

SIEMENS



RTUs for industry

Siemens Industry – The One-Stop-Shop for RTUs

Industry

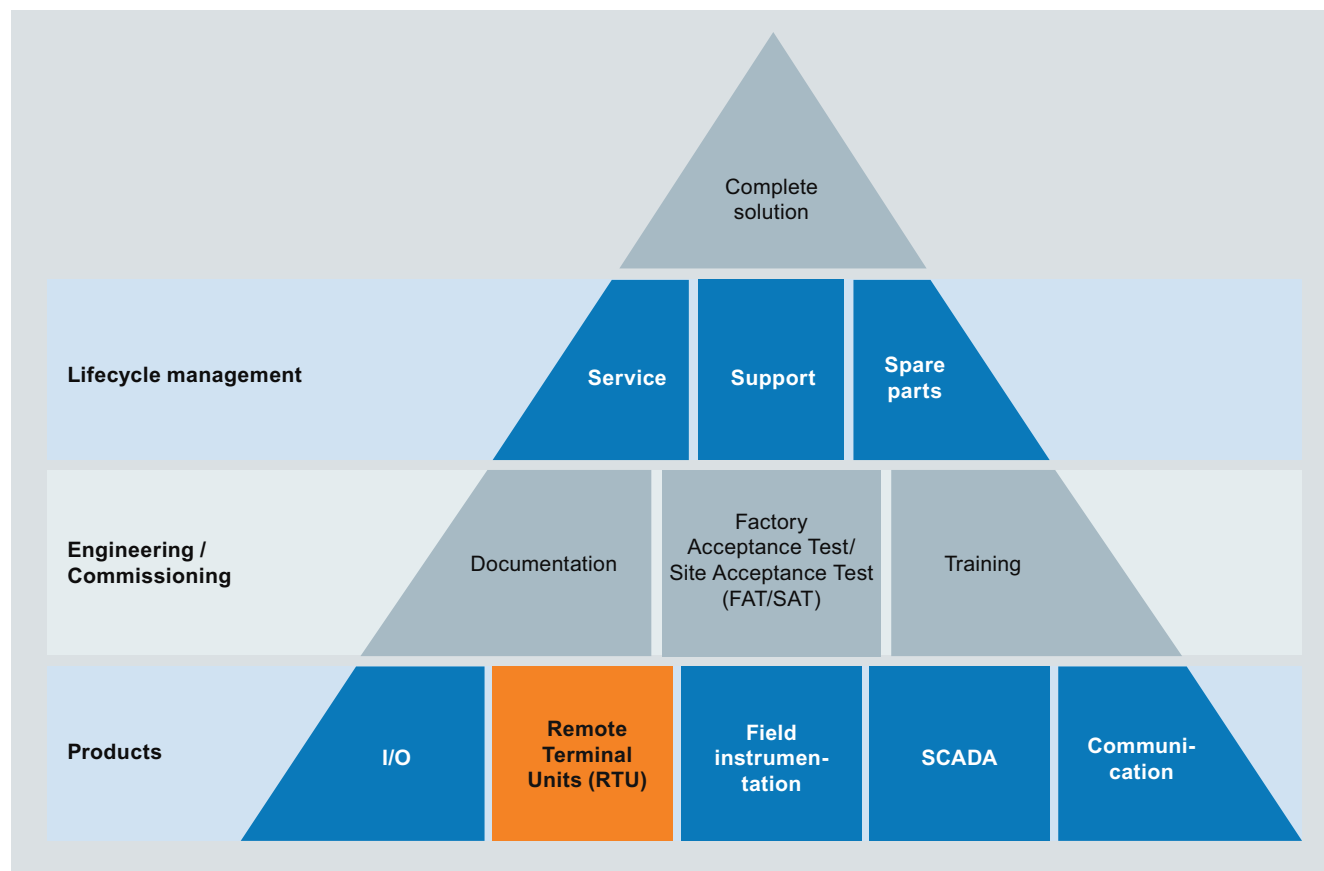
Brochure

March
2013

Answers for industry.

RTUs from Siemens Industry

Siemens Industry offers our customers
the whole product and service portfolio for RTUs



SIMATIC – The faster, more cost-effective route to an optimum solution

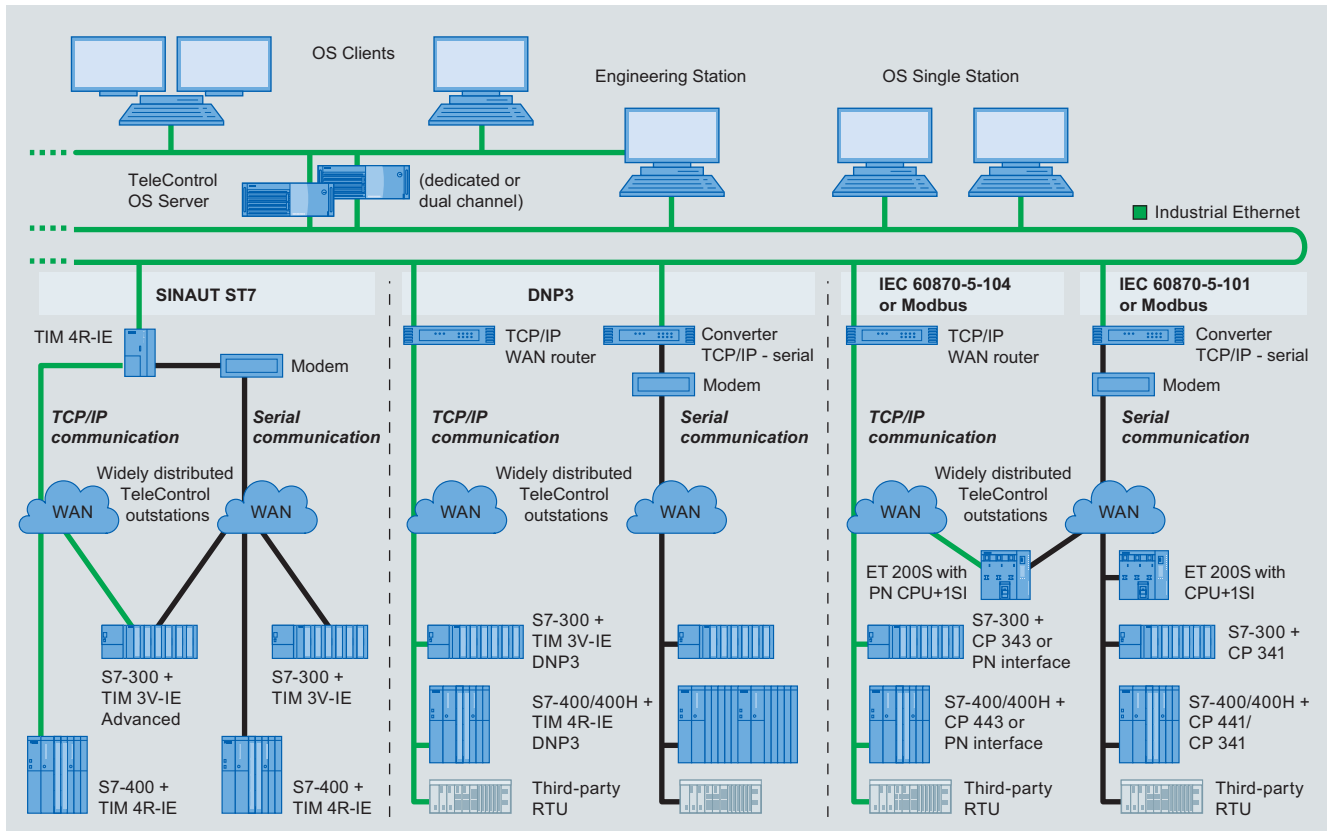
Users know that they will always get the highest possible integration with SIMATIC – the core of Totally Integrated Automation.

Plus, the systems' scalability allows users to customize solutions to their own unique requirements very quickly and cost efficiently, and provides genuine forward compatibility for maximum investment protection and all programming and applications are conform to IEC 61131-3 and IEC 61499 Standards for ease of engineering and application portability.

Siemens process instrumentation

Our comprehensive process instrumentation portfolio offers best-in-class transmitters for the widest range of applications. Whether you want to measure pressure, temperature, flow or level, we offer a unique portfolio of process instruments. To complement our range, we also offer electropneumatic positioners, process controllers and process recorders.

Integration in Process Control



SIMATIC WinCC/PCS 7 TeleControl system architecture

Integration of the telecontrol technology in TIA has made it possible to combine the automation of central plants and the monitoring of distributed units in a single process control system.

Homogenous operator control and monitoring using a common control station, uniform configuration with the same engineering system, and consistent utilization of hardware components from the TIA product portfolio result in significant savings with regard to investments, operation and service.

Remote terminal units

The remote control units supported by SIMATIC have a performance, classified as small, medium or large (see table on page 5).

In addition, the SIMATIC S7-300 F and S7-400 F controllers can be used to implement safety-related applications on site and automatically set the plant to a safe status in the event of a dangerous fault. And with SIMATIC S7-400FH fault tolerant and safety-related RTU applications can be realized.





And when talking about safety Siemens fulfills the international standards like IEC 61508, IEC 61511, ISA S84 and is SIL 3 TÜV certified.

The globally field proven Telecontrol Interface Modules (TIM) from SIMATIC handle the data exchange between remote systems and master system and offer a wide range of comfortable telecontrol functions like subscriber monitoring, redundancy of transmission paths, cross communication, or remote engineering in parallel to the normal data communication, all these independent from the used network types.

SIPLUS RIC (Remote Interface Control) is a telecontrol system that operates with the SIMATIC S7 automation system using internationally standardised communications protocols for:

- Serial transmission IEC 60870-5-101
- Ethernet (TCP/IP) IEC 60870-5-104
- Protective device IEC 60870-5-103

Classification of the remote terminal units




RTU	Applications	Possible protocols	Message buffer size
RTU Small: SIMATIC S7-1200 controller			
	RTU with 30 ... 150 I/Os For small-sized applications and cost-sensitive applications	• IP-T (IP-Telemetry)	CP 1242-7 buffering: up to 2 000 messages, only available for communication via GPRS
		• Modbus RTU	No buffering
RTU Small: controller integrated in SIMATIC ET 200S (incl. fail-safe application)			
	RTU with 30 ... 200 I/Os¹⁾ For small-sized applications and cost-sensitive applications ET 200S for safety-related applications	• Modbus RTU	No buffering
		• IEC 60870-5-101 • IEC 60870-5-103 • IEC 60870-5-104	Approx. 1 600 messages
RTU Medium: SIMATIC S7-300/S7-300F controller			
	RTU with 100 ... 2 000 I/Os¹⁾ For medium-sized applications; extremely flexible configuration S7-300F for safety-related applications	• SINAUT ST7	TIM module buffering Up to 60 000 messages ³⁾
		• DNP3	TIM module buffering Up to 200 000 data points ⁴⁾
		• Modbus RTU	No buffering
		• IEC 60870-5-101 • IEC 60870-5-103 • IEC 60870-5-104	Up to 25 000 messages ²⁾
RTU Medium: SIMATIC S7-1500 controller			
	RTU with 100 ... 2 500 I/Os¹⁾ For medium-sized applications; extremely flexible configuration S7-1500F for safety-related applications	• Modbus RTU	No buffering

¹⁾ depending on CPU size, protocol type and application

²⁾ 1 message can have
 - 1 single or double point indication
 - 1 analogue measurement
 - 1 transformer step position
 - 1 integrated totals
 - 1 bit pattern

³⁾ 1 message can have
 - 32 binary values
 - 4 analogue values
 - 1 or 4 counter values
 - 12 double words
 - 256 bytes

⁴⁾ 1 data point can have
 - 1 binary value
 - 1 analogue value
 - 1 counter value

RTU	Applications	Possible protocols	Message buffer size
RTU Large: SIMATIC S7-400/S7-400F controller			
	RTU with 500 ... 5 000 I/Os¹⁾ For larger applications requiring increased performance S7-400F for safety-related applications	• SINAUT ST7	TIM module buffering Up to 60 000 messages ³⁾
		• DNP3	TIM module buffering Up to 200 000 data points ⁴⁾
		• Modbus RTU	No buffering
		• IEC 60870-5-101 • IEC 60870-5-103 • IEC 60870-5-104	Up to 25 000 messages ^{1) 2)}
RTU Large: SIMATIC S7-400H/S7-400FH controller			
	RTU with 500 ... 5 000 I/Os¹⁾ For larger applications requiring increased performance S7-400FH for safety-related applications	• DNP3	TIM module buffering Up to 200 000 data points ⁴⁾
		• Modbus RTU	No buffering
		• IEC 60870-5-101 • IEC 60870-5-103 • IEC 60870-5-104	Up to 25 000 messages ^{1) 2)}
RTU based on Embedded Controllers (Microbox, Nanobox, S7-mEC, Panel PC etc.)			
	RTU with 250 ... 3 000 I/Os¹⁾ For larger applications requiring increased performance	• Modbus RTU	No buffering
		• IEC 60870-5-101 • IEC 60870-5-103 • IEC 60870-5-104	Up to 25 000 messages ²⁾

¹⁾ depending on CPU size, protocol type and application

²⁾ 1 message can have

- 1 single or double point indication
- 1 analogue measurement
- 1 transformer step position
- 1 integrated totals
- 1 bit pattern

³⁾ 1 message can have

- 32 binary values
- 4 analogue values
- 1 or 4 counter values
- 12 double words
- 256 bytes

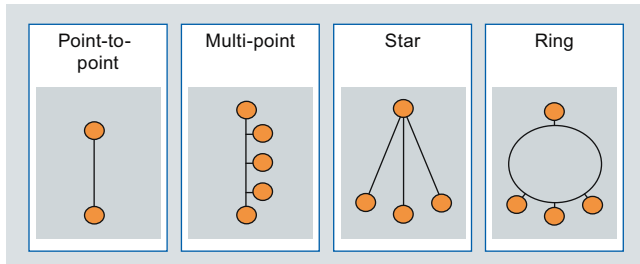
⁴⁾ 1 data point can have

- 1 binary value
- 1 analogue value
- 1 counter value

Network topologies

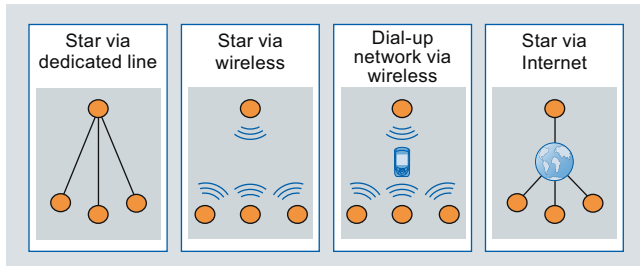
Basic topologies

Differently structured telecontrol networks can be implemented in the wide area network (WAN) based on the following four basic topologies.



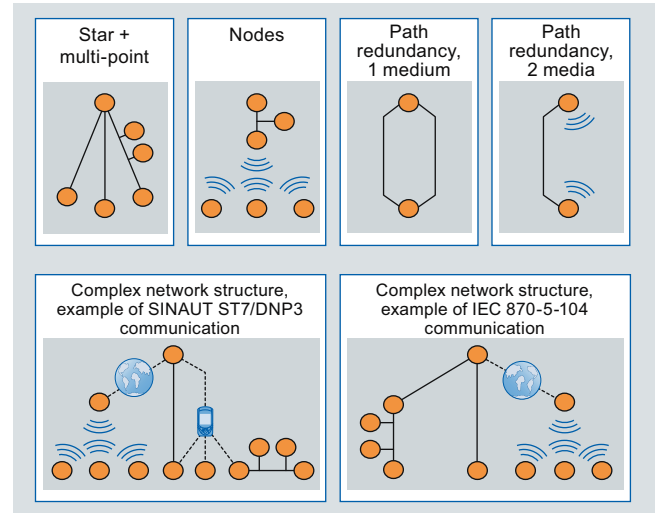
Media versions

Depending on the support provided by the selected telecontrol protocol, various transmission media are available for these basic topologies, e.g. dedicated line, private wireless networks, mobile radio networks, dial-up networks (wireless/landline), DSL over Internet.



Combinations of basic topologies and media versions

Through a combination of several basic topologies of the same or different media versions, it is additionally possible to design more complex network topologies, even with redundant communication paths. This allows adaptation to the respective local conditions and to the existing infrastructure.



Note

Suitable protective measures (among others IT Security, e.g. network segmentation) have to be taken up to ensure a safe operation of the plant. You find further information about the topic of Industrial Security on the Internet under www.siemens.com/industrialsecurity

RTUs for extreme environmental conditions

Particularly harsh industrial environmental conditions require products with special properties – products that are tougher

than the standard. Siemens provides the perfect solution to these requirements – SIPLUS extreme.

Comparison SIMATIC and SIPLUS extreme		
Environmental conditions	Standard SIMATIC	SIPLUS extreme
Climatic conditions	0 ... 60 °C (for defined product families)	-40/-25 ... +70 °C (for defined product families)
Relative humidity	10 ... 95 %, no condensation	100 %, temporary bedewing, condensation and icing are allowed
Chemical active substances	ISA 571.04 G3	EN 60721-3-3 Class 3C4 and ISA 571.04 G3
	SO ₂ 10 ppm; 4 days	SO ₂ 4.8 / 14.8 ppm ¹⁾
	H ₂ S 1 ppm; 4 days	H ₂ S 9.9 / 49.7 ppm ¹⁾
		Cl 0.2 / 1.0 ppm ¹⁾
		HCl 0.66 / 3.3 ppm ¹⁾
	At RH < 60 %, no condensation	At RH < 75 %, condensation allowed; according to EN 60068-2-52
Salt mist test	Not approved	Approved (EN 60068-2-52, Degree of severity 3)
Mechanic active substances	0.2 mg/m ³	4.0 mg/m ³
	1.5 mg/m ³	40 mg/m ³
	Except sand	incl. sand/dust (EN 60721-3-3 Class 3S4)
Biologic active substances	Not approved	Mold growth, fungus
EN60721-3B2		Except fauna (EN 60721-3B2), pending

¹⁾ Continuous operation / Maximum permissible (30 min/day)

Process Instrumentation and Process Analytics in RTU applications

Precision and reliability

The clear focus of our products is on precise measuring results and reliable control of all processes in your factory. We offer you a comprehensive portfolio suitable for all applications and industries with reliability and precision you can depend on.

Measuring and detecting

SITRANS T (temperature)

The SITRANS T family of products is a range of professional devices for temperature measurement, even under extreme conditions – from simple to highly complex applications. For versatile use in all industrial areas, we offer transmitters which can be mounted in different ways (in the connection head, on a mounting rail or in the field housing) and ensure maximum measuring precision.

SITRANS P (pressure)

SITRANS P is a complete family of measuring instruments for measuring relative, differential and absolute pressure. All transmitters, whether digital or analog, offer a convincing performance thanks to their perfect safety concept and ease of use, as well as their measuring precision and rugged design.

SITRANS L (level)

For detecting limit levels as well as for continuous procedures, we offer a full range of level measurement technologies and devices. With capacitance and electromechanical level switches, you can precisely detect the level of solids, liquids and slurries in many industrial fields of operation. For continuous measurements, our product portfolio encompasses radar, guided wave radar, capacitance, electromechanical, gravimetric, ultrasonic, and hydrostatic technology for unbeatable measuring performance in liquids, slurries and solids.

SITRANS F (flow)

Choosing the right flowmeter for the right application can dramatically improve your bottom line. Designed for all industrial sectors, the Siemens SITRANS F family encompasses a large selection of flowmeters based on different principles of measurement: electromagnetic, coriolis, ultrasonic (in-line or clamp-on), vortex, rotary piston and differential pressure flowmeters.










Controlling

The SIPART PS2 is a high-precision positioner for controlling valves or flaps and is by far the best electropneumatic positioner on the market. Numerous new diagnostic functions, including the partial stroke test, have been integrated in the SIPART PS2 in order to detect valve and operating mechanism faults.

Analyzing

Siemens is a leading supplier of process analyzers and process gas analysis systems. Here, engineering and the continuous development of our products are based on precise measuring of components in many different processes. In process gas chromatography, we utilize the latest microsystems technology as well as our tried-and-tested gas chromatography units, which are designed for complex tasks.

Selection assistant for RTUs based on standard PLCs from Siemens Industry

		Hard-wired I/O	Fieldbus						Communication protocols									
	Power supply redundancy		AI, AO, DI, DO	HART	FOUNDATION Fieldbus	PROFIBUS DP/PA	PROFINet	Connection of auxiliary systems with Modbus	Local HMI	IP-T (IP-Telemetry)	SINAUT ST7 (serial or TCP/IP)	DNP3 (serial or TCP/IP)	Modbus RTU serial	Modbus RTU TCP/IP	IEC 60870-5-101 serial	IEC 60870-5-103 protection relay	IEC 60870-5-104 TCP/IP	IEC 61850
RTU																		
S7-1200 	—	●	—	—	●	●	●	●	● ¹⁾	—	—	●	●	—	—	—	—	
ET 200S 	—	●	—	—	●	●	●	●	—	—	—	●	●	●	●	●	—	
S7-300 	—	●	●	—	●	●	●	●	—	●	●	●	●	●	●	●	●	
S7-1500 	—	●	● ³⁾	—	●	●	●	—	—	—	—	●	●	—	—	—	—	
S7-400 	●	●	● ²⁾	●	●	●	●	●	—	●	●	●	●	●	●	●	●	
S7-400F 	●	●	● ²⁾	●	●	●	●	●	—	●	●	●	●	●	●	●	●	
S7-400FH 	●	●	● ²⁾	●	●	●	●	●	—	—	● ⁴⁾	●	●	●	●	●	●	

¹⁾ only for GPRS, not for extreme environmental conditions








²⁾ via ET 200M/ET 200iSP

³⁾ via ET 200iSP

⁴⁾ full device redundancy available

**PLCs from Siemens Industry,
well-known as SIMATIC Controllers –
The innovative solution for all automation tasks**

SIMATIC Controllers are the global Number 1 for all automation requirements. They offer a host of integral functions and can be finely scaled with regard to performance.






	Private networks			Public networks									Extreme environmental condition		
	Radio	Dedicated line	WLAN	GPRS	EGPRS	UMTS	DSL	American Gas Association (AGA)	Industry Library (IL)	Logical user applications	Failsafe	IEC 61850-8 MMS (Manufacturing Message Specification)	Aggressive environmental	Condensation/icing	RTU
	-	-	-	●	-	-	-	-	-	●	-	-	●	●	S7-1200 
	●	●	●	●	●	●	●	●	●	●	●	●	●	●	ET 200S 
	●	●	●	●	●	●	●	●	●	●	●	●	●	●	S7-300 
	-	-	●	-	-	-	-	-	-	●	●	-	●	●	S7-1500 
	●	●	●	●	●	●	●	●	●	●	-	●	●	●	S7-400 
	●	●	●	●	●	●	●	●	●	●	●	●	●	●	S7-400F 
	●	●	●	●	●	●	●	●	●	●	●	●	●	●	S7-400FH 

SIMATIC Controllers are based on different hardware and software architectures:

- SIMATIC Modular Controllers
- SIMATIC Embedded Controllers

There are failsafe and fault-tolerant versions available for applications with high safety requirements. Controllers with integrated and/or distributed I/O complete our product range.





Selection assistant for RTUs based on embedded controllers

		Hard-wired I/O	Fieldbus						Communication protocols									
	Power supply redundancy		AI, AO, DI, DO	HART	FOUNDATION Fieldbus	PROFIBUS DP/PA	PROFINet	Connection of auxiliary systems with Modbus	Local HMI	IP-T (IP-Telemetry)	SINAUT ST7 (serial or TCP/IP)	DNP3 (serial or TCP/IP)	Modbus RTU serial	Modbus RTU TCP/IP	IEC 60870-5-101 serial	IEC 60870-5-103 protection relay	IEC 60870-5-104 TCP/IP	IEC 61850
RTU																		
Nanobox 	—	●	● ¹⁾	—	●	●	●	●	—	—	—	—	●	●	●	●	●	
Microbox 	—	●	● ¹⁾	—	●	●	●	●	—	—	—	—	●	●	●	●	●	
S7-mEC 	—	●	● ¹⁾	—	●	●	●	●	—	—	—	—	●	●	●	●	●	
Box PCs 	—	●	● ¹⁾	—	●	●	●	●	—	—	—	—	●	●	●	●	●	
Panel PCs 	—	●	● ¹⁾	—	●	●	●	●	—	—	—	—	●	●	●	●	●	

¹⁾ via ET 200M/ET 200iSP

The table shows which RTUs based on embedded controllers can be selected via different fieldbus, protocol and feature criteria.

Embedded controllers as RTU offer more flexibility in case of user applications (like AGA, long-term archiving, file transfer application).

	Private networks			Public networks									Extreme environmental condition		
	Radio	Dedicated line	WLAN	GPRS	EGPRS	UMTS	DSL	American Gas Association (AGA)	Industry Library (IL)	Logical user applications	Failsafe	IEC 61850-8 MMS (Manufacturing Message Specification)	Aggressive environmental	Condensation/icing	RTU
	•	•	•	•	•	•	•	•	•	•	•	•	-	-	Nanobox 
	•	•	•	•	•	•	•	•	•	•	•	•	-	-	Microbox 
	•	•	•	•	•	•	•	•	•	•	•	•	-	-	S7-mEC 
	•	•	•	•	•	•	•	•	•	•	•	•	-	-	Box PC 
	•	•	•	•	•	•	•	•	•	•	•	•	-	-	Panel PC 

Telecontrol protocols

General/elementary telecontrol functions

Telecontrol systems use special protocols to implement data transmission between the control center and the outstations (RTUs) at the process level for the automation functions on site. These telecontrol protocols manage the secure and error free data transmission over the WAN even with a low bandwidth and poor transmission quality. In addition to short transmission times for the information, this task requires effective protection of the frames against:

- Undetected bit errors
- Undetected frame errors resulting from synchronization errors
- Undetected loss of information
- Frame falsification
- Segregation or fault in related information

This particularly applies to event-controlled frames over transmission channels with a limited bandwidth and uncertain noise response. Since irregular bit sequences are compiled for data transmission, no limitation in codes must exist.

Time stamp

When linking RTUs by means of SINAUT ST7, DNP3, IEC 60870-5-101 or IEC 60870-5-104 telecontrol protocol, the raw data in the outstations is provided with a time stamp and transmitted to the SIMATIC WinCC/PCS 7 TeleControl OS (server/single station) acting as control center. Adaptation, further processing, and archiving are carried out here. This procedure is appropriate for the event-based principle of operation of the telecontrol protocol as well as the subsequent chronological processing of data previously buffered in the outstation.

Clock synchronization

The WinCC/PCS 7 TeleControl OS are the clock masters for the RTUs connected by means of SINAUT ST7, DNP3, IEC 60870-5-101, IEC 60870-5-103 or IEC 60870-5-104, and regularly synchronizes their date and time via the telecontrol connection. Switching over between summertime and wintertime is also considered during the synchronization.

Failsafe

For safety applications Siemens has a full range of safety products. Siemens also offers Safety consultancy services and Safety trainings based on the products and standards. The trainings based on the standards IEC 61508/11 are in cooperation with TÜV.

Data buffering

The SINAUT ST7, DNP3, IEC 60870-5-101 and IEC 60870-5-104 telecontrol protocols support reliable on-site intermediate buffering of the data including time tag, e.g. if a communication path is faulty or a station has failed. In addition, intermediate buffering of data can also be an effective means for reducing connection costs in the dial-up network. A data update for all participating communication partners is performed automatically following debugging or restarting of the failed station. Important events are not lost, and the integrity of the control center archive is assured.

American Gas Association (AGA)

The AGA library for calculation of the flow of natural gas is based on API 21 and contains function blocks and faceplates and is certified for non custody transfer.

Industry Library (IL)

The Industry Library provides an efficient support for graphical engineering with SIMATIC PCS 7 connected RTUs via SINAUT ST7. More than 100 tested blocks, including industry-specific faceplates for pumps, valves, controls etc. minimizes the commissioning and training overheads in different industries.

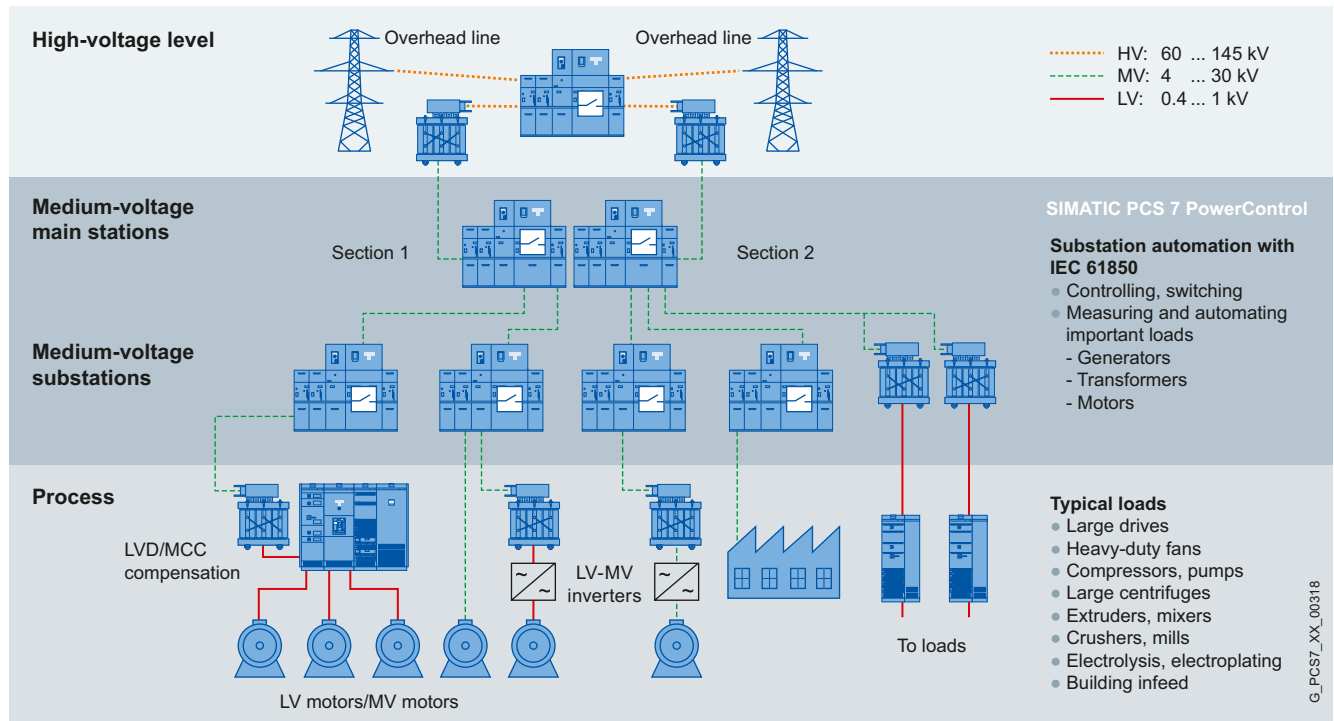
SCADA connectivity



Connectivity	Communication protocols								
	IP-T (IP-Telemetry)	SINAUT	DNP3	Modbus	IEC 60870-101	IEC 60870-103	IEC 60870-104	IEC 61850	Modbus Plus / SSI
PCS 7 TeleControl	-	●	●	●	●	-	●	-	-
PCS 7 PowerControl	-	-	-	-	-	-	-	●	-
WinCC TeleControl	-	●	●	-	●	-	●	-	-
WinCC ST7cc	-	●	-	-	-	-	-	-	-
WinCC OA	-	-	●	●	●	●	●	-	●
SCADA with ST7sc	-	●	-	-	-	-	-	-	-
SCADA with TeleControl Server Basic	●	-	-	-	-	-	-	-	-
Third-party SCADA	-	-	●	●	●	●	●	●	●

SCADA systems connect outstations via several protocols. The table shows which protocols are supported by SCADA control centers.

Integration of switchgear automation



Automation levels in power supply and distribution

Besides typical RTUs in field automation, also substation automation can be integrated in SIMATIC PCS 7. Historically, systems for automating a process and systems for automating the power supply to this process were always strictly segregated. With SIMATIC PCS 7 PowerControl, it is now possible to combine process automation and the automation of electrical switchgears for medium voltages ranging from 4 to 30 kV in one control system. This results in a host of benefits that provide huge cost savings over the entire life cycle of the plant, by means, for example, of:

- Simpler plant structures with more transparency in the technological dependencies
- Further increase in the level of integration of the plant
- Uniform process control and further expansion of the operator's task area
- Long-term investment security thanks to globally valid standard IEC 61850
- Rational, integrated engineering and fast commissioning
- Lower administration, service and training costs thanks to uniform holistic view
- Effective energy management (load management, consumption optimization)

These are gaining even more in importance given the increasing decentralization resulting from greater use of renewable energies. One example of this is provided by wind farms.

An electrical switchgear distributes or transforms electrical energy, bundling loads/consumers into load groups. With the help of switching devices, network nodes implemented as busbars connect incoming and outgoing cables known as feeders. When the substation is dimensioned, account is taken of changes to the network topology in the event of faults, and the isolation and grounding of equipment for maintenance work.

Integration of intelligent electronic devices into SIMATIC PCS 7

Electronic devices (IEDs) such as SIPROTEC protective devices or interoperable third-party devices are used for automating switchgears, that is, for protection, control, measuring and monitoring functions in electrical energy transmission and distribution. IEDs can be integrated into the SIMATIC PCS 7 process control system via Ethernet TCP/IP communication with the IEC 61850 transmission protocol for protection and control technology in electrical switchgears.

Service, Training



Siemens Industry service portfolio

Increasing demands make it ever more important that industrial plants operate at highest productivity and efficiency levels. Industry Services from Siemens provide industry businesses with the vital competitive edge.

Whether it's production or process industry - in view of rising cost pressure, growing energy costs, and increasingly stringent environmental regulations, services for industry are a crucial competitive factor in manufacturing as well as in process industries. All over the world Siemens supports its customers with product, system, and application-related services throughout the entire life cycle of a plant. Right from the earliest stages of planning, engineering, and building all the way to operation and modernization, these services enable customers to benefit from the Siemens experts' unique technological and product knowledge and industry expertise. Thus downtimes are reduced and the utilization of resources is optimized. The bottom line: increased plant productivity, flexibility, and efficiency, plus reduced overall costs.

SITRAIN – Training for Industry

Getting directly applicable know-how fast – practical training courses from the manufacturer!

From the basics and advanced to specialist skills, SITRAIN courses from the Siemens training program deliver extensive expertise directly from the manufacturer – and encompass the entire spectrum of Siemens Industry products and systems. Worldwide, SITRAIN courses are available wherever you need a training course in over 200 locations in 62 countries.

Training Topics Worldwide

SITRAIN training offer for automation and industrial solutions are available worldwide and provide extensive expertise directly from the manufacturer. You can take Siemens courses in a traditional classroom environment or expand your knowledge using innovative learning and communications media such web-based training. And, if you are looking for training on a specific product and want to know where the course is offered, just look through our overview of courses available worldwide.

Get more information in the internet
support.automation.siemens.com
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Get more information

For further information regarding RTUs from Siemens Industry
please have a look at

www.siemens.com/rtu

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