

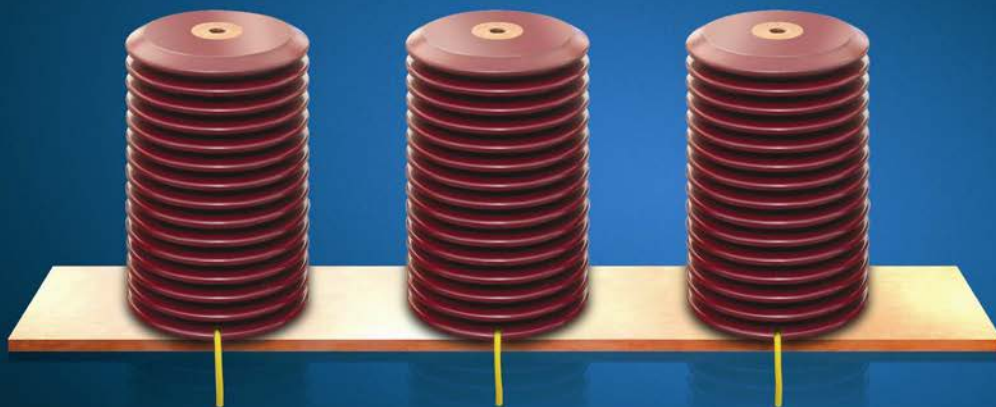
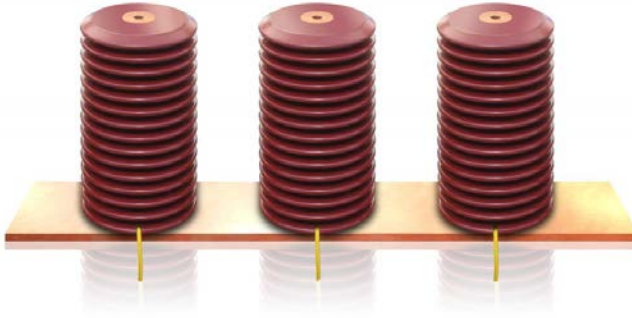


ABB AG - Calor Emag Medium Voltage Products

Ultra-Fast Earthing Switch Type UFES

Ultra-Fast Earthing Switch type UFES

The active internal arc protection by ABB



- The Ultra-Fast Earthing Switch type UFES
- Active internal arc protection in addition to available passive protection applicable for nearly all short-circuit proof, air-insulated switchgear
- Highest possible protection for switchgear in regard to the hazardous impacts caused by an internal arc

Ultra-Fast Earthing Switch type UFES

S³ – Speed, Safety, Savings

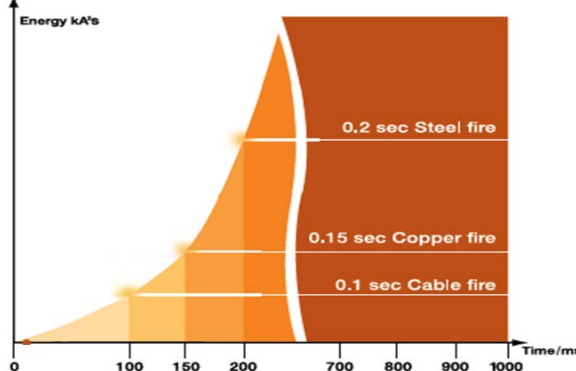
- Speed – A question of (Operation-) time
Nearly immediate extinction of an internal arc by fastest intervention of the Ultra-Fast Earthing Switch.
- Safety – Greatly enhanced protection for personnel, switchgear and the environment
A drastically reduced internal arc duration ensures minimized pressure and temperature rise. This leads, as a consequence, to minimal impacts at the fault location.
- Savings – The “insurance” for your switchgear
Greatly increased system and process availability in combination with drastically reduced repair costs.

Arc faults generally cause serious damage

Fault characteristics



- An arc arises when at least part of the current passes through a dielectric, usually air
- Maximum peak power up to 40 MW
- Arc plasma temperature up to five times the surface temperature of the sun (20 000°C)
- Light intensity more than 2000 times that of normal office light



Internal arc faults

Reasons of formation



Typical human and operational errors:

1. Work in a wrong cubicle
2. Operation of a wrong isolator
3. Forgetting to ground the working area
4. Forgetting to test the presence of voltage in the working area



Technical reasons to arc faults:

1. Faults in equipment and false operation of equipment
2. Ageing of insulation and mechanical wear
3. Overvoltage
4. Overheating
5. Moisture, dirt

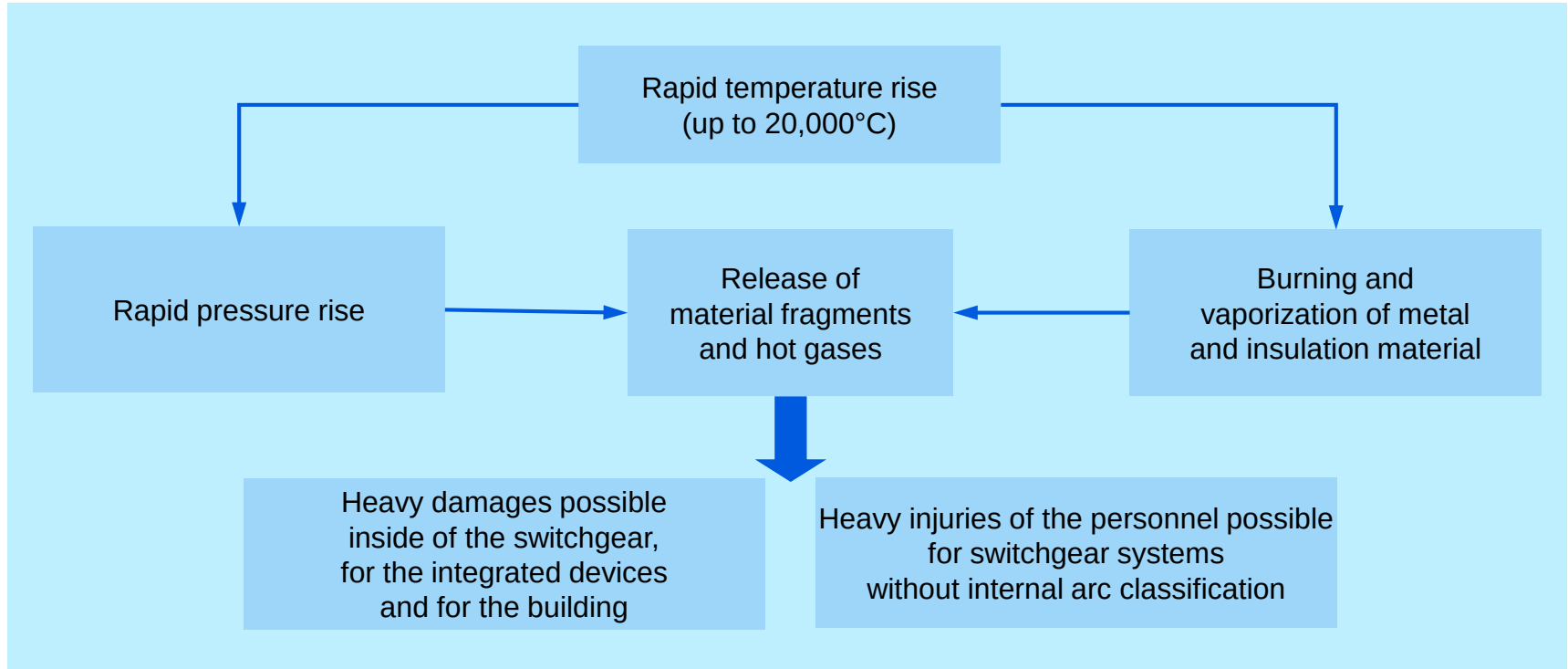


Other technical reasons to arc faults:

1. Corrosion
2. Foreign objects (e.g. tools) or small animals in the switchgear
3. Installation errors
4. Bad cable terminations and loose busbar joints

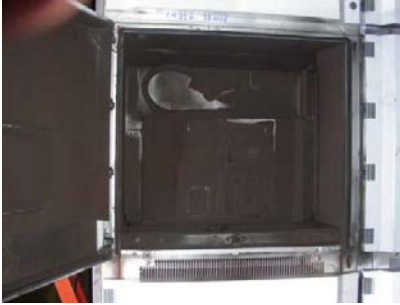
Internal arc faults

Impacts



Internal arc faults

Impacts



- Circuit-breaker compartment after internal arc impact



- Cable connection compartment after internal arc impact



- Contact terminal after internal arc impact

Ultra-Fast Earthing Switch type UFES

The basis for effective protection



UFES with electronic tripping unit type QRU100

- Electronic tripping unit
 - Fast and reliable interface to external arc detection systems
 - Tripping of the UFES primary switching elements
- 3 Primary switching elements
 - Ultra-fast initiation of a 3-phase short-circuit earthing after detection of a fault by the electronic
 - Elimination of the arc by resulting breakdown of the internal arc voltage

Ultra-Fast Earthing Switch type UFES

Combinable arc protection by ABB



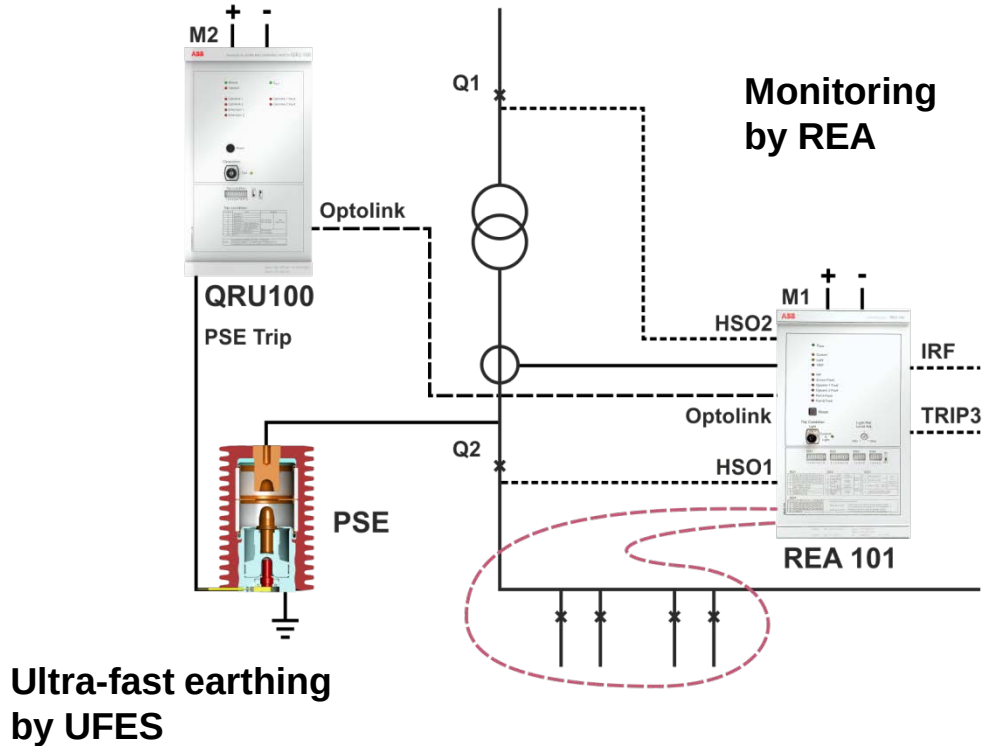
Combinable arc protection UFES + REA

UFES + REA

- Versatile monitoring options with REA system:
 - Optical detection via line or lens sensors
 - Overcurrent detection
 - Selective protection
 - Circuit-breaker failure protection
- Ultra-fast arc extinction by UFES
- Certified interfaces
- Extremely short tripping times < 4 ms (after detection)

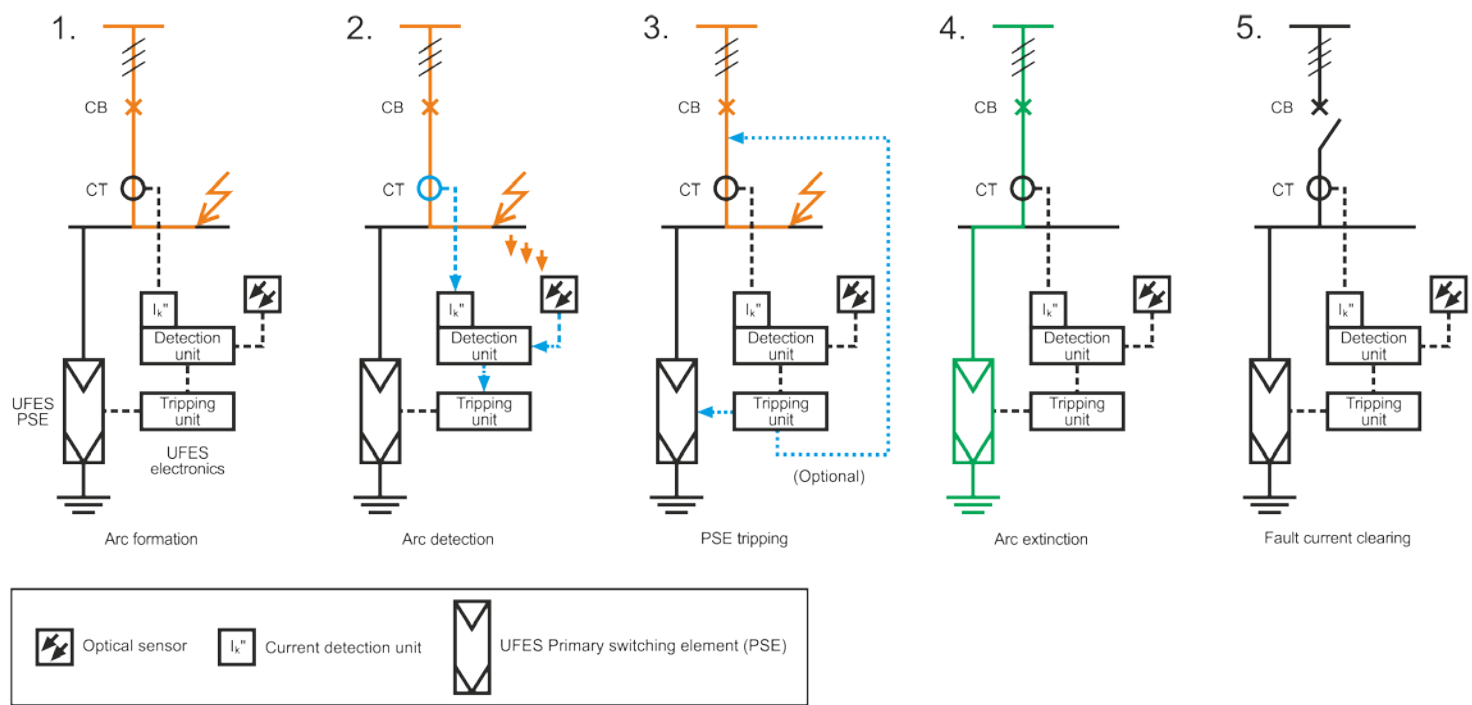
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Example of an application UFES + REA



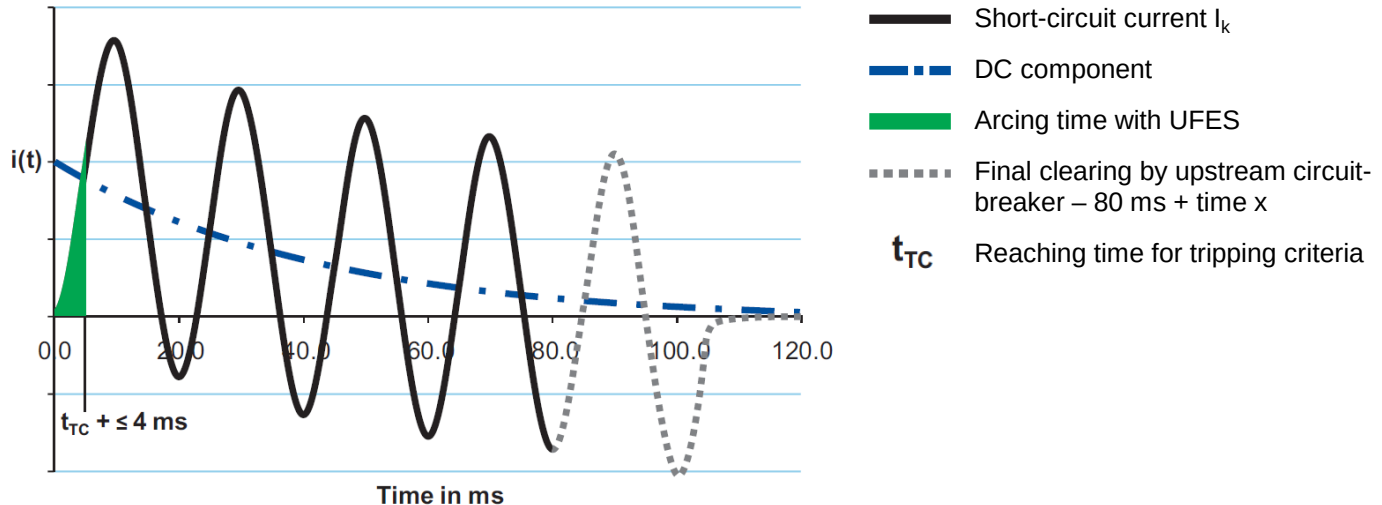
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Sequence of tripping operation



Ultra-Fast Earthing Switch type UFES

Ultra-fast reaction time



- Effective limitation of damage requires fastest intervention
- Extinction time of the Ultra-Fast Earthing Switch:
< 4 ms after fault detection

Ultra-Fast Earthing Switch type UFES

Standard: UFES electronic type QRU100 – Features

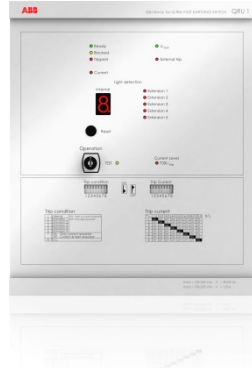


Electronic tripping unit type QRU100

- Electronic tripping unit
- Full compatible to the ABB arc protection system of type REA
- 2 Optolink inputs for connection of the REA101 relay
- 2 high-speed inputs (HSI) for connection of external arc detection systems
- Self monitoring including the Optolink connection to the REA system
- Logical combination of the external detection units by use of DIP-switches
- Testing mode for functional check
- Ideal for extension of existing ABB arc protection systems

Ultra-Fast Earthing Switch type UFES

Alternative: UFES electronic type QRU1 - Features



Electronic detection and tripping unit type QRU 1



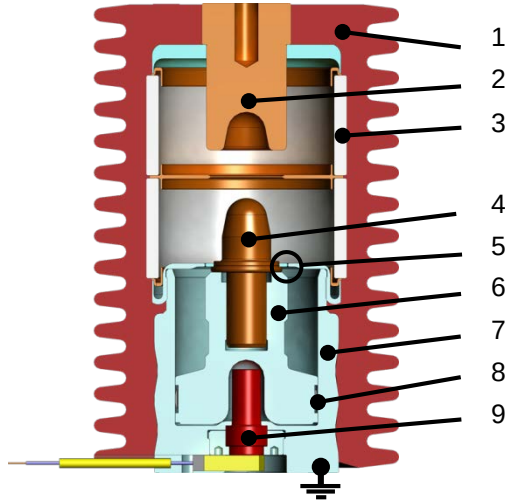
Lens sensor for optical detection

- Electronic detection and tripping unit
- 9 optical inputs for light detection
- 3 current inputs for monitoring of the instantaneous current value
- Up to 5 x 30 additional optical inputs with ABB arc guard type TVOC-2
- Completely in fast analogue technology
- Fast fault localization by use of single lens sensors
- Self monitoring
- Testing mode for functional check
- Simple DIP-switch configuration

Ultra-Fast Earthing Switch type UFES

Primary switching element

Primary switching element – section view

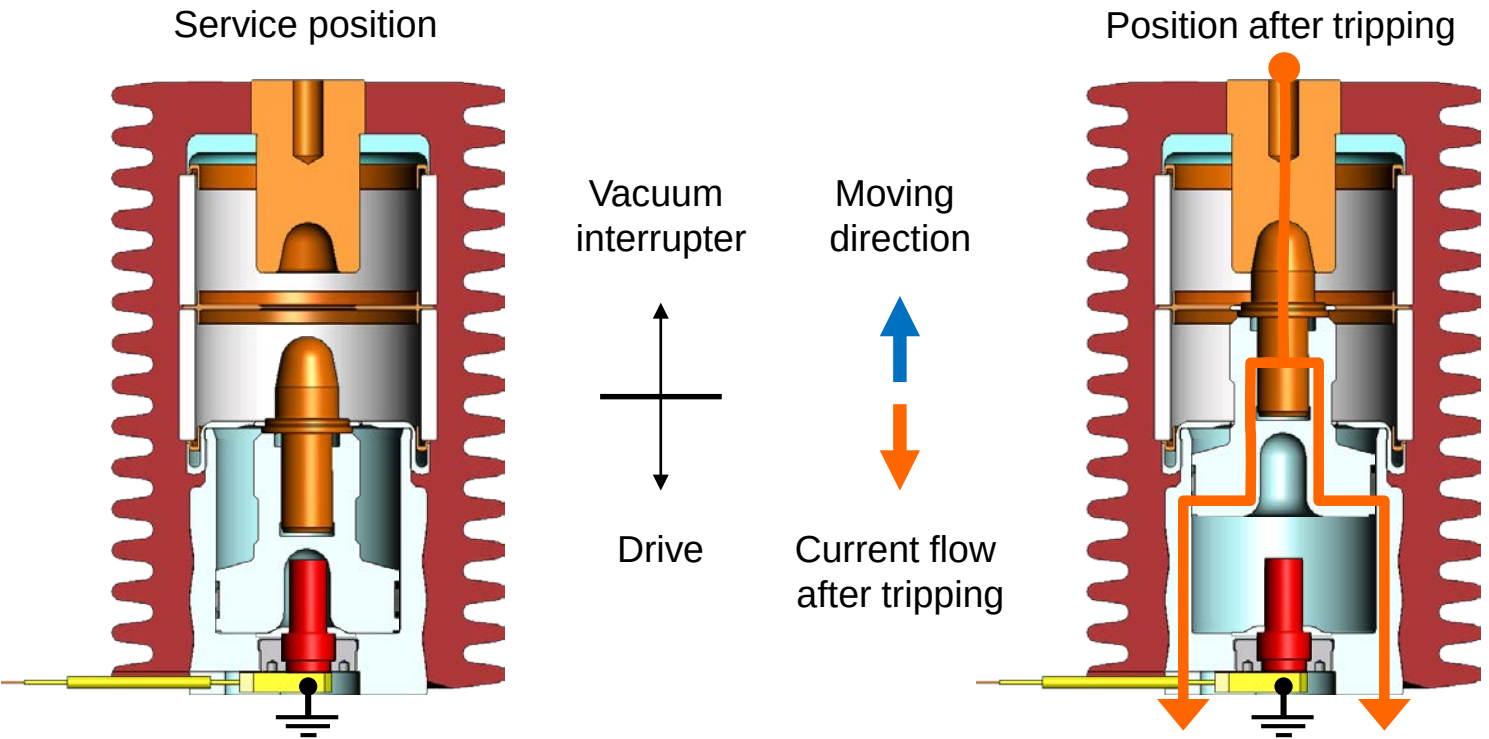


Primary switching element type U1

- Vacuum interrupter and operating system integrated in one compact unit
- Fast and reliable micro gas generator operating mechanism
- Fast switching time of ~ 1.5 ms
- Easy handling
- Low-maintenance
- Flexible installation

Ultra-Fast Earthing Switch type UFES

Switching principle



Ultra-Fast Earthing Switch type UFES

Speed – Differentiation

Conventional protection device

- Fault detection by standard relay
- Clearing of the arc fault current by the upstream circuit-breaker

Fast-acting protection relay with supplementary equipment

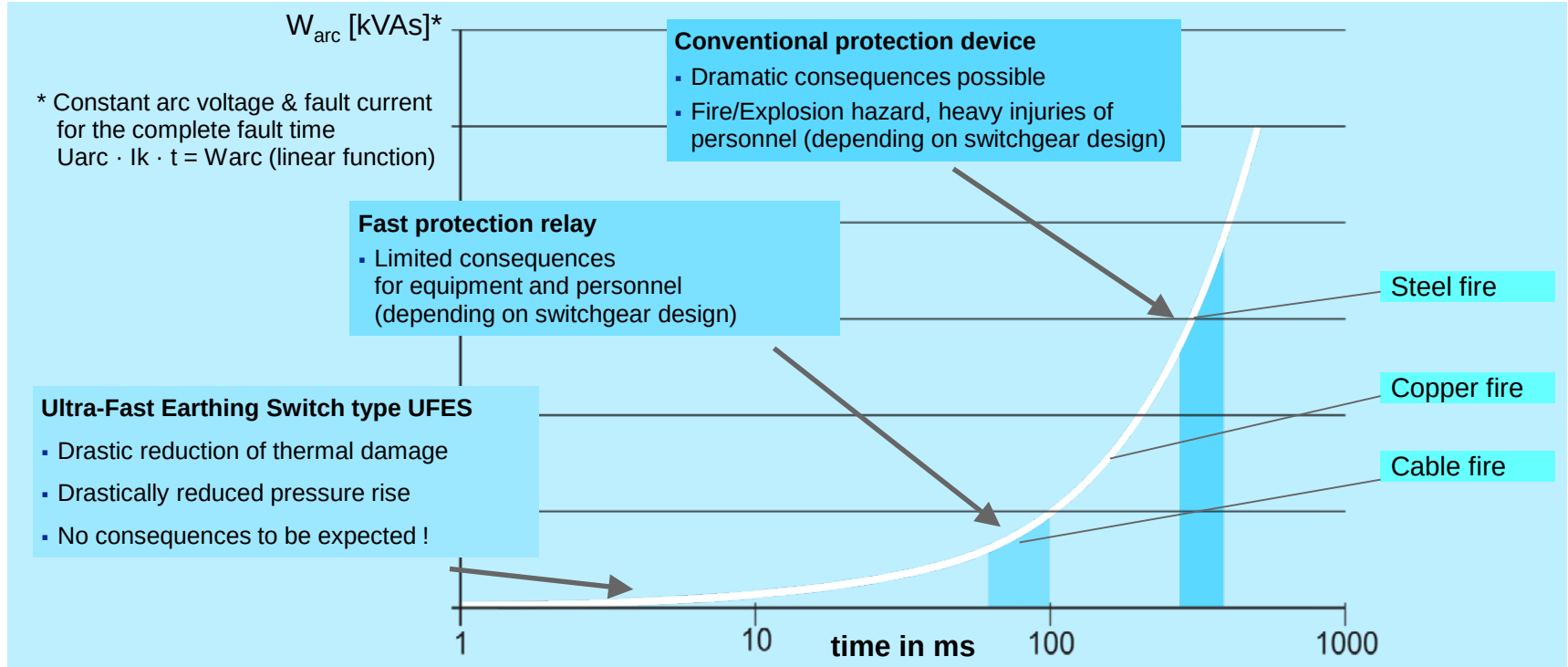
- Fast fault detection by special protection relay
- Clearing of the arc fault current by the upstream circuit-breaker

Ultra Fast Earthing Switch type UFES

- Fast fault detection by UFES electronic or REA system
- Ultra-fast extinction of an internal arc by switching of the UFES primary switching element type U1
- Final clearing of the fault current by the upstream circuit-breaker

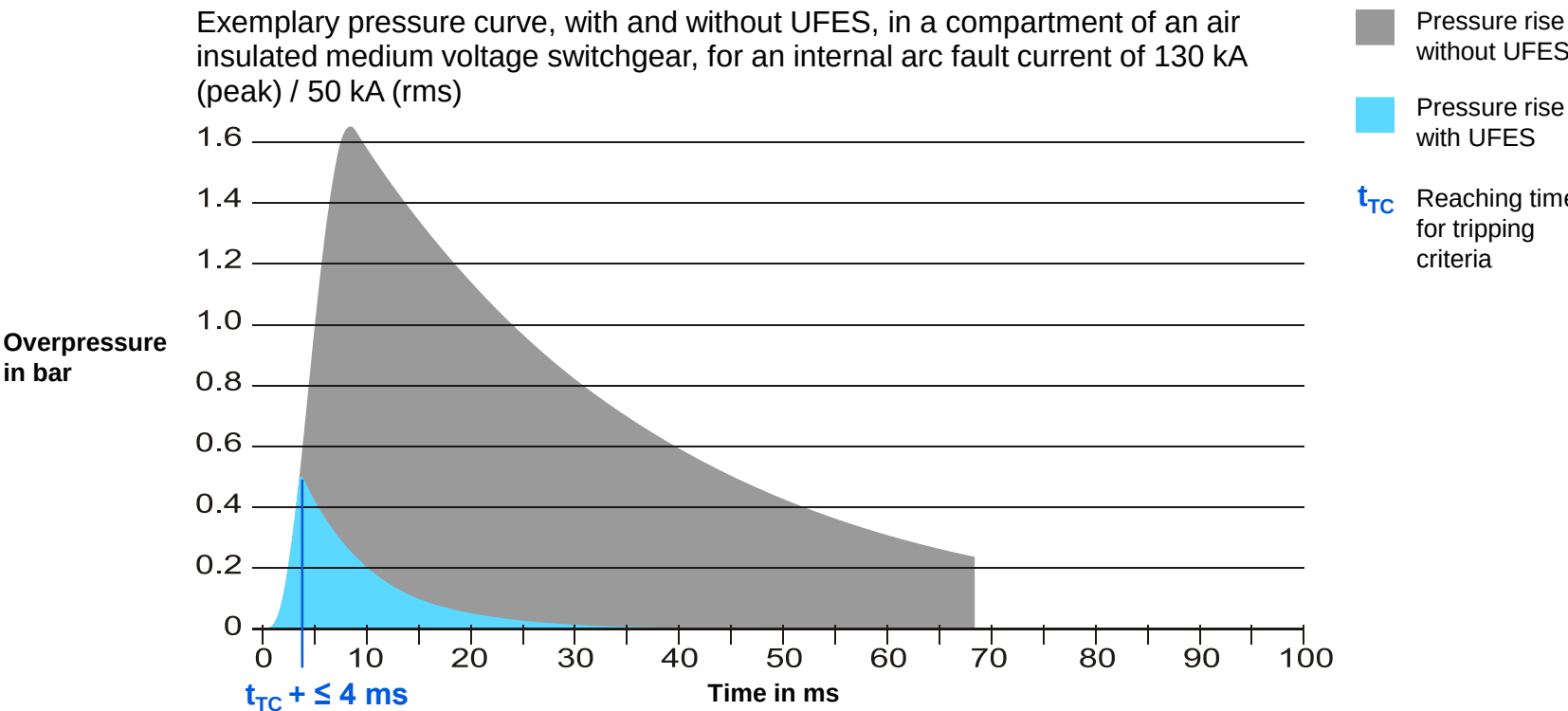
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Speed – Differentiation



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Speed & Safety – Pressure curves



Ultra-Fast Earthing Switch type UFES

Safety & Savings – The internal arc test with UFES



- Busbar compartment after internal arc impact with active UFES protection



- Point of fault initiation in the busbar compartment

Ultra-Fast Earthing Switch type UFES

S³ – Comparison



- Busbar compartment after internal arc impact with active UFES protection



- Busbar compartment after internal arc impact without active UFES protection (50 kA / 100 ms)

Ultra-Fast Earthing Switch type UFES

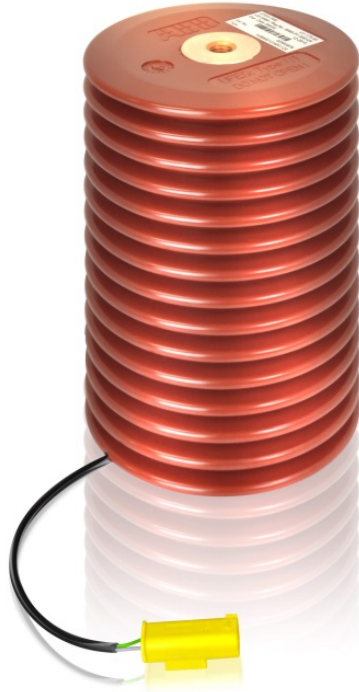
The formula for effective internal arc protection

$$\text{UFES} = S^3$$

- Speedy arc suppression
- Safety for investment and personnel
- Savings in regard of repair and downtime costs

Ultra-Fast Earthing Switch type UFES

Applicable for highest requirements



Maximum rated voltage:
 $U_r = 40.5 \text{ kV} \rightarrow I_k = 40 \text{ kA (3s)}$

Maximum rated short-time withstand
current for medium voltage:
 $I_k = 50 \text{ kA (3s)}, 63 \text{ kA (1s)} \rightarrow U_r = 17.5 \text{ kV}$

Maximum rated short-time withstand
current for low voltage:
 $I_k = 100 \text{ kA (0.5s)} \rightarrow U_r = 1.4 \text{ kV}$

Ultra-Fast Earthing Switch type UFES

Available as ... loose components



Standard: UFES-Kit-100* as OEM produkt, consisting of:

- Electronic detection and tripping unit type QRU100
- 1 set (3 off) Tripping cables (10 m) with special plug for PSE and electronic
- 3 Primary switching elements (PSE)

* For extension of existing or new arc protection systems. Full compatibility to the ABB arc protection system type REA.

Ultra-Fast Earthing Switch type UFES

Available as ... loose components



Alternative: UFES-Kit-1 as OEM produkt, consisting of:

- Electronic detection and tripping unit type QRU1
- 1 set (3 off) Tripping cables (10 m) with special plug for PSE and electronic
- 3 Primary switching elements (PSE)

Ultra-Fast Earthing Switch type UFES

Available as ... ABB Service retrofit solution



- Service-Box
(Illustration: Side-mounted)



- Draw-out technology

Ultra-Fast Earthing Switch type UFES Available for ... ABB switchgear (AIS)



UFES in UniGear – Top-Box installation



UFES in UniGear – Installation in cable compartment

Ultra-Fast Earthing Switch type UFES

Available for ... ABB dry type transformer

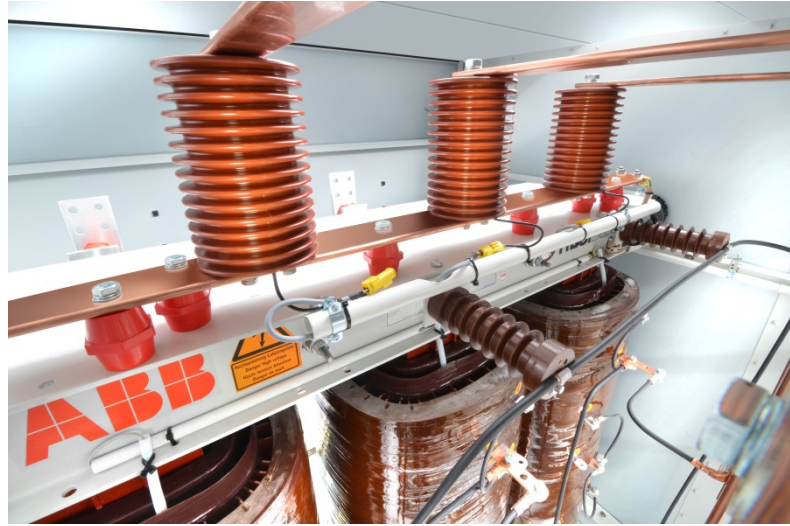


ABB Resibloc with UFES protection

Ultra-Fast Earthing Switch type UFES

S³ - Unbeatable advantages



Indirect benefit

- Greatly increased system and process availability by avoidance of heavy damages inside the switchgear, of the equipment and the direct environment
- Drastic reduction of downtimes and repair costs

Example for a production site (e.g. chemical-, paper- or oil industry)

- Risks: Exchange of damaged switchgear panel(s) or equipment necessary
- Consequence: Loss of production for possibly some days or weeks
- Costs: Up to multiple 100.000 EUR / day possible

Ultra-Fast Earthing Switch type UFES

S³ - Unbeatable advantages



Direct benefit

- Greatly increased operator safety for switchgears
- Minimization of pressure rise and gases in the faulty compartment and surrounding switchgear building

Ultra-Fast Earthing Switch type UFES

UFES = S³

Are you attracted by the UFES?

Please contact...

ufes@de.abb.com



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for a better world™

