36/72.5kV
Dry Air Insulated
Dead Tank
Vacuum Circuit Breaker
72.5kV Dry Air Insulated Dead Tank VCB

The Dry Air Insulated Dead Tank VCB was born of superb technology and abundant production experience of Meidensha Corporation. It is a circuit breaker employing vacuum interrupters and dry air for insulation. In order to use no SF₆, which is global warming gas, there is no fear to decomposition of gas due to current interruption. It is therefore a highly reliable and high-performance circuit breaker.

- **Contribution to global warming prevention**
  Dry air insulation are employed instead of SF₆ gas insulation. GWP (Global Warning Potential) of SF₆ is 23,900.

- **Excellent breaking performance**
  Since each current breaking section employs a vacuum interrupter, insulation recovery characteristics are excellent. It exhibits superb characteristics in cases of short-circuit interruption and short line fault interruption.

- **Sufficient capability against multiple strokes and evolving faults**
  Since the vacuum interrupters used are of completely self-arc-diffusion type, this circuit breaker is the only unit that is capable of disposing of multiple strokes and evolving fault currents.

- **Reduction of maintenance labor**
  Use of vacuum interrupters in the current breaking sections eliminates requirements of inspection for these sections. Therefore, man-hours can be saved for maintenance and inspection.
**Type and Ratings**

<table>
<thead>
<tr>
<th>Type and Ratings</th>
<th>NVBOA-30732B</th>
<th>NVBOA-60732BB</th>
<th>NVBOA-60832BB</th>
<th>NVBOA-60740BB</th>
<th>NVBOA-60840BB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage (kV)</td>
<td>36</td>
<td>72.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Withstand voltage</td>
<td>1 min power frequency (kV rms)</td>
<td>70</td>
<td>140</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.2x50μs impulse (kV peak)</td>
<td>200</td>
<td>350</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated frequency (Hz)</td>
<td>50 / 60</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated normal current (A)</td>
<td>2000</td>
<td>2000/3150</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated short circuit breaking current (kA)</td>
<td>31.5</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated transient recovery voltage</td>
<td>Rate of rise (kV/μs)</td>
<td>1.19</td>
<td>1.47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First pole to clear factor</td>
<td></td>
<td>1.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated short circuit making current (kA)</td>
<td></td>
<td>82</td>
<td>104</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated short time current (kA)</td>
<td></td>
<td>31.5 (3s)</td>
<td>40 (3s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated breaking time (cycle)</td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated opening time (s)</td>
<td></td>
<td>0.033</td>
<td>0.03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Make time with no load (s)</td>
<td></td>
<td>0.05</td>
<td>0.10</td>
<td></td>
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<tr>
<td>Operating duty</td>
<td>O-0.3s-CO-15s-CO</td>
<td></td>
<td></td>
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<tr>
<td>Closing control voltage (Vdc)</td>
<td>48, 100, 110, 125, 250</td>
<td></td>
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<tr>
<td>Rated tripping voltage (Vdc)</td>
<td>48, 100, 110, 125, 250</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Supply voltage for charging motor (Vdc)</td>
<td>48, 100, 110, 125, 250</td>
<td></td>
<td></td>
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<tr>
<td>Supply voltage for charging motor (Vac)</td>
<td>60, 120, 240</td>
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<td></td>
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<tr>
<td>Rated dry-air pressure</td>
<td></td>
<td>0.5MPa-g (at 20°C)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Closing operation system</td>
<td></td>
<td>Spring</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tripping control system</td>
<td></td>
<td>Spring</td>
<td></td>
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<tr>
<td>Applicable standard</td>
<td></td>
<td>IEC 62271-100-2008, ANSI/IEEE C37.06-2009</td>
<td></td>
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</tr>
</tbody>
</table>

**Overall construction**

For each phase, a current breaking vacuum interrupter is accommodated in the grounded tank. The operation system is such that closing and tripping are effected by spring force. The operating mechanism and 3-phase interlinkage are assembled on a common base, which is installed on the frame legs.

**Internal construction of vacuum circuit breaker**

**Internal construction of vacuum circuit breaker**

**Dry air system**

Dry air is used for insulation and sealed at the rated pressure of 0.5MPa-g. The internal pressure is supervised with a density monitor. When the dry air pressure lowers to 0.4MPa-g (20°C), the alarm contact of pressure switch is actuated.
Performance of the circuit breaker has been designed in accordance with ANSI and IEC standard, and verified by type test. All products are shipped after confirmation of various performances by acceptance test based on these standards.

**Withstand voltage characteristics**
Performance of withstand voltage is assured at the specified dry-air pressure. Even though the dry air pressure has been lowered to the alarming level, the required insulation level can be assured. Since the main contacts are located under vacuum, their surfaces are never oxidized and current passing performance is therefore stabilized. In the closing mode of circuit breaker, a pressing force is exerted between main contacts by the effect of pressing spring and sufficient tolerance is assured against closing current and arcing energy generated during current interruption is extremely low and contact erosion is minimal. This implies long contact life.

**Current passing performance**
Since the main contacts are located under vacuum, the required insulation level can be assured. In addition, even though this pressure lowers to the atmospheric pressure, the required insulation level can be assured. Since the main contacts are located under vacuum, their surfaces are never oxidized and current passing performance is therefore stabilized. In the closing mode of circuit breaker, a pressing force is exerted between main contacts by the effect of pressing spring and sufficient tolerance is assured against closing current and short-time current.

**Interruption performance**
Current breaking is accomplished by a vacuum interrupter with superb insulation recovery performance. Therefore, excellent current breaking performance is demonstrated against short-circuit current (BTF) and even against short line fault current (SLF) and out of phase interruption. In addition, the vacuum interrupter is of completely self-arc-diffusion type and it will assure exact current breaking in half a cycle even in case of multiple-stroke and evolving fault.

**Mechanical life**
Due to adoption of simplified operating mechanism, switching characteristics are extremely stabilized. Frequent switching performance has also been verified through continuous mechanical switching test by repeating switching operations more than 10,000 times.

**Electrical life**
Since current breaking is performed in the vacuum interrupter, arcing energy generated during current interruption is extremely low and contact erosion is minimal. This implies long contact life. Load current switching : 10,000 times
Rated breaking current switching : 20 times

**Performance of the vacuum circuit breaker**
Performance of the vacuum circuit breaker has been verified in accordance with ANSI and IEC. Its reliability has been confirmed through sufficient practical performance testing such as mechanical life test, long-term charging test, temperature test, etc.

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**Dimensions (72.5kV)**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>Mass w/o CT(kg)</th>
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</thead>
<tbody>
<tr>
<td>Porcelain (2000A)</td>
<td>2519</td>
<td>1157</td>
<td>2066</td>
<td>1090</td>
<td>3560</td>
<td>1200</td>
<td>2057</td>
<td>642</td>
<td>1290</td>
<td>1800</td>
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<tr>
<td>Composite (2000A)</td>
<td>2624</td>
<td>1183</td>
<td>2112</td>
<td>1111</td>
<td>3627</td>
<td>1200</td>
<td>2057</td>
<td>642</td>
<td>1290</td>
<td>1600</td>
</tr>
</tbody>
</table>

**Dimensions (36kV)**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>Mass w/o CT(kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Porcelain</td>
<td>1742</td>
<td>789</td>
<td>1938</td>
<td>860</td>
<td>3106</td>
<td>1205</td>
<td>1949</td>
<td>673</td>
<td>1145</td>
<td>1300</td>
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<tr>
<td>Composite</td>
<td>1842</td>
<td>806</td>
<td>1981</td>
<td>877</td>
<td>3161</td>
<td>1205</td>
<td>1949</td>
<td>673</td>
<td>1145</td>
<td>1150</td>
</tr>
</tbody>
</table>

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**Connections**

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**Performance**

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