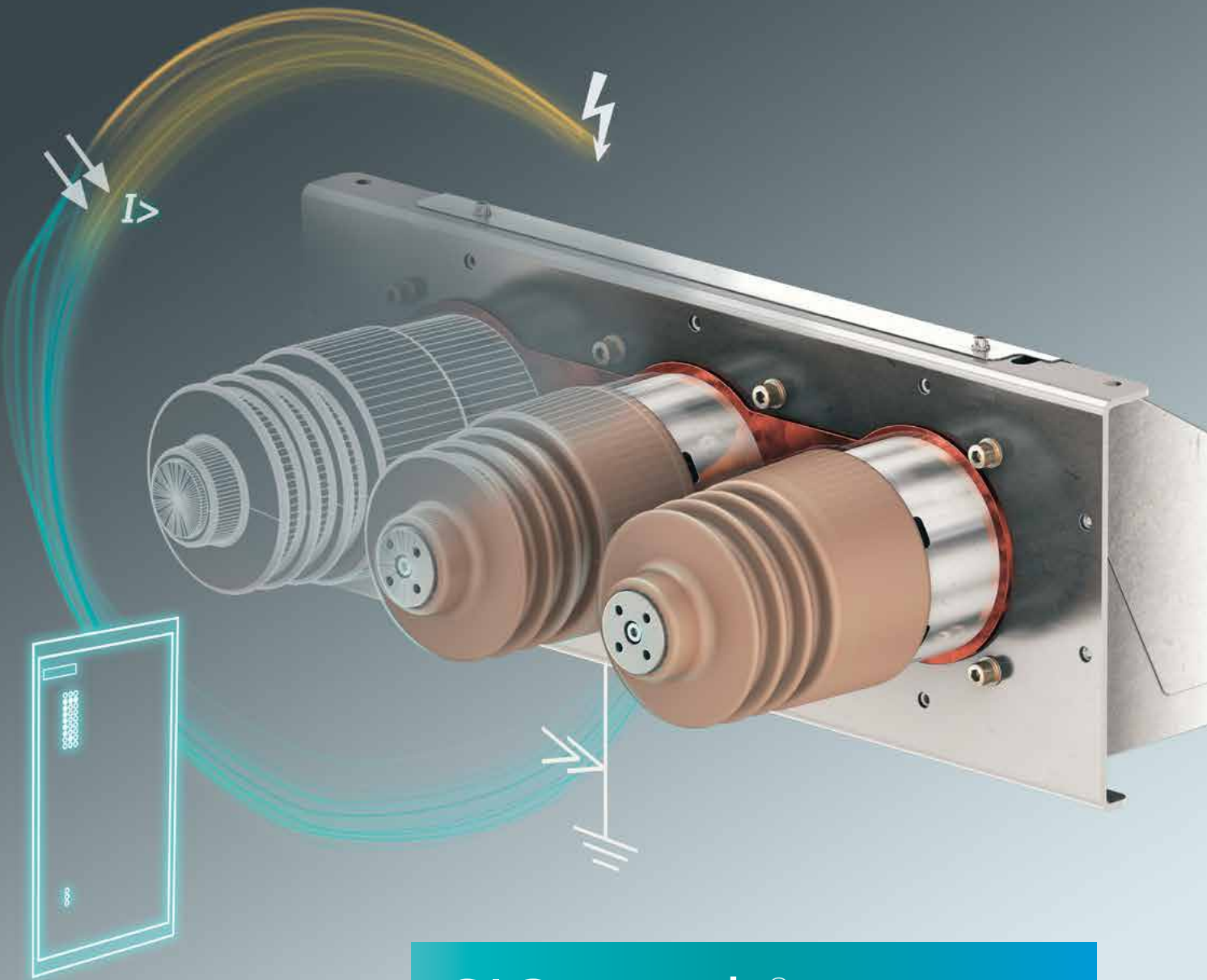


SIEMENS

Ingenuity for life



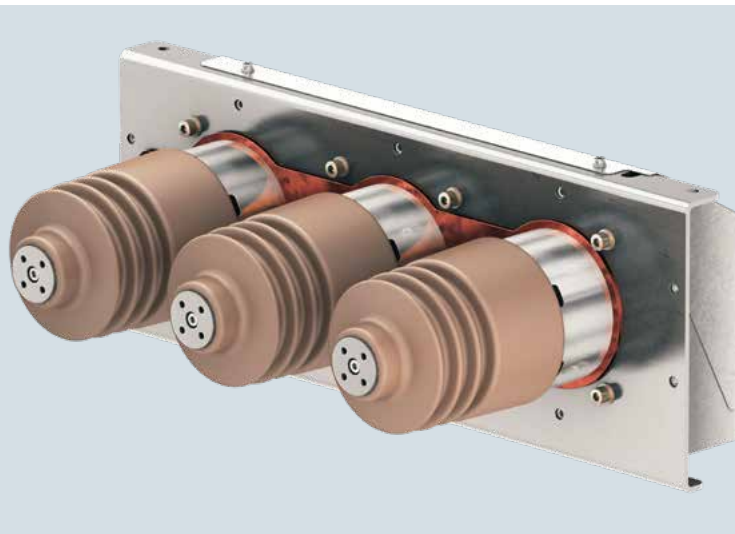
SIQuench[®]

Arc quenching device
for medium-voltage switchgear
"Protection beyond the standards"

[siemens.com/siquench](https://www.siemens.com/siquench)

SIQuench

The occurrence of an internal arc fault in a well-designed, type-tested, correctly installed and operated switchgear is improbable – but not impossible – mostly linked to human-related errors or environmental causes. The safety risk is only one aspect of arc faults. The damage to equipment causing power supply and process disturbance may lead to substantial costs, in the order of millions of euros per incident. In the case of occupational incidents, the total costs may be even higher due to medical and legal expenses. Said catastrophic effects could be mitigated through acting on the arc itself by limiting its duration.



SIQuench is an active arc effect mitigating system by Siemens, **quenching the internal arc in sub-cycle times**. It dramatically reduces pressure and avoids thermal, contamination and toxicity effects which are damaging the equipment with its surroundings. In the event of an internal arc fault it **minimizes the duration of downtime for operations** resulting in drastically reduced economic losses.

Fig. 1
Powerbox with primary switching units

Benefits

Highly increased equipment and process availability is at the core!

- Minimizes the damage within the switchgear due to reduced arc energy and pressure
- Possibility of restoring service rapidly, leading to minimized service outages

Reduced OPEX through cost-efficient measures!

- Minimized repair costs – The faulty functional unit of the switchgear can be used again
- The surroundings are fully protected from contamination and toxicity effects also eliminating related cleaning costs
- Reusable – Capable to switch 5 times without the need for replacement
- Maintenance-free for 20 years

Reliability through consistency!

- Continuous self-supervision of the system alarming on any faulty condition
- Capable to switch 30 times without load for testing/commissioning purposes without the need for replacement
- Contains no explosive medium as energy storage for switching operations

Safety excellence requires more than just following the compliance!

- Being a state-of-the-art solution in the range of proactive safety measures available, it takes the switchgear to another level going beyond the safety set by the standards
- Improves safety also for maintenance maneuvers
- Prevents the emission of toxic gases after an internal arc fault which have severe respiratory distress effects on human beings

The value received =
reliability + capability + functionality + availability + maintainability

The system works in conjunction with an arc protection relay to rapidly and **reliably** detect the ignition of an internal arc via continuous monitoring of light and overcurrent – the standard characteristics of an arc that make it detectable. Upon detection of an internal arc, the arc protection relay simultaneously sends a trip signal to the main circuit-breaker and a trigger signal to the controller of the SIQuench.

The enhanced arc effects mitigation **functionality** provided by SIQuench is achieved by consciously and rapidly closing the main current path of the switchgear to earth via dedicated phase-wise primary switching devices – creating a lower-impedance current path to the fault current – and transforming the open arc into a controlled 3-phase metallic short circuit. Continuous self-supervision maximizes the **reliability** of the system.

It is capable of extinguishing the arc fault in less than 5 ms* – long before the pressure peak, and before the arc can cause any significant damage.

Final clearance of the dead short circuit provided by the SIQuench is done by tripping the main circuit-breaker.

The damage to the switchgear is limited to an insignificant level and wholly avoided for the direct surroundings. This leads to an extreme reduction of repair costs along with absolute elimination of switchgear room and surroundings cleaning costs. The switchgear can be restored back to operation within **minimum maintenance time, meaning an incredible boost in system and process availability. The system needs no replacement after an arc fault.**

Oil is the insulating medium with a set of strengths perfectly matching the SIQuench application. Operated by a manually charged disc spring mechanism and a latch device actuated by an electromagnetic solenoid, the switching process is reversible.

SIQuench is reusable up to its permissible switching duties:

- Capable of switching 5 times at the full rated short-time withstand current (with peak withstand current)
- Capable of switching 30 times without load for testing / commissioning purposes

SIQuench is **maintenance-free for 20 years** and capable of serving for 30 years with maintenance at the end of the given maintenance-free period.

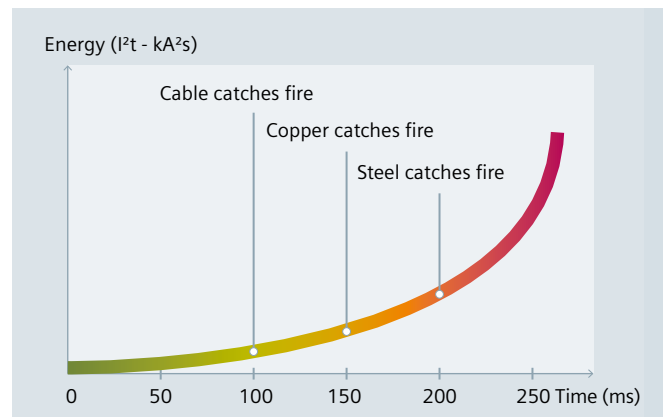


Fig. 2 Damage caused by incident arc energy

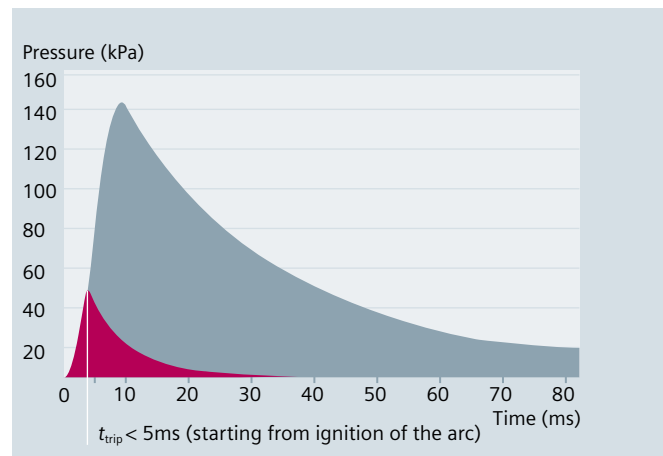


Fig. 3 Sample pressure curve in a compartment for an internal arc fault current of 80 kA (peak) / 31.5 kA (rms)

* From arc ignition to closing of the quenching device

Internal arc classified switchgear with SIQuench

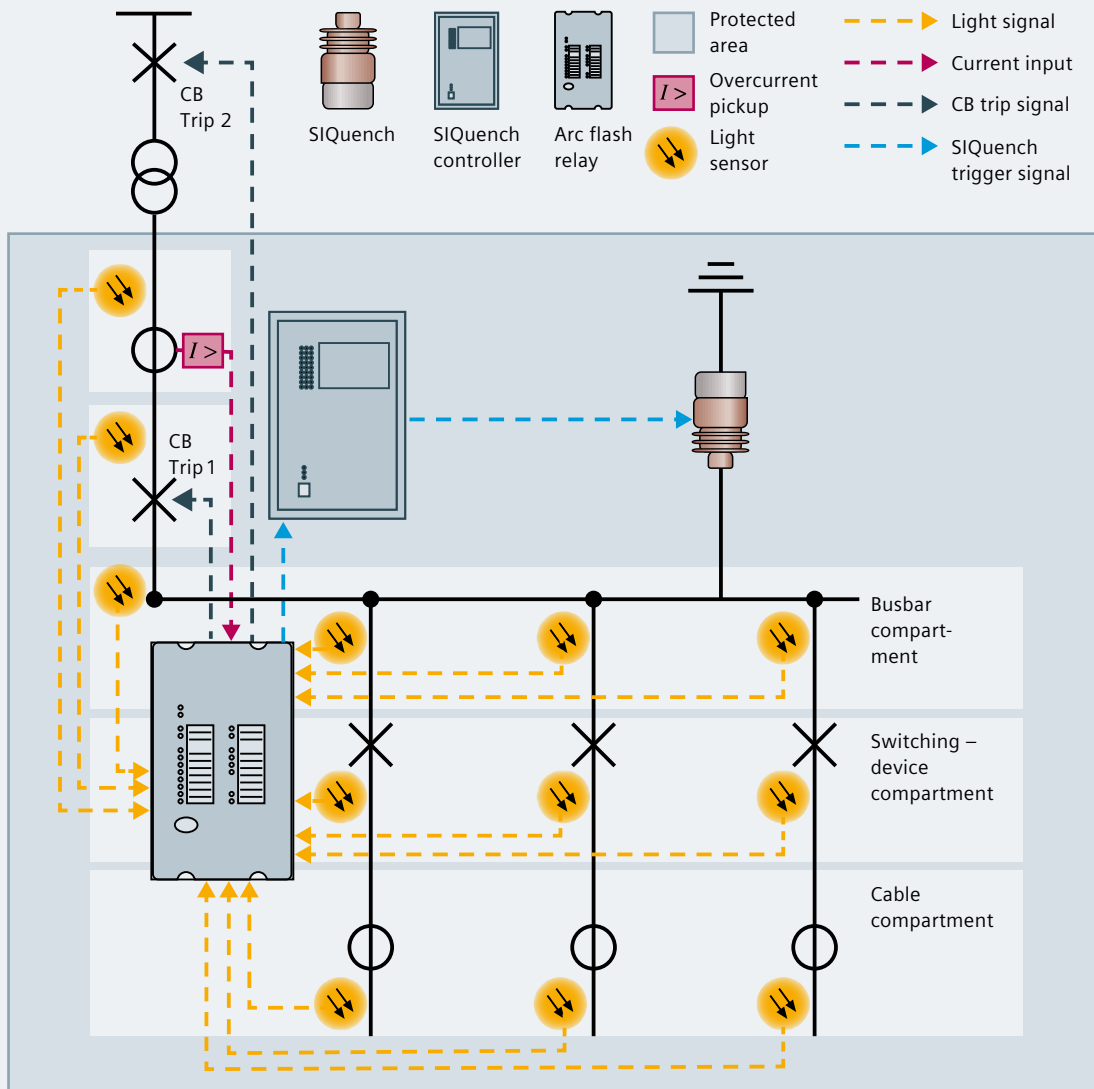


Internal arc classified switchgear without SIQuench



Fig. 4 Condition of a 12 kV NXAIR cable compartment after an internal arcing test with a fault current of 80 kA (peak) / 31.5 kA (r.m.s.), with arc ignition inside the cable compartment

Illustration of the system integration in an exemplary arc protection application (one incoming feeder with single protection zone)



SIQuench is available as a complete solution integrated into type-tested, internal arc classified, medium-voltage switchgear type NXAIR, rated up to 17.5 kV, 50 kA, 4000 A.

There are two versions available for the point of installation:

**In busbar compartment of NXAIR,
fixed-mounted**

- Possible in 600 mm and 800 mm panel widths
- Can be integrated into any functional unit**

**In switching-device compartment of NXAIR,
withdrawable**

- Possible in 800 mm panel width
- Easy access to SIQuench without isolating the busbar

** Functional units having busbar components (e.g. VTs, busbar earthing switch, ventilation box...) are out of this scope



Published by
Siemens AG 2019

Energy Management
Medium Voltage & Systems
Mozartstraße 31 C
91052 Erlangen, Germany

For further information, please contact
our Customer Support Center:
Phone: +49 180 524 70 00
Fax: +49 180 524 24 71
E-mail: support.energy@siemens.com
siemens.com/siquench

Article No. EMMS-B10128-00-7600
Printed in Germany
Dispo 30400
PU 184/004613 0219 0.6

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