

## TESTING AND MEASURING EQUIPMENT/ALLOWED SUBCONTRACTING

### Circuit breakers for equipment

#### IEC 60934 2. Edition (1993) + Am.1 (1994)

R=Required by Lab

S=May be subcontracted

Clause	Measurement/testing	Testing / measuring equipment / material needed	Subcontracting
8.3	Indelibility of marking.	Piece of cotton. Water Petroleum spirit (definition see note in sub-clause).	R
8.4	Reliability of screws, current carrying parts and connections.	Torque screwdrivers or spanners. Settings: 0.2 --- 10.0 Nm. OBS: Calibration of each torque-setting before use.	R
8.5	Reliability of terminals for external conductors.	Dynamometer for pulling force or 6 weights of: 40 – 50 – 60 – 80 – 90 and 100 N. Rigid and flexible standard copper conductors.	R
8.6	Protection against electric chock.	Standard test finger, Fig 7, with electric contact indicator showing contact with live parts. Recommendation: A lamp to be used for indication of contact and the voltage shall be not less than 40 V.	R

Clause	Measurement/testing	Testing / measuring equipment / material needed	Subcontracting
8.7	Electric properties.	<p><u>Humidity cabinet:</u></p> <ul style="list-style-type: none"> <li>- Relative humidity maintained between 91% and 95%</li> <li>- Air temperature between 20 and 30 °C within <math>\pm 1</math> °C</li> </ul> <p><u>Insulation resistance meter:</u></p> <ul style="list-style-type: none"> <li>- Voltage output approximately 500 V d.c.</li> </ul> <p><u>Dielectric strength test equipment:</u></p> <ul style="list-style-type: none"> <li>- Test voltage, 250 ... 2.000 Vrms</li> <li>- Frequency, between 45 Hz and 65 Hz</li> <li>- Minimum short-circuit current, 0.2 A</li> <li>- No over current tripping when current is lower than 100 mA</li> </ul>	R
8.8	Temperature rise.	<p><u>Power supply and load equipment:</u></p> <ul style="list-style-type: none"> <li>- Current output up to 125 A</li> <li>- voltage, up to 440 alt. 630 V a.c. up to 250 d.c.</li> </ul> <p>Temperature measuring equipment with fine wire thermocouplers or equivalent means.</p>	R
8.9	28-days test.	<p>Auxiliary switch making cycles of 21 h / 3 h with / without current flowing.</p> <p>Temperature measuring equipment with fine wire thermocouplers or equivalent means.</p>	R

Clause	Measurement/testing	Testing / measuring equipment / material needed	Subcontracting
8.10	Tripping characteristics.	<p>Current load equipment:</p> <ul style="list-style-type: none"> <li>- up to 750 A</li> </ul> <p>Tripping-time measuring equipment:</p> <ul style="list-style-type: none"> <li>- 0.001 sec. Through 1000 sec.</li> </ul> <p>Heating cabinet:</p> <ul style="list-style-type: none"> <li>- + 40 ± 2 °C</li> </ul> <p>Cold Cabinet:</p> <ul style="list-style-type: none"> <li>- - 5 ± 2 °C</li> </ul>	R
8.11	<p>Electrical capability.</p> <p>Making and breaking operation.</p>	<p>Load equipment system consisting of resistors and reactors connected in series.</p> <p>For <u>air-core</u> reactors, resistors taking aprox. 0.6 % of the current through the reactors must be available.</p> <p>For <u>iron-core</u> reactors, the iron power losses shall not appreciably influence the recovery voltage.</p> <p>Power supply, 3 phase system:</p> <ul style="list-style-type: none"> <li>- current: up to 750 A, quantities: 5 %</li> <li>- voltage: 440 V a.c., 250 V d.c., quantities: 5 %</li> <li>- frequencies: 50/60 Hz, quantities: 5 %</li> <li>- <math>\cos\varphi = 0,2 - 0,98</math></li> </ul> <p>Device for operating the test-sample:</p> <ul style="list-style-type: none"> <li>- setting of time of close/open position, 1 sec. Through 80 sec.</li> </ul>	R

Clause	Measurement/testing	Testing / measuring equipment / material needed	Subcontracting
8.12	Short-circuit test.	<p>The voltage for the short circuit test must be so designed that the value of the applied voltage is that which is necessary to produce the specified power frequency recovery voltage.</p> <p>The value of the power frequency recovery voltage in each phase shall be equal to a value corresponding to 105 % of the rated operational voltage of the test-sample.</p> <p>The axiliuary switch A in Fig. 3 to 6 shall be synchronized with respect to the voltage wave .</p> <p>Tolerances on the test quantities:</p> <ul style="list-style-type: none"> <li>- current: + 5 %</li> <li>- voltage: <math>\pm 5</math> % (including power-frequency recovery voltage)</li> <li>- frequency: <math>\pm 5</math> %</li> </ul>	<p>R: For rated short-circuit current up to 3.000 A</p> <p>S: For rated short-circuit current above 3.000 A</p>
8.13	Resistance to mechanical chock and impact.	Test-specifications under consideration	
8.14	Resistance to heat.	<p>Heating cabinet:</p> <ul style="list-style-type: none"> <li>- <math>75 \pm 2</math> °C</li> <li>- <math>100 \pm 2</math> °C</li> <li>- <math>125 \pm 2</math> °C</li> </ul> <p>Standard test finger:</p> <ul style="list-style-type: none"> <li>- posh-force: 5 N</li> </ul> <p>Ball-pressure test equipment:</p> <ul style="list-style-type: none"> <li>- diameter of steel ball: 5 mm</li> <li>- pressure force: 20 N</li> <li>- support steel plate</li> </ul>	R
8.15	Resistance to abnormal heat and to fire.	Glow-wire test procedure and equipment in accordance to IEC 60695-2-1/0	R



Clause	Measurement/testing	Testing / measuring equipment / material needed	Subcontracting
8.16	Resistance to tracking.	Tracking test procedure and equipment for determine CTI in accordance to IEC 60112	R
8.17	Resistance to rusting	Procedure for degreasing and treatment of parts to be tested: <ul style="list-style-type: none"><li>- cold chemical degreaser, methyl-chloroform or refined petrol</li><li>- 10 % solution of ammonium chloride in water, <math>20 \pm 5</math> °C</li><li>- box (desiccator) containing air satiated with moisture, <math>20 \pm 5</math> °C</li><li>- heating cabinet, <math>100 \pm 5</math> °C</li></ul>	R

Note: The presence of equipment alone does not indicate a satisfactory situation. Assessors must evaluate the equipment design, calibration, uncertainty and documentation to ensure compliance with the directions of the standard. The requirements of ISO Guide 25 regarding validation are applicable, as the tests of this standard are not standardised tests.