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HIMax®
Field Termination Assembly
Manual

SAFETY
NONSTOP

HIMA

X-FTA 002 02

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All of the instructions and technical specifications in this manual have been written with great care and effective quality assurance measures have been implemented to ensure their validity. For questions, please contact HIMA directly. HIMA appreciates any suggestion on which information should be included in the manual.

Equipment subject to change without notice. HIMA also reserves the right to modify the written material without prior notice.

For further information, refer to the HIMA DVD and our website at `http://www.hima.de` and `http://www.hima.com`.

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Revision index	Revisions	Type of Change	
		technical	editorial
3.02	Added: Numbering of the male connectors (cable plugs) XG1 and XG2	X	X
5.00	Updated edition for SILworX V5 Added: New I/O modules	X	X

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1   Introduction

This manual describes the technical characteristics of the X-FTA 002 02 universal field termination assembly (FTA) and its use.
It provides information on how to install and start up the module.

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.

1.3.2   Operating Tips

Additional information is structured as presented in the following example:

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 FTA itself.

Residual risk may result from:

- Faults in the engineering
- 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 FTAs are mounted on the DIN rails of the control or marshalling cabinets and are used to connect the individual actuators or sensors of the field zone to the corresponding I/O modules. The FTA is connected to the connector board of the I/O module via system cables, see Figure 6.

The FTA is suitable for operating I/O modules redundantly or as single modules. The use of the FTA to set the redundancy allows I/O modules that are not located in the base plate adjacently to be connected redundantly.

The following I/O modules can be connected to the universal FTAs (X-FTA 002 02L/02R) via system cables:

Analog input module
X-AI 16 51, only for connecting sensors
Analog output modules
X-AO 16 01
Counter module
X-CI 24 01
X-CI 24 51
Digital input modules
X-DI 32 01, only for connecting switching contacts or control circuit devices
X-DI 32 03, only for connecting switching contacts or control circuit devices
X-DI 32 04 SOE, only for connecting switching contacts or control circuit devices
Digital output modules
X-DO 24 01
X-DO 24 02
X-DO 32 01
X-DO 32 51

Table 3:   Appropriate I/O Modules for the X-FTA 002 02L/02R

The FTA can be encoded to ensure its connection to the proper system cable, see Chapter 3.4.2.

3.1   Safety Function

No safety function is performed by the FTA.

3.2   Scope of Delivery

The following components are included within the scope of delivery of the FTA:

- 2 x SK 20 shield connection terminal block
- 2 x coding schemes for cable plug
- 2 x fastening screws KV for the coding plates

3.3   Type Label

The type label specifies the following important details:

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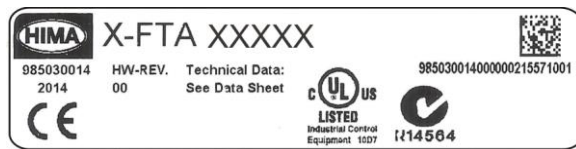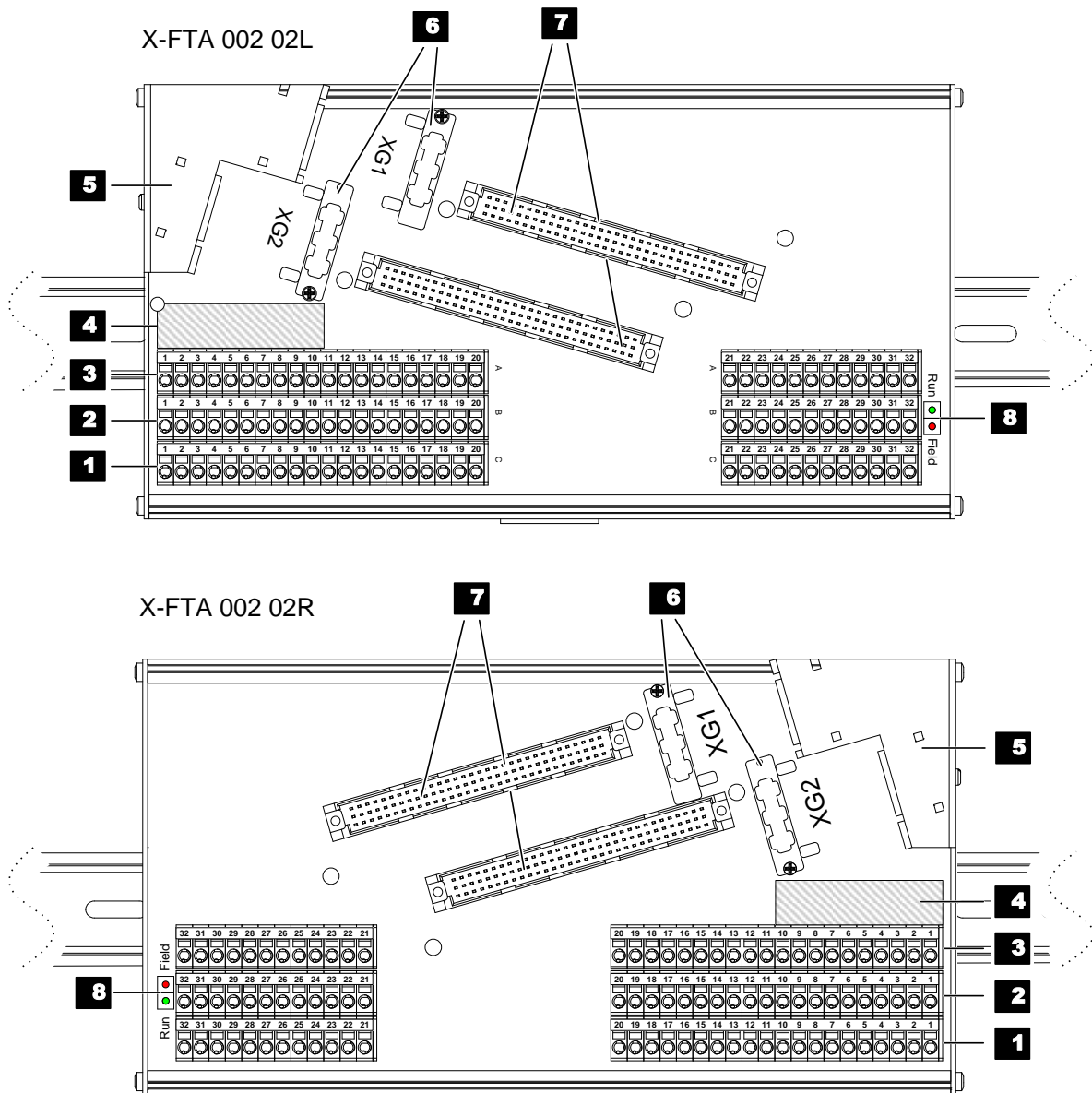- Production year (Prod-Year:)

Figure 1:   Sample Type Label

3.4   Structure

The FTA is manufactured in a left variant X-FTA 002 02L and a right variant X-FTA 002 02R.
The X-FTA 002 02L is connected on the left side with system cables, the X-FTA 002 02R on the
right side.

1 Row of Terminals C
2 Row of Terminals B
3 Row of Terminals A
4 Label Field

5 Mounting Rail for Shield Connection Terminal
Block SK 20
6 Recess for Coding Plate
7 Male Connectors (Cable Plugs) XG1 and XG2
8 Status Indicators

Figure 2:   X-FTA 002 02L and X-FTA 002 02R

i Only use a felt marker or a sticker to mark the label field **4** since traces are placed underneath it.

The mounting rail **5** is electrically connected to the enclosure and the FTA foot. The DIN rail is electrically connected to the equipotential bonding, ensuring a continuous functional ground.

3.4.1   Pin Assignment

The field termination assemblies are equipped with three rows of terminals (A, B, C) containing 32 terminals each, whereby in rows A and C the same voltage is always present on each set of four terminals (1...4, 5...8 to 29...32).

Patched wires are connected as follows:

Analog input module	Row of terminals A		Row of terminals B		Row of terminals C	
X-AI 16 51 [1]	1...16	AI1+...AI16+	1...16	AI1-...AI16-	1...4, 5...8 9...12, 13...16	S1+, S2+ S1-, S2-
	17...32	Not used	17...32	Not used	17...20, 21...24, 25...28, 29...32	Not used
[1] Only possible for connecting sensors in connection with the X-CB 020 53 connector board.						

Analog output module	Row of terminals A		Row of terminals B		Row of terminals C	
X-AO 16 01	1...16	AO1+... AO16+	1...16	AO1-... AO16-	1...4, 5...8, 9...12, 13...16, 17...20, 21...24, 25...28, 29...32	Not used
	17...32	Not used	17...32	Not used		

Counter module	Row of terminals A		Row of terminals B		Row of terminals C	
X-CI 24 01	1...24	S01+...S24+	1...24	CI1+...CI24+	1...4, 5...8, 9...12, 13...16, 17...20, 21...24, 25...28, 29...32	CI- CI- CI- CI-
	25...32	Not used	25...32	Not used		
X-CI 24 51 [2]	1...24	S01+...S24+	1...24	CI1+...CI24+	1...4, 5...8, 9...12, 13...16, 17...20, 21...24, 25...28, 29...32	CI- CI- CI- CI-
	25...32	Not used	25...32	Not used		
[2] Prior to using it, an accurate application-specific analysis is required.						

Digital input modules	Row of terminals A		Row of terminals B		Row of terminals C	
X-DI 32 01 [3]	1...32	Not used	1...32	DI1+...DI32+	1...4, 5...8, 9...12, 13...16, 17...20, 21...24, 25...28, 29...32	S1+, S2+, S3+, S4+, S5+, S6+, S7+, S8+
X-DI 32 03 [3]	1...32	Not used	1...32	DI1+...DI32+	1...4, 5...8, 9...12, 13...16, 17...20, 21...24, 25...28, 29...32	S1+, S2+, S3+, S4+, S5+, S6+, S7+, S8+
X-DI 32 04 [3]	1...32	Not used	1...32	DI1+...DI32+	1...4, 5...8, 9...12, 13...16, 17...20, 21...24, 25...28, 29...32	S1+, S2+, S3+, S4+, S5+, S6+, S7+, S8+
[3] Only the connection of switching contacts or control circuit devices is possible.						
Digital output modules	Row of terminals A		Row of terminals B		Row of terminals C	
X-DO 24 01	1...24 25...32	DO1+... DO24+ Not used	1...24 25...32	DO1-... DO24- Not used	1...4, 5...8, 9...12, 13...16, 17...20, 21...24, 25...28, 29...32	Not used
X-DO 24 02	1...24 25...32	DO1+... DO24+ Not used	1...24 25...32	DO1-... DO24- Not used	1...4, 5...8, 9...12, 13...16, 17...20, 21...24, 25...28, 29...32	Not used
X-DO 32 01	1...32	DO1+... DO32+	1...32	DO1-... DO32-	1...4, 5...8, 9...12, 13...16, 17...20, 21...24, 25...28, 29...32	Not used
X-DO 32 51 [2]	1...32	DO1+... DO32+	1...32	DO1-... DO32-	1...4, 5...8, 9...12, 13...16, 17...20, 21...24, 25...28, 29...32	Not used
[2] Prior to using it, an accurate application-specific analysis is required.						

Table 4:   Pin Assignment of Patched Wires

3.4.2   Coding

A coding plate can be used to encode the FTA. This prevents the wrong type of I/O cable plug from being inserted into the FTA. For more information on how to mount the coding plate, see Chapter 4.1.2.

The FTA is encoded using a coding plate that must be detached from a coding scheme (Figure 3). The coding scheme is composed of 20 individual coding plates, each with 4 coding options. The coding can be matched unambiguously with the system cable using the imprinted number. The readable number located on the right side is valid if the coding plate is aligned as depicted in Figure 4.
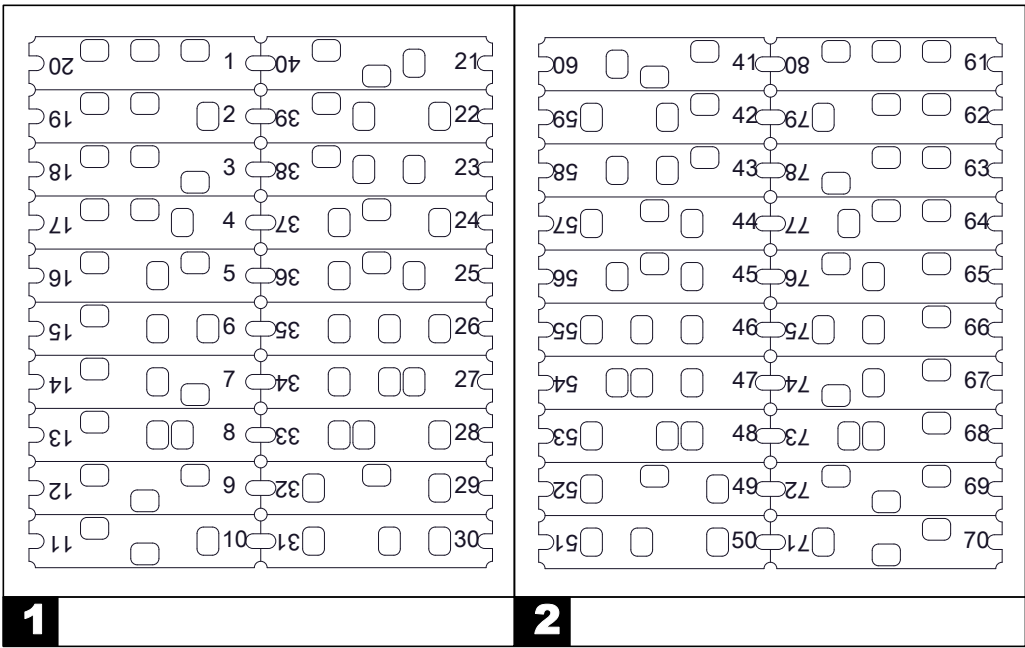
1 Coding Scheme Front Side   **2** Coding Scheme Rear Side

Figure 3:   Coding Scheme Composed of 20 Coding Plates
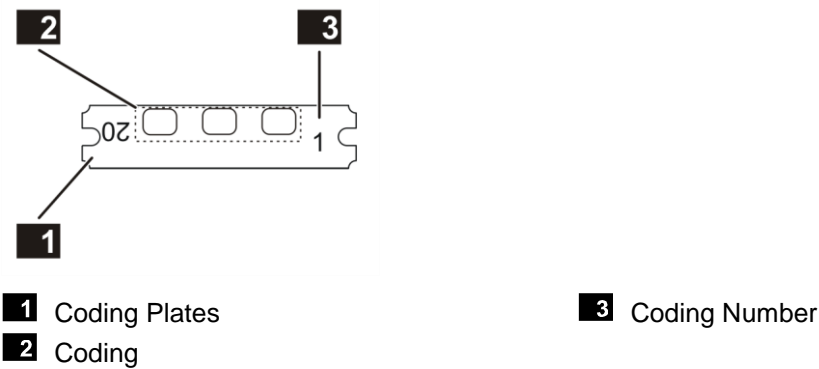
1 Coding Plates   **3** Coding Number
2 Coding

Figure 4:   Coding Plates

The following table specifies the I/O modules, system cables and corresponding coding number (coding plate).

Analog input module	System cable	Coding number
X-AI 16 51	X-CA 014	18
Analog output module	System cable	Coding number
X-AO 16 01	X-CA 011	5
Counter modules	System cable	Coding number
X-CI 24 01	X-CA 005	3
X-CI 24 51	X-CA 005	3
Digital input modules	System cable	Coding number
X-DI 32 01	X-CA 001	2
X-DI 32 03	X-CA 001	2
X-DI 32 04 SOE	X-CA 001	2
Digital output modules	System cable	Coding number
X-DO 24 01	X-CA 006	4
X-DO 24 02	X-CA 006	4
X-DO 32 01	X-CA 006	4
X-DO 32 51	X-CA 006	4

Table 5:   I/O Modules, System Cables and Corresponding Coding Number

3.5   Product Data

General	
Permissible voltage	SELV or PELV
Current load rating per channel	0.75 A per terminal
Terminal cross-section	0.2...2.5 mm² flexible
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)	253 x 133 x 48 mm 253 x 133 x 85 mm (with cable plug)
Mounting	On DIN rail 35 mm
Weight	approx. 700 g
Mounting position	Horizontal or vertical

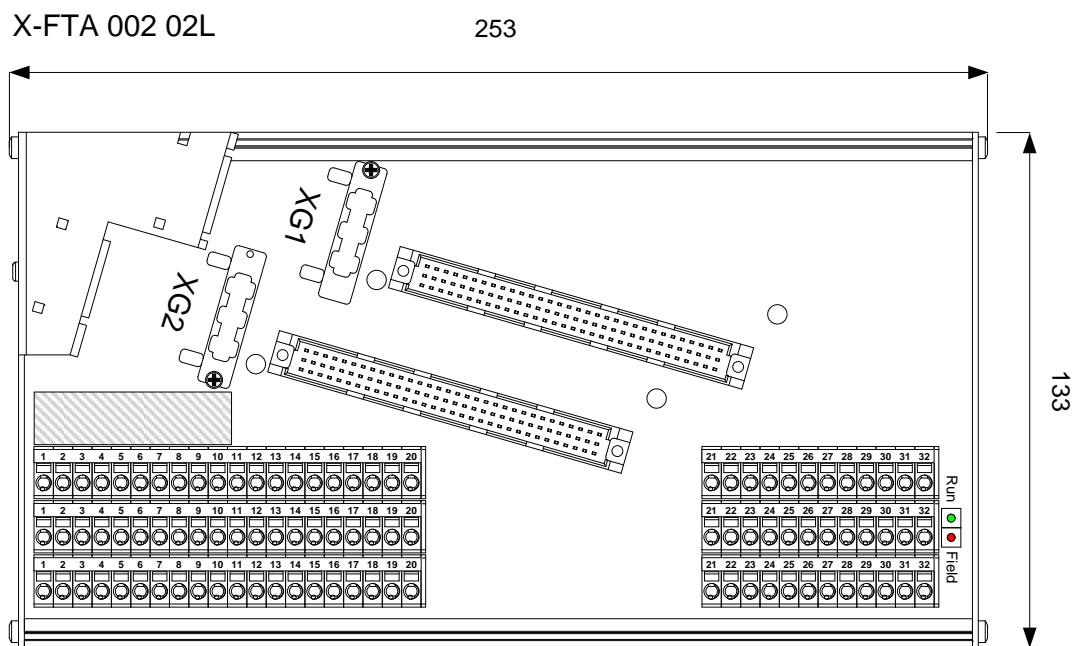Table 6:   Product Data

Figure 5:   Dimension Drawing

3.6   Accessories

No accessories are provided with the X-FTA 002 02.

4   Start-up

The I/O modules are connected to the FTA via pre-assembled cables. One cable plug of the system cable is plugged in to the connector board of the corresponding I/O module and the other cable plug to the FTA. The patched wires are applied to the rows of terminals on the FTA and connect the field cables attached to the field terminals with the FTA.
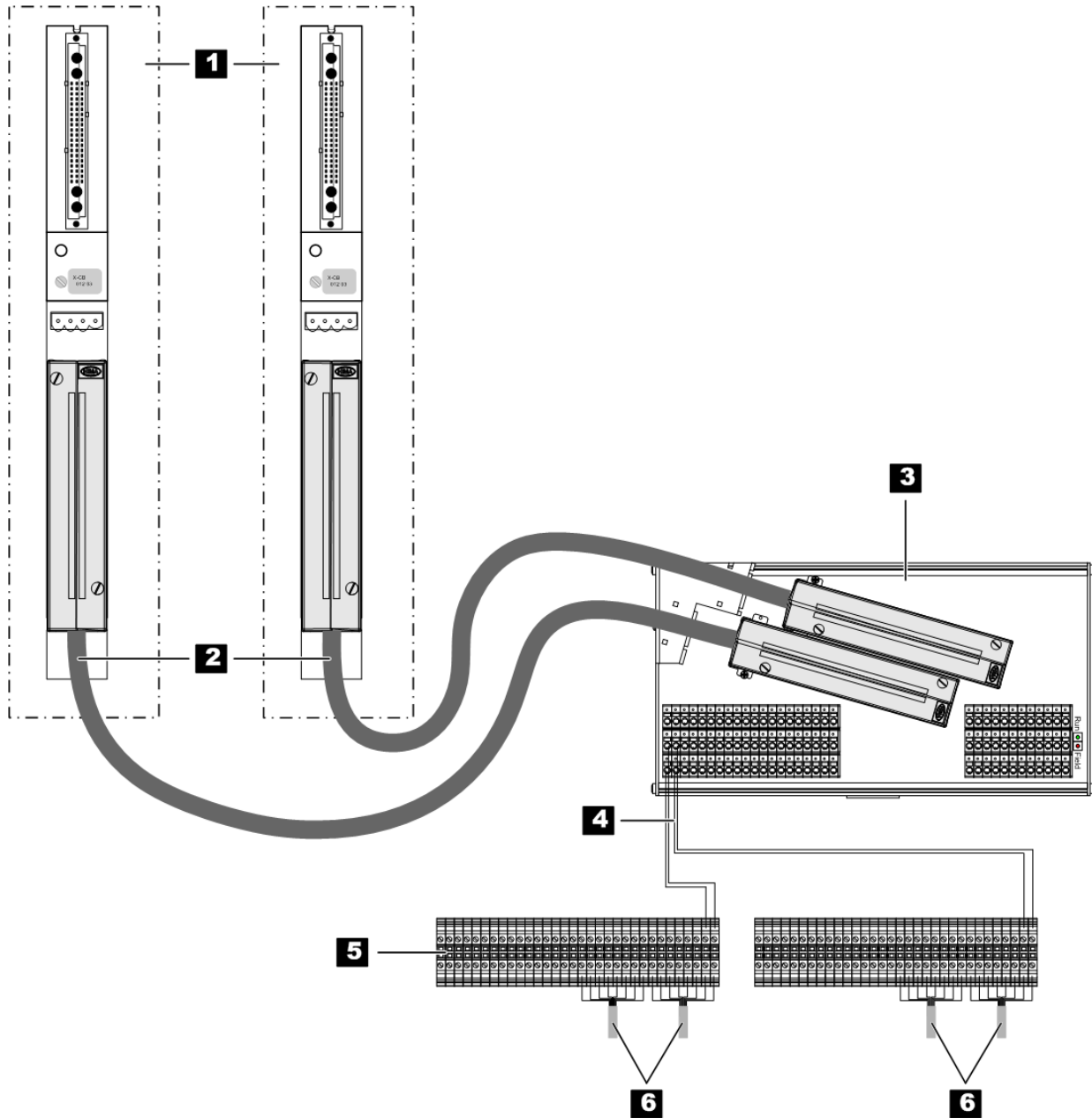
1 Connector Boards in the Base Plate   **4** Patched Wires
2 System Cable with Cable Plug   **5** Field Terminals in the Marshalling Cabinet
3 Field Termination Assembly   **6** Field Lines (Actuators/Sensors)

Figure 6:   Connection of the Field Lines to I/O Modules via FTA

4.1   **Installation/Mounting**

This chapter describes how to connect the patched wires and install the coding plates. Refer to the corresponding module manual for details on proper wiring of I/O modules via FTAs.

4.1.1   Connecting the Patched Wires

Tools and utilities:

- Screwdriver, slotted 0.6 x 3.5 mm
- Wire stripper

1. Strip the insulation from the ends of the connector cables to a length of 8 mm.
2. Hold the stripped end in the round openings intended for the wires and insert the screwdriver into the rectangular opening of the spring terminal to reduce its tension.
3. Insert the wire as far as it can go and remove the screwdriver.
   Wires with wire end ferrules can be inserted directly.
4. Check that the connector cable is holding securely.
5. Apply pressure with the screwdriver to remove the string clip to the side and release the connection.

i   After the system cable plugs were plugged in to the connector board and FTA, use the captive screws located on the plugs to secured them.

4.1.2 Mounting the Coding Plates

Install the coding plate prior to mounting the FTA in the control cabinet or the marshalling cabinet.

Tools and utilities:

- Screwdriver, Cross PZ1
- Coding plates

1. Detach the required coding plate from the coding scheme (Figure 3) at the predetermined breaking points. The number next to the screw fastening determines the coding.

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i Install the coding plate outside the control or marshalling cabinet.

To mount the coding plate, the fastening screw for the coding plate must be completely unscrewed. Keep the fastening screw safe since it is small and could easily get lost.

Only tighten the fastening screw slightly since the screw thread could otherwise be stripped.

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2. Completely unscrew the fastening screw **1** for the coding plate out of the PCB.
3. Place the coding plate over the recess and press it upwards underneath the housing edge **4** .
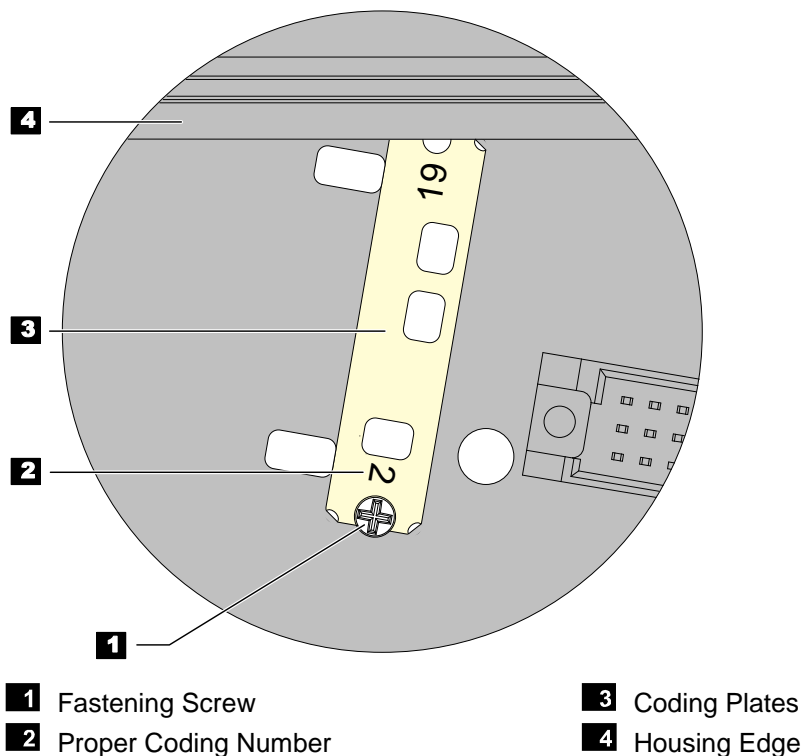4. Use the fastening screw to secure the coding plate **1** and only tighten the screw slightly.

1 Fastening Screw **3** Coding Plates
2 Proper Coding Number **4** Housing Edge

Figure 7: Coding Plate Mounted on the FTA

5 Operation

The field termination assembly is operated within a control or a marshalling cabinet and does not require any specific monitoring.

5.1 Handling

Direct handling of the FTA is not foreseen.

5.2 Diagnosis

The green LED *Run* and the red LED *Field* are used to indicate the following states:

LED	State
Run	The I/O module is supplied with voltage and connected to the FTA via system cables.
Field	The I/O module has detected field faults (e.g., in the I/O loop or in the connection between I/O module and FTA) Redundant operation: Both modules detect field faults

Table 7:   LED Indicators

i   The LED indicators are not refreshed when the module is in STOP mode. For this reason, the LEDs still indicate field faults, even if they were removed. The LED indicators are refreshed as soon as the module is in RUN mode again.

6   Maintenance

The FTA is maintenance free. All system components are designed for continuous operation.

6.1   Faults

If faults occur, the defective system components must be replaced with components of the same type or with approved replacement models. Send defective system components back to HIMA.

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

⚠ WARNING
Electrostatic discharge can damage the electronic components within the systems.

7   Decommissioning

Remove the system cable to decommission the FTA.

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
r_P	Peak value of a total AC component
Rack ID	Base plate identification (number)
Interference-free	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
W	Write
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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