Active arcing fault protection system for dry-type transformers
Active arcing fault protection system prevents arc faults

- When an arcing fault occurs in an electrical installation, it usually goes hand in hand with very high thermal and mechanical loads for the affected area.

- Arcing faults can be caused by incorrect dimensioning and reductions in insulation due to contamination etc., but they can also be the result of handling errors.

- An arcing fault can have fatal consequences for the operator and strongly damage the system and even the building.

Reliable protection of people and property with the Ultra-Fast Earthing Switch (UFES™) is now also available for dry-type transformers.
Ultra-Fast Earthing Switch type UFES
The new active internal arc protection by ABB

- Active internal arc protection in addition to available passive protection with UFES
- Highest possible protection for electrical components in regard to the hazardous impacts caused by an internal arc
Comprehensive tests document the high protection
Tests with UFES

Arc ignited on HV-side

Before

After

Arc ignited on LV-side

Before

After
Comprehensive tests document the high protection
Tests with arc fault protection enclosure, without UFES

Arc ignited on HV-side
Delivery options

- New transformer with integrated UFES
- ABB Service Box (up to 24 kV)
  - The universal ABB UFES Service Box for subsequent upgrading of ABB transformers with a protective enclosure.
- ABB Service Withdrawable Unit Solutions
  - UFES primary switching elements installed in ABB withdrawable units/truck-type switchgears offer a simple means of upgrading existing switchboards with active arcing fault protection, e.g. for transformers
## Technical data

*on request

<table>
<thead>
<tr>
<th>Rated voltage</th>
<th>Rated Short-time Withstand Current (3s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 17,5 kV</td>
<td>25 kA … 40 kA … 50 kA</td>
</tr>
<tr>
<td>up to 27 kV</td>
<td>25 kA … 40 kA</td>
</tr>
<tr>
<td>up to 36 kV</td>
<td>25 kA … 40 kA</td>
</tr>
<tr>
<td>up to 40,5 kV*</td>
<td>25 kA … 40 kA</td>
</tr>
</tbody>
</table>

* on request
Advantages of a protected transformer with UFES

- Greatly enhanced protection of people
- Far higher availability of systems and processes for the greatest possible competitiveness
- Drastically reduced repair costs through minimum impact of faults on the system: transformer and enclosure can be reused in the event of a fault; only the UFES unit needs to be replaced
- Use of energy-efficient cooling solutions in combination with enclosures independent of the IP-class
- Certified by IAC BFLR test (PEHLA)
Further accessories

$I_s$-limiter
**Iₚ-limiter**

- **Iₚ-limiter** as component or integrated in an air-insulated switchgear
- Rapid short-circuit current limitation in the first rise
- Reduction of the continuous current heat losses in distribution networks
- In use in power plants, by utilities or in industrial networks
- Chance: Direct positive economic and positive environmental impact for the customer
- No risk for the customer
Technical data of $I_s$-limiter

<table>
<thead>
<tr>
<th>Rated voltage</th>
<th>Rated current</th>
<th>Switching capability</th>
</tr>
</thead>
<tbody>
<tr>
<td>0,75 kV</td>
<td>… 5000 A</td>
<td>… 140 kA RMS</td>
</tr>
<tr>
<td>12,00 kV</td>
<td>… 4000 A</td>
<td>… 210 kA RMS</td>
</tr>
<tr>
<td>17,50 kV</td>
<td>… 4000 A</td>
<td>… 210 kA RMS</td>
</tr>
<tr>
<td>24,00 kV</td>
<td>… 3000 A</td>
<td>… 140 kA RMS</td>
</tr>
<tr>
<td>36,00 kV</td>
<td>… 2500 A</td>
<td>… 140 kA RMS</td>
</tr>
<tr>
<td>40,50 kV</td>
<td>… 2500 A</td>
<td>… 140 kA RMS</td>
</tr>
</tbody>
</table>

For higher rated currents $I_s$-limiter can be connected in parallel
### Customer advantages

<table>
<thead>
<tr>
<th>Product / System / Service</th>
<th>Customer advantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>( I_s )-limiter in the coupling of distribution arrangements to balance the transformer load</td>
<td>Reduction of the continuous heat losses in the transformers due to optimized current distribution</td>
</tr>
<tr>
<td></td>
<td>Improvement of the “Power Quality”</td>
</tr>
<tr>
<td></td>
<td>- Better energy reliability</td>
</tr>
<tr>
<td></td>
<td>- Reduction of network impedance</td>
</tr>
<tr>
<td></td>
<td>No need for new switchgear with higher short-circuit ratings</td>
</tr>
</tbody>
</table>
$I_s$-limiter

Separate energy distribution (without $I_s$-limiter)

Separate energy distribution (without $I_s$-limiter)

110 kV

T1: $S_r = 50$ MVA
$P_{Cu,r} = 300$ kW

$I_{T1} = 0.5 \times I_r$

10 kV

T2: $S_r = 50$ MVA
$P_{Cu,r} = 300$ kW

$I_{T2} = 0.5 \times I_r$

10 kV

Copper losses (current heat losses) in the transformer, $P_{Cu} \sim I^2$

T1: $I_{T1} = 0.9 \times I_r \Rightarrow P_{Cu,T1} = 0.81 \times P_{Cu,r} = 0.81 \times 300$ kW = 243 kW

T2: $I_{T1} = 0.1 \times I_r \Rightarrow P_{Cu,T2} = 0.01 \times P_{Cu,r} = 0.01 \times 300$ kW = 3 kW

Total sum of copper losses (current heat losses) = 246 kW
I_s-limiter
I_s-limiter in the coupling

Potential of savings in 30 years:
- 96 kW x 24 h x 365 days x 30 years = 25,228,800 kWh
- This is equal to ca. 7,500 tons black coal
- Resp. ca. 26,000 tons CO₂

T1: \( I_{T1} = 0.5 \times I_r \) => \( P_{CU,T1} = 0.25 \times P_{CU,r} = 0.25 \times 300 \text{ kW} = 75 \text{ kW} \)
T2: \( I_{T1} = 0.5 \times I_r \) => \( P_{CU,T2} = 0.25 \times P_{CU,r} = 0.25 \times 300 \text{ kW} = 75 \text{ kW} \)

Reduction of copper losses (current heat losses) from 246 kW to 150 kW
(separate energy distribution creates 64 % higher losses)!
Power and productivity for a better world™