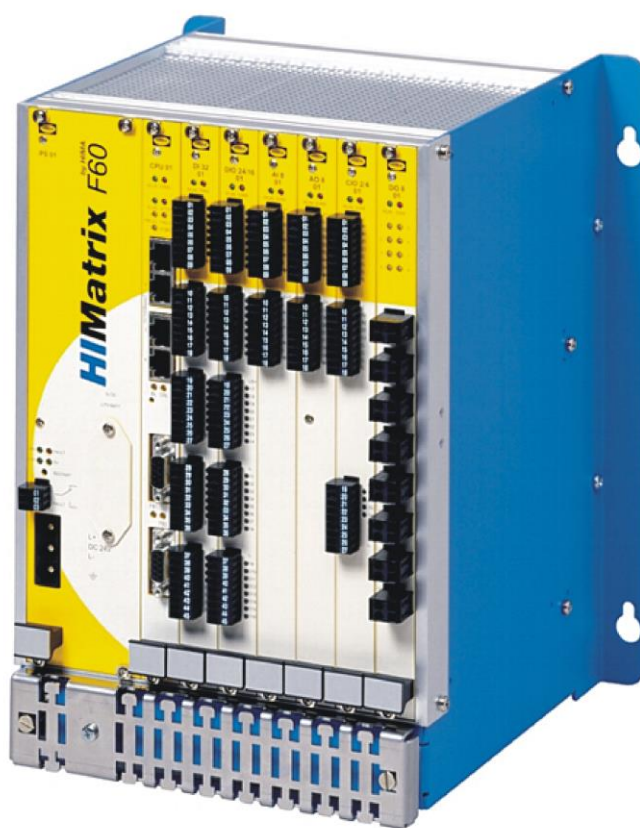


HIMatrix

Safety-Related Controller

PS 01 Manual



HIMA Paul Hildebrandt GmbH
Industrial Automation

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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>.

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Revision index	Revisions	Type of change	
		technical	editorial
1.00	Added: Configuration with SILworX	X	X
2.00	Deleted: Back-up battery Added: PS 014, SIL 4 certified according to EN 50126, EN 50128 and EN 50129, Chapter 4.1.3	X	X

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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.

1.1 Structure and Use of this Manual

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

This manual is organized in the following main chapters:

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

The HiMatrix F60 is available for the programming tools SILworX and ELOP II Factory. Which programming tool can be used, depends on the processor operating system of the HiMatrix F60, refer to the following table:

Programming tool	Processor operating system	Communication operating system
SILworX	CPU OS V7 and higher	COM OS V12 and higher
ELOP II Factory	CPU OS up to V6.x	COM OS up to V11.x

Table 1: Programming Tools for HiMatrix F60

In the manual, the differences are specified by using:

- Separated chapters
- Tables differentiating among the versions

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Projects created with ELOP II Factory cannot be edited with SILworX, and vice versa!

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The manual usually refers to the plug-in cards of the modular controller F60 as *modules*. *Modules* is also the term used in SILworX.

Additionally, the following documents must be taken into account:

Name	Content	Document number
HIMatrix System Manual Compact Systems	Hardware description of the HIMatrix compact systems	HI 800 141 E
HIMatrix System Manual Modular System F60	Hardware description of the HIMatrix modular system	HI 800 191 E
HIMatrix Safety Manual	Safety functions of the HIMatrix system	HI 800 023 E
HIMatrix Safety Manual for Railway Applications	Safety functions of the HIMatrix system using the HIMatrix in railway applications	HI 800 437 E
SILworX Online Help	Instructions on how to use SILworX	-
ELOP II Factory Online Help	Instructions on how to use ELOP II Factory, Ethernet IP protocol	-
SILworX First Steps	Introduction to SILworX using the HIMax system as an example	HI 801 103 E
ELOP II Factory First Steps	Introduction to ELOP II Factory	HI 800 006 E

Table 2: 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.
<i>Italics</i>	For parameters and system variables
<code>Courier</code>	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.
- 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:

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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.

This 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 ¹⁾
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
¹⁾ The values specified in the technical data apply and are decisive for devices with extended environmental requirements.	

Table 3: 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 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 system is a part of the safety equipment of a site. If a device or a module fails, the system enters the safe state.

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

3 Product Description

The PS 01 is a module for the modular F60 HIMatrix system.

The PS 01 module supplies the PES with all required voltages. The voltages are galvanically separated from one another.

The module can only be inserted in the first left slot of the HIMatrix F60.

The module has been certified by the TÜV for safety-related applications up to SIL 3 (IEC 61508, IEC 61511 and IEC 62061), Cat. 4 and PL e (EN ISO 13849-1) and SIL 4 (EN 50126, EN 50128 and EN 50129).

Further safety standards, application standards and test standards are specified in the certificates available on the HIMA website.

3.1 Safety Function

The power supply module monitors the output voltages. If the output voltages are too high, the module is switched off.

The module's front plate is equipped with LEDs to indicate the its status, see Chapter 3.4.3.

3.2 Equipment, Scope of Delivery

The following table specifies the available module variants:

Designation	Description
PS 01	Power supply module
PS 014	Power supply module, Operating temperature: -25...+70 °C (temperature class), Vibration and shock tested according to EN 50125-3 and EN 50155, class 1B according to IEC 61373

Table 4: Available Variants

3.3 Type Label

The type plate contains the following details:

- Product name
- Bar code (1D or 2D code)
- Part no.
- Production year
- Hardware revision index (HW Rev.)
- Firmware revision index (FW Rev.)
- Operating voltage
- Mark of conformity

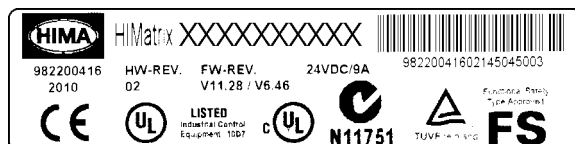
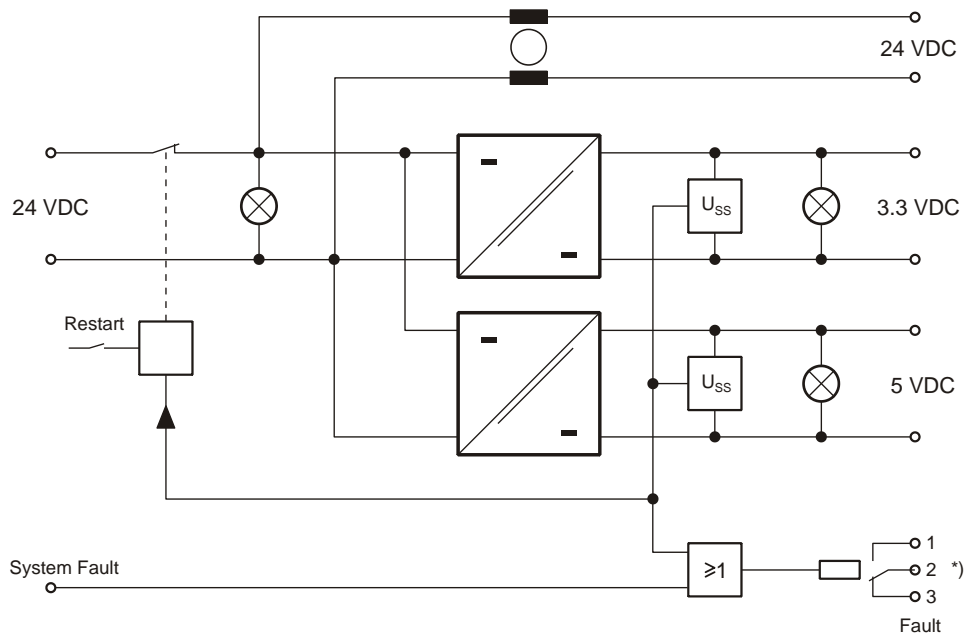


Figure 1: Sample Type Label

3.4 Structure

This chapter describes the layout and function of the module.

3.4.1 Block Diagram



*) Represented in the de-energized state

Figure 2: Block Diagram

3.4.2 Front View

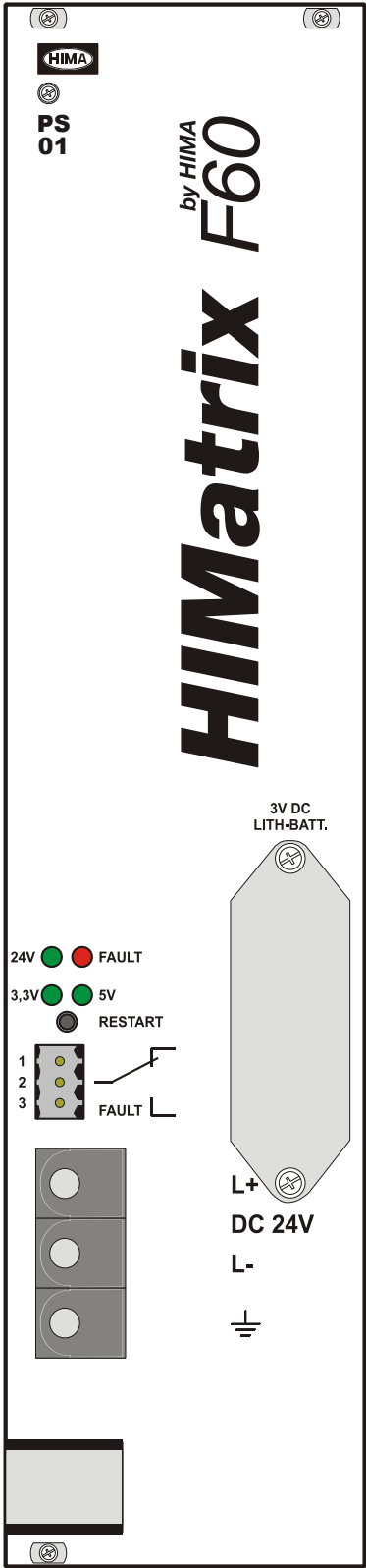


Figure 3: Front View

3.4.3 LED Indicators

The front plate is equipped with 4 LEDs to indicate the module's voltages and status.

LED	Color	Status	Description
24 V	Green	On	24 V voltage present
		Off	Malfunction, voltages switched off
5 V	Green	On	5 V voltage present
		Off	Malfunction, voltages switched off
3.3 V	Green	On	3.3 V voltage present
		Off	Malfunction, voltages switched off
FAULT	Red	On	Malfunction, voltages are being switched off Module replacement required
		Off	No malfunction

Table 5: LEDs

3.4.4 RESTART Button

If the 3.3 V, 5 V or 24 V output voltages are too high, the power supply module is switched off. Use the RESTART button to restart the system.

Using the RESTART button during operation has no effects on the system.

The RESTART button is located inside of the front plate below the 4 LEDs and can only be activated using a pin.

3.4.5 FAULT Contact

The module is equipped with one potential-free change-over contact. Faults occurring in the controller are displayed via the module's LEDs and can be evaluated using the system parameters in the PADT's user program.

Additionally, the contact can also be controlled from within the user program using 4 OR-jointed system parameters (in the system properties for the F60, module: CPU F60, tab: outputs, parameter: relay contact 1...4).

The contact can be used to connect optical and acoustic detectors with a current input of up to 1 A.

Contact connections	State
1-2 closed (2-3 open)	The module is normally running
1-2 open (2-3 closed)	Module without operating voltage, or CPU is in the ERROR STOP state.

Table 6: FAULT Contact

The contacts are electrically connected using a detachable 3-pole connector located on the module's front plate. The connector can accept wires of up to a maximum of 1.5 mm².

3.5 Product Data

General	
Operating voltage	24 VDC, -15...+20 %, $r_{PP} \leq 15$ %, from a power supply unit with safe insulation in accordance with IEC 61131-2. Ensure proper polarity!
Current input	max. 30 A external fusing with 32 A
Output voltages	3.3 VDC / 10 A 5.0 VDC / 2 A 24 VDC / 32 A
Fault contact (Fault)	30 VDC / 1 A
Ambient temperature	0...+60 °C
Storage temperature	-40...+85 °C
Space requirement	6 RU, 12 HP
Weight	820 g

Table 7: Product Data

3.5.1 Product Data PS 014

The PS 014 model variant is intended for use in railway applications. The electronic components are coated with a protective lacquer.

PS 014	
Operating temperature	-25...+70 °C (temperature class T1)
Weight	820 g

Table 8: Product Data PS 014

The PS 014 module meets the vibration and shock requirements in accordance with EN 61373, Category 1, Class B.

4 Start-up

To start up the controller, it must be mounted, connected and configured in the programming tool.

4.1 Installation and Mounting

The module is mounted in the subrack of the modular HIMatrix F60 system.

When laying cables (long cables, in particular), take appropriate measures to avoid interference, e.g., by separating the signal lines from the power lines.

4.1.1 Mounting and Removing the Modules

To mount and remove the modules, the connection cable clamp terminals must be unplugged.

Additionally, personnel must be protected from electrostatic discharge. For details, refer to Chapter 2.1.2.

Mounting the Modules

To mount a module into the subrack

1. Insert the module as far as it can go – without jamming it – into the two guiding rails which are located on the housing's upper and lower part.
2. Apply pressure to the upper and lower extremity of the front plate until the module plugs snap into the backplane socket.
3. Secure the module with the screws located on upper and lower extremity of the front plate.

The module is mounted.

Removing the Modules

To remove a module from the subrack

1. Remove the plugs from the module front plate.
2. Release the locking screws located on the upper and lower extremity of the front plate.
3. Loosen the module using the handle located on the lower part of the front plate and remove it from the guiding rails.

The module is removed.

4.1.2 24 VDC Electrical Connection

24 VDC is supplied via the detachable 3-pole connector located on the front plate.


Connection	Function
L+ DC 24 V	Power supply L+ (24 VDC)
L- DC 24 V	Power supply L- (24 VDC)
	Shielding earthing

Table 9: 24 VDC Electrical Connection

The connector can accept wires of up to a maximum of 6 mm². The maximum current input for the module is not monitored; an external 32 A fuse must be implemented. The module is not protected against improper connection of the lines. Reverse polarity can destroy the module.



Ensure proper polarity, when connecting the operating voltage.

4.1.3 Cable Plugs

Cable plugs attached to the pin headers of the module are used to connect to the power supply. The cable plugs are included within the scope of delivery of the HIMatrix modules.

Connection to the power supply	
Number of cable plugs	Three poles, screw terminals
Wire cross-section	0.75...10 mm ² (single-wire) 0.75...6 mm ² (finely stranded) 0.5...6 mm ² (with wire end ferrule)
Stripping length	12 mm
Screwdriver	Slotted 1.0 x 4.0 mm
Tightening torque	1.2...1.5 Nm

Table 10: Cable Plug Properties

4.1.4 Mounting the PS 01 in Zone 2

(EC Directive 94/9/EC, ATEX)

The module is suitable for mounting in zone 2. Refer to the corresponding declaration of conformity available on the HIMA website.

When mounting the device, observe the special conditions specified in the following section.

Specific Conditions X

1. Mount the HIMatrix F60 controller in an enclosure that meets the EN 60079-15 requirements and achieves a type of protection of at least IP54, in accordance with EN 60529. Provide the enclosure with the following label:

Work is only permitted in the de-energized state

Exception:

If a potentially explosive atmosphere has been precluded, work can also be performed when the controller is under voltage.

2. The enclosure in use must be able to safely dissipate the generated heat. The power dissipation (PV) of the HIMatrix F60 PS 01 module is 20 W at maximum output load.
3. The 24 VDC power must come from a power supply unit with safe isolation. Use power supply units of type PELV or SELV only.
4. Applicable standards:

VDE 0170/0171 Part 16,	DIN EN 60079-15: 2004-5
VDE 0165 Part 1,	DIN EN 60079-14: 1998-08

Pay particular attention to the following sections:

DIN EN 60079-15:

Chapter 5	Design
Chapter 6	Terminals and cabling
Chapter 7	Air and creeping distances
Chapter 14	Connectors

DIN EN 60079-14:

Chapter 5.2.3	Equipment for use in zone 2
Chapter 9.3	Cabling for zones 1 and 2
Chapter 12.2	Equipment for zones 1 and 2

The module is additionally equipped with the label represented below:

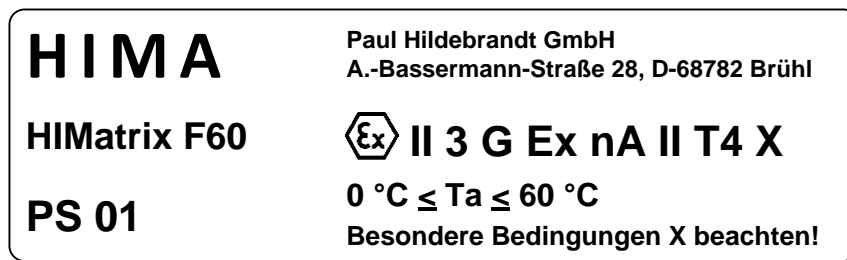


Figure 4: Label for Ex Conditions

4.2 Configuration

No specific configuration is required for the power supply module.

5 Operation

The module runs within a HIMatrix base plate and does not require any specific monitoring.

5.1 Handling

Handling of the controller during operation is not required.

5.2 Diagnosis

A first diagnosis results from evaluating the LEDs, see Chapter 3.4.3.

The module diagnostic history can also be read using the programming tool.

6 Maintenance

No maintenance measures are required during normal operation.

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

Only the manufacturer is authorized to repair the device/module.

6.1 Faults

If the test harness detects a fault, the module enters the safe state.

Module's faults are signaled by the *FAULT* LED located on the front plate.

NOTE



If a failure occurs, the module must be replaced to ensure the plant's safety.

A module may only be replaced while the power is switched off.

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Removing the module during operation interrupts the power supply and thus all system functions!

The instructions specified in Chapter 4.1.1 must be observed when replacing an existing module or installing a new one.

6.2 Maintenance Measures

The following measures are required for the modular F60 system:

- 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 F60 central module. HIMA recommends to use system downtimes to load the current version of the operating system into the F60 controller.

Refer to the release list to check the consequences of the new operation system version on the system!

The operating system is loaded using the programming tool.

Prior to loading the operating system, the F60 controller must be in STOP (displayed in the programming tool). Otherwise, stop the controller.

For more information, refer to the programming tool documentation and the system manual for the modular F60 system (HI 800 191 E).

6.2.2 Proof Test

HIMatrix devices and modules must be subjected to a proof test in intervals of 10 years. For more information, refer to the Safety Manual (HI 800 023 E).

7 Decommissioning

Remove the supply voltage of the PS 01 supply module to decommission the module.
Afterwards pull out the pluggable screw terminal connector blocks for inputs and outputs and the Ethernet cables.

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
ELOP II Factory	Programming tool for HIMatrix systems
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 or ELOP II Factory
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 <i>interference-free</i> if it does not distort the signals of the other input circuit.
R/W	Read/Write (column title for system variable/signal type)
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/signal is provided with value, e.g., from the user program
r_{PP}	Peak-to-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 ERROR STOP state.
WDT	Watchdog time

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SAFETY
NONSTOP

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