Manual

HIMax®

X-DI 32 04

Digital Input Module with
Sequence of Events Recording

Contact

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Document designation	Description
HI 801 050 D, Rev. 10.00 (1907)	German original document
HI 801 051 E, Rev. 10.00.00 (1922)	English translation of the German original document

Table of Contents

1 Introduction

This 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 This Manual

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

This manual contains the following main chapters:

- Introduction
- Safety
- Product description
- Start-up
- Operation
- Maintenance
- Decommissioning
- Transport
- Disposal

Additionally, the following documents must be taken into account:

Document	Content	Document no.
HIMax system manual	Hardware description of the HIMax system	HI 801 001 E
HIMax safety manual	Safety functions of the HIMax system	HI 801 003 E
HIMax maintenance manual	Description of significant operational and maintenance actions.	HI 801 171 E
Communication manual	Description of safeethernet communication and of the available protocols.	HI 801 101 E
Automation security manual	Description of automation security aspects in conjunction with HIMA systems.	HI 801 373 E
SILworX first steps manual	Introduction to SILworX	HI 801 103 E
SILworX online help (OLH)	Instructions on how to use SILworX	

Table 1: Additional Applicable Manuals

The current manuals can be obtained upon request by sending an e-mail to: documentation@hima.com. For registered HIMA customers, the product documentation is available at https://www.hima.com/en/downloads/.

1.2 Target Audience

This document is aimed at the planners, design engineers and programmers of automation systems as well as the persons authorized to start up, operate and maintain the devices and systems concerned. Specialized knowledge of safety-related automation systems is required.

1.3 Writing Conventions

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

Bold	To highlight important parts. Names of buttons, menu functions and tabs that can be clicked and used in the programming tool.
Italics	Parameters and system variables, references.
`Courier`	Literal user inputs.
RUN	Operating states are designated by capitals.
Chapter 1.2.3	Cross-references are hyperlinks even if they are not specially marked. In the electronic document (PDF): When the mouse pointer hovers over a hyperlink, it changes its shape. Click the hyperlink to jump to the corresponding position.

Safety notices and operating tips are specially marked.

1.3.1 Safety Notices

Safety notices must be strictly observed to ensure the lowest possible risk.

The safety notices are represented as described below.

- Signal word: warning, caution, notice.
- Type and source of risk.
- Consequences arising from non-observance.
- Risk prevention.

The signal words have the following meanings:

- Warning indicates hazardous situations which, if not avoided, could result in death or serious injury.
- Caution indicates hazardous situation which, if not avoided, could result in minor or moderate injury.
- Notice indicates a hazardous situation which, if not avoided, could result in property damage.

⚠ SIGNAL WORD

Type and source of risk!

Consequences arising from non-observance.

Risk prevention.

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 giving additional information is located here.

Useful tips and tricks appear as follows:

TIP The tip text is located here.

1.4 Safety Lifecycle Services

HIMA provides support throughout all the phases of the plant's safety lifecycle, from planning and engineering through commissioning to maintenance of safety and security.

HIMA's technical support experts are available for providing information and answering questions about our products, functional safety and automation security.

To achieve the qualification required by the safety standards, HIMA offers product or customer-specific seminars at HIMA's training center or on site at the customer's premises. The current seminar program for functional safety, automation security and HIMA products can be found on HIMA's website.

Safety Lifecycle Services:	
Onsite+ / On-Site Engineering	In close cooperation with the customer, HIMA performs changes or extensions on site.
Startup+ / Preventive Maintenance	HIMA is responsible for planning and executing preventive maintenance measures. Maintenance actions are carried out in accordance with the manufacturer's specifications and are documented for the customer.
Lifecycle+ / Lifecycle Management	As part of its lifecycle management processes, HIMA analyzes the current status of all installed systems and develops specific recommendations for maintenance, upgrading and migration.
Hotline+ / 24 h Hotline	HIMA's safety engineers are available by telephone around the clock to help solve problems.
Standby+ / 24 h Call-Out Service	Faults that cannot be resolved over the phone are processed by HIMA's specialists within the time frame specified in the contract.
Logistics+/ 24 h Spare Parts Service	HIMA maintains an inventory of necessary spare parts and guarantees quick, long-term availability.

Contact details:	
Safety Lifecycle Services	https://www.hima.com/en/about-hima/contacts-worldwide/
Technical Support	https://www.hima.com/en/products-services/support/
Seminar Program	https://www.hima.com/en/products-services/seminars//

2 Safety

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

The product is operated with SELV or PELV. No imminent risk results from the product itself. Use in the Ex zone is only 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

All the environmental requirements specified in this manual must be observed when operating the HIMax system. The environmental requirements are listed in the product data.

2.1.2 ESD Protective Measures

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

NOTICE

Damage to the HIMax system due to electrostatic discharge!

- **When performing the work, make sure that the workspace is free of static, and wear a grounding strap.**
- **If not used, ensure that the components are protected from electrostatic discharge, e.g., by storing them in their packaging.**

2.2 Residual Risk

No imminent risk results from a HIMA system itself.

Residual risk may result from:

- Faults related to engineering.
- Faults in the user program.
- Faults related to the wiring.

2.3 Safety Precautions

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

2.4 Emergency Information

A HIMA system is a part of the safety equipment of an overall system. If the controller fails, the system enters the safe state.

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

3 Product Description

The X-DI 32 04 digital input module is intended for use in the programmable electronic system (PES) HIMax.

The module is used to evaluate up to 32 digital input signals.

The module is suitable for sequence of events recording (SOE). Events are recorded within a module cycle of 1 ms, refer to Chapter 4.3 for details,

The module can be inserted into any of the base plate slots with the exception of the slots reserved for system bus modules. Refer to the system manual (HI 801 001 E) for details.

The module is interference-free. In particular with respect to EMC, electrical safety, communication to the X-SB and X-CPU modules, and the user program.

The module has been certified by the TÜV for safety-related applications up to SIL 3 (IEC 61508, IEC 61511, IEC 62061 and EN 50156) as well as Cat. 4 and PL e (EN ISO 13849-1).

3.1 Safety Function

The module evaluates the digital input signals and provides them to the user program.

The safety function is performed in accordance with SIL 3.

3.1.1 Response in the Event of a Fault

If a fault occurs, the module adopts the safe state and the assigned input variables transmit the initial value (default value = 0) to the user program.

The initial values must be set to 0 to ensure that the input variables transmit the value 0 to the user program if a fault occurs.

In all these cases, the module activates the *Error* LED on the front plate.

3.2 Scope of Delivery

To operate, the module must be installed on a matching connector board. 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 3.7, the system cables are described in Chapter 3.8. The FTAs are described in separate manuals.

3.3 X-DI 32 04 Certification

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.

The certificates and the EU type test certificate are available on the HIMA website.

3.4 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.)
- Operating system revision index (OS-Rev.)
- Supply voltage (Power)
- Ex specifications (if applicable)
- Production year (Prod-Year:)

Figure 1: Sample Type Label

3.5 Structure

The module has 32 safety-related digital inputs (24 V) for digital signals from electromechanical switching devices (mechanical contacts) and 2-wire or 3-wire proximity switches. For safely detecting a high level on the digital input, the voltage and current thresholds must be exceeded (see Table 7).

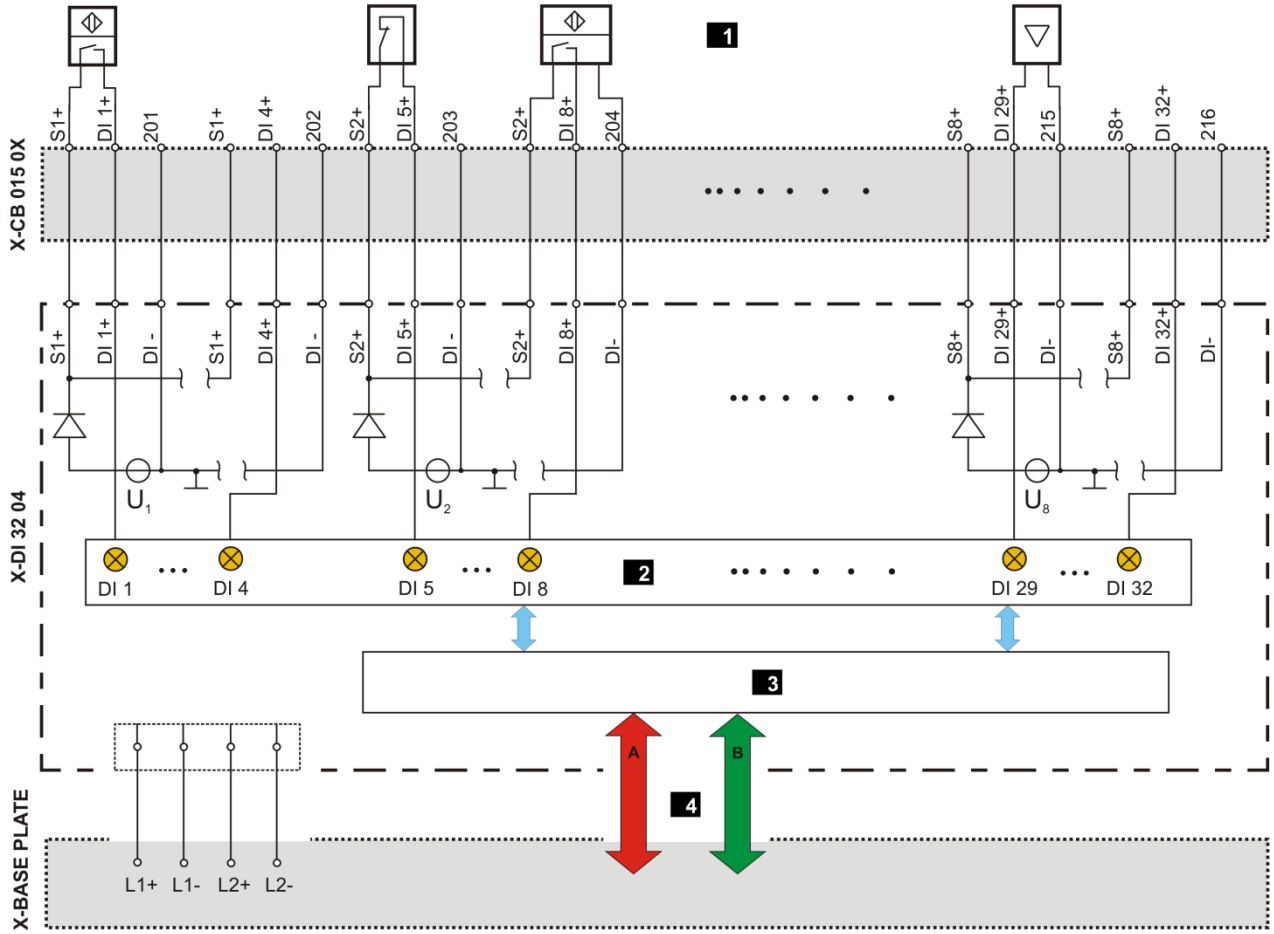
The eight short-circuit-proof supplies feed four supply outputs each (S1+ to S8+). One supply output is assigned to each digital input.

The 1oo2 processor system within the I/O module controls and monitors the I/O level. The data and states of the I/O module are provided 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 digital inputs, see Chapter 3.5.2.

3.5.1 Block Diagram

The following block diagram illustrates the structure of the module.



1 Field level: proximity switches and switching devices
2 Interface
3 Safety-related processor system
4 System buses

Figure 2: Block Diagram

3.5.2 Indicators

The following figure shows the front view of the module with the LEDs.

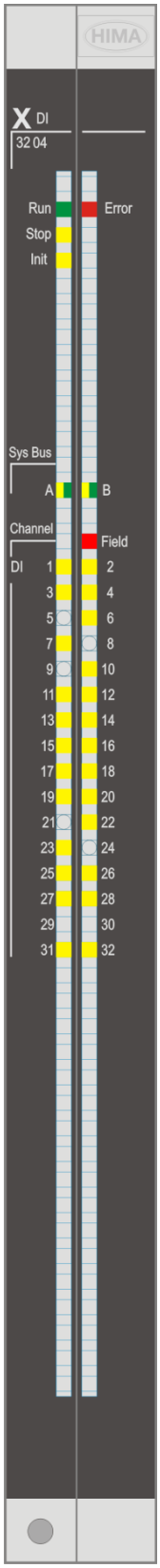


Figure 3: Front View

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 (DI 1...32, Field)

After connecting the supply voltage, an LED test is performed and all the LEDs are lit for at least 2 s. The color of two-color LEDs changes once during the test.

Definition of blinking frequencies

The following table defines the blinking frequencies:

Definition	Blinking frequencies
Blinking1	Long (600 ms) on, long (600 ms) off.
Blinking2	Short (200 ms) on, short (200 ms) off, short (200 ms) on, long (600 ms) off.
Blinking-x	Ethernet communication: Blinking synchronously with data transmission.

Table 2: Blinking Frequencies of the LEDs

Some LEDs can report warnings (On) and faults or errors (Blinking1), see the following tables. The indication of errors or faults has priority over the indication of warnings. Warnings cannot be reported if errors or faults are being signaled.

3.5.3 Module Status Indicators

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

LED	Color	Status	Description
Run	Green	On	Module in the RUN state, normal operation.
		Blinking1	Module state STOP / LOADING OS
		Off	Module not in the RUN state, observe the other status LEDs.
Error	Red	On	System warning, for example: ▪ No license for additional functions (e.g., communication protocols), test mode. ▪ Temperature warning
		Blinking1	System error, for example: ▪ Internal module faults detected by self-tests, e.g., hardware or voltage supply faults. ▪ Fault while loading the operating system.
		Off	No faults detected.
Stop	Yellow	On	Module state STOP / VALID CONFIGURATION
		Blinking1	The module is in one of the following states: ▪ STOP / INVALID CONFIGURATION ▪ STOP / LOADING OS
		Off	Module not in the STOP state, observe the other status LEDs.
Init	Yellow	On	Module state: INIT
		Blinking1	The module is in one of the following states: ▪ LOCKED ▪ STOP / LOADING OS
		Off	Module is in none of the states described, observe the other status LEDs.

Table 3: Module Status Indicators

3.5.4 System Bus Indicators

The system bus indicator 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 4: System Bus Indicators

3.5.5 I/O Indicators

The LEDs of the I/O indicators are labeled *Channel*.

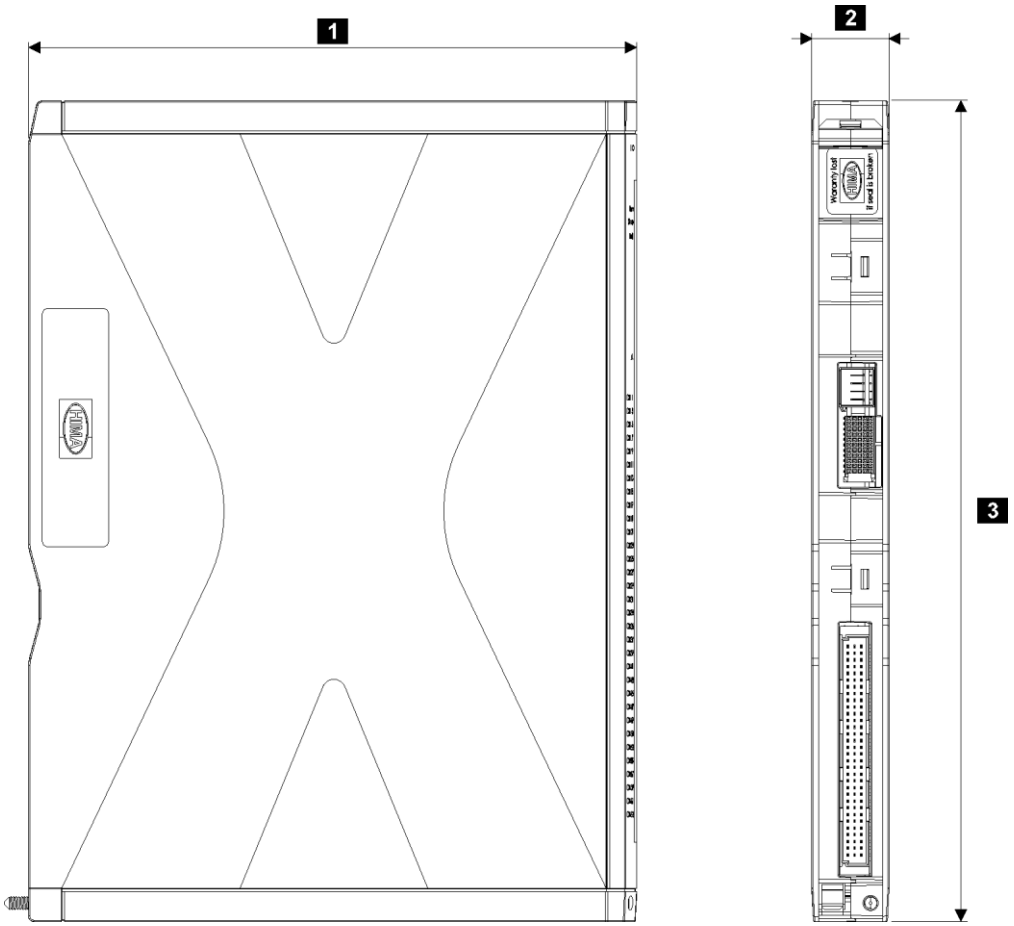
LED	Color	Status	Description
DI 1…DI 32	Yellow	On	High level present.
		Blinking2	Channel fault.
		Off	Low level present.
Field	Red	Blinking2	Undervoltage in at least one supply, caused by short-circuit or supply failure at field level.
		Off	The supply is not faulty.

Table 5: I/O Indicators

3.6 Product Data

General	
Supply voltage	24 VDC, -15…+20 %, $r_p \leq 5$ % SELV, PELV
Current consumption	400 mA at 24 VDC (without channels and supplies) Max. 1.5 A (if the max. output current is applied to the supplies)
Module cycle time	1 ms
Protection class	Protection class III in accordance with IEC/EN 61131-2
Ambient temperature	0…+60 °C
Storage temperature	-40…+85 °C
Humidity	Max. 95 % relative humidity, non-condensing
Pollution	Pollution degree II in accordance with IEC/EN 60664-1
Altitude	< 2000 m
Degree of protection	IP20
Dimensions (H x W x D) in mm	310 x 29.2 x 230
Weight	Approx. 1.0 kg

Table 6: Product Data



1 Depth: 230 mm
2 Width: 29.2 mm
3 Height: 310 mm

Figure 4: Views

Digital inputs	
Number of inputs (number of channels)	32 unipolar with reference pole DI- / L-, Not galvanically separated from one another
Type of input	Current sinking logic, 24 VDC, type 3 in accordance with IEC 61131-2
Rated input voltage	0…24 V
Input voltage operating range	-3…30 V (current limited to approx. 2.6 mA)
Voltage range low level	-3…5 V
Voltage range high level	11…30 V
Switching point	Typ. 9.4 V ± 0.8 V (2.1 mA ± 0.3 mA)
Sequence of events recording cycle	1 ms

Table 7: Specifications for the Digital Inputs

Supply	
Number of supplies	8 with 4 outputs each
Output voltage for supply	Supply voltage - 2.5 VDC
Output current for supply	100 mA for each group Short-circuit-proof
Undervoltage detection	The module monitors the supplies for undervoltage (< 16 VDC). If a fault occurs, the corresponding *Supply X OK* status is set to FALSE
Short-circuit of one supply	Undervoltage detection active. The output current is pulsed < 250 mA while the supply is short-circuited.
Assignment of Supply Outputs	
The voltage output assigned to each input must be used for power supply.	
Supply S1+	DI1+…DI4+
Supply S2+	DI5+…DI8+
Supply S3+	DI9+…DI12+
Supply S4+	DI13+…DI16+
Supply S5+	DI17+…DI20+
Supply S6+	DI21+…DI24+
Supply S7+	DI25+…DI28+
Supply S8+	DI29+…DI32+

Table 8: Supply Specifications

3.7 Connector Boards

A connector board connects the module to the field level. Module and connector board together form a functional unit. Insert the connector board into the appropriate slot prior to mounting the module.

The following connector boards are available for the module:

Connector board	Description
X-CB 015 01	Mono connector board with screw terminals
X-CB 015 02	Redundant connector board with screw terminals
X-CB 015 03	Mono connector board with cable plug
X-CB 015 04	Redundant connector board with cable plug

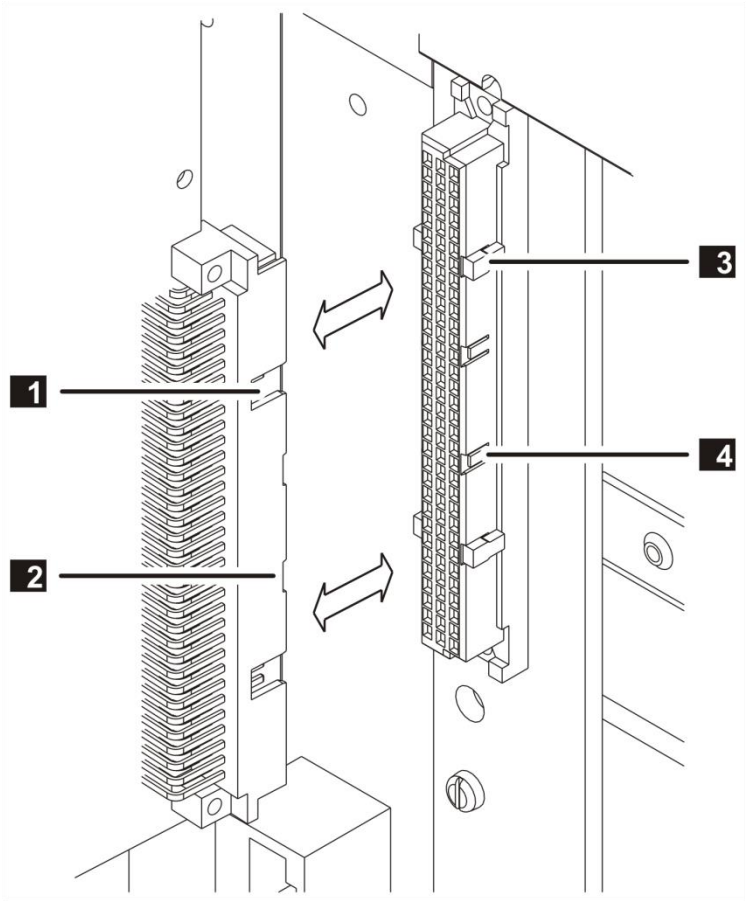
Table 9: Available Connector Boards

3.7.1 Mechanical Coding of Connector Boards

I/O modules and connector boards are mechanically coded starting from hardware revision index (HW-Rev.) 10. Coding avoids installation of improper I/O modules thus preventing negative effects on redundant modules and the field level.
Apart from that, improper equipment has no effect on the HIMax system since only I/O modules properly configured in SILworX can enter the RUN state.

I/O modules and the corresponding connector boards have a mechanical coding in the 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.

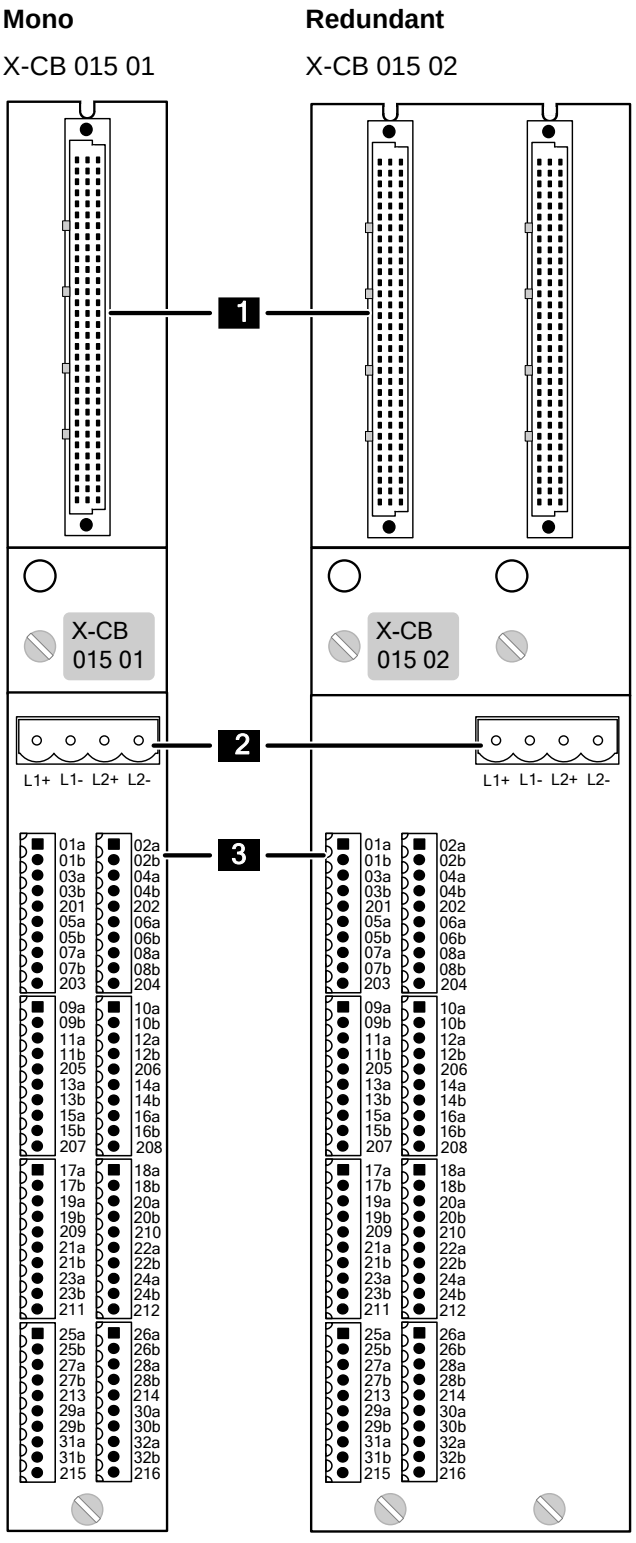
3.7.2 Coding of X-CB 015 0X Connector Boards

The following table specifies the position of the coding wedges on the I/O module plug:

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

Table 10: Position of Coding Wedges

3.7.3 Connector Boards with Screw Terminals



1 I/O module plug

2 External supply connection, not required for X-DI 32 04

3 Connection to the field level (screw terminals)

Figure 6: Connector Boards with Screw Terminals

3.7.4 Terminal Assignment for Connector Boards with Screw Terminals

Pin no.	Designation	Signal	Pin no.	Designation	Signal
1	01a	S1+	1	02a	S1+
2	01b	DI1+	2	02b	DI2+
3	03a	S1+	3	04a	S1+
4	03b	DI3+	4	04b	DI4+
5	201	DI-	5	202	DI-
6	05a	S2+	6	06a	S2+
7	05b	DI5+	7	06b	DI6+
8	07a	S2+	8	08a	S2+
9	07b	DI7+	9	08b	DI8+
10	203	DI-	10	204)	DI-
Pin no.	Designation	Signal	Pin no.	Designation	Signal
1	09a	S3+	1	10a	S3+
2	09b	DI9+	2	10b	DI10+
3	11a	S3+	3	12a	S3+
4	11b	DI11+	4	12b	DI12+
5	205	DI-	5	206	DI-
6	13a	S4+	6	14a	S4+
7	13b	DI13+	7	14b	DI14+
8	15a	S4+	8	16a	S4+
9	15b	DI15+	9	16b	DI16+
10	207	DI-	10	208	DI-
Pin no.	Designation	Signal	Pin no.	Designation	Signal
1	17a	S5+	1	18a	S5+
2	17b	DI17+	2	18b	DI18+
3	19a	S5+	3	20a	S5+
4	19b	DI19+	4	20b	DI20+
5	209	DI-	5	210	DI-
6	21a	S6+	6	22a	S6+
7	21b	DI21+	7	22b	DI22+
8	23a	S6+	8	24a	S6+
9	23b	DI23+	9	24b	DI24+
10	211	DI-	10	212	DI-
Pin no.	Designation	Signal	Pin no.	Designation	Signal
1	25a	S7+	1	26a	S7+
2	25b	DI25+	2	26b	DI26+
3	27a	S7+	3	28a	S7+
4	27b	DI27+	4	28b	DI28+
5	213	DI-	5	214	DI-
6	29a	S8+	6	30a	S8+
7	29b	DI29+	7	30b	DI30+
8	31a	S8+	8	32a	S8+
9	31b	DI31+	9	32b	DI 32+
10	215	DI-	10	216	DI-

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 level and to external power supplies.

The cable plugs feature the following characteristics:

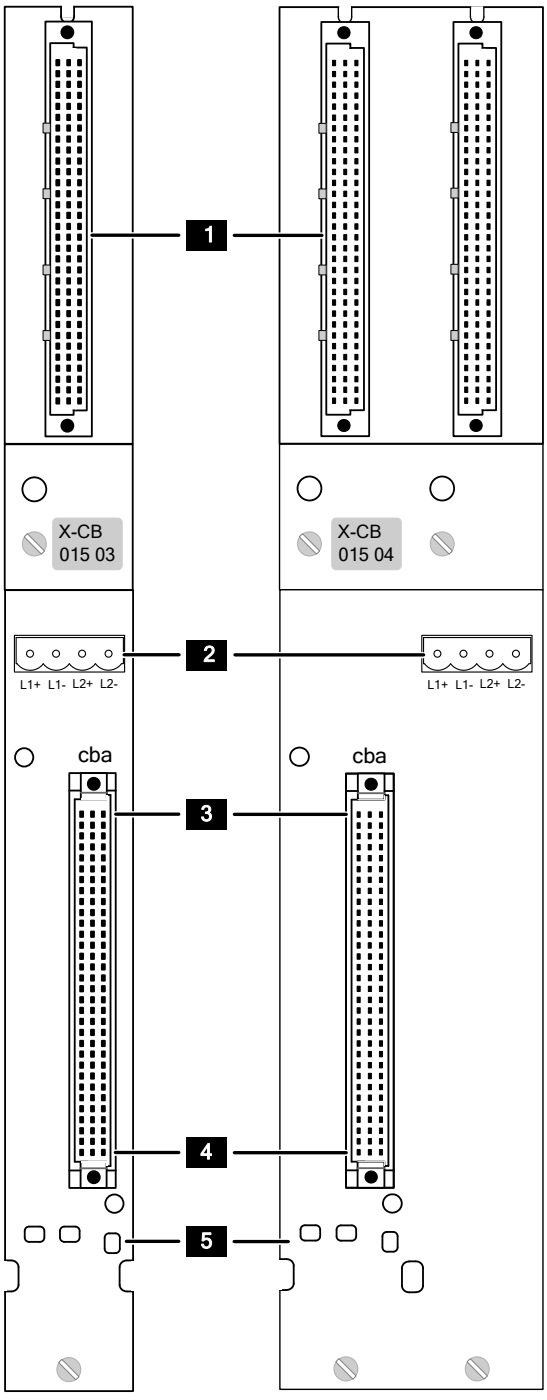
Connection to the field level	
Cable plugs	8 pieces, with 10 poles
Wire cross-section	0.2…1.5 mm^2 (single-wire) 0.2…1.5 mm^2 (finely stranded) 0.2…1.5 mm^2 (with wire end ferrule)
Stripping length	6 mm
Screwdriver	Slotted 0.4 x 2.5 mm
Tightening torque	0.2…0.25 Nm
External power supply (not required for X-DI 32 04)	
Cable plugs	4-pole
Wire cross-section	0.2…2.5 mm^2 (single-wire) 0.2…2.5 mm^2 (finely stranded) 0.25…2.5 mm^2 (with wire end ferrule)
Stripping length	7 mm
Screwdriver	Slotted 0.6 x 3.5 mm
Tightening torque	0.5…0.6 Nm

Table 12: Cable Plug Characteristics

3.7.5 Pin Assignment for Connector Boards with Cable Plug

Mono **Redundant**

X-CB 015 03 X-CB 015 04



1 I/O module plug

2 External supply connection, not required for X-DI 32 04

3 Connection to the field level (cable plug in row 1)

4 Connection to the field level (cable plug in row 32)

5 Coding of cable plugs

Figure 7: Connector Boards with Cable Plug

3.7.6 Pin Assignment for Connector Boards with Cable Plug

HIMA provides ready-made system cables for use with these connector boards, see Chapter 3.8. The cable plug and the connector boards are coded.

Connector pin assignment!

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

The wire color coding complies with IEC 60304. The color abbreviations used are in accordance with IEC 60757.

The following table applies to system cables X-CA 001:

Row	c		b		a	
	Signal	Color	Signal	Color	Signal	Color
1			DI32+	YEBU	Internal use [2]	RD [1]
2			DI31+	GNBU		BU [1]
3			DI30+	YEPK		PK [1]
4			DI29+	PKGN		GY [1]
5			DI28+	YEGY		
6			DI27+	GYGN		
7			DI26+	BNBK		
8			DI25+	WHBK		
9			DI24+	BNRD		
10			DI23+	WHRD		
11			DI22+	BNBU		
12			DI21+	WHBU		
13			DI20+	PKBN		
14			DI19+	WHPK		
15			DI18+	GYBN		
16			DI17+	WHGY		
17			DI16+	YEBN	DI-	YE [1]
18			DI15+	WHYE	DI-	GN [1]
19			DI14+	BNGN	DI-	BN [1]
20			DI13+	WHGN	DI-	WH [1]
21			DI12+	RDBU	DI-	RDBK
22			DI11+	GYPK	DI-	BUBK
23			DI10+	VT	DI-	PKBK
24			DI9+	BK	DI-	GYBK
25			DI8+	RD	S8+	PKRD
26			DI7+	BU	S7+	GYRD
27			DI6+	PK	S6+	PKBU
28			DI5+	GY	S5+	GYBU
29			DI4+	YE	S4+	YEBK
30			DI3+	GN	S3+	GNBK
31			DI2+	BN	S2+	YERD
32			DI1+	WH	S1+	GNRD

[1] For repeated wire color coding: Additional orange ring.

[2] The wires must be isolated individually! No other use is permitted!

Table 13: Pin Assignment for the Cable Plugs of System Cable X-CA 001

The external power supply is connected using a detachable 4-pole cable plug. Table 12 provides a description of the cable plug properties.

The following table applies to system cables X-CA 015:

Row	c		b		a	
	Signal	Color	Signal	Color	Signal	Color
1			DI32+	WHPK [1)]		
2			DI31+	WHGY [1)]		
3			DI30+	WHYE [1)]		
4			DI29+	WHGN [1)]		
5			DI28+	GYPK [1)]		
6			DI27+	BK [1)]		
7			DI26+	BU [1)]		
8			DI25+	GY [1)]		
9			DI24+	GN [1)]		
10			DI23+	WH [1)]		
11			DI22+	BUBK		
12			DI21+	GYBK		
13			DI20+	GYRD		
14			DI19+	GYBU		
15			DI18+	GNBK		
16			DI17+	GNRD		
17			DI16+	GNBU		
18			DI15+	PKGN		
19			DI14+	GYGN		
20			DI13+	WHBK		
21			DI12+	WHRD		
22			DI11+	WHBU		
23			DI10+	WHPK		
24			DI9+	WHGY		
25			DI8+	WHYE	S8+ (a25)	See also Table 15
26			DI7+	WHGN	S7+ (a26)	
27			DI6+	GYPK	S6+ (a27)	
28			DI5+	BK	S5+ (a28)	
29			DI4+	BU	S4+ (a29)	
30			DI3+	GY	S3+ (a30)	
31			DI2+	GN	S2+ (a31)	
32			DI1+	WH	S1+ (a32)	

[1)] For repeated wire color coding: Additional orange ring.

Table 14: Pin Assignment for the Cable Plugs of System Cable X-CA 015

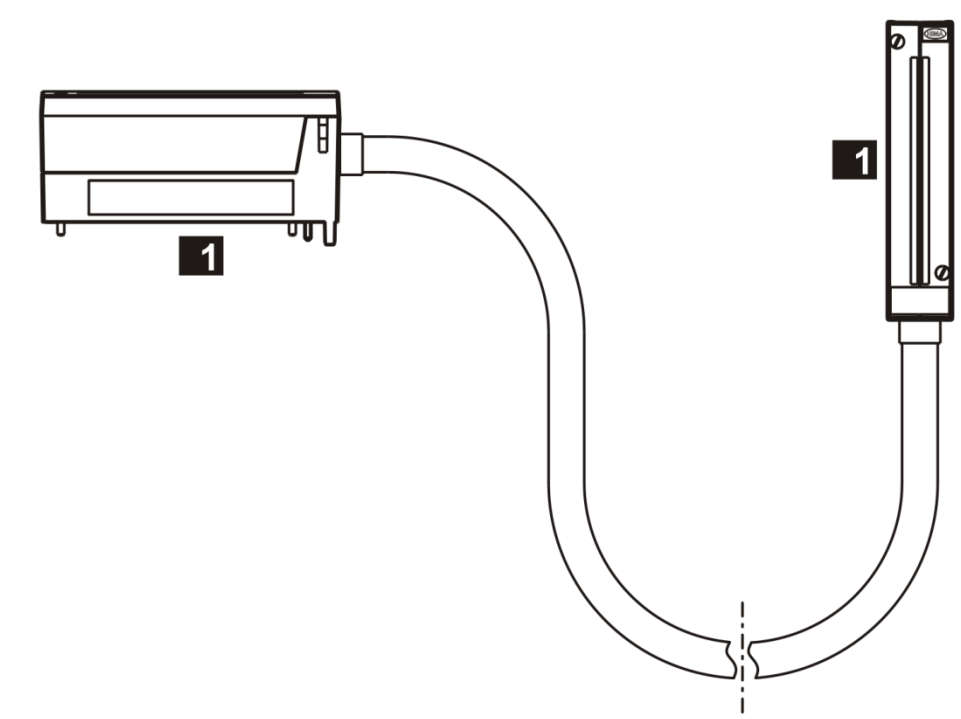
In the cable plug, the S+ signals are combined into groups of four wires, see Table 15.

Row	Signal	Color
a25 (S8+)	S8+	PKBN [1)]
	S8+	GYBN [1)]
	S8+	YEBN [1)]
	S8+	BNGN [1)]
a26 (S7+)	S7+	RDBU [1)]
	S7+	VT [1)]
	S7+	RD [1)]
	S7+	PK [1)]
a27 (S6+)	S6+	YE [1)]
	S6+	BN [1)]
	S6+	RDBK
	S6+	PKBK
a28 (S5+)	S5+	PKRD
	S5+	PKBU
	S5+	YEBK
	S5+	YERD
a29 (S4+)	S4+	YEBU
	S4+	YEPK
	S4+	YEGY
	S4+	BNBK
a30 (S3+)	S3+	BNRD
	S3+	BNBU
	S3+	PKBN
	S3+	GYBN
a31 (S2+)	S2+	YEBN
	S2+	BNGN
	S2+	RDBU
	S2+	VT
a32 (S1+)	S1+	RD
	S1+	PK
	S1+	YE
	S1+	BN
[1)] For repeated wire color coding: Additional orange ring.		

Table 15: Each S+ Used with Four Wires

3.8 System Cables

The system cables connect the connector boards to the field termination assemblies. Depending on the type of connector board, several types of system cables are available. System cable X-CA 015 with reduced number of wires and open wire ends is available for applications with passive 2-wire proximity switches and passive electromechanical switching devices.



1 Identical cable plugs

Figure 8: System Cable with Cable Plug on Both Sides

3.8.1 System Cable X-CA 001

System cable X-CA 001 is used to connect the X-CB 015 03/04 connector board to one field termination assembly.

General	
Cable	LIYY-TP 34 x 2 x 0.25 mm²
Wire	Finely stranded
Average outer diameter (d)	Approx. 15.2 mm Max. 20 mm for all types of system cables
Minimum bending radius Fixed installation Flexible application	 5 x d 10 x d
Burning behavior	Flame retardant and self-extinguishing in accordance with IEC 60332-1-2, IEC 60332-2-2
Color coding	Based on DIN 47100, see Table 13.

Table 16: Cable Data X-CA 001

The system cable is available in the following standard lengths:

System cables	Description	Length	Weight
X-CA 001 01 8	Coded cable plugs on both sides.	8 m	3.75 kg
X-CA 001 01 15		15 m	7 kg
X-CA 001 01 30		30 m	14 kg

Table 17: Available Standard System Cables X-CA 001 01

3.8.2 System Cable X-CA 015

System cable X-CA 015 can only be used for connection of passive 2-wire proximity switches and passive electromechanical switching devices. System cable X-CA 015 is implemented with a reduced number of wires and open wire ends. The open wire ends must be connected to terminals.

The system cable is available as standard type (X-CA 015 02) and as halogen-free, UL/CSA certified type (X-CA 015 04) in the following standard lengths:

System cables	Description	Length	Weight
X-CA 015 02 5	Cable plug coded on one side, with open wire ends.	5 m	1.75 kg
X-CA 015 02 8		8 m	2.75 kg
X-CA 015 02 15		15 m	5.25 kg
X-CA 015 02 30		30 m	10.5 kg
X-CA 015 04 5	Cable plug coded on one side, with open wire ends, halogen-free.	5 m	1.50 kg
X-CA 015 04 8		8 m	2.75 kg
X-CA 015 04 15		15 m	4.50 kg
X-CA 015 04 30		30 m	9.0 kg

Table 18: Available Standard System Cables X-CA 015

X-CA 015 02	
Cable	LIYY-TP 32 x 2 x 0.25 mm²
Wire	Finely stranded
Average outer diameter (d)	Approx. 16.3 mm, max. 20 mm for all types of system cables
Minimum bending radius Fixed installation Flexible application	 5 x d 10 x d
Burning behavior	Flame retardant and self-extinguishing in accordance with IEC 60332-1-2, IEC 60332-2-2
Color coding	Based on DIN 47100, see Table 14.

Table 19: Cable Data X-CA 015 02

X-CA 015 04	
Cable	LIHH-TP 32 x 2 x 0.25 mm²
Wire	Finely stranded
Average outer diameter (d)	Approx. 15.0 mm, max. 20 mm for all types of system cables
Minimum bending radius Fixed installation Flexible application	 5 x d 10 x d
Burning behavior	Flame retardant in accordance with IEC 60332-1-2, IEC 60332-2-2 IEC 61034-1/IEC 61034-2 (smoke density) UL c/us 758/1581 CSA FT2 UL c/us 20549/10493
Halogen-free	In accordance with IEC 60754-1
Color coding	Based on DIN 47100, see Table 14.

Table 20: Cable Data X-CA 015 04

3.8.3 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.

4 Start-Up

This chapter describes how to install, configure and connect the module. For further details, refer to the HIMax system manual (HI 800 001 E).

i The safety-related application (SIL 3 in accordance with IEC 61508) of the inputs and the connected proximity switches must comply with the safety requirements. For further details, refer to the safety manual (HI 801 003 E).

4.1 Mounting

Observe the following points when mounting the module:

- Only operate the module with the appropriate fan components. For further details, see the system manual (HI 801 001 E).
- Only operate the module with the suitable connector board. For further details, see Chapter 3.7.
- The module, including its connected components, must be installed to ensure compliance with the requirements for degree of protection IP20 or higher in accordance with EN 60529:1991 + A1:2000.

NOTICE

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 level.
  - Take the appropriate grounding measures when connecting the plugs and terminals to the field level.
  - An unshielded cable may be used for connecting the proximity switches and switching devices to the digital inputs.
  - If finely stranded wires are used, HIMA recommends fastening ferrules to the wire ends. The terminals must be suitable for fastening the cross-sections of the cables in use.
  - If finely stranded wires are used, 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 supply output used for the assigned input, see Table 8.

  HIMA recommends using the supply of the module.
  If an external current source is malfunctioning, the affected digital module input can be overloaded and damaged. If an external current source is used, the switching thresholds must be checked after a non-transient overload occurred at the digital inputs.
- The inputs can be interconnected redundantly using the corresponding connector boards, see Chapters 3.7 and 4.5.

4.1.1 Wiring Unused Inputs

Inputs that are not being used may stay open and need not be terminated. However, to prevent short-circuits, never connect a wire to a connector board if it is open on the field level.

4.2 Mounting and Removing the Module

This chapter describes how to replace an existing module or mount a new one.

When removing the module, the connector board remains in the HIMax base plate. This saves additional wiring effort at the clamp terminals 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 drawing). 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.

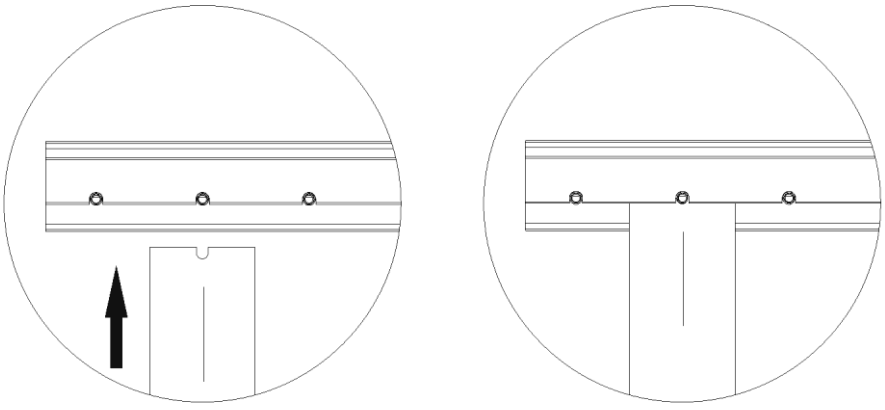


Figure 9: Example of how to Insert the Mono Connector Board

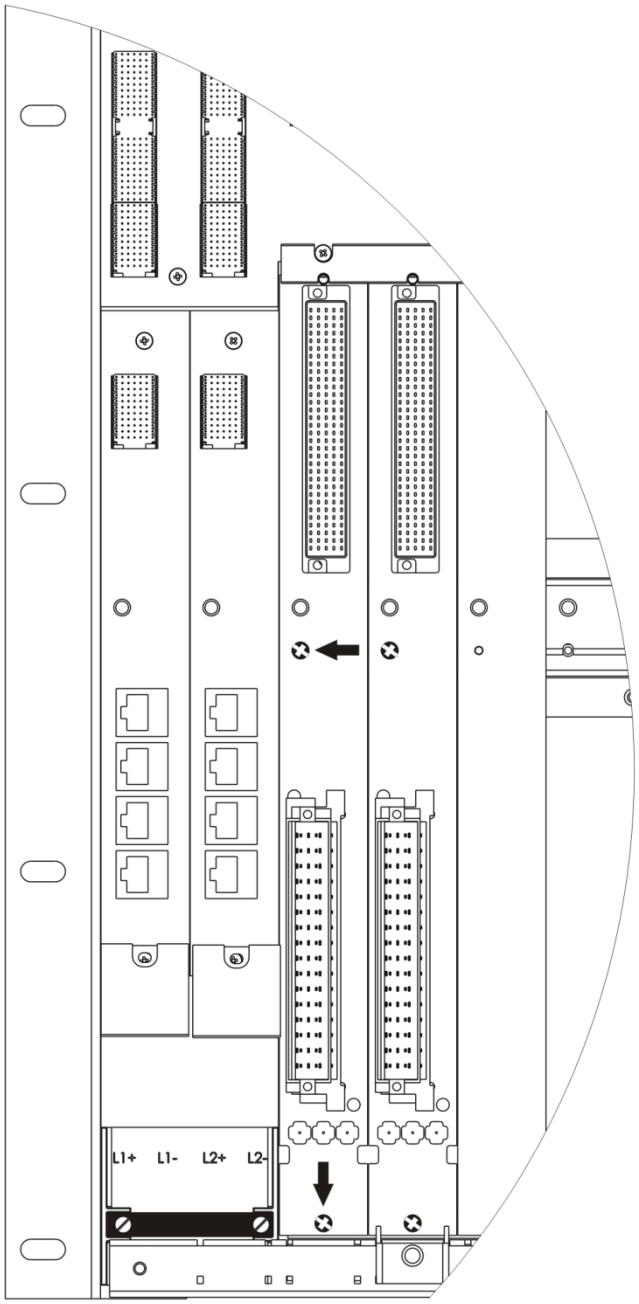


Figure 10: Example of how to Secure the Mono Connector Board with Captive Screws

i These instructions also apply for redundant connector boards. The number of used slots 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 a 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 comply with these instructions can damage the controller.

Always insert the module in the base plate carefully.

Tools and utilities:

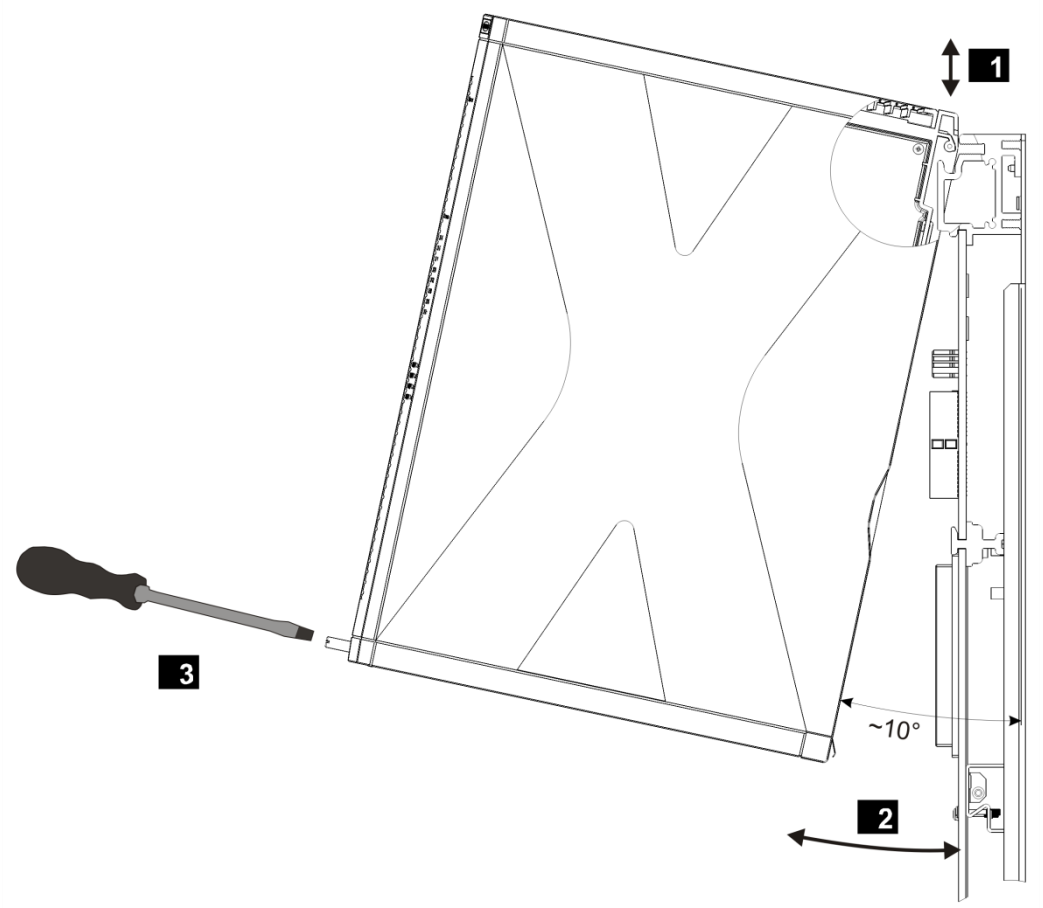
- Screwdriver, slotted 0.8 x 4.0 mm.
- Screwdriver, slotted 1.2 x 8.0 mm.

To insert the modules

1. Open the cover plate on the fan rack:
   ☑ Move the locks to the *open* position.
   ☑ Lift the cover plate and insert it 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.

To remove the modules

1. Open the cover plate on the fan rack:
   ☑ Move the locks to the *open* position.
   ☑ Lift the cover plate and insert it into the fan rack.
2. Release the screw, see 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 the module in and out
3 Securing and releasing a module

Figure 11: 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 Sequence of Events Recording (SOE)

Exactly one event (I/O event) can be configured for each channel. The configuration is performed using the programming tool SILworX, see the online help and the communication manual (HI 801 101 E).

During each cycle (1 ms), the I/O module reads the values measured for the digital inputs and records the events that are stored in the volatile I/O event buffer.

An event is composed of:

Event	Description
Event ID	The event ID is assigned by the PADT.
Timestamp	Date (e.g., 21/11/2008). Time (e.g., 9:31:57.531)
Event state	Alarm/Normal
Event quality	Quality good/ Quality bad, see www.opcfoundation.org

Table 21: Event Description

The processor module reads the events from the I/O event buffer cyclically and stores them in its non-volatile memory. Events stored in the I/O event buffer can be overwritten with new events read by the processor module.

If the I/O event buffer is full, the I/O module creates an overflow system event entry in the non-volatile memory of the processor module. Thereafter, events are no longer recorded until existing events have been read and space is once again available in the buffer.

4.4 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:

- To diagnose the module and channels, both the statuses and the measured value can be evaluated within the user program. For further details on the system parameters, refer to the following tables.
- The channel supply is monitored. If the *Sup. Used* parameter is activated, a supply fault results in a channel fault (-> *Channel OK* = FALSE). If the channel supply is not used, the *Sup. Used* parameter must be deactivated. In doing so, a supply error does not result in a channel fault (-> *Channel OK* = TRUE). To diagnose the supply in use, evaluate the *Supply OK* parameter in the user program. Refer to Table 23 for more details on the *Supply OK* parameter.
- If a redundancy group is created, its configuration is defined in the tabs. The tabs specific to the redundancy group differ from those of the individual modules, see the following tables.

To evaluate the system parameters in the user program, they must be assigned to global variables. Perform this step in the Hardware Editor using the module's detail view.

The following tables present the system parameters for the module in the same order as in the SILworX Hardware Editor.

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

4.4.1 The **Module** Tab

The **Module** tab contains the following system parameters for the module:

System parameter	Data type	S [1]	R/W	Description
Name	---	---	W	Module name.
Spare Module	BOOL	N	W	Activated: It is not considered a fault if a module of the redundancy group is missing in the base plate. Deactivated: It is considered a fault if a module of the redundancy group is missing in the base plate. Default setting: Deactivated **It is only displayed in the redundancy group tab!**
Noise Blanking	BOOL	N	W	Allow noise blanking performed by the process module (Activated/Deactivated). Default setting: Activated The processor module delays its response to transient interference until the safety time. The user program retains its last valid process value. Refer to the system manual (HI 801 001 E) for further details on noise blanking.
System parameter	Data type	S [1]	R/W	Description
The following statuses and parameters can be assigned global variables and used in the user program.				
Module OK	BOOL	Y	R	TRUE: Mono operation: No module faults. Redundancy operation: At least one of the redundant modules has no module fault (OR logic). FALSE: Module fault. Channel fault on one channel (no external faults). The module is not plugged in. Observe the *Module Status* parameter!
Module Status	DWORD	Y	R	Status of the module Coding / Description: 0x00000001 Module fault. [2] 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. [2] [2] These faults affect the *Module OK* status and need not be separately evaluated in the user program.
Timestamp [µs]	DWORD	N	R	Microsecond fraction of the timestamp. Point in time when the digital inputs were measured.
Timestamp [s]	DWORD	N	R	Second fraction of the timestamp. Point in time when the digital inputs were measured.
[1] The operating system handles the system parameter in a safety-related manner, yes (Y) or no (N).				

Table 22: The **Module** Tab in the Hardware Editor

4.4.2 The **I/O Submodule DI 32_04** Tab

The **I/O Submodule DI32_04** tab contains the following system parameters:

System parameters	Data type	S [1]	R/W	Description
This parameter cannot be changed.				
Name	---	---	W	Module name.
System parameters	Data type	S [1]	R/W	Description
The following statuses and parameters can be assigned global variables and used in the user program.				
Diagnostic Request	DINT	N	W	To request a diagnostic value, the appropriate ID must be sent to the module using the parameter *Diagnostic Request* (for coding details, see Chapter 4.4.5).
Diagnostic Response	DINT	N	R	As soon as *Diagnostic Response* returns the ID of *Diagnostic Request* (for coding details, see Chapter 4.4.5), *Diagnostic Status* contains the diagnostic value requested.
Diagnostic Status	DWORD	N	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.
Background Test Error	BOOL	N	R	TRUE: Background test is faulty. FALSE: Background test is not faulty.
Restart on Error	BOOL	Y	W	The *Restart on Error* parameter can be used to cause any I/O module that is shut down permanently due to errors or faults to once again enter the RUN state. To do so, set the *Restart on Error* parameter from 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
Supply 1 OK	BOOL	N	R	The supplies are monitored for undervoltage. TRUE: The supply is not faulty. FALSE: The supply is faulty.
Supply 2 OK	BOOL	N	R	Such as *Supply 1 OK.*
Supply 3 OK	BOOL	N	R	Such as *Supply 1 OK.*
Supply 4 OK	BOOL	N	R	Such as *Supply 1 OK.*
Supply 5 OK	BOOL	N	R	Such as *Supply 1 OK.*
Supply 6 OK	BOOL	N	R	Such as *Supply 1 OK.*
Supply 7 OK	BOOL	N	R	Such as *Supply 1 OK.*
Supply 8 OK	BOOL	N	R	Such as *Supply 1 OK.*
Submodule OK	BOOL	Y	R	TRUE: No submodule fault, no channel faults. FALSE: Submodule fault, channel faults (external faults included).
Submodule Status	DWORD	N	R	Bit-coded submodule status. For coding details, see Chapter 4.4.4.
[1] The operating system handles the system parameter in a safety-related manner, yes (Y) or no (N).				

Table 23: The **I/O Submodule DI 32_04** Tab in the Hardware Editor

4.4.3 The **I/O Submodule DI32_04: Channels** Tab

The **I/O Submodule DI32_04: Channels** tab contains the following system parameters for each digital input.
Global variables can be assigned to the system parameters with **->** and used in the user program. The value without **->** must be directly entered.

System parameters	Data type	S [1)]	R/W	Description
Channel no.	---	---	R	Channel number, preset and cannot be changed.
-> Channel Value [BOOL]	BOOL	Y	R	Boolean value of the digital input LOW or HIGH.
-> Channel OK [BOOL]	BOOL	Y	R	TRUE: Fault-free channel. The channel value is valid. FALSE: Faulty channel. The input value is set to FALSE.
T on [µs]	UDINT	Y	W	Time on Delay The module only indicates a level change from LOW to HIGH if the high level is present for longer than the configured time t_{on}. The time on delay cannot be extended by more than the cycle time of the module. This also results in a delayed evaluation of the *-> Channel Value [BOOL]* parameter. For blanking surge pulses in accordance with EN 61000-4-5, a time-on delay of 2000 µs must be configured. Range of values: 0…(2^{31} - 1) Granularity: 1000 µs, e.g., 0, 1000, 2000, … Default setting: 0
T off [µs]	UDINT	Y	W	Time off delay The module only indicates a level change from HIGH to LOW if the low level is present for longer than the configured time t_{off}. The time off delay cannot be extended by more than the cycle time of the module. This also results in a delayed evaluation of the *-> Channel Value [BOOL]* parameter. For blanking surge pulses in accordance with EN 61000-4-5, a time off delay of 2000 µs must be configured. Range of values: 0…(2^{31} - 1) Granularity: 1000 µs, e.g., 0, 1000, 2000, … Default setting: 0
Sup. Used	BOOL	N	W	Activated: The supply is used. Deactivated: The supply is not in use. Default setting: Activated

System parameter	Data type	S 1)	R/W	Description
Redund.	BOOL	Y	W	Requirement: The redundant module must exist. Activated: The channel redundancy for this channel is active. Deactivated: Deactivate the channel redundancy for this channel. Default setting: Deactivated
Redundancy Value	BYTE	Y	W	Setting for determining the redundancy value. ▪ And ▪ Or Default setting: OR **It is only displayed in the redundancy group tab!**
1) The operating system handles the system parameter in a safety-related manner, yes (Y) or no (N).				

Table 24: The **I/O Submodule DI32_04: Channels** Tab in the Hardware Editor

4.4.4 Description of *Submodule Status [DWORD]*

The following table specifies the coding of the *Submodule Status* parameter:

Coding	Description
0x00000001	Fault in hardware unit (submodule).
0x00000002	Reset of an I/O bus.
0x00800000	Module fault connected with reference voltage A.
0x01000000	Fault connected with reference voltage A (overvoltage).
0x02000000	Fault connected with reference voltage B (undervoltage).
0x04000000	Module fault connected with reference voltage B.
0x08000000	Fault connected with auxiliary voltage.
0x10000000	Fault connected with reference voltage A (low voltage).
0x20000000	Fault connected with reference voltage B (overvoltage).
0x40000000	Fault connected with chip select monitoring A.
0x80000000	Fault connected with chip select monitoring B.

Table 25: Coding of *Submodule Status [DWORD]*

4.4.5 Description of *Diagnostic Status [DWORD]*

The following table specifies the coding of the *Diagnostic Status* parameter:

<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>Not used!</td></tr>
<tr><td>202</td><td>Actual value of the internal core voltage.</td></tr>
<tr><td>203</td><td>Actual value of the internal core voltage.</td></tr>
<tr><td>204…207</td><td>Not used!</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>Fault occurred in hardware unit (submodule).</td></tr>
<tr><td>0x0002</td><td>Channel fault due to internal fault.</td></tr>
<tr><td>0x1000</td><td>Faulty connection to I/O bus A.</td></tr>
<tr><td>0x2000</td><td>Faulty connection to I/O bus B.</td></tr>
<tr><td>0x4000</td><td>Channel fault while testing digital input circuit A.</td></tr>
<tr><td>0x8000</td><td>Channel fault while testing digital input circuit B.</td></tr>
</table></td></tr>
<tr><td>2001…2008</td><td>Fault status of the power sources 1…8 (supplies).
<table>
<tr><th>Coding</th><th>Description</th></tr>
<tr><td>0x0001</td><td>Module fault.</td></tr>
<tr><td>0x8000</td><td>Undervoltage of supplies.</td></tr>
</table></td></tr>
</table>

Table 26: Coding of *Diagnostic Status [DWORD]*

4.5 Connection Variants

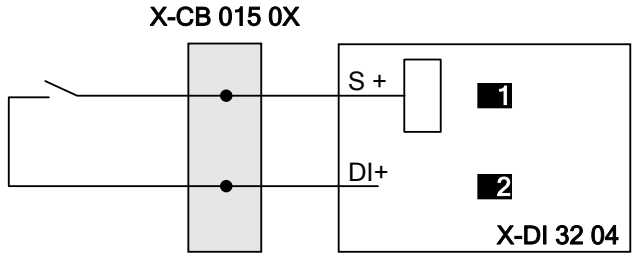
This chapter describes the proper wiring of the module in safety-related applications. The following connection variants are permitted.

4.5.1 Input Wiring Variants

The inputs are wired via connector boards. Special connector boards are available for redundantly wiring the modules.

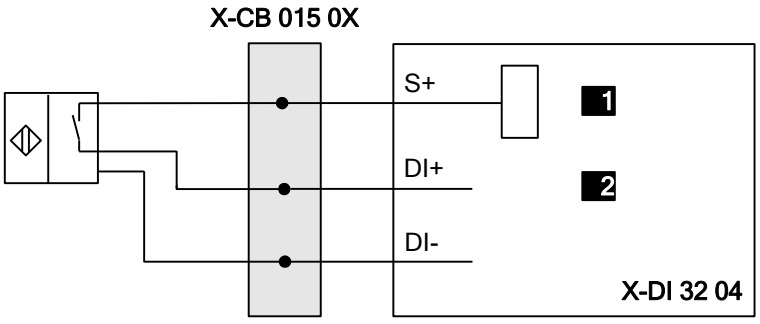
The supply is decoupled using diodes. This ensures that the supplies of two modules can supply one proximity switch if the modules are redundant to one another.

Connector boards X-CB 015 01 (with screw terminals) or X-CB 015 03 (with cable plug) can be used to perform the wiring such as described in Figure 12, Figure 13, Figure 14 and Figure 15.



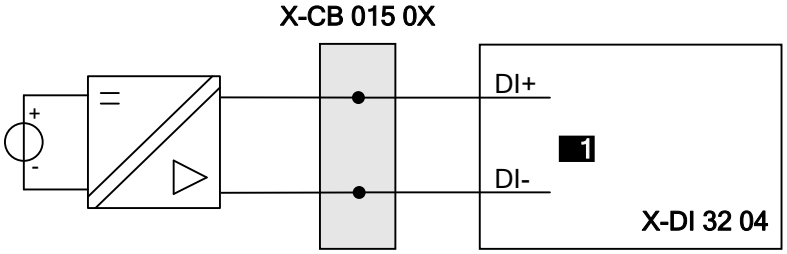
1 Transmitter supply 2 Digital input

Figure 12: Wiring with Switching Device or 2-Wire Proximity Switch



1 Transmitter supply 2 Digital input

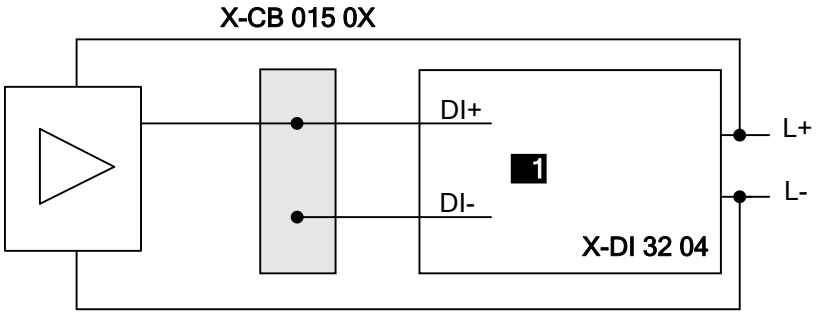
Figure 13: Wiring with 3-Wire Proximity Switch



1 Digital input

Figure 14: Wiring of a Digital Signal Source with Galvanically Separated Supply

When interconnecting a digital signal source with a non-galvanically separated supply to an input module, connect the signal source ground to the L- of the HIMax system.



1 Digital input

Figure 15: Wiring of a Digital Signal Source with Non-Galvanically Separated Supply

NOTICE

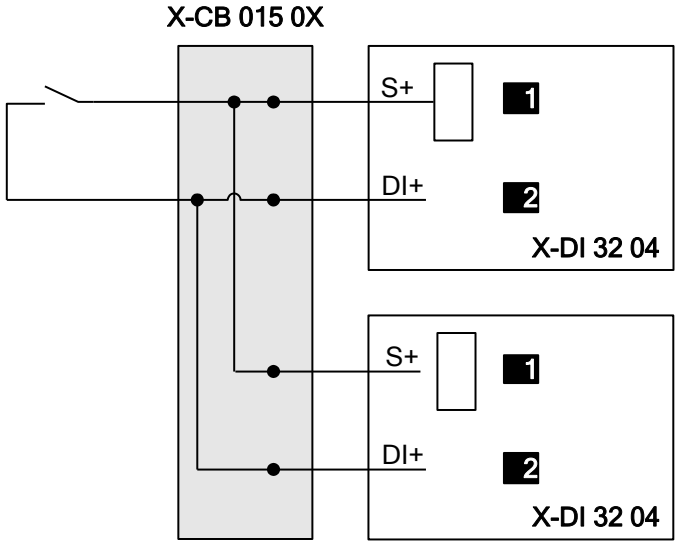
Overcurrent due to incorrect wiring!

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

Do not connect the ground of a digital signal source with a non-galvanically separated supply to the DI- of the input module.

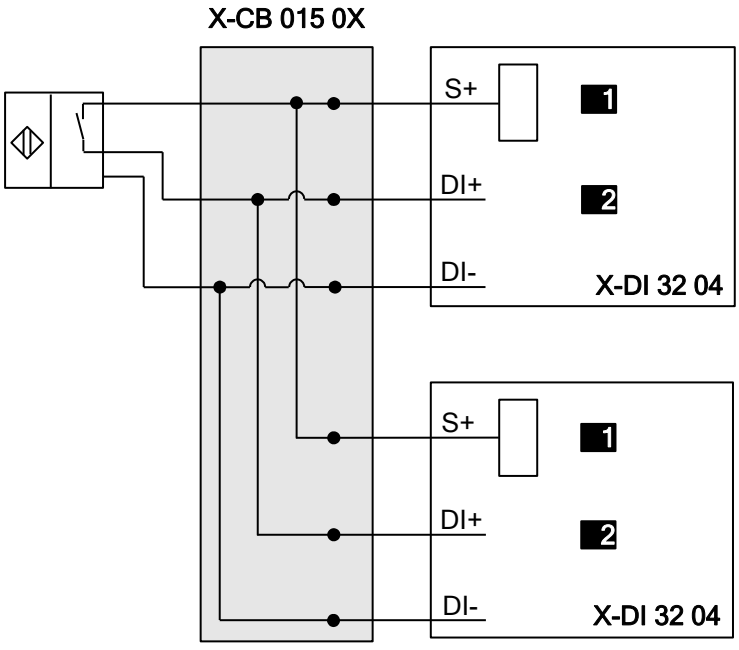
When redundantly wired as specified in Figure 16, Figure 17 and Figure 18, the input modules are inserted in the base plate next to each other and on a common connector board.

Connector boards X-CB 015 02 (with screw terminals) or X-CB 015 04 (with cable plug) can be used.



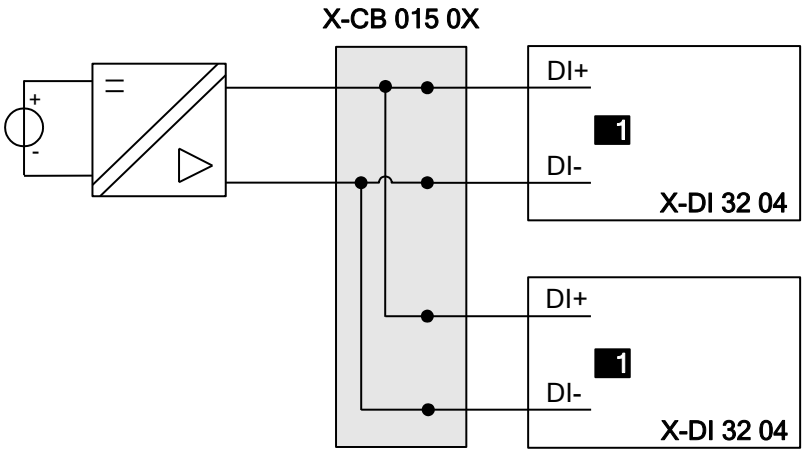
1 Transmitter supply 2 Digital input

Figure 16: Redundant Wiring with Switching Device or 2-Wire Proximity Switch



1 Transmitter supply 2 Digital input

Figure 17: Redundant Wiring with 3-Wire Proximity Switch



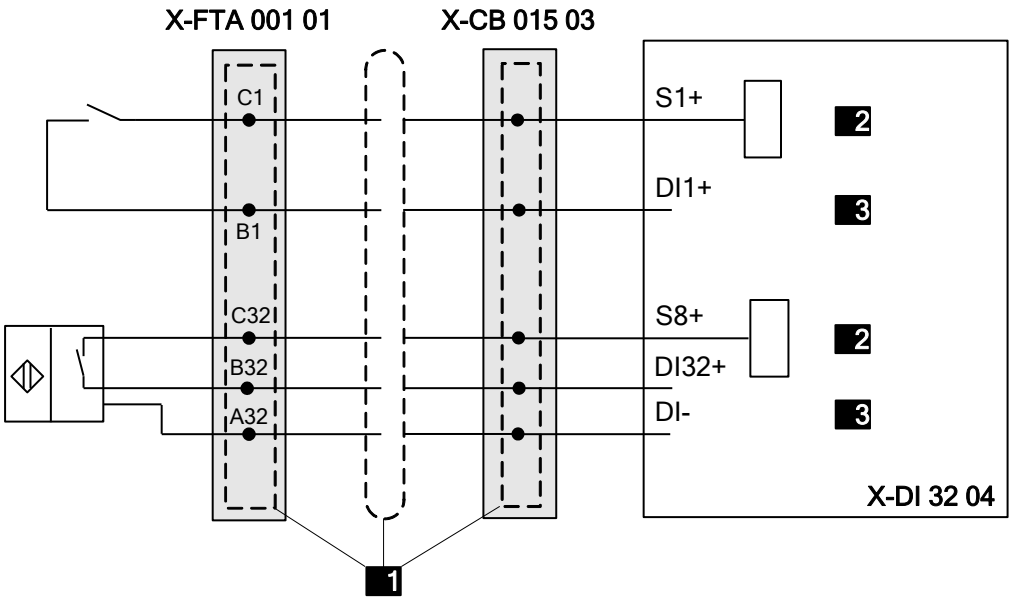
1 Digital input

Figure 18: Redundant Wiring of a Digital Signal Source with Galvanically Separated Supply

4.5.2 Connection to Transmitters via Field Termination Assembly

Switching devices and transmitters are connected via the X-FTA 001 01 as described in Figure 19. For further information, refer to the X-FTA 001 01 manual (HI 801 115 E).

The X-CB 015 03 connector board is used.

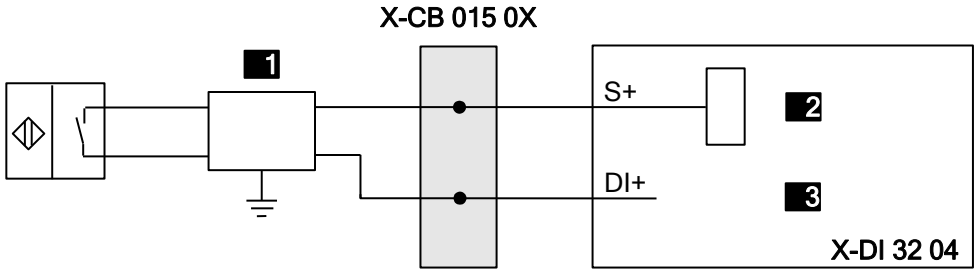


1 System cable with cable plug
2 Transmitter supply
3 Digital input

Figure 19: Connection via Field Termination Assembly

4.5.3 Ex Protection with Zener Barriers

Zener barriers can be used for Ex protection, e.g., barriers from MTL, type 7787+ or Pepperl+Fuchs, type Z787.

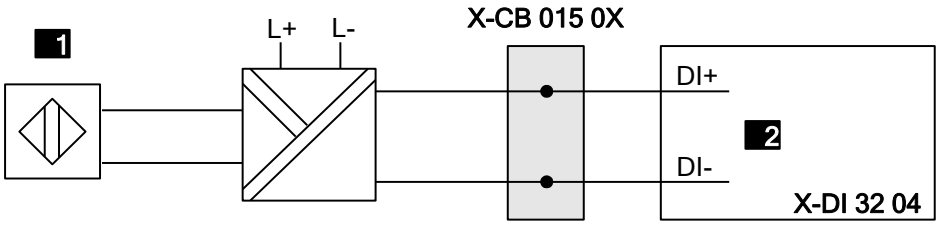


1 Barriers
2 Transmitter supply
3 Digital input

Figure 20: 1-Channel Proximity Switch Connection with Barrier

4.5.4 Ex Protection with Isolation Amplifier

Isolation amplifiers must be used for Ex protection such as the isolation amplifiers H 4011 and H 4012 from HIMA. The proximity switch supply is not used when wiring a repeater power supply.



Safety proximity switch (NAMUR)
2 Digital input

Figure 21: 1-Channel Connection of an Isolation Amplifier

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 is operated from within the PADT, e.g., for forcing the digital inputs. For further details, refer to the SILworX documentation.

5.2 Diagnostics

LEDs on the front side of the module indicate the module state, see Chapter 3.5.2.

The diagnostic history of the module can also be read out using SILworX. Chapter 4.4.4 and Chapter 4.4.5 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 modules of the same type or with approved replacement models.

When replacing modules, observe the instructions specified in the HIMax system manual (HI 801 001 E) and HIMax safety manual (HI 801 003 E).

6.1 Maintenance Measures

The following maintenance measures must be implemented for the modules:

- Proof testing.
- Loading of enhanced operating system versions.

6.1.1 Proof Test

The proof test interval for HIMax modules must be in accordance with the interval required by the application-specific safety integrity level (SIL). For further details, refer to the safety manual (HI 801 003 E).

6.1.2 Loading of Enhanced Operating System Versions

As part of product maintenance, HIMA is continuously improving the operating systems of the modules. HIMA recommends using system downtimes to load the current operating system versions into the modules.

i The current operating system versions of modules are displayed in the SILworX Control Panel. The type label specifies the delivered module version, see Chapter 3.4.

Before loading operating systems into the modules, check the system compatibilities and restrictions of the operating system versions. To this end, use the applicable release notes. Use SILworX to load the operating systems into the modules and ensure that these are in the STOP state.

7 Decommissioning

To decommission the module, remove it from the base plate. For more details, refer to Chapter *Mounting and Removing the Module*.

8 Transport

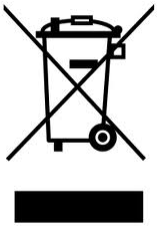
To avoid mechanical damage, the components must be transported in packaging.

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

9 Disposal

Industrial customers are responsible for correctly disposing of decommissioned 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
AI	Analog input
AO	Analog output
ARP	Address resolution protocol, network protocol for assigning the network addresses to hardware addresses
COM	Communication module
CRC	Cyclic redundancy check
DI	Digital input
DO	Digital output
EMC	Electromagnetic compatibility
EN	European standard
ESD	Electrostatic discharge
FB	Fieldbus
FBD	Function block diagrams
HW	Hardware
ICMP	Internet control message protocol, network protocol for status or error messages
IEC	International electrotechnical commission
Interference-free	Inputs are designed for interference-free operation and can be used in circuits with safety functions
MAC	Media access control address, hardware address of one network connection
PADT	Programming and debugging tool (in accordance with IEC 61131-3), PC with SILworX
PELV	Protective extra low voltage
PES	Programmable electronic system
R	Read, the variable is read out
R/W	Read/Write, column title for system variable type
Rack ID	Base plate identification (number)
r_P	Peak value of a total AC component
SB	System bus (module)
SC/OC	Short-circuit/open-circuit
SELV	Safety extra low voltage
SFF	Safe failure fraction, portion of faults that can be safely controlled
SIL	Safety integrity level (in accordance with IEC 61508)
SILworX	Programming tool
SNTP	Simple network time protocol (RFC 1769)
SRS	System.Rack.Slot, addressing of a module
SW	Software
TMO	Timeout
W	Write, the variable receives a value, e.g., from the user program
WD	Watchdog, device for monitoring the system's correct operation Signal for fault-free process
WDT	Watchdog time

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