Fixed-Mounted Circuit-Breaker Switchgear
Type 8DA and 8DB up to 40.5 kV, Gas-Insulated
Medium-Voltage Switchgear · Catalog HA 35.11 · 2014

www.siemens.com/medium-voltage-switchgear

Answers for infrastructure and cities.
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<td>Standards, specifications, guidelines</td>
<td>60 and 61</td>
</tr>
<tr>
<td>First 8DA10 – Year of manufacture 1982</td>
<td>62</td>
</tr>
</tbody>
</table>

The products and systems described in this catalog are manufactured and sold according to a certified management system (acc. to ISO 9001, ISO 14001 and BS OHSAS 18001).
Application

Versions

Circuit-breaker panel 8DA10
Circuit-breaker panel 8DB10
Circuit-breaker panel 8DA11/12
Fixed-mounted circuit-breaker switchgear 8DA and 8DB is indoor, factory-assembled, type-tested, single-pole metal-enclosed, metal-clad, SF₆-insulated switchgear for single-busbar and double-busbar applications, as well as for traction power supply systems.

It is used in transformer and switching substations, e.g., in:
- Power supply companies
- Power stations
- Cement industry
- Automobile industry
- Iron and steel works
- Rolling mills
- Mining industry
- Textile, paper and food industries
- Chemical industry
- Petroleum industry
- Pipeline installations
- Offshore installations
- Electrochemical plants
- Petrochemical plants
- Shipbuilding industry
- Diesel power plants
- Emergency power supply installations
- Lignite open-cast mines
- Traction power supply systems.

### Electrical data (maximum values) and dimensions

#### Single-busbar and double-busbar switchgear

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Single Busbar</th>
<th>Double Busbar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage (kV)</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>Rated frequency (Hz)</td>
<td>50/60</td>
<td>50/60</td>
</tr>
<tr>
<td>Rated short-duration power-frequency withstand voltage (kV)</td>
<td>28 1)</td>
<td>50</td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage (kV)</td>
<td>75</td>
<td>125</td>
</tr>
<tr>
<td>Rated peak withstand current (kA)</td>
<td>100/104</td>
<td>100/104</td>
</tr>
<tr>
<td>Rated short-circuit making current (kA)</td>
<td>100/104</td>
<td>100/104</td>
</tr>
<tr>
<td>Rated short-time withstand current 3 s (kA)</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>Rated short-circuit breaking current (kA)</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Rated normal current of the busbar (A)</td>
<td>5000</td>
<td>5000</td>
</tr>
<tr>
<td>Rated normal current of feeders (A)</td>
<td>2500</td>
<td>2500</td>
</tr>
<tr>
<td>Width (mm)</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>Depth – Single busbar (mm)</td>
<td>1625</td>
<td>2665</td>
</tr>
<tr>
<td>– Double busbar (mm)</td>
<td>2350</td>
<td>2700</td>
</tr>
</tbody>
</table>

#### Single-pole and double-pole traction power supply switchgear

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Single Pole</th>
<th>Double Pole</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage (kV)</td>
<td>17.5</td>
<td>27.5</td>
</tr>
<tr>
<td>Rated frequency (Hz)</td>
<td>16.7</td>
<td>50/60</td>
</tr>
<tr>
<td>Rated short-duration power-frequency withstand voltage (kV)</td>
<td>50</td>
<td>95</td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage (kV)</td>
<td>125</td>
<td>200</td>
</tr>
<tr>
<td>Rated peak withstand current (kA)</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Rated short-circuit making current (kA)</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Rated short-time withstand current 3 s (kA)</td>
<td>31.5</td>
<td>31.5</td>
</tr>
<tr>
<td>Rated short-circuit breaking current (kA)</td>
<td>31.5</td>
<td>31.5</td>
</tr>
<tr>
<td>Rated normal current of the busbar (A)</td>
<td>3150</td>
<td>3150</td>
</tr>
<tr>
<td>Rated normal current of feeders (A)</td>
<td>2500</td>
<td>2500</td>
</tr>
<tr>
<td>Width (mm)</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>Depth – Single-pole traction switchgear (mm)</td>
<td>865</td>
<td>865</td>
</tr>
<tr>
<td>– Double-pole traction switchgear (mm)</td>
<td>1245</td>
<td>1245</td>
</tr>
<tr>
<td>Height – Standard (mm)</td>
<td>2350</td>
<td>2350</td>
</tr>
<tr>
<td>– With high low-voltage compartment (mm)</td>
<td>2700</td>
<td>2700</td>
</tr>
</tbody>
</table>

1) 42 kV/70 kV according to some national requirements
2) 95 kV/185 kV according to some national requirements
Environmental independence
The enclosed high-voltage part of 8DA and 8DB switchgear is suitable for applications under aggressive ambient conditions, such as:
- Saline air
- Air humidity
- Dust
- Condensation.
It is tight to ingress of foreign objects, such as:
- Dust
- Pollution
- Small animals.
The application is independent of the site altitude.

Compact design
Thanks to the use of SF₆ insulation, compact dimensions are possible.
Thus:
- Existing switchgear rooms can be used effectively
- New constructions cost little
- Costly city-area space is saved.

Maintenance-free design
Switchgear housings designed as sealed pressure systems, maintenance-free switching devices and enclosed cable plugs ensure:
- Maximum supply reliability
- Personnel safety
- Sealed-for-life design according to IEC 62271-200 (sealed pressure system)
- Reduced operating costs
- Cost-efficient investment.

Innovation
The use of digital secondary systems and combined protection and control devices ensures:
- Clear integration in process control systems
- Flexible and highly simplified adaptation to new system conditions and thus to cost-efficient operation.

Service life
Under normal operating conditions, the expected service life of gas-insulated switchgear 8DA and 8DB is at least 35 years, probably 40 to 50 years, taking the tightness of the enclosed high-voltage part into account. The service life is limited by the maximum number of operating cycles of the switching devices installed:
- For circuit-breakers, according to the endurance class defined in IEC 62271-100
- For three-position disconnectors and earthing switches, according to the endurance class defined in IEC 62271-102.

Personal safety
- Safe-to-touch and hermetically sealed primary enclosure
- All high-voltage parts including the cable terminations, busbars and voltage transformers are metal-enclosed
- Capacitive voltage detecting system to verify safe isolation from supply
- Operating mechanisms and auxiliary switches safely accessible outside the primary enclosure (switchgear housings)
- Due to the system design, operation is only possible with closed switchgear enclosure
- Standard degree of protection IP 65 for all high-voltage parts of the primary circuit, IP 3XD for the switchgear enclosure according to IEC 60529
- High resistance to internal arcs by logical mechanical interlocks and tested switchgear enclosure
- Panels tested for resistance to internal faults up to 40 kA
- Logical mechanical interlocks prevent maloperation
- Make-proof earthing by means of the vacuum circuit-breaker.

Security of operation
- Hermetically sealed primary enclosure independent of environmental effects (pollution, humidity and small animals)
- Maintenance-free in an indoor environment according to IEC 62271-1
- Two-phase and three-phase short-circuits between the primary conductors are excluded by the single-pole primary enclosure
- In isolated or compensated systems, low-current earth-fault currents are self-extinguishing
- Operating mechanisms of switching devices accessible outside the primary enclosure (switchgear housings)
- Metal-enclosed, plug-in inductive voltage transformers mounted outside the SF₆ switchgear housings
- Current transformers as ring-core current transformers mounted outside the SF₆ switchgear housings
- Complete switchgear interlocking system with logical mechanical interlocks
- Bolted switchgear housings sealed for life
- Minimum fire load
- Option: Aseismic design.

Reliability
- Type and routine-tested
- Standardized, NC production processes
- Quality assurance in accordance with DIN EN ISO 9001
- More than 70,000 switchgear panels of Siemens in operation worldwide for many years.
General

- Single-pole enclosure of the primary part by modular switchgear housings made of corrosion-resistant aluminum alloy
- Insulating gas $\text{SF}_6$
- Three-position disconnector as busbar disconnector and feeder earthing switch
- Make-proof earthing by means of the vacuum circuit-breaker
- Compact dimensions due to $\text{SF}_6$ insulation
- Hermetically bolted switchgear housings made of corrosion-resistant aluminum alloy
- Single-pole metal-enclosed, $\text{SF}_6$-insulated busbars
- Cable connection with inside-cone plug-in system, or for connection of gas-insulated and solid-insulated bars
- Wall-standing or free-standing arrangement
- Installation and extension of existing switchgear at both ends without modification of existing panels.

Interlocks

- According to IEC 62271-200
- Logical mechanical interlocks prevent maloperation
- Three-position disconnector can only be operated with circuit-breaker in OPEN position
- Circuit-breaker can only be operated with three-position disconnector in end position and operating lever removed
- Locking device for circuit-breaker
- Locking device for three-position disconnector
- "Feeder earthed" locking device
- Option: Electromagnetic interlocks.

Modular design

- Replacement of the panel connection housings or the circuit-breaker possible without interrupting busbar operation
- Low-voltage compartment removable, plug-in bus wires
- Extension of double-busbar switchgear 8DB10 possible without interrupting operation
- Option: Extension of single-busbar switchgear 8DA10 possible without interrupting operation.

Instrument transformers

- Current transformers not subjected to dielectric stress
- Metal-enclosed, plug-in and disconnectable voltage transformers.

Vacuum circuit-breaker

- Maintenance-free under normal ambient conditions according to IEC 62271-1
- No relubrication or readjustment
- Vacuum interrupters sealed for life
- Up to 10,000 operating cycles (maintenance-free)
- Option: Up to 30,000 operating cycles (maintenance required).

Secondary systems

- Customary protection, measuring and control equipment
- Option: Numerical multifunction protection relay with integrated protection, control, communication, operating and monitoring functions
- Can be integrated in process control systems.
## Electrical data, filling pressure, temperature for single-busbar and double-busbar switchgear

### Technical data

#### Common electrical data, filling pressure and temperature

<table>
<thead>
<tr>
<th>Rated insulation level</th>
<th>Rated voltage $U_r$</th>
<th>12</th>
<th>24</th>
<th>36</th>
<th>40.5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>kV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated short-duration power-frequency withstand voltage $U_{d}$:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– phase-to-earth, open contact gap</td>
<td>kV</td>
<td>28</td>
<td>50</td>
<td>70</td>
<td>85</td>
</tr>
<tr>
<td>– across the isolating distance</td>
<td>kV</td>
<td>32</td>
<td>60</td>
<td>80</td>
<td>90</td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage $U_{l}$:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– phase-to-earth, open contact gap</td>
<td>kV</td>
<td>75</td>
<td>125</td>
<td>170</td>
<td>185</td>
</tr>
<tr>
<td>– across the isolating distance</td>
<td>kV</td>
<td>85</td>
<td>145</td>
<td>195</td>
<td>220</td>
</tr>
</tbody>
</table>

| Rated frequency $f_r$ | Hz | 50/60 | 50/60 | 50/60 | 50/60 |

<table>
<thead>
<tr>
<th>Rated normal current $I_r$ for the busbar</th>
<th>A</th>
<th>1250</th>
<th>1250</th>
<th>1250</th>
<th>1250</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>3150</td>
<td>3150</td>
<td>3150</td>
<td>3150</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>4000</td>
<td>4000</td>
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<tr>
<td></td>
<td>A</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
</tr>
</tbody>
</table>

| Rated filling level $p_{re}$ for the busbar | 70/120 kPa at 20 °C |
| Minimum functional level $p_{me}$ | 50/100 kPa at 20 °C |

| Ambient air temperature | – 5 °C to +55 °C |

#### Data of the switchgear panels

<table>
<thead>
<tr>
<th>Circuit-breaker panel, disconnector panel</th>
<th>Rated normal current $I_r$</th>
<th>A</th>
<th>1250</th>
<th>1250</th>
<th>1250</th>
<th>1250</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>1600</td>
<td>1600</td>
<td>1600</td>
<td>1600</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>3150</td>
<td>3150</td>
<td>3150</td>
<td>3150</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>4000</td>
<td>4000</td>
<td>4000</td>
<td>4000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
<td></td>
</tr>
</tbody>
</table>

| Rated short-time withstand current $I_k$ | up to kA | 40 | 40 | 40 | 40 |
| Rated peak withstand current $I_p$ | up to kA | 100/104 | 100/104 | 100/104 | 100/104 |
| Rated short-circuit making current $I_{ma}$ | up to kA | 100/104 | 100/104 | 100/104 | 100/104 |
| Rated short-circuit breaking current $I_{sc}$ | up to kA | 40 | 40 | 40 | 40 |

| Electrical endurance of vacuum circuit-breakers at rated normal current | 10,000 operating cycles |
| Minimum functional level $p_{me}$ | 50/100 kPa at 20 °C |

<table>
<thead>
<tr>
<th>Bus section-alizer, bus coupler</th>
<th>Rated normal current $I_r$</th>
<th>A</th>
<th>1250</th>
<th>1250</th>
<th>1250</th>
<th>1250</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>1600</td>
<td>1600</td>
<td>1600</td>
<td>1600</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>2300</td>
<td>2300</td>
<td>2300</td>
<td>2300</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
<td></td>
</tr>
</tbody>
</table>

| Rated short-time withstand current $I_k$ | up to kA | 40 | 40 | 40 | 40 |
| Rated peak withstand current $I_p$ | up to kA | 100/104 | 100/104 | 100/104 | 100/104 |
| Rated short-circuit making current $I_{ma}$ | up to kA | 100/104 | 100/104 | 100/104 | 100/104 |
| Rated short-circuit breaking current $I_{sc}$ | up to kA | 40 | 40 | 40 | 40 |

| Electrical endurance of vacuum circuit-breakers at rated normal current | 10,000 operating cycles |
| Minimum functional level $p_{me}$ | 50/100 kPa at 20 °C |

<table>
<thead>
<tr>
<th>Cable connection panel, metering panel</th>
<th>Rated normal current $I_r$</th>
<th>A</th>
<th>1250</th>
<th>1250</th>
<th>1250</th>
<th>1250</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>1600</td>
<td>1600</td>
<td>1600</td>
<td>1600</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
<td></td>
</tr>
</tbody>
</table>

| Rated short-time withstand current $I_k$ | up to kA | 40 | 40 | 40 | 40 |
| Rated peak withstand current $I_p$ | up to kA | 100/104 | 100/104 | 100/104 | 100/104 |
| Rated short-circuit making current $I_{ma}$ | up to kA | 100/104 | 100/104 | 100/104 | 100/104 |
| Rated short-circuit breaking current $I_{sc}$ | up to kA | 40 | 40 | 40 | 40 |

| Electrical endurance of vacuum circuit-breakers at rated normal current | 10,000 operating cycles |
| Minimum functional level $p_{me}$ | 50/100 kPa at 20 °C |
### Technical data

#### Electrical data, filling pressure, temperature for single-pole and double-pole traction power supply switchgear

<table>
<thead>
<tr>
<th>Common electrical data, filling pressure and temperature</th>
<th>Rated insulation level</th>
<th>Rated voltage $U_r$</th>
<th>17.5</th>
<th>27.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage according to IEC 60850/EN 50163</td>
<td>kV</td>
<td>15</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Rated short-duration power-frequency withstand voltage $U_{tr}$</td>
<td>kV</td>
<td>50</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>– phase-to-earth, open contact gap</td>
<td>kV</td>
<td>95</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>– across the isolating distance</td>
<td>kV</td>
<td>125</td>
<td>145</td>
<td></td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage $U_{ip}$</td>
<td>kV</td>
<td>125</td>
<td>145</td>
<td></td>
</tr>
<tr>
<td>– phase-to-earth, open contact gap</td>
<td>kV</td>
<td>200</td>
<td>220</td>
<td></td>
</tr>
<tr>
<td>– across the isolating distance</td>
<td>kV</td>
<td>200</td>
<td>220</td>
<td></td>
</tr>
</tbody>
</table>

| Rated frequency $f_r$ | Hz | 16.7 | 50/60 |

<table>
<thead>
<tr>
<th>Rated normal current $I_r$ for the busbar</th>
<th>A</th>
<th>1250</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>2500</td>
<td>2500</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>3150</td>
<td>3150</td>
</tr>
</tbody>
</table>

| Rated filling level $p_{re}$ for the busbar | 70/120 kPa at 20 °C |

| Minimum functional level $p_{me}$ | 50/100 kPa at 20 °C |

| Ambient air temperature | –5 °C to +55 °C |

#### Data of the switchgear panels

<table>
<thead>
<tr>
<th>Circuit-breaker panel, disconnector panel</th>
<th>Rated normal current $I_r$</th>
<th>A</th>
<th>1250</th>
<th>1250</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>1600</td>
<td>1600</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>2000</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>2300</td>
<td>2300</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>2500</td>
<td>2500</td>
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</tr>
</tbody>
</table>

| Rated short-time withstand current $I_{kt}$, $t_k = 3$ s | up to kA | 31.5 | 31.5 |

| Rated peak withstand current $I_{kp}$ | up to kA | 80 | 80/82 |

| Rated short-circuit making current $I_{ima}$ | up to kA | 80 | 80/82 |

| Rated short-circuit breaking current $I_{isc}$ | up to kA | 31.5 | 31.5 |

<table>
<thead>
<tr>
<th>Electrical endurance of vacuum circuit-breakers</th>
<th>at rated normal current</th>
<th>20,000 operating cycles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>at rated short-circuit breaking current</td>
<td>50 breaking operations</td>
</tr>
</tbody>
</table>

| Rated filling level $p_{re}$ for feeders | 70/120 kPa at 20 °C |

| Minimum functional level $p_{me}$ | 50/100 kPa at 20 °C |

<table>
<thead>
<tr>
<th>Bus sectionalizer</th>
<th>Rated normal current $I_r$</th>
<th>A</th>
<th>1250</th>
<th>1250</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>1600</td>
<td>1600</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>2000</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>2300</td>
<td>2300</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>2500</td>
<td>2500</td>
<td></td>
</tr>
</tbody>
</table>

| Rated short-time withstand current $I_{kt}$, $t_k = 3$ s | up to kA | 31.5 | 31.5 |

| Rated peak withstand current $I_{kp}$ | up to kA | 80 | 80/82 |

| Rated short-circuit making current $I_{ima}$ | up to kA | 80 | 80/82 |

| Rated short-circuit breaking current $I_{isc}$ | up to kA | 31.5 | 31.5 |

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<th>at rated normal current</th>
<th>20,000 operating cycles</th>
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<tr>
<td></td>
<td>at rated short-circuit breaking current</td>
<td>50 breaking operations</td>
</tr>
</tbody>
</table>

| Rated filling level $p_{re}$ for feeders | 70/120 kPa at 20 °C |

| Minimum functional level $p_{me}$ | 50/100 kPa at 20 °C |

---

**Footnotes for pages 8 and 9**

1) Higher values of the rated short-duration power-frequency withstand voltage available with:
   - 42 kV for phase-to-earth and open contact gap, as well as
   - 48 kV across the isolating distance

2) Higher values of the rated short-duration power-frequency withstand voltage available with:
   - 65 kV for phase-to-earth and open contact gap, as well as
   - 75 kV across the isolating distance

3) Higher values of the rated short-duration power-frequency withstand voltage available with:
   - 95 kV for phase-to-earth and open contact gap, as well as
   - 110 kV across the isolating distance

4) Higher values of the rated lightning impulse withstand voltage available with:
   - 190 kV for phase-to-earth and open contact gap, as well as
   - 230 kV across the isolating distance

5) Higher value applies to 60 Hz

6) Disconnector panel available for single-busbar switchgear 8DA10

7) Bus coupler available for double-busbar switchgear 8DB10

8) Rated normal current $I_r$ for cable connection panels

9) Maximum permissible normal current dependent on ambient air temperature
Technical data

Room planning

<table>
<thead>
<tr>
<th>Wall-standing arrangement (top view)</th>
<th>Free-standing arrangement (top view)</th>
</tr>
</thead>
</table>

Room planning for single-busbar switchgear 8DA10

Room planning for traction power supply switchgear 8DA11

Room planning for traction power supply switchgear 8DA12
Switchgear installation
• Wall-standing arrangement without rear wall (IAC FL)
• Free-standing arrangement without rear wall (IAC FL)
• Free-standing arrangement with rear wall (IAC FLR).

Room dimensions
See dimension drawings above.
Room height: ≥ 2900 mm.
If there are any busbar components, the minimum room height may have to be higher.
For switchable busbar components in 8DB10, free-standing arrangement is required.

Door dimensions
The door dimensions depend on the dimensions of the individual panels (see pages 14 to 25).

Switchgear fixing
• For floor openings and fixing points of the switchgear, see pages 14 to 25
• Foundations:
  – Steel girder construction
  – Steel-reinforced concrete with foundation rails, welded or bolted on.

Panel dimensions
See pages 14 to 25.

* Depending on national requirements
** Lateral wall distance ≥ 500 mm optionally required on the left or on the right
*** Lateral minimum wall distance ≥ 100 mm optionally possible on the left or on the right
Technical data

Shipping data

Transport

Single-busbar switchgear 8DA10 and traction power supply switchgear 8DA11/12 is delivered in transport units comprising up to four panels. Double-busbar switchgear 8DB10 is delivered in transport units comprising up to three panels.

Please observe the following:
- Transport facilities on site
- Transport dimensions and transport weights
- Size of door openings in building.

Packing

- Means of transport: Truck
  - Panels on pallets
  - Open packing with PE protective foil.
- Means of transport: Ship and airplane
  - Panels on pallets
  - In closed crates with sealed upper and lower PE protective foil
  - With desiccant bags
  - With sealed wooden base
  - Max. storage time: 6 months.
- Long-time packing
  - Panels on pallets
  - In closed crates with sealed, aluminum-coated PE protective foil
  - With desiccant bags
  - With sealed wooden base
  - Max. storage time: 12 months.

Transport dimensions, transport weights

<table>
<thead>
<tr>
<th>Panel widths (mm)</th>
<th>Transport dimensions Width x Height x Depth (mm x mm x mm)</th>
<th>Transport weight with packing approx. kg</th>
<th>Transport weight without packing approx. kg</th>
</tr>
</thead>
</table>

**Single-busbar switchgear 8DA10**

**Means of transport: Truck**

| 1 x 600 | 1764 x 2550 x 1870 | 850 | 750 |
| 2 x 600 | 1764 x 2550 x 1870 | 1700 | 1500 |
| 3 x 600 | 2400 x 2550 x 1870 | 2550 | 2250 |
| 4 x 600 | 2964 x 2550 x 1870 | 3400 | 3000 |

**Means of transport: Ship and airplane**

| 1 x 600 | 1764 x 2700 x 1888 | 850 | 750 |
| 2 x 600 | 1764 x 2700 x 1888 | 1700 | 1500 |
| 3 x 600 | 2400 x 2700 x 1888 | 2550 | 2250 |
| 4 x 600 | 2964 x 2700 x 1888 | 3400 | 3000 |

**Double-busbar switchgear 8DB10**

**Means of transport: Truck**

| 1 x 600 | 1870 x 2550 x 3124 | 1300 | 1200 |
| 2 x 600 | 1870 x 2550 x 3124 | 2600 | 2400 |
| 3 x 600 | 2416 x 2550 x 3124 | 3900 | 3600 |

**Means of transport: Ship and airplane**

| 1 x 600 | 1888 x 2850 x 3124 | 1300 | 1200 |
| 2 x 600 | 1888 x 2850 x 3124 | 2600 | 2400 |
| 3 x 600 | 2440 x 2850 x 3124 | 3900 | 3600 |

**Traction power supply switchgear 8DA11/12**

**Means of transport: Truck**

| 1 x 600 | 1764 x 2550 x 1870 | 600 | 500 |
| 2 x 600 | 1764 x 2550 x 1870 | 1200 | 1000 |
| 3 x 600 | 2400 x 2550 x 1870 | 1800 | 1500 |
| 4 x 600 | 2964 x 2550 x 1870 | 2400 | 2000 |

**Means of transport: Ship and airplane**

| 1 x 600 | 1764 x 2700 x 1888 | 600 | 500 |
| 2 x 600 | 1764 x 2700 x 1888 | 1200 | 1000 |
| 3 x 600 | 2400 x 2700 x 1888 | 1800 | 1500 |
| 4 x 600 | 2964 x 2700 x 1888 | 2400 | 2000 |

1) Average values with LV compartment 850 mm depending on the degree to which panels are equipped
### Classification of 8DA and 8DB switchgear according to IEC 62271-200

#### Design and construction

<table>
<thead>
<tr>
<th>Partition class</th>
<th>PM (metallic partition)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of service continuity category</td>
<td>LSC 2</td>
</tr>
<tr>
<td>Accessibility to compartments (enclosure)</td>
<td>Tool-based</td>
</tr>
<tr>
<td>Busbar compartment</td>
<td>Tool-based</td>
</tr>
<tr>
<td>Switching-device compartment</td>
<td>Tool-based</td>
</tr>
<tr>
<td>Low-voltage compartment</td>
<td>Tool-based</td>
</tr>
<tr>
<td>Cable compartment</td>
<td>Tool-based</td>
</tr>
</tbody>
</table>

#### Internal arc classification

<table>
<thead>
<tr>
<th>Designation of the internal arc classification IAC</th>
<th>Wall-standing arrangement</th>
<th>Free-standing arrangement</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAC A FL</td>
<td>40 kA, 1 s</td>
<td>IAC A FLR 40 kA, 1 s</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of accessibility A</th>
<th>Switchgear in closed electrical service location, access “for authorized personnel only” according to IEC 62271-200</th>
</tr>
</thead>
<tbody>
<tr>
<td>– F</td>
<td>Front</td>
</tr>
<tr>
<td>– L</td>
<td>Lateral</td>
</tr>
<tr>
<td>– R</td>
<td>Rear (for free-standing arrangement)</td>
</tr>
</tbody>
</table>

| Rated short-time withstand current               | 40 kA                                                                                                             |
| Rated duration of short-circuit                  | 1 s                                                                  |

### Classification of 8DA and 8DB switchgear according to IEEE Std C37.20.7™-2007

#### Internal arc classification

<table>
<thead>
<tr>
<th>Designation of the internal arc classification IAC</th>
<th>Wall-standing arrangement</th>
<th>Free-standing arrangement</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAC class for</td>
<td>Type 1B 40 kA, 0.5 s</td>
<td>Type 2B 40 kA, 0.5 s</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of accessibility</th>
<th>Switchgear in closed electrical service location, access “for authorized personnel only” according to IEEE Std C37.20.7™-2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>– Type 1B</td>
<td>Front</td>
</tr>
<tr>
<td>– Type 2B</td>
<td>Front, lateral, rear (for free-standing arrangement)</td>
</tr>
</tbody>
</table>

| Rated short-time withstand current               | 40 kA                                                                                                             |
| Rated duration of short-circuit                  | 0.5 s                                                                                                              |
Dimensions
Front views, sections, floor openings, fixing points for 8DA10
(panel height 2350 mm)
Disconnector panel up to 2500 A

Cable connection panel up to 2500 A

Metering panel

Dummy panel

Legend and footnotes for pages 14 and 15

1 Fixing hole for 26 mm x 45 mm
2 Base frame
3 Floor opening for high-voltage cables
4 Area for floor openings for control cables
Dimensions
Front views, sections, floor openings, fixing points for 8DA10
(panel height 2570 mm)
Fixed-Mounted Circuit-Breaker Switchgear Type 8DA and 8DB up to 40.5 kV, Gas-Insulated · Siemens HA 35.11 · 2014

Dimensions

Front views, sections, floor openings, fixing points for 8DA10 (panel height 2570 mm)

Legend and footnotes for pages 16 and 17
1 Fixing hole for 26 mm x 45 mm
2 Base frame
3 Floor opening for high-voltage cables
4 Area for floor openings for control cables
Dimensions

Front views, sections, floor openings, fixing points for 8DB10

Bus sectionalizer up to 2500 A (busbar system 1 and 2)

Bus sectionalizer with panel connection up to 2500 A (busbar system 1 and 2)

Legend and footnotes for pages 18 and 19

1 Fixing hole for 26 mm x 45 mm
2 Base frame
3 Floor opening for high-voltage cables
4 Area for floor openings for control cables
Dimensions
Front views, sections, floor openings, fixing points for 8DB10

Bus sectionalizer up to 2500 A (busbar system 1 and 2)

Cable connection panel up to 2500 A

Legend and footnotes for pages 20 and 21
1 Fixing hole for 26 mm x 45 mm
2 Base frame
3 Floor opening for high-voltage cables
4 Area for floor openings for control cables
Dimensions
Front views, sections, floor openings, fixing points for 8DB10
Example: Circuit-breaker panel with three-position disconnector at the feeder (option) up to 2000 A

Example: Circuit-breaker panel with disconnector bypass up to 2000 A

Legend and footnotes for pages 22 and 23
1 Fixing hole for 26 mm x 45 mm
2 Base frame
3 Floor opening for high-voltage cables
4 Area for floor openings for control cables
Dimensions
Front views, sections, floor openings, fixing points for 8DA11/12
(panel height 2350 mm)
Dimensions
Front views, sections, floor openings, fixing points for 8DA11/12
(panel height 2570 mm)

Legend and footnotes for pages 24 and 25
1 Fixing hole for 26 mm x 45 mm
2 Base frame
3 Floor opening for high-voltage cables
4 Area for floor openings for control cables

Single-pole circuit-breaker panel up to 2300 A

Single-pole circuit-breaker panel 2500 A

Double-pole circuit-breaker panel up to 2300 A

Double-pole circuit-breaker panel 2500 A
Product range

Single-busbar panels 8DA10

Circuit-breaker panel

Disconnector panel

Bus sectionalizer (2 panels)
Product range

Single-busbar panels 8DA10

Metering panel

Cable connection panel

Bus sectionalizer (2 panels)

- Three-position disconnector
- Vacuum circuit-breaker
- Plug-in voltage transformer (directly plugged or with cable connection)
- Voltage transformer with or without three-position disconnector
- Current transformer
- Capacitive voltage detecting system
- Busbar – earthing switch and – make-proof earthing switch
- Busbar connection with or without three-position disconnector
- Panel connection with inside-cone plug or bar connection
Product range

Double-busbar panels 8DB10

Circuit-breaker panel  

Bus coupler

- Three-position disconnector
- Vacuum circuit-breaker
- Plug-in voltage transformer (directly plugged or with cable connection)
- Voltage transformer with or without three-position disconnector
- Current transformer
- Capacitive voltage detecting system
- Busbar – earthing switch and – make-proof earthing switch
- Busbar connection with or without three-position disconnector
- Surge arrester
- Panel connection with inside-cone plug or bar connection
- Zero-sequence current transformer
- Top-mounted bus sectionalizer
Double-busbar panels 8DB10

**Product range**

**Metering panel**

**Cable connection panel**

- Three-position disconnector
- Plug-in voltage transformer (directly plugged)
- Voltage transformer with or without three-position disconnector
- Current transformer
- Capacitive voltage detecting system
- Busbar – earthing switch and – make-proof earthing switch
- Busbar connection with or without three-position disconnector
- Panel connection with inside-cone plug or bar connection
Product range

Double-busbar panels 8DB10

Bus sectionalizer (busbar system 1 and 2)
Product range

Double-busbar panels 8DB10

Bus sectionalizer (busbar system 1)

Three-position disconnector

Vacuum circuit-breaker

Voltage transformer with or without three-position disconnector

Current transformer

Capacitive voltage detecting system

Busbar earthing switch and make-proof earthing switch

Busbar connection with or without three-position disconnector
Product range
Double-busbar panels 8DB10

Bus sectionalizer (busbar system 2)
Product range

Double-busbar panels 8DB10

Bus sectionalizer (busbar system 1 and 2)

Three-position disconnector

Vacuum circuit-breaker

Voltage transformer with or without three-position disconnector

Current transformer

Capacitive voltage detecting system

Busbar – earthing switch and – make-proof earthing switch

Busbar connection with or without three-position disconnector

Product range

Three-position disconnector

Vacuum circuit-breaker

Voltage transformer with or without three-position disconnector

Current transformer

Capacitive voltage detecting system

Busbar – earthing switch and – make-proof earthing switch

Busbar connection with or without three-position disconnector
Product range
Double-busbar panels 8DB10

Bus sectionalizer (busbar system 1 and 2)

- Three-position disconnector
- Voltage transformer with or without three-position disconnector
- Current transformer
- Capacitive voltage detecting system
- Busbar:
  - earthing switch
  - make-proof earthing switch
- Busbar connection with or without three-position disconnector
Product range

Single-pole and double-pole single-busbar panels 8DA11/12

Single-pole circuit-breaker panel
- Three-position disconnector
- Vacuum circuit-breaker
- Plug-in voltage transformer (directly plugged or with cable connection)
- Voltage transformer with or without three-position disconnector
- Current transformer
- Capacitive voltage detecting system
- Busbar – earthing switch and – make-proof earthing switch
- Busbar connection with or without three-position disconnector
- Surge arrester
- Panel connection with inside-cone plug or bar connection
- Zero-sequence current transformer
- Top-mounted bus sectionalizer

Double-pole circuit-breaker panel
- Single-pole and double-pole single-busbar panels 8DA11/12
**Design**

**Basic panel design**

### Insulating system
- Switchgear housing filled with SF$_6$ gas
- Features of SF$_6$ gas:
  - Non-toxic
  - Odorless and colorless
  - Non-inflammable
  - Chemically neutral
  - Heavier than air
  - Electronegative (high-quality insulator)
- Pressure of the SF$_6$ gas in the switchgear housing dependent on the electrical ratings (relative pressure at 20 °C):
  - Rated filling level: 70 kPa to 120 kPa
  - Design pressure: 190 kPa
  - Design temperature of the SF$_6$ gas: 90 °C
  - Operating pressure of bursting disc: \( \geq 300 \) kPa
  - Bursting pressure: \( \geq 600 \) kPa
  - Gas leakage rate: < 0.1 % per year.

### Panel design
- Factory-assembled, type-tested
- Single-pole metal-enclosed, metal-clad
- Hermetically bolted switchgear housings made of corrosion-resistant aluminum alloy
- Switchpanel poles arranged one behind the other
- Maintenance-free in an indoor environment (IEC 62271-1)
- Degree of protection
  - IP 65 for all high-voltage parts of the primary circuit
  - IP 3XD for the switchgear enclosure
- Option: IP 31D for the switchgear enclosure
- Option: IP 41 for the low-voltage compartment
- Vacuum circuit-breaker
- Three-position disconnector for disconnecting and earthing
- Make-proof earthing by means of the vacuum circuit-breaker
- Cable connection with inside-cone plug-in system according to EN 50 181
- Wall-standing or free-standing arrangement
- Instrument transformers removable, as they are located outside the gas compartments
- Subframe, front cover, rear cover and end walls powder-coated in color “light basic” (SN 700)
- Low-voltage compartment removable, plug-in bus wires
- Standardized production processes and certified quality and environmental management system according to ISO 9001 and ISO 14001.

---

**Legend for 8DA10 and 8DB10**

1. Low-voltage compartment
2. Electronic control board, e.g. multifunction protection
3. Operating mechanism and interlock for three-position disconnector, as well as mechanical position indicators for three-position disconnector and circuit-breaker
4. Manometer for gas monitoring of feeder gas compartments
5. Circuit-breaker operating mechanism
6. Voltage detecting system
Single-pole and double-pole design for AC traction power supply

Typical uses

• Single-pole and double-pole panels 8DA11/12 for the supply of overhead contact line sections in AC traction power supply systems
• Double-pole panels 8DA12 for application in traction power supply systems with autotransformers, e.g. for high-speed railway traffic.

Panel design

• Panel design based on standard version of single-busbar switchgear 8DA10.

8DA11
Single-pole switchgear panel for traction power supply.

8DA12
Double-pole switchgear panel for traction power supply.

Legend for 8DA11 and 8DA12
1 Low-voltage compartment
2 Electronic control board, e.g. multifunction protection
3 Operating mechanism and interlock for three-position disconnector, as well as mechanical position indicators for three-position disconnector and circuit-breaker
4 Manometer for gas monitoring of feeder gas compartments
5 Circuit-breaker operating mechanism
6 Voltage detecting system
Gas compartment scheme

- Sealed pressure system (according to IEC 62271-1)
- No refilling required throughout the entire service life
- Gas compartments distributed to several areas
- Gas pressure manometers arranged at the switchgear front
- Gas pressure can be read with security even without auxiliary voltage supply
- SF₆ gas filling equipment with non-return valve arranged at the switchgear front beside the associated gas pressure manometer
- Gas pressure manometers with two signaling contacts for “gas pressure too low / gas pressure too high” indication
- Option: Gas pressure manometers with three signaling contacts for “gas pressure too low / very low” and “gas pressure too high” indication
- Option: Gas pressure manometers with temperature and pressure compensation.

Legend for 8DA10
1 Busbar L1 (manometer B11)
2 Busbar L2 (manometer B12)
3 Busbar L3 (manometer B13)
4 Circuit-breaker L1, L2, L3 (manometer B0)
5 Top-mounted bus sectionalizer L1, L2, L3 (manometer B16)
Legend for 8DB10

1. Busbar system 1, L1 (manometer B11)
2. Busbar system 1, L2 (manometer B12)
3. Busbar system 1, L3 (manometer B13)
4. Busbar system 2, L1 (manometer B21)
5. Busbar system 2, L2 (manometer B22)
6. Busbar system 2, L3 (manometer B23)
7. Three-position disconnector, busbar system 1, L1, L2, L3 (manometer B1)
8. Disconnector, busbar system 2, L1, L2, L3 (manometer B2)
9. Circuit-breaker L1, L2, L3 (manometer B0)
10. Top-mounted bus sectionalizer, busbar system 1, L1, L2, L3 (manometer B16)
11. Top-mounted bus sectionalizer, busbar system 2, L1, L2, L3 (manometer B26)
Components

Vacuum circuit-breaker

Features

- According to IEC 62271-100 (for standards, see page 60)
- Application in hermetically bolted switchgear housings in conformity with the system
- Vacuum interrupter in SF₆-filled switchgear housing
- Maintenance-free for indoor installation according to IEC 62271-1
- Individual secondary equipment
- A metal bellows is used for gasketless separation between the SF₆ insulation and the vacuum (already used with success for over 2 million vacuum interrupters).

Trip-free mechanism

The vacuum circuit-breaker is fitted with a trip-free mechanism according to IEC 62271-100.

Switching duties and operating mechanisms

The switching duties of the vacuum circuit-breaker are dependent, among other factors, on its type of operating mechanism.

Motor operating mechanism

- Motor-operating stored-energy mechanism
  - For auto-reclosing (K)
  - For synchronization and rapid load transfer (U)

Further operating mechanism features

- Located outside the switchgear housings in the operating mechanism box and behind the control board
- Stored-energy spring mechanism for 10,000 operating cycles
- Optional: Stored-energy spring mechanism for 30,000 operating cycles.

Operating mechanism functions

Motor operating mechanism ¹ (M1 *)

In the case of motor operating mechanism, the closing spring is charged by means of a motor and latched in the charged position (“spring charged” indication is visible). Closing is effected either by means of an ON pushbutton or a closing solenoid. The closing spring is recharged automatically (for auto-reclosing).

Endurance class of circuit-breaker

<table>
<thead>
<tr>
<th>Function</th>
<th>Class</th>
<th>Standard</th>
<th>Property of 8DA and 8DB</th>
</tr>
</thead>
<tbody>
<tr>
<td>BREAKING</td>
<td>M2</td>
<td>IEC 62271-100</td>
<td>10,000 times mechanically without maintenance</td>
</tr>
<tr>
<td></td>
<td>E2</td>
<td>IEC 62271-100</td>
<td>10,000 times rated normal current without maintenance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50 times short-circuit breaking current without maintenance</td>
</tr>
<tr>
<td></td>
<td>C2</td>
<td>IEC 62271-100</td>
<td>Very low probability of restrikes</td>
</tr>
</tbody>
</table>

Operating times

<table>
<thead>
<tr>
<th>Property</th>
<th>1st shunt release</th>
<th>2nd shunt release</th>
<th>Undervoltage release</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closing</td>
<td>&lt; 65 ms</td>
<td>&lt; 55 ms</td>
<td>&lt; 55 ms</td>
</tr>
<tr>
<td>Opening time</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arcing time at 50 Hz</td>
<td>&lt; 15 ms</td>
<td>&lt; 12 ms</td>
<td></td>
</tr>
<tr>
<td>Break time at 50 Hz</td>
<td>&lt; 80 ms</td>
<td>&lt; 70 ms</td>
<td>&lt; 70 ms</td>
</tr>
<tr>
<td>Dead time</td>
<td>300 ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total charging time</td>
<td>&lt; 15 s</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations for switching duties:

U = Synchronization and rapid load transfer
K = Auto-reclosing

¹) Motor rating: 24 V to 250 V DC: max. 650 W
110 V and 240 V AC: max. 850 VA
* Item designation

For further technical data and description of typical applications, please refer also to Catalog HG 11.04 "3AH4 Vacuum Circuit-Breakers"
Secondary equipment
The scope of the secondary equipment of the vacuum circuit-breaker depends on the type of application and offers a wide range of possible variations, allowing almost every requirement to be satisfied.

Closing solenoid
- Type 3AY15 10 (Y9 *)
- For electrical closing.

Shunt releases
- Types:
  - Standard: 3AY15 10 (Y1 *)
  - Option: 3AX11 01 (Y2 *), with energy store
- Tripping by protection relay or electrical actuation.

Undervoltage release
- Type 3AX11 03 (Y7 *)
- Comprising:
  - Energy store and unlatching mechanism
  - Electromagnetic system, which is permanently connected to voltage while the vacuum circuit-breaker is closed; tripping is initiated when this voltage drops
- Connection to voltage transformers possible.

Anti-pumping
- Function: If constant CLOSE and OPEN commands are present at the vacuum circuit-breaker at the same time, the vacuum circuit-breaker will return to the open position after closing. It remains in this position until a new CLOSE command is given. In this manner, continuous closing and opening (= pumping) is avoided.

Circuit-breaker tripping signal
- For electrical signaling (as pulse > 10 ms), e.g. to remote control systems, in the case of automatic tripping (e.g. protection)
- Via limit switch (S6 *) and cutout switch (S7 *).

Varistor module
- To limit overvoltages to approx. 500 V for protection devices (when inductive components are mounted in the vacuum circuit-breaker)
- For auxiliary voltages ≥ 60 V DC.

Auxiliary switch
- Type 3SV9 (S1 *)
- Standard: 12 NO + 12 NC.

Position switch
- Type 3SE4 (S4 *)
- For signaling “closing spring charged”.

Mechanical interlock
- Mechanical interlocking to the three-position disconnector
- During operation of the three-position disconnector, the vacuum circuit-breaker cannot be operated.

Abbreviations: NO = normally open contact
NC = normally closed contact
* Item designation

Examples
Electrical data (curve 1)
Rated short-circuit breaking current 25 kA
Rated normal current 1250 A
Electrical data (curve 2)
Rated short-circuit breaking current 31.5 kA
Rated normal current 2000 A
Electrical data (curve 3)
Rated short-circuit breaking current 40 kA
Rated normal current 2500 A
Rated operating sequences
Rapid load transfer (U): O-t-CO-t'-CO (t = 0.3 s, t' = 3 min)
Auto-reclosing (K): O-t-CO-t'-CO (t = 0.3 s, t' = 3 min)
O = OPEN operation
CO = CLOSE operation with subsequent OPEN operation at the shortest internal close-open time of the vacuum circuit-breaker

Possible release combinations

<table>
<thead>
<tr>
<th>Release</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st shunt release type 3AY15 10</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>2nd shunt release type 3AY11 01</td>
<td>–</td>
<td>*</td>
<td>–</td>
<td>*</td>
</tr>
<tr>
<td>Undervoltage release type 3AX11 03</td>
<td>–</td>
<td>–</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>
Components

Three-position disconnector

Features
• Rated normal currents up to 2500 A
• Up to 2000 operating cycles for the disconnector
• Option: Up to 3000 operating cycles for the disconnector
• Up to 1000 operating cycles for the earthing switch
• Option: Up to 2000 operating cycles for the earthing switch
• Operating shaft and contact blades with common center of rotation and reliable switch position up to the operating front of the panel
• Gas-tight bushings separate the busbar and circuit-breaker housings underneath the busbar disconnector contacts
• Cable connection and circuit-breaker housings can be removed without interrupting busbar operation
• Maintenance-free.

Switch positions
• CLOSED, OPEN, EARTHED or READY-TO-EARTH
• CLOSED: Contact blades connected with the busbar: Main circuit closed between busbar and circuit-breaker
• OPEN: Main circuit open between busbar and circuit-breaker: Test voltages for isolating distances are withstood
• READY-TO-EARTH: Contact blades connected with the earthing contact
• EARTHED: Feeder earthed and short-circuited by closing the circuit-breaker.

Operating mechanism
• Only permissible operations possible due to logical mechanical interlocks
• Mechanically coupled position indicator
• Separate operating shafts for the “DISCONNECTING”, “EARTHING” and “READY-TO-EARTH” functions
• With manual operating mechanism
• Option: With motor operating mechanism
  Motor rating at 24 V to 250 V DC: max. 100 W
  110 V to 240 V AC: max. 130 VA
• Same sense of rotation for the switching operations of the “CLOSE” or “OPEN” functions.

Endurance class of three-position disconnector

<table>
<thead>
<tr>
<th>Function</th>
<th>Class</th>
<th>Standard</th>
<th>Property of 8DA and 8DB</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISCONNECTING</td>
<td>M1</td>
<td>IEC 62271-102</td>
<td>2000 times mechanically without maintenance</td>
</tr>
<tr>
<td>READY-TO-EARTH</td>
<td></td>
<td></td>
<td>1000 times mechanically without maintenance</td>
</tr>
<tr>
<td>EARTHING</td>
<td>E2 ¹)</td>
<td>IEC 62271-102</td>
<td>50 times rated short-circuit making current I_{ma} without maintenance</td>
</tr>
</tbody>
</table>

Endurance class of make-proof earthing switch

<table>
<thead>
<tr>
<th>Function</th>
<th>Class</th>
<th>Standard</th>
<th>Property of 8DA and 8DB</th>
</tr>
</thead>
<tbody>
<tr>
<td>EARTHING</td>
<td>E1</td>
<td>IEC 62271-102</td>
<td>1000 times mechanically without maintenance 2 times rated short-circuit making current I_{ma} without maintenance</td>
</tr>
</tbody>
</table>

¹) By closing the circuit-breaker
**Interlocks**

- Selection of permissible switching operations by means of a control gate with mechanically interlocked vacuum circuit-breaker
- Selection of permissible switching operations in double-busbar switchgear additionally by means of a control gate with mechanically interlocked vacuum circuit-breaker
- Corresponding operating shafts are not released at the operating front until they have been pre-selected with the control gate
- Operating lever cannot be removed until switching operation has been completed
- Circuit-breaker cannot be closed until the control gate is in neutral position again
- **Option**: Switchgear interlocking system with electromechanical interlocks (mechanical interlocking for manual operation remains).

---

**Position indicators of 8DB10**

for three-position disconnector and vacuum circuit-breaker

- **Feeder OPEN**
- **Feeder busbar system 1 CLOSED**
- **Feeder busbar system 2 CLOSED**
- **Feeder READY-TO-EARTH**
- **Feeder EARTHED**
Components
Control board

Features
- Mechanical control board below the low-voltage compartment
- Actuations directly at the operating mechanisms
- Mechanical position indicators integrated in the switchgear front
- Unambiguous assignment of actuating openings and control elements to the corresponding position indicators
- Ergonomic height of all control elements.

Interlocking
- Panel-internal mechanical interlocks
- Operation of three-position disconnector (CLOSED, OPEN, EARTHED or READY-TO-EARTH)
- Vacuum circuit-breaker interlocked mechanically
- Control gate for opening the actuating openings (with single-busbar systems it can only be operated if the interrogation lever (4) is pushed downwards)
- Actuating openings (2, 3 and 8) cannot be opened as long as the vacuum circuit-breaker is in CLOSED position
- Operating lever can be inserted when the actuating openings are open
- Operating lever cannot be removed before the definite end position of the disconnecting or earthing function is reached
- Feeder de-earthing is secured by the vacuum circuit-breaker – electrically via the auxiliary switch – mechanically through the lever (14) of the mechanical circuit-breaker tripping block.

A Operating mechanism of the three-position disconnector
1 CLOSED/OPEN position indicator for disconnecting function of three-position disconnector
2 Actuating opening for earthing function
3 Actuating opening for disconnector function
4 Interrogation lever
5 CLOSED/OPEN position indicator for earthing function of three-position disconnector
6 CLOSED/OPEN position indicator for vacuum circuit-breaker
7 CLOSED/OPEN position indicator for 2nd disconnector in double-busbar systems
8 Actuating opening for 2nd disconnector in double-busbar systems
9 Control gate for selecting the three-position disconnector or the disconnector in double-busbar systems
10 Control gate for opening the actuating openings (with single-busbar systems it can only be operated if the interrogation lever (4) is pushed downwards)

B Operating mechanism of the vacuum circuit-breaker
11 Mechanical ON pushbutton for vacuum circuit-breaker
12 Actuating opening for manual charging of the circuit-breaker operating spring
13 Mechanical OFF pushbutton for vacuum circuit-breaker
14 Lever for locking the vacuum circuit-breaker against “de-earthing”
15 “Circuit-breaker spring charged” indicator
16 CLOSED/OPEN position indicator for vacuum circuit-breaker
17 Operations counter for vacuum circuit-breaker
Busbar features
- Single-pole enclosure with modular switchgear housings made of corrosion-resistant aluminum alloy
- Continuous SF₆ insulation without plug-in connections or adapters
- No alteration of the insulating medium throughout the complete busbar assembly
- Up to 4000 A with copper bar connection in one busbar housing
- 5000 A with copper bar connection in two busbar housings (twin busbar).

Design of busbar components
The busbars of single-busbar switchgear 8DA and double-busbar switchgear 8DB can be equipped with the following busbar components:
- Plug-in, metal-enclosed busbar voltage transformers with or without three-position disconnector
- Busbar current transformers
- Busbar connection with cable plug, or with solid-insulated or gas-insulated bar connection, with or without three-position disconnector
- Busbar earthing switch or make-proof earthing switch
- Capacitive voltage detecting system according to IEC 61243-5 or IEC 61958
- Top-mounted bus sectionalizer for distribution into two busbar sections without additional switchgear panels and space requirements.
Components

Current transformers

Features
- According to IEC 61869-2
- Designed as ring-core current transformers, single-pole
- Free of dielectrically stressed cast-resin parts (due to design)
- Insulation class E
- Inductive type
- Certifiable
- Climate-independent
- Secondary connection by means of a terminal strip in the low-voltage compartment of the panel
- Cast-resin insulated.

Installation
- Arranged outside the primary enclosure (switchgear housing).

Current transformers

Current transformer installation (basic scheme)

Electrical data *

<table>
<thead>
<tr>
<th>Designation</th>
<th>Type 4MC4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage</td>
<td>max. 0.8 kV</td>
</tr>
<tr>
<td>Rated short-duration power-frequency withstand voltage (winding test)</td>
<td>3 kV</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Rated continuous thermal current</td>
<td>max. 1.2 x rated current (primary)</td>
</tr>
<tr>
<td>Rated thermal short-time current, max. 3 s</td>
<td>max. 40 kA</td>
</tr>
<tr>
<td>Rated current dynamic primary secondary</td>
<td>unlimited 40 A to 2500 A 1 A and 5 A</td>
</tr>
</tbody>
</table>

* Further electrical data on request

Designation | Type 4MC4 |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiratio (secondary)</td>
<td>200 A – 100 A to 2500 A – 1250 A</td>
</tr>
<tr>
<td>Core data according to rated primary current: Measuring core</td>
<td>max. 3 cores</td>
</tr>
<tr>
<td>Protection core</td>
<td>2.5 VA to 30 VA 0.2 to 1 FS S, FS 10</td>
</tr>
<tr>
<td>Permissible ambient air temperature</td>
<td>max. 60 °C</td>
</tr>
<tr>
<td>Insulation class</td>
<td>E</td>
</tr>
</tbody>
</table>

B Current transformer in bus sectionalizer and bus coupler (type 4MC4_40)
C1 Feeder current transformer (type 4MC4_90)
C2 Feeder current transformer (type 4MC4_40)
D Feeder current transformer (type 4MC4_10)
E Busbar current transformer (type 4MC4_40)
Components

Voltage transformers

Features
- According to IEC 61869-3
- Single-pole, plug-in design
- Connection system with plug-in contact according to EN 50181
- Inductive type
- Safe-to-touch due to metal enclosure
- Certifiable
- Climate-independent
- Secondary connection by means of plugs in the low-voltage compartment of the panel
- Cast-resin insulated.

Installation
- Arranged outside the primary enclosure (switchgear housing).

Mounting locations
- On the busbar
- At the panel connection housing.

Voltage transformer types
Busbar voltage transformers 4MT3 and 4MU4
- Pluggable on the busbar with plug-in system according to EN 50181
- No separate metering panel required
- Option: Three-position disconnector for busbar voltage transformer CLOSED – OPEN – EARTHED
- Option 4MU4: Repeat test at 80 % of the rated short-duration power-frequency withstand voltage possible with mounted voltage transformer.

Feeder voltage transformers 4MT7 and 4MU3
- Pluggable at the feeder with plug-in system according to EN 50181
- Connection of 4MT7 directly at the panel connection housing
- Connection of 4MU3 via flexible cable with plug size S2 at the panel connection housing, and metal-enclosed voltage transformer.

Electrical data (maximum values)

<table>
<thead>
<tr>
<th>Designation</th>
<th>4MT3</th>
<th>4MU4</th>
<th>4MT7</th>
<th>4MU3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage kV</td>
<td>24.0</td>
<td>40.5</td>
<td>40.5</td>
<td>40.5</td>
</tr>
<tr>
<td>Rated short-duration power-frequency withstand voltage kV</td>
<td>65</td>
<td>95</td>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage kV</td>
<td>125</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Rated voltage factor</td>
<td>$U_{n/8h} = 1.9$</td>
<td>$U_{n/8h} = 1.9$</td>
<td>$U_{n/8h} = 1.9$</td>
<td>$U_{n/8h} = 1.9$</td>
</tr>
<tr>
<td></td>
<td>$U_{n/continuous} = 1.2$</td>
<td>$U_{n/continuous} = 1.2$</td>
<td>$U_{n/continuous} = 1.2$</td>
<td>$U_{n/continuous} = 1.2$</td>
</tr>
<tr>
<td>Standard</td>
<td>IEC</td>
<td>IEC</td>
<td>IEC</td>
<td>IEC</td>
</tr>
<tr>
<td></td>
<td>GOST</td>
<td>GOST</td>
<td>GOST</td>
<td>GOST</td>
</tr>
<tr>
<td></td>
<td>GB</td>
<td>GB</td>
<td>GB</td>
<td>GB</td>
</tr>
</tbody>
</table>
### Features
- Bushings for plugs with inside-cone plug-in system according to EN 50181
- Inside-cone plug-in system for plug sizes 2, 3 and 4
- Single and multiple connections possible per phase
- Connection of several cables with different plug sizes possible per phase
- Connection of solid-insulated or gas-insulated bar possible
- Connection of 4MT7 voltage transformer plugged in at the panel connection housing version 3
- Connection of 4MU3 voltage transformer via flexible cable and plug size 2 at the panel connection housing
- For rated normal currents up to 2500 A.

#### Surge arresters
- Pluggable via inside-cone plug-in system size 2 or 3
- Surge arresters recommended if, at the same time,
  - the cable system is directly connected to the overhead line,
  - the protection zone of the surge arrester at the end tower of the overhead line does not cover the switchgear.

### Panel connection of 8DA10, 8DB10 and 8DA11/12 for cable plugs and bar systems

<table>
<thead>
<tr>
<th>Switchgear type</th>
<th>Rated normal current [A]</th>
<th>Standard subframe</th>
<th>High subframe</th>
<th>Connection height of panel connection versions (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8DA10</td>
<td>up to 2300</td>
<td>X</td>
<td>X</td>
<td>320</td>
</tr>
<tr>
<td>8DA11</td>
<td>2500</td>
<td></td>
<td>X</td>
<td>540</td>
</tr>
<tr>
<td>8DA12</td>
<td></td>
<td></td>
<td>X</td>
<td>70</td>
</tr>
<tr>
<td>8DB10</td>
<td>up to 2500</td>
<td>X</td>
<td>X</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>540</td>
</tr>
</tbody>
</table>

### Legend
1. Panel connection housing
2. Subframe
3. Connection height of panel connection versions

[Diagram and table images are not transcribed here but are included in the document for visual understanding.]
## Components

### Panel connection

Panel connection of 8DA10, 8DB10 and 8DA11/12 for cable plugs and bar systems

![Diagram of panel connection](image)

### Table: Panel connection versions

<table>
<thead>
<tr>
<th>Version 4</th>
<th>Version 5</th>
<th>Version 6</th>
<th>Version 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>S2 S3</td>
<td>S2 S3</td>
<td>S2 S3 S4</td>
<td>Gas-insulated bar connection</td>
</tr>
<tr>
<td>Solid-insulated bar connection</td>
<td>Solid-insulated bar connection</td>
<td>Gas-insulated bar connection</td>
<td></td>
</tr>
<tr>
<td>4 – – – –</td>
<td>5 – – – –</td>
<td>6 – – – –</td>
<td>1</td>
</tr>
<tr>
<td>5 – – – –</td>
<td>6 – – – –</td>
<td>– 4 – – –</td>
<td>1</td>
</tr>
<tr>
<td>– 3 – – –</td>
<td>1 1 1 – –</td>
<td>1 – – –</td>
<td></td>
</tr>
<tr>
<td>1 1 – – –</td>
<td>2 2 – – –</td>
<td>2 2 2 1</td>
<td></td>
</tr>
<tr>
<td>– 3 1 – –</td>
<td>– 1 1 – –</td>
<td>– 2 1 1</td>
<td></td>
</tr>
<tr>
<td>– 2 1 1</td>
<td>– 1 1 1</td>
<td>– 1 1 1</td>
<td></td>
</tr>
</tbody>
</table>

### Connection height of panel connection versions (mm)

<table>
<thead>
<tr>
<th>Height</th>
<th>Version 4</th>
<th>Version 5</th>
<th>Version 6</th>
<th>Version 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>222</td>
<td>-15</td>
<td>294</td>
<td>327</td>
<td></td>
</tr>
<tr>
<td>442</td>
<td>205</td>
<td>514</td>
<td>547</td>
<td></td>
</tr>
<tr>
<td>-168</td>
<td>-405</td>
<td>96</td>
<td>-63</td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>-185</td>
<td>124</td>
<td>157</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>-215</td>
<td>94</td>
<td>127</td>
<td></td>
</tr>
<tr>
<td>442</td>
<td>205</td>
<td>514</td>
<td>547</td>
<td></td>
</tr>
</tbody>
</table>
### Panel Components

#### Busbar and panel connection (commercially available cable plugs and bar connections)

<table>
<thead>
<tr>
<th>Cable type</th>
<th>Make</th>
<th>Type</th>
<th>Size</th>
<th>Diameter across cable insulation (mm)</th>
<th>Conductor cross-section (mm²)</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermoplastic-insulated cables ≤ 12 kV according to IEC 60502-2</td>
<td>nkt cables</td>
<td>CPI 2</td>
<td>2</td>
<td>12.7 - 33.6</td>
<td>25 - 300</td>
<td>Insulation material silicone rubber, with or without metal housing, installation without special tools</td>
</tr>
<tr>
<td></td>
<td>CPI 3</td>
<td>3</td>
<td>21.2 - 45.6</td>
<td>185 - 630</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pfisterer</td>
<td>CONNEX 2</td>
<td>13.5 - 44.0</td>
<td>25 - 400</td>
<td></td>
<td>Insulation material silicone rubber, with metal housing</td>
</tr>
<tr>
<td></td>
<td>CONNEX 3</td>
<td>15.5 - 55.0</td>
<td>35 - 800</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CONNEX 4</td>
<td>33.0 - 78.0</td>
<td>95 - 1600</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Südakabel</td>
<td>SEIK 14</td>
<td>2</td>
<td>13.0 - 40.6</td>
<td>25 - 300</td>
<td>Insulation material silicone rubber, with metal housing</td>
</tr>
<tr>
<td></td>
<td>SEIK 15</td>
<td>3</td>
<td>19.3 - 50.6</td>
<td>120 - 630</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tyco Electronics</td>
<td>RPIT-321</td>
<td>2</td>
<td>19.5 - 36.0</td>
<td>95 - 300</td>
<td>Insulation material silicone rubber, with metal housing</td>
</tr>
<tr>
<td></td>
<td>RPIT-331</td>
<td>3</td>
<td>26.0 - 50.0</td>
<td>240 - 630</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bar type</th>
<th>Bar connection (commercially available bar systems)</th>
<th>Make</th>
<th>Type</th>
<th>Conductor material</th>
<th>Max. rated current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid-insulated bar</td>
<td>MGC Moser Glaser</td>
<td>Duresca DE</td>
<td>Copper, aluminum</td>
<td>2500 A</td>
<td>Outer sheath made of polyamide (polyamide tube)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Duresca DG</td>
<td>Copper, aluminum</td>
<td>2500 A</td>
<td>Outer sheath made of CrNi steel or aluminum (metal sheath)</td>
</tr>
<tr>
<td></td>
<td>Preissinger</td>
<td>ISOBUS MR</td>
<td>Copper, aluminum</td>
<td>2500 A</td>
<td>Outer sheath made of heat shrinkable tube; insulated with cast-resin impregnated paper bandage</td>
</tr>
<tr>
<td></td>
<td>Ritz</td>
<td>SIS</td>
<td>Copper, aluminum</td>
<td>2500 A</td>
<td>Outer sheath made of Raychem heat shrinkable tube</td>
</tr>
<tr>
<td>Gas-insulated bar</td>
<td>MGC Moser Glaser</td>
<td>Gaslink</td>
<td>Copper</td>
<td>2500 A</td>
<td>Aluminum housing</td>
</tr>
<tr>
<td></td>
<td>Preissinger</td>
<td>ISOBUS MG</td>
<td>Copper</td>
<td>2500 A</td>
<td>Aluminum housing</td>
</tr>
</tbody>
</table>

#### Busbar and panel connection (commercially available dummy plugs)

<table>
<thead>
<tr>
<th>Accessories</th>
<th>Dummy plug (commercially available dummy plugs)</th>
<th>Make</th>
<th>Type</th>
<th>Size</th>
<th>Rated voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inside-cage plug-in system according to EN 50181</td>
<td>nkt cables</td>
<td>FPI 2</td>
<td>2</td>
<td>40.5 kV</td>
<td>Insulation material silicone rubber, with metal housing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FPI 3</td>
<td>3</td>
<td>40.5 kV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pfisterer</td>
<td>Blindstecker 2</td>
<td>40.5 kV</td>
<td>Insulation material silicone rubber, with metal housing</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>40.5 kV</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Südakabel</td>
<td>ISIK 14/24/34</td>
<td>12 / 24 / 40.5 kV</td>
<td>Insulation material silicone rubber, with metal housing</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ISIK 15/25/35</td>
<td>12 / 24 / 40.5 kV</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tyco Electronics</td>
<td>RPIT-2</td>
<td>40.5 kV</td>
<td>Insulation material silicone rubber, with metal housing</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>RPIT-3</td>
<td>3</td>
<td>40.5 kV</td>
<td></td>
</tr>
</tbody>
</table>
Indicating and measuring equipment

Voltage detecting systems according to IEC 61243-5, IEC 62271-206 (WEGA ZERO)
- To verify safe isolation from supply
- LRM detecting systems
  - with plug-in indicator
  - with integrated indicator, type VOIS+, VOIS R+, WEGA ZERO
  - with integrated indicator, with integrated repeat test of the interface, with integrated function test, type CAPDIS-S1+, WEGA 1.2, WEGA 1.2 Vario, with integrated signaling relay, type CAPDIS-S2+, WEGA 2.2.

Plug-in voltage indicator
- Verification of safe isolation from supply phase by phase
- Indicator suitable for continuous operation
- Measuring system and voltage indicator can be tested
- Voltage indicator flashes if high voltage is present.

VOIS+, VOIS R+
- Integrated display, without auxiliary power
- With indication “A1” to “A3” (see legend)
- Maintenance-free, repeat test required
- With integrated 3-phase LRM test socket for phase comparison
- With integrated signaling relay (only VOIS R+)
- Degree of protection IP54.

Common features CAPDIS-Sx+
- Maintenance-free
- Integrated display, without auxiliary power
- Integrated repeat test of the interfaces (self-monitoring)
- With integrated function test (without auxiliary power) by pressing the “Display-Test” pushbutton
- Adjustable for different operating voltages (adjustable capacitance C2)
- With integrated 3-phase LRM test socket for phase comparison
- With connectable signal-lead test
- With overvoltage monitoring and signaling (1.2 times operating voltage)
- Degree of protection IP54.

CAPDIS-S1+
- Without auxiliary power
- With indication “A1” to “A7” (see legend)
- Without ready-for-service monitoring
- Without signaling relays (without auxiliary contacts).

CAPDIS-S2+
- With indication “A0” to “A8” (see legend)
- Only by pressing the “Test” pushbutton: “ERROR” indication (A8), e.g. in case of missing auxiliary voltage
- With ready-for-service monitoring (auxiliary power required)
- With integrated signaling relay for signals (auxiliary power required).

Voltage indication via capacitive voltage divider (principle)
- C1 Capacitance integrated into bushing
- C2 Capacitance of the connection leads and the voltage indicator to earth
- LRM system plugged in
- CAPDIS/VOIS installed

\[ U_{LE} = \frac{U_0 \cdot \sqrt{3}}{U_a} \]
- Voltage at the capacitive interface of the switchgear or at the voltage indicator
Components

Indicating and measuring equipment

**WEGA ZERO**
- Voltage detecting system according to IEC 62271-206
- With indication “A1” to “A4” (see legend)
- Maintenance-free
- With integrated 3-phase test socket for phase comparison
- Degree of protection IP54.

**WEGA 1.2, WEGA 1.2 Vario**
- Voltage detecting system according to IEC 61243-5
- With indication “A1” to “A5” (see legend)
- Maintenance-free
- Integrated repeat test of the interface (self-monitoring)
- With integrated function test (without auxiliary power) by pressing the “Display Test” pushbutton
- With integrated 3-phase LRM test socket for phase comparison
- Without integrated signaling relay
- Without auxiliary power
- Degree of protection IP54
- Adjustable for different operating voltages (adjustable capacitance C2) (only for WEGA 1.2 Vario).

**WEGA 2.2**
- Voltage detecting system according to IEC 61243-5
- With indication “A0” to “A6” (see legend)
- Maintenance-free
- Integrated repeat test of the interface (self-monitoring)
- With integrated function test (without auxiliary power) by pressing the “Display Test” pushbutton
- With integrated 3-phase LRM test socket for phase comparison
- With integrated signaling relay (auxiliary power required)
- Degree of protection IP54.

**Symbols shown**

<table>
<thead>
<tr>
<th>WEGA ZERO</th>
<th>WEGA 1.2</th>
<th>WEGA 2.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>L2</td>
<td>L3</td>
</tr>
<tr>
<td>A0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- LC display gray: not illuminated
- LC display white: illuminated

**Voltage indication**

via capacitive voltage divider (principle)

- C1 Capacitance integrated into bushing
- C2 Capacitance of the connection leads and the voltage indicator to earth

\[ U_{LE} = U_N / \sqrt{3} \text{ during rated operation in the three-phase system} \]

\[ U_2 = U_A = \text{Voltage at the capacitive interface of the switchgear or at the voltage indicator} \]
Verification of correct terminal-phase connections

- Verification of correct terminal-phase connections possible by means of a phase comparison test unit (can be ordered separately)
- Safe-to-touch handling of the phase comparison test unit by inserting it into the capacitive taps (socket pairs) of the switchgear.

Phase comparison test units according to IEC 61243-5

**Phase comparison test unit**
**make Kries, type CAP-Phase**
as combined test unit (HR and LRM) for:
- Voltage detection
- Phase comparison
- Interface test
- Integrated self-test
- Indication via LED

**Phase comparison test unit**
**make Pfisterer, type EPV**
as combined test unit (HR and LRM) for:
- Voltage detection
- Phase comparison
- Interface test
- Integrated self-test
- Indication via LED

**Phase comparison test unit**
**make Horstmann, type ORION 3.1**
as combined test unit (HR and LRM) for:
- Phase comparison
- Interface testing at the switchgear
- Voltage detection
- Integrated self-test
- Indication via LED and acoustic alarm
- Phase sequence indicator

**Phase comparison test unit**
**make Pfi sterer, type EPV**
as combined test unit (HR and LRM) for:
- Voltage detection
- Phase comparison
- Interface test
- Integrated self-test
- Indication via LED

**Phase comparison test unit**
**make Hachmann, type VisualPhase LCD**
as combined test unit (HR and LRM) for:
- Voltage detection with measured-value indication
- Interface test
- Low voltage detection
- Documentable repeat test
- Phase comparison with LED signal and measured-value indication
- Phase angle from $-180^\circ$ to $+180^\circ$
- Phase sequence evaluation
- Frequency quality
- Complete self-test
### Components

#### Indicating and measuring equipment

**Ready-for-service indication**

- **Components**
  - Gas pressure manometers with two or three signaling contacts for “gas pressure too low/very low” and “gas pressure too high” indication
  - Simple, visual check of the ready-for-service indicator by red/green indication areas
  - Indication of gas pressure also guaranteed without auxiliary voltage supply
  - SF₆ gas filling equipment with non-return valve and bolted protective cap arranged at the switchgear front beside gas pressure manometer
  - **Option:** Gas pressure manometers with temperature and pressure compensation.

**Low-voltage compartment**

- For accommodation of protection, control, measuring and metering equipment
- Partitioned safe-to-touch from the high-voltage part of the panel
- Low-voltage compartment can be removed, bus wires and control cables are plugged in
- **Option:** Higher low-voltage compartment (1200 mm instead of 850 mm) possible.

---

![Diagram of Gas monitoring of single-busbar switchgear 8DA10](image1.jpg)

Gas pressure manometer (1) for circuit-breaker housing (arranged at the panel front)

![Diagram of Gas monitoring for double-busbar switchgear 8DB10](image2.jpg)

Gas pressure manometers (3) for circuit-breaker and disconnector housings (arranged at the panel front)

Gas pressure manometers (2) for busbar housings (arranged at the lateral switchgear termination)

Gas pressure manometers (4) for busbar housings (arranged at the lateral switchgear termination)
Protecting, controlling and monitoring are the basic requirements placed on a complete bay controller across all technology generations. The properties the user expects from modern bay controllers are: multifunctionality, reliability, safety and communication capability. The increasing integration of many functions in one multifunctional device leads to an optimally supported engineering process, IT security, service and testability, or simple and safe operability of the devices and tools. On the following pages you will find functional descriptions for some selected devices. The low-voltage compartment can accommodate all customary protection, control, measuring and monitoring equipment available on the market:

### Overview of the device types of the SIPROTEC device series: SIPROTEC 5, SIPROTEC Compact and SIPROTEC 4

**SIPROTEC 5**

<table>
<thead>
<tr>
<th>Protection, control, measuring and monitoring equipment</th>
<th>7SJ82, 7SJ85</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overcurrent protection with PMU, control and power quality</td>
<td>7SA84, 7SA86, 7SA87</td>
</tr>
<tr>
<td>Distance protection with PMU and control</td>
<td>7SD84, 7SD86, 7SD87</td>
</tr>
<tr>
<td>Line differential protection with PMU and control</td>
<td>7SL86, 7SL87</td>
</tr>
<tr>
<td>Combined line differential and distance protection with PMU and control</td>
<td>7VK87</td>
</tr>
<tr>
<td>Circuit-breaker management device with PMU and control</td>
<td>7SJ86</td>
</tr>
<tr>
<td>Overcurrent protection for lines</td>
<td>7UT85, 7UT86, 7UT87</td>
</tr>
<tr>
<td>Transformer protection with PMU, control, monitoring</td>
<td>7SK82, 7SK85</td>
</tr>
<tr>
<td>Motor protection with PMU</td>
<td>7SS85</td>
</tr>
<tr>
<td>Central busbar protection</td>
<td>6MD85, 6MD86</td>
</tr>
<tr>
<td>Bay controllers for control/interlocking tasks with PMU and monitoring, optionally with protection functions</td>
<td>7KE85</td>
</tr>
</tbody>
</table>

**SIPROTEC Compact**

<table>
<thead>
<tr>
<th>Protection, control, measuring and monitoring equipment</th>
<th>7SJ80, 7SJ81</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overcurrent protection</td>
<td>7SK80, 7SK81</td>
</tr>
<tr>
<td>Motor protection</td>
<td>7SK80, 7SK81</td>
</tr>
<tr>
<td>Voltage and frequency protection</td>
<td>7RW80</td>
</tr>
<tr>
<td>Line differential protection</td>
<td>7SD80</td>
</tr>
<tr>
<td>Distribution system controller</td>
<td>7SC80</td>
</tr>
</tbody>
</table>

**SIPROTEC 4**

<table>
<thead>
<tr>
<th>Protection, control, measuring and monitoring equipment</th>
<th>EASY 7SJ45/7SJ46</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overcurrent protection</td>
<td>7SJ600, 7SJ601, 7SJ602</td>
</tr>
<tr>
<td>Distance protection</td>
<td>7SJ61, 62, 63, 64</td>
</tr>
<tr>
<td>Line differential protection</td>
<td>7SD600, 7SD610</td>
</tr>
<tr>
<td>Transformer differential protection</td>
<td>7SD52, 53</td>
</tr>
<tr>
<td>Busbar protection</td>
<td>7UT612, 613, 63</td>
</tr>
<tr>
<td>Generator and motor protection</td>
<td>7UT612, 7UM62, 7VE6</td>
</tr>
<tr>
<td>Accessories for generator and motor protection</td>
<td>7UW50, 7XR, 3PP, 7KG61, 7XT, 4NC</td>
</tr>
<tr>
<td>Rapid changeover device</td>
<td>7VU683</td>
</tr>
<tr>
<td>Bay controllers</td>
<td>6MD61, 6MD63</td>
</tr>
<tr>
<td>U/f relay</td>
<td>6MD662, 663, 664</td>
</tr>
<tr>
<td>Transformer earth-fault relay</td>
<td>6MB525</td>
</tr>
<tr>
<td>Breaker failure protection</td>
<td>7RW600</td>
</tr>
<tr>
<td>Automatic reclosing, synchrocheck</td>
<td>7SK600</td>
</tr>
<tr>
<td>High-impedance protection</td>
<td>7VK61</td>
</tr>
<tr>
<td>Automatic reclosing, synchrocheck</td>
<td>7VK61</td>
</tr>
<tr>
<td>High-impedance protection</td>
<td>7VH60</td>
</tr>
</tbody>
</table>
Components

ANSI design

Panel design
- Factory-assembled, type-tested according to IEC 62271
- Single-pole metal-enclosed, metal-clad
- Hermetically bolted switchgear housings made of corrosion-resistant aluminum alloy
- Switchpanel poles arranged one behind the other
- Maintenance-free in an indoor environment (IEC 62271-1)
- Cable connection with inside-cone plug-in system according to EN 50181
- Wall-standing or free-standing arrangement
- Subframe, front cover, rear cover and end walls powder-coated in color “light basic” (SN 700)
- Low-voltage compartment removable, plug-in bus wires
- Degree of protection
  - IP 65 for all high-voltage parts of the primary circuit
  - IP 3XD for the switchgear enclosure
- Option: IP 31D for the switchgear enclosure
- Option: IP 41 for the low-voltage compartment
- Vacuum circuit-breaker
- Three-position disconnector for disconnecting and earthing by means of the circuit-breaker
- Make-proof earthing by means of the vacuum circuit-breaker
- Option: Three-position disconnector for disconnecting and earthing at the feeder
- For further dimensions and product range, see pages 14 to 35.

Insulating system
- Switchgear housing filled with SF₆ gas
- Features of SF₆ gas:
  - Non-toxic
  - Odorless and colorless
  - Non-inflammable
  - Chemically neutral
  - Heavier than air
  - Electronegative (high-quality insulator)
- Pressure of the SF₆ gas in the switchgear housing dependent on the electrical ratings (relative pressure at 20 °C):
  - Rated filling level: 70 kPa to 120 kPa
  - Gas leakage rate: < 0.1 % per year.

Camera system
- Camera system for visual monitoring of the switch positions of the disconnectors and earthing switches (see also page 58).

UL certification
- For 8DA and 8DB ANSI design options there is a UL or cUL certificate available.
## Components

### ANSI design

#### Electrical data, filling pressure, temperature for single-busbar and double-busbar switchgear according to ANSI

<table>
<thead>
<tr>
<th>Common electrical data, filling pressure and temperature</th>
<th>Rated insulation level</th>
<th>Rated voltage ( U_r ) kV</th>
<th>4.76</th>
<th>8.25</th>
<th>15</th>
<th>27</th>
<th>38</th>
<th>40.5 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rated short-duration power-frequency withstand voltage ( U_{pf} ):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>– phase-to-earth, open contact gap – across the isolating distance</td>
<td>kV</td>
<td>19</td>
<td>36</td>
<td>36</td>
<td>70</td>
<td>80</td>
<td>80</td>
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<tr>
<td></td>
<td>Rated lightning impulse withstand voltage ( U_{li} ):</td>
<td></td>
<td>21</td>
<td>40</td>
<td>40</td>
<td>80</td>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td></td>
<td>– phase-to-earth, open contact gap – across the isolating distance</td>
<td>kV</td>
<td>60</td>
<td>95</td>
<td>105</td>
<td>125</td>
<td>200</td>
<td>200</td>
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<tr>
<td></td>
<td>Rated frequency ( f_r ) Hz</td>
<td></td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
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</tr>
<tr>
<td></td>
<td>Rated normal current ( I_{nr} ) for the busbar 2)</td>
<td>A</td>
<td>1250</td>
<td>1250</td>
<td>1250</td>
<td>1250</td>
<td>1250</td>
<td>1250</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>3150</td>
<td>3150</td>
<td>3150</td>
<td>3150</td>
<td>3150</td>
<td>3150</td>
<td>3150</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>4000</td>
<td>4000</td>
<td>4000</td>
<td>4000</td>
<td>4000</td>
<td>4000</td>
<td>4000</td>
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<tr>
<td></td>
<td>A</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
</tr>
<tr>
<td></td>
<td>Rated filling level ( p_{re} ) for the busbar</td>
<td></td>
<td>700/120 kPa at 20 °C</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Minimum functional level ( p_{me} )</td>
<td></td>
<td>50/100 kPa at 20 °C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ambient air temperature</td>
<td></td>
<td>–5 °C to +55 °C</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

#### Data of the switchgear panels

<table>
<thead>
<tr>
<th>Circuit-breaker panel, disconnector panel 3), bus sectionalizer 4), bus coupler 5)</th>
<th>Rated normal current ( I_{nr} ) 6)</th>
<th>A</th>
<th>1250</th>
<th>1250</th>
<th>1250</th>
<th>1250</th>
<th>1250</th>
<th>1250</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>1600</td>
<td>1600</td>
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<td>A</td>
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<td>4000</td>
<td>4000</td>
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<td>4000</td>
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<td>4000</td>
<td>4000</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
</tr>
<tr>
<td></td>
<td>Rated short-time withstand current ( l_s ) ( t_s = 3 ) s ( \text{up to} ) kA</td>
<td>A</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>Rated peak withstand current ( I_p ) ( \text{up to} ) kA</td>
<td>A</td>
<td>104</td>
<td>104</td>
<td>104</td>
<td>104</td>
<td>104</td>
<td>104</td>
</tr>
<tr>
<td></td>
<td>Rated short-circuit making current ( I_{ma} ) ( \text{up to} ) kA</td>
<td>A</td>
<td>104</td>
<td>104</td>
<td>104</td>
<td>104</td>
<td>104</td>
<td>104</td>
</tr>
<tr>
<td></td>
<td>Rated short-circuit breaking current ( I_{sc} ) ( \text{up to} ) kA</td>
<td>A</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>Electrical endurance of vacuum circuit-breakers at rated normal current</td>
<td>10,000 operating cycles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>at rated short-circuit breaking current</td>
<td>50 breaking operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rated filling level ( p_{re} ) for feeders</td>
<td>70/120 kPa at 20 °C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Minimum functional level ( p_{me} )</td>
<td>50/100 kPa at 20 °C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) Higher values of the rated voltage available with 42 kV
2) Rated normal current of the busbar with UL certification up to 4000 A
3) Disconnector panel available for single-busbar switchgear 8DA10
4) Bus sectionalizer not available for rated normal current 1600 A
5) Bus coupler available for double-busbar switchgear 8DB10
6) Maximum permissible normal current dependent on ambient air temperature
Components

ANSI design

Camera system
8DA and 8DB switchgear can be designed according to ANSI requirements. For this purpose, every three-position disconnector is equipped with a digital camera monitoring system. The CLOSED - OPEN - EARTHED positions are transmitted per phase through a USB / Firewire interface and signaled to the “Siemens Disconnector Tool (SDT)” software on a mobile computer.

Current transformer features
• Designed as ring-core current transformers, single-pole
• Free of dielectrically stressed cast-resin parts (due to design)
• Inductive type
• Climate-independent
• Secondary connection by means of a terminal strip in the low-voltage compartment of the panel
• Cast-resin insulated.

Voltage transformer features
• Single-pole, plug-in design
• Connection system with plug-in contact according to EN 50181
• Inductive type
• Safe-to-touch due to metal enclosure
• Climate-independent
• Secondary connection by means of plugs in the low-voltage compartment of the panel
• Cast-resin insulated.

Installation
• Arranged outside the primary enclosure (switchgear housing).

Internal arc classification
• Internal arcing test according to IEEE Std C37.20.7™-2007 (see also page 13).

Current transformer installation (basic scheme)
C1 Feeder current transformer (type 4MC4_90)
D Feeder current transformer (type 4MC4_10)
E Busbar current transformer (type 4MC4_40)

Option:
A Feeder current transformer between circuit-breaker and three-position disconnector on the busbar (type 4MC4_40)

Voltage transformer installation (basic scheme)
1 Busbar voltage transformer GBEA with primary fuses and three-position disconnector
2 Feeder voltage transformer GBEI with primary fuses (not in the panel, connection via flexible cable with plug size S2 at the panel connection housing and metal-enclosed voltage transformer)

USB and Firewire interface for visual monitoring of the positions of the three-position disconnector
Option:
In accordance with ANSI requirements, 8DA and 8DB switchgear can be equipped with an additional three-position disconnector at the feeder.

Features
- Rated normal currents up to 2000 A
- Up to 2000 operating cycles for the disconnector
- Up to 1000 operating cycles for the earthing switch
- Operating shaft and disconnector contacts with common center of rotation and reliable switch position up to the operating front of the panel
- Gas-tight bushings separate the busbar and circuit-breaker housings underneath the busbar disconnector contacts
- Cable connection and circuit-breaker housings can be removed without interrupting busbar operation
- Maintenance-free.

Switch positions
- CLOSED, OPEN, EARTHED or READY-TO-EARTH
- CLOSED: Disconnector contact connected with the busbar: Main circuit closed between busbar, circuit-breaker and feeder
- OPEN: Main circuit open between busbar, circuit-breaker and feeder: Test voltages for isolating distances are withstood
- READY-TO-EARTH: Contact blades connected with the earthing contact
- EARTHED: Circuit-breaker closed. Three-position disconnector at the feeder connected with earthing contact.

Operating mechanism
- Only permissible operations possible due to logical mechanical interlocks
- Mechanically coupled position indicators
- Separate operating shafts for the “DISCONNECTING”, “EARTHING” and “READY-TO-EARTH” functions
- With manual operating mechanism
- Option: With motor operating mechanism
  Motor rating at
  24 V to 250 V DC: max. 100 W
  110 V to 240 V AC: max. 130 VA
- Same sense of rotation for the switching operations of the “CLOSE” or “OPEN” functions.
Standards
Standards, specifications, guidelines

Type of service location
The switchgear can be used as indoor installation according to IEC 61936 (Power installations exceeding 1 kV AC)
- Outside lockable electrical service locations at places which are not accessible to the public. Enclosures of switchgear can only be removed with tools
- In lockable electrical service locations. A lockable electrical service location is a place outdoors or indoors that is reserved exclusively for housing electrical equipment and which is kept under lock and key. Access is restricted to authorized personnel and persons who have been properly instructed in electrical engineering. Untrained or unskilled persons may only enter under the supervision of authorized personnel or properly instructed persons.

Terms
“Make-proof earthing switches” are earthing switches with short-circuit making capacity according to IEC 62271-102 and EN 62271-102.

Dielectric strength
- The dielectric strength is verified by testing the switchgear with rated values of short-duration power-frequency withstand voltage and lightning impulse withstand voltage according to IEC 62271-1 (see table “Dielectric strength”).
- The rated values are referred to sea level and to normal atmospheric conditions (1013 hPa, 20 °C, 11g/m3 humidity according to IEC 60071).

Standards
8DA and 8DB switchgear complies with the relevant standards and specifications applicable at the time of type tests.
In accordance with the harmonization agreement reached by the countries of the European Union, their national specifications conform to the IEC standard.

Overview of standards (February 2014)

<table>
<thead>
<tr>
<th>Standards, specifications, guidelines</th>
<th>IEC standard</th>
<th>VDE standard</th>
<th>EN standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switchgear</td>
<td>8DA and 8DB</td>
<td>IEC 62271-1</td>
<td>VDE 0671-1</td>
</tr>
<tr>
<td></td>
<td>IEC 62271-200</td>
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<td>EN 62271-200</td>
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<tr>
<td>Devices</td>
<td>Circuit-breakers</td>
<td>IEC 62271-100</td>
<td>VDE 0671-100</td>
</tr>
<tr>
<td></td>
<td>Disconnectors and earthing switches</td>
<td>IEC 62271-102</td>
<td>VDE 0671-102</td>
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<tr>
<td></td>
<td>Voltage detecting systems</td>
<td>IEC 61243-5</td>
<td>VDE 0682-415</td>
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<tr>
<td>Degree of protection</td>
<td>IP code</td>
<td>IEC 60529</td>
<td>VDE 0470-1</td>
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<td></td>
<td>IK code</td>
<td>IEC 62262</td>
<td>VDE 0470-100</td>
</tr>
<tr>
<td>Insulation</td>
<td>–</td>
<td>IEC 60071</td>
<td>VDE 0111</td>
</tr>
<tr>
<td>Instrument transformers</td>
<td>–</td>
<td>IEC 61869-1</td>
<td>VDE 0414-9-1</td>
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<td></td>
<td>Current transformers</td>
<td>IEC 61869-2</td>
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<td>IEC 61869-3</td>
<td>VDE 0414-9-3</td>
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<td>Installation, erection</td>
<td>–</td>
<td>IEC 61936-1</td>
<td>VDE 0101</td>
</tr>
<tr>
<td>Insulating gas SF6</td>
<td>Use and handling of SF6</td>
<td>IEC 62271-4</td>
<td>VDE 0671-4</td>
</tr>
<tr>
<td></td>
<td>Specification for new SF6</td>
<td>IEC 60376</td>
<td>VDE 0373-1</td>
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<td></td>
<td>Guidelines for the checking and treatment of SF6 taken from electrical equipment</td>
<td>IEC 60480</td>
<td>VDE 0373-2</td>
</tr>
</tbody>
</table>

Overview of standards for traction applications

| Standards, specifications, guidelines | IEC standard | – | EN standard |
| Supply voltage                        | 8DA11 and 8DA12 | IEC 60850 | VDE 0115-102 | EN 50163 |
| Switchgear                            | 8DA11 and 8DA12 | IEC 62505 | VDE 0115-320 | EN 50152 |
| Insulation                            | 8DA11 and 8DA12 | – | VDE 0115-107 | EN 50124 |

Table – Dielectric strength
Single-busbar and double-busbar switchgear 8DA10 and 8DB10

<table>
<thead>
<tr>
<th>Rated voltage</th>
<th>kV</th>
<th>12</th>
<th>24</th>
<th>36</th>
<th>40.5</th>
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<td>– Between phase and earth</td>
<td>kV</td>
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<td>70</td>
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<td>kV</td>
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<td>Rated lightning impulse withstand voltage</td>
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<td>kV</td>
<td>75</td>
<td>125</td>
<td>170</td>
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<td>– Across isolating distance</td>
<td>kV</td>
<td>85</td>
<td>145</td>
<td>195</td>
</tr>
</tbody>
</table>

Table – Dielectric strength
Traction power supply switchgear 8DA11/12

| Rated voltage according to EN 50124-1 | kV | 17.5 | 27.5 |
| Nominal voltage according to IEC 60850/EN 50163 | kV | 15 | 25 |
| Rated short-duration power-frequency withstand voltage | – Between phase and earth | kV | 50 | 95 |
|               | – Across isolating distance | kV | 60 | 110 |
| Rated lightning impulse withstand voltage | – Between phase and earth | kV | 125 | 200 |
|               | – Across isolating distance | kV | 145 | 220 |

Table – Dielectric strength
Use and handling of SF6

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Specification for new SF6

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</table>
Current carrying capacity

• According to IEC 62271-200 or IEC 62271-1, the rated normal current refers to the following ambient air temperatures:
  – Maximum of 24-hour mean  + 35 °C
  – Maximum  + 40 °C

• The current carrying capacity of the panels and busbars depends on the ambient air temperature outside the enclosure.

Internal arc classifications

• Protection of operating personnel by means of tests for verifying the internal arc classification
  • Internal arcing tests must be performed in accordance with IEC 62271-200 and IEEE Std C37.20.7™-2007

• Definition of criteria according to IEC:
  – Criterion 1
    Correctly secured doors and covers do not open, limited deformations are accepted
  – Criterion 2
    No fragmentation of the enclosure, no projection of small parts above 60 g
  – Criterion 3
    No holes in accessible sides up to a height of 2 m
  – Criterion 4
    No ignition of indicators due to hot gases
  – Criterion 5
    The enclosure remains connected to its earthing point.

Resistance to internal faults

Due to the single-pole enclosure and the SF₆ insulation of the switchgear and the switching devices, the possibility of faults in SF₆-insulated switchgear is a mere fraction of that typical of other switchgear types:

• There are no effects due to external influences, such as:
  – Pollution layers
  – Humidity
  – Small animals and foreign objects
  – Maloperation is practically excluded due to logical arrangement of operating elements
  – Short-circuit-proof feeder earthing by means of the circuit-breaker.

In the unlikely event of a fault within the switchgear housing, the energy conversion in the case of an internal arc fault is minor thanks to the SF₆ insulation and the shorter length of the arc, approximately only ⅓ of the converted energy of an arc in air insulation.

Resistance to short circuits and earth faults

Two-phase and three-phase short circuits between the primary conductors are excluded by the single-pole primary enclosure.

Seismic withstand capability (optional)

8DA and 8DB switchgear can be upgraded for regions at risk from earthquakes.

For upgrading, earthquake qualification testing has been carried out in accordance with the following standards:

• IEC 60068-2-6 “Test Fc: Vibration (sinusoidal)"
• IEEE 693-2005 “Recommended Practice for Seismic Design of Substations”
• IEEE 344-2004 “IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations”
• IEC 60980-1989 "Recommended practices for seismic qualification of electrical equipment of the safety system for nuclear generating stations”.

For installation on even and rigid concrete or steel structure (without considering building influences), the tested ground accelerations meet the following requirements:

• Uniform Building Code 1997 (UBC) – Zone 4
• California Building Code 1998 (CBC) – Zone 4
• International Building Code 2006 (IBC) - 200 %
• American Society of Civil Engineers 2005 (ASCE) - 200 %
• IEEE 693-2005 – High required response spectrum (Figure A.1).

Color of the panel front

Siemens standard (SN) 47 030 G1, color “light basic” (SN700) (similar to RAL 7047 / gray).

Climate and environmental influences

8DA and 8DB switchgear is completely enclosed and insensitive to climatic influences.

• All medium-voltage devices are installed in gas-tight and bolted switchgear housings made of corrosion-resistant aluminum alloy and filled with SF₆ gas
• Live parts inside and outside the switchgear housing are provided with single-pole enclosure
• At no point can creepage currents flow from high-voltage potentials to earth
• Operating mechanism parts which are functionally important are made of corrosion-resistant materials
• Bearings in the operating mechanism are designed as dry-type bearings and do not require lubrication.

Protection against solid foreign objects, electric shock and water

8DA and 8D8 switchgear fulfills according to the standards

| IEC 62271-1 | EN 62271-1 |
| IEC 62271-200 | EN 62271-200 |
| IEC 60529 | EN 60529 |
| IEC 62262 | EN 50102 |

the following degrees of protection:

<table>
<thead>
<tr>
<th>Degree of protection</th>
<th>Type of protection</th>
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</thead>
<tbody>
<tr>
<td>IP 65</td>
<td>for parts of the primary circuit under high voltage</td>
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<tr>
<td>IP 3XD</td>
<td>for switchgear enclosure</td>
</tr>
<tr>
<td>IP 31D</td>
<td>for switchgear enclosure (optional)</td>
</tr>
<tr>
<td>IP 41</td>
<td>for low-voltage compartment (optional)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Degree of protection</th>
<th>Type of protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>IK 07</td>
<td>for switchgear enclosure</td>
</tr>
</tbody>
</table>
Up to now, more than 80,000 8DA and 8DB switchgear panels successfully in operation worldwide.