DIRECTIONAL FAULT INDICATOR TYPE **SGI**
panel-mounted

General

The directional earth-fault and short-circuit indicator type SGI can detect faults and the current flow direction of faults in

- solidly earthed
- resistance earthed
- isolated
- compensated medium voltage networks.

Detection methods

The type SGI utilizes several fault detection algorithms to detect fault. It can detect faults by using following detection methods:

- current-based, absolute threshold detection methods for phase-currents and unbalanced loads
- transient detection
- residual voltage detection with a percentage threshold
- current-based di/dt algorithm

The absolute threshold detection and the transient detection also provide a directional indication of the detected fault. Furthermore, all algorithms feature a wide variety of configurable parameters which can be conveniently adjusted at the device with the help of a lighted OLED display and an rotary encoder with push-button. No external device or PC program is required for configuration and commissioning.

The device can be connected to an LRM interface of an capacitive voltage detection system in order to measure phase voltages. As current sensors the device can be connected to retrofittable Rogowski-sensors type SR55 and also to current transformers with 1 A / 5 A secondary current.

microSD card slot for data logging, firmware updates and commissioning

The fault indicator type SGI also features a microSD card slot. The microSD card can be used to log fault recordings and manually triggered recordings of measuring data. The recordings include 8 analogue channels for current and voltage and several digital channels in Comtrade format. Additionally event data is stored in human-readable text. Furthermore, configuration changes are also written into an event log on the microSD card. All log entries are date-and-time-stamped by a real-time clock.

The microSD card can also be used to copy configuration files from one device to others for better commissioning procedures and for firmware updates.

Integration into SCADA

The indicator provides four fully configurable relay outputs. Fault detections including directional information can be flexibly mapped on any of the four relays. Furthermore, the type SGI features a RS485 interface with a Modbus protocol. The serial interface can be used to read out measurement data and also to fully configure the device.

figure 1: display unit

figure 2: sensor type SR55

figure 3: sensor type SR55, opened for installation

Elektro-Mechanik EM GmbH
Ringstr. 4 – D-42553 Velbert / Germany
Tel: +49-2053-422890 – Fax: +49-2053-422899
www.emg-ger.com

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Features and Options

Directional fault indication:	short-circuit and earth-fault detection with adjustable phase angle
Monitoring:	Measurement of current, voltage, phase angle, active power, reactive power and apparent power
Current-sensor inputs:	3x type SR55 Rogowski coil sensors
Voltage inputs:	LRM interface, interface cables available
OLED display:	For indicating up-to-date measuring data and for configuration
Four relays:	Four, freely configurable relays: mapping of certain fault types to a specific relay
Reset via current:	Reset via recovered network current with adjustable reset current threshold
Power supply:	24V - 265V DC / 48V - 265V AC with internal long life capacitor USV up to 24h (no battery)
External blinking lamps:	Directional and non-directional external blinking lamps are supported
Modbus:	Reading and writing of the configuration by Modbus RTU protocol through RS485 interface
Fault records:	Data recording in a Comtrade Log on a microSD card (1 second @ 2ksps)
Logging:	Logfile for configuration changes and faults with real time clock
Firmware update:	Firmware can be updated by microSD card
Password protection:	Password protection against non-authorized changes
Multilingual menu:	The menu language (English/German) can be selected

External Connectors

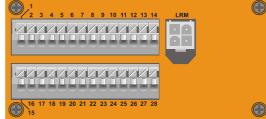|	
Connectors 1 – 3:	Modbus (RS485)
Connectors 4 – 5:	External reset
Connectors 5 – 6:	External test
Connectors 7 – 12:	Sensors type SR55
Connectors 13 – 14:	(optional) Sum current sensor
Connectors 15 – 16:	24V - 265V DC / 48V - 265V AC power supply
Connectors 20 – 21:	Blinking lamp type BL4.1 / BL6 / BL7
Connectors 24 – 28:	4x relay NO contacts
Connector LRM:	Connection to an LRM interface

figure 4: external connectors

General Data

Subject	Value
Absolute threshold detection methods *(voltage information required for directional fault indication)*	Phase-to-phase: Adjustable between 20A and 2500A in steps of 20 A Phase-to-earth: Adjustable between 40A and 500A in steps of 20 A Dedicated indication of a second short circuit. Triggering angles (offset and death zone) can be adjusted. Response delay adjustable between 20ms and 3000ms in steps of 20ms. *Methods can be deactivated.*
transient detection *(voltage information required)*	Adjustable parameters: a) trip current between 1A and 2500A in steps of 1A b) residual voltage (see residual voltage detection) c) directional filter (a filter can be applied to only indicate faults in cable direction) d) It can be selected if a permanent earth-fault generates a separate remote indication. *Method can be deactivated.*
di/dt earth-fault detection method	Adjustable between 5A and 160A in steps of 1A Evaluation window adjustable between 20 and 100ms in steps of 20ms *Method can be deactivated.*

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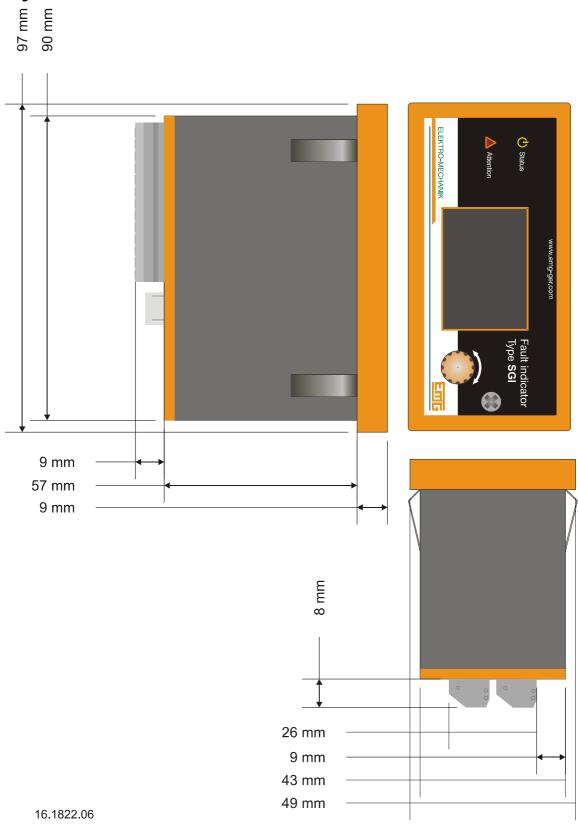| Subject	Value
residual voltage detection method *(voltage information required)*	Adjustable percentaged value between 1% and 90% as threshold for the zero sequence voltage shift *Method can be deactivated.*
Display unit	Suitable for panel-installation
Display	a) OLED b) 2 x LED for status indications
Configuration	a) At site: via menu (with password protection) b) via Modbus c) by copying of configuration files via a microSD card
Monitoring	Sample rate: 2kHz / 24Bit indication via display and Modbus of: a) service current b) service voltage c) phase angle d) active power (P), reactive power (Q) and apparent power (S)
Reset of the indicator	a) manually by push-button b) via reset input c) time: adjustable between 5 sec to 18h in steps of 1 sec – separately adjustable for all detection algorithms d) automatically with recovering net current with adjustable threshold level of 3A to 50A e) via Modbus
Self-test	a) self-test via display b) capacitor buffer status via display c) via test input
Dimensions: display unit	(WxHxD) 97 mm x 48 mm x 74 mm (dimensions of panel cut-out: 92+0.8 x 45+0.6 mm / IEC61554 / DIN43700)
Protection class: display unit	IP40
Internal type test	According to IEEE 495-2007
Operation temperature range	-20°C to +65°C
Power supply	a) 24V - 265V DC b) 48V - 265V AC with internal long life capacitor UPS up to 24h (no battery)
SCADA contact	4 x NO contacts, configurable via menu: a) permanent contact / wipe contact (contact duration adjustable via menu or Modbus) b) All detection algorithms and indicator status can be freely mapped onto the four relay contacts max. 230V AC / max. 2 A / max. 30 W insulation strength: 1.5kV / 1min
Modbus	Transmission mode: Modbus RTU addressing: 1 to 247 paritybit: none, odd, even baud rate: 9600, 19200, 38400 electric interface: RS485 (2-wire cabling)
Data logging	Format: ComTrade with time-stamping time: 4 sec. @ 2 ksps data logging: current, voltage and status flags up to 65535 log files storage: exchangeable microSD card FAT16/FAT32, 2GB to 32 GB manually triggered data logging is possible via menu

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Subject	Value
Storage of events	Automatic storage of events on a microSD card with time stamping of: a) events b) changes of the configuration of the indicator (protocol of the changes).
Firmware update	Firmware updates can be installed from a microSD card at site
Blinking lamp	Possibility to connect an external blinking lamp: a) non-directional: types BL4.1 and BL6 b) directional: type BL7
Current sensors	3 x sensors type SR55 (accuracy +/-3%) diameter range: 13-55 mm length of connecting cable: 8* m (screened copper cable)
Voltage sensors	connection to an LRM system via 4-Pin AMP socket apparent ohmic resistance: 10MOhn max. voltage: 100V AC

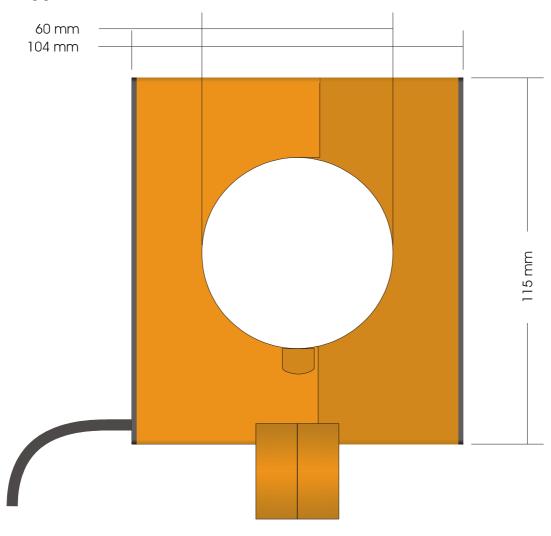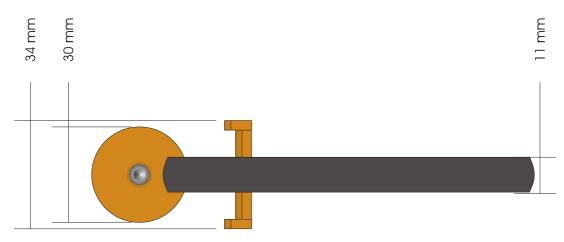* **Please note:** Other values can be ordered.

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Display unit

97 mm

90 mm

9 mm

57 mm

9 mm

8 mm

26 mm

9 mm

43 mm

49 mm

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Attention

Status

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Fault indicator
Type **SGI**

16.1822.06

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Sensor type SR55

60 mm
104 mm
115 mm

34 mm
30 mm
11 mm

12.1821.07