

Industrial communication

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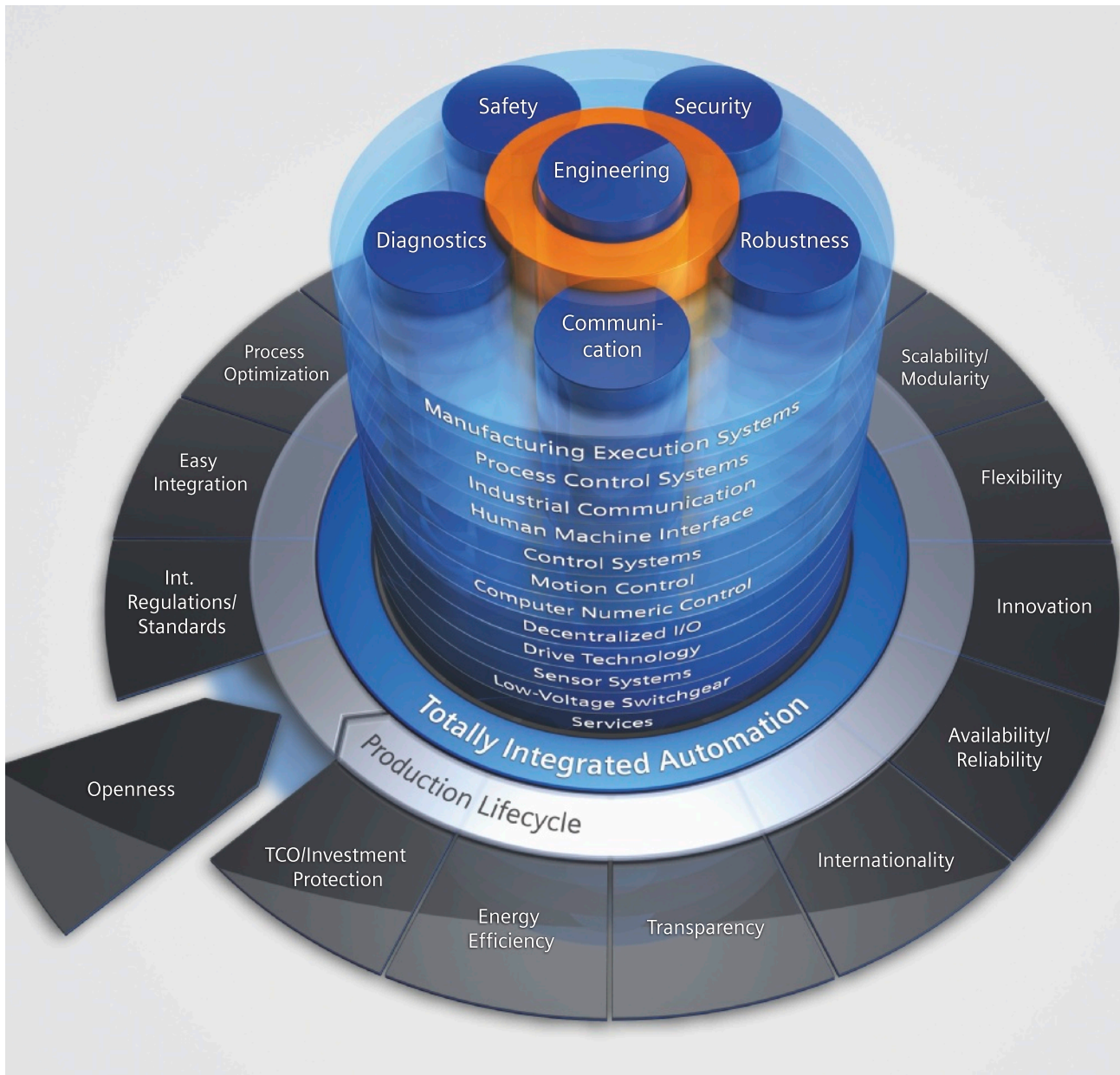
SIMATIC NET

Answers for industry.

SIEMENS

Totally Integrated Automation

Set new productivity standards
for sustained competitive advantages



As a response to increasing international competitive pressures, it is more important today than ever to consistently tap all 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 today more than ever the decisive success factor for industry.

Contents

Totally Integrated Automation is optimized for all requirements and is open for international standards and third-party systems. With its six characteristic system properties, Totally Integrated Automation supports the complete lifecycle of a machine or plant. The complete system architecture offers fully integrated solutions for every automation segment on the basis of a comprehensive range of products.

SIMATIC: more efficient and systematic automation

SIMATIC, a core of Totally Integrated Automation, comprises a wide range of standardized, flexible, and scalable products.

One of the core system characteristics of Totally Integrated Automation is communication, which is the central theme of this publication.

The basis for this are the various bus systems with network components and interfaces to the connected stations. Choose the communication systems and components appropriate to your solution from this comprehensive range.

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 characteristics of Totally Integrated Automation:

- Engineering
- Communication
- Diagnostics
- Safety
- Security
- Ruggedness

In addition, SIMATIC features two additional system characteristics:

- Technology
- High availability

You can find more about the system characteristics and the resulting advantages in the following chapter "System characteristics".

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System features

Engineering		<p>Maximum engineering efficiency – in all phases of the lifecycle of the machine and plant</p> <p>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.</p> <p>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.</p>
Communications		<p>Maximum data transparency on all automation levels – based on proven standards</p> <p>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 the 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.</p>
Diagnostics		<p>Minimization of downtimes – through efficient diagnostic concepts</p> <p>All SIMATIC products feature integrated diagnostic functions with which a fault can be identified and eliminated to provide increased system availability.</p> <p>Even with larger plants, the Maintenance Station provides you with a uniform view of the maintenance-relevant information of all automation components.</p>
Safety		<p>Protection of personnel and machines – within the framework of an integrated complete system</p> <p>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. Safety Integrated enables safety functions to be easily integrated into machines and plants.</p>

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

Introduction

Your requirements

Do you want to bring new products quickly onto the market? And at the same time be flexible and in a position to change your product range at short notice and shorten your time-to-market? Do you want to be able to manufacture efficiently at low costs? And at the same time optimize the capacity of your plant/machine and minimize possible downtimes?

Then all the machines in your plant should work together perfectly. Therefore, rely upon open, integrated automation communication not just within the whole company but also for external communication.

Avoid isolated automation and information technology solutions by assuring:

- A seamless flow of information from the actuator/sensor level through to the corporate management level
- Availability of information at any location
- High-speed data exchange between the different plant sections
- Easy, plant-wide configuration and efficient diagnostics
- Integrated security functions that block unauthorized access
- Fail-safe and standard communication via the same connection



Our range

Communication networks are of utmost importance for automation solutions. SIMATIC NET – Networking for Industry – stands for a diverse range of modular blocks – Designed for Industry – which contribute to efficiently solving your communications tasks:

- In the different automation areas
- Across the entire workflow
- For the complete plant life cycle
- For all industries

SIMATIC NET offers solutions which both maximize the benefits of Ethernet and simply integrate fieldbus systems. Noticeable examples are:

- The development of the field level for the use of Industrial Ethernet
- Complete integration from the field level to the corporate management level
- The implementation of new solutions by means of wireless communication
- The integration of IT technologies

Worldwide trends

Decentralization has been gaining worldwide importance for a number of years now. The distributed plant structure can reduce installation, maintenance and diagnostics costs. This involves intelligent devices working locally and being connected together across networks. Openness and flexibility are important in order to expand existing setups and to connect up different systems. For this reason, international committees define and standardize the standards for bus systems.

All configurations shown in this brochure should be regarded as examples only.

PROFINET/Industrial Ethernet	
■ Industrial Ethernet (IEEE 802.3)	The industrial standard based on the international Ethernet standard
■ PROFINET (IEC 61158/61784)	The leading Industrial Ethernet standard for automation
■ Industrial Wireless LAN (IEEE 802.11)	The industrial standard for wireless communication based on the international standard
PROFIBUS	
■ PROFIBUS (IEC 61158/61784)	The international standard for the field level is the global market leader among fieldbus systems.
AS-Interface	
■ AS-Interface (IEC 62026-2/EN 50295)	The international standard, which, as an economical alternative to the cable harness, links sensors and actuators by means of a two-wire line.
IO-Link	
■ IO-Link	The standard for intelligently connecting sensors and actuators from the field level to the MES level



Industrial communication with Totally Integrated Automation

With Totally Integrated Automation, Siemens is the only manufacturer to offer an integrated range of products and systems for automation in all industries – from incoming goods and the production process to outgoing goods, from the field level through the production control level to connection with the corporate management level.

The advantages of Totally Integrated Automation already pay off as regards design and engineering, but also assembly and commissioning and operation and maintenance.

Automation solutions can be implemented at little cost. New scope for development allows a quicker and more flexible response to new market requirements.

Systems can be easily expanded or converted without having to interrupt ongoing operations.

Thanks to the increased use of Industrial Ethernet in automation all the way down to the field level, the following topics within Totally Integrated Automation are becoming more and more important:

- PROFINET, including fail-safe communication PROFIsafe
- Industrial Wireless Communication with GSM/GPRS/UMTS, IWLAN and WirelessHART
- Industrial security concepts, e.g. with SCALANCE S

An overall solution consists of the following:

- Communication system with
 - Passive network components, e.g. cables
 - Active network components, e.g. switch
- Interfaces for connecting programmable controllers to the communication systems
 - Integrated interfaces
 - Own communications processors
- Components for the wireless networks, e.g. SCALANCE W
- Network transitions, e.g. IE/PB Link PN IO
- Software for configuring the networks
- Tools for servicing and diagnostics, e.g. SINEMA

PROFINET ... for increasing the productivity of your plant

You need a seamless information flow for your strategic decisions within your company – from the first manufacturing step through operation up to the corporate management level. To achieve this, when selecting an industrial communication standard, choose flexibility, efficiency, and performance.

PROFINET, the open and innovative Industrial Ethernet standard fulfills all the demands of industrial automation and ensures integrated, company-wide communication.

PROFINET also supports the direct connection of distributed field devices and drives to Industrial Ethernet and the solution of isochronous motion control applications. PROFINET also allows the vertical integration and solution of safety-oriented applications.

Industrial security

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 different 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 offers, with the SCALANCE S security modules as well as the security communication processors (CPs) with integrated security features (Security Integrated: firewall, VPN), components for setting up protected cells.

Siemens offers all the components necessary for an integrated overall solution and supports the following communication systems:

Industrial Ethernet (IEEE 802.3) –

the international standard for area networking is currently the number one network in the LAN environment with a share of over 90%.

Powerful communications networks with long ranges can be established via Industrial Ethernet.

On the basis of global wireless standards, e.g.

IEEE 802.11 a/b/g/n, GSM, GPRS or UMTS (3G) reliable wireless networks can be constructed in the industrial environment.

PROFINET (IEC 61158/61784) –

the international standard uses Industrial Ethernet and real-time communication right down to the field level.

With the full utilization of existing IT standards, PROFINET allows high-performance motion control applications, efficient cross-manufacturer engineering and high availability of machines and systems on the Industrial Ethernet. Due to its flexibility, PROFINET offers new opportunities when designing plants, such as the use of any topologies and fail-safe applications – even via wireless connections.

PROFIBUS (IEC 61158/61784) –

the international standard for the field level is the global market leader among fieldbus systems. It is the only fieldbus that allows communication in both manufacturing and process applications.

AS-Interface (IEC 62026/EN 50295) –

the international standard which, as an alternative to the cable harness, links especially cost-effective sensors and actuators by means of a two-wire line.

IO-Link –

the standard for intelligently connecting sensors, RFID systems and actuators from the field level to the MES level.

Network transitions –

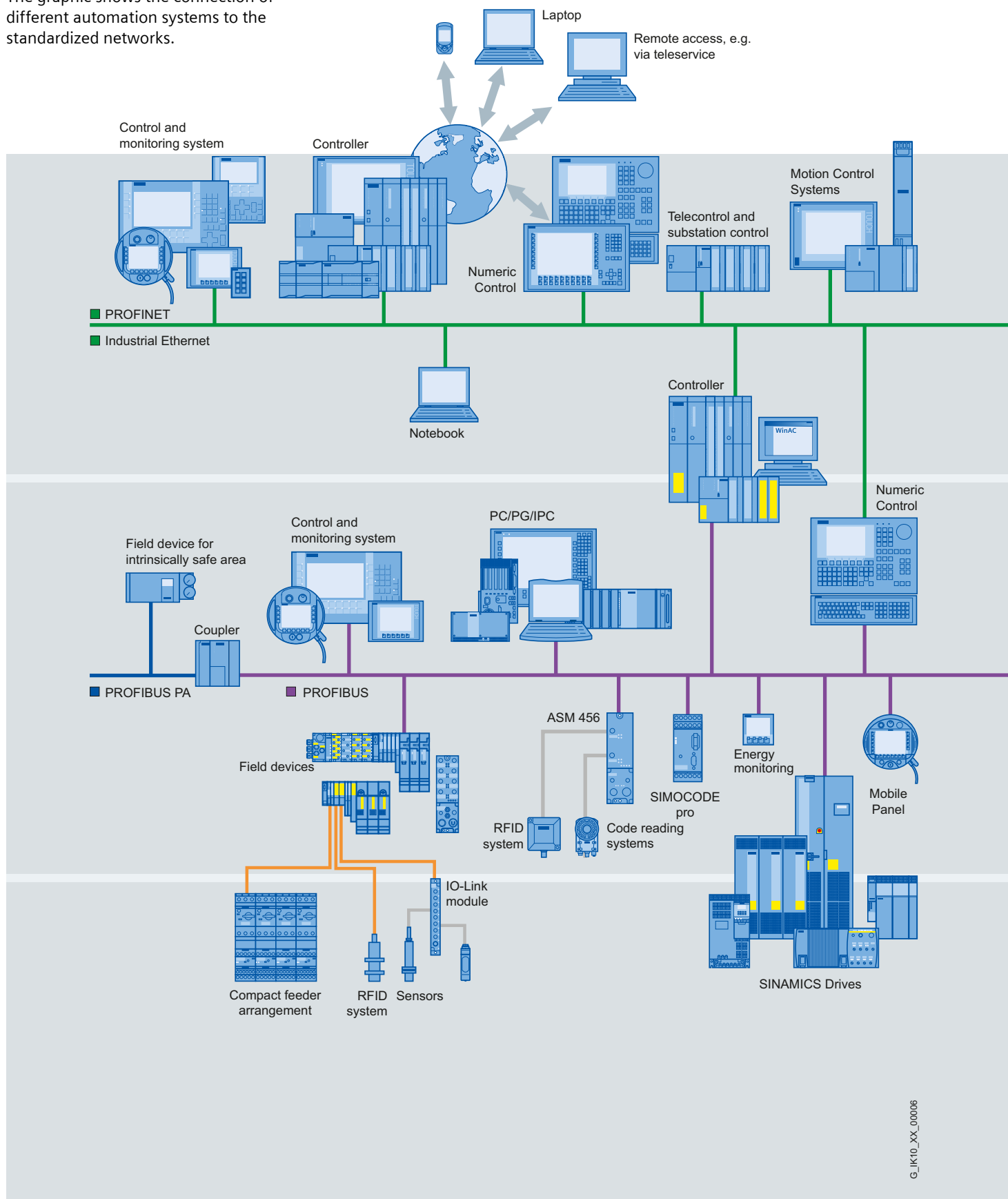
are implemented via controllers or links. Configuration and diagnostics can be carried out from any point in the plant.

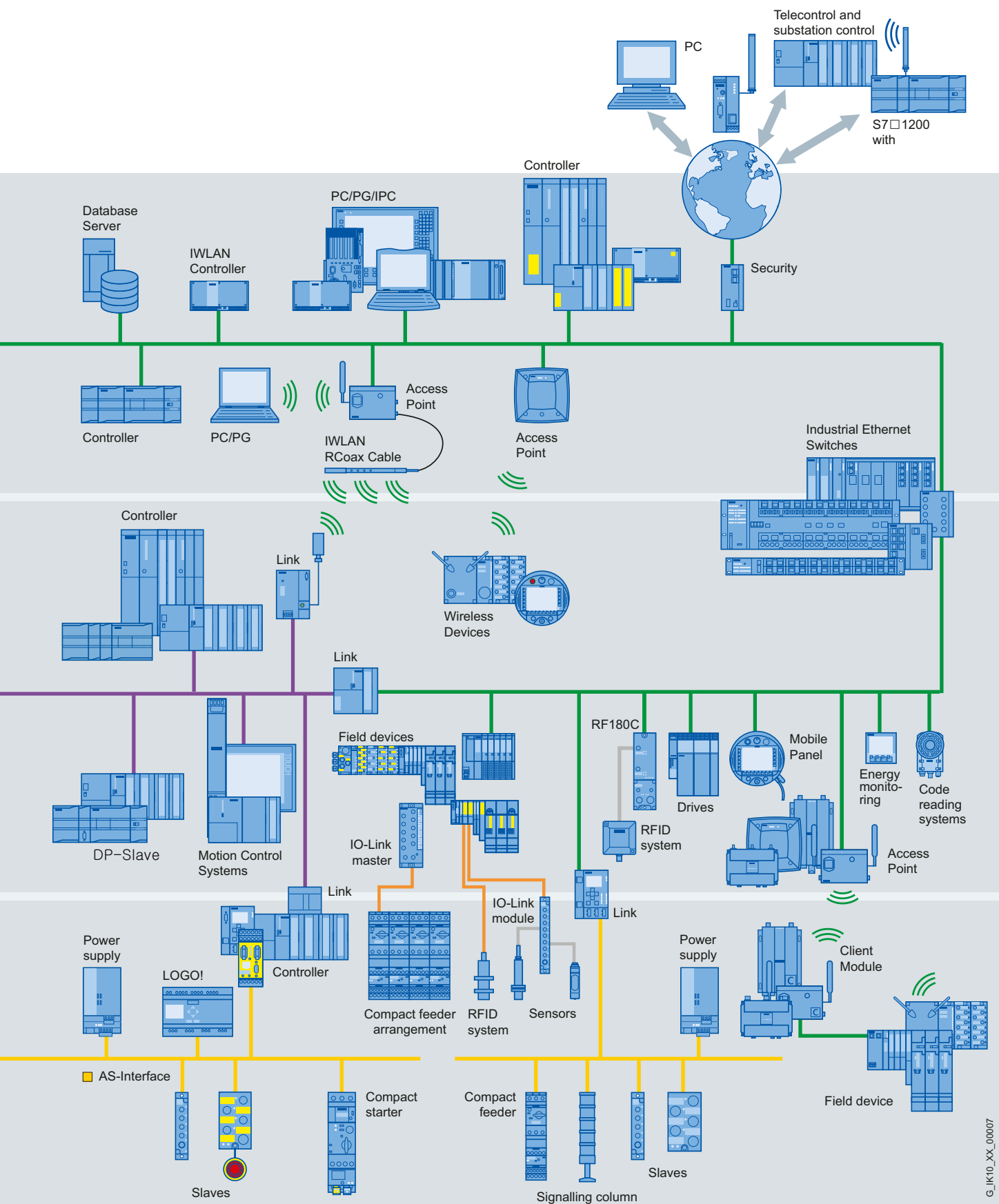
Use of communication systems					
	Industrial Ethernet	PROFINET	PROFIBUS DP	AS-Interface	IO-Link
Enterprise Resource Planning (ERP) (e.g. PC)	●	○			
Control (e.g. SIMATIC S7-300)	●	●	●	○	
Motion Control (e.g. SIMOTION)	●	●	●		
Intelligent field devices (e.g. ET 200S/CPU)		●	●	●	●
Simple field devices (e.g. ET 200)		●	●	●	●
Sensors/actuators		●	●	●	●
Identification systems (e.g. RFID and code reading systems)	●	●	●		
Drives (e.g. SINAMICS)	●	●	●	●	
SIRIUS (e.g. M200D motor starter, compact starters, monitoring and overload relay)		●	●	●	●
CNC system (e.g. SINUMERIK)	●	●	●		
Safety-oriented Communication		●	●	●	
not suitable ○ suitable ● ideally suitable					

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Industrial bus systems

The graphic shows the connection of different automation systems to the standardized networks.





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Industrial Ethernet/PROFINET

Industrial Ethernet

Industrial Ethernet offers a powerful area and cell network conforming to IEEE 802.3 (Ethernet), and IEEE 802.11 a/b/g/n (Wireless LAN) for industrial applications. Ethernet is the basic Internet technology for worldwide networking.

The numerous varied options of the intranet, Extranet and Internet that are already available today in the office sector can also be used in factory and process automation by means of the Industrial Ethernet.

Ethernet technology, which has been used successfully over many years for switching, Industrial Wireless LAN and security, allows the user to precisely match the network's performance to his requirements. The user can choose data rates up to 10 Gbit/s to suit particular needs, as integrated compatibility makes it possible to introduce new technology in stages.

Ethernet offers important advantages:

- Fast commissioning thanks to a simple connection technology
- High availability since existing networks can be extended without any adverse effects
- Virtually unlimited communication capabilities, since scalable performance using switching technology and high data rates are available if required
- Networking of different application areas such as the office and production
- Company-wide communication due to interface options via WAN (Wide Area Network) technology such as mobile communications or the Internet
- Precise time-based assignment of events in the overall plant by means of plant-wide clock control.
- Flexibility due to wireless expansion using Industrial Wireless LAN (IWLAN)

SIMATIC NET relies on this proven technology. Siemens has established well over two million connections worldwide in tough industrial environments subject to electromagnetic interference.

SIMATIC NET provides important supplements to Ethernet technology for industrial environments:

- Network components for use in harsh industrial environments
- Fast local assembly using the FastConnect cabling system for electrical and optical cabling
- Fail-safe networks through high-speed redundancy and redundant power supply
- Continuous monitoring of network components through a simple yet effective signaling concept
- Future-oriented network components for switching (SCALANCE X), Industrial Wireless LAN (SCALANCE W), Security (SCALANCE S) and modem/router communication (SCALANCE M)
- Gigabit communication on the control level for large amounts of data, e.g. WinCC, web applications, multimedia applications, etc.
- Network separation, e.g. by means of CP 443-1 Advanced

Communication functions/services

PG/OP communication

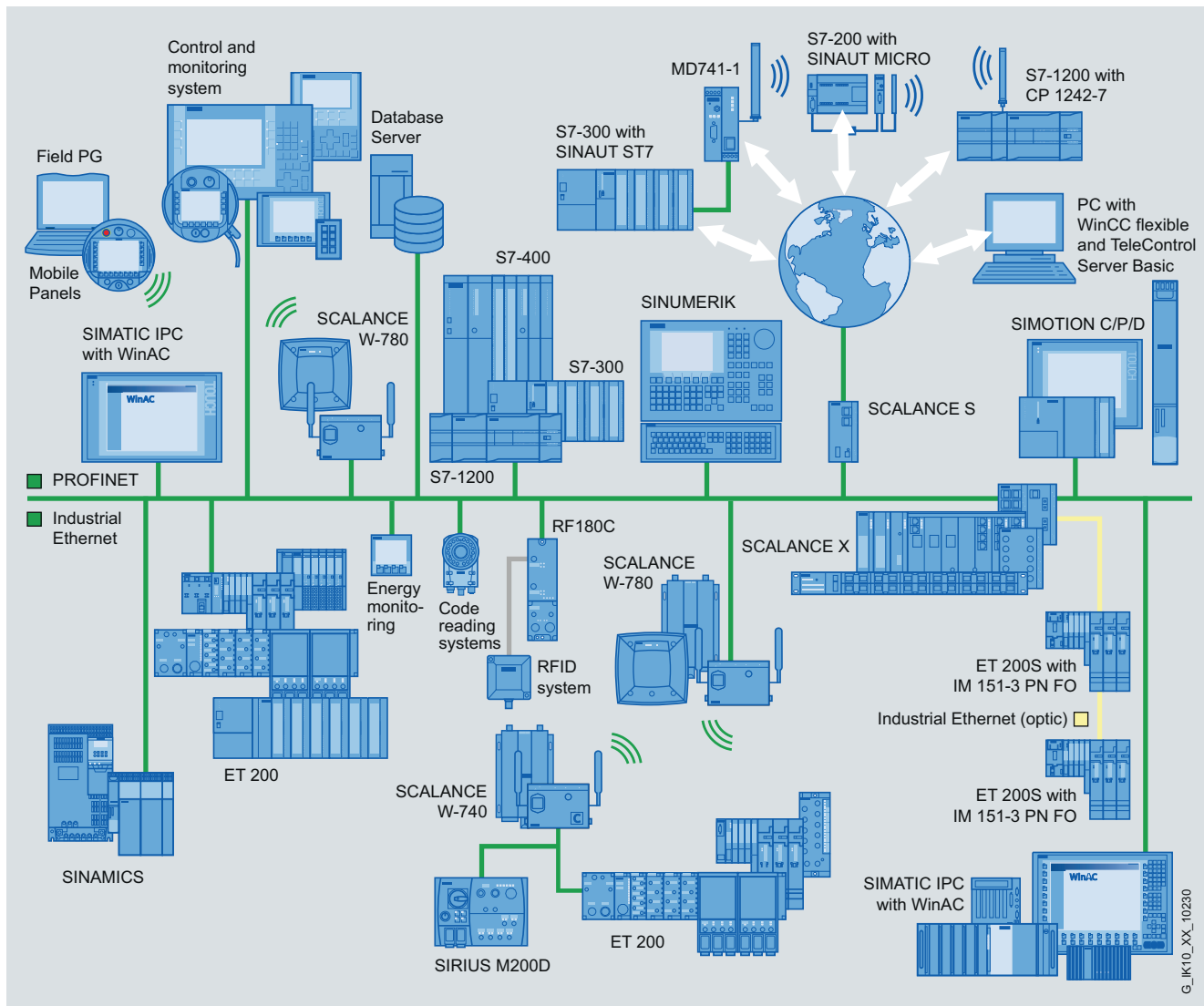
Comprises integrated communication functions which allow data communication via SIMATIC, SIMOTION and SINUMERIK automation systems with every HMI device and SIMATIC PG (STEP 7), also beyond network boundaries (S7 routing).

S7 communication

S7 communication is the integrated communication function (System Function Block) for S7-400 or loadable function blocks for S7-300, which have been optimized within SIMOTION, SINUMERIK and SIMATIC S7/WinAC. It enables PCs and workstations to be connected. The S7 communication provides simple, powerful and network-independent communication services.

Open communication

The open communication allows the SIMATIC S7 controllers to communicate with other SIMATIC S7 and SIMATIC S5 controllers, PCs/IPCs, and third-party systems. CPs support open communication by means of the SEND/RECEIVE function blocks. CPUs with an integral PROFINET interface use T-blocks for the open communication. For the simple connection of HMI stations, FETCH and WRITE are offered.



Complete overview of Industrial Ethernet

Socket interface for Industrial Ethernet

Allows data communication with computers via TCP/IP. On this interface which is widespread in the PC and UNIX world, users can freely program the data exchange. In the SIMATIC S7 and SIMATIC TDC, the SEND/RECEIVE blocks are used as an access to TCP/IP.

OPC (Openness, Productivity & Collaboration)

is a standardized, open, and vendor-independent interface that is widely used in automation. It permits the connection of OPC-capable Windows applications using many different protocols such as S7 communication, PROFINET, and SNMP.

OPC UA (Unified Architecture)

A distinction is currently made between classic OPC and OPC UA, the systematic further development of the former. A smooth migration to the new OPC UA standard, which offers added value such as security, is possible without problems. The SIMATIC NET OPC servers offer (at present for S7 and PROFINET) both OPC UA and classic OPC interfaces.

S7 OPC Redundancy

also allows the setup of redundant OPC UA servers, thus ensuring system access for the operator control and monitoring systems.

Industrial Ethernet

Information technology (IT) with e-mail, FTP and Web technology

integrates SIMATIC, SIMOTION and SINUMERIK into the information technology via Industrial Ethernet. In the office environment, e-mail and web browsers have prevailed as widespread means of communication. The file transfer protocol (FTP) permits simple, universal coupling, e.g. PLCs can be connected to various computers or embedded systems. Ethernet is primarily used as the communication route, in addition to telephone cables and the Internet.

Other services

Time-of-day synchronization

By means of the SIMATIC procedure or NTP (Network Time Protocol), plant-wide time-of-day synchronization is achieved.

Simple Network Management Protocol (SNMP)

SNMP is a standardized protocol for the transport of network management information and has been specifically designed for the administration of TCP/IP networks. The individual nodes in the network (network components or data terminals) are equipped with an SNMP agent that provides information in structured form. By means of this access to device information, for example, it is possible to implement a network visualization, system diagnostics, or the monitoring of plant states.

Vertical integration

For the vertical integration, i.e. the consistent communication from the field level up to the management level (ERP/MES), not only network separation, but also the option of the direct coupling of controllers to the management level is available.

Network separation

The network infrastructure enables two completely independent IP subnetworks to be constructed. This in turn enables a selective decoupling of the load to be achieved in the network or the different responsibilities within an enterprise (e.g. office and production network) to be controlled. Via a defined interface, selective communication between the subnetworks is possible.

ERP interface

Based on TCP/IP, a universal database interface is made available via the CP 343-1 ERPC communications processor, which supports the database applications of ORACLE, MySQL, MS-SQL, DB2 by means of partner software. To a large extent, the CP processes the protocol autonomously, thereby removing the burden of memory-intensive function blocks from the CPU. The necessary parameter settings, e.g. of which data area on the CPU is transferred to the database, are performed with a simple PC tool belonging to the partner software.

Network performance and network technologies with Industrial Ethernet

When combined, the current Industrial Ethernet technologies can boost performance in the network by a factor of 50 and more in comparison with the original 10 Mbit/s technology.

These technologies are:

- **Fast Ethernet**
with 100 Mbit/s: Message frames are transported much faster than Ethernet (10 Mbit/s) and therefore only occupy the bus for an extremely short time.
- **Gigabit Ethernet**
at 1 to 10 Gbit/s: In comparison to Fast Ethernet, Gigabit Ethernet is faster by a factor of 10 or 100 respectively.
- **Full Duplex**
prevents collisions: The data throughput increases enormously because the usual message repetitions are avoided. Data can be sent and received simultaneously between two stations.
The data throughput for a full-duplex connection therefore rises to 200 Mbit/s with Fast Ethernet and to 2 Gbit/s with Gigabit Ethernet. With full duplex, a greater extension of the network is possible. This means, for example, that when glass fiber-optic cables of 50/125 µm are used, distances of up to 26 km can be achieved.
- **Switching**
supports parallel communication: When a network is subdivided into several segments using a switch, this results in load separation. Data communication is possible in each individual segment independently of the other segments. In the overall network, several message frames can therefore be en-route simultaneously. The performance gain is due to the simultaneity of several message frames.
- **Autocrossover**
permits the automatic crossover between the send and receive cables at twisted-pair interfaces.
- **Autosensing**
describes the characteristic of network nodes (data terminals and network components) that automatically detect the transmission rate of a signal (10 Mbit/s, Mbit/s or 1 Gbit/s) and support Autonegotiation.
- **Autonegotiation**
is a configuration protocol on Fast Ethernet. Before initiating the actual data transmission, network devices automatically negotiate a transmission mode which is supported by any device (1000 Mbit/s, 100 Mbit/s or 10 Mbit/s, full duplex or half duplex)
- **Gigabit cabling system**
The 8-wire SIMATIC NET FastConnect cabling system with cables, connectors and outlets supports transmission rates of up to 1 Gbit/s, or up to 10 Gbit/s with fiber-optic technology.



Preassembled cables

Network infrastructure

Network topologies

Network topologies are oriented toward the requirements of the devices to be networked. The most common topologies include star, linear, tree and ring structures.

In practice, however, plants usually consist of a mixture of topologies. These can be implemented not only with copper cabling, but also with fiber-optic (FO) cables. Glass fiber-optic cables are used for long distances.

The FastConnect system enables users to assemble both copper and glass fiber-optic cables themselves. Plastic fiber-optic cables such as polymer optic fibers (POF) or polymer clad glass fibers (PCF) are an easy, do-it-yourself alternative for short distances. Industrial Ethernet switches and media converters as well as distributed field devices with integral POF/PCF interfaces are available for PROFINET.

Star

The characteristic feature of the star topology is a central switch with individual connections to all terminals in the network. Applications for star structures include areas with a high device density and short distances, for example small production cells or a single production machine.

Tree

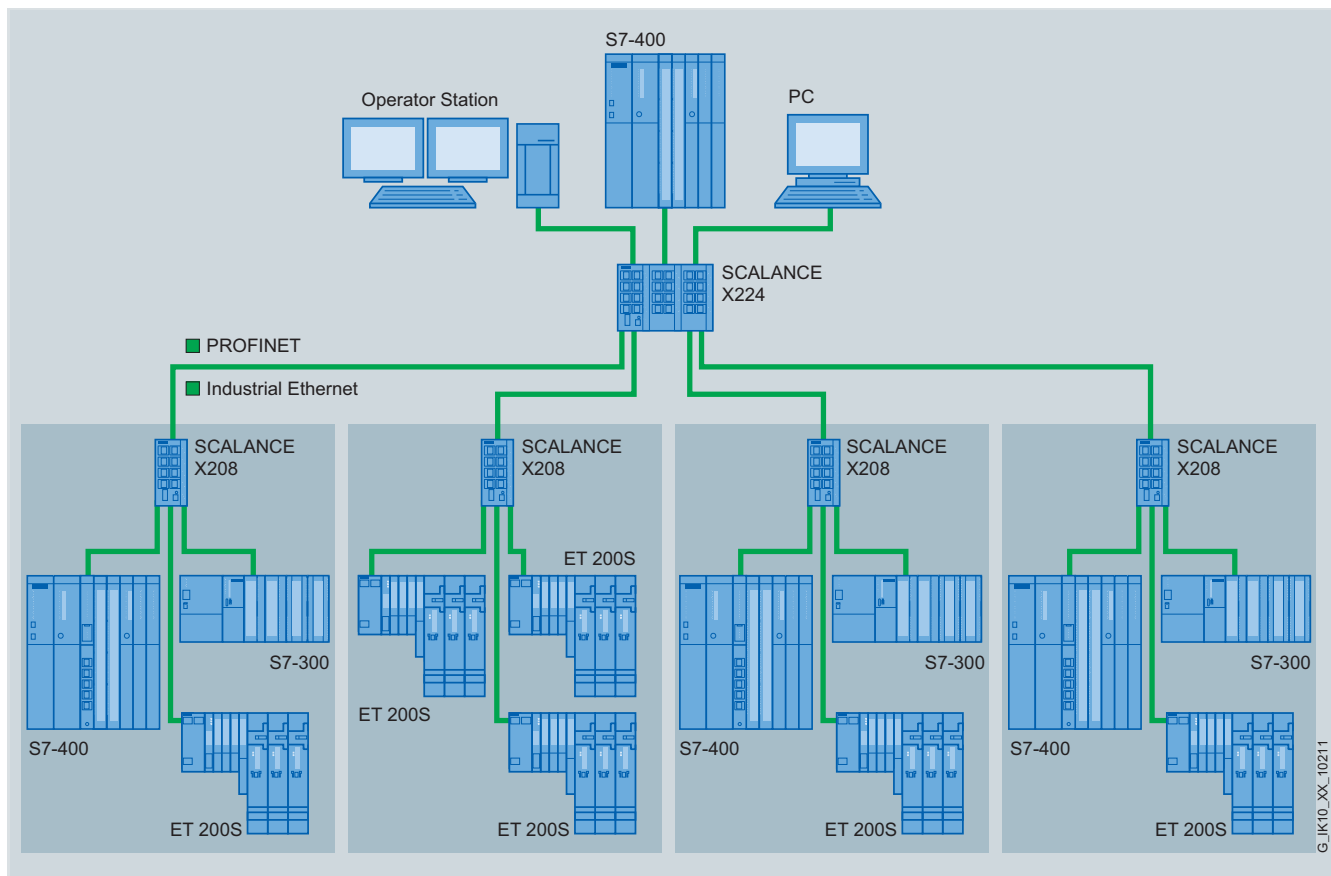
The tree structure is created by connecting several star topologies to create one network – possibly combining fiber-optic and twisted pair cabling. This structure is used when dividing complex plants into subsystems.

Bus

The linear topology can be implemented by a switch near the terminal device to be connected – or by a switch that is integrated into the terminal device. A line topology is preferred in plants with an extensive configuration, e.g. conveyor systems and for connecting production cells.

Ring

If the two ends of a line are connected by means of an additional connection, a ring topology is created. This is used in plants with higher availability requirements to provide protection in the event of a cable break or the failure of a network component. This media redundancy is made possible by implementing the Media Redundancy Protocol (MRP) in controllers, devices and network components and guarantees reconfiguration times of 200 ms.



Star network topology

Cabling system

For quick and error-free installation or changes on site, with FastConnect, Siemens has developed a sophisticated quick-assembly system of cables, plug-in connectors and assembly tools. FastConnect is available for Industrial Ethernet/PROFINET and PROFIBUS, for RJ45, M12 or sub-D/RS 485. FastConnect components are also available for fiber-optic cables (BFOC and SC-duplex) of up to 3 km in length.

Industrial Ethernet switching components

The communication network is of the utmost importance for automation solutions. With SIMATIC NET, Siemens offers Industrial Ethernet switching components for structuring networked machines and plants, and for integrating into the overall corporate network. A graded portfolio of switches (CSM, SCALANCE X) in various designs and also of communications processors with integral switch enables optimum solutions for all types of switching tasks, and not only in harsh industrial environments.

Different topologies such as line, ring or star offer wide-ranging possibilities, e.g. when implementing a production line or manufacturing cell.

Extremely fast reconfiguration of the network in a ring following an error is indispensable for industrial applications, because the connected data terminals will otherwise disconnect logical communication links. This would result in a process running out of control or emergency shutdown of the plant. In order to achieve the very fast reaction times required, various standardized procedures are used. In addition to the ability to configure and diagnose SCALANCE X switches in STEP 7, they offer optimized transmission of the PROFINET real-time message frames by means of prioritization.

Industrial Wireless LAN (IWLAN)

Thanks to wireless communication with programmable controllers, even greater flexibility is achieved, maintenance work is simplified, and service and standstill times reduced. The IWLAN solution from Siemens Industry makes these advantages available through a coordinated portfolio of WLAN equipment for industrial use, even for fail-safe communication in the context of operator and machine safety. This includes IWLAN access points and client modules (SCALANCE W), wireless interfaces for PROFIBUS and distributed I/O, mobile operator panels, planning software, and extensive accessories.

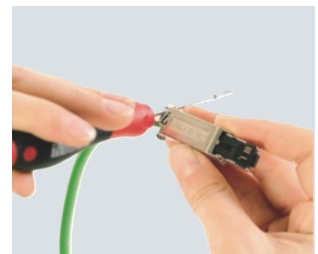
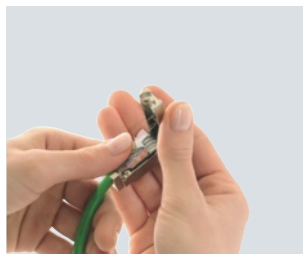
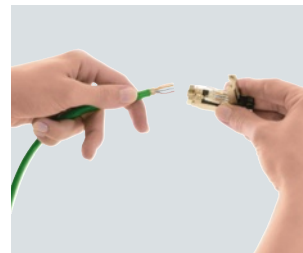
Industrial security

By integrating into the corporate network, the increased wired and wireless networking of industrial plants enables a degree of integration and openness that provides many benefits such as remote access to plant sections over the Internet. However, this also results in certain risks with regard to data security. With its industrial security concept, Siemens offers a safety solution specially designed for industrial automation engineering that satisfies the specific requirements of this application environment.

The industrial security products with integrated security functions (Security Integrated: firewall, VPN) such as SCALANCE S, S7 Advanced CPs, and SCALANCE M875 and the corresponding software are easy to handle, and reaction-free integration into existing networking concepts is possible.

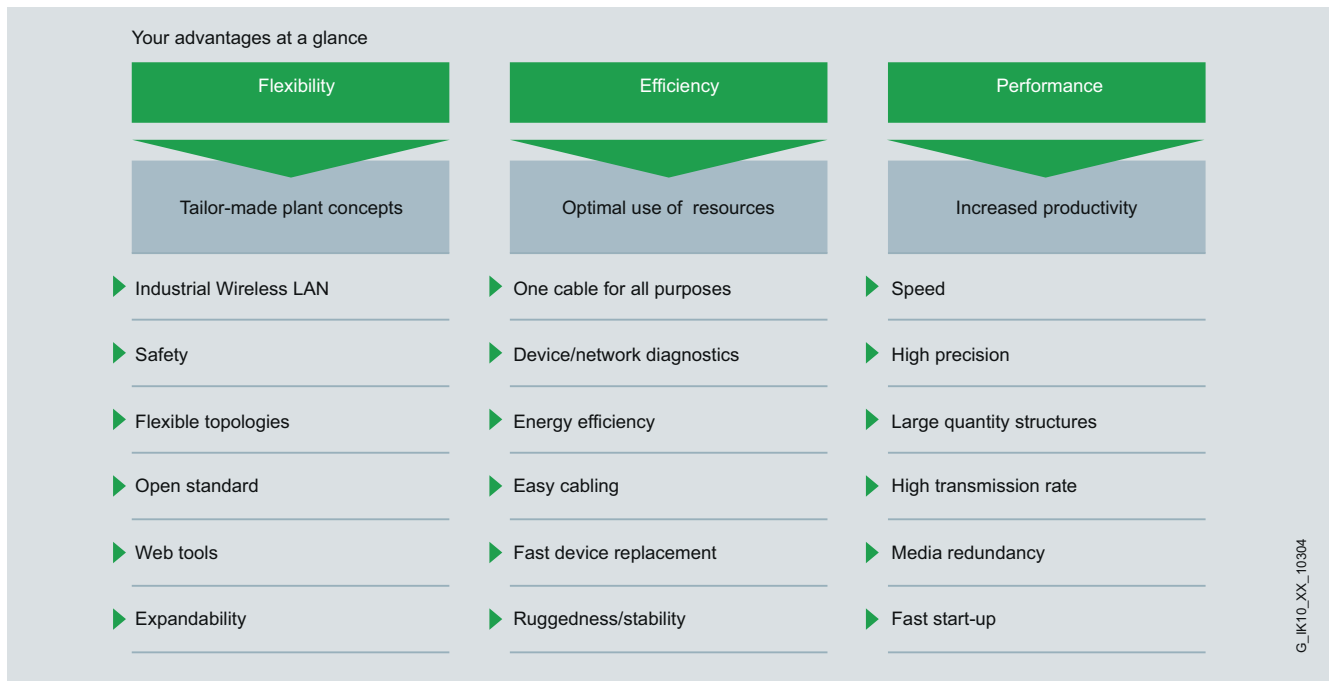


SCALANCE X308-2 switch



Simple and quick installation
with FastConnect

PROFINET – The Ethernet standard for automation



With PROFINET, Siemens applies the Ethernet standard to automation. PROFINET enables high-speed and secure data exchange at all levels, thus making it possible to implement innovative machine and plant concepts. Thanks to its flexibility and openness, PROFINET offers users maximum freedom in structuring their machine and plant architectures.

PROFINET's efficiency means optimal use of available user resources and a significant increase in plant availability.

Innovative Siemens products and the performance of PROFINET provide a sustained boost to company productivity.

The advantages at a glance

- PROFINET is the open Industrial Ethernet standard for automation
- PROFINET is based on Industrial Ethernet
- PROFINET uses TCP/IP and IT standards
- PROFINET is Real-Time Ethernet
- PROFINET permits seamless integration of fieldbus systems
- PROFINET supports fail-safe communication via PROFIsafe over IWLAN as well

Flexibility

Short response times and optimized processes are prerequisites for competitiveness in global markets, because product lifecycles are becoming shorter and shorter. PROFINET permits flexible communication structures and thus the implementation of innovative machine and plant concepts. This allows great flexibility in plant structures and production processes to be achieved to address these challenges successfully.

Industrial Wireless LAN (IWLAN)

PROFINET also supports wireless communication with Industrial Wireless LAN and thus opens up new application fields. For example, technologies subject to wear such as contact wires can be replaced and automated guided vehicle systems and mobile operator panels can be used.

Safety

The PROFIsafe safety profile (see page 42), which has been tried and tested with PROFIBUS and which permits the transmission of standard and safety-related data on a single bus cable, can also be used with PROFINET. No special network components are required for fail-safe communication, standard switches and standard network transitions can be used without restrictions. In addition, fail-safe communication is equally possible via Industrial Wireless LAN.

Flexible topologies

PROFINET also enables the use of star, tree, and ring topologies in addition to the linear topology characterized by the established fieldbuses. This results in a high degree of flexibility in the planning of machines and plants. The PROFINET network can be installed without any specialist knowledge and meets all requirements relevant to the industrial environment. The "PROFINET Installation Guide" provides network installation support for manufacturers and users. Symmetrical copper cables or RFI-resistant fiber-optic cables are used depending on the application. Devices from different manufacturers are easily connected via standardized and rugged plug-in connectors (up to IP65/IP67).

Thanks to the integration of switch functionality into the devices, linear topologies can be formed that are configured based on an existing machine or plant structure. This results in savings in cabling overhead and cuts down on components such as external switches.

Open standard

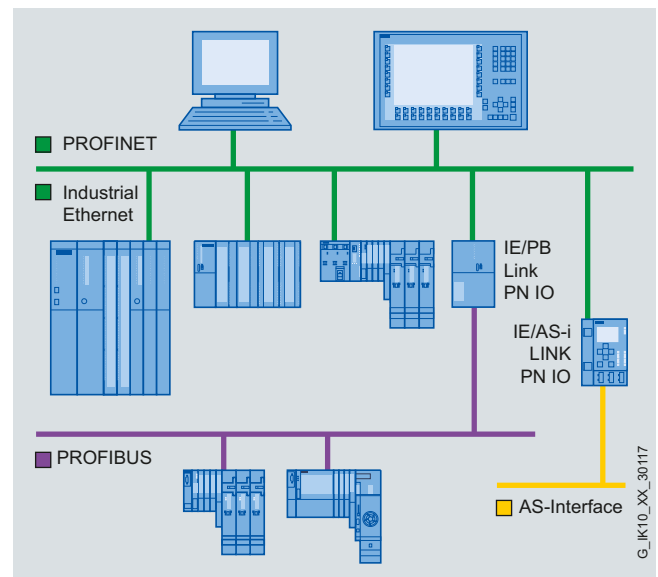
PROFINET, the open vendor-independent standard (IEC 61158/61784), is supported by PROFIBUS and PROFINET International (PI). It stands for maximum transparency, open IT communication, network security and simultaneous real-time communication.

Due to its openness, PROFINET creates the basis for a uniform automation network in the plant to which all of the machines and devices can be connected. The integration of existing parts of the plant, using PROFIBUS for example, can also be achieved without any problems through the use of network transitions.

Use of web tools

PROFINET's unrestricted support for TCP/IP permits the use of standard web services such as web servers in the device. Independently of the tool used, information from the automation level can be accessed from almost anywhere at any time using a commercially available Internet browser. This considerably simplifies commissioning and diagnostics.

Each user can decide for himself how much openness to the IT world he will permit for his machine or plant. Thus, PROFINET can be easily operated as an isolated plant network or it can be connected to the office network or the Internet via suitable security modules, such as the SCALANCE S modules. This allows new teleservice concepts or even the fast exchange of production data.



Fieldbus integration via a proxy

PROFINET – The Ethernet standard for automation

Expandability

On the one hand, PROFINET permits the easy integration of existing systems and networks without great effort. Thus, PROFINET protects the investments in existing plant units which communicate via PROFIBUS and other fieldbuses such as AS-Interface, for example. On the other hand, additional PROFINET stations can be added at any time. Network infrastructures can be expanded using additional network components, both wired and wireless versions, even during operation.

Efficiency

Global competition means that companies must deploy their resources economically and efficiently. This is especially true in production, where PROFINET ensures greater efficiency. Simple engineering guarantees fast commissioning, and reliable devices enable high plant availability. Comprehensive diagnostics and maintenance concepts help to reduce plant downtimes and maintenance costs to an absolute minimum.

One cable for all purposes

PROFINET permits simultaneous fieldbus communication in isochronous mode and standard IT communication (TCP/IP) via one cable. This real-time communication for the transmission of user/process data and diagnostic data is performed on a single cable. Specific profile communication (PROFIsafe, PROFIdrive and PROFlenergy) can be integrated without additional cabling overhead. This solution provides a wide range of functions with a low degree of complexity.

Device and network diagnostics

By retaining the proven device model of PROFIBUS, the same diagnostics information is available on PROFINET. In addition, module-specific and channel-specific data can also be read out from the devices during device diagnostics, enabling simple and fast location of faults.

In addition to the availability of device information, the top priority in network management is reliability of network operation. The Simple Network Management Protocol (SNMP) has become established in existing networks as the de-facto standard for the maintenance and monitoring of network components and their functions. PROFINET uses this standard and gives the user the capability of servicing networks using tools that are familiar to him.

In order to facilitate the maintenance of PROFINET devices, both locally and also remotely via a secure VPN connection, user-specific web sites in the familiar HTML standard can be created.

Energy efficiency

Moving toward the green factory: PROFlenergy

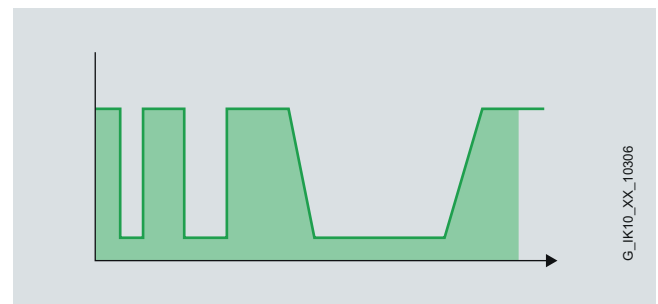
PROFlenergy is a profile that provides functions and mechanisms for PROFINET field devices that support energy-efficient production.

The vendor and device-independent profile defined by PROFIBUS & PROFINET International (PI) allows the user to significantly reduce the energy consumption and costs: PROFlenergy enables specific loads that are not required to be switched off. This noticeably reduces energy costs during pauses in production. PROFlenergy facilitates automated activation and deactivation of technologically related plant sections. The coordination is performed centrally by means of a higher-level controller, and the networking via PROFINET. This means that during long pauses, as much energy as possible is saved. Plant sections that are switched off for short periods contribute to the even distribution and most efficient use of energy.

The use of PROFlenergy is made easier for the machine builder by its integration into well-known series of products. In addition, PROFlenergy is defined in such a way that the necessary function blocks can be integrated into existing automation systems at a later date.



Energy consumption without PROFlenergy



Energy consumption with PROFlenergy

Stringent demands are placed on the installation of cables in the industrial environment. There is also the requirement to set up error-free industry-standard networks in the shortest possible time without specialist knowledge. Siemens offers FastConnect, a system that meets all these requirements.

FastConnect is the standards-compliant, industry-standard cabling system consisting of cables, connectors, and assembly tools for PROFINET networks. The time spent for connecting the terminal devices is minimized thanks to the easy installation using only a single tool, and installation errors can be avoided thanks to the practical color-coding. Both copper cables and glass fiber-optic cables can be assembled on-site in this way.

Fast device replacement

PROFINET devices are identified via a name that is assigned in the configuration. When replacing a defective device, a new device can be recognized by the IO Controller by means of topology information and have a name automatically assigned to it. An engineering tool is therefore not required when replacing devices. This mechanism can also be used during the initial commissioning of a complete plant. Quick commissioning is thus especially possible for series machines.

Ruggedness/stability

An automation network must be able to withstand most external sources of interference. The use of Switched Ethernet prevents faults in one section of the network from influencing the entire plant network. PROFINET enables the use of fiber-optic cables especially for areas that are critically sensitive to EMI.

Performance

Productivity and product quality determine market success. Precise motion control, dynamic drives, high-speed controllers, and the deterministic synchronization of devices are therefore important key factors. They allow high production speeds and simultaneously optimized product quality.

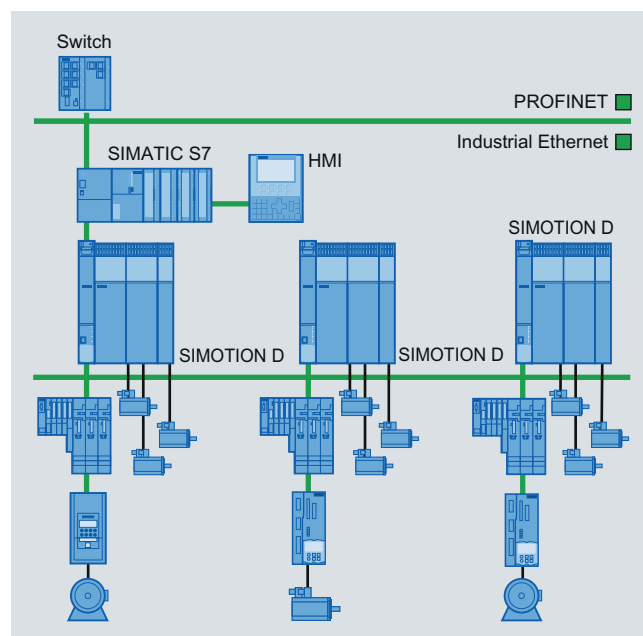
Speed and precision

Fast motion control applications need precise and deterministic data exchange. This is implemented thanks to isochronous drive controls using Isochronous Real-Time (IRT).

With IRT and isochronous mode, PROFINET supports high-speed, deterministic communication in which the different cycles of a system (input, network, CPU processing and output) are synchronized, even with TCP/IP communication operating in parallel.

PROFINET's short cycle times make it possible to increase the productivity of machines and plants, and to ensure product quality through high precision.

The standardized PROFIdrive drive profile enables vendor-independent communication between CPUs and drives.



Modular, distributed automation structure with drive-based motion controllers

PROFINET – The Ethernet standard for automation

Large quantity structures

Previous limitations in the scope of the machines and systems to be implemented can be easily overcome through the use of PROFINET. With PROFINET, up to 256 field devices can now be managed by one SIMATIC Controller. In a network, several controllers can interact with their assigned field devices. The number of field devices per PROFINET network is virtually unlimited – the entire band of IP addresses is available.

High transmission rate

By using 100 Mbit/s in full duplex mode, PROFINET achieves a significantly higher transmission rate than previous fieldbuses. Thanks to this, both the process data and other plant data can be transferred via TCP/IP without any problems. In this way, PROFINET combines the industrial requirements of simultaneously transferring fast IO data and large data quantities for other parts of the application. Even the transfer of large quantities of data such as by cameras does not affect the speed and the precision of the IO data transfer thanks to PROFINET mechanisms.

Media redundancy

Higher plant availability can be achieved by means of a redundant installation (ring topology). Redundancy can be achieved in different ways.

The media redundancy can be implemented both with the help of external switches and direct via integral PROFINET interfaces. Reconfiguration times of 200 ms can be achieved. In IRT mode, media redundancy can also be implemented bumplessly using MRPD. In the case of an interruption to the communication in only one part of the ring installation, this means that a plant standstill is prevented and the necessary servicing and repair work can be carried out without time pressure.

Fast start-up

The Fast Start-Up function allows rapid start-up of PROFINET IO Devices that are connected to SIMATIC Controllers. The communication connection between the controller and the device is established in less than a second. For modular plants, individual plant parts can therefore be connected or disconnected in the shortest time. For example, the tool change can be accelerated significantly in robot applications.

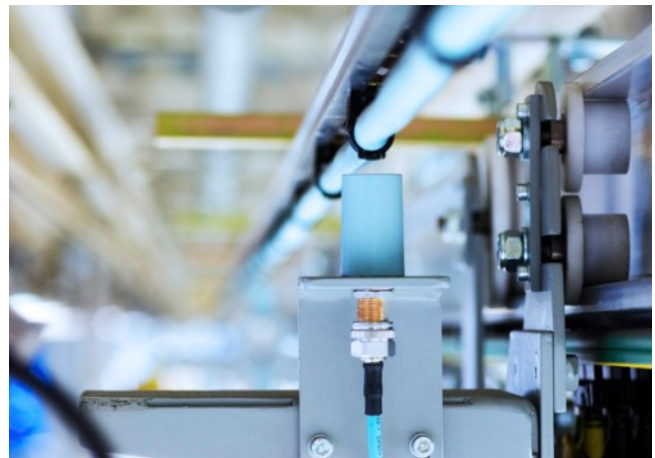
PROFINET innovations

System redundancy

Applications with stringent demands for availability can be configured for high availability using system redundancy mechanisms. Two controllers execute in parallel and, in the event of a fault, processing switches from the master system to the standby station.

Higher plant availability can be achieved using a ring topology and the **Media Redundancy Protocol (MRP)**. This runs directly via the integrated PROFINET ports on PROFINET devices and can be combined with any PROFINET switches.

High network availability can be achieved without re-configuration time using the **MRPD procedure (Media Redundancy for Planned Duplication)**.



Reliable, wireless communication with IWLAN and a leaky wave cable (antenna)

Industrial Wireless Communication

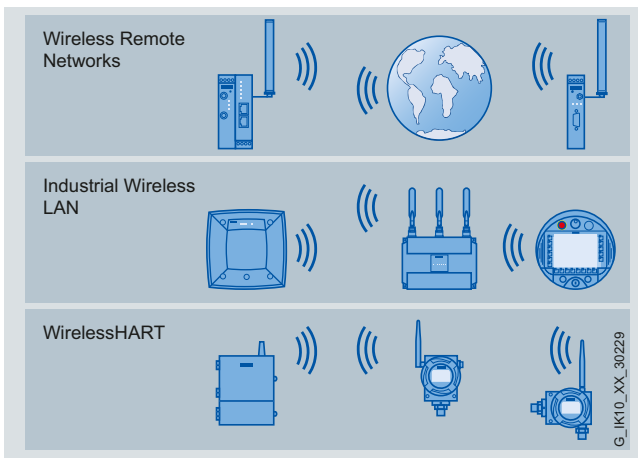


Components for Industrial Wireless LAN

Wireless communication is in no way the only option for improving the user-friendliness of an application by eliminating the need for cables. In fact, it is the key to new kinds of application and offers enormous advantages – particularly when used in the industrial environment:

- More competitive due to greater mobility and flexibility
- Reduced maintenance work, service costs and downtimes by using low-wear components
- Constant availability and accessibility of data regardless of the network connections indoors and outdoors

Siemens Industrial Wireless Communication offers the optimum solution for each task by using the best technology for each application, regardless of whether it is mobile radio (GSM/GPRS/UMTS), Industrial Wireless LAN (IWLAN), or WirelessHART.



GPRS/GSM/UMTS

Mobile technology on the basis of uniform standards permits world-wide access to machines and plants in every sector. The field of application extends from tasks involving remote maintenance and diagnostics, through the continuous communication between distantly located stations, to the transmission of job, position, or video data between mobile vehicles (e.g. buses, trains, trucks) and a control center. Mobile radio modems and routers from the telecontrol product range are used for this purpose and ensure reliable connections.

This makes it possible, for example, to reduce or eliminate costs for service calls, to monitor distributed stations economically and to improve safety in the vehicles.



Wireless router and modem

Industrial Wireless LAN

Industrial Wireless LAN (IWLAN) offers a reliable, robust and secure complete solution on the basis of the WLAN standard IEEE 802.11 for local wireless networking.

Applications range from networking across machines and buildings, through the connection of mobile stations (e.g. automated guided vehicle systems, overhead monorails, cranes), plant operation by means of SIMATIC Mobile Panels to transferring video data.

The IWLAN complete solution includes:

- Access points and SCALANCE W client modules for the construction of the radio infrastructure and for the wireless connection of terminals and even PROFIBUS segments
- An extensive range of accessories with antennas, connecting cables, connectors, mounting brackets and power supply units
- Wireless devices such as the SIMATIC Mobile Panel 277(F) IWLAN for the wireless operation of standard and safety-related plants (PROFINET with PROFI-safe profile) and the distributed I/O module ET 200pro IWLAN.

Industrial Wireless Communication

With Industrial Wireless LAN, extensions to the IEEE 802.11 standard are made available that address the requirements of industrial customers in particular with regard to deterministics and redundancy (iFeatures). This gives customers a single radio network for process-critical data (e.g. I/O communication, safety-related communication) and for non-critical communication (e.g. service and diagnostics).

Other advantages are the multifunctional infrastructure, e.g. for both voice and data transmission across corporate areas, as well as the elimination of complicated and expensive cable and contact-wire installations.

SCALANCE W – Infrastructure for wireless communication

In the case of SCALANCE W, it is a matter of IWLAN access points, client modules and an IWLAN controller for the construction of the wireless infrastructure and connection of terminals in the industrial environment. The products offer a unique combination of reliability, robustness and security. The IWLAN components SCALANCE W and the PROFINET communication that can be implemented over them provide a mobile solution for applications right down to the field level.

The reliability of the radio channel is reflected in the dustproof and waterproof design (IP65) of the rugged enclosure, with the high demands on mechanical stability familiar from SIMATIC. Modern security mechanisms for user identification (authentication) and data encryption protect against unauthorized access and can be integrated in existing security policies without any problems.

Wireless devices - panels and I/O

In order to make optimum use of the IWLAN infrastructure, mobile operator panels and distributed I/O devices with integrated wireless clients are part of the complete solution:

- SIMATIC Mobile Panel 277(F) IWLAN for mobile HMI even of safety-related applications with integral emergency stop pushbutton
- SIMATIC ET 200pro IWLAN for control cabinet and wireless construction of a distributed I/O directly at the machine



Access Point SCALANCE W788 M12 acc. to IEEE 802.11n

RCoax radiating cable – the special antenna for particularly demanding installations

- In areas with difficult radio coverage (e.g. in tunnels, channels and elevator shafts) where a mechanically wear-free and thus low-maintenance solution are important for ensuring reliable data transmission. This is made possible by the defined, spherical radio field along the RCoax cable.
- The RCoax cables offer, especially for conveyor systems, robots and every type of rail-mounted vehicle, a wear-free and reliable radio link.

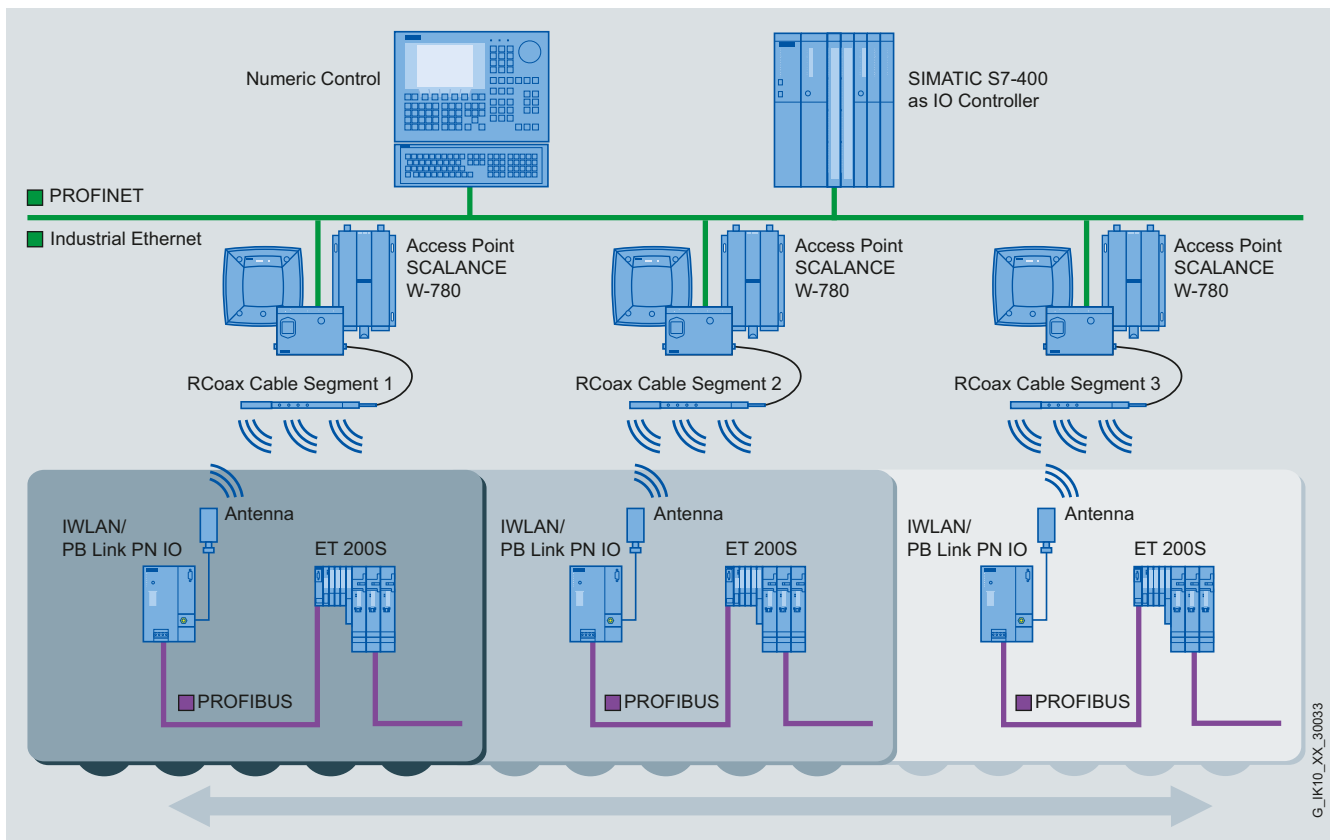
Application examples

- Suspended monorail
- Automated guided vehicles (AGV)
- Cranes
- Storage and retrieval systems
- Transfer lines
- Tool change trolleys
- Robots
- Railway stations
- Lifts
- Theater stages

WirelessHART

WirelessHART is an open industry standard, developed for the particular requirements of wireless communication at the field level in the process industry. It meets all specific requirements for reliability, safety, economy and user-friendly operation.

WirelessHART opens up new communication options that were previously not practicable or possible due to the operating environment or for economic reasons.

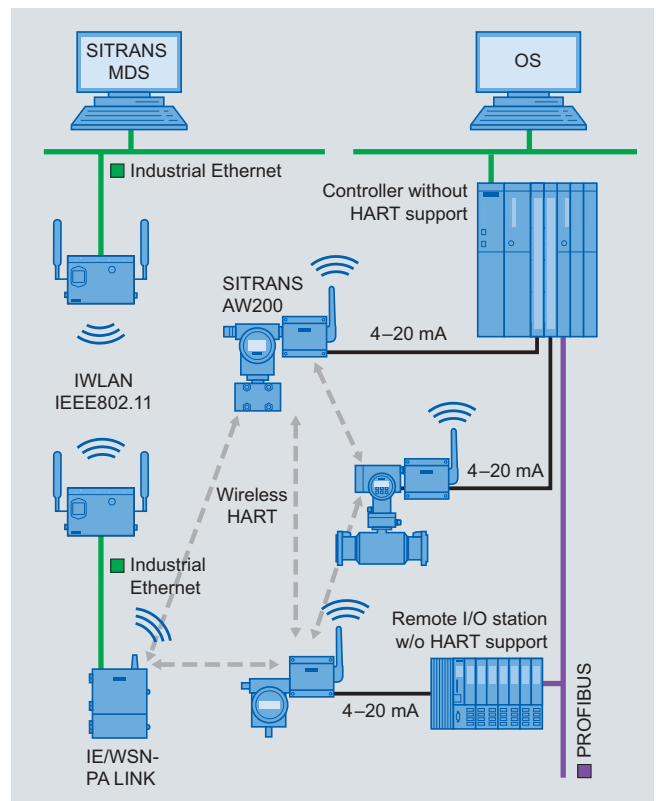


Configuration example of a suspended monorail system

Application examples and their advantages are:

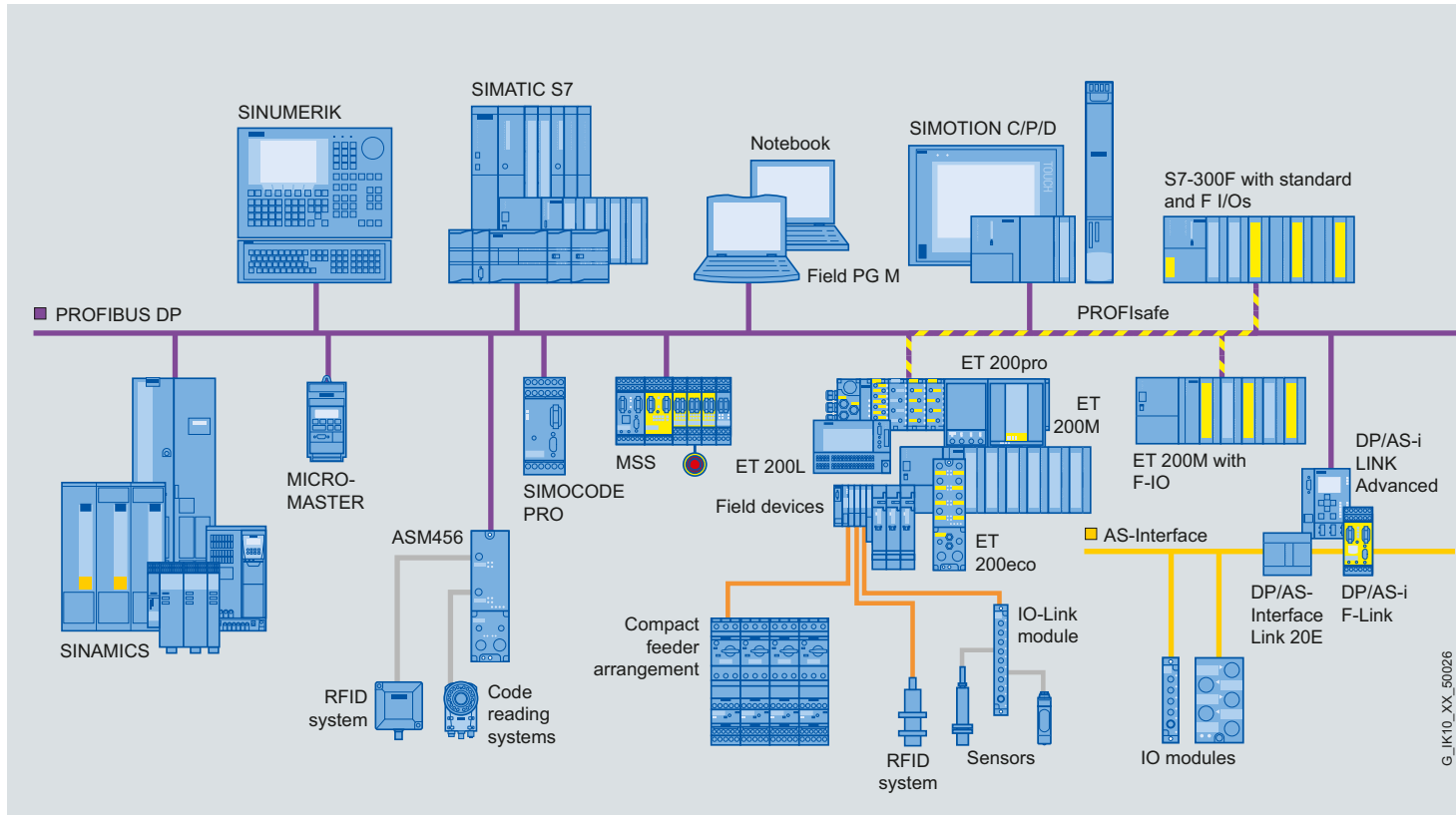
- Flexible installation, replacement, or retrofit: ideal for temporary measurements and for measurements on rotating equipment.
- Access to distributed plants and sites in poorly accessible areas: considerable savings on cabling, commissioning and engineering, as well as reduced operating costs thanks to higher plant efficiency and lower maintenance overheads.
- Access to diagnostics information for the development of predictive maintenance strategies: there is no longer any expenditure on cable maintenance or the manual checking of the device status.

The advantages of WirelessHART can be exploited by using SITRANS field devices with an integrated WirelessHART interface, or by an adapter for wired HART devices. For the connection to the plant network, the IE/WSN-PA LINK is available as a network transition between WirelessHART and Industrial Ethernet.



WirelessHART configuration

PROFIBUS



Complete overview of PROFIBUS

PROFIBUS is used to link field devices such as distributed I/O devices or drives with automation systems such as SIMATIC S7, SIMOTION, SINUMERIK or SIMATIC IPCs. PROFIBUS is standardized in accordance with IEC 61158/61784 and is a powerful, open and rugged fieldbus system with short response times. PROFIBUS is available in different forms for various applications.

PROFIBUS DP (distributed I/O)

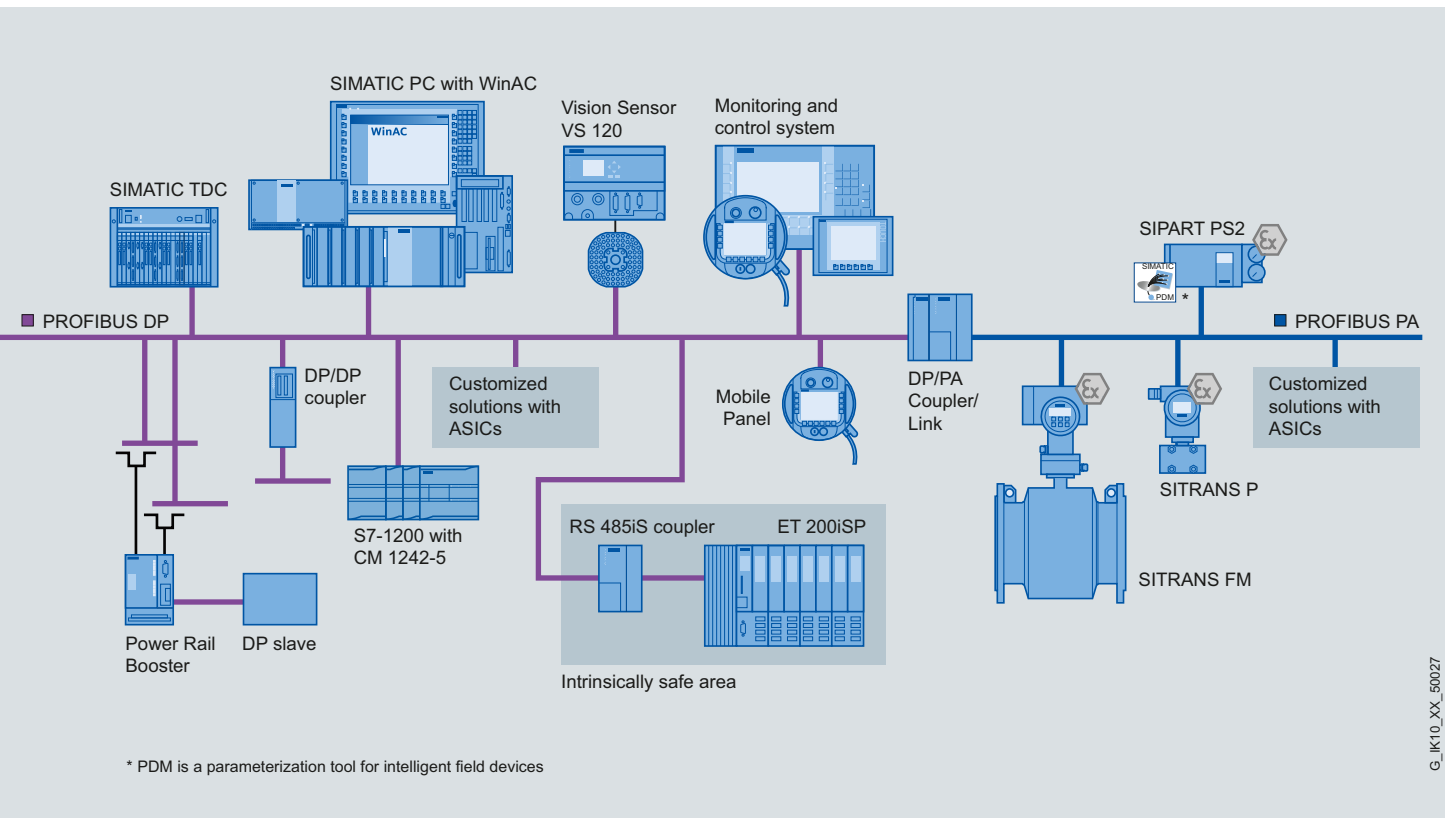
is used for connecting distributed field devices, e.g. SIMATIC ET 200, or drives with extremely fast response times. PROFIBUS DP is used when sensors/actuators are distributed at the machine or in the plant (e.g. field level). The actuators/sensors are connected to the field devices. These are supplied with output data according to the master/slave process and they supply input data to the controller or the industrial PC.

Openness all along the line

Thanks to the openness of PROFIBUS DP, standard-compliant components from different manufacturers can also be connected. The IEC 61158/61784 standards provide future protection for your investment.

Fail-safe communication
over PROFIBUS using PROFIsafe

See page 42



Member companies worldwide offer the most diverse products with PROFIBUS DP interface for the field area. Siemens has a complete range of products of standard and fail-safe controllers, network components, communication software and field devices. And for field device manufacturers, Siemens offers everything to do with the PROFIBUS DP interface, such as ASICs, training, certification, and much more.

PROFIsafe

permits standard and safety-related communication on one and the same bus cable. It is an open solution for safety-related communication over standard buses and uses the PROFIBUS services.

Isochronous mode

The CPU, I/O and user program are synchronized with the PROFIBUS cycle.

The "Isochronous mode" function is supported by many CPUs of SIMATIC, SIMOTION, SINUMERIK and SINAMICS. The drives are controlled using the PROFIdrive profile.

PROFIBUS PA (Process Automation)

expands PROFIBUS DP with intrinsically safe transmission of data and power (e.g. transducers in the food processing industry) in accordance with the international standard IEC 6158-2 (same protocol, different physical properties).

AS-Interface

Sensors, valves, actuators, drives – many different components operate on the field level. All of these actuators/sensors must be connected to an automation system. Distributed I/O devices are used for this; to a certain extent as intelligent outposts directly on-site.

As a cost-effective alternative to the cable harness, AS-Interface links the components of the field level by means of a simple two-wire cable for data and power.

AS-Interface is standardized as an international industrial standard according to EN 50295 and IEC 62026-2 and is supported worldwide by a number of member companies of the AS-International Association, including the leading manufacturers of actuators and sensors. AS-Interface is used where individual actuators/sensors are spatially distributed throughout the machine (e.g. in a bottle filling plant).

AS-Interface is a single master system. There are communications processors (CPs) for SIMATIC and for SIMOTION and links that control field communication as masters.

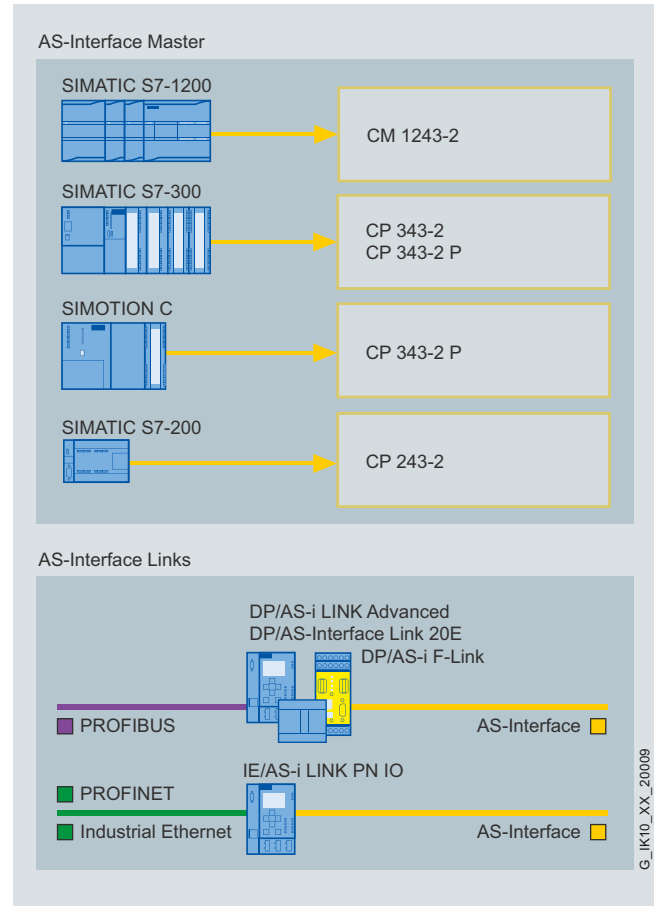
With the AS-Interface specification V2.1 or V3.0, up to 62 slaves can be connected. The AS-Interface specification V3.0 allows a maximum of 1000 digital inputs/outputs to be connected (profile S-7.A.A: 8DI/8DO as A/B slave). New profiles allow advanced addressing to be used for analog slaves, too. The analog value transmission is accelerated via "fast analog profiles". Thanks to the integrated analog value processing in the masters, the access to analog values is just as easy as the access to digital values.

For connecting the AS-Interface to PROFIBUS DP, the DP/AS-i LINK Advanced, DP/AS-i F-Link or DP/AS-Interface LINK 20E are available with degree of protection IP20. This enables the use of AS-Interface as a subnet for PROFIBUS DP. The IE/AS-i LINK PN IO allows the AS-Interface to be connected to Industrial Ethernet and thereby it is directly embedded in the PROFINET environment.

Cost savings

AS-Interface replaces costly cable harnesses and connects binary actuators and sensors such as proximity switches, valves or indicator lights, as well as analog signals with a controller such as SIMATIC.

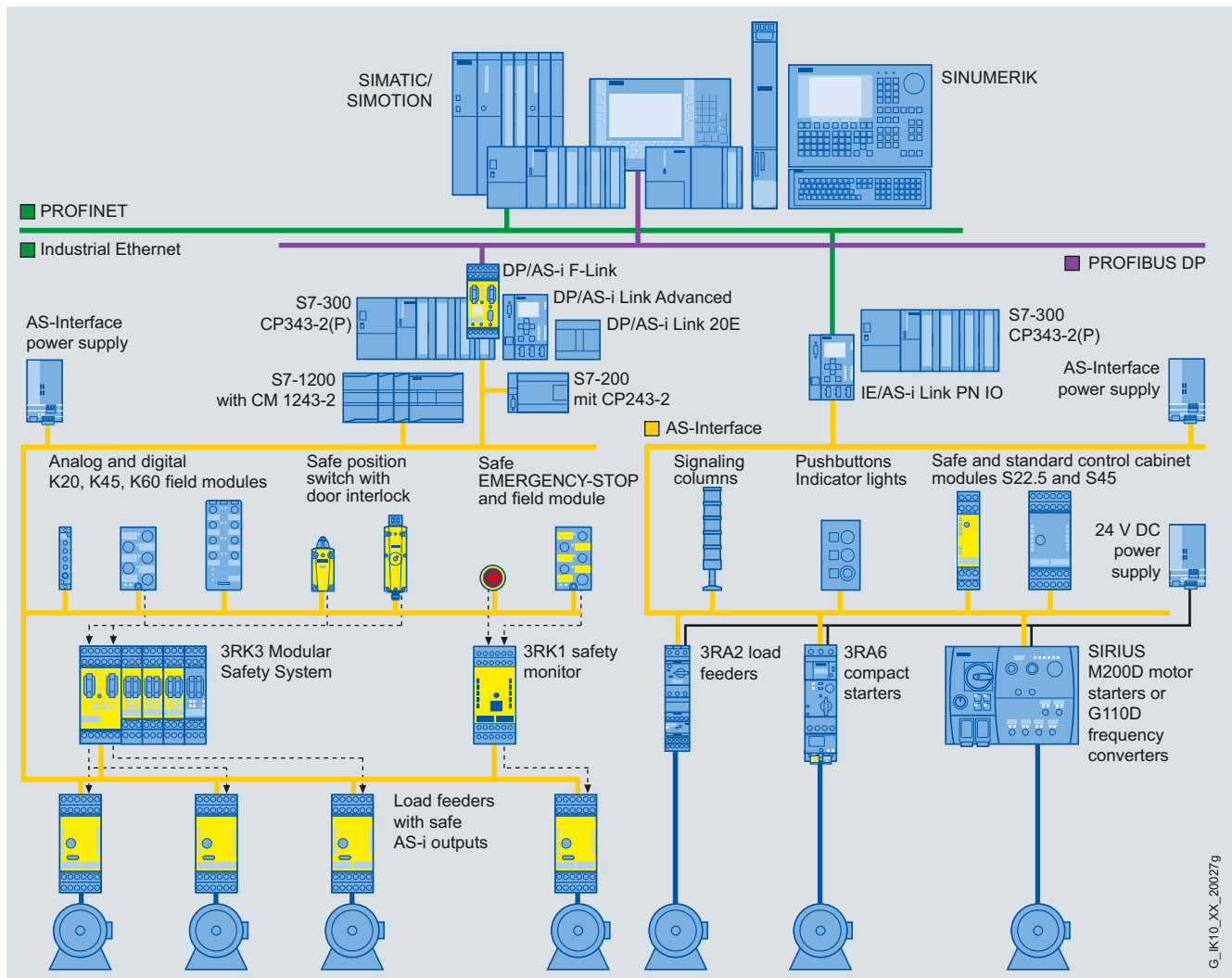
In practice this means: Installation runs smoothly because data and power are transported together over one single line. Thanks to the specially developed ribbon cable (yellow in color) and insulation displacement technology, the AS-Interface slaves can be connected anywhere.



AS-Interface master and links

This concept is extremely flexible and has a big effect on savings. No expert knowledge is required for installation and commissioning. Furthermore, through simple cable laying and the clear cable structure as well as the special design of the cable, you not only significantly reduce the risk of errors, but also service and maintenance costs.

The extension of AS-Interface with AS-i Power24 V now allows the use of 24 V standard power supplies in AS-i networks, which enables further cost savings. The AS-Interface communication technology works at 30 V DC and 24 V DC operating voltage with the same high quality.



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Fail-safe communication at the AS-Interface with ASIsafe

See page 44

Automation in the
beverage industry



IO-Link

Uninterrupted communication down to the last meter: the point-to-point interface IO-Link

IO-Link – more than just another interface

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

Improvements in the intelligence of field devices and their integration in the overall automation support data access down to the lowest field level.

The result: greater plant availability and reduced engineering overhead.

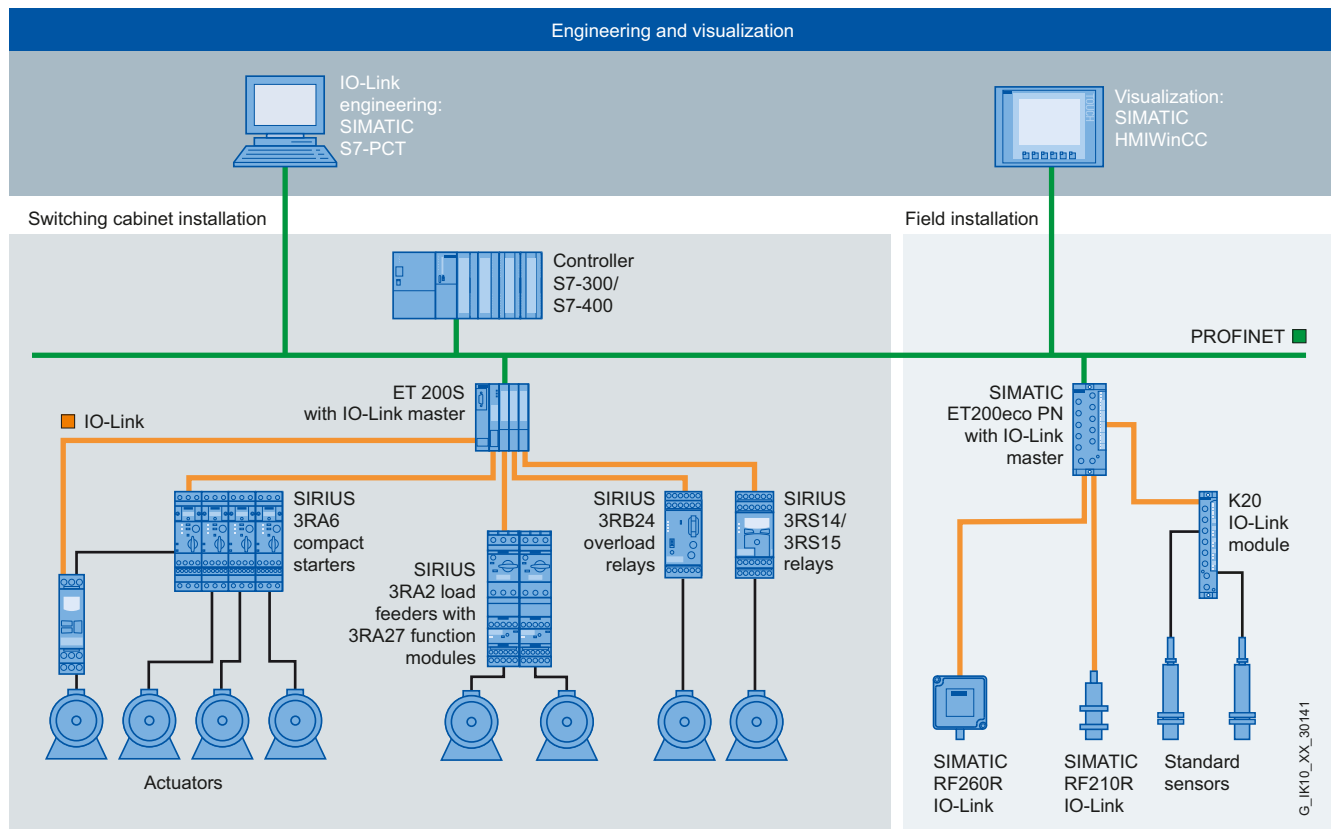
As an open interface, the IO-Link can be integrated into all common fieldbus and automation systems. Consistent interoperability ensures maximum protection of investment. This also applies in the context of existing machine concepts for continued use of sensors without an IO-Link interface.

Together for integrated quality

The communication standard was developed by the IO-Link members – leading providers of automation products that have come together to support the new concept in all areas of control, sensor, and actuator technology. The basis of the IO-Link Group's work is the specification. This is part of IEC 611 31-9, and has already been published as an IEC draft.

The requirements for integrated communication are increasing. At the same time, the variety of field devices, actuators, and sensors is increasing immensely – with ever greater intelligence. IO-Link offers the solution for these requirements and is seen by manufacturers as a valuable addition to the communications landscape (including AS-Interface).

As a committed driver of this issue, Siemens is further developing not only its product and system range accordingly, but by integrating IO-Link in Totally Integrated Automation, it is also providing a unique integrated communication solution.



Networking with IO-Link

Engineering	Commissioning	Operation and maintenance
<p>Reduced engineering times</p> <ul style="list-style-type: none"> ■ Standardized, open system for more flexibility (third-party IO-Link devices can be integrated in the engineering) ■ Uniform and transparent configuration and programming through integrated engineering (SIMATIC STEP 7) ■ Freely available function blocks for SIMATIC for user-friendly parameterization and diagnostics, and readout of measured values ■ Efficient engineering due to pre-integration of Siemens devices in SIMATIC HMI ■ Low error rate in CAD circuit design thanks to reduction in control circuit wiring 	<p>Reduced commissioning times</p> <ul style="list-style-type: none"> ■ Faster installation and minimized error rate thanks to reduction in control circuit wiring ■ Space savings in the control cabinet ■ Low-cost wiring technology with several branches thanks to unrestricted use of existing Siemens components 	<p>Increased plant availability</p> <ul style="list-style-type: none"> ■ High level of transparency in the plant down to the field level ■ Reduction of downtime and maintenance times through plant-wide diagnostics and faster error correction ■ Support for preventive maintenance ■ High transparency through incorporation of energy monitoring systems, readout of current values, and diagnostic messages ■ Shorter conversion times thanks to central parameter and recipe management for field devices as well

Industrial Remote Communication

Remote networks

Industrial Remote Communication		
Telecontrol <ul style="list-style-type: none"> ■ Permanently or spontaneously established connections ■ Low bandwidth requirements ■ Optimized data throughput 	Teleservice <ul style="list-style-type: none"> ■ Sporadic connection build-up ■ Medium bandwidth requirements 	Further applications for remote communication such as video monitoring, smart grid applications and condition monitoring <ul style="list-style-type: none"> ■ Permanently or spontaneously established connections ■ Low to high bandwidth requirements ■ Stationary and mobile applications
Remote networks remote communication over public and private, heterogeneous networks		
Integration in the industrial security concept		
Availability	Flexibility	Bandwidth

The megatrends of urbanization, globalization/population growth and climate change are the drivers for newly developed applications that extend beyond classic teleservice and telecontrol solutions.

Under the banner of Industrial Remote Communication, Siemens is offering a comprehensive range of telecontrol and teleservice applications. This is supplemented by an extensive range of products for implementing remote networks for other applications via public networks.

For classic remote control solutions in oil and gas pipelines, in the field of water supply and treatment and in the energy field, the comprehensive system TeleControl Professional is available. In these applications, outlying stations and metering points must send large volumes of data over long distances to the central control room, and often over widely differing telecommunication networks.

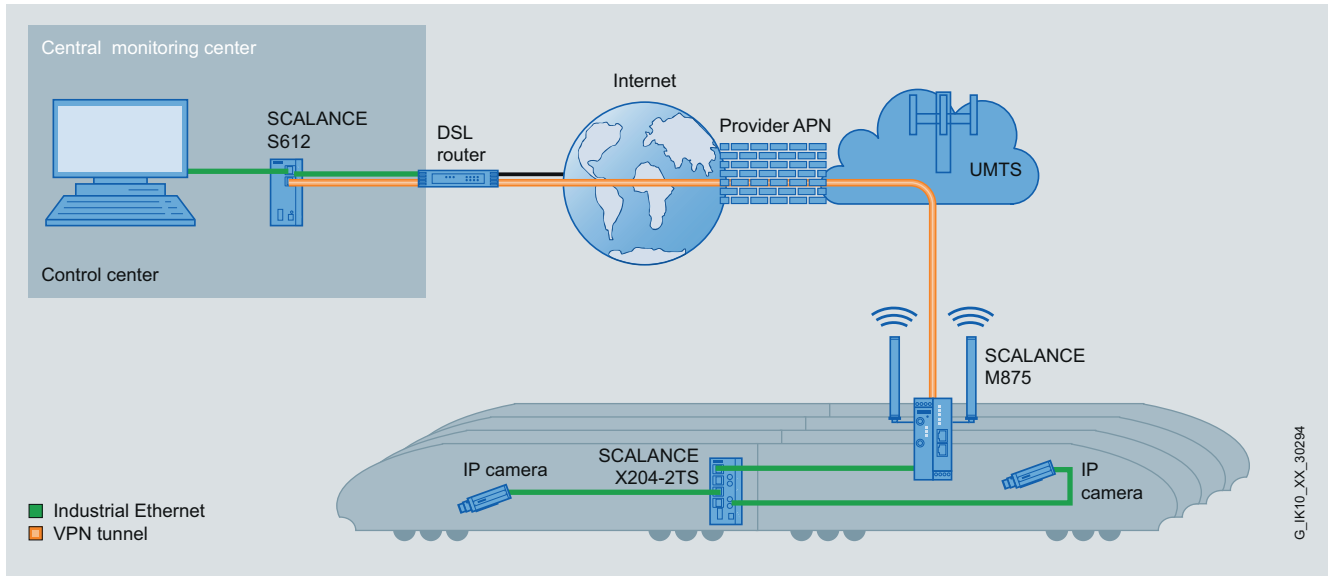
TeleControl Basic, on the other hand, is optimized for substations with a low degree of automation. The system supports an extremely large number of outlying stations, enabling many additional telecontrol applications to be implemented, for example, for monitoring mobile stations or systems for achieving energy savings.

Industrial Remote Communication also offers products and systems for cost-effective plant monitoring and maintenance from a distance (teleservice) tailored to individual customer requirements.

- SIMATIC Teleservice
- SIMATIC NET products CPs, SCALANCE M and S for IP-based teleservice
- IPC Remote Manager
- Siemens Remote Support Services

The SIMATIC NET products for **remote networks** of the new product family SCALANCE M offer further possibilities that extend beyond their use in telecontrol and teleservice applications.





Video monitoring from trains

The UMTS router SCALANCE M875, with its high downlink and uplink data rates, supports numerous data services with large bandwidth requirements via mobile wireless to and from vehicles. To increase the connection quality during motion, SCALANCE M875 is equipped with antenna diversity. Alternatively, sensitive data can be transmitted in a secure VPN tunnel.

Video transmission in real-time from the passenger cell is used to increase passenger safety (video surveillance). The video data from all vehicles is sent to a control center for monitoring and further processing.

In addition, applications such as data interfacing for ticket machines, infotainment services and Internet on Board, or proactive monitoring of vehicle engineering (telemetry) are also possible.

Condition monitoring

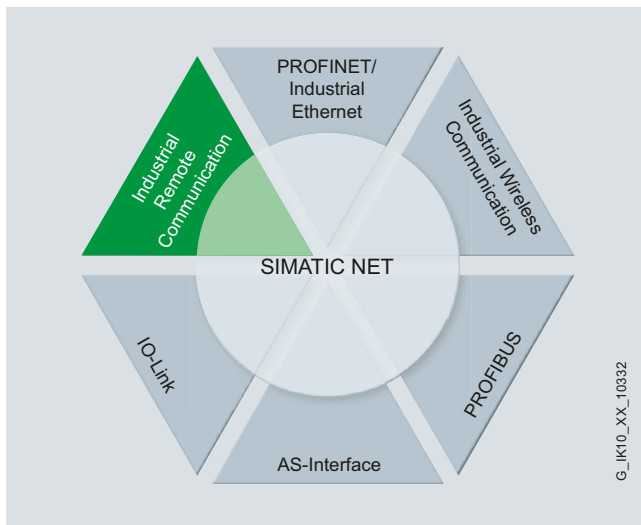
Wind power plants are getting larger and much more efficient. This has made wind power plants much more complex. Their condition must therefore be continuously monitored to predict when worn parts have to be replaced. This increases the availability of the plants and also provides the legally required degree of safety. The SCALANCE M components for mobile networks are perfect for connecting the wind power plants to a control center, due to their high data rates, high level of data security, and minimal installation costs.

Smart Grid (Energy Automation)

Today's energy supply network will undergo dramatic changes over the next few years and decades. Until now, power generation, distribution and consumption have been largely decoupled. The base load was covered by large-scale power plants and demand peaks and troughs were serviced by gas power plants and pumped-storage plants. In future the energy supply system will have to become more intelligent due to the increasing use of regenerative energy sources. Distribution stations and local network stations will be automated and interconnected. Consumption will be continuously monitored in each station and transmitted to central control desks over the remote networks with SCALANCE M.

www.siemens.com/industrial-remote-communication

Telecontrol



SIMATIC NET – Industrial Communication from Siemens

Industrial communication is of central importance for high-performance automation applications. Its diversity is mirrored in the broad range of industrial communication solutions from SIMATIC NET that extends beyond PROFINET/Industrial Ethernet: With Industrial Wireless Communication, Industrial Remote Communication, PROFIBUS, AS-Interface, and IO-Link, it covers all areas of industrial communication. The optimum solution is guaranteed for every application and every industry.

Industrial Remote Communication

Product portfolio for worldwide access to outlying plants, distant machines and mobile applications.

Siemens offers a suitable solution for every application!

Telecontrol

Comprises components and systems for secure monitoring and control of widely distributed plants over telecontrol connections with SIMATIC S7.

Teleservice

Offers components and systems for the remote maintenance of machines and plants over telephone networks, mobile networks or the Internet.

Remote networks

Offers a complete portfolio of transmission and security components for wireless or wired communication for telecontrol, teleservice and other remote applications, such as the transmission of video data.

Telecontrol involves the connection of distant process stations to one or more central control systems. Various different public or private networks can be used for communication for the purposes of monitoring and control. Event-driven or cyclic exchange of process data is performed with special telecontrol protocols and enables the operating personnel to manage the overall process effectively.

The telecontrol systems are based on SIMATIC. They supplement the SIMATIC system with corresponding hardware and software, and thus permit individual components to be networked over a WAN (Wide Area Network). The data for this is transmitted via classic WAN, e.g. dedicated copper cable, telephone network, radio, but also via IP-based networks such as mobile networks or the Internet.

TeleControl Basic – Reduced to the basics

For telecontrol solutions with a low degree of automation; the system also supports a large number of outlying stations and is ideally suited to controllers in the low-end performance range.

TeleControl Basic connects the control center via the TeleControl Server Basic control center software with the substations, consisting of SIMATIC S7-1200 controllers with CP 1242-7 GPRS module. The server also allows the connection of S7-200 and S7-300 stations with MD720-3 modems. The transmission medium is wireless GPRS technology. An S7-1200 substation permits remote communication with a control center (service center) as well as direct slave-slave communication with other S7-1200 substations. International approvals permit worldwide use.

TeleControl Server Basic with GPRS offers the following advantages:

- The worldwide mobile telephone standard for many providers
- Constant online connection with low-cost GPRS tariffs
- Data can be transferred immediately
- Station failure can be detected immediately
- Low investment costs
- No investment for communication infrastructure, as GPRS/Internet are available worldwide

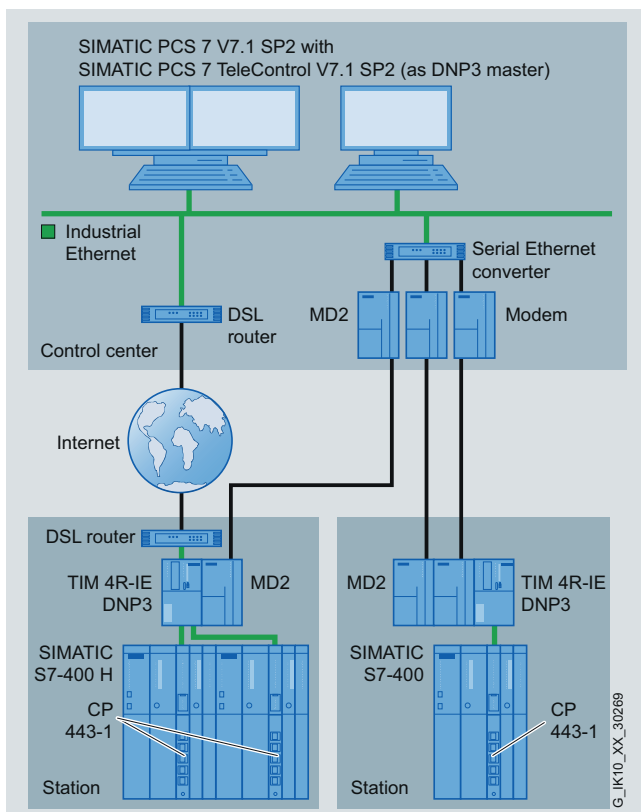
- Quick and easy commissioning due to perfectly matched system components
- Easy and convenient configuring of the outstations by several users simultaneously (multi-user capability)
- Changes and expansions during runtime without interrupting operation are possible
- User-friendly and secure alerts via multi-stage escalation management
- Connection to control center system via OPC interface

Extended TeleControl Server Basic functionalities allow the use of telecontrol server services.

The overall solution also includes the teleservice function and thus provides, for example, worldwide access to the S7-1200 stations for international plant and machine manufacturers.

TeleControl Professional – Keeping extensive process plants under control from a distance

For large-scale telecontrol solutions with a high degree of automation; the system supports a number of network topologies and communication media. Control systems such as PCS 7, WinCC and third-party control systems with OPC allow reliable control and monitoring of outstations based on the SIMATIC S7-300 and S7-400 controls.



Telecontrol application with control station and substations with DNP3

The outstations and substations can communicate with each other as well as with one or more control centers. TeleControl Professional is extremely modular and can thus be used flexibly in accordance with the customer's requirements.

Transmission networks

TeleControl Professional supports a wide variety of communication networks. In the classic WAN sector, these are:

- Dedicated lines (private or leased)
- Private wireless networks (optionally with time slots)
- Analog telephone network
- Digital ISDN network
- Mobile radio network (GSM)

TeleControl Professional also offers appropriate modems for conventional WANs. Communication, however, is also possible via Ethernet-based WAN, namely:

- Via Ethernet-based wireless systems, e.g. Industrial Wireless LAN with SCALANCE W
- Via fiber-optic conductors, e.g. through use of SCALANCE X switches with optical ports; distances of up to several hundred kilometers can then be covered
- Via public networks and Internet using DSL and/or GPRS/UMTS

There are no restrictions in terms of network combinations in a project. Star, line and node topologies can be designed, and also mixed configurations of these. A station can be linked to two transmission paths for redundant data transmission. The two paths can be of the same type or also different, e.g. dedicated line combined with telephone network or ISDN with DSL.

TeleControl Professional for the system control center

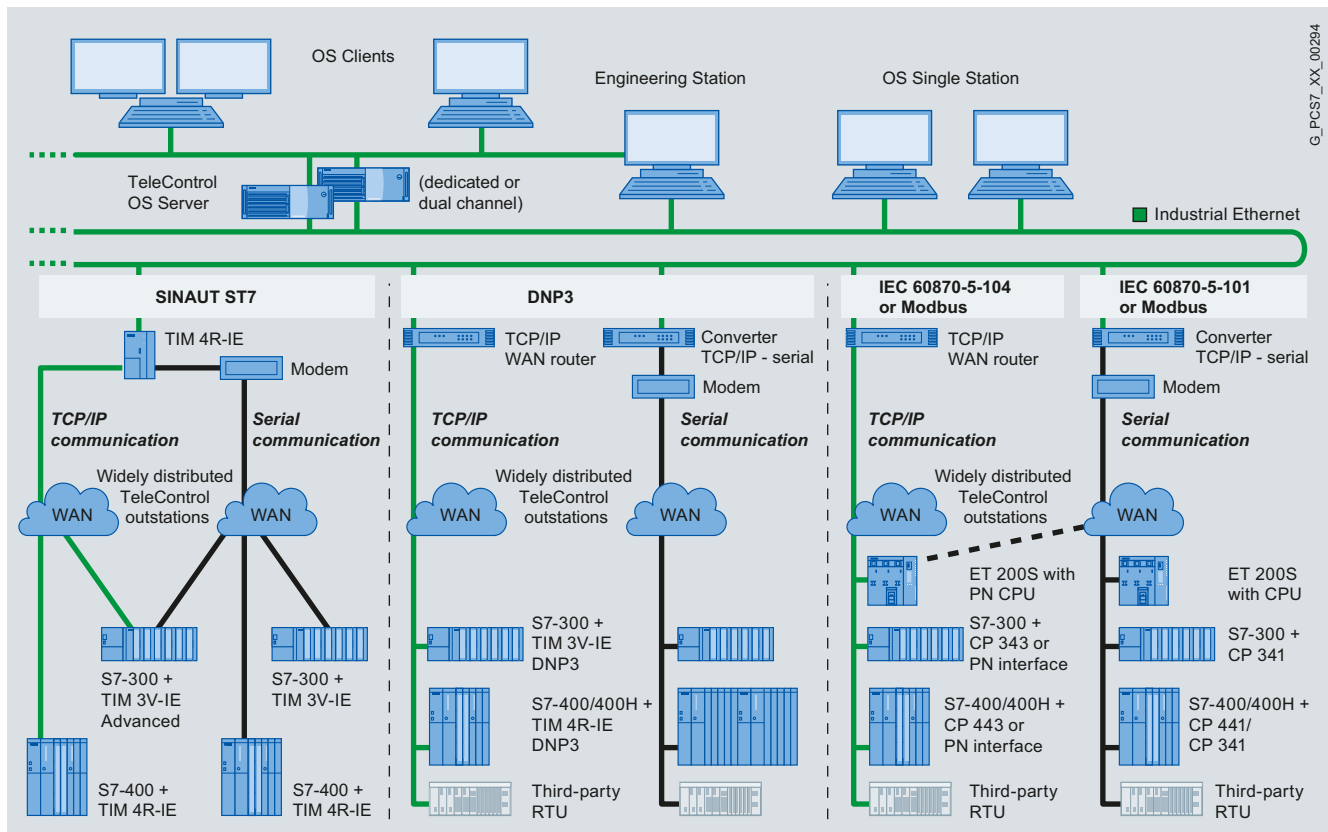
Using the SIMATIC PCS 7 or SIMATIC WinCC control systems, automation of centralized plants and monitoring of decentralized, distributed subsystems can be combined in a single system. In this way, machines and plants can be operated and monitored from a single control desk, and they can be configured using a single engineering system.

A number of different variants can be selected as components of the central control center:

SINAUT ST7cc

- Program package based on WinCC
- Ideal for SINAUT ST7
- Can be designed as a single system or a redundant system
- Supplies the archives provided in WinCC with process data in accordance with the time stamp supplied from the outstations

Telecontrol



Integration and communication options with TeleControl Professional via different protocols

SIMATIC PCS 7 TeleControl and SIMATIC WinCC TeleControl

- Based on WinCC and PCS 7, with added telecontrol interfaces
- Ideal for plants in which larger local automation tasks have to be combined with telecontrol interfaces
- SINAUT ST7, DNP3 or IEC 60870-5 protocols
- The engineering system is based on DBA technology (Data Base Automation) and has a comprehensive block library that also allows third-party telecontrol stations to be connected.

Connection to third-party control systems

Using the SINAUT ST7sc program package with OPC interface, the telecontrol stations with SINAUT ST7 can also be linked to control systems from other vendors. ST7sc has complex buffer mechanisms which prevent data loss, even if the OPC client fails.

Telecontrol stations with DNP3 can be connected to any control systems, provided they are equipped with a DNP3 master interface. Telecontrol stations based on the SIPLUS RIC (Remote Interface Control) can be connected to any control systems equipped with interfaces that comply with the IEC 60870-5 standard.

SIPLUS RIC Bundles

SIPLUS RIC offers substations for the TeleControl Professional system. This allows substations to be established on the basis of SIMATIC for the telecontrol protocols IEC 60870-5-101, -103, -104.

The SIPLUS RIC bundles generally comprise:

- CPU
- Interface/communication module
- Memory card
- CD with library and license

Remote programming and diagnostics

Program modifications or remote diagnostics are easy to carry out in the communication network both in the commissioning phase and during operation, even without interrupting the current process data communication. This saves traveling times and maintenance visits.

Extreme ambient conditions

The outstations for TeleControl Professional are also offered as variants for use under extreme ambient conditions (SIPLUS extreme components).

Teleservice (remote diagnostics and maintenance) with SIMATIC TeleService

Remote diagnostics and remote maintenance of production plants have become indispensable in modern automation technology. They are more efficient and more cost-effective than an on-site service employee. This allows faults to be detected and cleared much faster, downtimes of machines are reduced and their availability is increased.

Machines and plants are increasingly operated in places which are far away from the place of manufacture. Plant constructors must nevertheless be able to provide support in the event of a fault. Especially during the warranty period this can result in high costs. TeleService helps to reduce this risk. The possible applications for TeleService are manifold. Plants can be diagnosed, values set and data transmitted from any place on earth via a telephone cable.

TeleService also enables the SIMATIC controllers to send text messages per SMS or e-mail, making a significant contribution to saving travel and personnel costs in service work.

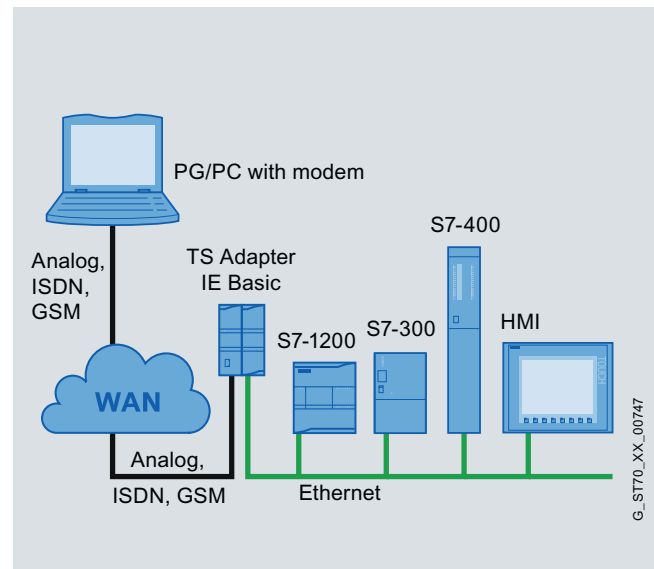
Remote connections with TeleService can be used for remote maintenance and remote linking.

Remote maintenance

Remote maintenance permits access to a CPU with STEP 7 or an HMI device over WinCC. For remote maintenance a technician dials into a remote plant by telephone. STEP 7 can be used to read status information or to correct the user program remotely.

Remote link

A remote link is a connection for data transmission. Remote connections are used to transmit data over the telephone network. TeleService supports program-controlled connection buildup between the PG or PC and automation system. Process data exchanges between several automation systems can also be coordinated.

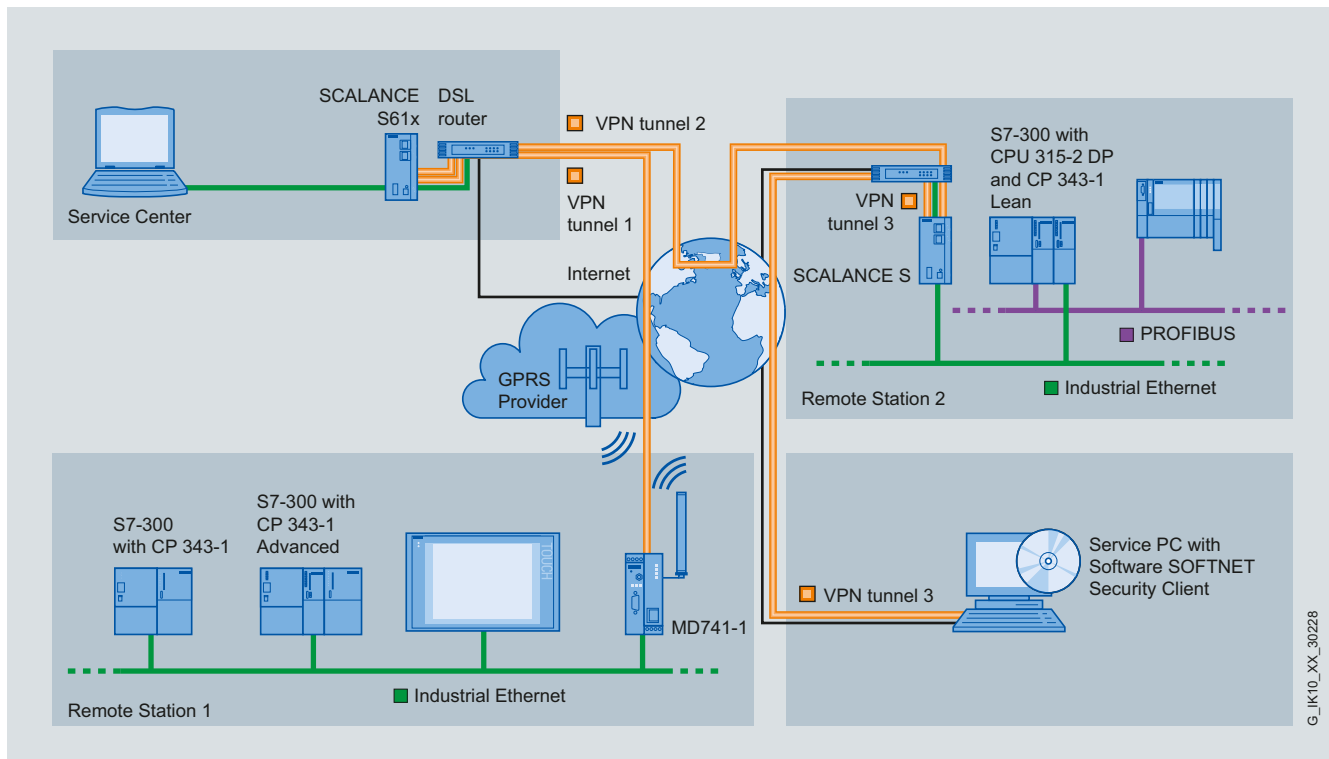


Example configuration: SIMATIC TeleService with TS Adapter IE Basic



TeleService adapter with integrated modem

Teleservice via IP-based networks



Typical remote access scenarios to distributed S7 stations via a secure GPRS-based Internet connection

Optimum remote maintenance is based on reliable, permanently available, secured and economical data connections.

Depending on the application, SIMATIC NET provides the appropriate solution:

- For continuous connections or simultaneous access to several plants, a solution using SCALANCE S is recommended, both on the service and the plant side.
- For flexible remote maintenance access from any Internet connection – whether in the office, home office or hotel room – SOFTNET Security Client is the right software solution for connecting to the SCALANCE S Security Module installed in the plant.
- For plants without wired network connection, the MD741-1 wireless router establishes remote maintenance access to the SCALANCE S in the service center.

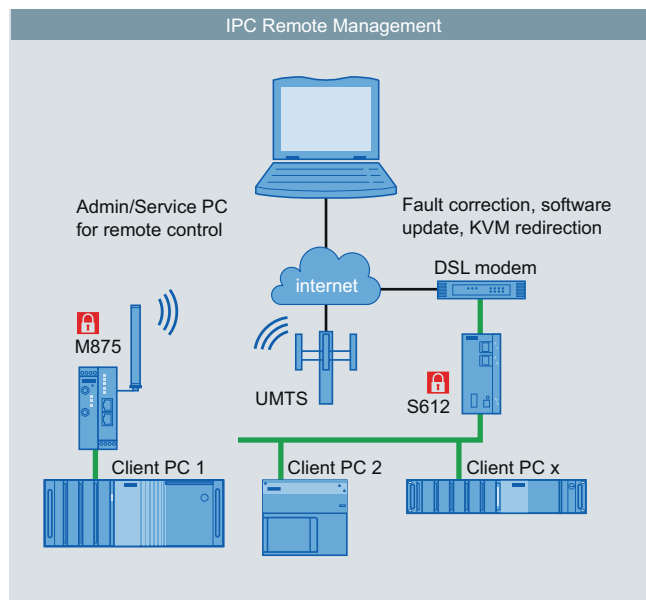
In all cases, the communication is reliably protected by authentication and encryption via a virtual private network (VPN) tunnel, in order to rule out the possibility of industrial espionage or manipulation.

The advantages at a glance

- Optimized servicing of remote plants
- Outlying stations can be reached around the world
- All remote stations can be parameterized and diagnosed using standard STEP 7 resources
- High availability of the communication by means of standardized mobile radio and Internet technology
- GPRS ensures short transmission times and continuous online connection
- Economical data transmission by billing on the basis of the data volume
- VPN functionality allows a secure, protected and encrypted data connection via the standard IPSec
- High degree of security thanks to integrated firewall
- Simple and user-friendly configuration of the VPN tunnel using the Security Configuration Tool

Teleservice with SIMATIC IPC Remote Manager

Remote maintenance and management of SIMATIC IPCs



Advantages at a glance

- Central service without on-site deployment
- Remote access via protected HTTPS or TLS link, without additional hardware and independently of the operating system
- Easy rectification of errors in the software, applications or operating system
- Rapid implementation of BIOS and program updates with a subsequent restart
- Efficient energy management and service management
- Reduced power consumption and costs due to timed coastdown, e.g. following production stop or over the weekend
- Reduced downtimes and costs since start-up and service work is performed outside the normal production times

SIMATIC IPC Remote Manager

SIMATIC IPC Remote Manager can be used to implement central service concepts in which SIMATIC IPCs can be remotely accessed by means of Intel Active Management technology functions (Intel AMT). For example, system or program errors can be rectified, or BIOS and program updates can be implemented from a control room without the need for on-site deployment.

Central activation and deactivation of systems and loading updates outside production times increases productivity and saves resources. Remote access is prohibited for unauthorized persons by means of secure connections with HTTPS (Hypertext Transfer Protocol Secure) or TLS (Transport Layer Security) encryption.

Safety note

In the case of Remote Management, suitable protective measures (including IT security such as network segmentation) should be taken in order to ensure safe operation of the plant.

For more information on the topic of industrial security, go to www.siemens.com/industrialsecurity

Functions

Keyboard Video Mouse Redirection (KVM)

The keyboard-video-mouse signal can be redirected to or from a computer in the IT department, so that an administrator can operate the computer remotely without additional hardware.

Remote Power Control

You can reduce the energy/operating costs with targeted switching on and off. The computer can be shut down at night or at the weekend, or it can be switched on temporarily for an update. A reset is possible at any time.

Remote reboot

The computer can be rebooted from a hard disk, CD or a network drive which saves the service engineer time-consuming and expensive traveling.

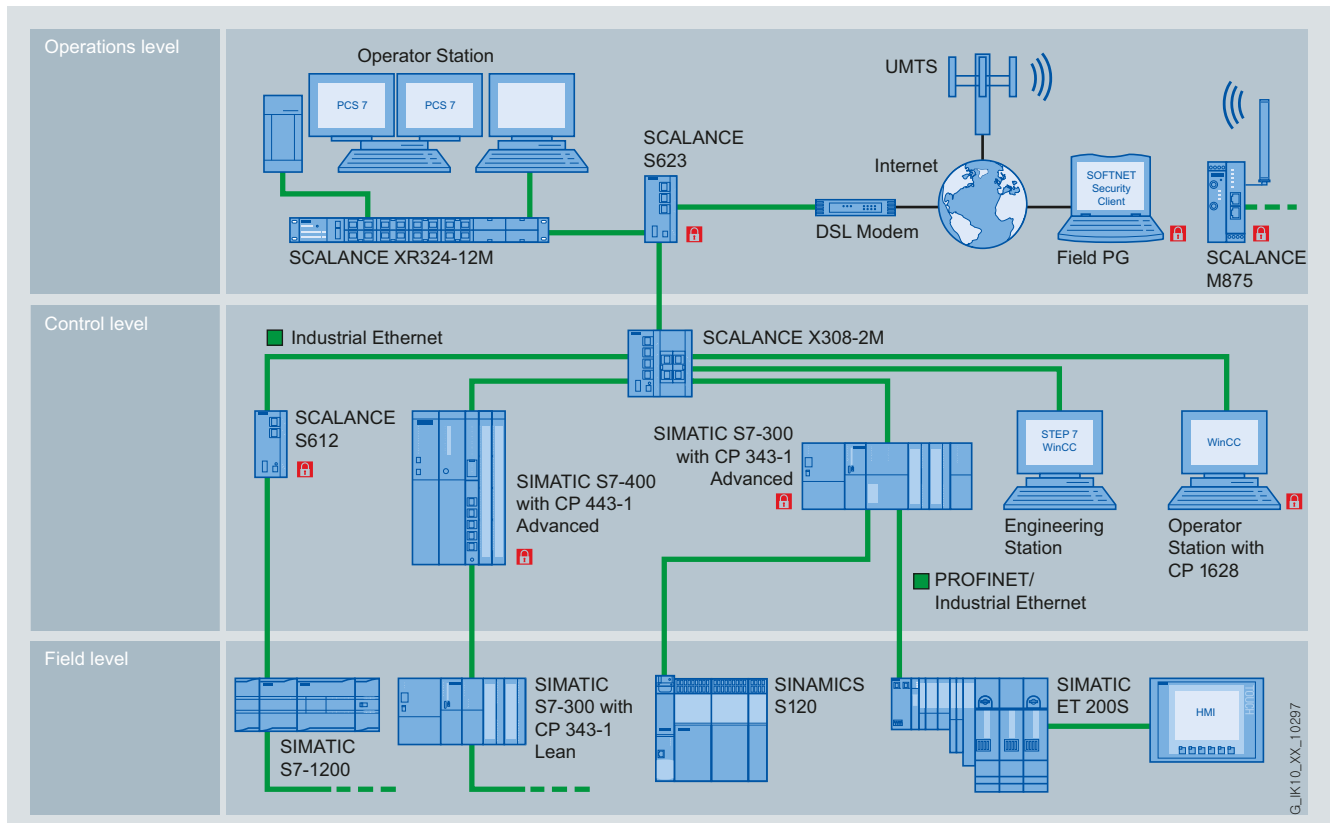
IDE redirection

To prevent time-consuming handling, for example, an ISO file located on a hard drive of the IT Management Console can be made available as a CD-ROM drive.

Siemens Remote Services

The service concept of Siemens Remote Services provides a powerful, secure platform for remote access to machines and plants. The inclusion of "Shared Experts" ensures effective support, not only from Siemens but also from the internal company specialists.

Industrial Security & Safety Integrated



Implementation of the cell protection concept by means of SCALANCE S and components with Security Integrated

Modern automation systems must be secure. The terms "secure" or "security" have different meanings in connection with programmable controllers and networks.

- Information security – Security
- Machine safety – Safety

New challenges for automation networks

Communication and the increasing networking of individual manufacturing cells are of great importance in automation technology. It is becoming more and more important to integrate all the manufacturing components into an integrated network that merges with the office network.

Industrial communication interacts increasingly with the IT environment and is subjected to the same dangers that are known from the office and IT environment, such as hackers, viruses, worms and Trojan horses.

With the cell protection concept, a plant network is subdivided into individual protected automation cells to secure the automation system. All devices are able to communicate with each other securely within an individual automation cell. The individual cells are connected to the overall network protected by a VPN and firewall.

Integrated security functions are available for the security of PCs and controls:

- User Management and Role Based Access Control with SIMATIC Logon for SIMATIC engineering and runtime systems
- Know-how protection by means of encryption of the user program for SIMATIC Controllers
- Whitelisting for secure operation of the SCADA System SIMATIC WinCC and the SIMATIC PCS 7 process control system

Professional services such as workshops and training, whitelisting packages, and firewalls, along with customer-specific solutions ensure holistic and sustainable security concepts. This reduces the susceptibility to failure of the entire production plant and thus increases its availability.

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Fail-safe communication PROFIsafe

Expansion by PROFINET

This range has been expanded by PROFINET-enabled components, thus providing a complete product range with fail-safe controllers, fail-safe I/O and a corresponding engineering environment. This includes controllers for the mid to upper performance range, digital input/output modules, motor starters and frequency converters with IP20 and also with IP65/67 degree of protection for a cabinet-free configuration. The fail-safe controllers have interfaces for PROFIBUS and PROFINET. The fail-safe input/output modules can be operated via corresponding interface modules either on PROFIBUS or PROFINET.

PROFIsafe protocol

The communication between the fail-safe controllers (SIMATIC, SINUMERIK) and the fail-safe I/Os takes place via the protocol profile initially developed for PROFIBUS DP, i.e. "PROFIsafe". PROFIsafe was the first communication standard according to IEC 61508 that permits both standard and safety-related communication on one bus. With SIL 3 and PL e, PROFIsafe meets the strictest requirements in the production and process industry. PROFIsafe is tested and authorized by the TÜV Group (German Technical Inspectorate) and by the BGIA (institute for work safety of the statutory industrial accident institutions).

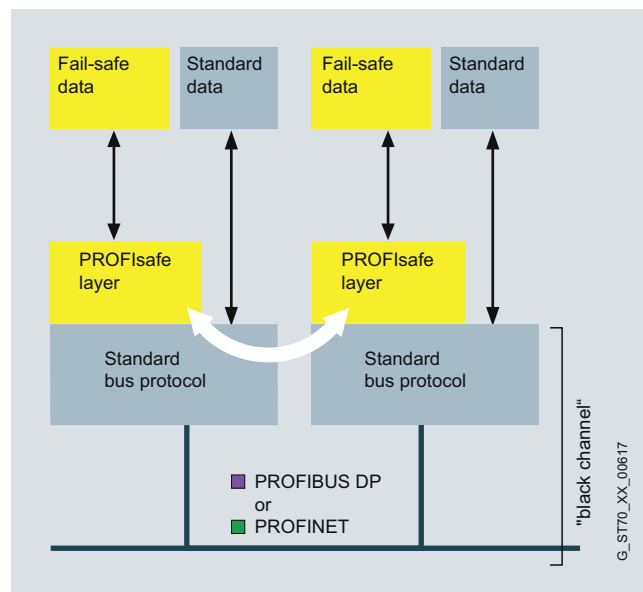
Openness of PROFIsafe

The PROFIsafe protocol V2 supports secure communication for the open standard buses – whether it is the proven PROFIBUS DP or all variants of the new, fast bus system PROFINET IO. With the transmission variant PROFIBUS PA (IEC 61158-2), the integrity of the distributed automation extends into the processing world, e.g. in hazardous environments. PROFIsafe is also used in modern radio technology.

PROFIsafe functionality

PROFIsafe prevents errors such as false addressing, loss, delay, etc. when transmitting messages, e.g. by consecutive numbering of the PROFIsafe data and time monitoring.

By means of slave nodes, safety-related encoder signals of a BUS node reach the safety-oriented CPU. After these sensor signals are linked, a corresponding output signal is sent to a fail-safe slave. The transmission takes place on a single channel without the use of a redundant path.



Transmission of safety-oriented and standard data with PROFIsafe

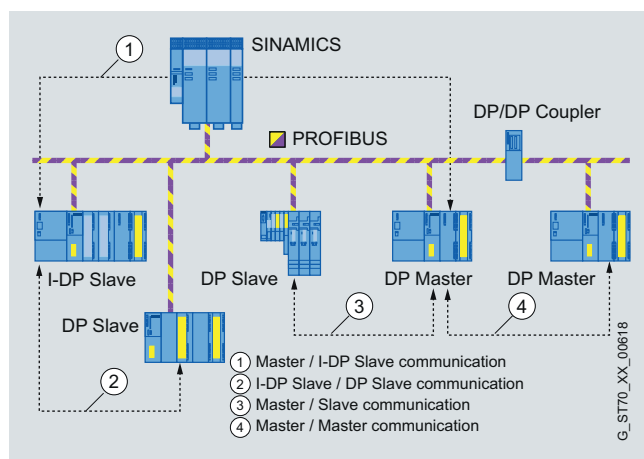
Some advantages of Safety Integrated at a glance

- The same operating philosophy for standard and safety-oriented automation
- One PROFIBUS/PROFINET cable for standard and safety-related communication
- Uniform configuration of the standard and safety-oriented communication
- One engineering tool for creating both standard and safety programs
- Ability to conveniently duplicate a solution on multiple machines/systems by copying the safety program
- Common data management for standard and safety program
- Shorter downtimes due to integrated diagnostics from the sensor and controller to the HMI system
- Support of fail-safe communication also via Wireless LAN

Communication options with the PROFI-safe profile

PROFIBUS

- Master/master communication between DP masters across subnet limits – for example, between fail-safe CPUs via DP/DP coupler
- Master to I-DP slave communication between DP master and I-DP slave in the same subnet – for example, between fail-safe CPU and ET 200S CPU
- Master to slave communications between DP master and DP slave in the same subnet – for example, between fail-safe CPU and ET 200 system with fail-safe modules
- Direct communication between I-DP-Slave and DP-Slave without switching the DP master – for example, between intelligent slave (fail-safe CPU) and slave (ET 200 with fail-safe modules). No fail-safe DP master is needed for this (fail-safe CPU), a standard DP master is sufficient.

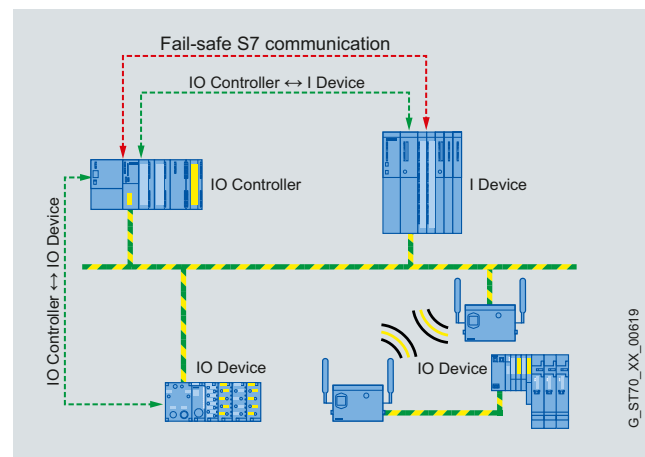


Fail-safe communications via PROFIBUS

PROFINET

PROFINET provides the following options for fail-safe communication:

- Fail-safe communication between CPUs beyond the boundaries of the subnet, e.g. with PN to PN coupler (not shown in the figure) or S7 communication
- Fail-safe communication between IO Controller and I Device in the same subnet
- Fail-safe communication between IO Controller and IO Device in the same subnet
- These communication channels are also possible wirelessly using the appropriate SCALANCE components
- The Shared Device function also enables two different IO Controllers to access the same IO Device simultaneously

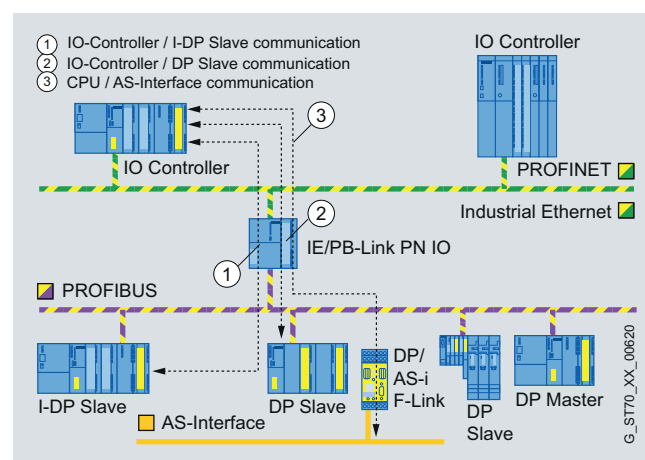


Fail-safe communication via PROFINET

Network transitions

Network transitions enable fail-safe communication between different bus systems:

- Communication between IO Controller and DP slave, for example, via IE/PB Link PN IO
- Master/slave communication between IO Controller and intelligent DP slave – for example, via IE/PB link
- Communication between CPU and AS-interface: with the DP/ASi F link fail-safe signals can be read in at the AS-Interface and the fail-safe CPU made available via PROFI-safe
- All SIMATIC components also can be accessed throughout the system via bus systems. You can access all devices from any access point in the plant.



Fail-safe communication via network transitions

Fail-safe communication – ASIsafe

The fail-safe components are part of Safety Integrated, the Siemens safety program based on devices for safe acquisition, analysis and response. ASIsafe and PROFIsafe are used for fail-safe communication.

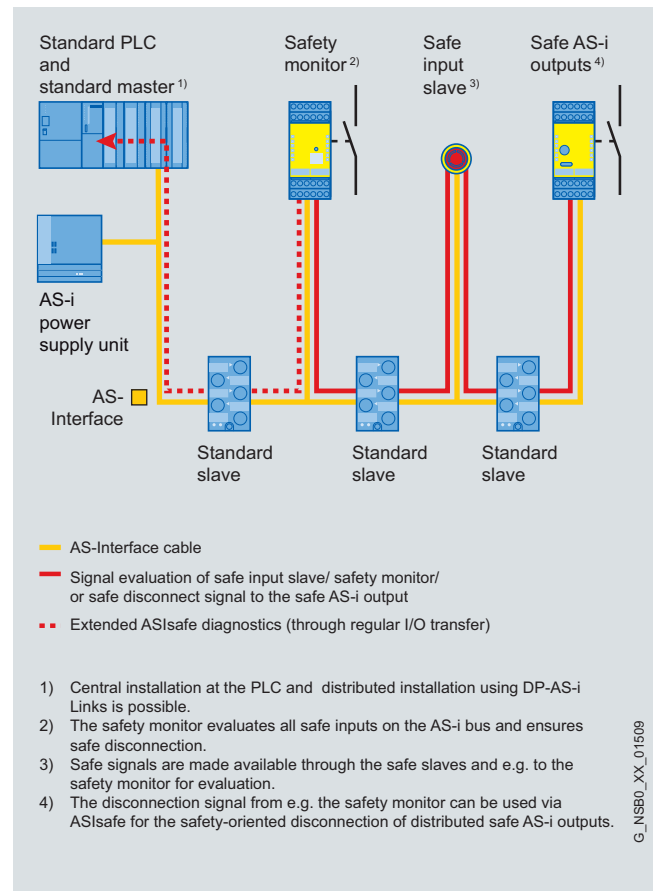
The "ASIsafe" concept supports direct integration of safety-related components, such as EMERGENCY-STOP switches, protective door switches or safety light arrays, on the AS-Interface network. These are fully compatible with the familiar AS-Interface components (masters, slaves, power supply, repeaters, etc.) in accordance with EN 62026-2 and are operated in conjunction with them on the yellow AS-Interface cable. Thus, safety-related shutdown is possible with ASIsafe up to Category 4/PL e (DIN EN ISO 13849-1) or SIL 3 (IEC 61508) while retaining the advantages of a simple, inexpensive wiring option.

Some advantages at a glance

- Bus-based security solutions, autonomous and available, also independent of higher-level bus and automation systems
- Low-cost configuration possible without a fail-safe PLC or special master
- Greater flexibility due to software-supported graphical configuration
- Ability to conveniently duplicate a solution on multiple machines/systems by copying the safety program
- Fast overview of safety functionality of the system available using a simple graphics tool
- Simple direct integration of hardware such as emergency stop switches, protective door switches, or safety light arrays using integrated AS-Interface slaves

ASIsafe Solution local: the safety monitor

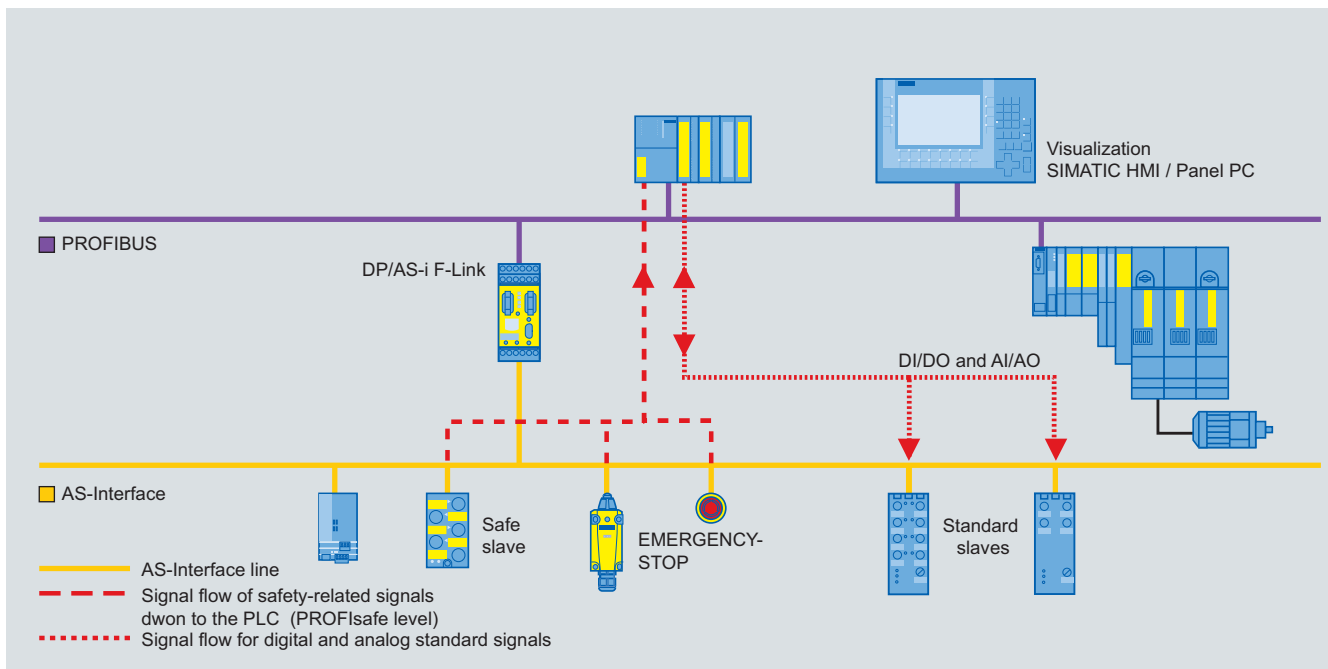
For the local ASIsafe solution, the safety monitor monitors the safe inputs and sensors, which are acquired via the safe slaves, links them using a parameterizable logic, and ensures safe shutdown by means of built-in safety relays.



ASIsafe Solution local: Design and components

In the event of a tripping operation or a communication failure, the safety monitor disconnects its two-channel enabling circuits with a maximum response time of 40 ms. At the same time as the second enabling circuit of the safety monitor, distributed valves or motor starters could also be activated for safety via ASIsafe (device version 3).

All of the data is transferred via a dynamic, safe protocol. In each bus cycle, the safety monitor expects from each slave a specific message frame that changes continuously in accordance with a defined algorithm. The asimon configuration software is used to parameterize the shutdown logic of the safety monitor and it can respond accordingly in each case when the safe nodes trip. The safety monitor can be diagnosed via the controller. No additional wiring is necessary for the safety components. Ready-made images for operating and monitoring tasks allow users to visualize the safety-oriented events on SIMATIC HMI Panels.



ASIsafe Solution PROFIsafe: Design and components

ASIsafe Solution PROFIsafe: the DP/AS-i F-Link

The DP/AS-i F-Link allows the use of AS-Interface among fail-safe SIMATIC or SINUMERIK controllers and converts the ASIsafe input signals into the PROFIsafe protocol. The acquisition of safe signals is done with ASIsafe modules or safety sensors with an integrated ASIsafe slave.

The existing fail-safe controller takes over the analysis. On the PROFIsafe level, the F-Link is the best choice:

- When large quantities of safe slaves are used
- When numerous trip circuits have been installed
- For safety-oriented further processing at the higher-level fieldbus levels
- For extensive, nested logical operations

Configuration and parameterization are done via STEP 7 HW-Config. The safe logic is programmed with the resources of STEP 7 Distributed Safety in F-LAD or F-FBD.

Diagnosis is carried out using the system functions provided by STEP 7 as well as locally on the devices by means of messages on the display.

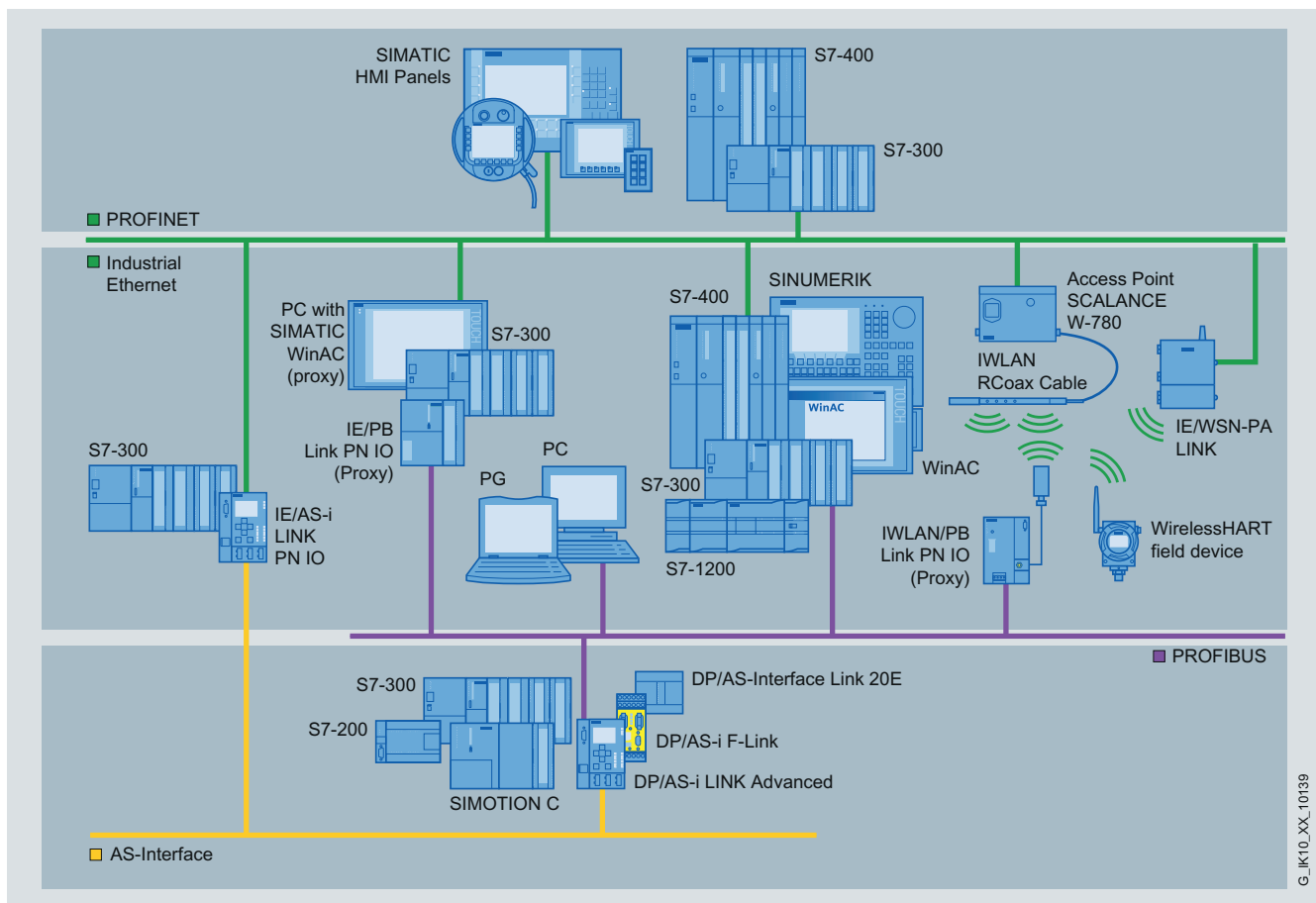
Configuration software asimon V3

- Pixel-graphics editor for the safety logic
- Expanded functionality, e.g. filtering out of transient single-channel interruptions in the sensor circuit
- Activation of safe AS-i actuators
- Coupling of several safe AS-i networks



Fail-safe network transition
DP/AS-i F-Link

Network transitions



Network transitions between the bus systems

Network transitions between one bus system and another are implemented using links, PLCs or PCs. In the case of controllers or IPCs, this can take place via integrated interfaces and communications processors (CPs). Links pass on the data from one network to the other without further linking. The following links are available:

- IE/WSN-PA LINK for the network transition between WirelessHART and Industrial Ethernet
- IE/PB Link PN IO for the transition from PROFINET/Industrial Ethernet to PROFIBUS
- IE/AS-i LINK PN IO for the transition from Industrial Ethernet to AS-Interface
- IWLAN/PB Link PN IO for the transition from IWLAN to PROFIBUS
- DP/AS-i LINK Advanced, DP/AS-Interface Link 20E and DP/AS-i F-Link for the transition from PROFIBUS to AS-Interface

For controllers such as SIMATIC S7-1200, S7-300, S7-400, SINUMERIK or SIMOTION C, data is exchanged between the individual networks via communication processors or integrated interfaces. The data is linked by means of a PLC, and therefore passed on to the other network already preprocessed.

PROFINET network transition with proxy functionality

PROFIBUS segments can be connected to an Industrial Ethernet via devices with proxy functions, PROFINET proxies. This connection can be made not only with the SIMATIC WinAC PN optional package, SIMATIC S7-300/400 CPUs with DP and PN interface, but also via the IE/PB Link PN IO.

For a wireless network transition, a SCALANCE W-700 access point with the IWLAN/PB Link PN IO can be used. This allows all PROFIBUS standard slaves to be used unchanged for PROFINET.

Fault-tolerant communication and redundancy

Process or field communication

Production plants are designed and calculated for 24-hour operation. The consequences of a system failure are costly downtimes, high restarting costs and the loss of valuable data or materials. Redundant control systems, such as the SIMATIC S7-H system, protect against failures of the automation systems.

High-availability systems

Flexible modular redundancy (FMR)

The design of the S7-400H system is unique thanks to its flexibility, modularity and redundancy.

The configuration of controller, I/Os and fieldbus can be tailored to requirements. Single and double redundancies can be mixed in one and the same system and coordinated with each other.

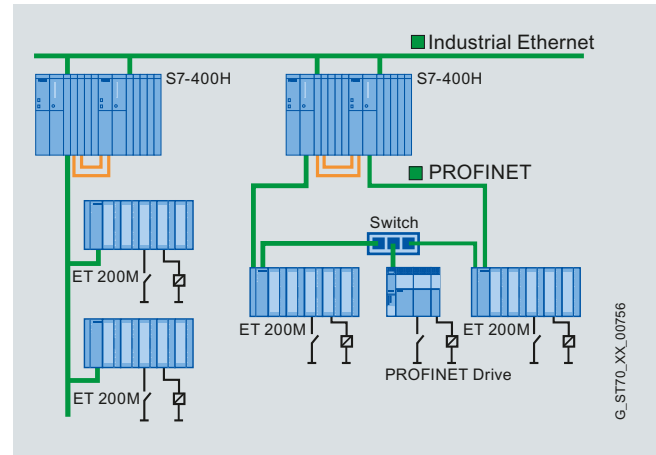
Thanks to this flexibility, redundancy only has to be provided where it is actually needed. This enables more attractive and cost-effective solutions than conventional architectures with uniform design.

I/O

The I/O can be connected flexibly via PROFIBUS and PROFINET. PROFIBUS and PROFINET configurations can be combined with one another.

PROFIBUS can provide a one-way interface (normal availability) or a switched interface (increased availability).

PROFINET provides a one-way interface (normal availability) or a system-redundant interface via open ring. Availability in the open ring increases when devices that support PROFINET IO system redundancy are connected, such as the SIMATIC ET 200M distributed I/O device.

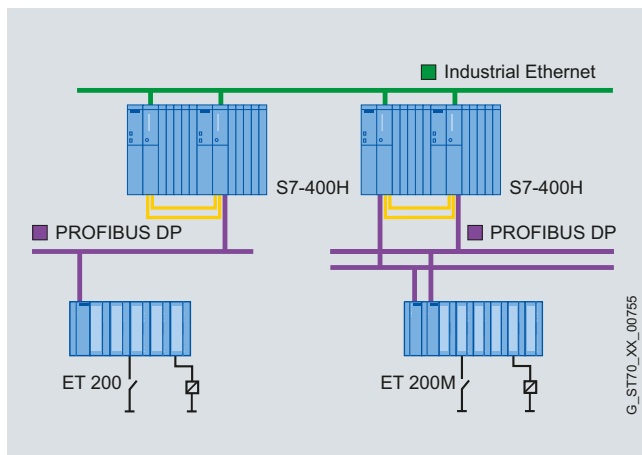


One-way (left) or switched (right) I/O interface via PROFINET

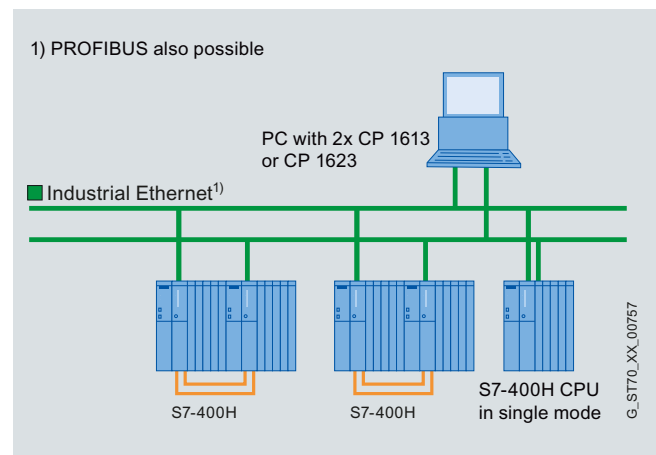
Communication

Fault-tolerant communication for redundant connections is already integrated into the SIMATIC S7-400H.

In the event of a fault, the fault-tolerant communication link can take over automatically, and invisibly to the user. When connecting the I/O via PROFIBUS, the internal PROFINET interface can be used for communication.



One-way (left) or switched (right) I/O interface via PROFIBUS



Fault-tolerant communication

Redundancy

Redundant networks

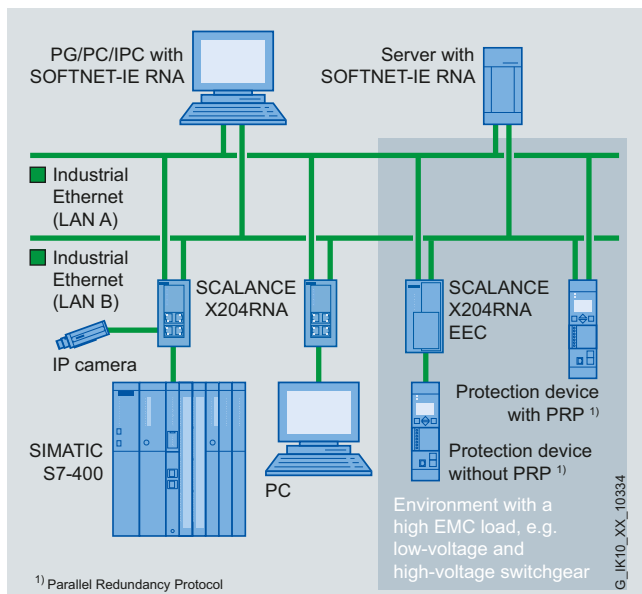
S7-REDCONNECT provides for problem-free communication from PC applications (e.g. WinCC) via redundant networks with S7-400H. PC applications that already use S7 communication today (e.g. via the OPC interface) can be adopted unchanged.

Media redundancy

To achieve the extremely fast response times required by industry, SIMATIC NET uses a specially developed procedure for controlling redundancy. The reconfiguration of a network after a fault (cable break or failure of a switch) to a functioning network infrastructure is thus ensured and no logical connections are disconnected.

Parallel Redundancy Protocol (PRP)

The PRP (IEC 62439-3) redundancy procedure is based on double transmission of message frames over two separate networks.



Application example with the PRP redundancy procedure

At the sender, the software SOFTNET-IE RNA or the network access point SCALANCE X-200RNA duplicates the message frame arriving from the sender (e.g. a PC) and feeds one message frame into each of the two networks. The message frame will always be transmitted without delay, even in the event of a fault, because there is no need for reconfiguration of the network. The procedure is transparent to the application (e.g. PCS 7) in the PC.

Media redundancy MRP and MRPD

Higher plant availability can be achieved by means of a redundant installation (ring topology). The media redundancy can be created on the one hand by means of switches, and on the other hand direct via the PROFINET interfaces on SIMATIC controllers and distributed I/Os.

Thanks to the MRP (IEC 61158 Type 10), reconfiguration times of just 200 ms, depending on number of stations, can be achieved. In the event of a break in communication in just one part of the ring installation this means that a plant standstill is prevented.

High network availability can be achieved without reconfiguration time using the MRPD procedure (Media Redundancy for Planned Duplication).

Router redundancy

Layer 3 switches support router redundancy in order to increase the availability of a network considerably and is therefore suitable for use in high-performance plant networks (e.g. with high-speed redundancy). Due to the modular design, the switch can be adapted to the task at hand. Due to the support of IT standards (e.g. VLAN, IGMP, RSTP), the seamless integration of automation networks into existing office networks is possible. Routing functions on Layer 3 support communication between different IP subnets.

Database connection



Database connection with Industrial Ethernet and CP 343-1 ERPC

The availability of production data in higher level databases for analyses and subsequently the optimization of processes is essential for the lasting success of businesses, but has until now been associated with certain expense.

Connection to databases can be configured without intermediate network transitions or PCs. The path leads via controllers at the control level with connection to databases via Industrial Ethernet.

The communication processor CP 343-1 ERPC, together with a partner software package, connects the SIMATIC S7-300 Controller directly to databases over Industrial Ethernet and converts the data between formats as required.

Simple solutions to demanding problems

In addition to the familiar communication possibilities with programming devices, operator control and monitoring devices and SIMATIC S7 systems, direct interfacing to database applications such as ORACLE, MySQL, MS-SQL and DB2 can be implemented easily. Controllers can therefore be supplied by means of CP 343-1 ERPC with data or orders from the databases of the Manufacturing Execution Systems (MES) or the Enterprise Resource Planning (ERP) level.

Diagnostics

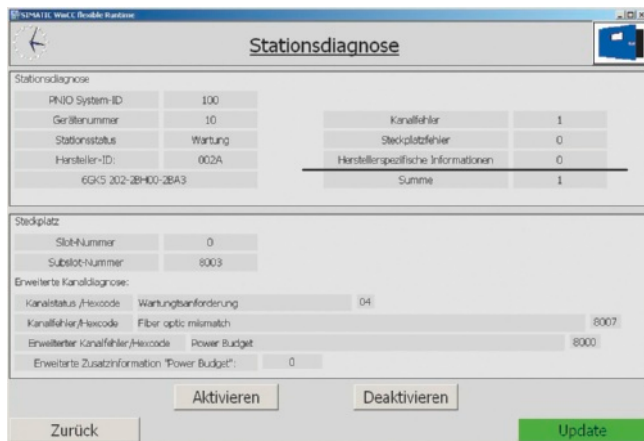
Network and device diagnostics simplify commissioning and the operation of the system. They keep network failures to a minimum and increase the operational reliability and system availability.

Diagnostics on Industrial Ethernet/PROFINET

The exchange of process and control data almost always takes place via Industrial Ethernet/PROFINET in modern production plants. Diagnostics are indispensable for this. Most analysis and management systems are complicated and expensive, however.

Diagnostics concept

PROFINET IO supports an integrated diagnostics concept for being able to efficiently find and clear any faults. If a fault occurs, the faulty IO device sends a diagnostic alarm to the IO controller. This in turn calls up a corresponding program routine in the user program in order to respond to faults. Alternatively, diagnostic information can be read directly from the field device (IO device) and displayed on an IO supervisor (PG or PC). The IO device then generates a diagnostic alarm if a fault occurs on a channel. An acknowledgement mechanism allows the faults to be processed sequentially in the IO controller.



Integrated diagnostics concept: graphical display of system faults on the HMI

Within the scope of Totally Integrated Automation, Siemens provides the freely downloadable PNIODiag diagnostics package on the Internet, in order to simplify the diagnostic analysis of distributed I/O systems in connection with SIMATIC S7.

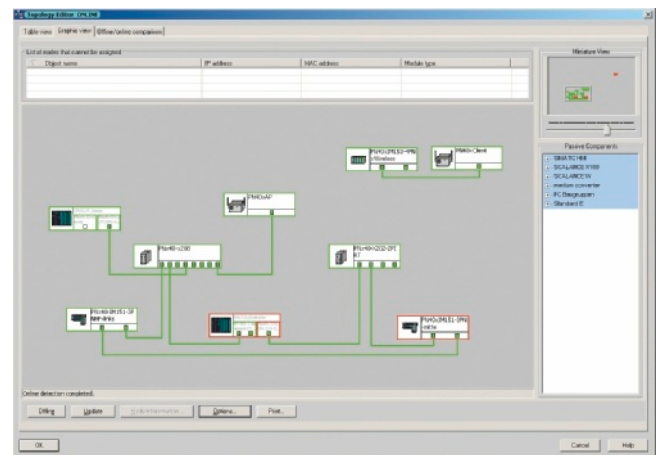
A function block in the CPU determines such things as:

- the statuses of the connected I/O systems and
- the station statuses of an I/O system.

The diagnostic analysis and operation are done completely via the visualization with WinCC flexible or WinCC.

The SCALANCE network technology is also integrated in this system solution. The tried and tested Industrial Ethernet switches are configured with STEP 7 and diagnosed during operation like field devices. The diagnostic information is processed in the PLC user program. This integrated functionality has advantages for engineering, commissioning and operation of the plant.

Topological plant view for more transparency



Topology editor: graphical representation of communicating ports

For PROFINET networks, the topology editor in SIMATIC STEP 7 or SIMOTION SCOUT can graphically display the port interconnections of the devices quickly and easily. Devices can be combined into groups so that the presentation is clearer when there are large numbers of components. In addition, SIMATIC IPCs and HMI stations are recognized and displayed. An of-line/online comparison identifies the communicating ports and presents them in tabular or graphical form.

By detecting, presenting and monitoring the physical connections between devices on PROFINET IO, the administrator can monitor and service complex networks easily. In addition, with the topology editor the user receives comprehensive diagnostics functions for all of the components during operation and support in generating the system documentation.

Diagnostics

Swapping a device without PG or swap medium

If a device has to be swapped in the event of a failure, a set-point topology is specified via the topology editor or it is acquired online. The replacement device must be installed in the same location with the same port cabling.

The IO controller can accommodate the device independently in the production communication.

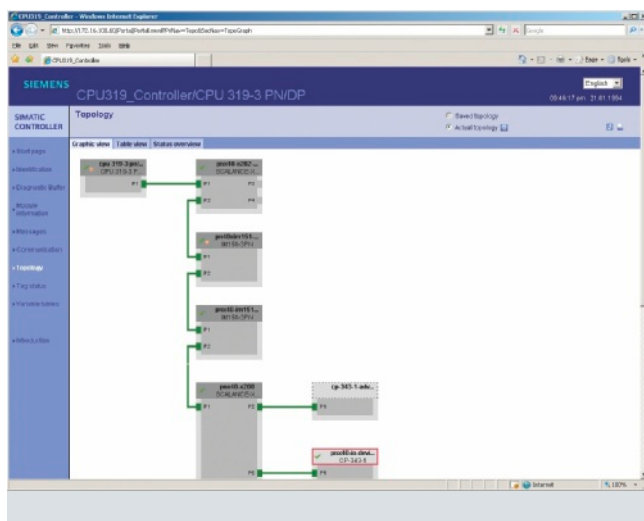
Electronic rating plate

The "electronic rating plate", e.g. for SIMATIC ET 200 field devices, simplifies maintenance planning. Specifying the manufacturer and serial number, for example, allows the respective device to be identified. Other data, e.g. plant ID, installation date, facilitate the maintenance itself.

Diagnostics via the web

System diagnostics

Via integrated Web servers, template diagnostics pages can be called up from any location in the plant using standard Web browsers. In this way, the topology and module status of connected PROFINET and PROFIBUS field devices can be displayed. The module status and variable status are automatically updated. Various controllers, communications processors and network components support the diagnostics via IT functions.



Graphical topology display in the Internet browser

Process diagnostics

Via the PLC program, simple process diagnostics can be implemented via e-mail, via FTP functions or custom dynamic web-sites. This is supported by various Industrial Ethernet communications processors.

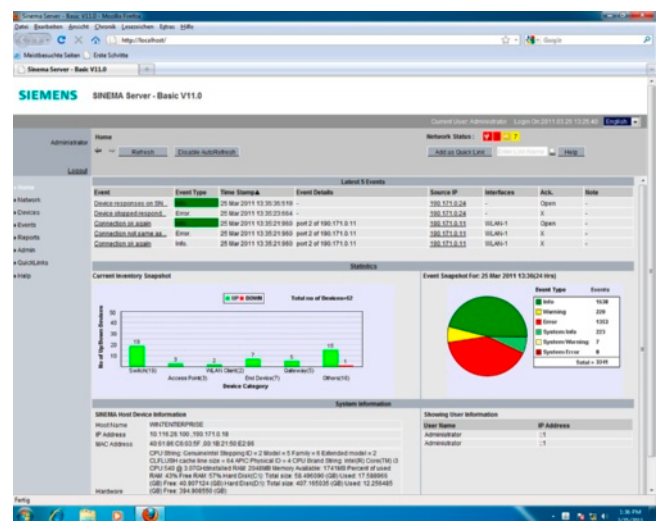
SINEMA Server network management

The SINEMA Server (SIMATIC Network Manager) network management software diagnoses and visualizes Ethernet networks. It permanently logs the network activity via various protocols, recognizes topologies, and creates network statistics. These can be displayed graphically and, if desired, also enhanced using individual diagnostics screens.

SINEMA Server can be easily integrated into HMI systems such as SIMATIC WinCC. The SINEMA user interface and the available features are accessible via the browser from any computers on the network. Changes in the network are also accordingly logged and archived in a database.

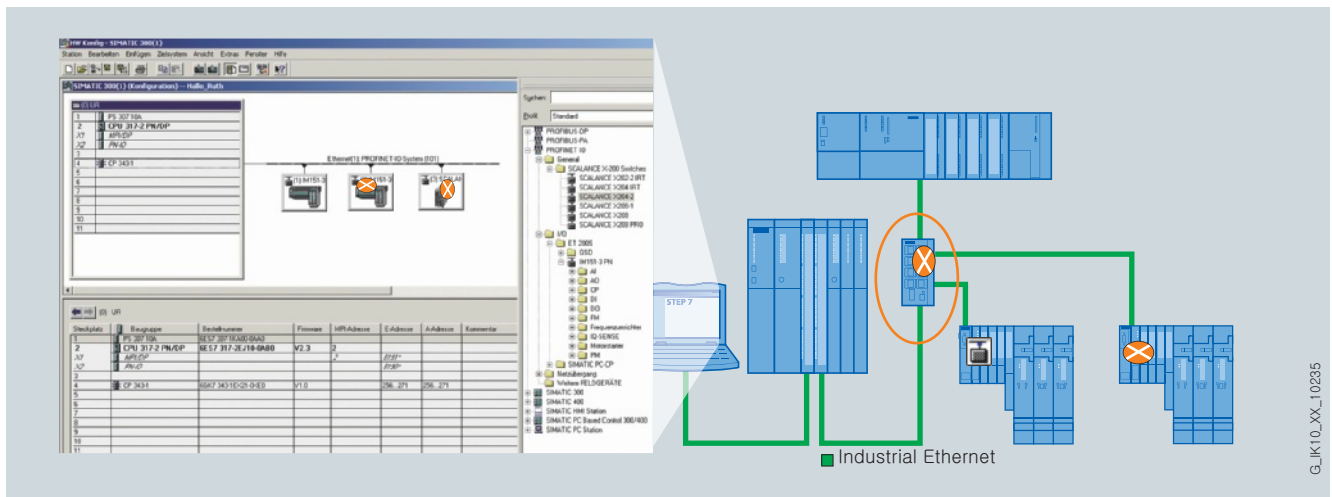
Diagnostics options with Industrial Ethernet switches

- Call-up of status information about the network status
- On-site diagnostics for data traffic via LED
- Remote diagnostics, integrated in STEP 7
- PROFINET diagnostics
- Cable diagnostics for POF cables



Visualization of Ethernet networks with SINEMA Server

Diagnostics



SIMATIC STEP 7: Uniform diagnostics view for network components and field devices

Diagnostics for PROFIBUS

Commissioning with the bus tester

The BT200 bus tester can ensure the functional capability of bus segments in offline mode, i.e. without a connected master.

The bus tester provides the following functions, for example:

- Bus cable diagnostics, e.g. broken cable, short circuit
- Testing of the PROFIBUS interfaces of master and slaves
- Testing of the availability of all slaves (life list)

Operating with the diagnostics repeater

The diagnostics repeater is available for cable diagnostics during normal operating conditions. It shows the topology of the automation system and detects the following cable faults, for example:

- Wire break
- Short circuit in signal lines
- Missing bus terminating resistors







Modules with diagnostics functionality

Diagnostics in STEP 7/SIMOTION SCOUT

STEP 7/SIMOTION SCOUT provide an "overview diagnostics". Diagnostics symbols refer to diagnostic information of the monitored devices (e.g. PROFIBUS slave faulted). A detail window shows additional information with exhaustive fault information for the individual modules (module status), e.g.:

- Module slot
- Channel number
- Cause of fault in plain text

Practical data

Communication Systems Compared in Practice					
	Industrial Ethernet	PROFINET	PROFIBUS DP	AS-Interface	IO-Link
Criteria					
Data rate	10/100 Mbit/s 1/10 Gbit/s (only 100 Mbit/s for PROFINET)	9.6 Kbit/s – 12 Mbit/s adjustable 31.25 Kbit/s ¹⁾	Send cycles 5 ms	4.8/38.4 Kbit/s or SIO (switching operation)	
Number of nodes Maximum	more than 1000	125	62	2	
		125 DP/PA links ¹⁾ 31 field devices per ¹⁾ DP/PA link			
Length of the network	Between two nodes: ■ electrical up to 100 m ■ optical up to 5 km (multimode) or up to 120 km (singlemode)	For the entire network: ■ electrical up to max. 10 km: - without repeater up to 1 km - with repeater up to 10 km ■ optically with optical link modules (OLM) up to 1875 km	For the entire network: ■ electrical up to max. 600 m: - with extension plug up to 200 m - with repeater or extender up to 300 m - with repeater and extension plug up to 600 m	■ electrical up to 20 m	
Topology	Line Tree Ring Star 	Line Tree Ring Star 	Line Tree Star 	Point-to-point 	
Power supply	- separate 24 V DC - Power-over-Ethernet (PoE)	separate 24 V DC (also via hybrid cable)	Sensors and modules: over bus cable actuators: over U _{AUX} 2 V DC (standard case) or over bus cable (30 V)	integrated	
Fail-safe communication	PROFIsafe SIL3, PL e	PROFIsafe SIL3, PL e	ASIsafe SIL3, PL e	–	

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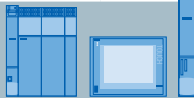

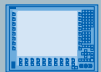



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¹⁾ For PROFIBUS PA

The table contains empirical values that can serve as recommendations for selecting the optimum network.

Devices and services for Industrial Ethernet

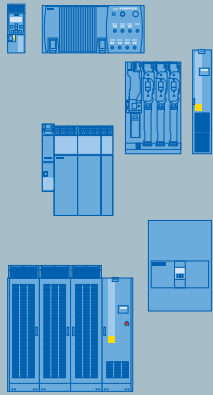




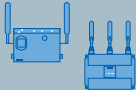

Communications processors (CP) and network components – supported functions

The following products support the listed functions or can be used in combination with these functions		Product	PG/OP	S7 communication	Open communication	PROFINET	Web diagnostics	PROFIsafe
SIMATIC								
S7-200		CP 243-1	●	●			●	
S7-300		CP 343-1 Lean ¹²⁾	●	● ¹⁾	●	● ²⁾	●	
		CP 343-1 ¹²⁾	●	●	●	● ⁸⁾	●	
		CP 343-1 Advanced ¹⁰⁾	●	●	●	●	● ⁹⁾	
		CP 343-1 ERPC	●	● ¹⁾	●		● ¹³⁾	
		TIM 3V-IE/TIM 3V-IE Advanced/TIM 4R-IE ¹²⁾	●	● ³⁾				
		TIM 3V-IE DNP3/TIM 4R-IE DNP3	● ¹⁵⁾					
S7-400		CP 443-1 ¹⁰⁾	●	●	●	●	●	● ⁴⁾
		CP 443-1 Advanced ¹⁰⁾	●	●	●	●	● ⁹⁾	● ⁴⁾
		TIM 4R-IE/TIM 4R-IE DNP3	● ¹⁵⁾	● ³⁾				
SIMATIC TDC		CP 5100			●			
		CP 51M1			●			
PCS 7 PC	 HARDNET-IE S7 / HARDNET-IE S7 REDCONNECT HARDNET PN IO Development Kit (DK-16xx)	CP 443-1	●	●	●	●	●	● ⁴⁾
		TIM 4R-IE/TIM 4R-IE DNP3	● ¹⁵⁾	● ³⁾				
		CP 1613 A2/CP 1623/CP 1628	●	●	●		●	
		CP 1616				●	●	
SIMOTION								
SIMOTION C/P/D		MCI-PN ⁵⁾	●	●	●	●	●	
		CBE30 ⁶⁾	●	●	●	●	●	
SIMATIC IPC/PG								
Nanobox PC Microbox PC Box PC Rack PC Panel PC Field PG	 HARDNET-IE S7 / HARDNET-IE S7 REDCONNECT  HARDNET PN IO Development Kit (DK-16xx)  SOFTNET PN IO  SOFTNET-IE S7 / SOFTNET-IE S7 Lean	CP 1613 A2/CP 1623/CP 1628	●	●	●		●	
		CP 1616				●	●	
		CP 1604				●	●	
		CP 1616 onboard ¹¹⁾				●	●	
		1612 A2				●		
		1612 A2	●	●	●			
PC-based Automation								
WinAC	 WinAC RTX/RTX F	CP 1613 A2/CP 1623/CP 1628 ⁷⁾	●	●				
		CP 1604/CP 1616	●	●	●	●	●	● ¹⁴⁾

- 1) Only in server mode
- 2) Only IO Device
- 3) Only within the scope of the telecontrol protocol SINAUT ST7
- 4) With CPU 416F
- 5) In connection with SIMOTION P
- 6) In connection with SIMOTION D

- 7) Also with integrated Ethernet interface of the SIMATIC IPC
- 8) As IO Controller or IO Device
- 9) FTP, web, e-mail
- 10) CPs for S7-300/S7-400 are also available as SIPLUS components for corrosive atmosphere/condensation
- 11) Not for field PG

- 12) CPs for S7-300/S7-400 are also available as SIPLUS components for an extended temperature range -25 ... +60/+70 °C and corrosive atmosphere/condensation
- 13) MES/ERP interface via partner software
- 14) With F variant
- 15) With DNP3 only via IP-based WAN




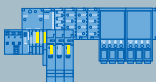
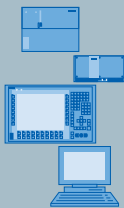







The following products support the listed functions or can be used in combination with these functions		Product	PG/OP	S7 communication	Open communication	PROFINET	Web diagnostics	PROFIsafe
SINAMICS								
	G120/G120D ⁶⁾	•				•		•
	G130/G150 ⁶⁾	•		•		•		•
	S120/S110 ⁶⁾	•		•		•		•
	DCM ⁶⁾	•		•		•		•
	GM150/SM150/GL150/SL150 ⁶⁾	•		•		•		•
Network components ¹⁾								
SCALANCE X-200		X-200 ⁴⁾ XF-200 X-200IRT ⁴⁾ XF-200IRT				•	•	•
SCALANCE X-300		X-300 ⁵⁾ XR-300 X-300EEC XR-300EEC				•	•	•
SCALANCE X-400		X-400				•	•	•
SCALANCE X-500		XR552-12M XR528-6M				•	•	•
SCALANCE W-700		W-780 W-740				•	•	•
Network transitions								
	IE/AS-i LINK PN IO					•	•	•
	IWLAN/PB Link PN IO					•		•
	IE/PB link PN IO					•		•

- 1) The components of the SCALANCE X, SCALANCE W and SCALANCE S product families can be used with all Industrial Ethernet networks for setting up a network and for processing data
 2) As IO Controller or IO Device
 3) FTP, web, e-mail

- 4) Some SCALANCE X200/200IRT are available as SIPLUS components also for extended temperature range -25 ... +60/+70 °C and corrosive atmosphere/condensation
 5) As SIPLUS components also available for corrosive atmosphere/condensation
 6) HMI access by means of S7 communication

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Integrated interface – supported functions

The following products support the listed functions or can be used in combination with these functions			Product	PG/OP	S7 communication	Open communication	PROFINET	Web diagnostics	PROFIsafe
SIMATIC controllers									
S7-1200	Modular		CPU 1211C ²⁾ CPU 1212C ²⁾ CPU 1214C ²⁾	●	●	● ¹⁾	● ⁶⁾	●	
S7-300			CPU 314C-2 PN/DP	●	●	●	●	●	
			CPU 315/317-2 PN/DP ²⁾	●	●	● ¹⁾	●	●	
			CPU 315/317F-2 PN/DP ²⁾	●	●	● ¹⁾	●	●	●
			CPU 319-3 PN/DP	●	●	● ¹⁾	●	●	
			CPU 319F-3 PN/DP	●	●	● ¹⁾	●	●	●
S7-400			CPU 412-2 PN	●	●	●	●	●	
			CPU 412-5H	●	●	●	●	●	
			CPU 414-3 PN/DP	●	●	● ¹⁾	●	●	
			CPU 414F-3 PN/DP	●	●	● ¹⁾	●	●	●
			CPU 414-5H	●	●	●	●	●	
			CPU 416-3 PN/DP ³⁾	●	●	● ¹⁾	●	●	
			CPU 416F-3 PN/DP	●	●	● ¹⁾	●	●	●
			CPU 416-5H	●	●	●	●	●	
ET 200pro ET 200S			CPU 417-5H	●	●	●	●	●	
			IM 154-8 PN/DP CPU	●	●	● ¹⁾	●	●	
			IM 154-8F PN/DP CPU	●	●	●	●	●	●
			IM 151-8 PN/DP CPU ²⁾	●	●	● ¹⁾	●	●	
			IM 151-8F PN/DP CPU ²⁾	●	●	● ¹⁾	●	●	●
			S7-mEC Embedded Controller ³⁾	●	●	● ¹⁾	●	●	● ⁴⁾
	SIMATIC IPC227D bundle ⁵⁾ SIMATIC IPC427C bundle via CP1616, CP1604 ⁵⁾		●	●	● ¹⁾	●	●	● ⁴⁾	
	SIMATIC IPC277D bundle SIMATIC HMI IPC477C bundle via CP1616 ⁵⁾		●	●	● ¹⁾	●	●	● ⁴⁾	
	Standard PC ⁵⁾ or SIMATIC IPC with WinAC RTX/RTX F		●	●	● ¹⁾	●	●	● ⁴⁾	
SIMATIC Distributed I/O									
ET 200S		IM 151-3 PN ²⁾ IM 151-3 PN HS	●			●			
		IM 151-3 PN HF IM 151-3 PN FO	●			●		●	
ET 200SP		IM 155-6 PN	●			●			
ET 200M		IM 153-4 PN ²⁾ IM 153-4 PN/HF	●			●			
ET 200pro		IM 154-4 PN HF IM 154-6 PN HF IWLAN	●			●		●	
ET 200eco PN			●			●			
SINAMICS									
S110		CU305 PN	●				●		●
S120		CU320-2 for multi-axis applications, CU310 PN for SINAMICS S120 AC-Drives	●				●		●
G120		G120 central frequency inverter and G120D distributed frequency inverter	●				●		●

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1) Open Industrial Ethernet communication

2) As SIPLUS component also available for extended temperature range -25...+60/+70 °C and corrosive atmosphere/condensation



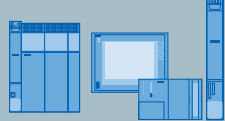

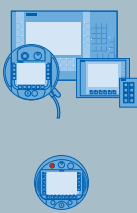

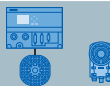
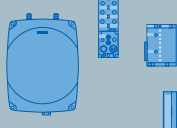
3) As SIPLUS component also available for corrosive atmosphere/condensation

4) Only with F variant

5) Only selected Ethernet interface

6) Firmware V2.0 or higher

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The following products support the listed functions or can be used in combination with these functions		Product	PG/OP	S7 communication	Open communication	PROFINET	Web diagnostics	PROFIsafe
SINAMICS								
MC Encoder	Absolute encoder	Singleturn/Multiturn	●			●		
SENTRON								
Protection, switching and measuring technology		Measuring unit 7KM PAC3200 Measuring unit 7KM PAC4200			●	●		
SINUMERIK								
		840D sl 840Di sl	● ●	● ●	● ●	●	●	● ¹⁾
SIMOTION								
SIMOTION C/P/D		C240 PN	●	●	●	●	●	●
		D410 PN	●	●	●	●	●	●
		P350/P320	●	●	●	●	●	●
		D4x5	●	●	●	●	●	●
SIMATIC IPC/PG								
Nanobox PC Microbox PC Box PC Rack PC Panel PC Field PG M		SOFTNET S7/ S7 Lean	Integrated interfaces	●	●			
		SOFTNET PN IO	Integrated interfaces			●		
SIMATIC HMI								
Panels		Key Panel KP8 PN	●	●		●		
		Key Panel KP8F PN	●	●		●		●
		Basic Panel	●	●		●		
		Comfort Panel	●	●	●	●		
		Mobile Panel 177/277	●	●		●		
		Mobile Panel 277 IWLAN	●	●		●		
		Mobile Panel 277F IWLAN	●	●		●		●
Visualization software PC/PG		WinCC flexible	●	●				
		WinCC	●	●	●			
SIMATIC Ident								
Code reading systems		VS 130-2		●		●		
		MV420/MV440		●		●	●	
RFID systems		RF170C		●		●		
		RF180C		●		●		
		RF182C			●			
		RF640R / RF670R			●			
		ASM 475		●		●		
PC-based Automation								
WinAC		WinAC via integrated interfaces	●	●	●	●	●	●

















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1) CNC SW 4.4 or higher

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Devices and services for PROFIBUS

Communication processor (CP) – supported functions

The following products support the listed functions or can be used in combination with these functions			Product	PG/OP	S7 communication	Open communication	DP/PA	OPC	PROFIsafe
SIMATIC									
S7-1200			CM 1243-5 CM 1242-5	●	●	●	●		
S7-300 ⁵⁾			CP 342-5 ⁷⁾ / CP 342-5 FO	●	●	●	●		
			CP 343-5	●	●	●			
S7-400			CP 443-5 Basic	●	●	●			
			CP 443-5 Extended ⁵⁾	●	●	●	●		● ³⁾
			IM 467/467 FO				●		
SIMATIC TDC			CP 50M0				●		
SINUMERIK									
840D			CP 342-5/CP 342-5 FO	●	●	●	●		●
			CP 343-5	●	●	●			●
SIMATIC IPC/PG									
Microbox PC Box PC Rack PC Panel PC Field PG		HARDNET-PB DP Development Kit (DK-5613)	CP 5603/CP 5613 A2/CP 5614 A2/CP 5623/CP 5624				●		
		SOFTNET-PB DP / SOFTNET-PB DP slave	CP 5512/CP 5611 A2/CP 5621/CP 5711	● ¹⁾		● ²⁾	●	●	
		SOFTNET-PB S7	CP 5512/CP 5611 A2/CP 5621/CP 5711	● ¹⁾	●	●		●	
		HARDNET-PB DP CP with DP-Base	CP 5603/CP 5613 A2/CP 5614 A2/CP 5623/CP 5624	●		●	●	●	
		HARDNET-PB DP	CP 5603/CP 5613 A2/CP 5614 A2/CP 5623/CP 5624	●	●	●		●	
PC-based Automation									
WinAC		WinAC RTX/RTX F	CP 5603/CP 5613 A2/CP 5623/CP 5611 A2/CP 5621	●	●		● ⁴⁾		● ⁶⁾
PC-based controllers		S7-mEC Embedded Controller	via CP 5603 in EM PC-104	●	●		● ⁴⁾		● ⁶⁾
		SIMATIC IPC427C bundle	Integrated interface or CP 5603	●	●		● ⁴⁾		● ⁶⁾
		SIMATIC IPC227D/IPC277D bundle	via CP 5621	●	●		● ⁴⁾		● ⁶⁾
		SIMATIC HMI IPC477C bundle	Integrated interface	●	●		● ⁴⁾		● ⁶⁾
PC/Notebook									
PC		SOFTNET-PB DP / SOFTNET-PB DP slave	CP 5512/CP 5611 A2/CP 5621/CP 5711	● ¹⁾		● ²⁾	●	●	
		SOFTNET-PB S7	CP 5512/CP 5611 A2/CP 5621/CP 5711	● ¹⁾	●	●		●	
		HARDNET-PB DP CP with DP-Base	CP 5613 A2/CP 5614 A2/CP 5623/CP 5624	●		●	●	●	
		HARDNET-PB DP	CP 5613 A2/CP 5614 A2/CP 5623/CP 5624	●	●	●		●	

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1) In connection with STEP 7

2) Not for SOFTNET DP slave

3) With CPU 416F







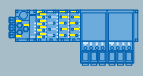
4) Without PA

5) CPs for S7-300/S7-400 are also available as SIPLUS components for corrosive atmosphere/condensation

6) Only with F variant

7) As SIPLUS component also available for extended temperature range -25...+60/+70 °C and corrosive atmosphere/condensation

Integrated interface – supported functions

The following products support the listed functions or can be used in combination with these functions		Product	PG/OP	S7 communication	Open communication	DP/PA	OPC	PROFIsafe
SIMATIC								
S7-300		CPU 315F ⁴⁾ /317F ⁴⁾ /319F	•	•		•		•
		CPUs with DP interface ³⁾	•	•		•		
S7-400		CPU 414H/417H ³⁾	•	•		•		•
		CPU 416F	•	•		•		•
		CPU 41x -2/3 ³⁾ FM 458-1 DP (isochronous)	•	•		•		
		CPUs with DP interface ³⁾	•	•		•		
ET 200S		IM 151-1 ⁴⁾	•			•		
		IM 151-1 HF ⁴⁾	•			•		•
		IM 151-7 CPU ⁴⁾	•	•		•		
		IM 151-7 F-CPU ⁴⁾	•	•		•		•
ET 200iSP		IM 152-1	•			• ²⁾		
ET 200eco		BM 141/142/143/148	•			•		• ¹⁾
ET 200M		IM 153-1 ⁴⁾	•			•		
		IM 153-2 ⁴⁾	•	•		•		•
ET 200pro		IM 154-1 DP	•			•		
		IM 154-2 DP HF	•			•		•

1) Only BM 148


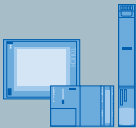
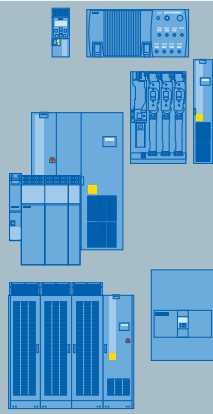

2) With 1.5 Mbit/s, via RS485-iS coupler

3) As SIPLUS components also available for corrosive atmosphere/condensation

4) As SIPLUS components also available for extended temperature range -25 ... +60/+70 °C and corrosive atmosphere/condensation

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
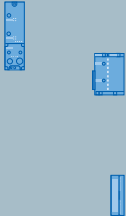
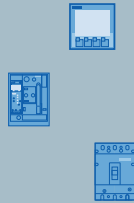
Integrated interface – supported functions

The following products support the listed functions or can be used in combination with these functions		Product	PG/OP	S7 communication	Open communication	DP/PA	OPC	PROFIsafe
SINUMERIK								
		840Di/840Di sl	•	•		•		
		840D/840D sl	•	•		•		• ²⁾
SIMOTION								
SIMOTION C/P/D 		C240, C240 PN	•	•		•	•	•
		P350	•	•		•	•	
		D410, D425/435/445	•	•		•	•	•
SINAMICS								
SINAMICS G/S/GM/GL/SL 		G120/G120C/G120D	•			•		•
		G130/G150 ³⁾	•	•		•		•
		S110/S120/S150 ³⁾	•	•		•		•
		DCM ³⁾	•	•		•		•
		GM150/SM150/GL150/SL150 ³⁾	•	•		•		•
MC Encoder								
Absolute encoder		Singleturn/Multiturn	•					
SIMATIC IPC/PG								
Microbox PC Box PC Rack PC Panel PC Field PG 	SOFTNET DP	IPC427C IPC627C/827C IPC647C/847C	• ¹⁾		•	•	•	G_K10_XX_50103
	SOFTNET DP Slave	HMI IPC477C/577C/677C Field PG	• ¹⁾			•	•	

1) In connection with STEP 7

2) SW version 2.5 or higher

3) HMI access by means of S7 communication

The following products support the listed functions or can be used in combination with these functions		Product	PG/OP	S7 communication	Open communication	DP/PA	OPC	PROFIsafe
SIMATIC HMI								
Panels		Basic, Comfort, Mobile Panels ¹⁾	•	•	•		• ²⁾	
Visualization software PC/PG		WinCC flexible	•	•				
		WinCC	•	•	•			
SIMATIC Ident								
Code reading systems		VS 130-2		•		• DP		
RFID systems		ASM 456/RF160C		•		•		
		RF170C		•		•		
		ASM 475		•		•		
SENTRON								
Protection, switching and measuring devices		Measuring device 7KM PAC3200				•		
		Measuring device 7KM PAC4200				•		
		3WL air circuit breakers				•		
		3VL circuit breakers				•		

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- 1) As SIPLUS components also available for corrosive atmosphere/condensation
 2) Only for Comfort Panels

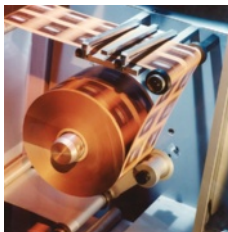
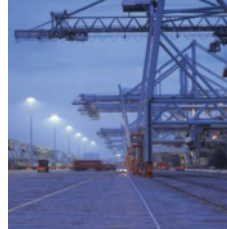
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Industrial communication

Advantages at a glance

Highlights

- Overall solution from bus system to engineering and diagnostic tools
- Security of investment due to compatible, continuing development based on international standards
- Setting up of networked, safety-oriented applications through the PROFIsafe safety profile for PROFIBUS and PROFINET
- Integrated communication from the field level to the enterprise resource planning (ERP) level
- Real-time communication and data transmission on an Ethernet bus system
- High degree of mobility and flexibility through industrial wireless communication
- Reliable protection of the automation solution, e.g. against addressing errors or unauthorized access
- Reliable, rugged and safe network components with integrated diagnostics functions



Industrial security

Greater penetration of networks into industrial plants increases productivity.

But this also creates risks in terms of IT security which must be countered by appropriate industrial security measures. A holistic approach is necessary here that considers both the technical measures and the training of personnel as well as the definition of guidelines and processes. This is necessary if the highest possible level of security is to be achieved and safe operation of the plant is to be ensured.

For further information regarding technical solutions and the range of services we offer for industrial security, visit:

<http://www.siemens.de/industrialsecurity>

Fax form

This brochure has given you an overview of the types of communication and networks for Totally Integrated Automation. For detailed information on devices, systems or functionalities, additional brochures and catalogs are available.

Please use this fax form and you will receive the information you requested in just a few days.

We thank you for your interest and look forward to your fax!

Brochures

- Totally Integrated Automation
- SIMATIC PCS 7 Process Control System
- PROFINET
- Industrial Ethernet Switches
- Industrial cabling technology
- Industrial Wireless LAN
- Industrial Remote Communication
- Industrial security
- Network solutions with PROFIBUS
- AS-Interface
- SIMATIC Controllers
- SIMATIC S7-1200
- SIMATIC Technology
- SIMATIC Safety Integrated
- Logic module LOGO!
- SIMATIC IPC / PC-based Automation
- SIMATIC Industrial Software
- SIMATIC IT
- SIMATIC Panels
- SIMATIC WinCC flexible
- SIMOTION
- SINAMICS
- SINUMERIK
- Variable-Speed Drives
- SIMATIC Ident
- IO-Link
- Telecontrol
- Safety Integrated for safe machines
- SIRIUS Modular Safety System 3RK3
- SIRIUS motor starter
- SIMOCODE pro – SIRIUS motor management and control devices

Catalogs

- Interactive catalog CA 01 - on DVD

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