HIMax®

Communication Module
Manual

SAFETY
NONSTOP

HIMA

X-COM 01

8

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		technical	editorial
4.00	New edition for SILworX V4	X	X
5.00	New edition for SILworX V5 Revised: Chapter 3.5	X	X

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
- Maintenance
- 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 the programming tool.
Italics	For parameters and system 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: warning, caution, notice
- Type and source of risk
- Consequences arising from non-observance
- Risk prevention

⚠ SIGNAL WORD

Type and source of risk!
Consequences arising from non-observance
Risk prevention

The signal words have the following meanings:

- 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.

NOTE

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 risk results from a HIMax system itself.

Residual risk may result from:

- Faults related to engineering
- Faults related to 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 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-COM 01 communication module is 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 module is approved for use in the safety-related HIMax system and can be used to transport safety-related protocols.

The module ensures communication with systems via Ethernet and fieldbus interfaces with safe**ethernet** and different standard protocols.

i Fore more information on how to configure the protocols and for details of the fieldbus interfaces, refer to the Communication Manual (HI 801 101 E).

Use the SILworX programming tool to select the interfaces for the available protocols.

3.1 Safety Function

No safety function is performed by the communication module.

3.1.1 Reaction in the Event of a Fault

If fault occur, the module enters the temporary ERROR STOP. The module is then rebooted and restarted from the INIT state.

No process data is exchanged with external communication partners in the ERROR STOP state. No process data is transferred to process module.

3.2 HIMax COM Module Part Number

Each COM module forms a functional unit with the X-CB 001 02 connector board. Note that the connector board must be separately purchased.

The fieldbus submodules are optional and must be mounted by the manufacturer. The fieldbus submodule is selected when ordering the controller using the part number. Additionally, the protocols used must be activated.

⚠ CAUTION

Improper opening of the COM module

Damage to COM module

Only HIMA is authorized to retrofit the fieldbus submodules.

When the module is equipped with one or multiple fieldbus submodules, the part number and also the module name changes from X-COM 01 to X-COM 010 XY.

The following table specifies the available components:

Designation	Description
X-COM 01	Communication module without fieldbus submodules
X-COM 010 **XY** [1)]	Communication module with fieldbus submodule
X-CB 001 02	Connector board
[1)] **X**: Option for fieldbus interface FB1 according to Table 4 **Y**: Option for fieldbus interface FB2 according to Table 4	

Table 3: Available HIMax Components

Numbers are allocated to the fieldbus to create the part numbers, see Table 4.

Options for FB1(X) and FB2(Y)	Description
0	No fieldbus submodule inserted
1	RS485 for Modbus (master or slave) or ComUserTask
2	PROFIBUS DP master
3	PROFIBUS DP slave
5	RS232 for ComUserTask
6	RS422 for ComUserTask
7	SSI for ComUserTask

Table 4: Options for Fieldbus Interfaces FB1(X) and FB2(Y)

The following table shows examples for part numbers and names:

Part no.	Designation	Fieldbus submodule 1 (FB1)	Fieldbus submodule 2 (FB2)
98 52600**21**	X-COM 010 **21**	PROFIBUS master (max. 12 Mbit/s)	RS485
98 52600**23**	X-COM 010 **23**	PROFIBUS master (max. 12 Mbit/s)	PROFIBUS slave (max. 1.5 Mbit/s)
98 52600**11**	X-COM 010 **11**	RS485	RS485
98 5260000	X-COM 01	---	---

Table 5: Examples of COM Module Part Numbers and Names

i HIMA recommends operating the PROFIBUS DP using the FB1 fieldbus interface (maximum transfer rate 12 Mbit/s). The maximum transfer rate permitted for the FB2 fieldbus interface is 1.5 Mbit/s.

The designation and part number (part no.) are printed on the type label of the module.

For more information, refer to the SILworX Communication Manual (HI 801 101 E).

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 composed of:

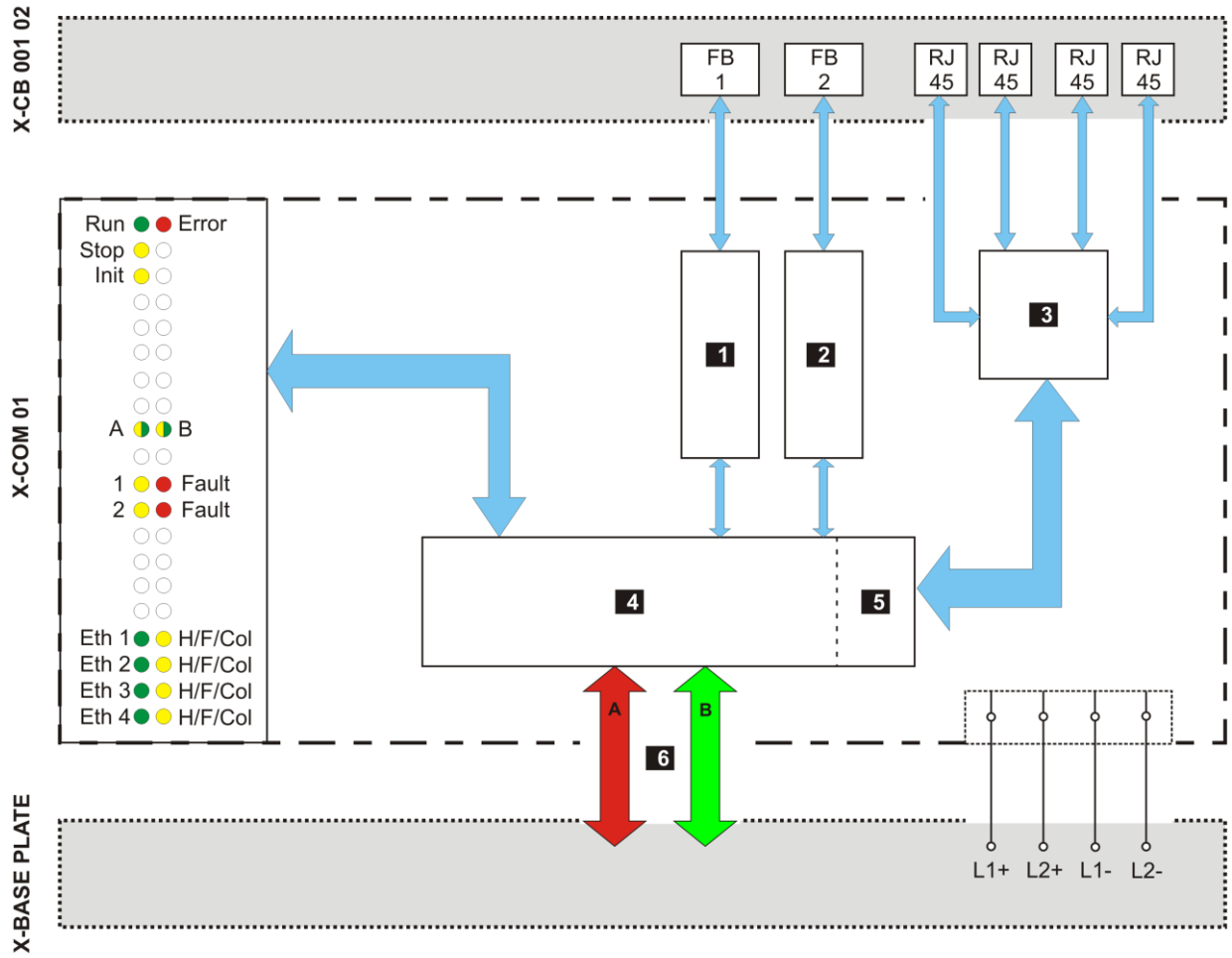
- Processor System
- Ethernet Switch

Ethernet and fieldbus interfaces on the connector board.

The module is equipped with LEDs to indicate the status, see Chapter 3.4.3.

3.4.1 Block Diagram

The following block diagram illustrates the structure of the module.



1 Fieldbus submodule 1
2 Fieldbus submodule 2
3 Ethernet Switch
4 Processor System
5 Ethernet Interface
6 System Busses

Figure 2: Block Diagram

3.4.2 Processor System

The processor system uses self tests to control and monitor the communication. Data is exchanged between the communication module and the processor module is carried out via 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 accordingly.

Operating system and error code history are stored in a non-volatile memory and can be read in SILworX via the diagnosis.

Ethernet Switch

Integrated Ethernet switch to configure different networks.

Ethernet interface

The communication module is equipped with four Ethernet switch ports connected to the Ethernet interface of the processor system via an integrated Ethernet switch.

Property	HIMax COM module
Ports	4
Transfer standard	10BASE-T/100BASE-Tx, Half and full duplex
Auto negotiation	Yes
Auto crossover	Yes
Connection Socket	RJ-45
IP address	Freely configurable[1)]
Subnet mask	Freely configurable[1)]
Supported protocols	safe**ethernet** Standard Protocols
[1)] The general rules for assigning IP address and subnet masks must be adhered to.	

Table 6: Ethernet Interface Properties

i Ensure that no loops result from the network wiring. Data packets may only reach a controller over a single path.

Fieldbus Interfaces

The fieldbus submodules activate the fieldbus interfaces and define the interface transfer standard. The required fieldbus submodules must be specified when ordering the module, see Chapter 3.2. Only one protocol can be run on each fieldbus interface.

Fieldbus interfaces	
Number	2
Transfer standard	For each fieldbus submodule
Connection Socket	D-sub connector, 9 poles
Supported protocols	Standard protocols, see Communication Manual (HI 801 101 E).

Table 7: Fieldbus Interface Specifications

i Wiring, Bus Termination:

- Observe the corresponding fieldbus standard when connecting the fieldbus interfaces.
- Use the bus terminations to terminate the fieldbuses on their physical ends.

3.4.3 Indicators

The following figure shows the LED indicators for the module.

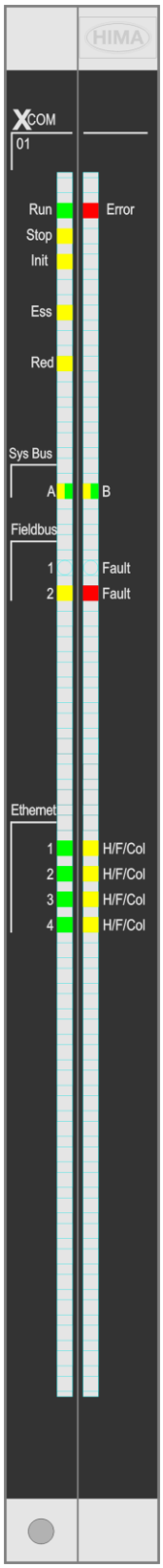


Figure 3: Indicators

The LEDs indicate the operating state of the communication module.

The LEDs on the module are divided into three groups:

- Module status indicators (Run, Error, Stop, Init)
- System bus indicators (A, B)
- Fieldbus indicators (1, 2, Fault)
- Communication indicators (Ethernet)

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

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: Blinking synchronously with data transfer

Table 8: Blinking Frequencies of LEDs

3.4.4 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 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
		Blinking1	Module state: LOCKED or STOP / LOADING OS
		Off	Module state: neither INIT nor LOCKED, observe the other status LEDs

Table 9: Module Status Indicators

3.4.5 Redundancy indicators

The LEDs are located below the module status indicators.

LED	Color	Status	Description
Ess	Yellow	On	At least one non-redundant fieldbus protocol is configured.
		Blinking1	A fieldbus protocol configured for redundant operation is not operating redundantly.
		Off	▪ All fieldbus protocols configured for redundant operation are operating redundantly. ▪ No non-redundant fieldbus protocols are running.
Red	Yellow	On	All fieldbus protocols configured for redundant operation are operating redundantly to the partner module.
		Blinking1	▪ Synchronization ▪ The redundant partner of at least one redundant fieldbus protocol is missing.
		Off	No redundant fieldbus protocol is configured.

Table 10: Redundancy Indicators

3.4.6 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 11: System Bus Indicators

3.4.7 Fieldbus Indicators

The fieldbus LEDs are labeled Fieldbus.

LED	Color	Status	Description
1, 2	Yellow	On	Fieldbus operating
		Off	No activity, fieldbus not operating
Fault	Red	Blinking1	Fieldbus fault of the bus (e.g., the slave is not present or faulty response), depending on the fieldbus protocol (minimum blinking duration 5 s).
		Off	No fieldbus faults

Table 12: Fieldbus Indicators

3.4.8 Ethernet Indicators

The Ethernet LEDs are labeled Ethernet.

LED	Color	Status	Description
Eth 1…4	Green	On	Communication partner connected No communication detected on interface
		Blinking-x	Communication detected on interface.
		Blinking1	IP address conflict detected All Ethernet LEDs are blinking
		Off	No communication partner connected
H/F/Col 1…4	Yellow	On	Full duplex operation on Ethernet line *F*
		Blinking-x	Collisions detected on Ethernet line *Col*
		Blinking1	IP address conflict detected All Ethernet LEDs are blinking
		Off	Half duplex operation on Ethernet line *H*

Table 13: Ethernet Indicators

3.5 Product Data

General	
Supply voltage	24 VDC, -15 %...+20 %, $r_P \leq 5$ %, SELV, PELV
Current input	min. 0.25 A max. 0.46 A
Operating temperature	0 °C...+60 °C
Storage temperature	-40 °C...+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. 1.3 kg

Table 14: Product Data

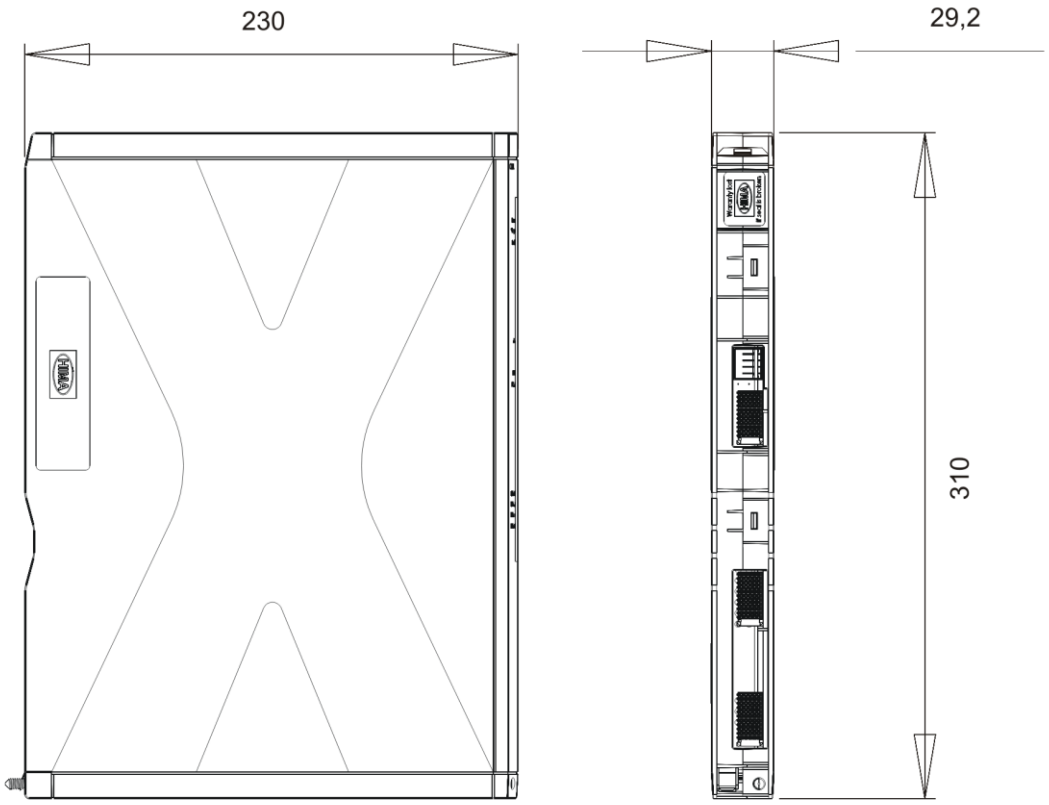


Figure 4: Views

3.6 Connector board

The connector board connects the module to other systems using the Ethernet and fieldbus interfaces. Each module forms a functional unit with the connector board. The connector board for the module is designated as X-CB 001 02. The connector board must be inserted into the appropriate slot prior to mounting the module on the base plate.

3.6.1 Pin Assignment

The interface designation is printed on the connector board.

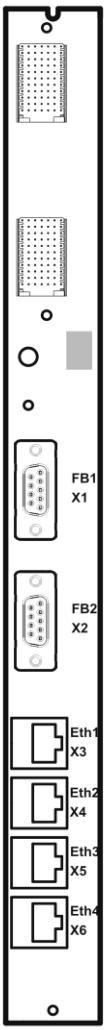


Figure 5: Connector Board

Designation	Description
Fieldbus interfaces	
FB1 (X1)	Connection for fieldbus, the protocol depends on the Fieldbus Submodule
FB2 (X2)	Connection for fieldbus, the protocol depends on the Fieldbus Submodule
Ethernet interfaces	
Eth1 (X3)	Connection for Ethernet
Eth2 (X4)	Connection for Ethernet
Eth3 (X5)	Connection for Ethernet
Eth4 (X6)	Connection for Ethernet

Table 15: Interfaces of X-CB 001 02

3.6.2 Fieldbus interfaces

Fieldbus interfaces of the COM module can be used to communicate with external systems. Only one protocol can be run on each fieldbus interface.

The fieldbus interfaces must be equipped with a fieldbus submodule. If no fieldbus submodule is used, communication is not possible on this interface. The transfer standard for the interface depends on the fieldbus submodule.

Refer to the communication manual (HI 801 101 E) for details of the fieldbus interfaces.