Combined Earth Fault and Short Circuit Indicator

EOR-1D

- **Panel mount housing**
- **Short Circuit (directed/undirected)**
- **Transient and pulse detection method**
- **Kit incl. current sensors or 1A/5A plug-on current transformers**
- **Fault recorder (max. 32 GB)**

1. Application

The combined **earth-fault and short-circuit indicator** type EOR-1D can be used in compensated, isolated and solidly earthed medium voltage networks.

A core balanced current transformer (CBCT) is not necessary. The sensors have to be mounted on shielded cables.

During the operational state, the indicator must be connected to an external power supply which is allowed to fail in case of a fault.

1.1 Short Circuit

For compensated, isolated and solidly earthed networks the EOR-1D can used as undirected short circuit indicator (only current measurement necessary) or as directed short circuit indicator (current and voltage measurement necessary).

- phase selective short circuit indication
- trigger angle setting (optional)

1.2 qu2 Transient Algorithm

For compensated and isolated neutral systems the reliable qu2 transient algorithm, known from the EOR-3D, can be used.

- One time evaluation of the initial transient event at the beginning of an earth fault
- Detection of low and high impedance faults
- Elimination of circulating currents in ring feeder setups

1.3 Pulse location w/o overcompensation

For compensated networks that have installed appropriate pulse sources, which generate a pulse signal during stationary state of an earth fault.

The pulse location method is based on evaluation of the three phase currents. Thereby the pulse location algorithm of the EOR-1D has significant advantages against classical pulse location devices:

- no separate core balanced current transformer (CBCT) is necessary
- independent from the detuning of the Petersen coil
- Pulse location with distributed Petersen coils possible
- correct results with symmetrical and unsymmetrical pulse signals also for high impedance faults

1.4 Remote connection

The EOR-1D can be not only connected via two freely programmable relays and two fixed binary inputs (test, reset), but also with **Modbus RTU** protocol via RS485. In the standard register configuration all information and indications can be polled, as well as most of the parameters be set. Even during power supply fail all data points are still available (backup-battery).

1.5 Fault recorder with up to 32 GB

Fault records with a length of 3.5 seconds are recorded on the internal SD-card in case of a recognized short circuit or earth fault. SD-cards with a maximum of 32 GB are supported.

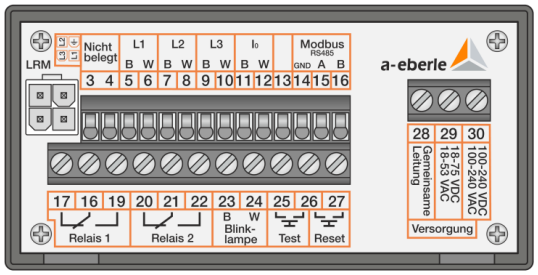
Hardware versions

- EOR-1D incl. 3 phase current sensors
  119.9005.00

- EOR-1D with plug-on current transf. (1A/5A)
  119.9005.21

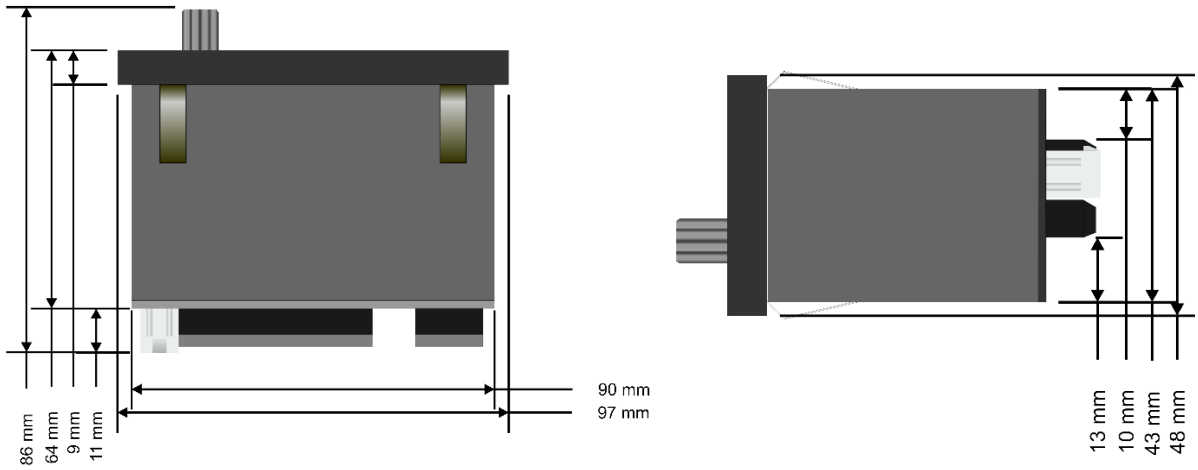
1.6 External connections

LRM:		4 pin socket for LRM system (voltage measurement)
terminals	3 - 4:	Not used
terminals	5 - 6:	Current sensor L1
terminals	7 - 8:	Current sensor L2
terminals	9 -10:	Current sensor L3
terminals	11 -13	Not used
terminals	14 -16:	Serial interface (RS485) with Modbus protocol
terminals	17 -19:	Relay 1
terminals	20 -22:	Relay 2
terminals	23 -24:	Flashing light (max. 30mA)
terminals	25 -26	External test (do use only potential-free)
terminals	27 -26:	External reset (do use only potential-free)
terminal	28:	Common ground power supply
terminal	29:	18 - 75 V DC / 18 - 53 V AC
terminal	30:	100 - 240 V DC / V AC



Picture 1: connections

1.7 Indicator dimensions

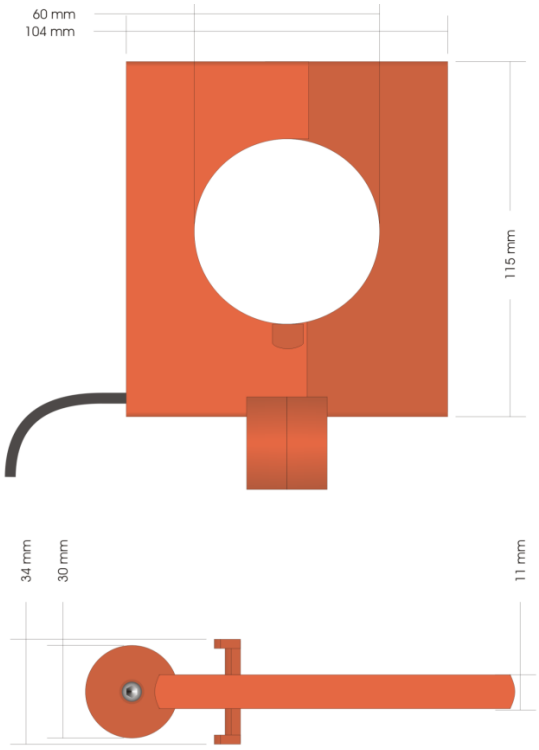


Picture 2: Dimensions of EOR-1D indicator
(Dimensions for panel cutout: 92+0.8 x 45+0.6 mm)

1.8 Installation and dimensions of phase current sensors

Picture 3: Easy assembly of phase current sensors

ATTENTION!: Lead shielding back through the sensor



Picture 4: Dimensions of current sensor (phase)

Included in set of article number 119.9005.00

1.9 Optional accessories: external flashing light & LRM – adapter cables

The external flashing lights type BL4.1 and type BL6 are optionally available upon request.

Blinking light BL4.1 without directional indication for wall mounting
cable length 6 m
Article-No. 119.9100.06

Blinking light BL6 without directional indication for surface mounting
cable length 6 m
Article-No. 119.9102.06

In addition, the following LRM – adapter cables are available optionally for connection of the voltage of a LRM – system to the AMP socket of the EOR-1D:

LRM adapter: 4 pole AMP-plug on both sides
Article-No. 582.8114.03 (length 0.3 m)
Article-No. 582.8114.10 (length 1.0 m)

LRM Y-adapter: 3x flat plug / socket to 4 pole AMP-connector
Article-No. 582.8113.03 (length 0.3 m)
Article-No. 582.8113.10 (length 1.0 m)

The EOR-1D does not provide a second capacity for measurement of the voltage on a capacitive voltage divider. An appropriate device has to be used that provides a capacity corresponding to the capacitive voltage divider (e.g. Capdis or WEGA system). The EOR-1D can only be connected in parallel to such a device with a LRM – adapter cable.

2. General data

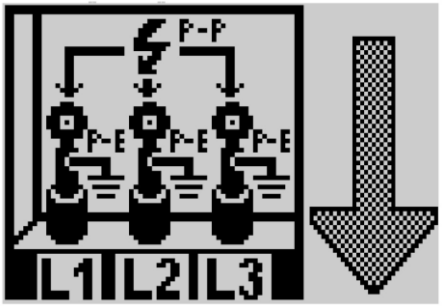
Subject	Description
Indicator	• LC display (backlit) Multilingual: German, English (other languages possible) • LEDs for status control
Configuration	• Menu-driven (push/turn control) • Via Modbus • Copy of configuration files via MicroSD card from another EOR-1D
Current measurement	• Indication of operating current via Display • Indication of operating current via Modbus • 24 Bit A/D-converter, 2kHz sampling frequency
Voltage measurement	• Indication of operating voltage via Display • Indication of operating voltage via Modbus • 24 Bit A/D-converter, 2kHz sampling frequency, accuracy +/-3% • LRM-interface (4 pin AMP-socket, 10 MΩ ohmic resistance) • Maximum permitted voltage: 55VAC
Power supply	• Input 1: 18-75 VDC, 18-53 VAC (isolated) • Input 2: 100-240 V DC+AC (isolated) • Power consumption AC: 0,3 VA (max. 0,6 VA) • Power consumption DC: 0,4 VA (max. 0,7 VA) • Easy changeable battery (3,6 V, 2600 mAh, AA) • Battery lifetime: ○ 20 years if disconnector is not removed (delivery state) ○ 15 years operation with power supply + 1000 h indication operation without power supply (without Modbus polling in case of power supply fail) ○ 2 years in standby operation (without indication, without power supply, without Modbus polling) ○ Without power supply the battery lifetime is reduced by the Modbus polling interval (worse case lifetime: 3 days)
SCADA terminals	• Two freely configurable relays (changeover contact) • Permanent/Immediate or wipe contact (time adjustable) • Indication of short circuit, earth fault, permanent fault, exceed of earth fault threshold, battery status • max. 230 V AC / max. 2 A / max. 30 W
Test/Reset	• Via menu navigation • Via external binary inputs reset and test • Via Modbus
Communication	• Transmission mode: Modus RTU • Adress range: 1 to 247 • Parity: no, odd, even • Baudrate: 9600 - 38400 • Interface: RS485 (2-wire + GND)
Fault recorder	• Saved on removeable MicroSD card • Fault records of current and voltage of phases 1,2 and 3 • Support of FAT16/FAT32 MicroSD cards with 2 - 32 GB and one partition • Fault record can be triggered manually • Up to 65535 fault record per SD card • Time stamp • Log file of events and parameter changes in readable text file

Real time clock	• Adjustable via Modbus • Adjustable via menu navigation • Precision 12 ppm (corresponds to 3,15 minutes/year)
Fault detection short circuit	• Adjustable to 20-2500 A • Suppression of wrong indications through settable response delay • Function disengageable
Fault detection Pulse location method	• Reliable detection with symmetrical pulse (Suppression of false indication through phase selective pulse location) • Reliable detection with unsymmetrical pulse • No continuous over-compensation necessary for reliable pulse location in the network, because of amplitude and phase evaluation of every phase! • Pulse detection with distributed Petersen coils possible • Minimum current amplitude of pulse settable (1A - 100A) • Tolerance of pulse ratio settable: x of y pulses detected correctly
Fault detection qu2 Transient Algorithm	• Reliable detection and location of earth faults for isolated as well as for compensated networks • Fault detection also possible in meshed networks • Detection of high impedance faults (up to kΩ-range) possible • Additional indication of permanent earth-faults possible • Thresholds for total current (Ice min) and zero sequence voltage (Ue) freely adjustable
External flashing light	• Connection of external flashing light possible (type BL4.1 or type BL6)
Operating temperature range	• from -20°C up to +65°C
Dimensions	• 97 mm x 48 mm x 86 mm (WxHxD) • Dimensions for panel cutout: 92+0.8 x 45+0.6 mm • IEC 61554 / DIN 43700
Protection class	• IP40

3. Menu navigation

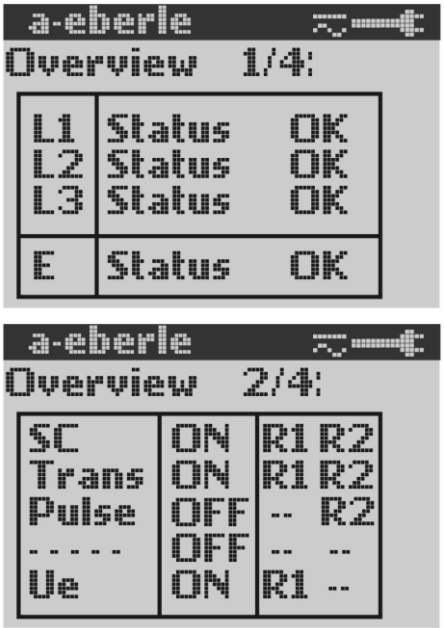
The EOR-1D can be configured completely via the display menu (turn/push control button). The display normally is in standby mode, i.e. in switched off mode. By pushing the turn/push control button on the front side of the device the display is activated.

At first potentially existing short circuit and/or earth fault indications will be displayed by a three-phase screen.



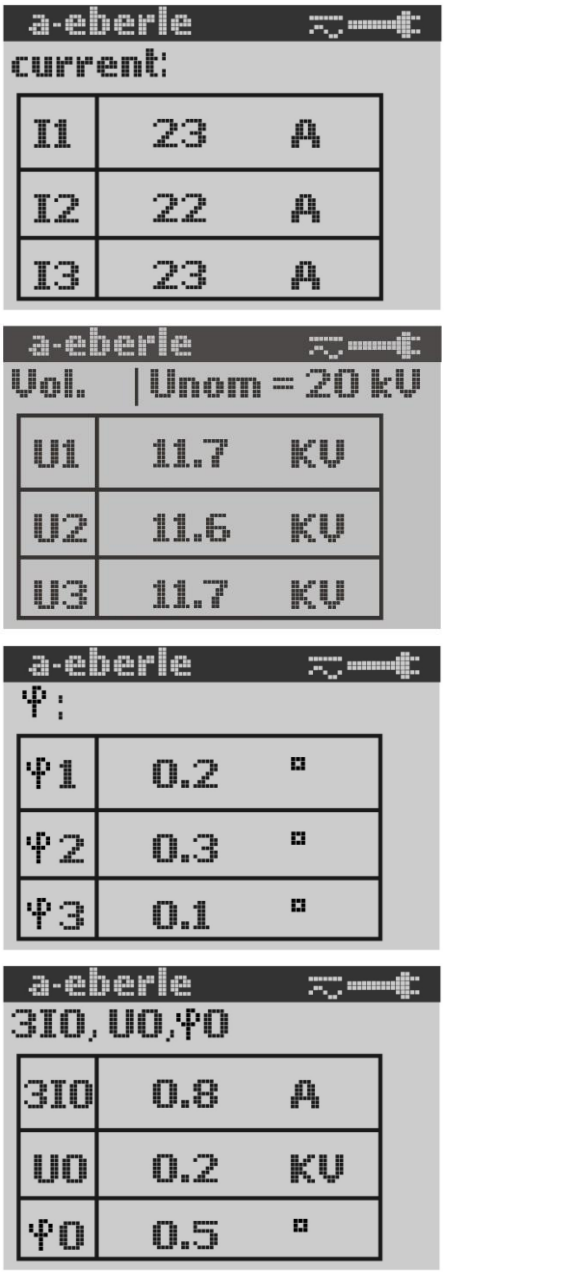
Picture 5: Three-phase short circuit in line direction

After pushing the turn/push control button overview displays will be shown. The different overview displays can be browsed by rotating the turn/push control button.



Picture 6:
Overview 1 - status of phases L1..3 and earth conductor
Overview 2 - status of short circuit and earth fault algorithms incl. assigned relays, respectively

In the following screens the current values of measured currents, voltages and phase angles of all three phases as well as the zero sequence system are displayed.



Picture 7: Overview of currents, voltages, phase angles and zero sequence system

By pushing the turn/push control button again the main menu can be entered, in which all parameters can be set.

Picture 8: Main menu for parameterization

Notes

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