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# Proven, reliable, safe

The SIPROTEC 4 device range is the synonym for efficient protection technology

Answers for energy.



SIPROTEC 4 has established itself as the industry standard for digital protection technology.

## SIPROTEC 4 protection devices – a sustainable success story

A homogenous system platform, the unique DIGSI 4 engineering program, and extensive experience of more than a million successfully operating devices in the field worldwide – thanks to these unique advantages, SIPROTEC 4 enjoys top recognition among users worldwide. SIPROTEC 4 is the industry standard for digital protection technology today in all fields of application.

SIPROTEC 4 protection and bay controller devices combine over one hundred years of Siemens experience in the field and have been proving their value for many years through their efficiency, reliability, and future-safety – all this, in the long-term: SIPROTEC 4 devices stand for low life cycle costs, making sustainable and profitable management possible. The implementation of the international IEC 61850 standards has played a significant role in this accomplishment, in that it forms a consistent and future-proof basis for all protection, communications, and control functions in substations.

### **The SIPROTEC 4 philosophy – one solution, multiple functions**

SIPROTEC 4 leads the way in integrating protection, control, measurement, and automation functions in one device. In many fields of application, all secondary technical functions can be carried out using just one device. This lowers investment costs, reduces installation work in every respect, and increases system availability.

The same philosophy is central to the DIGSI 4 engineering tool that manages all functions, from the setting and initial start-up of devices to the easy analysis and documentation of system faults.



## Efficient and future-proof thanks to seamless communication

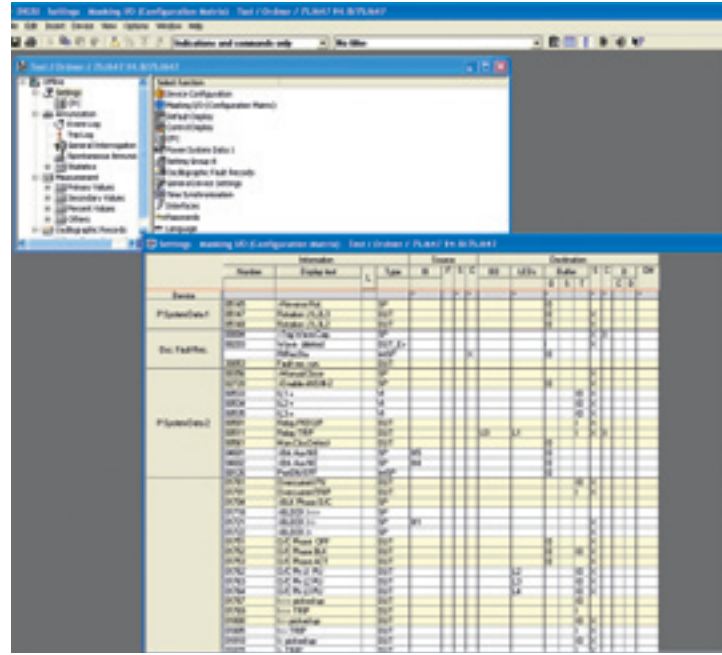
IEC 61850 is the worldwide accepted standard for Ethernet-based communication in substations. It was created jointly and subsequently developed by users and manufacturers for protection technology, communication and control in substations, on a future-proof and manufacturer-independent basis.

With SIPROTEC 4 Siemens is the first company worldwide to manufacture a complete device range with full IEC 61850 implementation and to develop it continuously. This standard has established itself quickly and successfully. With more than 150,000 devices with an IEC 61850 interface, SIPROTEC 4 stands for incomparable proven experience in the field.

It goes without saying that future editions will continue to support IEC 61850. Continuous further development of this kind guarantees investment and future-safety. Together with the long-term proven RSTP protocol, both PRP and HSR will feature two additional redundancy protocols in the future. In addition to IEC 61850, further standard protocols such as DNP 3 or IEC 60870-5-103, for instance, will be supported.

### The advantages of IEC 61850 at a glance:

- Comprehensive engineering support right through to implementation, from operation to service. This brings cost-savings to configuration, initial start-up, and maintenance
- Noticeably lower costs for wiring between feeder devices, control switches, and signaling devices
- Higher safety thanks to synchronized communication in real time and through the use of a common, Ethernet-based communications channel for all data, including the retrieval of fault records
- High investment safety thanks to the separation of the communications and data models
- Simple, clear system structure without interface, protocol, and integration problems. All IEC 61850-compatible field devices are interoperable, as the FGH clearly demonstrated during testing
- Manufacturer neutrality and worldwide acceptance



## Intuitive user interface, simple to operate

DIGSI 4 forms the interface between the user's PC and the SIPROTEC devices and brings together all important functions. Designed and created especially for industrial and energy-supply applications, DIGSI 4 makes the parameterization and analysis of the SIPROTEC devices really easy.

The downward-compatible PC software features a highly modern intuitive user interface that makes all functions easy to perform, from the parameterization and initial start-up of the devices to the simple analysis and documentation of system faults. A high-performance analysis tool enables quick troubleshooting and provides important data for possible servicing.

For many users, DIGSI 4 has become an established name in the business.

### DIGSI 4 at a glance:

- Representation of every given system structure
- Import and export of parameter sets
- Flexible and intuitive utilization of a comprehensive range of logic editor (CFC) options – no prior programming knowledge necessary
- Precise fault analysis and visualization using SIGRA
- Innovative configuration of inputs and outputs in a visually clear matrix (no box dialogs)
- Intelligent plausibility checks eliminate error entries
- Test and diagnostic functions
- Direct operation of the device via a serial interface and remote control via modem
- Integrated IEC 61850 workstation configurator



## SIPROTEC time overcurrent protection 7SJ6 – everything in a single device

### Reliable implementation of all functions within a single SIPROTEC 4 device

Protection, control, measuring, and automation functions are integrated into time overcurrent protection on the SIPROTEC 4 system platform. All secondary technical functions can be realized using a single device. In addition, parameterization effort is minimized. Furthermore, the installation of a range of external devices, instruments, and switches is not necessary anymore.

Both the ergonomics and the graphic quality of the user interfaces of the SIPROTEC 4 devices also set new standards. This provides maximum operational safety. Thanks to the CFC (Continuous Function Chart) logic parameterization for switching interlocks and simpler configuration, conventional supplementary circuits become unnecessary. For this reason, protecting substations with SIPROTEC 4 devices in all situations is both simple and safe.

### The advantages at a glance:

- Protection, control, automation, and monitoring in one device
- Outstanding cost-performance ratio, simple and user-friendly parameterization, and minimized wiring
- Two key-operated switches or password protection and four freely assignable keys make external switches and wiring unnecessary
- No additional instruments and no transducers are required thanks to a measuring tolerance of one percent of the measuring value
- Graphic display of feeder control diagrams replaces the conventional mimic diagram
- Free configuration of the feeder control diagram makes every conceivable configuration possible
- Conventional supplementary circuits are made redundant by CFC logic parameterization



## SIPROTEC 7SA6 and 7SA5 – much more than differential protection

### Active interface for maximum performance and safety

The SIPROTEC 4 range of distance protection devices are universally applicable, highly flexible devices that are ideally suited for protection, control, and automation functions at all voltage levels. They set themselves ahead of the competition through their active interface for digital communication at the remote end of the line. This optimizes signal procedures and enables 100 percent protection of the power line.

The protection devices at both ends of the connection line can communicate serially with one another via the active interface of the SIPROTEC 4 distance protection devices, without a converter. This makes intelligent signal-comparison procedures possible, without additional components and without extra wiring.

In addition, the active interface makes more channels available for the transfer of control and status-signal data.

The capabilities of the SIPROTEC 4 distance protection devices go far beyond those of mere distance protection. In combination with SIPROTEC 7SD5 comparison protection, the reliable, faster, and selective protection of connection lines is made possible. Here, two separate measuring principles in two separate devices ensure maximum reliability and selectivity.

### Substation automation on a proven basis

Siemens is the global market leader for industry automation solutions. This market advantage has a marked effect on SIPROTEC 4 devices for substation automation. Installed and operating successfully for many years in a broad range of applications to date, these distance protection devices feature an extremely flexible programmable logic, even in their basic functions. This allows important functions to be realized simply and easily, such as the realization of interlocking for local control, additional switching for protection functions, and the processing of measurement values with defined thresholds.

### The advantages at a glance:

- Simultaneous impedance measurement in all six measurement loops provides optimum protection at all voltage levels and the shortest tripping times
- Broad impedance setting ranges enable the selective protection of both the shortest and longest conceivable transmission lines and cables
- Space-saving and simply integrated local control for the switchgear
- Panel inherently adaptable to future standards for maximum investment safety via exchangeable communication modules
- Adaptive de-energized break optimizes the reconnecting function and minimizes impact on the circuit-breaker contactor.



## SIPROTEC 7SD5 and 7SD610 – ensures flexible line differential protection

### The unchallenged standard in line differential protection

The outstanding performance capability of the SIPROTEC line differential protection devices 7SD5 and 7SD610 have redefined the standard across the board, in terms of applications possibilities, expandability, and flexible adaptation. Even complex line configurations with transformers in protection zones can be protected selectively and effectively using the SIPROTEC 7SD5 and 7SD61. The protection range can be expanded up to six line ends via the 7SD5.

### Differential protection and distance protection in one device

The combination of distance and differential protection as an equivalent protection principle ensures a maximum of the utmost selectivity and system availability. In the SIPROTEC 7SD5, both functions are effectively both parallel and independent from each other. This makes particularly economical and profitable protection concepts possible. Furthermore, the protection zone is expanded to neighboring connections via distance protection.

### Communication without borders

All devices in the SIPROTEC 4 range adapt to existing communications structures in an optimal manner. Copper twisted-pair cables can be used, as can optical fiber cable

lines or communication networks – the differential measuring values of SIPROTEC devices mean that reliable operation of the protection devices via any communications medium is guaranteed at all times.

Differential protection can be connected directly to multi-mode or single-mode optical fibers. The maximum transmission range is 100 km. The synchronous X21 or G.703 interface (64 kbit/s or 2 Mbit/s) and the IEEE C37.94 interface allow direct connection to a digital communications network. Runtimes, runtime fluctuations, and fault rates are measured and compensated for adaptively.

### The advantages at a glance:

- Comprehensive protection of line configurations with transformers within the protection range of between two and six line ends
- Utilization of the existing communications infrastructure
- Integration into digital communications networks
- High system availability via automatic communication switching from loop to chain topologies
- Combination of distance and differential protection in a single device



## SIPROTEC 7UT6 – all-round safe transformers

### Reliable protection of highly valuable equipment at all times

Comprehensive protection concepts, for instance, via the constant monitoring of primary electrical and thermal measuring values and the evaluation of the monitoring data are just one of the special characteristics of the SIPROTEC 4 range. The SIPROTEC 7UT6 transformer relay plays out this strength. The device provides comprehensive short-circuit protection for transformers, motors, and generators, as well as for small busbars.

Furthermore, the SIPROTEC 7UT6 allows the electrical and thermal parameters of the transformer to be monitored during operation. Long-term monitoring, thermal prognosis calculations, and diagnostic functions can also be implemented for several transformers. This allows potential defects to be detected before costly damage occurs. In due time, the operator is warned or valuable equipment is switched off.

Setting up SIPROTEC 4 complete protection for transformers is really simple. Entering the data of the device that is to be protected and that of the primary converter is all that is required.

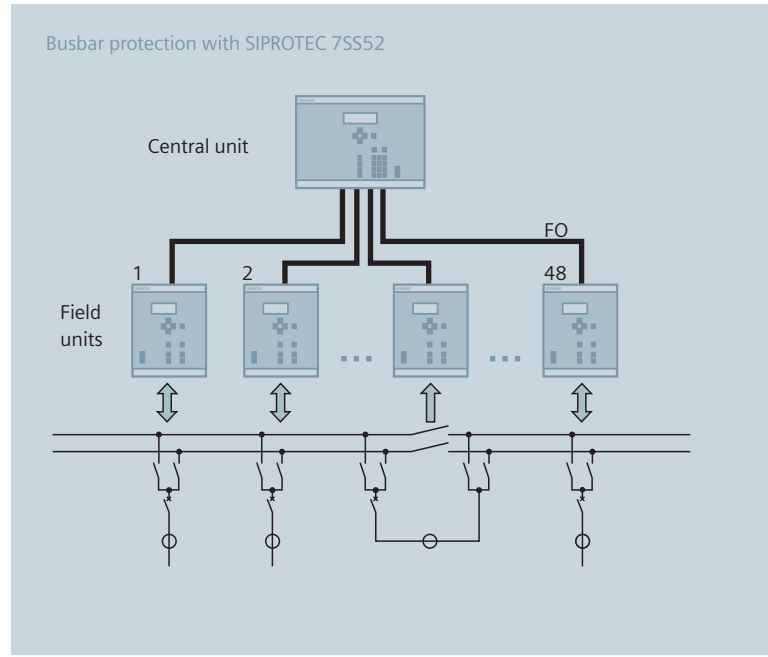
### Flexible programmable logic

The hallmark of the SIPROTEC 7UT63 is its extremely adaptable and programmable logic. It enables the configuration of interlockings for controlling the switching devices on the transformer. This applies to all functions, from additional switching and protection functions all the way to the evaluation of measuring values with defined parameters.

### The advantages at a glance:

- Reliable protection of two to five coil transformers
- A simple parameterization concept for the quick and user-friendly setup of optimum transformer protection
- Sensitive protection functions via ground current logging for the precise detection of coil-insulation faults to ground
- Comprehensive integrated reserve protection functions such as time overcurrent protection and switching failure protection make additional protection devices obsolete
- Start-up and operating help per Web browser cuts start-up times
- Thermal monitoring and the monitoring of transformers during operation make a higher level of controlled utilization possible





## SIPROTEC 7SS52 – perfect protection for busbars

### SIPROTEC 7SS52 – adaptable, reliable, and expandable at any time

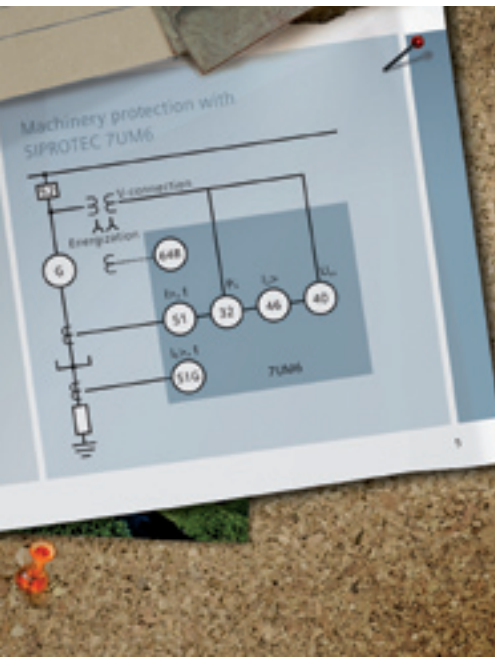
The modular system of the SIPROTEC 7SS52 provides reliable protection against both the short-circuiting of busbars and against switching failure, independent of the configuration of individual systems. It can be ideally adapted to the individual characteristics. Thanks to its modular design, additional field devices can be effortlessly connected to the system at any time. The convenient DIGSI 4 user program makes configuration a breeze. Additional communications modules connect the device to higher-level systems via the IEC 61850 interface.

### Selective, safe, and fast

In the event of a busbar fault, the protection system switches off the affected part of the system. This ensures the network stability of the entire region. Numerous measurement algorithms allow busbar faults and external faults to be differentiated from one another. With its high-speed tripping signal of under 15 milliseconds, the SIPROTEC 7SS52 sets the standard on the market in terms of speed.

### The advantages at a glance:

- Protection of busbars with up to 48 fields
- Extremely short tripping times
- Minimal converter requirements
- High level of safety against overfunctioning thanks to the check-zone
- Simple graphic configuration of the system in single-line mode using DIGSI 4



## SIPROTEC 7UM6 – reliable machine protection

### Numerical protection of power generation systems

Within milliseconds, SIPROTEC 7UM6 protection devices respond to faults. This guarantees maximum system safety. Potential damage is minimized, and breakdowns are prevented.

SIPROTEC 7UM6 devices provide complete protection in numerical technology for:

- Generators of all sizes
- Large transformers in power plants and industrial systems
- Large synchronous and asynchronous motors

### Individual consultation and configuration for maximum safety

From the design of individual protection concepts and their flexible configuration through to their initial start-up, Siemens' experts provide all the support needed to create unbeatable all-round reliable protection systems.

Thanks to years of experience and comprehensive know-how, any system can benefit from the maximum utilization of its device possibilities and secured system availability at minimum operational costs.



## SIPROTEC 4 devices in power plants – highest availability guaranteed

**The 7UM6 series – custom-made for power generation**  
 The 7UM61 and 7UM62 protection devices of the SIPROTEC 4 range are specially designed for the protection of power-generation systems. Their comprehensive range of functions makes them the ideal choice for all types of power plants, independent of their size. From decentralized regenerative power generators and combined heat and power plants to large conventional plants, SIPROTEC 4 protection devices successfully provide optimum safety and maximum system availability in numerous power plants worldwide.

**The 7VE6 series – safe parallel switching**  
 The 7VE61 and 7VE63 digital parallel switching devices are multifunctional compact devices that ensure a high safety level for the parallel switching of networks and generators. In the two-channel version 7VE63, two independent processes determine the synchronous conditions to meet the highest reliability requirements for bringing large generators onto load. This principle is central to achieving the highest safety requirements for switching large generators.

### The advantages at a glance:

- Comprehensive protection and supplementary functions
- High measuring accuracy in the frequency range from 11 Hz to 69 Hz
- Redundancy concepts for optimum safety and maximum system availability thanks to combining with SIPROTEC 7UM61 and 7UM62 devices
- Incorporation in the power plant control system through open communication
- High reliability and availability through self-monitoring
- Simple setting with DIGSI 4

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Siemens AG  
Energy Sector  
Freyeslebenstrasse 1  
91058 Erlangen, Germany

Siemens AG  
Energy Sector  
Power Distribution Division  
Energy Automation  
P. O. Box 4806  
90026 Nuremberg, Germany

For more information, please contact  
our Customer Support Center.  
Phone: +49 180 524 70 00  
Fax: +49 180 524 24 71  
(Charges depending on provider)  
E-mail: [support.energy@siemens.com](mailto:support.energy@siemens.com)

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