HIMatrix® M45

Safety-Related Controller
Manual
M-SO BUS

SAFETY
NONSTOP

HIMA

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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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		technical	editorial
1.00	First issue	X	X

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 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
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 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	For parameters and system variables
`Courier`	Literal user inputs.
RUN	Operating states 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 notices and operating tips are particularly marked.

1.3.1 Safety Notices

The safety notices are represented as described below.
They must be strictly observed to ensure the lowest possible operating risk. 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 situations which, if not avoided, could result in death or serious injury.
- Caution indicates hazardous situations 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, notices 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 Conditions

All the environmental requirements specified in this manual must be observed when operating the HIMatrix 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 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

With the bus extension sockets, M-SO BUS 01 and M-SO BUS 02, the HIMatrix M45 system can be distributed or extended to several DIN rails, see Figure 2. This can be necessary, e.g., due to space restrictions or system extensions.

The following bus extension sockets are required:

Socket	Function
M-SO BUS 01	System bus beginning The socket is mounted as the first element on the left side and connects the system bus to the M-SO BUS 02 socket of the previous DIN rail via an Ethernet cable.
M-SO BUS 02	System bus end The socket is mounted as the last element on the right side and connects the system bus to the M-SO BUS 01 socket of the following DIN rail via an Ethernet cable.

Table 2: Bus Extension Sockets

For ESD protection reasons, the bus extension sockets must be equipped with the M-BLK 01 blank module.

3.1 Safety Function

No safety function is performed by the bus extension sockets.

3.2 Scope of Delivery

The bus extension sockets and the M-BLK 01 blank module must be ordered separately.

3.3 Type Label

The type label specifies the following details:

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

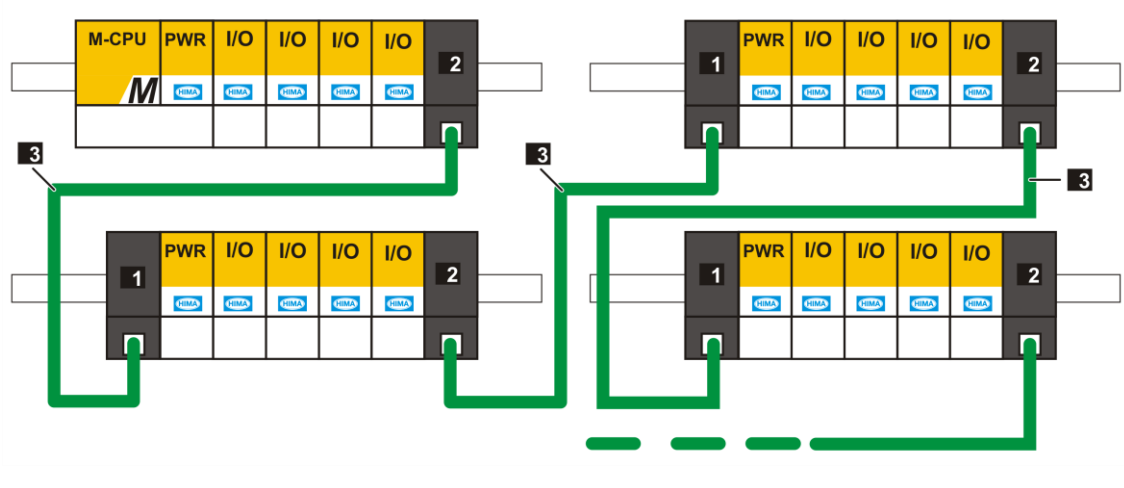
Figure 1: Sample Type Label

3.4 Assembly

This chapter describes the structure of the M45 system on several DIN rails using bus extension sockets.

A left socket (M-SO BUS 01) and a right socket (M-SO BUS 02) are required for extending an M45 system and ensuring the connection of the system bus to the sub-systems. The connection is performed with an Ethernet cable, which is inserted in the RJ-45 socket plug.

The M-SO BUS 02 socket must be used to extend the first DIN rail and every additional DIN rail. The M-SO BUS 02 extension socket on the right side forms the end of the sub-system. The Ethernet cable connects the M-SO BUS 02 to the M-SO BUS 01 of the next sub-system. The M-SO BUS 01 socket on the left side represents the beginning element of a sub-system. Whenever an M-SO BUS 01 socket is used, it must be followed by a power module with socket.



1 M-SO BUS 01
2 M-SO BUS 02
3 Ethernet Cable

Figure 2: Use of the Bus Extension Socket

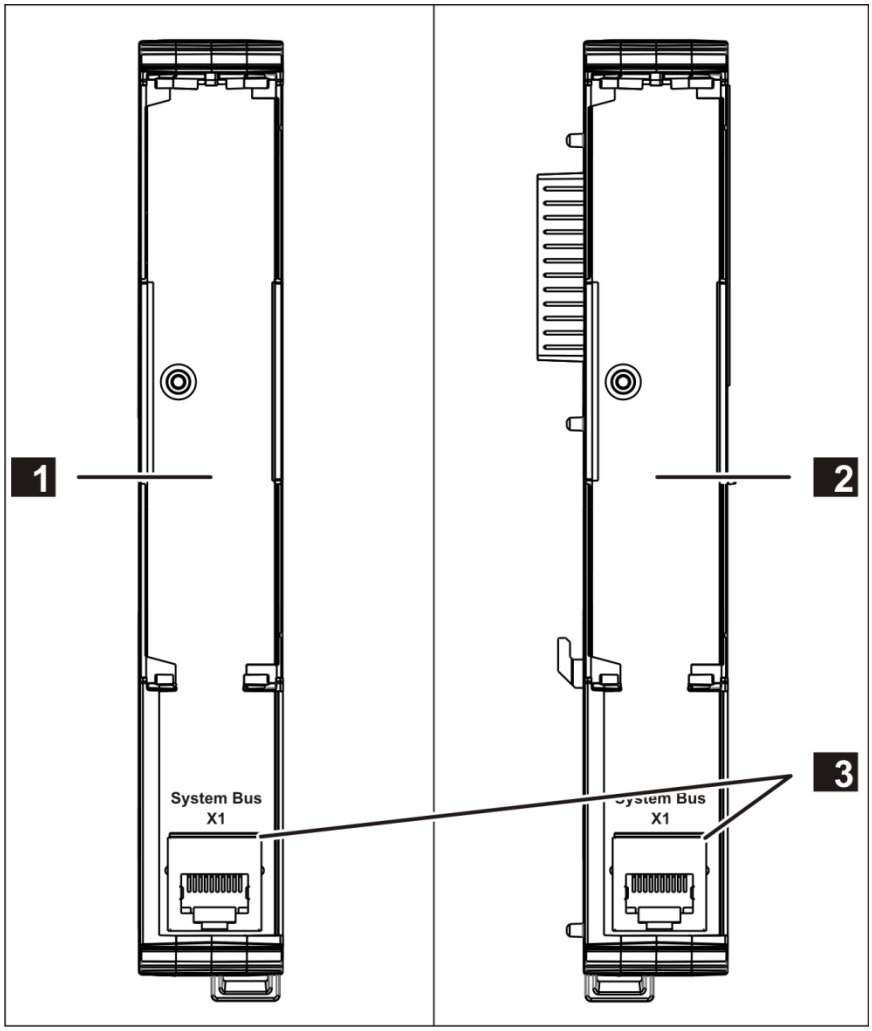
Only use passive Ethernet cables to extend the system bus!

The maximum length of the Ethernet cable between two bus extension sockets is 100 m. An M45 system bus may be extended via Ethernet cable at no more than 10 places. The maximum overall length of the Ethernet cables may be 1000 m.

Lay the Ethernet cables ensuring their adequate protection. They must not be run parallel to power supply cables.

3.4.1 Front View

The following figure shows the two bus extension sockets:



1 M-SO BUS 01
2 M-SO BUS 02
3 Ethernet Plugs

Figure 3: Bus Extension Sockets

3.5 Product Data

General	
Supply voltage	24 VDC, -15...+20 %, $r_p \leq 5$ %, PELV, SELV
Max. supply voltage	30 VDC
Ambient temperature	0…+60 °C
Storage temperature	-40…+85 °C
Humidity	max. 95 % relative humidity, non-condensing
Type of protection	IP20
Dimensions up to DIN rail (H x W x D) in mm	165 x 25.2 x 18
Weight	approx. 60 g (M-SO BUS 01) approx. 65 g (M-SO BUS 02)

Table 3: Product Data

4 Start-Up

This chapter describes how to mount the socket.

For more information, refer to HIMatrix M45 system manual (HI 800 651 E).

4.1 Mounting

The socket is mounted on a 35 mm DIN rail.

The sockets may only be removed or replaced in the de-energized state.

4.1.1 Mounting and Removing the Sockets

Tools and utilities:

- Screwdriver, slotted 1.0 x 5.5 mm

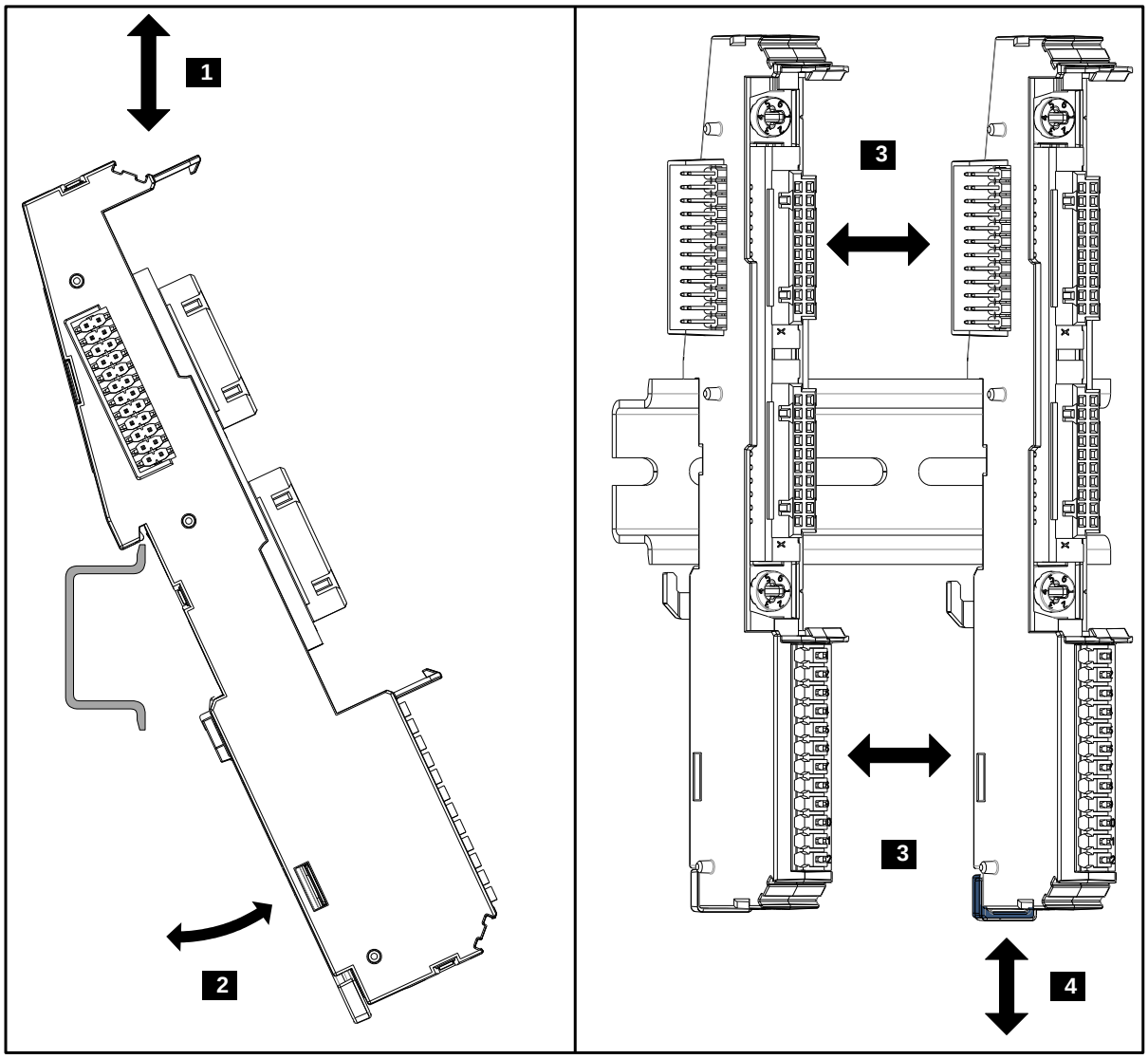
To insert the socket

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 blank module must be removed and the Ethernet cables must be released from the RJ-45 socket.

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 the Module In and Out
3 Connecting and Disconnecting Sockets
4 Closing and Opening the Latch

Figure 4: Example of Socket Mounting

4.2 Configuration

The system bus extensions need not be configured in SILworX.

The system bus extension and distribution of the modules over multiple rails can be represented in SILworX using the **Insert Linebreak** function. **Insert Linebreak** wraps the modules into multiple rows. The bus extension sockets required for the real hardware are not represented.

5 Operation

The socket 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 sockets and the HIMatrix M45 system during operation is not required.

Do not pull or plug the Ethernet cable during operation!

5.2 Diagnosis

No diagnostic functions are performed by the sockets. If the system bus is disturbed, the LEDs on the modules must be evaluated.

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

6 Maintenance

No maintenance measures are required during normal operation.

If failures occur, the defective socket must be replaced with a socket of the same type or with a replacement model approved by HIMA.

Sockets may only be replaced in the de-energized state.

Only the manufacturer is authorized to repair the socket.

7 Decommissioning

The decommissioning of the socket 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 socket.

8 Transport

To avoid mechanical damage, HIMatrix M45 components must be transported in packaging.

Always store HIMatrix components in their original product packaging. This packaging also provides protection against electrostatic discharge.

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
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 norm
ESD	Electrostatic discharge
FB	Fieldbus
FBD	Function block diagrams
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 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
R/W	Read/Write (column title for system variable/signal type)
Rack ID	Base plate identification (number)
r_P	Peak value of a total AC component
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
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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HI 800 691 E

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