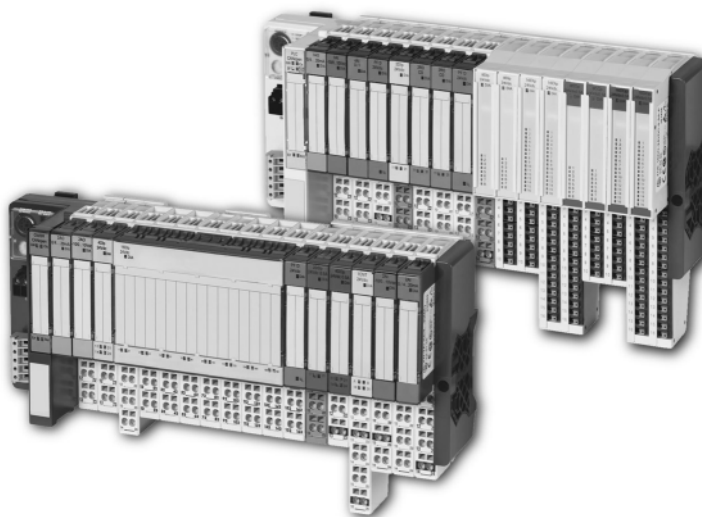


Digital I/O-Modules Supply Modules



EAT•N

Powering Business Worldwide

Imprint

Manufacturer

Eaton Automation AG
Spinnereistrasse 8-14
CH-9008 St. Gallen
Switzerland

www.eaton-automation.com

www.eaton.com

Support

Region North America

Eaton Corporation
Electrical Sector
1111 Superior Ave.
Cleveland, OH 44114
United States
877-ETN-CARE (877-386-2273)

www.eaton.com

Other regions

Please contact your supplier or send
an E-Mail to:

automation@eaton.com

Original manual

The German version of this document is the original manual.

Translations of the original manual

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

Editorial department

Monika Jahn

Brand and product names

All brand and product names are trademarks or registered trademarks of the owner concerned.

Copyright

© Eaton Automation AG, CH-9008 St. Gallen

All rights reserved, also for the translation.

None of this document may be reproduced or processed, duplicated or distributed by electronic systems in any form (print, photocopy, microfilm or any other process) without the written permission of Eaton Automation AG, St. Gallen.

Subject to modifications.

**Warning!**

Dangerous electrical voltage!

Before commencing the installation

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

Safety regulations

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

Table of contents

Table of contents	5
About this manual	11
Reading conventions	11
1 The XI/ON Station	13
Dimensions	13
Technical data for the XI/ON station	20
Technical data for the terminals	24
Designations of the base modules	25
Module designations and abbreviations	27
Wiring of the XI/ON modules	28
– Wiring of tension clamp connections	29
– Wiring of screw connections	30
– Handling the push-in tension clamp terminals of the XNE ECO modules	31
2 The supply modules	33
Bus refreshing modules	33
XN-BR-24VDC-D	35
– Technical data	36
– Diagnostic messages	37
– Base modules	39
– Connection diagrams	41
Power feeding modules	42
XN-PF-24VDC-D	43
– Technical data	44
– Diagnostic messages	45
– Base modules	46
– Connection diagrams	47
XN-PF-120/230VAC-D	48
– Technical data	49
– Diagnostic messages	50
– Base modules	52
– Connection diagrams	53

- Overview: base modules for supply modules 54
 - Tension clamp connection 54
 - Screw connection 54
- Supply modules in a sample station 55
- Internal connections in an XI/ON station 56

- 3 Digital input modules 57**
 - General 57
 - XN-2DI-24VDC-P 59
 - Technical data 60
 - Diagnostic messages 61
 - Base modules 62
 - Connection diagrams 63
 - XN-2DI-24VDC-N 64
 - Technical data 65
 - Diagnostic messages 66
 - Base modules 67
 - Connection diagrams 68
 - XN-2DI-120/230VAC 69
 - Technical data 70
 - Diagnostic messages 71
 - Connection diagrams 73
 - XN-4DI-24VDC-P 74
 - Technical data 75
 - Diagnostic messages 76
 - Base modules 77
 - Connection diagrams 78
 - XN-4DI-24VDC-N 79
 - Technical data 80
 - Diagnostic messages 81
 - Base modules 82
 - Connection diagrams 83
 - XN-16DI-24VDC-P 84
 - Technical data 85
 - Diagnostic messages 86
 - Base modules 87
 - Connection diagrams 88
 - XN-32DI-24VDC-P 89
 - Technical data 90
 - Diagnostic messages 91

– Base modules	92
– Connection diagram	93
XNE-8DI-24VDC-P	94
– Technical data	95
– Diagnostic messages	96
– Connection diagram	97
XNE-16DI-24VDC-P	98
– Technical data	99
– Diagnostics messages	100
– Connection diagram	101
Overview: base modules for digital input modules	103
– Tension clamp connection	103
– Screw connection	103
4 Digital output modules	105
General	105
XN-2DO-24VDC-0.5A-P	107
– Technical data	108
– Diagnostic messages	110
– Base modules	111
– Connection diagrams	112
XN-2DO-24VDC-0.5A-N	113
– Technical data	114
– Diagnostic messages	116
– Base modules	117
– Connection diagrams	118
XN-2DO-24VDC-2A-P	119
– Technical data	120
– Diagnostic messages	122
– Base modules	123
– Connection diagrams	124
XN-2DO-120/230VAC-0.5A	125
– Technical data	126
– Diagnostics messages	128
– Base modules	129
– Connection diagrams	130
XN-4DO-24VDC-0.5A-P	131
– Technical data	132
– Diagnostic messages	134
– Base modules	135

- Connection diagrams 136
- XN-16DO-24VDC-0.5A-P 137
- Technical data 138
- Diagnostic messages 140
- Base modules 142
- Connection diagram 142
- XN-32DO-24VDC-0.5A-P 143
- Technical data 144
- Diagnostic messages 146
- Base modules 148
- Connection diagram 149
- XNE-8DO-24VDC-0.5A-P 150
- Technical data 151
- Diagnostic messages 153
- Connection diagram 154
- XNE-16DO-24VDC-0.5A-P 155
- Technical data 156
- Diagnostics messages 158
- Connection diagram 159
- Overview: base modules for digital output modules 160
- Tension clamp connection 160
- Screw connection 160

- 5 Relay modules 161**
- General 161
- XN-2DO-R-NC 163
- Technical data 165
- Diagnostic messages 167
- Base modules 168
- Connection diagrams 169
- XN-2DO-R-NO 172
- Technical data 174
- Diagnostic messages 176
- Base modules 177
- Connection diagrams 178
- XN-2DO-R-CO 181
- Technical data 182
- Diagnostic messages 184
- Base modules 185
- Connection diagrams 186

	Overview: base modules for relay modules	187
	– Tension clamp connection	187
	– Screw connection	187
6	Integration in PROFIBUS-DP	189
	Process input data / process output data	189
	– Examples for allocation of the process data bits to the terminals	190
	Diagnostics	192
	Parameters	194
7	Integration in CANopen	195
	Process input data/process output data	195
	Objects for reading the process input data	196
	– Overview	196
	– 6000hex Read Input 8 Bit	197
	– 6020hex Read Input Bit (1...128)	198
	– 6021hex Read Input Bit (129...256)	198
	– 6022hex Read Input Bit (257...288)	198
	– 6100hex Read Input 16 Bit	199
	– 6120hex Read Input 32 Bit	200
	Objects for writing the process output data	201
	– Overview	201
	– 6200hex Write Output 8 Bit	202
	– 6220hex Write Output Bit (1...128)	203
	– 6221hex Write Output Bit (129...256)	203
	– 6222hex Write Output Bit (257...288)	203
	– 6300hex Write Output 16 Bit	204
	– 6320hex Write Output 32 Bit	205
	Objects for the substitute output value in the event of an error	206
	– Overview	206
	– 6206hex Error Mode Output 8 Bit	208
	– 6207hex Error State Output 8 Bit	209
	– 6250hex Error Mode Output Bit (1...128)	210
	– 6251hex Error Mode Output Bit (129...256)	210
	– 6252hex Error Mode Output Bit (257...288)	210
	– 6260hex Error State Output Bit (1...128)	212
	– 6261hex Error State Output Bit (129...256)	212

Table of contents

- 6262hex Error State Output Bit (257...288) 212
- 6306hex Error Mode Output 16 Bit 214
- 6307hex Error State Output 16 Bit. 215
- 6326hex Error Mode Output 32 Bit 216
- 6327hex Error State Output 32 Bit. 217
- Emergencies. 218

- 8 Integration in DeviceNet 219**
 - Digital Input Module Class (VSC104) 219
 - Digital Output Module Class (VSC105) 224

- Appendix 229**
 - Definitions 229
 - Protected outputs according to IEC/EN 61131-2) . 229
 - Short-circuit proof outputs (according to IEC/EN 61131-2). 230

- Index 231**

About this manual

Reading conventions

Symbols used in this manual have the following meanings:



Attention!

Warns of minor damage to property.



Caution!

Warns of major damage to property, and minor injuries.



Warning!

Warns of major damage to property, and death or major injuries.



Draws your attention to interesting tips and supplementary information

About this manual

Reading conventions

1 The XI/ON Station

Dimensions

Dimensions of gateways, , end plate and end bracket

Table 1: Dimensions of gateways, , end plate and end bracket

Electronics module	W x L x H [mm]
XN standard gateway (XN-GW...)	50.6 x 114.75 x 74.4
XNE ECO gateway (XNE-GWBR...)	33.5 x 129 x 75
End plate (XN-ABPL)	9.2 x 114.4 x 48.4
End bracket (XN-WEW-35/2-SW)	8 x 56 x 47

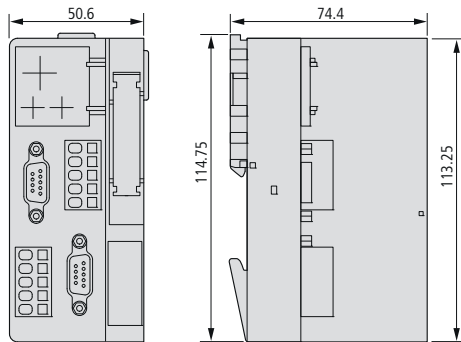


Figure 1: XN standard gateway (XN-GW...)

1 The XI/ON Station Dimensions

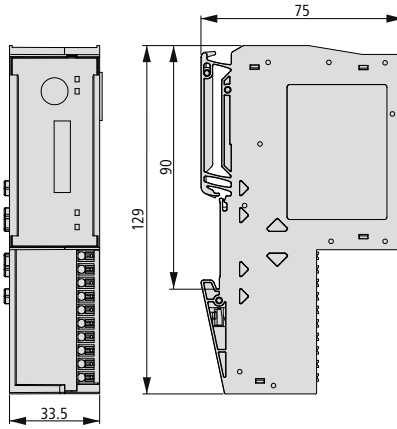


Figure 2: XNE ECO gateway (XNE-GWBR-...)

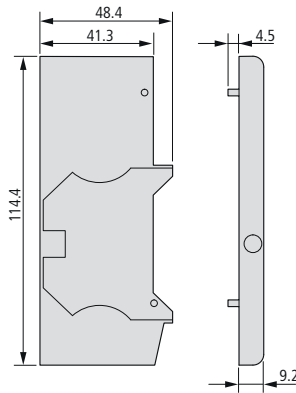


Figure 3: End plate (XN-ABPL)

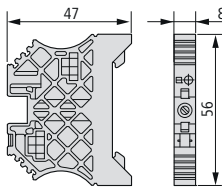


Figure 4: End bracket (XN-WEW-35/2-SW)

Dimensions of base and electronics modules

Table 2: Dimensions of electronics modules

Electronics module	W x L x H [mm]
XN standard electronics module:	
Slice design	12.6 x 74.1 x 55.4
Block design (XN-16..., XN-32...)	100.8 x 74.1 x 55.4
XNE ECO electronics module:	
XNE-8DI-24VDC-P XNE-8DO-24VDC-0.5A-P XNE-1SWIRE	13 x 129.5 x 74.5
XNE-16DI-24VDC-P XNE-16DO-24VDC-0.5A-P XNE-8AI-U/I-4PT/NI XNE-4AO-U/I XNE-2CNT-2PWM	13 x 161.5 x 74.5

Table 3: Dimensions of base modules

Base module	W x L x H [mm]
Slice design with:	
3 connection levels (XN-S3..., XN-P3...)	12.6 x 117.6 x 49.9
4 connection levels (XN-S4..., XN-P4...)	12.6 x 128.9 x 49.9
6 connection levels (XN-S6...)	12.6 x 154.5 x 49.9
Block design with:	
3 connection levels (XN-B3...)	100.8 x 117.6 x 49.9
4 connection levels (XN-B4...)	100.8 x 128.9 x 49.9
6 connection levels (XN-B6...)	100.8 x 154.5 x 49.9

1 The XI/ON Station

Dimensions

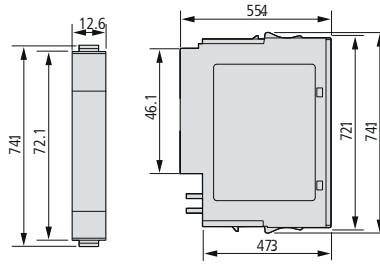


Figure 5: XN standard electronics module in slice design

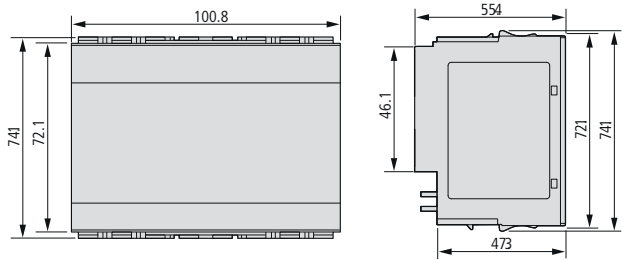


Figure 6: XN standard electronics module in block design

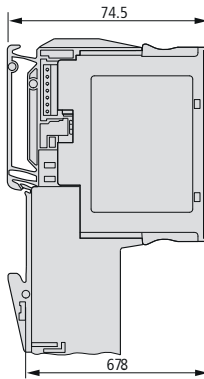


Figure 7: XN standard electronics module completed with a base module

1 The XI/ON Station Dimensions

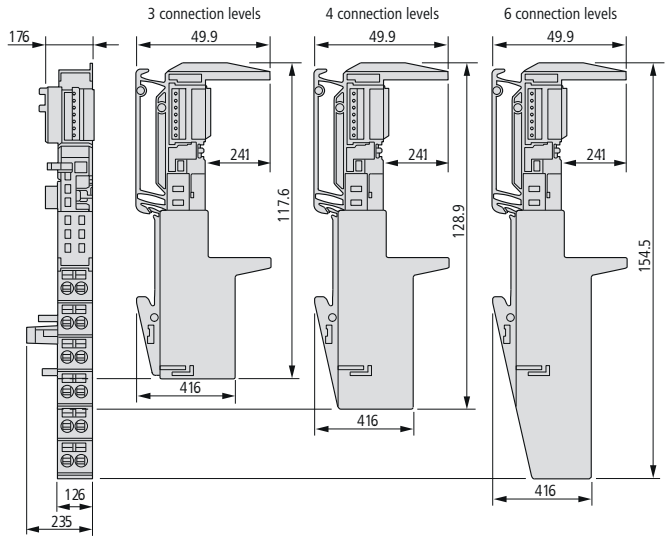


Figure 8: Base module in slice design with tension clamp connection (XN-SxT..., XN-PxT...)

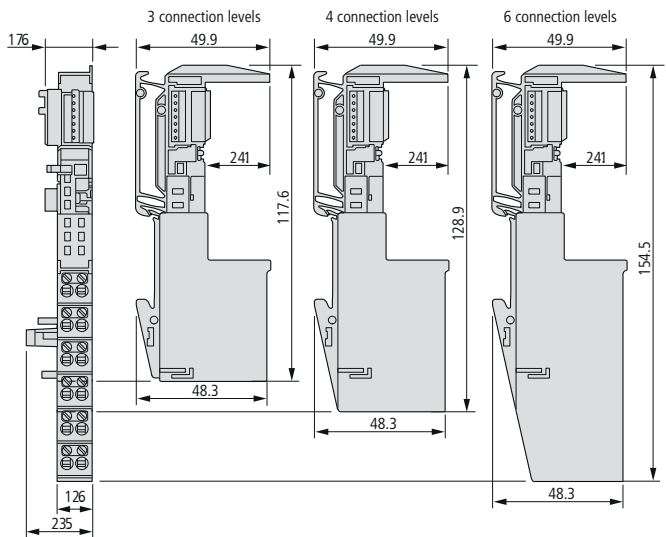


Figure 9: Base module in slice design with screw connection (XN-SxS..., XN-PxS...)

1 The XI/ON Station

Dimensions

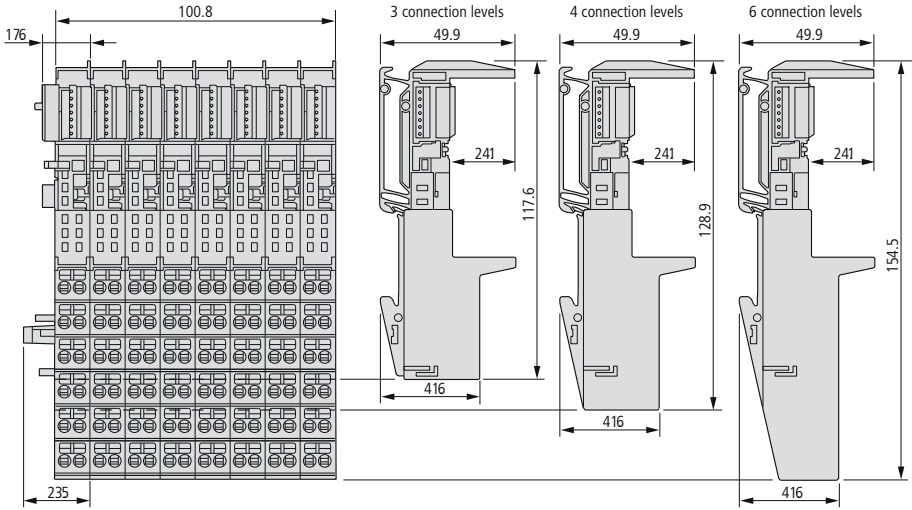


Figure 10: Base module in block design with tension clamp connection (XN-BxT...)

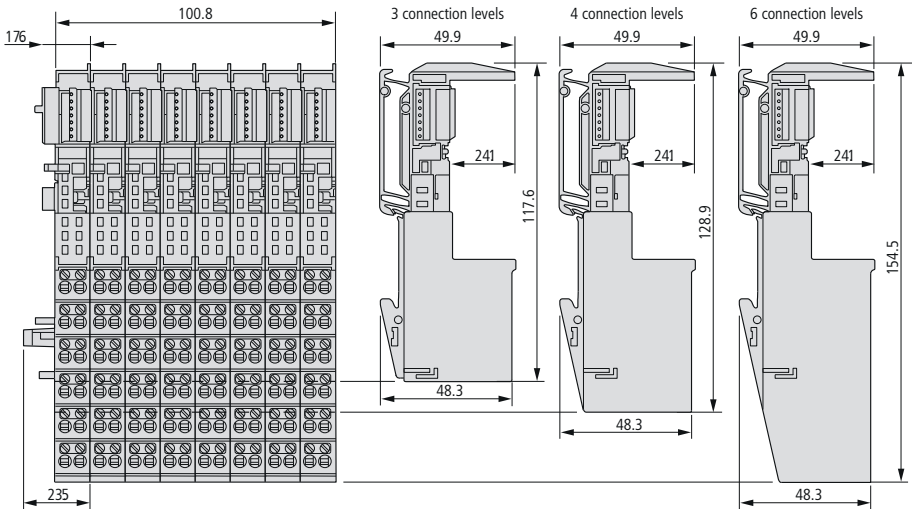


Figure 11: Base module in block design with screw connection (XN-BxS...)

I The XI/ON Station Dimensions

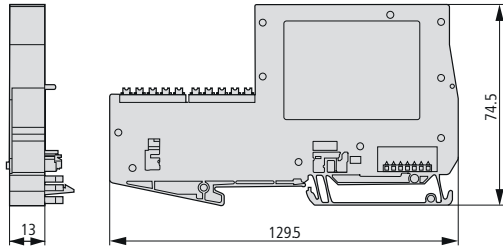


Figure 12: XNE ECO electronics module:
- XNE-8DI-24VDC-P
- XNE-8DO-24VDC-0.5A-P
- XNE-1SWIRE

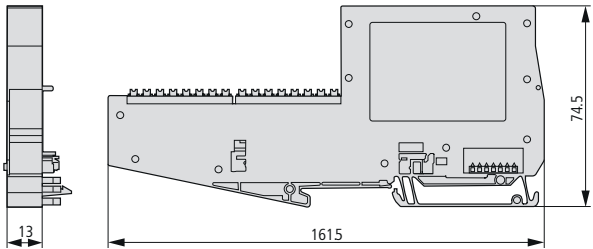


Figure 13: XNE ECO electronics module:
- XNE-16DI-24VDC-P
- XNE-16DO-24VDC-0.5A-P
- XNE-8AI-U/I-4PT/NI
- XNE-4AO-U/I
- XNE-2CNT-2PWM

1 The XI/ON Station

Technical data for the XI/ON station

Technical data for the XI/ON station



Attention!

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

Table 4: Technical data for the XI/ON station

Designation	Value
Supply voltage/auxiliary supply	
Nominal value (provided for other modules)	24 V DC
Residual ripple	according to IEC/EN 61131-2
Electrical isolation (U_L to U_{SYS} / U_L to field bus/ U_{SYS} to field bus)	Yes, via optocoupler
Environment/temperature	
Operating temperature, mounted horizontally	0...+55 °C
Operating temperature, mounted vertically	0...+55 °C
Storage temperature	-25...+85 °C
Relative humidity according to IEC/EN 60068-2-30	5...95 % (indoor), Level RH-2, no condensation (storage at 45 °C, no functional test)
Rating of XN standard enclosure ²⁾ for modules in slice design (max. possible power loss)	1.3 W
Rating of XN ECO enclosure ²⁾ for slice modules (max. possible power loss)	3 W
Rating of XN standard enclosure ²⁾ for block modules (max. possible power loss)	5 W
Corrosive gases	
SO ₂	10 ppm (rel. humidity < 75 %, no condensation)
H ₂ S	1.0 ppm (rel. humidity < 75 %, no condensation)

1 The XI/ON Station

Technical data for the XI/ON station

Designation	Value
Vibration resistance	
10...57 Hz, constant amplitude 0.075 mm, 1 g	yes
57...150 Hz, constant acceleration 1 g	yes
Vibration type	Variable frequency runs at a rate of change of 1 octave/min
Vibration duration	20 variable frequency runs per coordinate axis
Shock resistance according to IEC/EN 60068-2-27	18 shocks, half-sine 15 g peak value/11 ms, for both +/- directions per spatial coordinate
Repeated shock resistance according to IEC/EN 60068-2-29	1000 shocks, half sine 25 g peak value/6 ms, for both +/- directions per spatial coordinate
Drop and topple	
Fall height (weight < 10 kg)	1.0 m
Fall height (weight 10...40 kg)	0.5 m
Test runs	7
Instrument with packaging, electronics boards electrically tested	
Electromagnetic compatibility (EMC) according to IEC/EN 61000-6-2 (industrial)	
Static electricity according to IEC/EN 61000-4-2	
Air discharge (direct)	8 kV
Relay discharge (indirect)	4 kV
Electromagnetic HF fields according to IEC/EN 61000-4-3	10 V/m
Conducted interference, induced by HF fields according to IEC/EN 61000-4-6	10 V

1 The XI/ON Station

Technical data for the XI/ON station

Designation	Value
Fast transients (burst) according to IEC/EN 61000-4-4	1 kV / 2 kV
Radiated interference according to IEC/EN 61000-6-4 (industrial)	according to IEC/CISPR 11 / EN 55011, Class A ¹⁾

- 1) The use in residential areas may lead to functional errors. Additional suppression measures are necessary!
- 2) XNE ECO enclosures are one-piece enclosures. The module electronics and the connection level cannot be separated.
XN standard enclosures are two-piece enclosures. The module electronics are located in a separate enclosure and must be inserted into a suitable base module. The vast majority of the XN standard electronics modules can be combined with different base module types.

Table 5: Approvals and tests for a XI/ON station

Designation	Value
Approvals ¹⁾	CE, cULus
Tests (IEC/EN 61131-2)	
Cold	IEC/EN 60068-2-1
Dry heat	IEC/EN 60068-2-2
Damp heat, cyclical	IEC/EN 60068-2-30
Temperature changes	IEC/EN 60068-2-14
Operating life MTBF	120000 h ²⁾
Removal/insertion cycles for electronics modules	20
Pollution level according to IEC/EN 60664 (IEC/EN 61131-2)	2
Degree of protection according to IEC/EN 60529	IP 20

- 1) The approvals of newer XI/ON modules can still be pending
- 2) The operational life of the relay modules is not given in hours. The relevant factor for the operational life of relay modules is the number of switching operations (see technical data for the relay modules).

1 The XI/ON Station

Technical data for the terminals

Technical data for the terminals

Table 6: Technical data for the terminals

Designation	XN gateways, base modules	XNE gateways, XNE electronics modules
Protection class	IP20	IP20
Insulation stripping length	8.0...9.0 mm / 0.32...0.36 inch	8.0...9.0 mm / 0.32...0.36 inch
Max. wire range	0.5...2.5 mm ² / 0.0008...0.0039 inch ² / AWG 24...AWG 14	0.14...1.5 mm ² / 0.0002...0.0023 inch ² / AWG 24...AWG 16
Crimpable wire		
“e” solid core H 07V-U	0.5...2.5 mm ² / 0.0008...0.0039 inch ²	0.25...1.5 mm ² / 0.0004...0.0023 inch ²
“f” flexible core H 07V-K	0.5...1.5 mm ² / 0.0008...0.0023 inch ²	0.25...1.5 mm ² / 0.0004...0.0023 inch ²
“f” with ferrules without plastic collar according to DIN 46228-1 (ferrules crimped gas-tight)	0.5...1.5 mm ² / 0.0008...0.0023 inch ²	0.25...1.5 mm ² / 0.0004...0.0023 inch ²
“f” with ferrules with plastic collar according to DIN 46228-1 (ferrules crimped gas-tight)	0.5...1.5 mm ² / 0.0008...0.0023 inch ²	0.25...0.75 mm ² / 0.0004...0.0012 inch ²
Test finger according to IEC/EN 60947-1	A1	A1
Measurement data	according to VDE 0611 Part 1/8.92 / IEC/EN 60947-7-1	according to VDE 0611 Part 1/8.92 / IEC/EN 60947-7-1
Rated voltage	250 V	250 V
Rated current	17.5 A	17.5 A
Rated cross section	1.5 mm ²	1.5 mm ²
Rated surge voltage	4 kV	4 kV
Pollution degree	2	2
Connection method in TOP direction	Tension clamp or screw connection	Push-in tension clamp terminals

Designations of the base modules

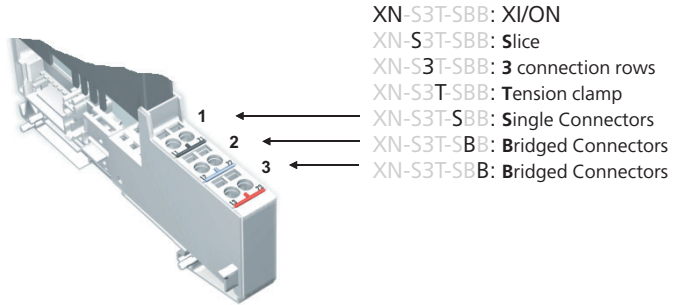


Figure 14: Example of a base module designation

Table 7: Abbreviations for base module designations

Identifier	Designation	Example
XN	Abbreviation for XI/ON	XN -B3S-SBB
B	Designation of base modules in block version (Block)	XN- B 3S-SBB
S	Designation of base modules in slice version (Slice)	XN- S 3T-SBB
P	Designation of base modules for feeding and bus refreshing modules (Power)	XN- P 3T-SBB
3, 4, 6	Number of terminal rows.	XN- P 3T-SBB
S	Designation of base modules with screw connection (Screw)	XN-S3 S -SBB
T	Designation of base modules with tension clamp connection (Tension Clamp)	XN-S3 T -SBB
x	Optionally S or T in the designation of base modules with screw or tension clamp connection (Screw/Tension)	XN-S3 x -SBB
S	Unlinked connections on the same connection level (connection level 1 in this case) in a base module, for connecting signals (Single Connector)	XN-S3T- S BB

1 The XI/ON Station

Designations of the base modules

Identifier	Designation	Example
B	Bridged connections on the same connection level in a base module, for voltage connections. (Bridged Connector)	XN-S3T-SBB
B	Supplement to the designation of base modules for bus refreshing modules that are used within an XI/ON station, but not for supplying the gateway. (Bus Refreshing)	XN-P4T-SBBC- B
C	Designation of a connection level that has a connection to a C-rail and can be used for a PE connection (only for specific base modules). (Cross Connection)	XN-S4T-SBBC
CJ	Base module for XN-2AI-THERMO-PI with integrated Pt1000 for cold junction compensation. (Cold Junction Compensation)	XN-S4T-SBBS- CJ

Module designations and abbreviations Table 8: Key to module designations

Identifier	Designation	Example
Analog input and output modules		
AI	Analog input module	XN-1 AI -U(-10/0...+10VDC)
AO	Analog output module	XN-1 AO -I(0/4...20MA)
PT	Analog input module for connecting resistance thermometers with PT100, PT200, PT500 and PT1000 sensors with 2- and 3-wire measuring	XN-2AI- PT /NI-2/3
NI	Analog input module for connecting resistance thermometers with Ni100 and Ni1000 sensors with 2- and 3-wire measuring	XN-2AI-PT/ NI -2/3
PI	Potentially isolated (analog modules for thermocouples)	XN-2AI-THERMO- PI
Supply modules		
BR	Bus refreshing module	XN- BR -24VDC-D
PF	Power feeding module	XN- PF -24VDC-D
D	Diagnostics	XN-BR-24VDC- D
Digital input and output modules		
DI	Digital input module	XN-2 DI -24VDC-P
DO	Digital output module	XN-2 DO -24VDC-2A-P
N	Negative switching (sourcing)	XN-2DI-24VDC- N
P	Positive switching	XN-2DI-24VDC- P
Relay modules		
R	Relay module	XN-2DO- R -NC
CO	Change over	XN-2DO-R- CO
NC	Normally closed	XN-2DO-R- NC
NO	Normally open	XN-2DO-R- NO

1 The XI/ON Station

Wiring of the XI/ON modules

Wiring of the XI/ON modules

The used method when wiring the XI/ON modules depends on the used connection engineering:

- The base modules use spring-finger contacts in the following versions:
 - Base modules using tension clamp connection technology (XN-...**T**-...)
 - Base modules using screw connection technology (XN-...**S**-...)
- The XNE ECO modules use direct push-in contacts:
 - Push-in tension clamp terminals



The XNE ECO modules can be easily combined with the base modules using tension clamp connection technology (XN-...**T**-...). A connection is **not** possible on base modules using screw connection technology (XN-...**S**-...).

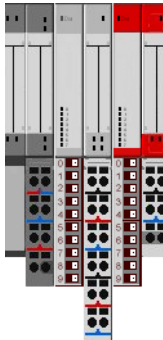


Figure 15: XNE ECO modules combined with tension clamp contact modules

Wiring of tension clamp connections

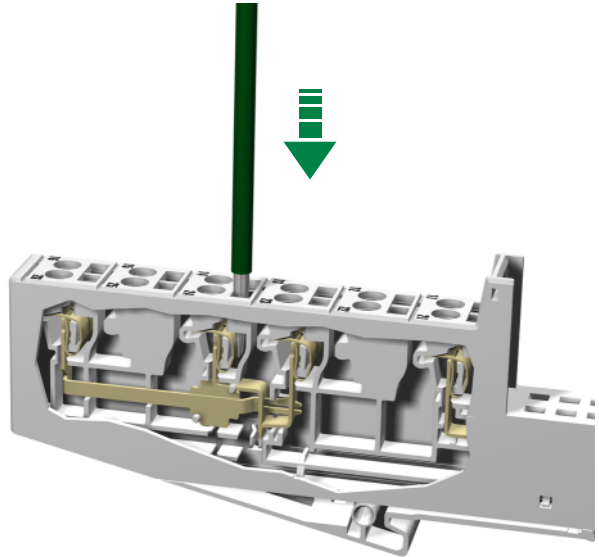


Figure 16: Tension clamp connections

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 connections

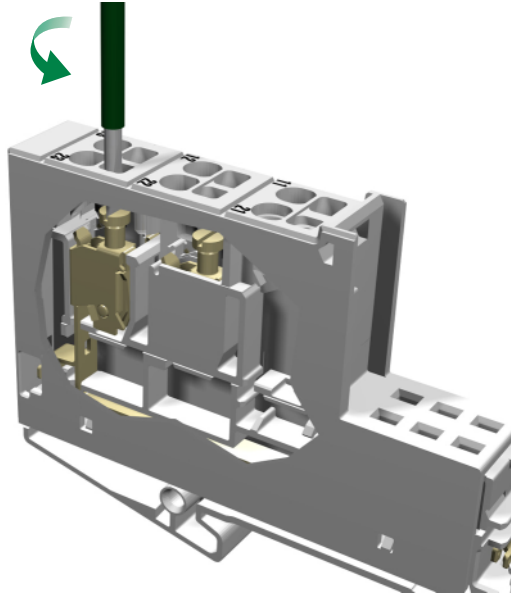


Figure 17: Screw connections

Method:

- ▶ Place the screwdriver in the rectangular opening of a connection level on the base module. Turn the screw counterclockwise 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.

Handling the push-in tension clamp terminals of the XNE ECO modules

Insertion of the conductor

The conductor is simply pushed into the corresponding contact.

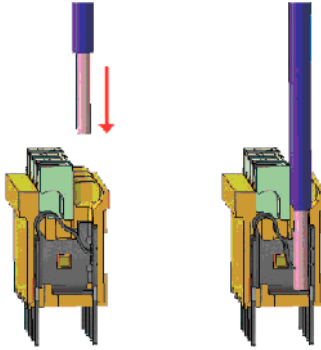


Figure 18: Insertion of the conductor

Removal of the conductor

The conductor can be removed from the corresponding contact by pressing the release mechanism, e.g. with a screw driver.

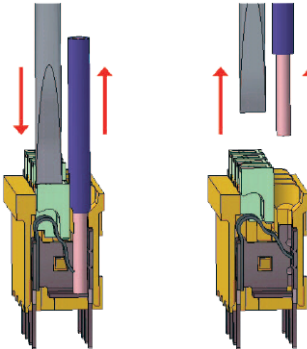


Figure 19: Removal of the conductor

1 The XI/ON Station

Wiring of the XI/ON modules

2 The supply modules

Bus refreshing modules

The bus refreshing modules provide:

- 5 V DC for the internal XI/ON module bus and the neighbouring gateway.
- 24 V DC (permissible range according to IEC/EN 61131-2) as the supply for the module electronics and the field. This 24 V DC supply voltage is distributed throughout the XI/ON station (→ “Internal connections in an XI/ON station”, page 56) as a separate cable.

They are electrically isolated from the adjacent supply group on the left.



Attention!

If the XI/ON station contains a gateway without an integrated power supply unit (XN-GW-...), the first bus refreshing module must be fitted directly to the right of a gateway. This provides the 5 V DC power supply to the gateway when connected to a special base module (→ “Base modules for XN-BR-24VDC-D”, page 39).

The use of supply modules means that it is not necessary to make individual connections of the field and/or system supply voltage to each individual XI/ON I/O-module.

Depending on the application, potential groups can thus be formed by the planned use of supply modules. Supply modules are built as XN standard electronics modules in slice design. They are completed by base modules with tension clamp or screw connection. The ash-grey cover of the base modules for supply modules makes them stand out against the base modules for the XI/ON I/O-modules.

2 The supply modules

Bus refreshing modules

LED indicators

The error and diagnostics messages are provided by the indicator LEDs of the module. The corresponding diagnostics information is also transmitted to the gateway as diagnostics bits.

XN-BR-24VDC-D



Figure 20: Bus refreshing module 24 V DC, with diagnostics

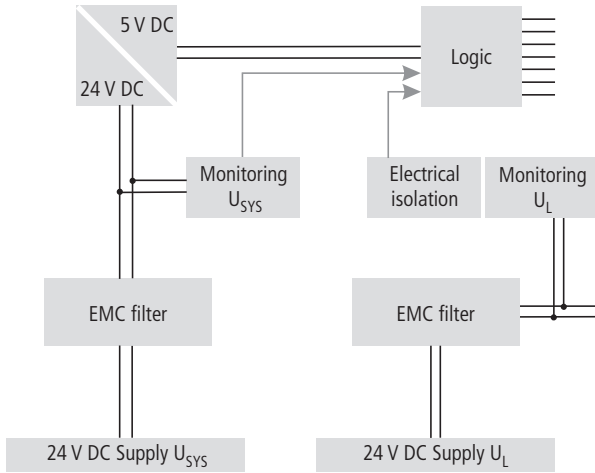


Figure 21: Block diagram

2 The supply modules

XN-BR-24VDC-D

Technical data

Table 9: XN-BR-24VDC-D

Designation	Value
Field supply	
U_L nominal value (range) (externally provided and internally filtered): <ul style="list-style-type: none">• Supply for module electronics• Field supply	24 V DC (18...30 V DC)
I_L max. field current	10 A
Insulation voltage (U_L to U_{SYS} / U_L to module bus / U_L to FE)	500 V _{rms}
System supply	
U_{SYS} nominal value (range) (externally provided)	24 V DC (18...30 V DC)
U_{MB} nominal value (range) (U_{SYS} internally converted): <ul style="list-style-type: none">• Gateway supply• Module bus supply	5 V DC (4.7...5.3 V DC)
I_{MB} (supply to the module bus participants)	1.5 A
Insulation voltage (U_{SYS} to U_L / U_{SYS} to module bus / U_{SYS} to FE)	500 V _{rms}
Ripple	< 5 %
Residual ripple, according to	IEC/EN 61131-2

Diagnostic messages

The diagnostics functions monitor the supply voltages that have to be provided by the user (system and field supplies) for undervoltage. They indicate any error through the DIA LED and send corresponding diagnostics information to the gateway.

The module features the following diagnostics data:

Table 10: Diagnostics through the LEDs



LED	Display	Meaning	Remedy
DIA	Red, flashing, 0.5 Hz	Fault in field supply U_L or system supply U_{sys}	Check the wiring of the system supply for the module bus and the field supply. Check that the voltages of the system supply and the field supply are within the permissible tolerances.
	Red	Failure of module bus communication	Check whether more than two adjacent electronics modules have been removed. Check the wiring of the system supply for the module bus.
	OFF	No fault indication or diagnostics	–
Vcc	Green	5 Vcc supply voltage for module bus is OK	–
	OFF	5 Vcc supply voltage for module bus has a fault	Check the voltage and the wiring for the system supply.

2 The supply modules

XN-BR-24VDC-D

LED	Display	Meaning	Remedy
Sys	Green	System supply from external power supply is OK.	–
	OFF	System supply from external power supply has a fault.	Check the wiring of the system supply. Check the external power supply.
U_L	Green	Field supply from external power supply is OK.	–
	OFF	Field supply from external power supply has a fault.	Check the wiring of the field supply. Check the external power supply.

- Module bus voltage warning
Monitoring of the externally provided system supply voltage ($U_{\text{sys}} = 24 \text{ V DC}$). The system supply is converted ($24 \text{ V DC} \Rightarrow 5 \text{ V}$).
- Field voltage missing
Monitoring of the externally provided field supply voltage.
 $U_{\text{L}} = 24 \text{ V DC}$

Base modules

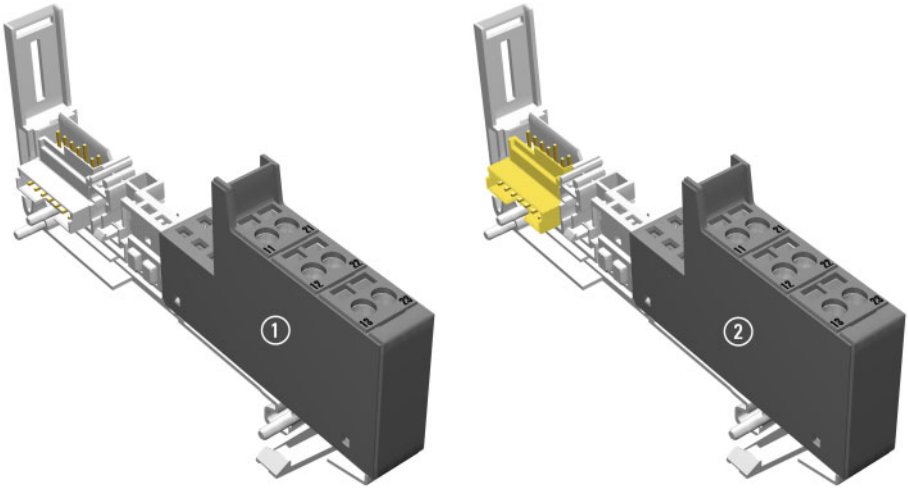


Figure 22: Base modules for XN-BR-24VDC-D

- ① Base module with gateway supply
- ② Base module without gateway supply

	Base modules with gateway supply	Base modules without gateway supply
With tension clamp connection	XN-P3T-SBB XN-P4T-SBBC	XN-P3T-SBB-B XN-P4T-SBBC-B
With screw connection	XN-P3S-SBB XN-P4S-SBBC	XN-P3S-SBB-B XN-P4S-SBBC-B



Attention!

Only the base modules XN-P3x-SBB or XN-P4x-SBBC can be used to supply a gateway without an integrated supply unit (XN-GW-...). The bus refreshing module is to be found immediately to the right of the gateway.

2 The supply modules XN-BR-24VDC-D

The base modules with or without gateway supply can be distinguished as follows.

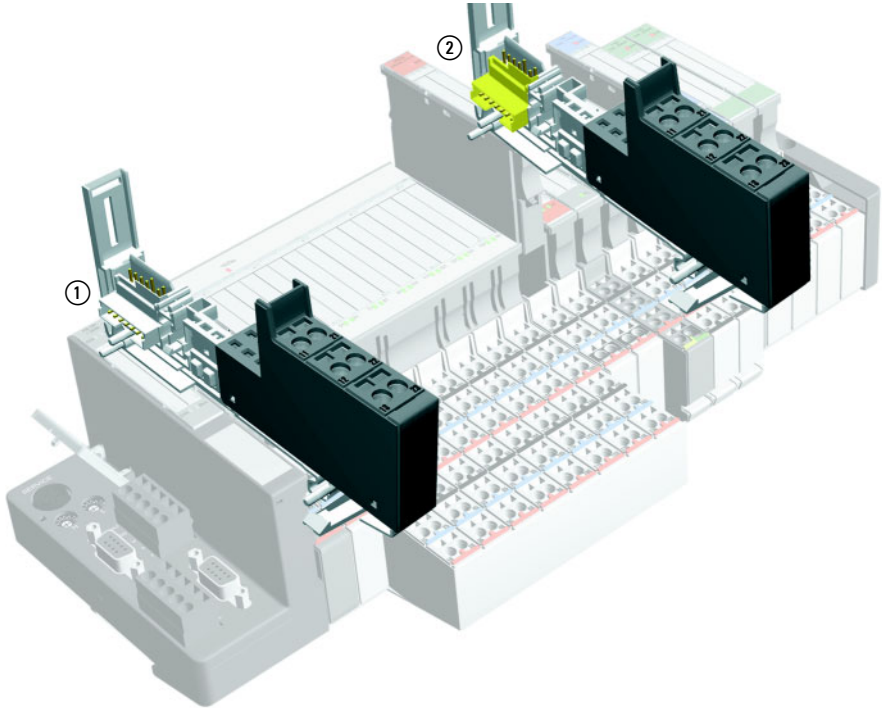


Figure 23: Assignment of the base modules

- ① Base module with gateway supply: light grey connection
- ② Base module without gateway supply: yellow connection

Connection diagrams

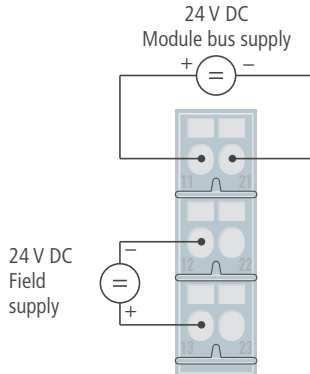


Figure 24: Connection diagram for
XN-P3x-SBB with gateway supply
XN-P3x-SBB-B without gateway supply

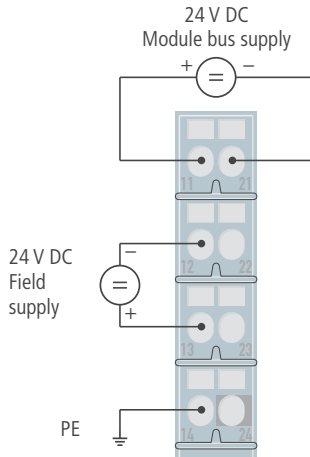


Figure 25: Connection diagram for
XN-P4x-SBBC with gateway supply
XN-P4x-SBBC-B without gateway supply

→ “Technical data for the terminals”, page 24

2 The supply modules

Power feeding modules

Power feeding modules

The power feeding modules are used to supply the various XI/ON modules with the field voltage of 24 V DC (XN-PF-24VDC-D) or 120/230 V AC (XN-PF-120/230VAC-D). They are used when different potential groups need to be set up within a XI/ON station, or in the event that the supply would otherwise be inadequate for the rated current requirements of the XI/ON modules. They are electrically isolated from the adjacent supply group on the left.



Warning!

Power feeding modules cannot be used to provide the 5 V DC supply for XI/ON gateways.

The use of power feeding modules means that it is not necessary to provide a supply feed to each individual XI/ON module.

Power feeding modules are built as XN standard electronics modules in slice design. They are completed by base modules with tension clamp or screw connection.

The ash-grey cover of the base modules for power feeding modules make them clearly distinguishable from the base modules for the XI/ON I/O modules.

LED indicators

The error and diagnostics messages are provided by the various LEDs on the module. The corresponding diagnostics information is transmitted to the gateway as diagnostics bits.

Module overview

XN-PF-24VDC-D

XN-PF-120/230VAC-D

XN-PF-24VDC-D



Figure 26: Power feeding module 24 V DC, with diagnostics

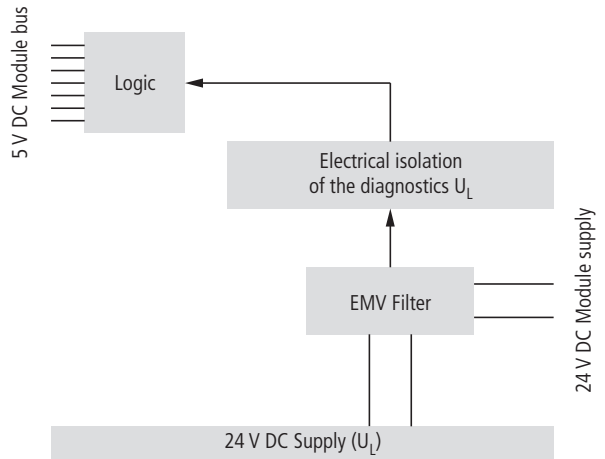


Figure 27: Block diagram

2 The supply modules

XN-PF-24VDC-D

Technical data

Table 11: XN-PF-24VDC-D

Designation	Value
Field supply	
U_L nominal value (range) (externally provided and internally filtered): <ul style="list-style-type: none"> • Supply for module electronics • Field supply 	24 V DC (18...30 V DC)
I_L max. field current	10 A
Nominal current consumption from module bus I_{MB}	$\cong 28$ mA
Insulation voltage (U_L to module bus / U_L to FE)	500 V_{rms}
Ripple	< 5 %
Residual ripple, according to	IEC/EN 61131-2
Voltage disturbances, according to	IEC/EN 61000-4-11 / IEC/EN 61131-2

Diagnostic messages

The diagnostics functions monitor the field supply voltage provided by the user for undervoltage. They indicate any error through the DIA LED and send corresponding diagnostics information to the gateway.

Table 12: Diagnostics through the LEDs



LED	Display	Meaning	Remedy
DIA	Red, flashing, 0.5 Hz	Diagnostics available	Check the wiring of the field supply. Check that the voltages of the field supply are within the permissible tolerances.
	Red	Failure of module bus communication	Check whether more than two adjacent electronics modules have been removed.
	OFF	No fault indication or diagnostics	–
UL	Green	Field supply from external power supply is OK.	–
	OFF	Field supply from external power supply has a fault.	Check the wiring of the field supply. Check the external power supply.

The module features the following diagnostics data:

- Field voltage missing
Monitoring of the externally provided field supply voltage.

Base modules

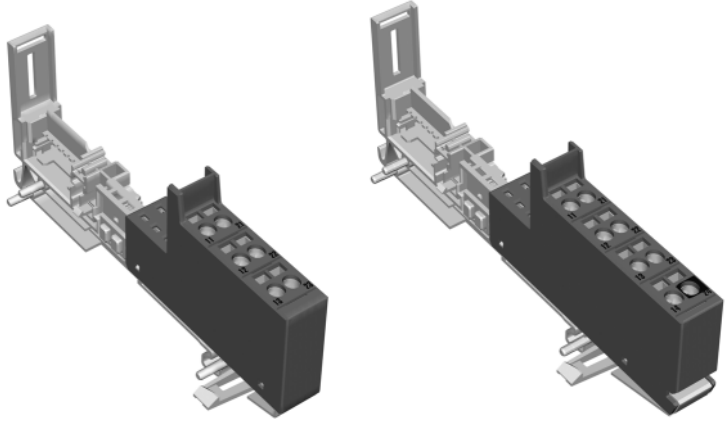


Figure 28: Base modules XN-P3T-SBB (left) and XN-P4T-SBBC (right)

	Base modules
With tension clamp connection	XN-P3T-SBB XN-P4T-SBBC
With screw connection	XN-P3S-SBB XN-P4S-SBBC

Connection diagrams

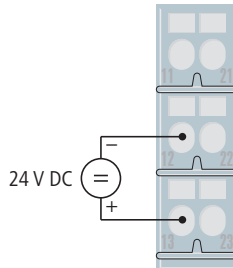


Figure 29: Connection diagram XN-P3x-SBB

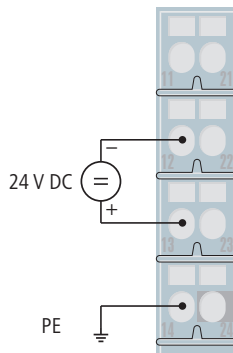


Figure 30: Connection diagram XN-P4x-SBBC

→ “Technical data for the terminals”, page 24

2 The supply modules

XN-PF-120/230VAC-D

XN-PF-120/230VAC-D

The following modules must be supplied from a preceding XN-PF-120/230VAC-D:

- XN-2DI-120/230VAC
- XN-2DO-120/230VAC-0.5A



Caution!

Relay modules must **not** be supplied from a preceding XN-PF-120/230VAC-D!

The nominal voltage at the supply terminals is 24 V DC (Δ coil voltage)!

The relay modules can be externally loaded by up to 230 V AC (Δ contact voltage).



Figure 31: Power feeding module 120/230 V AC, with diagnostics

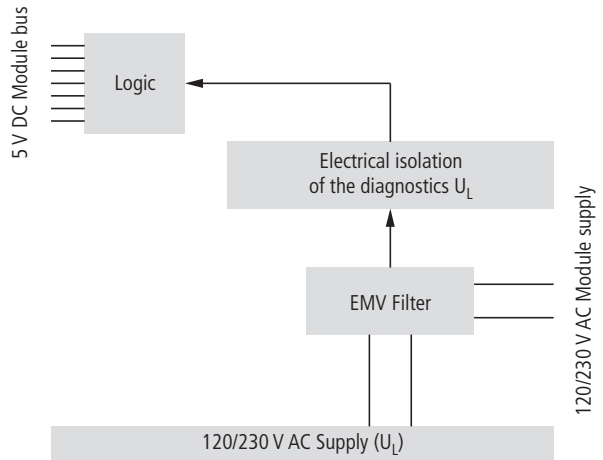


Figure 32: Block diagram

Technical data

Table 13: XN-PF-120/230VAC-D

Designation	Value
Field supply	
U _L nominal value (range) (externally provided and internally filtered):	120 V AC (102...132 V AC) 230 V AC (195.5...253 V AC)
<ul style="list-style-type: none"> • Supply for module electronics • Field supply 	
I _L max. field current	10 A
Nominal current consumption from module bus I _{MB}	≲ 25 mA
Insulation voltage (U _L to module bus / U _L to FE)	1500 V _{rms}
Ripple	< 5 %
Residual ripple, according to	IEC/EN 61131-2
Voltage disturbances, according to	IEC/EN 61000-4-11 / IEC/EN 61131-2

Diagnostic messages

The diagnostics functions monitor the field supply voltage provided by the user for undervoltage. They indicate any error through the DIA LED and send corresponding diagnostics information to the gateway.

Table 14: Diagnostics through the LEDs



LED	Display	Meaning	Remedy
DIA	Red, flashing, 0.5 Hz	Diagnostics available	Check the wiring of the field supply. Check that the voltages of the field supply are within the permissible tolerances.
	Red, flashing, 0.5 Hz and LED U _L OFF	The field voltage in outside the permissible range. The permissible range for the field supply voltage: → Table 13, Page 49	Check the wiring of the field supply. Check the external power supply or external supply feed.
	Red	Failure of module bus communication	Check whether more than two adjacent electronics modules have been removed.
	OFF	No fault indication or diagnostics	–
U_L	Green	Field voltage is present from external feed	–
	OFF	Field voltage from external feed is missing	Check the wiring of the field supply. Check the external power supply or external supply feed.

The module features the following diagnostics data:

- Field voltage missing
Monitoring of the externally provided field supply voltage.

Base modules

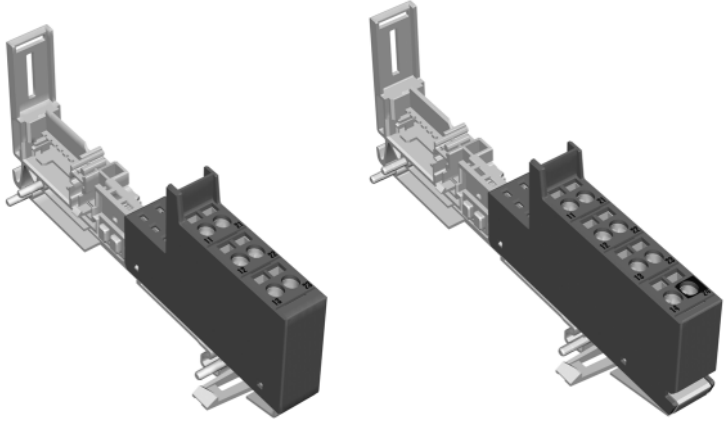


Figure 33: Base modules XN-P3T-SBB (left) and XN-P4T-SBBC (right)

	Base modules
With tension clamp connection	XN-P3T-SBB XN-P4T-SBBC
With screw connection	XN-P3S-SBB XN-P4S-SBBC

Connection diagrams

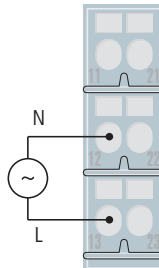


Figure 34: Connection diagram XN-P3x-SBB

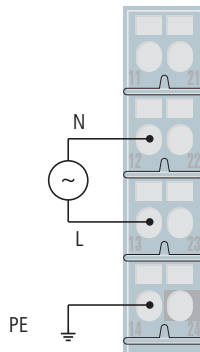


Figure 35: Connection diagram XN-P4x-SBBC

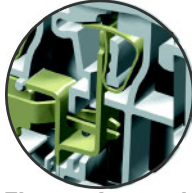
→ “Technical data for the terminals”, page 24

2 The supply modules

Overview: base modules for supply modules

Overview: base modules for supply modules

Tension clamp connection



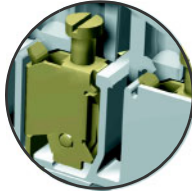
Electronics modules

	Base modules			
	XN-P3T-SBB	XN-P3T-SBB-B	XN-P4T-SBBC	XN-P4T-SBBC-B
XN-BR-24VDC-D	● ¹⁾	● ²⁾	● ¹⁾	● ²⁾
XN-PF-24VDC-D	●		●	
XN-PF-120/230VAC-D	●		●	

1) Base modules for the gateway supply

2) Base module for bus refreshing within the stations

Screw connection



Electronics modules

	Base modules			
	XN-P3S-SBB	XN-P3S-SBB-B	XN-P4S-SBBC	XN-P4S-SBBC-B
XN-BR-24VDC-D	● ¹⁾	● ²⁾	● ¹⁾	● ²⁾
XN-PF-24VDC-D	●		●	
XN-PF-120/230VAC-D	●		●	

1) Base modules for the gateway supply

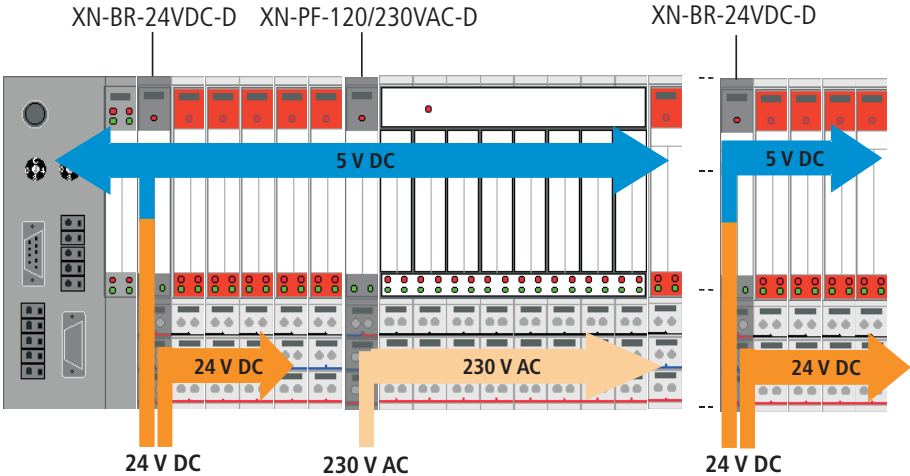
2) Base module for bus refreshing within the stations

2 The supply modules

Supply modules in a sample station

Supply modules in a sample station

The following diagram shows various potential groups within an XI/ON station. The 24 V DC or 230 V AC voltage is fed in through the internal supply cable (→ "Internal connections in an XI/ON station", page 56):



Basismodule

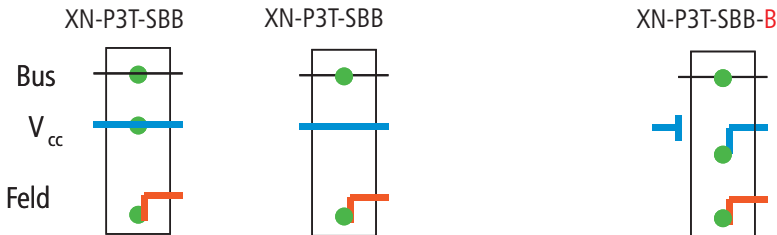


Figure 36: Potential groups in a sample station

2 The supply modules

Internal connections in an XI/ON station

Internal connections in an XI/ON station

The following diagram shows the internal data and supply cables for an XI/ON station:

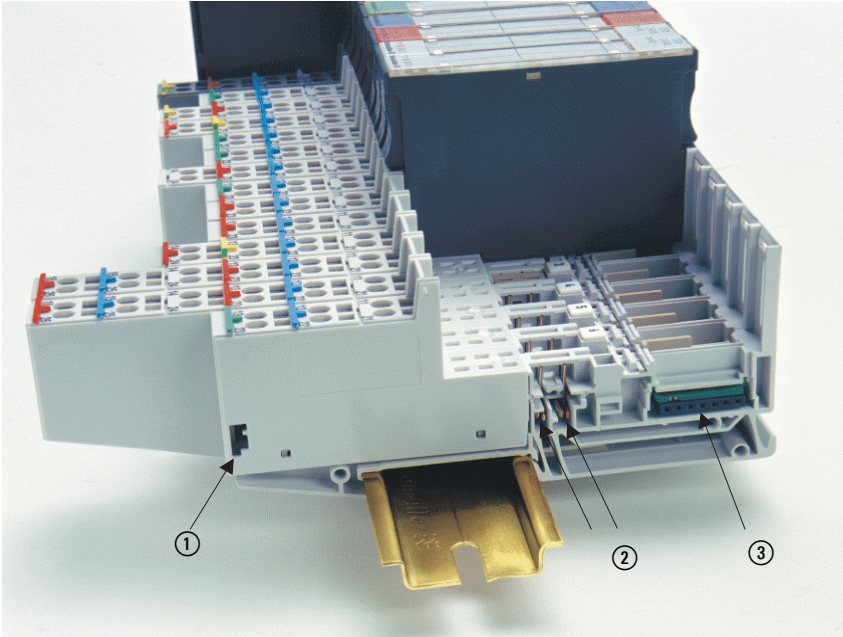


Figure 37: Internal connections in an XI/ON station

- ① This type of connection is known as a C-rail, and is led through all the base modules to the next supply module. All modules with a C in the designation have an electrical connection to the C-rail (e.g. XN-S4T-SBCS). The connections to the C-rail are marked by a black edge. The C-rail can be used as a protective earth (PE), or can have a maximum potential of 24 V.
- ② These connections provide the supply voltage U_L . The supply voltage U_L is used for the field supply, and also as a supply for the module electronics. The majority of XI/ON modules require this 24 V DC supply in addition to the 5 V DC module bus voltage.
- ③ This 7-core module bus connection includes the 5 V DC module bus voltage as well as the data cables.

3 Digital input modules

General

Digital input modules (DI) detect electrical High (**1**) and Low (**0**) levels and transmit the corresponding digital value to the gateway, via the internal module bus.

The electronics on the module bus side of the digital input modules is electrically isolated from the field level by optocouplers. Polarity reversal protection is also provided.

Digital input modules are built in both slice and block designs. XN standard electronics modules are completed by base modules with tension clamp or screw connection. XNE ECO electronics modules do not require a base module.

There are no parameter setting options for the digital input modules.

LED indicators

The channel status is indicated by the status LED. Error messages from the I/O level are made on a module basis, through the collective **DIA** indicator LED.

If the **DIA** LED is permanently red, this indicates that the module bus communication for the digital input module has failed.

3 Digital input modules

General

Table 15: Module summary

	No. of channels	Positive switching
XN-2DI-24VDC-P	2	yes
XN-2DI-24VDC-N	2	no
XN-2DI-120/230VAC	2	–
XN-4DI-24VDC-P	4	yes
XN-4DI-24VDC-N	4	no
XN-16DI-24VDC-P	16	yes
XN-32DI-24VDC-P	32	yes
XNE-8DI-24V-P	8	yes
XNE-16DI-24V-P	16	yes

XN-2DI-24VDC-P



Figure 38: Digitale input module, 2 digital inputs, 24 V DC, positive switching

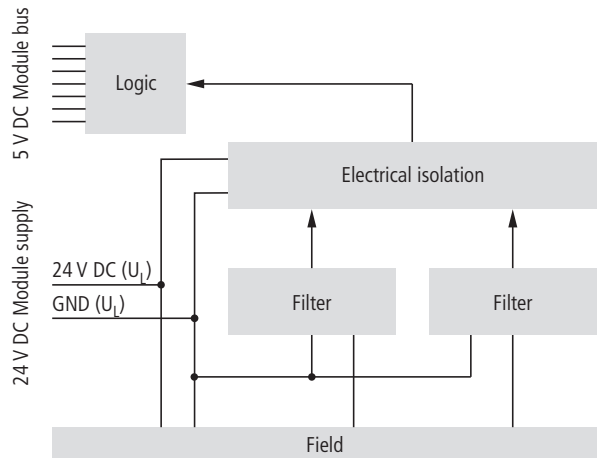


Figure 39: Block diagram

Technical data

Table 16: XN-2DI-24VDC-P

Designation	Value
Number of channels	2
Nominal supply from supply terminal U_L (range)	24 V DC (18...30 V DC)
Nominal current consumption from supply terminal I_L ¹⁾²⁾	≤ 20 mA
Nominal current consumption from module bus I_{MB} ²⁾	≤ 28 mA
Insulation voltage (channels to module bus)	500 V_{rms}
Power loss	0.7 W
Input voltage	
Input voltage, rated value	24 V DC
Low level (range)	-30 V...+5 V
High level (range)	11 V...30 V
Input current	
Low level/active level (current range for detection of a low level)	0 mA...1.5 mA
High level/active level (current range for detection of a high level)	2 mA...10 mA
Input delay	
$t_{rising\ edge}$	< 200 μs
$t_{falling\ edge}$	< 200 μs

2-wire initiators (Bero[®]) with a permissible quiescent current of 1.5 mA can be connected.

- 1) The supply terminal (U_L) provides the current for the module electronics and for the sensors on the inputs. The overall current that is required for each module is given by the sum of all the individual currents.
- 2) A part of the electronics of the XI/ON module is supplied from the module bus voltage (5 V DC), the rest from the supply terminal (U_L).

Diagnostic messages

Table 17: Diagnostics through the LEDs



LED	Display	Meaning	Remedy
DIA	Red	Failure of module bus communication	Check whether more than two adjacent electronics modules have been removed.
	OFF	No error message	–
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	–

Base modules

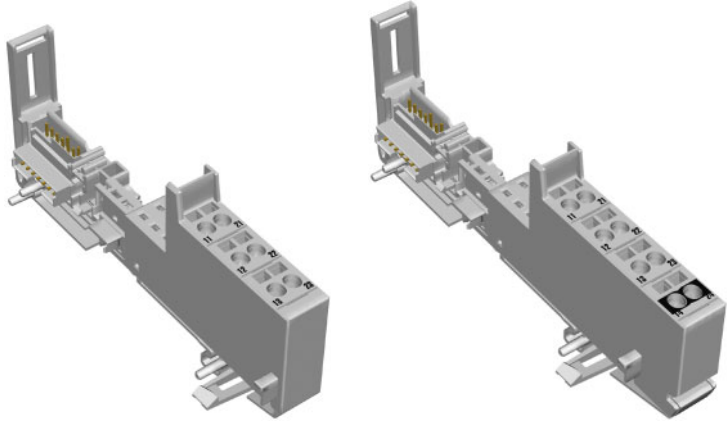


Figure 40: Base modules XN-S3T-SBB (left) and XN-S4T-SBBC (right)

	Base modules
With tension clamp connection	XN-S3T-SBB XN-S4T-SBBC
With screw connection	XN-S3S-SBB XN-S4S-SBBC

Connection diagrams

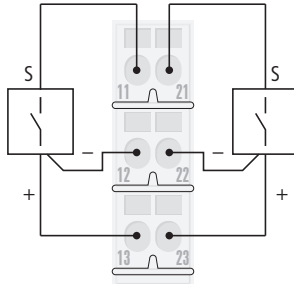


Figure 41: Connection diagram XN-S3x-SBB

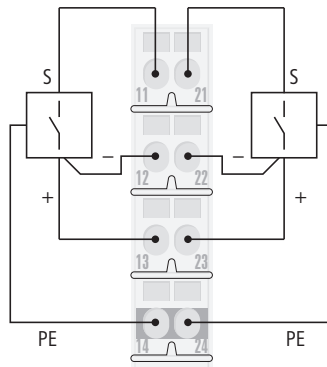


Figure 42: Connection diagram XN-S4x-SBBC

→ "Technical data for the terminals", page 24

3 Digital input modules
XN-2DI-24VDC-N

XN-2DI-24VDC-N



Figure 43: Digitale input module, 2 digital inputs, 24 V DC, negative switching

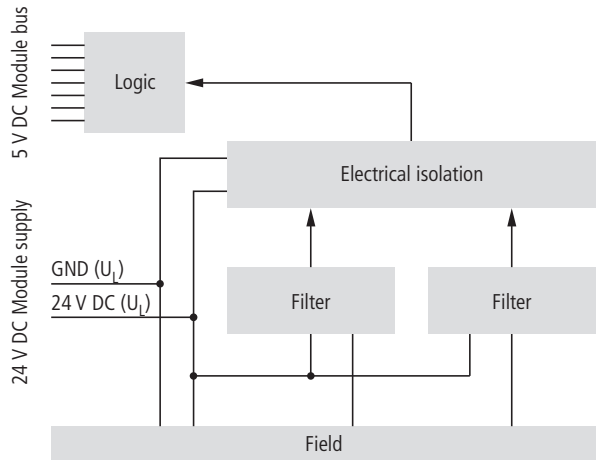


Figure 44: Block diagram

Technical data

Table 18: XN-2DI-24VDC-N

Designation	Value
Number of channels	2
Nominal supply from supply terminal U_L (range)	24 V DC (18...30 V DC)
Nominal current consumption from supply terminal I_L ¹⁾²⁾	≤ 20 mA
Nominal current consumption from module bus I_{MB} ²⁾	≤ 28 mA
Insulation voltage (channels to module bus)	500 V _{rms}
Power loss	0.7 W
Input voltage	
Input voltage, rated value	24 V DC
Low level (range)	30 V...($U_L - 11$ V)
High level (range)	0 V...5 V
Input current	
Low level/active level (current range for detection of a low level)	0 mA...1.7 mA
High level/active level (current range for detection of a high level)	1.8 mA...10 mA
Input delay	
$t_{\text{rising edge}}$	< 200 μ s
$t_{\text{falling edge}}$	< 200 μ s

2-wire initiators (Bero[®]) with a permissible quiescent current of 1.5 mA can be connected.

- 1) The supply terminal (U_L) provides the current for the module electronics and for the sensors on the inputs. The overall current that is required for each module is given by the sum of all the individual currents.
- 2) A part of the electronics of the XI/ON module is supplied from the module bus voltage (5 V DC), the rest from the supply terminal (U_L).

Diagnostic messages

Table 19: Diagnostics through the LEDs



LED	Display	Meaning	Remedy
DIA	Red	Failure of module bus communication	Check whether more than two adjacent electronics modules have been removed.
	OFF	No fault indication 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	–

Base modules

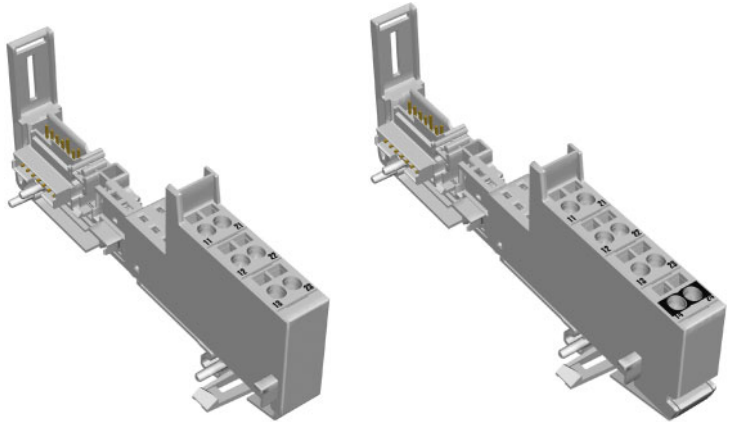


Figure 45: Base modules XN-S3T-SBB (left) and XN-S4T-SBBC (right)

	Base modules
With tension clamp connection	XN-S3T-SBB XN-S4T-SBBC
With screw connection	XN-S3S-SBB XN-S4S-SBBC

Connection diagrams

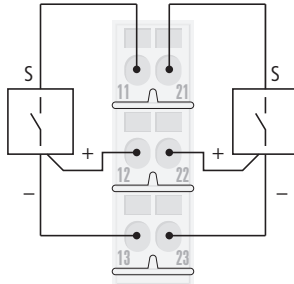


Figure 46: Connection diagram XN-S3x-SBB

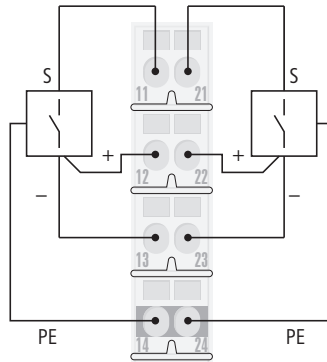


Figure 47: Connection diagram XN-S4x-SBBC

→ "Technical data for the terminals", page 24

XN-2DI-120/230VAC



Figure 48: Digitale input module, 2 digital inputs, 120/230 V AC

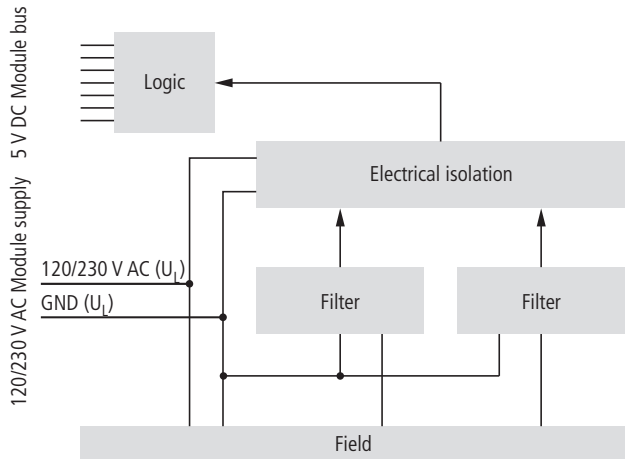


Figure 49: Block diagram

Technical data

Table 20: XN-2DI-120/230VAC

Designation	Value
Number of channels	2
Nominal supply from supply terminal U_L (range)	120 V AC (102...132 V AC) 230 V AC (195.5...253 V AC)
Nominal current consumption from supply terminal I_L ¹⁾²⁾	≤ 20 mA
Nominal current consumption from module bus I_{MB} ²⁾	≤ 28 mA
Insulation voltage (channels to module bus)	1500 V_{rms}
Power loss	1 W
Input voltage	
Input voltage, rated value	120/230 V AC
Low level (range)	0 V AC...20 V AC
High level (range)	79 V AC...265 V AC
Frequency range	48 Hz...63 Hz
Input current	
Low level/active level (current range for detection of a low level)	0 mA...1 mA
High level/active level (current range for detection of a high level)	3 mA...10 mA
Input delay	
$t_{rising\ edge}$	< 20000 μs
$t_{falling\ edge}$	< 20000 μs
Maximum permissible cable capacitance	141 nF at 79 V AC/50 Hz 23 nF at 265 V AC/50 Hz

- 1) The supply terminal (U_L) provides the current for the module electronics and for the sensors on the inputs. The overall current that is required for each module is given by the sum of all the individual currents.
- 2) A part of the electronics of the XI/ON module is supplied from the module bus voltage (5 V DC), the rest from the supply terminal (U_L).

Diagnostic messages

Table 21: Diagnostics through the LEDs



LED	Display	Meaning	Remedy
DIA	Red	Failure of module bus communication	Check whether more than two adjacent electronics modules have been removed.
	OFF	No fault indication 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	–

Base modules

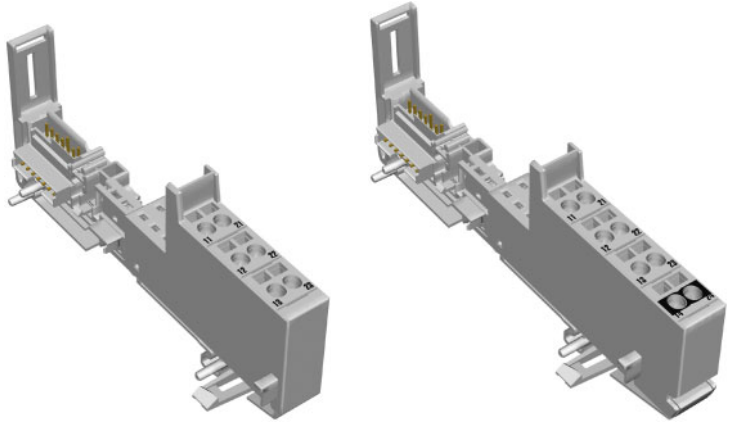


Figure 50: Base modules XN-S3T-SBB (left) and XN-S4T-SBBC (right)

	Base modules
With tension clamp connection	XN-S3T-SBB XN-S4T-SBBC
With screw connection	XN-S3S-SBB XN-S4S-SBBC

Connection diagrams

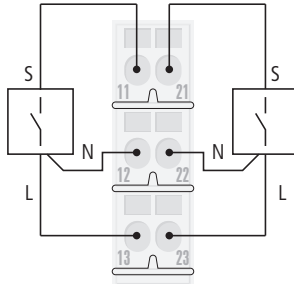


Figure 51: Connection diagram XN-S3x-SBB

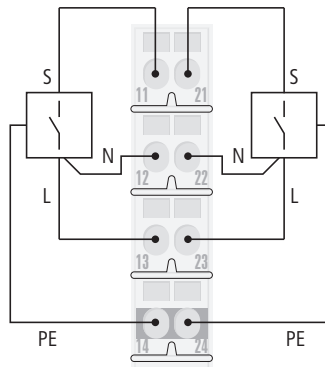


Figure 52: Connection diagram XN-S4x-SBBC

→ "Technical data for the terminals", page 24

3 Digital input modules
XN-4DI-24VDC-P

XN-4DI-24VDC-P



Figure 53: Digitale input module, 4 digital inputs, 24 V DC, positive switching

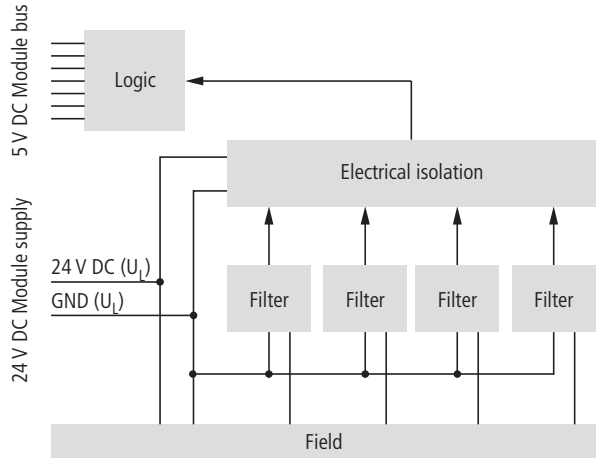


Figure 54: Block diagram

Technical data

Table 22: XN-4DI-24VDC-P

Designation	Value
Number of channels	4
Nominal supply from supply terminal U_L (range)	24 V DC (18...30 V DC)
Nominal current consumption from supply terminal I_L ¹⁾²⁾	≤ 40 mA
Nominal current consumption from module bus I_{MB} ²⁾	≤ 29 mA
Insulation voltage (channels to module bus)	500 V _{rms}
Power loss	1 W
Input voltage	
Input voltage, rated value	24 V DC
Low level (range)	-30 V...+5 V
High level (range)	15 V...30 V
Input current	
Low level/active level (current range for detection of a low level)	0 mA...1.5 mA
High level/active level (current range for detection of a high level)	2 mA...10 mA
Input delay	
$t_{\text{rising edge}}$	< 200 μ s
$t_{\text{falling edge}}$	< 200 μ s

- 1) The supply terminal (U_L) provides the current for the module electronics and for the sensors on the inputs. The overall current that is required for each module is given by the sum of all the individual currents.
- 2) A part of the electronics of the XI/ON module is supplied from the module bus voltage (5 V DC), the rest from the supply terminal (U_L).

Diagnostic messages

Table 23: Diagnostics through the LEDs



LED	Display	Meaning	Remedy
DIA	Red	Failure of module bus communication	Check whether more than two adjacent electronics modules have been removed.
	OFF	No error message	–
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	–

Base modules

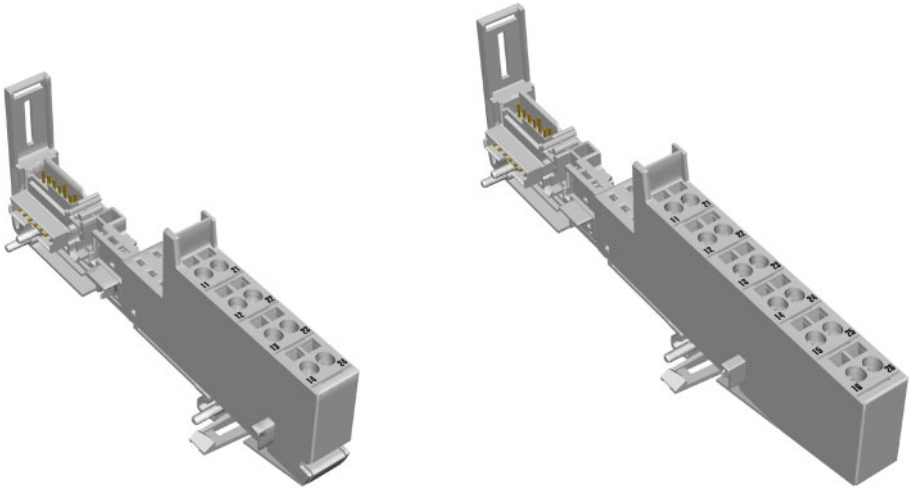


Figure 55: Base modules XN-S4T-SBBS (left) and XN-S6T-SBBSBB (right)

	Base modules
With tension clamp connection	XN-S4T-SBBS XN-S6T-SBBSBB
With screw connection	XN-S4S-SBBS XN-S6S-SBBSBB

Connection diagrams

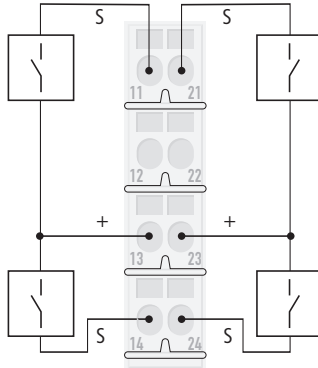


Figure 56: Connection diagram XN-S4x-SBBS

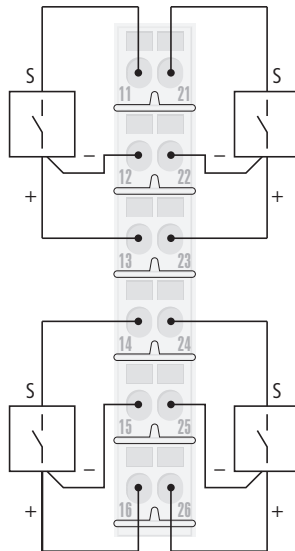


Figure 57: Connection diagram XN-S6x-SBBSBB

→ "Technical data for the terminals", page 24

XN-4DI-24VDC-N



Figure 58: Digitale input module, 4 digital inputs, 24 V DC, negative switching

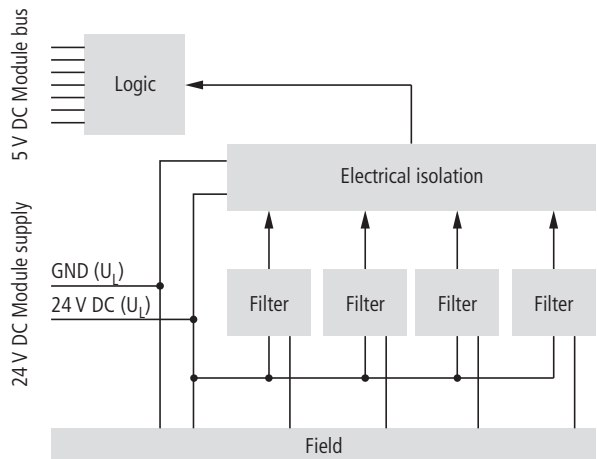


Figure 59: Block diagram

3 Digital input modules

XN-4DI-24VDC-N

Technical data

Table 24: XN-4DI-24VDC-N

Designation	Value
Number of channels	4
Nominal supply from supply terminal U_L (range)	24 V DC (18...30 V DC)
Nominal current consumption from supply terminal I_L ¹⁾²⁾	≤ 40 mA
Nominal current consumption from module bus I_{MB} ²⁾	≤ 28 mA
Insulation voltage (channels to module bus)	500 V _{rms}
Power loss	1 W
Input voltage	
Input voltage, rated value	24 V DC
Low level (range)	30 V...($U_L - 11$ V)
High level (range)	0 V...5 V
Input current	
Low level/active level (current range for detection of a low level)	0 mA...1.2 mA
High level/active level (current range for detection of a high level)	1.3 mA...6 mA
Input delay	
$t_{\text{rising edge}}$	< 200 μ s
$t_{\text{falling edge}}$	< 200 μ s

- 1) The supply terminal (U_L) provides the current for the module electronics and for the sensors on the inputs. The overall current that is required for each module is given by the sum of all the individual currents.
- 2) A part of the electronics of the XI/ON module is supplied from the module bus voltage (5 V DC), the rest from the supply terminal (U_L).

Diagnostic messages

Table 25: Diagnostics through the LEDs



LED	Display	Meaning	Remedy
DIA	Red	Failure of module bus communication	Check whether more than two adjacent electronics modules have been removed.
	OFF	No fault indication 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	–

Base modules

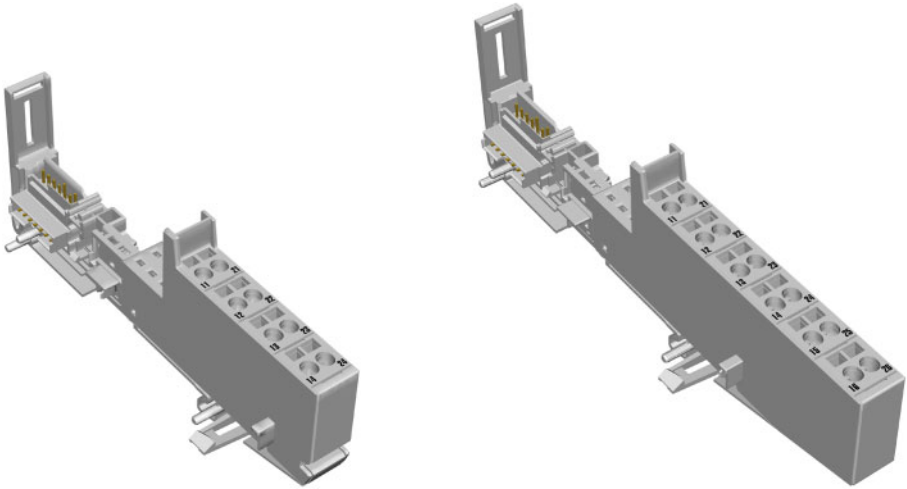


Figure 60: Base modules XN-S4T-SBBS (left) and XN-S6T-SBBSBB (right)

	Base modules
With tension clamp connection	XN-S4T-SBBS XN-S6T-SBBSBB
With screw connection	XN-S4S-SBBS XN-S6S-SBBSBB

Connection diagrams

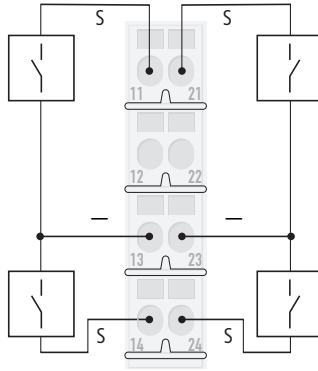


Figure 61: Connection diagram XN-S4x-SBBS

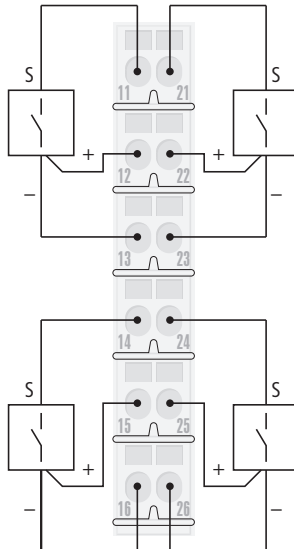


Figure 62: Connection diagram XN-S6x-SBBSBB

→ "Technical data for the terminals", page 24

3 Digital input modules
XN-16DI-24VDC-P

XN-16DI-24VDC-P



Figure 63: Digitale input module, 16 digital inputs, 24 V DC, positive switching

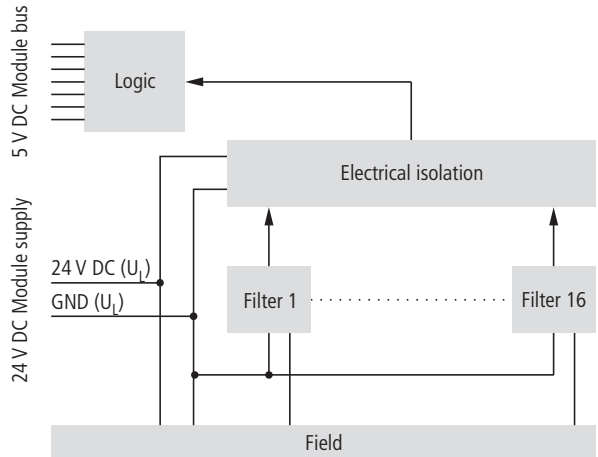


Figure 64: Block diagram

Technical data

Table 26: XN-16DI-24VDC-P

Designation	Value
Number of channels	16
Nominal supply from supply terminal U_L (range)	24 V DC (18...30 V DC)
Nominal current consumption from supply terminal I_L ¹⁾²⁾	≤ 40 mA
Nominal current consumption from module bus I_{MB} ²⁾	≤ 45 mA
Insulation voltage (channels to module bus)	500 V _{rms}
Power loss	2.5 W
Input voltage	
Input voltage, rated value	24 V DC
Low level (range)	-30 V...+5 V
High level (range)	15 V...30 V
Input current	
Low level/active level (current range for detection of a low level)	0 mA...1.5 mA
High level/active level (current range for detection of a high level)	2 mA...10 mA
Input delay	
$t_{\text{rising edge}}$	< 200 μ s
$t_{\text{falling edge}}$	< 200 μ s

- 1) The supply terminal (U_L) provides the current for the module electronics and for the sensors on the inputs. The overall current that is required for each module is given by the sum of all the individual currents.
- 2) A part of the electronics of the XI/ON module is supplied from the module bus voltage (5 V DC), the rest from the supply terminal (U_L).

Diagnostic messages



Table 27: Diagnostics through the LEDs

LED	Display	Meaning	Remedy
DIA	Red	Failure of module bus communication	Check whether more than two adjacent electronics modules have been removed.
	OFF	No fault indication 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	–

Base modules

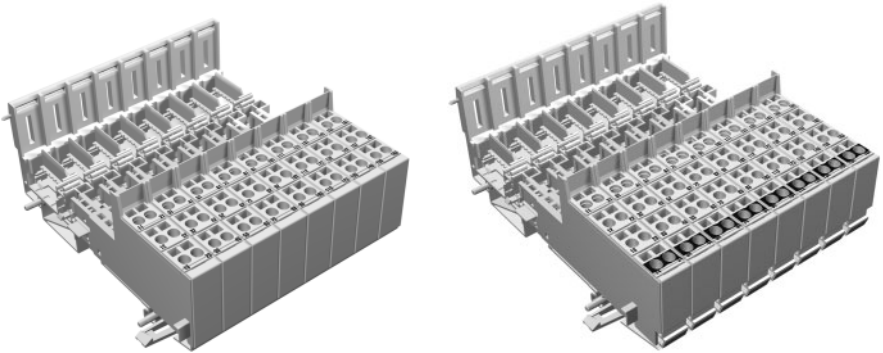


Figure 65: Base modules XN-B3T-SBB (left) and XN-B4T-SBBC (right)

	Base modules
With tension clamp connection	XN-B3T-SBB XN-B4T-SBBC
With screw connection	XN-B3S-SBB XN-B4S-SBBC

Connection diagrams

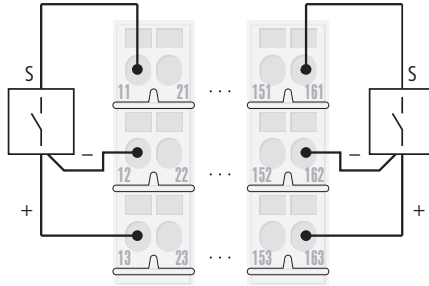


Figure 66: Connection diagram XN-B3x-SBB

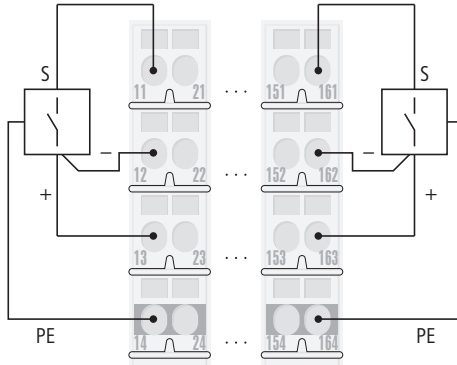


Figure 67: Connection diagram XN-B4x-SBBC

→ “Technical data for the terminals”, page 24

XN-32DI-24VDC-P



Figure 68: Digitale input module, 32 digital inputs, 24 V DC, positive switching

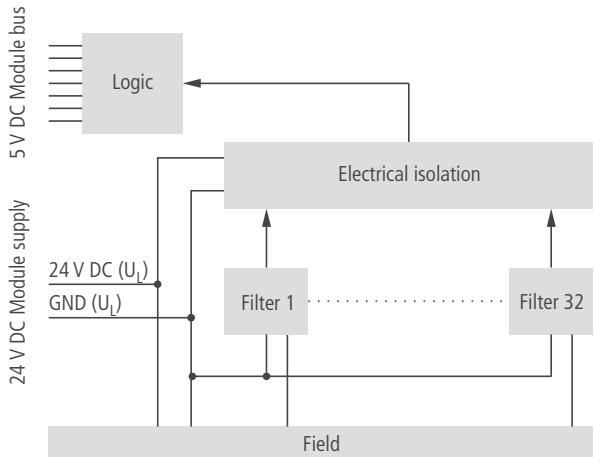


Figure 69: Block diagram

Technical data

Table 28: XN-32DI-24VDC-P

Designation	Value
Number of channels	32
Nominal supply from supply terminal U_L (range)	24 V DC (18...30 V DC)
Nominal current consumption from supply terminal I_L ¹⁾²⁾	≤ 30 mA
Nominal current consumption from module bus I_{MB} ²⁾	≤ 30 mA
Insulation voltage (channels to module bus)	500 V_{rms}
Power loss	4.2 W
Input voltage	
Input voltage, rated value	24 V DC
Low level (range)	-30 V...+5 V
High level (range)	15 V...30 V
Input current	
Low level/active level (current range for detection of a low level)	0 mA...1.5 mA
High level/active level (current range for detection of a high level)	2 mA...10 mA
Input delay	
$t_{rising\ edge}$	< 200 μs
$t_{falling\ edge}$	< 200 μs

- 1) The supply terminal (U_L) provides the current for the module electronics and for the sensors on the inputs. The overall current that is required for each module is given by the sum of all the individual currents.
- 2) A part of the electronics of the XI/ON module is supplied from the module bus voltage (5 V DC), the rest from the supply terminal (U_L).

Diagnostic messages

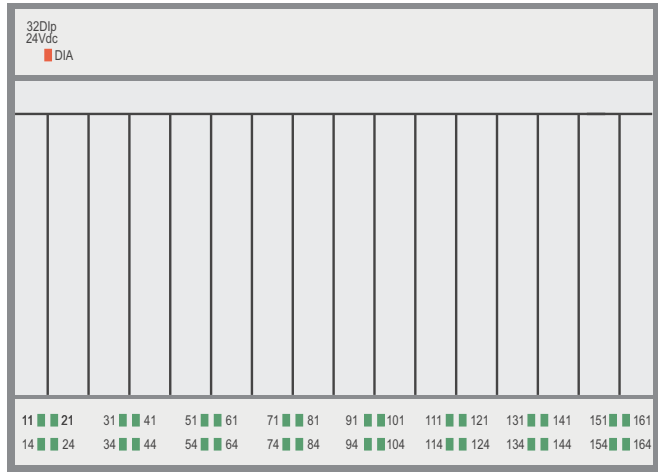


Table 29: Diagnostics through the LEDs

LED	Display	Meaning	Remedy
DIA	Red	Failure of module bus communication	Check whether more than two adjacent electronics modules have been removed.
	OFF	No fault indication or diagnostics	–
11	Green	Status of channel 1 = 1	–
	OFF	Status of channel 1 = 0	–
⋮			
161	Green	Status of channel 16 = 1	–
	OFF	Status of channel 16 = 0	–
14	Green	Status of channel 17 = 1	–
	OFF	Status of channel 17 = 0	–
⋮			
164	Green	Status of channel 32 = 1	–
	OFF	Status of channel 32 = 0	–

Base modules

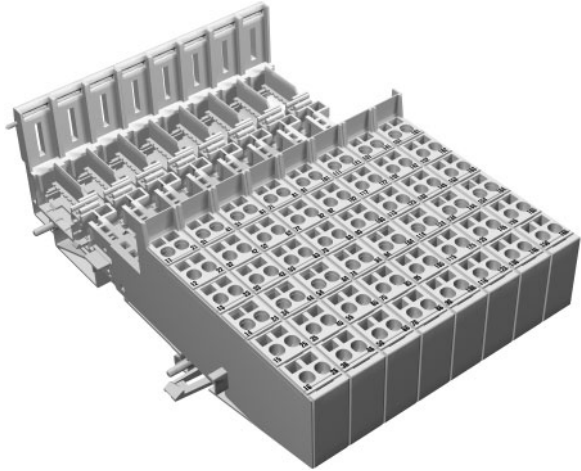


Figure 70: Base module XN-B6T-SBBSBB

	Base modules
With tension clamp connection	XN-B6T-SBBSBB
With screw terminal	XN-B6S-SBBSBB

Connection diagram

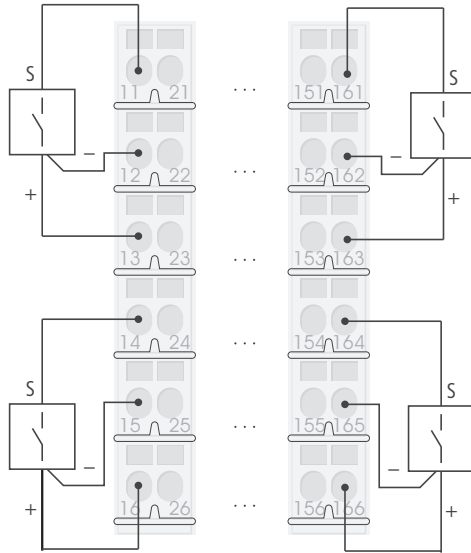


Figure 71: Connection diagram XN-B6x-SBBSBB

→ "Technical data for the terminals", page 24

3 Digital input modules
XNE-8DI-24VDC-P

XNE-8DI-24VDC-P

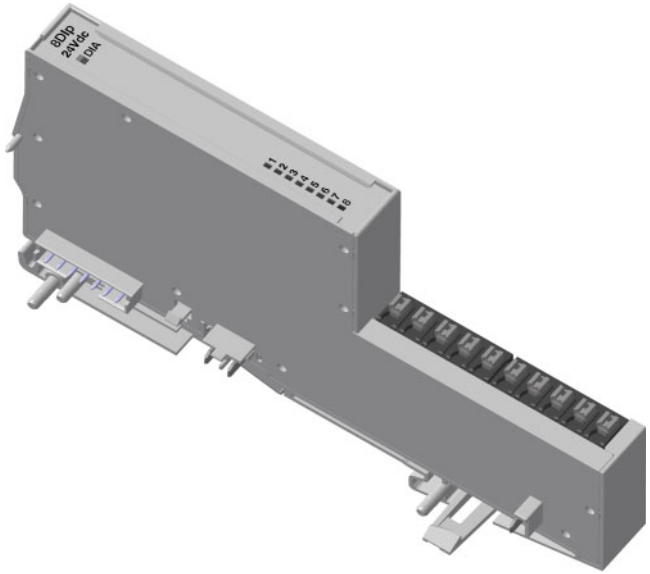


Figure 72: Digitale input module (XNE ECO),
8 digital inputs, 24 V DC, positive switching

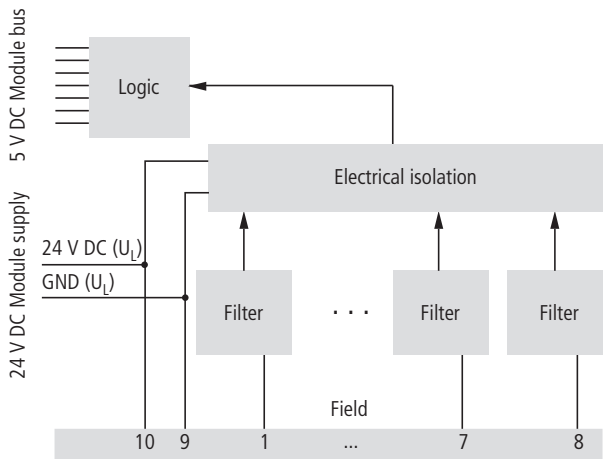


Figure 73: Block diagram

Technical data

Table 30: XNE-8DI-24VDC-P

Designation	Value
Number of channels	8
Nominal supply from supply terminal U_L (range)	24 V DC (18...30 V DC)
Nominal current consumption from supply terminal I_L ¹⁾²⁾	≤ 1.5 mA
Nominal current consumption from module bus I_{MB} ²⁾	≤ 15 mA
Insulation voltage (channels to module bus)	500 V_{rms}
Power loss	< 1.5 W
Input voltage	
Input voltage, rated value	24 V DC
Low level (range)	$-U_L \dots +5$ V
High level (range)	11 V... U_L
Input current	
Low level/active level (current range for detection of a low level)	-1 mA...+1.5 mA
High level/active level (current range for detection of a high level)	2 mA...5 mA
Input delay	
$t_{rising\ edge}$	< 100 μ s
$t_{falling\ edge}$	< 200 μ s
Simultaneity factor	100 %

- 1) The supply terminal (U_L) provides the current for the module electronics and for the sensors on the inputs. The overall current that is required for each module is given by the sum of all the individual currents.
- 2) A part of the electronics of the XI/ON module is supplied from the module bus voltage (5 V DC), the rest from the supply terminal (U_L).

Diagnostic messages

Table 31: Diagnostics through the LEDs

LED	Display	Meaning	Remedy
DIA	Red	Failure of module bus communication	Check whether more than two adjacent electronics modules have been removed.
	OFF	No error message	–
1...8	Green	Status of channel: 1	–
	OFF	Status of channel: 0	–

8Dip
24Vdc
■ DIA

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8

Connection diagram

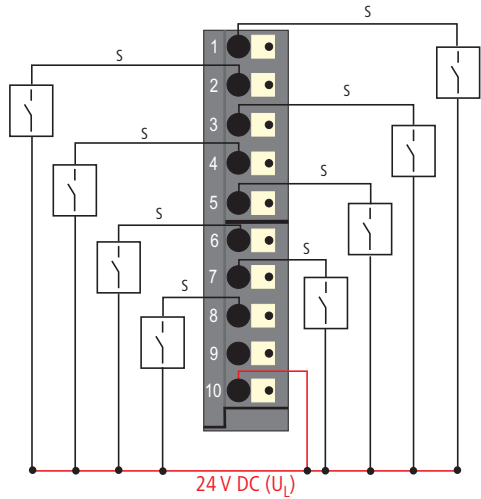


Figure 74: Connection diagram XNE-8DI-24VDC-P

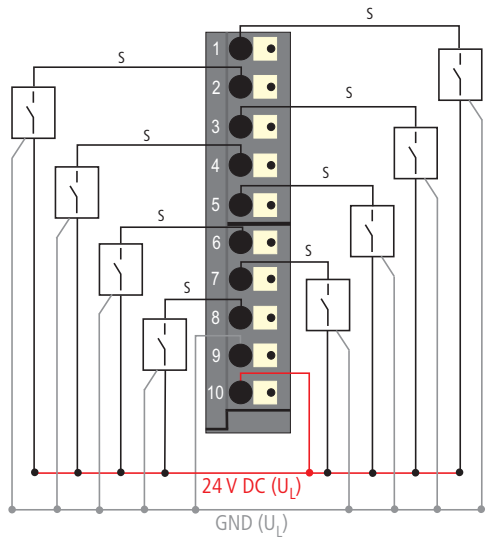


Figure 75: Connection diagram XNE-8DI-24VDC-P with power supply of the sensors

3 Digital input modules
XNE-16DI-24VDC-P

XNE-16DI-24VDC-P

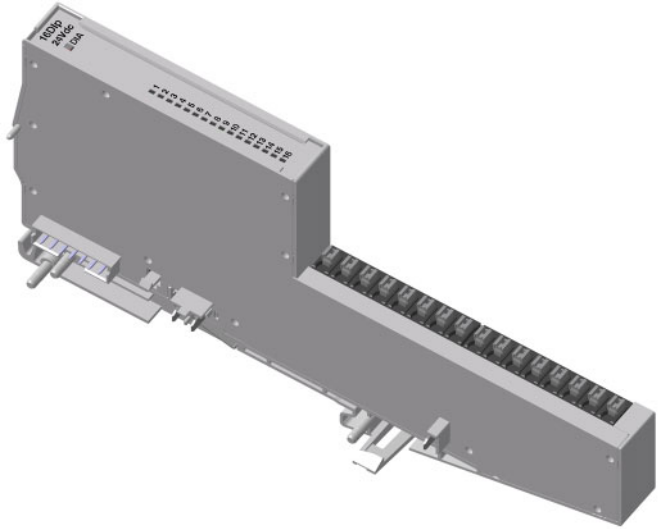


Figure 76: Digitale input module (XNE ECO), 16 digital inputs, 24 V DC, positive switching

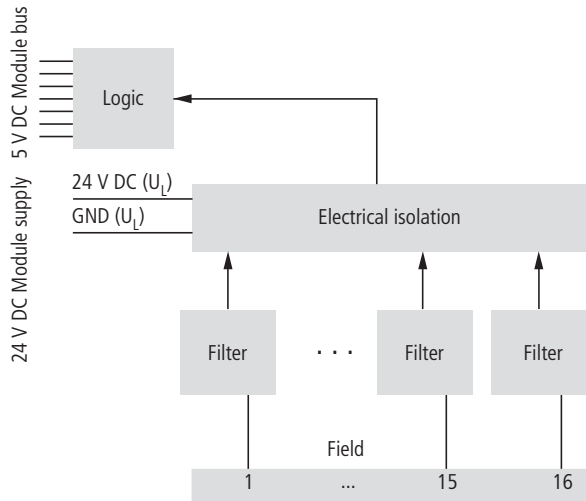


Figure 77: Block diagram

Technical data

Table 32: XNE-16DI-24VDC-P

Designation	Value
Number of channels	16
Nominal supply from supply terminal U_L (range)	24 V DC (18...30 V DC)
Nominal current consumption from supply terminal I_L ¹⁾²⁾	≤ 3 mA
Nominal current consumption from module bus I_{MB} ²⁾	≤ 15 mA
Insulation voltage (channels to module bus)	$500V_{rms}$
Power loss	< 2.5 W
Input voltage	
Input voltage, rated value	24 V DC
Low level (range)	$-U_L \dots +5$ V
High level (range)	11 V... U_L
Input current	
Low level/active level (current range for detection of a low level)	-1 mA... $+1.5$ mA
High level/active level (current range for detection of a high level)	2 mA... 5 mA
Input delay	
$t_{rising\ edge}$	< 150 μ s
$t_{falling\ edge}$	< 300 μ s
Simultaneity factor	100 %

- 1) The supply terminal (U_L) provides the current for the module electronics and for the sensors on the inputs. The overall current that is required for each module is the sum of all the individual currents.
- 2) A part of the electronics of the XI/ON module is supplied from the module bus voltage (5 V DC), the rest from the supply terminal (U_L).

Diagnostics messages

Table 33: Diagnostics through the LEDs

LED	Display	Meaning	Remedy
DIA	Red	Failure of module bus communication	Check whether more than two adjacent electronics modules have been removed.
	OFF	No error message	–
1...16	Green	Status of channel: 1	–
	OFF	Status of channel: 0	–

16 DIp
24 Vdc
■ DIA

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16

Connection diagram

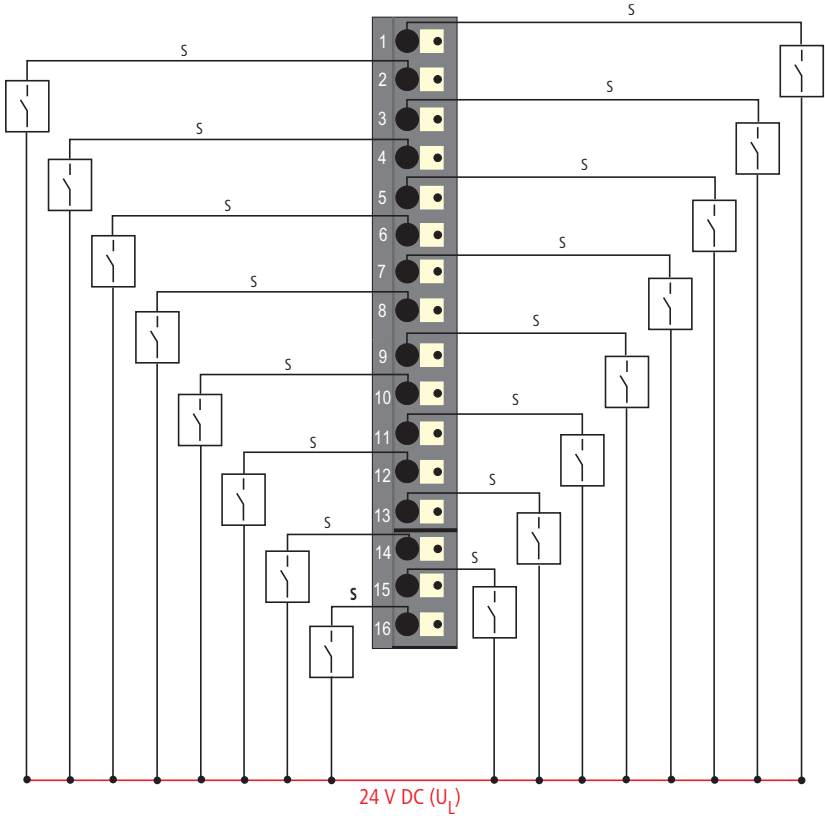


Figure 78: Connection diagram XNE-16DI-24VDC-P

3 Digital input modules
 XNE-16DI-24VDC-P

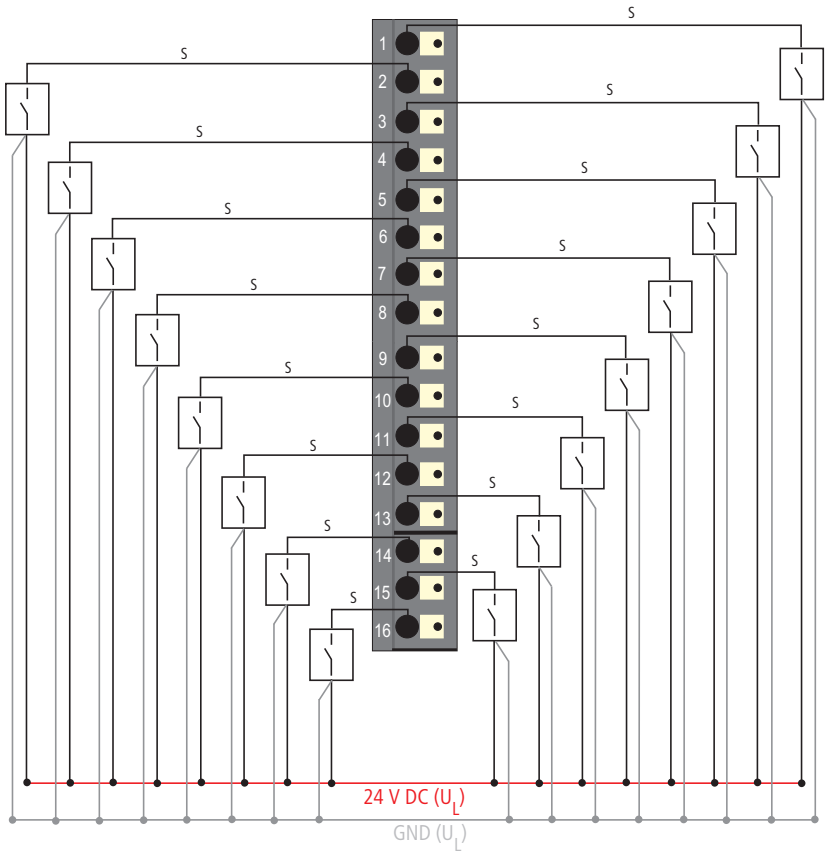


Figure 79: Connection diagram XNE-16DI-24VDC-P with power supply of the sensors

3 Digital input modules

Overview: base modules for digital input modules

Overview: base modules for digital input modules

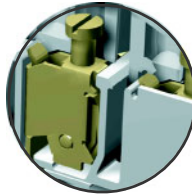
Tension clamp connection



Electronics modules

	Base modules						
	XN-S3T-SBB	XN-S4T-SBBC	XN-S4T-SBBS	XN-S6T-SBBSBB	XN-B3T-SBB	XN-B4T-SBBC	XN-B6T-SBBSBB
XN-2DI-24VDC-P	●	●					
XN-2DI-24VDC-N	●	●					
XN-2DI-120/230VAC	●	●					
XN-4DI-24VDC-P			●	●			
XN-4DI-24VDC-N			●	●			
XN-16DI-24VDC-P					●	●	
XN-32DI-24VDC-P							●

Screw connection



Electronics modules

	Base modules						
	XN-S3S-SBB	XN-S4S-SBBC	XN-S4S-SBBS	XN-S6S-SBBSBB	XN-B3S-SBB	XN-B4S-SBBC	XN-B6S-SBBSBB
XN-2DI-24VDC-P	●	●					
XN-2DI-24VDC-N	●	●					
XN-2DI-120/230VAC	●	●					
XN-4DI-24VDC-P			●	●			
XN-4DI-24VDC-N			●	●			
XN-16DI-24VDC-P					●	●	
XN-32DI-24VDC-P							●

3 Digital input modules

Overview: base modules for digital input modules

4 Digital output modules

General

Digital output modules (DO) receive output values from the gateway via the internal module bus. The modules convert the values and output the corresponding Low (**0**) or High (**1**) values to the field level.

The outputs are implemented according to IEC/EN 61131-2.

The electronics on the module bus side of a digital output module is electrically isolated from the field level by optocouplers.

Digital output modules are built in both slice and block designs. XN standard electronics modules are completed by base modules with tension clamp or screw connection. XNE ECO electronics modules do not require a base module.

There are no parameter setting options for the digital output modules.

LED indicators

The channel status is indicated by the status LED. Error messages from the I/O level are made on a module basis, through the collective **DIA** indicator LED. The corresponding diagnostics information is transmitted to the gateway as diagnostics bits.

If the **DIA** LED is permanently red, this indicates that the module bus communication for the digital output module has failed.



Attention!

External suppression components should be fitted when using inductive loads.

4 Digital output modules

General

Table 34: Module summary

	No. of channels	Positive switching	Max. output current per channel	Electrically isolated
XN-2DO-24VDC-0.5A-P	2	yes	0.5 A	yes
XN-2DO-24VDC-0.5A-N	2	no	0.5 A	yes
XN-2DO-24VDC-2A-P	2	yes	2A	yes
XN-2DO-120/230VAC-0.5A	2	–	0.5 A	yes
XN-4DO-24VDC-0.5A-P	4	yes	0.5 A	yes
XN-16DO-24VDC-0.5A-P	16	yes	0.5 A	yes
XN-32DO-24VDC-0.5A-P	32	yes	0.5 A	yes
XNE-8DO-24VDC-0.5A-P	8	yes	0.5 A	yes
XNE-16DO-24VDC-0.5A-P	16	yes	0.5 A	yes

XN-2DO-24VDC-0.5A-P

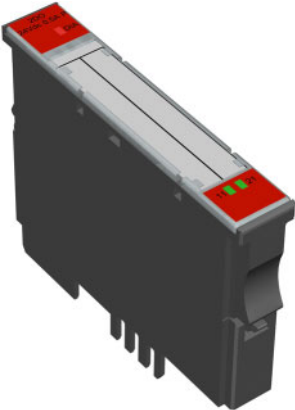


Figure 80: Digitale output module, 2 digital outputs, 24 V DC, 0.5 A, positive switching

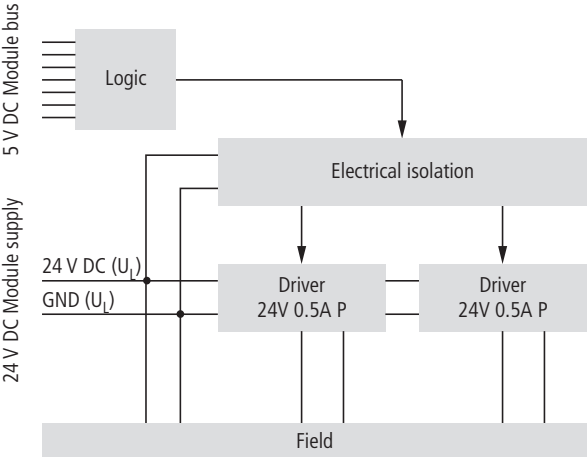


Figure 81: Block diagram

4 Digital output modules

XN-2DO-24VDC-0.5A-P

Technical data

Table 35: XN-2DO-24VDC-0.5A-P


Designation	Value
Number of channels	2
Nominal supply from supply terminal U_L (range)	24 V DC (18...30 V DC)
Nominal current consumption from supply terminal I_L ¹⁾²⁾	≤ 20 mA (when load current = 0 mA)
Nominal current consumption from module bus I_{MB} ²⁾	≤ 32 mA
Insulation voltage (channels to module bus)	500 V_{rms}
Power loss	Normally 1 W
Output voltage	
High level (the output is switched on and loaded)	$> U_L - 1$ V DC
Output current (to supply the actuators/the output is switched on)	
High level (nominal value)	0.5 A
High level (permissible range)	< 0.6 A
Permissible total current over all outputs	≤ 1 A
Simultaneity factor	100 %
Output delay for signal change and resistive load ($R_{LO} < 1$ k Ω)	
From Low to High level	< 100 μ s
From High to Low level	< 100 μ s
Load resistance range	> 48 Ω
Connectable equipment	
Resistive load R_{LO}	> 48 Ω
Inductive load R_{LI}	< 1.2 H
Lamp load R_{LL}	< 3 W
Switching frequency	
With resistive load ($R_{LO} < 1$ k Ω)	< 5000 Hz

Designation	Value
With inductive load	< 2 Hz
With lamp load	< 10 Hz
Output according to IEC/EN 61131-2	Protected, → Page 229
Restart after removal of a short-circuit	Automatic

- 1) The supply terminal (U_L) provides the current for the module electronics and for the consumers on the outputs. The overall current that is required for each module is the sum of all the individual currents.
- 2) A part of the electronics of the XI/ON module is supplied from the module bus voltage (5 V DC), the rest from the supply terminal (U_L).

Diagnostic messages

Table 36: Diagnostics through the LEDs



LED	Display	Meaning	Remedy
DIA	Red, flashing, 0.5 Hz	Diagnostics available	Remove the short-circuit on the corresponding channel.
	Red	Failure of module bus communication	Check whether more than two adjacent electronics modules have been removed.
	OFF	No fault indication 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 features the following diagnostics data per channel:

- **Overcurrent** (short-circuit)

Base modules

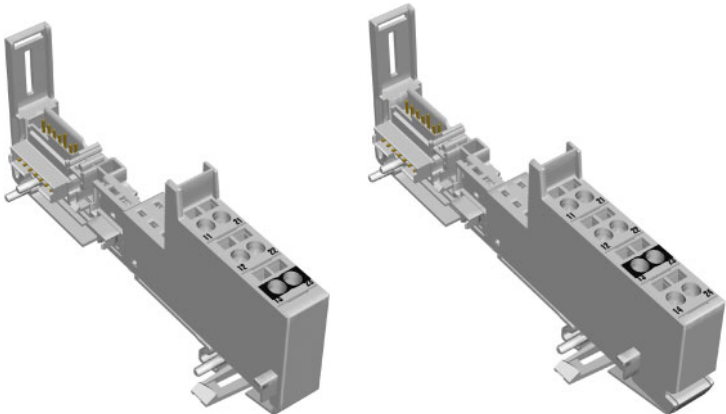


Figure 82: Base modules XN-S3T-SBC (left) and XN-S4T-SBCS (right)

	Base modules
With tension clamp connection	XN-S3T-SBC XN-S4T-SBCS
With screw connection	XN-S3S-SBC XN-S4S-SBCS

Connection diagrams

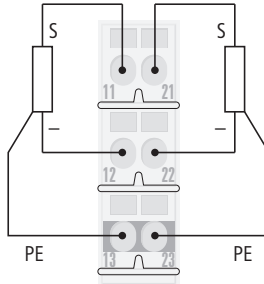


Figure 83: Connection diagram XN-S3x-SBC

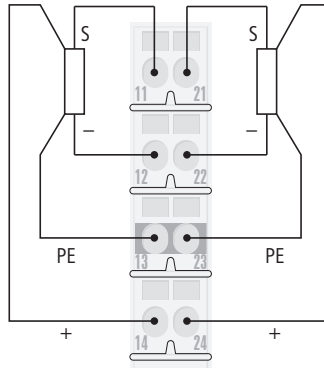


Figure 84: Connection diagram XN-S4x-SBCS

→ "Technical data for the terminals", page 24

XN-2DO-24VDC-0.5A-N

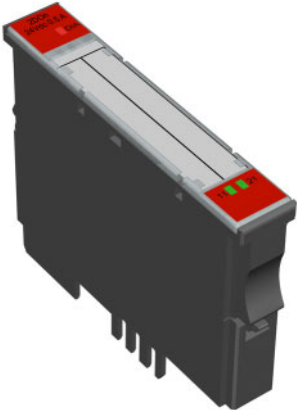


Figure 85: Digitale output module, 2 digital outputs, 24 V DC, 0.5 A, negative switching

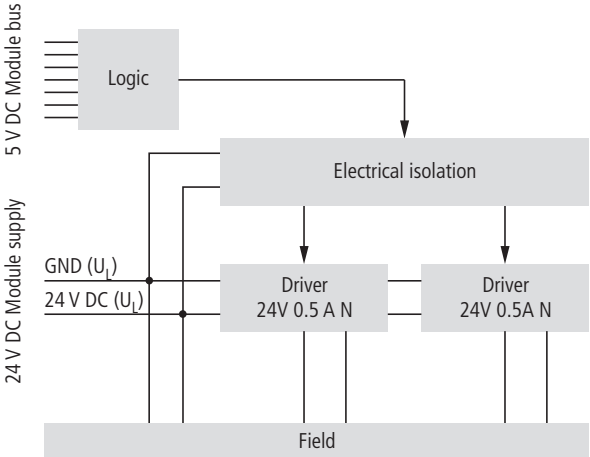


Figure 86: Block diagram

4 Digital output modules

XN-2DO-24VDC-0.5A-N

Technical data

Table 37: XN-2DO-24VDC-0.5A-N

Designation	Value
Number of channels	2
Nominal supply from supply terminal U_L (range)	24 V DC (18...30 V DC)
Nominal current consumption from supply terminal $I_L^{1)2)}$	≤ 20 mA (when load current = 0 mA)
Nominal current consumption from module bus $I_{MB}^{2)}$	≤ 32 mA
Insulation voltage (channels to module bus)	500 V_{rms}
Power loss	Normally 1 W
Output voltage	
High level (the output is switched on and loaded)	$< GND_L + 1$ V DC
Output current (to supply the actuators/the output is switched on)	
High level (nominal value)	0.5 A
High level (permissible range)	< 0.6 A
Permissible total current over all outputs	≤ 1 A
Simultaneity factor	100 %
Output delay for signal change and resistive load ($R_{LO} < 1$ k Ω)	
From Low to High level	< 100 μ s
From High to Low level	< 100 μ s
Load resistance range	> 48 Ω
Connectable equipment	
Resistive load R_{LO}	> 48 Ω
Inductive load R_{LI}	< 1.2 H
Lamp load R_{LL}	< 12 W
Switching frequency	
With resistive load ($R_{LO} < 1$ k Ω)	< 100 Hz

Designation	Value
With inductive load	< 2 Hz
With lamp load	< 10 Hz
Output according to IEC/EN 61131-2	Protected, → Page 229
Restart after removal of a short-circuit	Automatic

- 1) The supply terminal (U_L) provides the current for the module electronics and for the consumers on the outputs. The overall current that is required for each module is the sum of all the individual currents.
- 2) A part of the electronics of the XI/ON module is supplied from the module bus voltage (5 V DC), the rest from the supply terminal (U_L).

Diagnostic messages

Table 38: Diagnostics through the LEDs



LED	Display	Meaning	Remedy
DIA	Red, flashing, 0.5 Hz	Diagnostics available	Remove the short-circuit on the corresponding channel.
	Red	Failure of module bus communication	Check whether more than two adjacent electronics modules have been removed.
	OFF	No fault indication 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 features the following diagnostics data per channel:

- **Overcurrent** (short-circuit)

Base modules

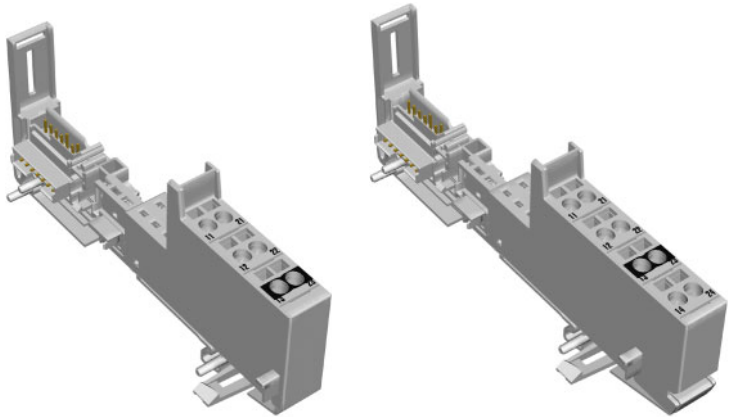


Figure 87: Base modules XN-S3T-SBC (left) and XN-S4T-SBCS (right)

	Base modules
With tension clamp connection	XN-S3T-SBC XN-S4T-SBCS
With screw connection	XN-S3S-SBC XN-S4S-SBCS

Connection diagrams

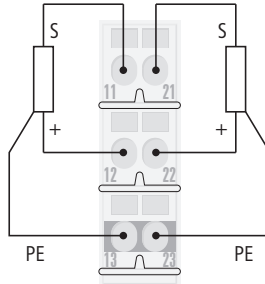


Figure 88: Connection diagram XN-S3x-SBC

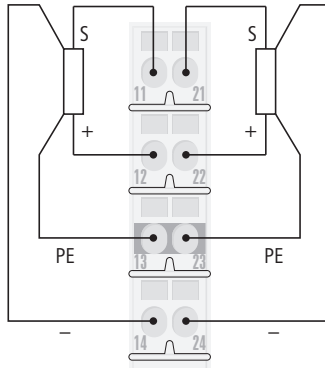


Figure 89: Connection diagram XN-S4x-SBCS

→ "Technical data for the terminals", page 24

XN-2DO-24VDC-2A-P

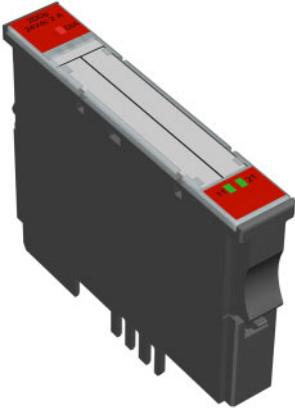


Figure 90: Digitale output module, 2 digital outputs, 24 V DC, 2 A, positive switching

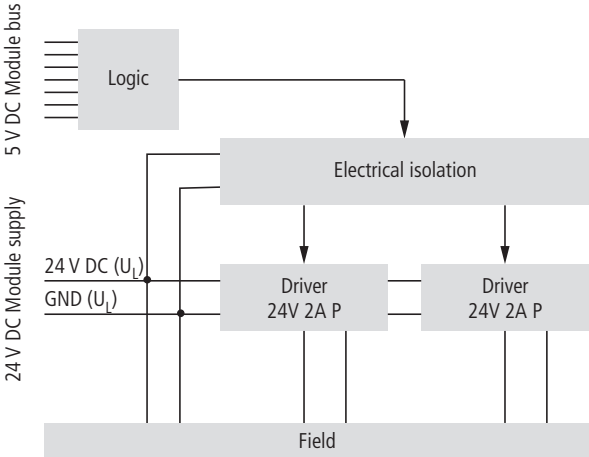


Figure 91: Block diagram

4 Digital output modules

XN-2DO-24VDC-2A-P

Technical data

Table 39: XN-2DO-24VDC-2A-P

Designation	Value
Number of channels	2
Nominal supply from supply terminal U_L (range)	24 V DC (18...30 V DC)
Nominal current consumption from supply terminal I_L ¹⁾²⁾	≤ 50 mA (when load current = 0 mA)
Nominal current consumption from module bus I_{MB} ²⁾	≤ 33 mA
Insulation voltage (channels to module bus)	500 V_{rms}
Power loss	Normally 1 W
Output voltage	
High level (the output is switched on and loaded)	$> U_L - 1$ V DC
Output current (to supply the actuators/the output is switched on)	
High level (nominal value)	2 A
High level (permissible range)	< 2.4 A
Value for inductive load (1.2 H)	< 1 A
Permissible total current over all outputs	≤ 4 A
Simultaneity factor	100 %
Output delay for signal change and resistive load ($R_{LO} < 1$ k Ω)	
From Low to High level	< 100 μ s
From High to Low level	< 100 μ s
Load resistance range	> 12 Ω
Connectable equipment	
Resistive load R_{LO}	> 12 Ω
Inductive load R_{LI}	< 1.2 H
Lamp load R_{LL}	< 6 W

Designation	Value
Switching frequency	
With resistive load ($R_{LO} < 1 \text{ k}\Omega$)	< 5000 Hz
With inductive load	< 2 Hz
With lamp load	< 10 Hz
Output according to IEC/EN 61131-2	Protected, → Page 229
Restart after removal of a short-circuit	Automatic

- 1) The supply terminal (U_L) provides the current for the module electronics and for the consumers on the outputs. The overall current that is required for each module is the sum of all the individual currents.
- 2) A part of the electronics of the XI/ON module is supplied from the module bus voltage (5 V DC), the rest from the supply terminal (U_L).

Diagnostic messages

Table 40: Diagnostics through the LEDs



LED	Display	Meaning	Remedy
DIA	Red, flashing, 0.5 Hz	Diagnostics available	Remove the short-circuit on the corresponding channel.
	Red	Failure of module bus communication	Check whether more than two adjacent electronics modules have been removed.
	OFF	No fault indication 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 features the following diagnostics data per channel:

- **Overcurrent** (short-circuit)

Base modules

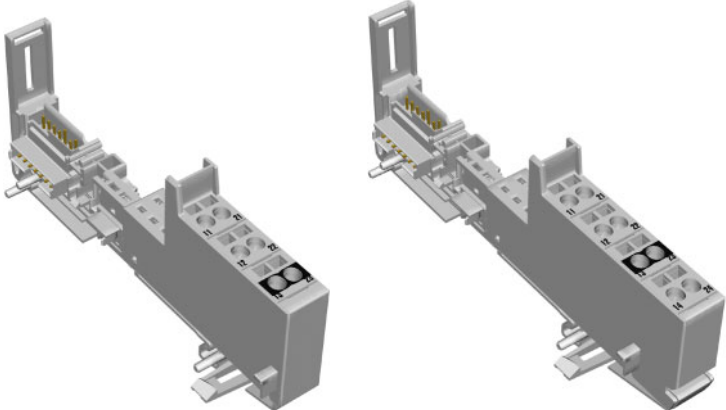


Figure 92: Base modules XN-S3T-SBC (left) and XN-S4T-SBCS (right)

	Base modules
With tension clamp connection	XN-S3T-SBC XN-S4T-SBCS
With screw connection	XN-S3S-SBC XN-S4S-SBCS

Connection diagrams

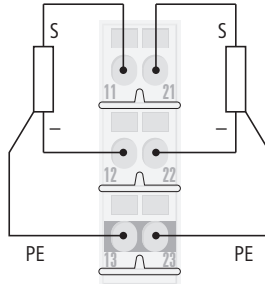


Figure 93: Connection diagram XN-S3x-SBC

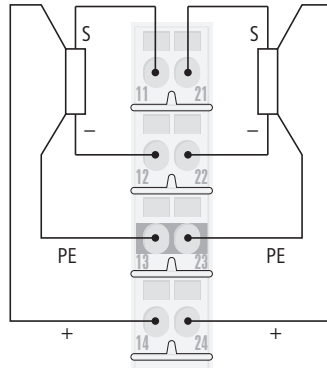


Figure 94: Connection diagram XN-S4x-SBCS

→ "Technical data for the terminals", page 24

XN-2DO-120/230VAC-0.5A

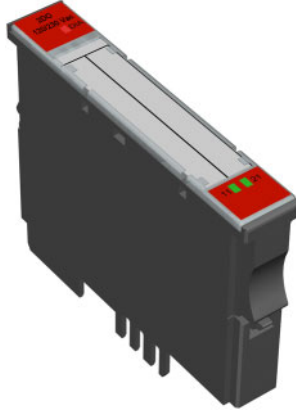


Figure 95: Digitale output module, 2 digital outputs, 120/230 V AC, 0.5 A

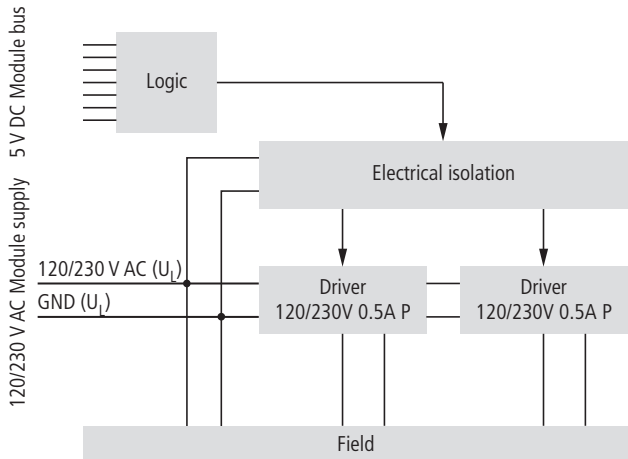


Figure 96: Block diagram

4 Digital output modules

XN-2DO-120/230VAC-0.5A

Technical data

Table 41: XN-2DO-120/230VAC-0.5A

Designation	Value
Number of channels	2
Nominal supply from supply terminal U_L (range)	120 V AC (102...132 V AC) 230 V AC (195.5...253 V AC)
Frequency range	45...65 Hz
Nominal current consumption from supply terminal $I_L^{1)2)}$	≤ 20 mA (when load current = 0 mA)
Nominal current consumption from module bus $I_{MB}^{2)}$	≤ 35 mA
Insulation voltage (channels to module bus)	1500 V_{rms}
Power loss	Normally 1 W
Output voltage	
High level (the output is switched on and loaded)	$> U_L - 1$ V DC (triac with zero-crossing switching)
Voltage drop with channel switched on	≤ 2 V
Output current (to supply the actuators/ the output is switched on)	
High level (nominal value)	0.5 A (pay attention to the derating)
High level (permissible range)	0.02...0.5 A
Low level	< 1.5 mA
Derating (maximum load)	At 40 °C: 1 A (per channel 0.5 A) At 50 °C: 0.75 A (per channel 0.375 A) At 55 °C: 0.5 A (per channel 0.25 A)
Leakage current (with channel switched on and switched off)	≤ 1.5 mA
Fusing	500 mA FF
Peak current	8 A (one period at 60 Hz)
Simultaneity factor	100 % (pay attention to the derating)

Designation	Value
Output delay for signal change and resistive load	
From Low to High level	$< T/2 + 1 \text{ ms}$
From High to Low level	$< T/2 + 1 \text{ ms}$
Load resistance range	At 120 V AC: $240 \Omega \dots 6 \text{ k}\Omega$ At 230 V AC: $460 \Omega \dots 11.5 \text{ k}\Omega$

- 1) The supply terminal (U_L) provides the current for the module electronics and for the consumers on the outputs. The overall current that is required for each module is the sum of all the individual currents.
- 2) A part of the electronics of the XI/ON module is supplied from the module bus voltage (5 V DC), the rest from the supply terminal (U_L).



Leakage currents can produce a voltage at the output, even in the switched- off state.

4 Digital output modules
 XN-2DO-1.20/230VAC-0.5A

Diagnostics messages



LED	Display	Meaning	Remedy
DIA	Red	Failure of module bus communication	Check whether more than two adjacent electronics modules have been removed.
	OFF	No fault indication or diagnostics	–
11	Green	Status of channel 1 = ON	–
	OFF	Status of channel 1 = OFF	–
21	Green	Status of channel 2 = ON	–
	OFF	Status of channel 2 = OFF	–



The display elements are supplied from the field voltage (not from the module bus voltage). They will therefore only indicate the switching status correctly if this voltage is fully present on the power feeding module.

Diagnostics data

None

Module parameters

None

Base modules

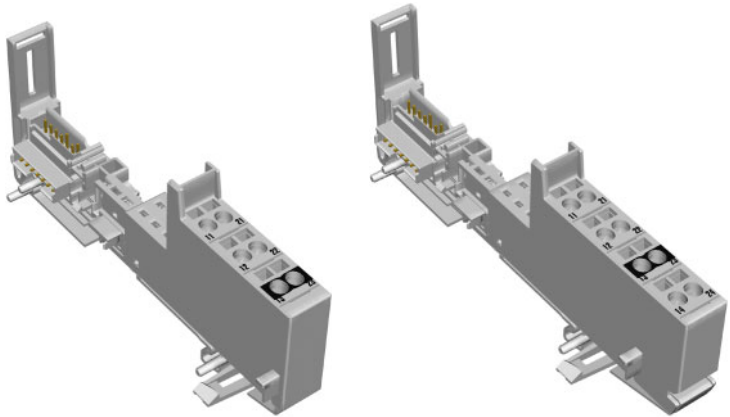


Figure 97: Base modules XN-S3T-SBC (left) and XN-S4T-SBCS (right)

	Base modules
With tension clamp connection	XN-S3T-SBC XN-S4T-SBCS
With screw connection	XN-S3S-SBC XN-S4S-SBCS

Connection diagrams

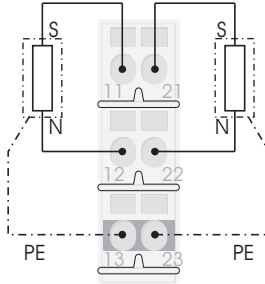


Figure 98: Connection diagram XN-S3x-SBC

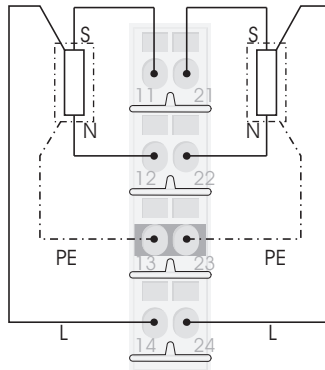


Figure 99: Connection diagram XN-S4x-SBCS

XN-4DO-24VDC-0.5A-P

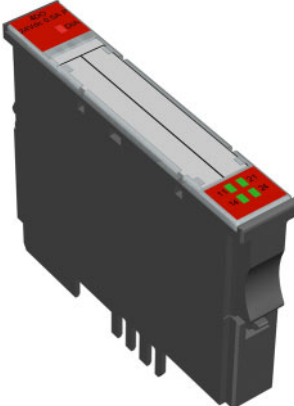


Figure 100: Digitale output module, 4 digital outputs, 24 V DC, 2 A, positive switching

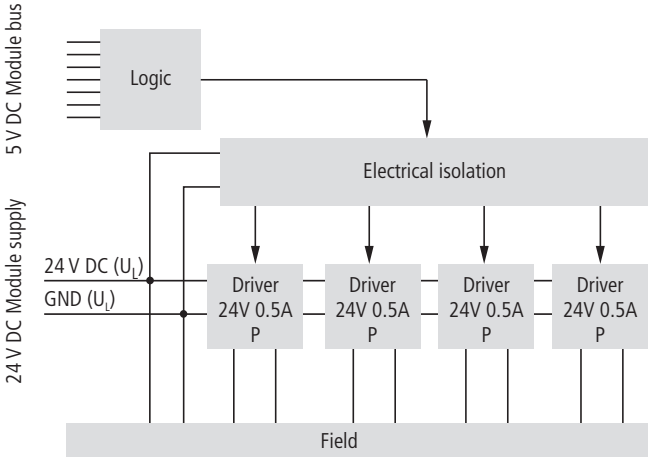


Figure 101: Block diagram

4 Digital output modules

XN-4DO-24VDC-0.5A-P

Technical data

Table 42: XN-4DO-24VDC-0.5A-P

Designation	Value
Number of channels	4
Nominal supply from supply terminal U_L (range)	24 V DC (18...30 V DC)
Nominal current consumption from supply terminal I_L ¹⁾²⁾	≤ 25 mA (when load current = 0 mA)
Nominal current consumption from module bus I_{MB} ²⁾	≤ 30 mA
Insulation voltage (channels to module bus)	500 V_{rms}
Power loss	Normally 1 W
Output voltage	
High level (the output is switched on and loaded)	$> U_L - 1$ V DC
Output current (to supply the actuators/the output is switched on)	
High level (nominal value)	0.5 A ³⁾
High level (permissible range for short-term over-load (maximum 5 minutes))	< 0.6 A
Permissible total current over all outputs	≤ 2 A
Simultaneity factor	100 %
Output delay for signal change and resistive load ($R_{LO} < 1$ k Ω)	
From Low to High level	< 250 μ s
From High to Low level	< 250 μ s
Load resistance range	> 48 Ω
Connectable equipment	
Resistive load R_{LO}	> 48 Ω
Inductive load R_{LI}	< 1.2 H
Lamp load R_{LL}	< 6 W

Designation	Value
Switching frequency	
With resistive load ($R_{LO} < 1 \text{ k}\Omega$)	< 1000 Hz
With inductive load	< 2 Hz
With lamp load	< 10 Hz
Output according to IEC/EN 61131-2	Short-circuit proof, → Page 230
Restart after removal of a short-circuit	Automatic

- 1) The supply terminal (U_L) provides the current for the module electronics and for the consumers on the outputs. The overall current that is required for each module is the sum of all the individual currents.
- 2) A part of the electronics of the XI/ON module is supplied from the module bus voltage (5 V DC), the rest from the supply terminal (U_L).
- 3) The outputs can be connected in parallel to increase the maximum output current to 2 A.

Diagnostic messages

Table 43: Diagnostics through the LEDs



LED	Display	Meaning	Remedy
DIA	Red, flashing, 0.5 Hz	Diagnostics available	Remove the short-circuit on the corresponding channel.
	Red	Failure of module bus communication	Check whether more than two adjacent electronics modules have been removed.
	OFF	No fault indication 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	-

The module features the following diagnostics:

- **Overcurrent** (short-circuit)



Attention!

If overcurrent occurs, the overloaded channel must be switched off.

Base modules

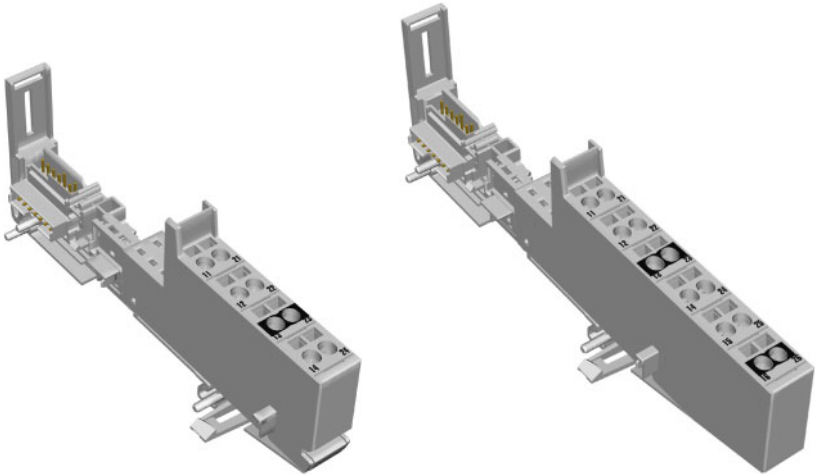


Figure 102: Base modules XN-S4T-SBCS (left) and XN-S6T-SBCSBC (right)

	Base modules
With tension clamp connection	XN-S4T-SBCS XN-S6T-SBCSBC
With screw connection	XN-S4S-SBCS XN-S6S-SBCSBC

Connection diagrams

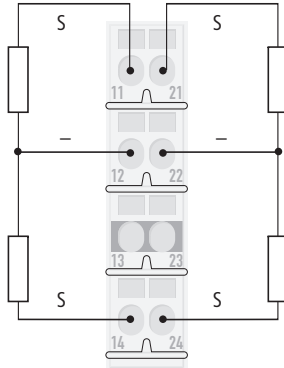


Figure 103: Connection diagram XN-S4x-SBCS

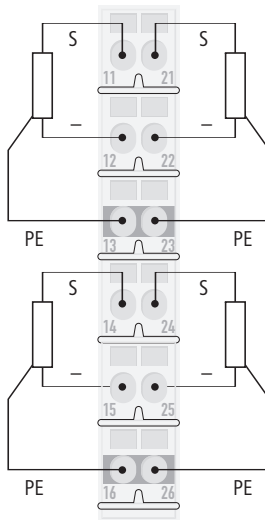


Figure 104: Connection diagram XN-S6x-SBCSBC

→ "Technical data for the terminals", page 24

XN-16DO-24VDC-0.5A-P

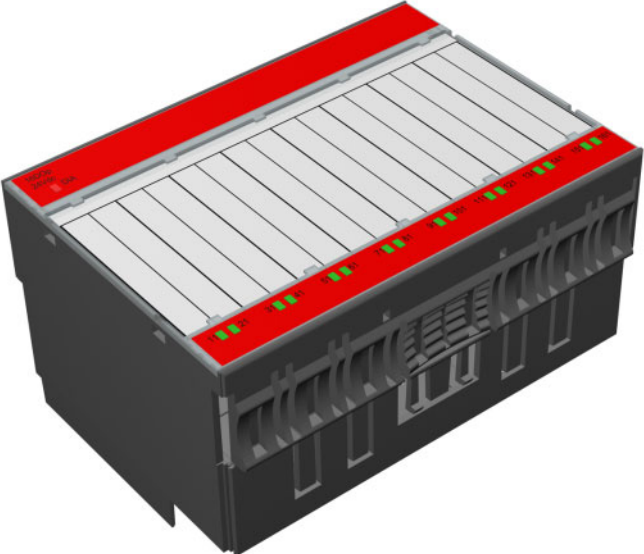


Figure 105: Digitale output module, 16 digital outputs, 24 V DC, 0.5 A, positive switching

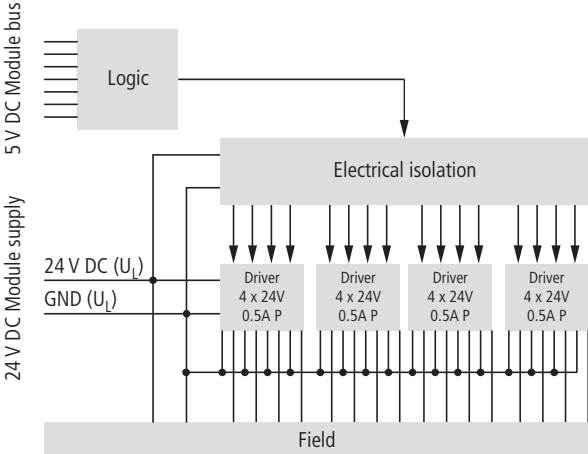


Figure 106: Block diagram

4 Digital output modules

XN-16DO-24VDC-0.5A-P

Technical data

Table 44: XN-16DO-24VDC-0.5A-P

Designation	Value
Number of channels	16
Nominal supply from supply terminal U_L (range)	24 V DC (18...30 V DC)
Nominal current consumption from supply terminal I_L ¹⁾²⁾	≤ 30 mA (when load current = 0 mA)
Nominal current consumption from module bus I_{MB} ²⁾	≤ 120 mA
Insulation voltage (channels to module bus)	500 V_{rms}
Power loss	Normally 4 W
Output voltage	
High level (the output is switched on and loaded)	$> U_L - 1$ V DC
Output current (to supply the actuators/the output is switched on)	
High level (nominal value)	0.5 A ³⁾
High level (permissible range ⁴⁾)	< 0.6 A
Permissible total current over all outputs	≤ 8 A
Simultaneity factor	100 %
Output delay for signal change and resistive load ($R_{LO} < 1$ k Ω)	
From Low to High level	< 100 μ s
From High to Low level	< 100 μ s
Load resistance range	> 48 Ω
Connectable equipment	
Resistive load R_{LO}	> 48 Ω
Inductive load R_{LI}	< 1.2 H
Lamp load R_{LL}	< 3 W
Switching frequency	
With resistive load ($R_{LO} < 1$ k Ω)	< 100 Hz

Designation	Value
Output according to IEC/EN 61131-2	Short-circuit proof, → Page 230
Restart after removal of a short-circuit	Automatic

- 1) The supply terminal (U_L) provides the current for the module electronics and for the consumers on the outputs. The overall current that is required for each module is the sum of all the individual currents.
- 2) A part of the electronics of the XI/ON module is supplied from the module bus voltage (5 V DC), the rest from the supply terminal (U_L).
- 3) From device version VN01-02 on, two outputs can be connected in parallel to increase the maximum output current to 1 A.
- 4) From device version VN01-02 on: permissible range for short-term overload (maximum 5 minutes)

Diagnostic messages

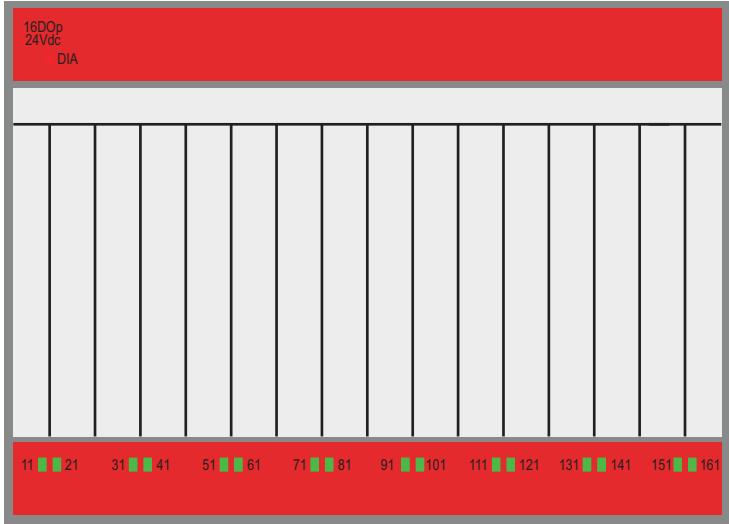


Table 45: Diagnostics through the LEDs

LED	Display	Meaning	Remedy
DIA	Red flashing, 0.5 Hz	There is a short-circuit on at least one of the 16 channels. A diagnostics message will be transmitted.	Remove the short-circuit on the corresponding channel.
	Red	Failure of module bus communication	Check whether more than two adjacent electronics modules have been removed.
	OFF	No fault indication 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	–

LED	Display	Meaning	Remedy
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 features the following diagnostics data (groupwise short-circuit detection):

- **Overcurrent** (short-circuit) channel 1...4
- **Overcurrent** (short-circuit) channel 5...8
- **Overcurrent** (short-circuit) channel 9...12
- **Overcurrent** (short-circuit) channel 13...16

Base modules

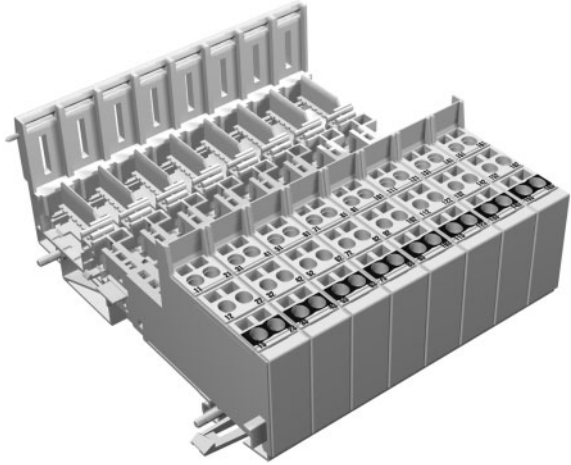


Figure 107: Base module XN-B3T-SBC

	Base modules
With tension clamp connection	XN-B3T-SBC
With screw connection	XN-B3S-SBC

Connection diagram

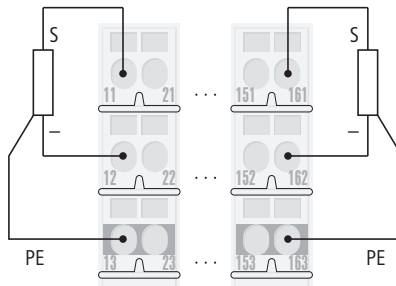


Figure 108: Connection diagram XN-B3x-SBC

→ “Technical data for the terminals”, page 24

XN-32DO-24VDC-0.5A-P

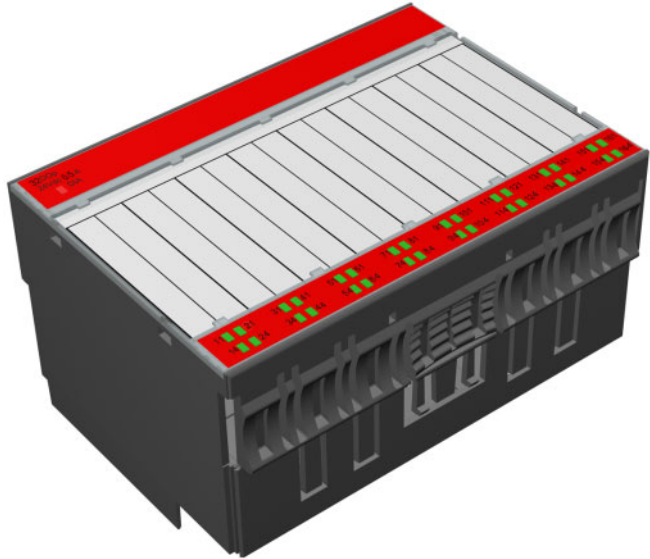


Figure 109: Digitale output module, 32 digital outputs, 24 V DC, 0.5 A, positive switching

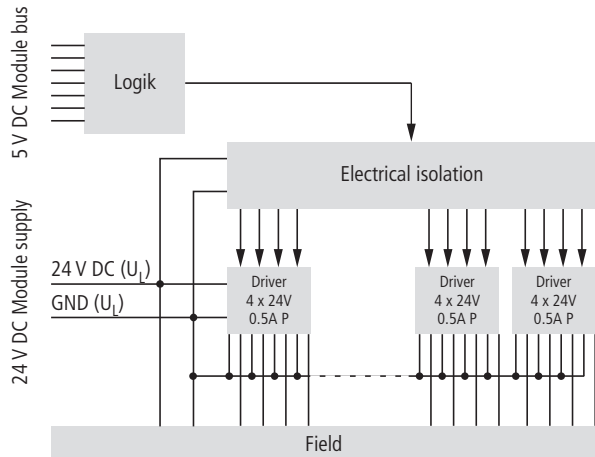


Figure 110: Block diagram

4 Digital output modules

XN-32DO-24VDC-0.5A-P

Technical data

Table 46: XN-32DO-24VDC-0.5A-P

Designation	Value
Number of channels	32
Nominal supply from supply terminal U_L (range)	24 V DC (18...30 V DC)
Nominal current consumption from supply terminal I_L ¹⁾²⁾	≤ 50 mA (when load current = 0 mA)
Nominal current consumption from module bus I_{MB} ²⁾	≤ 30 mA
Insulation voltage (channels to module bus)	500 V_{rms}
Power loss	Normally 5 W
Output voltage	
High level (the output is switched on and loaded)	$> U_L - 1$ V DC
Output current (to supply the actuators/the output is switched on)	
High level (nominal value)	0.5 A ³⁾
High level (permissible range for short-term over- load (maximum 5 minutes))	< 1.0 A
Permissible total current over all outputs	≤ 10 A ⁴⁾
Simultaneity factor	Depends on the permissible total current over all outputs
Output delay for signal change and resistive load ($R_{LO} < 1$ k Ω)	
From Low to High level	< 300 μ s
From High to Low level	< 300 μ s
Load resistance range	> 48 Ω
Connectable equipment	
Resistive load R_{LO}	> 48 Ω
Inductive load R_{LI}	< 1.2 H
Lamp load R_{LL}	< 6 W

Designation	Value
Switching frequency	
With resistive load ($R_{LO} < 1 \text{ k}\Omega$)	< 100 Hz
Output according to IEC/EN 61131-2	Short-circuit proof, → Page 230
Restart after removal of a short-circuit	Automatic

- 1) The supply terminal (U_L) provides the current for the module electronics and for the consumers on the outputs. The overall current that is required for each module is the sum of all the individual currents.
- 2) A part of the electronics of the XI/ON module is supplied from the module bus voltage (5 V DC), the rest from the supply terminal (U_L).
- 3) Two outputs can be connected in parallel to increase the maximum output current to 1 A.
- 4) The total current of the outputs switched simultaneously must not overload the current load of the feeding supply terminal U_L . The number of outputs that can be switched simultaneously may therefore be less than the total number of channels of the device.

Diagnostic messages

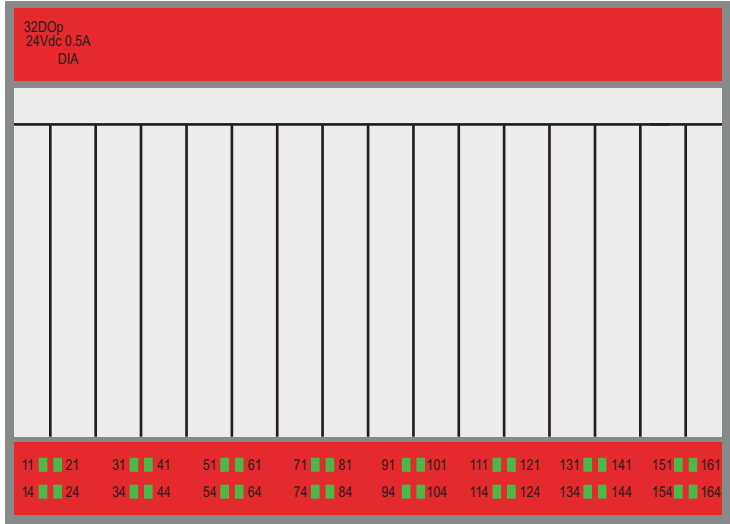


Table 47: Diagnostics through the LEDs

LED	Display	Meaning	Remedy
DIA	Red flashing, 0.5 Hz	There is a short-circuit on at least one of the 32 channels. A diagnostics message will be transmitted.	Remove the short-circuit on the corresponding channel.
	Red	Failure of module bus communication	Check whether more than two adjacent electronics modules have been removed.
	OFF	No fault indication or diagnostics	–
11	Green	Status of channel 1 = 1	–
	OFF	Status of channel 1 = 0	–
⋮			
161	Green	Status of channel 16 = 1	–
	OFF	Status of channel 16 = 0	–

LED	Display	Meaning	Remedy
14	Green	Status of channel 17 = 1	–
	OFF	Status of channel 17 = 0	–
⋮			
164	Green	Status of channel 32 = 1	–
	OFF	Status of channel 32 = 0	–

The module features the following diagnostics data (groupwise short-circuit detection):

- **Overcurrent** (short-circuit) channel 1...4
- **Overcurrent** (short-circuit) channel 5...8
- **Overcurrent** (short-circuit) channel 9...12
- **Overcurrent** (short-circuit) channel 13...16
- **Overcurrent** (short-circuit) channel 17...20
- **Overcurrent** (short-circuit) channel 21...24
- **Overcurrent** (short-circuit) channel 25...28
- **Overcurrent** (short-circuit) channel 29...32

Base modules

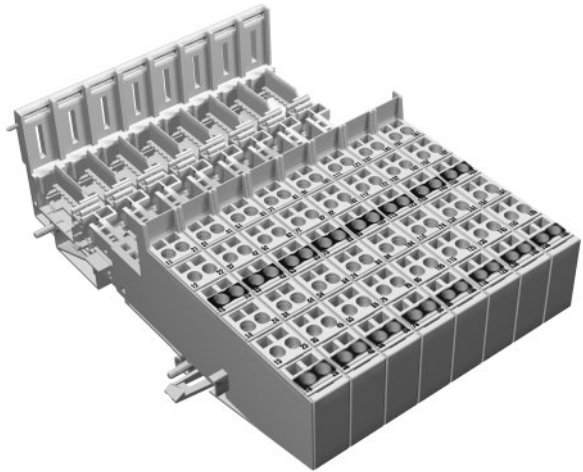


Figure 111: Base module XN-B6T-SBCSBC

	Base modules
With tension clamp connection	XN-B6T-SBCSBC
With screw connection	XN-B6S-SBCSBC

Connection diagram

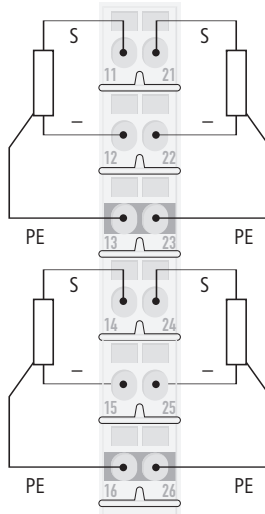


Figure 112: Connection diagram XN-B6x-SBCSBC

→ "Technical data for the terminals", page 24

4 Digital output modules
 XNE-8DO-24VDC-0.5A-P

XNE-8DO-24VDC-0.5A-P

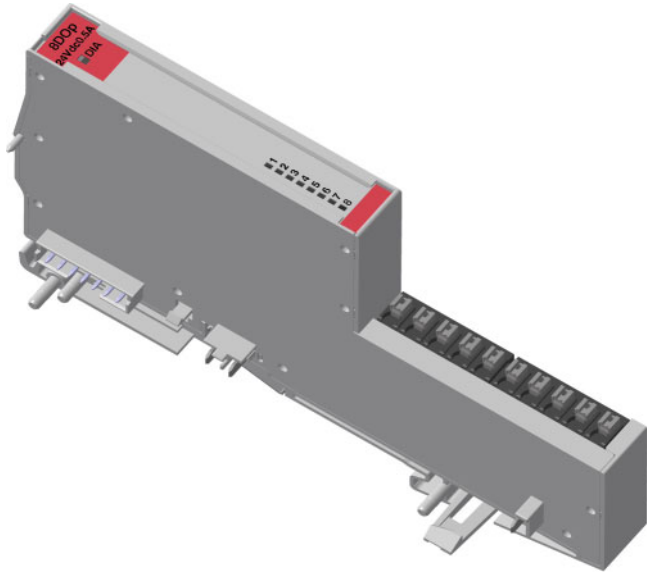


Figure 113: Digitale output module (XNE ECO), 8 digital outputs, 24 V DC, 0.5 A, positive switching

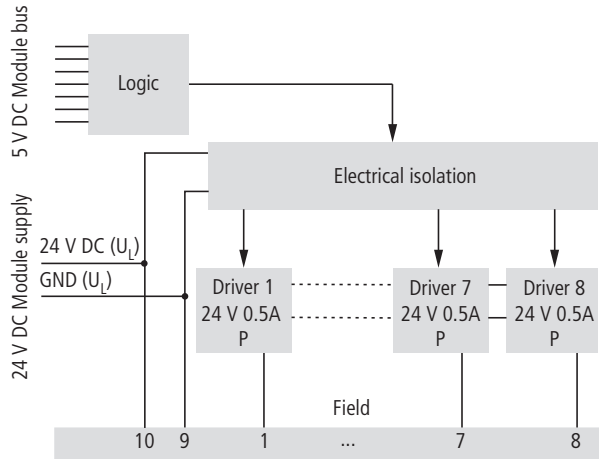


Figure 114: Block diagram

Technical data

Table 48: XNE-8DO-24VDC-0.5A-P

Designation	Value
Number of channels	8
Nominal supply from supply terminal U_L (range)	24 V DC (18...30 V DC)
Nominal current consumption from supply terminal $I_L^{1)2)}$	≤ 3 mA (when load current = 0 mA, all outputs OFF)
Nominal current consumption from module bus $I_{MB}^{2)}$	≤ 15 mA
Insulation voltage (channels to module bus)	500 V_{rms}
Power loss	Normally 1.5 W
Output voltage	
High level (the output is switched on and loaded)	$> U_L - 1$ V DC
Output current (to supply the actuators/the output is switched on)	
High level (nominal value)	0.5 A ³⁾
High level (permissible range for short-term over- load (maximum 5 minutes))	< 1.0 A
Permissible total current over all outputs	≤ 4 A ¹⁾
Simultaneity factor	100 %
Output delay for signal change and resistive load ($R_{LO} < 1$ k Ω)	
From Low to High level	< 300 μ s
From High to Low level	< 300 μ s
Load resistance range	> 48 Ω
Connectable equipment	
Resistive load R_{LO}	> 48 Ω
Inductive load R_{LI}	To DC13 according to IEC/EN 60947-5-1
Lamp load R_{LL}	< 6 W

4 Digital output modules

XNE-8DO-24VDC-0.5A-P

Designation	Value
Switching frequency	
With resistive load ($R_{LO} < 1 \text{ k}\Omega$)	< 100 Hz
With inductive load	To DC13 according to IEC/EN 60947-5-1
With lamp load	< 10 Hz
Output according to IEC/EN 61131-2	Short-circuit proof, → Page 230
Restart after removal of a short-circuit	Automatic

- 1) The supply terminal (U_L) provides the current for the module electronics and for the consumers on the outputs. The overall current that is required for each module is the sum of all the individual currents.
- 2) A part of the electronics of the XI/ON module is supplied from the module bus voltage (5 V DC), the rest from the supply terminal (U_L).
- 3) Two outputs can be connected in parallel to increase the maximum output current to 1 A.

Diagnostic messages

Table 49: Diagnostics through the LEDs

LED	Display	Meaning	Remedy
DIA	Red	Failure of module bus communication	Check whether more than two adjacent electronics modules have been removed.
	OFF	No error message	-
1...8	Green	Status of channel: 1	-
	OFF	Status of channel: 0	-

8DOp
24Vdc0.5A
■ DIA

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8

Connection diagram

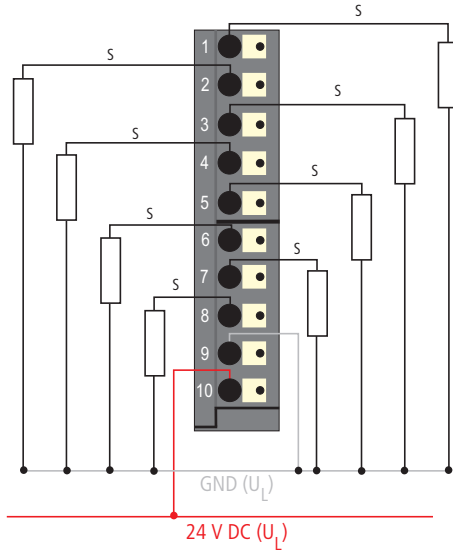


Figure 115: Connection diagram for XNE-8DO-24VDC-0.5A-P with supply of the actuators

XNE-16DO-24VDC-0.5A-P

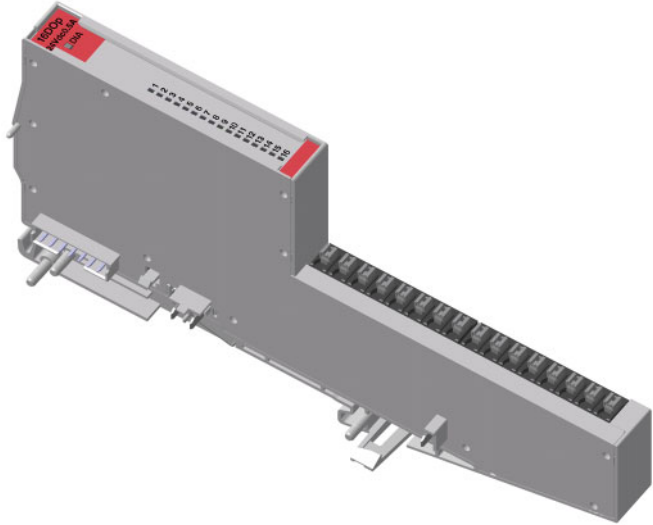


Figure 116: Digitale output module (XNE ECO), 16 digital outputs, 24 V DC, 0.5 A, positive switching

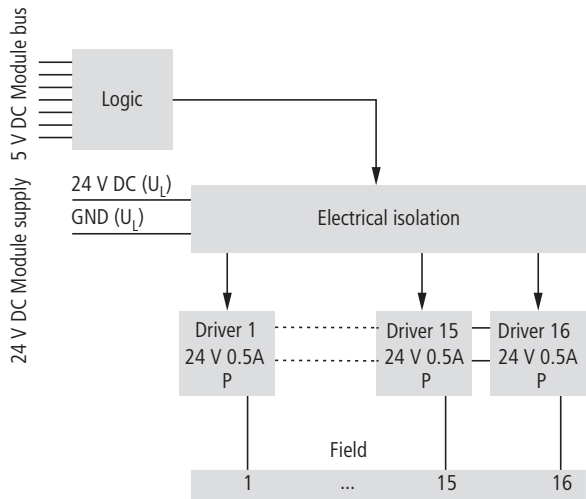


Figure 117: Block diagram

4 Digital output modules

XNE-16DO-24VDC-0.5A-P

Technical data

Table 50: XNE-16DO-24VDC-0.5A-P

Designation	Value
Number of channels	16
Nominal supply from supply terminal U_L (range)	24 V DC (18...30 V DC)
Nominal current consumption from supply terminal I_L ¹⁾²⁾	≤ 3 mA (when load current = 0 mA, all outputs OFF)
Nominal current consumption from module bus I_{MB} ²⁾	≤ 25 mA
Insulation voltage (channels to module bus)	500 V_{rms}
Power loss	Normally 2.5 W
Output voltage	
High level (the output is switched on and loaded)	$> U_L - 1$ V DC
Output current (to supply the actuators/the output is switched on)	
High level (nominal value)	0.5 A ³⁾
High level (permissible range for short-term over- load (maximum 5 minutes))	< 1.0 A
Permissible total current over all outputs	≤ 4 A ¹⁾
Simultaneity factor	Depends on the permissible total current over all outputs
Output delay for signal change and resistive load ($R_{LO} < 1$ k Ω)	
From Low to High level	< 300 μ s
From High to Low level	< 300 μ s
Load resistance range	> 48 Ω
Connectable equipment	
Resistive load R_{LO}	> 48 Ω
Inductive load R_{LI}	to DC13 according to IEC/EN 60947-5-1

Designation	Value
Lamp load R_{LL}	< 6 W
Switching frequency	
With resistive load ($R_{LO} < 1 \text{ k}\Omega$)	< 100 Hz
With inductive load	To DC13 according to IEC/EN 60947-5-1
With lamp load	< 10 Hz
Output according to IEC/EN 61131-2	Short-circuit proof, → Page 230
Restart after removal of a short-circuit	Automatic

- 1) The supply terminal (U_L) provides the current for the module electronics and for the consumers on the outputs. The electrical connection for the switched loads to ground GND_L must be made modular external. The overall current that is required for each module is the sum of all the individual currents.
- 2) A part of the electronics of the XI/ON module is supplied from the module bus voltage (5 V DC), the rest from the supply terminal (U_L).
- 3) Two outputs can be connected in parallel to increase the maximum output current to 1 A.

Diagnostics messages

Table 51: Diagnostics through the LEDs

LED	Display	Meaning	Remedy
DIA	Red	Failure of module bus communication	Check whether more than two adjacent electronics modules have been removed.
	OFF	No error message	-
1...16	Green	Status of channel: 1	-
	OFF	Status of channel: 0	-

16 DO_p
 24 Vdc 0.5 A
 ■ DIA

■ 1
 ■ 2
 ■ 3
 ■ 4
 ■ 5
 ■ 6
 ■ 7
 ■ 8
 ■ 9
 ■ 10
 ■ 11
 ■ 12
 ■ 13
 ■ 14
 ■ 15
 ■ 16

Connection diagram

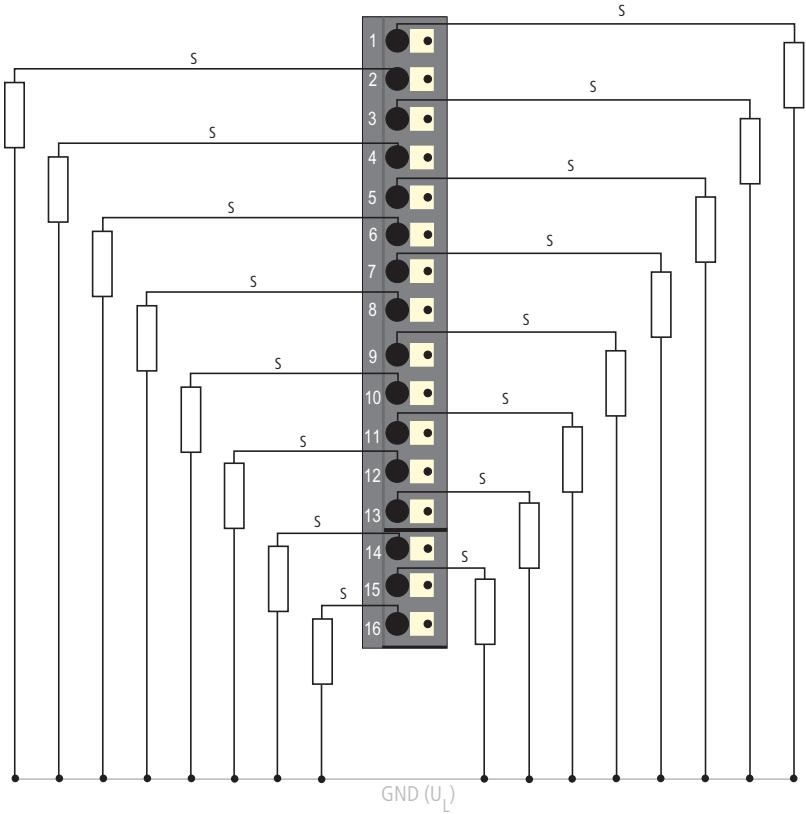


Figure 118: Connection diagram for XNE-16DO-24VDC-0.5A-P

4 Digital output modules

Overview: base modules for digital output modules

Overview: base modules for digital output modules

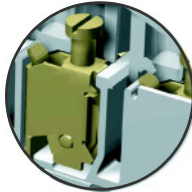
Tension clamp connection



Electronics modules

	Base modules					
	XN-S3T-SBC	XN-S4T-SBCS	XN-S6T-SBCSBC	XN-B3T-SBC	XN-B6T-SBCSBC	
XN-2DO-24VDC-0.5A-P	●	●				
XN-2DO-24VDC-0.5A-N	●	●				
XN-2DO-24VDC-2A-P	●	●				
XN-2DO-120/230VAC-0.5A	●	●				
XN-4DO-24VDC-0.5A-P		●	●			
XN-16DO-24VDC-0.5A-P				●		
XN-32DO-24VDC-0.5A-P					●	

Screw connection



Electronics modules

	Base modules					
	XN-S3S-SBC	XN-S4S-SBCS	XN-S6S-SBCSBC	XN-B3S-SBC	XN-B6S-SBCSBC	
XN-2DO-24VDC-0.5A-P	●	●				
XN-2DO-24VDC-0.5A-N	●	●				
XN-2DO-24VDC-2A-P	●	●				
XN-2DO-120/230VAC-0.5A	●	●				
XN-4DO-24VDC-0.5A-P		●	●			
XN-16DO-24VDC-0.5A-P				●		
XN-32DO-24VDC-0.5A-P					●	

5 Relay modules

General

The XI/ON relay modules (R) receive output values from the gateway via the internal module bus. The modules convert these values and transmit the appropriate switching states per channel to the field level via the base module.

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

Relay modules are fitted with reverse polarity protection, and electrically isolated from the supply voltage.

Relay modules are built as XN standard electronics modules in slice design. They are completed by base modules with tension clamp or screw connection.

There are no parameter setting options for relay modules.

LED indicators

Error messages from the I/O level are made on a module basis, through the collective **DIA** indicator LED. The corresponding diagnostics information is transmitted to the gateway as diagnostics bits. If the **DIA** LED is permanently red, this indicates that the module bus communication has failed for the relay modules.

Load limit curve for resistive load

For 1000 switching actions, not continuous arc may occur that burns for more than > 10 ms.

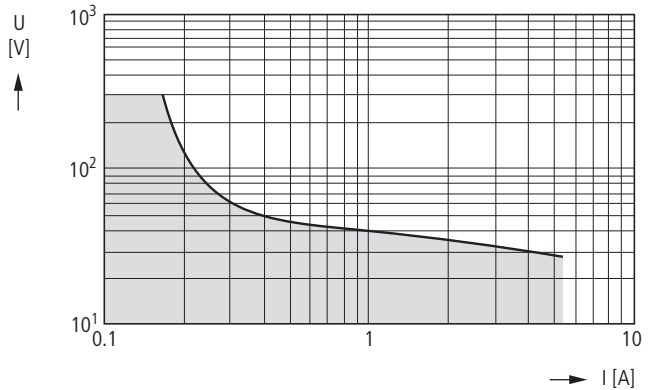


Figure 119: Definition of the load limit curve



Attention!

When using relay modules, a standard module representation should be avoided as far as possible. Otherwise, if relay modules are swapped (changeover/N/C/N/O) a short-circuit could be caused that destroys the module.



Attention!

External suppression components should be fitted when using inductive loads.



To avoid interferences in analog I/O modules and in technology modules (can be caused when relay modules switch loads):

- Do **not** place analog I/O modules and technology modules contiguous to relay modules.
- Suppress interferences of the switch contact externally.

Module overview

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

XN-2DO-R-NC

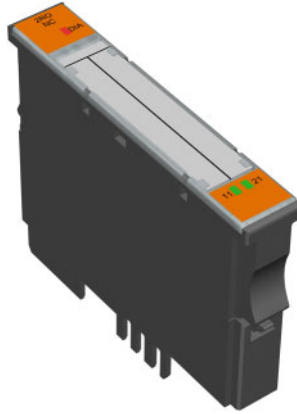


Figure 120: Relay module, 2 break contacts

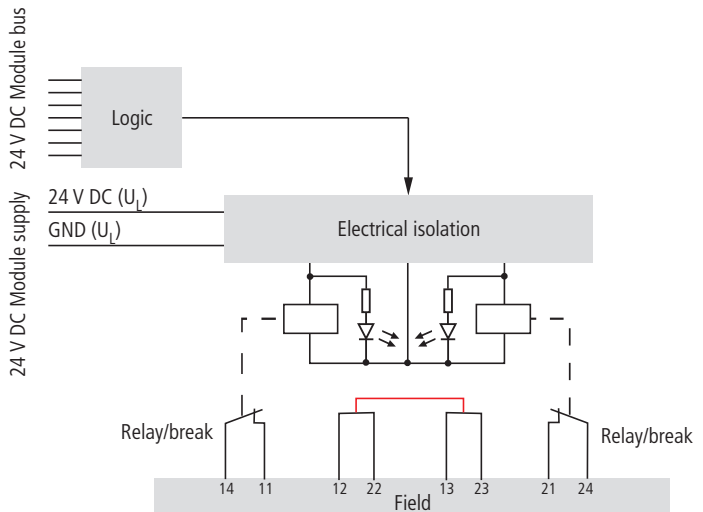


Figure 121: Block diagram XN-2DO-R-NC with the base module XN-S4x-SBBS

5 Relay modules

XN-2DO-R-NC

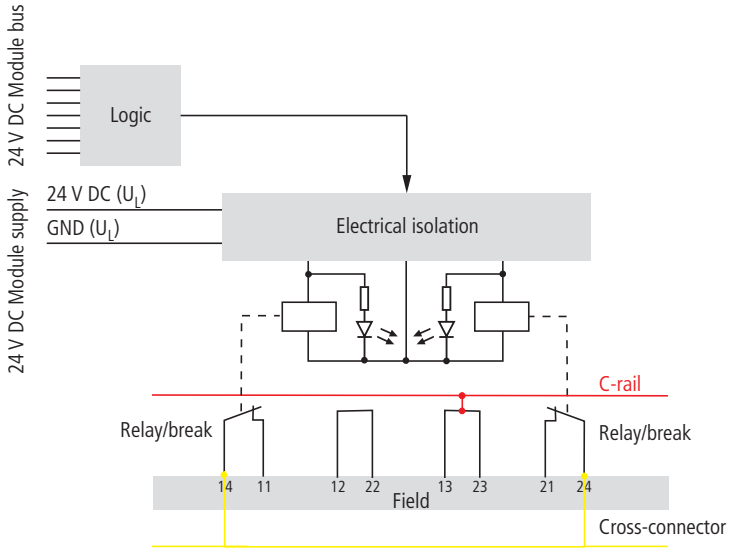


Figure 122: Block diagram XN-2DO-R-NC with the base module XN-S4x-SBCS

Technical data



Attention!

The relay outputs must be protected by an external fuse (6A fast)!

Table 52: XN-2DO-R-NC

Designation	Value
Relay outputs	
Number of channels	2
Implementation of the channels	Break contacts
Contact type/material	AgSnO ₂
Nominal supply from supply terminal U _L (range)	24 V DC (18...30 V DC)
Nominal current consumption from supply terminal I _L ¹⁾	≅ 20 mA
Nominal current consumption from module bus I _{MB} ¹⁾	≅ 28 mA
Insulation voltage	
Relay output to relay output	No
Relay output to module bus	1500 V _{rms}
Relay output to U _L	1500 V _{rms}
Module bus to U _L	500 V _{rms}
Power loss	Normally 1 W
Connectable equipment	Resistive loads Inductive loads Lamp loads
Switching voltage (to supply the actuators)	
Nominal load voltage	230 V AC/30 V DC
Switching current (to supply the actuators)	
Output current per channel at 230 V AC	
Nominal current (AC15) 250 V AC	1.5 A
Maximum continuous current	2 A
Maximum continuous current, resistive load	5 A, load-dependent

5 Relay modules

XN-2DO-R-NC

Designation	Value
Output current for DC voltage (purely resistive)	
Load limit curve	→ Figure 119
Nominal current (DC13) 24 V DC	1 A
Switching frequency (resistive load, inductive load and lamp load)	< 0.1 Hz
Minimum load current	100 mA at ≥ 12 V DC
Utilization factor	100 %
Lifespan (number of switching operations)	
At 230 V AC	> $0,1 \times 10^6$ at 5 A > 1×10^6 at 0.5 A
At AC15 (250 V AC)	1×10^5 at 2 A 2×10^5 at 1 A 4×10^5 at 0.5 A
At DC13 (24 V DC)	2×10^5 at 1 A > 5×10^5 at 0.5 A

- 1) A part of the electronics of the XI/ON module is supplied from the module bus voltage (5 V DC), the rest from the supply terminal (U_L).

Diagnostic messages

Table 53: Diagnostics through the LEDs



LED	Display	Meaning	Remedy
DIA	Red	Failure of module bus communication	Check whether more than two adjacent electronics modules have been removed.
	OFF	No fault indication 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	–

Base modules

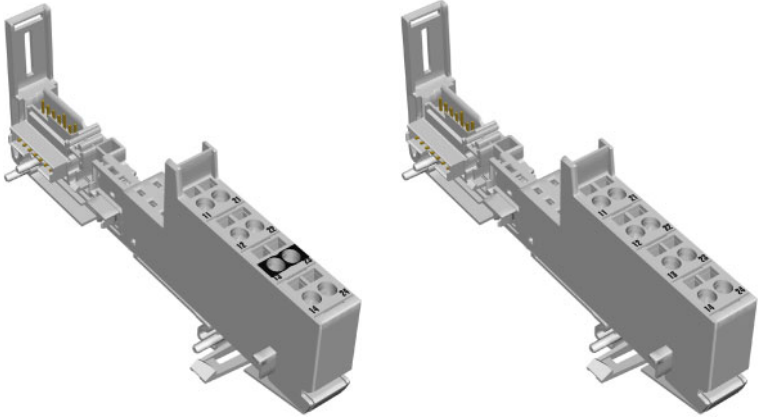


Figure 123: Base modules XN-S4T-SBBS (left) and XN-S4T-SBCS (right)

	Base modules
With tension clamp connection	XN-S4T-SBBS XN-S4T-SBCS
With screw connection	XN-S4S-SBBS XN-S4S-SBCS

Connection diagrams

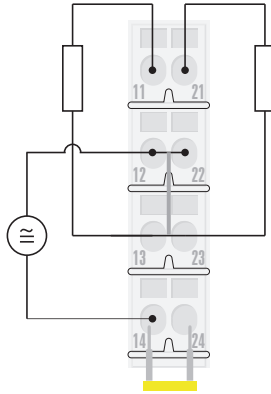


Figure 124: Connection diagram for XN-S4x-SBBS with externally applied supply and linked root (14/24). The contacts 12/22/13/23 are linked internally.

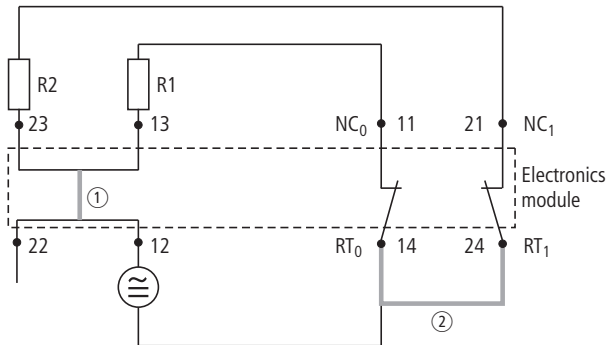


Figure 125: Module circuit diagram XN-S4x-SBBS

- ① Linked in the electronics
- ② Cross-connection via QVR to the base

5 Relay modules XN-2DO-R-NC

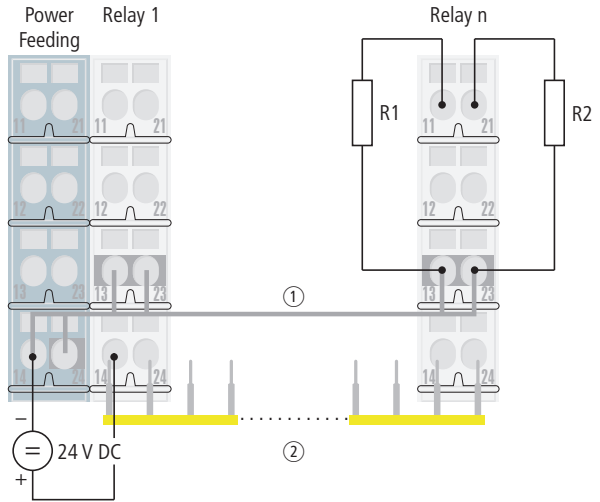


Figure 126: Connection diagram for XN-S4x-SBCS with supply via C-rail and linked root.

- ① Supply via C-rail (-)
- ② Max. 8 relay modules (+)

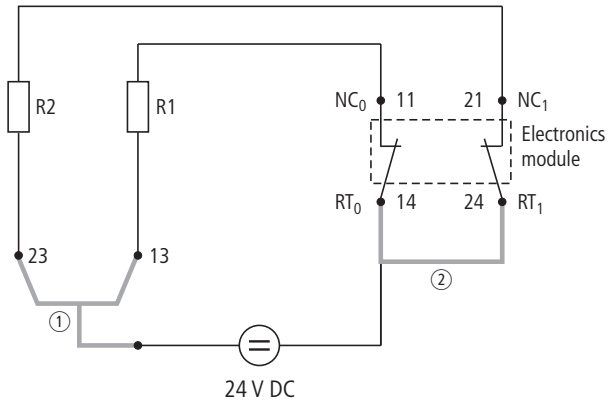


Figure 127: Module circuit diagram XN-S4x-SBCS

- ① C-rail
- ② Cross-connection via QVR to the base



Warning!

The C-rail must not have a potential above 24 V.
Not 230 V!



The contact designations for the base module
are not the relay contact designations according
to DIN.

→ “Technical data for the terminals”, page 24

5 Relay modules
 XN-2DO-R-NO

XN-2DO-R-NO

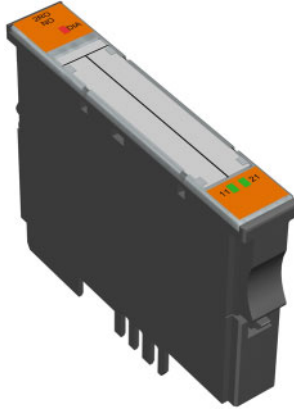


Figure 128: Relay module, 2 make contacts

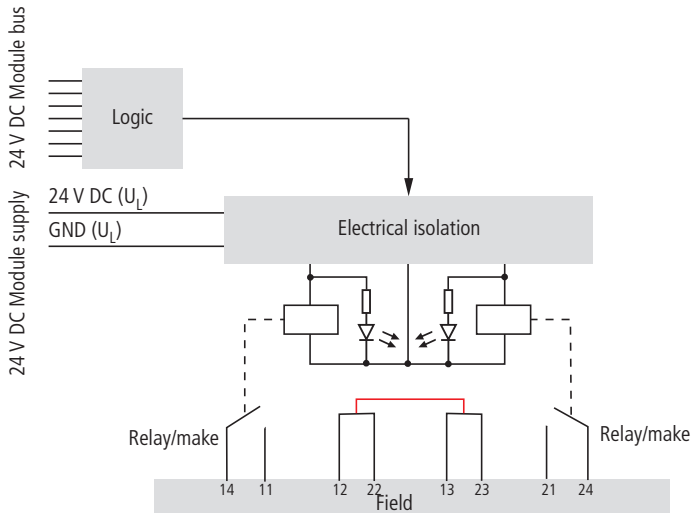


Figure 129: Block diagram XN-2DO-R-NO with the base module XN-S4x-SBBS

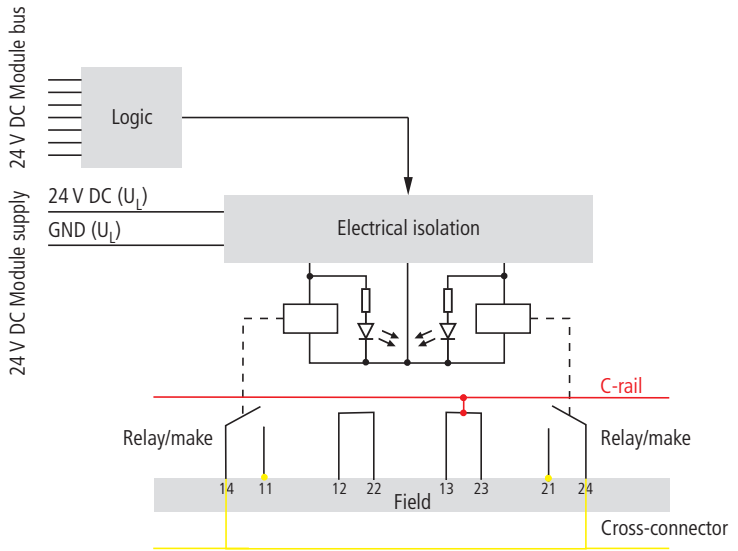


Figure 130: Block diagram XN-2DO-R-NO with the base module XN-S4x-SBCS

5 Relay modules

XN-2DO-R-NO

Technical data

Table 54: XN-2DO-R-NO

Designation	Value
Relay outputs	
Number of channels	2
Implementation of the channels	Make contacts
Contact type/material	AgSnO ₂
Nominal supply from supply terminal U _L (range)	24 V DC (18...30 V DC)
Nominal current consumption from supply terminal I _L ¹⁾	≤ 20 mA
Nominal current consumption from module bus I _{MB} ¹⁾	≤ 28 mA
Insulation voltage	
Relay output to relay output	No
Relay output to module bus	1500 V _{rms}
Relay output to U _L	1500 V _{rms}
Module bus to U _L	500 V _{rms}
Power loss	Normally 1 W
Connectable equipment	Resistive loads Inductive loads Lamp loads
Switching voltage (to supply the actuators)	
Nominal load voltage	230 V AC/30 V DC
Switching current (to supply the actuators)	
Output current per channel at 230 V AC	
Nominal current (AC15) 250 V AC	3 A
Maximum continuous current	2 A
Maximum continuous current, resistive load	5 A, load-dependent
Output current for DC voltage (purely resistive)	
Load limit curve	→ Figure 119
Nominal current (DC13) 24 V DC	1 A

Designation	Value
Switching frequency (resistive load, inductive load and lamp load)	< 0.1 Hz
Minimum load current	100 mA at ≥ 12 V DC
Utilization factor	100 %
Lifespan (number of switching operations)	
At 230 V AC	> $0,1 \times 10^6$ at 5 A > 1×10^6 at 0.5 A
At AC15 (250 V AC)	1×10^5 at 2 A 2×10^5 at 1 A 4×10^5 at 0.5 A
At DC13 (24 V DC)	2×10^5 at 1 A > 5×10^5 at 0.5 A

- 1) A part of the electronics of the XI/ON module is supplied from the module bus voltage (5 V DC), the rest from the supply terminal (U_L).

Diagnostic messages

Table 55: Diagnostics through the LEDs



LED	Display	Meaning	Remedy
DIA	Red	Failure of module bus communication	Check whether more than two adjacent electronics modules have been removed.
	OFF	No error message	–
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	–

Base modules

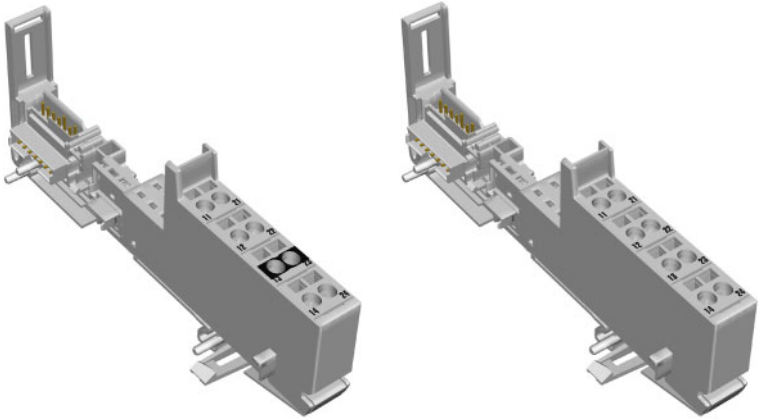


Figure 131: Base modules XN-S4T-SBBS (left) and XN-S4T-SBCS (right)

	Base modules
With tension clamp connection	XN-S4T-SBBS XN-S4T-SBCS
With screw connection	XN-S4S-SBBS XN-S4S-SBCS

Connection diagrams

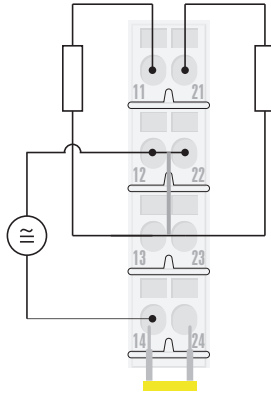


Figure 132: Connection diagram for XN-S4x-SBBS with externally applied supply and linked root

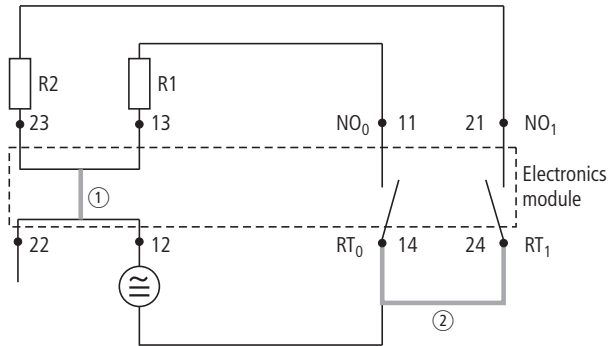


Figure 133: Module circuit diagram XN-S4x-SBBS

- ① Linked in the electronics
- ② Cross-connection via QVR to the base

5 Relay modules XN-2DO-R-NO

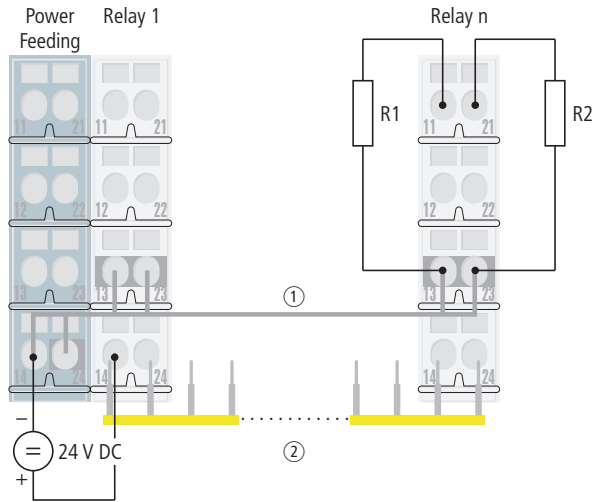


Figure 134: Connection diagram for XN-S4x-SBCS with supply via C-rail and linked root

- ① Supply via C-rail
- ② Max. 8 relay modules

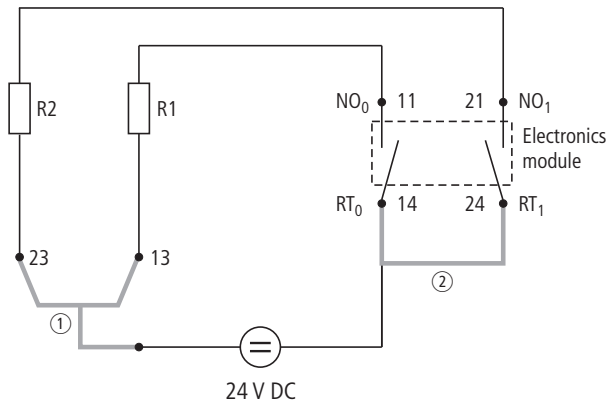


Figure 135: Module circuit diagram XN-S4x-SBCS

- ① C-rail
- ② Cross-connection via QVR to the base



Warning!

The C-rail must not have a potential above 24 V.
Not 230 V!



The contact designations for the base module
are not the relay contact designations according
to DIN.

→ "Technical data for the terminals", page 24

XN-2DO-R-CO

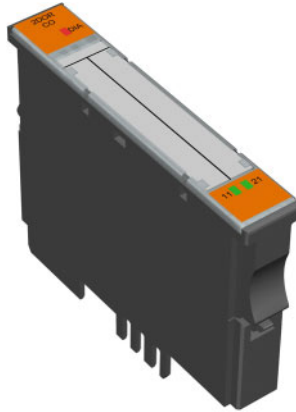


Figure 136: Relay module, 2 changeover contacts

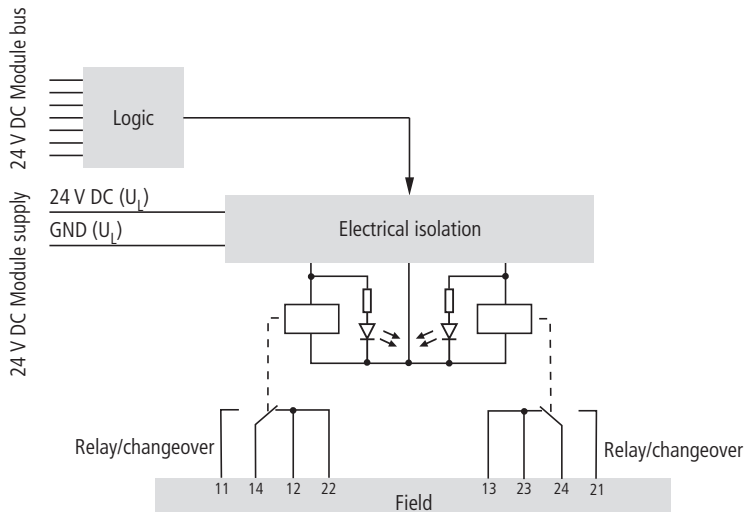


Figure 137: Block diagram XN-2DO-R-CO with the base module XN-S4x-SBBS

Technical data

Table 56: XN-2DO-R-CO

Designation	Value
Relay outputs	
Number of channels	2
Implementation of the channels	Changeover contacts
Contact type/material	AgSnO ₂
Nominal supply from supply terminal U _L (range)	24 V DC (18...30 V DC)
Nominal current consumption from supply terminal I _L ¹⁾	≤ 20 mA
Nominal current consumption from module bus I _{MB} ¹⁾	≤ 28 mA
Insulation voltage	
Relay output to relay output	No
Relay output to module bus	1500 V _{rms}
Relay output to U _L	1500 V _{rms}
Module bus to U _L	500 V _{rms}
Power loss	Normally 1 W
Connectable equipment	Resistive loads Inductive loads Lamp loads
Switching voltage (to supply the actuators)	
Nominal load voltage	230 V AC/30 V DC
Switching current (to supply the actuators)	
Output current per channel at 230 V AC	
Nominal current (AC15) 250 V AC at make contacts	3 A
Nominal current (AC15) 250 V AC at break contacts	1.5 A
Maximum continuous current	2 A
Maximum continuous current, resistive load	5 A, load-dependent
Output current for DC voltage (purely resistive)	
Load limit curve	→ Figure 119
Nominal current (DC13) 24 V DC	1 A

Designation	Value
Switching frequency (resistive load, inductive load and lamp load)	< 0.1 Hz
Minimum load current	100 mA at ≥ 12 V DC
Utilization factor	100 %
Lifespan (number of switching operations)	
At 230 V AC	> $0,1 \times 10^6$ at 5 A > 1×10^6 at 0.5 A
At AC15 (250 V AC)	1×10^5 at 2 A 2×10^5 at 1 A 4×10^5 at 0.5 A
At DC13 (24 V DC) make contacts	2×10^5 at 1 A > 5×10^5 at 0.5 A

- 1) A part of the electronics of the XI/ON module is supplied from the module bus voltage (5 V DC), the rest from the supply terminal (U_L).

Diagnostic messages

Table 57: Diagnostics through the LEDs



LED	Display	Meaning	Remedy
DIA	Red	Failure of module bus communication	Check whether more than two adjacent electronics modules have been removed.
	OFF	No error message	–
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	–

Base modules

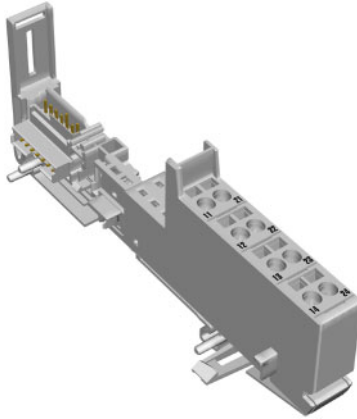


Figure 138: Base module XN-S4T-SBBS

	Base modules
With tension clamp connection	XN-S4T-SBBS
With screw connection	XN-S4S-SBBS

Connection diagrams

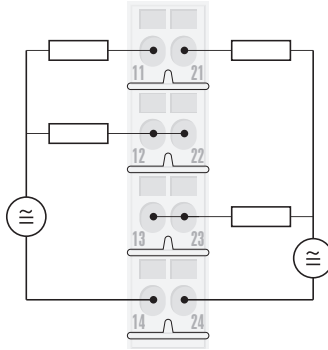


Figure 139: Connection diagram XN-S4x-SBBS

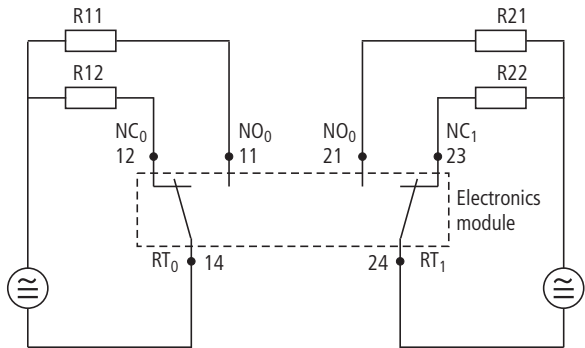


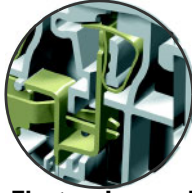
Figure 140: Module circuit diagram XN-S4x-SBBS

→ The contact designations for the base module do not correspond to the relay contact designations according to DIN.

→ "Technical data for the terminals", page 24

**Overview:
base modules for
relay modules**

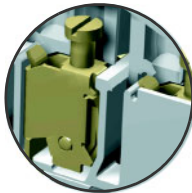
Tension clamp connection



Electronics modules

	Base modules	
	XN-S4T-SBBS	XN-S4T-SBCS
XN-2DO-R-NC	●	●
XN-2DO-R-NO	●	●
XN-2DO-R-CO	●	

Screw connection



Electronics modules

	Base modules	
	XN-S4S-SBBS	XN-S4S-SBCS
XN-2DO-R-NC	●	●
XN-2DO-R-NO	●	●
XN-2DO-R-CO	●	

5 Relay modules

Overview: base modules for relay modules

6 Integration in PROFIBUS-DP

Process input data / process output data

The process data are transmitted byte-wise (8-Bit) across the PROFIBUS. The digital module types have 1 bit of process data for each channel. This bit indicates the channel status (digital input) or fixes the channel status (digital output/relay).

The digital input modules only provide process input data.

The digital output modules and relay modules only receive process output data.

Process data from modules with a sum of 8 channels or less can be bundled together as 1 byte (8 bits). This reduces the total amount of process data. Bundling the process data in this way is known as **Packing**.

The packing of the modules is arranged by a software tool during the project engineering phase for the XI/ON station. A detailed description with corresponding examples can be found in the manual:

- User Manual XI/ON:
Gateways for PROFIBUS-DP



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

6 Integration in PROFIBUS-DP

Process input data / process output data

Examples for allocation of the process data bits to the terminals

The assignment of the channels to the individual process data bits is generally in ascending order. The data can belong to various modules because of the option of bundling the data of 2 or 4-channel modules. The modules must not necessarily be located alongside one another. The least significant bits are invalid if not all 8 bits of a process data byte are filled out.

Example 1

The following overview of the process input data of two **packed** XN-4DI-24VDC-P modules and the corresponding terminal numbers of the connection level:

Table 58: Example of a terminal number/process input data assignment

Byte 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Terminal numbers of Byte 0	24	14	21	11	24	14	21	11
	Second module XN-4DI-24VDC-P				First module XN-4DI-24VDC-P			

Example 2

The following overview of the process input data of a XN-32DI-24VDC-P module and the corresponding terminal numbers of the connection level:

Table 59: Example of a terminal number/process input data assignment

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Terminal numbers of Byte 0	81	71	61	51	41	31	21	11
Terminal numbers of Byte 1	161	151	141	131	121	111	101	91
Terminal numbers of Byte 2	84	74	64	54	44	34	24	14
Terminal numbers of Byte 3	164	154	144	134	124	114	104	94

Example 3

The following overview of the process output data of a XNE-8DO-24VDC-0.5A-P module and the corresponding terminal numbers of the connection level:

Table 60: Example of a terminal number/process input data assignment

Byte 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Terminal numbers of Byte 0	8	7	6	5	4	3	2	1

6 Integration in PROFIBUS-DP

Diagnostics

Diagnostics

The digital input modules do not provide diagnostics data.

The digital output modules and supply modules do provide diagnostics messages:

Module type	Diagnostics message	Position in diagnostics byte	Meaning
XN-2DO-24VDC-0.5A-P	Overcurrent	Bit 0	
XN-2DO-24VDC-0.5A-N			
XN-2DO-24VDC-2A-P			
XN-4DO-24VDC-0.5A-P	ovrcurr/shrt-circ (≥1 of K1-4)	Bit 0	There is a short-circuit on at least one of channels 1...4.
XN-16DO-24VDC-0.5A-P	ovrcurr/shrt-circ (≥1 of K1-4)	Bit 0	There is a short-circuit on at least one channel in the group of 4.
	ovrcurr/shrt-circ (≥1 of K5-8)	Bit1	
	ovrcurr/shrt-circ (≥1 of K9-12)	Bit2	
	ovrcurr/shrt-circ (≥1 of K13-16)	Bit3	

Module type	Diagnostics message	Position in diagnostics byte	Meaning
XN-32DO-24VDC-0.5A-P	ovrcurr/shrt-circ (≥1 of K1-4)	Bit 0	There is a short-circuit on at least one channel in the group of 4.
	ovrcurr/shrt-circ (≥1 of K5-8)	Bit1	
	ovrcurr/shrt-circ (≥1 of K9-12)	Bit2	
	ovrcurr/shrt-circ (≥1 of K13-16)	Bit3	
	ovrcurr/shrt-circ (≥1 of K17-20)	Bit4	
	ovrcurr/shrt-circ (≥1 of K21-24)	Bit5	
	ovrcurr/shrt-circ (≥1 of K25-28)	Bit6	
	ovrcurr/shrt-circ (≥1 of K29-32)	Bit 7	

XN-2DO-120/230VAC-0.5A, XNE-8DO-24VDC-0.5A-P and XNE-16DO-24VDC-0.5A-P do not provide diagnostics data.

6 Integration in PROFIBUS-DP

Parameters

Parameters

There are no settable parameters for the digital input modules and output modules, or the relay modules.

However, please note that all the modules that appear in the **Standard module representation** during the project engineering planning with a software tool will occupy one parameter byte.

This parameter byte contains the number of other parameter bytes for the modules.

In the case of the digital input modules and output modules, or the relay modules, the value of the parameter byte is always 00_{hex}.

Furthermore, please note that the response of the digital outputs in a fault condition (change of module, wrong module replaced, fieldbus error) can be defined through gateway parameters.

The description of these gateway parameters can be found in the manual:

- User Manual XI/ON:
Gateways for PROFIBUS-DP

7 Integration in CANopen

Process input data/ process output data

The digital module types have 1 bit of process data for each channel. This bit indicates the channel status (digital input) or fixes the channel status (digital output/relay).

The digital input modules only provide process input data.

The digital output modules and relay modules only receive process output data.

Objects, which can be defined by the Device Profile for I/O-Devices CiA DS-401, can be used to display the channel values as groups of 32, 16, 8 bits or as a single display of the values.



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

7 Integration in CANopen

Objects for reading the process input data

Objects for reading the process input data

Overview

The objects indicate the process input values for each digital input channel in an XI/ON station.

The user has the option of choosing between 4 different formats for the representation of the values:

- Only one channel is displayed per Sub-index (Objects 6020_{hex}, 6021_{hex} and 6022_{hex})
- 8 channels are displayed per Sub-index (Object 6000_{hex}).
- 16 channels are displayed per Sub-index (Object 6100_{hex}).
- 32 channels are displayed per Sub-index (Object 6120_{hex}).

Table 61: Objects for the process input data

Index (hex)	Page	Name
6000 _{hex}	→ Page 197	Read Input 8 Bit
6020 _{hex}	→ Page 198	Read Input Bit (1...128)
6021 _{hex}	→ Page 198	Read Input Bit (129...256)
6022 _{hex}	→ Page 198	Read Input Bit (257...288)
6100 _{hex}	→ Page 199	Read Input 16 Bit
6120 _{hex}	→ Page 200	Read Input 32 Bit

6000_{hex} Read Input 8 Bit

The object presents the values for the digital input modules in 8-bit groups.

A total of 36 groups (each 8-bit) can be displayed (288 digital input channels).

A PDO-Mapping of this object is always made automatically as a default for the first 8 sub-indices. This corresponds to 64 digital input channels.

If more than 64 input channels are present, then the **PDO-Mapping** must be carried out by the user.

Table 62: Object 6000_{hex} description

Feature	Sub-index	Description/Value
Name		Read Input 8 Bit
Object Code		ARRAY
PDO Mapping		Yes
Data type	Sub-index 00 _{hex}	Unsigned8
	Sub-index 01 _{hex} ...24 _{hex}	Unsigned8
Access	Sub-index 00 _{hex}	ro
	Sub-index 01 _{hex} ...24 _{hex}	ro
Default value, XI/ON	Sub-index 00 _{hex}	No
	Sub-index 01 _{hex} ...24 _{hex}	No

7 Integration in CANopen

Objects for reading the process input data

6020_{hex} Read Input Bit (1...128)

6021_{hex} Read Input Bit (129...256)

6022_{hex} Read Input Bit (257...288)

The objects are a bit-wise representation of the values of the digital input modules. Each Sub-index for these objects is a Boolean value.

A total of 128 bits can be represented (128 digital input channels).

If more than 128 input channels are present, then Object 6021_{hex} is used.

If more than 256 input channels are present, then Object 6022_{hex} is used.

Since the number of digital input channels in a station is limited to 288, it is not possible to make use of the complete range of the array in Object 6022_{hex}.

Table 63: Object 6020_{hex}, 6021_{hex}, 6022_{hex} description

Feature	Sub-index	Description/Value
Name		Read Input Bit
Object Code		ARRAY
PDO Mapping		Yes
Data type	Sub-index 00 _{hex}	Unsigned8
	Sub-index 01 _{hex} ...80 _{hex}	Boolean
Access	Sub-index 00 _{hex}	ro
	Sub-index 01 _{hex} ...80 _{hex}	ro
Default value, XI/ON	Sub-index 00 _{hex}	No
	Sub-index 01 _{hex} ...80 _{hex}	No

6100_{hex} Read Input 16 Bit

The object presents the values for the digital input modules in 16-bit groups.

A total of 18 groups (each 16-bit) can be displayed (288 digital input channels).

Table 64: Object 6100_{hex} description

Feature	Sub-index	Description/Value
Name		Read Input 16 Bit
Object Code		ARRAY
PDO Mapping		Yes
Data type	Sub-index 00 _{hex}	Unsigned8
	Sub-index 01 _{hex} ...12 _{hex}	Unsigned16
Access	Sub-index 00 _{hex}	ro
	Sub-index 01 _{hex} ...12 _{hex}	ro
Default value, XI/ON	Sub-index 00 _{hex}	No
	Sub-index 01 _{hex} ...12 _{hex}	No

7 Integration in CANopen

Objects for reading the process input data

6120_{hex} Read Input 32 Bit

The object presents the values for the digital input modules in 32-bit groups.

A total of 9 groups (each 32-bit) can be displayed (288 digital input channels).

Table 65: Object 6120_{hex} description

Feature	Sub-index	Description/Value
Name		Read Input Bit
Object Code		ARRAY
PDO Mapping		Yes
Data type	Sub-index 00 _{hex}	Unsigned8
	Sub-index 01 _{hex} ...09 _{hex}	Unsigned32
Access	Sub-index 00 _{hex}	ro
	Sub-index 01 _{hex} ...09 _{hex}	ro
Default value, XI/ON	Sub-index 00 _{hex}	No
	Sub-index 01 _{hex} ...09 _{hex}	No

Objects for writing the process output data

Overview

The objects indicate the process output values for each digital output channel in an XI/ON station.

The user has the option of choosing between 4 different formats for the representation of the values:

- Only one output channel is displayed per Sub-index (Objects 6020_{hex}, 6021_{hex} and 6022_{hex}).
- 8 output channel values are displayed per Sub-index (Object 6000_{hex}).
- 16 output channel values are displayed per Sub-index (Object 6100_{hex}).
- 32 output channel values are displayed per Sub-index (Object 6120_{hex}).

Table 66: Objects for the process output data

Index (hex)	Page	Name
6200 _{hex}	→ Page 202	Write Output 8 Bit
6220 _{hex}	→ Page 203	Write Output Bit (1...128)
6221 _{hex}	→ Page 203	Write Output Bit (129...256)
6222 _{hex}	→ Page 203	Write Output Bit (257...288)
6300 _{hex}	→ Page 204	Write Output 16 Bit
6320 _{hex}	→ Page 205	Write Output 32 Bit

7 Integration in CANopen

Objects for writing the process output data

6200_{hex} Write Output 8 Bit

The object presents the values for the digital output modules in 8-bit groups.

A total of 36 groups (each 8-bit) can be defined (288 digital output channels).

A PDO-Mapping of this object is always made automatically as a default for the first 8 sub-indices. This corresponds to 64 digital output channels.

If more than 64 output channels are present, then the **PDO-Mapping** must be carried out by the user.

Table 67: Object 6200_{hex} description

Feature	Sub-index	Description/Value
Name		Write Output 8 Bit
Object Code		ARRAY
PDO Mapping		Yes
Data type	Sub-index 00 _{hex}	Unsigned8
	Sub-index 01 _{hex} ...24 _{hex}	Unsigned8
Access	Sub-index 00 _{hex}	ro
	Sub-index 01 _{hex} ...24 _{hex}	rw
Default value, XI/ON	Sub-index 00 _{hex}	No
	Sub-index 01 _{hex} ...24 _{hex}	00 _{hex}

6220_{hex} Write Output Bit (1...128)

6221_{hex} Write Output Bit (129...256)

6222_{hex} Write Output Bit (257...288)

The objects are a bit-wise representation of the values of the digital output modules. Each Sub-index for these objects is a Boolean value.

A total of 128 bits can be represented (128 digital output channels).

If more than 128 output channels are present, then Object 6221_{hex} is used.

If more than 256 output channels are present, then Object 6222_{hex} is used.

Since the number of digital input channels in a station is limited to 288, it is not possible to make use of the complete range of the array in Object 6222_{hex}.

Table 68: Object 6220_{hex}, 6221_{hex}, 6222_{hex} description

Feature	Sub-index	Description/Value
Name		Write Output Bit
Object Code		ARRAY
PDO Mapping		Yes
Data type	Sub-index 00 _{hex}	Unsigned8
	Sub-index 01 _{hex} ...80 _{hex}	Boolean
Access	Sub-index 00 _{hex}	ro
	Sub-index 01 _{hex} ...80 _{hex}	rw
Default value, XI/ON	Sub-index 00 _{hex}	No
	Sub-index 01 _{hex} ...80 _{hex}	00 _{hex}

7 Integration in CANopen

Objects for writing the process output data

6300_{hex} Write Output 16 Bit

The object presents the values for the digital output modules in 16-bit groups.

A total of 18 groups (each 16-bit) can be defined (288 digital output channels).

Table 69: Object 6300_{hex} description

Feature	Sub-index	Description/Value
Name		Write Output 16 Bit
Object Code		ARRAY
PDO Mapping		Yes
Data type	Sub-index 00 _{hex}	Unsigned8
	Sub-index 01 _{hex} ...12 _{hex}	Unsigned16
Access	Sub-index 00 _{hex}	ro
	Sub-index 01 _{hex} ...12 _{hex}	rw
Default value, XI/ON	Sub-index 00 _{hex}	No
	Sub-index 01 _{hex} ...12 _{hex}	00 _{hex}

6320_{hex} Write Output 32 Bit

The object presents the values for the digital output modules in 32-bit groups.

A total of 9 groups (each 32-bit) can be defined (288 digital output channels).

Table 70: Object 6320_{hex} description

Feature	Sub-index	Description/Value
Name		Write Output Bit
Object Code		ARRAY
PDO Mapping		Yes
Data type	Sub-index 00 _{hex}	Unsigned8
	Sub-index 01 _{hex} ...09 _{hex}	Unsigned32
Access	Sub-index 00 _{hex}	ro
	Sub-index 01 _{hex} ...09 _{hex}	rw
Default value, XI/ON	Sub-index 00 _{hex}	No
	Sub-index 01 _{hex} ...09 _{hex}	00 _{hex}

7 Integration in CANopen

Objects for the substitute output value in the event of an error

Objects for the substitute output value in the event of an error

Overview

The objects define the substitute value and the substitute-value mode for each individual digital output channel of an XI/ON station. The substitute value is used in the event of a communication error or other unrecoverable error.

These values can not be saved in the digital output modules, since this type of module does not have an EEPROM memory. If the bus-master or the gateway is replaced, the values will have to be updated.

The user can choose between 4 different formats for the substitute-value settings of all the digital output values in the station concerned:

- Only one channel is set up per Sub-index. The substitute-value mode is then set with the Objects 6250_{hex} , 6251_{hex} and 6252_{hex} . The substitute value is set with Objects 6260_{hex} , 6261_{hex} and 6262_{hex} .
- 8 channels are set up per Sub-index. The substitute-value mode is then set with the Object 6206_{hex} . The substitute value is set with Object 6207_{hex} .
- 16 channels are set up per Sub-index. The substitute-value mode is then set with the Object 6306_{hex} . The substitute value is set with Object 6307_{hex} .
- 32 channels are set up per Sub-index. The substitute-value mode is then set with the Object 6326_{hex} . The substitute value is set with Object 6327_{hex} .

The settings are updated regardless of the format (Object) that has been selected.

7 Integration in CANopen

Objects for the substitute output value in the event of an error

Table 71: Objects for the substitute value and the substitute-value mode

Index (hex)	Page	Name
6206 _{hex}	→ Page 208	Error Mode Output 8 Bit
6207 _{hex}	→ Page 209	Error State Output 8 Bit
6250 _{hex}	→ Page 210	Error Mode Output Bit (1...128)
6251 _{hex}	→ Page 210	Error Mode Output Bit (129...256)
6252 _{hex}	→ Page 210	Error Mode Output Bit (257...288)
6260 _{hex}	→ Page 212	Error State Output Bit (1...128)
6261 _{hex}	→ Page 212	Error State Output Bit (129...256)
6262 _{hex}	→ Page 212	Error State Output Bit (257...288)
6306 _{hex}	→ Page 214	Error Mode Output 16 Bit
6307 _{hex}	→ Page 215	Error State Output 16 Bit
6326 _{hex}	→ Page 216	Error Mode Output 32 Bit
6327 _{hex}	→ Page 217	Error State Output 32 Bit

7 Integration in CANopen

Objects for the substitute output value in the event of an error

6206_{hex} Error Mode Output 8 Bit

The object defines values in 8-bit groups. A total of 36 groups (each 8-bit) can be defined (288 digital output channels).

It defines (for each digital output channel) whether or not the output should take on a substitute value in the event of an error. The rule is:

- 0 The output maintains its value if an error occurs.
- 1 The output is set to a substitute value if an error occurs.

The substitute values for the digital output channels are defined by the Error State Output Object (6207_{hex}).

Table 72: Object 6206_{hex} description

Feature	Sub-index	Description/Value
Name		Error Mode Output 8 Bit
Object Code		ARRAY
PDO Mapping		Yes
Data type	Sub-index 00 _{hex}	Unsigned8
	Sub-index 01 _{hex} ...24 _{hex}	Unsigned8
Access	Sub-index 00 _{hex}	ro
	Sub-index 01 _{hex} ...24 _{hex}	rw
Default value, XI/ON	Sub-index 00 _{hex}	No
	Sub-index 01 _{hex} ...24 _{hex}	FF _{hex}

Objects for the substitute output value in the event of an error

6207_{hex} Error State Output 8 Bit

The object defines values in 8-bit groups. A total of 36 groups (each 8-bit) can be defined (288 digital output channels).

The substitute value is defined for each digital output channel. The substitute values will only be used in the event of an error if a **1** is entered in an Error Mode Output Object (6206_{hex}) for the particular output channel.

Substitute values:

- 0 The output will be switched off if an error occurs.
- 1 The output will be switched on if an error occurs.

Table 73: Object 6207_{hex} description

Feature	Sub-index	Description/Value
Name		Error State Output 8 Bit
Object Code		ARRAY
PDO Mapping		Yes
Data type	Sub-index 00 _{hex}	Unsigned8
	Sub-index 01 _{hex} ...24 _{hex}	Unsigned8
Access	Sub-index 00 _{hex}	ro
	Sub-index 01 _{hex} ...24 _{hex}	rw
Default value, XI/ON	Sub-index 00 _{hex}	No
	Sub-index 01 _{hex} ...24 _{hex}	00 _{hex}

7 Integration in CANopen

Objects for the substitute output value in the event of an error

6250_{hex} Error Mode Output Bit (1...128)

6251_{hex} Error Mode Output Bit (129...256)

6252_{hex} Error Mode Output Bit (257...288)

The objects defined the values bit-wise. Each Sub-index for these objects is a Boolean value.

A total of 128 bits can be represented (128 digital output channels).

If more than 128 output channels are present, then Object 6251_{hex} is used.

If more than 256 output channels are present, then Object 6252_{hex} is used.

Since the number of digital input channels in a station is limited to 288, it is not possible to make use of the complete range of the array in Object 6252_{hex}.

It is possible to define, for each digital output channel, whether or not the output should take on a substitute value in the event of an error. The rule is:

- 0 The output maintains its value if an error occurs.
- 1 The output is set to a substitute value if an error occurs.

The substitute values for the digital output channels are defined by the Error State Output Objects (6260_{hex}, 6261_{hex} und 6262_{hex}) definiert.

Objects for the substitute output value in the event of an error

Table 74: Object 6250_{hex}, 6251_{hex}, 6252_{hex} description

Feature	Sub-index	Description/Value
Name		Error Mode Output Bit
Object Code		ARRAY
PDO Mapping		Yes
Data type	Sub-index 00 _{hex}	Unsigned8
	Sub-index 01 _{hex} ...80 _{hex}	Boolean
Access	Sub-index 00 _{hex}	ro
	Sub-index 01 _{hex} ...80 _{hex}	rw
Default value, XI/ON	Sub-index 00 _{hex}	No
	Sub-index 01 _{hex} ...80 _{hex}	01 _{hex}

7 Integration in CANopen

Objects for the substitute output value in the event of an error

6260_{hex} Error State Output Bit (1...128)

6261_{hex} Error State Output Bit (129...256)

6262_{hex} Error State Output Bit (257...288)

The objects defined the values bit-wise. Each Sub-index for these objects is a Boolean value.

A total of 128 bits can be represented (128 digital output channels).

If more than 128 output channels are present, then Object 6261_{hex} is used.

If more than 256 output channels are present, then Object 6262_{hex} is used.

Since the number of digital input channels in a station is limited to 288, it is not possible to make use of the complete range of the array in Object 6262_{hex}.

The substitute value is defined for each digital output channel. The substitute values will only be used in the event of an error if a 1 is entered in an Error Mode Output Object (6250_{hex}, 6251_{hex} and 6252_{hex}) for the particular output channel.

Substitute values:

- 0 The output will be switched off if an error occurs.
- 1 The output will be switched on if an error occurs.

Objects for the substitute output value in the event of an error

Table 75: Object 6260_{hex}, 6261_{hex}, 6262_{hex} description

Feature	Sub-index	Description/Value
Name		Error State Output Bit
Object Code		ARRAY
PDO Mapping		Yes
Data type	Sub-index 00 _{hex}	Unsigned8
	Sub-index 01 _{hex} ...80 _{hex}	Boolean
Access	Sub-index 00 _{hex}	ro
	Sub-index 01 _{hex} ...80 _{hex}	rw
Default value, XI/ON	Sub-index 00 _{hex}	No
	Sub-index 01 _{hex} ...80 _{hex}	00 _{hex}

7 Integration in CANopen

Objects for the substitute output value in the event of an error

6306_{hex} Error Mode Output 16 Bit

The object defines values in 16-bit groups. A total of 18 groups (each 16-bit) can be defined (288 digital output channels).

It is possible to define, for each digital output channel, whether or not the output should take on a substitute value in the event of an error. The rule is:

- 0 The output maintains its value if an error occurs.
- 1 The output is set to a substitute value if an error occurs.

The substitute values for the digital output channels are defined by an Error State Output Object (6307_{hex}).

Table 76: Object 6306_{hex} description

Feature	Sub-index	Description/Value
Name		Error Mode Output 16 Bit
Object Code		ARRAY
PDO Mapping		Yes
Data type	Sub-index 00 _{hex}	Unsigned8
	Sub-index 01 _{hex} ...12 _{hex}	Unsigned16
Access	Sub-index 00 _{hex}	ro
	Sub-index 01 _{hex} ...12 _{hex}	rw
Default value, XI/ON	Sub-index 00 _{hex}	No
	Sub-index 01 _{hex} ...12 _{hex}	FFFF _{hex}

Objects for the substitute output value in the event of an error

6307_{hex} Error State Output 16 Bit

The object defines values in 16-bit groups. A total of 18 groups (each 16-bit) can be defined (288 digital output channels).

The substitute value is defined for each digital output channel. The substitute values will only be used in the event of an error if a 1 is entered in an Error Mode Output Object (6306_{hex}) for the particular output channel.

Substitute values:

- 0 The output will be switched off if an error occurs.
- 1 The output will be switched on if an error occurs.

Table 77: Object 6307_{hex} description

Feature	Sub-index	Description/Value
Name		Error State Output 16Bit
Object Code		ARRAY
PDO Mapping		Yes
Data type	Sub-index 00 _{hex}	Unsigned8
	Sub-index 01 _{hex} ...12 _{hex}	Unsigned16
Access	Sub-index 00 _{hex}	ro
	Sub-index 01 _{hex} ...12 _{hex}	rw
Default value, XI/ON	Sub-index 00 _{hex}	No
	Sub-index 01 _{hex} ...12 _{hex}	0000 _{hex}

7 Integration in CANopen

Objects for the substitute output value in the event of an error

6326_{hex} Error Mode Output 32 Bit

The object defines values in 32-bit groups. A total of 9 groups (each 32-bit) can be defined (288 digital output channels).

It is possible to define, for each digital output channel, whether or not the output should take on a substitute value in the event of an error. The rule is:

- 0 The output maintains its value if an error occurs.
- 1 The output is set to a substitute value if an error occurs.

The substitute values for the digital output channels are defined by an Error State Output Object (6327_{hex}).

Table 78: Object 6326_{hex} description

Feature	Sub-index	Description/Value
Name		Error Mode Output 32 Bit
Object Code		ARRAY
PDO Mapping		Yes
Data type	Sub-index 00 _{hex}	Unsigned8
	Sub-index 01 _{hex} ...09 _{hex}	Unsigned32
Access	Sub-index 00 _{hex}	ro
	Sub-index 01 _{hex} ...09 _{hex}	rw
Default value, XI/ON	Sub-index 00 _{hex}	No
	Sub-index 01 _{hex} ...09 _{hex}	FFFFFFFF _{hex}

Objects for the substitute output value in the event of an error

6327_{hex} Error State Output 32 Bit

The object defines values in 32-bit groups. A total of 9 groups (each 32-bit) can be defined (288 digital output channels).

The substitute value is defined for each digital output channel. The substitute values will only be used in the event of an error if a 1 is entered in an Error Mode Output Object (6326_{hex}) for the particular output channel.

Substitute values:

- 0 The output will be switched off if an error occurs.
- 1 The output will be switched on if an error occurs.

Table 79: Object 6327_{hex} description

Feature	Sub-index	Description/Value
Name		Error State Output 32Bit
Object Code		ARRAY
PDO Mapping		Yes
Data type	Sub-index 00 _{hex}	Unsigned8
	Sub-index 01 _{hex} ...09 _{hex}	Unsigned32
Access	Sub-index 00 _{hex}	ro
	Sub-index 01 _{hex} ...09 _{hex}	rw
Default value, XI/ON	Sub-index 00 _{hex}	No
	Sub-index 01 _{hex} ...09 _{hex}	00000000 _{hex}

7 Integration in CANopen Emergencies

Emergencies

The following CANopen Emergencies can be triggered by an XI/ON module of type **Digital Output module**:

Designation	Meaning	Byte 0/1 Error Code	Byte 2 Error Register	Byte 3 Extra info	Byte 4 Addi- tional informa- tion
Output current too high	Output current is too high	2310 _{hex}	Bit1 (current fault)	Module number	Channel numbers for the 2- channel modules

Bytes 5, 6, 7 of the Emergency frame are unused and are therefore always 0.

8 Integration in DeviceNet

Digital Input Module Class (VSC104)

This class contains all the information and parameters for digital input modules.

Table 80: Class Instance

Attribute no. Dec hex	Attribute name	Access	Type	Description
100 64 _{hex}	CLASS REVISION	G	UINT	Contains the revision number of this class (Maj. Rel. × 1000 + Min. Rel.).
101 65 _{hex}	MAX INSTANCE	G	USINT	Contains the number of the highest instance of an object created at this level in the class hierarchy.
102 66 _{hex}	# OF INSTANCES	G	USINT	Contains the number of object instances created at this class level.
103 67 _{hex}	MAX CLASS ATTR	G	USINT	Contains the number of the last class attribute implemented.

8 Integration in DeviceNet

Digital Input Module Class (VSC104)

Table 81: Object Instances

Attribute no.	Attribute name	Access	Type	Description
100 64 _{hex}	MAX OBJECT ATTR	G	USINT	Contains the number of the last object attribute implemented.
101 65 _{hex}	MODULE PRESENT	G	BOOL	FALSE: XI/ON module is not inserted, vacant base module TRUE: XI/ON module is plugged in
102 66 _{hex}	TERMINAL SLOT NUMBER	G	USINT	The slot number of the base module (base module to the right of the gateway = No. 1) belonging to the module. Corresponds to the relevant instance number within the TERMINAL SLOT CLASS.
103 67 _{hex}	MODULE ID	G	DWORD	Contains the module ID.
104 68 _{hex}	MODULE ORDER NUMBER	G	UDINT	Contains the order no. of the module, e.g. 225000.
105 69 _{hex}	MODULE ORDER NAME	G	SHORT_STRING	Contains the module name, e.g. XN-4DI-24VDC-P.
106 6A _{hex}	MODULE REVISION	G	USINT	Contains the revision number of the module.

8 Integration in DeviceNet Digital Input Module Class (VSC104)

Attribute no. Dec hex	Attribute name	Access	Type	Description
107 6B _{hex}	MODULE TYPE ID	G	ENUM USINT	Provides information about the module type: 0 (00 _{hex}) unknown module type 1 (01 _{hex}) digital I/O-module 17 (11 _{hex}) analog module I/O-voltage 18 (12 _{hex}) analog module I/O-current 19 (13 _{hex}) analog module Pt-temperature 20 (14 _{hex}) analog module thermo-temperature 33 (21 _{hex}) 16-bit counter module 34 (22 _{hex}) 32-bit counter module 40 (28 _{hex}) SSI-module 49 (31 _{hex}) Motor-starter module as direct or reversing starter 50 (32 _{hex}) Electronic motor starter 65 (41 _{hex}) RS232 module 66 (42 _{hex}) RS485/422 module 67 (43 _{hex}) TTY-module
108 6C _{hex}	MODULE COMMAND INTERFACE	G/S	ARRAY	The control interface for the XI/ON module. ARRAY OF: BYTE: control byte sequence
109 6D _{hex}	MODULE RESPONSE INTERFACE	G	ARRAY	Message interface for the XI/ON module. ARRAY OF: BYTE: message byte sequence

8 Integration in DeviceNet

Digital Input Module Class (VSC104)

Attribute no.	Attribute name	Access	Type	Description
110 6E _{hex}	PRODUCED DATA SIZE	G	UINT	Contains the information about the amount of Produced Data for the module.
111 6F _{hex}	PRODUCED DATA	G	DWORD	Contains the input data for the module. DWORD: Bit-wise assignment, depending on the module specification.
112 70 _{hex}	DIAG SIZE	G	UINT	Contains the information about the amount of Diagnostics Data for the module.
113 71 _{hex}	DIAG	G	DWORD	Contains the diagnostics information for the module. The digital XI/ON-I modules do not provide diagnostics data. DWORD: Bit-wise assignment, depending on the module specification.
114 72 _{hex}	PARAM SIZE	G	UINT	Contains information about the scope of module parameters. The digital XI/ON I/O-modules do not have any settable parameters.
115 73 _{hex}	PARAMS	G/S	DWORD	Contains the parameters for the module. DWORD: Bit-wise assignment, depending on the module specification. Since the digital XI/ON I/O-modules have no settable parameters, this attribute is not used.

8 Integration in DeviceNet Digital Input Module Class (VSC104)

Attribute no.	Attribute name	Access	Type	Description
116 74 _{hex}	MODULE REGISTERED INDEX	G	ENUM USINT	Contains the index number found in all module lists.

8 Integration in DeviceNet

Digital Output Module Class (VSC105)

Digital Output Module Class (VSC105)

This class contains all the information and parameters for digital output modules.

Table 82: Class Instance

Attribute no.	Attribute name	Access	Type	Description
100 64 _{hex}	CLASS REVISION	G	UINT	Contains the revision number of this class (Maj. Rel. × 1000 + Min. Rel.).
101 65 _{hex}	MAX INSTANCE	G	USINT	Contains the number of the highest instance of an object created at this level in the class hierarchy.
102 66 _{hex}	# OF INSTANCES	G	USINT	Contains the number of object instances created at this class level.
103 67 _{hex}	MAX CLASS ATTR	G	USINT	Contains the number of the last class attribute implemented.

Table 83: Object Instances

Attribute no.	Attribute name	Access	Type	Description
100 64 _{hex}	MAX OBJECT ATTR	G	USINT	Contains the number of the last object attribute implemented.
101 65 _{hex}	MODULE PRESENT	G	BOOL	FALSE: XI/ON module is not inserted, vacant base module TRUE: XI/ON module is plugged in
102 66 _{hex}	TERMINAL SLOT NUMBER	G	USINT	The slot number of the base module (base module to the right of the gateway = No. 1) belonging to the module. Corresponds to the relevant instance number within the TERMINAL SLOT CLASS.
103 67 _{hex}	MODULE ID	G	DWORD	Contains the module ID.
104 68 _{hex}	MODULE ORDER NUMBER	G	UDINT	Contains the order no. of the module, e.g. 225000.
105 69 _{hex}	MODULE ORDER NAME	G	SHORT_STRING	Contains the module names, e.g. XN-2DO-24VDC-0.5A-P.
106 6A _{hex}	MODULE REVISION	G	USINT	Contains the revision number of the module.

8 Integration in DeviceNet

Digital Output Module Class (VSC105)

Attribute no.	Attribute name	Access	Type	Description
107 6B _{hex}	MODULE TYPE ID	G	ENUM USINT	Provides information about the module type: 0 (00 _{hex}) unknown module type 1 (01 _{hex}) digital I/O-module 17 (11 _{hex}) analog module I/O-voltage 18 (12 _{hex}) analog module I/O-current 19 (13 _{hex}) analog module Pt-temperature 20 (14 _{hex}) analog module thermo-temperature 33 (21 _{hex}) 16-bit counter module 34 (22 _{hex}) 32-bit counter module 40 (28 _{hex}) SSI-module 49 (31 _{hex}) Motor-starter module as direct or reversing starter 50 (32 _{hex}) Electronic motor starter 65 (41 _{hex}) RS232 module 66 (42 _{hex}) RS485/422 module 67 (43 _{hex}) TTY-module
108 6C _{hex}	MODULE COMMAND INTERFACE	G/S	ARRAY	The control interface for the XI/ON module. ARRAY OF: BYTE: control byte sequence
109 6D _{hex}	MODULE RESPONSE INTERFACE	G	ARRAY	Message interface for the XI/ON module. ARRAY OF: BYTE: message byte sequence

8 Integration in DeviceNet

Digital Output Module Class (VSC105)

Attribute no. Dec hex	Attribute name	Access	Type	Description
110 6E _{hex}	CONSUMED DATA SIZE	G	UINT	Contains the information about the amount of Consumed Data for the module.
111 6F _{hex}	CONSUMED DATA	G/S	DWORD	Contains the output data for the module. DWORD: Bit-wise assignment, depending on the module specification.
112 70 _{hex}	DIAG SIZE	G	UINT	Contains the information about the amount of Diagnostics Data for the module.
113 71 _{hex}	DIAG	G	DWORD	Contains the diagnostics information for the module. DWORD: Bit-wise assignment, depending on the module specification.
114 72 _{hex}	PARAM SIZE	G	UINT	Contains information about the scope of module parameters. The digital XI/ON I/O-modules do not have any settable parameters.
115 73 _{hex}	PARAMS	G/S	DWORD	Contains the parameters for the module. DWORD: Bit-wise assignment, depending on the module specification. Since the digital XI/ON I/O-modules have no settable parameters, this attribute is not used.
116 74 _{hex}	MODULE REGISTERED INDEX	G	ENUM USINT	Contains the index number found in all module lists.

8 Integration in DeviceNet

Digital Output Module Class (VSC105)

Appendix

Definitions

Protected outputs according to IEC/EN 61131-2)

For outputs that the manufacturer has specified as **protected**, the following applies:

- The output must be able to withstand the load and/or the corresponding protection device must protect the output for all continuous output currents that exceed 110 % of the rated value;
- After the reset or replacement of the protective device, the PLC system must return to normal operation;
- Additional restart features can be selected from the 3 following types:
 - Protected output with automatic restart: a protected output that automatically restarts operation as soon as the overload is no longer present;
 - Protected output with controlled restart: a protected output that is restarted as a response to specific signals (e.g. by remote control);
 - Protected output with manual restart: a protected output that is restarted by manual action (the protection can be ensured by means of fuses, electronic lock-outs etc.).

Note: Lengthy operation in overload conditions may result in a reduction of the operational life of the module.

The protected outputs do not necessarily provide protection for the external wiring. The user is responsible for providing the means necessary to achieve such protection.

Short-circuit proof outputs (according to IEC/EN 61131-2)

For outputs that the manufacturer has specified as **short-circuit proof**, the following applies:

- For all output currents above the maximum current $I_{e\text{ max}}$, and up to $2 \times$ the rated current I_e , the output must function and withstand a temporary overload. Such temporary overload situations must be defined by the manufacturer.
- The protective device must be activated for all foreseeable output currents greater than $20 \times$ the rated value. After a rest or replacement of the protective device, the PLC must once more function normally.
- For output currents in the range from $2 \dots 20 \times I_e$ or for temporary overloads above the limits given by the manufacturer (see Item 1 above), a repair or replacement of the module may be required.
- During an overload of $2 I_e$ for a duration of 5 minutes no danger of fire or electrical shock may result. Directly after every overload the highest temperature increase of the I/O insulation may not exceed the values stated in 4.4.2.

Index

A	Approvals	23
D	Degree of protection	23
	Diagnostics data	128
	Digital Input Module Class	219
	Digital Output Module Class	224
	Dimensions	13, 16
E	Electromagnetic compatibility	21
	Emergencies	218
G	Gateway supply	40
I	Indicator elements	128
L	LED DIA	37
	LED Sys	38
	LED UL	38
	LED Vcc	37
O	Operating life	23
	Optocoupler	57
P	Power feed	42
S	Supply voltage	20
T	Two-wire initiators	60, 65

