On-Load Tap Changers Type M&MS
On-Load Tap Changer
Type M

OLTC type M
model M III 500 Y,
$U_{in} = 123$ kV,
500 A,
± 9 steps

The type M & MS on-load tap changers are used to vary the ratio of oil-immersed transformers under load. In general, they are designed for network transformer as well as industrial transformer applications. The tap changers comprise a diverter switch and a tap selector in a single column design and represent the most recent state of technology. The tap changers offer both transformer manufacturer and user a great number of essential advantages.

On-load tap changers type M & MS

Versatility
- three-pole design for neutral application at 300 A, 350 A, 500 A and 600 A ratings for three-phase wye-connected windings
- three-pole fully insulated design, at 350 A, 500 A and 600 A ratings for three-phase delta or auto connected windings
- single-pole designs at 300 A, 350 A, 500 A, 600 A, 800 A, 1200 A, 1500 A and 1800 A ratings for auto connected windings or single-phase transformers
- available with ± 9°, ± 11°, ± 13°, ± 15°, ± 17 steps
- insulation to ground and tap selector size can be selected independently of one another
- convenient for bell-type tank installation
- additional devices for potential tie-in of tap winding during change-over operation of the change-over selector (tie-in resistors, tie-in contact)
- optional extras, especially for the application in industrial transformers, please refer to our documentation VK 04

Compactness
- high speed transition resistor type diverter switch with arc extinction at the first current zero
- diverter switch uses snap-action mechanics by energy accumulator mounted directly on the diverter switch
- minimum possible tap selector dimensions because four available sizes ensure matched impulse voltage withstandability
- radial dimensions of the tap selector are reduced by special shaping of all parts on high potential, distances between tap selector bars determined by actual voltage stress
- optimised integration of the change-over selector into the fine selector contact circle

1 applicable to type MS
On-Load Tap Changer
Type MS

The type MS is intended to cover the lower range of application of the type M. It is applicable to ratings up to 300 A, 27 operating positions and 300 kV lightning impulse withstand on the live tap selector.

This most economic design is the result of a tap selector of simple and functional construction with a max. rated throughput-current of 300 A.

On-load tap changers type M & MS

Robustness – long life

- rapid tap change operation, low thermal stress on the transition resistors
- diverter switch arcing contacts made of tungsten-copper alloy at 500 A and above
- simple tap selector design, effective contact cooling, high short-circuit withstandability
- tap selector gear with steady torque during the tap changer operation

Easy to install – cost saving

- oil-immersed installation of the entire tap changer in the transformer main tank
- simple to connect
- drive shaft and pipe connections easy to orientate
- straightforward coupling to motor drive unit

Reduced maintenance

- long contact life
- quick and easy to disassemble diverter switch insert
- simple to adjust and control
- oil suction pipe built-in
- diverter switch contacts easy to replace
The Diverter Switch Unit

This unit comprises the spring operated energy accumulator, the diverter switch itself and the transition resistors. For inspection, the unit has to be withdrawn from the oil compartment through the head.

The Tap Selector

The tap selector comprises the gearing, the column with take-off rings, the insulating bar cage with connecting terminals, the contact bridges with the corresponding drive tubes and segments, and the upper and lower cage rings. The tap selector may also include a change-over selector.
The technical data of types M and MS have been verified in type tests according to IEC International Standard 214 (1989). Moreover, they meet all corresponding National Standards. Detailed information and comprehensive data for selecting a type M for a particular application are contained in our printing matter TD 50, and for the type MS in TD 60.

<table>
<thead>
<tr>
<th>Tap changer model</th>
<th>M III 350 Y</th>
<th>M III 500 Y</th>
<th>M III 600 Y</th>
<th>M I 351</th>
<th>M I 501</th>
<th>M I 601</th>
<th>M I 802</th>
<th>M I 1000</th>
<th>M I 1500</th>
<th>M I 1800</th>
<th>M III 350 D</th>
<th>M III 500 D</th>
<th>M III 600 D</th>
<th>MS III 350 Y</th>
<th>MS I 301</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of poles and application</td>
<td>3 (neutral)</td>
<td>3 (neutral)</td>
<td>3 (neutral)</td>
<td>1</td>
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<td>3</td>
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<td>(neutral) 1</td>
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<tr>
<td>Max. rated through-current (A)</td>
<td>350</td>
<td>500</td>
<td>600</td>
<td>350</td>
<td>500</td>
<td>600</td>
<td>800</td>
<td>1200</td>
<td>1500</td>
<td>1800</td>
<td>350</td>
<td>600</td>
<td>300</td>
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<td>Short circuit strength (kA)</td>
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<td>Dynamic (peak)</td>
<td>15</td>
<td>20</td>
<td>20</td>
<td>15</td>
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<td>40</td>
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<td>15</td>
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<td>12.5</td>
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<td>Max. rated step voltage (Y)</td>
<td>3300</td>
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<tr>
<td>Max. rated switching capacity (kVA)</td>
<td>1000</td>
<td>1400</td>
<td>1500</td>
<td>1000</td>
<td>1400</td>
<td>1500</td>
<td>2000</td>
<td>3100</td>
<td>3500</td>
<td>4200</td>
<td>1000</td>
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<tr>
<td>Rated frequency (Hz)</td>
<td>50</td>
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<tr>
<td>Operating positions</td>
<td>without change-over selector, max. 18</td>
<td>with change-over selector, max. 30</td>
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<tr>
<td>Insulation to ground</td>
<td>72.5</td>
<td>123</td>
<td>170</td>
<td>245</td>
<td>72.5</td>
<td>123</td>
<td>72.5</td>
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<tr>
<td>Highest voltage for equipment $U_{m}$ (kV)</td>
<td>72.5</td>
<td>123</td>
<td>170</td>
<td>245</td>
<td>72.5</td>
<td>123</td>
<td>72.5</td>
<td>123</td>
<td>170</td>
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<tr>
<td>Rated lightning impulse withstand voltage (kV, 1.2/50)</td>
<td>350</td>
<td>550</td>
<td>750</td>
<td>950</td>
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<tr>
<td>Rated power frequency withstand voltage (kV, 50 Hz, 1 min.)</td>
<td>140</td>
<td>230</td>
<td>325</td>
<td>395</td>
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<tr>
<td>Tap selector</td>
<td>5 different tap selector sizes (A, B, C, D, DE) available according to the requirements by voltage stress on the tap winding. Lightning impulse withstand voltage in kV, 1.2/50 across regulating range A = 135, B = 265, C = 330, D = 495, DE = 550.</td>
<td>$U_{n}$/tap selector size 72.5/B, 123/C</td>
<td>tap selector size B</td>
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<td>Divertor switch oil compartment</td>
<td>pressure proof up to 0.3 bar pressure difference (test pressure 0.8 bar)</td>
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<td>Oil suction pipe</td>
<td>standard equipment</td>
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<tr>
<td>Oil displacement</td>
<td>approx. 195...265 litres (695 litres)*</td>
<td>72.5/B, 123/C</td>
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<tr>
<td>Oil filling quantity</td>
<td>approx. 125...190 litres (400 litres)*</td>
<td>72.5/B, 123/C</td>
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<tr>
<td>Weight</td>
<td>approx. 240...285 kg (540 kg)*</td>
<td>72.5/B, 123/C</td>
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<tr>
<td>Drying procedure</td>
<td>vacuum-drying up to max. 110°C</td>
<td>vapor-phase drying up to max. 125°C</td>
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<tr>
<td>Drive mechanism</td>
<td>motor drive unit MA 7, protective housing in outdoor design, motor data: 220/260 V, 3 ph., 50 Hz, 0.75 or 1.1 kW, step-by-step operation with local and remote control, mechanical and electrical position limitation, facility for remote position indication (pointer instrument, lamp panel, digital display), hand crank operation for emergency and adjustment purposes, alternative motor drive unit MA 9</td>
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VK 03/95 en — 0896/4000
Printed in Germany