Medium Voltage Switchgear
Type SIMOSEC up to 27.6 kV, Extendable, Metal-Enclosed up to 1200 A
Important

The information contained herein is general in nature and not intended for specific application purposes. It does not relieve the user of responsibility to use sound practices in application, installation, operation, and maintenance of the equipment purchased. Siemens reserves the right to make changes in the specifications shown herein or to make improvements at any time without notice or obligations. Should a conflict arise between the general information contained in this publication and the contents of drawings or supplementary material or both, the latter shall take precedence.

Qualified Person

For the purpose of this manual and product labels a qualified person is one who is familiar with the installation, construction, or operation of the equipment and the hazards involved. In addition, this person has the following qualifications:

(a) is trained and authorized to de-energize, clear, ground, and tag circuits and equipment in accordance with established safety practices.

(b) is trained in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses or face shields, flash clothing, etc., in accordance with established safety practices.

(C) is trained in rendering first aid.

Note

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, operation, or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser’s purposes, the matters should be referred to the local sales office.

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 obligation of Siemens Energy, Inc. The warranty contained in the contract between the parties is the sole warranty of Siemens Energy, Inc. Any statements contained herein do not create new warranties or modify the existing warranty.
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Safety instructions

1 Introduction

The SIMOSEC medium voltage metal-enclosed switchgear is designed to meet all the applicable ANSI, NEMA and IEEE standards, or the applicable IEC standards, as appropriate for the specific contract. Successful application and operation of this equipment depends as much upon proper installation and maintenance by the user as it does upon the careful design and manufacture by Siemens.

The purpose of this instruction manual is to assist the user in developing safe and efficient procedures for the installation, maintenance and use of the equipment.

Contact the nearest Siemens representative if any additional information is desired.

2 Qualified Person

For the purpose of this manual and product labels a Qualified Person is one who is familiar with the installation, construction or operation of the equipment and the hazards involved. In addition, this person has the following qualifications:

• Training and authorization to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety practices.
• Training in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses, face shields, flash clothing, etc., in accordance with established safety procedures.
• Training in rendering first aid.

3 Signal Words

The signal words “Danger”, “Warning” and “Caution” used in this manual indicate the degree of hazard that may be encountered by the user. These words are defined as:

Danger Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

Warning Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

Caution Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
4 Dangerous Procedures

In addition to other procedures described in this manual as dangerous, user personnel must adhere to the following:

1. Always work only on de-energized equipment. Always de-energize and ground the equipment before performing any tests, maintenance, or repair.

2. Always perform maintenance on the switching device after the spring-charged mechanisms are discharged.

3. Always let an interlock device or safety mechanism perform its function without forcing or defeating the device.

5 Field Service Operation

Siemens can provide competent, well-trained Field Service Representatives to provide technical guidance and advisory assistance for the installation, overhaul, repair and maintenance of Siemens equipment, processes and systems. Contact regional service centers, sales offices or the factory for details, or telephone Siemens Field Service at 1-800-347-6659 (919-365-2200 outside the U.S.).
Description

6 Features

SIMOSEC is an extendable, three-phase, metal-enclosed indoor switchgear.

SIMOSEC switchgear is used for power distribution in systems up to 27.6 kV:
- for customer substations, distribution substations and switching substations of utilities
- in public buildings such as high-rise buildings, airports, hospitals, sports arenas
- in industrial plants.

The ratings of your SIMOSEC panels are provided on the rating plates.

The following systems are used:
- Individual panels, for free combination and extension
- Three-pole primary enclosure
- Phases arranged one behind the other
- Bus bar system at top or bottom, as needed for the application
- Air-insulated bus bar and cable connection system for conventional cable terminations
- Three-position switch-disconnector, metal-enclosed, with air-insulated primary terminals and gas-insulated switching functions (maintenance-free quenching system)
- Switching devices in stainless-steel SF₆-filled vessel, without seals, with welded-in bushings (sealed for life)
- Metal-enclosed panel design
- Panel heating for severe climatic / ambient conditions to prevent condensation
- Three-phase current transformer (option), factory-assembled on the feeder bushings
- Integrated low voltage compartment for installation of:
  - terminals
  - MCBs
  - pushbuttons
  - protection devices
  - low voltage cables.
Security of operation and reliability due to:

- Type (design) and routine (production) tested panels
- Standardized and manufactured using numerically controlled machines
- Quality management system according to DIN EN ISO 9001
- More than 350,000 switchgear components in operation worldwide for many years
- No cross insulation between phases (all insulation phase-ground)
- Operating mechanisms outside switchgear vessel (gas compartment)
- Maintenance-free operating mechanism parts
- Mechanical switch position indication integrated in mimic diagram
- Switchgear interlocking system with logical mechanical interlocks
- Cable testing without the need to isolate the bus bar (see “Cable testing” on page 98)

Low life-cycle-costs and high availability throughout the entire product service life cycle as a result of:

- Low-maintenance technology concept
- Climatic independence
- Minimum space requirement
- Provisions for extension and replacement (modular switchgear concept)
- Installation and extension without SF₆ gas work
- Long service life of switching devices
- Standardized protection and control equipment
- Ecological manufacture and utilization/recycling
7 Panel versions

Fig. 2: Cable switch panel CS (shown with main bus in the middle)

1 Sockets for capacitive voltage detection system
2 Manual operation for the mechanism of the load-break / disconnecting function
3 Indicator “Fuse intact / Fuse blown”
4 Switch position indicator for load-break and for grounding function “CLOSED-OPEN-GROUNDED”
5 Manual operation for the mechanism of the grounding function
6 Sockets for capacitive voltage detection system
7 Insulating cap on bus bar (for > 15 kV)
8 Bus bar
9 Bushing-type insulator for bus bar
10 “Ready-for-service” indicator for switching device
11 Interlocking lever of cable compartment cover (with three-position switch)
12 Pressure relief device for switching device
13 Locking device for three-position switch
14 Cable compartment cover/ door

Fig. 3: Fuse switch panel FS (shown with main bus on top)

15 Gas-insulated vessel for switching device
16 Bushing-type insulator for feeder
17 Cable connection
18 Cable termination (not in scope of supply)
19 Cable connection compartment
20 Three-position switch
21 Grounding bus bar
22 Spring-operated mechanism for three-position switch
23 Grounding connection (for location see dimension drawings)
24 Option: Local-remote switch for the motor operating mechanism of the three-position switch
25 Option: Momentary-contact rotary control switch “CLOSED - OPEN” for motor operating mechanism for three-position switch
26 Option: HV HRC (current limiting) fuse
27 Post insulator
28 Low voltage compartment
8 Components

For further information about modules or components of your SIMOSEC switchgear, please refer to the medium voltage switchgear catalog.

8.1 Three-position switch-disconnector

The three-position switch-disconnector is designed to break normal currents of up to 600 A and to ground the feeder cables of the panel.

Mode of operation

The three-position switch-disconnector combines the functions of a switch-disconnector and a make-proof grounding switch. Make-proof grounding switches are grounding switches with short-circuit making capacity.

The switch shaft with the moving contact pieces rotates inside the chamber containing the fixed contact pieces. Compression vanes, which rotate in conjunction with the switch shaft, divide the arcing chamber into two subchambers, each of which changes in conjunction with the rotation. During the switching movement, the compression vanes generate a pressure difference between the subchambers. The SF₆ gas flows through a nozzle, causes a directional blow-out of the breaking arc and quenches it rapidly. Interlocking is not necessary as the “CLOSED” and “GROUNDED” functions cannot be implemented simultaneously.

Features

- Switch-disconnector
- Metal-enclosed, with gas-insulated, maintenance-free quenching principle
- No external cross insulation between phases
- Designed as a multi-chamber switch with the functions:
  - switch-disconnector and
  - make-proof grounding switch
- Three-position switch-disconnector with air-insulated primary connections for bus bar and feeder
- Operation via pivoting-arm welded gas-tight in the front of the switchgear vessel
- Hermetically welded, gas-tight stainless-steel vessel
- Up to 600 A
Equipment

- **Shunt (trip) release (F-release)** (option)
  Spring-operated/stored-energy mechanisms can be equipped with a shunt release. Remote electrical switching off / tripping of the three-position switch-disconnector is possible via the shunt release, e.g., transformer overtemperature tripping. The shunt release is deactivated by means of an auxiliary switch which is coupled mechanically with three-position switch-disconnector, or, in versions without auxiliary switch, by means of a signalling switch.

- **Auxiliary switch** (option)
  Each operating mechanism of the three-position switch-disconnector can be optionally equipped with an auxiliary switch for the switch position indication.
  - 2NO + 2NC

### 8.2 Operating mechanisms for the three-position switches

The operating mechanism box of the panel accommodates all electrical and mechanical control elements required for closing and opening the three-position switch.

Types of operating mechanisms for the three-position switch:

- **Manual spring-operated mechanism**
  The spring-operated mechanism is used for the three-position switches. Switching movements are executed independently of the speed at which the operating lever is moved.

- **Manual spring-operated/stored-energy mechanism**
  The spring-operated/stored-energy mechanism is used for three-position switch-disconnectors in transformer feeders (as transformer switch). Switching movements are executed independently of the speed at which the operating lever is moved. Stored energy is available to trip the switch by means of a striker pin of an HV HRC (current limiting) fuse or a shunt release (F-release).
  The energy to trip the switch is stored when the switch is operated from the “OPEN” position to the “CLOSED” position. After tripping (e.g. by means of the striker pin of the HV HRC (current limiting) fuse or the shunt release) the switch position indicator of the switch-disconnector shows “TRIPPED.” Since tripping occurs only as a result of a protective device operation (e.g., operation of fuse), re-closing of the switch is not allowed. Before the switch can be re-closed, the switch must be operated to the “GROUNDED” position to allow for correction of the problem that led to the tripping action.
Description

- **Motor operating mechanism (option)**
  - Remote operation applied to terminals (standard)
  - Local operation by means of momentary-contact rotary control switch, spring return (option)
  - Local-remote switch as maintained-contact rotary control switch, non-spring-return (option)

Fig. 5: Switch position indication

Fig. 6: Spring-operated mechanism

- Operating mechanism for three-position switch-disconnector with optional motor operating mechanism
- Manual operation of detachable lever mechanism for the grounding function

Fig. 7: Spring-operated/stored-energy mechanism

- Switch position indicator (mechanical)
- Spring
Switch positions of the three-position switch

Three-position switch-disconnector up to 600 A

Switch position

CLOSED

OPEN

GROUNDED

Fig. 8: Switch positions of the three-position switch

① Bus bar connection
② Feeder, e.g., for cable connection
Switch-positions of the make-proof grounding switch

Fig. 9: Switch-positions of the make-proof grounding switch

① Bus bar connection
② Feeder, e.g., for cable connection (option) or for metering (option)
### 8.3 Current and voltage transformers

**Fig. 10:** Toroidal-type current transformers installed around the cables

1. Three-phase current transformer 4MC63 53 (not shown)
2. Cable-type current transformer 4MC70 33

**Fig. 11:** Block-type current transformers and voltage transformers in the billing metering panel

3. Block-type current transformer 4MA7
4. Voltage transformer 4MR

**4MC70 33, 4MC70 31 toroidal-type current transformers and 4MC70 32 bus-type current transformer**
- Single-pole toroidal-core current transformer
- Free of dielectrically stressed cast-resin parts (due to design)
- Inductive type
- Climate-independent
- Secondary connection by means of a terminal strip inside the panel
- 1A or 5A CT secondary rating, to suit order requirements

**4MA7 block-type current transformer / 4MR voltage transformers**
- Dimensions according to DIN 42 600 Part 8
- Single-pole indoor block-type current transformer
- Single-pole indoor voltage transformer
- Cast-resin insulated
- Secondary connection by means of screw-type terminals
- 1A or 5A CT secondary rating, to suit order requirements
8.4 Protection and control equipment

Protection and control equipment is supplied according to the customer’s specifications. The devices are installed in the standard low voltage compartment (item 28, see Fig. 3, page 9). For details please refer to the schematic diagrams for the switchgear.

Mimic diagram

The mimic diagram on the control panel corresponds with the switching functions of the panel.

Local-remote switch (option)

The local-remote switch determines the location from which the three-position switch can be motor-operated.

![Fig. 12: Control panel section](image)

The local-remote switch latches (non-spring-return) in the corresponding switch position.

<table>
<thead>
<tr>
<th>LOCAL position:</th>
<th>REMOTE position:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local operation</td>
<td>Remote operation from the control room/monitoring station</td>
</tr>
</tbody>
</table>
Momentary-contact rotary control switch (option)

The three-position switch is CLOSED-OPENED locally with its motor operating mechanism. This function is only active when the local-remote switch (option) is in the “LOCAL” position.

The momentary-contact rotary control switch is spring-return type and returns to the center position (M position) automatically.

Bay controller (option)

For information on the bay controller (e.g., SIPROTEC 4), please refer to the instruction manual for the protective device.

8.5 HV HRC (current limiting) fuse assembly

The HV HRC (current limiting) fuse assembly protects downstream cable runs and/or devices.

The fuses used in SIMOSEC switchgear are manufactured by Bussman. The fuses comply with IEC 60282-1 and ANSI/IEEE C37.41. They are a general purpose current limiting fuse. The time-current characteristics of the fuses comply with the parameters for E-rated fuses as defined by ANSI C37.46.

The three-position switch-disconnector in the transformer feeder in combination with Bussmann HV HRC (current limiting) fuses was tested according to ANSI/IEEE C37.20.4.
Description

Features
- HV HRC (current limiting) fuses according to DIN 43625 (main dimensions) with striker pin in “medium” version
- Thermal striker pin tripping when the corresponding Bussmann HV HRC (current limiting) fuse is used.
- Dimension e=21.14 in (537 mm) up to 27.6 kV preset at the factory
- Option: Dimension e=17.4 in (442 mm) possible with extension tube (95 mm)
- Open the cover for fuse replacement is only possible when:
  - the feeder is grounded, so you can open the door
  - the compartment cover is unscrewed
- Option: When the cable compartment door is opened, the switch cannot be operated from the “GROUNDED” position to the “OPEN” position
- Option: Shunt release on the operating mechanism of the three-position switch-disconnector
- Option: “TRIPPED indication” of the fuse in the fuse switch panel switch at a remote electrical indication with a normally-open contact (1NO)
- Option: “FUSE BLOWN” indication with a microswitch

Principle of fuse tripping
In the event that a HV HRC (current limiting) fuse has tripped (striker pin tripped), the three-position switch-disconnector of the transformer feeder is tripped via a time relay or via a linkage provided at the fuse contact.

Fig. 14: Principle of fuse tripping

1. Striker pin not tripped (fuse intact)
2. Striker pin tripped (fuse blown)
8.6 Interlocks

Control gate of the three-position switch
The control gate of the three-position switch prevents switching directly from “CLOSED” to “GROUNDED” or from “GROUNDED” to “CLOSED”, as the operating lever must be re-inserted in the “OPEN” position.

Cable compartment cover, screwed on

![DANGER]

Hazardous voltage.
Will cause death, serious injury and equipment damage.
De-energize and ground high voltage conductors within switchgear before working on or near the conductors.

De-grounding lock-out at the three-position switch
If the cable compartment cover is removed, the three-position switch-disconnector of the transformer panel cannot be “DE-GROUNDED”.

Note
The cable compartment cover can only be removed when the three-position switch is in “GROUNDED” position.

Closing lock-out (option)
If the cable compartment door is opened, the three-position switch cannot be switched to the “CLOSED” position.

Locking device
The control gate of the three-position switch-disconnector and the three-position disconnector can be locked in all three switch positions.

<table>
<thead>
<tr>
<th>ONLY GROUNDING/DE-GROUNDING POSSIBLE</th>
<th>SWITCHING NOT POSSIBLE</th>
<th>ONLY OPENING/CLOSING POSSIBLE</th>
</tr>
</thead>
</table>

![Images of control gate in different positions]
**FII-Protection-System (option)**

The Fuse-Installed-Intact-Protection-Sytsem (FII-Protection-Sytsem) prevents moving the three-position switch to CLOSED position if any fuse is blown or not installed.

![Shutter of FII-Protection-Sytem](image)

**Fig. 15:** Shutter of FII-Protection-Sytem
8.7 Bus bars

Fig. 16: Bus bar compartment (bus with heat shrink insulation and insulating caps for >15 kV)

Features
- Metal-enclosed bus bar compartment
- Bus bars bolted from panel to panel
- Versions:
  - 1200 A
  - heat shrink insulation (option)
  - insulating caps (standard for over 15 kV)

8.8 Cable connection

Features
- Cable termination points are arranged one behind the other
- Uniform cable connection height per panel (see dimension drawings)
- With cable bracket or cable clamps and grounding points for cable shields
- Access to the cable connection compartment only when feeder has been grounded

Features for cable terminal
- For thermoplastic-insulated cables
- For paper-insulated mass-impregnated cables
- For connection cross-sections (cable size)* up to 300 mm² (600 kcmil)
- Cable bottom entry (from below) - standard
- Cable top entry (from above) - optional

Applicable cable types are described in Section “Cable terminations” (see Description, Page 34).

Installation of high voltage cables is described specifically for each panel in the operating Instructions (see “Connecting high voltage cables” on page 53).

* Larger connection cross-sections on request.
8.9 Rating plates

The rating plate identifies the components and the technical data.

Rating plate are provided as follows:
- bottom-right on the control panel
- in the operating mechanism box (inside cover)

**Fig. 17:** Rating plate on the control panel

**Fig. 18:** Rating plate in the operating mechanism box
8.10 “Ready-for-service” indicator for SF₆ gas

The ready-for-service indicator for SF₆ gas shows the gas density in the three-position switch required to operate the panel.

If a three-position switch filled with SF₆ gas is not ready for operation (see “Checking the ready for service indicator” on page 42), then:
- Do not energize the switchgear
- Do not operate the switchgear
- Contact the Siemens Field Service (see “Field Service Operation” on page 6).

**Features**
- Easy to read
- Self-monitoring
- Independent of temperature and pressure variations
- Option: Alarm switch 1NO + 1NC for remote electrical indication
For the ready-for-service indicator, a gas-tight measurement box is installed on the inside of the switchgear vessel.

A coupling magnet, which is fitted to the bottom end of the measurement box, transmits its position to an outside armature through the non-magnetic switchgear vessel. This armature moves the ready-for-service indicator of the switchgear.

While changes in the gas density during the loss of gas, which determines the dielectric capability, are displayed, changes in the gas pressure due to temperature and external pressure variations are not. The gas in the measurement box has the same temperature as that in the switchgear.

The temperature effect is compensated via the same pressure change in both gas volumes.

### 8.11 Voltage detection systems

Voltage detection systems are provided for verification of safe isolation from supply.

Regular tests of the voltage detection systems must be performed by the user and documented.

Voltage detection systems according to IEC 61243-5 and EN 61243-5 (VDE 0682-415) with:
- HR system (standard)
- LRM system (option)
- Integrated voltage detection system CAPDIS-S1/-S2 (option)

![Diagram of Voltage Detection System](image)

**Fig. 21:** Voltage detection system via capacitive voltage divider (phase L3 shown)

1. HR indicator, plug-in type

- -C1: capacitance integrated into bushing or post insulator
- -C2: capacitance of the connection leads and of the voltage indicator to ground
**HR system**

The control panel section of the three-position switch contains:

- Verification of safe isolation from supply phase by phase by insertion in each socket pair
- Voltage indicator flashes if high voltage is present
- Measuring system and voltage indicator can be tested
- Does not require auxiliary power

### 8.12 Accessories

**Standard accessories:**
- SIMOSEC documentation (operating and installation instructions)
- Operating lever for three-position switch/grounding switch (black grip)

**Further accessories according to order documentation/purchase order (selection):**
- Operating lever for three-position switch (black grip)
- Operating lever for grounding switch (red grip)
- Double-bit key
- HV HRC (current limiting) fuses
- Surge arresters
- Test fuses for mechanical simulation of the striker pin of HV HRC (current limiting) fuses in transformer feeders

### Features of HR system

Fig. 22: Control board section: Sockets for capacitive voltage detection system

- Plug-in voltage indicator (such as Horstmann HR-ST)
- Ground test socket
- Capacitive test socket for L2
- Socket cover

Fig. 23: Test fuse for striker pin function tests

- HR/LRM voltage indicators
- Test units to check the capacitive interface and the voltage indicators
Fig. 24: Functional tester (Horstmann type HO-ST)

- Phase comparison test units (e.g., make Pfisterer, type EPV)

Fig. 25: Electronic phase comparer
## 9 Technical data

### 9.1 Electrical data, pressure values, temperature

The technical data of your switchgear/panels are shown on the rating plate.

#### Complete switchgear

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Value</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated insulation level</td>
<td>U&lt;sub&gt;r&lt;/sub&gt;</td>
<td>8.25</td>
<td>15</td>
</tr>
<tr>
<td>Rated short-duration (one minute) power-frequency withstand voltage</td>
<td>U&lt;sub&gt;d&lt;/sub&gt;, rms</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage</td>
<td>U&lt;sub&gt;p&lt;/sub&gt;, peak</td>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td>Rated frequency</td>
<td>f&lt;sub&gt;r&lt;/sub&gt;</td>
<td>50/60</td>
<td></td>
</tr>
<tr>
<td>Rated continuous current of bus bar</td>
<td>I&lt;sub&gt;r&lt;/sub&gt;</td>
<td>600</td>
<td>1200</td>
</tr>
<tr>
<td>Rated short-time withstand current</td>
<td>I&lt;sub&gt;k&lt;/sub&gt;</td>
<td>up to 25</td>
<td>25</td>
</tr>
<tr>
<td>Rated peak withstand current</td>
<td>I&lt;sub&gt;p&lt;/sub&gt;, peak</td>
<td>up to 65</td>
<td>65</td>
</tr>
<tr>
<td>Rated filling pressure</td>
<td>p&lt;sub&gt;re&lt;/sub&gt;</td>
<td>21.8 (150)</td>
<td></td>
</tr>
<tr>
<td>Min. operating pressure</td>
<td>p&lt;sub&gt;me&lt;/sub&gt;</td>
<td>18.9 (130)</td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>T</td>
<td>-30 to +40</td>
<td></td>
</tr>
</tbody>
</table>

#### Cable-switch panel type CS; cable connection panel type CC

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Value</th>
<th>Value</th>
</tr>
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<tbody>
<tr>
<td>Rated voltage</td>
<td>U&lt;sub&gt;r&lt;/sub&gt;</td>
<td>8.25</td>
<td>15</td>
</tr>
<tr>
<td>Rated continuous current of panel type CS</td>
<td>I&lt;sub&gt;r&lt;/sub&gt;</td>
<td>600</td>
<td>1200</td>
</tr>
<tr>
<td>Rated continuous current of panel type CC</td>
<td>I&lt;sub&gt;r&lt;/sub&gt;</td>
<td>600 - 1200</td>
<td></td>
</tr>
<tr>
<td>Rated fault closing current</td>
<td>I&lt;sub&gt;m&lt;/sub&gt;</td>
<td>32</td>
<td>40</td>
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</table>

#### Transformer panel type FS, FU

<table>
<thead>
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<th>Parameter</th>
<th>Value</th>
<th>Value</th>
<th>Value</th>
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<tbody>
<tr>
<td>Rated voltage</td>
<td>U&lt;sub&gt;r&lt;/sub&gt;</td>
<td>8.25</td>
<td>15</td>
</tr>
<tr>
<td>Rated continuous current for feeder</td>
<td>I&lt;sub&gt;r&lt;/sub&gt;</td>
<td>200, 600</td>
<td></td>
</tr>
<tr>
<td>Rated peak withstand current</td>
<td>I&lt;sub&gt;p&lt;/sub&gt;, peak</td>
<td>164</td>
<td>164</td>
</tr>
<tr>
<td>Rated fault closing current</td>
<td>I&lt;sub&gt;m&lt;/sub&gt;</td>
<td>101</td>
<td>101</td>
</tr>
<tr>
<td>Reference dimension &quot;e&quot;</td>
<td>mm</td>
<td>537 / 21.1</td>
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#### Bus bar grounding panel type BG

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Value</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>U&lt;sub&gt;r&lt;/sub&gt;</td>
<td>8.25</td>
<td>15</td>
</tr>
<tr>
<td>Rated fault closing current</td>
<td>I&lt;sub&gt;m&lt;/sub&gt;</td>
<td>32</td>
<td>40</td>
</tr>
</tbody>
</table>
1) The rated continuous currents apply to ambient temperatures of 40 °C.

2) Pressure values for SF₆-insulated vessels.

3) The fuse assembly is designed for a reference dimension "e" = 537 mm. With reference dimension "e" = 442 mm, an extension tube (95 mm long) is required.

9.2 Tightening torques

If not stated otherwise, the following tightening torques apply to SIMOSEC switchgear:

<table>
<thead>
<tr>
<th>Joint: material/material</th>
<th>Thread</th>
<th>Tightening torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal joints: steel/steel e. g.: front plates, top plates, etc.</td>
<td>M6 (self-cutting)</td>
<td>9 lbf·ft (12 Nm)</td>
</tr>
<tr>
<td></td>
<td>M8</td>
<td>16 lbf·ft (21 Nm)</td>
</tr>
<tr>
<td>Grounding bus bar: steel/copper</td>
<td>M8</td>
<td>16 lbf·ft (21 Nm)</td>
</tr>
<tr>
<td></td>
<td>M8</td>
<td>16 lbf·ft (21 Nm)</td>
</tr>
<tr>
<td></td>
<td>M10</td>
<td>23 lbf·ft (30 Nm)</td>
</tr>
<tr>
<td>Current conductor joint: copper/copper</td>
<td>M8</td>
<td>16 lbf·ft (21 Nm)</td>
</tr>
<tr>
<td></td>
<td>M10</td>
<td>23 lbf·ft (30 Nm)</td>
</tr>
<tr>
<td>Switchgear grounding: steel/cable lug</td>
<td>M12</td>
<td>37 lbf·ft (50 Nm)*</td>
</tr>
<tr>
<td>Cable shield grounding</td>
<td>M10</td>
<td>23 lbf·ft (30 Nm)*</td>
</tr>
<tr>
<td></td>
<td>M12 (all other cable panels)</td>
<td>max. 37 lbf·ft (50 Nm)*</td>
</tr>
</tbody>
</table>

* The tightening torque at the cable lug joint depends on:
  - material of cable lug
  - instructions of termination manufacturer
  - instructions of cable manufacturer
9.3 Protection against solid foreign bodies, electric shock and ingress of water

The medium voltage switchgear SIMOSEC complies with the following degrees of protection:

<table>
<thead>
<tr>
<th>Degree of protection</th>
<th>Type of protection</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IP2X</strong></td>
<td>Protection against solid foreign bodies: Protected against the penetration of solid foreign bodies; diameter 0.5 in (12.5 mm).</td>
<td>Enclosure of live parts under high voltage</td>
</tr>
<tr>
<td></td>
<td>Protection against electric shock: Protected against access to dangerous parts by means of a finger (the distance between a test finger with a diameter of 0.5 in (12.5 mm) to dangerous parts must be sufficient).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Protection against the ingress of water: No definition.</td>
<td></td>
</tr>
<tr>
<td><strong>IP3X</strong></td>
<td>Protection against solid foreign bodies: Protected against the penetration of solid foreign bodies; diameter 0.1 in (2.5 mm).</td>
<td>Enclosure of live parts under high voltage in switchgear with locking device</td>
</tr>
<tr>
<td></td>
<td>Protection against electric shock: Protected against access to dangerous parts by means of a wire (the distance between a test rod with a diameter of 0.1 in (2.5 mm) and a length of 3.94 in (100 mm) to dangerous parts must be sufficient)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Protection against the ingress of water: No definition.</td>
<td></td>
</tr>
<tr>
<td><strong>IP3XD</strong> (on request)</td>
<td>Protection against solid foreign bodies: Protected against the penetration of solid foreign bodies; diameter 0.1 in (2.5 mm).</td>
<td>Enclosure of live parts under high voltage in switchgear with locking device</td>
</tr>
<tr>
<td></td>
<td>Protection against electric shock: Protected against access to dangerous parts by means of a wire (the distance between a test rod with a diameter of 1 mm and a length of 3.94 in (100 mm) to dangerous parts must be sufficient)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Protection against the ingress of water: No definition.</td>
<td></td>
</tr>
<tr>
<td><strong>IP65</strong></td>
<td>Protection against solid foreign bodies: Dust-proof; no penetration of dust.</td>
<td>Metal enclosure of gas-filled switchgear vessels</td>
</tr>
<tr>
<td></td>
<td>Protection against the ingress of water: Protected against water jets; water which is directed towards the enclosure from any direction may not have a damaging effect.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Protection against electric shock: Protected against access to dangerous parts by means of a wire (test probe with a diameter of 0.04 in (1 mm) may not penetrate)</td>
<td></td>
</tr>
</tbody>
</table>
9.4 Standards and guidelines

SIMOSEC switchgear complies with the following relevant standards and specifications:

**IEC-, ANSI-, IEEE-Standards**

- IEC 62271 - 105
- ANSI/IEEE Std C37.20.3 - 2001
- ANSI/IEEE Std C37.20.4 - 2001
- ANSI/IEEE Std C37.57 - 2003
- ANSI/IEEE Std 1247 - 2005
- ANSI/IEEE Std C37.22 - 1997
- CSA C22.2 No. 193 - M 1983
- CSA C22.2 No. 31-04
- EEMAC G11-1 (Measurement of Corona)

**Transport regulations**

According to Annex A of the European agreement about international transport of hazardous materials (Anlage A des Europäischen Übereinkommens über die internationale Beförderung gefährlicher Güter auf der Straße (ADR)), SF\textsubscript{6} gas insulated medium voltage switchgear manufactured by Siemens is not categorized as hazardous materials with respect to transport procedures, and are exempt from special transport regulations according to ADR, Section 1.1.3.1 b.

9.5 Type of service location

SIMOSEC switchgear can be used in an indoor installation in accordance with IEC 61 936 (Power installations exceeding AC 1kV) and VDE 0101 and the NEC:

- Outside lockable electrical service locations at places which are not accessible to the public. The equipment enclosure in which the indoor SIMOSEC switchgear is installed must have doors that are lockable.

- Inside lockable electrical service locations. A lockable electrical service location is a room or place which is reserved exclusively for the operation of electrical equipment and is kept under lock and key. Access is restricted to authorised personnel and persons who have been properly instructed in electrical engineering. Untrained or unskilled persons may only enter under the supervision of authorised personnel or properly instructed persons.

- In any event, access to the equipment must be restricted to authorized personnel.
9.6 **Service conditions**

SIMOSEC switchgear is intended for application under the “usual service conditions” defined in ANSI/IEEE C37.20.3, clauses 4 and 8.1.

Generally, “usual service conditions” are defined as an environment in which the equipment is not exposed to excessive dust, acid fumes, damaging chemicals, salt air, rapid or frequent changes in temperature, vibration, high humidity, and extremes of temperature.

For application is other than “usual service conditions” defined by ANSI/IEEE C37.20.3, Consult Siemens.

SIMOSEC switchgear is largely insensitive to climate and ambient conditions by virtue of the following features:

- No cross insulation between phases
- Metal enclosure of switching devices (e.g. three-position switch) in gas-filled stainless-steel switchgear vessel
- Dry-type bearings in operating mechanism
- Essential parts of the operating mechanism made of corrosion-resistant materials
- Use of climate-independent current transformers
9.7 Insulating capacity and site altitude

Insulating capacity

- The insulating capacity is verified by testing the switchgear with rated values of short-duration power-frequency withstand voltage and lightning impulse withstand voltage according to IEC 60 694 / VDE 0670 Part 1000, and ANSI/IEEE C37.20.3.
- The rated values are referred to sea level and to normal atmospheric conditions (14.7 PSI, 68 °F, 0.000687 lb/ft³ humidity in accordance with IEC 60 071 and VDE 0111) and ANSI/IEEE Std 4.
- The insulating capacity decreases with increasing altitude.

For site altitudes above 1000 m, the correction factor “a” is recommended, depending on the actual site altitude above sea level.

### Rated voltage (r.m.s. value) [kV]

<table>
<thead>
<tr>
<th>Rated voltage (r.m.s. value)</th>
<th>[kV]</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.25</td>
<td>15</td>
</tr>
<tr>
<td>27.6</td>
<td></td>
</tr>
</tbody>
</table>

### Rated short-duration (one minute) power-frequency withstand voltage (rms value) [kV]

<table>
<thead>
<tr>
<th>- Across isolating distance</th>
<th>[kV]</th>
</tr>
</thead>
<tbody>
<tr>
<td>39.6</td>
<td>39.6</td>
</tr>
<tr>
<td>66</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>- Between phases and to ground</th>
<th>[kV]</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>

### Rated lightning impulse withstand voltage (peak value) [kV]

<table>
<thead>
<tr>
<th>- Across isolating distance</th>
<th>[kV]</th>
</tr>
</thead>
<tbody>
<tr>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td>138</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>- Between phases and to ground</th>
<th>[kV]</th>
</tr>
</thead>
<tbody>
<tr>
<td>95</td>
<td>95</td>
</tr>
<tr>
<td>125</td>
<td></td>
</tr>
</tbody>
</table>

![Fig. 26: Correction factor “a” as a function of the site altitude in meters above sea level](image)

Example:

- 3000 m site altitude above sea level
- 15 kV switchgear rated voltage
- 95.0 kV rated lightning impulse withstand voltage

Result: According to the above table, switchgear for a rated voltage of 27.6 kV should be selected.
9.8  Three-position switch-disconnector
The three-position switch is tested in accordance with:
• IEC 62271 - 105
• ANSI/IEEE C37.20.4
• CAN/CSA C22.2 No. 193

9.9  Make-proof grounding switch (feeder grounding switch)

<table>
<thead>
<tr>
<th>Rated voltage</th>
<th>Ur</th>
<th>kV</th>
<th>8.25</th>
<th>15</th>
<th>27.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make-proof grounding function of the three-position switch-disconnector</td>
<td>Rated fault closing current</td>
<td>Ima</td>
<td>up to kA (asym)</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Rated short-time withstand current</td>
<td>Ik</td>
<td>up to kA</td>
<td>25</td>
<td>25</td>
<td>20</td>
</tr>
</tbody>
</table>

9.10  Selection of HV HRC (current limiting) fuses

Allocation of HV HRC fuses and transformers
The fuses used in SIMOSEC switchgear are manufactured by Bussmann. The fuses comply with IEC 60282-1 and ANSI/IEEE C37.41. They are a general purpose current limiting fuse. The time-current characteristics of the fuses comply with the parameters for E-rated fuses as defined by ANSI C37.46. The fuse dimensions comply with the requirements of DIN 43625.
The three-position switch-disconnector in the transformer feeder of SIMOSEC switchgear in combination with Bussmann HV HRC (current limiting) fuses was tested in accordance with IEC 62 271-105 and ANSI/IEEE C37.20.3.
Please contact us for applications or HV HRC (current limiting) fuses from other manufacturers.
### 9.11 Cable terminations

#### Connection height

<table>
<thead>
<tr>
<th>Panel family</th>
<th>CS1+2</th>
<th>FS1+2+3</th>
<th>FU1+2+3</th>
<th>CC1+2</th>
<th>CG1+2</th>
<th>MC3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Top cable entry</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main switch or vertical copper bar in upper position (fuse assembly in lower position)</td>
<td>490 mm / 19.3&quot;</td>
<td>490 mm / 19.3&quot;</td>
<td>490 mm / 19.3&quot;</td>
<td>490 mm / 19.3&quot;</td>
<td>490 mm / 19.3&quot;</td>
<td>530 mm / 20.8&quot;</td>
</tr>
<tr>
<td></td>
<td>2550 mm / 100.4&quot;</td>
<td>2550 mm / 100.4&quot;</td>
<td>2550 mm / 100.4&quot;</td>
<td>2550 mm / 100.4&quot;</td>
<td>2550 mm / 100.4&quot;</td>
<td>2250 mm / 88.6&quot;</td>
</tr>
<tr>
<td>Main switch or vertical copper bar in lower position (fuse assembly in upper position)</td>
<td>not available</td>
<td>not available</td>
<td>490 mm / 19.3&quot;</td>
<td>not available</td>
<td>not available</td>
<td>not available</td>
</tr>
<tr>
<td></td>
<td>not available</td>
<td>not available</td>
<td>2550 mm / 100.4&quot;</td>
<td>not available</td>
<td>not available</td>
<td>not available</td>
</tr>
<tr>
<td><strong>Middle cable connection</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>to top</td>
<td>940 mm / 37&quot;</td>
<td>not available</td>
<td>940 mm / 37&quot;</td>
<td>940 mm / 37&quot;</td>
<td>940 mm / 37&quot;</td>
<td>not available</td>
</tr>
<tr>
<td></td>
<td>2250 mm / 88.6&quot;</td>
<td>2250 mm / 88.6&quot;</td>
<td>2250 mm / 88.6&quot;</td>
<td>2250 mm / 88.6&quot;</td>
<td>2250 mm / 88.6&quot;</td>
<td>not available</td>
</tr>
<tr>
<td>to bottom</td>
<td>1240 mm / 49&quot;</td>
<td>not available</td>
<td>1240 mm / 49&quot;</td>
<td>1240 mm / 49&quot;</td>
<td>1240 mm / 49&quot;</td>
<td>not available</td>
</tr>
<tr>
<td></td>
<td>2250 mm / 88.6&quot;</td>
<td>2250 mm / 88.6&quot;</td>
<td>2250 mm / 88.6&quot;</td>
<td>2250 mm / 88.6&quot;</td>
<td>2250 mm / 88.6&quot;</td>
<td>not available</td>
</tr>
<tr>
<td><strong>Bottom cable entry</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main switch or vertical copper bar in upper position (fuse assembly in lower position)</td>
<td>not available</td>
<td>not available</td>
<td>490 mm / 19.3&quot;</td>
<td>not available</td>
<td>not available</td>
<td>not available</td>
</tr>
<tr>
<td></td>
<td>not available</td>
<td>not available</td>
<td>2250 mm / 88.6&quot;</td>
<td>not available</td>
<td>not available</td>
<td>not available</td>
</tr>
<tr>
<td>Main switch or vertical copper bar in lower position (fuse assembly in upper position)</td>
<td>490 mm / 19.3&quot;</td>
<td>490 mm / 19.3&quot;</td>
<td>490 mm / 19.3&quot;</td>
<td>490 mm / 19.3&quot;</td>
<td>490 mm / 19.3&quot;</td>
<td>580 mm / 22.8&quot;</td>
</tr>
<tr>
<td></td>
<td>2250 mm / 88.6&quot;</td>
<td>2250 mm / 88.6&quot;</td>
<td>2250 mm / 88.6&quot;</td>
<td>2250 mm / 88.6&quot;</td>
<td>2250 mm / 88.6&quot;</td>
<td>2250 mm / 88.6&quot;</td>
</tr>
</tbody>
</table>

For actual dimensions, please remark the dimension drawings.

#### Principle of cable connection

![Fig. 27: Drawing of the principle of cable connections](image-url)
Installation

10 Receiving, Handling & Storage

The installation of the switchgear should be carefully planned before the equipment arrives at the site. This can avoid delays or equipment damage resulting from inadequate facilities or handling.

Receiving

Each transport unit of type SIMOSEC metal-enclosed switchgear is securely blocked and braced for shipment. It is crated, boxed, or covered as required by shipping conditions. Whatever method of shipment, every precaution is taken to insure its safe arrival. If special handling is required, it is so indicated.

- Handle the switchgear assembly carefully when unloading because relatively delicate instruments are included.

Identification

When the shipment includes more than one shipping group or equipment for more than one substation, marking tags are attached to each crate or package for identification. The drawing number on the tag is also on the shipping list. The shipping list identifies the contents with the section numbers included in the shipping group.

- Refer to the general arrangement drawing for the location of each section within the group lineup.
- Use this information to simplify the assembly operation and save unnecessary handling.

Inspection & Unpacking

- Inspect the equipment as soon as possible after receiving for any damage that may have occurred in transit.
- Examine before unpacking the package itself, as a damaged package may indicate an area of damage within.
- Be careful when unpacking equipment.
- Do not damage the plastic film protection during unloading.
- Check the ready-for-service indicator for SF$_6$ gas
- Do not climb onto the roof of the sections.
- Do not use sledge hammers and crowbars. They may damage the finish, if not the equipment itself.
- Use nail pullers.
- Examine the equipment after unpacking for any possible damage.
- Check the shipping manifest to be certain that all items have been received.
- Make certain that any shortage is noted on the freight bill and contact the carrier immediately.
- Notify the Siemens sales office of any shortage or damage.
Shipping Damage Claims

Important: The way visible shipping damage is treated by consignee prior to signing the delivery receipt can determine the outcome of the damage claim to be filed.

Notification to carrier within the 15 day limit on concealed damage is essential if loss resulting from unsettled claims is to be eliminated or minimized.

Arrival of Shipment

- Note whether equipment is properly protected from the elements.
- Note trailer number on which the equipment arrived.
- Note blocking of equipment.
- Ensure count agrees with delivery receipt during unloading.

Prior to unloading when possible:

- Make immediate inspection for visible damage upon arrival, and prior to disturbing or removing packaging or protective wrapping.
- Document transportation damage photographically.

When total inspection cannot be made on vehicles prior to unloading:

- Perform close inspection during unloading.
- Note visible damage on the delivery receipt.
- Document transportation damage photographically.

Damage

- Note any visible damage on the delivery receipt and have damage acknowledged with the driver’s signature.
- Detail the damage as much as possible.
- Document transportation damage photographically.
- Include a notation “Possible internal damage, subject to inspection” on delivery receipt.
- Do not let the shipment be signed for by the consignee or his agent, if the driver will not sign the delivery receipt with damage noted.
- Notify the Siemens sales office immediately of any damage.
- Arrange for a carrier inspection of damage immediately.
- Be sure equipment is properly protected from any further damage by covering it properly after unloading.

Important: The following steps should be performed to eliminate loss due to claims by carrier that equipment was damaged or further damaged on site after unloading:

- Do not move equipment from the place it was set when unloading.
- Do not remove or disturb packaging or protective wrapping prior to carrier damage inspection.
- Have the equipment inspected by carrier prior to handling after receipt.
Installation

**Inspection**
- Make further inspection, if practical, for possible concealed damage while the carrier's inspector is on site.
- Do the inspection for concealed damage within 15 days of receipt of equipment if it is not practical at the time the carrier's inspector is present.
- Notify the carrier again and make inspection if concealed damage is found, prior to taking any corrective action to repair.
- Notify Siemens sales office immediately.

**Documentation & Repair**
- The carrier inspection report and/or driver's signature on the delivery receipt does not constitute approval to repair.
  - Obtain the original of the carrier inspection report and forward it along with a copy of the noted delivery receipt to the Siemens sales office.
  - Siemens must have approval from the carrier before any repair work can be performed.
  - The documents must be provided to Siemens before approval can be obtained.

**Note:** Any determination as to whether the equipment was properly loaded or properly prepared by shipper for over-the-road travel cannot be made at the destination. Shipments are not released from the factory without a clear bill of lading. Approved methods are employed for preparation, loading, blocking and tarping of the equipment before it leaves the Siemens factory. Therefore, if the equipment is received in a damaged condition, this damage to the equipment had to occur while enroute due to conditions beyond Siemens control. If the procedure outlined above is not followed by the consignee, purchaser, or his agent, Siemens cannot be held liable for repairs. Siemens will not be held liable for repairs in any case where the work was performed prior to authorization from Siemens.
**Switchgear room**

Please observe the following points when selecting and preparing the switchgear room:

- Space to move switchgear into the room
- Room size
- Door dimensions
- Construction and load-bearing capacity of the floor
- Illumination, heating and power supply
- Installation of foundation rails
- Installation of high voltage cables
- Grounding system

**Tools / Auxiliary means**

Before starting to work on the switchgear, provide the tools / auxiliary means required:

- Angular hex key 10 mm (Allen screwdriver)
- Torx screwdriver T30 M6
- Torque wrench 15 - 27 lbf·ft (20 - 36 Nm)
- Ratchet, 1/4” drive
- Extension 1/4” drive, length 6” (150 mm)
- Sockets, metric, 1/4” drive (10 mm, 13 mm, 16 mm, 18 mm)
- Laser level
- Shim plates for adapting for floor unevenness 0.02 - 0.04 in (0.5 - 1.0 mm) or as needed
- Household cleaner
- Suitable movable lifting device
- Roller crowbars
- Transport rollers
11 Unloading the switchgear and transporting to the place of installation

Transport unit and packing

Transport unit
Transport units consist either of:

- individual switchpanels
  - one panel per pallet (for interconnection at site)
  - several panels per pallet (for interconnection at site)
- or pre-assembled panel groups up to a maximum of 3 panels, with interconnection bus bars installed (optional)
- and accessories.

Packing
The transport units can be packed as follows:

- on pallets, covered with plastic film
- in a seaworthy crate (switchgear is sealed with desiccant bags in plastic film)
- other packings in special cases (e.g., cardboard box for air-freight).

Unloading and transport at site

WARNING
Heavy weight.
Can cause death, serious injury or property damage.
Observe all handling instructions in this instruction manual to prevent tipping or dropping of equipment.

Please observe:

- The handling equipment must be suitable for the weight marked on the transport unit. For planning purposes, a weight of 900 lbs (400 kg) per panel should be assumed.
- Leave the transport units packed as long as possible.
- Open the plastic film only as far as required for transport.
- Lifting cables so that the angle between cables is less than 90°.
- Move the transport unit as far as possible before removing the wooden pallet.

Transport with lifting device

CAUTION
Heavy weight.
May cause injury or property damage.
Angle between lift cables must be less than 90°. Use lifting and handling equipment rated for the weight to be moved. Do not tip equipment.

A panel group consisting of more than two panels is transported with a spreader bar (not furnished) to prevent the panels from being damaged during lifting.

Transport units with switchgear end walls are equipped with the special lifting device.

For transport with a fork-lift truck the transport unit is lifted by means of two carrying rods (not furnished) which are fitted through the lifting device holes.
Remove packing.

Attach the lifting cables or other lifting means to the transport unit as shown in the illustration.

Remove or open the cable compartment cover from the panel subframe.

Remove the transport unit from the wooden pallet. The transport unit is bolted to the wooden pallet at the switchgear subframe.

Remove plastic film.

Take out the accessories, if applicable.

Remove the bolts that secure the switchgear frame to the wooden pallet.

Dispose of the packing material in an appropriate manner.

Lift the transport unit.

Slowly move the transport unit to the desired location.

Slowly lower the transport unit.

Remove the lifting cables, spreader bar or other lifting means.

Remove the lifting device.

• Undo the bolts.
• Remove the lifting device.
• Reinstall the bolts (protection against electric shock and foreign bodies).

Transport at site without wooden pallet

Caution

Improper lifting may damage frames

Use transport rollers rated for weight of transport unit.

Apply transport rollers only at corner of panel.

If the transport unit cannot be lowered directly onto its mounting position, please proceed as follows:
Installation

Transport the transport unit as far as possible using the lifting device.

Slowly lower the transport unit onto the transport roller (reinforced rollers).

Push the transport unit to the mounting position.

Lift the transport unit at the side edges with roller crowbars and lower it slowly onto the mounting position.

Storage

When switchgear is not to be installed immediately, it should be unpacked, inspected within 15 days of receipt and stored in a clean dry location. Indoor switchgear is neither weather resistant nor drip resistant.

Store SIMOSEC equipment indoors.

Provide an adequate covering and place a heat source of approximately 100 watts output within each panel to prevent condensation if it is to be kept in a humid or unheated area.

Fig. 28: Transport with transport roller

- Transport unit
- Transport roller (reinforced roller)
Checking the auxiliary switch of the ready-for-service indicator

The auxiliary switch of the ready-for-service indicator can latch tight in the red area due to extreme shocks during transport.

To put the ready-for-service indicator into operation again, the plastic part fixed at the auxiliary switch must be brought to the initial position again by hand.

The following check can be carried out safely with the panel in operation.

⇒ Undo the four screws ① of the front cover and remove this front cover.

Fig. 29: SIMOSEC front

⇒ Insert the top of a screwdriver through the cutout of the red/green plastic disc.

Fig. 30: Screwdriver in cutout of the red/green plastic disc

⇒ Push the small lever of the microswitch and keep it in this position, then turn the red/green plastic disc carefully downwards until the pointer is in the green; keep this position.
Take the screwdriver out of the red/green plastic disc. Now check whether the indicator shows the green area and the disc remains in this position. If the ready-for-service indicator remains in this position (showing the green area), please check whether the magnet is positioned at the mark.

![Fig. 31: Position of the ready-for-service indicator magnet](image1)

If the magnet is positioned exactly on the lower mark, the gas pressure is correct.

![Fig. 32: Magnet positioned on the lower mark](image2)

Fasten the front cover to close the front side of the panel.
12 Installing the panels

If required, the actions described in this section must be repeated until all panels are bolted together.

In the operations described in the following sections, it is assumed that
- the transport units are installed starting either from the left or right.
- a new switchgear unit or group is being installed which has not been connected to a source of power yet, and that it is therefore not energized.

12.1 Installing the end wall

There must not be any partition wall between the end wall and the frame of the end panel. Partition walls are only used to separate individual panels, respectively the cable compartments (see Fig. 37: Bolted joint of panels, page 47). The end panels are shipped from the factory without partition wall, except for group orders without a specified panel configuration. In this case, remove the partition wall before starting installation.

![Fig. 33: Fixing points of left end wall](image)

**Installing left end wall**
- Align the end wall with the panel frame.
- Secure the end wall to the frame of the panel with the bolts provided.

**Installing right end wall**
The right end wall is mounted in a similar manner.
12.2 Aligning the panel and fastening to the foundation

Aligning the panel
Observe the minimum distances to the side and rear wall of the switchgear room in accordance with the switchgear arrangement drawing. For the dimensions and minimum distances of the panels, please refer to the dimension drawing and arrangement diagram for the switchgear.

Caution

Panel distortion will cause operational problems.
Follow alignment instructions carefully. Use shims at mounting locations to prevent distorting panel.

The switchgear may have a level difference of 0.04 in/yd (1 mm/m) as a maximum.

☞ Align the panel in horizontal position.
☞ Align the panel in vertical position.
   Check to assure that the panel is aligned (levelled to a maximum level difference of 0.04 in/yd (1 mm/m).

Fastening the panel to the foundation

Fasten the panel to the foundation at 4 points at least.

There are two possibilities for fastening the panel to the foundation:
• bolting to sill channels (not furnished)
• bolting to foundation inserts (not furnished)

![Fig. 34: Bolting to sill channel](image1)

![Fig. 35: Bolting to foundation inserts](image2)
Bolting the panel to the sill channels

- Align the panel in horizontal and vertical position.
- Bolt the panel to the sill channels, without distorting the panel.

Bolting the panel to the foundation inserts

- Drill holes for inserts according to the hole pattern (see dimension drawing).
- Install the insert anchors.
- Clean drilling dust and debris from the panel.
- Align the panel in horizontal and vertical position.
- Bolt the panel to the foundation inserts, without distorting the panel.

12.3 Aligning and joining another panel

For trouble-free operation, all panels must be in vertical position and may only have a horizontal level difference (mis-alignment) of 0.04 in/yd (1 mm/m).

- Establish the same level (0.04 in/yd (1 mm/m)) using shims 4.
- Align the panel 3 in horizontal and vertical position.

![Diagram](image)

Fig. 36: Alignment and levelling of panels

1. Foundation
2. Aligned panel
3. Next panel
4. Shims 0.02 - 0.04 in (0.5 - 1.0 mm)
**Joining panels**  
Materials to join the panels are furnished with the switchgear.

- Bolt panels together, without distorting panels.
- Verify horizontal and vertical alignment of panels.

**Joining rear walls**  
In case of free-standing (i.e., installed with an aisle behind the switchgear) arrangement, the rear walls of the panels must be joined with connecting links.

- Bolt the connecting link onto the rear walls.
12.4 Installing the bus bar

Access to bus bar compartment

Access to bus bar compartment:
- from the side (during installation)
- from the front side

Cleaning insulators / bus bars

→ Clean insulators / bus bars with cleaning agent (household cleaner) and a lint-free cloth.
→ Dry insulators / bus bars with a lint-free cloth.
→ Do not use any abrasive cleaner or wire brush on plated contact surfaces.

Fig. 39: Access to bus bar compartment

1. Bus bar compartment
2. Front cover of bus bar compartment
Fastening bus bars

Assemble the bus bars and the fixing material on the points of contact of the panel.

Screw the bus bar tight (tightening torque 37 lbf·ft (50 Nm)).
Installing insulating caps (> 15 kV only)

Position insulating cap and align with holding clip.

Snap insulating cap onto holding clip.

Check that insulating cap is properly seated in the holding clip.

Fig. 41: Installing insulating cap (for over 15 kV)
12.5 Installing the ground bus bar

All panels of the switchgear are conductively connected together by means of the ground bus bar. The ground bus bar is pre-mounted. The ground bus bars of the panels must be connected by jumpers.

- Interconnect the ground bus bars by the jumpers.

Ground bus bar standard

![Diagram of ground bus bar standard]

Fig. 42: Bolted joint of ground bus bar (standard)

- Panel frame
- Pressnut
- Conical spring washer
- Connection bar (delivery position)
- Ground bus bar
- Nut
- Carriage-head bolt

Ground bus bar 25 kA/1s

![Diagram of ground bus bar 25 kA/1s]

Fig. 43: Bolted joint of ground bus bar (25 kA/1s)
12.6 Installing the end wall

The installation of the switchpanels is completed by installing the second end wall (see “Installing the panels” on page 44).

12.7 Connecting the station ground grid to the switchgear frame

The switchgear must be connected to the station ground grid at the grounding points. The position of the grounding points is shown in the dimension drawing.

Recommended points of connection for the station ground:
- the two end panels
- every third panel of the switchgear
- each metering panel.

The station ground can be optionally connected to the panel internally or externally.

⇒ Select mounting direction of station ground (internal or external).
⇒ Bolt the station ground to the switchgear frame (apply 52 lbs·ft or 70 Nm).
   Check that the switchgear frame is properly grounded.

---

![Diagram of switchgear frame with grounding point](image)

Fig. 44: Switchgear frame with grounding point (bolted joint M12)
13 Connecting high voltage cables

13.1 Preparing connection of high voltage cables

**Preconditions**

- The switchgear frame is connected to the station ground.
- The **window-type current transformers are mounted on the high voltage cables**.
- The cables have been terminated according to the manufacturer’s instructions.

**Cleaning cable/ cable lug**

- Clean cable/ cable lug with a lint-free cloth.

**Aligning high voltage cable**

- Align cable with connection location.
- Align the hole pattern of the cable lug of the cable connection.

**Securing high voltage cable to cable bracket**

If the C-rail (see Fig. 49, Page 61) is located in the area of the cable termination, shift the cable bracket so that the cable clamps are located at the required distance from the termination.

When securing the cables, ensure that the cable clamps are around the outer sheath of the cable. The cable clamps should fit snugly, but should not compress the cable.

**Caution**

- Secure the cable in the cable clamp.

**Mounting Window-type current transformers**

If there is not enough space available for the window-type current transformer between the cable clamps and the floor cover (protection against small animals), the transformer can also be mounted underneath the optional floor cover.
Installation

- Break the recess for the retaining device out of the optional floor cover at the point provided for this purpose.
- Bolt the retaining device for the window-type current transformer to the cable bracket.
- Mount the window-type current transformer on the retaining device.
- Install the secondary leads of the window-type current transformer through the metal duct to the associated terminal strip in the terminal connection compartment.

**Connecting cable shields**

The cable shields of all three phases (L1, L2 and L3) are connected to one common grounding point. The cable shields have to be routed through the windows of the current transformers.

- Route the cable shields directly to the C-rail, or alternatively, to the ground bus bar. Ensure a minimum clearance of 210 mm (8.27 in) to live parts.
- Bolt the cable shields to the C-rail, or alternatively, to the ground bus bar.

### 13.2 Cable connection types

![Diagram of cable connection types](image)

**Fig. 45:** Cable connection type CC 1

**Fig. 46:** Cable connection type CS 1

1. Cold shrink insulation (for over 15 kV)
2. Cable lug
3. Cable termination
4. Heat shrink insulation (>15 kV, factory installed)
Fig. 47: Cable connection
   type CS 2
* The first skirt of the bushing must be wrapped by the cold shrink.

Fig. 48: Cable connection
   type FS 1 ... 3
** Field-installed cold shrink insulation (item ①) must overlap factory-installed heat shrink (item ④)
13.3 Installing cold shrink insulation at cable connections

<table>
<thead>
<tr>
<th>NOTE!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before installing, read the supplier’s documentation of the cold shrink insulation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NOTE!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before installing, the cold shrink insulation should be at room temperature. If the cold shrink insulation is installed while cold, the material may not contract (shrink) fully.</td>
</tr>
<tr>
<td>☞ Before installing, bring the cold shrink insulation up to room temperature.</td>
</tr>
</tbody>
</table>

Determine the length of the cold shrink

☞ Measure the distance between the second skirt of the bushing type insulator and a reference-point, e.g., the middle of the lower hole in the cable connection terminal, and note the distance.

☞ Measure the distance between the upper edge of the cable termination and a reference-point, e.g., the middle of the lower hole in the cable lug and note the distance.
Add the two distances together and add 1 inch to the sum of the distances. The result of this addition is the necessary length of the cold shrink. This length is approximately equal to the length “a” (see Fig. 45: Cable connection type CC 1, page 54).

Cut the cold shrink insulation to its necessary length

Measure from the upper edge, i.e., the side opposite the loose pull tab, of the cold shrink and mark the determined length at the cold shrink.

Cut the cold shrink insulation carefully using a handsaw at the marked distance while turning the cold shrink insulation around its axis.

NOTE!
While cutting the cold shrink insulation, use care that you do not cut the loose pull tab in the middle of the cold shrink insulation.

Do not cut the pull tab in the middle of the cold shrink insulation.

Cut the cold shrink insulation carefully using a handsaw at the marked distance while turning the cold shrink insulation around its axis.
Installation

**Mounting of the cold shrink**

⁻ Pull the cold shrink insulation over the cable termination. The loose pull tab of the cold shrink insulation must point away from the switchgear cable connection terminal.

⁻ Bolt the the high voltage cable together with the cable connection terminal (tightening torque 37 lbf·ft or 50 Nm).
Push the cold shrink insulation over the bushing so that the end of the cold shrink insulation is located between the first and the second skirt of the bushing. You can use the neighboring bushing as reference.

Pull down the loose pull tab gently while unwinding in a counter-clockwise direction.
Finish the mounting of the cold shrink insulation by pulling down gently the loose pull tab completely. The cold shrink insulation material must fully cover all bare conductors.

The cold shrink insulation is correctly installed.
13.4 Connecting cable panel to high voltage

All cable panels have a similar cable connection.

Cable panels:
- CS cable switch
- Cable panel with make-proof grounding switch
- Cable panels without switching devices

For the exact panel dimensions, such as the cable connection height, please refer to the dimension drawing and arrangement diagram for the specific panel.

**Connecting high voltage cables**
- Check the tightening torque (37 lbf·ft or 50 Nm) of the bolted joint between the cable connection terminal and the bushing-type insulator.
- Put the cold shrink (for over 15 kV) over the cable connection (see “Installing cold shrink insulation at cable connections” on page 56).
- Bolt terminated cable to the cable connection terminal and avoid undue strain on bushing type insulator. For the tightening torques of the cable lugs / cable terminations, please observe the manufacturer’s instructions, however do not exceed 37 lbf·ft (50 Nm).
13.5 Connecting fuse switch panel to high voltage

For the exact panel dimensions, such as the cable connection height, please refer to the dimension drawing and arrangement diagram for the switchgear.

Connecting high voltage cables

Bolt terminated cable to the cable connection terminal and avoid undue strain on bushing. For the tightening torques of the cable lugs / cable terminations, please observe the manufacturer’s instructions, however do not exceed 37 lbf-ft (50 Nm).
13.6 Connecting metering panel to high voltage

For the exact panel dimensions, such as the cable connection height, please refer to the dimension drawing and arrangement diagram of the switchgear.

- Connect the voltage transformer’s primary to the cable termination at the desired point.
- Check the tightening torque (37 lbf·ft or 50 Nm) of the bolted joint between the cable and the block-type current and/or voltage transformers.
- Bolt terminated cable to the cable connection terminal and avoid undue strain on bushing. For the tightening torques of the cable lugs / cable terminations, please observe the manufacturer’s instructions, however do not exceed 37 lbf·ft (50 Nm).
14 Installing and connecting low voltage equipment

14.1 Installing secondary cables

The secondary cables are routed above the control compartment behind the screwed-on cover.

The secondary cables can be installed directly into the terminal connection compartment either from above through an entrance bushing or conduit fitting or from below through a flexible metal conduit (not furnished) arranged along the switchgear frame.

Please observe the correct polarity of the secondary leads of the window-type current transformers to be connected.

14.2 Connecting low voltage wiring

Connect all customer low voltage wiring according to the terminal plug and cable designations of the circuit diagrams of the switchgear.

14.3 Connecting the space heater

The individual panels of SIMOSEC switchgear are equipped with a space heater to prevent condensation.

| Rating       | 100 W |

Connect the space heater terminal according to the circuit diagrams for the switchgear.
15 Switchgear extension

If required, installed switchgear can be extended with additional panels, or the existing panel configuration can be modified. After disconnecting and grounding the electric circuits, and after discharging any stored-energy in operating mechanisms, additional panels can be installed and connected. The procedure to be followed for switchgear extension is the same as for first installation.

16 Placing SIMOSEC switchgear into service

16.1 Safety instructions

The correct and safe operation of this switchgear is conditional on:
- Proper transportation
- Correct storage
- Correct assembly and installation
- Careful operation in accordance with established procedures which comply with applicable codes and regulations
- Use of proper Personal Protective Equipment (PPE) (see NFPA 70E)

16.2 Instructing the operating personnel

- The operating personnel should have these instructions available.
- Instruct operating personnel in theory and practice of switchgear operation.
- Ensure that the operating personnel are familiar with all operational details when placing equipment into service.

16.3 Checking the assembly work and the accessories

Accessories supplied with the equipment:
- Operating instructions
- Operating levers for three-position switch
- Double-bit keys (if necessary)
- Circuit diagrams
- Voltage detector or voltage detection system

- Ensure that the above listed accessories are easily accessible.
- Ensure that the assembly work has been performed correctly (see sections 12 - 14).
- Ensure that all covers have been installed and enclosure hardware torqued to the correct values.
- Ensure that all electrical connections have been torqued to the correct values.
Installation

16.4 Final work

Visual inspection of switchgear

- Check data on the rating plates according to the circuit diagrams.
- Clean the switchgear thoroughly. Remove all foreign matter. Clean all insulation with a lint-free cloth.
- Close all covers/doors.
- Check safety/warning labels provided at the switchgear.

Checking the accessories

16.5 Testing the switchgear electrically

Checking the grounding

Check the following at the panels:

- All grounding connections are properly made
- Proper operation of all discharge switches

Fuse switch panel: Movable grounding contacts (option) touching on all three phases in GROUNDED position

Checking high voltage connections

- Check that cables have been properly terminated and connections are insulated.
- Check correct phase sequence of cables.
- Check correct installation and grounding of cable ground shields.
- Check covers of capacitive test sockets
- Check grounding connections including bus connections in switchgear and connections to system ground.
- Check that insulating caps are properly installed and undamaged.
- Check insulation for damage.
- Check tightening torque of bolted joints.
- Check that cable clamps are properly installed for all high voltage cables.

Checking low voltage connections

- Check low voltage wiring for correct installation.
- Check tightness of terminal screws.
- Check secondary wiring of transformers.
- Check that any current transformer that is not connected to a permanent load device has the secondary terminals connected with a short-circuiting jumper.
16.6 Operating the switchgear for test

SIMOSEC switchgear is operated mechanically and electrically for test at the factory. Before commissioning, operate the switchgear again mechanically and electrically for test.

**Mechanical operation**

The panels are delivered from the factory with all switching devices in “GROUNDED” position, and the closing and opening springs of the stored-energy mechanisms partially charged.

- Operate the different switching options of each panel several times.
- Switch the three-position switches several times to each position (CLOSED, OPEN, and GROUNDED), verifying the correct indication of the associated switch position indicators at the same time.
- Test interlocking conditions of each switching option (without using excessive force).

The switch positions of the SIMOSEC switchgear are described in the operating instructions.

**Testing low voltage system**

- Check the auxiliary circuits according to the circuit diagram and manual.
- Switch on control voltage using an external source.
- Check the indicators according to the circuit diagram and the mimic diagram of the switchgear.
- Check the control elements according to the circuit diagram and the mimic diagram of the switchgear.

---

**WARNING**

Risk of eye injury.
Eye protection required.

Do not look into view port during switching operation. Arcing during switch operations may damage your eyes.

**Fig. 54:** Warning label

**Electrical operation**

The switch positions of SIMOSEC switchgear are described in the operating instructions.

- Operate the different switching options of each panel several times.
- Verify correspondence between the switch position indication on the control panel and the actual switch position using the view port.
- Test interlocking conditions of each switching option (without using excessive force).
16.7 Testing

SIMOSEC switchgear is well prepared to fulfill the following tests:

<table>
<thead>
<tr>
<th>Rated Maximum Voltage kV (rms)</th>
<th>Power Frequency Withstand kV (rms)</th>
<th>Field Test Voltage kV (rms)</th>
<th>kV (dc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.76</td>
<td>19</td>
<td>14.25</td>
<td>20.2</td>
</tr>
<tr>
<td>8.25</td>
<td>36</td>
<td>27</td>
<td>38.2</td>
</tr>
<tr>
<td>15</td>
<td>36</td>
<td>27</td>
<td>38.2</td>
</tr>
<tr>
<td>27.6</td>
<td>60</td>
<td>45</td>
<td>63.6</td>
</tr>
</tbody>
</table>

Following tests should be made on the equipment (observe manufacturers and local prescriptions):

- An insulation resistance test is made on the high voltage circuit to be sure that all connections made in the field are properly insulated. An insulation resistance test is also advisable on the control circuit.

- A dielectric test, if possible, should be made on the high voltage circuit for one minute at one of the above shown voltages (see table) corresponding to the rated voltage of the equipment. (Note: Voltage transformers, control power transformers, surge arresters, and surge capacitors must be disconnected during this test. The test sockets of capacitive voltage indication system must be grounded).

Note: The DC test voltage is given as a reference only for those using DC Tests to verify the integrity of connected cable installations without disconnecting the cables from the switchgear. It represents values believed to be appropriate and approximately equivalent to the corresponding power frequency withstand test values specified for each voltage rating of switchgear. The presence of this column in no way implies any requirement for a DC withstand test on AC equipment or that a DC withstand test represents an acceptable alternative to AC withstand tests. When making DC Tests, the voltage should be raised to the test value in discrete steps and held for a period of one minute.

In accordance with ANSI C37.20.3 Clause 6.5, Field Dielectric Tests are also recommended when new units are added to an existing installation, or after major field modifications. The equipment should be put in good condition prior to the field test. It is not expected that equipment shall be subjected to these tests after it has been stored for long periods of time or has accumulated a large amount of dust, moisture, or other contaminants without being first restored to good condition.

A dielectric test on secondary and control circuits should be made for one minute at 1125 volts AC or 1590 volts DC. The above voltages are in accordance with NEMA Standards. (Note: Certain control devices, such as motors and motor circuits, should be tested at 675 volts AC. Electronic devices should be tested at the voltages specified in the instruction manual for the electronic device).
16.8 Connecting operating voltage (high voltage)

The connection is conditional on complete and trouble-free commissioning

⚠️ Danger

Hazardous voltage.
Will cause death, serious injury or property damage.

Do not energize equipment if misoperation has occurred during any of the checks and tests in section 12.3 - 12.7. Remedy any misoperation before energizing equipment.

⚠️ Danger

Hazardous voltage and high-speed moving parts.
Will cause death, serious injury or property damage.

To avoid electrical shock, burns and entanglement in moving parts, this equipment must be installed, operated, and maintained only by qualified persons thoroughly familiar with the equipment, instruction manuals and drawings.

⇒ Switch all switching devices to "OPEN" position.
⇒ Ground cable feeders without connected high voltage cables at the feeder, and secure the grounding switch against de-grounding (opening).
⇒ Verify correct terminal-phase connections with respect to next incoming feeder:
  • Apply operational high voltage to opposite substation.
  • Connect phase comparison test unit (e.g., make Pfisterer, type EPV) to the capacitive test sockets of one phase at the panel and at the adjacent panel.

⇒ Test all three phases using phase comparitor.
⇒ Connect tested incoming feeder (bus bars / feeders) according to the specifications / the instructions of the switchgear owner.
17 Indicators and control elements

For detailed information about the modules and components of your SIMOSEC switchgear, please refer to the individual sections of these instructions and the corresponding catalog.
18 To be observed for operation

Before operation, always verify readiness for service of the panels to be operated.

18.1 Verification of readiness for service

The "ready-for-service" indicator for SF₆ gas shows the gas density in the three-position switch required to operate the panel.

If a three-position switch filled with SF₆ gas is not ready for operation:
- Do not put the switchgear into operation
- Do not operate the switchgear
- Contact the Siemens Service Operation.

![Ready-for-service indicator for SF₆ gas](image)

18.2 Verification of safe isolation from supply of a feeder

Verify safe isolation from supply of the switchgear or the panel:
- with the voltage indicator of the capacitive voltage detection system
Operation

Verification of safe isolation from supply with the capacitive voltage detection system

Fig. 57: Control board section: Sockets for capacitive voltage detection system

Proceed as follows:

➤ Determine type of measuring system HR (= High Resistive System).
➤ Select suitable indicator ‘HR-ST’.
➤ Verify perfect operation of indicator.
➤ Remove cover from test socket.
➤ Plug in the voltage indicator.
➤ Read indicator:
  • If the indicator flashes or lights up, the phase is energized.
  • If the indicator does not flash or light up, the phase is not energized.
➤ Remove indicator.
➤ Replace cover in test socket.
➤ Check the other phases in the same way.
19 Operating the three-position switch

Cable panels, bus sectionaliser panels and fuse switch panels are equipped with a three-position switch disconnecter.

**WARNING**

Risk of eye injury.
Eye protection required.

Do not look into viewport during switching operation. Arcing during switch operations may damage your eyes.

19.1 Indicators and control elements of the three-position switch

![Diagram of control panel](image)

Fig. 58: Control panel of cable switch panel with three-position switch-disconnector

Fig. 59: Control panel of fuse switch panel with three-position switch-disconnector

Fig. 60: Operating levers for three-position switch

---

1. Opening for the operating lever of the three-position switch
2. "Ready-for-service" indicator for SF₆ gas
3. Interlocking lever for cable compartment cover (option)
4. Control gate for three-position switch
5. Socket for capacitive voltage indicators (blue label)
6. Socket for capacitive voltage indicators (yellow label)
7. Switch position indicator
8. Indicator: "Fuse intact/ Fuse blown"

1. Coded operating lever for the switch-disconnector (red grip)
2. Operating lever (black grip) for grounding switch
**Possible switch positions of the three-position switch-disconnector**

The operating lever is mechanically coupled to the switching operation through the operating shaft.

<p>| | | |</p>
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<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CLOSED position</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>OPEN position</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>GROUNDED position</td>
<td></td>
</tr>
</tbody>
</table>

**Fig. 61:** Switch positions of the three-position switch-disconnector with detachable lever mechanism

**GROUNDED**
- Switch-disconnector open
- Grounding switch closed
- Cable compartment cover unlocked (option)

Option: In the fuse switch panel, the feeder can be grounded via a mechanical, positively coupled discharge switch located in the panel subframe

**OPEN**
- Switch-disconnector open
- Grounding switch open
- Cable compartment cover locked (option)

**CLOSED**
- Switch-disconnector closed
- Grounding switch open
- Cable compartment cover locked (option)
19.2 Preconditions for operation

Preconditions for operating the three-position switch:

- Cable compartment cover installed
- Switchgear “ready for service”
- Operating lever available
- Control gate unlocked

19.3 Switching the three-position switch to CLOSED position

Push control gate of three-position switch to the right and hold.

- Insert operating lever (with black grip) onto operating shaft of operating mechanism.
- Move operating lever up to the “CLOSED” position.
The three-position-switch of the cable / bus sectionalizer and fuse switch panel is now closed.

- Remove operating lever.
- Install padlock at center position of control gate of three-position switch (if desired).
- Stow away operating lever.
  The three-position switch is protected against unauthorized use, if the control gate is padlocked.

19.4 **Switching the three-position switch to OPEN position**

- Push control gate of three-position switch to the right and hold.

  - Insert operating lever (with black grip) onto operating shaft of operating mechanism.
  - Move operating lever down to the "OPEN" position.
The three-position switch of the cable / bus sectionaliser and fuse switch panel is open.

- Remove operating lever.
- Install padlock at center position of control gate of three-position switch (if desired).
- Stow away operating lever.

The three-position switch is protected against unauthorized use, if the control gate is padlocked.

19.5 Switching the three-position switch to GROUNDED position

**Caution**

Grounding an energized cable or busbar will cause upstream protective device (circuit breaker or fuse) to open.

Verify that circuits are de-energized before switching the three-position switch to the grounded position. After operation, verify position of grounding switch through viewport.

- Establish safe isolation from supply voltage.
  Verify that the panel feeder of the three-position switch is isolated from supply. Use the capacitive voltage detection system (see “Verification of safe isolation from supply with the capacitive voltage detection system” on page 72).

- Remove padlock (if present) from control gate of three-position switch (option).
- Push control gate of three-position switch to the left and hold.
Operation

- Insert operating lever (with red grip) onto operating shaft of operating mechanism.
- Move operating lever down to the "GROUNDED" position. Verify the position of the switch through the viewport.

**GROUNDED position in fuse panel:**
- Verify that the discharge switch is closed - i.e., the movable grounding contact (option) is touching the second fuse contact - through the inspection window of the cable compartment cover.

Position of discharging contacts with discharge switch in "GROUNDED" position.

- Remove operating lever.
- Install padlock at center position of control gate of three-position switch (if desired).
- Stow away operating lever.
  The three-position switch is protected against unauthorized use, if the control gate is padlocked.

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19.6 Switching the three-position switch from GROUNDED to OPEN position

Obtain clearance for removal of ground in accordance with established procedures for lockout-tagout complying with OSHA regulations and NFPA 70E.

- Verify that all work requiring grounding has been completed.
- Verify that all personnel are clear of conductors.
- Verify that any temporary grounds or short-circuits have been removed.
- Verify that all covers and doors have been closed.

⇒ Remove padlock (if present) from control gate of three-position switch.
⇒ Push control gate of three-position switch to the left and hold.

⇒ Insert operating lever (with red grip) onto operating shaft of operating mechanism.
⇒ Move operating lever up to the “OPEN” position.

**OPEN position in fuse switch panel**

⇒ Verify that the discharge switch is in OPEN position - i.e., the movable grounding contact (option) is not touching the second fuse contact - through the inspection window of the cable compartment cover.

Position of grounding contacts with grounding switch in OPEN position.

⇒ Remove operating lever.
⇒ Install padlock at center position of control gate of three-position switch (if desired).
⇒ Stow away operating lever.

The three-position switch is protected against unauthorized use, if the control gate is padlocked.
19.7 Switching the three-position switch with FII-Protection-System (option)

The Fuse-Installed-Intact-Protection-System (FII-Protection-System) could be installed in fuse switch panels. It prevents to switch the three-position switch to CLOSED position if only one fuse is blown or not installed. To switch the three-position switch to OPEN position is possible if the FII-Protection-System is active.

Switch to CLOSED position

The shutter of the FII-Protection-System is visible in the slot for closing/opening of the three-position switch.

Fig. 62: Shutter of FII-Protection-System

To switch the three-position to CLOSED position is blocked by the shutter.

Fig. 63: Switching to CLOSED position blocked by shutter

- Check if fuses are blown or not installed.
- Replace or install fuses.
- Check if the shutter of the FII-Protection-System is still visible in the slot for closing/opening of the three-position switch.
- Switch the three-position switch to CLOSED position.
Switch to OPEN position

Switching the three-position switch to OPEN position is always possible even if the FII-Protection-System is active or not.

Fig. 64: Switching to OPEN position is always possible

- Switch the three-position switch to OPEN position.
- Check if fuses are blown or not installed.
- Replace or install fuses.
- Check if the shutter of the FII-Protection-System is still visible in the slot for closing/opening of the three-position switch.
20 Operating the make-proof grounding switch

Panels with make-proof grounding switch:
- Cable grounding panel CG
- Bus bar grounding panel BG, CG

20.1 Indicators and control elements of the make-proof grounding switch

Fig. 65: Control panel of cable grounding panel with make-proof grounding switch

Fig. 66: Control panel of bus bar grounding panel with make-proof grounding switch

1. Opening for the operating lever mechanism of the make-proof grounding switch
2. “Ready-for-service” indicator for SF₆ gas
3. Control gate for fault make grounding switch
4. Socket for capacitive voltage indicators
5. Switch position indicator
Possible switch positions of the make-proof grounding switch

Fig. 67: Switch positions of the make-proof grounding switch with detachable lever mechanism

20.2 Preconditions for operation

Preconditions for operating the make-proof grounding switch:
- Switchgear ready for service
- Operating lever available
- Absence of voltage, feeder isolated

Caution

Grounding an energized outgoing cable or bus bar will cause upstream protective device (circuit breaker or fuse) to open.

Verify that circuits are de-energized before switching the three-position switch to the grounded position. After operation, verify position of grounding switch through viewing window or viewport.

Danger

Hazardous voltages and potential switch failure.
Will cause death, serious injury or property damage.

Do not operate switch if “ready-for-service” indicator is in red area. Isolate this section and contact Siemens Service Operation at 1-800-347-6859 (919-386-2200 outside the US)
20.3 Switching the make-proof grounding switch to GROUNDED position

- Verify safe isolation from voltage supply of bus bar.
- Verify the position of the switch through the viewport.

![Warning]

- Establish safe isolation from supply if required.
- Verify that the bus bars and the panel feeder of the make-proof grounding switch are isolated from supply.
- Remove padlock (if present) from control gate of make-proof grounding switch.
- Push control gate of make-proof grounding switch to the left and hold.

![Diagram]

- Insert operating lever (with red grip) onto operating shaft of operating mechanism.
- Move operating lever down to the “GROUNDED” position.
  The bus bar grounding switch is in the “GROUNDED” position.

![Diagram]

- Remove operating lever.
- Install padlock at center position of control gate of make-proof grounding switch (if desired).
- Stow away operating lever.
  The make-proof grounding switch is protected against unauthorized use, if the control gate is padlocked.
20.4 Switching the make-proof grounding switch to OPEN position

Obtain clearance for removal of ground in accordance with established procedures for lockout-tagout complying with OSHA regulations and NFPA 70E.

- Verify that all work requiring grounding has been completed
- Verify that all personnel are clear of conductors
- Verify that any temporary grounds or short-circuits have been removed
- Verify that all covers have been reinstalled

⇒ Remove padlock (if present) from control gate of make-proof grounding switch.
⇒ Push control gate of make-proof grounding switch to the left and hold.

⇒ Insert operating lever (with red grip) onto operating shaft of operating mechanism.
⇒ Move operating lever up to the "OPEN" position.
  ✔ The bus bar grounding switch is in the de-grounded position.

⇒ Remove operating lever.
⇒ Install padlock at center position of control gate of make-proof grounding switch (if desired).
⇒ Stow away operating lever.
  The make-proof grounding switch is protected against unauthorized use, if the control gate is padlocked.
21 Grounding of panels that do not have switching devices

Panels that have no switching devices:
- Cable panel CC
- Bus riser panel BR
- Metering panels MC, MT
- Fuse panel

Cable panels, bus riser panels or metering panels must be grounded via the grounding devices of the panels allocated for this purpose or by means of grounding cables. Grounding cables are not furnished as part of SIMOSEC switchgear. Grounding cables are available from a number of suppliers, including W.H. Salisbury & Co. and A.B. Chance (Hubbell Power Systems).

Grounding cables should be used in accordance with the instructions of the grounding clamp manufacturer and in accordance with applicable regulatory requirements, including those of OSHA.

Fig. 68: Grounding of a metering panel using grounding cables (example)
Maintainance

22 Switchgear maintenance

Periodic inspections and maintenance are essential to obtain safe and reliable operation of the switchgear. When SIMOSEC switchgear is operated under "Usual Service Conditions", maintenance and lubrication is recommended at ten year intervals. The maintenance intervals of devices (e.g., relays, PLC’s, etc.) installed in the switchgear may differ. "Usual" and "Unusual" service conditions for Medium Voltage Metal-Enclosed Interrupter Switchgear are defined in ANSI/IEEE C37.20.3, clauses 4 and 8.1. Generally, "usual service conditions" are defined as an environment in which the equipment is not exposed to excessive dust, acid fumes, damaging chemicals, salt air, rapid or frequent changes in temperature, vibration, high humidity, and extremes of temperature.

The definition of “usual service conditions” is subject to a variety of interpretations. Because of this, you are best served by adjusting maintenance and lubrication intervals based on your experience with the equipment in the actual service environment.

- Under indoor operating conditions, SIMOSEC requires low maintenance.
- The climatic and local ambient conditions determine the extent of cleaning work to be performed.
- We recommend an annual visual inspection. If required, the intervals have to be adjusted to the climatic and local ambient conditions.
- Independently of the regular maintenance, immediately determine the cause of faults and short circuits as well as partial discharges, and replace damaged parts by original parts if required.
- If you have any questions, please contact Siemens Service (see “Field Service Operation” on page 6).

Introduction and Maintenance Intervals

Regardless of the length of the maintenance and lubrication interval, Siemens recommends that switching devices should be inspected and exercised annually.

For the safety of maintenance personnel as well as others who might be exposed to hazards associated with maintenance activities, the safety related work practices of NFPA 70E should always be followed when working on electrical equipment. Maintenance personnel should be trained in the safety practices, procedures and requirements that pertain to their respective job assignments. This manual should be reviewed and retained in a location readily accessible for reference during maintenance of this equipment.

The user must establish a periodic maintenance program to ensure trouble-free and safe operation. The frequency of inspection, periodic cleaning, and preventive maintenance schedule will depend upon the operation conditions. NFPA Publication 70B, “Electrical Equipment Maintenance” may be used as a guide to establish such a program.
A preventive maintenance program is not intended to cover reconditioning or major repair, but should be designed to reveal, if possible, the need for such actions in time to prevent malfunctions during operation.

Switchgear assemblies are enclosed on all sides and top with sheet metal. Access into the enclosure is provided by doors or removable covers. Although the bus and connections may be covered with insulating materials in metal-enclosed switchgear assemblies, it is a coordinated insulation system; insulation plus air or creep distance equals a given insulation level.

![Danger]

**Danger**

Hazardous voltage.

Will cause death, serious injury and equipment damage.

De-energize and ground high voltage conductors within switchgear before working on or near the conductors.

### 22.1 Recommended Hand Tools

SIMOSEC switchgear uses metric fasteners. For additional information call Siemens.
22.2 Recommended Maintenance and Lubrication

Periodic maintenance and lubrication should include all the tasks shown in table below.

**WARNING**

Failure to properly maintain the equipment could result in death, serious injury and product failure, as well as prevent successful functioning of connected apparatus.

The instructions contained herein should be carefully reviewed, understood, and followed.

The maintenance tasks in the following table must be performed regularly.

| 1. Before any maintenance work is performed within primary compartments, make certain that the equipment is completely de-energized, tested, grounded, tagged or properly identified and released for work in an authorized manner. |
| 2. Before starting work on the switchgear, the following should be completed on any equipment that will affect the area of the work: |
| A. Disable remote control and automatic transfer schemes. |
| B. De-energize all direct and back feed power and control sources, test and ground. |
| C. Disconnect all voltage and control power transformers. |
| D. Open all disconnects. |
| E. Ground outgoing circuits. |
| 3. Include the following items in your inspection procedure: |
| A. Check general condition of switchgear installation. |
| B. Inspect switchgear interior for accumulation of dust, dirt or any foreign matter. |
| C. Examine indicating lamps and replace as required. |
| D. Check terminal block contacts for loose connections. |
| E. Check instrument and control switches and inspect their contacts. |
| F. Check for proper condition of instrument transformers. Replace burned out fuses, if any. Check primary and secondary connections. |
| G. Remove dust and other contaminants from all insulators and insulation. |
| H. Inspect bus bars and connections for proper condition. If bus bars are overheating check for poor or loose connections or for overload. |
| I. Examine all safety interlocks. |
| J. Check space heaters and thermostat (if equipped) for proper operation. |
| K. Maintain other equipment per their respective instruction book requirements. |
| L. Replace, reassemble, re-insulate, return all items to proper operating conditions and remove grounds prior to energization. |

The list of tasks in the table does not represent an exhaustive survey of maintenance steps necessary to ensure safe operation of the equipment. Particular applications may require further procedures. Should further information be desired or should particular problems arise which are not covered sufficiently for the Purchaser’s purposes, the matter should be referred to the local Siemens sales office.
22.3 Cleaning the switchgear

Most of the plastics and synthetics used in insulation systems are attacked by solvents containing aromatics or halogenated hydrocarbons. The use of these may cause crazing and deformation of the material reducing the dielectric strength. **Use only water and household cleaner to clean insulation.**

---

### WARNING

**Hazardous voltages.**

Use of improper cleaning agents can cause death, serious injury or property damage.

Failure to use recommended cleaning agents for cleaning insulation materials may result in reduction of dielectric strength.

---

To clean the switchgear or single components please use the recommended cleaning agents and aids.

<table>
<thead>
<tr>
<th>Cleaning agents and cleaning aids</th>
<th>Contents</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>WD40</td>
<td>Water-resistant spray-oil</td>
<td>Corrosion protection for sliding parts</td>
</tr>
<tr>
<td>Household cleaner and water</td>
<td></td>
<td>Cast-resin parts, control panels, covers, transformers</td>
</tr>
<tr>
<td>Brush</td>
<td></td>
<td>Dust</td>
</tr>
<tr>
<td>Lint-free cleaning rag</td>
<td></td>
<td>Humid cleaning, drying</td>
</tr>
<tr>
<td>Vacuum cleaner</td>
<td></td>
<td>Drilling chips, rubble, dust</td>
</tr>
</tbody>
</table>
22.4 Checking corrosion protection

Scratches, impacts or bare spots in the surface painting of the switchgear enclosure can produce corrosion.

<table>
<thead>
<tr>
<th>Touch-up set</th>
<th>Contents</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>8DX2 011</td>
<td>Paint pen in color “Light Basic SN700”</td>
<td>Scratches, impacts, bare spots</td>
</tr>
<tr>
<td>8DX2 012</td>
<td>Paint tin in color “Light Basic SN700”</td>
<td>Scratches, impacts, bare spots</td>
</tr>
<tr>
<td>on request</td>
<td>Paint pen in color &quot;light gray No. 61 per ASTM D1535-97 (Munsell notation 8.3 G6.10/0.54)&quot;</td>
<td>Scratches, impacts, bare spots</td>
</tr>
<tr>
<td>on request</td>
<td>Paint tin in color &quot;light gray No. 61 per ASTM D1535-97 (Munsell notation 8.3 G6.10/0.54)&quot;</td>
<td>Scratches, impacts, bare spots</td>
</tr>
</tbody>
</table>

22.5 Returning SIMOSEC switchgear to service

Follow the procedures given in “Placing SIMOSEC switchgear into service” (see Installation, Page 65).

23 Access to the switchgear

23.1 Identifying the panel

The accessibility, safety measures and work operations are dependent on the panel type. Identify the panel type and proceed accordingly.
23.2 Removing the cable compartment cover

There are two kinds of locking systems available for the cable compartment cover:
- Interlocked cable compartment cover (panels with grounding switch)
- Screwed-on cable compartment cover (panels without switching devices, e.g. ME1)

Open interlocked cable compartment door

☞ Check panel grounding (see “Switching the three-position switch to GROUNDED position” on page 77).

![Position of grounding contacts with discharging switch in “CLOSED” position](image1)

![Position of grounding contacts with discharging switch in “OPEN” position](image2)

![Switch-disconnector positions using viewport](image3)

**WARNING**

Risk of eye injury.

Eye protection required.

Do not look into viewport during switching operation. Arcing during switch operations may damage your eyes.

![Switch-disconnector positions using viewport](image4)
Verify that the grounding switch is closed, i.e., that the movable discharge switch contacts are touching the lower fuse contacts - through the inspection window of the cable compartment cover, or that the moving contacts of the switch-disconnector are in the “GRD” (“grounded”) position.

Push interlocking lever upwards and hold in this position.

Open the cable compartment door.

Release the interlocking lever.
Open screwed-on cable compartment door

- Check panel grounding (see “Switching the three-position switch to GROUNDED position” on page 77).
- Remove the two screws securing the cable compartment door.

Fig 74: Screwed-on cable compartment door

- Open the screwed-on cable compartment door.

Close the cable compartment door

To close the cable compartment door, proceed in reverse order.

Remove the screwed-on cable compartment cover

- Check panel grounding (see “Switching the three-position switch to GROUNDED position” on page 77).
- Remove the 4 screws in the corners of the cable compartment cover.

Fig 75: Screwed-on cable compartment cover

- Remove the screwed-on cable compartment cover.

Replace the screwed-on cable compartment cover

To replace the screwed-on cable compartment cover, proceed in reverse order.
23.3 Removing the cover of the compartment for customer low voltage equipment

Fig 76: Access to the compartment for customer low voltage equipment

Removing the compartment cover

- Remove the screws that secure the compartment cover.
- Remove the compartment cover.
23.4 Removing the cover of the bus bar compartment

![DANGER]

- Hazardous voltage.
- Will cause death, serious injury and equipment damage.
- De-energize and ground high voltage conductors within switchgear before working on or near the conductors.

Fig 77: Access to bus bar compartment

- Remove the screws on the bus bar compartment cover.
- Remove the bus bar compartment cover.

24 Testing

24.1 Verification of grounding

The integrity of ground connections should be verified before performing any tests.

Check the following at each panel:
- All grounding connections properly made.
- Proper operation of grounding switches. Check that all three movable grounding contacts of the discharging switch touch the cable termination point as shown in Fig. 69, page 92, and that the moving contact of switch-disconnectors are in the “GRD” ("grounded") position as shown in Fig. 70, page 92.
24.2 Verification of correct terminal-phase connections

**DANGER**

Hazardous voltage.
Will cause death, serious injury, or equipment damage.

Verify that all sources of power to the switchgear have the same phase sequence. Use only a phase comparison test unit which is compatible with type HR or LRM test sockets.

The three-position switch-disconnector of the feeder to be tested must be in “OPEN” position. The switchgear main bus bar must be energized. The outgoing circuit must also be energized from the remote source (not by closing the three-position switch-disconnector).

Verify correct terminal-phase connections at the capacitive test sockets of the panel to be tested as compared to the test sockets of an adjacent panel contacted to the same main bus bar, and whose three-position switch-disconnector is closed. The phase connections are verified using a phase comparison test unit.

Plug the test leads of the phase comparison test unit into the “L1” test sockets of the two panels.

![Fig 78: Use of electronic phase comparer](image)

Read the indication.

Proceed in the same way with the test sockets of the other phases (“L2” and “L3”). If the test unit shows “coincidence” in each case, the phase sequence of the tested feeder is correct.
24.3 Cable testing

For cable testing, the operating and installation instructions of SIMOSEC switchgear must be observed as well as the specifications and recommendations of the cable and cable termination manufacturers.

Voltage transformers or surge arresters connected to the circuit to be tested must be removed or disconnected.

SIMOSEC switchgear is designed for rated voltages up to 27.6 kV and the connected cable can be tested with a DC test voltage of up to 72 kV for cable tests. During this test, the main bus bar voltage can be energized at normal system AC voltage up to 27.6 kV.

Do not exceed test voltage recommended by the cable manufacturer.

<table>
<thead>
<tr>
<th>Rated voltage of switchgear</th>
<th>DC test voltage, maximum value</th>
<th>VLF* test voltage cosine-rectangular waveform rms (peak) voltage</th>
<th>VLF* test voltage sinusoidal waveform rms (peak) voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 kV</td>
<td>55 kV</td>
<td>22 (22) kV</td>
<td>16 (22) kV</td>
</tr>
<tr>
<td>27.6 kV</td>
<td>72 kV</td>
<td>33 (33) kV</td>
<td>23 (33) kV</td>
</tr>
</tbody>
</table>

* Very Low Frequency. Refer to IEEE Std. 400.2-2004, "IEEE Guide for Field Testing of Shielded Power Cable Systems Using Very Low Frequency (VLF)." For cosine-rectangular waveform, the rms value is taken as equal to the peak value. For sinusoidal waveform, the rms value is 0.707 times the peak value if distortion is less than 5%.

Preconditions for testing:

- Three-position switch in "OPEN" position

Procedure to be followed for cable testing:

- Isolate the panel feeder to be tested.
- Isolate all sources of voltage from the cable circuit to be tested, and lockout switching devices to prevent re-energization.
- Verify safe isolation from sources of voltage.
- Ground the cable to be tested.
- OPEN compartment cover (see “Removing the cable compartment cover” on page 92).
- Connect source of test voltage to the cable connection point of cable to be tested.
- Switch switching devices of panel to be tested to test position (OPEN position).
- Test cable in accordance with instructions of the test equipment manufacturer.
- Do not exceed test voltage recommended by the cable manufacturer.
- After test is complete, ground the cable that was tested.
- Remove test connections from the cable connection point.
- Reinstall the cable compartment cover.

The cable has been tested. Other panels can be tested, or the panel can be put into operation again.
24.4 Cable sheath testing

DANGER
Hazardous voltage.
Will cause death, serious injury and equipment damage.
De-energize and ground high voltage conductors within switchgear before working on or near the conductors.

- Isolate the panel feeder to be tested.
- Isolate all sources of voltage from the cable circuit to be tested, and lockout switching devices to prevent re-energization.
- Verify safe isolation from sources of voltage.
- Ground the cable to be tested.
- Remove the cable compartment cover (see “Removing the cable compartment cover” on page 92).
- Isolate the cable shield from the ground connection.
- Perform cable shield test in accordance with cable manufacturer’s recommendations.
- Reconnect the cable shield to ground.
- Reinstall the cable compartment cover.

The cable shield has been tested. Other cable shields can be tested, or the panel can be put into operation again.

25 Replacing HV HRC (current limiting) fuses

Always replace the HV HRC (current limiting) fuses in all three phases.

The actions described in this section are in logical order. In practice it may be necessary to deviate from the sequence recommended here.

DANGER
Hazardous voltage.
Will cause death, serious injury and equipment damage.
De-energize and ground high voltage conductors within switchgear before working on or near the conductors.

25.1 Preparing fuse replacement

- Ground transformer panel (see Operation, Page 77).
- Remove cable compartment cover (see “Removing the cable compartment cover” on page 92).

The cable connection compartment with the HV HRC (current limiting) fuse links is accessible.
25.2 Removing HV HRC (current limiting) fuse link

⚠️ **Caution**

**Burn Hazard**
May cause skin burns

Allow fuse to cool before handling, or use appropriate protection while handling fuses which are at high temperature.

> Grasp the HV HRC (current limiting) fuse in the lower portion of the fuse body.

> Pull the HV HRC (current limiting) fuse towards the front of the panel to release the fuse from the fuse clips.

The HV HRC (current limiting) fuse has been removed.

Fig 79: Removing HV HRC (current limiting) fuse link

⇒ Grasp the HV HRC (current limiting) fuse in the lower portion of the fuse body.

⇒ Pull the HV HRC (current limiting) fuse towards the front of the panel to release the fuse from the fuse clips.

The HV HRC (current limiting) fuse has been removed.

25.3 Checking the fuse tripping mechanism

When first placing the SIMOSEC switchgear into service and before installing replacement HV HRC (current limiting) fuse, check the tripping behavior of the switch-disconnector in all three phases, preferably by means of test fuses.

To check the fuse tripping mechanism on switchgear connected to the power system, the panel to be tested must be isolated and grounded, including the bus bars.
Install test fuse instead of the HV HRC (current limiting) fuse.

Close switch-disconnector.

Trip striker pin of test fuse.
Verify that the striker pin of the test fuse trips the switch-disconnector and that the switch-disconnector is in the "TRIPPED" position.

Open switch-disconnector.
Verify by control the movement of the switch position indication (see Fig. 5: Switch position indication, page 12) that the tripping mechanism is charged.
While switching the three-position switch from CLOSED to OPEN position the switch position indicator changes from TRIPPED to OPEN. This means that the stored-energized mechanism is pre-charged.
25.4 Installing the HV HRC (current limiting) fuses

Caution

Use of incorrect fuses may cause damage to equipment

Use only the make, model and rating of fuses for which the panel was designed. Fuses must have the correct dimensions and current ratings. Fuses must be installed with striker pin pointing towards the switch.

⇒ Select correct HV HRC fuse as shown on switchgear drawings.
⇒ Grasp HV HRC (current limiting) fuse in the middle of the fuse body, with the fuse striker pin installed closest to the switch.
⇒ With the fuse tilted as needed, insert the upper end of the fuse in the upper clip, and then move the fuse to vertical and install the lower end of the fuse in the lower fuse clip.
⇒ Check that the fuse is installed uniformly into both the upper and lower fuse clips.

Fig 81: Installing HV HRC (current limiting) fuse

1. Grounding switch
2. Upper fuse contact
3. HV HRC (current limiting) fuse

25.5 Completing fuse replacement

⇒ Install cable compartment cover see “Close the cable compartment door” on page 94.
⇒ Put fuse switch panel into operation (see “Placing SIMOSEC switchgear into service” on page 65).
26 Switchgear recycling

The switchgear is an environmentally compatible product.

The switchgear can be disposed of in environmentally compatible manner in compliance with existing legislation. Always observe the local laws, regulations, guidelines and standards for work, health and environmental protection.

The components of the switchgear should be recycled in an environmentally compatible way by dismantling into sorted scrap and residual mixed scrap. For this purpose, evacuate the SF$_6$ gas professionally and have it recycled.

The switchgear mainly consists of the following materials:
- Galvanized steel (enclosure and operating mechanisms)
- Stainless steel (vessel)
- Copper (conductor bars)
- Silver (contacts)
- Cast-resin epoxy (bushings and post insulators)
- Plastic material (arcing chamber and fuse tripping mechanism)
- Sulphur hexafluoride (SF$_6$)
- Silicone rubber

The switchgear does not contain hazardous materials.

Auxiliary devices such as short-circuit indicators, relays, instruments, etc., should be disposed of as electronic scrap.

Batteries have to be disposed of professionally.

As for disposal of SF$_6$ gas and further information, please contact Siemens Service (see “Field Service Operation” on page 6).

27 Help

Should these operating instructions not answer all your questions about installation, operation and servicing of your SIMOSEC switchgear, please contact your Siemens sales partner.

Reporting faults

Should an operational fault have occurred on your SIMOSEC switchgear, which you cannot clear by yourself according to the information given in these operating instructions, please contact Siemens Service immediately (see “Field Service Operation” on page 6).

Please provide to following data to help us in answering the issue.
- Type, serial and panel number of the switchgear (see rating plate)
- Precise description of the fault (e.g. with a copy of the associated page of these instructions, photos, drawings, sketches or circuit diagrams).
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