Heat resistance testing of switch disconnectors

Requested by: ABB Oy
Requested by  
ABB Oy  
Protection and Connection  
Muottitie 2 A, Fl-65320, Vaasa, Finland  
Mobile: +35850 3341284  
email: jukka.lintamo@fi.abb.com

Order  
Minna Vainionpää, 27.9.2016

Contact person  
VTT Expert Services Ltd  
P.O. Box 1001  
FI-02044 VTT, Finland  
Product Manager Kimmo Kaukanen  
Tel: +358-20-722 4859

Task  
Heat resistance testing of switch-disconnectors

Test method  
ABB Oy assigned VTT to develop a special heat resistance test method and furthermore to test the heat resistance of its switch-disconnector products. The switch-disconnectors are intended to be used in conjunction with powered smoke and heat control ventilators and therefore the switch-disconnector could also be installed inside a smoke reservoir and subjected to heat during its operation.

The customer assigned VTT to verify that the switch-disconnectors are able to withstand the same temperatures as the powered ventilators. A product standard exists for switch-disconnectors (IEC 60947-3) but it does not include high heat resistance testing and furthermore no (switch-disconnector specific) test standard exists to verify the functionality of the switch-disconnectors when subjected to heat (300 °C). Therefore a special heat resistance test was designed for the above mentioned purpose. The customer specified that the switch-disconnector product family should last at least in similar temperature condition as a F300 (300 °C for 120 min) classified powered smoke and heat control ventilator (the test class F300 refers to the standard EN 12101-3 for powered heat and smoke exhaust ventilator). The following chapters document the planned special testing.

The test series included the fire tests and dielectric strength tests (after the fire tests).

The Auxiliary Contacts (secondary switching device to give indication of the state of operation) were not tested.

Test specimen  
Switches are mechanical switching devices capable of making, carrying and breaking currents under normal circuit conditions. Disconnectors are mechanical devices that fulfil in the open position the requirements specified for the isolation function (according to IEC 60947-1). Switch disconnectors combine the properties of (load) switches and disconnectors.

The following table 1 presents the test specimen. An assessment was made to evaluate the coverage of the test regarding the whole product family. The assessment is presented in Appendix 4.
<table>
<thead>
<tr>
<th>Specimen ID</th>
<th>Model of the switch:</th>
<th>Model of the enclosed switch:</th>
<th>Cable:</th>
<th>Drawings:</th>
</tr>
</thead>
<tbody>
<tr>
<td>A6</td>
<td>OT250E12</td>
<td>OKA250P3B</td>
<td>REKA FRHT-EMC 4x120/70 F4A 0.6/1kV</td>
<td>2CMR201077A1001-Z23</td>
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<tr>
<td>A7</td>
<td>OT400E03</td>
<td>OKA400P3B</td>
<td>REKA FRHT-EMC 4x240/120 F4A 0.6/1kV</td>
<td>2CMR201052-Z23</td>
</tr>
<tr>
<td>A8</td>
<td>OT630E03</td>
<td>OKA600P3B</td>
<td>2 x REKA FRHT-EMC 4x240/120 F4A 0.6/1kV</td>
<td>2CMR201058-Z23</td>
</tr>
</tbody>
</table>

Drawings and customer delivered
Information of the products: Appendix 1
Manufacturer of the tested enclosed switch-disconnectors: ABB

Date of test 21st November 2016.
Witness Jukka Lintamo, ABB

Test set-up Fire tests

The tests were performed at the VTT Expert Services Ltd structural fire test hall (Kivimiehentie 4) in Espoo, Finland. The test set-up consisted of a furnace, a current circuit and measuring devices. The specimens were fixed to brackets and the brackets were placed inside the furnace in the tests.

A power circuit loop was built up from a power supply through the specimen in the furnace in order to be able to define the functionality of the test specimen. Each specimen had a separate power circuit loop. The power loop equipment is presented in table 2. The test current was adjusted to the operating range maximum value (declared by the manufacturer). For personnel safety reasons the voltage was kept small. The current loop current was measured and verified by calibrated equipment prior to test and during the test.

The test results relate only to the sample tested.

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