

Arc Protection Module REA 103

Operator's Manual



1. About this manual	5
1.1. Copyrights	5
1.2. Trademarks	5
1.3. Guarantee	5
1.4. General	5
1.5. Use of symbols	6
1.6. Terminology	7
1.7. Abbreviations	7
1.8. Related documents	7
1.9. Document revisions	7
2. Safety	9
3. Introduction	11
3.1. Features	11
3.2. Use of the REA 103 unit	11
4. Block diagram	13
5. Operation	15
5.1. Light detection	15
5.2. Operation of IN and OUT ports	15
5.3. Self-supervision unit	15
5.4. Front panel	16
5.5. Functions of LEDs and switches	17
5.5.1. "Light Ref. Level Adj." potentiometer	17
5.5.2. Switchgroup SG1	17
6. Connections	19
7. Commissioning	21
7.1. Setting the unit	21
7.2. Testing the arc protection system	21
7.3. Setting the light reference level	21
8. Dimensions and fixing	23
9. Technical data	25

1. About this manual

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1.3. Guarantee

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1.4. General

This manual provides thorough information on the Arc Protection Module REA 103 (later REA 103).

1.5. Use of symbols

This publication includes warning, caution, and information icons that point out safety related conditions or other important information. It also includes tip icons to point out useful information to the reader. The corresponding icons should be interpreted as follows:



The electrical warning icon indicates the presence of a hazard which could result in electrical shock.



The warning icon indicates the presence of a hazard which could result in personal injury.



The caution icon indicates important information or warning related to the concept discussed in the text. It might indicate the presence of a hazard which could result in corruption of software or damage to equipment or property.



The information icon alerts the reader to relevant facts and conditions.



The tip icon indicates advice on, for example, how to design your project or how to use a certain function.

Although warning hazards are related to personal injury, and caution hazards are associated with equipment or property damage, it should be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process performance leading to personal injury or death. Therefore, comply fully with all warning and caution notices.

1.6. Terminology

The following is a list of terms associated with REA 103 that you should be familiar with. The list contains terms that are unique to ABB or have a usage or definition that is different from standard industry usage.

Term	Description
Central unit	Arc Protection Relay REA 101
Extension unit	Arc Protection Module REA 103, REA 105, or REA 107.
IRF relay	A relay with change-over (NO or NC) output contacts. Usually, the NO output gap is used. When no fault is detected in the auxiliary power supply or in the relay, this contact gap is closed.
IRF relay resets	When the self-supervision system of the relay detects a fault in the relay function or in the auxiliary power supply, the contact opens, that is, the IRF relay resets.
Optolink communication	The communication between REA 101 central units.

1.7. Abbreviations

IRF	Internal relay fault
LED	Light-emitting diode
NC	Normally closed
NO	Normally open
SG	Switch group



1.8. Related documents

Name of the manual	MRS number
Arc Protection Relay REA 10_, Buyer's Guide	1MRS 750929-MBG
Arc Protection Relay REA 101, Operator's Manual	1MRS 751003-MUM
Arc Protection Module REA 105, Operator's Manual	1MRS 751005-MUM
Arc Protection Module REA 107, Operator's Manual	1MRS 752135-MUM

1.9. Document revisions

Version	Revision number	Date	History
C	-	09.06.2005	-Updated commissioning instructions and technical data -Updated figures

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 fibers have to be handled according to the instructions given by the sensor fiber manufacturer.
	Sensor fibers have to be handled with care. Sharp bends must be avoided; the minimum allowed bending radius is 50 mm. To avoid stepping on sensor fibers, they should not be placed on the floor unnecessarily during the installation.
	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.

3. Introduction

The Arc Protection Module REA 103 is an extension unit designed to be used together with the central unit, Arc Protection Relay REA 101, in medium and low-voltage air-insulated switchgear protection.

3.1. Features

- 2 sensor fibers for arc detection; loop or radial arrangement
- 2 signal relays for each sensor fiber
- Relays activated by light detected by the sensor fiber
- 2 RJ-45 ports for connecting REA 101 relay and extension units
- Self-supervision unit monitoring operating voltages and sensor fiber loops

3.2. Use of the REA 103 unit

The function of the REA 103 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 protected object to be divided into smaller areas.

4. Block diagram

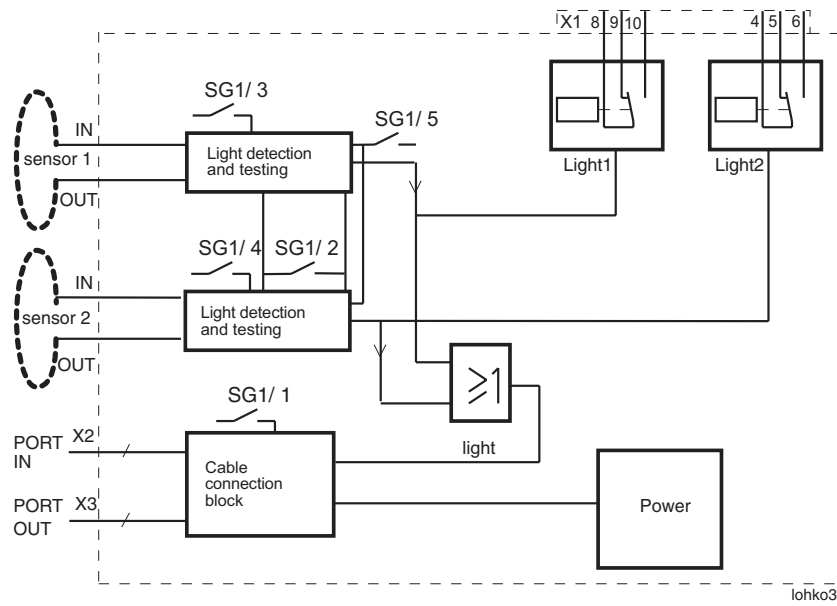


Fig. 4.-1 REA 103 block diagram

5. Operation

5.1. Light detection

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

The light captured by the sensor fiber 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 or 2) of the concerned fiber 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 an automatic or a manual reference level. The unit itself forms the automatic reference level according to the present backlight intensity measured by the sensor fiber. The "Light Ref. Level Adj." potentiometer on the front panel is used for selecting the manual reference level.

The condition of the sensor fiber is monitored by sending a test pulse through the fiber. If a test pulse is not received at regular intervals at the other end of the loop, the sensor fault LED "Fault 1" or "Fault 2" and the "IRF" LED are lit.



The condition monitoring of the sensor fibers can be deactivated with the SG1/5 switch (sensor supervision deactivation ON/OFF), after which a radial (terminating) fiber can be used.

5.2. 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 is connected to the port OUT.

A maximum of 5 extension units can be chained to one port of REA 101. The terminators have to be connected (the switch SG1/1) in the last extension unit of the chain. This way, the central unit REA 101 is able to monitor the condition of the connection cable. Should the terminators be unconnected, the fault indicating LED "Port A Fault" or "Port B Fault" and the "IRF" LED are lit, and the IRF relay resets.



The REA 103 extension unit does not need an own auxiliary voltage supply, but is supplied by the central unit REA 101 over the connection cable.

5.3. 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" LED of the REA 103 extension unit is lit, the "Port A Fault" or "Port B Fault" LED of the REA 101 relay starts flashing, the "IRF" LED is lit and the IRF relay resets.

5.4. Front panel

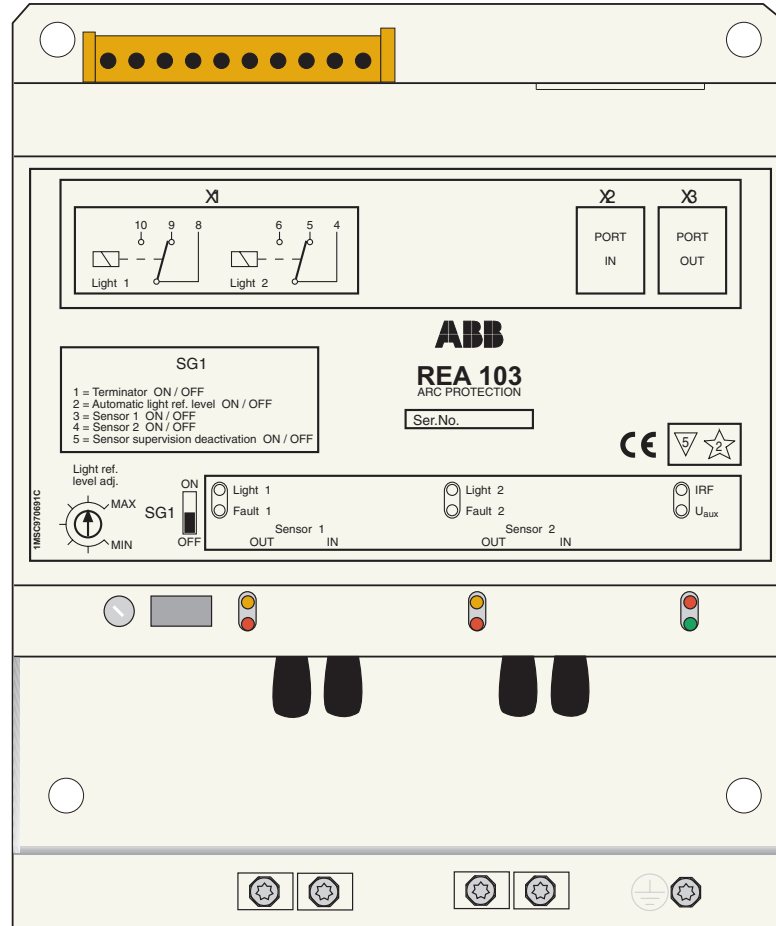


Fig. 5.4.-1 REA 103 front panel

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5.5. Functions of LEDs and switches

Table 5.5.-1 REA 103 LEDs

LED	Indication when the LED is lit
U _{aux}	Power supply is connected.
Light 1	The sensor fiber 1 has detected light.
Light 2	The sensor fiber 2 has detected light.
IRF	The self-supervision system has detected a fault. (The REA 101 relay's fault LED "Port A Fault" or "Port B Fault" is flashing, the "IRF" LED is lit, and the IRF relay has reset.)
Fault 1 + IRF	Sensor fiber 1 broken. (The sensor fiber may still detect light between the sensor input and the breakage.) Transmitter/transceiver is defective.
Fault 2 + IRF	Sensor fiber 2 broken. (The sensor fiber may still detect light between the sensor input and the breakage.) Transmitter/transceiver is defective.

5.5.1. "Light Ref. Level Adj." potentiometer

Potentiometer for manual backlight compensation:

- Switch SG1/2 is in OFF position:
the potentiometer is in use.
- Switch SG1/2 is in ON position:
the potentiometer is not in use.

5.5.2. Switchgroup SG1

- Switch 1 (terminators):
 - Switch 1 is in ON position:
the terminators are connected.
 - Switch 1 is in OFF position:
the terminators are not connected.
- Switch 2 (automatic light reference level):
 - Switch 2 is in ON position:
automatic backlight compensation is selected
(the "Light Ref. Level Adj." potentiometer is not in use).
 - Switch 2 is in OFF position:
manual backlight compensation is selected
(the "Light Ref. Level Adj." potentiometer is in use).
- Switch 3 ("Sensor 1"):
 - Switch 3 is in ON position:
the sensor fiber 1 is used for arc detection.
 - Switch 3 is in OFF position:
the sensor fiber 1 is not used for arc detection.

Operator's Manual

- Switch 4 (“Sensor 2”):
 - Switch 4 is in ON position:
the sensor fiber 2 is used for arc detection.
 - Switch 4 is in OFF position:
the sensor fiber 2 is not used for arc detection.
- Switch 5 (sensor supervision deactivation):
 - Switch 5 is in ON position:
the sensor fiber condition monitoring is not in use (that is, a radial fiber can be used).
 - Switch 5 is in OFF position:
the sensor fiber loop condition monitoring is in use.

6. 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 fiber 1 connectors

Sensor 1 OUT
Sensor 1 IN

Sensor fiber 2 connectors

Sensor 2 OUT
Sensor 2 IN

7. Commissioning

7.1. Setting the unit



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

1. Program the switchgroup SG1.

The default setting for the switchgroup SG1 is “00000”.

2. Set the switches of the switchgroup SG1 as required by the application.

Refer to the Section 5.5. Functions of LEDs and switches, and to the application examples given in the operator's manual of REA 101 (see Section 1.8. Related documents).

3. Check that the terminator of the last extension unit in each extension unit chain is connected, that is, the switch SG1/1 is in position ON.
4. Set the potentiometer “Light Ref. Level Adj.”.

As a default, the potentiometer is in the middle position. If the automatic backlight compensation has been selected (the switch SG1/2 is in ON position), the setting of the potentiometer does not have to be changed.

7.2. Testing the arc protection system

1. Check the current measurement function of each REA 101 relay by measuring the primary or secondary circuit. When the current threshold is exceeded, the “Current” LED of the REA 101 relay is lit.
2. Turn the “Trip Condition” key switch into “Light” position to check that the overcurrent data is transmitted through the entire system arrangement as required by the application.
3. Check that the “Current” LED of the concerned REA 101 unit is lit.
4. Finally, turn the “Trip Condition” key switch into the “Current&Light” position.
5. Check each REA 101 relay included in the application in the same way.

7.3. Setting the light reference level

1. Set the lighting level of the environment as close to normal work conditions as possible.
2. Turn the “Light Ref. Level Adj.” potentiometer of the REA 103 unit until the “Light” LED is lit, or goes off.
3. Turn the potentiometer one scale mark to the right.



If the “Light” LED remains dark even though the potentiometer is in the “Min.” position, you can either leave the potentiometer in this position or turn it one or several scale marks to the right, depending on the wanted sensitivity level.

Operator's Manual

4. Turn the “Trip Condition” key switch of one REA 101 relay into “Light” position.



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

5. Expose one sensor fiber at a time to light by using, for example, a flash, and check that the right circuit breakers operate.



The flash duration should be at least 1 ms. Note that the integrated flashes of pocket cameras are normally not powerful enough. Using separate flash units with fresh batteries (guide nr 20 or more) is recommended.

6. When all the sensor fibers are tested, set the “Trip Condition” key switch of the REA 101 relay(s) as required by the application.

8. Dimensions and fixing

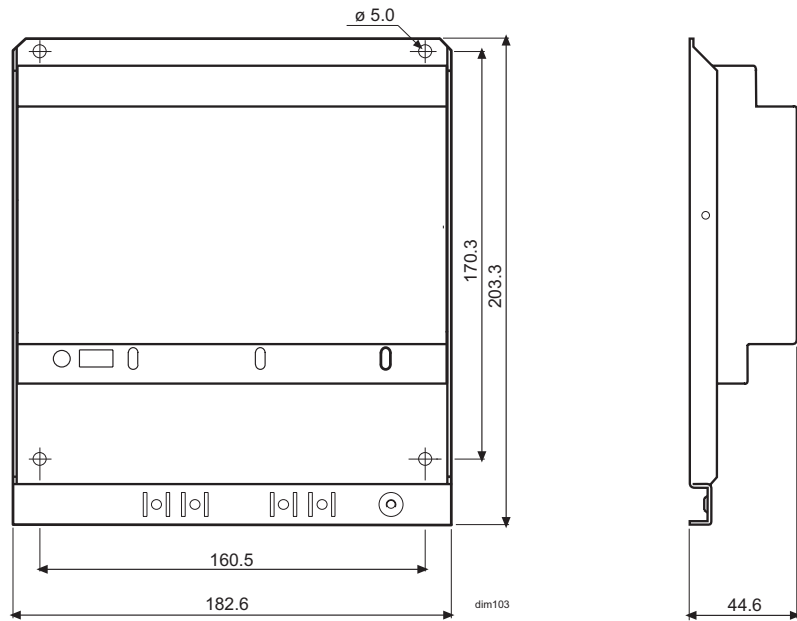


Fig. 8.-1 REA 103 dimensions

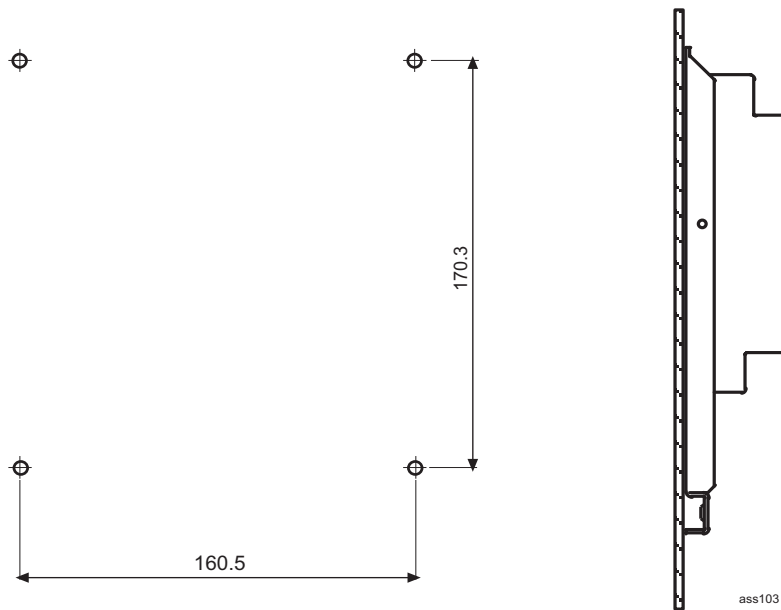


Fig. 8.-2 Fixing methods

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.

9. Technical data

Table 9.-1 Signal contacts (Light1, Light2)

Maximum rated 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

Table 9.-2 Power consumption (operating voltage over the REA 101 port ^a)

Under quiescent conditions/maximum	~1.6 W/~3.3 W
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a. A maximum of 5 extension units can be connected to one REA 101 port.

Table 9.-3 Sensor fiber

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

Table 9.-4 Connection cable

Maximum length ^a	40 m
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a. Total length of the connection chain between the central unit and extension units.

Table 9.-5 Environmental tests

Specified service temperature range	-10...+55°C
Transport and storage temperature range	-40...+70°C
Dry heat test	According to IEC 60068-2-2
Dry cold test	According to IEC 60068-2-1
Damp heat test cyclic	According to IEC 60068-2-30 r.h. >95%, t = 20...55°C
Storage temperature test	According to IEC 60068-2-48

Table 9.-6 Enclosure

Degree of protection, IEC 60529	IP 20
Weight	~1.1 kg

Table 9.-7 Insulation tests

Dielectric test according to IEC 60255-5	2 kV, 50 Hz, 1 min
Impulse voltage test according to IEC60 60255-5	5 kV, 1.2/50 μs, 0.5 J
Insulation resistance test according to IEC 60255-5	100 MΩ, 500 V DC

Table 9.-8 Electromagnetic compatibility tests

1 MHz burst disturbance test according to IEC 60255-22-1, class III:	
• Common mode	2.5 kV
• Differential mode	1 kV
Electrostatic discharge test according to IEC 61000-4-2 class IV, IEC 60255-22-2 class III and ANSI/IEEE C37.90.3.-2001:	
• Contact discharge	8 kV
• Air discharge	15 kV
Radio-frequency electromagnetic field disturbance test according to IEC 61000-4-3 and IEC 60255-22-3:	
Amplitude-modulated:	
• Frequency f	80...1000 MHz
• Field strength E	10 V/m (rms)
Pulse-modulated:	
• Frequency f	900 MHz
• Field strength E	10 V/m (rms)
Radio frequency disturbance test according to IEC 61000-4-6 and IEC 60255-22-3:	
• Conducted, common mode	10 v, 150 kHz...80 Mhz
Fast transient disturbance test according to IEC 60255-22-4 and IEC 61000-4-4	4 kV
Surge immunity test according to IEC 61000-4-5 and IEC 60255-22-5:	
Signal output contacts:	
• Line-to-line	1 kV
• Line-to-earth	2 kV
Electromagnetic emission tests according to EN 55011 and IEC 60255-25:	
• Radiated RF emission	EN 55011, class A, IEC 60255-25
SWC tests according to ANSI/IEEE C37.90.1-2002:	
• Oscillatory tests	2.5 kV
• Fast transient test	4 kV
Power frequency (50 Hz) magnetic field according to IEC61000-4-8	300 A/m, continuous

Table 9.-9 CE approval

Complies with the EMC directive 89/336/EEC and the LV directive 73/23/EEC	
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Table 9.-10 Mechanical tests

Vibration test (sinusoidal) according to IEC 60255-21-1	Class 1
Shock and bump test according to IEC 60255-21-2	Class 1
Seismic test according to IEC 60255-21-3	Class 2



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