

The background of the entire page is a close-up photograph of industrial networking hardware. It shows several RJ45 ports on a grey panel. Two thick green Ethernet cables are plugged into the top two ports. Below them, another port has a cable with a red and black braided shield and a white plastic RJ45 connector. The panel has labels like P4, P5, P7, P8, P14, P15, P16, P11, P12, and P13. A MAC address 'MAC:00-1B-1B-7B-25-00' is printed on the panel. A 'SELECT/SET' button and a 'CONSOLE' port are also visible. The Siemens logo is in the top left corner.

SIEMENS

Industrial Communication


SIMATIC NET

Catalog
IK PI

Edition
2015

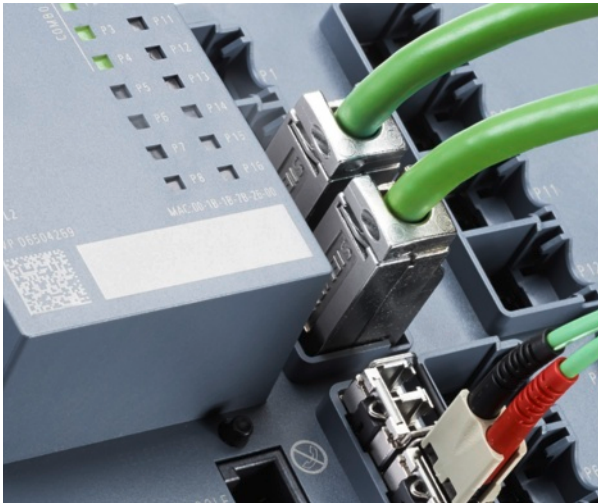
Answers for industry.

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Industrial Communication

SIMATIC NET



Catalog IK PI · 2015

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The products contained in this catalog can also be found
in the Interactive Catalog CA 01.

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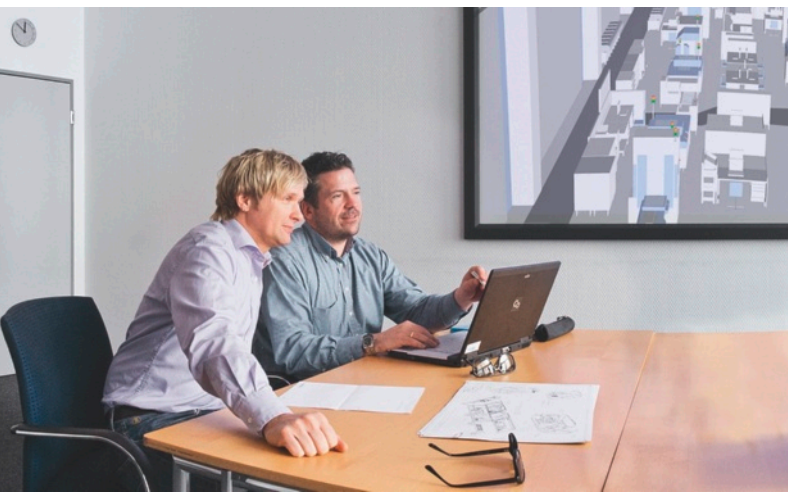
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DIN EN ISO 9001 (Certified Registration
Numbers are shown on page 9/19). The cer-
tificate is recognized by all IQNet countries.

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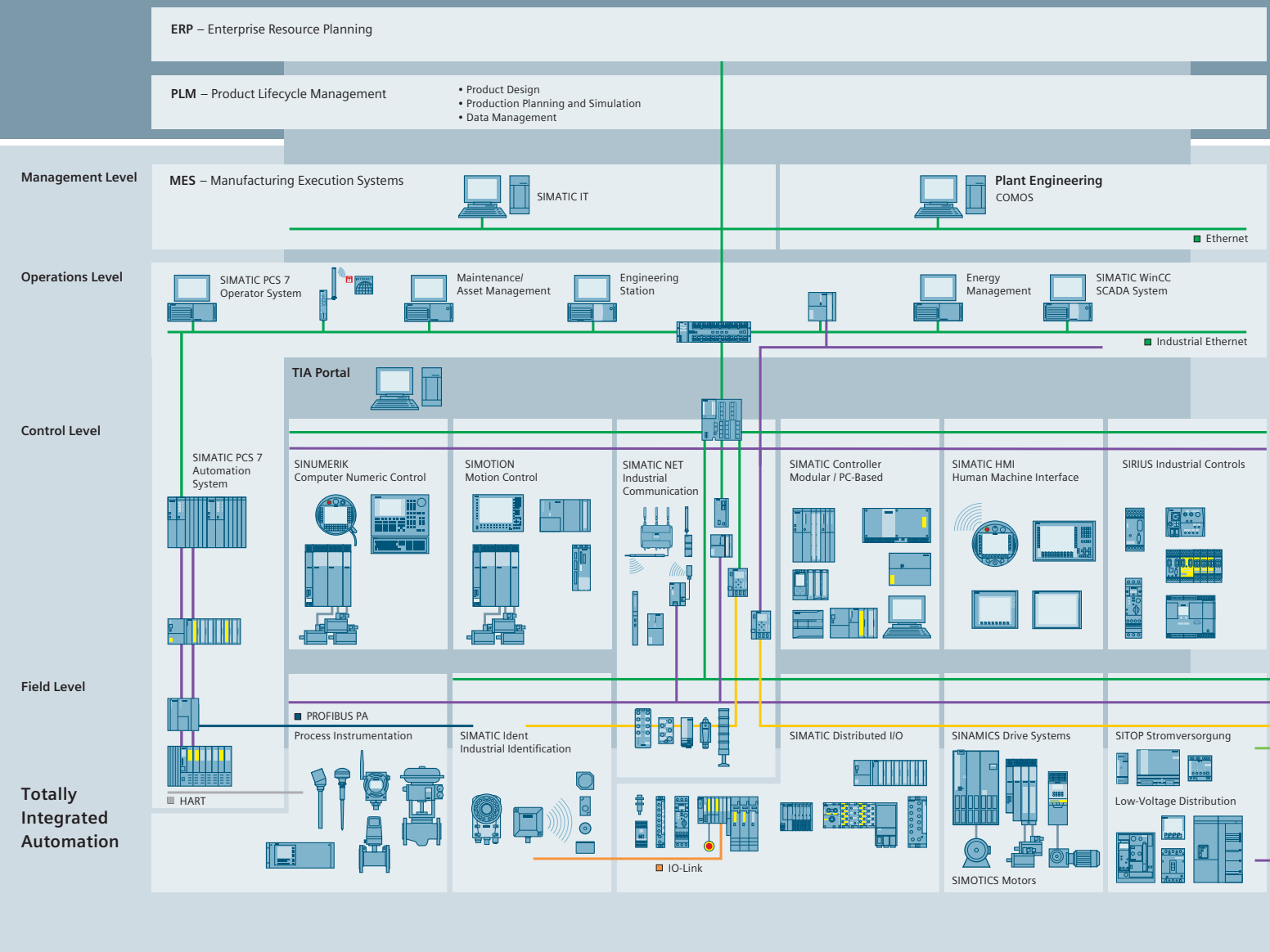
Answers for industry.

Integrated technologies, vertical market expertise and services for greater productivity, energy efficiency, and flexibility.

The Siemens Industry Sector is the world's leading supplier of innovative and environmentally friendly products and solutions for industrial companies. End-to-end automation technology and industrial software, solid market expertise, and technology-based services are the levers we use to increase our customers' productivity, efficiency and flexibility. With a global workforce of more than 100 000 employees, the Industry Sector comprises the Industry Automation, Drive Technologies, and Customer Services divisions, as well as the Metals Technologies Business Unit.

We consistently rely on integrated technologies and, thanks to our bundled portfolio, we can respond more quickly and flexibly to our customers' wishes. With our globally unmatched range of automation technology, industrial control and drive technology as well as industrial software, we equip companies with exactly what they need over their entire value chain – from product design and development to production, sales and service. Our industrial customers benefit from our comprehensive portfolio, which is tailored to their market and their needs.

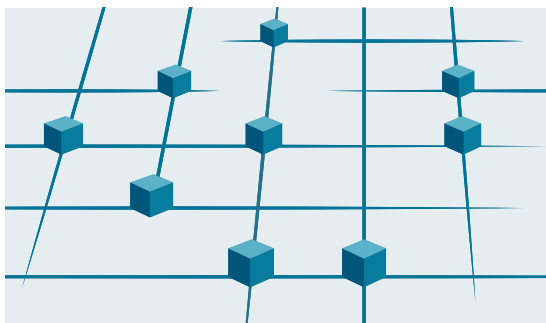
Market launch times can be reduced by up to 50% due to the combination of powerful automation technology and industrial software from Siemens Industry. At the same time, the costs for energy or waste water for a manufacturing company can be reduced significantly. In this way, we increase our customers' competitive strength and make an important contribution to environmental protection with our energy-efficient products and solutions.



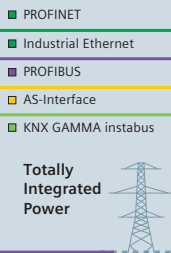
Efficient automation starts with efficient engineering.

Totally Integrated Automation: Efficiency driving productivity.

Efficient engineering is the first step toward better production that is faster, more flexible, and more intelligent. With all components interacting efficiently, Totally Integrated Automation (TIA) delivers enormous time savings right from the engineering phase. The result is lower costs, faster time-to-market, and greater flexibility.



Totally Integrated Automation
Efficient interoperability of all automation components



A unique complete approach for all industries

As one of the world's leading automation suppliers, Siemens provides an integrated, comprehensive portfolio for all requirements in process and manufacturing industries. All components are mutually compatible and system-tested. This ensures that they reliably perform their tasks in industrial use and interact efficiently, and that each automation solution can be implemented with little time and effort based on standard products. The integration of many separate individual engineering tasks into a single engineering environment, for example, provides enormous time and cost savings.

With its comprehensive technology and industry-specific expertise, Siemens is continuously driving progress in manufacturing industries – and Totally Integrated Automation plays a key role.

Totally Integrated Automation creates real value added in all automation tasks, especially for:

- **Integrated engineering**
Consistent, comprehensive engineering throughout the entire product development and production process
- **Industrial data management**
Access to all important data occurring in productive operation – along the entire value chain and across all levels
- **Industrial communication**
Integrated communication based on international cross-vendor standards that are mutually compatible
- **Industrial security**
Systematic minimization of the risk of an internal or external attack on plants and networks
- **Safety Integrated**
Reliable protection of personnel, machinery, and the environment thanks to seamless integration of safety technologies into the standard automation

Making things right with Totally Integrated Automation

Totally Integrated Automation, industrial automation from Siemens, stands for the efficient interoperability of all automation components. The open system architecture covers the entire production process and is based on end-to-end shared characteristics: consistent data management, global standards, and uniform hardware and software interfaces.

Totally Integrated Automation lays the foundation for comprehensive optimization of the production process:

- Time and cost savings due to efficient engineering
- Minimized downtime due to integrated diagnostic functions
- Simplified implementation of automation solutions due to global standards
- Better performance due to interoperability of system-tested components



Totally Integrated Power

We bring power to the point – safely and reliably.



Comprehensive answers for power distribution in complex energy systems – from Siemens

Efficient, reliable, safe: These are the demands placed on electrification and especially power distribution. And our answer – for all application areas of the energy system – is Totally Integrated Power (TIP). It's based on our comprehensive range of products, systems, and solutions for low and medium voltage, rounded out by our support throughout the entire lifecycle – from planning with our own software tools to installation, operation, and services.

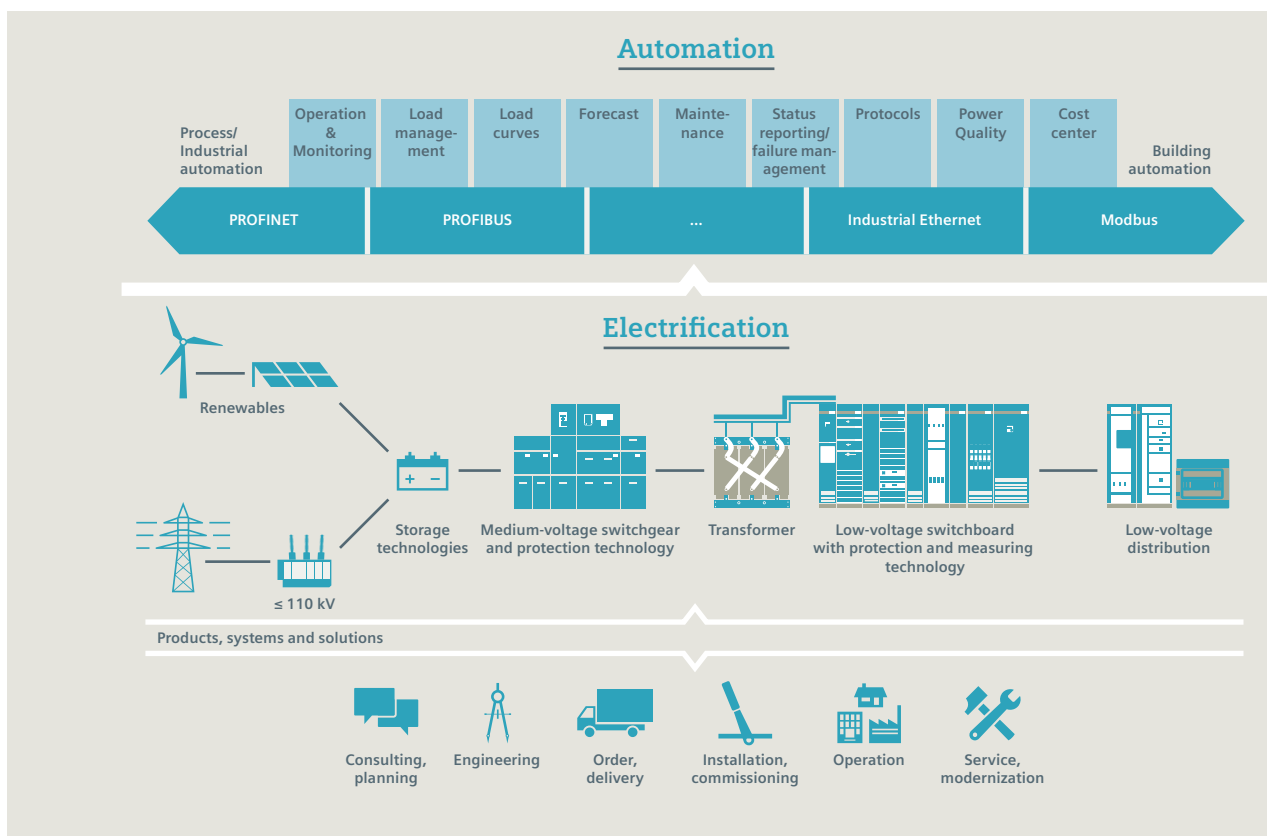
Smart interfaces allow linking to industrial or building automation, making it possible to fully exploit all the optimization potential of an integrated solution. This is how we provide our customers around the world with answers to their challenges. With highly efficient, reliable, and safe power distribution, we lay the foundation for sustainable infrastructure and cities, buildings, and industrial plants. We bring power to the point – wherever and whenever it is needed.

More information: www.siemens.com/tip

Totally Integrated Power offers more:

- **Consistency:**
For simplified plant engineering and commissioning as well as smooth integration into automation solutions for building or production processes
- **One-stop-shop:**
A reliable partner with a complete portfolio for the entire process and lifecycle – from the initial idea to after-sales service
- **Safety:**
A comprehensive range of protection components for personnel safety and line and fire protection, safety by means of type testing
- **Reliability:**
A reliable partner who works with customers to develop long-lasting solutions that meet the highest quality standards
- **Efficiency:**
Bringing power to the point means greater plant availability and maximum energy efficiency in power distribution
- **Flexibility:**
End-to-end consistency and modular design of Totally Integrated Power for any desired expansions and adaptation to future requirements
- **Advanced technology:**
Reliable power distribution especially for applications in which supply is critical, continuous refinement of the technology

Challenges are our speciality



Introduction



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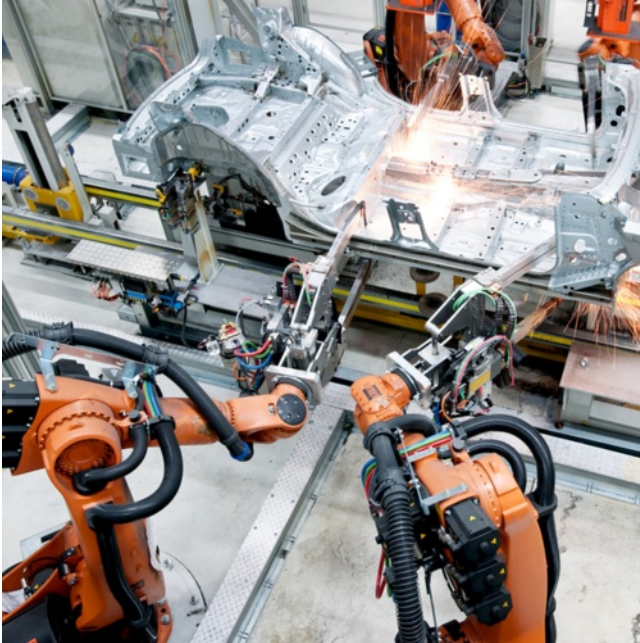
Introduction

Industrial communication

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SIMATIC NET offers all the components necessary for an integrated complete solution and supports the following bus systems:

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

Industrial Ethernet (IEEE 802.3) –

the international standard for area networking is the number one network in the LAN environment. Industrial Ethernet enables powerful communication networks to be constructed over wide areas.

PROFINET (IEC 61158/61784) –

the international standard is based on Industrial Ethernet and allows real-time communication all the way to the field level, but also integrates the enterprise level. With the full utilization of existing IT standards, PROFINET allows isochronous motion control applications, efficient cross-manufacturer engineering and high availability of machines and systems on the Industrial Ethernet. PROFINET supports distributed automation (and controller-controller communication) and it allows fail-safe applications.

PROFIBUS



PROFIBUS (IEC 61158/61784)	- the international standard for the field level is the global market leader among fieldbus systems
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PROFIBUS (IEC 61158/61784) –

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

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.

AS-Interface (EN 50295/IEC 62026) –

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



IO-Link

- the standard for intelligently connecting sensors and actuators from the field level to the MES level

IO-Link –

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

Network transitions are implemented via controllers or links. Configuration and diagnostics can be performed from any point in the plant.

Introduction

Industrial communication

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Overview

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, you 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:

- Continuous 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
- Implementation of state-of-the-art solutions with mobile and wireless communication
- The integration of IT technologies

Worldwide trends

Decentralization has been gaining worldwide importance for a number of years now. A 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.

Benefits

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 sectors – 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. Due to the increased use of Industrial Ethernet in automation, two topics within Totally Integrated Automation are becoming more and more important – PROFINET and SCALANCE.



Benefits (continued)**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. In order to achieve this, you rely on efficiency and transparency already during engineering.

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

PROFINET also supports the direct connection of distributed field devices to Industrial Ethernet and the implementation of isochronous motion control applications. PROFINET also allows distributed automation with the support of component technology, as well as vertical integration and the implementation of safety-oriented applications. PROFINET also supports controller-controller communication.

**Securely and flexibly networked across all levels with
SCALANCE network components**

SCALANCE X Industrial Ethernet Switches, SCALANCE S Industrial Security Modules and Industrial Wireless LAN (IWLAN) access points, client modules (SCALANCE W) and SCALANCE M industrial routers that ideally meet the demands of industrial applications are available for networking the stations on the PROFINET/Industrial Ethernet.

The use of wireless communication to automation devices and industrial terminal devices helps to achieve greater flexibility. As a result you can simplify maintenance work and reduce service costs and downtimes. With Safety, even fail-safe communication is possible by means of wireless networking with SCALANCE products. This increases a company's competitiveness considerably.

Challenging applications with real-time requirements can be implemented in the radio field. The use of wireless features for moving machines saves cable and servicing costs; driverless transport systems can receive data via the wireless system without requiring cables and remain flexible in the choice of route.

An overall solution comprises:

- Bus system with
 - Passive network components, e.g. cables
 - Active network components, e.g. switches
- Interfaces for connecting automation devices to the bus systems
 - Integrated interfaces
 - Own communications processors
- Network transitions, e.g. IE/PB Link PN IO
- Software for configuring the networks
- Tools for servicing and diagnostics, e.g. SINEMA

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

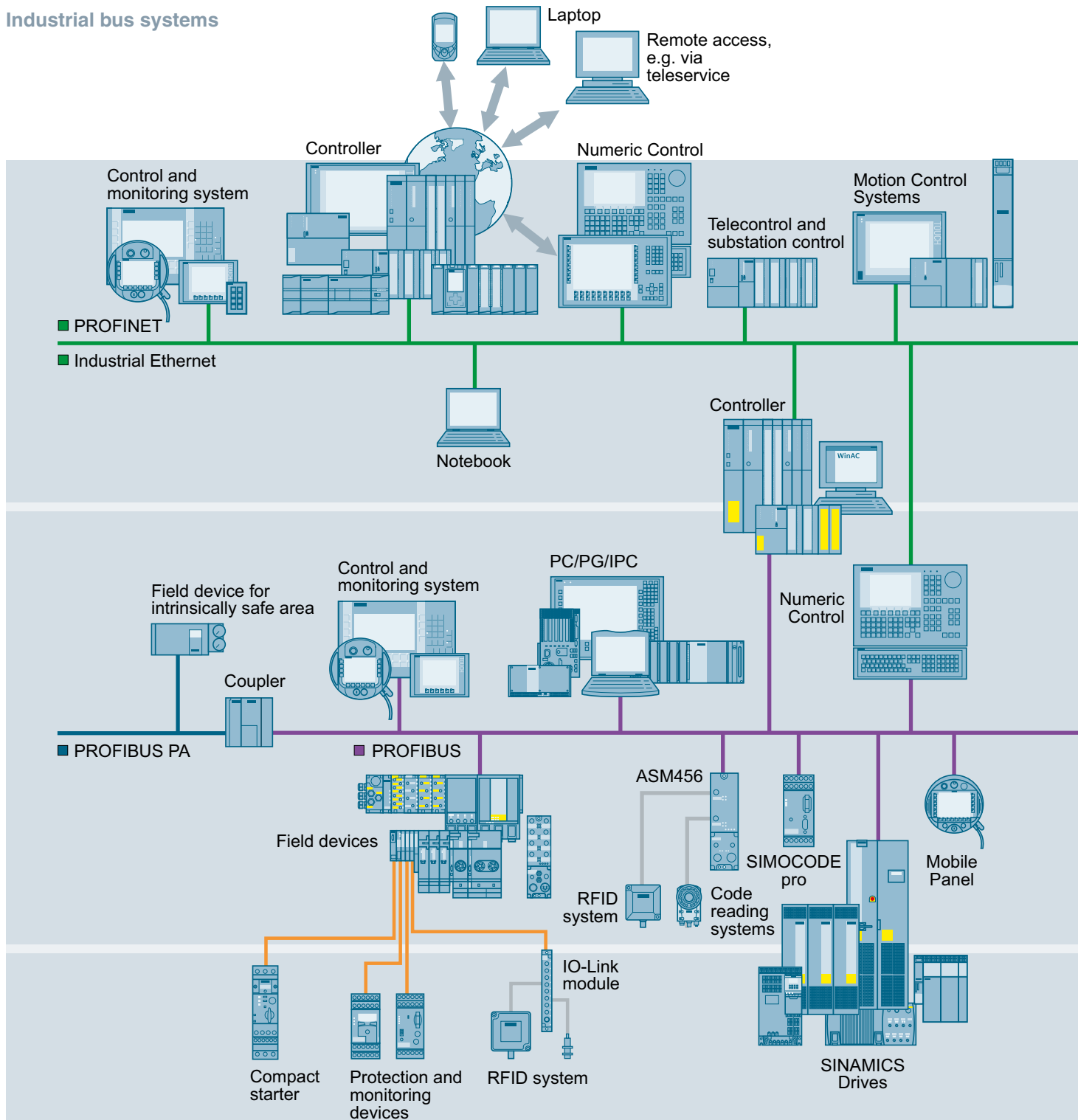
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Introduction

Industrial bus systems

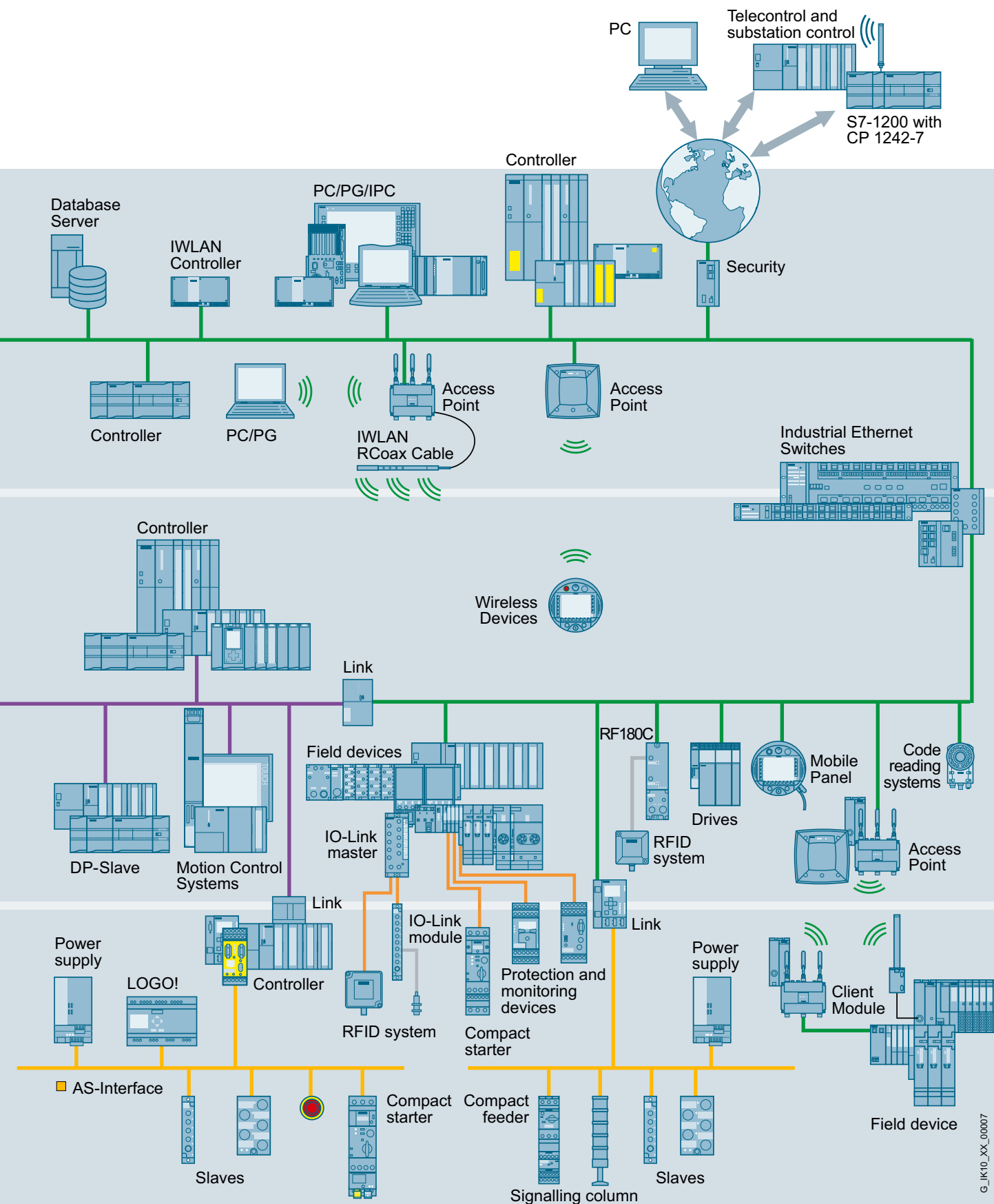
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Industrial bus systems



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

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Introduction

Industrial bus systems

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Industrial Ethernet

Overview

Industrial Ethernet provides the industrial area with a powerful network that complies with the IEEE 802.3 (Ethernet) and 802.11 a/b/g/h/n (wireless LAN) standards.

The diverse options of Ethernet and the Internet that are already available today in the office sector can also be used in factory and process automation by means of Industrial Ethernet. Ethernet technology, which has been used successfully for decades, allows users to precisely match network performance to requirements. The user can choose the data throughput rate to suit particular needs, as integrated compatibility makes it possible to introduce this technology in stages.

Ethernet is the world's current Number 1 in the network environment and offers significant benefits:

- Fast commissioning thanks to the simplest connection method
- 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
- Networking of the most varied application areas such as the office and production areas
- Company-wide communication thanks to the Internet connection option, with security components providing for data integrity
- Investment protection through continuous compatible further development
- Precise time-based assignment of events in the overall plant by means of plant-wide clock control.

SIMATIC NET, the industrial communication system from Siemens, relies on this proven technology. Siemens has already supplied several million connections worldwide in tough industrial environments subject to electromagnetic interference.

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

- Network components of the SCALANCE product families for the use of wired and wireless communication in harsh industrial environments
- Fast on-site assembly using the FastConnect cabling system
- Failsafe networks through high-speed redundancy and redundant power supply
- Continuous monitoring of network components through an effective signaling concept, and network monitoring software

The following communication functions/services are offered by Industrial Ethernet:

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). PG/OP communication is supported by PROFINET/Industrial Ethernet and PROFIBUS.

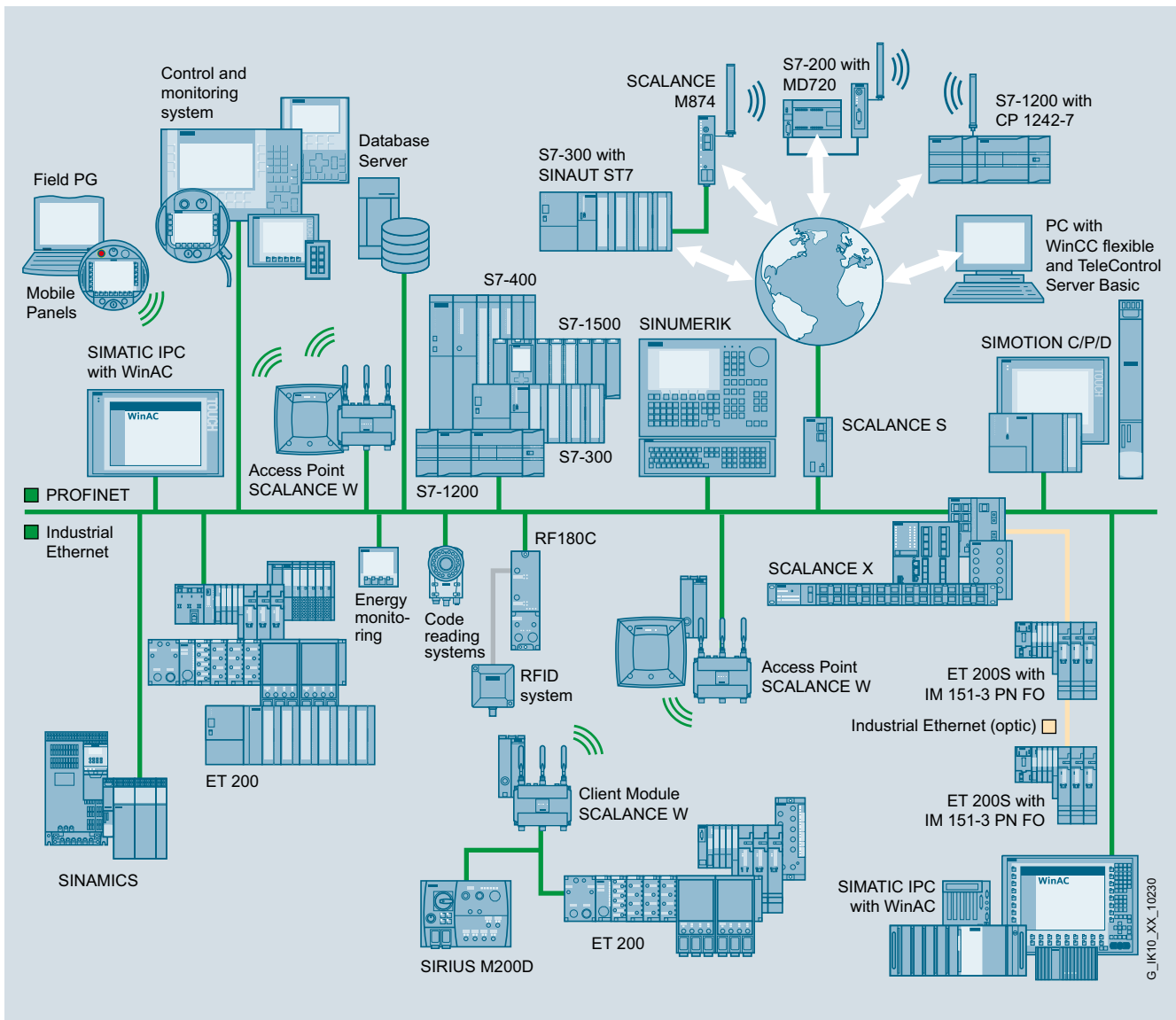
S7 communication

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 also enables PCs/IPCs and workstations to be connected. The maximum volume of user data per task is 64 KB. S7 communication offers simple, powerful communication services and provides a network-independent software interface.

Open communication

The open communication (SEND/RECEIVE) allows the SIMATIC S7 controllers to communicate with other SIMATIC S7 and SIMATIC S5 controllers, PCs/IPCs and third-party systems. In addition, for the simple connection of HMI stations, FETCH and WRITE are offered.



Overview (continued)

Complete overview of Industrial Ethernet

The 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. The SEND/RECEIVE blocks (S/R) are used as access to TCP/IP in SIMATIC S7.

OPC (Openness, Productivity & Collaboration) is a standardized, open and cross-vendor software interface. It permits interfacing of OPC-capable Windows applications to S7-communication, open communication (SEND/RECEIVE) and PROFINET.

IT communication**Information technology (IT) with e-mail, File Transfer (FTP), and web technology**

integrates SIMATIC, SIMOTION and SINUMERIK into IT via Industrial Ethernet. In the office environment, e-mail, FTP, and web browsers have prevailed as widespread means of communication.

PROFINET communication

This communication is compliant with the IEC 61158/61784 standard. PROFINET, the international standard, uses Industrial Ethernet and enables real-time communication right down to the field level.

Introduction

Industrial bus systems

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PROFINET

Overview

PROFINET – The Ethernet standard for automation

PROFINET is the leading Industrial Ethernet standard with more than 7,6 ¹⁾ million nodes worldwide.

PROFINET makes businesses more successful by speeding up processes, boosting productivity, and increasing plant availability.

With PROFINET, Siemens is applying 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 when engineering and structuring their plant architectures.

PROFINET's efficiency means optimal utilization 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.

PROFINET innovations

PROFINET has been expanded by a number of innovative features. These simplify the system configuration, in safety-critical applications for example, and support a leaner and more flexible topology in many different scenarios.

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

The **Shared Device** function allows two controllers to access the same PROFINET IO Device, such as a distributed ET 200 or a drive in a safety application. Because fewer devices need to be installed in the field, the engineering, cabling, energy and installation costs are reduced.

Plant availability can be increased using a ring topology and the **Media Redundancy Protocol (MRP)**. This runs directly via the integrated RJ45 ports on PROFINET devices and can be combined in any way with the relevant Industrial Ethernet switches (e.g. SCALANCE X-200).

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

Advantages at a glance

More flexibility with PROFINET

Industrial Wireless LAN (IWLAN)

IWLAN reduces maintenance costs, increases reliability, and gives a convincing high communication performance. Only PROFINET allows the use of IWLAN with safety.

Safety

Safety-related communication via PROFIsafe reliably protects personnel, the environment, and plants.

Flexible topologies

PROFINET also enables the use of star, tree and ring topologies in addition to the linear topology.

Open standard

Thanks to its openness, PROFINET creates the basis for a uniform machine/plant automation network to which programmable controllers as well as standard Ethernet devices can be connected.

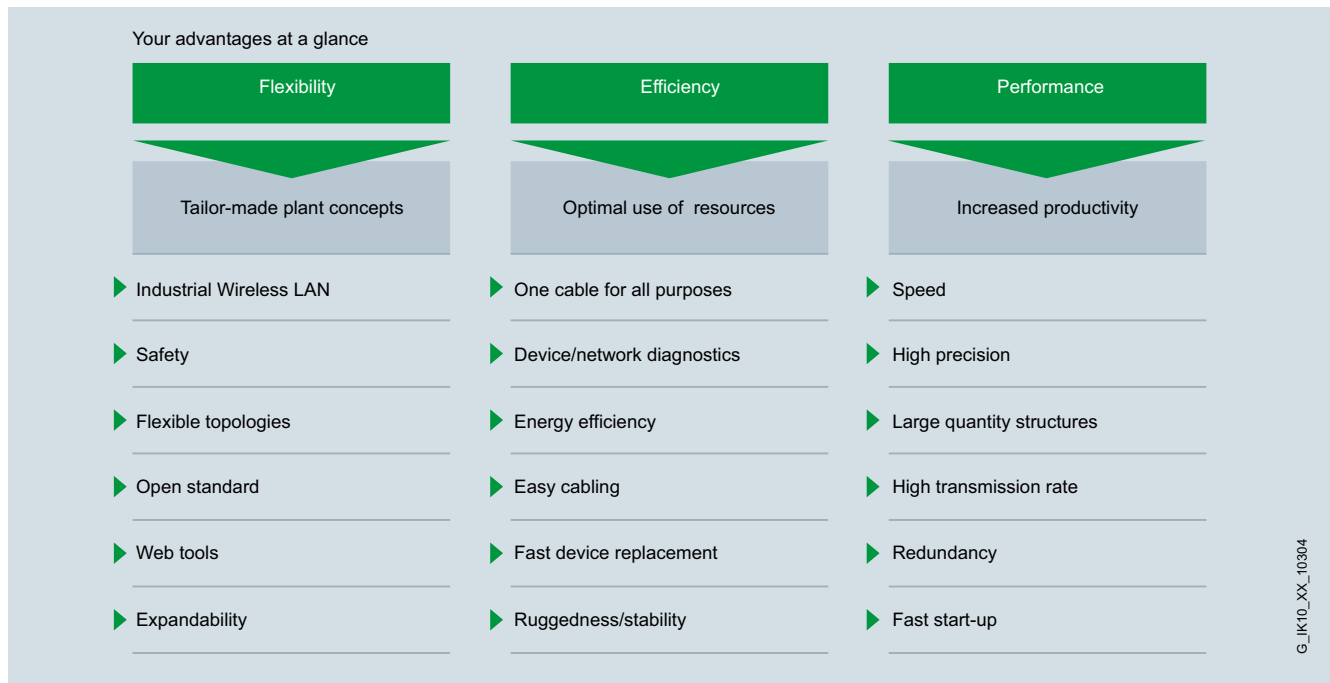
Web tools

PROFINET is 100 percent Ethernet and supports TCP/IP. Among other things, this enables the use of Web technologies, such as access to the integrated Web server of the field devices.

Expandability

With PROFINET, network infrastructures can be expanded as desired, even during operation.

¹⁾ Source: PROFIBUS and PROFINET International (PI), values at end of 2013

Overview (continued)

More efficiency with PROFINET
One cable for all purposes

PROFINET offers a host of functions on a single cable, allowing convergence of machine data and standard IT data. This creates consistency and cuts costs by reducing the overhead for cabling and training.

Device and network diagnostics

Extensive diagnostic data can be read out from the devices to locate faults quickly. HTML standard Web sites are used for servicing PROFINET devices – locally and remotely.

Increased energy efficiency

PROFenergy switches off individual loads or entire production units during breaks – in a coordinated and centrally controlled way.

Easy cabling

Fault-free establishment of industrial networks in a short time without the need for specialist knowledge: PROFINET makes this possible with the FastConnect system.

Quick device replacement

When replacing a PROFINET device, the IO Controller detects the new device and automatically assigns its name.

Extremely robust

The use of switches even in field devices prevents faults in one section of the network from influencing the entire plant network. PROFINET enables the use of fiber-optic cables for areas that are particularly sensitive to EMI.

More performance with PROFINET
Speed

Fast motion control applications need high-speed data exchange. PROFINET's short cycle times increase the productivity of machines and plants.

Precision

Communication via PROFINET is deterministic. A jitter of < 1 µs results in maximum precision cycles and thus ensures high product quality.

Large quantity structures

With PROFINET, up to 256 devices can be managed by one SIMATIC controller. The number of nodes per network is more or less unlimited.

High transmission rate

By using Ethernet, PROFINET achieves a significantly higher transmission rate than previous fieldbuses. This enables problem-free transmission of even large volumes of data without affecting I/O data transfer.

Redundancy

Higher plant availability can be achieved by means of a redundant installation. This can be implemented both with the help of external switches and directly via integral PROFINET interfaces.

Fast start-up

In modular plants, IO controllers must be able to detect new machines or plant sections quickly. With Fast Startup, PROFINET can detect devices and connect them to the IO controller within 500 ms.

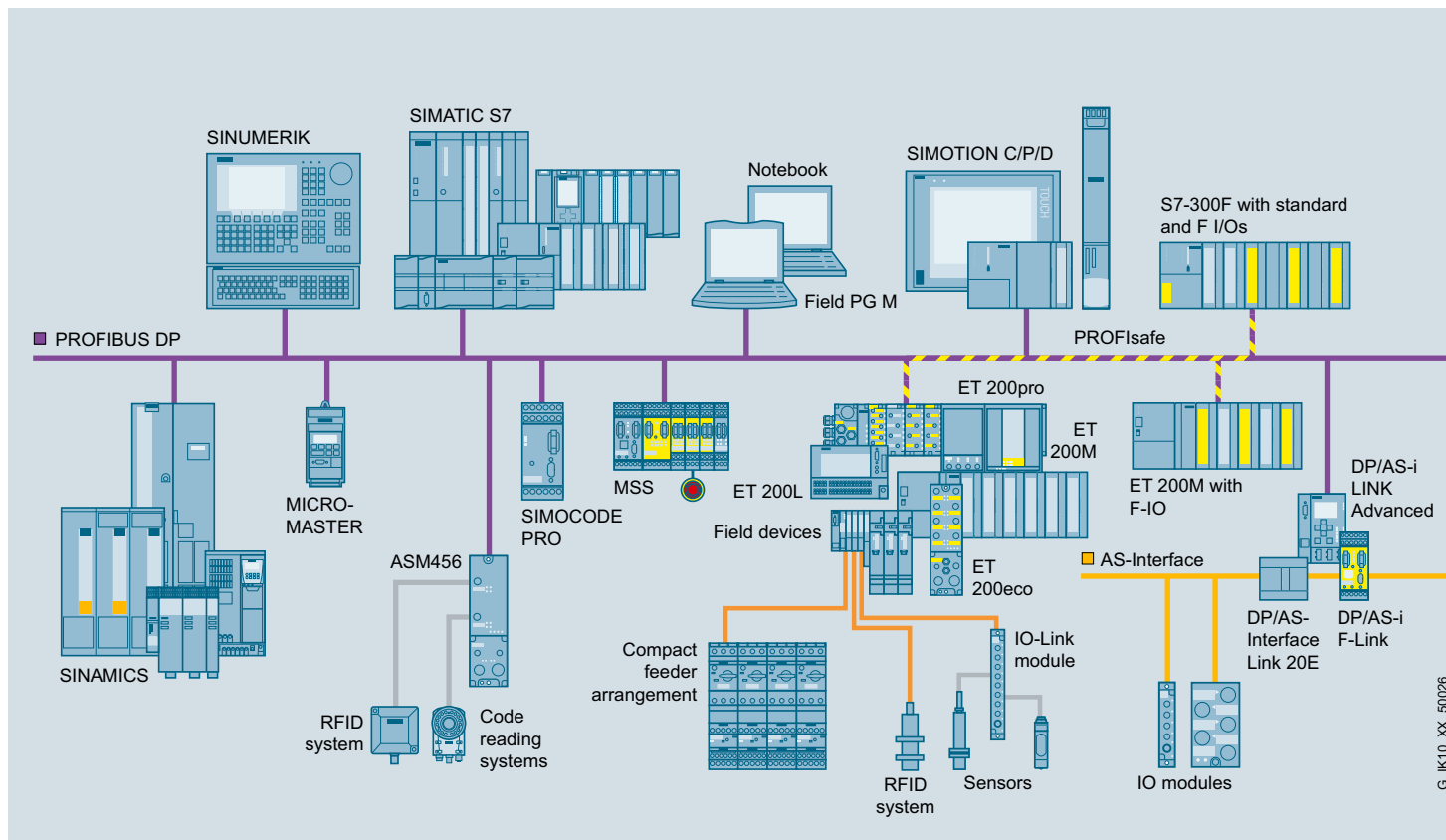
Introduction

Industrial bus systems

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PROFIBUS

Complete overview of PROFIBUS



PROFIBUS is used to connect field devices, e.g. distributed I/O devices or drives, to automation systems such as SIMATIC S7, SIMOTION, SINUMERIK or PCs. 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)

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 and sensors are connected to the field devices.

The field devices are supplied with output data in accordance with the master/slave technique and transfer input data to the controller or PC.

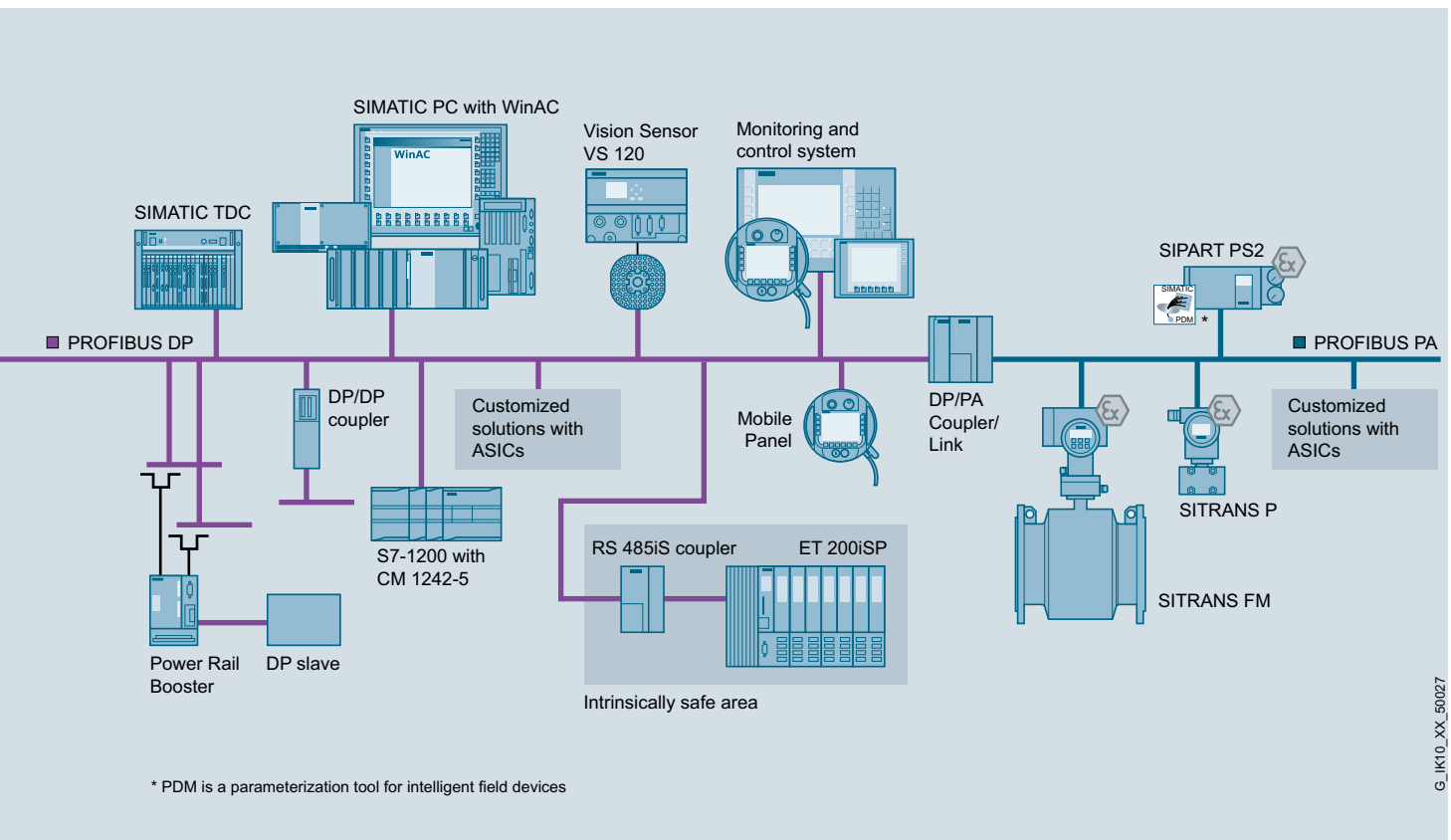
Openness all along the line

Dank 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. A simple link to other bus systems, e.g. from the AS-Interface, is implemented by means of links and thus permits an integrated solution in the field of failsafety for the protection of both human and machine.

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 servo drives. 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 61158-2 (same protocol, different physical properties). PROFIBUS PA is used predominantly in the hazardous areas of refineries (chemical, oil and gas).

Introduction

Industrial bus systems

1

AS-Interface

Overview

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.

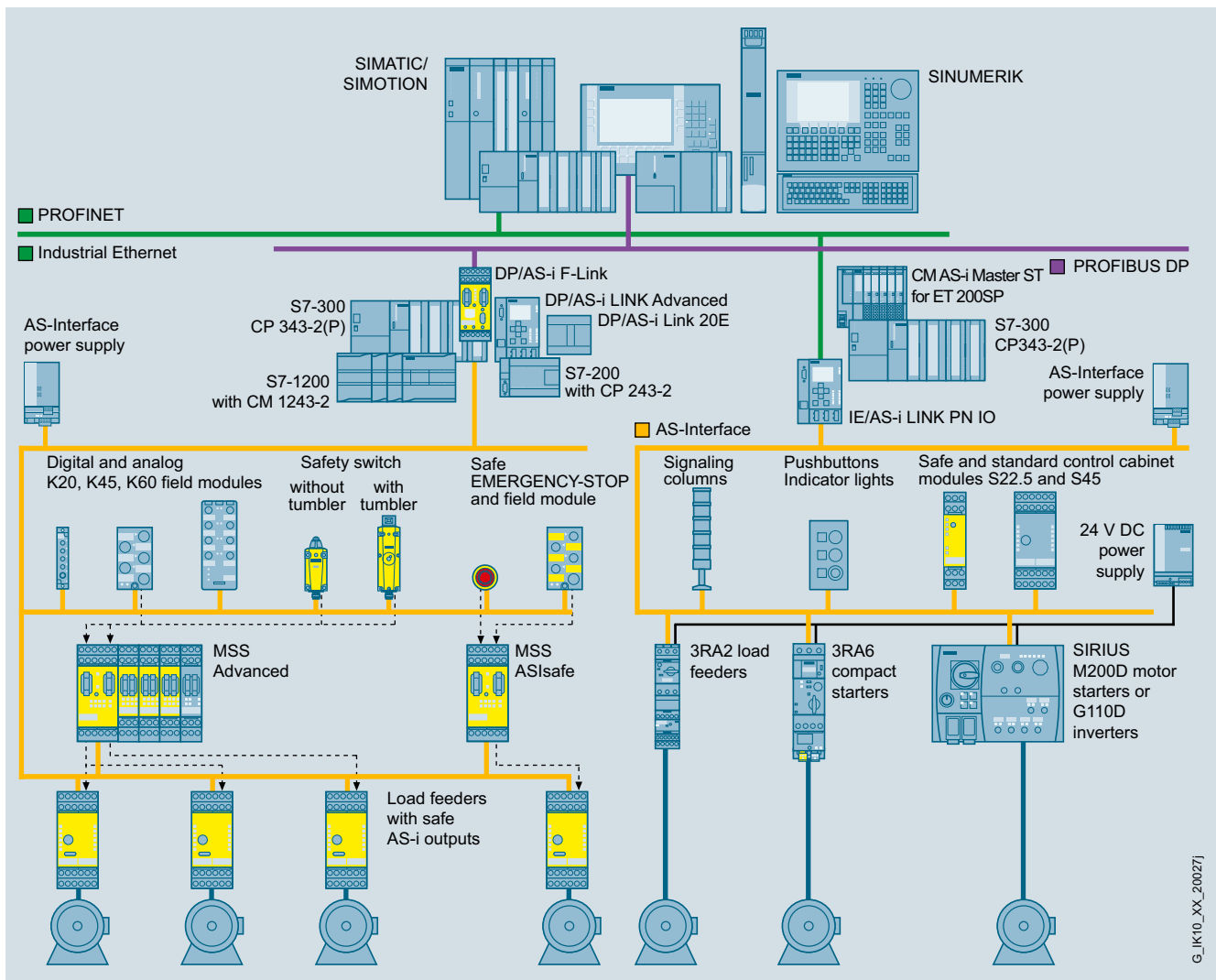
As a cost-effective alternative to the cable harness, AS-Interface links the components of the field level by means of a simple 2-wire cable for data and power.

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 extended addressing (A/B) 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 subordinate network for PROFIBUS DP. The IE/AS-i LINK PN IO allows AS-Interface to be connected to Industrial Ethernet and thereby a direct embedding in the PROFINET environment.



Overview (continued)



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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.

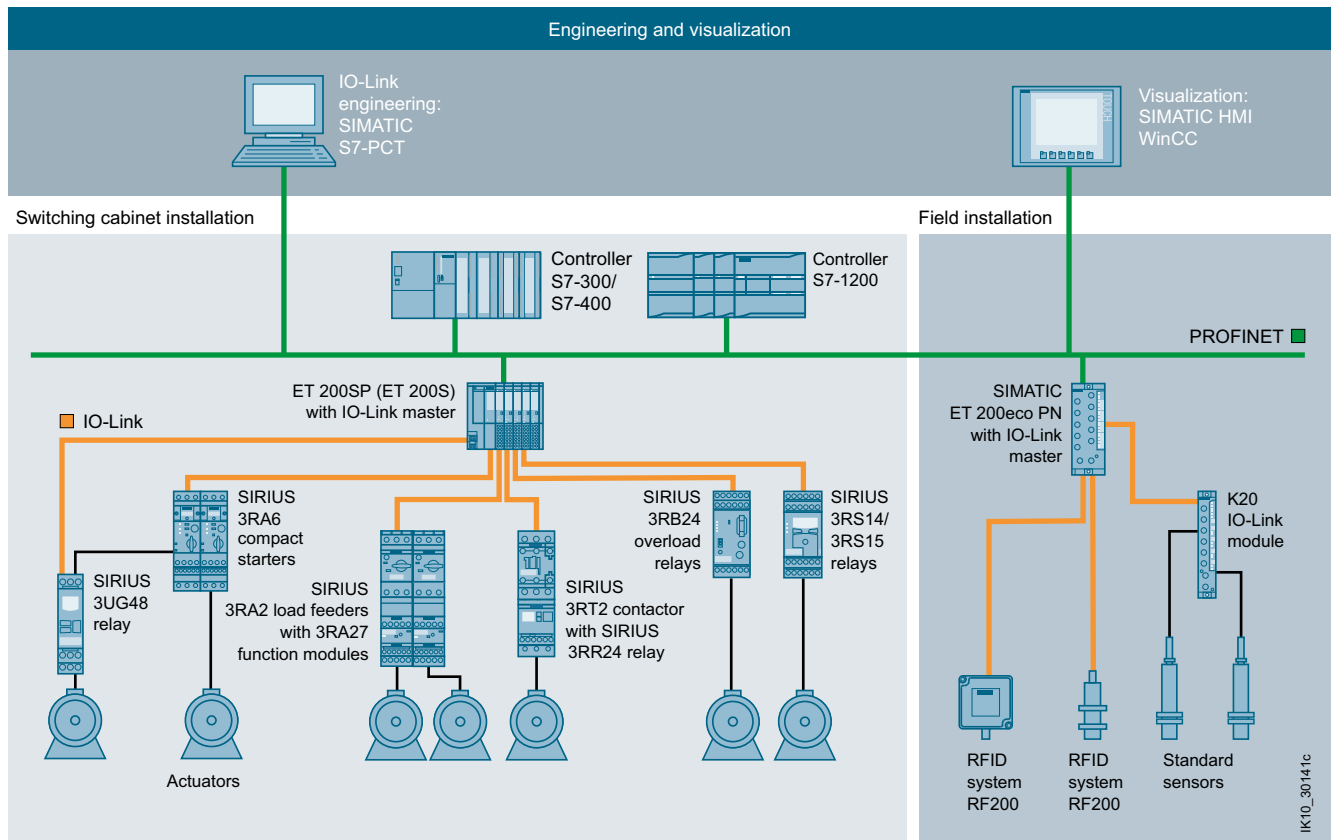
This concept is extremely flexible and has a great effect on savings. No expert knowledge is required for installation and commissioning. Furthermore, through simple cable laying and the clear cable structure as well as the special design of the cable, you not only significantly reduce the risk of errors,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

Introduction

Industrial bus systems

IO-Link

Overview



**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 and sensors 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.

Overview (continued)

Together for integrated quality

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.

Engineering
Reduced engineering times

- 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 read-out of measured values
- Efficient engineering thanks to use of off-the-shelf faceplates in SIMATIC HMI
- Low error rate in CAD circuit design thanks to reduction in control circuit wiring

Commissioning
Reduced commissioning times

- 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

Operation and maintenance
Increased plant availability

- 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 management systems, readout of current values, and diagnostic messages
- Shorter conversion times thanks to central parameter and recipe management for field devices as well



Introduction

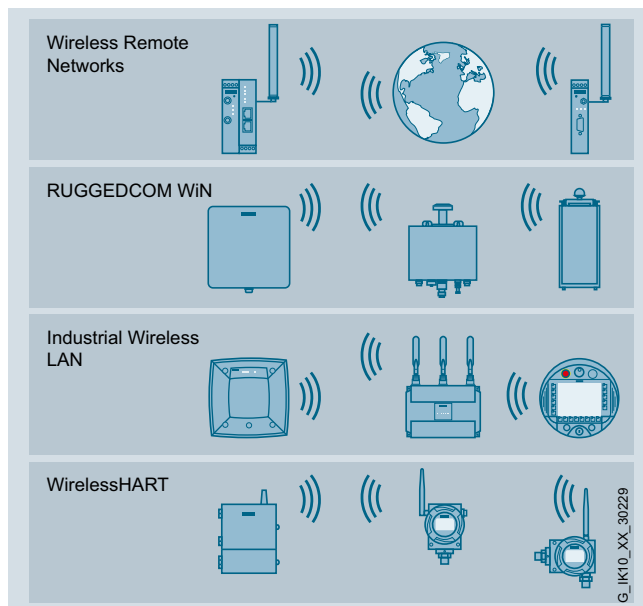
Industrial bus systems

Industrial Wireless Communication

Overview

Within the scope of industrial communication, wireless communications opens up new perspectives – from partial modernization of a plant, right up to optimizing complex logistics or production processes.

On the basis of Wireless Remote Networks, RUGGEDCOM WiN, Industrial Wireless LAN and WirelessHART, Siemens offers solutions for reliable automation with Industrial Wireless Communication.



Reliable, wireless communication

Wireless Remote Networks – low-cost and versatile wireless technology for longer distances

Continuous communication between widely separated plant sections in the area of water/wastewater, or high-speed remote maintenance access to machines and plants on the other side of the world - these are just two of the countless ways you can reap the benefits of Wireless Remote Networks. Thanks to integration in a telecontrol system or an HMI/SCADA system, transferred process data is available at any time via mobile radio.

RUGGEDCOM WiN

RUGGEDCOM WiN products according to the IEEE 802.16e-2005 (WiMax) standard support longer distances and are designed for use in critical locations or under demanding environmental conditions.



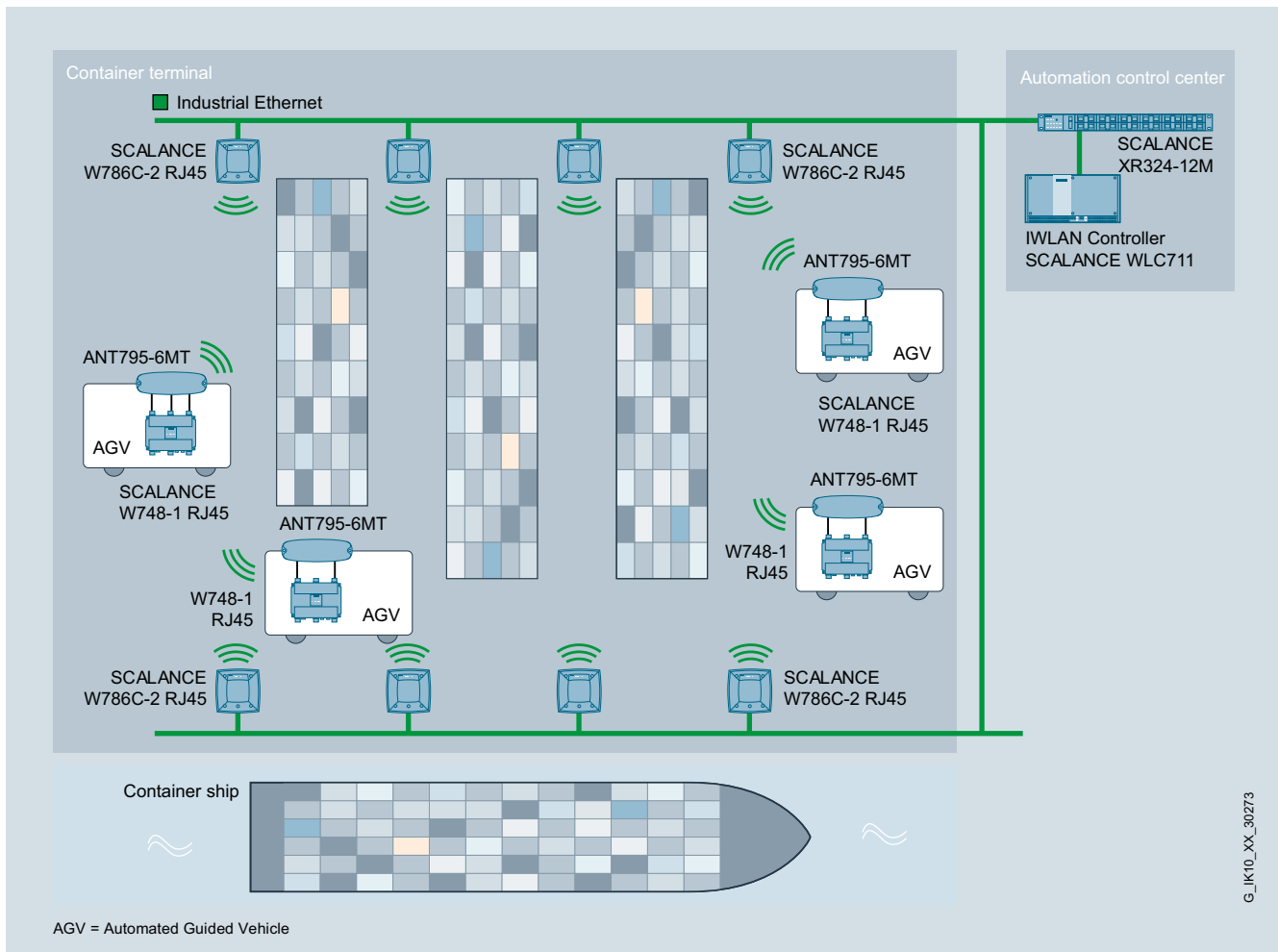
Industrial Wireless LAN – flexible, plant-wide wireless infrastructure

Wireless solutions are increasingly becoming a matter of course in machines and plants. In the case of high data communication requirements, Industrial Wireless LAN (IWLAN) backs innovations like deterministic radio and the Industrial Ethernet standard PROFINET. Thanks to the use of PROFINET via IWLAN, PROFINET opens up completely new perspectives – from efficient engineering, through real-time solutions, all the way to safety-related tasks. Furthermore, an IWLAN infrastructure can also be used for additional applications such as video monitoring.

WirelessHART – wireless connection of the process instrumentation

WirelessHART is an open industry standard, developed for the particular requirements of wireless communication for field devices in the process industry. It meets all specific requirements for reliability, security, economy and user-friendly operation system-wide. With more than 30 million installed devices worldwide, HART technology is the most frequently used communication protocol for intelligent process instrumentation at the field level. WirelessHART is backwards-compatible with the wired HART technology and thus offers maximum investment security for hardware, software and expertise.

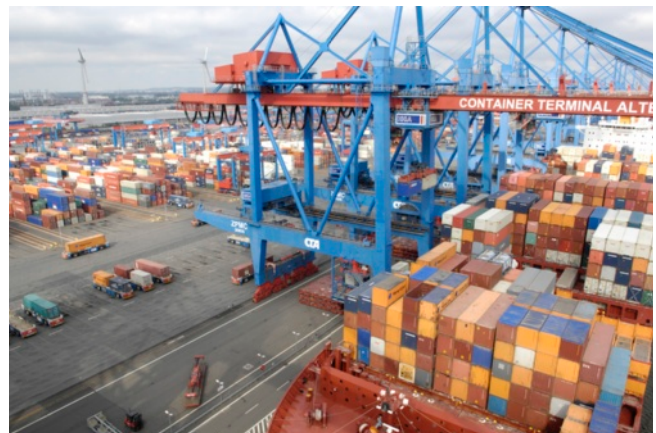
Overview (continued)



Application example for controller-based IWLAN applications with a large number of access points, e.g. in a container terminal

Advantages of a wireless communication network

- Increased competitiveness, since greater flexibility is achieved through mobility
- Maintenance work is simplified, service costs and downtimes are reduced, and personnel are used optimally
- No wear and tear of rotating and moving equipment or system components
- Integrated wireless network for voice and data across the divisions of the company
- Remote diagnostics for different production machines from a central service location reduces service costs
- Awkwardly located installations can be accessed easily; there is no need for complex wiring



Overview (continued)

TeleControl Basic

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 or CP 1243-1 GPRS module for Ethernet-based connections. The server also supports the connection of S7-200 stations with MD720 modems. Wireless GPRS technology or IP-based networks, such as DSL, are available as transmission media. 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. Small-scale applications with few outstations can be implemented, as well as large-scale plants comprising up to 5000 outstations. International approvals permit worldwide use.

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

TeleControl Professional comprises the Siemens telecontrol systems for extensive, expanded applications in the process industry. 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 S7-1200, S7-300 and S7-400 controllers.

The outstations and substations can communicate with each other as well as with one or more control centers.

Transmission networks

Telecontrol supports a wide variety of communication networks. In the classical WAN sector, these are:

- Dedicated lines (private or leased)
- Private radio networks (optionally with time slot procedure)
- Dial-up networks (analog, ISDN, GSM)

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

- Via Internet connections, e.g. with SCALANCE M ADSL2+ routers
- Via 2-wire connections, e.g. with SCALANCE M SHDSL routers
- Via serial or Ethernet-based wireless systems, e.g. via UHF radio devices or Industrial Wireless LAN with SCALANCE W or RUGGEDCOM WIN (WiMax)
- Via fiber-optic conductors, e.g. through use of SCALANCE X switches with optical ports; distances of up to 120 km can then be covered
- Via mobile networks and the Internet using GPRS, GPRS(E) or UMTS and DSL

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 using two transmission paths to permit 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.

Control center systems

A number of different variants can be selected for setting up the control center depending on the process requirements and extent of the information:

- **SINAUT ST7cc**
This WinCC-based PC control center is the ideal control center system for both SINAUT ST7 and SINAUT ST1. It has been developed specifically for event-driven and time-stamped data transmission on the SINAUT system and can have a single or redundant design.
- **PCS 7 with PCS 7 TeleControl**
This is the ideal control center system for plants in which larger local automation tasks have to be combined with telecontrol connections. In addition to SINAUT ST7, remote stations with other communication protocols can be connected, e.g. over DNP3 or IEC 870-5-101/-104.
- **WinCC TeleControl**
This WinCC-based control center system offers the connection of SIMATIC substations to other telecontrol protocols such as DNP3 or IEC 870-5-101/-104.
- **SINAUT ST7sc**
This OPC server software is ideal for connecting the SINAUT telecontrol system to control centers from other vendors via OPC client function. ST7sc features extensive buffer mechanisms which prevent data from being lost even if the OPC client fails, and it can have a single or redundant design
- **SIMATIC S7 controller as control center**
Like the substations, this control center comprises a SIMATIC S7-300 or S7-400 controller and is suitable for simpler applications requiring only one current process image of the telecontrol stations. The station process control can be influenced by entering commands, setpoints or parameters. The control center can also be used to extend a PC control center (SINAUT ST7cc or ST7sc), e.g. for data output on a panel, as an emergency operating system, or for implementing cross-station control tasks.

Introduction

Industrial bus systems

Industrial Remote Communication

Overview (continued)

Teleservice / Remote Access (remote diagnostics and remote maintenance)

Remote diagnostics and remote maintenance of production plants are 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 production site. Plant constructors must nevertheless be able to provide support in the event of a fault. And with the industrial security concept from Siemens, the increasing security requirements for remote access of this type are fulfilled. During the warranty period in particular 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 anywhere in the world 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.

Teleservice via IP-based networks

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

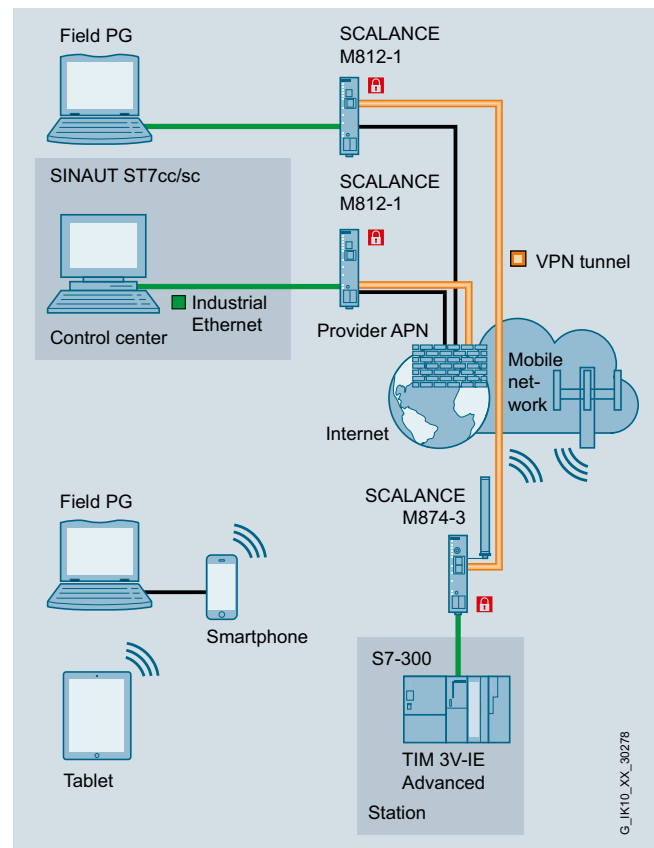
Depending on the application, SIMATIC NET provides the appropriate solution:

- For continuous connections or simultaneous access to several plants, a solution via the Internet using SCALANCE S modules 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 M874-2 GPRS router establishes remote maintenance access to the SCALANCE S in the service center.
- The SCALANCE M874-3 and M875 UMTS routers or the M812 and M816 ADSL routers are available for plants requiring remote maintenance access at an especially high bandwidth

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.

Siemens Remote Services

The teleservice product portfolio of Siemens is supplemented with a service concept for SRS. "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 company's own specialists.







Remote access via an UMTS-based Internet connection

Remote networks

Any type of remote communication is based on the public and private networks used for this purpose (e.g. mobile radio or fixed network), referred to as "remote networks".

Under the name SCALANCE M, Siemens offers a comprehensive range of high-performance transmission components, routers and modems that are tailored to the specific properties of the respective remote networks or their transmission media and therefore combine the maximum possible security with reliability. Regardless of whether spontaneous or permanent transmission, whether high or moderate bandwidth, whether mobile or stationary – with the SCALANCE M products for IP-based connectivity, users have a comprehensive spectrum of components at their disposal for remote access – flexible, optimized for industrial use and integrated into the TIA environment and into the Industrial Security concept. SCALANCE M devices can be used universally in the fields of telecontrol, teleservice (remote diagnosis and maintenance), and any other application for industrial remote communication.

Overview
Data for practical applications

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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1) For PROFIBUS PA

¹⁾ For PROFIBUS PA

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

Introduction

Notes

1