DESCRIPTIVE BULLETIN

UFES™

Ultra-fast earthing switch

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The UFES (ultra-fast earthing switch) is a combination of devices consisting of an electronic device and the corresponding primary switching elements which initiate a three-phase grounded bolted fault in the event of a fault. The extremely short switching time of the primary switching element ensures that an arc fault is extinguished almost immediately after it arises.

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UFES™
Arc fault protection device for switchgear

The occurance of an arc fault, the most serious fault within a switchgear system, is associated with extremely high thermal and mechanical stresses in the area concerned.

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01 Arc extinction within ≤ 4 ms (after detection)

An active arc fault protection system based on the know-how gained from decades of experience with the ABB vacuum interrupter and I_s-limiter technology now effectively helps to avoid these negative effects if a fault should occur.

The UFES (ultra-fast earthing switch) is a combination of devices consisting of an electronic device and the corresponding primary switching elements which initiate a three-phase grounded bolted fault in the event of a fault. The extremely short switching time of the primary switching element, less than 1.5 ms, in conjunction with the rapid and reliable detection of the fault, ensures that an arc fault is extinguished almost immediately after it arises. With a total extinguishing time of less than 4 ms after detection, an active protection concept with the UFES enables switchgear installations to achieve a highest possible level of protection for people and equipment.

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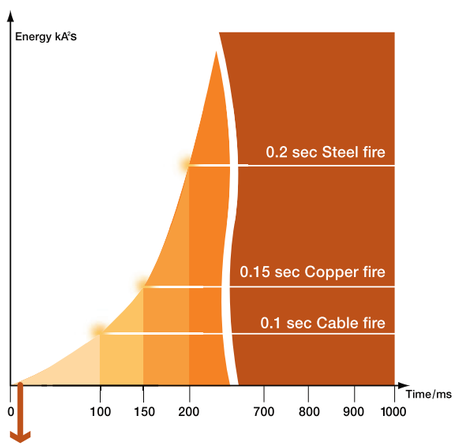
Advantages:

- Increased system and process availability to maintain competitiveness
- Increased switchgear operator safety during or after maintenance work
- Reduced repair costs by minimizing the effects of faults on the system
- Minimization of pressure relief measures by application of active protection concepts
- Reduction of incident energy below (1) cal/cm2. As per OSHA regulations, this brings the hazard risk category to zero.

Avoidance of the severe effects of an arc fault, such as:

- Extreme pressure
- Temperature rise up to 20,000 °C
- Burning/vaporization of metal and insulating material
- Release of particles and hot gases
- Intensive light/high acoustic stress



UFES™
Ultra-fast earthing switch

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01 The Ultra-Fast Earthing Switch eliminates the arc fault well before the first peak of the fault current

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02 Example pressure curves, with and without UFES, in a compartment of an air-insulated medium voltage switchgear system with an internal arc fault current of 130 kA (peak) / 50 kA (rms)

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03 Primary switching element for one phase

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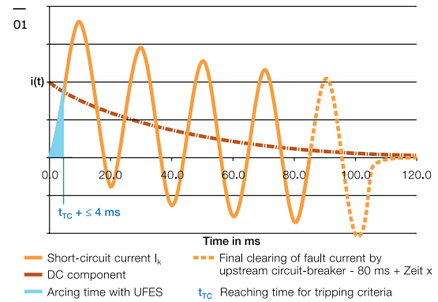

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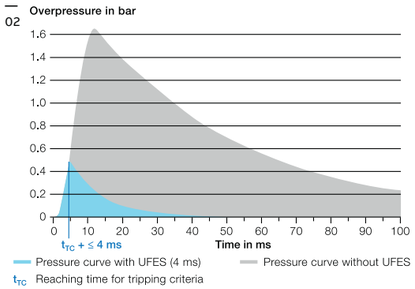

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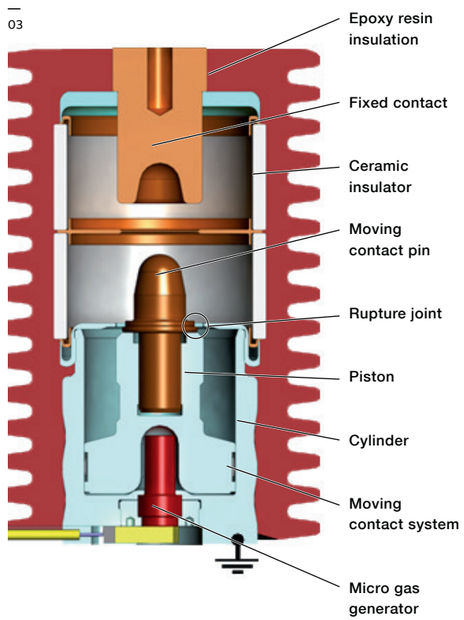

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UFES primary switching element type U1

Electrical maximum characteristics for each voltage category (different types available)						
Rated voltage (ms)*	kV	1.4		17..5	27	36
Rated power frequency withstand voltage (rms)	kV	5		42	60	70
Rated lightning impulse withstand voltage (peak)	kV	12		95	150	170
Rated frequency	Hz	50/60		50/60	50/60	50/60
Rated short-time withstand current	kA	100	50	63	40	40
Rated peak withstand current	kA	220	130	165	104	104
Rated duration of short-circuit	s	0.5	3	2	3	3
Rated short-curcuit making current	kA	220	130	165	104	104
Mechanical properties						
Dimension (diameter x height)	mm (in)	~137 x 210 (~5.4" x 8.3")				
Closing time	ms	< 1.5				
Contact bounce time	ms	0				
Service life expectation						
Number of closing operations		1				
Mechanical	years	up to 30				
Micro gas generator	years	up to 15				

* 40.5 kV on request

UFES
Application example

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01 UFES application (example)
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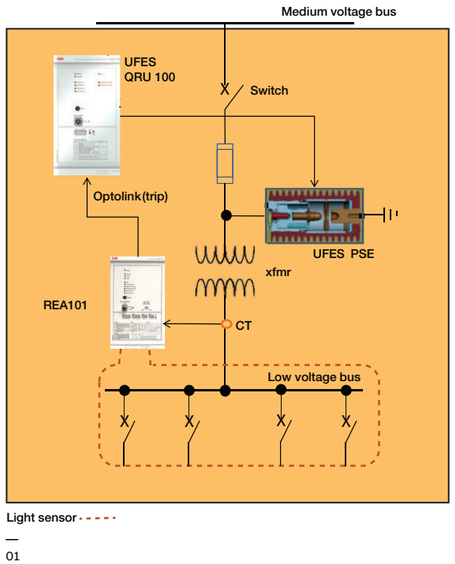
02 Circuit breaker compartment after 60 kA arc fault with UFES protection



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Industries are facing internal and external deadlines to perform arc flash mitigation within their facilities. The UFES is a unique solution to mitigate arc flash risks. Tests based on IEEE Standard 1584 (arc flash calculation standard) of the combination of a fuse based switch and an ultra-fast earthing switch applied between the fuse's load side and the transformer's primary connection have documented that.

During the test, an arc was initiated in the low voltage switchgear that was connected to the transformer. The UFES was able to successfully extinguish the arc within 4 ms by three-phase grounding on the MV system that was subsequently cleared by the fuses so quickly that the system barely felt any disturbance. No arcing, just rapid fault clearing. Moreover, the LV switchgear sustained no visible damage and remained in working condition. With this test, ABB also proved that this arc flash solution on medium/ low voltage systems using UFES is able to reduce the incident energy below (1) cal/ cm2. As per OSHA regulations, this brings the hazard risk category to zero.

UFES
Active protection for switchgear

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01 UFES electronics type QRU100
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02 UFES primary switching element type U1
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03 REA system

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UFES electronics type QRU100
- Standard electronic tripping unit for the combination with ABB arc protection system REA
- Two Optolink inputs for connection of the REA101 relay
- Two high-speed inputs (HSI)
- Self-monitoring
- Optolink supervision
- Testing mode for functional check
- DIP switch configuration
- Ideal for extension of existing ABB arc protection systems
- Alternative: Fault detection by non-ABB system (compatibility verification required)

UFES primary switching element type U1
- Ultra-fast operating mechanism with micro-gas generator
- Vacuum interrupter
- Compact design
- Versatile in installation
- Long service life

ABB arc protection system REA
- Optical detection via line or lens sensors
- Overcurrent detection
- Selective protection
- Circuit breaker failure protection