

INSTRUCTION MANUAL

AQ101, AQ101D, AQ110P, AQ01

Revision History

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Changes	Scheme 2a tripping matrix table is added. Scheme 2a dipswitch setting is added. Application example of scheme 2a is added.

Abbreviations

HSO – High speed output
BI – Binary input
BO – Binary output
CBFP – Circuit breaker failure protection
QD – Quenching device
IL – Phase current
Io – Neutral sequence current
LED – Light emitting diode
L> – Light signal
I> – Overcurrent signal
MT – Master trip signal

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1 INSTALLATION

1.1 MECHANICAL INSTALLATION

1.1.1 AQ101, AQ110P ARC FLASH PROTECTION RELAYS

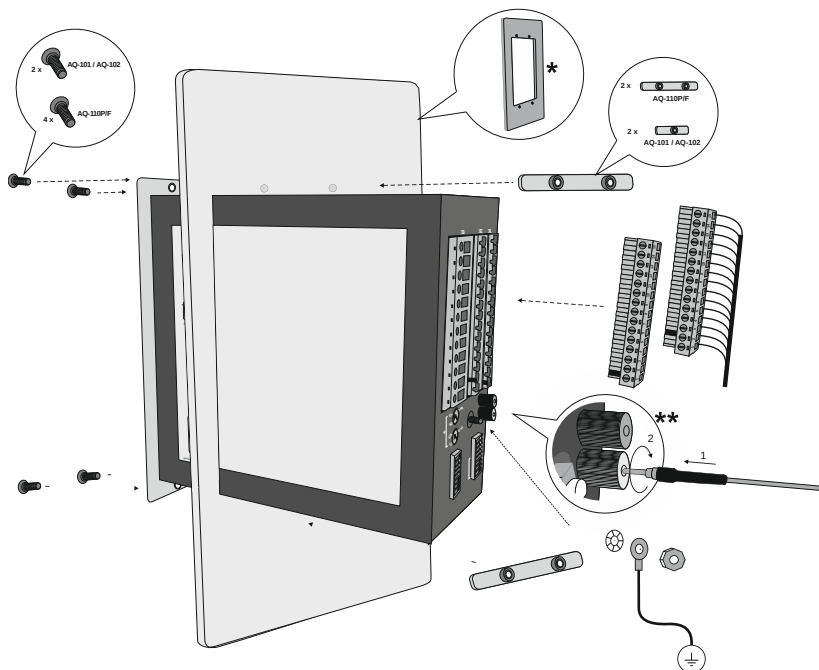


Figure 1-1: AQ101, AQ110P door mounting installation picture

1.1.2 AQ101D ARC FLASH PROTECTION RELAYS

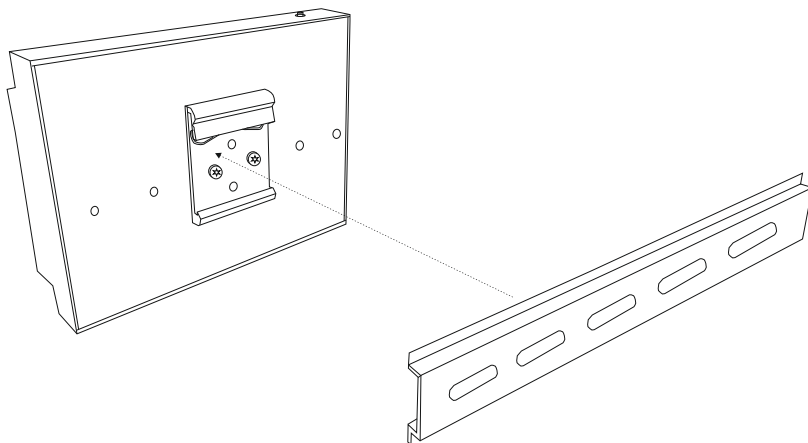


Figure 1-2: AQ101D din rail mounting Installation picture

*) See panel cut-out dimensions on separate cut-out sheet included with this manual.



See installation and mounting related technical parameters refer to chapter 8.1.

1.1.3 AQ01 ARC FLASH SENSOR

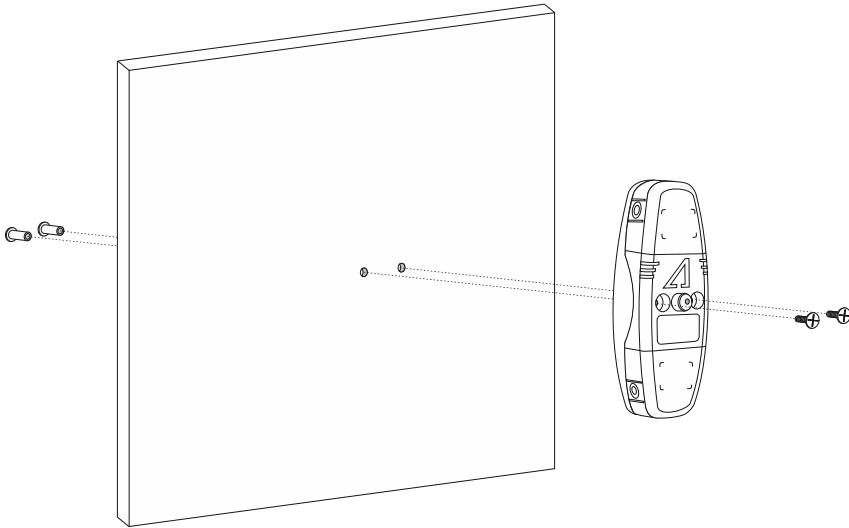


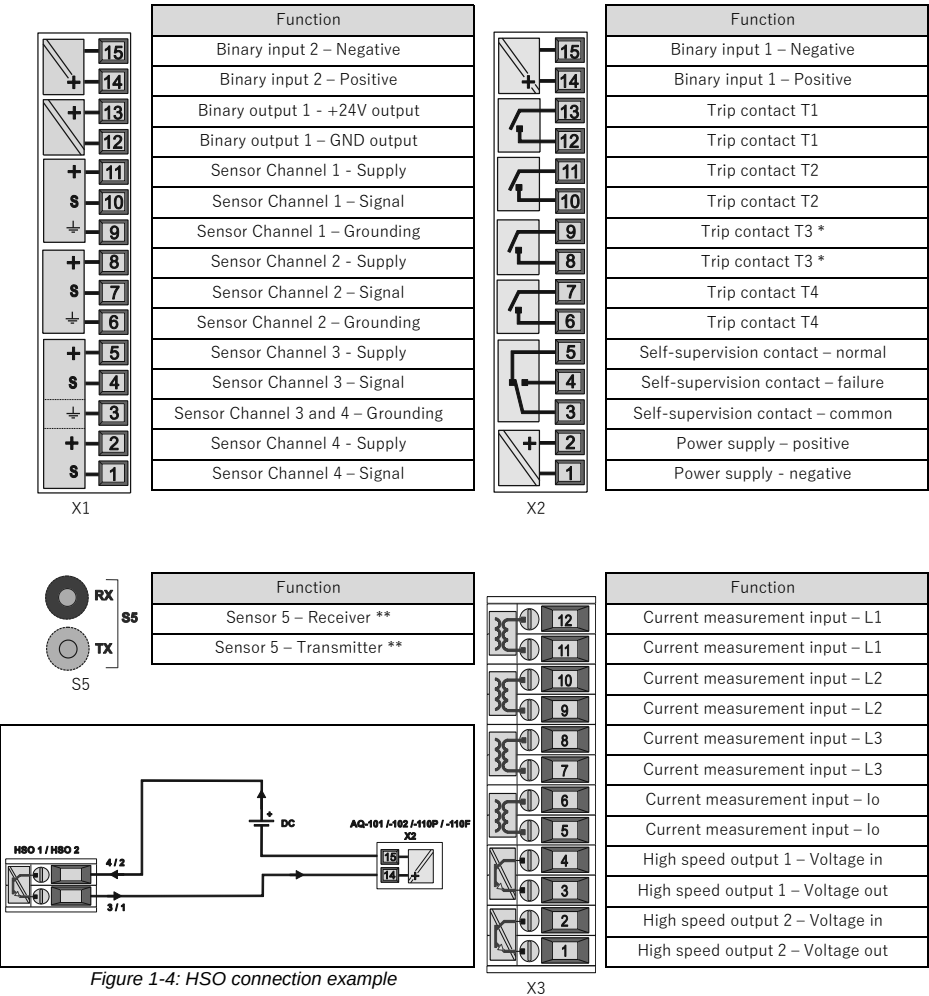
Figure 1-3: AQ01 Installation picture



See installation and mounting related technical instructions in chapter 8.2.

1.2 WIRING

1.2.1 AQ110P ARC FLASH PROTECTION RELAY



*) Trip contact T3 may be normally open or normally closed type. Refer to the ordering codes.

**) Sensor 5 is optional for fiber sensor or quenching device control. Refer to the ordering codes.

	Always ensure that current measurement circuits are not energized during disconnection.
	See rated voltages and connector tightening torques from chapter 7.1 "Technical data".

1.2.2 AQ101, AQ101D ARC FLASH PROTECTION RELAYS

X1		Function	X2		Function
	15	Binary input 2 – Negative		15	Binary input 1 – Negative
	14	Binary input 2 – Positive		14	Binary input 1 – Positive
	13	Binary output 1 - +24V output		13	Trip contact T1
	12	Binary output 1 – GND output		12	Trip contact T1
	11	Sensor Channel 1 - Supply		11	Trip contact T2
	10	Sensor Channel 1 – Signal		10	Trip contact T2
	9	Sensor Channel 1 – Grounding		9	Trip contact T3 *
	8	Sensor Channel 2 - Supply		8	Trip contact T3 *
	7	Sensor Channel 2 – Signal		7	Trip contact T4
	6	Sensor Channel 2 – Grounding		6	Trip contact T4
	5	Sensor Channel 3 - Supply		5	Self-supervision contact – normal
	4	Sensor Channel 3 – Signal		4	Self-supervision contact – failure
	3	Sensor Channel 3 and 4 – Grounding		3	Self-supervision contact – common
	2	Sensor Channel 4 - Supply		2	Power supply – positive
	1	Sensor Channel 4 – Signal		1	Power supply - negative

S5		Function
	RX	Sensor 5 – Receiver **
	TX	Sensor 5 – Transmitter **

*) Trip contact T3 may be normally open or normally closed type. Refer to the ordering codes.

**) Sensor 5 is optional for fiber sensor. Refer to the ordering codes.

	See rated voltages and connector tightening torques from chapter 7.1 "Technical data".
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1.2.3 AQ01 ARC FLASH SENSOR



Sensor

Function
Sensor - Grounding
Sensor – Signal
Sensor – Supply



See rated voltages and connector tightening torques from chapter 7.2 “Technical data”.

2 CONFIGURATION

2.1 DIP SWITCHES (AQ101, AQ101D, AQ110P)

Functionality such as tripping logic is configured using dipswitch settings. Tripping may be selected based on arc light only or arc light and current thresholds.



Scheme selection is made with dip switches by calculating the sum of weight factors

2.1.1 AQ101, AQ101D

2.1.1.1 Scheme 0

SW 1	no	Text	Function at ON position	Function at OFF position
ON OFF	8	$L> / L> + I>$	Tripping with light only criterion.	Tripping with light and current criterion.
	7	$S1: L> / L> + I>$	Sensor 1 tripping with light only criterion.	Sensor 1 tripping with light and current criterion.
	6	Latch: On / Off	Output relays latched.	Output relays not latched.
	5	100 / 150 ms*	Circuit breaker failure protection operating time 100 ms.	Circuit breaker failure protection operating time 150 ms.
	4	Scheme Select	Weight factor 0	Weight factor 8
	3		Weight factor 0	Weight factor 4
	2		Weight factor 0	Weight factor 2
	1		Weight factor 0	Weight factor 1

Table 2-1: AQ101, AQ101D scheme 0 DIP switches definition.

*) Circuit breaker failure protection function is not included in the scheme 0.

2.1.2 AQ110P

2.1.2.1 Scheme 1a

SW 1	no	Text	Function at ON position	Function at OFF position
ON OFF 	8	S1: L> / L> + I>	Sensor 1 tripping with light only criterion.	Sensor 1 tripping with light and current criterion.
	7	S2: L> / L> + I>	Sensor 2 tripping with light only criterion.	Sensor 2 tripping with light and current criterion.
	6	L> / L> + I>	Tripping with light only criterion	Tripping with light and current criterion.
	5	a/b	Scheme a	Scheme b
	4	Scheme Select	Weight factor 0	Weight factor 8
	3		Weight factor 0	Weight factor 4
	2		Weight factor 0	Weight factor 2
	1		Weight factor 0	Weight factor 1

SW 2	no	Text	Function at ON position	Function at OFF position
ON OFF 	8	T1/T2 Latch / non Latch.	Trip relays 1 and 2 latched.	Trip relays 1 and 2 not latched.
	7	HSO Latch / non Latch.	High speed outputs latched.	High speed outputs not latched.
	6	S1: P> & L>	NA	Sensor 1 connected with AQ01 light sensor.
	5	S5: Fib. loop / Elim.	Sensor 5 connected with fiber loop sensor.	Sensor 5 connected with quenching device control (TX only).
	4	Fast / CBFP **	Fast mode tripping without circuit breaker failure protection.	Circuit breaker failure protection activated.
	3	100 / 150 ms *	Circuit breaker protection delay setting 100 ms.	Circuit breaker protection delay setting 150 ms.
	2	I> 1A / 5A	Phase current measurement channels nominal rating 1 A.	Phase current measurement channels nominal rating 5 A.
	1	Io> 1A / 5A	Neutral current measurement channels nominal rating 1 A.	Neutral current measurement channels nominal rating 5 A.

Table 2-2: AQ110P scheme 1a DIP switches definition.

2.1.2.2 Scheme 1b

SW 1	no	Text	Function at ON position	Function at OFF position
ON OFF  8 7 6 5 4 3 2 1	8	S1: L> / L> + I>	Sensor 1 tripping with light only criterion.	Sensor 1 tripping with light and current criterion.
	7	S2: L> / L> + I>	Sensor 2 tripping with light only criterion.	Sensor 2 tripping with light and current criterion.
	6	L> / L> + I>	Tripping with light only criterion.	Tripping with light and current criterion.
	5	a/b	Scheme a	Scheme b
	4	Scheme Select	Weight factor 0	Weight factor 8
	3		Weight factor 0	Weight factor 4
	2		Weight factor 0	Weight factor 2
	1		Weight factor 0	Weight factor 1

SW 2	no	Text	Function at ON position	Function at OFF position
ON OFF  8 7 6 5 4 3 2 1	8	T1/T2 Latch / non Latch.	Trip relays 1 and 2 latched.	Trip relays 1 and 2 not latched.
	7	HSO Latch / non Latch.	High speed outputs latched.	High speed outputs not latched.
	6	S1: P> & L>	NA	Sensor 1 connected with AQ01 light sensor.
	5	S5: Fib. loop / Elim.	Sensor 5 connected with fiber loop sensor.	Sensor 5 connected with quenching device control (TX only).
	4	Fast / CBFP **	Fast mode tripping without circuit breaker failure protection	Circuit breaker failure protection activated.
	3	100 / 150 ms *	Circuit breaker protection delay setting 100 ms.	Circuit breaker protection delay setting 150 ms.
	2	I> 1A / 5A	Phase current measurement channels nominal rating 1 A	Phase current measurement channels nominal rating 5 A
	1	Io> 1A / 5A	Neutral current measurement channels nominal rating 1 A	Neutral current measurement channels nominal rating 5 A

Table 2-3: AQ110P scheme 1b DIP switches definition.

*) Circuit breaker failure protection delay dip switch has no function if the device has been configured to Fast operating mode.

**) When CBFP mode is selected, the trip relay T2 will work as CBFP relay. If sensor channel (S2, S3, S4) or L> input (B11, B12) is activated for more than CBFP set time (100 or 150ms) the CBFP function activates trip relay T2.

2.1.2.3 Scheme 2a

SW 1	no	Text	Function at ON position	Function at OFF position
ON OFF  8 7 6 5 4 3 2 1	8	S1: L> / L> + I>	Sensor 1 tripping with light only criterion.	Sensor 1 tripping with light and current criterion.
	7	S2: L> / L> + I>	Sensor 2 tripping with light only criterion.	Sensor 2 tripping with light and current criterion.
	6	L> / L> + I>	Tripping with light only criterion.	Tripping with light and current criterion.
	5	a/b	Scheme a	Scheme b
	4	Scheme Select	Weight factor 0	Weight factor 8
	3		Weight factor 0	Weight factor 4
	2		Weight factor 0	Weight factor 2
	1		Weight factor 0	Weight factor 1

SW 2	no	Text	Function at ON position	Function at OFF position
ON OFF  8 7 6 5 4 3 2 1	8	T1/T2 Latch / non Latch.	Trip relays 1 and 2 latched.	Trip relays 1 and 2 not latched.
	7	HSO Latch / non Latch.	High speed outputs latched.	High speed outputs not latched.
	6	S1: P> & L>	NA	Sensor 1 connected with AQ01 light sensor.
	5	S5: Fib. loop / Elim.	Sensor 5 connected with fiber loop sensor.	Sensor 5 connected with quenching device control (TX only).
	4	Fast / CBFP **	Fast mode tripping without circuit breaker failure protection	Circuit breaker failure protection activated.
	3	100 / 150 ms *	Circuit breaker protection delay setting 100 ms.	Circuit breaker protection delay setting 150 ms.
	2	I> 1A / 5A	Phase current measurement channels nominal rating 1 A	Phase current measurement channels nominal rating 5 A
	1	Io> 1A / 5A	Neutral current measurement channels nominal rating 1 A	Neutral current measurement channels nominal rating 5 A

Table 2-4: AQ110P scheme 2a DIP switches definition.

*) Circuit breaker failure protection delay dip switch has no function if the device has been configured to Fast operating mode.

**) When CBFP mode is selected, the trip relay T2 will work as CBFP relay. If sensor channel (S2, S3, S4) or L> input (BI1, BI2) is activated for more than CBFP set time (100 or 150ms) the CBFP function activates trip relay T2.

2.2 POTENTIOMETERS (AQ110P ONLY)

Current pick-up setting (set point) is done with potentiometers on the back side of the device. Use flat head screw driver for moving the potentiometer to the desired set point. See chapter 4.1.2 for accurate setting of the current activation level.

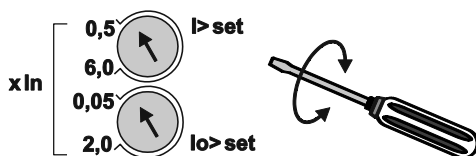


Figure 2-1: Current pick-up potentiometers.

2.3 SIEMENS PROTECTION SCHEME LOGICS (AQ101, AQ101D, AQ110P)

Following tables describes the basic functionality of scheme 0 (AQ101, AQ101D), scheme 1a, 1b and 2a (AQ110P).

Following tables doesn't segregate the light and light + current mode trip settings. In case light and current mode has been chosen with dip switches, corresponding sensor activation requires simultaneous overcurrent injection. For the CBFP operation, refer to the relevant dipswitch settings.



Activation table letters:

X = activation of output when signal is active

C = output activates according to the CBFP functionality

Y = output activation has more than one function depending on the setting of CBFP function. See dip switch settings on chapter 2.1.

For C and Y activation, refer to the scheme logic tables

Table 2-5 and Table 2-6.

2.3.1 AQ101, AQ101D

	Scheme 0				
	T1	T2	T3***	T4***	B01
S1	X	X			X
S2	X	X	X		X
S3	X	X		X	X
S4	X	X	X	X	X
S5**					
BI1*					
BI2	X	X			

Table 2-5: AQ101 scheme 0 protection scheme logics.

*) BI1 is common over current measurement channel. BI1 is necessary to be activated simultaneously with light sensors for making trip with light + current settings. Refer to DIP switch configuration.

**) S5 is optional and may be used as fiber optic sensor input (AQ101 and AQ101D). Refer to the technical manual and ordering codes.

***) T3 and T4 are mainly for fault location identification.

2.3.2 AQ110P

	Scheme 1a								Scheme 1b							
	T1	T2***	T3**	T4**	B01	HS01	HS02	QD	T1	T2***	T3**	T4**	B01	HS01	HS02	QD
S1	X	X			X		X	X	X	X			X		X	X
S2	X	Y	X		X		X	X	X	Y	X		X		X	X
S3	X	Y		X	X		X	X	X	Y		X	X		X	X
S4	X	Y	X	X	X		X	X	X	Y	X	X	X		X	X
S5*	X	Y			X		X		X	Y			X		X	
BI1	X	Y					X	X	X	Y					X	X
BI2	X	Y			X		X	X	X	Y			X		X	X
IL1-3						X								X		
Io						X								X		

Table 2-6: AQ110 scheme 1a and 1b protection scheme logics.

	Scheme 2a							
	T1	T2	T3**	T4**	B01	HS01	HS02	QD
S1	X	X					X	X
S2	X	X	X				X	X
S3	X	X		X			X	X
S4	X	X	X	X			X	X
S5*								
BI1						X		
BI2	X	X					X	X
IL1-3						X		
Io						X		

Table 2-7: AQ110 scheme 2a protection scheme logics.

*) S5 is optional and may be used as fiber optic sensor input or quenching device control. Refer to the technical manual and ordering codes.

**) T3 and T4 are mainly for fault location identification.

***) When DIP switch SW2:4 is set to FAST mode, the trip relay T2 is activated without CBFP function. When DIP switch SW2:4 is set to CBFP mode, the CBFP function activates trip relay T2 if sensor channel (S2, S3, S4) or L> input (BI1, BI2) is activated for more than CBFP set time (100ms or 150ms).

2.3.3 I/O DESCRIPTION

AQ110P	AQ101	I/O Description
IL1 / IL2 / IL3 / Io		Current inputs Phase IL1, IL2, IL3 and E/F Io, measuring current for incomer.
BI1		Receive L> light signal from connected AQ110P
BI2		Receive L> light signal from connected AQ101. In scheme 1a, 2a, it counts the amount of connected AQ101 units while supervising each BO1 connections from AQ101 units. In scheme 1b, it excludes the counting function and triggers the supervision alarm (SF relay) when loss of all connected AQ101 units.
S1		Detect arc flash light for incomer cable compartment.
S2 / S3 / S4		Detect arc flash light for - incomer switching device and cable compartment - feeder busbar compartment and cable compartment.
HSO1		Send I> overcurrent signal to connected AQ101 units; In normal operation, it is used to synchronize all connected AQ101 units.
HSO2		Send MT signal to connected AQ101 units; When it activates, the connected AQ101 units activate T1 and T2 trip relays.
BO1		Send sensor channel (S1, S2, S3, S4) and binary input (BI2) L> signal to connected AQ110P.
T1		Trip relay for incomer circuit breaker.
T2		Trip relay for incomer upstream circuit breaker.
T3 / T4		Trip relays mainly for fault location identification.
	BI1	Receive I> overcurrent signal from connected AQ110P.
	BI2	Receive MT signal from connected AQ110P.
	S1/S2/S3/S4	Detect arc flash light for feeder busbar compartment, switching device compartment and cable compartment.
	BO1	Send sensor channel (S1, S2, S3, S4) to connected AQ110P. In normal operation, it is used to send feedback pulse to connected AQ110P.
	T1/T2	Trip relay for feeder circuit breaker or bussectionalizer circuit breaker if available.
	T3/T4	Trip relays mainly for fault location identification.

3 OPERATION

3.1 AQ101, AQ101D, AQ110P ARC FLASH PROTECTION RELAYS

3.1.1 LED INDICATORS

All the devices contain LED indicators for operating states as per the latter definitions.

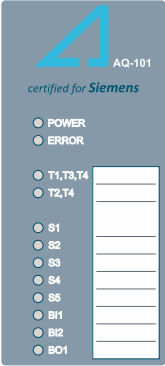
	LED	Color	OFF	Steady ON	Blinking
	Arcteq logo	Blue	Auxiliary supply disconnected	Auxiliary power connected	N/A
	Power	Blue	Auxiliary supply disconnected	Auxiliary power connected	N/A
	Error	Red	System healthy	System failure	Configuration mismatch. Protection partly operational
	T1, T3, T4	Red	Normal status	Trip relays T1,T3,T4 activated	N/A
	T2, T4	Red	Normal status	Trip relays T2, T4 activated	N/A
	S1	Amber	Normal status	Corresponding sensor channel activated.	Corresponding sensor channel have loose connection or system set-up not performed
	S2 / S3 / S4 / S5	Amber	Normal status	Corresponding sensor channel activated.	Corresponding sensor channel have loose connection or system set-up not performed;
	BI1 / BI2	Amber	Normal status	Corresponding binary input activated	Corresponding binary input lost connection
	BO1	Amber	Normal status	Binary Output activated	N/A

Table 3-1: AQ101, AQ101D LED indications definition.

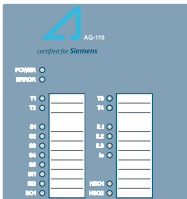
	LED	Color	OFF	Steady ON	Blinking
	Arcteq logo	Blue	Auxiliary supply disconnected	Auxiliary power connected	N/A
	Power	Blue	Auxiliary supply disconnected	Auxiliary power connected	N/A
	Error	Red	System healthy	System failure	Configuration mismatch. Protection partly operational.
	T1 / T2 / T3 / T4	Red	Normal status	Corresponding trip relay activated	N/A
	S1	Amber	Normal status	Corresponding sensor channel activated.	Corresponding sensor channel have loose connection or system set-up not performed.
	S2 / S3 / S4	Amber	Normal status	Corresponding sensor channel activated.	Corresponding sensor channel have loose connection or system set-up not performed;
	S5 (AQ110P)	Amber	Normal status	Corresponding sensor or quenching device channel activated.	Corresponding sensor channel have loose connection or system set-up not performed;
	BI1 / BI2	Amber	Normal status	Corresponding binary input activated	Corresponding binary input have loose connection
	BO1	Amber	Normal status	Binary Output activated	N/A
	IL1 / IL2 / IL3	Amber	Normal status, measured current below set point	Corresponding current channel above set point. Overcurrent stage activated.	Unbalance alarm, corresponding channel CT connection is open, corresponding channel activated for over 10s
	Io	Amber	Normal status, measured current below set point	Residual current above set point. Overcurrent stage activated.	N/A
	HSO1 / HSO 2	Red	Normal status	HSO channel activated.	N/A

Table 3-2: AQ110P LED indications definition.

3.1.2 TEXT POCKET

All devices contain a text pocket for entering sensor specific information. Text pocket can be slide out and texts can be entered with a pen or with ready print paper or label.

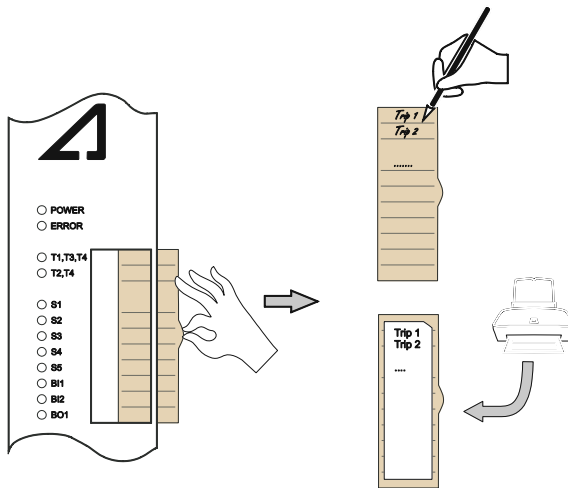


Figure 3-1: Using text pocket.

3.1.3 SET BUTTON

All devices contain a set button in the front panel, which is used for installing the system, checking the number of connected sensors and units, resetting the device after trip event and clear the alarm signals.



Figure 3-2: Set button.

Function	Instruction	Indications
Install (add binary input or sensor amount) the system configuration	Press the button for 3 seconds	All connected inputs LED's lit steadily during installation.
Install (reduce binary input or sensor amount) the system configuration	Switch any DIP switch back and forth one time, press the button for 3 seconds	All connected inputs LED's lit steadily during installation.
Clear the alarm signals	Press the button once	Respective blinking led indicators turns off
Check the number of installed sensors and unit connections (Binary inputs) *	Press the button 3 times within 2 seconds.	Corresponding connected input LED blinks showing amount of connected units and sensors.
Reset after trip or sensor or binary input activation	Press the button once	Corresponding activated signals and LED's turns off. Also latched outputs resets.

Table 3-3: Set button function vs. indication behaviors.

*) Only available at AQ101, AQ101D and AQ110P.

3.2 AQ01 ARC FLASH SENSOR

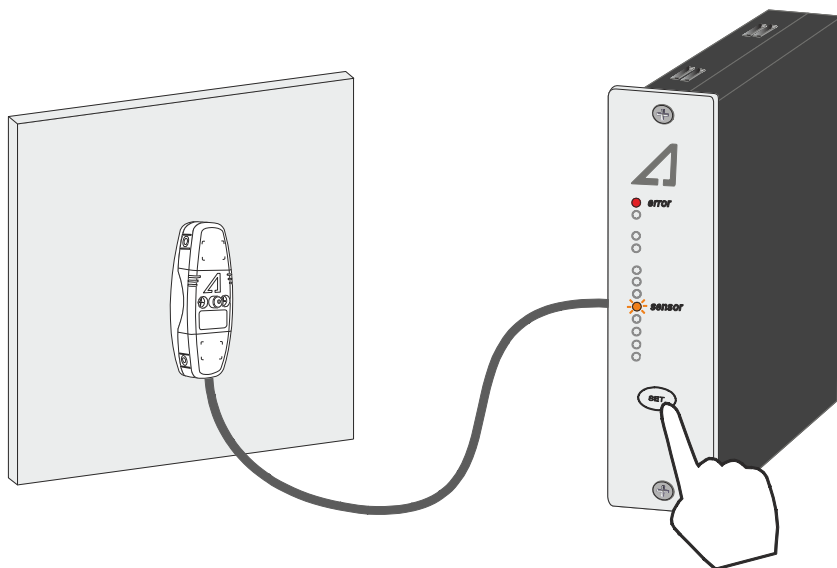


Figure 3-3: AQ01 sensor configuration



Sensor connectors are located at both ends of the sensor for series connecting maximum three sensors in one line.

After connecting the sensor to relay, the ERROR LED turns on, and the appropriate sensor channel LED starts to blink.

Press and hold the SET button on the front panel for 3 seconds to run system auto-configuration setting.

See configuration related technical instructions in chapter 3.1.3.

4 COMMISSIONING

4.1 AQ101, AQ101D, AQ110P ARC FLASH PROTECTION RELAYS

4.1.1 SYSTEM INSTALLATION

When all the connections are done, the system shall be commissioned by installing the devices one by one by pressing the set button according to the instructions on chapter 3.1.3.

4.1.2 CURRENT MEASUREMENT (AQ110P ONLY)

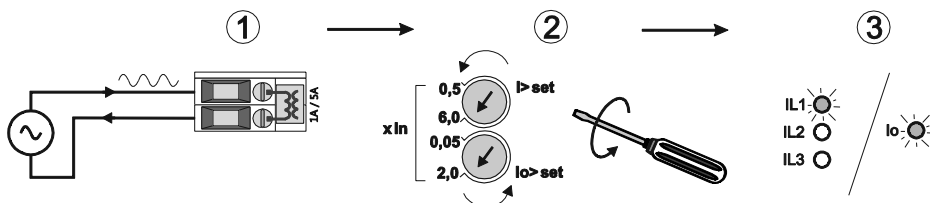


Figure 4-1: Current measurement commissioning procedure.

Current measurement channels should be adjusted to the pick-up setting value by:

- 1) Injecting the current level of desired pick-up value to IL1 and Io separately.
- 2) Starting from maximum setting, adjusting the potentiometer slowly down.
- 3) Corresponding current measurement channel LED lights steadily when the activation with injected current has occurred.



IL1 – IL3 measurement channels have a common adjustment potentiometer “I>set”. Therefore, each current channel is not necessary to commission separately. Alternatively, channels IL1 – IL3 can be injected with the same current in serial connection. After successful commissioning, the device has to be re-installed according to the instructions on chapter 3.1.

Light channel activation

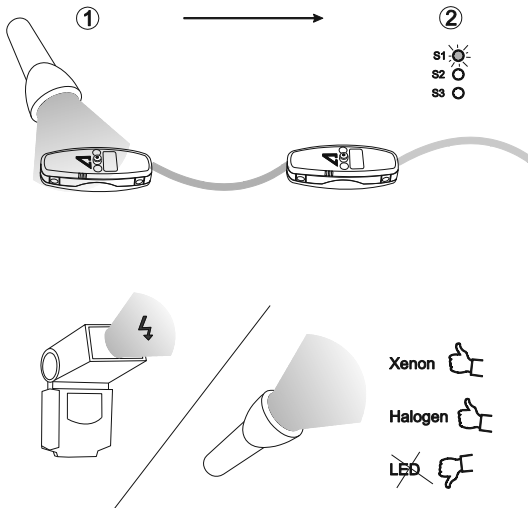


Figure 4-2: Light channel activation.

Light channels are commissioned by applying strong light to the light sensor detector area. The same procedure applies also for fiber sensors.

- 1) Applying light to the sensor.
- 2) Corresponding light sensor channel LED lights steadily when light has been detected.



Use strong, non-LED, light source for light channel activation. Light sensors are available with different sensitivity levels. Least sensitive sensors require stronger light source. Refer to sensor ordering codes. Activation longer than 3s will initiate self-supervision error. Refer to trouble shooting and LED indications.

4.1.3 ACTIVATION OF OUTPUTS (TRIPPING)

Activation of output relays, electrical binary outputs and high-speed outputs (AQ110P only) is dependent on the application scheme of each device. Refer to chapter 2.3 for definition of scheme logics and related LED indicators in chapter

Error! Reference source not found..



Activation of outputs from light or light + current modes are chosen with dip switches. Refer to chapter 2.1

5 ARC PROTECTION APPLICATIONS

5.1 ONE INCOMER

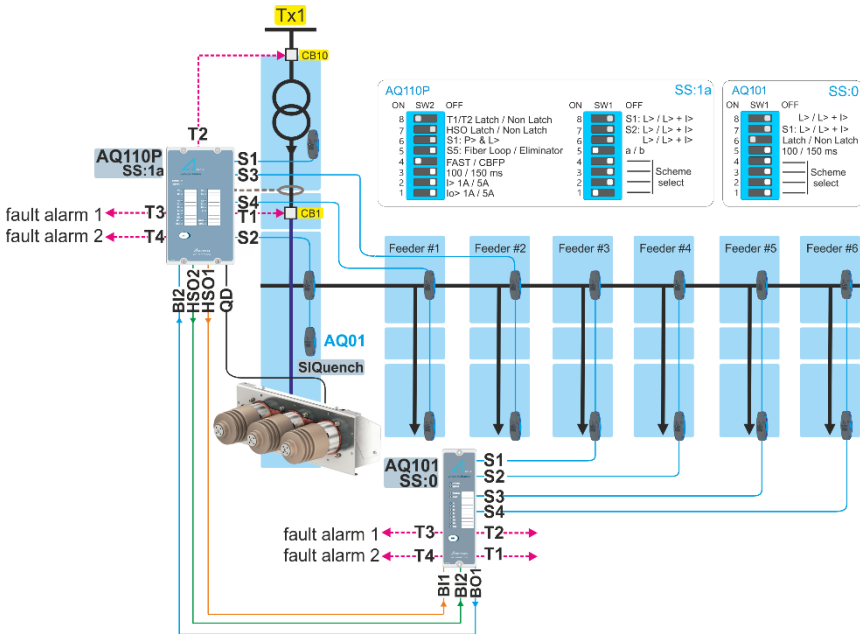


Figure 5-1: One incomer application

5.2 TWO INCOMERS WITHOUT TIE BREAKER

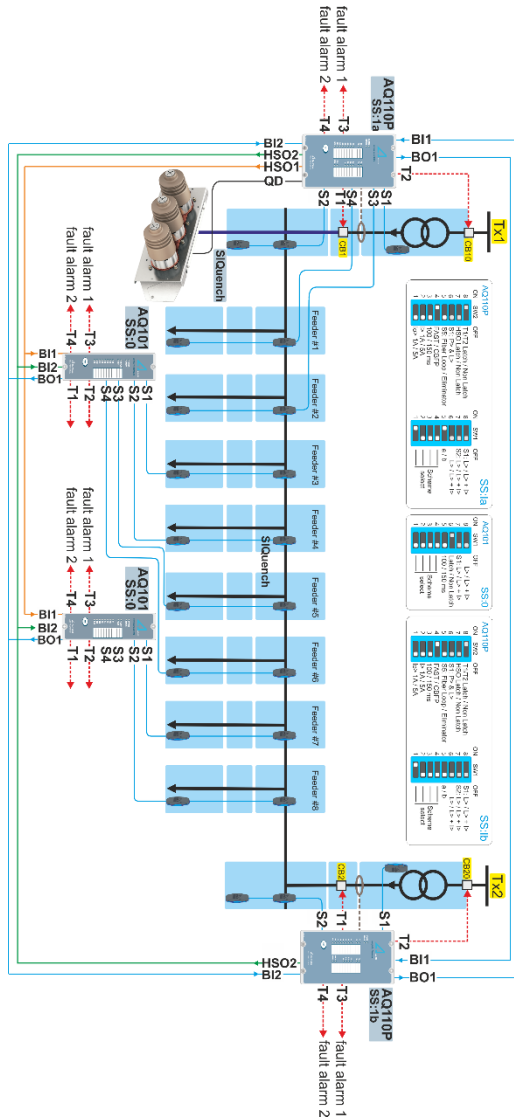


Figure 5-2: two incomers without tie breaker application

5.3 TWO INCOMERS WITH TIE BREAKER

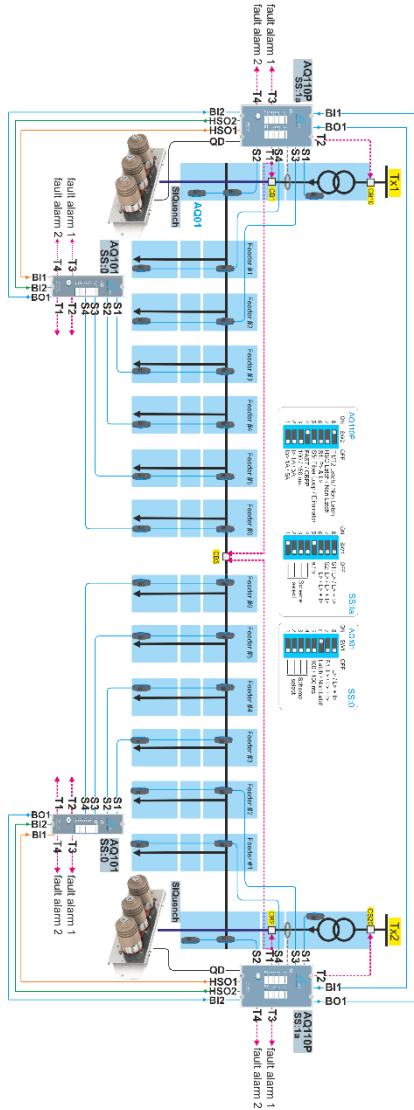


Figure 5-3: Two incomers with tie breaker application

5.4 TWO INCOMERS WITH TIE BREAKER

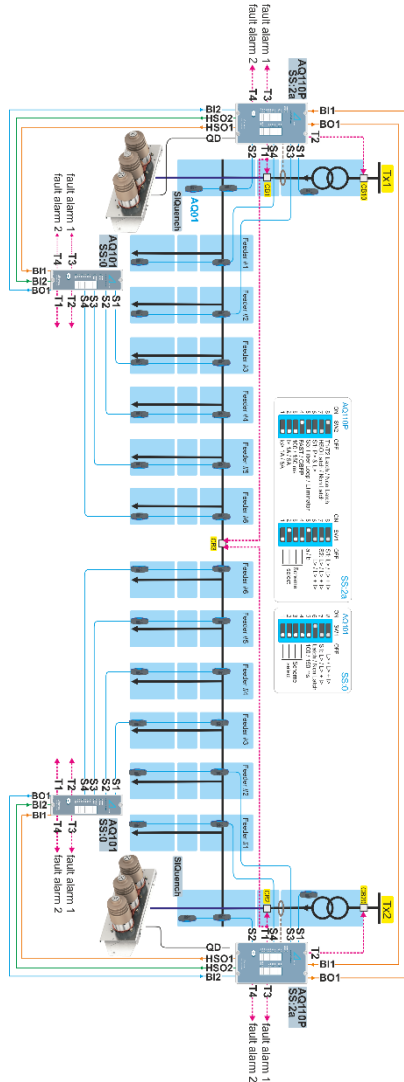


Figure 5-4: Two incomers with tie breaker application

6 TROUBLE SHOOTING

6.1 AQ101, AQ101D, AQ110P ARC FLASH PROTECTION RELAYS

Led:	State	Error led state	IF relay state	Possible issues
Binary input or Sensor	Blink	ON	OFF	- Bad connection between sensors or other devices connected to BI - Damaged wire - Unit amount or sensor amount changed
Others than error	OFF	ON	OFF	- Dip switch settings changed or current pick-up potentiometer value changed > 20% (AQ110P only)
Power	OFF	ON	OFF	- Internal voltage too low. Auxiliary supply voltage may be less than specified
	Blink	OFF	OFF	- Input channels (binary inputs and sensor channel) connection verification. See set button function in chapter 3.1.3.
All	OFF	OFF	OFF	- Auxiliary supply voltage not connected.

Table 6-1: troubleshoot function description.

7 TECHNICAL DATA

7.1 AQ101, AQ101D, AQ110P ARC FLASH PROTECTION RELAYS

7.1.1 MOUNTING AND INSTALLATION

Panel material: Panel thickness (min-max):	Metal panel 1.0 – 5 mm / 1/16" – 13/64"
Panel mounting screw type: Key size: Tightening torque (min-max):	ISO 14581-M4x12 galvanized Torx T20 1.5 – 2.0 Nm / 13 – 18 in-lbs
Grounding nut type: Key size: Tightening torque (min-max):	DIN934-M5 galvanized 8 2.5 – 3.0 Nm / 22 – 26 in-lbs
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 / 24-12 AWG 7 mm / 0.275" 0.5 – 0.6 Nm / 4.4 – 5.3 in-lbs
Connector X3 (AQ110P only) Wire cross section (solid and multicore) (min-max): Minimum stripping length: Screw tightening torque (min-max):	0.5 – 6.0 mm ² / 20 – 10 AWG 14 mm / 0.55" 0.5 – 0.6 Nm / 4.4 – 5.3 in-lbs
Fiber connectors Nut tightening torque:	Light finger tightening

7.1.2 OPERATION TIMES

Tripping time using HSO (AQ110P only):	2 ms*
Tripping time using mechanical relays (T1-T4):	7 ms*
Reset time Light activation: Overcurrent measurement (AQ110P only):	1 ms 50 ms
Protection stages active after energization:	50 ms (typically)

*) Total trip time using arc light (L>) or phase/residual overcurrent (I>) and arc light (L>)

7.1.3 AUXILIARY VOLTAGE

Us (min-max): Us (nominal)	85 – 265V AC / DC 110, 220 V DC, 110, 115, 220, 230 V AC 50/60 Hz
	18 – 72 V DC 24, 36, 48, 60 V DC
Maximum interruption in normal operating state:	100 ms
Maximum power consumption:	5W (AQ110P) 4W (AQ101, AQ101D)

7.1.4 CURRENT MEASUREMENT CIRCUITS IL1-IL3, IO (AQ110P ONLY)

Nominal current	1 or 5A
Rated Frequency	2…1000Hz
Number of inputs	3 (phase) + 1 (residual)
Thermal withstand continuous	30A
Thermal withstand 1s	500A
Thermal withstand 10s	100A
Phase overcurrent setting range	0.5…6 x In
Residual overcurrent setting range	0.05…2 x In
Measurement accuracy	10%
Rated AC Burden (VA)	Input resistance <10mΩ

7.1.5 TRIP RELAYS T1, T2, T3, T4

Number	3 NO + 1 NC or 4 NO
Rated voltage	250V ac/dc
Continuous carry	5A AC / DC
Make and carry for 0.5s	30A DC
Make and carry for 3s	16A DC
Breaking capacity DC, when time constant L/R=40ms	40W (0.36A at 110 V DC)
Contact material	AgNi 90/10

7.1.6 HIGH SPEED OUTPUTS HSO1, HSO2 (AQ110P ONLY)

Number	2
Rated voltage	250 V DC
Continuous carry	0.5 A
Make and carry for 0.5s	15 A DC
Make and carry for 3s	6 A DC
Make and carry for 20s	2 A DC
Breaking capacity DC, when time constant L/R=40ms	110W (1A at 110V DC)
Contact material	Semiconductor

7.1.7 BINARY OUTPUT BO1

Number of outputs	1
Rated voltage	24 V DC (internally supplied)
Maximum burden	20mA / 480 mW

7.1.8 BINARY INPUTS BI1, BI2

Number of inputs	2
Rated voltage	24 or 110 or 220Vdc *
Rated burden	3 mA

*) Refer to the ordering codes.



Binary inputs are galvanically isolated from the device grounding. Attention shall be paid for avoiding galvanic loops via binary input ground.

7.2 AQ01 ARC FLASH SENSOR

Supply voltage	24Vdc
Supply current (standby)	2mA
Pick up time ¹	<1ms
Sensor cable specification	Shield twisted pair Size: 0.5 ~ 0.75mm ² , AWG: 18 ~ 20 Cable cover: Ø 4.5 ~6.0 mm
Max. sensor cable length per sensor channel	200 meters
Operating temperature	-20°C ~ 85°C
Storage temperature	-20°C ~ 85°C
Mechanical protection for photodiode element	IP60
Mounting (screw, pop rivet):	e.g. Phillips Pan-head sheet metal screw, Diameter: M3, Length: 20mm.
Dimensions (W x H x D)	90.0 x 27.5 x 32.5 mm
Weight	20 g

¹: Time for activation after exceeding the set light intensity level.

8 DIMENSIONS

8.1 AQ101, AQ101D, AQ110P ARC FLASH PROTECTION RELAYS

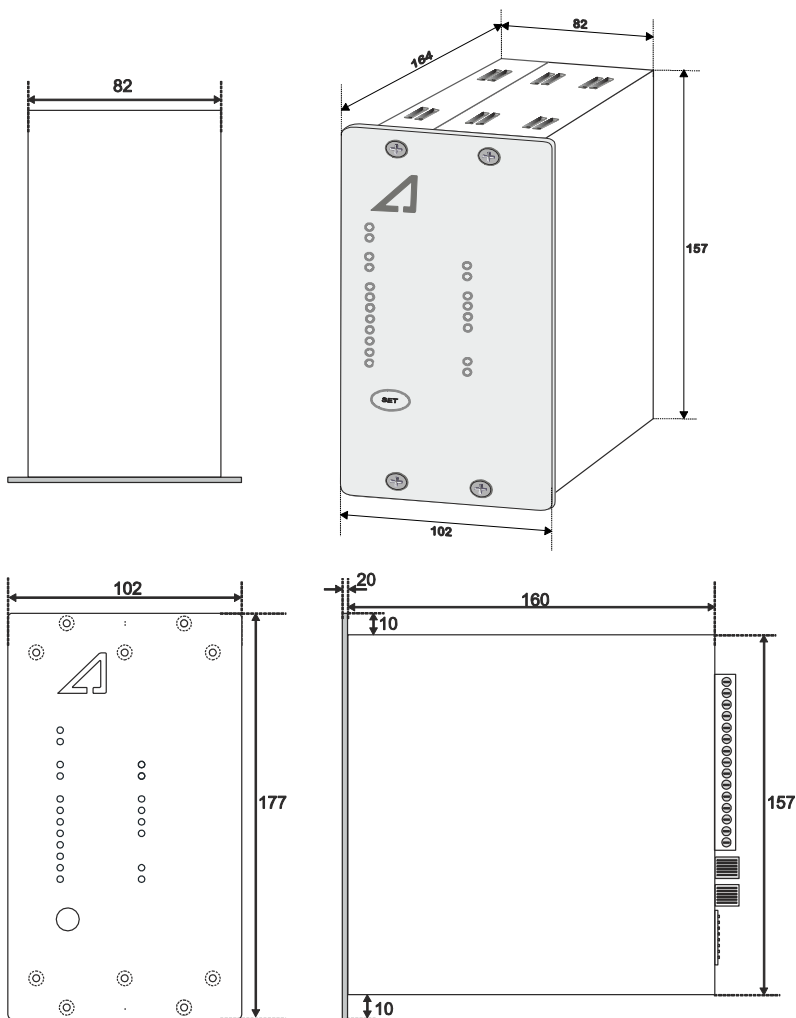


Figure 8-1: AQ110P device dimensions, all dimensions in millimeters.

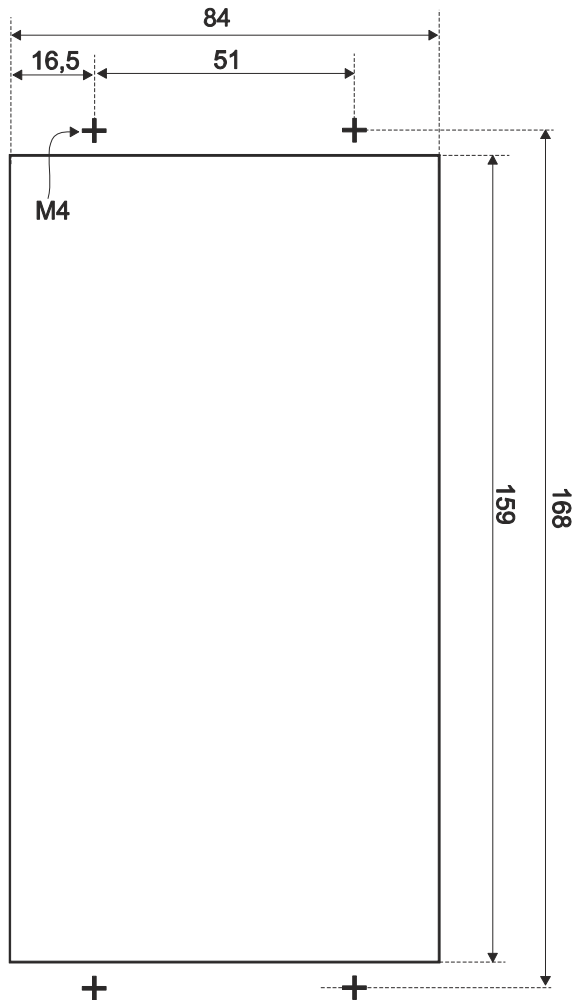


Figure 8-2: AQ110P cut out for panel mounting, scaling in millimeter.

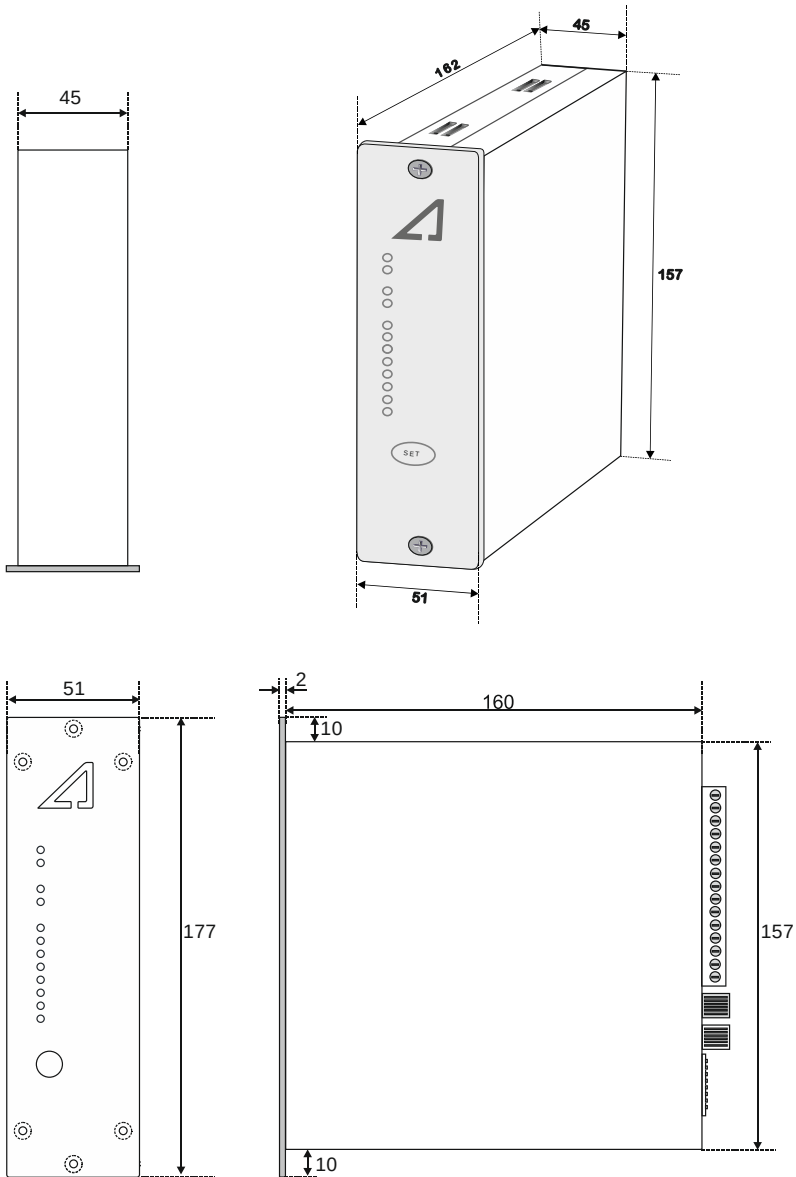


Figure 8-3: AQ101 device dimensions, all dimensions in millimeters.

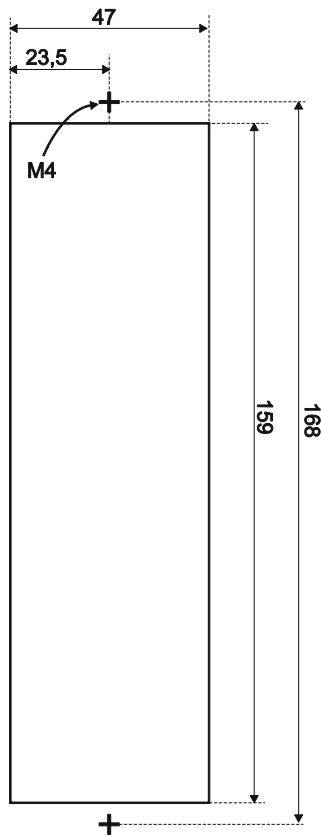


Figure 8-4: AQ101 cut out for panel mounting, scaling in millimeter.

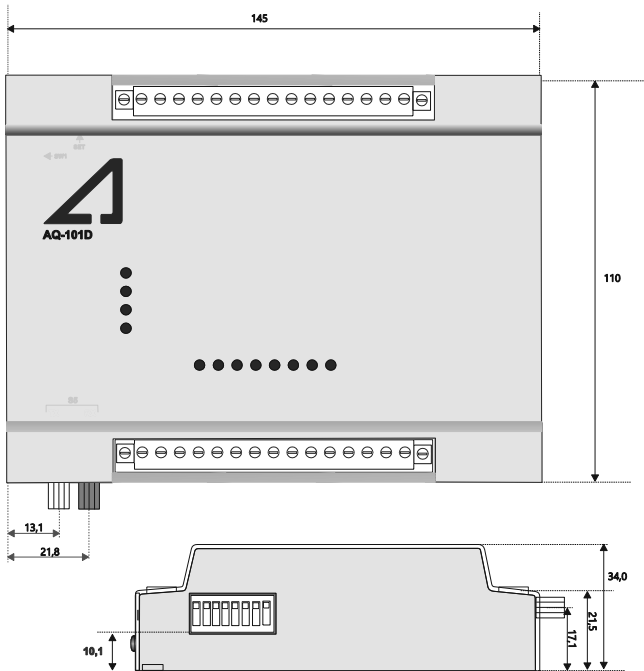


Figure 8-5: AQ101D device dimensions, all dimensions in millimeters.

8.2 AQ01 ARC FLASH SENSOR

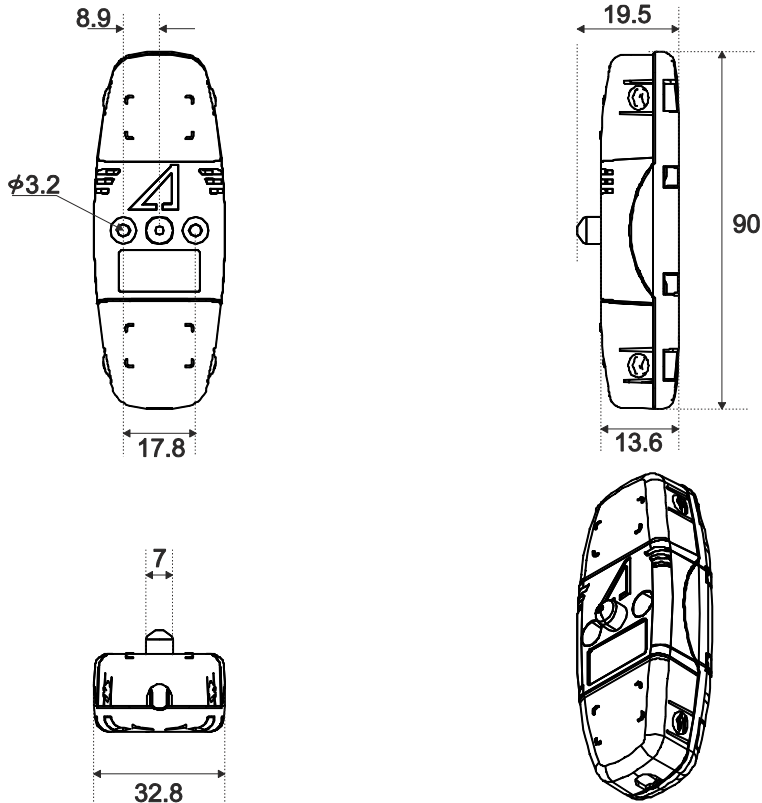
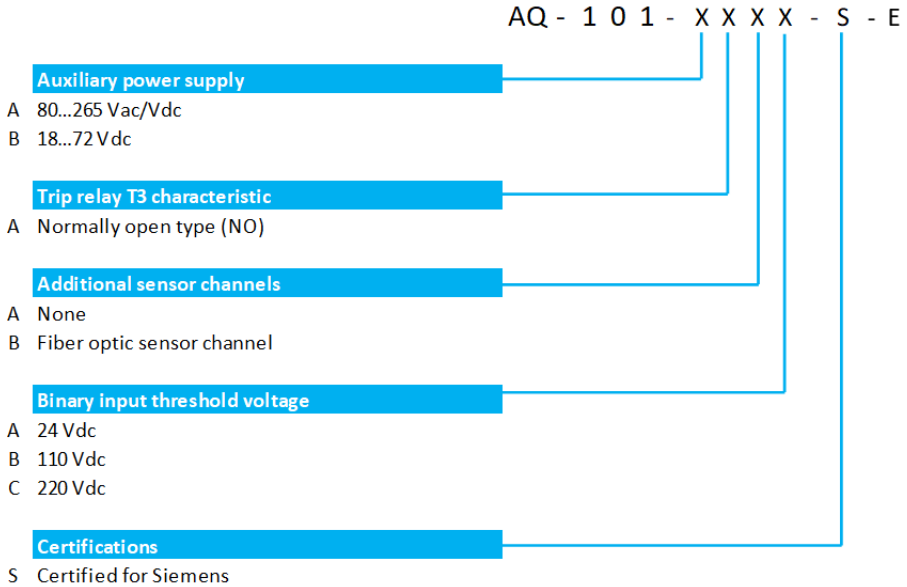


Figure 8-6: AQ01 sensor dimensions, all dimensions in millimeters.

9 ORDERING CODES

9.1 AQ101, AQ101D, AQ110P ARC FLASH PROTECTION RELAYS



AQ - 1 0 1 D - X X X X - S - E

Auxiliary power supply

- A 80...265 Vac/Vdc
- B 18...72 Vdc

Trip relay T3 characteristic

- A Normally open type (NO)

Additional sensor channels

- A None
- B Fiber optic sensor channel

Binary input threshold voltage

- A 24 Vdc
- B 110 Vdc
- C 220 Vdc

Certifications

- S Certified for Siemens

AQ - 1 1 0 X - X X X X - S - E

Sensor card version

P Point sensor unit

Auxiliary power supply

A 80...265 Vac/Vdc

B 18...72 Vdc

Trip relay T3 characteristic

A Normally open type (NO)

Arc quencher option

A None

B Fiber optic sensor channel for SIQuench

Binary input threshold voltage

A 24 Vdc

Certifications

S Certified for Siemens

9.2 AX001 CONNECTION FIBER

Connection fiber lenght 3m

A X 0 0 1 - 3

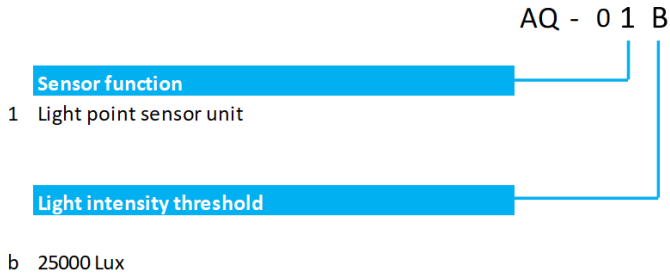
Connection fiber lenght 5m

A X 0 0 1 - 5

Connection fiber lenght 10m

A X 0 0 1 - 10

9.3 AQ01 ARC FLASH SENSOR



10 REFERENCE INFORMATION

Manufacturer information:

Arcteq Relays Ltd. Finland

For more information regarding SIQuench® arc quenching device, please contact:

Siemens Customer Support Center:

Tel.: +49 180 524 70 00

Fax: +49 180 524 24 71

(Charges depending on provider)

E-mail: support.energy@siemens.com