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Generally the information provided and agreements made when processing the individual quotations and orders are binding.
The original operating instructions were written in German.
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1 Introduction

This technical file contains detailed information about the technical properties of the product. Basic information is given in the "Technical Data (TD 61) - General Section".

1.1 On-load tap-changer designations

Each type of on-load tap-changer is available in a number of models, offering a different number of phases, maximum rated through-current, highest voltage for equipment $U_m$, selector size and basic connection diagram. The designation of a particular on-load tap-changer model therefore depends on these features, hence ensuring an unmistakable and non-interchangeable on-load tap-changer designation.

1.1.1 Example of on-load tap-changer type designation

On-load tap-changer VACUTAP® VRF I 1601–72.5 / RC–10 19 1 WR.

<table>
<thead>
<tr>
<th>Type designation</th>
<th>VACUTAP® VRF I 1601-72.5 / RC-10 19 1 WR</th>
</tr>
</thead>
<tbody>
<tr>
<td>VACUTAP® VRF</td>
<td>On-load tap-changer type</td>
</tr>
<tr>
<td>I</td>
<td>Number of phases</td>
</tr>
<tr>
<td>1601</td>
<td>Maximum rated through-current $I_{rm}$ in A and number of equipped sectors (last digit) for single-phase on-load tap-changers</td>
</tr>
<tr>
<td>72.5</td>
<td>Highest voltage for equipment $U_m$ (in kV)</td>
</tr>
<tr>
<td>RC</td>
<td>Selector size</td>
</tr>
<tr>
<td>10 19 1 WR</td>
<td>Basic connection diagram</td>
</tr>
</tbody>
</table>

Table 1: Example of designation of on-load tap-changer

1.1.2 Number of positions and basic connection

The selector can be adapted to a large extent to the required number of positions and tap winding connection. The basic connections differ in terms of selector division, number of operating positions, number of mid-positions, change-over selector model and type of potential connection.

Example: 10 19 1 WR

<table>
<thead>
<tr>
<th>Designation of basic connection</th>
<th>10 19 1 WR</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Contact circle pitch of selector</td>
</tr>
<tr>
<td>19</td>
<td>Maximum number of operating positions</td>
</tr>
<tr>
<td>1</td>
<td>Number of mid-positions</td>
</tr>
</tbody>
</table>
1 Introduction

<table>
<thead>
<tr>
<th>Designation of basic connection</th>
<th>10 19 1 WR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>W</strong></td>
<td>Change-over selector model:</td>
</tr>
<tr>
<td></td>
<td>$W$ = reversing change-over selector</td>
</tr>
<tr>
<td></td>
<td>$G$ = coarse tap connection</td>
</tr>
<tr>
<td><strong>R</strong></td>
<td>Type of potential connection:</td>
</tr>
<tr>
<td></td>
<td>$R$ = attached tie-in resistors</td>
</tr>
<tr>
<td></td>
<td>$S$ = tie-in switches and tie-in resistors on board</td>
</tr>
<tr>
<td></td>
<td>$P$ = tie-in switches with attached tie-in resistors</td>
</tr>
</tbody>
</table>

Table 2: Example of designation of basic connection
1.2 Basic connections

Below you will find some examples of the on-load tap-changer’s basic connections with designation of selector connection contacts in accordance with MR standard. You will find the connections that can actually be made in the section “Permitted voltage stresses”.

Figure 1: Basic connections without change-over selector
Figure 2: Basic connections for reversing change-over tap selector connection
Figure 3: Basic connections for coarse tap selector connection
2 Technical data

2.1 On-load tap-changer properties

<table>
<thead>
<tr>
<th>On-load tap-changer</th>
<th>VRF I 1601</th>
<th>VRF I 1801</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum rated through-current $I_{\text{rm}}$ [A]</td>
<td>1,600</td>
<td>1,800</td>
</tr>
<tr>
<td>Rated short-time current [kA]</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>Rated duration of short-circuits [s]</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Rated peak withstand current [kA]</td>
<td>47.5</td>
<td>47.5</td>
</tr>
<tr>
<td>Maximum rated step voltage $U_{\text{rm}}$ [V]</td>
<td>4,000</td>
<td>4,000</td>
</tr>
<tr>
<td>Step capacity $P_{\text{stm}}$ [kVA]</td>
<td>3,750</td>
<td>3,750</td>
</tr>
<tr>
<td>Rated frequency [Hz]</td>
<td></td>
<td>50…60</td>
</tr>
</tbody>
</table>

Table 3: Electrical data for VACUTAP® VRF I 1601/1801

<table>
<thead>
<tr>
<th>Number of operating positions</th>
<th>Without change-over selector: maximum 18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of equipped sectors</td>
<td>1</td>
</tr>
<tr>
<td>Selector sizes</td>
<td>RC, RD, RDE</td>
</tr>
<tr>
<td>Dimensions</td>
<td>See dimensional drawings (page ► 19)</td>
</tr>
<tr>
<td>Weight</td>
<td></td>
</tr>
<tr>
<td>Displacement and oil volume</td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Mechanical data for VACUTAP® VRF I 1601/1801

2.2 Permitted voltage stresses

This section describes the permitted voltage stresses of single-phase and multiphase on-load tap-changers. When selecting the on-load tap-changer, you must check that the highest stresses do not exceed the related rated withstand voltages at the insulation distances.
**Insulation distances**

The following diagram shows the insulation distances on the selector for connection without change-over selector, for reversing change-over selector connection and for coarse tap selector connection.

<table>
<thead>
<tr>
<th>Without change-over selector</th>
<th>With reversing change-over selector</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Diagram" /></td>
<td><img src="image2" alt="Diagram" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>With coarse change-over selector in position +</th>
<th>With coarse change-over selector in position -</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3" alt="Diagram" /></td>
<td><img src="image4" alt="Diagram" /></td>
</tr>
</tbody>
</table>

Note maximum stress with rated lightning impulse withstand voltage at a0 in mid-position!

Figure 4: Insulation distances

<table>
<thead>
<tr>
<th>a0</th>
<th>between selected and preselected tap on the diverter switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>a1</td>
<td>between tap selector contacts of the winding of one tap position (connected or not connected)</td>
</tr>
</tbody>
</table>
2 Technical data

between beginning and end of a tapped winding and, for a coarse winding model, also between beginning and end of a coarse winding.

Note for coarse tap selector connection in position (-) of the change-over selector:
When stressed with impulse voltage, the permissible withstand voltage "a" between the end of a coarse winding connected with the K tap selector contact and the tap selector contact at the end of the tapped winding of the same phase must be adhered to.

between the tap selector contacts of different phases and between change-over selector contacts of different phases, which are connected with the beginning/end of a tapped winding or with a tap selector contact

Additionally for coarse tap selector connection in position (+) of the change-over selector:

c1 from one change-over selector contact (-) to take-off lead of the same phase

c2 between change-over selector contacts (-) of different phases

Realizable connections with associated selector sizes

The connections listed below can also be realized for change-over selectors with reversing change-over selectors and 3 mid-positions (3W) and for change-over selectors with coarse tap connection and 3 mid-positions (3G).

<table>
<thead>
<tr>
<th>Connection</th>
<th>Selector size</th>
<th>Connection</th>
<th>Selector size</th>
<th>Connection</th>
<th>Selector size</th>
</tr>
</thead>
<tbody>
<tr>
<td>10050</td>
<td>RC/RD/RDE</td>
<td>10071W</td>
<td>RC/RD/RDE</td>
<td>10071G</td>
<td>RC/RD/RDE</td>
</tr>
<tr>
<td>10060</td>
<td>RC/RD/RDE</td>
<td>10081W</td>
<td>RC/RD/RDE</td>
<td>10081G</td>
<td>RC/RD/RDE</td>
</tr>
<tr>
<td>10070</td>
<td>RC/RD/RDE</td>
<td>10091W</td>
<td>RC/RD/RDE</td>
<td>10091G</td>
<td>RC/RD/RDE</td>
</tr>
<tr>
<td>10080</td>
<td>RC/RD/RDE</td>
<td>12101W</td>
<td>RC/RD/RDE</td>
<td>12101G</td>
<td>RC/RD/RDE</td>
</tr>
<tr>
<td>10090</td>
<td>RC/RD/RDE</td>
<td>14111W</td>
<td>RC/RD/RDE</td>
<td>14111G</td>
<td>RC/RD/RDE</td>
</tr>
<tr>
<td>10100</td>
<td>RC/RD/RDE</td>
<td>14121W</td>
<td>RC/RD/RDE</td>
<td>14121G</td>
<td>RC/RD/RDE</td>
</tr>
<tr>
<td>12110</td>
<td>RC/RD/RDE</td>
<td>16131W</td>
<td>RC/RD/RDE</td>
<td>16131G</td>
<td>RC/RD/RDE</td>
</tr>
<tr>
<td>12120</td>
<td>RC/RD/RDE</td>
<td>16141W</td>
<td>RC/RD/RDE</td>
<td>16141G</td>
<td>RC/RD/RDE</td>
</tr>
<tr>
<td>14130</td>
<td>RC/RD/RDE</td>
<td>18151W</td>
<td>RC/RD/RDE</td>
<td>18151G</td>
<td>RC/RD/RDE</td>
</tr>
<tr>
<td>14140</td>
<td>RC/RD/RDE</td>
<td>18161W</td>
<td>RC/RD/RDE</td>
<td>18161G</td>
<td>RC/RD/RDE</td>
</tr>
<tr>
<td>16150</td>
<td>RC/RD/RDE</td>
<td>10191W</td>
<td>RC/RD/RDE</td>
<td>10191G</td>
<td>RC/RD/RDE</td>
</tr>
<tr>
<td>16160</td>
<td>RC/RD/RDE</td>
<td>12231W</td>
<td>RC/RD/RDE</td>
<td>12231G</td>
<td>RC/RD/RDE</td>
</tr>
<tr>
<td>18170</td>
<td>RC/RD/RDE</td>
<td>14271W</td>
<td>RC/RD/RDE</td>
<td>14271G</td>
<td>RC/RD/RDE</td>
</tr>
<tr>
<td>18180</td>
<td>RC/RD/RDE</td>
<td>16311W</td>
<td>RC/RD/RDE</td>
<td>16311G</td>
<td>RC/RD/RDE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18351W</td>
<td>RC/RD/RDE</td>
<td>18351G</td>
<td>RC/RD/RDE</td>
</tr>
</tbody>
</table>

Table 5: Realizable connections for VACUTAP® VRF I 1601/1801
Selector according to basic connection diagram 12111W(G) is realized as 14111W(G).
Selector according to basic connection diagram 14131W(G) is realized as 16131W(G).
Selector according to basic connection diagram 16151W(G) is realized as 18151W(G).
Selector according to basic connection diagram 18171W(G) cannot be realized.
2.2.1 Rated insulation level on diverter switch

<table>
<thead>
<tr>
<th><strong>U_m</strong></th>
<th><strong>LI</strong></th>
<th><strong>LIC</strong></th>
<th><strong>SI</strong></th>
<th><strong>AC</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>72.5</td>
<td>350</td>
<td>385</td>
<td>-</td>
<td>140</td>
</tr>
<tr>
<td>123</td>
<td>550</td>
<td>605</td>
<td>460</td>
<td>230</td>
</tr>
<tr>
<td>170</td>
<td>750</td>
<td>825</td>
<td>620</td>
<td>325</td>
</tr>
<tr>
<td>245</td>
<td>1,050</td>
<td>1,155</td>
<td>850</td>
<td>460</td>
</tr>
<tr>
<td>300&lt;sup&gt;1)&lt;/sup&gt;</td>
<td>1,050</td>
<td>1,155</td>
<td>850</td>
<td>460</td>
</tr>
<tr>
<td>362&lt;sup&gt;2)&lt;/sup&gt;</td>
<td>1,175</td>
<td>1,290</td>
<td>950</td>
<td>510</td>
</tr>
<tr>
<td>420&lt;sup&gt;2)&lt;/sup&gt;</td>
<td>1,550</td>
<td>1,705</td>
<td>1,175</td>
<td>630</td>
</tr>
</tbody>
</table>

Table 6: Rated insulation level on diverter switch

LI: full wave lightning impulse voltage (kV, 1.2/50 μs)
LIC: chopped wave lightning impulse voltage (kV, 1.2/50/3 μs)
SI: switching impulse voltage (kV, 250/2500 μs)
AC: applied voltage (kV, 50 Hz, 1 min)

<sup>1)</sup> In accordance with IEC 60214-1: highest effective value for phase-to-phase voltage in a three-phase system for which an on-load tap-changer is designed with respect to its insulation.

<sup>2)</sup> Only single-phase on-load tap-changers
2.2.2 Rated insulation level of inner insulation on the selector

The admissible maximum operating voltage on the individual selector distances corresponds to half the value of the values listed below for applied voltage (AC).

<table>
<thead>
<tr>
<th>Insulation distance</th>
<th>Selector size</th>
<th>RC</th>
<th>RD</th>
<th>RDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>a0</td>
<td>LI</td>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LIC</td>
<td>165</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SI</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AC</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a1</td>
<td>LI</td>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LIC</td>
<td>165</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SI</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AC</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>LI</td>
<td>400</td>
<td>500</td>
<td>550</td>
</tr>
<tr>
<td></td>
<td>LIC</td>
<td>440</td>
<td>550</td>
<td>605</td>
</tr>
<tr>
<td></td>
<td>SI</td>
<td>260</td>
<td>325</td>
<td>355</td>
</tr>
<tr>
<td></td>
<td>AC</td>
<td>100</td>
<td>145</td>
<td>165</td>
</tr>
<tr>
<td>b1)</td>
<td>LI</td>
<td>400</td>
<td>500</td>
<td>550</td>
</tr>
<tr>
<td></td>
<td>LIC</td>
<td>440</td>
<td>550</td>
<td>605</td>
</tr>
<tr>
<td></td>
<td>SI</td>
<td>260</td>
<td>325</td>
<td>355</td>
</tr>
<tr>
<td></td>
<td>AC</td>
<td>120</td>
<td>160</td>
<td>180</td>
</tr>
<tr>
<td>c1</td>
<td>LI</td>
<td>550</td>
<td>590</td>
<td>660</td>
</tr>
<tr>
<td></td>
<td>LIC</td>
<td>605</td>
<td>645</td>
<td>725</td>
</tr>
<tr>
<td></td>
<td>SI</td>
<td>355</td>
<td>385</td>
<td>430</td>
</tr>
<tr>
<td></td>
<td>AC</td>
<td>180</td>
<td>210</td>
<td>250</td>
</tr>
<tr>
<td>c2)</td>
<td>LI</td>
<td>550</td>
<td>590</td>
<td>660</td>
</tr>
<tr>
<td></td>
<td>LIC</td>
<td>605</td>
<td>645</td>
<td>725</td>
</tr>
<tr>
<td></td>
<td>SI</td>
<td>355</td>
<td>385</td>
<td>528</td>
</tr>
<tr>
<td></td>
<td>AC</td>
<td>195</td>
<td>230</td>
<td>280</td>
</tr>
</tbody>
</table>

Table 7: Rated insulation level of inner insulation on the selector

LI: full wave lightning impulse voltage (kV, 1.2/50 μs)
LIC: chopped wave lightning impulse voltage (kV, 1.2/50/3 μs)
SI: switching impulse voltage (kV, 250/2500 μs)
AC: applied voltage (kV, 50 Hz, 1 min)
1) not applicable to single-phase on-load tap-changer

2) varistor response voltage at 1.2/50 μs lightning impulse: starting at 55 kV \( (U_{100\%}(t)\text{standardized} \neq U_{75\%}(t)\text{standardized}) \), residual voltage at 3 kA peak withstand current: 70 kV

2.3 Step capacity diagram for network application

Figure 5: Step capacities (rated voltage \( U_{ir} \), rated through current \( I_r \))
2.4 Tapped winding potential connection

During its switching operation the tap winding is briefly electrically isolated from the main winding by the reversing change-over selector or coarse change-over selector. It then adopts a potential resulting from the voltages of the adjacent windings and coupling capacities for these windings or earthed parts.

This potential shift of the tap winding produces corresponding voltages between the deactivating change-over selector contacts because one contact is always connected to the tap winding and the other contact is always connected to the main winding. This voltage is known as the recovery voltage $U_W$.

When separating the change-over selector contacts, a capacitive current has to be interrupted. This current depends on the aforementioned coupling capacities of the tap winding. This current is known as the breaking current $I_S$.

The recovery voltage $U_W$ and breaking current $I_S$ may result in impermissible signs of discharge on the change-over selector. The permissible recovery voltage $U_W$ and breaking current $I_S$ ranges are listed below.

The Active Gas Inhibition System (AGIS) reduces the amount of gas that arises during a change-over selector operation. For more information about recovery voltage and breaking current, see Technical Data TD 61 - General Part.

Recovery voltage $U_W$ and breaking current $I_S$ without tie-in resistor

![Figure 6: Guide values for $U_W$ and $I_S$ without tie-in resistor $R_p$ for selector sizes RC, RD, RDE](image)

- Selector size RC, RD, RDE without AGIS
- Selector size RC, RD, RDE with AGIS
Recovery voltage $U_w$ and breaking current $I_s$ with tie-in resistor

![Graph showing recovery voltage $U_w$ and breaking current $I_s$ with tie-in resistor $R_p$.]  

Figure 7: Guide values for $U_w$ and $I_s$ with tie-in resistor $R_p$ for selector sizes RC, RD, RDE

<table>
<thead>
<tr>
<th>Selector size</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RC, RD, RDE without AGIS</td>
</tr>
<tr>
<td>2</td>
<td>RC, RD, RDE with AGIS</td>
</tr>
</tbody>
</table>

### 2.5 Bridges for parallel connection of connection contacts

Bridges for parallel connection of connection contacts serve to split current over the connection contacts of 2 selector planes.

The bridges are mandatory if the tap winding has been wound in two or more branches and each of these branch taps is connected as a tap to the connection contacts of the selector.

This measure reliably prevents the following:

- Introduction of equalizing currents into the current paths of selector and diverter switch
- Commutating arc on movable selector contact bridges
- Overvoltage between adjacent selector connection contacts connected in parallel
### 2.6 Permissible ambient conditions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air temperature during operation</td>
<td>-25°C…+50°C</td>
</tr>
<tr>
<td>Temperature of the insulating fluid in operation</td>
<td>-25°C…+105°C (up to +115°C when the transformer is in emergency operation)</td>
</tr>
<tr>
<td>Transport temperature, storage temperature</td>
<td>-40°C…+50°C</td>
</tr>
<tr>
<td>Drying temperatures</td>
<td>See installation and commissioning instructions, &quot;Mounting&quot; chapter</td>
</tr>
<tr>
<td>Compressive strength</td>
<td>See technical data TD 61 – General section</td>
</tr>
<tr>
<td>Insulating fluid</td>
<td>- Unused insulating oils derived from petroleum products(^1) in accordance with IEC60296 and ASTM D3487 (equivalent standards on request)</td>
</tr>
<tr>
<td></td>
<td>- Unused insulating oils derived from other virgin hydrocarbons in accordance with IEC60296, or blends of these oils with petroleum products(^2) in accordance with IEC60296, ASTM D3487 or equivalent standards on request</td>
</tr>
<tr>
<td></td>
<td>- Alternative insulating fluids, such as natural and synthetic esters or silicone oils, on request.</td>
</tr>
<tr>
<td></td>
<td>(^1) Gas-to-liquid oils (GTL oils) are understood in this context as petroleum products</td>
</tr>
<tr>
<td>Installation height of the oil conservator</td>
<td>See technical data TD 61 – General section</td>
</tr>
<tr>
<td>Installation height above sea level</td>
<td>See technical data TD 61 – General section</td>
</tr>
</tbody>
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Table 8: Permissible ambient conditions
3 Drawings

3.1 Dimensional drawings
ON-LOAD TAP-CHANGER VACUTAP® VR
VRF1601/1801-725...420-RC/RO/RDE
DIMENSION DRAWING

- THE DETAILED CONNECTION DIAGRAM IS BINDING FOR THE DESIGNATION OF THE CONNECTION CONTACTS AND PHASES
- E-E REFER TO 10009030
- B-D - TYPE WITH CONNECTING LEAD 3W/3G REFER TO 10010019
- CONNECTING OF PARALLEL SELECTOR PLANES REFER TO 10009916

- DRIVE SIDE OF SELECTOR
- ON-LOAD TAP-CHANGER CURRENT TAKE-OFF TERMINAL
- C-F IS CONNECTED TO POTENTIAL OF A
- SHIELDING RINGS FOR UM OF 170 KV OR GREATER
- SUPPORTING FLANGE FOR BELL-TYPE TANK INSTALLATION IS OPTIONAL WITH 725kV-300kV AVAILABLE WITH 362kV-420kV OBLIGATORY
- BOTTOM-MOST LIVE PARTS, THESE ARE CONNECTED TO THE POTENTIAL OF THE ASSOCIATED AND/OR WIRING CONNECTION CONTACT
- SELECTOR BASE IS MADE OF INSULATING MATERIAL

FOR THE TYPE OF OLTC-HEAD REFER TO THE ORDER-SPECIFIC DRAWING OF THE OLTC-HEAD AND DRIVE SHAFTS

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## VACUTAP® VRF

### Dimensions (mm)

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<th>Dim (kV)</th>
<th>72.5</th>
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<th>170</th>
<th>245</th>
<th>362</th>
<th>420</th>
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</tr>
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</table>

### Oil Volume (dm³)

- 172
- 192
- 207
- 227
- 249
- 275
- 295
- 172
- 192
- 207
- 227
- 249
- 275
- 255

### Displacement (dm³)

- 278
- 301
- 329
- 347
- 373
- 417
- 439
- 280
- 303
- 331
- 349
- 375
- 419
- 441

### Max. Weight (kg)

- 462
- 467
- 472
- 477
- 482
- 487
- 492
- 467
- 472
- 477
- 482
- 487
- 492
- 497
3.2 Installation drawings
ON-LOAD TAP-CHANGER VACUTAP® VRVRF - SELECTOR SIZE RC/RD/RDE

INSTALLATION DRAWING

1. Mounting Flange on Transformer Cover
2. Fixing Bolt M12
3. On-Load Tap-Changer Head Gasket
4. Remove Tap Position Indicator Disc Before Withdrawal of Diverter Switch Insert
5. Inspection Window
6. Drive Shaft for Tap Position Indicator
7. \( \phi 15 \) mm holes
8. On-Load Tap-Changer Head
9. Cover Bolt
10. Cover Gasket
11. On-Load Tap-Changer Head Cover
12. Centric Gear Unit with Drive Shaft 25a
13. Pipe Connection R for Protective Relay
14. Pipe Connection S for Suction Pipe
15. Pipe Connection Q (optional)
16. Air-Vent Valve of On-Load Tap-Changer Head Cover
17. Bleeding Facility for Transformer Oil Compartment
18. Vent Screw for Suction Pipe
19. Diverter Switch Oil Compartment
20. Oil Compartment Base
21. Screening Rings for Um of 170 kV or Greater
22. Oil Compartment Connection Terminal
23. Connection Ring for On-Load Tap-Changer Current Take-Off Terminal
24. Connecting Lead
25. Suction Pipe
26. Selector Suspension
27. Selector Gear
28. Tap Selector
29. Change-Over Selector
30. Selector Connection Contacts (Refer to 10009917)
31. Tap Selector Connecting Lead
32. Diverter Switch Insert
33. Transition Resistors
34. Eyebolt
35. Drive Side of Selector

MAX. WITHDRAWAL HEIGHT 1800 mm

DIMENSION IN mm EXCEPT AS NOTED

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3.3 On-load tap-changer head
A considerable number of variants of the on-load tap-changer head are available for adapting the horizontal part of the drive shaft to the transformer tank.

The mounting position of the selector A and diverter switch oil compartment B is determined by the drive side of selector M.

The on-load tap-changer head C together with its pipe connections D may be turned through 120 degrees clockwise or anticlockwise. This results in the variants 1, 2 and 3.

The upper gear unit F can be turned continuously on its own axis. Table 720027 lists the limitation of the swivel range for the particular head variant. The angle specifications refer to the center of rotation of the gear unit. Pay particular attention to the offset of the drive shaft.
<table>
<thead>
<tr>
<th>SKETCH</th>
<th>HEAD VERSION COMPONENTS USED</th>
<th>LIMITATION OF THE SWIVEL RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Sketch Head Version 1" /></td>
<td>DRIVE SHAFT RIGHT HEAD VERSION 1</td>
<td>-180° -6° 180°</td>
</tr>
<tr>
<td><img src="image2.png" alt="Sketch Head Version 2" /></td>
<td>DRIVE SHAFT RIGHT HEAD VERSION 2</td>
<td>-180° -6° 180°</td>
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<tr>
<td><img src="image3.png" alt="Sketch Head Version 3" /></td>
<td>DRIVE SHAFT LEFT HEAD VERSION 1</td>
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<td><img src="image5.png" alt="Sketch Head Version 5" /></td>
<td>DRIVE SHAFT LEFT HEAD VERSION 3</td>
<td>-180° -6° 180°</td>
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</tbody>
</table>

### LIMITATION OF THE SWIVEL RANGE THROUGH PIPE CONNECTIONS R AND S
- -180° to -6°
- 6° to 180°

### LIMITATION OF THE SWIVEL RANGE THROUGH OPTIONAL EXISTING PIPE CONNECTIONS Q, E2, AND PRESSURE RELIEF DEVICE DV
- -180° to -6°
- 6° to 180°

### SWIVEL RANGE POSSIBLE, BUT THE TEMPERATURE SENSOR T AND THE INSPECTION WINDOW SL / SR ARE NOT VISIBLE
- -180° to -6°
- 6° to 180°
ARRANGEMENT

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<tr>
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<th>G9, G10</th>
<th>G11, G12</th>
<th>G13, G14</th>
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<tr>
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<td>SPECIAL DESIGN</td>
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MINIMUM DIMENSIONS³ (DETERMINED FOR MECHANICAL REASONS: NEEDED, INSULATION SPACINGS NOT CONSIDERED)

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</table>

NOTE: 1) FOR OLTS WITH THE CHANGE-OVER SELECTOR ATTACHED LATERALLY, THE DIMENSIONS OF THE CHANGE-OVER SELECTOR AFTER INSTALLED IN POSITION HAVE TO BE TAKEN INTO ACCOUNT (SEE THE CORRESPONDING OLTC-DIMENSION DRAWING)
2) IN GENERAL DETERMINED BY THE INSULATION SPACING BETWEEN POLES A, B, C.

INTERMEDIATE BEARING FOR

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</table>

³ HEAD VERSION
⁴ DRIVE SIDE OF SELECTOR
PIPE CONNECTION WITH TAP-CHANGE SUPERVISORY CONTROL BUSHING WITHOUT OIL FILTER UNIT

NOTICE!
The vent screw (2) of the mounted housing (1) has to be on the top.

A 11
REPRESENTED WITHOUT COVER

M20x15
CLAMPING RANGE FOR CONNECTION CABLE:
EXTERNAL DIAMETER: 7 - 13 mm

Connection terminals for tap-change supervisory control

Wiring see connection diagram of the motor-drive unit

Function diagram for tap-change supervisory control see motor-drive connection diagram

Rated continuous current: 2A
Rated voltage: DC/AC 150Hz. 24V - 250V
Dielectric strength: 1150V / 50Hz / 1 min.

Dielectric test of all voltage carrying terminals to ground:
2000V AC, 50Hz, test-duration 1 min.
3.4 Selector
CONTACT ARRANGEMENT - WITHOUT CHANGE-OVER SELECTOR

E.G.: 3 = UPPER SELECTOR PLANE
(4) = LOWER SELECTOR PLANE

THE DETAILED CONNECTION DIAGRAM IS BINDING FOR THE DESIGNATION OF THE CONNECTION CONTACTS AND PHASES

DESIGNATION OF SELECTOR CONNECTION CONTACT

DRIVE SIDE OF SELECTOR

M
O
600
BLANK BAR
CONTACT ARRANGEMENT - REVERSING CHANGE-OVER SELECTOR

SELECTOR SIZE RC/RD/RDE

DIMENSION DRAWING
CONTACT ARRANGEMENT - COARSE CHANGE-OVER SELECTOR

SELECTOR SIZE RC/RD/RDE

CONTACT ARRANGEMENT - COARSE CHANGE-OVER SELECTOR

(1038.5)

TAP SELECTOR

COARSE CHANGE-OVER SELECTOR

CONTACT ARRANGEMENT - COARSE CHANGE-OVER SELECTOR

(1038.5)
REVERSING CHANGE-OVER SELECTOR

SELECTOR SIZE RC/RD/RDE
PARALLEL BRIDGE/CONNECTING LUG
DIMENSION DRAWING

3 SELECTOR PLANES WITH PARALLEL BRIDGE
2 SELECTOR PLANES WITH PARALLEL BRIDGE
WITHOUT PARALLEL BRIDGE

© MASCHINENFABRIK REINHAUSEN GMBH 2015
DIMENSION
IN mm
EXCEPT AS NOTED
DOCUMENT NO.
STAND.
CHANGE NO.
DFTR.
CHKD.

NAME

DATE

SELECTION
IN mm
EXCEPT AS NOTED

MATERIAL NUMBER

SERIAL NUMBER

SHIELD

100100870E 1/2
COARSE CHANGE-OVER SELECTOR

3 SELECTOR PLANES WITH PARALLEL BRIDGE
2 SELECTOR PLANES WITH PARALLEL BRIDGE
WITHOUT PARALLEL BRIDGE

SELECTOR SIZE RC/RD/RDE
PARALLEL BRIDGE/CONNECTING LUG
DIMENSION DRAWING

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REVERSING CHANGE-OVER SELECTOR

COARSE CHANGE-OVER SELECTOR

THE DETAILED CONNECTION DIAGRAM IS BINDING FOR THE DESIGNATION OF THE CONNECTION CONTACTS AND PHASES

3W (OPTIONAL)

3G (OPTIONAL)

M DRIVE SIDE OF SELECTOR

THE DETAILED CONNECTION DIAGRAM IS BINDING FOR THE DESIGNATION OF THE CONNECTION CONTACTS AND PHASES
3.5 Potential connection unit
WITH CHANGE-OVER SELECTOR (REVERSING / COARSE CHANGE-OVER SELECTOR)

- M - DRIVE SIDE OF SELECTOR
- A - ON-LOAD TAP-CHANGER CURRENT TAKE-OFF TERMINAL
- PK - CONNECTION CONTACT
- PS - TIE-IN SWITCH
- T - REFER TO DIMENSION DRAWING

- THE DETAILED CONNECTION DIAGRAM IS BINDING FOR THE DESIGNATION OF THE CONNECTION CONTACTS AND PHASES

- POSITION OF CONNECTION CONTACT - ORDER RELATED

- REFER TO DIMENSION DRAWING

- FOR THE DESIGNATION OF THE CONNECTION CONTACTS AND PHASES

- ON-LOAD TAP-CHANGER CURRENT TAKE-OFF TERMINAL
- TIE-IN SWITCH

- PHASES

- 3-PHASE DESIGN
- 2-PHASE DESIGN
- 1-PHASE DESIGN

- VARIOUS VARIANT DISPLAYED
3.6 Connection diagrams (examples)

The connection diagrams contained herein are just examples.
The order-specific connection diagram is enclosed with the delivery.
ACHTUNG
PARALLELBÜCKEN VON MR ANGEBAUT
VON TS_1 NACH TS_2
VON TS_3 (PS_3) NACH TS_4 (PS_4)
ATTENTION!
PARALLEL BRIDGES ARE INSTALLED BY MR
FROM TS_1 TO TS_2
FROM TS_3 (PS_3) TO TS_4 (PS_4)

MOTORANTRIEB
MOTOR DRIVE UNIT

STELLUNG DES GROBWÄHLERS
POSITION OF COARSE TAP SELECTOR

BETRIEBSSTELLUNGEN
SERVICE POSITIONS
VERSCHIEDENE SPANNUNGEN
DIFFERENT VOLTAGES
JUSTIERSTELLUNG
ADJUSTMENT POSITION

35
35
18

LU
LASTUMSCHALTER
DIVERTER SWITCH
MR worldwide

Australia
Reinhausen Australia Pty. Ltd.
17/20-22 St Albans Road
Kingsgrove NSW 2228
Phone: +61 2 9502 2202
Fax: +61 2 9502 2224
E-Mail: sales@au.reinhausen.com

Brazil
MR do Brasil Indústria Mecânica Ltda.
Av. Elias Yazbek, 465
CEP: 06803-000
Embu - São Paulo
Phone: +55 11 4785 2150
Fax: +55 11 4785 2185
E-Mail: vendas@reinhausen.com.br

Canada
Reinhausen Canada Inc.
3755, rue Java, Suite 180
Brossard, Québec J4Y 0E4
Phone: +1 514 370 5377
Fax: +1 450 659 3092
E-Mail: m.foata@ca.reinhausen.com

India
Easun-MR Tap Changers Ltd. (Joint Venture)
612, CTH Road
Tirunelveli, Chennai 602 024
Phone: +91 44 26300883
Fax: +91 44 26390881
E-Mail: service@easumr.com

Indonesia
PT. Reinhausen Indonesia
German Center, Suite 6310,
BSD City, Tangerang
Phone: +62 21 5315-3183
Fax: +62 21 5315-3184
E-Mail: c.haering@id.reinhausen.com

Iran
Iran Transfo After Sales Services Co. (Joint Venture)
Zanjan, Industrial Township No. 1 (Alibad)
Corner of Morad Str.
Postal Code 4533144551
E-Mail: ilias@iran-transfo.com

Italy
Reinhausen Italia S.r.l.
Via Alserio, 16
20159 Milano
Phone: +39 02 69434766
Fax: +39 02 69434766
E-Mail: sales@it.reinhausen.com

Japan
MR Japan Corporation
German Industry Park
1-18-2 Hakusan, Midori-ku
Yokohama 226-0006
Phone: +81 45 929 5728
Fax: +81 45 929 5741

Luxembourg
Reinhausen Luxembourg S.A.
72, Rue de Prés
L-7333 Steinsel
Phone: +352 27 3347 1
Fax: +352 27 3347 99
E-Mail: sales@lu.reinhausen.com

Malaysia
Level 11 Chulan Tower
No. 3 Jalan Conlay
50450 Kuala Lumpur
Phone: +60 3 2142 6481
Fax: +60 3 2142 6422
E-Mail: mr_rap@my.reinhausen.com

P.R.C. (China)
MR China Ltd. (MRT)
开德贸易(上海)有限公司
中国上海浦东新区浦东南路360号
新上海国际大厦4楼E座
邮编: 200120
电话: +86 21 61634588
传真: +86 21 61634582
邮箱: mr-sales@cn.reinhausen.com
mr-service@cn.reinhausen.com

Russian Federation
OOO MR
Naberezhnaya Akademika Tupoleva
15, Bid. 2 ("Tupolev Plaza")
105005 Moscow
Phone: +7 495 980 89 67
Fax: +7 495 980 89 67
E-Mail: mrr@reinhausen.ru

South Africa
Reinhausen South Africa (Pty) Ltd.
No. 15, Third Street, Booyens Reserve
Johannesburg
Phone: +27 11 8352077
Fax: +27 11 8353806
E-Mail: support@za.reinhausen.com

South Korea
Reinhausen Korea Ltd.
21st floor, Standard Chartered Bank Bldg.,
47, Chongro, Chongno-gu,
Seoul 110-702
Phone: +82 2 767 4909
Fax: +82 2 736 0049
E-Mail: you-mi.jang@kr.reinhausen.com

U.S.A.
Reinhausen Manufacturing Inc.
2549 North 9th Avenue
Humboldt, TN 38343
Phone: +1 731 784 7681
Fax: +1 731 784 7682
E-Mail: sales@reinhausen.com

United Arab Emirates
Reinhausen Middle East FZE
Dubai Airport Freezone, Building Phase 6
3rd floor, Office No. 6EB, 341 Dubai
Phone: +971 4 2368 451
Fax: +971 4 2368 225
Email: service@ae.reinhausen.com

Maschinenfabrik Reinhausen GmbH
Falkensteinstrasse 8
93059 Regensburg
5224580/04 EN • 10/21 • F0343404

www.reinhausen.com
+49(0)941 4090-0
+49(0)941 4090-7001
sales@reinhausen.com