Power Transmission and Distribution

I'm on guard here!

SIMEAS R reports power system weaknesses quickly and accurately

SIEMENS

SIMEAS R – the watchdog in your power system

Competition among Power Suppliers is increasing. At the same time, requirements of industrial and commercial customers in regard to Power Quality are growing. Disturbances such as short circuits and irregularities in the quality of the supply voltage such as voltage dips, flicker and long-term fluctuations must be detected and analyzed without any delay to be able to elaborate countermeasures.

Achievement of high power quality through rapid identification of weak points

SIMEAS R is a digital disturbance recorder and power quality monitoring equipment for application in power plants, medium-voltage (MV), high-voltage (HV) and extremely-high-voltage (EHV) substations as well as in industrial sites.

In regard to power quality, SIMEAS R measures and records key data that are defined in the international standard EN 50160.

Due to its large number of integrated functions, it identifies power supply weaknesses quickly and reliably. Whenever a fault occurs, all relevant data – including prehistory, fault pattern and post-fault data – are recorded and transferred for evaluation and archiving. Ethernet, analog or ISDN telephone communication channels using a modem can be applied for data transmission. This enables rapid decision-making and quick solution of problems.

Quite a feat!
SIMEAS R's many functions make life much easier

SIMEAS R is a multi-functional recorder with the following functions:

Digital Fault Recorder (DFR) for dynamic recording of short circuits

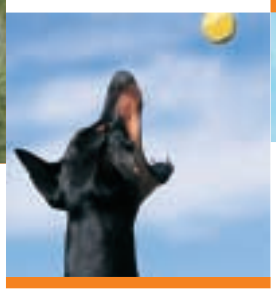
The fault recorder for analog and binary channels records current and voltage patterns whenever a short circuit occurs in substations or on transmission lines. Start selectors continuously monitor the measured analog and binary channels. In case of a trigger, all the analog and binary inputs are recorded together with their prehistory, with variable length of the fault (depending on retriggering) and post history. The PC software module "Diagnosis" can be applied to calculate the fault location. With binary input channels, status information such as the position of breakers and isolators can be detected and recorded.

The intelligent sequence control system for triggering and retriggering makes sure that only data is recorded that is relevant for the analysis of the fault. Another outstanding advantage of this device is its high dynamic range for the nominal and short-circuit currents due to 16-bit resolution with a sampling rate of 256 samples per cycle.

Power and frequency recorder for recording voltage and power oscillations in power plants

The power and frequency recording function detects and records the power balance and frequency stability in power plants and substations. In case of a short circuit in a network, stability problems can arise due to the loss of generation power. In this case, there will be a sudden change of the power output of power plants that are not affected by the network fault. With SIMEAS R, the change of the power balance in a power plant and the possible change of the system frequency can be recorded in detail with prehistory.

While the transient analog fault recorder described above records rather brief events lasting some seconds, the power and frequency recorder is designed for recording long-duration events lasting hours. Both functions can be active at the same time if the device is parameterized accordingly. For example, the power and frequency recorder can monitor and record 30 minutes of prehistory and additional 2 hours the development of the power and frequency after a short circuit in the network with high resolution and accuracy.



Continuous Digital Recorder – RMS value and power quality recorder – 450 MByte per year

The RMS value and power quality recorder monitors and records the long-time pattern of input signals. With this continuous recorder with a ring buffer, all relevant power system data such as the RMS value of voltage and current signals, active power, reactive power, current and voltage harmonics, power factor, frequency, positive and negative sequence components and the total harmonic distortion of the current and voltage signals can be recorded. This function can also be applied for the recording of short-time voltage dips and flicker effects in substations.

With a recording in accordance with the power quality norm IEC 50160, the amount of data per recorder is approximately 450 MByte per year. The integrated flash disk-based database copes easily with this data, even in such large quantities, if the recorded values are collected at least twice a year. High-speed data transmission combined with data compression enables the handling of such large amounts of data.

The digital recorder provides you with additional safeguards: it is your online quality monitoring eye. The quality of your power system is detected in accordance with IEC 50160 and can be used for verification purposes in case of disputes. It also provides important information and data to optimize your primary equipment which is an important criterion for future investments.

With this function, SIMEAS R can be used as a paperless recorder and can make all classical recorders obsolete.

Event recorder – faster than a millisecond

The event recorder records switching events in the substations and other status information such as trip and flag information of protection devices. All binary signals are sampled with a speed of 0.5 ms and each status change is recorded in correct time sequence. If for example 5 MByte is reserved for this function in the integrated flash memory, it corresponds to 120,000 status changes and therefore space for many years – your decentralized data archive.

Due to the assignment of the binary status changes to the analog recordings, you are provided with detailed information of your power system's performance in form of a graphic illustration. In addition, the data are shown in the form of a list with a real-time stamp, with a resolution of up to one millisecond and plain-text statements.

High resolution and high accuracy

To be able to record power quality-related effects in detail and with high accuracy, current and voltage signals must be sampled with high accuracy in the range of nominal voltage and nominal current. In contrast, a fault recorder has to record in case of a short circuit up to 50 times of the nominal current with a high degree of precision, even if the current channels are affected by large DC components. With a new transducer concept in the SIMEAS R and 16-bit A/D – conversion, these requirements have been met without any loss of quality.

A good friend seldom comes alone

SIMEAS R is the central component of an extensive fault detection and recording device, consising of:

- **SIMEAS R recorder**

  This unit is available with two housing types. The smaller type has one data acquisition unit (DAU) whereas the larger 19-inch type can be equipped with up to four DAU modules.

- **OSCOP P parameterization and evaluation software**

  All the data recorded with SIMEAS R can be analyzed with the help of the OSCOP P software package. OSCOP P is also used for parameterization of the SIMEAS R and for archiving fault records and RMS values. With the "COMTRADE file Import and Export" option, fault records can be analyzed in more detail with other software components.

- **DAKON industrial PC**

  The DAKON is an industrial PC to which several SIMEAS Rs and digital protection devices with IEC 60870-5-103 protocol can be connected. In "Automatic Mode," a DAKON can automatically collect data from the SIMEAS R as well as fault records from protection devices and store them in its own memory. Moreover, the DAKON is able to send time information to the connected SIMEAS Rs with a sufficient degree of accuracy. If highly precise time synchronization is required, a GPS receiver with a Synchbox must be used.

- **Evaluation PCs and communication components**

  An evaluation PC can be applied for direct communication with a SIMEAS R for purposes of parameterization and data analysis. The communication components include, for example, fiber-optic cable converters, Hubs, star couplers and modems.

  Ethernet communication between several SIMEAS Rs, DAKON PCs and an evaluation PC can take place in different ways, for example in form of a Wide Area Network (WAN) or Local Area Network (LAN) with the TCP/IP protocol including electrical and optical connecting cables and converters as well as Hubs.

  As an alternative, communication can also be established via analog or ISDN modems with a star coupler.

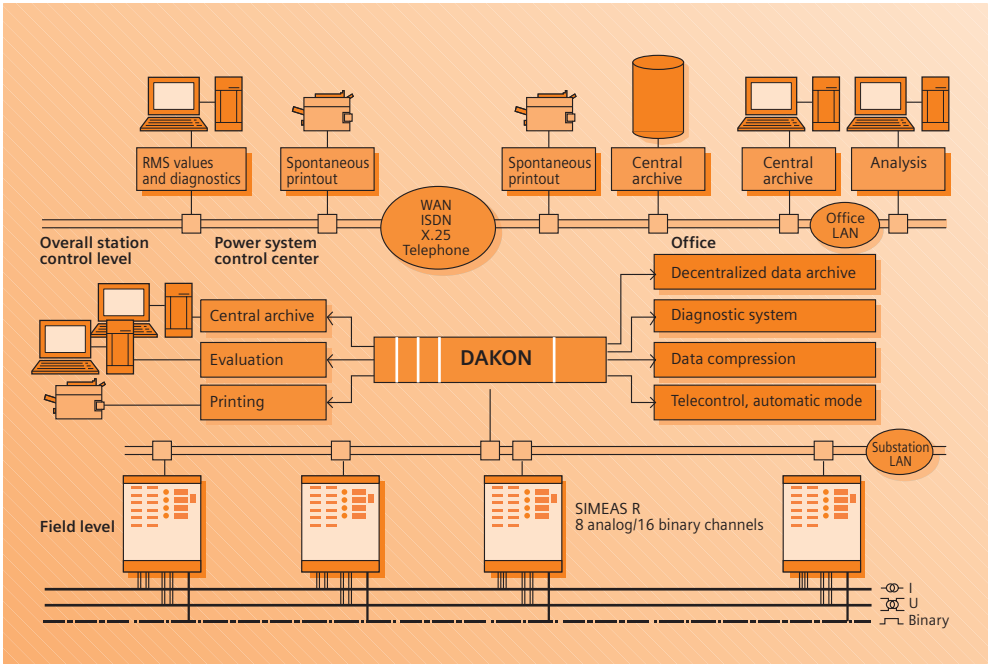
- **Components for time synchronization**

  In order to be able to compare the records of fault recorders and protection devices located in different places with each other, precise time synchronization of all the SIMEAS R and DAKON units is necessary. This is done by using additional components such as GPS receivers with IRIG-B or CF77 decoding and the Synchbox adapter module.

- **SICARO PQ and DIAGNOSE application software**

  The optional SICARO PQ application software can evaluate and visualize power quality data and create PQ reports as well.

  The DIAGNOSE software module is an optional package for OSCOP P. With this module it is possible to calculate the location of a fault on transmission lines and cables.



The all-inclusive software concept allows high-speed networking of all the devices

Every weakness is tracked down: Power system diagnostics with high-accuracy fault location

The more you record, the more data you collect. This can become rather complicated in the event of complex power system faults as all the data have to be transferred and evaluated in a very short time. The SIMEAS R and the OSCOP P system take a lot of pressure off the power system experts and allow information to be sent to the office quickly for evaluation. Moreover, the integrated fault locator combined with the OSCOP P evaluation package enables power system diagnosis in the office or at the power system control center.

When everything goes smoothly: The world of automated analysis with OSCOP P

Recorder systems – automated data analysis with OSCOP P

OSCOP P runs under MS Windows and is used for automatic data collection from SIMEAS R units as well as for remote parameterization of these units. The collected data can be evaluated in a short time for fault analysis purposes. It is more than just a graphic evaluation program – it also monitors your entire fault recorder system. Depending on the parameter settings, the recorded results are transferred automatically and the collected data are stored in a large database.

With OSCOP P, data evaluation and fault analysis are simple and fast, and the program is very user-friendly. Many activities have been automated: the transfer of fault records, the visualization on the screen, sending the results to a printer or fax, etc. And you do not need to press any buttons to start any of these tasks.

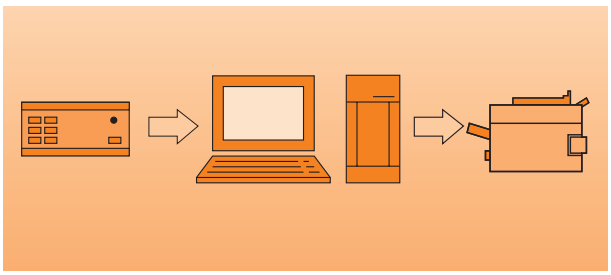
Data searching made easy

OSCOP P is a powerful program for modern data management and has an integrated database. Combined with the database of each connected SIMEAS R unit on a flash memory, it has the form of a huge decentralized database.

With the installation of additional server PCs, the user can build up a company-wide decentralized data network for fault records, for the data of the frequency and power recorder, RMS value and power quality recorder, and event recorder.

Thus, access to recorded and stored data from any location of the company is possible without difficulty, even to the records stored several years ago.

SIMEAS R for 32 analog/64 binary channels

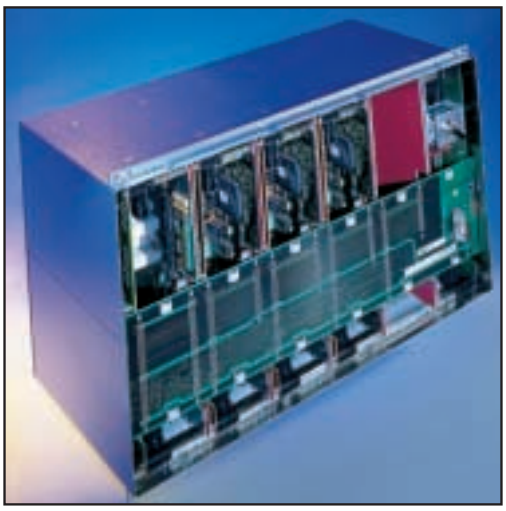


The advantages keep on growing

SIMEAS R hardware concept – the future technology implemented today

A SIMEAS R consists of a central processor module, up to four data acquisition units (DAUs) and a power supply module.

The VCDAU data acquisition unit has 4 current and 4 voltage inputs, the CDAU has 8 current inputs and the VDAU has 8 voltage inputs. The DDAU can record 8 process signals, also DC signals. All these modules can record 16 binary channels at the same time. If additional binary channels are to be recorded, a BDAU with 32 inputs can be used. With these options, SIMEAS R offers a high degree of configuration flexibility and can therefore be optimally adapted to any recording and monitoring application. The SIMEAS R makes other recording devices obsolete as all the relevant signals are recorded or calculated by high-speed signal processors with great precision.



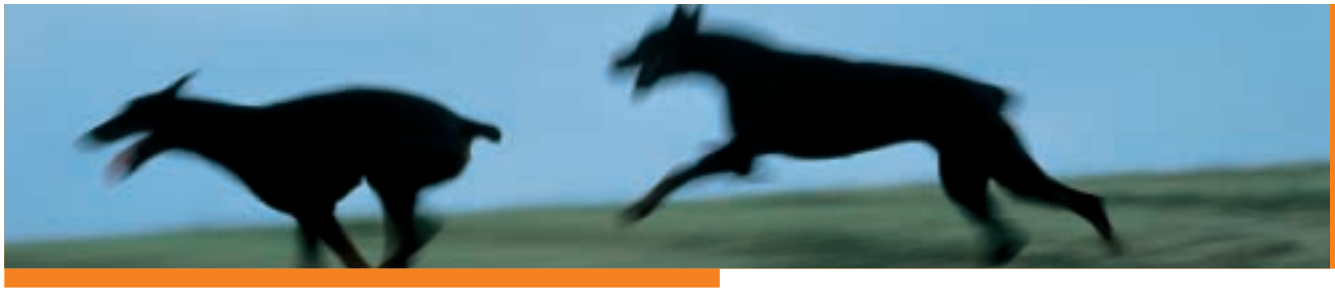
1	Integration of digital fault recorder, power and frequency recorder, RMS and power quality recorder, and event recorder, all in one device.	**You save investment costs and avoid wiring for additional devices.**
2	Current and voltage transformers are integrated in the device and designed for applications in substations	**As a result, additional costs for shunts, assembly material, wiring and documentation are avoided.**
3	With its high sampling frequency, resolution and accuracy as well as GPS time synchronization, comparisons of different fault records within a power system region are possible.	**This can play an important role in the case of customer claims and help you to save money.**
4	Short data transmission times due to the integrated database, automatic data collection and high degree of data reduction.	**You save telephone costs if analog or ISDN modem communication is applied. Your personnel can focus all activities on real problem analysis.**
5	Compact design in 7XP housing.	**This saves space in the control cabinet and reduces installation costs.**
6	The existing infrastructure of analog or ISDN telephone networks or Ethernet 802.3 with TCP/IP protocol can be facilitated for long-distance data transmission.	**The result is low investment costs for a high quality of data transmission. The system becomes simple and is easy to expand in future.**
7	Calibration and adjustment are not necessary.	**Saves operating and commissioning costs.**
8	Commissioning is possible from your office via long-distance data link.	**Saves operating and commissioning costs.**
9	With an intelligent decentralized database solution, all recorded data over several years are available.	**You can observe changes in your system behavior and can easily plan refurbishment investments.**

When there's no time to lose:
Storage capacity and data compression – for short transmission times

A high sampling rate normally means long transmission times as well as high long-distance telephone costs and increasing memory costs. Not so with our data compression system for fault recording. It increases the efficiency of memory allocation and shortens considerably the transmission times.

Very large data storage

The data obtained by the SIMEAS R are written into a large internal mass memory. For substation applications, installations in power plants and industrial facilities, it takes under normal conditions several months for the capacity of such a memory to become exhausted. Once this has happened, the memory will be managed as a "ring" memory. This means that the oldest values are overwritten by the newest values. The stored data are transferred from each SIMEAS R to a DAKON PC or an evaluation PC with the OSCOP P software. This can be done either manually or automatically. In these evaluation PCs, there is also a large mass memory and a powerful database. This ensures that the transmitted data can be stored and therefore are available for a very long time, even for several years.



Connection made easy

The correct current input, problems with maximum short-circuit current, potentiometer and switches for calibration are all matters you do not need to take care of any more. SIMEAS R always records the correct current with a very high resolution and dynamic range. The unit is completely maintenance-free, signal inputs no longer need to be calibrated. And installation is also very user-friendly: simply connect to the voltage and current channels at the terminals on the rear. You can then carry out complete commissioning comfortably from your office.

You do not need to keep anything on a short lead: UPS and long-distance data transmission – a good match

Built-in UPS – safety at all times

The built-in power supply module can be equipped with a battery module. Even if the substation power supply fails, the SIMEAS R continues recording all relevant data.
It is even possible to determine the cause of the power supply failure in the substation if the corresponding signals are connected to the device.

Long-distance data transmission – the concept of networking

A decentralized disturbance recorder system in a substation including several SIMEAS Rs can be simply built up using suitable Ethernet cables. For a standard application, the units have to be connected, for example using Hubs to a DAKON PC, the central data unit. From this DAKON PC data can be passed through to a server PC at the power system control center.

A high data compression algorithm is also implemented for the data exchange between a DAKON PC and server PC. Therefore, even if slow data transmission over analog telephone lines is available, the data transfer time will be in an acceptable range.

No problem whatever you want to hunt:
The expert system "diagnosis" for a wide range of fault analysis

Intelligent analysis of faults and power quality problems

Faults and power quality-related events in power networks are becoming more and more complex. This is especially the case when a fault occurs and a high number of protection devices trip due to evolving faults. Depending on the type of the fault and the type of the line, different ways of fault analysis can be required. As an example, the calculation of the fault location on a transmission line with an overhead line segment and cable segment and parallel line will be more complex and different than the analysis of a fault on a simple overhead line.

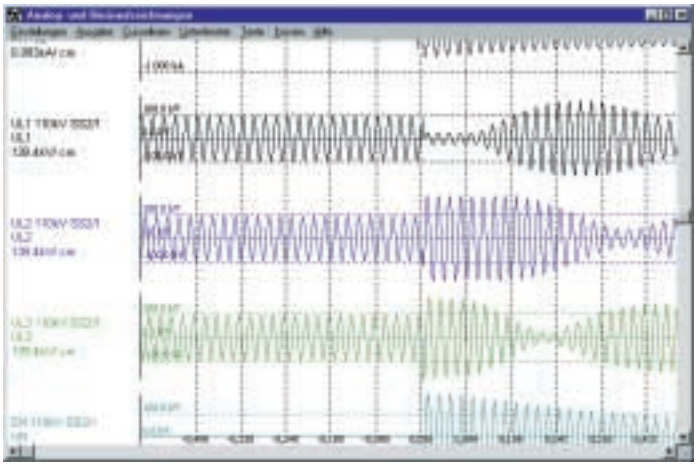
An optional powerful diagnostic system integrated in OSCOP P helps you to analyze a fault and identify the fault location in a very short time.

With the optional power quality analysis program module SICARO PQ, you can monitor the quality of the voltage of your power system and create corresponding reports. These software packages present graphical results in a very ergonomic way.

Graphic evaluation – specially developed for fault analysis

We have developed the OSCOP P software system for power system experts. With the "Eval" tool of OSCOP P, these experts have a variety of possibilities to analyze the fault records and create reports including detailed graphics. With a built-in flexibility, different channels can be added or removed from a graphical report, for the purpose to collect all important information for example on one page of paper.

With a powerful parameterization tool, it is possible to manage all your plant data. With this tool you can manage the parameters of the connected SIMEAS R fault recorders and the assignment in the power system of all SIMEAS Rs and protection devices with IEC 60870-5-103 protocol.



If you have any questions regarding power transmission and distribution, contact our Customer Support Center 24 hrs. a day under:

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