HIMA

SMART SAFETY.

Manual

HIQuad®X

F-PWR 02

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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 the Document

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

This manual contains the following main chapters:

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

Additionally, the following documents must be taken into account:

Document	Content	Document no.
HIQuad X system manual	Hardware description of the HIQuad X system	HI 803 211 E
HIQuad X safety manual	Safety functions of the HIQuad X system	HI 803 209 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 Applicable Manuals

The current manuals can be obtained upon request by sending an e-mail to: documentation@hima.com. The documentation is available for registered HIMA customers in the download area https://www.hima.com/en/downloads/.

1.2 Target Audience

This document is aimed at the planners, design engineers and programmers of automation systems as well as the persons authorized to start up, operate and maintain the devices and systems concerned. 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	Parameters and system variables, references.
`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

Safety notices must be strictly observed to ensure the lowest possible risk.

The safety notices are represented as described below.

- Signal word: warning, caution, notice.
- 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.

⚠ SIGNAL WORD

Type and source of risk!

Consequences arising from non-observance.

Risk prevention.

NOTICE

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 giving 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. Use in the Ex zone is only permitted if additional measures are taken.

2.1 Intended Use

HIQuad X components are designed for assembling safety-related controller systems.

When using the components in the HIQuad X system, comply with the following general requirements.

2.1.1 Environmental Requirements

All the environmental conditions specified in this manual must be observed when operating the HIQuad X 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 components.

NOTICE

Damage to the HIQuad X system due to electrostatic discharge!

- **When performing the work, make sure that the workspace is free of static, and wear a grounding strap.**
- **If not used, ensure that the components are protected from electrostatic discharge, e.g., by storing them in their packaging.**

2.2 Residual Risk

No imminent risk results from a HIMA system itself.

Residual risk may result from:

- Faults related to engineering.
- Faults in 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 HIMA system is a part of the safety equipment of a plant. If the controller fails, the system enters the safe state.

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

3 Product Description

The F-PWR 02 buffer module is intended for use in the programmable electronic system (PES) HIQuad X.

The buffer module monitors the 24 V supply voltages (L1+/L2+) and supplies a buffered 24 V output voltage LS+ with a nominal current of 4 A.

The 24 V output voltage LS+ supplies a maximum of 8 I/O processing modules in 8 extension racks.

The buffer module is used in slots 6 and 7 of the base rack of the H51X system. No buffer module is intended in the base rack of the H41X system.

Refer to the HIMA website and the HIQuad X safety manual (HI 803 209 E) for more information on the standards used to test and certify the module and the HIQuad X system.

3.1 Safety Function

No safety function is performed by the buffer module.

3.1.1 Response in the Event of a Fault

The module is not safety-related and therefore does not react to faults.

The module reports overvoltage and overcurrent for the 24 V supply voltages (L1+/L2+) through the LEDs on the front plate as well as through the fault relay.

3.2 Scope of Delivery

The module is delivered with no additional accessories.

3.3 Type Label

The type label specifies the following important details:

- Product name
- Mark of conformity
- Part no.
- Serial number
- Hardware revision index (HW-Rev.)
- Operating system revision index (OS-Rev.)
- Ex specifications (if applicable)
- Production year (Prod-Year:)

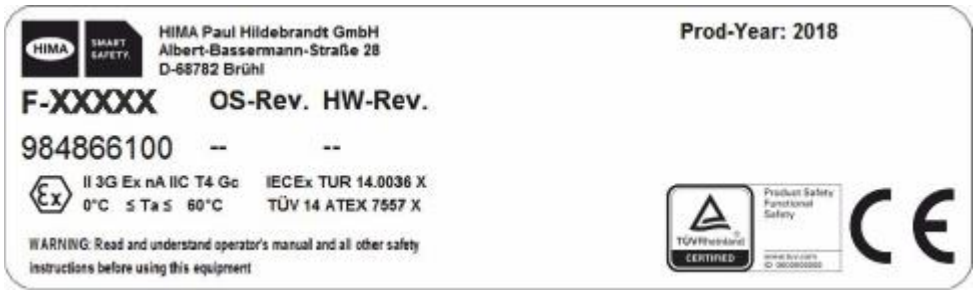


Figure 1: Sample Type Label

3.4 Structure

The buffer module supplies a 24 V output voltage L+ with a nominal current of 4 A (short-circuit-proof) and bridges voltage dropouts of up to 10 ms. Both buffer modules inserted in a base rack can be fed redundantly.

NOTICE

Voltage dropouts of > 10 ms.

The user has to implement external measures to make sure that short interruptions and voltage drops of > 10 ms can be compensated.

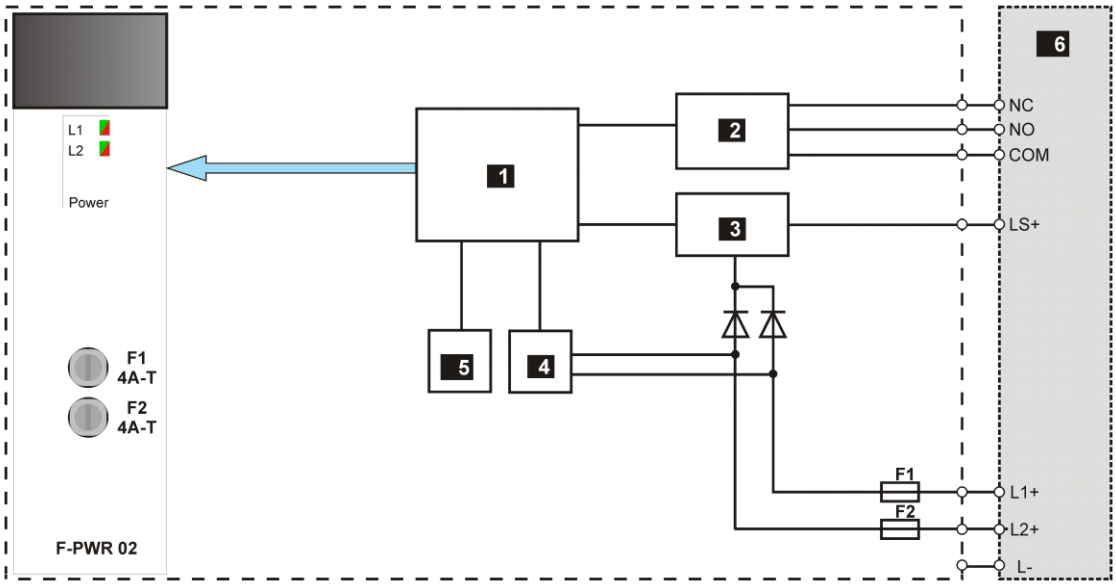
Functional units of the module:

- Monitoring of the 24 V supply voltage for undervoltage and fuse state through LEDs and fault relay.
- LEDs and fault relay for monitoring the supply current at LS+.
- Capacitive buffering of the 24 V output voltage LS+.

LEDs on the indicator panel displaying the status, see Chapter 3.4.5.1.

3.4.1 Block Diagram, Functional Units

The following block diagram illustrates the structure of the module.



1 Logic
2 Fault relay
3 Buffer
4 Voltage monitoring
5 DIP switch S1
6 Backplane PCB

Figure 2: Block Diagram

3.4.2 DIP Switch S1 Settings

The DIP switch is used to activate/deactivate the different monitoring options for the 24 V power supply.

DIP switch S1	Description
	No monitoring of L1+ and L2+.
	L1+ is monitored.
	L2+ is monitored.
	L1+ and L2+ are monitored.

Table 2: DIP Switch S1 Settings

3.4.3 Fault Relay

The module is equipped with one potential-free change-over contact (relay).

The change-over contact is electrically connected via the XG6 terminal block on the H51X base rack backplane. The contact connections depend on the module slot:

- Slot 6 includes the common contact XG6:5 (COM), the break contact XG6:6 (NC) and the make contact XG6:4 (NO).
- Slot 7 includes the common contact XG6:2 (COM), the break contact XG6:3 (NC) and the make contact XG6:1 (NO).

Slot	Terminal block	Contact connections	Module state
6	XG6:/ REL1	4-5 closed (5-6 open)	The 24 V supply voltage is OK
		4-5 open (5-6 closed)	The 24 V supply voltage is faulty
7	XG6:/ REL2	1-2 closed (2-3 open)	The 24 V supply voltage is OK
		1-2 open (2-3 closed)	The 24 V supply voltage is faulty

Table 3: Fault Relay

The contact can be used to connect optical and acoustic detectors with current consumption up to 1 A. The XG6 terminal block can accept wires of up to a maximum of 1.5 mm².

3.4.4 24 V output voltage LS+

The 24 V output voltage LS+ is electrically connected via the XG7 terminal block on the H51X base rack backplane. The terminals depend on the module slot:

Slot	Terminal block	Terminal
6	XG7:/ LS1+	4
6	XG7:/ LS1-	3
7	XG7:/ LS2+	2
7	XG7:/ LS2-	1

Table 4: 24 V Output Voltage LS+

The 24 V output voltage LS+ is connected to the XG3 terminal block L+ of the extension rack and supplies the F-IOP 01 module of one extension rack.

3.4.5 Indicators

The following figure shows the front view of the module with the LEDs.

Figure 3: Front View with LEDs

The LEDs indicate the operating state of the module. All LEDs should be considered together. The module LEDs include the following categories:

- 24 VDC system voltage (L1, L2)

3.4.5.1 Power Status Indicators

The LEDs of the power status indicators.

LED	Color	Status	Description
L1, L2	Green	On	Supply voltage (L1+/L2+) available.
	Red	On	Error: ▪ Supply voltage < 18 V ▪ Supply current > 4 A
		Off	No supply voltage (L1+/L2+) or monitoring deactivated.

Table 5: Power Status Indicators

3.5 Product Data

General	
Supply voltage	24 VDC, -15...+20 %, $r_p \leq 5$ %, SELV, PELV
Maximum supply voltage	30 VDC
Nominal load	Max. 4 A
Current consumption	20 mA + load current at 24 V
Fault Relay	1 A at 30 V
Protection class	Protection class III in accordance with IEC/EN 61131-2.
Ambient temperature	0...+60 °C
Transport and storage temperature	-40...+70 °C
Humidity	Max. 95 % relative humidity, non-condensing
Pollution	Pollution degree II in accordance with IEC/EN 60664-1
Altitude	< 2000 m
Degree of protection	IP20
Dimensions	4 HP
Weight	Approx. 200 g

Table 6: Product Data

4 Start-Up

To start up the buffer module, insert the buffer module into a permissible base rack slot, see Chapter 4.1.1.

The buffer module starts to operate as soon as the supply voltage is connected.

NOTICE

Permanent damage to internal power supply module fuses possible!

Ripple supply voltage of > 5 % must be avoided since the voltage peaks of the ripple load the buffer capacitors. This may cause pulsating input currents to exceed the fuse value.

The 24 V supply voltage of the power supply module may only be provided from a SELV/PELV source.

4.1 Mounting

Observe the following points when mounting the module:

- The module is intended for use within a HIQuad X base rack. For more information on how to structure the base rack, refer to the system manual (HI 803 211 E).
- Only operate the processor module in the permissible slot, see Chapter 4.1.1.
- Only operate the module with forced cooling (fan rack).
- Modifications or extensions to the system wiring must be performed by personnel with knowledge of ESD protective measures.

NOTICE

Electrostatic discharge!

Failure to comply with these instructions can destroy the module.

- **Make sure that the workspace is free of static and wear a grounding strap.**
- **If not used, ensure that the device is protected from electrostatic discharge, e.g., by storing it in its packaging.**

- Effects due to EMC influences

  Exposing the module to environmental influences other than those specified in the manual may lead to malfunctions or even the destruction of the module.

NOTICE

Damage to the controller or system malfunction possible!

Only expose the modules to permissible environmental influences, see Chapter 3.5.

4.1.1 Slots Permitted for the Buffer Module

The following points must be observed when assigning the slots to the buffer modules, including the Hardware Editor:

- No buffer modules are intended for use in the H41X (F-BASE RACK 02) system.
- A maximum of 2 buffer modules in slots 6 and 7 of the base rack are permitted in the H51X (F-BASE RACK 01) system.

4.2 Mounting and Removing the Module

This chapter describes how to mount and remove a module.

The following points must be adhered to when mounting and removing modules:

- Strictly observe the following instructions when removing and reinserting the modules of the HIQuad X system.
- Quickly disconnect the modules from the backplane to avoid faulty signals in the system that could cause its shutdown.
- Only use the module in the designated slot.

i HIMA cannot be made liable for consequential loss caused by improperly removing and reinserting the modules.

NOTICE

Damage to bus and power sockets due to module jamming!

Failure to comply with these instructions can damage the controller.

Always insert the modules in the racks carefully.

Tools

- Screwdriver, cross PH1

Installation

1. Pull back as far as possible the fastening screws on the module's front plate.
2. Insert the module into the guiding rail of the intended slot and push it in the rack as far as it can go.
3. Push the red release button bottom up to unlock the extractor handle.
4. With your thumbs, press the module carefully, but quickly inwards as far as it can go to ensure that no faulty signals are triggered within the system.
5. Press the extractor handle down until it snaps into position.
6. Tighten the fastening screws (max. 0.35 Nm).
7. If provided, insert the Ethernet and fieldbus cables.

► The module is mounted.

Removal

1. Completely release the fastening screws from the module.
2. Push the red release button bottom up to unlock the extractor handle.
3. Completely push the extractor handle upwards to rapidly separate the module from the backplane. This avoids faulty signals in the system.
4. Press the extractor handle down once again until it snaps into position.
5. Remove the module from the rack holding it by the extractor handle.

► The module is removed.

4.3 Configuring the Module in SILworX

The module icon can be created in the Hardware Editor of the SILworX programming tool. No configuration is provided for the buffer module.

5 Operation

The module is operated within a HIQuad X base rack. No specific monitoring is required.

5.1 Handling

Direct handling of the module is not foreseen.

5.2 Diagnostics

LEDs on the front side of the module indicate the module state, see Chapter 3.4.5.1.

6 Maintenance

Defective modules must be replaced with a faultless module of the same type or with an approved replacement model, see Chapter 4.2.

Only the manufacturer is authorized to repair the module.

When replacing modules, observe the instructions specified in the system manual (HI 803 211 E) and safety manual (HI 803 209 E).

6.1 Interval for Replacing the Buffer Module

The buffer module must be replaced in intervals of ≤ 10 years due to the aging process of the electrolytic capacitors.

The lifetime of electrolytic capacitors depends on the temperature (typical manufacturer specifications: >10 years at ≤ 40°C)

7 Decommissioning

To decommission the module, remove it from the base rack. For more details, refer to the Chapter *Mounting and Removing the Module*.

8 Transport

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

Always store the components in their original product packaging. This packaging also provides protection against electrostatic discharge (ESD). Note that the product packaging alone is not sufficient for transport.

9 Disposal

Industrial customers are responsible for correctly disposing of decommissioned 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
DI	Digital input
DO	Digital output
EMC	Electromagnetic compatibility
EN	European standard
ESD	Electrostatic discharge
FBD	Function block diagrams
IEC	International electrotechnical commission
Interference-free	Inputs are designed for interference-free operation and can be used in circuits with safety functions
PADT	Programming and debugging tool (in accordance with IEC 61131-3), PC with SILworX
PE	Protective ground
PELV	Protective extra low voltage
PES	Programmable electronic system
R	Read, the variable is read out
R/W	Read/Write, column title for system variable type
Rack ID	Rack identification (number)
r_{PP}	Peak value of a total AC component
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
SRS	System.Rack.Slot, addressing of a module
SW	Software
TMO	Timeout
W	Write, the variable receives a value, e.g., from the user program
WD	Watchdog, device for monitoring the system's correct operation Signal for fault-free process
WDT	Watchdog time

Index of Figures

Index of Tables

Index

MANUAL
F-PWR 02
HI 803 227 E

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