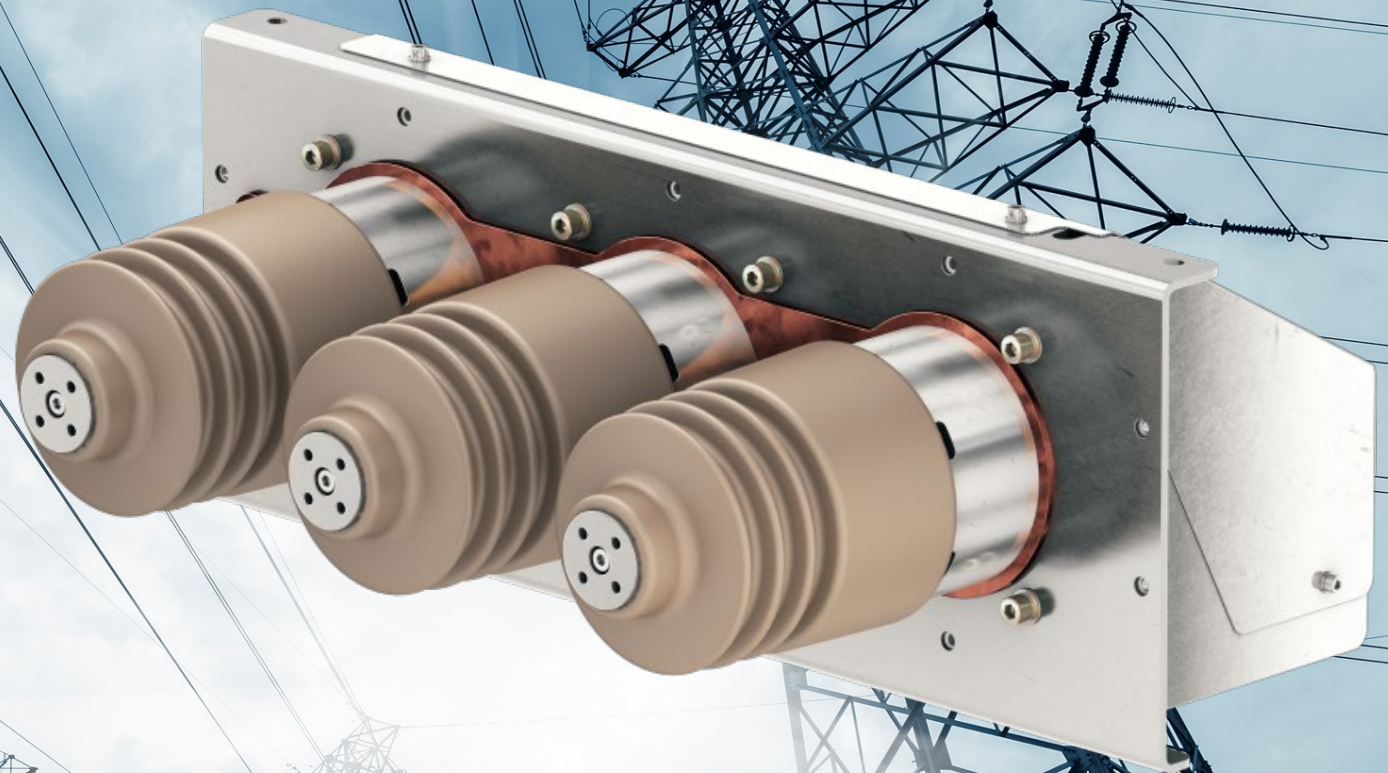
SiQuench

The resettable
Arc Quenching Device
Launch



Mikko Manninen 09.03.2021

ARCTEQ®
RELAYABLE POWER

Arc Flash

Phenomena

Arc Protection AQ100 – SiQuench Launch Program 2021

WELCOME

Arc Flash : Uncontrolled release of energy, can be considered as an Explosion

Controlled Arc has been used in several applications since 1809 after Arc lamp was invented. Almost 80 years later Arc welding was patented and todays infrastructure and our way of life has a lot to thank for that.

Uncontrolled Arc and it´s energy we want to limit with such inventions like Arc Flash relays and with Arc Quenching Devices – Safety matters

Phenomena – High Pressure

- High Pressure from an Arc generates from two sources

- 1. Air expanding >1600 times

- 2. Copper expands by a factor of 67000 in vaporizing
- Shrapnel and molten metal explodes ~1000 km/hour

Imagine to compare with water boiling to steam - 1670 times more volume

Phenomena – Intensive Light

- Arc Flash Contains UV and IR spectrum waves and may damage eyesight permanently

- causes inflammation of the cornea and can burn the retinas of the eyes

- Think about Arc welding without proper goggles. – splinters in the eyes all night and no sleep

Phenomena – Sound waves and Hot temperatures

- Permanent hearing loss cause of high dB sound waves
- Arc flash ~4 times the temperature of the sun surface.
- 20000K, but special types of arcs can reach upto 50000K

SiQuench

Arc Quenching Device

Part of the Arc Protection

AQ 100 series (MV)

MEDIUM VOLTAGE PRODUCTS

AQ-110P CURRENT AND LIGHT POINT SENSOR UNIT

Flush mounted current and light sensing main unit

4 current inputs, up to 12 light detectors and one light detecting fiber

AQ-110F CURRENT AND FIBER SENSOR UNIT

Flush mounted current and light sensing main unit

4 current inputs, up to 3 light detecting fibers

AQ-102 FIBER SENSOR UNIT

Flush mounted light sensing unit installed as sub-unit to AQ-110F or standalone for light only system

Up to 3 light detecting fibers

AQ-101 POINT SENSOR UNIT

Flush mounted light sensing unit installed as sub-unit to AQ-110P or standalone for light only system

Up to 12 light detectors and one light detecting fiber

AQ-101S POINT SENSOR UNIT (double BB /duplex)

Light sensing unit for double busbar applications. Installed as sub-unit to AQ-110P or standalone for light only system

Up to 12 light detectors

AQ-101D POINT SENSOR UNIT

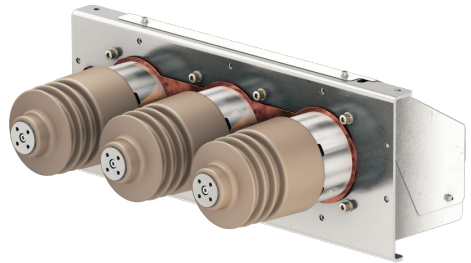
Din rail mounted light sensing unit installed as sub-unit to AQ-110P or standalone for light only system

Up to 12 light detectors and one light detecting fiber

AQ-103 POINT SENSOR UNIT

Flush mounted light sensing unit

Up to 14 light detectors and one light detecting fiber



SiQuench AQD

Resettable AQD

Up to 24kV
50kA 3sec.

ARCTEQ®
RELAYABLE POWER

AQ 100 series (MV)

Arc Relays with Current option

MEDIUM VOLTAGE PRODUCTS

AQ-110P CURRENT AND LIGHT POINT SENSOR UNIT

Flush mounted current and light sensing main unit

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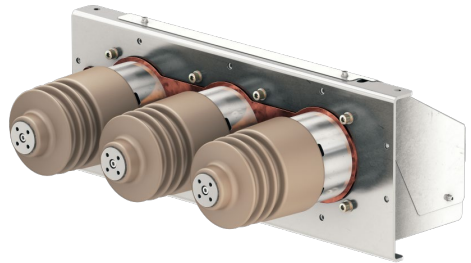
AQ-103 POINT SENSOR UNIT

Flush mounted light sensing unit

Up to 14 light detectors and one light detecting fiber



SiQuench AQD

Resettable AQD

Up to 24kV
50kA 3sec.

ARCTEQ®
RELAYABLE POWER

AQ 100 series (MV)

Arc Relays with point sensor option

MEDIUM VOLTAGE PRODUCTS

AQ-110P CURRENT AND LIGHT POINT SENSOR UNIT

Flush mounted current and light sensing main unit

4 current inputs, up to 12 light detectors and one light detecting fiber

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Flush mounted light sensing unit

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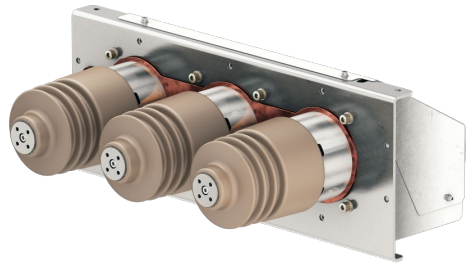

SiQuench AQD

Resettable AQD

Up to 24kV
50kA 3sec.

ARCTEQ®
RELAYABLE POWER

AQ 100 series (MV)

Arc Relays with fiber sensor option

MEDIUM VOLTAGE PRODUCTS

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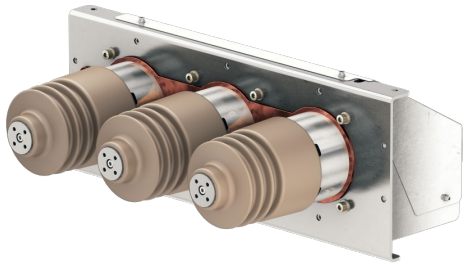
Up to 12 light detectors and one light detecting fiber

AQ-103 POINT SENSOR UNIT

Flush mounted light sensing unit

Up to 14 light detectors and one light detecting fiber



SiQuench AQD

Resettable AQD

Up to 24kV
50kA 3sec.

ARCTEQ®
RELAYABLE POWER

AQ 100 series (MV)

Arc Quenching Unit

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Up to 12 light detectors and one light detecting fiber

AQ-103 POINT SENSOR UNIT

Flush mounted light sensing unit

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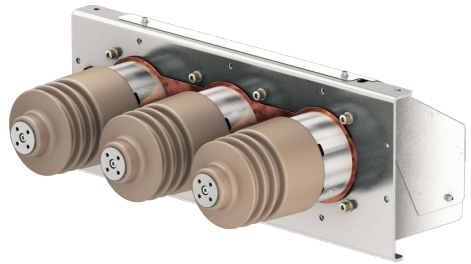


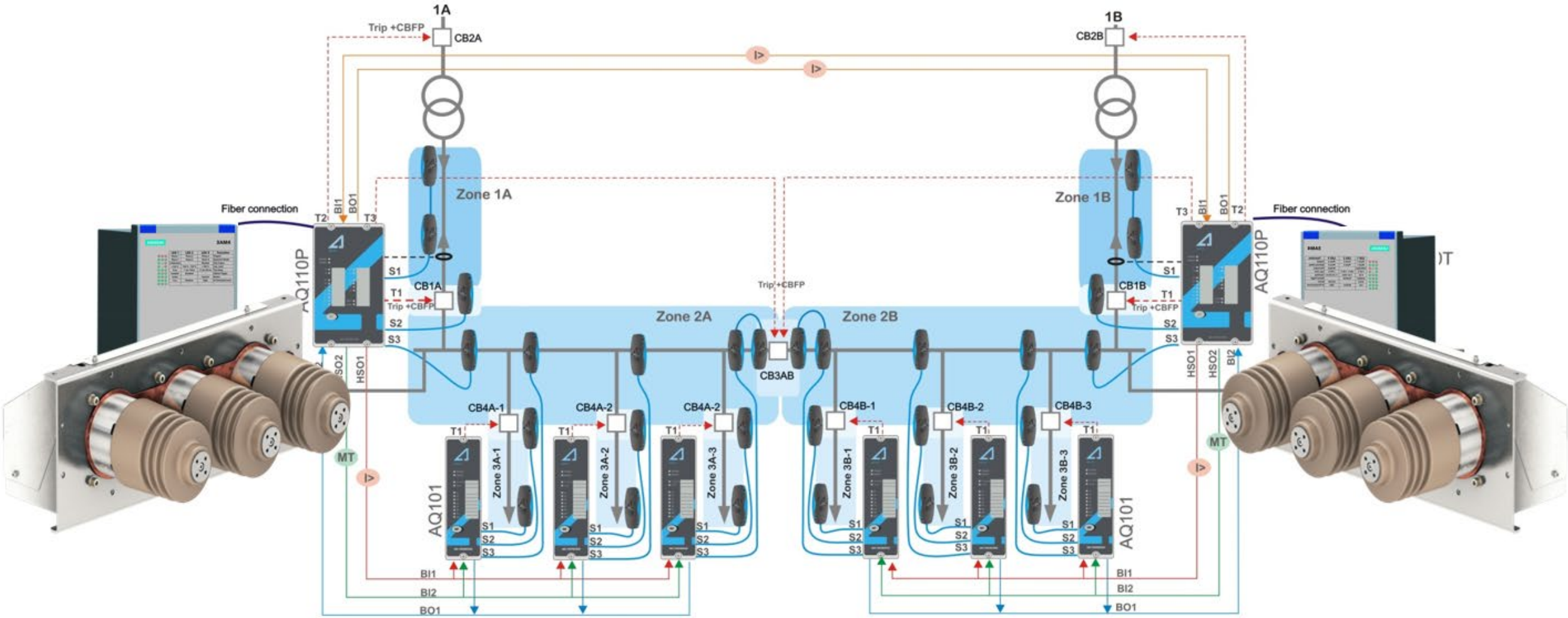
SiQuench AQD

Resettable AQD

Up to 24kV
50kA 3sec.

ARCTEQ®
RELAYABLE POWER

SIQuench Arc Quenching Device

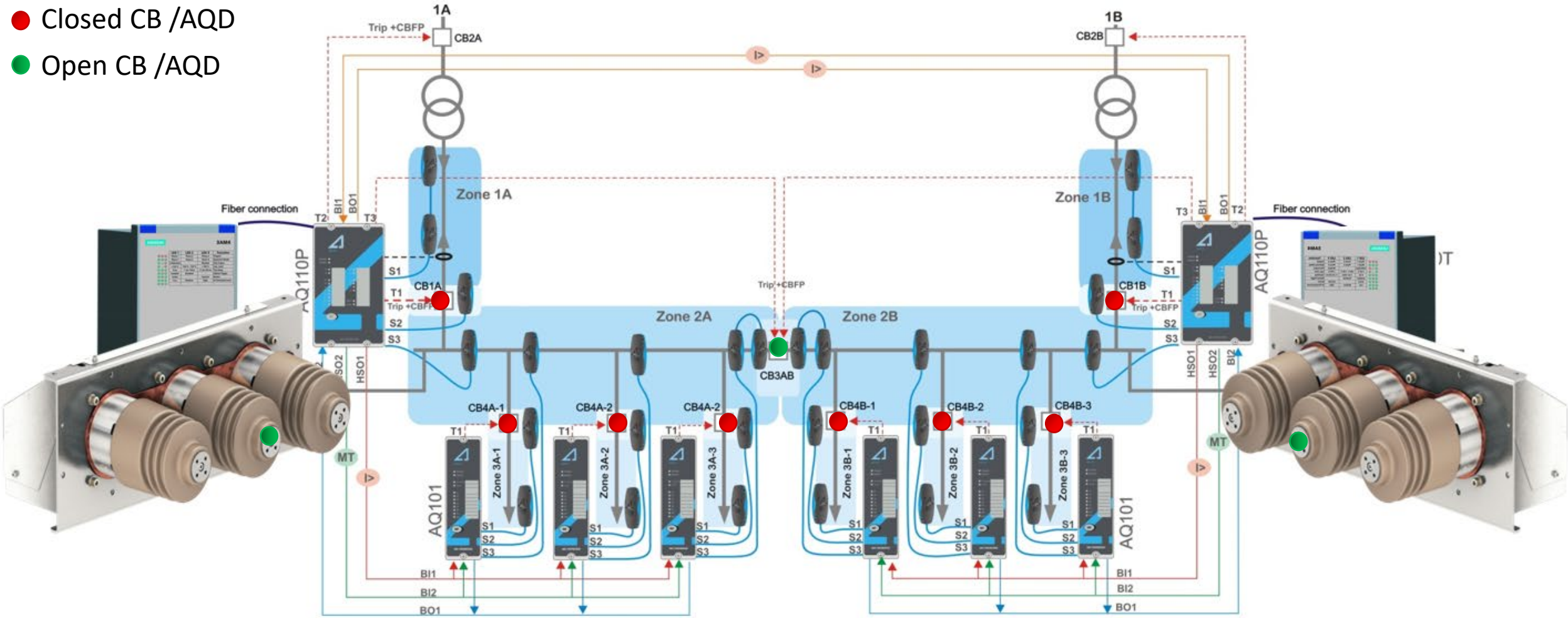


Full feeder selectivity

ARCTEQ®
RELAYABLE POWER

SIQuench Arc Quenching Device

- Closed CB /AQD
- Open CB /AQD

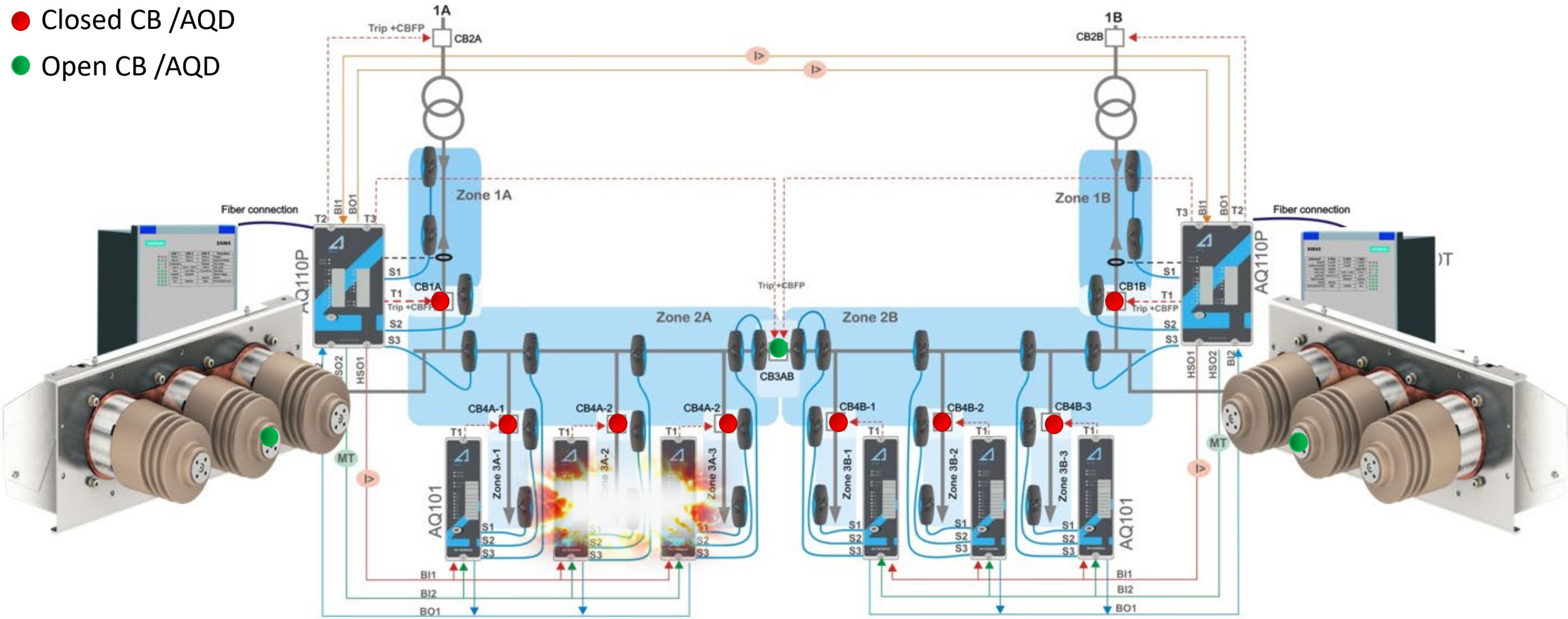


Full feeder selectivity

ARCTEQ®
RELAYABLE POWER

SIQuench Arc Quenching Device

- Closed CB /AQD
- Open CB /AQD

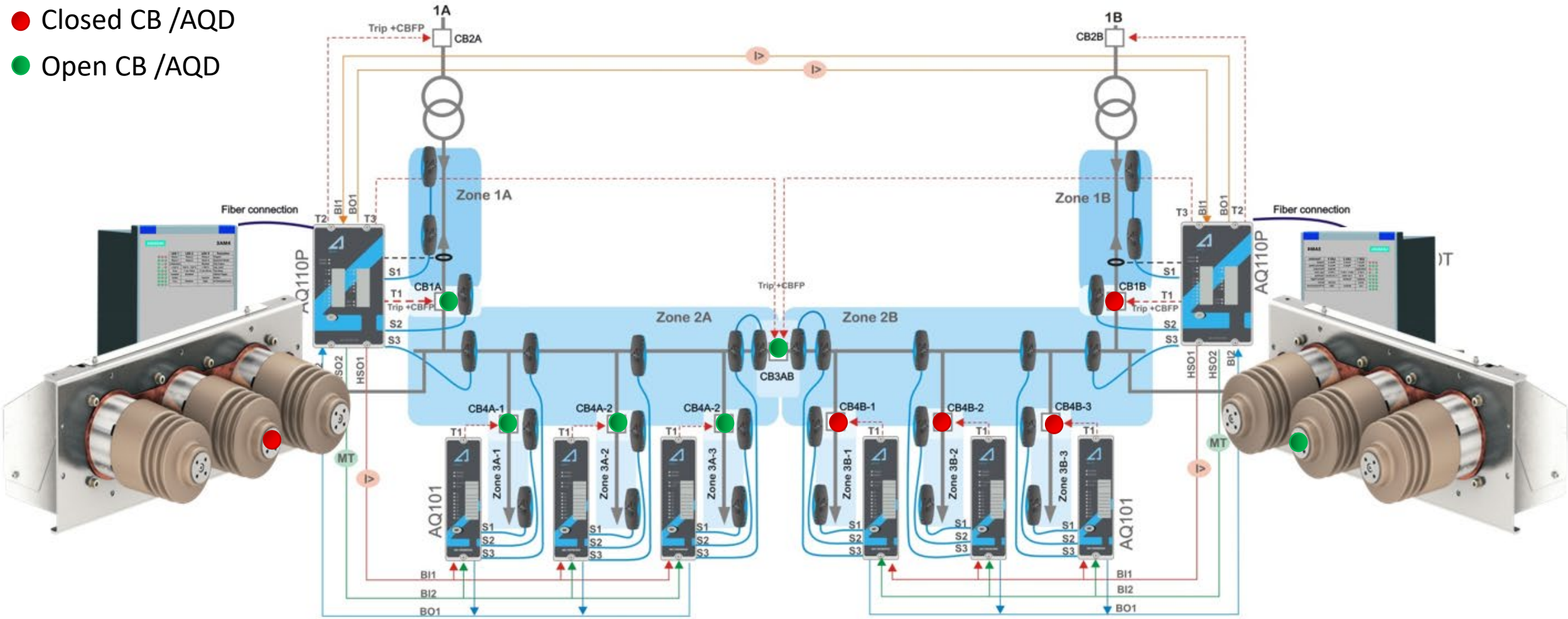


Full feeder selectivity

ARCTEQ®
RELAYABLE POWER

SIQuench Arc Quenching Device

- Closed CB /AQD
- Open CB /AQD

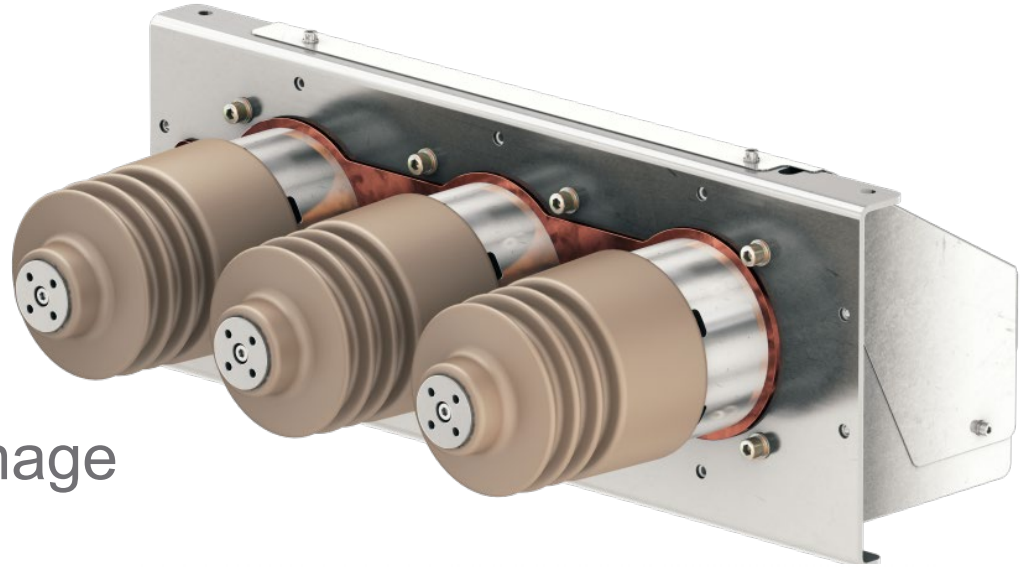


Full feeder selectivity

ARCTEQ®
RELAYABLE POWER

SiQuench

- Minimize Arc fault Energy
- To maximize personnel safety
- To minimize downtime and equipment damage



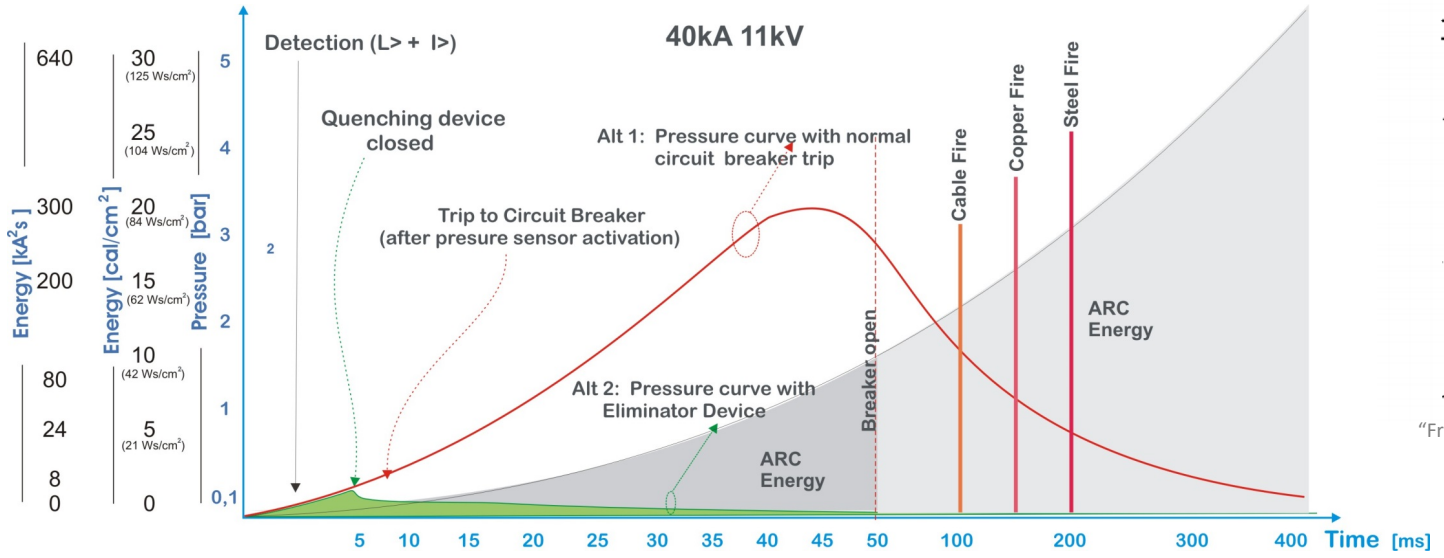


TABLE I
MAXIMUM POWER IN THREE PHASE ARC, MW

Bolted Fault kA	System Voltage, kV					
	0.48	2.4	4.2	7.2	13.2	34.5
1	0.42	2.0	3.6	6.3	11.4	29.8
2	0.83	4.2	7.2	12.5	22.8	59.6
3	1.25	6.2	10.8	18.7	34.8	91.0
5	2.08	10.3	18.0	31.2	57.1	149.2
10	4.15	20.8	36.0	62.3	114.2	295.5
15	6.23	31.1	54.0	93.4	171.3	447.7
20	8.3	41.5	72.0	120.5	228.3	596.7
30	12.5	62.2	108.0	186.8		
40	16.6	83.0	144.0			
50	20.8	103.8	180.0			

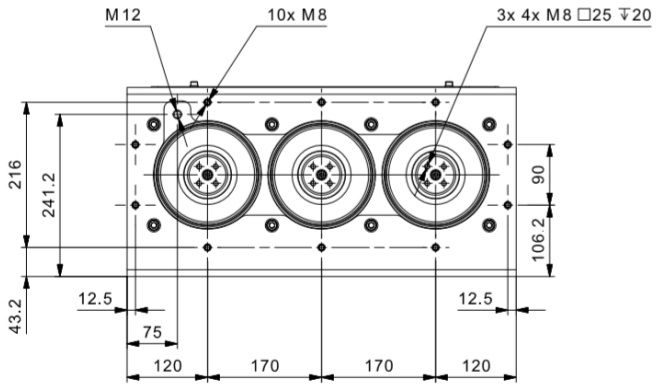
"From: IEEE Member Ralph H. Lee paper "The Other Electrical Hazard: Electric Arc Blast Burns"

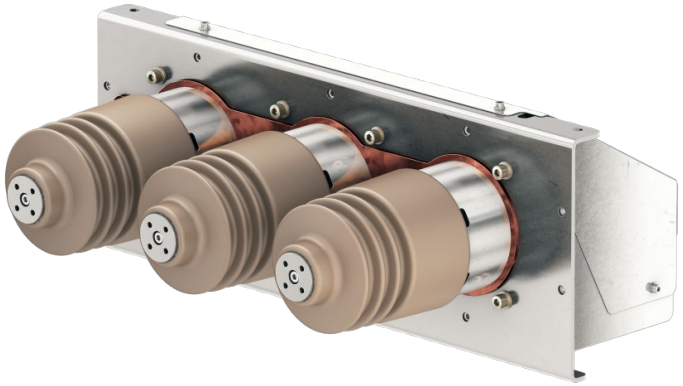
ARCTEQ®
RELAYABLE POWER

SiQuench Dimensions PMA210

3AM4132-1DA12-0AB2-Z

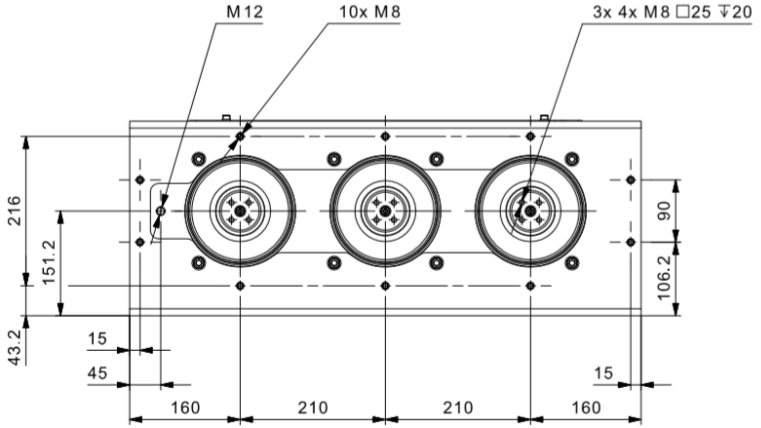
Arc quenching device (17,5kV)
Controller (trigger device) included
31,5 kA - 3s
BIL: 95 kV
Phase conductor displacement: 170 mm, total width 580 mm
Reusable: 30 mechanical operations, 5 operations under fault current
Connection cables between trigger device and quenching device included
Auxiliary supply 110 - 250 Vac/dc

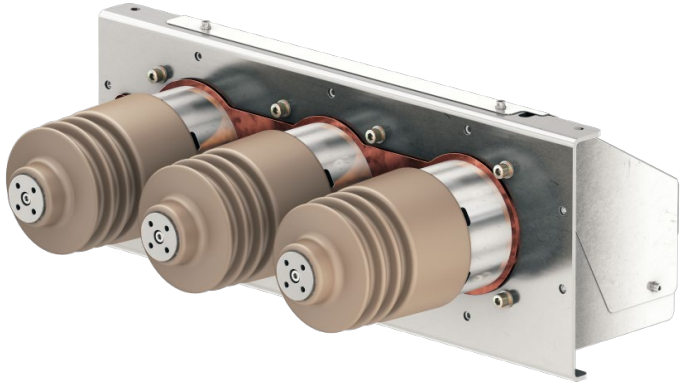




3AM4143-3DA12-0AB2-Z

Arc quenching device
(24 kV)
Controller (trigger device) included
50 kA - 3s
BIL: 125 kV
Phase conductor displacement: 210 mm, total width 740 mm
Reusable: 30 mechanical operations, 5 operations under fault current
Connection cables between trigger device and quenching device included
Auxiliary supply 110 - 250 Vac/dc





- Testing and commissioning can be fully done!

ARCTEQ®
RELAYABLE POWER

MV and LV product selection

AQ 01 Arc Light Sensor

Sensitivity levels 8 / 25 / 50 kLux

- 3 wire (+24Vdc, Signal, Gnd)
- Current based information (2mA, 20mA)
- Maximum 3 sensors in line (up to 200m line)
- Snap-in cable connector for quick installation
- Shielded cable connection

ARCTEQ®
RELAYABLE POWER

MV and LV product selection

AQ 02 Arc Light and Pressure Sensor

- 3 wire (+24Vdc, Signal, Gnd)
- Current based information (2mA, 20mA)
- Maximum 3 sensors in line (up to 200m line)
- Snap-in cable connector for quick installation
- Shielded cable connection
- 1ms pick up for light and pressure (0,2bar increase)

ARCTEQ®
RELAYABLE POWER

MV and LV product selection

AQ06 / AQ07 / AQ08 Arc fiber loop sensor

- Plastic or multi core glass fiber
- Length 5 to 50m
- Self supervision
- Up to 125 °C / 257F
- Sensitivity 8…25kLux
- Can touch the live parts

ARCTEQ®
RELAYABLE POWER

ARC QUENCHING

Typical protective equipment (PPE)

Level of damage

ARC QUENCHING	
Typical clearing time	<4 ms
Typical worst-case incident energy level (IEEE 1584)	>1 cal/cm²
Typical Personal Protective Equipment (PPE)	Category 1
Typical outage and repair time	Hour
Recommended	Fault current >10 kA and all important loads
Level of protection	**ULTIMATE**

ARC FLASH RELAY

Typical protective equipment (PPE)

Level of damage

ARC FLASH RELAY	
Typical clearing time	50-80 ms
Typical worst-case incident energy level (IEEE 1584)	<10 cal/cm²
Typical Personal Protective Equipment (PPE)	Category 2
Typical outage and repair time	Hours
Recommended	Fault current <10 kA and non-important loads
Level of protection	**GOOD**

CONVENTIONAL RELAY

Typical protective equipment (PPE)

Level of damage

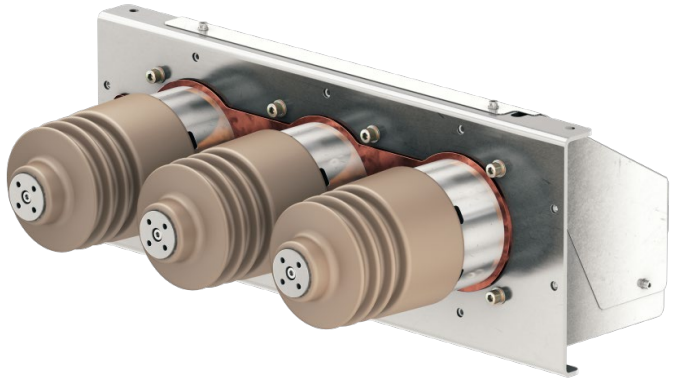
CONVENTIONAL RELAY	
Typical clearing time	>500 ms
Typical worst-case incident energy level (IEEE 1584)	>40 cal/cm²
Typical Personal Protective Equipment (PPE)	Category 4
Typical outage and repair time	Days or weeks
Recommended	Never
Level of protection	**BAD**

ARCTEQ®
RELAYABLE POWER

SiQuench

MV　Arc Quenching Device

Arcteq - SiQuench



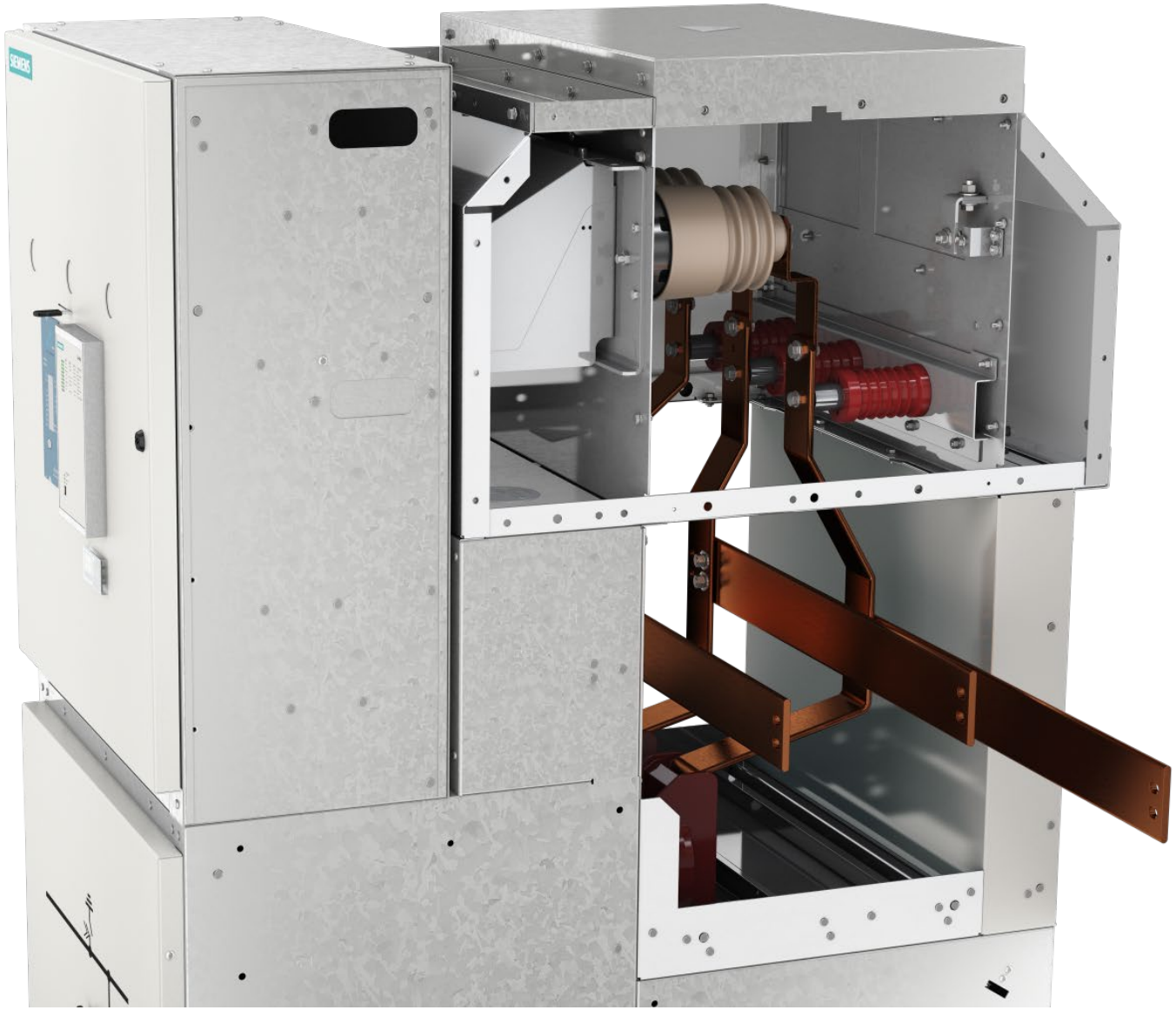
2020

ARCTEQ®
RELAYABLE POWER

SIEMENS
Ingenuity for life

ARCTEQ®
RELAYABLE POWER

SiQuench Installation



https://www.youtube.com/watch?v=S3lD9khZf-M&t=91s

Siemens SiQuench installation in NXAir Switchgear

ARCTEQ®
RELAYABLE POWER

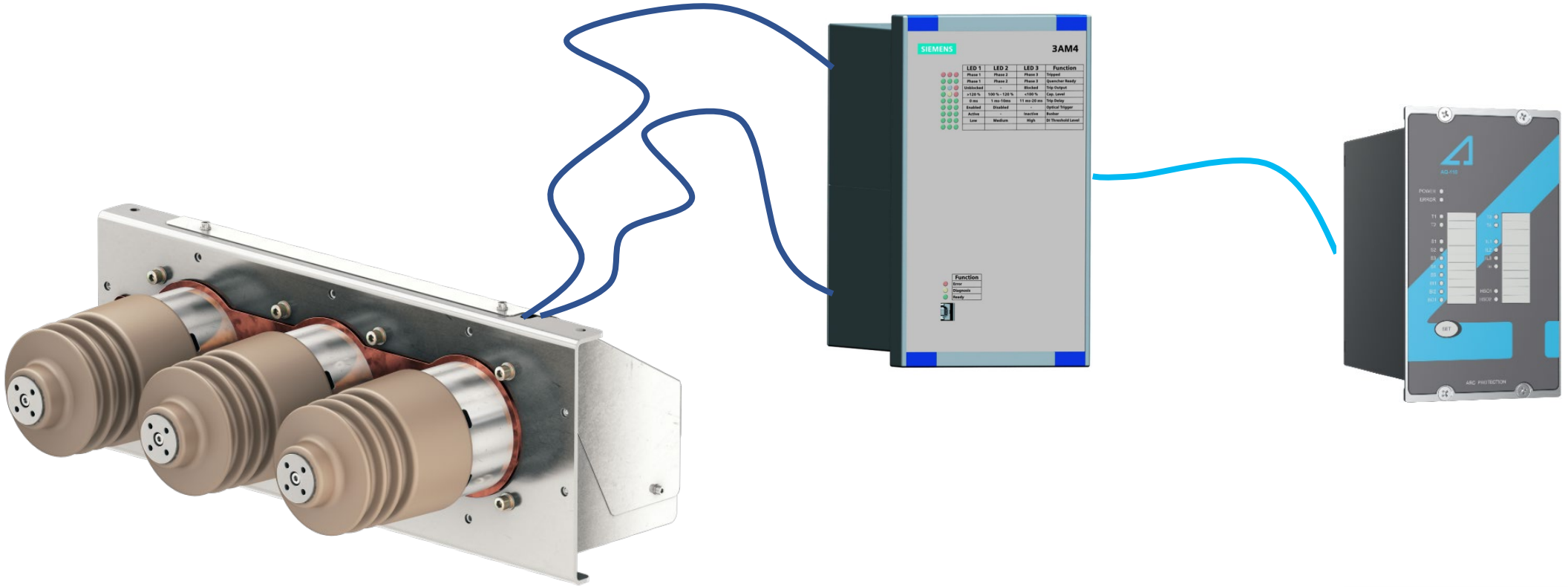
Siemens SIQuench

your natural choice!

ARCTEQ®

RELAYABLE POWER

SiQuench Installation



ARCTEQ®
RELAYABLE POWER

SiQuench Installation

NEW BUILD

- For Any Metal Clad or Metal Enclosed Air insulated system up to 24kV
- Easy design for standard installation method
- Added value and performance for the switchgears

RETROFIT

- For Any Metal Clad or Metal Enclosed Air insulated system up to 24kV
- Case by case installation method. On site designing may be necessary.
- Added value and performance for the switchgears

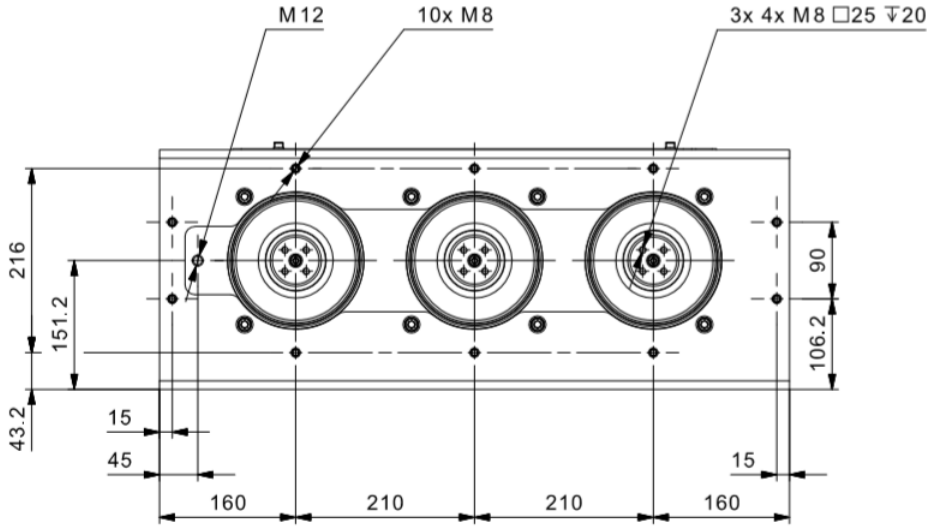
ARCTEQ®
RELAYABLE POWER

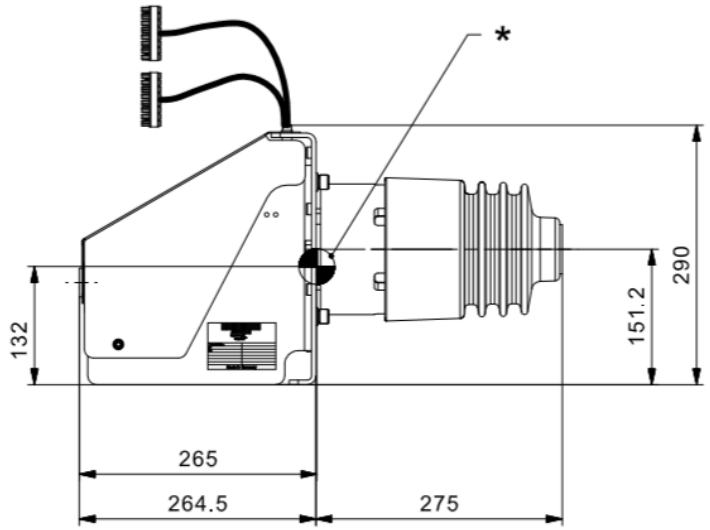
SiQuench

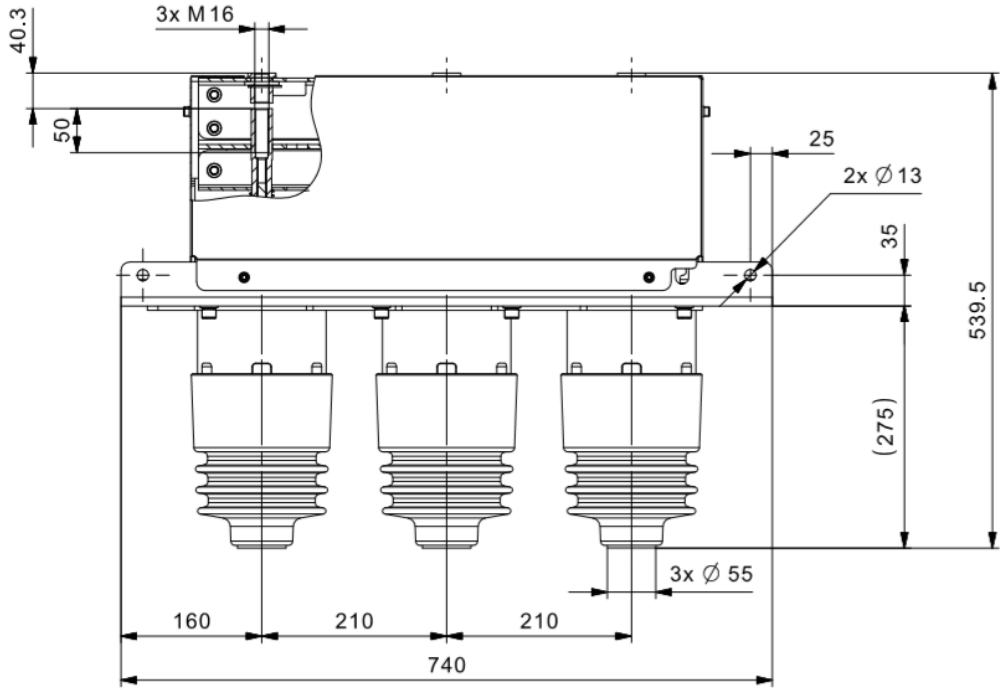
Arc Quenching Device

Mechanical and Technical

SiQuench Dimensions PMA210

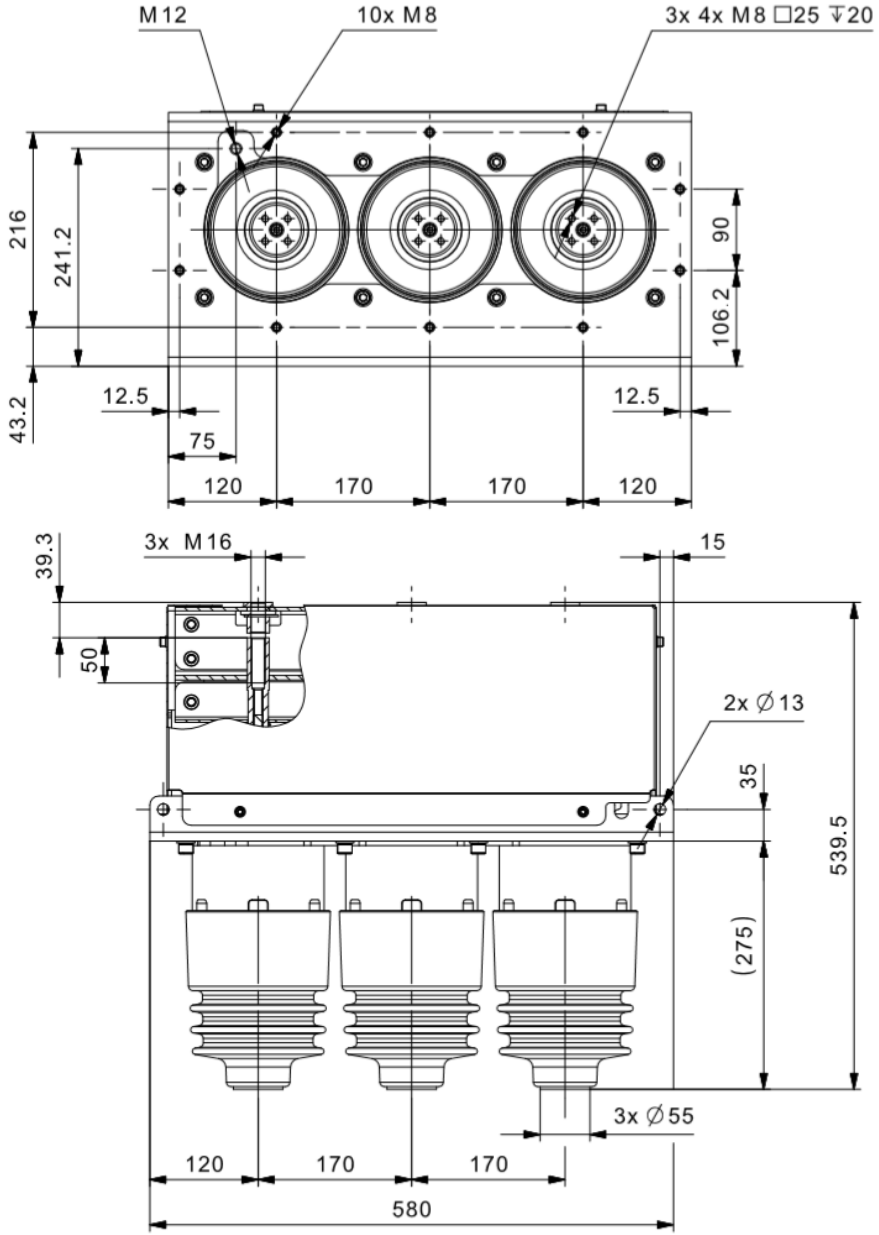


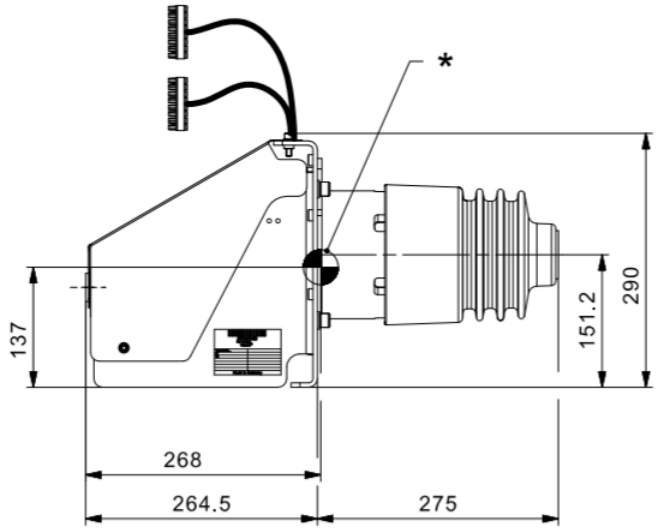




ARCTEQ®
RELAYABLE POWER

SiQuench Dimensions PMA170





ARCTEQ®
RELAYABLE POWER

SiQuench Installation

Design

The SIQuench 3AM4 is a 3-pole switching device consisting of:

- High-voltage section
- Switching part

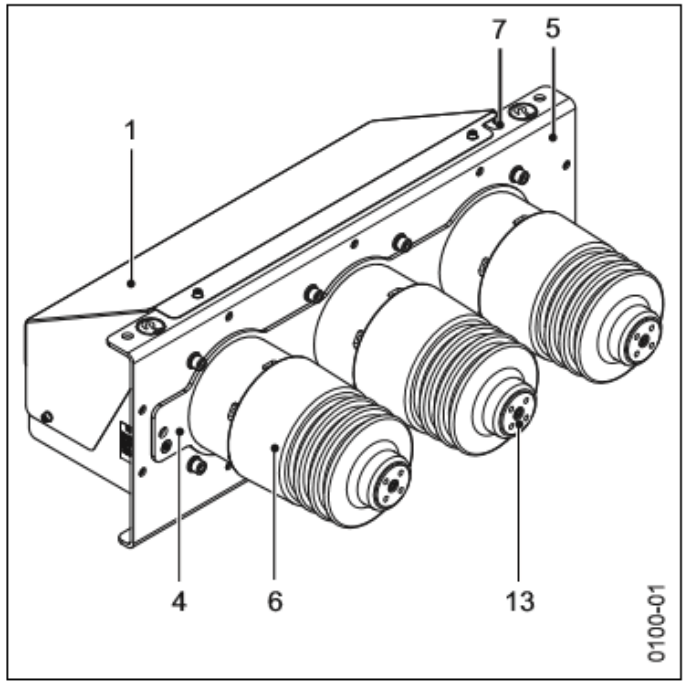


Fig. 1 Front view – high-voltage part

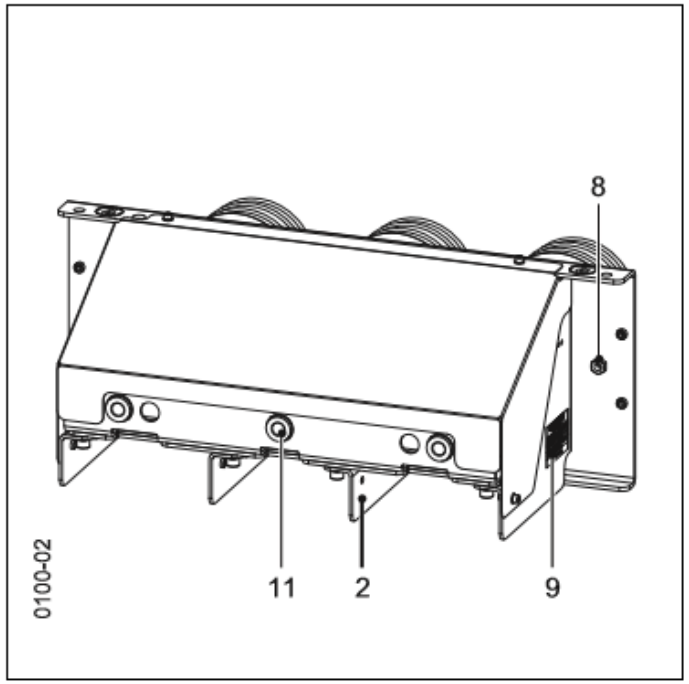


Fig. 2 Rear view – switching part

1 Cover
4 Earthing plate, short circuit connection
5 Base plate
6 Insulating housing
7 Cable outlet
13 High-voltage connection

2 Switching part
8 Earthing terminal
9 Name plate
11 Interface for clamping mechanism for switchgear

High-voltage section

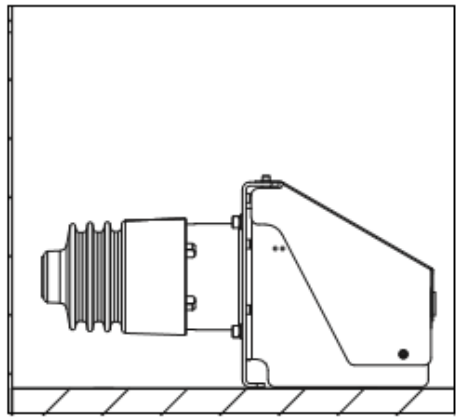
The high-voltage section consists of three poles with insulating housings (6) with short-circuit connection for connecting the conductor bars. The inner mechatronics for a pole consists of, for example, from position switch for signal "ready to shift", switching mechanism, contact and solenoid. The high-voltage section is connected to the switching part via the short circuit connection, earth plate and base plate.

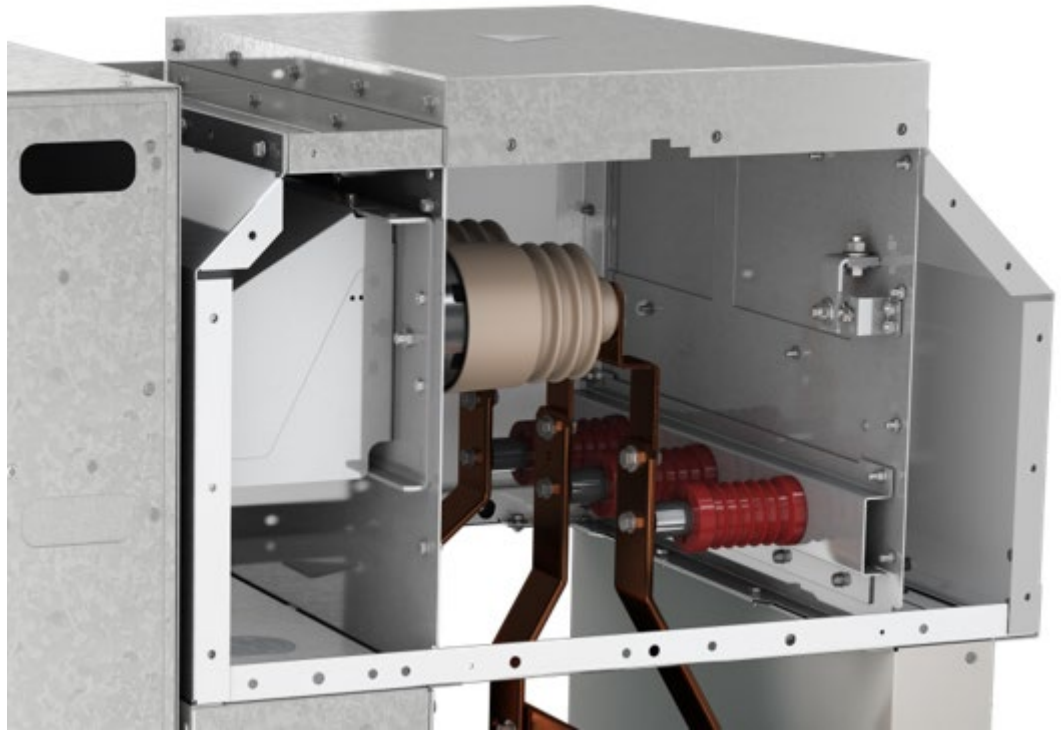
Switching part

The components of the switching part such as the position switch for oil leakage, contact rods and return mechanism are protected by a cover. On the back of the SIQuench 3AM4 are the interfaces for the clamping mechanism for the return of the individual movable contacts.

ARCTEQ®
RELAYABLE POWER

SiQuench Installation





Installation position

Observe the distances as per IEC 60071 insulation coordination or comply with the required leeway distances according to the national operational requirements.

Installation position

The SIQuench 3AM4 recommended installation position is horizontally for the high-voltage connection!!!

also vertical installation is possible.

ARCTEQ®
RELAYABLE POWER

SiQuench Installation

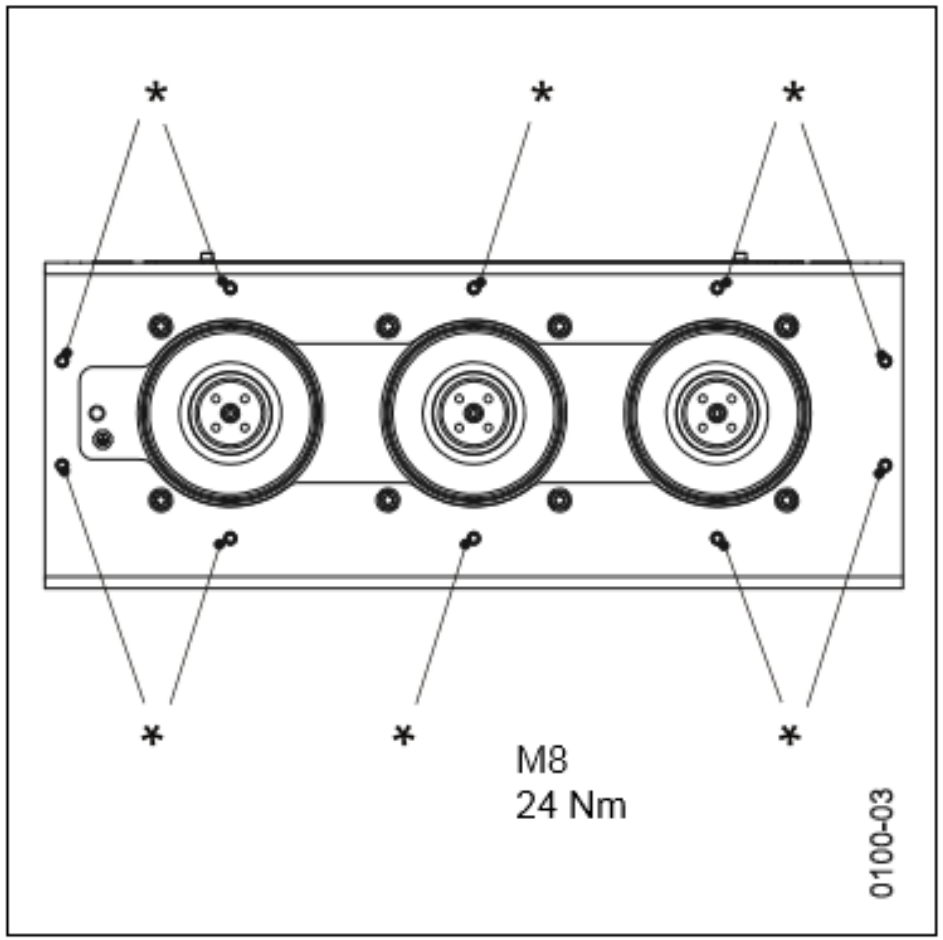


Fig. 14 Mounting points

Mount the SIQuench 3AM4 tension-free and torsion-free at the 10 specified mounting points (*) on a frame, wall, or on a withdrawable part. Mounting screws M8 with fastening elements, (resistance 8.8 bolt strength), tightening torque 24 Nm

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SiQuench Installation

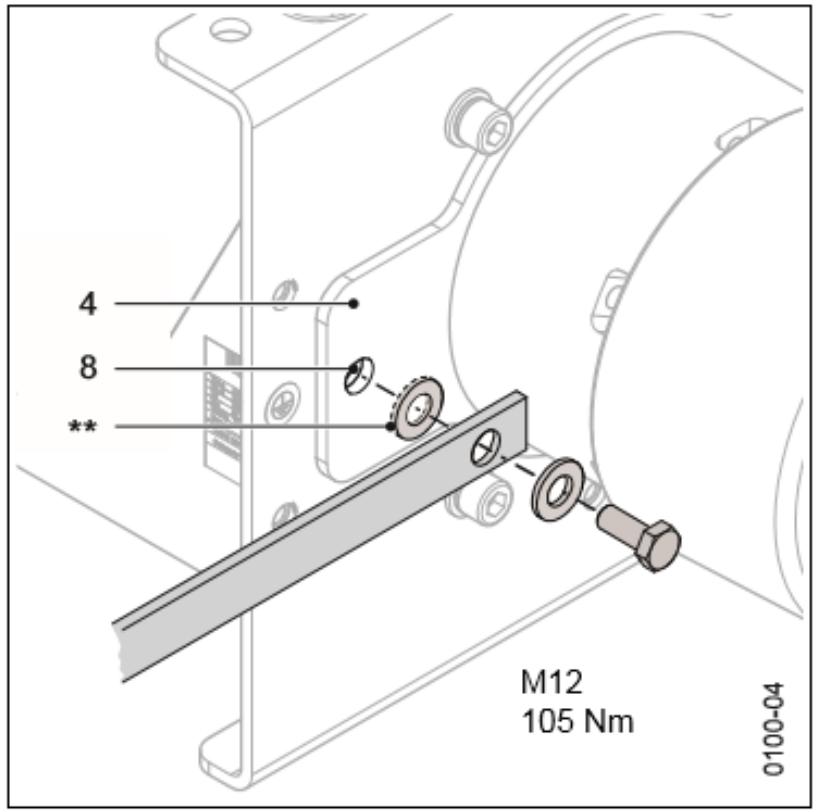

Fig. 15 Earthing terminal with earthing bar

4 Earthing plate
8 Earthing terminal

Connecting to earth

• Dimension earthing for the complete short-circuit current.
• Select the cross-section of the earth bar so that the rated short-circuit current, with a maximum voltage drop of 3 V can be conducted to the provided earthing point (see IEC 62271-200). (40x10 Cu recommended)
• Observe the order of the fixing elements: Place the washer, ring-main cable of the earthing bar and contact washer (SN 70093) with the teeth facing the operating mechanism box under the bolt head. Fix M12 hexagonal bolt with the fixing elements to the earthing terminal (8) with 105 Nm.

- Consult Arcteq about all mechanical connection and together we can fit this into your systems.

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SiQuench Installation

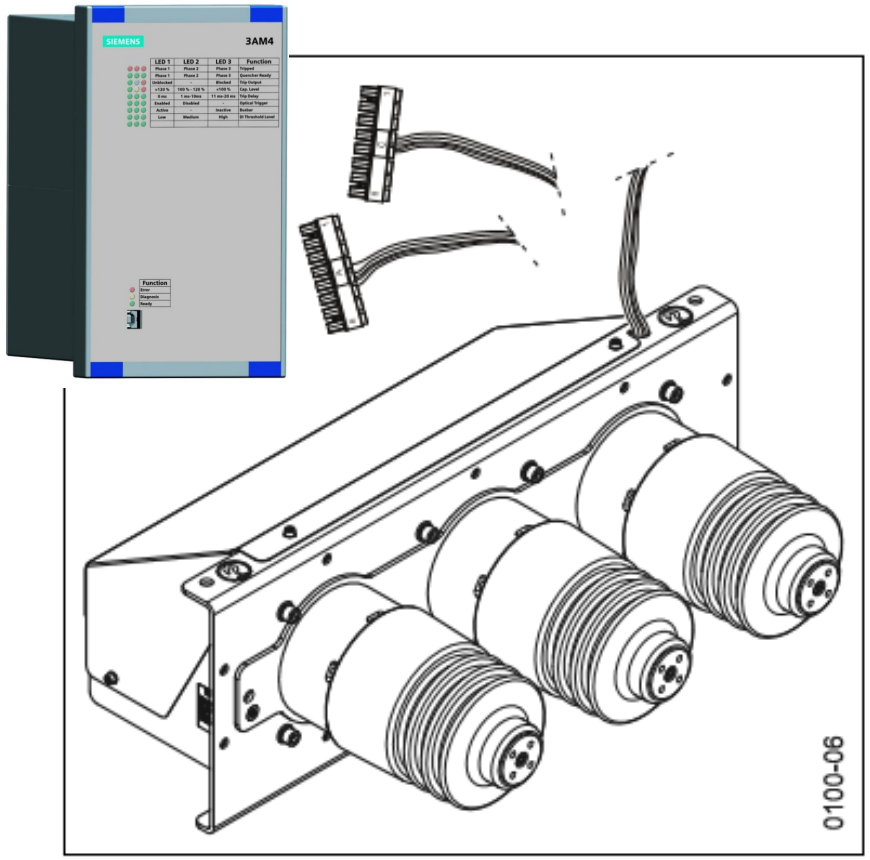

Fig. 16 Example – low-voltage cable harness with connectors

1 Cover
7 Cable outlet

Connecting the low voltage

Connect the SIQuench 3AM4 connecting leads to the customer's Door mounted SIQuench controller in such a way that safe operation as per supplied circuit diagram is guaranteed.

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SiQuench Arc quenching device (MV)

PERSONNEL SAFETY

- Reduce risk of injury during operations and maintenance
- Protection active even in open door situation
- More comfortable personal protection equipment (PPE) requirements, typically category 1

EQUIPMENT SAFETY

- Minimized damage to equipment
- Less repair costs
- Shorter power outages

APPLICABLE FOR NEW OR RETROFIT INSTALLATION

- Applicable for most types of new air insulated switchgear configurations
- Can be easily build as retrofit installation to existing installations

REDUCED TOTAL SWITCHGEAR AND BUILDING COST AND FOOTPRINT

- “Arc resistant” characteristics with metal clad switchgear designs
- Option to arc resistant switchgear applications
- No arc flash energy release beyond switchgear enclosure
- Minimized pressure effect

DEPENDABILITY

- Continuous self-supervision of the system
- Alarm on any erroneous condition
- Meets with highest EMC immunity requirements

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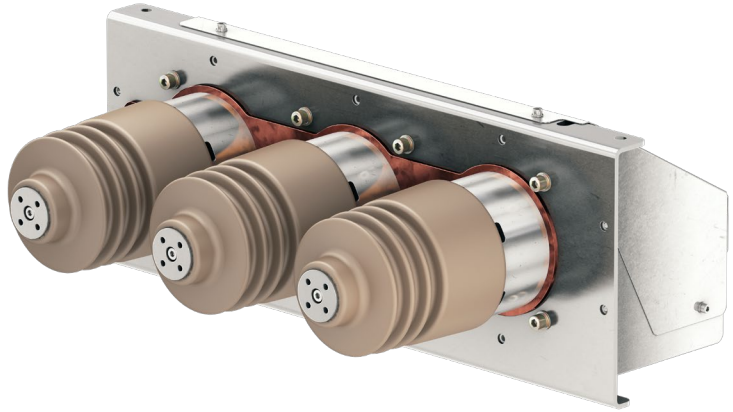
SIQuench marketing

Marketing

- The Siemens SIQuench is sold through the Arcteq global sales network, for installation in any MV network substation/switchgear
- Two variants
  - SIQuench 3AM4132 up to 17,5 kV
  - SIQuench 3AM4143 up to 24 kV



- Pricing added to Arcteq pricelists 2021
- Please get in touch with your sales contact at Arcteq for any question you may have.

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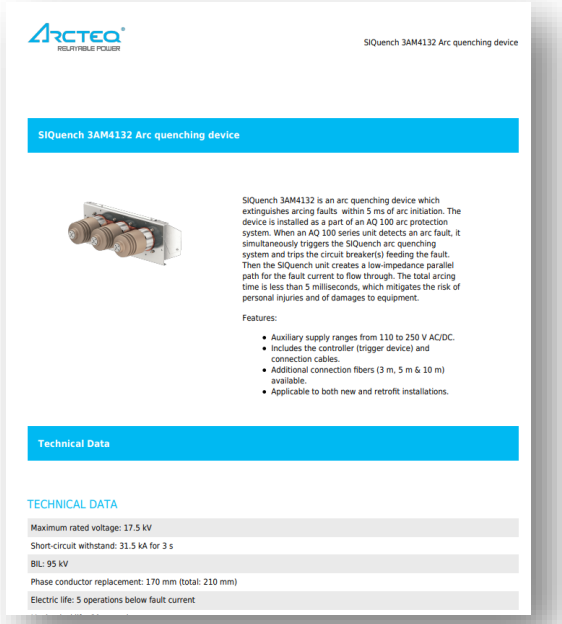
SIQuench on Arcteq.fi web

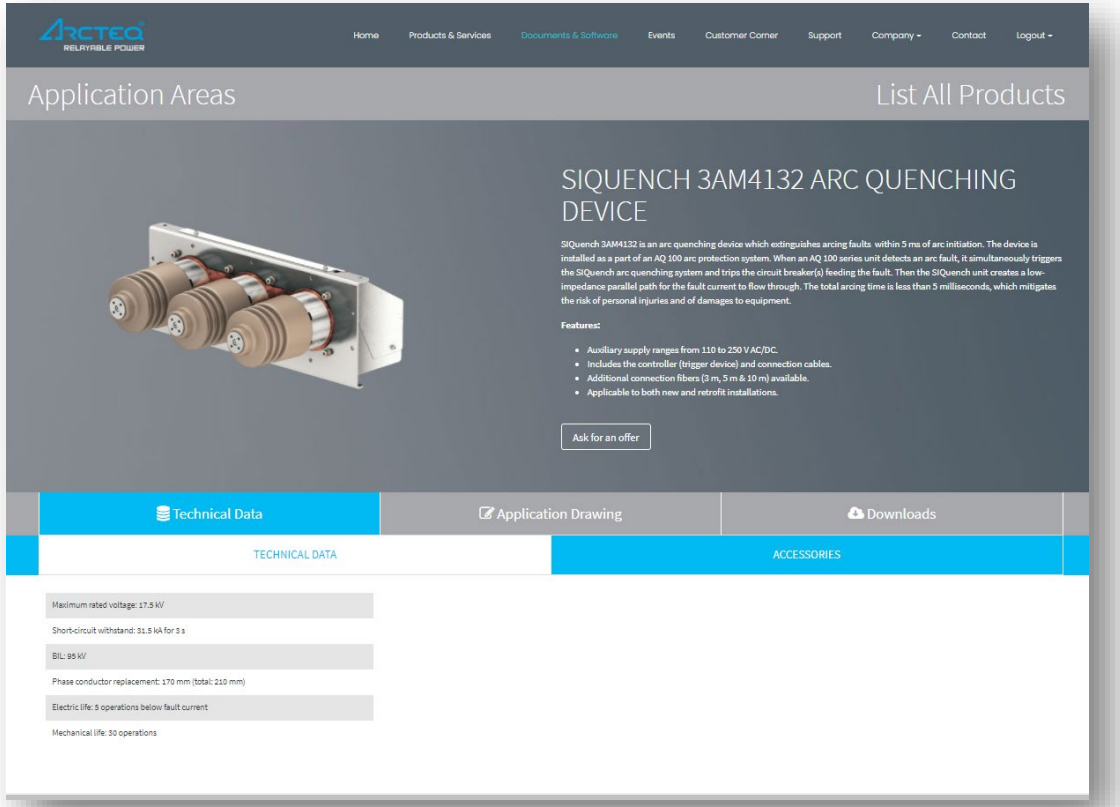
Products and Services:

[SIQuench 3AM4132 Arc quenching device]

[SIQuench 3AM4143 Arc quenching device]

Datasheet available from product page
(Create PDF button)





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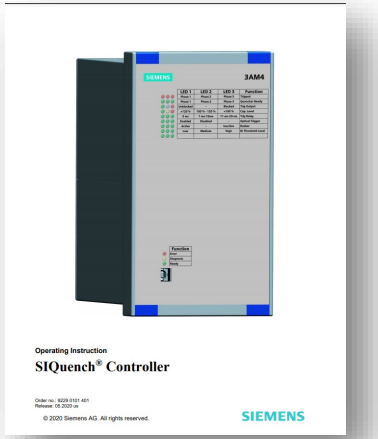
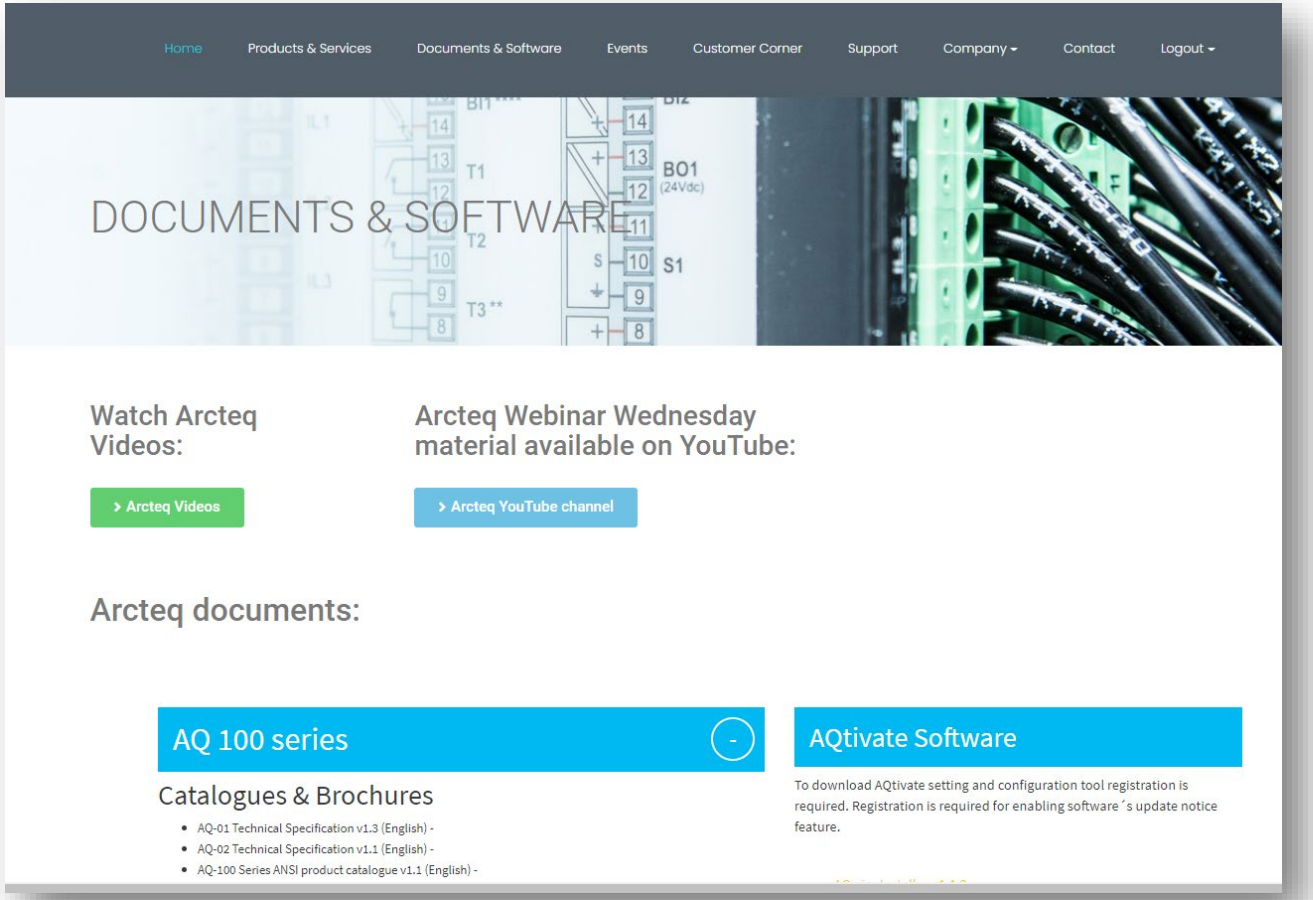
SIQuench Documentation at https://www.arcteq.fi/documents-and-software/

Brochure

Instruction manuals





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