SIMATIC ET 200

For distributed automation solutions

Brochure · April 2009

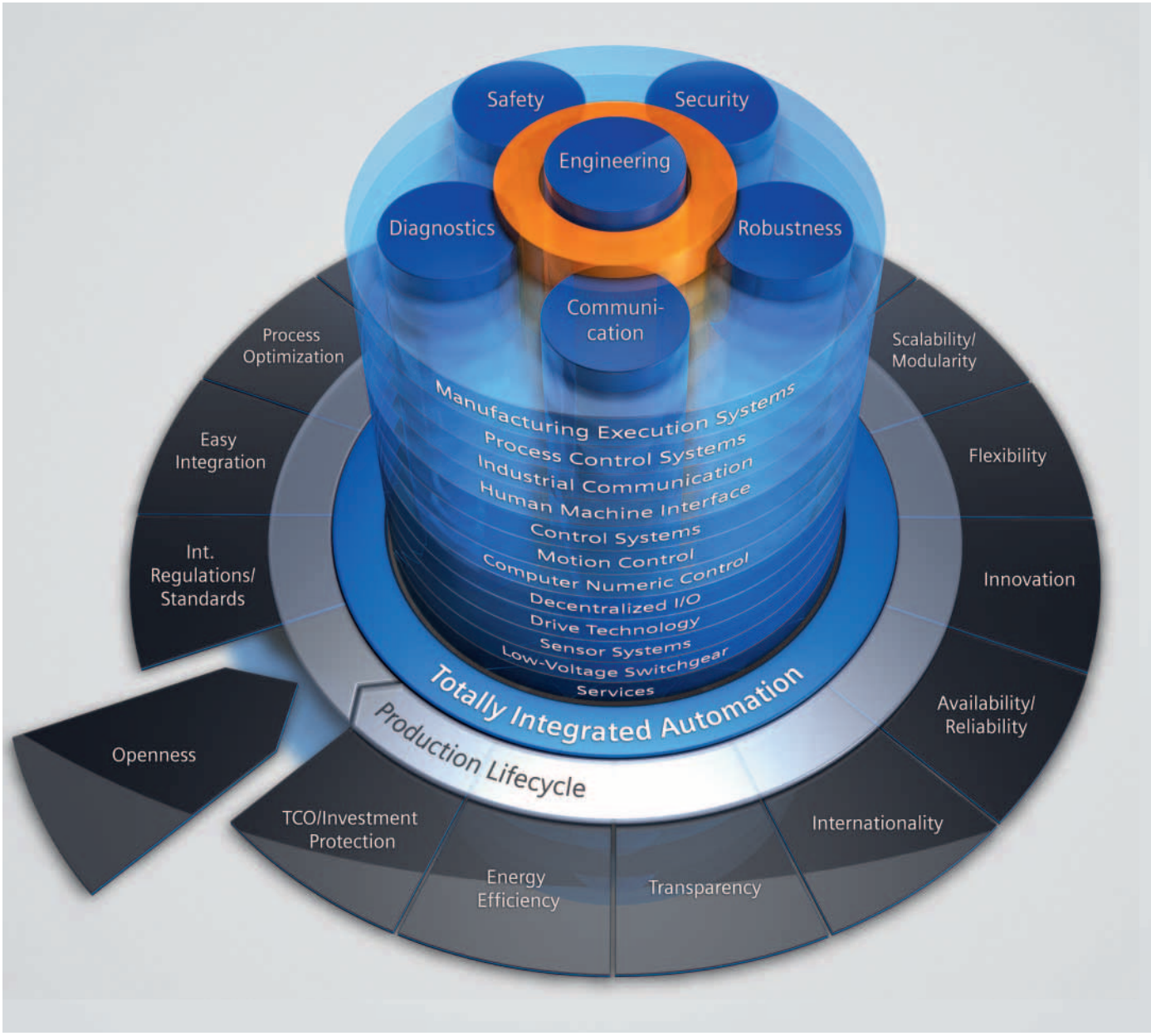
SIMATIC Distributed I/O

Answers for industry.

SIEMENS

Totally Integrated Automation

Rely on new productivity standards for sustained competitive advantages



To be able to respond to the increasing international competitive pressure, it is more important than ever to consistently make full use of the potential for optimization – over the complete lifecycle of a machine or plant.

Optimized processes reduce the total cost of ownership, shorten the time to market, and improve quality. This perfect balance between quality, time, and costs is now, more than ever, the decisive success factor in industry.

Contents

Totally Integrated Automation is optimally aligned to all requirements and open for international standards and third-party systems. With its six characteristic system features (engineering, communications, diagnostics, safety, security, and robustness), Totally Integrated Automation supports the complete lifecycle of a machine or plant. The complete system architecture offers holistic solutions for every automation segment on the basis of a comprehensive range of products.

SIMATIC: more efficient and systematic automation

SIMATIC, a core component of Totally Integrated Automation, includes a variety of standardized, flexible, and scalable products – such as the distributed I/O devices of the SIMATIC ET 200 portfolio presented in this brochure.

SIMATIC is currently considered to be the global number one in automation. One of the decisive reasons for this is that SIMATIC exhibits the six system features of Totally Integrated Automation:

- Engineering
- Communication
- Diagnostics
- Safety
- Security
- Robustness

In addition, SIMATIC features two additional system features:

- Technologly
- High availability

As an integral part of the SIMATIC range, the SIMATIC ET 200 distributed I/O system can offer you a host of benefits that are described in detail on the following pages.

SIMATIC system features

The overview

Engineering

Maximum engineering efficiency –
in all phases of the lifecycle of the machine and plant
With SIMATIC you rely on an integrated engineering environment. Efficient software supports you over the complete lifecycle of your machine or plant – from the planning and design stages through configuring and programming as far as commissioning, operation and upgrading. With its integration capability and harmonized interfaces, SIMATIC software supports a high degree of data consistency – throughout the entire engineering process.

Communications

Maximum data transparency on all automation levels –
based on proven standards
SIMATIC creates the foundations for unlimited integration in communication – and thus for maximum transparency on all levels, from the field and control level to the operations management level all they way up to the corporate management level. SIMATIC relies on international, cross-vendor standards which can be combined flexibly: PROFIBUS, the global No. 1 fieldbus, and PROFINET, the leading Industrial Ethernet standard.

Diagnostics

Minimization of downtimes –
through efficient diagnostic concepts
All SIMATIC products feature integrated diagnostic functions with which a fault can be identified and eliminated to provide increased system availability.
Even with larger plants, the Maintenance Station provides you with a uniform view of the maintenance-relevant information of all automation components.

Safety

Protection of personnel and machines –
within the framework of an integrated complete system
SIMATIC Safety Integrated offers TÜV-certified products, which facilitate compliance with relevant standards: IEC 62061 up to SIL 3, EN ISO 13849-1 up to PL e, as well as EN 954-1. Due to the integration of safety technology in standard technology, only one controller, one I/O, one engineering, and one bus system are required. Thus the system advantages and comprehensive functionality of SIMATIC are also available for fail-safe applications.

Data security in the networked world – through harmonized, scalable security systems
With SIMATIC you can use all the advantages that result as the worlds of automation and office grow together more and more: Seamless exchange of data across all levels (Collaborative Manufacturing), or access to production data via the Internet from any location. In order to meet the resulting increased security requirements, SIMATIC offers you IT Security for the protection of production and data, e.g. by means of firewall functions, access protection, encryption, and Virtual Private Networks.

Security

Maximum industrial suitability – through increased robustness
Each standard product from the SIMATIC range is characterized by the highest quality and robustness and is perfect for use in industrial environments. Specific system tests ensure the planned and required quality. SIMATIC components meet all relevant international standards and are certified accordingly. Temperature and shock resistance are defined in the SIMATIC quality guidelines, as are vibration resistance or electromagnetic compatibility.
For demanding to extreme rated conditions, special versions such as SIPLUS or special versions of SIMATIC ET200 are available. These include an increased degree of protection, extended temperature ranges, and exceptional environmental stress.

Robustness

**Integrated technology functions –
counting, measuring, positioning, closed-loop control, and cam control**
Counting and measuring, cam control, closed-loop control, or motion control: You can integrate technological tasks in many different combinations and with various degrees of complexity without a system changeover into the world of SIMATIC – easily, conveniently, consistently. Parameter assignment and programming are implemented in the familiar STEP 7 environment.

Technology

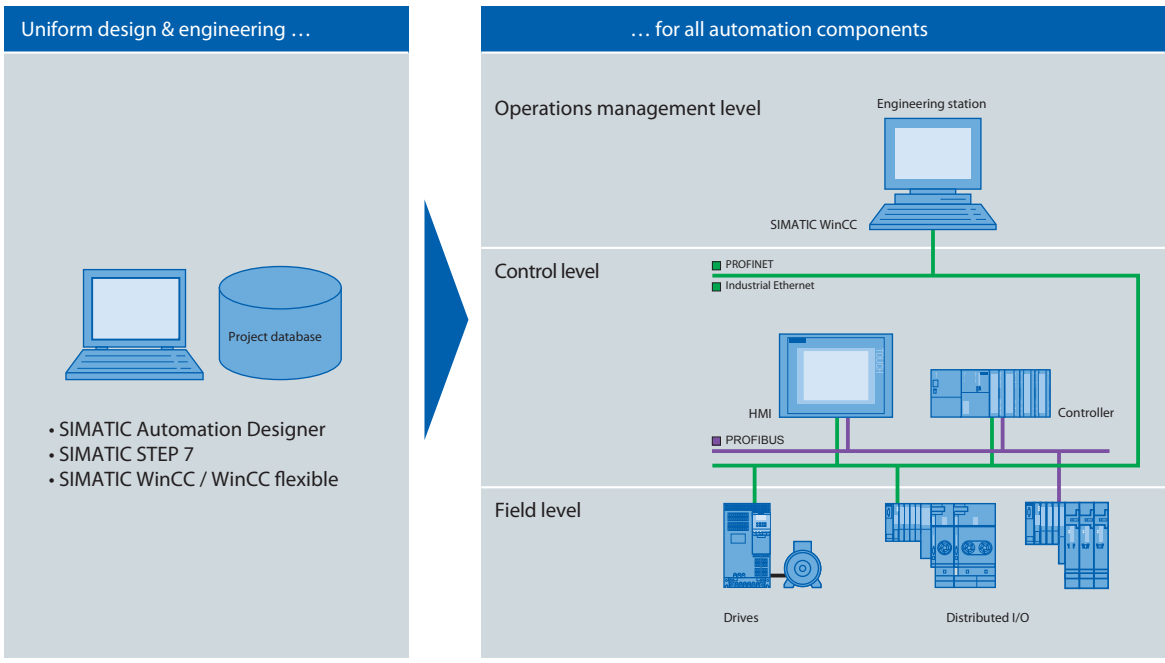
**Maximum availability –
with integrated high availability concepts**
Siemens offers a comprehensive high availability concept to ensure high availability for the entire plant: from the field level to the control level all the way up to the management level. For example, field-tested controllers ensure high availability through bumpless switching with automatic event synchronization.

High availability

www.siemens.com/simatic-system-features

Engineering

Maximum engineering efficiency – in all phases of the lifecycle of the machine and plant



With SIMATIC you rely on an integrated engineering environment. Efficient software supports you over the complete lifecycle of your machine or plant – from the planning and design stages through configuring and programming as far as commissioning, operation and upgrading.
With its integration capability and harmonized interfaces, SIMATIC software permits a high degree of data consistency – throughout the entire engineering process.

Data consistency in the entire project
- Variables only have to be entered and configured in one editor
- Project-wide synchronization

Modularity through blocks
- Program sections and user interfaces can be created modularly as reusable blocks
- Program modules can be loaded into the automation system during operation
- In addition, expansions and changes to the hardware configuration are possible during operation

Shared configuration for the complete automation hardware
- Shared hardware configuration
- Shared network configuration

Open data interfaces
- Third-party components can be incorporated based on GSD/EDD
- Import/export interfaces permit data exchange with third-party software (MS Excel)
- Data transfer from planning software – e.g. from electrical engineering department (CAE)
- Ability to incorporate Visual Basic scripts for further processing

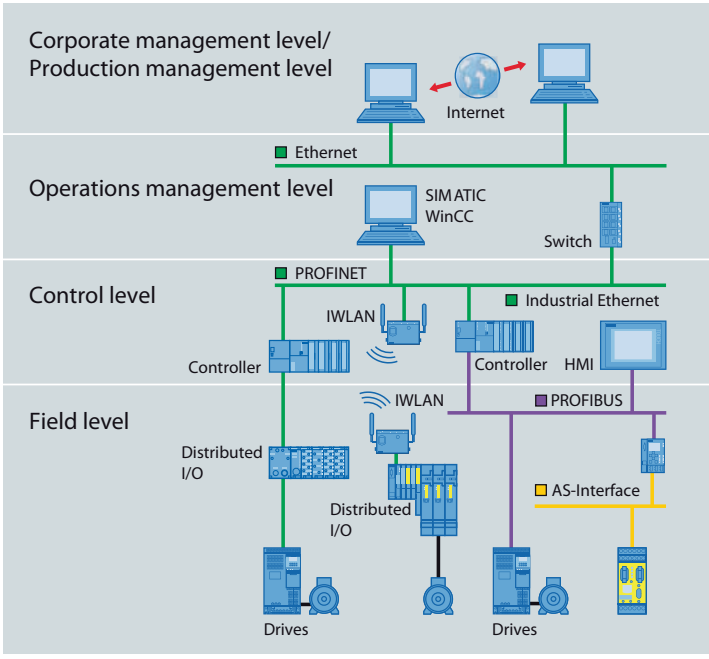
Data archiving
- All data, hardware configuration data, programs, user interfaces are saved and archived in one project

Multilingual/internationality
- The user interface of many software packages is available in six or more languages
- The interfaces of the HMI devices (operator panels) can be created in various languages, even during operation – as can the program comments within SIMATIC STEP 7

Standard programming languages
- Six PLCopen or IEC 61131-3-compliant programming languages
- PLCopen-certified motion control blocks

Communications

Maximum data transparency on all automation levels – based on proven standards



With SIMATIC you create the prerequisite for full integration of communication – and thus for maximum transparency from the field and control level via the operations management level all the way up to the corporate management level. SIMATIC relies on international, cross-vendor standards which can be combined flexibly: PROFIBUS, the global No. 1 fieldbus, and PROFINET, the leading Industrial Ethernet standard.
With SIMATIC, relevant information is thus available at any time throughout the plant. This enormously simplifies commissioning, diagnostics, and maintenance – even wirelessly or over the Internet. It is also possible to access the components from anywhere in order to intervene in the process if necessary.

Plant-wide or company-wide data access
- Integrated communications options via all automation levels
  - Management level
  - Operations management level
  - Control level
  - Field level

Flexibility and scalability
- Flexible combination options of the communication standard – without affecting the performance of a system (safety, diagnostics, etc.)
- Implementation of time-critical applications up to isochronous mode

Combinable bus systems
- Existing communications structures can be integrated and/or retained with the CP/Link communications processors (PROFINET, PROFIBUS, AS-Interface, etc.)

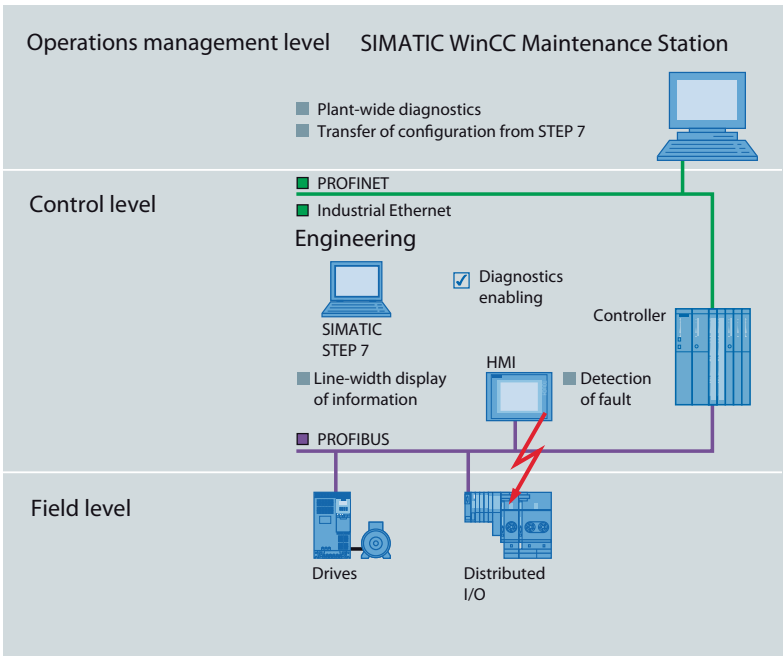
Wireless communication
- Support for wireless communication based on Industrial Wireless LAN – even safety functionality is implemented through IWLAN communication

Routing function
- System-wide access to all components – for facilitated commissioning, diagnostics, and remote maintenance

Integration in office applications
- OPC and OPC XML for the connection of office applications
- Web server functionality for access to device information (z. B. diagnostic buffer) from every Internet-ready PC

Diagnostics

Minimization of downtimes – through efficient diagnostic concepts



All SIMATIC products feature integrated diagnostic functions with which a fault can be detected and eliminated efficiently to provide increased system availability. Even with larger plants, the Maintenance Station provides you with a uniform view of the maintenance-relevant information of all automation components. This increases Overall Equipment Efficiency (OEE), minimizes downtimes, and saves costs.

Integrated diagnostics
- Totally Integrated Automation offers products and modules with integrated diagnostic function
- Plant-wide system diagnostics for detection and automatic signaling of faults
- Additional messages for monitoring the application/process (process diagnostics) are easy to configure and can be generated automatically

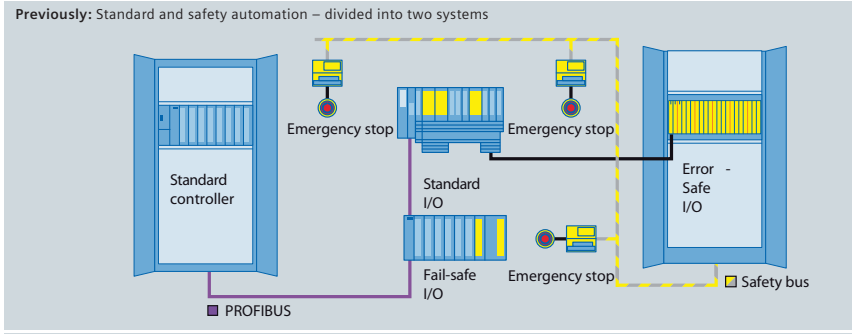
Diagnostics with display of relevant information
- Error text information
- Unique module identification (number)
- Address/slot information
- Chronological time stamp

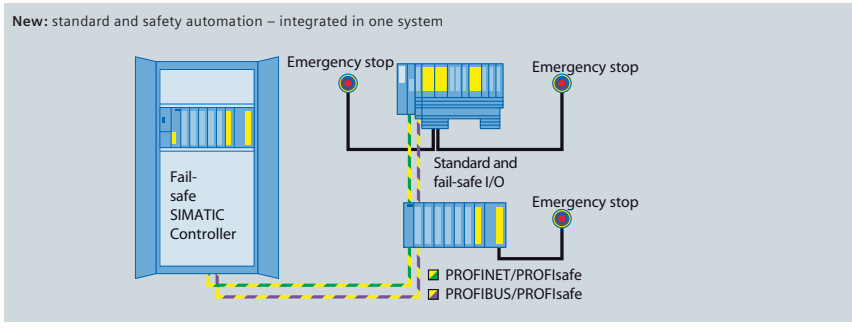
Diagnostics can be activated, no programming is required
- The diagnostic function of the modules is easily activated in SIMATIC STEP 7
- Message texts are available in five languages
- Predefined message windows/views for visualization on the HMI device

Consistent diagnostics from the field level to the management level
- System states (module and network status, system error messages) are available plant-wide with consistent display.
- Diagnostics displays with different degrees of detail (hierarchy) are automatically generated from configuration data (HW Config)

Safety

Protection of personnel and machines – within the framework of an integrated complete system





As a machine builder and plant constructor and operator, you are obliged by law to ensure the safety of personnel and the environment. With Safety Integrated, Siemens offers TÜV-certified products to meet these guidelines and that simplify compliance with relevant standards: IEC 62061 up to SIL 3, EN ISO 13849-1 up to PL e, as well as EN 954-1 up to Cat. 4.
In the spirit of Totally Integrated Automation, safety-related functions are integrated into standard automation with Safety Integrated. Thus Siemens offers a complete and integrated safety program – from detection to evaluation to reaction.
One of the cornerstones is SIMATIC Safety Integrated – the fail-safe control system. By integrating safety into standard technology, only one controller, one I/O, one engineering, and one bus system are required. Thus the system benefits and comprehensive functionality of SIMATIC are also available for fail-safe applications.

The result: A significant reduction in engineering overhead and the number of hardware components.

One controller for Standard and Safety
- Comprehensive self-tests and self-diagnostics of the fail-safe SIMATIC Controllers
- Simultaneous processing of the standard and safety program on one controller

Mixed configuration of I/O
- Space-saving setup thanks to the combination of fail-safe modules and standard modules in one station

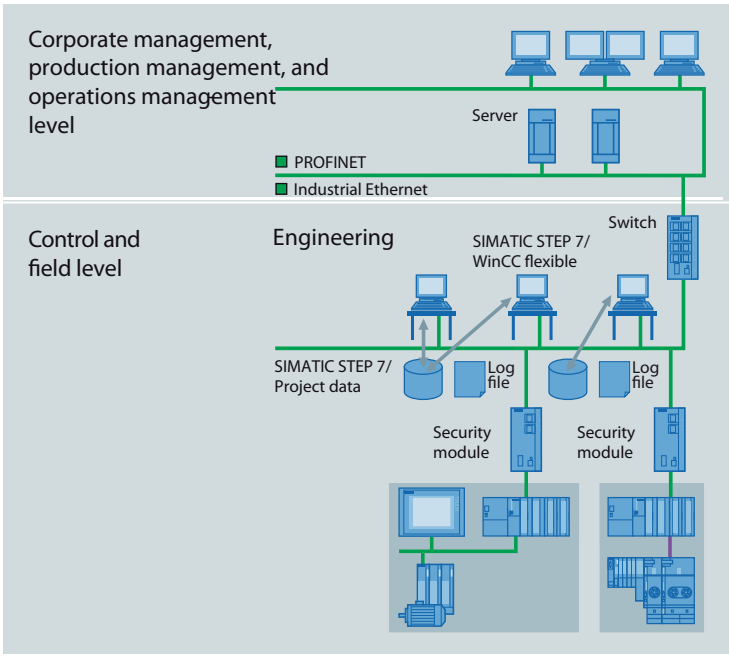
Uniform engineering
- All programming (standard and safety) is implemented in the proven STEP 7 environment
- Programming as needed with ready-made, TÜV-certified, or user-created blocks

Fail-safe communication
- Fail-safe communication over the global proven communication standards PROFINET or PROFIBUS, with the PROFIsafe profile
- Innovative approaches such as wireless fail-safe communication over IWLAN (Industrial Wireless LAN) and PROFINET – e.g. using the SIMATIC Mobile Panel 277F IWLAN with integrated safety function

Diagnostic function
- Identical system diagnostics of safety modules and standard components: Uniform function, display, parameterization as well as easy activation of the diagnostic function without programming

Security

Data security in the networked world – through matched, scalable security concepts



With SIMATIC you can use all the advantages that result as the worlds of automation and office grow together more and more: Seamless exchange of data across all levels (Collaborative Manufacturing), or access to production data via the Internet from any location. In order to meet the resulting increased security requirements, SIMATIC offers you IT Security for the protection of production and data.
With the SCALANCE S device family or the SOFTNET Security Client, firewall functions, access protection, encryption, VPNs, etc. can be implemented very easily – to protect plants and machinery. With SIMATIC Logon, the engineering or control system is extended with a user administration function, with which plant personnel can be assigned role-based access rights to control machinery or plants.

Total protection of plants, machinery, and expertise:
- Low administrative effort without IT expertise
- Support for relevant IT security standards such as firewalls, VPN, WEP, WPA

Security architecture on every level: Defense in Depth
- Physical separation and access protection
- Levels can function autonomously
- Clearly defined and monitored access points between levels

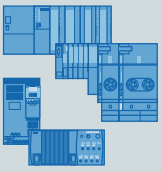
Uniform user administration (Single Logon)
- Uniform user management for secure authentication of the user

Robustness

Maximum industrial suitability – through increased robustness

System/device level
- Shock/vibration resistance
- Shielding for EMC
- Temperature range +5 to +45 °C

Drive and station level
- Shock/vibration resistance
- Coated modules
- Positive Connections
- Hot swapping
- Shielding for EMC



Module/submodule level
- Replaceable terminal box
- Coding of connecting terminals
- Gold-plated pins
- Shielding for EMC

Connection level
- RJ45 connector in industrial design
- Shielding for EMC

With any standard product from the SIMATIC range, you rely on maximum quality and robustness – perfect for use in industrial environments. Specific system tests ensure the planned and required quality of each individual component. For example, SIMATIC PCs undergo more than 50 tests to ensure industrial compatibility.

Of course, SIMATIC components meet all relevant international standards and are certified accordingly. Temperature and shock resistance are defined in the SIMATIC quality guidelines, as are vibration resistance and electromagnetic compatibility.

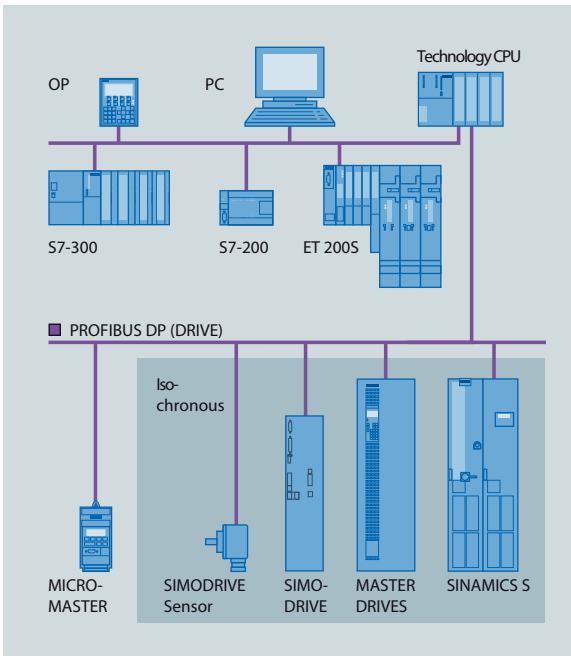
For industrial applications with harsh to extreme conditions, special versions are available such as SIPLUS or special SIMATIC ET 200 versions. These products meet special demands regarding rrobustness. These include an increased degree of protection, extended temperature ranges, or exceptional environmental stress. Thus they can also be used in harsh industrial environments, outdoors, or in hazardous areas.

Suitable for industry – even under difficult operating conditions

- An integrated range of products for all industrial application areas and extremely rough conditions
- Maximum robustness at all levels of automation and for all applications: from field devices to control units to operator panels
- Can be used direct on the machine or close to the process - even without a control cabinet, i.e. without requiring installation and wiring

Technology

Integrated technology functions – counting, measuring, positioning, closed-loop control, and cam control



Counting and measuring, cam control, closed-loop control, or motion control: You can integrate technological tasks in many different combinations and with various degrees of complexity without a system changeover into the world of SIMATIC – easily, conveniently, consistently.

Thanks to maximum freedom and scalability when choosing a software or hardware-based solution, SIMATIC Technology allows the effective implementation of technological functions at an excellent price-performance ratio. Parameter assignment and programming are implemented in the familiar STEP 7 environment.

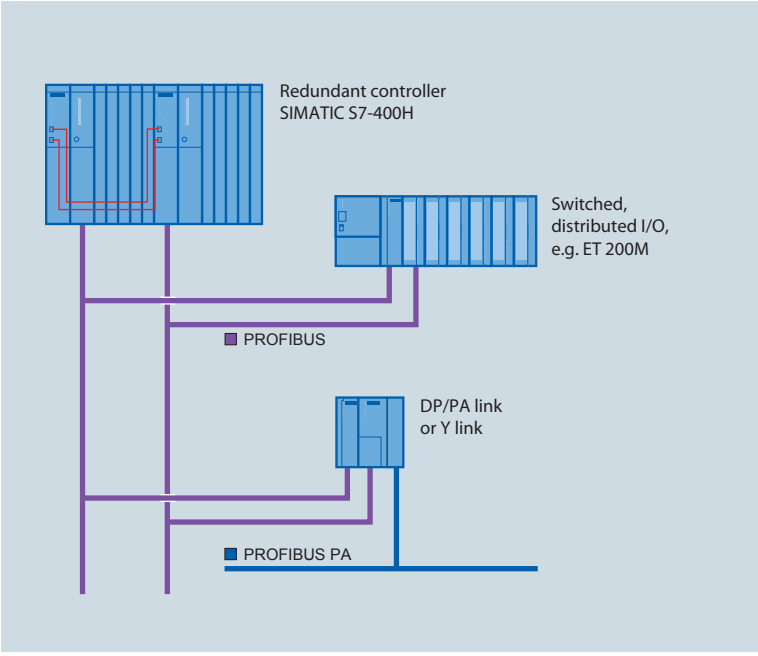
For example, in technology controllers, the PLCopen-certified motion control modules are integrated in a standard S7-300 CPU. They are therefore especially suited for coupled motion sequences of multiple axes. The isochronous PROFIBUS ensures maximum precision of fast processing operations.

Integrated technology functions

- CPU/STEP 7-integrated functions – for compact machines with few axes and counter/control channels
- Loadable, software-based function blocks – for flexible implementation on almost all SIMATIC hardware platforms
- ET 200S modules – distributed solutions through intelligent I/O modules
- Parameterizable function modules – for high demands on accuracy and dynamic response
- Technology controllers – Solution to comprehensive motion control tasks with high performance
- Freely-configurable application modules and closed-loop control systems – for very complex technology tasks with highest performance

High availability

Maximum availability – with integrated high availability concepts



Downtimes in automation systems can lead to complicated re-start procedures, which cripple entire processes and production sequences and can result in very high costs – in any industry. Risk factors such as power outages, water damage, fire outbreaks, or lightning strikes, but also system failures or operator errors, can significantly affect the operation of a plant.
For high plant availability, Siemens offers a comprehensive high availability concept for the whole plant and on all levels of automation. This helps prevent the high cost of downtime. For example, field-tested controllers ensure high availability through bumpless switching with automatic event synchronization. Where necessary, the controllers can even be up to 10 km apart.

High availability options

- Interruption-free operation due to redundant controllers
- Redundant I/O – for a loss-free signal transfer from the field devices to the control system
- Redundant servers – for complete integrity of plant data; redundant archive servers can also be implemented
- Fault-tolerant fieldbuses – for reliable communication from the field devices to the controller via distributed I/O

Efficient programming and configuring of scalable solutions

- Highly efficient solutions – with scalable performance and flexibly adjustable degree of high availability
- Simple programming and configuration in the familiar STEP 7 engineering environment

Advantages in operation

- Problem-free exchange of all components during operation
- Changes to configuration during operation
- Highest system availability with early fault detection and integrated diagnostic capabilities
- No data loss in the event of failure – thanks to the event-driven synchronization of the controllers and redundant servers

Distributed automation

The right solution for any requirement

You are constantly on the look out for possibilities of optimizing production and reducing costs? With increasing competition it is essential to provide individual machinery and plants as fast and cost-effectively as possible? This starts with the design of your machine and continues through installation, commissioning and normal operation right up to maintenance.

Uniform engineering, comprehensive functionality, simple installation and high-precision diagnostics from any point in the plant are essential – and it all needs to be based on international standards.

Ahead of the competition thanks to consistent decentralization

Flexible, distributed solutions are an essential part of modern automation – solutions that are tailored to your requirements and permit significant cost savings. Whether compact or modular, purely digital I/O interfaces or complete distributed systems with drive technology, installed in the control cabinet or directly in harsh industrial environments.

SIMATIC ET 200 – The right solution for every application

With SIMATIC ET 200 a wide range of distributed I/O systems is available – for solutions in the control cabinet or without a control cabinet directly at the machine, as well as for applications in hazardous areas. SIMATIC ET 200 systems for cabinet-free configurations are installed in a rugged, fiber-glass reinforced plastic enclosure, making them resistant to shock and dirt, as well as watertight. Furthermore, you need fewer additional components, save on cabling, and profit from extremely fast response times.

The modular design makes it possible to scale and expand the ET 200 systems simply and in small stages. Already integrated add-on modules reduce costs, and at the same time offer a widely diverse range of possible applications. You can choose from many different combination options: digital and analog inputs/outputs, intelligent modules with CPU functionality, safety engineering, motor starters, pneumatic systems, frequency converters, and diverse technology modules.

Communication over PROFIBUS and PROFINET, uniform engineering, transparent diagnostic possibilities as well as optimal interfacing to SIMATIC controllers and HMI units prove the unique integration of Totally Integrated Automation.

In a control cabinet (IP20)

Multifunctional	Compact and expandable	Block
		
ET 200S	ET 200S COMPACT	ET 200L

Modular	Intrinsically-safe
	
ET 200M	ET 200iSP

Without control cabinet (IP65/67)

Multifunctional	Block	Block
		
ET 200pro	ET 200eco PN NEW	ET 200eco

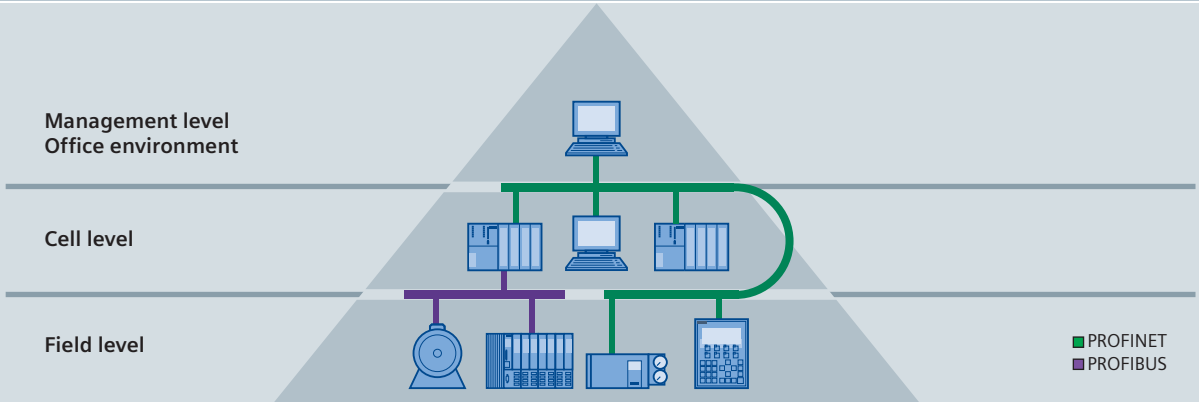
Robot

ET 200R

Distributed fieldbus systems are elementary components of the automation landscape Communication is performed at the field level with PROFIBUS and PROFINET – these systems ensure rapid data transfer between the components and consistent decentralization of the automation solution.

The use of open communication standards offers flexible connection possibilities – whichever system you decide on. You also have flexibility with the ET200 systems – most systems communicate both over PROFIBUS and PROFINET.

Distributed fieldbus systems



PROFIBUS

PROFIBUS is the No. 1 fieldbus – the proof lies in the 28.3 million nodes installed worldwide.

PROFIBUS is not only implemented in the manufacturing area, but it can also be used throughout the process industry – even in hazardous areas. Standard interfaces support quick and easy connection of the I/O to your systems and therefore integrated communication from the cell level down to the field level.

PROFINET

With 1.6 million nodes installed, PROFINET is the world's leading Industrial Ethernet standard. The forecast annual growth of 37% emphasizes the strong position.

Company-wide automation with PROFINET:
PROFINET – the open Industrial Ethernet Standard for automation – ensures integrated communication.

Existing fieldbus systems can be easily integrated. This protects your investments for the future. With PROFINET, the established IT services (e.g. web services, remote services, TCP/IP communication) can be used easily. PROFINET offers innovative diagnostics options, expanded quantity structures, and high performance and supports new, user-friendly applications such as wireless automation with Industrial Wireless LAN.

Product range at a glance

Solutions in a control cabinet (IP20)

SIMATIC ET 200S – the all-rounder with a comprehensive range of functions

- Discretely modular configuration with multi-conductor connection
- Multifunctional thanks to a wide range of modules: Motor starters, frequency converters, safety technology, distributed intelligence, IO-Link modules.
- Use in hazardous area (Zone 2)
- Also available as expandable block version with integral DI/DO: SIMATIC ET 200S COMPACT

SIMATIC ET 200M – the multi-channel S7-300

- Modular design using standard SIMATIC S7-300 modules; redundant design also possible
- Fail-safe I/O modules
- For use in hazardous areas up to Zone 2, sensors and actuators up to Zone 1.
- High plant availability thanks to redundancy, hot swapping, and configuration changes during operation

SIMATIC ET 200L – digital block I/O

- Low-cost digital block I/O
- Digital electronic blocks of up to 32 channels

SIMATIC ET 200iSP – the intrinsically-safe version for hazardous areas

- Modular design, also available with redundancy
- Rugged, intrinsically-safe design
- Use in hazardous areas up to Zone 1/21, sensors and actuators may even be located in Zone 0/20
- High plant availability thanks to redundancy, hot swapping, and configuration changes during operation

Solutions without a control cabinet (IP65/67)

SIMATIC ET 200pro – modular and multi-functional

- Modular design with an extremely compact enclosure
- Easy installation
- Multifunctional thanks to a wide range of modules – from simple inputs and outputs through safety systems, motor starters and frequency converters to the MOBY identification system
- High plant availability thanks to hot swapping and permanent wiring
- Extensive diagnostics

SIMATIC ET 200eco PN – Block I/O with PROFINET connection

NEW

- Low-cost, space-saving block I/Os
- Digital modules with up to 16 channels (can also be parameterized)
- Analog modules, IO-Link Master and load voltage distributor
- PROFINET connection with 2-port switch in each module
- Can be flexibly distributed in the plant via PROFINET in a line and/or star topology

SIMATIC ET 200eco – digital block I/O

- Low-cost digital block I/O
- Flexible connection options
- Fail-safe modules
- High plant availability – the electronic block can be easily replaced during operation without any interruption in bus communication or power supply

SIMATIC ET 200R – the solution for robots

- Specially for use on robots, e.g. in body-in-white assembly in the automotive industry
- Mounted directly on the chassis
- Resistant to weld spatter thanks to heavy-duty metal enclosure

Product overview

SIMATIC ET 200 for the control cabinet

I/O system	ET 200S	ET 200M	ET 200L	ET 200iSP
				
Design				
Degree of protection	IP20	IP20	IP20	IP30
Construction type	Bit-modular, expandable block	Modular	Block	Modular
Mounting	DIN rail	Mounting rail	DIN rail	Mounting rail
Connection system for sensors/actuators	Multi-conductor connection Spring-loaded/screw-type, Fast Connect	Single-conductor connection Spring-loaded/screw-type, Top Connect	Multi-conductor connection Spring-loaded/ screw-type	Multi-conductor connection Spring-loaded/ screw-type
Special applications				
Safety technology	●	●		
For use in hazardous areas	Zones 2, 22	Zones 2, 22		Zone 1, 21
Increased availability		Switched, redundant		Switched, redundant
Temperature range	0 °C ... +60 °C [1]	0 °C ... +60 °C [1]	0 °C ... +60 °C [1]	-20 °C ... +70 °C
Vibration resistance (continuous)	2 *g*	1 *g*	1 *g*	1 *g*
Communication				
PROFINET (copper/fiber-optic)	● / ●	● / ○		
PROFIBUS (copper/fiber-optic)	12 Mbit/s / 12 Mbit/s	12 Mbit/s / 12 Mbit/s	1.5 Mbit/s / ○	1.5 Mbit/s / ○
System functions				
Permanent wiring	●	●	●	●
Hot swapping	●	● (with act. b.-p. bus)		●
Isochronous mode, e.g. for high-speed control	●	●		
Expansion/configuration during operation	● / ○	● / ●		● / ●
Diagnostics (module-dependent)	Channel-discrete	Channel-discrete	Submodule-discrete	Channel-discrete
Functions				
Digital channels	●	●	●	●
Analog channels incl. HART	●	● ●		● ●
Motor starters / frequency converters	● / ●			
Pneumatic interface	● [2]			● [2]
Technological functions	Counting/measuring, positioning, weighing	Counting/measuring, positioning, cam control, closed-loop control, weighing		Counting, frequency measuring
Integrated CPU functionality	●	● (with S7-300 CPUs)		
Sensor technology (IO-Link)	●			

● applicable / available
○ not applicable / not available

[1] Also available as SIPLUS components for expanded temperature range -25 °C ... +60/70 °C and corrosive atmosphere/condensation (exact details at www.siemens.com/siplus)

[2] You can find additional information on the supplemental products at www.siemens.com/et200

SIMATIC ET 200 without control cabinet

I/O system	ET 200pro	ET 200eco PN (NEW)	ET 200eco	ET 200R
				
Design				
Degree of protection	IP65/66/67	IP65/67	IP65/67	IP65
Construction type	Modular	Block	Block	Block
Mounting	Mounting rail	Direct mounting	Direct mounting	Direct mounting
Connection system for sensors/actuators	M12	M12	M12	M12
Special applications				
Safety technology	●		●	
For use in hazardous areas				
Increased availability				
Temperature range	-25 °C ... +55 °C (0 °C ... +55 °C) [1]	-25 °C ... +60 °C	0 °C ... +55 °C	0 °C ... +55 °C
Vibration resistance (continuous)	5 *g* (module-dependent)	20 g	5 *g*	5 *g*
Communication				
PROFINET (copper/fiber-optic)	● / ●	● / -		
PROFIBUS (copper/fiber-optic)	12 Mbit/s / 12 Mbit/s		12 Mbit/s / ○	12 Mbit/s / ○
System functions				
Permanent wiring	●			
Hot swapping	●			
Isochronous mode	●			
Expansion/configuration during operation				
Diagnostics (module-dependent)	Channel-discrete	Channel-discrete	Submodule-discrete	Group-discrete
Functions				
Digital channels	●	● [2]	●	●
Analog channels incl. HART	●	●		
Motor starters / frequency converters	● / ●			
Pneumatic interface	● [3]			
Technological functions				
Integrated CPU functionality	●			
Sensor technology (IO-Link)		●		

● applicable / available
○ not applicable / not available

[1] In parenthesis: Temperature range of the frequency converter
[2] also parameterizable
[3] You can find additional information on the supplemental products at www.siemens.com/et200

ET 200 - Features

Simple design and increased plant availability

Simple configuration

Integral plug-in connections make installation quick and easy and therefore reduce the costs. In the case of modular systems, mounting is on a rail. The modules are snapped onto the rail and plugged into each other.

The sensors and actuators can be easily connected to a bus system without the need to use an array of single wires with cable distributors and cable racks. This makes the wiring simple and transparent, less error-prone and therefore low-cost.

Self-assembling backplane bus

Permanent wiring

Due to the separation of mechanics and electronics, permanent wiring is possible, i.e. the station can be prewired before installation or start-up. Prewiring can therefore be inspected without the electronics modules which prevents damage to sensitive components. The start-up time is therefore reduced. In addition, the modules can also be replaced in the event of a fault without time-consuming rewiring.

Permanent wiring: connections and electronics are separate from one another

Hot swapping

In the event of a fault, electronic modules are easily replaced during operation with the equipment live (hot swapping).

The station remains functional, and the plant therefore remains available – there is no need for costly shutting down and starting up of the plant. While the components are being replaced, the wiring remains intact.

Hot swapping: Module replacement during operation

Configuration in Run (CiR)

Changes or expansions are required even during active operation of a (sub-) system. Possible applications are due to non-stop requirements, that is, in continuous processes in process engineering that cannot be shut down or whose production cannot be interrupted.

Changes to the hardware configuration in RUN are possible when distributed I/Os are connected to the S7-400:

- Stations can be added and removed, e.g. for configuring a new process line
- I/O modules can be added and removed, e.g. for implementing additional sensors
- I/O modules can be reparameterized, e.g. for replacement parts

Changes to the configuration are possible during normal operation

Use in hazardous areas

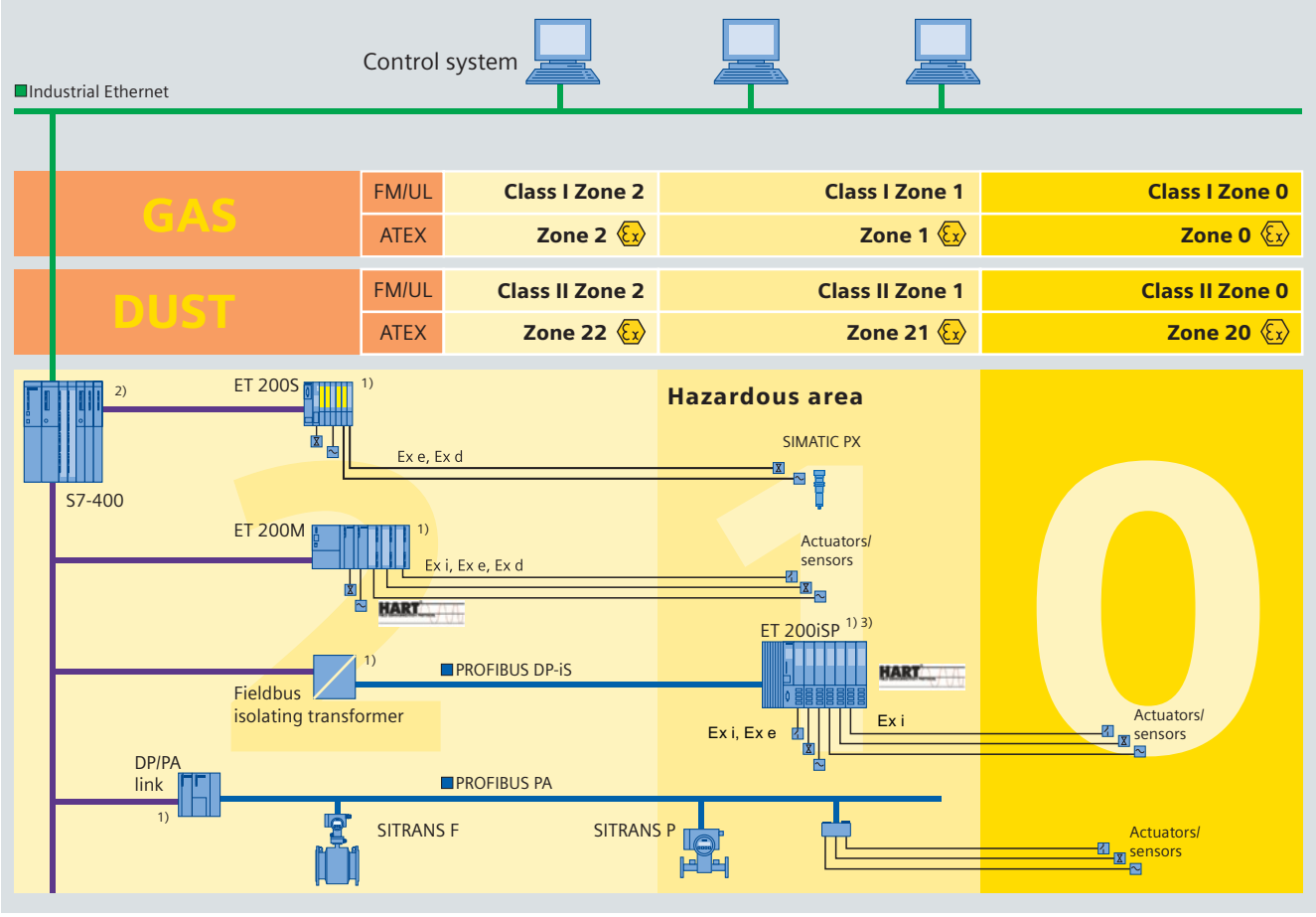
In many industries, the manufacture, processing, transport or storage of combustible materials results in the creation or release of gases, vapors or mist into the environment. Other processes create combustible dust. In combination with oxygen in the air, a potentially explosive atmosphere can occur that will result in an explosion if ignited. Special properties must be exhibited by the equipment used in these environments, and they must be certified. SIMATIC ET 200 is equipped for this, and includes a corresponding range of products.

The ET 200 systems can be used in different zones – either in Zones 2 and 1 in the case of gaseous atmospheres, or in Zones 22 and 21 in the case of dusty atmospheres.

The sensors and actuators linked to the I/O can even be in Zone 0 or Zone 20.

A manufacturer's declaration (compliance of the control cabinet with the ATEX directive) is necessary for installation in Zone 2/22. Certification of the control cabinet for the gas/dust area must be procured for installation in Zone 1/21.

Data communication takes place as usual over PROFIBUS. If communication is continued over PROFIBUS stations in Zone 1 or for other reasons over intrinsically safe PROFIBUS stations, the PROFIBUS is made intrinsically safe by an intermediate fieldbus isolating transformer. This limits the ignition energy to the permissible level and the intrinsically safe PROFIBUS is routed to the hazardous area.



ET 200 in hazardous gas and dust atmospheres

1) Dusty atmospheres: installation of components always in an enclosure with IP6x degree of protection.
2) With 10 A DC Standard Power Supply
3) Installation of the station complies with FM/UL up to Class I, Division 2; connected sensors and actuators even up to Class I, Division 1 or installation of station and sensors/actuators according to FM/UL up to Class II/III, Division 1

Mastering fast processes through isochronous mode

Distributed solutions with isochronous mode ensure extremely high accuracy as well as fast and reliable processing sequences. This is particularly important for controlling drives.

In order to control high-speed machines, production and machining processes, the processing cycles are synchronized. This means that the cycles of certain sequences are unified and embedded in a fixed time grid – the system clock. The processing sequences then exhibit continuity, and can therefore be handled faster and more reliably.

In order to implement this, short, repeatable and defined process response times are required. This means that I/O signals must be read in, output and synchronized with the user program at equidistant intervals.

For this reason, the time from acquisition of a signal by the distributed I/O through to the appropriate response of the actuator must be kept as short and as accurately reproducible as possible.

This requirement is solved in that a direct link is made between the equidistant DP cycle, the I/O modules and the user program.

Synchronism is decisive: Paper manufacture

Maximum demand for clock accuracy: Weaving machines

The synchronous linking of a SIMATIC automation solution to the equidistant PROFIBUS is referred to as *isochronous mode* and offers the following advantages:

- High-speed, time-based procedures in which reproducibility (deterministic features) plays a decisive role can also be automated with distributed I/O.
- Isochronous mode opens up a wide range of possible applications that are not simply restricted to drive applications. Isochronous mode is suitable for applications whose sensors and actuators are distributed throughout the machine.

The isochronous mode system function is supported by ET 200S and ET 200M.

SIMATIC ET 200 Configurator

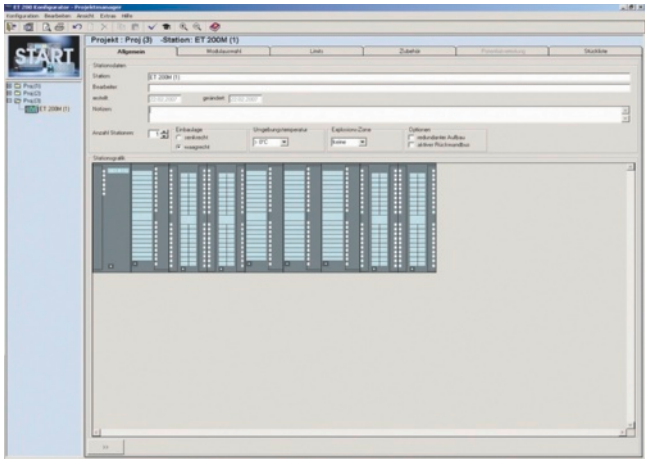
Just a mouse click away from a tailor-made I/O station: With the SIMATIC ET 200 Configurator

With the ET 200 Configurator, you get first class support with configuring your ET 200 station. The software tool guides you comfortably, easily and conveniently through the configuration and creates automatic ordering lists for you including accessories. It also supports you with compliance with limitations, for example, for load currents, slot rules or parameters.

The configuration generated in the ET 200 Configurator can be imported easily into STEP 7. This reduces the engineering overhead and avoids double entries.

The software tool is structured clearly: Six configuration views make working easy and convenient.

- **General**: General station data as well as a graphical presentation of the configured station
- **Module selection**: Guided selection of modules by means of module suggestions
- **Limits**: Display of station size, weight, number of modules, load voltage, parameters, etc.
- **Accessories**: Guided selection of the required accessories (module-specific or station-wide)
- **Potential distribution**: Graphical presentation of the potentials within a station
- **Parts list**: Automatic generation of a transparent parts list makes ordering easier



Configuration made easy with the ET 200 Configurator

SIMATIC Selection Tool

Besides the ET 200 Configurator, ET 200 stations can also be configured in the SIMATIC Selection Tool. The selection tool is available online via the Industry Mall.

Standards and approvals

Standards and approvals	
PROFIBUS	EN 50 170, Volume 2
PROFINET	IEC 61158
IEC 1131	IEC 1131, Part 2
UL	acc. to UL508 standard, File No. E 116536/E 75310 (AC modules)
CSA	acc. to standard C22.2 No. 142. File No. LR 48323/LR 44226 (AC modules)
cULus (for hazardous locations)	acc. to UL 508 standard File No. E 116536 acc. to hazardous locations UL 1604 File no. E 222109 acc. to CSA C22.2 standard No. 142
FM	Standard Class No. 3611, Class I Div. 2, Group A, B, C, D Class I, Zone 2, Group IIC (without motor starter)
Shipbuilding	American Bureau of Shipping Bureau Veritas Det Norske Veritas Germanischer Lloyd Lloyds Register of Shipping Nippon Kaiji Kyokai
Ex approval Cat. 3 (for Zone 2 acc. to ATEX-100a)	EN 50 021
ISA	ISA-S71.04 Severity Level G1, G2, G3 (for ET 200S, ET 200M, ET 200iSP)

The **ET200 Configurator** can be found on the Internet under
www.siemens.com/et200
and also in the catalog CA01 on DVD

SIMATIC ET 200S

The all-rounder with the comprehensive range of modules

SIMATIC ET 200S is the multifunctional, highly modular I/O system with IP20 degree of protection that can be exactly tailored to the automation task. Thanks to its rugged construction, it can also be used under conditions of high mechanical stress.

Various interface modules are available for interfacing to the PROFIBUS and/or PROFINET bus systems. Interface modules with an integral CPU transfer the computing power of an S7-300 CPU directly into the I/O device. They therefore offload the central PLC, and permit rapid responses to time-critical signals.

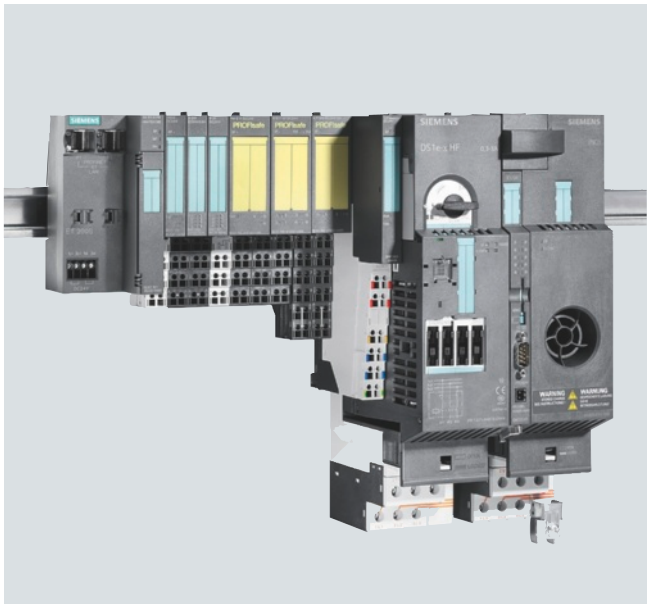
Interface modules with integrated CPU and PROFINET/ PROFIBUS connection are available – both in standard and safety-oriented designs.

New high feature interface modules, fast I/O modules, isochronous mode and an extremely fast internal data transport increase the performance of the ET 200S and permits the use even with extremely fast closed-loop controls.

With the 8-channel digital input and output modules, the bit-modular ET 200S is even more compact. They are perfectly suited for configurations with many channels and a space-saving and cost-saving configuration is demanded. The 8-channel module permits the connection of 2-wire sensors and they offer an simultaneity factor of 100% (i.e. 4 A summation current with 8 outputs with 0.5 A each).

Distributed automation solutions increasingly involve not just digital and analog signals, but also technological functions, motor starters, frequency converters or a pneumatic interface. The bit-modular ET 200S offers a comprehensive module range to implement the tasks:

- Technology modules are available e.g. for counting and positioning tasks, for cam control or for closed-loop control tasks.
- Using the motor starters, any three-phase loads up to 7.5 KW can be connected. Motor starters are available in several designs, including a fail-safe design.
- Frequency converters (also with integral safety technology) provide stepless speed control for asynchronous motors up to 4 kW.
- Pneumatic interfacing using modules from Bürkert.
- I/O-Link modules support the connection of intelligent sensors such as sonar BEROs.



ET 200S with PROFINET connection, I/O modules, motor starters and frequency converters

- Failsafe I/O modules permit the integration in safety-related plants with SIMATIC Safety Integrated.
- SIPLUS components allow for operation also in the expanded temperature range -25 °C ... +60 °C and in corrosive atmosphere or under condensation (**exact details at** www.siemens.com/siplus).

Diagnostics functions and hot swapping of modules increase plant availability:

- Comprehensive diagnostic interrupts indicate the module status on the one hand and channel-specific information on the other hand.
- Electronic modules, motor starters and frequency converters can be replaced during normal operation without the need for tools and with the equipment live (hot swapping). During replacement of a module, the SIMATIC ET 200S can continue to operate and the application will continue to function properly. If motor starters and frequency converters are used, even the otherwise obligatory isolation of the system can be avoided.

The **ET200 Configurator** can be found on the Internet under
www.siemens.com/et200s
and also in the catalog CA01 on DVD

Bit-modular economical design with multi-conductor connection

In addition to the extremely low space requirements, the ET 200S results in savings in wiring of up to 80 % in comparison to conventional solutions.

The reasons for this are:

- The backplane bus is built up automatically.
- All supply terminals have the characteristics of terminal blocks, allowing signal leads and motor cables to be directly connected to the SIMATIC ET 200S without the need for intermediate terminals.
- The integral safety system is a system component – an additional safety bus can therefore be omitted.
- Reserve modules can be used to reserve module slots for future use.
- Permanent wiring
- Considerably less cross-wiring thanks to the self-assembling voltage busses – this reduces the testing outlay and possible sources of error.
- The module labeling is not covered by the wiring when the module is installed.
- Easy configuration of an ET 200S station with the Configurator

Fast Connect

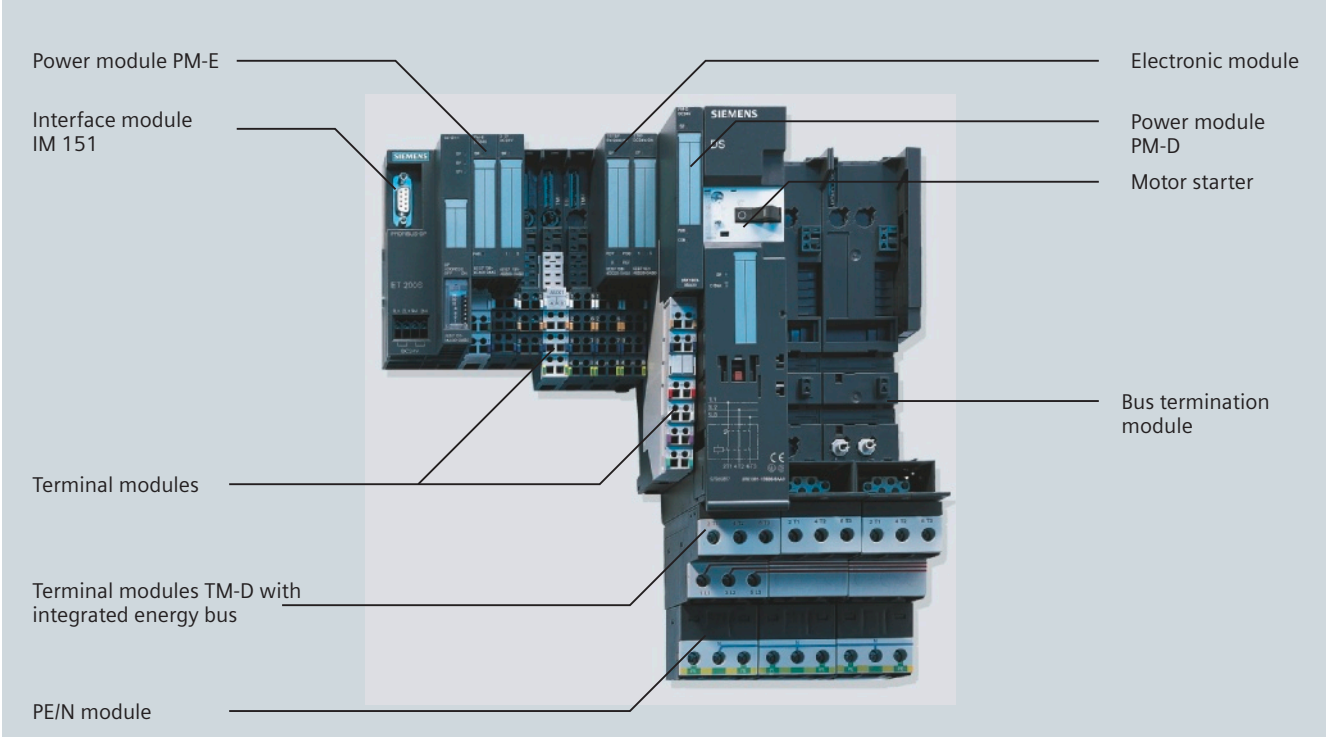
The insulation displacement method Fast Connect offers even more benefits for installation of the electronic and power modules.

With this new method, the standard conductor cross-sections from 0.34 mm² to 1.5 mm² can be connected.

Fast Connect connection system

No preparation is required for installation:

- Time savings of up to 60 % for installation as compared to the conventional connection methods.
- No stripping or crimping necessary
- Simple and safe installation with a screwdriver. Reduction of error ratio during installation
- The stripped length does not have to be determined



Bit-modular design of ET 200S

Interface modules for bus connection

ET 200 S is connected to the bus system via the interface module – either to the well-proven PROFIBUS or to PROFINET, the open Industrial Ethernet standard. Various interface modules can be chosen, which all provide for channel-discrete diagnostics:

	IM 151-1 BASIC IM 151-1 COMPACT	IM 151-1[5] Standard/ Standard FO	IM 151-1[5] High Feature (HF)	IM 151-3 PN[5]	IM 151-3 PN HF IM 151-3 PN FO	IM 151-3 PN HS
PROFIBUS	Copper	Copper/FOC[1]	Copper			
PROFINET				Copper	Copper/FOC[1]	Copper [6]
Additional PROFIBUS line						
2-port switch [4]				●	●	●
Number of modules	12	63	63	63	63	32
Station width	2 m	1 m/2 m	2 m	2 m	2 m	0.5 m
CPU functionality						
Fail-safety			●		●	
Isochronous mode			●			● [6]
Electronic rating plate [2]		●	●	●	●	●
Firmware update		Bus	●	Bus/Micro Memory Card	Bus/Micro Memory Card	Bus/Micro Memory Card
Order No. group 6ES7 151-	1CA.	1AA. / 1AB.	1BA.	3AA.	3BA.	3BA6-.

Interface module IM 51-3 PN for PROFINET with standard cable

Interface module IM 151-3 PN FO with fiber optic cable

	IM 151-7 CPU/ CPU FO[5]	IM 151-7[5] F-CPU	IM 151-8[5] PN/DP CPU	IM 151-8F[5] PN/DP CPU
PROFIBUS	Copper/FOC[1]	Copper	● [3]	● [3]
PROFINET			Copper	Copper
Additional PROFIBUS line	● [3]	● [3]	● [3]	● [3]
2-port switch [4]			● [7]	● [7]
Number of modules	63	63	63	63
Station width	2 m	2 m	2 m	2 m
CPU functionality	CPU 314	CPU 314	CPU 314	CPU 314
Fail-safety		●		●
Isochronous mode				
Electronic rating plate [2]			●	●
Firmware update	Micro Memory Card	Micro Memory Card	Bus, Micro Memory Card	Bus, Micro Memory Card
Order No. group 6ES7 151-	7AA. / 7AB.	7FA.	8AB.	8FB.

[1] Plastic, polycarbonate fiber (PCF)
[2] The electronic rating plate contains a module's stored identification data, e.g. the order number, version, installation date, plant identifier, which uniquely identify this module and which are available online, e.g. in order to simplify troubleshooting.
[3] With master module 6ES7 138-4HA.
[4] The integrated 2-port switch for IM 151-3 now allows, in addition to the star topology, a very simple line configuration.
[5] Also available as SIPLUS components for an expanded temperature range -25 °C ... +60/70 °C and corrosive atmosphere/condensation (exact details at www.siemens.com/siplus).
[6] Available with SIMOTION Controllers as of V4.1 SP1 and PROFINET with IRT.
[7] 3-port switch

Distributed intelligence

IM151-8 PN/DP CPU

The interface modules with integrated CPU can be used both in stand-alone mode and for distributed automation solutions with a medium-sized program. They correspond to a CPU 314 and enable distributed preprocessing of the production data locally – even in the failsafe version. Depending on the version, communication can take place via MPI/PROFIBUS and/or PROFINET. This has the following advantages:

- Relieves the central control unit
- Reduction in the response times to critical local signals
- More transparent and shorter programs
- Easier trouble-shooting
- Less load on the bus system
- Modularization of the system structure and precommissioning – also at different sites

Additional PROFIBUS line

Interface module IM 151-7: with integral CPU (also as F version) and master module

The DP master module for the interface module with integrated CPU is used to expand the ET 200S as master with an integrated DP master interface. A lower-level PROFIBUS line can then be configured with further distributed I/O.

Options handling

With the use of options handling with SIMATIC ET 200S, the entire station including all options is configured. Modules for unnecessary options are either replaced by reserve modules or can be completely eliminated. Optional functions are activated during operation without new configuration. Options handling is integrated step-by-step in the interface module of the ET 200S.

Options handling is available in two versions:

With reserve modules

In this case, the station is configured with all options. I/O modules that are not required are replaced by cost-effective reserve modules. Later, they can be exchanged for the configured modules without new configuration, even during ongoing operation.

Without reserve modules

In this case, the station is configured with all options, however, only the necessary modules (terminal and I/O modules) are plugged in. The modules which are not plugged in can be later retrofitted as required without new configuration.

Options handling is currently available in the interface modules IM 151-1 Standard and IM 151-1 High Feature. Options handling for the interface module with PROFINET interface will be available soon.

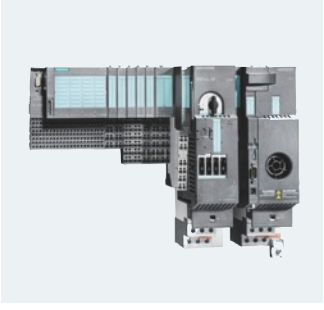
SIMATIC ET 200S COMPACT –
The block I/O featuring bit-modular expansion

ET 200S COMPACT expandable block

SIMATIC ET 200S COMPACT is the new interface for the bit-modular ET 200S I/O system. The new IM 151-1 COMPACT interface module expands the well-known range of proven ET 200S modules and permits use as a block I/O.

The functionality is based on the IM 151-1 BASIC and comprises an interface module and 32 channels in one block. Two different variants of the ET 200S COMPACT are offered – either a station with 32 digital inputs or mixed with 16 digital inputs and 16 digital outputs.

By expanding the block with ET 200S modules (up to 12 modules), a total of 128 channels can be connected to the SIMATIC ET 200S COMPACT. Thus frequently required inputs/outputs in block form can be combined with bit-modular specialist modules such as motor starters, frequency converters, pneumatics, etc.



ET 200S COMPACT with expansions

Expansions with the 8-channel modules support an extremely high packing density. As a result, one terminal box can accommodate more components or a smaller terminal box can be used.

Motor starters for any application

The ET 200S motor starters can be used to protect and switch any three-phase load. The completely prewired devices are available in different performance classes as direct, reversing or soft-starters up to an output of 7.5 kW.

The terminal module contains the self-assembling energy bus and the terminals for direct connection of the motor cable. A motor starter can be removed and inserted without the need to isolate the system.

Standard motor starters

- Circuit-breaker and contactor combination up to 5.5 kW
- Direct-on-line or reversing starters
- Optional safety system

High Feature motor starters

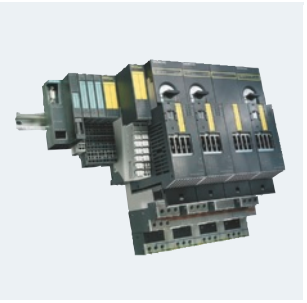
- Combination of starter circuit-breaker, electronic overload relay and contactor or soft starter up to 7.5 kW
- Comprehensive diagnostics messages, e.g. actual current value
- Statistical data, e.g. current for the last overload trip, can be read out using the service and commissioning software Motorstarter ES
- Parameterization over the bus
- Only two current setting ranges up to 7.5 kW
- Safety technology integrated

Fail-safe motor starter

As soon as more complex or widely distributed safety applications are implemented, the Failsafe motor starter in combination with the PM-D F PROFIsafe power module is the optimized solution. Signals from safe sensors are read in through safe inputs at any required point in a plant and transferred to the failsafe programmable controller via PROFIBUS by means of the PROFIsafe message frame. In the application program they are linked to the Failsafe motor starters or the associated power module.

These motor starters based on the High Feature motor starter offer a completely new patented technique for safety shutdown: Whereas under normal operation the contactor is responsible for shutdown, in the event of a fault, e.g. welded contactor contacts, the integral dual processor monitoring also trips the circuit-breaker. This ensures that each individual motor starter achieves Category 4 or SIL 3 without additional redundancy contactors.

The fail-safe motor starter monitors the function of the contactor regardless of whether the application is safety-related or not, so these devices are also suitable for use in high-availability processes.



Motor starter for failsafe ET 200S

Further characteristics that support high availability are:

- Type of coordination 2 over the complete power range up to 7.5 kW
- The emergency start function allows important processes to be continued to completion despite a reason for shutdown, e.g. overload.

Advantages of fail-safe motor starters over conventional safety systems

- Significantly fewer components, therefore less complex configurations and considerably less HW engineering and wiring overhead
- Rapid installation thanks to simple plug-in technology
- Motor starters are fault tolerant and failsafe
- High degree of flexibility thanks to assignment to switch-off groups in software
- When the safety application changes, there is less overhead because the wiring is retained

Two alternatives are available:

Local Solution

- Used for locally restricted safety applications
- For group deactivation of Standard, High-Feature or Failsafe motor starters without complex wiring for conventional safety systems
- For local evaluation of EMERGENCY STOP circuits with automatic or monitored starting
- Cascading of the shutdown groups
- Can also be used in combination with ext. safety circuits

PROFIsafe Solution

- For usage with safety-related applications that are complex and interconnected
- The logic of the safety functions (safe sensors can be freely assigned to Failsafe motor starters) is implemented with software and thanks to safety-related communication (PROFIsafe)
- Safety module PM-DF PROFIsafe forms 6 shutd. groups
- Selective and autonomous shutdown of the fail-safe motor starter for any safety function
- Also for controlling external safety systems through F-CM contact multiplier

Frequency converter for stepless speed control

When stepless speed control of asynchronous motors up to 4 kW is required, the SIMATIC ET 200S FC frequency converter opens up new applications for the ET 200S I/O system in the field of drive technology.

The frequency converter is of a modular design: Apart from a closed-loop control module, one from three possible power sections is snapped onto purely mechanical components (terminal modules).

Advantages of the frequency converters

- No tools needed for installation
- Self-assembling communication and power busses
- Permanent wiring
- Pulling and plugging in of the control module and power unit during operation
- Complete parameter settings on optional Micro Memory Card for servicing requirements
- Communication via PROFIBUS or PROFINET

Regenerative feedback function included

Line-commutated feedback of power into the supply system without he need for a chopper module or braking resistance is unique in this class.

The power loss of the overall system is reduced – which reduces the thermal load on the station and supports the use of smaller control cabinets. And what is more, the power fed back into the system when braking is available to other loads free-of-charge.

The new concept of the frequency converter also makes external line reactors superfluous. This saves additional installation space as well as procurement and installation costs.

For applications that are particularly sensitive to EMC, an external EMC filter is available that is connected in the infeed of the power bus.

Frequency converters in size A (0.75 kW)

Failsafe frequency converter in size B (2.2 to 4.0 kW)

Wide range of applications

- Simple drive tasks
- Conveyor system applications such as driving and lifting gear and winding and unwinding drives
- Closed-loop control with motor encoder for extremely precise speed and torque control
- Unwinding units, lowering of loads with hoisting gear, or electric braking of large centrifugal masses when making use of line-commutated energy recovery

Fail-safe frequency converter

The integrated safety functions of the failsafe version of the frequency converter support simple drive solutions in plant sections which pose a potential danger. In combination with the PM-D F PROFIsafe power module, the frequency converter in the failsafe version offers comprehensive integrated safety functions:

- Safe Torque Off, STO – the drive is prevented from starting up purely electronically, and therefore without contact.
- Safe Stop 1, SS1 – shutdown of the drive is monitored without a motor encoder or other encoder.
- Safely Limited Speed, SLS – the violation of a reduced motor speed is monitored without a motor encoder or other encoder.

I/O modules for simple applications

Module type	Information	Order No. group
Power modules for electronic modules and motor starters	For supplying and monitoring the load voltage and encoder voltage; voltage and/or fuse failures; additional LEDs indicate the status of the voltage and the fuse; different function AC, DC, PROFIsafe ■ PM-E 24 V DC with diagnostics or PM-E 24 ... 48 V DC, with diagnostics and status ■ PM-E 24 V DC to 230 V AC with diagnostics and fuse ■ PM-E F 24 V DC PROFIsafe for failsafe shutdown (max. Cat. 3) with digital output ■ PM-D F 24 V DC PROFIsafe for fail-safe motor starter and frequency converter	■ 6ES7 138-4CA.[1)] ■ 6ES7 138-4CB.[1)] ■ 6ES7 138-4CF. ■ 3RK1 903-1.
Terminal modules	For the electrical and mechanical connection of I/O modules and process wiring. Available with screw-type and spring-loaded terminals as well as the Fast Connect insulation-piercing technique ■ TM-P for power; TM-E for electronics ■ TM-D for motor starters	■ 6ES7193-4C.[1)] ■ 3RK1903-0A.
Electronic modules	For supplying the ET 200S with digital inputs and outputs; High Feature variants increase the plant availability and offer additional functions and diagnostics.	
Digital input modules	■ 2-, 4- and 8-channel ■ Available from 24 V DC to 230 V AC ■ Different functionalities: Standard, High Feature source input module 8 DI DC 24 V SRC	■ 6ES7131-4.[1)]
Digital output modules	■ 2-, 4- and 8-channel ■ Available from 24 V DC to 230 V AC; 0.5 to 5 A ■ Different functionalities: Standard, High Feature ■ Electronics and relays Sink output modules 4 DO 24 V DC/0.5 A 8 DO 24 V DC/0.5 A	■ 6ES7132-4.[1)]
Analog input modules	■ 2- and 4-channel ■ Current and voltage input, thermocouple and resistance measurement ■ Functionalities: Standard, High Feature, High Speed	■ 6ES7134-4.[1)]
Analog output modules	■ 2-channel ■ Current and voltage output ■ Functionality: Standard, High Feature, High Speed	■ 6ES7135-4.[1)]
Relay module	■ 2-channel, 24 V DC or 24...230 V AC, 5A ■ 2-channel, 24 V DC or 24...230 V AC, 5 A, can be switched channel-by-channel using the front switch	■ 6ES7132-4HB.[1)]
Fail-safe modules	■ Failsafe input module 4/8F-DI 24 V DC PROFIsafe ■ Failsafe output module 4F-DO 24 V DC/2 A PROFIsafe ■ Failsafe input/output module 4F-DI/3F-DO 24 V DC/2 A PROFIsafe ■ Fail-safe relay module 1F-RO 24 V DC or 24 - 230 V AC, 5 A	■ 6ES7138-4FA.[1)] ■ 6ES7138-4FB.[1)] ■ 6ES7138-4FC. ■ 6ES7138-4FR.
Reserve modules	Used as dummy modules for unused slots within an ET 200S station	■ 6ES7138-4AA.
IO-Link	The I/O-Link master module offers 4 I/O link channels with master functionality and enables the connection of intelligent IO-Link devices to the ET200S. All IO-Link functions are provided by ET200S to PROFIBUS DP or PROFINET I/O master modules. Simple data handling of IO-Link components is ensured via the configuration tool integrated in STEP 7. Up to 4 sensors, actuators or other IO-Link devices are each connected to a standard cable. In addition to the central parameterization, IO-Link in SIMATIC S7 also enables an expanded diagnostics up to device level. ■ 4-channel You can find additional information on the IO-Link at www.siemens.de/IO-Link	■ 6ES7138-4GA.

[1)] Also available as SIPLUS components for expanded temperature range -40/25 °C ... +60/70 °C and corrosive atmosphere/condensation (exact details at www.siemens.com/siplus)

I/O modules for special applications, accessories

Module type	Information	Order No. group
Technology modules	For the solution of technological tasks, high-performance function modules are available that perform these tasks largely autonomously and relieve the CPU significantly. Used directly on site; parameterization using STEP 7 or GSD file; serial interface	
	■ High-speed counting and measuring tasks with 5 V or 24 V encoders Counter module: 24 V DC / 100 kHz or 5 V DC / 500 kHz 1 COUNT	■ 6ES7138-4DA.[1)]
	■ Simple positioning tasks through position sensing with SSI encoders SSI module 1 SSI	■ 6ES7138-4DB.
	■ Controlled positioning of simple drives via digital outputs 1 POS U positioning module	■ 6ES7138-4DL.
	■ Positioning with stepper motors over a pulse/direction interface 1 STEP stepper motor module	■ 6ES7138-4DC.
	■ Proportioning, resetting and controlling of actuators and valves pulse module (timer, pulse-width modulation, stepper motor) 2 PULSE	■ 6ES7138-4DD.[1)]
	■ Serial data exchange via point-to-point connection 1 SI interface module	■ 6ES7 138-4DF.[1)]
Measuring modules	SIWAREX CS is a compact electronic weighing system with calibration capability for the distributed I/O system SIMATIC ET 200S. The SIWAREX CS weighing module can be used for various different measuring tasks such as container weighing, fill-level measurement, platform weighing, crane weighing as well as the measuring of forces and torques. ■ Uniform design and communication through integration in SIMATIC S7 ■ Use in distributed plant concept through connection to PROFIBUS DP via ET 200S ■ Measuring of weight or force with a resolution of 65,000 increments ■ Calibration according to OIML R76 ■ A display with calibration capability can be connected ■ Extensive diagnostics options ■ Easy to parameterize using the SIWATOOL CS program ■ Theoretical adjustment without adjustment weights ■ Replacement of module without renewed adjustment of scale ■ Use possible in Ex applications	■ 7MH4910-.
	SIWAREX CF is a measuring module for connection of sensors operating according to the strain gauge principle. The module can be used for various tasks, e.g. for measuring forces and torques. ■ Uniform design technology and consistent communication thanks to integration into SIMATIC S7 ■ Use in distributed plant concept through connection to PROFIBUS DP via ET 200S ■ Measurement with a resolution of ± 16,000 parts, accuracy 0.15% ■ Measurement rate 50 Hz ■ Ready-to-use, free application software "Getting started"	■ 7MH4920-.
Motor starter **(also with integrated safety system)**	■ Direct, reversing and soft starters ■ Functionality: Standard, High Feature, Failsafe ■ Up to 7.5 kW	■ 3RK1301-. ■ 3RK1903-.
Frequency converter **(also with integrated safety system)**	■ Output up to 4.0 kW ■ Regenerative feedback in generating mode ■ Functionality: Standard and Failsafe ■ Fail-safe functions certified in accordance with Cat. 3 according to EN 954-1 and SIL2 according to IEC 61508	■ 6SL3244-0S.
Accessories	■ Integrated **s**hield connection system for low-impedance connections of individual lengths. Space-saving, low-cost standard components with a simple plug-in technique are used for this purpose. ■ Individual **color-coded labels** for terminals on the terminal modules; they are available in different colors. ■ **Labeling plates** for numbering the terminal modules: inscribed or blank. ■ DIN A4 **labeling sheets** in different colors, pre-perforated; suitable for printing using a laser printer. Information: **www.s7-smartlabel.de**	■ 6ES7193-4..[1)]

[1)] Also available as SIPLUS components for expanded temperature range -40/25 °C ... +60/70 °C and corrosive atmosphere/condensation (exact details at www.siemens.com/siplus)

SIMATIC ET 200M

The S7-300 I/O with high channel density

The ET 200M distributed I/O system is modularly designed with IP20 degree of protection. Up to 12 multi-channel signal modules (e.g. 64 digital inputs) and function modules as well as S7-300 communications processors can be used as I/O modules – the interface to the process.

There are no slot rules. Hot swapping and expansion of modules is permissible when using active bus modules.

Connection to PROFIBUS and PROFINET is achieved using interface modules – optionally for PROFIBUS also using fiber optic cables.

In addition to screw-type and spring-loaded terminals, connection of the signals can be made even simpler and faster using SIMATIC TOP connect. Preassembled front connectors with single conductors and a complete plug-in modular system are available. FastConnect plugs do not require the cables to be stripped. The cable is simply plugged in and the contact is made using the insulation displacement method.

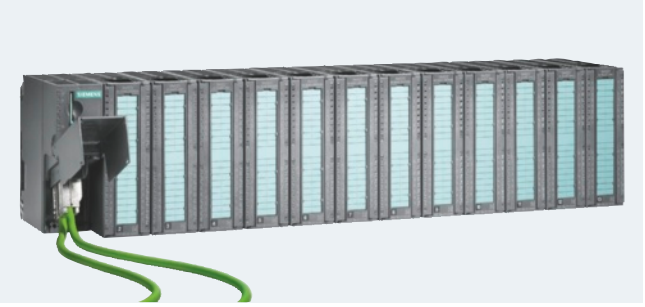
When the ET 200M is operated with an S7-400H/FH, the availability of the plant can be increased:
- Switched connection:
  One ET 200M with two interface modules
- Redundant connection:
  Two ET 200M with one interface module each

When the ET 200M is connected to PROFIBUS on an S7-400, the controller can be configured during normal operation (Configuration in RUN - CiR).

In this manner,
- complete ET 200M I/O stations can be added,
- individual modules can be added within a station, and
- individual digital and analog module parameters can be modified.

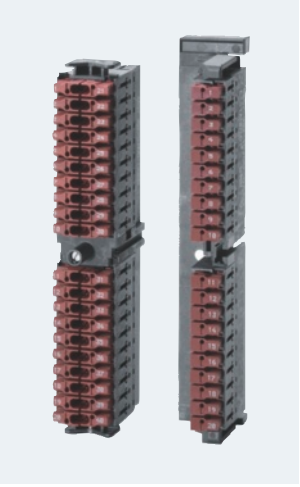
Hot swapping of signal modules is possible, thus reducing downtimes. Failsafe I/O modules permit the integration in safety-related plants with SIMATIC Safety Integrated.

SIPLUS components allow for operation also in the expanded temperature range -25 °C ... +60 °C and in corrosive atmosphere or under condensation
(**exact details at** www.siemens.com/siplus).



ET 200M with PROFINET connection and S7-300 modules

Fast Connect



Fast Connect plug for ET 200M

The insulation displacement method Fast Connect offers even more benefits for installation of the electronic and power modules.
- Available as 20-pole and 40-pole variants
- Suitable for all S7-300 I/O modules
- Permissible core cross-sections: 0.5 ... 1.5 mm²
- Suitable for rigid and flexible conductors
- Opening for test tip with a diameter of up to 1.5 mm
- Time savings of up to 60 % for installation as compared to conventional connection methods.
- No stripping or crimping necessary
- Easy, secure installation with a screwdriver
- Reduction in the number of installation errors
- The stripped length does not have to be determined

Interface modules for PROFIBUS and PROFINET

The various S7-300 modules in the distributed I/O system ET 200M are connected to the bus system via the interface module – either to the well-proven PROFIBUS fieldbus or to PROFINET, the open Industrial Ethernet standard.

Interface module IM 153-4 for PROFINET

The following interface modules are available:

Interface modules	IM 153-1 [5]	IM 153-2 HF [5]	IM 153-2 HF FO	IM 153-4 PN [5]
PROFIBUS	Copper	Copper	FOC	
PROFINET				Copper
2-port switch [1]				
Number of modules	8	12	8	12
Station width	360 mm	520 mm	520 mm	520 mm
Diagnostics	Channel-specific	Channel-specific	Channel-specific	Channel-specific
Time synchronization on PROFIBUS, time stamping of alarms[2]		●	●	
Use of function modules (FM) and communications processors (CP)	Restricted	●	●	
Forwarding of parameterization data to intelligent field devices		● (HART)	● (HART)	
Connection to high-availability (redundant) systems (S7-400H)		●	●	
In the redundant system In the non-redundant system		●	●	
Fail-safety (PROFIsafe)		●	●	
Isochronous mode [3]		●		
Electronic rating plate [4]		●	●	
Firmware update		Bus	Bus	Bus/Micro Memory Card
Order No. group ES7 153-	1AA.	2BA.	2BB.	4AA.

[1] The integrated 2-port switch of the IM 153-4 now also easily permits a linear structure in addition to the star topology.

[2] Changes to the digital inputs are already marked on site (in the IM 153 of the ET 200M) with a time stamp and transmitted to the CPU via a process alarm.

[3] Isochronous mode means the synchronous coupling of the distributed I/Os and the user program to the equidistant PROFIBUS. In this manner, actual value sensing and setpoint output are performed synchronously and with a constant cycle time and with consistent data images.

[4] The "electronic rating plate" or identification data are the data stored in a module such as the order number, version, installation date, plant identifier that uniquely identify this module and which are available online, for example, to simplify troubleshooting.

[5] Also available as SIPLUS components for expanded temperature range -25 °C ... +60/70 °C and corrosive atmosphere/condensation (exact details at www.siemens.com/siplus).

S7-300 modules

The multi-faceted module range of S7-300 enables the ET 200M to be modularly adapted to a wide range of different tasks.

Standard modules (digital and analog modules) and modules for special applications are available:

Digital modules	Function	Order No. group
SM 321	Digital input SM 321, 8DI	6ES7 321-1FF. [1]
	Digital input SM 321, 16DI	6ES7 321-1*H. [1]
	Digital input SM 321, 32DI	6ES7 321-1*L. [1]
	Digital input SM 321, 64DI	6ES7 321-1BP.
SM 322	Digital output SM 322, 8DO	6ES7 322-8*F. [1]
	Digital output SM 322, 16DO	6ES7 322-1*H. [1]
	Digital output SM 322, 32DO	6ES7 322-1*L. [1]
	Digital output SM 322, 64DO	6ES7 322-1BP.
SM 323	Digital input/output SM 323, 8DI/8DO or 16DI/16DO	6ES7 323-1B*. [1]
SM 327	Digital input/output SM 327, 8DI/8DX	6ES7 327-1BH.

Analog modules	Function	Order No. group
SM 331	Analog input SM 331, 2AI	6ES7 331-7KB. [1]
	Analog input SM 331, 8AI	6ES7 331-7*F. [1]
SM 332	Analog output SM 332, 2AO	6ES7 332-5HB. [1]
	Analog output SM 332, 4AO	6ES7 332-**D. [2]
	Analog output SM 332, 8AO	6ES7 332-5HF. [1]

Modules for technological functions	Function	Order No. group
FM 350-1	Counting, measurement	6ES7 350-1AH. [1]
FM 350-2	Counting, measuring, proportioning	6ES7 350-2AH. [2]
FM 351	Controlled positioning in rapid traverse/creep speed	6ES7 351-1AH.
FM 352	Electronic cam control	6ES7 352-1AH.
FM 352-5	High-speed Boolean operations	6ES7 352-5AH.
FM 353	Positioning with stepper motors	6ES7 353-1AH.
FM 354	Positioning with servo motors	6ES7 354-1AH.
FM 355C	Universal closed-loop control (continuous closed-loop control)	6ES7 355-0VH.
FM 355S	Universal closed-loop control (step controller)	6ES7 355-1VH.
FM 355-2	Temperature control with self-optimization	6ES7 355-2CH.
FM 357-2	Multi-axis interpolation, synchronous operation	6ES7 357-4AH.
SIWAREX U	Single-channel or dual-channel universal weighing module	7MH4601-1.
SIWAREX FTA	Fast weighing and dosing module with calibration capability	7MH4900-2.
SIWAREX FTC	Module for continuous weighing tasks	7MH4900-3.

[1] Also available as SIPLUS components for expanded temperature range -40/25 °C ... +60/70 °C and corrosive atmosphere/condensation (exact details at www.siemens.com/siplus).

[2] Also available as SIPLUS components for corrosive atmosphere/condensation (exact details at www.siemens.com/siplus).

Modules for fail-safe systems	Function	Order No. group
SM 326F DI 24	Digital input (24 x 24 V single-channel or 12 x 24 V dual-channel)	6ES7 326-1BK. [1]
SM 326F DI 8 NAMUR	Digital input (8 x NAMUR single-channel or 4 x NAMUR dual-channel)	6ES7 326-1RF.
SM 326F DO 10PP	Digital output (10 x 24 V)	6ES7 326-2BF. [1]
SM 326F DO 8PM	Digital output (8 x current sourcing/sinking)	6ES7 326-. [1]
SM 336F AI 6	Analog input (0/4...20 mA, HART)	6ES7 336-4GE. [2]
Isolation module	Galvanic isolation between F module and standard module for SIL3/Cat.4	6ES7 195-7KF. [1]

Modules for hazardous areas	Function	Order No. group
SM 321	Digital input (4 x NAMUR)	6ES7 321-7RD0.
SM 322	Digital output (4 x 15 or 24 V)	6ES7 322-5.D0.
SM 331	Analog input (4 x 0...20 mA or 4...20 mA)	6ES7 331-7RD0.
SM 331	Analog input (8 thermocouples or 4 thermoresistors)	6ES7 331-7SF0. [2]
SM 332	Analog output (4 x 0...20 mA or 4...20 mA)	6ES7 332-5RD0.
SM 331	HART analog input (2 x 0...20 mA or 4...20 mA)	6ES7 331-7TB0. [2]
SM 332	HART analog output (2 x 0...20 mA or 4...20 mA)	6ES7 332-5TB0.

[1] Also available as SIPLUS components for expanded temperature range -40/25 °C ... +60/70 °C and corrosive atmosphere/condensation (exact details at www.siemens.com/siplus)

[2] Also available as SIPLUS components for corrosive atmosphere/condensation (exact details at www.siemens.com/siplus).

SIMATIC ET 200L

Digital block I/O

ET 200L block I/O

The compact SIMATIC ET 200L I/O device with IP20 degree of protection comprises one terminal block and one electronic block. Connection to PROFIBUS DP (with a transmission rate of 1.5 Mbit/s) is through the interface integrated in the electronic block.

Terminal block

The terminal block accommodates the electronic block. It carries the wiring, so that no cables need to be unplugged when the electronic block is replaced. The terminal blocks have a 2-wire connection system as standard. As an option, additional terminals can be clipped on to enable 3-wire or 4-wire connection to be used.

The terminal block can be mounted in any position on a standard rail. Terminal blocks are available for 16 and 32 channels with screw-type or spring-loaded terminals.

Terminal block	Order No. group
16 channels, screw-type terminals	6ES7 193-1CH0. [1]
16 channels, spring-loaded terminals	6ES7 193-1CH1.
32 channels, screw-type terminals	6ES7 193-1CL0.
32 channels, spring-loaded terminals	6ES7 193-1CL1.

Electronic block

The electronic blocks contain the digital input and output channels for 24 V DC. The station address is set using rotary coding switches on the electronic block.

Electronic block	Order No. group
16 DI	6ES7 131-1BH. [1]
32 DI	6ES7 131-1BL.
16 DO; 0.5 A	6ES7 132-1BH.
32 DO; 0.5 A	6ES7 132-1BL.
16 DI and 16 DO; 0.5 A	6ES7 133-1BL.

[1] Also available as SIPLUS components for expanded temperature range -25 °C ... +60 °C and corrosive atmosphere/condensation (exact details at www.siemens.com/siplus)

SIMATIC ET 200iSP

The intrinsically-safe version for hazardous areas

ET 200S with redundant PROFIBUS connection

ET 200iSP can be used in hazardous areas with a gas or dust atmosphere:

- The ET 200iSP station can be installed in Zones 1, 21 and 2, 22.
- The connected sensors and actuators can also be located in Zones 0 and 20.

Communication between the field devices and the process control system or automation system is performed over PROFIBUS DP. This considerably reduces the wiring outlay. The terminal blocks commonly used today, as well as the necessary distribution boards and Ex isolating transformers for the signals, can be omitted.

PROFIBUS DP has established itself as the standard bus in the field level right up to hazardous areas. This open and system-wide communication keeps the solution flexible and also open to other manufacturers. International standardization of PROFIBUS DP also ensures future protection to the customer for investments that are often considerable and intended to last for many years.

ET 200iSP supports high availability of the system thanks to
- Configuration during normal operation
- Hot swapping
- Redundancy

During normal operation
- stations can be added,
- stations can be expanded with modules, and
- module parameters changed.

The independent wiring supports easy, reliable replacement of modules during normal operation. Hot swapping of the power supply is possible without arcing. PROFIBUS DP and/or the power supply can also be redundantly implemented.

HART support

ET 200iSP offers the HART protocol for connecting process devices with HART capability. These HART modules also support the transfer of auxiliary variables. Apart from the actual measured value, up to four IEEE variables can be transferred in the process image. By means of a routing function, a central station can access the HART process devices transparently over PROFIBUS DP. A higher-level control system can therefore perform central data administration. The process devices are connected by means of a 4 to 20 mA analog signal. Further device information is transferred over a modulated signal:
- Parameters that are specified by a central engineering station (routing)
- Diagnostics data that are read by the engineering station

This principle is called HART (Highway Addressable Remote Transducer). The majority of process instruments, e.g. for temperature, level, pressure or flow measurements, have HART connections.

Powerful diagnostics with SIMATIC PCS 7

With SIMATIC ET 200iSP, numerous items of diagnostics information are generated when internal and external faults occur, e.g. on open-circuit or short-circuit.

The HART status of the connected HART field devices such as maintenance and additional information is mirrored in the diagnostics and signaled to the host control system. Standard diagnostics drivers are available for SIMATIC PCS 7 for the diagnostics messages. These drivers prepare all the relevant signals for the higher-level PCS 7 operator system. The detected faults are transferred quickly to the higher-level systems and support online diagnostics from a central point at any time.

A watchdog module monitors the ET 200iSP by means of
- targeted reading or writing of I/O data
- Reading an input that switches (toggles) with a constant frequency
- Provision of an intrinsically safe power supply for the deactivation signal of the digital outputs

Modular, intrinsically safe design

The ET 200iSP is installed in just a few steps:

- The terminal modules are snapped onto the rugged and well-proven S7-300 standard rail
- Prewiring without electronics modules with spring-loaded and screw-type terminals
- No need for tools, because the power supply, interface module and electronics modules are simply plugged in

The **ET 200iSP Configurator** can be found on the Internet under
www.siemens.com/et200isp
and also in the Catalog CA01 on DVD

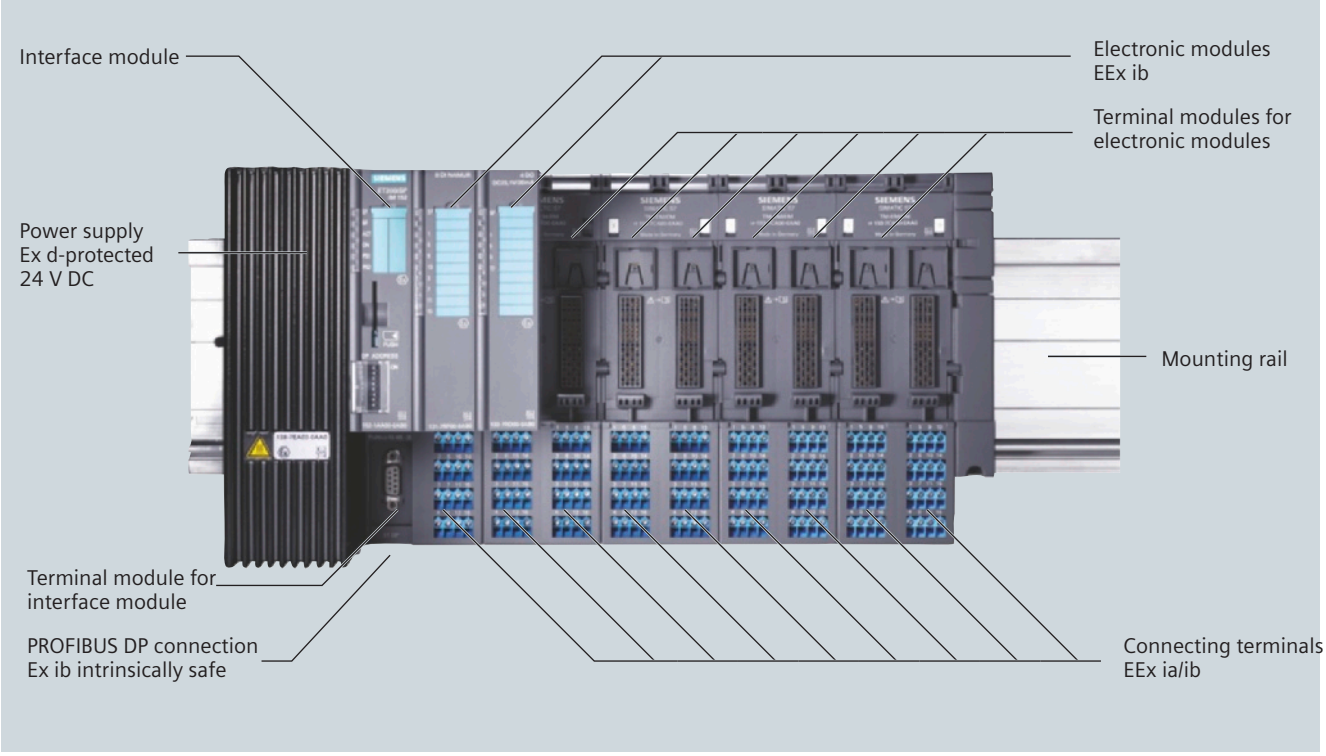
Safe in the field with the isolating transformer

Fieldbus isolating transformer

So that all the advantages of a failsafe bus installation are also available with PROFIBUS DP, an isolating transformer is used to make PROFIBUS DP intrinsically safe. This is done by isolating the bus and limiting the energy in the safe area. The fieldbus isolating transformer is used here as a barrier that converts PROFIBUS DP to an intrinsically safe PROFIBUS DP. It allows the PROFIBUS connector to be disconnected and connected even under Ex conditions.

The fieldbus isolating transformer offers the following advantages:

- Plug and Play without the need for time-consuming circuit calculations and certifications (PROFIBUS International guidelines 2262)
- Simple modification/expansion
- Connection of numerous devices
- Implementation as a barrier or repeater



Modular design of the ET 200iSP

Basic modules for the configuration

High-capacity power supply

The power supply with the explosion-proof casing provides all the voltages and currents required for operation of the ET 200iSP and feeds them into the backplane bus of the terminal modules. The 24 V supply is connected to the power supply terminal through EEx e terminals. The power supply supplies the ET 200iSP with safe galvanically isolated operational voltage for:

- Up to 32 electronics modules
- PROFIBUS DP interface of IM 152
- Supply of sensors/actuators

It provides for the safety-related limitation of the output voltages. The PS has an explosion-proof metal casing (EEx d explosion protection) and is permitted to be removed and replaced in the working position (hot swapping) under hazardous conditions. It provides up to 5A for supplying the modules and the sensors and actuators. In fault-tolerant solutions, two power supplies can be configured redundantly.

Power Supply PS 138	
Power supply	24 V DC/5 A
Dimensions	60 x 190 x 136.5mm
Order No. group	6ES7 138-7EA.

Power Supply – can also be used redundantly

Redundant IM 152 interface module

Interface module IM 152

Interfacing to the intrinsically safe PROFIBUS DP with transmission rates up to 1.5 Mbit/s over the IM 152 interface module. The IM 152 communicates autonomously with the higher-level system (PLC or master system).

For I&M purposes (Identification & Maintenance), the IM 152 and the electronics modules have an electronic rating plate[1)].

It is also possible for digital process signals to be tagged with a time stamp. The firmware of the IM 152 can also be upgraded with a plug-in SIMATIC Micro Memory Card (MMC) or via bus.

The IM 152 interface module and the PROFIBUS connector may be removed and replaced under hazardous conditions.

With fault-tolerant solutions, up to two IM 152 modules can be configured redundantly.

Interface module IM 152	
Transfer rate	9.6 Kbit/s...1.5 Mbit/s
Protocol	PROFIBUS DP
Interface	RS 485 iS
Firmware update	PROFIBUS, Micro Memory Card
Dimensions	30 x 125 x 136.5 mm
Order No. group	6ES7 152-1AA.

Terminal modules	Order No. group
TM-PS-A for PS	6ES7 193-7DA.
TM-PS-B for PS redundant	6ES7 193-7DB.
TM-IM/IM for two IMs	6ES7 193-7AB.
TM-IM/EM for IM and one EM	6ES7 193-7AA.
TM-EM/EM for two EMs	6ES7 193-7CA.
TM-RM/RM for 2 RMs (relay modules)	6ES7 193-7CB.
Dimensions	60 x 190 x 52 mm

Other components	Order No. group
Reserve module	6ES7 138-7DA.
Watchdog module	6ES7 138-7BB.

[1)]The "electronic rating plate" or identification data are the data stored in a module such as the Order No., release date, installation date, or plant identifier that uniquely identify this module and which are available online, for example, to facilitate troubleshooting.

Digital and analog electronics modules

Input/output modules

2-channel, 4-channel and 8-channel digital and analog input/output modules are available for the ET 200iSP (dimensions: 30 x 125 x 136.5 mm).

The digital and analog process signals are matched to ET 200iSP via these electronics modules (EM).

Electronic module

The electronics modules support the connection of HART process devices and all generally available EEx i valves and therefore offer flexible application possibilities. The process signals are connected via the terminals of the associated terminal modules with either screw-type or spring-loaded connection.

All EMs are designed as the EEx i "intrinsically safe" modules and can be easily replaced under Ex conditions (hot swapping).

The output modules have a special input for fail-safe deactivation:

- H deactivation (*active* high)
- L deactivation (*active* low)

External actuator deactivation is often required in plants in the event of evacuation or an emergency. L deactivation also ensures wire-break monitoring.

The digital output modules permit load-free switching of the digital outputs.

Digital electronic module 2 DO Relay

For the connection of certain actuators such as solenoid valves, hydraulic valves, DC contactors and indicator lights, signals with an increased current load are often required. In order to connect such devices, there is a relay module 2 DO Relay with two outputs and each with 2 A output current. The contacts are NO contacts with galvanic isolation from the supply voltage.

Digital modules

Application	NAMUR encoder, etc.	Valves, indicator lights, DC relays, etc.	Magnetic hydraulic valves, DC contactors, indicator lights
Module	8 DI NAMUR	4 DO	2 DO Relay
Number of channels	8	4	2 with 2 A each
Special feature	2 channels can be used as ■ Counter (max. 5 kHz) ■ Frequency meter (1 Hz ... 5 kHz) ■ With gate function	■ 23.1 V DC, 20 mA ■ 17.4 V DC, 27 mA ■ 17.4 V DC, 40 mA	■ UC 60V/2A ■ Hot Swapping in Ex Zone 1
Order No. group	6ES7 131-7RF.	6ES7 132-7RD. [1] 6ES7 132-7GD. [2]	6ES7 132-7HB0

[1] H deactivation, [2] L deactivation

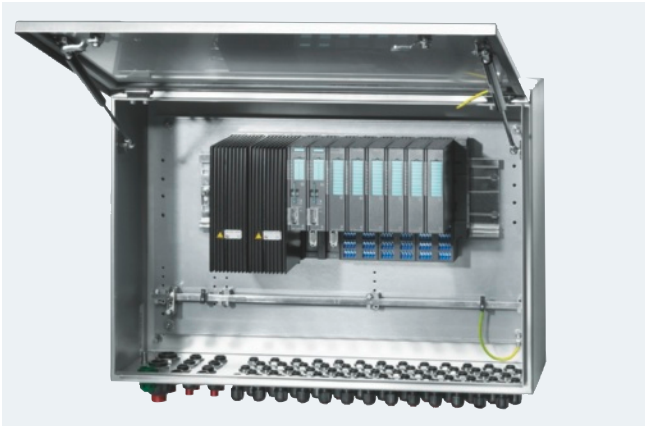
Analog modules

Application	Resistance thermometer (Pt100, Ni100) Resistance test 600 Ω	Thermocouple types B, E, J, K, L, N, R, S, T, U Thermal e.m.f. (± 80 mV)
Module	4 AI RTD	4 AI TC
Number of channels	4	4
Resolution	15 bit + sign	15 bit + sign
Order No. group	6ES7 134-7SD5.	6ES7 134-7SD0.

Analog HART modules

Use as HART module	HART process devices		
Use as analog module	2-wire transducer 4 - 20 mA	4-wire transducer 0 - 20 mA, 4 - 20 mA	Current output 0 - 20 mA, 4 - 20 mA
Module	4 AI I 2 WIRE HART	4 AI I 4 WIRE HART	4 AO I HART
Number of channels	4	4	4
Resolution	12 bit + sign	12 bit + sign	14 bit
Order No. group	6ES7 134-7TD0.	6ES7 134-7TD5.	6ES7 135-7TD0.

Standards, approvals and accessories



Control cabinets available as accessories

The housings (control cabinets) are suitable for hazardous areas of Zones 1 and 2 as well as 21 and 22. They either have surface treatment or are made of non-corrosive material.

The permissible operating temperature lies between -20 °C and +70 °C. The main components in the scope of supply of the housing are:

- Housing with wall bracket
- Mounting rail
- Equipotential bonding strip
- Cable and wire grommets

Standards and approvals		
ATEX	II 2 G (1) GD I M2	Ex de [ia/ib] IIC T4 Ex de [ia/ib] I
IECEx	Zone 1	Ex de [ia/ib] IIC T4
INMETRO	Zone 1	BR-Ex de [ia/ib] IIC T4
cFMus	Class I, II, II	NI Division 2, Groups A,B,C,D,E,F,G T4 AIS Division 1, Groups A,B,C,D,E,F,G
	Class I	Zone 1, AEx de [ia/ib] IIC T4
cULus	Class I, II, II	Division 2, Groups A,B,C,D,E,F,G T4 providing int. safe circuits for Division 1, Groups A,B,C,D,E,F,G
	Class I	Zone 1, AEx de [ia/ib] IIC T4
CE	In accordance with 94/9/EC (ATEX 100a), 89/336/EEC and 73/23/EEC	
Marine approval	Classification societies ■ ABS (American Bureau of Shipping) ■ BV (Bureau Veritas) ■ DNV (Det Norske Veritas) ■ GL (Germanischer Lloyd) ■ LRS (Lloyds Register of Shipping) ■ Class NK (Nippon Kaiji Kyokai)	

Accessories	Order No. group
Fieldbus isolating transformer	6ES7 972-0AC.
PROFIBUS cable for intrinsically safe PROFIBUS RS 485-iS	6XV1 831-2A.
PROFIBUS DP connector	6ES7 972-0DA6.
Control cabinets	6DL2 804.

Ambient temperature	
Horizontal, for max. 5 A current output of the PS	-20 °C to +70 °C
Horizontal, for max. 3.5 A current output of the PS	-20 °C to +70 °C
Other mounting positions	-20 °C to +50 °C

SIMATIC ET 200pro

Compact and multi-functional

SIMATIC ET 200pro is an especially small, extremely rugged and high-performance I/O system with IP65/66/67 degree of protection. It does not require a control cabinet and can be directly mounted to the machine. Its modular and time-saving structure allows flexible, customized, distributed automation solutions to be implemented.

ET 200pro can be connected to well-proven fieldbuses such as PROFIBUS or to PROFINET, the open Industrial Ethernet standard for company-wide automation.

ET 200pro offers comprehensive diagnostics to reduce the downtimes of your plant:

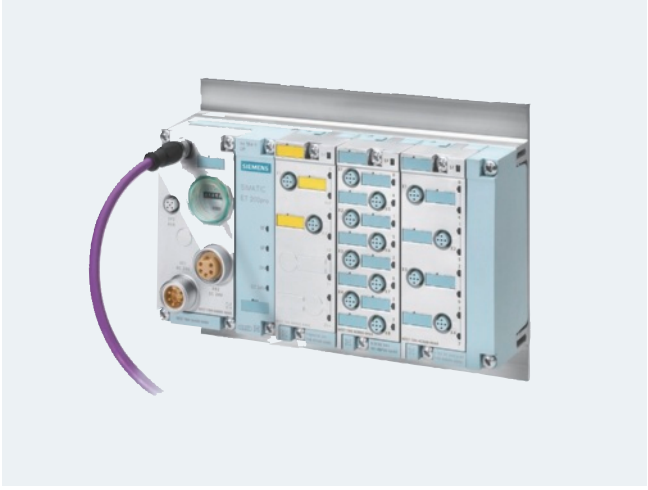
- The standard modules also offer module diagnostics for short-circuiting of the encoder supply or the outputs.
- The High Feature modules offer more precise diagnostic functions through channel diagnostics for short-circuit and wire-break. Additional process interrupts can be used for digital inputs for six channels.
- Diagnostic alarms are reported to the higher-level PLC over PROFIBUS or PROFINET in the form of plain text.

Fail-safe electronic modules and high-feature interface modules are available for automation tasks with maximum safety demands. The electronic modules can be used on their own in a station, or in mixed configurations with standard modules.

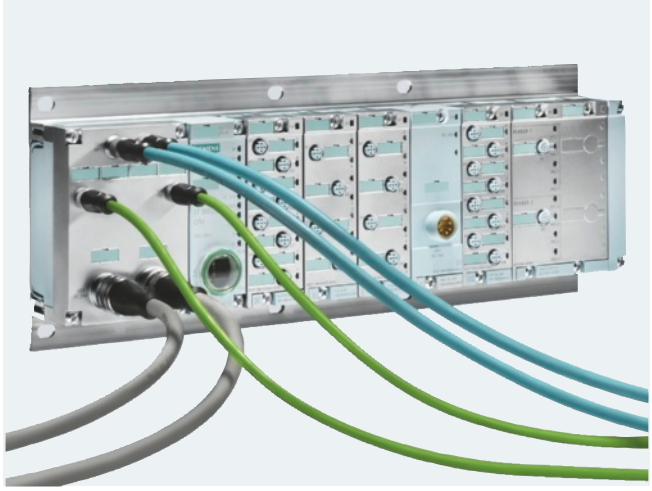
Together with the failsafe SIMATIC S7-300F and S7-400F controllers, automation tasks can be solved with safety requirements up to SIL 3 (EN 61508) or up to Category 4 (EN 954-1) – efficiently and without cabinets.

Failsafe communication between the ET 200pro and the higher-level failsafe CPU is achieved using PROFIsafe profile – via PROFIBUS or PROFINET.

The **ET 200pro Configurator** can be found on the Internet under
www.siemens.com/et200pro
and also in the Catalog CA01 on DVD



ET 200pro with PROFIBUS connection



ET 200pro with PROFINET connection, CPU and RFID module

Modular, space-saving design

The ET 200pro has a compact design and up to 16 modules can be combined as required over a length of up to one meters. An ET 200pro station can be preassembled on the work bench with narrow module carriers and then fitted to the machine as a complete unit. Alternatively, the compact module carrier can also be fixed in place first and the station can be assembled later. The modules are simply latched into the module carrier and pushed onto each other. Module carriers are available with 0.5 m, 1 m and 2 m.

The expansion modules are divided into bus module, electronic module and connection module:

- The **bus module** contains the backplane bus for signals and supply voltage in build-as-you-go design.
- The **electronic module** determines the function and is easily replaced during normal operation with the equipment live (hot swapping). The station therefore remains functional in the event of a fault. Coding prevents the wrong module from being plugged in inadvertently.
- The **connection module** with permanent wiring is plugged on and screwed down with 2 screws. Pre-assembled connecting cables can be attached quickly and easily.

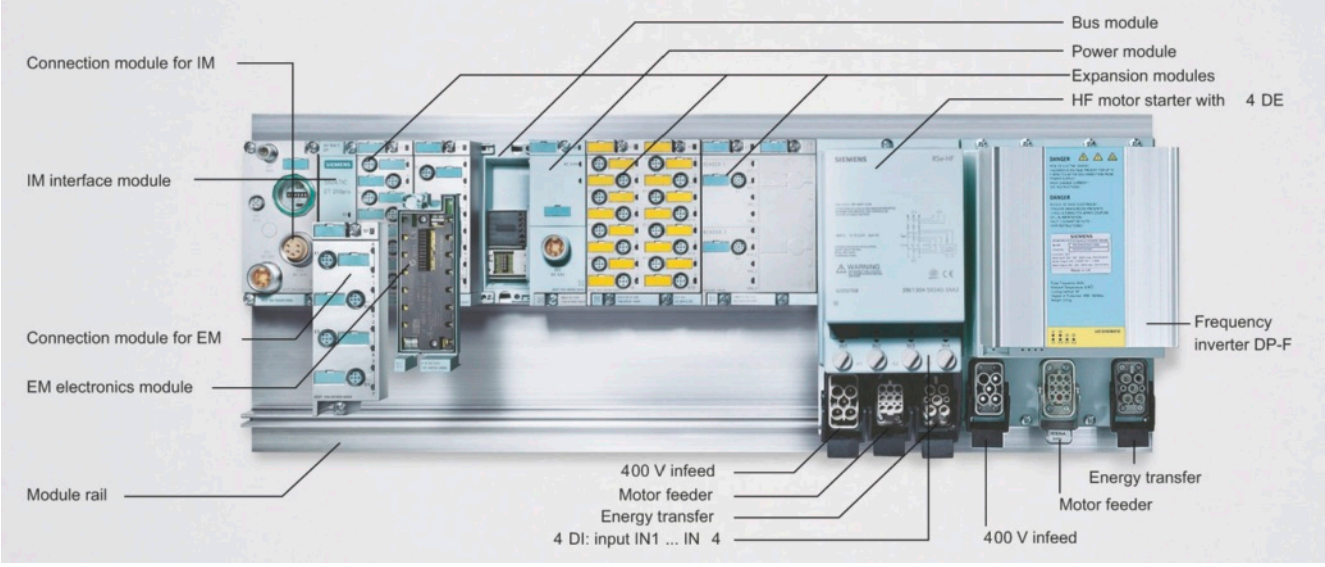
8-channel electronic modules can be combined with the 8 x M12 or 4 x M12 connection modules. This gives you the choice of single or dual assignment of the M12 sockets. A wide variety of different sensors and actuators can therefore be connected to the electronic module without the need for additional accessories such as Y connectors or Y leads. This not only reduces the wiring but also the costs for accessories and parts inventories.

Failsafe I/O modules permit the integration in safety-related plants with SIMATIC Safety Integrated.

Selective formation of load groups

Power modules allow load groups to be built up as required by supplementary supply from the load power supply. In this case, the same connection techniques (direct connection; M12, 7/8"; ECOFAST) are available as for the power supply of the complete station. More than one load segment can be integrated into a single station.

In the interface and in each power module, built-in fuses ensure that nether total failure of all load groups nor damage outside the station can occur.



Modular design of the ET 200pro

Interface modules for PROFIBUS

The **interface modules (IMs) for PROFIBUS** can be combined with three different modules for connecting the bus and power supply.

All **connection modules for PROFIBUS** have visible address setters that allow the addresses to be easily read as well as a selectable terminating resistor. The integrated T functionality supports the start-up of partial segments and uninterrupted bus communication in the event of a servicing requirement.

- **Direct connection** with cable gland: For up to 16 A electronic load and a cross-section of up to 2.5 mm².
- **ECOFAST** (Energy and Communication Field Installation System) – The standardized Siemens connection technique for cabinet-free distribution is based on hybrid cables for bus signals and power supply.
- **M12, 7/8"**: The familiar connection method with widely implemented connector standard.

Interface modules	IM 154-1 DP IM 154-2 DP HF
Protocol	PROFIBUS DP
Transfer rate, max.	12 Mbit/s
Firmware update	via PROFIBUS
Dimensions (with connection module)	90 x 130 x 173 mm With CM IP DP M12, 7/8" 90 x 130 x 120 mm With CM IP DP directly 90 x 130 x 80 mm With CM IP DP ECOFAST
Order No. group	6ES7 154-1. 6ES7 154-2.

PROFIBUS IM with M12, 7/8" connection

PROFIBUS IM with direct connection

PROFIBUS IM with ECOFAST connection

Interface module for PROFINET

The **interface module** (IM) **for PROFINET** contains a 2-port switch for easy configuration of a line structure. More parameters are possible per station using PROFINET, and therefore more high-function modules can be used. In case of service, the IM can be replaced without using a programming device – the device name and parameters remain on the module.

As with the PROFIBUS variant, the interface module and the connection module on the **interface module IM 154-4 PN HF** are separated so that various connection methods are possible.

The interface module offers both the proven M12 7/8" connection and the option of the connection with push-pull technology. The integrated switch enables the easy construction of line structures.

Interface module IM 154-4 PN HF	
Function	PROFINET interface module HF for ET 200pro with integrated switch and data transmission rate up to 100 Mbit/s
Mounting dimensions W x H x D (mm)	135 x 130 x 50.8
Order No. group	6ES7 154-4AB10-0AB.

The following connection modules are available:

Connection module CM IM PN		
		
	M12, 7/8"	**2xRJ45 2xSCRJ FO**
Function	Connection module for PROFINET interface module ET 200pro	
Connection options	2x M12 and 2x 7/8"	2x RJ45 or 2x SCRJ FO 2x push-pull power connectors
Dimensions W x H x D	90 x 130 x 50.8 mm	90 x 130 x 50.8
Order No. group: 6ES7...	194-4AJ00-0AA.	194-4AF00-0AA. 194-4AG00-0AA.

Interface module for wireless data transfer NEW

Interface module IM 154-6 PN HF IWLAN for wireless data transfer

With the new interface module IM 154-6 PN HF IWLAN (Industrial Wireless LAN), the distributed I/O system ET 200pro can now be connected wirelessly to a higher-level PROFINET IO Controller for the first time. IM 154-6 PN HF IWLAN communicates wirelessly as an IWLAN client with an IWLAN Access point of the communication network (e.g. SCALANCE W). Both standard and safety-related applications can be implemented via this wireless connection with PROFINET.

IM 154-6 PN HF IWLAN is especially well-suited for overhead monorail conveyors, automated guided vehicle systems, building management and warehouse logistics.

An integrated web server allows very easy setting and parameterization. Modern procedures (e.g. encryption, authentication) ensure a high degree of data security. Antennas and antenna cables are available as accessories.

Interface module IM 154-6 PN HF IWLAN	
Function	Wireless PROFINET connection
WLAN standards	IEEE 802.11 a/b/g/h/e/i
Frequency bands	2.4 and 5 GHz
Transfer rate	54 Mbit/s
WLAN services	Optimized media access, uninterrupted wireless cell switching, anti-interference mechanisms
Mounting dimensions W x H x D (mm)	90 x 130 x 50.8
Order No. group	6ES7 154-6AB.

CPU module

The interface module IM154-8 PN/DP CPU with CPU functionality is based on the CPU 315-2 PN/DP and offers the same quantity structures and functions. The IM154-8 PN/DP CPU has two communication interfaces,

- one combined MPI/ PROFIBUS DP interface, and
- one PROFINET interface with three ports.

CPU module for ET 200pro

The IM 154-8 PN/DP CPU supports both PROFINET IO (up to 128 IO devices can be connected) and PROFINET CBA, as well as PROFIBUS DP (as master for up to 124 slaves).

The IM 154-8 PN/DP CPU is not only compatible with the programs of the S7-300 CPUs, but it also offers a high degree of data retentivity (protection against voltage failure). A separate LED signals maintenance alarms. Modules can be replaced easily thanks to the Micro Memory Card. Firmware can be updated over the network.

Furthermore, a web server functionality for information, status, diagnostics, clock synchronization via the Ethernet (NTP) is available. The open Ethernet communication (TCP/IP, UDP, ISO-on-TCP) permits reliable and high-speed data exchange. Isochronous mode is possible on the PROFIBUS.

There is less loading on the central controller because individual plant sections can be configured, commissioned, diagnosed and operated individually.

CPU module	IM154-8 PN/DP CPU
PN/DP connection block	CM IM PN DP M12 7/8"
Degree of protection	IP65/67
Memory	256 KB / 85 K instructions
Interfaces	X1: MPI/DP interface (2x M12) X2: PN interface (2x M12, 1x RJ45)
CPU mounting dimensions W x H x D (mm)	135 x 130 x 59.3
Connection block mounting dimensions W x H x D (mm)	90 x 130 x 50.8
CPU Order No. group	6ES7154-8AB.
Connection block Order No. group	6ES7194-4AN.

Power supply module NEW

The power supply module converts 3-phase rated voltages from 380 to 480 V into controlled DC voltage and reliably supplies power to the I/O system with up to 8 A. Thus, the ET 200pro can be very easily supplied with the often available 3-phase connector, without needing its own 24 V power supply.

ET 200pro power supply module for 380 to 480 V

The controlled 24 V power supply feeds the connecting modules for the electronics/encoder (1L+) and load voltage supply (2L+). To supply a new potential group (2L+), the 4-pin 24 V cable is connected to the power module.

To cover power failures, the power supply unit can be expanded with a SITOP UPS500P. The absolutely maintenance-free 24 V/7 A UPS module on a capacitor basis is also designed in IP65 and is suitable for ambient temperatures up to +55 °C.

Power supply module	
Input voltage	380 - 480 V (340...550 V) 3 AC
Frequency	50/60 Hz (45 ... 66 Hz)
Output voltage	24 V DC
Output current	8 A
Short-circuit protection	Electronic, independent restart
Mounting dimensions W x H x D (mm)	310 x 135.5 x 90
Order No. group	6ES7 148-4PC.

Electronic modules

Digital electronic modules with 4 and 8 channels for 24 V and 4-channel analog electronic modules are available for voltage, current, and resistance thermometers.

Digital electronic modules 8 DI and 4 DO

Digital electronic modules	Order No. group
EM 8 DI DC 24V	6ES7 141-4BF.
EM 8 DI DC 24V HF	6ES7 141-4BF.
EM 4 DO DC 24V, 2A	6ES7 142-4BD.
EM 4 DO DC 24V, 2A HF	6ES7 142-4BD.
EM 8 DO DC 24V, 0.5A	6ES7 142-4BF.

Analog electronic modules	Order No. group
EM 4AI U HF	6ES7 144-4FF.
EM 4AI I HF	6ES7 144-4GF.
EM 4AI RTD HF	6ES7 144-4JF.
EM 4AO U HF	6ES7 145-4FF.
EM 4AO I HF	6ES7 145-4GF.

Different connection modules are available for screwing onto the I/O:

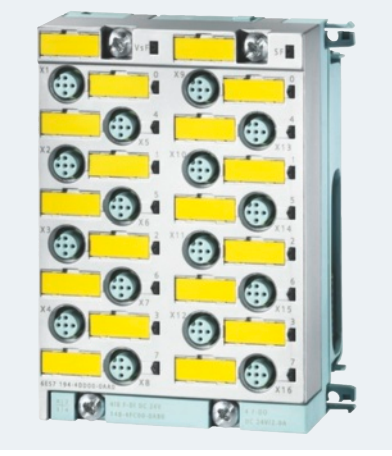
- CM IO 8 x M8
- CM IO 2 x M12, 4 x M12, 8 x M12
- CM IO 1 x M23

Fail-safe modules

Fail-safe electronic modules	Order No. group
EM 8/16 F- DI DC 24V	6ES7 148-4FA.
EM 4/8 F-DI/4 F-DO DC 24V	6ES7 148-4FC.

The following connection modules are available:

- CM IO F 12 x M12
- CM IO F 16 x M12



Fail-safe digital module 4/8 F-DI/4 F-DO

RFID communication

RFID communication module RF 170C	Order No. group
Electronic module	6GT2002-0HD.
Connection block	6GT2002-1HD.

Compact, intelligent motor starters

The intelligent ET 200pro motor starters are used for starting and protecting motors and loads of up to 5.5 kW. They are available as Standard and High Feature electromechanical motor starter and High Feature electronic motor starter versions.

SIMATIC ET 200pro with electromechanical/electronic motor starter

The electromechanical motor starter is switched with conventional contactors and is offered as direct or reversing starter with optional 400 V brake control.

The electronic motor starter is equipped with semiconductor switching elements and is therefore especially suited for applications with high switching frequencies. This high feature device not only handles the direct on/off switching of motors with high switching frequency, but also fulfills the additional function of a full-fledged soft starter for a soft start-up and stoppage. The conversion from motor starter to soft starter is achieved using simple re-parameterization in SIMATIC Manager.

The High Feature motor starters differ from the Standard motor starters in that they have more parameters and feature four parameterizable digital inputs. Parameterization is easy and convenient to carry out using the SIMATIC Manager.

The motor starters ET 200pro feature high functionality with a small footprint, as well as simple and fast configuration and installation – and they increase the availability of production plants.

Easy installation

The compact ET 200pro motor starter can be installed in the ET 200pro station with just a few actions. The integral connector technology results in significant reduction of the wiring overhead. The motor cables can be plugged directly onto the motor starter module. The compact design enables up to eight motor starters to be integrated in a one meter wide station in the field.

Electronic current measurement

The actual current flow with the ET 200pro motor starter is measured electronically. The evaluation of defined current limits for the parameterizable electronic overload protection increases the availability of the drive system. An upward or downward violation is signaled by the ET 200pro to the host controller, resulting in high plant availability.

The motor starter recognizes unbalanced load currents, and switches these off directly. All motor protection functions can be defined by simple parameterization. The local control station which is sometimes required for a drive is provided via the integral digital inputs (High Feature motor starter) and can therefore be easily incorporated into the control system.

Special modules for further functions

If required, a maintenance switch module can be used, which for example isolates series-connected starters from the supply voltage.

Maintenance switch module

Safety modules

The Safety Motorstarter Solution local or Solution PROFIsafe is used for safety-oriented applications.

For local safety applications, the Safety local maintenance switch module with safe input and the 400 V disconnecting module are used. These two components enable a safe disconnection of the 400 V supply of the series-connected motor starters.

PROFIsafe solutions are implemented quickly and easily by using an F switch module in combination with a 400 V disconnecting module.

Type selection	Order No. group
Standard motor starters	3RK1 304
Direct starter, mechanical	-5.S40-4AA.
Reversing starter, mechanical	-5.S40-5AA.
High Feature motor starters	3RK1 304
Direct starter, mechanical	-5.S40-2AA.
Reversing starter, mechanical	-5.S40-3AA.
Direct starter, electronic	-5.S70-2AA.
Reversing starter, electronic	-5.S70-3AA.
Special modules	3RK1 304
Maintenance switch module	-0HS00-6AA.
Safety Local maintenance switch module	-0HS00-7AA.
400 V switch-off module	-0HS00-8AA.
F switch	6ES7 148-4FS.
Connection module for F switch	6ES7 194-4DA.

Two types of frequency converters

With the structure of a SIMATIC module, the frequency converter SIMATIC ET200pro FC can be smoothly inserted into the ET200pro system. Two device variants (with and without safety functions) are available for output up to 1.1 kW (1.5 kW with reduced ambient temperature). The communication can be achieved via PROFINET or PROFIBUS.

Flexible and fast

The integration of the frequency converter in the distributed I/O system SIMATIC ET 200pro offers the following benefits:

- Flexibility due to open combination of ET 200pro modules with the frequency converter
- 400 V power transmission to downstream converters via jumper plugs up to 25 A

In addition, the ET 200pro FC features a multitude of highlights of the SINAMICS drive family:

- V/f control and sensor-free frequency adjustment
- Feedback of braking energy in the network (the same technology as the SINAMICS-G120 power module PM250) so that braking resistor and braking chopper are eliminated.
- Integrated safety functions: functional safety without a costly external protective circuit
- Optional Micro Memory Card for automatic download of parameters
- Design of the system motor frequency converter with the SIZER (as of Version 2.8)
- Parameterization via STARTER (as of Version 4.1, SP1)

Integrated safety functions

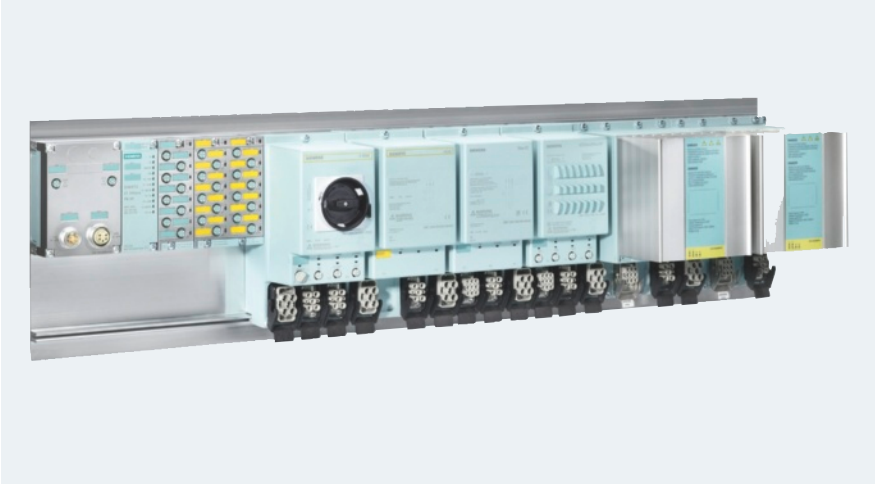
The fail-safe design of SIMATIC ET 200pro FC offers comprehensive safety functions, certified in accordance with Category 3 of EN954-1 and SIL 2 of IEC61508.

- Safe Torque Off (STO, previously "Safe Standstill") – for protection against an active movement of the drive.
- Safe Stop 1 (SS1, previously "Safe Braking Ramp") – for continuous monitoring of a safe braking ramp.
- Safely Limited Speed (SLS, previously "Safely Reduced Speed) – for protection against hazardous movements caused by exceeding a speed limit.

Neither of the functions "Safe Stop 1" or "Safely Limited Speed" requires a motor encoder or other encoder. The safety functions can be controlled using inputs of the Safety Local maintenance switch module (F-RSM) or the module F Switch PROFIsafe.

Frequency converter	Order No. group
Frequency converter ET 200pro FC with integrated safety functions	6SL3235-0TE21-1SB.
Frequency converter ET 200pro FC Standard	6SL3235-0TE21-1RB.

Frequency converter ET 200pro FC



ET 200pro station with frequency converters and motor starters

SIMATIC ET 200eco PN

Block I/O with IP67 degree of protection with PROFINET connection NEW

SIMATIC ET 200eco PN is the new, rugged and space-saving block I/O with IP67 degree of protection. The connection to PROFINET is done with 100 Mbit/s.

Thanks to its fully-sealed zinc die-cast housing, the ET 200eco PN is mechanically very rugged and resistant to vibrations, dust, oil, or humidity. It can therefore be mounted directly on the machine.

The PROFINET connection with a 2-port switch is integrated into every module and allows flexible expansion in line and star topologies.

The SIMATIC ET 200eco PN is the product for the trend in the market, which is to migrate the I/Os from the control cabinet into the machine gaps.

Configuration

The sensors and actuators, as well as power and bus are connected via the rugged M12 connection system. The ET 200eco PN is available with two different enclosure designs:

- Modules with 4 x M12 connection in a long and narrow design (30 x 200 x 37 mm)
- Modules with 8 x M12 connection in a short and wide design (60 x 175 x 37 mm)

The modules can be mounted head-on or rotated 90 degrees to the side.

ET 200eco PN in wide and narrow design

Module range

For ET 200eco PN, there is a comprehensive and graded range of modules available. This includes digital modules with up to 16 channels (inputs or outputs), including a parameterizable 8-channel module. Analog modules (current, voltage, resistance thermometer, thermocouple), an IO-Link master module, and a load voltage distributor are also available.

Module range								
Module	8 DI DC 24V	16 DI DC 24V	8 DO DC 24V	16 DO DC 24V	8 DIO DC 24V	8 AI	4 AO	4 IO-Link (IO-Link Master) [1]
Number of input/output channels	8/0	16/0	0/8 0.5 A; 1.3 A; 2 A	0/16 1.3 A	Parameterizable 1.3 A	4 U/I and 4 RTD/TC	4 U/I	8 DI, 4 DO, (1.3 A)
Connections	4 x M12, 8 x M12	8 x M12	4 x M12, 8 x M12	8 x M12	8 x M12			8 x M12
Order No. group 6ES7	141-6BF. 141-6BG.	141-6BH.	142-6BF. 142-6BG. 142-6BR.	142-6BH.	147-6BG.	144-6KD.	145-6HD.	148-GJA.

General technical specifications	
Transfer rate	100 Mbit/s full duplex
Enclosure	Zinc die-casting (fully cast)
Vibration strength, continuous	20 g
Temperature range	-25 °C to +60 °C

[1] You can find additional information on the IO-Link at www.siemens.com/IO-Link

SIMATIC ET 200eco

Digital block I/O with IP65/67 degree of protection

ET 200eco has a compact, rugged enclosure and is very easy to use. It can be connected to PROFIBUS DP at up to 12 Mbit/s.

The plant availability is increased by the integrated T functionality in the connection block. The electronic block can be replaced with the equipment live without the need to interrupt the supply voltage or the bus train.

The following diagnostic functions are available for checking the mode of operation of the ET 200eco:

- BF (Bus Fault)
- SF (system fault)
- Encoder and load power supply

The diagnostic data are indicated by LEDs on the module and can be evaluated by software on the PG/PC or by user program of the PLC.

Configuration

ET 200eco comprises basic modules and two different connection blocks. Selection is possible between M12, 7/8" and ECOFAST:

- Bus connection via 2 x M12 and power supply via 2 x 7/8" with 2 rotary coding switches for PROFIBUS address assignment
- ECOFAST: 2 x hybrid field bus interface RS 485 with identification connector for the PROFIBUS address setting

In the 16 DI version, antivalent sensors can also be connected.

Module range

For the application and integration of PROFIBUS applications, a compact, perfectly interacting module spectrum of digital I/Os is available. Fail-safe modules enable integration in safety-related systems with SIMATIC Safety Integrated using the PROFIsafe profile over PROFIBUS DP. The pin assignment for the actuators and sensors is modeled on the IP65/67 standardization trends.

Module range

Module	Basic modules						F modules	Connection blocks	
	8 DI	16 DI	8 DO (2 A)	16 DO (0.5 A)	8 DI/8 DO (2 A)	8 DI/8 DO (1.3 A)	4/8 F-DI	ECOFAST RS 485	M12, 7/8"
Qty. input/output channels	8/0	16/0	0/8	0/16	8/8	8/8	4/0[1)] 8/0[2)]		
Connections	8 x M12 cable glands (for 16 channels with dual assignment)							ECOFAST Cu	M12, 7/8"
Order No. group	6ES7141-3BF.	6ES7141-3BH.	6ES7142-3BF.	6ES7142-3BH.	6ES7143-3BH.	6ES7143-3BH.	6ES7148-3FA.	6ES7194-3AA.	6ES7194-3AA.

1) 2-channel for SIL3 sensors 2) 1-channel for SIL2 sensors

General technical specifications

Transfer rates	9.6 Kbit/s to 12 Mbit/s
Power supply	24 V DC
Current input from load circuit 1, up to 55 °C	Up to 1 A (according to version)
Current carrying capacity of the outputs per channel	0.5/1.3/2 A (according to version)
Current input from load circuit 2, up to 55 °C, max.	8 A
Diagnostic function	
Group fault display	Yes
Short-circuit (encoder supply)	Module-by-module
Load voltage	Module-by-module
Dimensions (W x H x D) in mm	
Basic module	210 x 60 x 28
Basic module with ECOFAST	210 x 60 x 54
Basic module with M12, 7/8	210 x 60 x 53

ET 200eco block I/O

SIMATIC ET 200R

The solution for robots with IP65 degree of protection

For the optimized solution of welding and handling applications in body-in-white assembly in the automobile industry, SIMATIC ET200R is ideal. The rugged construction with IP65 degree of protection in a cast aluminum casing can be used direct on the robot in environments with strong electromagnetic interference. Weld spatter is not a problem!

ET 200R for robots

The advantages of PROFIBUS are naturally integrated into the module

- Transmission rates up to 12 Mbit/s
- Troubleshooting with diagnostic message frames
- Extremely fast ramp-up times (optimized for tool replacement systems)

The I/O and repeater functionalities are integrated in the electronics. The integrated repeater functionality means that applications with tool changers can be mastered perfectly. PROFIBUS interruption on tool changeover on the second segment (downward segment) leaves the first segment completely unaffected thanks to the integrated galvanic isolation. The advantage of this is an increase in plant availability.

Configuration

- PROFIBUS, the power supply, and analog signals are connected using 17-pin M23 connectors.
- The signals are looped through over a hybrid cable to further ET 200R modules through the 17-pin M23 connector. A plug-in terminal strip on the rear of the welding module supports easy start-up and rapid service.
- The pin assignment for the actuators and sensors is modeled on the IP65/67 standardization trends.
- The PROFIBUS address is set on two rotary coding switches accessible from the outside.
- The PROFIBUS address is set via two easily accessible M12 cable glands on the front face of the module.

As the terminating resistor is already implemented in an integral solution, there is no need for inspection of the terminating resistor on the last station. This reduces the number of hardware components on the robot.

Module range

The I/O offers up to 16 digital input channels. The 16DI can be transformed into 15DI/1DO, 14DI/2DO, etc., as far as 8DI/8DO with appropriate software parameterization.

In the case of the welding module, analog signals (SKÜ, KSR) from the welding transformer can also be connected to the rear of the module.

Module range	Order No. group
ET 200R-H (handling)	6ES7 143-2BH00.
ET 200R-W (welding[1)])	6ES7 143-2BH50.

General technical specifications	
Number of channels	16 process channels 8 DI fixed 8 DI/DO parameterizable
Input characteristic	according to IEC 61131, type 2
Power supply	24 V DC
Output current per channel	Max. 0.5 A
Total output current	2 A
Ambient temperature	55 °C
Ramp-up time at 12 MBaud	approx. 80 ms
Enclosure material	Die-cast aluminum
Diagnostic function Missing load voltage	Yes
Short-circuit (encoder supply)	Group-by-group, XO
Short-circuit of the digital outputs	Group-by-group
Dimensions (W x H x D) in mm	54 x 150 x 55

[1)] Welding

Degrees of protection

Ingress Protection (IP) is a classification for degrees of protection which are defined in IEC 60529 and DIN 40050. The standards describe the classification of degrees of protection by means of enclosures for electrical equipment. They apply for operator protection and against the ingress of solids and liquids.

Nomenclature for degrees of protection

The IP degree of protection is classified using code letters and a two digit number. The higher the two numbers, the better the protection.

- The first IP digit represents protection against solid bodies. Foreign bodies of various particle sizes as small as dust are distinguished here.
- The second digit represents protection against water droplets that drip onto the equipment from different angles, spray water, water jets, and submersion of the equipment in a liquid.

Protection against the ingress of solid bodies	Protection against the ingress of water		
1.	**2.**	**Brief description**	**Definition**
0		Not protected	
1		Protected against solid foreign bodies ≥ 50 mm	The object probe, sphere of 50 mm ∅, must not penetrate fully.
2		Protected against solid foreign bodies ≥ 12.5 mm	The object probe, sphere of 12.5 mm ∅, must not penetrate fully.
3		Protected against solid foreign bodies ≥ 2.5 mm	The object probe, sphere of 2.5 mm ∅, must not penetrate at all.
4		Protected against solid foreign bodies ≥ 1 mm	The object probe, sphere of 1 mm ∅, must not penetrate at all.
5		Dust protected	The ingress of dust cannot be totally prevented. The dust must not penetrate in such a quantity to affect satisfactory operation of the device or safety.
6		Dust-proof	No ingress of dust.
	0	Not protected	
	1	Protected against dripping water	Vertically falling drip water must not have a harmful effect.
	2	Protected against dripping water	Vertically falling drip water must not have a harmful effect when the housing is inclined at up to 15° from the vertical to either side.
	3	Protected against spray water	Water sprayed on both sides of the vertical at an angle of up to 60° must not have a harmful effect.
	4	Protected against splash water	Water spray from a hose which is directed on the enclosure must not have a harmful effect.
	5	Protected against water jets	A water jet which is directed on the enclosure from any direction must not have a harmful effect.
	6	Protected against intense water jets	An intense water jet which is directed on the enclosure from any direction must not have a harmful effect.
	7	Protected against harm from temporary submersion in water	Water must not enter in quantities that can cause damage when the casing is temporarily submerged in water under standardized pressure and time conditions.
	8	Protected against harm from long-term submersion in water	Water must not enter in quantities that can cause damage when the casing is submerged in water for a long time. The conditions must be agreed between the manufacturer and the user. The conditions must, however, be more severe than for 7.
	9	Protected against water from high-pressure hoses and steam cleaning	Water directed at extremely high pressure onto the enclosure from all directions must not result in harmful effects.

SIMATIC ET 200S with PROFINET

**Peterstaler Mineralquellen, Germany –
Bottling of mineral water**

Requirements

Peterstaler Mineralquellen GmbH operates bottling plants at two sites in the Black Forest for their mineral water and non-alcoholic beverages. To improve the flexibility and capacity utilization of these two plants, they have been connected together using pipes in a project that is unique in this sector. Great emphasis was placed here on the communication between the two head stations and the substations along the route that had to be suitable for automation and telephone purposes.

Solution

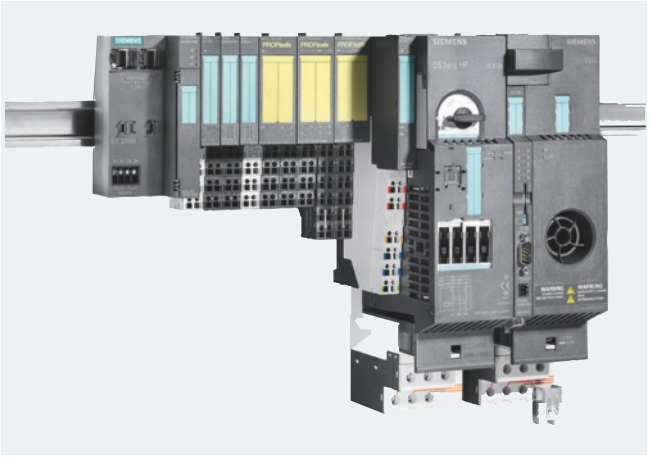
The decision was in favor of an integrated, distributed solution using PROFINET. A single-mode fiber-optic network based on Ethernet (14 km distance) forms the backbone for the communication for the automation systems and the Voice-over-IP between the two sites. The mainstays of the automation solution are PROFINET-capable S7-300 controllers that are connected to the fiber-optic backbone via Switches. The actuators and sensors of the field level (such as valve terminals) are connected to the integrated PROFINET interface via SIMATIC ET 200S distributed I/O devices.

Benefits

Thanks to the integral PROFINET functionality in the controllers of the S7-300 range as well as the SIMATIC ET 200S I/O, the automation devices could be directly connected to the Ethernet-based single-mode network. When programming with SIMATIC STEP 7, there is no distinction between accessing an I/O device such as SIMATIC ET 200S over PROFIBUS or PROFINET, so the expertise gained by the customer with PROFIBUS was safeguarded.

The important advantage of PROFINET over standard Ethernet according to the customer are the cycle times of between 5 ms and 10 ms that can be achieved over the real-time channel without which the extremely demanding closed-loop control tasks of this application would not have been possible over large distances.

"*We are very satisfied with this solution: Transporting the mineral water over the hill has been problem-free since then. Transport by truck became unnecessary and this reduced the associated pollutant emission, which in turn was evaluated very positively in our current environment protection audit according to ISO 14001.*"
Wolfgang Sum, Manager



SIMATIC ET 200S COMPACT

Meyer Burger AG, Switzerland –
Manufacturing and processing of materials

Requirements

Meyer Burger AG has over 50 years of experience in cutting hard and brittle materials and special crystals such as silicon and sapphire. The global sales and service network of Meyer Burger has a separate subsidiary in China and Japan as well as service centers in Germany and the Philippines. The main industries are the photovoltaic, semiconductor and optical and ceramics industries. More than 3,500 systems have been installed worldwide.

Hard and brittle materials have to be cut faster, more accurately and with less loss of material. This places stringent demands on the control system and the I/O: Compact size, fast response, reduced wiring outlay and modular construction of machines.

Solution

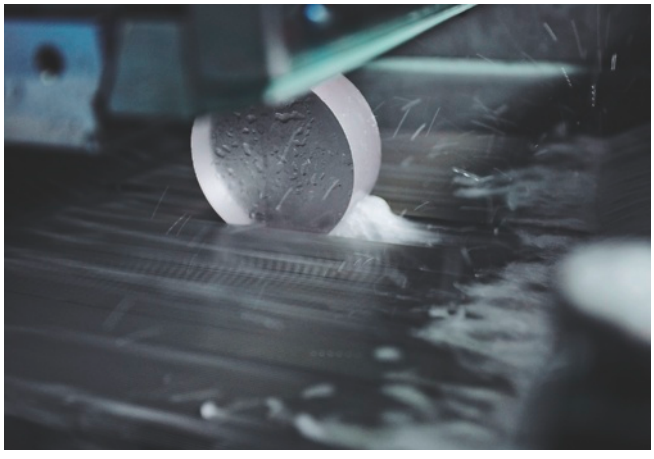
To meet these requirements, Meyer Burger relies on the compact distributed I/O ET 200S COMPACT. Thanks to their high channel density, it was not necessary to expand the stations. Add-on terminals were also used to enable 3-wire connection without the need for additional terminal blocks. This saves space and time during wiring up. The existing bus system was PROFIBUS DP, so this was also used for the new solution.

Benefits

The use of ET 200S COMPACT provides several benefits: The signals of the different sensors and switches can now be bundled and evaluated by the existing PROFIBUS. Complete preassembly (wiring) of the modules means that on final installation only the bus cable has to be connected. Time-consuming wiring of modules in the control cabinet is therefore reduced.

"*By using ET 200S COMPACT, we can acquire control variables on our machines decentralized and transfer them to the controller over PROFIBUS. Fewer signals therefore have to be routed to the control cabinet. This reduces the wiring costs and increases our flexibility considerably. We can therefore reduce throughput time at final assembly.*"

Dr. Urs Schönholzer, Head of Development



SIMATIC ET 200M

Turgai-Petroleum, Canada –
Remote control for oil production

Requirements

Turgai-Petroleum AG with headquarters in Kysyl-Orda is a joint venture between the Russian LUKOIL Overseas and the Canadian Petro Kazakhstan. LUKOIL is one of the leading worldwide corporations in the oil and gas sector and is mainly active in the exploration and production of oil and gas as well as the production and marketing of mineral oil products and petrochemicals. The capacity of their production plants in Russia alone is 41.8 million tons of oil per annum. Petro Kazakhstan is one of the 100 largest oil producers. The Canadian company has specialized in oil-rich Kazakhstan, produces 150,000 barrels per day, and operates a refinery in the Central Asian country.

Energotechservice GmbH with headquarters in Almaty, Siberia, was tasked with the data acquisition and remote control of oil production. The focus here was on integration in the existing system and user-friendly features as well as their consistent further development. Further requirements included implementation of data transmission over wireless channels and integration in the existing telemechanical system.

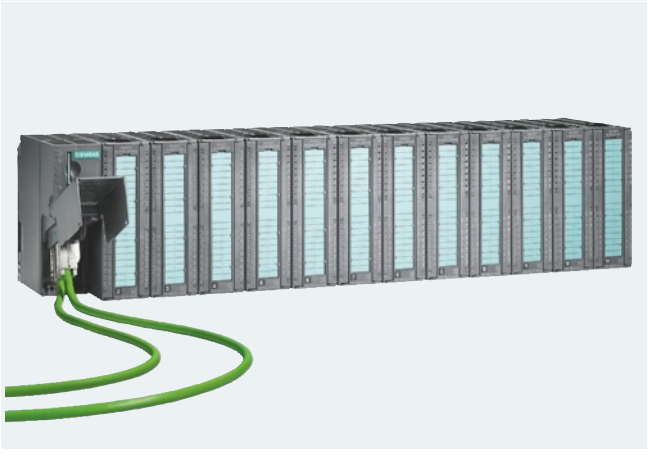
Solution

The automatic control system for the technological processes of the oil and gas sector is based on a system for telemetric data acquisition and remote control. For Turgai-Petroleum, 120 probes were optimized using automation.

Due to the environmental conditions, SIMATIC ET 200M modules for use in hazardous areas were used. They are of a particularly rugged and intrinsically-safe construction. This I/O is based on the same principle as the S7 controllers, so it interacts well with the SIMATIC S7-300 components used.

Benefits

Due to the modular structure of ET 200M, the application was implemented with the smallest possible number of components. The redundant structure and the ability to make changes to the configuration during normal operation has increases the availability of the plant significantly. Modules can now be replaced during normal operation and downtimes are reduced to a minimum. By using STEP 7, 50 to 70% of the engineering costs and time could be saved. Overall, the stability of the process and the productivity has significantly increased. Drives can now be easily controlled, either remotely or locally as required.



SIMATIC ET 200iSP

**Norr Systems, Singapore –
cargo and ballast system**

Requirements

The loading and unloading of liquids from tanks is a great challenge. The emphasis on safety is thereby of greatest importance. Especially with hazardous and flammable materials, the proper loading and unloading procedure is an important task of the freight master. Thus the valve control has become the most important system within the freight distribution. The valve control system must be constructed from reliable components. Any error in this system can result in undesired consequences for the safety of both the ship and the crew.

Solution

NORR SYSTEMS has developed an interesting control system which uses hydraulic high-pressure and low-pressure valves and integrates Siemens automation products. Considered from the mechanical perspective, an intrinsically safe low-pressure way valve increases the reliability (the purity of the oil is less significant than with a high-pressure way valve) and simplifies the maintenance. Seen from the electronic viewpoint, the SIMATIC controls from Siemens together with the intrinsically safe distributed I/O SIMATIC ET 200iSP and PROFIBUS form a good solution for communication between hazardous (Zone 1) and non-hazardous areas. The electric control and response signals for the valve control system are carried out via PROFIBUS.

The expense for the ship installation was minimized and in the software specification many additional functions for error diagnostics of the entire system could be programmed. It was even more important that thanks to the Siemens solution the number of components used in the entire system could be reduced and the availability of the entire system could be increased.

Benefits

The main benefit of this integrated hydraulic valve control system is that it completely fulfills the special requirements of the customer for both user friendliness and simple maintenance. The SIMATIC ET 200iSP allows for extremely easy establishment of communication between the hazardous and safe areas and the avoidance of a Zener barrier. The customer is highly satisfied with this system, since it supports the ship's crew in the loading and unloading of freight in one of the offshore oil fields.

SIMATIC ET 200pro with Safety Integrated and PROFINET

**Volkswagen Nutzfahrzeuge, Germany –
Vibrating roller test bed**

Requirements

Volkswagen Nutzfahrzeuge (VWN), an autonomous brand of the Volkswagen corporation has installed the final noise test in the transporter works in Hanover in the workshop hall. Now the commercial vehicle business is operating a vibrating roller test bed in its works in Hanover in cooperation with the "Automation Initiative of the German Automotive Industry" (AIDA).

The customer's requirements were extensive: The vibrating roller test bed had to be linked into the existing network structure (PROFINET); fail-safe communication was just as important as a reduction in training costs. The use of distributed I/O was also demanded.

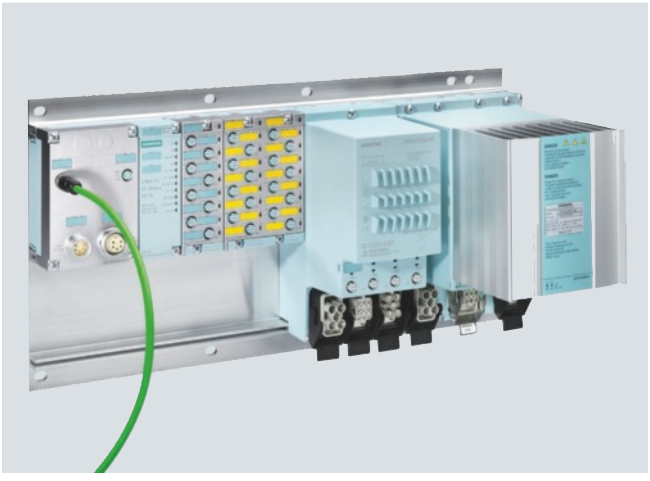
Solution

The distributed I/O had to be installed in the support structure of the test bed, in a compact space, close to the vibration dampers. Therefore the only solution was a cabinet-free solution of extremely high ruggedness and industrial compatibility, which is why SIMATIC ET 200pro was used.

An S7-400F controller was used which ensured fail-safe communication over PROFINET. Apart from the cabinet-free SIMATIC ET 200pro, the SIMATIC ET 200S – which was installed in the control cabinet alongside the controller – was also used as distributed I/O. Both distributed I/O systems are in a standard but fail-safe configuration. A PROFINET-capable SCALANCE X208pro switch with IP65 degree of protection distributes incoming and outgoing data.

Benefits

Use of SIMATIC ET 200pro resulted in a number of advantages: Costs were saved thanks to standardization and optimization of the spare parts inventory. The reduction in training costs for maintenance and service personnel was also satisfied. Due to the ability to replace electronic modules during operation (hot swapping), high availability was achieved for the plant. There was also a reduction in the installation and wiring costs for the safety-related part of the plant.



SIMATIC ET 200eco

Veronesi, Italy –
Animal feed manufacturer modernizes basic materials infeed

Requirements

One of the largest European manufacturers of animal feeds, Veronesi S.p.A, Italy, was looking for an efficient solution for modernized automation of their basic materials infeed. Materials infeed is the critical point in production for the animal feed manufacturer. When no products continue to come in, the entire plant is idle. Thus it was important that production continues without restriction. The safety regulations for installations in a dust-filled atmosphere must also be satisfied. The greatest challenge, however, was presented by selection of the technical configuration: All sensors and actuators had to be connected to the distributed I/O over the shortest possible connections; this demanded a cabinet-free configuration.

Solution

The Swiss system integrator ASE-Bühler AG developed the new plant concept – taking into account the plant philosophy of Veronesi: All subsystems are subdivided into individual sectors. The materials infeed too. This was automated by means of a SIMATIC S7-400 controller. It replaced the aging relay control. The special feature of the new plant is the PROFIBUS architecture. Four PROFIBUS lines run from the S7-400 PLC into the concrete towers containing the silos. A total of 150 SIMATIC ET 200eco stations are connected to the four bus lines which were installed without a cabinet directly in the plant. Control boxes were only required for the repeaters that were installed to support PROFIBUS branches. The connections were implemented using the standardized ECOFAST system with data and power supplied along the same cable.

Benefits

Commissioning of the fully automated complete solution was problem-free and implementation was possible during normal operation of the plant. The wiring over the ECOFAST connections was extremely easy, so the retrofit was completed quickly. The new solution supported a cost-saving bus architecture with cabinet-free distributed I/O as well as increased transparency in the automation system.

Since the entire solution originates from Siemens, the training time for the maintenance personnel was reduced. In the event of a disturbance, they merely need to contact a partner at Siemens.

Get more information

Distributed I/O:
www.siemens.com/et200

PROFINET:
www.siemens.com/profinet

SIMATIC Safety Integrated:
www.siemens.com/f-cpu

Totally Integrated Automation
www.siemens.com/totally-integrated-automation

SIPLUS extreme – hardening and conditioning
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SIMATIC Manuals Guide:
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