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For your safety!

- Make sure that the installation room (spaces, divisions and ambient) is suitable for the electrical apparatus.
- Check that all the installation, putting into service and maintenance operations are carried out by qualified personnel with suitable knowledge of the apparatus.
- Make sure that the standard and legal prescriptions are complied with during installation, putting into service and maintenance, so that installations according to the rules of good working practice and safety in the work place are constructed.
- Strictly follow the information given in this instruction manual.
- Check that the rated performance of the apparatus is not exceeded during service.
- Check that the personnel operating the apparatus have this instruction manual to hand as well as the necessary information for correct intervention.
- Pay special attention to the danger notes indicated in the manual by the following symbol:

\[\text{For any requests, please contact the ABB Assistance Service.}\]
I. Introduction

This publication contains the information needed to install medium voltage VD4 circuit-breakers and put them into service. For correct use of the product, please read it carefully. Like all the apparatus we manufacture, the VD4 circuit-breakers are designed for different installation configurations. However, this apparatus allows further technical-construction modifications (at the customer’s request) to adapt to special installation requirements. Consequently, the information given below may sometimes not contain instructions concerning special configurations. Apart from this manual, it is therefore always necessary to consult the latest technical documentation (electric circuit and wiring diagrams, assembly and installation drawings, any protection coordination studies, etc.), especially regarding any variants requested in relation to the standardised configurations. Only use original spare parts for maintenance operations. For further information, please also see the technical catalogue of the circuit-breaker and the spare parts catalogue.

II. Environmental protection programme

The VD4 circuit-breakers are manufactured in accordance with the ISO 14000 Standards (Guidelines for environmental management). The production processes are carried out in compliance with the Standards for environmental protection in terms of reduction in energy consumption as well as in raw materials and production of waste materials. All this is thanks to the medium voltage apparatus manufacturing facility environmental management system.

All the installation, putting into service, running and maintenance operations must be carried out by skilled personnel with in-depth knowledge of the apparatus.
1. Packing and transport

The circuit-breaker is shipped in special packing, in the open position and with the spring discharged. Each piece of apparatus is protected by a plastic cover to prevent any infiltration of water during the loading and unloading stages and to keep the dust off during storage.
2. Checking on receipt

Before carrying out any operation, always make sure that the operating mechanism spring is discharged and that the apparatus is in the open position.

On receipt, check the state of the apparatus, integrity of the packing and correspondence with the nameplate data (see fig. 1) with what is specified in the order confirmation and in the accompanying shipping note.

Also make sure that all the materials described in the shipping note are included in the supply.

Should any damage or irregularity be noted in the supply on unpacking, notify ABB (directly or through the agent or supplier) as soon as possible and in any case within five days of receipt.

The apparatus is only supplied with the accessories specified at the time of ordering and validated in the order confirmation sent by ABB.

The accompanying documents inserted in the shipping packing are:
- instruction manual (this document)
- test certification
- identification label
- copy of the shipping documents
- electric wiring diagram.

Other documents which are sent prior to shipment of the apparatus are:
- order confirmation
- original shipping advice note
- any drawings or documents referring to special configurations/conditions.
3. Storage

When a period of storage is foreseen, our workshops can (on request) provide suitable packing for the specified storage conditions.

On receipt the apparatus must be carefully unpacked and checked as described in Checking on receipt (chap. 2).

If immediate installation is not possible, the packing must be replaced, using the original material supplied.

Insert packets of special hygroscopic substances inside the packing, with at least one standard packet for piece of apparatus.

Should the original packing not be available and immediate installation is not possible, store in a covered, well-ventilated, dry, dust-free, non-corrosive ambient, away from any easily flammable materials and at a temperature between −5 °C and + 45 °C.

In any case, avoid any accidental impacts or positioning which stresses the structure of the apparatus.
4. Handling

Before carrying out any operations, always make sure that the operating mechanism spring is discharged and that the apparatus is in the open position.

To lift and handle the circuit-breaker, proceed as follows (fig. 2):

– use a special lifting tool (1) (not supplied) fitted with ropes with safety hooks (2);
– insert the hooks (2) in the supports (3) fixed to the frame of the circuit-breaker and lift. Put the hooks (2) into the support holes (3) according to the type of apparatus (see table);
– on completion of the operation (and in any case before putting into service) unhook the lifting tool (1) and dismantle the supports (3) from the frame.

During handling, take great care not to stress the insulating parts and the terminals of the circuit-breaker.

![Fig. 2](image)

![Fig. 3](image)

<table>
<thead>
<tr>
<th>Version</th>
<th>Pole centre distance</th>
<th>Rated current</th>
<th>Hole</th>
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</thead>
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<tr>
<td>Fixed</td>
<td>150-210 mm</td>
<td>up to 1250 A</td>
<td>A</td>
</tr>
<tr>
<td>Fixed</td>
<td>275 mm</td>
<td>from 1600 to 3150 A</td>
<td>A</td>
</tr>
<tr>
<td>Fixed</td>
<td>210 mm</td>
<td>from 1600 to 2000 A</td>
<td>A</td>
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<tr>
<td>Fixed</td>
<td>210-275 mm</td>
<td>up to 4000 A</td>
<td>C</td>
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<tr>
<td>Withdrawable</td>
<td>150 mm</td>
<td>up to 1250 A</td>
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<td>Withdrawable</td>
<td>210 mm</td>
<td>from 1600 to 2500 A</td>
<td>B</td>
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<tr>
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<td>275 mm</td>
<td>up to 1250 A</td>
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</tr>
<tr>
<td>Withdrawable</td>
<td>275 mm</td>
<td>from 1600 to 3150 A</td>
<td>C</td>
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<tr>
<td>Withdrawable</td>
<td>210 mm</td>
<td>up to 1250 A</td>
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<tr>
<td>Withdrawable</td>
<td>210-275 mm</td>
<td>up to 4000 A</td>
<td>C</td>
</tr>
</tbody>
</table>

The apparatus must not be handled by putting lifting devices directly under the apparatus itself. Should it be necessary to use this technique, put the circuit-breaker onto a pallet or a sturdy supporting surface (see fig. 3). In any case, it is always advisable to carry out lifting using the supports (3).
5. Description

5.1. General

The VD4 are vacuum circuit-breaker for indoor installation. For the electrical performances, please refer to the corresponding technical catalogue code 1VCP000001.

For special installation requirements, please contact ABB.

The following versions are available:
- fixed
- withdrawable for UniGear ZS1 switchgear and PowerCube modules.

5.2. Reference Standards

The VD4 circuit-breakers conform to the IEC 62271-100, CEI - VDE - BS Standards are equivalent to IEC Standards due to harmonization with IEC.

5.3. EL operating mechanism

VD4 circuit-breakers are equipped with modular EL spring operating mechanisms. The operating mechanism is designed to cover the whole range of performances as shown in the following table:

<table>
<thead>
<tr>
<th>Type of operating mechanism</th>
<th>Rated short-circuit current</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL1 - EL2</td>
<td>Up to 31.5 kA</td>
</tr>
<tr>
<td>EL3</td>
<td>Up to 40 kA - 24 kV, 31.5 kA</td>
</tr>
<tr>
<td>EL1 TWIN</td>
<td>Up to 50 kA (rated current up to 2000 A)</td>
</tr>
<tr>
<td>EL2 TWIN</td>
<td>Up to 50 kA (rated current ≥ 2500 A)</td>
</tr>
</tbody>
</table>

5.4. Fixed circuit-breakers

The fixed circuit-breaker (fig. 4) is the basic version complete with structure and front protection screen. The fixing holes are made in the lower part of the structure.

The electrical connections of the circuit-breaker auxiliary circuits, the terminal box (10) is available (also see par. 7.8.1.). The earthing screw is placed in the rear part of the circuit-breaker. For further details please see the caption to figure 4.

Fig. 4

Caption
1 Lever for manual closing spring charging
2 Signalling device for circuit-breaker open/closed
3 Rating plate
4 Opening pushbutton
5 Closing pushbutton
6 Signalling device for closing spring charged/discharged
7 Operation counter
8 Terminals
9 Earthing screw
10 Delivery terminal box
11 Cabling connection
12 Mechanical override of the undervoltage release (on request)
5.4.1. General characteristics of fixed circuit-breakers

General characteristics of fixed circuit-breakers (12 kV)

<table>
<thead>
<tr>
<th>Circuit-breaker</th>
<th>VD4 12 (1)</th>
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</thead>
<tbody>
<tr>
<td>Standards</td>
<td>IEC 62271-100 • VDE 0671; CEI EN 62271-100- File 7642 •</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>Ur [kV] 12</td>
</tr>
<tr>
<td>Rated insulation voltage</td>
<td>Us [kV] 12</td>
</tr>
<tr>
<td>Withstand voltage at 50 Hz</td>
<td>Ud (1 min) [kV] 28</td>
</tr>
<tr>
<td>Impulse withstand voltage</td>
<td>Up [kV] 75</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>fr [Hz] 50-60</td>
</tr>
<tr>
<td>Rated normal current (40 °C)</td>
<td>Ir [A] 630 630 630 1250 1250 1250 1250 1250 1250 1250 1600 1600 1600 1600 1600 1600 2000 2000 2000 2000 2500 2500 2500 3150 3150</td>
</tr>
<tr>
<td>Rated breaking capacity (rated short-circuit breaking current symmetrical)</td>
<td>Isc [kA] 16 16 16 16 16 16 25 25 25 25 25 25 31.5 31.5 31.5 31.5 31.5 31.5 40 40 40 40 40 40 50 50 50 50 50 50</td>
</tr>
<tr>
<td>Rated short-time withstand current (3s)</td>
<td>Ik [kA] 16 16 16 16 16 16 25 25 25 25 25 25 31.5 31.5 31.5 31.5 31.5 31.5 40 40 40 40 40 40 50 50 50 50 50 50</td>
</tr>
<tr>
<td>Making capacity</td>
<td>Ip [kA] 63 63 63 63 63 63 80 80 80 80 80 80 80 80 80 80 80 80 80 80 100 100 100 100 100 100 125 125 125 125 125 125</td>
</tr>
<tr>
<td>Operation sequence</td>
<td>[O - 0.3 s - CO - 15 s - CO] • • • • • • • • • • • • • • • •</td>
</tr>
<tr>
<td>Opening time</td>
<td>[ms] 33 ... 60</td>
</tr>
<tr>
<td>Arcing time</td>
<td>[ms] 10 ... 15</td>
</tr>
<tr>
<td>Total breaking time</td>
<td>[ms] 43 ... 75</td>
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<tr>
<td>Closing time</td>
<td>[ms] 60 ... 80</td>
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<tr>
<td>Maximum overall dimensions</td>
<td>H [mm] 461 461 461 461 461 461 589 589 589 589 589 589 610 610 610 610 610 610</td>
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<td></td>
<td>W [mm] 450 570 700 450 570 700 570 700 700 600 750 700 700 700 700 700 700 700 700 700 700 700 700 700 700 700</td>
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<tr>
<td>Pole distance P [mm]</td>
<td>150 210 275 150 210 275 210 275 210 275 210 275 210 275 210 275 210 275 210 275</td>
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<tr>
<td>Weight</td>
<td>[kg] 73 75 79 73 75 79 79 84 84 146 158 84 84 146 158 84 84 146 158 84 84 146 158 84 84 146 158</td>
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<tr>
<td>Standardised table of dimensions</td>
<td>1VCD — — 000051 — — 000051 000282 000285 003440 003441 003441</td>
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<tr>
<td>Operating temperature</td>
<td>[°C] - 5 ... + 40</td>
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<tr>
<td>Tropicalization</td>
<td>IEC: 60068-2-30, 60721-2-1 •</td>
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<tr>
<td>Electromagnetic compatibility</td>
<td>IEC: 62271-1 •</td>
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</table>

(1) Circuit-breakers up to 1250 A and 31.5 kA have polyamide poles.
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<tbody>
<tr>
<td>Rated Frequency (Hz)</td>
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<td>Short-Time Withstand Current (kA)</td>
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<td>Making Capacity (kA)</td>
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<td>Weight (kg)</td>
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<th>Standard Dimensions</th>
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## General characteristics of fixed circuit-breakers (17.5 kV)

### Circuit-breaker VD4 17 (1)

<table>
<thead>
<tr>
<th>Standards</th>
<th>IEC 62271-100 • VDE 0671; CEI EN 62271-100- File 7642 •</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage Ur [kV]</td>
<td>17.5</td>
</tr>
<tr>
<td>Rated insulation voltage Us [kV]</td>
<td>17.5</td>
</tr>
<tr>
<td>Withstand voltage at 50 Hz Ud (1 min) [kV]</td>
<td>38</td>
</tr>
<tr>
<td>Impulse withstand voltage Up [kV]</td>
<td>95</td>
</tr>
<tr>
<td>Rated frequency fr [Hz]</td>
<td>50-60</td>
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### Rated normal current (40 °C) Ir [A]

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### Rated breaking capacity (rated short-circuit breaking current symmetrical) Isc [kA]

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### Rated short-time withstand current (3s) Ik [kA]

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### Making capacity Ip [kA]

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<th>75</th>
<th>79</th>
<th>73</th>
<th>75</th>
<th>79</th>
<th>84</th>
<th>84</th>
<th>146</th>
<th>158</th>
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</table>

### Operation sequence

<table>
<thead>
<tr>
<th>O - 0.3 s - CO - 15 s - CO</th>
</tr>
</thead>
</table>

### Opening time [ms]

| 33 ... 60                   |

### Arcing time [ms]

| 10 ... 15                   |

### Total breaking time [ms]

| 43 ... 75                   |

### Closing time [ms]

| 60 ... 80                   |

### Maximum overall dimensions

<table>
<thead>
<tr>
<th>H [mm]</th>
<th>461</th>
<th>461</th>
<th>461</th>
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<th>461</th>
<th>589</th>
<th>589</th>
<th>610</th>
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<tbody>
<tr>
<td>W [mm]</td>
<td>450</td>
<td>570</td>
<td>700</td>
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<tr>
<td>D [mm]</td>
<td>424</td>
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### Pole distance P [mm]

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<th>210</th>
<th>275</th>
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<th>210</th>
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</table>

### Weight [kg]

| 73 | 75 | 79 | 73 | 75 | 79 | 84 | 84 | 146 | 158 |

### Standardised table of dimensions

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<tr>
<th>TN 7405</th>
<th>7406</th>
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</table>

### Operating temperature [°C]

| - 5 ... + 40 |

### Tropicalization

| IEC: 60068-2-30, 60721-2-1 |

### Electromagnetic compatibility

| IEC: 62271 |

(1) Circuit-breakers up to 1250 A and 31.5 kA have polyamide poles.
<table>
<thead>
<tr>
<th>Voltage [kV]</th>
<th>Rated Voltage Ur</th>
<th>Rated Insulation Voltage Us</th>
<th>Withstand Voltage at 50 Hz Ud (1 min)</th>
<th>Impulse Withstand Voltage Up</th>
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</thead>
<tbody>
<tr>
<td>17.5</td>
<td>17.5</td>
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<td>95</td>
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<table>
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<table>
<thead>
<tr>
<th>Dimension [mm]</th>
<th>H</th>
<th>W</th>
<th>D</th>
<th>Pole Distance P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1600</td>
<td>461</td>
<td>450</td>
<td>424</td>
<td>150</td>
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<tr>
<td>1800</td>
<td>589</td>
<td>570</td>
<td>424</td>
<td>210</td>
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<td>2000</td>
<td>610</td>
<td>600</td>
<td>499</td>
<td>275</td>
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<tr>
<td>2500</td>
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<td>315</td>
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<td>3150</td>
<td>840</td>
<td>840</td>
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<td>375</td>
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</table>

| Weight [kg] | 73 | 75 | 79 | 73 | 75 | 79 | 84 | 84 | 146 | 158 | 98 | 105 |

<table>
<thead>
<tr>
<th>Temperature [°C]</th>
<th>-5 to +40</th>
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<table>
<thead>
<tr>
<th>Tropicalization</th>
<th>IEC: 60068-2-30, 60721-2-1</th>
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<table>
<thead>
<tr>
<th>Electromagnetic Compatibility</th>
<th>IEC: 62271</th>
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</thead>
</table>

| Circuit-breakers up to 1250 A and 31.5 kA have polyamide poles. | Provided by Northeast Power Systems, Inc. | www.nepsi.com |
## General characteristics of fixed circuit-breakers (24 kV)

<table>
<thead>
<tr>
<th>Circuit-breaker</th>
<th>VD4 24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standards</td>
<td>IEC 62271-100 • VDE 0671; CEI EN 62271-100- File 7642 •</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>Ur [kV] 24</td>
</tr>
<tr>
<td>Rated insulation voltage</td>
<td>Us [kV] 24</td>
</tr>
<tr>
<td>Withstand voltage at 50 Hz</td>
<td>Urd (1 min) [kV] 50</td>
</tr>
<tr>
<td>Impulse withstand voltage</td>
<td>Up [kV] 125</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>fr [Hz] 50-60</td>
</tr>
<tr>
<td>Rated normal current (40 °C)</td>
<td>Ir [A] 630 630 1250 1250 1600 2000 2500</td>
</tr>
<tr>
<td>Making capacity</td>
<td>Ip [kA] 40 40 40 40 40 40 – 50 50 50 50 50 50 – 63 63 63 63 63 63 63 –</td>
</tr>
<tr>
<td>Operation sequence</td>
<td>[O - 0.3 s - CO - 15 s - CO] • • • • • • •</td>
</tr>
<tr>
<td>Opening time</td>
<td>[ms] 33 … 60</td>
</tr>
<tr>
<td>Arcing time</td>
<td>[ms] 10 … 15</td>
</tr>
<tr>
<td>Total breaking time</td>
<td>[ms] 43 … 75</td>
</tr>
<tr>
<td>Closing time</td>
<td>[ms] 60 … 80</td>
</tr>
<tr>
<td>Maximum overall dimensions</td>
<td>H [mm] 631 631 631 631 642 642 642</td>
</tr>
<tr>
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<td>W [mm] 570 700 570 700 700 700 700</td>
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<tr>
<td></td>
<td>D [mm] 424 424 424 424 424 424 424</td>
</tr>
<tr>
<td></td>
<td>Pole distance P [mm] 210 275 210 275 275 275 275</td>
</tr>
<tr>
<td>Weight</td>
<td>[kg] 100 104 100/106 (1) 104 110 110 110</td>
</tr>
<tr>
<td>Standardised table of dimensions</td>
<td>1VCD – – 000172 (1) – – – –</td>
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<tr>
<td>Operating temperature</td>
<td>[°C] - 5 … + 40</td>
</tr>
<tr>
<td>Tropicalization</td>
<td>IEC: 60068-2-30, 60721-2-1 •</td>
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<td>Electromagnetic compatibility</td>
<td>IEC: 62271-1 •</td>
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(1) 31.5 kA version.
## General characteristics of fixed circuit-breakers (36 kV)

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<th>Circuit-breaker</th>
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<tbody>
<tr>
<td>Standards</td>
<td>IEC 62271-100 • VDE 0671; CEI EN 62271-100- File 7642 •</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>Ur [kV] 36</td>
</tr>
<tr>
<td></td>
<td>Rated insulation voltage Us [kV] 36</td>
</tr>
<tr>
<td>Withstand voltage at 50 Hz</td>
<td>Ud [1 min] [kV] 70</td>
</tr>
<tr>
<td>Impulse withstand voltage</td>
<td>Up [kV] 170</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>fr [Hz] 50-60</td>
</tr>
<tr>
<td>Rated normal current (40 °C)</td>
<td>Ir [A] 1250 1600 2000 2500 (*)</td>
</tr>
<tr>
<td>Rated breaking capacity (rated short-circuit breaking current symmetrical)</td>
<td>Isc [kA] 31.5 31.5 31.5 31.5</td>
</tr>
<tr>
<td>Rated short-time withstand current (3s)</td>
<td>Ik [kA] 31.5 31.5 31.5 31.5</td>
</tr>
<tr>
<td>Making capacity</td>
<td>Ip [kA] 80 80 80 80</td>
</tr>
<tr>
<td>Operation sequence</td>
<td>[O - 0.3 s - CO - 15 s - CO] • • • •</td>
</tr>
<tr>
<td>Opening time</td>
<td>[ms] 35 ... 60</td>
</tr>
<tr>
<td>Arcing time</td>
<td>[ms] 10 ... 15</td>
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<tr>
<td>Total breaking time</td>
<td>[ms] 45 ... 75</td>
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<tr>
<td>Closing time</td>
<td>[ms] 60 ... 80</td>
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<tr>
<td>Maximum overall dimensions</td>
<td>H [mm] 564 564 564 –</td>
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<td>W [mm] 778 778 778 –</td>
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<td>D [mm] 468 468 468 –</td>
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<td></td>
<td>Pole distance P [mm] 275 275 275 –</td>
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<tr>
<td>Weight</td>
<td>[kg] 150 150 170 –</td>
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<td>Standardised table of dimensions</td>
<td>TN 1VYN300901-LT 1VYN300901-LT 1VYN300901-LT –</td>
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<td>Operating temperature</td>
<td>[°C] - 5 ... + 40</td>
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<td>IEC: 60068-2-30, 60721-2-1 (*)</td>
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<tr>
<td>Electromagnetic compatibility</td>
<td>IEC: 62271-1 (*)</td>
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(*) Contact ABB
### 5.4.2. Types of circuit-breakers available in the fixed version

**VD4 fixed circuit-breaker without bottom and top terminals (12 kV)**

<table>
<thead>
<tr>
<th>Ur</th>
<th>Isc</th>
<th>Rated uninterrupted current (40°C) [A]</th>
<th>Circuit-breaker type</th>
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**Legend:**

- **H** = Height of the circuit-breaker.
- **W** = Width of the circuit-breaker.
- **D** = Depth of the circuit-breaker.
- **u/l** = Distance between bottom and top terminal.
- **l/g** = Distance between the bottom terminal and the resting surface of the circuit-breaker.
- **P** = Pole horizontal centre distance.
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VD4 fixed circuit-breaker without bottom and top terminals (17.5 kV)

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H = Height of the circuit-breaker.
W = Width of the circuit-breaker.
D = Depth of the circuit-breaker.
u/l = Distance between bottom and top terminal.
l/g = Distance between the bottom terminal and the resting surface of the circuit-breaker.
P = Pole horizontal centre distance.
### VD4 fixed circuit-breaker without bottom and top terminals (24 kV)

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**H** = Height of the circuit-breaker.

**W** = Width of the circuit-breaker.

**D** = Depth of the circuit-breaker.

**u/l** = Distance between bottom and top terminal.

**l/g** = Distance between the bottom terminal and the resting surface of the circuit-breaker.

**P** = Pole horizontal centre distance.

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### VD4 fixed circuit-breaker without bottom and top terminals (36 kV)

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</table>

**H** = Height of the circuit-breaker.

**W** = Width of the circuit-breaker.

**D** = Depth of the circuit-breaker.

**u/l** = Distance between bottom and top terminal.

**l/g** = Distance between the bottom terminal and the resting surface of the circuit-breaker.

**P** = Pole horizontal centre distance.

(*) = To be released. Contact ABB.
5.4.3. Standard fittings for fixed circuit-breakers

The basic versions of the fixed circuit-breakers are three-pole and fitted with:

- EL type manual operating mechanism
- mechanical signalling device for closing spring charged/discharged
- mechanical signalling device for circuit-breaker open/closed
- closing pushbutton, opening pushbutton and operation counter
- set of ten circuit-breaker open/closed auxiliary contacts
  Note: with the set of ten auxiliary contacts supplied as standard and the maximum number of electrical applications possible, three make contacts (signalling circuit-breaker open) and five break contacts (signalling circuit-breaker closed) are available.
- lever for manual closing spring charging
- auxiliary circuit support terminal box.
5.5. Withdrawable circuit-breakers

The withdrawable circuit-breakers up to 24 kV are available for UniGear ZS1 and UniSec switchgear, PowerCube modules (see fig. 5a) and for ZS8.4 switchgear (see fig. 5b). The 36 kV circuit-breakers are available for ZS2 switchgear. They consist of a truck on which the supporting structure of the circuit-breaker is fixed.

Circuit-breakers for UniGear ZS1 and UniSec switchgear and for PowerCube modules (fig. 5a)

The cord with the connector (14) (plug) for connection of the operating mechanism electrical accessories comes out of the connection (15).

The strikers for operating the contacts (connected/isolated) placed in the switchgear are fixed in the top part of the circuit-breaker.

The shutter actuator (9) (roller (18) for UniSec version) are provided for operating the segregation shutters of the medium voltage contacts of the enclosure or of the switchgear are fixed on the sides of the circuit-breaker.

The crosspiece with the handles (17) for hooking up the circuit-breaker for the racking-in/out operations by means of the special operating lever (16) is mounted on the front part of the circuit-breaker truck.

The circuit-breaker is completed with the isolating contacts (8). The withdrawable circuit-breaker is fitted with special locks on the front crosspiece, which allow hooking up into the corresponding couplings of the switchgear.

The locks can only be activated by the handles with the truck fully resting against the crosspiece.

The operating lever (16) must be fully inserted (also see par. 7.5.). A lock prevents the truck from advancing into the enclosure or fixed part when the earthing switch is closed. Another lock prevents racking-in and racking-out with the circuit-breaker closed. With the truck in an intermediate position between isolated and connected, a further lock prevents circuit-breaker closing (either mechanical or electrical).

A locking magnet is also mounted on the truck which, when de-energised, prevents the truck racking-in operation. On request, an interlock is available which prevents racking-in of the circuit-breaker with the door open, and door opening with the circuit-breaker closed.

The lever for loading the closing spring (1) in the manual mode is built into the operating mechanism. The spring is loaded by repeatedly lowering the lever with linear movements until the yellow indicator (6) appears to show that loading is complete. The spring can only be loaded with the switchgear door open.

Comply with the instructions in the UniGear switchgear manual for the operations that can be performed with the door open.

Note: on request, the closing spring loading device for withdrawable circuit-breakers for UniGear switchgear can be supplied with the lever outside the operating mechanism and a rotary loading movement. This device is part of the standard equipment for VD4/ZS8 withdrawable circuit-breakers only (see detail 1 of Fig. 5b on the next page). This rotary loading device allows the closing spring to be loaded with the switchgear door closed.

---

**Fig. 5a**

| 1 | Lever for manually charging the closing spring |
| 2 | Signalling device for circuit-breaker open/closed |
| 3 | Rating plate |
| 4 | Opening pushbutton |
| 5 | Closing pushbutton |
| 6 | Signalling device for closing spring charged/discharged |
| 7 | Operation counter |
| 8 | Isolating contacts |
| 9 | Slide for operating the switchgear shutters (UniGear ZS1, PowerCube, ZS8.4) |
| 10 | Truck |
| 11 | Locks for hooking into the fixed part |
| 12 | Mechanical override of the undervoltage release (on request) |
| 13 | Strikers for activating the contacts placed in the enclosure |
| 14 | Connector (plug) |
| 15 | Cabling connection |
| 16 | Operating lever for circuit-breaker racking-in/out |
| 17 | Handles for activating the locks (11) |
| 18 | Shutters actuator (for UniSec version only) |
Circuit-breakers for ZS8.4 switchgear (fig. 5b)
The socket (13) takes the connector (plug) placed in the switchgear. The slides (9) for operating the segregation shutters of the medium voltage contacts of the switchgear are fixed on the sides of the circuit-breaker. The crosspiece with the handles (17) for hooking up the circuit-breaker for the racking-in/out operations by means of the special operating lever (16) is mounted on the front part of the circuit-breaker truck. The circuit-breaker is completed with the isolating contacts (8). The withdrawable circuit-breaker is fitted with special locks, described below (see fig. 5c - 5d).

1) Prevention of traverse with circuit-breaker closed
With the circuit-breaker closed, the feeler pin (16 - fig. 5c) prevents the shutter sliding (19 - fig. 5c) and therefore insertion of the lever (20 - fig. 5c) for traverse of the apparatus.

2) Prevention of traverse with socket-plug disconnected
When the plug is not inserted in the socket (13), the stem (21 - fig. 5c) prevents the plate (22 - fig. 5c) lifting and traverse of the apparatus.

3) Prevention of switchgear door closing with socket-plug disconnected (*)
When the plug is not inserted in the socket (13), the feeler pin (23 - fig. 5d) prevents door closing.

4) Prevention of circuit-breaker racking-out with the socket-plug connected (*)
When the plug is inserted in the socket (13), the lock bolt (29 - fig. 5d) hits the pin (30 - fig. 5d) preventing the apparatus from being racked out of the switchgear.

(*) Only VD4/ZS8 Preussen - Elektra EON version.
Fig. 5c

Fig. 5d
### General characteristics of withdrawable circuit-breakers for UniGear ZS1 switchgear (12 kV)

#### Circuit-breaker VD4/P 12 (1)

| Standards | IEC 62271-100 | VDE 0671; CEI EN 62271-100-7642 |

| Rated voltage Ur [kV] | 12 |
| Rated insulation voltage Us [kV] | 12 |
| Withstand voltage at 50 Hz Ud (1 min) [kV] | 28 |
| Impulse withstand voltage Up [kV] | 75 |
| Rated frequency fr [Hz] | 50-60 |

| Rated normal current (40 °C) (1) Ir [A] | 630 | 1250 | 1250 | 1250 | 1600 | 1600 |
| Rated breaking capacity (rated short-circuit breaking current symmetrical) Isc [kA] | 16 | 16 | - | - | - | - |
| | 20 | 20 | - | - | - | - |
| | 25 | 25 | - | - | - | - |
| | 31.5 | 31.5 | - | - | - | - |
| Rated short-time withstand current (3s) Ik [kA] | 16 | 16 | - | - | - | - |
| | 20 | 20 | - | - | - | - |
| | 25 | 25 | - | - | - | - |
| | 31.5 | 31.5 | - | - | - | - |
| Making capacity Ip [kA] | 31.5 | 31.5 | - | - | - | - |
| | 40 | 40 | - | - | - | - |
| | 50 | 50 | - | - | - | - |
| | 63 | 63 | - | - | - | - |
| | 80 | 80 | - | - | - | - |
| Operating sequence [ O - 0.3 s - CO - 15 s - CO ] | • | • | • | • | • | • |
| Opening time [ms] | 33 ... 60 |
| Arcing time [ms] | 10 ... 15 |
| Total breaking time [ms] | 43 ... 75 |
| Closing time [ms] | 60 ... 80 |
| Maximum overall dimensions H [mm] | 628 | 628 | 691 | 691 | 691 | 691 |
| W [mm] | 503 | 503 | 653 | 653 | 653 | 853 |
| D [mm] | 662 | 662 | 641 | 642 | 642 | 642 |
| Pole distance P [mm] | 150 | 150 | 210 | 275 | 210 | 275 |
| Weight [kg] | 116 | 116 | 174 | 176 | 180 | 160 |
| Standardised table of dimensions 1VCD | - | - | 003284 | 003286 | 003444 | - |
| Operating temperature [°C] | -5 ... 40 |
| Tropicalization | IEC: 60068-2-30, 60721-2-1 |
| Electromagnetic compatibility | IEC: 62271-1 |

(1) Rated current guaranteed with circuit-breaker installed in UniGear ZS1 switchgear and with 40 °C ambient temperature.
(2) Up to 4000 A with forced ventilation.
(3) Circuit-breakers up to 1250 A and 31.5 kA have polyamide poles.
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<thead>
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<th>Current (A)</th>
<th>1600</th>
<th>1600</th>
<th>1600</th>
<th>2000</th>
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* Operating temperature: -5°C to +40°C
* Standards: IEC 62271-100, VDE 0671, CEI EN 62271-100
* Rated voltage: Ur [kV] 12
* Rated insulation voltage: Us [kV] 12
* Withstand voltage at 50 Hz: Ud (1 min) [kV] 28
* Impulse withstand voltage: Up [kV] 75
* Rated frequency: fr [Hz] 50-60
* Rated normal current: Ir [A] 630, 1250, 1250, 1250, 1600, 1600, 1600, 1600, 2000, 2000, 2000, 2000, 2500, 2500, 3150
* Rated breaking capacity: Isc [kA]
* Rated short-time withstand current: Ik [kA]
* Making capacity: Ip [kA]
* Operation sequence: O - 0.3 s - CO - 15 s - CO
* Opening time: [ms] 33 ... 60
* Arcing time: [ms] 10 ... 15
* Total breaking time: [ms] 43 ... 75
* Closing time: [ms] 60 ... 80
* Maximum overall dimensions:
  - H [mm]: 628, 628, 691, 691, 691, 691, 691, 691, 691, 691, 730, 742
  - W [mm]: 503, 503, 653, 653, 681, 653, 653, 853, 653, 853, 853, 853, 853, 853, 853
  - Pole distance: P [mm]: 150, 150, 210, 210, 210, 275, 210, 275, 210, 275, 210, 275, 210, 275, 210, 275, 275, 275, 275

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General characteristics of withdrawable circuit-breakers for UniGear ZS1 switchgear (17.5 kV)

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<th>VD4/P 17 (3)</th>
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<td>Standards</td>
<td>IEC 62271-100 • VDE 0671; CEI EN 62271-100- File 7642 •</td>
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<td>Rated insulation voltage</td>
<td>Us [kV] 17.5</td>
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<td>Withstand voltage at 50 Hz</td>
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<td>Up [kV] 95</td>
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<td>Rated frequency</td>
<td>fr [Hz] 50-60</td>
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<td>Opening time</td>
<td>[ms] 33 ... 60</td>
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(1) Rated current guaranteed with circuit-breaker installed in UniGear ZS1 switchgear and with 40 °C ambient temperature.
(2) Up to 4000 A with forced ventilation.
(3) Circuit-breakers up to 1250 A and 31.5 kA have polyamide poles.
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### Rated Voltage
- Ur [kV]: 17.5
- Us [kV]: 17.5
- Ud (1 min) [kV]: 38
- Up [kV]: 95
- fr [Hz]: 50-60

### Rated Current
- Ir [A]:
  - 630
  - 1250

### Rated Breaking Capacity
- Isc [kA]:
  - 16
  - 20
  - 25
  - 31.5

### Rated Short-time Withstand Current
- Ik [kA]:
  - 16
  - 20
  - 25

### Making Capacity
- Ip [kA]:
  - 40
  - 50
  - 63
  - 80

### Characteristics
- Operation sequence: O - 0.3 s - CO - 15 s - CO - 
- Opening time [ms]: 33 ... 60
- Arcing time [ms]: 10 ... 15
- Total breaking time [ms]: 43 ... 75
- Closing time [ms]: 60 ... 80

### Dimensions
- H [mm]: 632
- W [mm]: 503
- D [mm]: 664
- Pole distance P [mm]: 150

### Weight
- [kg]: 116

### Standards
- IEC 62271-100
- VDE 0671; CEI EN 62271-100

### Additional Information
- Guaranteed with circuit-breaker installed in UniGear ZS1 switchgear and with 40 °C ambient temperature.
- Up to 4000 A with forced ventilation.
- Circuit-breakers up to 1250 A and 31.5 kA have polyamide poles.

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General characteristics of withdrawable circuit-breakers for UniGear ZS1 switchgear (24 kV)

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<td>[ms] 43 ... 75</td>
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<td>Closing time</td>
<td>[ms] 60 ... 80</td>
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<td>Pole distance P [mm] 210 275 210 275 275 275 275 275</td>
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<tr>
<td>Weight</td>
<td>[kg] 140 148 140/146 (4) 148 228 228 228 277</td>
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<tr>
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<td>IEC: 60068-2-30, 60721-2-1 •</td>
</tr>
<tr>
<td>Electromagnetic compatibility</td>
<td>IEC: 62271-1 •</td>
</tr>
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</table>

(1) Rated current guaranteed with circuit-breaker installed in UniGear ZS1 switchgear and with 40 °C ambient temperature.
(2) 2300 A rated current guaranteed with natural ventilation; 2500 A rated current guaranteed with forced ventilation.
(3) 2700 A rated current guaranteed with natural ventilation; 3150 A rated current guaranteed with forced ventilation.
(4) 31.5 kA version.
### General characteristics of withdrawable circuit-breakers for UniGear ZS2 switchgear and PowerCube modules (36 kV)

<table>
<thead>
<tr>
<th>Circuit-breaker</th>
<th>VD4/W 36</th>
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<tbody>
<tr>
<td><strong>Standards</strong></td>
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<tr>
<td><strong>Rated voltage</strong></td>
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<td><strong>Rated insulation voltage</strong></td>
<td>Us [kV]</td>
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<td><strong>Withstand voltage at 50 Hz</strong></td>
<td>Ud (1 min) [kV]</td>
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<tr>
<td><strong>Impulse withstand voltage</strong></td>
<td>Up [kV]</td>
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<tr>
<td><strong>Rated frequency</strong></td>
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<td><strong>Rated normal current (40 °C) (1)</strong></td>
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<tr>
<td><strong>Rated breaking capacity</strong> (rated short-circuit breaking current symmetrical)</td>
<td>Isc [kA]</td>
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<tr>
<td><strong>Rated short-time withstand current (3s)</strong></td>
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<td><strong>Making capacity</strong></td>
<td>Ip [kA]</td>
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<tr>
<td><strong>Operation sequence</strong></td>
<td>[O - 0.3 s - CO - 15 s - CO]</td>
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<tr>
<td><strong>Opening time</strong></td>
<td>[ms]</td>
</tr>
<tr>
<td><strong>Arcing time</strong></td>
<td>[ms]</td>
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<tr>
<td><strong>Total breaking time</strong></td>
<td>[ms]</td>
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<tr>
<td><strong>Closing time</strong></td>
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<td><strong>Maximum overall dimensions</strong></td>
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<tr>
<td>W [mm]</td>
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<td>D [mm]</td>
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(*) Ask ABB
## 5.5.2. Types of withdrawable circuit-breakers available for UniGear ZS1 switchgear

### VD4 withdrawable circuit-breaker (12 kV)

<table>
<thead>
<tr>
<th>kV</th>
<th>kA</th>
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<th>Circuit-breaker type</th>
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<td>P=210</td>
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<td>u/l=205</td>
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W = Width of the circuit-breaker.
P = Pole horizontal centre distance.
u/l = Distance between bottom and top terminal.
ø = Diameter of the isolating contact.

(1) Up to 4000 A rated current guaranteed with forced ventilation.
## VD4 withdrawable circuit-breaker (17.5 kV)

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<th>Isc (kA)</th>
<th>Rated uninterrupted current (40 °C) [A]</th>
<th>Circuit-breaker type</th>
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W = Width of the circuit-breaker.
P = Pole horizontal centre distance.
u/l = Distance between bottom and top terminal.
ø = Diameter of the isolating contact.

(1) Up to 4000 A rated current guaranteed with forced ventilation.
### VD4 withdrawable circuit-breaker (24 kV)

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W = Width of the switchgear.
P = Pole horizontal centre distance.
\( u/l \) = Distance between bottom and top terminal.
\( \phi \) = Diameter of the isolating contact.
(1) 3500 A rated current guaranteed with forced ventilation.
(2) 3150 A rated current guaranteed with forced ventilation.

### VD4 withdrawable circuit-breaker (36 kV)

<table>
<thead>
<tr>
<th>Ur</th>
<th>Isc</th>
<th>Rated uninterrupted current (40 °C) [A]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>H=951</td>
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<tr>
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<tr>
<td></td>
<td></td>
<td>u/l=380</td>
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<tr>
<td></td>
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<td>( \phi )=399</td>
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<tr>
<td></td>
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<td>P=275</td>
</tr>
<tr>
<td>kV</td>
<td>kA</td>
<td>W=778</td>
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<td>--------------------------------------</td>
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<tr>
<td>36</td>
<td>31.5</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>2500 A ((^*))</td>
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<tr>
<td></td>
<td></td>
<td>VD4/W 36.12.32 p225</td>
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<td>VD4/W 36.16.32 p225</td>
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<td>VD4/W 36.20.32 p225</td>
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<td>VD4/W 36.25.32 p225</td>
</tr>
</tbody>
</table>

H = Height of the circuit-breaker.
D = Depth of the circuit-breaker.
\( u/l \) = Distance between bottom and top terminal.
\( \phi \) = Diameter of the isolating contact.
P = Pole horizontal centre distance.
W = Width of the circuit-breaker.
(\(^*\)) = To be released. Contact ABB
5.5.3. Standard fittings of withdrawable circuit-breakers for UniGear ZS1 switchgear (up to 24 kV) - UniGear ZS2 and PowerCube modules (VD4 36 kV)

The basic versions of the withdrawable circuit-breakers are three-pole and fitted with:
- EL type manual operating mechanism
- mechanical signalling device for closing spring charged/discharged
- mechanical signalling device for circuit-breaker open/closed
- closing pushbutton
- opening pushbutton
- operation counter
- set of ten auxiliary circuit-breaker open/closed contacts

Note: with the set of ten auxiliary contacts supplied as standard and the maximum number of electrical applications possible, three make contacts (signalling circuit-breaker open) and four break contacts (signalling circuit-breaker closed) are available.

- lever for manually charging the closing spring
- isolating contacts
- cord with connector (plug only) for auxiliary circuits, with striker pin which does not allow connection of the plug in the socket if the rated current of the circuit-breaker is different from the rated current of the panel
- racking-in/out lever (the quantity must be defined according to the number of pieces of apparatus ordered)
- locking electromagnet in the truck. This prevents the circuit-breaker from being racked into the panel with auxiliary circuits not connected (plug not inserted in the socket).
### General characteristics of withdrawable circuit-breakers for PowerCube modules (12 kV)

<table>
<thead>
<tr>
<th>Circuit-breaker</th>
<th>VD4/P 12 (1)</th>
<th>VD4/W 12 (1)</th>
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<tr>
<td>PowerCube module</td>
<td>PB1</td>
<td>PB2</td>
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<td></td>
<td>VDE 0671; CEI EN 62271-100- Fasc. 7642</td>
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<tr>
<td><strong>Rated voltage</strong></td>
<td>Ur [kV] 12</td>
<td>12</td>
</tr>
<tr>
<td><strong>Rated insulation voltage</strong></td>
<td>Us [kV] 12</td>
<td>12</td>
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<tr>
<td><strong>Withstand voltage at 50 Hz</strong></td>
<td>Ud (1 min) [kV] 28</td>
<td>28</td>
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<tr>
<td><strong>Impulse withstand voltage</strong></td>
<td>Up [kV] 75</td>
<td>75</td>
</tr>
<tr>
<td><strong>Rated frequency</strong></td>
<td>fr [Hz] 50-60</td>
<td>50-60</td>
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<tr>
<td><strong>Rated normal current (40 °C)</strong></td>
<td>Ir [A] 630</td>
<td>1250</td>
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<tr>
<td><strong>Rated breaking capacity</strong> (rated short-circuit breaking current symmetrical)</td>
<td>Isc [kA] 16</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>20</td>
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<tr>
<td><strong>Rated short-time withstand current (3s)</strong></td>
<td>Ik [kA] 25</td>
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<td><strong>Operation sequence</strong></td>
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<tr>
<td><strong>Opening time</strong></td>
<td>[ms] 33 ... 60</td>
<td>33 ... 60</td>
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<tr>
<td><strong>Arcing time</strong></td>
<td>[ms] 10 ... 15</td>
<td>10 ... 15</td>
</tr>
<tr>
<td><strong>Total breaking time</strong></td>
<td>[ms] 43 ... 75</td>
<td>43 ... 75</td>
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<tr>
<td><strong>Closing time</strong></td>
<td>[ms] 60 ... 80</td>
<td>60 ... 80</td>
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<td><strong>Maximum overall dimensions</strong></td>
<td>H [mm] 626</td>
<td>628</td>
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<td>W [mm] 503</td>
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<td>D [mm] 662</td>
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<td>Pole distance P [mm] 150</td>
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</table>

(1) Rated current guaranteed with circuit-breaker installed in PowerCube enclosure and with 40 °C ambient temperature
(2) Up to 4000 A with forced ventilation.
(3) Circuit-breakers up to 1250 A and 31.5 kA have polyamide poles.
<table>
<thead>
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<th>VD4/P 12</th>
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<th>PB3</th>
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- **Rated voltage Ur [kV]**: 12
- **Rated insulation voltage Us [kV]**: 12
- **Withstand voltage at 50 Hz Ud (1 min) [kV]**: 28
- **Impulse withstand voltage Up [kV]**: 75
- **Rated frequency fr [Hz]**: 50-60
- **Rated normal current (40 °C) (1) Ir [A]**: 630
- **Rated breaking capacity (rated short-circuit breaking current symmetrical) Isc [kA]**: 16
- **Rated short-time withstand current (3s) Ik [kA]**: 16
- **Making capacity Ip [kA]**: 40
- **Operation sequence [O - 0.3 s - CO - 15 s - CO]**
- **Opening time [ms]**: 33 ...
- **Arcing time [ms]**: 10 ...
- **Total breaking time [ms]**: 43 ...
- **Closing time [ms]**: 60 ...
- **Maximum overall dimensions H [mm]**: 628
- **W [mm]**: 503
- **D [mm]**: 662
- **Pole distance P [mm]**: 150
- **Weight [kg]**: 116
- **Operating temperature [°C]**: -5 ...

*(1) Rated current guaranteed with circuit-breaker installed in PowerCube enclosure and with 40 °C ambient temperature
(2) Up to 4000 A with forced ventilation.
(3) Circuit-breakers up to 1250 A and 31.5 kA have polyamide poles.
### General characteristics of withdrawable circuit-breakers for PowerCube modules (17.5 kV)

**Circuit-breaker**

<table>
<thead>
<tr>
<th>PowerCube module</th>
<th>VD/P 17 (°)</th>
<th>VD/W 17 (°)</th>
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</thead>
<tbody>
<tr>
<td>Standards</td>
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<tr>
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<td>Rated voltage Ur [kV]</td>
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</tr>
<tr>
<td>Rated insulation voltage Us [kV]</td>
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<td>17.5</td>
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<tr>
<td>Withstand voltage at 50 Hz Ud (1 min) [kV]</td>
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<tr>
<td>Impulse withstand voltage Up [kV]</td>
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<td>95</td>
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<tr>
<td>Rated frequency fr [Hz]</td>
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<tr>
<td>Rated normal current (40 °C) [A] (1)</td>
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<td>Rated breaking capacity (rated short-circuit breaking current symmetrical) Isc [kA]</td>
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<td>Arcing time [ms]</td>
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<td>Total breaking time [ms]</td>
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</table>

(1) Rated current guaranteed with circuit-breaker installed in PowerCube enclosure and with 40 °C ambient temperature.
(2) Up to 4000 A with forced ventilation.
(3) Circuit-breakers up to 1250 A and 31.5 kA have polyamide poles.
<table>
<thead>
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<th>PB3</th>
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<td>125</td>
<td>125</td>
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</tr>
</tbody>
</table>

(1) Rated current guaranteed with circuit-breaker installed in PowerCube enclosure and with 40 °C ambient temperature.

(2) Up to 4000 A with forced ventilation.

(3) Circuit-breakers up to 1250 A and 31.5 kA have polyamide poles.

Provided by Northeast Power Systems, Inc. www.nepsi.com
### General characteristics of withdrawable circuit-breakers for PowerCube modules (24 kV)

#### Circuit-breaker VD4/P 24

<table>
<thead>
<tr>
<th>PowerCube module</th>
<th>VD4/P 24</th>
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</thead>
<tbody>
<tr>
<td><strong>Standards</strong></td>
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</tr>
<tr>
<td>IEC 62271-100</td>
<td>•</td>
</tr>
<tr>
<td>VDE 0671; CEI EN 62271-100- File 7642</td>
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<tr>
<td><strong>Rated voltage</strong></td>
<td>Ur [kV]</td>
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<tr>
<td><strong>Rated insulation voltage</strong></td>
<td>Us [kV]</td>
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<tr>
<td>24</td>
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<tr>
<td><strong>Withstand voltage at 50 Hz</strong></td>
<td>Ud (1 min) [kV]</td>
</tr>
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<tr>
<td><strong>Impulse withstand voltage</strong></td>
<td>Up [kV]</td>
</tr>
<tr>
<td>125</td>
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<tr>
<td><strong>Rated frequency</strong></td>
<td>fr [Hz]</td>
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<tr>
<td>50-60</td>
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<td><strong>Rated normal current (40 °C) (1)</strong></td>
<td>Ir [A]</td>
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<td>1600</td>
<td>2000</td>
</tr>
<tr>
<td>2500 (2)</td>
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</tr>
<tr>
<td><strong>Rated breaking capacity (rated short-circuit breaking current symmetrical)</strong></td>
<td>Isc [kA]</td>
</tr>
<tr>
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<td>20</td>
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<tr>
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<td>31.5</td>
</tr>
<tr>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>25</td>
<td>25</td>
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<tr>
<td>–</td>
<td>31.5</td>
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<td>40</td>
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<td>63</td>
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<tr>
<td>–</td>
<td>80</td>
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<tr>
<td><strong>Operation sequence</strong></td>
<td>[O - 0.3 s - CO - 15 s - CO]</td>
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<td>•</td>
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<tr>
<td><strong>Opening time</strong></td>
<td>[ms]</td>
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<tr>
<td>33 ... 60</td>
<td>33 ... 60</td>
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<tr>
<td><strong>Arcing time</strong></td>
<td>[ms]</td>
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<tr>
<td>10 ... 15</td>
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<tr>
<td><strong>Total breaking time</strong></td>
<td>[ms]</td>
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<tr>
<td>43 ... 75</td>
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<td><strong>Closing time</strong></td>
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<td><strong>Maximum overall dimensions</strong></td>
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<tr>
<td>H</td>
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<tr>
<td>W</td>
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<td>D</td>
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<tr>
<td>Pole distance P</td>
<td>[mm]</td>
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<tr>
<td><strong>Weight</strong></td>
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<td><strong>Standardised table of dimensions</strong></td>
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<tr>
<td><strong>Operating temperature</strong></td>
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</tr>
<tr>
<td>- 5 ... 40</td>
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<td><strong>Tropicalization</strong></td>
<td>IEC: 60068-2-30, 60721-2-1</td>
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<tr>
<td><strong>Electromagnetic compatibility</strong></td>
<td>IEC: 62271-1</td>
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</table>

(1) Rated current guaranteed with circuit-breaker installed in PowerCube enclosure and with 40 °C ambient temperature.
(2) 2000 A rated uninterrupted current guaranteed with natural ventilation; 2500 A rated current guaranteed with forced ventilation.
(3) 31.5 kA version.
### 5.5.5. Types of withdrawable circuit-breakers available for PowerCube modules

#### VD4 withdrawable circuit-breaker (12 kV)

<table>
<thead>
<tr>
<th>Ur</th>
<th>Isc</th>
<th>Rated uninterrupted current (40 °C) [A]</th>
<th>Circuit-breaker type</th>
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<tbody>
<tr>
<td></td>
<td>kA</td>
<td>W=650</td>
<td>W=800</td>
</tr>
<tr>
<td>16</td>
<td>630</td>
<td>W=150</td>
<td>W=210</td>
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<tr>
<td>20</td>
<td>630</td>
<td>u/l=205</td>
<td>u/l=310</td>
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<tr>
<td>25</td>
<td>630</td>
<td>ø=35</td>
<td>ø=79</td>
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</tr>
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<td>630</td>
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<td></td>
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<tr>
<td>25</td>
<td>630</td>
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</tr>
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</tr>
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</tr>
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<td>50</td>
<td>3150 (1)</td>
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</tbody>
</table>

**W** = Width of the switchgear.

**P** = Pole horizontal centre distance.

**u/l** = Distance between bottom and top terminal.

**ø** = Diameter of the isolating contact.

(1) Up to 4000 A rated current guaranteed with forced ventilation. Available on request.
# VD4 withdrawable circuit-breaker (17.5 kV)

<table>
<thead>
<tr>
<th>Ur</th>
<th>Iac</th>
<th>Rated uninterrupted current (40 °C) [A]</th>
<th>Circuit-breaker type</th>
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<td></td>
<td>kA</td>
<td>W=650</td>
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<td>79</td>
</tr>
<tr>
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<td>p210</td>
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<td>17.32.50</td>
<td>p275</td>
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</table>

W = Width of the switchgear.
P = Pole horizontal centre distance.
u/l = Distance between bottom and top terminal.
ø = Diameter of the isolating contact.
(1) Up to 4000 A rated current guaranteed with forced ventilation. Available on request.
5.5.6. Standard fittings for withdrawable circuit-breakers for PowerCube modules

The basic versions of the withdrawable circuit-breakers are always three-pole and fitted with:

- EL type manual operating mechanism
- mechanical signalling device for closing spring charged/discharged
- mechanical signalling device for circuit-breaker open/closed
- opening pushbutton
- operation counter
- set of ten auxiliary circuit-breaker open/closed contacts

Note: with the group of ten auxiliary contacts supplied as standard and the maximum number of electrical applications, three make contacts (signalling circuit-breaker open) and four break contacts (signalling circuit-breaker closed) are available.

- lever for manually charging the closing spring
- isolating contacts
- cord with connector (only plug) for auxiliary circuits, with striker pin which does not allow connection of the plug in the socket if the rated current of the circuit-breaker is different from the rated current of the panel
- racking-in/out lever (the quantity must be defined according to the number of pieces of apparatus ordered)
- locking electromagnet in the truck. This prevents racking-in of the circuit-breaker in the panel with auxiliary circuits not connected (plug not inserted in the socket).

### Ur Isc Rated uninterrupted current (40 °C) [A]

<table>
<thead>
<tr>
<th>kV</th>
<th>Isc</th>
<th>Circuit-breaker type</th>
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W = Width of the switchgear.
P = Pole horizontal centre distance.
u/l = Distance between bottom and top terminal.
Ø = Diameter of the isolating contact.
(1) Up to 2500 A rated current guaranteed with forced ventilation.

Provided by Northeast Power Systems, Inc. www.nepsi.com
## 5.5.7. General characteristics of withdrawable circuit-breakers for ZS8.4 switchgear

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<thead>
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<th>Circuit-breaker</th>
<th>VD4/Z8</th>
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<td>Panel without partitions</td>
<td>•</td>
</tr>
<tr>
<td>Panel with partitions</td>
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</tr>
<tr>
<td>Preussen Elektra - EON</td>
<td>(2) –</td>
</tr>
</tbody>
</table>

| Width [kV] | 650 | 650 | 650 | 650 | 800 | 800 |
| Depth [kV] | 1000 | 1000 | 1000 | 1000 | 1200 | 1200 |

| Standards | IEC 62271-100 • |
| VDE 0671 • |

| Rated voltage | Ur [kV] | 12 | 12 | 17.5 | 17.5 | 24 | 24 |
| Rated insulation voltage | Us [kV] | 12 | 12 | 17.5 | 17.5 | 24 | 24 |
| Withstand voltage at 50 Hz | Ud (1 min) [kV] | 28 | 28 | 38 | 38 | 50 | 50 |
| Impulse withstand voltage | Up [kV] | 75 | 75 | 95 | 95 | 125 | 125 |
| Rated frequency | fr [Hz] | 50-60 |
| Rated normal current (40 °C) | Ir [A] | 630 | 1250 | 630 | 1250 | 630 | 1250 |
| Rated breaking capacity | Isc [kA] | 20 | 20 | 20 | 20 | 20 | 20 |
| Rated short-time withstand current (3 s) | Ik [kA] | 20 | 20 | 20 | 20 | 20 | 20 |
| Making capacity | Ip [kA] | 18,5 mm | 50 | 50 | 50 | 50 | 50 |
| Operation sequence | [O-0.3s-CO-15s-CO] • |
| Opening time | [ms] | 33...60 |
| Arcing time | [ms] | 10...15 |
| Total breaking time | [ms] | 43...75 |
| Closing time | [ms] | 60...80 |
| Maximum overall dimensions | H [mm] | 579 | 579 | 579 | 579 | 680 | 680 |
| | W [mm] | 503 | 503 | 503 | 503 | 653 | 653 |
| | D [mm] | 548 | 548 | 548 | 548 | 646 | 646 |
| | Pole distance P [mm] | 150 | 150 | 150 | 150 | 210 | 210 |
| Weight | [kg] | 116 | 116 | 116 | 116 | 140 | 140 |
| Standardised table of dimensions | 1VCD | 000092 | 000137 | 000137 | 000137 | 000089 | 000138 |
| Operating temperature | [°C] | – 5 ... + 40 |
| Tropicalisation | IEC 60068-2-30 • |
| Electromagnetic compatibility | IEC 62271-1 • |

(1) Rated current guaranteed with circuit-breaker installed in switchgear with 40 °C ambient temperature.
(2) Special type with device for charging the closing spring by means of a rotary handle outside the operating mechanism.
<table>
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<tr>
<th>Width [kV]</th>
<th>650</th>
<th>650</th>
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<th>650</th>
<th>800</th>
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<tr>
<td>Depth [kV]</td>
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<td>1000</td>
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<td>1000</td>
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<td>Standards</td>
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<td>Rated voltage Ur [kV]</td>
<td>12</td>
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<td>Withstand voltage at 50 Hz Ud (1 min) [kV]</td>
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<td>Rated frequency fr [Hz]</td>
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<td>Rated normal current (40 °C) (1) Ir [A]</td>
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<td>1250</td>
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<td>Rated breaking capacity (rated symmetrical short-circuit current) Isc [kA]</td>
<td>–</td>
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<td>16</td>
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<td>Rated short-time withstand current (3 s) Ik [kA]</td>
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<td>Making capacity Ip [kA]</td>
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<td>Operating temperature [°C]</td>
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### General characteristics of withdrawable circuit-breakers for ZS8.4 switchgear

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<thead>
<tr>
<th>Ur</th>
<th>Isc</th>
<th>Panel without partition</th>
<th>Panel with partition</th>
<th>Special panel EON</th>
<th>Circuit-breaker type</th>
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<td>1250</td>
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</tbody>
</table>

W = Width of the switchgear.
P = Pole horizontal centre distance.
u/l = Distance between bottom and top terminal.
Ø = Diameter of the isolating contact.

Provided by Northeast Power Systems, Inc.
www.nepsi.com
5.5.9. Standard fittings for withdrawable circuit-breakers for ZS8.4 switchgear

The basic versions of the withdrawable circuit-breakers are always three-pole and fitted with:
- EL type manual operating mechanism
- mechanical signalling device for closing spring charged/discharged
- mechanical signalling device for circuit-breaker open/closed
- closing pushbutton
- opening pushbutton
- operation counter
- set of ten auxiliary circuit-breaker open/closed contacts

Note: with the set of ten auxiliary contacts supplied as standard and the maximum number of electrical applications possible, three make contacts (signalling circuit-breaker open) and four break contacts (signalling circuit-breaker closed) are available.

- lever for manually charging the closing springs incorporated in the operating mechanism for VD4/Z8 and VD4/ZT8, external with rotary movement for VD4/ZS8
- isolating contacts
- cord with connector (only plug) for auxiliary circuits, with striker pin which does not allow connection of the plug in the socket if the rated current of the circuit-breaker is different from the rated current of the panel
- racking-in/out lever (the quantity must be defined according to the number of pieces of apparatus ordered)

5.5.10. VD4/ZS8 (Preussen Elektra-EON version)
- Device for recharging the closing spring, with door closed, by means of removable rotary handle and outside the operating mechanism and the switchgear
- 64-pin Harting socket with mechanical interlock which prevents traverse of the circuit-breaker when the plug is not inserted in the socket
- Interlock with the door which prevents insertion of the spring charging lever when the circuit-breaker is closed
- Interlock with the door and the 64-pin Harting socket which prevents door closure when the plug is not inserted in the socket.

5.5.11. VD4/Z8 - VD4/ZT8
- Harting 64-pin socket with mechanical interlock which prevents traverse of the circuit-breaker when the plug is not inserted in the socket.

Caption
1) Device for spring charging with rotary handle
2) Harting 64-pin socket with mechanical interlock which prevents traverse when the socket is not inserted
3) Door-socket-spring charging device interlock (only VD4/ZS8 version)
### 5.5.12. General characteristics of withdrawable circuit-breakers for UniSwitch switchgear and UniMix (24 kV) switchgear

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<td>UniSwitch (unit CBW type)</td>
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<td>UniMix (unit P1/E type)</td>
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<td>VDE 0671; CEI EN 62271-100- File 7642</td>
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<tr>
<td>Rated voltage</td>
<td>Ur [kV]</td>
<td>24</td>
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<tr>
<td>Rated insulation voltage</td>
<td>Us [kV]</td>
<td>24</td>
</tr>
<tr>
<td>Withstand voltage at 50 Hz</td>
<td>Ud (1 min) [kV]</td>
<td>50</td>
</tr>
<tr>
<td>Impulse withstand voltage</td>
<td>Up [kV]</td>
<td>125</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>fr [Hz]</td>
<td>50-60</td>
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<tr>
<td>Rated normal current (40 °C) (1)</td>
<td>Ir [A]</td>
<td>630</td>
</tr>
<tr>
<td>Rated breaking capacity</td>
<td>(rated symmetrical short-circuit current)</td>
<td>Isc [kA]</td>
</tr>
</tbody>
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| | | &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &n...
### General characteristics of withdrawable circuit-breakers for UniSec switchgear

#### Circuit-breaker VD4/SEC

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<th>Value</th>
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</tr>
<tr>
<td><strong>Rated voltage</strong></td>
<td>Ur [kV] 24</td>
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<tr>
<td><strong>Rated insulation voltage</strong></td>
<td>Us [kV] 24</td>
</tr>
<tr>
<td><strong>Withstand voltage at 50 Hz</strong></td>
<td>Ud (1 min) [kV] 50</td>
</tr>
<tr>
<td><strong>Impulse withstand voltage</strong></td>
<td>Up [kV] 125</td>
</tr>
<tr>
<td><strong>Rated frequency</strong></td>
<td>fr [Hz] 50-60</td>
</tr>
<tr>
<td><strong>Rated normal current (40 °C)</strong></td>
<td>Ir [A] 630 - 1250</td>
</tr>
<tr>
<td><strong>Rated breaking capacity</strong></td>
<td>Isc [kA] 16</td>
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<tr>
<td>(rated symmetrical short-circuit current)</td>
<td>20</td>
</tr>
<tr>
<td>( rated short-time withstand current (3 s)</td>
<td>Ik [kA] 16</td>
</tr>
<tr>
<td><strong>Making capacity</strong></td>
<td>Ip [kA] 63</td>
</tr>
<tr>
<td><strong>Operation sequence</strong></td>
<td>O - 0.3 s - CO - 15 s - CO</td>
</tr>
<tr>
<td><strong>Opening time</strong></td>
<td>[ms] 33 ... 60</td>
</tr>
<tr>
<td><strong>Arcing time</strong></td>
<td>[ms] 10 ... 15</td>
</tr>
<tr>
<td><strong>Total breaking time</strong></td>
<td>[ms] 43 ... 75</td>
</tr>
<tr>
<td><strong>Closing time</strong></td>
<td>[ms] 60 ... 80</td>
</tr>
<tr>
<td><strong>Maximum overall dimensions</strong></td>
<td>W [mm] 653</td>
</tr>
<tr>
<td></td>
<td>D [mm] 742</td>
</tr>
<tr>
<td></td>
<td>H [mm] 743</td>
</tr>
<tr>
<td><strong>Pole distance</strong></td>
<td>P [mm] 210</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>[kg] 133</td>
</tr>
<tr>
<td><strong>Standardised table of dimensions</strong></td>
<td>1VCD 000190</td>
</tr>
<tr>
<td><strong>Operating temperature</strong></td>
<td>[°C] -5 ... + 40</td>
</tr>
<tr>
<td><strong>Tropicalization</strong></td>
<td>IEC: 60086-2-30, 60721-2-1</td>
</tr>
<tr>
<td><strong>Electromagnetic compatibility</strong></td>
<td>IEC 62271</td>
</tr>
</tbody>
</table>

(1) Rated current guaranteed with withdrawable circuit-breaker installed in switchgear with 40 °C ambient temperature.
5.5.14. Standard fittings for withdrawable circuit-breakers for UniSwitch, UniMix and UniSec switchgear

The basic versions of the withdrawable circuit-breakers are three-pole and provided with:

- EL type manual operating mechanism
- Mechanical signalling device for closing spring charged/discharged
- Mechanical signalling device for circuit-breaker open/closed
- Closing pushbutton
- Opening pushbutton
- Operation counter
- Set of ten circuit-breaker open/closed auxiliary contacts
  Note: with the set of ten auxiliary contacts supplied as standard and the maximum electrical accessories, three break contacts are available (signalling circuit-breaker open) and four make contacts (signalling circuit-breaker closed).
- Lever for manual charging of the closing spring incorporated in the operating mechanism
- Isolating contacts
- Racking-out/racking-in lever (the quantity must be established according to the number of pieces of apparatus ordered).

VD4 withdrawable circuit-breaker for switchgear UniSwitch (type unit CBW) and UniMix (type unit P1/E)

<table>
<thead>
<tr>
<th>Ur (kV)</th>
<th>Isc (kA)</th>
<th>Circuit-breaker type</th>
</tr>
</thead>
<tbody>
<tr>
<td>P=210</td>
<td>P=210</td>
<td></td>
</tr>
<tr>
<td>u/l=310</td>
<td>u/l=310</td>
<td>Circuit-breaker type</td>
</tr>
<tr>
<td>ø=35</td>
<td>ø=35</td>
<td>Circuit-breaker type</td>
</tr>
</tbody>
</table>

(1) 25 kA Isc at the 12 kV rated voltage
P = Pole horizontal centre distance.
u/l = Distance between bottom and top terminal.
ø = Diameter of the isolating contact.

5.6. Characteristics of the electrical accessories

- Shunt opening release (-MO1)
- Additional shunt opening release (-MO2)
- Shunt closing release (-MC)
- Locking magnet on the actuator (-RL1)

<table>
<thead>
<tr>
<th>Un</th>
<th>24 - 30 - 48 - 60 - 110 - 125 - 220 - 250 V~</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inrush power (Ps)</td>
<td>DC 200 W; AC = 200 VA</td>
</tr>
<tr>
<td>Inrush time</td>
<td>approx. 100 ms</td>
</tr>
<tr>
<td>Continuous power (Pc)</td>
<td>DC = 5 W; AC = 5 VA</td>
</tr>
<tr>
<td>Opening time</td>
<td>35 … 60 ms</td>
</tr>
<tr>
<td>Closing time</td>
<td>30 … 80 ms</td>
</tr>
<tr>
<td>Insulation voltage</td>
<td>2000 V 50 Hz (for 1 min)</td>
</tr>
</tbody>
</table>

Undervoltage release (-MU)

<table>
<thead>
<tr>
<th>Un</th>
<th>24 - 30 - 48 - 60 - 110 - 125 - 220 - 250 V~</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inrush power (Ps)</td>
<td>DC 200 W; AC = 200 VA</td>
</tr>
<tr>
<td>Inrush time</td>
<td>approx. 100 ms</td>
</tr>
<tr>
<td>Continuous power (Pc)</td>
<td>DC = 5 W; AC = 5 VA</td>
</tr>
<tr>
<td>Opening time</td>
<td>60 … 80 ms</td>
</tr>
<tr>
<td>Insulation voltage</td>
<td>2000 V 50 Hz (for 1 min)</td>
</tr>
</tbody>
</table>

Electronic time delay device for undervoltage release (mounted outside the circuit-breaker)

<table>
<thead>
<tr>
<th>Un</th>
<th>24 … 30 - 48 - 60 - 110 - 127 - 220 - 250 V~</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjustable opening time (release + time delay device)</td>
<td>0.5-1-1.5-2-3 s</td>
</tr>
</tbody>
</table>
Motor for motorised truck (-MT) (only for withdrawable circuit-breakers for UniGear ZS1, UniSec and ZS8.4 switchgear)

Un 24-30-48-60-110-220 V DC
Operating limits 85 … 110% Un
Rated power (Pn) 40 W

Motor operator (-MS)

Characteristics
Un 24…30 - 48…60 - 110…130 - 220…250 V–
Un 100…130 - 220…250 V – 50/60 Hz
Operating limits 85 … 110% Un
Inrush power (Ps) ≤ 40 kA 50 kA
Rated power (Pn) DC=600 W; DC=900 VA
AC=600 VA
AC=900 VA
Inrush time 0.2 s 0.2 s
Charging time 6-7 s 6-7 s
Insulation voltage 2000 V 50 Hz (for 1 min) 2000 V 50 Hz (for 1 min)

Auxiliary contacts of the circuit-breaker

Rated insulation voltage according to VDE 0110, Group C 660 V AC
Rated voltage 800 V DC 24 V…660 V
Insulation-test test voltage 2.5 kV
Maximum rated current 10 A
Number of contacts 5
Stroke 6 mm … 7 mm
Contact force 26 N
On resistance 3 mΩ
Storing temperature range - 20°C … + 120°C
Operating temperature range - 20°C … + 70°C
Contact over temperature 20 K
Operating cycles 30,000
Unlimited short circuit stability by using fuses of max. 10 A time-lag

Cosφ | Rated current | Breaking capacity
--- | --- | ---
220 V AC | 0.7 | 2.5 A | 25 A
380 V AC | 0.7 | 1.5 A | 15 A
500 V AC | 0.7 | 1.5 A | 15 A
660 V AC | 0.7 | 1.2 A | 12 A

Time constant

| 24 V DC | 200 ms | 4 A | 7.7 A |
| 380 V DC | 15 ms | 10 A | 15 A |
| 500 V AC | 1 ms | 8 A | 10 A |
| 660 V AC | 1 ms | 8 A | 10 A |

Inrush power (Ps) DC = 250 W; AC = 250 VA
Continuous power (Pc) DC = 5 W; AC = 5 VA
Inrush time 150 ms

(*) Not available for versions with motorized truck.

Locking magnet on the truck (-RL2) (*)


Operating limits 85 … 110% Un
Inrush power (Ps) DC = 250 W; AC = 250 VA
Continuous power (Pc) DC = 5 W; AC = 5 VA
Inrush time 150 ms

(*) Not available for versions with motorized truck.
6. Instructions for operating the circuit-breaker

6.1. Safety indications

The VD4 circuit-breakers guarantee a minimum IP2X degree of protection when installed in the following conditions:
- fixed circuit-breaker, installed behind a protective metal net
- withdrawable circuit-breaker, installed in switchgear.

Under these conditions the operator is totally guaranteed against accidental contact with moving parts.

Should mechanical operations be carried out on the circuit-breaker outside of the switchgear, take great care of the moving parts.

If the operations are prevented, do not force the mechanical interlocks and check that the operating sequence is correct.

Racking the circuit-breaker in and out of the switchgear must be done gradually to avoid shocks which may deform the mechanical interlocks.

Due to safety reasons, the circuit-breaker has to be treated as "switched on" if the switching position cannot be clearly determined.

In this case all high voltage connections to the circuit-breaker have to be de-energized and zero potential on the primary side of the circuit-breaker has to be confirmed prior to commissioning, operation, maintenance or repair work.

6.2. Switching and signalling parts

VD4 circuit-breakers for UniGear switchgear and PowerCube modules (fig. 6a)

Fig. 6a
6.3. Circuit-breaker closing and opening operations

Circuit-breaker operation can be either manual or electrical (fig. 6 - fig. 7).

a1) Manual closing spring charging for VD4 circuit-breakers for UniGear switchgear and PowerCube modules (fig. 7a)

Repeatedly activate the charging lever (2) (maximum rotation angle of the lever: about 90°) until the yellow indicator (7) appears.

The maximum forces which can normally be applied to the lever are ≤ 150 N for the EL1 operating mechanism, ≤ 200 N for the EL2 operating mechanism and ≤ 250 N for EL3 operating mechanism.

EL1 Twin and EL2 Twin type operating mechanisms are provided for circuit-breakers with 50 kA breaking capacity. For manual charging, the additional lever (1) should be inserted fully, as indicated in fig. 7c. In this way, the maximum force to be applied is ≤ 200 N. For the type of operating mechanism, please refer to the rating plate in fig. 1.

a2) Closing spring loading in the manual mode for withdrawable VD4 circuit-breakers for UniGear switchgear equipped with a hand-operated rotary loading device for the closing spring (refer to fig. 6b for indicative details)

Rotate the charging lever (2) (rotate about 12 times) until the yellow indicator (7) appears. The maximum force which can normally be applied to the lever is ≤ 150 N for the EL1 operating mechanism and ≤ 230 N for the EL3 operating mechanism.

The operation can be carried out with the door either open or closed and the circuit-breaker either withdrawn or connected.

WARNING (fig. 6b): Fit the hand-operated loading lever of the closing spring (2b) into its housing (2a). Turn the lever clockwise (about 12 times) until the yellow indicator (7) appears to show that loading is complete. Once this happens, the lever will continue for half a turn without loading (without exercising any force), after which it will lock owing to a sudden load increase. Do not exercise force or try to continue loading as this will damage the device.

VD4 circuit-breakers for ZS8.4 switchgear (fig. 6b)

a3) Manual closing spring charging for VD4 circuit-breakers (fig. 7b)

Rotate the charging lever (2) until the yellow indicator (7) appears. The maximum force which can normally be applied to the lever is ≤ 150 N for the EL1 operating mechanism and ≤ 230 N for the EL3 operating mechanism.

The operation can be carried out with the door either open or closed and the circuit-breaker either withdrawn or connected.

WARNING (fig. 6b): Fit the hand-operated loading lever of the closing spring (2b) into its housing (2a). Turn the lever clockwise (about 12 times) until the yellow indicator (7) appears to show that loading is complete. Once this happens, the lever will continue for half a turn without loading (without exercising any force), after which it will lock owing to a sudden load increase. Do not exercise force or try to continue loading as this will damage the device.

b) Electrical spring charging operation

On request, the circuit-breaker can be fitted with the following accessories for electrical operation:
– geared motor for automatic closing spring charging
– shunt closing release
– shunt opening release.

The geared motor automatically recharges the spring after each closing operation until the yellow indicator (7) appears. If the power is cut off during charging, the geared motor stops and automatically starts recharging the springs again when the power returns.

In any case, it is always possible to complete the charging operation manually.

c) Circuit-breaker closing

The operation can only be carried out with the closing spring completely charged.

For manual closing, press the pushbutton (5 - fig. 6b). When there is a shunt closing release, the operation can also be carried out remotely by means of a special control circuit. Closing having taken place is indicated by the signalling device (6 - fig. 6b).

d) Circuit-breaker opening

For manual opening, press the pushbutton (4 - fig. 6b). When there is a shunt opening release, the operation can also be carried out remotely by means of a special control circuit. Opening having taken place is indicated by the signalling device (6 - fig. 6b).
Caption
1 Key lock (if provided)
2 Lever for manually charging the closing spring
   2a Coupling for manual closing spring charging (when lever 2 is not provided)
   2b Lever for manual closing spring charging for rotary charging device
3 Coupling for racking-out operation lever (only for withdrawable circuit-breakers)
4 Opening pushbutton
5 Closing pushbutton
6 Signalling device for circuit-breaker open/closed
7 Signalling device for closing spring charged/discharged
8 Operation counter.
9 Handles for operating the truck locks (only for withdrawable circuit-breakers)
10 Operating lever for circuit-breaker racking-in/out.

Fig. 6b
7. Installation

7.1. General

Correct installation is of primary importance. The manufacturer’s instructions must be carefully studied and followed. It is good practice to use gloves for handling the pieces during installation.

7.2. Installation and operating conditions

The following Standards must be taken into particular consideration during installation and service:

- IEC 62271-1/DIN VDE 0101
- VDE 0105: Electrical installation service
- DIN VDE 0141: Earthing systems for installations with rated voltage above 1 kV
- All the accident prevention regulations in force in the relative countries.

7.2.1. Normal conditions

Follow the recommendations in the IEC 62271-1 and 62271-100 Standards. In more detail:

**Ambient temperature**

<table>
<thead>
<tr>
<th>Maximum</th>
<th>+ 40 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average maximum over 24 hours</td>
<td>+ 35 °C</td>
</tr>
<tr>
<td>Minimum (according to class – 5), apparatus for indoor installation</td>
<td>– 5°C</td>
</tr>
</tbody>
</table>

**Humidity**

The average value of the relative humidity, measured for a period longer than 24 hours, must not exceed the 95%.

The average value of the pressure of the water vapour, measured for a period longer than 24 hours, must not exceed 2.2 kPa.

The average value of the relative humidity, measured for a period longer than 1 month, must not exceed the 90%.

The average value of the pressure of the water vapour, measured for a period longer than 1 month, must not exceed 1.8 kPa.

**Altitude**

≤ 1000 m above sea level.

7.2.2. Special conditions

**Installations over 1000 m a.s.l.**

Possible within the limits permitted by reduction of the dielectric resistance of the air.

**Increase in the ambient temperature**

Reduction in the rated current.

Encourage heat dissipation with appropriate additional ventilation.

**Climate**

To avoid the risk of corrosion or other damage in areas:

- with a high level of humidity, and/or
- with rapid and big temperature variations, take appropriate steps (for example, by using suitable electric heaters) to prevent condensation phenomena.

For special installation requirements or other operating conditions, please contact ABB.

**The areas involved by the passage of power conductors or auxiliary circuit conductors must be protected against access of any animals which might cause damage or disservices.**

7.2.3. Trip curves

The following graphs show the number of closing-opening cycles (No.) allowed, of the vacuum interrupters, according to the breaking capacity (Ia).

Caption (Figs. 8...)

No. Number of closing-opening cycles allowed for the vacuum interrupters.

Ia: Breaking capacity of the vacuum interrupters.

---

Fig. 8a
7.3. Preliminary operations
- Clean the insulating parts with clean dry cloths.
- Check that the top and bottom terminals are clean and free of any deformation caused by shocks received during transport or storage.

7.4. Installation of fixed circuit-breakers
The circuit-breaker can be mounted directly on supporting frames to be provided by the customer, or on a special supporting truck (available on request).
The circuit-breaker, with supporting truck, must be suitably fixed to the floor of its own compartment by the customer. The floor surface in correspondence with the truck wheels must be carefully levelled.
A minimum degree of protection (IP2X) must be guaranteed from the front towards live parts.

7.4.1. Mounting the circuit-breaker on a truck made by other manufacturers
The VD4 circuit-breakers which are not installed on ABB trucks, but on trucks made by the customer, must be fitted with one or two additional auxiliary contacts (activated by the mechanical lock and by the circuit-breaker release device) to carry out the function of interrupting the shunt closing release circuit (-MC) during traverse from isolated and vice versa.
In ABB trucks, this function is carried out by the -BT1 and -BT2 auxiliary contacts which cut off the release power supply during and before activation of the mechanical lock of the screw truck racking-in device. This means that the shunt closing release power supply can only by applied at the end of activation of the mechanical lock. In this way it is certain that no electrical impulse can activate the shunt closing release with the circuit-breaker in an intermediate position.

7.5. Installation of withdrawable circuit-breaker
The withdrawable circuit-breakers are preset for use in UniGear ZS1, UniGear ZS2, UniSec switchgear and PowerCube modules.
For racking-in/racking-out of the switchgear, fully insert the lever (1) (fig. 9) in the appropriate seat (2) and work it clockwise for racking-in, and anti-clockwise for racking-out, until the limit switch positions are reached.
Circuit-breaker racking-in/-out must be carried out gradually to avoid shocks which may deform the mechanical interlocks and the limit switches.
The torque normally required to carry out racking-in and racking-out is <25 Nm. This value must not be exceeded. If operations are prevented or difficult, do not force them and check that the operating sequence is correct.

Note
To complete the racking-in/out operation, about 20 rotations of the lever are required for circuit-breakers up to 17.5 kV, and about 30 rotations for 24 kV circuit-breakers.

When the circuit-breaker has reached the isolated for test/isolated position, it can be considered racked into the switchgear and, at the same time, earthed by means of the truck wheels. Withdrawable circuit-breakers of the same version, and therefore with the same dimensions, are interchangeable. However, when, for example, different electrical accessory fittings are provided, a different code for the plug of the auxiliary circuits does not allow incorrect combinations between panels and circuit-breakers. For the circuit-breaker installation operations, also refer to the technical documentation of the above-mentioned switchgear.

- **The racking-in-/out operations must always be carried out with the circuit-breaker open.**
- **When putting into service for the first time, it is advisable to charge the circuit-breaker operating mechanisms manually so as not to overload the auxiliary power supply circuit.**

7.5.1. Circuit-breakers with withdrawable motorized truck

Carry out the racking-in/racking-out test of the motorized truck in the same way as for a manual truck, following the instructions below:

- Rack the circuit-breaker into the switchgear in the open and isolated position, with the power supply to the motor circuit cut off and with the enclosure door closed.

- Insert the manual racking-in lever (1) in the special coupling (2) Fig. 9, and take the motorized truck to about half its run between the isolated for test and the connected position. The torque needed to carry out truck handling is ≤ 25 Nm. In the case of accidental inversion of the truck motor power supply polarity, this operation allows a possible error in direction to be dealt with without any damage. Verification checks:
  a) motor rotation clockwise during circuit-breaker racking-in.
  b) motor rotation anticlockwise during circuit-breaker racking-out.

- Remove the manual lever (1) from the coupling (2) Fig. 9
- Supply the truck motor circuit.
- Activate the control for the electrical racking-in operation. When racking-in has taken place, check correct changeover of the relative auxiliary contact.

- On completion, activate the control for the electrical racking-out operation. When racking-out has taken place, check correct changeover of the relative auxiliary contact.

- In the case of a motor fault during a racking-in or racking-out operation, in an emergency the truck can be taken to the end of its run manually, after first cutting off the power supply to the motor power supply circuit and then, using the manual lever, work in the same way as with the manual truck.

Note
By means of the chain transmission, truck handling carried out using the manual lever makes the truck motor armature rotate which, behaving like a generator, can cause inverse voltage at the connection terminals. This may damage the permanent magnet of the motor, therefore all the truck racking-in and racking-out operations carried out using the manual lever must be done without power supply in the motor circuit.
7.6. Power circuit connections of fixed circuit-breakers

7.6.1. General recommendations
- Select the cross-section of the conductors according to the service current and the short-circuit current of the installation.
- Prepare special pole insulators, near the terminals of the fixed circuit-breaker or of the enclosure, sized according to the electrodynamic forces deriving from the short-circuit current of the installation.

7.6.2. Assembly of the connections
- Check that the contact surfaces of the connections are flat, and are free of any burrs, traces of oxidation or deformation caused by drilling or impacts received.
- According to the conductor material and the surface treatment used, carry out the operations indicated in table T1 on the contact surface of the conductor.

Assembly procedure
- Put the connections in contact with the circuit-breaker terminals, taking care to avoid mechanical stresses (traction / compression) on, for example, the conducting busbars on the terminals.
- Interpose a spring washer and a flat washer between the head of the bolt and the connection.
- It is advisable to use bolts according to DIN class 8.8 Standards, also referring to what is indicated in table T2.
- In the case of cable connections, strictly follow the manufacturer’s instructions to make the terminals.

T1

<table>
<thead>
<tr>
<th>Bare copper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean with a fine file or emery cloth.</td>
</tr>
<tr>
<td>Tighten fully and cover the contact surfaces with SRX Moly type grease.</td>
</tr>
</tbody>
</table>

Copper or silver-plated aluminium
- Clean with a rough dry cloth.
- Only in the case of obstinate traces of oxidation, clean with a very fine grain emery cloth taking care not to remove the surface layer.
- If necessary, restore the surface treatment.

Bare aluminium
- Clean with a metal brush or emery cloth.
- Cover the contact surfaces again immediately with neutral grease.
- Insert the copper-aluminium bimetal with surfaces shined (copper side in contact with the terminal; aluminium side in contact with the connection) between the aluminium connection and the copper terminal.

T2

<table>
<thead>
<tr>
<th>Bolt</th>
<th>Recommended tightening torque</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Without lubricant</td>
</tr>
<tr>
<td>M6</td>
<td>10.5 Nm</td>
</tr>
<tr>
<td>M8</td>
<td>26 Nm</td>
</tr>
<tr>
<td>M10</td>
<td>50 Nm</td>
</tr>
<tr>
<td>M12</td>
<td>86 Nm</td>
</tr>
<tr>
<td>M16</td>
<td>200 Nm</td>
</tr>
</tbody>
</table>

(1) The nominal tightening torque is based on a friction coefficient of the thread of 0.14 (distributed value the thread is subjected to which, in some cases, is not negligible). The nominal tightening torque with lubricant is according to the DIN 43673 Standards.
(2) Oil or grease. The thread and surfaces in contact with the lubricated heads. Take into account the deviations from the general Standards table (for example, for systems in contact or terminals) as foreseen in the specific technical documentation. The thread and surfaces in contact with the heads of bolts must be slightly oiled or greased, so as to obtain a correct nominal tightening torque.

7.7. Earthing
For the fixed version circuit-breaker, carry out earthing by means of the special screw marked with the relative symbol. Clean and degrease the area around the screw to a diameter of about 30 mm and, on completion of assembly, cover the joint again with Vaseline grease. Use a conductor (busbar or braid) with a cross-section conforming to the Standards in force.

7.8. Connection of the auxiliary circuits
Note: the minimum cross-section of the wires used for the auxiliary circuits must not be less than the one used for the internal cabling. Furthermore, they must be insulated for 3 kV of test.

7.8.1. Fixed circuit-breaker
Connection of the circuit-breaker auxiliary circuits must be made by means of the terminal box (1) (fig. 10) mounted inside the circuit-breaker and the cables must pass through the connector (2).
Outside the connector, the cables must pass through a suitable metal protective cover (pipe, wiring duct, etc.), which must be earthed.

To prevent the cabling wires outside the circuit-breaker (carried out by the customer) from accidentally coming into contact with moving parts and therefore undergoing damage to the insulation, it is recommended to fix the wires as shown in fig. 10a.

Before removing the operating mechanism cover to access the terminal box, check that the circuit-breaker is open and the closing spring discharged.

7.8.2. Withdrawable circuit-breakers
The auxiliary circuits of withdrawable circuit-breakers are fully cabled in the factory as far as the connector (fig. 11).
For the external connections, refer to the electric wiring diagram of the switchgear.
VD4 circuit-breaker for UniGear switchgear and PowerCube module.

VD4 circuit-breaker for ZS8.4 switchgear (VD4/ZS8 version with rotary charging).

Fig. 10

Fig. 10a

Fig. 11
8. Putting into service

8.1. General procedures

Before putting the circuit-breaker into service, carry out the following operations:

– check tightness of the power connections to the circuit-breaker terminals;
– establish the setting of the primary electronic overcurrent release (if provided);
– check that the value of the power supply voltage of the auxiliary circuits is between 85% and 110% of the rated voltage of the electrical accessories;
– check that no foreign bodies, such as bits of packing, have got into the moving parts;
– check that there is a sufficient exchange of air in the installation place to avoid overtemperatures;
– also carry out the checks indicated in table T3.

All the operations regarding putting into service must be carried out by ABB personnel or by suitably qualified customer personnel with in-depth knowledge of the apparatus and of the installation. Should the operations be prevented, do not force the mechanical interlocks and check that the operating sequence is correct.

The operating forces which can be applied for racking-in withdrawable circuit-breakers are indicated in paragraph 7.5.
<table>
<thead>
<tr>
<th>ITEM INSPECTED</th>
<th>PROCEDURE</th>
<th>POSITIVE CHECK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Insulation resistance.</td>
<td>With a 2500 V megger, measure the insulation resistance between the phases and the exposed conductive part of the circuit.</td>
<td>The insulation resistance should be at least 50 Mohm and in any case constant over time.</td>
</tr>
<tr>
<td></td>
<td>Auxiliary circuits</td>
<td>With a 500 V megger (if the apparatus installed allows this), measure the insulation resistance between the auxiliary circuits and the exposed conductive part.</td>
</tr>
<tr>
<td>2 Auxiliary circuits.</td>
<td>Check that the connections to the control circuit are correct: proceed at the relative power supply.</td>
<td>Operations and signals normal.</td>
</tr>
<tr>
<td>3 Manual operating mechanism.</td>
<td>Carry out a few closing and opening operations (see cap. 6). N.B. Supply the undervoltage release and the locking magnet on the operating mechanism at the relative rated voltage (if provided).</td>
<td>The operations and relative signals take place normally.</td>
</tr>
<tr>
<td>4 Motor operator (if provided).</td>
<td>Supply the spring charging geared motor at the relative rated voltage.</td>
<td>The spring is charged normally. The signals are normal. With the spring charged, the geared motor stops.</td>
</tr>
<tr>
<td></td>
<td>Carry out a few closing and opening operations. N.B. Supply the undervoltage release and the locking magnet on the operating mechanism at the relative rated voltage (if provided).</td>
<td>The geared motor recharges the spring after each closing operation.</td>
</tr>
<tr>
<td>5 Undervoltage release (if provided).</td>
<td>Supply the undervoltage release at the relative rated voltage and carry out the circuit-breaker closing operation.</td>
<td>The circuit-breaker closes normally. The signals are normal.</td>
</tr>
<tr>
<td></td>
<td>Cut off power to the release.</td>
<td>The circuit-breaker opens. The signalling changes over.</td>
</tr>
<tr>
<td>6 Shunt opening release and additional shunt opening release (if provided).</td>
<td>Close the circuit-breaker and supply the shunt opening release at the relative rated voltage.</td>
<td>The circuit-breaker opens normally. The signals are normal.</td>
</tr>
<tr>
<td>7 Shunt closing release (if provided).</td>
<td>Open the circuit-breaker and supply the shunt closing release at the relative rated voltage.</td>
<td>The circuit-breaker opens normally. The signals are normal.</td>
</tr>
<tr>
<td>8 Key lock (if provided).</td>
<td>Open the circuit-breaker, keep the opening pushbutton depressed, then turn the key and remove it from the housing. Attempt the circuit-breaker closing operation.</td>
<td>Neither manual nor electrical closing takes place.</td>
</tr>
<tr>
<td></td>
<td>Put the key back in and turn it 90°. Carry out the closing operation.</td>
<td>Both electrical and manual closing take place normally; in this position the key cannot be removed.</td>
</tr>
<tr>
<td>9 Locking electromagnet (-RL1) (if provided).</td>
<td>With the circuit-breaker open, spring charged and locking electromagnet not supplied, attempt circuit-breaker closing both manually and electrically.</td>
<td>Closing is not possible.</td>
</tr>
<tr>
<td>10 Auxiliary contacts in the operating mechanism.</td>
<td>Insert the auxiliary contacts in suitable signalling circuits. Carry out a few closing and opening operations.</td>
<td>Signals take place normally.</td>
</tr>
<tr>
<td>11 Locking electromagnet on the truck circuit-breaker (-RL2) (if provided).</td>
<td>With the circuit-breaker open, in the isolated for test position and the locking electromagnet not supplied, attempt racking-in of the circuit-breaker.</td>
<td>Racking-in is not possible.</td>
</tr>
<tr>
<td></td>
<td>Supply the locking electromagnet and carry out the racking-in operation.</td>
<td>Racking-in takes place correctly.</td>
</tr>
<tr>
<td>12 Auxiliary transmitted contacts for signalling circuit-breaker racked-in, isolated (UniGear switchgear or PowerCube modules).</td>
<td>Insert the auxiliary contacts in suitable signalling circuits. With the circuit-breaker racked into the enclosure, carry out a few traverse operations from the isolated for test position to the connected position. Take the circuit-breaker to the racked-out position.</td>
<td>The signals due to the relative operations take place normally.</td>
</tr>
</tbody>
</table>
9. Maintenance

The maintenance operations are aimed at keeping the apparatus in good working condition for as long as possible. In accordance with what is specified in the IEC 61208 / DIN 31 051 Standards, the following operations must be carried out.

- **Inspection:** Finding out the actual conditions
- **Overhauling:** Measures to be taken to maintain the specific conditions
- **Repairs:** Measures to be taken to restore the specific conditions.

9.1. General

The vacuum circuit-breakers are characterised by simple, sturdy construction and a long life.

The operating mechanism requires maintenance and functional inspections to reach the expected operating-life (see par. 9.3.2.).

The vacuum interrupters are maintenance-free for their whole operating life.

Vacuum interruption does not produce any harmful effects even when there are frequent interruptions at the rated and short-circuit current.

The interventions during service and their aim are determined by the ambient conditions, by the sequence of operations and by the short-circuit interruptions.

Note

Respect the following Standards for maintenance work:
- the relative specifications given in the chapter on “Standards and Specifications”;
- work safety regulations in the chapter on “Putting into service and operations”;
- standards and specifications of the country where the apparatus is installed.

The maintenance operations must only be carried out by trained personnel and who follow all the safety regulations.

Furthermore, it is advisable to call on ABB personnel, at least in cases for checking the performances in service and for repairs.

Cut the power supply off and put the apparatus under safe conditions during the maintenance operations.

- **Before carrying out any operations, check that the circuit-breaker is open, with the spring discharged and that it is not supplied (medium voltage circuit and auxiliary circuits).**

9.1.1. Operating life expectancy

The operating life expectancy for the VD4 circuit-breakers is as follows:

- vacuum interrupters: up to 30,000 operations, according to their type (see par. 7.2.3. Trip curves);
- switching device, actuator and transmission system: up to 30,000 operations, under normal operating conditions, according to the type of circuit-breaker and with regular maintenance (see par. 9.3.2.);
- with operations correctly executed it is possible to carry out up to 1000 racking-out/in operations (as prescribed in the IEC 60271-200 Standards);
- the data regarding the operating life are basically applicable to all the components which cannot be directly affected by operator activity. The manually operated components (moving parts of isolatable parts, etc.) can vary their behaviour.

9.2. Inspections and functionality tests

9.2.1. Interruption devices in general

- Check the conditions of the interruption devices with regular inspections.
- Inspection at fixed intervals can be avoided when the apparatus is permanently under the control of qualified personnel.
- The checks must, first of all, include visual inspection to check for any contamination, traces of corrosion or electrical discharge phenomena.
- Carry out more frequent inspections when there are unusual operating conditions (including severe climatic conditions) and in the case of environmental pollution (e.g. high level of contamination or an atmosphere with aggressive agents).
- Visual inspection of the isolating contacts.
  It is recommended to turn the contact system alternately in order to keep the internal surface of the contact areas clean. The contact areas must be cleaned when there are signs of overheating (discoloured surface) (also see Repairs).
- In the case of abnormal conditions, take suitable overhauling measures (see Overhauling par.).

9.2.2. Stored energy operating mechanism

Carry out the functional test of the operating mechanism after 5,000 operations (2,000 operations for 3150 A circuit-breakers) or during ordinary maintenance operations as specified in par. 9.2.1.

Before doing the test, open the circuit-breaker and carry out the following operations:

- in the case of withdrawable circuit-breakers, take the circuit-breaker to the isolated for test position
- in the case of fixed circuit-breakers: cut off the power supply to the medium voltage circuit.

Note

Insulate the work area and make it safe, following the safety regulations specified in the IEC/DIN VDE Standards.
Functional test

- With the circuit-breaker not connected to the load, carry out a few opening and closing operations.
- If foreseen, cut the power supply to the spring charging motor off. Discharge the spring by closing and opening the circuit-breaker by means of the closing and opening pushbuttons.
- Visually inspect the lubrication conditions of the tulip isolating contacts, of the sliding surfaces, etc.
- Check correct electrical and mechanical operation of the various devices, with particular attention to the interlocks.
- The screws and nuts are tightened in the factory and correct tightening is marked with a collared sign. No further tightening operations are foreseen during the operating life of the circuit-breaker. However, following any maintenance interventions, should it be necessary to re-tighten the screws or nuts, it is recommended to always replace the screws and nuts and to keep to the values indicated in fig. 12.

Checking tightness of the screws

EL Twin actuator - 50 kA

Fig. 12
9.2.3. Circuit-breaker pole

No other check except what has already been specified in par. 9.2.1. is necessary.

9.2.4. Withdrawable assembly (truck and circuit-breaker)

Visually inspect the components, especially those which may be damaged by incorrect operations (also see table in chap. 8). Visually inspect the isolating contacts and that all the contact elements are clean, especially in cases where signs of overheating are found (also see par. 9.4.). Visually inspect and carry out the functional tests of the locks, checking their correct operation and activation without abnormal force – maximum 25 N (also see table in chap. 8).

9.3. Overhauling

9.3.1. Interruption devices in general

Should it have been necessary to clean the devices during the inspections, according to what is specified in par. 9.2.1., use the following procedure:
• insulate the work area and make it safe, following the safety regulations specified in the IEC/DIN VDE Standards;
• general cleaning of the surfaces:
  – dry and eliminate light deposits of dirt with a soft dry cloth;
  – more resistant deposits of dirt can be removed using slightly alkaline domestic type detergent or Rivolta BWR 210 type detergent;
• cleaning insulating surfaces and conductive parts:
  – light dirt: with Rivolta BWR 210 detergent;
  – resistant dirt: with cold detergent type 716.

After cleaning, rinse thoroughly with clean water and dry carefully.

Note

Only use detergents without halogens and never 1.1.1-trichloroethane, trichloroethylene or carbon tetrachloride!

9.3.2. Tripping device: actuator and transmission system

Circuit-breakers up to 17.5 kV, 2500 A, 31.5 kA and up to 24 kV, 2500 A, 25 kA

To ensure correct operation of the circuit-breaker, inspection and maintenance of the tripping devices is recommended every 10,000 operations. For this purpose, please contact the ABB Service office. Complete replacement of the actuator must be carried out every 10,000 operations. Complete replacement of the shock absorber and of the other transmission system parts (shaft, main levers, safety rings, etc.) must be carried out after 30,000 operations. Replacement of spring charging geared motor (if provided) must be carried out every 3,000 operations.

Circuit-breakers up to 17.5 kV, 40 kA and 24 kV, 31.5 kA

To ensure correct operation of the circuit-breaker, inspection and maintenance of the tripping devices is recommended every 10,000 operations. For this purpose, please contact the ABB Service office. Complete replacement of the actuator must be carried out every 10,000 operations. Complete replacement of the shock absorber and of the other transmission system parts (shaft, main levers, safety rings, etc.) must be carried out after 30,000 operations. Replacement of spring charging geared motor (if provided) must be carried out every 3,000 operations.

Circuit-breakers up to 17.5 kV, 3150 A, 40 kA

To ensure correct operation of the circuit-breaker, inspection and maintenance of the tripping devices is recommended every 2,000 operations. For this purpose, please contact the ABB Service office. Complete replacement of the actuator must be carried out every 10,000 operations. Complete replacement of the shock absorber and of the other transmission system parts (shaft, main levers, safety rings, etc.) must be carried out every 10,000 operations. Replacement of spring charging geared motor (if provided) must be carried out every 3,000 operations.

Circuit-breakers up to 17.5 kV, 50 kA and EL twin actuator

To ensure correct operation of the circuit-breaker, inspection and maintenance of the tripping devices is recommended every 10,000 operations. For this purpose, please contact ABB Service. Complete replacement of the shock absorber and of the other parts of the transmission system (shaft, main levers, safety rings, etc.) must be carried out every 10,000 operations. Replacement of spring charging geared motor (if provided) must be carried out every 2,000 operations.

Note

Dismantling and replacement of the operating mechanism (trip box) can only be carried out by ABB personnel or by skilled and specially trained personnel, particularly for the necessary adjustments.

Details regarding overhauling
• When foreseen, cut of the power supply to the spring charging motor and manually discharge the operating mechanism spring by closing and opening the circuit-breaker.
• Replace the parts subjected to mechanical stress or stress due to particular environmental conditions, (contact and ABB service centre).

Note

These operations can only be carried out by ABB personnel or by skilled and specially trained personnel.
9.3.3. Circuit-breaker pole

The circuit-breaker pole and relative vacuum interrupter are maintenance-free until the maximum number of electrical operations for the type of interrupter is reached (see par. 7.2.3. Trip curves).

The operating life of the vacuum interrupter is defined by the sum of the ultimate currents corresponding to the specific type of interrupter in accordance with what is indicated in the graphs of par. 7.2.3. Trip curves: when the sum of the ultimate currents is reached, the whole pole must be replaced.

Note
Dismantling and replacement of the pole can only be carried out by ABB personnel or by skilled and specially trained personnel, particularly for the necessary adjustments.

To carry out the interrupter test without dismantling the circuit-breaker pole, use:

- the VIDAR vacuum tester, made by the company Programma Electric GmbH, Bad Homberg v.d.H.

To check vacuum tightness of the interrupter, the following test values must be set on the VIDAR tester:

<table>
<thead>
<tr>
<th>Rated voltage of the circuit-breaker</th>
<th>d.c. test voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 kV</td>
<td>40 kV</td>
</tr>
<tr>
<td>17.5 kV</td>
<td>40 kV</td>
</tr>
<tr>
<td>24 kV - 36 kV</td>
<td>60 kV</td>
</tr>
</tbody>
</table>

The test must always be carried out with the circuit-breaker open with the contacts at the nominal distance.

Procedure for testing the degree of vacuum of the interrupter of the circuit-breaker poles:

- turn the power supply off and make the working area safe by following the safety regulations specified in the IEC/DIN VDE Standards;
- open the circuit-breaker;
- earth a terminal of each circuit-breaker pole;
- connect the earth terminal of the VIDAR tester to the circuit-breaker structure;
- connect the high voltage terminal of the VIDAR tester to the terminal of the circuit-breaker pole not connected to earth (L1 phase) and carry out the test. Repeat the test for phases L2 and L3.

Note
The tester connection cables can produce an indication due to the capacitive effect. In this case the cables must not be removed.

9.4. Repairs

Replacement of spare parts and accessories must only be carried out by ABB personnel or suitably qualified and specially trained personnel.

Always work with the circuit-breaker open and locked so that it cannot be closed again, with the work area insulated and made safe.

The operating mechanism spring must be discharged. All power supply sources must be disconnected and made safe against any reclosing during removal and installation work.

⚠️ Should maintenance be carried out by the customer’s personnel, responsibility for the interventions remains with the customer.

The replacement of parts not included in the “List of spare parts/accessories” (par. 12.1.) must only be carried out by ABB personnel. In particular:

- complete pole with bushings/connections
- actuator and transmission system
- closing spring set
- opening spring
- shock-absorber.
10. Application of the X-ray emission Standards

One of the physical properties of vacuum insulation is the possibility of X-ray emission when the interrupter contacts are open. The specific tests carried out at the PTB laboratories (Physikalisch-Technische Bundesanstalt, in Brunswick - Germany) show that local emission at a distance of 10 cm from the interrupter or pole surface, does not exceed 1 mSv/h.

It follows that:
- at the rated service voltage the use of vacuum interrupters is absolutely safe;
- application of the withstand voltage at power frequency, according to the IEC 62271-100 and VDE 0670 Standards, is safe;
- application of a voltage higher than the withstand voltage at power frequency or of a test voltage in direct current, specified in the IEC and VDE Standards, cannot be used;
- limitation of the above-mentioned local phenomena, with interrupters with open contacts, depends on keeping the specific distance between the contacts. This condition is intrinsically guaranteed by correct operation of the operating mechanism and by the adjustments of the transmission system.
11. Spare parts and accessories

11.1. List of spare parts

- Shunt opening release
- Additional shunt opening release
- Undervoltage release
- Contact for signalling undervoltage release energised/de-energised
- Time delay device for undervoltage release
- Mechanical override for undervoltage release
- Shunt closing release
- Spring charging geared motor with electrical signalling of spring charged
- Contact signalling protection circuit-breaker of the geared motor open/closed
- Contact signalling closing spring charged/discharged
- Transient contact with momentary closing during circuit-breaker opening
- Circuit-breaker auxiliary contacts
- Locking electromagnet on the operating mechanism
- Position contact of the withdrawable truck
- Contacts signalling connected/isolated
- Opening solenoid
- Key lock in open position
- Isolation interlock with the door
- Protection for opening pushbutton
- Protection for closing pushbutton
- Locking electromagnet on the withdrawable truck
- Set of six tulip contacts.

All assembly operations of spare parts/accessories must be carried out following the instructions enclosed with the spare parts, by ABB personnel or by suitably qualified customer personnel with in-depth knowledge of the apparatus (IEC 60694) and of all the Standards aimed at carrying out these interventions in safe conditions. Should the maintenance be carried out by the customer’s personnel, responsibility for the interventions remains with the customer. Before carrying out any operation, always make sure that the circuit-breaker is open, the spring discharged and that it is not energised (medium voltage circuit and auxiliary circuits).

To order circuit-breaker spare parts/accessories, refer to the ordering sales codes indicated in the technical catalogue and always state the following:
- type of circuit-breaker
- rated voltage of the circuit-breaker
- rated normal current of the circuit-breaker
- breaking capacity of the circuit-breaker
- serial number of the circuit-breaker
- rated voltage of any electrical spare parts.

For availability and to order spare parts, please contact our Service office.

To order circuit-breaker spare parts/accessories, refer to the ordering sales codes indicated in the technical catalogue and always state the following:
- type of circuit-breaker
- rated voltage of the circuit-breaker
- rated normal current of the circuit-breaker
- breaking capacity of the circuit-breaker
- serial number of the circuit-breaker
- rated voltage of any electrical spare parts.

For availability and to order spare parts, please contact our Service office.
12. Electric circuit diagrams

The standard VD4 circuit-breaker electric circuit diagrams are as follows:

- VCD400046: Fixed circuit-breakers
- VCD400099: Fixed circuit-breakers 50 kA
- VCD400055: Fixed circuit-breakers with 64-pole connector
- VCD400064: Fixed circuit-breakers with 58-pole connector
- VCD400078: Fixed circuit-breakers with truck
- VCD400047: Withdrawable circuit-breakers
- VCD400048: Withdrawable circuit-breakers with motorized truck
- VCD400100: Withdrawable circuit-breakers 50 kA
- VCD400080: Withdrawable circuit-breakers for ZS8.4 switchgear VD4/ZS8, ZT8 and Z8 with circuit-breaker
- VCD400080: Withdrawable circuit-breakers for ZS8.4 switchgear with VD4/ZS8, ZT8 and Z8 circuit-breaker with motorized truck
- VCD400102: Withdrawable circuit-breakers with motorized truck 50 kA.

Each circuit-breaker is always provided with the standard electric diagram or with a specific diagram in the case of a circuit-breaker with non-standard cabling.
13. Overall dimensions

Fixed circuit-breakers

<table>
<thead>
<tr>
<th>VD4</th>
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</thead>
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<td>TN</td>
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</tr>
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<tr>
<td></td>
<td>25 kA</td>
</tr>
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<td></td>
<td>31.5 kA</td>
</tr>
</tbody>
</table>

(*) Fixing interchangeability with previous series (345 x 400).

Fixed circuit-breakers

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<tr>
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<td>TN</td>
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<td>20 kA</td>
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<td>25 kA</td>
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<td></td>
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(*) Fixing interchangeability with previous series (345 x 400).
Fixed circuit-breakers

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<tr>
<td>Isc</td>
<td>16 kA</td>
<td>20 kA</td>
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</tbody>
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(*) Fixing interchangeability with previous series (345 x 520).

(*) Fixing interchangeability with previous series (345 x 650).
Fixed circuit-breakers

VD4

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(*) Fixing interchangeability with previous series (345 x 650).

Fixed circuit-breakers

VD4

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<tr>
<td>Isc</td>
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(*) Fixing interchangeability with previous series (345 x 650).
# Fixed circuit-breakers

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<th>Description</th>
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<td>Ir: 1600 A, 2000 A</td>
<td><img src="image3.png" alt="Diagram" /></td>
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(*) Fixing interchangeability with previous series (345 x 650).

---

**Fixed circuit-breakers**

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<td>Ir: 1600 A</td>
<td><img src="image5.png" alt="Diagram" /></td>
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(*) Fixing interchangeability with previous series (345 x 650).
Fixed circuit-breakers

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<td>4000 A (**)</td>
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<td>50 kA</td>
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(*) Fixing interchangeability with previous series (345 x 650).
(**) With forced ventilation.

Fixed circuit-breakers

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Provided by Northeast Power Systems, Inc.
www.nepsi.com
Fixed circuit-breakers

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(*) 4000 A with forced ventilation.

Provided by Northeast Power Systems, Inc.
www.nepsi.com
Fixed circuit-breakers

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<td>I.Sc</td>
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<tr>
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(* ) Fixing interchangeability with previous series (345 x 520).

Fixed circuit-breakers

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<td>I.Sc</td>
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<td>I.Sc</td>
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</tr>
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<td>I.Sc</td>
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(* ) Fixing interchangeability with previous series (345 x 650).
Fixed circuit-breakers

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(*) Fixing interchangeability with previous series (345 x 650).

Fixed circuit-breakers

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(*) Fixing interchangeability with previous series (345 x 650).
### Fixed circuit-breakers

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![Circuit-breaker Diagram](image-url)
Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube modules

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Withdrawable circuit-breakers for PowerCube modules

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Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube modules

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Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube modules

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Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube modules

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Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube modules

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Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube modules

**VD4/P**

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Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube modules

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Withdrawable circuit-breakers for PowerCube modules

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(*) 4000 A with forced ventilation.

Withdrawable circuit-breakers for UniGear ZS1 switchgear

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(*) 4000 A with forced ventilation.
Withdrawable circuit-breakers for UniGear ZS1 switchgear

VD4/P

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(*) 4000 A with forced ventilation.

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Withdrawable circuit-breakers for UniGear ZS1 switchgear and PowerCube modules

VD4/P

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Withdrawable circuit-breakers for UniGear ZS1 switchgear

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(1) The rated uninterrupted current of 2300 A is guaranteed with natural ventilation. The rated uninterrupted current of 2500 A is guaranteed with forced ventilation.
Withdrawable circuit-breakers for UniGear ZS1 switchgear

### Technical Specifications

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Withdrawable circuit-breakers for UniGear ZS1 switchgear

### Technical Specifications

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Withdrawable circuit-breakers for PowerCube modules

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(*) 4000 A with forced ventilation.
Withdrawable circuit-breakers for ZS8.4 switchgear

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Withdrawable circuit-breakers for ZS8.4 switchgear

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Withdrawable circuit-breakers for ZS8.4 switchgear

**VD4/ZS8**

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### Withdrawable circuit-breakers for ZS8.4 switchgear

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Withdrawable circuit-breakers for ZS8.4 switchgear

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Withdrawable circuit-breakers for ZS8.4 switchgear

VD4/ZS8

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Withdrawable circuit-breakers for ZS8.4 switchgear

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## Withdrawable circuit-breakers for ZS8.4 switchgear

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Provided by Northeast Power Systems, Inc.
www.nepsi.com
Withdrawable circuit-breakers for UniSwitch / UniMix switchgears

<table>
<thead>
<tr>
<th>VD4/US</th>
<th>1VCD000047</th>
</tr>
</thead>
<tbody>
<tr>
<td>TN</td>
<td>TN</td>
</tr>
<tr>
<td>Ur</td>
<td>24 kV</td>
</tr>
<tr>
<td>Ir</td>
<td>630 A</td>
</tr>
<tr>
<td>1250 A</td>
<td></td>
</tr>
<tr>
<td>Isc</td>
<td>16 kA</td>
</tr>
<tr>
<td>20 kA</td>
<td></td>
</tr>
<tr>
<td>25 kA</td>
<td></td>
</tr>
</tbody>
</table>

Withdrawable circuit-breakers for UniSec switchgears

<table>
<thead>
<tr>
<th>VD4/SEC</th>
<th>1VCD000190</th>
</tr>
</thead>
<tbody>
<tr>
<td>TN</td>
<td>TN</td>
</tr>
<tr>
<td>Ur</td>
<td>24 kV</td>
</tr>
<tr>
<td>Ir</td>
<td>630 A</td>
</tr>
<tr>
<td>1250 A</td>
<td></td>
</tr>
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<td>Isc</td>
<td>16 kA</td>
</tr>
<tr>
<td>20 kA</td>
<td></td>
</tr>
<tr>
<td>25 kA</td>
<td></td>
</tr>
</tbody>
</table>

Provided by Northeast Power Systems, Inc. www.nepsi.com
Withdrawable circuit-breakers for UniGear ZS2 switchgear and PowerCube modules (36 kV)

<table>
<thead>
<tr>
<th>Breaker type</th>
<th>ø A mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>VD4 36.12.32</td>
<td>35</td>
</tr>
<tr>
<td>VD4 36.16.32 - VD4 36.20.32</td>
<td>79</td>
</tr>
</tbody>
</table>

Provided by Northeast Power Systems, Inc.
www.nepsi.com
14. Product quality and environmental protection

The apparatus are produced in compliance with the requirements of international standards for the quality management system and environmental management system. In these fields, the excellent level is proved by quality certificates according to ISO 9001 and by the EMS according to ISO 14 001.

End of life of product

The ABB company is committed to complying with the relevant legal and other requirements for environment protection according to the ISO 14 001 standard.

The duty of company is to facilitate subsequent recycling or disposal at the end of product life. During disposal of the product, it is always necessary to act in accordance with local legal requirements in force.

Methods of disposal

Disposal can either be carried out thermally in an incineration plant or by storing on a waste site.

<table>
<thead>
<tr>
<th>RAW MATERIAL</th>
<th>RECOMMENDED METHOD OF DISPOSAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal material (Fe, Cu, Al, Ag, Zn, W, others)</td>
<td>Separation and recycling</td>
</tr>
<tr>
<td>Thermoplasts</td>
<td>Recycling or disposal</td>
</tr>
<tr>
<td>Epoxy resin</td>
<td>Separation of metal material and the disposal of rest</td>
</tr>
<tr>
<td>Rubber</td>
<td>Disposal</td>
</tr>
<tr>
<td>Oil as dielectric (transformer oil)</td>
<td>Draining from equipment and further recycling or disposal</td>
</tr>
<tr>
<td>SF6 gas</td>
<td>Discharging from equipment and further recycling or disposal</td>
</tr>
<tr>
<td>Packing material – wood</td>
<td>Recycling or disposal</td>
</tr>
<tr>
<td>Packing material – foil</td>
<td>Recycling or disposal</td>
</tr>
</tbody>
</table>
For more information please contact:

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**Power Products Division**  
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Petzower Strasse 8  
D-14542 Glindow  
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