ARCTEQ®
RELAYABLE POWER

AQ-1000

Arc Quenching Device

Instruction manual

Table of contents

1 Document information

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Manual revision history

Revision	1.00
Date	20.06.2016
Changes	- The first revision for AQ-1000 manual
Revision	1.01
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Revision	1.06
Date	10.3.2022
Changes	- Operating time updated in "Introduction" - Removed AQ-01 GIS sensor and AST-01 tester from "Accessories and arc protection system devices" - Updated a link in "Application example"

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Please read these instructions carefully before using the equipment or taking any other actions with respect to the equipment. Only trained and qualified persons are allowed to perform installation, operation, service or maintenance of the equipment. Such qualified persons have the responsibility to take all appropriate measures, including e.g. use of authentication, encryption, anti-virus programs, safe switching programs etc. necessary to ensure a safe and secure environment and usability of the equipment. The warranty granted to the equipment remains in force only provided that the instructions contained in this document have been strictly complied with.

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2 Safety precautions

	The AQ-1000 arc quenching device is intended for making a low-impedance short-circuit between all the phases, which is comparable to a bolted short-circuit. Installation shall not be done before the entire system has been verified to withstand a bolted short-circuit. This verification shall include (but is not limited to) the following: • Source transformers and generators • PTs, CTs, VTs • Circuit breakers • Busbars and cables • Busbar insulators and supports • Switchgear structure.
	During tripping, the equipment can exceed a noise level of 85 A-weighted decibels. It is recommended to wear proper hearing protection when making commissioning tests or when operating the device.
	Before installation, it shall be verified that there is no intentional live feed or any unintentional back feed to the busbars.
	Read these instructions carefully and inspect the equipment to become familiar with it before trying to install, operate, service or maintain it. Any electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. Local safety regulations should be followed. Arcteq does not assume any responsibility for any consequences that may arise from the use of this material. We reserve the right to make changes to this document without prior notice.
	The device should not be removed nor any other service works done, when the energy storage component is charged or is being charged.

3 Introduction

AQ-1000 is a resettable arc quenching device. The device is used to mitigate the arc flash energy from an arc flash event. When an arc fault occurs, AQ-1000 creates an low impedance three-phase short-circuit which extinguishes the arc and gives the circuit breaker time to open and completely clear the fault. The arc quenching time is less than 2 ms; when used together with Arcteq's arc protection system, the total arcing time can be reduced to below 4 ms.

The device can tested up to one hundred (100) times under no-load conditions. This allows for complete testing and commissioning of the AQ-1000 device and the entire arc protection system to take place on-site. AQ-1000 can be used in low-voltage switchgears up to 690 V, with short-circuit currents up to 100 kA. Both new and retrofitted installations are possible, which makes AQ-1000 an excellent choice for arc protection.

4 Installation

NOTE!

For the technical instructions related to installation and mounting, please refer to the chapter titled "Technical data".

4.1 Device dimensions

Figure. 4.1 - 1. Device dimensions from the front (all dimensions in millimeters).

Figure. 4.1 - 2. Device dimensions from the left side (all dimensions in millimeters).

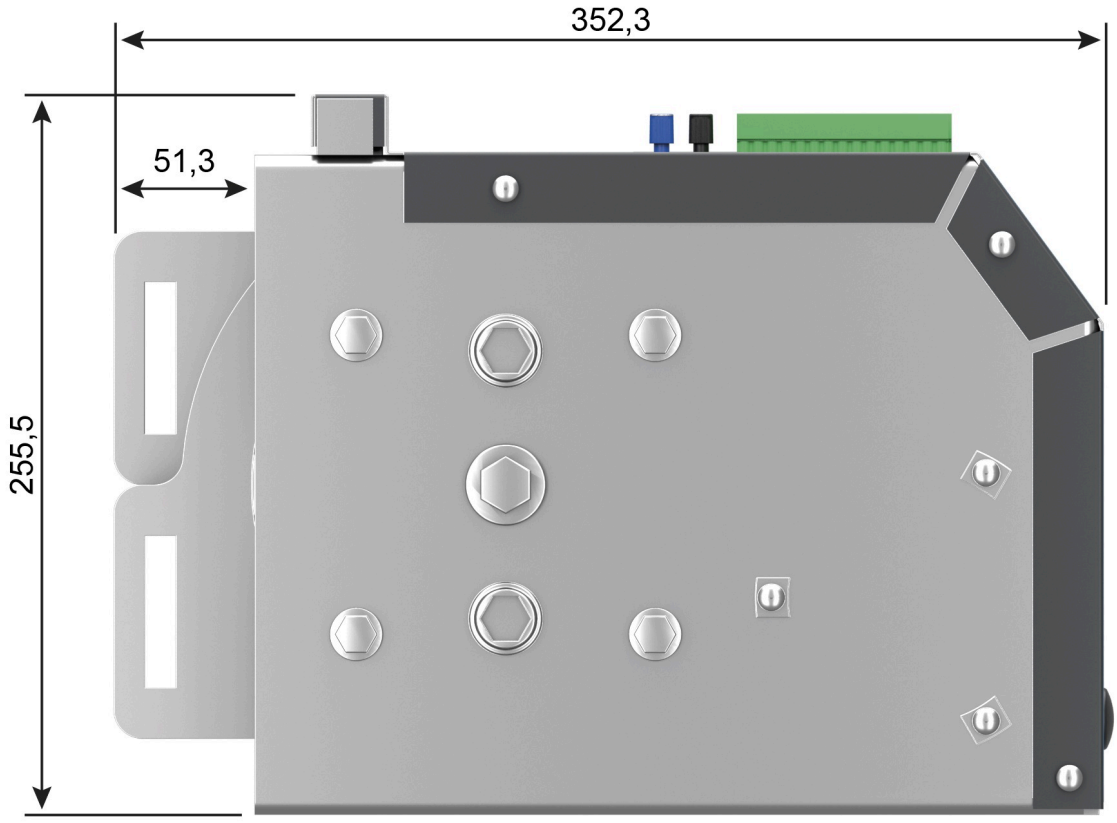


Figure. 4.1 - 3. Reset handle movement area and space reservation (all dimensions in millimeters).

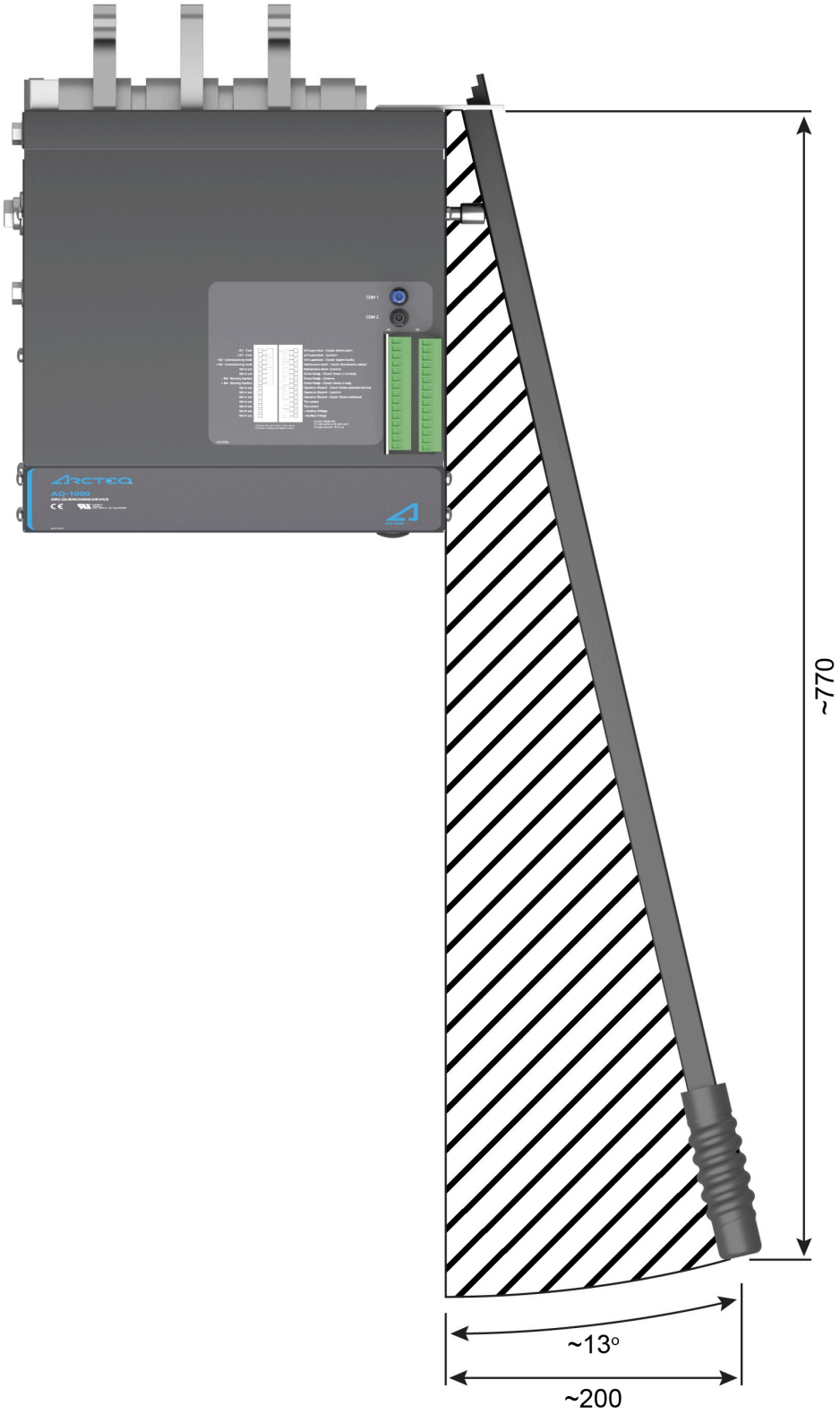


Figure. 4.1 - 4. Mounting dimensions from the bottom side (all dimensions in millimeters).

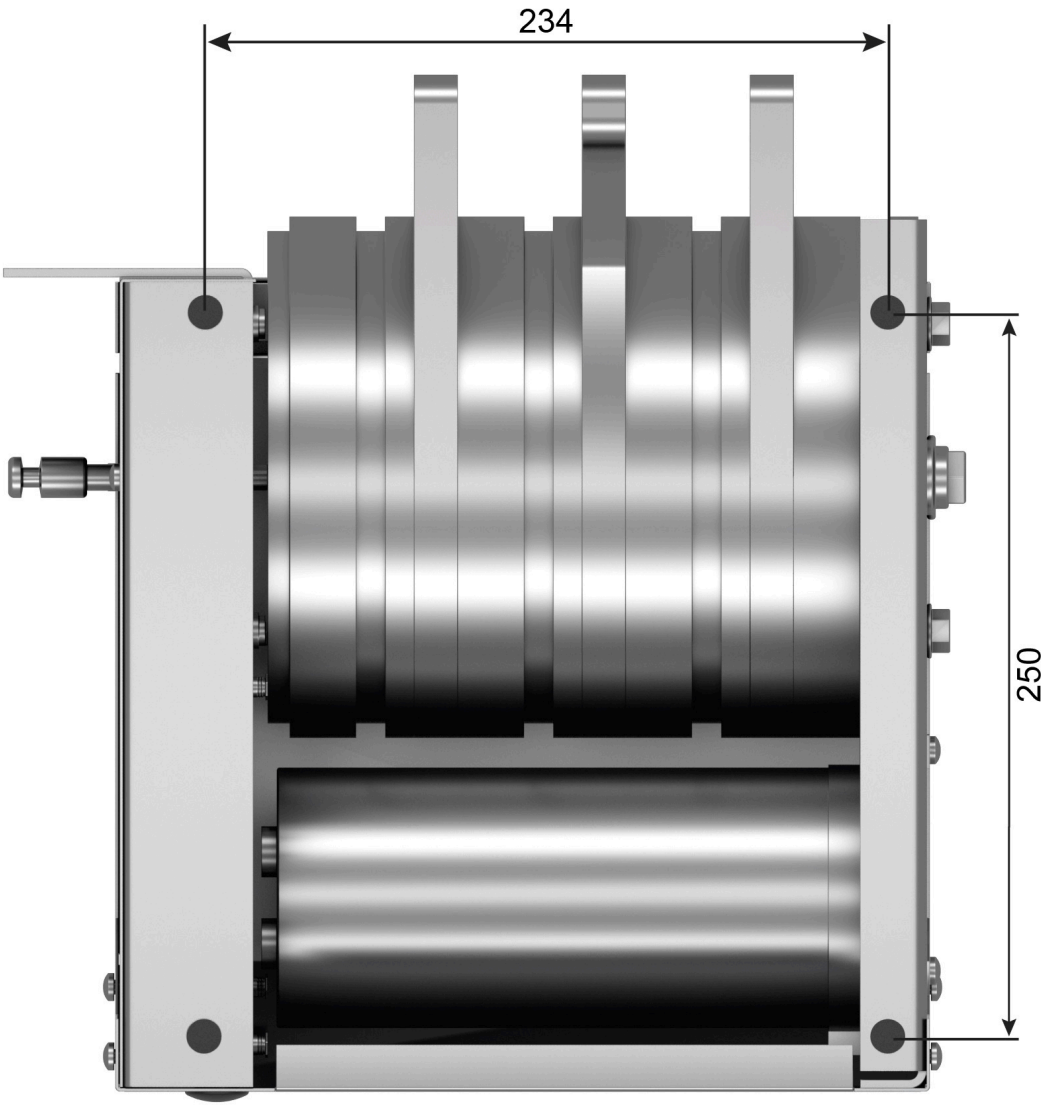
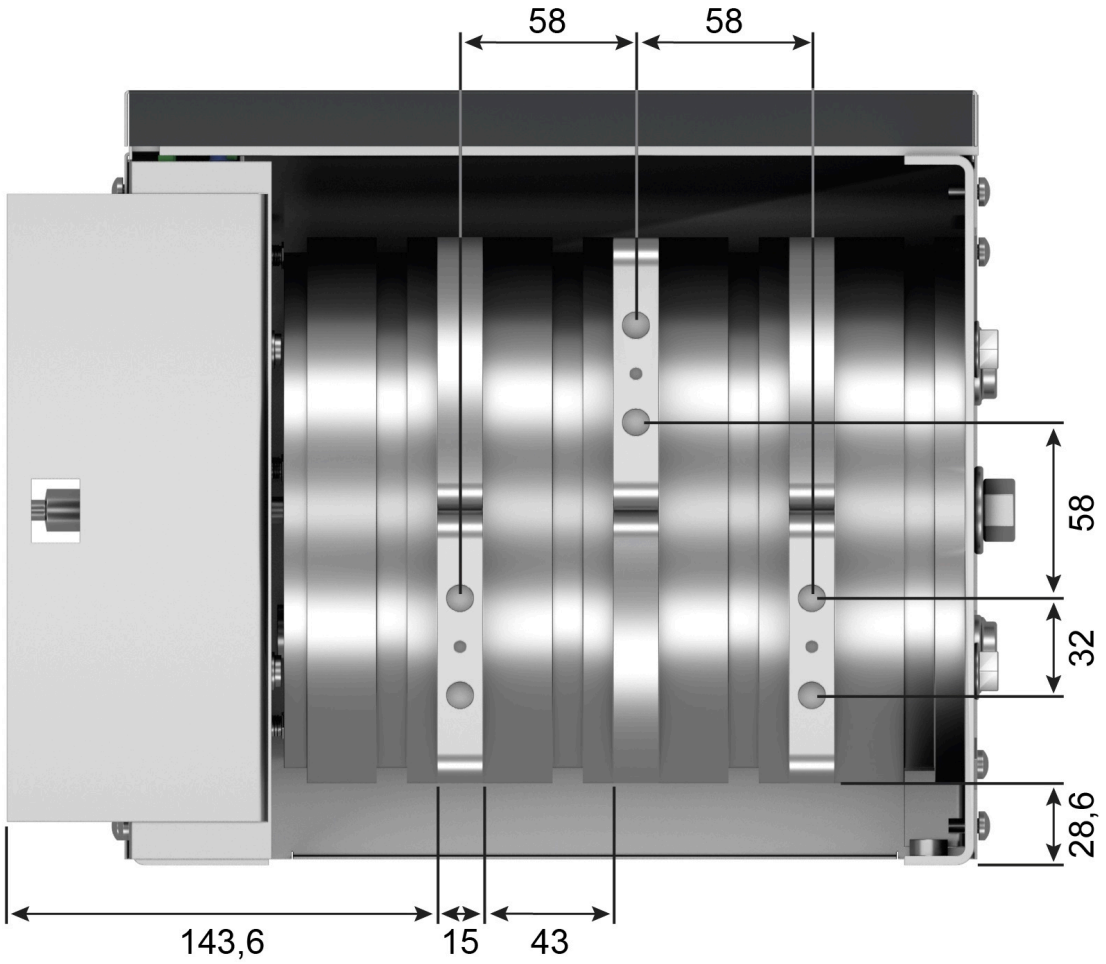


Figure. 4.1 - 5. Busbar joint dimensions form the back side (all dimensions in millimeters).



4.2 Mechanical installation

Figure. 4.2 - 6. Installation picture – tray assembly.

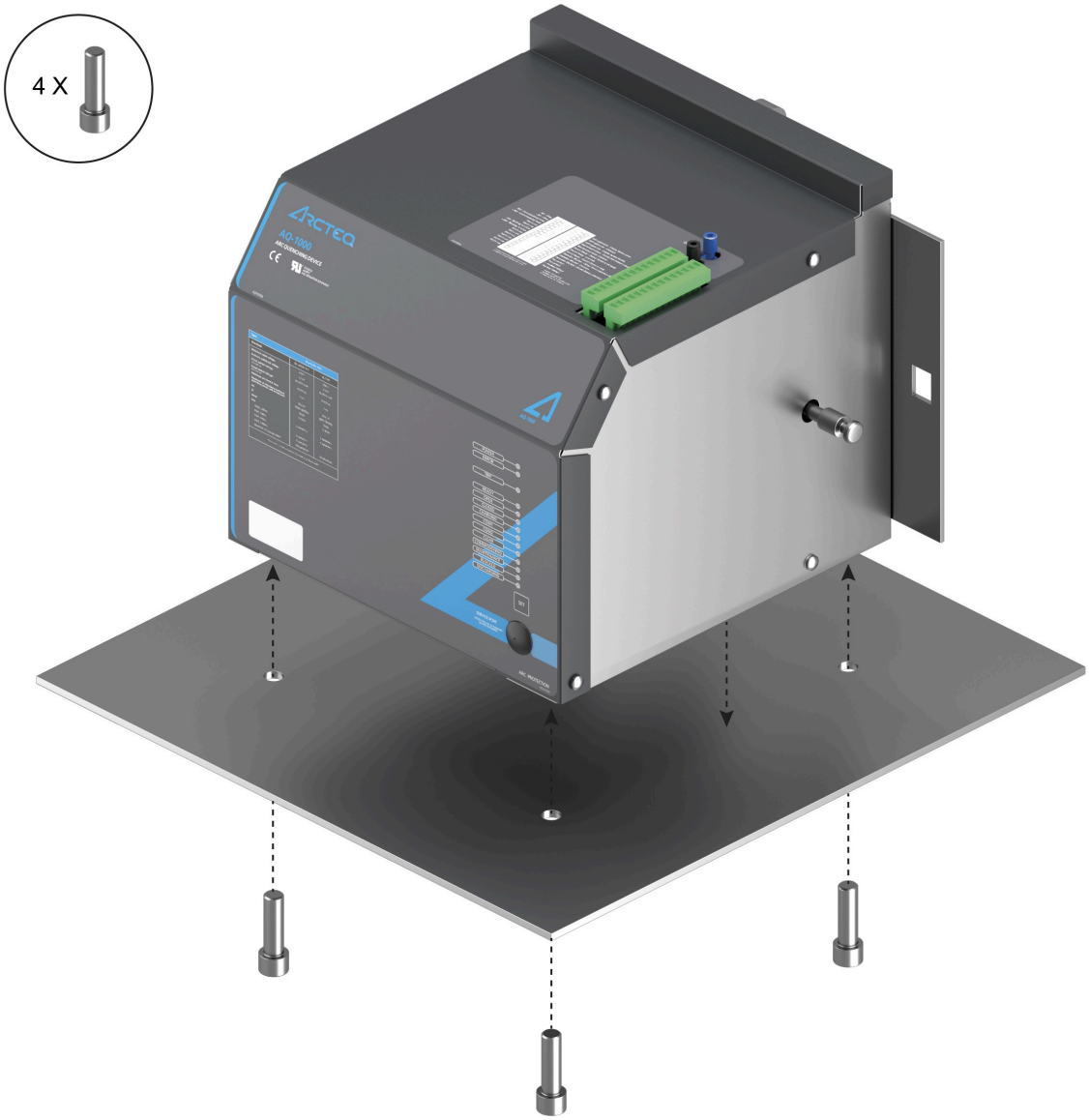


Figure. 4.2 - 7. Installation picture – C-rail assembly.

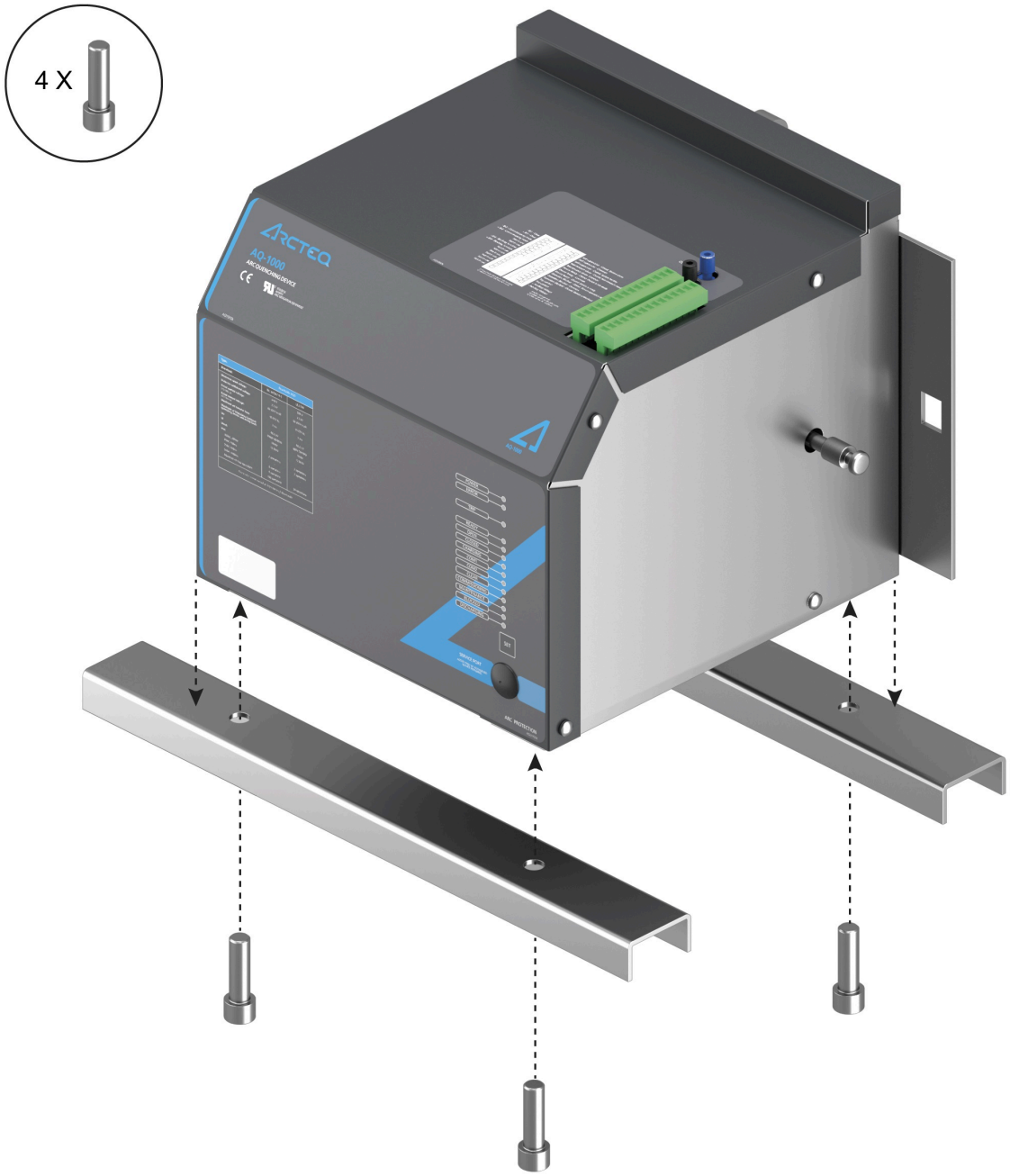
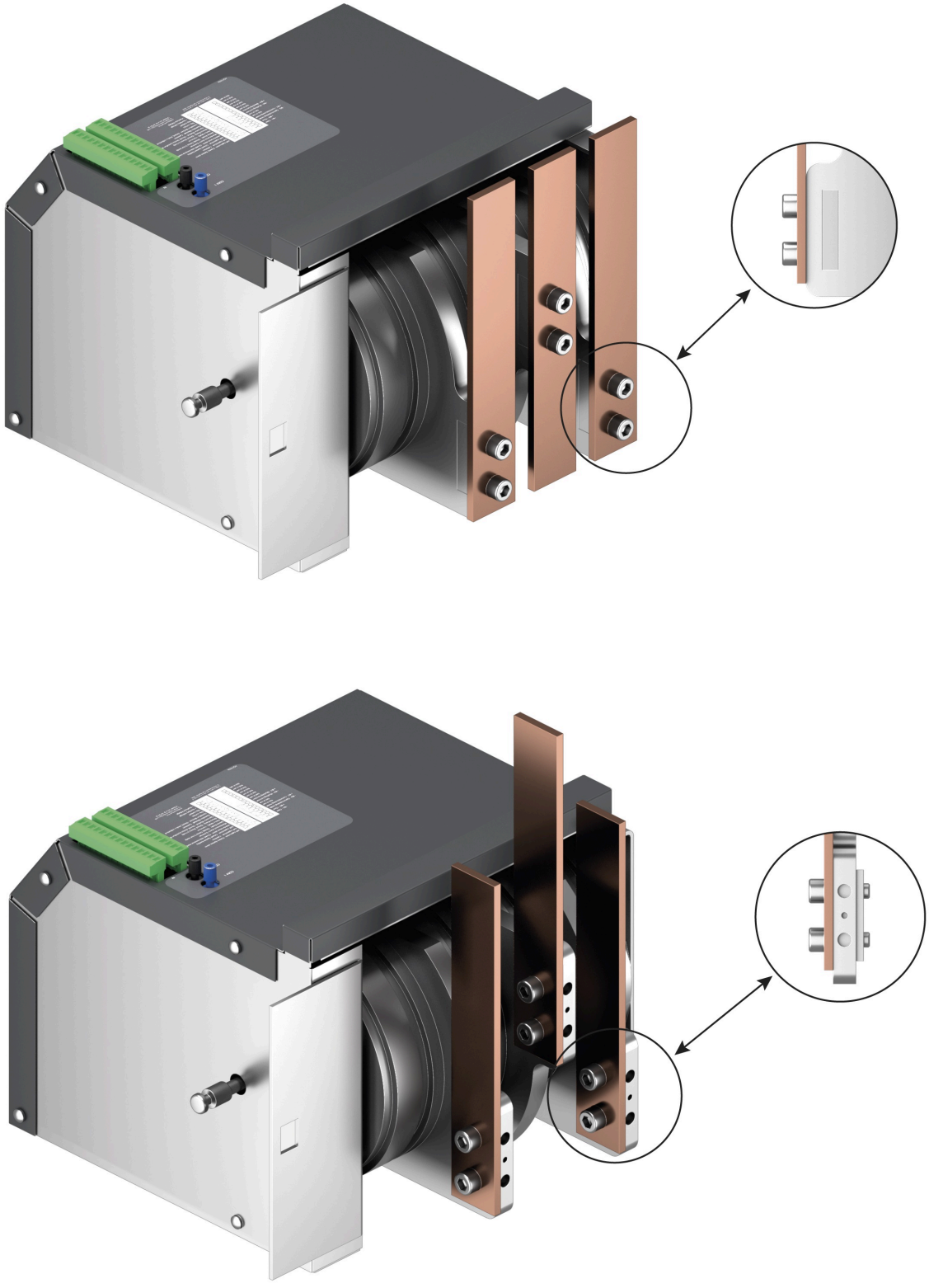


Figure. 4.2 - 8. Installation picture – busbar mounting alternatives.



NOTE!

For the technical instructions related to installation and mounting, please refer to the chapter titled "Technical data".

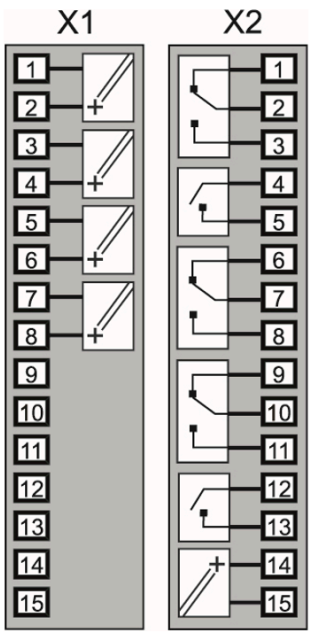
NOTE!

Busbar sizing and clearance distances shall be dimensioned according to switchgear ratings and the maximum short-circuit current.

4.3 Wiring

Description	
COM 1 – Fiber Connector; Self-Supervision and Trip Signal	 COM 1
COM 2 – Fiber Connector; Self-Supervision and Trip Signal	 COM 2

Description
- Binary Input 1 – Clear
+ Binary Input 1 – Clear
- Binary Input 2 – Commissioning mode
+ Binary Input 2 – Commissioning mode
Not in use
Not in use
- Binary Input 4 – Blocking function
+ Binary Input 4 – Blocking function
Not in use
Not in use
Not in use
Not in use
Not in use
Not in use
Not in use



Description
Self-supervision – Closed; System alarm
Self-supervision – Common
Self-supervision – Closed; System healthy
Maintenance alarm – Closed; Maintenance needed
Maintenance alarm – Common
Device Ready – Closed; Device not ready
Device Ready – Common
Device Ready – Closed; Device is ready
Operation Blocked – Closed; Device unblocked or Device de-energized
Operation Blocked – Common
Operation Blocked – Closed; Device operation blocked
Trip contact
Trip contact
+ Auxiliary Supply: Option A: 85 – 265V AC / DC, Option B: 17 – 82 DC *
- Auxiliary Supply: Option A: 85 – 265V AC / DC, Option B: 17 – 82 DC *

** Absolute minimum and maximum values*

NOTE!

The image above shows the self-supervision status when the device is de-energized. The self-supervision contact changes state when the device is energized and the device recognizes the correct fiber connection.

4.4 Device earthing

The device earth (also known as the device ground) is connected to the device chassis. When earthing the AQ-1000 device, you should make sure that the switchgear has adequate earthing. If the device is mechanically installed on a tray, C-rail or some other structure that is properly connected to the switchgear earth, no additional earthing practices are required.

If the device is installed on a surface that is isolated from the switchgear earth, the device needs to be earthed through an additional cable to the switchgear earth. If this is the case, the earthing cable can be attached to one of the four bolts that fasten the AQ-1000 device to its mounting surface.

5 Device states

Mode	Definition
Charging	In Charging Mode, the device charges the energy storage to a high enough energy level as to move the contacts to the closed position. During normal operation, the charging occurs several times in an hour as the charged energy level is constantly monitored and adjusted. In this state, the LED indicators "Open" and "Charging" are on.
Ready	In Ready State, the device's energy storage has reached the optimal energy level and the device is ready to operate. In this state, the LED indicators "Ready" and "Open" are on.
Trip	When the device enters Trip State, the device has received a trip signal. In this state, the LED indicator "Trip" is on. If the device has operated, the LED indicator "Closed" is also on.
Error	When the device enters Error State, an error (or multiple errors) has occured. In this state, the LED indicator "Error" is on. Depending on the source of the fault, one or several other LED incidators may be blinking. If the error does not resolve automatically within one minute, the device enters Discharging Mode. If the device recovers from the fault, Error State is removed and the device re-enters Charging Mode if it is not already in Ready State.
Discharging	Discharging Mode occurs when the device's auxiliary power is disconnected or if the device has been in an erronous state for longer than one minute. In Discharging Mode, the energy storage is safely discharged. The LED indicator for Discharging Mode remains on until a safe voltage level is reached, when the indicator turns off. Discharging will also occur if the device enters a faulty state that prevents it from operating correctly. For information on the discharging time specifications, please refer to the chapter titled "Technical data".
Commissioning	When performing commissioning tests or periodical testing, Commissioning Mode must be activated by energizing Binary Input 2. Alternatively, Commissioning Mode can be entered using the AQtivate software. When in Commissioning Mode, the device can be tripped any number of times without affecting the internal trip counter.
Blocked	Blocked Mode is activated when Binary Input 4 is energized. In this state, the LED indicator "Blocked" is on. When the blocking function is active, the movement of the arc quenching contacts is prevented in case a trip signal is received.
Maintenance	Maintenance Error is generated when the device has reached the maximum number of trips. A Maintenance Alarm or Error is also generated if the device's energy capacitor has reached the end of its lifetime. Please contact Arcteq technical support for further instructions.

Figure. 5 - 9. Operating modes Ready and Trip.

6 LED indicators

AQ-1000 has fourteen (14) LED indicators on its front panel for the various operating states. The following table describes them in detail.

Table. 6 - 1. LED indicators.

LED name	Color	LED is OFF	LED is ON	LED is blinking
Power	Blue	The auxiliary supply is disconnected.	The auxiliary power is connected.	There is an internal voltage error.
Error	Red	The system is healthy.	The system is unhealthy.	N/A
Trip	Red	The device has not tripped.	The device has tripped.	N/A
Ready	Green	The device is not ready to trip.	The device is ready to trip.	N/A
Open	Green	The arc quenching contacts are not open.	The arc quenching contacts are open.	The arc quenching contacts are in an error position.
Closed	Red	The arc quenching contacts are not closed.	The arc quenching contacts are closed.	The arc quenching contacts are in an error position.
Charging	Orange	The device is not charging.	The device is charging.	There is a charging error.
COM1	Green	Not in use./Not installed.	The fiber connection is healthy.	The fiber connection is lost.
COM2	Green	Not in use./Not installed.	The fiber connection is healthy.	The fiber connection is lost.
Clear	Green	The "Clear" input is inactive.	The "Clear" input is active.	N/A
Commissioning	Orange	The commissioning mode is OFF.	The device is in the commissioning mode.	N/A
Maintenance	Orange	No maintenance is needed.	Maintenance is needed; contact the manufacturer.	Maintenance is needed; contact the manufacturer.
Blocked	Red	The device is unblocked.	The "Blocking function" is active.	N/A
Discharging	Red	* (When the device is OFF) The energy storage has been discharged. * (When the device is ON) The energy storage is not being discharged.	The device is discharging the energy storage.	N/A

NOTE!

When the "Error" LED is active, please refer to the table above for troubleshooting. All self-resolved errors are indicated by a blinking LED, in which case the "Error" LED is off.

7 Binary input functions

Input	Function
BI1 - Clear	Clears/resets the indications after an Error or Trip event.
BI2 - Commissioning mode	When the device is in the commissioning mode, it can be tripped any number of times. See also Chapter 10 for using Binary Input 2 for testing and commissioning purposes.
BI3 – Not in use	Not in use. (Reserved for future purposes.)
BI4 - Blocking function	Blocks the trip contact activation during commissioning tests or during any other circumstances where actual tripping must be prevented. See also Chapter 10 for using Binary Input 4 for testing and commissioning purposes.

8 Relay functions

Relay contact	Default state	Activated state
Self-supervision	The system is not OK. The optical fiber input is faulty or missing.	The system is OK. Both optical fiber control and self-supervision are OK.
Maintenance alarm	The device does not need maintenance.	The device needs to be maintained. Contact the manufacturer.
Device ready	The device is not ready to trip.	The device is ready to trip.
Operation blocked	The device is unblocked. The quenching contacts will move when the device is tripped.	The movement of the quenching contacts is blocked by the blocking function (BI4).
Trip contact	The device has not tripped.	The device has tripped.

9 Set button

AQ-1000 contains a SET button in the front panel which is used for resetting the indicators after a Trip event and to clear resolved error signals. The SET button is pressed for five (5) seconds when installing fiber inputs to the COM ports.

Figure. 9 - 10. SET button.

10 Self-supervision functions: alarms and errors

AQ-1000 features self-supervision functions that monitor the health and status of the device. When a fault occurs, the device indicates the fault source by blinking the corresponding LED on the front panel. If the device automatically recovers from the fault, the device returns to normal operation mode on its own. However, the LED remains blinking until the fault is manually cleared, in order to make it easy to identify the source of the resolved problem.

All self-supervision functions also generate events, and they can be seen in the AQtivate software when the device is connected via USB. For more information on how to use the AQtivate software, please refer to the AQtivate 1000 user guide.

Error: Fiber connection lost

This error occurs when one or two fiber connections are missing from the fiber input COM ports. When installing the Arc Protection System, always ensure that the AQ-1000 device has a connection to the AQ-100 host device. When using a connection from two AQ-100 host devices, make sure that both COM ports are properly installed.

Error: Fiber connection lost, using one com port only

When a fiber connection is lost either from the COM 1 or the COM 2 port (depending on which one has been installed), the "Error" LED turns on and the "Ready" LED turns off. The corresponding fiber LED ("COM 1" or "COM 2") blinks to indicate the faulty connection channel. At the same time the self-supervision contacts change status to indicate a system alarm. After the connection is restored, the blinking COM LED can be cleared with the Set button or the "Clear" input (Binary Input 1).

Error: Fiber connections lost, using both COM ports

When a fiber connection is lost from one or both of the COM ports, the "Error" LED turns on and the "Ready" LED turns off. One or both of the fiber LEDs are blinking, indicating the fault. At the same time the self-supervision contacts change status to indicate a system alarm. After the faulty connections have been restored, the blinking COM LEDs can be cleared with the Set button or the "Clear" input (Binary Input 1).

WARNING!

Whenever a fiber connection is lost, restore the missing or faulty fiber input to the COM port as soon as possible. When using two fibers, if the connection to one of the two ports is missing, the device **cannot be operated from ANY COM port**. Please investigate the reason for the missing signal and correct the fault. The fault can be as small as one fiber cable being damaged or bent out of shape.

Error: Shaft position unknown

The shaft must be properly and completely reset after a trip. When the piston shaft is between the open and closed states, the "Open" and "Closed" LEDs begin to blink simultaneously. To remove the error, use the reset handle and make sure to open the shaft fully. Clear the fault by pressing the Set button.

Error: Internal temperature out of bounds

When the temperature is above or below the device's allowed temperature range (+5…+ 70 °C, or + 41…+ 158 °F), the "Error" LED turns on and the "Ready" LED turns off. At the same time the self-supervision contacts change status to indicate a system alarm. After the temperature is within the allowed range, the device automatically switches to the normal state. This causes the "Error" LED to be switched off, the "Ready" LED to be switched on, and for the self-supervision contacts to change status to indicate a healthy system.

Error: Capacitor temperature out of bounds

When the temperature is above or below the device's allowed temperature range (+5…+ 70 °C, or + 41…+ 158 °F), the "Error" LED turns on and the "Ready" LED turns off. At the same time the self-supervision contacts change status to indicate a system alarm. After the temperature is within the allowed range, the device automatically switches to the normal state. This causes the "Error" LED to be switched off, the "Ready" LED to be switched on, and for the self-supervision contacts to change status to indicate a healthy system.

Alarm: Capacitor condition low

When the device's energy storage capacity drops below 90 % of the nominal value, Maintenance Mode is automatically activated. The device is still operational. The user should contact Arcteq technical support for further instructions.

Error: Capacitor condition critical

When the device's energy storage capacity drops below 85 % of the nominal value, Maintenance Mode is automatically activated. The device can no longer be used and needs maintenance in order to return to a working condition. The user should contact Arcteq technical support for further instructions.

Alarm: Capacitor lifetime spent

When the device has been in use for over ten (10) years, the device generate a maintenance alarm. This does not prevent the device from operating. When this alarm is generated, the AQ-1000 device should be replaced as soon as possible. The user should contact Arcteq technical support for further instructions.

Alarm: Device lifetime spent

When the device has been in use for over twenty (20) years, the device generates a maintenance alarm. This does not prevent the device from operating. When this alarm is generated, the AQ-1000 device should be replaced as soon as possible. The user should contact Arcteq technical support for further instructions.

Error: Maximum trips reached

When the device has performed the maximum allowed number of normal trips, Maintenance Mode is automatically activated. The device can no longer be used and must be replaced. The user should contact Arcteq technical support for further instructions.

NOTE!

Trips done using the *Commissioning function* do **not** count towards the maximum trips counter. Trips done using the *Blocking function* do **not** count towards the maximum trips counter. The factory default for the number of real allowed trips is two (2).

11 Accessories and arc protection system devices

Accessories

The AQ-1000 device is accompanied by the following accessories:

- AX001 – Optical fiber cable
  - One (or two) per an AQ-1000 device
- AQX060C – Reset handle
  - One per an AQ-1000 device

Arc protection system devices

AQ-1000 is an additional part of the Arc Protection System (the AQ 100 series). The following devices are compatible with the Arc Protection System:

- Medium-voltage series of arc flash relays
  - AQ-101
  - AQ-101D
  - AQ-101S
  - AQ-102
  - AQ-110P
  - AQ-110F
- Low-voltage series of arc flash relays
  - AQ-101LV
  - AQ-101DLV
  - AQ-102LV
  - AQ-110PLV
  - AQ-110FLV
- Arc sensors (point sensors, for both the LV and the MV series)
  - AQ-01
  - AQ-02
- Fiber optic sensors
  - AQ-06
  - AQ-07
  - AQ-08
- Arc sensor & system testers
  - AST-02

12 Arc protection system testing

NOTE!

The total arcing time consists of the time it takes for the trip to activate and the arc to quench. The former depends on the selected arc protection application: typically, an arc protection system that is based solely on light sensing is faster than a system based on both light and current sensing. Please refer to the ach scheme of your application for more details.

12.1 Preparing AQ-1000 for commissioning tests

The commissioning of the AQ-1000 arc quenching device requires an entire arc protection system to be installed and configured. Please refer to the Arcteq AQ-100 series manuals and the Arcteq SAS standard schemes manual for more information on commissioning of the arc protection system.

WARNING!

When doing commissioning or similar trip tests with the device, ALWAYS enter either Commissioning Mode (activation with Binary Input 2 or with AQtivate) OR use the blocking function (activation with Binary Input 4) before tripping! A failure to do so will result in the device entering Maintenance State prematurely, which will permanently block the device from further operation!

WARNING!

Please verify that there is no voltage on busbars and that all feeding circuits are disconnected and locked before performing testing trips in either Commissioning Mode or while using the Blocked Signal.

WARNING!

Always remove the handle after the device has been reset. If it is not removed, the handle may disengage from its slot as a result of a trip and thus cause harm or damage.

Testing AQ-1000 using the commissioning function

When commissioning or testing the device, the commissioning function can be used to verify that the signal transmission to the AQ-1000 device is correct. While in this mode, the device trips normally but the trip counter does not increase. This mode can be entered by connecting the device with AQtivate software through the front USB port. Alternatively, Commissioning Mode can be entered by activating Binary Input 2 (BI2) on the device. When this mode has been activated through BI2, the "Commissioning" LED on the front of the device will turn on.

After a successful trip command has been received, the "Trip" LED indicates a successful trip and the "Closed" LED indicates that the quenching contacts have been shorted.

After a trip, press the "Set" button to clear the trip.

WARNING!

Commissioning Mode must be de-activated as soon as the commissioning process is done, either through AQtivate or through BI2. A failure to de-activate Commissioning Mode after a commissioning process leaves the device open for more real-situation trips than the maximum ratings allow.

Testing AQ-1000 using the blocking function

When commissioning or testing the device, the blocking function can be used to verify that a functioning trip signal has been transmitted to the AQ-1000 device from the connected AQ-110 sensor unit. While in this mode, the device receives a trip signal without moving the quenching contacts. Using this mode does not increase the normal trip counter. The "Trip" LED indicates that a successful trip command was received, and the "Closed" LED indicates that the quenching contacts have moved and shorted the terminals.

After a trip has occured, the device must be mechanically reset using the provided handle. After the device has been mechanically reset, press the "Set" button to clear the trip. The device will start charging again and will be ready for operation in approximately three minutes.

When the blocking function (Binary Input 4) is energized, the commissioning trip can be performed without an actual quenching operation. The "Trip" LED indicates that a successful trip command was received, but the contacts have not moved and the device remains in the open position.

It is also recommended to perform one or more actual trips without the blocking function in use in order to verify that the main contacts function properly. The user should activate Commissioning Mode by energizing Binary Input 2, which blocks the functionality of the internal operation counter. Always de-energize the blocking function input (BI4) after the tests are finished.

WARNING!

If the blocking function (BI4) is used for commissioning tests, the signal must be de-activated as soon as the commissioning or testing process is over. A failure to do this prevents the device from closing the quenching contacts in the event of a real arc flash, which can lead to catastrophic damages and injury to personnel.

12.2 Testing individual arc sensors

Verifying functionality and wiring

The functionality of the sensors can be verified by tripping the individual sensor and then inspecting the connected AQ-100 series arc protection relay. If the corresponding LED indicator on the front panel is lit, the arc sensor in question has registered the flash and is therefore functional. Additionally, this procedure can also be used to confirm that the sensor's wiring is correct.

Simulating an arc flash to trip arc sensors

AQ-01 light sensors can be activated by a standard camera flash. Alternatively, an AST-01 arc sensor tester can be used to trip the sensors. Please note that AQ-02 light–pressure sensors require the AST-02 arc sensor tester for simultaneous injection of light and pressure for activation.

12.3 Testing the full arc protection system

A complete system test requires that both individual sensors, the connected arc protection relays as well as the AQ-1000 arc quenching device are all tested.

The selected Standard Arc Scheme (SAS) describes which arc protection relay trips the AQ-1000 device and under what conditions the trip occurs. The host relay might not trip the AQ-1000 device with light sensor activation (L>) alone, as it may require a current activation (I>) signal as well. Please refer to your chosen Arc Scheme for more details.

In applications that rely solely on sensor activation for tripping the breakers (as well as the AQ-1000 arc quenching device), the arc sensor testers (AST-01 and AST-02) can be used to complete a full test on the arc protection system. However, in devices requiring simultaneous light and current activation, an additional current injection device must be used in order to trip the AQ-100 arc protection relay. For this purpose, current injection and control devices that are used for protection relays are also suited for testing the arc protection system.

These commissioning devices can also be used to remotely control the AST-01/02 for exact timing of the current and light activation.

12.4 Testing with arc sensor testers

The Arcteq AST-01 arc sensor tester can be used to test the following sensors and features:

Arc sensor	AQ-01 activation (only light)
Arc sensor	Options for light element sensitivity threshold: 8 000 lx, 25 000 lx and 50 000 lx
Arc relay	Normal sensor trip and breaker activation
Arc relay	Breaker activation + CBFP function (first and second stage)
Control	Local or external control device

The Arcteq AST-02 arc sensor tester can be used to test the following sensors and features:

Arc sensor	AQ-02 activation (both light and pressure)
Arc sensor	AQ-01 activation (only light)
Arc sensor	Options for light element sensitivity threshold: 8 000 lx, 25 000 lx and 50 000 lx
Arc relay	Normal sensor trip and breaker activation
Arc relay	Breaker activation + CBFP function (first and second stage)
Control	Local or external control device

12.5 Restoring the quenching contacts

After an arc flash incident has occured, the restoration of the arc protection system and the quenching device must be done carefully and systematically. Always follow national instructions, safety policies and regulations as well as the instructions of the equipment manufacturer.

WARNING!

Locate and remove the cause of the fault and repair any possible damage caused by the arc flash. The system must be verified to be in normal operating condition before the quenching contacts are restored.

- Restore the device contacts to the open position by using the reset handle (see the figure below).
- Reset and clear all indicators in the arc protection system with the Set buttons.

NOTE!

It is recommended to use the AQ-1000's contact labelled "Ready" as the lock-out signal for the circuit breaker. This prevents the closed operation of the circuit breaker while the AQ-1000 device is in the closed position or otherwise not ready to operate.

When a trip has occurred, the quenching contacts must be restored to the open position by using the handle provided with the device (see the figure below). Reset the device by connecting the handle to the reset shaft. Then, gently but firmly press the handle to the right. When the reset shaft has moved slightly, move the handle to the next handle position. Repeat until the device “snaps” completely open. Then press the Clear button.The device's LED indicators show that the contacts are now in the open position.

Figure. 12.5 - 11. Resetting contacts.

WARNING!

Always remove the handle after the device has been reset. If it is not removed, the handle may disengage from its slot as a result of a trip and cause harm or damage.

WARNING!

Never attach the handle to the device when the device is in the open position.

13 Application example

This chapter demonstrates one example how an arc protection system can be set. Please refer to the Arcteq AQ-100 series manuals as well as the Arcteq SAS (standard arc scheme) booklets for more information regarding the various arc protection system schemes and applications. They can be found at https://www.arcteq.fi/documents-and-software/.

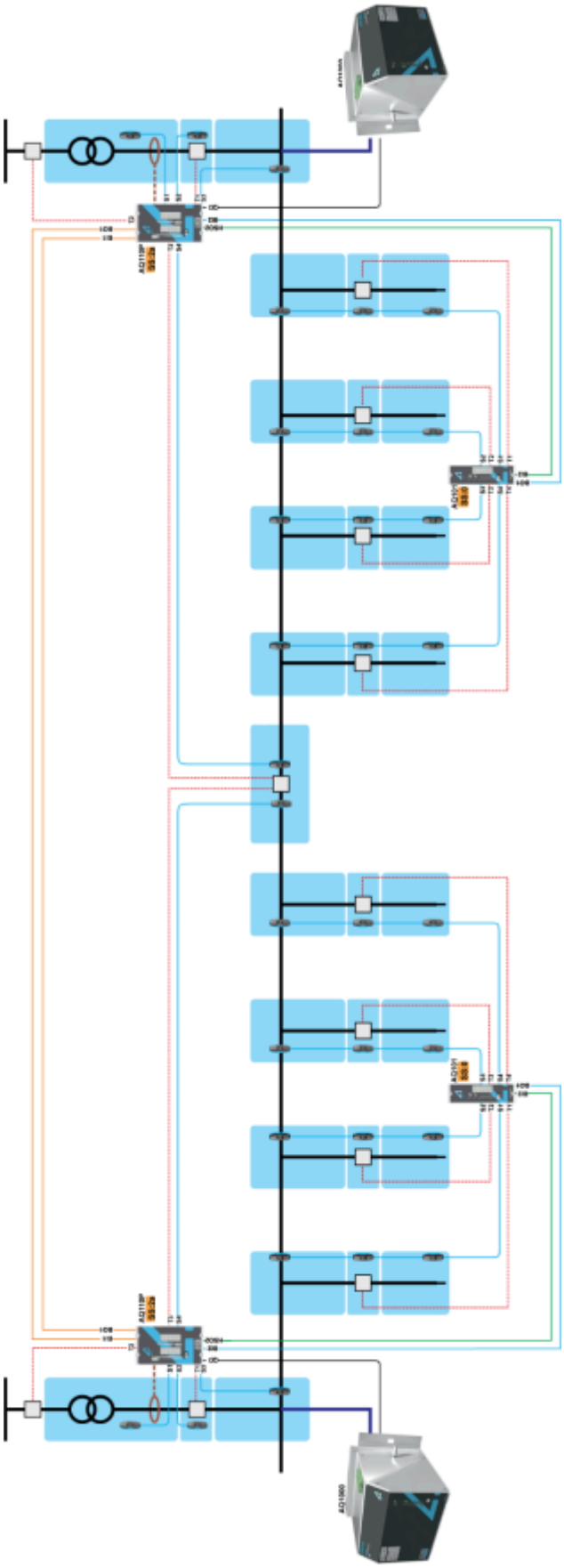
This example is a selective Main-Tie-Main configuration. Its trip logic is explained in the table below, while the image below the table shows its connections.

Arc in compartment	AQ-1000	Primary side incomer	Secondary side incomer	Feeder 1	Feeder 2	Feeder 3	Tie breaker
Incomer CB cable compartment	No	Yes	Yes	No	No	No	No
Incomer CB breaker compartment	No	Yes	Yes	Yes	Yes	Yes	Yes
Busbar compartment	Yes	No *	Yes	Yes	Yes	Yes	Yes
Feeder 1 cable compartment	No**	No	No**	Yes	No	No	No**
Feeder 2 cable compartment	No**	No	No**	No	Yes	No	No**
Feeder 3 cable compartment	No**	No	No**	No	No	Yes	No**
Tie breaker compartment	Yes	No *	Yes	Yes	Yes	Yes	Yes

**) The circuit breaker of the high-voltage side is tripped when the circuit breaker failure protection is activated. Please refer to the AQ-100 series manuals and the SAS booklet for more information regarding circuit breaker failure protection.*

***) AQ-1000, the secondary side incomer and the tie breaker are tripped when the circuit breaker failure protection is activated. Please refer to the AQ-100 series manuals and the SAS booklet for more information regarding circuit breaker failure protection.*

Figure. 13 - 12. Connections of the example application.



14 Technical data

14.1 Mounting and installation

Table. 14.1 - 2. Technical data for mounting and installation.

Tray material: Tray thickness (recommended min): C-rail material: C-rail material thickness (recommended min):	Steel tray plate 3.0 mm (0.118") Steel rail 2.0 mm (0.079")
Device mounting screw type: Key size: Tightening torque (min…max):	ISO 4762 M8x30, galvanized Allen key 6 20…25 N·m (177…220 lbf·ft)
Busbar mounting screw type: Key size: Tightening torque (min…max):	ISO 4762 M8x30, galvanized Allen key 6 20…25 N·m (177…220 lbf·ft)
Connectors X1 and X2 type: Wire cross section (solid and multicore) (min…max): Minimum stripping length: Screw tightening torque (min…max):	Phoenix contact MSTB 2,5/15-ST-5,08 0.2…2.5 mm^2 (24…13 AWG) 7 mm (0.275") 0.5…0.6 N·m (4.4…5.3 lbf·ft)
Fiber connectors: Fiber type:	IF-D91B Arcteq AX-001 multicore glass fiber

14.2 Device ratings

Table. 14.2 - 3. Technical data for AQ-1000.

Maximum busbar voltage (line-to-line) (IEC rating):	690 V AC 50/60 Hz (power frequency withstand voltage 1000 V AC)
Maximum busbar voltage (line-to-line) (UL rating):	508 V AC 50/60 Hz
Maximum short-circuit current (IEC rating):	100 kA (200 ms, 2 operations) 75 kA (500 ms, 3 operations) 50 kA (1 s, 4 operations) 25 kA (2 s, 5 operations)
Maximum short-circuit current (UL rating):	100 kA (200 ms, 2 operations) 85 kA (500 ms, 2 operations)
Operation time:	<2 ms
Basic insulation level (phase contacts): (For other circuits please see the following chapters.)	12 kV
AC dielectric voltage withstand (phase contacts): (For other circuits please see the following chapters.)	2.2 kV AC 50/60 Hz

Typical charging time of the energy storage (empty to full):	<5 minutes
Typical discharge time of the energy storage (full to empty, when auxiliary power is disconnected):	<15 minutes
Device dimensions: Weight (gross): Weight (net):	(Please see Chapter 2.1 for device dimensions.) 15.7 kg (34.6 lbs) 15.0 kg (33 lbs)

NOTE!

The total system operation time is typically <4 ms (AQ-110P + AQ-1000). Power system studies which incorporate the Arcteq AQ-1000/AQ-110P system should use a clearing time of 5 ms for all assets protected by this system.

14.3 Auxiliary voltage

Table. 14.3 - 4. Technical data for auxiliary voltage.

Option A: 80…265 VDC auxiliary power supply	
U_S (min…max): U_S (nominal): Impulse voltage withstand: AC dielectric voltage withstand:	85…265 V AC/DC 110, 220 V DC 110, 115, 220, 230 V AC, 50/60 Hz 5 kV (1.2 µs) 2 kV (50 µs)
Option B: 18…72 VDC auxiliary power supply	
U_S (min…max): U_S (nominal): Impulse voltage withstand: AC dielectric voltage withstand:	18…72 V DC 24, 36, 48, 60 V DC 1 kV (1.2/50 µs) 450 V
Maximum interruption in ready operating mode (both options):	100 ms
Maximum power consumption (both options):	5 W (standby, device ready) 11 W (device charging)

14.4 Output relays

Table. 14.4 - 5. Technical data for output relays (Trip, Ready, Blocked, Maintenance, IRF).

Rated voltage:	250 V AC/DC
Impulse voltage withstand: AC dielectric voltage withstand:	5 kV (1.2/50 µs) 2 kV
Continuous carry (both options):	5 A AC/DC
Contact material:	AgNi 90/10

14.5 Binary inputs

Table. 14.5 - 6. Technical data for binary inputs.

Nominal activation voltage (min…max):	24 V DC
Nominal activation threshold:	24 V DC
Impulse voltage withstand: AC dielectric voltage withstand:	5 kV (1.2/50 µs) 2 kV
Rated burden:	3 mA

WARNING!

The binary inputs are galvanically isolated from the device earthing. Attention must be paid to avoid galvanic loops via binary input earth.

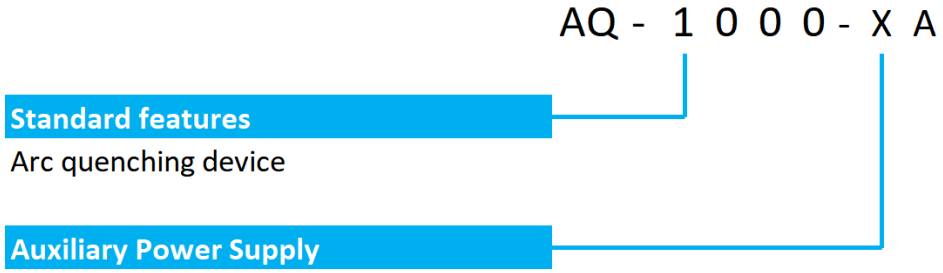
14.6 Environmental ratings

Table. 14.6 - 7. Environmental ratings.

Environmental operating temperature (min…max):	5…70 °C (41…158 °F)
Humidity (max):	95 % RH, no condensation allowed
Storage temperature (min…max):	–40… 85 °C (–40…185 °F)

15 Order code

Figure. 15 - 13. Order code for AQ-1000.



Standard features
Arc quenching device

Auxiliary Power Supply	
A	80...265 Vac/dc
B	18...72 Vdc

Accessories	Order code
Connection fiber, length 3 meters	AX001 - 3
Connection fiber, length 5 meters	AX001 - 5
Connection fiber, length 10 meters	AX001 - 10
Reset handle	AQX060C

16 Contact and reference information

Manufacturer

Arcteq Relays Ltd.

Visiting and postal address

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Contacts

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