

SGIM

english

Smart Grid Interface Module



The Smart Grid Interface Module (SGIM) is a ready-to-use system to monitor measured electrical values in switch cabinets and cable distribution cabinets. The mechanical design of SGIM is in line with industrial standards and is especially meant to be installed in a 185mm busbar system.

SGIM is built from two main parts: the installation platform and the Smart Grid Interface Module plug-in unit. These contains all necessary control, communication and measurement functions to provide measured data either to a cloud-based data management system or via standard IEC protocols like IEEE 1815 - DNP3, IEC 60870-5-104 and IEC 61850 as well as industrial protocols like OPC/UA.

The device includes a local web server for the visualisation of the acquired data, the configuration of drivers and communication protocols as well as an interface to the WEB-PLC editor.

General Technical data

Size (W x L x H)	100 x 100 x 590 mm
------------------	--------------------

Power supply

Supplied via the SGIM installation platform

Input voltage Lx – N:	230V (100V..240V) 50Hz
Power input L1:	≤ 2990 VA + including Socket-outlet
Power input L2, L3:	< 0,1VA
Overvoltage category:	TN-C mains CAT IV TN-C-S, TN-S or TT CAT III

Smart Grid Interface CPU module

CPU:	IPC@CHIP® SC145 Embedded Controller
Operating System:	IPC@CHIP® RTOS-LNX Real-time operating system
Real-time clock:	Backed up by a lithium rechargeable battery Back-up duration > 10 weeks Expected battery lifetime > 10 years
Ethernet interface:	2 x 10/100BaseT, RJ45 connector, Link and traffic LED indicators
Serial interface:	1 x RS232/RS485 (selectable in software and by wiring), Weidmüller BL 3.50/08 connector Supported baud rates: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 187500 Supply for external devices 24 VDC, 5 W
SD card interface:	1 x SD card, SD / SDHC, Push/push slot
Wireless interface:	Bluetooth 4.0
Environmental sensor:	Internal, temperature and humidity sensor
Temp. sensor range:	-40°C to +125°C
Temp. accuracy:	±0.2°C
Humidity sensor range:	0 %RH to 100 %RH
Humidity accuracy	±2 %

Electric specification

Measurement Voltage

Method:	L – N
Nominal Voltage:	230V/50Hz
Resolution:	0.01 V
Sampling rate:	A/D Sampling rate = 1.024 MHz
Value types:	current (average of the last 200 ms) Average, minimum, maximum: Reset after Transfer to the portal

Measurement Current RC

Method:	Rogowski coils (RC)
Input RC:	22,5mV / kA
Resolution:	0.01 A
Metering range:	0..15kA
Sampling rate:	A/D Sampling rate = 1.024 MHz
Value types:	current (average of the last 200 ms) Average, minimum, maximum: Reset after Transfer to the portal

Measurement Current CT

Method:	Current transformers (CT)
Input CT:	1A Transfer ratio is confi-gurable by user (xxx:1)
Resolution:	0.1 A
Metering range:	Secondary: 0..1A Primary: depending on transfer ratio
Impedance:	typ. 250 mOhm
Sampling rate:	A/D Sampling rate = 1.024 MHz
Value types:	current (average of the last 200 ms) Average, minimum, maximum: Reset after Transfer to the portal

Functional parameters

Functional parameters for 50Hz, without sensors. The parameters are applicable for both RC and CT measurements.

The parameters are determined based on EN 61557-12:2008:

Type of Characteristics	Characteristics value
Power quality assessment function (if any)	
Classification of PMD according to 4.3	PMD-SD
Temperature	K55
Active power or active energy function performance class	0,5 (active power) 2 (active energy)

Parameter

Function	Symbol	Precision class	Metering range
Active power	P	0,5	2,3 W..10,35 MW (RC)
Reactive power	Q _A , Q _V	1	2,3..230 W (CT)
Apparent power	S _A , S _V	0,5	2,3 W..10,35 MW (RC)
Active energy	E _a	2	2,3..230 W (CT)
Reactive energy	Er _A , Er _V	3	2,3 W..10,35 MW (RC)
Apparent energy	E _{apA} , E _{apV}	2	2,3..230 W (CT)
Frequency	f	0,5	3.402823 × 10 ³⁸ kWh
Current	I	0,5	3.402823 × 10 ³⁸ kvarh
Measured neutral current	I _N	n.a.	3.402823 × 10 ³⁸ kVAh
Computed neutral current	I _{nc}	n.a.	45-55Hz
Voltage	UL-N	0,5	0,02..10 kA (RC)
Power factor	PF _A , PF _V	0,5	0,01..1A (CT)
Flicker	P _{st} , P _{lt}	n.a.	
Voltage dips	U _{dip}	n.a.	
Voltage increases	U _{swl}	n.a.	
Transient overvoltages	U _{tr}	n.a.	
Voltage interruptions	U _{int}	n.a.	
Voltage unbalance	U _{nba} , U _{nb} , U _h	n.a.	
THD of the voltage	THD _u	n.a.	
THD of the voltage	THD-R _u	n.a.	
Mains signal voltage	M _{sv}	n.a.	

Module

Service section

Socket-outlet:	connected to L1 and N, one switched by rocker switch.
Socket type:	2 Sockets Type J (SEV1011 - T13) with INTERFACE BASE.AJ 2 Sockets Type F (CEE 7/3) with INTERFACE BASE.AF
Voltages taps:	5 x 4 mm laboratory sockets connected to L1 – brown L2 – black L3 – grey N – blue PE – yellow/green

Radio module (RM.LTE)

SIM card:	Micro SIM card slot (3FF)
Antenna interface:	SMA female
Mobile protocols:	GSM / GPRS / EDGE / LTE / HSPA+

Media converter (MCFO.SME2)

Ethernet interface:	10/100BaseT, RJ45 connector, Link and traffic LED indicators
Fiber optics Interface:	100BASE-LX10, E2000 connector, Link and traffic LED indicators

IO module (MIO10.A)

Input channels:	8
Input characteristics:	sourcing, 12 VDC, isolated against the system, not against each other
Output channels:	2
Output characteristics:	Relay, 230 VAC: 5A (NO), 3 A (NC) 30 VDC: 5A (NO), 3 A (NC)

LoRaWAN Modbus Bridge modul (LoRaWAN)

RF transceiver

Type:	Semtech SX1272
Frequency:	863MHz to 870MHz
Max. TX Power:	max. +14dBm
Typical RF Range:	≤2 km
Ideal RF Range:	≤10 km (free line of sight)

LoRa communication Protocol

Protocol:	Class A LoRaWAN 1.0.1 EU868 Class C
Activation methods:	Over-the-air activation (OTAA) Activation by personalization (ABP)
Encryption:	AES128

Measuring module for rogowski coils 2 inputs for 3-phase current measurement (RC) (MURC.2x3.A)

Measuring channels:	2 (per module)
Measuring mode:	3-phase measurement, L1/L2/L3
Sensor:	SENSOR - MU-3RC-D70-170CM

Measuring module for Rogowski coils with 1 input for 3-phase four-wire current measurement (RC) (MURC.1x3+N.A)

Measuring channels:	1 (per module)
Measuring mode:	3-phase measurement, L1/L2/L3 plus neutral conductor
Sensor:	SENSOR - MU-3RC-D70-170CM SENSOR -MU-1RC-D70-170CM

Measuring module for current transformer 2 inputs for 3-phase current measuring with 1-A-transformers (CT) (MUCT.2x3.A)

Measuring channels:	2 (per module)
Measuring mode:	3-phase measurement, L1/L2/L3
Sensor:	Only for current transformers with secondary currents of max. 1 A

Measuring module for current transformer 1 Input for 3-phase four-wire current measurement with 1 A converter (CT) (MUCT.1x3.A)

Measuring channels:	1 (per module)
Measuring mode:	3-phase measurement, L1/L2/L3 plus neutral conductor
Sensor:	Only for current transformer with secondary current of max. 1 A

Measuring module for current transformer 2 inputs for 3-phase current measuring with small signal converter (MUCT.2x3.B)	
Measuring channels:	2 (per module)
Measuring mode:	3-phase measurement, L1/L2/L3
Sensor:	Only for current transformers with LSL-specific plug

Connector descriptions

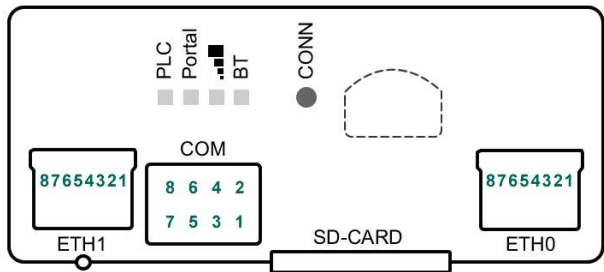
CPU module (CPU.110)

ETH0, ETH1

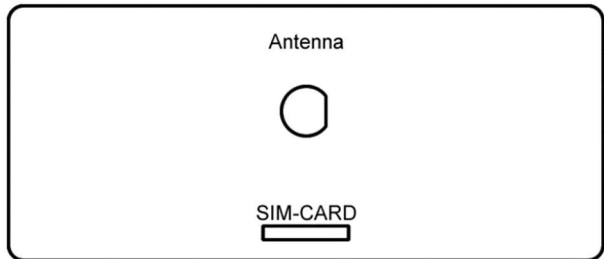
Pin	Function
1	Tx+
2	Tx-
3	Rx+
4	n.c.
5	n.c.
6	Rx-
7	n.c.
8	n.c.

COM

Pin	Function
1	GND
2	RS232 CTS
3	RS485 B (+)
4	RS232 TXD
5	RS485 A (-)
6	RS232 RTS
7	24 VDC (out)
8	RS232 RXD

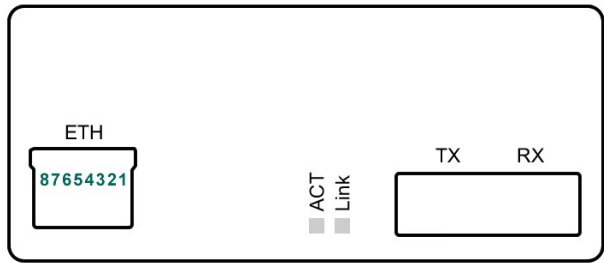


Radio Modul (RM.LTE.EU.A)



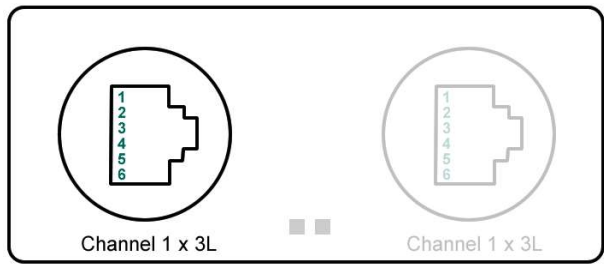
Media converter module (MCFO.SME2)
ETH0, ETH1

Pin	Function
1	Tx+
2	Tx-
3	Rx+
4	n.c.
5	n.c.
6	Rx-
7	n.c.
8	n.c.



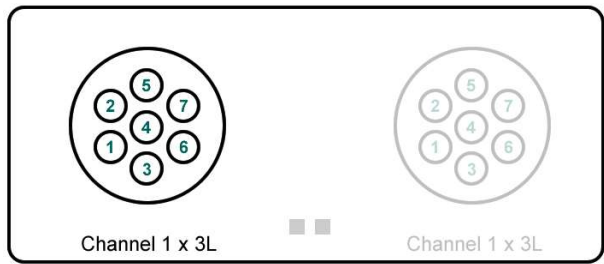
Measuring module for current transformer 2 inputs for 3-phase
current measuring with small signal converter (MUCT.2x3.B)

Pin	Function
1	N
2	I L1
3	N
4	I L2
5	N
6	I L3



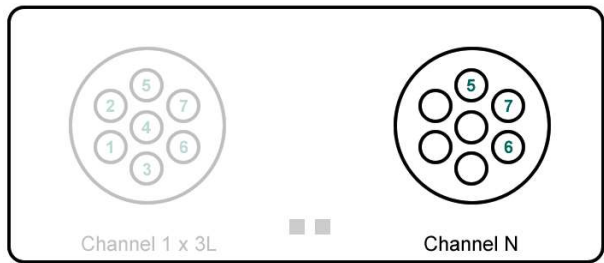
Measuring module for rogowski coils 2 inputs for 3-phase current measurement (RC) (MURC.2x3.A)

Pin	Function
1	I L1
2	N
3	I L2
4	N
5	I L3
6	N
7	Kabelerkennung



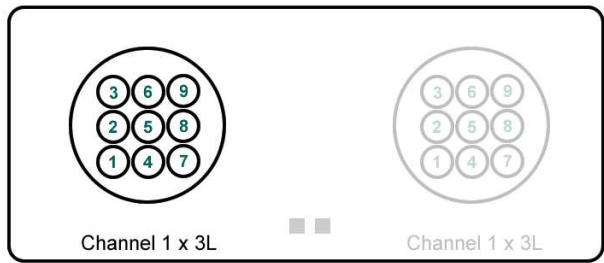
Measuring module for Rogowski coils with 1 input for 3-phase four-wire current measurement (RC) (MURC.1x3+N.A)

Pin	Function
5	I N
6	N
7	Kabelerkennung



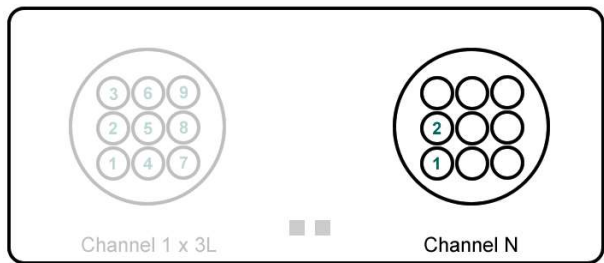
Measuring module for current transformer 2 inputs for 3-phase current measuring with 1-A-transformers (CT) (MUCT.2x3.A)

Pin	Function
1	I L1
2	N
3	I L2
4	N
5	I L3
6	N
7	Kabelerkennung
8	N
9	Nicht bestückt



Measuring module for current transformer 1 Input for 3-phase four-wire current measurement with 1 A converter (CT) (MUCT.1x3+N.A)

Pin	Function
1	I N
2	N



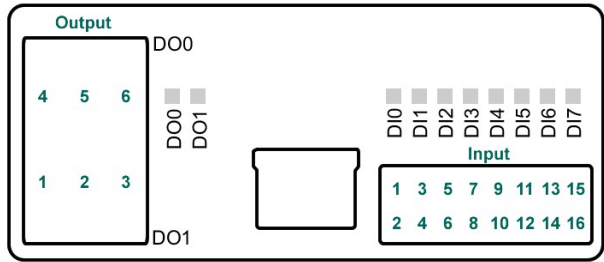
IO module (MIO10.A)

Outputs

Pin	Function
1	NC0
2	COM0
3	NO0
4	NC1
5	COM1
6	NO1

Inputs

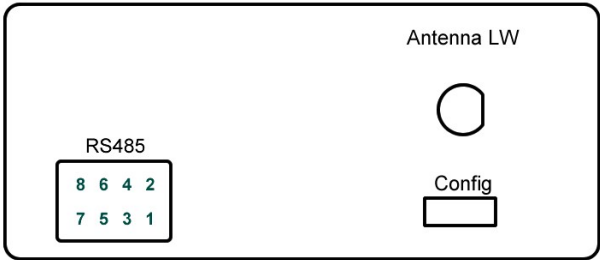
Pin	Function
1	IN0
2	INPUT-GND
3	IN1
4	INPUT-GND
5	IN2
6	INPUT-GND
7	IN3
8	INPUT-GND
9	IN4
10	INPUT-GND
11	IN5
12	INPUT-GND
13	IN6
14	INPUT-GND
15	IN7
16	INPUT-GND



LoRaWAN Modbus bridge module (LoRaWAN)

COM

Pin	Function
1	GND
2	RS485 B (+)
3	n.c.
4	n.c.
5	n.c.
6	n.c.
7	24 VDC (in)
8	RS485 A (-)



Software

Operating System - IPC@CHIP® RTOS-LNX Real-time operating system

WEB-PLC editor and runtime

- Visual programming editor running on the internal web server
- Quick I/O mapping editor
- Up to 1024 I/O values
- Up to 256 portal variables

WEB-PLC diagram

- Up to 512 function units, I/O values, portal variables and constants
- IPO cycle time: 10ms to 1000ms

WEB-PLC function units

Data type converters:	Bool, Uint8, Sint8, Uint16, Sint16, Uint32, Uint64, Sint32, Sint64, Float32, Float64, String
Binary:	AND, OR, XOR
Bits and bytes:	- Extract, Pack, Put Bit, Shift Register, Unpack - Controllers: On/Off, P, Shade
Messages:	Send, Receive
Numerical:	Addition, Subtraction, Multiplication, Division, Minimum, Maximum, Min Acc, Max Acc, Average, Counter, Compare, Signal Limiter, Signal Converter, Signal Smoother, Signal Tracker
Special:	First Cycle, OpenVPN, Portal Status
Storage, Selection, Edge Detection:	Demultiplexer, Multiplexer, RS Flipflop, T Flipflop, Trigger, Analog Trigger, Load Profile, State Machines
Timing:	Local Clock, Local Clock Timer, UTC Clock, UTC Clock Timer, Stop Watch, TON, TOFF, TP, Timer, Compare Time, Time Switches

SGIM PORTAL communication

Transferred information:

- Device information
- Portal round trip times
- Update URL, trigger and status
- OpenVPN activation and status
- Event log messages
- I/O values
- Portal variables

WEB-PLC additional functions

Event log:	- System events are logged to a circular buffer in RAM with timestamp, message and event type - Simple Network Time Protocol (SNTP) synchronization of the system clock
OpenVPN client:	Integrate the SGIM device into a virtual private network
DHCP server:	Up to 100 clients, up to 20 static leases
NAT:	Route traffic between a local (internal) and a global (external) network, up to 1000 mappings, up to 50 static mappings
Firewall:	Filter incoming traffic, up to 1000 rules (including dynamic rules for outgoing traffic), up to 50 static rules
Messages:	Send and receive short messages (up to 10 templates respectively)
Modbus RTU master/slave:	Up to 32 devices and 512 values (up to 1024 values including array members)
Modbus TCP client/server:	Up to 32 devices and 512 values (up to 1024 values including array members)
CODESYS network variables:	Up to 32 lists and 512 values
SNMP manager:	Up to 32 agents and 512 values Trap receiver
COM server:	Gemäß RFC 2217
Zeitschaltuhren:	Bis zu 8 Schalter, Crontab-Format
MicroBrowser interface:	yes
Local or remote installation of updates (firmware or configuration) Export:	Export the diagram and/or the settings of the SGIM device as an update package

OPC-UA server

Micro Embedded Device Server Profile

- User Token – User Name Password Server Facet
- Security policies – None, Basic128Rsa15, Basic256Sha256
- UA-TCP UA-SC UA-Binary
- Embedded DataChange Subscription Server Facet

Up to 32 groups, 512 values, 1024 scalar values or array elements

Up to 4 concurrent client connections

Environmental data

Rated operating temperature range

Operating temperature

*1

no supply of external modules via serial connector

*2

Maximum 4 modules

*3

Not permitted

No restriction

K55 (−5 °C to +55 °C)

−20 °C to +70 °C - with derating

SGIM Module	−20 °C ... 0 °C	0 °C ... 40 °C	40 °C ... 55 °C	55 °C ... 70 °C
CPU.110				*1
RM.UMTS				
MCFO.SME2	*3		*3	*3
MURC.2x3.A				
MUCT.2x3.A			*2	*2

Transport and storage temperature

−25 °C to +70 °C

Relative humidity

0 % to 90 % RH, without condensation

Operating altitude

0 to 2000 m above sea level

Mounting position

Vertical, only with SGIM installation platform

Protection rating

IP21

Protection class

SGIM module

II

Service module

I

Conformity

SGIM conformity to EU regulations and standards

EMC Directive 2014/30/EU	Radiated Emission HF-Field - Class B
Emission - EN 55032	Conducted Emission - Class A
Immunity - EN 61326-1	EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-11
Radio Equipment Directive (RED) 2014/53/EU	ETSI EN 301 489-1 V2.1.1 ETSI EN 301 489-17 V2.2.1 ETSI EN 300 328 V2.1.1 ETSI EN 301 511 V12.5.1 ETSI EN 301 908-1 V11.1.1 ETSI EN 301 908-2 V11.1.2
Low Voltage Directive 2014/35/EU	EN 61557-1, EN 61010-1

Restriction of Hazardous Substances (RoHS 2) Directive 2011/65/EU

Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation 1907/2006 (REACH)

BeEnergy SG GmbH

Weissenburgring 23
35415 Pohlheim
Germany

Phone +49 (0) 64 04 / 65 76 700
www.beenergy-sg.de
info@beenergy-sg.de