Medium-Voltage Switchgear
Type 8BT1 Extendable Truck-Type Circuit-Breaker Switchgear up to 24 kV
Metal-Enclosed, Cubicle-Type, Single Busbar, Air-Insulated

Order No.: 881-4006.9
Revision: 01
Issue: 07-12-2006
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.

For details about technical design and equipment like e.g. technical data, secondary equipment, circuit diagrams, please refer to the order documents.

The switchgear is subject to continuous technical development within the scope of technical progress. If not stated otherwise on the individual pages of these instructions, we reserve the right to modify the specified values and drawings. All dimensions are given in mm.

For further details, e.g. about additional equipment and information about other switchgear types, please refer to catalogue HA 26.31.

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 competent Siemens department.

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.
Safety instructions

1  Signal terms and definitions

<table>
<thead>
<tr>
<th>Symbols used</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="DANGER!" /></td>
<td><strong>DANGER!</strong> as used in these instructions, this means that personal injuries can occur if the relevant precautionary measures are not taken.</td>
<td>⇒ Observe the safety instructions.</td>
</tr>
<tr>
<td><img src="image" alt="ATTENTION!" /></td>
<td><strong>ATTENTION!</strong> as used in these instructions, this means that damage to property or environment can occur if the relevant precautionary measures are not taken.</td>
<td>⇒ Observe the safety instructions.</td>
</tr>
<tr>
<td><img src="image" alt="NOTE!" /></td>
<td><strong>NOTE!</strong> as used in these instructions, this points at facilitations of work, particularities for operation or possible maloperation.</td>
<td>⇒ Observe the notes.</td>
</tr>
</tbody>
</table>

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 barriering 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.

<table>
<thead>
<tr>
<th>DANGER!</th>
</tr>
</thead>
<tbody>
<tr>
<td>The perfect and safe operation of this switchgear is conditional on:</td>
</tr>
<tr>
<td>✓ Observance of operating and installation instructions.</td>
</tr>
<tr>
<td>✓ Qualified personnel.</td>
</tr>
<tr>
<td>✓ Proper transportation and correct storage of the switchgear.</td>
</tr>
<tr>
<td>✓ Correct installation and commissioning.</td>
</tr>
<tr>
<td>✓ Diligent operation and maintenance.</td>
</tr>
<tr>
<td>✓ Observance of the instructions applicable at site for installation, operation and safety.</td>
</tr>
</tbody>
</table>

4 Qualified personnel

Qualified personnel in accordance with these instructions are persons who are familiar with transport, installation, commissioning, maintenance and operation of the product and have appropriate qualifications for their work.

To obtain the necessary qualification about transport, installation and commissioning, this personnel must have participated in a training of assembly and installation of Siemens air-insulated medium-voltage switchgear type 8BT1.

This installation training provides detailed information about design, operation, installation and trouble shooting on the primary part of 8BT1 switchgear. After successful participation, the participants in this training get a certificate. This certificate authorises the participant to install, assemble and connect this medium-voltage switchgear electrically as his own responsibility.

For further information about this installation training, please contact:

SIEMENS AS

Yakacik Caddesi No:111

Kartal 34870 Istanbul

TURKEY

Tel : +90 216 459 2999

Furthermore, qualified personnel must have the following training and instruction or authorisation:

- 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
Mr. N.N.
Siemens Power Services

This is to certify the successful participation in the Training of Assembly and Installation of Siemens air-insulated, medium-voltage switchgear type 8BT1 at the Siemens Training Center Kartal/Turkey.

By this certificate Mr. N.N. is authorized to install the a.m. medium-voltage switchgear and perform the electrical connections, including mechanical and electrical tests on site, at his own responsibility.

Mr. N.N. is obliged to send written reports to the Siemens Factory Kartal/Turkey department PTD M Q about any work performed on this switchgear.

This certificate expires three years after the date of issue. Its validity can only be extended by the Training Center Kartal.

Kartal, Sep 22nd, 2006

Training Center Kartal

420145
Description

5 Features

8BT1 Truck-type circuit-breaker switchgear / fixed-mounted switch-disconnector switchgear is air-insulated, factory-assembled, type-tested, metal-enclosed switchgear for indoor installation according to IEC 62 271-200, type of accessibility A.

Personal safety
- All switching operations can be performed with high-voltage door closed
- Standard degree of protection IP4X according to IEC 60 529
- Panels tested for internal arcs as per IEC 62 271-200
- Partition class PM for circuit-breaker panels by means of earthed, metallic shutters and partitions
- Loss of service continuity category LSC 2A
- Metallic, positively driven shutters protect against accidental contact with the live upper contacts and the busbars in the circuit-breaker panel
- In the switch-disconnector panel, an integrated partition inserted between the switch-disconnector contacts when the earthing switch is in CLOSED position protects against accidental contact with the live fixed contacts and the busbars
- Mechanical switch position indicator for the circuit-breaker
- Switch position of the switch-disconnector and the earthing switch as well as position of the switching-device truck visible through window in the high-voltage door.
- Logical interlocks for actuating the circuit-breaker, the switch-disconnector, the operating mechanism of the truck and the operating mechanism of the earthing switch prevent maloperation
- Option: Verification of safe isolation from supply with high-voltage door closed by means of a voltage detecting system according to IEC 61 243-5
- Feeder earthing by means of make-proof earthing switches.

Security of operation
- Operation of all switching, disconnecting and earthing functions from panel front
- Convenient height of actuating openings, control elements and switch position indicators on high-voltage door, as well as of low-voltage equipment in door of low-voltage compartment.

Flexibility
- High flexibility due to various configurations of the basic panel types
- Wall-standing or free-standing arrangement
- Cable connection from front
- Designed as truck-type switchgear (circuit-breaker) or fixed-mounted switchgear (switch-disconnector)
- Use of block-type current transformers
- Extension of existing switchgear at both ends without modification of panels
- Secondary multiratio for current transformers
- Pressure relief ducts for different arc-fault stresses

Re-availability
- Panel-internal control cables routed in metallic wiring ducts or steel spiral tubes
- Cable testing without isolating the switchgear possible due to accessibility of the combined switching-device/cable compartment
- Extension of existing switchgear at both ends without modification of panels
- Metallic partitions and shutters in the circuit-breaker panel
6 Panel types

8BT1 truck-type circuit-breaker switchgear consists of various panel types which can be freely combined according to the requirements.

Product range

The panel versions are shown hereafter. Graphical symbols shown in dotted lines can be ordered optionally.

<table>
<thead>
<tr>
<th>Circuit-breaker panel</th>
<th>Disconnecting panel</th>
<th>Bus sectionaliser</th>
<th>Switch-disconnector panel</th>
<th>Metering panel</th>
<th>Bus riser panel</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Diagram" /></td>
<td><img src="image2.png" alt="Diagram" /></td>
<td><img src="image3.png" alt="Diagram" /></td>
<td><img src="image4.png" alt="Diagram" /></td>
<td><img src="image5.png" alt="Diagram" /></td>
<td><img src="image6.png" alt="Diagram" /></td>
</tr>
<tr>
<td>SION vacuum circuit-breaker</td>
<td></td>
<td>Current transformer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disconnector links</td>
<td></td>
<td>Voltage transformer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switch-disconnector</td>
<td></td>
<td>Voltage transformer, withdrawable, with/without primary fuses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switch-disconnector with HV HRC fuses</td>
<td></td>
<td>HV HRC fuse</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Make-proof earthing switch</td>
<td></td>
<td>Cable sealing ends, max. 4x500 mm² per phase ¹)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacitive voltage detecting system</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surge arrester</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surge limiter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹) The details refer to conventional RXS single-core sealing ends for XLPE cables or other makes with similar dimensions.
Panel design
Truck-type circuit-breaker switchgear 8BT1 is of the modular type and has two compartments.

Features
- Enclosure made of powder-coated or galvanised sheet-steel
- Compartments bolted together
- Each compartment has its own pressure relief

Fig. 1: 8BT1 circuit-breaker panel 12 kV / 1250 A

A Combined switching-device compartment
B Busbar compartment (tool-based accessible)
C Low-voltage compartment / Low-voltage niche
D SION circuit-breaker on switching-device truck

1 Pressure relief
2 Low-voltage plug connector
3 Switching-device truck
4 Cable sealing ends
5 Make-proof earthing switch
6 Voltage transformer
7 Block-type current transformer
8 Busbar voltage transformer
9 Bushings
10 Make-proof busbar earthing switch
11 Busbars
6.1 Circuit-breaker panel

Circuit-breaker panels are used as incoming or outgoing feeder panels. The SION vacuum circuit-breaker is mounted on a truck for pushing the vacuum circuit-breaker into the panel. The vacuum circuit-breaker can break the normal and short-circuit currents specified on the rating plate.

Basic components
- Truck with SION vacuum circuit-breaker
- Busbar system
- Low-voltage plug connector to be coupled manually
- Panel connection for cables

Additional components
- Current transformers at the cable feeder as block-type current transformers
- Voltage transformers
  - at the cable feeder
  - at the busbar
- Surge arresters
- Busbar earthing switch with short-circuit making capacity
- Sockets for capacitive voltage detecting systems
- Feeder earthing switch with short-circuit making capacity
6.2 Switch-disconnector panel

Two versions of switch-disconnector panels are available: As cable panels for breaking currents up to 630 A, and as transformer panels with high-voltage fuses for transformer protection. Loss of service continuity category for this panel: LSC 2A

**Basic components**
- Busbars
- Switch-disconnector, fixed-mounted
- Feeder earthing switch with short-circuit making capacity
- Panel connection for cables

**Additional components**
- Auxiliary switch for fuse trip indication
- Current transformers
- Capacitive voltage detection
- 3 fixed-mounted high-voltage fuses according to DIN 43625, striker pin “medium” according to IEC 60282

6.3 Disconnecting panel

Disconnecting panels can be used for no-load disconnection of two busbar sections in bus sectionalisers.

**Basic components**
- Truck with disconnector links
- Busbar system
- Low-voltage plug connector to be coupled manually
- Panel connection for cables

**Additional components**
- Current transformers at the cable feeder as block-type current transformers
- Voltage transformers
  - at the cable feeder
  - at the busbar
- Busbar earthing switch with short-circuit making capacity
- Sockets for capacitive voltage detecting systems
- Feeder earthing switch with short-circuit making capacity

6.4 Metering panel

Metering panels are used for measuring the voltage at the busbar system. The metering panel is equipped with a metering truck.

**Basic components**
- Metering truck with voltage transformers
- Busbar system
- Low-voltage plug connector to be coupled manually between truck and panel

**Additional components**
- Sockets for capacitive voltage detecting systems
- Busbar earthing switch with short-circuit making capacity
- Three HV HRC fuses mounted on the truck
6.5 Bus sectionaliser

Bus sectionalisers consist of a circuit-breaker panel and a bus riser panel.

**Basic components**
- Truck with SION vacuum circuit-breaker
- Busbar system
- Low-voltage plug connector to be coupled manually between truck and panel

**Additional components**
- Metering truck (in the bus riser panel)
- Sockets for capacitive voltage detecting systems
- Two sets of block-type current transformers (one set in the circuit-breaker panel, one set in the bus riser panel)
- Two sets of voltage transformers (in the bus riser)

6.6 Busbar connection panel

Busbar connection panels are bus riser panels with a panel connection for cables.

**Basic components**
- Busbar system
- Panel connection for cables

**Additional components**
- Current transformers at the cable feeder as block-type current transformers
- Voltage transformers
  - at the cable feeder
- Sockets for capacitive voltage detecting systems
7 Components

7.1 Truck with SION vacuum circuit-breaker

Features of truck with vacuum circuit-breaker
- Integrated mechanical interlock for operating mechanism
- Mechanical switch position indicators for circuit-breaker
- Truck firmly interlocked with panel
- Manual operation of the switching-device truck mechanism
- The control cables of the truck are connected with the panel through a low-voltage plug connector to be coupled manually when the circuit-breaker truck is inserted in the panel

Fig. 3: Truck with SION vacuum circuit-breaker

1. Contact pole
2. Truck
3. Mechanical interlock for operation of switching-device truck
4. Pick-up for earthing busbar
5. Control for racking the switching-device truck
6. Fixing levers to lock the truck in the panel
7. Rating plate
8. Front plate of SION circuit-breaker with control
Description

Basic equipment of vacuum circuit-breaker

- Operating mechanism unit for circuit-breaker
- Isolating contacts
- Mechanical interlocks
- Control board for mechanical operation
- Closing solenoid
- Mechanical "closing spring charged" indicator
- First shunt release
- Operating cycle counter
- Circuit-breaker tripping signal
- Electrical anti-pumping device
- Varistor module for auxiliary voltage ≥ 60 V
- Auxiliary switch 12NO+12NC

Additional equipment for vacuum circuit-breaker

- Electromagnetic interlocks
- Second shunt release
- Undervoltage release
- C.t.-operated release 0.1 s
- Design for higher insulation requirements

7.2 Disconnector truck

- Truck firmly interlocked with panel
- The control cables of the truck are connected with the panel through a low-voltage plug connector to be coupled manually when the truck is inserted in the panel

Basic components

- Disconnector links
7.3 Metering truck

Basic components of metering truck
- Measuring transformers for all three phases

Additional components of metering truck
- Three primary fuses mounted on the truck

7.4 Busbar compartment

Fig. 5: Busbar compartment with 1250 A busbars

Basic components
- Version with rated normal current 630 A, 1250 A or 2000 A (conductor bar connections Cu-Ag as per IEC 60694)
- Busbars made of bare flat copper, bolted from panel to panel
- Transverse partition from panel to panel
- Pressure relief upwards into the pressure relief duct

Additional components
- Capacitive voltage taps in the post insulators for capacitive voltage detection
- Busbar voltage transformers
- Make-proof busbar earthing switch
7.5 Cable connection compartment

Cable connections for 8BT1 truck-type switchgear are introduced in the switchgear at the front.

Fig. 6: Cable compartment

Basic components
- Version with rated normal current 630 A, 1250 A or 2000 A (conductor bar connections Cu-Ag as per EN 60694)
- Panel bars made of bare flat copper
- Pressure relief upwards through the pressure relief duct

Possible connections
- Cables: Single-core XLPE up to max. 2 x 500 mm² (for rated normal current 630 A and 1250 A) / 4 x 500 mm² (for rated normal current 2000 A) per phase, or three-core XLPE up to max. 300 mm² with RXS cable terminations or other types with similar dimensions (with additional deep bottom pan and with reduced quantity: 1 instead of 2 and 2 instead of 4)

Additional components
- Block-type current transformers
- Voltage transformers, max. 3 nos. single-pole
- Surge arresters
- Earthing switch with short-circuit making capacity
- Panel heater
- Sockets for capacitive voltage detecting systems
7.6 Low-voltage compartment

Fig. 7: Low-voltage compartment

**Basic components**
- Completely partitioned off the panel and removable from the panel as a separate unit
- For accommodation of protection, control, measuring and metering equipment
- Plug-in bus wires and control cables
- Standard version with 580 mm height
- Door hinge on the left

**Additional components**
- Heater

7.7 Current transformers

**Features**
- According to IEC 60044-1
- 4MA7 block-type current transformer, cast-resin insulated

**Mounting location**
The block-type current transformers can be installed in the cable compartment of switching-device or bus sectionaliser panels.
### Description

#### 7.8 Voltage transformers

**Features**
- According to IEC 60044-2
- 4MR12, 4MR14 voltage transformers
  - Cast-resin insulated

#### Mounting location

Voltage transformers can be mounted on the metering truck, in the cable compartment or at the busbar. The transformers on the metering truck can be equipped with fuses.

### 8 Interlocks

#### 8.1 Interlocks for panels with circuit-breakers

**Mechanical interlocks**

<table>
<thead>
<tr>
<th>Action</th>
<th>Interlocking condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating the circuit-breaker</td>
<td>Switching-device truck is in service or test position</td>
</tr>
<tr>
<td>Closing the circuit-breaker</td>
<td>Low-voltage plug connector on circuit-breaker is plugged in; switching-device truck has reached defined end position</td>
</tr>
<tr>
<td>Removing the low-voltage plug connector from the circuit-breaker</td>
<td>Switching-device truck is in test position</td>
</tr>
<tr>
<td>Interrupting auxiliary voltage on the circuit-breaker</td>
<td>Switching-device truck is in test position</td>
</tr>
<tr>
<td>Opening the door to the switching-device compartment</td>
<td>If the switching-device truck is in the panel: Switching-device truck is in test position</td>
</tr>
<tr>
<td>Closing the door to the switching-device compartment</td>
<td>If the switching-device truck is in the panel: Low-voltage plug connector on circuit-breaker is plugged in, and locking gates of guide rails are closed</td>
</tr>
<tr>
<td>Racking the switching-device truck to service position</td>
<td>Door to switching-device compartment is closed and locked</td>
</tr>
<tr>
<td>Replacing the switching-device truck</td>
<td>Switching-device truck can only be replaced if the coding is identical</td>
</tr>
</tbody>
</table>

**Additional interlocks (option)**

<table>
<thead>
<tr>
<th>Action</th>
<th>Interlocking condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Racking the switching-device truck</td>
<td>Electromechanical interlock</td>
</tr>
<tr>
<td></td>
<td>Mechanical locking device with padlock for switching-device truck</td>
</tr>
<tr>
<td>Opening the door to the switching-device compartment</td>
<td>Feeder earthing switch is in CLOSED position</td>
</tr>
</tbody>
</table>
8.2 Interlocks for panels with switch-disconnectors

**Mechanical interlocks**

<table>
<thead>
<tr>
<th>Action</th>
<th>Interlocking condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating the switch-disconnector</td>
<td>Earthing switch in OPEN position</td>
</tr>
<tr>
<td>Operating the earthing switch</td>
<td>Switch-disconnector in OPEN position and high-voltage door closed</td>
</tr>
<tr>
<td>Opening the door to the switching-device compartment</td>
<td>Earthing switch in CLOSED position</td>
</tr>
</tbody>
</table>

**Additional interlocks (option)**

<table>
<thead>
<tr>
<th>Action</th>
<th>Interlocking condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating the switch-disconnector</td>
<td>Padlock</td>
</tr>
<tr>
<td>Operating the earthing switch</td>
<td>Padlock</td>
</tr>
</tbody>
</table>

8.3 Interlocks for panels with feeder earthing switch

**Mechanical interlocks**

<table>
<thead>
<tr>
<th>Action</th>
<th>Interlocking condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating the feeder earthing switch</td>
<td>Switching-device truck in test position</td>
</tr>
<tr>
<td>Racking the switching-device truck to service position</td>
<td>Feeder earthing switch in OPEN position</td>
</tr>
</tbody>
</table>

**Additional interlocks (option)**

<table>
<thead>
<tr>
<th>Action</th>
<th>Interlocking condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating the feeder earthing switch</td>
<td>Electromechanical interlock</td>
</tr>
<tr>
<td></td>
<td>Padlock</td>
</tr>
</tbody>
</table>

9 Accessories

**Standard accessories**
The following accessories are supplied with the switchgear:
- Operating lever for closing/opening the circuit-breaker mechanically
- Double-bit key for the door of the switching-device compartment
- Double-bit key for the door of the low-voltage compartment
- Operating lever for the feeder or busbar earthing switch
- Hand crank for racking the switching-device truck in and out
- Hand crank for charging the circuit-breaker closing spring

**Other accessories**
According to the order documents/purchase order (selection):
- HV HRC fuse links
- Cable plugs / adapter systems
- Surge arresters
- LRM and HR voltage indicators
Description

• Test units to check the capacitive interface and the voltage indicators

• Phase comparison test units for capacitive voltage indicators type EPV-HR (e.g. make Pfisterer, including 2HR-LRM adapters and storage bag)

• Wall-mounting holder for accessories
• Earthing accessories for 25 kA/1 s version
• Touch-up set for paint damages
• 64-pole connecting cable, length: 3 m
• Lubricants
• KP incandescent lamp voltage indicator with operating rod 12 kV
• Test equipment for pressure switch
10 Technical data

10.1 Complete switchgear

### Electrical data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Value 1</th>
<th>Value 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>kV</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>Rated short-duration power-frequency withstand voltage</td>
<td>kV</td>
<td>28</td>
<td>50</td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage</td>
<td>kV</td>
<td>75</td>
<td>125</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>Hz</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Rated short-circuit breaking current</td>
<td>kA</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Rated short-circuit making current</td>
<td>kA</td>
<td>63</td>
<td>63</td>
</tr>
<tr>
<td>Rated peak withstand current</td>
<td>kA</td>
<td>63</td>
<td>63</td>
</tr>
<tr>
<td>Rated short-time withstand current</td>
<td>kA</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Rated duration of short circuit</td>
<td>sec</td>
<td>max. 3*</td>
<td>max. 3*</td>
</tr>
<tr>
<td>Rated normal current of the busbar</td>
<td>A</td>
<td>630/1250/2000</td>
<td>630/1250/2000</td>
</tr>
<tr>
<td>Rated normal current for incoming and outgoing feeders</td>
<td>A</td>
<td>630/1250/2000</td>
<td>630/1250/2000</td>
</tr>
<tr>
<td>Ambient air temperature</td>
<td>°C</td>
<td>~5 to +55</td>
<td></td>
</tr>
</tbody>
</table>

* Depending on the design.

### Transport weights without packing

The transport weights can be quite different due to the various equipment versions. The exact weights of the panels supplied are given in the order documents. The weights for the different panel widths are described below. If no exact information is available in order to provide for suitable lifting equipment and for planning the floor loads, the respective maximum values apply:

- Panels with a width of 600 mm: 350-800 kg
- Panels with a width of 800 mm: 450-900 kg
- Panels with a width of 1000 mm: 550-1000 kg

### Dimensions for transport packing

<table>
<thead>
<tr>
<th></th>
<th>Individual panel</th>
<th>Double panel</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Depth in mm</strong></td>
<td>1600</td>
<td>1600</td>
</tr>
<tr>
<td><strong>Width in mm</strong></td>
<td>750</td>
<td>1200</td>
</tr>
<tr>
<td><strong>Height in mm</strong></td>
<td>2200/2500*</td>
<td>2200/2500*</td>
</tr>
</tbody>
</table>

*Panel with pressure relief duct
Dimensions of switchgear room in mm

<table>
<thead>
<tr>
<th>Height</th>
<th>Switchgear room, at least: 2400* / 2800 / 3000**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>Control aisle between two rows</td>
</tr>
<tr>
<td></td>
<td>for panel width of 600 mm, at least: 1200</td>
</tr>
<tr>
<td></td>
<td>for panel width of 800 mm, at least: 1600</td>
</tr>
</tbody>
</table>

*Panel with closed pressure relief duct
** For 1 s arcing time

Protection against ingress of solid foreign bodies, electric shock and water

The switchgear 8BT1 complies with the following degrees of protection according to IEC 60529:
- IP4X for switchgear enclosure of the operating front and the side walls
- IP2X for internal connections

<table>
<thead>
<tr>
<th>Degree of protection</th>
<th>Type of protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP4X</td>
<td><strong>Protection against ingress of solid foreign bodies:</strong> Protected against ingress of solid foreign bodies, diameter 1 mm.</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>IP2X</td>
<td><strong>Protection against ingress of solid foreign bodies:</strong> Protected against ingress of solid foreign bodies, diameter &gt;12.5 mm.</td>
</tr>
<tr>
<td></td>
<td><strong>Protection against electric shock:</strong> Protected against access to hazardous parts with a test finger (diameter 12 mm, length 80 mm). Test finger must be sufficiently clear of hazardous parts.</td>
</tr>
</tbody>
</table>

Basic prescriptions and standards

The truck-type circuit-breaker switchgear 8BT1 for indoor installation corresponds to 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>60 694</td>
<td>0670-1000</td>
</tr>
<tr>
<td></td>
<td>60 29862 271-200</td>
<td>0670-6 *0671-200</td>
</tr>
<tr>
<td>Switching devices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circuit-breaker</td>
<td>62 271-100</td>
<td>0671-100</td>
</tr>
<tr>
<td>Disconnecter/earthing sw.</td>
<td>62 271-102</td>
<td>0671-102</td>
</tr>
<tr>
<td>Switch-disconnector</td>
<td>60 265</td>
<td>0670-301</td>
</tr>
<tr>
<td>Switch-disconnector/fuse combination</td>
<td>62 271-105</td>
<td>0671-105</td>
</tr>
<tr>
<td>Voltage detect. systems</td>
<td>61 243-5</td>
<td>0682-415</td>
</tr>
<tr>
<td>Surge arresters</td>
<td>60 099</td>
<td>0675</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>60 529</td>
<td>0470-1</td>
</tr>
<tr>
<td>Measuring 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>Installation</td>
<td>61 936-1</td>
<td>0101</td>
</tr>
<tr>
<td>Environm. conditions</td>
<td>60 721-3-3</td>
<td>DIN EN 60 721-3-3</td>
</tr>
<tr>
<td>*) Transition period until 2007-02-01</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

X-ray regulations

The vacuum interrupters fitted in the SION vacuum circuit-breakers are type-approved in accordance with the X-ray regulations of the Federal Republic of Germany. They conform to the requirements of the X-ray regulations of January 8, 1987 (Federal Law Gazette Page 144) §8 and Annex III Section 5 up to rated short-duration power-frequency withstand voltage stipulated in accordance with IEC/DIN VDE.
10.2 Rating plates

The rating plates contain all relevant data for the switchpanel and its components.

Rating plates are located:

- On the inside of the door of the low-voltage compartment (rating plates for switchpanel, current/voltage transformers)
- On the gear block of the circuit-breaker (circuit-breaker rating plate)
10.3 Vacuum circuit-breaker

Operating times

<table>
<thead>
<tr>
<th>Operating times</th>
<th>Component</th>
<th>Duration</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closing time</td>
<td></td>
<td>&lt;75 ms</td>
<td></td>
</tr>
<tr>
<td>Charging time</td>
<td></td>
<td>&lt;10 s</td>
<td></td>
</tr>
<tr>
<td>Opening time</td>
<td>Shunt release (Y1)</td>
<td>&lt;65 ms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Additional release 3AX 11</td>
<td>&lt;50 ms</td>
<td></td>
</tr>
<tr>
<td>Arcing time</td>
<td></td>
<td>&lt;15 ms</td>
<td></td>
</tr>
<tr>
<td>Breaking time</td>
<td>Shunt release (Y1)</td>
<td>&lt;80 ms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Additional release 3AX 11</td>
<td>&lt;65 ms</td>
<td></td>
</tr>
<tr>
<td>Dead time</td>
<td></td>
<td>300 ms</td>
<td></td>
</tr>
<tr>
<td>Close-open contact time</td>
<td>Shunt release (Y1)</td>
<td>&lt;75 ms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Additional release 3AX 11</td>
<td>&lt;60 ms</td>
<td></td>
</tr>
<tr>
<td>Minimum command duration</td>
<td>CLOSE Closing solenoid (Y9)</td>
<td>45 ms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OPEN Shunt release (Y1)</td>
<td>40 ms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OPEN Additional release 3AX 11 (Y2), (Y4), (Y7)</td>
<td>20 ms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Short-time impulse duration of c.b. tripping signal</td>
<td>10 ms</td>
<td></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>24 kV / 25 kA: 30 times</td>
</tr>
<tr>
<td></td>
<td>12 kV / 25 kA: 80 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 SION vacuum circuit-breakers are suitable for auto-reclosing. For DC operation, the maximum power consumption is approx. 380 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:
The supply voltage may deviate from the rated supply voltage specified in the table by 
−15% to +10%.

Auxiliary switch (S1)

<table>
<thead>
<tr>
<th>Rated insulation voltage</th>
<th>AC/DC 250 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulation group</td>
<td>C according to DIN VDE 0110</td>
</tr>
<tr>
<td>Continuous current</td>
<td>10 A</td>
</tr>
<tr>
<td>Making capacity</td>
<td>50 A</td>
</tr>
</tbody>
</table>

The breaking capacity of the auxiliary switch 3SV92 is shown in the following table:

<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>10</td>
</tr>
<tr>
<td>DC 24</td>
<td>Resistive load</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Inductive load</td>
<td>10</td>
</tr>
<tr>
<td>48</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>220</td>
<td>2.5</td>
<td></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: 60 W or 
  60 VA.

Undervoltage release

Undervoltage releases comprise an electromagnetic system which is permanently 
connected to voltage while the circuit-breaker is closed. If the voltage falls below a 
predetermined value, unlatching of the release is enabled and the circuit-breaker is 
opened via the stored-energy mechanism. 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. Undervoltage releases can also be connected to voltage 
transformers. If the operating voltage falls unpermissibly, the undervoltage release trips

<table>
<thead>
<tr>
<th>Rated supply voltage V</th>
<th>Recommended rated current of the protection equipment*</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC 24</td>
<td>16</td>
</tr>
<tr>
<td>DC 48</td>
<td>8</td>
</tr>
<tr>
<td>DC 60</td>
<td>6</td>
</tr>
<tr>
<td>DC/AC 110 50/60 Hz</td>
<td>3</td>
</tr>
<tr>
<td>DC 220/AC 230 50/60 Hz</td>
<td>1.6</td>
</tr>
</tbody>
</table>

*) Installed m.c.b. with C-characteristic
Description

the circuit-breaker automatically. Any necessary varistors and rectifiers are integrated in the release. Power consumption: $\leq 6.5 \text{ W}$ or $\leq 7.5 \text{ VA}$.

Circuit-breaker tripping signal

When the circuit-breaker is tripped by a release, there is a signal. If the circuit-breaker is tripped deliberately with the mechanical pushbutton, this signal is suppressed.

C.t.-operated release (Y4, Y5)

C.t.-operated releases comprise a stored-energy mechanism, an unlatching mechanism, and an electromagnetic system. When the tripping current is exceeded (90 % of the rated current of the c.t.-operated release), the stored-energy mechanism is unlatched to start opening the circuit-breaker. When c.t.-operated releases are used, auxiliary transformers are required beside the main current transformers. Power consumption for 0.5 A and 1 A $\leq 6 \text{ VA}$ at $\leq 90 \%$ of the rated current and open armature.

Varistor module

<table>
<thead>
<tr>
<th>ATTENTION!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switching overvoltages can damage electronic control devices.</td>
</tr>
<tr>
<td>Do not switch off inductive consumers in DC circuits.</td>
</tr>
</tbody>
</table>

All necessary varistors and rectifiers are integrated in the 2nd shunt release and / or the c.t.-operated release.

10.4 Circuit diagrams

The circuit diagrams are given in the catalogues and product descriptions of the respective switching devices, which can be obtained at your regional Siemens representative.

11 Service information

11.1 Maintenance

The vacuum circuit-breakers used are maintenance-free within the range of the permissible operating cycles. Under normal environmental and operating conditions, the switchgear has maintenance intervals of 5 years.

11.2 Switchgear extension

The switchgear can be extended on both sides without having to modify existing panels.

Please contact your Siemens partner for switchgear extensions and component replacements.

11.3 Spare part orders

Required information when ordering spare parts for individual components and equipment:

• Type and serial number of switchgear as per 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

ATTENTION!

Switching overvoltages can damage electronic control devices.

Do not switch off inductive consumers in DC circuits.
11.4 Replacement of switchpanels and components

Replacement of switchpanels
Panels can be replaced after undoing the panel connecting bolts.

If you are planning to replace a panel, please contact your regional representative, as the replacement must only be done by experts with special tools.

Replacement of components
The individual components such as measuring instruments, current transformers etc. can be replaced. Please contact regional Siemens representative for replacing components.

11.5 Disposal

8BT1 switchgear is an environmentally compatible product.

All metal plates are powder-coated with resistant epoxy resin material.

The switchgear materials should be recycled if possible. The switchgear can be disposed of in an 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 with a residual mixed-scrap portion is the more environmentally compatible way.

Electronic scrap has to be disposed of in accordance with the existing regulations.

The switchgear consists of the following materials:
- Sheet-steel, powder coated
- Copper
- Aluminium
- Cast resin
- Fibre-reinforced plastics
- Rubber materials
- Ceramic materials
- Lubricants
- Bolts, washers, nuts, rivets

As delivered by Siemens, the switchgear does not contain hazardous materials as per the Hazardous Material Regulations applicable in the Federal Republic of Germany. In other countries, the locally applicable regulations must be followed.

Should you require further information, please contact your regional Siemens representative.
12 Safety instructions

**DANGER!**

High voltage! Danger!

- Do not touch live components.
- Ensure that the switchgear is only operated by qualified personnel who are familiar with the operating instructions and observe the warnings.

**DANGER!**

During operation of electrical equipment and switchgear, parts of this equipment are under dangerous electrical voltage. Mechanical components may move quickly, even remotely controlled.

- Do not remove covers.
- Do not reach into openings.
- Do not touch breaker poles and switching rods.

The perfect and safe operation of this switchgear is conditional on:
- Proper transportation
- Correct storage
- Correct erection and installation
- Diligent operation

Installation and operation of this switchgear are conditional on observance of the following standards:
- VDE 0100 – IEC 60364
- VDE 0101
- VDE 0105
13 Control elements and indicators

Indicator for circuit-breaker closing spring

When the auxiliary voltage supply is switched on, the circuit-breaker closing spring is charged automatically within approx. 15 s. After charging, the spring charged indicator changes from the "spring charged" to the "spring not charged" position.

Switch position indications

<table>
<thead>
<tr>
<th>Switch position indications</th>
<th>CLOSED</th>
<th>OPEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circuit-breaker / switch-disconnector / earthing switch</td>
<td><img src="CLOSED.png" alt="Image" /></td>
<td><img src="OPEN.png" alt="Image" /></td>
</tr>
<tr>
<td>Spring energy store of the circuit-breaker</td>
<td>CHARGED</td>
<td>NOT CHARGED</td>
</tr>
</tbody>
</table>

Fig. 9: Control elements, circuit-breaker panel

- ① Actuating opening for earthing switch
- ② Actuating opening and interlock for racking the switching-device truck
- ③ Button for opening the high-voltage door
- ④ Inspection window to identify the switch position indicator of the circuit-breaker, the spring charged indicator and the operating cycle counter
- ⑤ Actuating openings for manual operation of the circuit-breaker
- ⑥ Actuating opening for manual charging of the circuit-breaker closing spring
- ⑦ Actuating opening for busbar earthing switch
- ⑧ Actuating opening for locking or unlocking the high-voltage door
- ⑨ Inspection window to identify the test / service position of the switching-device truck
- ⑩ High-voltage door
- ⑪ Capacitive voltage detecting system for feeder / busbar
- ⑫ Actuating opening for locking or unlocking the low-voltage door
- ⑬ Low-voltage door
13.1 Operating tools

The following operating tools are supplied as accessories:

Fig. 10: Hand crank for racking the switching-device truck

Fig. 11: Double-bit key to release the truck position interlock and to open the high-voltage or low-voltage door

Fig. 12: Operating rod for closing / opening the circuit-breaker mechanically

Fig. 13: Operating tool for the feeder earthing switch, the busbar earthing switch and the switch-disconnector.

Fig. 14: Hand crank for manual charging of the closing spring in service position

Fig. 15: Hand crank for manual charging of the closing spring in test position
14 Opening the door to the switching-device compartment

<table>
<thead>
<tr>
<th>DANGER!</th>
</tr>
</thead>
<tbody>
<tr>
<td>High voltage! Danger!</td>
</tr>
<tr>
<td>- Isolate the busbars and the cable or bar connections <strong>before</strong> opening the high-voltage door. Observe the <strong>Five Safety Rules</strong>.</td>
</tr>
<tr>
<td>- Verify safe isolation from supply.</td>
</tr>
</tbody>
</table>

Opening the door
The door to the switching-device compartment is interlocked mechanically and can only be opened when the switching-device truck is in test position.

- Insert the double-bit key type 5 DIN 43 668-C35 horizontally in the opening at the front of the door to the switching-device compartment.
- Turn double-bit key 90° counter-clockwise.
- Push the control gate of the door upwards and open the door.

Closing the door
The door to the switching-device compartment can only be closed if the low-voltage connector is plugged in.

- Push the control gate of the door upwards.
- Press the door onto the switchgear frame and then push the control gate downwards.
- To lock the door mechanically: Turn double-bit key type 5 DIN 43 668-C35 90° clockwise.
- Remove double-bit key.

15 Racking the switching-device truck

Control elements of switching-device truck

![Control elements of switching-device truck](image)

Racking positions
The SION circuit-breaker is mounted on the truck. The switching-device truck can be racked to two different positions:

- **Service position:** The contact poles of the switching device are connected with the busbar and the feeder. The low-voltage connector is plugged in.
- **Test position:** The contact poles of the switching device are disconnected from the busbar and the feeder. In this position, electrical interlocks can be checked, for example. The low-voltage connector can be unplugged.
15.1 Racking the switching-device truck to service position

Preconditions for operation

- Truck completely inserted and interlocked in panel
- Door to switching-device compartment closed
- Circuit-breaker in OPEN position
- Feeder earthing switch in OPEN position
- Low-voltage connector plugged in

**DANGER!**

If there is no auxiliary voltage, both the electrical and the mechanical interlocks are closed. If the interlocks are eliminated, manual switching operations will be possible despite an existing electrical interlock, and they can cause operational breakdowns.

Ensure that the intended manual switching operation has been released externally.

To release the switching-device truck: Insert double-bit key horizontally into actuating opening ① and turn 90° clockwise to the “Racking free” position (manual racking).

Push hand crank for racking the switching-device truck onto operating shaft ② and turn clockwise as far as it will go.

Remove hand crank for racking the switching-device truck.
1. Turn double-bit key 90° clockwise to the “Service pos’n locked” position (service position interlocked).

2. Remove double-bit key.

3. The switching-device truck was racked from TEST to SERVICE position.

15.2 Racking the switching-device truck to test position

Preconditions for operation

- Switching-device truck in SERVICE position
- Circuit-breaker in OPEN position

DANGER!

If there is no auxiliary voltage, both the electrical and the mechanical interlocks are closed. If the interlocks are eliminated, manual switching operations will be possible despite an existing electrical interlock, and they can cause operational breakdowns.

- Ensure that the intended manual switching operation has been released externally.

- To release the switching-device truck: Insert double-bit key horizontally into actuating opening ① and turn 90° counter-clockwise to the “Racking free” position (manual racking).

- Push hand crank for racking the switching-device truck onto operating shaft ② and turn counter-clockwise as far as it will go.
Operation

> Remove hand crank for racking the switching-device truck.

> Turn double-bit key 90° counter-clockwise to the “Test pos’n locked” position (test position interlocked).

> Remove double-bit key.

✓ The switching-device truck was racked from SERVICE to TEST position.

16 Operating the circuit-breaker

The SION vacuum circuit-breaker is equipped with a spring-operated/stored-energy mechanism. The closing spring is charged automatically after every closing operation. If the supply voltage fails, the closing spring can be charged manually. The opening spring is always charged during the closing operation.

16.1 Closing the circuit-breaker

Preconditions for operation

- Truck completely inserted and interlocked in panel (service position)
- Circuit-breaker in OPEN position
- Feeder earthing switch in OPEN position
- Low-voltage connector plugged in
- Door to switching-device compartment closed

![Control elements for operating the circuit-breaker](image)

Fig. 17: Control elements for operating the circuit-breaker
### Operation

#### Preconditions for operation
- Truck completely inserted and interlocked in panel (service position)
- Circuit-breaker in CLOSED position
- Feeder earthing switch in OPEN position
- Low-voltage connector plugged in
- Door to switching-device compartment closed

#### 16.2 Opening the circuit-breaker

1. **Turn cover of actuating opening** ② **aside using the rotary button ① located over it.**
2. **Insert the operating rod through the actuating opening ② in the door and operate the ON pushbutton of the circuit-breaker.**

   - The switch position indicator changes from "0" position to "I" position.
   - Take operating rod out of actuating opening.
   - The circuit-breaker is closed.

#### DANGER!
If there is no auxiliary voltage, both the electrical and the mechanical interlocks are closed. If the interlocks are eliminated, manual switching operations will be possible despite an existing electrical interlock, and they can cause operational breakdowns.

1. Ensure that the intended manual switching operation has been released externally.
2. **Turn cover of actuating opening ③ aside using the rotary button ④ located over it.**
3. **Insert the operating rod through the actuating opening ③ in the door and operate the OFF pushbutton of the circuit-breaker.**

   - The switch position indicator changes from "I" position to "0" position.
   - Take operating rod out of actuating opening.
   - The circuit-breaker is open.
17 Operating the feeder earthing switch

The feeder earthing switch is operated bottom right beside the door to the switching-device compartment.

17.1 Feeder earthing

Preconditions
- Switching-device truck interlocked in test position
- or: Switching-device truck not in panel

DANGER!
Once you have started a switching operation, you must complete it; turning back is blocked. The operating tool cannot be removed at intermediate positions.

⇒ Move the operating tool until reaching the end position.

Feeder earthing

ATTENTION!
Safe operation of the earthing switch is not guaranteed if the penetration of the earthing blade is beyond the tolerance. If the penetration is beyond the tolerance:

⇒ Do not put the earthing switch in operation.
⇒ Contact the local Siemens representative.

⇒ Push the operating lever for the feeder earthing switch onto the actuating lug ②.
⇒ Push the metal cover inside with the engaged operating lever until the lateral pins of the operating lever reach behind the front plate.
Push the operating lever downwards to CLOSED position.

The feeder earthing switch was switched from OPEN to CLOSED position.

Remove operating lever.

17.2 Feeder de-earthing

Preconditions
• Switching-device truck interlocked in test position

ATTENTION!
Once you have started a switching operation, you must complete it; turning back is blocked. The operating tool cannot be removed at intermediate positions.

Move the operating tool until reaching the end position.

Feeder de-earthing

ATTENTION!
Safe operation of the earthing switch is not guaranteed if the penetration of the earthing blade is beyond the tolerance. If the penetration is beyond the tolerance:

Do not put the earthing switch in operation.
Contact the local Siemens representative.

Push the operating lever for the feeder earthing switch onto the actuating lug.
Push the metal cover inside with the engaged operating lever until the lateral pins of the operating lever reach behind the front plate.
Press the operating lever upwards to OPEN position ①.

The feeder earthing switch was switched from CLOSED to OPEN position.

Remove operating lever.

18 Operating the busbar earthing switch

End position: Busbar earthing switch OPEN
Actuating lug
End position: Busbar earthing switch CLOSED

The busbar earthing switch is operated top right beside the door to the switching-device compartment.
### Busbar earthing

**DANGER!**

> Once you have started a switching operation, you must complete it; turning back is blocked. The operating tool cannot be removed at intermediate positions.

- Move the operating tool until reaching the end position.

#### ATTENTION!

Safe operation of the earthing switch is not guaranteed if the penetration of the earthing blade is beyond the tolerance. If the penetration is beyond the tolerance:

- Do not put the earthing switch in operation.
- Contact the local Siemens representative.

![Busbar earthing switch](image)

- Push the operating lever for the busbar earthing switch onto the actuating lug ②.
- Push the metal cover inside with the engaged operating lever until the lateral pins of the operating lever reach behind the front plate.
- Push the operating lever downwards to CLOSED position ③.

- The busbar earthing switch was switched from OPEN to CLOSED position.
- Remove operating lever.
18.2 Busbar de-earthing

**ATTENTION!**

- Once you have started a switching operation, you must complete it; turning back is blocked. The operating tool cannot be removed at intermediate positions.

  - Move the operating tool until reaching the end position.

**ATTENTION!**

- Safe operation of the earthing switch is not guaranteed if the penetration of the earthing blade is beyond the tolerance. If the penetration is beyond the tolerance:
  - Do not put the earthing switch in operation.
  - Contact the local Siemens representative.

- Push the operating lever for the busbar earthing switch onto the actuating lug ②.
- Push the metal cover inside with the engaged operating lever until the lateral pins of the operating lever reach behind the front plate.
- Push the operating lever upwards to OPEN position ①.

- The busbar earthing switch was switched from CLOSED to OPEN position.
- Remove operating lever.
19 Moving the switching-device truck into and out of the panel

The switching-device truck can be moved into and out of the switching-device compartment.

- Open the door to the switching-device compartment.
- Fold the locking gates of the guide rails to the inside.

- Move the switching-device truck into the switching-device compartment.
- If there is an earthing switch available, verify that the pin in the carriage mechanism reaches into the opening of the locking rod.

- Push the switching-device truck into the panel as far as it will go.
- Check whether the round shutter levers with slots located on the side covers of the truck are correctly seated in the guide bearings of the shutter mechanism.
Operation

⇒ Lock the switching-device truck in the switching-device compartment. To do this, turn the lateral fixing levers 90° inside and fold the locking gates of the guide rails to the outside.

✓ The switching-device truck is inserted and locked.
⇒ Plug the low-voltage connector in and latch the connector lock tight downwards.
⇒ Close the door to the switching-device compartment.
Moving the truck out of the panel

ATTENTION!
The door to the switching-device compartment can only be opened and the truck can only be racked if the switching-device truck is in test position and the truck is interlocked.

⇒ Rack the switching-device truck to test position.
⇒ Interlock the switching-device truck.

⇒ Open the door to the switching-device compartment.
⇒ Remove the low-voltage connector. To do this, push the connector lock upwards.
⇒ Fold the locking gates of the guide rails to the inside and turn the lateral fixing levers 90° outside.

⇒ Move the switching-device truck to the front and out of the panel.
⇒ Fold the locking gates of the guide rails to the outside again.
⇒ Close the door to the switching-device compartment.
20 Charging the circuit-breaker closing spring manually

If the control voltage fails, the closing spring for operating the circuit-breaker is no longer charged automatically. To operate the circuit-breaker in spite of this, the closing spring must be charged manually with the hand crank.

Preconditions
- Truck completely inserted and interlocked in panel

<table>
<thead>
<tr>
<th>DANGER!</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
</tr>
<tr>
<td>➔ Use special hand crank with freewheel from the accessories!</td>
</tr>
</tbody>
</table>

- Turn cover of operating shaft ② aside using the rotary button ① located over it.
- Push hand crank onto operating shaft.
- Turn hand crank clockwise approx. 25 turns until the “spring charged” indication appears in the inspection window.

- Remove hand crank.
  ✓ The spring is latched automatically. The energy required for the operating sequence OPEN-CLOSED-OPEN (auto-reclosing) is stored in the spring.
21 Verification of safe isolation from supply (LRM system)

The panels can be equipped with voltage detection systems.

Use voltage indicators according to IEC 78/183/CDV only.

The perfect function of the voltage indicator must have been verified:
• with a test unit according to IEC 78/183/CDV
• on live equipment

The function of the coupling section must have been checked according to:
• IEC 78/183/CDV

Plug 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 phases, the phases are isolated from supply.

22 Verification of safe isolation from supply (without LRM system)

Open the high-voltage door (see Page 31, “Opening the door to the switching-device compartment”).

Move the switching-device truck out of the panel (see Page 41, “Moving the switching-device truck into and out of the panel”).

Use high-voltage tester according to DIN VDE 0681.

23 Connecting the earthing and short-circuiting facility

<table>
<thead>
<tr>
<th>Preconditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Switching-device truck out of panel</td>
</tr>
</tbody>
</table>

The earthing and short-circuiting facility is connected to the earthing bar for the truck in the switching-device compartment with a bolt M12.
Operation

Connecting the earthing and short-circuiting facility at the feeder

- Connect earthing and short-circuiting facility to earthing bar for truck.
- Plug connector onto main fixed contacts of feeders (lower contact row) and screw tight.

Connecting the earthing and short-circuiting facility at the busbars

- Connect earthing and short-circuiting facility to earthing bar for truck.
- Open busbar shutters by pushing the opening levers.
- Plug connector onto main fixed contacts of busbars (upper contact row) and screw tight.

Fig. 18: Point of connection for earthing and short-circuiting facility
24 Switch-disconnector panel

24.1 Control elements and indicators of switch-disconnector panel

![Control elements of switch-disconnector panel]

Fig. 19: Control elements of switch-disconnector panel

1. Actuating opening for earthing switch
2. Button for opening the high-voltage door
3. Actuating opening for switch-disconnector
4. Actuating opening for locking or unlocking the high-voltage door
5. Inspection window to identify the switch positions of the switch-disconnector and the earthing switch, as well as the "fuse tripped" state
6. High-voltage door

24.2 Opening and closing the high-voltage door of the switch-disconnector panel

Precondition
- Switch-disconnector in OPEN position
- Feeder earthing switch in CLOSED position

The high-voltage door of the switch-disconnector panel is opened and closed in the same way as the high-voltage door of the circuit-breaker panel (see Page 31, "Opening the door to the switching-device compartment").
24.3 Operating the switch-disconnector

The switch-disconnector is operated top right beside the high-voltage door.
Operation

Closing the switch-disconnector

Preconditions
• High-voltage door closed
• Earthing switch in OPEN position
• Striker pin of HV HRC fuse link not tripped

<table>
<thead>
<tr>
<th>ATTENTION!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Once you have started a switching operation, you must complete it; turning back is blocked. The operating tool cannot be removed at intermediate positions.</td>
</tr>
<tr>
<td>➔ Move the operating tool until reaching the end position.</td>
</tr>
</tbody>
</table>

Switching operation

➔ Push the operating lever for the switch-disconnector onto the actuating lug ②.
➔ Push the metal cover inside with the engaged operating lever until the lateral pins of the operating lever reach behind the front plate.
➔ Push the operating lever upwards to CLOSED position ①.

✓ The switch-disconnector was switched from OPEN to CLOSED position.
➔ Remove operating lever.
Operation

Opening the switch-disconnector

Preconditions

- None, the switch-disconnector can always be opened.

<table>
<thead>
<tr>
<th>ATTENTION!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Once you have started a switching operation, you must complete it; turning back is blocked. The operating tool cannot be removed at intermediate positions.</td>
</tr>
</tbody>
</table>

- Move the operating tool until reaching the end position.

Switching operation

- Push the operating lever for the switch-disconnector onto the actuating lug.
- Push the metal cover inside with the engaged operating lever until the lateral pins of the operating lever reach behind the front plate.
- Push the operating lever downwards to OPEN position. Push the operating lever completely down to ensure that the toggle fastener of the switch-disconnector latches tight and the switch-disconnector can be closed again.

The switch-disconnector was switched from CLOSED to OPEN position.

- Remove operating lever.
24.4 Operating the feeder earthing switch

The feeder earthing switch is operated bottom right beside the high-voltage door.

The feeder earthing switch is operated bottom right beside the high-voltage door.
Operation

Closing the earthing switch

Preconditions
• Switch-disconnector in OPEN position

<table>
<thead>
<tr>
<th>ATTENTION!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Once you have started a switching operation, you must complete it; turning back is blocked. The operating tool cannot be removed at intermediate positions.</td>
</tr>
<tr>
<td>⇒ Move the operating tool until reaching the end position.</td>
</tr>
</tbody>
</table>

Switching operation
⇒ Push the operating lever for the feeder earthing switch onto the actuating lug ②.
⇒ Push the metal cover inside with the engaged operating lever until the lateral pins of the operating lever reach behind the front plate.
⇒ Push the operating lever downwards to CLOSED position ③.

✔ The feeder earthing switch was switched from OPEN to CLOSED position.
⇒ Remove operating lever.
Operation

Opening the earthing switch

Preconditions
- High-voltage door closed

<table>
<thead>
<tr>
<th>ATTENTION!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Once you have started a switching operation, you must complete it; turning back is blocked. The operating tool cannot be removed at intermediate positions.</td>
</tr>
<tr>
<td>Move the operating tool until reaching the end position.</td>
</tr>
</tbody>
</table>

Switching operation

- Push the operating lever for the feeder earthing switch onto the actuating lug.
- Push the metal cover inside with the engaged operating lever until the lateral pins of the operating lever reach behind the front plate.
- Push the operating lever upwards to OPEN position.

✓ The feeder earthing switch was switched from CLOSED to OPEN position.
- Remove operating lever.

24.5 Cable testing

<table>
<thead>
<tr>
<th>ATTENTION!</th>
</tr>
</thead>
<tbody>
<tr>
<td>High voltage! Danger!</td>
</tr>
<tr>
<td>Isolate the cables. To do this, observe the Five Safety Rules.</td>
</tr>
</tbody>
</table>

To test the cables it may be necessary to switch the earthing switch to OPEN position with the high-voltage door open. As the integrated partition is also inserted between the open switch contacts when the earthing switch is switched to CLOSED position, operation of the earthing switch with open high-voltage door is normally interlocked.

Preconditions
- Earthing switch CLOSED
Operation

Eliminating the earthing switch interlock

- Open the high-voltage door.
- Remove the nut.

- Disengage the operating rod of the integrated partition from the operating rod of the feeder earthing switch.

- Push the elastic interlocking plate to the left and switch the feeder earthing switch to OPEN position.

- Perform cable test.
Operation

24.6 Replacing HV HRC fuses

When a fuse operates, the switch-disconnector is tripped by the striker pin of the fuse. In this case, the actuating lug of the switch-disconnector operating mechanism remains in CLOSED position.

Attention!

High voltage! Danger! If the operating rod of the integrated partition and the operating rod of the feeder earthing switch are not interconnected, the integrated partition will not slide between the open switch contacts when the earthing switch is operated.

⇒ It is absolutely necessary to interconnect the operating rod of the integrated partition and the operating rod of the feeder earthing switch again!

⇒ Push the elastic interlocking plate to the left and switch the feeder earthing switch to CLOSED position again.

⇒ Interconnect the operating rod of the integrated partition and the operating rod of the feeder earthing switch again and fit the nut.

⇒ Close the high-voltage door.

Attention!

Risk of burning due to hot fuses.

⇒ Do not touch fuses, check temperature first.

⇒ Let hot fuses to cool down.

Attention!

The switchgear can be damaged!

⇒ During replacement, take care to use HV HRC fuse links with the same ratings and from the same manufacturer.

⇒ Always replace all HV HRC fuses.
Switch the switch-disconnector to OPEN position.
Switch the feeder earthing switch to CLOSED position.
Open the high-voltage door.
Remove fuse links.

Fig. 20: Tripped fuse (right-hand fuse)

⇒ Insert the new fuse links into the holders with the striker pin at the top.
⇒ Close the high-voltage door.
⇒ Switch the feeder earthing switch to OPEN position.
⇒ Push the operating lever onto the actuating lug of the switch-disconnector and switch strongly towards the OPEN position again. This makes the toggle fastener latch tight again and the switch-disconnector can now be closed.
⇒ Close the switch-disconnector.
✓ The HV HRC fuse replacement is completed.
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