SIEMENS

SIMATIC ET 200

For distributed automation solutions

SIMATIC Distributed I/O

Brochure

Edition
November
2012

Answers for industry.

SIMATIC ET 200

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.

The modular design allows the ET 200 system to be scaled up and expanded in small, easy steps: digital and analog inputs/outputs, intelligent modules with CPU functionality, safety engineering, motor starters, pneumatic systems, frequency converters, and diverse technology modules.

In a control cabinet (IP20)

ET 200SP
A new generation of scalable I/O

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ET 200S
Discretely modular design and multifunctional

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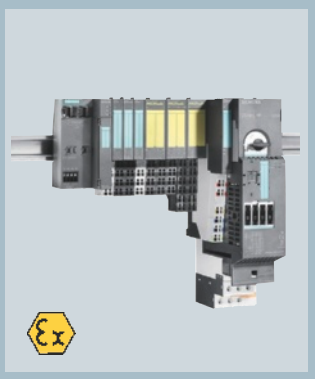

ET 200MP
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ET 200M
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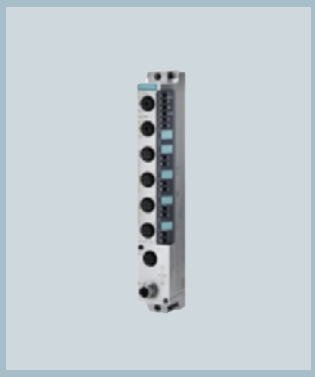

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Low-cost, digital block I/O

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Intrinsically safe version
for hazardous area

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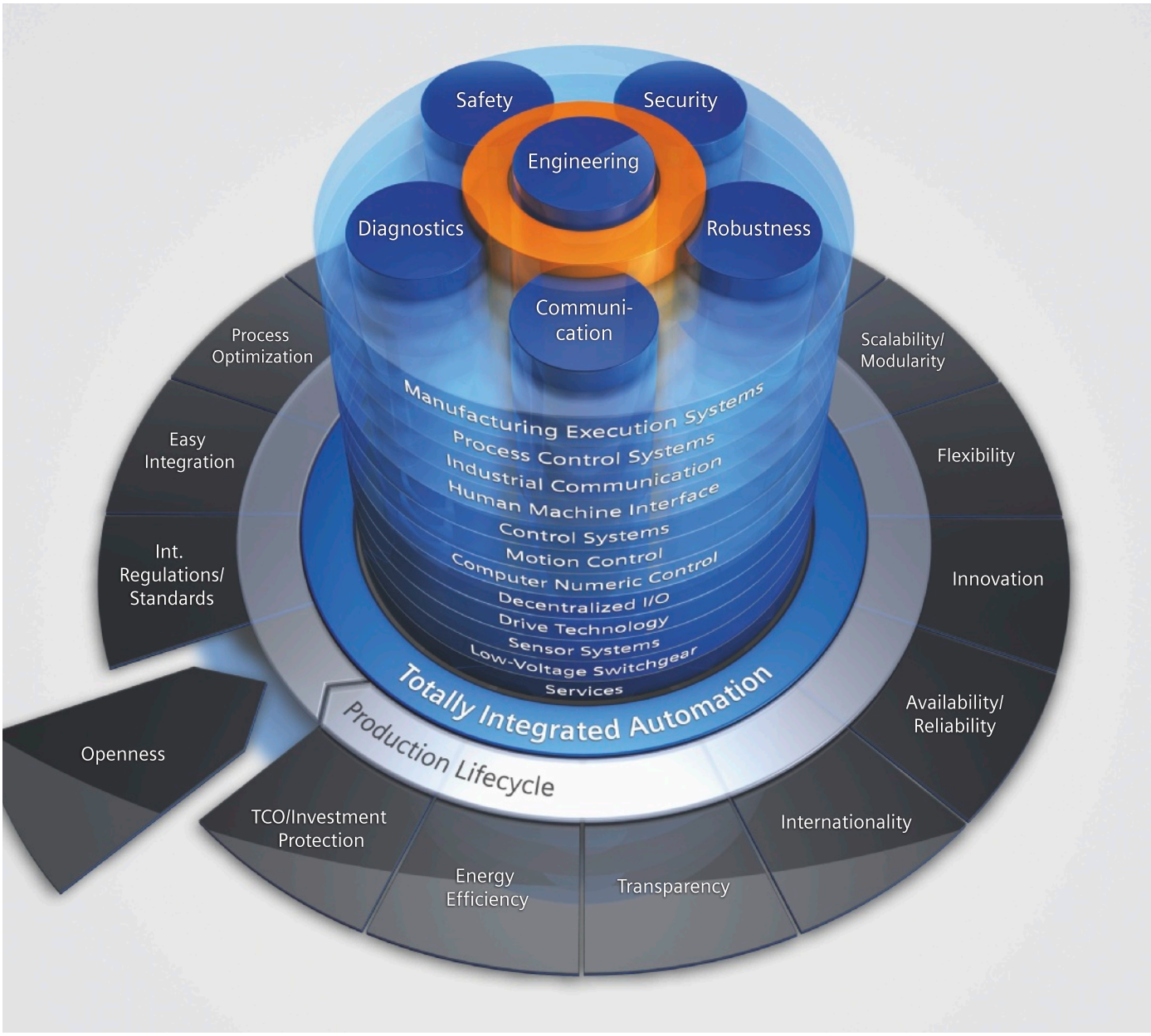
Highlights

- Multifunctional
- Modular
- Discretely scalable
- Networking via PROFINET and PROFIBUS

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.

Totally Integrated Automation is optimally aligned to all requirements and open for international standards and third-party systems. With its six characteristic system features, 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:

- Technology
- 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.

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 supports a high degree of data consistency – throughout the entire engineering process.
Siemens has redefined engineering with its Totally Integrated Automation Portal (TIA Portal). The new TIA Portal engineering framework combines the SIMATIC STEP 7, SIMATIC WinCC and SINAMICS Startdrive automation software tools in a unique development environment.

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: PROFINET, the leading Industrial Ethernet standard and PROFIBUS, the global No. 1 fieldbus.

Diagnostics

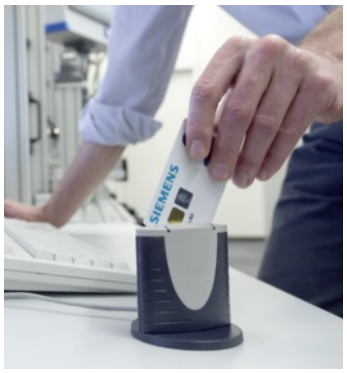
Minimization of downtimes –
through efficient diagnostic concepts
All SIMATIC products feature integrated diagnostic functions with which a fault can be identified and eliminated to provide increased system availability.
Even with larger plants, the Maintenance Station provides you with a uniform view 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
Due to the increased use of Ethernet connections penetrating the field level, security issues are gaining in importance in industry. For comprehensive protection of a plant, a variety of suitable measures must be implemented. These range from the company organization and its guidelines regarding protective measures for PC and control systems through to protection of automation cells by segmenting the network. Siemens follows the cell protection concept and, with the modules of the SCALANCE series and the Security modules, offers components for building up protected cells.

www.siemens.com/industrialsecurity



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 extreme or special versions of SIMATIC ET200 are available. These include an increased degree of protection, extended temperature ranges, and exceptional environmental stress.

Robustness

More possibilities, less complexity – through integrated technology functionality
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-properties

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, direct in harsh industrial environments.

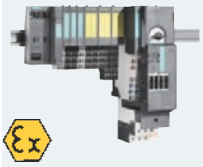
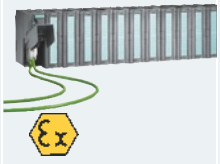
SIMATIC ET 200 – the right solution for every application

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 PROFINET and PROFIBUS, 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)

Scalable	Multifunctional	Compact and expandable
		
ET 200SP	ET 200S	ET 200S COMPACT
Multi-channel	**Modular**	**Intrinsically-safe**
		
ET 200MP	ET 200M	ET 200iSP

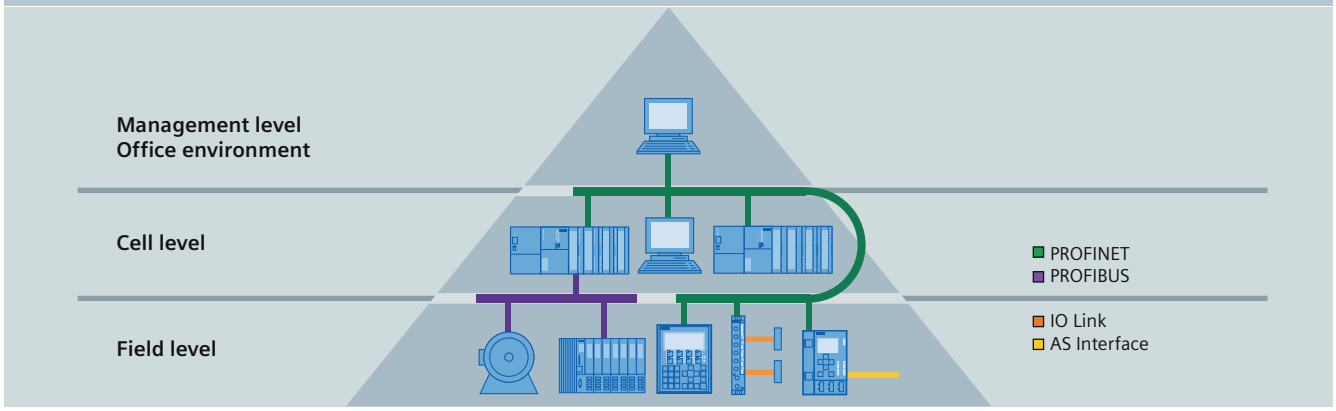
Without control cabinet (IP65/67)

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

Distributed fieldbus systems are elementary components of the automation landscape Communication is performed at the field level with PROFINET and PROFIBUS – these systems ensure rapid data transfer between the components and consistent decentralization of the automation solution.
In addition to the fieldbus systems, the point-to-point connection I/O-Link is also available for intelligent connection of sensors and actuators.

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 PROFINET and PROFIBUS.

Distributed fieldbus systems



PROFINET

With 4.3 million nodes installed, PROFINET is the world's leading Ethernet standard for automation. The forecast annual growth of more than 30% 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, new functions such as Shared Service, I-Device, MRP (Media Redundancy Protocol), and high performance. This enables new, user-friendly applications, such as wireless, high-precision automation with Industrial Wireless LAN – now also in process automation.

PROFIBUS

PROFIBUS is the No. 1 fieldbus – the proof lies in the 40.1 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.

AS-Interface

AS-Interface is an open, standardized bus system that enables simple integration of actuators and sensors at the lowest field level.

IO-Link

IO-Link is the smart concept for the standardized linking of sensors and switching devices to the control level by means of an economical point-to-point connection. This new communications standard below the fieldbus level allows central fault diagnosis and location as far as the sensor/actuator level and simplifies commissioning and maintenance by allowing the parameter data to be modified dynamically, direct from the application.

Product range at a glance

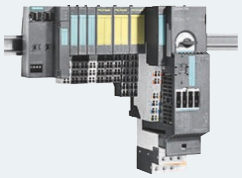
Solutions in a control cabinet (IP20)

SIMATIC ET 200SP – The scalable I/O with outstanding user-friendliness [1)]

- Adjustable connection of the PROFINET interface via bus adapter
- Individual load groups can be formed without separate feeder module
- System construction with permanent wiring, hot swapping and operation with rack gaps
- Extensive diagnostics
- Space-saving push-in terminals for one-handed wiring without any tools and self-holding measuring probe
- Simple disconnection of wiring thanks to arrangement of wire insertion, spring opener and measuring probe in columns
- Terminals for single- or multi-conductor connection
- Meaningful color-coding and labeling concept

SIMATIC ET 200S – the all-rounder with a comprehensive range of functions [1)]

- Discretely modular configuration with multi-conductor connection
- Multifunctional thanks to a wide range of modules: motor starters, safety technology, technology modules, distributed intelligence, as well as IO-Link modules
- Use in hazardous area (Zone 2)
- Also available as a high-speed (HS) version for high performance and maximum precision
- Also available as expandable block version with integral DI/DO: SIMATIC ET 200S COMPACT



SIMATIC ET 200MP – NEW The multi-channel and multi-functional S7-1500 I/O

- High performance and very short response times for high-speed applications
- Scalable design with 35 mm wide modules
- Standardized pinning of the modules and cable storage space that grows with the system
- Versatile labeling options for better identification
- Standardized diagnostics and display concept

SIMATIC ET 200M – the multi-channel S7-300 [1)]

- Modular design using standard SIMATIC S7-300 modules; redundant design also possible
- Fail-safe I/O modules
- High channel density with up to 64 channels per module
- 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 200iSP – the intrinsically-safe version for hazardous areas

- Modular design, also available with redundancy
- Rugged, intrinsically-safe design
- Fail-safe I/O modules
- 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

1) available as SIPLUS extreme in refined version for extreme environmental conditions.

Solutions without a control cabinet (IP65/67)

SIMATIC ET 200pro – modular and multifunctional

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

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

- 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

Product overview

SIMATIC ET 200 for the control cabinet

I/O system	ET 200SP	ET 200S	ET 200MP	ET 200M
			NEW 	
Configuration				
Degree of protection	IP20	IP20	IP20	IP20
Construction type	Discretely scalable	Bit-modular, expandable block	Modular	Modular
Mounting	DIN rail	DIN rail	S7-1500 mounting rail	S7-300 mounting rail
Connection system for sensors/ actuators	Single or multi-conductor connection Push-in terminal	Single- or multi-conductor connection Spring-loaded/screw-type, Fast Connect	Single-conductor connection Screw-type, push-in-terminal	Single-conductor connection Spring-loaded/screw-type, Fast Connect, Top Connect
Special applications				
Safety technology	● (available soon)	●	● (available soon)	●
For use in hazardous areas	Zones 2, 22	Zones 2, 22	Zones 2, 22	Zones 2, 22
Increased availability	○	○	○	Switched, redundant
Temperature range	0 °C ... +60 °C (horizontal mounting) [1]	0 °C ... +60 °C [1]	0 °C ... +60 °C (horizontal mounting)	0 °C ... +60 °C [1]
Vibration resistance (continuous)	to 5 *g* [4]	2 *g*	2 *g*	1 *g*
Communication				
PROFINET (copper/fiber-optic)	● / ● (available soon)	● / ●	● / ○	● / ○
PROFIBUS (copper/fiber-optic)	● (avail soon)/(avail soon)	12 Mbit/s / 12 Mbit/s	● (available soon) / ○	12 Mbit/s / ○
AS-Interface	●	○	○	○
Other	○	● [8]	○	○
System functions				
Permanent wiring	●	●	● Front connector	● Front connector
Hot swapping / operation with gaps	● / ●	● [6] / ● [6]	● (available soon) / ○	● [8] / ● [8]
Isochronous mode, e.g. for high-speed controls	●	●	●	●
Re-configuration during operation	●	●	● (available soon)	●
High-speed modules	●	●	●	●
Diagnostics (module-dependent)	Submodule-specific (chan.-spec. avail. soon)	Channel-specific	Channel-specific	Channel-specific
Functions				
Digital channels	●	●	●	●
Analog channels incl. HART	● ○	●	● ○	● ●
Motor starters / frequency converters	○ / ○	● / ○	○ / ○	○ / ○
Pneumatic interface	● (available soon)	● [2]	○	○
Technological functions	●	Counting/measuring, positioning, weighing	●	Counting/measuring, positioning, cam ctrl, closed-loop ctrl, weighing
Integrated CPU functionality/ I-Device	● (available soon)/ ● (available soon)	● / ●	○ / ○	● / ● (via S7-300 CPUs)
Shared device [3]	●	●	●	●
MRP [3]	●	●	●	●
Options handling	● [5]	●	● (available soon)	○
Sensors and actuators (IO-Link)	●	●	○	○

● can be used / available

○ cannot be used / not available

1) Also available as SIPLUS component for extended temperature range -40 °C ... 70 °C and corrosive atmosphere/condensation (for details, see: www.siemens.com/siplus-extreme)

2) You can find additional information on the supplemental products at: www.siemens.com/simatic-et200

3) Available for PROFINET versions

4) With bus adapter BA2 x FC

5) Configuration control via user program

6) With reserve modules

7) Communication module CANopen, DeviceNet

8) With active backplane bus

SIMATIC ET 200 without control cabinet

ET 200iSP	ET 200pro	ET 200eco PN	ET 200eco	I/O system
				
				Design
IP30	IP65/66/67	IP65/66/67	IP65/66/67	Degree of protection
Modular	Modular	Block	Block	Construction type
Mounting rail	Mounting rail	Direct mounting	Direct mounting	Mounting
Multi-conductor connection Spring-loaded/ screw-type	M8, M12, M23	M12	M12	Connection system for sensors/actuators
				Special applications
●	●	○	●	Safety technology
Zone 1, 21	○	○	○	For use in hazardous areas
Switched, redundant	○	○	○	Increased availability
-20 °C to +70 °C	-25 °C ... +55 °C (0 °C ... +55 °C) [9]	-40 °C ... +60 °C	0 °C to +55 °C	Temperature range
1 *g*	5 *g* (mod.-dependent)	20 *g*	5 *g*	Vibration resistance (continuous)
				Communication
○	● / ○	● / ○	○ / ○	PROFINET (copper/fiber-optic)
1.5 Mbit/s / ○	12 Mbit/s / 12 Mbit/s	○	12 Mbit/s / ○	PROFIBUS (copper/fiber-optic)
○	○	○	○	AS-Interface
○	○	○	○	Other
				System functions
●	●	○	○	Permanent wiring
● [6] / ● [6]	● / ○	○ / ○	○ / ○	Hot swapping / operation with gaps
○	○	○	○	Isochronous mode, e.g. for high-speed controls
●	●	○	○	Re-configuration during operation
○	○	○	○	High-speed modules
Channel-specific	Channel-specific	Channel-specific	Submodule-specific	Diagnostics (module-dependent)
				Functions
●	●	● [10]	●	Digital channels
● ●	● ○	● ○	○ ○	Analog channels incl. HART
○ / ○	● / ●	○ / ○	○ / ○	Motor starters / frequency converters
● [2]	● [2]	○	○	Pneumatic interface
Counting, frequency measuring	○	○	○	Technological functions
○ / ○	● / ●	○ / ○	○ / ○	Integrated CPU functionality/I-Device
○	●	○	○	Shared device [11]
○	●	●	○	MRP [11]
○	●	○	○	Options handling
○	○	●	○	Sensors and actuators (IO-Link)

[9] In parentheses: Temperature range of the frequency converter

[10] Also configurable

[11] Available for PROFINET versions

● can be used / available

○ cannot be used / not available

ET 200 - characteristics

Simple configuration and increased plant availability

Simple configuration

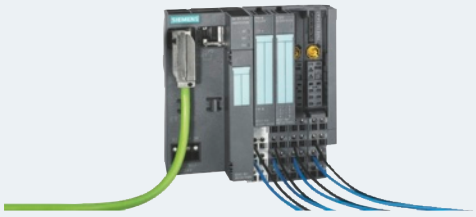
Integral plug-in connections make installation quick and easy and therefore reduce the costs. In the case of modular systems, mounting is on a rail. The modules are snapped onto the rail and plugged into each other.

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.

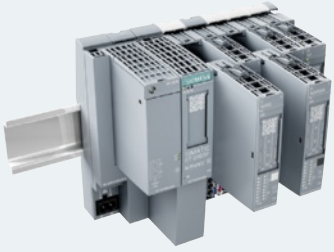


Permanent wiring: Connections and electronics are separate from one another

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.



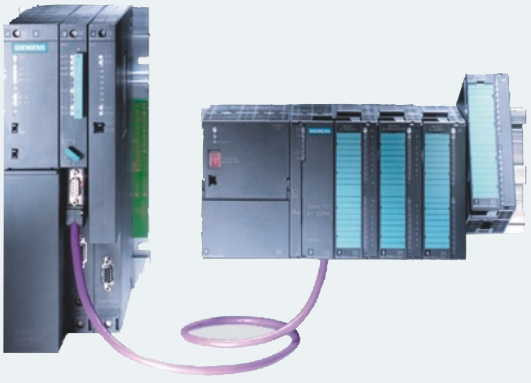
Hot swapping: Module replacement during operation

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

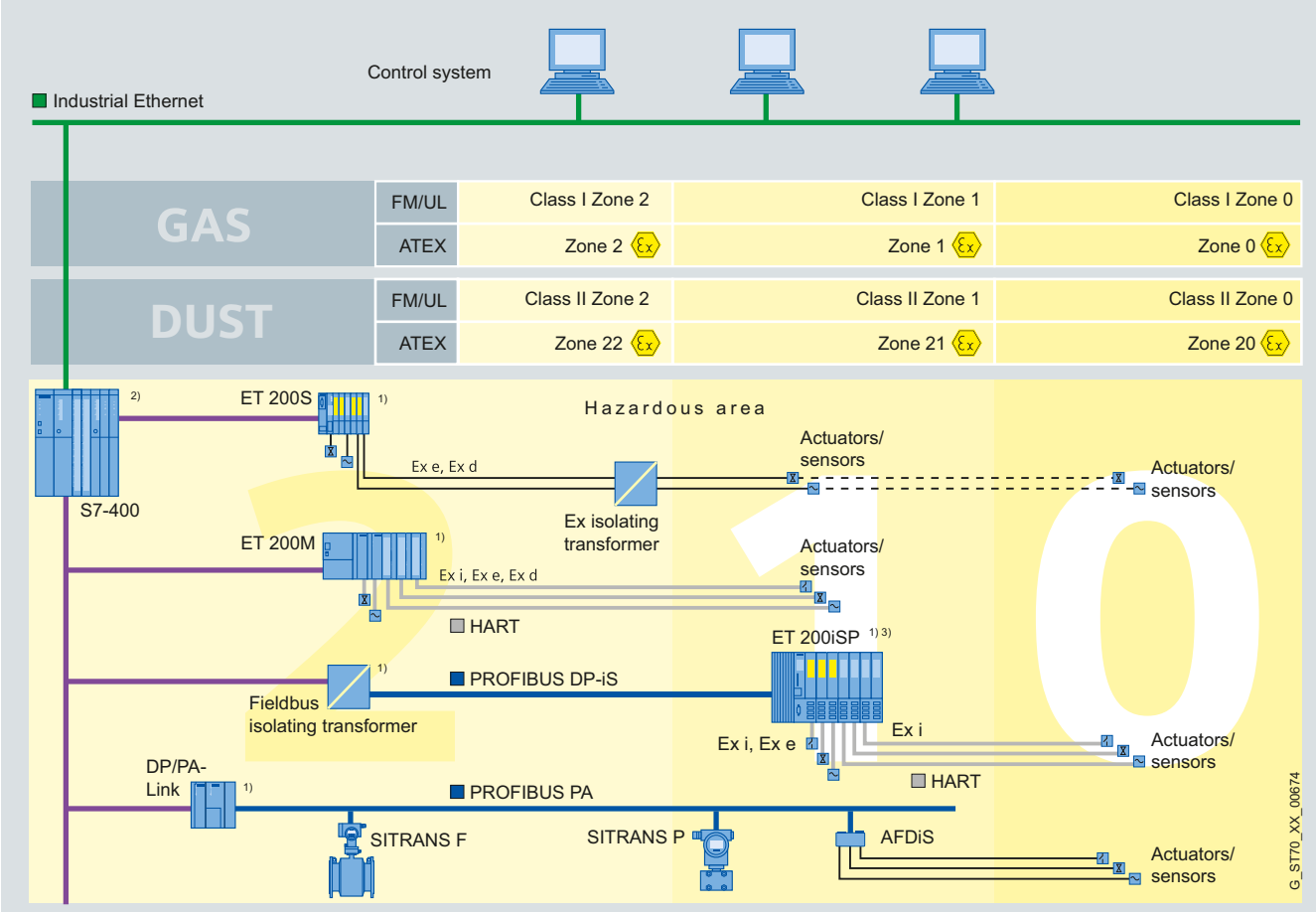
In many industries, the manufacture, processing, transport or storage of combustible materials results in the creation or release of gases, vapors or mist into the environment. Other processes create combustible dust. In combination with oxygen in the air, a potentially explosive atmosphere can occur 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/Os 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) Gas atmosphere: Installation of the components always in an enclosure in Zone 2 in degree of protection IP5x and in Zone 1 in an Ex e enclosure. Dust atmosphere: Installation of the components always in an enclosure in Zone 22 with IP5x degree of protection and in Zone 21 with IP6x degree or protection.

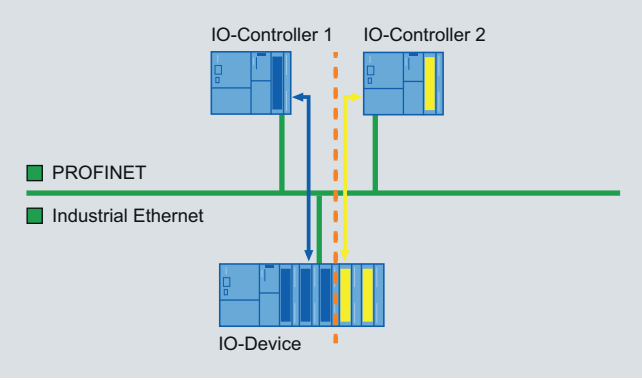
2) With 10 A DC standard power supply

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

PROFINET innovations

PROFINET has been expanded by a number of innovative features. These simplify system configuration in fail-safe applications, for example, and they allow a leaner and more versatile topology in many different scenarios.

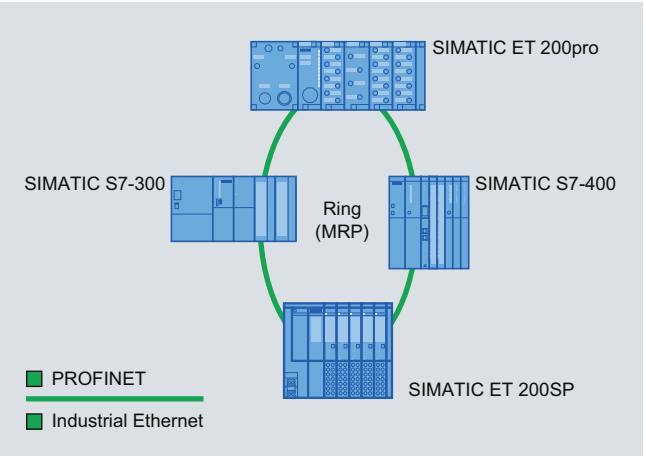
The **Shared Device** function enables two controllers to access the same PROFINET IO device, for example a distributed ET 200 station. Since fewer remote devices have to be installed in the field, the engineering, wiring and installation costs can be reduced. In addition, the modules can be flexibly assigned to one of the two CPUs.



With the Shared Device function, two different IO controllers can access the same IO device simultaneously

The **I-Device (intelligent IO device)** function enables simple and fast controller-controller communication through direct access to the IO address image with the PROFINET IO protocol.Local controllers, such as the ET 200S CPU, can be more easily integrated into modular machines or safety applications, for example.

PROFINET systems with the innovative **PROFIenergy** profile are able to control power consumption. They can be configured in such a way that they can be disconnected automatically and in a coordinated way during breaks in production, and then connected again when production starts up again – in the correct order, at the correct intervals, reliably and plant-wide.



Ring topology with Media Redundancy Protocol (MRP)

Higher plant availability can be achieved using a ring topology and the **Media Redundancy Protocol (MRP)**. This runs direct via the integral PROFINET port to SIMATIC controllers and ET 200 IO stations and can be used with or without IE switches.

Additional expanded functions

The ET 200S supports the Options handling function. With this, an application can be subdivided into several modules or sub-tasks (e.g. bottling, labeling, packaging), without the need to manage several projects for different machine constellations. In the ET 200S station, the input/output modules are assigned to the appropriate sub-tasks. The actually available machine modules or the input/output modules of the ET 200 station required for this are selected and activated at commissioning.

PROFINET IRT allows high-speed and deterministic communication in which the different cycles of a system (input, remote station, network, CPU processing and output) are synchronized even in the case of parallel TCP/IP traffic. High-precision and dynamic applications can thus be implemented using SIMATIC.

Configurator (selection tool)

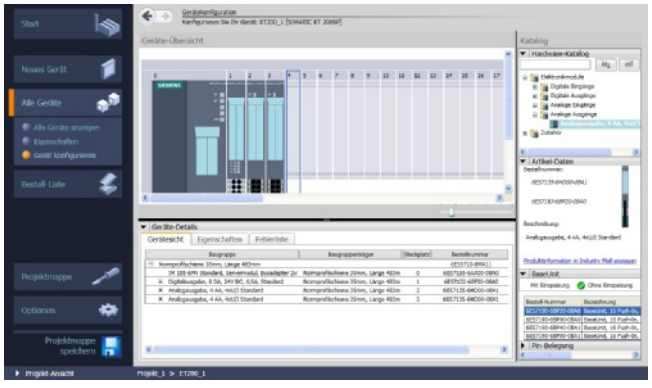
Just a mouse click away from a tailor-made I/O station

With the Configurator, you get first class support with assembling your overall automation system (SIMATIC S7, 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 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

You can find the field-proven ET 200S, ET 200M, ET 200iSP, ET 200pro, ET 200ecoPN and ET 200eco devices in the SIMATIC Selection Tool. You can configure the new ET 200SP in the TIA Selection Tool.



Configuration made easy with the TIA Selection Tool

You can find the Configurator on the Internet at:

www.siemens.com/et200
www.siemens.com/tia-selection-tool

or in the Industry Mall and also in the Catalog CA01 on DVD

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)
Safety	IEC 62061 up to SIL3, EN ISO 13849-1 up to PLe, as well as EN 954-1 up to Cat. 4
Corrosive gas resistance (in SIPLUS extreme version)	EN 60721-3-3 for classes 3C4, 3B2 and 3S4
Salt fog test (in SIPLUS extreme version)	According to EN 60068-2-52

CAx data

"CAx data"
(product data, graphics, manuals) are available for our ET 200 systems as free downloads via the CAx online shopping cart:

www.siemens.com/cax

Configuration engineers, electrical planning engineers, and commissioning engineers with CAE systems such as EPLAN Electric P8, can use such CAx data for quick and easy creation of, for example, electrical circuit diagrams, installation diagrams, and parts lists, as well as for wiring and servicing the control cabinet. In this way, the best possible support is provided for the customer's project - from product selection, through electronic
CAx data provision, right up to generating CAE/CAD documentation.

SIMATIC ET 200SP

The scalable I/O with excellent ease of use

SIMATIC ET 200SP* (Scalable Peripherals) is the universal I/O system with IP20 degree of protection for installation in the control cabinet. Its wide area of application ranges from standard mechanical equipment manufacture, through high-speed applications (available soon), up to plant building. The ET 200SP is particularly easy to use, ensures maximum economy in the control cabinet with its compact design, and offers high performance.

Compact design

The ET 200SP makes optimal use of the available space in the control cabinet. The compact design is achieved by increasing the number of channels per module. The station width is reduced by one slot per potential group because the power module for feeding in the supply voltage is already integrated into the system.

The ET 200SP is about 50% narrower than comparable distributed I/O systems. This means up to 64 modules with a maximum of 16 signals each can be set up depending on the interface module used.

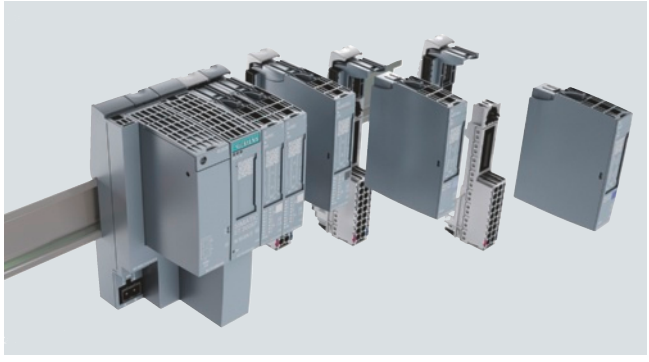
Thanks to the newly developed connection system, the height for the terminals has been significantly reduced and thus the overall height of the system, even with double the number of terminals:

- With a height of around 117 millimeters, the system provides space for 16 channels with a single-conductor connection (without AUX terminals).
- For a 3-wire connection with AUX-terminals, the height is 141 millimeters for 8 channels.
- The depth is about 75 millimeters.

An ET 200SP station consists of an interface module (IM) for connecting to PROFINET, the I/O modules and a server module that terminates the station:

- The modules are plugged into passive BaseUnits (BUs) that are in turn mounted on a standard DIN rail. The BaseUnits (BUs) connect the modules of the ET 200SP station electrically and mechanically with each other. The terminal box of a BaseUnit can be simply replaced in the case of terminal damage, for example.
- The PROFINET connection is via bus adapters (BAs) on the IM with which the connections and physical characteristics can be selected freely in accordance with requirements, e.g. RJ45 connector or direct connection (FastConnect).
- The I/O modules define the function of the module at the terminals and are subdivided into seven module types. These are each labeled on the front with a colored square specific to the module type. The mechanical coding of the I/O modules with the BaseUnit prevents mix-up of the modules during installation. To achieve simple load shutdown, individual potential groups can be formed.

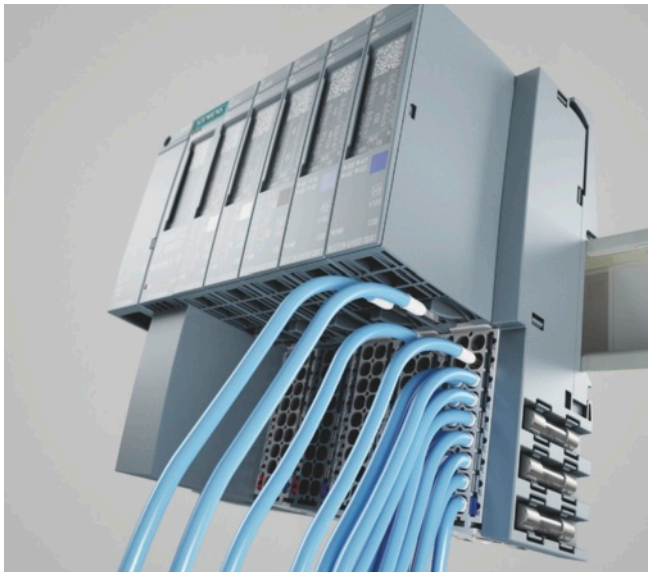
* Now also available as SIPLUS extreme version for use under extreme environmental conditions.



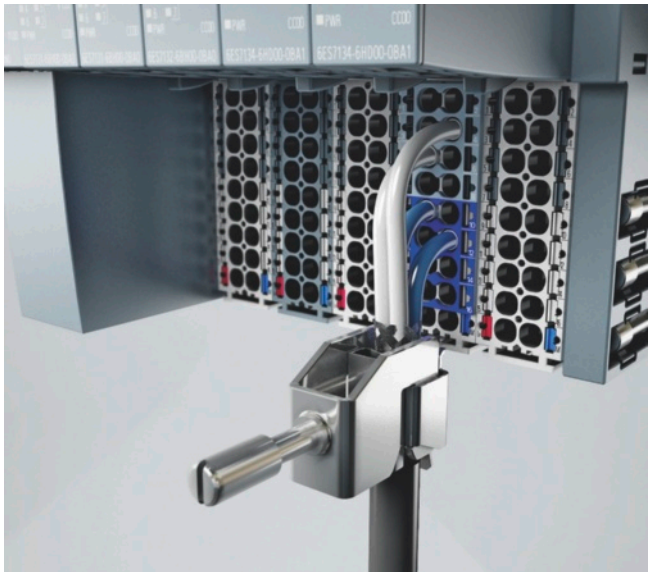
Wiring

The separation of mechanical and electronic components permits permanent wiring. In addition, it is possible to pre-wire the BaseUnits on the standard DIN mounting rail.

This allows the modules as well as the terminal boxes to be replaced during operation (hot swapping).



The new arrangement of the terminals and the push-in terminals makes wiring and disconnection of the cables faster and simpler than ever. Wiring is carried out without tools, using one hand, and with very low insertion force. Despite this, the connections have an extremely high mechanical load capacity. Only a screwdriver is required for disconnecting the cables.



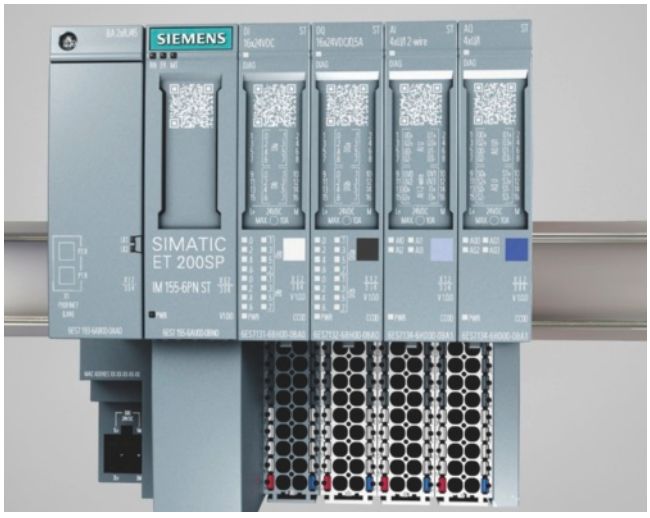
The shielding concept covers the conductor, the terminal box, the backplane bus, and the PROFINET cable. It ensures the greatest possible electromagnetic compatibility (EMC) and increases the signal quality.

Labeling

A well thought-out labeling system ensures clear and proper presentation of the ET 200SP station.

The following labels are found at the factory:

- Order number and version release of the hardware and firmware are printed.
- The I/O modules are color-coded depending on type.
- The terminal connection diagram helps with fast and error-free replacement of connected devices.
- A 2D matrix code is printed on the front. It specifies the order number and the serial number. This makes it possible to conduct an automated comparison between projected and actual station layout. The barcode also allows you to link to other information (e.g. manuals, firmware, certificates) via a smartphone application.



The following labels are possible on the user side:

- The system components can be labeled using clip-on identification tags.
- Individually printable, generous labeling strips allow description of the signals applied to the terminal.
- Color coding labels identify the potentials of an I/O module and simply assignment of the cables.

Communication

The ET 200SP communicates via PROFINET, the global Ethernet standard in automation. The I/O system is dimensioned for a maximum internal data transfer rate of 100 Mbit/s.

This is the first I/O system in which the internal communication cycle synchronizes automatically, and without configuring overhead, to the set PROFINET bus clock. This significantly reduces undesirable response time fluctuations, and makes more accurate positioning or closed-loop control possible, for example.

In IRT (isochronous real-time) mode, there is system-wide synchronization from the user software to the terminal.
The input data of all stations is acquired synchronously and offset-free, and the output data is then also output synchronously and offset-free.

The interface module of the SIMATIC ET 200SP will also be available with a PROFIBUS interface – the tried-and-tested communication standard proven in numerous applications.

ET 200SP increases energy efficiency in the automation system with PROFIenergy by shutting down the loads during breaks in a controlled manner, module-by-module or channel-by-channel (available soon), thus reducing energy consumption. PROFIenergy also uses parameterizable break-time substitute values for inputs and outputs.

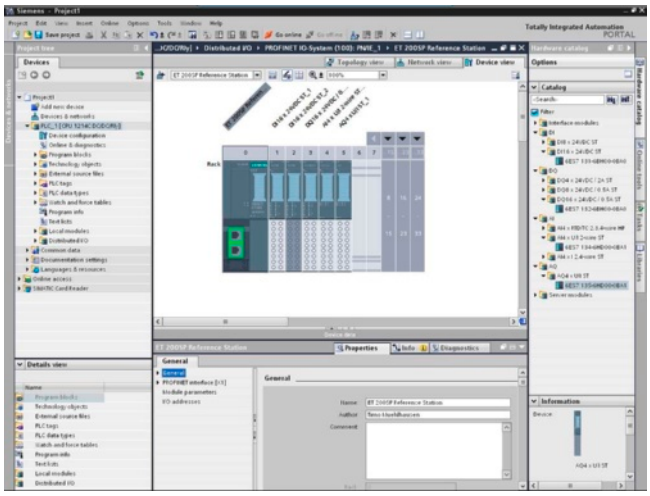
Safety Integrated

SIMATIC ET 200SP also permits safety-related communication. The digital safety modules are exactly as compact as the standard modules. Their functional safety is certified in accordance with EN 61508. They are designed for safety-related use up to SIL3 according to EN 62061 and PL e according to ISO 13849.

One special feature of the F-modules of SIMATIC ET 200SP is that the F-addresses no longer have to be set manually by means of the DIL switches on the module. Instead, they are now assigned with the engineering tool during commissioning, which simplifies the setting process and saves time.

Engineering

The ET 200SP is configured with the TIA Portal from V11, SP2 or STEP 7 from V5.5, SP2.



Diagnostics

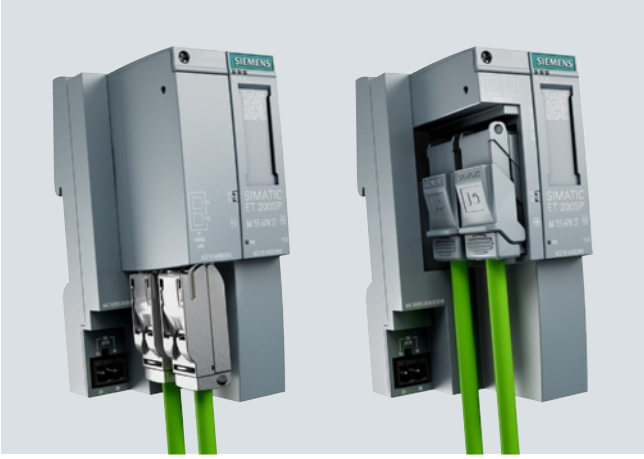
Extensive diagnostics functions simplify monitoring and maintenance. The digital modules of the function class "Standard" already offer wirebreak and short-circuit diagnostics. Diagnostics takes place via LEDs on the I/O module.

In addition, SIMATIC ET 200SP features an easily accessible, self-holding measuring probe. It remains inserted in the device and permits "multi-connection" (simultaneous existence of several measuring probes).

Other system functions include:

- Multi hot swapping: Modules can be replaced during operation
- "Reset to factory" settings of the interface module via pushbutton
- Dynamic reparameterization of the I/O modules during operation
- Configuration of the ET 200SP station controlled via the user program, e.g. adaptation of the configuration to the actual machine (option handling) and partial commissioning
- Firmware update for functional expansion of the interface module and the I/O modules without module replacement
- Electronic rating plate (identification data) for unique identification of the relevant module for test or quality assurance purposes

Interface modules



The interface module connects the ET 200SP to PROFINET and exchanges data between the higher-level controller and the I/O modules. The variable bus adapter (BA) is simply plugged into the interface module and enables free selection of the connection system:

- IM 155-6PN Standard incl. server module
  6ES7 155-6AU00-0BN0
- IM 155-6PN Standard incl. server module and mounted bus adapter 2xRJ45
  6ES7 155-6AA00-0BN0

SIPLUS versions

The interface modules and the I/O modules listed below are also available as SIPLUS components for the extended temperature range of -40 to +70°C and corrosive atmosphere / condensation.
(For details, visit: **www.siemens.com/siplus-extreme**)

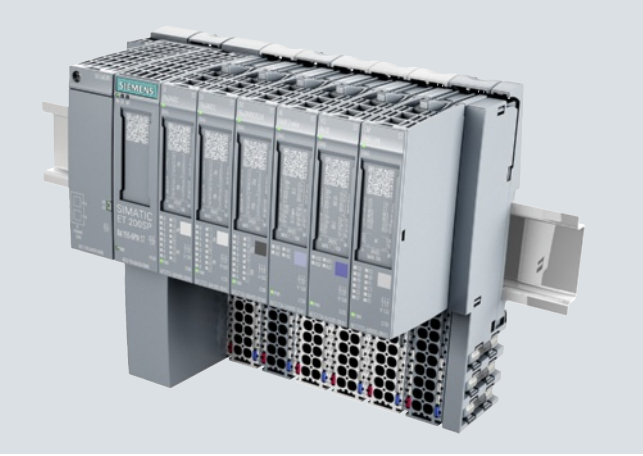
I/O modules

The I/O modules are 1-, 2-, 4-, 8- and 16-channel, and they permit scalable and cost-optimized design of the ET 200SP. Digital and analog input/output modules are available:

Function	Order No. group
Digital input DI 8x24 V DC Standard	6ES7 131-6BF.
Digital input DI 16x24 V DC Standard	6ES7 131-6BH.
Digital output DQ 4x24V DC/2A Standard	6ES7 132-6BD.
Digital output DQ 8x24V DC/0.5A Standard	6ES7 132-6BF.
Digital output DQ 16x24V DC/0.5A Standard	6ES7 132-6BH.

Function	Order no. group
Analog input AI 4xI 2-/4-wire Standard	6ES7 134-6GD.
Analog input AI 4xU/I 2-wire Standard	6ES7 134-6HD.
Analog input AI 4xRTD/TC 2-/3-/4-wire, high-feature	6ES7 134-6JD.
Analog output AQ 4xU/I Standard	6ES7 135-6HD.

Communication modules



There will also be an AS-Interface master communication module. This AS-i master makes it possible to connect simple field devices via AS-Interface to the ET 200SP. The AS-i master is characterized by an extremely small size, meets specification V3.0, and enables connection of up to 62 nodes.

In order to expand the AS-i network with safety-oriented communication (ASIsafe), the AS-i safety module can be inserted in addition to the AS-i master without any additional wiring. This means that as many as 31 safety-related sensors and actuators are possible in each AS-i network (SIL3 according to EN 62061 and PL e according to ISO 13849).

The new IO-Link master module of SIMATIC ET 200SP integrates the fast and simple IO-Link communication with sensors and actuators into the established PROFINET or PROFIBUS field bus system.

The new IO-Link master is based on the current IO-Link specification V1.1. and allows not only the IO-Link device parameters, but also the master parameters to be stored consistently. This means that when a device is replaced, the current parameters are automatically transferred into the replaced IO-Link device – without any additional effort by the user. In addition, a replacement of the master module is possible without PG/PC and without the data being restored by the user. Moreover, the IO-Link master offers shorter response times, thanks to support of COM3. It goes without saying that IO-Link devices according to specification V1.0 continue to be supported.

The **TIA Selection Tool** can be found on the Internet at
www.siemens.com/tia-selection-tool
or in the Industry Mall 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 PROFINET and/or PROFIBUS bus systems. Interface modules with an integral CPU transfer the computing power of an S7-300 CPU directly into the I/O device and constitute a local controller. 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-related designs.
The PROFINET version of the ET 200S also offers the following new functions:

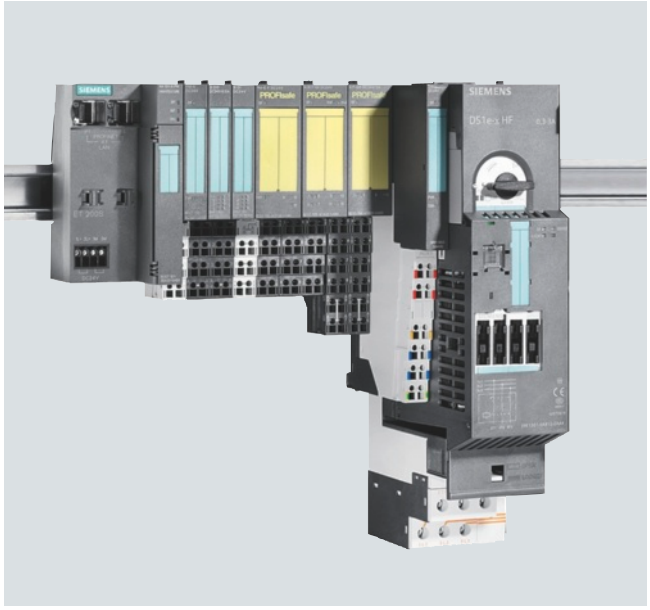
- I-Device
- Shared device
- MRP

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 a simultaneity factor of 100% (that is, 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, or a pneumatics connection. 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/soft 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.
- The motor starters have the PROFIenergy function and support acyclic services. Acyclic services permit the sending and receiving of data sets, e.g. for precise diagnostics and parameterization during operation.



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

- Pneumatic connection using modules from Bürkert
- I/O-Link modules support the connection of intelligent sensors such as non-contact sonar proximity switches.
- CANopen module from HMS
- PROFIenergy power modules and High Feature motor starters
- Failsafe I/O modules permit the integration in safety-related plants with SIMATIC Safety Integrated.
- SIPLUS components also allow for operation in the extended temperature range -40 °C ... +70 °C and in corrosive atmospheres or under condensation conditions (For details, visit: www.siemens.com/siplus-extreme)

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 and motor starters can be replaced while connected to power during normal operation and without the need for tools (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 are used, the otherwise obligatory system isolation can even be avoided.

The **SIMATIC Selection Tool** can be found on the Internet at www.siemens.com/et200
or in the Industry Mall 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 SIMATIC Selection Tool

Fast Connect

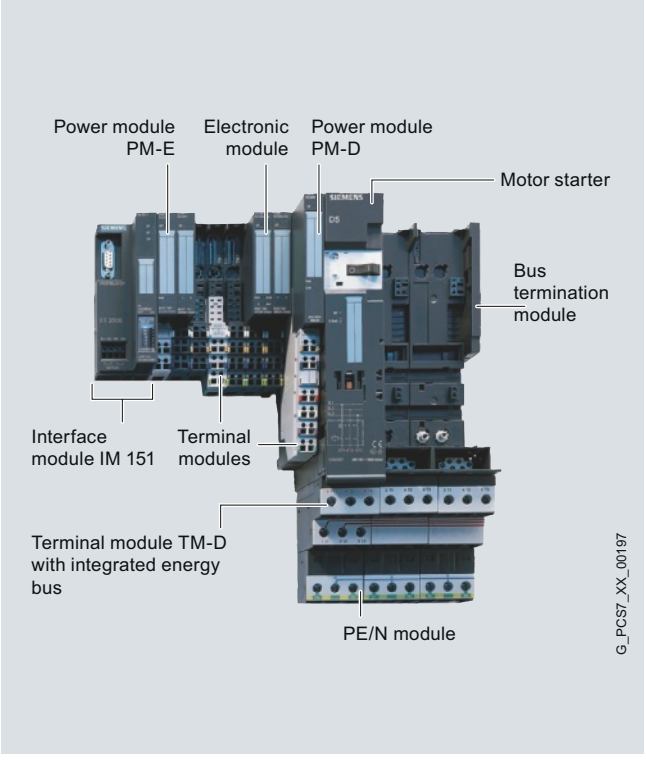
The insulation displacement method Fast Connect offers even more benefits for installation of the electronic and power modules.

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

Fast 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 200S is connected to the bus system via the interface module – either to the field-proven PROFIBUS or to PROFINET, the open Industrial Ethernet standard.

Various interface modules can be chosen, which all provide for channel-specific diagnostics:

Interface modules without CPU functionality

	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 [5] IM 151-3 PN FO	IM 151-3 PN HS
PROFIBUS	Copper	Copper/FOC[1]	Copper	○	○	○
PROFINET	○	○	○	Copper	Copper/FOC[1]	Copper [6]
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
Fail-safety	○	○	●	○	●	○
Isochronous mode	○	○	●	○	○	● [6]
PROFIenergy	○	○	○	○	● / ○	○
Shared device	○	○	○	●	●	●
MRP	○	○	○	●	● / ○	○
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 151-3 PN HF for PROFINET with standard cable

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

Interface modules with CPU functionality[3]

	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
2-port switch [4]	○	○	● [7]	● [7]
Number of modules	63	63	63	63
Station width	2 m	2 m	2 m	2 m
Fail-safety	○	●	○	●
Isochronous mode	○	○	○	○
PROFIenergy	○	○	●	○
I-Device	○	○	●	●
Shared device	○	○	●	●
MRP	○	○	●	●
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.

● can be used / available
○ cannot be used / not available

1) Plastic, polymer-cladded fiber (PCF)

2) The electronic rating plate contains identification data saved in a module, e.g. order number, product version, installation date, plant identification, which unequivocally identify the module and are available online, to simplify troubleshooting, for example.

3) Additional PROFIBUS line with master module 6ES7 138-4HA.

4) The integral 2-port switch of the IM 151-3 now also easily permits a linear structure in addition to the star topology.

5) Also available as a SIPLUS component for extended temperature range -40 °C ... +70 °C and corrosive atmosphere/condensation (for details, see www.siemens.com/siplus-extreme).

6) Available with SIMOTION controller 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 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 available for interface modules with PROFINET interface and for those with PROFIBUS interface.

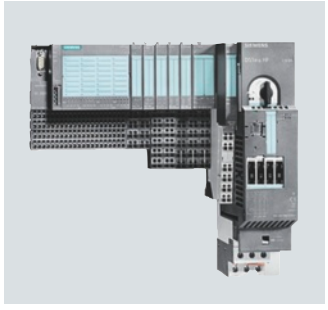
SIMATIC ET 200S COMPACT –
The block I/O featuring bit-modular expansion

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. This means that frequently required inputs/outputs in block form can be combined with bit-modular specialist modules such as motor starters, 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
- PCS7 faceplates for visualizing diagnostics data

High Feature motor starters

- Combination of starter circuit-breaker, electronic overload protection and contactor or soft starter up to 7.5 kW
- PROFIenergy functionality for selective shutdown of motors during breaks, and reading out the motor current
- PCS7 faceplates for visualizing diagnostics data
- Statistical data, e.g. current for the last overload trip, can be read out using the service and commissioning software Motorstarter ES
- Parameterization via bus, and sending and receiving of acyclic data via the fieldbus
- 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 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.

The failsafe motor starter has been developed on the basis of the High Feature motor starter. It offers the following innovative, patented technology:
In normal operation, the contactor shuts down the circuit breaker; in the event of a fault, this is handled by the integral dual-processor monitoring. This makes shutdown possible even if a contactor has a welded contact. It also ensures that each individual motor starter achieves SIL 3 or Category 4 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:

Solution local

- 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 external safety circuits

Solution PROFIsafe

- 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 shutdown groups
- Selective and autonomous shutdown of the fail-safe motor starter for any safety function
- Also for infeed to external safety systems through F-CM contact multiplier

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 and PROFIenergy.	
	■ PM-E 24 V DC with diagnostics or PM-E 24 ... 48 V DC, with diagnostics and status [1)]	■ 6ES7 138-4CA.
	■ PM-E 24 V DC to 230 V AC with diagnostics and fuse [1)]	■ 6ES7 138-4CB.
	■ PM-E RO 24 V DC with diagnostics	■ 6ES7 138-4CA.
	■ PM-E F 24 V DC PROFIsafe for failsafe shutdown (max. Cat. 3) with standard modules	■ 6ES7 138-4CF.
	■ PM-D F 24 V DC PROFIsafe for fail-safe motor starter	■ 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 [1)]	■ 6ES7193-4C.
	■ TM-D for motor starters	■ 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 [1)]	■ 2-, 4- and 8-channel ■ Available from 24 V DC to 230 V AC ■ Different functionalities: Standard, High Feature source input module 8 DI 24 V DC SRC	■ 6ES7131-4.
Digital output modules [1)]	■ 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.
Analog input modules [1)]	■ 2- and 4-channel ■ Current and voltage input, thermocouple and resistance measurement ■ Functionalities: Standard, High Feature, High Speed	■ 6ES7134-4.
Analog output modules [1)]	■ 2-channel ■ Current and voltage output ■ Functionality: Standard, High Feature, High Speed	■ 6ES7135-4.
Relay module [1)]	■ 2-channel, 24 V DC or 24...230 V AC, 5 A ■ 2-channel, 24 V DC or 24...230 V AC, 5 A, channel-by-channel switching using front switch	■ 6ES7132-4HB.
Fail-safe modules	■ Failsafe input module 4/8F-DI 24 V DC PROFIsafe [1)]	■ 6ES7138-4FA.
	■ Failsafe output module 4F-DO 24 V DC/2 A PROFIsafe [1)]	■ 6ES7138-4FB.
	■ Failsafe input/output module 4F-DI/3F-DO 24 V DC/2 A PROFIsafe	■ 6ES7138-4FC.
	■ Fail-safe relay module 1F-RO 24 V DC or 24 - 230 V AC, 5 A	■ 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 central parameterization, IO-Link in SIMATIC S7 also enables expanded diagnostics up to device level.	
	■ 4-channel	■ 6ES7138-4GA.
	You can find additional information on the IO-Link at www.siemens.com/io-link	

[1)] Also available as SIPLUS component for extended temperature range -40 °C ... +70 °C and corrosive atmosphere/condensation (For details, see:www.siemens.com/siplus-extreme).

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 direct on site; parameterization using STEP 7 or GSD file; serial interface: ■ High-speed counting and measuring tasks with 5V or 24V encoders Counter module 24 V DC / 100 kHz [1)] Counter module 5 V DC / 500 kHz 1 COUNT ■ Simple positioning tasks through position sensing with SSI encoders SSI module 1 SSI ■ Controlled positioning of simple drives via digital outputs 1 POS U positioning module ■ Positioning with stepper motors over a pulse/direction interface 1 STEP stepper motor module ■ Proportioning, resetting and controlling of actuators and valves pulse module (timer, pulse-width modulation, stepper motor) 2 PULSE [1)] ■ Serial data exchange via point-to-point connection 1 SI interface module [1)]	■ 6ES7138-4DA. 6ES7 138-4DE. ■ 6ES7138-4DB. ■ 6ES7138-4DL. ■ 6ES7138-4DC. ■ 6ES7138-4DD. ■ 6ES7 138-4DF.
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 different measuring tasks, for example, measuring forces and torques: uniform design and system-wide 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-.
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.[1)] ■ 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)] Also available as SIPLUS component for extended temperature range -40 °C ... +70 °C and corrosive atmosphere/condensation (For details, see:www.siemens.com/siplus-extreme)

SIMATIC ET 200MP

The multi-channel and multi-functional S7-1500 I/O

The ET 200MP I/O system with IP20 degree of protection is scalable and is used not only as a central IO for S7-1500, but also in a distributed configuration connected to PROFINET or PROFIBUS (available soon). As many as 30 IO modules can be inserted into each station. The modules have a low parts variance and the front connector is standardized for all 35 mm wide modules. This considerably simplifies ordering, logistics and storage of spare parts

Station design

The module width has been reduced from 40 mm (S7-300) to 35 mm. Thanks to the smaller footprint, better use is made of the cabinet space.

SIMATIC ET 200MP station design

All IO modules have a standardized 40-pin front connector, which simplifies the ordering process and the storage of spare parts.

Due to the self-assembling backplane bus, the IO system can be constructed on a scalable and flexible basis. In addition, an active backplane bus is being prepared that allows modules to be withdrawn or inserted during operation ("hot swapping"). In both cases, the same IO modules are used.

Mechanical slot coding guarantees the unique assignment of module and front connector. This prevents wiring errors caused by the use of an incorrect front connector and protects the modules from being destroyed during replacement. In addition, the modules have electronic short-circuit protection.

Wiring

The front connectors have a pre-engaged position in which they are not yet electrically connected. In this position, the front connectors can be conveniently pre-wired. This means that rewiring and fault repair are possible during operation.

Pre-engaged position of front connector

SIMATIC TOP connect – preassembled system cabling for digital and analog signals – is available to ensure fast assembly and to prevent wiring errors. SIMATIC TOP connect enables you to complete the wiring easily, quickly and safely.

For details, visit:
www.automation.siemens.com/mcms/automation/en/automation-systems/system-cabling/simatic-top-connect/pages/default.aspx

The circuit diagrams of the modules are printed on the inside doors. This enables servicing work to be carried out without detailed plant documentation or by less experienced personnel.

Standardized pinning

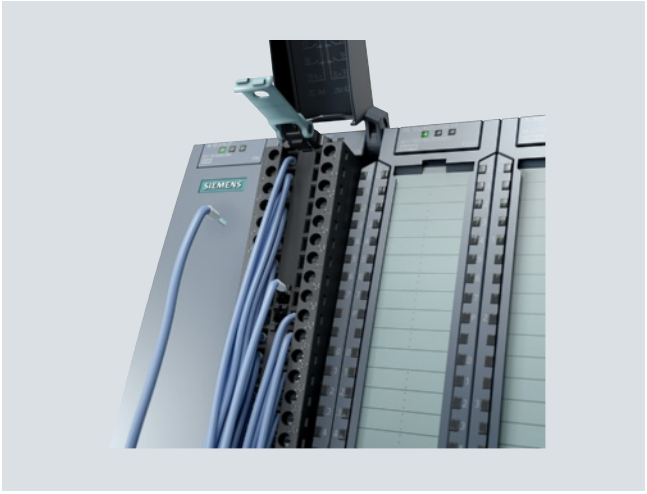
Modules of the same type have standardized pinning and are therefore wired the same way. This reduces the risk of errors and also enables the wiring to be performed reliably by less experienced personnel.

Potential groups

Potential groups are easily formed by inserting jumpers in the front connector instead of wiring. This means that potential groups are more easily recognized and can be changed very easily.

Cable space expands with system

ET 200MP has a cable storage space that expands with the system and the front doors have two latching positions. This simplifies the wiring, particularly when cables with a large core cross-section and/or thick insulation are used.



Integrated shielding

The integrated shielding concept for analog modules makes the system more robust and more resistant to electromagnetic interference, thereby increasing plant availability.

Labeling concept

On the front, the modules have a small area available for equipment identification. Normal commercial labeling systems can be used for this. This enables modules to be identified more quickly and easily.

The LEDs are assigned to the terminal and labeling on a 1:1 basis. This enables the wiring to be checked quickly and easily and ensures that the channel status is clearly readable. In the event of a fault, e.g. wire break on a channel, the corresponding LED lights up red. The fault can therefore be located quickly and precisely and then corrected. This reduces plant downtimes to a minimum.

Diagnostics and display concept

The display and diagnostics are consistent across all modules. Module and channel states are uniformly displayed in plain text – regardless of the type of module. Faults are displayed on a channel-specific basis so that they can be pinpointed and corrected faster. The user can configure substitute values for the event of a fault, so that the behavior of the module can be defined for the respective fault.

Diagnostics and display concept

Electronic rating plate

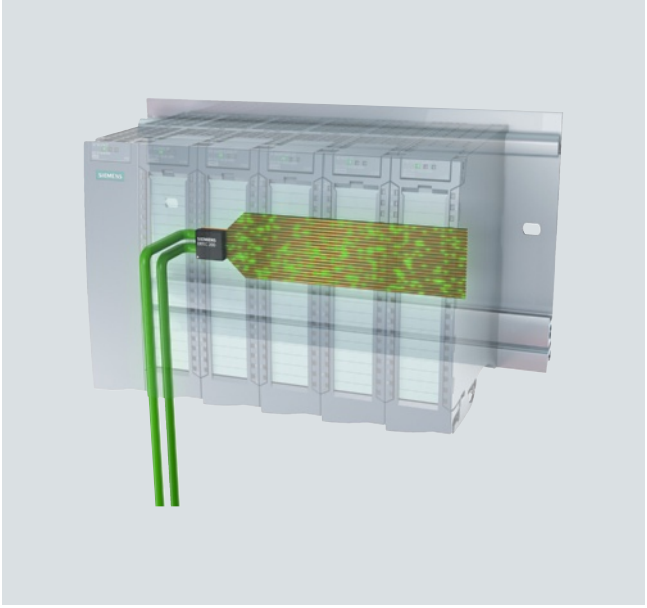
All modules have an electronic rating plate as standard (I&M data), with which they can be identified quickly and clearly. For this reason, simple plant documentation is possible with software (e.g. TIA portal).

Channel-specific parameter assignment

Each channel of the IO modules can be configured individually. This increases the flexibility and enables changes during runtime to be performed more easily.

Performance

ET 200MP offers impressive performance in order to achieve the shortest possible response times and to implement the fastest applications. The high-speed backplane bus, special IO modules and the consistent use of PROFINET mechanisms contribute to this.



High speed backplane

Module overview

The following interface modules and IO modules are available:

Interface modules	Order No. group
IM 155-5 PN	6ES7 155-5AA0.
IO modules	
DI 16x24VDC HF	6ES7 521-1BH0.
DI 32x24VDC HF	6ES7 521-1BL0.
DI 16x24VDC SRC BA	6ES7 521-1BH5.
DI 16x230VAC BA	6ES7 521-1FH0.
DQ 16x24VDC/0.5A ST	6ES7 522-1BH0.
DQ 32x24VDC/0.5A ST	6ES7 522-1BL0.
DQ 8x24VDC/2A HF	6ES7 522-1BF0.
DQ 8x230VAC/2A ST	6ES7 522-5FF0.
DQ 8x230VAC/5A ST	6ES7 522-5HH0.
AI 8xU/I/RTD/TC ST	6ES7 531-7KF0.
AI 8xU/I HS	6ES7 531-7NF1.
AQ 4xU/I ST	6ES7 532-5HD0.
AQ 8xU/I HS	6ES7 532-5HF0.

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 PROFINET and PROFIBUS is made via interface modules.

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.

The PROFINET version of the ET 200M offers new functions, e.g.:

- Shared device
- Media redundancy protocol (MRP)

When the ET 200M is operated with an S7-400H/FH on PROFIBUS, 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.

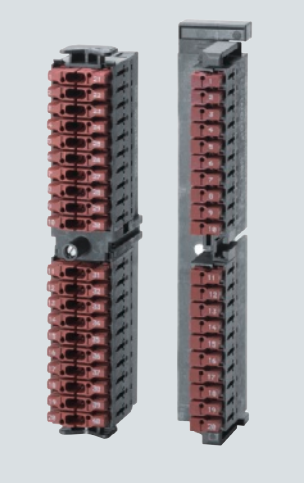
Hot swapping of signal modules is possible, thus reducing downtimes. Failsafe I/O modules permit the integration in safety-related plants with SIMATIC Safety Integrated.

SIPLUS components also enable operation in the extended temperature range -40 °C ... +70 °C and in corrosive atmospheres or under condensation conditions (**for details, see: www.siemens.com/siplus-extreme**).

ET 200M with PROFINET connection and S7-300 modules

FastConnect

The insulation displacement method Fast Connect offers even more benefits when wiring the I/O modules:



FastConnect plug for ET 200M

- 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 153-4 PN [5]	IM 153-4 PN HF
PROFIBUS	Copper	Copper		
PROFINET			Copper	Copper
2-port switch [1]/MRP	○ / ○	○ / ○	● / ●	● / ●
Number of modules	8	12	12	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	●	●	●
Routing of parameterization data to intelligent field devices	-	● (HART)	-	● (HART)
Connection to fault-tolerant (redundant) systems (S7-400H)	-	●	-	-
In the redundant system In the non-redundant system	-	●	-	-
Fail-safety (PROFIsafe)	-	●	-	●
Isochronous mode [3]	-	●	-	
Shared device	-	○	●	●
Electronic rating plate [4]	-	●	●	●
Firmware update	-	Bus	Bus/Micro Memory Card	Bus/Micro Memory Card
Order No. group 6ES7 153-	1AA.	2BA.	4AA.	4BA.

● can be used / available
○ cannot be used / not available

[1] The integrated 2-port switch of the IM 153-4 now also easily permits a ring configuration by means of MRP functionality in addition to the star topology.

[2] Changes to digital inputs are tagged with a time stamp locally (in the IM 153 of the ET 200M) and transferred to the CPU by means of a process interrupt.

[3] Isochronous mode is the synchronized coupling of distributed I/O and the user program on PROFIBUS with a constant cycle time. 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, product version, installation date, or plant identifier that uniquely identify this module and which are available online, for example, to facilitate troubleshooting.

[5] Also available as SIPLUS component for extended temperature range -40 °C ... +70 °C and corrosive atmosphere/condensation (for details, see: www.siemens.com/siplus-extreme).

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 [1]	6ES7 321-1FF.
	Digital input SM 321, 16DI [1]	6ES7 321-1*H.
	Digital input SM 321, 32DI [1]	6ES7 321-1*L.
	Digital input SM 321, 64DI	6ES7 321-1BP.
SM 322	Digital output SM 322, 8DO [1]	6ES7 322-8*F.
	Digital output SM 322, 16DO [1]	6ES7 322-1*H.
	Digital output SM 322, 32DO [1]	6ES7 322-1*L.
	Digital output SM 322, 64DO	6ES7 322-1BP.
SM 323	Digital input/output SM 323, 8DI/8DO or 16DI/16DO [1]	6ES7 323-1B*.
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 [1]	6ES7 331-7KB.
	Analog input SM 331, 6AI	6ES7 331-7PE.
	Analog input SM 331, 8AI [1]	6ES7 331-7*F.
SM 332	Analog output SM 332, 2AO [1]	6ES7 332-5HB.
	Analog output SM 332, 4AO [1]	6ES7 332-**D.
	Analog output SM 332, 8AO [1]	6ES7 332-5HF.

Modules for technological functions	Function	Order No. group
FM 350-1	Counting, measuring [1]	6ES7 350-1AH.
FM 350-2	Counting, measuring, proportioning [1]	6ES7 350-2AH.
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 [1]	7MH4601-1.
SIWAREX FTA	Fast weighing and dosing module with calibration capability	7MH4900-2.
SIWAREX FTC	Module for continuous weighing tasks	7MH4900-3.
SIFLON FC	Function module for industrial flow measurement	7ME4120.

[1] Also available as SIPLUS component for extended temperature range -40 °C ... +70 °C and corrosive atmosphere/condensation (for details, see: www.siemens.com/siplus-extreme).

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) [1]	6ES7 326-1BK.
SM 326F DI 8 NAMUR	Digital input (8 x NAMUR single-channel or 4 x NAMUR dual-channel) [1]	6ES7 326-1RF.
SM 326F DO 10PP	Digital output (10 x 24 V) [1]	6ES7 326-2BF.
SM 326F DO 8PM	Digital output (8 x current sourcing/sinking) [1]	6ES7 326-.
SM 336F AI 6	Analog input (0/4...20 mA, HART) [1]	6ES7 336-4GE.
Isolation module	Galvanic isolation between standard and fail-safe HART modules [1]	6ES7 195-7KF.

Modules for hazardous areas	Function	Order No. group
SM 321	Digital input (4 x NAMUR) [1]	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) [1]	6ES7 331-7RD0.
SM 331	Analog input (8 thermocouples or 4 thermoresistors) [1]	6ES7 331-7SF0.
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) [1]	6ES7 331-7TB0.
SM 332	HART analog output (2 x 0...20 mA or 4...20 mA)	6ES7 332-5TB0.

[1] Also available as SIPLUS component for extended temperature range -40 °C ... +70 °C and corrosive atmosphere/condensation (for details, see: www.siemens.com/siplus-extreme).

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

You can find the **SIMATIC Selection Tool** on the Internet at:
www.siemens.com/et200
as well as in the Industry Mall or the Catalog CA01 on DVD

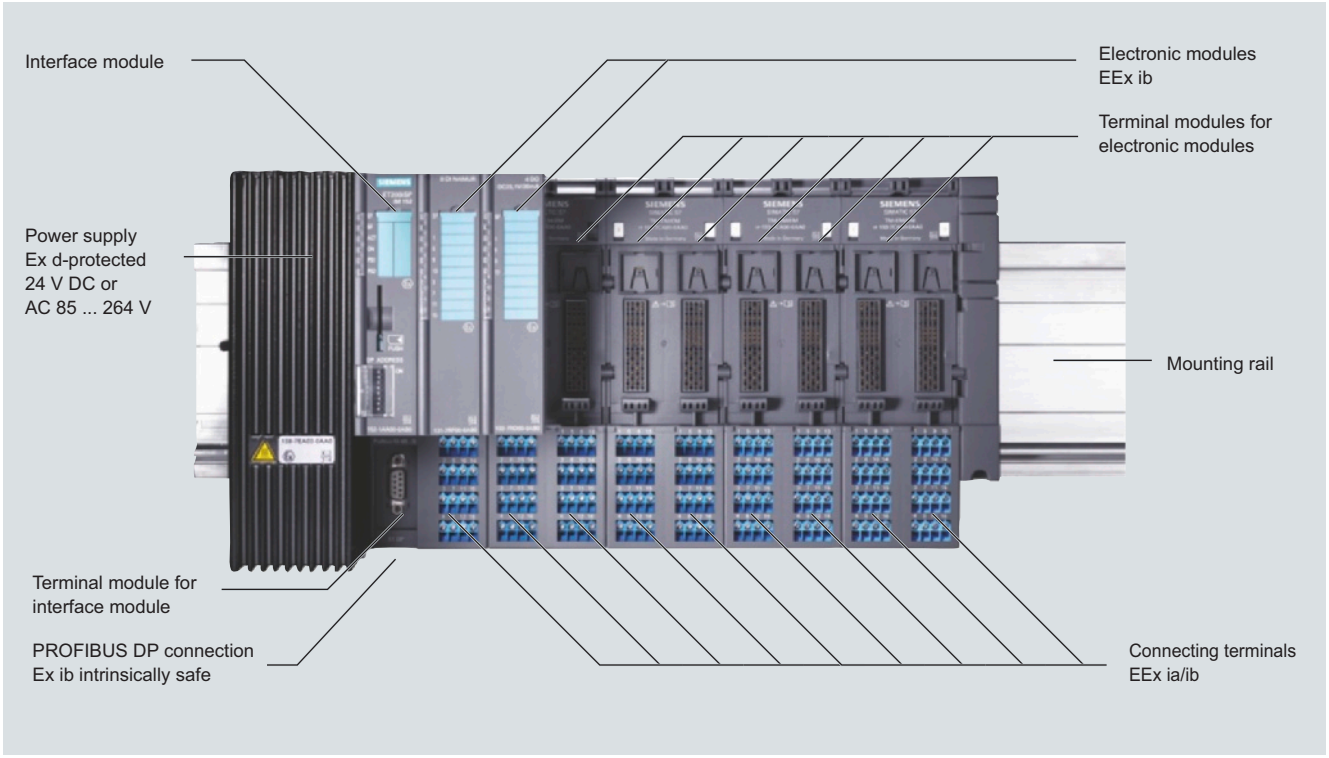
Safe in the field with the isolating transformer

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.

Fieldbus isolating transformer

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 or 230 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	85 ... 264 V AC/5A
Dimensions	60 x 190 x 136.5 mm	60 x 190 x 136.5 mm
Order No. group	6ES7 138-7EA.	6ES7 138-7EC.

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 24 V DC	6ES7 193-7DA1.
TM-PS-B for PS redundant 24 V DC	6ES7 193-7DB1.
TM-PS-A for PS 85...264 V AC	6ES7 193-7DA2.
TM-PS-B for PS 85 ... 264 V AC redundant	6ES7 193-7DB2.
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., product version, installation date or plant identifier that uniquely identify this module and which are available online, to facilitate troubleshooting, for example.

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).

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).

Electronic module

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.

Fail-safe input/output modules

Three fail-safe modules are available for digital input, digital output and analog input up to SIL3/PLe for use up to Zone 1 or 21. This means the otherwise required Ex barrier can be ignored for the SIL calculation.

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 2 DO Relay module available with two outputs, 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**	**NAMUR encoders and single contacts with/without resistance circuit**	**Solenoid valves**
Module	8 DI NAMUR	4 DO	2 DO Relay	8 F-DI Ex NAMUR	4 F-DO Ex 17.4V/40mA
Number of channels	8	4	2 with 2 A each	8	4
Special feature	2 channels can be used as ■ Counter (max. 5 kHz) ■ Frequency meter (1 Hz ... 5 kHz) ■ With gate function	■ 25.5 V DC, 22 mA ■ 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	Up to SIL 3, PLe, Pulse Stretching, 1oo2 on module possible; FW update via network	Up to SIL 3, PLe, parallel switching of outputs, Energize To Trip [ETT] diagnostics, Last valid value; FW update via network
Order no. group	6ES7 131-7RF.	6ES7 132-7RD. [1] 6ES7 132-7GD. [2]	6ES7 132-7HB0.	6ES7138-7FN.	6ES7138-7FD0.

[1] H deactivation, [2] L deactivation

Analog modules		
	Resistance thermometer (Pt100, Ni100)	**Thermocouple types B, E, J, K, L, N, R, S, T, U**
Application	**Resistance test 600 Ω**	**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**	**0/4...20mA encoder with/without HART**
Module	4 AI I 2 WIRE HART	4 AI I 4 WIRE HART	4 AO I HART	4 F-AI Ex HART
Number of channels	4	4	4	4
Resolution	12 bit + sign	12 bit + sign	14 bit	15-bit resolution + sign
Special feature				Up to SIL 3, PLe, HART communication V7.0; FW update via network
Order no. group	6ES7 134-7TD0.	6ES7 134-7TD5.	6ES7 135-7TD0.	6ES7138-7FA.

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

Pneumatic system expansions

Modular in design, fully integrated into the system – ET 200iSP with valve modules from Bürkert.

You can find these and other accessories in our Add-ons Catalog ST PCS7.1 • 2011

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
NEPSI		Ex ib [ia] IIC T4 Ex e [ia/ib] IIC T4
GOST		Ex ib [ia] IIC T4 Ex e [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	According to 94/9/EC (previously ATEX 100a), 2004/108/EC and 2006/95/EC	
KCC	Korea Certification	
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	
For horizontal mounting [1]	-20 °C ... +70 °C
For other mounting positions:	-20 °C ... +50 °C

[1] For details and further information, please refer to the product description: www.siemens.com/ET200iSP

SIMATIC ET 200pro

Compact and multi-functional

SIMATIC ET 200pro is an especially rugged and high-performance I/O system with IP65/66/67 degree of protection. It does not require a control cabinet and can be mounted directly on 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 leading Industrial Ethernet standard for company-wide automation. Communication here can also take place via Industrial Wireless LAN as well as using cables solutions.

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

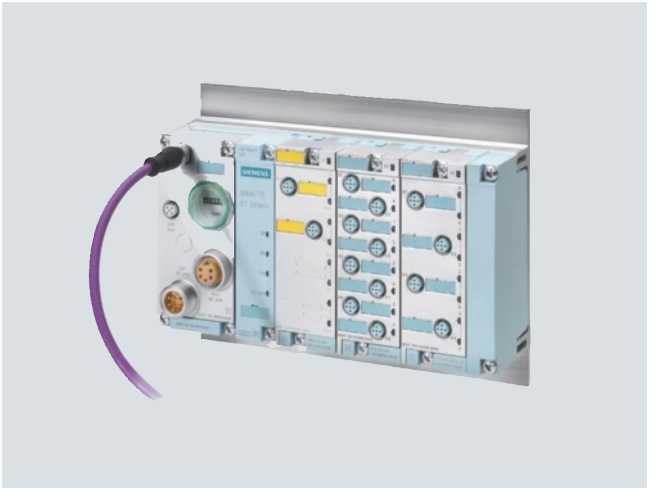
- The standard modules also offer module diagnostics for short-circuiting of the encoder supply or the outputs.
- The High Feature modules offer more precise diagnostic functions through channel diagnostics for short-circuit and wire-break. Additional process interrupts can be used for digital inputs 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.

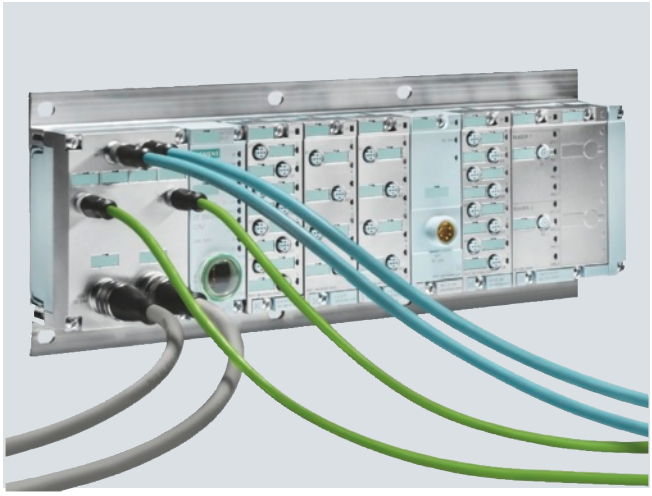
Together with the failsafe SIMATIC S7-300F and S7-400F controllers, automation tasks can be solved with safety requirements up to SIL 3 (EN 61508) or up to Category 4 (EN 954-1) – efficiently and without cabinets. With the F-CPU module, local, safety-related applications can also be set up.

Failsafe communication between the ET 200pro and the higher-level or integral failsafe CPU is achieved using PROFIsafe – cabled via PROFIBUS and PROFINET or wirelessly via Industrial Wireless LAN.

You can find the **SIMATIC Selection Tool** on the Internet at:
www.siemens.com/et200
as well as in the Industry Mall or 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 modular and extremely compact design. Up to 16 modules can be combined in any way over a length up to one meter. 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 in lengths of 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.

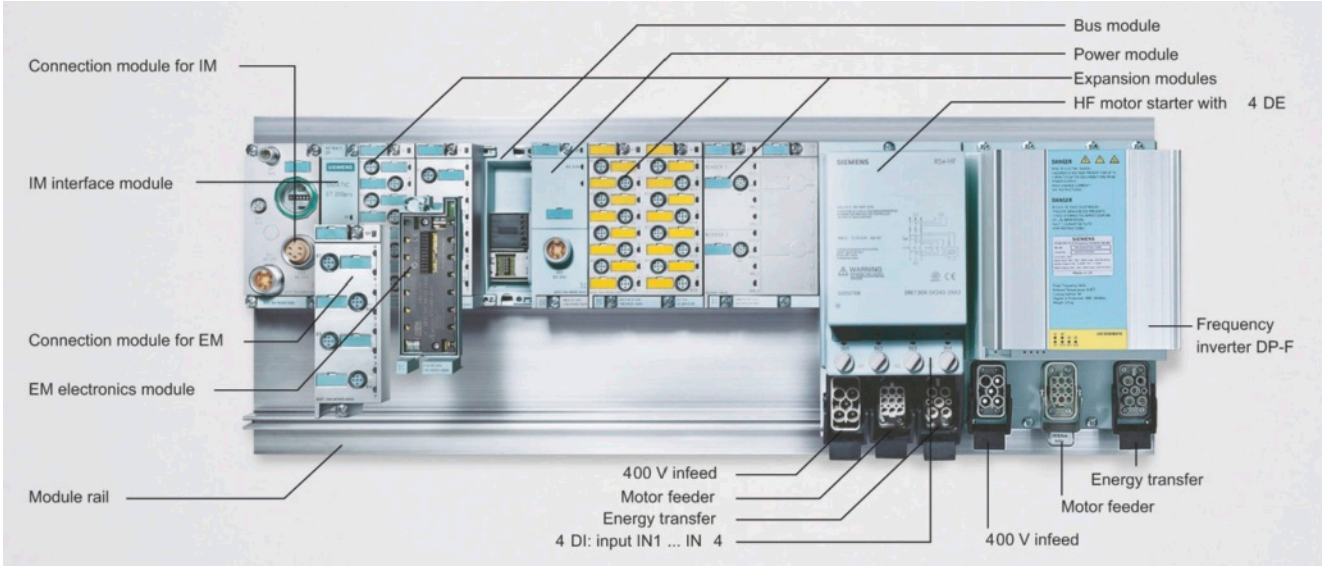
8-channel electronic modules can be combined with the 8 x M12 or 4 x M12 connection modules. This gives you the choice of single or dual assignment of the M12 sockets. A wide variety of different sensors and actuators can therefore be connected to the electronic module without the need for additional accessories such as Y connectors or Y leads. This not only reduces the wiring but also the costs for accessories and parts inventories. Wiring with connection modules 8xM8, 2xM12 and 1xM23 is also possible.

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 neither total failure of all load groups, nor damage beyond 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. It supports the PROFINET functions:

- IRT
- Media redundancy protocol (MRP)
- Shared device

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 154-4AB.

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

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

CPU modules (with F-CPU)

Fail-safe CPU module for ET 200pro

The interface modules IM 154-8 PN/DP CPU and IM 154-8F PN/DP with CPU functionality are based on the CPU 315-2 PN/DP and offer the same quantity structures and functions. Both IM 154s have two communication interfaces,

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

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, started up, diagnosed and operated individually.

CPU modules	**IM 154-8 PN/DP CPU IM 154-8F PN/DP CPU IM 154-8FX PN/DP CPU**
PN/DP connection block	CM IM PN DP M12 7/8"
Memory	384 KB / 85 k statements 512 KB / 85 k statements (F-IM) 1.5 MB / 256 k statements (F-IM)
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	6ES7 154-8AB. 6ES7 154-8FB. 6ES7 154-8FX.
Connection block Order No. group	6ES7 194-4AN.

Power supply module

ET 200pro power supply module for 380 to 480 V

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.

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

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	Order No. group
EM 8 DI DC 24V	6ES7 141-4BF.
EM 8 DI DC 24V HF	6ES7 141-4BF.
EM 16 DI DC 24V	6ES7 141-4BH.
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.
EM 4DI / 4DO DC 24 V, 0.5 A NEW	6ES7 143-4BF.
EM 4 DIO / 4 DO DC 24 V, 0.5 A	6ES7 143-4BF.

Analog electronic modules	Order No. group
EM 4 AI U HF	6ES7 144-4FF.
EM 4 AI I HF	6ES7 144-4GF.
EM 4 AI RTD HF	6ES7 144-4JF.
EM 4 AI TC HF	6ES7 144-4PF.
EM 4 AO U HF	6ES7 145-4FF.
EM 4 AO 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, CM 4 x M12 inverse, 8 x M12, 8 x M12D
- 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.

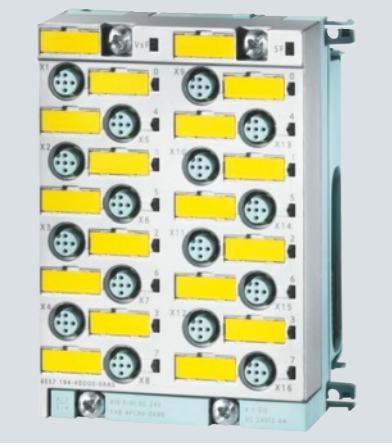
The following connection modules are available:

- CM IO F 12xM12
- CM IO F 16xM12

RFID communication

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

Digital electronic modules 8 DI and 4 DO



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

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. In addition, the motor starter is now available with PROFIenergy functionality. This makes it possible to selectively shut down motors via PROFINET during breaks. Energy-related data such as the motor current can also be integrated into higher-level control systems. Faceplates are offered for PCS7 for visualizing diagnostics data. 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 that isolates series-connected starters from the supply voltage, for example.

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 repair switch module with safe input and the 400 V disconnecting module are used. These two components permit a safe shutdown 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
- Energy efficiency through power recovery and reactive power compensation
- 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.

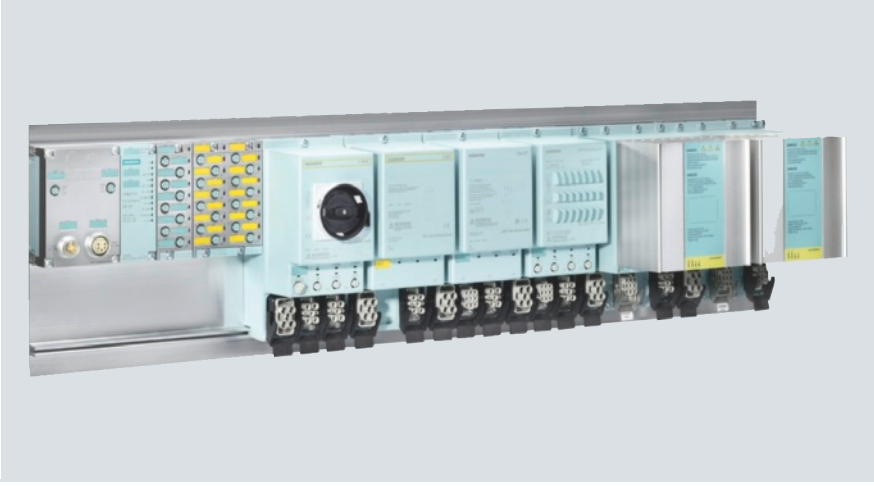
- Safe Torque Off (STO, previously "Safe Standstill") – for protection against an active movement of the drive.
- Safe Stop 1 (SS1, previously "Safe Braking Ramp") – for continuous monitoring of a safe braking ramp.
- Safely Limited Speed (SLS, previously "Safely Reduced Speed) – for protection against 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 [1]	Order No. group
Frequency converter ET 200pro FC with integrated safety functions	6SL3235-0TE21-1SB.
Frequency converter ET 200pro FC Standard	6SL3235-0TE21-1RB.

1) Available on request.

Frequency converter ET 200pro FC



ET 200pro station with frequency converters and motor starters

SIMATIC ET 200eco PN

Block I/O with IP65/66/67 degree of protection with PROFINET connection

SIMATIC ET 200eco PN is the new, rugged and space-saving block I/O with IP65/66/67 degree of protection. Connection to PROFINET is at 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 current market trend for migrating 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 24 V DC	16 DI 24 V DC	8 DO 24 V DC	16 DO 24 V DC	8 DI/DO 24 V DC
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
Connections	4 x M12, 8 x M12	8 x M12	4 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.

General technical specifications	
Transfer rate	100 Mbit/s full duplex
Enclosure	Zinc die-casting (fully cast)
Vibration strength, continuous	20 g
Temperature range	-40 °C ... +60 °C [2]

Module range					
Module	8 AI	8 AI RTD/TC NEW	4 AO	4 IO-Link (IO-Link Master) [1]	24 V DC voltage divider
Number of input/output channels	4 U/I and 4 RTD/TC	8 RTD/TC	4 U/I	4 IO-L, 8 DI, 4 DO, (1.3 A)	–
Connections	8 x M12	8 x M12	4 x M12	8 x M12	1 x 7/8" 4 x M12
Order no. group 6ES7	144-6KD0.	144-6KD5.	145-6HD.	148-GJA.	148-6CB.

1) For additional information on the IO-Link, see: www.siemens.com/io-link

2) Without IO-Link module and voltage distributor

SIMATIC ET 200eco

Digital block I/O with IP65/66/67 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

References

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

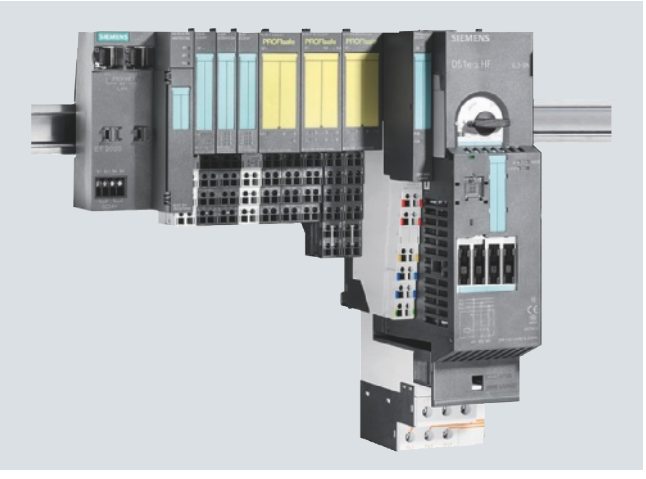
The decision was in favor of an integrated, distributed solution using PROFINET. A single-mode fiber-optic network based on Ethernet (14 km distance) forms the backbone for the communication for the automation systems and the Voice-over-IP between the two sites. The mainstays of the automation solution 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 ISO 14001 environment protection audit.*"
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.

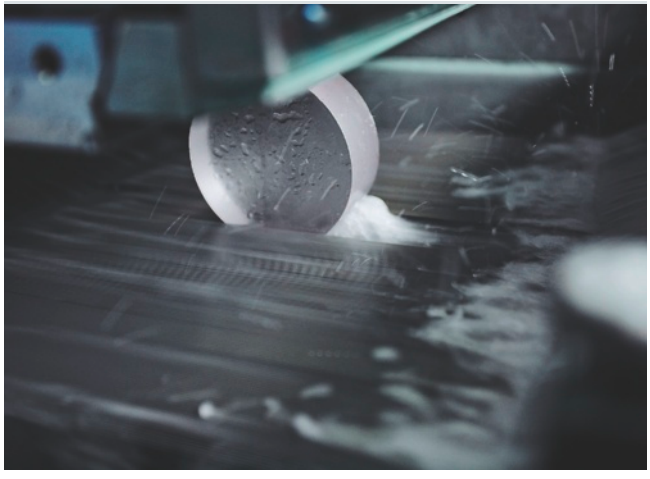
Solution

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.

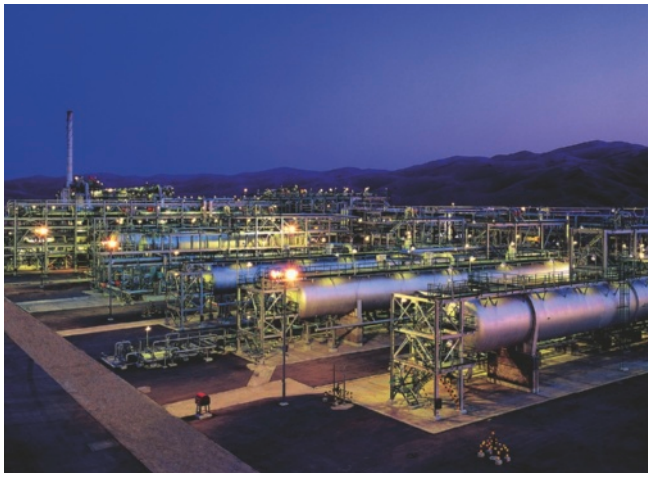
Solution

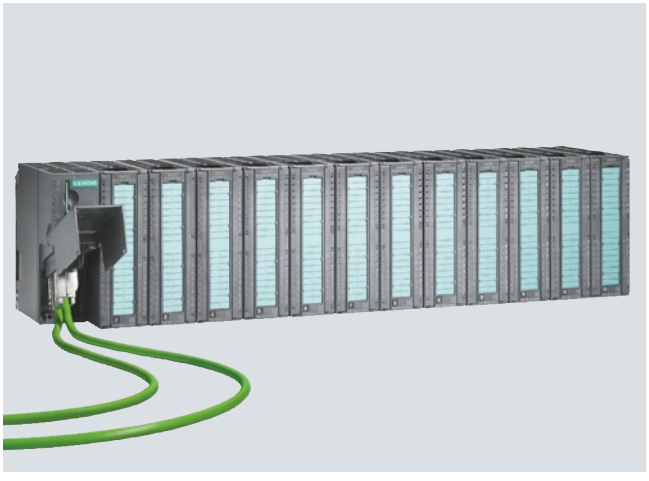
The automatic control system for the technological processes of the oil and gas sector is based on a system for telemetric data acquisition and remote control. For Turgai-Petroleum, 120 probes were optimized using automation.

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.

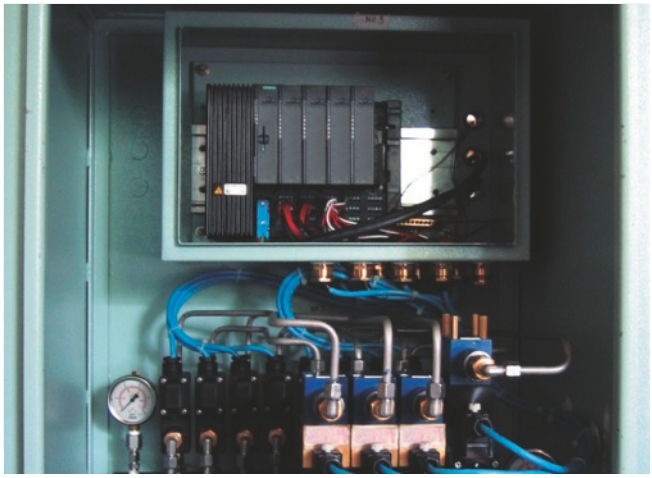
Solution

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 PN

**Stihl Andreas AG & Co KG, Germany –
Production of chain saws**

Requirements

Stihl in Waiblingen/Germany is one of the leading manufacturers of chain saws and equipment for greenspace and forest maintenance. Stihl chain saws combine innovative technology, high performance, optimum ergonomics and low weight, mainly through different equipment variants for any application. This requires modern and highly flexible manufacturing plants. With proprietary equipment production and highly qualified and specialized personnel, Stihl is able to equip its own manufacturing and assembly facilities.

That is why the automation specialists are extremely interested in innovative and lasting automation solutions. To simplify handling and to make maintenance/adjustment as efficient as possible, a uniform solution with a minimum of engineering tools is required. To protect investments on a long-term basis, Stihl places great emphasis on long-lasting solutions.

Solution

In the newly installed assembly line (50 m long), different chain saw variants are produced flexibly, from the chassis through the assembly up to final inspection and testing. At the beginning, a manufacturing data set consisting of up to 20 variants is assigned to each mounting structure. An uncoded RFID chip which stores the manufacturing data is attached to the mounting structure for this purpose.

During the entire manufacturing process, the mounting structure is uniquely identified at RFID reading stations and is read in directly at the machine via ET 200eco PN IO-Link Master. Furthermore, the production steps are visualized and controlled at mobile panels (SIMATIC Mobile Panel 277 IWLAN) throughout the entire assembly line via Industrial Wireless LAN (IWLAN).

Benefits

Through the use of the flexible and rugged ET 200eco PN, the data can be bundled direct at the RFID reader and, via standard PROFINET protocols, sent direct to the CPU for further processing. Integrated tools, such as the Port Configurator Tool (PCT) for IO-Link, have also made maintenance very easy, since replacement IO-Link Master modules receive their addresses without any configuration overhead and are then immediately ready for operation, with the result that "the modules of SIMATIC ET 200eco PN do not have to be addressed at all, neither during installation nor during replacement in the event of a failure", says Michael Muerdter, automation expert at Stihl. Faults are detected at an early stage via the integrated diagnostics, indicated on the visual display device and remedied before any significant failure occurs. Costs can thus be reduced in the long term and downtimes minimized.

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.

Step into the world of SIMATIC

This brochure has given you an initial overview of the extensive SIMATIC portfolio for process automation – and of the advantages for you as a machine builder and plant operator. Further information on the individual families of systems can be found in the Internet sites listed below.

S I M A T I C

SIMATIC is a principal component of Totally Integrated Automation, the comprehensive and integrated range of products and systems for automation:
www.siemens.com/tia

SIMATIC – the leading automation system for industry:
www.siemens.com/simatic

Get to know the SIMATIC consistency through its system features:
www.siemens.com/simatic-system-features

SIMATIC PCS 7	SIMATIC Controller	SIMATIC ET 200
The powerful, scalable process control system for all sectors	Powerful controller based on various hardware platforms	The distributed, modular I/O system for all requirements
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Comprehensive range of hardware and software products for PC-based Automation	The basis for customer-specific, integrated MES solutions	The extensive range of products and systems for industrial communication
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SIMATIC Safety Integrated	SIMATIC Sensors	SIPLUS extreme
The seamless system for safety technology that integrates smoothly and completely into standard automation	Sensors for an enormous variety of requirements in the production industry	Products for industrial applications in harsh ambient conditions and extreme environments
www.siemens.com/simatic-safety-integrated	**www.siemens.com/simatic-sensors**	**www.siemens.com/siplus-extreme**

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

PROFINET:
www.siemens.com/profinet

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

Totally Integrated Automation:
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