HIMax®

HART Communication Module
Manual

SAFETY
NONSTOP

HIMA

X-HART 32 01

8

Contact

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Revision index	Revisions	Type of change	
		technical	editorial
5.00	First edition of the manual		

Table of Contents

1 Introduction

The present manual describes the technical characteristics of the module and its use. It provides information on how to install, start up and configure the module in SILworX.

1.1 Structure and Use of the Manual

The content of this manual is part of the hardware description of the HIMax programmable electronic system.

This manual is organized in the following main chapters:

- Introduction
- Safety
- Product Description
- Start-up
- Operation
- Repairs
- Decommissioning
- Transport
- Disposal

Additionally, the following documents must be taken into account:

Name	Content	Document no.
HIMax System Manual	Hardware description of the HIMax system	HI 801 001 E
HIMax Safety Manual	Safety functions of the HIMax systems	HI 801 003 E
HIMax Communication Manual	Description of communication and protocols	HI 801 101 E
SILworX Online Help (OLH)	Instructions on how to use SILworX	-
First Steps	Introduction to SILworX	HI 801 103 E

Table 1: Additional Valid Manuals

The latest manuals can be downloaded from the HIMA website at www.hima.com. The revision index on the footer can be used to compare the current version of existing manuals with the Internet edition.

1.2 Target Audience

This document addresses system planners, configuration engineers, programmers of automation devices and personnel authorized to implement, operate and maintain the devices and systems. Specialized knowledge of safety-related automation systems is required.

1.3 Formatting Conventions

To ensure improved readability and comprehensibility, the following fonts are used in this document:

Bold:	To highlight important parts Names of buttons, menu functions and tabs that can be clicked and used in SILworX.
Italics:	System parameter and variables
`Courier`	Literal user inputs
RUN	Operating state are designated by capitals
Chapter 1.2.3	Cross references are hyperlinks even though they are not particularly marked. When the cursor hovers over a hyperlink, it changes its shape. Click the hyperlink to jump to the corresponding position.

Safety notes and operating tips are particularly marked.

1.3.1 Safety Notes

The safety notes are represented as described below.
These notes must absolutely be observed to reduce the risk to a minimum. The content is structured as follows:

- Signal word: danger, warning, caution, notice
- Type and source of danger
- Consequences arising from the danger
- Danger prevention

⚠ SIGNAL WORD

Type and source of danger!
Consequences arising from the danger
Danger prevention

The signal words have the following meanings:

- Danger indicates hazardous situation which, if not avoided, will result in death or serious injury.
- Warning indicates hazardous situation which, if not avoided, could result in death or serious injury.
- Warning indicates hazardous situation which, if not avoided, could result in minor or modest injury.
- Notice indicates a hazardous situation which, if not avoided, could result in property damage.

NOTICE

Type and source of damage!
Damage prevention

1.3.2 Operating Tips

Additional information is structured as presented in the following example:

i The text corresponding to the additional information is located here.

Useful tips and tricks appear as follows:

TIP The tip text is located here.

2 Safety

All safety information, notes and instructions specified in this manual must be strictly observed. The product may only be used if all guidelines and safety instructions are adhered to.

This product is operated in accordance with SELV or PELV. No imminent danger results from the module itself. The use in Ex-Zone is permitted if additional measures are taken.

2.1 Intended Use

HIMax components are designed for assembling safety-related controller systems.

When using the components in the HIMax system, comply with the following general requirements

2.1.1 Environmental Requirements

Requirement type	Range of values
Protection class	Protection class III in accordance with IEC/EN 61131-2
Ambient temperature	0...+60 °C
Storage temperature	-40...+85 °C
Pollution	Pollution degree II in accordance with IEC/EN 61131-2
Altitude	< 2000 m
Housing	Standard: IP20
Supply voltage	24 VDC

Table 2: Environmental Requirements

Exposing the HIMax system to environmental conditions other than those specified in this manual can cause the HIMax system to malfunction.

2.1.2 ESD Protective Measures

Only personnel with knowledge of ESD protective measures may modify or extend the system or replace modules.

NOTE

Device damage due to electrostatic discharge!

- **When performing the work, make sure that the working area is free of static and wear an ESD wrist strap.**
- **If not used, ensure that the device is protected from electrostatic discharge, e.g., by storing it in its packaging.**

2.2 Residual Risk

No imminent danger results from a HIMax module itself.

Residual risk may result from:

- Faults in the engineering
- Faults in the user program
- Faults in the wiring

2.3 Safety Precautions

Observe all local safety requirements and use the protective equipment required on site.

2.4 Emergency Information

A HIMax controller is a part of the safety equipment of a system. If the controller fails, the system adopts the safe state.

In case of emergency, no action that may prevent the HIMax systems from operating safely is permitted.

3 Product Description

The X-HART 32 01 module is a 32-channel communication module, intended for use in the programmable electronic system (PES) HIMax.

The module is inserted into any of the base plate slots with the exception of the slots reserved for system bus modules. For more information, refer to the System Manual (HI 801 001 E).

The connector boards can be used to allow the module to be combined with analog input or output modules.

The HART protocol is operated on the module. HART is used for digital field communications during which the HART signal is superimposed onto the (4…20 mA) analog current signal.

The HART signal is used to transfer the measuring and device data to sensors or actuators. The X-HART modules transfer the HART data to the assigned X-COM module within the HIMax system. The X-COM module transfers the HART data via the HART over IP protocol to the host (asset management system or HART OPC server).

The X-COM module and the assigned X-HART modules form a I/O system as referred to in the HART specification.

The module has been certified by the TÜV for safety-related applications up to SIL 3 (IEC 61508, IEC 61511 and IEC 62061) as well as Cat. 4 and PL e (EN ISO 13849-1).

Refer to the HIMax Safety Manual (HI 801 003 E) for more information on the standards used to test and certify the module and the HIMax system.

3.1 Safety Function

The safety function of the X-HART module includes the following points:

- HART Deactivation of one channel: If the module is shut down, the HART channels are safely deactivated in accordance with SIL 3 (HART channels de-energized).
- HART Filtering: HART write access to HART transmitters or sensors is locked in accordance with SIL 3. If the HART filtering function is deactivated on the HART module, the corresponding analog input or output channel is writeable.

3.1.1 Reaction in the Event of a Fault

If a fault occurs, the module adopts the safe state.

The X-HART module is interference-free to the analog input or output modules connected in the same circuit.

The module activates the *Error* LED on the front plate.

3.2 Scope of Delivery

The module must be installed on a suitable connector board to be able to operate. If a Field Termination Assembly (FTA) is used, a system cable is required to connect the connector board to the FTA. Connector boards, system cables and FTAs are not included within the scope of delivery.

The connector boards are described in Chapter 3.6, the system cables are described in Chapter 3.7. The FTAs are described in own manuals.

3.3 Type Label

The type label specifies the following important details:

- Product name
- Mark of conformity
- Bar code (2D or 1D code)
- Part number (Part-No.)
- Hardware revision index (HW Rev.)
- Software revision index (SW Rev.)
- Operating voltage (Power)
- Ex specifications (if applicable)
- Production year (Prod-Year:)

Figure 1: Sample Type Label

3.4 Structure

The module is equipped with 32 HART channels for HART communications with transmitters or actuators. The HART channels are electrically isolated from one another and from the voltage supply. Analog input or output modules are connected in parallel with the HART module via the corresponding connector board, see Chapter 4.4.2 and Chapter 4.4.4.

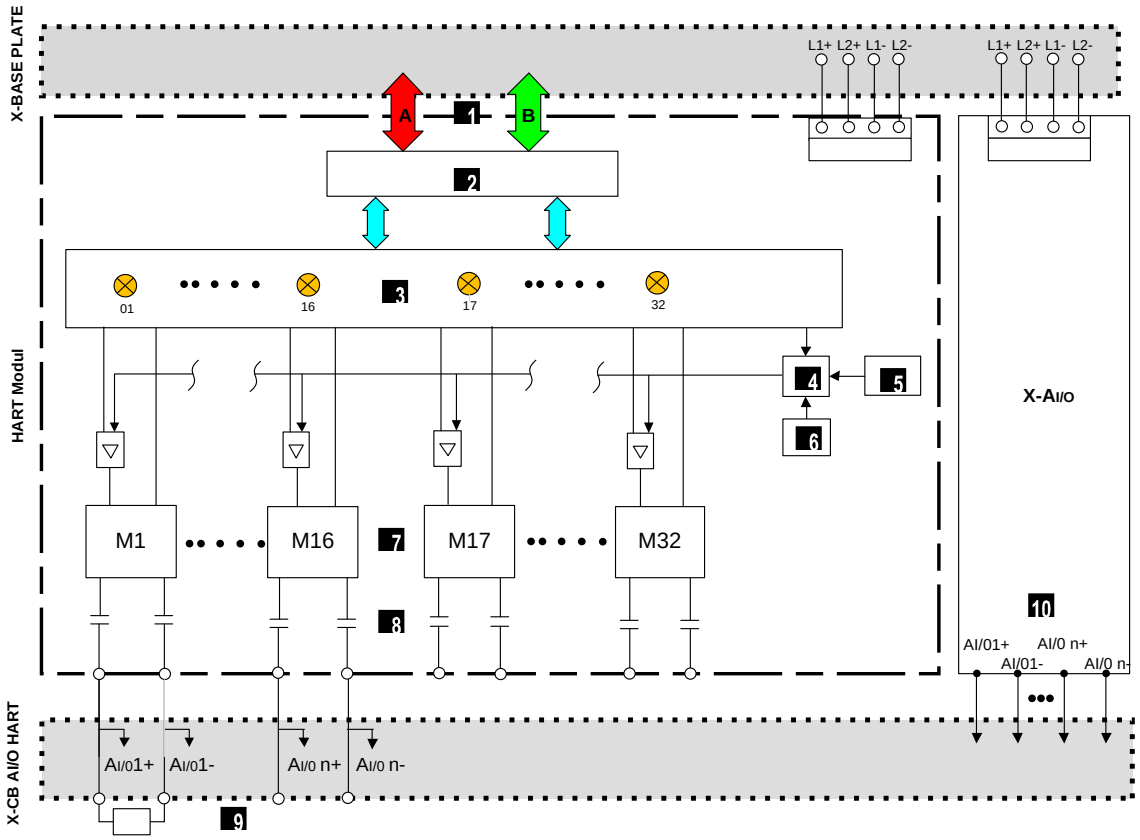
The transmitter supply as well as the open-circuit and short-circuit monitoring functions for the analog input and output modules are not affected by the HART module connected in parallel. HART operation influences the analog measurement accuracy by approx. 1 %.

The safety-related 1oo2 processor system for the I/O module controls and monitors the I/O level. The data and states of the I/O module are made available to the processor modules via the redundant system bus. The system bus has a redundant structure for reasons of availability. Redundancy is only ensured if both system bus modules are inserted in the base plates and configured in SILworX.

The module is equipped with LEDs to indicate the status of the HART communication channels, see Chapter 3.4.2.

3.4.1 Block Diagram

The following block diagram illustrates the structure of the module.



1 System Busses
2 Safety-Related Processor System
3 Interface
4 Safety Switch
5 Power Supply
6 Watchdog
7 HART Channels (M1…M32)
8 Capacitive Galvanic Isolation
9 Field Zone: Proximity Switches or Contact Makers
10 Analog Input or Output Module

Figure 2: Block Diagram

3.4.2 Indicators

The following figure shows the LED indicators for the module.

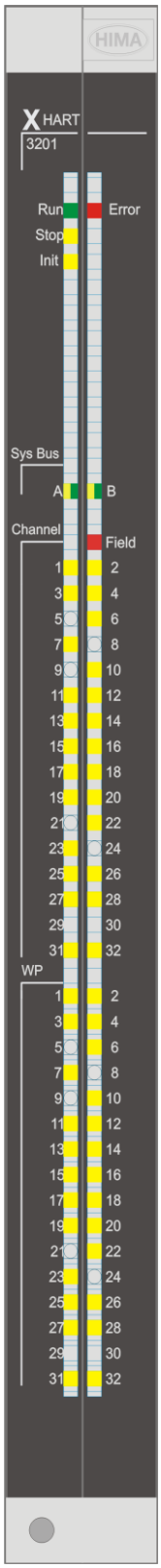


Figure 3: Indicators

The LEDs indicate the operating state of the module.

The LEDs on the module are divided into three groups:

- Module status indicators (Run, Error, Stop, Init)
- System bus indicators (A, B)
- I/O indicators (channel 1...32, field, WP 1...32)

When the supply voltage is switched on, a LED test is performed and all LEDs briefly flash simultaneously.

Definition of Blinking Frequencies

The following table defines the blinking frequencies of the LEDs:

Name	Blinking Frequencies
Blinking1	Long (approx. 600 ms) on, long (approx. 600 ms) off
Blinking2	Short (approx. 200 ms) on, short (approx. 200 ms) off, short (approx. 200 ms) on, long (approx. 600 ms) off
Blinking-x	Ethernet communication: Flashing in sync with data transfer

Table 3: Blinking Frequencies of LEDs

3.4.3 Module Status Indicators

These LEDs are located on the front plate, on the upper part of the module.

LED	Color	Status	Description
Run	Green	On	Module in RUN, normal operation
		Blinking1	Module state: STOP/OS_DOWNLOAD or OPERATE (only with processor modules)
		Off	Module not in RUN, observe the other status LEDs
Error	Red	On/Blinking1	Internal module faults detected by self-tests, e.g., hardware, software or voltage supply. Fault while loading the operating system
		Off	Normal operation
Stop	Yellow	On	Module state: STOP / VALID CONFIGURATION
		Blinking1	Module state: STOP / INVALID CONFIGURATION or STOP / OS_DOWNLOAD
		Off	Module not in STOP, observe the other status LEDs
Init	Yellow	On	Module state: INIT, observe the other status LEDs
		Blinking1	Module state: LOCKED, observe to the other status LEDs
		Off	Module state: neither INIT nor LOCKED, observe the other status LEDs

Table 4: Module Status Indicators

3.4.4 System Bus Indicators

The system bus LEDs are labeled *Sys Bus.*

LED	Color	Status	Description
A	Green	On	Physical and logical connection to the system bus module in slot 1.
		Blinking1	No physical connection to the system bus module in slot 1.
	Yellow	Blinking1	The physical connection to the system bus module in slot 1 has been established. No connection to a (redundant) processor module running in system operation.
B	Green	On	Physical and logical connection to the system bus module in slot 2.
		Blinking1	No physical connection to the system bus module in slot 2.
	Yellow	Blinking1	The physical connection to the system bus module in slot 2 has been established. No connection to a (redundant) processor module running in system operation.
A+B	Off	Off	Neither physical nor logical connection to the system bus modules in slot 1 and slot 2.

Table 5: System Bus Indicators

3.4.5 I/O indicators

The LEDs for the I/O indicators signal the status of the HART channels. Channel 1…32 (the upper LEDs) signal the HART status of the corresponding channel. WP 1…32 (the lower LEDs) indicate the write protection for the HART commands.

LED	Color	Status	Description
Channel 1…32	Yellow	On	Channel is used, HART communication is OK
		Blinking2	Channel fault
		Off	HART deactivated
Field	Red	Blinking2	HART communication error with field device in at least one channel
		Off	HART communication OK for all channels or deactivated.
WP 1…32	Yellow	On	Write protection configured
		Off	Write protection not configured

Table 6: I/O Indicators LEDs

3.5 Product Data

General	
Supply voltage	24 VDC, -15 %...+20 %, $r_P \leq 5$ %, SELV, PELV
Current input	min. 300 mA max. 400 mA
Operating temperature	0...+60 °C
Storage temperature	-40...+85 °C
Humidity	max. 95 % relative humidity, non-condensing
Type of protection	IP20
Dimensions (H x W x D) in mm	310 x 29.2 x 230
Weight	approx. 1.0 kg

Table 7: Product Data

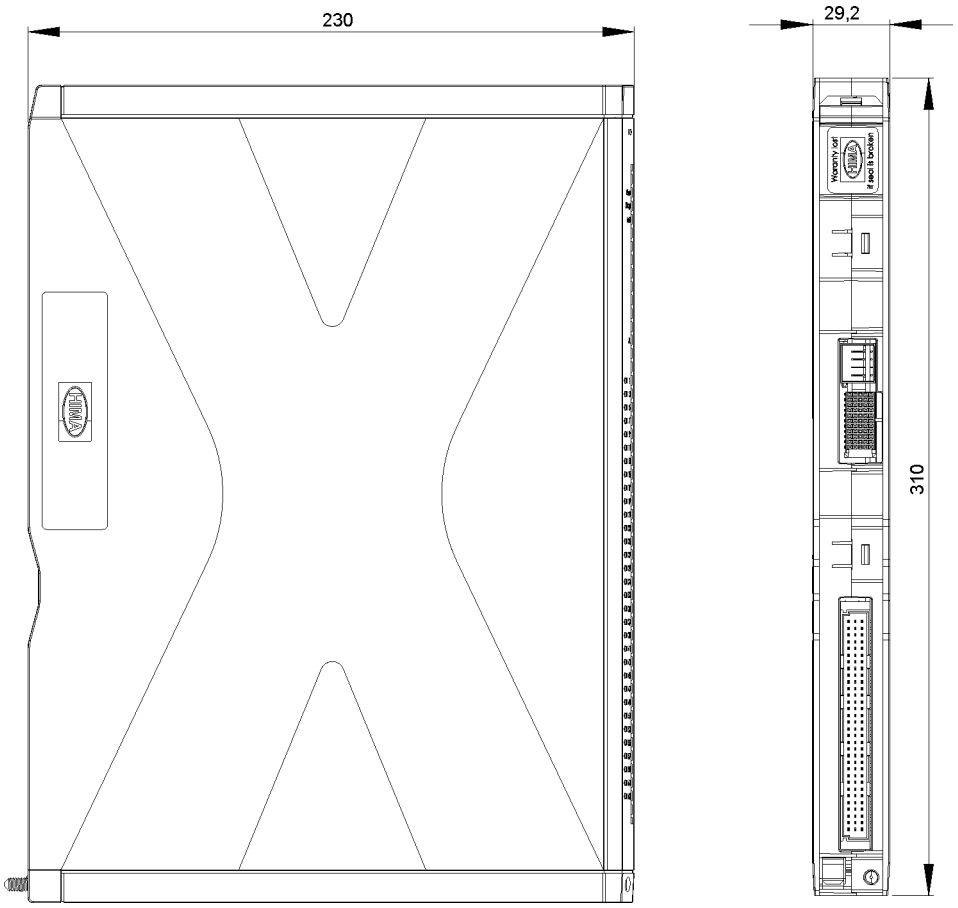


Figure 4: Views

HART channels	
Number of HART channels	32, capacitive galvanic isolation of the channels from one another. No electrical isolation!
Output impedance	230…600 Ω
Ohmic load	max. 600 Ω
Inductive load	max. 1 mH
Capacitive load	max. 100 µF in parallel to the ohmic load
Crosstalk (channel to channel) DC or 50 Hz and 60 Hz	not detectable (except for the range 0.3...150 kHz) >70 dB
Crosstalk (group to group) DC or 50 Hz and 60 Hz	>70 dB
Refresh of measured values (in the user program)	Cycle time of the user program
Hardware response time of the safety switch	≤ 500 µs opening of the safety switches
Hardware response time of the channel switches	≤ 500 µs opening of the channel switches

Table 8: Specifications for the HART Channels

3.6 Connector Boards

A HART connector board connects the modules to the field zone. Analog input and output modules, HART module and connector board form together a functional unit. Insert the connector board into the appropriate slot prior to mounting the analog input and output modules and the HART module.

The HART module is inserted in the corresponding HART connector board in accordance with the wiring options for the analog input and output modules.

i Two analog modules and one HART module are inserted into each redundant connector board.

The following HART connector boards are available for the HART module in accordance with the wiring options for the analog input and output modules:

HART connector board	Modules	Description
X-CB 016 01	X-AI 32 01 X-AI 32 02	Connector board with screw terminals
X-CB 016 02	X-AI 32 01 X-AI 32 02	Redundant connector board with screw terminals
X-CB 016 03	X-AI 32 01 X-AI 32 02	Connector board with cable plug
X-CB 016 04	X-AI 32 01 X-AI 32 02	Redundant connector board with cable plug
X-CB 016 51	X-AI 32 51	Connector board with screw terminals
X-CB 016 52	X-AI 32 51	Redundant connector board with screw terminals
X-CB 016 53	X-AI 32 51	Connector board with cable plug
X-CB 016 54	X-AI 32 51	Redundant connector board with cable plug
X-CB 017 01	X-AO 16 01	Connector board with screw terminals
X-CB 017 02	X-AO 16 01	Redundant connector board with screw terminals
X-CB 017 03	X-AO 16 01	Connector board with cable plug
X-CB 017 04	X-AO 16 01	Redundant connector board with cable plug
X-CB 017 51	X-AO 16 51	Connector board with screw terminals
X-CB 017 53	X-AO 16 51	Connector board with cable plug

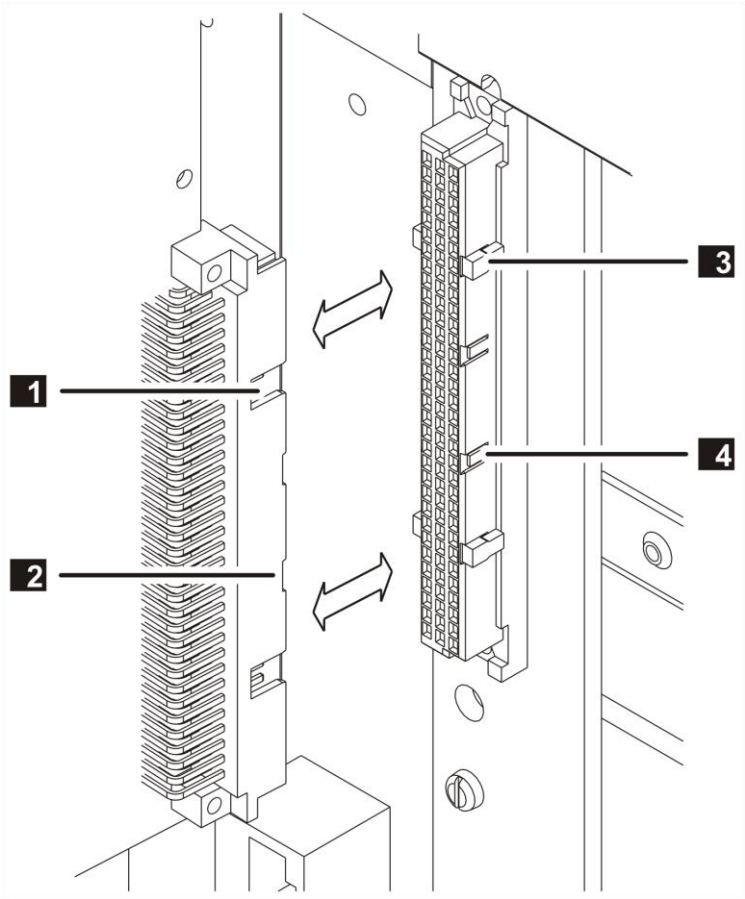
Table 9: Available Connector Boards

3.6.1 Mechanical Coding of Connector Boards

I/O modules and connector boards are mechanically coded starting from hardware revision AS10 to prevent them from being equipped with improper I/O modules. Coding avoids installation of improper I/O modules thus preventing negative effects on redundant modules and field zone. A part from that, improper equipment has no effect on the HIMax system since only I/O modules that are correctly configured in SILworX enter the RUN state.

I/O modules and the corresponding connector boards have a mechanical coding in form of wedges. The coding wedges in the female connector of the connector board match with the male connector recesses of the I/O module plug, see Figure 5.

Coded I/O modules can only be plugged in to the corresponding connector boards.



1 Male Connector Recess
2 Prepared Male Connector Recess
3 Coding Wedge
4 Guideway for Coding Wedge

Figure 5: Coding Example

Coded I/O modules can be plugged in to uncoded connector boards. Uncoded I/O modules cannot be plugged in to coded connector boards.

3.6.2 Coding of X-CB 016 and X-CB 017 Connector Boards

a7	a13	a20	a26	c7	c13	c20	c26
X	X				X		X

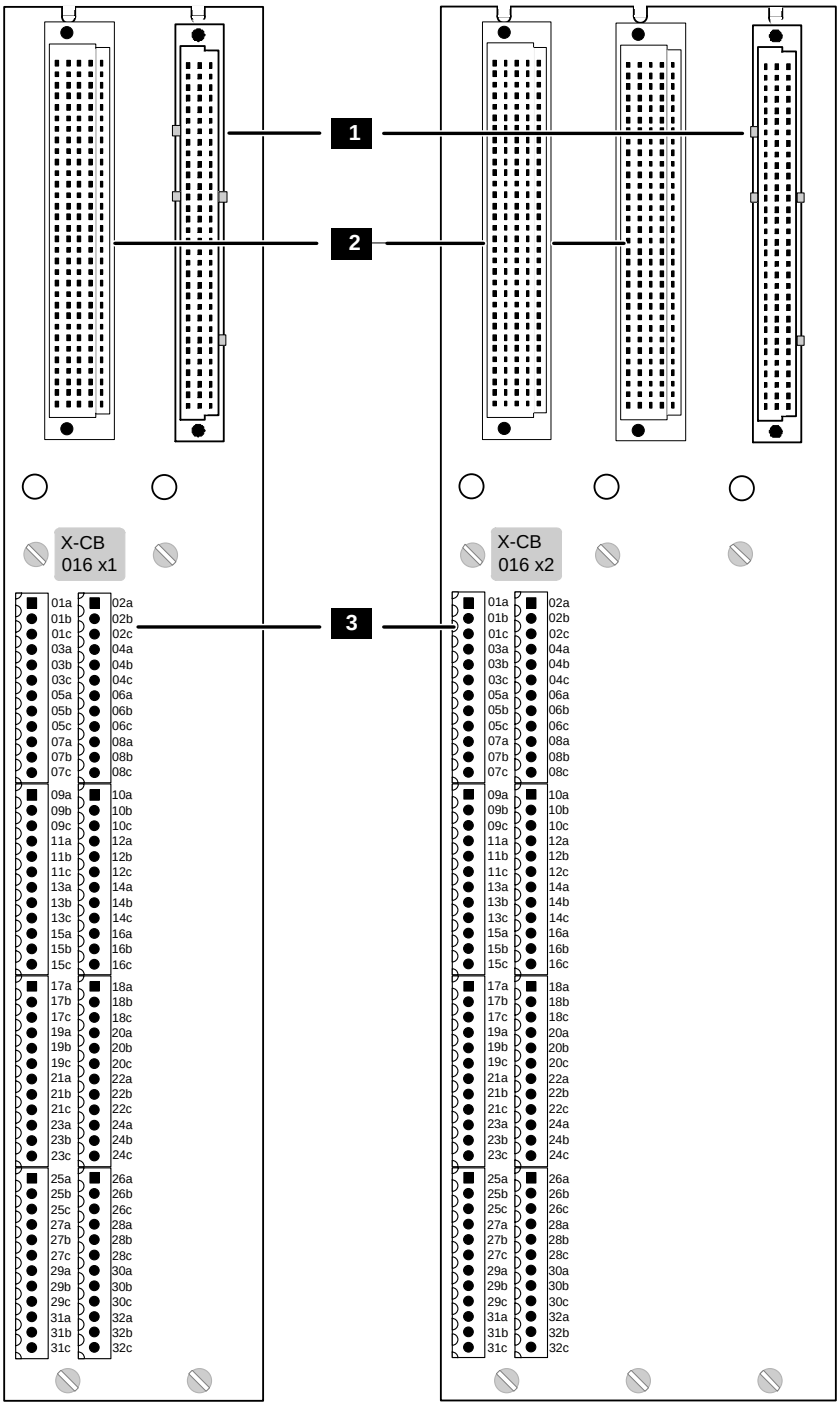
Table 10: Position of Coding Wedges on HART Module Slot

i Position of the coding wedges on the analog module slots, see the corresponding module-specific manual.

3.6.3 Connector Boards for Analog Input Modules

3.6.3.1 Pin Assignment for Connector Boards with Screw Terminals

Mono	**Redundant**
X-CB 016 01 X-CB 016 51	X-CB 016 02 X-CB 016 52



1 HART Module Plug

2 I/O Module Plug

3 Connection to the Field Zone (Screw Terminal Connector Block)

Figure 6: X-CB 016 Connector Boards with Screw Terminals

3.6.3.2 Terminal Assignment for Connector Boards with Screw Terminals

Pin no.	Designation	Signal	Pin no.	Designation	Signal
1	01a	S1+	1	02a	S2+
2	01b	AI1+	2	02b	AI2+
3	01c	AI1-	3	02c	AI2-
4	03a	S3+	4	04a	S4+
5	03b	AI3+	5	04b	AI4+
6	03c	AI3-	6	04c	AI4-
7	05a	S5+	7	06a	S6+
8	05b	AI5+	8	06b	AI6+
9	05c	AI5-	9	06c	AI6-
10	07a	S7+	10	08a	S8+
11	07b	AI7+	11	08b	AI8+
12	07c	AI7-	12	08c	AI8-
Pin no.	Designation	Signal	Pin no.	Designation	Signal
1	09a	S9+	1	10a	S10+
2	09b	AI9+	2	10b	AI10+
3	09c	AI9-	3	10c	AI10-
4	11a	S11+	4	12a	S12+
5	11b	AI11+	5	12b	AI12+
6	11c	AI11-	6	12c	AI12-
7	13a	S13+	7	14a	S14+
8	13b	AI13+	8	14b	AI14+
9	13c	AI13-	9	14c	AI14-
10	15a	S15+	10	16a	S16+
11	15b	AI15+	11	16b	AI16+
12	15c	AI15-	12	16c	AI16-
Pin no.	Designation	Signal	Pin no.	Designation	Signal
1	17a	S17+	1	18a	S18+
2	17b	AI17+	2	18b	AI18+
3	17c	AI17-	3	18c	AI18-
4	19a	S19+	4	20a	S20+
5	19b	AI19+	5	20b	AI20+
6	19c	AI19-	6	20c	AI20-
7	21a	S21+	7	22a	S22+
8	21b	AI21+	8	22b	AI22+
9	21c	AI21-	9	22c	AI22-
10	23a	S23+	10	24a	S24+
11	23b	AI23+	11	24b	AI24+
12	23c	AI23-	12	24c	AI24-

Pin no.	Designation	Signal	Pin no.	Designation	Signal
1	25a	S25+	1	26a	S26+
2	25b	AI25+	2	26b	AI26+
3	25c	AI25-	3	26c	AI26-
4	27a	S27+	4	28a	S28+
5	27b	AI27+	5	28b	AI28+
6	27c	AI27-	6	28c	AI28-
7	29a	S29+	7	30a	S30+
8	29b	AI29+	8	30b	AI30+
9	29c	AI29-	9	30c	AI30-
10	31a	S31+	10	32a	S32+
11	31b	AI31+	11	32b	AI32+
12	31c	AI31-	12	32c	AI32-

Table 11: Terminal Assignment for Connector Boards with Screw Terminals

Cable plugs attached to the connector board pin headers are used to connect to the field zone.

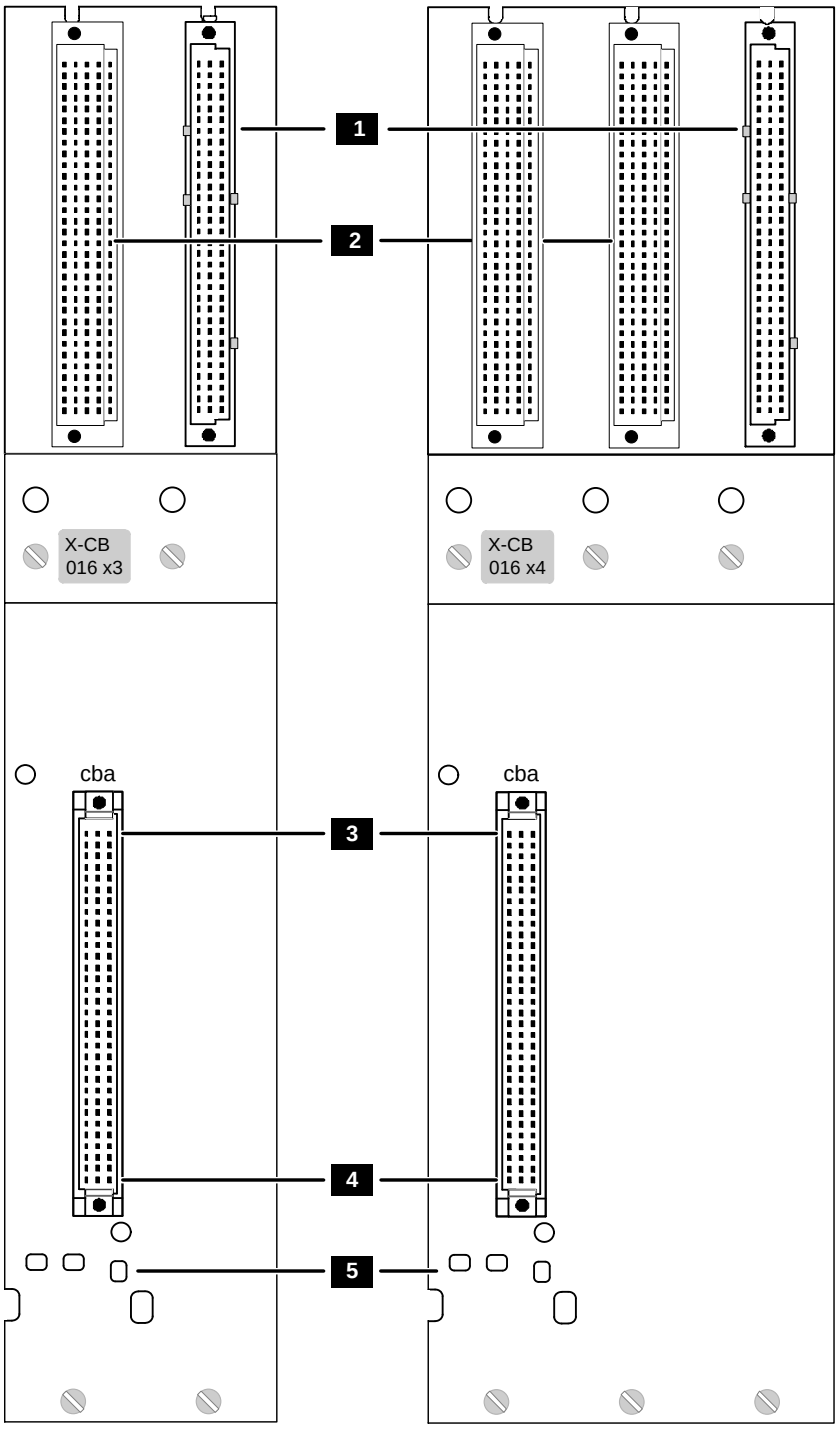
The cable plugs feature the following properties:

Connection to the field zone	
Cable plugs	8 pieces, with 12 poles
Wire cross-section	0.2…1.5 mm^2 (single-wire) 0.2…1.5 mm^2 (finely stranded) 0.2…1.5 mm^2 (with wire end ferrule)
Stripping length	6 mm
Screwdriver	Slotted 0.4 x 2.5 mm
Tightening torque	0.2…0.25 Nm

Table 12: Cable Plug Properties

3.6.3.3 Pin Assignment for Connector Boards with Cable Plug

Mono	Redundant
X-CB 016 03 X-CB 016 53	X-CB 016 04 X-CB 016 54



1 HART Module Plug
2 I/O Module Plug
3 Connection to the Field Zone (Cable Plug in Row 1)
4 Connection to the Field Zone (Cable Plug in Row 32)
5 Coding for Cable Plugs

Figure 7: X-CB 016 Connector Boards with Cable Plug

3.6.3.4 Pin Assignment for Connector Boards with Cable Plug

HIMA provides ready-made system cables for use with these connector boards, see Chapter 3.7. The cable plug and the connector boards are coded.

Connector pin assignment!

The following table describes the connector pin assignment for the system cable plug.

Lead marking based on DIN 47100:

Row	c		b		a	
	Signal	Color	Signal	Color	Signal	Color
1	S32+	PK-BN [1)]	AI32+	WH-PK [1)]	Reserved	YE-BU [1)]
2	S31+	GY-BN [1)]	AI31+	WH-GY [1)]	Reserved	GN-BU [1)]
3	S30+	YE-BN [1)]	AI30+	WH-YE [1)]	Reserved	YE-PK [1)]
4	S29+	BN-GN [1)]	AI29+	WH-GN [1)]	Reserved	PK-GN [1)]
5	S28+	RD-BU [1)]	AI28+	GY-PK [1)]	Not used	
6	S27+	VT [1)]	AI27+	BK [1)]	Not used	
7	S26+	RD [1)]	AI26+	BU [1)]	Not used	
8	S25+	PK [1)]	AI25+	GY [1)]	Not used	
9	S24+	YE [1)]	AI24+	GN [1)]	Not used	
10	S23+	BN [1)]	AI23+	WH [1)]	Not used	
11	S22+	RD-BK	AI22+	BU-BK	Not used	
12	S21+	PK-BK	AI21+	GY-BK	Not used	
13	S20+	PK-RD	AI20+	GY-RD	Not used	
14	S19+	PK-BU	AI19+	GY-BU	Not used	
15	S18+	YE-BK	AI18+	GN-BK	Not used	
16	S17+	YE-RD	AI17+	GN-RD	Not used	
17	S16+	YE-BU	AI16+	GN-BU	Not used	
18	S15+	YE-PK	AI15+	PK-GN	Not used	
19	S14+	YE-GY	AI14+	GY-GN	Not used	
20	S13+	BN-BK	AI13+	WH-BK	Not used	
21	S12+	BN-RD	AI12+	WH-RD	Not used	
22	S11+	BN-BU	AI11+	WH-BU	Not used	
23	S10+	PK-BN	AI10+	WH-PK	Not used	
24	S9+	GY-BN	AI9+	WH-GY	Not used	
25	S8+	YE-BN	AI8+	WH-YE	AI-	YE-GY [1)]
26	S7+	BN-GN	AI7+	WH-GN	AI-	GY-GN [1)]
27	S6+	RD-BU	AI6+	GY-PK	AI-	BN-BK [1)]
28	S5+	VT	AI5+	BK	AI-	WH-BK [1)]
29	S4+	RD	AI4+	BU	AI-	BN-RD [1)]
30	S3+	PK	AI3+	GY	AI-	WH-RD [1)]
31	S2+	YE	AI2+	GN	AI-	BN-BU [1)]
32	S1+	BN	AI1+	WH	AI-	WH-BU [1)]

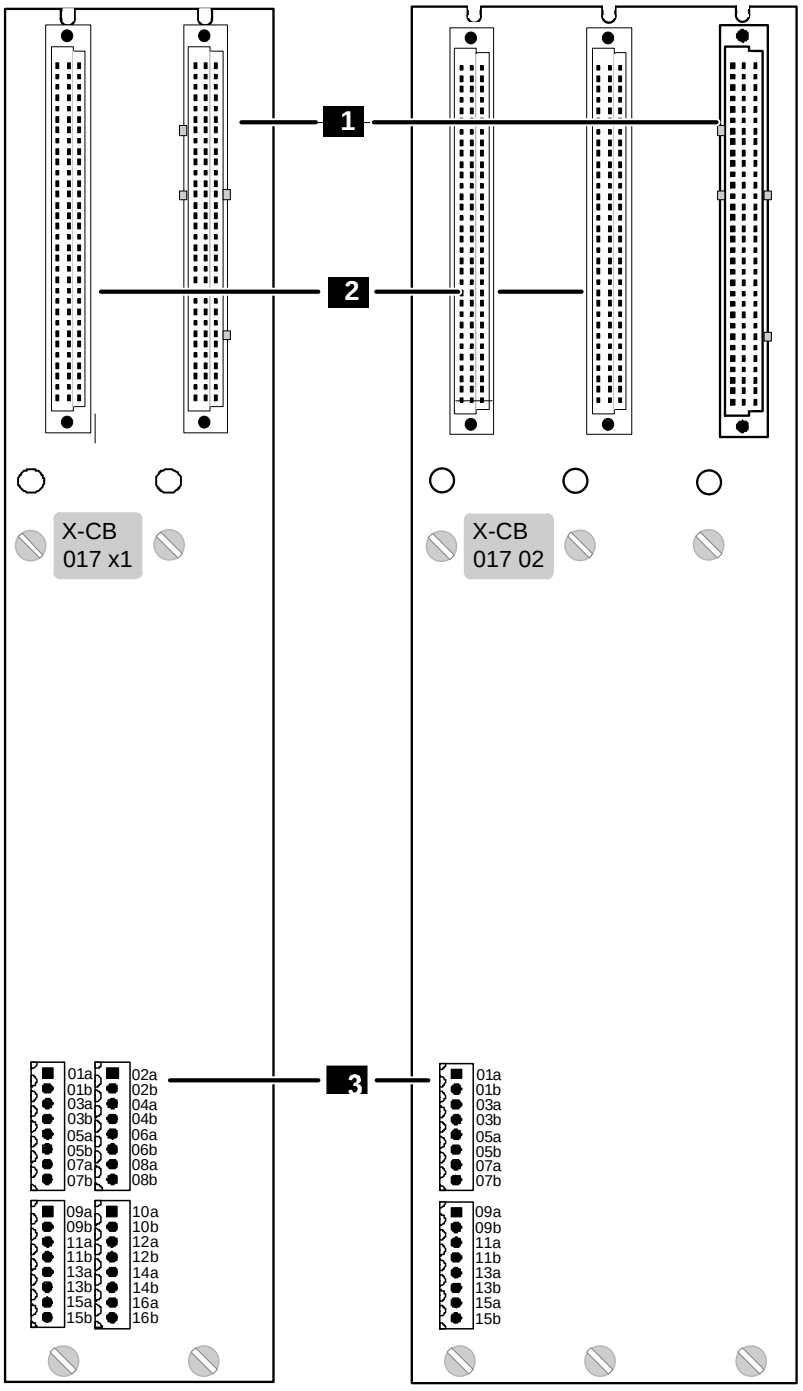
[1)] Additional orange ring if one lead marking color is repeated.

Table 13: Pin Assignment for the System Cable Plug

3.6.4 Connector Board for Analog Output Modules

3.6.4.1 Connector Board with Screw Terminals

Mono	Redundant
X-CB 017 01 X-CB 017 51	X-CB 017 02



1 HART Module Plug
2 I/O Module Plug
3 Connection to the Field Zone (Screw Terminal Connector Block)

Figure 8: Connector Boards with Screw Terminals

3.6.4.2 Terminal Assignment for Mono Connector Boards with Screw Terminals

Pin no.	Designation	Signal	Pin no.	Designation	Signal
1	01a	AO1+	1	02a	AO2+
2	01b	AO1-	2	02b	AO2-
3	03a	AO3+	3	04a	AO4+
4	03b	AO3-	4	04b	AO4-
5	05a	AO5+	5	06a	AO6+
6	05b	AO5-	6	06b	AO6-
7	07a	AO7+	7	08a	AO8+
8	07b	AO7-	8	08b	AO8-
Pin no.	Designation	Signal	Pin no.	Designation	Signal
1	09a	AO9+	1	10a	AO10+
2	09b	AO9-	2	10b	AO10-
3	11a	AO11+	3	12a	AO12+
4	11b	AO11-	4	12b	AO12-
5	13a	AO13+	5	14a	AO14+
6	13b	AO13-	6	14b	AO14-
7	15a	AO15+	7	16a	AO16+
8	15b	AO15-	8	16b	AO16-

Table 14: Terminal Assignment for Mono Connector Boards with Screw Terminals

Cable plugs attached to the connector board pin headers are used to connect to the field zone.

The cable plugs feature the following properties:

Connection to the field zone	
Cable plugs	4 pieces, with 8 poles
Wire cross-section	0.2…1.5 mm^2 (single-wire) 0.2…1.5 mm^2 (finely stranded) 0.2…1.5 mm^2 (with wire end ferrule)
Stripping length	6 mm
Screwdriver	Slotted 0.4 x 2.5 mm
Tightening torque	0.2…0.25 Nm

Table 15: Cable Plug Properties

3.6.4.3 Terminal Assignment for Redundant Connector Boards with Screw Terminals

Pin no.	Designation	Signal
1	01a	AO1+
2	01b	AO1-
3	03a	AO3+
4	03b	AO3-
5	05a	AO5+
6	05b	AO5-
7	07a	AO7+
8	07b	AO7-
Pin no.	Designation	Signal
1	09a	AO9+
2	09b	AO9-
3	11a	AO11+
4	11b	AO11-
5	13a	AO13+
6	13b	AO13-
7	15a	AO15+
8	15b	AO15-

Table 16: Terminal Assignment for Redundant Connector Boards with Screw Terminals

Cable plugs attached to the connector board pin headers are used to connect to the field zone.

The cable plugs feature the following properties:

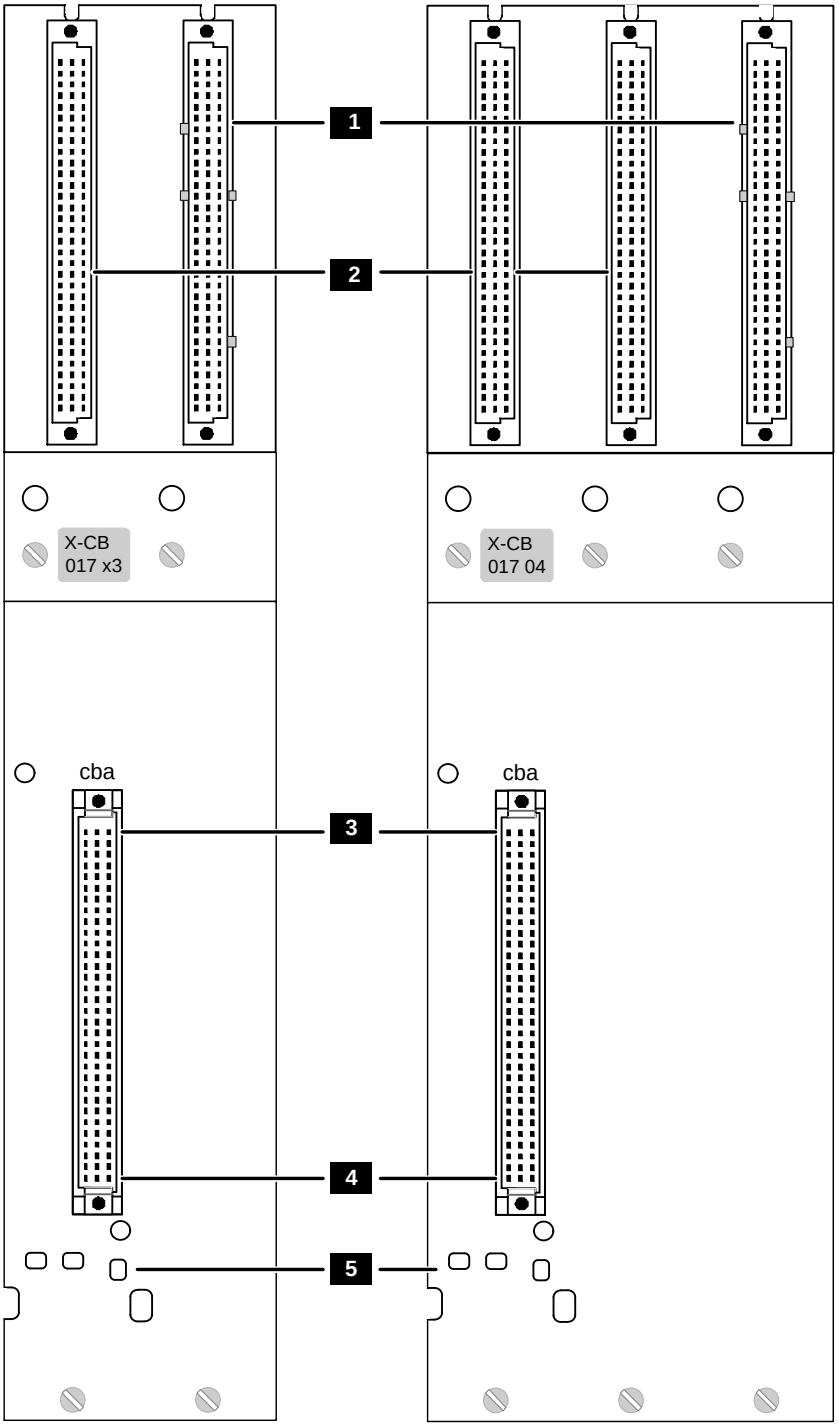
I/O lines	
Cable plugs	2 pieces, with 8 poles
Wire cross-section	0.2…1.5 mm^2 (single-wire) 0.2…1.5 mm^2 (finely stranded) 0.2…1.5 mm^2 (with wire end ferrule)
Stripping length	6 mm
Screwdriver	Slotted 0.4 x 2.5 mm
Tightening torque	0.2…0.25 Nm

Table 17: Cable Plug Properties

3.6.4.4 Pin Assignment for Connector Boards with Cable Plug

Mono
X-CB 017 03
X-CB 017 53

Redundant
X-CB 017 04



1 HART Module Plug
2 I/O Module Plug
3 Connection to the Field Zone (Cable Plug in Row 1)
4 Connection to the Field Zone (Cable Plug in Row 32)
5 Coding for Cable Plugs

Figure 9: X-CB 017 Connector Boards with Cable Plug

3.6.4.5 Pin Assignment for Mono Connector Boards with Cable Plug

HIMA provides ready-made system cables for use with this connector board, see Chapter 3.7.

The cable plug and the connector boards are coded.

Lead marking based on DIN 47100:

Row	C		B		a	
	Signal	Color	Signal	Color	Signal	Color
1	Not used		Not used		U1-D1A	YE-BK
2	Not used		Not used		U1-D1B	GN-BK
3	Not used		Not used		U1-D2A	YE-RD
4	Not used		Not used		U1-D2B	GN-RD
5	Not used		Not used			
6	Not used		Not used			
7	Not used		Not used			
8	Not used		Not used			
9	Not used		Not used			
10	Not used		Not used			
11	Not used		Not used			
12	Not used		Not used			
13	Not used		Not used			
14	Not used		Not used			
15	Not used		Not used			
16	Not used		Not used			
17	AO16+	YE-BU	AO16-	GN-BU		
18	AO15+	YE-PK	AO15-	PK-GN		
19	AO14+	YE-GY	AO14-	GY-GN		
20	AO13+	BN-BK	AO13-	WH-BK		
21	AO12+	BN-RD	AO12-	WH-RD		
22	AO11+	BN-BU	AO11-	WH-BU		
23	AO10+	PK-BN	AO10-	WH-PK		
24	AO9+	GY-BN	AO9-	WH-GY		
25	AO8+	YE-BN	AO8-	WH-YE		
26	AO7+	BN-GN	AO7-	WH-GN		
27	AO6+	RD-BU	AO6-	GY-PK		
28	AO5+	VT	AO5-	BK		
29	AO4+	RD	AO4-	BU		
30	AO3+	PK	AO3-	GY		
31	AO2+	YE	AO2-	GN		
32	AO1+	BN	AO1-	WH		

Table 18: Pin Assignment for Mono Connector Boards with Cable Plug

3.6.4.6 Pin Assignment for Redundant Connector Boards with Cable Plug

HIMA provides ready-made system cables for use with this connector board, see Chapter 3.7. The cable plug and the connector boards are coded.

Lead marking based on DIN 47100:

Row	C		b		A	
	Signal	Color	Signal	Color	Signal	Color
1	Not used		Not used		U1-D1A	YE-BK
2	Not used		Not used		U1-D1B	GN-BK
3	Not used		Not used		U1-D2A	YE-RD
4	Not used		Not used		U1-D2B	GN-RD
5	Not used		Not used			
6	Not used		Not used			
7	Not used		Not used			
8	Not used		Not used			
9	Not used		Not used			
10	Not used		Not used			
11	Not used		Not used			
12	Not used		Not used			
13	Not used		Not used			
14	Not used		Not used			
15	Not used		Not used			
16	Not used		Not used			
17	Not used		Not used			
18	AO15+	YE-PK	AO15-	PK-GN		
19	Not used		Not used			
20	AO13+	BN-BK	AO13-	WH-BK		
21	Not used		Not used			
22	AO11+	BN-BU	AO11-	WH-BU		
23	Not used		Not used			
24	AO9+	GY-BN	AO9-	WH-GY		
25	Not used		Not used			
26	AO7+	BN-GN	AO7-	WH-GN		
27	Not used		Not used			
28	AO5+	VT	AO5-	BK		
29	Not used		Not used			
30	AO3+	PK	AO3-	GY		
31	Not used		Not used			
32	AO1+	BN	AO1-	WH		

Table 19: Pin Assignment for Redundant Connector Boards with Cable Plug

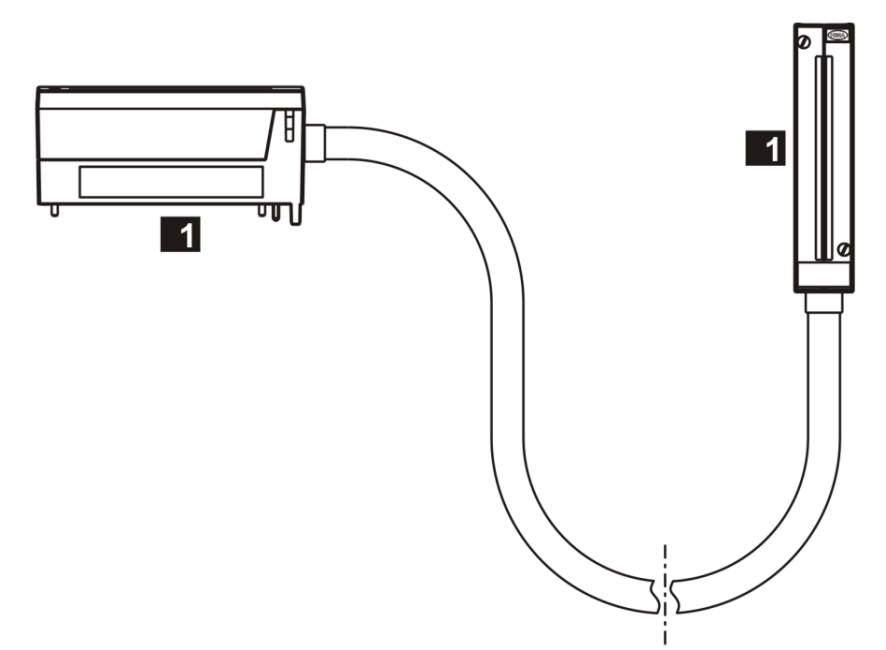
3.7 System cable

3.7.1 System Cable X-CA 005

The X-CA 005 system cable is used to wire the X-CB 016 03/04 and X-CB 016 53/54 connector boards to the field termination assemblies.

General	
Cable	LIYY-TP 38 x 2 x 0.25 mm²
Wire	Finely stranded
Average outer diameter (d)	approx. 15.2 mm
Minimum bending radius Fixed laying Flexible application	 5 x d 10 x d
Combustion behavior	Flame resistant and self-extinguishing in accordance with IEC 60332-1-2, -2-2
Length	8…30 m
Color coding	Based on DIN 47100, see Table 13.

Table 20: Cable Data



1 Identical Cable Plugs

Figure 10: System Cable X-CA 001 01 n

The system cable is available in the following standard length:

System cable	Description	Length
X-CA 001 01 8	Coded cable plugs on both sides	8 m
X-CA 001 01 15		15 m
X-CA 001 01 30		30 m

Table 21: Available System Cables

3.7.2 Cable Plug Coding

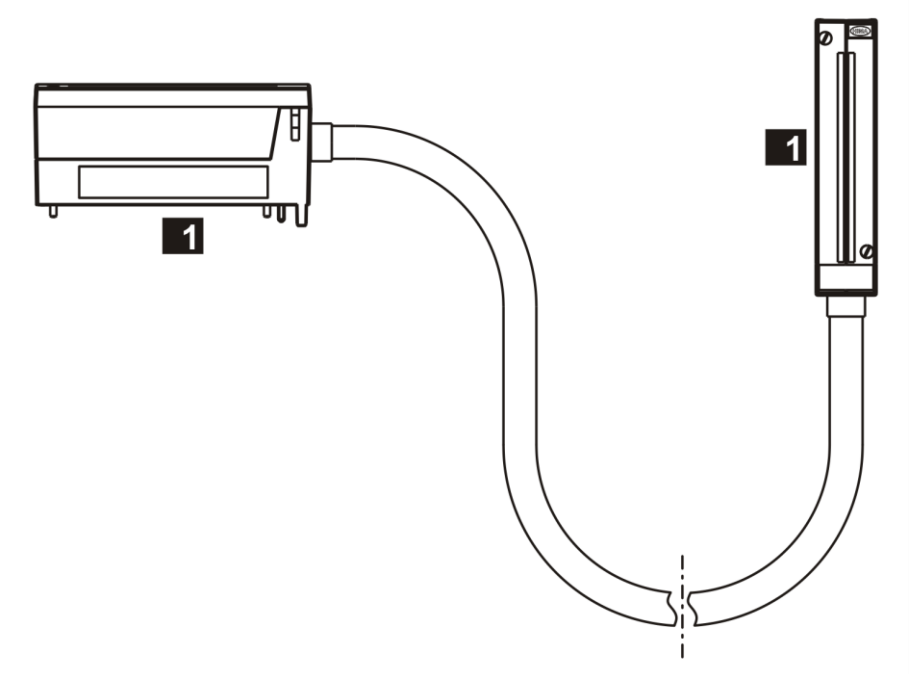
The cable plugs are equipped with three coding pins. Therefore, cable plugs only match connector boards and FTAs encoded accordingly, see Figure 7.

3.7.3 System Cable X-CA 011

The X-CA 011 system cable is used to wire the X-CB 017 03/04 and X-CB 017 53 connector boards to the field termination assemblies.

General	
Cable	LIYCY-TP 18 x 2 x 0.25 mm²
Wire	Finely stranded
Average outer diameter (d)	approx. 12.7 mm
Minimum bending radius Fixed laying Flexible application	 5 x d 10 x d
Combustion behavior	Flame resistant and self-extinguishing in accordance with IEC 60332-1-2, -2-2
Length	8…30 m
Color coding	Based on DIN 47100, see Table 18 and Table 19.

Table 22: Cable Data



1 Identical Cable Plugs

Figure 11: System Cable X-CA 011 01 n

The system cable is available in the following standard length:

System cable	Description	Length
X-CA 011 01 8	Coded cable plugs on both sides	8 m
X-CA 011 01 15		15 m
X-CA 011 01 30		30 m

Table 23: Available System Cables

3.7.4 Cable Plug Coding

The cable plugs are equipped with three coding pins. Therefore, cable plugs only match connector boards and FTAs encoded accordingly, see Figure 9.

4 Start-up

This chapter describes how to install, configure and connect the HART module to the analog input and output modules. For more information, refer to the HIMax manuals for the analog input and output modules and the HIMax Safety Manual (HI 801 003 E).

i The safety-related application (SIL 3 in accordance with IEC 61508) of the inputs and the proximity switches connected must comply with the safety requirements. For more information, refer to the HIMax Safety Manual.

4.1 Mounting

Observe the following points when mounting the module:

- Only operate the module with the suitable connector board. For more information, see Chapter 3.6.
- Only operate the module in parallel with the appropriate analog input or output module.
- The modules and their connected components must be mounted to provide protection of at least IP20 in accordance with EN 60529: 1991 + A1: 2000.

NOTE

Damage due to incorrect wiring!

Failure to comply with these instructions can damage the electronic components.

Observe the following points:

- Plugs and terminals connected to the field zone.
  - Take the appropriate earthing measures when connecting the plugs and terminals to the field zone.
  - Use shielded cables with twisted pairs.
  - Connect one twisted pair of the shielded cable to each of the channels.
  - On the module side, the shielding must be connected to the cable shield rail (use SK 20 shield connection terminal block or similar).
  - When using stranded wires, HIMA recommends fastening ferrules to the wire ends. The terminals must be suitable for fastening the cross-sections of the cables in use.
- If the supply is used, utilize the voltage output used for the assigned channel, see 4.4.1.
- HIMA recommends using the supply of the analog input module.
  If an external supply or measurement unit fails, the affected channel on the module can be overloaded and damaged. If an external supply is required for the given application, check the switching threshold following a non-transient overload that exceeds the limit values of the module.
- The analog modules may be wired redundantly using the corresponding connector boards. For more information, see Chapters 3.6 and 4.4.

4.1.1 Wiring I/O Channels Not in Use

I/O channels that are not being used may stay open and need not be terminated. To prevent short-circuits and sparks in the field zone, never connect a wire to a connector board if it is open on the field side.

4.2 Mounting and Removing the Module

When replacing an existing module or mounting a new one, follow the instructions given in this chapter.

When removing the module, the connector board remains in the HIMax base plate. This saves additional wiring effort since all field terminals are connected via the connector board of the module.

4.2.1 Mounting a Connector Board

Tools and utilities

- Screwdriver, cross PH 1 or slotted 0.8 x 4.0 mm
- Matching connector board

To install the connector board

1. Insert the connector board into the guiding rail with the groove facing upwards (see following figure). Fit the groove into the guiding rail pin.
2. Place the connector board on the cable shield rail.
3. Secure the captive screws to the base plate. First screw in the lower screws than the upper ones.

To remove the connector board

1. Release the captive screws from the base plate.
2. Carefully lift the lower section of the connector board from the cable shield rail.
3. Remove the connector board from the guiding rail.

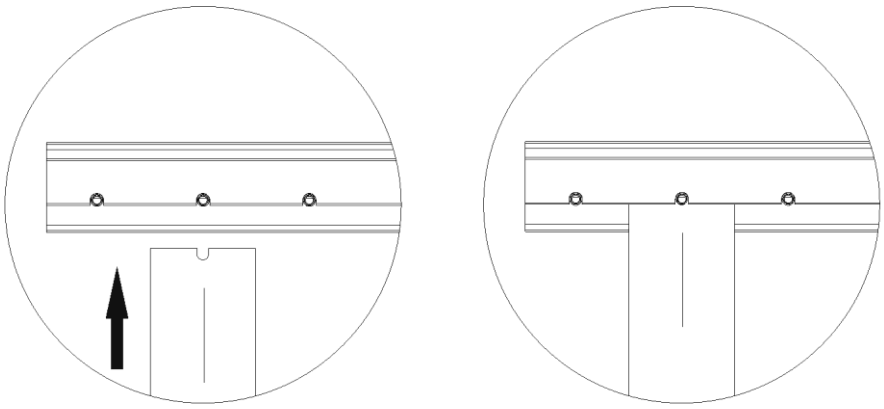


Figure 12: Example of how to Insert the Mono Connector Board

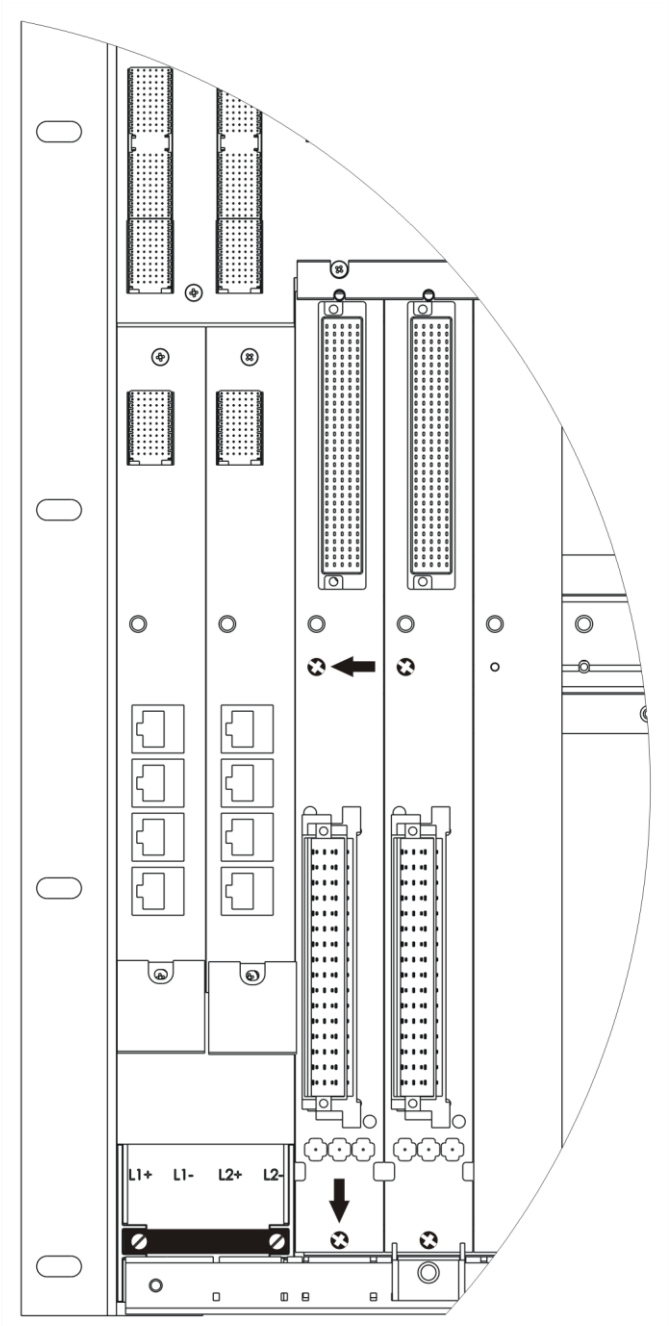


Figure 13: Example of how to Secure the Mono Connector Board with Captive Screws

i These instructions also apply for redundant connector boards. The number of slots used varies in accordance with the connector board type. The number of captive screws depends on the connector board type.

4.2.2 Mounting and Removing the Module

This chapter describes how to mount and remove the HIMax module. A module can be mounted and removed while the HIMax system is operating.

NOTICE

Damage to bus and power sockets due to module jamming!

Failure to observe this can damage the controller.

Always take care when inserting the module in the base plate.

Tools and utilities

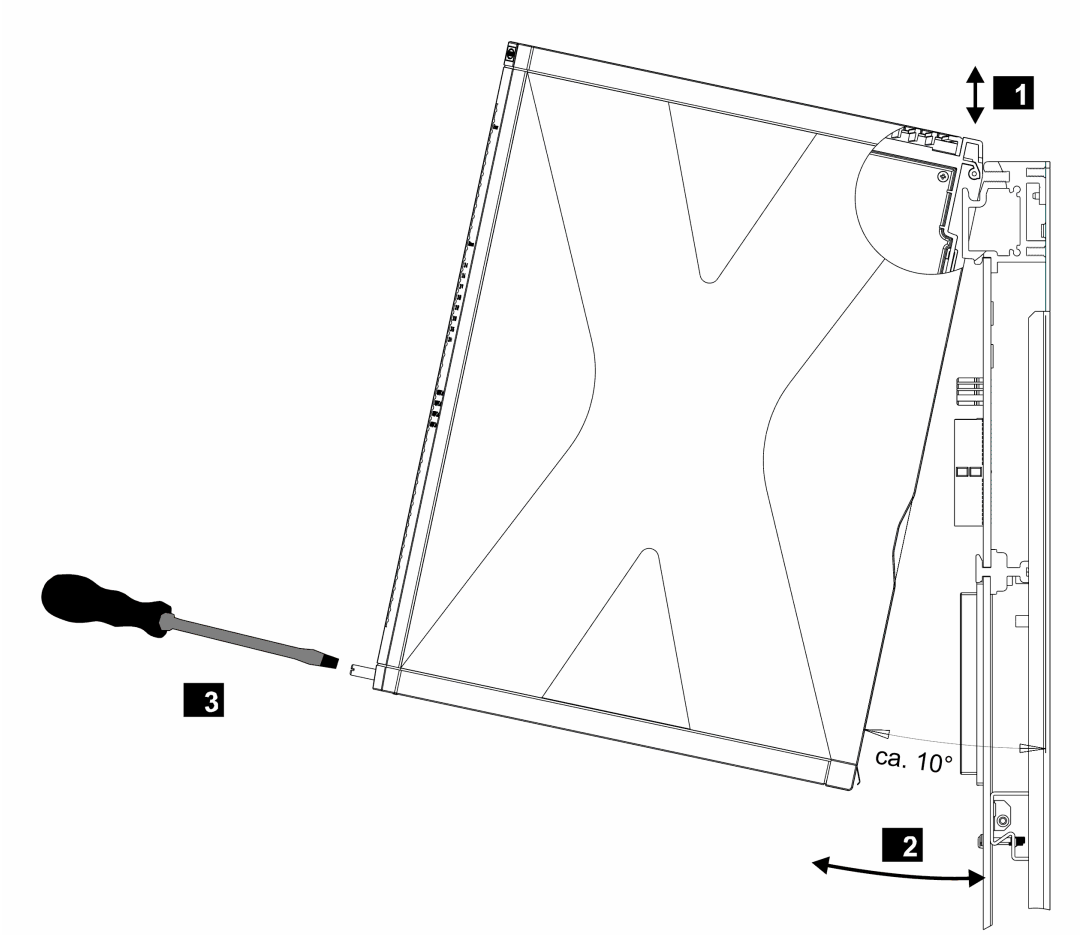
- Screwdriver, slotted 0.8 x 4.0 mm
- Screwdriver, slotted 1.2 x 8.0 mm

Installation

1. Open the cover plate on the fan rack:
   ☑ Move the locks to the *open* position.
   ☑ Lift the cover plate and insert into the fan rack
2. Insert the top of the module into the hook-in rail, see **1**.
3. Swivel the lower edge of the module towards the base plate and apply light pressure to snap it into place, see **2**.
4. Tighten the screws, see **3**.
5. Pull the cover plate out of the fan rack and close it.
6. Lock the cover plate.

Removal

1. Open the cover plate on the fan rack:
   ☑ Move the locks to the *open* position.
   ☑ Lift the cover plate and insert into the fan rack
2. Release the screw **3**.
3. Swivel the lower edge of the module away from the base plate. Lift and apply light pressure to remove the module from the hook-in rail, see **2** and **1**.
4. Pull the cover plate out of the fan rack and close it.
5. Lock the cover plate.



1 Inserting and Removing a Module
2 Swiveling a Module in and out
3 Securing and Releasing a Module

Figure 14: Mounting and Removing a Module

i If the HIMax system is operating, do not open the cover plate of the fan rack for more than a few minutes (< 10 min) since this affects the forced cooling.

4.3 Configuring the Module in SILworX

The module is configured in the Hardware Editor of the SILworX programming tool.

Observe the following points when configuring the module:

- Configure the corresponding analog input or output module in SILworX.
- To diagnose the module and channels, the system parameters can be evaluated within the user program. For more information on the system parameters, refer to the tables starting with Chapter 4.3.
- In case of analog output redundancy, the *Module Status* parameter must be additionally taken into account, see HI 801 111 E.

If short-circuits or open-circuits occur, no HART communication is possible. Under these conditions, the requests or settings performed through HART communication must be rejected.

To evaluate the statuses from within the user program, assign the module statuses global variables. Perform this step in the Hardware Editor using the module's detail view.

The following tables present the statuses and parameters for the module in the same order given in the Hardware Editor.

TIP To convert hexadecimal values to bit strings a scientific calculator such as the Windows® calculator with the corresponding view can be used.

4.3.1 Tab: Module

The **Module** tab contains the statuses and parameters for the module.

Name		R/W	Description
Enter these statuses and parameters directly in the Hardware Editor.			
Name		W	Module name
Noise Blanking		W	Noise blanking performed by processor module allowed (activated/deactivated). Default setting: Activated The processor modules defers the reaction to detected transient faults until the safety time has expired. The user program retains its last valid process value.
Name	**Data type**	**R/W**	**Description**
The following statuses and parameters can be assigned global variables and used in the user program.			
Module OK	BOOL	R	TRUE: No module fault. FALSE: Module fault Channel fault (no external faults), the module is not inserted. Observe the *Module Status* parameter!
Module Status	DWORD	R	Status of the module

Coding	Description
0x00000001	Module fault [1)]
0x00000002	Temperature threshold 1 exceeded
0x00000004	Temperature threshold 2 exceeded
0x00000008	Incorrect temperature value
0x00000010	Voltage on L1+ is defective
0x00000020	Voltage on L2+ is defective
0x00000040	Internal voltage is defective
0x80000000	No connection to the module [1)]

[1)] These faults affect the *Module OK* status and need not be separately evaluated in the user program.

Timestamp [µsec]	DWORD	R	Microsecond fraction of the timestamp. Point in time at which the channel measurement was performed.
Timestamp [s]	DWORD	R	Second fraction of the timestamp. Point in time at which the channel measurement was performed.

Table 24: Module Tab in the Hardware Editor

4.3.2 Tab: I/O Submodule HART_32_01

The **I/O Submodule HART_32_01** tab contains the following system parameters:

Name		R/W	Description
These statuses and parameters are entered directly in the Hardware Editor.			
Name		W	Module name
HART ID			The HART ID corresponds to the IO Card Number when addressing field devices using HART command 77. Range of values: 0...249 Standard: 0
X-COM			Selection of the COM module within which HART over IP is processed.
Name	Data type	R/W	Description
The following statuses and parameters can be assigned global variables and used in the user program.			
Diagnostic Request	DINT	W	To request a diagnostic value, the appropriate ID must be sent to the module using the parameter *Diagnostic Request* (see Chapter 4.3.5 for coding details).
Diagnostic Response	DINT	R	As soon as *Diagnostic Response* returns the ID of *Diagnostic Request* (see 4.3.5 for coding details), *Diagnostic Status* contains the diagnostic value requested.
Diagnostic Status	DWORD	R	Requested diagnostic value in accordance with *Diagnostic Response.* The IDs of *Diagnostic Request* and *Diagnostic Response* can be evaluated in the user program. *Diagnostic Status* only contains the requested diagnostic value when both Diagnostic Request and Diagnostic Response have the same ID.
HART: Allow Device-Specific Commands	BOOL	W	TRUE: Allow Device-Specific Commands FALSE: Lock Device-Specific Commands If the lock is active (FALSE), the following device-specific commands are not forwarded to the HART field device: (**77**, 128...253) and all the commands between 0 and 65535 that are not specified as read or write commands in this table.
HART: Allow Read Commands	BOOL	W	TRUE: Allow universal common practice read command FALSE: Lock universal common practice read command If the lock is active (FALSE), the following read commands are not allowed: (0, 1, 2, 3, 7, 8, 9, 11, 12, 13, 14, 15, 16, 20, 21, 48, 33, 50, 54, 57, 60, 61, 62, 63, 70, 72, 73, 74, 75, 76, **77**, 78, 80, 81, 84, 85, 86, 90, 91, 93, 94, 95, 96, 98, 101, 105, 110, 114, 115, 512)

HART: Allow Write Commands	BOOL	W	TRUE: Allow universal common practice write command FALSE: Lock universal common practice write command If the lock is active (FALSE), the following write commands are not forwarded to the HART field device: (6, 17, 18, 19, 22, 38, 34, 35, 36, 37, 39, 40, 41, 42, 43, 44, 45, 46, 47, 49, 51, 52, 53, 55, 56, 58, 59, 64, 65, 66, 67, 68, 69, 71, **77**, 79, 82, 83, 87, 88, 89, 92, 97, 99, 102, 103, 104, 106, 107, 108, 109, 111, 112, 113, 116, 117, 118, 119, 513)
Background Test Error	BOOL	R	TRUE: Background test is faulty FALSE: Background test is free of faults
Restart on Error	BOOL	W	Using the parameter *Restart on Error*, each I/O module that has switched off permanently due to faults can be forced to re-adopt the RUN state. To do this, set the *Restart on Error* parameter FALSE to TRUE. The I/O module performs a complete self-test and only enters the RUN state if no faults are detected. Default setting: FALSE
Submodule OK	BOOL	R	TRUE: No submodule fault. No channel faults FALSE: Submodule fault. Channel fault (external faults included)
Submodule Status	BOOL	R	Bit-coded submodule status (see 4.3.4 for coding details)

Table 25: Tab I/O Submodule HART_32_01 in the Hardware Editor

4.3.3 Tab: I/O Submodule HART_32_01: Channels

The **I/O Submodule HART_32_01:Channels** tab contains the following system parameters for each HART channel.
Global variables can be assigned to the statuses and parameters with **->** and used in the user program. The value without **->** must be directly entered.

Name	Data type	R/W	Description
Channel no.	---	R	Channel number, defined by default
-> Channel OK	BOOL	R	TRUE: Faultless channel FALSE: Faulty channel
Activate HART [BOOL] ->	BOOL	W	Activate/deactivate HART communication for this channel

Table 26: Tab I/O Submodule HART_32_01:Channels in the Hardware Editor

4.3.4 Submodule Status [DWORD]

Coding of the variable **Submodule Status**.

Coding	Description
0x00000008	Fault detected while initializing the module
0x00000080	Chip select monitoring time
0x00020000	Warning, deviation of internal voltage measurement
0x00100000	Deviation of the HART clock to the internal 33 MHz clock
0x00200000	Deviation of the 33 MHz clock
0x00400000	Defective voltage monitoring
0x00800000	Internal voltage on 3V4 is defective
0x01000000	Internal voltage on 1V8 is defective
0x02000000	Internal voltage on 1V2 is defective
0x04000000	Internal voltage on 3V3 is defective
0x08000000	Internal voltage on GND is defective
0x10000000	Internal voltage on SI1 is defective
0x20000000	Internal voltage on SI2 is defective
0x40000000	Internal voltage on MES_WD is defective

Table 27: Submodule Status [DWORD]

4.3.5 Diagnostic Status [DWORD]

Coding of the variable **Diagnostic Status**.

<table>
<tr><th>ID</th><th>Description</th></tr>
<tr><td>0</td><td>Diagnostic values are indicated consecutively.</td></tr>
<tr><td>100</td><td>Bit-coded temperature status
0 = normal
Bit0 = 1 : Temperature threshold 1 has been exceeded
Bit1 = 1 : Temperature threshold 2 has been exceeded
Bit2 = 1 : Fault in temperature measurement</td></tr>
<tr><td>101</td><td>Measured temperature (10 000 digits/ °C)</td></tr>
<tr><td>200</td><td>Bit-coded voltage status
0 = normal
Bit0 = 1 : L1+ (24 V) is faulty
Bit1 = 1 : L2+ (24 V) is faulty</td></tr>
<tr><td>201</td><td rowspan="3">Not used!</td></tr>
<tr><td>202</td></tr>
<tr><td>203</td></tr>
<tr><td>300</td><td>Comparator 24 V undervoltage (BOOL)</td></tr>
<tr><td>1001…1032</td><td>Status of the channels 1...32
<table>
<tr><th>Coding</th><th>Description</th></tr>
<tr><td>0x0001</td><td>Error during internal tests, see Chapter 4.3.4</td></tr>
<tr><td>0x0008</td><td>Internal fault occurred while controlling the channel switches (corrupted to 0)</td></tr>
<tr><td>0x0040</td><td>Internal fault occurred while controlling the channel switches (corrupted to 1)</td></tr>
<tr><td>0x0100</td><td>HART communication error or no device found</td></tr>
<tr><td>0x0200</td><td>Warning, internal deviation occurred while controlling the channel switches</td></tr>
<tr><td>0x0400</td><td>Defective sending of HART data</td></tr>
<tr><td>0x0800</td><td>Defective channel RTS signal</td></tr>
<tr><td>0x1000</td><td>Defective channel Rx signal</td></tr>
<tr><td>0x2000</td><td>Defective channel Tx signal</td></tr>
<tr><td>0x4000</td><td>Defective HART clock reading back</td></tr>
<tr><td>0x8000</td><td>Channel cannot be opened.</td></tr>
</table></td></tr>
</table>

Table 28: Diagnostic Information [DWORD]

4.4 Connection Variants

This chapter describes the proper wiring of the module in safety-related applications. The connection variants specified here are permitted.

The inputs and outputs are wired via connector boards. Special connector boards are available for redundantly wiring the modules, see Chapter 3.6.

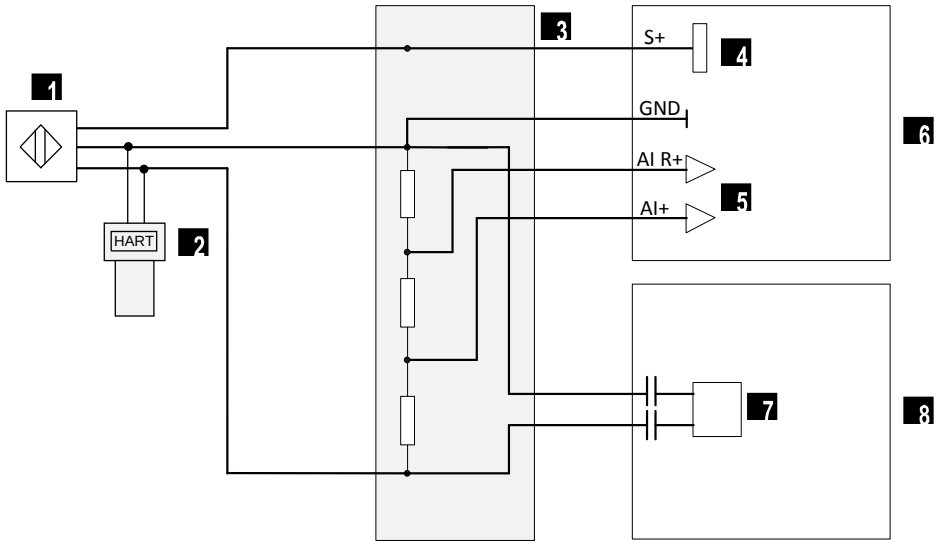
The supply is decoupled using diodes. This ensures that the supplies of two modules can supply one proximity switch if the modules are redundant to one another

i Additionally, a HART handheld can be configured for evaluation or set-up purposes; this HART handheld operates as secondary master and is connected in parallel to the transmitter/actuator.

The operator is responsible for ensuring safety-related and proper configuration of the HART field devices.

4.4.1 HART Module with Analog Input Module

Connector boards X-CB 016 01 (with screw terminals) or X-CB 016 03 (with cable plug) can be used to perform the wiring such as described in Figure 15.



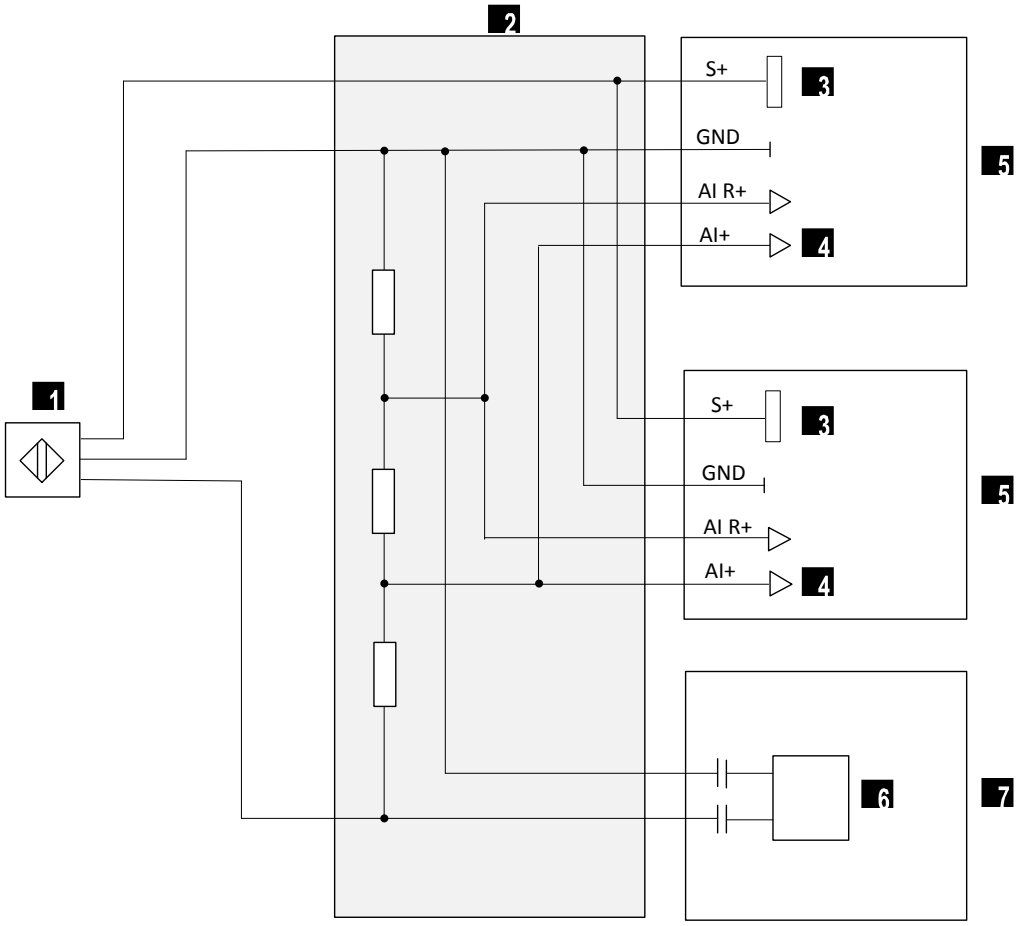
1 Transmitter
2 HART Handheld
3 Connector Board
4 Supply
5 Analog Measuring Facility
6 Analog Input Module
7 HART Channel
8 HART Module

Figure 15: Connection of Analog Input Modules to the HART Module

4.4.2 HART Module with Redundant Analog Input Modulesn

When redundantly wired as specified in Figure 16, the analog input modules and the HART module are inserted in the base plate next to each other and on a common connector board.

Connector boards X-CB 016 02 (with screw terminals) or X-CB 016 04 (with cable plug) can be used.

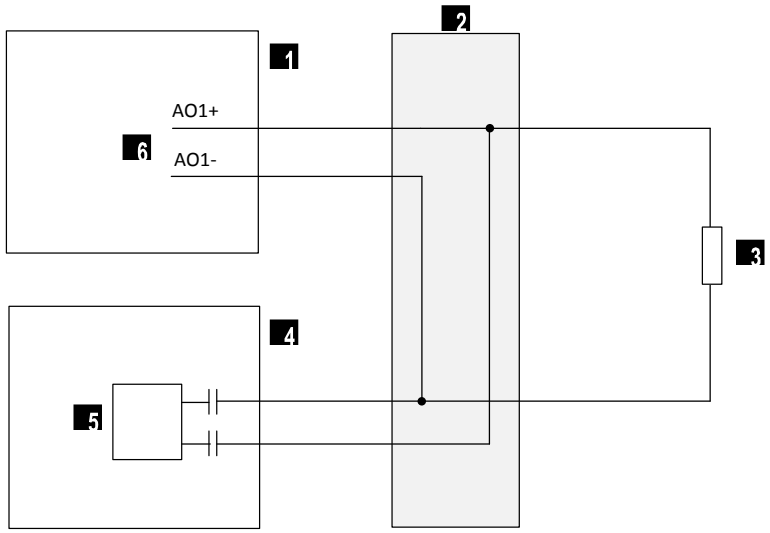


1 Transmitter
2 Connector Board
3 Supply
4 Analog Measuring Facility
5 Analog Input Module
6 HART Channel
7 HART Module

Figure 16: Redundant Connection of Analog Input Modules to the HART Module

4.4.3 HART Module with Analog Output Module

Connector boards X-CB 017 01 (with screw terminals) or X-CB 017 03 (with cable plug) can be used to perform the wiring such as described in Figure 15.



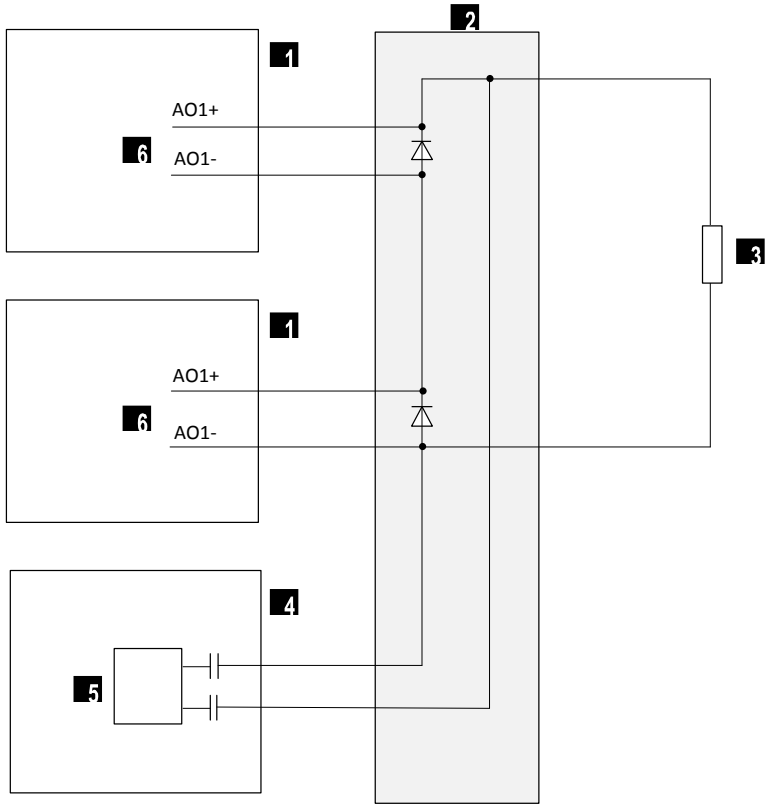
1 Analog Output Module
2 Connector Board
3 Actuator (Load)
4 HART Module
5 HART Channel
6 Analog Output

Figure 17: Connection of Analog Output Modules to the HART Module

4.4.4 HART Module with Redundant Analog Output Modules

When redundantly wired as specified in Figure 18, the analog output modules and the HART module are inserted in the base plate next to each other and on a common connector board.

Connector boards X-CB 017 02 (with screw terminals) or X-CB 017 04 (with cable plug) can be used.



1 Analog Output Module
2 Connector Board
3 Actuator (Load)
4 HART Module
5 HART Channel
6 Analog Output

Figure 18: Redundant Connection of Analog Output Modules to the HART Module

5 Operation

The module runs within a HIMax base plate and does not require any specific monitoring.

5.1 Handling

Direct handling of the module is not foreseen.

The module and submodule are operated from within the PADT. For more details, refer to the SILworX documentation.

5.2 Diagnosis

LEDs on the front side of the module indicate the module state, see Chapter 3.4.2.

The diagnostic history of the module can also be read using SILworX. Chapter 4.3.4 and Chapter 4.3.5 describe the most important diagnostic statuses.

i If a module is plugged in to a base plate, it generates diagnostic messages during its initialization phase indicating faults such as incorrect voltage values.

These messages only indicate a module fault if they occur after the system starts operation.

6 Maintenance

Defective modules must be replaced with a faultless module of the same type or with an approved replacement model.

Only the manufacturer is authorized to repair the module.

When replacing modules, observe the instructions specified in the System Manual (HI 801 001 E) and Safety Manual (HI 801 003 E).

6.1 Maintenance Measures

6.1.1 Loading the Operating System

HIMA is continuously improving the operating system of the module. HIMA recommends to use system downtimes to load the current version of the operating system into the module.

For detailed instructions on how to load the operating system, see the system manual and the online help. The module must be in STOP to be able to load an operating system.

i The current version of the module in use is displayed in the SILworX Control Panel! The type label specifies the version when the module is delivered, see Chapter 3.3.

6.1.2 Proof Test

HIMax modules must be subjected to a proof test in intervals of 10 years. For more information, refer to the Safety Manual HI 801 003 E.

7 Decommissioning

To decommission the module, remove it from the base plate. For more information, see *Mounting and Removing the Module*.

8 Transport

To avoid mechanical damage, HIMax components must be transported in packaging.

Always store HIMax components in their original product packaging. This packaging also provides protection against electrostatic discharge. Note that the product packaging alone is not suitable for transport.

9 Disposal

Industrial customers are responsible for correctly disposing of decommissioned HIMax hardware. Upon request, a disposal agreement can be arranged with HIMA.

All materials must be disposed of in an ecologically sound manner.

Appendix

Glossary

Term	Description
ARP	Address Resolution Protocol: Network protocol for assigning the network addresses to hardware addresses
AI	Analog Input
Connector Board	Connector board for the HIMax module
COM	Communication module
CRC	Cyclic Redundancy Check
DI	Digital Input
DO	Digital Output
EMC	Electromagnetic Compatibility
EN	European Norm
ESD	ElectroStatic Discharge
FB	Fieldbus
FBD	Function Block Diagram
FTT	Fault Tolerance Time
ICMP	Internet Control Message Protocol: Network protocol for status or error messages
IEC	International Electrotechnical Commission
MAC address	Hardware address of one network connection (Media Access Control)
PADT	Programming And Debugging Tool (in accordance with IEC 61131-3), PC with SILworX
PE	Protective Earth
PELV	Protective Extra Low Voltage
PES	Programmable Electronic System
PFD	Probability of Failure on Demand, probability of failure on demand of a safety function
PFH	Probability of Failure per Hour, probability of a dangerous failure per hour
R	Read
Rack ID	Base plate identification (number)
Non-reactive	Supposing that two input circuits are connected to the same source (e.g., a transmitter). An input circuit is termed "non-reactive" if it does not distort the signals of the other input circuit.
R/W	Read/Write
SB	System Bus (Module)
SELV	Safety Extra Low Voltage
SFF	Safe Failure Fraction, portion of safely manageable faults
SIL	Safety Integrity Level (in accordance with IEC 61508)
SILworX	Programming tool for HIMax
SNTP	Simple Network Time Protocol (RFC 1769)
SRS	System.Rack.Slot addressing of a module
SW	Software
TMO	TiMeOut
TMR	Triple Module Redundancy
W	Write
r_P	Peak value of a total AC component
Watchdog (WD)	Time monitoring for modules or programs. If the watchdog time is exceeded, the module or program enters the ERROR STOP state.
WDT	WatchDog Time

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