

Grid dynamics require flexible remote terminal units

Changes in the grid demand new devices for telecontrol and grid automation

Changing power flow direction as well as load and voltage fluctuations push today's distribution grids to their limits. The reason for this is mainly the strong increase of infeeds from volatile power sources like photovoltaic and biogas facilities. Siemens answers these requirements with the modular device range Sicam A8000 - a new telecontrol and grid automation system for use in electrical power supply.

Before having a closer look at grid dynamics and the challenges involved for remote terminal units, there is an important question to be asked: What exactly are the changes in the grids and what do frequently used terms like energy revolution or transformation process mean in this context?

The guideline created in the framework of the research project "New planning and operating principles for rural distribution grids as the backbone of the energy revolution" (Neue Planungs- und Betriebsgrundsätze für ländliche Verteilungsnetze als Rückgrat der Energiewende) at the Bergische Universität Wuppertal provides a clear statement:

The current transformation process, also paraphrased with the political buzzword energy revolution, involves fundamental and unprecedented changes of the German power supply system.

This means that the new challenges - changing power flow directions as well as load and voltage fluctuations - push today's distribution grids to their limits. The reason for this is mainly the strong increase of infeeds from volatile power sources like photovoltaic or biogas facilities and wind farms on the lower voltage levels. Experience shows that an extension of the power system, for example with additional or reinforced cables, may not be the most cost-effective solution.

A combination of conventional methods and innovative technologies - like distributed grid automation

systems - is a good compromise for the efficient operation of future distribution grids.

All in all, the requirements for energy distribution, and thus the medium and low voltage grids, are increasing steadily and therefore have a great impact on the market and the demand of the utilities. The manufacturers meet these demands with new solutions fulfilling the requirements. The devices to be used must provide a wide range of features (Fig. 1):

- They always have to adapt to the actual requirements using detailed modularity and universal scalability.
- Withstand increasing cyber security threats;
- Ensure high investment security through the use of standards;
- Contain functions like automation logic, versatile communication features and integrated measuring functions;
- Offer an extended application area, either by high voltage strength or a broad temperature range.

Siemens answers these requirements with the modular device range Sicam A8000 - a new telecontrol and grid automation system for use in electrical power supply. This series is a module combination of processor, energy supply and expansion modules for inputs and outputs (Fig. 2).



Fig. 1. The devices to be used must provide a wide range of features.

The basis of the Sicam A8000 series, the CP-8000 compact device, combines a power supply, display with function keys, and binary inputs and outputs in one housing. Individual power supply and process modules in connection with numerous expansion modules provide scalable solutions for diverse performance requirements.

Sicam A8000 module combinations

Analog input modules with four inputs, binary input modules with 16 inputs and binary output modules with eight outputs are available. In addition, there are analog input modules with three inputs for current and voltage as well as a current transformer adapter module with three current inputs. The modules with a width of 3 cm can be mounted in any order on the DIN rail. They are connected with one another through a bus connection on the rear. Once the system starts up, it automatically detects the individual modules. Thanks to the different performance levels of the processor modules and the expansion modules, the SICAM A8000 series is nearly continuously scalable and can be expanded at any time.

The telecontrol and grid automation system is based on international standards like IEC 61850 and can be used even in difficult ambient conditions with its extended temperature range of -40 to +70 °C. The increased EMC stability of up to 5 kV (IEC 60255) also qualifies the devices for direct use in substations.

And when it comes to cyber security, the Sicam A8000 leaves nothing to desire. An integrated crypto chip protects all data in a safe environment, IPsec encryption enables secure communication via IP networks and the https protocol ensures the secure transmission of sensitive data. The integrated firewall lets you separate TCP/IP networks. The firmware is protected against manipulation. Additionally, a security logbook takes on the fail-safe storage of all syslog events.

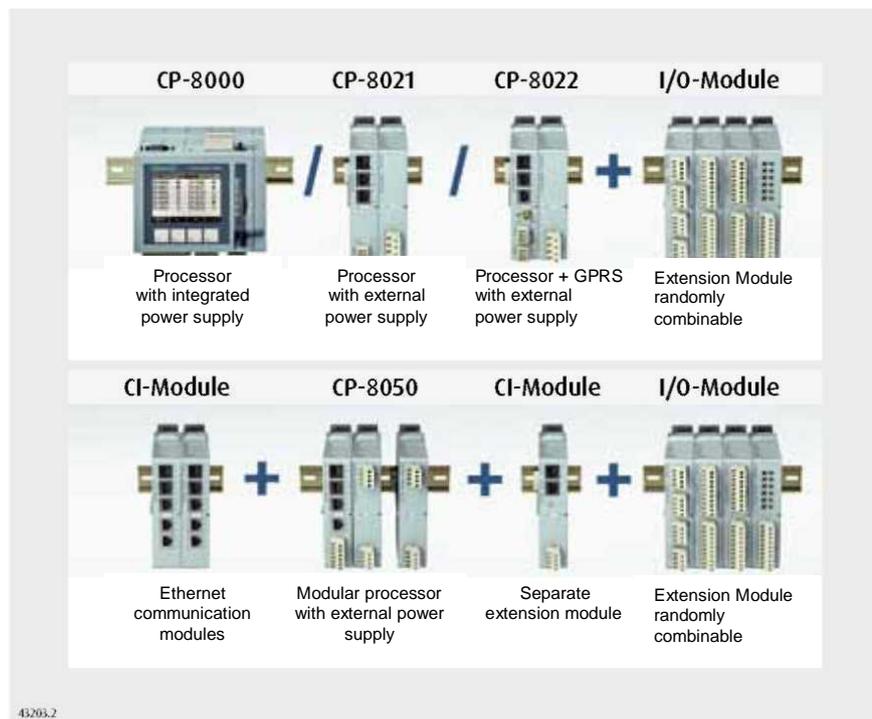


Fig. 2. The Sicam A8000 series is a module combination of processor, energy supply and expansion modules for inputs and outputs.

The Sicam A8000 can be adapted to the specific communication infrastructure with various interfaces and an integrated GPRS module (CP-8022). And the system not only supports standard protocols like IEC 61850, IEC 60870-5-101/103/104 and Modbus, but also custom protocols of third-party devices.

Short-circuit indicator functionalities facilitate its use for cable network monitoring; and finally, the integrated web parameterization tool simplifies engineering the system.

In energy transmission and distribution applications, the system can be used for the automation of several voltage levels in substations for the transmission system. In distribution automation applications, the system takes on medium-voltage monitoring and control of the transformer substations regarding fault localization and automatic restoration of the power supply.

Another area of application is the grid connection of wind and solar farms with the input controller as the center of information exchange between wind farm and grid. Open-loop and closed-loop control functions can be created with the logic functions of the Sicam A8000 system, for example for turbine and sequential control systems or switchgear interlocking. In industrial applications, it can be used for the local infeed and the integration

of emergency power supply right down to the low-voltage distribution level.

In micro-grids, the system controls the distributed power generation systems and is therefore able to master the individual challenges of the specific application. It also serves as a communication gateway when coupling networks which can be based on completely different network and communication protocols. And it can be used for protocol conversion and network separation between process and visualization level. Sicam A8000 is also suitable for railway power supply automation.

Conclusion

Electrical power supply is becoming increasingly complex. Siemens is therefore even more dedicated to optimizing reliability and efficiency and providing customers with opportunities for sustainable success from the control center and the grid right down to the consumer.



Dipl.-Ing./Dipl.-Wirtsch.-Ing. Daniel Nehls, Product Promotor Distribution Automation, Siemens-Division Energy Management Business Unit Digital Grid, Siemens AG, Nuremberg

>> daniel.nehls@siemens.com

>> www.siemens.com