Medium-Voltage Switchgear
Type SIMOPRIME Extendable Truck-Type Circuit-Breaker Switchgear up to 17.5 kV
Single Busbar, Metal-Enclosed, Metal-Clad, Air-Insulated
About these Instructions

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

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

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

For further details, e.g. about additional equipment and information about other switchgear types, please refer to catalog HA 26.11.

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

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

1 Signal terms and definitions

<table>
<thead>
<tr>
<th>Symbols used</th>
<th>Operation symbol: Identifies an operation. Asks the operator to perform an operation.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>✓ Result symbol: Identifies the result of an operation.</td>
</tr>
</tbody>
</table>

2 General instructions

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

Any kind of modification on the product or alteration of the product must be coordinated with the manufacturer in advance, as uncoordinated modifications or alterations can cause the expiration of warranty claims, cause danger to life, limb and other legally protected interests, and the fulfillment of the type tests (according to IEC 62271-200) may not be guaranteed anymore.

The edition of the standard is only mentioned in the test report applicable at the time of switchgear manufacture.

Five Safety Rules of Electrical Engineering

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

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

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

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

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

4 Qualified personnel

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

To get appropriate qualifications about transport, installation and commissioning, this personnel must have taken part in a training for assembly and installation of Siemens air-insulated medium-voltage switchgear type SIMOPRIME.

This installation training provides detailed information about design, operation, installation and trouble shooting on the primary part of SIMOPRIME switchgear. After successful participation, the participants in this training get a certificate. This certificate authorizes the participants to install, assemble and connect this medium-voltage switchgear electrically at their own responsibility.

For further information about this installation training, please contact:

SIEMENS Sanayi ve Ticaret A.S.
Gebze Organize Sanayi Bölgesi (GOSB)
41480 Kocaeli
TURKEY
Tel : +90 262 676 20 91

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

- Training and instruction or authorization to switch on, switch off, earth and identify power circuits and equipment / systems as per the relevant safety standards
- Training and instruction regarding the applicable specifications for the prevention of accidents and the care and use of appropriate safety equipment
- Training in first aid and behavior in the event of possible accidents
Certificate
Assembly and Installation Training
SIMOPRIME switchgear

Mr./Mrs. N.N.
Country

This is to certify that Mr./Mrs. N.N. successfully participated in the Training of Assembly
and Installation of Siemens air-insulated medium-voltage switchgear type Simoprine
at the Siemens Training Center Gebze, Turkey.

By this certificate Mr./Mrs N.N. is authorized to install Simoprine medium-voltage
switchgear and the electrical connections self-dependently, including mechanical
and electrical tests on site.

Mr./Mrs. N.N. is obliged to send written reports about any work performed on the
switchgear to the Switchgear Factory Gebze, Turkey, department E D MV Q.

This certificate expires three years after the date of issue. Its validity can be extended
by E D MV Training Center Gebze.

Gebze, May 4, 2010
Training Center Gebze

__________________________  __________________________
Instructor & Head of Training  Plant Manager
Center Gebze

Answers for energy.

SIEMENS
5 Features

Truck-type circuit-breaker switchgear type SIMOPRIME is air-insulated, factory-assembled, type-tested, metal-enclosed switchgear for indoor installation according to IEC 62 271-200, type of accessibility A.

Personal safety
- All switching operations can be performed with high-voltage door closed
- Standard degree of protection IP4X according to IEC 60 529
- Panels tested for internal arcs as per IEC 62 271-200
- Metal-clad design
- Metallic, positively driven shutters protect against accidental contact with live parts
- Mechanical position indicators for circuit-breaker, removable part and earthing switch visible at the panel front
- Logical interlocks between the actuation of the circuit-breaker, the operating mechanism of the removable part and the operating mechanism of the earthing switch prevent maloperation
- Option: Verification of safe isolation from supply with high-voltage door closed by means of a voltage detecting system according to IEC 61 243-5
- Feeder earthing by means of make-proof earthing switches.

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

Flexibility
- High flexibility due to various configurations of the basic panel types
- Wall-standing or free-standing arrangement
- Cable connection from front or rear
- Designed as truck-type switchgear
- Use of block-type transformers
- Connection of all familiar types of cables
- Extension of existing switchgear at both ends without modification of panels
- Secondary multiratio for current transformers
- Baffles for various internal arc stresses

Availability
- Panel-internal control cables laid in metallic wiring ducts
- Option: Pressure-resistant floor cover
- Cable testing without isolating the switchgear possible by separately opening shutter of switching device compartment
- Extension of existing switchgear at both ends without modification of panels
- Secondary multiratio for current transformers
- Metallic partitions and shutters
- Option: Degree of protection IP51 according to IEC 60 529
- Option: Aseismic capacity according to ETGI 1020 / IEC 68-3-3 (UBC 97)
# Panel types

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

## 6.1 Product range

### Product range

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

## Circuit-breaker panel

<table>
<thead>
<tr>
<th>Description</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>3AH5/SION vacuum circuit-breaker</td>
<td><img src="symbol1" alt="Symbol" /></td>
</tr>
<tr>
<td>Disconnector links</td>
<td><img src="symbol2" alt="Symbol" /></td>
</tr>
<tr>
<td>Vacuum contactor with HV HRC fuses</td>
<td><img src="symbol3" alt="Symbol" /></td>
</tr>
<tr>
<td>Vacuum contactor with control transformer and HV HRC fuses</td>
<td><img src="symbol4" alt="Symbol" /></td>
</tr>
<tr>
<td>Make-proof earthing switch</td>
<td><img src="symbol5" alt="Symbol" /></td>
</tr>
<tr>
<td>Capacitive voltage detecting system</td>
<td><img src="symbol6" alt="Symbol" /></td>
</tr>
<tr>
<td>Surge arrester</td>
<td><img src="symbol7" alt="Symbol" /></td>
</tr>
<tr>
<td>Surge limiter</td>
<td><img src="symbol8" alt="Symbol" /></td>
</tr>
</tbody>
</table>

### Disconnecting panel

<table>
<thead>
<tr>
<th>Description</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current transformer</td>
<td><img src="symbol9" alt="Symbol" /></td>
</tr>
<tr>
<td>Voltage transformer</td>
<td><img src="symbol10" alt="Symbol" /></td>
</tr>
<tr>
<td>Voltage transformer with primary fuses</td>
<td><img src="symbol11" alt="Symbol" /></td>
</tr>
<tr>
<td>Voltage transformer, withdrawable, with/without primary fuses</td>
<td><img src="symbol12" alt="Symbol" /></td>
</tr>
<tr>
<td>HV HRC fuse</td>
<td><img src="symbol13" alt="Symbol" /></td>
</tr>
<tr>
<td>Cable sealing ends, max. 6x500 mm² per phase</td>
<td><img src="symbol14" alt="Symbol" /></td>
</tr>
<tr>
<td>Solid-insulated bar connection</td>
<td><img src="symbol15" alt="Symbol" /></td>
</tr>
<tr>
<td>Current transformer in run of busbar</td>
<td><img src="symbol16" alt="Symbol" /></td>
</tr>
</tbody>
</table>

1. The details refer to conventional RXS single-core sealing ends for XLPE cables or other makes with similar dimensions.
2. Not applicable for 435mm vacuum contactor panel.
3. Not applicable for busbar of 435mm vacuum contactor panel.
Panel design

Truck-type circuit-breaker switchgear type SIMOPRIME is modular and has three compartments.

Features

- Enclosure made of powder-coated sheet steel
- Compartments bolted together
- Each compartment has a pressure relief

6.2 Circuit-breaker panel

Circuit-breaker panels are used as incoming or outgoing feeder panels. The 3AH5/SION vacuum circuit-breaker is mounted on a truck to be moved into the panel. The vacuum circuit-breaker can break all the rated normal and short-circuit currents specified on the rating plate.

Basic equipment

- Truck with 3AH5/SION vacuum circuit-breaker
- Busbar system
- Low-voltage plug connector to be coupled mechanically between truck and panel
- Panel connection for cables

Fig. 1: SIMOPRIME circuit-breaker panel (shown with baffles for IAC 0.1s)
Additional equipment
- Insulated busbar system
- Busbar transverse partition
- Block-type current transformers at the cable feeder
- Busbar current transformers, block-type
- Voltage transformers
  - at the cable feeder
  - at the busbar (for 600 mm panels rated at $I_k \leq 31.5$ kA)
  - withdrawable type, mounted on the truck
- Surge arresters
- Surge limiters
- Busbar earthing switch with short-circuit making capacity (for 600 mm panels rated at $I_k \leq 31.5$ kA)
- Sockets for capacitive voltage detecting systems
- Feeder earthing switch with short-circuit making capacity
- Solid-insulated bar connection (only for 2500 A, 3150 A and 3600 A panels)

6.3 600 mm vacuum contactor panel with HV HRC fuses
The 600 mm vacuum contactor panel with HV HRC fuses can be equipped with the vacuum contactor types 3TL61, 3TL65 or 3TL81. The respective vacuum contactor is mounted on a truck to be moved into the basic panel.

Basic equipment
- Switching device truck with 3TL61, 3TL65 or 3TL81 vacuum contactor and HV HRC fuse-links
- Electrical tripping of vacuum contactor by HV HRC fuses
- Busbar system
- Low-voltage plug connector to be coupled mechanically between switching device truck and panel
- Panel connection for cables
- Three to six HV HRC fuses mounted on the switching device truck, according to DIN 43625, "medium" striker according to IEC 60282, and auxiliary switch for fuse trip indications

Additional equipment
- Insulated busbar system
- Busbar transverse partition
- Feeder earthing switch with short-circuit making capacity
- Sockets for capacitive voltage detecting systems
- Block-type current transformers at the cable feeder
- Busbar current transformers, block-type
- Voltage transformers
  - at the cable feeder
  - at the busbar
- Surge arresters
- Surge limiters
- Busbar earthing switch with short-circuit making capacity
- Control transformer mounted on the truck (up to 7.2 kV)
6.4 435 mm vacuum contactor panel with HV HRC fuses

The 435 mm vacuum contactor panel with HV HRC fuses can be equipped with the vacuum contactor types 3TL62, 3TL63 or 3TL66. The respective vacuum contactor is mounted on a withdrawable part to be moved into the basic panel.

**Basic equipment**
- 3TL62, 3TL63 or 3TL66 vacuum contactor fuse combination (with HV HRC fuse-links)
- Electrical tripping of vacuum contactor by HV HRC fuses
- Busbar system
- Low-voltage plug connector to be coupled mechanically between withdrawable part and panel
- Panel connection for cables
- Three to six HV HRC fuses mounted on the withdrawable part, according to DIN 43625, "medium" striker according to IEC 60282, and auxiliary switch for fuse trip indications

**Additional equipment**
- Insulated busbar system
- Busbar transverse partition
- Feeder earthing switch with short-circuit making capacity
- Sockets for capacitive voltage detecting systems
- Block-type current transformers at the cable feeder
- Surge limiters
- Control transformer mounted on the withdrawable part (up to 7.2 kV)

6.5 Disconnecting panel

Disconnecting panels can be used for no-load disconnection of two busbar sections as a part of bus sectionalizer panels, or - as incoming or outgoing feeder panels - for no-load disconnection of high-voltage cables from the busbar, or of the busbar from high-voltage cables. The disconnector links are mounted on a truck to be moved into the basic panel.

**Basic equipment**
- Truck with disconnector links
- Busbar system
- Low-voltage plug connector to be coupled mechanically between truck and panel
- Panel connection for cables

**Additional equipment**
- Insulated busbar system
- Busbar transverse partition
- Block-type current transformers at the cable feeder
- Busbar current transformers, block-type
- Voltage transformers
  - at the cable feeder
  - at the busbar (for 600 mm panels rated at \( I_k \leq 31.5 \text{ kA} \))
- Busbar earthing switch with short-circuit making capacity (for 600 mm panels rated at \( I_k \leq 31.5 \text{ kA} \))
- Sockets for capacitive voltage detecting systems
- Feeder earthing switch with short-circuit making capacity
- Solid-insulated bar connection (only for 2500 A, 3150 A and 3600 A panels)
6.6 Metering panel

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

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

**Additional equipment**
- Insulated busbar system
- Busbar transverse partition
- Sockets for capacitive voltage detecting systems
- Busbar earthing switch with short-circuit making capacity
- Three HV HRC fuses mounted on the truck, with “fuse tripped” indication
- Busbar current transformers, block-type

6.7 Bus sectionalizer panel

Bus sectionalizers consist of a circuit-breaker panel or a disconnecting panel in combination with a bus riser panel.

**Basic equipment**
- Truck with 3AH5/SION vacuum circuit-breaker or truck with disconnector links (in the circuit-breaker or the disconnecting panel)
- Busbar system
- Low-voltage plug connector to be coupled mechanically between truck and panel

**Additional equipment**
- Insulated busbar system
- Busbar transverse partition
- Metering truck (in the bus riser panel)
- Sockets for capacitive voltage detecting systems
- One set of block-type current transformers (in the circuit-breaker or the disconnecting panel)
- One set of voltage transformers (in the bus riser)
7 Components

7.1 Truck with 3AH5 vacuum circuit-breaker

Features of truck with vacuum circuit-breaker
- Integrated mechanical interlock for operating mechanism
- Mechanical position indicators for circuit-breaker
- Truck firmly interlocked with panel
- Manually operated switching device truck mechanism
- The control cables of the truck are connected with the panel through a low-voltage plug connector to be coupled manually when the circuit-breaker truck is inserted in the panel
- Option: Integrated electromagnetic and/or key/Ronis interlock for operating mechanism

![Diagram of Truck with 3AH5 vacuum circuit-breaker](image)
Basic equipment of vacuum circuit-breaker

- Operating mechanism unit for circuit-breaker
- Isolating contacts
- Mechanical interlocks
- Control board for mechanical operation
- Closing solenoid
- Mechanical “closing spring charged” indicator
- First shunt release
- Operations counter
- Circuit-breaker tripping signal
- Electrical anti-pumping device
- Varistor module for auxiliary voltage ≥ 60 V
- Auxiliary switch 6NO+6NC or 12NO+12NC

Additional equipment for vacuum circuit-breaker

- Second shunt release
- Undervoltage release
- C.t.-operated release 0.1 s
- Design for higher insulation requirements
- Voltage transformers with/without fuses

Fig. 3: 3AH5 vacuum circuit-breaker (shown without front plate)
7.2 **Truck with SION vacuum circuit-breaker**

Features of truck with vacuum circuit-breaker
- Integrated mechanical interlock for operating mechanism
- Mechanical position indicators for circuit-breaker
- Truck firmly interlocked with panel
- Manually operated switching device truck mechanism
- The control cables of the truck are connected with the panel through a low-voltage plug connector to be coupled manually when the circuit-breaker truck is inserted in the panel
- Option: Integrated electromagnetic and/or key/Ronis interlock for operating mechanism

Basic equipment of vacuum circuit-breaker

Fig. 4: Truck with SION vacuum circuit-breaker

![Diagram of truck with SION vacuum circuit-breaker]

- Contact pole
- Vacuum interrupter
- Rating plate
- Actuating opening of mechanical interlock for truck operation
- Truck
- Actuating opening for racking the switching device truck
- Fixing levers to lock the truck in the panel
- Front plate of SION circuit-breaker
- Low-voltage plug connector

Fig. 5: SION vacuum circuit-breaker

![Diagram of SION vacuum circuit-breaker]

- ON pushbutton
- Hand crank coupling
- Rating plate
- "Closing spring charged" indicator
- Operations counter
- Position indicator
- OFF pushbutton
Description

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

Additional equipment for vacuum circuit-breaker

- Second shunt release
- Undervoltage release
- C.t.-operated release 0.1 s
- Design for higher insulation requirements
- Voltage transformers with/without fuses
7.3 Vacuum contactor truck

Siemens vacuum contactors 3TL81 and 3TL6 are three-pole indoor contactors for rated voltages from 7.2 kV to 12 kV. The vacuum contactors are load-break devices with electromagnetic operating mechanism for high switching rates and unlimited operating time. Depending on the design, the electromagnetic operating mechanism is suitable for AC or DC operation. For short-circuit protection, the vacuum contactors are equipped with a maximum of two HV HRC fuse-links per phase.

Fig. 7: Truck with vacuum contactor 3TL81

- Integrated mechanical interlock for operating mechanism
- Truck firmly interlocked with panel
- Manually operated switching device truck mechanism
- The control cables of the truck are connected with the panel through a low-voltage plug connector to be coupled manually when the contactor truck is inserted in the panel
- Option: Integrated electromagnetic and/or key/Ronis interlock for operating mechanism
- Option: Control transformer with HV HRC fuse-links (up to 7.2 kV)

NOTE!
The requirements regarding equipment and features of the vacuum contactors depends on the local technical conditions. The exact equipment of the switching devices is defined in the order documents.

☞ Observe the specifications in the order documents.
Description

**Basic equipment of vacuum contactor**
- Operating mechanism box with electromagnetic operating mechanism and control elements for unlimited operating time
- Three contactor poles with vacuum interrupters

The operating mechanism box accommodates all electrical and mechanical components required for closing and opening the contactor. The rating plate is mounted on the operating mechanism box.

**Additional equipment of vacuum contactor**
- Electromechanical closing latch with electrical and mechanical release

The vacuum contactor has opening springs to ensure that the contactor switches off if the supply voltage fails, as long as there is no additional latch installed to prevent involuntary shutdown.

### 7.4 Withdrawable vacuum contactor

Siemens vacuum contactors 3TL62, 3TL63 and 3TL66 are three-pole indoor contactor fuse combinations for rated voltages from 7.2 kV to 12 kV. The vacuum contactors are load-break devices with electromagnetic operating mechanism for high switching rates and unlimited operating time. Depending on the design, the electromagnetic operating mechanism is suitable for AC or DC operation. For short-circuit protection, the vacuum contactors are equipped with a maximum of two HV HRC fuse-links per phase.

![Fig. 8: Withdrawable vacuum contactor 3TL62](image-url)

**NOTE!**

The requirements regarding equipment and features of the vacuum contactors depends on the local technical conditions. The exact equipment of the switching devices is defined in the order documents.

➔ Observe the specifications in the order documents.
Description

Features of truck with vacuum contactor
- Integrated mechanical interlock for operating mechanism
- Withdrawable part firmly interlocked with panel
- Manual operation switching for withdrawable part
- The control cables of the truck are connected with the panel through a low-voltage plug connector to be coupled manually when the contactor truck is inserted in the panel
- Option: Integrated electromagnetic and/or key/Ronis \textsuperscript{®} interlock for operating mechanism
- Option: Control transformer with HV HRC fuse-links (up to 7.2 kV)

Basic equipment of vacuum contactor
- Operating mechanism box with electromagnetic operating mechanism and control elements for unlimited operating time
- Three contactor poles with vacuum interrupters

The operating mechanism box accommodates all electrical and mechanical components required for closing and opening the contactor. The rating plate is mounted on the operating mechanism box.

Additional equipment of vacuum contactor
- Electromechanical closing latch with electrical and mechanical release

The vacuum contactor has opening springs to ensure that the contactor switches off if the supply voltage fails, as long as there is no additional latch installed to prevent involuntary shutdown.

7.5 Disconnector truck

![Fig. 9: Disconnector truck](image)

1. Disconnector links
2. Fixing levers to lock the truck in the panel
3. Truck
Features of disconnector truck
- Truck firmly interlocked with panel
- Manually operated disconnector truck mechanism
- The control cables of the truck are connected with the panel through a low-voltage plug connector to be coupled manually when the disconnector truck is inserted in the panel
- Option: Integrated electromagnetic and/or key/Ronis interlock for operating mechanism

Basic equipment
- Disconnector links

7.6 Metering truck

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

Basic equipment
- Instrument transformers for all three phases

Additional equipment
- Three primary fuses mounted on the truck (with fuse tripped indication)
7.7 Busbar compartment

Fig. 11: Busbar compartment with 2500 A busbars

**Basic equipment**
- Version with rated normal current 1250 A, 2500 A, 3150 A or 3600 A (conductor bar connections Cu-Ag as per IEC 62 271-1)
- Busbars made of bare flat copper, bolted from panel to panel
- Pressure relief to the rear into the pressure relief duct

**Additional equipment**
- Insulated busbars
- Transverse partition from panel to panel
- Capacitive voltage taps in post insulators
- Busbar voltage transformers (up to 31.5 kA only for panels with a width of 600 mm)
- Busbar earthing switch (up to 31.5 kA only for panels with a width of 600 mm)

7.8 Additional compartment to the busbar compartment of a single panel

An additional compartment can be mounted on the busbar compartment for installation of a busbar earthing switch or busbar voltage transformers. The additional compartment is pre-assembled at the factory. It is available only for 600 mm panels up to 31.5 kA.

Fig. 12: Additional compartment for busbar earthing switch

**Basic equipment**
- Design for busbar earthing switch
- Design for busbar voltage transformers
7.9 Additional compartment to the busbar compartment of a double panel

An additional compartment can be mounted on the busbar compartments of double panels. It is designed for installation of busbar current transformers. The additional compartment is pre-assembled at the factory. These two panels are shipped as double panels.

![Additional compartment to the busbar compartment of a double panel](image13)

**Basic equipment**
- Design for busbar current transformers

7.10 Cable compartment

The cable connection in truck-type or withdrawable SIMOPRIME switchgear can be accessed either from the front or from the rear.

![Cable compartment](image14)

**Basic equipment**
- Version with rated normal current 630 A, 1000 A, 1250 A, 2500 A, 3150 A or 3600 A (conductor bar connections Cu-Ag as per EN 62 271-1)
- Panel bars made of bare flat copper
- Pressure relief upwards through the pressure relief duct
**Possible connections**
- Cables: Single-core XLPE up to max. $2 \times 500 \text{ mm}^2$ (for 600 mm panel width) / $6 \times 500 \text{ mm}^2$ (for 800 mm panel width) per phase, or three-core XLPE up to max. $300 \text{ mm}^2$ with RXS sealing ends or other types with similar dimensions
- Flat copper bars with bushings in the floor cover

**Additional equipment**
- Block-type current transformers
- Voltage transformers can be installed optionally, max. 3 nos. 1-pole
- Surge arresters or limiters
- Make-proof earthing switch
- Panel heater
- Sockets for capacitive voltage detecting systems

**7.11 Low-voltage compartment**

**Basic equipment**
- Completely partitioned off the panel and removable from the panel as a separate unit
- For accommodation of protection, control, measuring and metering equipment
- Plug-in bus wires and control cables
- Standard version with 700 mm height
- Option: 1000 mm height (only for 0.1 s arc duration)
- Door hinge on the left

**Additional equipment**
- Heater
7.12 Current transformers

Features
- According to IEC 60044-1
- Block-type current transformers, cast-resin insulated

Mounting locations
The block-type current transformers can be installed in the cable compartment of circuit-breaker, vacuum contactor or bus sectionalizer panels. The block-type current transformers can also be installed on the busbar in the additional compartment on top of a double panel.

7.13 Voltage transformers

Features
- According to IEC 60044-2
- Voltage transformers, cast-resin insulated

Mounting locations
Voltage transformers can be mounted on the circuit-breaker truck or the metering truck, in the cable compartment or at the busbar. Voltage transformers on the metering truck can be equipped with fuses.
7.14 Forced ventilation

A radial fan, which can be operated either by current or ambient temperature control, is mounted on top of the ventilation duct in panels with forced ventilation. A second fan, which operates if the first fan fails, is used for redundant forced ventilation. The redundant system is not a must, but an option.

Basic equipment
- Radial fan

<table>
<thead>
<tr>
<th>Rated feeder or bus sectionalizer current [A]</th>
<th>Current-controlled setting</th>
<th>Ambient-temperature-controlled setting T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current value [A]</td>
<td>Current ratio [%]</td>
<td>T = T_A + 10 K</td>
</tr>
<tr>
<td>2500</td>
<td>1750</td>
<td>(T_A: Ambient temperature)</td>
</tr>
<tr>
<td>3150</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>3600</td>
<td>2200</td>
<td></td>
</tr>
</tbody>
</table>
8  Interlocks

8.1  Interlocks for vacuum contactor panels and circuit-breaker panels

### Mechanical interlocks

<table>
<thead>
<tr>
<th>Action</th>
<th>Interlocking condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Racking the switching device truck either from TEST to SERVICE or from SERVICE to TEST position</td>
<td>Circuit breaker/vacuum contactor is in OPEN position</td>
</tr>
<tr>
<td>Operating (closing or opening) the circuit-breaker/vacuum contactor</td>
<td>Switching device truck is locked in SERVICE or TEST position, or switching device truck is out of the switching device compartment</td>
</tr>
<tr>
<td>Closing the circuit-breaker/vacuum contactor in SERVICE position</td>
<td>Low-voltage plug connector on circuit-breaker/vacuum contactor is plugged in; truck has reached defined end position (locked in SERVICE position)</td>
</tr>
<tr>
<td>Removing the low-voltage plug connector from the circuit-breaker/vacuum contactor</td>
<td>Switching device truck is in TEST position</td>
</tr>
<tr>
<td>Interrupting auxiliary voltage at the circuit-breaker/vacuum contactor</td>
<td>Switching device truck is in TEST position</td>
</tr>
<tr>
<td>Opening the door to the switching device compartment</td>
<td>Switching device truck is in TEST position</td>
</tr>
<tr>
<td>Closing the door to the switching device compartment</td>
<td>Low-voltage plug connector on circuit-breaker/vacuum contactor is plugged in; ramps are folded in</td>
</tr>
<tr>
<td>Racking the switching device truck to SERVICE position</td>
<td>Door to switching device compartment is closed and locked</td>
</tr>
<tr>
<td>Replacing the switching device truck</td>
<td>Switching device truck can only be replaced if ratings are identical</td>
</tr>
<tr>
<td></td>
<td>Switching device truck can only be replaced if low-voltage plug connector is correctly coded</td>
</tr>
</tbody>
</table>

### Additional interlocks (option)

<table>
<thead>
<tr>
<th>Action</th>
<th>Interlocking condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Racking the switching device truck either from TEST to SERVICE or from SERVICE to TEST position</td>
<td>Electromagnetic interlocking coil is pulled</td>
</tr>
<tr>
<td></td>
<td>Padlock for locking the switching device truck is removed</td>
</tr>
<tr>
<td></td>
<td>Key (of key/Ronis interlock) is inserted and turned to LOCKED position</td>
</tr>
</tbody>
</table>

8.2  Interlocks for panels with feeder earthing switch

### Mechanical interlocks

<table>
<thead>
<tr>
<th>Action</th>
<th>Interlocking condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closing the feeder earthing switch</td>
<td>Switching device truck is locked in TEST position</td>
</tr>
<tr>
<td>Racking the switching device truck to SERVICE position</td>
<td>Feeder earthing switch is in OPEN position</td>
</tr>
</tbody>
</table>

### Additional interlocks (option)

<table>
<thead>
<tr>
<th>Action</th>
<th>Interlocking condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating (closing or opening) the feeder earthing switch</td>
<td>Electromagnetic interlocking coil is pulled</td>
</tr>
<tr>
<td></td>
<td>Padlock for locking earthing switch is removed</td>
</tr>
<tr>
<td></td>
<td>Related key (of key/Ronis interlocking) is inserted and rotated to CAPTURED position</td>
</tr>
</tbody>
</table>
9 Accessories

Standard accessories
The following accessories are supplied with the switchgear:

- Operating rod for closing/opening the circuit-breaker mechanically
- Double-bit key for the door of the switching device compartment
- Double-bit key for the door of the low-voltage compartment
- Operating lever for the feeder or busbar earthing switch
- Hand crank for racking the switching device truck in and out
- Hand crank for charging the circuit-breaker closing spring
- Ramp for moving the truck into or out of 800 mm panels (only with SION VCB)

Other accessories
According to the order documents/purchase order (selection):

- HV HRC fuse-links
- Cable plugs / adapter systems
- Operating lever for shutter operation
- Surge arresters / limiters
- LRM voltage indicators
- Test units to check the capacitive interface and the voltage indicators

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

- Wall-mounting holder for accessories
- Earthing accessories for 25 kA/1 s version
- Touch-up set for paint damages
- 64-pole connecting cable, length: 3 m
- Lubricants
10 Technical data

10.1 Complete switchgear

### Electrical data

<table>
<thead>
<tr>
<th>Description</th>
<th>Rated voltage</th>
<th>U_r (kV)</th>
<th>7.2</th>
<th>12</th>
<th>17.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated short-duration power-frequency withstand voltage</td>
<td>U_d (kV)</td>
<td>20(^1)</td>
<td>28(^2)</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage</td>
<td>U_p (kV)</td>
<td>80(^3)</td>
<td>75/65(^4) 95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated frequency</td>
<td>f_r (Hz)</td>
<td>50/60</td>
<td>50/60</td>
<td>50/60</td>
<td></td>
</tr>
<tr>
<td>Rated short-circuit breaking current</td>
<td>I_{SC} (kA)</td>
<td>25/31.5/40(^5)</td>
<td>25/31.5/40(^6)</td>
<td>25/31.5/40(^6)</td>
<td></td>
</tr>
<tr>
<td>Rated short-circuit making current</td>
<td>I_{ma} (kA)</td>
<td>65/82/104(^5)</td>
<td>65/82/104(^5)</td>
<td>65/82/104(^5)</td>
<td></td>
</tr>
<tr>
<td>Rated peak withstand current</td>
<td>I_{p} (kA)</td>
<td>65/82/104(^5)</td>
<td>65/82/104(^5)</td>
<td>65/82/104(^5)</td>
<td></td>
</tr>
<tr>
<td>Rated short-time withstand current</td>
<td>I_k (kA)</td>
<td>25/31.5/40(^4)</td>
<td>25/31.5/40(^4)</td>
<td>25/31.5/40(^4)</td>
<td></td>
</tr>
<tr>
<td>Rated short-circuit duration</td>
<td>I_k (sec)</td>
<td>max. 3(^4)</td>
<td>max. 3(^4)</td>
<td>max. 3(^4)</td>
<td></td>
</tr>
<tr>
<td>Rated normal current of the busbar</td>
<td>I_f (A)</td>
<td>1250/2500/3150/3600(^5)</td>
<td>1250/2500/3150/3600(^5)</td>
<td>1250/2500/3150/3600(^5)</td>
<td></td>
</tr>
<tr>
<td>Rated normal current for incoming and outgoing feeders</td>
<td>I_r (A)</td>
<td>400/630/1000/1250/2500/3150/3600(^6)</td>
<td>400/630/1000/1250/2500/3150/3600(^6)</td>
<td>400/630/1000/1250/2500/3150/3600(^6)</td>
<td></td>
</tr>
<tr>
<td>Ambient air temperature</td>
<td>T_a °C</td>
<td>-5 to +40</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) Optional: 32 kV for GOST
2) Optional: 42 kV for GOST
3) 40 kV across open contacts for vacuum contactor panels
4) Depending on the design.
5) 60 kV across open contacts for vacuum contactor panels
95 kV is not available for vacuum contactor panels

### Panel dimensions in mm

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Panel type</th>
<th>[A]</th>
<th>[≤ 31.5 kA]</th>
<th>[40 kA]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>Circuit-breaker panel</td>
<td>[≤ 1250]</td>
<td>600 (^1)</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>2500/3150/3600</td>
<td>800</td>
<td>800</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Contactor panel</td>
<td>–</td>
<td>435/600</td>
<td>435</td>
</tr>
<tr>
<td></td>
<td>Disconnecting panel</td>
<td>[≤ 1250]</td>
<td>600 (^2)</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>2500/3150/3600</td>
<td>800</td>
<td>800</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bus sectionalizer/circuit-breaker panel</td>
<td>[≤ 1250]</td>
<td>600 (^1)</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>2500/3150/3600</td>
<td>800</td>
<td>800</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bus sectionalizer/bus riser panel</td>
<td>[≤ 2500]</td>
<td>600</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>3150/3600</td>
<td>800</td>
<td>800</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Metering panel</td>
<td>–</td>
<td>600</td>
<td>800</td>
</tr>
<tr>
<td>Height</td>
<td>Without low-voltage compartment</td>
<td>–</td>
<td>1780</td>
<td>1780</td>
</tr>
<tr>
<td></td>
<td>With standard low-voltage compartment, IAC = 0.1 s</td>
<td>–</td>
<td>2253</td>
<td>2253</td>
</tr>
<tr>
<td></td>
<td>With standard low-voltage compartment, IAC = 1.0 s</td>
<td>–</td>
<td>2425</td>
<td>2460</td>
</tr>
<tr>
<td>Depth</td>
<td>Circuit-breaker, disconnector, metering and bus sectionalizer panels</td>
<td>–</td>
<td>1860</td>
<td>1860</td>
</tr>
<tr>
<td></td>
<td>Contactor panel</td>
<td>–</td>
<td>1837</td>
<td>1837</td>
</tr>
</tbody>
</table>

1) 1250 A panel with SION VCB has a width of 800 mm
2) 1250 A disconnecting panel in switchgear using SION-VCB has a width of 800 mm
Dimensions of switchgear room in mm

<table>
<thead>
<tr>
<th>Height</th>
<th>Switchgear room, minimum</th>
<th>2800</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>Control aisle</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- for 435 mm panel width, minimum</td>
<td>1500</td>
</tr>
<tr>
<td></td>
<td>- for 600 mm panel width, minimum</td>
<td>1500</td>
</tr>
<tr>
<td></td>
<td>- for 800 mm panel width, minimum</td>
<td>1500</td>
</tr>
</tbody>
</table>

Transport weights

For transport weights, weights of additional components and max. dimensions for transport packing, see Page 44, "Packing and transport unit".

Protection against solid foreign objects, electric shock and water

SIMOPRIME switchgear complies with the following degrees of protection according to IEC 60529:

- IP4X for switchgear enclosure of the operating front and the side walls
- IP2X for internal connections
- Option: IP51 for the complete switchgear enclosure

<table>
<thead>
<tr>
<th>Degree of protection</th>
<th>Type of protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP4X</td>
<td>Protection against solid foreign objects: Protected against solid foreign objects, diameter 1 mm.</td>
</tr>
<tr>
<td></td>
<td>Protection against electric shock: Protected against access to hazardous parts with a wire (the access probe of 1 mm diameter shall not penetrate).</td>
</tr>
<tr>
<td>IP2X</td>
<td>Protection against solid foreign bodies: Protected against solid foreign bodies, diameter &gt;12.5 mm.</td>
</tr>
<tr>
<td></td>
<td>Protection against electric shock: Protected against access to hazardous parts with a finger (the jointed test finger of 12 mm diameter, 80 mm length, shall have adequate clearance from hazardous parts).</td>
</tr>
<tr>
<td>IP51</td>
<td>Protection against solid foreign objects: Dust-protected.</td>
</tr>
<tr>
<td></td>
<td>Protection against electric shock: Protected against access to hazardous parts with a wire (the access probe of 1 mm diameter shall not penetrate).</td>
</tr>
<tr>
<td></td>
<td>Protection against ingress of water: Protected against vertically falling water drops.</td>
</tr>
</tbody>
</table>

Environmental conditions

SIMOPRIME switchgear can be used under the below mentioned climate classes according to IEC 60721-3-3.

<table>
<thead>
<tr>
<th>Environmental parameter</th>
<th>Unit</th>
<th>Climate classes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>3K3</td>
</tr>
<tr>
<td>Low air temperature</td>
<td>°C</td>
<td>+5</td>
</tr>
<tr>
<td>High air temperature</td>
<td>°C</td>
<td>+40</td>
</tr>
<tr>
<td>Low relative humidity</td>
<td>%</td>
<td>5</td>
</tr>
<tr>
<td>High relative humidity</td>
<td>%</td>
<td>85</td>
</tr>
<tr>
<td>Low relative humidity</td>
<td>g/m³</td>
<td>1</td>
</tr>
<tr>
<td>High relative humidity</td>
<td>g/m³</td>
<td>29</td>
</tr>
<tr>
<td>Rate of change of temperature</td>
<td>°C/min</td>
<td>0.5</td>
</tr>
<tr>
<td>Low air pressure²</td>
<td>kPa</td>
<td>70</td>
</tr>
<tr>
<td>High air pressure²</td>
<td>kPa</td>
<td>106</td>
</tr>
<tr>
<td>Condensation</td>
<td>–</td>
<td>No</td>
</tr>
<tr>
<td>Wind driven precipitaion (rain, snow, hail, etc.)</td>
<td>–</td>
<td>No</td>
</tr>
<tr>
<td>Formation of ice</td>
<td>–</td>
<td>No</td>
</tr>
</tbody>
</table>

1) Averaged period of time of 5 min.
2) Severity value of 70 kPa covers worldwide application (altitudes up to 3000 m)
3) Conditions in mines are not considered
Usage of heaters

Heaters can be used in switching device and cable compartments, if ambient temperature is lower and relative humidity is higher than defined values for climate class 3K3. For this purpose the heater control devices, such as thermostats and hydostats, must be set to maximum 85 % humidity and minimum +5 °C temperature.

Basic prescriptions and standards

The truck-type or withdrawable circuit-breaker switchgear SIMOPRIME for indoor installation complies with the following prescriptions and standards:

<table>
<thead>
<tr>
<th>IEC/EN Standard</th>
<th>VDE Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switchgear</td>
<td>60 694 / 62 271-1</td>
</tr>
<tr>
<td></td>
<td>60 298 / 62 272-200</td>
</tr>
<tr>
<td></td>
<td>0670-6 / 0671-200</td>
</tr>
<tr>
<td>Switching devices</td>
<td>62 271-100</td>
</tr>
<tr>
<td></td>
<td>62 271-102</td>
</tr>
<tr>
<td></td>
<td>0671-100</td>
</tr>
<tr>
<td></td>
<td>0671-102</td>
</tr>
<tr>
<td>Voltage detecting systems</td>
<td>61 243-5</td>
</tr>
<tr>
<td></td>
<td>0682-415</td>
</tr>
<tr>
<td>Surge arresters</td>
<td>60 099</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>60 529</td>
</tr>
<tr>
<td>Instrument transformers</td>
<td>60 044-1</td>
</tr>
<tr>
<td></td>
<td>60 044-2</td>
</tr>
<tr>
<td></td>
<td>0414-1</td>
</tr>
<tr>
<td></td>
<td>0414-2</td>
</tr>
<tr>
<td>Installation</td>
<td>61 936-1</td>
</tr>
<tr>
<td>Environmental conditions</td>
<td>60 721-3-3</td>
</tr>
<tr>
<td></td>
<td>DIN EN 60 721-3-3</td>
</tr>
</tbody>
</table>

X-ray regulations

The vacuum interrupters fitted in the vacuum circuit-breakers 3AH5/SION and the vacuum contactors 3TL6/8 are type-approved in accordance with the X-ray regulations of the Federal Republic of Germany. They conform to the requirements of the X-ray regulations of January 8, 1987 (Federal Law Gazette I Page 144) §8 and Annex III Section 5 up to rated short-duration power-frequency voltage (rated power-frequency withstand voltage) stipulated in accordance with IEC/DIN VDE.

Electromagnetic compatibility - EMC

The a.m. standards as well as the "EMC Guide for Switchgear"* are applied during design, manufacture and erection of the switchgear. Installation, connection and maintenance have to be performed in accordance with the stipulations of the operating instructions. For operation, the legal stipulations applicable at the place of installation have to be observed additionally. In this way, the switchgear assemblies of this type series fulfill the basic protection requirements of the EMC guide.

The switchgear operator / owner must keep the technical documents supplied with the switchgear throughout the entire service life, and keep them up-to-date in case of modifications of the switchgear.

* (Dr. Bernd Jäkel, Ansgar Müller; Medium-Voltage Systems - EMV Guide for Switchgear; A&D ATS SR/PTD M SP)
10.2 Rating plates

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

Rating plates are located:

- On the inside of the door of the low-voltage compartment (rating plates for switchgear panel, current/voltage transformers)
- On the operating mechanism of the vacuum contactor (rating plate for contactor)
- On the gear block or on the right of the terminal strip of the circuit-breaker (circuit-breaker rating plate)

Fig. 16: Rating plate: Switchgear panel

![Rating plate: Switchgear panel](image1)

Fig. 17: Rating plate: Circuit-breaker

![Rating plate: Circuit-breaker](image2)

Fig. 18: Rating plate: Switchgear panel GOST

![Rating plate: Switchgear panel GOST](image3)
### 10.3 3AH5 vacuum circuit-breaker

#### Operating times

<table>
<thead>
<tr>
<th>Operating times</th>
<th>Component</th>
<th>Duration</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closing time</td>
<td>–</td>
<td>&lt;75</td>
<td>ms</td>
</tr>
<tr>
<td>Charging time</td>
<td>–</td>
<td>&lt;10</td>
<td>s</td>
</tr>
<tr>
<td>Opening time</td>
<td>Shunt release (Y1)</td>
<td>&lt;65</td>
<td>ms</td>
</tr>
<tr>
<td></td>
<td>Additional release 3AX 11 (Y2), (Y4),(Y7)</td>
<td>&lt;50</td>
<td>ms</td>
</tr>
<tr>
<td>Arcing time</td>
<td>–</td>
<td>&lt;15</td>
<td>ms</td>
</tr>
<tr>
<td>Break time</td>
<td>Shunt release (Y1)</td>
<td>&lt;80</td>
<td>ms</td>
</tr>
<tr>
<td></td>
<td>Additional release 3AX 11 (Y2), (Y4),(Y7)</td>
<td>&lt;65</td>
<td>ms</td>
</tr>
<tr>
<td>Dead time</td>
<td>–</td>
<td>300</td>
<td>ms</td>
</tr>
<tr>
<td>Close-open contact time</td>
<td>Shunt release (Y1)</td>
<td>&lt;75</td>
<td>ms</td>
</tr>
<tr>
<td></td>
<td>Additional release 3AX 11 (Y2), (Y4),(Y7)</td>
<td>&lt;60</td>
<td>ms</td>
</tr>
<tr>
<td>Minimum command duration</td>
<td>Closed solenoid (Y9)</td>
<td>45</td>
<td>ms</td>
</tr>
<tr>
<td></td>
<td>Shunt release (Y1)</td>
<td>40</td>
<td>ms</td>
</tr>
<tr>
<td></td>
<td>Additional release 3AX 11 (Y2), (Y4),(Y7)</td>
<td>20</td>
<td>ms</td>
</tr>
</tbody>
</table>

#### Number of operating cycles

<table>
<thead>
<tr>
<th>Number of operating cycles</th>
<th>Rated normal current</th>
<th>10 000 times</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Short-circuit breaking current</td>
<td>25 times</td>
</tr>
</tbody>
</table>

#### Motor operating mechanism

The operating mechanisms of the 3AH circuit-breakers are suitable for auto-reclosing.

For DC operation, the maximum power consumption is approx. 350 W. For AC operation, the maximum power consumption is approx. 400 VA.

The rated currents of the motor protection equipment are shown in the following table:

<table>
<thead>
<tr>
<th>Rated supply voltage V</th>
<th>Recommended rated current for the protection equipment* A</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC 24 V</td>
<td>8 A</td>
</tr>
<tr>
<td>DC 48 V</td>
<td>6 A</td>
</tr>
<tr>
<td>DC 90 V</td>
<td>4 A</td>
</tr>
<tr>
<td>DC/AC 110 V 50/60 Hz</td>
<td>2 A</td>
</tr>
<tr>
<td>DC 220 V 50/60 Hz</td>
<td>1.6 A</td>
</tr>
</tbody>
</table>

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

The supply voltage may deviate from the rated supply voltage specified in the table by -15% to +10%.
### Features of auxiliary switch (3SV92)

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

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

<table>
<thead>
<tr>
<th>Breaking capacity</th>
<th>Operating voltage [V]</th>
<th>Normal current [A]</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC 40 to 60 Hz</td>
<td>up to 230</td>
<td>10</td>
</tr>
<tr>
<td>DC</td>
<td>24</td>
<td>Resistive load</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inductive load</td>
</tr>
<tr>
<td>24</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>48</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td>60</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>110</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>220</td>
<td>2.5</td>
<td>2</td>
</tr>
</tbody>
</table>

### Closing solenoid (Y9)

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

### Shunt releases

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

Shunt releases based on two different principles are used:

- **The shunt release (Y1) 3AY1510** is used as standard in the basic circuit-breaker version. With this design, the circuit-breaker is opened electrically. Power consumption: 140 W or 140 VA.

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

### Undervoltage release

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

### Circuit-breaker tripping signal

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

### C.t.-operated release (Y6)

The c.t.-operated release 3AX1104 is adequate for a tripping pulse of ≤ 0.1 Ws in connection with adequate protection systems. If auxiliary voltage is missing, tripping takes place via protection relay.
Varistor module

**ATTENTION!**

Switching overvoltages can damage electronic control devices.

 ⇒ Do not switch off inductive consumers in DC circuits.

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

### 10.4 SION vacuum-circuit-breaker

#### Operating times

<table>
<thead>
<tr>
<th>Operating times</th>
<th>Component</th>
<th>Duration</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closing time</td>
<td>–</td>
<td>&lt;75</td>
<td>ms</td>
</tr>
<tr>
<td>Charging time</td>
<td>–</td>
<td>&lt;10</td>
<td>s</td>
</tr>
<tr>
<td>Opening time</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; shunt release</td>
<td>&lt;65</td>
<td>ms</td>
</tr>
<tr>
<td></td>
<td>Additional release 3AX 11</td>
<td>&lt;50</td>
<td>ms</td>
</tr>
<tr>
<td>Arcing time</td>
<td>–</td>
<td>&lt;15</td>
<td>ms</td>
</tr>
<tr>
<td>Break time</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; shunt release</td>
<td>&lt;80</td>
<td>ms</td>
</tr>
<tr>
<td></td>
<td>Additional release 3AX 11</td>
<td>&lt;65</td>
<td>ms</td>
</tr>
<tr>
<td>Dead time</td>
<td>–</td>
<td>300</td>
<td>ms</td>
</tr>
<tr>
<td>Close-open contact time</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; shunt release</td>
<td>&lt;75</td>
<td>ms</td>
</tr>
<tr>
<td></td>
<td>Additional release 3AX 11</td>
<td>&lt;60</td>
<td>ms</td>
</tr>
</tbody>
</table>

Minimum command duration

<table>
<thead>
<tr>
<th>Command</th>
<th>Component</th>
<th>Duration</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLOSE</td>
<td>Closing solenoid</td>
<td>(Y9)</td>
<td>45</td>
</tr>
<tr>
<td>OPEN</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; shunt release</td>
<td>(Y1)</td>
<td>40</td>
</tr>
<tr>
<td>OPEN</td>
<td>Additional release 3AX 11</td>
<td>(Y2),(Y4),(Y7)</td>
<td>20</td>
</tr>
</tbody>
</table>

Pulse time for circuit-breaker tripping signal

<table>
<thead>
<tr>
<th>Component</th>
<th>Duration</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; shunt release</td>
<td>–</td>
<td>&gt;15</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt; release</td>
<td>–</td>
<td>&gt;10</td>
</tr>
</tbody>
</table>

Synchrism error between the poles

|                | –  | 2   | ms |

#### Number of operating cycles

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated normal current</td>
<td>10000 times</td>
<td></td>
</tr>
<tr>
<td>Short-circuit breaking current</td>
<td>50 times</td>
<td></td>
</tr>
</tbody>
</table>
### Short circuit protection of motors (fuse protection of drive motors)

<table>
<thead>
<tr>
<th>Rated voltage of the motor</th>
<th>Operating voltage</th>
<th>Power consumption of the motor</th>
<th>Smallest possible rated current(^1) of the m.c.b. (miniature circuit-breaker) with C characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>max.V</td>
<td>min.V</td>
<td>W (at DC)</td>
</tr>
<tr>
<td>DC 24</td>
<td>26</td>
<td>20</td>
<td>350</td>
</tr>
<tr>
<td>DC 48</td>
<td>53</td>
<td>41</td>
<td>350</td>
</tr>
<tr>
<td>DC 60</td>
<td>66</td>
<td>51</td>
<td>350</td>
</tr>
<tr>
<td>DC 110</td>
<td>121</td>
<td>93</td>
<td>350</td>
</tr>
<tr>
<td>DC 220</td>
<td>242</td>
<td>187</td>
<td>350</td>
</tr>
<tr>
<td>AC 110</td>
<td>121</td>
<td>93</td>
<td>–</td>
</tr>
<tr>
<td>AC 230</td>
<td>244</td>
<td>187</td>
<td>–</td>
</tr>
</tbody>
</table>

\(^1\) The current inrush in the drive motor can be neglected due to its very short presence.

### Consumption data of releases

<table>
<thead>
<tr>
<th>Release</th>
<th>Power consumption</th>
<th>Tripping ranges</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Operation at DC approx. W</td>
<td>AC approx. VA</td>
</tr>
<tr>
<td>Closing solenoid 3AY15 10</td>
<td>140</td>
<td>140</td>
</tr>
<tr>
<td>1(^{st}) shunt release (without energy store) 3AY15 10</td>
<td>140</td>
<td>140</td>
</tr>
<tr>
<td>2(^{nd}) shunt release (without energy store) 3AY11 01</td>
<td>70</td>
<td>50</td>
</tr>
<tr>
<td>Undervoltage release 3AY11 03</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Current-transformer operated release 3AX11 02 (rated normal current 0.5A or 1A)</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Current-transformer operated release 3AX11 04 (tripping pulse ≥ 0.1Ws)</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

\(^2\) Consumption at pickup current (90% of the rated normal current) and open armature
10.5  Vacuum contactor 3TL81, 3TL61 and 3TL65

<table>
<thead>
<tr>
<th>Parameter</th>
<th>3TL81</th>
<th>3TL61</th>
<th>3TL65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage  $U_r$ [kV]</td>
<td>7.2</td>
<td>7.2</td>
<td>12</td>
</tr>
<tr>
<td>Rated current  $I_r$ [A]</td>
<td>400</td>
<td>450</td>
<td>400</td>
</tr>
<tr>
<td>Rated making current  $I_{ma}$ [kA]</td>
<td>4</td>
<td>4.5</td>
<td>4</td>
</tr>
<tr>
<td>Rated breaking current  $I_{SC}$ [kA]</td>
<td>3.2</td>
<td>3.6</td>
<td>3.2</td>
</tr>
<tr>
<td>Rated short-time withstand current (1 s)  $I_k$ [kA]</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage  $U_p$ [kV]</td>
<td>$60^1$</td>
<td>$60^1$</td>
<td>$75^2$</td>
</tr>
<tr>
<td>Rated short-duration power frequency withstand voltage  $U_d$ [kV]</td>
<td>20</td>
<td>32$^3$</td>
<td>28</td>
</tr>
<tr>
<td>Auxiliary contacts for contactor</td>
<td>-</td>
<td>-</td>
<td>max. 8NO+7NC</td>
</tr>
<tr>
<td>Operating life cycle</td>
<td>-</td>
<td>-</td>
<td>0.25 million</td>
</tr>
</tbody>
</table>

1) 40 kV across the open contact gap
2) 60 kV across the open contact gap
3) GOST certificated contactor: 20 kV across open contacts

10.6  Vacuum contactor 3TL62, 3TL63 and 3TL66

<table>
<thead>
<tr>
<th>Parameter</th>
<th>3TL62</th>
<th>3TL63</th>
<th>3TL66</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage  $U_r$ [kV]</td>
<td>7.2</td>
<td>7.2</td>
<td>12</td>
</tr>
<tr>
<td>Rated current  $I_r$ [A]</td>
<td>450</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>Rated making current  $I_{ma}$ [kA]</td>
<td>4.5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Rated breaking current  $I_{SC}$ [kA]</td>
<td>3.6</td>
<td>3.2</td>
<td>3.2</td>
</tr>
<tr>
<td>Rated short-time withstand current (1 s)  $I_k$ [kA]</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Rated lightning impulse withstand voltage  $U_p$ [kV]</td>
<td>$60^1$</td>
<td>$60^1$</td>
<td>$75^2$</td>
</tr>
<tr>
<td>Rated short-duration power frequency withstand voltage  $U_d$ [kV]</td>
<td>20</td>
<td>32</td>
<td>28</td>
</tr>
<tr>
<td>Auxiliary contacts for contactor</td>
<td>-</td>
<td>-</td>
<td>max. 8NO+7NC</td>
</tr>
<tr>
<td>Operating life cycle</td>
<td>-</td>
<td>-</td>
<td>1 million</td>
</tr>
</tbody>
</table>

1) 40 kV across the open contact gap
2) 60 kV across the open contact gap

10.7  Circuit diagrams

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

11.1 Maintenance
The vacuum circuit-breakers used are maintenance-free within the range of the permissible operating cycles. Under normal environmental and operating conditions, the switchgear has maintenance intervals of 10 years.

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

Please contact your regional Siemens representative for switchgear extensions and component replacements.

11.3 Spare part orders
Required information when ordering spare parts for single parts and devices:
- Type and serial number of switchgear as per rating plates
- Precise designation of the device or component, if applicable on the basis of the information and illustrations in the associated instructions, a drawing, sketch or circuit diagram

11.4 Replacement of switchpanels and components

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

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

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

12 Preparing installation

12.1 Preliminary clarifications

In order to load the transport units in a suitable installation order, the regional Siemens representative requires the following information from you several weeks before delivering the switchgear:

- Sketch of the installation room including the locations and numbers of the individual switchpanels and the storage space for the accessories.
- Sketch of the access route from the public road to the switchgear building and information concerning the condition thereof (meadows, arable soil, sand, gravel, etc.).
- Sketch of the transport route inside the switchgear building with the locations and dimensions of doors and other narrow points, as well as the floor number of the installation room.
- Information about available lifting equipment, e.g. mobile crane, fork-lift truck, lifting truck, hydraulic jack, roller pads. If no lifting equipment is available, please notify this explicitly.

12.2 Switchgear room

Please observe the following points when preparing the switchgear room:

- Transport ways to the switchgear room
- Distribution and intermediate storage spaces
- Construction and load-bearing capacity of the floor
- Illumination, heating, power and water supply
- Dimensions of installation scaffoldings and foundation rails
- Installation of high-voltage cables
- Earthing system
- Cleanliness: Switchgear room free of dirt and dust

12.3 Storage before installation

If the supplied switchgear or parts thereof are to be stored before installation, suitable storage rooms or spaces should be available.

The following describes what to consider for storage and during the storage period.
Switchgear storage

**DANGER!**
Risk of injury as well as damage to the storage place and the stored goods if the storage surface is overloaded.

- Observe the load-bearing capacity of the floor.
- Do not stack heavy goods.
- Do not overload lighter components by stacking.

**Switchgear storage in closed rooms**

As a rule, the switchgear must be stored in a closed room. The storage room should have the following characteristics:

- Floor with adequate load-bearing capacity.
- Well-ventilated and as free of dust as possible.
- Dry (relative humidity below 50%).
- Heatable to about 10 °C above outside temperature to prevent condensation

Measures during storage period:

- Provide adequate ventilation in heated storage rooms.
- Check humidity in packing every 4 weeks (condensation).

**Outdoor storage of switchgear packed in seaworthy crates or containers**

If the switchgear or parts thereof are supplied in seaworthy crates or containers, they can be stored in other rooms or outdoor for up to 6 months. The storage space must have the following characteristics:

- Floor with adequate load-bearing capacity.
- Protected against humidity (flooding, melted snow and ice), dirt, vermin (rats, mice, termites, etc.) and unauthorized access.
- Fire brigade access available.

Measures during storage period:

- Place all crates on planks or square timber for protection against floor humidity.
- Protect against humidity from above.
- After 6 months of storage, have the desiccant agent replaced in a professional way. Ask for expert personnel via the regional Siemens representative.
- Do not expose the panels to direct sun radiation.

**DANGER!**
Fire risk!

- No smoking.
- Keep fire extinguishers in a weatherproof place and mark their locations.

- Store transport units in such a way that they can be taken out later in the correct order for installation.
- Do not unpack small parts to avoid corrosion.
12.4 Tools

The following items are required for correct installation:

- These instructions
- Measuring sheet of the base frame
- Lifting truck
- Several roller pads (reinforced rollers)
- Several strong boards
- Rope or chain with transport shackles
- Reinforcing bars, roller crowbars
- Torque wrench 8 to 20 Nm, 20 to 70 Nm
- Shim plates 0.5 to 1 mm
- Phase tape (L1, L2, L3, gn/ye)
- Shell Vaseline 8422 DAB 8 (0.250 kg tube, order no.: 8BX 2041)
- Plumb bob, nylon thread (kite string or similar)
- Supporting beams for lifting by crane
- Wire brush, copper sponge
- Soft, lint-free cloth
- Brush, cleaning cloth
- Cleaning agent: ARAL 4005 or HAKU 1025/90, HAKU 5067, MTX 60 and household cleaner

Also useful:

- Building site distribution board for 400/230 V AC (50/60 Hz)
- Extensions for 230 V AC (50/60 Hz)
- Hydraulic jack (2 to 3 t, for vertical and horizontal stroke)
- Sling ropes
- Transport rollers
- Various pieces of squared timber
- Step-ladders
- Workbench with vise
- 1/2" and 3/8" ratchet spanners with various extensions
- Nuts for M6, M8, M10, M12, M16, and M20
- Ring spanners for M6, M8, M10, M12, M16 and M20
- Various slotted-head and Torx screwdrivers
- Side cutter
- Water pump pliers
- Various crimping pliers, stripping pliers, flat nose pliers, universal pliers, pointed pliers etc.
- Water level
- Guide string
- Scriber
- Try-square
- Tape measure
- Vernier caliper
- Measuring instrument with test probes, measuring cables, clamp-type test probes
- Continuity tester (beeper)
- Site illumination
- Hand lamp
- Pocket lamp
- Vacuum cleaner
- Hammer drill
12.5 Installation and fixing material

Before starting to install the individual components, provide for the required installation and fixing material.

12.6 Comments on electromagnetic compatibility

To achieve appropriate electromagnetic compatibility (EMC), some basic requirements must be observed while erecting the switchgear. This applies especially to the installation and connection of external cables and wires.

Basic measures for ensuring EMC are already taken during design and assembly of the switchgear panels. Among other things, these measures include:

- the low-voltage compartment is an integral part of the panel, which means that the protection and control devices with the internal wiring are metal-enclosed;
- reliable earth connections of the frame parts via toothed contact washers or locking washers;
- inside the panel, wires are laid in metal ducts;
- spatial separation of sensitive signal wires from wires with high interference voltage levels;
- limitation of switching overvoltages of inductive loads (e.g. relay or contactor coils, motors) by means of protective circuits with diode, varistor or RC element;
- within the LV compartment, the secondary devices are mounted in defined zones;
- shortest possible connection between corresponding modules in subracks;
- consideration of the magnetic leakage fields of conductor bars and cables;
- protection of subracks and wiring backplanes against interference by perforated shielding plates;
- large surface bonding between all modules and devices as well as bonding to the earthing conductor of the switchgear assembly.

These measures basically enable proper operation of the switchgear itself. The planner or operator of the switchgear must decide whether additional measures are required depending on the electromagnetic environment where the switchgear is installed. Such measures must be implemented by the installation company in charge.

In an environment with heavy electromagnetic interference it may be necessary to use shielded cables and wires for the external connections in order to avoid interferences in the low-voltage compartment and thus, undesired influences on the electronic protection and control or other automation devices.

Cable shields must be electrically bonded to be able to carry high frequencies, and contacted concentrically at the cable ends.

The shields of cables and wires are connected and earthed in the low-voltage compartment.

Connect the shields to earth potential - with high electrical conductivity and all around as far as possible. Protect the contact surfaces from corrosion in case of humidity (regular condensation).
When laying cables into the switchgear assembly, separate the control, signaling and data cables and other lines with different signal and voltage levels by laying them on separate racks or riser cable routes.

Corresponding to the different shield designs, there is a number of methods to perform connection. The planning department or site management determines which of the methods will be used, taking EMC requirements into account. The preceding points should always be taken into account.

The shield is connected to cables or wires with clamps contacting all around. If low demands are placed on EMC, it is also possible to connect the shield directly to earth potential (combine or twist the shield wires) or via short cable connections. Use cable lugs or wire-end ferrules at the connecting points.

Always keep the connecting leads of the shields as short as possible (< 10 cm).

If shields are used as protective earth conductors at the same time, the connected plastic-insulated lead must be marked green/yellow over its entire length. Non-insulated connections are inadmissible.
13 Unloading and erecting the switchgear

13.1 Packing and transport unit

Packing

The transport units can be packed as follows:

- On pallets, covered with PE protective foil
- In a seaworthy crate (switchgear is sealed with desiccant bags in PE protective foil, maximum storage period: 6 months)
- Other packings in special cases.

| NOTE! |
The packing materials of SIMOPRIME switchgear can be disposed of as classified materials.

¡ Please observe the local regulations for disposal and environmental protection.

Transport unit

Transport units consist of:

- Individual panels, if applicable with separate low-voltage compartment
- Panel groups consisting of two panels
- Baffles for 1 s arc duration
- Accessories

<table>
<thead>
<tr>
<th>Transport weights</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Panel type</th>
<th>Panel width [mm]</th>
<th>Average transport weights</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Packing with foil / seaworthy crate approx. [kg]</td>
<td>Without packing approx. [kg]</td>
</tr>
<tr>
<td>Circuit-breaker panel</td>
<td>1250 A</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td>1250/2500 A</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>3150/3600 A</td>
<td>800</td>
</tr>
<tr>
<td>Vacuum contactor panel</td>
<td>435</td>
<td>720/940</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>950/1170</td>
</tr>
<tr>
<td>Disconnecting panel</td>
<td>1250 A</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td>1250/2500 A</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>3150/3600 A</td>
<td>800</td>
</tr>
<tr>
<td>Bus sectionalizer, circuit-breaker panel</td>
<td>1250 A</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td>1250/2500 A</td>
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<tr>
<td></td>
<td>3150/3600 A</td>
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<td>600</td>
<td>720/940</td>
</tr>
<tr>
<td></td>
<td>800</td>
<td>800/1030</td>
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<tr>
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<td>820/1040</td>
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<td>900/1130</td>
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<tr>
<td></td>
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## Installation

### Weights for additional equipment

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<th>Additional equipment</th>
<th>Weight [kg]</th>
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<td>Additional compartment with busbar earthing switch</td>
<td>100</td>
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<tr>
<td>Additional compartment with voltage transformers</td>
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</tr>
<tr>
<td>Additional compartment with current transformers</td>
<td>250</td>
</tr>
<tr>
<td>Panels with forced ventilation</td>
<td>50</td>
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<tr>
<td>Panels with redundant ventilation</td>
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### Max. dimensions for transport packing in mm

#### Packing with foil for road transport/airfreight

<table>
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<th>Double panel</th>
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<tbody>
<tr>
<td>Panel width [mm]</td>
<td>435  600  800  435+435  435+600  435+800  600+800</td>
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<tr>
<td>Width [mm]</td>
<td>760  760  930  1450  1900  1450  1450</td>
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<tr>
<td>Height [mm] *</td>
<td>2480 / 2730*</td>
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</tbody>
</table>

* For standard / 1000 mm LV compartment

** Panels with busbar current transformers are shipped as double panels

#### Seaworthy crate

<table>
<thead>
<tr>
<th>Single panel**</th>
<th>Double panel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel width [mm]</td>
<td>435  600  800  435+435  435+600  435+800  600+800</td>
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<tr>
<td>Depth [mm]</td>
<td>2080  2080  2080  2080  2080  2080  2080</td>
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<tr>
<td>Width [mm]</td>
<td>820  820  1020  1450  1900  1090  1450</td>
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<tr>
<td>Height [mm] *</td>
<td>2520 / 2770*</td>
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</table>

* For standard / 1000 mm LV compartment

** Panels with busbar current transformers are shipped as double panels

### 13.2 Unloading transport units

**DANGER!**

- If incorrectly unloaded, the transport units may fall down and cause injury.

- Please ensure that the lifting and transport gear used meets the requirements as regards construction and load-bearing capacity.

- Ensure even weight distribution.

**ATTENTION!**

- If incorrectly unloaded, the transport units may be damaged.

- Attach ropes far enough on the hoisting tackle so that they cannot exert any forces on the switchpanel walls under load.

- Do not climb onto the roof of the switchpanels.

- Observe the instructions on the packing.

- Unload the transport units in packed condition and leave packed for as long as possible.

- Do not damage the PE protective foil.
Transport weights including packing

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

<table>
<thead>
<tr>
<th>Panel width [mm]</th>
<th>Transport weight [kg]</th>
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<tr>
<td>max.</td>
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<td>600</td>
<td>970</td>
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<td>1460</td>
</tr>
</tbody>
</table>

Unloading by fork-lift truck

- Unloading the transport units from the truck should be done with a fork-lift truck. The lifting forks must be inserted from the side of the panel, and the length of the forks must be greater than 1100 mm for single panels and greater than 2000 mm for double panels. Ensure that the panel is in balance on the fork-lift truck.
- Move the transport units as close as possible to the foundation they are going to be installed on.
- Dismantle and remove the crates if provided.
- Move the transport units into the building.
- Remove the foil only in the building right before assembling the transport units, and temporarily to check for transport damage.

Unloading by crane

- Unloading the transport units by a crane is possible if the panels are going to be brought into the building from above or there is no fork-lift truck available on site.
- The transport unit must not be lifted from the top by hooks.
- Attach a transport rod longer than the transport unit to the crane hook.
- Make up a triangle connection between the lifting eyes and the transport rod using synthetic fiber ropes.
- It is not recommended to use steel ropes to avoid scratching the panels.
- Take care that the ropes do not touch the upper part of the panels.
- Lift the transport unit to see whether it is in balance or not. If not, adjust the rope lengths accordingly.

For detailed dimensions, see the drawings on each transport unit.
Unload the transport units and set them down as close to the switchgear building as possible in order to avoid unnecessary ways.

Move the transport units into the building, if possible on their wooden pallets. Only remove packing where absolutely necessary in order to keep the switchgear as clean as possible.

Remove the foil only in the building, right before assembling the transport units.

13.3 Completeness and transport damage

Checking for completeness

- Check whether the delivery is complete and correct using the delivery note and packing lists.
- Compare the serial number of the switchgear panels on the delivery note with that on the packing and the rating plates of the panels.
- Check whether the accessories are complete.

* First dimensions are given for 800 mm panels, second dimensions are given for both 435 mm and 600 mm panels.

** Second value applies if LV compartment is 1000 mm high.
Checking for transport damage

- Temporarily open the packing in a weatherproof place (preferably in the building) to detect hidden damages. Fix the PE foil again and do not remove it completely until reaching the mounting position in order to keep the switchgear as clean as possible.
- Inform the forwarding agent immediately about any defects or transport damages; if required, refuse to accept the delivery.
- As far as possible, document larger defects and transport damages photographically; prepare a damage report and inform the regional Siemens representative.
- Have the transport damages repaired, otherwise you may not start installation.
- Refit the packing.

13.4 Transport to the place of installation (switchgear room)

- Thoroughly clean the switchgear room, since extreme cleanliness is required during installation.
- Move the transport units on their wooden pallets as long and as far as possible.
- Move the transport units to the switchgear room in the order of installation.
- Inside the building, move the transport units to the place of installation using a lifting truck, fork-lift truck or crane.
- Set down the transport units in the correct sequence directly in front of the place of installation. Leave enough clearance between the transport units to perform installation work.

Removing from the wooden pallets

- Remove PE foil.
- Open the door to the switching device compartment and remove the transport fixing screws.
- Unscrew the cable compartment cover and remove the transport fixing screws.
- Prepare transport facilities such as ropes, hooks, eyelets, roller pads (reinforced rollers), etc.
- Each delivery comprises lifting parts which can be fitted on both sides of the transport unit. These parts are included in the accessories, and must be used for lifting all transport units. The parts can be mounted by screwing three M8 bolts in. There is no need to use nuts for connections to the left wall of the panel, as press-in nuts are already available there, whereas the given parts with press-in nuts or M8 nuts and washers must be used for connections to the right wall.

Fig. 19: Lifting parts
Close the door to the switching device compartment.

Refit the cable compartment cover to protect the panels against distortion during further transport.

Lift the transport unit to see whether it is in balance or not. If not, adjust the rope lengths.
Installation

**Further transport without wooden pallets**

If the transport units cannot be directly lifted from the wooden pallets onto their mounting position:

- Lower the transport unit onto boards placed on roller pads (reinforced rollers), i.e. one board placed on two roller pads. Distribute the roller pads so as to support the outer edges of the transport unit.

- Lift one side, then the other side of the transport unit and slowly lower it on the mounting position.

**13.5 Erecting the panels**

**Preparing the foundation**

Please observe the following when preparing the foundation:

- A suitable foundation can be a false floor, a double floor or a reinforced-concrete foundation. The reinforced-concrete floor must be equipped with foundation rails for supporting the panels.

- As for design and construction of the foundation, the relevant standards DIN 43 661 "Fundamentschienen in Innenanlagen der Elektrotechnik" (Foundation rails in electrical indoor installations) and DIN 18 202 "Maßtoleranzen im Hochbau" (Blatt 3) (Measuring tolerances in structural engineering (Sheet 3)) apply.

- The dimensions of the floor opening and the fixing points of the switchgear frame are given hereafter in this section.

- Determine level differences between the installation surfaces of the panels using a measuring sheet, and compensate them with shims (0.5 - 1.0 mm).
**Measuring sheet for the foundation**

Fig. 21: Measuring sheet for the foundation. Straightness / evenness tolerance according to DIN 43661: max. 1 mm over 1 m and 2 mm over total length.

**Dimensions of the switchgear room**

To install SIMOPRIME switchgear, the switchgear room must have certain minimum dimensions. Please observe the following illustrations.

1) Control aisle for panel replacement ≥ 2000 mm

B: Panel width
T: Panel depth

Height of switchgear room ≥ 2800mm.
Height of door to switchgear room ≥ 2500mm for panel replacement.
**Floor openings and floor fixing points**

Fig. 24: Floor opening with floor fixing points

Fig. 25: Floor opening with foundation rails

1. Floor fixing point (dimensions: 20 x 46 mm)
2. Floor opening for low-voltage cables
3. Floor opening for high-voltage cables
4. Switchgear end wall
5. Foundation rails (when earthquake reinforcement is required, rail width will be 100mm)
6. Maximum floor opening
7. Contact area of the switchgear base frame at the front, rear, left and right
8. Fixing points for aseismic capacity (with minimum M10 8.8 bolts)
### Dimension drawings up to 31.5 kA and with 3AH5 VCB

<table>
<thead>
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### Dimension drawings up to 31.5 kA and with SION VCB

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**Installation**

**Erecting the panels**

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**Dimension drawings for 40 kA**

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<td>forced</td>
<td>Bus sectionalizer on the left</td>
<td>888-1167.9</td>
</tr>
<tr>
<td>Bus riser panel</td>
<td>800</td>
<td>1250</td>
<td>-</td>
<td>Bus sectionalizer on the right</td>
<td>888-1173.9</td>
</tr>
<tr>
<td></td>
<td>800</td>
<td>2500</td>
<td>-</td>
<td>Bus sectionalizer on the right</td>
<td>888-1174.9</td>
</tr>
<tr>
<td></td>
<td>800</td>
<td>3600</td>
<td>-</td>
<td>Bus sectionalizer on the left</td>
<td>888-1175.9</td>
</tr>
<tr>
<td></td>
<td>800</td>
<td>1250</td>
<td>-</td>
<td>Bus sectionalizer on the left</td>
<td>888-1176.9</td>
</tr>
<tr>
<td></td>
<td>800</td>
<td>2500</td>
<td>-</td>
<td>Bus sectionalizer on the left</td>
<td>888-1177.9</td>
</tr>
<tr>
<td></td>
<td>800</td>
<td>3600</td>
<td>-</td>
<td>Bus sectionalizer on the left</td>
<td>888-1178.9</td>
</tr>
<tr>
<td>Metering panel</td>
<td>800</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>888-1179.9</td>
</tr>
</tbody>
</table>

**NOTE!**

Before starting to erect the panels:

- Make sure that there are no transport damages on the panels.
- Level the base frame according to DIN 43 661.
- Prepare the materials and auxiliary devices required for installation.

- Place the first (i.e. rearmost) panel as exactly as possible on its final mounting position and place the second one at a small distance (approx. 20 to 30 cm), so that the panels can still be aligned before bolting together.
- Repeat the procedure until all panels are standing side by side.
- Remove packing and transport materials from the place of installation.
- Remove any dirt occurred during transport, since extreme cleanliness is required during installation.
- Now the panels are in the correct order for assembly.
14  Assembling the switchgear

For assembling the switchgear you have to perform the following work:

- Aligning the panels
- Bolting the panels together
- Fastening the panels to the foundation
- Mounting the panel connection links
- Opening the busbar compartment
- Assembling and interconnecting the busbars
- Closing the busbar compartment
- Assembling and interconnecting the earthing busbars
- Installing the end wall (if required)
- Assembling and interconnecting the baffles

14.1  Aligning and bolting the panels together

For perfect operation of SIMOPRIME switchgear it is necessary to align the individual panels and bolt them firmly together after erection.

The following tightening torques apply for installation and for checking bolted joints:

<table>
<thead>
<tr>
<th>Bolted joint</th>
<th>Tightening torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>M8</td>
<td>20 Nm</td>
</tr>
<tr>
<td>M12</td>
<td>70 Nm</td>
</tr>
<tr>
<td>M16</td>
<td>155 Nm</td>
</tr>
</tbody>
</table>

Aligning the panels

The panels must be aligned with each other in vertical and horizontal position.

- Align the first panel on the base frame in vertical and horizontal position.
- Align further panels with the first panel.
- If required, lay shim plates under the panels according to the measuring sheet of the base frame.

Bolting panels together

The panels are bolted together from inside. Press-in nuts for interconnecting the panels are pressed into the left part of the panel frame, i.e. the panels are bolted together from the right panel to the left panel.

The following illustration shows the panel joints including the points of connection for the optional baffles for 0.1 s and 1 s arc duration.
14.2 Degree of protection IP51

The degree of protection IP51 prevents ambient dust as well as water drops caused by condensation on the ceiling from reaching the mechanical and electrical components under voltage in the switchgear.

When the panels are installed on site, the rear edge of the top cover of the busbar compartment, the panel joints, the joints of the top cover of the switching device compartment and other open areas of the IP51 protection must be carefully coated with silicone.

Remaining open areas can be easily spotted by watching where ambient light falls through the panel.
14.3 Fastening the panels to the foundation

The switchpanels can be fastened to the foundation in the following ways:

- Welded floor fixing,
- bolted floor fixing,
- floor fixing with dowels.

For fixing the panels on the floor, an elongated hole 20 x 46 mm has been provided in each of the three cross members of the panel frame.

Fasten each panel to the foundation at two points at least. If aseismic capacity is expected, fasten each panel to the foundation at all three standard fixing points and also at four additional fixing points (see Page 50, “Erecting the panels”).

- Place shims in the spaces between the switchpanel frame and the foundation in the area of the elongated holes, so that the switchgear is not distorted when it is bolted tight, and the seam does not cover any air-filled gaps when the switchgear is welded tight.

- For floor fixing with dowels: Drill holes directly into the concrete and insert dowels with a diameter of 10 mm. Fasten the panels using a metal cover (adjust its dimensions to the elongated hole 20 x 46 mm) and screws matching with the dowels.

- For bolted floor fixing: Bolt the cross members inside the panel frame to the C profiles in the foundation using anchor bolts and shim plates.

- For welded floor fixing: Weld the cross members at the elongated holes 20 x 46 mm down to the U profile supports in the foundation.

- Remove any dirt occurred during drilling or welding work. Extreme cleanliness is required during installation.

- Paint welding seams to prevent corrosion.

- Now the switchgear is fastened to the foundation.
14.4 Assembling the busbars

When the switchgear is installed, the busbars of the individual panels must be interconnected. The busbars are delivered in the busbar compartment of each individual panel.

When panels are supplied in groups, the busbars are pre-assembled in the respective panel group.

Preparing assembly

- For free-standing arrangement: Remove the rear wall of the busbar compartment.
- For end panels: Remove the switchgear end wall.
- For wall-standing arrangement: Remove the busbar cover and the baffles. We recommend to remove the baffle above the busbar compartment, too.

Brush the contact surfaces of the busbars and the connecting bars and apply a thin film of Vaseline.

Fig. 27: Busbar system up to 1250 A

Fig. 28: Busbar system up to 2500 A
Installation

Assembling 1250 A busbar system
- Bolt the busbars to the corresponding connecting bars 7 with two M12 bolts each.

Assembling 2500 A busbar system
- Lay the first busbar between the connecting angles.
- Place the second busbar on the front connecting angle.
- Bolt the busbars together with the connecting angles.
- Tighten the fixing bolts of the connecting angles.

Assembling 3600 A busbar system

NOTE!
The strain washers at the busbars have one side cambered inwards and one side cambered outwards. Observe correct position of strain washers for assembly.

⇒ Mount the strain washers so that the side cambered outwards points to the bolt head or the nut.

NOTE!
The outer busbars have recesses for the strain washers on one side.

⇒ Observe the correct arrangement of the busbars while mounting (see illustration above).
⇒ The recesses of the busbars must face outwards.
⇒ Up to 12 kV rated voltage, the busbars have no recesses and can be arranged at will.

⇒ Lay the first busbar between the connecting angles.
⇒ Place the second busbar on the front connecting angle.
⇒ Place the third busbar on the rear connecting angle.
⇒ Bolt the busbars together with the connecting angles.
⇒ Tighten the fixing bolts of the connecting angles.
14.5 Interconnecting the earthing busbars and earthing the switchgear

The earthing busbars are pre-assembled at the factory. When the switchgear is installed, the earthing busbars of the individual panels must just be interconnected by means of panel links. The panel links are located on the earthing busbar in the connection compartment of the individual panel. There are no panel links in the end panels.

Interconnecting earthing busbars

Loosen the panel link on the earthing busbar, and push it through the opening in the side wall to the adjacent panel.

Check the contact surfaces of the earthing busbar and the panel link. Brush if required and apply a thin film of Vaseline.
Bolt the earthing busbars of the two adjacent panels together with the link.  
Tightening torque: 70 Nm.

**Switchgear earthing**  
After interconnecting the earthing busbar, the switchgear must be connected to the substation earth.  

Connect the earthing busbar of the left end panel to the substation earth.

**14.6 Installing the panel connection links**  
If the switchgear is installed freely in the room (free-standing arrangement), panel connection links must be mounted at the rear between the panels. The panel connection links are bolted together with the rear walls at the panel joint. These connection links are not required for wall-standing arrangement.

Fig. 31: Position of panel connection links

- Lay upper panel connection link over the panel joint.
- Apply the rear wall of the busbar compartment.
- Bolt upper panel connection link and rear wall together.
- Lay lower panel connection link over the panel joint.
- Apply the rear wall of the connection compartment.
- Bolt lower panel connection link and rear wall together.
14.7 Installing the switchgear end walls

The switchgear end walls are already mounted on the end panels of the switchgear. The switchgear end walls comprise the following materials:

- End wall of the switching device compartment
- End wall of the connection compartment
- End cover of the busbar compartment
- End cover for the baffles, arc duration 0.1 s
- End cover for the baffles, arc duration 1 s

For panels with baffles

If baffles for an arc duration of 1 s have to be mounted on the switchgear, the end panel must be equipped with an end cover for the baffles.

Mount the end cover for the baffles for an arc duration of 1 s.
14.8 Installing low-voltage compartments

On request, the low-voltage compartments can be delivered separately and must be mounted on site.

<table>
<thead>
<tr>
<th>ATTENTION!</th>
</tr>
</thead>
<tbody>
<tr>
<td>The low-voltage compartments weigh up to 60 kg.</td>
</tr>
<tr>
<td>✔️ Observe safe standing position of low-voltage compartment while lifting!</td>
</tr>
<tr>
<td>✔️ Do not stay under a lifted compartment!</td>
</tr>
</tbody>
</table>

✔️ Lift low-voltage compartment up to height of upper edge of the high-voltage door with suitable lifting equipment.

✔️ Push low-voltage compartment onto switching device compartment.

✔️ Bolt low-voltage compartment to switching device compartment at four points (inside the low-voltage compartment, use bolts with contact washers only).
14.9 Assembling the baffles

Baffles for 0.1 s arc duration

The baffle for 0.1 s arc duration is pre-assembled at the factory.

Assembling baffles for 1 s arc duration

The baffles on the busbar compartment are pre-assembled. The baffles on the low-voltage compartment have to be mounted on site.

Fig. 33: Baffles for t=0.1 s

Fig. 34: Baffles for t=1 s

- Fasten the rear angled baffle ① at the baffle over the busbar compartment.
- Fasten the front angled baffle ② at the front edge of the low-voltage compartment with two screws.
15 Electrical connections

In the instructions given in the following sections it is assumed that a new switchgear is being installed which has not yet been connected to the mains, and that it is therefore not live.

<table>
<thead>
<tr>
<th>DANGER!</th>
</tr>
</thead>
<tbody>
<tr>
<td>High voltage! Danger!</td>
</tr>
<tr>
<td>➔ To extend an existing switchgear or replace components, please contact your regional Siemens representative.</td>
</tr>
</tbody>
</table>

15.1 Connecting high-voltage cables

The high-voltage cables can be connected from the front or rear side of the panel.

Preparing cable installation from the front

➔ Remove bolts of partition to connection compartment inside the switching device compartment.

➔ Remove the partition
Preparing cable installation from the rear

- Remove bolts from rear wall to connection compartment.
- Remove rear wall to connection compartment.

Cable installation

- Check contact surfaces of cable sealing ends, brush if necessary and apply a thin film of Vaseline.
- Slip rubber sleeve for the metal floor covers over the cable.
- Mount cable sealing end according to the manufacturer's instructions.
- Pull cable into connection compartment.
- Connect cable at the panel connection.

**ATTENTION!**
The connection compartment can be destroyed if cable sealing ends are used with other dimensions than RXS makes.

- Do only use cables sealing ends with the corresponding dimensions.
- Otherwise contact the regional Siemens representative.

- Fasten cable at cable bracket (use antimagnetic clamps for single-core cables)
- Lead earth of sealing end to earthing busbar and bolt tight.
Mount pre-punched floor covers. Adjust the rubber sleeve to the punched holes.

Completing cable installation

Mount the partition to the connection compartment and bolt it tight.

ATTENTION!

Cable compartment:

⇒ All cable sealing ends must be connected to the panel connections in the connection compartment. All connections must be tightened properly.

⇒ Mount pre-punched floor covers. Adjust the rubber sleeve to the punched holes.
15.2 Connecting earthing and short-circuiting facility

**Preconditions**
- Removable part is out of the panel
- Feeder or busbar shutters are open

The earthing and short-circuiting facility is connected with an M12 bolt either directly or at the end of the extension of the earthing bar in the switching device compartment.

**DANGER!**

High voltage! Danger! If the busbars in the busbar compartment and the cable or bar connections in the connection compartment have not been isolated, the contacts are live at operating voltage.

- Isolate the busbars in the busbar compartment and the cable or bar connections in the connection compartment **before** opening the shutters. Observe the Five Safety Rules.
- Verify safe isolation from supply (see Page 122, “Verification of safe isolation from supply (LRM system)”).

**Connecting the earthing and short-circuiting facility at the feeder**

- Connect earthing and short-circuiting facility at the end of the extension of the earthing bar in the switching device compartment.
- Plug connector on main fixed contacts of feeders (lower row of bushings) and screw tight.

**Connecting the earthing and short-circuiting facility at the busbars**

- Fix earthing clamp on earthing bar.
- Plug connector on main fixed contacts of busbars (upper row of bushings) and screw tight.
15.3 Connecting control cables
The circuit diagrams for connecting the control cables are included in the low-voltage compartment.

▫ Dismantle main wiring duct covers on the left inside of the switching device compartment.
▫ Lay cables from foundation through main wiring duct into low-voltage compartment.
▫ Refit main wiring duct covers.
▫ Connect control cables according to circuit diagrams.

15.4 Connecting bus wires
The bus wire is the electrical connection from panel to panel.

▫ Connect or plug bus wires onto bus wire terminal block in low-voltage compartment.
16 Final installation work

16.1 Checking high-voltage connections
Perform the following tests on all connected high-voltage cables:

 CONCAT Check tightness of bolts with torque wrench.
 CONCAT Check earthing of cable sealing ends.

16.2 Checking bolted joints

<table>
<thead>
<tr>
<th>Bolted joint</th>
<th>Control tightening torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>M8</td>
<td>17 Nm</td>
</tr>
<tr>
<td>M12</td>
<td>60 Nm</td>
</tr>
<tr>
<td>M16</td>
<td>130 Nm</td>
</tr>
</tbody>
</table>

 CONCAT Perform random checks of bolted joints on busbars, current/voltage transformers, etc. with the torque wrench.

16.3 Checking control cable connections
Check the following screw-type connections of control cables:

 CONCAT Perform random checks of the control cable connections on devices and terminal blocks.
 CONCAT Check all control cable connections of current transformer terminals in low-voltage compartment (including slides and jumpers).
 CONCAT If there are any terminal blocks without labels, complete labels using the information given in the circuit diagrams.

16.4 Cleaning the switchgear
The bushings and the post insulators of the busbars, especially the openings to the switching device compartment must be free of grease and other pollution.

 CONCAT Wipe all bushings and post insulators of the busbars using a soft, lint-free, dry cloth.

16.5 Checking and completing protection against adverse environmental influences (protection against corrosion)

 CONCAT Touch up scratches and impact marks on surface painting

The following products can be supplied for touching up the surface:

- Paint pen for minor paint damages
- Touch-up paint, 1 kg tin
16.6 Checking installation work

⇒ Check whether all installation work has been performed properly in accordance with the previous sections of these installation instructions.

⇒ Open ventilation flaps on HV door. Their movement must not be restricted by any means (see ①).

![Fig. 37: Ventilation flaps at HV door](image)

16.7 Switchgear extension

<table>
<thead>
<tr>
<th>DANGER!</th>
</tr>
</thead>
<tbody>
<tr>
<td>High voltage! Danger! Before extending the switchgear or replacing panels, the switchgear must be isolated and earthed.</td>
</tr>
</tbody>
</table>

⇒ Isolate the busbars in the busbar compartment and the cable or bar connections in the connection compartment before extending the switchgear or replacing panels.

⇒ Observe the Five Safety Rules.

The SIMOPRIME truck-type or withdrawable circuit-breaker switchgear is modular and extendable. Furthermore, panels of an existing switchgear can be replaced.

To extend the switchgear or replace panels, you must carry out the work described in these installation instructions. Before extending the switchgear or replacing panels, the switchgear must be isolated and earthed. Always observe the Five Safety Rules.

Before extending the switchgear or replacing panels, please contact your regional Siemens representative.
17 Commissioning

17.1 Safety instructions

<table>
<thead>
<tr>
<th>DANGER!</th>
</tr>
</thead>
<tbody>
<tr>
<td>High voltage! Danger!</td>
</tr>
<tr>
<td>⇒ Do not touch live components.</td>
</tr>
<tr>
<td>⇒ Ensure that the switchgear is only operated by qualified personnel who are familiar with the operating instructions and observe the warnings.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DANGER!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of injury! During operation of electrical equipment and switchgear, parts of this equipment are under dangerous electrical voltage. Mechanical components may move quickly, even remotely controlled.</td>
</tr>
<tr>
<td>⇒ Do not remove covers.</td>
</tr>
<tr>
<td>⇒ Do not reach into openings.</td>
</tr>
<tr>
<td>⇒ Do not touch circuit-breaker poles and operating rods.</td>
</tr>
</tbody>
</table>

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

- Proper transportation
- Correct storage
- Correct assembly and installation
- Diligent operation
- Erection and installation free of dust and dirt

17.2 Instructing the operating personnel

⇒ The operating personnel should be given the operating instructions in good time.
⇒ Instruct operating personnel in theory and practice of switchgear operation.
⇒ Ensure that the operating personnel are familiar with all operational details when commissioning takes place.
17.3 Checking the installation work and the accessories

Make sure that the following accessories are ready to hand:

- Operating instructions
- Hand crank for racking the removable part in and out
- Slip-on lever for shutter operation (optional)
- Operating lever for the feeder or busbar earthing switch
- Hand crank for charging the circuit-breaker closing spring
- Double-bit key for the door of the switching device compartment
- Double-bit key for the door of the low-voltage compartment
- Circuit diagrams
- Warning signs
- Earthing and short-circuiting facility (optional)
- Voltage tester or voltage detecting system (optional)

Ensure that the installation work has been performed correctly (see Page 72, “Checking installation work”).

Ensure that all covers have been fitted

17.4 Checking interlocks mechanically

Check each panel to verify that the removable part can only be racked to SERVICE position when the circuit-breaker/vacuum contactor and the earthing switch are in OPEN position and the door to the switching device compartment is closed.

Check the circuit-breaker/vacuum contactor panels to verify that the circuit-breakers/contactors can only be operated when the respective removable part is interlocked in end position (TEST or SERVICE position).

Check all earthing switches to verify that the earthing switches can only be operated when the respective removable parts are interlocked in TEST position.

Verify that the door to the switching device compartment can only be opened when the removable part is in interlocked TEST position.

17.5 Test operation

With test operation you can check the correct operation of the switchgear before commissioning without being endangered by operational high voltage.

DANGER!

High voltage! Danger!

If you find out during test operation that a part of the system does not operate in the way described in this document, you must not put the switchgear into operation.
Preparing test operation

DANGER!

High voltage! Danger!

Do not switch on operational high voltage during test operation!

Switch on control voltage.

The motors of the circuit-breaker operating mechanisms start up and charge the closing springs.

Rack each removable part from TEST position to SERVICE position and back several times.

Switch each earthing switch from OPEN to EARTHED position and back several times. At the same time, verify that these positions are correctly indicated on the panel and in the control room, if applicable.

Close and open each circuit-breaker several times locally and from remote for test. At the same time, verify that these positions are correctly indicated on the panel and in the control room, if applicable, and that the auxiliary switches and position switches operate correctly.

Check the function of the existing shunt closing and shunt opening releases by electrical operation.

Checking the switching process and the position indicators

17.6 Preparing the power-frequency voltage test

If required, a power-frequency voltage test can be performed at site on the readily assembled switchgear. In this case, make the following preparations:

Remove voltage transformers as well as surge arresters and surge limiters.

Protect bushings of transformers, surge arresters and surge limiters in a surge-proof way using suitable sealing caps.

Earth the test sockets of the capacitive voltage detecting systems.

Now the test can be carried out.

Malfunction during operation

If you have determined a malfunction during one of these tests:

Do not put the switchgear into operation.

Inform your regional Siemens representative.
17.7 Switching on operational high voltage

The operating personnel must have been trained, the installation work checked and test operation must have been carried out successfully without malfunctions.

- Close all front doors of the panels.
- Open all circuit-breakers (see Page 96, “Opening the circuit-breaker”).
- Rack all trucks to TEST position (see Page 87, “Racking the switching device truck to TEST position”).
- If there is a feeder without connected cables, earth this feeder (see Page 99, “Feeder earthing”).
- Ensure that all consumers connected to all outgoing feeders are switched off.
- Now you can switch on the operational high voltage to put the switchgear into operation.

Applying voltage to the busbar

<table>
<thead>
<tr>
<th>DANGER!</th>
</tr>
</thead>
<tbody>
<tr>
<td>High voltage! Danger!</td>
</tr>
<tr>
<td>Switch on the operational high voltage only if you have checked the installation work and performed test operation without malfunctions.</td>
</tr>
</tbody>
</table>

- Connect the incoming feeder in the associated opposite substation.
- Connect the incoming feeder to the busbar (rack the removable part to SERVICE position and close the circuit-breaker).
- Now the busbar of the switchgear is live.

Connecting more incoming feeders

<table>
<thead>
<tr>
<th>DANGER!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-circuit on the busbar if the incoming feeders have different phase sequences.</td>
</tr>
<tr>
<td>Ensure that all incoming feeders have the same phase sequence.</td>
</tr>
</tbody>
</table>

- Verify phase coincidence between the respective incoming feeder and the busbar.
- Connect tested incoming feeder.

Connecting consumer feeders

When all the incoming feeders have been connected:

- One after the other, switch on all outgoing feeders with connected consumers.
- Now all feeders are connected; the switchgear is totally in operation.

17.8 Correcting circuit diagrams

- Note any modifications which may have been made during installation or commissioning in the supplied circuit diagrams.
- Send the corrected documentation to the regional Siemens representative so that the modifications can be included.
Operation

18 Safety instructions

DANGER!
High voltage! Danger!

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

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

 ⇒ Do not remove covers.
 ⇒ Do not reach into openings.
 ⇒ Do not touch circuit-breaker poles and operating rods.

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

• Proper transportation
• Correct storage
• Correct erection and installation
• Diligent operation

Installation and operation of this switchgear are conditional on observance of the following standards:

• VDE 0100 – IEC 60364
• VDE 0101
• VDE 0105
19 Control elements and indicators

19.1 Control elements at the panel front

Control elements circuit-breaker panel

1. Door of low-voltage compartment
2. Sockets for capacitive voltage detecting system (optional); right side: tap at the busbar, left side: tap at the feeder
3. Inspection window
4. Door lock (double-bit lock)
5. Actuating opening for circuit-breaker CLOSED
6. Actuating opening for circuit-breaker OPEN
7. Position indicator for circuit-breaker
8. Control gate for opening the door to the switching device compartment
9. Actuating opening for releasing the switching device truck
10. Actuating opening for racking the switching device truck
11. Control gate for actuating openings of switching device truck
12. Position indicator for feeder earthing switch
13. Actuating opening for feeder earthing switch
14. Control gate for actuating opening of feeder earthing switch
15. High-voltage door
16. "Closing spring charged / not charged" indicator
17. Operations counter
18. Manual charging of the circuit-breaker closing spring

Fig. 38: SIMOPRIME control elements and indicators
Indicator for circuit-breaker closing spring

When the auxiliary voltage supply is applied, the circuit-breaker closing spring is charged automatically within approx. 15 s. After charging, the indicator for the closing spring changes from the “spring charged” to the “spring not charged” position.

Fig. 39: “Spring not charged” indication for 3AH5

Fig. 40: “Spring charged” indication for 3AH5

Fig. 41: “Spring not charged indication” for SION

Fig. 42: “Spring charged” indication for SION
Fig. 43: Control elements of withdrawable part for 435mm contactor-fuse combination (CFC)

1. Door of low-voltage compartment
2. Sockets for capacitive voltage detecting system (optional)
3. Door lock (double-bit lock)
4. Inspection window
5. Control gate for opening the door to the switching device compartment
6. Control gate for opening and closing the actuating opening for racking the switching device
7. Control gate for opening and closing the actuating opening for operating the earthing switch mechanism
8. Actuating opening for earthing switch
9. Mechanical position indicator for earthing switch
10. Actuating opening for inserting the double-bit key to control racking of the withdrawable part
11. Actuating opening for racking the switching device
12. High-voltage door
19.2 Operating tools

1. Hand crank for charging the circuit-breaker closing spring
2. Operating rod for circuit-breaker
3. Operating lever for feeder/busbar shutters
4. Double-bit key (2 nos.)
   - for switching device compartment (5 mm)
   - for low-voltage compartment (3 mm)
5. Operating lever for feeder/busbar earthing switch
6. Racking crank for racking the switching device truck

Fig. 44: Operating tools

Fig. 45: Ramp for moving the switching device truck with SION in or out of 800 mm panels

Fig. 46: Service truck to insert and remove a withdrawable contactor
<table>
<thead>
<tr>
<th><strong>Operation</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hand crank for the truck</strong></td>
<td>This hand crank is used to rack the switching device truck to SERVICE and TEST position.</td>
</tr>
<tr>
<td><strong>Hand crank for the closing spring</strong></td>
<td>This hand crank is used to charge the circuit-breaker closing spring manually.</td>
</tr>
<tr>
<td><strong>Operating rod for the circuit-breaker</strong></td>
<td>The operating rod is used to switch the circuit-breaker to CLOSED or OPEN position.</td>
</tr>
<tr>
<td><strong>Operating lever for the earthing switch</strong></td>
<td>This operating lever is used to switch the feeder or busbar earthing switch to EARTHED or OPEN position.</td>
</tr>
<tr>
<td><strong>Operating lever for shutters</strong></td>
<td>This operating lever is used to open or close the feeder or busbar shutters manually.</td>
</tr>
<tr>
<td><strong>Double-bit key 3 mm</strong></td>
<td>Double-bit key with 3 mm diameter for opening and closing the low-voltage door.</td>
</tr>
<tr>
<td><strong>Double-bit key 5 mm</strong></td>
<td>Double-bit key with 5 mm diameter for opening and closing the high-voltage door as well as for unlocking and locking the withdrawable part.</td>
</tr>
<tr>
<td><strong>Ramp for moving the truck</strong></td>
<td>The ramp is used for moving the switching device truck with SION VCB or metering truck into or out of 800 mm panels.</td>
</tr>
<tr>
<td><strong>Service truck for moving the withdrawable contactor</strong></td>
<td>The service truck is used for moving the withdrawable contactor into or out of the contactor panel.</td>
</tr>
</tbody>
</table>
20 Opening the door to the switching device compartment

DANGER!

High voltage! Danger!

- Isolate the busbars in the busbar compartment and the cable or bar connections in the connection compartment before opening the high-voltage door. Observe the Five Safety Rules.
- Verify safe isolation from supply.

NOTE!

The following instructions for opening and closing the high-voltage door apply to:
- Circuit-breaker panels
- Disconnecting panels
- Metering panels
- Contactor panels

Opening high-voltage door of circuit-breaker panel

Preconditions
- Double-bit key available
- Switching device truck in test position

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

Fig. 47: Opening the high-voltage door of the circuit-breaker panel

✓ High-voltage door is open.
**Operation**

**Opening the high-voltage door of the 435mm contactor panel**

**Preconditions**
- Double-bit key available
- Withdrawable part in test position

**Procedure**
- Insert double-bit key in door lock and turn 90° counter-clockwise.
- Pull door handle upwards and open the door.

![Fig. 48: Opening the high-voltage door of the contactor panel](image)

✓ High-voltage door is open.

**Closing high-voltage door of circuit-breaker panel**

**Preconditions**
- Double-bit key inserted in door lock.

Either without Switching device truck or:
- Switching device truck inserted in test position
- Low-voltage plugged in.

- Push the control gate of the door upwards.
- Press the door onto the switchgear frame and then push the control gate downwards.
- To lock the door mechanically: Turn double-bit key 90° clockwise.
Operation

Removing double-bit key.

 ✓ High-voltage door is closed

Closing the high-voltage door of the 435 mm contactor panel

**Preconditions**
- Double-bit key inserted in door lock.
- Either without withdrawable part or:
  - Withdrawable part inserted in test position
  - Low-voltage connector couples automatically in the panel.

**Procedure**
- Pull door handle upwards and close the door.
- Push door handle downwards.
- Turn double-bit key 90° clockwise and remove it.

✓ High-voltage door is closed.
21 Racking the switching device truck

Control elements of switching device truck

Racking positions
The switching devices are mounted on the truck. The switching device truck can be racked to two different positions:

- **SERVICE position:** The contact poles of the switching device are connected with the busbar and the feeder. The low-voltage connector is plugged in.
- **TEST position:** The contact poles of the switching device are disconnected from the busbar and the feeder. The low-voltage connector can be plugged in or unplugged.

21.1 Racking the switching device truck to SERVICE position

Preconditions for operation

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

**DANGER!**
If there is no auxiliary voltage, both the electrical and the mechanical interlocks are closed. If the interlocks are overridden, it is possible to perform manual operations despite existing interlocks, and this can cause failures.

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

⇒ Push control gate ① upwards.
⇒ To release the switching device truck: Insert double-bit key horizontally into actuating opening ② and turn 90° clockwise.
Operation

⇒ Push hand crank for racking the switching device truck onto operating shaft ③ and turn clockwise as far as it will go.

⇒ Remove hand crank for racking the switching device truck.

⇒ Lock switching device truck. To do this, turn double-bit key clockwise into horizontal position.

⇒ Remove double-bit key.

⇒ Push control gate ① downwards.

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

21.2 Racking the switching device truck to TEST position

Preconditions for operation

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

DANGER!

If there is no auxiliary voltage, both the electrical and the mechanical interlocks are closed. If the interlocks are overridden, it is possible to perform manual operations despite existing interlocks, and this can cause failures.

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

⇒ Push control gate ① upwards.

⇒ To release the switching device truck: Insert double-bit key horizontally into actuating opening ② and turn 90° counter-clockwise.
Operation

Push hand crank for racking the switching device truck onto operating shaft ③ and turn counter-clockwise as far as it will go.

Remove hand crank for racking the switching device truck.

Lock switching device truck. To do this, turn double-bit key counter-clockwise into horizontal position.

Remove double-bit key.

Push control gate ① downwards.

✓ The switching device truck was racked from SERVICE to TEST position.
22 Racking the withdrawable contactor of 435 mm panel

The switching device is the core part of the withdrawable part. The withdrawable part can be racked to two different positions:

- **SERVICE position**: The contact poles of the switching device are connected with the busbar and the feeder. The low-voltage connector is plugged in.
- **TEST position**: The contact poles of the switching device are disconnected from the busbar and the feeder. The low-voltage connector can be plugged in or unplugged.

### 22.1 Racking the withdrawable contactor to service position

**Preconditions for operation**

- Withdrawable contactor inserted and locked in the panel
- High-voltage door closed
- Withdrawable part in test position
- Contactor in OPEN position
- Racking crank for moving the withdrawable contactor available
- Double-bit key available

The actuating opening for racking the withdrawable contactor is located on the control board of the high-voltage door.
ATTENTION!
If there is no auxiliary voltage, both the electrical and the mechanical interlocks are closed. If the interlocks are overridden, it is possible to perform manual operations despite existing interlocks, and this can cause failures.

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

Procedure

ATTENTION!
All interlocks are only released when the withdrawable contactor is in a stable end position.

⇒ Always rack the withdrawable contactor completely up to the end position.

⇒ Open lock (optional).

⇒ Push control gate upwards.

ATTENTION!
If the contactor on the withdrawable part is equipped with a mechanical closing latch, the contactor will automatically be switched to OPEN position as soon as the double-bit key is inserted and turned 90° clockwise.

⇒ Automatic opening only happens when the contactor on the withdrawable part is in CLOSED position.

⇒ To release access to the withdrawable part, insert the double-bit key and turn 90° clockwise.
Operation

⇒ Push the racking crank for racking the withdrawable contactor onto the operating shaft, and turn clockwise as far as it will go.

⇒ Remove racking crank for moving the withdrawable part.
⇒ Turn double-bit key 90° clockwise to interlock the withdrawable part.

⇒ Remove double-bit key.
⇒ Close control gate.
⇒ Close lock (optional).

✓ The withdrawable contactor has been racked from test position to service position.
22.2 Racking the withdrawable contactor to test position

Preconditions for operation
- Withdrawable contactor inserted and locked in the panel
- High-voltage door closed
- Withdrawable part in service position
- Contactor in OPEN position
- Racking crank for racking the withdrawable contactor available
- Double-bit key available

Fig. 53: Actuating opening for racking the withdrawable contactor

ATTENTION!
If there is no auxiliary voltage, both the electrical and the mechanical interlocks are closed. If optional interlocks are overridden locally, it is possible to perform manual operations despite existing interlocks, and this can cause failures.

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

ATTENTION!
All interlocks are only released when the withdrawable contactor is in a stable end position.

⇒ Always rack the withdrawable contactor completely up to the end position.
Operation

- Open lock (optional).
- Push control gate upwards.

**ATTENTION!**

If the contactor on the withdrawable part is equipped with a mechanical closing latch, the contactor will automatically be switched to OPEN position as soon as the double-bit key is inserted and turned 90° clockwise.

- Automatic opening only happens when the contactor on the withdrawable part is in CLOSED position.

- To release access to the withdrawable part, insert the double-bit key and turn 90° counter-clockwise.
Operation

- Push the racking crank for racking the withdrawable part onto the operating shaft, and turn counter-clockwise as far as it will go.

- Remove racking crank for moving the withdrawable part.
- Turn double-bit key 90° counter-clockwise to interlock the withdrawable part.

- Remove double-bit key.
- Close control gate.
- Close lock (optional).

✓ The withdrawable part has been racked from service position to test position.
23 Operating the circuit-breaker

The 3AH5 and SION vacuum circuit-breakers are equipped with a spring-operated/ stored-energy mechanism.

23.1 Closing the circuit-breaker

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

![Fig. 54: Closing the circuit-breaker mechanically (3AH5)](image)

![Fig. 55: Closing the circuit-breaker mechanically (SION)](image)

**DANGER!**

If there is no auxiliary voltage, both the electrical and the mechanical interlocks are closed. If the interlocks are overridden, it is possible to perform manual operations despite existing interlocks, and this can cause failures.

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

⇒ Turn cover of actuating opening aside using the nut located over it.

⇒ Insert the operating rod through the actuating opening in the door and operate the ON pushbutton.

✓ The position indicator changes from "0" position to "I" position.

![Fig. 56: Position indicator in "I" position (3AH5)](image)

![Fig. 57: Position indicator in "I" position (SION)](image)

⇒ Take operating rod out of actuating opening.

✓ The circuit-breaker is closed.
### 23.2 Opening the circuit-breaker

**Preconditions for operation**

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

---

**Fig. 58:** Opening the circuit-breaker mechanically (3AH5)

**Fig. 59:** Opening the circuit-breaker mechanically (SION)

---

**DANGER!**

If there is no auxiliary voltage, both the electrical and the mechanical interlocks are closed. If the interlocks are overridden, it is possible to perform manual operations despite existing interlocks, and this can cause failures.

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

- Turn cover of actuating opening aside using the nut located over it.

- Insert the operating rod through the actuating opening in the door and operate the OFF pushbutton.

- The position indicator changes from "I" position to "O" position.

- Take operating rod out of actuating opening.

- The circuit-breaker is open.
24 Charging the circuit-breaker closing spring manually

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

Preconditions

- Truck completely inserted and interlocked in the panel

![Image](Fig. 62: Charging the closing spring manually (3AH5))

![Image](Fig. 63: Charging the closing spring manually (SION))

**DANGER!**

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

- Use special hand crank with freewheel from the accessories!

- Turn cover of operating shaft aside using the nut located over it.
- The operating shaft is visible in the inspection window.
- Push hand crank onto operating shaft.
- Turn hand crank clockwise approx. 25 - 40 turns until the “spring charged” indication appears in the inspection window.

![Image](Fig. 64: “Spring charged” indication (3AH5))

![Image](Fig. 65: “Spring charged” indication (SION))

- Remove hand crank.
- The spring is latched automatically. The energy required for the operating sequence OPEN-CLOSED-OPEN (auto-reclosing) is stored in the spring. The spring charged indicator changes from “spring not charged” to “spring charged”.

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25  Contactor function

25.1  Closing or opening the contactor

Electrical operation  The contactor in the contactor panel can be closed or opened by electrical operation. The control elements for electrical operation are located on the front door of the low-voltage compartment.

Alternatively, electrical operation can also be done from a control board or a separate switching room.

Mechanical operation  Besides electrical opening, a contactor can also be switched off through a mechanical opening operation. To do this, the contactor must be equipped with a mechanical closing latch.

Mechanical opening can take place with the withdrawable contactor both in test and service position
- see Page 89, “Racking the withdrawable contactor to service position”
- see Page 91, “Racking the withdrawable contactor to test position”

Instruction label  If contactors on withdrawable parts are designed without mechanical closing latch, these contactors are identified with an instruction label on the front cover of the withdrawable part.

Fig. 66: Instruction label on withdrawable contactor
26 Operating the feeder earthing switch

26.1 Feeder earthing

Preconditions
- The feeder to be earthed is isolated
- The padlock at the feeder earthing switch is removed, the electrical interlock or the key/Ronis interlock is released.

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

Do not remove the operating lever at intermediate positions.

The actuating opening and the position indicator of the feeder earthing switch are located down-right beside the door to the switching device compartment. The actuating opening is locked by an additional gate.

DANGER!
If there is no auxiliary voltage, both the electrical and the mechanical interlocks are closed. If the interlocks are overridden, it is possible to perform manual operations despite existing interlocks, and this can cause failures.

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

To avoid maloperation, the operating lever for the feeder earthing switch must be adjusted for the planned switching operation.

⇒ To close the feeder earthing switch: Adjust the operating spindle of the lever so that the arrow points to the “I” position.

![Operating lever diagram]

Feeder earthing

<table>
<thead>
<tr>
<th>ATTENTION!</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the operating lever is not inserted correctly, the earthing switch may be damaged.</td>
</tr>
<tr>
<td>⇒ Insert the operating lever in the actuating opening as far as it will go.</td>
</tr>
</tbody>
</table>

⇒ Push the gate down to release the actuating opening.
⇒ Insert the operating lever for the feeder earthing switch in the actuating opening.
⇒ Turn operating lever 90° clockwise.

![Gate closed]

✔ The position indicator changes from “0” position (green background) to “I” position (red background)
⇒ Remove operating lever.
✔ Gate closes automatically.
26.2 Feeder de-earthing

Preconditions
- The feeder to be earthed is isolated
- The padlock at the feeder earthing switch is removed, the electrical interlock or the key/Ronis interlock is released.

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

⇒ Do not remove the operating lever at intermediate positions.

DANGER!
If there is no auxiliary voltage, both the electrical and the mechanical interlocks are closed. If the interlocks are overridden, it is possible to perform manual operations despite existing interlocks, and this can cause failures. e.

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

Preparing the operating lever
To avoid maloperation, the operating lever for the feeder earthing switch must be adjusted for the planned switching operation.

⇒ To open the feeder earthing switch: Adjust the operating spindle of the lever so that the arrow points to the “0” position.
Feeder de-earthing

ATTENTION!

If the operating lever is not inserted correctly, the earthing switch may be damaged.

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

⇒ Push the gate down to release the actuating opening.
⇒ Insert the operating lever for the feeder earthing switch in the actuating opening.
⇒ Turn operating lever 90° counter-clockwise.

✔ The position indicator changes from "I" position (red background) to "0" position (green background)
⇒ Remove operating lever.
✔ Gate closes automatically.
27 Operating the busbar earthing switch

27.1 Busbar earthing

Preconditions
- The busbar section to be earthed is isolated
- The padlock at the busbar earthing switch is removed, or the electrical interlock is released

DANGER!
High voltage! Danger! The busbar must have been isolated before operating the busbar earthing switch.

- Isolate the busbar.
- Verify safe isolation from supply.

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

- Do not remove the operating lever at intermediate positions.

The actuating opening and the position indicator of the busbar earthing switch are located top-right at the panel front, beside the door of the low-voltage compartment. The actuating opening is locked by an additional gate.
Preparing the operating lever

To avoid maloperation, the operating lever for the busbar earthing switch must be adjusted for the planned switching operation.

- To close the busbar earthing switch: Adjust the operating spindle of the lever so that the arrow points to the “I” position.

---

**DANGER!**

If there is no auxiliary voltage, both the electrical and the mechanical interlocks are closed. If the interlocks are overridden, it is possible to perform manual operations despite existing interlocks, and this can cause failures.

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

---

**ATTENTION!**

If the operating lever is not inserted correctly, the earthing switch may be damaged.

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

- Push the gate down to release the actuating opening.
- Insert the operating lever for the busbar earthing switch in the actuating opening.
- Turn operating lever 90° clockwise.

- The position indicator changes from “0” position (green background) to “I” position (red background)
- Remove operating lever.
- Gate closes automatically.

---

**Busbar earthing**
27.2 Busbar de-earthing

Preconditions

- The busbar section to be earthed is isolated
- The padlock at the busbar earthing switch is removed, or the electrical interlock is released

**DANGER!**

High voltage! Danger! The busbar must have been isolated before operating the busbar earthing switch.

- Isolate the busbar.
- Verify safe isolation from supply.

**DANGER!**

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

- Do not remove the operating lever at intermediate positions.

The actuating opening and the position indicator of the busbar earthing switch are located top-right at the panel front, beside the door of the low-voltage compartment.
Preparing the operating lever

To avoid maloperation, the operating lever for the busbar earthing switch must be adjusted for the planned switching operation.

- To open the busbar earthing switch: Adjust the operating spindle of the lever so that the arrow points to the “0” position.

Busbar de-earthing

- Push the gate down to release the actuating opening.
- Insert the operating lever for the busbar earthing switch in the actuating opening.
- Turn operating lever 90° counter-clockwise.

- The position indicator changes from “I” position (red background) to “0” position (green background)

- Remove operating lever.

ATTENTION!

If the operating lever is not inserted correctly, the earthing switch may be damaged.

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

DANGER!

If there is no auxiliary voltage, both the electrical and the mechanical interlocks are closed. If the interlocks are overridden, it is possible to perform manual operations despite existing interlocks, and this can cause failures.

- Ensure that the intended manual switching operation has been released externally.
28 Operating the feeder earthing switch of the 435 mm contactor panel

28.1 Feeder earthing

Preconditions for operation

- The feeder to be earthed is isolated
- Withdrawable part in test position
- Operating lever available

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

Do not remove the operating lever at intermediate positions.

In contactor panels, the actuating opening and the position indicator of the feeder earthing switch are located bottom-right on the high-voltage door. The actuating opening is locked by means of an additional control gate.

Fig. 67: Actuating opening at the contactor panel

<table>
<thead>
<tr>
<th>DANGER!</th>
</tr>
</thead>
<tbody>
<tr>
<td>If there is no auxiliary voltage, both the electrical and the mechanical interlocks are closed. If the interlocks are overridden, it is possible to perform manual operations despite existing interlocks, and this can cause failures.</td>
</tr>
</tbody>
</table>

- Observe the Five Safety Rules (see Page 5, “General instructions”).
- Ensure that the intended manual switching operation has been released externally. 

Fig. 67: Actuating opening at the contactor panel
Procedure

<table>
<thead>
<tr>
<th>ATTENTION!</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the operating lever is not inserted correctly, the earthing switch may be damaged.</td>
</tr>
<tr>
<td>⇒ Insert the operating lever in the actuating opening as far as it will go.</td>
</tr>
</tbody>
</table>

⇒ Open lock (optional).
⇒ Pull control gate upwards to release the actuating opening.

Fig. 68: Control gate at the contactor panel

⇒ Insert operating lever for feeder earthing switch into actuating opening.

Fig. 69: Operating lever at the contactor panel

⇒ Turn operating lever 180° clockwise.
✓ The position indicator changes to CLOSED position. The earthing switch is closed.
⇒ Remove operating lever.
⇒ Close control gate.
⇒ Close lock (optional).
28.2 Feeder de-earthing

Preconditions for operation

- Authorization to deactivate the feeder earthing is available

<table>
<thead>
<tr>
<th>DANGER!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Once you have started a switching operation, you must complete it totally; turning back is blocked. The operating lever cannot be removed at intermediate positions.</td>
</tr>
<tr>
<td>- Do not remove the operating lever at intermediate positions</td>
</tr>
</tbody>
</table>

In in contactor panels the actuating opening and the position indicator of the feeder earthing switch are located bottom-right on the high-voltage door. The actuating opening is locked by means of an additional control gate.

Fig. 70: Actuating opening at the contactor panel

<table>
<thead>
<tr>
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<tr>
<td>If there is no auxiliary voltage, both the electrical and the mechanical interlocks are closed. If the interlocks are overridden, it is possible to perform manual operations despite existing interlocks, and this can cause failures.</td>
</tr>
<tr>
<td>- Observe the Five Safety Rules (see Page 5, “General instructions”).</td>
</tr>
<tr>
<td>- Ensure that the intended manual switching operation has been released externally.</td>
</tr>
</tbody>
</table>
**Operation**

<table>
<thead>
<tr>
<th>ATTENTION!</th>
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<tbody>
<tr>
<td>If the operating lever is not inserted correctly, the earthing switch may be damaged.</td>
</tr>
<tr>
<td>⇒ Insert the operating lever in the actuating opening as far as it will go.</td>
</tr>
</tbody>
</table>

⇒ Open lock (optional).
⇒ Pull control gate upwards to release the actuating opening.

![Control gate at the contactor panel](image1)

Fig. 71: Control gate at the contactor panel

⇒ Insert operating lever for feeder earthing switch into actuating opening.

![Operating lever at the contactor panel](image2)

Fig. 72: Operating lever at the contactor panel

⇒ Turn operating lever 180° counter-clockwise.
✓ The position indicator changes to OPEN position. The earthing switch is open.
⇒ Remove operating lever.
⇒ Close control gate.
⇒ Close lock (optional).
29 Moving the switching device truck into and out of the panel

The switching device truck is moved into or out of the switching device compartment by means of the ramps folded inside the panel for 600 mm panels and panels with 3AH5 circuit-breaker, and through a separate ramp for 800 mm panels with SION circuit-breaker.

Moving the truck into the panel with ramps folded out

- Open the door to the switching device compartment.
- Fold out the ramps.
- Move the switching device truck into the switching device compartment over the ramps.
- Push the switching device truck into the panel as far as it will go.
- Lock the switching device truck in the switching device compartment. To do this, turn the lateral fixing levers 90° inside.

DANGER!
Risk of injury by the switching device truck falling over.
- Only qualified personnel is permitted to move the switching device truck.
- Make sure that the switching device truck does not slip off the ramps.
- Support the switching device truck with one foot at the bottom of the truck (1) while moving the truck into the panel.
- Move the switching device truck into the switching device compartment over the ramps.
- Plug the low-voltage connector in.
- Fold in the ramps.
- Close the door to the switching device compartment.

- The switching device truck is inserted and locked.
Moving the truck into the panel over a separate ramp

**DANGER!**
Risk of injury by the switching device truck falling over.

- Only qualified personnel is permitted to move the switching device truck.
- Make sure that the switching device truck does not slip off the ramps.
- Support the switching device truck with one foot at the bottom of the truck (1) while moving the truck into the panel.

- Open the door to the switching device compartment.
- Hang the ramp in at the front of the panel.

![Diagram showing the truck being moved into the panel](image)

- Move the switching device truck into the switching device compartment over the ramps as far as it will go.
- Lock the switching device truck in the switching device compartment. To do this, turn the lateral fixing levers 90° inside.

![Diagram showing the lateral fixing levers](image)

- The switching device truck is inserted and locked.
- Plug the low-voltage connector in.
- Remove the ramp from the panel.
- Close the door to the switching device compartment.
Moving the truck out of the panel with ramps folded out

**ATTENTION!**
The door to the switching device compartment can only be opened and the truck can only be moved if the switching device truck is in TEST position and the truck is interlocked.

- Rack the switching device truck to TEST position.
- Interlock the switching device truck.

- Open the door to the switching device compartment.
- Remove the low-voltage connector.
- Fold out the ramps.

- Unlock the switching device truck. To do this, turn the lateral fixing levers 90° outside.
Operation

**DANGER!**
Risk of injury by the switching device truck falling over.
- Only qualified personnel is permitted to move the switching-device truck.
- Make sure that the switching device truck does not slip off the ramps.
- Pull the switching device truck slowly to the front and out of the panel.
- Support the switching device truck with one foot at the bottom of the truck while moving the truck out of the panel.
- Move the switching device truck to the front and out of the panel.
- Fold in the ramps.
- Close the door to the switching device compartment.

**Moving the truck out of the panel over a separate ramp**

**ATTENTION!**
The door to the switching device compartment can only be opened and the truck can only be moved if the switching device truck is in TEST position and the truck is interlocked.
- Rack the switching device truck to TEST position.
- Interlock the switching device truck.
- Open the door to the switching device compartment.
- Remove the low-voltage connector.
- Hang the ramp in at the front of the panel.

1

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Unlock the switching device truck. To do this, turn the lateral fixing levers 90° outside.

DANGER!
Risk of injury by the switching device truck falling over.

- Only qualified personnel is permitted to move the switching device truck.
- Make sure that the switching device truck does not slip off the ramps.
- Pull the switching device truck slowly to the front and out of the panel.
- Support the switching device truck with one foot at the bottom of the truck a while moving the truck out of the panel.

- Move the switching device truck to the front and out of the panel.
- Remove the ramp from the panel.
- Close the door to the switching device compartment.
30 Moving the withdrawable contactor into and out of the panel

The withdrawable contactor is moved into or out of the switching device compartment at 435 mm panels by using the service truck.

30.1 Taking the withdrawable contactor out of the panel

**Preconditions**

- Service truck available
- Withdrawable contactor in test position
- High-voltage door open

**Fig. 73: Preparing the withdrawable contactor for removal**

1. Withdrawable contactor
2. Locking lever
3. Service truck
4. Locking bracket

- Open the two locking levers 2 at the withdrawable contactor.
Operation

Pull the withdrawable contactor ① out of the switching device compartment and onto the service truck ③ until the withdrawable contactor latches tight on the service truck.

The low-voltage connection is separated automatically.

Now the locking bracket ④ can be lowered, and the service truck with the withdrawable contactor can be removed.

ATTENTION!
If the service truck is not properly interlocked with the panel while removing the withdrawable part, the switchgear and the withdrawable part can be seriously damaged.

Move the withdrawable part only if the service truck is interlocked with the panel.

Move the service truck only if the withdrawable part is interlocked in its end position on the service truck.

NOTE!
Withdrawable contactors are designed without coding.

Do absolutely observe the rated currents of the HV HRC fuse-links.
**Operation**

**Procedure**

Move the service truck centrally in front of the contactor panel. Bring the centering bolts ① of the service truck into line with the centering openings ② at the panel base.

Fold the locking bracket ③ upwards. This will lower the locking plate ④.

The service truck is interlocked with the contactor panel.
30.2 Inserting the withdrawable contactor in the panel

Before inserting the withdrawable contactor

<table>
<thead>
<tr>
<th>NOTE!</th>
</tr>
</thead>
<tbody>
<tr>
<td>When the withdrawable contactor is inserted, the mechanism for manual operation of the feeder shutter and the busbar shutter is not accessible.</td>
</tr>
</tbody>
</table>

⇒ Insert the withdrawable contactor in the panel only if the feeder shutter and the busbar shutter are closed and secured with a padlock each.

⇒ If required, close the feeder shutter and secure it with a padlock (see Page 127, “Closing the feeder shutter (lower shutter)”).

⇒ If required, close the busbar shutter and secure it with a padlock (see Page 128, “Closing the busbar shutter (upper shutter)”).

Fig. 74: Feeder and busbar shutters closed and locked
Inserting the withdrawable contactor in the panel

Before inserting the withdrawable contactor, check the position of the earthing switch coupling. The coupling must be in position 2, then the receptacle 1 for the coupling pin of the earthing switch operating shaft 3 is in vertical position.

- Make sure that the coupling pin of the earthing switch operating shaft 3 in the withdrawable part is in vertical position.

The low-voltage connection 4 couples automatically when the withdrawable contactor is inserted.
Positioning the service truck with the withdrawable part in front of the panel

ATTENTION!
If the service truck is not properly interlocked with the panel while inserting the withdrawable part, the switchgear and the withdrawable part can be seriously damaged.

★ Move the withdrawable part only if the service truck is interlocked with the contactor panel.
★ Move the service truck only if the withdrawable part is interlocked in its end position on the service truck.

★ Open the high-voltage door (see Page 84, “Opening the high-voltage door of the contactor panel”).
★ Move the service truck with the withdrawable contactor centrally in front of the contactor panel. Bring the centering bolts of the service truck into line with the centering openings at the panel base.
★ Fold the locking bracket at the service truck upwards. The service truck is interlocked with the contactor panel.
★ Release the withdrawable contactor from the service truck using the pedal, and push it completely into the contactor panel.

★ Fold the locking bracket at the service truck downwards. The service truck can be removed.

Fig. 77: Pedal at the service truck  
Fig. 78: Pushing the withdrawable contactor into the panel
Close the two locking levers at the withdrawable contactor.

![Fig. 79: Closing the locking levers](image1)

![Fig. 80: Locking lever closed](image2)

- The withdrawable contactor is interlocked with the contactor panel.
- Close the high-voltage door (see Page 85, "Closing the high-voltage door of the contactor panel").
31 Verification of safe isolation from supply (LRM system)

The panels can be equipped with voltage detecting systems.

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

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

The perfect function of the coupling section must have been verified according to:
- IEC 78/183/CDV

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

If the indicator does not flash or light up in any of the three phases, the phases are isolated from supply.
32  Manual operation of shutters

32.1  Manual operation of shutters in circuit-breaker and disconnecting panels

The feeder and busbar shutters can be opened individually. When one shutter is opened, the mechanism of the other one can be padlocked. If both shutters have to be opened at the same time, locking the shutter mechanism is omitted during the following operations.

<table>
<thead>
<tr>
<th>Preparation</th>
</tr>
</thead>
<tbody>
<tr>
<td>➔ Rack the switching device truck to TEST position.</td>
</tr>
<tr>
<td>➔ Open the door to the switching device compartment.</td>
</tr>
<tr>
<td>➔ Pull the switching device truck out of the panel over the ramps.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opening the busbar shutter (upper shutter)</th>
</tr>
</thead>
<tbody>
<tr>
<td>➔ Padlock the feeder shutter mechanism on the left side of the panel.</td>
</tr>
<tr>
<td>➔ Apply operating lever on shutter mechanism on right side of panel.</td>
</tr>
</tbody>
</table>

DANGER!

High voltage! Danger! If the busbars in the busbar compartment and the cable or bar connections in the connection compartment have not been isolated, the contacts are live at operating voltage.

➢ Isolate the busbars in the busbar compartment and the cable or bar connections in the connection compartment before opening the shutters.

➢ Observe the **Five Safety Rules** (see Page 5, "General instructions").

➢ Verify safe isolation from supply.
Operation

Push operating lever down.

The busbar shutter is open.

- Hold operating lever in lower position.
- Move operating lever upwards.
- Shutters close automatically.
- Move the switching device truck into the panel over the ramp.
- Close the door to the switching device compartment.

Closing the busbar shutter (upper shutter)

Opening and closing the feeder shutter (lower shutter)

The feeder shutter is opened and closed in the same way as the busbar shutter. Perform the same work operations as for operating the busbar shutter on the other side of the panel.

- Padlock the busbar shutter mechanism on the right side of the panel.
- Operate the feeder shutter on the left side of the panel.
32.2 Manual operation of shutters in the 435 mm contactor panel

The feeder and busbar shutters can be opened individually. When one shutter is opened, the mechanism of the other one can be padlocked. If both shutters have to be opened at the same time, locking the shutter mechanism is omitted during the following operations.

<table>
<thead>
<tr>
<th>DANGER!</th>
</tr>
</thead>
<tbody>
<tr>
<td>High voltage! Danger! If the busbars in the busbar compartment and the cable or bar connections in the connection compartment have not been isolated, the contacts are live at operating voltage.</td>
</tr>
<tr>
<td>➔ Isolate the busbars in the busbar compartment and the cable or bar connections in the connection compartment before opening the shutters.</td>
</tr>
<tr>
<td>➔ Observe the Five Safety Rules (see Page 5, “General instructions”).</td>
</tr>
<tr>
<td>➔ Verify safe isolation from supply.</td>
</tr>
</tbody>
</table>

Preparing shutter operation

➔ Rack the withdrawable contactor to test position.
➔ Open the high-voltage door.
➔ Take the withdrawable contactor out of the panel (see Page 115, “Taking the withdrawable contactor out of the panel”).

![Diagram of shutter mechanism]

Fig. 81: Front view of contactor panel, high-voltage door open and withdrawable contactor removed

The shutter mechanism for manual operation of the shutters is located top-left in the switching device compartment of the contactor panel.
Shutter mechanism for manual operation

Opening the feeder shutter (lower shutter)

→ Loosen the locking buttons ⑥ and ⑧.
→ Open and remove the padlock ①.
→ Turn the shutter operating lever ⑦ clockwise by the handle as far as it will go.
→ Tighten the locking buttons ⑥ and ⑧.

Fig. 82: Control elements of the shutter mechanism
The feeder shutter is open.

Perform voltage test or other intended operation.

Closing the feeder shutter (lower shutter)

Loosen the locking buttons 6 and 8.

Turn the shutter operating lever 7 counter-clockwise by the handle as far as it will go.

Tighten the locking buttons 6 and 8.

Refit the padlock 1 and lock it.

The feeder shutter is closed.

Close the high-voltage door.

Opening the busbar shutter (upper shutter)

Loosen the locking buttons 4 and 5.

Open and remove the padlock 2.

Turn the shutter operating lever 3 counter-clockwise by the handle as far as it will go.

Tighten the locking buttons 4 and 5.
The busbar shutter is open.

Perform voltage test or other intended operation.

Closing the busbar shutter (upper shutter)

Loosen the locking buttons 4 and 5.

Turn the shutter operating lever 3 clockwise by the handle as far as it will go.

Tighten the locking buttons 4 and 5.

Refit the padlock 2 and lock it.

The busbar shutter 9 is closed.

Close the high-voltage door.
33 Replacing high-voltage fuses

The fuses are located at the removable contactor and the metering truck.

### ATTENTION!

- The switchgear can be damaged.
- Use HV HRC fuse-links only.
- During replacement, take care to use HV HRC fuse-links with the same ratings and from the same manufacturer.

- Open the door to the switching device compartment, see Page 83, “Opening the door to the switching device compartment”.
- Pull the removable part out of the panel, see Page 110, “Moving the switching device truck into and out of the panel”.

### DANGER!

- Risk of burning due to hot fuses.
- Do not touch fuses, check temperature first.
- Let hot fuses to cool down.

**Removing fuse-links**

- Remove defective fuses. To do this, pull the fuse out of the contact spring first at the top and then at the bottom.
**Operation**

**Inserting fuse-links**

- Insert new fuses so that the striker is at the top. To do this, insert the fuse first in the lower contact spring and then in the upper contact spring.

- Reset the fuse tripping contact (push the operating rod briefly to the back).
- Move the removable part into the panel.
- Close the door to the switching device compartment.

The current carrying capacity of the withdrawable contactor with HV HRC fuse-links performs according to the tables below:
### Current carrying capacity at a system frequency of 50 Hz

<table>
<thead>
<tr>
<th>$U_n$</th>
<th>$I_{th}$</th>
<th>$f$</th>
<th>Order no.</th>
<th>Number per phase</th>
<th>$I_{th}$ HV HRC fuse</th>
<th>Current carrying capacity in [A] at ambient temperature in [°C]</th>
</tr>
</thead>
<tbody>
<tr>
<td>[kV]</td>
<td>[kA]</td>
<td>[Hz]</td>
<td></td>
<td></td>
<td></td>
<td>[A] 25 30 35 40 45 50 55</td>
</tr>
<tr>
<td>7.2</td>
<td>≤ 40</td>
<td>50</td>
<td>3011054.250</td>
<td>2</td>
<td>250</td>
<td>344 333 322 310 298 285 272</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3011054.200</td>
<td>2</td>
<td>200</td>
<td>284 275 266 256 246 235 225</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3010953.160</td>
<td>2</td>
<td>160</td>
<td>250 242 233 225 216 207 197</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3011054.315</td>
<td>1</td>
<td>315</td>
<td>264 256 247 238 229 219 209</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3011054.250</td>
<td>1</td>
<td>250</td>
<td>224 217 210 202 194 186 177</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>3011054.200</td>
<td>1</td>
<td>200</td>
<td>184 178 172 166 159 153 146</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3010953.160</td>
<td>1</td>
<td>160</td>
<td>161 156 150 145 139 133 127</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3010953.125</td>
<td>1</td>
<td>125</td>
<td>124 120 116 112 108 103 98</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3010853.100</td>
<td>1</td>
<td>100</td>
<td>100 97 93 90 86 83 79</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>3010853.80</td>
<td>1</td>
<td>80</td>
<td>80 79 76 74 71 68 65</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>3010853.63</td>
<td>1</td>
<td>63</td>
<td>63 63 63 63 63 63 63</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3010853.50</td>
<td>1</td>
<td>50</td>
<td>50 50 50 50 50 50 50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$U_n$</th>
<th>$I_{th}$</th>
<th>$f$</th>
<th>Order no.</th>
<th>Number per phase</th>
<th>$I_{th}$ HV HRC fuse</th>
<th>Current carrying capacity in [A] at ambient temperature in [°C]</th>
</tr>
</thead>
<tbody>
<tr>
<td>[kV]</td>
<td>[kA]</td>
<td>[Hz]</td>
<td></td>
<td></td>
<td></td>
<td>[A] 25 30 35 40 45 50 55</td>
</tr>
<tr>
<td>12</td>
<td>≤ 40</td>
<td>50</td>
<td>3010353.160</td>
<td>2</td>
<td>160</td>
<td>212 205 198 191 184 178 168</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3010353.160</td>
<td>1</td>
<td>160</td>
<td>136 132 128 123 118 113 108</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3010253.125</td>
<td>1</td>
<td>125</td>
<td>105 102 99 95 91 87 83</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3010253.100</td>
<td>1</td>
<td>100</td>
<td>84 82 79 76 73 70 67</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3010253.80</td>
<td>1</td>
<td>80</td>
<td>69 67 64 62 60 57 54</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3010153.63</td>
<td>1</td>
<td>63</td>
<td>59 57 55 53 51 49 46</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3010153.50</td>
<td>1</td>
<td>50</td>
<td>47 45 44 42 40 39 37</td>
</tr>
</tbody>
</table>
Current carrying capacity at a system frequency of 60 Hz

<table>
<thead>
<tr>
<th>$U_h$</th>
<th>$I_{th}$</th>
<th>$f$</th>
<th>Order no.</th>
<th>Number per phase</th>
<th>$I_{hHV HRC fuse}$</th>
<th>Current carrying capacity in [A] at ambient temperature in [°C]</th>
</tr>
</thead>
<tbody>
<tr>
<td>[kV]</td>
<td>[kA]</td>
<td>[Hz]</td>
<td></td>
<td></td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>7.2</td>
<td>≤ 40</td>
<td>60</td>
<td>3011054.250</td>
<td>2</td>
<td>250</td>
<td>339</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3011054.200</td>
<td>2</td>
<td>200</td>
<td>280</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td>2</td>
<td>160</td>
<td>246</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3011054.315</td>
<td>1</td>
<td>315</td>
<td>260</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3011054.250</td>
<td>1</td>
<td>250</td>
<td>221</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3011054.200</td>
<td>1</td>
<td>200</td>
<td>181</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3010953.160</td>
<td>1</td>
<td>160</td>
<td>158</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3010953.125</td>
<td>1</td>
<td>125</td>
<td>122</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3010853.100</td>
<td>1</td>
<td>100</td>
<td>98</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3010853.60</td>
<td>1</td>
<td>80</td>
<td>79</td>
</tr>
<tr>
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<td></td>
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<td>3010853.63</td>
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<td>63</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3010853.50</td>
<td>1</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

For rated fuse currents ≤ 63 A, no current reductions must be considered due to the ambient temperature and the system frequency.

Due to the arising motor starting current, the instant when the motor starts represents the maximum stress for the HV HRC fuse-link. Motor starting currents are dependent on the starting time and the starting frequency.

The latest motor protection tables with HV HRC fuse-links type HHM are available in the download area of the SIBA company: www.SIBA.de

These motor protection tables show the correspondence between the maximum permissible starting currents of downstream HV motors (depending on the stating time and the starting frequency) and the associated HV HRC fuse-links.
Operation

The illustration below shows the coordination of a HV HRC fuse characteristic with a motor characteristic as an example:

![Diagram showing coordination of HV HRC fuse and motor characteristics]

Fig. 85: Example for the coordination of a HV HRC fuse characteristic 125 A with a motor characteristic

1. Characteristic of the HV HRC fuse
2. Motor starting current
3. Motor starting time
4. Characteristic of the overcurrent-time protection

The latest time-current characteristics for HV HRC fuse links type HHM are available in the download area of the SIBA company: www.SIBA.de

**Coordination**

Rules for coordinating the components of the motor circuit:

- The time-current characteristic must be located on the right of the motor starting current (point A).
- The rated current of the HV HRC fuse-link must exceed the normal current of the motor.
- The current corresponding to the intersection B of the HV HRC fuse-link characteristic and the characteristic of the overcurrent-time protection must be higher than the minimum breaking current of the HV HRC fuse-link.
- If this is not feasible, it must be ensured that overload currents that are smaller than the minimum breaking current of the HV HRC fuse-link are interrupted by the switching device via the striker. This prevents thermal overloading of the HV HRC fuse-link, which would otherwise be destroyed.
- The selected HV HRC fuse-link limits the sustained symmetrical short-circuit current $I_k$ to the let-through current $I_D$, shown in the diagram for the current-limiting characteristics ($I_D$ as a function of $I_k$ for HV HRC fuse-links with different rated currents). The maximum permissible let-through current is $I_D = 46$ kA.
**Requirements**

The coordination of the components of the motor circuit places the following requirements:

- The let-through current $I_D$ must not exceed 46 kA at 7.2 kV/12 kV.

- In case of low-voltage supply via a control transformer, short-circuit currents ranging above the limit breaking capacity must be interrupted within 80 ms. This requirement does not apply if
  - the mechanical latch is provided
  - or
  - the opening times have been extended so much, that – in the a.m. current range – the contactor can only open when the fuse has interrupted the current

- The limit breaking capacity is:
  - 3TL62: 5.0 kA
  - 3TL63: 5.0 kA
  - 3TL66: 4.5 kA

- Due to the arising motor starting current, the instant when the motor starts represents the maximum stress for the HV HRC fuse-link. This stress must neither operate nor pre-damage the fuse-link.

- Other factors of influence on the stress of the HV HRC fuse-links are the starting time and the starting frequency of the motors.
Maintenance and servicing

34 Maintenance

The vacuum circuit-breakers / contactors used are maintenance-free within the scope of the permissible number of operating cycles. Under normal environmental and operating conditions the maintenance intervals are longer than five years.

Built-in equipment such as voltage transformers, current transformers, relays, meters, protection equipment, etc. must be serviced and maintained as specified in the associated operating instructions.

- Commercially available tools are sufficient for carrying out the maintenance work
- After maintenance, put the equipment again into operation as per the operating instructions
- Carry out maintenance and servicing at shorter intervals (to be specified by the owner) if there is a lot of dust, or if the air is extremely humid and/or polluted
- Grease main fixed contacts of bushings and fixed contacts of earthing switches as well as other surfaces exposed to friction (e.g. shutter operating linkage, guide rails) at shorter intervals (to be specified by the owner): Tin of Longtherm 2 grease (8BX1022)
- Independently of the regular maintenance, immediately determine the cause of faults and short circuits and replace any damaged components

Maintenance intervals

The maintenance intervals described hereafter are a recommendation when the switchgear is operated under normal environmental conditions. In case of extreme operating conditions the maintenance intervals must be adjusted accordingly.

Annual maintenance

- Carry out general check for damages, dust layers, humidity in the switchpanels, and for partial discharge noises.
- Check whether accessories are complete and in good condition (including the truck or the withdrawable element and the service truck).

Maintenance after five years

- Operate earthing switches for test.
- Clean switchpanels.
- Check function of switchpanels and put switchgear again into operation.
- Check primary connections of current and voltage transformers.
- Check bolted joints, see Page 71, “Checking bolted joints”.


35 Maintenance of vacuum circuit-breaker / vacuum contactor

**Preconditions**
- Supply voltage switched off
- Circuit-breaker in OPEN position
- Spring energy store not charged

<table>
<thead>
<tr>
<th>DANGER!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working on a closed circuit-breaker and on a open circuit-breaker with charged spring energy store can cause dangerous injuries.</td>
</tr>
<tr>
<td>⇧ Switch off low-voltage supply before performing maintenance.</td>
</tr>
<tr>
<td>⇧ Close and open the circuit-breaker manually. In this way it is ensured that the circuit-breaker is open and the spring energy store is not charged.</td>
</tr>
</tbody>
</table>

Under normal conditions, the circuit-breaker is maintenance-free. However, we recommend to make visual inspections at regular intervals.

For optimal insulation, the insulating parts must be clean.

- Clean insulating parts with a humid cloth and soft cleaning agent, e.g. dish cleaner.
- Clean all other parts with a lint-free cloth if they are dirty.
- Grease relevant parts with Klüber Isoflex Topas L32.
### 36 Trouble shooting

#### Truck interlocking

<table>
<thead>
<tr>
<th>Fault</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck cannot be pulled out of panel</td>
<td>Truck interlock closed</td>
<td>Open truck interlock</td>
</tr>
<tr>
<td>Door to switching device compartment cannot be closed</td>
<td>Fixing lever not folded inwards</td>
<td>Fold fixing lever inwards</td>
</tr>
<tr>
<td>Positions of earthing switch actuation (truck) and earthing switch (panel) do not coincide</td>
<td>Adjust position of earthing switch actuation to position of earthing switch</td>
<td></td>
</tr>
</tbody>
</table>

#### Truck

<table>
<thead>
<tr>
<th>Fault</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck cannot be pulled out of panel</td>
<td>Truck interlock closed</td>
<td>Open truck interlock</td>
</tr>
<tr>
<td>Door to switching device compartment cannot be closed</td>
<td>Fixing lever not folded inwards</td>
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<tr>
<td>Positions of earthing switch actuation (truck) and earthing switch (panel) do not coincide</td>
<td>Adjust position of earthing switch actuation to position of earthing switch</td>
<td></td>
</tr>
</tbody>
</table>

#### Earthing switches

<table>
<thead>
<tr>
<th>Fault</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control gate at cross member of operating mechanism cannot be opened (truck cannot be racked to SERVICE position mechanically). Double-bit key cannot be turned (control gate cannot be opened)</td>
<td>Hand crank for switching device truck inserted</td>
<td>Remove hand crank for switching device truck</td>
</tr>
<tr>
<td>General switchgear interlock active</td>
<td>General switchgear interlock active (electromagnetic interlock active)</td>
<td>Observe general switchgear interlock (electromagnetic interlock active)</td>
</tr>
<tr>
<td>Control gate locked with padlock</td>
<td>Control gate locked with padlock</td>
<td>Remove the padlock</td>
</tr>
<tr>
<td>Operating lever cannot be inserted</td>
<td>&quot;1&quot; Key/Ronis interlock is not released</td>
<td>Insert and rotate the key</td>
</tr>
<tr>
<td>Operating lever cannot be rotated</td>
<td>&quot;0&quot; Key/Ronis interlock is not released</td>
<td>Insert and rotate the key</td>
</tr>
</tbody>
</table>

#### Circuit-breaker

<table>
<thead>
<tr>
<th>Fault</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circuit-breaker cannot be closed</td>
<td>Hand crank for removable part inserted</td>
<td>Remove hand crank for switching device truck and lock the switching device truck at SERVICE or TEST position</td>
</tr>
<tr>
<td>Truck in FAULTY position</td>
<td>Truck in FAULTY position</td>
<td>Rack truck to SERVICE or TEST position</td>
</tr>
<tr>
<td>Spring not charged</td>
<td>Spring not charged</td>
<td>Wait for 15 s (motor) or charge manually</td>
</tr>
<tr>
<td>Undervoltage release not energized</td>
<td>Undervoltage release not energized</td>
<td>Energize undervoltage release</td>
</tr>
<tr>
<td>Low-voltage connector not plugged in</td>
<td>Low-voltage connector not plugged in</td>
<td>Plug low-voltage connector in</td>
</tr>
<tr>
<td>Spring energy store does not charge</td>
<td>Spring energy store does not charge</td>
<td>Apply control voltage or charge spring energy store manually</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fault</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control voltage not applied</td>
<td>Control voltage not applied</td>
<td>Apply control voltage or charge spring energy store manually</td>
</tr>
</tbody>
</table>
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