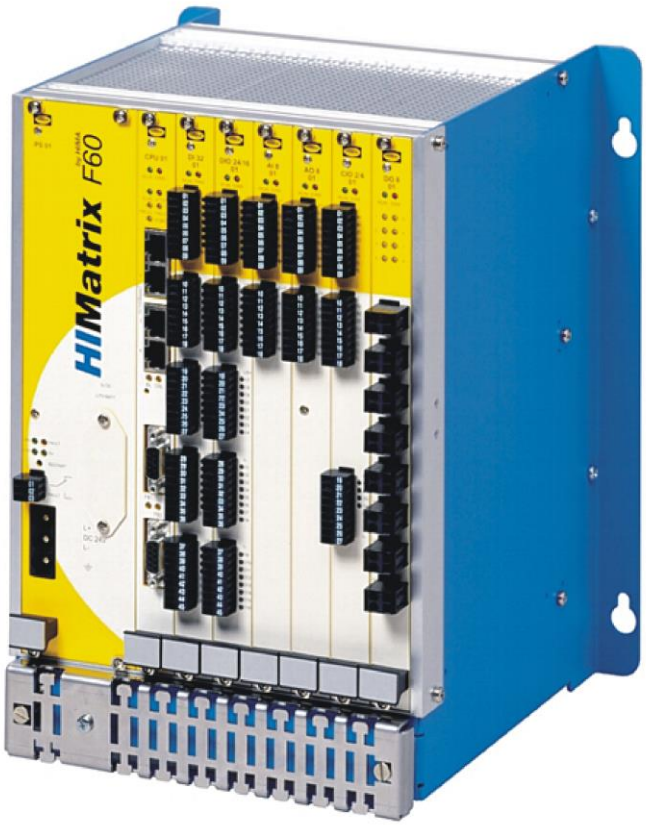
HIMatrix

Safety-Related Controller

DO 8 01 Manual



HIMA Paul Hildebrandt GmbH
Industrial Automation

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HI 800 207 E

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

Revision index	Revisions	Type of change	
		technical	editorial
1.00	Added: Configuration with SILworX	X	X
2.00	Added: SIL 4 certified according to EN 50126, EN 50128 and EN 50129, Chapter 3.4.2 and 4.1.3 Revised: Chapter 3.1 and 3.5	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.

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

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

i 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.
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.
- 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.

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 II 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 DO 8 01 is a module with 8 outputs for the modular F60 HIMatrix system.

The module can be inserted in the F60 subrack's slot 3...8. Slots 1 and 2 are reserved for the power supply module and central module, respectively.

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 129).
Further safety standards, application standards and test standards are specified in the certificates available on the HIMA website.

3.1 Safety Function

The safety function meets the integrity requirements described in the corresponding test standards.

The module is equipped with safety-related relay outputs.

The module is designed in accordance with the de-energize to trip principle. If a system fault occurs, all relay outputs are set to the de-energized safe state. If a channel fault occurs, only the affected channel is de-energized.

In both cases, the *ERR* LED is lit. In addition, reactions in the user program can be triggered using error codes.

The module can also be used in energized to trip applications. To this end, the relay output is switched on to perform a safety function (energize to trip).

All instructions on how to use the module specified in the safety manual must be observed.

3.2 Equipment, Scope of Delivery

The following table specifies the available component:

Designation	Description
DO 8 01	Module with 8 relay outputs.

Table 4: Available Component

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

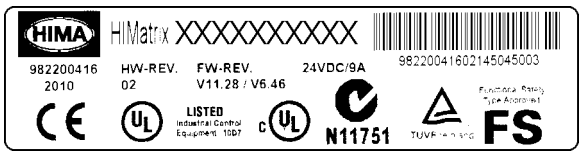
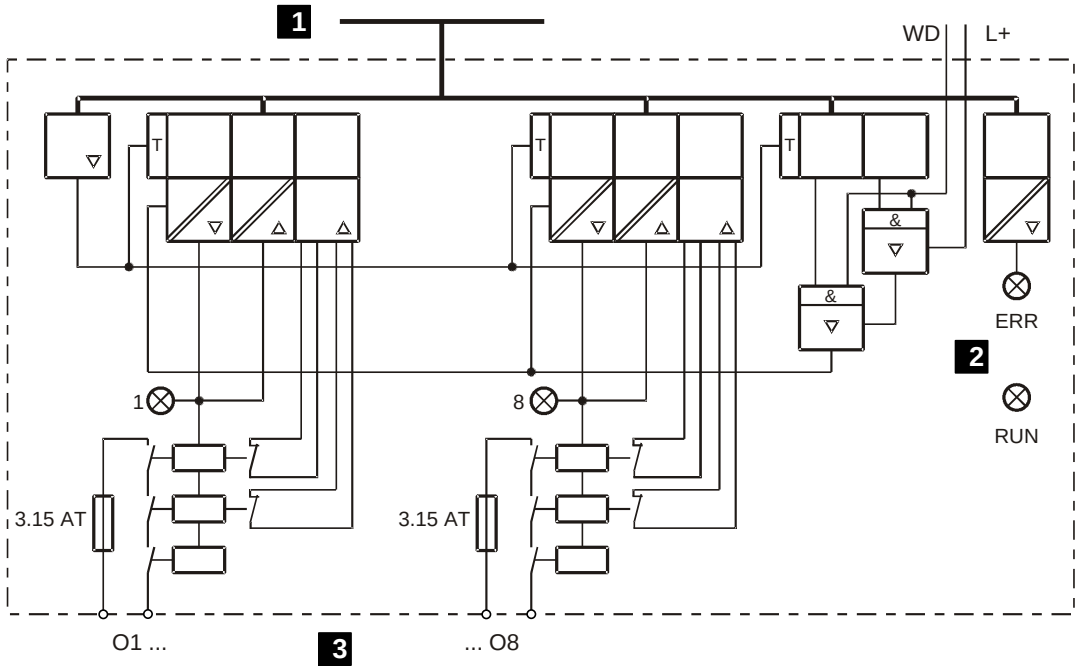


Figure 1: Sample Type Label

3.4 Structure

This chapter describes the layout and function of the module.

3.4.1 Block Diagram



1 I/O Bus

2 Status Indicators

3 8 Safety-Related Relay Outputs

Figure 2: Block Diagram

3.4.2 Safety-Related Relay Outputs

The module is equipped with eight safety-related relay outputs. Each relay output is switched via three relays connected in series. One relay is a standard relay, whereas the two other relays are safety relays with forcibly guided contacts (EN 50205).

All eight relay outputs are electrically safely separated from one another and from the power supply of the device. For safe separation, the air and creeping distances are designed in accordance with IEC 61131-2 for overvoltage class II up to 300 V.

The relay outputs are connected with numbered terminals. To facilitate the assignment of the individual relay outputs, an identical number is located on the front plate of the module, see Chapter 4.1.2.

The terminal connections and the housing comply with IP20 protection requirements. With higher requirements, the F60 must be mounted in an enclosure with suitable type of protection.

If voltages other than SELV and PELV are connected, cables with suitable insulation must be used.

The state of each relay output is signaled by an individual LED, see Chapter 3.4.5.

3.4.2.1 Burner Control Applications

For burner control applications, an internal fuse is used to limit the relay outputs switching current to 60 % (3.15 A) of the maximum permissible value in accordance with EN 298 and EN 50156-1 (VDE 0116). The relay outputs can be used for safety shutdowns, i.e., to shutdown the entire fuel supply.

If burner control applications require a reduced switching current (AC/DC) than the limited switching current (3.15 A), an external pre-fuse must be switched into the circuit.

The relays in use comply with the contact lifetime required for burner control applications.

- mechanical ≥ 3 x 10^6 switching operations
- electrical ≥ 250 000 switching operations

3.4.2.2 General Safety Applications

The instructions specified in Figure 3 and in Table 9 must be observed for general safety applications:

- The maximum permissible number of switching operations.
- The maximum permissible switching currents (up to 3.15 A), voltage and power.

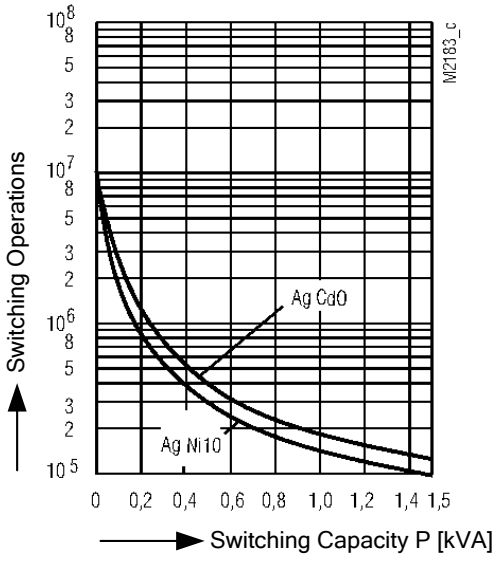


Figure 3: Contact Lifetime AC

3.4.3 Front View

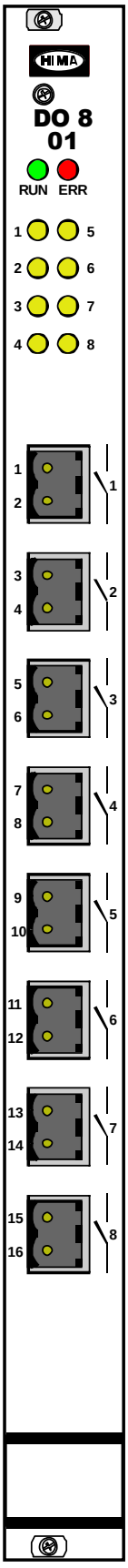


Figure 4: Front View

3.4.4 Status Indicators

LED	Color	Status	Description
RUN	Green	On	Operating voltage present
		Off	No operating voltage
ERR	Red	On	Module faulty or external faults Reaction as dictated by the diagnosis
		Off	No module faults and / or no channel faults

Table 5: Status Indicators

3.4.5 I/O LEDs

LED	Color	Status	Description
1...8	Yellow	On	The corresponding channel is active (energized)
		Off	The corresponding channel is not active (de-energized)

Table 6: I/O LEDs

3.5 Product Data

General	
Operating voltage [1]	24 VDC, -15...+20 %, $r_{PP} \leq 15$ %, at 0…+30 °C [2]
Operating voltage [1] increased ambient temperature	24 VDC, ±10 %, $r_{PP} \leq 15$ %, at >30…+50 °C [3] 24 VDC, -10...-2,5 %, $r_{PP} \leq 15$ %, at >50...+60 °C [3]
Current input	max. 0.7 A
Electrical isolation of the channels	Yes
Storage temperature	-40...+85 °C
Space requirement	6 RU, 4 HP
Weight	300 g
[1] From a power supply unit with safe insulation in accordance with IEC 61131-2. [2] Restricted temperature range! [3] With uses at temperatures higher than 30 °C, the operating voltage is only permitted in the specified range.	

Table 7: Product Data

Relay Outputs	
Number	8 potential-free normally open contacts
Execution	2 safety relays with forcibly guided contacts, 1 standard relay
Switching voltage	≥ 6 V, ≤ 250 VAC / 250 VDC
Switching current	≥ 10 mA, ≤ 3 A, internally fused with 3.15 A fuse breaking capacity: 100 A
Type of protection	IP40
Contact material	Silver alloy, flash plated
Switching time	approx. 30 ms
Reset time	approx. 20 ms
Bounce time	approx. 30 ms
Life time mechanical electrical	 ≥ 3 x 10^6 switching operations see Figure 3

Table 8: Specifications for the Relay Outputs

Relay output switching capacity (general safety applications)		
Switching capacity DC induction-free[1]	≤ 30 VDC	max. 90 W (3,15 A)
	≤ 70 VDC	max. 35 W (0,5 A)
	≤ 127 VDC	max. 45 W (0,315 A)
	≤ 250 VDC	max. 60 W (0,25 A)
Switching capacity AC induction-free [1]	≤ 250 VAC	max. 600 VA
Switching capacity AC cos φ > 0,5	≤ 250 VAC	max. 400 VA
Switching capacity DC, UL 508	30 VDC at 3 A, resistive[1] 60 VDC at 0,3 A, resistive[1]	
[1] Circuit induction-free - Free-wheeling diode - Use suitable protective circuit, i.e., RC elements, Zener diodes or varistors		

Table 9: Relays Output Switching Capacity

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.

When dimensioning the cables, ensure that their electrical properties have no negative impact on the measuring circuit.

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 Connecting the Relay Outputs

The use of shielded cables is not required, but improves the EMC conditions significantly. To allow the connection of the clamps to the earth grid of the F60, the diameter of the cable shielding should not exceed 12 mm.

The output contacts are connected in pairs using connectors with numbered terminals. The terminal pins on the front plate of the module have the same numbered sequence to avoid invalid connections.

The terminal connections comply with IP20 protection requirements. With higher requirements, an enclosure with suitable type of protection must be used for the F60.

If voltages other than SELV and PELV are connected, suitable cables with double or increased insulation must be used, e.g., power cables.

The relay outputs are connected as follows:

Terminal	Designation	Function
1	1	Contact 1, terminal A
2		Contact 1, terminal B
3	2	Contact 2, terminal A
4		Contact 2, terminal B
5	3	Contact 3, terminal A
6		Contact 3, terminal B
7	4	Contact 4, terminal A
8		Contact 4, terminal B
9	5	Contact 5, terminal A
10		Contact 5, terminal B
11	6	Contact 6, terminal A
12		Contact 6, terminal B
13	7	Contact 7, terminal A
14		Contact 7, terminal B
15	8	Contact 8, terminal A
16		Contact 8, terminal B

Table 10: Terminal Assignment for the Relay Outputs

4.1.3 Cable Plugs

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

Connection to the field zone	
Number of cable plugs	8 pieces, two poles, screw terminals
Wire cross-section	0.2…2.5 mm^2 (single-wire) 0.2…1.5 mm^2 (finely stranded) 0.2…1.5 mm^2 (with wire end ferrule)
Stripping length	13 mm
Screwdriver	Slotted 0.6 x 3.5 mm
Tightening torque	0.4…0.5 Nm

Table 11: Cable Plug Properties

4.2 Configuration

The module can be configured using a programming tool, SILworX or ELOP II Factory. Which programming tool should be used, depends on the revision status of the operating system (firmware):

- SILworX is required for CPU OS V7 and higher.
- ELOP II Factory is required for CPU OS up to V6.x.

i How to switch between operating systems is described in Chapter *Loading Operating Systems* of the system manual for the modular F60 system (HI 800 191 E).

4.2.1 Module Slots

Slots 1 and 2 on the F60 subrack are reserved for the PS 01 power supply module and the central module, respectively. Any type of I/O modules can be plugged in to slots 3...8.

The module slots in SILworX and ELOP II Factory are numbered as follows:

Module	Slot on the rack	Slot in SILworX	Slot in ELOP II Factory
PS 01	1	-	-
CPU/COM	2	0/1	-
I/O	3	2	1
I/O	4	3	2
I/O	5	4	3
I/O	6	5	4
I/O	7	6	5
I/O	8	7	6

Table 12: Module Slots

i
- The PS 01 power supply module is not configured.
- CPU and COM are both on the central module. In the programming tools, however, they are represented as separate items.

4.3 Configuring the Module with SILworX

In the Hardware Editor, the controller is represented with the following modules:

- one processor module (CPU)
- one communication module (COM)
- 6 slots available for I/O modules

To insert I/O modules, drag them from the module list onto an available slot.

Double-click the module to open the Detail View with the corresponding tabs. The tabs are used to assign the global variables configured in the user program to the system parameters of the corresponding module.

4.3.1 Parameters and Error Codes for the Output

The following tables specify the system parameters that can be read and set for the outputs, including the corresponding error codes.

In the user program, the error codes can be read using the variables assigned within the logic.

The error codes can also be displayed in SILworX.

4.3.2 Digital Outputs

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

4.3.2.1 Tab **Module**

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

<table>
<tr><th>System parameter</th><th>Data type</th><th>R/W</th><th>Description</th></tr>
<tr><td>DO.Error Code</td><td>WORD</td><td>R</td><td>Error codes for all digital outputs
<table>
<tr><th>Coding</th><th>Description</th></tr>
<tr><td>0x0001</td><td>Module fault</td></tr>
<tr><td>0x0002</td><td>Safety switch 1 faulty</td></tr>
<tr><td>0x0004</td><td>Safety switch 2 faulty</td></tr>
<tr><td>0x0008</td><td>FTT test of test pattern faulty</td></tr>
<tr><td>0x0010</td><td>Test of the read back channels faulty</td></tr>
<tr><td>0x0020</td><td>Active shutdown faulty</td></tr>
<tr><td>0x0040</td><td>Relay status fault detected during initialization</td></tr>
<tr><td>0x0100</td><td>FTT test of CS (chip select) signals faulty</td></tr>
<tr><td>0x0400</td><td>FTT test: 1st temperature threshold exceeded</td></tr>
<tr><td>0x0800</td><td>FTT test: 2nd temperature threshold exceeded</td></tr>
<tr><td>0x1000</td><td>FTT test: Monitoring of auxiliary voltage 1: Undervoltage</td></tr>
<tr><td>0x2000</td><td>Status of safety switches</td></tr>
<tr><td>0x4000</td><td>Active shutdown via watchdog faulty</td></tr>
</table></td></tr>
<tr><td>Module Error Code</td><td>WORD</td><td>R</td><td>Error codes for the module
<table>
<tr><th>Coding</th><th>Description</th></tr>
<tr><td>0x0000</td><td>I/O processing, if required with errors</td></tr>
<tr><td>0x0001</td><td>No I/O processing (CPU not in RUN)</td></tr>
<tr><td>0x0002</td><td>No I/O processing during the booting test</td></tr>
<tr><td>0x0004</td><td>Manufacturer interface operating</td></tr>
<tr><td>0x0010</td><td>No I/O processing: invalid configuration</td></tr>
<tr><td>0x0020</td><td>No I/O processing: fault rate exceeded</td></tr>
<tr><td>0x0040/
0x0080</td><td>No I/O processing: configured module not plugged in</td></tr>
</table></td></tr>
<tr><td>Module SRS</td><td>UDINT</td><td>R</td><td>Slot number (System.Rack.Slot)</td></tr>
<tr><td>Module Type</td><td>UINT</td><td>R</td><td>Type of module, target value: 0xF906 [63 750$_{dec}$]</td></tr>
</table>

Table 13: SILworX - System Parameters for Digital Outputs, **Module** Tab

4.3.2.2 Tab **DO 8 01_1: Channels**

The **DO 8 01_1: DO Channels** tab contains the following system variables:

System parameter	Data type	R/W	Description
-> Error Code	BYTE	R	Error codes for the digital output channels Coding: Description 0x01: Fault in the digital output module 0x04: Error while reading back the digital outputs 0x10: Error while reading back the status relay [x].1 (the channel is permanently de-energized) 0x20: Error while reading back the status relay [x].2 (the channel is permanently de-energized) 0x80: The channel cannot be switched on after a shut down triggered by e.g., the user program, forcing, a channel fault or a module fault.
Value ->	BOOL	W	Output values of the digital output channels 0 = output de-energized 1 = output activated

Table 14: SILworX - System Parameters for Digital Outputs, **DO 8 01_1: Channels** Tab

4.4 Configuring the Module with ELOP II Factory

4.4.1 Configuring the Outputs

The signals previously defined in the Signal Editor (Hardware Management) are assigned to the individual channels (outputs) using ELOP II Factory. Refer to the system manual for the modular F60 system or the online help for more details.

The following chapter describes the system signals used for assigning signals in the controller.

4.4.2 Signals and Error Codes for the Output

The following tables specify the system signals that can be read and set for the outputs, including the corresponding error codes.

In the user program, the error codes can be read using the signals assigned within the logic.

The error codes can also be displayed in ELOP II Factory.

4.4.3 Digital Outputs

<table>
<tr><th>System signal</th><th>R/W</th><th>Description</th></tr>
<tr><td>Mod.SRS [UDINT]</td><td>R</td><td>Slot number (System.Rack.Slot)</td></tr>
<tr><td>Mod. Type [UINT]</td><td>R</td><td>Type of module, target value: 0xF906 [63 750$_{dec}$]</td></tr>
<tr><td>Mod. Error Code [WORD]</td><td>R</td><td>Error codes for the module
<table>
<tr><th>Coding</th><th>Description</th></tr>
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<tr><td>0x0002</td><td>No I/O processing during the booting test</td></tr>
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<tr><td>0x0001</td><td>Module fault</td></tr>
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<tr><td>0x0008</td><td>FTT test of test pattern faulty</td></tr>
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<tr><td>0x2000</td><td>Status of safety switches</td></tr>
<tr><td>0x4000</td><td>Active shutdown via watchdog faulty</td></tr>
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<tr><td>0x04</td><td>Error while reading back the digital outputs</td></tr>
<tr><td>0x10</td><td>Error while reading back the status relay [x].1 (the channel is permanently de-energized)</td></tr>
<tr><td>0x20</td><td>Error while reading back the status relay [x].2 (the channel is permanently de-energized)</td></tr>
<tr><td>0x80</td><td>The channel cannot be switched on after a shut down triggered by e.g., the user program, forcing, a channel fault or a module fault.</td></tr>
</table></td></tr>
<tr><td>DO[xx].Value [BOOL]</td><td>W</td><td>Output values of the digital output channels
0 = output de-energized
1 = Output activated</td></tr>
</table>

Table 15: ELOP II Factory - System Signals for the Relay Outputs

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 3.4.4.

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 or module.

6.1 Faults

Module's faults are signaled by the *ERR* LED located on the front plate. Additionally, the status parameters can be evaluated in the user program.

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.

i Modules may not be removed or inserted during operation.

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

Relay modules must be subjected to a proof test in intervals of 3 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

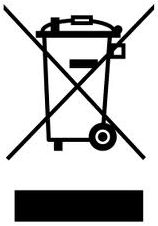
To avoid mechanical damage, HIMatrix components must be transported in packaging.

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 *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)
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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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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