ARCTEQ®
RELAYABLE POWER

AQ-0x

Arc sensors

Instruction manual

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1 Document information

Table. 1 - 1. History of Revision 1.

Revision	1.00
Date	July 2010
Changes	- The first revision of the manual.
Revision	1.01
Date	July 2012
Changes	- The sensor chapter revised (fiber pictures and point sensor connections added).
Revision	1.02
Date	July 2012
Changes	- Order code updated. - Point sensor max. wiring length updated to 200 meters.
Revision	1.03
Date	January 2020
Changes	- Content completely rewritten to improve grammar and readability. - The AQ-02 point sensor chapter added to the "Arc sensors" chapter, and AQ-02's technical data added to the "Technical data" chapter. - Sensor–unit type dependency list updated. - The "Connecting sensors" chapter moved to the AQ-0x instruction booklet from the AQ-101 and AQ-110x instruction manuals. The chapter on how to connect fiber loop sensors added. - All technical data checked and updated where necessary. - Ordering information updated. - Images updated where necessary.
Revision	1.04
Date	October 2022
Changes	- Added the front cover image. - Changed " the AQ-100 series" to "the AQ 100 series" throughout the manual. - Added the note of AQ-103 variants only accepting one sensor per sensor channel where relevant. - AQ-02: added that both pressure and light detection required for sensor activation. - Removed the on-site cutting from the manual. - Removed the tubing paragraph from AQ-06 and AQ-08. - Removed the entire "Tubing" section from the "Connecting sensors" chapter. - Removed all fiber sensor images. - Technical data: updated the IP classifications for AQ-01 and AQ-02, corrected the AWG measurements. - Updated the order codes.

NOTE!

This booklet only describes the AQ-0x series sensors used in the arc protection system in conjunction with other units from the AQ 100 series. It is important to read the instruction manuals for the individual AQ-100 units as well!

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2 Arc sensors

The AQ 100 series provides different types of arc sensors to be used with different units and different switchgear types according to specific application requirements. There are two types of sensors: arc light point sensors and arc light fiber optic loop sensors.

Arc light point sensors are typically installed in metal-clad compartments, and they provide a quick and accurate location of the faulted area. Arc light fiber loop sensors typically cover a wider protected area with one fiber, when there is no need to pinpoint the exact location for a fault.

2.1 Arc light point sensor AQ-01

AQ-01 is an arc light point sensor with a light-sensitive photodiode element activated by arc light. The AQ-01 sensors should be mounted in the switchgear cubicles in such a way that the light-sensitive part covers the protected area as completely as possible. Only one sensor should be used per one closed metal-clad compartment. In open spaces (such as a busbar section) the sensors should be mounted no more than two meters apart.

The default light intensity threshold for an AQ-01 sensor is 8,000 lux. Depending on the demand of the application, light point sensors can be ordered with 25,000 lux or 50,000 lux thresholds. Its detection radius is 180 degrees.

Figure. 2.1 - 1. The AQ-01 light sensor.

An AQ-01 is installed either on the compartment wall or through the wall. When wall-mounting, the unit is placed on the wall (with the gray side against the wall) and then fixed to the wall with two screws from the back of the sensor. Through-the-wall mounting is similar: the unit is placed on the wall (with the blue side against the wall and the eye is pushed into the drilled compartment hole for protection) and then fixed to the wall with two screws from the back of the sensor. No external mounting plates are needed regardless of the mounting type; however, mounting brackets can be used if so desired.

Up to three (3) sensors can be connected in series (with the exception of AQ-103 which can take only one point sensor per channel). Installing a connection cable is simple as each end of the sensor has a detachable cover over the cable connectors. Please remember to reattach the cover once the wires have been installed.

NOTE!

The AQ-01 point sensor does not come with a connection cable!

2.2 Arc light and pressure point sensor AQ-02

AQ-02 is an arc light and pressure point sensor that comes with arc light detection and ambient pressure detection. AQ-02 point sensor activates when both light and pressure are detected. The AQ-02 sensors should be mounted in the switchgear cubicles in such a way that the light-sensitive part covers the protected area as completely as possible. Only one sensor should be used per one closed metal-clad compartment. The AQ-02 sensors cannot be installed in open spaces.

The default light intensity threshold for an AQ-02 sensor is 8,000 lux. Depending on the demand of the application, AQ-02 can also be ordered with 25,000 lux or 50,000 lux thresholds. Its detection radius is 180 degrees. The pressure threshold is fixed at 0.2 bar above ambient pressure.

Figure. 2.2 - 2. AQ-02 arc light and pressure point sensor.

An AQ-02 can only be installed on the compartment wall as not to block pressure detection located next to "the eye". The unit placed on the wall (with the gray side against the wall), and then fixed to the wall with two screws. No external mounting plates are needed regardless of the mounting type; however, mounting brackets can be used if so desired.

Up to three (3) sensors can be connected in series (with the exception of AQ-103 which can take only one point sensor per channel). Installing a connection cable is simple as each end of the sensor has a detachable cover over the cable connectors. Please remember to reattach the cover once the wires have been installed.

2.3 Arc light fiber optic loop sensor AQ-06

AQ-06 is an arc light fiber optic loop sensor, which is a plastic fiber optic cable. Fiber sensors are distributed through the protected switchgear cells. The fixed light intensity threshold of an AQ-06 sensor is 8,000 lux. The sensor's detection radius is 360 degrees.

AQ-06 sensors can be ordered in pre-manufactured lengths of 3…40 meters (3 m, 5 m, 10 m, 15 m, 20 m, 25 m, 30 m, 35 m, 40 m).

2.4 Arc light fiber optic loop sensor AQ-07

AQ-07 is an arc light fiber optic loop sensor, which is a robust fiber optic cable with a practically unlimited bending radius. The sensor contains hundreds of glass fiber drains covered by a plastic tube, thus making it extremely strong and durable. Fiber sensors are distributed through the protected switchgear cells.

AQ-07 sensors can be ordered in pre-manufactured lengths of 3…50 meters (3 m, 5 m, 10 m, 15 m, 20 m, 25 m, 30 m, 35 m, 40 m, 45 m, 50 m).

The fixed light intensity threshold of an AQ-07 sensor is 8,000 lux. The sensor's detection radius is 360 degrees.

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If necessary, the ends of an AQ-07 cable can be covered with black rubber to avoid light detection outside the protected zone. The covered area can be one (1) or two (2) meters by default; if other lengths are required, please consult the Arcteq sales team. You can find the "Contact and reference information" page at the end of this manual.

2.5 Arc light fiber optic loop sensor AQ-08

AQ-08 is an arc light fiber optic loop sensor. It is designed to withstand temperatures up to 125 ºC, which makes it suitable for e.g. wind turbine windings. AQ-08 is a robust fiber optic cable with a practically unlimited bending radius. The sensor contains hundreds of glass fiber drains that are covered by a plastic tube, thus making it extremely strong and durable. Fiber sensors are distributed through the protected switchgear cells.

AQ-08 sensors can be ordered in pre-manufactured lengths of 3…15 meters (3 m, 5 m, 10 m, 15 m).

The fixed light intensity threshold of an AQ-08 sensor is 8,000 lux. The sensor's detection radius is 360 degrees.

2.6 Sensor—unit dependencies

Different sensor types can be used with different arc flash protection units of the AQ-100 series. The table below describes those dependencies.

Table. 2.6 - 2. Sensor—unit dependencies.

	AQ-01	AQ-02	AQ-06	AQ-07	AQ-08
AQ-101	Yes	Yes	Yes (when the unit is equipped with the fiber option)	Yes (when the unit is equipped with the fiber option)	Yes (when the unit is equipped with the fiber option)
AQ-101D	Yes	Yes	Yes (when the unit is equipped with the fiber option)	Yes (when the unit is equipped with the fiber option)	Yes (when the unit is equipped with the fiber option)
AQ-101S	Yes	Yes	No	No	No
AQ-102	No	No	Yes	Yes	Yes
AQ-103	Yes	Yes	Yes (when the unit is equipped with the fiber option)	Yes (when the unit is equipped with the fiber option)	Yes (when the unit is equipped with the fiber option)
AQ-110P	Yes	Yes	Yes (when the unit is equipped with the fiber option)	Yes (when the unit is equipped with the fiber option)	Yes (when the unit is equipped with the fiber option)
AQ-110F	No	No	Yes (when the unit is equipped with the fiber option)	Yes (when the unit is equipped with the fiber option)	Yes (when the unit is equipped with the fiber option)

Table. 2.6 - 3. Sensor—unit dependencies.

	AQ-01	AQ-02	AQ-06	AQ-07	AQ-08
AQ-101LV	Yes	Yes	Yes (when the unit is equipped with the fiber option)	Yes (when the unit is equipped with the fiber option)	Yes (when the unit is equipped with the fiber option)
AQ-101DLV	Yes	Yes	Yes (when the unit is equipped with the fiber option)	Yes (when the unit is equipped with the fiber option)	Yes (when the unit is equipped with the fiber option)
AQ-102LV	No	No	Yes	Yes	Yes
AQ-103LV	Yes	Yes	Yes (when the unit is equipped with the fiber option)	Yes (when the unit is equipped with the fiber option)	Yes (when the unit is equipped with the fiber option)
AQ-110PLV	Yes	Yes	Yes (when the unit is equipped with the fiber option)	Yes (when the unit is equipped with the fiber option)	Yes (when the unit is equipped with the fiber option)
AQ-110FLV	No	No	Yes (when the unit is equipped with the fiber option)	Yes (when the unit is equipped with the fiber option)	Yes (when the unit is equipped with the fiber option)

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3 Connecting sensors

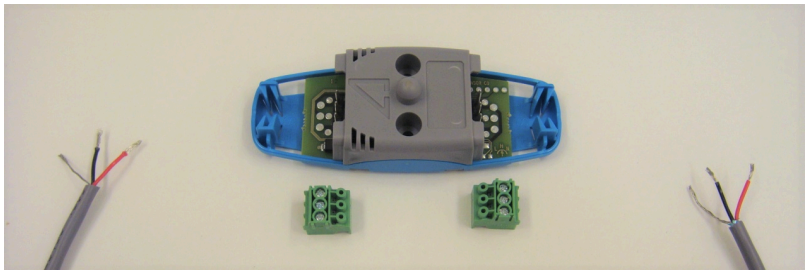
3.1 Point sensors

NOTE!

While the images and the text below refer to the AQ-01 sensor unit, these instructions are also applicable to an AQ-02 sensor unit.

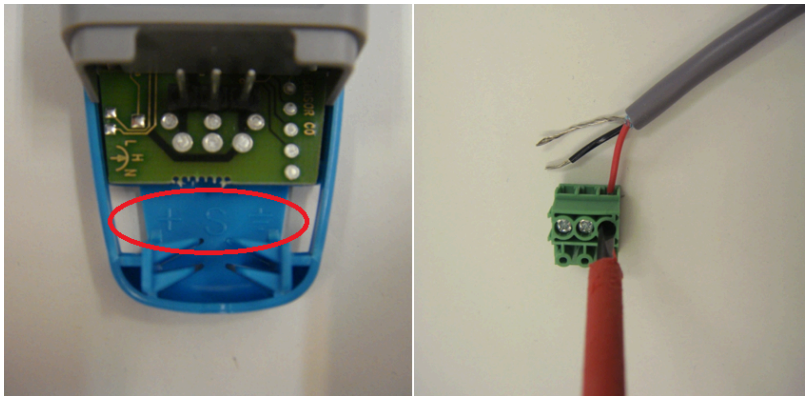
1. Open the gray covers of the sensor and detach the green connectors from the sensor's PCB. Prepare the shielded twisted pair cable for connecting (see the image below).

Figure. 3.1 - 3. Preparing the cable and the sensor.



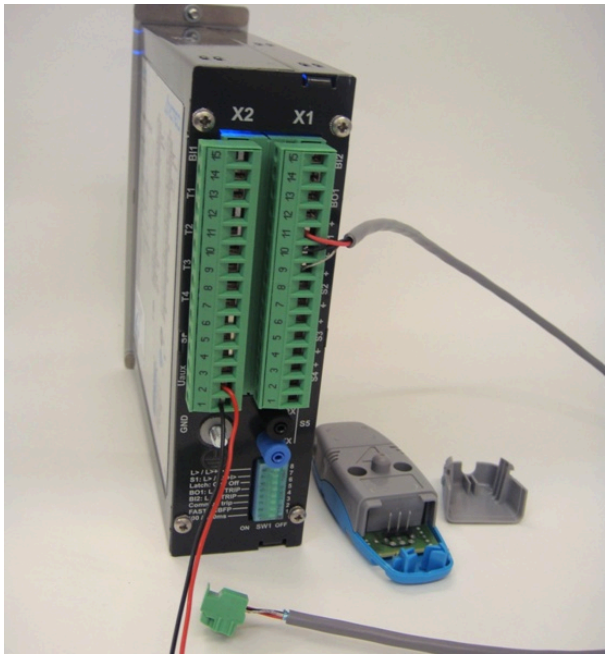
2. Before connecting the cable to the connector, make sure that the connecting order is correct (+, signal, shield). You can check the appropriate pins from the sensor, as the information is shown on the inside of the sensor's blue plastic cover (see the circled area in the image below, on the left). Next, plug the wires into the connector and fasten them with a screw driver (see the image below, on the right). Repeat for the other connector.

Figure. 3.1 - 4. Pin information (left) and fastening wires (right).



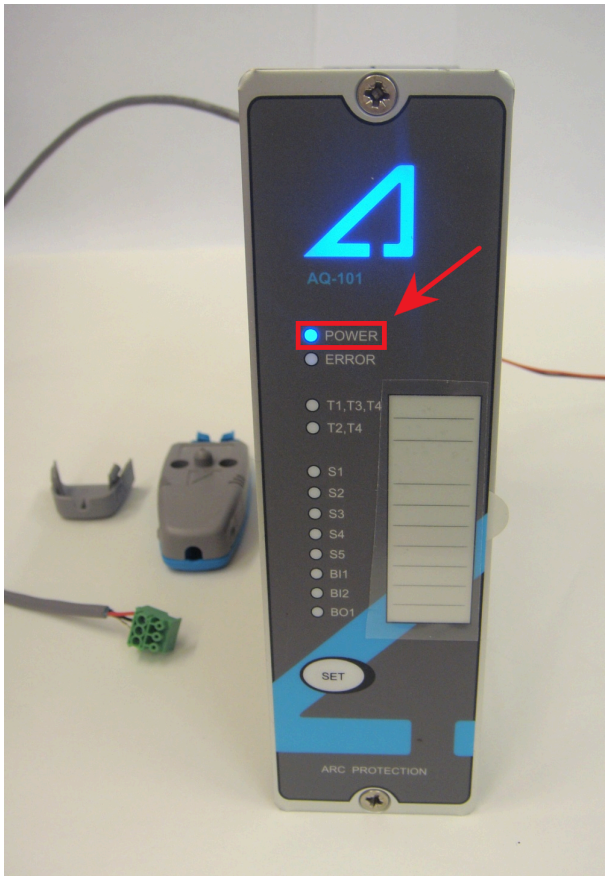
3. Connect the other end of the cable into a sensor channel of an appropriate AQ-100 unit (AQ-101 variants, AQ-103 variants and AQ-110P, or their LV versions). See the image below, where the cable is connected to an AQ-101 unit.

Figure. 3.1 - 5. Connecting the cable to a unit.



4. Check the unit's front panel that only the "Power" LED is lit (see the image below).

Figure. 3.1 - 6. Front panel check.



5. Attach the connector back into its slot in the sensor PCB (see the red arrow in the image below; the connector is already in place on the right side).

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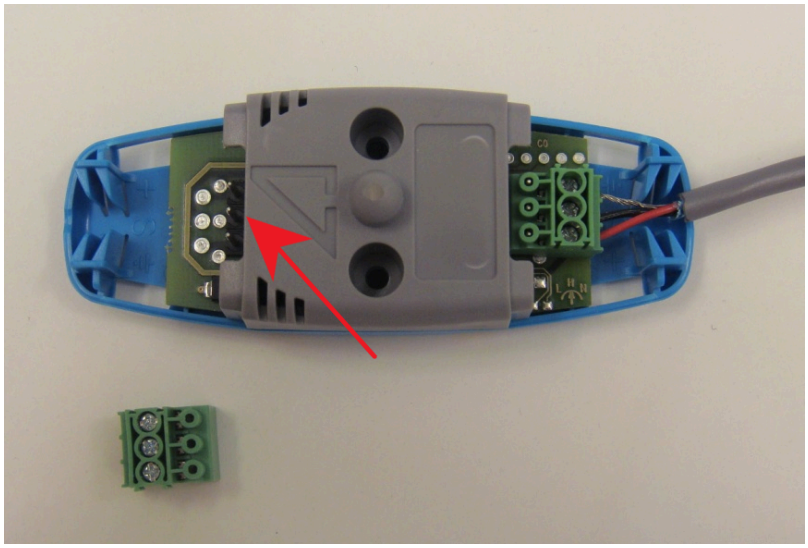
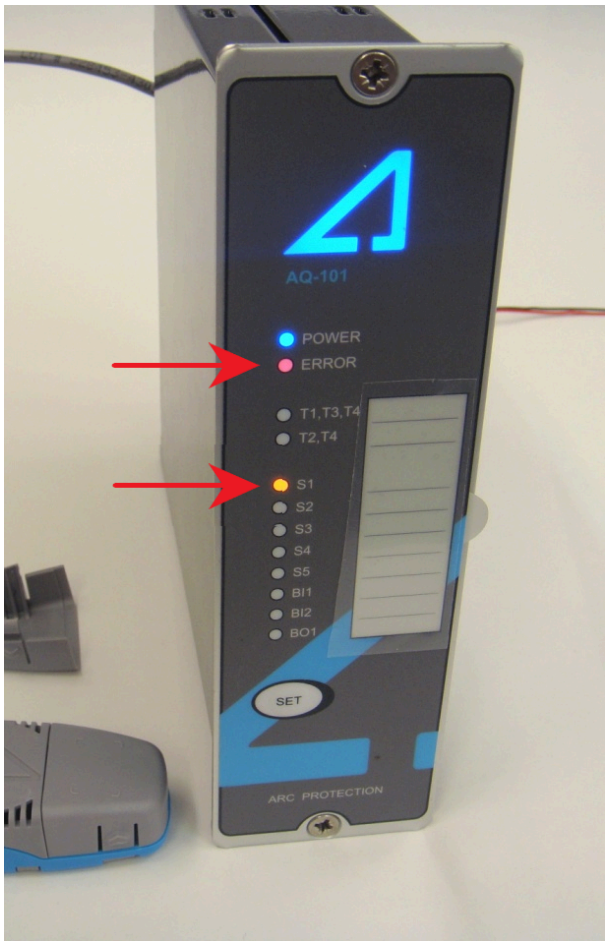
Figure. 3.1 - 7. Reattaching the connector into the sensor PCB.



6. Now, the "Error" LED should be lit and the LED for the appropriate sensor channel should start blinking ("S1", for example; see the image below).

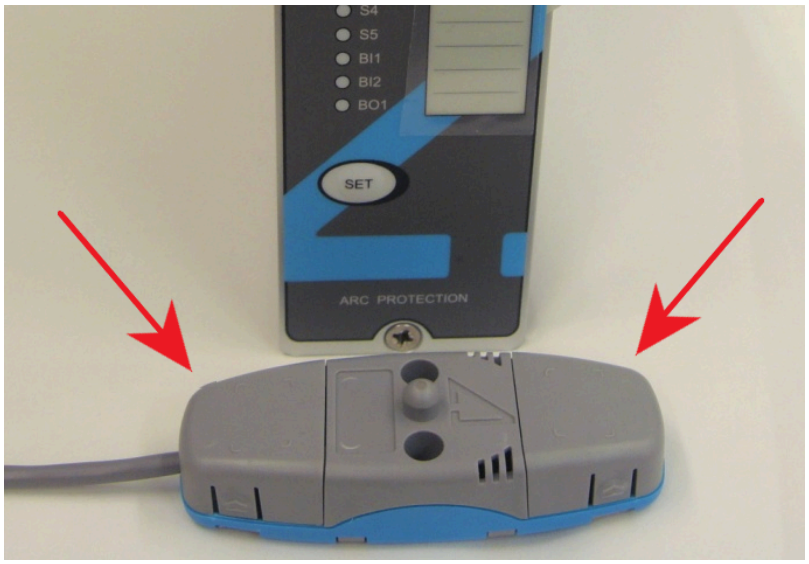
Figure. 3.1 - 8. LEDs.



7. Press and hold the SET push button on the front panel for two seconds to run the system's auto-configuration procedure. The unit memorizes the number of connected sensors and the connected binary input lines (if any). Please note that auto-configuration is a part of the system self-supervision function, which continuously ensures that all connectors and sensors are fully functional and ready to operate.

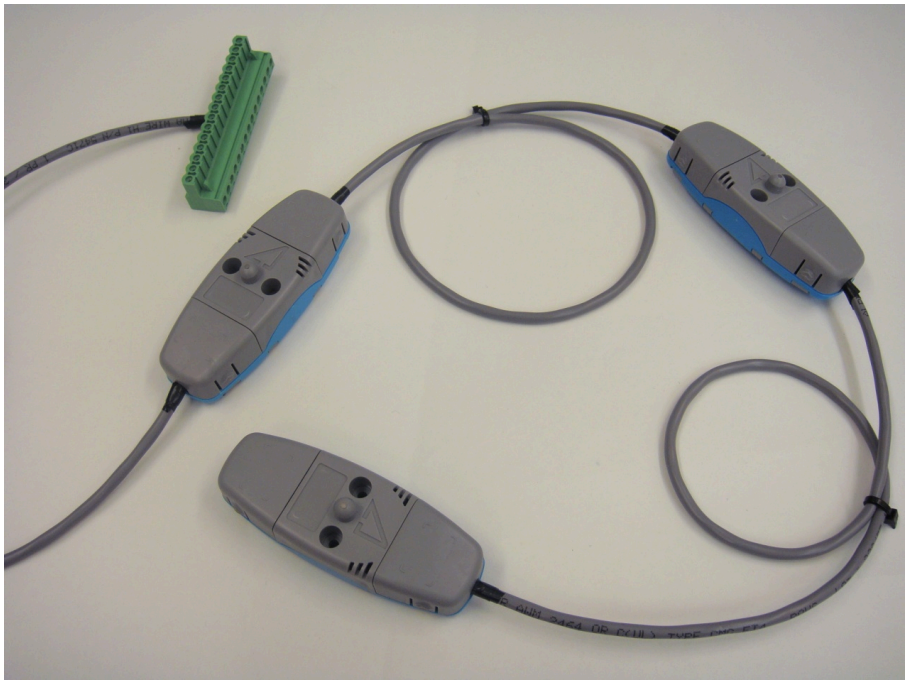
8. Once the auto-configuration procedure is completed and only the blue "Power" LED is lit, click the two gray covers back in place on the sensor (see the image below).

Figure. 3.1 - 9. Closing the sensor covers.



You can connect a maximum of three (3) point sensor in a series on one sensor channel (see the image below). Please note that the AQ-103 and AQ-103LV units are an exception: you can only have one (1) sensor per channel!

Figure. 3.1 - 10. Three sensors connected in series.



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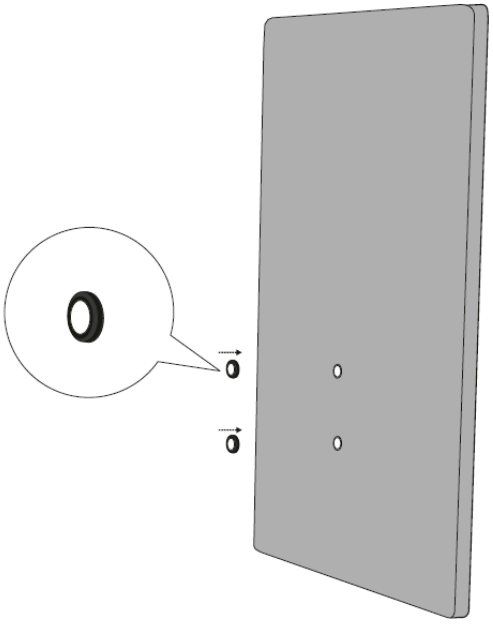
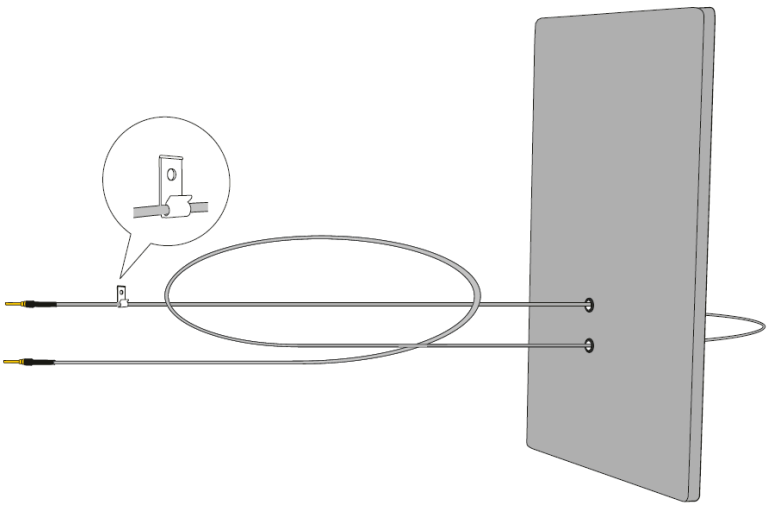
3.2 Fiber loop sensors

Installation

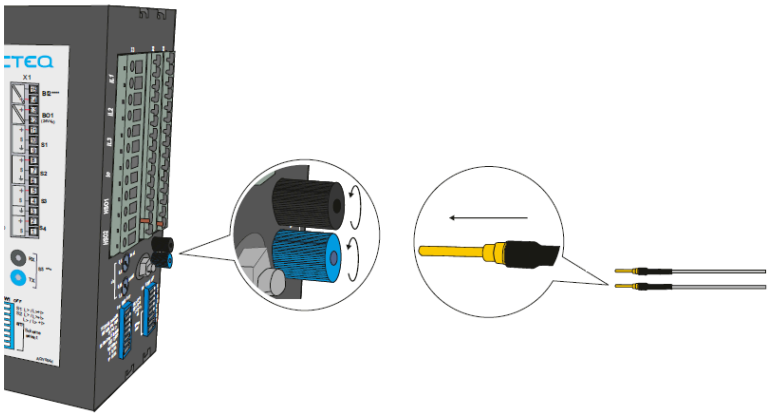
1. Drill holes on the wall for the sensor cable to enter the protected compartment.
2. Install protective covers in the holes to ensure the sensor cable remains unharmed by rough edges.



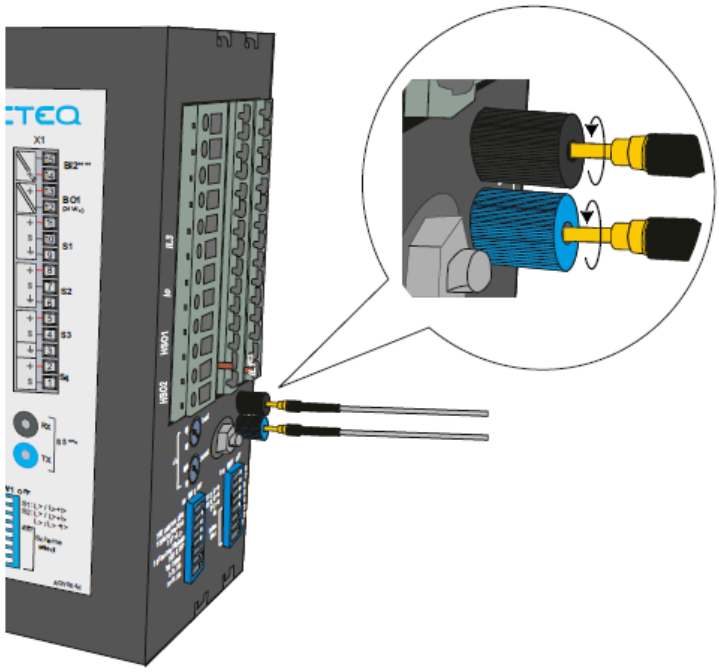
3. Run the sensor cable through the holes and along the protected area. Fasten it to the compartment walls with cable clips or some other appropriate anchoring method.



4. Turn the black and blue receiver (“Rx”) and transceiver (“Tx”) screws counter-clockwise and plug in the sensor cable terminals.



5. Turn the screws clockwise to secure the terminals in their place.



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4 Technical data

4.1 Sensors

AQ-01 point sensor

Table. 4.1 - 4. Technical data for the AQ-01 light point sensor.

Light intensity threshold	8,000 lux 25,000 lux 50,000 lux
Detection radius	180º
Mechanical protection	IP 20
Sensor cable specification	Shielded twisted pair 0.75 mm^2 (AWG: 18)
Maximum sensor cable length (per channel)	200 m
Operating temperature	–20…+85 ºC

AQ-02 point sensor

Table. 4.1 - 5. Technical data for the AQ-02 light and pressure point sensor.

Light intensity threshold	8,000 lux 25,000 lux 50,000 lux
Pressure threshold (fixed)	0.2 bar above ambient pressure
Pressure measuring accuracy	±1.8 % (of full scale)
Detection radius	180º
Mechanical protection	IP 20
Sensor cable specification	Shielded twisted pair 0.75 mm^2 (AWG: 18)
Maximum sensor cable length (per channel)	200 m
Operating temperature	–20…+85 ºC

AQ-06 fiber optic loop sensor

Table. 4.1 - 6. Technical data for the AQ-06 fiber optic loop sensor.

Material	Plastic fiber
Light intensity threshold	8,000 lux
Cable length (min…max)	3…40 m
Cable diameter	1.0 mm
Detection radius	360º
Bending radius	5 cm
Operating temperature	–40…+85 ºC

AQ-07 fiber optic loop sensor

Table. 4.1 - 7. Technical data for the AQ-07 fiber optic loop sensor.

Material	Covered glass fiber
Light intensity threshold	8,000 lux
Cable length (min…max)	3…50 m
Cable diameter	1.2 mm
Detection radius	360º
Bending radius	1 cm
Operating temperature	–40…+85 ºC

AQ-08 fiber optic loop sensor

Table. 4.1 - 8. Technical data for the AQ-08 fiber optic loop sensor.

Material	Covered glass fiber
Light intensity threshold	8,000 lux
Cable length (min…max)	3…15 m
Cable diameter	1.2 mm
Detection radius	360º
Bending radius	1 cm
Operating temperature	–40…+125 ºC

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5 Ordering information

AQ-0x point sensors

AQ - 0 X X

Sensor function

1 Light point sensor
2 Light and pressure point sensor

Light activation level

A 8,000 lx
B 25,000 lx
C 50,000 lx

AQ-0x fiber optic loop sensors

AQ - 0 X - X - X - X

Sensor function

6 Plastic fiber optic loop sensor
7 Glass fiber optic loop sensor
8 Glass fiber optic loop sensor (high temperature)

Cable length

(see the available options in the "Arc sensors" chapter of this manual)

End 1 covering length (AQ-07 only!)

0 None
1 1 meter
2 2 meters

(for other lengths please consult Arcteq sales at sales@arcteq.fi)

End 2 covering length (AQ-07 only!)

0 None
1 1 meter
2 2 meters

(for other lengths please consult Arcteq sales at sales@arcteq.fi)

6 Contact and reference information

Manufacturer

Arcteq Relays Ltd.

Visiting and postal address

Kvartsikatu 2 A 1

65300 Vaasa, Finland

Contacts

Phone:	+358 10 3221 370
Website:	arcteq.fi
Technical support:	support.arcteq.fi
	+358 10 3221 388 (EET 9:00 – 17.00)
E-mail (sales):	sales@arcteq.fi

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