HIMatrix M45

Safety-Related Controller

M-COM 010 Manual

HIMA Paul Hildebrandt GmbH

Industrial Automation

Rev. 1.01

HI 800 657 E

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.

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

Contact

HIMA contact details:

HIMA Paul Hildebrandt GmbH

P.O. Box 1261

68777 Brühl, Germany

Phone: +49 6202 709-0

Fax: +49 6202 709-107

E-mail: info@hima.com

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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 HIMatrix M45 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.
HIMatrix M45 Safety Manual	Safety functions of the HIMatrix system	HI 800 653 E
HIMatrix M45 System Manual	Hardware description of the HIMatrix M45	HI 800 651 E
SILworX Communication Manual	Description of communication and protocols	HI 801 101 E
SILworX Online Help (OLH)	Instructions on how to use SILworX	-
SILworX First Steps Manual	Introduction to SILworX	HI 801 103 E

Table 1: Additional Relevant Documents

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 modules 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 if 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.
- Caution 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 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. The use in Ex-Zone is permitted if additional measures are taken.

2.1 Intended Use

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

When using the components in the HIMatrix 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 HIMatrix system to environmental conditions other than those specified in this manual can cause the HIMatrix 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 devices.

NOTE

Device damage due to electrostatic discharge!

- **When performing the work, make sure that the workspace 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 HIMatrix M45 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 HIMatrix M45 system is a part of the safety equipment of a plant. If a device or a module fails, the system enters the safe state.

In case of emergency, no action that may prevent the HIMatrix M45 systems from operating safely is permitted.

3 Product Description

The M-COM 010 x communication modules are intended for use in the HIMatrix M45 system.

A total of four communication modules with the following communication options are available:

Module	FB1	FB2	FB3
M-COM 010 2	PROFIBUS DP master	RS485	RS422/RS485
M-COM 010 3	PROFIBUS DP slave	RS232	RS422/RS485
M-COM 010 7	SSI	RS485	RS422/RS485
M-COM 010 8	CAN-Bus	RS485	RS422/RS485

Table 3: M-COM 010 x Communication Module

The communication modules must be arranged directly next to the M-CPU 01 processor module and the power module. A maximum of 3 communication modules are allowed in the HIMatrix M45 system. To structure a HIMatrix M45 system, observe the instructions specified in the system manual (HI 800 651 E).

The module is suitable for use in the safety-related HIMatrix M45 system and can be employed for transporting safety-related protocols. The socket is equipped with Ethernet and fieldbus interfaces and ensures communication with systems via safe**ethernet** and different standard protocols.

i For more information on how to configure the protocols and details of the fieldbus interfaces, refer to the communication manual (HI 801 101 E).

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

3.1 Safety Function

No safety function is performed by the communication module.

In terms of safety technology, the module features interference-free operation with the HIMatrix M45 system. This is achieved through specific decoupling measures on the interfaces.

3.1.1 Reaction in the Event of a Fault

If faults occur, the module enters the temporary STOP_ERROR state. The module is then rebooted and restarted from the INIT state.

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

3.2 Scope of Delivery

To be able to operate, the module must be installed on a suitable M-SO COM 01 socket. The socket is not included within the scope of delivery of the module.

The socket is described in Chapter 3.6.

3.3 Type Label

The type plate contains the following details:

- Product name
- Mark of conformity
- Bar code (2D code)
- Part number (Part-No.)
- Hardware revision index (HW-Rev.)
- Operating system revision index (OS-Rev.)
- Operating data (Power:)
- Production year (Prod-Year:)

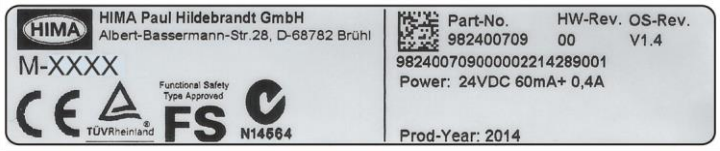


Figure 1: Sample Type Label

3.4 Structure

The chapter is structured as follows:

- Description of the interfaces
- Block diagram
- Front view
- LED indicators

The module is equipped with the following components:

- A safety-related 1oo2D processor system. This uses self-tests to monitor the module's functions, and exchanges data with the M-CPU 01 processor module via the system bus.
- A non-safety-related communication processor system for standard protocols.

3.4.1 Ethernet Interfaces

The socket is equipped with four Ethernet switch ports (Eth1...Eth4). The switch ports are connected to the Ethernet interface of the communication processor system via an integrated Ethernet switch.

Ethernet interfaces	
Number of 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 4: Ethernet Interface Properties

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

3.4.2 Fieldbus Interfaces

The socket is equipped with three Ethernet switch ports (Eth1...Eth3). Only one protocol can be run on each fieldbus interface.

Fieldbus interfaces	
Number	3
Transfer standard	Depending on the protocol
Connection socket	D-sub connector, 9 poles
Supported protocols	Standard protocols, see communication manual (HI 801 101 E).

Table 5: Fieldbus Interface Properties

A total of four modules with different assignment of the fieldbus interfaces are available, see Table 3.

For more information on how to configure the protocols and details of the fieldbus interfaces, refer to the communication manual (HI 801 101 E).

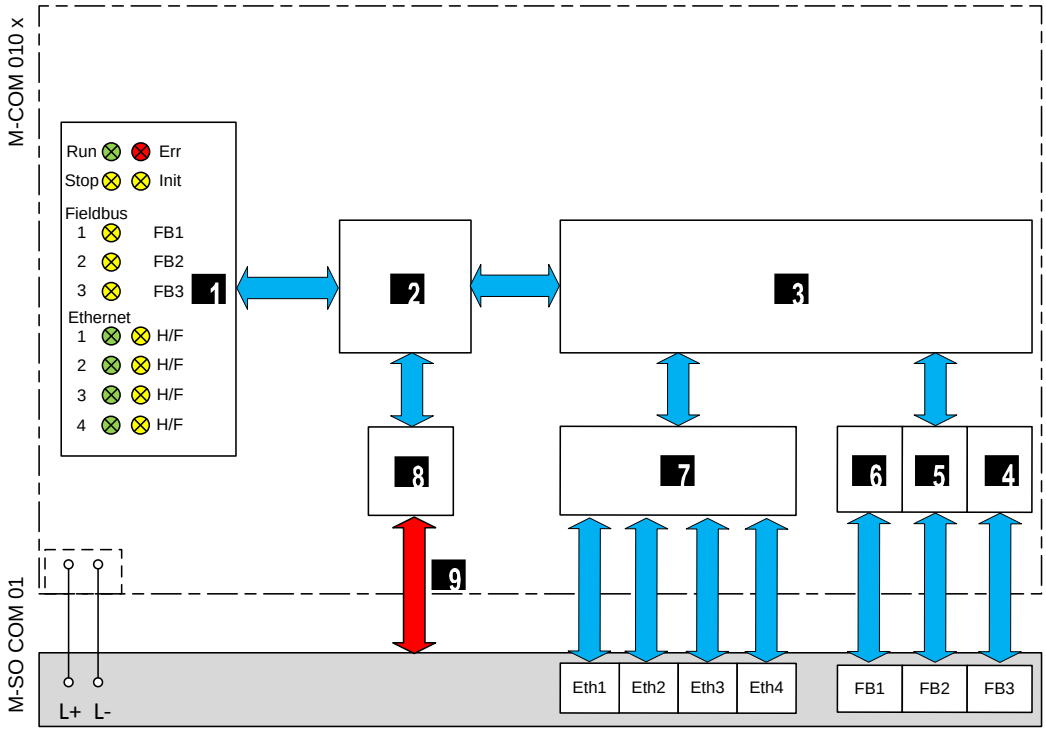
⚠ WARNING

Wiring, Bus Termination:

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

3.4.3 Block Diagram

The following block diagram illustrates the structure of the module.



1. Indicators
2. Safety-Related Processor System
3. Communication Processor
4. Fieldbus Submodule FB3
5. Fieldbus Submodule FB2
6. Fieldbus Submodule FB1
7. Ethernet Switch for External Communication
8. Switch
9. System Bus

Figure 2: Block Diagram

3.4.4 Front View

The following figure shows the front view of the module using the example of the M-COM 010 02:

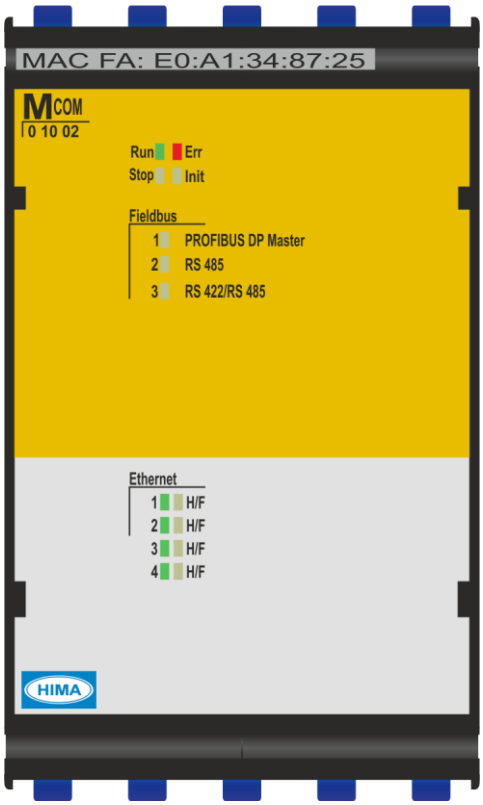


Figure 3: Example of Front View

3.4.5 LED Indicators

The LEDs indicate the operating state of the module. The LEDs are classified as follows:

- Module status indicators
- Fieldbus indicators
- Ethernet indicators

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 6: Blinking Frequencies of LEDs

3.4.5.1 Module Status Indicators

The LEDs signal the following states:

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.
Err	Red	On	Warning, e.g.: No license for additional functions (e.g., communication protocols), test mode.
		Blinking1	Fault, e.g.: ▪ Internal module fault 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 / LOADING OS
		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 7: Module Status Indicators

3.4.5.2 Fieldbus Indicators

LEDs FB1…FB3 are used to display the state of communication occurring via the serial interfaces. The function of the LED depends on the used protocol.

Refer to the SILworX communication manual (HI 801 101 E) for more details on the function of the LEDs.

3.4.6 Ethernet Indicators

The Ethernet LEDs are labeled *Ethernet*.

LED	Color	Status	Description
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	Yellow	On	Full duplex operation on Ethernet line
		Blinking-x	Collisions detected on Ethernet line
		Blinking1	IP address conflict detected All Ethernet LEDs are blinking
		Off	Half duplex operation on Ethernet line

Table 8: Ethernet Indicators

3.5 Product Data

General	
Supply voltage	24 VDC, -15 %...+20 %, $r_P \leq 5$ %, SELV, PELV
Maximum supply voltage	30 V
Current input M-COM 010 2 M-COM 010 3 M-COM 010 7 M-COM 010 8	 370 mA at 24 VDC 330 mA at 24 VDC 320 mA at 24 VDC 300 mA at 24 VDC
Ambient temperature	0…+60 °C
Storage temperature	-40…+85 °C
Dimensions without socket (H x W x D) in mm	105 x 50 x 72
Dimensions with socket up to DIN rail (H x W x D) in mm	165 x 75.2 x 90
Weight Module Socket	 approx. 185 g approx. 210 g

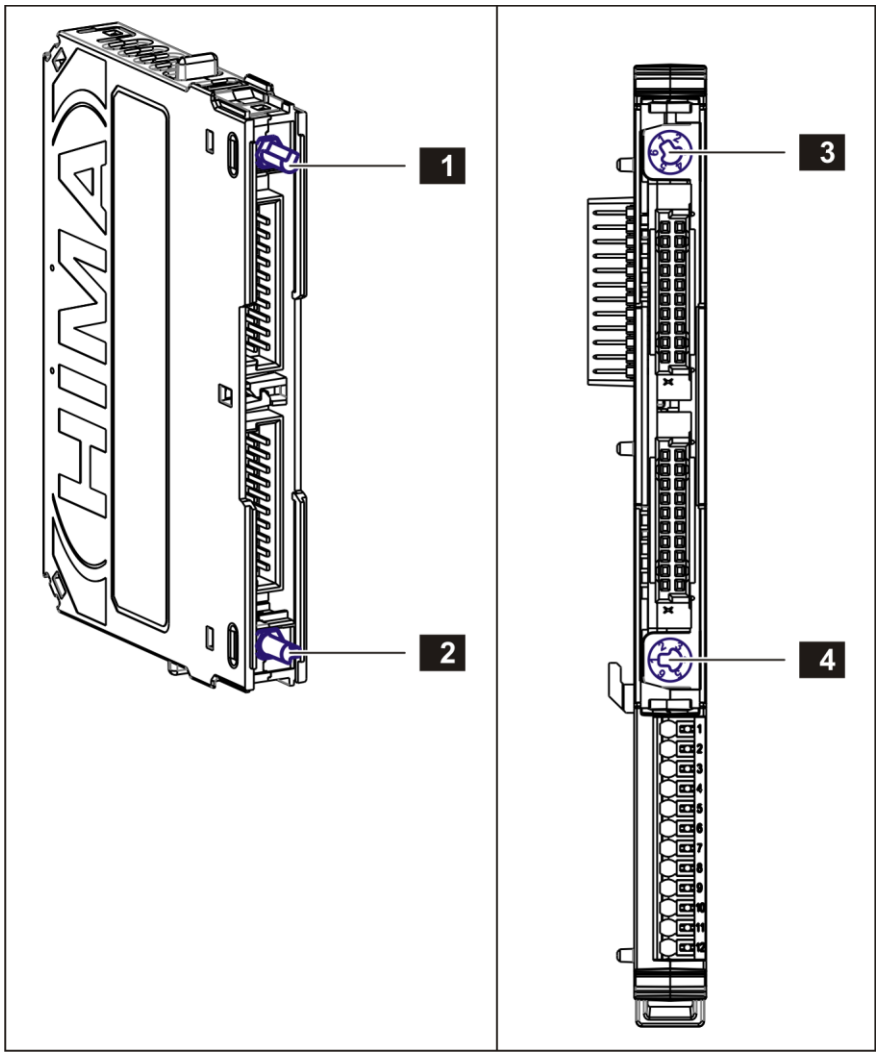
Table 9: Product Data

3.6 Socket

Socket and module form together a functional unit. The module is connected to the system bus, the power supply and the field zone via a socket. The communication interfaces are composed of four RJ-45 ports and three D-sub ports, see Figure 5.

3.6.1 Mechanical Coding

Module and socket are mechanically coded, see Figure 4. The position of the coding pins determines the module's coding and is defined by the manufacturer. Two coding sockets accept the coding pins and must be configured in the selected module, see Chapter 3.6.2. A total of six different positions are possible. Coding prevents the socket from improper assembling.



1 Upper Coding Pin
2 Lower Coding Pin
3 Upper Coding Socket
4 Lower Coding Socket

Figure 4: Example of Module and Socket Coding

3.6.2 Coding the M-COM 010 Module and Socket

To attach the module, the coding socket of the M-SO COM 01 socket must be set up as follows:

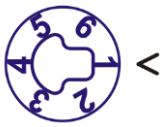
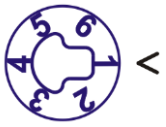
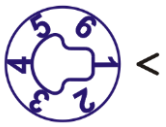
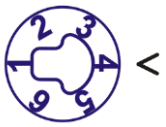
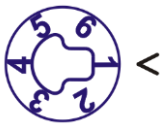
Module	Order	Module coding (rear view)	Position	Coding socket
M-COM 010 2	Upper		1	
	Lower		2	
M-COM 010 3	Upper		1	
	Lower		3	
M-COM 010 8	Upper		1	
	Lower		4	
M-COM 010 7	Upper		1	
	Lower		5	

Table 10: Module and Socket Coding

3.6.2.1 Configuring the Socket Coding

Tools and utilities:

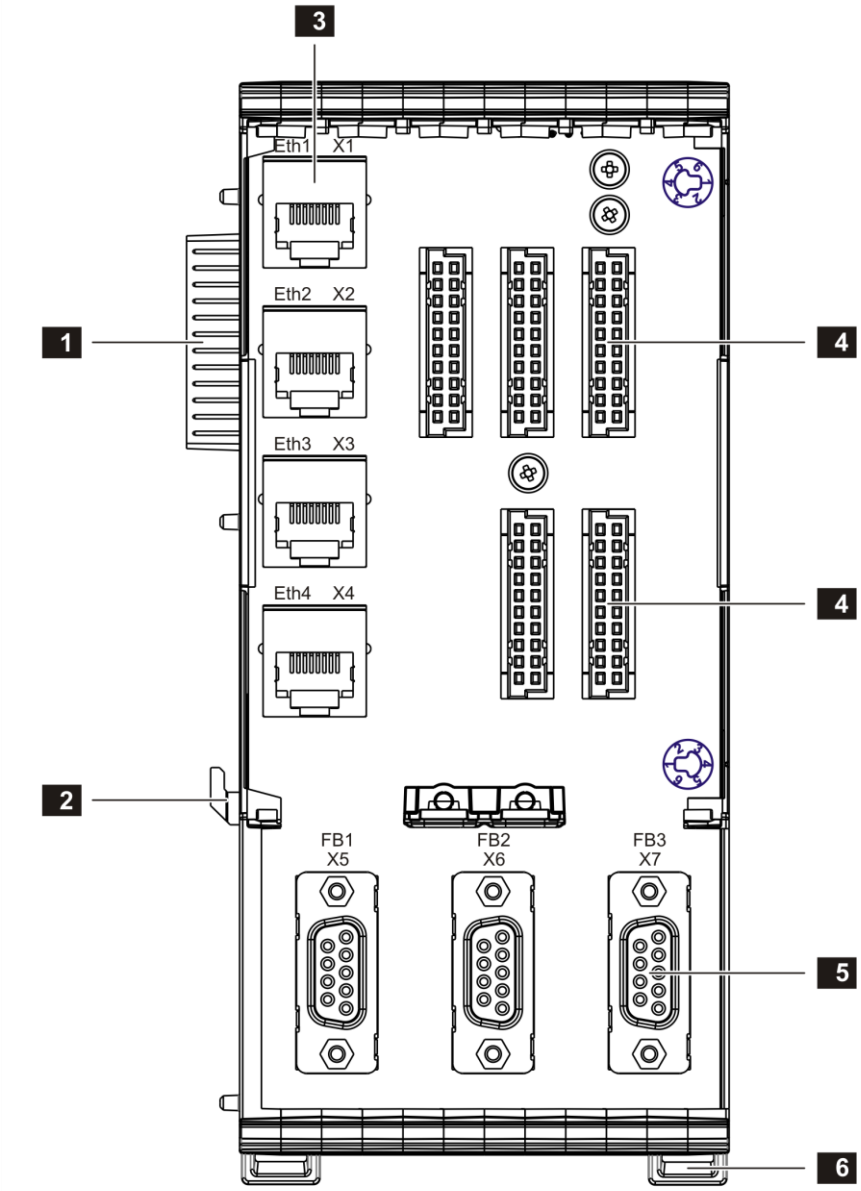
- Screwdriver, slotted 0.8 x 4.0 mm

Configuring the upper and lower coding socket

1. Insert the screwdriver into the opening of the upper coding socket.
2. Turn the screwdriver until the required coding is set.
3. Repeat these steps for the lower coding socket.
4. Insert the module into the socket to check the coding.
5. Remove the module

3.6.3 M-SO COM 01 Socket

The following figure shows the socket for the various COM modules.



1 System Bus with Power Supply
2 Latch (Connection to the Left Socket)
3 Ethernet Switch
4 I/O Plug
5 Fieldbus Interfaces
6 Latch (Securing to DIN Rail)

Figure 5: M-SO COM 01 Socket

A latch 6 is used to secure the socket to the DIN rail and another latch 2 ensures connection to the next socket on the left hand-side. Socket and module are connected to the processor module and the power supply via the system bus. The I/O plugs provide the connection between module and socket.

4 Start-Up

This chapter describes how to install, configure and connect the module. For more information, refer to HIMatrix M45 system manual (HI 801 651 E).

4.1 Mounting

The module is plugged in to the corresponding socket, which is mounted on a 35 mm DIN rail.

Observe the following points when mounting the module and the socket:

- Screwdriver, slotted 0.8 x 4.0 mm
- Sockets or modules may only be removed or replaced in the de-energized state.

⚠ WARNING

The module may only be plugged out and in again in the de-energized state.

4.2 Mounting Module and Socket

This chapter describes how to mount and remove the modules and sockets. When replacing modules, the sockets remain on the DIN rail. This saves additional wiring effort since all communication lines are connected to the socket.

4.2.1 Mounting and Removing the Sockets

Tools and utilities:

- Screwdriver, slotted 1.0 x 5.5 mm

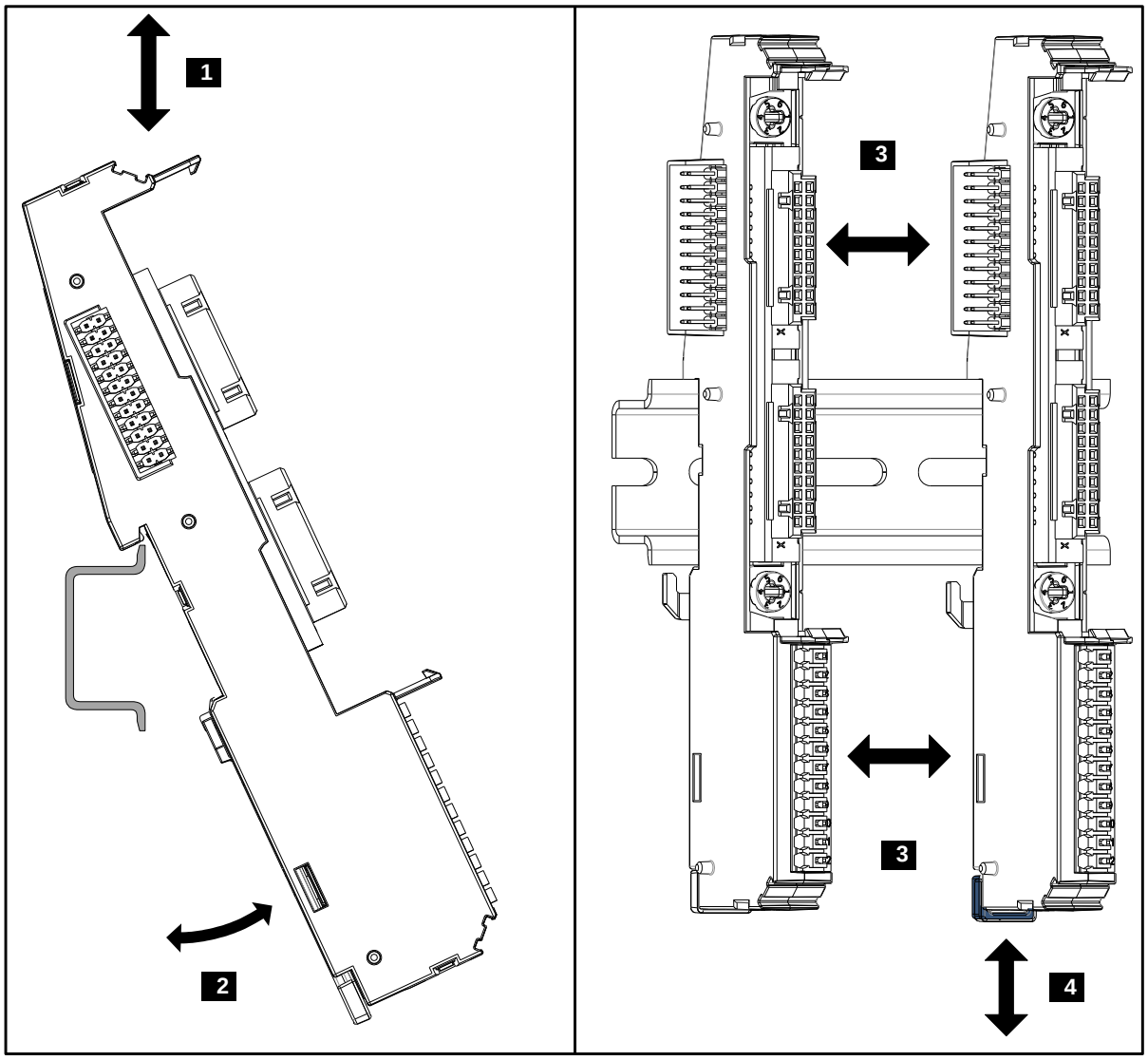
To insert the socket

1. Set the socket onto the DIN rail 1.
2. Swivel the socket in 2.
3. Move the socket on the DIN rail and connect it to another socket 3.
4. Press the socket's latch upwards 4.
   ☑ The latch is used to attach the socket to the DIN rail, and is secured to the socket located on its left-hand side.
5. The socket mounting is completed, the field lines can be connected.

To remove the socket

Prior to removing the socket, the module must be removed and the field lines must be released from the terminals.

1. Use a screwdriver to push the blue latch downwards 4.
2. Remove the sockets from the adjacent sockets 3.
3. Swivel the socket out 2.
4. Lift the socket and remove it 1.



1 Setting and Lifting the Socket
2 Swiveling a Module In and Out
3 Connecting and Disconnecting Sockets
4 Closing and Opening the Latch

Figure 6: Example of Socket Mounting

4.2.2 Mounting and Removing the Module

This chapter describes how to mount and remove a module in the M45 system.

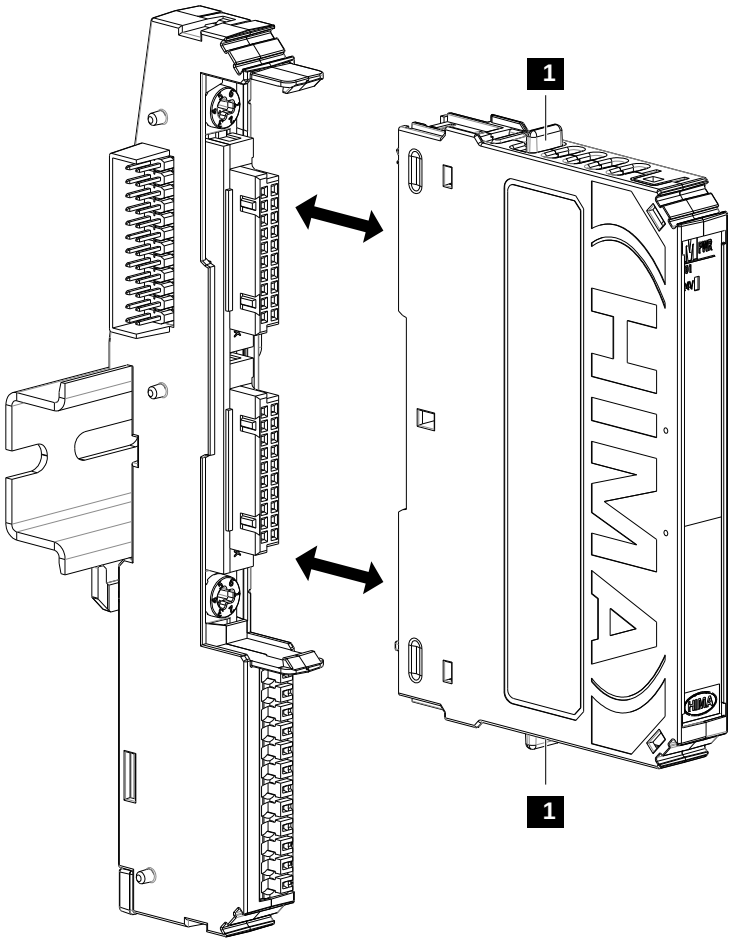
Coding prevents the module from improper assembling.

To insert the module

1. Plug the module in to the socket, until the locking mechanism is engaged.

To remove the module

1. Press the latch **1** backwards as far as it can go. The locking mechanism is released.
2. Remove the module from the socket.



1 Latch for Releasing the Module

Figure 7: Example of Mounting and Removing the Module

4.3 Configuration

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

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

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

4.3.1 Tab **Module**

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

Designation	Description
Name	Name of the communication module.
Activate Max. µP Budget for HH Protocol	▪ Activated: Use CPU load limit from the *Max. µP Budget for HH Protocol [%]* field. ▪ Deactivated: Do not use the CPU load limit for IP data transfer. Default setting: Deactivated
Max. µP Budget for HH Protocol [%]	Maximum module's CPU load that can be used for processing the IP data transfer. i The maximum load must be distributed among all the implemented protocols that use this communication module.
IP Address	IP address of the Ethernet interface. Default value: 192.168.0.99
Subnet Mask	32-bit address mask to split up the IP address in network and host address. Default value: 255.255.252.0
Standard Interface	Activated: The interface is used as standard interface for system login. Default setting: Deactivated
Default Gateway	IP address of the default gateway. Default value: 0.0.0.0
ARP Aging Time [s]	A COM module stores the MAC addresses of the communication partners in a MAC/IP address assignment table (ARP cache). The MAC address remains stored in the ARP cache, if messages from the communication partner are received in a period of 1x...2x *ARP Aging Time*. The MAC address is erased from the ARP cache, if no messages from the communication partner are received in a period of 1x...2x *ARP Aging Time*. The typical value for the *ARP Aging Time* in a local network ranges from 5...300 s. The user cannot read the contents of the ARP cache. Range of values: 1...3600 s Default value: 60 s **Note:** If routers or gateways are used, the *ARP Aging Time* must be adjusted (increased) due to the additional time required for two-way transmission. If the *ARP Aging Time* is too low, the MAC address of the communication partner is erased from the ARP cache and communication is delayed or interrupted. For an efficient performance, the ARP aging time value must be less than the receive timeout set for the protocols in use.

Designation	Description
MAC Learning	*MAC Learning* and *ARP Aging Time* are used to set how quick the Ethernet switch should learn the MAC address. The following settings are possible: ▪ Conservative (recommended): If the ARP cache already contains MAC addresses of communication partners, these are locked and cannot be replaced by other MAC addresses for at least 1 *ARP Aging Time* and a maximum of 2 *ARP Aging Time* periods. This ensures that data packets cannot be intentionally or unintentionally forwarded to external network subscribers (ARP spoofing). ▪ Tolerant: When a message is received, the IP address contained in the message is compared to the data in the ARP cache and the MAC address stored in the ARP cache is immediately overwritten with the MAC address from the message. The *Tolerant* setting must be used if the availability of communication is more important than the authorized access to the controller. Default setting: Conservative
IP Forwarding	Function is not supported, must be deactivated. Default setting: Deactivated
ICMP Mode	The Internet Control Message Protocol (ICMP) allows the higher protocol layers to detect error states on the network layer and optimize the transmission of data packets. Message types of Internet Control Message Protocol (ICMP) supported by the processor module: ▪ No ICMP Responses All the ICMP commands are deactivated. This ensures a high degree of safety against potential sabotage that might occur over the network. ▪ Echo Response If Echo Response is activated, the node responds to a ping command. It is thus possible to determine if a node can be reached. Safety is still high. ▪ Host Unreachable Not important for the user. Only used for testing at the manufacturer's facility. ▪ All Implemented ICMP Responses All ICMP commands are activated. This allows a more detailed diagnosis of network malfunctions. Default setting: Echo Response

Table 11: Configuration Parameters, Module Tab

4.3.2 Tab **Routings**

The **Routings** tab contains the routing table. This table is empty if the module is new. A maximum of 8 routing entries are possible.

Designation	Description
Name	Denomination of the routing settings
IP Address	Target IP address of the communication partner (with direct host routing) or network address (with subnet routing). Range of values: 0.0.0.0...255.255.255.255 Default value: 0.0.0.0
Subnet Mask	Define the target address range for a routing entry. 255.255.255.255 (with direct host routing) or subnet mask of the addressed subnet. Range of values: 0.0.0.0...255.255.255.255 Default value: 255.255.252.0
Gateway	IP address of the gateway to the addressed network. Range of values: 0.0.0.0...255.255.255.255 Default value: 0.0.0.1

Table 12: Routing Parameters

4.3.3 Tab **Ethernet Switch**

Designation	Description
Name	Port number as printed on the housing; per port, only one configuration may exist. Range of values: 1...4
Speed [Mbit/s]	10: Data rate 10 Mbit/s 100: Data rate 100 Mbit/s Autoneg: Automatic baud rate setting Default value: Autoneg
Flow Control	Full duplex: Simultaneous communication in both directions Half duplex: Communication in one direction Autoneg: Automatic communication control Default value: Autoneg
Autoneg also with fixed values	The *Advertising* function (forwarding the speed and flow control properties) is also performed if the parameters *Speed* and *Flow Control* have fixed values. This allows other devices with ports set to *Autoneg* to recognize the HIMatrix port settings.
Limit	Limit the inbound multicast and/or broadcast packets. Off: No limitation Broadcast: Limit broadcast packets (128 kbit/s) Multicast and Broadcast: Limit multicast and broadcast packets (1024 kbit/s) Default value: Broadcast

Table 13: Ethernet Switch Parameters

4.3.4 Tab **VLAN** (Port-Based VLAN)

For configuring the use of port-based VLAN.

i Should VLAN be supported, port-based VLAN should be off to enable each port to communicate with the other switch ports.

For each switch port, the user can define which other switch ports received Ethernet frames may be sent to.
The table in the VLAN tab contains entries through which the connection between two ports can be set to *active* or *inactive*.

Name	Eth1	Eth2	Eth3	Eth4
Eth1				
Eth2	active			
Eth3	active	active		
Eth4	active	active	active	
COM	active	active	active	active

Table 14: VLAN Tab

Default setting: All connection between ports are set to *Active*

4.3.5 Tab **LLDP**

With LLDP (Link Layer Discovery Protocol), information such as MAC address, device name, port number is sent per multicast in periodic intervals via the own device and is received from the neighboring devices.

LLDP uses the following values depending on whether PROFINET is configured on the communication module:

PROFINET on the COM module	ChassisID	TTL (Time to Live)
Used	Device name	20 s
Not used	MAC Address	120 s

Table 15: Values for LLDP

The processor and communication modules support LLDP on the Eth1, Eth2, Eth3 and Eth4 ports.

The following parameters define how a given port should work:

Off	LLDP is disabled on this port.
Send	LLDP sends LLDP Ethernet frames, received LLDP Ethernet frames are deleted without being processed.
Receive	LLDP sends no LLDP Ethernet frames, but received LLDP Ethernet frames are processed.
Send/Receive	LLDP sends and processes received LLDP Ethernet frames.

Default setting: Off

4.3.6 Tab **Mirroring**

Mirroring is used to configure whether the module should duplicate Ethernet packets on a given port such that they can be read from a device connected to that port, e.g., for test purposes.

The following parameters define how a given port should work:

Off	This port does not participate to the mirroring process.
Egress:	Outgoing data of this port are duplicated.
Ingress:	Incoming data of this port are duplicated.
Ingress/Egress:	Incoming and outgoing data of this port are duplicated.
Dest Port:	This port is used to send duplicated data.

Default setting: Off

4.3.7 Network Ports Used for Ethernet Communication

UDP ports	Use
123	SNTP (time synchronization between PES and remote I/O, PES and external devices)
502	Modbus salve (can be modified by the user)
6010	safe**ethernet** and OPC
8000	Programming and operation with SILworX
8001	Configuration of the remote I/O using the PES (SILworX)
34 964	PROFINET endpoint mapper (required for establishing the connection)
49 152	PROFINET RPC server
49 153	PROFINET RPC client

Table 16: Network Ports (UDP Ports) in Use

TCP ports	Use
502	Modbus salve (can be modified by the user)
xxx	TCP SR assigned by the user

Table 17: Network Ports (TCP Ports) in Use

i All ports listed above are destination ports.

The ComUserTask can use any port if it is not already used by another protocol.

5 Operation

The module runs within the HIMatrix M45 system and does not require any specific monitoring.

When operating the system, ensure that the air circulation is not obstructed.

5.1 Handling

Handling of the module and the HIMatrix M45 system during operation is not required.

Do not pull or plug the modules during operation!

5.2 Diagnosis

The LEDs are used to give a overview of the operating state, see Chapter 3.4.5.

The diagnostic history of the M45 system can also be read using SILworX.

6 Maintenance

No maintenance measures are required during normal operation.

If a failure occurs, the defective module must be replaced with a module of the same type or with a replacement model approved by HIMA.

Replacing of modules is only permitted in the de-energized state.

Only the manufacturer is authorized to repair the module.

6.1 Errors

Refer to Chapter 3.1.1, for more information on the fault reaction of inputs.

If the test harnesses detect faults in the processor system, the device is rebooted. If a further internal fault occurs within the first minute after start-up, the module enters the STOP_INVALID state and will remain in this state. This means that the input signals are no longer processed by the module and the outputs switch to the de-energized, safe state. The evaluation of diagnostics provides information about the fault cause.

6.2 Maintenance Measures

The following measures are required for the module:

- Load the operating system, if a new version is required
- Perform the proof test

6.2.1 Loading the Operating System

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

Refer to the release notes to check the impact of the operation system version on the system!

The operating system can be loaded into the module using SILworX. To this end, the HIMatrix M45 system must be in STOP. Otherwise, stop the system.

For more information, refer to the system manual (HI 800 651 E).

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

6.2.2 Proof Test

HIMatrix M45 modules must be subjected to a proof test in intervals of 10 years. For more information, refer to the safety manual (HI 800 653 E).

7 Decommissioning

The decommissioning of the module is carried out after de-energization. Following steps are necessary:

1. Stop the HIMatrix M45 system.
2. Disconnect the system from the power supply.
3. Remove the module from the socket.

8 Transport

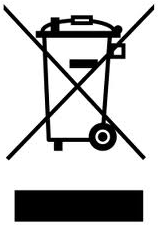
To avoid mechanical damage, HIMatrix components must be transported in packaging.

Always store HIMatrix 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 HIMatrix 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
AO	Analog output
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 diagrams
FTT	Fault tolerance time
ICMP	Internet control message protocol: Network protocol for status or error messages
IEC	International electrotechnical commission
MAC Address	Media access control address: Hardware address of one network connection
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
R	Read: The system variable or signal provides value, e.g., to the user program
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 *interference-free* if it does not distort the signals of the other input circuit.
R/W	Read/Write (column title for system variable/signal type)
SB	System bus
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 for HIMatrix systems
SNTP	Simple network time protocol (RFC 1769)
SRS	System.Rack.Slot addressing of a module
SW	Software
TMO	Timeout
W	Write: System variable is provided with value, e.g., from the user program
r_P	Peak value of a total AC component
Watchdog (WD)	Time monitoring for modules or programs. If the watchdog time is exceeded, the module or program enters the STOP_ERROR state.
WDT	Watchdog time

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HIMA Paul Hildebrandt GmbH
P.O. Box 1261
68777 Brühl, Germany
Phone: +49 6202 709-0
Fax: +49 6202 709-107
E-mail: info@hima.com Internet: www.hima.com

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