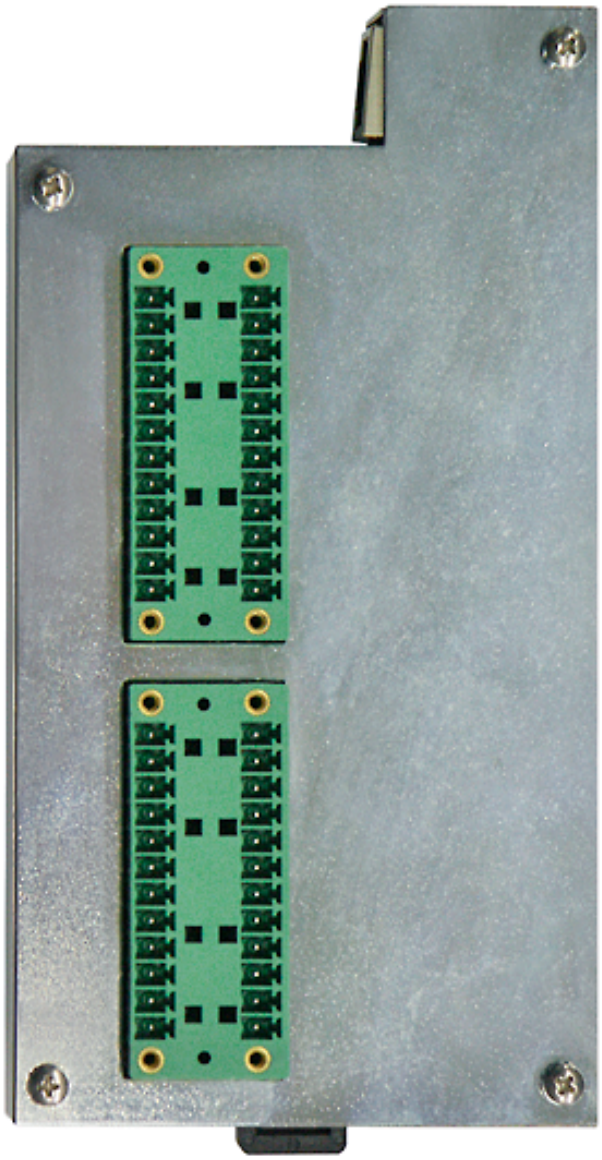
Operating Instructions
I/O Module

for GMS800 Series



Endress+Hauser
People for Process Automation

Described product
Produktname: I/O Module
Basic device: GMS800 Series gas analyzers

Manufacturer
Endress+Hauser SICK GmbH+Co. KG
Bergener Ring 27
01458 Ottendorf-Okrilla
Germany

Legal information

Original document
This document is an original document of Endress+Hauser SICK GmbH+Co. KG.

CE

Glossary

AC	Alternating Current
CAN	Field bus (Control Area Network) with high data security; especially suitable for safety-relevant applications.
CANopen	Communication protocol for the CAN bus. Standardized as European standard EN 50325-4. (www.can-cia.org)
CSA	Canadian Standards Association (www.csa.ca)
DC	Direct Current
Ethernet	Cable-based network technology for data networks. Basis for network protocols (e.g. TCP/IP).
PC	Personal Computer.
SOPAS	SICK Open Portal for Applications and Systems: Family of computer programs to set parameters, capture and calculate data.
SOPAS ET	SOPAS Engineering Tool: PC application program to configure modular system components.

Warning symbols

Hazard (general)

Warning levels / signal words

CAUTION
Hazard or unsafe practice which *could* result in personal injury or property damage.

NOTICE
Hazard which *could* result in property damage.

Information symbols

Important technical information for this product

Important information on electric or electronic functions

Nice to know

Supplementary information

Link to information at another place

I/O Module

1 Important information

Product description
Main information
Additional information

1.1 Main safety information

NOTICE: **Sensitive electronics**

► *Before signal connections are established (also with plug connections):* Disconnect the I/O Module and all connected devices from the mains (switch off).

Otherwise electronic components could be damaged.

1.2 Important operating information

If an »Alarm« message is displayed

► Check the current measured values. Consider the situation.

► Perform the measures planned at your site for the particular situation.

► When necessary: Switch the alarm message off (»acknowledge«).

In hazardous situations:

► Switch off the emergency switch or mains disconnector switch of the host system.

1.3 Additional documentation/information

This document supplements the Operating Instructions for GMS800 gas analyzers. It extends the “GMS800“ Operating Instructions with technical information on the I/O Module.

► Observe the Operating Instructions delivered with the “GMS800”.

The “GMS800” Operating Instructions also specify all further documents belonging to the individual device.

NOTICE:

► Pay primary attention to any individual information provided.

I/O Module

2 Product description

Function
Versions

2.1 Function

The I/O Module is an electronic module for GMS800 Series series gas analyzers. It provides the GMS800 signal connections (electronic inputs and outputs).

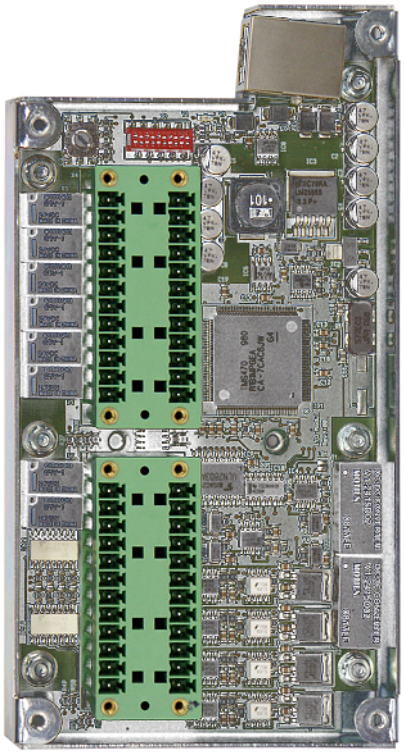
Connection with the other device components is performed with a CAN bus.

The logical function of the signal connections can be configured individually (→ p. 18, § 4.2).

2.2 Versions

- Open module for integration in enclosure (→ Fig. 1)
- Closed module with top hat rail adapter (→ p. 20, § 5.1)

Fig. 1 Open I/O Module



I/O Module

3 Installation

Connections
Electric functions
Settings

3.1 Signal connection layout

Design

- The signal connections have 12-pole plug connectors.
- The plug connector counterparts delivered have screw terminals.
- Each plug connector housing delivered accommodates two plug connector counterparts.

NOTICE:

► Install the plug connector counterparts in the delivered metallic plug connector housings after connection of the signal cables.

► Secure the plug connection with the screws of the plug connectors so that the plug connector housing is pressed against the enclosure (EMC sealing tape).

Otherwise the specified electromagnetic compatibility (EMC) will probably not be attained.

The plug connector housings have strain relief clamps for the signal cables.

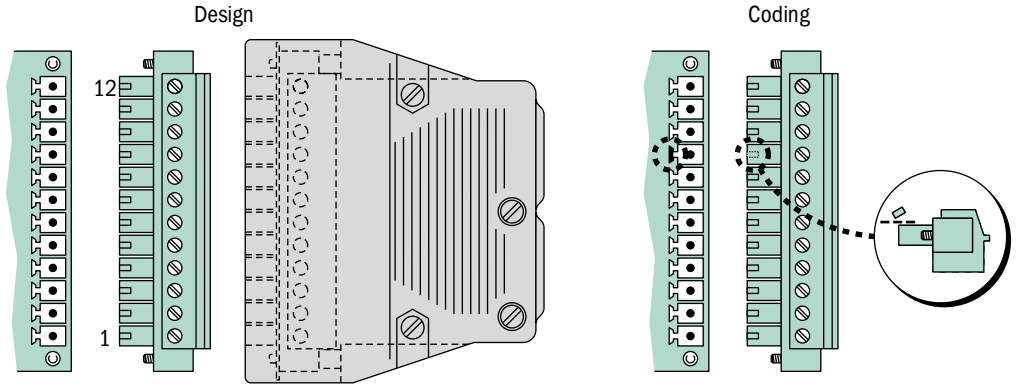
Position of signal connections → Supplementary Operating Instructions for Enclosure

Mechanical coding (if required)

► Block a recess in the plug connection with a plastic insert.

► Remove the corresponding burr on the counterpart (→ Fig. 2).

Fig. 2 I/O Module plug connector



3.2 Suitable signal cables

► Use shielded cables for all of the signal connections with a low high-frequency impedance of the shield.

► Only connect the earth on *one* cable end with GND/enclosure. Whenever possible, ensure a short connection with broad contact.

► Observe the shielding concept of the host system (if existing).

NOTICE:

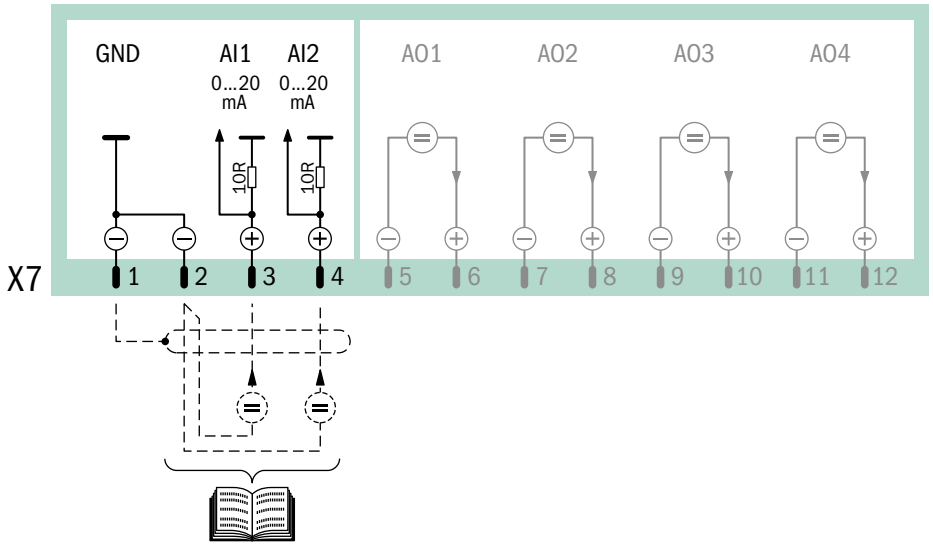
► Use suitable cables only. Install all cables properly.

Otherwise the specified electromagnetic compatibility (EMC) will probably not be attained and functional problems might occur.

3.3 Signal connections description

3.3.1 Analog inputs (plug connector X7)

Fig. 3 Plug connector X7 (analog inputs)



Identification in Formula editor	Identification for I/O assignment
AI1	N3M07AI0**1** (AI02)
AI2	N3M07AI0**2** (AI02)

Function

Analog input (AI1, AI2) must only be connected when the GMS800 considers these inputs; this requires an appropriate configuration of the analog inputs. The appropriate information is delivered separately when the analog inputs are configured at the factory or system manufacturer.

► Check whether the information on the analog inputs has been delivered.

► When required, connect the specified signals to the analog inputs.

Application examples

– Display an external measured value on GMS800

– Mathematical link of an external measured value to internal measured values, e.g. for cross-sensitivity compensation or physical conversion

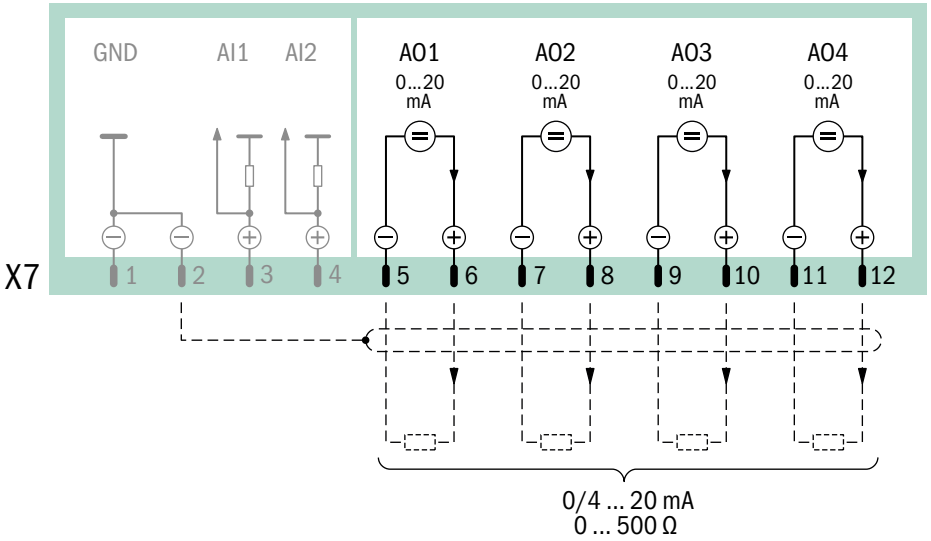
Electric function

- The input signal is an analog current signal (0 ... 20 mA).
- The signal current must originate from an external current source.
- Load (internal resistance) of an analog input: 10 Ω

- Configuration options → p. 18, § 4.1
- Electronic data → p. 21, § 5.2
- Suitable signal cables → p. 10, § 3.2

3.3.2 Analog outputs (plug connector X7)

Fig. 4 Plug connector X7 (analog outputs)



Identification in Formula editor	Identification for I/O assignment
AO1	N3M0**5**AO0**1** (AO02)
AO3	N3M0**5**AO0**2** (AO02)
AO4	N3M0**6**AO0**1** (AO02)
AO5	N3M0**6**AO0**2** (AO02)

Function

Each analog output (AO1 ... AO4) can be assigned to one of the available sources (→ p. 18, §4.1). The current value of the source is output as a potential-free current signal.

When the current measured value of an Analyzer module is selected as source, the measured value can be output in two different measuring ranges when allowed by the Analyzer module configuration.

New measured values are created approximately every 0.5 ... 20 seconds (depending on the type and number of Analyzer modules).

Electric function

The analog outputs are potential-free and deliver a load-independent current signal.

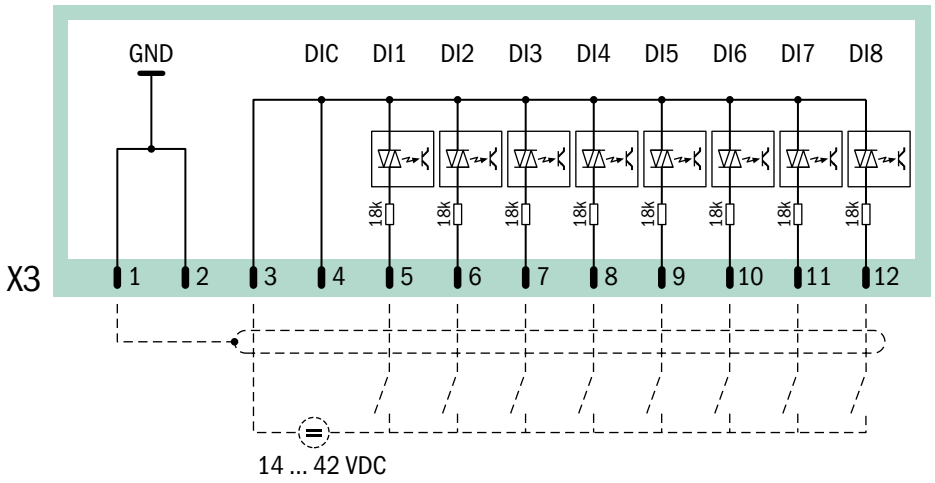
- ► Maintain the allowable load (standard: 500 Ω).
- ► *For device versions for potentially explosive atmospheres and fitted with Zener barriers:* Observe the separate specification for the allowable load (Data Sheet).

- Configuration options → p. 18, §4.1
- Electronic data → p. 21, §5.2
- Suitable signal cables → p. 10, §3.2

Do not connect the minus pole with GND (ground) otherwise the potential separation is nullified.

3.3.3 Digital inputs (plug connector X3)

Fig. 5 Plug connector X3 (digital inputs)



Identification in Formula editor	Identification for I/O assignment
DI1	N3M01DI01 (DI04)
DI2	N3M01DI02 (DI04)
DI3	N3M01DI03 (DI04)
DI4	N3M01DI04 (DI04)
DI5	N3M02DI01 (DI04)
DI6	N3M02DI02 (DI04)
DI7	N3M02DI03 (DI04)
DI8	N3M02DI04 (DI04)

NOTICE:

► Keep voltages above 50 V DC away from the signal connections.

Higher voltages could severely damage components. In addition, the safe separation of functional voltages would no longer be guaranteed.

- Configuration options → p. 18, § 4.1
- Electronic data → p. 21, § 5.2
- Suitable signal cables → p. 10, § 3.2

Function

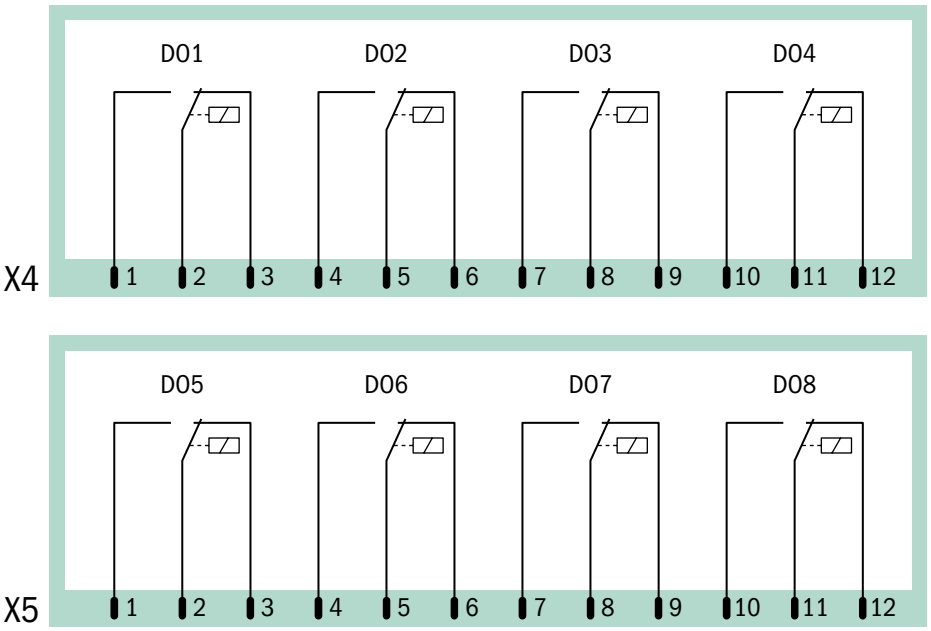
Each digital input (control input) can be assigned to one of the available logical functions (→ p. 18, § 4.1).

Electric function

- The digital inputs (DI1 ... DI8) are potential-free optical coupler inputs with common reference potential (DIC).
- The signal voltage must originate from an external voltage source (14 ... 42 V DC).
- The digital inputs can be run with either positive or negative voltage (reference potential optionally “-” or “+”).
- With inverted switching logic, the logical function of the control input is activated when no current flows through the control input.

3.3.4 Digital outputs (plug connectors X4, X5)

Fig. 6 Plug connectors X4 and X5 (digital outputs)



Identification in Formula editor	Identification for I/O assignment
D01	N3M03D001 (DO04)
D02	N3M03D002 (DO04)
D03	N3M03D003 (DO04)
D04	N3M03D004 (DO04)
D05	N3M04D001 (DO04)
D06	N3M04D002 (DO04)
D07	N3M04D003 (DO04)
D08	N3M04D004 (DO04)

NOTICE:

- ► Keep voltages above 50 V DC away from the signal connections.
- ► Observe the maximum contact load (→ p. 21, §5.2).
- ► Only connect inductive loads (e.g. relays, solenoid valves) using discharging diodes.

Unallowed loads could severely damage components and the safe separation of functional voltages would no longer be guaranteed.

- Configuration options → p. 18, §4.1
- Electronic data → p. 21, §5.2
- Suitable signal cables → p. 10, §3.2

Function

The digital outputs are potential-free relay switching contacts (switching outputs). Each digital output (DO1 … DO8) can be assigned to one of the available logical functions (→ p. 18, § 4.1).

Switching logic

a) *Normal (open-circuit principle):* When the assigned switching function is activated logically, the switching output is also activated electronically (relay is energized).

b) *Inverted (closed-circuit principle):* The switching output is activated electronically as long as the logical switching function is not activated. The switching output is deactivated electronically in logically activated state (relay deactivated).

   Check this variant carefully when the switching output is used for a warning message (→ p. 15 "Safety criteria").

Safety criteria

CAUTION: Risks for connected devices/systems

- ► Before using the switching outputs, clarify the safety-relevant consequences for the following operational malfunctions:
  - Power failure (for example, local power failure or accidental switching-off or defective fuse)
  - Defect in the I/O Module (for example, electronic defect of a switching output)
  - Interruption of the electrical connection
- ► Observe the switching method:
  - Switching outputs with normal switching logic signal the switching function as *not activated* after a power failure
  - Switching outputs with inverted switching logic signal the associated switching function as *triggered* immediately after a power failure.
- ► Carefully review the consequences. Make sure that no dangerous situation can arise when a failure or defect occurs.

I/O Module

4 Configuration

Options
Programming

4.1 Setting options

Each signal connection can be individually configured with the functions of the control unit (→ Table 1). A defined standard configuration or the ordered configuration are set at the factory. If the GMS800 is part of a measuring system, the signal connections are programmed to match the system.

Table 1 I/O configuration options

Functional group	Variables (examples)
Analog inputs	● Electronic zero point (0/2/4 mA) ● Unit of the signal fed ● Physical start and end values of the signal span
Analog outputs	● Electronic zero point (0/2/4 mA) ● Source of the value output ● Physical start and end values of the signal span
Digital outputs	● Source that controls the switching state ● Normal or inverted activation logic
Digital inputs	● Name (designation) ● Normal or inverted activation logic

- If required, an individual output function can be assigned to several outputs.
- List of signal connections (with space for notes) → p. 23, § 5.4.

4.2 Automation with formulas

The “SOPAS ET” application program can be used to program logical and mathematical function links (“formulas”). This allows digital output actions controlled by logic and time to automate external processes.

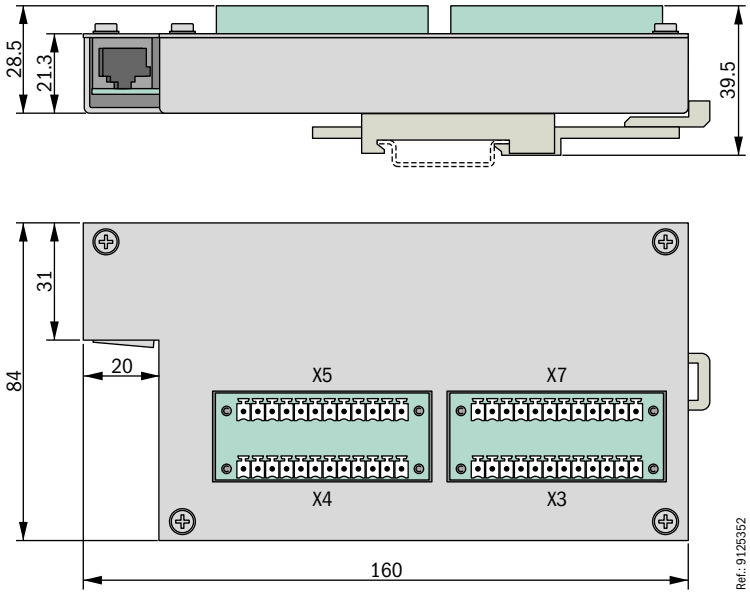
Instructions for programming formulas → Technical Information “Basic Control Unit (BCU) with SOPAS ET”

I/O Module

5 Technical data

Electronic data
List (overview) of the signal connections

5.1 Dimensions



5.2 Electronic data

Analog outputs	
Number:	4
Reference potential:	Potential-free (electrically isolated)
Signal range:	0 ... 24 mA
Residual ripple:	0.02 mA
Resolution/precision:	0.1 % (20 µA)
Precision:	0.25 % of measuring range end value
Maximum load:	500 Ω
Maximum output voltage:	15 V
Start or error state:	Adjustable

Analog inputs	
Number:	2
Reference potential:	GND
Input signal:	0 ... 20 mA
Highest allowable input signal:	30 mA
Overload protection:	±1000 mA
Input load	50 Ω
Transducer precision:	0.5 %

Digital inputs (control inputs)	
Type of construction:	Optical coupler
Number:	8
Switching range:	18 ... 42 V
Highest allowable voltage:	±50 V DC

Table 2 Maximum load per relay switching contact [1]

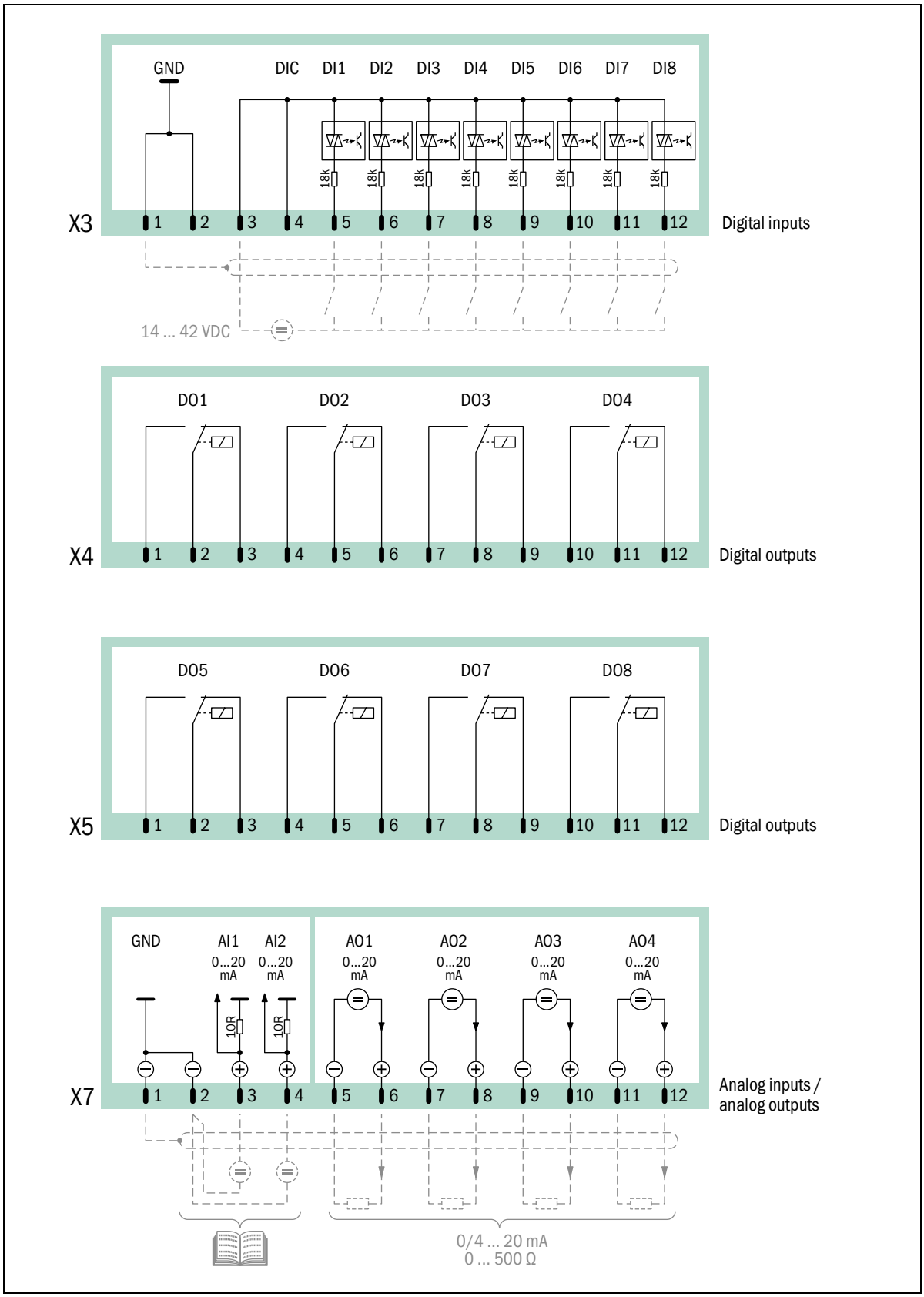
Application area		AC voltage [2]	DC voltage	Current [2]
Standard:		max. 30 V AC	max. 48 V DC	Max. 500 mA
CSA [3]	Either:	max. 30 V AC	max. 48 V DC	Max. 50 mA
	Or:	max. 15 V AC	max. 24 V DC	Max. 200 mA
	Or:	max. 12 V AC	max. 18 V DC	Max. 500 mA

[1] All voltages relative to GND/enclosure
[2] Effective value
[3] Possible voltage/current combinations in CSA Standard range or within the framework of a CSA certification

Digital outputs (switching outputs)	
Number of relays:	8
Contact type:	1-pole changeover switch, 3 connections
Contact load:	→ Table 2
Highest allowable voltage:	±50 V DC

NOTICE:
Only use discharging diodes to connect inductive loads (e.g. relays, solenoid valves) to the switching outputs.
- ► *For inductive loads:* Check whether the discharging diodes are fitted.
- ► *If not:* Install external discharging diodes.

5.3 Signal connections – overview



5.4 Signal connections – list

Terminal	Pin	Function	Name		Notes
X3	1	Ground	GND		
	2				
	3	Control input common	DIC		
	4				
	5	Control input 0	DI1	N3M01**1**DI0**1** (DI04)	
	6	Control input 1	DI2	N3M01**1**DI0**2** (DI04)	
	7	Control input 2	DI3	N3M01**1**DI0**3** (DI04)	
	8	Control input 3	DI4	N3M01**1**DI0**4** (DI04)	
	9	Control input 4	DI5	N3M02**2**DI0**1** (DI04)	
	10	Control input 5	DI6	N3M02**2**DI0**2** (DI04)	
	11	Control input 6	DI7	N3M02**2**DI0**3** (DI04)	
	12	Control input 7	DI8	N3M02**2**DI0**4** (DI04)	
X4	1	Relay contact 1 – normally open	DO1	N3M03**3**DO0**1** (DO04)	
	2	Relay contact 1 – common			
	3	Relay contact 1 – normally closed			
	4	Relay contact 2 – normally open	DO2	N3M03**3**DO0**2** (DO04)	
	5	Relay contact 2 – common			
	6	Relay contact 2 – normally closed			
	7	Relay contact 3 – normally open	DO3	N3M03**3**DO0**3** (DO04)	
	8	Relay contact 3 – common			
	9	Relay contact 3 – normally closed			
	10	Relay contact 4 – normally open	DO4	N3M03**3**DO0**4** (DO04)	
	11	Relay contact 4 – common			
	12	Relay contact 4 – normally closed			
X5	1	Relay contact 5 – normally open	DO5	N3M04**4**DO0**1** (DO04)	
	2	Relay contact 5 – common			
	3	Relay contact 5 – normally closed			
	4	Relay contact 6 – normally open	DO6	N3M04**4**DO0**2** (DO04)	
	5	Relay contact 6 – common			
	6	Relay contact 6 – normally closed			
	7	Relay contact 7 – normally open	DO7	N3M04**4**DO0**3** (DO04)	
	8	Relay contact 7 – common			
	9	Relay contact 7 – normally closed			
	10	Relay contact 8 – normally open	DO8	N3M04**4**DO0**4** (DO04)	
	11	Relay contact 8 – common			
	12	Relay contact 8 – normally closed			
X7	1	Ground	GND		
	2				
	3	(+) Analog input 1 (0 ... 20 mA)	AI1	N3M07AI0**1** (AI02)	
	4	(+) Analog input 2 (0 ... 20 mA)	AI2	N3M07AI0**2** (AI02)	
	5	(–) Analog output 1	AO1	N3M0**5**AO0**1** (AO02)	
	6	(+) Analog output 1 (0/2/4 ... 20 mA)			
	7	(–) Analog output 2	AO2	N3M0**5**AO0**2** (AO02)	
	8	(+) Analog output 2 (0/2/4 ... 20 mA)			
	9	(–) Analog output 3	AO3	N3M0**6**AO0**1** (AO02)	
	10	(+) Analog output 3 (0/2/4 ... 20 mA)			
	11	(–) Analog output 4	AO4	N3M0**6**AO0**2** (AO02)	
	12	(+) Analog output 4 (0/2/4 ... 20 mA)			

8029911/AE00/V2-0/2012-12

www.addresses.endress.com

Endress+Hauser

People for Process Automation