MTE Meter Test Equipment

SGIM

Smart Grid Interface Module for the Digitization of Distribution Substations and Cable Distribution Cabinets

The SGIM is an easy-to-install measuring, monitoring and control system for digitizing of distribution substations and cable distribution cabinets in the smart grid. It enables cost-effective and uninterrupted installation in the 185mm busbar system in connection with NH strip-type fuse-switch disconnectors in accordance with EN IEC 61439/60947 and thus the construction of a monitoring system at critical points and nodes in the distribution network.

With the SGIM, all voltages and other voltage quality information as well as the frequency can be recorded directly and transmitted to control rooms via the SCADA or substation protocols in accordance with EN IEC 60870-5-104 or EN IEC 61850. In addition, an internet portal and an SGIM app are available for quick and direct availability of the measurement data from the SGIM without connection to the SCADA system.

The SGIM is a Modulear system that can optionally be expanded to measure currents, powers and energies of up to 14 secondary circuits with the help of Rogowski coils or current transformers of the NH striptype fuse-switch disconnectors.

Advantages and Special Features

- Construction consisting of the installation platform and the Smart Grid Interface Modulee SGIM
- Uninterrupted installation in the 185mm busbar system
- Width 100mm (NH strip-type fuse-switch disconnector size 1-3 according to EN IEC 61439/60947)
- Measurement of voltage and frequency as well as other voltage quality parameters
- Modulear extension for measuring currents, power and energy of up to 14 secondary circuits using flexible current transformers (Rogowski coils) or integrated 1A current transformers of the NH strip-type fuse-switch disconnectors
- Modulear expansion for recording conditions and switching loads
- Integrated recording of temperature and humidity in the control cabinet
- Communication via Ethernet (RJ45 / LWL), MODBUS, LoRaWAN and LTE

Developed and supplied by be energy SG

Challenges of the Energy Mix Transition

The goals of the energy mix transition in many European countries pose considerable challenges for the transmission and distribution network operators:

- Major increase of renewable energy share of gross electricity consumption by 2030
- Switching off conventional (thermal) power plants and (in some countries) nuclear power plants
- Reduction of greenhouse gas emissions and primary energy consumption (oil, coal, gas, etc.) by 50%

Achieving these goals will undoubtedly be associated with significantly increased load fluctuations in all areas of the power grid (high, medium and low voltage) due to the meteorological (weather) influences on regenerative power generation.

Another influencing factor is the increase in load peaks due to the extensive change in inner-city and, in particular, passenger traffic from fuel-based technologies to electric mobility.

Transparency on the „Last Mile“

Today's distribution networks are not designed across the board for the increase in electromobility and feed-in from regenerative energy generation systems, so that, in addition to targeted network expansion, intelligent feed-in and load management is required.

In the first step, it is therefore above all necessary to know more in order to derive the right measures in a second step:

- Acquisition of measurement data in distribution network substations and cable distribution cabinets (voltages, currents, powers, energy consumption and network quality parameters)
- Communicative connection to the SCADA system and central bundling and processing of information

Investigations at leading German distribution network operators have shown that for a good overview approx. 15-30% of the distribution network substations and approx. 10-20% of the cable distribution cabinets should be equipped with measurement technology.

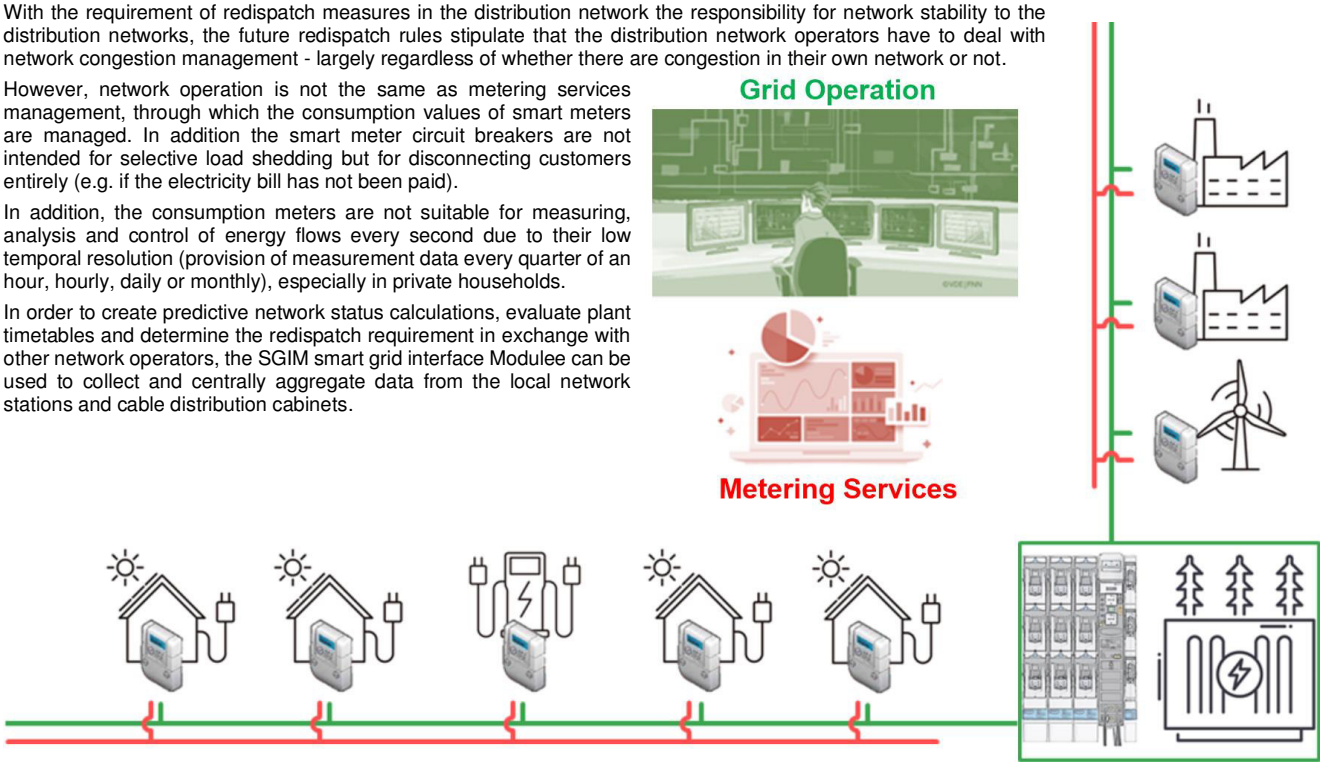
Distribution Network Redispatch

With the requirement of redispatch measures in the distribution network the responsibility for network stability to the distribution networks, the future redispatch rules stipulate that the distribution network operators have to deal with network congestion management - largely regardless of whether there are congestion in their own network or not.

However, network operation is not the same as metering services management, through which the consumption values of smart meters are managed. In addition the smart meter circuit breakers are not intended for selective load shedding but for disconnecting customers entirely (e.g. if the electricity bill has not been paid).

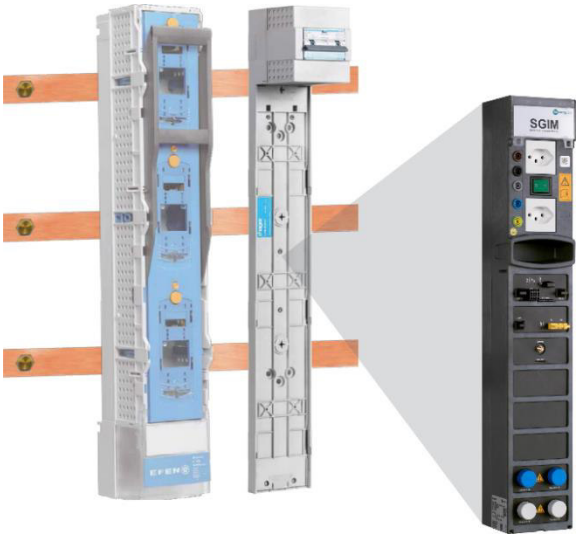
In addition, the consumption meters are not suitable for measuring, analysis and control of energy flows every second due to their low temporal resolution (provision of measurement data every quarter of an hour, hourly, daily or monthly), especially in private households.

In order to create predictive network status calculations, evaluate plant timetables and determine the redispatch requirement in exchange with other network operators, the SGIM smart grid interface Modulee can be used to collect and centrally aggregate data from the local network stations and cable distribution cabinets.



Uninterrupted Installation of the Smart Grid Interface Modulee SGIM

Mechanical Setup and Easy Installation



The Smart Grid Interface Modulee SGIM includes an installation platform that enables uninterrupted installation in the 185mm busbar system in connection with NH strip-type fuse-switch disconnectors sizes 1-3 in accordance with EN IEC 61439/60947.

To assemble the installation platform, the 4-pole circuit breaker must first be switched off, then the screw connection on the 185mm busbar can be carried out with an insulated 8mm Allen key in accordance with EN IEC 80900.

The following assembly of the Smart Grid Interface Modulee SGIM takes place in a few simple steps:

- Opening the locking cover
- Pull out the locking handle
- Placing the SGIM in the installation platform
- Lock and close the lock cover

The last step is the connection of the current measurement of the up to 14 secondary circuits of the busbar, depending on the Modulear design of the Smart Grid Interface Modulee SGIM. Depending on the version, this takes place via the integrated 1A current transformers of the NH striptype fuse-switch disconnectors or via flexible Rogowski coils.

Software

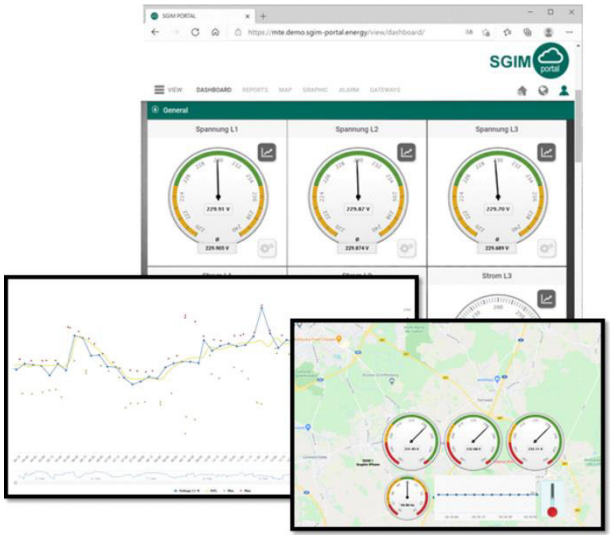
SCADA and Substation Automation Integration

The Smart Grid Interface Module SGIM offers a wide range of communication interfaces for the integration into the SCADA network and substation automation:

- Electrical Ethernet interface (RJ45)
- Fibre-optical Ethernet interface (optional)
- Bluetooth
- UMTS/LTE
- LoRaWAN

The integration follows the standard SCADA protocol EN IEC 60870-5104, that is compatible via internet protocol TCP/IP with all SCADA system suppliers (e.g. SIEMENS, Hitachi ABB, PSI, KISTERS etc.).

In addition, the Smart Grid Interface Module SGIM supports the standard substation automation protocol EN IEC 61850 for the client-server communication via MMS (Manufacturing Messaging Specification).

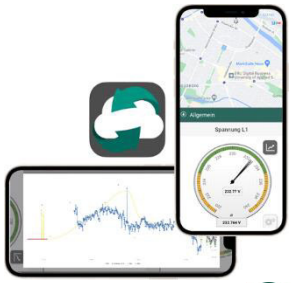


SGIM Portal and SGIM App for quick and easy

With the SGIM portal and the SGIM app, all measurement data is immediately available for the user on a configurable dashboard without a connection to the SCADA system. The SGIM portal can be used as a service from BeEnergy and EMH (SaaS) and, even in the basic configuration, offers many options for creating evaluations and interactions with the data obtained:

- Presentation of the measurement data on a dashboard
- Creation of overview websites for display on the PC or app (iOS / Android)
- Alerting and alarm handling including SMS and email functions
- Geolocation
- Easy reporting and export to CSV files
- Device management including remote-controlled update
- Detailed user rights management

The optional switching and status query module (I / O module) of the SGIM can be logically programmed within the SGIM portal for status detection and for controlling and switching loads.



Among other things, the SGIM app is available for on-site configuration; communication with the Smart Grid Interface Module SGIM then takes place via the integrated Bluetooth interface. A basically configured SGIM can be put into operation with the most important communication parameters:

- Ethernet-Parameters
- Modem-configuration
- Real-time clock setting
- SGIM Portal Parameter

Another advantage is that the cable distribution cabinet does not have to be opened for this on-site work.

Developed and supplied by be energy SG

Technical Data Smart Grid Interface Module SGIM

General

Supply voltage:	100 VACmin .. 240VACmax / 47Hz .. 63Hz
Power consumption:	max. 25VA
Housing:	Kunststoff
Dimensions:	100mm (B) x 100mm (H) x 590mm (T)
Weight:	5.8kg
Operation Temperature:	-5°C .. +55°C nominal -20°C.. +70°C derating
Relative humidity:	0% .. 90% no condensation

Protection

Insulation protection:	EN 61010-1
Environmental protection:	IP 21
Overvoltage category:	CAT IV TN-C network CAT III TN-C-S / TN-S / TT network

Measurement

Measuring Quantity		**Range**	**Resolution**	**Accuracy**
Voltage		0V .. 300V	10mV	0.5%
Current	fuse switch CTs flexible CTs	1mA .. 1A 10mA .. 15kA	1mA 10mA	0.5% 1.0%
Active power/energy	fuse switch CTs flexible CTs			0.5% 1.0%
Reactive power/energy	fuse switch CTs flexible CTs			1.0% 0.2%
Frequency		45Hz .. 65Hz	0.01Hz	0.5%
Power Quality (Option)		**Definition**		**Accuracy**
Voltage		U1, U2, U3, UN		0.1%
Voltage dips		$U_{RMS\,½}$		
Voltage swells		$U_{RMS\,½}$		
Voltage interruptions		$U_{RMS\,½}$		
Harmonics		2te .. 64te		
Interharmonics		1-2te .. 63-64te		
Signal voltages		f_S < 3kHz		
Flicker		P_{st} | P_{lt}		
Symmetry		u_0 | u_1 | u_2		
Current	fuse switch CTs flexible CTs	I1, I2, I3, IN, IPE		0.5% 1.0%
Harmonics		2te .. 64te		
Interharmonics		1-2te .. 63-64te		
Standards EN IEC 61000-4-30		■		Class A
EN IEC 62586		■		Class A
EN 50160		■		
Environmental Parameters		**Range**	**Resolution**	**Accuracy**
Temperature		-40°C .. +125°C	0.1°C	0.2°C
Humidity		0% .. 100%	0.1%	2.0%

Communication

Interfaces		**Specification**
RS 232		300 .. 115200 Baud
RS 485		300 .. 115200 Baud
Ethernet	electrical fibre-optical	10/100BaseT 100BaseLX10 SC Duplex single-mode
Bluetooth		4.0
Radio	UMTS LTE LoRaWAN	Mini SIM – SMA Antenna 868MHz – RF 2-10km – Class A 1.0.1

The SGIM consists of two main parts: the installation platform and the Smart Grid Interface Module plug-in unit. This contains all the necessary control, communication and measurement functions to transfer measurement data either for a cloud-based data management system or via SCADA and substation communication protocols (EN IEC 60870-5-104, EN IEC 61850, DNP 3.0) or industrial protocols (OPC / UA).

The device includes a local web server for the visualization of the recorded data, the configuration of drivers and communication protocols.

In addition to the power supply unit and the CPU, additional functions can be optionally equipped. Up to 7 measuring modules for 3-phase measurement and monitoring of up to 14 low-voltage connections can be fitted in the plug-in unit. Alternatively slots can be fitted with universal function modules (e.g. radio or fibre-optical ethernet communication) as well as status query and switching modules (I / O modules).

Modules

Name		**Functions**
CPU module	(Standard)	Ethernet interface 0 (RJ45) Ethernet interface 1 (RJ45) Seriel interface (RS232, RS485) Bluetooth Humidity/Temperature sensor SD- memory card
Fibre-optical ethernet module	(option)	Ethernet interface (RJ45) Ethernet interface (SC Duplex)
Radio module	(option)	UMTS / LTE / LoRaWAN SMA antenna socket Mini SIM-slot
Measurement module fuse-switch CTs	(option)	Measurement through 1A current trans-formers of NH strip-type fuse-switch disconnectors 3-phase voltage measurement 3-phase current measurement 2 secondary circuits or L1, L2, L3, N, PE
Measurement module flexible CTs	(option)	Current range 0 – 15.000A 3-phase voltage measurement 3-phase current measurement 2 secondary circuits or L1, L2, L3, N, PE
Power quality module fuse-switch CTs or flexible CTs	(option)	Voltage measurement U1, U2, U3, UN Current measurement I1, I2, I3, IN, IPE
I/O module	(option)	8 digital inputs 2 digital outputs 2 potential-free relays 1 change-over contact

SCADA / Substation Communication Protocols

DIN EN 60870-5-104
DIN EN 61850
DNP3.0