Manual

Power Supply

PS 1000/230 02

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Table of Contents

1 Introduction

This manual describes the technical characteristics of the power supply unit and its use. It provides information on how to install and start up the devices.

1.1 Structure and Use of This Manual

This manual contains the following main chapters:

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

All the current manuals can be obtained upon request by sending an e-mail to: documentation@hima.com. Registered customers can download the product documentation from the HIMA Extranet.

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 specially marked. In the electronic document (PDF): When the mouse pointer hovers over a hyperlink, it changes its shape. Click the hyperlink to jump to the corresponding position.

Safety notices and operating tips are specially 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 situation which, if not avoided, could result in minor or moderate 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, 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.

2.1 Intended Use

The product is designed for assembling safety-related controller systems.

When using the product, comply with the following general requirements.

2.1.1 Environmental Conditions

All the environmental conditions specified in this manual must be observed when operating the product. 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 modules.

NOTICE

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 the power supply unit itself.

Residual risk may result from:

- Faults related to engineering.
- 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 a power outage occurs, the power supply unit reacts safely. Applications in accordance with the energize-to-trip principle are allowed under applicable operating measures.

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

3 Product Description

The electronic power supply unit is designed for the power supply of safety-related HIMA controller.

The power supply unit supplies an output voltage of 48 VDC with a nominal current of 20 A.

The output voltage meets the requirements for SELV and PELV.

The power supply is available in the following variants:

Variant	Design	Mounting
PS 1000/230 020	Cartridge	M 3421 19-inch subrack

Table 1: Power Supply Variants

The PS 1000/230 020 variant is a modular cartridge for use in the19-inch M 3421 subrack with 4 RU, see the M 3421 data sheet. The M 3421 subrack is designed for up to three power supply units and is used for the HIMA PS 1000 series of power supply units. The subrack variants are mechanically coded to ensure that the proper power supply unit is used in the base plate, see Chapter 4.1.1.4.

3.1 Safety Function

The PS 1000 ensures that no voltage greater than 60 V is issued at the voltage output even if a fault occurs.

3.1.1 Response in the Event of a Fault

In cases of output short-circuit or overheating, the voltage output is de-energized. The power supply unit is implemented without automatic restart. After the faults have been removed, the power supply unit must be first switched off using the thermal overcurrent circuit breaker and then switched on again.

Optical and acoustic detectors with a current consumption of up to 1 A can be connected to the fault relay's contacts. The fault relay is activated during normal operation and trips if the following faults occur:

- The fan speed is too low.
- The fan is blocked.
- The output voltage is too low.
- The temperature is too high.
- The power supply unit is defective.

The following table describes the statuses of the fault relay contacts:

Contact (Fail)	State
C-NC closed (C-NO open)	Relay energized, normal function
C-NC open (C-NO closed)	Relay de-energized, fault within the power supply unit

Table 2: Fault Relay States

3.2 Scope of Delivery

The coding screws are included within the scope of delivery of the PS 1000/230 020 variant.

3.3 Type Label

The type label specifies the following important details:

- Product name
- Mark of conformity
- Bar code (2D code)
- Part no.
- Production year

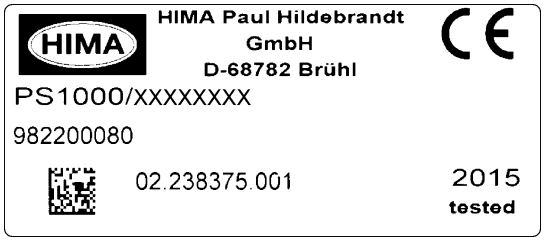


Figure 1: Sample Type Label

3.4 Structure

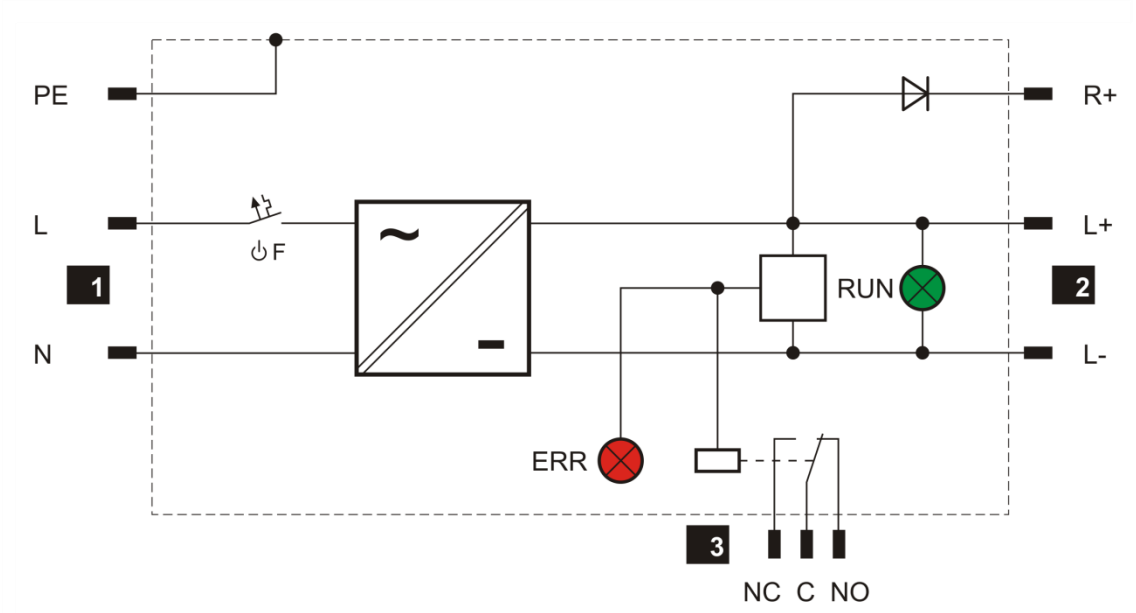
The power supply unit supplies 48 VDC to the L+/L- or R+/L- terminals with a nominal current of 20 A (short-circuit-proof) and is able to compensate for voltage dropouts of up to 20 ms. For redundancy operation, the power supply units can be connected in parallel via the decoupled R+ terminals, see Chapter 4.

The power supply unit is equipped with a fan on the front side. If the fan fails, the fault relay trips, see Chapter 3.1.1. The fault relay's contact is lead through to the rear side of the power supply unit.

Two LEDs on the front plate indicate the functioning of power supply unit. The green *RUN* LED is lit if sufficient output voltage is available. The red *ERR* LED is lit if the fan speed is too low, the fan is idle or the output voltage is too low.

A ΔU potentiometer is located on the front side for adjusting the voltage, see Chapter 4.3.

3.4.1 Block Diagram

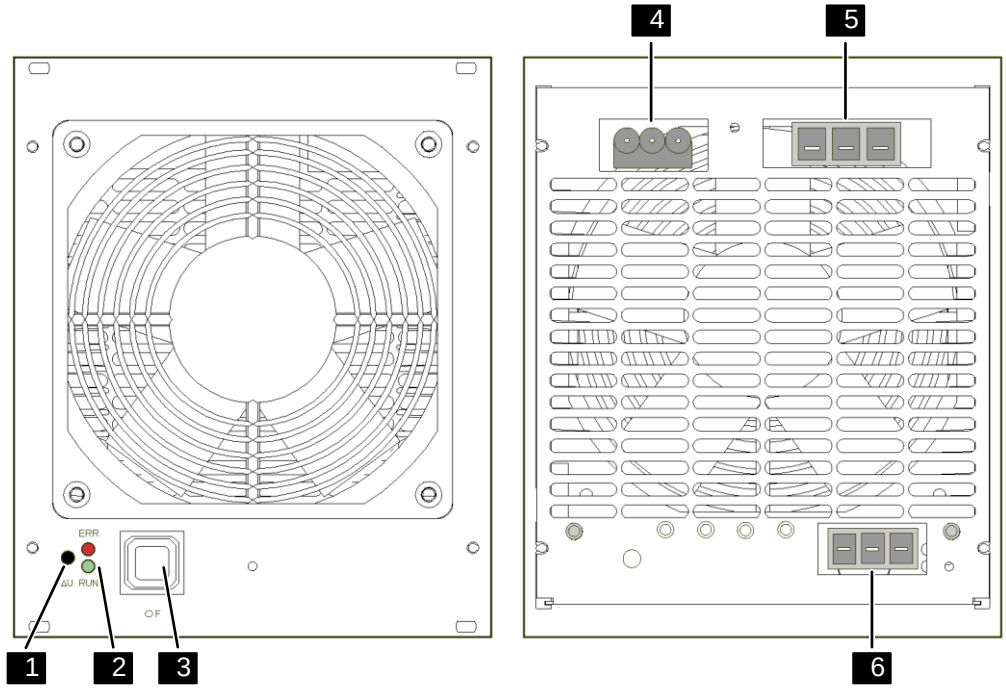


1 230 VAC
2 48 VDC
3 Fault relay

Figure 2: Block Diagram

3.4.2 Indicators

The following figures show the front view and the rear view of the power supply unit:



1 ΔU potentiometer
2 LEDs
3 Thermal overcurrent circuit breaker
4 Fault relay connection
5 Output voltage connection
6 Input voltage connection

Figure 3: Front View und Rear View PS 1000/115 01

The LEDs indicate the operating state of the power supply unit.

LED	Color	Status	Description
ERR	Red	On	Fault within the power supply unit, e.g., ▪ The fan speed is too low. ▪ The fan is blocked. ▪ The output voltage is too low.
		Off	No errors detected.
RUN	Green	On	Output voltage present.
		Off	No output voltage present.

Table 3: Status Indicators

3.5 Product Data

General	
Input voltage	230 VAC, -15…+10 % and 240 VAC, -15…+10 %, 50…60 Hz
Output voltage L+	48 VDC, short-circuit-proof 43.2…50 VDC, adjustable using the ΔU potentiometer
Output voltage R+	(L+) - 0.2 VDC at 20 A
Thermal overcurrent circuit breaker	250 VAC, 10 A
Load	20 A continuous load
Maximum inrush current	7 A
Regulation	< 100 mV under load
Efficiency	> 89 %
Power dissipation	< 110 W
Power failure bridging	20 ms
Degree of protection	IP20
Humidity	< 95 % relative humidity, non-condensing
Ambient temperature	0…60 °C
Storage temperature	-40…+85 °C
Dimensions Cartridge	 28 RU, 4 HP W x H x D: 142 x 173 x 281 mm
Weight	Approx. 6 kg
External fusing	16 A
Connectors L, N, PE (XG.3) L+, R+, L- (XG.1) NC, C, NO (XG.2)	Minimum cross-section for wiring: 240 VAC 1.5 mm^2 48 VDC 10 mm^2 Fail 0.5 mm^2
Fault contact (Fail) Switching current	Potential-free change-over contact, connection via terminals 3 x 1.5 mm^2 within the subrack 30 VDC / 1 A 30 VAC / 0.5 A
MTTF	30 years

Table 4: Product Data

4 Start-Up

Only use the thermal circuit breaker on the front side (soft start) to switch on the power supply unit and thus the connected control unit. To switch on, press the overcurrent circuit breaker until it is engaged.

To allow the soft start electronics to regulate the inrush current, wait at least 1 min after switching the power supply unit off and before switching it on again.

All connections are established using separate female connectors located on the back of the power supply unit.

The decoupled R+ terminal must be used when multiple power supply units are connected in parallel to increase power or implement redundancy.

4.1 Mounting

The following chapter describes how to mount the power supply unit.

4.1.1 Mounting the PS 1000/230 020 in the M 3421 Subrack

The equipment depends on the wiring connecting to the M 3421 subrack. Slots not in use can be fitted with the M 4413 dummy front plate (part no. 60 5240002). Maintain a distance of 30 mm in front of the fan of the power supply unit.

4.1.1.1 ESD Protective Measures During Installation

Only personnel with knowledge of ESD protective measures may install and remove a power supply unit.

⚠ CAUTION

Electrostatic discharge can damage the electronic components within the systems.

- Touch a grounded object to discharge any static in your body.
- When performing the work, make sure that the workspace is free of static, and wear a grounding strap.
- If not used, ensure that the power supply unit is protected from electrostatic discharge, e.g., by storing it in its packaging.

4.1.1.2 Mounting the Power Supply Unit

A Phillips screwdriver PH1 must be used for mounting the power supply unit.

1. Check the mechanical coding on the subrack.
2. When switched off, completely plug the power supply unit in the subrack.
3. Use the four captive screws to secure the power supply unit to the subrack enclosure.
4. M 4413 dummy front plates may be secured to unused slots.

⚠ CAUTION

Prior to inserting the power supply unit, check for proper coding on the subrack. Inserting a 48 V instead of a 24 V power supply unit causes the electronic components to be completely damaged.

4.1.1.3 Removing the Power Supply Unit

A Phillips screwdriver PH1 must be used for removing the power supply unit.

1. Switch off the power supply unit using the overcurrent circuit breaker.
2. Release the four captive screws in the subrack.
3. Remove the power supply unit from the subrack.

4.1.1.4 Operating Multiple Power Supply Units in the M 3421 Subrack

All connections for the power supply unit are established using separate female connectors located on the rear side of the subrack.

The decoupled R+ terminal must be used if several power supply units are connected in parallel to increase power or implement redundancy.

If power supply units are used redundantly, a power supply unit may be replaced during operation. To this end, prior to removing the power supply unit, it must be switched off using the thermal overcurrent circuit breaker on the front side.

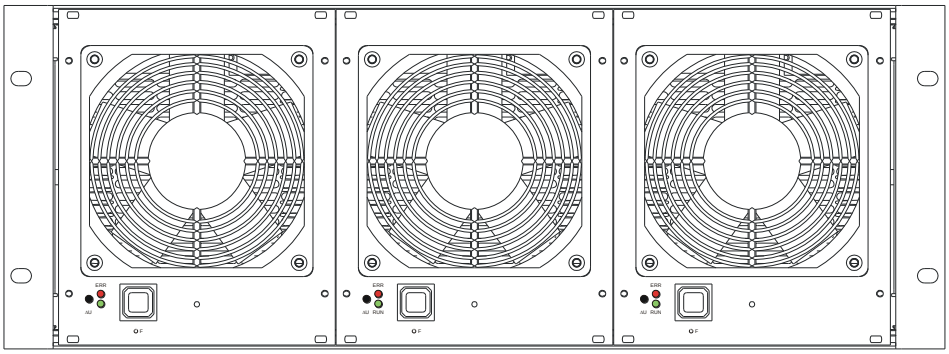


Figure 4: Front View of a Fully Equipped M 3421 Subrack

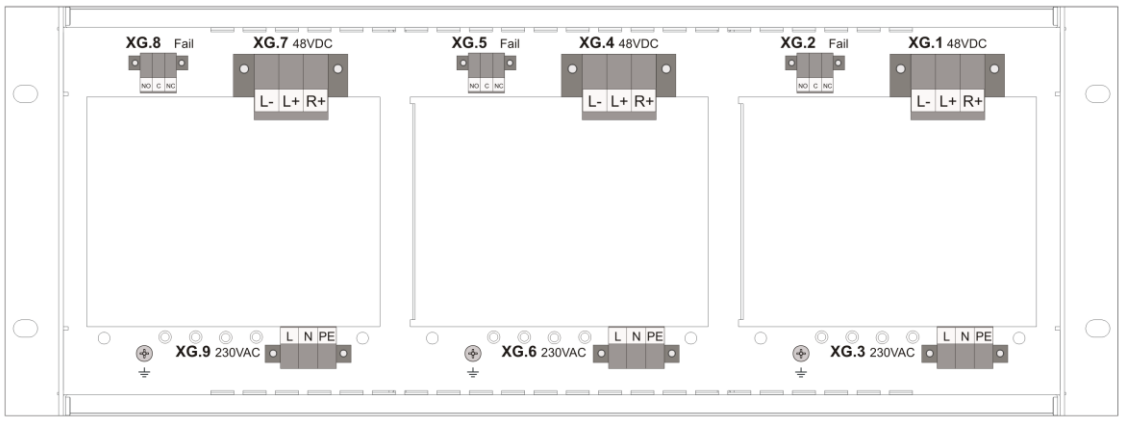
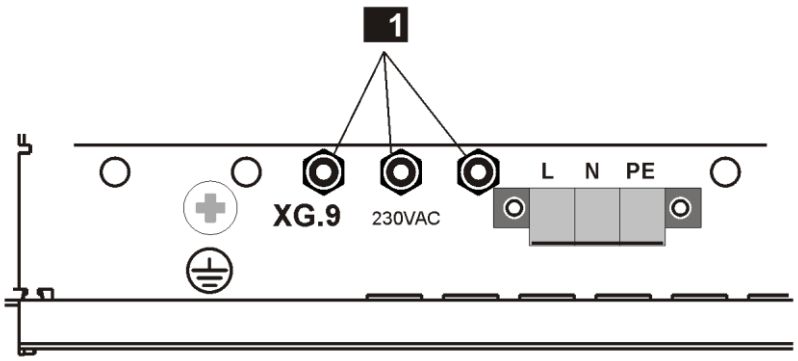


Figure 5: Rear View of the M 3421 Subrack wit Terminals

4.1.1.5 Mechanical Coding

The variants for the 19-inch subrack M 3421 are mechanically coded on the rear side. Coding is implemented using up to four coding pins and the corresponding coding screws that are screwed into the rear side of the M 3421 subrack.

The PS 1000/ 230 020 variant is coded with one coding pin. Three of the four coding screws provided with the power supply unit must therefore be screwed into the M 3421 subrack, see Figure 6.



1 3 coding screws

Figure 6: Securing the Coding Screws to the M 3421 Subrack

4.2 Installation Requirements

The power supply unit is suitable for use in burner applications in accordance with EN 298. The following points must be observed:

- A surge absorber must be used before the primary connection of the power supply unit (PS 1000), e.g., DEHNrail M, DR M 2P 255 for 230 VAC nominal voltage.
- The mains filter H 7021 (for HIMatrix and HIMax) or H 7035 (for HIQuad X) must be used on the secondary side.
- The maximum cable length for connecting to the fault relay (XG.2) is 10 m (in both directions).
- Power and signal cables must be laid separately, even if short wires are used.

The power supply unit is suitable for use in zone C in accordance with EN 61131-2. The following points must be observed:

A surge absorber must be used before the primary connection of the power supply unit (PS 1000), e.g., DEHNrail M, DR M 2P 255 for 230 VAC nominal voltage.

- The mains filter H 7021 (for HIMatrix and HIMax) or H 7035 (for HIQuad X) must be used on the secondary side.
- The maximum cable length for connecting to the fault relay (XG.2) is 30 m (in both directions).

To meet the requirements of EN 61326-1, the mains filter H 7021 (for HIMatrix and HIMax) or H 7035 (for HIQuad X) must also be used on the secondary side.

If the HIMax X-DO 24 02 is supplied with 48 VDC via the PS 1000, the H 7021 mains filter must be used. The filter must be installed as close as possible to the power supply of the connector board.

4.3 Female Connectors

The female connectors feature the following characteristics:

XG.1 48 VDC	
Female connector	1 plug, 3 poles, screw terminals
Wire cross-section	0.2…16 mm² (single-wire) 0.5…16 mm² (finely stranded) 0.25…16 mm² (with wire end ferrule)
Stripping length	12 mm
Screwdriver	Slotted, 1.0 x 5.5
Tightening torque	1.2…1.5 Nm
XG.2 Fail	
Female connector	1 plug, 3 poles, screw terminals
Wire cross-section	0.2…2.5 mm² (single-wire) 0.2…2.5 mm² (finely stranded) 0.2…2.5 mm² (with wire end ferrule)
Stripping length	7 mm
Screwdriver	Slotted, 0.6 x 3.5
Tightening torque	0.4…0.5 Nm
XG.3 230 VAC	
Female connector	1 plug, 3 poles, screw terminals
Wire cross-section	0.2…4 mm² (single-wire) 0.2…4 mm² (finely stranded) 0.25…4 mm² (with wire end ferrule)
Stripping length	7 mm
Screwdriver	Slotted, 0.6 x 3.5
Tightening torque	0.4…0.5 Nm

Table 5: Female Connector Properties

i When performing the wiring, observe the minimum cross-sections specified in the product data.

4.4 Adjusting Power Supplies Connected in Parallel

With 20 A load applied to L+, the output voltage of the power supply units is factory set to 48.2 V ± 10 mV. Decoupling reduces the output voltage on R+ by the voltage drop, see Table 4. For parallel operation, connect wires of the same length to R+ to avoid load differences.

The power supply units are adjusted to other voltage ranges using the ΔU potentiometer located on the front side.

1. Measure the output voltage on each power supply unit's R+.
2. Turn the ΔU potentiometer until the required output voltage has been reached.
3. Repeat step 2 with all power supply units connected in parallel.
4. Use a clamp meter to verify that the current of all power supply units connected in parallel is distributed uniformly.
5. If the current is not distributed uniformly, use the ΔU potentiometer to adjust the output voltage.

5 Operation

The power supply unit does not require any specific monitoring.

5.1 Handling

The power supply unit is switched on and off using the thermal overcurrent circuit breaker on the front side.

Additional handling of the power supply unit is not foreseen.

5.2 Diagnostics

LEDs on the front side of the power supply unit indicate the module state, see Chapter 3.4.2.

6 Maintenance

Defective power supply units must be replaced with a faultless power supply unit of the same type or with an approved replacement model.

Only the manufacturer is authorized to repair the power supply unit.

6.1 Maintenance Measures

The following maintenance measures are required.

6.1.1 Replacing the Fans

HIMA strongly recommends replacing the power supply unit fan in accordance with the specified maintenance interval. HIMA cannot be held liable for damages caused by improper maintenance.

Operating temperature	Maintenance interval
≤ 40 °C	Every 5 years
> 40 °C	Every 3 years

Table 6: Maintenance Intervals

The fan may only be replaced by HIMA.

6.1.2 Replacing the Electrolytic Capacitors

The electrolytic capacitors of the PS 1000 must be replaced in intervals of ≤ 10 years.

The electrolytic capacitors may only be replaced by HIMA!

7 Decommissioning

Switch the power supply unit off and remove the female connectors to decommission the power supply unit.

8 Transport

To avoid mechanical damage, power supply units must be transported in packaging.

Always store HIMA products in their original product packaging. This packaging also provides protection against electrostatic discharge. Notice that the product packaging alone is not suitable 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
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 standard
ESD	Electrostatic discharge
FB	Fieldbus
FBD	Function block diagrams
HW	Hardware
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	Media access control address, hardware address of one network connection
PADT	Programming and debugging tool (in accordance with IEC 61131-3), PC with SILworX
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	Base plate identification (number)
r_P	Peak value of a total AC component
SB	System bus (module)
SC/OC	Short-circuit/open-circuit
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
SNTP	Simple network time protocol (RFC 1769)
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
PS 1000/230 02

HI 800 125 E

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