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1 HIMA: The company

Safety. Nonstop.

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Maximum safety and profitability

The HIMA nonstop philosophy

1.1.0

HIMA is the world's leading designer and manufacturer of automated safety solutions. Everything we do, think and create is designed to help you achieve nonstop safety.

The result of this philosophy: solutions that provide maximum safety and uninterrupted plant operations.

HIMA solutions increase your efficiency through:

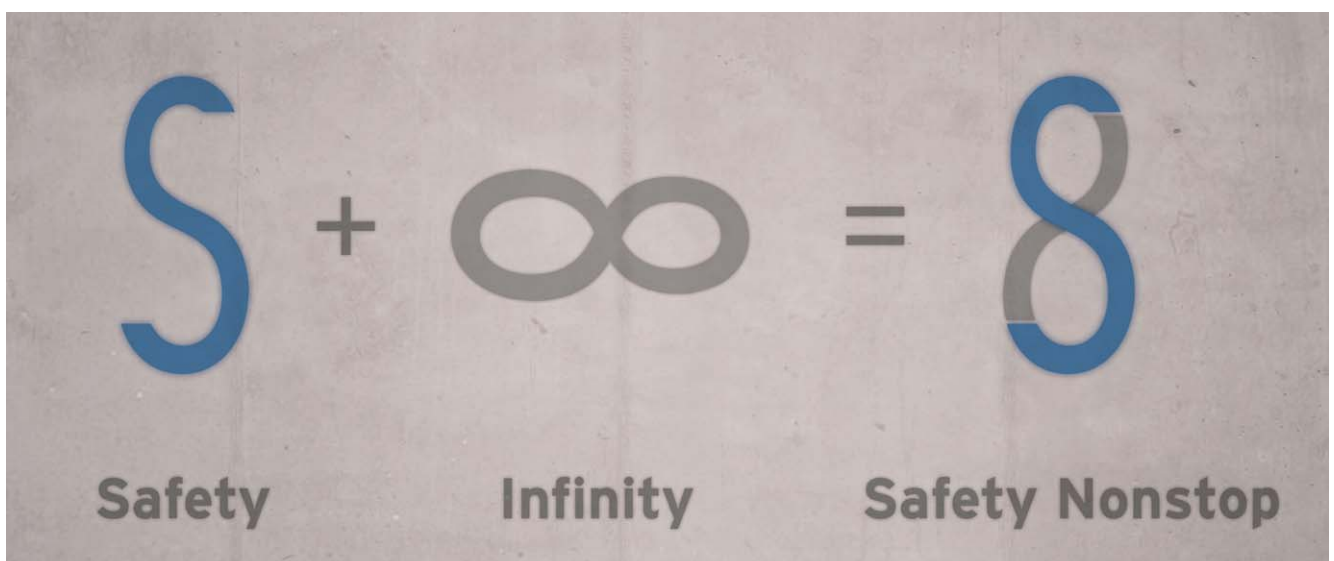
- Avoiding over- and under-dimensioning
- Maximum plant uptime
- Reduced investment and lifecycle costs
- Future-proof, lifetime flexibility
- Superior ease of use

A history of looking forward

Founded in Germany in 1908, HIMA began establishing safety automation milestones in 1970 when the company introduced the world's first TÜV-certified safety system. Since then, HIMA systems have protected operations at the world's largest oil, gas, chemical, pharmaceutical and power companies. Today, HIMA's expertise is also being used to develop new, creative solutions for the rail sector, logistics and machine safety.

HIMA highlights:

- The world's leading and only independent designer and manufacturer of automated safety solutions
- More than 40 years of experience
- More than 25,000 systems installed in over 80 countries
- Long-term commitment of a 100-year-old, family-owned company
- More TÜV-certified safety specialists than any other safety systems manufacturer
- World's first TÜV-certified safety system
- Industry's largest range of flexible and scalable product platforms
- Proven system integration with any DCS and automation environment
- 100% made in Germany



Safety Nonstop for all industries

Solutions for process safety

1.2.0

Maximum safety. Maximum availability.

HIMA is the world's leading specialist for safety-related automation solutions in the process industry. More than 25,000 HIMA systems have been installed in over 80 countries, protecting the equipment of the world's largest companies in the oil, gas, chemicals, pharmaceuticals and power generation industries for more than 40 years.

HIMA solutions guarantee safe and uninterrupted operation in every safety-critical application. All systems, which have proven themselves time after time, can be easily and comprehensively integrated into any conventional process control system. Application areas include:

- Emergency shutdown systems (ESD)
- Burner control systems (BCS)
- Fire and gas systems (F&G)
- High-integrity pressure protection systems (HIPPS)
- Turbo machinery control (TMC)
- Pipeline management and control (PMC)

Thanks to its corporate independence, HIMA is able to work in any project structure - taking on complete projects or partial

tasks, and working both directly for end customers and as part of a team with EPCs, MACs and PCS manufacturers.

Solutions for process safety

HIMA solutions comply with the latest international and local safety standards, including IEC 61508/11, and are suitable for SIL 3 or SIL 4 applications. Examples include:

- Steam crackers
- Polyethylene, polypropylene and PVC production plants
- Fertiliser plants
- Onshore/offshore facilities, platforms and FPSO
- Pipelines
- Tank farms and gas containers
- Loading stations
- Refineries
- Combustion and power plants
- Turbines and compressors
- Batch operations



Safety Nonstop for all industries

Solutions for the rail sector

1.3.0

On track for a standardised solution

Previously, safety solutions for the rail sector have usually relied on special proprietary technology. The future, however, belongs to modern COTS (commercial-off-the-shelf) solutions, which offer clear cost benefits across the entire lifecycle and greater flexibility.

All HIMA solutions are based on proven HIMA safety controllers, featuring intuitive programming and the capacity to easily be networked and integrated with cross-manufacturer communication interfaces. The result: HIMA solutions are always a perfect fit in any technical environment, whether it involves a conversion project or new investment.

As with all HIMA solutions, the foundation of the company's rail solutions is the 'Safety. Nonstop.' principle. HIMA solutions not only create permanent safety, but they also prevent unnecessary stops and help to achieve uninterrupted and reliable system/plant operations.

Together with HIMA application engineers, customers can create future-proof safety solutions for rail, reduce investment and operating costs and simultaneously increase the level of flexibility for future adaptations. In addition, HIMA supports customer engineers with advice and training when switching to modern COTS solutions.

HIMA solutions are certified up to SIL 4 according to CENELEC and up to Category 1 Class B according to DIN EN 61373. They are used for the following safety-critical rail applications:

- Signalling
 - Railway crossings
 - Rolling stock
 - Power supply
-



Safety Nonstop for all industries

Solutions for logistics and machine safety

1.4.0

Heading into the future with safety

Logistics and intralogistics weave together all stages of production into an interdependent network. A single failure in a logistics system can have severe consequences for the entire material and goods flow. This places high demands on safety solutions, which must automatically shut down an installation to prevent hazards to people, the environment and goods - while also avoiding unnecessary stops.

HIMA solutions are designed for maximum safety and reliable, uninterrupted plant operations. Applying this 'Safety. Nonstop.' principle, HIMA has developed its own technical innovations for logistics and machine safety while also collaborating with scientific institutes and other manufacturers to create advanced solutions.

Together with its customers, HIMA applications engineers create comprehensive safety solutions for a variety of applications. Examples include material handling systems in large distribution centres, conveyor belts in industrial production and baggage handling systems at airports. Modularity and flexible network and integration options enable optimum acquisition costs. HIMA's proven safety technology ensures reliability and low operating costs, creating

demand for the company's solutions in an increasing number of machine safety fields.

HIMA technology is proven in many safety-critical applications that must meet requirements in accordance with PL e (EN ISO 13849) and SIL 3 (EN/IEC 62061).

Examples include:

- Material handling systems
- Cranes, crane networks and lifting equipment in production facilities or on docks
- Driverless transport systems (DTS)
- Punching and presses
- Painting plants
- Robot cells
- Lifts
- Sluices and polders
- Lifters and elevating platforms
- Cableways
- High-bay warehouses
- Complete solutions for airports



One technology - always the right solution

1.5.0

HIMA provides the industry's largest selection of flexible and scalable safety systems for almost every safety-critical application in the process industry, the rail sector and for logistics and machine safety. Our systems are based on safety technology that's been proven and refined for decades, and which can be integrated easily into every automation environment on the basis of cross-manufacturer, open communications standards.

Our solutions guarantee safe and economical plant operation.

HIMA systems adapt to any number of I/Os, to every type of I/O, to central and distributed applications, to all availability requirements and to integration with every DCS. All HIMA systems can be used for SIL 3 applications (in accordance with IEC 61508). Our Planar4 system can be used for SIL 4 applications.



HIMatrix®

- SIL 3, PL e, SIL 4 CENELEC
- Fast, flexible, compact
- Extremely cost-effective
- Distributed applications
- Applications with just a few I/O points
- Subsea applications

HIQuad

- SIL 3
- For highest fault-tolerance requirements
- Scalable redundancy
- Central and distributed installations
- Ideal for small and mid-size applications
- Broad range of I/O modules

HIMax®

- SIL 3, PL e, SIL 4 CENELEC
- Nonstop operation
- Maximum performance
- Maximum configuration flexibility - for life
- Various mechanical concepts
- Ideal for mid-size and large applications

Planar4

- SIL 4
- Hard-wired system
- Programming: solder, Termipoint and Wire Wrap
- Extremely robust
- Scalable redundancy

Integrated safety solutions

1.6.0

Full integration with DCS operating and monitoring functions

The advantages of a HIMA solution, including nonstop operation, can be combined with all leading distributed control systems (DCS). DCS SIS integration is achieved through high-capacity, cross-manufacturer communication standards. Based on the extensive integration know-how of our DCS competence team, HIMA assumes responsibility for DCS SIS integration and provides the required functionality (ICSS by HIMA).

HIMA solutions offer features such as:

- Integration of alarms and events into the alarm management of the DCS
- Integration of faceplates for operating and monitoring
- Transfer and visualisation of diagnostic data
- Transfer and visualisation of process data and safety-related locking states
- Timestamp transfer
- Maintenance override switch (MOS)
- Partial stroke test (PST)
- Start-up bypass (SUB)

The HIMA DCS Competence Team

All leading control systems are installed at HIMA. The HIMA DCS competence team continuously tests all integration options, thoroughly documents them and develops efficient, pretested configurations. Based on this extensive integration know-how of our DCS competence team, HIMA assumes responsibility for DCS SIS integration and provides the required functionalities (ICSS by HIMA).



The integration of HIMA solutions into all leading DCS is achieved through cross-manufacturer communication standards, including:

- OPC DA and OPC A&E
- Modbus TCP master & slave
- Modbus master & slave RS 485
- PROFIBUS DP master & slave
- PROFINET
- FOUNDATION Fieldbus H1 (in conjunction with FF SIS protocol)*
- Send & Receive TCP
- HART protocol
- ComUserTask, programmable protocols

*Details are subject to change

Safety is inseparable

HIMA LIFECYCLE SERVICES

1.7.0

Comply with your legal and economic responsibilities

Anyone who is planning, constructing or operating a processing plant today is confronted with an array of new and complex laws, regulations and standards in the area of 'functional safety'. Safety considerations must, for example, be applied across the entire lifecycle of the plant and be integrated into each and every phase, from the initial analysis through project execution all the way to operation.

This new complexity, coupled with growing cost pressure and more aggressive project schedules makes it increasingly difficult for project managers to meet their legal and economic responsibilities.

In response, HIMA has developed the HIMA LIFECYCLE SERVICES concept.

We offer qualified, sophisticated and coordinated services for all phases of the safety lifecycle - an expression of our non-stop philosophy. HIMA possesses specialist safety knowledge which is often missing from today's planning and operating staff. Due to our independence, we are able to work in any project constellation: we accept both subtasks and complete projects, and work for end customers as well as part of a team with EPC, MAC and DCS manufacturers.

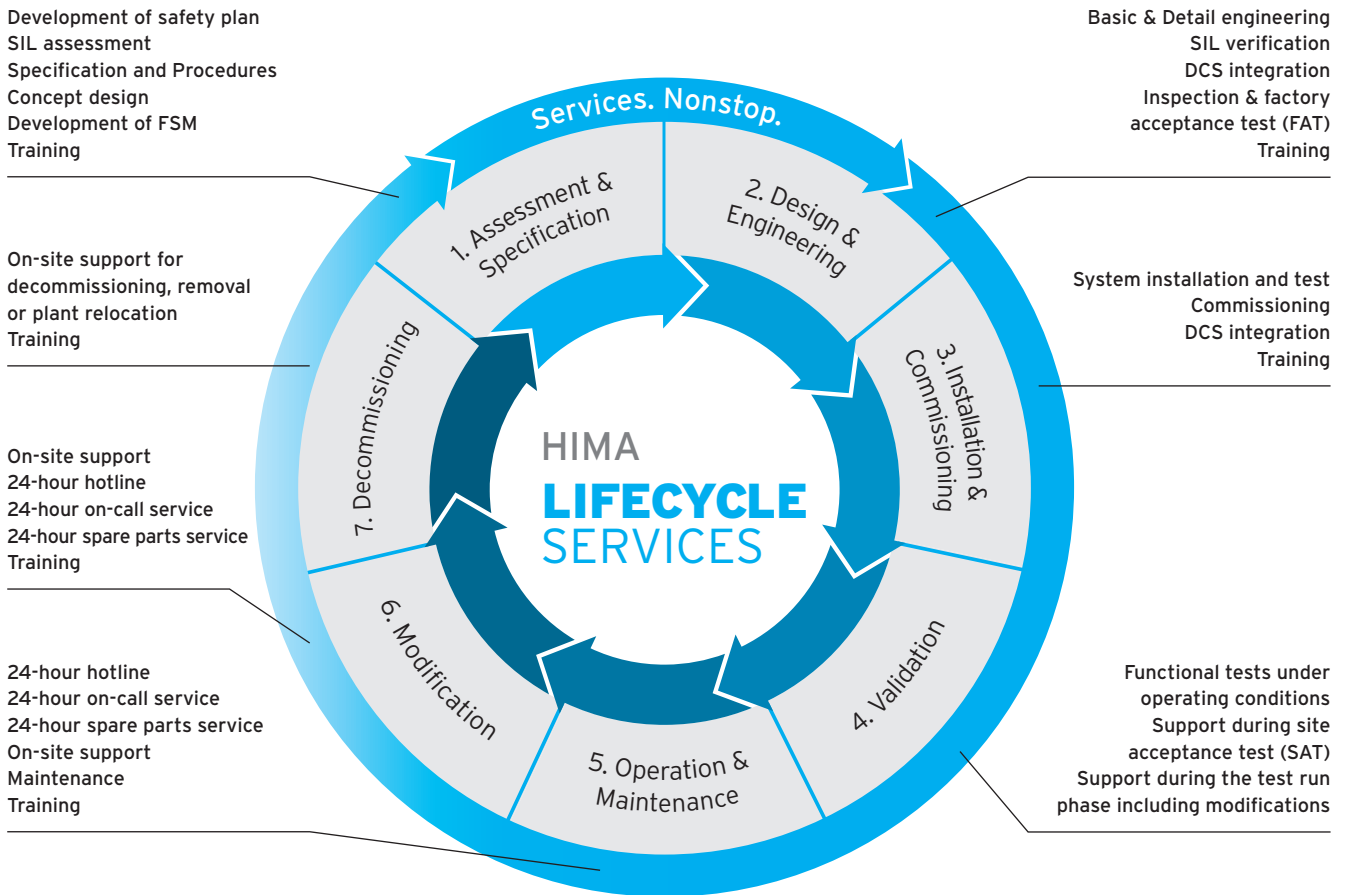
The concept provided by HIMA LIFECYCLE SERVICES offers an overview of all functional safety requirements and consistently supports the right decision at the right time.



HIMA LIFECYCLE SERVICES

The right decision at each stage

1.8.0



Benefits from these advantages:

- Full conformity with the latest standards resulting in full legal security (including IEC 61511, Seveso II Directive)
- Considerable reduction in planning and implementation errors and their negative effects on schedules and budgets
- Reduction of insurance premiums by up to 20%
- No underspending on protection ensuring that the required risk reduction is achieved
- No overspending on protection resulting in optimised capital costs
- High productivity, product quality and plant availability
- Reduced OPEX, e.g., thanks to optimised maintenance costs

Training courses

In accordance with the new safety standards, all members of a safety-critical project must provide proof of their personal qualification. HIMA offers you a comprehensive and high-quality training programme for your development, operating and maintenance personnel. You can choose between product-specific or project-specific, tailor-made training. Training can be conducted at one of the HIMA training centres or on-site at your premises. Our functional safety courses include those that lead to TÜV certification.

On location worldwide

The HIMA group

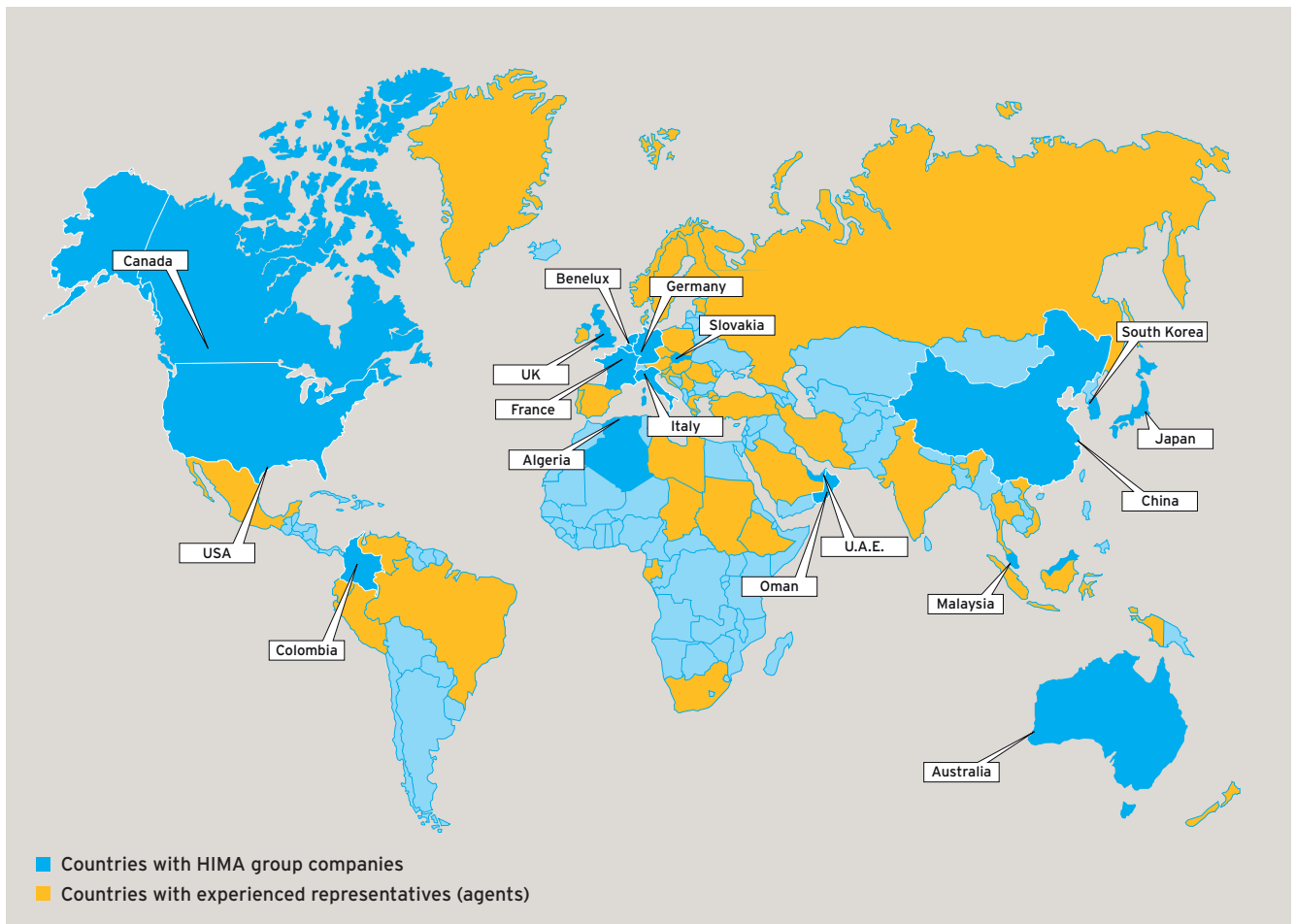
1.9.0

Our products and services are delivered worldwide through a steadily growing network of group companies, sales and service centres, and representatives. Currently, we are in more than 50 countries. Count on us to be where you need us: on location.

With HIMA, you always deal with qualified safety specialists. In addition, you know that the solution you receive will be safe and efficient and will comply with regional requirements and regulations. Safety, after all, knows no boundaries.

A detailed list of our group companies and representatives is available on our website:

<http://www.hima.com/meta/contact.php>



2 HiMatrix

The benefits in brief

| | |
|--|-------|
| Uniquely fast, uniquely flexible | 2.1.0 |
| HiMatrix overview | 2.2.0 |
| HiMatrix for extreme operating conditions | 2.3.0 |
| New features | 2.4.0 |
| Perfect networking | 2.5.0 |
| General specifications | 2.6.0 |

HIMatrix

Uniquely fast, uniquely flexible

2.1.0

HIMatrix - efficient, reliable and flexible

The safety-related controllers and remote I/O modules of the HIMatrix series were developed especially for distributed and time-critical automation concepts. The combination of one of the world's fastest safety controllers and the HIMA safety bus, safe**ethernet**, forms the basis for a range of efficient HIMatrix solutions.

The high level of performance, the compact design and easy assembly enable safety solutions to be implemented economically, reliably and extremely flexibly.

Combined with our wide range of hardware, this means that our systems can be adapted perfectly to any kind of application - thus creating more efficient solutions.

HIMatrix - the highlights

- Certified up to PL e, cat. 4, and SIL 3
- Certified according to SIL 4 CENELEC
- Response time ≤ 5 ms possible
- Cycle time for a 1K program: approx. 0.002 ms
- Safety-related networking at 100 Mbit/s on standard Ethernet
- Use of all Ethernet functions for safety-critical applications
- Integrated switch for a range of network topologies (line, tree, star) and ring structures
- For use in Ex-Zone 2
- IEC 61131-3 compliant programming with ELOP II Factory or SILworX
- Certified function blocks
- Certified to: EN 13849-1, EN 954, IEC 61508, IEC 61131, IEC 61511, ICE 62061, EN 50156, EN 54, NFPA 85, NFPA 72, ATEX



HIMatrix

Overview

2.2.0

The programmable electronic systems (PES) in the HIMatrix series are available in two different performance classes. The choice of engineering software directly determines the performance level. The other technical data for the respective HIMatrix controllers remain unchanged, irrespective of their performance level or engineering software.

The following PES can be supplied with two different operating systems and can be programmed with either ELOP II Factory or SILworX:

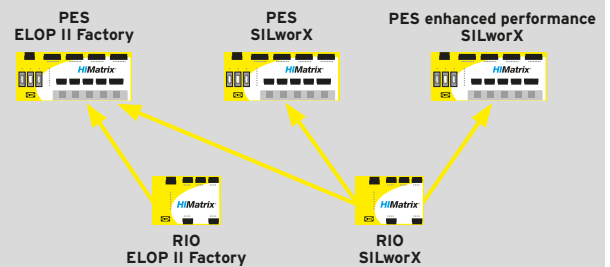
| ELOP II Factory | SILworX® |
|------------------------|----------------------|
| ▪ F20 01 | ▪ F20 01 SILworX |
| ▪ F30 01 | ▪ F30 01 SILworX |
| ▪ F31 02 | ▪ F31 02 SILworX |
| ▪ F35 | ▪ F35 SILworX |
| ▪ F60 CPU 01 | ▪ F60 CPU 01 SILworX |

The following PES with a new, more-powerful processor unit providing enhanced performance can only be programmed with SILworX:

| SILworX® |
|----------------------|
| ▪ F10 PCI |
| ▪ F30 03 SILworX |
| ▪ F31 03 SILworX |
| ▪ F35 03 SILworX |
| ▪ F60 CPU 03 SILworX |

Networking different HIMatrix releases:

All remote I/O systems with SILworX programming can be connected to all HIMatrix controllers. In contrast, remote I/O systems with ELOP II Factory programming can only be used with ELOP II Factory programmable systems.



HIMatrix-PES: nomenclature and programming

| | |
|-----------------------|--|
| FXX 01 | Programmable with ELOP II Factory, 500 kB memory each for the program and data |
| FXX 01 SILworX | Programmable with SILworX, 1,023 kB memory each for the program and data |
| FXX 03 SILworX | Enhanced performance, programmable with SILworX, 5 MB shared memory for the program and data |

HIMatrix

HIMatrix for extreme operating conditions

2.3.0

Subsea

The following HIMatrix model versions have been especially developed for subsea use at depths of up to 4,000 metres. The housing is made of V2A stainless steel. The electronic components are coated with a protective lacquer.



F35 012

Products

F35 012
F3 AIO 8/4 012

Description

| | |
|-----------------------|--|
| Housing material | V2A stainless steel |
| Operating temperature | -20 °C ... 60 °C |
| ISO 13628-6:2006 | Fulfils vibration and shock test according to levels Q1 and Q2. Fulfils stochastic vibration test, ESS (environmental stress screening). |

Rail

These safety controllers feature an extended temperature range of -25 °C to 70 °C and were developed especially for the rail sector.



F3 DIO 20/8 02

Product

F3 DIO 20/8 023

F30 014
F3 DIO 8/8 014
F35 014
F3 DIO 20/8 024
F3 AIO 8/4 014
F2 DO 16 014

Description

Salt-spray-resistant for railway and signal boxes

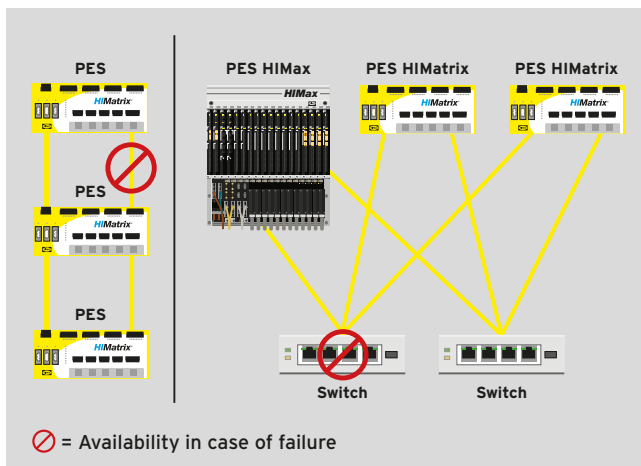
Tested for railway vehicle operating equipment. These devices are vibration- and shock-resistant in accordance with IEC 61373 Class 1B.

F10 PCI
F30 03 SILworX
F31 03 SILworX
F35 03 SILworX
F60 CPU 03 SILworX

The new HIMatrix PES programmed exclusively with SILworX (F10 PCI, F30 03 SILworX, F31 03 SILworX, F35 03 SILworX and F60 CPU 03 SILworX) provide a much higher performance level, an increased processing speed (basic cycle time of 3 ms) and a higher memory capacity. In addition, they are available with the following features:

Double communication redundancy

The new controllers listed above provide the option of setting up a safe communication, which is doubly redundant. Such a communication redundancy can have the following setup, for example:



Reload

Programs can be updated without interrupting ongoing operations. This reload function is essential with continuous processes, in particular. To protect against unwanted changes, program modifications can only be made based on the program already loaded. The system variables 'reload disabling' can be used to block a reload.

Event recording

Event recording is of importance, especially when searching for faults, because it is on that basis that the cause of a fault is determined. Each HIMatrix system can define up to 4,000 different events and store up to 1,000 events. This applies to both analog and digital information. These data are sent to other systems via OPC AE. This ensures that events can always be shown in the correct time sequence.

Multitasking

The HIMatrix multitasking operating system lets you run up to 32 independent user programs in one system. Each program has its own safety-related checksum. This means that a section of the system can be overhauled or extended without affecting the other programs. HIMatrix's multitasking capacity enables use of individual programs with their own cycle times. This, in turn, allows you to integrate slower parts of the plant (such as a burner management system) and time-critical areas (such as turbo machinery control) with the central HIMatrix system. It also means that fixed cycle times are possible for every application.

With its multitasking capacity, the HIMatrix system demonstrates just how efficient and economical a modern safety system can be.

HIMatrix

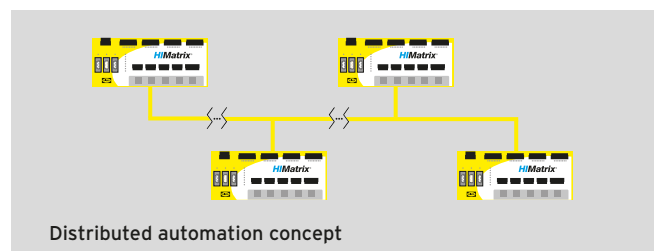
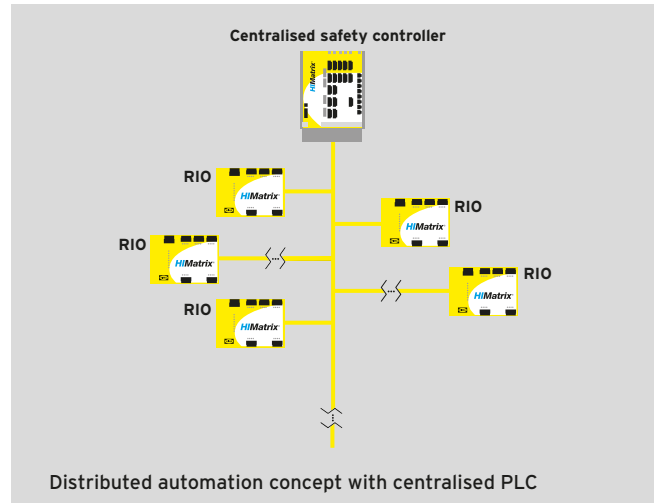
Perfect networking

2.5.0

Systematic safety

HIMatrix can be used to implement distributed automation concepts with only one centralised controller. All signals can be connected on-site via remote I/O modules. Alternatively, one can efficiently implement distributed automation concepts with networked safety controllers. Higher-level controller functions are performed by any HIMatrix safety controller within the network.

Both automation concepts can be flexibly combined and extended - at any point in time. The connection to HIMax is also supported. **safeethernet** allows safe and non-safe data to be integrated in a standard Ethernet network - without limiting safety. The number of buses to be installed is reduced; the time-consuming installation of a separate safety bus is no longer required.



HIMatrix - for comprehensive integration

Safety systems must not only be safe, reliable and efficient, but also be able to be seamlessly integrated with control systems and other automation components. HIMA has implemented the interconnection to every visual display system and other automation components, and considers itself as integral component of these systems.

The HIMatrix controllers can safely communicate in PL e, cat. 4 and SIL 3 via Ethernet. Additionally, numerous proven industrial protocols are available to ensure optimal integration in the overall controller concept. In this scenario, both Ethernet and field buses can be used.

HIMatrix - Communication options

- **safeethernet**
- OPC (DA + A&E)
- Modbus TCP (Master and Slave)
- PROFINET IO (Controller and Device)
- PROFIsafe (F-Host and F-Device for PROFINET IO)
- EtherNet/IP (Originator and Target)
- Send & Receive TCP
- PROFIBUS DP (Master and Slave)
- Modbus RTU (Master and Slave)
- INTERBUS Master
- ComUserTask
- SNTP

Cable connection

- Power supply: 2.5 mm²
- Clamp terminals: 1.5 mm²
- Screw terminal connector blocks included within the scope of delivery

Operating principles

- Operating principles
- De-energize-to-trip principle
- Energize-to-trip principle for F35, F60 and F3 AIO 8/4 01

Behaviour in the event of short-circuit or overload on outputs

- If the total current is exceeded: all outputs are switched off
- If channel current is exceeded: the affected output is switched off
- Each output is switched on again cyclically

Integrated ethernet switch

- Auto crossover
- Configurable (speed, flow control, broadcast limiter)

Communication

HIMatrix is a system that is designed for high-performance open communication. It supports both safe communication up to SIL 3/PL e (safe**ethernet**) as well as the most common non-secure industrial protocols for connecting to external systems (see HIMatrix communication).

Proof test interval in accordance with IEC 61511

- 10 years (the next interval begins when the components are restarted)
- 3 years for relay modules

Service life according to EN ISO (PL e) 13849

- 20 years
- 3 years for relay modules

Programming

- Function Block Diagram (FBD)
- Sequential Function Chart (SFC)

Program update possible for:

- Controllers in STOP state
- Controllers with enhanced performance in RUN state

Calculation values for safety

Available upon request

Program update

Possible for controllers in the STOP state

Forcing

Possible at any time, if permitted in the user program

Online test

Possible at any time

Diagnosis

- State variables
- Evaluation of other diagnosis data in ELOP II Factory or SILworX

Standards met

- EN ISO 13849 (PL e)
- EN 954-1:1969 (Cat. 4)
- EN 62061 (SIL 3)
- IEC 61511:2004 (SIL 3)
- IEC 61508 Parts 1-7:2000 (SIL 3)
- EN 12067-2:2004, EN 198:203, EN 230:1990
- NFPA 85:2001
- DIN VDE 0116:1989, EN 50156-1:2004
- EMC Directive 89/336/EEC
- Ex-Directive 94/9/EG, EN 1127-1
- EN 54-2:1997, NFPA 72:2002: F35, F60, F3 AIO 8/4 01
- Lloyd's Register, UL, FM Approvals: see manual
- SIL 4 according to CENELEC

Operating requirements

- EN 61131-2 (2003) PLC standard (Zone B)
- EN 61000-6-2:2001 EMC immunity, for industrial environments
- EN 61000-6-4:2001 EMC emission, for industrial environments

Rail standards

- EN 50126 (SIL 4)
- EN 50128 (SIL 4)
- EN 50129 (SIL 4)
- EN 50159-1
- EN 61373 Category 1 Class B

3 Compact systems PES

Efficient distributed safety systems

| | |
|---------|-------|
| F35 | 3.1.0 |
| F31 | 3.2.0 |
| F30 | 3.3.0 |
| F20 | 3.4.0 |
| F10 PCI | 3.5.0 |



24DI 8AI 2CNT 8DO 3FB 4TX

HIMatrix® F35

3.1.0

HIMatrix F35, 24 digital and 8 analog inputs, 2 counter inputs, 8 digital outputs, add. 4 port-switch
100 Base-Tx with safe**ethernet**, SIL 3/Cat. 4/PL e

Specifications, Dimensions and Weight

| | |
|--------------------------------|--|
| Dimensions | 257 mm x 114 mm x 97 mm (WxHxD) |
| Weight approx. | 1200 g |
| Mounting | Horizontal on 35 mm DIN rail |
| Minimum distances | 20 mm horizontally, 100 mm vertically (keep the ventilation slots free) |
| Power supply | 24 VDC, -15% ... +20%, power supply unit with safe isolation in accordance with IEC 61131-2 (SELV, PELV) |
| Power consumption | 12 W idle; 216 W max. |
| External fuse | 10 A time-lag |
| Digital inputs | 24 (no electrical isolation) |
| Input level | Configurable |
| Sensor supply LS+ | 3 x 20 V / 100 mA - short-circuit-proof |
| Analog inputs | 8 (unipolar, no electrical isolation) |
| Accuracy intrinsic errors | ±0.1% (25 °C) |
| Accuracy operating errors | ±0.5% (60 °C) |
| Safety-related accuracy | 2% |
| Nominal value/operating value | Related to L- 0 ... 10 VDC / -0.1 ... 11.5 VDC 0 ... 20 mA / -0.4 ... 23 mA (at 500 Ω) |
| Resolution A/D converter / eff | 12 bit / 9 bit |
| Transmitter supply | 8 x 24 V ≤ 46 mA - short-circuit-proof |
| Digital outputs | 8 (no electrical isolation) |
| Output current | 0.5 A (channels 4 and 8: 1 A at 60 °C, 2 A at 50 °C) |
| Counters | 2 (no electrical isolation) |
| Inputs | 3 (A, B, C), 5 V or 24 V each |
| Frequency | 0 ... 100 kHz |

[continued on back page]

Specifications, Dimensions and Weight (continued from F35)

| | |
|--|--------------------------------------|
| Number of switch ports | 4 (RJ-45, 10/100 Mbit/s) |
| Number of fieldbus interfaces | 3 (see the description of protocols) |
| RS485 for Modbus | Fixed on FB3 |
| Type of protection | IP20 |
| Operating temperature | 0 ... 60 °C |
| Storage temperature | -40 °C ... +85 °C |
| Use in Ex-Zone | Ex II 3 G EEx nA II T4 X |
| Use above sea level ≤ 2000 m a.s.l. | Without restrictions |
| > 2000 ≤ 4000 m a.s.l. at max. 50 °C | Digital outputs max. 0.5 A |

Accessories to F35

| Product | Part number | Description |
|---------------|-------------------|--|
| Z 7301 | 98 2220059 | External shunt adapter for current measurement 250 Ω for 2 analog inputs |
| Z 7302 | 98 2220067 | External shunt adapter for current measurement 500 Ω for 2 analog inputs |
| Z 7306 | 98 2220115 | External shunt adapter for current measurement 250 Ω for 2 analog inputs with HART rejection and short-circuit protection |
| Z 7308 | 98 2220137 | External shunt adapter for current measurement Voltage divider, over voltage protection |

| Product | ELOP II Factory | SILworX | Description |
|----------------|-------------------|-------------------|---|
| F35 01 | 98 2200416 | 98 2200473 | - |
| F35 03 | - | 98 2200497 | Enhanced performance |
| F35 011 | 98 2200453 | 98 2200476 | Operation temperature -20 °C ... 60 °C |
| F35 012 | 98 2200454 | 98 2200477 | Operation temperature -20 °C ... 60 °C, cabinet material stainless steel V2A, vibration and shock test: ISO 13628-6:2006 Level Q1 and Q2, random vibration test, ESS (environmental stress screening), dimensions of mounting plate 200 mm x 136 mm x 6 mm (WxHxD), weight approx. 1700g |
| F35 014 | 98 2200511 | 98 2200510 | Operation temperature -25 °C ... 70 °C, shock resistance due to IEC 61373 Class 1B for trans- portation and mobile applications |



20DI 8DO TO 4TX

HIMatrix[®] F31

3.2.0

HIMatrix F31, 20 digital inputs configurable with line control, 8 digital outputs, add. 4 port-switch
100 Base-Tx with safe**ethernet**, SIL 3/Cat. 4/PL e

Specifications, Dimensions and Weight

| | |
|--------------------------------------|--|
| Dimensions | 257 mm x 114 mm x 66 mm (WxHxD) |
| Weight approx. | 1200 g |
| Mounting | Horizontal on 35 mm DIN rail |
| Minimum distances | 20 mm horizontally, 100 mm vertically (keep the ventilation slots free) |
| Power supply | 24 VDC, -15% ... +20%, power supply unit with safe isolation in accordance with IEC 61131-2 (SELV, PELV) |
| Power consumption | 12 W idle; 192 W max. |
| External fuse | 10 A time-lag |
| Digital inputs | 20 (no electrical isolation) |
| Input level | Low: ≤ 5 V; High: 15 ... 30 V |
| Sensor supply LS+ | 5 x 20 V/100 mA - short-circuit-proof |
| Digital outputs | 8 (no electrical isolation) |
| Output current | 0.5 A (channels 4 and 8: 1 A at 60 °C, 2 A at 50 °C) |
| Pulsed outputs for line monitoring | Each digital output can be used (time configurable) |
| Number of switch ports | 4 (RJ-45, 10/100 Mbit/s) |
| Number of fieldbus interfaces | 0 |
| Type of protection | IP20 |
| Operating temperature | 0 ... 60 °C |
| Storage temperature | -40 °C ... +85 °C |
| Use in Ex-Zone | Ex II 3 G EEx nA II T4 X |
| Use above sea level | Without restrictions |
| ≤ 2000 m a.s.l. | |
| > 2000 ≤ 4000 m a.s.l. at max. 50 °C | Digital outputs max. 0.5 A |

[continued on back page]

Accessories to F31

| Product | Part number | Description |
|---------|-------------|--|
| Z 7303 | 98 2220077 | Filter for light curtain ESPE (electro-sensitive protective equipment) For 4 digital input channels, IP20 |
| Z 7310 | 982200518 | Filter for door switch "Euchner MGB-L" For 4 digital input channels |

| Product | ELOP II Factory | SILworX | Description |
|---------|-----------------|------------|----------------------|
| F31 02 | 98 2200420 | 98 2200475 | - |
| F31 03 | - | 98 2200498 | Enhanced performance |



20DI 8DO TO 3FB 4TX

HIMatrix[®] F30

3.3.0

HIMatrix F30, 20 digital inputs configurable with line control, 8 digital outputs, add. 4 port-switch
100 Base-Tx with safe**ethernet**, SIL 3/Cat. 4/PL e

Specifications, Dimensions and Weight

| | |
|------------------------------------|--|
| Dimensions | 257 mm x 114 mm x 66 mm (WxHxD) |
| Weight approx. | 1200 g |
| Mounting | Horizontal on 35 mm DIN rail |
| Minimum distances | 20 mm horizontally, 100 mm vertically (keep the ventilation slots free) |
| Power supply | 24 VDC, -15% ... +20%, power supply unit with safe isolation in accordance with IEC 61131-2 (SELV, PELV) |
| Power consumption | 12 W idle; 192 W max. |
| External fuse | 10 A time-lag |
| Digital inputs | 20 (no electrical isolation) |
| Input level | Low: ≤ 5 V; High: 15 ... 30 V |
| Sensor supply LS+ | 5 x 20 V/100 mA - short-circuit-proof |
| Digital outputs | 8 (no electrical isolation) |
| Output current | 0.5 A (channels 4 and 8: 1 A at 60 °C, 2 A at 50 °C) |
| Pulsed outputs for line monitoring | Each digital output can be used (time configurable) |
| Number of switch ports | 4 (RJ-45, 10/100 Mbit/s) |
| Number of fieldbus interfaces | 3 (see the description of protocols) |
| RS485 for Modbus | Fixed on FB3 |
| Type of protection | IP20 |
| Operating temperature | 0 ... 60 °C |
| Storage temperature | -40 °C ... +85 °C |
| Use in Ex-Zone | Ex II 3 G EEx nA II T4 X |
| Use above sea level | |
| ≤ 2000 m a.s.l. | Without restrictions |
| ≤ 4000 m a.s.l. at max. 50 °C | Digital outputs max. 0.5 A |

[continued on back page]

Accessories to F30

| Product | Part number | Description |
|---------|-------------|--|
| Z 7303 | 98 2220077 | Filter for light curtain ESPE (electro-sensitive protective equipment) For 4 digital input channels, IP20 |
| Z 7310 | 982200518 | Filter for door switch "Euchner MGB-L" For 4 digital input channels |

| Product | ELOP II Factory | SILworX | Description |
|---------|-----------------|------------|--|
| F30 01 | 98 2200415 | 98 2200472 | - |
| F30 03 | - | 98 2200496 | Enhanced performance |
| F30 011 | 98 2200455 | 98 2200478 | Operation temperature -20 °C ... 60 °C |



8DI/DO 4TO 2FB 2TX

HIMatrix® F20

3.4.0

HIMatrix F20, 4 digital Outputs for line control, 8 connectors free configurable as digital in- or output, integrated 2 port-switch 100 Base-Tx and safe**ethernet**, SIL 3/Cat. 4/PL e

Specifications, Dimensions and Weight

| | |
|---|--|
| Dimensions | 95 mm x 114 mm x 140 mm (WxHxD) |
| Weight approx. | 750 g |
| Mounting | Horizontal on 35 mm DIN rail |
| Minimum distances | 20 mm horizontally, 100 mm vertically (keep the ventilation slots free) |
| Power supply | 24 VDC, -15% ... +20%, power supply unit with safe isolation in accordance with IEC 61131-2 (SELV, PELV) |
| Power consumption | 12 W idle; 192 W max. |
| External fuse | 10 A time-lag |
| Digital inputs | 8 (individually configurable as input or output, no electrical isolation) |
| Input level | Low: ≤ 5 V; High: 15 ... 30 V |
| Sensor supply LS+ | 2 x 20 V/100 mA - short-circuit-proof |
| Digital outputs | See „digital inputs“ |
| Output current | 0.5 A (channels 4 and 8: 1 A at 60 °C, 2 A at 50 °C) |
| Pulsed outputs for line monitoring | 4 additional (time configurable) Max. 60 mA - short-circuit-proof |
| Number of switch ports | 2 (RJ-45, 10/100 Mbit/s) |
| Number of fieldbus interfaces | 2 (see the description of protocols) |
| RS485 for Modbus | Fixed on FB2 |
| Type of protection | IP20 |
| Operating temperature | 0 ... 60 °C |
| Storage temperature | -40 °C ... +85 °C |
| Use in Ex-Zone | Ex II 3 G EEx nA II T4 X |
| Use above sea level | |
| ≤ 2000 m a.s.l. | Without restrictions |
| $> 2000 \leq 4000$ m a.s.l. at max. 50 °C | Digital outputs max. 0.5 A |

[continued on back page]

Accessories to F20

| Product | Part number | Description |
|---------|-------------|--|
| Z 7303 | 98 2220077 | Filter for light curtain ESPE (electro-sensitive protective equipment) For 4 digital input channels, IP20 |
| Z 7310 | 982200518 | Filter for door switch "Euchner MGB-L" For 4 digital input channels |

| Product | ELOP II Factory | SILworX | Description |
|---------|-----------------|------------|-------------|
| F20 01 | 98 2200417 | 98 2200474 | - |



4TX

HIMatrix® F10 PCI

3.5.0

HIMatrix F10, integrated 4 port-switch 100 Base-Tx and safe**ethernet**, SIL 3/Cat. 4/PL e

Specifications, Dimensions and Weight

| | |
|--|--|
| Dimensions | 107 mm x 168 mm (WxH) |
| Weight approx. | 184 g |
| Mounting | Be freely |
| Power supply | 24 VDC, -15% ... +20%, Power supply unit with safe isolation in accordance with IEC 61131-2 (SELV, PELV) |
| Power consumption | 8.7 W |
| External fuse | 10 A time-lag |
| Number of switch ports | 4 (RJ-45, 10/100 Mbit/s) |
| Type of protection | IP00 |
| Operating temperature | 0 ... 45 °C |
| Storage temperature | -40 °C ... +85 °C |
| Use above sea level ≤ 2000 m a.s.l. | Without restrictions |

| Product | ELOP II Factory | SILworX | Description |
|---------|-----------------|------------|----------------------|
| F10 PCI | - | 98 2200469 | Enhanced performance |

4 Compact systems Remote IO

Maximum safety on site

| | |
|----------------|-------|
| F1 DI 16 01 | 4.1.0 |
| F2 DO 16 01 | 4.2.0 |
| F2 DO 16 02 | 4.3.0 |
| F2 DO 8 01 | 4.4.0 |
| F2 DO 4 01 | 4.5.0 |
| F3 DIO 8/8 01 | 4.6.0 |
| F3 DIO 16/8 01 | 4.7.0 |
| F3 DIO 20/8 02 | 4.8.0 |
| F3 AIO 8/4 01 | 4.9.0 |



16DI 4TO 2TX

HIMatrix® F1 DI 16 01

4.1.0

Remote I/O device, 16 digital inputs configurable with line control, 4 clock outputs for input line control, add. 2 port-switch 100 Base-Tx with safeethernet, SIL 3/Cat. 4/PL e

Specifications, Dimensions and Weight

| | |
|--------------------------------------|--|
| Dimensions | 152 mm x 114 mm x 66 mm (WxHxD) |
| Weight approx. | 700 g |
| Mounting | Horizontal on 35 mm DIN rail |
| Minimum distances | 20 mm horizontally, 100 mm vertically (keep the ventilation slots free) |
| Power supply | 24 VDC, -15% ... +20%, power supply unit with safe isolation in accordance with IEC 61131-2 (SELV, PELV) |
| Power consumption | 19.2 W max. |
| External fuse | 10 A time-lag |
| Digital inputs | 16 (no electrical isolation) |
| Input level | Low: ≤ 5 V; High: 15 ... 30 V |
| Sensor supply LS+ | 4 x 19.2 V/40 mA - short-circuit-proof |
| Pulsed outputs for line monitoring | 4 (time configurable) Max. 60 mA - short-circuit-proof |
| Number of switch ports | 2 (RJ-45, 10/100 Mbit/s) |
| Type of protection | IP20 |
| Operating temperature | 0 ... 60 °C |
| Storage temperature | -40 °C ... +85 °C |
| Use in Ex-Zone | Ex II 3 G EEx nA II T4 X |
| Use above sea level | |
| ≤ 2000 m a.s.l. | Without restrictions |
| > 2000 ≤ 4000 m a.s.l. at max. 50 °C | Without restrictions |

Accessories to F1 DI 16 01

| Product | Part number | Description |
|---------|-------------|--|
| Z 7303 | 98 2220077 | Filter for light curtain ESPE (electro-sensitive protective equipment) For 4 digital input channels, IP20 |
| Z 7310 | 982200518 | Filter for door switch "Euchner MGB-L" For 4 digital input channels |

| Product | ELOP II Factory | SILworX | Description |
|--------------|-----------------|------------|--|
| F1 DI 16 01 | 98 2200405 | 98 2200479 | - |
| F1 DI 16 011 | 98 2200456 | 98 2200488 | Operation temperature -20 °C ... 60 °C |



16DO (2A) 2TX

HIMatrix® F2 DO 16 01

4.2.0

Remote I/O device, 16 digital outputs 24 VDC with 1 A, add. 2 port-switch, 100 Base-Tx with safe**ethernet**, SIL 3/Cat. 4/PL e

Specifications, Dimensions and Weight

| | |
|--------------------------------------|--|
| Dimensions | 207 mm x 114 mm x 66 mm (WxHxD) |
| Weight approx. | 850 g |
| Mounting | Horizontal on 35 mm DIN rail |
| Minimum distances | 20 mm horizontally, 100 mm vertically (keep the ventilation slots free) |
| Power supply | 24 VDC, -15% ... +20%, power supply unit with safe isolation in accordance with IEC 61131-2 (SELV, PELV) |
| Power consumption | 9.6 W idle; 432 W max. |
| External fuse | 10 A time-lag each group |
| Digital outputs | 16 (no electrical isolation) 2 groups with 8 DO each The groups are separately supplied |
| Output current | Max. 1 A at 60°, max. 2 A at 40° |
| Lamp load | Max. 10 W at 1 A Max. 25 W at 2 A |
| Inductive load | Max. 500 mH |
| Number of switch ports | 2 (RJ-45, 10/100 Mbit/s) |
| Type of protection | IP20 |
| Operating temperature | 0 ... 60 °C |
| Storage temperature | -40 °C ... +85 °C |
| Use in Ex-Zone | Ex II 3 G EEx nA II T4 X |
| Use above sea level | Without restrictions |
| ≤ 2000 m a.s.l. | Without restrictions |
| > 2000 ≤ 4000 m a.s.l. at max. 50 °C | Without restrictions |

| Product | ELOP II Factory | SILworX | Description |
|--------------|-----------------|------------|---|
| F2 DO 16 01 | 98 2200406 | 98 2200480 | - |
| F2 DO 16 014 | 98 2200517 | 98 2200516 | Operation temperature -25 °C ... 70 °C, shock resistance due to IEC 61373 Class 1B for transportation and mobile applications |



8DO (Relais) 2TX

HIMatrix® F2 DO 8 01

4.4.0

Remote I/O device, 8 relay outputs to 250 VAC/ DC, add. 2 port-switch 100 Base-Tx with safe**ethernet**, SIL 3/Cat. 4/PL e

Specifications, Dimensions and Weight

| | |
|--|--|
| Dimensions | 207 mm x 114 mm x 86 mm (WxHxD) |
| Weight approx. | 1300 g |
| Mounting | Horizontal on 35 mm DIN rail |
| Minimum distances | 20 mm horizontally, 100 mm vertically (keep the ventilation slots free) |
| Power supply | 24 VDC, -15% ... +20%, power supply unit with safe isolation in accordance with IEC 61131-2 (SELV, PELV) |
| Power consumption | 14.4 W max. |
| External fuse | 10 A time-lag |
| Relay outputs | 8 potential-free NOC |
| Switching voltage | $\geq 5 \text{ V}$, $\leq 250 \text{ VAC}/250 \text{ VDC}$ |
| Switching current | $\geq 10 \text{ mA}$, $\leq 3 \text{ A}$ Internally fused with 3.15 A Fuse interrupting capacity: 100 A |
| Switching capacity AC UL | 250 VAC at 6 A GP |
| Switching capacity AC TÜV (max.) | 250 VA, $\cos\phi \geq 0.5$ at 250 VAC max. 625 VA, $\cos\phi = 1$ at 250 VAC max. |
| Switching capacity DC non-inductive UL | 24 VDC at 1 A ohmic load |
| TÜV | Up to 30 VDC: max. 90 W (3.15 A) Up to 70 VDC: max. 22 W (0.315 A) Up to 127 VDC: max. 25 W (0.25 A) Up to 250 VDC: max. 40 W (0.16 A) (Adapt external fuse) |
| Switching time | ~ 30 ms |
| Reset time | ~ 10 ms |
| Bounce time | ~ 15 ms |
| Mechanical product life | $\geq 3 \times 10^6$ switching operations |
| Electrical product life | $\geq 2.5 \times 10^5$ cycles (with ohmic full load and ≤ 0.1 cycles per second) |

[continued on back page]

Specifications, Dimensions and Weight (continued from F2 DO 8 01)

| | |
|------------------------|---------------------------|
| Number of switch ports | 2 (RJ-45, 10/100 Mbit/s) |
| Type of protection | IP20 |
| Operating temperature | 0 ... 60 °C |
| Storage temperature | -40 °C ... +85 °C |
| Use in Ex-Zone | Ex II 3 G EEx nC IIC T4 X |
| Use above sea level | ≤ 2000 m a.s.l. |

| Product | ELOP II Factory | SILworX | Description |
|-------------------|------------------------|-------------------|--------------------|
| F2 DO 8 01 | 98 2200407 | 98 2200481 | - |



4DO (5A) 2TX

HIMatrix® F2 DO 4 01

4.5.0

Remote I/O device, 4 digital power outputs 24 VDC with 5 A, add. 2 port-switch 100 Base-Tx with safe**ethernet**, SIL 3/Cat. 4/PL e

Specifications, Dimensions and Weight

| | |
|--------------------------------------|--|
| Dimensions | 152 mm x 114 mm x 66 mm (WxHxD) |
| Weight approx. | 800 g |
| Mounting | Horizontal on 35 mm DIN rail |
| Minimum distances | 20 mm horizontally, 100 mm vertically (keep the ventilation slots free) |
| Power supply | 24 VDC, -15% ... +20%, power supply unit with safe isolation in accordance with IEC 61131-2 (SELV, PELV) |
| Power consumption | 12 W idle; 492 W max. |
| External fuse | 10 A time-lag per output |
| Digital outputs | 4 (no electrical isolation) each separately supplied |
| Output current | Max. 5 A |
| Lamp load | Max. 60 W |
| Inductive load | Max. 500 mH |
| Voltage drop | Max. 1 V at 5 A |
| Number of switch ports | 2 (RJ-45, 10/100 Mbit/s) |
| Type of protection | IP20 |
| Operating temperature | 0 ... 60 °C |
| Storage temperature | -40 °C ... +85 °C |
| Use in Ex-Zone | Ex II 3 G EEx nA II T4 X |
| Use above sea level | |
| ≤ 2000 m a.s.l. | Without restrictions |
| > 2000 ≤ 4000 m a.s.l. at max. 50 °C | Without restrictions |

| Product | ELOP II Factory | SILworX | Description |
|------------|-----------------|------------|-------------|
| F2 DO 4 01 | 98 2200408 | 98 2200482 | - |



8DI 6DO 2DO (Two-pole switching) 2TO 2TX

HIMatrix® F3 DIO 8/8 01

4.6.0

Remote I/O device, 8 digital inputs configurable with line control, 6 digital outputs, 2 digital 2 pole outputs, add. 2 port-switch 100 base-Tx with safe**ethernet**, SIL 3/Cat. 4/PL e

Specifications, Dimensions and Weight

| | |
|------------------------------------|--|
| Dimensions | 152 mm x 114 mm x 66 mm (WxHxD) |
| Weight approx. | 1000 g |
| Mounting | Horizontal on 35 mm DIN rail |
| Minimum distances | 20 mm horizontally, 100 mm vertically (keep the ventilation slots free) |
| Power supply | 24 VDC, -15% ... +20%, power supply unit with safe isolation in accordance with IEC 61131-2 (SELV, PELV) |
| Power consumption | 9.6 W idle; 192 W max. |
| External fuse | 10 A time-lag |
| Digital inputs | 8 (no electrical isolation) |
| Input level | Low: ≤ 5 V; High: 15 ... 30 V |
| Sensor supply LS+ | 2 x 20 V/100 mA - short-circuit-proof |
| Digital outputs | 6 (no electrical isolation) |
| One-pole switching | |
| Digital outputs | 2 (no electrical isolation) |
| Two-pole switching | |
| Output current DO+ | 0.5 A (Channels 4 and 8: 1 A at 60 °C, 2 A at 40 °C) |
| Output current DO- | 1 A at 60 °C, 2 A at 40 °C |
| Total current | Max. 7 A |
| Lamp load | Max. 10 W Channels 4 and 8 and DO- max. 25 W |
| Inductive load | Max. 500 mH |
| Line break | > 4 k Ω |
| Line short-circuit | < 10 Ω |
| Pulsed outputs for line monitoring | 2 (no electrical isolation) Max. 60 mA - short-circuit-proof |

[continued on back page]

Specifications, Dimensions and Weight (continued from F3 DIO 8/8 01)

| | |
|--|----------------------------|
| Number of switch ports | 2 (RJ-45, 10/100 Mbit/s) |
| Type of protection | IP20 |
| Operating temperature | 0 ... 60 °C |
| Storage temperature | -40 °C ... +85 °C |
| Use in Ex-Zone | Ex II 3 G EEx nA II T4 X |
| Use above sea level ≤ 2000 m a.s.l. | Without restrictions |
| > 2000 ≤ 4000 m a.s.l. at max. 50 °C | Digital outputs max. 0.5 A |

Accessories to F3 DIO 8/8 01

| Product | Part number | Description |
|---------------|-------------------|--|
| Z 7303 | 98 2220077 | Filter for light curtain ESPE (electro-sensitive protective equipment) For 4 digital input channels, IP20 |
| Z 7310 | 982200518 | Filter for door switch "Euchner MGB-L" For 4 digital input channels |

| Product | ELOP II Factory | SILworX | Description |
|-----------------------|-------------------|-------------------|--|
| F3 DIO 8/8 01 | 98 2200425 | 98 2200487 | - |
| F3 DIO 8/8 014 | 98 2200492 | 98 2400400 | Operation temperature -25 °C ... 70 °C, shock resistance due to IEC 61373 Class 1B for transportation and mobile applications |



16DI 8DO (2-polig) 2TO 2TX

HIMatrix® F3 DIO 16/8 01

4.7.0

Remote I/O device, 16 digital inputs configurable with line control, 8 digital 2 pole outputs, add. 2 portswitch 100 base-Tx with safe**ethernet**, SIL 3/Cat. 4/PL e

Specifications, Dimensions and Weight

| | |
|---|--|
| Dimensions | 205 mm x 114 mm x 88 mm (WxHxD) |
| Weight approx. | 1300 g |
| Mounting | Horizontal on 35 mm DIN rail |
| Minimum distances | 20 mm horizontally, 100 mm vertically (keep the ventilation slots free) |
| Power supply | 24 VDC, -15% ... +20%, power supply unit with safe isolation in accordance with IEC 61131-2 (SELV, PELV) |
| Power consumption | 10.8 W idle; 264 W max. |
| External fuse | 12 A time-lag |
| Digital inputs | 16 (no electrical isolation) |
| Input level | Low: ≤ 5 V; High: 15 ... 30 V |
| Sensor supply LS+ | 4 x 20 V/40 mA - short-circuit-proof, 20 ms buffer 2 x 22 V/1 mA - short-circuit-proof |
| Digital outputs | 8 (no electrical isolation) |
| Two-pole switching | |
| Output current | Max. 2 A at 40 °C; max. 1 A at 60 °C |
| Total current | Max. 8 A |
| Lamp load | Max. 25 W |
| Inductive load | Max. 500 mH |
| Line break | > 4 k Ω |
| Line short-circuit | < 10 Ω |
| Pulsed outputs for line monitoring | 2 (no electrical isolation) Max. 60 mA - short-circuit-proof |
| Number of switch ports | 2 (RJ-45, 10/100 Mbit/s) |
| Type of protection | IP20 |
| Operating temperature | 0 ... 60 °C |
| Storage temperature | -40 °C ... +85 °C |
| Use in Ex-Zone | Ex II 3 G EEx nA II T4 X |
| Use above sea level | |
| ≤ 2000 m a.s.l. | Without restrictions |
| $> 2000 \leq 4000$ m a.s.l. at max. 50 °C | Digital outputs max. 0.5 A |

[continued on back page]

Accessories to F3 DIO 16/8 01

| Product | Part number | Description |
|---------|-------------|--|
| Z 7307 | 98 2220127 | Filter for light curtain ESPE (electro-sensitive protective equipment) For 4 digital input channels, IP20 |

| Product | ELOP II Factory | SILworX | Description |
|----------------|-----------------|------------|-------------|
| F3 DIO 16/8 01 | 98 2200423 | 98 2200486 | - |



20DI 8D0T0 2TX

HIMatrix® F3 DIO 20/8 02

4.8.0

Remote I/O device, 20 digital inputs configurable with line control, 8 digital outputs, add. 2 port-switch 100 Base-Tx with safe**ethernet**, SIL 3/Cat. 4/PL e

Specifications, Dimensions and Weight

| | |
|---|--|
| Dimensions | 207 mm x 114 mm x 66 mm (WxHxD) |
| Weight approx. | 1000 g |
| Mounting | Horizontal on 35 mm DIN rail |
| Minimum distances | 20 mm horizontally, 100 mm vertically (keep the ventilation slots free) |
| Power supply | 24 VDC, -15% ... +20%, power supply unit with safe isolation in accordance with IEC 61131-2 (SELV, PELV) |
| Power consumption | 9.6 W idle; 192 W max. |
| External fuse | 10 A time-lag |
| Digital inputs | 20 (no electrical isolation) |
| Input level | Low: ≤ 5 V; High: 15 ... 30 V |
| Sensor supply LS+ | 5 x 20 V/100 mA - short-circuit-proof |
| Digital outputs | 8 (no electrical isolation) |
| Output current | 0.5 A (channels 4 and 8: 1 A at 60 °C, 2 A at 50 °C) |
| Pulsed outputs for line monitoring | Each of the 8 digital outputs can be used (time configurable) Max. 60 mA - short-circuit-proof |
| Number of switch ports | 2 (RJ-45, 10/100 Mbit/s) |
| Type of protection | IP20 |
| Operating temperature | 0 ... 60 °C |
| Storage temperature | -40 °C ... +85 °C |
| Use in Ex-Zone | Ex II 3 G EEx nA II T4 X |
| Use above sea level | |
| ≤ 2000 m a.s.l. | Without restrictions |
| $> 2000 \leq 4000$ m a.s.l. at max. 50 °C | Digital outputs max. 0.5 A |

[continued on back page]

Accessories to F3 DIO 20/8 02

| Product | Part number | Description |
|---------|-------------|--|
| Z 7303 | 98 2220077 | Filter for light curtain ESPE (electro-sensitive protective equipment) For 4 digital input channels, IP20 |
| Z 7310 | 982200518 | Filter for door switch "Euchner MGB-L" For 4 digital input channels |

| Product | ELOP II Factory | SILworX | Description |
|-----------------|-----------------|------------|--|
| F3 DIO 20/8 02 | 98 2200404 | 98 2200484 | - |
| F3 DIO 20/8 021 | 98 2200459 | 98 2200490 | Operation temperature -20 °C ... 60 °C |
| F3 DIO 20/8 023 | 98 2200462 | 98 2400401 | Operation temperature -25 °C ... 70 °C salty fog resistance according to IEC 60068-2-11 |
| F3 DIO 20/8 024 | 98 2200513 | 98 2200512 | Operation temperature -25 °C ... 70 °C, shock resistance due to IEC 61373 Class 1B for transportation and mobile applications |



8AI 4AO 2TX

HIMatrix® F3 AIO 8/4 01

4.9.0

Remote I/O device, 8 analog inputs (0 ... 10 V), 4 analog not safety-related outputs (0 ... 20 mA), add. 2 port-switch 100 Base-Tx with safe**ethernet**, SIL 3/Cat. 4/PL e

Specifications, Dimensions and Weight

| | |
|--------------------------------------|--|
| Dimensions | 207 mm x 114 mm x 97 mm (WxHxD) |
| Weight approx. | 950 g |
| Mounting | Horizontal on 35 mm DIN rail |
| Minimum distances | 20 mm horizontally, 100 mm vertically (keep the ventilation slots free) |
| Power supply | 24 VDC, -15% ... +20%, power supply unit with safe isolation in accordance with IEC 61131-2 (SELV, PELV) |
| Power consumption | 9.6 W idle; 19.2 W max. |
| External fuse | 10 A time-lag |
| Analog inputs | 8 (unipolar, no electrical isolation) |
| Accuracy intrinsic errors | ±0.1% (25 °C) |
| Accuracy operating errors | ±0.5% (60 °C) |
| Safety-related accuracy | 2% |
| Nominal value/operating value | Related to L- 0 ... 10 VDC/-0.1 ... 11.5 VDC 0 ... 20 mA/-0.4 ... 23 mA (at 500 Ω) |
| Resolution A/D converter/eff | 12 bit/9 bit at 10 V |
| Transmitter supply | 8, configurable to 26 V or 8.2 V/200 mA - short-circuit-proof |
| Digital outputs | 4 (no electrical isolation) Non-safe with common safe switch-off |
| Accuracy intrinsic errors | ±0.1% (25 °C) |
| Accuracy operating errors | ±0.5% (60 °C) |
| Nominal range /operating range | 4 ... 20 mA/0 ... 20 mA |
| Resolution (software) | 12 bit |
| Number of switch ports | 2 (RJ-45, 10/100 Mbit/s) |
| Type of protection | IP20 |
| Operating temperature | 0 ... 60 °C |
| Storage temperature | -40 °C ... +85 °C |
| Use in Ex-Zone | Ex II 3 G EEx nA II T4 X |
| Use above sea level | |
| ≤ 2000 m a.s.l. | Without restrictions |
| > 2000 ≤ 4000 m a.s.l. at max. 50 °C | Without restrictions |

[continued on back page]

Accessories to F3 AIO 8/4 01

| Product | Part number | Description |
|---------|-------------|--|
| Z 7301 | 98 2220059 | External shunt adapter for current measurement 250 Ω for 2 analog inputs |
| Z 7302 | 98 2220067 | External shunt adapter for current measurement 500 Ω for 2 analog inputs |
| Z 7306 | 98 2220115 | External shunt adapter for current measurement 250 Ω for 2 analog inputs with HART rejection and short-circuit protection |
| Z 7309 | 98 2220177 | External shunt adapter for Namur-proximity-switches 500 Ω resistor for 2 analog inputs |

| Product | ELOP II Factory | SILworX | Description |
|----------------|-----------------|------------|---|
| F3 AIO 8/4 01 | 98 2200409 | 98 2200483 | - |
| F3 AIO 8/4 011 | 98 2200457 | 98 2200489 | Operation temperature -20 °C ... 60 °C |
| F3 AIO 8/4 012 | 98 2200458 | 98 2200493 | Operation temperature -20 °C ... 60 °C, cabinet material stainless steel V2A, vibration and shock test ISO 13628-6:2006 Level Q1 and Q2, random vibration test, ESS (environmental stress screening), dimensions of mounting plate 200 mm x 160 mm x 6 mm (WxHxD), weight approx. 1700 g |
| F3 AIO 8/4 014 | 98 2200515 | 98 2200514 | Operation temperature -25 °C ... 70 °C, shock resistance due to IEC 61373 Class 1B for trans- portation and mobile applications |

5 Modular system F60

Flexibility through modularity

| | |
|---------------------|-------|
| F60 | 5.1.0 |
| AI 8 01 | 5.2.0 |
| DI 32 01 | 5.3.0 |
| DI 24 01 | 5.4.0 |
| MI 24 01 | 5.5.0 |
| DIO 24/16 01 | 5.6.0 |
| CIO 2/4 01 | 5.7.0 |
| AO 8 01 | 5.8.0 |
| DO 8 01 | 5.9.0 |



6 Modules up to 24DIO 144AIO or 12CNT 2FB 4TX

HIMatrix® F60

5.1.0

Modular, safety-related control system F60

Specifications, Dimensions and Weight

| | |
|-------------------------------|---|
| Dimensions | 259 mm x 310 mm x 228 mm (WxHxD) for PS, CPU 01 and additional 6 modules that can be freely placed (not pluggable during operation) |
| Weight approx. | 1500 g (GEH) + 820 g (PS) + 280 g (CPU) |
| Mounting | Vertical, wall mounting |
| Power supply | 24 VDC, -15% ... +20%, power supply unit with safe isolation in accordance with IEC 61131-2 (SELV, PELV) |
| Power consumption max. | 20 W (PS 01) 12 W (CPU 01) |
| Power supply PS | 30 A |
| External fuse PS | 32 A |
| Digital outputs | Potential-free contact on PS for displaying if CPU 01 is normally operating |
| Number of switch ports | 4 (RJ-45, 10/100 Mbit/s) |
| Number of fieldbus interfaces | 2 (see the description of protocols) |
| Type of protection | IP20 |
| Operating temperature | 0 ... 60 °C |
| Storage temperature | -40 °C ... +85 °C (Without back-up battery) |
| Use in Ex-Zone | Ex II 3 G EEx nA II T4 X (CPU) Ex II 3 G EEx nA IIC T4 X (PS) |
| Use above sea level | Max. 2000 m a.s.l. |
| Fans | Yes |

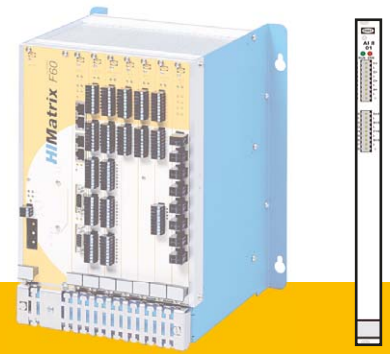
Accessories to F60

| Part number | Description |
|-------------------|-----------------------------------|
| 44 0000019 | Back-up-battery |
| Replacement | Every 4 years, on the front of PS |
| Function | Clock and data buffer |

[continued on back page]

Basic components

| Product | ELOP II Factory | SILworX | Description |
|---------|-----------------|------------|--|
| GEH 01 | 98 2200103 | - | Rack HIMatrix F60 for PS 01, CPU 01 up to 6 IO-boards |
| PS 01 | 98 2200096 | - | Power supply |
| CPU 01 | 98 2200126 | 98 2200137 | CPU, add. 4 port switch 100Base-Tx with safe ethernet |
| CPU 03 | - | 98 2200139 | Enhanced performance |
| BLK 01 | 60 5282106 | - | Cover plate 4 TE, 6 HE |



8AI

HIMatrix® AI 8 01

5.2.0

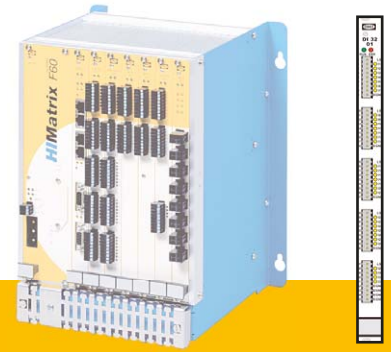
Specifications, Dimensions and Weight

| | |
|--------------------------------|---|
| Weight approx. | 240 g |
| Power supply | Central power supply (PS 01) |
| Power consumption | Max. 12 W |
| Analog inputs | 8 (unipolar, electrically isolated from the I/O bus) |
| Use | 8 unipolar analog inputs or 4 bipolar analog inputs |
| Nominal value/operating value | ± 10 VDC/ ± 10.25 VDC 0 ... 20 mA/0 ... 20.5 mA (at 500 Ω) |
| Resolution A/D converter / eff | 12 bit/9 bit at 10 V |
| Input resistance | 1 M Ω |
| Source resistance input | $\leq 500 \Omega$ |
| Accuracy intrinsic errors | $\pm 0.1\%$ (25 °C) |
| Accuracy operating errors | $\pm 0.5\%$ (60 °C) |
| Safety-related accuracy | 1% |
| Measured value refresh | Once per F60 cycle |
| Sampling time | Approx. 45 μ s |
| Type of protection | IP20 |
| Operating temperature | 0 ... 60 °C |
| Storage temperature | -40 °C ... +85 °C |
| Use in Ex-Zone | Ex II 3 G EEx nA II T4 X |
| Use above sea level | Max. 2000 m a.s.l. |

Accessories to AI 8 01

| Part number | Description |
|-------------|---|
| 00 0710251 | external shunt 250 Ω for current measurement |
| 00 0603501 | external shunt 500 Ω for current measurement (accuracy 0.05%, P1W) |

| Product | Part number | Description |
|---------|-------------|--|
| AI 8 01 | 98 2200214 | 8 channel analog input module, independent of operating system |



32DI

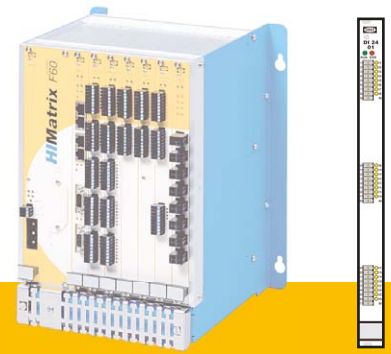
HiMatrix® DI 32 01

5.3.0

Specifications, Dimensions and Weight

| | |
|------------------------------------|--|
| Weight approx. | 260 g |
| Power supply | Central power supply (PS 01) |
| Power consumption | Max. 7 W |
| Digital inputs | 32 (electrically isolated) |
| Input voltage | 24 VDC nom. |
| Input level | High: 10 V ... 30 V Low: ≤ 5 V |
| Input current | High: 2 mA at 10 V; 5 mA at 24 V Low: 1 mA at 5 V |
| Pulsed outputs for line monitoring | The first 8 outputs of any DIO 24/16 01 located in the same cabinet can be used. |
| Type of protection | IP20 |
| Operating temperature | 0 ... 60 °C |
| Storage temperature | -40 °C ... +85 °C |
| Use in Ex-Zone | Ex II 3 G EEx nA II T4 X |
| Use above sea level | Max. 2000 m a.s.l. |

| Product | Part number | Description |
|----------|-------------|---|
| DI 32 01 | 98 2200114 | 32 channel analog input module, configurable with line control, independent of operating system |



24DI

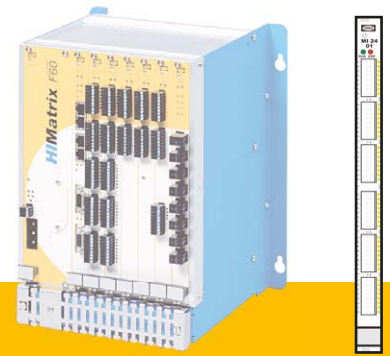
HIMatrix® DI 24 01

5.4.0

Specifications, Dimensions and Weight

| | |
|-----------------------|---------------------------------------|
| Weight approx. | 260 g |
| Power supply | Central power supply (PS 01) |
| Power consumption | Max. 3.1 W |
| Digital inputs | 24 (electrically isolated) |
| Input voltage | 110 VDC nom., 127 VAC monophas |
| Input level | High: ≥ 79 V Low: ≤ 20 V |
| Input current | ≤ 2.2 mA at 79 V |
| Type of protection | IP20 |
| Operating temperature | 0 ... 60 °C |
| Storage temperature | -40 °C ... +85 °C |
| Use in Ex-Zone | Ex II 3 G EEx nA II T4 X |
| Use above sea level | Max. 2000 m a.s.l. |

| Product | Part number | Description |
|----------|-------------|---|
| DI 24 01 | 98 2200113 | 24 channel analog input module, 110 VDC, 127 VAC, independent of operating system |



24AI/DI

HIMatrix® MI 24 01

5.5.0

Specifications, Dimensions and Weight

| | |
|---|--|
| Weight approx. | 580 g |
| Power supply | Central power supply (PS 01) |
| Power consumption | 16 W |
| Inputs | 24, configurable as analog current inputs 0/4 ... 20 mA or digital signal inputs for initiators e.g. in accordance with EN 60947-5-6, safety initiators or contacts wired with resistors |
| Analog inputs | Unipolar with ground I-, non-electrically isolated from one another |
| Nominal range / operating range | 0 ... 20 mA/-1 ... 25 mA |
| Nominal input resistance | 200 Ω |
| Total resistance | ~250 Ω |
| Safety-related accuracy | Max. ±1% |
| Line break and line short-circuit detection | Freely configurable values |
| Digital inputs | 24 unipolar ground I-, non-electrically isolated from one another, analog measurement processing |
| Nominal range | 0 ... 20 mA, freely configurable switching threshold |
| Nominal input resistance | 674 Ω |
| Nominal short-circuit current at initiator supply | 12.2 mA |
| Supply outputs | 24 |
| Nominal voltages | 8.2 VDC/26 VDC, switchable for each group |
| Type of protection | IP20 |
| Operating temperature | 0 ... 60 °C |
| Storage temperature | -40 °C ... +85 °C |
| Use in Ex-Zone | Ex II 3 G EEx nA II T4 X |
| Use above sea level | Max. 2000 m a.s.l. |
| Max. permanent overload | 50 mA/10 V |
| Maximum overload duration (short-circuit S+ AI+) | 60 ms |
| Digital resolution of the nominal value (20 mA) | 2000 parts (LSB 10 μA) |
| Accuracy intrinsic errors | ±0.2% (25 °C) |
| Accuracy operating errors | ±0.5% (60 °C) |
| Safety-related accuracy | 1% |
| Crosstalk with DC/50 Hz/60 Hz | Not detectable, except for the range 0.3 ... 150 kHz |
| Measured value refresh | Once per F60 cycle |
| Sampling time | Approx. 45 μs |

[continued on back page]

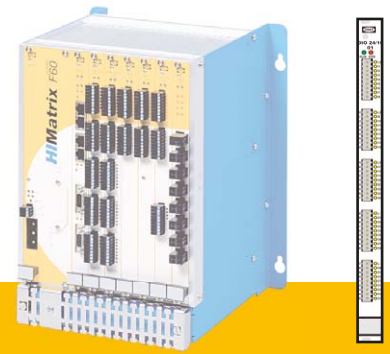
Specifications, Dimensions and Weight (continued from MI 24 01)

| Digital inputs | |
|---|--|
| Delay time L→H H→L | 2 x cycle time F60 |
| Initiator in accordance with EN 60947-5-6: | The values must be configured and verified for the initiator in use: |
| Switching threshold L→H | 1.7 mA (170 digits) signal MI [xx]. Hysteresis HIGH |
| Switching threshold H→L | 1.5 mA (150 digits) signal MI [xx]. Hysteresis LOW |
| Line break | 0,125 mA (13 digits) signal MI [xx]. Limit LOW |
| Line short-circuit | 8.5 mA (850 digits) signal MI [xx]. Limit HIGH |
| Safety initiator in accordance with EN 60947-5-6: | The values must be configured and verified for the initiator in use: |
| Switching threshold L→H | 1.9 mA (190 digits) signal MI [xx]. Hysteresis HIGH |
| Switching threshold H→L | 1.7 mA (170 digits) signal MI [xx]. Hysteresis LOW |
| Line break | 0.125 mA (13 digits) signal MI [xx]. Limit LOW |
| Line short-circuit | 5.5 mA (550 digits) signal MI [xx]. Limit HIGH |
| Contact wired with resistors (1 k/10 k): | The values must be configured and verified for the contact in use: |
| Switching threshold L→H | 1.7 mA (170 digits) signal MI [xx]. Hysteresis HIGH |
| Switching threshold H→L | 1.5 mA (150 digits) signal MI [xx]. Hysteresis LOW |
| Line break | 0.125 mA (13 digits) signal MI [xx]. Limit LOW |
| Line short-circuit | 8.5 mA (850 digits) signal MI [xx]. Limit HIGH |
| Supply outputs | |
| Tolerance | ±5% |
| Limit values safely monitored | |
| Range 8.2 V | 7.6 V ... 8.8 V (tolerance range: 7.3 V ... 9.1 V) |
| Range 26 V | 24.3 V ... 27.7 V (tolerance range: 24.0 V ... 28.0 V) |
| Current limiting | > 200 mA (0 V each group), the output is switched off |

Accessories to MI 24 01

| Product | Part number | Description |
|---------------|-------------------|--|
| H 7032 | 99 4703202 | Filter and protection module for the connection of 2 wire transmitters to the MI 24, 8 channels |
| H 7033 | 99 4703302 | Filter and protection module for the connection of 3 wire transmitters to the MI 24, 8 channels |

| Product | Part number | Description |
|-----------------|-------------------|--|
| MI 24 01 | 98 2200115 | 24 channel analog input module or input module for proximity switches, independent of operating system |



24DI 16DO (8TO)

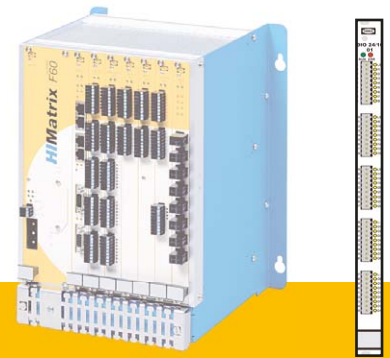
HIMatrix[®] DIO 24/16 01

5.6.0

Specifications, Dimensions and Weight

| | |
|------------------------------------|--|
| Weight approx. | 260 g |
| Power supply | Central power supply (PS 01) |
| Power consumption | Max. 25 W |
| Digital inputs | 32 (electrically isolated) |
| Input voltage | 24 VDC nom. |
| Input level | High: 10 V ... 30 V Low: ≤ 5 V |
| Input current | High: 2 mA at 10 V; 5 mA at 24 V Low: 1 mA at 5 V |
| Supply | 3 x 20 V/100 mA - short-circuit-proof |
| Digital outputs | 16 (electrically isolated) |
| Output current | 2 A each channel (max. 8 A each module, permanently short-circuit-proof) |
| Pulsed outputs for line monitoring | The first 8 outputs of any DIO 24/16 01 located in the same cabinet can be used. |
| Type of protection | IP20 |
| Operating temperature | 0 ... 60 °C |
| Storage temperature | -40 °C ... +85 °C |
| Use in Ex-Zone | Ex II 3 G EEx nA II T4 X |
| Use above sea level | Max. 2000 m a.s.l. |

| Product | Part number | Description |
|--------------|-------------|--|
| DIO 24/16 01 | 98 2200100 | 24/16 channel digital input/output module, configurable with line control, independent of operating system |



2CNT 4DO

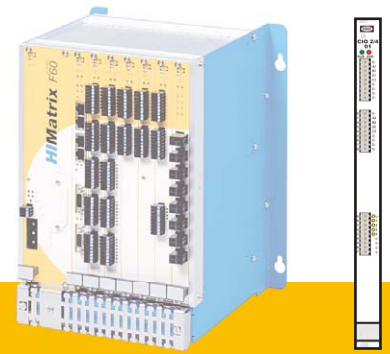
HiMatrix® CIO 2/4 01

5.7.0

Specifications, Dimensions and Weight

| | |
|-----------------------|--|
| Weight approx. | 260 g |
| Power supply | Central power supply (PS 01) |
| Power consumption | Min. 7 W; max. 14 W |
| Counter Inputs | 2 (electrically isolated from the I/O bus) |
| Voltage level | 5 V or 24 V configurable |
| Input current | ≤ 3 mA |
| Input resistance | 3.7 kΩ |
| Frequency | 0 ... 1 MHz |
| Resolution | 24 bit |
| Accuracy of time base | 0.2% |
| Digital outputs | 4 (electrically isolated from the I/O bus) |
| Output current | 0.5 A each channel (max. 2 A each module, permanently short-circuit-proof) |
| Type of protection | IP20 |
| Operating temperature | 0 ... 60 °C |
| Storage temperature | -40 °C ... +85 °C |
| Use in Ex-Zone | Ex II 3 G EEx nA II T4 X |
| Use above sea level | Max. 2000 m a.s.l. |

| Product | Part number | Description |
|------------|-------------|--|
| CIO 2/4 01 | 98 2200099 | 2 channel counter module with 4 digital outputs, independent of operating system |



8AO

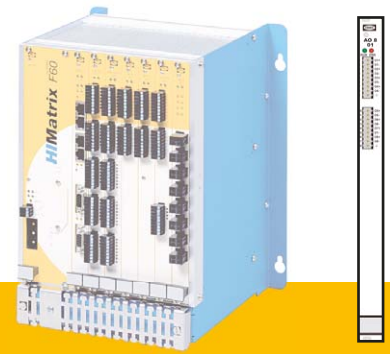
HIMatrix[®] AO 8 01

5.8.0

Specifications, Dimensions and Weight

| | |
|---|--|
| Weight approx. | 280 g |
| Power supply | Central power supply (PS 01) |
| Power consumption | Max. 21 W |
| Digital outputs | 8 (electrically isolated from the I/O bus) |
| Nominal value/maximum value each channel | ±10 VDC/±10.25 VDC or 0 ... 20 mA/0 ... 21 mA |
| Output resistor | ≤ 600 Ω (current) > 1 kΩ (voltage) |
| Resolution A/D converter/eff | 12 bit/7 bit |
| Type of protection | IP20 |
| Operating temperature | 0 ... 60 °C |
| Storage temperature | -40 °C ... +85 °C |
| Use in Ex-Zone | Ex II 3 G EEx nA II T4 X |
| Use above sea level | Max. 2000 m a.s.l. |
| Digital outputs | |
| Accuracy intrinsic errors | ±0.3% (25 °C) |
| Accuracy operating errors | ±1.0% (60 °C) |
| Safety-related accuracy | ±1% |

| Product | Part number | Description |
|---------|-------------|---|
| AO 8 01 | 98 2200215 | 8 channel analog output module, independent of operating system |



8DO (Relais)

HIMatrix[®] DO 8 01

5.9.0

Specifications, Dimensions and Weight

| | |
|--|---|
| Weight approx. | 600 g |
| Power supply | Central power supply (PS 01) |
| Power consumption | Max. 25 W |
| Digital outputs | 8 potential-free normally open contact |
| Switching voltage | $\geq 6 \text{ V}$, $\leq 250 \text{ VAC}/250 \text{ VDC}$ |
| Switching current | $\geq 10 \text{ mA}$, $\leq 3 \text{ A}$ internally fused with 3.15 A, fuse interrupting capacity 100 A |
| Switching capacity AC TÜV (max.) | 400 VA, $\cos\phi \geq 0.5$ at max. 250 VAC 600 VA, $\cos\phi = 1$ at max. 250 VAC |
| Switching capacity DC non-inductive UL | 30 VDC at 3 A ohmic load 60 VDC at 0.3 A ohmic load |
| TÜV | Up to 30 VDC: max. 90 W (3.15 A) Up to 70 VDC: max. 35 W (0.5 A) Up to 127 VDC: max. 40 W (0.315 A) Up to 250 VDC: max. 60 W (0.25 A) (Adapt external fuse) |
| Switching time | $\sim 30 \text{ ms}$ |
| Reset time | $\sim 20 \text{ ms}$ |
| Bounce time | $\sim 30 \text{ ms}$ |
| Mechanical product life | $\geq 3 \times 10^6$ switching operations |
| Electrical product life | $\geq 2.5 \times 10^5$ cycles with ohmic full load and ≤ 0.1 switching cycles per second |
| Type of protection | IP40 |
| Operating temperature | 0 ... 50 °C (limited system data) 0 ... 60 °C (if used in accordance with EN 298) |
| Storage temperature | -40 °C ... +85 °C |
| Use in Ex-Zone | - |
| Use above sea level | Max. 2000 m a.s.l. |

| Product | Part number | Description |
|---------|-------------|--|
| DO 8 01 | 98 2200112 | 8 channel analog input module, independent of operating system |

6 Software

Making safety simpler

Engineering-Software

| | |
|-----------------|-------|
| ELOP II Factory | 6.1.0 |
| SILworX | 6.2.0 |

Function block library

| | |
|---------------------------|-------|
| Factory | 6.3.0 |
| Burner Management Systems | 6.4.0 |
| Motion Control | 6.5.0 |

ELOP II Factory

Engineering software

ELOP II Factory

6.1.0

| Overview | | System requirements | |
|---|-------------------|---|--|
| <p>ELOP II Factory ensures safety-related planning and communication of the HIMatrix systems and provides for simplified diagnosis and documentation. ELOP II Factory supports the HIMatrix controllers F60 CPU 01, F35 01, F31 02, F30 01, F20 01, as well as all remote I/O modules. Systems are comfortably programmed and configured centrally via Ethernet. ELOP II Factory stands for easy programming, diagnosis and documentation. Intelligent features save time and cost in the system engineering phase and help avoid operational errors.</p> | | <ul style="list-style-type: none">▪ Microsoft Windows® 2000 SP 1 or beyond, XP Professional SP 2 or beyond, Windows® 7 64-bit, XP-Mode (tested with Ultimate)▪ Intel® Pentium® III▪ 256 MB free RAM▪ Approx. 200 MB hard disk space available▪ Resolution 1024 x 768▪ Ethernet interface | |
| Product | | Features | |
| Product | Part number | <ul style="list-style-type: none">▪ Licenced via hardlock▪ Language switching German and English▪ Compatible with Windows® XP Professional▪ Compatible with Windows® 7 64-bit (in XP-Mode)▪ Intuitive, fully graphical programming with drag&drop functionality▪ IEC 61131-3-compliant, supporting all functions and variable types for safety-related programming▪ Flexible programming using function block diagrams (FBD), sequential function charts (SFC)▪ Monitored forcing of online values▪ Multiple controllers managed from within a single project▪ Project-wide cross-references and navigation▪ csv import/export of variables▪ Automatic generation of documents (without preview and PDF functionality)▪ Programming/remote maintenance via Ethernet▪ Offline logics simulation▪ Online test of the logic*▪ User management for controller access▪ Central handling of multiple controllers via the multi control panel▪ Supports ServicePDA▪ TÜV-certified function blocks for manufactory industry | |
| ELOP II Factory German, package without online test module, incl. hardlock | 89 2042520 | | |
| ELOP II Factory English, package without online test module, incl. hardlock | 89 2042525 | | |
| ELOP II Factory Floating Licence Package without online test module, dynamic licence management within the network, incl. hardlock | 89 2042540 | | |
| Online test module for ELOP II Factory Required for each licence | 89 2042530 | | |
| ELOP II Factory upgrade Current version | 89 2042545 | | |
| | | <p>* Requirement: Online test module</p> | |

Engineering software

SILworX®

6.2.0

Overview

SILworX from HIMA is the fully integrated configuration, programming and diagnostic tool for the HIMA system family. SILworX supports all HIMatrix controllers, including HIMatrix controllers with enhanced performance. The intuitive user interface reduces application errors, and speeds up the engineering process. A range of user levels, the displaying of all status and diagnostic information, and comprehensive validation tools guarantee quick planning and commissioning.

Product

Part number

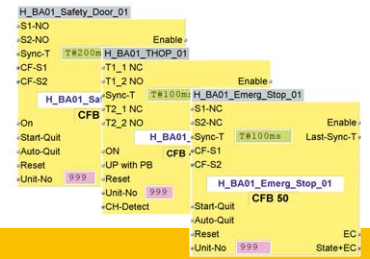
| | |
|---|------------------|
| SILworX German, incl. softlock | 89 530001 |
| SILworX English, incl. softlock | 89 531001 |
| SILworX German, incl. hardlock | 89 520001 |
| SILworX English, incl. hardlock | 89 521001 |
| SILworX upgrade Current version | 89 540001 |

System requirements

- Microsoft Windows® XP Professional with Service Pack 2 or beyond/Windows®7 64-bit (tested by Ultimate)
- Intel® Pentium® 4
- 256 MB free RAM
- Approx. 500 MB hard disk space available
- Resolution 1024 x 768
- Ethernet interface

Features

- Licenced via hardlock or softlock
- Language switching German and English
- Compatible with Windows® XP Professional
- Compatible with Windows® 7 (64-bit)
- Intuitive, fully graphical programming with drag&drop functionality
- IEC 61131-3-compliant, supporting all functions and variable types for safety-related programming
- Flexible programming using function block diagrams (FBD), sequential function charts (SFC)
- Fully integrated Hardware Editor
- Monitored forcing of online values
- Multiple controllers managed from within a single project
- Project-wide cross-references and navigation
- csv import/export of variables
- Automatic generation of documents, including preview and PDF functionality
- Programming/remote maintenance via Ethernet
- Offline logic simulation
- Online test of the logic
- User management for project data access
- User management for controller access
- Safe comparison function if changes are performed
- Supports SOE programming
- Supports online changes
- Supports multitasking
- TÜV-certified function blocks for manufactory industry
- TÜV-certified function blocks for gas and oil burners
- TÜV-certified function blocks for path detection



Function block library

Factory

6.3.0

| Overview | | Standards/Certificates | |
|---|--------------------------|--|-------------------|
| <p>With their extensive diagnostic functions, the TÜV-certified function blocks for SILworX or ELOP II Factory ensure simple programming for machine and plant automation applications.</p> | | <p>IEC 61508, Part 1-7/EN 954-1 TÜV-Rheinland</p> | |
| Description | Certified function block | Name of the item | Part number |
| Monitoring Dynamic Proximity Switches | H_BA01_Dyn_Init_01 | H_BA01 Factory For ELOP II Factory version 7.56.0 and beyond | 89 2042552 |
| Monitoring Two-Hand Operating Devices | H_BA01_THOP_01 | H_BA01 SILworX For SILworX version 2.46.0 and beyond | 89 5600001 |
| Monitoring Operating Mode Selector Switches (2 out of 6) | H_BA01_OpMod_2oo6_01 | | |
| Monitoring Operating Mode Selector Switches (1 out of 8) | H_BA01_OpMod_1oo8_01 | | |
| Monitoring Enable Switches (2-channel) | H_BA01_Enable_Sw_01 | | |
| Monitoring Enable Switches (3/4-channel) | H_BA01_ES_E4_01 | | |
| Monitoring Emergency Stop Switches | H_BA01_Emerg_Stop_01 | | |
| Monitoring Safety Lockings | H_BA01_Safety_Locking_01 | | |
| Monitoring Emergency Stop Switches, one channel | H_BA01_Emerg_Stop_1C_01 | | |
| Monitoring Safety Gate Switches | H_BA01_Safety_Door_01 | | |
| Controlling Feedback Loops | H_BA01_FBL_01 | | |
| Monitoring Electrosensitive Protective Equipment | H_BA01_BWS_PLS_01 | | |
| Muting Electrosensitive Protective Equipment | H_BA01_Muting_01 | | |
| Monitoring Analogue Values | H_BA01_Analog_01 | | |
| Controlling Press Safety Valves | H_BA01_PSV_01 | | |
| | | Features | |
| | | <ul style="list-style-type: none"> ▪ Drag&drop functionality ▪ Online help with circuit diagrams and configuration examples ▪ Offline/online test function ▪ Integrated, automatic safety test ▪ Closed, non-manipulable function blocks ▪ Unique identification via CRC checksum ▪ The diagnostic values of a group of modules can be grouped ▪ A single diagnostic value for function block features as well as hardware and software parameter setting ▪ Distinction between existing and removed faults | |
| | | Advantages | |
| | | <ul style="list-style-type: none"> ▪ Reduced time for program development ensured by ready-made functions ▪ Higher safety ensured by the use of function blocks tested by the TÜV ▪ Quick fault clearance ensured by extensive diagnosis ▪ Cost and time savings thanks to simplified TÜV acceptance testing and commissioning | |

Function block library

Burner Management Systems

6.4.0

| Overview | | Name of the item | Part number |
|--|--------------------------------|--|-------------------|
| <p>With their extensive diagnostic functions, the TÜV-certified function blocks for SILworX enable easy programming of user programs for burner controllers.</p> | | X(H)_BMS_Gas_Lib BMS function blocks for SILworX version 3.38.0 and beyond | 89 2042570 |
| | | X(H)_BMS_Oil_Lib BMS function blocks for SILworX version 3.38.0 and beyond | 89 2042571 |
| | | X(H)_BMS_Lib Gas and oil burner function blocks for SILworX version 3.38.0 and beyond | 89 2042572 |
| Description | Certified function block | Features | |
| Pre- and post-purging of the furnace and combustion chamber | X(H)_BMS_Purge | <ul style="list-style-type: none"> Integration in the resource structure tree Drag&drop functionality Closed and access restricted function blocks Verification of function block validity Unique identification (SILworX) via CRC checksum Sequential program flow within function blocks Unique operating state indication based on step numbers Step number based fault indication Higher-level fault indication | |
| Gas ignition burner | X(H)_BMS_Igniter | <h3>Advantages</h3> <ul style="list-style-type: none"> Reduced time for program development ensured by ready-made functions Higher safety ensured by the use of function blocks tested by the TÜV Simple and quick troubleshooting thanks to extensive diagnosis Cost and time savings thanks to simplified TÜV acceptance testing and commissioning | |
| Gas main burner | X(H)_BMS_Gasburner | | |
| Gas main burner with igniter rod | X(H)_BMS_Igniteburner | | |
| Oil burner with pressurized atomization | X(H)_BMS_Pressoilburner | | |
| Oil burner with steam atomization | X(H)_BMS_Steamoilburner | | |
| Fuel-air ratio monitoring | X(H)_BMS_FARC | | |
| Standards/Certificates | | | |
| <ul style="list-style-type: none"> IEC DIN 61508 up to SIL3, DIN EN 50156 (VDE 0116) and DIN EN 746-2 DIN EN 267, DIN EN 230, DIN EN 298, DIN EN 676, DIN EN 12067-2, DIN EN 12952-7 and -8 DIN EN 1643, DIN EN 12953-6 and -7 TRD 411, TRD 412, TRD 413, TRD 414, TRD 415 | | | |

Function block library

Motion Control

6.5.0

| Overview | | Standards/Certificates | |
|--|--------------------------|--|-------------|
| Certified function blocks for SILworX with extensive diagnostic functions for safety-related position detection. | | <ul style="list-style-type: none">IEC 61508EN 62061EN 61800EN 13849 | |
| Description | Certified function block | Name of the item | Part number |
| Hiperface - interface | H-MO-Hiperface | H-MO Software requirements for SILworX version 4.58.0 and beyond | 89 560002 |
| WCS3B - interface | H-MO-WCS3B | | |
| CDH75M - interface | H-MO-CDH75M | | |
| 1oo2 function block | H-MO-1oo2 | | |
| CRC function block | H-MO-16CRC24 | | |
| CRC function block | H-MO-8CRC16 | | |
| Traction slip supervision | H-MO-TSS1 | | |
| Safe stop 1/2 | H-MO-SSx | | |
| Safe operated Stopp | H-MO-SOS | | |
| Safe limited position | H-MO-SLP | | |
| Safe limited increment | H-MO-SLI | | |
| Safe limited speed | H-MO-SLS | | |
| Safe speed range | H-MO-SSR | | |
| Safe direction | H-MO-SDI | | |
| Safe speed monitoring | H-MO-SSM | | |
| Safe limited acceleration | H-MO-SLA | | |
| Safe limited acceleration range | H-MO-SAR | | |
| 1. Derivation | H-MO-1Derivation | | |
| 2. Derivation | H-MO-2Derivation | | |
| | | Features | |
| | | <ul style="list-style-type: none">Position detection and processingDrag&drop functionalityOnline helpOffline/online test functionIntegrated, automatic safety testClosed, non-manipulable function blocksUnique identification via CRC checksumDetailed diagnostic functions | |
| | | Advantages | |
| | | <ul style="list-style-type: none">Reduced time for program development ensured by ready-made functionsHigher safety ensured by the use of function blocks tested by the TÜVEasy and fast troubleshooting thanks to extensive diagnosisCost and time savings thanks to simplified TÜV acceptance testing and commissioning | |

7 Communication

Flexible integration solutions

| | |
|--|--------|
| Communication Flexible integration solutions | 7.1.0 |
| Communication HiMatrix / HiMatrix with enhanced performance & Network ports | 7.2.0 |
| safeethernet | 7.3.0 |
| OPC-Server | 7.4.0 |
| Modbus TCP | 7.5.0 |
| EtherNet/IP | 7.6.0 |
| Send & Receive | 7.7.0 |
| PROFINET IO | 7.8.0 |
| PROFIBUS DP | 7.9.0 |
| Modbus RTU | 7.10.0 |
| INTERBUS Master | 7.11.0 |
| ComUserTask | 7.12.0 |
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Communication

Flexible integration solutions

7.1.0

Overview

All HIMatrix systems can safely communicate in SIL 3/PL e via Ethernet.

Numerous proven industrial protocols are available to ensure optimal integration in the overall controller concept. Therefore, either Ethernet and field busses may be used. The following options are available:

- **safeethernet**
- OPC DA & AE
- Modbus TCP (Master and Slave)
- PROFINET IO (Controller und Device)
- PROFIsafe (F-Host und F-Device for PROFINET IO)
- EtherNet/IP (Originator and Target)
- Send & Receive TCP
- PROFIBUS DP (Master and Slave)
- Modbus RTU (Master and Slave)
- INTERBUS Master
- ComUserTask (CUT)

Communication options

All HIMatrix systems can be fitted and retrofitted with all Ethernet-based protocols available. This is done by ordering the corresponding option and activating it via the Internet.

Additionally, the HIMatrix controllers F20, F30, F35 and F60 can be equipped with fieldbus interfaces, even at a later point in time. The assembly is carried out by HIMA, and results in a modified part number.

| Product | Part number | RS485 on | | | |
|-----------------|-------------|----------|-----|-----|-----|
| HIMatrix F20 01 | 9822 | X | 0 | 417 | FB2 |
| HIMatrix F30 01 | 9822 | X | X | 415 | FB3 |
| HIMatrix F35 01 | 9822 | X | X | 416 | FB3 |
| HIMatrix F60 01 | 9822 | X | X | 126 | |
| | | FB1 | FB2 | | |

This diagram also applies to F30 03, F35 03, F60 03 and all versions.

Abbreviations:

FB = fieldbus interface

X = **0:** FB remains available; **1:** RS485 for Modbus and CUT (M&S); **2:** PROFIBUS DP Master; **3:** PROFIBUS DP Slave; **4:** INTERBUS Master; **5:** RS232 exclusively for CUT; **6:** RS422 exclusively for CUT; **7:** SSI exclusively for CUT; **8:** CAN exclusively for CUT



Accordingly, a HIMatrix F30 with one Modbus Slave on FB3 and one PROFIBUS Master on FB1 has the part number: 982240415

The RS485 interface is already installed on FB3. Since it can be operated as Master or Slave, the option must be activated at http://www.hima.com/Products/Registration_default.php. The 6-digit licence code noted in the confirmation of order can be used to create a licence key for the project.

Without the activation code, protocols not requiring additional hardware can be used for testing purposes for 5,000 operating hours. Once the test period has expired and the PES has been de-energized, this option can only be restarted with an activation code. Important: Since the activation changes the checksum (CRC), this option should be activated prior to commissioning.

Communication

HIMatrix

| | Number of non-secure protocols | Total amount of data from non-secure protocols [kB] | Number of TCP sockets | Amount of data for safeethernet [kB] |
|-----------------|--|---|---|--------------------------------------|
| HIMatrix | 4 | 16 | 64 | 64 |
| | SNTP client and SNTP server are not included in this calculation | Half in each case for transmitted and received data | Reduced to 32 on SILworX programming tool | |

Communication Options

| | Connections | Data length | Transfer rate* | Activation | Note |
|----------------------------------|-----------------------|-------------|----------------|-----------------------|--|
| safeethernet (SIL 3/PL e) | 63 | 900 | FE | - | PES and RIO are treated in the same way |
| OPC | 4 | 1024 | FE | - | Non-secure protocol |
| Modbus Master RS485 | 247 | 250 | 115 K | License (plus module) | ≤ 988 orders, max. three RS485 modules, once master instance |
| Modbus Slave RS485 | 2 | 250 | 115 K | License (plus module) | Pseudo redundancy possible with SILworX |
| Modbus Master Eth (TCP) | 32 | 250 | FE | License | ≤ 988 orders, gateway function |
| Modbus Slave Eth (TCP) | 20 | 250 | FE | License | |
| PROFIBUS DP Master | 125 | 244 | 12 M | Module | Two PROFIBUS masters possible, DP V2 restricted |
| PROFIBUS DP Slave | 1 | 244 | 12 M | Module | DP V0 |
| Send/Receive on TCP | 32 | 16 k | FE | License | |
| EtherNet/IP Originator | 32 | 504 | FE | License | |
| EtherNet/IP Target | 32 | 504 | FE | License | |
| INTERBUS Master | 512 | 1024 | 2 M | Module | Sixteen levels, 253 configuration frames, two modules |
| ComUserTask | 8 (TCP-Sockets + UDP) | 1024 | FE + FB | License (plus module) | UDP, TCP, RS232, RS422, RS485, SSI |

Each communication option may be used once.

Full descriptions of the functionalities of the communication options can be found in the project management manual, the SILworX communications manual and the ELOP II Factory and SILworX online help sections.

* FE ... Fast Ethernet (100 Mb).
All other transfer rates are processed with field bus interfaces.

All figures are maximum values.

Communication

HIMatrix with enhanced performance

7.2.0

| | Number of non-secure protocols | Total amount of data from non-secure protocols [kB] | Number of TCP sockets | Amount of data for safeethernet [kB] |
|---|--|---|-----------------------|--------------------------------------|
| HIMatrix with enhanced performance | 6 | 64 | 64 | 512 |
| | SNTp client and SNTp server are not included in this calculation | Half in each case for transmitted and received data | | |

Communication Options

| | Connections | Data length | Transfer rate* | Activation | Note |
|--|-----------------------|-------------|----------------|-----------------------|---|
| safeethernet / X-OPC DA & AE (SIL 3/PL e) | 128 | 1100 | FE | - | PES, RIO and X-OPC treated in the same way |
| Modbus Master RS485 | 247 | 250 | 56,7 K | License (plus module) | ≤ 988 orders, max. three RS485 modules, one master instance |
| Modbus Slave RS485 | 2 | 250 | 56,7 K | License (plus module) | Pseudo redundancy possible |
| Modbus Master Eth (TCP) | 64 | 1100 | FE | License | ≤ 988 orders, gateway function |
| Modbus Slave Eth (TCP) | 20 | 1100 | FE | License | |
| PROFINET IO Controller | 64 | 1440 | FE | License | |
| PROFINET IO Device | 1 | 1440 | FE | License | |
| PROFIsafe F-Host (SIL 3/PL e) | 64 | 123 | FE | License | via PROFINET |
| PROFIsafe F-Device (SIL 3/PL e) | 1 | 123 | FE | License | via PROFINET |
| PROFIBUS DP Master | 125 | 244 | 12 M | Module | Two PROFIBUS masters possible, DP V2 restricted |
| PROFIBUS DP Slave | 1 | 244 | 12 M | Module | DP V0 |
| Send/Receive on TCP | 32 | 16 k | FE | License | |
| ComUserTask | 8 (TCP-Sockets + UDP) | 1400 | FE + FB | License (plus module) | UDP, TCP, RS232, RS422, RS485, SSI |

Each communication option may be used once.

Full descriptions of the functionalities of the communication options can be found in the project management manual, the SILworX communications manual and the ELOP II Factory and SILworX online help sections.

* FE ... Fast Ethernet (100 Mb).
All other transfer rates are processed with field bus interfaces.

All figures are maximum values.

Communication

Network ports

The ports in use

The following ports may be used to configure network components.

UDP

| | |
|------------------------|---|
| 123 | SNTP (time synchronization) |
| 502* | Modbus |
| 6010 | safe ethernet |
| 8000 | ELOP II Factory |
| 8001 | ELOP II Factory RIO configuration via PLC |
| 8004 | SILworX RIO configuration via PLC |
| 2222 | EtherNet/IP data exchange |
| 44818 | EtherNet/IP device identification |
| 49152, 49153, 34964 | PROFINET IO |
| XXX* | CUT |

TCP

| | |
|-------|--|
| xxx* | TCP-SR (configurable) |
| 502* | Modbus |
| | |
| | |
| | |
| | |
| | |
| 44818 | EtherNet/IP Explicit Messaging Service |
| | |
| XXX* | CUT |

* Freely selectable ports.

safeethernet

Communication protocols

safeethernet

7.3.0

Overview

All HIMatrix systems can safely communicate via Ethernet. The **safeethernet** protocol ensures the safety-related communication (SIL 3/PL e).

Transfer organisation

HIMatrix controllers can communicate directly with a maximum of 128* (63*) other safety-related participants. In this respect, controllers (PES) and remote I/O modules are treated in the same way. To expand the number of participants, a cross-project communication (proxy resource) can be employed, which can also be used for separation purposes in the project planning.

A maximum of 1,100 (900) bytes can be transferred on each of these connections. Data are processed only if the connection has been established. Otherwise, the initial values are used.

* Please bear in mind the description of the maximum extension of the communication system.

Transfer mode

The efficient transfer via UDP allows fast reaction times with a low network load. The network used has no effect on safety. Thus a variety of media, such as the following, can be used:

- TX/FX
- ISDN
- SHDSL
- Wireless...

Interrupted connections are detected. Therefore, either a default value can be used or a reaction can be induced in the user program. If the connection is re-established, communication is automatically continued. External standard redundancy mechanisms such as HIPERRing or RSTP (Rapid Spanning Tree Protocol) can be used to increase availability.

Communication protocols

OPC-Server

7.4.0

Overview

OPC is an open interface to connect third-party systems. All the safety-related controllers of the HIMatrix system family can be connected to the HIMA OPC server via Ethernet.

OPC for HIMatrix programmed with ELOP II Factory

| Product | Part number |
|---------|-------------|
| HOPC | 89 2042400 |

Configuration

To allow communication between a controller and an OPC server (PC) via Ethernet, both the controller and the OPC server must be configured. After generating the code for the resource and the OPC server, an XML file containing the configuration for the OPC server is created. The XML file is then read into the OPC server.

Transfer organisation

One controller can be connected to a maximum of four OPC servers. An OPC server can be connected to as many controllers as desired. The number of controllers is limited only by the PC capacity.

X-OPC for HIMatrix programmed with SILworX

| Product | Part number |
|---|-------------|
| X-OPC DA | 89 4000015 |
| X-OPC A&E | 89 4000016 |
| Only for HIMatrix F10 PCI, F30 03, F31 03, F35 03, F60 CPU 03 | |

Configuration

For a controller to be able to communicate with an OPC server (PC) via Ethernet, the controller and OPC server must be configured. After generating the code for the resource and OPC server, this configuration is loaded into the X-OPC server as if it were a controller.

Transfer organisation

A controller can be connected to a maximum of 128 X-OPC servers. One X-OPC server can be connected to a maximum of 255 controllers.

HIMatrix F10 PCI, F30 03, F31 03, F35 03 and F60 CPU 03 can define 4,000 events and temporarily store 500 events. These can be retrieved from the X-OPC A&E.

Modbus-IDA

Communication protocols

Modbus TCP

7.5.0

Overview

The Modbus protocol is based on client/server architecture. HIMatrix safety controllers programmed with ELOP II Factory can be configured as a Modbus TCP client (Master) and a Modbus TCP server (Slave).

- Interface Ethernet 10/100 Mbit/s
- Level 4: TCP or UDP
- Port default 502 (configurable)
- Function codes available:
 - 01 read coils
 - 02 read discrete inputs
 - 03 read holding registers
 - 04 read input register
 - 05 write single coils
 - 06 write single register
 - 23 read write holding register
 - 15 write multiple coils
 - 16 write multiple register
- The user program can activate and deactivate both the Master and the Slave.
- The offset counting begins with 0.

Master

- Number of connectable Slaves: 32
- Max. number of telegrams: 988
- Max. amount of send data: 8192
- Max. amount of receive data: 8192
- Data format: Big Endian

Note: A HIMatrix controller can be used as gateway from Modbus TCP to Modbus RTU.

Slave

A maximum of 20 Masters can access the Slave. This value can be adjusted in the engineering phase.

Download

Activation code at http://www.hima.com/Products/Registration_default.php

| Product | Part number |
|-------------------|-------------|
| Modbus TCP Master | 89 4000001 |
| Modbus TCP Slave | 89 4000002 |

Communication protocols

EtherNet/IP

7.6.0

| Overview | Product | Part number |
|---|--|-------------------------|
| <p>EtherNet/IP is an Ethernet-based industrial communication protocol. HIMatrix safety controllers programmed with ELOP II Factory can be configured as an EtherNet/IP originator and target.</p> <ul style="list-style-type: none"> ▪ Interface: Ethernet 10/100 Mbit/s ▪ Configuration: scan RSNetWorx Afterwards, the configuration is part of the ELOP II Factory project. No scan is required when replacing HIMatrix systems. ▪ Number of TCP connections: max. 32 ▪ Number of assemblies: max. 64 ▪ Explicit Message Server: Yes ▪ Explicit Message Client: No ▪ Cyclic Data Exchange: Yes ▪ COS: No ▪ Exclusive owner connection: Yes ▪ Input only connection: Yes ▪ Listen only connection: Yes ▪ Run/Idle Header: Yes ▪ Support of DHCP: No SIL 3 devices should not automatically receive the IP addresses from non-safety-related devices. | <p>EtherNet/IP</p> <p>Note</p> <p>EtherNet/IP is available exclusively for ELOP II Factory programmed systems.</p> <p>Download</p> <p>EDS file for HIMatrix at http://www.hima.com/Products/HIMatrix/Overview_systems_default.php Activation code at http://www.hima.com/Products/Registration_default.php</p> | <p>89 400008</p> |

Communication protocols

Send & Receive

7.7.0

Overview

TCP S/R is a manufacturer independent, non-safety-related protocol. It can be used to simultaneously exchange data cyclically and acyclically with up to 32 participants. No protocols other than TCP/IP are used. The data stream is transferred without typecasting. This ensures support communication with almost all third-party systems. PCs can also be connected via socket services.

The Ethernet interface is used to perform the physical connection.

Product

Part number

Send & Receive

89 400007

Cyclic data exchange

With cyclic data exchange, please take into account that both communication partners run with almost the same sending interval.

TCP S/R is compatible with the Siemens SEND & RECEIVE interface.

The required S7 function blocks are:
AG_SEND (FC5) and AG_RCV (FC6)

Acyclic data exchange

Acyclic data exchange is controlled in the program via function blocks. Only one communication partner may send data at a time.

TCP mechanisms are used to control the connections.

Download

Activation code at http://www.hima.com/Products/Registration_default.php
Function block libraries can be obtained from HIMA support.



Communication protocols

PROFINET IO

7.8.0

Overview

PROFINET IO is the Ethernet-based transfer protocol of the PROFIBUS user organisation used for automation. As with PROFIBUS DP, the distributed field units on PROFINET IO are integrated using a device description (GSDML file) in SILworX.

The HIMA PROFINET IO controller meets conformance class A spec. 2.2 and supports non-real-time (NRT) and real-time (RT) communication with the PROFINET IO devices. Here, RT communication is automatically used for time-critical data exchange and NRT communication for non-time-critical processes (e.g., acyclic reading/writing).

The safety controllers F10 PCI, F30 O3 SILworX, F31 O3 SILworX, F35 O3 SILworX and F60 CPU O3 SILworX can be configured both as a controller and a device. If HIMatrix is used as a controller, then up to 64 devices can be connected.

| Product | Part number |
|-------------------------------|-------------------|
| PROFINET IO Controller | 89 4000018 |
| PROFINET IO Device | 89 4000019 |
| PROFIsafe Host | 89 4000022 |
| PROFIsafe Device | 89 4000023 |

Please also refer to the table included on page 7.1.0 "HIMatrix Communication" to determine the HIMatrix part number.

Function blocks

For acyclic data exchange purposes in SILworX you have the same function blocks in functional terms at your disposal as with PROFIBUS DP. With these PROFINET IO function blocks, you ideally can adapt the HIMA PROFINET IO controller and the PROFINET IO devices assigned to it to the requirements of your project. The function blocks are available from the hotline.

PROFIsafe

Communication by means of PROFIsafe V2.5c via PROFINET is possible both as an F-Host and as an F device.

Note

Only for systems with enhanced performance.

Download

Further information and the GSDML file for HIMatrix are available at: http://www.hima.com/Products/HIMatrix/Overview_systems_default.php
Activation code at http://www.hima.com/Products/Registration_default.php
Function block libraries can be obtained from HIMA support.



Communication protocols

PROFIBUS DP

7.9.0

Overview

The safety-related controllers F20, F30, F35 and F60 can be equipped with one PROFIBUS interface (only the F20) or two PROFIBUS interfaces.

| Product | Part number |
|------------------------|------------------|
| PROFIBUS Master | 89 400005 |
| PROFIBUS Slave | 89 400006 |

Please also refer to the table included on page 7.1.0 "HiMatrix Communication" to determine the HiMatrix part number.

Transfer mode

- RS485 cables of type A are used.
9 pin D-Sub male connectors are used.
- Station number 0 ... 125
- Data rates

| | |
|--------------|--------|
| 9.6 kbit/s | 1200 m |
| 19.2 kbit/s | 1200 m |
| 93.75 kbit/s | 1200 m |
| 187.5 kbit/s | 1000 m |
| 500 kbit/s | 400 m |
| 1.5 Mbit/s | 200 m |
| 3 Mbit/s | 100 m |
| 6 Mbit/s | 100 m |
| 12 Mbit/s | 100 m |

Master/Slave

- The Slave version is DPV0.
- The Master version is DPV2 (currently limited).
- Function blocks for Master and Slave are available:
 - To modify the Master state
 - (1) Read alarms
 - To read diagnostic messages
 - (1) Read acyclic data
 - To modify the Slave state
 - (1) Write acyclic data
- All functions labeled with (1) can be used with the HiMatrix PROFIBUS Master, but not with the Slave.
- Function blocks are available through the hotline.
- The Slave detects when the Master is missing and enters the STOP state.
- The amount of Slave data to be transferred depends on the number of modules created.

Download

For further information and for downloading the GSD file for HiMatrix, please refer to:
http://www.hima.com/Products/HiMatrix/Overview_systems_default.php
Function block libraries can be obtained from HIMA support.

Modbus-IDA

Communication protocols

Modbus RTU

7.10.0

Overview

The safety-related controllers F20, F30, F35 and F60 can be equipped with two RS485 interfaces. While one of these interfaces operates as Modbus Slave, the other interface can be used for Modbus Master. Additionally, all remaining protocols available, including Modbus TCP, can be used.

- The user program can activate and deactivate both the Master and the Slave.
- The offset counting begins with 0.

Product

| Product | Part number |
|---------------|-------------|
| Modbus Master | 89 4000003 |
| Modbus Slave | 89 40000064 |

Please also refer to the table included on page 7.1.0 "HIMatrix Communication" to determine the HIMatrix part number.

Transfer mode

- Transfer rates:
[bps]: 300; 600; 1200; 2400; 4800; 9600
[Kbps]: 19,2; 38,4; 57,6; 62,5; 76,8; 115,2
- Parity: none; odd; even
- Stop bits: one; two

Transfer mode

- Function codes available:
01 read coils
02 read discrete inputs
03 read holding registers
04 read input register
05 write single coils
06 write single register
23 read write holding register
15 write multiple coils
16 write multiple register

Master

- Number of connectable Slaves: 122 (if three repeaters are used)
- Max. number of telegrams: 988
- Max. amount of send data: 8192
- Max. amount of receive data: 8192
- Data format: Big Endian

Note: A HIMatrix controller can be used as gateway from Modbus TCP to Modbus RTU.

Slave

Because of the RS485 transfer principle, only one Master can have access.

Download

Activation code at http://www.hima.com/Products/Registration_default.php



Communication protocols

INTERBUS Master

7.11.0

Overview

INTERBUS is a fast sensor/actuator bus used to transmit process data. The INTERBUS is a single Master system, i.e., all participants of an INTERBUS ring are controlled by an INTERBUS Master (the so-called interface module). The INTERBUS basically uses a ring structure.

The INTERBUS Master considers all sensors and actuators together with their data as a single "logical" INTERBUS participant. The Summation Frame Method, such as begin and end identifier, is only sent once in each INTERBUS cycle for all INTERBUS participants.

The safety-related controllers F20 01, F30 01, F35 01 and F60 CPU 01 can be equipped with one (F20) or two INTERBUS Master interfaces.

Product

Part number

INTERBUS Master

89 4000009

Please also refer to the table included on page 7.1.0 "HIMatrix Communication" to determine the HIMatrix part number.

Transfer organisation

- | | |
|----------------------------------|-----------------|
| ▪ Process data input | max. 1024 bytes |
| ▪ Process data output | max. 1024 bytes |
| ▪ INTERBUS levels | max. 16 |
| ▪ Number of configuration frames | max. 253 |
| ▪ Total of bus participants | max. 512 |

To optimally configure the INTERBUS, the function blocks can be parameterized in the user program. Functions such as Start_Data_Transfer, Alarm_Stop, Activate_Configuration ... are available.

Transfer mode

- Transfer rate: 500 kbit/s or 2 Mbit/s (the master switches automatically)
- Transfer rate: CRC (Cyclic Redundancy Check)
- Hamming distance: 4
- Protocol: IEC 61158
- Distance between two bus terminals: max. 400 m
- Spatial extension: max. 12.8 km
- Interface: RS485 (D-sub 9)
- Connector pin assignment: 1DO, 6nDO, 2DI, 7nDI, 3COM

Note

INTERBUS master is only available for ELOP II Factory programmed systems.

Communication protocols

ComUserTask

7.12.0

Overview

All safety-related controllers of the HIMatrix system family support a ComUserTask (CUT).

This functionality allows the execution of user-defined logic, programmed in C code. Any type of communication can thus be used via RS-232, RS-485 and Ethernet (TCP: connection oriented, UDP: connectionless). Future, non-safety-related protocols can also be integrated in HIMatrix directly by the user. In many cases, the use of gateways is no longer necessary. The type of integration ensures that the cycle time of the safety-related controller is not affected by the use of CUT programming.

Therefore, CUT offers the user full flexibility while completely maintaining SIL 3/PL e safety.

| Product | Part number |
|-------------|-------------|
| ComUserTask | 89 4000012 |

Please also refer to the table included on page 7.1.0 "HIMatrix Communication" to determine the HIMatrix part number.

Transfer organisation

- Programming environment: Cygwin
Compiler: GNU C Compiler makefiles for binaries with link instructions and header files, as well as the software, are available on the CD provided by HIMA.
- Memory available:
 - 440 kB data and program
 - 64 kB stack
 - 8 kB data exchange with safe CPU
- Debugging via COM diagnostic entries (online diagnosis)

Transfer mode

Ethernet (UDP and TCP), RS232, RS422, RS485 and SSI

Communication protocols

SNTP

7.13.0

Overview

All safety-related controllers of the HIMatrix system family support SNTP for time synchronization. The SNTP protocol is used to synchronize the time of the HIMA controllers via Ethernet. HIMA controllers can be configured and used as an SNTP server and/or as an SNTP client. This function is activated by default in all HIMatrix systems.

The current time can be obtained at defined time intervals from a HIMA controller, which is configured as an SNTP server, or from a PC via Ethernet, for example.

A maximum of 4 servers can be configured for the client.

8

Accessories

ServicePDA and adaptation modules

| | |
|---------------------------|-------|
| ServicePDA | 8.1.0 |
| Adaptation modules | 8.2.0 |



Accessories

ServicePDA

8.1.0

Overview

ServicePDA is a portable, battery operated device for servicing the HIMatrix controllers. All essential service actions can be performed with-out using a PC or laptop, since ServicePDA can be connected to a HIMatrix controller directly on-site. The configuration and programs of one or several controllers can be saved on the memory card delivered with ServicePDA. The memory card ensures that programs created with ELOP II Factory can be loaded to a controller quickly and easily.

Functionality

ServicePDA provides the following functions for easy and quick start-up and maintenance:

- Start and stop the controller
- Save the controller configuration
- Save the user program
- Load a saved user program
- Display details about the operating system
- Display and modify the Ethernet settings
- Display and modify the safety parameters
- Display the system status

Product

Part number

| | |
|-------------------------------|-------------------|
| ServicePDA | 89 2200418 |
| Multimedia memory card | 99 0000080 |

Note

Cannot be used with SILworX programmed systems.

Data

Size: 16.5 cm x 9 cm x 3 cm (HxWxD)

Weight: approx. 300 g

Features

- No PC or programming knowledge required
- Configuration and program can be saved from within ELOP II Factory or from a controller to ServicePDA.
- Data saved on ServicePDA can be easily transferred to controllers
- Menu-controlled replacement of HIMatrix components
- Poll and display all HIMatrix components within a network
- Display the controller's state:
 - Status of the central, communications, input and output modules
 - Program name, program state, operating system version
- Display and modify the following settings:
 - Network IP address, subnet mask, routing
 - Controller's time and date
 - Safety parameters
- Language switching German/English
- Display brightness and contrast configurable
- Battery status display

Scope of delivery

- ServicePDA
- Network cables
- Battery (type: AA)
- Battery charger
- Multimedia memory card

Accessories

Adaptation modules

8.2.0

| Type | Part number | Identifier |
|--------|-------------|--|
| Z 7301 | 98 2220059 | Plug with 250 Ω shunt for 2 analog input channels of the F35 and F3 AIO 8/4 01, IP20 |
| Z 3702 | 98 2220067 | Plug with 500 Ω shunt for 2 analog input channels of the F35 and F3 AIO 8/4 01, IP20 |
| Z 7303 | 98 2220077 | Filter for ESPE (electro-sensitive protective equipment) for 4 digital input channels, IP20 |
| Z 7306 | 98 2220115 | Plug with 250 Ω shunt for 2 analog input channels with HART rejection and short-circuit protection of the F35 and F3 AIO 8/4 01, IP20 |
| Z 7307 | 98 2220127 | Filter for light curtain ESPE (electro-sensitive protective equipment) for 4 digital input channels of F3 DIO 16/8 01, IP20 |
| Z 7308 | 98 2220137 | Shunt Adapter for contact with resistor, with voltage divider and over voltage protection for 2 analogue input channels of F35 or F3 AIO 8/4, IP20 |
| Z 7309 | 98 2220177 | Shunt Adapter for Namur-proximity-switches with 500 Ω resistor for 2 analog inputs of F35 or F3 AIO 8/4, IP20 |
| Z 7310 | 982200518 | Filter for door switch "Euchner MGB-L" for 4 digital input channels |
| H 7032 | 99 4703202 | Filter and protection module for the connection of 2 wire transmitters to the MI 24, 8 channels |
| H 7033 | 99 4703302 | Filter and protection module for the connection of 3 wire transmitters to the MI 24, 8 channels |