Metal-Enclosed Interrupter Switchgear
Type SIMOSEC, up to 27.6 kV, ANSI, Air-Insulated, Extendable

Medium-Voltage Switchgear
Catalog HA 41.31 · 2008

Answers for energy.
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application, Requirements</td>
<td></td>
</tr>
<tr>
<td>Typical uses, features</td>
<td>2 to 4</td>
</tr>
<tr>
<td>Technical Data</td>
<td></td>
</tr>
<tr>
<td>Electrical data, pressure values, temperature</td>
<td>5</td>
</tr>
<tr>
<td>Switchgear installation</td>
<td>6</td>
</tr>
<tr>
<td>Shipping data</td>
<td>7</td>
</tr>
<tr>
<td>Product Range</td>
<td></td>
</tr>
<tr>
<td>Product range overview, equipment features</td>
<td>8 and 9</td>
</tr>
<tr>
<td>Panels</td>
<td>10 to 18</td>
</tr>
<tr>
<td>Design</td>
<td></td>
</tr>
<tr>
<td>Panel design</td>
<td>19</td>
</tr>
<tr>
<td>Components</td>
<td></td>
</tr>
<tr>
<td>Two/three-position switch-disconnector</td>
<td>20</td>
</tr>
<tr>
<td>Two/three-position switch</td>
<td>21</td>
</tr>
<tr>
<td>Busbars, HV CL (current-limiting) fuse assembly</td>
<td>22 and 23</td>
</tr>
<tr>
<td>Operating mechanisms</td>
<td>24</td>
</tr>
<tr>
<td>Indicating and measuring equipment</td>
<td>25</td>
</tr>
<tr>
<td>Transformers</td>
<td>26 and 27</td>
</tr>
<tr>
<td>Cable connection</td>
<td>28 and 29</td>
</tr>
<tr>
<td>Dimensions (in mm/inch)</td>
<td></td>
</tr>
<tr>
<td>Panels</td>
<td>30 to 38</td>
</tr>
<tr>
<td>Floor openings, fixing points</td>
<td>39</td>
</tr>
<tr>
<td>Standards</td>
<td></td>
</tr>
<tr>
<td>Standards, specifications, guidelines</td>
<td>40 and 41</td>
</tr>
<tr>
<td>Notes</td>
<td></td>
</tr>
</tbody>
</table>

Invalid: Catalog HA 41.31 · 2007
Application

Typical uses
Application, Requirements

Features

SIMOSEC ANSI switchgear is a factory-assembled, type-tested, three-phase, metal-enclosed, indoor switchgear according to ANSI/IEEE C37.20.3* for single busbars.

Typical uses
SIMOSEC ANSI switchgear is used for power distribution in distribution systems with feeder currents up to 1200 A.

Modular space-saving design allows use in
- Substations, customer transfer substations, distribution substations and switching substations of power supply and public utilities
- Public buildings, such as high-rise buildings, railway stations, hospitals
- Industrial plants

Typical examples
- Office parks
- Airports
- Underground railway stations
- Sewage treatment plants
- Schools
- Shopping centers
- Petroleum industry
- Chemical industry
- Industrial plants
- Textile, paper and food industry

Modular design
- Individual panels, for free combination and extension

Technical features
- Air-insulated indoor switchgear
- Gas-insulated, maintenance-free switching functions for the two/three-position switch
- Three-pole primary enclosure
- Phases arranged one behind the other
- No cross-insulation between phases
- Busbar system at the top or bottom, as required by application
- Air-insulated busbar and cable connection system
- Two/three-position switch, metal-enclosed, with air-insulated primary terminals and gas-insulated switching functions
- Hermetically-sealed (welded) stainless-steel switchgear vessel,
  - For switching devices
  - With welded-in bushings (for electrical connections and mechanical components)
  - With insulating gas SF₆
- Metal-enclosed design
- Pressure relief
  - To the rear and upwards
  - Separately for each compartment
- Air-insulated cable connection system for conventional cable lugs
- Three-phase current transformer, factory-assembled on the feeder bushings
- Integrated low-voltage niche (standard) for installation of low-voltage devices,
  - E.g. terminals, pushbuttons, MCBs
- Option: Space heaters for severe ambient conditions, e.g. condensation

Reliability
- Type (design) tested with third-party witness
- Standardized and manufactured using numerically controlled machines
- Quality management system according to ISO 9001
- More than 500,000 switchgear panels in operation worldwide for many years
- No cross-insulation between phases

Personal safety
- All switching operations can be performed with closed panel front
- Metal-enclosed switchgear
- HV CL fuses and cable terminations are only accessible when the outgoing feeders are grounded
- Logical mechanical interlocking
- Capacitive voltage detection system for verification of safe isolation from supply
- Grounding of outgoing feeders by means of make-proof grounding switches

Security of operation
- Components, e.g., operating mechanisms, three-position switches proven for years
- Metal-enclosed panels plus metal compartmentalization between busbar and switching device and between switching device and cable connection compartment
- Three-position switch metal-enclosed with gas-insulated switching functions
  - Welded sealed-for-life switchgear vessel
  - No cross-insulation between phases
  - With welded-in bushings for cable connection, busbar and operating mechanism
- Switch operating mechanisms outside switchgear vessel
- Maintenance-free operating mechanism parts

- Mechanical switch position indications integrated in mimic diagram
- Switchgear interlocking system with logical mechanical interlocks

Life-cycle cost-efficiency
Extremely low life-cycle costs and extremely high availability throughout the entire product service life cycle as a result of:
- Two/three-position switch with gas-insulated quenching principle
- Minimum space requirement
- Easy switchgear extension

Electrical features
- Rated voltages up to 27.6 kV
- Rated short-circuit current (fused) up to 63 kA at 15 kV and below, and 20 kA at 27.6 kV
- Rated short-time withstand current up to 20 kA, 2 second or 25 kA, 2 seconds
- Rated normal current of feeders
  - Up to 600 A (feeders)
  - Up to 1200 A (panel without switch)
- Rated normal current of busbar up to 1200 A

* Standards see page 40
## Technical Data

### Electrical data of panels, pressure values, temperature

#### Complete switchgear

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated insulation level</td>
<td>Rated voltage $U_r$ kV</td>
</tr>
<tr>
<td></td>
<td>Rated short-duration (one minute) power-frequency withstand voltage $U_{d,r}$ kV</td>
</tr>
<tr>
<td></td>
<td>Rated lightning impulse withstand voltage $U_{p,peak}$ kV</td>
</tr>
<tr>
<td>Rated frequency $f_r$ Hz</td>
<td>50/60</td>
</tr>
<tr>
<td>Rated continuous current $I_{r,1}$ of busbar</td>
<td>On request A</td>
</tr>
<tr>
<td></td>
<td>Standard A</td>
</tr>
<tr>
<td>Rated short-circuit current</td>
<td>for switchgear with all feeders fused (panel type FS) $I_{c,1}$ kA (sym)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated short-time withstand current $I_{k,6}$ for switchgear with $t_k=2$ s rated duration up to kA</td>
<td>20</td>
</tr>
<tr>
<td>Rated peak withstand current $I_{p,k,6}$ up to kA</td>
<td>52</td>
</tr>
<tr>
<td>Rated filling pressure $p_{re,2}$ PSI (kPa)</td>
<td>at 20 °C/68 °F (absolute)</td>
</tr>
<tr>
<td>Minimum operating pressure $p_{me,2}$ PSI (kPa)</td>
<td>18.9 (130)</td>
</tr>
<tr>
<td>Ambient temperature $T$ for panels without secondary equipment °C/°F</td>
<td>-30 to 40 / -22 to +104</td>
</tr>
</tbody>
</table>

#### Cable switch panel type CS, cable connection panel type CC, cable grounding panel type CG

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage $U_r$ kV</td>
<td>4.76</td>
</tr>
<tr>
<td>Rated continuous current $I_{r,1}$ for panel type CS, CG</td>
<td>A 600</td>
</tr>
<tr>
<td></td>
<td>only for panel type CC</td>
</tr>
<tr>
<td>Rated fault closing current $I_{ma,5}$ only for panel type CG</td>
<td>kA (sym)</td>
</tr>
<tr>
<td></td>
<td>kA (peak)</td>
</tr>
</tbody>
</table>

#### Fuse panel types FS, FU

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage $U_r$ kV</td>
<td>4.76</td>
</tr>
<tr>
<td>Rated continuous current $I_{r,1,4}$ for feeder</td>
<td>A 200, 600</td>
</tr>
<tr>
<td>Rated peak withstand current $I_{p,k,5}$ up to kA</td>
<td>164</td>
</tr>
<tr>
<td>Rated fault closing current $I_{ma,5}$ only for panel type FS</td>
<td>kA (sym)</td>
</tr>
<tr>
<td></td>
<td>kA (peak)</td>
</tr>
<tr>
<td>Reference dimension &quot;e&quot; for HV CL (current limiting) fuses mm/inch</td>
<td>537/21.1</td>
</tr>
<tr>
<td>Maximum fuse rating</td>
<td>for panel FS-1</td>
</tr>
<tr>
<td></td>
<td>for panel FS-2</td>
</tr>
<tr>
<td></td>
<td>for panel FS-3</td>
</tr>
</tbody>
</table>

#### Busbar grounding panel type BG

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage $U_r$ kV</td>
<td>4.76</td>
</tr>
<tr>
<td>Rated fault closing current $I_{ma,6}$</td>
<td>kA (sym)</td>
</tr>
<tr>
<td></td>
<td>kA (peak)</td>
</tr>
</tbody>
</table>

#### Busbar voltage metering switch panel types MS2, MS3

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage $U_r$ kV</td>
<td>4.76</td>
</tr>
<tr>
<td>Rated peak withstand current $I_{p,k,5}$ up to kA</td>
<td>52</td>
</tr>
<tr>
<td>Rated fault closing current $I_{ma,5}$</td>
<td>kA (sym)</td>
</tr>
<tr>
<td></td>
<td>kA (peak)</td>
</tr>
</tbody>
</table>

#### Metering panel types MT3, MC3, bus riser panel BR

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage $U_r$ kV</td>
<td>4.76</td>
</tr>
<tr>
<td>Rated continuous current $I_{r,1}$</td>
<td>A 600, 1200</td>
</tr>
</tbody>
</table>

---

1) The rated continuous currents apply to ambient temperatures of 40 °C/104 °F.
2) Pressure values for SF6-insulated vessels.
3) The fuse assembly is designed for a reference dimension "e" = 537 mm/21.1 inch.
   With reference dimension "e" = 442 mm/17.4 inch, an extension tube (95 mm/3.7 inch long) is required.
4) Depending on the HV CL fuse links.
5) Fused
6) Without fuses
Room planning

Switchgear installation

Wall-standing or free-standing arrangement
- Single row
- Double row (for face-to-face arrangement)

Room dimensions

See opposite dimension drawings

Door dimensions

The door dimensions depend on the
- Number of panels in a transport unit
- Height of the panel

Switchgear fastening

- For floor openings and fixing points of the switchgear, see page 39
- Foundations:
  - Steel structure
  - Steel-reinforced concrete

Panel dimensions

See pages 30 to 38

Weight

The weight of a panel depends on the extent to which it is equipped (e.g. with motor operating mechanism, voltage transformer). For details, please refer to page 7.

* Switchgear height 2250 mm / 88.5” or 2550 mm / 100.5”
** Depending on bending radius of cable
*** 950/37.5 distance shown is the space required by the equipment. The actual space must also reflect requirements of applicable codes (e.g. NEC) or standards and regulations.
### Technical Data

#### Shipping data

**Transport units for shipping** (plan view)

![Diagram of transport units](https://example.com/diagram)

1. **T1** = Depth of individual panel
2. Individual panel dimension **B1 x T1**
3. Transport unit, dimension **B2 x T2**
4. **B3** = Overall width of combination of different individual panels
5. **B2** = Width of the transport unit

**Transport of individual panels**

<table>
<thead>
<tr>
<th>Panel type</th>
<th>Weight kg/lb</th>
<th>Width B1 mm / inch</th>
<th>Height H1 mm / inch</th>
<th>Depth T1 mm / inch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable switch panel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS1</td>
<td>180/397</td>
<td>375 / 14.8</td>
<td>2250 / 88.6</td>
<td>1230 / 48.4</td>
</tr>
<tr>
<td>CS2</td>
<td>205/452</td>
<td>500 / 19.7</td>
<td>2250 / 88.6</td>
<td>1230 / 48.4</td>
</tr>
<tr>
<td>Fuse switch panel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FS1</td>
<td>205/452</td>
<td>375 / 14.8</td>
<td>2250 / 88.6</td>
<td>1230 / 48.4</td>
</tr>
<tr>
<td>FS2</td>
<td>230/507</td>
<td>500 / 19.7</td>
<td>2250 / 88.6</td>
<td>1230 / 48.4</td>
</tr>
<tr>
<td>FS3</td>
<td>250/551</td>
<td>750 / 29.5</td>
<td>2250 / 88.6</td>
<td>1230 / 48.4</td>
</tr>
<tr>
<td>Fuse panel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FU1</td>
<td>160/353</td>
<td>375 / 14.8</td>
<td>2250 / 88.6</td>
<td>1230 / 48.4</td>
</tr>
<tr>
<td>FU2</td>
<td>185/408</td>
<td>500 / 19.7</td>
<td>2250 / 88.6</td>
<td>1230 / 48.4</td>
</tr>
<tr>
<td>FU3</td>
<td>210/463</td>
<td>750 / 29.5</td>
<td>2250 / 88.6</td>
<td>1230 / 48.4</td>
</tr>
<tr>
<td>Cable connection panel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CC1</td>
<td>145/320</td>
<td>375 / 14.8</td>
<td>2250 / 88.6</td>
<td>1230 / 48.4</td>
</tr>
<tr>
<td>CC2</td>
<td>170/375</td>
<td>500 / 19.7</td>
<td>2250 / 88.6</td>
<td>1230 / 48.4</td>
</tr>
<tr>
<td>Cable grounding panel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CG1</td>
<td>180/397</td>
<td>375 / 14.8</td>
<td>2250 / 88.6</td>
<td>1230 / 48.4</td>
</tr>
<tr>
<td>CG2</td>
<td>205/452</td>
<td>500 / 19.7</td>
<td>2250 / 88.6</td>
<td>1230 / 48.4</td>
</tr>
<tr>
<td>Metering panel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MT3</td>
<td>420/926</td>
<td>750 / 29.5</td>
<td>2250 / 88.6</td>
<td>1230 / 48.4</td>
</tr>
<tr>
<td>Metering cable panel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MC3</td>
<td>420/926</td>
<td>750 / 29.5</td>
<td>2250 / 88.6</td>
<td>1230 / 48.4</td>
</tr>
<tr>
<td>Metering switch panel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MS2</td>
<td>350/772</td>
<td>500 / 19.7</td>
<td>2250 / 88.6</td>
<td>1230 / 48.4</td>
</tr>
<tr>
<td>MS3</td>
<td>420/926</td>
<td>750 / 29.5</td>
<td>2250 / 88.6</td>
<td>1230 / 48.4</td>
</tr>
<tr>
<td>Bus riser panel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BR1</td>
<td>145/320</td>
<td>375 / 14.8</td>
<td>2250 / 88.6</td>
<td>1230 / 48.4</td>
</tr>
<tr>
<td>BR2</td>
<td>170/375</td>
<td>500 / 19.7</td>
<td>2250 / 88.6</td>
<td>1230 / 48.4</td>
</tr>
<tr>
<td>Busbar grounding panel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BG1</td>
<td>180/397</td>
<td>375 / 14.8</td>
<td>2250 / 88.6</td>
<td>1230 / 48.4</td>
</tr>
</tbody>
</table>

**Transport of combinations of different individual panels**

<table>
<thead>
<tr>
<th>Transport unit</th>
<th>Overall width B2 mm / inch</th>
<th>Weight kg/lb</th>
<th>Width B2 mm / inch</th>
<th>Height H2 mm / inch</th>
<th>Depth T2 mm / inch</th>
<th>Volume B2 x H2 x T2 m³ / yd³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport unit</td>
<td>≤ 750 / 29.5</td>
<td>70/155</td>
<td>1100 / 43.3</td>
<td>2450 / 96.5</td>
<td>1400 / 56.1</td>
<td>3.8 / 5.0</td>
</tr>
<tr>
<td>Transport unit</td>
<td>≤ 1750 / 68.9</td>
<td>120/265</td>
<td>2200 / 86.6</td>
<td>2450 / 96.5</td>
<td>1400 / 56.1</td>
<td>7.6 / 10.0</td>
</tr>
</tbody>
</table>

**Packing, transport** (examples)

<table>
<thead>
<tr>
<th>Packing</th>
<th>Version</th>
<th>For supply</th>
<th>Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panels mounted on wooden floor and covered with protection sheeting</td>
<td>For container</td>
<td>Overseas</td>
<td>Ship + truck</td>
</tr>
</tbody>
</table>

* Additional packing weight in kg/lb (without weight of panels)

** Transport unit for air freight, height H2 2610 mm /102.8 inch and width B2 1700 mm/66.9 inch
Product Range

Product range overview

<table>
<thead>
<tr>
<th>Panel designation</th>
<th>Panel type</th>
<th>Panel width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable switch panel</td>
<td>CS1</td>
<td>375 mm / 14.8”</td>
</tr>
<tr>
<td></td>
<td>CS2</td>
<td>500 mm / 19.7”</td>
</tr>
<tr>
<td>Fuse switch panel</td>
<td>FS1</td>
<td>375 mm / 14.8”</td>
</tr>
<tr>
<td></td>
<td>FS2</td>
<td>500 mm / 19.7”</td>
</tr>
<tr>
<td></td>
<td>FS3</td>
<td>750 mm / 29.5”</td>
</tr>
<tr>
<td>Fuse panel</td>
<td>FU1</td>
<td>375 mm / 14.8”</td>
</tr>
<tr>
<td></td>
<td>FU2</td>
<td>500 mm / 19.7”</td>
</tr>
<tr>
<td></td>
<td>FU3</td>
<td>750 mm / 29.5”</td>
</tr>
<tr>
<td>Cable connection panel</td>
<td>CC1</td>
<td>375 mm / 14.8”</td>
</tr>
<tr>
<td></td>
<td>CC2</td>
<td>500 mm / 19.7”</td>
</tr>
<tr>
<td>Cable grounding panel (= cable connection panel with grounding switch)</td>
<td>CG1</td>
<td>375 mm / 14.8”</td>
</tr>
<tr>
<td></td>
<td>CG2</td>
<td>500 mm / 19.7”</td>
</tr>
<tr>
<td>Metering panel</td>
<td>MT3</td>
<td>750 mm / 29.5”</td>
</tr>
<tr>
<td>Metering cable panel</td>
<td>MC3</td>
<td>750 mm / 29.5”</td>
</tr>
<tr>
<td>Metering switch panel</td>
<td>MS2</td>
<td>500 mm / 19.7”</td>
</tr>
<tr>
<td></td>
<td>MS3</td>
<td>750 mm / 29.5”</td>
</tr>
<tr>
<td>Bus riser panel</td>
<td>BR1</td>
<td>375 mm / 14.8”</td>
</tr>
<tr>
<td></td>
<td>BR2</td>
<td>500 mm / 19.7”</td>
</tr>
<tr>
<td>Busbar grounding panel</td>
<td>BG1</td>
<td>375 mm / 14.8”</td>
</tr>
</tbody>
</table>
## Product Range

### Equipment features

<table>
<thead>
<tr>
<th>Feature</th>
<th>CS1</th>
<th>CS2</th>
<th>FS1</th>
<th>FS2</th>
<th>FS3</th>
<th>FU1</th>
<th>FU2</th>
<th>FU3</th>
<th>CC1</th>
<th>CC2</th>
<th>CG1</th>
<th>CG2</th>
<th>MT3</th>
<th>MC3</th>
<th>MS2</th>
<th>MS3</th>
<th>BR1</th>
<th>BR2</th>
<th>BG1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic equipment</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>Additional (optional) equipment</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>Not available</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
</tbody>
</table>

- Two-position switch-disconnector (CLOSED-OPEN)
- Three-position switch-disconnector (CLOSED-OPEN-GROUNDED)
- Grounding switch (CLOSED-OPEN GROUNDED)
- Manual operating mechanism
- Stored energy mechanism - electrically operated with stored energy mechanism
- Signal switch (CLOSED-OPEN-GROUNDED)
- Auxiliary switch
- Local remote switch
- Cable compartment cover with inspection window
- Intruder lock - closing not possible if the door is open
- Intruder lock - closing and releasing
- C-rail for cable fixing
- Panel cover
- Heating
- Heating with thermostat
- Heating with humidistat
- Panel type

- **Basic equipment**
- **Additional (optional) equipment**
- **Not available**
Cable switch panel

Cable switch panel as feeder panel

Note: For detailed design, please contact your local Siemens partner.
Metal-Enclosed Interrupter Switchgear Type SIMOSEC, up to 27.6 kV, ANSI, Air-Insulated, Extendable · Siemens HA 41.31 · 2008

Fuse switch panel

as feeder panel

as transfer panel

Fuse switch panel as feeder panel

Note: For detailed design, please contact your local Siemens partner.
**Product Range**

**Fuse panel**

Note: For detailed design, please contact your local Siemens partner.
Note: For detailed design, please contact your local Siemens partner.
Product Range

Cable grounding panel, busbar grounding panel

Cable grounding panel

Cable grounding panel/busbar grounding panel

Note: For detailed design, please contact your local Siemens partner.
Product Range

Metering panel

Note: For detailed design, please contact your local Siemens partner.
Product Range

Metering panel with cable

Note: For detailed design, please contact your local Siemens partner.
Product Range

Metering panel with cable (continued), metering switch panel

Note: For detailed design, please contact your local Siemens partner.

* Switch-disconnector as:
  - two-position switch-disconnector
  - three-position switch-disconnector

** Only in combination with VT or CPT

*** Fuses: Potential transformer fuses type CAV

HA41-2608.eps
Product Range

Bus riser panel, busbar grounding panel

Bus riser panel

Busbar grounding panel

Note: For detailed design, please contact your local Siemens partner.
Components

Two/three-position switch-disconnector

Characteristics
- Switch positions:
  – CLOSED-OPEN
  or
  – CLOSED-OPEN-GROUNDED
- Designed as a multi-chamber switch incorporating the following functions
  – Switch-disconnector and
  – Make-proof grounding switch
- Operation via gas-tight welded bushing at the front of the switchgear vessel
- Switching functions as general purpose switch-disconnector according to ANSI/IEEE C37.20.3 *

Mode of operation
The switch shaft with the moving contacts rotates inside the chamber containing the fixed contacts.

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.

Legend
1 Moving contact
2 Fixed contact for GROUNDED
3 Fixed contact for CLOSED

* Standards see page 40
Common features
- Metal-enclosed
- Located in a gas-insulated switchgear vessel
- Switch positions: CLOSED-OPEN or CLOSED-OPEN-GROUNDED
- No cross insulation between phases
- Two/three-position switch with air-insulated primary connections for busbar and feeder
- Operation via a gas-tight welded-in metal bellows in the front of the switchgear vessel

View port
The visual inspection of the actual position of the two/three-position switch is possible via a view port. (Fig. shown on the right)

Two/three-position switch-disconnector 600 A
- Up to 600 A
- With gas-insulated, maintenance-free quenching principle

Operating mechanism
- Spring-operated mechanism with detachable lever
- Manual operation with the aid of a detachable lever
- Options:
  - Mechanical ready-for-service indication
  - Auxiliary switch
  - Motor operating mechanism for switch-disconnector
  - Locking device
- Spring-operated/stored-energy mechanism for transformer panel type FS

Interlocks
- Opening of panel cover or cable compartment cover only in "GROUNDED" position

Operating cycles
- Capable of 100 operating cycles at rated continuous current 600 A
- Mechanical endurance of 1000 operating cycles

Legend for view port
1 Moving contact
2 Fixed contact for CLOSED
3 Fixed contact for GROUNDED

Switching functions of the three-position switch-disconnector 600 A
- Switching and disconnecting under load
- General-purpose switching function
- Make-proof grounding function

View port
Closed
Open
Grounded

Components
Two/three-position switch as two/three-position switch-disconnector
Components

Busbars, HV CL (current-limiting) fuse assembly

Busbars
- Metal-enclosed busbar compartment
- Three-pole design, bolted from panel to panel
- Easy switchgear extension
- Made of copper: Round-edge copper for up to 1200 A

Option: Shrink-on sleeve

HV CL fuse assembly
- For fuse panel type FS
- For busbar voltage metering panel type MS
- HV CL fuse links acc. to ANSI/IEEE C37.41/C37.46 *
  - As short-circuit protection before transformers
  - With selectivity (depending on correct selection) to upstream and downstream connected equipment
- Requirements fulfilled as HV alternating current switch fuse combination
- Selection of HV CL fuses for transformers
- Fuse replacement possible only when feeder is grounded
- Option: Shunt release on operating mechanism of two/three-position switch-disconnector
- Option: “Tripped indication” of two/three-position switch-disconnector in transformer feeder (transformer switch) for remote electrical indication with one normally-open contact (1NO)

“HV CL fuse tripped”
Following the tripping of an HV CL fuse link, the mechanism for charging the spring must be set to the “OPEN” position
Subsequently, grounding can be implemented by means of the two/three-position switch-disconnector and e.g., the fuse can be replaced.

Replacement of HV CL fuse links
- Isolating and grounding of the transformer feeder
- Subsequent manual replacement of the HV CL fuse links

* Standards see page 40

---

HV HRC fuse assembly

Displays
- Fuse intact
- Fuse blown

Control board of a fuse panel

Busbar compartment extending over 2 panels, example (side view)

1 Busbar
2 Bushing-type insulator for busbar

HV CL fuses in fuse panel type FS (side view, 2 sets of fuses shown)

3 HV CL fuse
4 Lower fuse holder
5 Grounding stud
6 Cable termination (not included in the scope of supply)
The table opposite shows the recommended fuse links (electrical data valid for ambient temperatures of up to 40 °C (104 °F) for the fuse protection of transformers.

**Recommendation**
The two-three-position switch-disconnector in the transformer feeder (transformer switch) is combined with Bussmann fuse links. Dimensions according to DIN standards (especially manufactured for Siemens).

**Standards**
HV CL fuse links according to ANSI/IEEE C37.41/C37.46 *

### Components

**Allocation of HV CL fuses and transformers**

<table>
<thead>
<tr>
<th>Bussmann fuses</th>
<th>Rated voltage</th>
<th>Length</th>
<th>Diameter</th>
<th>Rated current (I_t)</th>
<th>Power loss</th>
<th>Panel type **</th>
<th>Code/reference No. for SIMOSEC ANSI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>kV</td>
<td>mm / inch</td>
<td>mm / inch</td>
<td>A</td>
<td>W</td>
<td>FS1/FU1</td>
<td>FS2/FU2</td>
</tr>
<tr>
<td>5.5</td>
<td>442 / 17.4</td>
<td>51 / 2.0</td>
<td>10</td>
<td>8</td>
<td>10</td>
<td>18</td>
<td>24</td>
</tr>
<tr>
<td>5.5</td>
<td>442 / 17.4</td>
<td>51 / 2.0</td>
<td>15</td>
<td>11</td>
<td>15</td>
<td>27</td>
<td>36</td>
</tr>
<tr>
<td>5.5</td>
<td>442 / 17.4</td>
<td>51 / 2.0</td>
<td>20</td>
<td>11</td>
<td>20</td>
<td>36</td>
<td>48</td>
</tr>
<tr>
<td>5.5</td>
<td>442 / 17.4</td>
<td>51 / 2.0</td>
<td>25</td>
<td>15</td>
<td>25</td>
<td>45</td>
<td>60</td>
</tr>
<tr>
<td>5.5</td>
<td>442 / 17.4</td>
<td>51 / 2.0</td>
<td>30</td>
<td>17</td>
<td>30</td>
<td>54</td>
<td>72</td>
</tr>
<tr>
<td>5.5</td>
<td>442 / 17.4</td>
<td>51 / 2.0</td>
<td>40</td>
<td>27</td>
<td>40</td>
<td>72</td>
<td>96</td>
</tr>
<tr>
<td>5.5</td>
<td>442 / 17.4</td>
<td>51 / 2.0</td>
<td>50</td>
<td>36</td>
<td>50</td>
<td>90</td>
<td>120</td>
</tr>
<tr>
<td>5.5</td>
<td>442 / 17.4</td>
<td>51 / 2.0</td>
<td>65</td>
<td>44</td>
<td>65</td>
<td>117</td>
<td>156</td>
</tr>
<tr>
<td>5.5</td>
<td>442 / 17.4</td>
<td>51 / 2.0</td>
<td>80</td>
<td>53</td>
<td>80</td>
<td>144</td>
<td>192</td>
</tr>
<tr>
<td>5.5</td>
<td>442 / 17.4</td>
<td>51 / 2.0</td>
<td>100</td>
<td>69</td>
<td>100</td>
<td>180</td>
<td>240</td>
</tr>
<tr>
<td>5.5</td>
<td>442 / 17.4</td>
<td>51 / 2.0</td>
<td>125</td>
<td>94</td>
<td>120</td>
<td>220</td>
<td>300</td>
</tr>
<tr>
<td>5.5</td>
<td>442 / 17.4</td>
<td>67 / 3.0</td>
<td>150</td>
<td>103</td>
<td>150</td>
<td>270</td>
<td>360</td>
</tr>
<tr>
<td>5.5</td>
<td>442 / 17.4</td>
<td>67 / 3.0</td>
<td>175</td>
<td>121</td>
<td>164</td>
<td>292</td>
<td>416</td>
</tr>
<tr>
<td>5.5</td>
<td>442 / 17.4</td>
<td>67 / 3.0</td>
<td>200</td>
<td>126</td>
<td>183</td>
<td>327</td>
<td>466</td>
</tr>
<tr>
<td>5.5</td>
<td>442 / 17.4</td>
<td>67 / 3.0</td>
<td>250</td>
<td>139</td>
<td>220</td>
<td>390</td>
<td>555</td>
</tr>
<tr>
<td>5.5</td>
<td>442 / 17.4</td>
<td>67 / 3.0</td>
<td>300</td>
<td>147</td>
<td>241</td>
<td>429</td>
<td>598</td>
</tr>
<tr>
<td>5.5</td>
<td>442 / 17.4</td>
<td>67 / 3.0</td>
<td>350</td>
<td>161</td>
<td>269</td>
<td>478</td>
<td>600</td>
</tr>
<tr>
<td>5.5</td>
<td>442 / 17.4</td>
<td>76 / 3.0</td>
<td>400</td>
<td>167</td>
<td>302</td>
<td>536</td>
<td>600</td>
</tr>
<tr>
<td>5.5</td>
<td>442 / 17.4</td>
<td>76 / 3.0</td>
<td>450</td>
<td>183</td>
<td>325</td>
<td>575</td>
<td>600</td>
</tr>
<tr>
<td>15.5</td>
<td>537 / 21.4</td>
<td>88 / 3.5</td>
<td>175</td>
<td>177</td>
<td>167</td>
<td>310</td>
<td>420</td>
</tr>
<tr>
<td>15.5</td>
<td>537 / 21.4</td>
<td>88 / 3.5</td>
<td>200</td>
<td>238</td>
<td>165</td>
<td>305</td>
<td>430</td>
</tr>
<tr>
<td>17.5</td>
<td>442 / 17.4</td>
<td>51 / 2.0</td>
<td>10</td>
<td>22</td>
<td>10</td>
<td>18</td>
<td>24</td>
</tr>
<tr>
<td>17.5</td>
<td>442 / 17.4</td>
<td>51 / 2.0</td>
<td>15</td>
<td>30</td>
<td>15</td>
<td>27</td>
<td>36</td>
</tr>
<tr>
<td>17.5</td>
<td>442 / 17.4</td>
<td>51 / 2.0</td>
<td>20</td>
<td>32</td>
<td>20</td>
<td>36</td>
<td>48</td>
</tr>
<tr>
<td>17.5</td>
<td>442 / 17.4</td>
<td>51 / 2.0</td>
<td>25</td>
<td>41</td>
<td>25</td>
<td>45</td>
<td>60</td>
</tr>
<tr>
<td>17.5</td>
<td>442 / 17.4</td>
<td>51 / 2.0</td>
<td>30</td>
<td>47</td>
<td>30</td>
<td>54</td>
<td>72</td>
</tr>
<tr>
<td>17.5</td>
<td>442 / 17.4</td>
<td>51 / 2.0</td>
<td>40</td>
<td>79</td>
<td>40</td>
<td>72</td>
<td>69</td>
</tr>
<tr>
<td>17.5</td>
<td>442 / 17.4</td>
<td>51 / 2.0</td>
<td>50</td>
<td>95</td>
<td>50</td>
<td>90</td>
<td>120</td>
</tr>
<tr>
<td>17.5</td>
<td>442 / 17.4</td>
<td>51 / 2.0</td>
<td>65</td>
<td>130</td>
<td>59</td>
<td>104</td>
<td>149</td>
</tr>
<tr>
<td>17.5</td>
<td>442 / 17.4</td>
<td>67 / 3.0</td>
<td>80</td>
<td>126</td>
<td>73</td>
<td>131</td>
<td>186</td>
</tr>
<tr>
<td>17.5</td>
<td>442 / 17.4</td>
<td>67 / 3.0</td>
<td>100</td>
<td>169</td>
<td>85</td>
<td>155</td>
<td>225</td>
</tr>
<tr>
<td>17.5</td>
<td>537 / 21.4</td>
<td>88 / 3.5</td>
<td>125</td>
<td>203</td>
<td>112</td>
<td>207</td>
<td>292</td>
</tr>
<tr>
<td>17.5</td>
<td>537 / 21.4</td>
<td>88 / 3.5</td>
<td>150</td>
<td>221</td>
<td>123</td>
<td>238</td>
<td>336</td>
</tr>
<tr>
<td>25.8</td>
<td>537 / 21.4</td>
<td>51 / 2.0</td>
<td>20</td>
<td>27</td>
<td>10</td>
<td>18</td>
<td>24</td>
</tr>
<tr>
<td>25.8</td>
<td>537 / 21.4</td>
<td>51 / 2.0</td>
<td>30</td>
<td>44</td>
<td>20</td>
<td>36</td>
<td>48</td>
</tr>
<tr>
<td>25.8</td>
<td>537 / 21.4</td>
<td>51 / 2.0</td>
<td>50</td>
<td>67</td>
<td>30</td>
<td>54</td>
<td>72</td>
</tr>
<tr>
<td>25.8</td>
<td>537 / 21.4</td>
<td>51 / 2.0</td>
<td>65</td>
<td>140</td>
<td>65</td>
<td>117</td>
<td>156</td>
</tr>
</tbody>
</table>

* Standards see page 40
** FS1/FU1: Single fuse
FS2/FU2: Two fuses in parallel
FS3/FU3: Three fuses in parallel
Components

Operating mechanisms for two/three-position switches

Manual operating mechanism

- **Standard:** As detachable lever mechanism
- **Spring-operated mechanism**
  - For cable-switch panel type CS
  - For all two/three-position switches (except in panel type FS)
- **Spring-operated/stored-energy mechanism**
  For fuse panel type FS as well as for busbar voltage metering switch panel type MS

The two/three-position switch is operated via a rocker with metal bellows which is gas-tight and welded at the switchgear vessel.

Motor operating mechanism (option)

The manual operating mechanisms can be equipped with motor operating mechanisms for the two/three-position switch-disconnector.

Operating voltages for motor operating mechanisms:
- 24, 48, 60, 125 V DC
- 50/60 Hz 120 and 240 V AC

Electrical operation:

- **Standard:** Remote operation (applied to terminal)
- **Option:** Local operation by momentary-contact rotary control switch

Shunt release (option)

Spring-operated/stored-energy mechanisms can be equipped with a shunt release. Remote electrical tripping of the two/three-position switch-disconnector is possible via the magnetic coil of the shunt release, e.g., transformer overtemperature tripping.

To avoid thermal overloading of the shunt release in the event of a continuous signal that may be applied, the shunt release is switched off via an auxiliary switch which is mechanically coupled with the three-position switch-disconnector.

Auxiliary switch (option)

Each operating mechanism of the two/three-position switch-disconnector can be optionally equipped with an auxiliary switch for the switch position indication:
- Function switch-disconnector or disconnecter: CLOSED and OPEN: 2NO + 2NC
- Function grounding switch at the two/three-position switch: CLOSED and OPEN: 2NO + 2NC

Technical data of the auxiliary switch

<table>
<thead>
<tr>
<th>Operating voltage</th>
<th>Normal current</th>
<th>AC operation at 50 Hz to 60 Hz</th>
<th>DC operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>A</td>
<td>V</td>
<td>A</td>
</tr>
<tr>
<td>up to 240</td>
<td>10</td>
<td>24</td>
<td>10</td>
</tr>
<tr>
<td>24</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>48</td>
<td>10</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>60</td>
<td>9</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>5</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>5</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>240</td>
<td>2.5</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Rated insulation voltage 250 V AC/DC

Insulation group C to VDE 0110

Continuous current 10 A

Making capacity 50 A

Rated switching capacity

Abbreviations:

NO = normally-open contact
NC = normally-closed contact

Operating mechanism parts in panel types FS... (transformer feeders)
Ready-for-service indicator
(option for three-position switch)
- Self-monitoring; easy to read
- Independent of temperature and pressure variations
- Independent of site altitude
- Only responds to changes in gas density
- Option: Alarm switch "1NO contact"

Mode of operation
For the ready-for-service indicator, a gas-tight measuring box is installed on the inside of the switchgear vessel. A coupling magnet, which is fitted to the bottom end of the measuring box, transmits its position to an outside armature through the stainless-steel 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 are decisive for the insulating capacity, are displayed, temperature-dependent changes in the gas pressure are not. The gas in the measuring box has the same temperature as that in the switchgear. The temperature effect is compensated via the same pressure change in both gas volumes.

Voltage detection systems
For voltage detection according to IEC 61 243-5 / VDE 0682-415
Plug-in voltage detection systems
- Standard: HR system

Features of the HR system
- Voltage indicator
- HR system (standard)
- Verification of safe isolation from supply phase by phase through insertion in each socket pair
- Voltage indicator flashes if high voltage is present
- For continuous operation
- Safe-to-touch
- Measuring system and voltage indicator can be tested
- Fixed-mounted capacitive voltage divider in bushings
- Without auxiliary power

Mounting of voltage detection systems
See "Product range" pages 10 to 18

Verification of correct terminal-phase connections
- Possible by means of a phase comparison test unit (optional)
- Safe-to-touch handling of the phase comparison test unit by inserting it into the capacitive taps (socket pairs) of the switchgear

Components
Indicating and measuring equipment

(Examples)

Control board of a ring-main panel
(example)
Mounting locations in the control board for
1 Ready-for-service indicator (option)
2 Voltage indicator, HR system, plugged-in (standard)

Voltage indicator, HR system (standard)

Principle of operation of gas monitoring with ready-for-service indicator
Components

4MC70 33 cable-type current transformers

Application
- For cable panel types CS, CC, CG
- For fuse panel types FS, FU

Features
- According to ANSI / IEEE C57.13
- Designed as a single-pole ring-core current transformer
- Only for shielded cables
- Climate-independent
- Free of dielectrically stressed cast-resin parts (due to design)
- Inductive type
- Secondary connection by means of a terminal strip inside the panel

Installation
- Arranged on the cable at the panel connection
- Transformers mounted on a supporting plate at the factory; final assembly on the cables at site

Technical data

<table>
<thead>
<tr>
<th>Primary data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. equipment operating voltage $U_m$</td>
<td>0.60 kV</td>
</tr>
<tr>
<td>Rated current $I_N$</td>
<td>30 A to 600 A</td>
</tr>
<tr>
<td>Rated short-duration power-frequency withstand voltage (winding test)</td>
<td>3 kV</td>
</tr>
<tr>
<td>Rated thermal short-time withstand current $I_{th}$</td>
<td>25 kA</td>
</tr>
<tr>
<td>Rated continuous thermal current $I_D$</td>
<td>1.0 x $I_N$ option: 1.2 x $I_N$</td>
</tr>
<tr>
<td>Rated peak withstand current $I_{dyn}$</td>
<td>unlimited</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Secondary data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated current</td>
<td>5 A</td>
</tr>
<tr>
<td>Measuring core</td>
<td>Class *** 0.3</td>
</tr>
<tr>
<td>Burden</td>
<td>0.2 VA to 1.8 VA</td>
</tr>
<tr>
<td>Protection core</td>
<td>Class *** C10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimensions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall height $H$</td>
<td>mm 50* 100* 170* 285*</td>
</tr>
<tr>
<td>Outside diameter</td>
<td>Ø 145 mm / 5.7 inch</td>
</tr>
<tr>
<td>Inside diameter</td>
<td>Ø 55 mm / 2.2 inch</td>
</tr>
<tr>
<td>For cable diameter</td>
<td>Ø 36 ... 50 mm / 1.4 ... 2.0 inch</td>
</tr>
</tbody>
</table>

* Depending on the core data
** Assembly normally under the panel floor
*** Accuracy class varies according to CT data

Other values available on request

4MC70 33 cable-type current transformers on the cable at the panel connection **

4MC70 33 cable-type current transformer, 4 different overall heights

R-HA41-102eps
R-HA41-024eps
Components

4MA7 block-type current transformers and 4MR voltage transformers

Application
- For metering panel types MT, MS, MC

Features
- 4MA7 current transformer
- According to ANSI / IEEE C57.13
- Dimensions according to DIN 42 600-8
- Designed as a single-pole indoor block-type current transformer
- Cast-resin insulated
- Secondary connection by means of screw-type terminals

4MR voltage transformer
- According to ANSI / IEEE C57.13
- Dimensions according to DIN 42 600-9 (small model)
- Designed as an indoor voltage transformer:
  - Type 4MR, single-pole
  - Option: Type 4MR, two-pole
- Cast-resin insulated
- Secondary connection by means of screw-type terminals

Other values available on request

Technical data

4MA7 single-pole block-type current transformer

<table>
<thead>
<tr>
<th>Max. equipment operating voltage $U_{m}$</th>
<th>15.5 kV</th>
<th>27.6 kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated short-duration power-frequency withstand voltage $U_{p}$</td>
<td>34 kV</td>
<td>1) 40 kV</td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage $U_{p}$</td>
<td>36 kV</td>
<td>2) 60 kV</td>
</tr>
<tr>
<td>Rated current $I_{N}$</td>
<td>50 A to 600 A</td>
<td>up to 25 kA</td>
</tr>
<tr>
<td>Rated thermal short-time withstand current $I_{th}$</td>
<td>up to 25 kA</td>
<td></td>
</tr>
<tr>
<td>Rated continuous thermal current $I_{D}$</td>
<td>up to 1.0 x $I_{N}$ option: 1.2 x $I_{N}$</td>
<td></td>
</tr>
<tr>
<td>R. peak withst. current $I_{p}$</td>
<td>max. 2.5 x $I_{N}$</td>
<td></td>
</tr>
</tbody>
</table>

4MR single-pole voltage transformer

<table>
<thead>
<tr>
<th>Rated voltage</th>
<th>5.6 kV</th>
<th>9.52 kV</th>
<th>15.5 kV</th>
<th>25.5 kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated short-duration power-frequency withstand voltage $U_{p}$</td>
<td>16 kV</td>
<td>26 kV</td>
<td>34 kV</td>
<td>40 kV</td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage $U_{p}$</td>
<td>20 kV</td>
<td>28 kV</td>
<td>36 kV</td>
<td>60 kV</td>
</tr>
<tr>
<td>Rated voltage for auxiliary winding $U_{a}$</td>
<td>100 V</td>
<td>110 V</td>
<td>120 V</td>
<td></td>
</tr>
<tr>
<td>Burden</td>
<td>25 ... 200 VA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class</td>
<td>0.3</td>
<td>0.5</td>
<td>1.2</td>
<td></td>
</tr>
</tbody>
</table>

Other values available on request

Δ On request: operating voltage $U_{m}$ > 25.5 kV, e.g. 27.6 kV
1) Acc. to ANSI/IEEE C57.13 (standard)
2) Option: on request
3) Accuracy class varies according to CT data
Components

Cable connection

General 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 terminals
- 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)

Legend
1. As delivered condition for cable termination
2. As delivered condition, prepared for cable termination
3. Cold shrink brand 3M
4. Cable termination brand 3M or Tyco Electronics Raychem
5. Cable termination brand 3M or Tyco Electronics Raychem (with cold shrink brand 3M)

* Larger connection cross-sections on request.
## Components

Selection data for various cable terminations

<table>
<thead>
<tr>
<th>Panel type</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></td>
<td>Cable termination height in mm/inch</td>
<td>Cable termination height in mm/inch</td>
<td>Panel height in mm/inch</td>
<td>Panel height in mm/inch</td>
<td>Panel height in mm/inch</td>
<td>Panel height in mm/inch</td>
</tr>
</tbody>
</table>

### Top cable entry

Main switch or vertical copper bar in upper position (fuse assembly in lower position):

- 490/19.3
- 2550/100.4
- 490/19.3
- 2550/100.4
- 490/19.3
- 2550/100.4

Main switch or vertical copper bar in lower position (fuse assembly in upper position):

- Not available
- Not available
- Not available

### Middle cable connection

To top:

- 940/37
- 2250/88.6
- 2250/88.6
- 940/37
- 940/37
- 940/37

To bottom:

- 1240/48.8
- Not available
- Not available

### Bottom cable entry

Main switch or vertical copper bar in upper position (fuse assembly in upper position):

- Not available
- Not available
- Not available

Main switch or vertical copper bar in lower position (fuse assembly in lower position):

- 490/19.3
- 2250/88.6
- 490/19.3
- 2250/88.6

### Principle of cable connection (dimensions in mm/inch)

(e.g. for panel type C5)

![Diagram of principle of cable connection](image-url)
Dimensions

Cable switch panel types CS... (dimensions in mm/inch)

Legend
1. Available mounting depth in the LV niche
Dimensions

Fuse switch panel types FS... (dimensions in mm/inch)

Legend
1 Available mounting depth in the LV niche
2 Screwed-on door (fuse compartment)
3 Top case for cable top entry
Dimensions

Fuse panel types FU... (dimensions in mm/inch)

Legend
1 Available mounting depth in the LV niche
2 Screwed-on door (fuse compartment)
3 Top case for cable top entry
Dimensions

Cable connection panel types CC... (dimensions in mm/inch)

Legend
1 Available mounting depth in the LV niche
2 Screwed-on cover
Dimensions

Cable grounding panel types CG... (dimensions in mm/inch)
Dimensions

Metering panel type MT3, metering switch panel types MS (dimensions in mm/inch)

Legend
1 Available mounting depth in the LV niche
2 Screwed-on cover

Type MT3

Type MT3

Type MT3

Type MS2 (with voltage transformer 4MR)

Type MS3 (with control power transformer make ITI)
Dimensions

**Metering cable panel type MC3** (dimensions in mm/inch)

Legend

1. Available mounting depth in the LV niche
2. Screwed-on cover
Dimensions

Bus riser panel types BR... (dimensions in mm/inch)

Legend

1 Available mounting depth in the LV niche
2 Screwed-on cover
Dimensions

Busbar grounding panel type BG1 (dimensions in mm/inch)

Legend
1 Available mounting depth in the LV niche
2 Screwed-on cover
Dimensions

Floor openings (dimensions in mm/inch in red) and fixing points

1. Wall distance
2. Fixing frame (base) of an individual panel or panel block
3. Floor opening for high-voltage cables and, where applicable, control cables
4. Position of the cables for the feeder
5. Fixing points
6. Floor opening if required for panels without cable connection
## Standards

### Standards, specifications, guidelines

### Overview of standards
SIMOSEC ANSI switchgear complies with the following relevant standards and specifications as applicable:
- 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
- CSA C22.2 No. 193-M 1983
- CSA C22.2 No. 31-04
- EEMAC G11-1 (measurement of Corona)
- IEC 62 271-105

### Third-party listing
SIMOSEC ANSI is available for most configurations with UL or C-UL listing.

### Type of service location
SIMOSEC ANSI switchgear can be used as an indoor installation in accordance with NEC (NFPA70)
- Outside lockable electrical service locations at places which are not accessible to the public. Enclosures of switchgear can only be removed with tools.
- Inside lockable electrical service locations. A lockable electrical service location is a place outdoors or indoors that is reserved exclusively for housing electrical equipment and which is kept under lock and key. Access is restricted to authorized personnel and persons who have been properly instructed in electrical engineering. Untrained or unskilled persons may only enter under the supervision of authorized personnel or properly instructed persons.

### Terms
- "Make-proof grounding switches" are grounding switches with short-circuit making capacity according to IEC 62 271-102
- Switch-disconnector corresponds to interrupter switch
- HV CL are high-voltage current limiting fuse links

### Table – Insulating capacity

<table>
<thead>
<tr>
<th>Voltage (rms value)</th>
<th>Rated voltage (rms value)</th>
<th>8.25</th>
<th>15</th>
<th>27.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated short-duration (1 minute) power-frequency withstand voltage (rms value)</td>
<td>Across isolating distances</td>
<td>39.6</td>
<td>39.6</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td>Between phases and to ground</td>
<td>36</td>
<td>36</td>
<td>60</td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage (peak value)</td>
<td>Across isolating distances</td>
<td>105</td>
<td>105</td>
<td>138</td>
</tr>
<tr>
<td></td>
<td>Between phases and to ground</td>
<td>95</td>
<td>95</td>
<td>125</td>
</tr>
</tbody>
</table>

### 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 0670-1000 and ANSI/IEEE C37.20.3.
- The rated values are referred to sea level and to normal atmospheric conditions 14.7 PSI, 68 °F, 0.00068 lb/ft³ humidity in accordance with IEC 60 071/VDE 0111 and ANSI/IEEE.
- The insulating capacity decreases with increasing altitude. For site altitudes above 1000 m/3281 ft (above sea level) the standards do not provide any guidelines for the insulation rating. Instead, special regulations apply to these altitudes.

### Site altitude
- As the altitude increases, the insulating capacity of insulation in air decreases due to the decreasing air density.
- For site altitudes above 1000 m/3281 ft a higher insulation level must be selected. This results from the multiplication of the rated insulation level for 0 mm/0 ft to 1000 m/3281 ft (above sea level) with altitude correction factor $K_a$.

### Altitude correction factor $K_a$

![Graph of Altitude Correction Factor $K_a$]

- For site altitudes above 1000 m/3281 ft, the altitude correction factor $K_a$ is recommended, depending on the actual site altitude above sea level.

### Example:
- 3000 m/9842 ft site altitude above sea level
- 15 kV switchgear rated voltage
- 95.0 kV rated lightning impulse withstand voltage
- Rated lightning impulse withstand voltage to be selected 95 kV · 1.28 = 122 kV

### Result:
- According to the above table, a switchgear for a rated voltage of 27.6 kV is to be selected.
Cable testing

- For cable testing
  - the installation and operating instructions of the switchgear
  - the information on manufacturer-dependent cable sealing ends
  - the cable version (e.g. paper-insulated mass-impregnated cables, PVC cables or XLPE cables) must be observed.

Test voltages:

<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>kV</td>
<td>kV</td>
<td>kV</td>
<td>kV</td>
</tr>
<tr>
<td>15</td>
<td>55</td>
<td>22 (22)</td>
<td>16 (22)</td>
</tr>
<tr>
<td>27.6</td>
<td>72</td>
<td>33 (33)</td>
<td>23 (33)</td>
</tr>
</tbody>
</table>

Climate and ambient conditions

SIMOSEC ANSI switchgear may be used, subject to possible additional measures – e.g. panel heaters or floor covers – under the following ambient conditions and operating temperatures:

- Ambient conditions
  - Natural foreign materials
  - Chemically active pollutants
  - Small animals

- Operating temperatures
  The operating temperatures are classified according to ANSI/IEEE C37.20.3

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

- No cross insulation for isolating distances between phases

Aseismic capacity (optional)

SIMOSEC ANSI switchgear can be upgraded for regions at risk from earthquake.

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

- IEC 60 068-3-3, 1993
- IEC 60 068-2-6, 1195
- IABG TA13-TM-002/98 (guide)
- NFPA 5000 and IBC Level Seismic Simulation

Within the range of the prevailing earthquake frequencies from 1 to 35 Hz, the required response spectrum to IBC 200 % and 300 % covers the following response spectra:

- Uniform Building Code zone 4
- Seismic Requirements Spec. 9067; Department of Water & Power, Los Angeles
- GTS-1.1013 ENDES, Chile
- VDE 0670-111
- IABG TA13-TM-002/98 category 2

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

SIMOSEC ANSI switchgear fulfills acc. to the standards ANSI/IEEE C37.20.3 the following type of protection:

- All openings in the enclosure prevent the entrance of a rod with a diameter of 3.2 mm/0.13 inch.

Standards

Standards, specifications, guidelines

Switchgear color

Light grey No. 61 according to ASTM D1535 97 (Munsell notation 8.3 G6.10/0.54)