REA 103
Arc protection module

Operator's manual

Contents:

1. General

The REA 103 is an extension unit designed to be used together with the arc protection relay REA 101. The function of the unit is to detect light and to provide the REA 101 relay with information about this. The use of the extension unit allows the protection area to be extended and the object to be divided into smaller areas.

1.1. Features

- 2 sensor fibres for arc detection, loop or radial arrangement.
- 2 signal relays for each sensor fibre.
- Relays activated by light detected by the sensor fibre.
- 2 RJ-45 ports for the connection of REA 101 relay and extension units.
- Self-supervision unit monitoring operating voltages and sensor fibre loops.

2. Safety

	National and local electrical safety regulations must always be followed.
	Dangerous voltages can occur on the connectors, even though the auxiliary voltage is disconnected.
	The frame of the device has to be carefully earthed.
	Only a competent electrician is allowed to carry out the electrical installation.
	Sensor fibres have to be handled according to the instructions given by the sensor fibre manufacturer.
	Settings and configuration changes have to be done with the auxiliary supply voltage (U_{aux}) disconnected. Malfunction may occur if changes are made with the supply voltage connected.

Block diagram

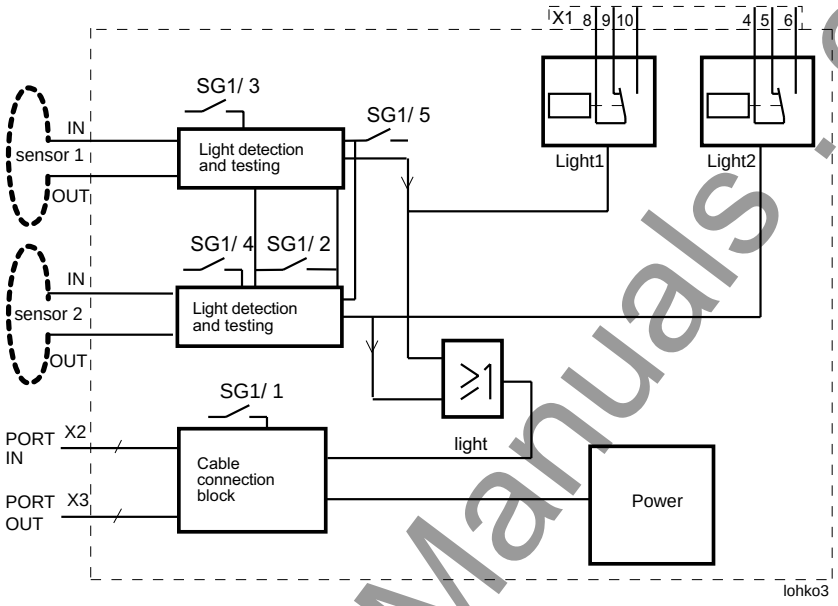

Fig. 2.-1 REA 103 block diagram

3. Description of operation

3.1. Light indication

The switches SG1/3-4 are used for selecting sensor fibre 1 and sensor fibre 2.

The light captured by the sensor fibre is amplified and compared either to an automatic or a manual reference level. Once the reference level is exceeded, a light signal is generated and the signal relay "Light 1/2" of the concerned fibre is activated for about 0.5 second.

The light signal is transferred to the central unit REA 101 via the port IN and the bus. In a trip situation the central unit provides information about the tripping and the signal relay is locked in the active state. If no tripping occurs, the signal relay resets.

The SG1/2 switch is used for selecting the automatic or manual reference level. The unit itself forms the automatic reference level according to the present backlight intensity measured by the sensor fibre. The potentiometer "Light Ref. Level Adj." on the front panel is used for selecting the manual reference level.

The condition of the sensor fibre is monitored by sending a test pulse through the fibre. Unless a test pulse is received at regular intervals at the other end of the loop, the sensor fault LED "Fault1/2" and the IRF indicator are activated. Condition monitoring of the sensor fibres can be deactivated (switch SG1/5), in which case a radial, i.e. a terminating, fibre can be used.

3.2. Operation of IN and OUT ports

The ports IN and OUT are connected in parallel. The connection cable from the central unit REA 101 is connected to the port IN and the connection cable to the next extension unit departs from the port OUT. A maximum of five extension units, one after the other, can be linked to one port of the central unit. The terminators have to be connected (switch SG1/1) in the last extension unit of the chain. Then the REA 101 unit is able to monitor the condition of the connection cable. Should the terminators be unconnected, the fault indicating LED "Port A/B Fault" of the central unit REA 101 and the IRF indicator are activated, and the IRF relay resets. The REA 103 extension unit does not need its own auxiliary voltage supply, but is supplied by the central unit REA 101 over the connection cable.

3.3. Self-supervision unit

In addition to that mentioned above, the self-supervision system monitors the operating voltages of the device. If a fault is detected in the operating voltages, the self-supervision unit prevents the device from operating. When the IRF indicator of the REA 103 extension unit is lit, the LED "Port A/B Fault" of the REA 101 relay starts flashing, the IRF indicator is lit and the IRF relay resets.

3.4. Front panel

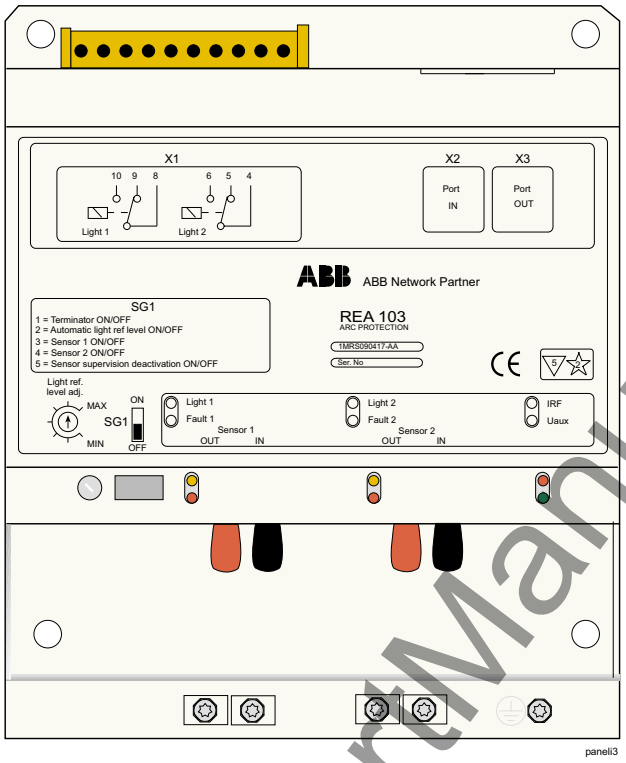

Fig. 3.4.-1 Front panel

3.5. Functions of LEDs and switches

Table 3.5.-1 LEDs activated

U_{aux}	Power supply is connected.
Light 1	The sensor fibre 1 has detected light.
Light 2	The sensor fibre 2 has detected light.
IRF	The self-supervision system has detected a fault. (The fault LED *Port A/B Fault* of the REA 101 relay is flashing, the IRF indicator is lit, and the IRF relay has reset.)
Fault 1 + IRF	Sensor fibre 1 broken. (The sensor fibre may still detect light between the sensor input and the breakage.) Transmitter/transceiver is defective.
Fault 2 + IRF	Sensor fibre 2 broken. (The sensor fibre may still detect light between the sensor input and the breakage.) Transmitter/transceiver is defective.

Light Ref. Level Adj.:

Potentiometer for manual backlight compensation:
- potentiometer in use, if switch SG1/2 in OFF position.
- potentiometer not in use, if switch SG1/2 in ON position.

Switchgroup SG1:

1. Switch 1 (Terminator ON/OFF)

   Switch in ON position: Terminators connected.

2. Switch 2 (Automatic light ref. level ON/OFF)

   Switch in ON position: Automatic backlight compensation selected. (Potentiometer *Light Ref. Level Adj*. not in use).

   Switch in OFF position: Manual backlight compensation selected. (Potentiometer *Light Ref. Level Adj*. in use).

3. Switch 3 (Sensor 1 ON/OFF)

   Switch in ON position: Sensor fibre 1 is used for arc detection.

4. Switch 4 (Sensor 2 ON/OFF)

   Switch in ON Position: Sensor fibre 2 is used for arc detection.

5. Switch 5 (Sensor supervision deactivation ON/OFF)

   Switch in ON position: Sensor fibre condition monitoring not in use, i.e. a radial fibre may be used.

   Switch in OFF position: Sensor fibre loop condition monitoring in use.

4. Connections

Connector X1:

1	Not in use	
2	Not in use	
3	Not in use	
4	Light 2 common	Signal relay of sensor 2
5	Light 2/NC	Signal relay of sensor 2
6	Light 2/NO	Signal relay of sensor 2
7	Not in use	
8	Light 1 common	Signal relay of sensor 1
9	Light 1/NC	Signal relay of sensor 1
10	Light 1/NO	Signal relay of sensor 1

Connection ports X2 and X3:

X2	Port IN
X3	Port OUT

Sensor fibre 1 connectors:

Sensor 1	OUT
Sensor 1	IN

Sensor fibre 2 connectors:

Sensor 2	OUT
Sensor 2	IN

5. Commissioning

5.1. Instructions for commissioning:

Follow the procedure below when commissioning the unit.

All switch settings have to be made before the auxiliary voltage of the unit is connected.

1. Switchgroup SG1:

   Default setting: SG1= 00000

   Set the switches as required by the application. See sections "Function of LEDs and switches" in this manual and "Application examples" of the REA 101 Operator's manual.

2. Terminator:

   Check that the terminator of the last extension unit of each extension unit chain is connected, i.e. switch SG1/1 is in position ON.

3. Potentiometer "Light Ref. Level Adj":

   Default setting: middle position.
   If the SG1/2 switch is set for automatic backlight compensation, the setting of the potentiometer does not have to be changed.

5.2. Testing of arc protection system level

1. Check the current measurement function of each REA 101 relay by measuring the primary or secondary circuit.
   When the current limit is exceeded, the "I> Start" LED of the relay is lit.
2. Turn the "Trip Condition" key switch into position *Light* to check that overcurrent data is transmitted through the entire system arrangement, as required by the application.
3. Check that the LED "I>Start" of the concerned REA 101 units is lit.
4. Finally, turn the "Trip Condition" key switch into the position *I> & Light*.

Check each REA 101 relay included in the application in the same way.

5.3. Light reference setting

1. Set the lighting level as close to normal work conditions as possible.
2. Turn the "Light Ref. Level Adj." potentiometer until the "Light" LED is lit or goes out.
3. Turn the potentiometer one scale mark interval to the right.
4. Should the "Light" LED remain dark, even though the potentiometer is in the Min. position, the potentiometer can be either left in this position or turned one scale mark interval to the right, depending on the sensitivity level desired.
5. Turn the key switch "Trip Condition" of one REA 101 relay into position *Light*.
6. Expose one sensor fibre at a time to light, for example using a flash, and check that the right circuit breakers operate.

7. When all of the sensor fibres have been tested, set the "Trip Condition" key switch/key switches as required by the application.

The Trip Condition key switch must always be in an extreme position.

6. Dimensions and fixing

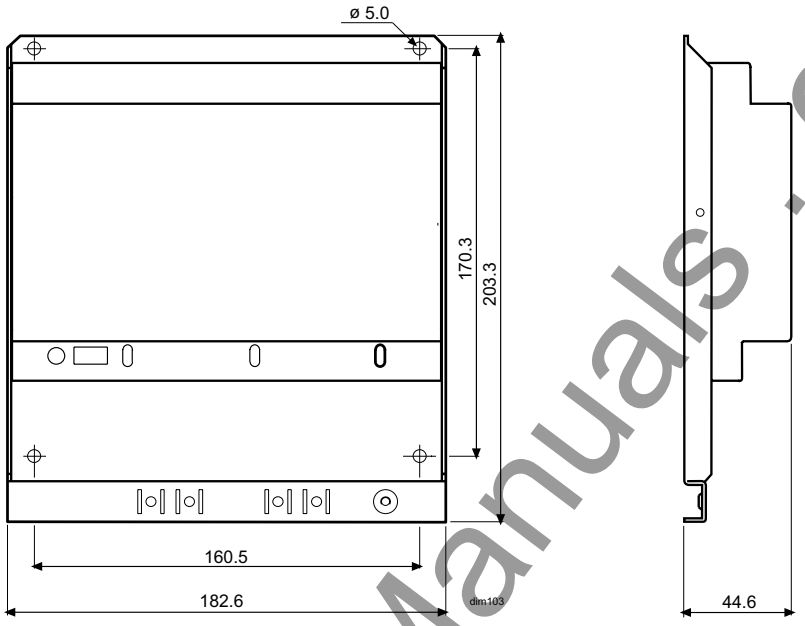

Fig. 6.-1 Dimensions.

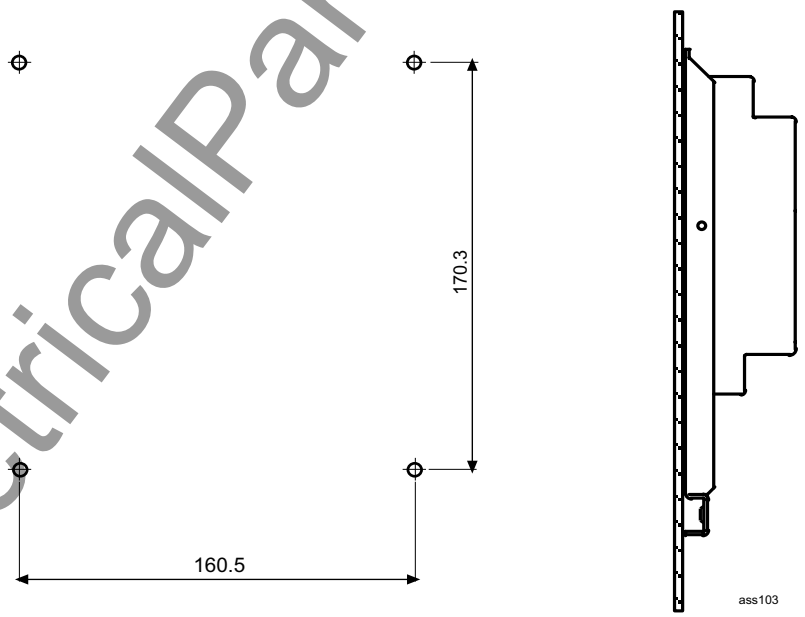

Fig. 6.-2 Fixing methods

Fixing method 1: M4 threaded hole, fixing with M4 machine screw.
Fixing method 2: ϕ 4.2 mm hole, fixing with M4 machine screw and nut.

7. Technical data

Signal contacts (Light 1, Light 2)	
Maximum system voltage	250 V dc/ac
Continuous carry	5 A
Make and carry for 0.5 s	10 A
Make and carry for 3 s	8 A
Breaking capacity for dc, when the control circuit	250 V dc/ac
time constant L/R <40 ms, at 48/110/220 V dc	1 A/0.25 A/0.15 A
Power consumption (operating voltage over the port of REA 101)	
Under quiescent conditions/maximum	~1.6 W/~3.3 W
Note: Maximum of 5 extension units can be linked to one port of REA 101	
Sensor fibre	
Maximum length without splices or with one splice	60 m
Maximum length with two splices	50 m
Maximum length with three splices	40 m
Service temperature range	-35...+80°C
Minimum permissible bending radius	50 mm
Connection cable	
Maximum length	40 m[a]
Environmental tests	
Specified service temperature range	-10...+55°C
Transport and storage temperature range	-40...+70°C
Dry heat test	Acc. to IEC 60068-2-2 (BS 2011: Part 2.1 B)
Dry cold test	Acc. to IEC 60068-2-1 (BS 2011: Part 2.1 A)
Damp heat test cyclic	Acc. to IEC 60068-2-30 (BS 2011: Part 2.1 Db) r.h. >95%, t = 20...55°C
Storage temperature test	Acc. to IEC 60068-2-48
Enclosure	
Degree of protection, IEC 60529	IP 20
Weight	~1.1 kg
Insulation tests	
Dielectric test acc. to IEC 60255-5	2 kV, 50 Hz, 1 min
Impulse voltage test acc. to IEC60 60255-5	5 kV, 1.2/50 µs, 0.5 J
Insulation resistance test acc. to IEC 60255-5	100 MΩ, 500 Vdc
Electromagnetic compatibility tests	
1 MHz burst disturbance test acc. to IEC 60255-22-1, class III:	
- common mode	2.5 kV
- differential mode	1 kV
Electrostatic discharge test acc. to IEC 61000-4-2 and IEC 60255-22-2, class III:	
- contact discharge	6 kV
- air discharge	8 kV
Radio frequency electromagnetic field disturbance test acc. to IEC 61000-4-3:	
- frequency f	80 - 1000 MHz
- field strength E	10 V/m (rms)
Radio frequency disturbance test acc. to IEC 61000-4-6:	
- conducted, common mode	10 V, 150 kHz - 80 MHz

Fast transient disturbance test acc. to IEC 60255-22-4 and IEC 61000-4-4:	4 kV
Surge immunity test acc. to IEC 61000-4-5:	
signal output contacts	
- common mode	2 kV
- differential mode	1 kV
Electromagnetic emission tests acc. to EN 55011 and EN 50081-2	
- radiated RF emission	EN 55011, class A
CE approval	
Complies with the EMC directive 89/336/EEC and the LV directive 73/23/EEC	
Mechanical tests	
Vibration tests (sinusoidal) acc. to IEC 60255-21-1	Class 1
Shock and bump test acc. to IEC 60255-21-2	Class 1
Seismic tests acc. to IEC 60255-21-3	Class 2

a. Total length of the connection chain between the central unit and extension units

8. Order information

Order numbers

Arc protection relay REA 101 U_n = 110…240 V ac U_n = 110…220 V dc	1MRS 090416-AAA *)
Arc protection relay REA 101 U_n = 24…60 V dc	1MRS 090416-CAA *)
Arc protection relay REA 101 with optolink connectors for glass fibre U_n = 110…240 V ac U_n = 110…220 V dc	1MRS 090416-AAAG *)
Arc protection relay REA 101 with optolink connectors for glass fibre U_n = 24…60 V dc	1MRS 090416-CAAG *)
Rear plate protective cover	1MRS 060196
Mounting kit for semi-flush mounting	1MRS 050254
Mounting kit for surface mounting	1MRS 050240
Mounting kit for connecting cases together	1MRS 050241
Mounting kit for 19" rack	1MRS 050258
Extension unit REA 103	1MRS 090417-AA
Extension unit REA 105	1MRS 090418-AA
Extension unit REA 107	REA 107-AA

*) Includes mounting kit 1MRS 050209 for flush mounting

Pre-manufactured fibre sensors

Length	Order number
5 m ±3%	1MRS 120512.005
10 m ±3%	1MRS 120512.010
15 m ±3%	1MRS 120512.015
20 m ±3%	1MRS 120512.020
25 m ±3%	1MRS 120512.025
30 m ±3%	1MRS 120512.030
40 m ±3%	1MRS 120512.040
50 m ±3%	1MRS 120512.050
60 m ±3%	1MRS 120512.060

Accessories for manufacturing fibre sensors

Sensor fibre 100 m	1MSC 380018.100
Sensor fibre 300 m	1MSC 380018.300
Sensor fibre 500 m	1MSC 380018.500
ST connector	SYJ-ZBC 1A1
ST splice adapter	SYJ-ZBC 1A2
ST fibre termination kit	1MSC 990016

Pre-manufactured lens sensors for REA 107

1,5 m ±3%	1MRS 120534-1.5
3 m ±3%	1MRS 120534-3.0
5 m ±3%	1MRS 120534-5.0
7 m ±3%	1MRS 120534-7.0
10 m ±3%	1MRS 120534-10
15 m ±3%	1MRS 120534-15
20 m ±3%	1MRS 120534-20
25 m ±3%	1MRS 120534-25
30 m ±3%	1MRS 120534-30

Pre-manufactured lens sensors for REA 101, REA 103 and REA 105

2 m ±3%	1MRS 120536-2
3 m ±3%	1MRS 120536-3
5 m ±3%	1MRS 120536-5
10 m ±3%	1MRS 120536-10

Spare parts for lens sensors

Light collecting lens	1MRS060743

Cables for connecting REA 101 to an extension unit or extension units to each another

1 m ±3%	1MRS 120511.001
3 m ±3%	1MRS 120511.003
5 m ±3%	1MRS 120511.005
10 m ±3%	1MRS 120511.010
15 m ±3%	1MRS 120511.015
20 m ±3%	1MRS 120511.020
30 m ±3%	1MRS 120511.030
40 m ±3%	1MRS 120511.040

Plastic fibre optolink for signal transfer between central units

1 m ±3%	SPA-ZF AA 1
2 m ±3%	SPA-ZF AA 2
3 m ±3%	SPA-ZF AA 3
5 m ±3%	SPA-ZF AA 5
10 m ±3%	SPA-ZF AA 10
20 m ±3%	SPA-ZF AA 20
30 m ±3%	SPA-ZF AA 30
40 m ±3%	1MRS 120517

Glass fibre optolink for signal transfer between central units

50 m ±3%	SPA-ZF1MM50
60 m ±3%	SPA-ZF1MM60
70 m ±3%	SPA-ZF1MM70
80 m ±3%	SPA-ZF1MM80
90 m ±3%	SPA-ZF1MM90
100 m ±3% *)	SPA-ZF1MM100

*) Note! Lengths over 100 m on request, max. length 2000 m.

9. References

REA10_ Technical Overview Brochure	1MRS 750929-MBG
REA101 Operator's Manual	1MRS 751003-MUM
REA105 Operator's Manual	1MRS 751005-MUM
REA107 Operator's Manual	1MRS 752135-MUM

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