Combined Earth Fault and Short Circuit Indicator

EOR-1DS

- **Short circuit indication (directed/undirected)**
- **Earth fault detection (transient and stationary)**
- **Low power sensor inputs**
- **Opt. incl. current sensors or 1A/5A transformers**
- **Fault recorder (max. 32 GB)**

1. Application

The combined **earth fault and short circuit indicator** type EOR-1DS can be used in compensated, isolated, low ohmic 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. A long-life capacitor supplies the EOR-1DS for indication operation at minimum 4 h in case of a fault.

1.1 Earth fault detection

- **Transient earth fault detection** for compensated and isolated grids using the qu2 algorithms for
  - 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
- **Active power direction** or cos(φ) method (suitable transducers required)
- **Reactive power direction** or sin(φ) method
- **Pulse location**
  - Pulse location with complex evaluation
  - No separate core balanced current transformer (CBCT) necessary
  - Independent from detuning of Arc Suppresion Coil (ASC)

1.2 Short circuit indication

For compensated, isolated and solidly earthed networks the EOR-1DS can used as undirected short circuit indicator or as directed short circuit indicator.

- Phase selective short circuit indication
- Indication of short circuits to earth

1.3 SCADA connection

The EOR-1DS can be not only connected via four freely programmable relays and two fixed binary inputs (test, reset), but also with **Modbus RTU** protocol via RS485.

1.4 General Features

- OLED display
- Configuration in menu via turn/push control button, via MODBUS or via SD card with the help of a preconfigured parameter file
- Up to 32 GB memory for fault recording, log book and parameter set exchange via SD-card

1.5 Hardware variants

- EOR-1DS incl. 3 phase current sensors (SR55)
- EOR-1DS for low power sensors (only indicator)
- EOR-1DS with plug-on transd. 3IO + 3xLx (1 A / 5 A)
- EOR-1DS with plug-on transd. 3IO (1 A / 5 A)
- EOR-1DS with additional voltage adapter for classic 100 V measurement

2. Characteristics

2.1 qu2 algorithm (transient)

With the qu2 algorithm, transient earth faults can be selectively detected to a few kΩ. In the zero sequence system the healthy outputs can be considered as capacitors. To obtain a voltage shift $u_{0(t)}$, these capacitors have to be charged. This charge is created with the null current $i_{0(t)}$ and results in the charge $q_{0(t)}$. With healthy outputs this yields the equation $q_{0(t)} = C_0 u_{0(t)}$. When $u_{0(t)}$ is plotted on the x-axis and $q_{0(t)}$ on the y-axis of the qu-graph, this gives a straight line for healthy outputs. This behavior does not apply for faulty outputs. Figure 1 shows this behavior for a low impedance earth fault.

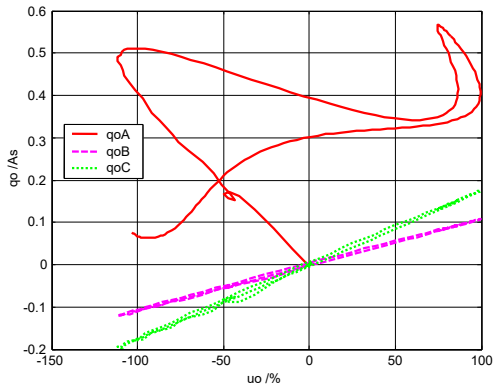


Figure 1: qu-graph for a low impedance earth fault

In parallel lines and meshed networks, circulating currents occur that can lead to an erroneous display. The improved qu2 algorithm eliminates this influence through linearization to the operating point and a downstream, non-linear filter. This algorithm is thus the first algorithm that really works in a meshed network and performs a successful, directional evaluation

This results in the following properties for the qu2 algorithm:

- Suitable for earth faults up to several kΩ
- The triggering threshold of the voltage shift u_{NE}
- The triggering current as an equivalent phase-earth capacitance
- Suppression of the earth fault in response to a selectable minimum duration of the earth fault (continuous earthing message)
- Recording of transient events in the logbook
- For the evaluation, either the measured or calculated u_{NE} from the three phase-earth voltages can be used
- Recording of the associated fault record with adjustable pre-event history (0 .. 1 s) and adjustable fault record length (0.. 3 s)
- Errors due to higher-frequency signals are greatly reduced by integral evaluation
- The qu2 algorithm, in comparison with the standard transient method, uses a much larger time range for the evaluation of the fault direction
- Reset of the indication by an external signal, in menu, automatically after a specified period or at the end of the earth fault

2.2 Reactive power direction method for isolated networks: sin(φ)

- The trigger thresholds for the voltage shift U_{NE} and the total current $3I_0$ are configurable
- For the evaluation, either the measured or the out of three phases calculated $3I_0$ current can be used
- In the reactive power direction method, the requirements for the accuracy of the angle between current and voltage transformers are less.
- Reset of the indication by an external signal, in menu, automatically after a specified period or at the end of the earth fault

2.3 Active power direction method for compensated networks: cos(φ)

- The trigger thresholds for the voltage shift U_{NE} and the total current $3I_0$ are configurable
- Selectable operating modes:
  - Fault tracking indication of the direction of the active power in the null system
  - Stored indication of the active residual current increase
- When using the active power direction method, the accuracy of the angle between current and voltage transformers must be monitored
- Additional non-directional indication for inaccurate measurement (>= cl. 1)
- Reset of the indication by an external signal, in menu, automatically after a specified period or at the end of the earth fault

2.4 Pulse location without 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-1DS has significant advantages against classical pulse location devices:

- Pulse location with complex evaluation
- No separate core balanced current transformer (CBCT) 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
- Reset of the indication by an external signal, in menu, automatically after a specified period or at the end of the earth fault

2.5 Non-directional short circuit

- Adjustable activation threshold
- Reset of the indication by an external signal, in menu, automatically after a specified period or at the end of the short circuit

2.6 Directional short circuit

- Directional indication through evaluation of the phase-earth voltages
- Adjustable activation threshold
- reset of the indication by an external signal, in menu, automatically after a specified period or at the end of the short circuit

2.7 Applicability of the methods

The following table shows the applicability of the methods for the EOR-1DS, depending on the accuracy class of the transformers and sensors.

Available transformers / sensors			Transient qu2 (directional)	Pulse location (non-directional)	sin(φ) (directional)	cos(φ) (directional)	cos(φ) (directional + non-directional)	Short circuit (directional)	Short circuit (non-directional)	Short circuit to earth (directional)	Short circuit to earth (non-directional)
I_0	$3 \cdot I_L$	$3 \cdot U_L$									
	x			x					x		x
	x	x	x	x	x	x	x	x	x	x	x
x											x
x	x			x					x		x
x		x	x		x	x	x			x	x
x	x	x	x	x	x	x	x	x	x	x	x

Legend of minimum requirements for class of accuracy of transducers and sensors:		
		> cl. 1
		<= cl. 1
		<= cl. 0.5 + phase sensors / transducers preselected regarding error in amplitude and angle

2.8 SCADA connection

The EOR-1DS can be not only connected via four 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 (long life capacitor). Additional customer specific register assignments can be implemented.

2.9 Fault recorder with up to 32 GB

Fault records with a length of up to 4 seconds @ 2 ksps are recorded on the internal SD-card in case of a recognized short circuit or earth fault. During this, current, voltage and status messages are recorded. SD-cards with a memory size from 2 GB up to 32 GB are supported.

2.10 Logbook

- Displaying important messages directly on the EOR-1DS
- Detailed recording of the logbook on a supported SD card
- Recording in ASCII format and direct readable
- Events and changings in the configuration are recorded with a timestamp

2.11 Binary inputs

- 2 binary inputs with fixed functions (test and reset)
- Only use potential free

2.12 Binary outputs (relays)

- 4 free configurable relay outputs (bistable, NO/NC)
- Permanent/Immediate or wipe contact (time adjustable)
- All indication algorithm and the status are freely programmable on the relays
- Multiple signals can be combined (OR-operation)

3. Menu navigation

The EOR-1DS 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.

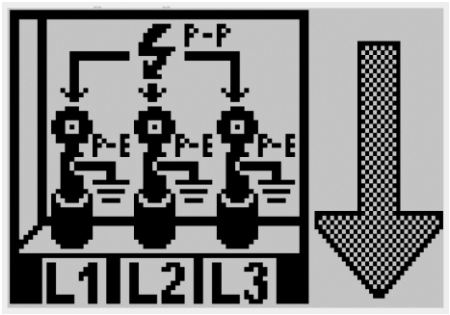


Figure 2: Three-phase short circuit in line direction

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.

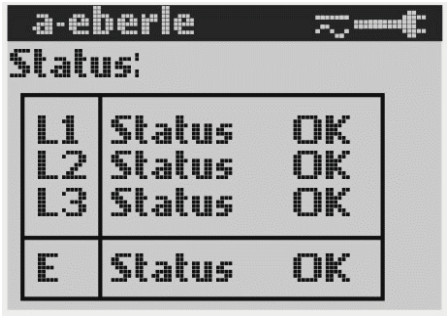


Figure 3: Status L1, L2, L3 and earth conductor

Figure 4: Summary short circuit and earth fault methods incl. assigned relays

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 and the total power for P, Q and S and the phases and zero sequence system are displayed.

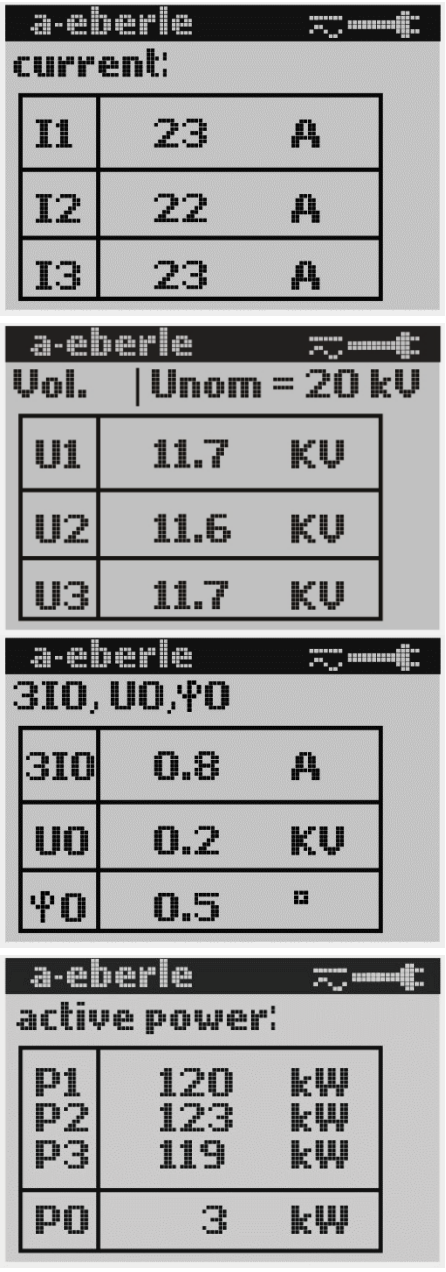


Figure 5: Summary of current, voltage, zero sequence system and active power

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

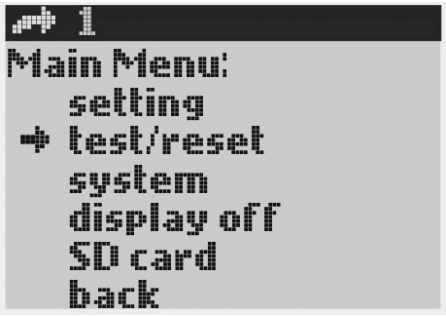


Figure 6: Main menu for parameterization

4. Technical specifications

4.1 Regulations and standards

DIN EN 61010-1:2020-03
DIN EN 61010-2-030:2011-07
DIN EN 61326-1:2013
CISPR 11:2015 (EN55011)

CE

4.2 AC voltage input LRM

Capacitive voltage tap-off on LRM systems

Measuring voltage	0 ... 60 VAC
Shape of the curve	Sine
Frequency range of the fundamental wave	48 … 52 Hz
Burden	10 MΩ
Accuracy	± 3 %

4.3 AC voltage input low power U06

Low power sensors with 200 kΩ rated burden and U_r = 3,25 V / $\sqrt{3}$ e.g. sensors from ABB, Greenwood-Power, Zelisko, etc. (U_n settable)

Measuring voltage	0 ... 4 VAC
Shape of the curve	Sine
Frequency range of the fundamental wave	48 … 52 Hz
Burden	200 kΩ
Accuracy	± 1 %

4.4 AC voltage input low power U07

Low power sensors with 2 MΩ rated burden and U_r = 3,25 V / $\sqrt{3}$ e.g. sensors from ABB, Greenwood-Power, Zelisko, etc. (U_n settable)

Measuring voltage	0 ... 4 VAC
Shape of the curve	Sine
Frequency range of the fundamental wave	48 … 52 Hz
Burden	2 MΩ
Accuracy	± 1 %

4.5 AC voltage input U10

Classical voltage transducers with 100 V or 110 V; all values refer to the connection at the U10 adapter; AC voltage input at indicator itself like U06

Measuring voltage	0 ... 150 VAC
Shape of the curve	Sine
Frequency range of the fundamental wave	48 … 52 Hz
Burden	10 MΩ
Accuracy	± 1.5 %

4.6 AC current input low power C10

Inductive low power sensors with U_r = 225 mV, e.g. sensors from ABB, Greenwood-Power, Zelisko, etc. (U_n settable)

Measuring voltage	0 … 420 mVAC
Shape of the curve	Sine
Frequency range of the fundamental wave	48 … 52 Hz
Internal consumption	Burden 1 MΩ
Accuracy	± 1 %

4.7 AC current input C11

SR55 Rogowski phase current transformer

Measuring current	0 … 2500 A
Shape of the curve	Sinus
Frequency range of the fundamental wave	48 … 52 Hz
Accuracy	± 3 %
Cable length	8 m
Conductor diameter	13 – 55 mm
Conductor type	• Only for shielded conductors • Conductor shield (ground) must be led back for each phase, so a current on the shield does not influence the measurement

4.8 AC current input C21/C25

Classical current transducers 1 A / 5 A secondary

Measuring voltage	0 … 12 A
Shape of the curve	Sinus
Frequency range of the fundamental wave	48 … 52 Hz
Internal consumption	≤ 0.1 VA
Accuracy	± 1 %

4.9 Binary inputs

Input voltage	Potential free

4.10 Binary outputs

Electrical isolation	Electrically isolated from all other device inter potentials
Contact load (maximal values for ohmic load)	AC 150 V / 0,4 A DC 30 V / 2 A DC 150 V / 0,25 A
Minimal switching voltage	1 mV
Amount of switching operation	>10^5 electrical
Type	Bistable relays, programable as NO or NC contact

4.11 Serial RS485 interface

Typ	2-wire RS485 interface
Potential isolation	galvanic separated
Connection	shielded cabel
120 Ω termination	No termination included; use external termination if needed

4.12 Supply voltage

DC	20 V – 240 V
AC	48 V – 240 V
Power consumption DC	0,6 W (max 1,0 W)
Power consumption AC	1,9 VA (max 2,6 VA)
Indication operation by long-life capacitor - without flashing light and display OFF	Min. 12 h
Indication operation by long-life capacitor - with flashing light and display OFF	Min. 4 h
Indication operation by long-life capacitor - display ON	Min. 7 min

4.13 Conductor nominal values

Length of wire end ferrule or stripped wire	8 to 10 mm
Diameter with wire end ferrule	1 mm^2
Diameter without wire end ferrule	1,5 mm^2

4.14 Limit value monitoring

Limit value	Programmable
Response time	Programmable
Alarm displays	Programmable: relays, display

4.15 Measurement value recording

Non-volatile	≤ 32 GB

4.16 Environmental parameters

Reference temperature	23°C ± 1 K
Function	-20 °C ... +65 °C
Transport and storage	-25 °C ... +65 °C
Relative humidity	5% … 95% not condensing
Operating altitude a. s. l.	Up to 2000 meters

4.17 Weight

EOR-1DS C10 without adapter	0.19 kg
EOR-1DS C11 with 3x Rogowski sensors	1.24 kg
EOR-1DS C21/C25 with plug-on transd.	0.31 kg
EOR-1DS C21/C25 with U10 Adapter	0.48 kg

4.18 Electrical safety

DIN EN 61010-1:2020-03 DIN EN 61010-2-030:2011-07	
Protection class	IP40
Protection category	II
Pollution degree	2
Measurement category (only U10-adapter)	III/150 V
Measurement category (only U10-adapter)	II/300 V
Overvoltage category	II

Working voltages

50 V	150 V	240 V
Low power inputs, LRM input	Relay outputs	Power supply

4.19 Electromagnetic compatibility

Immunity	DIN EN 61326-1:2013
Emission	CISPR11 (EN55011)

4.20 Special features EOR-1DS

- SD card behind removable front, for access release the screw on the front side
- In contrast to the EOR-1D, there is no battery behind the removable front, because the battery was replaced with a long life capacitor
- SD card useable for firmware updates, parameter updates, fault record and logbook

Figure 7: EOR-1DS with demounted front plate for SD card access

4.21 Indicator dimensions

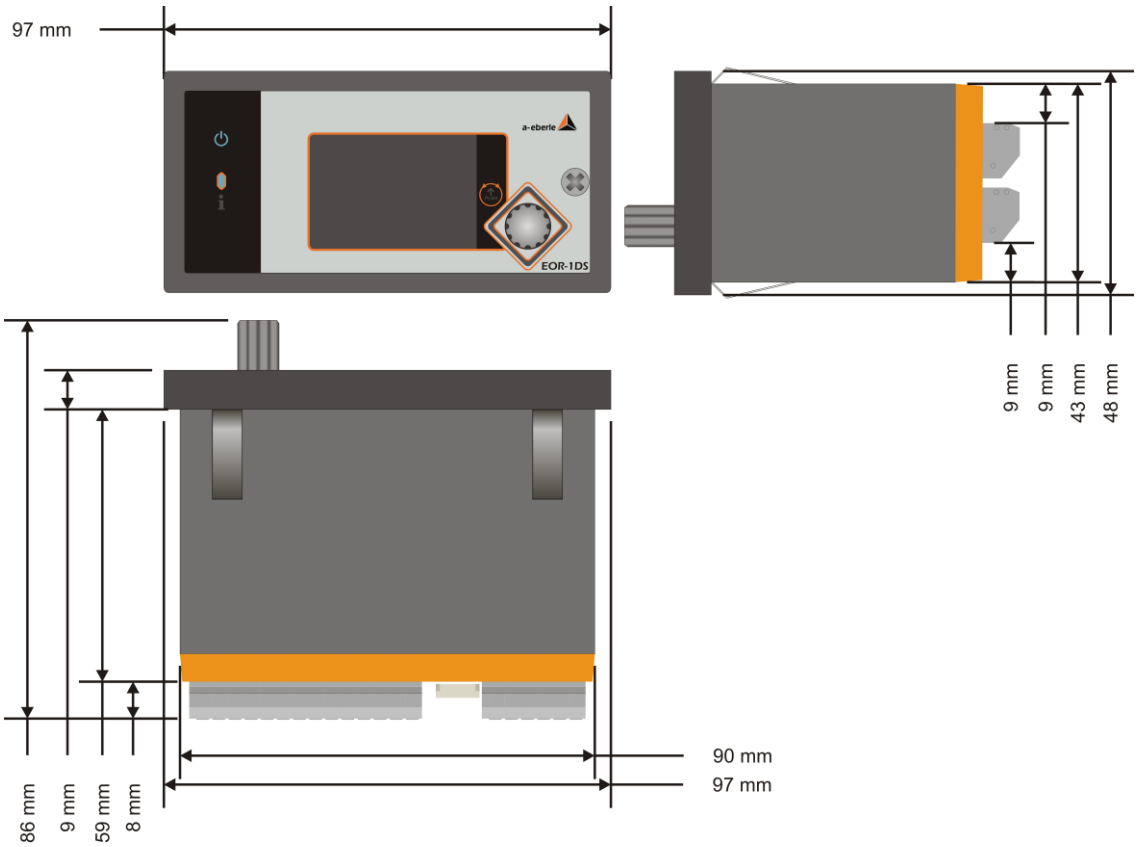


Figure 8: Dimensions EOR-1DS

Necessary panel cutout

92+0,8 mm x 45+0,6 mm (IEC 61554 / DIN 43700)

4.22 Dimensions phase current sensors (part of EOR-1DS art. 119.9006.11xx)

Figure 9: Installation phase current sensor

ATTENTION!
Conductor shield must be led back

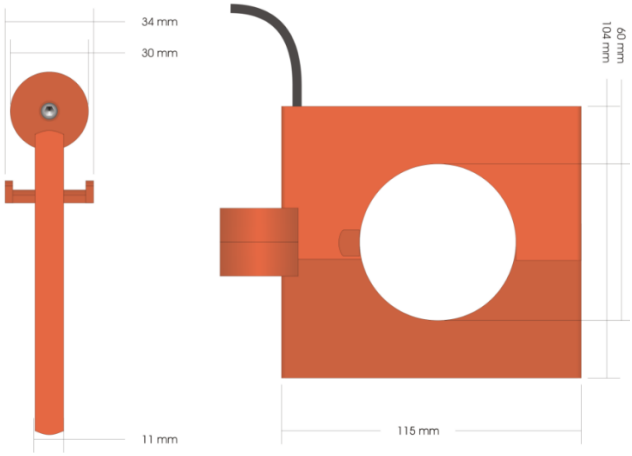


Figure 10: Dimensions phase current sensor

3x Rogowski coil sensors included in set with articel number 119.9006.11xx

4.23 Dimensions current adapter C21/C25 and voltage adapter U10

The following picture shows the current adapter C21 for classical current measurement of 1 A / 5 A values. Feature C25 has in comparison with feature C21 only the $3I_0$ current transducer. The transducers for I1..3 are not available with this feature.

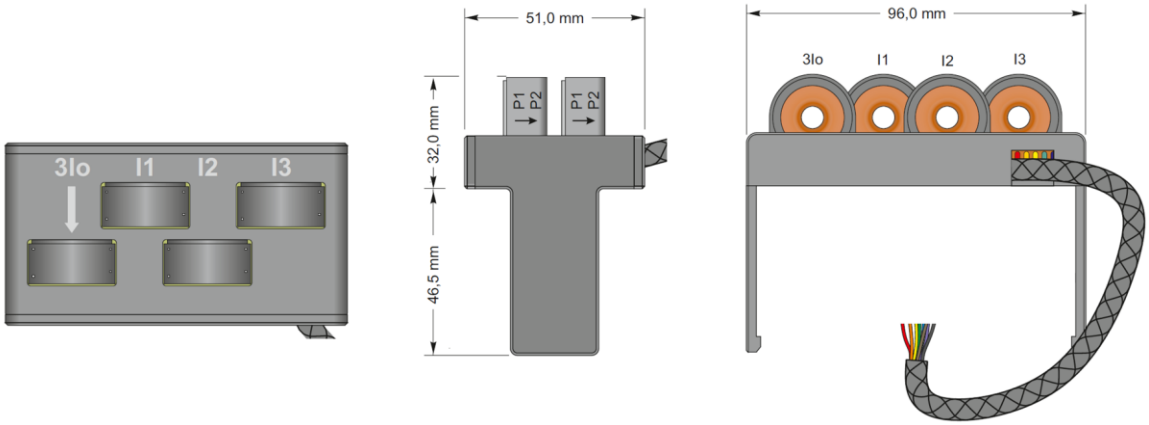


Figure 11: Dimensions of adapter for classical current measurement feature C21

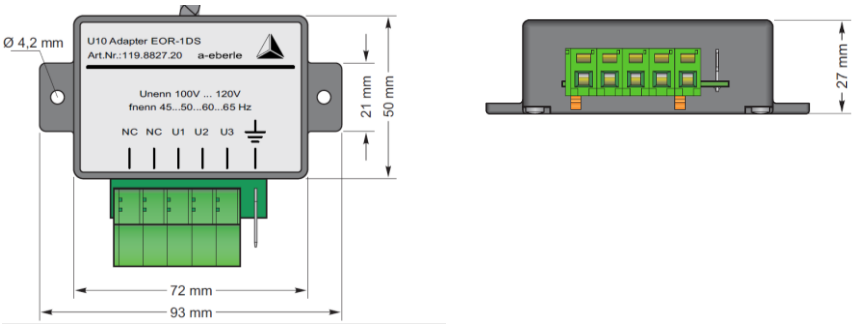


Figure 12: Dimensions of voltage measurement adapter for 100 V / 110 V transducers; order code U10

4.24 Terminal assignment indicator

PIN	Function
1	Modbus GND
2	Modbus A
3	Modbus B
4	Reset extern (use only potential free)
5	Common (Reset extern / Test extern)
6	Test extern (use only potential free)
7	Current sensor L1
8	Current sensor L1 GND
9	Current sensor L2
10	Current sensor L2 GND
11	Current sensor L3
12	Current sensor L3 GND
13	Current sensor 3I0
14	Current sensor 3I0 GND

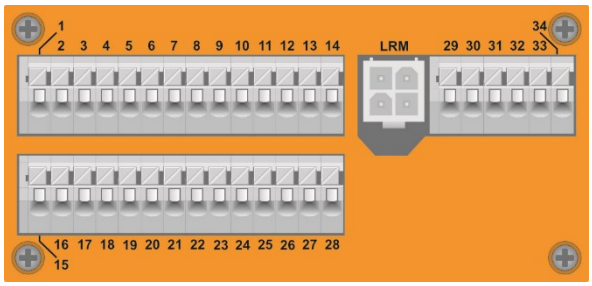
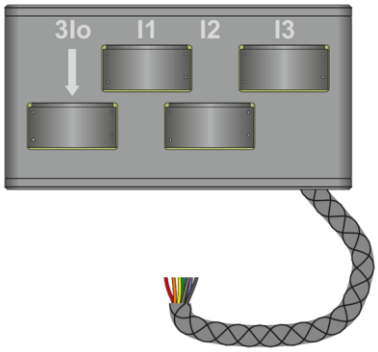


Figure 13: Pins EOR-1DS

PIN	Function
LRM	4 pin socket for LRM system (U-measurement)
29	Voltage sensor L1
30	Voltage sensor GND
31	Voltage sensor L2
32	Voltage sensor GND
33	Voltage sensor L3
34	Voltage sensor GND

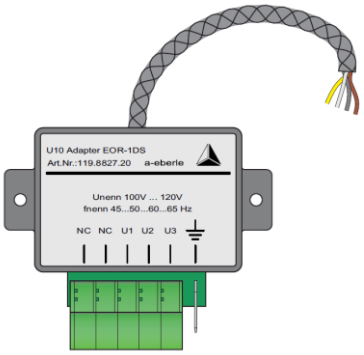
PIN	Function
15	Auxilary voltage 20..240 VDC / 48..240 VAC
16	Auxilary voltage 20..240 VDC / 48..240 VAC
17-19	not used
20	Flashing lights BL4.1/BL6/BL7 (brown)
21	Flashing lights BL4.1/BL6/BL7 (white)
22	not used
23	not used
24	Relays 1..4 Common
25	Relay 1 / status
26	Relay 2
27	Relay 3
28	Relay 4

4.25 Terminal assignment C21/C25 current adapter



PIN indicator	Function	Cable colour
7 (only C21)	Current sensor L1	Orange
8 (only C21)	Current sensor L1 GND	Red
9 (only C21)	Current sensor L2	Green
10 (only C21)	Current sensor L2 GND	Yellow
11 (only C21)	Current sensor L3	Violet
12 (only C21)	Current sensor L3 GND	Blue
13 (C21 & C25)	Current sensor 3I0	Brown
14 (C21 & C25)	Current sensor 3I0 GND	Black

4.26 Terminal assignment U10 voltage adapter



PIN indicator	Function	Cable colour
29	Voltage L1	Brown
30	Voltage GND	Yellow
31	Voltage L2	White
33	Voltage L3	Grey

5. Accessories for EOR-1DS

5.1 External flashing lights

Optional the external flashing lights type BL4.1 and BL7 for wall mounting and BL6 for surface mounting are available. Typ BL7 verfügt zusätzlich über eine Richtungsanzeige.

Figure 1: Type BL4.1

Figure 2: Type BL7

Figure 3: Type BL6

Type	Description	Cable length	Article number
BL4.1	Without direction indication for wall mounting	6m	119.9100.06
BL7	With direction indication for wall mounting	6m	119.9103.06
BL6	Without direction indication for surface mounting	6m	119.9102.06

5.2 LRM Adapter cables

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-1DS:

Figure 4: LRM adapter

Figure 5: Y-LRM adapter

Type	Description	Article number
LRM adapter	4 pole AMP-socket on both ends	582.8114.xx
Y-LRM adapter	3x flat plug / socket on 4 pole AMP socket	582.8113.xx

The EOR-1DS 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-1DS can only be connected in parallel to such a device with a LRM – adapter cable.

5.3 Low power sensors

Zelisko sensor (split core type) 1 set (3 pcs.)

Phase current sensor (split core type) for power and short circuit measurement 300 A / 0.225 V cl. 0.5 up to 200 % afterwards 5P10 (Inner-Ø: 55 mm). Also available as preselected set.

Sensor type	Cable length	Article no.
SMCS/T-JW1002	3.7m	330.1510
SMCS/T-JW1002 preselected	3.7 m	330.1510.00

Zelisko sensor (closed ring core type) 1 set (3 pcs.)

Phase current sensor (closed ring core type) for power and short circuit measurement 300 A / 0.225 V cl. 0.5 up to 200 % afterwards 5P10 (Inner-Ø: 82 mm). Directly mountable on the bushings of compact switch gears. Also available as preselected set.

Sensor type	Cable length	Article no.
SMCS-JW1001	3.7m	330.1511
SMCS-JW1001 preselected	3.7 m	330.1511.00

Zelisko 3-phase (I1+I2+I3) + Core Balanced Current Sensor (3Io) multi-function sensor (closed ring core type)

Phase current sensor for power and short circuit measurement 300 A / 0.225 V cl. 0.5 up to 200 % afterwards 5P10 (Inner-Ø: 84 mm).

Sensor type	Cable length	Article no.
SMCS3-JW1004	3.7m	330.1514

Zelisko sensor (split core type) Core Balanced Current Sensor (3Io)

Core Balanced Current Sensor for 3Io measurement with a ratio of 60 A / 0.225 V; (Inner-Ø: 120 mm), cl. 0.5.

Sensor type	Cable length	Article no.
GAE120/SENS-JW1003	3.7m	330.1515

Zelisko combined current and voltage sensor (up to 12/24/36 kV) for open air facility

The open facility sensor combines the functions of a current and voltage sensor in one device. Due to the construction design and the special cast resin mixture the product can be used outdoors. The combined sensor is available up to an isolation level of 36 kV. (current sensor cl. 0.5 5P20 / voltage sensor cl 0.5 3P)

Sensor type	Cable length	Article no.
SMVS-K1112 (<= 12 kV isol. level)	-	330.1512.12
SMVS-K1112 (<= 24 kV isol. level)	-	330.1512.24
SMVS-K1112 (<= 36 kV isol. level)	-	330.1512.36

5.4 Current transducers with low nominal load

Phase current transformer for load current and short circuit detection ELEQ TQ50 (Inside- Ø: 42 mm, rated burden 0,5 VA)

Transducer type	Cable length	Article no.
250/1 A (Kl.1)	5,0 m	330.1502
300/1 A (Kl.1)	5,0 m	330.1503
400/1 A (Kl.0,5)	5,0 m	330.1504
500/1 A (Kl.0,5)	5,0 m	330.1505
600/1 A (Kl.0,5)	5,0 m	330.1506

6. Order specifications

For determining the order details:

- Only one unit can be ordered for codes with the same capital letter.
- When a code's capital letter is followed only by zeros, the code may be omitted.

Characteristic	CODE
Combined short circuit & earth fault indicator EOR-1DS ● For undirected and directed short circuit and earth fault indication with fault records and logbook on SD card for easy fault analysis ● Power meter ● Switch panel mounting with 4 relays and 2 binary inputs ● Low power voltage sensor inputs 3x ULx and Low power current sensor inputs 1x 3I0 + 3x ILx ● Push-in terminals ● LRM interface for capacitive voltage input ● Incl. MODBUS RTU protocol ● 8GB-Flash-memory ● Wide-range power supply, long-life capacitor for >4h indication operation	EOR-1DS
Input configuration current	
● Without additional current sensors Art.-No.: 119.9006.10xx	C10
● Current measurement via rogowski coil sensors directly at medium voltage cables; Incl. 3 phase current sensors with each 8 m connection cable, no core balanced CT required Art.-No.: 119.9006.11xx	C11
● Current measurement on classical current transducers 1A / 5A; Incl. plug-on adapter for measurement of 1x 3I0 + 3x ILx Art.-No.: 119.9006.21xx	C21
● Current measurement on classical current transducers 1A / 5A; Incl. plug-on adapter for measurement of 1x 3I0 Art.-No.: 119.9006.25xx	C25
Input configuration voltage	
● Low power voltage sensor inputs with 200 kΩ burden Art.-No.: 119.9006.xx06	U06
Low power voltage sensor inputs with 2 MΩ burden Art.-No.: 119.9006.xx07	U07
● 4 voltage inputs up to 120V for classical 100V VT (via additional adapter) Art.-No.: 119.9006.xx10	U10
Customer specific parameterization	
● Without	K0
● With	K1

Accessories	article number
Adapter for DIN-rail mounting of the EOR-1DS	
● Mounting the EOR-1DS on an existing DIN-rail, set of 2 DIN-rail adapters (left and right housing side), existing screws of EOR-1DS (rear side) must be re-used to mount the adapter on the EOR-1DS	564.0495
Adapter cable EOR-1DS	
● LRM Y-adapter cable for 4,8 mm flat socket	
○ cable length 0,3 m	582.8113.03
○ cable length 1,0 m	582.8113.10
○ cable length 1,5 m	582.8113.15
● LRM connection cable for 2 x 4-pol socket	
○ cable length 0,3 m	582.8114.03
○ cable length 1,0 m	582.8114.10
○ cable length 1,5 m	582.8114.15
Flashing lights EOR-1DS	
● BL6 without direction indication for surface mounting, cable length 6 m	119.9102.06
● BL4.1 without direction indication for wall mounting, cable length 6 m	119.9100.06
● BL7 with direction indication for wall mounting, cable length 6 m	119.9103.06
Low power sensors (see also chapter 5.3)	
● 1 set (3 pcs.) sensors, split core type	
○ Zelisko SMCS/T-JW1002, length of conn. cable 3.7 m	330.1510
○ Zelisko SMCS/T-JW1002, preselected, length of conn. cable 3.7 m	330.1510.00
● 1 set (3 pcs.) sensors, closed ring core type	
○ Zelisko SMCS-JW1001, length of conn. cable 3.7 m	330.1511
○ Zelisko SMCS-JW1001, preselected, length of conn. cable 3.7 m	330.1511.00
● 1x 3-phase (I1+I2+I3) + Core Balanced Current Sensor (3Io) multi-function sensor, closed ring core type	
○ Zelisko SMCS3-JW1004, length of conn. cable 3.7 m	330.1514
● 1x Core Balanced Current Sensor (3Io), split core type	
○ Zelisko GAE120/SENS-JW1003, length of conn. cable 3.7 m	330.1515
● 1x combined current and voltage sensor (up to 12/24/36 kV) for open air facility	
○ Zelisko SMVS-K1112 (up to 12 kV isolation level)	330.1512.12
○ Zelisko SMVS-K1112 (up to 24 kV isolation level)	330.1512.24
○ Zelisko SMVS-K1112 (up to 36 kV isolation level)	330.1512.36

Accessories	article number
Current transducers with low nominal load (see also chapter 5.4)	
● Phase current transformer für load current and short circuit detection ELEQ TQ50 (Inside-Ø: 42mm, rated burden 0.5 VA)	
○ ELEQ TQ50 250/1 A (cl.1), length of connection cable 5.0 m	330.1502
○ ELEQ TQ50 300/1 A (cl.1), length of connection cable 5.0 m	330.1503
○ **ELEQ TQ50 400/1 A (cl.0.5), length of connection cable 5.0 m**	**330.1504**
○ ELEQ TQ50 500/1 A (cl.0.5), length of connection cable 5.0 m	330.1505
○ ELEQ TQ50 600/1 A (cl.0.5), length of connection cable 5.0 m	330.1506

Notes

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