Automation solutions with distributed I/O

simatic ET 200

SIEMENS

April 2005

Distributed I/O –
The right solution for any requirements

You are constantly on the look out for possibilites of optimizing production and reducing costs. In increasing competition it is essential to provide individual machinery and plants as fast and cost-effective 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.

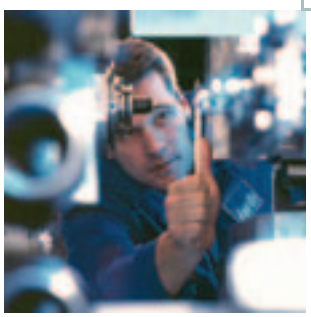
Ahead of the competition thanks to consistent decentralization

Flexible, distributed solutions are an essential part of modern automation – solutions that are tailored to your requirements and permit significant cost savings.

SIMATIC – The modular product line ET 200 permits distributed solutions for every requirement in any sector. Whether compact or modular, purely digital I/O interfaces or complete distributed systems with drive technology, installed in the control cabinet or directly in harsh industrial environments.

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



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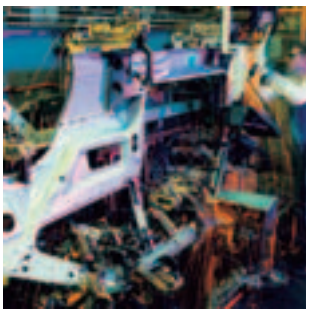


Product range of SIMATIC ET200

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 configuration allows the ET 200 systems to be configured or expanded in small steps. Ready-to-use, integrated add-on modules reduce the costs and offer a wide range of different application possibilities.

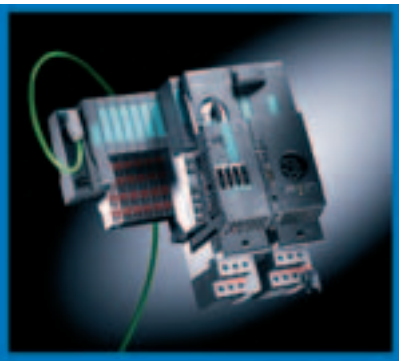
Many different possible combinations are available: Digital and analog inputs and outputs, intelligent modules with CPU functionality, safety systems, motor starters, pneumatic devices, frequency converters as well as various different technology modules (e.g. for counting, positioning).

Integral plug connections make installation quick and easy and therefore reduce the costs. The sensors and actuators can be easily connected to a bus system without the need to use a mass of single wires with cable distributors and cable racks. This makes the wiring simple and transparent, less error-prone and therefore low-cost.

The ET 200 systems can be integrated into the SIMATIC PCS7 process control system with minimal engineering outlay. But it can also be used with non-Siemens process control systems.

Solutions in the control cabinet

SIMATIC ET 200S –
the multi-talent with a comprehensive range of functions

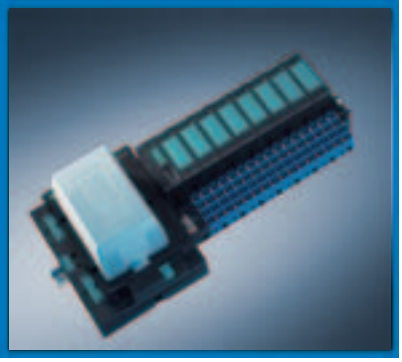


- Bit-modular design with multi-conductor connection.
- Multifunctional thanks to a wide range of modules: Motor starters, frequency converters,safety technology, distributed intelligence, IQ-Sense sensor modules
- For use in hazardous areas (Zone 2)
- **NEW!** Also available as block variant with integrated DI/DO: SIMATIC ET 200S COMPACT.

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

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

SIMATIC ET 200iS –
the intrinsically safe variant for hazardous areas



- Modular design
- Rugged, intrinsically-safe construction
- For use in hazardous areas up to Zone 1/21, sensors and actuators are even permitted in Zone 0/20
- High plant availability, hot swapping

ET 200 systems for cabinet-free configurations are installed in a rugged, fiber-glass strengthened plastic casing, making them resistant to shock and dirt, as well as watertight. You need fewer additional components, save on cabling and profit from the fastest response times.

Solutions without a control cabinet

SIMATIC ET 200pro –
modular and multi-functional

- Modular design with an extremely compact casing (small footprint).
- Easy installation.
- Multi-functional thanks to a wide range of modules: simple I/O, safety systems, motor starters, frequency converters, MOBY identification system.
- High plant availability thanks to hot swapping and independent wiring
- Extensive diagnostics

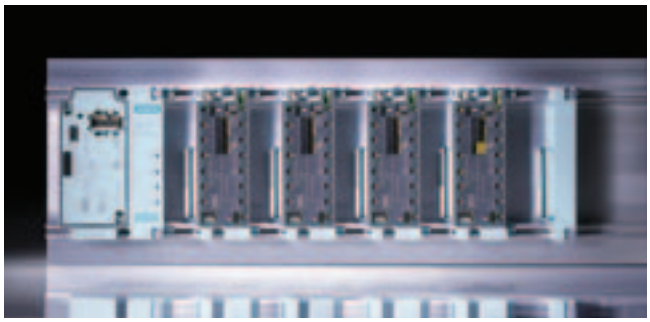
SIMATIC ET 200eco –
digital block I/O

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

Simple design for all applications

The ET 200 systems are easy to assemble and can be adapted to the requirements of any automation system thanks to the different construction types (modular or block). In the case of modular systems, unused channels no longer have to be connected and spare parts inventories are reduced.

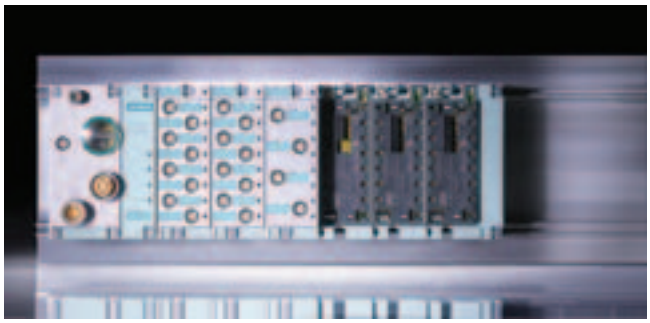
Mounting is on a rail – either already on the "work bench" or directly on the machine. The modules are snapped onto the rail and plugged into each other such that the backplane bus is assembled automatically.



Self-assembling backplane bus

The mechanical and electronic systems are separated from each other. This makes permanent wiring possible. Prewiring can therefore be inspected before the electronic modules are installed which prevents damage to sensitive components. The start-up time is therefore reduced.

Furthermore in the event of a fault, electronic modules are easily replaced during normal operation with the equipment live (hot swapping). The station remains functional and there is no need for costly shutting down and starting up of the plant. While the components are being replaced, the wiring remains intact. Coding prevents the wrong electronic modules or connectors from being fitted.



Independent wiring: connections and electronics are separate from one another

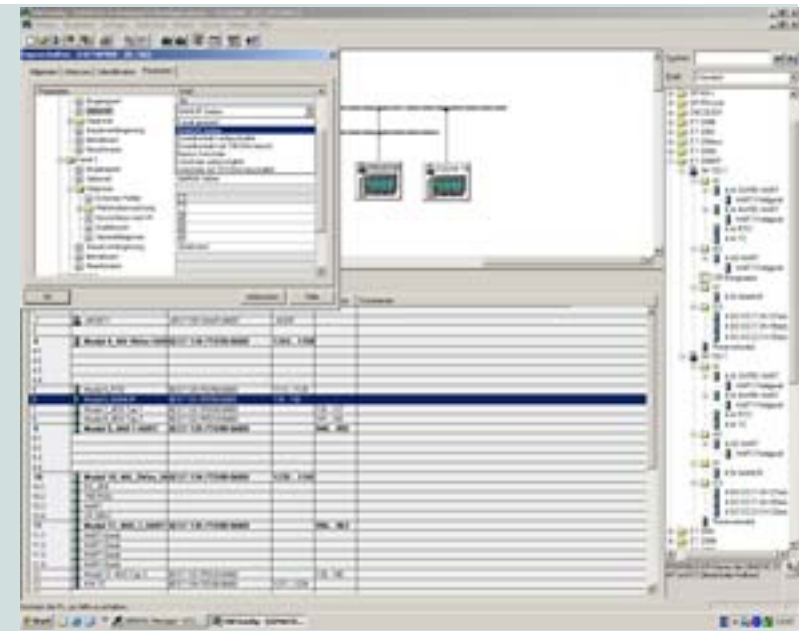
The correct physical structure of the bus system is a basic requirement for fault-free plant operation. Since poorly assembled plugs are often the reason for plant down times, extreme care should be taken during installation.

The FastConnect system for PROFIBUS significantly supports and accelerates this work. Tools, bus cables and connectors which are easy to handle enable fault-free assembly within minutes:

- FastConnect stripping tool
- FastConnect standard bus cable
- FastConnect high-speed bus connector

FastConnect bus connector for fast and fault-free assembly

Integrated engineering and diagnostics



Configuring and parameterizing with STEP 7

Bus test unit BT 200

Diagnostic repeater

Graphical module analysis with plain text messages in STEP 7

The widely implemented standard tool STEP 7 is used for engineering and diagnostics. The distributed I/O is configured in the same manner as the central I/O. Engineering can be performed from any point in the system – locally in the plant or centrally in the engineering station.

If the ET 200 is operated on a non-Siemens PLC over PROFIBUS, the supplied GSD file (device master file) is used. This file contains the configuration and parameterization data in standardized form and is used in the configuration tool of the non-Siemens master.

A plant can only be productive and efficient throughout the complete life-cycle if the causes of faults can be detected and rectified rapidly. During installation and start-up and especially during normal operation it is important to minimize downtimes.

The SIMATIC ET 200 I/O systems offer powerful, multi-level diagnostic systems within the framework of Totally Integrated Automation for any disturbances that occur.

These system errors are automatically detected and are caught by programmable exception handling routines. In addition to system-wide diagnostics, PROFIBUS offers so-called bus diagnostics.

Even before start-up, you can check bus cables, interfaces and the accessibility of components with the bus test unit BT 200 on PROFIBUS. The diagnostics repeater allows wiring to be checked during normal operation. The status of the connected stations and modules is monitored and indicated in plain text.

During commissioning and operation, the topology of the automation system with the ET 200 stations is offered as overview diagnostics.

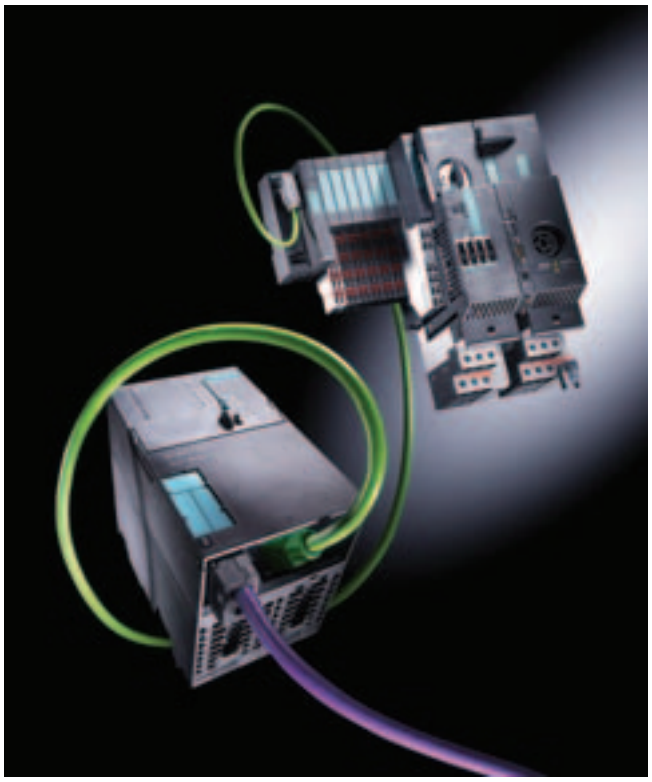
Module diagnostics includes, for example, short-circuit testing of encoder supplies and outputs. Modules with diagnostic capability monitor each channel for short-circuit and wire-break. This makes it possible to react immediately to every irregularity and process event. The response of the controller can easily be programmed with STEP 7.

In addition to the system diagnostics, software tools are also available for process diagnostics in order to determine and eliminate faults outside the PLC.

Open thanks to communication standards

PROFIBUS and PROFINET ensure rapid data transfer between the components and consistent decentralization of your automation solution. The use of open communication standards offers you flexibility with interfacing: whatever system you decide to implement.

PROFIBUS is the No. 1 fieldbus; the proof lies in the 13 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.



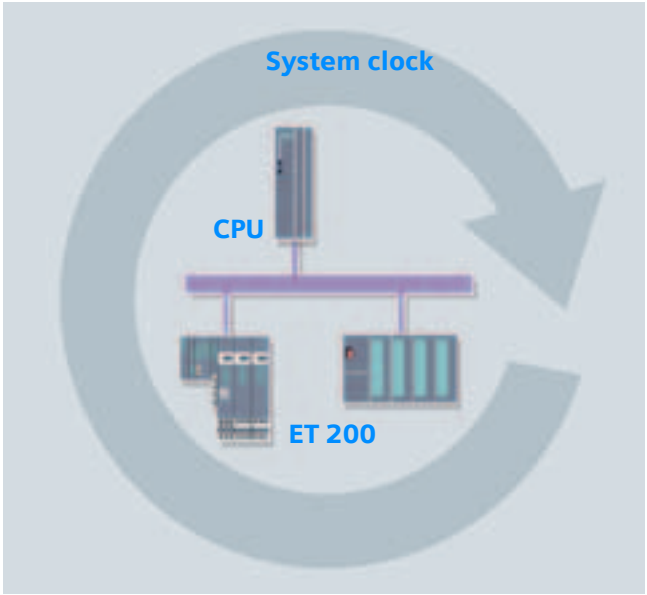
Company-wide automation with **PROFINET**:
PROFINET – the open Industrial Ethernet Standard for automation – ensures integrated communication. The Indiustrial Ethernet standard is increasingly used to connect the field area to the management level. Existing fieldbus systems can be easily integarted. This protects your investments for the future. PROFINET offers new diagnostic possibilities and communication over Industrial Wireless LAN for applications in which fieldbusses previously reached the limit of their capabilities.

New applications with isochronous mode

Increasingly, even high-speed machines in production and machining processes that must operate with extreme accuracy are being implemented in a distributed configuration, e.g. for drive controls.

In such a case, repeatable and defined process response times are required, even for the distributed I/O. This means that I/O signals must be read in, output and synchronized with the user program at equidistant intervals.

Furthermore, the time from recording of a signal by the distributed I/O up to the corresponding response on the actuator must be as short as possible and exactly reproducible.



The system clock applies throughout the complete automation structure

Maximum demand for clock accuracy: weaving machines

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

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

- Fast, time-based procedures where reproducibility (strict real-time requirements) are of decisive importance can also be automated with distributed I/Os.
- Isochronous mode opens up numerous possibilities which are not just limited to drive applications. Isochronous mode is equally suitable for applications where sensors and actuators are present distributed on the machine.

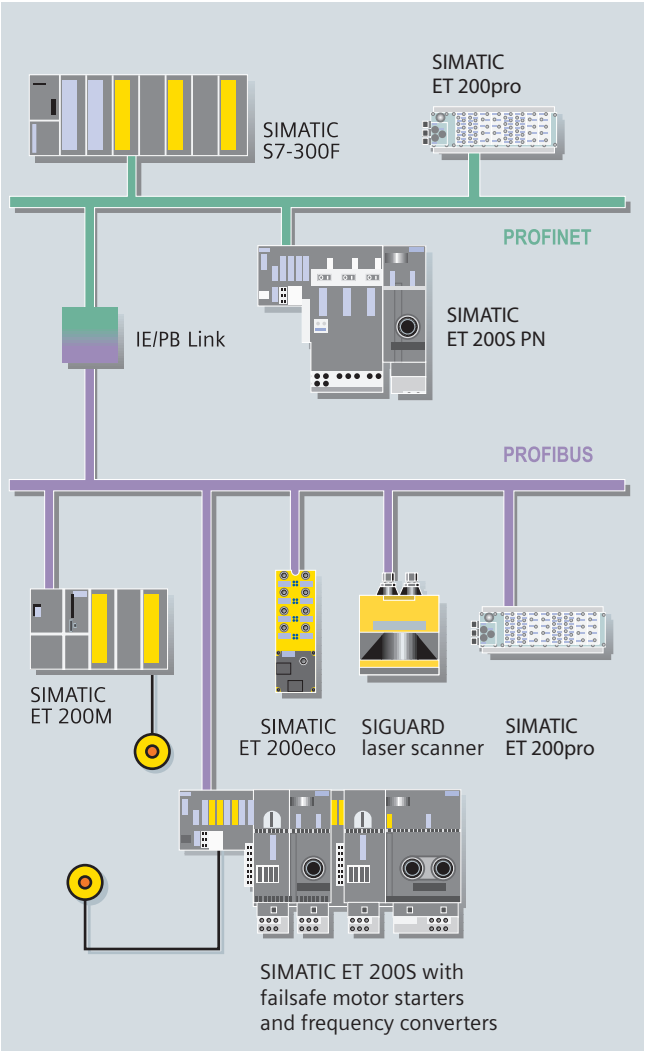
The isochronous mode function is supported by ET 200S and ET 200M.

Integrated safety systems – SIMATIC Safety Integrated

Until recently it has been common to implement safety tasks and standard tasks using different systems. This led to discontinuous systems and additional outlay. With SIMATIC, however, the safety system is directly integrated into the standard automation.

This means that you have at your disposal a system-wide safe and well-proven control system whose flexibility, easy expansion and comprehensive performance reserves further strengthens your powers of innovation. With SIMATIC Safety Integrated, you profit from an efficient and reliable system – in both the manufacturing and process industries.

Apart from the hardware, assembly and installation costs for separate safety wiring, Safety Integrated as a system-wide solution also saves engineering costs because standard and safety automation are configured in the same manner.



Versatility of ET 200 in safety-relevant area

SIMATIC Safety Integrated incluedes the failsafe programmable controllers SIMATIC S7-300F and S7-400F/FH as well as failsafe I/O and engineering products within the range of Safety Integrated. If a fault occurs, the complete programmable controller or a sub-process can be transferred to and retained in a safe state. Distributed I/O systems are used for distributed expansion of a failsafe programmable controller.

The failsafe SIMATIC ET 200 systems can be assembled as combinations including both failsafe and standard I/O modules. The I/O spectrum ranges from simple I/O channels through motor starters as far as frequency converters.

Safety-related communication can take place in the same manner as standard communication over the two PROFIBUS and PROFINET bus systems. These have been expanded for failsafe communication by means of the PROFIsafe profile. Safety-related communication and standard communication are now possible over the same cable.

Failsafe SIMATIC I/O has been certified by the German Technical Inspectorate and satisfies even the most stringent safety requirements such as IEC 61508 (SIL 3), EN 954 (Category 4) and NFPA 79.

Advantages of SIMATIC Safety Integrated:

- Use of the same hardware components for safety-relevant and standard automation.
- No additional safety bus – standard and safety-relevant communication are carried out in parallel on the same bus with the PROFIsafe profile for PROFIBUS and PROFINET.
- Effective diagnostics functions reduce expensive down times.
- Maximum plant availability resulting from failsafe, fault-tolerant systems.

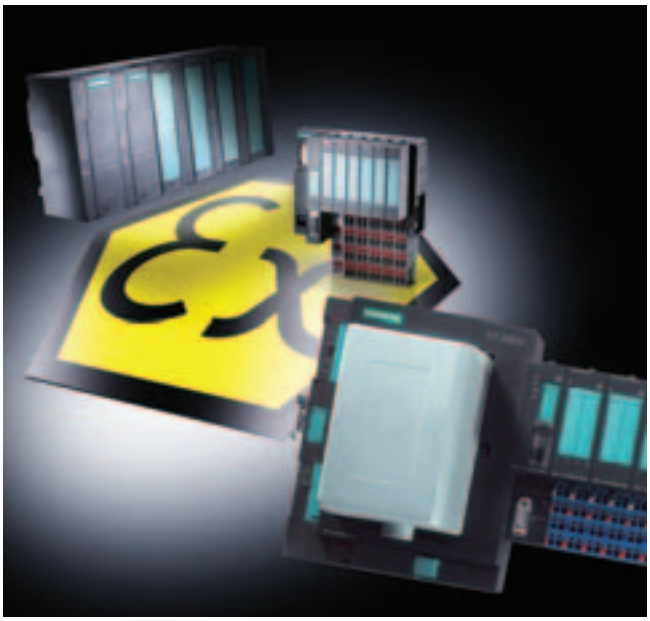
Use in hazardous areas

In many industries, the manufacture, processing, transport, or storage of combustible materials results in the creation or release into the surrounding environment of gases, vapors, or mist; in other processes, flammable dust is produced. In combination with oxygen in the air, these form a potentially explosive atmosphere which will result in an explosion if ignited.

Especially in the chemical and petrochemical industries, with the extraction of mineral oil and gas, in mining, mills and in many other industrial sectors, these explosions can result in serious personal injury and damage to equipment.

The distributed I/O systems ET 200S, ET 200M and ET 200iS can also be used in areas subject to gas and dust explosion hazards, e.g. in the chemical, food and tobacco or pharmaceutical industries, or on drilling platforms. Data communication takes place as usual over PROFIBUS DP.

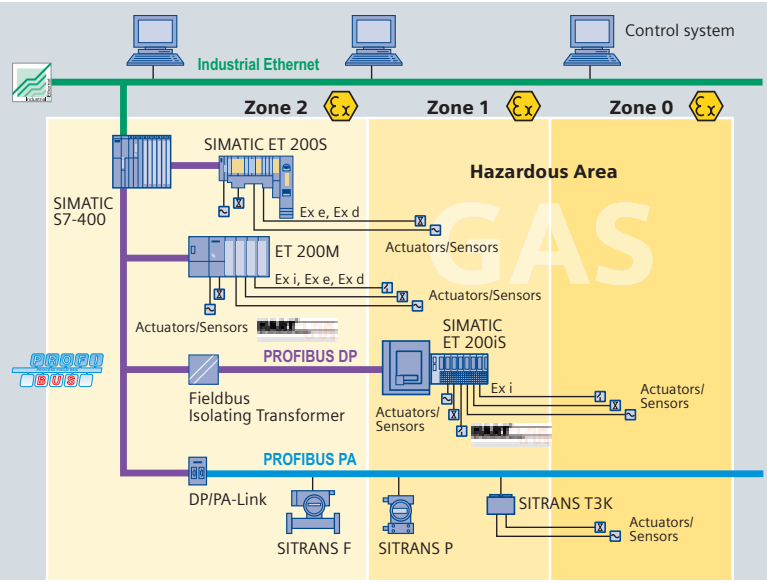
For ET 200iS the intrinsic safety of PROFIBUS DP is achieved by a fieldbus isolating transformer inserted before the area subject to explosion hazard. This limits the ignition energy to the permissible level and routes it to the hazardous area with intrinsic safety.



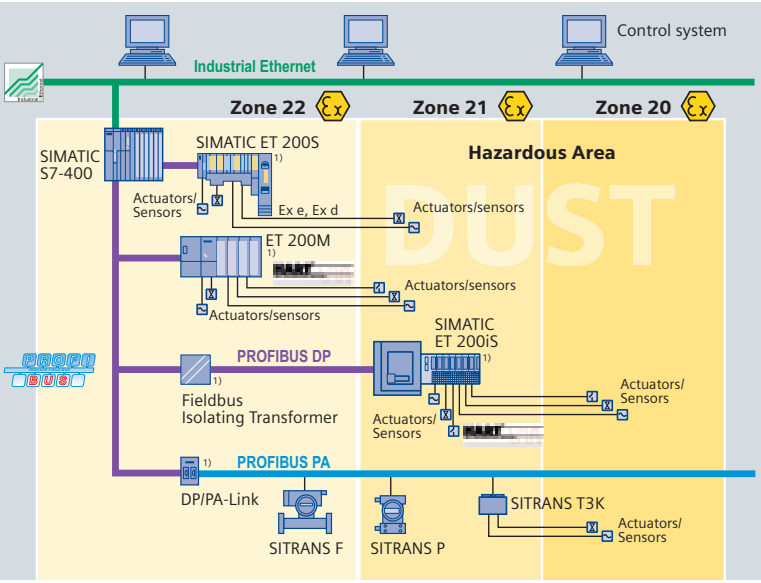
ET 200 systems for hazardous areas

1) Dusty atmosphäre:

Installation of the components always in an enclosure in degree of protection IP6x. An explanation from the manufacturer is necessary for installation in Zone 22. A certification for dusty areas must be procurred for installation in Zone 21.

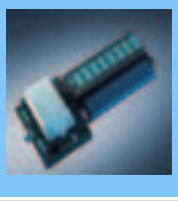


ET 200 in potentially explosive gas atmospheres



ET 200 in potentially explosive dust atmospheres

SIMATIC ET 200 in the control cabinet

I/O system	ET 200S	ET 200M	ET 200iS
			
Design			
Type of protection	IP20	IP20	IP30
Design	bit modular, expandable block	modular	modular
Installation	Standard rail	Mounting rail	Standard rail
Connections for sensors/actuators	Multi-conductor connection Spring-loaded/screw-type, Fast Connect	Single-conductor connection Spring-loaded/screw-type, Top Connect	Multi-conductor connection Spring-loaded/screw-type
Special applications			
Integrated safety technology			–
For use in hazardous areas	Zone 2, 22	Zone 2, 22	Zone 1,21
Increased availability	–	Switched, redundant	–
Temperature range	0...+60 °C	0 °C ... +60 °C	-20 °C...+60 °C
Vibration resistance (continuous)	max. 5 *g*	max. 5 *g*	max. 2 *g*
Communication			
PROFINET		available soon	–
PROFIBUS (copper/fiber-optic)	12 Mbit/s / 12 Mbit/s	12 Mbit/s / 12 Mbit/s	1,5 Mbit/s / –
System function			
Permanent wiring			
Hot swapping		(with active backplane bus)	
Isochrone mode			–
Configuration during normal operation	–		–
Diagnostics (depending on module type)	channel-discrete	channel-discrete	channel-discrete
Functions			
Digital channels			
Analog channels incl. HART	–		
Motor starters / Frequency converters	/	– / –	– / –
Pneumatic interface	from Burkert company	–	–
Technological functions	counting/measuring (C/M), positioning, weighing	C/M, positioning, cam ctrl., closed-loop ctrl, weighing	–
Integrated CPU functionality	(with IM 151-7)	(with S7-300-CPUs)	–
Sensors (IQ-Sense)			–

SIMATIC ET 200 without the control cabinet

ET 200pro 	ET 200eco 	I/O system
		Design
IP65/66/67	IP65/67	Type of protection
modular	Block	Design
Mounting rail	Direct mounting	Installation
M12, 7/8“	M12, 7/8“	Connections for sensors/actuators
		Special applications
		Integrated safety technology
–	–	For use in hazardous areas
–	–	Increased availability
0...+55 °C (-25° upon request)	0 ...+55 °C	Temperature range
max. 5 *g*	max. 5 *g*	Vibration resistance (continuous)
		Communication
	–	PROFINET
12 Mbit/s / –	12 Mbit/s / –	PROFIBUS (copper/fiber-optic)
		System function
	–	Permanent wiring
	–	Hot swapping
–	–	Isochrone mode
–	–	Configuration during normal operation
channel-discrete	module-discrete	Diagnostics (depending on module type)
		Functions
		Digital channels
– –	– –	Analog channels incl. HART
available soon	– / –	Motor starters / Frequency converters
available soon	–	Pneumatic interface
–	–	Technological functions
–	–	Integrated CPU functionality
–	–	Sensors (IQ-Sense)

SIMATIC ET 200S –
The multi-talent with the comprehensive module spectrum

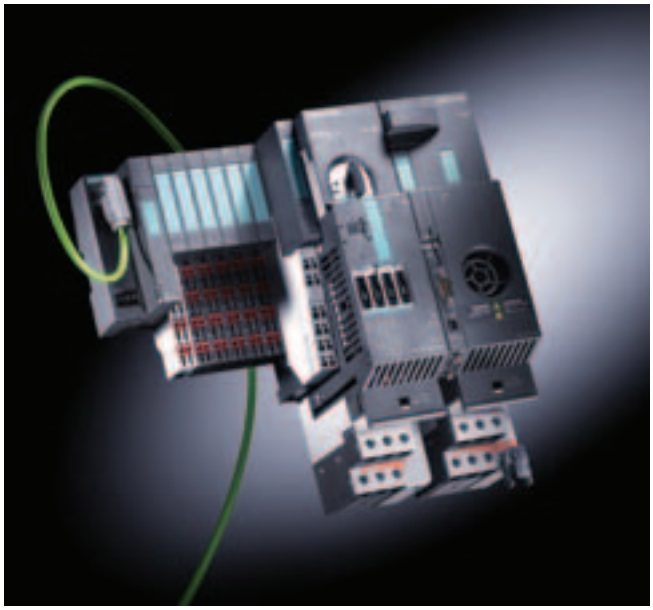
SIMATIC ET 200S is the multifunctional, highly modular I/O system with IP20 degree of protection that can be exactly tailored to the automation task. Thanks to its rugged construction, it can also be used under conditions of high mechanical stress.

Various interface modules are available for interfacing to the PROFIBUS and/or PROFINET bus systems. Interface modules with an integral CPU transfer the computing power of an S7-300 CPU directly into the I/O device. They take the load off the central controller and facilitate a rapid response to time-critical signals.
Distributed automation solutions increasingly involve not just digital and analog signals, but also technological functions, motor starters, frequency converters or a pneumatic interface. The bit-modular ET 200S offers a comprehensive module range to implement the task:

- Technology modules are available, for example, for counting and positioning tasks, for cam control or for closed-loop control tasks.
- Using the motor starters, any three-phase loads up to 7.5 KW can be connected. Motor starters are available in several designs, including a fail-safe design.
- Frequency converters (also with integral safety technology) provide stepless speed control for asynchronous motors up to 4 kW.
- Pneumatic interfacing using modules from the Bürkert company.
- IQ-Sense sensor modules support the connection of intelligent sensors, such as Sonar BEROs.
- Failsafe I/O modules are used for inputs and outputs in safety-related plants with SIMATIC Safety Integrated.

Diagnostic functions and module replacement during normal operation increase availability of the plant:

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



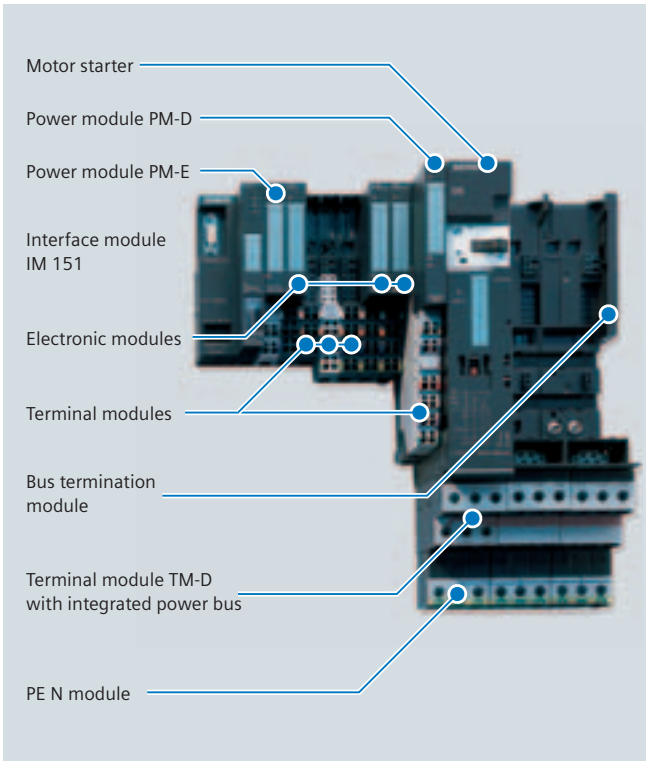
ET 200S with PROFINET connection, I/O modules, motor starter and frequency converter

Low-cost, bit-modular 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 reserve module slots for future use.
- Independent 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.
- Easy configuration of an ET 200S station with the Configurator (see accessories)



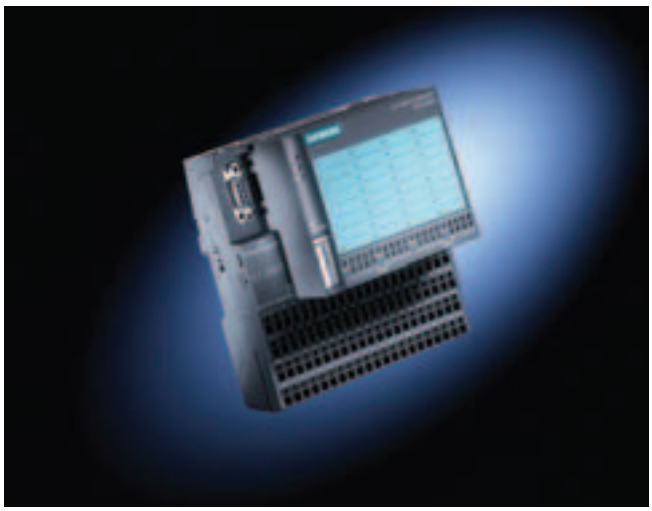
Bit-modular design of ET 200S

Fast Connect

The insulation-piercing 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.

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
- Easy, secure installation with a screwdriver
- Reduction in the number of installation errors
- The stripped length does not have to be determined



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

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. It combines frequently required inputs/outputs in block form with bit-modular specialists such as motor starters, frequency converters, pneumatics etc.

The functionality of the new block interface is based on the IM 151-1 BASIC and comprises an interface module and 32 channels in one block. A total of 80 channels can be connected to SIMATIC ET 200S COMPACT. Therefore 12 modules can be combined as desired – simple input/output modules and integrated technologies.

Interface modules for bus connection

ET 200 S is connected to the bus system via the interface module – either to the well-proven PROFIBUS or to PROFINET, the open Industrial Ethernet standard. Different interface modules are available for selection:

	IM 151-1 BASIC	IM 151-1 COMPACT	IM 151-1 Standard/ Standard FO	IM 151-1 HF	IM 151-3 PN	IM 151-7 CPU/CPU FO	IM 151-7 F-CPU
PROFIBUS	Copper	Copper	Copper/FOC[1]	Copper	–	Copper/LWL[1]	Copper
PROFINET	–	–	–	–		–	–
No. of modules	12	12	63	63	63	63	63
Station width	2m	2m	2m	2m	2m	1m	1m
Diagnostics	module-specific	module-specific	channel-specific	channel-specific	channel-specific	channel-specific	channel-specific
CPU functionality	–	–	–	–	–	CPU 314	CPU 314
Failsafety	–	–	–	–	–	–	
Isochrone mode	–	–	–		–	–	–
Identification data [2]	–	–		available soon	available soon	–	–
Firmware-Update	–	–	Bus	available soon	Bus/MicroMemoryCard	Micro Memory Card	Micro Memory Card
Order No. group 6ES7 151-	1CA.	1...	1AA. / 1AB.	1BA.	3AA	7AA. / 7AB.	7FA.

[1] Fiber optic cable: plastic, polymer-cladded fiber (PCF)

[2] Identification data are those saved in a module, e.g. Order No., release version, installation date, plant identification, which unequivocally identify the module and are available online, e.g. in order to simplify troubleshooting.

Distributed intelligence on PROFIBUS

The IM 151-7 CPU can be implemented for distributed automation solutions with a medium-sized program. It corresponds to a CPU 314 and supports distributed preprocessing of the production data locally – it is also available in a failsafe version.

It communicates with the higher-level programmable controller over the coexistent MPI/PROFIBUS DP slave interface.

This results in the following advantages:

- Relief of the central programmable controller
- Shorter response times for critical local signals
- More transparent and shorter programs
- Easier trouble-shooting
- Relief of the bus system
- Modularization of the system structure and precommissioning – also at different sites

Additional PROFIBUS line

The DP master module can be used with the IM 151-7 CPU 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.

Interface-Modul IM 151-3 PN für PROFINET

Interfacemodul IM 151-7: mit integrierter CPU (auch als F-Variante) und Mastermodul

I/O modules for simple applications

Module type	Information	Order No. group
DP master module	· PROFIBUS DP master interface for a lower-level PROFIBUS DP line	6ES7138-4HA00-0AB.
Power modules for electronics modules and motor starters	For the supply and monitoring of load voltage and encoder voltage; voltage and/or fuse failures; additional LEDs indicate the status of the voltage and the fuse; different function AC, DC, PROFIsafe	
	· PM-E 24 V DC or PM-E 24 to 48 V DC, with diagnostics · PM-E 24 V DC to 230 V AC with diagnostics and fuse · PM-E F 24 V DC PROFIsafe For failsafe shutdown (max. Cat. 3) with digital output · PM-D F 24 V DC PROFIsafe for F motor starter	6ES7138-4CA.. 6ES7138-4CB.. 6ES7132-4BD.. 3RK1903-0A..
Terminal modules	For the electrical and mechanical connection of I/O modules and process wiring. Available with screw-type and spring-loaded terminals as well as the Fast Connect insulation-piercing technique	
	TM-P for power; TM-E for electronics; TM-D for motor starters	6ES7193-4.../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 module s	· 2- and 4-channel · Available from 24 V DC to 230 V AC · Different functionalities: Standard, High Feature	6ES7131-4...
Digital output module s	· 2- and 4-channel · Available from 24 V DC to 230 V AC; 0.5 ... 5 A · Different functionalities: Standard, High Feature · Electronics and relay	6ES7132-4...
Failsafe digital modules	· Failsafe input module 4/8F-DI 24 V DC PROFIsafe · Failsafe output module 4F-DO 24 V DC/2 A PROFIsafe	6ES7138-4FA 6ES7138-4FB..
Analog input modules	· 2- and 4-channel · Current and voltage input, thermocouple and resistance measurement · Different functionalities: Standard, High Feature, High Speed	6ES7134-4...
Analog output modules	· 2-channel · Current and voltage output · Functionality: Standard, High Feature	6ES7135-4...
Reserve modules	· Used as dummy modules for unused slots within an ET 200S station	6ES7138-4...
IQ-Sense Sensor module	The four-channel IQ-Sense sensor module offers, in conjunction with the new IQ-Sense sensors, a new concept for the intelligent integration of sensors in automation systems. ET 200 S makes all functions available to any PROFIBUS DP master modules. Standard function blocks are available for simplified handling on a SIMATIC S7. Up to four sensors are connected using just two cables and they are parameterized using IntelliTeach functions.	
	· 4-channel · For connection of up to 4 IQ-Sense sensors · Extended diagnostics and IntelliTeach functionality	6ES7138-4...

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 modules contain the self-assembling power bus (only one infeed for up to 20 motor starters and up to 50A max.) 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 SIGUARD safety system

High Feature motor starters

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

Failsafe motor starter

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

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

The Failsafe 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.

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 electronic motor starters in comparison to 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 of the shutdown modules in software
- When the safety application changes, there is less overhead because the wiring is retained

Frequency converter for stepless speed control

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

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

Advantages of the frequency converters

- No tools needed for installation
- Self-assembling communication and power busses
- Independent wiring
- Removal of the closed-loop control module and power section under normal operation
- Complete parameter settings on optional Micro Memory Card for servicing requirements

Regenerative feedback function included

Line-commutated feedback of power into the supply system without he need for a chopper module or braking resistance is unique in this class. The power loss of the overall system is reduced – which reduces the thermal load on the station and supports the use of smaller control cabinets. And what is more, the power fed back into the system when braking is available to other loads free-of-charge.

The integrated input filter of the frequency converter makes external line reactors superfluous. This saves additional installation space as well as procurement and installation costs.

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

Wide range of applications

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

Frequency converter – Size A (0.75 kW)

Failsafe frequency converter – Size B (2.2 to 4.0 kW)

Failsafe frequency converters

The integrated safety functions of the failsafe variants of the frequency converter support simple drive solutions in plant sections which pose a potential danger.

In combination with the PM-D F PROFIsafe power module, the frequency converter in the failsafe version offers comprehensive integrated safety functions:

- Safe standstill – The drive is prevented from starting up
- Safe braking ramp – Shut down of the drive is monitored
- Safely reduced speed – The reduced motor speed is monitored for correct speed

I/O modules for special applications

Module type	Information	Order No. group
Process-related modules	Powerful function modules are available for solving technological tasks. They handle the tasks largely autonomously, and greatly reduce the load on the CPU. They are used directly on site; parameter assignment with STEP 7 or GSD file; serial interface	
	· High-speed counting and measuring tasks with 5 V or 24 V encoders Counter module: 24 V DC / 100 kHz or 5 V DC / 500 kHz 1 COUNT · Simple positioning tasks through position sensing with SSI encoders SSI module 1 SSI · Controlled positioning of simple drives by means of a digital/analog signal Positioning modules for controlled positioning 1 POS U · Positioning with stepper motors over a pulse/direction interface Stepper motor module 1 STEP · Proportioning, adjusting and closed-loop control of final control elements and valves Pulse module (timer, pulse-width modulation, stepper motor) 2 PULSE · Serial interface through point-to-point connection Serial interface modules 1 SI	6ES7138-4DA. 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 technology and consistent communication thanks to integration into 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 possibilities · Easy to parameterize using the SIWATOOL CS program · Theoretical adjustment without adjustment weights · Replacement of module without renewed adjustment of scale · Use possible in Ex applications	7MH4910-....
	SIWAREX CF is a measuring module for connection of sensors operating according to the strain gauge principle. The module can be used for various tasks, e.g. for measuring forces and torques. · Uniform design and communication through integration in SIMATIC S7 · Use in distributed plant concept through connection to PROFIBUS DP via ET 200S · Measurement with a resolution of ± 16,000 units, accuracy 0.15% · Measurement rate 50 Hz · Ready-to-use, free application software "Getting started"	7MH4920-....
Motor starters (also w/integrated safety system)	· Direct, reversing and soft starters · Functionality: Standard, High Feature, Failsafe · Up to 7.5 kW	3RK1301-.... 3RK1301-.... 3RK1903-....
Frequency converter (also with integrated safety system)	· Closed-loop control group and power section · Output up to 4.0 kW · Standard · Failsafe: Cat. 3 acc. to EN 954-1, SIL2 acc. to IEC 61508	6SL3244-0S..
ET 200S SIGUARD	conventional safety relays for simple, local safety applications. Power modules for emergency stop or protective door applications are available in addition to modules for time delay and contact multiplication. · Safety sensors are directly connected to these modules. · The monitoring functions, such as short-circuit monitoring, are performed in the same manner as monitoring of the switching function of the motor starters in the ET 200S SIGUARD modules. ET 200S SIGUARD modules automatically signal operating states and fault conditions via PROFIBUS diagnostics to the higher-level PLC. · Safety segments can be easily cascaded within an ET 200S station by combining the SIGUARD modules or their terminal modules. · For Category 3 or 4, external redundancy contactors can be connected in to the power infeed of the power bus which can also be controlled and monitored by the SIGUARD modules.	

Accessories

ET 200S is also well-equipped for practical application thanks to the wide range of accessories that are available:

Integrated shield connection system for low-impedance connections of individual lengths.Space-saving, low-cost standard components with a simple plug-in technique are used for this purpose.

Individual color-coded labels for terminals on the terminal modules; they are available in different colors and are available individually packed.

Labelling 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

For further details, visit: www.s7-smartlabel.com

A tool for quick and easy configuration of an ET 200S station can be found in Catalog CA01 or under...

www.siemens.com/et200s

Accessories for ET 200 can be found starting at Order No. 6ES7193-4..

SIMATIC ET 200M – the multi-channel S7-300 I/O

The ET 200M distributed I/O station is a modularly configured DP slave with the IP20 degree of protection. Up to 8 multi-channel signal modules (e.g. 32 digital inputs) and function modules as well as communication processors of the S7-300 can be used as I/O modules.

There are no slot rules. If active bus modules are used, modules can be replaced and expanded during operation (Hot swapping).

Connection to PROFIBUS DP is achieved using interface modules – optionally also using fiber optic cables.

In addition to screw-type and spring-loaded terminals, signals can also be connected quickly and easily with SIMATIC TOP connect. Pre-assembled front connectors with single cores and a complete plug-in building block system are available.

When the ET 200M is operated with an S7-400H/FH, the availability of the plant can be increased:

Switched connection:
An ET 200M with two interface modules

Redundant connection:
Two ET 200M systems each with one interface module

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

In this manner,

complete ET 200M I/O stations can be added,

modules can be supplemented and

digital and analog modules can be reparameterized.

Signal modules can be replaced during normal operation so that standstill times can be reduced (hot swapping).

Failsafe I/O modules are used for inputs and outputs in safety-related plants with SIMATIC Safety Integrated.

Interface modules for PROFIBUS

Various different IM 153 interface modules are available as standard DP slaves for connecting the different S7-300 modules in the ET 200M distributed I/O station to PROFIBUS DP.

	IM 153-1	IM 153-2 HF	IM 153-2 HF FO
Transmission medium	Copper		Fiber optic
Time synchronization on PROFIBUS, time stamping of alarms [1]	–		
Use of function modules (FM) and communication processors (CP)	Restricted		
Routing of parameterization data to intelligent field devices	–	(HART, IQ-Sense)	
Connection to high-availability (redundant) systems (software redundancy, S7-400H)	–		
Configuration changes in RUN [2] · In the redundant system · In the non-redundant system	 – –		
Support of failsafety	–		
Support of isochrone mode [3]	–		–
Identification data [4]	–		
Firmware update over the bus	–		
Order No. group	6ES7 153-1AA.	6ES7 153-2BA.	6ES7 153-2BB.

[1] 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.

[2] Changing the configuration in RUN means that changes to the hardware configuration, e.g. reparameterization or the addition of modules, can be performed during normal operation without any adverse effects.

[3] Isochrone 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 identification data are the data stored in a module such as the Order No., release date, installation date or plant ID-code that uniquely identify this module and which are available online, for example, to simplify fault rectification.

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.

Apart from the standard modules (digital and analog modules) the following modules are available for special application areas:

Dimensions: n x 40 x 125 x 120 mm

Modules for technology functions	Function	Order No. group
SM 331 HART	Analog input (8 x 0...20 mA or 4...20 mA)	6ES7 331-7TFO.
SM 332 HART	Analog output (8 x 0...20 mA or 4...20 mA)	6ES7 332-8TFO.
FM 350-1	Counting, measurement	6ES7 350-1AH..
FM 350-2	Counting, measuring, proportioning	6ES7 350-2AH..
FM 351	Open-loop 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 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, synchronism	6ES7 357-4AH..
SIWAREX U	Single-channel or dual-channel universal weighing module	7MH4601-1....
SIWAREX FTA	Fast weighing and dosing module with verification capability	7MH4900-2....
SIWAREX FTC	Module for continuous weighing tasks	7MH4900-3....

Modules for failsafe systems	Function	Order No. group
SM 326F DI 24	Digital input (24 x 24 V single-channel or 12 x 24 V 2-channel)	6ES7 326-1BK..
SM 326F DI 8 NAMUR	Digital input module (8 x NAMUR single-channel or 4 x NAMUR 2-channel)	6ES7 326-1RF..
SM 326F DO 10PP	Digital output (10 x 24V)	6ES7 326-2BF..
SM 326F DO 8PM	Digital output (8 x current sourcing/sinking)	6ES7 326-.....
SM 336F AI 6 13Bit	Analog input (6/4 inputs single-channel or 3/2 inputs 2-channel)	6ES7 336-1HE..
Isolation module	Galvanic isolation between F module and standard module for SIL3/Cat.4	6ES7 ...-.....

Modules for areas subject to explosion hazard	Function	Order No. group
SM 321	Digital input module (4 x NAMUR)	6ES7 321-7RD0.
SM 322	Digital output module (4 x 15 or 24 V)	6ES7 322-5.D0.
SM 331	Analog input module (4 x 0...20 mA or 4...20 mA)	6ES7 331-7RD0.
SM 331	Analog input (8 thermocouples or 4 temperature sensors)	6ES7 331-7SF0.
SM 332	Analog output module (4 x 0...20 mA or 4...20 mA)	6ES7 332-5RD0.
SM 331	HART analog input module (2 x 0...20 mA or 4...20 mA)	6ES7 331-7TB0.
SM 332	HART analog output module (2 x 0...20 mA or 4...20 mA)	6ES7 332-5TB0.

SIMATIC ET 200iS – the intrinsically safe variant for hazardous areas

ET 200iS can be used in areas subject to explosion hazards with a gas or dust atmosphere:

The ET 200iS 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 reduces the wiring outlay considerably. 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.

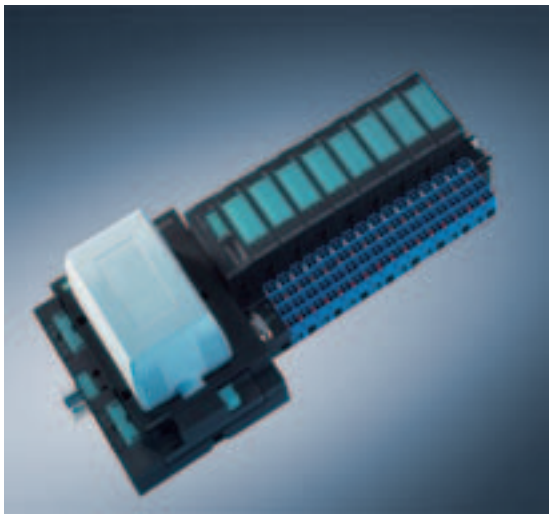
ET 200iS supports high availability of the system thanks to hot swapping

During normal operation

stations can be added

modules can be reparameterized

The independent wiring supports easy, reliable replacement of modules during normal operation. Hot swapping of the power supply is possible without a fire certificate.



HART support

ET 200iS 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 4 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)

Diagnostic 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, fill-level, pressure or flowrate measurement have HART connections.

Powerful diagnostics with SIMATIC PCS7

With SIMATIC ET 200iS, numerous items of diagnostic information are generated when internal and external faults occur, e.g. on wire-break 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 higher-level control system. Standard diagnostic drivers are available for SIMATIC PCS7 for the diagnostic messages. These drivers prepare all the relevant signals for the higher-level operator system of PCS7.

The detected faults are transferred quickly to the higher-level systems and support online diagnostics from a central point at any time.

Modular, intrinsically safe design

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

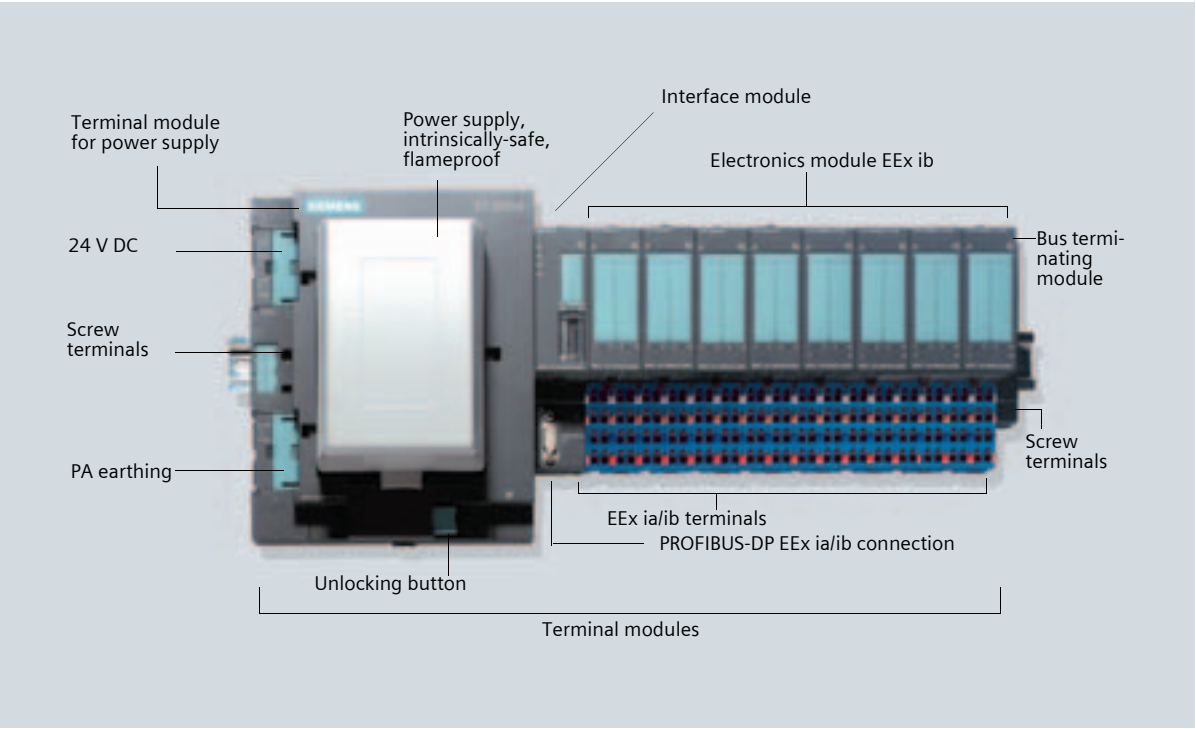
- The terminal modules are snapped onto a standard rail (35 x 15 mm)
- Prewiring without electronic modules with spring-loaded and screw-type terminals
- No need for tools, because the power supply, interface module and electronic modules are simply plugged in

Safe in the field with the isolating transformer

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

The fieldbus isolating transformer offers the following advantages:

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



The bit-modular and flexible design of the ET 200iS

Basic modules for the design

Power supply

Interface module IM 151

Power supply unit

The power supply unit provides all voltages and currents required for operation of the ET 200iS, and applies these to the backplane bus of the terminal modules. The 24-V connection to the power supply terminal is made using Ex e terminals.

The power supply unit provides operating voltages to the ET 200iS with safe electrical isolation for:

- Logic
- PROFIBUS-DP interface of the IM 151-2
- Power bus

It handles the safety-related limitation of the output voltages.

The power supply has a flameproof plastic enclosure (explosion protection Ex d).

The enclosure is provided with a carriage system with mechanical locking/unlocking which is used to move the power supply module into/out of its operating position. The module can be removed from its working position and replaced even under Ex conditions.

IM 151-2 interface module

The connection to the intrinsically-safe PROFIBUS-DP is made using the IM 151-2 interface module. Transmission rates up to 1.5 Mbit/s are permissible. Communication with the master is handled autonomously via the IM 151-2. Time stamping for the process signals, provision of the identification data of the modules, as well as setting of the PROFIBUS address are handled by the IM 151-2.

The last station in the PROFIBUS line must be provided with a terminating resistor on this connector.

The IM 151-2 interface module as well as the PROFIBUS connection may be inserted and removed under Ex conditions.

Module range	
Power supply unit PS 138	
Power supply	DC 24 V/5A
Dimensions	165 x 200 x 160.5mm
Order No. group	6ES7 138-5EA..-...
Interface-Modul IM 151-2	
Transmission rate	9.6 kBit/s...1.5 Mbit/s
Protocol	PROFIBUS DP
Interface	RS 485 iS
Dimensions	30 x 81 x 76 mm
Order No. group	6ES7 151-2AA..-....
Terminal modules	**Order No. group**
Terminal module TM-E30S-44iS for electronics modules (screw terminal)	6ES7193-5CB00-....
Terminal module M-E30C-44iS for electronics modules (spring-loaded terminal)	6ES7193-5CB10-...
Terminal module TM-PS-iS for power supply	6ES7193-5DA00--...
Terminal module TM-IM-iS for interface module	6ES7193-5DB00-....
Dimensions	30 x 132 x 43.5 mm

Digital and analog electronic modules

Input/output modules

4-channel and 8-channel digital and analog input/output modules (Dimensions: 30 x 81 x 76 mm) are available for the ET 200iS. The digital and analog process signals are matched to ET 200iS via these electronic modules.

The electronic 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 implemented in the EEx i "intrinsically safe" degree of protection and can be easily replaced under Ex conditions (hot swapping).

Electronic module

Digital modules		
Application	**NAMUR encoder etc.**	**Solenoid valve etc.**
Module	4 DI NAMUR	2 DO DC 25 V/25 mA
Number of channels	4	2
Special feature	acc. to NAMUR DIN 19234 can be parameterized for various types of wiring	for solenoid valves with low power consumption
Order No. group	6ES7 131-5RD..-...	6ES7 132-5SB..-...

Analog Modules					
Application	**2-wire measuring transducer**	**4-wire measuring transducer**	**Resistance thermometer**	**Thermocouple (voltage)**	**Thermocouple (current output)**
Module	2 AI I 2DMU	2 AI I 4DMU	2 AO RTD	2 AI TC	2 AO 0/4-20 mA
No. of channels	2	2	2	2	2
Special feature	2-wire measuring transducer 0...20 mA 4...20 mA	4-wire measuring transducer 0...20 mA 4...20 mA	Resistance thermometer Pt100/Ni100	Thermocouple types E, N, J, K, L, S, R, B, T, U	0...20 mA 4...20 mA
Order No. group	6ES7 134-5RB0.-...	6ES7 134-5RB5.-...	6ES7 134-5SB5.-...	6ES7 134-5SB0.-...	6ES7 135-5RB0.-...

HART modules			
Application	**2-wire measuring transducer**	**4-wire measuring transducer**	**Current output**
Module	2 AI I HART 2DMU	2 AI HART 4DMU	2 AO HART
No. of channels	2	2	2
Special feature	2-wire measuring transducer 0...20 mA 4...20 mA	4-wire measuring transducer 0...20 mA 4...20 mA	4...20 mA
Order No. group	6ES7 134-5TB0.-...	6ES7 135-5TB5.-...	6ES7 135-5RB0.-...

Standards, approvals and accessories

Standards, approvals	
· PROFIBUS	EN 50170, Volume 2
· EC directive	94/9/EC (ATEX 100a)
· CENELEC	II2G EEx de [ia/ib] IIC/IIB T4
· FM	FM: Class I Division 2 Group A-D T4 or FM: Class I Zone 1, T_{amb} = -20 °C to +60 °C
· IEC	IEC 1131, Part 2
· CE	To 89/336/EEC To 73/23/EEC

Accessories	
Shield connection element for connection of cable shields	6ES7193-4GA00-...
Pre-perforated DIN A4 labelling sheets for electronics modules in various colors, for machine printing	6ES7193-4B...-....
Colored labels for individual coding of process terminals	6ES7193-4LA00-....
Slot numbering labels for identification of terminal modules	8WA8861-...

SIMATIC ET 200pro – small and multifunctional

SIMATIC ET 200pro is an extremely small, rugged and high-performance I/O system with IP65/67 degree of protection. It does not require a control cabinet and can be directly mounted 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 open Industrial Ethernet standard for company-wide automation.

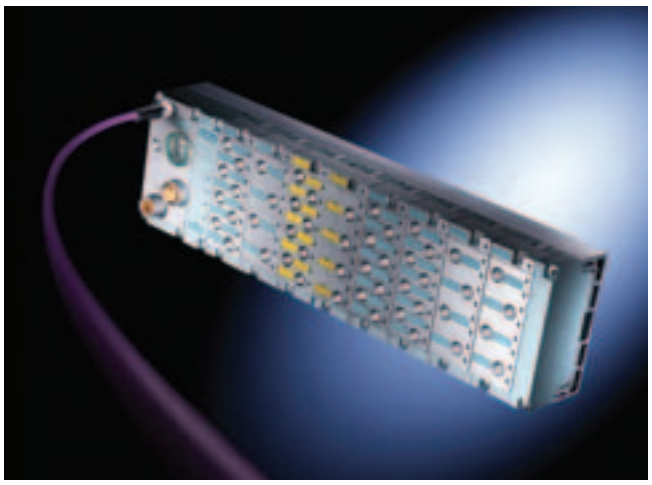
ET 200pro offers comprehensive diagnostics to reduce the downtimes of your plant:

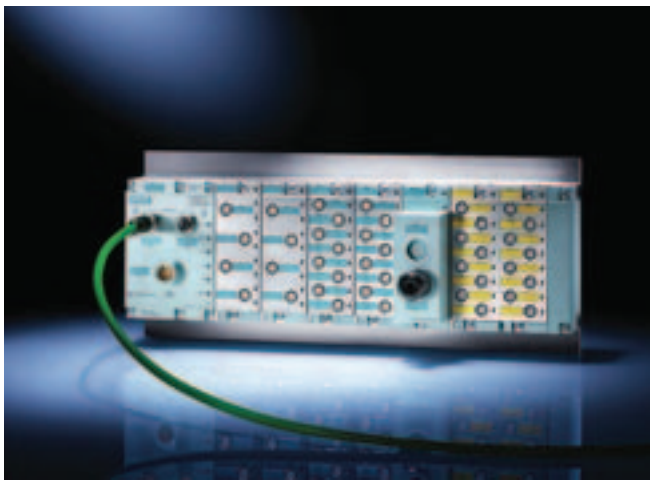
- The standard modules also offer module diagnostics for short-circuiting of the encoder supply or the outputs.
- The High Feature modules offer more precise diagnostic functions through channel diagnostics for short-circuit and wire-break. Additional process interrupts can be used for digital inputs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

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

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

Failsafe communication between the ET 200pro and the associated failsafe CPU is therefore using the PROFIsafe profile – via PROFIBUS or PROFINET.





Modular, space-saving design

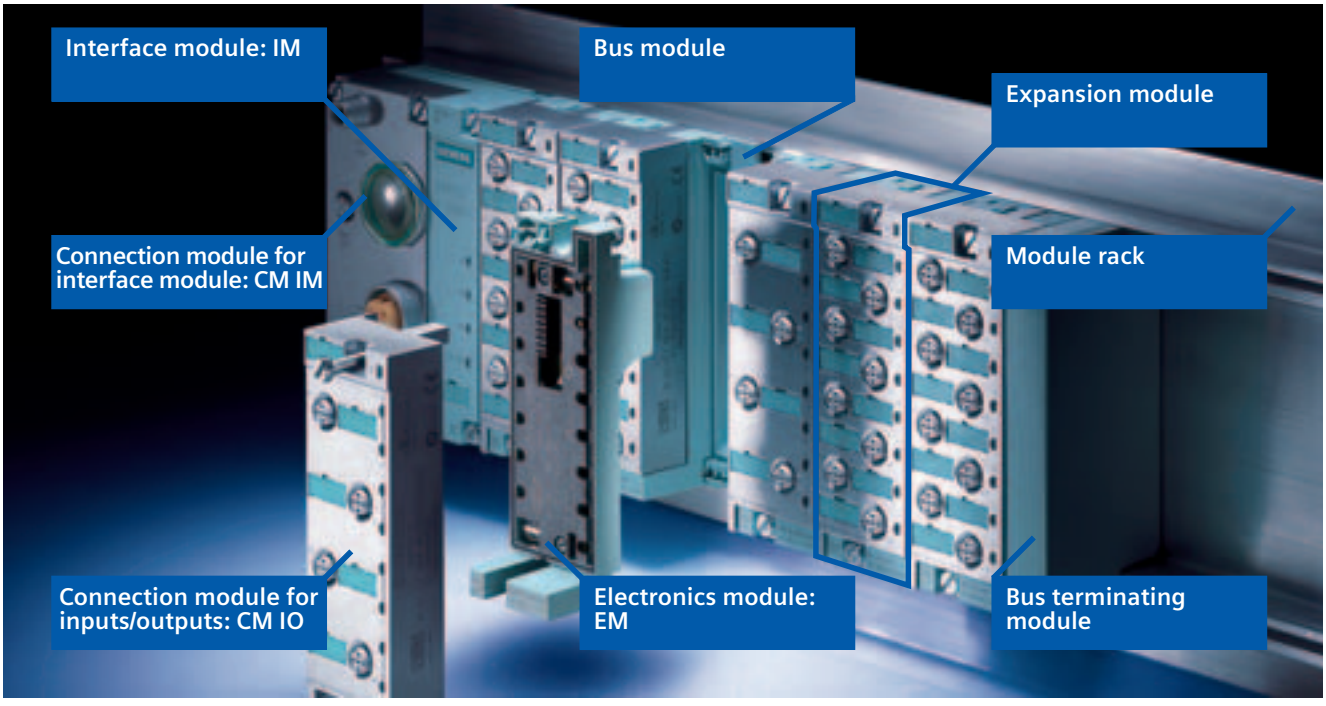
The ET 200pro is compact and up to 16 modules can be combined as required over a length of up to 1 meter. An ET 200pro station can be preassembled on the work bench with narrow module carriers and then fitted to the machine as a complete unit. Alternatively, the compact module carrier can also be fixed in place first and the station can be assembled later.

The modules are simply latched into the module carrier and pushed onto each other. The expansion modules are divided in three sections, a bus module, an electronic module and a 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 complete with independent wiring is plugged on and screwed down with 2 screws. Preassembled connecting cables can be attached quickly and easily.

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

Failsafe I/O modules are used for inputs and outputs in safety-related plants with SIMATIC Safety Integrated



Interface modules for PROFIBUS and PROFINET

For connecting the bus and power supply, there is a choice of **three connection types** for PROFIBUS that you can combine with the interface module of your choice.

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.

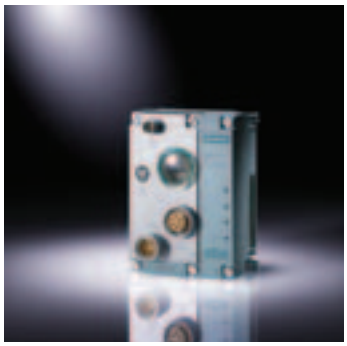
ECOFAST (Energy and Communication Field Installation System) – The standardized Siemens connection technique for cabinet-free distribution is based on hybrid cables for bus signals and power supply. One preassembled cable for data and power reduces the cabling outlay.

M12, 7/8": The familiar connection method with widely implemented connector standard.

The **interface module for PROFINET** contains a 2-port switch for easy configuration of a line structure. There is an M12 connection for PROFINET and a 7/8" connection for the power supply.
More parameters are possible per station using PROFINET, and therefore more high-function modules can be used. When servicing, the IM can be replaced without using a programming device – the device name and parameters are saved on the replaceable SIMATIC Micro Memory Card.

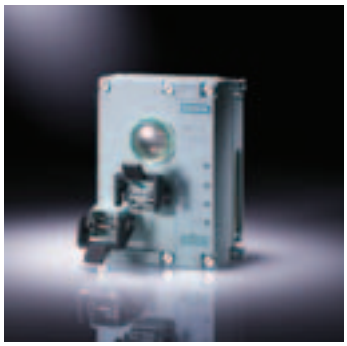
Power modules allow different load groups to be built up as required by supplementary supply from the load power supply. In this case, the same connection techniques are available as for the power supply of the complete station. More than one load segment can be integrated into a single station.

In the interface and in each power module, built-in fuses ensure that nether total failure of all load groups nor damage outside the station can occur. Failsafe I/O modules are used for inputs and outputs in safety-related plants with Safety Integrated.

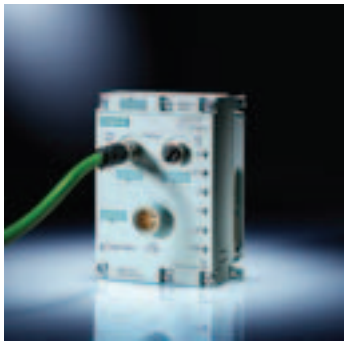


PROFIBUS-Interface-Modul, M12, 7/8"-connection

PROFIBUS interface module with direct connection



PROFIBUS interface module, ECOFAST connection



PROFINET interface module

Module range

Interface module (IM) (incl. terminating module)		
	PROFIBUS	PROFINET
Type selection	IM 154-1 DP IM 154-2 DP HF	IM 154-4 PN HF
Order No. group	6ES7 154-1.... 6ES7 154-2....	6ES7 154-4....
Protocol	PROFIBUS DP	PROFINET IO
Transmission rate, max.	12 Mbit/s	100 Mbit/s
Firmware update	via PROFIBUS	via SIMATIC Micro Memory Card
Connection module (CM) (Order No. group)	CM IM DP direct (6ES7 194-4AC.) CM IM DP ECO-FAST Cu (6ES7 194-4AA.) CM IM DP M12, 7/8" (6ES7 194-4AD.)	M12, 7/8" (integrated in IM)
Dimensions in mm		
Interface module		
· With connection module M12, 7/8"	90 x 130 x 173	
· Direct connection module	90 x 130 x 120	
· ECOFAST connection module	90 x 130 x 80	
Expansion modules incl. connection module · digital/analog · failsafe	 45 x 130 x 60 90 x 130 x 60	
Power module incl. · 7/8" connection · direct connection · ECOFAST connection	 45 x 130 x 73 45 x 130 x 80 45 x 130 x 80	
Bus terminating module	19 x 130 x 60	
Accessories		
Rack	6ES7 194-4G..	
Configurator	www.siemens.com/et200pro	
Cables	available soon	
Plug connector	available soon	

Electronic modules (EM): Digital modules (incl. bus module)		Order No. group 6ES7
Type selection	EM 8DI DC 24 V EM 8DI DC 24 V HF EM 4DO 2,0 A EM 4DO 2,0 A HF	141-4BF. 141-4BF. 142-4BD. 142-4BD.
Electronic modules (EM): Analog modules (incl. bus module)		
Type selection	EM 4AI-U HF EM 4AI-I HF EM 4AO-U HF EM 4AO-I HF	144-4FF. 144-4GF. 145-4FF. 145-4GF.
Connection module (CM) for digital/analog EM		
Type selection	CM IO 4xM12 CM IO 8xM12	194-4CA. 194-4CB.
Failsafe electronic modules (EM)		
Type selection	EM 8/16 F-DI EM 4/8 F-DI/F-DO	148-4FA. 148-4FC.
Connection modules	CM IO F 16xM12 CM IO F 12xM12	194-4DD. 194-4DC.
Power modules (incl. bus module)		
Type selection	PM E DC 24 V	148-4CA.
Connection modules	CM PM direkt CM PM ECOFAST Cu CM PM 7/8"	194-4BC. 194-4BA. 194-4BD.
Integrated technologies		
Motor starters Identification module Fail-safe modules Frequency converter Pneumatic interface	(being developed)	

SIMATIC ET 200eco – digital block I/O in IP65/67

ET 200eco has a compact, rugged casing and is very easy to use. It can be connected to PROFIBUS DP with transmission rates of 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.

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 the PLC.

Design

ET 200eco comprises a basic module 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 RS 485 hybrid fieldbus connection with identification plug for setting the PROFIBUS address

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 safety-related applications to be built up using the PROFIsafe profile over PROFIBUS DP. The pin assignment for the actuators and sensors is modelled on the IP65/67 standardization trends.

Module range

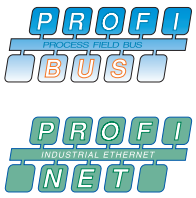
	Basic modules						**F module**	**Connection blocks**	
	8 DI	16 DI	8 DO (2 A)	16 D0 (0,5 A)	8 DI/8 DO (2 A)	8 DI/8 DO (1,3 A)	4/8 F-DI	ECOFAST RS 485	M12, 7/8"
No. of I/O channels	8/0	16/0	0/8	0/16	8/8	8/8	4/0[1)] 8/0[2)]	--	--
Connections	8 x M12 cable glands (for 16 channels with dual assignment)							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 specifications

Transmission rates	9,6 kbit/s ... 12 Mbit/s
Power supply	24 V DC
Current input from load circuit 1, up to 55 °C	Up to 1 A (according to variant)
Current loading capability of the outputs per channel	0.5/1.3/2 A (according to variant)
Current input from load circuit 2, up to 55 °C,max.	8 A
Diagnostics function · Group fault display · Short-circuit (encoder supply) · Load voltage	 yes Module-by-module Module-by-module
Dimensions (W x H x D) in mm · Basic submodule · Basic submodule with ECOFAST · Basic submodule with M12, 7/8	 210 x 60 x 28 210 x 60 x 54 210 x 60 x 53

Standards and approvals



Further information on the topic:

Product brief	
S7-300: modular controller for innovative system solutions in the production industry	6ZB5310-0HW01-0BB.
S7-400: the power controller for system solutions in the production and process industries	6ZB5310-0JD01-0BB.
SIMATIC fail-safe controllers	6ZB5310-0KE01-0BB.
STEP 7 Professional	6ZB5310-0JB01-0BA.
Diagnostics	6ZB5310-0JS01-0BB.
System diagnostics with PROFIBUS and SIMATIC	6ZB5310-0JR01-0BB.
Industrial Communication for Automation and Drives	6ZB5530-1AE01-0BA.
Explosion protection – fundamentals	6ZB5310-0LE01-0BA.

Distributed I/O in the internet:

www.siemens.com/simatic-dp

Standards and Approvals	
· PROFIBUS	EN 50 170, Volume 2
· PROFINET	IEC 61158
· IEC 1131	IEC 1131, Teil 2
· UL	According to standard UL508, File No. E 116536/E 75310 (AC-Module)
· CSA	According to standard C22.2 No. 142. File No. LR 48323/LR 44226 (AC-Module)
· cULus for hazardous locations	To standard UL 508 File no. E 116536 To hazardous locations UL 1604 File No. E 222109 To Standard CSA C22.2 No. 142
· FM	Standard Class No. 3611, Class I Div. 2, Group A, B, C, D Class I, Zone 2, Group IIC (w/o motor starter)
· Marine	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

You can find more detailed information in the
SIMATIC Guide documentation:
www.siemens.com/simatic-docu

You can order **further documents**
on the topic SIMATIC at:
www.siemens.com/simatic/printmaterial

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