Switchgear Type SIMOSEC
up to 24 kV, Air-insulated, Extendable

Medium-Voltage Switchgear
Catalog HA 41.21 · 2008

Answers for energy.
The products and systems described in this catalog are manufactured and sold according to a certified quality and environmental management system (acc. to ISO 9001 and ISO 14001). (DQS Certificate Reg. No. DQS 003473 QM UM). The certificate is accepted in all IQNet countries.

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**Modular design**

- Individual panels, for free combination and extension
- **Option:** Low-voltage compartments can be supplied in two overall heights

**Technical features**

- Air-insulated indoor switchgear
- Gas-insulated, maintenance-free switching functions for the three-position switch
- Partition class: PM (metallic partition)
- Three-pole primary enclosure
- Phases arranged one behind the other
- No cross-insulation between phases
- Busbar system at the top
- Air-insulated busbar and cable connection system
- Three-position switch, metal-enclosed, with air-insulated primary terminals and gas-insulated switching functions
- Vacuum circuit-breaker 3AH5, metal-enclosed, up to 630 A, fixed-mounted in gas-insulated switchgear vessel
- Vacuum circuit-breaker 3AH6, air-insulated, up to 1250 A, easy to remove after loosening the fixing bolts
- Hermetically-sealed by welding, stainless-steel switchgear vessel,
  - For switching devices
  - With welded-in bushings (for electrical connections and mechanical components)
  - With insulating gas SF₆
- LSC 2 A or LSC 2 B panels
- Pressure relief
  - To the rear and upwards
  - Separately for each compartment
- Air-insulated cable connection system for conventional cable sealing ends
- Three-phase current transformer, factory-assembled on the feeder busings
- Integrated low-voltage niche (standard) for installation of, e.g.
  - Terminals, MCBs, push-buttons
  - Protection devices
- **Option:** Top-mounted low-voltage compartment
- **Option:** Panel heating for severe ambient conditions, e.g. condensation

**Reliability**

- Type and routine-tested *
- Standardized and manufactured using numerically controlled machines
- Quality management system according to DIN EN ISO 9001
- More than 500,000 switchgear components 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 LSC 2 A or LSC 2 B panels
- HV HRC fuses and cable sealing ends are only accessible when the outgoing feeders are earthed
- Logical mechanical interlocking (metal-clad)
- Capacitive voltage detection system for verification of safe isolation from supply
- Earthing of outgoing feeders by means of make-proof earthing switches

**Security of operation**

- Components, e.g. operating mechanisms, three-position switches, vacuum circuit-breakers proven for years
- LSC 2 B panels (metal compartmentalization (metal-clad) between busbar and switching device and between switching device and cable connection compartment)
- LSC 2 A panels with metal compartmentalization between switching device and busbar 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 (IEC 62271-1/ VDE 0671-1 *)

**Features**

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

**Reavailability**

- Three-position switch disconnector with gas-insulated, maintenance-free quenching principle
- Metal compartmentalization between busbar compartment, switching devices and cable connection compartment
- Separate pressure relief for each compartment
- Cable testing without the need to isolate the busbar
- Mounting location of three-phase current transformer for selective disconnection of circuit-breaker feeders

**Cost-efficiency**

Extremely low life-cycle costs and extremely high availability throughout the entire product life cycle as a result of:

- Three-position switch with gas-insulated quenching principle
- 3AH vacuum circuit-breaker
- Minimum space requirement
- Easy switchgear extension
- Standard protection relays, e.g. multifunction protection SIPROTEC 4

**Electrical features**

- Rated voltages up to 24 kV
- Rated short-time withstand current up to 25 kA
- Rated normal current of feeders
  - Up to 630 A, e.g. for ring-main, metering and circuit-breaker panels
  - Up to 1250 A, for circuit-breaker and bus sectionizer panels
- Rated normal current of busbar up to 1250 A
Technical Data

Electrical data of panels, pressure values, temperature

Common details on electrical data, filling pressure and temperature

<table>
<thead>
<tr>
<th>Rated insulation level</th>
<th>Rated voltage U&lt;sub&gt;r&lt;/sub&gt; kV</th>
<th>7.2</th>
<th>12</th>
<th>15</th>
<th>175</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rated short-dur. power-freq. withstand voltage U&lt;sub&gt;d&lt;/sub&gt; kV</td>
<td>20</td>
<td>28</td>
<td>36</td>
<td>38&lt;sup&gt;3&lt;/sup&gt;</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Rated lightning impulse withstand voltage U&lt;sub&gt;ip&lt;/sub&gt; kV</td>
<td>60</td>
<td>75</td>
<td>95</td>
<td>95</td>
<td>125</td>
</tr>
</tbody>
</table>

| Rated frequency f<sub>n</sub> of busbar | 50/60 Hz |
| Rated normal current I<sub>nr</sub> | 630 A |

- **Rated short-time withstand current I<sub>rk</sub>** for switchgear with t<sub>rk</sub> = 1 s
  - up to kA: 20, 25, 20, 16, 20, 16, 20, 16, 20

- **Rated peak withstand current I<sub>rp</sub>**
  - up to kA: 50, 63, 63, 63, 40, 50, 63, 40, 63, 40, 63

- **Rated filling pressure p<sub>fl</sub>** for insulation
  - 1500 hPa (absolute) at 20 °C

- **Minimum operating pressure p<sub>me</sub>** for insulation
  - 1300 hPa (absolute) at 20 °C

- **Ambient temperature T<sub>amb</sub>**
  - For panels without secondary equipment: Class “Minus 25 indoor” (–25 °C to +55 °C)
  - For panels with secondary equipment: Class “Minus 5 indoor” (–5 °C to +55 °C)

- **Ring-main panel type RK and cable connection panel type K, K-E**

  - **Rated normal current I<sub>nr</sub>** for feeder and transfer, panel type RK
    - up to kA: 630 A (standard), 400 A (on request)
  - **Rated peak withstand current I<sub>rp</sub>**
    - up to kA: 630 A (standard), 400 A (on request)
  - **Rated short-circuit making current I<sub>rm</sub>**
    - up to kA: 630 A (standard), 1250 A

- **Transformer panel type TR**

  - **Rated normal current I<sub>nr</sub>** for feeder
    - 200 A
  - **Rated short-circuit making current I<sub>rm</sub>**
    - up to kA: 50, 63, 63, 63, 40, 50, 63, 40, 63, 40, 50

- **Circuit-breaker panel type LS**

  - **Rated short-circuit making current I<sub>rm</sub>**
    - up to kA: 50, 63, 63, 63, 40, 50, 63, 40, 63, 40, 50

- **Busbar earthing panel type SE**

  - **Rated short-circuit making current I<sub>rm</sub>**
    - up to kA: 50, 63, 63, 63, 40, 50, 63, 40, 50, 40, 63

- **Busbar voltage metering panels type ME3 and type ME31-F**

  - **Rated peak withstand current I<sub>rp</sub>**
    - up to kA: 50, 63, 63, 63, 40, 50, 63, 40, 63, 40, 50

- **Billing metering panels type ME1**

  - **Rated normal current I<sub>nr</sub>** for transfer, panel types ME1 and ME1-H
    - 630 A, 1250 A
  - **Rated peak withstand current I<sub>rp</sub>**
    - up to kA: 50, 63, 63, 63, 40, 50, 63, 40, 63, 40, 63

- **Bus sectionizer panels type LT**

  - **Rated short-circuit making current I<sub>rm</sub>**
    - up to kA: 50, 63, 63, 63, 40, 50, 63, 40, 63, 40, 50

1) The rated normal currents apply to ambient temperatures of 40 °C. The 24-hour-mean value is max. 35 °C (according to IEC 62271-1/VDE 0671-1)
2) Pressure values for SF<sub>6</sub>-insulated vessels
3) Data for Russian Federation
   - Rated voltage 12 kV
   - Rated short-duration power-frequency withstand voltage 42 kV
4) With reference dimension e = 192 mm, an extension tube (100 mm long) is additionally required for fuse mounting 292 mm
5) For panel types TR and ME31-F depending on the max. cut-off current of the HV HRC fuse link (I<sub>D</sub> ≤ 25 kA)
### Technical Data

#### Electrical data * of the switching devices

**Three-position switch-disconnector**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated insulation level</th>
<th>Rated voltage</th>
<th>kV</th>
<th>7.2</th>
<th>12</th>
<th>15</th>
<th>17.5</th>
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<tr>
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</table>

#### Switching capacity of general-purpose switches (class E3) according to IEC 60265-1/VDE 0670 Part 301

(Standards see page 43)

<table>
<thead>
<tr>
<th>Test duty 1</th>
<th>Rated mainly active load breaking current</th>
<th>Ipk</th>
<th>63</th>
<th>63</th>
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<td>Test duty 2a</td>
<td>Rated closed-loop breaking current</td>
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<td>Rated transformer breaking current</td>
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<td>Test duty 4a</td>
<td>Rated cable-charging breaking current</td>
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<td>Test duty 4b</td>
<td>Rated line-charging breaking current</td>
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<tr>
<td>Test duty 6a</td>
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</table>

#### Switching capacity of switch-disconnector/fuse combination

(Standards see page 43)

<table>
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<tr>
<th>Test duty 1</th>
<th>Rated mainly active load breaking current</th>
<th>Ipk</th>
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<td>Test duty 3</td>
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<td>Test duty 4b</td>
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#### Earthing switch

<table>
<thead>
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<th>Parameter</th>
<th>Rated voltage</th>
<th>Ue</th>
<th>7.2</th>
<th>12</th>
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<th>17.5</th>
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<td></td>
<td>Ue</td>
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<tr>
<td>Rated short-duration power-frequency withstand voltage</td>
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<td>Ur</td>
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<tr>
<td>Rated lightning impulse withstand voltage</td>
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<td>Ue</td>
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<table>
<thead>
<tr>
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<th>Ipk(kA)</th>
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<tr>
<td>Transformer feeders 2</td>
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<table>
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#### 3AH5 and 3AH6 vacuum circuit-breakers

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated insulation level</th>
<th>Rated voltage</th>
<th>Ue</th>
<th>7.2</th>
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<tr>
<td>Rated short-duration power-frequency withstand voltage</td>
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<tr>
<td>Rated lightning impulse withstand voltage</td>
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#### Electrical service life at rated normal current

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Electrical service life at rated normal current</th>
<th>–</th>
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<th>10,000 operating cycles</th>
</tr>
</thead>
</table>

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* Higher values of electrical data available on request
** Indications in parenthesis acc. to previous standards
1) Depending on the HV HRC fuse links
2) Corresponds to the max. permissible cut-off current of the HV HRC fuse
3) Data for Russian Federation – Rated voltage 12 kV
   – Rated short-duration power-frequency withstand voltage 42 kV
   – Rated short-circuit breaking current 50 kA

Switchgear Type SIMOSEC up to 24 kV, Air-insulated, Extendable · Siemens HA 41.21 · 2008
Technical Data

Switchgear installation

Room planning

Switchgear installation
Wall-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
- Design with or without low-voltage compartment

Switchgear fastening
- For floor openings and fixing points of the switchgear, see page 42
- Foundations:
  - Steel structure
  - Steel-reinforced concrete

Panel dimensions
See pages 35 to 41

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 2100 mm if height of low-voltage compartment 350 mm;
switchgear height 2300 mm if height of low-voltage compartment 550 mm

** Depending on bending radius of cable
As multi-panel transport unit, individual panels with combinations of different panel types for standard switchgear (without pressure relief duct) are used.

- **T1** = Depth of individual panel
- **B1** = Width
- **T2** = Height
- **B2** = Overall width
- **T3** = Overall height

<table>
<thead>
<tr>
<th>Panel</th>
<th>Panel type</th>
<th>Width B1</th>
<th>Net weight</th>
<th>Height T2</th>
<th>Gross weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ring-main panel</td>
<td>RK1</td>
<td>375</td>
<td>0.60</td>
<td>270</td>
<td>1.95 / 2.3</td>
</tr>
<tr>
<td>Cable panel</td>
<td>K1, K1-6</td>
<td>375</td>
<td>0.30</td>
<td>270</td>
<td>1.95 / 2.3</td>
</tr>
<tr>
<td>Transformer panel</td>
<td>TR</td>
<td>375</td>
<td>0.20</td>
<td>270</td>
<td>1.95 / 2.3</td>
</tr>
<tr>
<td>Circuit-breaker panel</td>
<td>630 A</td>
<td>750</td>
<td>0.10</td>
<td>270</td>
<td>1.95 / 2.3</td>
</tr>
</tbody>
</table>

- **B2** = Overall width
- **T2** = Height

**Transport of individual panels**

- **B2** = Overall width
- **T2** = Height

<table>
<thead>
<tr>
<th>Panel</th>
<th>Panel type</th>
<th>Width B2</th>
<th>Net weight</th>
<th>Height T2</th>
<th>Gross weight</th>
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<tbody>
<tr>
<td>Ring-main panel</td>
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<td>0.60</td>
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<td>TR</td>
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<td>Circuit-breaker panel</td>
<td>630 A</td>
<td>750</td>
<td>0.10</td>
<td>270</td>
<td>1.95 / 2.3</td>
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**Transport of combinations of different individual panels**

- **B2** = Overall width
- **T2** = Height

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<tr>
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<th>Panel type</th>
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<th>Net weight</th>
<th>Height T2</th>
<th>Gross weight</th>
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<tbody>
<tr>
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<td>0.60</td>
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<td>1.95 / 2.3</td>
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<td>Circuit-breaker panel</td>
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<td>750</td>
<td>0.10</td>
<td>270</td>
<td>1.95 / 2.3</td>
</tr>
</tbody>
</table>

**Packing, transport (examples)**

- **Panel type**
- **Width B2**
- **Height T2**
- **Gross weight**

1) The net weight and the gross weight depend on the extent to which the panel is equipped (e.g., current transformers, motor operating mechanisms) and are therefore given as mean values.

2) Sum of the net weights of individual panels

---

**Switchgear Type SIMOSEC up to 24 kV, Air-insulated, Extendable - Siemens HA 41.21 - 2008**
Product Range

Product range overview

Standard panels

Panel designation |
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<tr>
<th>Panel type</th>
<th>Panel width</th>
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<tr>
<td>Ring-main panel ¹) as feeder</td>
<td>RK, RK1 375 mm, 500 mm</td>
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<tr>
<td>as transfer</td>
<td>RK-U 375 mm</td>
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<tr>
<td>Transformer panel ²) as feeder</td>
<td>TR, TR1 375 mm, 500 mm</td>
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<td>Cable panel as feeder</td>
<td>K, K1 375 mm, 500 mm</td>
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<tr>
<td>Cable panel ³) as feeder</td>
<td>K-E, K1-E 375 mm, 500 mm</td>
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<tr>
<td>Circuit-breaker panel 630 A ¹) with 3AHS ³) as feeder</td>
<td>LS1 750 mm</td>
</tr>
<tr>
<td>as transfer</td>
<td>LS1-U 750 mm</td>
</tr>
<tr>
<td>Circuit-breaker panel 630 A ³) with 3AHS ³) as feeder</td>
<td>LS11 750 mm</td>
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<tr>
<td>as transfer</td>
<td>LS11-U 750 mm</td>
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<tr>
<td>Circuit-breaker panel 1250 A ³) with 3AHS ³) as feeder</td>
<td>LS31, LS32 750 mm, 875 mm</td>
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<td>as transfer</td>
<td>LS31-U 750 mm</td>
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<tr>
<td>Bus sectionalizer panel 630 A ¹) with 3AHS ³), for panel type HF</td>
<td>LT10 750 mm</td>
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<tr>
<td>Bus sectionalizer panel 630 A ³) with 3AHS ³), for panel type HF</td>
<td>LT11 750 mm</td>
</tr>
<tr>
<td>Bus sectionalizer panel 1250 A ³) with 3AHS ³), for panel type HF</td>
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<tr>
<td>Bus sectionalizer panel 630 A ³) ⁴) as feeder</td>
<td>LT2, LT2-W 750 mm, 750 mm</td>
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<td>LT22, LT22-W 750 mm, 750 mm</td>
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<td>Billing metering panel Standard as end panel</td>
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<td>ME1-K, ME1-KS 750 mm</td>
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<td>Billing metering panel for additional current transformer</td>
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<tr>
<td>Busbar voltage metering panel ¹)</td>
<td>ME3, ME31-F 375 mm, 500 mm</td>
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<td>Busbar earthing panel ¹)</td>
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<td>⁶)</td>
<td>SE2 500 mm</td>
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<td>Bus riser panel</td>
<td>HF 375 mm</td>
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</table>

1) Panels type LSC2B (metal-clad)
2) With additional make-proof earthing switch
3) Type designation of vacuum circuit-breaker
4) With 1 three-position switch-disconnector
5) With 2 three-position switch-disconnectors
6) With voltage transformer for busbar metering
Product Range

Equipment features

- Basic equipment
- Additional equipment (option), further additional equipment on request
  - Not available

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<td>ME3</td>
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</tbody>
</table>

1) Three-position switch as three-position switch-disconnector
2) Three-position switch as three-position disconnector in panel types LS31, LS31-U, LS32 and LT31
3) Type designation of the vacuum circuit-breaker
4) In special cases, deeper floor cover for panels with cable feeder required
5) Not to be applied for versions with separate feeder earthing switch in panel types LS11, LS31 and LS32
6) Inspection window is a standard equipment in panel types LS11, LS31 and LS32 for versions with separate earthing switch
7) Panel heating: wired on terminal (standard), option: version with thermostat.
**Product Range**

**Ring-main panels**

**Ring-main panels as feeder panels**

- **Type RK**
  - 375 mm wide

- **Type RK1**
  - 500 mm wide

- **Type RK1**
  - 500 mm wide

- **Type LT10**
  - 750 mm wide
  - Bus sectionalizer panel type LT10 with ring-main transfer panel type RK-U

**Ring-main panel as transfer panel for attachment to panel types ME1... or ME1-H**

- **Standard:**
  - transfer to the right
  - Option: transfer to the left

- **Type RK-U**
  - 375 mm wide

**For other panel combinations**

- **Type LT10**
  - 750 mm wide
  - Bus sectionalizer panel type LT10 with ring-main transfer panel type RK-U

- **Type LT11**
  - 750 mm wide
  - Bus sectionalizer panel type LT11 with ring-main transfer panel type RK-U (non-interchangeable arrangement)

- **Type RK-U**
  - 375 mm wide

- **With 3AH5 vacuum circuit-breaker, fixed-mounted**

- **With 3AH6 vacuum circuit-breaker, removable**

**Standard:**

- Option P1 and P2 are terminal designations of the current transformer

**Option:**

- Option P1 and P2 are terminal designations of the current transformer

**On request:**

- Option: 1 set of voltage transformers possible

**On request up to 12 kV**

**On request:**

- Voltage transformer e.g. 4MR, 2-pole, cast-resin insulated, only up to 17.5 kV

**On request:**

- Voltage transformer e.g. 4MR, 1-pole, cast-resin insulated

**Cable (not included in the scope of supply)**

- 2nd cable (not included in the scope of supply)

- Surge arrester

**Capacitive voltage detection system**

**Voltage transformers**

- e.g. 4MR, 1-pole, cast-resin insulated
- e.g. 4MR, 2-pole, cast-resin insulated
- e.g. 4MC703...
- Three-phase transformer e.g. 4MC3

**Current transformers**

- Block-type current transformer e.g. 4MA
- Cable-type current transformer e.g. 4MC703
- Cable-type current transformer e.g. 4MC63...
- Three-phase current transformer e.g. 4MC3

**Cable (not included in the scope of supply)**

- 2nd cable (not included in the scope of supply)

- Surge arrester

**On request:**

- Voltage transformer e.g. 4MR, 1-pole, cast-resin insulated
- Voltage transformer e.g. 4MR, 2-pole, cast-resin insulated

**On request:**

- Voltage transformer e.g. 4MR, 1-pole, cast-resin insulated,
- only up to 17.5 kV
## Product Range

### Transformer and cable panels

<table>
<thead>
<tr>
<th>Transformer panels</th>
<th>Cable panels</th>
<th>Cable panels</th>
</tr>
</thead>
<tbody>
<tr>
<td>as feeder panels</td>
<td>as feeder panels, 630 A</td>
<td>as feeder panels, 630 A, with make-proof earthing switch</td>
</tr>
<tr>
<td><strong>Type TR</strong> 375 mm wide</td>
<td><strong>Type K</strong> 375 mm wide</td>
<td><strong>Type K-E</strong> 375 mm wide</td>
</tr>
<tr>
<td><img src="diagram1.png" alt="Diagram" /></td>
<td><img src="diagram2.png" alt="Diagram" /></td>
<td><img src="diagram3.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

| **Type TR1** 500 mm wide | **Type K1** 500 mm wide | **Type K1- E** 500 mm wide |
| ![Diagram](diagram4.png) | ![Diagram](diagram5.png) | ![Diagram](diagram6.png) |

- **Type TR1** 500 mm wide
- **Type TR** 375 mm wide
- **Type K** 375 mm wide
- **Type K-E** 375 mm wide
- **Type K1** 500 mm wide
- **Type K1- E** 500 mm wide

* Current transformer located partly underneath the panel
** On request up to 12 kV

### Options

- Three-position switch-disconnector
- HV HRC fuse
- Capacitive voltage detection system
- Earthing switch
- Make-proof earthing switch
- Fixed earthing point
- Cable-type current transformer, e.g. 4MC703
- Block-type current transformer 4MA, cast-resin insulated
- Three-phase current transformer 4MC63
- Voltage transformer e.g. 4MR, 1-pole, cast-resin insulated
- Cable (not included in the scope of supply)
- 2nd cable (not included in the scope of supply)
- Surge arrester

---

Switchgear Type SiMOSEC up to 24 kV, Air-insulated, Extendable - Siemens HA 41.21 - 2008
Product Range

Circuit-breaker panels

Circuit-breaker panels 630 A
as feeder panels
Type LS1
750 mm wide
With 3AH5 vacuum circuit-breaker, fixed-mounted
Type LS31
750 mm wide
With 3AH6 vacuum circuit-breaker, removable
Type LS11
750 mm wide
With 3AH6 vacuum circuit-breaker, removable
Type LS11-U
750 mm wide
With 3AH6 vacuum circuit-breaker

Circuit-breaker panels 1250 A
as feeder panels
Type LS31
876 mm wide
With 3AH6 vacuum circuit-breaker
Type LS32
876 mm wide
With 3AH6 vacuum circuit-breaker

---

* On request
** Standard: Feeder earthing via the 3AH6 vacuum circuit-breaker with interlocks (without earthing switch)
\( \Delta \) Mounting position of the current transformer with terminal P1 at the top only

P1 and P2 are terminal designations of the current transformer
Bus sectionalizer panels 630 A in combination with bus riser panel

- **Type HF** 375 mm wide
- **Type LT10** 750 mm wide
- **Type LT2-W** 750 mm wide
- **Type LT2** 750 mm wide
- **Type LT11** 750 mm wide
- **Type HF** 375 mm wide
- **Type LT10** 750 mm wide

Bus sectionalizer panels 630 A with 1 three-position switch-disconnector

- **Type LT2** 750 mm wide
  - corresponds to type RK-U with type HF

Bus sectionalizer panel 1250 A in combination with bus riser panel

- **Type LT31** 750 mm wide
- **Type HF** 375 mm wide
- **Type LT22-W** 750 mm wide
  - corresponds to type RK-U with type HF

Switchgear Type SIMOSEC up to 24 kV, Air-insulated, Extendable · Siemens HA 41.21 · 2008
Billing metering panels

630 A and 1250 A

Type ME1
750 mm wide

Standard
Transfer to the right

Type ME1-S
750 mm wide

Standard **
Transfer to the right

Type ME1-H
750 mm wide

Standard **
Transfer to the right

** Transfer to the right

P1 and P2 are terminal designations of the current transformer

on request

** Option: transfer to the left

*** Transformer terminals interchanged

630 A and 1250 A

for busbar connection

for additional transformer

Capacitive voltage detection system

Block-type current transformer

transformer

transformer

of the current

designations

are terminal

P1 and P2

Fixed earthing point

on request:

cast-resin insulated

Voltage transformer, e.g. 4MR, 1-pole,
cast-resin insulated, or on request:

1) Voltage transformer, e.g. 4MR, 1-pole,
cast-resin insulated, instead of a
2nd set of current or voltage transformers

2) Voltage transformer, e.g. 4MR, 1-pole,
cast-resin insulated

Fixed earthing point

for busbar earthing

* On request

** Option: transfer to the left

*** Transformer terminals interchanged
Product Range

Billing metering panels, busbar voltage metering panels, busbar earthing panels and bus riser panels

Billing metering panels 630 A and 1250 A ** for cable connection

Type ME1-K 750 mm wide

Option

Transformer terminals interchanged

Scheme 1

Option

Option

Option

Billing metering panels 630 A and 1250 A ** for busbar connection

Type ME1-KS 750 mm wide

Option

Transformer terminals interchanged

Scheme 1

Option

Option

Option

Busbar voltage metering panels

Type ME3 375 mm wide

Option

Option

Option

Bus riser panels 630 A and 1250 A

Type ME31-F 500 mm wide

Option

Option

Option

Busbar earthing panels

Type SE1 375 mm wide

Option

Option

Option

Type SE2 500 mm wide

Option

Option

Option

Bus earthing panels

Type SE3 500 mm wide

Option

Option

Option

Earthing switch

Three-position switch-disconnector

Make-proof earthing switch

Voltage transformer, e.g. 4MR, 1- or 2-pole, cast-resin insulated

Capacitive voltage detection system

Fixed earthing point

Earthing switch

Block-type current transformer 4MA, cast-resin insulated

Voltage transformer, e.g. 4MR, 1-pole cast-resin insulated

Type ME1-KS 750 mm wide

Option

Transformer terminals interchanged

Scheme 2

Option

Option

Option

Type ME1-E 750 mm wide

Option

Transfer to the right

Scheme 2

Option

Option

Option

Type ME1-E 750 mm wide

Option

Transfer to the left

Scheme 2

Option

Option

Option

Type ME31-F 500 mm wide

Option

Option

Option

Type SE1 375 mm wide

Option

Option

Option

Type SE2 500 mm wide

Option

Option

Option

Type SE3 500 mm wide

Option

Option

Option

Option

On request

Connection up to 12 kV

** Connection for 3 cables possible

Δ Δ Transfer to the left

Δ Δ For attachment to left or right ring-main panels type RK-U

Switchgear Type SIMOSEC up to 24 kV, Air-insulated, Extendable · Siemens HA 41.21 · 2008
Design

Panel design (examples)

Legend for pages 16 and 17
1 Option: Low-voltage compartment
2 Niche for optional low-voltage equipment, cover can be unscrewed
3 Option: CAPDIS voltage detection system
4 Option: Short-circuit/earth-fault indicator
5 Option: Ready-for-service indicator for switching device
6 Switch position indication for load-break function "CLOSED – OPEN"
7 Switch position indication for earthing function "OPEN – EARTHED"
8 Feeder designation label
9 Mimic diagram
10 Option: Sockets for capacitive voltage detection system (depending on arrangement)
11 Option: Momentary-contact rotary control switch "CLOSED – OPEN" for motor operating mechanism with local-remote switch for three-position switch-disconnector
12 Option: Locking device for three-position switch-disconnector
13 Pressure relief device for switching device
14 Manual operation for the mechanism of the earthing function
15 Manual operation for the mechanism of the load-break function
16 Rating and type plate
17 Gas-insulated vessel for switching device
18 Interlocking of the cable compartment cover
19 Bushing-type insulator for busbar
20 Bushing-type insulator for feeder
Feeder earthing via make-proof earthing switch (= locking device for three-position switch-disconnector and device for feeder earthed when circuit-breaker "CLOSED")

Vacuum circuit-breaker:

- 3AH5 vacuum circuit-breaker, fixed-mounted
- 3AH6 vacuum circuit-breaker, removable

Switch position indication

- Manual operation for closing with manual operating mechanism
- for emergency operation with motor operating mechanism
- Mechanical "OFF" pushbutton
- Mechanical "ON" pushbutton (not supplied with spring-operated mechanism)
- "Spring charged" indicator

Wiring duct, removable, for control cables and/or bus wires

Switchgear Type SIMOSEC up to 24 kV, Air-insulated, Extendable · Siemens HA 41.21 · 2008
Components

3AH5 and 3AH6 vacuum circuit-breakers

Common features
- Circuit-breakers with vacuum interrupters
- Stored-energy spring-operated mechanism for 10,000 operating cycles
- Maintenance-free for indoor installation according to IEC 62271-1/
  VDE 0671-1*
- Individual secondary equipment

Switching duties and operating mechanisms
The switching duties of the vacuum circuit-breaker are dependent, among other factors, on its type of operating mechanism. Three operating mechanism versions are available:
- Motor operating stored-energy mechanism
  - For auto-reclosure (K),
  - For synchronization and rapid load transfer (U)
- Manual operating stored-energy mechanism
- For auto-reclosure (K)
- Manual spring-operated mechanism
  (= spring CLOSED, stored-energy OPEN)
  - Not for auto-reclosure (K)
  - For normal closing and
  - For storage of one opening

Trip-free mechanism
- The vacuum circuit-breakers are fitted with a trip-free mechanism according to IEC 62271-100/
  VDE 0671-100

3AH5 vacuum circuit-breaker
- Metal-enclosed
- Up to 630 A
- Pole parts with vacuum interrupters fixed-mounted in hermetically welded, gas-filled switchgear vessel
- System-conforming use with three-position switch in gas-insulated switchgear vessel
- Operating mechanism arranged outside the switchgear vessel and behind the control board
- Air-insulated primary terminals

Installation in metal-clad panels
- Feeder panels type LS1, panel width 750 mm
- Transfer panels type LS1-U, panel width 750 mm
- Bus sectionalizer panels type LT10 (for adjacent bus riser panel type HF), panel width 750 mm

3AH6 vacuum circuit-breaker
- Removable lateral-mechanism circuit-breaker, air-insulated
- Up to 1250 A
- Circuit-breaker poles arranged one behind the other
- Operating mechanism in separate box behind lower panel cover
- Logical mechanical interlocking between 3AH6 vacuum circuit-breaker and three-position switch

Installation in:
- Feeder panel type LS11, panel width 750 mm
- Transfer panel type LS11-U, panel width 750 mm
- Bus sectionalizer panels type LT11 and LT31 (for adjacent bus riser panel type HF), panel width 750 mm
- Feeder panel type LS31 (for connection of max. 2 cables), panel width 750 mm
- Feeder panel type LS32 (for connection of 3 cables; 4 cables on request), panel width 875 mm

Abbreviations for switching duties and applications:
- U = Synchronization and rapid load transfer (make time ≤ 90 ms)
- K = Auto-reclosure

For further details, please refer also to Catalogs HG 11.03/04 “3AH3/4 Vacuum Circuit-Breakers”

* Standards see page 43
1) Removable after loosening the respective contact connections and fixing bolts

For further details, please refer also to Catalogs HG 11.03/04 “3AH3/4 Vacuum Circuit-Breakers”
Operating mechanism elements of the 3AH5 vacuum circuit-breaker

1 Gear
2 Coupling on gear for operation with hand crank
3 Closing spring
4 Motor (M1 *)
5 **Closing spring charged** indicator
6 Circuit-breaker "OPEN"
7 Circuit-breaker "CLOSED"
8 Operating rod

Operating mechanism elements of the 3AH6 vacuum circuit-breaker

1 Gear
2 Operating mechanism elements
3 Closing spring
4 Motor (M1 *)
5 **Closing spring charged** indicator
6 Circuit-breaker "OPEN"
7 Circuit-breaker "CLOSED"
8 Operating rod

Operating mechanism functions

Motor operating mechanism 1)
(M1 *)
In the case of the motor operating mechanism, the closing spring is charged by means of a motor and latched in the charged position (the "spring charged" indication is visible). Closing is effected either by means of an ON pushbutton or a closing solenoid. The closing spring is recharged automatically (for auto-reclosure).

Manual operating stored-energy mechanism
The closing spring is charged by means of the supplied hand crank until latching of the closing latch is indicated ("spring charged" indication). Subsequently the vacuum circuit-breaker can be closed either manually or electrically. The closing spring can be recharged manually. The "possibility to close" is thus stored once more (for auto-reclosure).

Manual spring-operated mechanism
(= spring CLOSED, stored-energy OPEN)
The closing spring of the vacuum circuit-breaker is charged by means of the supplied hand crank until the vacuum circuit-breaker closes. Subsequently either manual or electrical opening is possible.

Vacuum circuit-breakers with spring-operated mechanism are not suitable for auto-reclosure.

1) Motor rating at 24 V to 220 V DC: 350 W
110 V and 220 V AC: 400 VA
2) With closing solenoid
* Equipment code

Abbreviations:
O = OPEN operation
CO = CLOSE operation with subsequent OPEN operation at the shortest internal close-open time of the vacuum circuit-breaker
t = Dead time 0.3 s
t’ = Dead time 3 min

For further details, please refer also to Catalogs HG 11.03/04 "3AH3/4 Vacuum Circuit-Breakers"

Differences between the vacuum circuit-breakers depending on the operating mechanism version

<table>
<thead>
<tr>
<th>Operating mechanism version</th>
<th>Motor operating stored-energy mechanism</th>
<th>Manual operating stored-energy mechanism</th>
<th>Manual spring-operated mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical uses</td>
<td>Utility substations and industrial plants</td>
<td>Classic transfer substations and substations without auxiliary voltage supply</td>
<td>Simple utility substations (circuit-breaker as transformer switch)</td>
</tr>
<tr>
<td>Mechanism function</td>
<td>Stored-energy CLOSED, stored-energy OPEN</td>
<td>Stored-energy CLOSED, stored-energy OPEN</td>
<td>Spring CLOSED, stored-energy OPEN</td>
</tr>
<tr>
<td>Mechanism operation</td>
<td>With motor 1), manual (emergency) operation at the panel including anti-pumping</td>
<td>With hand crank</td>
<td>With hand crank</td>
</tr>
<tr>
<td>Closing the vacuum circuit-breaker</td>
<td>Electrically 2) or mechanically at the panel with pushbutton</td>
<td>Mechanically at the panel with pushbutton, option: electrically 2)</td>
<td>Mechanically at the panel with hand crank (charging process)</td>
</tr>
<tr>
<td>Closing solenoid, e.g. for remote electrical closing</td>
<td>Always provided, with electrical signal &quot;closing spring charged&quot;</td>
<td>Option</td>
<td>Without</td>
</tr>
<tr>
<td>Rated switching sequence</td>
<td>D+CO or D+CO+Y-CO</td>
<td>D+CO</td>
<td>O or CO</td>
</tr>
<tr>
<td>Auto-reclosure (K)</td>
<td>Suitable (multiple auto-reclosure possible)</td>
<td>Suitable (only with closing solenoid)</td>
<td>–</td>
</tr>
</tbody>
</table>
The scope of the secondary equipment of the 3AH vacuum circuit-breaker depends on the type of application and offers a wide range of variations, thus allowing even the highest requirements to be satisfied.

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

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

**Current transformer-operated release**
- Type 3AX11 04 (Y6 *) for tripping pulse ≥ 0.1 Ws in conjunction with suitable protection systems, e.g. 7SJ4 protection relay, SEG relay (other designs on request)
- Used where no external auxiliary voltage is available, tripping by protection relay

**Undervoltage release**
- Type 3AX11 03 (Y7 *)
- Comprising:
  - Energy store and unlatching mechanism
  - Electromagnetic system, to which voltage is permanently applied in the CLOSED position of the vacuum circuit-breaker; tripping is initiated when this voltage drops
- Connection to voltage transformer possible

**Position switch**
- Type 3SE4 (S4 *)
- For signalling “closing spring charged”
- Only in conjunction with stored-energy mechanisms

**Anti-pumping** (standard)
- Function: If CLOSE and OPEN commands are applied simultaneously and continuously to the vacuum circuit-breaker, this reverts to its OPEN position after closing. The circuit-breaker remains in this position until the OPEN command is eliminated and a new CLOSE command is given. Thus continuous closing and opening (= pumping) is avoided.

**Breaker tripping signal** (standard)
- For electrical signalling (as pulse > 10 ms), e.g. to remote control systems, in the case of automatic tripping (e.g. protection)
- Via NO contact (S6 *) and cut-out switch (S7 *)

**Varistor module**
- As overvoltage protection for protection devices in conjunction with inductive devices in the vacuum circuit-breaker (limiting to approx. 500 V)
- Recommended for auxiliary voltages ≥ 60 V DC

**Auxiliary switch**
- Type 3SV9 (S1 *)
- Standard: 6NO+6NC, of which 2NO+2NC +2 changeover contacts are free
- Option: 12NO+12NC, of which 7NO+4NC+2 changeover contacts are free

**Mechanical interlocking**
- Dependent on the type of operating mechanism:
  - Spring-operated mechanism or
  - Stored-energy mechanism
- Option: Switchgear interlocking with the three-position switch-disconnector
For further details concerning interlocking functions, refer to page 28.

For further details, please refer also to Catalogs HG 11.03/04 “3AH3/4 Vacuum Circuit-Breakers”
Common features
- Metal-enclosed
- Located in a gas-insulated switchgear vessel
- Switch positions: CLOSED-OPEN- EARTHED
- No cross insulation between phases
- 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

Mode of operation
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 “EARTHED” functions cannot be implemented simultaneously.

Three-position switches as three-position switch-disconnectors or disconnectors

Three-position switch-disconnector 630 A
- Up to 630 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 types TR, TR1 and ME31-F

Interlocks
- Opening of lower panel cover or cable compartment cover only in “EARTHED” position
- Option: Logical mechanical interlocking of three-position switch-disconnector with vacuum circuit-breaker

Three-position disconnector 1250 A
- Up to 1250 A, for panel types LS31, LS31-U, LS32 and LT31
- Metal-enclosed

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 disconnector
  - Locking device

Interlocks
- Opening of lower panel cover or cable compartment cover only in “EARTHED” position
- Option:
  - Logical mechanical interlocking with vacuum circuit-breaker

Note: Standards see page 43
Components

Busbars, HV HRC fuse assembly

**Busbars**
- Safe-to-touch due to metallic enclosure
- Metal-clad busbar compartment
- Three-pole design, bolted from panel to panel
- Easy switchgear extension
- Made of copper:
  - Fl E-Cu for ≤ 630 A
  - Rd E-Cu for > 630 A to 1250 A
- Versions:
  - 630 A, > 12 kV: With insulating shrink-on sleeve
  - 1250 A, up to 24 kV: Rd E-Cu bare

**HV HRC fuse assembly**
- For transformer panel types TR and TR1
- For busbar voltage metering panel type ME31-F
- HV HRC fuse links acc. to DIN 43625 (main dimensions) with striker pin; version “medium” acc. to IEC 60282/VDE 0670-4 *
  - 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 HRC fuses for transformers
- Fuse replacement possible only when feeder is earthed
- Option: Shunt release on operating mechanism of three-position switch-disconnector
- Option: “Tripped indication” of three-position switch-disconnector in transformer feeder (transformer switch) for remote electrical indication with one normally-open contact (1NO)

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

Replacement of HV HRC fuse links
- Isolating and earthing of the transformer feeder
- Subsequent manual replacement of the HV HRC fuse link

---

* Standards see page 43
### Components

Allocation of HV HRC fuses and transformers

The table opposite shows the recommended 3GD HV HRC fuse links (electrical data valid for ambient temperatures of up to 40 °C) for the fuse protection of transformers.

**Recommendation**

The three-position switch-disconnector in the transformer feeder (transformer switch) was combined with Siemens HV HRC fuse links of type 3GD and tested *.

**Standards**

HV HRC fuse links with striker pin, “medium” version according to:

- IEC 60282-1 *VDE 0670-4 *
- IEC 60787/VDE 0670-402
- DIN 43625 main dimensions

<table>
<thead>
<tr>
<th>Rated system voltage (kV)</th>
<th>Transformer</th>
<th>Rated normal current of the HV HRC fuse</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rating S&lt;sub&gt;n&lt;/sub&gt;</td>
<td>kVA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 to 7.2</td>
<td>50</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>75</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>125</td>
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<tr>
<td></td>
<td>160</td>
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<tr>
<td></td>
<td>630</td>
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<tr>
<td></td>
<td>800</td>
<td>5 to 6</td>
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<tr>
<td>10 to 12</td>
<td>50</td>
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<td>1250</td>
<td>5 to 6</td>
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<tr>
<td>15 to 17.5</td>
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<td>1000</td>
<td>5 to 6</td>
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<td>20 to 24</td>
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<tr>
<td></td>
<td>1600</td>
<td>5 to 6</td>
</tr>
<tr>
<td>2000</td>
<td>5 to 6</td>
<td>57.8</td>
</tr>
</tbody>
</table>

* Standards see page 43
Components

Operating mechanisms for three-position switches

Manual operating mechanism
- **Standard**: As detachable lever mechanism
- **Option**: Different operating handles \(^1\) for the operating mechanisms of the switch-disconnector and make-proof earthing switch

**Spring-operated mechanism**
- For ring-main panel types RK and RK1
- For all three-position switches (except in panel types TR and TR1)

**Spring-operated/stored-energy mechanism**
For transformer panel types TR and TR1 as well as for busbar voltage metering panel type ME31-F.

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

**Operating voltages for motor operating mechanisms**:
- 24, 48, 60, 110, 220 V DC
- 50/60 Hz 110 and 230 V AC

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

**Detachable lever mechanism (example)**
As spring-operated mechanism for ring-main feeders

**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:
- Function switch-disconnector or disconnector: CLOSED and OPEN: 2NO + 2NC
- Function earthing switch at the three-position switch: CLOSED and OPEN: 2NO + 2NC
- Separate earthing switch (at the feeder): CLOSED and OPEN: 2NO + 2NC

**Shunt release (option)**
Spring-operated/stored-energy mechanisms can be equipped with a shunt release. Remote electrical tripping of the 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.

**Technical data of the auxiliary switch**
<table>
<thead>
<tr>
<th>Operating voltage</th>
<th>Normal current</th>
<th>Normal current resistive inductive: T=20 ms</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>A</td>
<td>V A</td>
</tr>
<tr>
<td>up to 230</td>
<td>10</td>
<td>24 10 10</td>
</tr>
<tr>
<td>24</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>48</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>60</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>110</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>240</td>
<td>2.5</td>
<td>2</td>
</tr>
</tbody>
</table>

**Rated switching capacity**
- Rated insulation voltage 250 V AC/DC
- Insulation group C to VDE 0110
- Continuous current 10 A
- Making capacity 50 A

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

\(^1\) According to VDN*/VDEW** recommendation

* Association of German network operators VDN e. V. in Germany (as of 2003)

** Association of German Power Stations – VDEW e. V. (until 2003)
Components

Indicating and measuring equipment

Voltage detection systems acc. to IEC 61243-5 or VDE 0682-415

- To verify safe isolation from supply
- Detection systems
  - Standard: HR system with plug-in indicator
  - Option: LRM system with plug-in indicator
- LRM system with integrated indicator type VOIS+, VOIS R+
- LRM system with integrated indicator, with integrated repeat test of the interface, with integrated function test type CAPDIS-S1+
- LRM system with integrated indicator, with integrated repeat test of the interface, with integrated function test, with integrated signalling relay type CAPDIS-S2+

HR system, LRM system

- Verification of safe isolation from supply phase by phase by insertion in each socket pair
- Indicator suitable for continuous operation
- Safe-to-touch
- Routine-tested
- Measuring system and voltage indicator can be tested
- Voltage indicator flashes when high voltage is present

VOIS+, VOIS R+

- Integrated display, without auxiliary power
- With indication “A1” to “A3”, (see legend)
- Maintenance-free; repeat test required
- With integrated 3-phase test socket for phase comparison (also suitable for plug-in voltage indicator)
- Degree of protection IP 67, temperature range –25 °C to +55 °C
- With integrated signalling relay (only VOIS R+):
  - “M1”*: Voltage present at least at one phase L1, L2 or L3
  - “M2”*: Voltage not present at L1, L2 and L3

<table>
<thead>
<tr>
<th>Components</th>
<th>Symbols shown</th>
<th>VOIS+, VOIS R+</th>
<th>CAPDIS-S1+</th>
<th>CAPDIS-S2+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage indicator</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>plug-in voltage indicator</td>
<td>per phase at</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>the panel front</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plug-in voltage indicator</td>
<td>mounted</td>
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<tr>
<td>VOIS+</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Integrated voltage indicator</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>VOIS R+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integrated voltage detection system</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAPDIS-S1+, -S2+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage indication</td>
<td></td>
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</tr>
<tr>
<td>with capacitive voltage divider (principle)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– C1: Capacity integrated into bushing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– C2: Capacity of the connection leads and of the voltage indicator to earth</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Voltage (not operating voltage)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>A0</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>A1</td>
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<td>A2</td>
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<td>A5</td>
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<tr>
<td>A6</td>
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</tr>
</tbody>
</table>

Features of CAPDIS-S1+

- Without auxiliary power
- With indication “A1” to “A5” (see legend)
- Without ready-for-service monitoring
- Without signalling relay (thus without auxiliary contacts)

Features of CAPDIS-S2+

- With indication “A0” to “A6” (see legend)
- Only by pressing the “Device-Function-Test” pushbutton: “ERROR” indication (A6), e.g. in case of missing auxiliary voltage

- With ready-for-service monitoring (external auxiliary power required)
- With integrated signalling relay for signalling “M1” to “M4” (auxiliary power required):
  - “M1”*: Voltage present at phases L1, L2, L3
  - “M2”*: Voltage not present at L1, L2 and L3 (= active zero indication)
  - “M3”*: Earth fault or voltage failure, e.g. in one phase
  - “M4”*: External auxiliary power missing (operating voltage present or not)

Switchgear Type SIMOSEC up to 24 kV, Air-insulated, Extendable · Siemens HA 41.21 · 2008
**Components**

**Indicating and measuring equipment**

**Short-circuit/earth-fault indicators (option)**
All ring-main feeders can be optionally equipped with a 3-phase short-circuit or earth-fault indicator.

**Characteristics**
- Use depends on network conditions
- Optical signal when a preselected pickup value is exceeded
- Depending on the type, reset
  - Manually
  - Automatically after a preset time (e.g. 2 hours)
- With ring-type sensors
- Display panel, withdrawable housing, depending on the type
- Response values settable (depending on the type of device)

**Options:**
- Remote electrical indication via contact (1 NO + 1 NC) depending on the type of device settable as passing contact (W) or maintained contact (D).

**Indicating and measuring equipment**

**Short-circuit/earth-fault indicators (examples)**

<table>
<thead>
<tr>
<th>Indicator type</th>
<th>Reset</th>
<th>Manual</th>
<th>Automatical (after)</th>
<th>Remote reset: A by aux. voltage B via NO contact (floating)</th>
<th>Automatical reset after return of power supply</th>
<th>Response values</th>
<th>Response values</th>
<th>Opt: Remote indicat. as</th>
<th>W (passing contact = standard)</th>
<th>D (maintained contact = option)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-circuit indicator</td>
<td></td>
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</tr>
<tr>
<td>ALPHA M</td>
<td>x</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>400, 600, 800, 1000</td>
<td>–</td>
<td>W, D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALPHA E</td>
<td>x</td>
<td>2 h or 4 h</td>
<td>A (12-60 V AC/DC)</td>
<td>–</td>
<td>400, 600, 800, 1000</td>
<td>–</td>
<td>W, D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GAMMA 5.0</td>
<td>x</td>
<td>• 4 s after return of power supply • 2 h or 4 h</td>
<td>–</td>
<td>x (230 V AC, 50 Hz)</td>
<td>400, 600, 800, 1000</td>
<td>–</td>
<td>W, D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALPHA – automatic</td>
<td>x</td>
<td>3 h</td>
<td>A (12-60 V AC/DC)</td>
<td>–</td>
<td>self-adjusting, change of current with 150 A ≤ Δ i ≤ 300 A, response time: t ≤ 20 ms</td>
<td>–</td>
<td>W, D</td>
<td></td>
<td></td>
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<tr>
<td>KA-Opto F</td>
<td>x</td>
<td>after 2 h or 4 h</td>
<td>B (1NO)</td>
<td>–</td>
<td>400, 600, 800, 1000</td>
<td>–</td>
<td>W, D</td>
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<tr>
<td>IKI-10 V2 SP</td>
<td>x</td>
<td>after 2 h or 4 h</td>
<td>B (1NO)</td>
<td>–</td>
<td>400, 600, 800, 1000</td>
<td>–</td>
<td>W, D</td>
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<tr>
<td>IKI-10 V2 L</td>
<td>x</td>
<td>after 2 h or 4 h</td>
<td>B (1NO)</td>
<td>x (110-230 V AC, 50/60 Hz)</td>
<td>400, 600, 800, 1000</td>
<td>–</td>
<td>W, D</td>
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<tr>
<td>Earth-fault/short-circuit indicator</td>
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<tr>
<td>EKA-3</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>x (230 V AC, 50 Hz)</td>
<td>450</td>
<td>40, 80, 160</td>
<td>W, D</td>
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<tr>
<td>DELTA M</td>
<td>x</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>400, 600, 800, 1000</td>
<td>200</td>
<td>W, D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DELTA E</td>
<td>x</td>
<td>after 2 h or 4 h</td>
<td>A (12-60 V AC/DC)</td>
<td>–</td>
<td>400, 600, 800, 1000</td>
<td>200</td>
<td>W, D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KA-Opto F+E</td>
<td>x</td>
<td>after 2 h or 4 h</td>
<td>B (1NO)</td>
<td>–</td>
<td>400, 600, 800, 1000</td>
<td>40, 60, 80</td>
<td>W, D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IKI-10 V2 SP/ES</td>
<td>x</td>
<td>after 2 h or 4 h</td>
<td>B (1NO)</td>
<td>–</td>
<td>400, 600, 800, 1000</td>
<td>10% or 25% of Iₖ</td>
<td>W, D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IKI-10 V2 L/ES</td>
<td>x</td>
<td>after 2 h or 4 h</td>
<td>B (1NO)</td>
<td>x (110-230 V AC, 50/60 Hz)</td>
<td>400, 600, 800, 1000</td>
<td>10% or 25% of Iₖ</td>
<td>W, D</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) Further types and other makes available on request
2) External auxiliary voltage required (120 V AC or 240 V AC)

**Earth-fault indicator**

<table>
<thead>
<tr>
<th>Indicator type</th>
<th>Reset</th>
<th>Manual</th>
<th>Automatical (after)</th>
<th>Remote reset: A by aux. voltage B via NO contact (floating)</th>
<th>Automatical reset after return of power supply</th>
<th>Response values</th>
<th>Response values</th>
<th>Opt: Remote indicat. as</th>
<th>W (passing contact = standard)</th>
<th>D (maintained contact = option)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EKA-3/1</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>x (230 V AC, 50 Hz)</td>
<td>–</td>
<td>40, 80, 160</td>
<td>W, D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IKI-10 V2 L/ES</td>
<td>x</td>
<td>after 2 h or 4 h</td>
<td>B (1NO)</td>
<td>x (110-230 V AC, 50/60 Hz)</td>
<td>–</td>
<td>30, 55, 80, 100</td>
<td>W, D</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) Further types and other makes available on request
2) External auxiliary voltage required (120 V AC or 240 V AC)
3) Power supply required for the LED indications (indication by means of an integrated battery or 12 V AC to 60 V AC voltage)
4) External auxiliary voltage required (230 V AC, 50 Hz, device with integrated battery

5) Make: Horstmann
6) Make: Kries Energietechnik
7) Ring-type sensor: d = 110 mm

---

**Components**

**Indicating and measuring equipment**

**Short-circuit/earth-fault indicators (options)**
All ring-main feeders can be optionally equipped with a 3-phase short-circuit or earth-fault indicator.

**Characteristics**
- Use depends on network conditions
- Optical signal when a preselected pickup value is exceeded
- Depending on the type, reset
  - Manually
  - Automatically after a preset time (e.g. 2 hours)
- With ring-type sensors
- Display panel, withdrawable housing, depending on the type
- Response values settable (depending on the type of device)

**Options:**
- Remote electrical indication via contact (1 NO + 1 NC) depending on the type of device settable as passing contact (W) or maintained contact (D).

**Indicating and measuring equipment**

**Short-circuit/earth-fault indicators (examples)**

<table>
<thead>
<tr>
<th>Indicator type</th>
<th>Reset</th>
<th>Manual</th>
<th>Automatical (after)</th>
<th>Remote reset: A by aux. voltage B via NO contact (floating)</th>
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<th>Response values</th>
<th>Response values</th>
<th>Opt: Remote indicat. as</th>
<th>W (passing contact = standard)</th>
<th>D (maintained contact = option)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-circuit indicator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALPHA M</td>
<td>x</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>400, 600, 800, 1000</td>
<td>–</td>
<td>W, D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALPHA E</td>
<td>x</td>
<td>2 h or 4 h</td>
<td>A (12-60 V AC/DC)</td>
<td>–</td>
<td>400, 600, 800, 1000</td>
<td>–</td>
<td>W, D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GAMMA 5.0</td>
<td>x</td>
<td>• 4 s after return of power supply • 2 h or 4 h</td>
<td>–</td>
<td>x (230 V AC, 50 Hz)</td>
<td>400, 600, 800, 1000</td>
<td>–</td>
<td>W, D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALPHA – automatic</td>
<td>x</td>
<td>3 h</td>
<td>A (12-60 V AC/DC)</td>
<td>–</td>
<td>self-adjusting, change of current with 150 A ≤ Δ i ≤ 300 A, response time: t ≤ 20 ms</td>
<td>–</td>
<td>W, D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KA-Opto F</td>
<td>x</td>
<td>after 2 h or 4 h</td>
<td>B (1NO)</td>
<td>–</td>
<td>400, 600, 800, 1000</td>
<td>–</td>
<td>W, D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IKI-10 V2 SP</td>
<td>x</td>
<td>after 2 h or 4 h</td>
<td>B (1NO)</td>
<td>–</td>
<td>400, 600, 800, 1000</td>
<td>–</td>
<td>W, D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IKI-10 V2 L</td>
<td>x</td>
<td>after 2 h or 4 h</td>
<td>B (1NO)</td>
<td>x (110-230 V AC, 50/60 Hz)</td>
<td>400, 600, 800, 1000</td>
<td>–</td>
<td>W, D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earth-fault/short-circuit indicator</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EKA-3</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>x (230 V AC, 50 Hz)</td>
<td>450</td>
<td>40, 80, 160</td>
<td>W, D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DELTA M</td>
<td>x</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>400, 600, 800, 1000</td>
<td>200</td>
<td>W, D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DELTA E</td>
<td>x</td>
<td>after 2 h or 4 h</td>
<td>A (12-60 V AC/DC)</td>
<td>–</td>
<td>400, 600, 800, 1000</td>
<td>200</td>
<td>W, D</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>KA-Opto F+E</td>
<td>x</td>
<td>after 2 h or 4 h</td>
<td>B (1NO)</td>
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<tr>
<td>IKI-10 V2 SP/ES</td>
<td>x</td>
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<td>10% or 25% of Iₖ</td>
<td>W, D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IKI-10 V2 L/ES</td>
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<td>400, 600, 800, 1000</td>
<td>10% or 25% of Iₖ</td>
<td>W, D</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) Further types and other makes available on request
2) External auxiliary voltage required (120 V AC or 240 V AC)
3) Power supply required for the LED indications (indication by means of an integrated battery or 12 V AC to 60 V AC voltage)
4) External auxiliary voltage required (230 V AC, 50 Hz, device with integrated battery

5) Make: Horstmann
6) Make: Kries Energietechnik
7) Ring-type sensor: d = 110 mm
**Ready-for-service indicator**

**Characteristics**
- 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 "1 NO contact" for remote electrical indication

**Mode of operation**
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 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 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.

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

---

**Phase comparison test units**

- Make: Pfisterer, type EPV
  - For plug-in voltage detection systems
  - For integrated voltage detection systems (CAPDIS-S1+, -S2+)

- Make: Horstmann, type ORION 3.0
  - Combined test unit for:
    - Phase comparison
    - Interface testing at switchgear
    - Voltage detection for HR and LRM systems and CAPDIS-S1+, -S2+

- Make: Kries, type CAP-Phase
  - As combined test unit (HR and LRM)
  - For:
    - Voltage detection
    - Repeat test
    - Phase comparison
    - Phase sequence test
    - Self-test
  - The unit doesn’t require any battery or other makes
Interlocking systems and locking devices

Interlocking of connection compartment

Ring-main and circuit-breaker panel

- Access to the cable connection compartment (e.g. for cable testing) is only possible provided that the feeder is isolated and earthed (three-position switch-disconnector in “EARTHED” position)
- Option: Closing lock-out
  This prevents the three-position switch-disconnector from being switched from “OPEN” to “CLOSED” position, when the cable compartment cover is removed

Transformer panel

- Access to the cable connection compartment and to the HV HRC fuse compartment (e.g. for replacement of HV HRC fuse links) is only possible provided that the feeder is isolated and earthed (three-position switch-disconnector in “EARTHED” position)
- Option: De-earthing lock-out
  This prevents the three-position switch-disconnector from being switched from position “EARTHED” to “OPEN”.

Switchgear interlocking

- Dependent on the vacuum circuit-breaker operating mechanism with
  - Spring-operated or
  - Stored-energy mechanism
- Option: Switchgear-side mechanical interlocking with three-position switch-disconnector
- Vacuum circuit-breaker cannot be closed when three-position switch-disconnector is in the “OPEN” position:
  - Spring-operated mechanism: Hand crank opening is blocked
  - Stored-energy mechanism with closing solenoid 3AY15 10: Pushbutton (S12) operated by mechanical interlock prevents continuous command to closing solenoid

Interlocking in circuit-breaker panel types LS11, LS11-U and LT11 (with 3A66 fixed-mounted vacuum circuit-breaker)

- Option: Logical mechanical interlocking with three-position switch-disconnector
- Earthing of feeder via three-position switch-disconnector in “EARTHED” position

Interlocking in circuit-breaker panels (with 3A66 removable vacuum circuit-breaker)

- Option: For 630 A panel types LS11, LS11-U and LT11: Logical mechanical interlocking with three-position switch-disconnector
- Standard: For 1250 A panel types LS31, LS31-U, LS32 and LT31: Logical mechanical interlocking with three-position disconnectors
- Logical mechan. interlocking of cable compartment cover: Opening of cable compartment cover only possible provided that the feeder is earthed

Feeder earthing

- Standard: For panel types LS11, LS11-U, LT11, LS31, LS31-U and LS32:
  Earthing by switching of vacuum circuit-breaker 3A661 in position “CLOSED” and of three-position switch2 in position “EARTHED”
- Option: For circuit-breaker panel types LS11, LS31 and LS32:
  Earthing by means of an additional make-proof earthing switch at the feeder with inspection window in the cable compartment cover

Options:
- For circuit-breaker panel types LS11, LS31 and LS32: Earthing by means of an additional make-proof earthing switch at the feeder with inspection window in the cable compartment cover

Locking devices

The three-position switch-disconnector can be locked on the operating mechanism side in any position (option).

Options:
- Logical mechanical interlocking with three-position switch-disconnector

1) With additional locking device – optionally with signalling switch – for securing the “CLOSED” position of the vacuum circuit-breaker for feeder “EARTHED”
2) Three-position switch as
  - Switch-disconnector in panel types LS11, LS11-U and LT11
  - Disconnectors in panel types LS31, LS31-U, LS32 and LT31
Components

4MC63 three-phase current transformers for panel types LS ... and LT ...

Application
- For circuit-breaker panels type LS ...
- For bus sectionalizer panels type LT ...
- Option: For ring-main panels type RK ...

Features
- According to IEC 60044-1/ VDE 0414-1
- Designed as a three-pole ring-core current transformer
- Free of dielectrically stressed cast-resin parts (due to design)
- Insulation class E
- Inductive type
- Climate-independent
- Secondary connection by means of a terminal strip inside the panel

Installation
- Arranged outside the switchgear vessel on the bushings
- Factory-assembled

Other designs (option)
Three-phase current transformers for protection equipment based on c.t. operation:
- 7SJ45 protection relay as definite-time overcurrent protection
- Definite-time overcurrent protection relay, make SEG, type WIP 1, WIC 1

Technical data

<table>
<thead>
<tr>
<th>Primary data</th>
<th>4MC63 53 three-phase current transformer for $I_N &lt; 150$ A</th>
<th>for $I_N = 600$ A</th>
<th>for $I_N = 1250$ A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. equipment operating voltage $U_{e,n}$</td>
<td>0.72 kV</td>
<td>0.72 kV</td>
<td>0.72 kV</td>
</tr>
<tr>
<td>Rated current $I_N$</td>
<td>3 A</td>
<td>3 A</td>
<td>3 A</td>
</tr>
<tr>
<td>Rated short-duration power-frequency withstand voltage (winding test)</td>
<td>25 kA</td>
<td>25 kA</td>
<td>25 kA</td>
</tr>
<tr>
<td>Rated continuous thermal current $I_{D}$</td>
<td>630 A</td>
<td>630 A</td>
<td>1250 A</td>
</tr>
<tr>
<td>Transient overload current</td>
<td>1.5 x $I_D$ / 1 h</td>
<td>2 x $I_D$ / 0.5 h</td>
<td>1.5 x $I_D$ / 1 h</td>
</tr>
<tr>
<td>Rated peak withstand current $I_{dyn}$</td>
<td>unlimited</td>
<td>unlimited</td>
<td>unlimited</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Secondary data</th>
<th>4MC63 53 three-phase current transformer for $I_N &lt; 150$ A</th>
<th>for $I_N = 600$ A</th>
<th>for $I_N = 1250$ A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated current</td>
<td>A</td>
<td>1</td>
<td>0.67</td>
</tr>
<tr>
<td>Rating VA</td>
<td>5</td>
<td>3.33</td>
<td>2.5</td>
</tr>
<tr>
<td>Rated current (option)</td>
<td>5 A</td>
<td>5 A</td>
<td>5 A</td>
</tr>
<tr>
<td>Current at $I_N$</td>
<td>4.2 A</td>
<td>1.575 A</td>
<td>1.25 A</td>
</tr>
<tr>
<td>Protection core</td>
<td>10 P</td>
<td>10 P</td>
<td>10 P</td>
</tr>
<tr>
<td>Overcurrent factor</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

Other values available on request

Switchgear Type SIMOSEC up to 24 kV, Air-insulated, Extendable · Siemens HA 41.21 · 2008
**Components**

### 4MC70 33 and 4MC70 31 cable-type current transformers

**Application**
- For circuit-breaker panels type LS ...
- For ring-main panels type RK ...
- For transformer panels type TR ...

**Features**
- According to IEC 60044-1/ VDE 0414-1
- 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)
- Insulation class E
- Inductive type
- Secondary connection by means of a terminal strip inside the panel

**Installation**
- 4MC70 33 cable-type current transformer for panel types LS ...
- 4MC70 31 cable-type current transformer: e.g. for panel types RK ..., K ... and TR ...
- Arranged on the cable at the panel connection
- Transformers mounted on a supporting plate at our factory; final assembly on the cables on site

---

**Technical data**

<table>
<thead>
<tr>
<th></th>
<th>4MC70 33 cable-type current transformer</th>
<th>4MC70 31 cable-type current transformer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary data</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. equipment operating voltage $U_{em}$</td>
<td>0.72 kV</td>
<td>0.72 kV</td>
</tr>
<tr>
<td>Rated current $I_N$</td>
<td>30 A to 600 A</td>
<td>50 A to 600 A</td>
</tr>
<tr>
<td>Rated short-duration power-frequency withstand voltage (winding test)</td>
<td>3 kV</td>
<td>3 kV</td>
</tr>
<tr>
<td>Rated thermal short-time withstand current $I_{th}$</td>
<td>25 kA</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>
<td>1.0 x $I_N$ option: 1.2 x $I_N$</td>
</tr>
<tr>
<td>Transient overload current</td>
<td>1.5 x $I_N$ / 1 h or 2 x $I_N$ / 0.5 h</td>
<td>1.5 x $I_N$ / 1 h or 2 x $I_N$ / 0.5 h</td>
</tr>
<tr>
<td>Rated peak withstand current $I_{dop}$</td>
<td>unlimited</td>
<td>unlimited</td>
</tr>
</tbody>
</table>

|                  |                                        |                                        |
| **Secondary data** |                                        |                                        |
| Rated current | 1 A (option: 5 A) | 1 A (option: 5 A) |
| Measuring core Class | 0.2 | 0.5 | 1 | 1 |
| Overcurrent factor | FS10 (option: FS5) | FS5 (option: FS10) |
| Rating | 2.5 VA to 10 VA | 2.5 VA to 10 VA |
| Protection core Class | 10 P | 5 P | – |
| Overcurrent factor | 10 | 10 | – |
| Rating | 2.5 VA to 10 VA | – |
| Option: Secondary tap | 1 : 2 (e.g. 150 A – 300 A) | 1 : 2 |

**Dimensions**

|                  | 50* | 100* | 170* | 285* |
| Overall height $H$ ** | 89 |
| Outside diameter | Ø 145 mm | 85 mm x 114 mm |
| Inside diameter | Ø 55 mm | Ø 40 mm |
| For cable diameter | Ø 50 mm | Ø 36 mm |
| Other values available on request | \* Depending on the core data | \* Available installation height inside panel types RK or RK1: Approx. 285 mm, depending on make, type and cross-section of sealing end
Application

- For billing metering panels type ME1 ...
- For bus riser panel type HF ...
- For mounting at the feeder

Features

4MA7 current transformer

- According to IEC 60044-1/ VDE 0414-1
- Dimensions according to DIN 42600-8
- Designed as a single-pole indoor block-type current transformer
- Cast-resin insulated
- Insulation class E
- Secondary connection by means of screw-type terminals

4MR voltage transformer

- According to IEC 60044-2/ VDE 0414-2
- Dimensions according to DIN 42600-9 (small model)
- Designed as an indoor voltage transformer: Type 4MR, single-pole
  - Option: Type 4MR, two-pole
- Cast-resin insulated
- Insulation class E
- Secondary connection by means of screw-type terminals

Technical data

### 4MA7 single-pole block-type current transformer (other values on request)

#### Primary data

<table>
<thead>
<tr>
<th>Max. equipment operating voltage Ue (kV)</th>
<th>3.6</th>
<th>7.2</th>
<th>12</th>
<th>17.5</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated short-dur. power-freq. withstand voltage Ud (kV)</td>
<td>10</td>
<td>20</td>
<td>28</td>
<td>38</td>
<td>50</td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage Ud (kV)</td>
<td>20</td>
<td>60</td>
<td>75</td>
<td>95</td>
<td>125</td>
</tr>
<tr>
<td>Rated current Ids (A) to 1250</td>
<td>20 to 25</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated thermal short-time withstand current Ith (kA)</td>
<td>up to 1.0 x Ith (option: 1.2 x Ith)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated peak withstand current Idyn</td>
<td>max. 2.5 x Ith</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Secondary data

| Rated current (A) | 1 or 5 |
| Measuring core rating | 0.2; 0.5; 1 |
| Overcurrent factor | FS5 or FS10 |
| Protection class | 5 P or 10 P |
| Overcurrent factor | 10 |
| Rating (VA) | 20 to 50 |

### 4MR single-pole voltage transformer (other values on request)

#### Primary data

<table>
<thead>
<tr>
<th>Max. equipment operating voltage Ue (kV)</th>
<th>3.6</th>
<th>7.2</th>
<th>12</th>
<th>17.5</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated short-dur. power-freq. withstand voltage Ud (kV)</td>
<td>10</td>
<td>20</td>
<td>28</td>
<td>38</td>
<td>50</td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage Ud (kV)</td>
<td>20</td>
<td>60</td>
<td>75</td>
<td>95</td>
<td>125</td>
</tr>
<tr>
<td>Rated voltage Ue (kV)</td>
<td>3.6\sqrt{3}</td>
<td>7.2\sqrt{3}</td>
<td>10.8\sqrt{3}</td>
<td>17.5\sqrt{3}</td>
<td>24\sqrt{3}</td>
</tr>
<tr>
<td>Rated voltage factor (8h)</td>
<td>1.9 x Ud</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Rated voltage (V)</td>
<td>100\sqrt{3}</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(option)</td>
<td>120\sqrt{3}</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Secondary data

| Rated voltage (V) | 110\sqrt{3} |
| (option) | 120\sqrt{3} |
| Rated voltage for auxiliary winding (option) | 1000 |
| (option) | 1100 |
| Rating | 20 | 50 | 100 |
| Class | 0.2 | 0.5 | 1.0 |
Components

Cable connection

General features
- Connecting lugs for sealing ends arranged one behind the other
- Uniform cable connection height for the respective panel types
- With cable bracket, e.g., type C40 according to DIN EN 50024
- Access to the cable connection compartment only if feeder has been isolated and earthed

Special features
- In ring-main panels
- In circuit-breaker panels
- In cable panels
- For thermoplastic-insulated cables
- For paper-insulated mass-impregnated cables with adapter systems
- For connection cross-sections up to 300 mm²
- Cable routing downwards
- In transformer panels:
  - For thermoplastic-insulated cables
  - For connection cross-sections up to 120 mm²: Cable lug max. 32 mm wide
  - For rated normal currents of 200 A

For options see figures

Cable cross-sections

<table>
<thead>
<tr>
<th>Panel type</th>
<th>Connectable cables x connection cross-section</th>
<th>No. x mm² for rated voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 kV</td>
<td>17.5 kV</td>
<td>24 kV</td>
</tr>
<tr>
<td>K Standard</td>
<td>1x 300</td>
<td>1x 300 1x 300 1x 300</td>
</tr>
<tr>
<td>K1 On request</td>
<td>2x 300</td>
<td>2x 400 2x 400 2x 400</td>
</tr>
<tr>
<td>RK, Standard</td>
<td>1x 300</td>
<td>1x 300 1x 300 1x 300</td>
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<tr>
<td>K1-E On request</td>
<td>2x 300</td>
<td>2x 300 2x 300 2x 300</td>
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<tr>
<td>LS1</td>
<td>2x 300</td>
<td>2x 300 2x 300 2x 300</td>
</tr>
<tr>
<td>LS11, LS31</td>
<td>2x 400</td>
<td>2x 400 2x 400 2x 400</td>
</tr>
<tr>
<td>LS32 Standard</td>
<td>3x 400</td>
<td>3x 400 3x 400 3x 400</td>
</tr>
<tr>
<td>Option</td>
<td>4x 300</td>
<td>4x 300 4x 300 4x 300</td>
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<tr>
<td>On request</td>
<td>4x 300</td>
<td>4x 300 4x 300 4x 300</td>
</tr>
<tr>
<td>ME1-K, ME1-KS</td>
<td>3x 400</td>
<td>3x 400 3x 400 3x 400</td>
</tr>
</tbody>
</table>

1) Only with ring-main panel type RK1
2) Cable clamps with transformer panels type TR ... partly mounted underneath the panel in the cable basement
3) Make Siemens, type 3EK7, other makes on request

Note
- Cable sealing ends and cable clamps are not included in the scope of supply
### Components

**Selection data for various cable sealing ends**

#### Cable sealing ends (examples)

1. **As-delivered condition**, e.g. for L₄ ≤ 96 kV, prepared for cable sealing end

2. **As-delivered condition**, e.g. for L₄ > 96 kV, additionally with insulating sleeve, prepared for cable sealing end

3. **Phase L1:**
   - Make Lovink-Enertech
   - Type AIN 20, 95 mm² (20 kV)

4. **Phase L2:**
   - Make Tyco Electronics Raychem
   - Type EPKT 24 C / 1X, 185 mm² (24 kV), as shrink-on sealing end, for severe ambient conditions

5. **Phase L3:**
   - Make Prysmian Kabel und Systeme (Pirelli Elektrik)
   - Type ELTI mb-1C-12, 240 mm² (24 kV)

6. **As-delivered condition**, prepared for cable sealing end

7. **Phase L1:**
   - Make Lovink-Enertech
   - Type IAES 20, 95 mm² (20 kV)

8. **Phase L2:**
   - Make Tyco Electronics Raychem
   - Type TFI18S1, 95 mm² (24 kV), as push-on sealing end

9. **Phase L3:**
   - Make Euromold
   - Type AIN, 95 mm² (24 kV)

10. **As-delivered condition**, e.g. for L₄ ≤ 96 kV, prepared for cable sealing end

11. **As-delivered condition**, e.g. for L₄ > 96 kV, additionally with insulating cap, prepared for cable sealing end

12. **Phase L1:**
    - Make Lovink-Enertech
    - Type IAES 20, 95 mm² (20 kV)

13. **Phase L2:**
    - Make Prysmian Kabel und Systeme (Pirelli Elektrik)
    - Type ELTI mb-1C-D-T3, 240 mm² (24 kV), as indoor sealing end, for severe ambient conditions

14. **Phase L3:**
    - Make Euromold
    - Type AIN 20, 240 mm² (24 kV)

#### Single-core thermoplastic-insulated cables for ≤ 12 kV (6/10 kV)

<table>
<thead>
<tr>
<th>Make</th>
<th>Type</th>
<th>Cross-section in mm²</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Euromold</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIN 10</td>
<td>25-300 (600*)</td>
<td></td>
</tr>
<tr>
<td>35 MSC</td>
<td>25-70</td>
<td></td>
</tr>
<tr>
<td>35 MSC (option 3)</td>
<td>25-185</td>
<td></td>
</tr>
<tr>
<td>TIT-212</td>
<td>50-300 (400*)</td>
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</tr>
<tr>
<td><strong>Prysmian Kabel und</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Systeme (Pirelli Elektrik)</strong></td>
<td></td>
<td></td>
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<tr>
<td>ELTI mb-1C-12</td>
<td>35-240</td>
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<tr>
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<td><strong>Tyco Electronics Raychem</strong></td>
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<tr>
<td>XSU-F</td>
<td>16-300 (500*)</td>
<td></td>
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<tr>
<td>TFI1</td>
<td>25-300 (400*)</td>
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<td>EPKT-1</td>
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<td>25-300 (500*)</td>
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#### Single-core thermoplastic-insulated cables for > 12 kV to ≤ 24 kV (12/20 kV)

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<tr>
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<tr>
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<tr>
<td>36 MSC</td>
<td>95-200 (500*)</td>
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<td>36 MSC (option 3)</td>
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<td>TIT-224</td>
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#### Three-core thermoplastic-insulated cables for ≤ 12 kV (6/10 kV)

<table>
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<td><strong>Prysmian Kabel und</strong></td>
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<td>SEHDI 20.2</td>
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</tr>
<tr>
<td>SEI 24</td>
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</tr>
<tr>
<td><strong>nkt cables</strong></td>
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<tr>
<td>TI 24</td>
<td>25-240</td>
<td></td>
</tr>
<tr>
<td>AV 20 E</td>
<td>25-300 (500*)</td>
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<td>AV 10 E</td>
<td>25-300 (500*)</td>
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</table>

#### Three-core thermoplastic-insulated cables for > 12 kV to ≤ 24 kV (12/20 kV)

<table>
<thead>
<tr>
<th>Make</th>
<th>Type</th>
<th>Cross-section in mm²</th>
</tr>
</thead>
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<tr>
<td><strong>Euromold</strong></td>
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<td>SR-DI 24</td>
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<td><strong>Lovink-Enertech</strong></td>
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<tr>
<td>GHKI</td>
<td>16-300 (400*)</td>
<td></td>
</tr>
</tbody>
</table>

1. **Transformer panel types TR:**
   - Lower edge of sealing end below panel
   - Cable lugs of sealing ends up to 32 mm width
   - Owing to the various sealing end lengths, some of the mounted cable clamps are underneath the panel
   - Note: Depending on make and type, the termination of the cable sealing end (= shield earth) for the 3-core thermoplastic-insulated cable and the fitted cable clamp (option) may be located underneath the panel in the cable basement. This must be taken into account in panels with floor cover (option).

2. **Circuit-breaker panel types LS11, LS31 and LS32:**
   - Lower edge of sealing end below panel

3. **Cable sealing end type with insulation shields**
   - On request: Max. connection cross-section of cable sealing end types

---

**Switchgear Type SIMOSEC up to 24 kV, Air-insulated, Extendable · Siemens HA 41.21 · 2008**

---

**Connection height**

- **Due to the installation of 4MA cast-resin insulated block-type current transformers in panels RK1 and LS1**, the connection height of the cables is reduced to 380 mm
Components

Low-voltage equipment

Low-voltage niche
(standard)
- Screwed-on cover as
  - Cover (available mounting depth behind of approx. 184 mm)
  - Frame cover, approx. 46 mm deeper version (available mounting depth behind of approx. 230 mm)
- For accommodation of terminals and standard protection devices, e.g. in circuit-breaker panels combined with frame cover for panels
  - Type LS1: Protection relays (with max. 75 mm wide mounting frame), e.g.
    - Type 7SJ45, 7SJ46
    - Make SEG, type WIC
    - On request: 7SJ60
    - Make SEG, WIP1
  - Type LS11, LS31 and LS32: Protection relays (with max. 75 mm wide mounting frame), e.g.
    - Type 7SJ45, 7SJ46, 7SJ60
    - On request: 7SJ61/62 (150 mm wide)
    - Make SEG, WIP1
- For bus wires and/or control cables; niche open at the side to the adjacent panel
- Safe-to-touch, separated from high-voltage part of the panel
- Degree of protection IP 3X (standard)

Low-voltage compartment
(option)
- Overall heights: 350 mm, 550 mm
- Available mounting depth: 442 mm
- Overall widths: 375 mm, 500 mm, 750 mm
- For mounting on the panel
- Dependent on the panel-specific scope of the secondary equipment
- For accommodation of protection, control, measuring and metering equipment, e.g. multifunction protection relay SIPROTEC 4 7SJ61/62/63 or other makes of protection relays
- Compartment 750 mm wide for panel LS32

Electronic functions
Multifunction protection relay SIPROTEC 4 7SJ62 or 7SJ63 with the following features:
1. User-programmable LEDs with application-specific label, for displaying any desired process and equipment data
2. LCD for process and equipment data, e.g. for:
   - Measuring and metering values
   - Binary information on the status of switching point and device
   - Protection data
   - General indications
   - Alarms
3. Keys for navigation in menus and for entering values
4. Four user-programmable function keys for frequently performed actions

Low-voltage cables
- Control cables of the panel to the low-voltage compartment are connected via multi-pole, coded module plug connectors
- Option: Plug-in bus wires from panel to panel inside the low-voltage niches, optionally in separate cable duct on the panel
- On request: Short-circuit/earth-fault indicator
- Option: Momentary-contact rotary control switch ON-OFF for motor operating mechanism of the three-position switch-disconnector
- Local-remote switch for three-position switch-disconnector
- Control board
- Low-voltage niche open
- Option: Installed equipment

Low-voltage compartment
(option)
- Overall heights: 350 mm, 550 mm
- Available mounting depth: 442 mm
- Overall widths: 375 mm, 500 mm, 750 mm
- For mounting on the panel
- Dependent on the panel-specific scope of the secondary equipment
- For accommodation of protection, control, measuring and metering equipment, e.g. multifunction protection relay SIPROTEC 4 7SJ61/62/63 or other makes of protection relays
- Compartment 750 mm wide for panel LS32

On circuit-breaker panel type LS1
(low-voltage niche open)
- SIPROTEC 4 7SJ61:
  1. LED indications
  2. LCD
  3. Navigation keys
  4. Function keys

In bus sectionalizer panel type LT11
(low-voltage niche closed)

In circuit-breaker panel type LS1
(low-voltage niche open)
Dimensions

Ring-main panels, transformer panels

1) Location of voltage transformer in left-hand panel, e.g. in panel type LT10 or LT11
* Option: Low-voltage compartment available in two heights: 350 mm or 550 mm
** Available mounting depth for low-voltage equipment
*** For panel type RK1 the cable connection height is reduced to approx. 380 mm for panel version with 4MA block-type current transformer
Dimensions

Cable panels

Option:
Low-voltage compartment available in two heights:
350 mm or 550 mm

** Available mounting depth for low-voltage equipment
Dimensions

Circuit-breaker panels

1) Type designation of the vacuum circuit-breaker
2) Option: Inspection window
3) Option: With make-proof earthing switch

* Option: Low-voltage compartment available in two heights:
  350 mm or 550 mm

** Available mounting depth for low-voltage equipment
  – Approx. 184 mm with cover
  – Approx. 230 mm with extended frame cover

*** The cable connection height is reduced to approx. 380 mm for panel version with 4MA block-type current transformer

Circuit-breaker panels
630 A
with 3AH5

Circuit-breaker panels
630 A
with 3AH6

Circuit-breaker panels
1250 A
with 3AH6

Switchgear Type SIMOSEC up to 24 kV, Air-insulated, Extendable · Siemens HA 41.21 · 2008
Dimensions

Bus sectionalizer panels with bus riser panel

Type LT10 + type HF

Type LT11 + type HF

Type LT31 + type HF

Bus sectionalizer panel 630 A with 3AH5

Bus sectionalizer panel 630 A with 3AH6

Bus sectionalizer panel 1250 A with 3AH6

1) Type designation of the vacuum circuit-breaker

* Option:
Low-voltage compartment available in two heights:
350 mm or 550 mm

** Available mounting depth for low-voltage equipment
– Approx. 184 mm with cover
– Approx. 230 mm with extended frame cover

Dimensions
**Dimensions**

Bus sectionalizer panels

---

**Type LT2**
- 750 mm high
- Type RK-U with type HF

**Type LT22**
- 750 mm high
- Type RK-U with type RK-U

---

**Type LT2-W**
- 750 mm high

**Type LT22-W**
- 750 mm high

---

**Bus sectionalizer panels without transformers**

---

**Bus sectionalizer panels with transformers**

---

**Dimensions**

---

* Option:
  - Low-voltage compartment available in two heights: 350 mm or 550 mm

** Available mounting depth for low-voltage equipment
Dimensions

Billing metering panels

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Dimensions (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME1</td>
<td>Billing metering panel (standard)</td>
<td></td>
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<tr>
<td>ME1-S</td>
<td>Billing metering panel for busbar connection</td>
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</tr>
<tr>
<td>ME1-H</td>
<td>Billing metering panel for 2nd current transformer set</td>
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</tr>
<tr>
<td>ME1-K</td>
<td>Billing metering panel for busbar and cable connection</td>
<td></td>
</tr>
</tbody>
</table>

* Option: Low-voltage compartment available in two heights: 350 mm or 550 mm

** Available mounting depth for low-voltage equipment
Busbar voltage metering panels, busbar earthing panels, bus riser panels

Dimensions

Type SE1
- Without transformers
- Dimensions: 375 x 500 x 1750 mm

Type SE2
- With voltage transformers
- Dimensions: 500 x 1050 x 1880 mm

Type SE1-F
- With fuses

Type SE2-F
- Dimensions: 184 x 380 mm

Type HF
- Without transformers
- Dimensions: 375 x 500 x 1750 mm

Type HF-F
- With transformers
- Dimensions: 500 x 1050 x 1880 mm

Type ME3
- With fuses

Type ME31-F
- Dimensions: 184 x 380 mm

1) Location of voltage transformer in left-hand panel

* Option:
- Low-voltage compartment available in two heights: 350 mm or 550 mm

** Available mounting depth for low-voltage equipment

Switchgear Type SIMOSEC up to 24 kV, Air-insulated, Extendable · Siemens HA 41.21 · 2008
### Dimensions

**Floor openings (dimensions in red) and fixing points**

<table>
<thead>
<tr>
<th>Panel Width</th>
<th>Dimensions</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>375 mm</td>
<td>375 x 28</td>
<td>With cable connection</td>
</tr>
<tr>
<td>500 mm</td>
<td>500 x 28</td>
<td>Without cable connection</td>
</tr>
<tr>
<td>750 mm</td>
<td>750 x 28</td>
<td>Without cable connection</td>
</tr>
<tr>
<td>875 mm</td>
<td>875 x 28</td>
<td>Without cable connection</td>
</tr>
</tbody>
</table>

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; in panel types LS11, LS31 and LS31-K: floor opening also possible below floor cover**
4. **Position of the led-in cables for the feeder**
5. **Fixing points**
6. **Floor opening if required for panels without cable connection**
**Standards**

The SIMOSEC switchgear complies with the relevant standards and specifications applicable at the time of type tests.

In accordance with the harmonization agreement reached by the countries of the European Community, their national specifications conform to the IEC standard.

**Overview of standards** (May 2008)

<table>
<thead>
<tr>
<th>Devices</th>
<th>IEC standard</th>
<th>VDE standard</th>
<th>EN standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switchgear</td>
<td>IEC 62271-1</td>
<td>VDE 0671-1</td>
<td>EN 62271-1</td>
</tr>
<tr>
<td></td>
<td>IEC 62271-200</td>
<td>VDE 0671-200</td>
<td>EN 62271-200</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disconnectors and earthing switches</td>
<td>IEC 62271-102</td>
<td>VDE 0671-102</td>
<td>EN 62271-102</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switch-disconnector / fuse combination</td>
<td>IEC 62271-105</td>
<td>VDE 0671-105</td>
<td>EN 62271-105</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HV HRC fuses</td>
<td>IEC 60282-1</td>
<td>VDE 0670-4</td>
<td>EN 60282</td>
</tr>
<tr>
<td>Voltage detection system</td>
<td>IEC 61243-5</td>
<td>VDE 0682-15</td>
<td>EN 61243-5</td>
</tr>
</tbody>
</table>

**Table – Insulating capacity**

<table>
<thead>
<tr>
<th>Rated voltage (kV rms)</th>
<th>72</th>
<th>12</th>
<th>15</th>
<th>17.5</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated short-duration power-frequency withstand voltage (rms value)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Across isolating distances</td>
<td>20</td>
<td>28</td>
<td>36</td>
<td>38</td>
<td>50</td>
</tr>
<tr>
<td>– Between phases and to earth</td>
<td>23</td>
<td>32</td>
<td>39</td>
<td>45</td>
<td>60</td>
</tr>
</tbody>
</table>

**Altitude correction factor Ka**

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

Rated short-duration power-frequency withstand voltage, for site altitudes > 1000 m to be selected

\[
\text{Rated short-duration power-frequency withstand voltage up to } \leq 1000 \text{ m} = K_a
\]

Rated lightning impulse withstand voltage, for site altitudes > 1000 m to be selected

\[
\text{Rated lightning impulse withstand voltage up to } \leq 1000 \text{ m} = K_a
\]

**Example:**

- Site altitude above sea level 3000 m
- Rated lightning impulse withstand voltage

\[
95 \text{ kV} \cdot 1.28 \approx 122 \text{ kV}
\]

\[
\text{Result: According to the above table, a switchgear for a rated voltage of 24 kV with a rated lightning impulse withstand voltage of } 125 \text{ kV is to be selected.}
\]

**Type of service location**

SIMOSEC switchgear can be used as an indoor installation in accordance with IEC 61936 (Power installations exceeding 1 kV AC) and VDE 0101

- 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 earthing switches" are earthing switches with short-circuit making capacity according to

- IEC 62271-102
- VDE 0671-102

**Colour of panel front**

Siemens standard (SN) 47 030 G1, colour no. 700 / light basic (similar to RAL 7047 / grey)

**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 62271-1/ VDE 0671-1 (see table “Insulating capacity”).

- The rated values are referred to sea level and to normal atmospheric conditions (1013 hPa, 20 °C, 11 g/m³ humidity in accordance with IEC 60071 and VDE 0111).

- The insulating capacity decreases with increasing altitude.

For site altitudes above 1000 m (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. This reduction is permitted up to a site altitude of 1000 m according to IEC and VDE.

  - For site altitudes above 1000 m a higher insulation level must be selected. It results from the multiplication of the rated insulation level for 0 to 1000 m with the altitude correction factor K_a.
Standards

Standards, specifications, guidelines, classification

Cable testing

- For circuit-breaker and switch-disconnector feeders
- DC voltage test before the test:
  Remove or disconnect any voltage transformers at the cable connection in SIMOSEC switchgear.
SIMOSEC switchgear for rated voltages up to 24 kV can be subjected to cable tests at a max. DC test voltage of 72 kV or according to VDE at 70 kV, 15 min. The voltage at the busbar may be 24 kV in this case.

Internal arc classification (option)

- Safety of operating personnel ensured by tests to verify internal arc classification
- The possibility of arc faults in SIMOSEC switchgear is much less due to:
  – Metal-enclosed and gas-insulated switching functions (e.g. of three-position switch-disconnector and 3AH5 vacuum circuit-breaker)
  – Logical arrangement of operating mechanism elements and mechanical interlocks
  – Short-circuit-proof feeder earthing by means of the three-position switch-disconnector
- The internal arc fault tests must be performed in accordance with IEC 62271-200/ VDE 0671-200 *

Criteria for internal arc faults

- Criteria according to IEC 62271-200/ VDE 0671-200 * with respect to the behaviour in case of internal arc faults
- Definitions of criteria:
  – Acceptance criterion 1: Covers and doors remain closed. Limited deformations are accepted.
  – Acceptance criterion 2: No fragmentation of the enclosure. No projection of small parts above 60 g weight.
  – Acceptance criterion 3: No holes in the accessible sides up to a height of 2 m.
  – Acceptance criterion 4: Indicators do not ignite due to the effect of hot gases.
  – Acceptance criterion 5: The enclosure remains connected to its earthing parts.

Test voltages:

<table>
<thead>
<tr>
<th>Rated voltage</th>
<th>U0/U (Uc)</th>
<th>Max. test voltage applied to cable</th>
<th>VLF 1), 0.1 Hz</th>
<th>acc. to IEC</th>
<th>VDE 0278</th>
</tr>
</thead>
<tbody>
<tr>
<td>U0 (kV)</td>
<td></td>
<td></td>
<td>3 x U0</td>
<td>U = AC (kV)</td>
<td>6 x U0 15 min.</td>
</tr>
<tr>
<td>12</td>
<td>6 / 10 (12)</td>
<td>19</td>
<td>24</td>
<td>38 2)</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>12 / 20 (24)</td>
<td>38</td>
<td>48</td>
<td>70</td>
<td></td>
</tr>
</tbody>
</table>

1) VLF = very low frequency
2) Referred to: $U_0/U_1 = U_{0.1} = 6.35/11$ (12 kV)
* Standards see page 43

Climate and ambient conditions

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

- Ambient conditions
  – Natural foreign materials
  – Chemically active pollutants
  – Small animals
- Climate classes
  The climate classes are classified according to IEC 60721-3-3
SIMOSEC switchgear is largely insensitive to climate and ambient conditions by virtue of the following features:

- No cross insulation for isolating distances 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-proof materials
- Use of climate-independent three-phase current transformers

Standards
Classification of the SIMOSEC switchgear according to IEC 62271-200

<table>
<thead>
<tr>
<th>Construction and design</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Partition class</strong></td>
<td>PM (metallic partition)</td>
</tr>
<tr>
<td><strong>Loss of service continuity category</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Panels</strong></td>
<td></td>
</tr>
<tr>
<td>- With HV HRC fuses, and for panel types with removable circuit-breakers type 3AH6</td>
<td>LSC 2A</td>
</tr>
<tr>
<td>- Without HV HRC fuses, and for panel types without removable circuit-breakers type 3AH6</td>
<td>LSC 2B</td>
</tr>
<tr>
<td>- In a SIMOSEC switchgear, panel types ME1 or HF are also part of the busbar. According to IEC 62271-200 a category is not applicable</td>
<td>-</td>
</tr>
<tr>
<td><strong>Accessibility to compartments</strong></td>
<td></td>
</tr>
<tr>
<td>- Busbar compartment</td>
<td>Tool-based</td>
</tr>
<tr>
<td>- Switching-device compartment</td>
<td>Not accessible</td>
</tr>
<tr>
<td>- Switching-device compartment with circuit-breakers type 3AH6 (removable)</td>
<td>Accessible and interlock-based</td>
</tr>
<tr>
<td>- Low-voltage compartment</td>
<td>Tool-based</td>
</tr>
<tr>
<td>- Cable connection compartment</td>
<td>Tool-based</td>
</tr>
<tr>
<td>- Without HV HRC fuses</td>
<td>Interlock-based and tool-based</td>
</tr>
<tr>
<td>- With HV HRC fuses</td>
<td></td>
</tr>
</tbody>
</table>

**Internal arc classification (option)**

<table>
<thead>
<tr>
<th>Class</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>- Free-standing arrangement</td>
<td>7.2 kV to 24 kV</td>
</tr>
<tr>
<td>- Wall-standing arrangement</td>
<td>IAC A FL, 20 kA, 1 s</td>
</tr>
<tr>
<td><strong>Degree of accessibility A</strong></td>
<td></td>
</tr>
<tr>
<td>- F</td>
<td>Switchgear in closed electrical service location, access only for properly instructed personnel</td>
</tr>
<tr>
<td>- L</td>
<td>Front</td>
</tr>
<tr>
<td>- R</td>
<td>Lateral</td>
</tr>
<tr>
<td><strong>Test current</strong></td>
<td>20 kA</td>
</tr>
<tr>
<td><strong>Test duration</strong></td>
<td>1 s</td>
</tr>
</tbody>
</table>

---

1) The loss of service continuity category always refers to the complete switchgear, i.e. the panel with the lowest category determines the loss of service continuity category of the complete switchgear.
### Protection against solid foreign bodies, electric shock and ingress of water

SIMOSEC switchgear fulfills acc. to the standards:

<table>
<thead>
<tr>
<th>Degree of protection</th>
<th>Type of protection</th>
<th>IEC 62271-1</th>
<th>VDE 0671-1</th>
<th>EN 62271-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP 2X (standard)</td>
<td>Enclosure of live parts under high-voltage compartments</td>
<td>IEC 62271-200</td>
<td>VDE 0671-200</td>
<td>EN 60529</td>
</tr>
<tr>
<td>IP 3X (option)</td>
<td>Enclosure of live parts under high-voltage in switchgear with locking device</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IP 3XD (on request)</td>
<td>Enclosure of live parts under high-voltage in switchgear with locking device</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IP 6S</td>
<td>Metal enclosure of gas-filled switchgear vessels</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### IEC 60529 and EN 60529:

<table>
<thead>
<tr>
<th>Type of protection</th>
<th>Degree of protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection against solid foreign bodies</td>
<td>Protected against the penetration of solid foreign bodies, diameter ≥ 12.5 mm</td>
</tr>
<tr>
<td>Protection against electric shock</td>
<td>Protected against access to dangerous parts by means of a finger (the distance between a test finger with a diameter of 12 mm to dangerous parts must be sufficient)</td>
</tr>
<tr>
<td>Protection against the ingress of water</td>
<td>No definition</td>
</tr>
</tbody>
</table>

#### IP 2X

| Protection against solid foreign bodies | Protected against the penetration of solid foreign bodies, diameter ≥ 2.5 mm |
| 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 2.5 mm and a length of 100 mm to dangerous parts must be sufficient) |
| Protection against the ingress of water | No definition |

#### IP 3X

| Protection against solid foreign bodies | Protected against the penetration of solid foreign bodies, diameter ≥ 2.5 mm |
| 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 100 mm to dangerous parts must be sufficient) |
| Protection against the ingress of water | No definition |

#### IP 3XD

| Protection against solid foreign bodies | Protected against the penetration of solid foreign bodies, diameter ≥ 2.5 mm |
| 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 100 mm to dangerous parts must be sufficient) |
| Protection against the ingress of water | No definition |

#### IP 6S

| Protection against solid foreign bodies | Dust-proof: no penetration of dust |
| Protection against electric shock | Protected against access to dangerous parts by means of a wire (test probe with a diameter of 1 mm may not penetrate) |
| 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 |

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* Standards see page 43
** For explanations see adjacent table

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**Notes**

If not stated otherwise on the individual pages of this catalog, we reserve the right to include modifications, especially regarding the stated values, dimensions and weights.

Drawings are not binding.

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If not stated otherwise, all dimensions in this catalog are given in mm.

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