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NOTE

These technical data are intended for the calculator and designer of the transformer. These type-specific data are only valid in connection with the information contained in the general section (TD 61) since this section contains important information on such subjects as potential connection, leakage inductance, current division, and so on. Dimensional drawings and connection diagrams are subject to change without prior notice. Drawings submitted during bidding and ordering are always binding.

Since the on-load tap-changer is delivered to the specifications of the transformer manufacturer, the transformer manufacturer is responsible for selecting the correct properties of the on-load tap-changer so that the requirements of the transformer are met.
1 General

1.1 Summary of the technical data

<table>
<thead>
<tr>
<th>On-load tap-changer</th>
<th>G III 1602 Y</th>
<th>G I 1612</th>
<th>G I 3022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of poles and application</td>
<td>3 (neutral point)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Max. rated through-current $I_{\text{um}}$ (in A)</td>
<td>1600</td>
<td>1600</td>
<td>3000</td>
</tr>
<tr>
<td>Rated short-time withstand current (in kA)</td>
<td>24</td>
<td>24</td>
<td>30</td>
</tr>
<tr>
<td>Rated short-circuit duration (in s)</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Rated peak withstand current (in kA)</td>
<td>60</td>
<td>60</td>
<td>75</td>
</tr>
<tr>
<td>Max. rated step voltage $U_{\text{im}}$ (in V)</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
</tr>
<tr>
<td>Step capacity ($P_{\text{StN}}$) (in kVA)</td>
<td>5000</td>
<td>5000$^{2)}$</td>
<td>6500$^{2)}$</td>
</tr>
<tr>
<td>Rated frequency (in Hz)</td>
<td></td>
<td></td>
<td>50 to 60</td>
</tr>
<tr>
<td>Operating positions</td>
<td>Without change-over selector: max. of 16 (18)$^{3)}$ With change-over selector: max. of 31 (35)$^{3)}$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Rated insulation level**

| Highest voltage for equipment $U_{\text{m}}$ (in kV) | 72.5 | 123 | 170 | 245 | 300 | 362$^{4)}$ |
| Highest operating voltage $U_{\text{b}}$ (phase-phase) on diverter switch (in kV) | 55 | 79 | 145 | 170 | 245 | 300 |
| Rated lightning impulse withstand voltage (in kV, 1.2/50) | 350 | 550 | 750 | 950$^{4)}$ | 1050 | 1175 |
| AC withstand voltage (in kV, 50 Hz, 1 min.) | 140 | 230 | 325 | 395$^{4)}$ | 460 | 510 |
| Rated withstand voltages of internal insulation | see table 3 |

**Oil compartment**

Pressure-proof up to 0.3 bar continuous difference pressure (test pressure 0.6 bar), head and cover of the on-load tap-changer are vacuum-proof.

**Oil suction pipe**

Installed as standard (for details, see BA 18)

**Temperature range**

The on-load tap-changer OILTAP® M can be operated in the rated load range with oil temperatures of -25 °C to +105 °C.

Table 1 a
1 General

On-load tap-changer | G III 1602 Y | G I 1612 | G I 3022
--- | --- | --- | ---
Weight (in kg) ca. | | | |
without change-over selector | 1480 | 1380 | 1460
with change-over selector | 1620 | 1500 | 1560
Displacement volume (in dm³) ca. | | | |
72.5 kV | 1000⁵ | – | –
123 kV | 1025⁵ | 1040 | 1060
170 kV | 1100⁵ | 1050 | 1135
245 kV | 1155⁵ | 1220 | 1190
300 kV | 1220⁵ | 1150 | 1245
Oil filling quantity $V_S$⁶ of the diverter switch oil compartment in dm³ (ca.) | | | |
72.5 kV | 690⁷ | 750 | 720
123 kV | 730⁷ | 790 | 760
170 kV | 750⁷ | 810 | 780
245 kV | 820⁷ | 880 | 850
300 kV | 905⁷ | 965 | 935

Notes for tables 1a and 1b:

1) The maximum rated step voltage may be exceeded by 10% due to overexcitation of the transformer if the step capacity is limited to its rated value.
2) Higher step capacities available as special design
3) Only available with limited rated withstand voltages
4) Rated withstand voltages comply with IEC 60214: 1989; unrestricted tests possible up to 1050 kV 1.2/50 or 460 kV, 50 Hz, 1 min..
5) Applies to $i = i_1$; for $I_{\text{h}}$: adhere to +67 dm³
6) Minimum volume of oil conservator for oil temperature $\vartheta = -30 \, ^\circ\text{C} \ldots +100 \, ^\circ\text{C}$: $\Delta V = 0.1 \, V_S + 90 \, (\text{dm}^3)$.
7) Applies to $i = i_1$; for $I_{\text{h}}$: adhere to +60 dm³
8) On request
1.2 Survey

**Fig. 1** Survey of the on-load tap-changer designs (no. of poles, change-over selector, and installation length)
Survey of the basic connection diagrams (fig. 2a, 2b, 2c) with designation of the tap selector contact terminals in accordance with MR standards. This contact terminal designation corresponds to the specifications in the on-load tap-changer dimensional drawings.

Fig. 2a
1 General
1 General

Fig. 2c
Examples of connection diagrams (contact designation in acc. w. MR standards)

Fig. 3 Example: On-load tap-changer G III 1602 Y, basic connection diagram 10 19 1 G
Fig. 4  Example: On-load tap-changer  G III 1602 Y, basic connection diagram 14 27 1 G
Fig. 5 Example: On-load tap-changer G I 1612, basic connection diagram 16 31 3 W
Fig. 6  Example: On-load tap-changer GI 3022, basic connection diagram 10 19 1 W
2 Technical Data

2.1 Rated through-current (\(I_u\)), rated step voltage (\(U_i\)) and step capacity (\(P_{StN}\))

<table>
<thead>
<tr>
<th>On-load tap-changer</th>
<th>G III 1602 Y</th>
<th>G I 1622</th>
<th>G I 3022</th>
<th>G I 1602</th>
<th>G I 3002</th>
</tr>
</thead>
<tbody>
<tr>
<td>(I_u) (A)</td>
<td>1000</td>
<td>1600</td>
<td>1300</td>
<td>1600</td>
<td>–</td>
</tr>
<tr>
<td>(U_i) (V)</td>
<td>5000</td>
<td>3125</td>
<td>5000</td>
<td>4060</td>
<td>3250</td>
</tr>
<tr>
<td>(P_{StN}) (kVA)</td>
<td>5000</td>
<td>5000</td>
<td>6500</td>
<td>6500</td>
<td>8000</td>
</tr>
</tbody>
</table>

Table 2
Rated through-currents (\(I_u\)), related rated step voltages (\(U_i\)) and step capacities (\(P_{StN}\)), at highest and lowest rated step voltage of the step capacity curve (see fig. 7)

Note:  
\(^1\) Special design with 2-sector diverter switch (see fig. 8)  
\(^2\) Special design with 3-sector diverter switch (see fig. 8)

![Fig. 7](image)

Step capacities (rated step voltages \(U_i\), rated through-currents \(I_u\)) for neutral-point, on-load tap-changer G III 1602 Y

CAUTION: Only applies to network service. When used for industrial transformers, please contact us.
2.2 Contact life

The mean expected contact life of the arcing diverter switch contacts can be estimated based on the relative load \((I_u / I_{um})\) as shown in fig. 9. Since actual contact life in individual cases depends on many influencing factors while in service, only estimations can be given (not applicable to constant current service).

The inspection regulations must be observed.

Fig. 9

Expected mean contact life under average load

\(n\) – Number of operations

\(I_u\) – Rated through-current

\(I_{um}\) – Max. rated through-current
Fig. 10 shows diagrams of the voltage stress present on the tap winding of the three primary basic connections of three-pole on-load tap-changers and single-pole on-load tap-changers. When selecting the on-load tap-changer, a check must be made to determine whether the highest stress on the tap selector does not exceed the related rated withstand voltages.

**CAUTION**
Adhere to maximum rated lightning impulse withstand voltage stress on a₀ in mid-position.

---

**CAUTION**
Adhere to maximum rated lightning impulse withstand voltage stress on a₀ in mid-position.

---

**Fig. 10** Specific voltage stresses of the tap winding
## Technical Data

### On-load tap-changer G III 1602 Y, G I 1612, G I 3022

Connectors in acc. w. 890741, sheet 1

Connectors in acc. w. 890741, sheet 2

<table>
<thead>
<tr>
<th>Insulation distances</th>
<th>Tap selector size D 10 - 16 pitch</th>
<th>Tap selector size E 1.2/50 kV 50 Hz 1 min</th>
<th>Tap selector size D 10 - 16 pitch</th>
<th>Tap selector size E 10 - 16 pitch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>kV 1.2/50 50 Hz 1 min</td>
<td>kV 50 Hz 1 min</td>
<td>kV 1.2/50 50 Hz 1 min</td>
<td>kV 1.2/50 50 Hz 1 min</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tap selector pitch</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 12 14 16 18</td>
<td>10 12 14 16 18</td>
<td>10 12 14 16 18</td>
<td>10 12 14 16 18</td>
</tr>
<tr>
<td>a0</td>
<td>80 kV 1.2/50; 3 x U_{st} with Z_n'0 or 140 kV 1.2/50; 30 kV, 50 Hz, 1 min without Z_n'0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a_1</td>
<td>150 30 150 150 150 150 150 150 30 150 30 150 30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>500 150 680 660 645 630 560 180 380 120 420 150</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>500 150 680 660 645 630 560 180 380 120 420 150</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c_1</td>
<td>650 235 850 280 490 190 530 190</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c_2</td>
<td>680 245 850 280 510 200 530 190</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a_3</td>
<td>400 120 400 120 400 120 400 120</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Notes:
1) Choice of connectors for tap selector contacts as shown in drawing 890741; sheet 1 or sheet 2, see section 3
2) Omitted for single-phase, on-load tap-changers G I 1612, G I 2012, G I 3012
3) Between opened contacts of the potential switch (special design, see section 3)

### Table 3

Rated withstand voltages of the internal insulation of the tap selector

The tap selector size (letters D, E) characterizes the internal insulation of the tap selector whose rated withstand voltages must be adjusted to the requirements of the transformer winding.

The maximum permissible operating voltage along the individual tap selector paths is half the value of the AC withstand voltages listed in table 3.
3 Appendix

Dimensional drawings
On-load tap-changer OILTAP® G III 1602 Y ................................................................. 892636
On-load tap-changer OILTAP® G I 1612, G I 1622, G I 1602 ........................................... 891389
On-load tap-changer OILTAP® G I 3022, G I 3002 .......................................................... 891391

Arrangement of tap selector terminals .................................................................................. 894247

Special accessories
On-load tap-changer OILTAP® G III 1602 Y, G I 1612, G I 3022,
Connectors for tap selector terminal contacts ........................................................................ 890741, sheet.1 + sheet 2
On-load tap-changer OILTAP® G I 3022/3002, jumpers for parallel connection
of tap selector terminal contacts ............................................................................................... 894548
Lifting cross for installation and removal of the diverter switch unit ........................................ 890442

On-load tap-changer installation drawings
On-load tap-changer OILTAP® G III 1602 Y, G I 1602, G I 3022 ........................................... 894641

Additional drawings for on-load tap-changers
On-load tap-changer head ........................................................................................................ 890716
Special design for installation in bell-type tanks ................................................................. 890659
On-load tap-changer cover with mounting flange for pressure relief valve ......................... 897963
Potential switch, tie-in resistors .................................................................................. 897962
Horizontal drive shaft ........................................................................................................ 890453
Directory of the additional drawings in acc. w. note in dimensional drawings .................. 898805
On-load tap-changer OILTAP® G
Design G III 1602, with and without change-over selector
Tap selector pitch 10 to 16

For inherent drawings refer to 898806

Measure in mm

<table>
<thead>
<tr>
<th>B</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
<td>16</td>
</tr>
</tbody>
</table>

DIMENSION TABLE

<table>
<thead>
<tr>
<th>SW</th>
<th>1724</th>
<th>600</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>1024</td>
<td>575</td>
</tr>
<tr>
<td>15</td>
<td>924</td>
<td>575</td>
</tr>
<tr>
<td>14</td>
<td>824</td>
<td>575</td>
</tr>
<tr>
<td>13</td>
<td>724</td>
<td>575</td>
</tr>
<tr>
<td>12</td>
<td>624</td>
<td>575</td>
</tr>
<tr>
<td>11</td>
<td>524</td>
<td>575</td>
</tr>
<tr>
<td>10</td>
<td>424</td>
<td>575</td>
</tr>
<tr>
<td>9</td>
<td>324</td>
<td>575</td>
</tr>
<tr>
<td>8</td>
<td>224</td>
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<tr>
<td>7</td>
<td>124</td>
<td>575</td>
</tr>
<tr>
<td>6</td>
<td>116</td>
<td>575</td>
</tr>
<tr>
<td>5</td>
<td>106</td>
<td>575</td>
</tr>
<tr>
<td>4</td>
<td>96</td>
<td>575</td>
</tr>
<tr>
<td>3</td>
<td>86</td>
<td>575</td>
</tr>
<tr>
<td>2</td>
<td>76</td>
<td>575</td>
</tr>
<tr>
<td>1</td>
<td>66</td>
<td>575</td>
</tr>
</tbody>
</table>

REV SWITCH

COARSE TAP SEL

REV SWITCH

COARSE TAP SEL
On-load tap-changer OILTAP® G
Design G I 1612, G I 1622, G I 1602, with and without change-over selector, tap selector pitch 10 to 16
On-load tap-changer OILTAP® G
Design G I 3022 and G I 3002, with and without change-over selector, tap selector pitch 10 to 16

DIMENSION TABLE

<table>
<thead>
<tr>
<th>TAP SELECTOR</th>
<th>D 10 - 16 DIV</th>
<th>E 10 - 18 DIV</th>
</tr>
</thead>
<tbody>
<tr>
<td>REV. SWITCH</td>
<td>204</td>
<td>205</td>
</tr>
<tr>
<td>COARSE TAP SEL</td>
<td>208</td>
<td>209</td>
</tr>
</tbody>
</table>

FOR INHERENT DRAWINGS REFER TO 898825
MEASURE IN MM
On-load tap-changer OILTAP® G
Arrangement of tap selector terminals (shown for G I 1612)
On-load tap-changer OILTAP® G III 1602 Y, G I 1612, G I 3022
Connectors for tap selector terminal contact

VERSION 01
SOLDER CONNECTION FOR 1 LEAD

VERSION 02
SOLDER CONNECTION FOR 2 LEADS

VERSION 03
SCREW CONNECTION WITH SCREENING HOOD (MAX 2 LEADS)

X - CHANGER-OVER SELECTOR CONNECTING LEAD

DIM. IN MM
On-load tap-changer OILTAP® G III 1602 Y, G I 1612, G I 3022
Connectors for tap selector terminal contact

VERSION 04
STANDARD - CONNECTION

VERSION 05
SCREW CONNECTION FOR MAX. 2 LEADS

VERSION 06
SCREW CONNECTION FOR MAX. 4 LEADS

VERSION 07
SCREW CONNECTION FOR 2 LEADS WITH CABLE SHOES

SEE SHEET 1
DIM. IN MM
On-load tap-changer OILTAP® G I 3022, G I 3002
Jumpers for parallel connection of tap selector terminal contacts
On-load tap-changer OILTAP® G
Lifting cross for diverter switch unit
On-load tap-changer OILTAP® G III 1602 Y, G I 1612, G I 3022
Installation drawing
On-load tap-changer OILTAP® G
On-load tap-changer head, possible connection for protective relay, suction pipe, bleeder facility
On-load tap-changer OILTAP® G
Special design for installation in bell-type tank

TRANSMER Cover

Supporting Tube
Fixed on core of Transformer

Level Traverse

On-load Tap-changer Head

Support

Supporting Tube
Fixed on core of Transformer

In the Bearing Area

* In connection with the flange, see: 894641

Section A-B

Transformer Flange for on-load tap-changer head

Dimensions see installation drawing 894641.
On-load tap-changer OILTAP® G
On-load tap-changer cover with flange for pressure relief valve

Detail X

Gasket 4,25x178,5x200

M12
Tightening torque = 30Nm

φ235
On-load tap-changer OILTAP® G

Principal arrangement of the potential switch and the tie-in resistors

Arrangement of the cylinder:
1. Below the FW max. 12 resistors/phase (totalling 36)
2. Below the VW max. 12 resistors/phase (totalling 36)
3. Below the FW and VW max. 24 resistors/phase (totalling 72)
4. Tie-in resistors mounted on a separate panel max 24 resistors/phase

In single-phase design a total of 36 resistors with 1/2 and a total of 72 resistors with 3/4

Longitudinal section of the tie-in resistors without screening ring

Longitudinal section of the tie-in resistors with screening ring

Sp = Potential switch
Rp = Tie-in resistors
VW = Change-over selector
FW = Tap selector
S = Screening ring
Dimensions h, i, and p, according to dimension drawing
Note:
Additional screening on customer's request
On-load tap-changer OILTAP® G
Diverter switch G 22000
Limit dimensions (in mm) of the horizontal drive shaft

The min. dimensions of H3...H8 are determined by the insulation distance between the on-load tap-changer poles A, B, C (for mechanical reasons the min. limit for H3, H4 is 653 mm, for H5, H6 it is 1355 mm, for H7, H8 it is 1110 mm).

Intermediate bearing in the driving shaft is necessary if H2, H5, H6 > 2250 and H3, H4, H7, H8 > 2599.07, G8, G11, G12, G17, G18 are standard arrangements (no extra charge).
Basic circuit diagram for on-load tap-changer
OILTAP® G .................................................................................................... 890616

Installation drawing for on-load tap-changer
OILTAP® G .................................................................................................... 894641

Special design for installation in bell-type tank ...................... 890659

On-load tap-changer head ............................................................ 890716

Horizontal drive shaft ........................................................................ 890453

Step capacities ..................................................................................... 890711

Survey of on-load tap changer versions ................................. 890720