Medium-Voltage Switchgear

Type 8DA Extendable Fixed-Mounted Circuit-Breaker Switchgear up to 40.5 kV
Single Busbar, Single-Pole Metal-Enclosed, Metal-Clad, Gas-Insulated

Order No.: 861-9272.9
Revision: 03
Issue: 01-03-2006
About these Instructions

These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation or operation.

Should further information be desired or should particular problems arise which are not covered sufficiently by these instructions, the matter should be referred to the local Siemens Service Centre.

The contents of this instruction manual shall not become part of or modify any prior or existing agreement, commitment or relationship. The Sales Contract contains the entire obligations of Siemens. The warranty contained in the contract between the parties is the sole warranty of Siemens. Any statements contained herein do not create new warranties or modify the existing warranty.

To connect or install devices from other manufacturer’s, the associated user information and ratings have to be considered.

If you want to make suggestions for improvement of these instructions, or if there is something you do not understand, please contact the address given below:

Division PTD M2.
Siemens Aktiengesellschaft
Power Transmission and Distribution
Carl-Benz-Str. 22
D-60386 Frankfurt
Germany

Subject to modifications.
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<td>25.6 Cleaning agents and cleaning aids</td>
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<tr>
<td>25.8 Switchgear extension and replacement of panels and components</td>
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<td>25.10 Service life and disposal</td>
<td>63</td>
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</tbody>
</table>
Safety instructions

1  Signal terms and definitions

<table>
<thead>
<tr>
<th>DANGER!</th>
<th>as used in these instructions, this means that personal injuries can occur if the relevant precautionary measures are not taken.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>➞ Observe the safety instructions.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ATTENTION!</th>
<th>as used in these instructions, this means that damage to property or environment can occur if the relevant precautionary measures are not taken.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>➞ Observe the safety instructions.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NOTE!</th>
<th>as used in these instructions, this points at facilitations of work, particularities for operation or possible maloperation.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>➞ Observe the notes.</td>
</tr>
</tbody>
</table>

Symbols used

- ➞ Operation symbol: Identifies an operation. Asks the operator to perform an operation.
- ✔ Result symbol: Identifies the result of an operation.

2  General instructions

Independently of the safety instructions given in these operating instructions, the local laws, ordinances, guidelines and standards for operation of electrical equipment as well as for labour, health and environmental protection apply.

The Five Safety Rules of Electrical Engineering must generally be observed during operation of the products and components described in these operating instructions:

- Isolating.
- Securing against reclosing.
- Verifying safe isolation from supply.
- Earthing and short-circuiting.
- Covering or barrierig adjacent live parts.

3  Due application

The switchgear corresponds to the relevant laws, prescriptions and standards applicable at the time of delivery. If correctly used, they provide a high degree of safety by means of logical mechanical interlocks and shockproof metal enclosure of live parts.
4 Qualified personnel

Qualified personnel in accordance with these instructions are persons certified by the Switchgear Factory Frankfurt who are familiar with transport, installation, commissioning, maintenance and operation of the product and have appropriate qualifications for their work, e.g.:

- Training and instruction or authorisation to switch on, switch off, earth and identify power circuits and equipment / systems as per the relevant safety standards.
- Training and instruction about the relevant safety standards and the use of appropriate safety equipment.
- Training in first aid and behaviour in the event of possible accidents.

DANGER!
The perfect and safe operation of this switchgear is conditional on:

- Observance of operating and installation instructions.
- Qualified personnel.
- Proper transportation and correct storage of the switchgear.
- Correct installation and commissioning.
- Diligent operation and maintenance.
- Observance of the instructions applicable at site for installation, operation and safety.
Description

5 Application and typical uses

Extendable fixed-mounted circuit-breaker switchgear of the 8DA series is mainly used in transformer and distribution substations as well as for switching duties in industrial plants and railways systems.

The panels are designed for rated voltages up to 40.5 kV and rated currents up to 2500 A. They are suitable for a maximum permissible rated short-circuit current of 100 kA and a maximum short-circuit breaking current of 40 kA.

6 Features

The fixed-mounted circuit-breaker switchgear of the 8DA series has the following features:

- Factory-assembled, type-tested, metal-enclosed and metal-clad switchgear for indoor installations
- SF₆-gas
- Safe-to-touch connection systems for cables as well as for solid-insulated and SF₆-gas insulated bar
- Single-pole metal enclosure
- Minimum fire load
- Maintenance-free
- Complete switchgear interlocking system with logical mechanical interlocks
- Primary part independent of environmental effects (pollution, humidity and small animals) due to hermetically sealed enclosure

This provides:

- Maximum personal safety
- Maximum security of operation

7 Type classification

The following table shows the different types of the 8DA series.
8 Circuit-breaker panel

8.1 Function
The circuit-breaker panel is the basic panel type of the 8DA series. The circuit-breaker panel can fulfil the function "incoming feeder" or "outgoing feeder". It can carry or switch all rated busbar and feeder currents as well as the short-circuit currents quoted on the respective rating plates.

8.2 Frame
- Support for switchpanel poles and switchgear front
- Forms the cable connection compartment

8.3 Low-voltage compartment
- For accommodation of protection, control, measuring and metering equipment
- With plug-in cables of the circuit-breaker and three-position disconnector operating mechanisms on C-profile, with screw-type connections for the incoming and outgoing cables (e.g. bus wires)
- Devices can be optionally mounted in the door or on mounting plates inside the low-voltage compartment
8.4 Switchpanel pole

- Poles arranged one behind the other.

- One switchpanel pole consists of a vertically arranged housing with a vacuum interrupter inside.

- The busbar housing with the three-position disconnector inside is arranged horizontally over the switchpanel pole.
8.5 Switchpanel

The vacuum circuit-breaker 3AH49 is an integral component of the switchpanel and consists of the following components:

- Operating mechanism with stored-energy spring mechanism and control elements
- Switching rods for contact operation
- 1 to 3 switchpanel poles with vacuum interrupters

9 Circuit-breaker

9.1 Design

The vacuum circuit-breaker 3AH49 is an integral component of the switchpanel and consists of the following components:

- Operating mechanism with stored-energy spring mechanism and control elements
- Switching rods for contact operation
- 1 to 3 switchpanel poles with vacuum interrupters

**Mechanical interlock**

The circuit-breaker and the three-position disconnector are mechanically interlocked against each other. The mechanical interlock prevents the circuit-breaker from being closed as long as the three-position disconnector is not in a defined end position (CLOSED/OPEN). Furthermore, the mechanical interlock prevents the three-position disconnector from being operated while the circuit-breaker is closed.
Vacuum interrupters

The vacuum interrupter is fixed at the connecting piece of the circuit-breaker pole. The fixed contact (4) is directly connected to the housing. The moving contact (3) is firmly connected to the connection bolt (1) and is centrally aligned in the guide. The metal bellows (2) inside the interrupter forms the vacuum-tight connection to the gas compartment.

Fig. 5: Sectional view of a vacuum interrupter
9.2 Operating mechanism box

Design The operating mechanism box is closed with a removable front plate. In front plate there are openings for the control elements and indicators. The operating mechanism box accommodates all components required to operate the circuit-breaker.
Function Depending on its design, the circuit-breaker is closed electrically or mechanically with the ON pushbutton. The operating power is transmitted to the vacuum interrupters through an operating linkage. The closing spring is immediately recharged by the motor after closing.

If the motor supply voltage fails, the closing spring can be charged manually. To do this, there is an opening in the removable front plate with the hand crank coupling of the gear behind. The charging condition of the spring can be read on the indicator.

10 Three-position disconnector

Function The three-position disconnector combines the functions of a disconnector and an earthing switch. It is designed for no-load operation only.
Fig. 8: Three-position disconnector with busbar and bushing

1. Fixed contact, CLOSED position
2. Busbar housing
3. Busbar
4. Busbar support
5. Fixed contact, READY-TO-EARTH position
6. Bushing
7. Moving contact, READY-TO-EARTH position
8. Moving contact, CLOSED position
9. Moving contact, OPEN position
Switch positions

<table>
<thead>
<tr>
<th>Switch positions</th>
<th>Switch position indicator</th>
<th>Basic scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPEN</td>
<td><img src="image1" alt="Diagram" /></td>
<td><img src="image2" alt="Diagram" /></td>
</tr>
<tr>
<td>CLOSED</td>
<td><img src="image3" alt="Diagram" /></td>
<td><img src="image4" alt="Diagram" /></td>
</tr>
<tr>
<td>READY-TO-EARTH</td>
<td><img src="image5" alt="Diagram" /></td>
<td><img src="image6" alt="Diagram" /></td>
</tr>
<tr>
<td>EARTHED</td>
<td><img src="image7" alt="Diagram" /></td>
<td><img src="image8" alt="Diagram" /></td>
</tr>
</tbody>
</table>

**Description**

- Three-position disconnector OPEN - Circuit-breaker OPEN
- Three-position disconnector CLOSED - Circuit-breaker CLOSED
- Three-position disconnector READY-TO-EARTH - Circuit-breaker OPEN
- Three-position disconnector EARTHED - Circuit-breaker CLOSED
11 Current and voltage transformers

11.1 Voltage transformers

Features
- According to IEC 60 044-2 (for railway applications, EN 50152-3-3)
- Cast-resin insulated
- Inductive operation
- Safe-to-touch due to metal coating (safe-to-touch by means of an additional cover)
- Safe-to-touch due to metal enclosure

Option:
- Designed as low-power voltage transformer (resistor divider):
  - According to IEC 60 044-7
  - Mounted over the panel connection as flange dividers, or pluggable in any free socket as an inside-cone plug-in system
  - Suitable for all protection and measuring functions
  - No ferroresonance possible anymore
  - No disconnection for switchgear or cable tests
  - Resistant against transient overvoltages
  - Extended voltage measuring range from 0.4 to 1.2 times rated voltage
  - High reliability and availability
  - Short-circuit-proof
  - Rating-independent wiring
  - System-conformity to numerical secondary systems

Voltage transformer types

<table>
<thead>
<tr>
<th>Mounting locations</th>
<th>Type</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Busbar</td>
<td>4MT3</td>
<td>optionally with voltage transformer disconnector</td>
</tr>
<tr>
<td></td>
<td>4MU1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4MT6</td>
<td></td>
</tr>
<tr>
<td>Panel connection</td>
<td>4MU32</td>
<td>external</td>
</tr>
<tr>
<td></td>
<td>4MU34</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4MU36</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4MT72</td>
<td>directly pluggable</td>
</tr>
<tr>
<td></td>
<td>4MT74</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4MT76</td>
<td></td>
</tr>
</tbody>
</table>

11.2 Current transformers

Features
- According to IEC 60 044-1 (EN 50152-3-2 for railway applications)
- Designed as ring-core current transformers:
  - Ring core as carrier of secondary winding
  - Main circuit corresponds to primary winding

- Arranged outside the primary enclosure (switchgear housing) due to single-pole design of the panel
- Free of dielectrically stressed cast-resin parts (due to design)

Mounting locations
- On the busbar
- On the circuit-breaker housing
- At the panel connection
- On the cable
12 Gas compartments

Function

The distribution of the gas compartments is decisive for the feasibility of work during operation and the resulting operational restrictions. Thus, in case of fault, the distribution of the gas compartments determines the extent of work. The following example shows the distribution of the gas compartments in a single-pole insulated switchgear with the associated gas weights and gas compartment volumes required to reorder SF₆-gas. As for data to other configurations please contact your local Siemens representative.

Fig. 9: Example of a panel combination. Gas compartments with identical numbers are interconnected.

<table>
<thead>
<tr>
<th>Gas compartment</th>
<th>SF₆-gas weight per panel at rated operating pressure (relative) and 20 °C ambient temperature</th>
<th>Gas compartment volume</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Left end panel / intermediate panel (right end panel)</td>
<td>Left end panel / intermediate panel (right end panel)</td>
</tr>
<tr>
<td>1</td>
<td>50 kPa 70 kPa 100 kPa 120 kPa</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0.9 kg - 1.1 kg 1.3 kg 94 l</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2.4 kg - 3.2 kg 3.5 kg 339 l</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0.9 kg - 1.2 kg 1.3 kg 96 l</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0.8 kg (0.7 kg) 0.9 kg (0.7 kg) - 1.2 kg (1.0 kg) 87 l (68 l)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0.9 kg (0.8 kg) 1.1 kg (0.8 kg) - 1.3 kg (1.1 kg) 97 l (78 l)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0.8 kg (0.8 kg) 0.9 kg (0.7 kg) - 1.1 kg (0.9 kg) 81 l (62 l)</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>0.9 kg (0.7 kg) 1.0 kg (0.8 kg) - 1.3 kg (1.0 kg) 92 l (73 l)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>1.0 kg (0.9 kg) 1.2 kg (1.0 kg) - 1.5 kg (1.2 kg) 107 l (88 l)</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>1.3 kg 1.5 kg - 1.9 kg 138 l</td>
<td></td>
</tr>
</tbody>
</table>
13 Panel connections

13.1 Overview
The fully insulated panel connections are available for cables with inside-cone plug-in system, or for solid-insulated or gas-insulated bars. Three different sizes of cable plugs are available, depending on the cable cross-section. Besides single connections, multiple connections for a maximum of six cables are possible, too. With multiple connections it is also possible to combine different interface types. Multiple connections for two cables can also be used to connect a voltage transformer (external or plug-in type) instead of the second cable.

13.2 Panel connection types

<table>
<thead>
<tr>
<th>Interface types</th>
<th>Inside cone cable plugs (Make Pfisterer, Type Connex)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface size</td>
<td>2</td>
</tr>
<tr>
<td>Capacitive voltage tap</td>
<td>no</td>
</tr>
<tr>
<td>Rated normal current (A)</td>
<td>800</td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage (kV)</td>
<td>200</td>
</tr>
<tr>
<td>Rated short-duration power-frequency withstand voltage (kV)</td>
<td>95</td>
</tr>
<tr>
<td>min. cable cross section (mm²)</td>
<td>25</td>
</tr>
<tr>
<td>min. Leiterdurchmesser (mm)</td>
<td>4,9</td>
</tr>
<tr>
<td>max. Querschnitt (mm²)</td>
<td>325</td>
</tr>
<tr>
<td>max. wire diameter (mm)</td>
<td>22,3</td>
</tr>
<tr>
<td>min. diameter incl. Insulation (mm)</td>
<td>13,5</td>
</tr>
<tr>
<td>max. diameter incl. Insulation (mm)</td>
<td>40,0</td>
</tr>
</tbody>
</table>
Examples

Fig. 10: Single cable connection, interface type 2

Fig. 11: Multiple cable connection with plug-in voltage transformer

Fig. 12: Single cable connection, interface type 3

Fig. 13: Connection for solid-insulated bar

Fig. 14: Single cable connection, interface type 4

Fig. 15: Connection for gas-insulated bar

1) Gas compartment sealed by the connection flange of the bar. Gas compartment is only filled at 10 kPa.

Description

1) Switchgear frame (upper part)
2) Panel connection housing, SF₆-insulated
3) Panel connection for inside-cone plug-in system
4) Switchgear frame (lower part)
5) Floor of switchgear room
6) Voltage transformer, plug-in type
7) Solid-insulated bar
8) Gas-insulated bar
## 14 Technical data

### 14.1 Electrical data

#### Complete switchgear

<table>
<thead>
<tr>
<th></th>
<th>8DA10</th>
<th>8DA11 / 8DA12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage (kV)</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>frequency (Hz)</td>
<td>50/60</td>
<td>50/60</td>
</tr>
<tr>
<td>short-duration power-frequency withstand voltage (kV)</td>
<td>28</td>
<td>50</td>
</tr>
<tr>
<td>lightning impulse withstand voltage (kV)</td>
<td>75</td>
<td>125</td>
</tr>
<tr>
<td>short-circuit breaking current (max. kA)</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>short-time withstand current 3s (max. kA)</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>short-circuit making current (max. kA)</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>peak withstand current (max. kA)</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>normal current of busbar (max. A)</td>
<td>3150</td>
<td>3150</td>
</tr>
<tr>
<td>normal current of feeders (max. A)</td>
<td>2000</td>
<td>2000</td>
</tr>
</tbody>
</table>

### 14.2 Three-position disconnector

<table>
<thead>
<tr>
<th></th>
<th>8DA10</th>
<th>8DA11 / 8DA12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage (kV)</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>short-duration power-frequency withstand voltage (kV)</td>
<td>32</td>
<td>60</td>
</tr>
<tr>
<td>lightning impulse withstand voltage (kV)</td>
<td>85</td>
<td>145</td>
</tr>
</tbody>
</table>

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14.3 Vacuum circuit-breaker

Switching times

<table>
<thead>
<tr>
<th>Switching times</th>
<th>Component</th>
<th>Duration</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closing time</td>
<td></td>
<td>95</td>
<td>ms</td>
</tr>
<tr>
<td>Charging time</td>
<td></td>
<td>&lt;15</td>
<td>s</td>
</tr>
<tr>
<td>Opening time</td>
<td>Shunt release</td>
<td>&lt;70</td>
<td>ms</td>
</tr>
<tr>
<td></td>
<td>Additional release 3AX</td>
<td>&lt;55</td>
<td>ms</td>
</tr>
<tr>
<td></td>
<td>(Y1) (Y2), (Y4), (Y7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arcing time</td>
<td></td>
<td>&lt;15</td>
<td>ms</td>
</tr>
<tr>
<td>Breaking time</td>
<td>Shunt release</td>
<td>&lt;85</td>
<td>ms</td>
</tr>
<tr>
<td></td>
<td>Additional release 3AX</td>
<td>&lt;70</td>
<td>ms</td>
</tr>
<tr>
<td></td>
<td>(Y1) (Y2), (Y4), (Y7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dead time</td>
<td></td>
<td>300</td>
<td>ms</td>
</tr>
<tr>
<td>Close-open contact time</td>
<td>Shunt release</td>
<td>&lt;90</td>
<td>ms</td>
</tr>
<tr>
<td></td>
<td>Additional release 3AX</td>
<td>&lt;70</td>
<td>ms</td>
</tr>
<tr>
<td></td>
<td>(Y1) (Y2), (Y4), (Y7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum command duration</td>
<td>CLOSE</td>
<td>45</td>
<td>ms</td>
</tr>
<tr>
<td></td>
<td>OPEN</td>
<td>40</td>
<td>ms</td>
</tr>
<tr>
<td></td>
<td>OPEN</td>
<td>20</td>
<td>ms</td>
</tr>
<tr>
<td>Short-time impulse duration of</td>
<td>1st shunt release</td>
<td>15</td>
<td>m</td>
</tr>
<tr>
<td>c.b. tripping signal</td>
<td>2nd/3rd shunt release</td>
<td>10</td>
<td>ms</td>
</tr>
</tbody>
</table>

Number of operating cycles

<table>
<thead>
<tr>
<th>Rated normal current</th>
<th>10 000 times</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-circuit breaking current</td>
<td>50 times</td>
</tr>
</tbody>
</table>

Closing time
The interval of time between the initiation (command) of the closing operation and the instant when the contacts touch in all poles.

Opening time
The interval of time between the initiation (command) of the opening operation and the instant when the contacts separate in all poles.

Arcing time
The interval of time from the first initiation of an arc and the instant of final arc extinction in all poles.

Breaking time
The interval of time between the initiation (command) of the opening operation and the instant of final arc extinction in the last quenching pole (= opening time and arcing time).

Close-open contact time
The interval of time - in a make-break operating cycle - between the instant when the contacts touch in the first pole in the closing process, and the instant when the contacts separate in all poles in the subsequent opening process.

Motor operating mechanism
The operating mechanisms of the 3AH vacuum circuit-breakers are suitable for auto-reclosing. For DC operation, the maximum power consumption is approx. 350 W. For AC operation, the maximum power consumption is approx. 400 VA.

The rated current of the motor protection equipment is shown in the following table:

<table>
<thead>
<tr>
<th>Rated supply voltage</th>
<th>Recommended rated current for the protection equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC 24</td>
<td>8</td>
</tr>
<tr>
<td>DC 48</td>
<td>6</td>
</tr>
<tr>
<td>DC 60</td>
<td>4</td>
</tr>
<tr>
<td>DC/AC 11050/60 Hz</td>
<td>2</td>
</tr>
<tr>
<td>DC 220/AC 23050/60 Hz</td>
<td>1.6</td>
</tr>
</tbody>
</table>

*) M.c.b. assembly type 8RL74 or m.c.b. with C-characteristic

The supply voltage may deviate from the rated supply voltage specified in the table by -15% to +10%.
The breaking capacity of the auxiliary switch 3SV92 is shown on the following tables:

<table>
<thead>
<tr>
<th>Breaking capacity</th>
<th>Operating voltage [V]</th>
<th>Normal current [A]</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC 40 to 60 Hz</td>
<td>up to 230</td>
<td></td>
</tr>
<tr>
<td>DC</td>
<td></td>
<td>Resistive load</td>
</tr>
<tr>
<td>24</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>48</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>60</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>110</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>220</td>
<td></td>
<td>2.5</td>
</tr>
</tbody>
</table>

**Closing solenoid (Y9)**

The closing solenoid 3AY1510 closes the circuit-breaker. After completion of a closing operation, the closing solenoid is de-energised internally. It is available for AC or DC voltage. Power consumption: 140 W or 140 VA.

**Shunt releases**

The shunt releases are used for automatic and deliberate tripping of circuit-breakers. They are designed for connection to external voltage (DC or AC voltage). In special cases, for deliberate tripping, they can also be connected to a voltage transformer.

Shunt releases based on two different principles are used:

- The **shunt release (Y1) 3AY1510** is used as standard in the basic circuit-breaker version. With this design, the circuit-breaker is opened electrically. Power consumption: 140 W or 140 VA.
- The **shunt release (Y2) 3AX1101** with energy store is fitted if more than one shunt release is required. With this design, the electrical opening command is transferred magnetically and thus, the circuit-breaker is opened. Power consumption: 70 W or 50 VA.

**Undervoltage release**

Undervoltage releases are tripped automatically through an electromagnet or deliberately. The deliberate tripping of the undervoltage release generally takes place via a NC contact in the tripping circuit or via a NO contact by short-circuiting the magnet coil. With this type of tripping, the short-circuit current is limited by the built-in resistors. Power consumption: 20 W or 20 VA.

**Circuit-breaker tripping signal**

When the circuit-breaker is tripped by a release (e.g. by protection tripping) there is a signal through the NO contact -S6. If the circuit-breaker is tripped deliberately with the mechanical pushbutton, this signal is suppressed by the NC contact -S7.

**C.t.-operated releases (Y6)**

The following c.t.-operated releases are available:

- The **c.t.-operated release 3AX1102** consists of an energy store, a latching mechanism and an electromagnetic system. Rated tripping current: 0.5 A/1 A
- The **c.t.-operated release 3AX1104** (low-energy release) is adequate for a tripping pulse of ≤ 0.1 Ws in connection with adequate protection systems. It is used if auxiliary voltage is missing, tripping via protection relay.

**Varistor module**

ATTENTION!

Switching overvoltages can damage electronic control devices.

⇒ Do not switch off inductive consumers in DC circuits.

With the varistor module 3AX1526, the inductances of the circuit-breaker operating mechanism and the circuit-breaker control system (motor, closing solenoid, shunt release and auxiliary contactor) can be operated with DC. The module limits the overvoltage to approx. 500 V and is available for rated operating voltages from 60 V (DC) up to 220 V (DC). It contains two separate varistor circuits.
14.4 Insulating gas SF\(_6\)

Sulphur hexafluoride SF\(_6\) according to IEC 60 376 is used as insulating gas. SF\(_6\) insulates live parts between each other and against earth potential.

Features
- Non-toxic
- Odourless
- Colourless
- Non-inflammable
- Chemically neutral
- Electronegative
- Heavier than air

Filling degree of the pressure gas cylinders

1.04 kg SF\(_6\) / litre cylinder volume (valid at a max. ambient temperature of + 65 °C).

Vapour pressure over liquid SF\(_6\)

In the supplied cylinders about 2/3 of the cylinder volume is liquid at + 20 °C, the rest is saturated SF\(_6\)-vapour.

Vapour pressure as a function of temperature

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Vapour pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ 20 °C</td>
<td>2100 kPa</td>
</tr>
<tr>
<td>+ 30 °C</td>
<td>2700 kPa</td>
</tr>
<tr>
<td>+ 65 °C</td>
<td>7000 kPa (test pressure of cylinder)</td>
</tr>
</tbody>
</table>

Transport regulations

According to Annex 1 of the European agreement about international transportation of hazardous materials on the road (ADR), Siemens SF\(_6\)-gas insulated medium-voltage switchgear do not belong to the category of hazardous materials in respect of transportation, and are exempted from special transport regulations according to ADR, Clause 1.1.3.1 b).

Storage

Store the cylinders in vertical position in a cool place

Gas pressures in kPa at 20°C

<table>
<thead>
<tr>
<th>Busbar housing</th>
<th>Rated feeder current [A] *</th>
<th>≤ 2500 *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated busbar current [A] *</td>
<td>≤ 2500</td>
<td>3150</td>
</tr>
<tr>
<td>Rated voltage [kV]</td>
<td>≤ 36</td>
<td>40.5</td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage [kV]</td>
<td>≤ 170</td>
<td>185</td>
</tr>
<tr>
<td>Rated short-duration power-frequency withstand voltage [kV]</td>
<td>≤ 70</td>
<td>85</td>
</tr>
<tr>
<td>Rated operating pressure [kPa]</td>
<td>50</td>
<td>70</td>
</tr>
<tr>
<td>Min. operating pressure [kPa]</td>
<td>30</td>
<td>50</td>
</tr>
<tr>
<td>Signal “pressure drops” [kPa]</td>
<td>30</td>
<td>50</td>
</tr>
<tr>
<td>Max. operating pressure [kPa]</td>
<td>90</td>
<td>120</td>
</tr>
<tr>
<td>Signal “pressure increases” [kPa]</td>
<td>90</td>
<td>120</td>
</tr>
</tbody>
</table>

All gas pressures are gauge pressures. The operating pressure depends on the temperature. The value can be corrected according to characteristics to suit the conditions at the place of installation.

* Rated feeder current 2500 A only possible for disconnector panels. All other panel types only up to 2000 A.
### Gas pressure - temperature characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value at 20°C</th>
<th>Characteristic</th>
<th>Value at 20°C</th>
<th>Characteristic</th>
<th>Value at 20°C</th>
<th>Characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>120 kPa</td>
<td>100 kPa</td>
<td>100 kPa</td>
<td>100 kPa</td>
<td>100 kPa</td>
<td>100 kPa</td>
<td>100 kPa</td>
</tr>
<tr>
<td>100 kPa</td>
<td>80 kPa</td>
<td>80 kPa</td>
<td>80 kPa</td>
<td>80 kPa</td>
<td>80 kPa</td>
<td>80 kPa</td>
</tr>
<tr>
<td>70 kPa</td>
<td>50 kPa</td>
<td>50 kPa</td>
<td>50 kPa</td>
<td>50 kPa</td>
<td>50 kPa</td>
<td>50 kPa</td>
</tr>
<tr>
<td>50 kPa</td>
<td>30 kPa</td>
<td>30 kPa</td>
<td>30 kPa</td>
<td>30 kPa</td>
<td>30 kPa</td>
<td>30 kPa</td>
</tr>
</tbody>
</table>

All gas pressures are gauge pressures. The operating pressure depends on the temperature. The value can be corrected according to characteristics to suit the conditions at the place of installation.

* Rated feeder current 2500 A only possible for disconnector panels. All other panel types only up to 2000 A.

---

**Fig. 16: Characteristics of gas pressure as a function of temperature**

**Example for 20°C**

<table>
<thead>
<tr>
<th>Rated operating pressure**</th>
<th>Min. operating pressure</th>
<th>Signal &quot;pressure drops&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value at 20°C</td>
<td>Characteristic</td>
<td>Value at 20°C</td>
</tr>
<tr>
<td>120 kPa</td>
<td>No. 1</td>
<td>100 kPa</td>
</tr>
<tr>
<td>100 kPa</td>
<td>No. 4</td>
<td>80 kPa</td>
</tr>
<tr>
<td>70 kPa</td>
<td>No. 7</td>
<td>50 kPa</td>
</tr>
<tr>
<td>50 kPa</td>
<td>No. 10</td>
<td>30 kPa</td>
</tr>
</tbody>
</table>

Characteristic 1 = Characteristic 11, Characteristic 4 = Characteristic 8** Permissible deviation 10 kPa
14.5 Protection against ingress of solid foreign bodies, electric shock and water

The fixed-mounted circuit-breaker switchgear of the 8DA series complies with the following degrees of protection according to IEC 60529:

- IP3XD for external enclosure
- IP65 for parts under high voltage

<table>
<thead>
<tr>
<th>Degree of protection</th>
<th>Type of protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP3XD</td>
<td><strong>Protection against ingress of solid foreign bodies:</strong> Protected against ingress of solid foreign bodies, diameter ≥2.5 mm.</td>
</tr>
<tr>
<td></td>
<td><strong>Protection against ingress of water:</strong> No specification.</td>
</tr>
<tr>
<td></td>
<td><strong>Protection against electric shock:</strong> Protected against access to hazardous parts with a wire (test probe with diameter 1 mm, length 100 mm, must be sufficiently clear of hazardous parts).</td>
</tr>
<tr>
<td>IP65</td>
<td><strong>Protection against ingress of solid foreign bodies:</strong> Dust-tight, protection against ingress of dust.</td>
</tr>
<tr>
<td></td>
<td><strong>Protection against ingress of water:</strong> Protected against water jets; water directed against the enclosure from any direction in the form of a jet must not have any harmful effect.</td>
</tr>
<tr>
<td></td>
<td><strong>Protection against electric shock:</strong> Protected against access to hazardous parts: Wire (test probe with diameter 1 mm) must not be allowed to ingress.</td>
</tr>
</tbody>
</table>

14.6 Basic prescriptions and standards

The fixed-mounted circuit-breaker switchgear 8DA10 for indoor installation complies with the following prescriptions and standards:

<table>
<thead>
<tr>
<th>Description</th>
<th>IEC/EN Standard</th>
<th>VDE Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switchgear</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switching devices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circuit-breaker</td>
<td>82 271-200</td>
<td>0671-200</td>
</tr>
<tr>
<td>Disconnector/earthing switch</td>
<td>82 271-100</td>
<td>0671-100</td>
</tr>
<tr>
<td>Switch-disconnector</td>
<td>62 271-102</td>
<td>0671-102</td>
</tr>
<tr>
<td>Switch-disconnector/fuse combination</td>
<td>62 271-105</td>
<td>0671-105</td>
</tr>
<tr>
<td>Voltage detection systems</td>
<td>81 243-5</td>
<td>0682-415</td>
</tr>
<tr>
<td>Surge arresters</td>
<td>80 099</td>
<td>0675</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>80 529</td>
<td>0470-1</td>
</tr>
<tr>
<td>Instrument transformers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current transformers</td>
<td>60 044-1</td>
<td>0414-1</td>
</tr>
<tr>
<td>Voltage transformers</td>
<td>60 044-2</td>
<td>0414-2</td>
</tr>
<tr>
<td>Combined transformers</td>
<td>60 044-3</td>
<td>0414-3</td>
</tr>
<tr>
<td>SF6</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>60 376</td>
<td>0373-1</td>
</tr>
<tr>
<td></td>
<td>60 480</td>
<td>0373-2</td>
</tr>
<tr>
<td>Installation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>81 936-1</td>
<td>0101</td>
</tr>
<tr>
<td>Environmental conditions</td>
<td>60 721-3-3</td>
<td>DIN EN 60 721-3-3</td>
</tr>
</tbody>
</table>

14.7 Special standards for railway switchgear

Additionally, the fixed-mounted circuit-breaker switchgear 8DA11 and 8DA12 corresponds to the following prescriptions and standards for railway applications:
### 14.8 Rating plates

**Switchpanel**

The rating plate contains all information that is binding for the panel. It is provided on the inside of the door of the low-voltage compartment of each panel. If the circuit-breaker class is specified as M2*, a maximum of 30,000 (20,000 in railway switchgear) mechanical operating cycles are possible with the circuit-breaker. If the disconnector class is specified as M1**, a maximum of 3,000 mechanical operating cycles are possible with the disconnector in railway switchgear.

---

<table>
<thead>
<tr>
<th>IEC Standard</th>
<th>EN Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>EN 50163</td>
</tr>
<tr>
<td>Switchgear</td>
<td>EN 50152</td>
</tr>
<tr>
<td>Insulation coordina</td>
<td>EN 50124</td>
</tr>
</tbody>
</table>

---

**IAC classification**

This data (see item 7) describes the internal arc classification of the panel according to IEC 62271-200. The entries **IAC A FL 31.5 kA 1 s** in the example shown mean:

- **IAC**: Internal Arc Classification
- **A**: Degree of accessibility A; for authorised personnel only; switchgear in closed service location; access for expert personnel only.
- **F**: Internal arc classification for the front side (Front)
- **L**: Internal arc classification for the lateral surfaces (Lateral)
- **31,5 kA**: Tested short-circuit current
- **1 s**: Test duration

The IAC classification is referred to each panel. The data on the rating plate (see item 7) describes the areas classified for the corresponding panel.

---

*Fig. 17: Rating plate of switchgear*
15 Accessories

15.1 Standard accessories
- Operating and installation instructions
- Operating lever for three-position disconnector: DISCONNECTING function
- Operating lever for three-position disconnector: EARTHING/READY-TO-EARTH function
- Emergency operating lever for three-position disconnector
- Hand crank to charge the circuit-breaker closing spring
- Double-bit key

15.2 Other accessories
According to the order documents/purchase order (selection):
- Cable plugs / adapter systems
- Surge arresters / limiters
- Voltage detection system CAPDIS S1+/CAPDIS S2+
- LRM voltage indicators, plug-in type (e.g. make Horstmann)
- Test units to check the capacitive interface and the voltage indicators
- Phase comparison test units (e.g. make Pfisterer, type EPV)
Operation

**DANGER!**

The internal arc classification of the switchgear according to IEC 62271-200 has only been proved by tests for the switchgear sides with internal arc classification and with closed high-voltage compartments.

- Determine the IAC classification of the switchgear by means of the data on the rating plate (see Page 26, "Rating plates").
- Regulations for access to switchgear areas without internal arc classification according to IEC 62271-200 must be defined by the entrepreneur or the switchgear owner.
16 Control elements and indicators

Overview

Fig. 18: Control elements and indicators of the circuit-breaker panel

1. SIPROTEC protection and control unit (option)
2. Manometer for gas compartment monitoring of busbar gas compartments L1, L2, L3
3. Filling socket for busbar gas compartments L1, L2, L3
4. Control and indication board for three-position disconnector
5. Manometer for gas compartment monitoring of feeder gas compartments
6. Filling socket for feeder gas compartments
7. Control and indication board for circuit-breaker
8. Sockets for LRM voltage detection system
Operating tools

The operating levers for the three-position disconnector functions DISCONNECTING and READY-TO-EARTH have a slot and a nose, which are arranged in such a way that the levers can only be used for their respective function. The emergency operating lever only has a slot, and may exclusively be used as described (see Page 38, “Emergency operation of the three-position disconnector”).

Fig. 19: Operating lever for DISCONNECTING function

Fig. 20: Operating lever for READY-TO-EARTH function (cross bar marked red)

Fig. 21: Emergency operating lever

Fig. 22: Hand crank to charge the closing spring

Fig. 23: Double-bit key 5 mm
17 Operating the circuit-breaker

Circuit-breaker control board

1. ON pushbutton
2. OFF pushbutton
3. “Feeder earthed” locking device
4. Operating cycle counter
5. Switch position indicator for circuit-breaker
6. “Closing spring charged / not charged” indicator
7. Opening to charge the closing spring manually

Fig. 24: Circuit-breaker control board

17.1 Closing the circuit-breaker manually

Preconditions
- “Feeder earthed” locking device is open
- Closing spring is charged

⇒ Operate the ON pushbutton in the circuit-breaker control board.
✓ The switch position indicator changes to “I” position. The circuit-breaker is closed.

17.2 Opening the circuit-breaker manually

If the control voltage fails, the circuit-breaker can only be opened mechanically by hand.

NOTE!
If the feeder is earthed through the three-position disconnector and the circuit-breaker, all electrical OFF signals are ineffective.

Preconditions
- “Feeder earthed” locking device is open

DANGER!
If the “feeder earthed” locking device is padlocked, the circuit-breaker cannot be opened, neither electrically nor mechanically.
⇒ Padlock only if the feeder is earthed.

⇒ Operate the OFF pushbutton in the circuit-breaker control board.
✓ The circuit-breaker is open.
17.3 Recommendation for sealing the pushbuttons

ATTENTION!
If you close manually, all electrical and mechanical interlocks are ineffective.

To guarantee safe operation of the interlocks: Seal/lock the pushbuttons (see table below).

<table>
<thead>
<tr>
<th>Panel types</th>
<th>Sealing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incoming or outgoing feeder panels</td>
<td>ON pushbutton</td>
</tr>
<tr>
<td>Bus sectionaliser panels</td>
<td>ON pushbutton and OFF pushbutton</td>
</tr>
</tbody>
</table>

17.4 Test operation without auxiliary voltage

ATENTION!
On circuit-breakers with undervoltage release 3AX1103: If the retaining screw of the striker pin is not set back from position B to position A after the test operation without auxiliary voltage, the undervoltage release will not function.

After the test operation without auxiliary voltage, set the retaining screw of the striker pin back from position B to position A.

Perform the following actions to guarantee that the circuit-breaker is ready for operation:

- Charge the closing spring (see Page 33, “Charging the closing spring manually”).
- Operate the ON pushbutton in the circuit-breaker control board.
  - The circuit-breaker is closed.
- Operate the OFF pushbutton in the circuit-breaker control board.
  - The circuit-breaker is open.
- Set the retaining screw of the striker pin from position A to B.

17.5 Test operation with auxiliary voltage (motor operating mechanism)

- Switch on the supply voltage.
  - The motor operating mechanism starts up and charges the closing spring.
Check whether the "closing spring charged" indication appears.

Operate the ON pushbutton in the circuit-breaker control board.

The closing spring is charged by the motor.

Check whether the switch position "circuit-breaker CLOSED" appears.

Operate the OFF pushbutton in the circuit-breaker control board.

Check whether the switch position "circuit-breaker OPEN" appears.

17.6 Charging the closing spring manually

The closing spring is charged by the motor after applying the control voltage. The energy required for the switching sequence OPEN-CLOSED-OPEN (auto-reclosing) is stored in the closing spring about 15 seconds after closing the circuit-breaker.

The hand crank is required to charge the closing spring manually if the control voltage fails.

DANGER!
Risk of injury by sudden rotation of hand crank. If you use a hand crank without a freewheel to charge the spring, the hand crank will rotate when the control voltage is switched on again (motor starts up) and can lead to injury.

Use special hand crank with freewheel from the accessories.

Remove cover from cutout.

Insert hand crank.

Turn hand crank clockwise approx. 30 turns until the indication "closing spring charged" appears.

Remove hand crank.

Close cutout with cover.

18 Three-position disconnector operation

The procedures described in this section apply to:

- Disconnectable voltage transformers or disconnectable busbar connections
18.1 Control elements and indicators

Control board on the switchgear front

- Switch position indicator for three-position disconnector (DISCONNECTING function)
- Actuating opening for earthing switch (EARTHING/READY-TO-EARTH function)
- Actuating opening for disconnector (DISCONNECTING function)
- Switch position indicator for three-position disconnector (EARTHING/READY-TO-EARTH function)
- Opening for selector key
- Switch position indicator for circuit-breaker

![Control board on the switchgear front](image)

The manual switching operations DISCONNECTING or READY-TO-EARTH must be pre-selected with a double-bit key. Pre-selection is only possible if the associated switching operation is permissible.

Switch position indicator at the rear

The position of the three-position disconnector is indicated both at the front and at the rear of the switchgear. The switch position indicator at the rear is located on the side of the outermost busbar housing, over the circuit-breaker housing.

![Switch position indicator at the rear](image)
18.2 Closing the three-position disconnector manually

**ATTENTION!**
In circuit-breaker panels, a mechanical interlock prevents the three-position disconnector from being operated under load.

- Open the circuit-breaker (see Page 31, “Opening the circuit-breaker manually”).

**ATTENTION!**
In disconnector panels without electromechanical/mechanical interlock, maloperation of the three-position disconnector is possible. Here, the three-position disconnector can be operated under load. Operating under load will destroy the three-position disconnector!

- Do not operate the three-position disconnector under load.

---

Fig. 29: Closing the three-position disconnector

- Insert the double-bit key.
- Turn the double-bit-key **clockwise** as far as it will go.
- The opening for the DISCONNECTING function is free.
Hold the lever for the DISCONNECTING function in horizontal position (nose on the left) and push it onto the hexagonal shaft as far as it will go.

Turn the operating lever for the DISCONNECTING function 180° clockwise (nose on the right).

The three-position disconnector is closed. The switch position indicator changes to CLOSED position.

Remove the operating lever for the DISCONNECTING function.

Turn the double-bit key counter-clockwise and remove it.

The opening for the DISCONNECTING function is closed.

### 18.3 Opening the three-position disconnector manually

Insert the double-bit key.

Turn the double-bit-key clockwise as far as it will go.

The opening for the DISCONNECTING function is free.

Hold the lever for the DISCONNECTING function in horizontal position (nose on the right) and push it onto the hexagonal shaft as far as it will go.

Turn the operating lever for the DISCONNECTING function 180° counter-clockwise (nose on the left).

The three-position disconnector is open. The switch position indicator changes to OPEN position.

Remove the operating lever for the DISCONNECTING function.

Turn the double-bit key counter-clockwise and remove it.

The opening for the DISCONNECTING function is closed.

### 18.4 Activating the ready-to-earth function manually

**ATTENTION!**

In circuit-breaker panels, a mechanical interlock prevents the three-position disconnector from being operated under load.

Open the circuit-breaker (see Page 31, “Opening the circuit-breaker manually”).

**ATTENTION!**

In disconnector panels without electromechanical/mechanical interlock, maloperation of the three-position disconnector is possible. Here, the three-position disconnector can be operated under load. Operating under load will destroy the three-position disconnector!

Do not operate the three-position disconnector under load.
Fig. 30: Operating the three-position disconnector for the READY-TO-EARTH function

- Insert the double-bit key and turn **counter-clockwise**.
- The opening for the READY-TO-EARTH function is free.
- Hold the operating lever for the READY-TO-EARTH function in horizontal position (nose on the left) and push it onto the hexagonal shaft as far as it will go.
- Turn the operating lever for the READY-TO-EARTH function 180° **clockwise**.
- The nose of the operating lever for the READY-TO-EARTH is on the right and the READY-TO-EARTH function is established. The switch position indicator changes to READY-TO-EARTH position.
- Remove the operating lever for the READY-TO-EARTH function.
- Turn the double-bit key **clockwise** and remove it.
- The opening for the READY-TO-EARTH function is closed.

**DANGER!**

Danger! High voltage! The earthing process is **not** completed until the circuit-breaker is closed.
- Close the circuit-breaker after having switched the three-position disconnector to READY-TO-EARTH position.

18.5 **Deactivating the ready-to-earth function**

- Open the circuit-breaker see Page 31, "Opening the circuit-breaker manually".
Operation

- Insert the double-bit key.
- Turn the double-bit-key **counter-clockwise** as far as it will go.
- The opening for the READY-TO-EARTH function is free.

- Hold the operating lever for the READY-TO-EARTH function in horizontal position (nose on the right) and push it onto the hexagonal shaft as far as it will go.

- Turn the operating lever for the READY-TO-EARTH function **180° counter-clockwise** (nose on the left).
- The three-position disconnector is open. The switch position indicator changes to OPEN position.

- Remove the operating lever for the READY-TO-EARTH function.
- Turn the double-bit key **clockwise** and remove it.
- The opening for the READY-TO-EARTH function is closed.

18.6 Three-position disconnector with auxiliary voltage (motor operating mechanism)

Three-position disconnectors with motor operating mechanism can also be controlled from remote according to their design.

18.7 Emergency operation of the three-position disconnector

If the motor voltage of the three-position disconnector with motor operating mechanism fails, and the three-position disconnector is in no defined end position, you must operate the three-position disconnector manually with the emergency operating lever.

**Emergency operation of the DISCONNECTING function**

<table>
<thead>
<tr>
<th>ATTENTION!</th>
</tr>
</thead>
<tbody>
<tr>
<td>The emergency operating lever does not have a stop. Switching with the emergency operating lever beyond the end position of the DISCONNECTING function of the three-position disconnector will damage the three-position disconnector.</td>
</tr>
<tr>
<td>Do not turn the emergency operating lever beyond the horizontal position.</td>
</tr>
</tbody>
</table>
Fig. 31: Emergency operation of the DISCONNECTING function of the three-position disconnector

- Insert the double-bit key.
- Turn the double-bit key **clockwise** and remove it.
- The opening for the DISCONNECTING function is free.

- Push the emergency operating lever onto the hexagonal shaft for the DISCONNECTING function so that the pin of the hexagonal shaft fits in the slot of the emergency operating lever.

To switch the DISCONNECTING function of three-position disconnector to the desired end position (CLOSED or OPEN), perform the following actions:

- Turn the emergency operating lever until the switch position indicator changes to CLOSED or OPEN position.
  - The emergency operating lever is in **horizontal** position, the marking of the slot is **at the bottom**: The three-position disconnector is in CLOSED position. Or: The emergency operating lever is in **horizontal** position, the mark of the slot is **at the top**: The three-position disconnector is in OPEN position.

- Remove the emergency operating lever.
- Turn the double-bit key **counter-clockwise** and remove it.
- The opening for the DISCONNECTING function is closed.
Emergency operation of the READY-TO-EARTH function

ATTENTION!
The emergency operating lever does not have a stop. Switching with the emergency operating lever beyond the end position of the READY-TO-EARTH function of the three-position disconnector will damage the three-position disconnector.

- Do not turn the emergency operating lever beyond the vertical position.

- Insert the double-bit key.
- Turn the double-bit-key **counter-clockwise** as far as it will go.
- The opening for the READY-TO-EARTH function is free.
- Push the emergency operating lever onto the hexagonal shaft for the READY-TO-EARTH function so that the pin of the hexagonal shaft fits in the slot of the emergency operating lever.

To switch the the READY-TO-EARTH function of the three-position disconnector to the desired end position (READY-TO-EARTH or OPEN), perform the following actions:

- Turn the emergency operating lever until the switch position indicator changes to READY-TO-EARTH or OPEN position.
The emergency operating lever is in **vertical** position, the marking of the slot is **on the left**: The three-position disconnector is in **READY-TO-EARTH** position. Or: The emergency operating lever is in **vertical** position, the marking of the slot is **on the right**: The three-position disconnector is in **OPEN** position.

- Remove the emergency operating lever.
- Turn the double-bit key **clockwise** and remove it.
- The opening for the READY-TO-EARTH function is closed.

### Switching operations after emergency operation

- Perform further manual switching operations only with the associated operating levers for the DISCONNECTING or READY-TO-EARTH functions.

## 19 Feeder earthing and de-earthing

### DANGER!

High voltage! Danger! Do always observe the Five Safety Rules:

- Isolate the switchgear.
- Secure against reclosing.
- Verify safe isolation from supply.
- Earth and short-circuit.
- Cover or barrier adjacent live parts.

### DANGER!

Danger! High voltage! The earthing process is **not** completed until the circuit-breaker is closed.

- Close the circuit-breaker after having switched the three-position disconnector to READY-TO-EARTH position.

### ATTENTION!

Earthing under load will destroy the three-position disconnector.

- Open the circuit-breaker see Page 31, "Opening the circuit-breaker manually".
- Make sure that the feeder is isolated from supply.

### 19.1 Feeder earthing

**ATTENTION!**

If the "feeder earthed" locking device is padlocked, the circuit-breaker cannot be opened, neither electrically nor mechanically.

- Fit the padlock only if the feeder is earthed.

- Switch the three-position disconnector to READY-TO-EARTH position see Page 36, "Activating the ready-to-earth function manually".
Operation

▷ Close the circuit-breaker (see Page 31, “Closing the circuit-breaker manually”).
▷ Pull the moving part of the “feeder earthed” locking device upwards.
▷ Padlock the locking device.

19.2 Feeder de-earthing
▷ Remove the padlock at the “feeder earthed” locking device.
✓ The moving part of the locking device folds downwards automatically.

<table>
<thead>
<tr>
<th>NOTE!</th>
</tr>
</thead>
<tbody>
<tr>
<td>In circuit-breaker operating mechanisms with undervoltage release, the circuit-breaker trips automatically after removing the padlock if</td>
</tr>
</tbody>
</table>
▷ the panel is earthed and 
▷ auxiliary voltage is available.

▷ Open the circuit-breaker (see Page 31, “Opening the circuit-breaker manually”).
▷ Switch the three-position disconnector to OPEN position (see Page 36, “Opening the three-position disconnector manually”).

20 Operation of the busbar earthing switch

20.1 Control elements and indicators

![Diagram](Fig. 32: Manual operating mechanism for busbar earthing switch)

1. Additional compartment for busbar earthing switch drive
2. Switch position indicator
3. Actuating opening
4. Operating spindle at the operating lever
5. Setscrew at the operating spindle
The busbar earthing switch is equipped with a high-speed closing facility for make-proof earthing of the busbar.

The cover of the actuating opening is padlocked mechanically or interlocked electromechanically. The opening for inserting or removing the operating lever is only released if the busbar earthing switch is in a defined end position.

If the space in the switchgear room is limited, you can undo the setscrew and change the position of the operating spindle at the operating lever by 45°.

20.2 Closing

**DANGER!**

High voltage! Danger! By no means may the busbar make-proof earthing switch be operated under load, as it will be destroyed in case of repetition.

- Observe the Five Safety Rules.
- Disconnect the incoming and outgoing feeders in all panels.

**ATTENTION!**

The electromechanical interlock can be deactivated if the operating lever is not removed after a switching operation.

- Remove the operating lever after every switching operation.
Hold the operating lever in horizontal position.

Insert the operating lever in the actuating opening as far as it will go.

Press the operating lever into the actuating opening with one hand over the operating spindle, and move it downwards by 90° with the other hand as far as it will go.

Remove the operating lever.

In case of mechanical interlock: Fit a padlock.

The busbar earthing switch is closed.

20.3 Opening

**DANGER!**

Avoid any intermediate position of the busbar make-proof earthing switch during the opening process. Reversal will not be possible!

- Perform the opening operation continuously and up to the end position.
- Do not use force (torque approx. 140 Nm).

**ATTENTION!**

The electromechanical interlock can be deactivated if the operating lever is not removed after a switching operation.

- Remove the operating lever after every switching operation.
Fig. 35: Opening the busbar earthing switch

Hold the operating lever in vertical position.

Insert the operating lever in the actuating opening as far as it will go.

Press the operating lever into the actuating opening with one hand over the operating spindle, and move it upwards by 90° with the other hand as far as it will go.

Remove the operating lever.

In case of mechanical interlock: Fit a padlock.

The busbar earthing switch is open.

21 Interlocks

Switching devices may only be controlled and operated in logical dependence on the switch position of other devices. Unpermissible switching operations must be blocked in order to

- provide full protection for the personnel,
- prevent switchgear damages and power failures.

The interlocks are mainly of the mechanical type.

### Interlocking conditions

<table>
<thead>
<tr>
<th>Feeder and circuit-breaker panel of bus sectionaliser</th>
<th>Switching operation</th>
<th>Switching operation only possible if</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disconnecter CLOSED/OPEN</td>
<td>circuit-breaker OPEN earthing switch OPEN</td>
<td>mechanical</td>
<td>mechanical</td>
</tr>
<tr>
<td>Earthing switch CLOSED/OPEN</td>
<td>circuit-breaker OPEN disconnector OPEN</td>
<td>mechanical</td>
<td>mechanical</td>
</tr>
<tr>
<td>Circuit-breaker CLOSED</td>
<td>disconnector or earthing switch not in intermediate position (shutter closed)</td>
<td>mechanical</td>
<td></td>
</tr>
<tr>
<td>Circuit-breaker OPEN</td>
<td>not locked by a locking device</td>
<td>mechanical</td>
<td></td>
</tr>
</tbody>
</table>

Additionally, electromechanical interlocks may be fitted for disconnectors and earthing switches or for earthing switches.
22 Verification of safe isolation from supply

The panels are equipped with voltage detection systems.

Use voltage indicators according to IEC 61 243-5 or DIN VDE 0682-415 only.

The function of the voltage indicator must have been checked:
• with test unit according to IEC 61 243-5 or DIN VDE 0682-415
• on live equipment

The function of the coupling section must have been checked:
• IEC 61 243-5 or DIN VDE 0682-415
Remove the covers from the interface (capacitive test sockets L1, L2, L3).

Plug the voltage indicator in all three phases L1, L2, L3 of the interface.

If the indicator does not flash or light up in any of the three test sockets, the phases are not live.

Replace the covers on the interface.
### 23 Overview of switching operations

#### 23.1 Switching operations in the circuit-breaker panel

<table>
<thead>
<tr>
<th>Connecting feeder with busbar</th>
<th>Disconnecting feeder from busbar</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.</strong></td>
<td><strong>1.</strong></td>
</tr>
<tr>
<td><img src="image1" alt="Diagram" /></td>
<td><img src="image2" alt="Diagram" /></td>
</tr>
<tr>
<td><strong>Initial situation</strong></td>
<td><strong>Initial situation</strong></td>
</tr>
<tr>
<td><strong>2.</strong></td>
<td><strong>2.</strong></td>
</tr>
<tr>
<td><img src="image3" alt="Diagram" /></td>
<td><img src="image4" alt="Diagram" /></td>
</tr>
<tr>
<td><strong>1. Insert double-bit key.</strong>&lt;br&gt;<strong>2. Turn clockwise.</strong>&lt;br&gt;Opening for DISCONNECTING function is free.</td>
<td><strong>1. Open the circuit-breaker.</strong></td>
</tr>
<tr>
<td><strong>3.</strong></td>
<td><strong>3.</strong></td>
</tr>
<tr>
<td><img src="image5" alt="Diagram" /></td>
<td><img src="image6" alt="Diagram" /></td>
</tr>
<tr>
<td><strong>1. Hold operating lever for DISCONNECTING in horizontal position (nose on the left) and push onto hexagonal shaft as far as it will go.</strong>&lt;br&gt;<strong>2. Turn operating lever for DISCONNECTING function 180° clockwise.</strong></td>
<td><strong>1. Insert double-bit key.</strong>&lt;br&gt;<strong>2. Turn clockwise.</strong>&lt;br&gt;Opening for DISCONNECTING function is free.</td>
</tr>
<tr>
<td><strong>4.</strong></td>
<td><strong>4.</strong></td>
</tr>
<tr>
<td><img src="image7" alt="Diagram" /></td>
<td><img src="image8" alt="Diagram" /></td>
</tr>
<tr>
<td><strong>1. Remove operating lever for DISCONNECTING function.</strong>&lt;br&gt;<strong>2. Turn double-bit key counter-clockwise and remove it.</strong>&lt;br&gt;Opening for DISCONNECTING function is closed.</td>
<td><strong>1. Hold operating lever for DISCONNECTING in horizontal position (nose on the right) and push onto hexagonal shaft as far as it will go.</strong>&lt;br&gt;<strong>2. Turn operating lever for DISCONNECTING function 180° counter-clockwise.</strong></td>
</tr>
<tr>
<td><strong>5.</strong></td>
<td><strong>5.</strong></td>
</tr>
<tr>
<td><img src="image9" alt="Diagram" /></td>
<td><img src="image10" alt="Diagram" /></td>
</tr>
<tr>
<td><strong>1. Close the circuit-breaker.</strong></td>
<td><strong>1. Remove operating lever for DISCONNECTING function.</strong>&lt;br&gt;<strong>2. Turn double-bit key counter-clockwise and remove it.</strong>&lt;br&gt;Opening for DISCONNECTING function is closed. The feeder is disconnected from the busbar.</td>
</tr>
</tbody>
</table>
### 23.2 Switching operations in the bus sectionaliser

#### Feeder earthing

1. **Initial situation**

2. 1. Insert double-bit key.
   2. Turn counter-clockwise.

   Opening for READY-TO-EARTH function is free.

3. 1. Hold operating lever for READY-TO-EARTH in horizontal position (nose on the left) and push onto hexagonal shaft as far as it will go.
   2. Turn operating lever for READY-TO-EARTH function 180° counter-clockwise.

   Opening for READY-TO-EARTH function is free.

4. 1. Remove operating lever for READY-TO-EARTH function.
   2. Turn double-bit key clockwise and remove it.

   Opening for READY-TO-EARTH function is closed.

5. 1. Close the circuit-breaker.
   2. Padlock “feeder earthed” locking device.

   Opening for READY-TO-EARTH function is closed. The feeder is earthed.

#### Feeder de-earthing

1. **Initial situation**

2. 1. Remove padlock at “feeder earthed” locking device.
   2. Open the circuit-breaker.

3. 1. Insert double-bit key.
   2. Turn counter-clockwise.

   Opening for READY-TO-EARTH function is free.

4. 1. Hold operating lever for READY-TO-EARTH in horizontal position (nose on the right) and push onto hexagonal shaft as far as it will go.
   2. Turn operating lever for READY-TO-EARTH function 180° clockwise.

   Opening for READY-TO-EARTH function is closed. The feeder is de-earthed.

5. 1. Remove operating lever for READY-TO-EARTH function.
   2. Turn double-bit key clockwise and remove it.

   Opening for READY-TO-EARTH function is closed. The feeder is de-earthed.
### Coupling busbar sections

<table>
<thead>
<tr>
<th>Initial situation</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Diagram" /></td>
<td><img src="image2" alt="Diagram" /></td>
<td></td>
</tr>
</tbody>
</table>

1. "CLOSE" disconnector in circuit-breaker panel.  
2. "CLOSE" disconnector in bus riser panel.  

### Decoupling busbar sections

<table>
<thead>
<tr>
<th>Initial situation</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3" alt="Diagram" /></td>
<td><img src="image4" alt="Diagram" /></td>
<td></td>
</tr>
</tbody>
</table>

2. "OPEN" disconnector in circuit-breaker panel.  
3. "OPEN" disconnector in bus riser panel.

### Earthing busbar section 1

<table>
<thead>
<tr>
<th>Initial situation</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image5" alt="Diagram" /></td>
<td><img src="image6" alt="Diagram" /></td>
<td></td>
</tr>
</tbody>
</table>

1. "CLOSE" disconnector in circuit-breaker panel.  
2. "CLOSE" earthing switch in bus riser panel.  
4. Padlock "feeder earthed" locking device.
De-earthing busbar section 1

1. Initial situation


Earthing busbar section 2

1. Initial situation


De-earthing busbar section 2

1. Initial situation

23.3 Switching operations in top-mounted bus sectionaliser

### Coupling busbar sections

<table>
<thead>
<tr>
<th>Initial situation</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Diagram" /></td>
<td><img src="image2" alt="Diagram" /></td>
<td><img src="image3" alt="Diagram" /></td>
</tr>
</tbody>
</table>

1. "CLOSE" disconnector in left-hand busbar section. 2. "CLOSE" disconnector in right-hand busbar section.

### Decoupling busbar sections

<table>
<thead>
<tr>
<th>Initial situation</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image4" alt="Diagram" /></td>
<td><img src="image5" alt="Diagram" /></td>
<td><img src="image6" alt="Diagram" /></td>
</tr>
</tbody>
</table>

1. "OPEN" disconnector in left-hand busbar section. 2. "OPEN" disconnector in right-hand busbar section.

### Earthing busbar section 1

<table>
<thead>
<tr>
<th>Initial situation</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image7" alt="Diagram" /></td>
<td><img src="image8" alt="Diagram" /></td>
<td><img src="image9" alt="Diagram" /></td>
</tr>
</tbody>
</table>

1. "CLOSE" disconnector in left-hand busbar section. 2. "CLOSE" earthing switch in right-hand busbar section.
De-earthing busbar section 1

1. "OPEN" earthing switch in right-hand busbar section. 2. "OPEN" disconnector in left-hand busbar section.

Earthing busbar section 2

1. "CLOSE" disconnector in right-hand busbar section. 2. "CLOSE" earthing switch in left-hand busbar section.

De-earthing busbar section 2

1. "OPEN" earthing switch in left-hand busbar section. 2. "OPEN" disconnector in right-hand busbar section.
### 23.4 Switching operations for disconnectable voltage transformers

<table>
<thead>
<tr>
<th>Connecting voltage transformers with busbar</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Diagram 1" /></td>
</tr>
<tr>
<td><img src="image2" alt="Diagram 2" /></td>
</tr>
<tr>
<td><img src="image3" alt="Diagram 3" /></td>
</tr>
<tr>
<td><img src="image4" alt="Diagram 4" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Disconnecting voltage transformers from busbar</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image5" alt="Diagram 5" /></td>
</tr>
<tr>
<td><img src="image6" alt="Diagram 6" /></td>
</tr>
<tr>
<td><img src="image7" alt="Diagram 7" /></td>
</tr>
<tr>
<td><img src="image8" alt="Diagram 8" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Earthing voltage transformers</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image9" alt="Diagram 9" /></td>
</tr>
<tr>
<td><img src="image10" alt="Diagram 10" /></td>
</tr>
<tr>
<td><img src="image11" alt="Diagram 11" /></td>
</tr>
<tr>
<td><img src="image12" alt="Diagram 12" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>De-earthing voltage transformers</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image13" alt="Diagram 13" /></td>
</tr>
<tr>
<td><img src="image14" alt="Diagram 14" /></td>
</tr>
<tr>
<td><img src="image15" alt="Diagram 15" /></td>
</tr>
<tr>
<td><img src="image16" alt="Diagram 16" /></td>
</tr>
</tbody>
</table>
### 23.5 Switching operations for disconnectable busbar connection

#### Connecting busbar with feeder

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[Diagram]</td>
</tr>
<tr>
<td>2</td>
<td>[Diagram]</td>
</tr>
<tr>
<td>3</td>
<td>[Diagram]</td>
</tr>
<tr>
<td>4</td>
<td>[Diagram]</td>
</tr>
</tbody>
</table>

#### Disconnecting busbar from feeder

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[Diagram]</td>
</tr>
<tr>
<td>2</td>
<td>[Diagram]</td>
</tr>
<tr>
<td>3</td>
<td>[Diagram]</td>
</tr>
<tr>
<td>4</td>
<td>[Diagram]</td>
</tr>
</tbody>
</table>

#### Feeder earthing

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[Diagram]</td>
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<tr>
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<td>[Diagram]</td>
</tr>
<tr>
<td>3</td>
<td>[Diagram]</td>
</tr>
<tr>
<td>4</td>
<td>[Diagram]</td>
</tr>
</tbody>
</table>
**Feeder de-earthing**

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

1. [Diagram 1]
2. [Diagram 2]
3. [Diagram 3]
4. [Diagram 4]
24 Cable testing

24.1 Function test

Before commissioning, a high DC voltage is applied to the cables for test. A possibility for cable testing is described hereafter.

The following table contains the maximum values for the DC test voltage:

<table>
<thead>
<tr>
<th>Rated voltage of switchgear kV</th>
<th>DC test voltage, maximum value kV</th>
<th>AC test voltage 0.1 Hz, maximum value kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>48</td>
<td>19</td>
</tr>
<tr>
<td>24</td>
<td>72</td>
<td>38</td>
</tr>
<tr>
<td>36</td>
<td>72</td>
<td>57</td>
</tr>
<tr>
<td>40.5</td>
<td>72</td>
<td>57</td>
</tr>
</tbody>
</table>

24.2 Safety instructions

**DANGER!**

High voltage! Danger! Cable testing may produce flashovers which can cause death or serious bodily injuries.

- Cable testing may only be performed by qualified personnel who is familiar with the danger involved.
- The permissible test voltages must not be exceeded.
- Keep safety distances.
- Install barriers.
- Switch on warnings.

**ATTENTION!**

If the voltage transformer is energised, or if it is of the non-disconnectable type, the test voltage can destroy the voltage transformer and cause personal injuries.

- Earth disconnectable voltage transformers before cable testing.
- Remove non-disconnectable voltage transformers.

**ATTENTION!**

The voltage indicators CAPDIS-S1+ and CAPDIS-S2+ may be damaged at test voltages > 15 kV and frequencies < 16 2/3 Hz.

- Short-circuit voltage indicators with the earthing points of the test sockets.
24.3 Procedure

Cable testing with dismantled cable

Fig. 37: Test arrangement with dismantled cable

- Earth the feeder (see Page 41, “Feeder earthing”).
- Earth the voltage transformers (see Page 41, “Feeder earthing” or remove non-disconnectable voltage transformers).
- Remove cable to be tested.
- Screw test adapter onto cable termination.
- Connect test lead.
- Perform voltage test.
Cable testing with connected cable

- Earth the feeder (see Page 41, “Feeder earthing”).
- Earth the voltage transformers (see Page 41, “Feeder earthing” or remove non-disconnectable voltage transformers).
- Short-circuit capacitive test sockets and test sockets on integrated voltage detection systems (e.g. CAPDIS).
- Open the circuit-breaker (see Page 31, “Opening the circuit-breaker manually”).
- Switch three-position disconnector to OPEN position (see Page 36, “Opening the three-position disconnector manually”).
- Close the circuit-breaker (see Page 31, “Closing the circuit-breaker manually”).
- Screw test adapter onto cable termination.
- Connect test lead.
- Perform voltage test.
25 **Maintenance**

25.1 **Switchgear maintenance**

Under normal operating conditions the fixed-mounted circuit-breaker switchgear 8DA and the 3AH49 circuit-breaker are maintenance-free. We recommend to inspect the switchgear according to the following maintenance recommendation. To prevent any danger during maintenance, please observe the following safety instructions.

25.2 **Safety instructions**

**DANGER!**

High voltage! Danger! Do always observe the Five Safety Rules:

- Isolate the switchgear.
- Secure against reclosing.
- Verify safe isolation from supply.
- Earth and short-circuit.
- Cover or barrier adjacent live parts.

**DANGER!**

High voltage! Danger! Touching live parts will cause death or serious injuries.

- Switchgear maintenance may be performed only by qualified personnel who are familiar with the danger associated with maintenance.

25.3 **Maintenance recommendation**

The switchgear should be inspected at the following intervals:

<table>
<thead>
<tr>
<th></th>
<th>8DA10</th>
<th>8DA11/12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual inspection</td>
<td>every 5 years</td>
<td>every 5 years</td>
</tr>
<tr>
<td>State inspection</td>
<td>every 10 years</td>
<td>every 10 years</td>
</tr>
<tr>
<td>Maintenance</td>
<td>after 1000 operating cycles</td>
<td>after 3000 operating cycles of the disconnectors or 10000 operating cycles of the earthing switches or after 10000 operating cycles of the circuit-breaker</td>
</tr>
</tbody>
</table>

These intervals are guidelines which have to be adjusted to the different operating conditions (e.g. dusty environment, frequent condensation, etc.). The maintenance actions with the associated test and maintenance operations are shown in the following table.
25.4 Procedure for bolted joints and seals

Please observe the following procedure for maintenance of switchgear parts with bolted joints:

- Recommendation: Always replace the spring elements on loosened bolted joints.

Please observe the following procedure for maintenance of switchgear parts with seals:

- 

Maintenance recommendation

<table>
<thead>
<tr>
<th>Visual inspection</th>
<th>Condition inspection</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Check and document SF₆-gas pressure (see Page 23, “Insulating gas SF₆”)</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>Check and document dew-point (humidity content) (≤ −15° C)</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>Check and document gas quality (air content) (SF₆-share ≥ 95 %)</td>
</tr>
<tr>
<td>X</td>
<td>Check operating mechanism and interlocking of disconnector and earthing switch (if required, grease linkage and bearings)</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>Vacuum circuit-breaker operating mechanism</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>In all gas compartments - if gas has to be exchanged -, or upon reaching the number of operating cycles:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Evacuate SF₆-gas.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Replace desiccant bags.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Replace O-rings.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fill in SF₆-gas.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Check and document gas pressure.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Check tightness.</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>Check additionally in all compartments with three-position disconnector:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Operate disconnector and earthing switch for test and verify that the switch positions are reached correctly.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Check contact surfaces, rotary insulators and operating linkages for signs of wear.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If required, clean the insulating bushings with a vacuum cleaner.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Grease contact surfaces and joints of the operating linkages.</td>
<td></td>
</tr>
</tbody>
</table>

DANGER!

Danger of suffocation! SF₆-gas is heavier than air and concentrates first near to the floor and in floor openings.

- Do not let SF₆-gas get into the environment.
- While working with SF₆-gas, provide for sufficient ventilation.
- After working with SF₆-gas, vent the cable basement and any hollows in the floors with special care.
- Observe the safety data sheet for SF₆-gas.
- Cover or barrier adjacent live parts.
- To be done generally before working with SF₆-gas: Check and document re-usability (dew-point, gas quality) of the SF₆.
Always replace removed O-rings with new ones. O-rings are available at your Siemens Service Centre.

Clean the surfaces and grooves in the flanges with a lint-free rag.

Check the surfaces before installation.

Grease the O-rings and place them in the grooves of the flanges.

If required, place desiccant bags in the cover.

Fit the cover.

Bolt the flanges tight cross-wise with the hexagonal bolts M8 with new spring elements. Tightening torque: 20 Nm.

25.5 Maintenance of the vacuum circuit-breaker operating mechanism

Under normal operating conditions the fixed-mounted circuit-breaker switchgear 8DA and the 3AH49 circuit-breaker are maintenance-free.

After 10,000 operating cycles or depending on the respective operating conditions (e. g. dusty environment, frequent condensation, etc.) we recommend to inspect the switchgear according to the above maintenance recommendation. To do this, you may only use the materials specified hereafter on the individual functional parts of the circuit-breaker.

Permissible cleaning agents / lubricants:

- For bearings, sliding surfaces:
  Isoflex Topas L 32
  Klüber - Lubrication KG
  Geisenhauer Str. 7
  Postfach 70 10 47
  D-81310 München

- For bearings that are inaccessible for grease, and bearings of the auxiliary switch S1:
  Tellus Öl 32
  Shell Direct GmbH
  Suhrenkamp 71
  D-22335 Hamburg

ATTENTION!
The parts of the switchgear that cannot be dismantled may be damaged if they come into contact with cleaning agents.

- Do not treat joints and bearings which cannot be dismantled with a cleaning agent.

- Clean the external parts of the circuit-breaker at regular intervals.
- Renew the anti-corrosion protection greasing.
- Operate the circuit-breaker several times mechanically for test.
25.6 Cleaning agents and cleaning aids

DANGER!
For protection of personnel and environment:

⇒ Read the instructions for use of cleaning agents carefully.
⇒ Observe the warnings (e.g. inflammable!, corrosive!, etc.)

<table>
<thead>
<tr>
<th>Cleaning agents</th>
<th>HAKU 1025-920</th>
<th>Contains carbon hydrogen!</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Household cleaner</td>
<td>For cleaning electrostatically stressed insulation (e.g. epoxy resin)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cleaning aids</th>
<th>Lint-free cleaning paper</th>
<th>For applying and cleaning liquid cleaning agent (single use)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Brush</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cleaning rag</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vacuum cleaner</td>
<td></td>
</tr>
</tbody>
</table>

25.7 Lubricants

<table>
<thead>
<tr>
<th>Designation</th>
<th>Manu-fac-turer</th>
<th>Application</th>
<th>Remark</th>
<th>Packing/Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polylub GLY 801</td>
<td>Siemens</td>
<td>Current-carrying fixed-mounted connections (current conductors and earthing bars, connections), flanges with O-rings</td>
<td>No greasing effect; used as mounting aid for O-rings; mounting paste for flanges</td>
<td>Tube (0.25 kg)</td>
</tr>
<tr>
<td>Barrierta GTE 403</td>
<td>Klüber</td>
<td>Contact blades and contact pieces of the three-position disconnectors</td>
<td>Observe the designation “GTE 403” in order to avoid mistakes with other Barrierta products</td>
<td>Tube (0.02 kg)</td>
</tr>
<tr>
<td>Longtherm 2+</td>
<td>Molykote</td>
<td>Bearings of the operating linkage</td>
<td>Not suitable for greasing points on the circuit-breaker operating mechanism</td>
<td></td>
</tr>
</tbody>
</table>

25.8 Switchgear extension and replacement of panels and components

For switchgear extension and replacement of components, please contact the local Siemens Service Centre.

Information required for spare part orders of single components and devices:

• Type and serial number of the switchgear and the circuit-breaker (see rating plates)
• Precise designation of the device or component, if applicable on the basis of the information and illustrations in the associated instructions, a drawing, sketch or circuit diagram

25.9 Spare parts

Due to the fact that all parts of this switchgear type have been optimised to last the normal service life, it is not possible to recommend particular spare parts.

25.10 Service life and disposal

Service life
The maximum permissible number of mechanical operating cycles of the built-in circuit-breakers is 30,000. The current number of operating cycles can be checked on the mechanical operating cycle counter.
Disposal  The fixed-mounted circuit-breaker switchgear of the 8DA series is an environmentally compatible product.

At the end of the service life, the switchgear material should be recycled. The switchgear can be disposed of in environment-compatible manner in compliance with existing legislation.

The components of the switchgear can be recycled as mixed scrap; however, dismantling as far as possible into sorted scrap is the more environmentally compatible way.

The switchgear consists of the following materials:
- Steel
- Copper
- Aluminium
- Cast-resin
- Fibre-reinforced plastics
- Rubber materials
- Sulphur hexafluoride (SF₆)
- Ceramic materials
- Lubricants

The switchgear does not contain hazardous materials as defined in the hazardous material regulations.

As this is an SF₆-insulated switchgear, the gas enclosed in the gas compartment must be evacuated, collected and recycled. To do this, observe the necessary safety measures according to the instruction leaflet for accident prevention “SF₆-Switchgear” of the professional association for fine mechanics and electrical engineering. Outside Germany, the locally applicable regulations must be followed.

Should you require further information, please contact your Siemens Service Centre.
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Impressum

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