HIMax®

Nonstop safety for everyone who thinks ahead

SAFETY
NONSTOP

HIMA

8
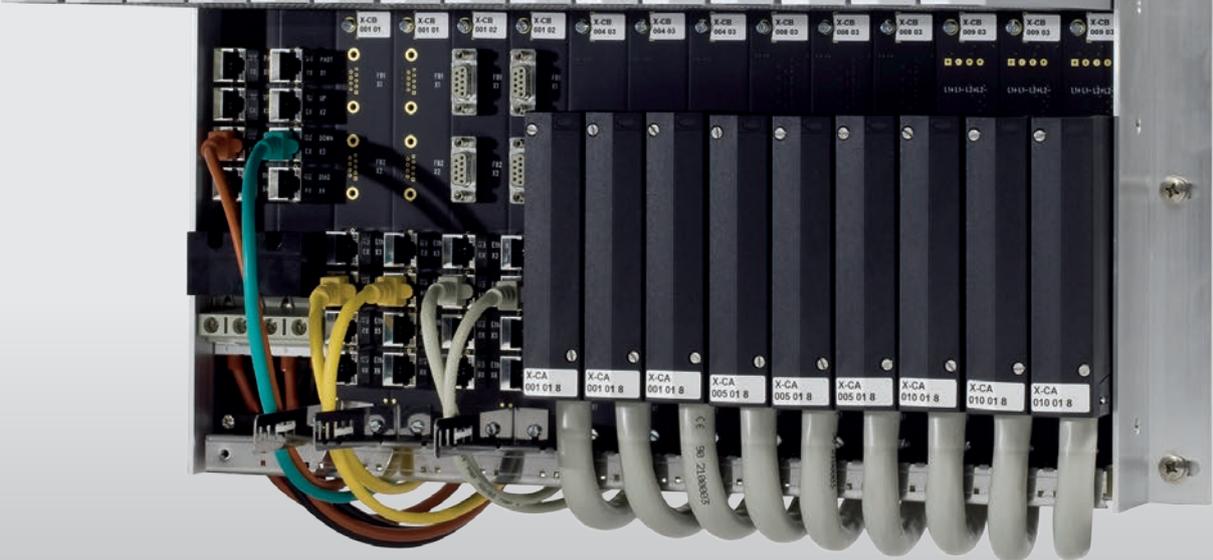
HIMax
Safety is a must. Productivity as well

High plant productivity thanks to intelligent safety solutions

Do you wish safety solutions that neither cause unscheduled shutdowns and nor need to stop the plants for maintenance works, changes or extensions? Do you think that safety systems are neither supposed to limit the productivity of a system nor to cause excessive and unnecessary investments?

Then you need intelligent safety solutions that both ensure maximized safety and availability, and increase plant productivity. These safety solutions can, for example:

- Reduce lifecycle costs
- Reduce investment costs
- Minimize planning and operating failures
- Reduce costs due to operating stops

HIMax will meet your expectations:

- No compromises in safety!
- No compromises in productivity

HIMA. Safety. Nonstop.

It's a philosophy more than 100 years in the making. It's built on HIMA's singular focus on safety and is proven by decades of technology breakthroughs. It represents our commitment to providing maximum safety and uninterrupted plant operations. Our goal isn't just to design the world's best safety systems. It's to help keep your business safe and running. No shutdowns. No failures. Maximum uptime. Maximum profitability.

S + ∞ = 8

Safety   Infinity   Safety Nonstop

HIMax – growing with the tasks

Nonstop SIL 3 safety for the process industry

HIMax solutions are used in the most various SIL 3 applications. For instance:

- Steam crackers
- Polyethylene, polypropylene and PVC production plants
- Fertilizer 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
- Others
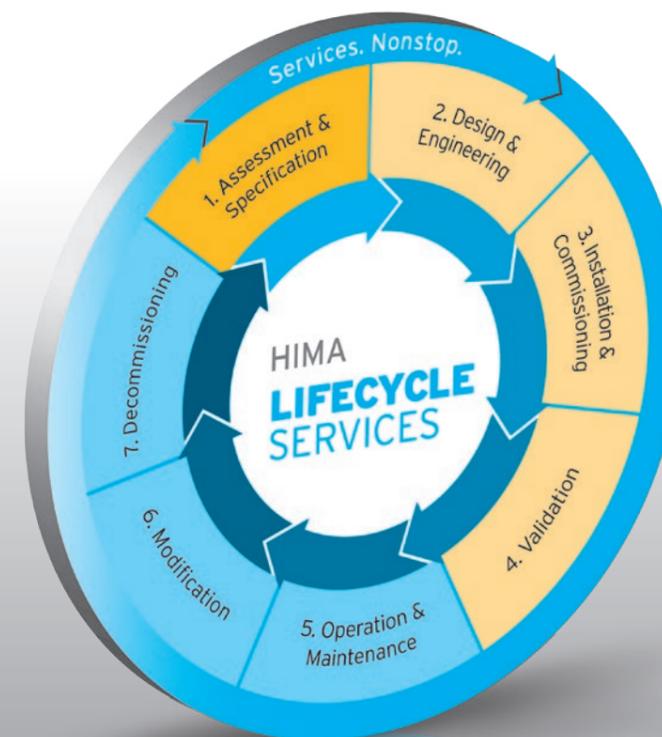
Thinking ahead within the lifecycle

With HIMax, HIMA provides you not only the world's leading nonstop safety system, but also supports you simultaneously with qualified, sophisticated and coordinated services for all phases of the safety lifecycle.

HIMax – more margin for action

Major solutions

High-availability solutions with HIMax guarantee safe and uninterrupted operation for every safety-critical process in your facility. Emergency shutdown systems (ESD), Fire & Gas systems or high-integrity pressure protection systems (HIPPS) are but a few typical applications.

Additionally, HIMax is the core element of the new complete solutions developed for the process industry:

- FlexSILon TMC for turbines and compressors
- FlexSILon BCS for burner control and boiler protection
- FlexSILon PMC for the management of gas and liquid fuel pipelines

FlexSILon®

HIMax provides the flexibility you need. Because HIMax offers safe SIL and standard NonSIL modules. In case of a safety related revalidation of a machine you are able to substitude NonSIL for SIL modules quickly and easily afterwards.

Profitability on top

- Buy only what you need. HIMax adapts to meet virtually any application requirement.
- HIMax can be your single platform for all I/O count, response time and fault-tolerance requirements, as well as centralized or distributed applications.
- Save engineering time and costs using a flexible, intuitive and easily adaptable platform.
- HIMax integrates with any DCS that you use today or in the future.
- HIMax offers virtually unlimited expansion – hardware and software changes can be performed on demand, without interruption, for the full life cycle. Cabinet size is minimised because there's no need to allocate slots for spares.
- Benefit from HIMax's unprecedented performance and system flexibility by integrating more I/Os or greater application complexity per system.
- HIMax is a cost-effective solution with different rack sizes to match your physical space requirements.
- No hidden software costs. With a SILworX® software license, you get a single intuitive software tool for all tasks.

Your advantage

User programs, system modules, racks and operating systems can be extended or modified at any time without interrupting the system or plant operation.

User-friendly features

How HIMax makes it easier for the user:
- Automatic module detection
- Fully integrated and protected power distribution eliminates the need for external wiring
- Fast implementation via HIMA SILworX, a user-friendly software tool with an intuitive interface, self-documentation and embedded version control
- Accelerate start-up by building-up and testing the hardware configuration without the application program (Loop check mode)
- Comprehensive diagnostics, automatic recording of 500/2,500 diagnostic entries on each module
- Built-in user management for project- and system access
- HART protocol support simplifies asset management solutions
- Multitasking affords interference free, parallel processing of applications
- Integrated version comparison provides exact and graphical traceability of changes

Your advantage

Application errors are dramatically reduced and valuable time in the planning and installation phase is saved.

Greater efficiency through simulation

The X-OTS HIMax Safety Simulator adds the aspects of safety to the classical OTS (Operator Training System). X-OTS is based on HIMA's programming tool SILworX and a corresponding number of extended soft PLCs. Each HIMax controller will be simulated by one soft PLC. Up to 10 soft PLCs can be run on one PC (performance depending).

- Application software can be checked in real scenarios prior to commissioning, leading to shorter commissioning times
- Shorter commissioning times lead to an earlier plant start up
- Application software can already be optimized prior to start up, leading to a higher plant efficiency already at start-up (instead of optimizing in the running plant)
- Avoiding of plant trips by improved behaviour of operators

Your advantage

Performing simulations with X-OTS, the HIMax safety simulator, increases safety and enhances profitability.

Learn more at our website
www.hima.com/X-OTS

HIMax – intelligent design

Sophisticated mechanics

For the best possible handling:
- Fully enclosed modules
- Replace module without disturbing I/O or power wiring
- All racks are panel mountable; the 15 slot is also available for 19-inch rack installation
- Fully integrated and protected power distribution
- Two different field wiring options, i.e., direct wiring using terminal strips or system cables on field termination assemblies

1 Insert …

2 press …

3 ready!
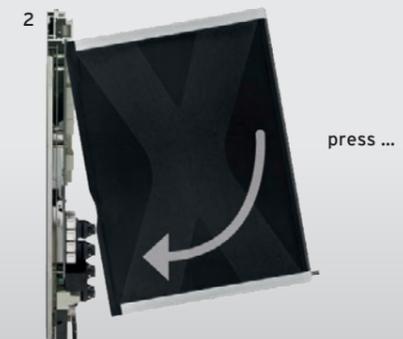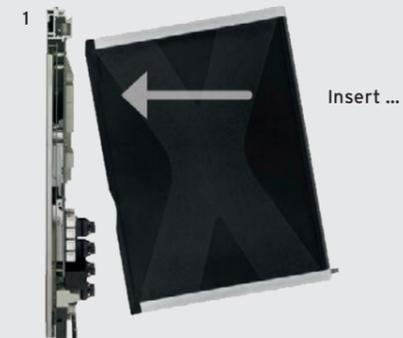
Requirement based rack sizes

- Three available rack sizes: 10, 15 and 18 slots
- In case of using X-CPU 31, up to 4 slots can be used with additional I/O or COM modules

10 slot rack

15 slot rack

18 slot rack

Flexible nonstop system solution

HIMax is a flexible SIL 3 platform designed for critical production processes that can never afford to go down. HIMax adapts to all I/O count, response-time and fault-tolerance requirements as well as centralized or distributed applications. Yet it always delivers maximum plant availability and future-proof flexibility.

- Two different CPU modules with optimized performance accordance with the required number of I/Os
- XMR architecture: scalable redundancy for operation in quad, triple (TMR), dual and single modes
- Unlimited change and expansion of hardware and software, including operating systems, while the system is running
- Multitasking operations: Separate applications independently executed in the same processor module

HIMax
Unrivalled performance for nonstop operation

Performance pays off

HIMax is the most powerful safety platform ever invented. Its unprecedented performance is based on high-performance components and smart system architectures.

- Cycle time of 50 ms with 1,000 I/Os (split 50% analog/digital)
- Unlimited complex calculations
- Impact of calculation of 1,000 PIDs on cycle time: 10 ms
- Signal conditioning directly on I/O modules with no impact on CPU performance
- Up to 2,048 I/Os per cabinet
- A system with up to 12,800 I/Os
- Up to 200 I/Os in up to 16 racks per system
- 250 systems per network
- Multitasking: Set fixed scan times for dedicated applications
- Sequence of event (SOE), 1 ms resolution quality
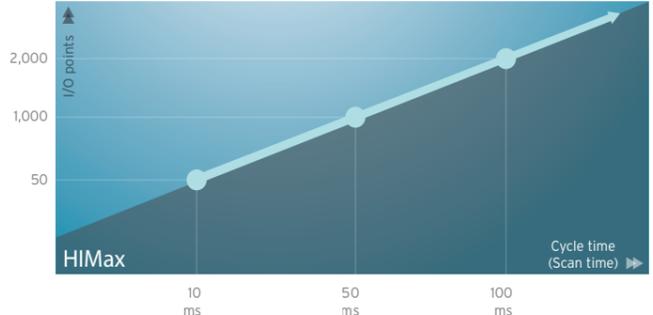
Online expandability

In case of expanding the update is written to a second memory area, after which the system switches seamlessly to the update. This method of intelligent memory management ensures that the controller is always operational regardless of whether it is mono or redundant. There is no limit to the number of times a program can be reloaded during operation. Even operating systems can be updated during operation.

I/O modules, their associated connector boards, base plates and remote components can also be added during operation. The same applies to new base plates and remote components. All can be modified without having to stop the plant. Online expandability of hardware and software guarantees maximum flexibility during the entire life cycle.

Optimizing plant efficiency, e.g., using C code
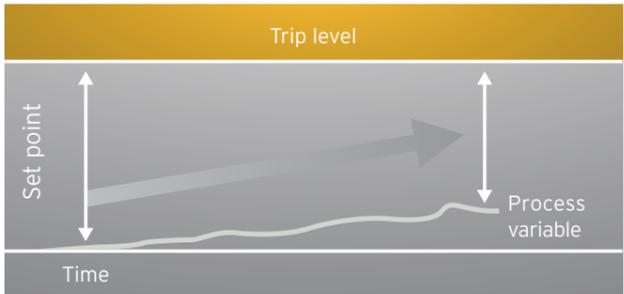
New process optimization potential is opened up by integrating mathematical and statistical models for dynamic process control or by more frequent sampling of process values within the safety system. Critical processes with continuously changing process variable values can thus be run closer to the limit ranges. For example: If the dynamic process value temperature in an ethylene cracker can be kept 1 to 2 degree closer to the critical limit, plant productivity increases considerably, while full process safety and availability are maintained.

Self education

If the system diagnoses an internal fault, the module involved can be replaced quickly during operation. Only a few moves are required.

If a processor module is swapped, the new module is automatically brought up to date with the currently operative modules. The parameter setting and the user program are imported from the functional processor module and then loaded.

"Self-education" has other benefits for the user:
- Your inventory of spare parts will be smaller
- You do not have to search for correct software versions
- When replacing a processor module, you do not have to connect a computer, which eliminates subsequent potential fault causes.

HIMax
Engineered for flexibility and productivity

Multitasking for enhanced performance
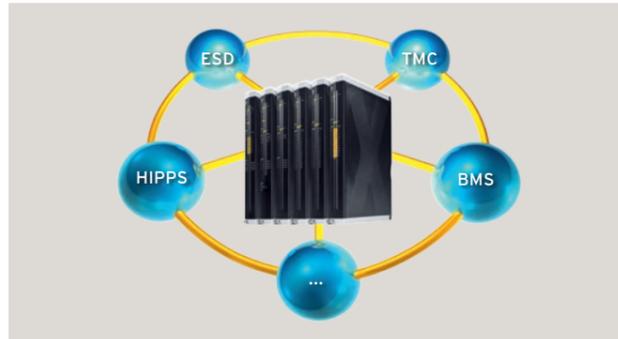
HIMax can process or change up to 32 user programs simultaneously and independently and interference-free from one another.

- Each application with user-defined cycle time
- Various applications/programs within a system are possible, e.g., ESD, TMC, BCS, HIPPS or others
- Even, e.g., C++ code and ESD
- Time-critical and non-time-critical applications within one system
- Individual checksums for minimized certification efforts
- Interference-free addition of applications
- Each program with individual cycle time/scan time
- Fixed cycle time possible for every application

Meaningful diagnostics

- Stores up to 2,500 diagnostic entries in the processor module and 500 entries per I/O module automatically
- Maintenance log includes relevant information such as reload, download, run, stop, force automatically
- All diagnostic information can be transferred to the DCS
- Condition monitoring, e.g., for relay modules

Proof test at any time without stops

In accordance with IEC 61508 and IEC 61511, all safety systems must be subjected to proof tests at regular intervals to reliably ensure compliance with the latest standards. With HIMax, testing is done as required – with no need to stop the safety system.

Fully integration capable

HIMA continuously tests all options for integrating HIMax in the leading control systems, thoroughly documents the results and develops efficient, pre-tested configurations. Irrespective of the process control system in use, the customers will be able to fully benefit from all the advantages offered by HIMax. DCS SIS integration is achieved through high-capacity, cross-manufacturer communication standards. HIMA's DCS specialists have the required integrations know-how and make sure that all features wished by the customers will be implemented:

- 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 overwrite switch (MOS)
- Partial stroke test (PST)
- Start-up bypass (SUB)

Supported protocols include:
- OPC DA and OPC A&E
- Modbus TCP Master & Slave
- Modbus RS485 Master & Slave
- PROFIBUS DP Master & Slave
- PROFINET IO Controller & Device
- Send & Receive TCP
- HART
- ComUserTask, programmable protocols

Redundant networking via system bus

Thanks to its remote rack functionality, HIMax offers the widest range of remote/distributed SIL 3 solutions
- Local solution within one rack
- Distributed solution with racks connected with copper cables and a maximum distance of 100 m between the racks in a line
- Distributed solution with racks connected with media converters via fibre optics and a maximum expansion of ~20 km in a line
- **Remote Rack functionality** offers the ability to distribute up to 16 racks of a HIMax system in free (e.g. star) topology. The internal system bus can be used in a redundant manner and at theoretical maximum distance of 10,000 km. Remote Rack functionality enables faster reaction time than distributed CPUs via safe**ethernet**.

System bus with external switches
Max. rack distance: 10,000 km
Max. system expansion: 20,000 km
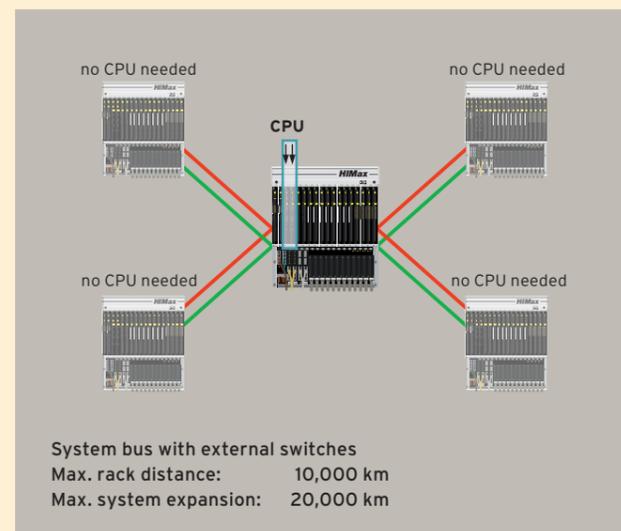
Redundant networking via safe**ethernet**

All of the necessary parameters such as IP address, network mask, routes and standard gateway can be setup in accordance with the Ethernet standard.
- SIL 3
- Data transmission at 1 GBit/s
- Fast response times, even for networked applications
- No limitations on physical separation
- Use of standard Ethernet functionalities
- Use of any transmission media
- Networking of up to 255 systems in each project
- Up to 64 connections (each up to 1100 Byte) between two systems
- Any infrastructure
- Intelligent, diverse redundancy concepts and reload functionality for uninterrupted system operation

safe**ethernet** on any Ethernet infrastructure
Virtually no limit in the expansion
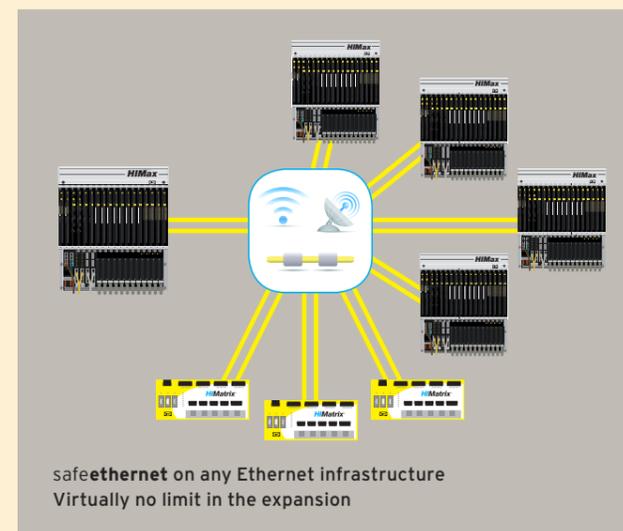
XMR architecture
Moving beyond TMR fault tolerance and functionality

Maximizing availability as needed

HIMax is designed to maximize plant availability and therefore improve productivity. Key to this promise is HIMax's revolutionary XMR architecture. XMR combines the best of all existing safety architectures. As the X in "XMR" can represent values from 1 to 4, HIMax offers unprecedented levels of redundancy and fault-tolerance at constant maximum safety (SIL 3).

The results are "available for life" safety solutions with no single point of failure. Even multiple failures will not trigger a shutdown. Replace the faulty module online - at any time and without restrictions. HIMax need not be shutdown, even when upgrading software or hardware, or performing maintenance.

XMR Modularity	Modes of operation	Architecture	Description	Benefits
X = 1 SIL = 3	1	CPU INPUT OUTPUT	Single inputs Single outputs Single CPU	The original safety architecture – used wherever multiple process facilities need protection without redundancy.
X = 2 SIL = 3	2	CPU INPUT OUTPUT	Dual inputs Dual outputs Dual CPUs	The most widely used safety architecture providing absolute safety and availability.
X = 3 SIL = 3	3	CPU INPUT OUTPUT	Triple inputs Triple outputs Triple CPUs	A traditional architecture, also known as TMR, which can provide similar safety and availability characteristics as X = 2. This application is offered for customers who "require" TMR technology.
X = 4 SIL = 3	4	CPU INPUT OUTPUT	Quad inputs Quad outputs Quad CPUs	An application that provides maximum common cause hardware protection and maximum availability.
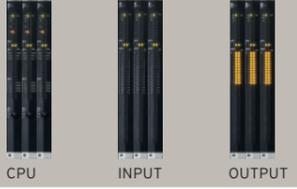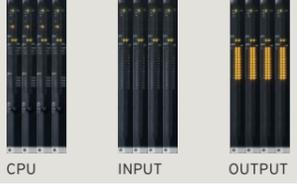
Protecting against common-cause failures

HIMax offers reliable protection against common-cause failures through the physical separation of the redundant system components. Supposing critical components of the safety system fail in a control cabinet due to fire or water damage, the redundant components located in another control cabinet continue to operate, ensuring the system complete functionality.

This results in enhanced availability, system runtime and productivity.

Control room
with a HIMax system

Remote location
with a fully redundant HIMax system running the same application
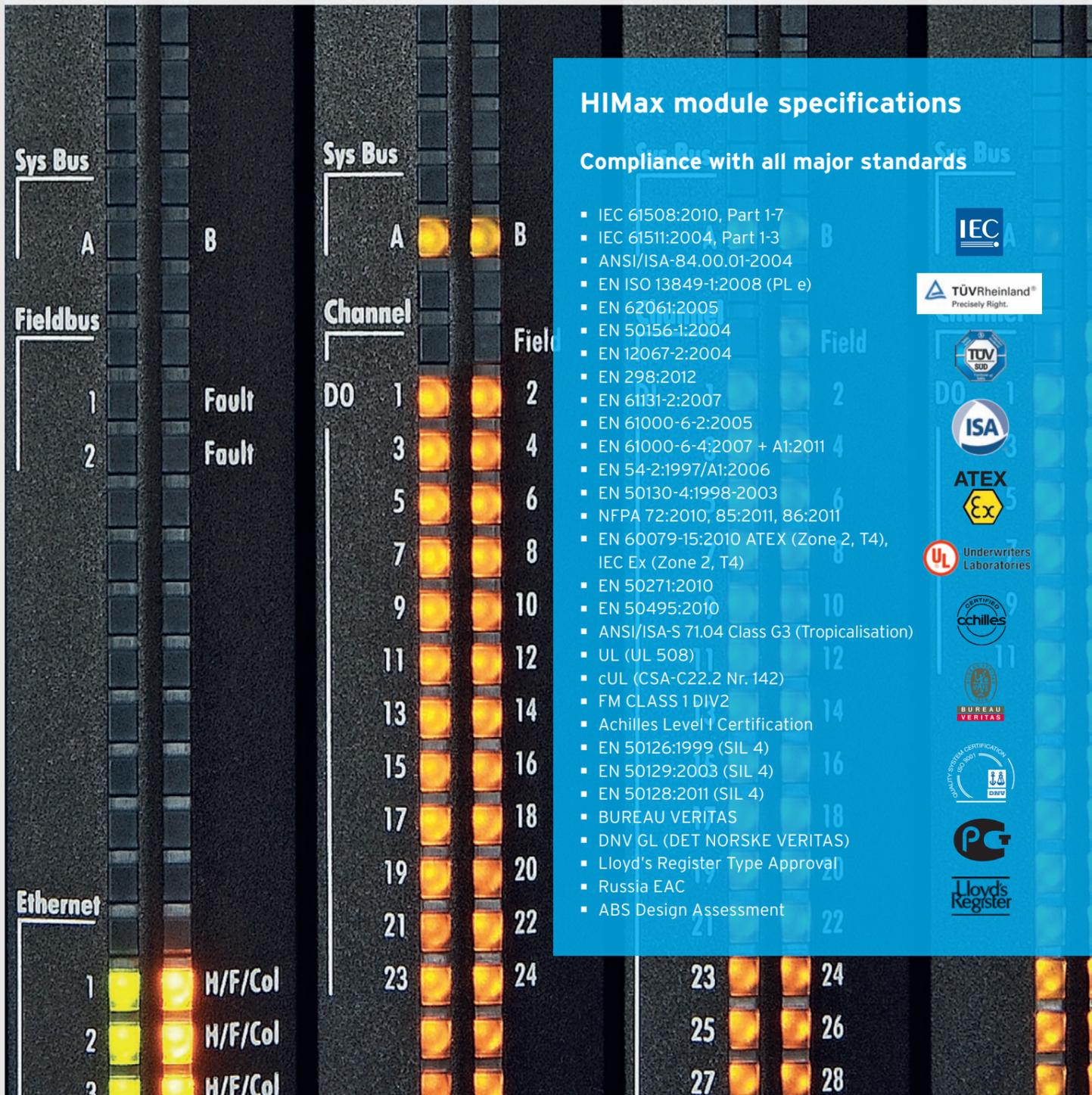
HIMax module specifications

Compliance with all major standards

- IEC 61508:2010, Part 1-7
- IEC 61511:2004, Part 1-3
- ANSI/ISA-84.00.01-2004
- EN ISO 13849-1:2008 (PL e)
- EN 62061:2005
- EN 50156-1:2004
- EN 12067-2:2004
- EN 298:2012
- EN 61131-2:2007
- EN 61000-6-2:2005
- EN 61000-6-4:2007 + A1:2011
- EN 54-2:1997/A1:2006
- EN 50130-4:1998-2003
- NFPA 72:2010, 85:2011, 86:2011
- EN 60079-15:2010 ATEX (Zone 2, T4), IEC Ex (Zone 2, T4)
- EN 50271:2010
- EN 50495:2010
- ANSI/ISA-S 71.04 Class G3 (Tropicalisation)
- UL (UL 508)
- cUL (CSA-C22.2 Nr. 142)
- FM CLASS 1 DIV2
- Achilles Level I Certification
- EN 50126:1999 (SIL 4)
- EN 50129:2003 (SIL 4)
- EN 50128:2011 (SIL 4)
- BUREAU VERITAS
- DNV GL (DET NORSKE VERITAS)
- Lloyd's Register Type Approval
- Russia EAC
- ABS Design Assessment

Central modules	Type	Description
Processor module	X-CPU 01	For high performance requirements and large safety applications, 4 x RJ-45
Processor module	X-CPU 31	For smaller and mid-size safety applications, 4 x RJ-45
System bus module	X-SB 01	
Communication module	X-COM 01	4 x RJ-45, 2 x 9-pole D-Sub, up to 6 different protocols

Input/output modules	Type	Description
Input modules		
Digital input module	X-DI 64 01	64 channels, 24 VDC, SIL 3
Digital input module	X-DI 64 51	64 channels, 24 VDC
Digital input module	X-DI 32 01	32 channels, 24 VDC, SIL 3
Digital input module	X-DI 32 02	32 channels, 8,2 VDC, proximity switch, line monitoring, SIL 3
Digital input module	X-DI 32 03	32 channels, 48 VDC, SIL 3
Digital input module	X-DI 32 04	32 channels, 24 VDC, SOE, SIL 3
Digital input module	X-DI 32 05	32 channels, 8,2 VDC, proximity switch, line monitoring, SOE, SIL 3
Digital input module	X-DI 32 51	32 channels, 24 VDC
Digital input module	X-DI 32 52	32 channels, 8,2 VDC, proximity switch, line monitoring
Digital input module	X-DI 16 01	16 channels, 120 VAC, SIL 3
Analog input module	X-AI 16 51	16 channels, 0/4 ... 20 mA, ±280 mV, galvanically isolated, thermocouple TC, Pt100
Analog input module	X-AI 32 01	32 channels, 4 ... 20 mA, line monitoring, SIL 3
Analog input module	X-AI 32 02	32 channels, 4 ... 20 mA, line monitoring, SOE, SIL 3
Analog input module	X-AI 32 51	32 channels, 0/4 ... 20 mA, line monitoring
Counter module	X-CI 24 01	24 channels, 0 ... 20 kHz, SIL 3
Counter module	X-CI 24 51	24 channels, 0 ... 20 kHz

Output modules	Type	Description
Digital output module	X-DO 32 01	32 channels, 24 VDC, 0,5 A, short-circuit monitoring LS, individual channel shut-off, SIL 3
Digital output module	X-DO 32 51	32 channels, 24 VDC, 0,5 A, protected outputs, group shut-off
Digital output module	X-DO 24 01	24 channels, 24 VDC, 0,5 A, line monitoring LS/LB, individual channel shut-off, SIL 3
Digital output module	X-DO 24 02	24 channels, 48 VDC, 0,5 A, line monitoring LS/LB, individual channel shut-off, SIL 3
Relay output module	X-DO 12 01	12 channels, 230 VAC/DC, current measurement, cycle counting, SIL 3
Digital output module	X-DO 12 02	12 channels, 24 VDC, 2 A, short-circuit monitoring LS, individual channel shut-off, SIL 3
Relay output module	X-DO 12 51	12 channels, 230 VAC/DC
Analog output module	X-AO 16 01	16 channels, 4 ... 20 mA, pairwise galvanically isolated
Analog output module	X-AO 16 51	16 channels, 4 ... 20 mA

Further modules	Type	Description
HART communication module	X-HART 32 01	32 modems, SIL 3, X-AI 32 01, X-AI 32 02, X-AI 32 51, X-AO 16 01, X-AO 16 51
Overspeed trip module	X-MIO 7/6 01	3 counter, 4 digital input, 5 digital output, 1 relay channel, SIL 3

Dimensions	Type	Description
Size of modules	All	310 x 29 x 230 mm
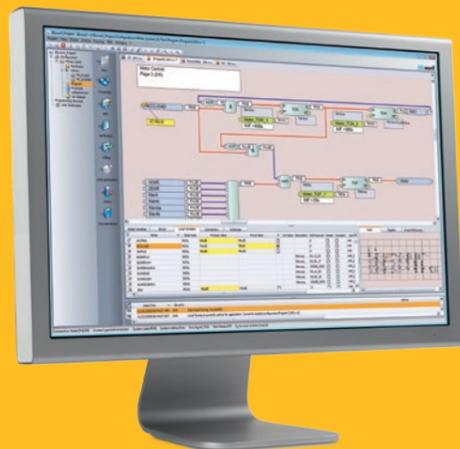
SILworX®

The world's most advanced safety application manager

SILworX is HIMA's easy-to-use, fully integrated configuration, programming and diagnostic environment. Its state-of-the art interface with drag&drop programming helps users avoid mistakes and speeds up the engineering process. Different levels of user guidance, clear display of all status and diagnostic information and comprehensive validation tools help engineers achieve safe applications.

SILworX highlights:

- A single fully integrated software tool for all tasks
- One licence for all functions
- IEC 61131-3-compliant, supporting all functions and variable types for safety-related programming
- Flexible programming using function block diagrams, sequential function charts
- Supports reload funcitonality for hardware and logic changes
- Project saved automatically each time it is loaded
- Safe comparator for hardware and logic changes, including detail view and Go to ... functionality
- Program validation inlcuding offline simulation, online test
- Secure double code generation with code comparison
- Monitored forcing of signals
- Project-wide cross-references and navigation
- Password protection for projects and controller access
- ST (Structered Text)
- Supports SOE programming
- Supports multitasking for up to 32 independent programs
- Hardware import/export via XML
- Library including function blocks developed in accordance with IEC 61511
- C Code function block option

Why HIMA?

HIMA is the world's leading specialist for safety-related automation solutions. HIMA solutions provide maximum safety and maximum availability and can be integrated into any automation environment. More than 35,000 HIMA systems have been installed in over 80 countries, protecting the assets of the world's largest companies in the oil, gas, chemicals, pharmaceuticals and power generation industries for more than 45 years. In the fields of rail, logistics and machine safety, HIMA solutions are leading the way to increased safety and profitability.

HIMA develops solutions that provide both maximum safety and availability for processes, plants and machinery – nonstop. The HIMA LIFECYCLE SERVICES concept gives customers an overview of all the requirements of 'functional safety' allowing them to always make the right decision at the appropriate time. HIMA solutions therefore offer maximum safety, strengthen a plant's productivity and profitability whilst ensuring compliance to global statutory requirements.

HIMA was founded in Germany in 1908. Since 1970, the company has achieved numerous milestones in the field of safety-related automation engineering, including the introduction of the world's first TÜV-certified safety system. HIMA now has over 800 employees with every third member of staff at the headquarters in Brühl working solely in research and development.

Through a steadily growing network of group companies, sales and service centres, as well as representatives in more than 50 countries, HIMA implements projects of all sizes all over the world. Thanks to its corporate independence, the family-run company 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 DCS manufacturers. This enables HIMA to continue to concentrate on safety solutions. The results are quality products, unrivalled specialist knowledge and customer confidence built on decades of successful projects.

HIMA

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For a detailed list of all our subsidiaries and representatives,
please visit our website: www.hima.com/contact