ON-LOAD TAP CHANGER TYPE V

General Manual
On-Load Tap changer Type V

The on-load tap changer type V serves to vary the ratio of oil-immersed transformers under load. The tap changer is designed as selector which combining the features of a diverter switch and a tap selector. It represents the most recent state of technology. This tap changer offers both the transformer manufacturer and the end-user a great number of essential advantages.

Versatile application, design savings.
- three pole design for neutral application for 200 A, 350A and 500 A, for three-phase star-connected windings
- three-pole design, fully insulated, for 200 A, 350 A and 500 A, for three-phase delta-connected or autotransformer windings
- single-pole tap changers for 200 A, 350 A and 700 A for single –phase transformers
- available up to ± 13 steps
- insulation level (according to highest voltage for equipment) up to $U_m = 76 \, \text{kV}$
- Convenient installation into bell-type tank

Sturdy construction, reliable in service
- High-speed transition resistor taps changer, arc extinction at the first current zero
- Simple gear mechanism
- Arcing contact material for 350 A and 500 A is of tungsten alloy, for 200 A of copper
- Current paths for switching current and continuous current are separate.

Cost saving and easy installation
- Oil-immersed installation of the entire tap changer into transformer main tank
- Low installation length and simple connection
- Easy handling
- Drive shaft and pipe connections can be swivelled as desired.
- Simple coupling to motor drive unit

Reduced maintenance
- Long contact life
- Easy and quick disassembling of selector switch insert
- Arcing contacts exchangeable
- Simple adjustment and control
- Oil suction pipe incorporated

On-load tap changer V III 500 D
$U_m=40\,\text{kV}$, 500 A, +9 steps
On Load Tap Changer V III 350 Y
$U_m = 40kV$, $350$ A, $\pm 11$ steps

On Load Tap Changer V III 200 D
$U_m = 76kV$, $200$ A, $\pm 9$ steps
The essential parts of the type V tap changer are the tap changer head, the oil compartment, the gearing mechanism, and the tap changer insert.

The tap changer head, which serves to mount the tap changer on the transformer cover, is provided with connecting facilities for a pipe leading to the oil conservator and for a suction pipe to drain the oil compartment. The tap changer head is closed with a cover which is designed as a pressure relief diaphragm. The cover carry the upper gear unit with the drive shaft. The pipe connections and gear unit can be swiveled.

The oil compartment is a GFRP insulating cylinder. Its upper end is attached to the tap changer head and its lower end is closed by the bottom flange. The fixed contacts of both change-over selector and selector switch are arranged in separate levels on the internal side of the oil compartment cylinder and connected to outside terminals.

Properly designed screening electrodes around the outside terminals and screening rings on the selector switch inside the oil compartment optimize the static field distribution, thereby resulting in an outstanding lightning impulse and power-frequency withstand.

The gearing mechanism for actuating the selector switch shaft and change-over selector is assembled on a base plate within the tap changer head. It comprises of the spring energy accumulator, a step-by-step gear for the operation of the selector switch and another step-by-step gear for the operation of the position indicator and change-over selector. The step-by-step gears are self-locking. All parts subject to high mechanical stress have been heat-treated on the surface. The gearing mechanism is maintenance free.

The tap changer insert contains the entire movable contact system of the tap changer (selector switch and change-over selector contact carrier).

The upper end of the switch shaft is connected to the gearing mechanism by means of a pin coupling. Its lower end is pivoted in a bearing centered in the oil compartment bottom. The change-over selector contact carrier is located on the top of the switch shaft and can be tuned independently of the switch shaft.

The switching elements are mounted to the switch shaft at the levels of the corresponding fixed contacts. There are 3 contact rollers side by side per switching element which function as main switching or transition arcing contacts respectively during tap changer operation.
ON-LOAD TAP CHANGER TYPE V
General Manual

Group 10 - Tap Changer head
11- Tap Changer head casting
12- Tap Changer cover
13- upper gear unit (Swivelling)
14- Bleeder Valve

Group 20 - Oil compartment
21- Oil compartment cylinder
22- Oil compartment bottom
23- Change over selector terminal
24- Selector switch terminal
25- Current take-off terminal
26- kerosene solvent drain screw

Group 30 - Gearing
31- Gear base plate
32- Cog wheel with coupling
33- Geneva wheel for selector switch drive shaft
34- Drive crank for change-over selector

Group 40 - Selector Switch
41- Selector switch drive shaft
42- Switching element
43- Contact roller for arcing contacts
44- Fixed arcing contact
45- Contact roller for shunt contact
46- Contact roller for current take-off
47- Current collecting ring
48- Transition resistor
49- Bottom bearing

Group 50 - Change- over selector
51- Contact carrier
52- Grading ring
53- Movable contact

Group 40 - Selector Switch
61- Connection facility with bleeder screw
62- Internal connection pipe
63- Suction pipe
64- Centring
# Technical Data

The Technical Data of the tap changer type V have been verified in type tests according to IEC International Standard 214. Moreover, the tap changer meets all corresponding National Standards.

## Tap Changer Type V

<table>
<thead>
<tr>
<th>Tap Changer</th>
<th>V III 200 Y</th>
<th>V III 200 D</th>
<th>V I 200</th>
<th>V III 350 Y</th>
<th>V III 350 D</th>
<th>V I 350</th>
<th>V I 700</th>
<th>V III 500 Y</th>
<th>V III 500 D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of poles</td>
<td>3 in the neutral</td>
<td>3 in any part of the winding</td>
<td>1 in the neutral</td>
<td>3 in any part of the winding</td>
<td>3 in the neutral</td>
<td>1 in the neutral</td>
<td>1 in the neutral</td>
<td>3 in the neutral</td>
<td>3 in any part of the winding</td>
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<tr>
<td>Max. rated through current (in A)</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>350</td>
<td>350</td>
<td>350</td>
<td>700</td>
<td>500</td>
<td>500</td>
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<td>Short circuit withstand (in kA)</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>7</td>
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<tr>
<td>dynamic (three second value)</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>12.5</td>
<td>12.5</td>
<td>12.5</td>
<td>25</td>
<td>17.5</td>
<td>17.5</td>
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<tr>
<td>Max. rated step voltage (in V)</td>
<td>10 contacts</td>
<td>1500</td>
<td>1500</td>
<td>1500</td>
<td>1500</td>
<td>1500</td>
<td>1500</td>
<td>1500</td>
<td>1500</td>
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<tr>
<td></td>
<td>12 contacts</td>
<td>1400</td>
<td>1400</td>
<td>1400</td>
<td>1400</td>
<td>1400</td>
<td>1400</td>
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</tr>
<tr>
<td></td>
<td>14 contacts</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
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<tr>
<td>Rated switching capacity (in kVA)</td>
<td>10 contacts</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>525</td>
<td>525</td>
<td>525</td>
<td>660</td>
<td>400</td>
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<td></td>
<td>12 contacts</td>
<td>280</td>
<td>280</td>
<td>280</td>
<td>420</td>
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<td>420</td>
<td>520</td>
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<td>14 contacts</td>
<td>200</td>
<td>200</td>
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<td>350</td>
<td>350</td>
<td>350</td>
<td>450</td>
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<tr>
<td>Rated frequency</td>
<td>50...60 Hz</td>
<td>50...50 Hz</td>
<td></td>
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<tr>
<td>Operating positions</td>
<td>without change-over selector max. 14</td>
<td>max.12</td>
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<tr>
<td>with change-over selector max. 27</td>
<td>max. 23</td>
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<tr>
<td>Insulation</td>
<td>(U_m = 123 kV as special design V III 200/350 Y - 123 and V III 200/350 D - 123/76)</td>
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<tr>
<td>Highest voltage for equipment U_{in} (in kV)</td>
<td>40</td>
<td>76</td>
<td>123</td>
<td>Note</td>
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<td></td>
<td>1 increased rated switching capacity with reduced through current</td>
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<tr>
<td>Rated lighting withstand voltage</td>
<td>200</td>
<td>350</td>
<td>550</td>
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<td>(in kV, 50Hz 1min)</td>
<td>70</td>
<td>140</td>
<td>230</td>
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<tr>
<td>Selector switch of compartment</td>
<td>pressure proof up to 0.3 bar pressure difference (test pressure 0.6 bar)</td>
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<tr>
<td>Oil suction pipe</td>
<td>standard equipment</td>
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<tr>
<td>Oil displacement</td>
<td>approx. 80...220 litres</td>
<td>approx. 275 litres</td>
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<tr>
<td>Oil filling quantity</td>
<td>approx. 55...180 litres</td>
<td>approx. 235 litres</td>
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<tr>
<td>Weight</td>
<td>approx. 110...150 kg</td>
<td>approx. 200kg</td>
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<tr>
<td>Drying procedure</td>
<td>vacuum drying up to max. 110°C, vapor phase drying up to max. 125°C</td>
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<tr>
<td>Drive mechanism</td>
<td>Motor drive unit MA 9, protective housing in outdoor design, motor data 3 AC 230/400 V, 50 Hz, 0.55 kW step-by-step operation with local and remote control, electrical position limitation facility for remote position indication (pointer instrument or lamp panel or digital display). hand crank operation for emergency and adjustment purpose</td>
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</tbody>
</table>

Note 1 increased rated switching capacity with reduced through current

1. U_m = 123 kV as special design V III 200/350 Y - 123 and V III 200/350 D - 123/76
2. with V III 200/350 D - 123/76 between phases

EMR/GEN/V/0010