load lower limit				LOAD_VAL
Bytes 1 to 0		Reserve = 0				

1) Bytes 4 to 7 have three assignments each. Depending on the status of the bits 0 to 4 in byte 5, one of the following assignments is valid: ”upper limit or lower limit”, ”function of DO1” or ”integration time”.
2) The assignments of bits 0 to 4, byte 2 LOAD_VAL, LOAD_PREPARE, C_INTTIME and C_DOPARAM, lead to changes in the current parameter and therefore to an interruption of the measurement operation. Pending measurement values become invalid.

Table 56: Explanatory notes about control bits

Control bit	Explanations
C_DOPARAM	Change function and behavior of DO1 and DO2 (see Figure 250) The values from bytes 4 to 7 are accepted as new functions of DO1.
C_INTTIME	Integration time The integration time can be altered via bytes 4 to 7 in the control interface, if the status bit C_INTTIME has been set.
CTRL_DO1	Release DO1 This control bit releases the output DO1.
EXTF_ACK	Error acknowledgement The error bits must be acknowledged by the control bit EXTF_ACK once the reason has been eliminated. This control bit must be subsequently reset. No new error messages will be set as long as the control bit EXTF_ACK is set! (see Figure 251)
LOAD_PREPARE	Load upper limit The value from bytes 4 to 7 is accepted as the new upper limit.
LOAD_VAL	Load lower limit The value from bytes 4 to 7 is accepted as the new lower limit.
RES_STS	Trigger reset of status bits The reset of the status bits is performed via the acknowledgement process between the bits RES_STS and RES_STS_A (see Figure 249)
SET_DO1	Control bit DO1 The digital outputs are either set or reset if the status bit CTRL_DO1 is set.
SW_GATE	Control bit SW release The software release (SW gate) is set or reset by the control bit SW_GATE via the control interface.

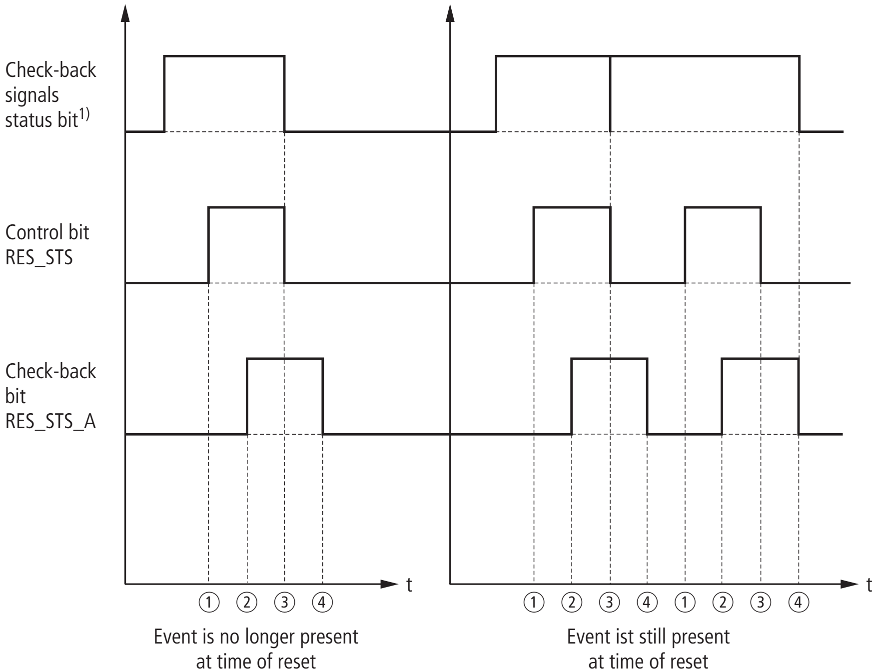


Figure 249: Resetting of status bits[1)]

1) Status bits: STS_CMP1, STS_OFLW, STS_UFLW

① Reset is requested by the controller

② The electronics module performs the reset

③ The controller withdraws reset request.

④ The reset is completed in the electronics module.

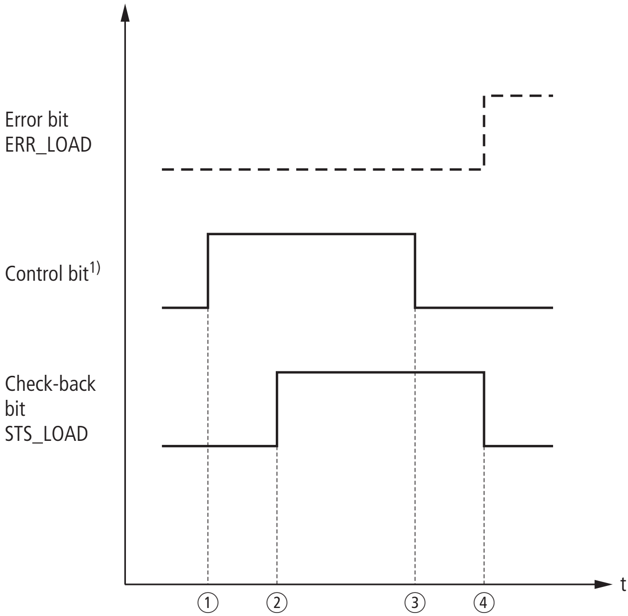


Figure 250: Acceptance of values by the load function.

1) Control bits: LOAD_VAL, LOAD_PREPARE, C_DOPARAM, C_INTTIME

① The controller requests the transfer of value. The value is made available.

② The electronics module has understood the request.

③ The controller withdraws reset request. The value remains available.

④ The value is accepted. The transfer is complete.

→ Only one of the named control bits1) may be set. Otherwise the error message ERR_LOAD is given until all named control bits are reset.

The status bit ”error digital output” ERR_DO and ”short-circuit sensor supply” ERR_24Vdc must be acknowledged. They are recognized by the counter module and indicated in the check-back interface. In addition, appropriate parameterization triggers a diagnostics message.

The following diagram describes the chronological connection between the occurrence of the error and its acknowledgement.

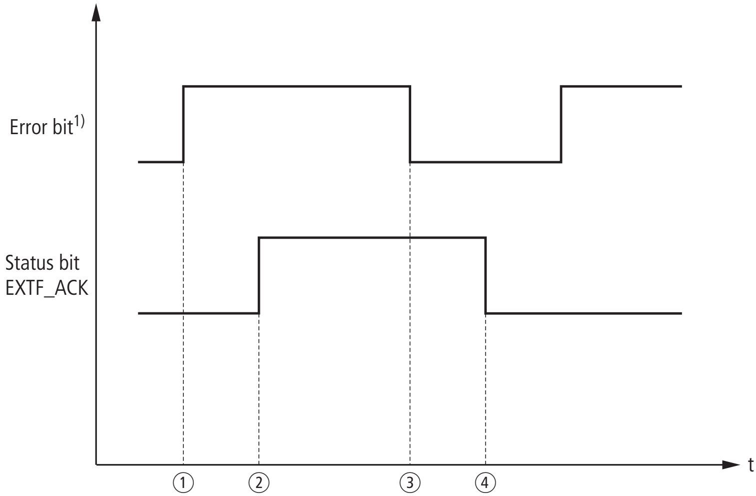


Figure 251: Error recognition

1) Error bit: ERR_DO or ERR_24Vdc

① The error has occurred. The module sets the error bit and, if necessary, a diagnostic message. Error recognition continues.

② The error bit is acknowledged. Any diagnostic message will be deleted. A further error recognition is not possible.

③ The error bit is reset. A further error recognition is not possible.

④ The status bit EXTF_ACK is reset. As a result, making further error recognition possible.

Parameter list for measurement modes

The parameterization of the parameter lists is carried out either via a fieldbus-specific configuring tool or via the software I/O*assistant*. Some parameters cannot be altered when in online mode. Which means that the parameterization must take place **before** commissioning. Some parameters can be altered via the control interface after commissioning (see Table 55).

Caution!
The current count procedure is terminated when alterations are made to parameters during operations.

A description of the Software tool I/O*assistant* can be found in chapter 9. The English translation of the texts in the "Parameters", "Range of values" and "Preset" columns is in the "Appendix".

Table 57: Parameter list for measurement modes

Parameters	Range of values	Preset
Release		
Sammeldiagnose	freigeben sperren	freigeben
Behavior when the higher-level controller fails		
Verhalten CPU/Master STOP	DO1 abschalten Betriebsart weiterarbeiten DO1 Ersatzwert schalten DO1 letzten Wert halten	DO1 abschalten
Sensor parameters		
Signalauswertung (A, B)	Impuls und Richtung Drehgeber einfach	Impuls und Richtung
Sensor and input filter		
Geber-/Eing.-Filter (A)	2.5µs (200kHz) 25µs (20kHz)	2.5µs (200kHz)
Geber-/Eing.-Filter (B)	2.5µs (200kHz) 25µs (20kHz)	2.5µs (200kHz)
Geber-/Eing.-Filter (DI)	2.5µs (200kHz) 25µs (20kHz)	2.5µs (200kHz)
Sensor (A)	Normal Invertiert	Normal

Parameters	Range of values	Preset
Richtungseingang (B)	Normal Invertiert	Normal
Output parameters		
Diagnose DO1	Ein Aus	Ein
Funktion DO1	Ausgang Ausserhalb der Grenze Unterhalb der Untergrenze Oberhalb der Obergrenze	Ausgang
Ersatzwert DO1	0 1	0
Operating mode		
Messbetriebsart	Frequenzmessung Drehzahlmessung Periodendauermessung	Frequenzmessung
Funktion DI	Eingang HW-Tor	Eingang
Digitaleingang DI	Normal invertiert	Normal
Untergrenze[1)] Untergrenze (HWORD) Untergrenze (LWORD)	0 to f_{max}-1/n_{max}-1/t_{max}-1 0 to 255 (SINT) 0 to 65 535 (SINT)	 0 0
Obergrenze[1)] Obergrenze (HWORD) Obergrenze (LWORD)	1 to f_{max}/n_{max}/t_{max} 0 to 255 (SINT) 0 to 65535 (SINT)	 255 65535 (SINT)
Integrationszeit [n*10 ms] oder Anzahl der Perioden	Frequenzmessung1 to 1000 Drehzahlmessung1 to 1000 Periodendauermessung1 to 1000	10
Geberimpulse pro Umdrehung	1 to 65535 (SINT)	1

1) In some controllers the measurement value limits (each a double word) are divided respectively in a high word ("HWORD" XXXX ----) and a low word ("LWORD" ---- XXXX). The corresponding ranges are given.

Setting the lower and upper measurement value limits

To divide the lower measurement value limit in a high and a low word, proceed as follows:

- Convert the decimal measurement value limit into the hexadecimal format.

  Example:
  The lower measurement value limit should be 654321. This decimal value is represented in hexadecimal format (double word) as 0009 FBF1.
- The hexadecimal value (double word) is divided in a high word (0009) and a low word (FBF1).
- The low word is converted to a decimal value:

  In the example:
  Low word (hexadecimal): FBF1
  Low word (binary): 1111 1011 1111 0001

Bit 0:	2^0	=	1	×	1	=	1
Bit 1:	2^1	=	2	×	0	=	0
Bit 2:	2^2	=	4	×	0	=	0
Bit 3:	2^3	=	8	×	0	=	0
Bit 4:	2^4	=	16	×	1	=	16
Bit 5:	2^5	=	32	×	1	=	32
Bit 6:	2^6	=	64	×	1	=	64
Bit 7:	2^7	=	128	×	1	=	128
Bit 8:	2^8	=	256	×	1	=	256
Bit 9:	2^9	=	512	×	1	=	512
Bit 10:	2^{10}	=	1024	×	0	=	0
Bit 11:	2^{11}	=	2048	×	1	=	2048
Bit 12:	2^{12}	=	4096	×	1	=	4096
Bit 13:	2^{13}	=	8192	×	1	=	8192
Bit 14:	2^{14}	=	16384	×	1	=	16384
Bit 15:	2^{15}	=	32768	×	1	=	32768

  Low word (decimal): 64497
- The same principle applies to the high word:

  In the example:
  High word (hexadecimal): 0009
  High word (binary): 0000 0000 0000 1001
  High word (decimal): 9

4

- The calculated values are entered in the corresponding input lines of the parameter mask for the XI/ON counter module (measurement mode), (see Figure 252).

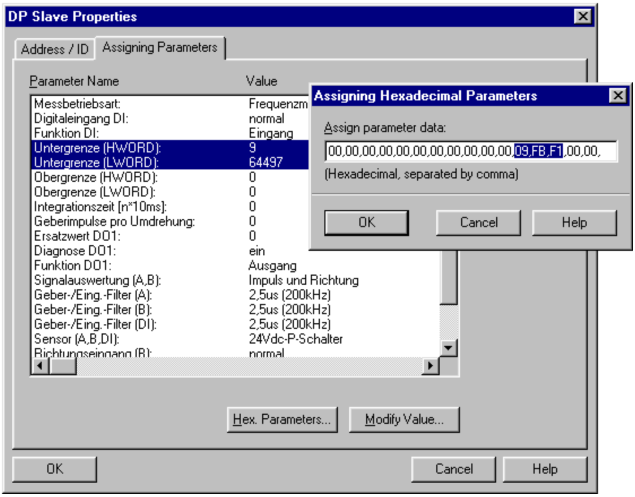


Figure 252: Input of the lower measurement value limit as high and low word

You can gain access to the above window via the ‹Hex-Parameters...› button with the calculated hexadecimal values for your lower measurement value limit, divided up into groups of 8 bits each.

To divide the lower measurement value limit in a high and a low word, proceed as follows:

- Convert the decimal measurement value limit into the hexadecimal format.

  Example:
  The upper measurement value limit should be 782955. This decimal value is represented in hexadecimal format (double word) as 000B F26B.

- The hexadecimal value (double word) is divided in a high word (0009) and a low word (FBF1).
- The low word is converted to a decimal value:

  In the example:
  Low word (hexadecimal): F26B
  Low word (binary): 1111 0010 0110 1011

Bit 0:	2^{0}	=	1	×	1	=	1
Bit 1:	2^{1}	=	2	×	1	=	2
Bit 2:	2^{2}	=	4	×	0	=	0
Bit 3:	2^{3}	=	8	×	1	=	8
Bit 4:	2^{4}	=	16	×	0	=	0
Bit 5:	2^{5}	=	32	×	1	=	32
Bit 6:	2^{6}	=	64	×	1	=	64
Bit 7:	2^{7}	=	128	×	0	=	0
Bit 8:	2^{8}	=	256	×	0	=	0
Bit 9:	2^{9}	=	512	×	1	=	512
Bit 10:	2^{10}	=	1024	×	0	=	0
Bit 11:	2^{11}	=	2048	×	0	=	0
Bit 12:	2^{12}	=	4096	×	1	=	4096
Bit 13:	2^{13}	=	8192	×	1	=	8192
Bit 14:	2^{14}	=	16384	×	1	=	16384
Bit 15:	2^{15}	=	32768	×	1	=	32768

  Low word (decimal): 62059

- The same principle applies to the high word:

  In the example:
  High word (hexadecimal): 000B
  High word (binary): 0000 0000 0000 1011
  High word (decimal): 11
- The calculated values are entered in the corresponding input lines of the parameter mask for the XI/ON counter module (measurement mode), (Figure 253).

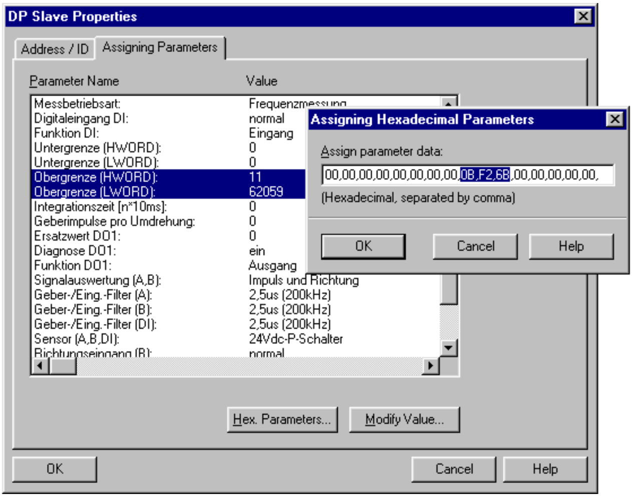


Figure 253: Input of the upper measurement value limit as a high and low word.

You can gain access to the above window via the ‹Hex-Parameters...› button with the calculated hexadecimal values for your upper measurement value limit, divided up into groups of 8 bits each.

Parameterization error

- Operating mode wrong
- Lower limit wrong
- Upper limit wrong
- Integration time wrong
- Sensor pulse wrong

In addition, the status bit ERR_PARA is set in the check-back interface. The status is revoked by a correct parameter setting.

Signal evaluation options for rotary sensors

The evaluation options settings are made via the configuration of the XI/ON counter module. The following settings are possible:

- Single
- Double
- Fourfold

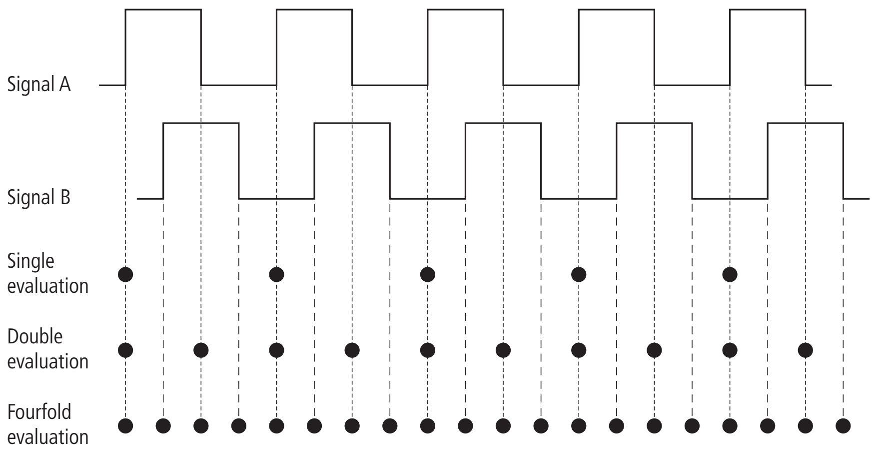


Figure 254: Evaluation options for count and measurement modes

Scanning points with varying evaluations

According to the configuration, the counter content or the measurement signal increments or decrements depending on the rising and falling edges of the signals A and B.

- Single evaluation:
  The rising edge of signal A only is evaluated.
- Double evaluation:
  Both the rising and the falling edges of signal A are evaluated.
- Fourfold evaluation :
  The rising and the falling edges of both signal A and signal B are evaluated.

In the count mode, rotary sensors can be selected with single, double and fourfold evaluation.

Rotary sensors with single evaluation only can be selected during measurement operations.

Figure 255: Electronics module XN-1CNT-24VDC

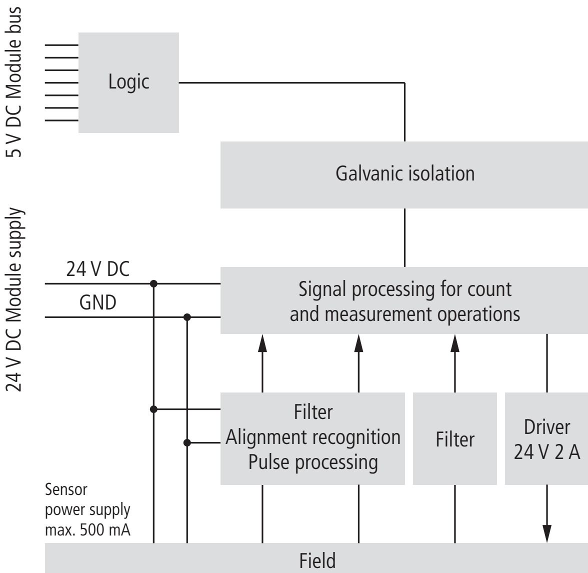


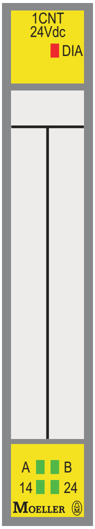
Figure 256: Block diagram

Electronics module

Designation	XN-1CNT-24VDC
Number of channels	1
Nominal voltage from power supply terminal	24 V DC
Nominal current from supply terminal I_{EI}	< 50 mA (at load current = 0)
Nominal current from module bus I_{MB}	< 40 mA
Power loss of the module, typical	1.3 W
Supply to sensor	
Output voltage	L+ (-0.8 V)
Output current	≦ 0.5 A short-circuit proof
Count signals and digital input	
Input voltage with nominal value at 24 V DC	
Low level U_L	-30 V DC to 5 V DC
High level U_H	11 V DC to 30 V DC
Input current	
Low level I_L	-8 mA to 1.5 mA
High level I_H	2 mA to 10 mA
Input delay	≦ 200 µs
Min. pulse width (max. counter frequency)	
Filter on	≧ 25 ms (20 kHz)
Filter off	≧ 2.5 ms (200 kHz)
Digital output	
Output voltage with nominal value at 24 V DC	
Low level U_L	≦ 3 V DC
High level U_H	≧ L+ (-1 V DC)
Output current	
High level I_H (permissible range)	5 mA to 2 A
High level I_H (nominal value)	up to 0.5 A (55 °C)

Operating frequency	
with resistive load	100 Hz
with inductive load	2 Hz
with lamp load	≦ 10 Hz
Lamp load R_{LL}	≦ 10 W
Output delay (resistive load)	100 µs
Short-circuit proof	Yes
Response threshold	2.6 A to 4 A
inductive reset	L+ -(50 to 60 V)
Measurement ranges	
Frequency measurement	0.1 Hz to 200 kHz
Rotational speed measurement	1 rev/min to 25000 rev/min
Period duration measurement	5 ms to 120 s
Counter modes	
Signal evaluation A, B	Pulse and direction Rotary sensor: single Rotary sensor: double Rotary sensor: fourfold
Counter mode	Continuous count Single-action count Periodical count
Hysteresis	0 to 255
Pulse duration	0 to 255
Synchronization	Single action periodical
Count limit	
Upper count limit	0 to 7FFF FFFF
Lower count limit	8000 0000 to 0
Measurement modes	
Signal evaluation A, B	Pulse and direction Rotary sensor: single

Diagnostic messages



LED	Display	Meaning	Remedy
DIA	Red flashing, 0.5 Hz	Parameter error	Check the parameterization of the counter module
		Short-circuit digital output	Check the wiring to the digital output.
	Red	Module bus communication failure	Check if more than two adjoining electronics modules have been pulled. Check the power supply of the module bus.
	OFF	No error message	–
A	Green	Count input active or measurement input active	–
	OFF	Count input not active or measurement input not active	–
B	Green	Count input not active or direction input "count down"	–
	OFF	Count input active or direction input "count up"	–
14	Green	Status digital input = "1"	–
	OFF	Status digital input = "0"	–
24	Red	Error digital output	Check the wiring to the digital output.
	Green	Status digital output = "1"	–
	OFF	Status digital output = "0"	–

The following diagnostic messages are transmitted to the fieldbus:

Table 58: Diagnostic messages to the fieldbus

Bit	Diagnostics counter operation		Diagnostics measurement operations	
0	Short-circuit / open circuit	ERR_DO	Short-circuit / open circuit	ERR_DO
1	Short-circuit in sensor power supply	ERR-24V DC	Short-circuit in sensor power supply	ERR-24V DC
2	End of counter range wrong		Sensor pulse wrong	
3	Start of counter range wrong		Integration time wrong	
4	It is not permitted to invert the level of the digital input when using the latch-retrigger function		Upper limit wrong	
5	Main count direction wrong		Lower limit wrong	
6	Operating mode wrong		Operating mode wrong	
7	Bit = 0 operating mode: counter operation is active		Bit = 1 operating mode: measurement operation is active	

It should be observed that the diagnostic message ”measurement mode” is set only in connection with a further diagnostic bit.

Dynamic changes of diagnostics immediately result in a transmission of a new data record DATA CLASS 1 (diagnostic).

Module parameters

The parameters are saved to a non-volatile memory before being tested. Thereby, parameters that are independent of the operating-mode are evaluated and implemented first. If an error should occur with an operating-mode dependent parameter, the corresponding diagnostic is triggered and the bits in the check-back interface are set.

Caution!

It is not permitted to start the count or measurement procedure if a parameter error has occurred (diagnostic bits 2 to 7)!

Parameter list for counter modes

	Parameters[1)]	Value range[1)]
Operating mode	Zaehlbetriebsart	Endlos Zaehlen[1)] Einmalig Zaehlen Periodisch Zaehlen
	Torfunktion	Zaehlvorgang abbrechen[1)] Zaehlvorgang unterbrechen
	Digitaleingang DI	normal[1)] invertiert
	Funktion DI	Eingang[1)] HW-Tor Latch-Retrigger bei pos. Flanke Synchronisation bei pos. Flanke
	Synchronisation	einmalig[1)] periodisch
	Hauptzaehlrichtung	keine[1)] vorwaerts rueckwaerts
	Untere Zaehlgrenze Untere Zaehlgrenze (HWORD) Untere Zaehlgrenze (LWORD)	8000 0000[1)] to 0 (hex) -32 768 to 0 (SINT) -32 768 to 32 767 (SINT)
	Obere Zaehlgrenze Obere Zaehlgrenze (HWORD) Obere Zaehlgrenze (LWORD)	0 to 7FFF FFFF[1)] (hex) 0 to 32 767 (SINT) 0 to 65 535 (SINT)
Output parameters	Hysterese	0[1)] to 255 (UINT)
	Impulsdauer DO1, DO2 [n*2ms]	0[1)] to 255 (UINT)
	Ersatzwert DO1	0[1)] 1
	Diagnose DO1	ein[1)] aus
	Funktion DO1	Ausgang[1)] Ein bei Zaehlwert ≧ Vergl.-Wert Ein bei Zaehlwert ≦ Vergl.-Wert Impuls bei Zaehlwert = Vergl.-Wt
	Funktion DO2	Ausgang[1)] Ein bei Zaehlwert ≧ Vergl.-Wert Ein bei Zaehlwert ≦ Vergl.-Wert Impuls bei Zaehlwert = Vergl.-Wt

	Parameters[1]	Value range[1]
Sensor parameters	Signalauswertung (A, B)	Impuls und Richtung[1] Drehgeber einfach Drehgeber zweifach Drehgeber vierfach
	Geber-/Eing.-Filter (A)	2,5µs (200kHz)[1] 25µs (20kHz)
	Geber-/Eing.-Filter (B)	2,5µs (200kHz)[1] 25µs (20kHz)
	Geber-/Eing.-Filter (DI)	2,5µs (200kHz)[1] 25µs (20kHz)
	Sensor (A)	normal[1] invertiert
	Richtungseingang (B)	normal[1] invertiert
Release	Sammeldiagnose	freigegeben[1] sperren
Behavior when the higher-level controller fails	Verhalten CPU/Master STOP	DO1 abschalten[1] Betriebsart weiterarbeiten DO1 Ersatzwert schalten DO1 letzten Wert halten

1) See "Appendix" for English translation

2) Presets

Parameter lists for measurement modes

	Parameters[1)]	Value range[1)]
Operating mode	Messbetriebsart	Frequenzmessung[1)] Drehzahlmessung Periodendauermessung
	Digitaleingang DI	normal[1)] invertiert
	Funktion DI	Eingang[1)] HW-Tor
	Untergrenze Untergrenze (HWORD) Untergrenze (LWORD)	Frequency measurement: 0[1)] to f_{max}-1 Rotational speed measurement 0[1)] to n_{max}-1 Period duration measurement: 0[1)] to t_{max}-1 0 to 255 (SINT) 0 to 65535 (SINT)
	Obergrenze Obergrenze (HWORD) Obergrenze (LWORD)	Frequency measurement: 1 to f_{max}[1)] Rotational speed measurement: 1 to n_{max}[1)] Period duration measurement: 1 to t_{max}[1)] 0 to 255 (SINT) 0 to 65535 (SINT)
	Integrationszeit [n*10 ms] oder Anzahl an Perioden	Frequency measurement: 1 to 1000; 10[1)] Rotational speed measurement 1 to 1000, 10[1)] Period duration measurement: 1 to 1000; 10[1)]
	Geberimpulse pro Umdrehung	1[1)] to 65535
Output parameters	Ersatzwert DO1	0[1)] 1
	Diagnose DO1	ein[1)] aus
	Funktion DO1	Ausgang[1)] Ausserhalb der Grenze Unterhalb der Untergrenze Oberhalb der Obergrenze

4

	Parameters[1]	Value range[1]
Sensor parameters	Signalauswertung (A, B)	Impuls und Richtung[1] Drehgeber einfach Reserve Reserve
	Geber-/Eing.-Filter (A)	2,5µs (200kHz)[1] 25µs (20kHz)
	Geber-/Eing.-Filter (B)	2,5µs (200kHz)[1] 25µs (20kHz)
	Geber-/Eing.-Filter (DI)	2,5µs (200kHz)[1] 25µs (20kHz)
	Sensor (A)	normal[1] invertiert
	Richtungseingang (B)	normal[1] invertiert
Release	Sammeldiagnose	freigegeben[1] sperren
Behavior when the higher-level controller fails	Verhalten CPU/Master STOP	DO1 abschalten[1] Betriebsart weiterarbeiten DO1 Ersatzwert schalten DO1 letzten Wert halten

1) See “Appendix” for English translation

2) Presets

Base module

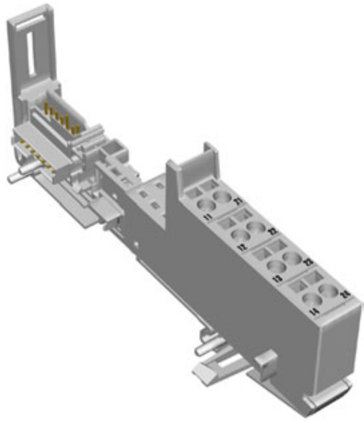


Figure 257: Base module XN-S4T-SBBS

Designation	
With tension clamp connection	XN-S4T-SBBS
With screw connection	XN-S4S-SBBS

Wiring diagram

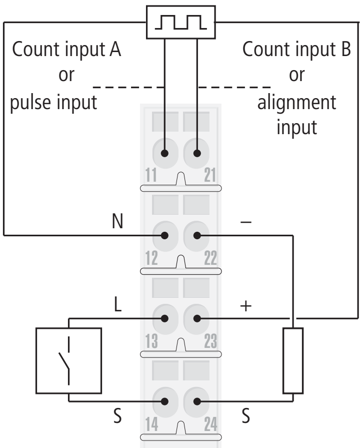


Figure 258: Wiring diagram XN-S4x-SBBS

Table 59: Connection options for pulse generator

	Connection	Count direction
Pulse generator without alignment sensing element	Count signal, 24 V DC at connection 11	Up
Pulse generator with alignment level	Count signal, 24 V DC at connection 11 and direction 24 V DC at connection 21	Up, down
Pulse generator with two 90° offset spur lines	Track A to connection 11 and track B to connection 21	Up, down

Measurement data in accordance with VDE 0611 Part 1/8.92/IEC 947-7-1/1989	
Rated voltage	250 V
Rated current	17.5 A
Rated cross-section	1.5 mm^2
Rated surge voltage	4 kV
Pollution severity	2
TOP connection technology	Tension clamp or screw connections

5 Guidelines for Station Planning

Chapter Overview

This chapter contains guidelines which must be observed when planning a XI/ON station.

You can find the following subjects in this chapter:

Module Arrangement on the Mounting Rail

Random Module Arrangement

The arrangement of the I/O modules within a XI/ON station can basically be chosen at will. Nevertheless, it can be useful with some applications to group certain modules together.

→ The mixed usage of base modules with screw connections and base modules with tension clamp connections requires a futher power supply module to be mounted. Thereby, it must be ensured that the base modules are fitted with the same connection technology (screw or tension clamp) as the power supply module.

Complete Planning

The planning of a XI/ON station should be thorough to avoid faults and increase operating reliability.

Attention!
If there are more than two empty slots next to one another, the communication is interrupted to all following XI/ON modules.

The power to XI/ON systems is supplied from a common external source, independent of the number of Bus Refreshing modules on the station. This avoids the occurrence of potential compensating currents within the XI/ON station.

Maximum System Extension

A XI/ON station can consist of a gateway and a maximum of 74 modules in slice design (equivalent to 1 m in length of mounting rail including the end bracket and endplate).

The limit placed on the maximum possible number of channels is based on the number of bytes of the process data, diagnostics, parameters as well as the configuration bytes of the XI/ON modules, these being limited by the field controller used in the XI/ON station. The following are maximum possible bytes available in a XI/ON station:

- Process data bytes 176 Bytes
- Diagnostic bytes 64 Bytes (61 Bytes module diagnostics + 3 Bytes gateway diagnostics)
- Parameter bytes 117 Bytes
- Configuration bytes 176 Bytes

Further limitations are imposed by the method of data description (standard or according to type) or by the method of module description (compressed or not compressed).

The following overview shows the maximum number of channels possible under these conditions:

- The entire station is made up of the resective channel type only
- The transmission to PROFIBUS-DP is supported only until the maximum possible 16 diagnostic bytes is reached. The diagnistics of the following modules are not taken in to consideration.

Table 60: Maximum system extension, process data dependent

Channels		Modules		Module description in the GSD file	
Type	Max. number	Type	Max. number	Type of GSD file	Module description
Digital inputs	288	XN-4DI-24VDC-P	72 1)	Standard	Not compressed
Digital outputs	144	XN-2DO-24VDC-2A-P	72 1)	Standard	Not compressed
Analog inputs, current	57	XN-1AI-I(0/4...20MA)	57 1)	Standard	Not compressed
Analog inputs, voltage	57	XN-1AI-U(-10/0...+10VDC)	57 1)	Standard	Not compressed
Analog inputs, PT / Ni	46	XN-2AI-PT/NI-2/3	23 2)	Standard	Not compressed
Analog inputs, thermocouple	76	XN-2AI-THERMO-PI	38 1)	Standard	Not compressed
Analog outputs, current	33	XN-1AO-I(0/4...20MA)	33 1)	According to type	Not compressed
Analog outputs, voltage	38	XN-2AO-U(-10/0...+10VDC)	19 2)	According to type	Not compressed
Counter	7 / 7	XN-1CNT-24VDC	7 2)	Standard	Not compressed

1) plus 2 Bus Refreshing modules XN-BR-24VDC-D

2) plus 1 Bus Refreshing module XN-BR-24VDC-D

The following overview shows the maximum possible number of channels, taking in to consideration the number of module-specific diagnostic bytes.

Table 61: Maximum system extension, process and diagnostic data dependent

Channels		Modules		Module description in the GSD file
Type	**Max. number**	**Type**	**Max. number**	**Type of GSD file**
Digital inputs	288	XN-4DI-24VDC-P	72 1)	Standard
Digital outputs	122	XN-2DO-24VDC-2A-P	61 1)	Standard
Analog inputs, current	57	XN-1AI-I(0/4...20MA)	57 1)	Standard
Analog inputs, voltage	57	XN-1AI-U(-10/0...+10VDC)	57 1)	Standard
Analog inputs, PT / Ni	46	XN-2AI-PT/NI-2/3	23 2)	Standard
Analog inputs, thermocouple	58	XN-2AI-THERMO-PI	29 1)	Standard
Analog outputs, current	33	XN-1AO-I(0/4...20MA)	33 1)	According to type
Analog outputs, voltage	38	XN-2AO-U(-10/0...+10VDC)	19 2)	According to type
Counter	7 / 7	XN-1CNT-24VDC	7 2)	Standard

1) plus 2 Bus Refreshing modules XN-BR-24VDC-D

2) plus 1 Bus Refreshing module XN-BR-24VDC-D

5

The following table offers an overview of the process data, diagnostic, parameter and configuration bytes of the individual XI/ON modules:

Table 62: Overview of the process data and diagnostic bytes

XI/ON Module	Process data bytes		Diagnostic bytes
	Not compressed	Compressed as follow-up	
Gateway	–	–	2
XN-BR-24VDC-D	0	–	1
XN-PF-24VDC-D	0	–	1
XN-PF-120/230VAC-D	0	–	1
XN-2DI-24VDC-P	1	0	0
XN-2DI-24VDC-N	1	0	0
XN-2DI-120/230VAC	1	0	0
XN-4DI-24VDC-P	1	0	0
XN-4DI-24VDC-N	1	0	0
XN-16DI-24VDC-P	2	–	0
XN-1AI-I(0/4...20MA)	2	–	1
XN-1AI-U(-10/0...+10VDC)	2	–	1
XN-2AI-PT/NI-2/3	4	–	2
XN-2AI-THERMO-PI	4	–	2
XN-2DO-24VDC-2A-P	1	0	1
XN-2DO-24VDC-0.5A-P	1	0	1
XN-2DO-24VDC-0.5A-N	1	0	1
XN-16DO-24VDC-0.5A-P	2	–	1
XN-1AO-I(0/4...20MA)	2	–	0
XN-2AO-U(-10/0...+10VDC)	4	–	0
XN-2DO-R-NC	1	0	0
XN-2DO-R-NO	1	0	0
XN-2DO-R-CO	1	0	0
XN-1CNT-24VDC	8 (Input)/8 (Output)	–	1

Table 63: Overview of the parameter and configuration bytes

XI/ON Module	Module description			
	Standard		According to type	
	Parameter bytes	Configuration bytes	Parameter bytes	Configuration bytes
Gateway	5	0	5	0
XN-BR-24VDC-D	–	–	0	4
XN-PF-24VDC-D	–	–	0	4
XN-PF-120/230VAC-D	–	–	0	4
XN-2DI-24VDC-P	1	1 1)	0	5 2)
XN-2DI-24VDC-N	1	1 1)	0	5 2)
XN-2DI-120/230VAC	1	1 1)	0	5 2)
XN-4DI-24VDC-P	1	1 1)	0	5 2)
XN-4DI-24VDC-N	1	1 1)	0	5 2)
XN-16DI-24VDC-P	1	1	0	5
XN-1AI-I(0/4...20MA)	2	1	1	5
XN-1AI-U(-10/0...+10VDC)	2	1	1	5
XN-2AI-PT/NI-2/3	5	1	4	5
XN-2AI-THERMO-PI	3	1	2	5
XN-2DO-24VDC-2A-P	1	1 1)	0	5 2)
XN-2DO-24VDC-0.5A-P	1	1 1)	0	5 2)
XN-2DO-24VDC-0.5A-N	1	1 1)	0	5 2)
XN-16DO-24VDC-0.5A-P	1	1	0	5
XN-1AO-I(0/4...20MA)	4	1	3	5
XN-2AO-U(-10/0...+10VDC)	7	1	6	5
XN-2DO-R-NC	1	1 1)	0	5 2)
XN-2DO-R-NO	1	1 1)	0	5 2)
XN-2DO-R-CO	1	1 1)	0	5 2)
XN-1CNT-24VDC	17	1	16	6

1) With compressed module description as follow-up module 2 bytes
2) With compressed module description as follow-up module 4 bytes

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The bytes of the modules can be described in a compressed form, depending on the description of the modules in the GSD files. Examples can be found in chapter 3.

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

→ If the system limits are exceeded, the software I/O*assistant* generates an error message when the user activates the command ‹Station → Verify›.

Overview of the process data, diagnostic, parameter and configuration bytes based on an example

The following offers an overview of the different bytes of an example station The composition of this station is described in chapter 3 of the XI/ON manual.

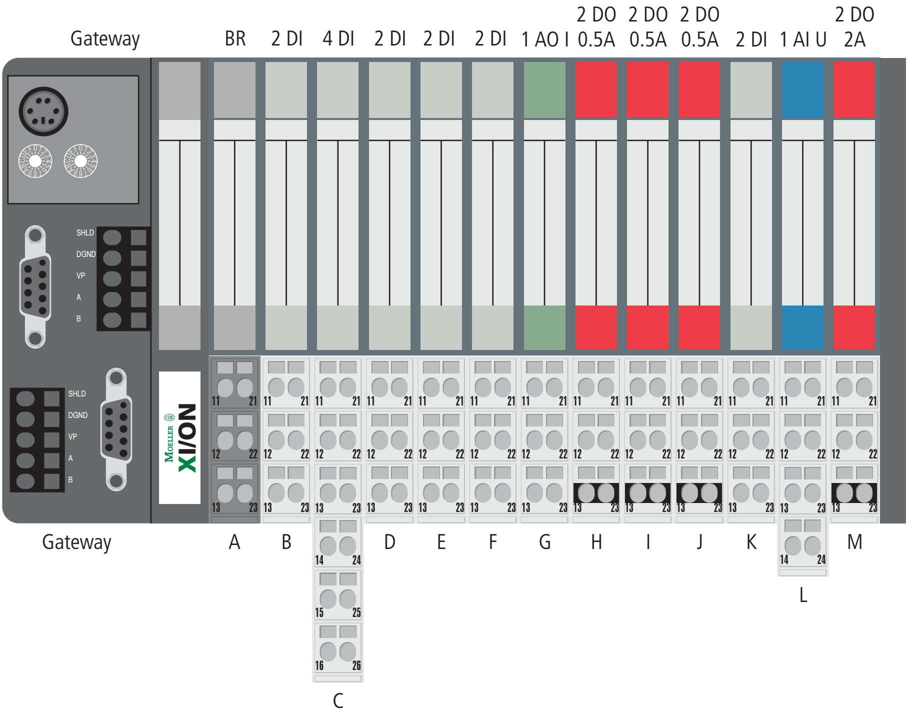


Figure 259: Example station

Table 64: Overview of the process data and diagnostic bytes of the example station

XI/ON Module	Process data bytes U[1]	Process data bytes G[2]	Diagnostic bytes
Gateway	–	–	2
XN-BR-24VDC-D	0	–	1
XN-2DI-24VDC-P	1	1	0
XN-4DI-24VDC-P	1	1	0
XN-2DI-24VDC-P	1	1	0
XN-2DI-24VDC-P	1	0	0
XN-2DI-24VDC-P	1	0	0
XN-1AO-I(0/4...20MA)	2	2[3]	0
XN-2DO-24VDC-0.5A-P	1	1	1
XN-2DO-24VDC-0.5A-P	1	0	1
XN-2DO-24VDC-0.5A-P	1	0	1
XN-2DI-24VDC-P	1	1	0
XN-1AI-U(-10/0...+10VDC)	2	2[3]	1
XN-2DO-24VDC-2A-P	1	1	1
Total:	**14**	**10**	**8**

1) Not compressed module description
2) Compressed module description
3) Module available in not compressed module description only

Table 65: Overview of the parameter and configuration bytes of the example station

XI/ON Module	Standard module description			Module description according to type		
	Parameter bytes	Configuration bytes		Parameter bytes	Configuration bytes	
		U[1]	G[2]		U[1]	G[2]
Gateway	5	0	0	5	0	0
XN-BR-24VDC-D	(0	4	4)[3]	0	4	4
XN-2DI-24VDC-P	1	1	1	0	5	5
XN-4DI-24VDC-P	1	1	1	0	5	4
XN-2DI-24VDC-P	1	1	1	0	5	4
XN-2DI-24VDC-P	1	1	2	0	5	5
XN-2DI-24VDC-P	1	1	2	0	5	4
XN-1AO-I(0/4...20MA)	4	1	1	3	5	5
XN-2DO-24VDC-0.5A-P	1	1	1	0	5	5
XN-2DO-24VDC-0.5A-P	1	1	2	0	5	4
XN-2DO-24VDC-0.5A-P	1	1	2	0	5	4
XN-2DI-24VDC-P	1	1	1	0	5	4
XN-1AI-U(-10/0...+10VDC)	2	1	1	1	5	5
XN-2DO-24VDC-2A-P	1	1	1	0	5	4
Total:	**21**	**16**	**20**	**9**	**64**	**57**

1) Not compressed module description
2) Compressed module description
3) Bus Refreshing module available in module description according to type only

Power Supply

Power Supply to the Gateway

→ On a XI/ON station, the first module to be mounted after the gateway is a Bus Refreshing module with either a XN-P3x-SBB or a XN-P4x-SBBC base module with tension clamp or screw connection.

Module Bus Refreshing

The number of XI/ON modules that can be supplied by a Bus Refreshing module via the internal module bus depends on the respective nominal current consumption of the individual modules on the module bus (see chapter 4).

Attention!
The sum total of the nominal current consumption of the connected XI/ON modules must not exceed 1.5 A (see chapter 4).

The following example shows the calculation for the required number of Bus Refreshing modules:

Example 1:
The XI/ON station consists of 20 XN-1AI-I(0/4...20MA) modules. The number of Bus Refreshing modules required is calculated as follows:

Gateway		430 mA
20 XN-1AI-I(0/4...20MA)	20 x 41 mA	820 mA
	Total:	1 250 mA
Maximum permissible current via module bus		1 500 mA

The calculation shows that no further Bus Refreshing module is required.

Example 2:
The XI/ON station comprises 15 XN-1AI-U(-10/0...+10VDC) modules, 10 XN-2AO-U(-10/0...+10VDC) modules, 10 XN-2DI-24VDC-P modules and 5 XN-2DO-24VDC-0.5A-P modules. The required number of Bus Refreshing modules is calculated as follows:

Gateway		430 mA
15 XN-1AI-U(-10/0...+10VDC)	15 x 41 mA	615 mA
10 XN-2AO-U(-10/0...+10VDC)	10 x 43 mA	430 mA
10 XN-2DI-24VDC-P	10 x 28 mA	280 mA
5 XN-2DO-24VDC-0.5A-P	5 x 32 mA	160 mA
	Total:	1915 mA
Maximum permissible current via module bus		1500 mA

The calculation shows that a further Bus Refreshing module is required at the latest following the last XN-2AO-U(-10/0...+10VDC) module. This Bus Refreshing module is sufficient to supply the remaining modules.

→ The power requirements of the XI/ON gateway is to be considered when calculating the required number of Bus Refreshing modules.

The following table offers an overview of the nominal current consumption of the individual XI/ON modules on the module bus:

Table 66: Nominal current consumption of the XI/ON modules on the module bus

Modul	Supply	Nominal current consumption
Gateway		≦ 430 mA
XN-BR-24VDC-D	1500 mA	
XN-PF-24VDC-D		≦ 28 mA
XN-PF-120/230VAC-D		≦ 25 mA
XN-2DI-24VDC-P		≦ 28 mA
XN-2DI-24VDC-N		≦ 28 mA
XN-2DI-120/230VAC		≦ 28 mA

Modul	Supply	Nominal current consumption
XN-4DI-24VDC-P		≦ 29 mA
XN-4DI-24VDC-N		≦ 28 mA
XN-16DI-24VDC-P		≦ 45 mA
XN-1AI-I(0/4...20MA)		≦ 41 mA
XN-1AI-U(-10/0...+10VDC)		≦ 41 mA
XN-2AI-PT/NI-2/3		≦ 45 mA
XN-2AI-THERMO-PI		≦ 45 mA
XN-2DO-24VDC-0.5A-P		≦ 32 mA
XN-2DO-24VDC-0.5A-N		≦ 32 mA
XN-2DO-24VDC-2A-P		≦ 33 mA
XN-16DO-24VDC-0.5A-P		≦ 45 mA
XN-1AO-I(0/4...20MA)		≦ 39 mA
XN-2AO-U(-10/0...+10VDC)		≦ 43 mA
XN-2DO-R-NC		≦ 28 mA
XN-2DO-R-NO		≦ 28 mA
XN-2DO-R-CO		≦ 28 mA
XN-1CNT-24VDC		≦ 40 mA

If the power supply from the module bus is not guaranteed, thereby making a further Bus Refreshing module necessary, the software I/O*assistant* generates an error message when the user activates the command ‹Station → Verify›.

→ Bus Refreshing modules which do not supply the gateway with power are to be combined with either a XN-P3T-SBB-B or an XN-P4T-SBBC-B (tension clamp connection) base module or with the base modules XN-P3S-SBB-B or XN-P4S-SBBC-B (screw connection).

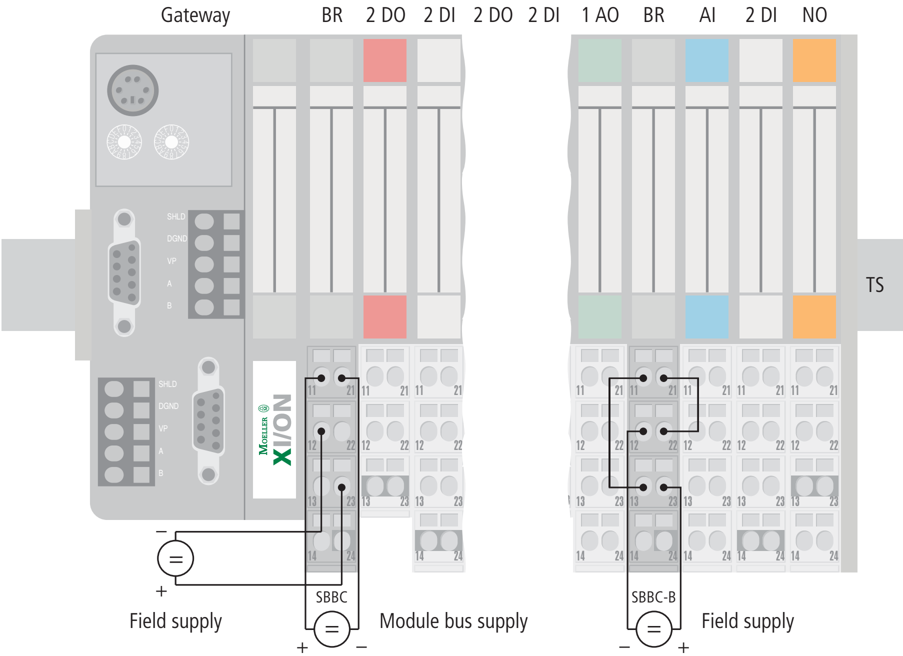


Figure 260: Possible supply options for Bus Refreshing modules

It must be ensured that the same ground potential and ground connections are used. If different ground potentials or ground connections are used, compensating currents flow via the module bus, which can lead to the destruction of the Bus Refreshing module.

All Bus Refreshing modules are connected to one another via the same ground potential.

The power to the module bus is supplied via the connections 11 and 21 on the base module.

Attention!
In order to comply with radiation limit values in accordance with EN 55011/ 2000, the supply lines of the module XN-BR-24VDC-D for supplying the gateway with power are to be fed through a ferrite ring (PS416-ZBX-405). This is to be placed immediately next to the connection terminals. From there on, it is not permitted to make connections to further devices.

Creating Potential Groups

Bus Refreshing and Power Feeding modules can be used to create potential groups. The potential isolation of potential groups to the left of the respective power distribution modules is provided by the base modules.

Attention!
Ensure that the correct base modules are planned for when using Bus Refreshing modules.

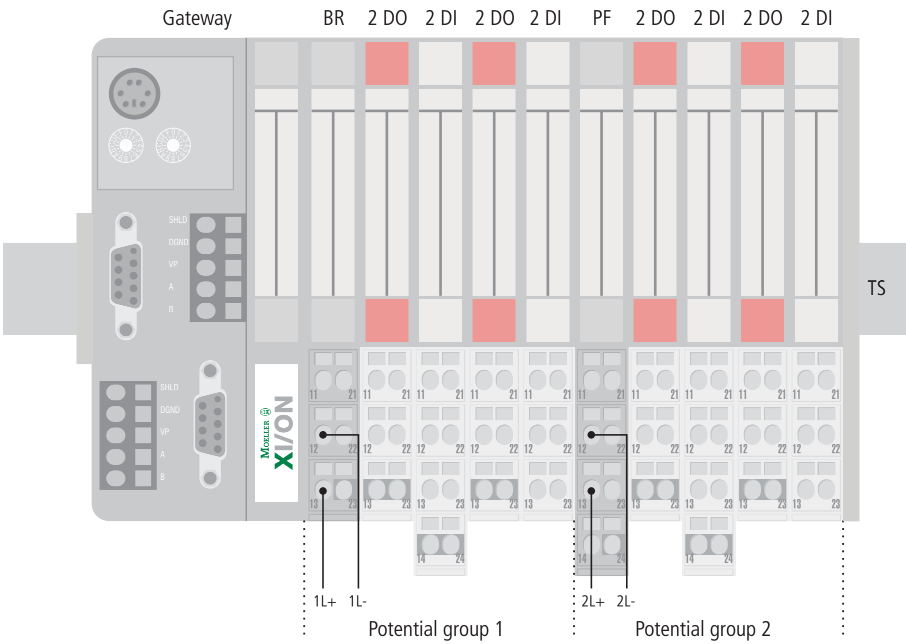


Figure 261: Example for creating potential groups

The system can be supplied with power independent of the potential group formation described above.

When using a digital input module for 120/230 V AC, it should be ensured that a potential group is created in conjunction with the Power Feeding module XN-PF-120/230VAC-D.

Attention!
It is not permitted to use the modules with 24 V DC and 120/230 V AC field supply in a joint potential group.

Protecting the Service Interface on the Gateway

During operation, the cover protecting the service interface and the hexadecimal rotary coding-switches must remain closed due to EMC and ESD.

Figure 262: XI/ON Gateway 1.5 MB with tension clamp connection

C-Rail (Cross Connection)

The C-rail runs through all base modules. The C-rail of the base modules for power distribution modules is mechanically separated; thus potentially isolating the adjoining supply groups.

Access to the C-rail is possible with the help of base modules with a **C** in their designation (for example, XN-S4T-SB**C**S). The corresponding connection level is indicated on these modules by a thick black line. The black line is continuous on all I/O modules. On power distribution modules, the black line is only above the connection 24. This makes clear that the C-rail is separated from the adjoining potential group to its left.

Figure 263: C-rail front view

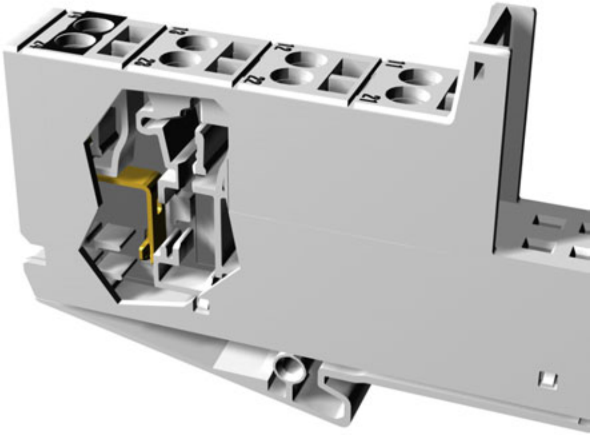


Figure 264: C-rail side view

Warning!
It is permitted to load the C-rail with a maximum of 24 V. Not 230 V!

The C-rail can be used as required by the application, for example, as a protective earth (PE). In this case, the PE connection of each power distribution module must be connected to the mounting rail via an additional PE terminal, which is available as an accessory.

→ For information about introducing a XION station into a ground reference system, please read chapter 7.

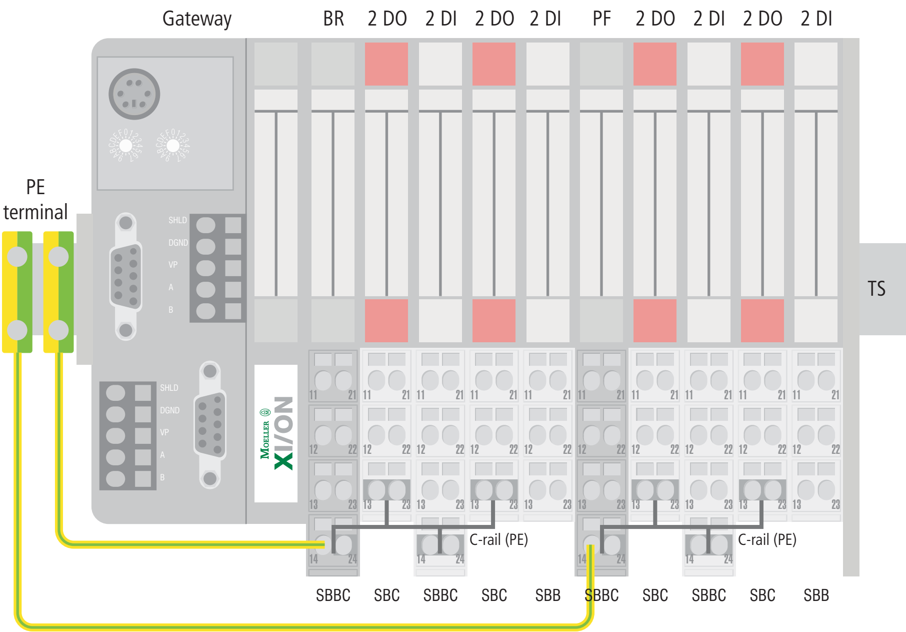


Figure 265: Using the C-rail as a protective earth

C-rails can be used for a common voltage supply when relay modules are planned. To accomplish this, the load voltage is connected to a Power Feeding module with the XN-P4x-SBBC base module with tension clamp or screw connection. All the following relay modules are then supplied with power via the C-rail.

Attention!
When relay modules are planned and the C-rail is used for a common voltage supply, a further power distribution module must be used for the potential isolation to the following modules. The C-rail can only again be used as a PE following potential isolation.

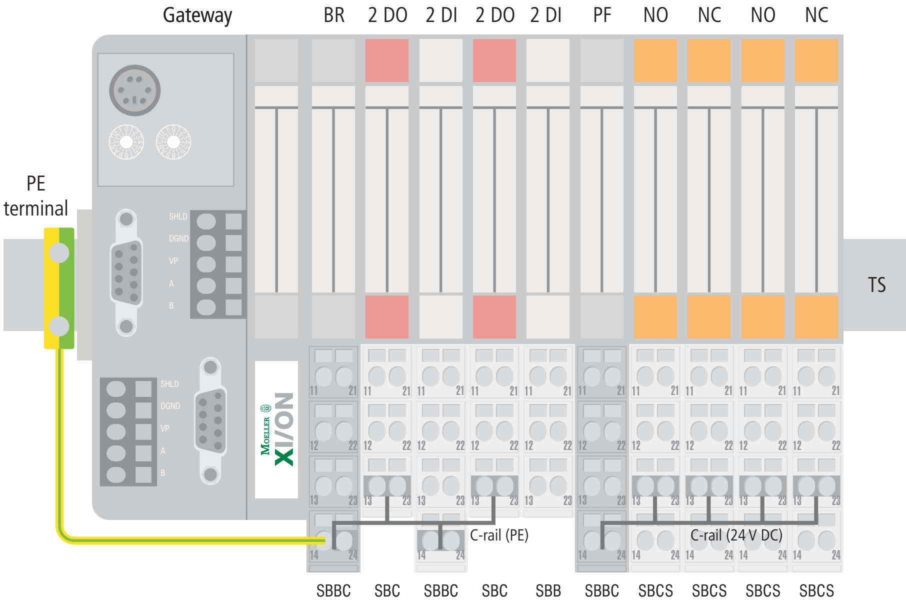


Figure 266: Using the C-rail as protective earth and for the power supply with relay modules

Cross-connecting relay module roots is achieved by the use of jumpers. The corresponding wiring diagram including the jumpers can be found in chapter 4.

Direct Wiring of Relay Modules

As well as the options mentioned above, relay modules can be wired directly. In this case, base modules without C-rail connections should be chosen to guarantee the potential isolation to the adjoining modules.

Plugging and Pulling Electronics Modules

XI/ON enables the pulling and plugging of electronics modules without having to disconnect the field wiring. The XI/ON station remains in operation if an electronics module is pulled. The voltage and current supplies as well as the protective earth connections are not interrupted.

Attention!
If the field and system supplies remain connected when electronics modules are plugged or pulled, short interruptions to the module bus communications can occur in the XI/ON station. This can lead to undefined statuses of individual inputs and outputs of different modules.

Extending an Existing Station

Attention!
Please note that extensions to the station (mounting further modules) should be carried out only when the station is in a voltage-free state.

Firmware Download

Firmware can be downloaded via the service interface on the gateway using the software tool I/O*assistant*. More information is available in the program's online help.

Attention!
The station should be disconnected from the fieldbus when downloading.

Firmware must be downloaded by authorized personnel only.

The field level must be isolated.

6 Mounting and Wiring

Chapter Overview

You can find the following subjects in this chapter:

Mechanical Mounting

General Mounting Rules

- Keep a small space to the left of the gateway free for the first end bracket.
- The gateway is the first electronics component on a XI/ON station.
- The second component is a Bus Refreshing module, which provides the gateway with 5 V DC via the module bus. It must be ensured that the correct base module is used (see chapter 4).
- Digital, analog, relay and technology modules are mounted subsequently in the order required.
- Should it become necessary, a potential isolation can be achieved by mounting a Power Feeding module (power distribution) before mounting the next module.
- Power Feeding and Bus Refreshing modules can be mounted between the rest of the modules as required.
- An end plate is mounted at the end of each XI/ON station.
- The complete XI/ON system is secured to the mounting rail by means of two end brackets. The first is to the left of the gateway, the second is placed at the other end of the system and mounted together with the end plate.

Mounting Rails

The mounting rails used for XI/ON should be mounted onto a galvanized mounting plate with a minimum thickness of 2 mm. This allows a reference potential for protective earth (PE) and functional earth to be created. Please allow for a maximum distance of 150 mm between mounting holes, when mounting non pre-drilled mounting rails.

Installation Dimensions

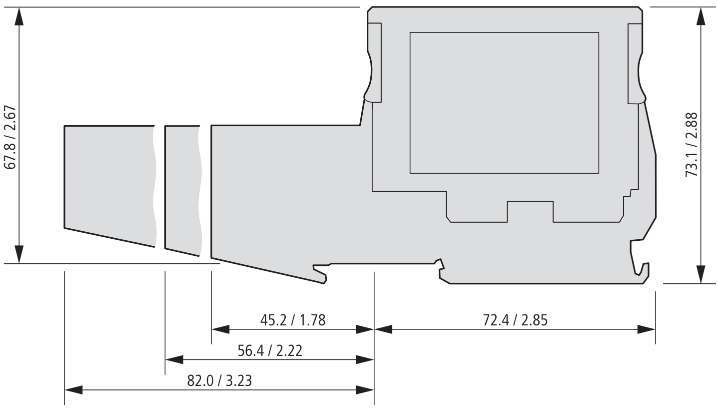


Figure 267: Complete XI/ON module (with tension clamp connection)

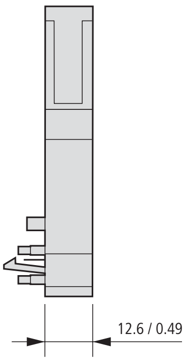


Figure 268: Rear view of complete XI/ON module in slice design

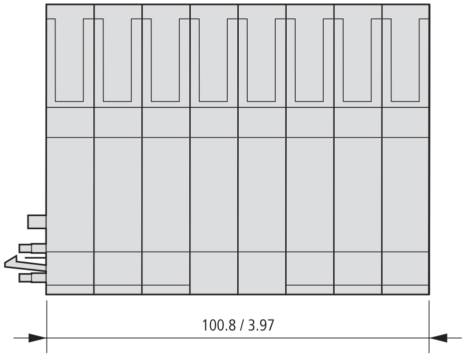


Figure 269: XI/ON module in block design (top view)

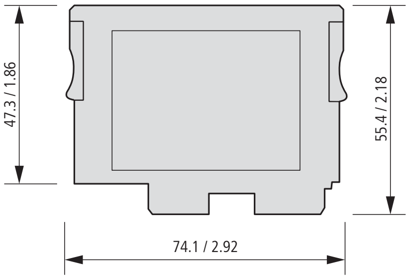


Figure 270: Electronics module

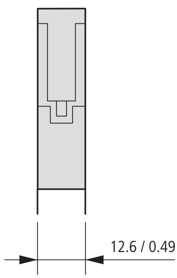


Figure 271: Rear view of electronics module in slice design

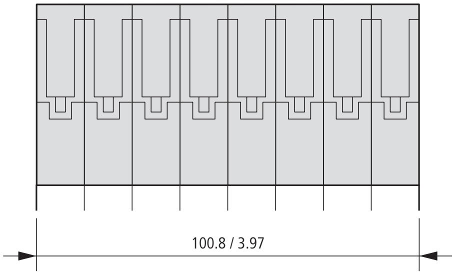


Figure 272: Rear view of electronics module in block design

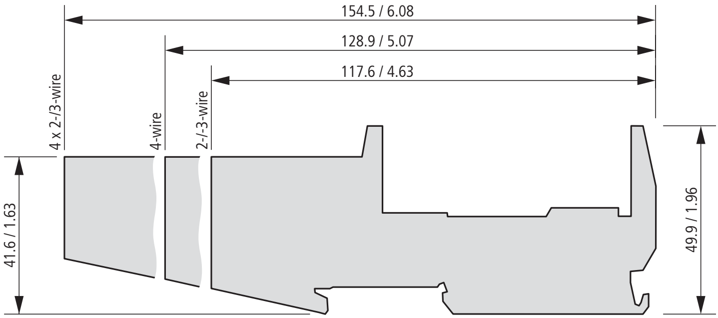


Figure 273: Base module with tension clamp connection

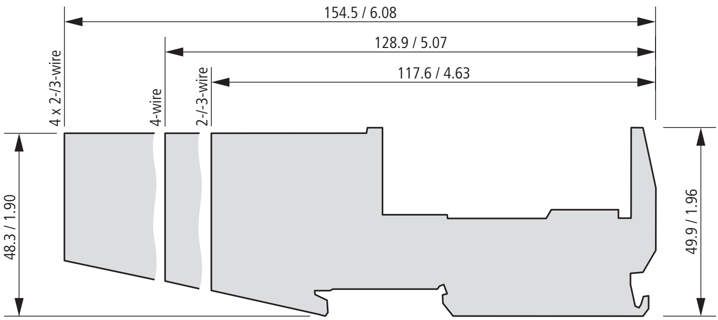


Figure 274: Base module with screw connection

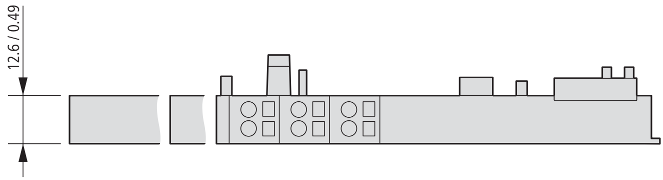


Figure 275: Base module in slice design (top view)

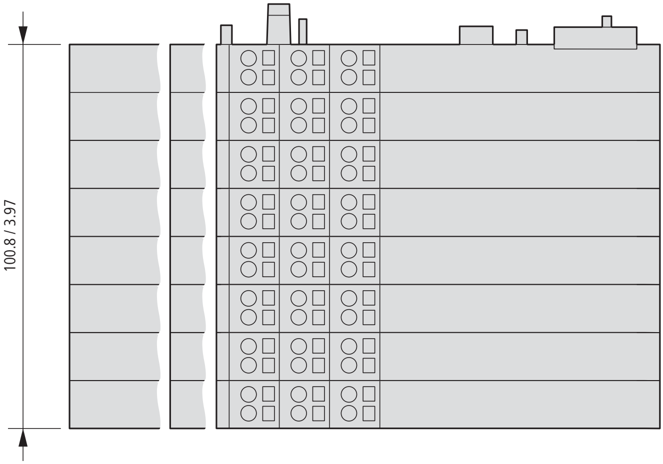


Figure 276: Top view of base module in block design

Dimensions in mm / inch

Mounting the Gateway

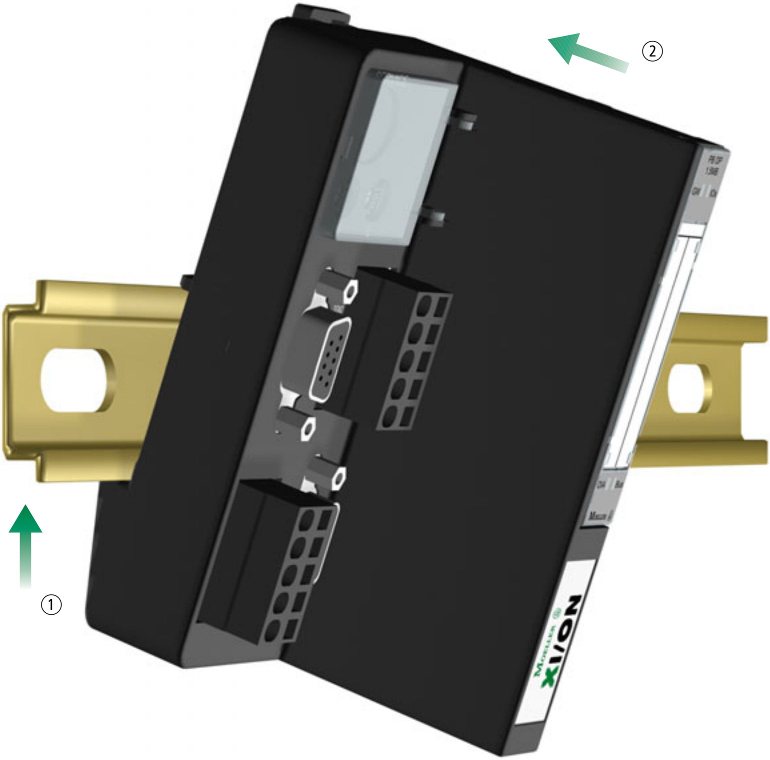


Figure 277: Mounting the gateway

Please observe:

- The mounting rail must already be mounted.
- An end bracket must be mounted to the left of the gateway. The end bracket can be mounted before or after the station is mounted. If the gateway is mounted first, then a space must be kept free for the end bracket. Please read Section “Mounting End Brackets and End Plates” in this chapter.
- The gateway is the first **electronics** component on a XI/ON station.

- When fully mounted, the gateway's resistance to vibration is provided for by the locating hook located on the underside of the gateway. The locating hook is moved only when the gateway is mounted or dismounted.

Method:

▶ Tilt the top of the gateway towards you, position the groove provided on the rear of the gateway onto the lower edge of the mounting rail ①.

▶ Tilt the top of the gateway away from you ② and towards the mounting rail.

▶ Press the gateway until it locks in with an audible click ③.

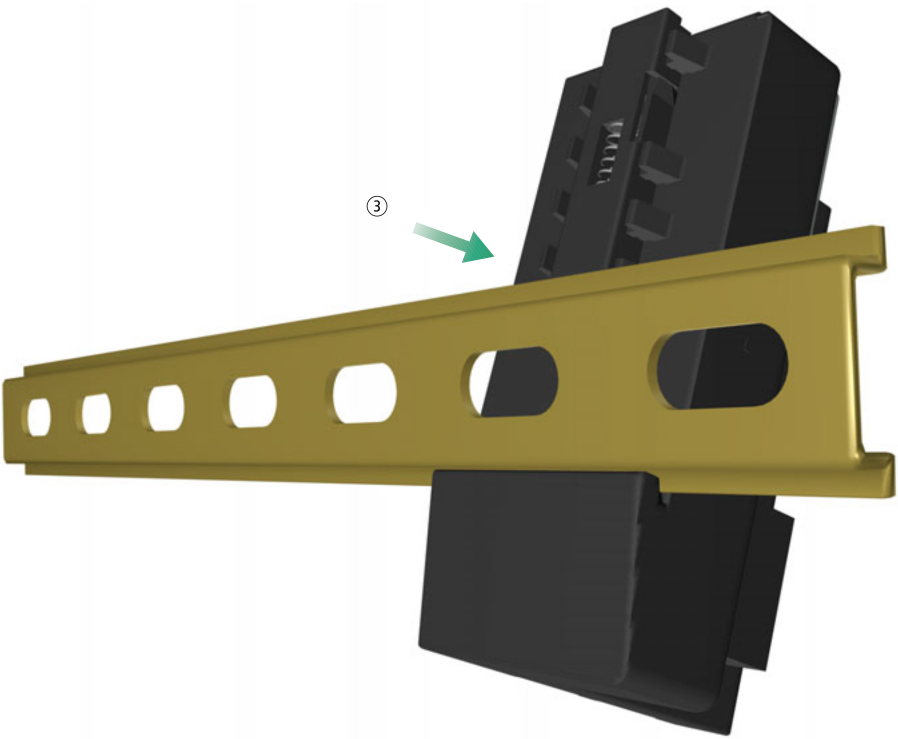


Figure 278: Locating hook on the gateway

Mounting the Base Module (Block or Slice Design)

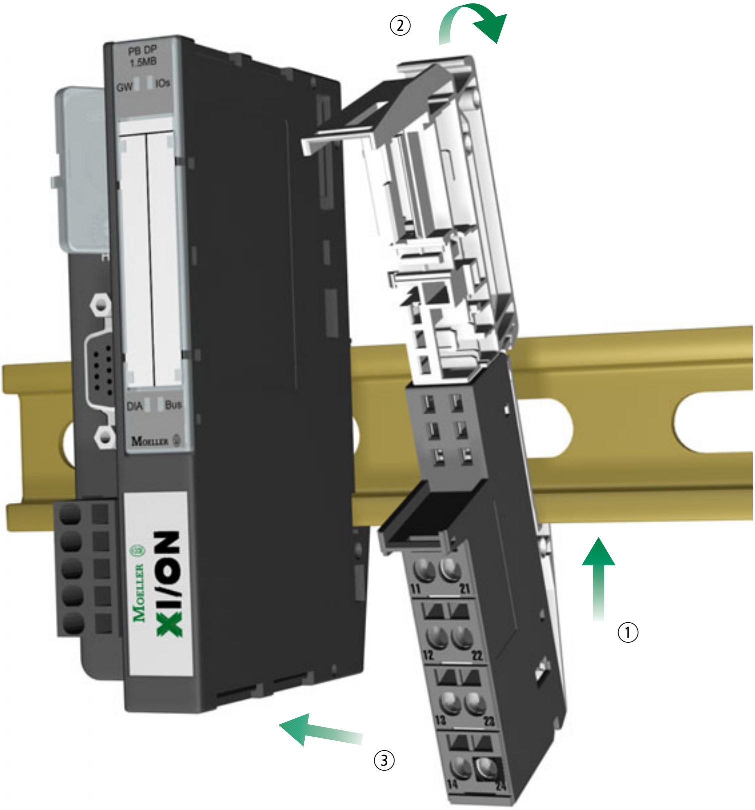


Figure 279: Mounting the base module for the Bus Refreshing module

Please observe:

- The gateway must already be mounted.
- The base modules are mounted to the right of the gateway onto the mounting rail.
- The first base module following a gateway must be suitable for a Bus Refreshing module which supplies the gateway with power.
- It is recommended that the base modules should be mounted and wired **before the electronics modules are mounted**.

- Suitable measures should be taken to protect the contacts of the module bus and electronics modules from becoming dirty.

→ Mixed usage of base modules with screw connections and tension clamp connections is only possible once a new power distribution module has been added. Thereby, all the following base modules must have the same connection technology as the power distribution module (tension clamp or screw connection).

Method:

▶ Tilt the top of the base module towards you, position the groove provided on the rear of the base module onto the lower edge of the mounting rail ①.

▶ Tilt the top of the base module away from you and towards the mounting rail, and press until it locks in with an audible click ②.

▶ Slide the base module as far as possible to the left until the locating hooks lock in with an audible click into the gateway (should this be the first base module to be mounted) or into the next base module ③. This provides a stable connection and guarantees communication via the module bus.

Mounting Slot Identification and Color Markers

Mounting Slot Identification

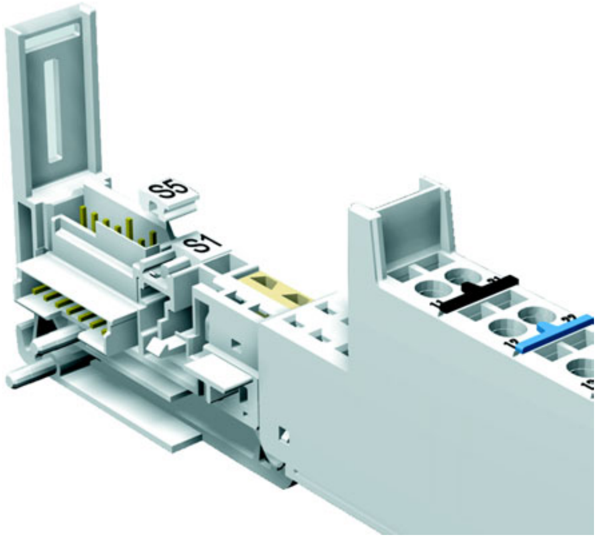


Figure 280: Mounting slot identification using Dekafix

Please observe:

- Dekafix labels can be used to label mounting slots. There is room for a six-digit label on every base module. For example, the six-digit device short name, which you can define in the software tool I/O*assistant*. Dekafix labels must be attached **before the electronics modules are mounted**.

Method:

▶ Press the Dekafix labels into the recesses provided in the base module (see Figure 280).

Color Markers

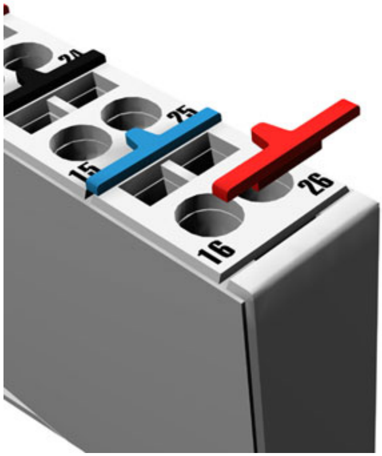


Figure 281: Color-coding of the connection levels

Please observe:

- The base modules can be fitted with colored connection markers for the purposes of individual identification of channels and to ease cable assignment. The colored connection markers are available as accessories.

Method

▶ Insert the colored connection markers, according to the module wiring (see wiring diagrams in chapter 4), into the slots provided immediately below each connection level on the base module. The table shows the meaning of the colors and connection types.

Table 67: Color-coding of base modules

Color of label	Connection type
Black	Signal cable
Red	V DC (+24V; +5V)
Blue	-; 0V; N
Red-blue	System supply
Yellow-green	PE
Green	Shield
Brown	Phase L1

Jumpers for Relay Modules

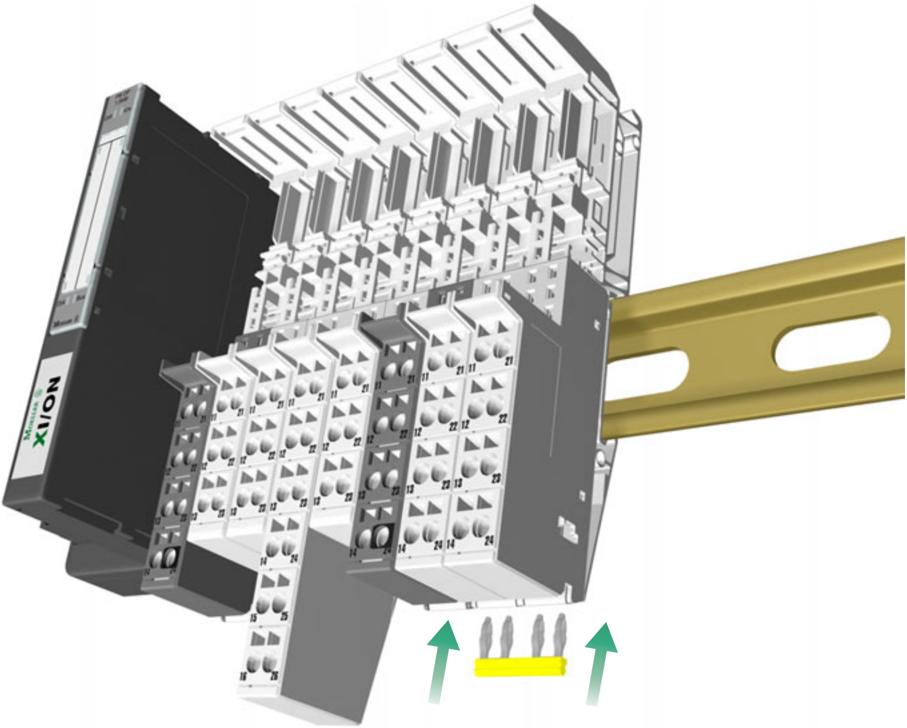


Figure 282: Plugging jumpers

Please observe:

- To multiply signals and/or save wiring, it can be useful to cross-connect a number of base modules for relays. To achieve this, jumpers (QVR) are available as accessories in various sizes.

Method:

▶ Press the jumper as far as it will go into the slots provided on the front (facing down) of two adjoining base modules.

Mounting End Brackets and End Plates

End Bracket

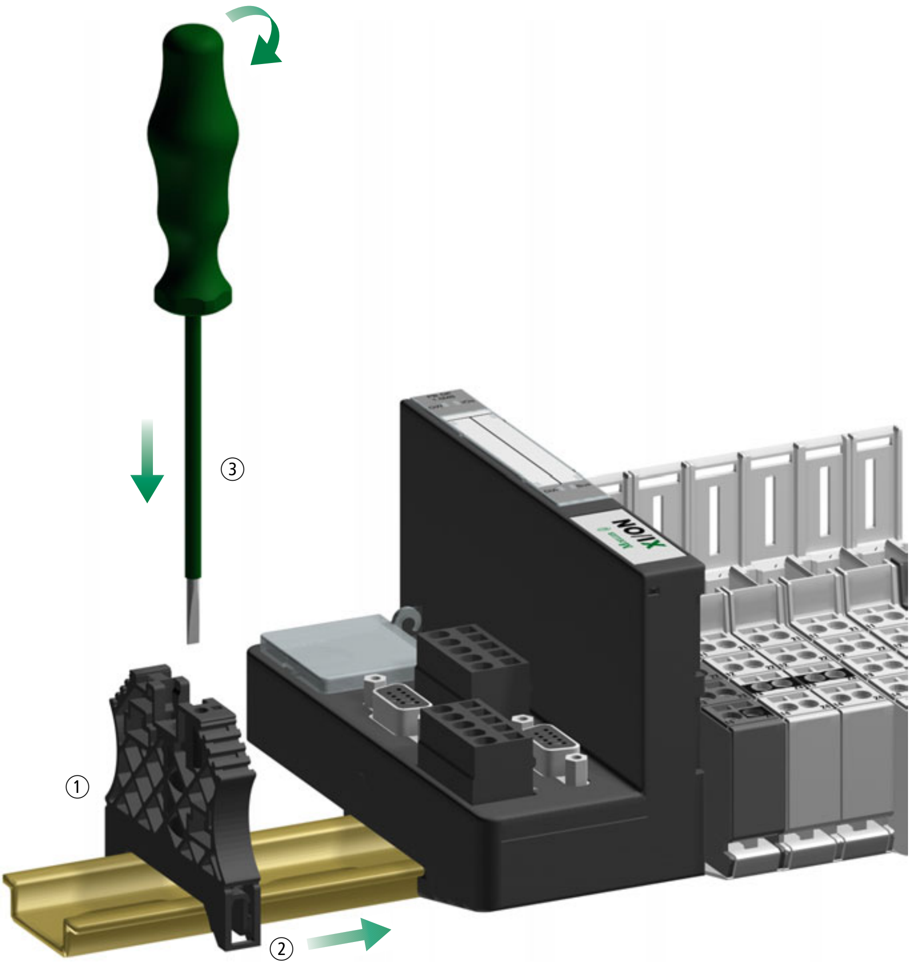


Figure 283: Mounting end brackets

Please observe:

- XI/ON stations must be fixed securely onto the mounting rail using two end brackets (XN-WEW-35/2-SW). The first end bracket is mounted to the left of the gateway, the second is mounted together with the end plate at the end of the station.

Method:

▶ The first end bracket is mounted to the left of the gateway onto the mounting rail. Clip the end bracket onto the mounting rail until you hear an audible click ①. If necessary, loosen the screw beforehand.

▶ Slide the end bracket up to the gateway ② and tighten the screw ③.

End Plate

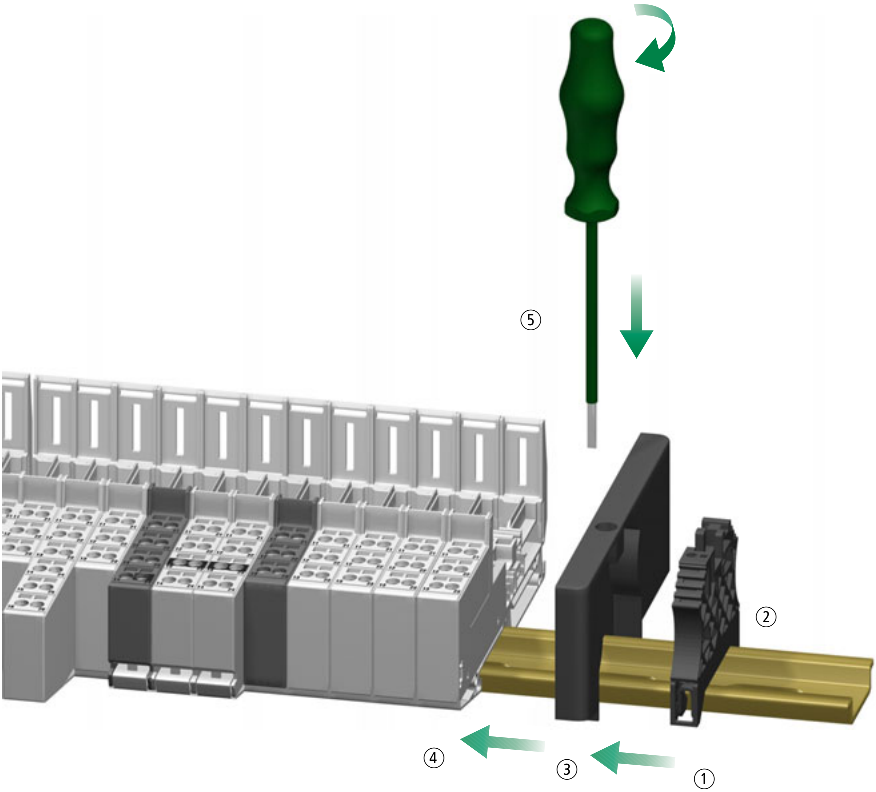


Figure 284: Mounting end bracket and end plate

Method:

▶ Insert the end bracket into the recess provided in the end plate ①.

- The end bracket and end plate should be held so that the connectors on the end plate are facing the last module of the XI/ON station.
- Press the end plate onto the mounting rail until you hear an audible click ② (if necessary, loosen the screw beforehand). Then slide the end bracket and end plate up to the last module of the XI/ON station ③.
- Press the end plate with the end bracket firmly up to the last module of the XI/ON station. The end plate’s connectors must lock firmly into the locating holes provided in the module ④.
- To secure the end bracket, insert a screwdriver into the hole provided in the end plate and tighten the screw ⑤.

Wiring with tension clamp connections

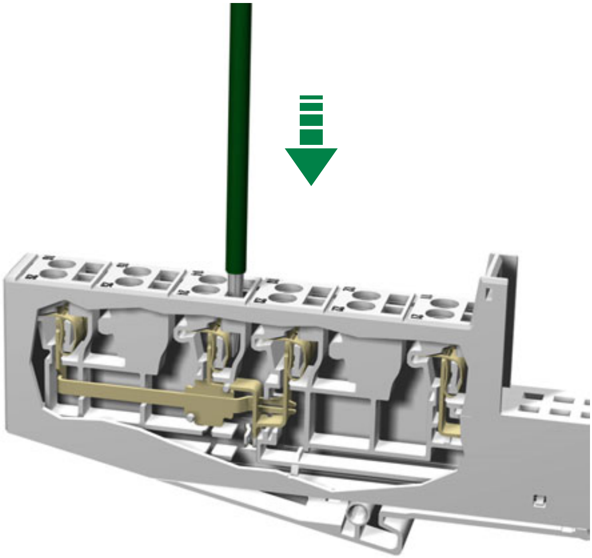


Figure 285: Tension clamp connections

Method:

▶ Insert a screwdriver into the rectangular opening located immediately above the connection level of the base module. When you feel a slight resistance, push the screwdriver into the opening until it comes up against a stop. This opens a tension clamp on the inside of the connection level.

▶ Insert the wiring into the round opening located directly below the rectangular opening, until the wire comes up against a stop.

▶ Remove the screwdriver; the tension clamp closes and secures the wire.

Wiring of screw connection

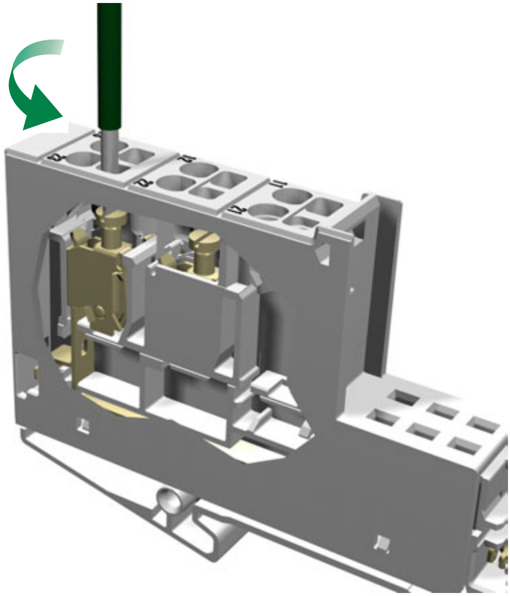


Figure 286: Screw connection

Method:

▶ Place the screwdriver in the rectangular opening of a connection level on the base module. Turn the screw ant-clockwise as far as possible, without fully removing it.

▶ Insert the wire in to the round opening, located directly below the rectangular opening, until it comes up against a stop.

▶ Turn the screw clockwise until the wire is fully secured, and cannot be pulled out.

Mounting the Electronics Modules

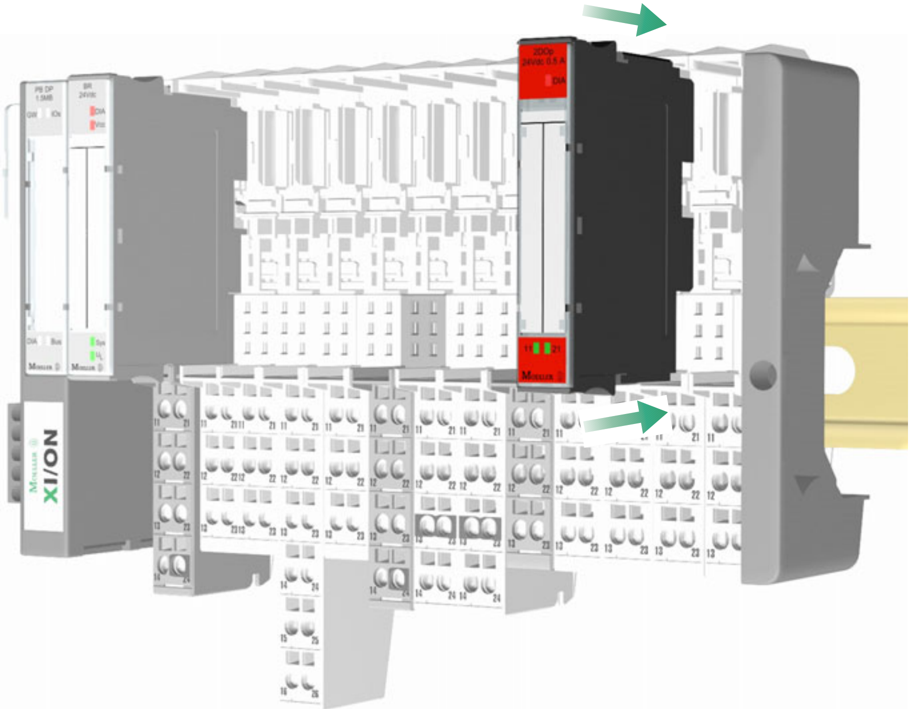


Figure 287: Plugging electronics modules

Please observe:

- The correct base module must have been previously mounted onto the mounting rail.
- Electronics modules are fitted onto the previously mounted and wired base modules.

→ Before plugging the electronics modules, it is advisable to blow-clean the station with compressed air. This prevents dust and grains of dirt from contaminating the contacts, which can negatively influence the communication on the station.

Method:

▶ Press the electronics module squarely onto the base module, until you hear it lock into place at the front and back.

Prevention of False Mounting

A mechanical coding element prevents an electronics module from being mounted onto the wrong base module – for example, following a defect in an electronics module. The coding element consists of two pieces and is supplied with every electronics module.

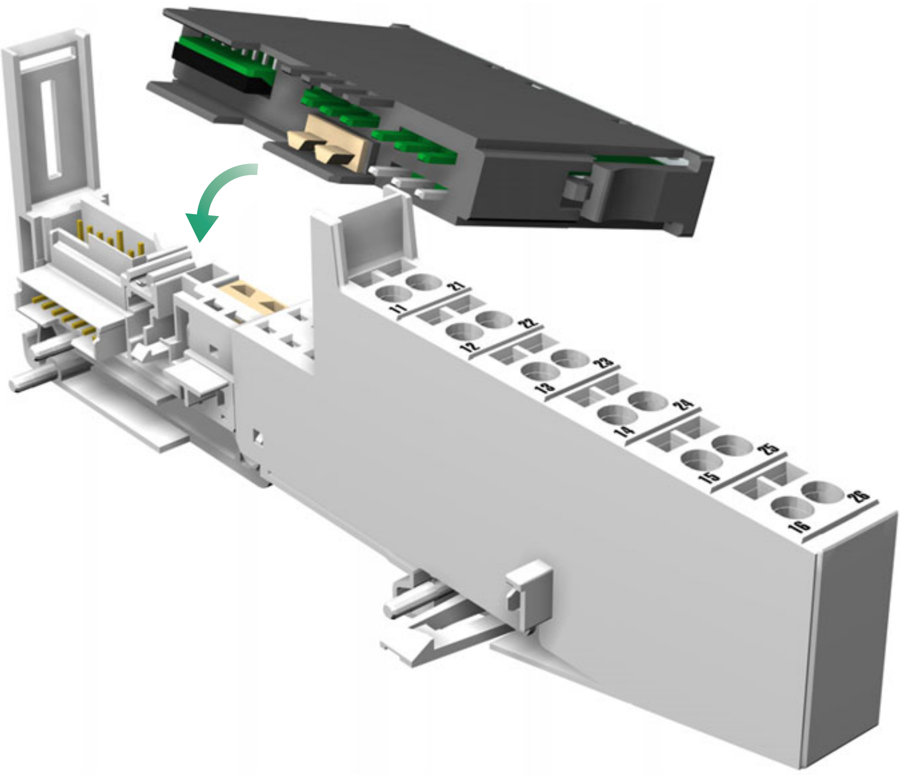


Figure 288: Coding an electronics and base module

The complete coding element is mounted on the underside of each electronics module. When mounting the electronics module for the first time, the lower part of the coding element is automatically inserted into the recess provided in the base module.

→ When plugging electronics modules for the first time, an initial resistance must be overcome. This is because the lower part of the coding element has to be pressed into the base module.

Should the electronics module be pulled, one half of the coding element remains in the base module, the other half remains in the electronics module. It is now possible to mount a new electronics module only when its coding matches that of the base module.

When replacing an electronics module (plugging a new electronics module), remove and dispose of the lower part of the coding element (that part destined for the base module). The original lower part of the coding element, which remains in the base module, cannot be removed.

→ When all modules are mounted, the supply to the module bus should be applied to check if the station communication functions correctly (no false mounting, no empty slots, etc). The field voltage should be applied only when the correct functioning of the station has been established.

Switchgear Cabinet Layout

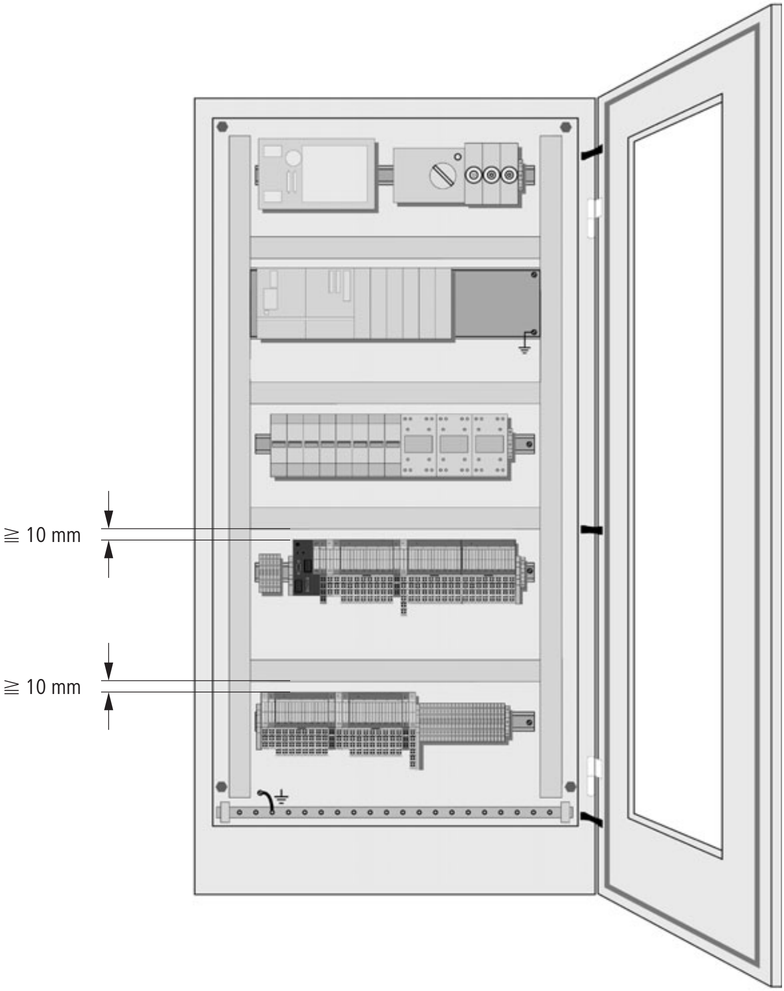


Figure 289: Switchgear cabinet layout

XI/ON modules are suitable for installation and operation in confined spaces. The minimum distance to any passive components should be 10 mm. Should the adjoining component be an active element (for example load-current supply, transformers), then a minimum distance of 75 mm must be kept, to comply with EMC regulations and to prevent overheating. If necessary, provide for an appropriate air conditioning/cooling of the temperature. You should in every case, take into consideration the values for ambient temperature given in chapter 4.

Dismounting from the Mounting Rail

Please observe the following basic rules when dismounting:

Dismounting of a single component

- **Base modules** and **gateways** can only be dismounted after the end plate has been disconnected from the last base module on the mounting rail. To do this, the end bracket mounted together with the end plate must be loosened.
- The **gateway** can only be dismounted from a station after all the base modules located on its right are separated and moved away to the right along the mounting rail. Furthermore, all connections from the gateway to the fieldbus must be disconnected. All wires must be disconnected and the fieldbus must be switched off.
- Individual base modules can only be removed from a station when all base modules located to its right have been moved away to the right along the mounting rail. A minimum distance of 30 mm is required between the base module to be replaced and the previously adjoining base modules.

Warning!
Before dismounting a base module, the supply voltage to the relevant power distribution modules must be switched off. All wires must be disconnected.

Dismounting an entire XI/ON station in chronological order.

- Switch off the power to the distribution modules (Bus Refreshing and Power Feeding)
- Pull the electronics modules
- Disconnect wiring
- Loosen/remove end bracket and end plate
- Dismount base modules
- Dismount gateway

Dismounting Electronics Modules

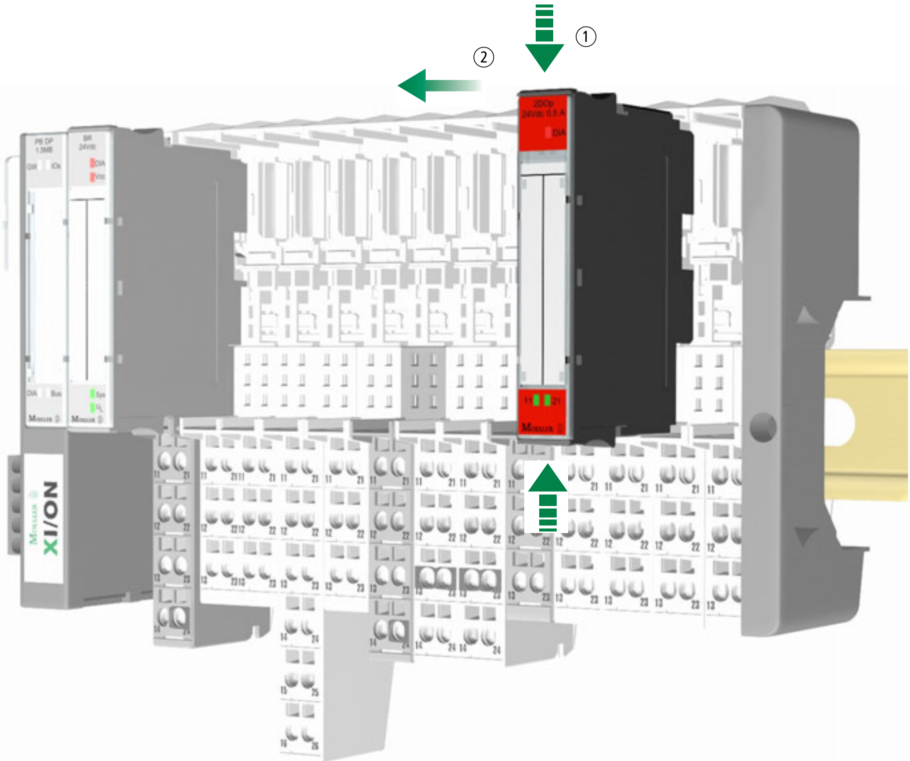


Figure 290: Dismounting electronics modules

Please observe:

- Tools are not usually required to dismount electronics modules.

Method:

▶ Squeeze both locating hooks towards one another 1; these are located at either end of the electronics modules and pull the module away from the base module 2.

Dismounting End Brackets and End Plates

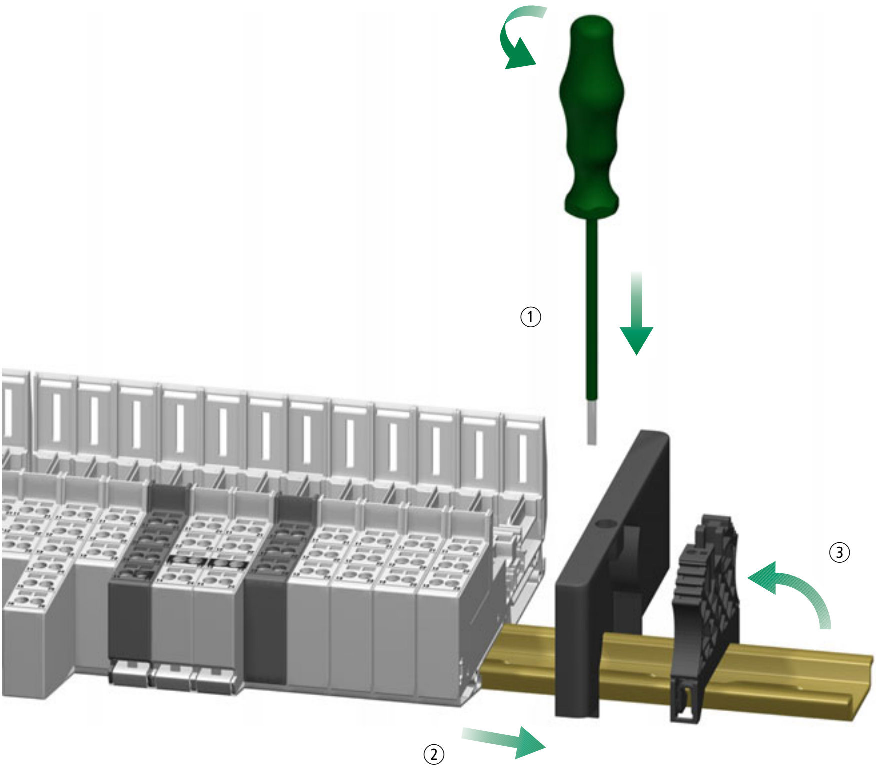


Figure 291: Dismounting the end plate

Method:

▶ Insert the screwdriver into the hole in the end plate and loosen the screw in the end bracket ①.

▶ Slide the end plate and end bracket to the right, away from the last base module. If necessary, use a screwdriver; however take care not to break the end plate connectors which are locked into the locating holes of the base module ②.

▶ Loosen the screw in the end bracket to remove the end bracket and end plate from the mounting rail ③.

Dismounting Base Modules

Warning!
The supply voltage to the relevant power distribution modules must be switched off before dismounting a base module.

Please observe:

- Base modules can only be dismounted from the right.
- The end plate must already be dismounted.
- The electronics module must be pulled.

Method for dismounting base modules in slice design:

▶ Disconnect the wiring from the base module.

Attention!
If you are dismounting a base module for a relay, then any mounted jumpers must be removed from the front of the module before commencing with dismounting.

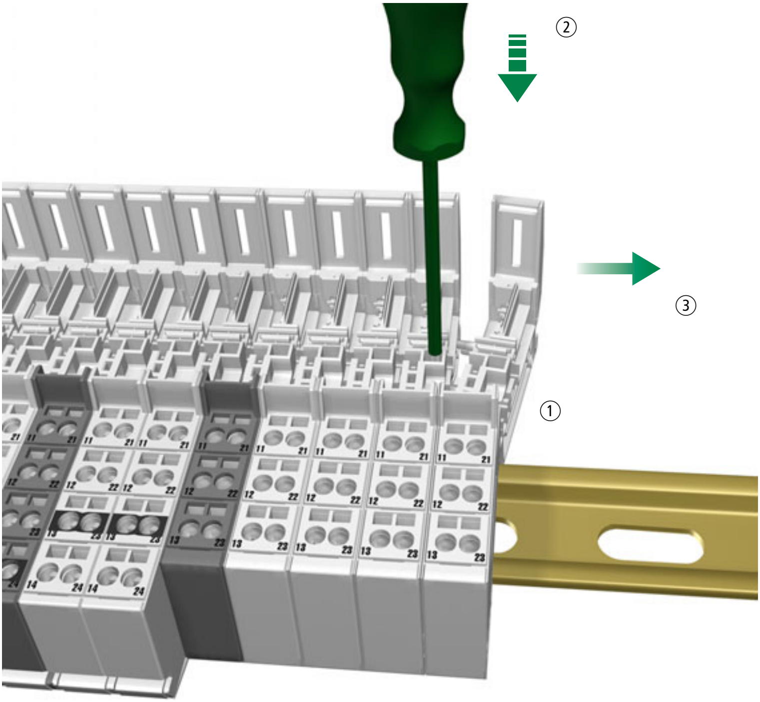


Figure 292: Dismounting base modules in slice design

▶ Insert a screwdriver into the rectangular opening in the mounting slot of the base module ①.

▶ Press the screwdriver into the opening ②, thereby disengaging the connection between the base module to be dismounted and the adjoining module to its left. Pull the module away to the right until the rear locating hook disengages. Remove the screwdriver.

▶ Pull the modules apart at the rear by hand (the module to be dismounted and the adjoining module) ③. This “drawing apart” motion automatically disengages the locating hook which connects both modules at the front.

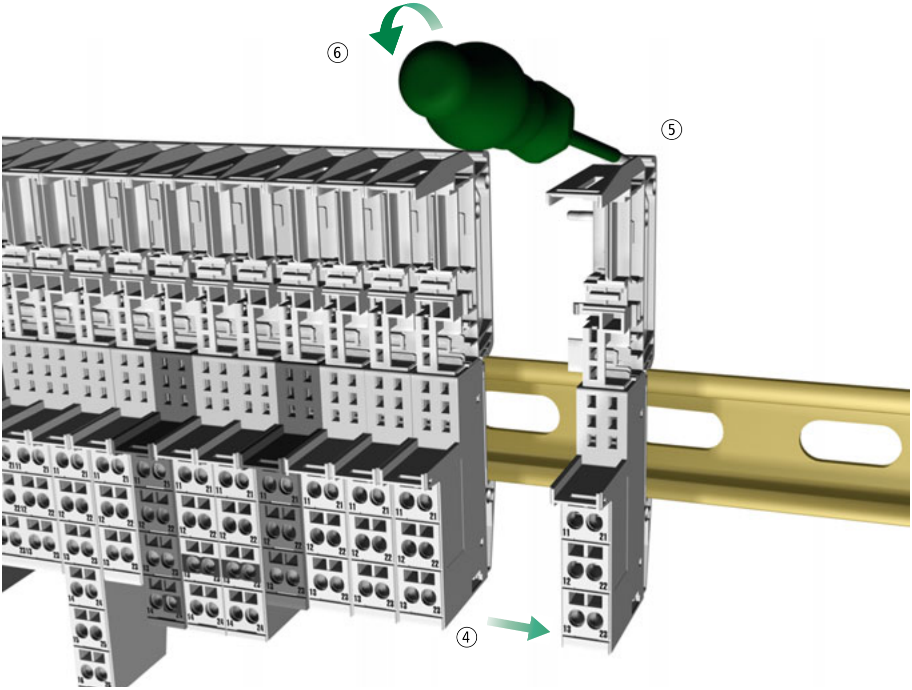


Figure 293: Removing a base module from the mounting rail

▶ When both locating hooks are disengaged, slide the base module to be dismounted to the right 4.

▶ Insert the screwdriver into the slot provided in the locking mechanism 5 and lever the base module up and towards you, thereby releasing it from the mounting rail 6.

Method for Dismounting Base Modules in Block Design:

▶ Disconnect the wiring from the base module.

▶ Carry out the steps indicated in Figure 292 and Figure 293. The method is identical at this point for both slice and block base modules.

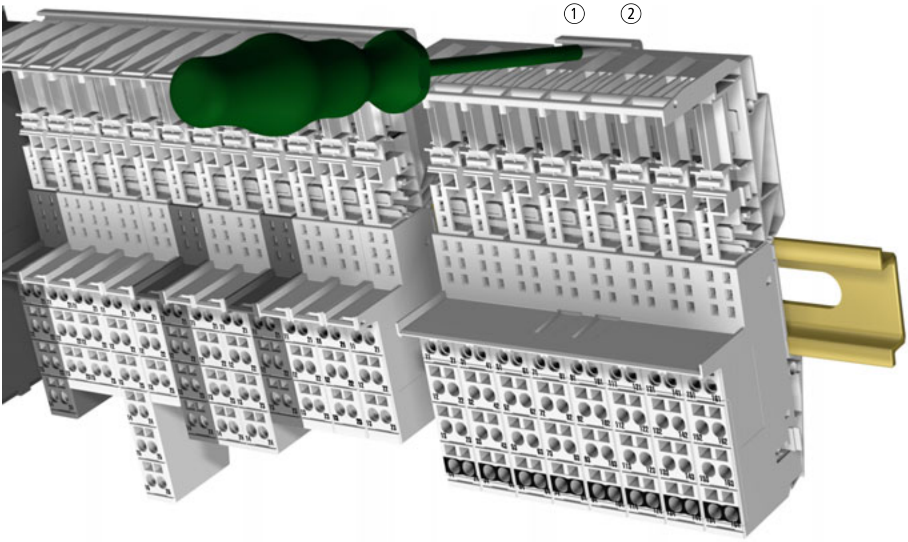


Figure 294: Removing a base module in block design from the mounting rail

▶ There are two locking mechanisms in the middle of the block base module. These must be unlocked in two steps.
Insert the screwdriver into the slot provided in the **left-hand** locking mechanism ① and lever the handle of the screwdriver downwards thereby moving the locking mechanism up until it disengages from the mounting rail.
Insert the screwdriver into the slot of the provided in the **right-hand** locking mechanism ② and lever the handle of the screwdriver downwards thereby moving the second mounting foot up until it disengages from the mounting rail. Remove the base module from the mounting rail.

Dismounting the Gateway

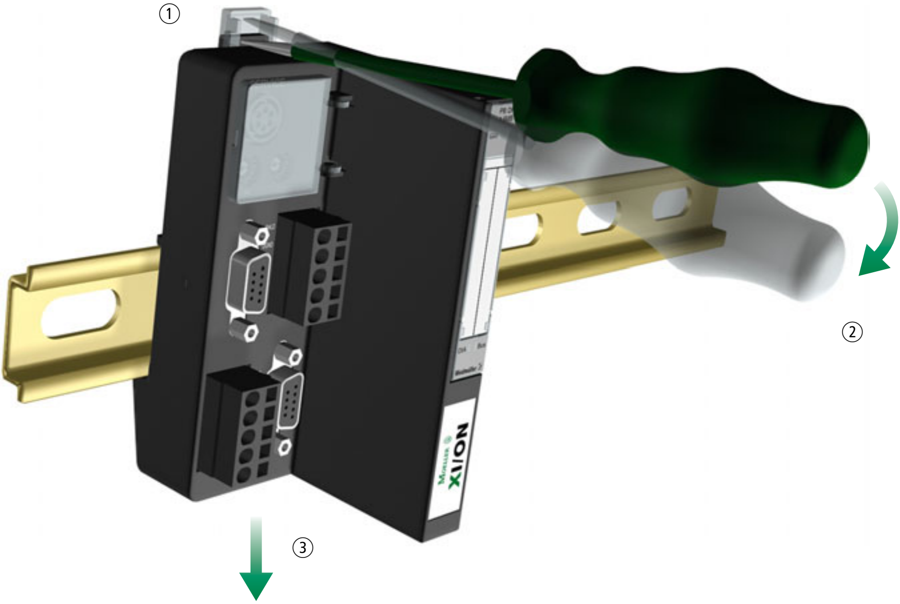
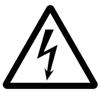


Figure 295: Dismounting the gateway



Warning!
The supply voltage to the Bus Refreshing module must be switched off before dismounting the gateway. The connection to the fieldbus must also be disconnected.

Please observe:

- All base modules on the mounting rail must be either moved away sufficiently to the right or dismounted.

Method:

▶ Disconnect the connection between the fieldbus and the gateway.

▶ Insert a screwdriver into the opening provided in the locking mechanism – on the top of the gateway – ①, then carefully pull the screwdriver downwards as far as it will go ②. The spring loaded locking mechanism is levered upwards and disengages.

▶ Tilt the top end of the gateway with the screwdriver towards you and away from the mounting rail ③.

Plugging and Pulling Electronics Modules

XI/ON enables the pulling and plugging of electronics modules without having to disconnect the field wiring. The XI/ON station remains in operation if an electronics module is pulled. The voltage and current supplies as well as the protective earth connections are not interrupted.

Attention!
If the field and system supplies remain connected when electronics modules are plugged or pulled, short interruptions to the module bus communications can occur in the XI/ON station. This can lead to undefined statuses of individual inputs and outputs of different modules.

7 Guidelines for Electrical Installation

Overview of this Chapter

You can find the following subjects in this chapter:

General Notes

General

Cables should be grouped together, for example: signal cables, data cables, heavy current cables, power supply cables.

Heavy current cables and signal or data cables should always be routed in separate cable ducts or bundles. Signal and data cables must always be routed as close as possible to ground potential surfaces (for example support bars, cabinet sides etc.).

Cable Routing

Correct cable routing prevents or suppresses the reciprocal influencing of parallel routed cables.

Cable Routing Inside and Outside of Cabinets:
To ensure EMC-compatible cable routing, the cables should be grouped as follows:

Group 1: shielded bus and data cables
shielded analog cables
unshielded cables for DC voltage ≦ 60 V
unshielded cables for AC voltage ≦ 25 V

Group 2: unshielded cables for DC voltage > 60 V and ≦ 400 V
unshielded cables for AC voltage > 25 V and ≦ 400 V

Group 3: unshielded cables for DC and AC voltages > 400 V

Various types of cables within the groups can be routed together in bundles or in cable ducts.

The following group combination can be routed only in separate bundles or separate cable ducts (no minimum distance apart):

Group 1/Group 2

The group combinations:

Group 1/Group 3 and Group 2/Group 3

must be routed in separate cable ducts with a minimum distance of 10 cm apart. This is equally valid for inside buildings as well as for inside and outside of switchgear cabinets.

Cable Routing Outside Buildings

Outside of buildings, cables should be routed in closed (where possible), cage-type cable ducts made of metal. The cable duct joints must be electrically connected and the cable ducts must be earthed.

Warning!
Observe all valid guidelines concerning internal and external lightning protection and grounding specifications when routing cables outside of buildings.

Lightning Protection

The cables must be routed in double-grounded metal piping or in reinforced concrete cable ducts.

Signal cables must be protected against overvoltage by varistors or inert-gas filled overvoltage arrestors. Varistors and overvoltage arrestors must be installed at the point where the cables enter the building.

Transmission Cables

The bus stations are connected to one another via fieldbus cables, which comply with the RS 485 specifications and with DIN 19245. Accordingly, the cable must have the following characteristics:

Parameter	Cable A DIN 19245 part 3	Cable B DIN 19245 part 1
Characteristic impedance	135 to 165 Ω (3 to 20 MHz)	100 to 130 Ω (f >100 kHz)
Capacitance per unit length	< 30 nF/km	< 60 nF/km
Loop resistance	< 110 Ω/km	
Wire diameter	> 0.64 mm	> 0.53 mm
Wire cross-section	> 0.34 mm^2	> 0.22 mm^2
Terminating resistor	220 Ω	150 Ω

Attention!
The adherence to these parameters becomes more important the higher the baud rate, the more stations there are on the bus and the longer the length of the cable.

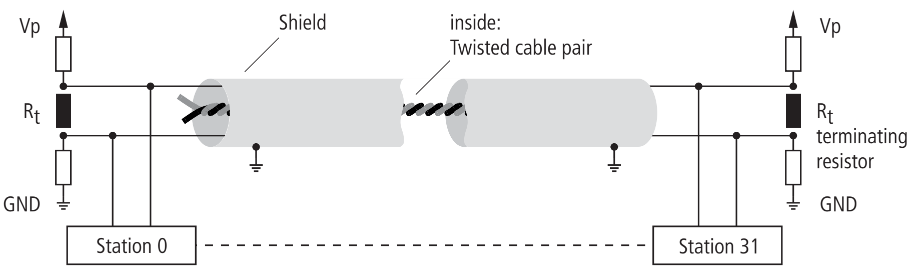


Figure 296: Representation of a PROFIBUS-DP cable

Cable Types

The following cable types are examples of cables which can be used as transmission cables:

Cable type "A":	Moeller	ZB4-900-KB1 (for indoors) 1x2x0.64
	SIEMENS	SINEC L2 Bus cable (2-wire, shielded)
		SINEC L2 Direct-buried cable (2-wire, shielded)
		SINEC L2 Trailing cable (2-wire, shielded)
		SINEC L2 Bus cable (for festooned cables)
		SINEC L2 Bus cable (with PE shielding)
	LAPP	UNITRONICS-BUS FD P L2/F.I.P. 1x2x0.25 (24 AWG) (highly flexible) UNITRONICS-BUS Yv L2/F.I.P. 1x2x0.64 Ø (routing outside/underground) UNITRONICS-BUS L2/F.I.P. 1x2x0.64 Ø (for secure routing)
Cable type "B":	BELDEN	"Low Capacitance Cable for RS 485, Application Type 9841" "Low Capacitance Cable for RS 485, Application Type 9842" "Low Capacitance Cable for RS 485, Application Type 9843"
	SUMITOMO	"Type RS 485 9841"
	BICC	"Twinax BICC, TYPE H8106"

→ According to information received from the PROFIBUS Users Organization, the use of Cable type "B" is not to be recommended.

Potential Relationships

General

The potential relationship of a PROFIBUS-DP system realized with XI/ON modules is characterized by the following:

- The system's power supply to the gateway, I/O modules and the field level is distributed via a Bus Refreshing module.
- All XI/ON modules (gateway, Bus Refreshing, Power Feeding and I/O modules), are connected capacitively via base modules to the mounting rails.
- Separate power supplies for the system and the field level allow a potential-free installation.

The block diagram shows the arrangement of a typical XI/ON station.

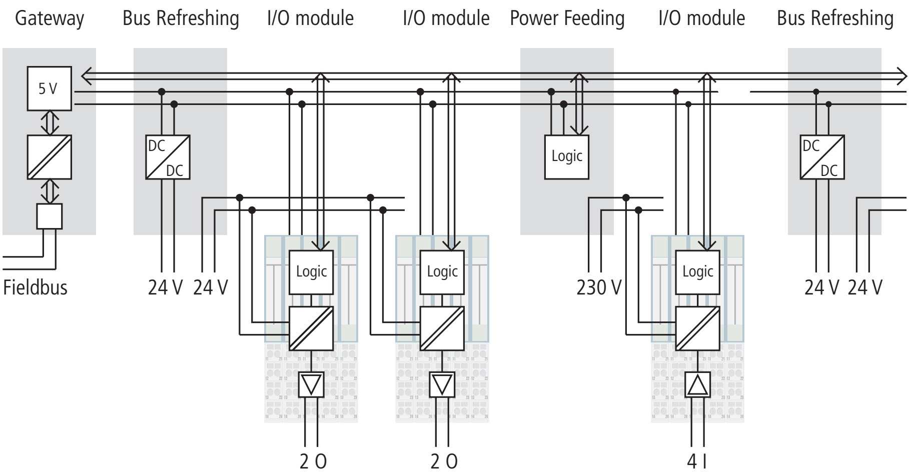


Figure 297: Block diagram of a XI/ON system

Potential-Free Installation

In a potential-free installation, the reference potentials of control and load circuitry are galvanically isolated from each other.

A potential-free installation is necessary with

- All AC load circuits (for example, when using the Power Feeding module XN-PF-120/230VAC-D)
- Floating DC load circuits

The potential-free installation does not depend on the method of grounding.

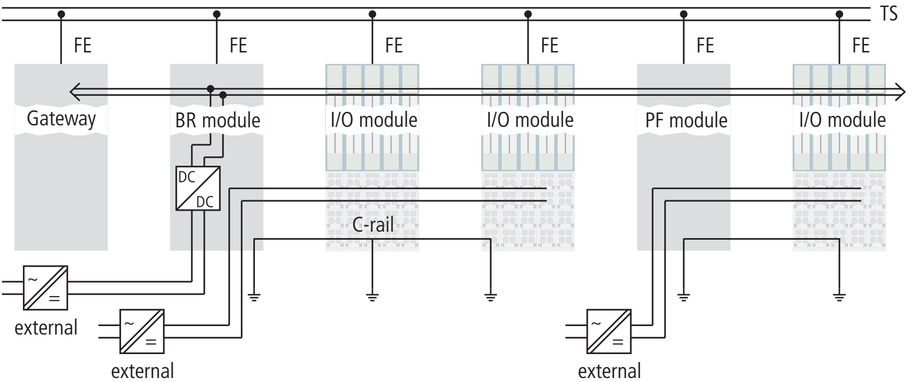


Figure 298: Potential-free system and field supply

Non-isolated Installation

In a non-isolated installation, the reference potentials of the control and load circuitry are galvanically connected.

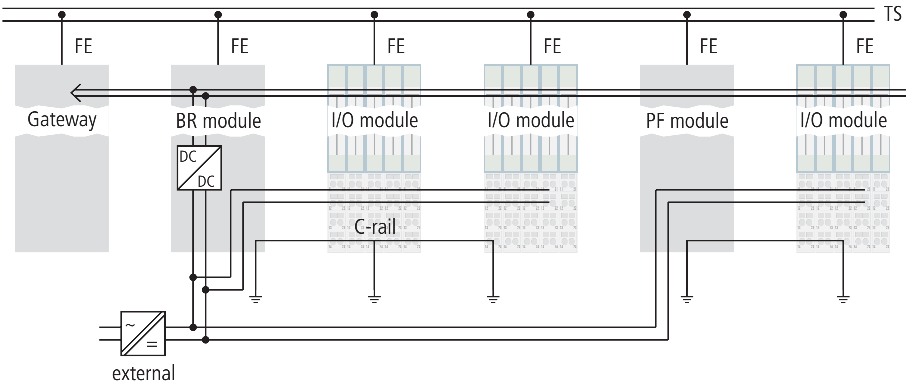


Figure 299: Non-isolated system and field supply

Electromagnetic Compatibility (EMC)

XI/ON products comply in full with the requirements pertaining to EMC regulations. Nevertheless, an EMC plan should be made before installation. Hereby, all potential electromechanical sources of interference should be considered such as galvanic, inductive and capacitive couplings as well as radiation couplings.

Ensuring Electromagnetic Compatibility

The EMC of XI/ON modules is guaranteed when the following basic rules are adhered to:

- Correct and large surface grounding of inactive metal components.
- Correct shielding of cables and devices.
- Proper cable routing – correct wiring.
- Creation of a standard reference potential and grounding of all electrically operated devices.
- Special EMC measures for special applications.

Grounding of Inactive Metal Components

All inactive metal components (for example: switchgear cabinets, switchgear cabinet doors, supporting bars, mounting plates, top-hat rails, etc.) must be connected to one another over a large surface area and with a low impedance (grounding). This guarantees a standardized reference potential area for all control elements and reduces the influence of coupled disturbances.

- In the areas of screw connections, the painted, anodized or isolated metal components must be freed of the isolating layer. Protect the points of contact against rust.
- Connect all free moving groundable components (cabinet doors, separate mounting plates, etc.) by using short bonding straps to large surface areas.
- Avoid the use of aluminum components, as its quick oxidizing properties make it unsuitable for grounding.

Warning!
The grounding must never – including cases of error – take on a dangerous touch potential. For this reason, always protect the ground potential with a protective cable.

PE Connection

A central connection must be established between ground and PE connection (protective earth).

Earth-Free Operation

Observe all relevant safety regulations when operating an earth-free system.

Protect against high frequency interference signals

Attention!
In order to comply with radiation limit values in accordance with EN 55011/2000, the supply lines of the module XN-BR-24VDC-D for supplying the gateway with power are to be fed through a ferrite ring (PS416-ZBX-405). This is to be placed immediately next to the connection terminals. From there on, it is not permitted to make connections to further devices.

Mounting Rails

All mounting rails must be mounted onto the mounting plate with a low impedance, over a large surface area, and must be correctly earthed.

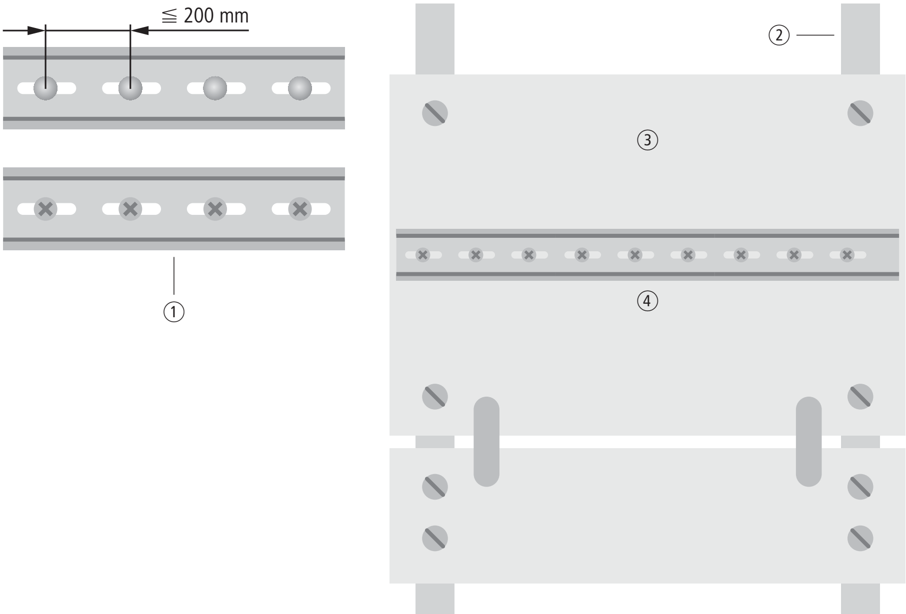


Figure 300: Mounting options

① TS 35 mounting rail
② Mounting rail
③ Mounting plate
④ TS 35 mounting rail

Mount the mounting rails over a large surface area and with a low impedance to the support system using screws or rivets.

Remove the isolating layer from all painted, anodized or isolated metal components at the connection point. Protect the connection point against corrosion (for example with grease; caution: use only suitable grease).

EMC Compliant Cabinet Installation

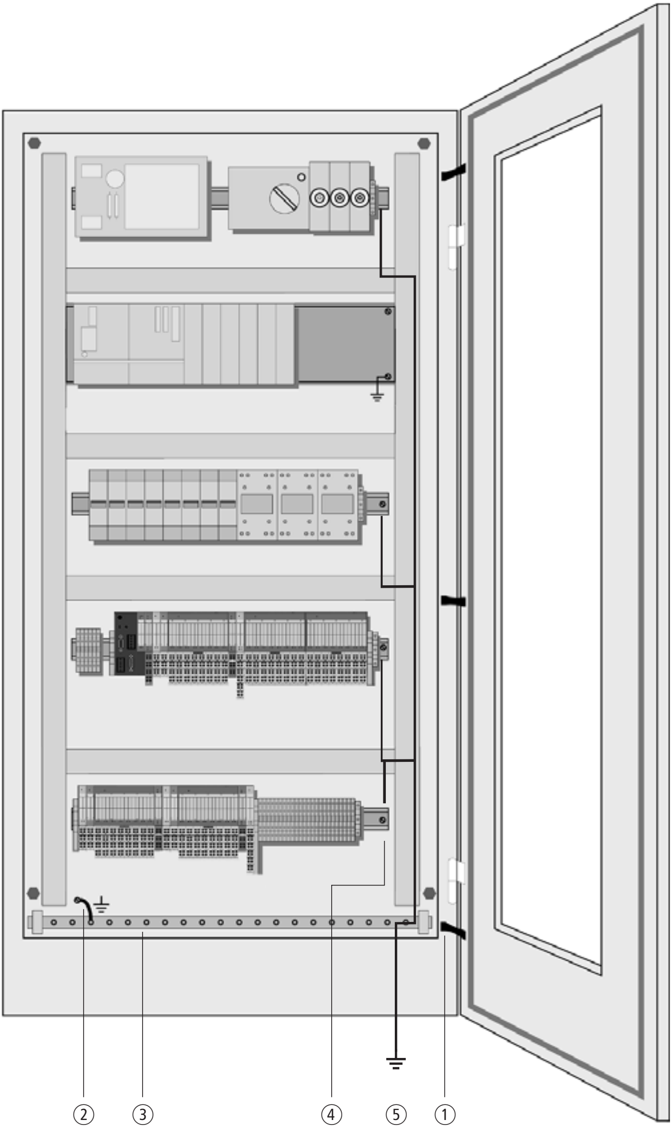


Figure 301: EMC compliant cabinet installation

① **Bonding straps**
Bonding straps connect inactive metal components, if it is not possible to create a large surface area contact. Use short bonding straps with large surface areas.

② **Mounting plates**
Mounting plates used to hold control components must have a large surface area contact with the cabinet housing.

③ **Protective conductor rail**
The protective conductor rail must also be connected over a large surface area to the mounting plates and additionally with an external cable (cross-section at least 10 mm^2) to the protective conductor system to avoid interference currents.

④ **Protective conductor terminal block**
The protective conductor terminal block must be connected to the protective conductor rail.

⑤ **Protective conductor system cable (grounding point)**
The cable must be connected over a large surface area with the protective conductor system.

Shielding of cables

Shielding is used to prevent interference from voltages and the radiation of interference fields by cables. Therefore, use only shielded cables with shielding braids made from good conducting materials (copper or aluminum) with a minimum degree of coverage of 80 %.

The cable shield should always be connected to both sides of the respective reference potential (if no exception is made, for example, such as high-resistant, symmetrical, analog signal cables). Only then can the cable shield attain the best results possible against electrical and magnetic fields.

A one-sided shield connection merely achieves an isolation against electrical fields.

Attention!
When installing, please pay attention to the following...
the shield should be connected immediately when entering the system,
the shield connection to the shield rail should be of low impedance,
the stripped cable-ends are to be kept as short as possible,
the cable shield is not to be used as a bonding conductor.
If the data cable is connected via a SUB-D connector, the shielding should never be connected via pin 1, but to the mass collar of the plug-in connector.

The insulation of the shielded data-cable should be stripped and connected to the shield rail when the system is not in operation. The connection and securing of the shield should be made using metal shield clamps. The shield clamps must enclose the shielding braid and in so doing create a large surface contact area. The shield rail must have a low impedance (for example, fixing points of 10 to 20 cm apart) and be connected to a reference potential area. The cable shield should not be severed, but routed further within the system (for example, to the switchgear cabinet), right up to the interface connection.

Should it not be possible to ground the shield on both sides due to switching arrangements or device specific reasons, then it is possible to route the second cable shield side to the local reference potential via a capacitor (short connection distances). If necessary, a varistor or resistor can be connected parallel to the capacitor, to prevent disruptive discharges when interference pulses occur.

A further possibility is a double-shielded cable (galvanically separated), whereby the innermost shield is connected on one side and the outermost shield is connected on both sides.

Potential Compensation

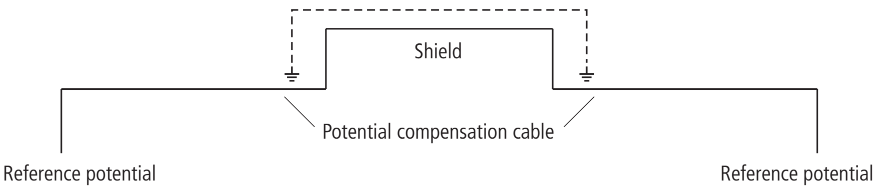
Potential differences can occur between installation components that are in separate areas and these

- are fed by different supplies,
- have double-sided conductor shields which are grounded on different installation components.

A potential-compensation cable must be routed to the potential compensation.

Warning!
Never use the shield as a potential compensation.

Connection 1			Connection 2	
B	3	o------------------------o	3	B
	5	o o	5	
A	8	o------------------------o	8	A



A potential compensation cable must have the following characteristics:

- Low impedance. In the case of compensation cables that are routed on both sides, the compensation line impedance must be considerably smaller than that of the shield connection (max. 10 % of shield connection impedance).
- Should the length of the compensation cable be less than 200 m, then its cross-section must be at least 16 mm^2. If the cable length is greater than 200 m, then a cross-section of at least 25 mm^2 is required.
- The compensation cable must be made of copper or zinc coated steel.
- The compensation cable must be connected to the protective conductor over a large surface area and must be protected against corrosion.
- Compensation cables and data cables should be routed as close together as possible, meaning the enclosed area should be kept as small as possible.

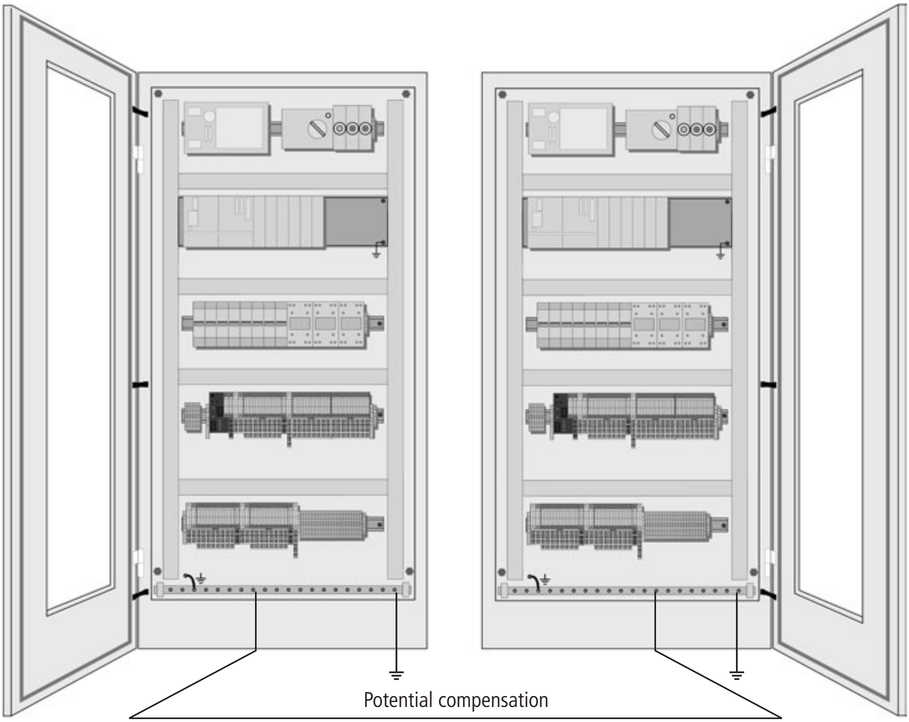


Figure 302: Potential compensation between switchgear cabinets

Switching Inductive Loads

In the case of inductive loads, a protective circuit on the load is recommended.

Protection against Electrostatic Discharge (ESD)

Attention!
Electronics modules and base modules are at risk from electrostatic discharge when disassembled. Avoid touching the bus connections with bare fingers as this can lead to ESD damage.

Bus Connection

The bus connection of XI/ON I/O modules is established via a 9-pole SUB-D connector according to RS 485 DIN 19245 Part 1 or via direct wiring with a tension clamp terminal on the gateway. The assignment of the connections is described fully in chapter 2.

If the gateway is wired directly, the bus connection must be shielded. This can be done, for example, using the clamping yoke SCH-1-WINBLOC.

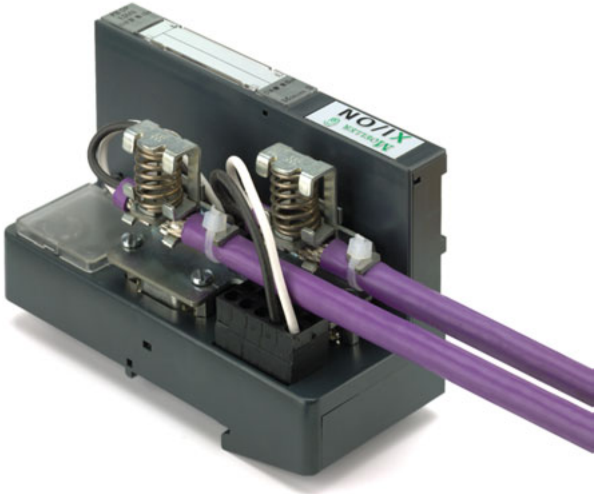


Figure 303: Shield connection for PROFIBUS-DP

When connecting the gateway via a SUB-D male connector, the bus connection is shielded by using a metal bus data plug (ZB4-209-DS2).

Attention!
Where necessary, the bus termination must be made via a bus terminating resistor in a bus data plug (ZB4-209-DS2).

Wiring

The graphic shows the minimum wiring with shielding between two bus stations using a SUB-D connector as an example.

Connection 1				Connection 2	
B	3	o------------------------o		3	B
	5	o	o	5	
A	8	o------------------------o		8	A

Reference potential

Reference potential

Attention!

The two signal wires must not be reversed!

Two-Pole Shield Connection

Shielded cables can be used for analog input and output signals. The connection between the shield and the respective base module can be made via a shield connection, which is available as an accessory.

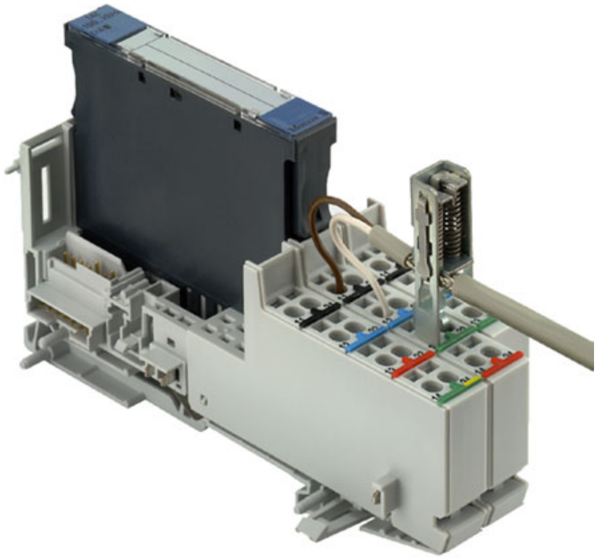


Figure 304: Two-pole shield connection for analog modules

The shield connection is to be mounted in the corresponding connection level of the base module. The following cable diameters are permissible for the shield connection:

Diameter of the shielding braid: max. 4.9 mm

Outer diameter of the cable: max. 6.5 mm

8 Module Labeling

Chapter Overview

You can find the following subjects in this chapter:

General Notes

All electrical and electronics components for XI/ON stations are supplied with labels to guarantee clear identification. In addition, Moeller offers marking and labeling materials which enable individual and application specific labeling of each component. Fundamentally, the differences are as follows:

Colors

Each electronics module can be recognized immediately by the colored lid imprint (top and bottom).

Table 68: Color identification of XI/ON modules

Gateway (GW)	■	dusty grey
Power Feeding 24 V DC (PF)	■	dusty grey
Power Feeding 120/230 V AC (PF)	■	orange brown
Bus Refreshing (BR)	■	dusty grey
Digital input modules (DI)	■	light grey (white)
Analog input modules (AI)	■	pigeon blue
Digital output modules (DO)	■	strawberry red
Analog output modules (AO)	■	pale green
Relay modules (R)	■	pastel orange
Technology modules (CNT)	■	zinc yellow

Designations/Catalog Numbers

The designation is imprinted on the top of the electronics modules. Each module is clearly identified by a catalogue number. The catalogue number as well as further module-specific details can be found on a label attached to the side of the respective module.

Gateways

Example: XI/ON gateway, 1.5 MBits/s.

Figure 305: Gateway labeling

① Designation

② Label for application specific details

Electronics Modules

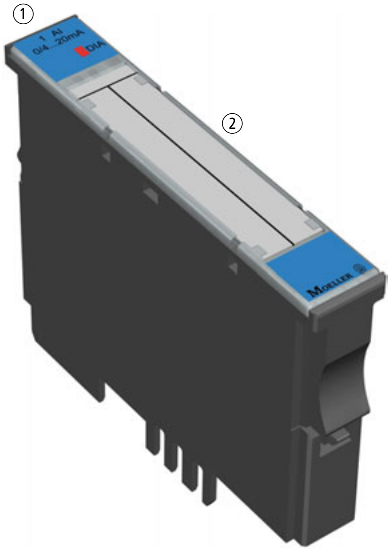


Figure 306: Electronics module labeling

① Designation

② Label for application-specific details

The module’s wiring diagram is printed on the lid of every electronics module. Example:

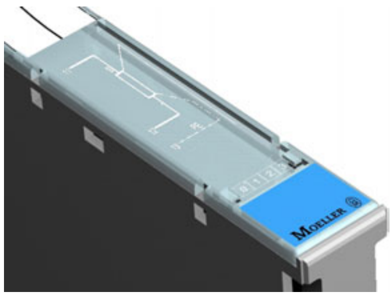


Figure 307: Wiring diagram

Base Modules

Base module connections are numbered consecutively channel by channel.

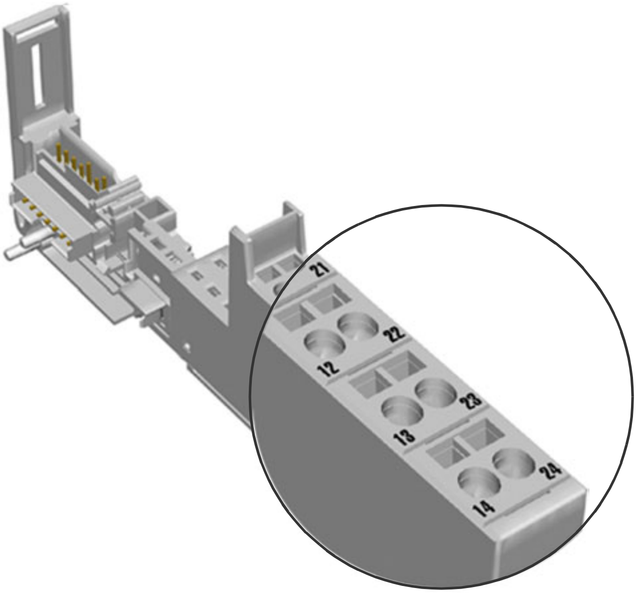


Figure 308: Channel numbering

The colored markers are used to label the different base module connection levels and can be used to denote specific applications. They are available as accessories in the following colors: blue, red, green, black, brown, red/blue and yellow/green.

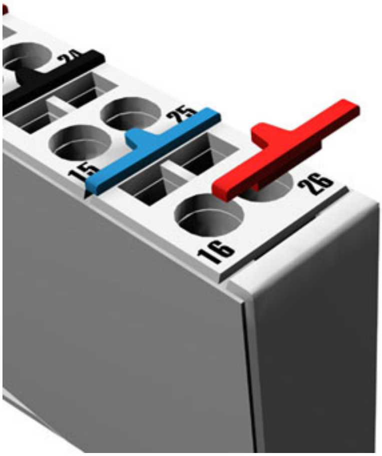


Figure 309: Color-coding of connection levels

→ The individual colored markers assigned to the connection levels should be chosen in accordance with the electronics modules used.

Dekafix connection markers can be used to label the mounting slots for the electronics modules. Insert the connection into the mounting slots to the rear of the base module.

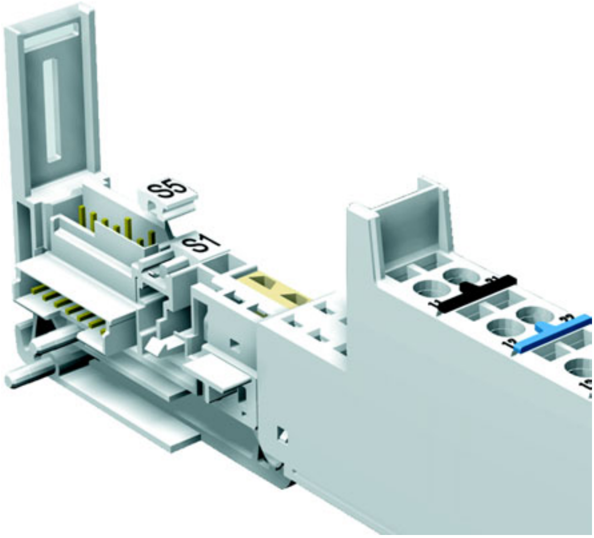


Figure 310: Mounting slot identification using Dekafix

Labels

Each electronics module is supplied with a label to enable application-specific identification. Labels are available as accessories (see “Appendix”).

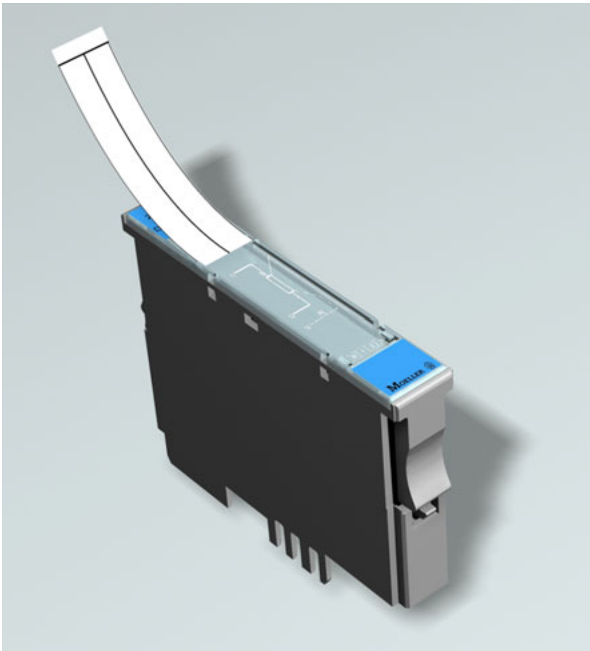


Figure 311: Label

9 I/O*assistant* Software

Chapter Overview

This chapter provides you with an overview of the most important functions in I/O*assistant*, the software for project planning, testing and diagnosing XI/ON stations. A detailed description is available in the Online Help.

You can find the following subjects in this chapter:

General

The interactive software tool I/O*assistant* supports the entire planning and configuration process of an I/O system. I/O*assistant* helps with planning stations, it configures and sets parameter values, online as well as offline. Furthermore, it is possible to commission the plant and carry out tests and diagnostics on the stations.

I/O*assistant* is available in two versions:

1. Offline version

The offline version of I/O*assistant* can be downloaded from the Moeller homepage www.moeller.net for self installing. The main features at a glance:

- Project examples
- Creating, structuring and expanding projects on-screen
- Selecting and including necessary modules and accessories
- Realistic display of Moeller I/O products
- Station plausibility testing
- Configuring and setting of parameters for individual stations in offline mode.
- Detailed project documentation
- Online Help

2. Full version

As well as the above, the full version of I/O*assistant* (for the CD-ROM, see the list of accessories) offers the following additional features:

- Online configuration and parameter setting of individual stations
- Production of station-specific GSD files
- Commissioning of stations
- Reading and setting process data
- Diagnostics and troubleshooting
- Downloading new firmware to a XI/ON station
- Resetting a XI/ON station

→ A detailed description of all I/O*assistant* functions and how to work with the program can be found in the Online Help.

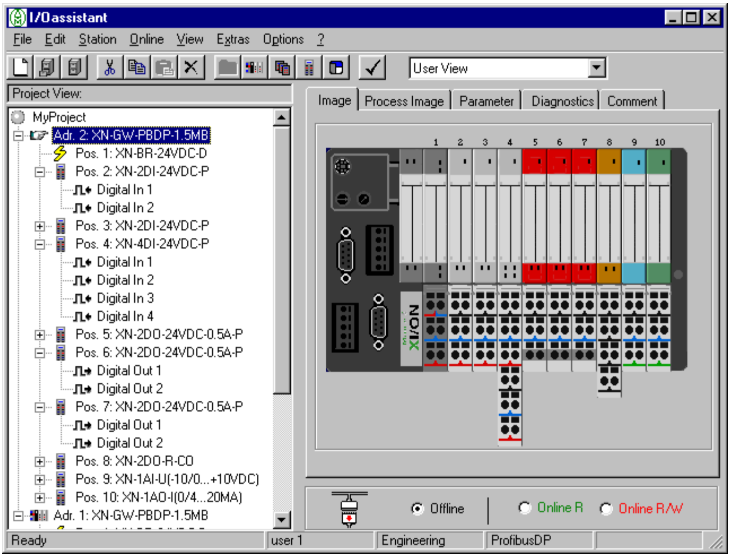


Figure 312: I/O*assistant*

The project tree is displayed on the left-hand side of the main screen. The individual stations are displayed with the gateway and the I/O modules in logical succession.

A realistic graphic display of the station is shown on the right-hand side of the screen (depending on the setting), as well as the corresponding process image, parameter and diagnostics data, and user-specific comments concerning the individual modules.

Installation

I/O*assistant* runs on the operating systems Windows 95/98 and Windows NT4. For online operations, the PC requires a serial COM port and a SUB-D/PS2 adapter cable, both of which are available from Moeller.

Attention!
To install the full version of the software, follow the instructions included on the CD.

To start I/O*assistant*:

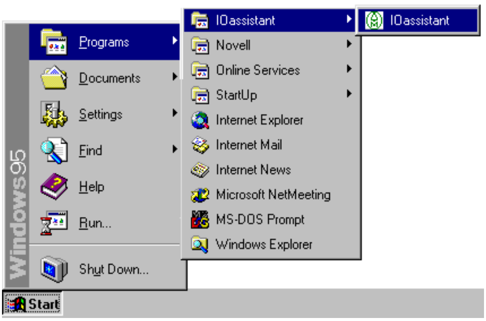


Figure 313: From the Windows taskbar ‹Start → Programs → I/O*assistant*›

After successfully downloading it from the Moeller homepage www.moeller.net double-click the installation file to install the offline version of I/O*assistant*. Follow the instructions on-screen to complete the installation.

To uninstall I/O*assistant*:

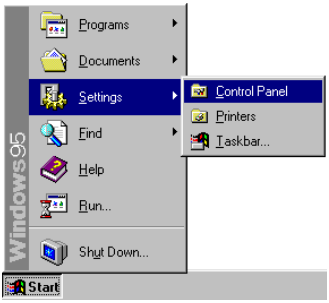


Figure 314: From the Windows taskbar ‹Start ➞ Settings ➞ Control Panel› command

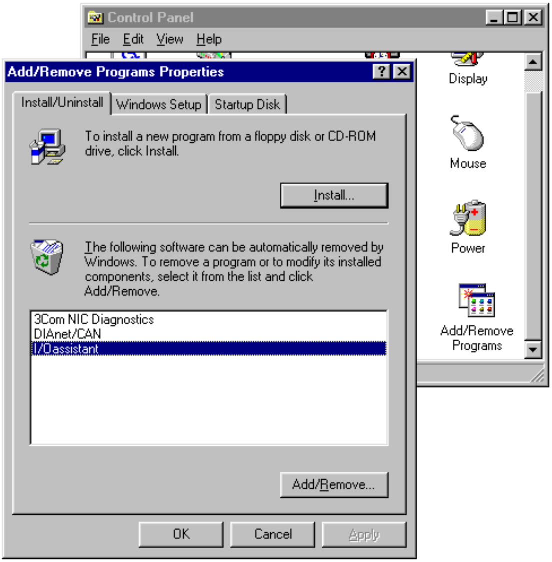


Figure 315: ‹Software ➞ Select I/Oassistant ➞ Add/Remove›

Offline Functions

Login

I/O*assistant* has three access levels:

- Engineering
- Service
- Diagnostics

Each of these access levels and its program functions can be assigned to different user profiles. In addition, each level can be protected by a password.

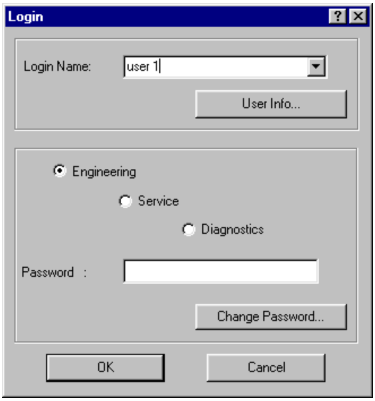


Figure 316: Login dialog box

Engineering	On this level, the project engineer has access to all software functions. Stations can be added or deleted.
Service	On this level, it is not possible to make changes to a project. The stations are tested for plausibility. Station data can be read and transmitted, outputs can be set and parameters adjusted. Following the planning phase, commissioning tests can be carried out on this level.
Diagnostics	This level is used for the diagnosis/monitoring of stations during operation. Station data can be transmitted, but not altered.

Engineering

During the engineering phase, a project planning engineer can plan a station, select the I/O modules and set the parameters.

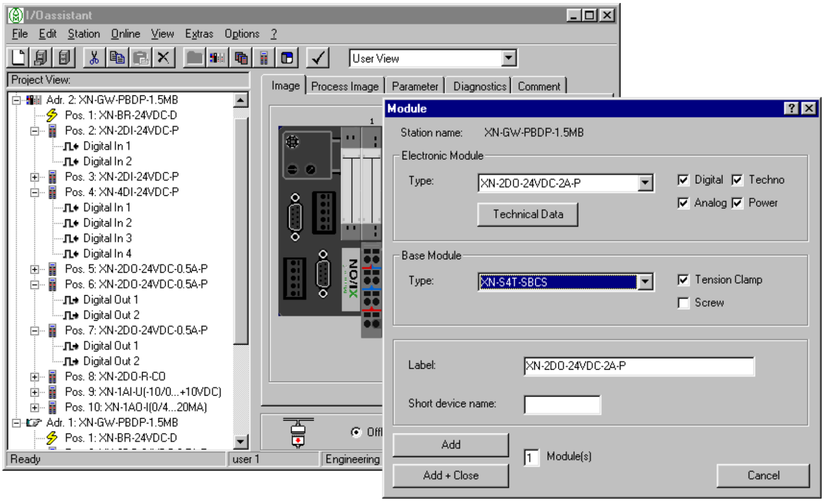


Figure 317: Planning a XI/ON station

By using the I/O*assistant* in the offline mode, the project planning engineer can plan new projects or make alterations to existing stations.

Plausibility Test

Using I/O*assistant*, it is possible to verify if individual stations and the entire project are physically complete. Planning errors are displayed in an error report.

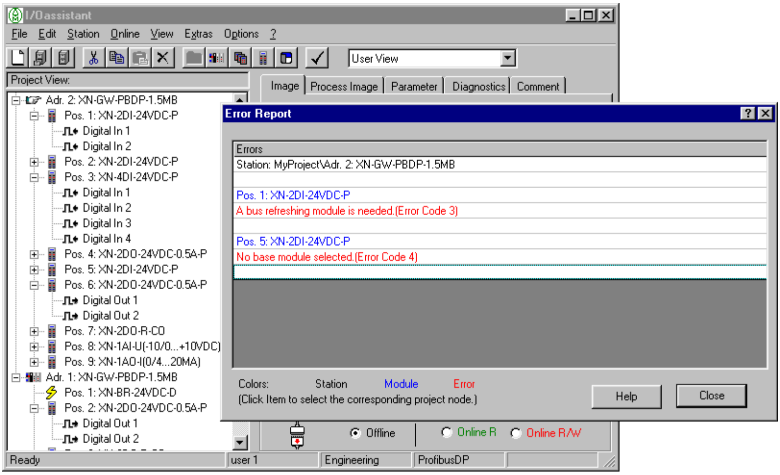


Figure 318: Error report

Station Documentation

Documentation can be drawn up for each planned station. The documentation includes a list of components, from which a fax form for ordering can be generated, a view of the station's process, an image of the station, station dimensions and a list of the station's parameters.

The list of components contains all products planned for in the project. It is possible to alter the number of components and add other Moeller products to the list.

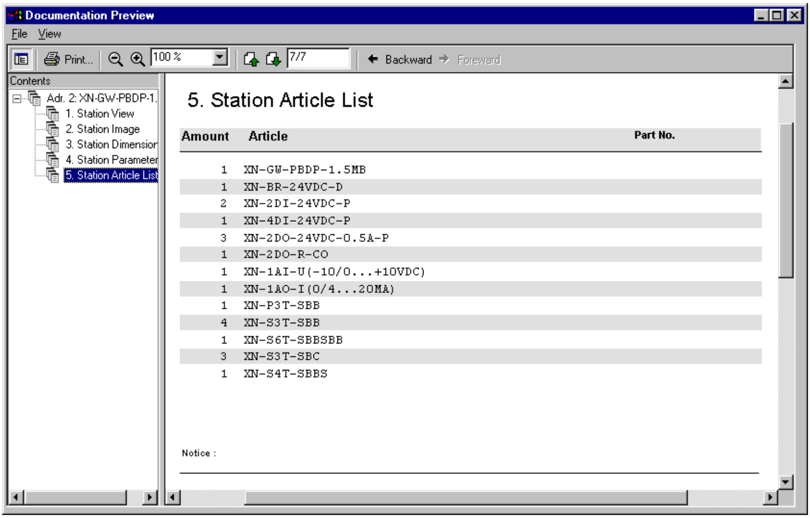


Figure 319: Article list of a XI/ON station

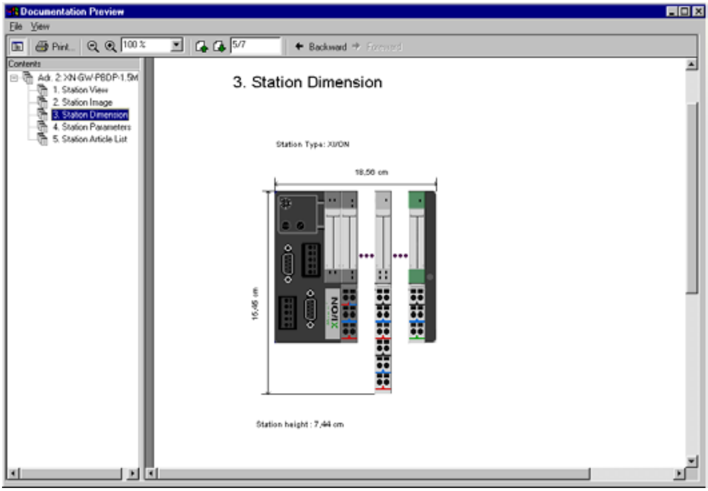


Figure 320: Dimensions of a XI/ON station

Online Functions (Full Version only)

As well as planning projects offline using I/O*assistant*, it is also possible to access existing stations online. To do so, connect the serial COM-port to the service interface on the station's gateway using a Sub-D/PS2 adapter cable.

The following features are available in online mode:

- Exporting of labels
- Generating of station-specific GSD files
- Testing wiring
- Displaying the process image
  Setting outputs
  Reading inputs
- Diagnostic functions
- Reading and writing parameters
- Comparing connected and planned stations

Generating a Station-Specific GSD File

The universal GSD file (electronic device data sheet) is normally used for planning a XI/ON PROFIBUS station in the master. After the planning phase, it is possible to generate an application-specific GSD file for each XI/ON station using I/O*assistant*. This file contains an exact description of the modules, including all parameters which have been configured in the corresponding XI/ON station. General notes on GSD files can be found in chapter 3.

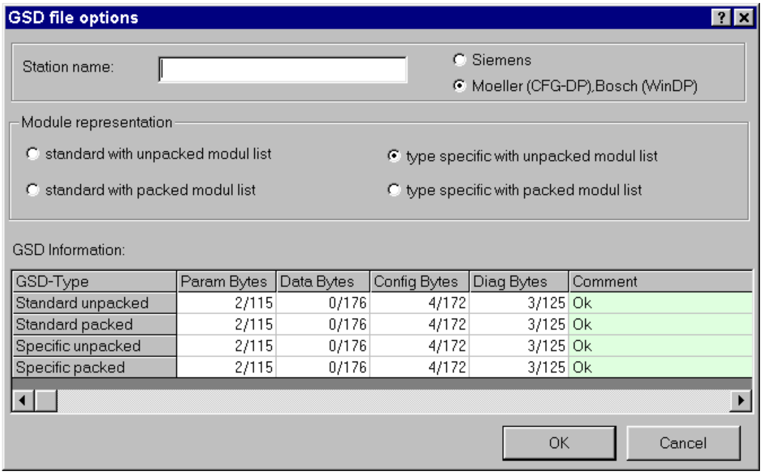


Figure 321: Generating a GSD file

Reading a Process Image

When the application is operating, it is possible to visualize the current process image via the service interface, parallel to the fieldbus communication.

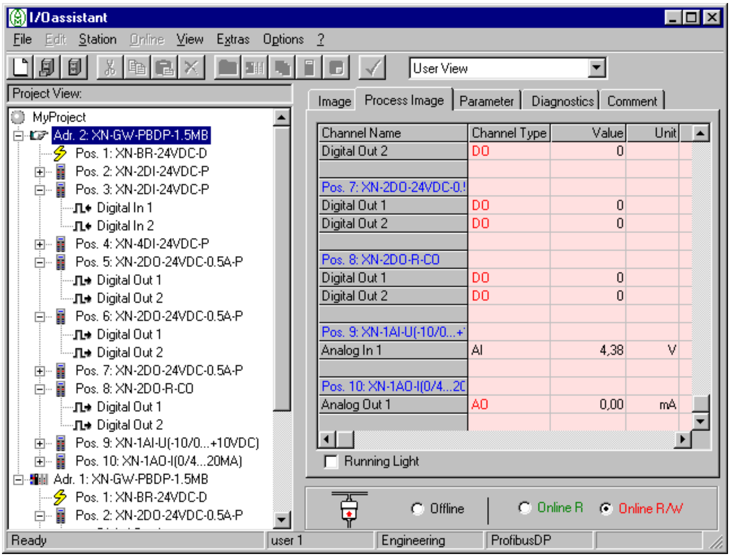


Figure 322: Project tree with process data

Reading and Writing Parameters

It is possible to read and write parameters in online mode.

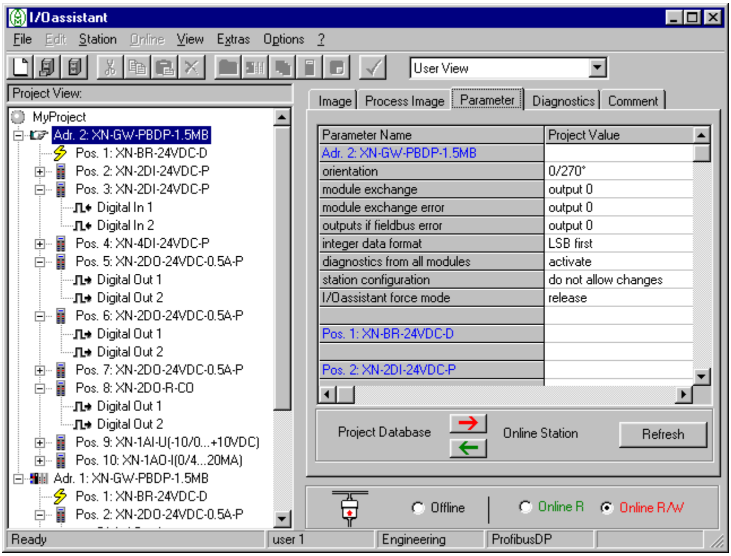


Figure 323: Setting parameters

I/O*assistant* can force outputs as well as read input data.

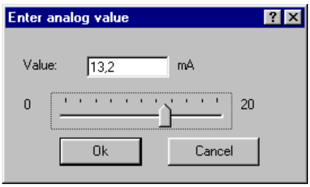


Figure 324: Forcing analog values

Diagnostics

I/O*assistant* reads the diagnostic data of the stations during operation.

I/O*assistant* indicates the existence of diagnostic data from the gateway and the I/O modules by means of small symbols in the station’s image.

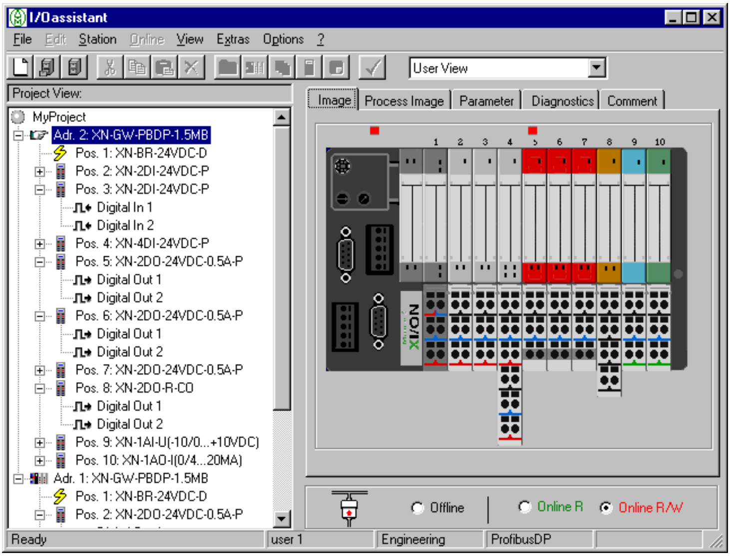


Figure 325: Indicating diagnostics in the station’s image

The corresponding diagnostic data can be found in plain text in the “Diagnostics” tab. The station-specific diagnostics record is scanned-in from the gateway and displayed on-screen.

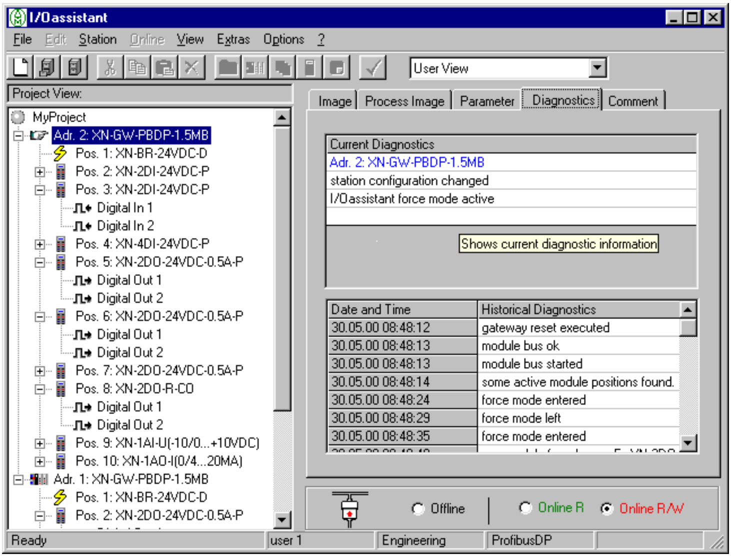


Figure 326: "Diagnostics" tab with plain text diagnostics and a history of the diagnostics

10 Example for Commissioning

Chapter Overview

You can find the following subjects in this chapter:

General

This chapter contains information for practicing installing, mounting, connecting and commissioning of a XI/ON station based on a thorough example. The PS 416 PLC from Moeller is used as the controller. It must at least comprise a module subframe, power supply unit, a CPU 400 and the PROFIBUS-DP master card PS416-Net-440. Use the software Sucosoft S40 to configure your Moeller controller.

- what is important regarding safety: Page 483
- how to prepare mounting rails and XI/ON components: Page 484
- which XI/ON components to mount and how: Page 489
- how to wire XI/ON components: Page 496
- how to plug the electronics modules onto base modules: Page 501
- how to configure the XI/ON station with the help of the “CFG-DP” software: Page 502
- what to observe when loading the configuration data: Page 510
- how to commission the station: Page 511
- what is important regarding the diagnostics of the installed station: Page 512

→ The designations used in this chapter for programmable logic controllers and software programs are registered and protected trademarks belonging to the respective manufacturer.

Safety Relevant Information

Warning!
Please read this section carefully. Safety aspects cannot be left to chance when dealing with electrical equipment.

This section includes all information necessary for the appropriate use of XI/ON products. It has been specially conceived for personnel with the necessary qualifications.

- as service staff, they are trained to operate automated installations and are familiar with the operation of the type of equipment described in this documentation.
- they are responsible for maintenance or service and have received special training that qualifies them to repair these automated installations. Furthermore, they are entitled/certified to put electronic circuits and systems into operation, to ground and label them according to the safety guidelines.

Intended Usage

Warning!
The devices described in this manual should be used only in applications intended in the technical descriptions, and should be used only with components and devices from third party manufacturers that have been certified or recommended by Moeller.

Appropriate transport, storage, deployment and mounting as well as careful operating and thorough maintenance guarantee the trouble-free and safe operation of these devices.

Preparing Mounting Rails and Modules

▶ Attach the TS 35 mounting rails over a large surface area and with a low impedance to the mounting plates. Please ensure correct earthing is provided.

▶ Ensure a good contact between the mounting rails and the support system using screws or rivets is provided. Remove any isolating layers (for example, painted or anodized layers) from the metal components at the connection point.

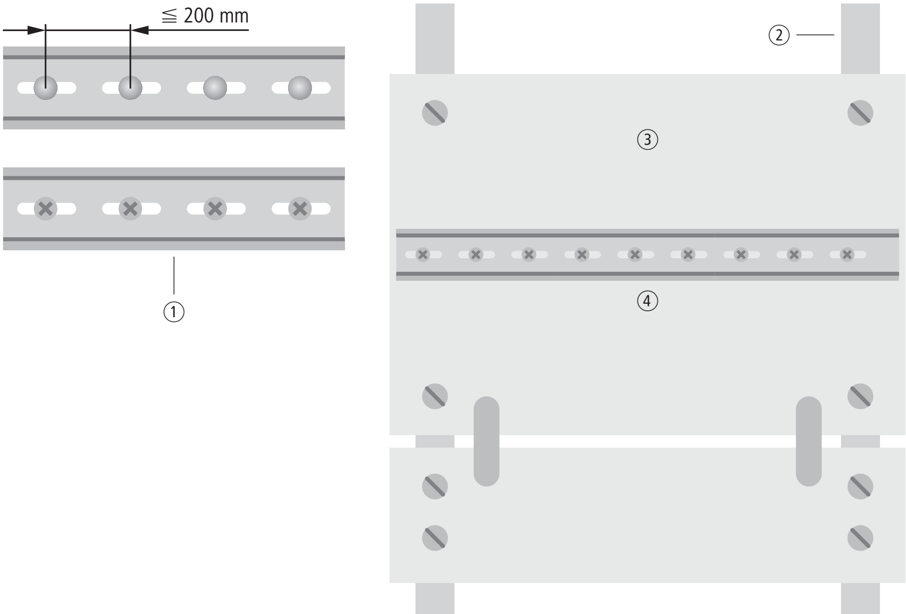


Figure 327: Mounting possibilities

① TS 35 mounting rail
② Mounting rail
③ Mounting plate
④ TS 35 mounting rail

▶ Protect the connection point against corrosion by using a suitable grease.

▶ Read chapter 7 to gain relevant information about potential relationships and EMC guidelines concerning the installation.

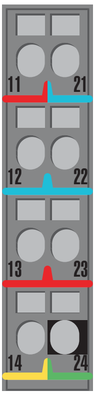
▶ Unpack the necessary XI/ON components.

→ Base modules with tension clamp connections were used in the XI/ON station described in the following example.

Attention!
Do not touch the connections on the modules with bare hands, this can lead to damage due to electrostatic charges.

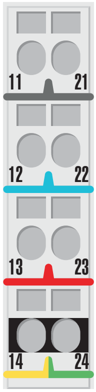
▶ You can label the connection level of the base modules with colored markers, which are available as accessories. These identify, for example, input and output signals and voltage. Use the colored markers to clearly and quickly identify the respective connection levels. The markers are used as follows in our example:

XN-P4T-SBBC (base module for Bus Refreshing module with gateway power supply and connection for C-rail, 4-wire connection technology)



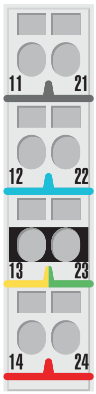
1. Connection level = red/blue (system power supply, 24 V DC)
2. Connection level blue (negative)
3. Connection level = red (+24V DC, +5V DC)
4. Connection level = yellow/green (protective earth)

XN-S4T-SBBC (base module: 2 digital inputs with connection for C-rail, 4-wire connection technology)



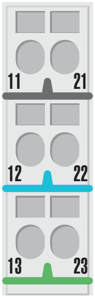
1. Connection level = black (signal cable)
2. Connection level = blue (negative)
3. Connection level = red (+24V DC)
4. Connection level = yellow/green (protective earth)

XN-S4T-SBCS (base module: 2 digital outputs with connection for C-rail, 4-wire connection technology)



1. Connection level = black (signal cable)
2. Connection level = blue (negative)
3. Connection level = yellow/green (protective earth)
4. Connection level = red (+24V DC)

XN-S3T-SBB (base module: 1 analog input without sensor power supply, 2-/3-wire connection technology)

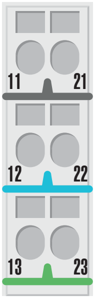


1.Connection level = black (signal cable)

2. Connection level = blue (negative)

3. Connection level = green (shield)

XN-S3T-SBB (base module: 1 analog output, 2-/3-wire connection technology)



1.Connection level = black (signal cable)

2. Connection level = blue (negative)

3. Connection level = green (shield)

→ If necessary, attach labels to the electronics modules (supplied with the modules). These labels can be written on using a waterproof pen.

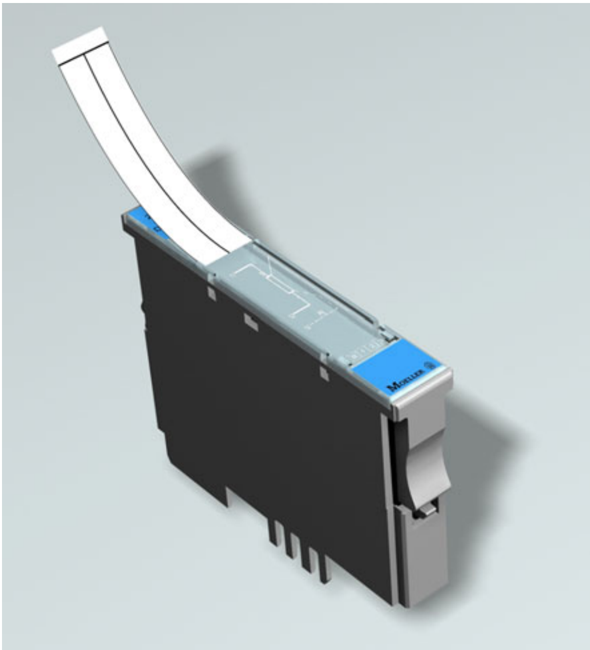


Figure 328: Label

Mounting a Station on a Mounting Rail

The following components are used in our example:

Table 69: XI/ON components

Type	Designation	Qty.
XI/ON gateway PROFIBUS DP 1.5 MBit/s	XN-GW-PBDP-1.5MB	1
Bus Refreshing module with diagnostics	XN-BR-24VDC-D	1
Base module with power supply to gateway and connection for C-rail, 4-wire connection technology	XN-P4T-SBBC	1
Digital input module for 2 digital inputs, positive switching (sinking)	XN-2DI-24VDC-P	1
Base module for 2 digital inputs, with connection for C-rail, 4-wire connection technology	XN-S4T-SBBC	1
Digital output module for 2 digital outputs, 0.5 ampere, positive switching (sourcing)	XN-2DO-24VDC-0.5A-P	1
Base module for 2 digital outputs, with connection for C-rail, 4-wire connection technology	XN-S4T-SBCS	1
Analog input module for 1 analog input, -10/0 to 10 volt	XN-1AI-U(-10/0...+10VDC)	1
Base module for 1 analog input without Sensor power supply, 2-/3-wire connection technology	XN-S3T-SBB	1
Analog output module for 1 analog output, 0/4 to 20 milliampere	XN-1AO-I(0/4...20MA)	1
Base module for 1 analog output, 2-/3-wire connection technology	XN-S3T-SBB	1
Mounting rail, TS 35 x 7.5 mm, with drillings		1
End plate	XN-ABPL	1
End bracket	XN-WEW-35/2-SW	2
Protective-conductor terminal block		1
Markers for connection levels (various colors)		18

→ The following example makes the assumption that you are familiar with the mounting and installation of electronics modules on mounting rails, as well as the specific conditions exclusive to PROFIBUS-DP. You can find background information on mounting XI/ON stations in chapter 6 and background information on electrical installation in chapter 7.

Mounting the Gateway

Proceed as follows using the gateway **XN-GW-PBDP-1.5MB**:

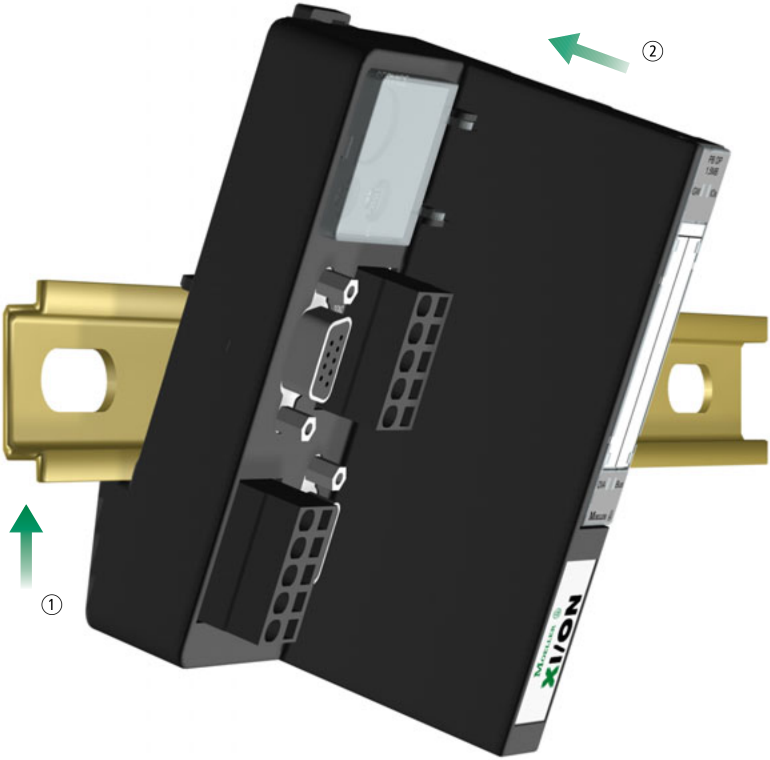


Figure 329: Mounting the gateway

- ▶ Tilt the top of the gateway towards you, position the groove provided on the rear of the gateway onto the lower edge of the mounting rail ①.
- ▶ Tilt the top of the gateway away from you and towards the mounting rail ②, and press until it locks in with an audible click.

Mounting Base Modules

Attention!
A Bus Refreshing module has to be mounted next to the gateway, which then supplies the gateway and the I/O modules with power.

Using the base module with the designation **XN-P4T-SBBC** (base module for supplying the gateway with power and connection for the C-rail, 4-wire connection technology), and proceed as follows:

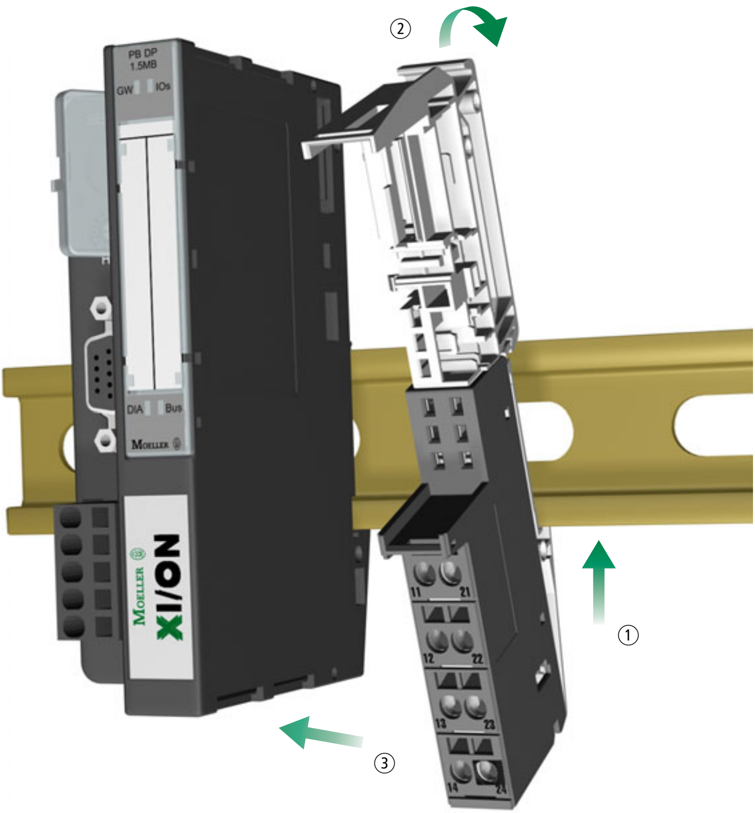


Figure 330: Mounting the base module XN-P4T-SBBC

▶ Tilt the top of the base module towards you, position the groove provided on the rear of the gateway onto the lower edge of the mounting rail ①.

▶ Tilt the top of the base module away from you and towards the mounting rail, and press until it locks in with an audible click ②.

▶ Slide the base module as far as possible to the left until the locating hooks lock in with an audible click into the gateway ③. This provides a stable connection and guarantees communication via the module bus.

▶ Take the base module with the designation **XN-S4T-SBBC** (base module for 2 digital inputs with connection for C-rail, 4-wire connection technology) and proceed as described in step 1 and step 2.

▶ Slide the base module as far as possible to the left until the locating hooks lock in with an audible click into base module belonging to the Bus Refreshing module. This provides a stable connection and guarantees communication via the module bus.

▶ Mount the following base modules onto the mounting rails in the same manner described in steps 1, 2, and 5:

Table 70: Additional base modules

Type	Designation
Base module for 2 digital outputs with connection for C-rail, 4-wire connection technology	XN-S4T-SBCS
Base module for 1 analog input without sensor power supply, 2-/3-wire connection technology	XN-S3T-SBB
Base module for 1 analog output, 2-/3-wire connection technology	XN-S3T-SBB

Mounting End Brackets, End Plates and the Protective-Conductor Terminal Block

Starting with one of the end brackets, proceed as follows:

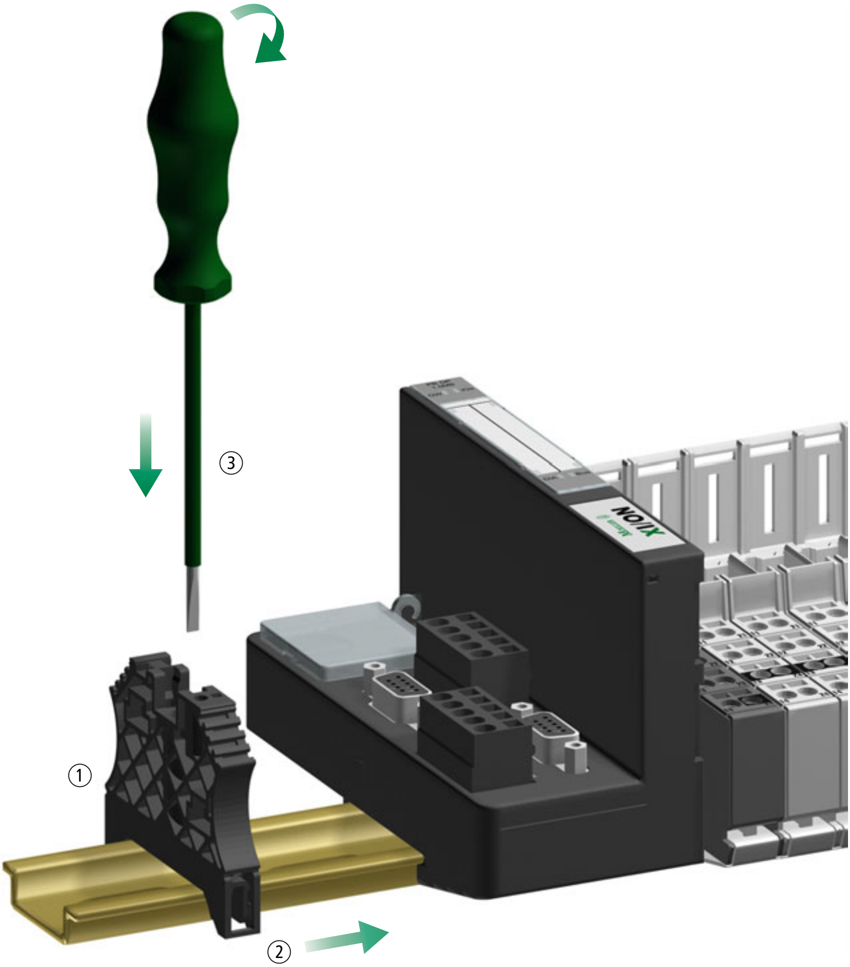


Figure 331: Mounting the end bracket

▶ Clip the end bracket onto the mounting rail and to the left of the gateway until you hear an audible click 1. If necessary, loosen the screw beforehand.

▶ Slide the end bracket up to the gateway ② and tighten the screw ③.

▶ Mount the protective conductor terminal block onto the mounting rail to the left of the end bracket. To do this, proceed as described above when mounting an end bracket.

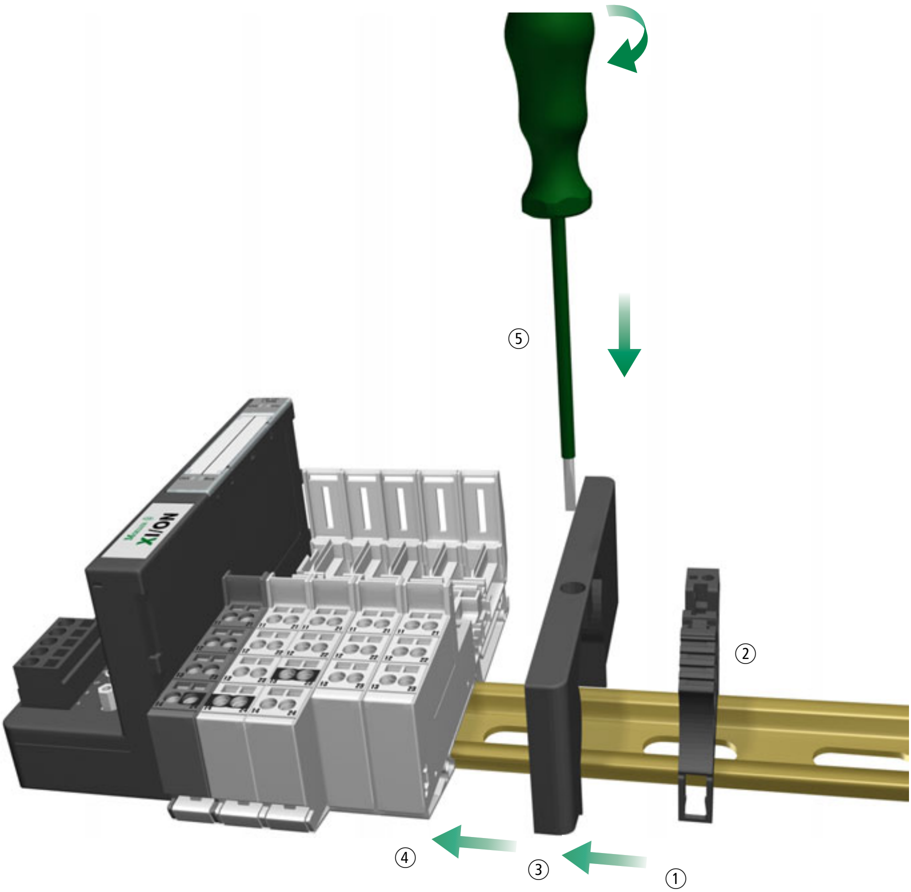


Figure 332: Mounting the end plate

▶ Take the second end bracket and the end plate, and proceed as follows:

- ▶ Insert the end bracket into the recess provided in the end plate ①.
- ▶ The end bracket and end plate should be held so that the connectors on the end plate are facing the last module of the XI/ON station.
- ▶ Press the end plate onto the mounting rail until you hear an audible click ②, (if necessary, loosen the screw beforehand). Then slide the end bracket and end plate up to the last module of the XI/ON station ③.
- ▶ Press the end plate with the end bracket firmly up to the last module of the XI/ON station. The end plate’s connectors must lock firmly into the locating holes provided in the module ④.
- ▶ To secure the end bracket, insert a screwdriver into the hole provided in the end plate and tighten the screw ⑤.

Wiring

Proceed as follows to wire the mounted XI/ON station.

▶ Step 1: Prepare one meter lengths of red, blue and yellow/green cables (∅ each 1.5 mm^2, 0.06 inch^2/16 AWG) by stripping approx. 8 mm (0.32 inch) of insulation from all of the ends.

▶ Step 2: Insert a screwdriver into the rectangular opening located immediately above connection **14** (PE connection) of the base module **XN-P4T-SBBC** (for the power supply to the gateway). When you feel a slight resistance, press the screwdriver firmly until it comes up against a stop. This opens a tension clamp on the inside of the connection level. Leave the screwdriver in place.

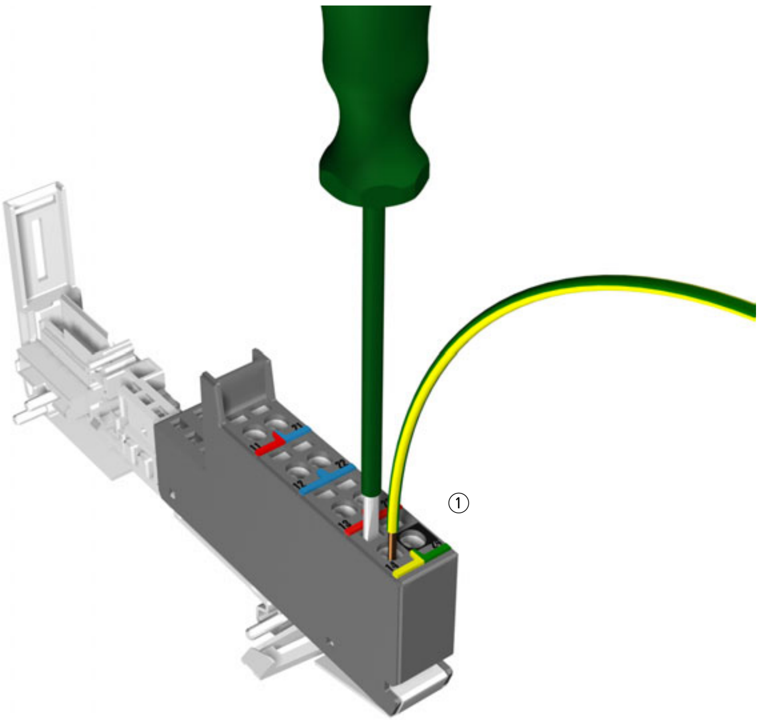


Figure 333: Base module XN-P4T-SBBC with power supply to the gateway

① yellow-green: to 14

▶ Step 3: Insert one end of the yellow/green wire (protective earth) into the round opening located directly below the screwdriver, until the wire comes up against a stop. Remove the screwdriver; the tension clamp closes and secures the wire.

▶ Step 4: Repeat steps 2 and 3 for the field supply cable (connection **13**: red, +24 V DC; connection **12**: blue, negative) and the system's power supply cable (connection **11**: red, +24 V DC; connection **21**: blue, negative).

▶ Step 5: Connect the free ends of the cables to the corresponding outputs of the power supply unit. Red cables are connected to the "+" terminals and the blue cables are connected to the "–" terminals.

▶ Step 6: Connect the protective earth cable (yellow/green) to the protective conductor terminal block. The base module is now fully wired.

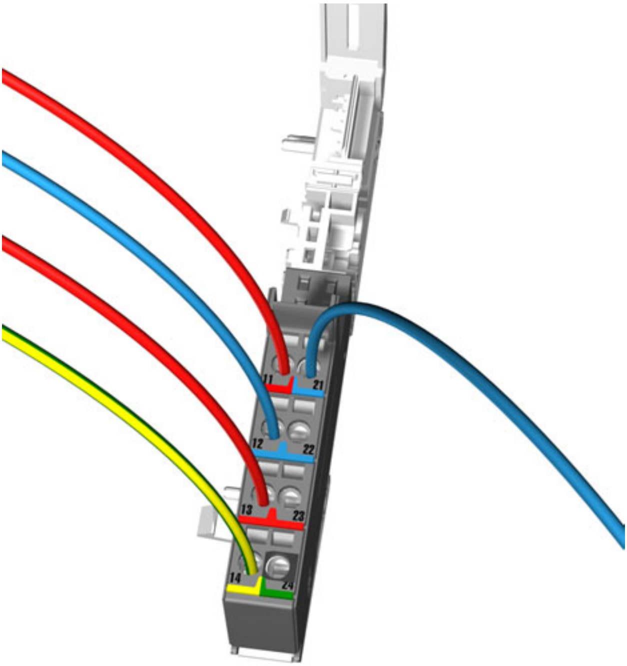


Figure 334: Base module XN-P4T-SBBC with power supply to the gateway

Table 71: Wiring base module XN-P4T-SBBC

Base module XN-P4T-SBBC	Power supply unit	Protective conductor terminal block
Red to 11	Red to "+"	
Blue to 21	Blue to "–"	
Blue to 12	Blue to "–"	
Red to 13	Red to "+"	
Yellow/green to 14		Yellow/green to connection

After having connected the field and system power supplies to the XI/ON station, proceed as follows to wire the base modules for the digital input and output modules.

▶ Step 7: Prepare red, blue and black cables (∅ 1.5 mm^2, 0.06 $inch^2$/16 AWG) by stripping approx. 8 mm of insulation from both ends of all cables. The length of the cables depends upon the distances to the periphery devices.

▶ Step 8: Insert one end of the black cable into the tension clamp connection **11** of the base module **XN-S4T-SBBC** for the digital input module. Open the tension clamp connection as described in step 2.

▶ Step 9: Insert one end of the blue cable into the tension clamp connection **12** of the base module **XN-S4T-SBBC**.

▶ Step 10: Insert one end of the red cable into the tension clamp connection **13** of the base module **XN-S4T-SBBC**.

▶ Step 11: Connect the free ends of the cables to the digital periphery device. Please observe the appropriate installation and operating instructions for the respective device.

▶ Step 12: If you wish to connect a digital periphery device to your digital output module, repeat steps 7 to 11 for the base module **XN-S4T-SBCS**. Please note: the red cable should be inserted into connection **24** of the base module.

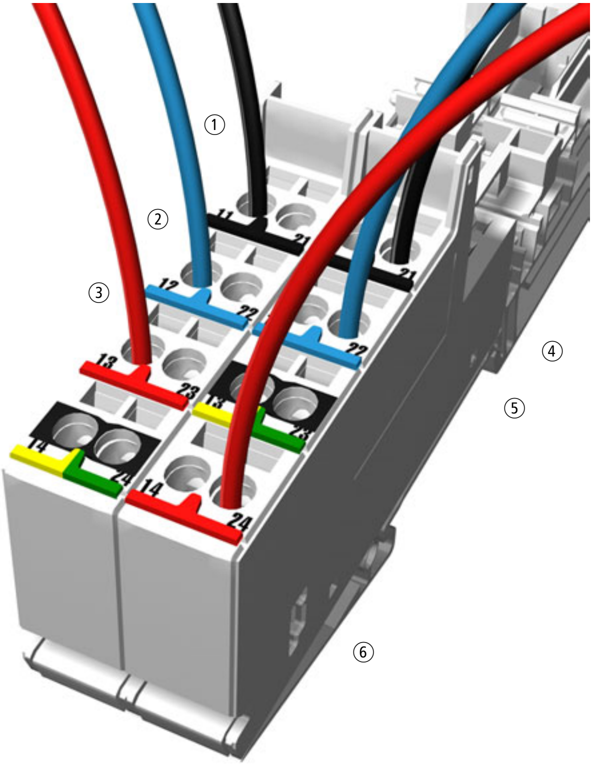


Figure 335: Base modules XN-S4T-SBBC (left) and XN-S4T-SBCS (right)

① Black: to 11
② Blue: to 12
③ Red: to 13
④ Black: to 21
⑤ Blue: to 22
⑥ Red: to 24

Proceed as follows to wire the base modules for the analog input and output modules.

▶ Step 13: Prepare a black and a blue cable (∅ 1.5 mm^2, 0.06 $inch^2$/16 AWG) by stripping approx. 8 mm (0.32 inch) of insulation from both ends of the cables. The length of these cables depends upon the distance to the analog periphery device (for example, a measuring device).

▶ Step 14: Insert one end of the blue cable into the tension clamp connection **22** of the base module **XN-S3T-SBB** for an analog output module (open the tension clamp as described in step 2).

▶ Step 15: Insert one end of the black cable into the tension clamp connection **21** of the same base module **XN-S3T-SBB** (for the analog output module).

▶ Step 16: Connect the free end of the blue cable to the analog periphery device. Please observe the appropriate installation and operating instructions for the respective device.

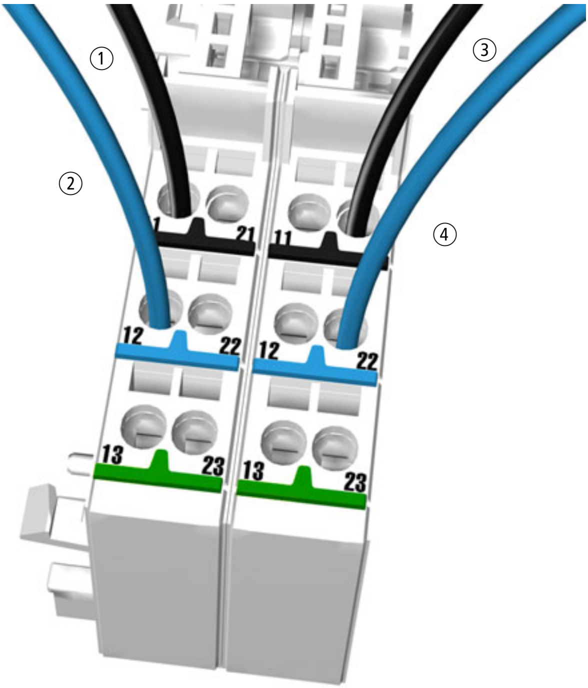


Figure 336: Base modules XN-S3T-SBB and XN-S3T-SBB (both modules are of the same type)

① Black: to 11
② Blue: to 12
③ Black: to 21
④ Blue: to 22

▶ Step 17: Should you wish to connect an analog sensor to the input module, then repeat steps **13** to **16** for the adjoining base module (also **XN-S3T-SBB**, for an analog input module). Connect the loose ends of the cables to the analog sensor. Please observe the appropriate installation and operating instructions for the respective device.

The station is now fully wired.

Plugging Electronics Modules

Proceed as follows with the power distribution module **XN-BR-24VDC-D** (Bus Refreshing module with diagnostics):

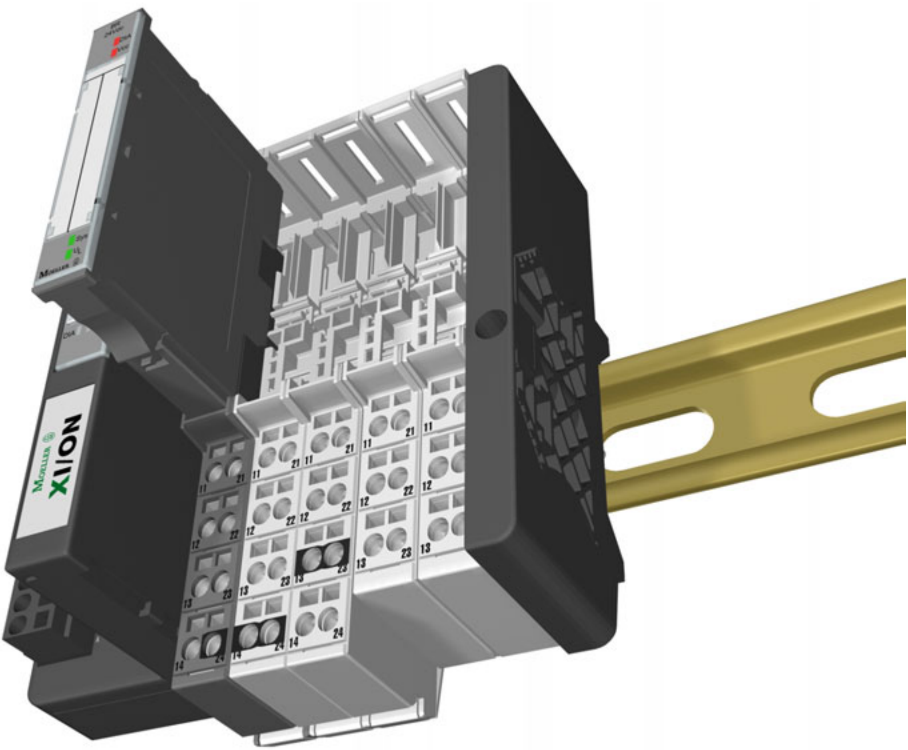


Figure 337: Plugging electronics modules

▶ Press the electronics module squarely onto the base module, until you hear it lock into place in the front and the back.

- ▶ Take the electronics module **XN-2DI-24VDC-P** (digital input module for 2 digital inputs, positive switching) and proceed as in step 1.
- ▶ Mount the following electronics modules as described in step 1.

Table 72: Additional electronics modules

Type	Designation
Digital output module for 2 digital outputs, 0.5 ampere positive switching (sourcing)	XN-2DO-24VDC-0.5A-P
Analog input module for 1 analog input, -10/0 to 10 volt	XN-1AI-U(-10/0...+10VDC)
Analog output module for 1 analog output, 0/4 to 20 milliampere	XN-1AO-I(0/4...20MA)

Configure the Station Using the PLC Software “CFG-DP” from Moeller

Planning a New Project

For the following example, use the “CFG-DP” software from Moeller to configure your XI/ON station and the PROFIBUS-DP master card PS416-Net-440:

- ▶ Install the software in accordance with the installation instructions supplied with the software.
- ▶ Copy the extended GSD file “XN02B2E.gsd” into the “...\Fieldbus\Profibus\Gsd” directory.
- ▶ Copy the icon files “XionV0_n.bmp” and “XionV0_s.bmp” into the “...\Fieldbus\Profibus\Bitmaps” directory.
- ▶ Start the “CFG-DP”” software via the icon on the PC desktop. All GSD files in the “...\Fieldbus\Profibus\Gsd” directory will automatically be read into the configuration software.
- ▶ Create a new project using the ‹File → New› command.
- ▶ Save the new project using the ‹File → Save As...› command. Type in “XION_Test” as the project name.

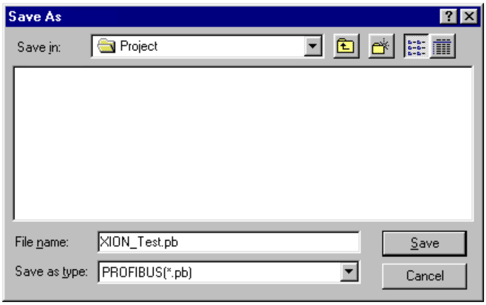


Figure 338: Saving a new project

Configuring a New Station

▶ Insert a new PROFIBUS-DP master in your new project using the ‹Insert → Master...› command.

Figure 339: Inserting a master

▶ Place the cursor in the project field and click with the left mouse button.

▶ Select the “PS416-Net-440” master card from the “Available masters” on the left-hand side of the “Insert Master” dialog box. Click the “Add >>” button to add this master card to the “Selected masters” on the right-hand side of the dialog box. This procedure activates the option to enter an address and designation for the station.

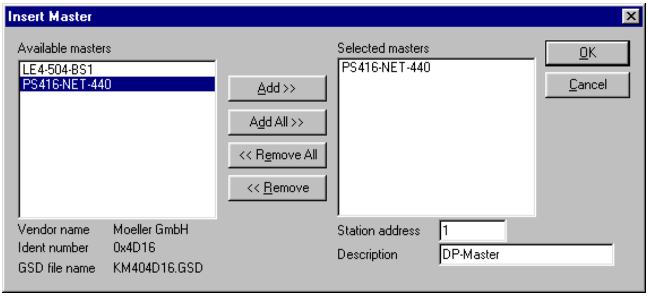


Figure 340: Selecting a master

▶ Enter "1" as the station number and "DP-Master" as the description, then click "OK" to confirm.

▶ Insert the XI/ON-Station as a slave via the ‹Insert → Slave...› command.

Figure 341: Inserting a slave

▶ Place the cursor in the project field and click with the left mouse button.

▶ Select the station "XN-GW-PBDP-1.5MB" from the "Available slaves" on the left-hand side of the "Insert Slave" dialog box. The name of the GSD file is displayed below this area in the last line: "XN02B2E.GSD". Click the "Add >>" button to add the slave to the "Selected slaves" on the right-hand side of the dialog box. This procedure activates the option to enter an address and designation for the station.

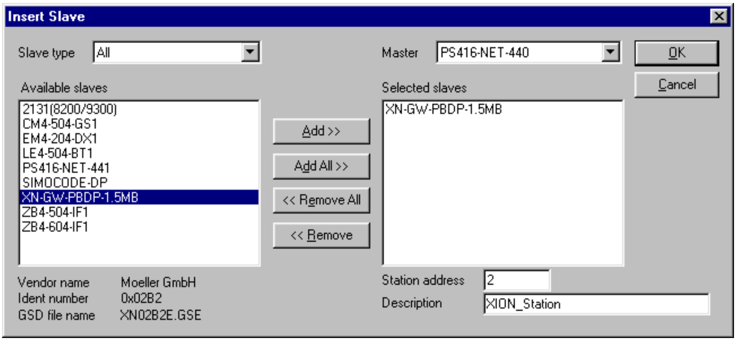


Figure 342: Selecting a slave

▶ Enter "2" as the station number and "XION_Station" as the description, then click "OK" to confirm.

▶ Your station should now have the following structure.

Figure 343: PROFIBUS-DP structure

→ As a precaution, do not forget to periodically save your project.

Configuring the XI/ON Station

▶ Double-click your XI/ON station to open the "Slave Configuration" dialog box, in which you can enter all parameters and I/O modules.

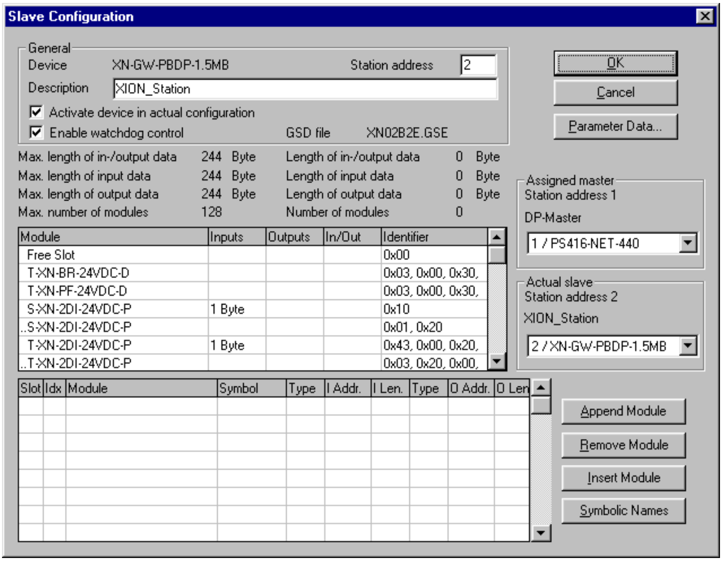


Figure 344: Slave configuration window

▶ Click the "Parameter Data" button to open the "Parameter Data" dialog box with the gateway parameters. Click the "Common" button to switch from the hexadecimal to the text description of the individual parameters.

You can find a description of the gateway parameters in Section "Setting Parameters" in chapter 2.

▶ Double-click the parameter "Outputs module exchange" to open the "Outputs module exchange" dialog box where you can set the parameters. Select "Hold current value". Click "OK" to confirm.

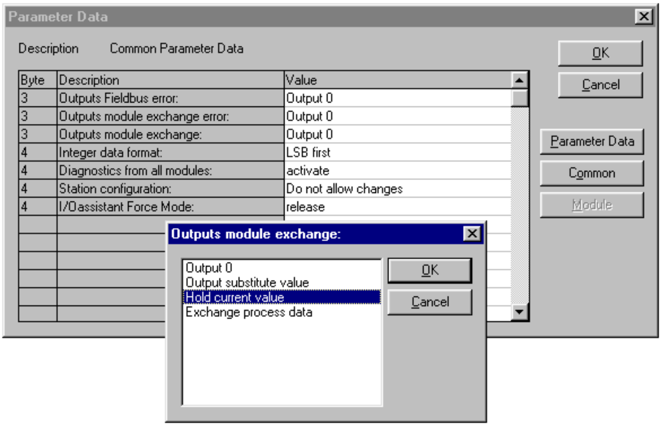


Figure 345: Setting the gateway parameters

Inserting and Setting the Parameters of XI/ON Modules

Select the same module as you have mounted onto your XI/ON station, from the “Slave Configuration” dialog box. Select the Bus Refreshing module with the designation **T-XN-BR-24VDC-D** from the upper module list. Click the “Append Module” button to insert this module in slot “1” displayed in the overview below.

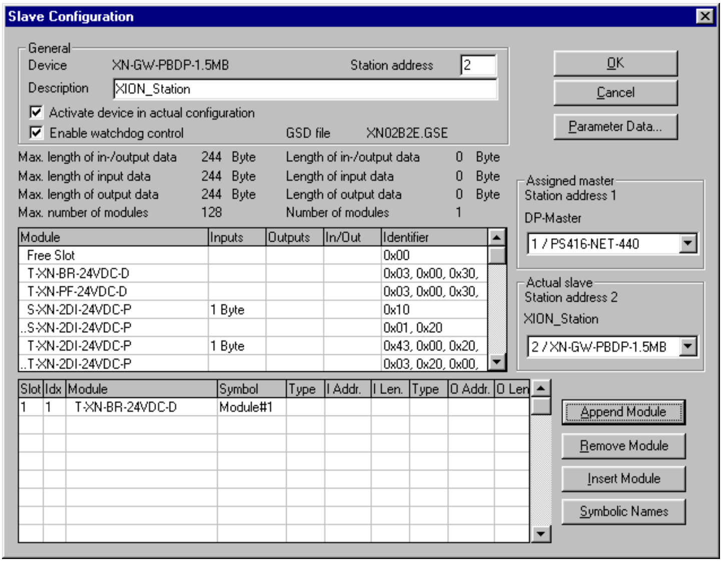


Figure 346: Inserting the Bus Refreshing module

▶ Repeat the last step for the modules designated

T-XN-2DI-24VDC-P	in slot 2
T-XN-2DO-24VDC-0.5A-P	in slot 3
T-XN-1AI-U(-10/0...+10VDC)	in slot 4
T-XN-1AO-I(0/4...20MA)	in slot 5

→ Ensure that you only use module descriptions according to type for this example.

▶ The dialog box should appear as below, once you have inserted all the modules into the list:

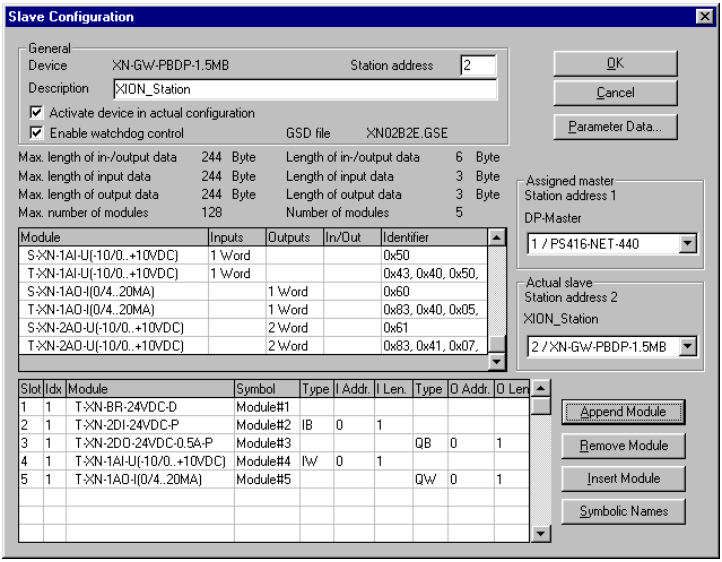


Figure 347: XI/ON module insertion complete

▶ To set the parameters of your analog modules, click the "Parameter Data" button, then click the "Module" button in the "Parameter Data" dialog box.

▶ The "Select Module" dialog box opens, in which all XI/ON modules whose parameters can be set are listed. Select the analog input module with the designation **T-XN-1AI-U(-10/ 0...+10VDC)**, and click "OK" to confirm.

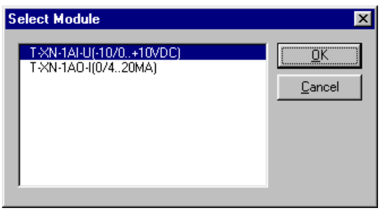


Figure 348: Setting configurable I/O modules

- ▶ Set the measurement range to "0..10V" and click "OK" to confirm.
- ▶ Repeat the last two steps for the analog output module with the designation **T-XN-1AO-I(0/4...20MA)**. Set the measurement range to "4 to 20mA" and click "OK" to confirm.
- ▶ Save your project.

You have now completed configuring your XI/ON station.

Loading the Configuration Data into the Moeller PS416 PLC

Proceed as follows to load your configuration data into the PROFIBUS-DP master card **PS416-Net-440**:

- ▶ Connect your PC to the CPU CDP-400 using the data cable **PS416-ZBK-210** (available as an accessory).
- ▶ Start the "Sucosoft S40" software.
- ▶ Configure your PLC PS416. Load the configuration data into the CPU-400.

→ Please observe the operating instructions for the software and the CPU CDP-400 when configuring and loading data.

Commissioning the Station

Connect the PROFIBUS-DP master card PS416-Net-440 to your XI/ON station using a standard PROFIBUS-DP cable (see chapter 2).

Attention!
Mount an active terminating resistor to both ends of the PROFIBUS-DP cable because the PROFIBUS-DP structure in our example consists of two stations.

Proceed as follows:

▶ Disconnect the XI/ON gateway from the system’s power supply.

▶ Open the hinged lid on the gateway. Set the hexadecimal rotary coding-switches to the following settings:

Switch H	to 0
Switch L	to 2

This sets the PROFIBUS-DP address of your XI/ON gateway to the same station address set by you in the configuration software.

▶ Close the hinged lid on the gateway.

▶ Plug a PROFIBUS-DP connector (male) with an active terminating resistor into the left-hand SUB-D socket of the XI/ON gateway and screw it tight.

▶ Plug the other PROFIBUS-DP connector into the PROFIBUS-DP master card and screw it tight.

▶ Reconnect the XI/ON station to the system’s power supply.

The connection between the XI/ON station and the PLC is established. The corresponding LEDs on the gateway and master card should light-up green.

Diagnostic Examples

Connection between the Master Card and the XI/ON Station

Carry out the following steps to ensure that the diagnostic messages of the configuration software “CFG-DP” are displayed:

▶ Connect the PROFIBUS-DP master card **PS416-Net-440** to your PC using the data cable **PS416-ZBK-210**.

▶ Switch to the still open project “XION_Test” in the configuration software “CFG-DP”.

▶ Establish the connection between the PC and the PROFIBUS-DP master card **PS416-Net-440** using the ‹Online → Start Debug Mode› command.

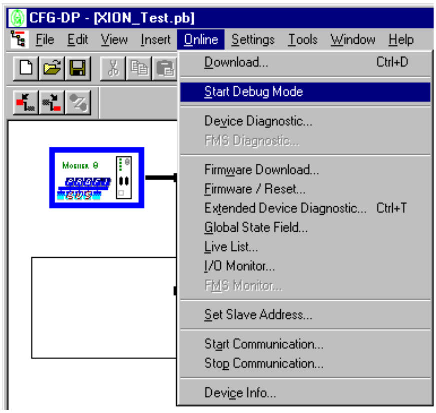


Figure 349: Starting the online connection between the PLC and XI/ON

▶ In the “Device Assignment” dialog box , click the “Check COM” button for the interface on your PC to which the data cable **PS416-ZBK-210** is connected. This checks the interface. If you have chosen the correct interface, the text “PB-COMBI-NET-440” is displayed in the “Firmware” column. Select the entry “1 / PS416-NET-440” from the corresponding “Com” box on left-hand side of the screen. Click “OK” to confirm.

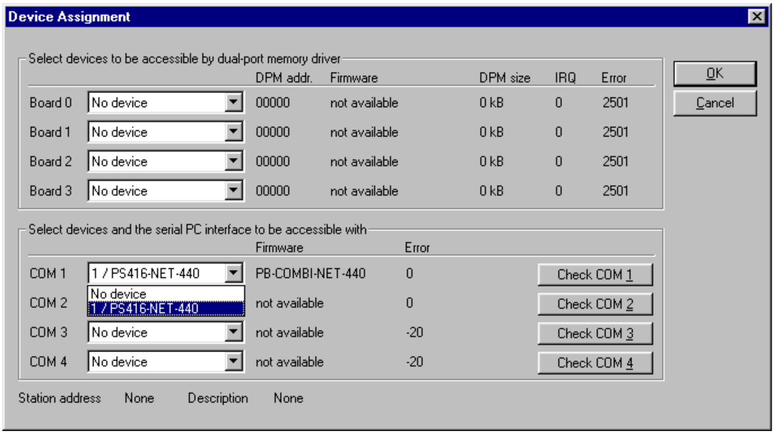


Figure 350: Setting the com interface

If the communication between the master card and the XI/ON station is functioning correctly, the bus connection line lights up green. In the case of an error, it lights up red.

▶ The message “Diag”, which is displayed next to the XI/ON station icon, can be deleted by double-clicking the XI/ON station. Click “OK” to confirm.

Diagnostic Displays

The following statuses are simulated as diagnostic messages in the configuration software “CFG-DP”:

- The pulling of an output module
- The field power supply is interrupted at the Bus Refreshing module
- An incorrect output module is plugged

These are just a few examples. If you wish to simulate further diagnostic messages, you can, for example, provoke short-circuits, pull various modules, disconnect the XI/ON’s system power supply and more.

The respective XI/ON station diagnostic messages are displayed in the following screenshots. The meaning of the individual values can be found in the Section “Connection to a Moeller PS416 PLC“, chapter 3. The meaning of the XI/ON gateway and module LEDs offered in these examples can be found in Section “Status Indicators/Diagnostic Messages Gateway“, chapter 2, as well as in chapter 4.

Proceed as follows to create the diagnostic messages mentioned above:

Pulling an output module

▶ Pull the digital output module. The configuration software displays the word “Diag” next to the XI/ON station icon in the structure overview.

▶ Double-click the XI/ON station icon to open the dialog box, in which the station status is displayed.

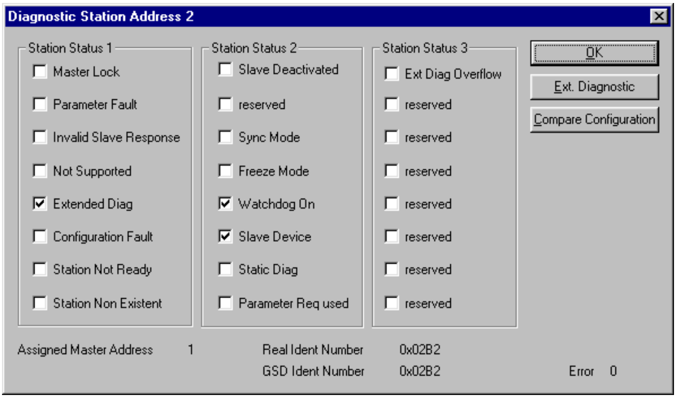


Figure 351: Station status showing extended diagnostics

▶ Click the “Ext. Diagnostic” button to open a further dialog box in which the individual diagnostic bytes are displayed.

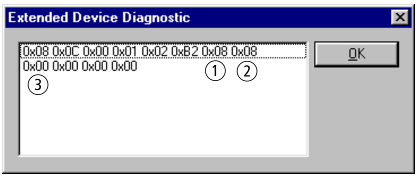


Figure 352: Diagnostic bits when electronics module pulled

1. Gateway; diagnostic byte 1
2. Gateway; diagnostic byte 2
3. Gateway; diagnostic byte 3

The “DIA” LED on the gateway flashes red with 1 Hz. Additionally the “IOs” LED on the gateway flash alternately red/green with1 Hz.

▶ Replug the output module. The gateway LEDs return to their normal status.

▶ Close both dialog boxes in the configuration software by clicking “OK”.

▶ The diagnostic message “Diag” can be deleted from the configuration software by double-clicking the XI/ON station icon and then closing the window by clicking “OK”.

Interrupting the power supply to the field

▶ Interrupt the field power supply by disconnecting the cable at connection "13" of the Bus Refreshing module. The configuration software displays the word "Diag" next to the XI/ON station icon in the structure overview.

▶ Double-click the XI/ON station icon, then the "Ext. Diagnostic" button.

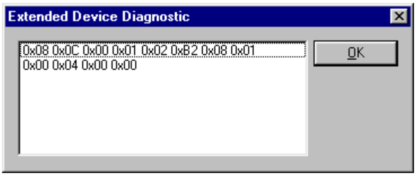


Figure 353: Diagnostic bits when field supply is interrupted

① Gateway; diagnostic byte 1

② Gateway; diagnostic byte 2

③ Gateway; diagnostic byte 3

④ Bus Refreshing module; diagnostic bit 2

The gateway LED "DIA" flashes red with 1 Hz. In addition, the "DIA" LED on the Bus Refreshing module flashes with 0.5 Hz.

▶ Reconnect the Bus Refreshing module to the field power supply. The LEDs on the gateway and Bus Refreshing module return to their normal status.

▶ Click "OK" to close both dialog boxes.

▶ The diagnostic message "Diag" can be deleted from the configuration software by double-clicking the XI/ON station icon and then closing the window by clicking "OK".

Plugging a false input module

Pull the digital output module **XN-2DO-24VDC-0.5A-P**. The configuration software displays the word "Diag" next to the XI/ON station icon in the structure overview.

▶ Plug a different digital output module (for example, XN-2DO-24VDC-2A-P).

▶ Double-click the XI/ON station icon, then click the "Ext. Diagnostic" button.

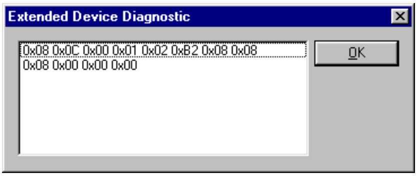


Figure 354: Diagnostis bits when an incorrect electronics module is plugged

① Gateway; diagnostic byte 1

② Gateway; diagnostic byte 2

③ Gateway; diagnostic byte 3

▶ The “DIA” LED on the gateay flashes red with 1 Hz. In addition, the “IOs” LED on the gateway flash red with 1 Hz.

▶ Replug the digital output module **XN-2DO-24VDC-0.5A-P**. The gateway LEDs return to their normal status.

▶ Close both dialog boxes by clicking “OK”.

▶ The diagnostic message “Diag” can be deleted from the configuration software by double-clicking the XI/ON station and renewed closing the window by clicking “OK”.

All three diagnostic messages have been simulated.

Appendix

Glossary

Acknowledge	Acknowledgment of a signal received.
Active metal component	Conductor or conducting component that is electrically live during operation.
Address	Identification number of, e.g. a memory position, a system or a module within a network.
Addressing	Allocation or setting of an address, e. g. for a module in a network.
Analog	Infinitely variable value, e. g. voltage. The value of an analog signal can take on any value, within certain limits.
Automation device	A device connected to a technical process with inputs and outputs for control. Programmable logic controllers (PLC) are a special group of automation devices.
Baud	Baud is a measure for the transmission speed of data. 1 Baud corresponds to the transmission of one bit per second (Bit/s).
Baud rate	Unit of measurement for measuring data transmission speeds in Bit/s.
Bidirectional	Working in both directions.
Bonding strap	Flexible conductor, normally braided, that joins inactive components, e. g. the door of a switchgear cabinet to the cabinet main body.
Bus	Bus system for data exchange, e. g. between CPU, memory and I/O levels. A bus can consist of several parallel cables for data transmission, addressing, control and power supply.
Bus cycle time	Time required for a master to serve all slaves or stations in a bus system, i. e. reading inputs and writing outputs.
Bus line	Smallest unit connected to a bus, consisting of a PLC, a coupling element for modules on the bus and a module.
Bus system	All units which communicate with one another via a bus.
Capacitive coupling	Electrical capacitive couplings occur between cables with different potentials. Typical sources of interference are, for example, parallel-routed signal cables, contactors and electrostatic discharges.

Check-back interface	The check-back interface is the interface from the counter module to the XI/ON's internal module bus. The bits and bytes are converted by the XI/ON gateway from the respective type of communication applicable to the fieldbus in to the module-specific bits and bytes.
Coding elements	Two-piece element for the unambiguous assignment of electronics and base modules.
Configuration	Systematic arrangement of the I/O modules of a station.
Control interface	The control interface is the interface from the XI/ON's internal module bus to the counter module. The commands and signals directed to the counter module are converted by the XI/ON gateway from the respective type of communication applicable to the fieldbus in to the module-specific bits and bytes.
CPU	Central Processing Unit. Central unit for electronic data processing, the processing core of the PC.
Digital	A value (e. g. a voltage) which can adopt only certain statuses within a finite set, mostly defined as 0 and 1.
DIN	German acronym for German Industrial Standard.
EIA	Electronic Industries Association – association of electrical companies in the United States.
Electrical components	All objects that produce, convert, transmit, distribute or utilize electrical power (e. g. conductors, cable, machines, control devices).
EMC	Electromagnetic compatibility – the ability of an electrical part to operate in a specific environment without fault and without exerting a negative influence on its environment.
EN	German acronym for European Standard.
ESD	Electrostatic Discharge.
Field power supply	Voltage supply for devices in the field as well as the signal voltage.
Fieldbus	Data network on sensor/actuator level. A fieldbus connects the equipment on the field level. Characteristics of a fieldbus are a high transmission security and real-time behavior.
Force Mode	Software mode which enables the user to set his plant to a required state by forcing certain variables on the input and output modules.
GND	Abbreviation of ground (potential „0“).

Ground	Expression used in electrical engineering to describe an area whose electrical potential is equal to zero at any given point. In neutral grounding devices, the potential is not necessarily zero, and one speaks of the ground reference.
Ground connection	One or more components that have a good and direct contact to earth.
Ground reference	Potential of ground in a neutral grounding device. Unlike earth whose potential is always zero, it may have a potential other than zero.
GSD	German acronym for Electronic Device Data Sheet which contains standardized PROFIBUS DP station descriptions. They simplify the planning of the DP master and slaves.
Hexadecimal	System of representing numbers in base 16 with the digits 0 ... 9, and further with the letters A, B, C, D, E and F.
HW gate	A hardware release, which is controlled via the digital input on the module. This release is configured as a function of the digital input. It is set by change of edge from 0-1 at the input, and reset by a change change of edge 1-0. The hardware release is called “HW gate” in the controller and parameters.
Hysteresis	A sensor can get caught up at a certain point, and then “waver“ at this position. This condition results in the counter content fluctuating around a given value. Should a reference value be within this fluctuating range, then the relevant output would be turned on and off in rhythm with the fluctuating signal.
I/O	Input/output.
Impedance	Total effective resistance that a component or circuit has for an alternating current at a specific frequency.
Inactive metal components	Conductive components that cannot be touched and are electrically isolated from active metal components by insulation, but can adopt voltage in the event of a fault.
Inductive coupling	Magnetic inductive couplings occur between two cables through which an electrical current is flowing. The magnetic effect caused by the electrical currents induces an interference voltage. Typical sources of interference are for example, transformers, motors, parallel-routed network and HF signal cables.

Intelligent modules	Intelligent modules are modules with an internal memory, able to transmit certain commands (e. g. substitute values and others).
Laod value	Predefined value for the counter module with which the count process begins.
Latch-retrigger function	This function saves the current internal counter content of the electronics module at the digital input when there is a change of status, and the count procedure is “retriggered“. That means, the current internal counter content is saved at the point in time the change of status occurs. The counter is subsequently reloaded with the load value and then continues to count.
Lightning protection	All measures taken to protect a system from damage due to overvoltages caused by lightning strike.
Low impedance connection	Connection with a low AC impedance.
LSB	Least Significant Bit
Mass	All interconnected inactive components that do not take on a dangerous touch potential in the case of a fault.
Master	Station in a bus system that controls the communication between the other stations.
Master/slave mode	Mode of operation in which a station acting as a master controls the communication between other stations in a bus system.
Module bus	The module bus is the internal bus in a XI/ON station. The XI/ON modules communicate with the gateway via the module bus which is independent of the fieldbus.
MSB	Most Significant Bit
Multi-master mode	Operating mode in which all stations in a system communicate with equal rights via the bus.
Namur	German acronym for an association concerned with standardizing measurement and control engineering. Namur initiators are special versions of the two-wire initiators. Namur initiators are characterized by their high immunity to interference and operating reliability, due to their special construction (low internal resistance, few components and compact design).
Overhead	System administration time required by the system for each transmission cycle.
PLC	Programmable Logic Controller.

Potential compensation	The alignment of electrical levels of electrical components and external conductive components by means of an electrical connection.
Potential free	Galvanic isolation of the reference potentials in I/O modules of the control and load circuits.
Potential linked	Electrical connection of the reference potentials in I/O modules of the control and load circuits.
PROFIBUS-DP	PROFIBUS bus system with DP protocol. DP stands for decentralized periphery. PROFIBUS-DP is based on DIN 19245 Parts 1 + 3 and has been integrated into the European fieldbus standard EN 50170. It ensures a fast cyclic data exchange between the central DP master and the decentralized periphery devices (slaves). Its universal use is realized by the multi master concept.
PROFIBUS-DP address	Each PROFIBUS-DP module is assigned an explicit PROFIBUS-DP address, with which it can be queried by the master.
PROFIBUS-DP master	The PROFIBUS-DP master is the central station on the bus and controls access of all stations to PROFIBUS.
PROFIBUS-DP slave	PROFIBUS-DP slaves are queried by the PROFIBUS-DP master and exchange data with the master on request.
Protective earth	Electrical conductor for protection against dangerous shock currents. Generally represented by PE (protective earth).
Radiation coupling	A radiation coupling appears when an electromagnetic wave hits a conductive structure. Voltages and currents are induced by the collision. Typical sources of interference are for example, sparking gaps (spark plugs, commutators from electric motors) and transmitters (e. g. radio), that are operated near to conducting structures.
Reaction time	The time required in a bus system between a reading operation being sent and the receipt of an answer. It is the time required by an input module to change a signal at its input until the signal is sent to the bus system.
Reference potential	Potential from which all voltages of connected circuits are viewed and/or measured.
Repeater	Amplifier for signals transmitted via a bus.
Root-connecting	Creating a new potential group using a power distribution module. This allows sensors and loads to be supplied individually.

RS 485	Serial interface in accordance with EIA standards, for fast data transmission via multiple transmitters.
Serial	Type of information transmission, by which data is transmitted bit by bit via a cable.
Setting parameters	Setting parameters of individual stations on the bus and their modules in the configuration software of the master.
Shield	Conductive screen of cables, enclosures and cabinets.
Shielding	Description of all measures and devices used to join installation components to the shield.
Short-circuit proof	Characteristic of electrical components. A short-circuit proof part withstands thermal and dynamic loads which can occur at its place of installation due to a short circuit.
Station	A functional unit or I/O components consisting of a number of elements.
SUB-D connector	9-pin connector for connecting the fieldbus to the I/O-stations.
SW gate	A software release, which has to be controlled via the control bit SW_GATE. The software release can only be set by means of a change of edge (from 0-1) of the control bit SW_GATE. Resetting of this bit resets the software release. The software release is called “SW gate“ in the controller.
Terminating resistance	Resistor on both ends of a bus cable used to prevent interfering signal reflections and which provides bus cable matching. Terminating resistors must always be the last component at the end of a bus segment.
To ground	Connection of a conductive component with the grounding connection via a grounding installation.
Topology	Geometrical structure of a network or the circuitry arrangement.
UART	Universal Asynchronous Receiver/Transmitter. UART is a logic circuit which is used to convert an asynchronous serial data sequence to a parallel bit sequence or vice versa.
Unidirectional	Working in one direction.

Acronyms

Table 73: Module abbreviations

Abbr.	Designation	Example
ABPL	End plate for right-sided termination of a XI/ON station	XN-**ABPL**
AI	Analog input module	XN-1**AI**-U(-10/0...+10VDC)
AO	Analog output module	XN-1**AO**-I(0/4...20MA)
B	designation for base module in block design	XN-**B**3S-SBB
B	Bridge connector: bridged connections on the same connection level in a base module, for applying potentials	XN-S3T-S**BB**
B	Added to designation of base modules for those Bus Refreshing modules used within a XI/ON station but do not supply the gateway with power.	XN-P4T-SBBC-**B**
BR	Bus Refreshing module	XN-**BR**-24VDC-D
C	Designation of a connection level with cross-connection to a C-rail and can, among other things, be used as a PE (only possible with certain base modules).	XN-S4T-SBB**C**
CJ	Base module for XN-2AI-THERMO-PI with integrated PT1000 for cold junction compensation	XN-S4T-SBBS-**CJ**
CNT	Counter	XN-1**CNT**-24VDC
CO	Change over	XN-2DO-R-**CO**
D	Diagnostics	XN-BR-24VDC-**D**
DI	Digital input module	XN-2**DI**-24VDC-P
DO	Digital output module	XN-2**DO**-24VDC-2A-P
GW	Gateway	XN-**GW**-PBDP-1.5MB
KLBU	Terminal clip, shielded connection for analog input modules	XN-**KLBU**/T
KO	Coding element for coding electronics and base module	XN-**KO**/2
MB	Transmission rate MBit/s	XN-GW-PBDP-1.5**MB**
N	Negative switching	XN-2DI-24VDC-**N**
NC	Normally closed	XN-2DO-R-**NC**
NI	Potential isolation of analog modules for thermocouples	XN-2AI-PT/**NI**-2/3
NO	Normally open	XN-2DO-R-**NO**

Abbr.	Designation	Example
P	Positive switching	XN-2DI-24VDC-**P**
P	Designation of the base module for Power Feeding and Bus Refreshing modules	XN-**P**3T-SBB
PBDP	XI/ON-Gateway for PROFIBUS-DP	XN-GW-**PBDP**-1.5MB
PF	Power Feeding modules	XN-**PF**-24VDC-D
PI	Analog input module for connecting thermocouples with cold junction compensation	XN-2AI-THERMO-**PI**
PT	Analog input module for connecting resistance thermometers with sensors PT100, PT200, PT500 and PT1000 in 2- or 3-wire measurement type	XN-2AI-**PT**/NI-2/3
QV	Jumper for relay modules	XN-**QV**/1
R	Relay module	XN-2DO-**R**-NC
S	Designation for base module in slice design	XN-**S**3T-SBB
S	Designation for base modules with screw connection	XN-S3**S**-SBB
S	Designation for gateway with screw connection	XN-GW-PBDB-1.5MB-**S**
S	Single connector: non-bridged connections on the same connection level in a base module, used for connecting the signal	XN-S3T-**S**BB
T	Designation for base modules with tension clamp connection	XN-S3**T**-SBB
x	Partly for "S" or "T" in the designations of base modules with screw or tension clamp connection	XN-S3**x**-SBB

Ordering Information

Gateways

Designation	Type
PROFIBUS-DP	
with tension clamp connection	
XI/ON Gateway PROFIBUS-DP 1.5 MBit/s	XN-GW-PBDP-1.5MB
XI/ON Gateway PROFIBUS-DP 12 MBit/s	XN-GW-PBDP-12MB
with screw connection	
XI/ON Gateway PROFIBUS-DP 1.5 MBit/s	XN-GW-PBDP-1.5MB-S

→ 1 end plate (XN-ABPL) and 2 end brackets (XN-WEW-35/2-SW) are included in the range of supply of XI/ON gateways.

XI/ON Modules: Tension Clamp

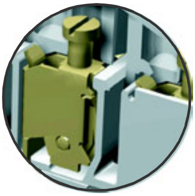
Base modules	XN-S3T-SBB	XN-S3T-SBC	XN-S4T-SBBC	XN-S4T-SBBS	XN-S4T-SBCS	XN-S4T-SBBS-CJ	XN-S6T-SBBSBB	XN-B3T-SBB	XN-B3T-SBC	XN-B4T-SBBC	XN-P3T-SBB	XN-P3T-SBB-B	XN-P4T-SBBC	XN-P4T-SBBC-B
Electronics modules														
Digital input														
XN-2DI-24VDC-P	●		●											
XN-2DI-24VDC-N	●		●											
XN-2DI-120/230VAC-P	●		●											
XN-4DI-24VDC-P							●							
XN-4DI-24VDC-N							●							
XN-16DI-24VDC-P								●		●				
Analog input														
XN-1AI-I(0/4...20MA)	●			●										
XN-1AI-U(-10/0...+10VDC)	●			●										
XN-2AI-PT/NI-2/3	●			●										
XN-2AI-THERMO-PI						●								
Digital output														
XN-2DO-24VDC-2A-P		●			●									
XN-2DO-24VDC-0.5A-P		●			●									
XN-2DO-24VDC-0.5A-N		●			●									
XN-16DO-24VDC-0.5A-P									●					
Analog output														
XN-1AO-I(0/4...20MA)	●													
XN-2AO-U(-10/0...+10VDC)	●													

Electronics modules / **Base modules**	XN-S3T-SBB	XN-S3T-SBC	XN-S4T-SBBC	XN-S4T-SBBS	XN-S4T-SBCS	XN-S4T-SBBS-CJ	XN-S6T-SBBSBB	XN-B3T-SBB	XN-B3T-SBC	XN-B4T-SBBC	XN-P3T-SBB	XN-P3T-SBB-B	XN-P4T-SBBC	XN-P4T-SBBC-B
Relay modules														
XN-2DO-R-NC				●	●									
XN-2DO-R-NO				●	●									
XN-2DO-R-CO				●										
Technology modules														
XN-1CNT-24VDC				○										
Power distribution														
XN-BR-24VDC-D											● 1)	● 2)	● 1)	● 2)
XN-PF-24VDC-D											●		●	
XN-PF-120/230VAC-D											●		●	

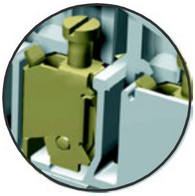
1) Base modules for gateway supply

2) Base modules for bus refreshing within the station

XI/ON Modules: Screw Connection



Electronics modules / **Base modules**	XN-S3T-SBB	XN-S3T-SBC	XN-S4T-SBBC	XN-S4T-SBBS	XN-S4T-SBCS	XN-S4T-SBBS-CJ	XN-S6T-SBBSBB	XN-B3T-SBB	XN-B3T-SBC	XN-B4T-SBBC	XN-P3T-SBB	XN-P3T-SBB-B	XN-P4T-SBBC	XN-P4T-SBBC-B
Digital input														
XN-2DI-24VDC-P	●		●											
XN-2DI-24VDC-N	●		●											
XN-2DI-120/230VAC-P	●		●											
XN-4DI-24VDC-P							●							
XN-4DI-24VDC-N							●							
XN-16DI-24VDC-P								●		●				
Analog input														
XN-1AI-I(0/4...20MA)	●			●										
XN-1AI-U(-10/0...+10VDC)	●			●										
XN-2AI-PT/NI-2/3	●			●										
XN-2AI-THERMO-PI						●								
Digital output														
XN-2DO-24VDC-2A-P		●			●									
XN-2DO-24VDC-0.5A-P		●			●									
XN-2DO-24VDC-0.5A-N		●			●									
XN-16DO-24VDC-0.5A-P									●					
Analog output														
XN-1AO-I(0/4...20MA)	●													
XN-2AO-U(-10/0...+10VDC)	●													



Electronics modules / Relay modules	XN-S3T-SBB	XN-S3T-SBC	XN-S4T-SBBC	XN-S4T-SBBS	XN-S4T-SBCS	XN-S4T-SBBS-CJ	XN-S6T-SBBSBB	XN-B3T-SBB	XN-B3T-SBC	XN-B4T-SBBC	XN-P3T-SBB	XN-P3T-SBB-B	XN-P4T-SBBC	XN-P4T-SBBC-B
XN-2DO-R-NC				●	●									
XN-2DO-R-NO				●	●									
XN-2DO-R-CO				●										
Technology modules														
XN-1CNT-24VDC				●										
Power distribution														
XN-BR-24VDC-D											● 1)	● 2)	● 1)	● 2)
XN-PF-24VDC-D											●		●	
XN-PF-120/230VAC-D											●		●	

1) Base modules for gateway supply

2) Base modules for bus refreshing within the station

XI/ON Accessories

Designation		Type
Labels for labeling electronics modules		
DIN A5 sheets, slice, perforated (laser printer) 10 x 57 labels		XN-LABEL/SCHEIBE
DIN A5 sheets, block, perforated (laser printer) 10 x 6 labels		XN-LABEL/BLOCK
Markers for labeling base modules		
Color markers for clear identification of the connection level on the base module (strip of 8):		
	Blue	XN-ANBZ-BL
	Red	XN-ANBZ-RT
	Green	XN-ANBZ-GN
	Black	XN-ANBZ-SW
	Brown	XN-ANBZ-BR
	Red / blue	XN-ANBZ-RT/BL-BED
	Green / yellow	XN-ANBZ-GN/GE-BED
	White	XN-ANBZ-WS
Dekafix connector markers, labeled 1-50		FW5/1-50
Dekafix connector markers, labeled 51-100		FW5/51-100
Dekafix connector markers, labeled 101-150		FW5/101-150
Dekafix connector markers, labeled 151-200		FW5/151-200
Jumpers for relays (QVR)		
for bridging the 4th connection level (14/24) of base modules for relays		
1 grid		XN-QV/1
2 grid		XN-QV/2
3 grid		XN-QV/3
4 grid		XN-QV/4
5 grid		XN-QV/5
6 grid		XN-QV/6
7 grid		XN-QV/7
8 grid		XN-QV/8

Designation		Type
Coding for electronics and base modules		
for coding slots of electronics and base modules		
Electronics module, type	XN-*DI-24VDC	XN-KO/2
Electronics module, type	XN-*DO-24VDC	XN-KO/6
Electronics module, type	XN-2DO-R-NO	XN-KO/8
Electronics module, type	XN-2DO-R-NC	XN-KO/9
Electronics module, type	XN-2DO-R-CO	XN-KO/10
Electronics module, type	XN-AI-I(0/4...20MA)	XN-KO/11
Electronics module, type	XN-AI-U(-10/0...+10V)	XN-KO/12
Electronics module for temperature measurement		
Electronics module, type	XN-*AO-I(0/4...20MA)	XN-KO/13
Electronics module, type	XN-*AO-U(-10/0...+10V)	XN-KO/14
Electronics module, type	power distribution modules 24 V DC	XN-KO/16
Electronics module, type	XN-PF-120/230VAC-D	XN-KO/17
Software and accessories		
I/O*assistant* CD-ROM		SW-I/OASSISTANT
I/O*assistant* package incl. CD-ROM and connection cable		SW-I/OASSISTANT-PACKAGE
Connection cable, service station to XI/ON gateway; 2.5 m		XN-PS2-CABLE
DIAmon package (incl. CD-ROM and adapter cable)		SW-DIAMON-DP-WIN95-NT-KIT
DIAmon CD-ROM		CD-SW-DIAMON/DP-WIN95-NT
Adapter cable for DIAmon		DP-DIAMON-ADAPTER
Mechanical accessories		
End plate (mechanical termination of the XI/ON station on the right-hand side)		XN-ABPL
End bracket, black (mechanical fixing of the XI/ON station)		XN-WEW-35/2-SW
Electrical accessories		
Shield connection for direct wiring of XI/ON gateway		SCH-1-WINBLOC
Shield connection for analog signals		
	tension clamp	XN-KLBU/T
	screw connection	XN-KLBU/S
Ferrite ring for damping high-frequency interference signals to data and supply lines		PS416-ZBX-405
Switched-mode power supply unit 24 V DC		
	nominal current 2.5 A	SN4-025-B17
	nominal current 5 A	SN4-050-B17

Designation		Type
Documentation		
XI/ON Manual PROFIBUS-DP	German	AWB2700-1394D
	English	AWB2700-1394GB
XI/ON Ergänzungshandbuch	German	AWB2700-1404D
	English	AWB2700-1404GB
Main catalogue, Automation Systems	German	HPL0213-2001D
	English	HPL0213-2001GB
Catalogue supplement XI/ON	German	NK2725-1042D
	English	NK2725-1042GB
Tools		
Screwdriver for wire connection according to DIN 5264-A		SCREW-DRIVER/ZF
Screwdriver for address setting according to DIN 60900		SCREW-DRIVER/ADR.
Tension clamp operating tool		XN-ZBW2
PROFIBUS-DP accessories		
Moeller PROFIBUS-DP plug		ZB4-209-DS2
Moeller PROFIBUS-DP data cable; twisted; without plug; 2-wire, 2×0.64 mm^2; length: 100 m		ZB4-900-KB1
PROFIBUS-DP Repeater for PROFIBUS-DP to max. 1.5 MBit/s		PB-EG4-REPEATER
PROFIBUS LWL Converter (for converting of PROFIBUS-RS485 interfaces in optical PROFIBUS interfaces and vice-versa)		DP-OZD-PROFI-P3
	for redundant network configurationen	DP-OZD-PROFI-P4

Nominal current consumption and power loss

Table 74: Nominal current consumption of the XI/ON modules from supply terminal I_{EL}

Modules	Power supply	Nominal current consumption
Gateway		–
XN-BR-24VDC-D	10 A	
XN-PF-24VDC-D	10 A	
XN-PF-120/230VAC-D	10 A	
XN-2DI-24VDC-P		≦ 20 mA
XN-2DI-24VDC-N		≦ 20 mA
XN-2DI-120/230VAC		≦ 20 mA
XN-4DI-24VDC-P		≦ 40 mA
XN-4DI-24VDC-N		≦ 40 mA
XN-16DI-24VDC-P		≦ 40 mA
XN-1AI-I(0/4..20MA)		≦ 50 mA
XN-1AI-U(-10/0..+10VDC)		≦ 50 mA
XN-2AI-PT/NI-2/3		< 30 mA
XN-2AI-THERMO-PI		< 30 mA
XN-2DO-24VDC-0.5A-P		20 mA (when load current = 0)
XN-2DO-24VDC-0.5A-N		20 mA (when load current = 0)
XN-2DO-24VDC-2A-P		< 50 mA (when load current = 0)
XN-16DO-24VDC-0.5A-P		< 30 mA
XN-1AO-I(0/4..20MA)		≦ 50 mA
XN-2AO-U(-10/0..+10VDC)		≦ 50 mA
XN-2DO-R-NC		< 20 mA
XN-2DO-R-NO		< 20 mA
XN-2DO-R-CO		< 20 mA
XN-1CNT-24VDC		< 50 mA (when load current = 0)

Table 75: Nominal current of the XI/ON modules on the module bus

Modules	Power supply	Nominal current consumption
Gateway		≦ 430 mA
XN-BR-24VDC-D	1500 mA	
XN-PF-24VDC-D		≦ 28 mA
XN-PF-120/230VAC-D		≦ 25 mA
XN-2DI-24VDC-P		≦ 28 mA
XN-2DI-24VDC-N		≦ 28 mA
XN-2DI-120/230VAC		≦ 28 mA
XN-4DI-24VDC-P		≦ 29 mA
XN-4DI-24VDC-N		≦ 28 mA
XN-16DI-24VDC-P		≦ 45 mA
XN-1AI-I(0/4...20MA)		≦ 41 mA
XN-1AI-U(-10/0...+10VDC)		≦ 41 mA
XN-2AI-PT/NI-2/3		≦ 45 mA
XN-2AI-THERMO-PI		≦ 45 mA
XN-2DO-24VDC-0.5A-P		≦ 32 mA
XN-2DO-24VDC-0.5A-N		≦ 32 mA
XN-2DO-24VDC-2A-P		≦ 33 mA
XN-16DO-24VDC-0.5A-P		≦ 45 mA
XN-1AO-I(0/4...20MA)		≦ 39 mA
XN-2AO-U(-10/0...+10VDC)		≦ 43 mA
XN-2DO-R-NC		≦ 28 mA
XN-2DO-R-NO		≦ 28 mA
XN-2DO-R-CO		≦ 28 mA
XN-1CNT-24VDC		≦ 40 mA

Table 76: Power loss of the XI/ON modules

Modules	Power loss (typical)
Gateway	–
XN-BR-24VDC-D	–
XN-PF-24VDC-D	–
XN-PF-120/230VAC-D	–
XN-2DI-24VDC-P	0.7 W
XN-2DI-24VDC-N	0.7 W
XN-2DI-120/230VAC	< 1 W
XN-4DI-24VDC-P	< 1 W
XN-4DI-24VDC-N	< 1 W
XN-16DI-24VDC-P	< 2.5 W
XN-1AI-I(0/4..20MA)	< 1 W
XN-1AI-U(-10/0..+10VDC)	< 1 W
XN-2AI-PT/NI-2/3	< 1 W
XN-2AI-THERMO-PI	1 W
XN-2DO-24VDC-0.5A-P	1 W
XN-2DO-24VDC-0.5A-N	1 W
XN-2DO-24VDC-2A-P	1 W
XN-16DO-24VDC-0.5A-P	< 4 W
XN-1AO-I(0/4..20MA)	< 1 W
XN-2AO-U(-10/0..+10VDC)	< 1 W
XN-2DO-R-NC	1 W
XN-2DO-R-NO	1 W
XN-2DO-R-CO	1 W
XN-1CNT-24VDC	1.3 W

Conversion Table Decimal to Hexadecimal

Decimal	Hexadecimal	Decimal	Hexadecimal	Decimal	Hexadecimal	Decimal	Hexadecimal	Decimal	Hexadecimal
001	01	026	1A	051	33	076	4C	101	65
002	02	027	1B	052	34	077	4D	102	66
003	03	028	1C	053	35	078	4E	103	67
004	04	029	1D	054	36	079	4F	104	68
005	05	030	1E	055	37	080	50	105	69
006	06	031	1F	056	38	081	51	106	6A
007	07	032	20	057	39	082	52	107	6B
008	08	033	21	058	3A	083	53	108	6C
009	09	034	22	059	3B	084	54	109	6D
010	0A	035	23	060	3C	085	55	110	6E
011	0B	036	24	061	3D	086	56	111	6F
012	0C	037	25	062	3E	087	57	112	70
013	0D	038	26	063	3F	088	58	113	71
014	0E	039	27	064	40	089	59	114	72
015	0F	040	28	065	41	090	5A	115	73
016	10	041	29	066	42	091	5B	116	74
017	11	042	2A	067	43	092	5C	117	75
018	12	043	2B	068	44	093	5D	118	76
019	13	044	2C	069	45	094	5E	119	77
020	14	045	2D	070	46	095	5F	120	78
021	15	046	2E	071	47	096	60	121	79
022	16	047	2F	072	48	097	61	122	7A
023	17	048	30	073	49	098	62	123	7B
024	18	049	31	074	4A	099	63	124	7C
025	19	050	32	075	4B	100	64	125	7D

Parameter Gateway – Assignment in Hexadecimal Format

Parameter 4

Parameter in hexadecimal format	Outputs module exchange				Outputs module exchange error				Outputs fieldbus error		
	Output 0[1)]	Output substitute value	Hold current value	Exchange process data	Output 0[1)]	Output substitute value	Hold current value	Exchange process data	Output 0[1)]	Output substitute value	Hold current 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		
0A			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	

Parameter in hexadecimal format	Outputs module exchange				Outputs module exchange error				Outputs fieldbus error		
	Output 0[1)]	Output substitute value	Hold current value	Exchange process data	Output 0[1)]	Output substitute value	Hold current value	Exchange process data	Output 0[1)]	Output substitute value	Hold current value
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	
1A			X				X			X	
1B				X			X			X	
1C	X							X		X	
1D		X						X		X	
1E			X					X		X	
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

Parameter in hexadecimal format	Outputs module exchange				Outputs module exchange error				Outputs fieldbus error		
	Output 0 1)	Output substitute value	Hold current value	Exchange process data	Output 0 1)	Output substitute value	Hold current value	Exchange process data	Output 0 1)	Output substitute value	Hold current value
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.

Parameter 5

Parameter in hexadecimal format	Integer Data format		Diagnostics all Modules		Station Configuration		I/O*assistant* Force Mode	
	LSB first[1)]	MSB first	Activate[1)]	Deactivate[1)]	Do not allow changes[1)]	Allow changes	Release[1)]	Lock
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	
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

Parameter in hexadecimal format	Integer Data format		Diagnostics all Modules		Station Configuration		I/O*assistant* Force Mode	
	LSB first[1)]	MSB first	Activate[1)]	Deactivate[1)]	Do not allow changes[1)]	Allow changes	Release[1)]	Lock
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.

Translation Parameter and Diagnostic Texts

Description of the gateway parameters

The texts in the column “German“ correspond to those determined in the GSD files (Electronic Device Data Sheets), which are described in this manual. In addition, these texts are identical to those in the configuration software of the DP master. The column “English“ contains the corresponding English translation.

Table 77: Parameter translation

German		English	
Ausgaenge Feldbusfehler	0 ausgeben	Outputs fieldbus error	Output 0
	Ersatzwert ausgeben		Output substitute value
	Momentanwert halten		Hold current value
Ausgaenge Modulwechsel	0 ausgeben	Outputs module exchange	Output 0
	Ersatzwert ausgeben		Output substitute value
	Momentanwert halten		Hold current value
	Prozessdaten austauschen		Exchange process data
Ausgaenge Modulwechsel-Fehler:	0 ausgeben	Outputs module exchange error:	Output 0
	Ersatzwert ausgeben		Output substitute value
	Momentanwert halten		Hold current value
	Prozessdaten austauschen		Exchange process data
Diagnose	freigeben sperren	Diagnostic	release block
Diagnose DO1	ein aus	Diagnostic DO1	on off
Diagnose KX	freigeben sperren	Diagnostic KX	release block
Diagnosen aller Module	aktivieren	Diagnostics from modules	Activate
	deaktivieren		Deactivate
Digitaleingang DI	normal invertiert	Digital input DI	normal inverted

German		English	
Element KX	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 Widerstand, 0..100Ω Widerstand, 0..200Ω Widerstand, 0..400Ω Widerstand, 0..1000Ω	Element KX	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..100Ω Resistance, 0..200Ω Resistance, 0..400Ω Resistance, 0..1000Ω
Element KX	Typ K, -270..1370°C Typ B, +100...1820°C Typ E, -270..1000°C Typ J, -210..1200°C Typ N, -270..1300°C Typ R, -50..1760°C Typ S, -50..1540°C Typ T, -270..400°C +/-50mV +/-100mV +/-500mV +/-1000mV	Element Kx	Typ K, -270..1370°C Typ B, +100...1820°C Typ E, -270..1000°C Typ J, -210..1200°C Typ N, -270..1300°C Typ R, -50..1760°C Typ S, -50..1540°C Typ T, -270..400°C +/-50mV +/-100mV +/-500mV +/-1000mV
Ersatzwert A1	The substitute value allocated to the module will be transmitted if the parameter "Ersatzwert ausgeben" has been set on the gateway.	Substitute value A1	The substitute value allocated to the module will be transmitted if the parameter "Output substitute value" has been set on the gateway.
Ersatzwert A2	The substitute value allocated to channel 2 will be transmitted if the parameter "Ersatzwert ausgeben" has been set on the gateway.	Substitute value A2	The substitute value allocated to channel 2 will be transmitted if the parameter "Output substitute value" has been set on the gateway.

German		English	
Ersatzwert DO1	0 1	Substitute value DO1	0 1
Funktion DI	Eingang HW-Tor Latch-Retrigger bei pos. Flanke Synchronisation bei pos. Flanke	Function DI	Input HW gate Latch-retrigger when edge pos. Synchronization when edge pos.
Funktion DI	Eingang HW-Tor	Function DI	Input HW gate
Funktion DOX	Ausgang ein bei Zaehlwert >= Vergl.-Wert ein bei Zaehlwert <= Vergl.-Wert Impuls bei Zaehlwert = Vergl.-Wt	Function DOX	Output On when count value >= reference value On when count value <= reference value Pulse when count value = reference value
Funktion DO1	Ausgang ausserhalb der Grenzen unterhalb der Untergrenze oberhalb der Obergrenze	Function DO1	Output outside of limit below lower limit above upper limit
Geber-/Eing.-Filter (X)	2.5µs (200kHz) 25µs (20kHz)	Sensor/input filter (X)	2.5µs (200kHz) 25µs (20kHz)
Geberimpulse pro Umdrehung	1 to 65535 (SINT)	Sensor pulse per revolution	1 to 65535 (SINT)
Hauptzaehlrichtung	keine vorwaerts rueckwaerts	Main count direction	None Up Down
Hysterese	0 to 255 (UINT)	Hysteresis	0 to 255 (UINT)
I/O*assistant*-ForceMode	freigeben	I/O*assistant*-ForceMode:	Release
Impulsdauer DO1, DO2 [n*2ms]	0 to 255 (UINT)	Pulse duration DO1, DO2 [n*2ms]	0 to 255 (UINT)
Integer-Datenformat	LSB zuerst	Integer data format:	LSB first
	MSB zuerst		MSB first

German		English	
Integrationszeit [n*10 ms] oder Anzahl der Perioden	Frequenzmessung 1 to 1000 Drehzahlmessung 1 to 1000 Periodendauermessung 1 to 1000	Integration time [n*10 ms] or Number of periods	Frequency measurement 1 to 1000 Rotational speed measurement 1 to 1000 Period duration measurement 1 to 1000
Kanal KX	aktivieren deaktivieren	Channel KX	activate deactivate
Messbetriebsart	Frequenzmessung Drehzahlmessung Periodendauermessung	Measurement mode	Frequency measurement Revolutions measurement Period duration measurement
Messbetriebsart KX	2-Leiter 3-Leiter	Measurement mode KX	2-wire 3-wire
Netzunter-drueckung KX	50Hz 60Hz	Mains suppression KX	50Hz 60Hz
Obere Zaehlgrenze Obere Zaehlgrenze (HWORD) Obere Zaehlgrenze (LWORD)	0 to 7FFF FFFF (hex) 0 to 32767 (SINT) 0 to 65535 (SINT)	Upper count limit Upper count limit (HWORD) Upper count limit (LWORD)	0 to 7FFF FFFF (hex) 0 to 32767 (SINT) 0 to 65535 (SINT)
Obergrenze		Upper limit	
Obergrenze (HWORD)		Upper limit (HWORD)	
Obergrenze (LWORD)		Upper limit (LWORD)	
Obergrenze Obergrenze (HWORD) Obergrenze (LWORD)	Frequency measurement: 1 to f_{max} Rotational speed measurement: 1 to n_{max} Period duration measurement: 1 to t_{max} 0 to 255 (SINT) 0 to 65535 (SINT)	Upper limit Upper limit (HWORD) Upper limit (LWORD)	Frequency measurement: 1 to f_{max} Rotational speed measurement: 1 to n_{max} Period duration measurement: 1 to t_{max} 0 to 255 (SINT) 0 to 65535 (SINT)

German		English	
Obergrenze Obergrenze (HWORD) Obergrenze (LWORD)	1 to $f_{max}/n_{max}/t_{max}$ 0 to 255 (SINT) 0 to 65535 (SINT)	Upper count limit Upper limit (HWORD) Upper limit (LWORD)	1 to $f_{max}/n_{max}/t_{max}$ 0 to 255 (SINT) 0 to 65535 (SINT)
reserviert		Reserved	
Richtungseingang (B)	normal invertiert	Direction input (B)	normal inverted
Sammeldiagnose	freigegeben sperren	Group diagnostics	Released Block
Sensor (A)	normal invertiert	Sensor (A)	normal inverted
Signalauswertung (A, B)	Impuls und Richtung Drehgeber einfach Drehgeber zweifach Drehgeber vierfach	Signal evaluation (A, B)	Pulse and direction Rotary sensor: single Rotary sensor: double Rotary sensor: fourfold
Spannungs-Modus (Kanal X)	0...10V -10...+10V	Voltage mode (channel X)	0...10V -10...+10V
Stationskonfiguration	Abweichungen nicht zulassen	Station configuration:	Do not allow changes
	Abweichungen adaptieren		Allow changes
	sperren		Lock
Strom-Modus	0...20mA 4...20mA	Current mode	0...20mA 4...20mA
Synchronisation	einmalig periodisch	Synchronisation	single-action periodical
Torfunktion	Zaehlvorgang abbrechen Zaehlvorgang unterbrechen	Gate function	abort count procedure interrupt count procedure
Untere Zaehlgrenze Untere Zaehlgrenze (HWORD) Untere Zaehlgrenze (LWORD)	8000 0000 to 0 (hex) -32768 to 0 (SINT) -32768 to 32767 (SINT)	Lower count limit Lower count limit (HWORD) Lower count limit (HWORD)	8000 0000 to 0 (hex) -32768 to 0 (SINT) -32768 to 32767 (SINT)

German		English	
Untergrenze		Lower limit	
Untergrenze (HWORD)		Lower limit (HWORD)	
Untergrenze (LWORD)		Lower limit (LWORD)	
Verhalten CPU/Master STOP	DO1 abschalten Betriebsart weiterarbeiten DO1 Ersatzwert schalten DO1 letzten Wert halten	Behavior CPU/ master STOP	Turn off DO1 Proceed with operating mode DO1 switch to substitute value DO1 hold last value
Werte-Darstellung (Kanal X)	Integer (15Bit + Vorzeichen) 12Bit (linksbuendig)	Value representation (channel X)	Integer (15Bit + sign) 12Bit (left-justified)
Zaehlbetriebsart	endlos zaehlen einmalig zaehlen periodisch zaehlen	Counter mode	Continuous count Single-action count Periodical count

Description of the gateway diagnostic bits

Table 78: Diagnostic translation

German	English
Abweichende Konfiguration	Station configuration changed
Betriebsart falsch	Operating mode wrong
Drahtbruch	Open circuit
Feldspannung fehlt	Undervoltage field supply
Geberimpulse falsch	Sensor pulse wrong
Hauptzaehlrichtung falsch	Main count direction wrong
I/Oassistant-Force Mode aktiv	I/Oassistant-Force Mode active
Integrationszeit falsch	Integration time wrong
Kurzschluss Geberversorgung ERR-24VDC	Short-circuit in sensor power supply ERR-24VDC
Kurzschluss (nur bei Temperaturmessbereichen)	Short-circuit (in temperature measurement ranges only)
Kurzschluss/ Drahtbruch ERR_DO	Short-circuit / open circuit ERR_DO
Master-Konfigurationsfehler	Master configuration error
Messwert-Bereichsfehler	Measurement value range error
Modulbus-Spannungs-Warnung	Supply voltage system
Modulbusausfall	Module-bus failure
Modulbusfehler	Module bus error
Modul-Diagnose liegt vor	Module diagnostics available
Obergrenze falsch	Upper limit wrong
Parametrierung unvollstaendig	Parameterization incomplete
Pegel des Digitaleingangs invertieren ist bei der Latch-Retrigger-Funktion nicht zulaessig	It is not permitted to invert the level of the digital input when using the latch-retrigger function
Stations-Konfigurationsfehler	Station configuration error
Ueberstrom (Kurzschluss Kanal X)	Overcurrent (short-circuit channel X)
Untergrenze falsch	Lower limit wrong
Zaehlbereichsanfang falsch	Start of counter range wrong
Zaehlbereichsende falsch	End of counter range wrong

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