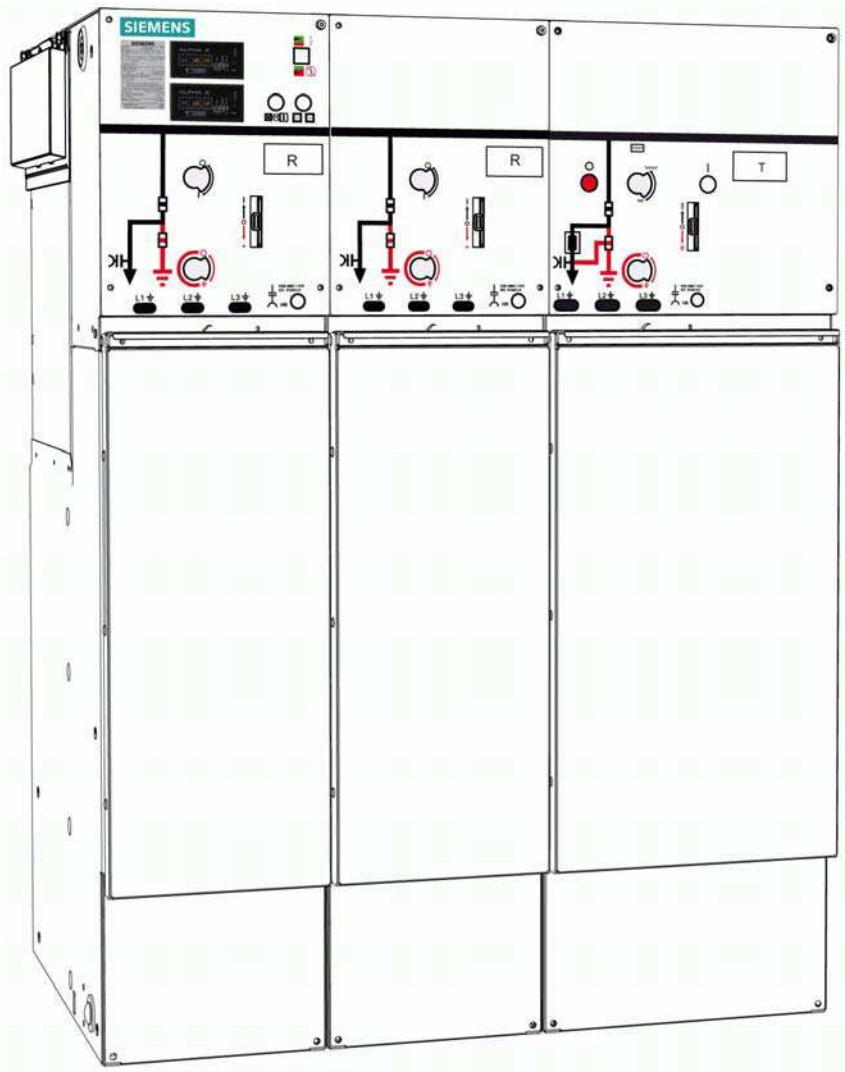
SIEMENS

# Medium-Voltage Switchgear

## Medium-voltage switchgear type 8DJH, block versions

Up to 24 kV, gas-insulated

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## INSTALLATION AND OPERATING INSTRUCTIONS

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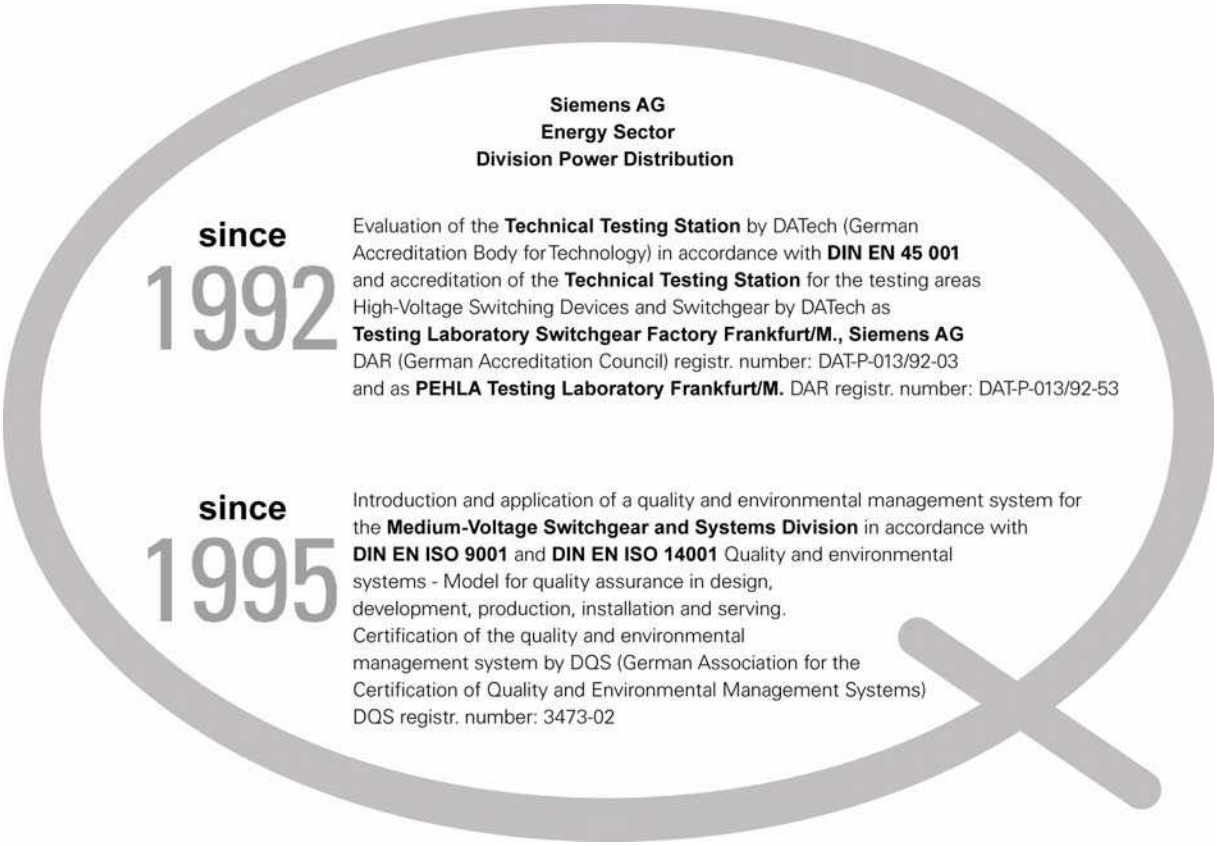



## About these Instructions

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. Should further information be desired or should particular problems arise which are not covered sufficently 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.

## Contents

# Safety instructions

## 1 Signal terms and definitions

| | |
|---|---|
|  | **DANGER!**<br>as used in these instructions, this means that personal injuries can occur if the relevant precautionary measures are not taken.<br><br>⇨ Observe the safety instructions. |

| | |
|---|---|
|  | **ATTENTION!**<br>as used in these instructions, this means that damage to property or environment can occur if the relevant precautionary measures are not taken.<br><br>⇨ Observe the safety instructions. |

| | |
|---|---|
|  | **NOTE!**<br>as used in these instructions, this points at facilitations of work, particularities for operation or possible maloperation.<br><br>⇨ Observe the notes. |

# 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.

**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:

- Isolating.
- Securing against reclosing.
- Verify safe isolation from supply.
- Earthing and short-circuiting.
- Covering or barriering adjacent live parts.

**Hazardous materials**

If hazardous materials are required to perform the work, the relevant safety data sheets and operating instructions must be observed.

**Personal protective equipment (PPE)**

To perform the work, the necessary personal protective equipment (PPE) must be worn.

To protect oneself against exhausting hot gases in case of an internal arc, the national standards and specifications of the corresponding authorities and professional associations must absolutely be observed and accomplished while selecting the work protective equipment.

The protective equipment consists of:

- Protective clothing
- Gloves
- Helmet and face protection

**Protective clothing**

Jacket and overalls made of double-layer material providing a protective effect against electric arcs (e.g. Nomex® Comfort); if applicable, additional polo shirt made of the same material.

Underwear only made of cotton or also Nomex®.

**Gloves**

Gloves with gauntlets, the material of which must feature a dielectric strength of 1000 V as a minimum.

**Helmet**

Helmet in closed design (without ventilation holes), consisting of glass-fiber polyester resin (not dripping under thermal effects), holding its shape up to 500° Celsius as a minimum.

**Face protection**

A face vizor made of clear acetate with a minimum thickness of 1.5 mm, protecting against arc faults.

It should be possible to attach the face vizor to the helmet so that it can be folded.

## 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 (e.g. DIN VDE 0101/0105).

## 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, e.g.:

- 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 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.

# Description

## 5 Features

**Typical uses**

8DJH switchgear is used - even under severe ambient conditions - for power distribution in secondary distribution systems, such as

- Industrial distribution systems
- Consumer and transfer substations

It is available for rated voltages up to 24 kV and rated currents of the feeders up to 630 A.

**Technology**

- Factory-assembled, type-tested, metal-enclosed switchgear for indoor installation
- Individual panels and/or panel blocks can be freely combined to a switchgear assembly
- Circuit-breaker panels with maintenance-free indoor vacuum circuit-breakers for rated voltages from 7.2 to 24 kV
- Hermetically welded switchgear vessel, made of stainless steel, with welded-in bushings for electrical connections and mechanical components
- Insulating gas $SF_6$
- Maintenance-free
- Climate-independent
- Three-position switch-disconnector with load-break and make-proof earthing function
- Circuit-breaker with vacuum interrupters and integrated three-position disconnector with make-proof earthing function
- Cable connection for bushings with outside cone
- Installation and extension without gas work
- Comprehensive special equipment or accessories
- Ecological manufacture and recycling

**Freely configurable block versions**

Besides the standard panel blocks, the fully modular switchgear concept offers the possibility to combine freely configurable panel blocks.

Up to four modules can be combined in one panel block. The position of the individual modules is free, except for the bus sectionalizer modules.

The width and weight of the switchgear results from the addition of the configured individual panels.

**Personal safety**

- Safe-to-touch and hermetically sealed primary enclosure
- HV HRC fuses and cable sealing ends are only accessible when outgoing feeders are earthed
- Operation only possible when enclosure is closed
- Logical mechanical interlocking
- Capacitive voltage detecting system to verify safe isolation from supply and phase coincidence
- Feeder earthing via make-proof earthing switches

**Security of operation and availability**

- Sealed primary enclosure
- Independent of environmental effects such as pollution, humidity and small animals
- Sealed for life: Welded switchgear vessel, welded-in bushings and operating mechanism
- Operating mechanism parts maintenance-free (IEC/EN 62 271-1/VDE 0671-1)
- Operating mechanisms of switching devices accessible outside the switchgear vessel
- Switchgear interlocking system with logical mechanical interlocks
- Mechanical position indicators integrated in the mimic diagram

# 6 Functional modules (selection)

**Overview: Configurability of panel modules**

| | Panel modules | Panel width | Freely configurable arrangement in panel blocks | Stipulated arrangement in panel blocks |
|---|---|---|---|---|
| **R** | Ring-main feeder | 310 mm | X | |
| **T** | Transformer feeder with switch-disconnector/fuse combination | 430 mm | X | |
| **L** | Circuit-breaker feeder | 430 mm | X | |
| **K** | Cable feeder (combinations of transformer and circuit-breaker feeder are possible via panel extensions) | 310/430 mm | | X |

**Examples for panel modules**

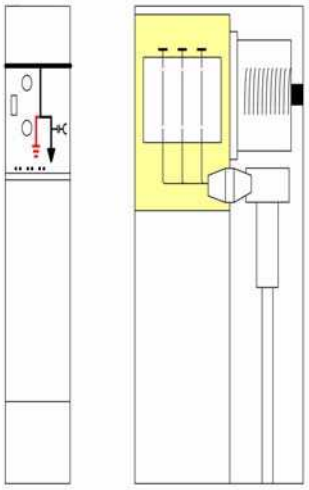


Fig. 1: Ring-main feeder type R

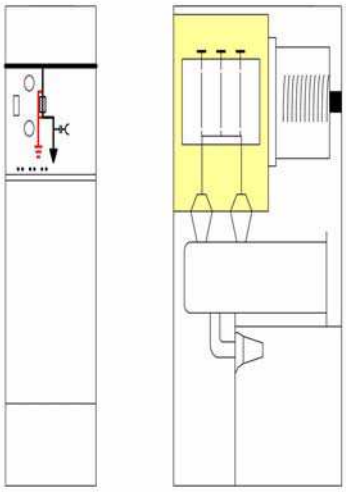


Fig. 2: Transformer feeder type T

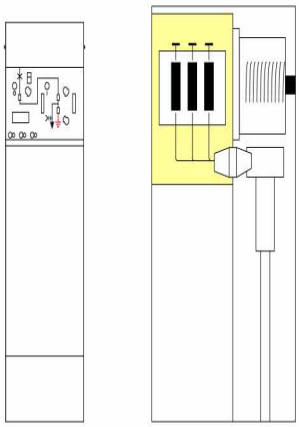


Fig. 3: Circuit-breaker feeder type L (430 mm)

**Overview: Panel modules as individual panels**

| | **Panel modules as individual panels** | **Panel width** |
|---|---|---|
| **R** | Ring-main feeder | 310/500 mm |
| **K** | Cable feeder | 310/430 mm |
| **T** | Transformer feeder | 430 mm |
| **L** | Circuit-breaker feeder | 430/500 mm |

# 7 Components

## 7.1 Three-position switch-disconnector

**Features**

- The three-position switch-disconnector is designed for rated voltages from 7.2 kV to 24 kV
- Switching functions as general-purpose switch-disconnector (class E3) according to IEC/EN 60 265-1 / VDE 0670-301, IEC/EN 62 271-102 / VDE 0671-102 and IEC/EN 62 271-105 / VDE 0671-105
- Designed as a three-position switch incorporating the functions of a switch-disconnector and a make-proof earthing switch with the switch positions: "CLOSED -OPEN - EARTHED"
- The function of a 2nd earthing switch is integrated in the switch-fuse combination

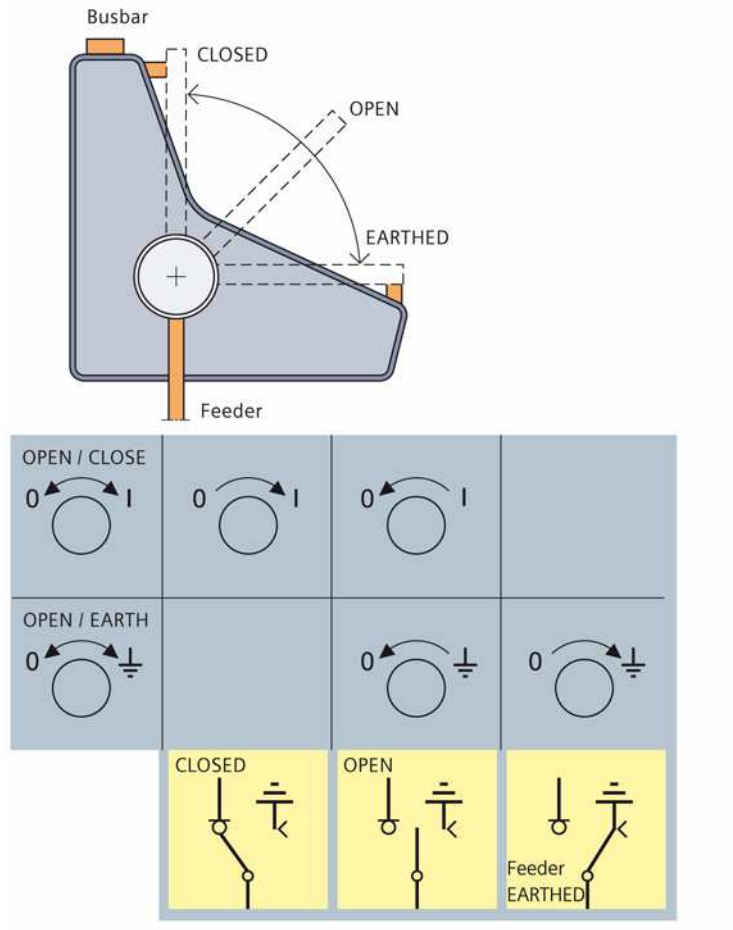



Fig. 4: Operation of three-position switch

**Mode of operation**

The operating shaft forms one unit together with the three contact blades.
Due to the arrangement of the fixed contacts (earth - busbar), it is not necessary to interlock the CLOSE and EARTHING functions.

**Closing operation**

During the closing operation, the operating shaft with the moving contact blades changes from the “OPEN” to the “CLOSED” position.

The force of the spring-operated mechanism ensures a high closing speed and a reliable connection of the main circuit.

**Opening operation**

During the opening operation, the arc is caused to rotate by the arc-suppression system, thus preventing the development of a fixed root. This very effective arc extinction provides short arcing times. The isolating distance in gas established after opening satisfies the conditions for isolating distances according to IEC/EN 60 265-1 / VDE 0671-102 and IEC/EN 62 271-1 / VDE 0671-1.

**Earthing operation**

The "EARTHING" operation is implemented by the turning movement of the operating lever (rotation, if required) from the "OPEN" to the "EARTHED" position.

**Operating mechanisms for the three-position switch**

**Common features**

- Mechanical endurance of more than 1000 operating cycles
- Manual operation with the help of a slip-on operating lever
- Option: Motor operation of the disconnecting function
- Control board with accordingly cut-out switching gate prevents the three-position switch-disconnector from being switched directly from the CLOSED via the OPEN to the EARTHED position.
- Two separate actuating openings are provided for unambiguous selection of either the load-break function or make-proof earthing.
- Operation via rotary movement, operating direction according to IEC/EN 60 447 (VDN/VDEW recommendation).

The switching movements are performed independently of the operating speed.

**Features of spring-operated/stored-energy mechanism**

During the charging process, the closing and opening springs are charged. This ensures that the switch-disconnector/fuse combination can switch off all types of faults reliably even during closing.

Closing and opening is done via pushbuttons after removing the operating lever, and is therefore identical with the operation of circuit-breaker operating mechanisms.

An energy store is available for tripping by means of an operating HV HRC fuse or via a shunt release (f-release).

After the HV HRC fuse has tripped, a red crossbar appears on the "fuse tripped" indicator.

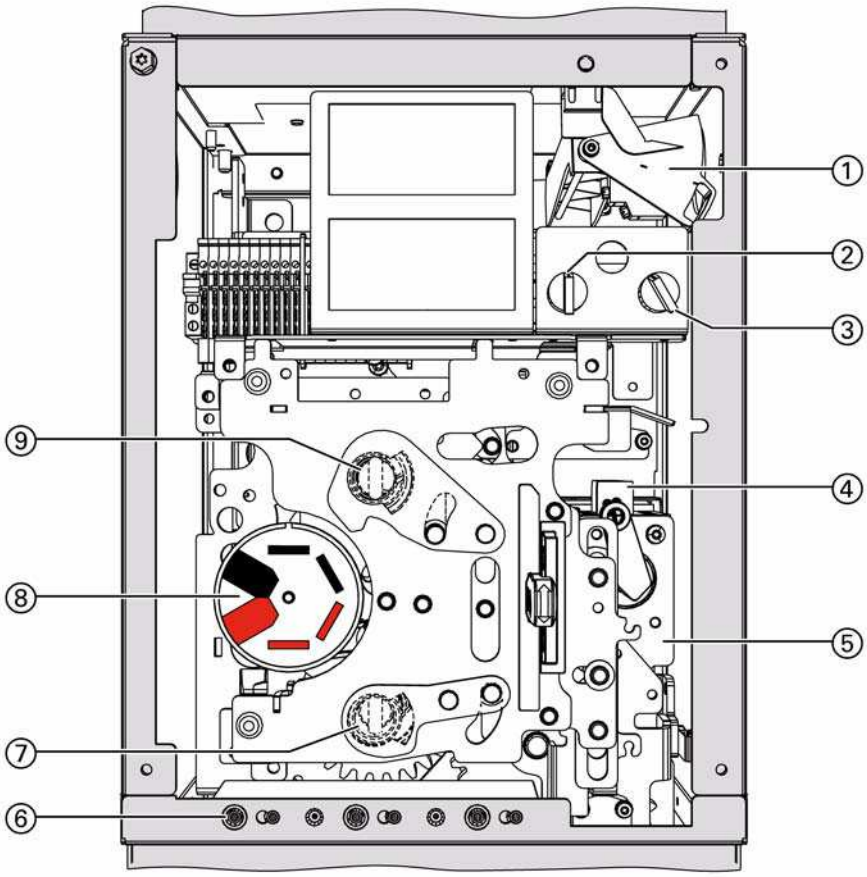
Manual operation for the EARTHING function with the help of a slip-on operating lever.

**Assignment of operating mechanism type of three-position switch to panel types**

| Panel type | R, L | | T | |
|---|---|---|---|---|
| Function | Switch-disconnector (R)<br>Disconnector (L) | Earthing switch | Switch-disconnector | Earthing switch |
| Type of operating mechanism | Spring-operated | Spring-operated | Stored-energy | Spring-operated |
| Operation | Manual<br>Motor (option) | Manual | Manual<br>Motor (option) | Manual |

**Design**

The three-position switch-disconnector is operated through a gas-tight welded bushing at the front of the switchgear vessel.




**Ring-main feeder:**

① Ready-for-service indicator

② Knob-operated switch for CLOSE/OPEN, motor operating mechanism (option)

③ Knob-operated switch for local-remote operation (option)

④ Auxiliary switch (option)

⑤ Motor operating mechanism (option)

⑥ Capacitive voltage detecting system

⑦ Manual operation of the rotary lever mechanism for the EARTHING function

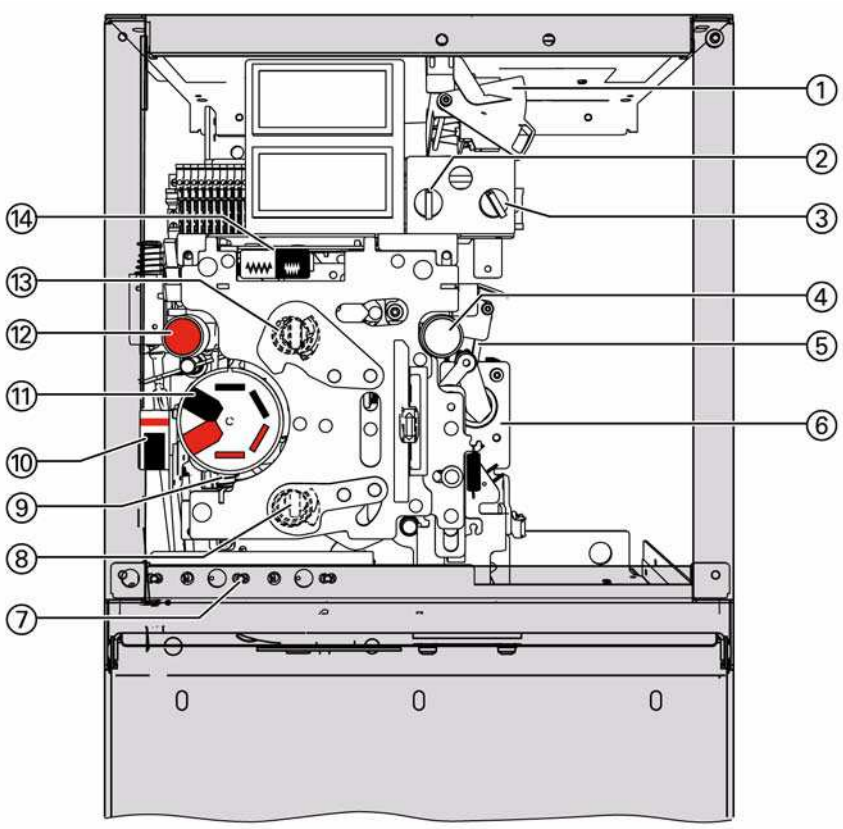
⑧ Position indicator for three-position switch-disconnector

⑨ Manual operation of the rotary lever mechanism for the CLOSE function

Fig. 5: Front operating mechanism in ring-main feeder

**Spring-operated mechanism**

The spring-operated mechanism is used for the three-position switch-disconnector in ring-main panels (as ring-main switch). The switching movements are performed independently of the operating speed.




① Ready-for-service indicator
② Knob-operated switch for CLOSE/OPEN, motor operating mechanism for DISCONNECTING function (option)
③ Knob-operated switch for local-remote operation (option)
④ "ON" pushbutton (mechanical operation)
⑤ Auxiliary switch (option)
⑥ Motor operating mechanism (option)
⑦ Capacitive voltage detecting system
⑧ Manual operation of the rotary lever mechanism for the EARTHING function
⑨ Shunt release (f-release) (option)
⑩ "Fuse tripped" indicator
⑪ Position indicator for three-position switch-disconnector
⑫ "OFF" pushbutton (mechanical operation)
⑬ Actuating opening for "spring charging"
⑭ "Spring charged" indicator for closing and opening springs of stored-energy mechanism

Fig. 6: Front operating mechanism in transformer feeder

**Mode of operation of spring-operated/stored-energy mechanism**

The spring-operated/stored energy mechanism is used for three-position switch-disconnectors in transformer panels (as transformer switch). First, the operating springs are charged with the "spring charged" operation. Then, closing and opening is done via separate pushbuttons. An energy store is available for the opening process when an HV HRC fuse or a shunt release (f-release) trips. No additional charging process is required for the energy store. This energy store is already charged by switching from the "spring not charged" position to the "spring charged" position. This pre-charged energy store ensures that the switch-disconnector/fuse combination can switch off all types of faults reliably even during closing. After the HV HRC fuse has tripped, a red transverse bar appears on the "fuse tripped" indicator.

The switchgear is equipped with an operating lever ejection system, which means that, after charging the springs, the operating lever is ejected, thus preventing it from being left inserted accidentally.

| Sequence | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Operation | | Charging the springs | | |
| Switch position | OPEN | OPEN | CLOSED | OPEN |
| Position indicator | | | | |
| "Spring charged" indicator | | | | |
| Closing spring | not charged | charged | not charged | not charged |
| Opening spring | not charged | charged | charged | not charged |

**Equipment**

**Mechanism operation**

Operating lever for charging the springs of the switch-disconnector and the make-proof earthing switch. Coding of the operating levers is optionally possible.

**Motor operating mechanism (optional)**

Operation

- Local operation by momentary-contact rotary control switch (option)
- Remote operation (standard) applied to terminal

Operating voltages for motor operating mechanisms and tripping coils

- 24, 48, 60, 110, 220 V DC
- 110 and 230 V AC 50/60 Hz

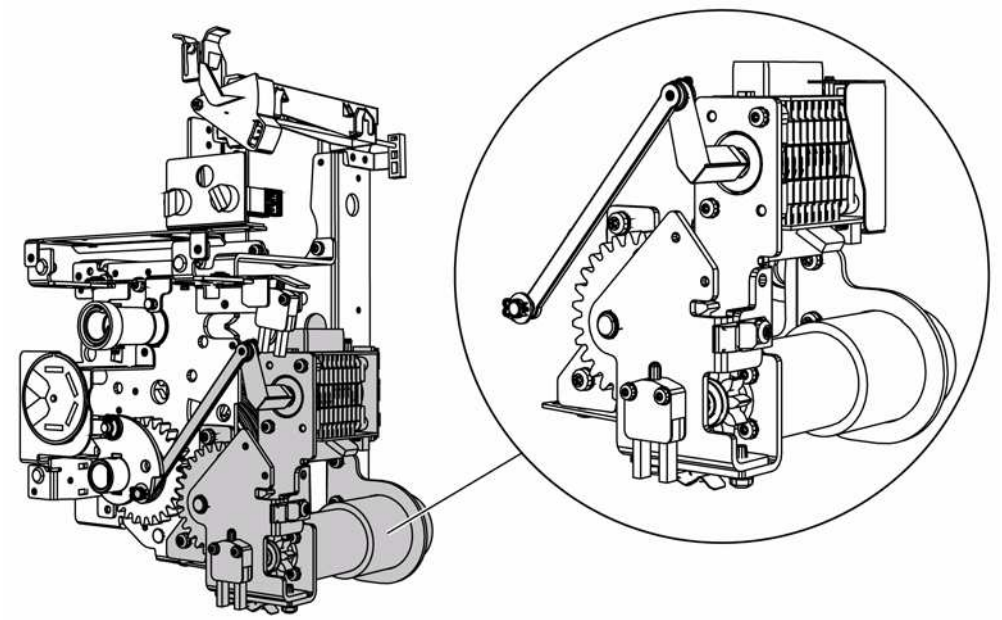


Fig. 7: Motor unit with auxiliary switch block

**Shunt release (f-release) CLOSED/OPEN (optional)**

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

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

In transformer panels, continuity at the shunt release can only be tested when the operating lever is removed.

**Auxiliary switch (optional)**

The operating mechanism of the three-position switch-disconnector can be optionally equipped with an auxiliary switch for the position indication. A motor operating mechanism is equipped with an auxiliary switch as standard.

- For switch-disconnector function: CLOSED and OPEN: 2 NO + 2 NC
- For earthing switch function: CLOSED and OPEN: 2 NO + 2 NC

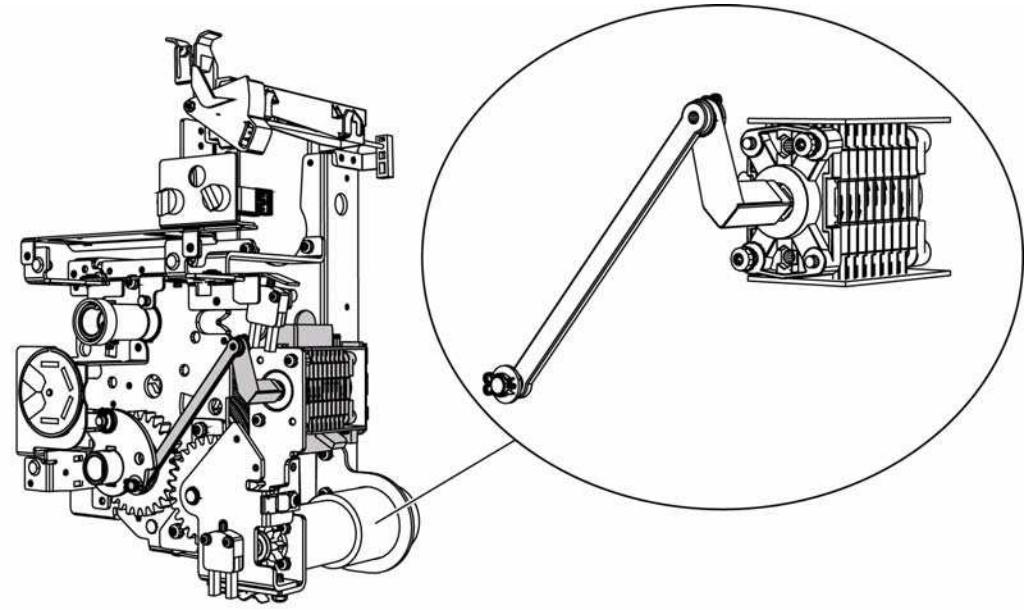


Fig. 8: Auxiliary switch in the operating mechanism of the three-position switch-disconnector, for example in the ring-main feeder

**Wiring**

Auxiliary switches, motor operating mechanisms or shunt releases are wired to terminal strips. The terminal strips are feeder-related and located over the operating mechanism assembly of the feeder concerned. Customer-side cable routing is made from the side, if required from above to the terminal strip arranged at the operating mechanism assembly.

### 7.2 Vacuum circuit-breaker type 2

**Features**

- Vacuum circuit-breaker for rated voltages from 7.2 kV to 24 kV
- According to IEC/EN 62 271-100 / VDE 0671-100
- Climate-independent vacuum interrupter poles in the gas-filled switchgear vessel
- Application in hermetically welded switchgear vessel in conformity with the system
- Operating mechanism located outside the switchgear vessel in the front operating mechanism box
- Maintenance-free according to IEC/EN 62 271-1 / VDE 0671-1

**Operating mechanism functions**

The closing and opening springs are charged by means of the operating lever supplied, or by the motor (option), until the latching of the closing/opening spring is indicated ("spring charged" indicator). Then, the vacuum circuit-breaker can be closed manually or electrically (option).

**Operating mechanism for circuit-breaker feeder**

The operating mechanism assigned to a circuit-breaker feeder consists of the following components:

- Operating mechanism for circuit-breaker
- Operating mechanism for three-position disconnector
- Motor operating mechanism (optional)
- Position indicators
- Pushbuttons for CLOSING and OPENING the circuit-breaker
- Mechanical operations counter (optional)
- Interlocking between circuit-breaker and disconnector
- "Spring charged" indicator

| **Assignment of operating mechanism type to panel types** | | | |
|---|---|---|---|
| Panel type | **L** | | |
| Function | Circuit-breaker | Three-position disconnector | |
| | | Disconnector | Earthing switch |
| Type | Stored-energy | Spring-operated | Spring-operated |
| Operation | Manual/motor | Manual/motor | Manual |

The vacuum circuit-breaker consists of a vacuum interrupter unit with integrated three-position disconnector located in the switchgear vessel, and the associated operating mechanisms.

The vacuum circuit-breaker is a circuit-breaker without automatic reclosing.

For further data, see Page 41, "Technical data".

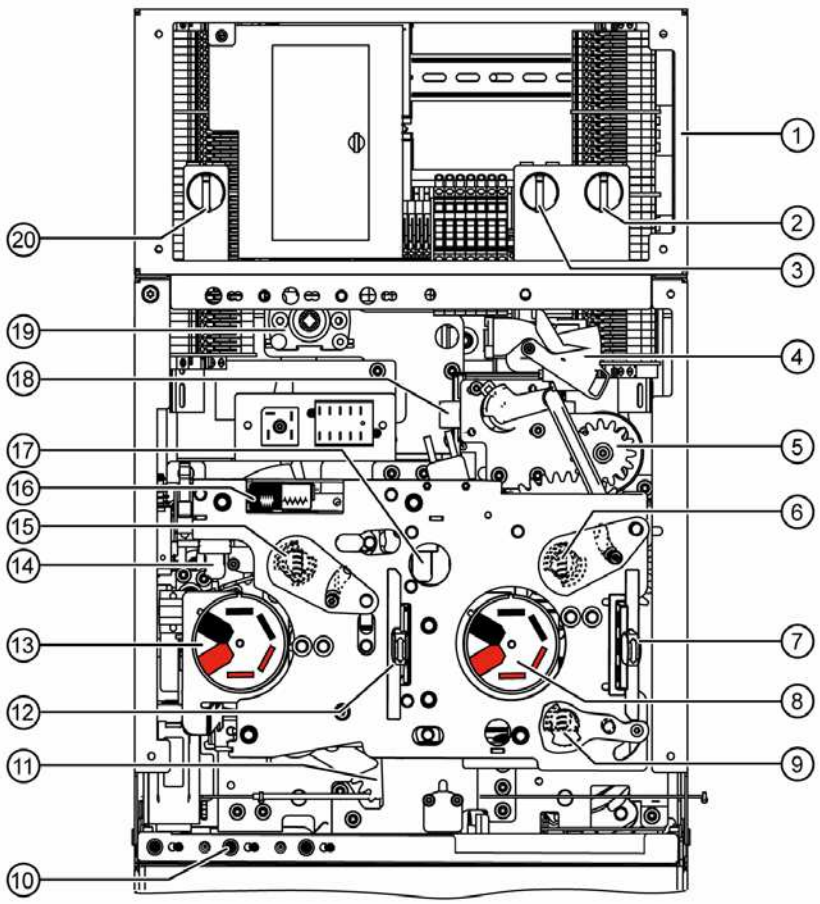



Fig. 9: Operating mechanism for circuit-breaker type 2

1 Low-voltage housing
2 Knob-operated switch for local-remote operation (option)
3 Knob-operated switch for CLOSE/ OPEN, motor operating mechanism for disconnector (option)
4 Ready-for-service indicator
5 Motor of the three-position disconnector (option)
6 Actuating opening for DISCONNECTING, three-position disconnector
7 Control gate/locking device for three-position disconnector
8 Position indicator for three-position disconnector
9 Actuating opening for EARTHING, three-position disconnector
10 Sockets for capacitive voltage detecting system
11 Motor of the vacuum circuit-breaker (option)
12 Control gate/locking device for circuit-breaker
13 Position indicator for circuit-breaker
14 "OFF" pushbutton for circuit-breaker (mechanical operation)
15 Actuating opening for "spring charging" at the circuit-breaker
16 "Spring charged" indicator for closing and opening springs of stored-energy mechanism
17 "ON" pushbutton for circuit-breaker (mechanical operation)
18 Auxiliary switch at the three-position disconnector (option)
19 Auxiliary switch at the circuit-breaker (option)
20 Knob-operated switch for CLOSE/ OPEN at the circuit-breaker (option)

In individual panels, the rating plate is located top-left on the front cover, in blocks it is only provided on the left-hand panel.

| Sequence | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Operation | | Charging the  springs |  |  |
| Switch position | OPEN | OPEN | CLOSED | OPEN |
| Position indicator |  |  |  |  |
| "Spring charged" indicator |  |  |  |  |
| Closing spring | not charged | charged | not charged | not charged |
| Opening spring | not charged | charged | charged | not charged |

**Secondary equipment of the vacuum circuit-breaker type 2**

**Secondary components**

The scope of the secondary equipment of the vacuum circuit-breaker depends on the type of application.

**Motor operating mechanism (option)**

Operating voltages for motor operating mechanisms (circuit-breaker and disconnector)

- 24, 48, 60, 110, 220 V DC
- 110 and 230 V AC 50/60 Hz
- Power consumption: 80 W for AC and DC

**Closing solenoid (option)**

- For electrical closing (coil voltage is coupled with motor voltage)

**Shunt release (option)**

- Magnet coil
- Magnet coil with energy store
- Tripping by protection relay or electrical actuation

**C.t.-operated release (option)**

- For tripping pulse 0.1 Ws in conjunction with suitable protection systems, e.g. protection system 7SJ45, SEG WIC; other designs on request
- Used if external auxiliary voltage is missing, tripping via protection relay

**Low-energy magnetic release (option)**

- For tripping pulse 0.01 Ws, tripping via transformer monitor (IKI-30)

**Undervoltage release (option)**

- Comprising:
  - Energy store and unlatching mechanism
  - Electromagnetic system, which is permanently connected to voltage while the vacuum circuit-breaker is closed; tripping is initiated when this voltage drops
- Connection to voltage transformers possible

**Circuit-breaker tripping signal (option)**

- For electrical signaling (as pulse ≥ 10ms), e.g. to remote control systems, in the case of automatic tripping (e.g. protection)
- Via auxiliary switch

**Varistor module**

- Integrated in the releases for voltages > 60 V DC

**Auxiliary switch (option)**

- For circuit-breaker: 6NO + 6NC, free contacts thereof 2NO + 2NC + 2 changeover, depending on equipped releases
- For disconnector: 6NO + 6NC, free contacts thereof 2NO + 2NC + 2 changeover

**Position switch (option)**

- For "closing/opening spring charged" indication

**Interlock between circuit-breaker and disconnector**

- Operating mechanism with mechanical interlocking
- Mutual interrogation between circuit-breaker and three-position disconnector
- During operation of the three-position disconnector from CLOSED to OPEN and from EARTHED to OPEN, the vacuum circuit-breaker cannot be closed
- When the circuit-breaker is closed, the three-position disconnector is interlocked

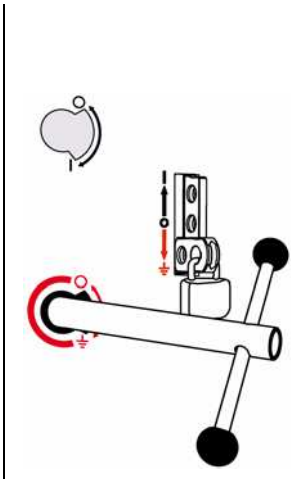
**Gas pressure monitoring (option)**

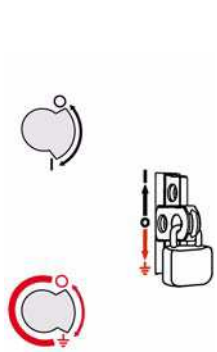
- Free contacts: 1 NO

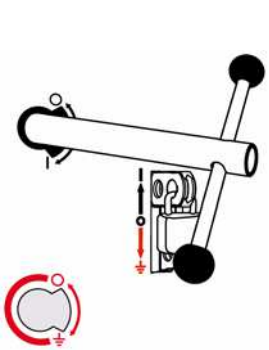
### 7.3 Interlocks

**Mechanical interlock**

- The switching gate prevents switching straight from "CLOSED" to "EARTHED" or from "EARTHED" to "CLOSED", as the operating lever must be re-inserted in the "OPEN" position.
- The cable compartment cover (HV HRC fuse compartment cover) can only be removed if the transformer feeder is earthed and the operating lever is removed.
  The three-position switch-disconnector can only be switched from the "EARTHED" position to another position if the cable compartment cover (HV HRC fuse compartment cover) is fitted.
- Interlocks between the circuit-breaker and the three-position disconnector
  - Circuit-breaker in OPEN position: The three-position disconnector can be closed and opened. The circuit-breaker is locked out.
  - Circuit-breaker in CLOSED position: The three-position disconnector cannot be operated.
- The cable compartment covers can only be removed when the associated feeder is earthed.
- A closing lock-out (option) in the ring-main or circuit-breaker feeder prevents the three-position disconnector / switch-disconnector from being switched to the "CLOSED" position if the cable compartment cover is removed.
- A de-earthing lock-out in the transformer panel (standard), the ring-main panel or the circuit-breaker panel (option) prevents the three-position disconnector / switch-disconnector from being switched from "EARTHED" to "OPEN" if the cable compartment cover is removed.
- With stored-energy and circuit-breaker operating mechanisms, closing and opening is not possible if the operating lever is inserted.
- The locking device (option) of the switching gate can be padlocked in all three switch positions. The locking device can be padlocked so that **no closing** or **no opening** or **no earthing** is possible. The padlock can also be fitted in such a way that none of the three switching operations can be performed.







| **Padlock** | Down | Center | Up | |
|---|---|---|---|---|
| **Actuating opening** | Earthing switch | - | Disconnector/ switch-disconnector | Circuit-breaker/ transformer switch |
| **Possible switching operations** | Only EARTHING and DE-EARTHING possible | No switching operations possible | - Only CLOSING and OPENING possible<br>- Only possible if the circuit-breaker is open | - Charging the spring |

**Electrical interlock**

If the operating lever for the three-position switch is inserted, the motor operating mechanism cannot be operated from remote or locally anymore.

### 7.4 Cable compartment covers

- The cable compartment covers can only be removed when the associated feeder is earthed.

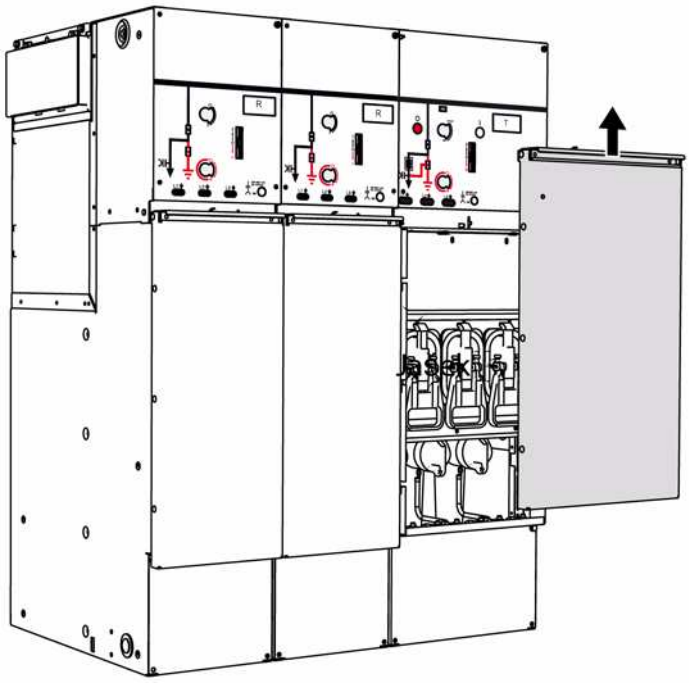


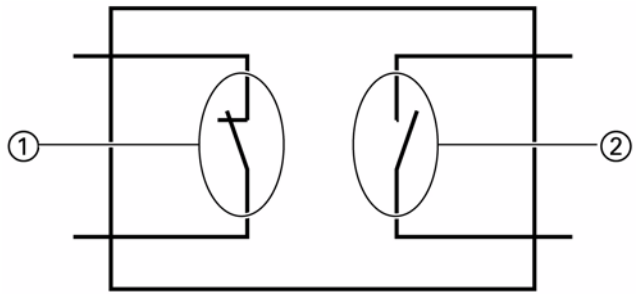
Fig. 10: Removing the cable compartment cover at the transformer panel

| | |
|---|---|
|  | **ATTENTION!**<br>In switchgear panels without switching devices, the cable compartment covers are screwed on. Do absolutely observe the Five Safety Rules of Electrical Engineering.<br>⇨ Isolate.<br>⇨ Secure against reclosing.<br>⇨ Verify safe isolation from supply.<br>⇨ Earth and short-circuit.<br>⇨ Cover or barrier adjacent live parts. |

### 7.5 HV HRC fuse assembly

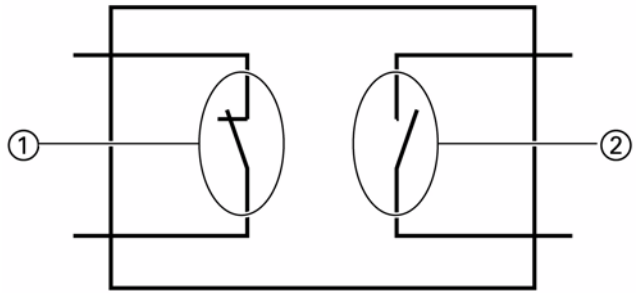
**Features**

- HV HRC fuse-links according to DIN 43 625 (main dimensions) with striker in "medium" version according to IEC/EN 60 282-1
  - As short-circuit protection before transformers,
  - with selectivity to upstream and downstream connected equipment
  - 1-pole insulated
- Requirements according to IEC 62 271-105 / VDE 067-105 fulfilled by combination of HV HRC fuses with the three-position switch-disconnector
- Thermal striker tripping when the corresponding HV HRC fuse-link is used
- Climate-independent and maintenance-free, with fuse boxes made of cast resin
- Arrangement of fuse assembly below the switchgear vessel
- Fuse assembly connected to the three-position switch-disconnector via welded-in bushings and connecting bars
- Fuses can only be replaced if feeder is earthed
- Option: "Tripped indication" of the HV HRC fuse of the transformer switch for remote electrical indication with 1NO contact




① 1 NC contact wired to terminal
② 1 NO contact wired to terminal

Fig. 11: Signaling switch in manual operating mechanism




① 1 NC contact for de-energizing
② 1 NO contact wired to terminal

Fig. 12: Signaling switch in motor operating mechanism

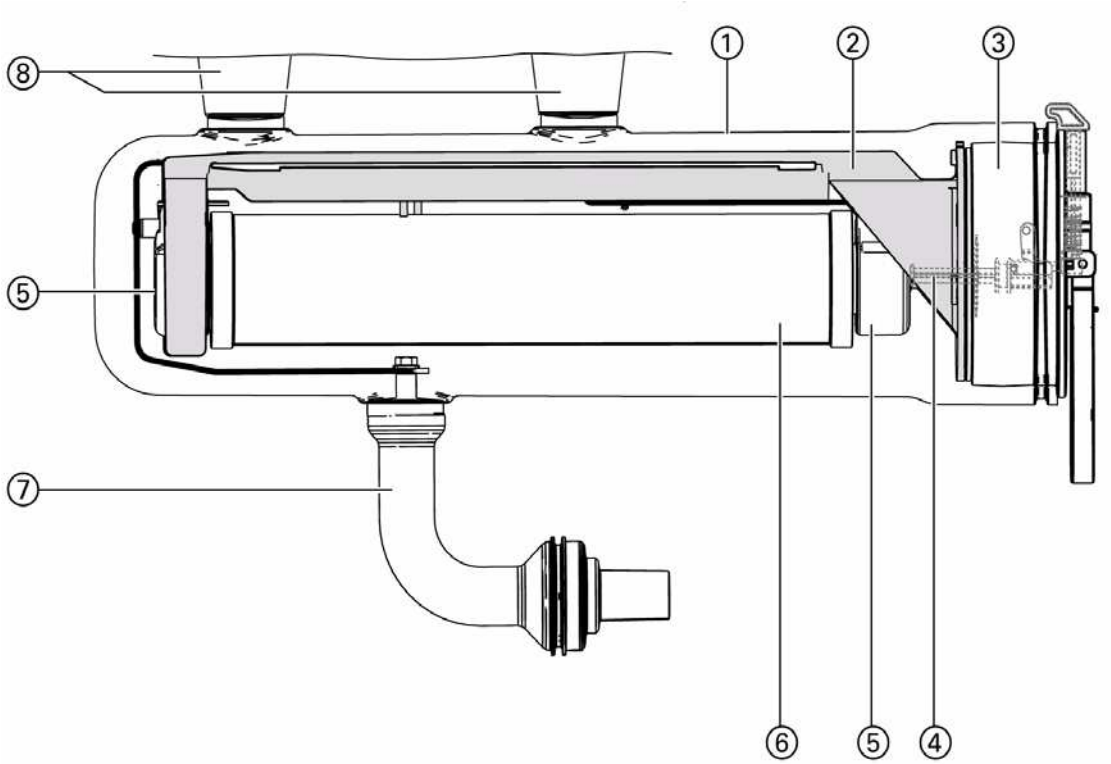



Fig. 13: HV HRC fuse assembly

① Fuse box
② Fuse slide
③ Sealing cover with seal
④ Tripping pin for redirection at the spring-operated/stored-energy mechanism
⑤ Locking cap with control electrode
⑥ HV HRC fuse
⑦ Cable connection (bushing)
⑧ Fuse bushing

**Possible cable connections for the HV HRC fuse assembly**

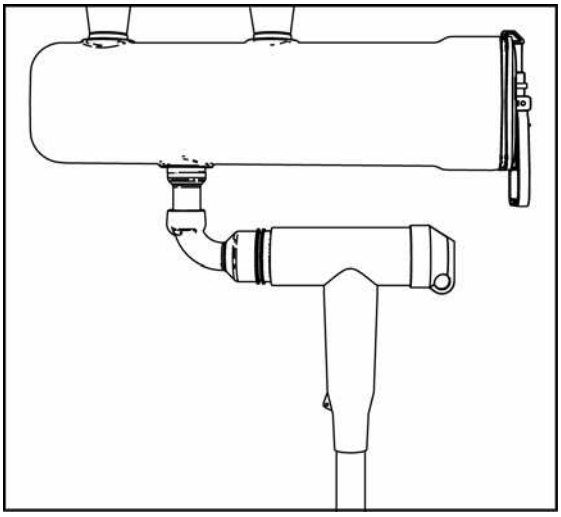


Fig. 14: Fuse assembly with bushing according to DIN 50181 type C for connection of T-plugs or elbow plugs for cable routing downwards (T-plug shown)

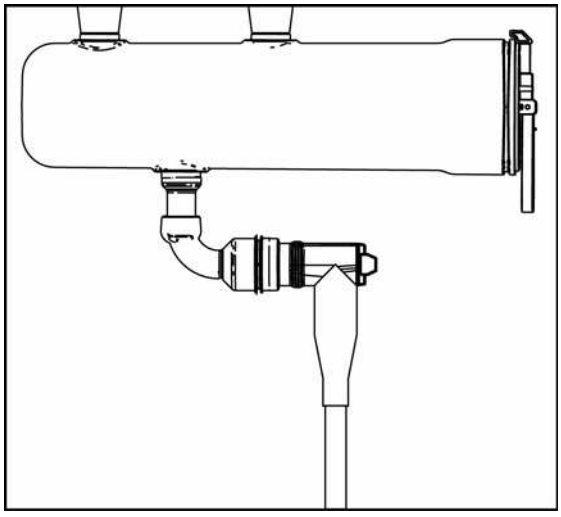


Fig. 15: Fuse assembly with bushing according to DIN 50181 type A for connection of elbow plugs for cable routing downwards

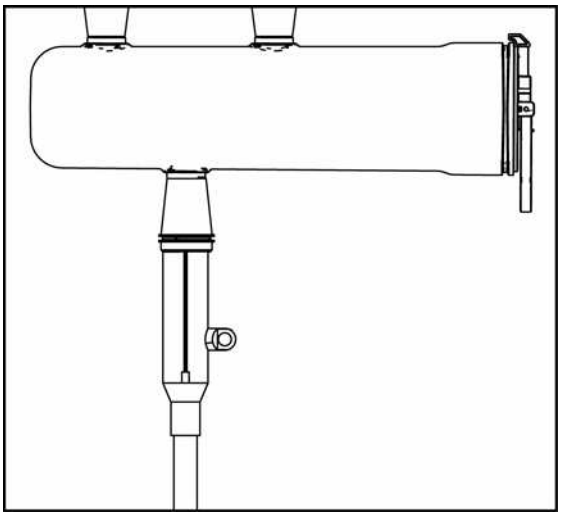


Fig. 16: Fuse assembly with bushing according to DIN 50181 type A for connection of straight cable plugs for cable routing downwards

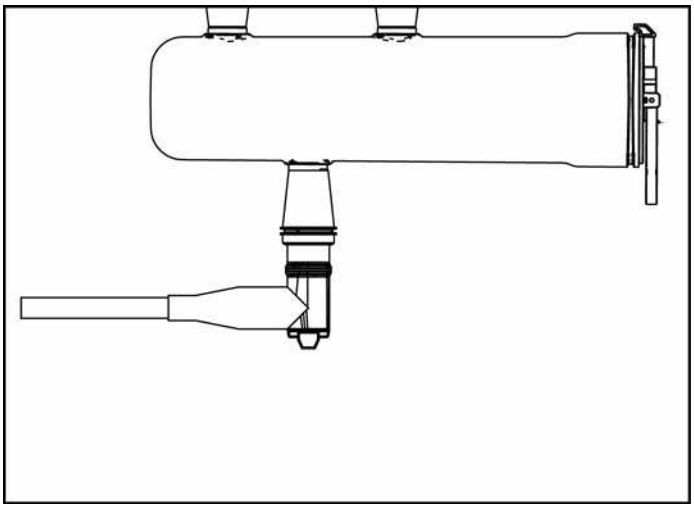


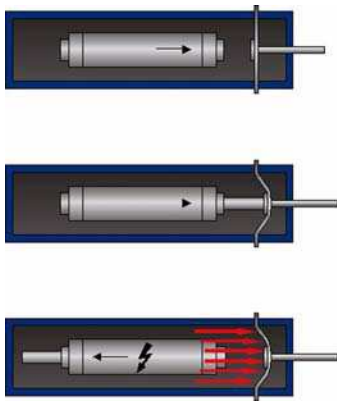
Fig. 17: Fuse assembly with bushing according to DIN 50181 type A for connection of elbow plugs for cable routing to the rear

**Mode of operation**

In the event that an HV HRC fuse-link has tripped, the switch is tripped via an articulation which is integrated into the cover of the fuse box.

In the event that fuse tripping fails, e.g. if the fault current is less than $I_{min}$, or if the fuse has been inserted incorrectly, the fuse box is protected by thermal protection.
The overpressure generated by overheating trips the switch via a diaphragm in the cover of the fuse box and via the articulation. This breaks the current before the fuse box incurs irreparable damage. This thermal protection works independently of the type and design of the HV HRC fuse used. Like the fuse itself, it is maintenance-free and independent of any outside climatic effects.

**Schematic sketches for fuse tripping**




Furthermore, the specified HV HRC fuses release the striker depending on the temperature and trip the switch-disconnector as early as in the fuse overload range. Impermissible heating of the fuse box can be avoided in this way.

## 7.6 Cable connection

### Cable connections with bolted contact for ring-main and circuit-breaker feeders

**Features**

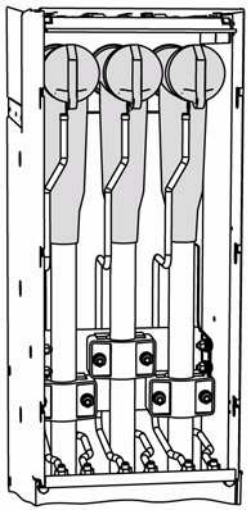


Fig. 18: Cable connection for ring-main and circuit-breaker feeders (example Euromold K400 TB)

- For bushings according to EN 50 181/DIN EN 50 181 (interface type C with bolted contact M16)
- For thermoplastic-insulated cables
- For paper-insulated mass-impregnated cable with adapter systems
- Access to the cable compartment only if the feeder has been disconnected and earthed
- As screened (semi-conductive) version independent of the site altitude
- Connection of cable elbow plugs or cable T-plugs with bolted contact M16 for 630 A, paper-insulated mass-impregnated cables via customary adapters, power cables as thermoplastic-insulated single-core cables with the corresponding plugs and adapters mentioned above

**Options**
- Mounted cable clamps on cable bracket (e.g. C profiles or similar)
- Surge protection devices of the same make in connection with the respective cable T-plugs

**Surge arresters**
- Pluggable on cable T-plug, cable elbow plug
- Installation of certain configurations with surge arresters possible via deep cable compartment cover
- Surge arresters recommended if, at the same time, the cable system is directly connected to the overhead line, or the protection zone of the surge arrester at the end tower of the overhead line does not cover the switchgear

**Surge limiters**
- Pluggable on cable T-plug
- Surge limiters recommended when motors are connected

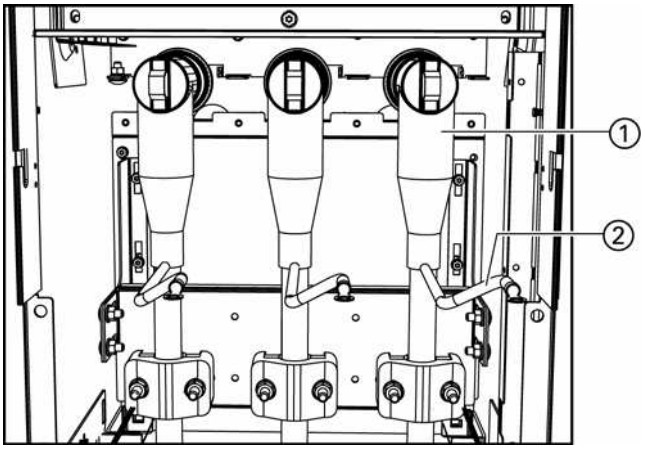
**Conventional cable connections for ring-main feeders and circuit-breaker feeders**

Conventional cable sealing ends can be equipped with elbow adapters, e.g. RICS (Tyco Electronics Raychem).

**Possibilities of connection**
- Cable testing e.g. with measuring bolt, make nkt cables, type PAK 630, see Page 124, "Cable testing"
- Conventional sealing end: As customer supply

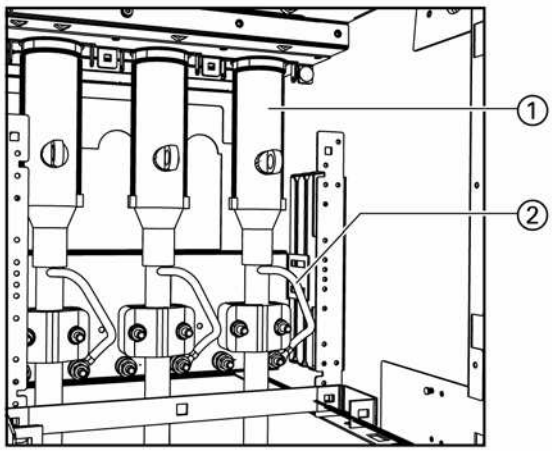
**Options**
- Mounted cable clamps on cable bracket (e.g. C profile or similar)

**Cable connections with plug-in contact for transformer feeders**



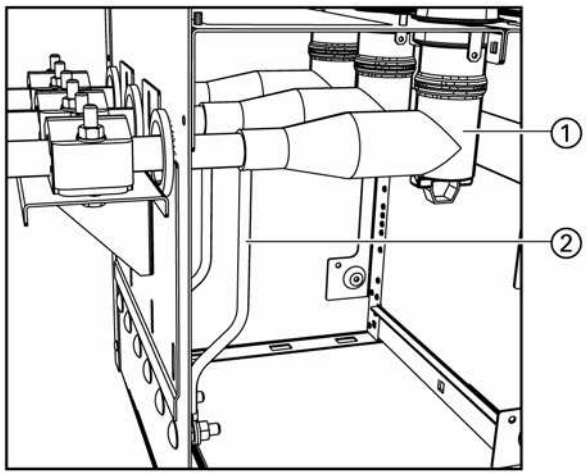

① Elbow cable plug, e.g. Euromold K158
② Earthing

Fig. 19: Cable connection for transformer feeder:
Interface type A (250 A) - Cable feeder to the front




① Straight cable plug, e.g. Euromold K152
② Earthing

Fig. 20: Cable connection for transformer feeder: Interface type A (250 A) - Cable feeder downwards




① Elbow cable plug, e.g. Euromold K158
② Earthing

Fig. 21: Cable connection for transformer feeder: Interface type A (250 A) - Cable feeder to the rear

**Cable connections with bolted contact for transformer feeders**

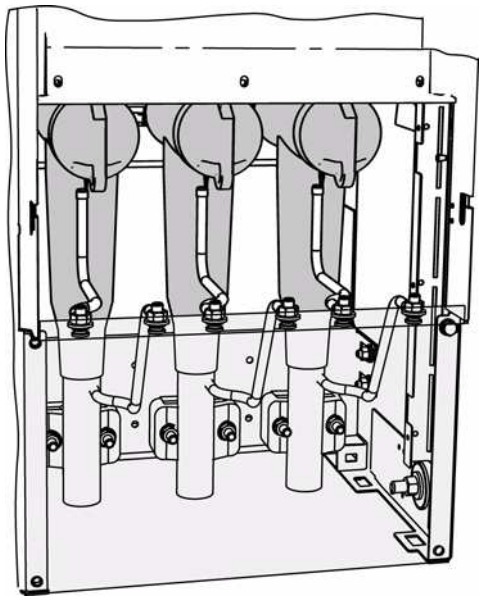


Fig. 22: Cable connection for transformer feeder: Interface type C (630 A):
E.g. Euromold K400 TB (black), nkt AB 24-630 and ASA 24-5 (gray)

**Features**

- As plug-in contacts according to EN 50 181/DIN EN 50 181 interface type A for cable elbow plugs or straight cable plugs
- For bushings according to EN 50 181/DIN EN 50 181 interface type C with bolted contact M16

**Cable sealing ends**

The transformer cables are connected with cable plugs.

**Option**

- Mounted cable clamps on cable bracket
- Bolted contact (M16)

**Selection table for plug systems**

**Plug systems**

| Manufacturer | Plug type for ring-main feeders | Plug type for transformer feeders |
|---|---|---|
| Euromold | (K) 400 TB (S) | (K) 158 LR |
| | (K) 400 LB | (K) 151 SR |
| | - - - | AGW (L) 10 (20); AGG (L) 10 (20) |
| nkt cables | CB 24-630 | CE 24-250 |
| | AB 24-630 | EASW 10/250 |
| | - | EASW 20/250 |
| Südkabel (ABB) | SEHDT 13 (23) | SEHDG 11.1 (21.1) |
| | SEHDT 13.1 (23.1) | SEW 12 (24) |
| Prysmian Kabel (Pirelli) | FMCTs(m)-400 | FMCE(m)-250 |
| Tyco Electronics Raychem | RICS 51 ... | RSES; RSSS |
| Cooper | DT 400 P | DE 250; DS 250 |
| Further plug types on request | | |

### 7.7 Current and voltage transformers

**Current and voltage transformers**

Current transformers

- According to IEC 60 044-1/ VDE 0414-44-1

Voltage transformers

- According to IEC 60 044-2 / VDE 0414-44-2

**Technical data** The technical data of the current and voltage transformers are given in the associated order documents.

### 7.8 Protection and control equipment

Protection and control equipment is equipped according to the customer's specifications. The devices are normally installed in the low-voltage compartment and/or in the low-voltage niche. For details please refer to the relevant circuit documentation.

### 7.9 Voltage detecting systems

For voltage detection according to IEC 61243-5/VDE 0682-415 with:

- HR system (standard)
- LRM system (option)
- VOIS+, VOIS R+ (option)
- Integrated voltage detecting system CAPDIS-S1+/-S2+(option)

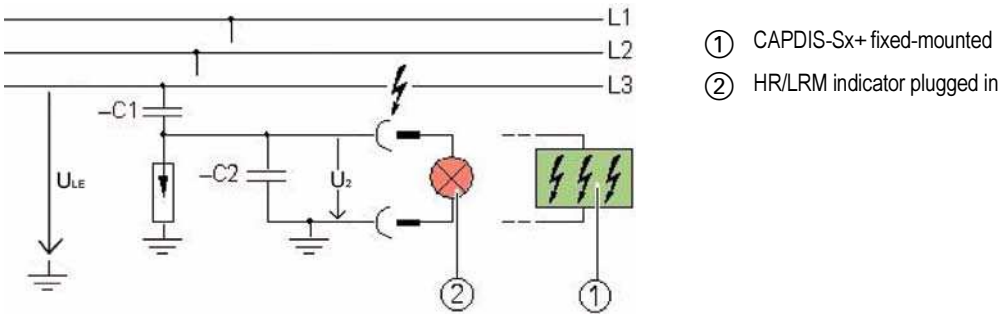
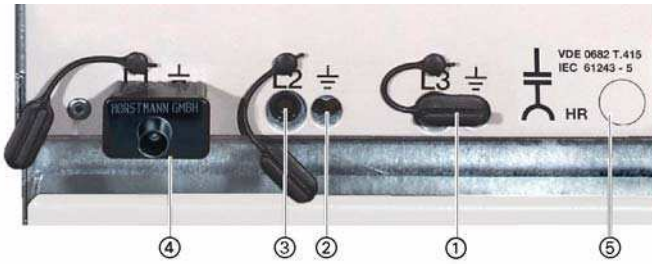



Fig. 23: Voltage detecting system via capacitive voltage divider (principle)

- -C1: Capacity integrated into bushing
- -C2: Capacity of the connection leads and the voltage indicator to earth
- $U_{LE}=U_N/\sqrt{3}$ during rated operation in the three-phase system

- $U_2=U_A$=Voltage at the capacitive interface of the switchgear or at the voltage indicator

**Features of HR/LRM system**




① Cover for test sockets
② Earth socket
③ Ccapacitive test socket for L2
④ Voltage indicator type LRM, make Horstmann
⑤ Documentation to repeat test of interface condition

- With voltage indicator
  - HR system (standard)
  - LRM system (option)
  - LRM system (option), integrated type VOIS+
  - LRM system (option), integrated type CAPDIS-S1+
  - LRM system (option), integrated type CAPDIS-S2+

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

**Features of VOIS+, VOIS R+**

- Integrated display, without auxiliary power
- With indications "A1" to "A3" (see VOIS and CAPDIS indications)
- Maintenance-free, repeat test required
- With integrated 3-phase test socket for phase comparison (also suitable for plug-in voltage indicator)
- Degree of protection IP 67, temperature range -25 °C to +55°C
- With integrated signaling relays (only VOIS R+)
- "M1": Operating voltage present at one phase L1, L2 or L3 as a minimum
- "M2": Operating voltage not present at L1, L2 and L3


Fig. 24: VOIS+: Cover closed

**Common features of CAPDIS-Sx+**

- Maintenance-free
- Integrated display, without auxiliary power
- Integrated repeat test of the interfaces (self-monitoring)
- With integrated function test (without auxiliary power) by pressing the "Device-Function-Test" pushbutton
- With integrated 3-phase test socket for phase comparison (also suitable for plug-in voltage indicator)
- Degree of protection IP 54, temperature range –25 °C to +55 °C
- With capacitance circuit

**Features of CAPDIS-S1+**

- Without auxiliary power
- With indication "A1" to "A5"
- Without ready-for-service monitoring
- Without signaling relay (thus without auxiliary contacts)

**Features of CAPDIS-S2+**

- With indication "A0" to "A6"
- Only by pressing the "Device-Function-Test" pushbutton: "ERROR" indication (A6), e.g. in case of missing auxiliary voltage
- With ready-for-service monitoring (external auxiliary power required)
- With integrated signaling relay for signals "M1" to "M4" (auxiliary power required):
  - "M1": Voltage present at phases L1, L2, L3
  - "M2": Voltage not present at L1, L2 and L3 (= active zero indication)
  - "M3": Earth fault or voltage failure, e.g. in one phase
  - "M4": External auxiliary power missing (with operating voltage present or not)

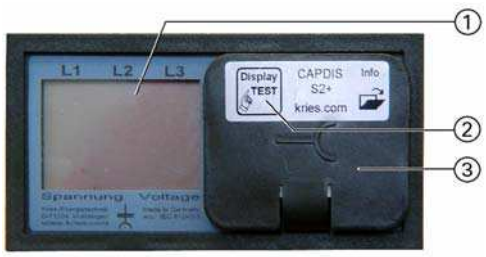
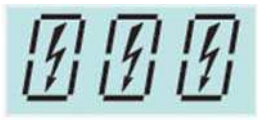



Fig. 25: CAPDIS-S2+: Cover closed


Fig. 26: CAPDIS-S2+: Cover open

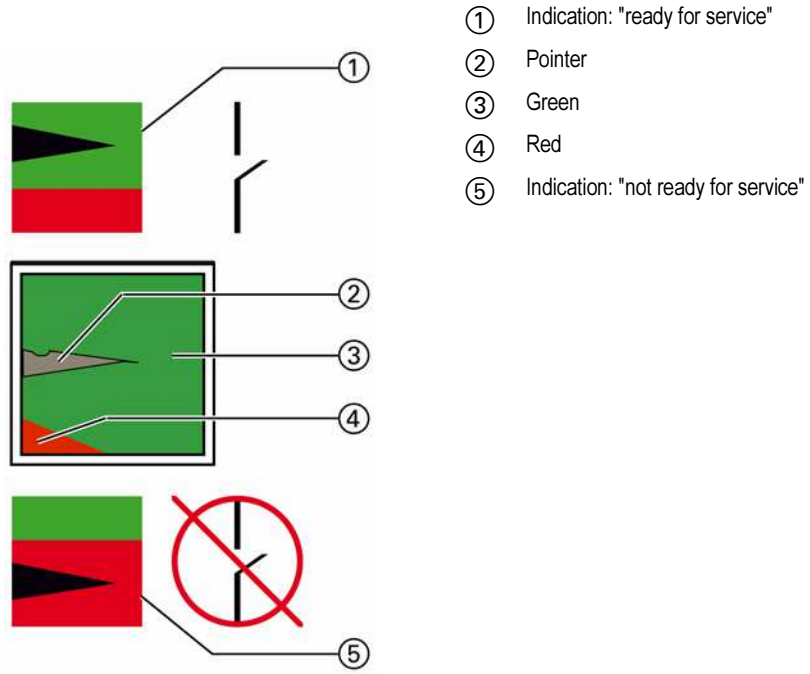
① LC display
② "Display Test" button
③ Cover
④ Test socket L1
⑤ Test socket L2
⑥ Test socket L3
⑦ Earth socket
⑧ Short instructions

**Indications VOIS, VOIS R+, CAPDIS -S1+/-S2+**

| Indication | VOIS+, VOIS R+ | | | CAPDIS-S1+ | | | CAPDIS-S2+ | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | L1 | L2 | L3 | L1 | L2 | L3 | L1 | L2 | L3 | |
| A0 | | | | | | |  | | | Operating voltage not present (CAPDIS-S2+) |
| A1 |  | | |  | | |  | | | Operating voltage present |
| A2 |  | | |  | | |  | | | - Operating voltage not present<br>- Auxiliary power not present (CAPDIS-S2+) |
| A3 |  | | |  | | |  | | | Failure in phase L1, operating voltage at L2 and L3 (for CAPDIS-Sx+ also earth-fault indication) |
| A4 | | | |  | | |  | | | Voltage (**not** operating voltage) present |
| A5 | | | |  | | |  | | | Indication: "Device-Funtion-Test" passed |
| A6 | | | | | | |  | | | Indication: "ERROR" e.g. in case of missing auxiliary voltage (CAPDIS-S2+, error indication M4) |

### 7.10 Ready-for-service indicator

The switchgear is filled with insulating gas at a relative pressure. The ready-for-service indicator at the switchgear front shows through the red/green indication if the gas density is in order.



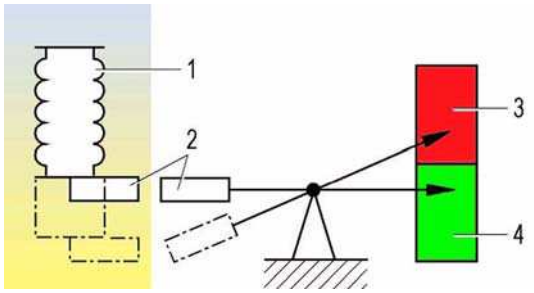

① Indication: "ready for service"
② Pointer
③ Green
④ Red
⑤ Indication: "not ready for service"

Fig. 27: Ready-for-service indicator

**Features**

- Self-monitoring, easy to read
- Independent of temperature and external pressure variations
- Independent of the site altitude
- Only responds to changes in gas density
- Option: Alarm switch "1NO" for remote electrical indication

**Mode of operation**




Principle of gas monitoring with ready-for-service indicator

① Measurement box in filled stainless-steel vessel

② Magnetic coupling

③ Red indication: not ready for service

④ Green indication: ready for service

For the ready-for-service indicator, a gas-tight measurement box is installed on the inside of the switchgear vessel.

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

While changes in the gas density during the loss of gas, which are decisive for the insulating capacity, are displayed, changes in the gas pressure dependent on temperature and external pressure variations are not. The gas in the measurement box has the same temperature as that in the switchgear.

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

### 7.11 Short-circuit/earth-fault indicators

All ring-main feeders can be **optionally** equipped with a 3-phase short-circuit or earth-fault indicator.

**Features**

- Indication at the switchgear front
- Factory-assembled including sensor mounted on ring-main cable bushing
- Short-circuit pickup values: See table
- Reset manually or automatically after a preset time, depending on the type
- Optical signals when a pre-selected pickup value is exceeded
- Option: Remote electrical indication via passing contact (changeover contact) or via maintained contact (D) connected to terminals (rear side of device).

**Selection of short-circuit/earth-fault indicators**

Make Horstmann [1)]


Fig. 28: Short-circuit indicator ALPHA E [1)]

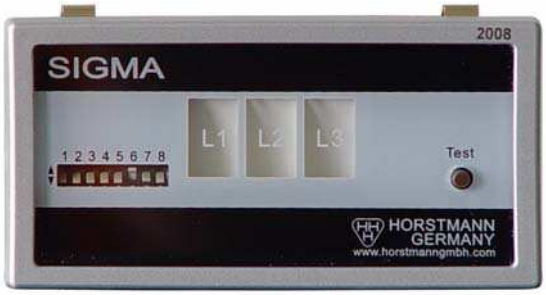



Fig. 29: Short-circuit indicator SIGMA [1)]


Fig. 30: Short-circuit indicator IKI-20

| Indicator type [1] | Reset | | Remote reset:<br>A: By auxiliary voltage<br>B: Via NO contact (floating) | Automatic reset after return of auxiliary voltage supply | Pickup values<br>Short-circuit current $I_k$ (A)<br>Standard, other values on request | Pickup values<br>Earth-fault current $I_E$ (A)<br>Standard, other values on request | Option: Remote indication as<br>W (passing contact = standard)<br>D (maintained contact = option) |
|---|---|---|---|---|---|---|---|
| | manually | automatically after | | | | | |
| **Short-circuit indicator** | | | | | | | |
| ALPHA M [5] | x | - | - | - | 400, 600, 800, 1000 | - | W, D |
| ALPHA E [5] | x | 2 h or 4 h | A (12-60V AC/DC) | - | 400, 600, 800, 1000 | - | W, D |
| GAMMA 5.0 [2] [5] | x | 4 s after return of power supply<br>2 h or 4 h | - | x (50 Hz, 230 V AC) | 400, 600, 800, 1000 | - | W, D |
| KA-Opto F [3] [5] [8]) | x | after 2 h or 4 h | B (1NO) | - | 400, 600, 800, 1000 | - | W, D |
| SIGMA | x | after 1, 2, 4, 8 h | B (1NO) | - | 300, 400, 600, 800, 1000 | - | W, D |
| SIGMA ACDC [2] [5] | x | after 1, 2, 4, 8 h | B (1NO) | x (adjustable) | 300, 400, 600, 800, 1000 | - | W, D |
| IKI-20-B1 [6] | x | after 2 h or 4 h | B (1NO) | - | 400, 600, 800, 1000 | - | W, D |
| IKI-20-T1 [6] | x | after 2 h or 4 h | B (1NO) | x (50/60 Hz, 110-230 V AC) | 400, 600, 800, 1000 | - | W, D |
| **Earth-fault/short-circuit indicator** | | | | | | | |
| EKA-3 [4] [5] | - | - | - | x (50 Hz, 230 V AC) [4] | 450 | 40, 80, 160 | W, D |
| SIGMA F+E [5] | x | after 1, 2, 4, 8 h | B (1NO) | - | 300, 400, 600, 800, 1000 | adjustable | W, D |
| SIGMA F+E [5] ACDC | x | after 1, 2, 4, 8 h | B (1NO) | x (adjustable) | 300, 400, 600, 800, 1000 | adjustable | W, D |
| DELTA E [5] | x | after 2 h or 4 h | A (12-60 V AC/DC) | - | 400, 600, 800, 1000 | 200 | W, D |
| KA-Opto F+E [5] | x | after 2 h or 4 h | B (1NO) | - | 400, 600, 800, 1000 | 40, 60, 80 | W, D |
| IKI-20-B1 [6] [7] | x | after 2 h or 4 h | B (1NO) | - | 400, 600, 800, 1000 | 10% or 25% of $I_K$ | W, D |
| IKI-20-T1 [6] [7] | x | after 2 h or 4 h | B (1NO) | x (50/60 Hz, 110-230 V AC) | 400, 600, 800, 1000 | 10% or 25% of $I_K$ | W, D |
| **Earth-fault indicator** | | | | | | | |
| EKA-3/1 [2] [4] [5] | - | - | - | x (50 Hz, 230 V AC) [4] | - | 40, 80, 160 | W, D |
| CN-E [5] | x | after 1, 2, 4, 8 h | B (1NO) | - | - | adjustable | D |
| IKI-20-T1 [6] [7] | x | after 2 h or 4 h | B (1NO) | x (50/60 Hz, 110-230 V AC) | - | 30, 55, 80, 100 | W, D |

[1] Further types on request.

[2] External auxiliary voltage required (120 V AC or 240 V AC).

[3] Power supply required for the LED indication (indication by means of an integrated battery or 12 V AC to 60 V AC voltage).

[4] External auxiliary voltage required (230 V AC, 50 Hz), device with integrated battery (capacity approx. 10 h).

[5] Make Horstmann.

[6] Make Kries Energietechnik.

[7] Ring-type sensor: d = 110 mm.

[8] With 3 LED indications.

## 7.12 Accessories

**Accessories, standard (selection)**

- Operating and installation instructions
- Operating lever for disconnector, switch-disconnector and circuit-breaker

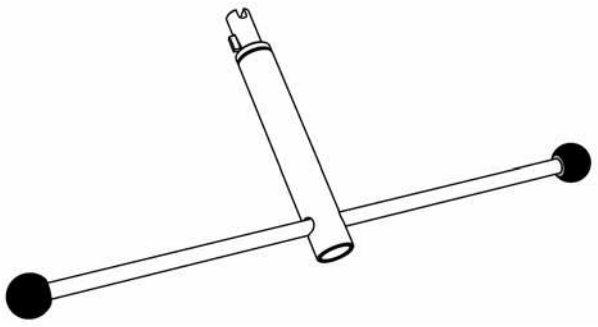


Fig. 31: Standard: Single-lever operation with black handle and coding as universal lever.
Alternative 1: One operating lever with red handle for earthing and de-earthing, and one operating lever with black handle for load breaking.
Alternative 2: Single-lever operation via anti-reflex lever with and without coding.

- Double-bit key (option)

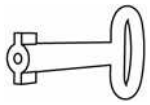


Fig. 32: Double-bit key with a diameter of 3 mm for low-voltage door

**Other accessories**

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

- HV HRC fuse-links
- Cable plugs / adapter systems
- Surge arresters
- Test fuses for mechanical simulation of the striker of HV HRC fuse-links in transformer feeders

Fig. 33: Test fuse with extension tube

- HR/LRM voltage indicators
- Test units to check the capacitive interface and the voltage indicators (e.g. make Horstmann)

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

# 8 Technical data

## 8.1 General technical data

### General electrical data

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Rated insulation level | Rated voltage $U_r$ | kV | **7.2** | **12** | **15** | **17.5** | **24** |
| | Rated short-duration power-frequency withstand voltage $U_d$ | | | | | | |
| | - phase-to-phase, phase-to-earth, open contact gap | kV | 20 | 28/42* | 36 | 38 | 50 |
| | - across isolating distance | kV | 23 | 32/48* | 39 | 45 | 60 |
| | Rated lightning impulse withstand voltage $U_p$ | | | | | | |
| | - phase-to-phase, phase-to-earth, open contact gap | kV | 60 | 75 | 95 | 95 | 125 |
| | - across isolating distance | kV | 70 | 85 | 110 | 110 | 145 |
| Rated frequency $f_r$ | | Hz | 50/60 | | | | |
| Rated normal current $I_r$ | for ring-main feeders | A | 400 or 630 | | | | |
| | for busbar | A | 630 | | | | |
| | for transformer feeders | A | 200[1)] | | | | |
| Rated short-time withstand current $I_k$ | for switchgear with $t_k$ = 1 s | up to kA | 25 | | | | 20 |
| | for switchgear with $t_k$ = 3 s (design option) | kA | 20 | | | | |
| Rated peak withstand current $I_p$ | | up to kA | 63 | | | | 50 |
| Rated short-circuit making current $I_{ma}$ | for ring-main feeders | up to kA | 63[2)] | | | | 50 |
| | for transformer feeders | kA | 25 | | | | |
| Ambient air temperature T | without secondary equipment | °C | -25/-40* to +70 | | | | |
| | with secondary equipment | °C | -5/-15[3)]/-25[3)] to +55 | | | | |
| | Storage and transport including secondary systems | °C | -40 to +70 | | | | |
| Type of protection | for parts of the primary circuit under high voltage | | IP 65 | | | | |
| | for switchgear enclosure | | IP2X/IP3X* | | | | |
| | Low-voltage compartment | | IP3X/IP4X* | | | | |

* Design option [1)] Depending on HV HRC fuse-link [2)] 52.5 kA at 60 Hz [3)] Depending on the secondary equipment used

**Filling pressure** Pressure values at 20 °C

| | | |
|---|---|---|
| Rated filling level $p_{re}$ for insulation (absolute) | kPA | 150 |
| Minimum functional level $p_{re}$ for insulation (absolute) | kPA | 130 |

## 8.2 Three-position switch-disconnector

### Three-position switch-disconnector

**Switching capacity for general-purpose switch**

Switching capacity for general-purpose switches (class E3) according to IEC/EN 60 265-1 / VDE 06070-301

| Rated voltage $U_r$ | | | | **kV** | **7.2** | **12** | **15** | **17.5** | **24** |
|---|---|---|---|---|---|---|---|---|---|
| Test duty 1 | Rated mainly active load breaking current | 100 operations | $I_1$ | A | 630 | | | | |
| | | 20 operations | 0.05 $I_1$ | A | 31.5 | | | | |
| Test duty 2a | Rated closed-loop breaking current | | $I_{2a}$ | A | 630 | | | | |
| Test duty 3 | Rated no-load transformer breaking current | | $I_3$ | A | 40 | | | | |
| Test duty 4a | Rated cable-charging breaking current | | $I_{4a}$ ($I_c$ or $I_6$) | A | 68 | | | | |
| Test duty 4b | Rated line-charging breaking current | | $I_{4b}$ | A | 68 | | | | |
| Test duty 5 | Rated short-circuit making current | | $I_{ma}$ | up to kA | 63 [1] | | | | 50 |
| Test duty 6a | Rated earth-fault breaking current | | $I_{6a}$ ($I_e$) | A | 200 | | | | |
| Test duty 6b | Rated cable-charging breaking current and line-charging breaking current under earth-fault conditions | | $I_{6b}$ (3 . $I_{CL}$) | A | 115 | | | | |
| - | Cable-charging breaking current under earth-fault conditions with superimposed load current | | $I_L$ + v3 * $I_{CL}$ | A | 630 +50 | | | | |
| Number of operating cycles, mechanical / Classification | | | | n | 1,000 / M1 | | | | |
| Number of operating cycles, electrical / Classification | | | | n | 100 / E3 | | | | |

[1] 52.5 kA at 60 Hz

| **Switching capacity for make-proof earthing switch** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Rated voltage $U_r$ | | | **7.2** | **12** | **15** | **17.5** | **24** |
| Rated short-circuit making current | $I_{ma}$ | up to kA | 63[1] | | | | 50 |
| Number of operating cycles, mechanical / Classification | | n | 1000 / M0 | | | | |
| Number of short-circuit making operations / Classification | | n | 5 / E2 | | | | |

[1] 52.5 kA at 60 Hz

| **Switching capacity for switch-disconnector/fuse combination (according to IEC 62 271-105 / VDE 0671-105)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Rated voltage $U_r$ | | | **7.2** | **12** | **15** | **17.5** | **24** |
| Rated normal current | | A | 200 [2] | | | | |
| Rated transfer current | $I_{transfer}$ | A | 1500 | | 1300 | | |
| Rated take-over current | $I_{to}$ | A | 1500 | | 1300 | | |
| Maximum transformer rating | | kVA | 1000 | 1250 | 1600 | 1600 | 1600 [3] |

[2] Depending on HV HRC fuse-link [3] 2000 kVA on request

| **Switching capacity for make-proof earthing switch (with HV HRC fuse on feeder side)** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Rated voltage $U_r$ | | | **7.2** | **12** | **15** | **17.5** | **24** |
| Rated short-circuit making current | $I_{ma}$ | kA | 5 | | | | |
| Rated short-time withstand current | $I_k$ with $t_k$ = 1 s | kA | 2 | | | | |

**Motor operating mechanism**

The rated current of the motor protection equipment is shown in the following table:

| **Rated supply voltage V** | **Recommended rated current for the protection equipment A** |
|---|---|
| DC/AC **24**/30/32 | 4 |
| DC/AC **48** | 2 |
| DC/AC **60** | 1.6 |
| DC/AC 100/**110**/120/125/127 | 1.0 |
| DC/AC **220**/230/240/250 | 8 |
| Control voltage (including releases) is generally protected with 8A. | |

### 8.3 Three-position disconnector

#### Three-position disconnector

Switching capacity and classification of three-position disconnectors and earthing switches according to IEC/EN 62 271-102 / VDE 0671-102.

#### For disconnector

| Rated voltage $U_r$ | **kV** | **7.2** | **12** | **15** | **17.5** | **24** |
|---|---|---|---|---|---|---|
| Rated normal current $I_r$ | A | 250, 630 | | | | |
| Number of operating cycles, mechanical / Classification | n | 1000 / M0 | | | | |

#### For make-proof earthing switch

| Rated voltage $U_r$ | **kV** | **7.2** | **12** | **15** | **17.5** | **24** |
|---|---|---|---|---|---|---|
| Rated short-circuit making current $I_{ma}$ | A | 63[1)] | | | | 50 |
| Number of short-circuit making operations / Classification | n | 5 / E2 | | | | |

[1)] 52.5 kA at 60 Hz

### 8.4 Vacuum circuit-breaker

**Switching capacity and classification of switching devices**

Vacuum circuit-breaker with switching capacity according to IEC/EN 62 271-100 / VDE 0671-100.

| **Type 2 for individual switchgear panels and panel blocks** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Rated voltage $U_r$ | | | **kV** | **7.2** | **12** | **15** | **17.5** | **24** |
| Rated normal current of feeders $I_r$ | | | A | 250, 630 | | | | |
| Rated short-time withstand current $I_k$ | for switchgear with $t_k$ = 1 s | $I_k$ (th) | kA | 20 | | | | 16 |
| | for switchgear with $t_k$ = 3 s | $I_k$ (th) | kA | 20 | | | | 16 |
| Rated peak withstand current $I_p$ | | | up to kA | 50 | | | | 40 |
| Rated short-circuit breaking current $I_{sc}$ | | | up to kA | 20 * | | | | 16 [2] |
| Rated short-circuit making current $I_{ma}$ | | | up to kA | 50 | | 40 | | |
| Number of mechanical operating cycles for disconnector / earthing switch | Classification | | n | 1,000 / M0 | | | | |
| Number of mechanical operating cycles for circuit-breaker | Classification | | n | 2,000 / M1 | | | | |
| Classification, electrical | | | | E2, C1 | | | | |
| Rated operating sequence | | | | O-3min-CO-3min-CO | | | | |
| Number of short-circuit breaking operations | | | n | 6 or 20 | | | | |

* 21 kA at 60 Hz

[2] 20 kA in preparation

**Operating times**

| **Operating times** | **Component** | | **Duration for type 2** | **Unit** |
|---|---|---|---|---|
| Closing time | | | 25 | ms |
| Charging time | | | < 15 | s |
| Opening time | Shunt release | (Y1) | < 30 | ms |
| | Additional release 3AX 11 | (Y2), (Y4),(Y7) | < 50 | ms |
| Arcing time | | | < 15 | ms |
| Break time | Shunt release | (Y1) | < 50 | ms |
| | Additional release 3AX 11 | (Y2), (Y4),(Y7) | < 50 | ms |
| Dead time | | | 3 min | ms |
| Close-open contact time | Shunt release | (Y1) | < 80 | ms |
| | Additional release 3AX 11 | (Y2), (Y4),(Y7) | < 80 | ms |
| Minimum command duration | | | | |
| CLOSED | Closing solenoid | (Y9) | 60 | ms |
| OPEN | Shunt release | (Y1) | 30 | ms |
| OPEN | Additional release 3AX 11 | (Y2), (Y4),(Y7) | < 40 | ms |
| Shortest impulse duration of the c.b. tripping signal | | | 10 | ms |

**Closing time** The interval of time between the initiation (command) of the closing operation and the instant when the contacts touch in all poles.

**Opening time** The interval of time between the initiation (command) of the opening operation and the instant when the contacts separate in all poles.

**Arcing time** The interval of time from the first initiation of an arc and the instant of final arc extinction in all poles.

**Break time** The interval of time between the initiation (command) of the opening operation and the instant of final arc extinction in the last-pole-to-clear (=opening time and arcing time).

**Close-open contact time** The interval of time - in a make-break operating cycle - between the instant when the contacts touch in the first pole in the closing process, and the instant when the contacts separate in all poles in the subsequent opening process.

**Motor operating mechanism** For DC operation, the maximum power consumption is approx. 350 W.
For AC operation, the maximum power consumption is approx. 400 V A

The rated current of the motor protection equipment is shown in the following table:

| **Rated supply voltage** | **Recommended rated current for the protection equipment*** Type 1.1 |
|---|---|
| **V** | **A** |
| DC 24 | 8 |
| DC 48 | 6 |
| DC 60 | 4 |
| DC/AC 110 50/60 Hz | 2 |
| DC 220/AC 230 50/60 Hz | 1.6 |

*) M.c.b. with C-characteristic

The supply voltage may deviate from the rated supply voltage specified in the table by -15% to +10%.

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

| **Breaking capacity** | **Operating voltage [V]** | **Normal current [A]** | |
|---|---|---|---|
| AC 40 to 60 Hz | up to 230 | 10 | |
| DC | | Resistive load | Inductive load |
| | 24 | 10 | 10 |
| | 48 | 10 | 9 |
| | 60 | 9 | 7 |
| | 110 | 5 | 4 |
| | 220 | 2.5 | 2 |

**Closing solenoid (Y9)** The closing solenoid 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**

Shunt releases are used for automatic or deliberate tripping of circuit-breakers. They are designed for connection to external voltage (DC or AC voltage). They can also be connected to a voltage transformer for deliberate tripping.

Shunt releases based on two principles **(Y1, Y2)** can be used:

- With the **shunt release (Y1)** the circuit-breaker is opened electrically. Power consumption: 140 W or 140 VA.
- With the **shunt release (Y2)** 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 an NC contact in the tripping circuit or via an 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 (e.g. by protection tripping) there is a signal through the NO contact -S6. If the circuit-breaker is tripped deliberately with the mechanical pushbutton, this signal is suppressed by the NC contact -S7.

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

The following c.t.-operated releases are available:

- The c.t.-operated release **3AX1102** consists of an energy store, an unlatching mechanism and an electromagnetic system. Rated tripping current: 0.5 A/1 A
- The c.t.-operated release **3AX1104** (low-energy release) is adequate for a tripping pulse of ≤ 0.1 Ws in connection with adequate protection systems. It is used if auxiliary voltage is missing, tripping via protection relay.

**Low-energy magnetic release (for type 2)**

For tripping pulse 0.01 Ws, tripping via transformer monitor (IKI-30).

**Varistor module**

Integrated in the releases.

## 8.5 Classification of 8DJH switchgear according to IEC/EN 62 271-200

8DJH is classified according to IEC/EN 62 271-200 / VDE 0671-200.

**Design and construction**

| **Partition class** | **PM (metallic partition)** | |
|---|---|---|
| Loss of service continuity category for functions/ modules | - with HV HRC fuses (T, H) | LSC 2A |
| | - without HV HRC fuses (R, L, ...) | LSC 2B |
| Accessibility to compartments (enclosure) | | |
| Busbar compartment | | Non-accessible |
| Switching device compartment | | Non-accessible |
| Cable compartment for functions/modules | - with HV HRC fuses (T, H) | Interlock-controlled |
| | - without HV HRC fuses (R, L, ...) | Interlock-controlled |
| | - only cable feeder (K) | Tool-based |

**Internal arc classification IAC (option)**

| Designation of the internal arc classification IAC | | |
|---|---|---|
| IAC class for | | |
| - wall-standing arrangement | | IAC A FL up ot 21 kA, 1 s |
| - free-standing arrangement | | IAC A FLR up to 21 kA, 1 s |
| | - F | Front |
| | - L | Lateral |
| | - R | Rear |

## 8.6 Standards and guidelines

The medium-voltage switchgear type 8DJH for indoor installation complies with the following prescriptions and standards:

| | | **IEC/EN standard** | **VDE standard** |
|---|---|---|---|
| **Switchgear** | | 62 271-1 | 0670-1000 |
| | | 62 271-200 | 0671-200 |
| **Switching devices** | Circuit-breakers | 62 271-100 | 0671-100 |
| | Disconnectors/earthing switches | 62 271-102 | 0671-102 |
| | Switch-disconnectors | 60 265-1 | 0670-301 |
| | Switch-disconnector/fuse combination | 62 271-105 | 0671-105 |
| **Voltage detecting systems** | | 61 243-5 | 0682-415 |
| **Surge arresters** | | 60 099 | 0675 |
| **Degree of protection** | | 60 529 | 0470-1 |
| **Instrument transformers** | Current transformers | 60 044-1 | 0414-1 |
| | Voltage transformers | 60 044-2 | 0414-2 |
| **$SF_6$** | | 60 376 | 0373-1 |
| **Installation and earthing** | | 61 936-1 / HD 637 -S1 | 0101 |
| **Environmental conditions** | | 60 721-3-3 | DIN EN 60 721-3-3 |

**Type approval according to German X-ray regulations (RöV)**

The vacuum interrupters fitted in the vacuum circuit-breakers are type-approved in accordance with the X-ray regulations of the Federal Republic of Germany. They conform to the requirements of the X-ray regulations of January 8, 1987 (Federal Law Gazette I 1987, Page 114) in the new edition of April 30, 2003 (Federal Law Gazette I 2003, No. 17) up to the value of the rated voltage stipulated in accordance with IEC/DIN VDE.

**Electromagnetic compatibility - EMC**

The a.m. standards as well as the "EMC Guideline 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 guideline.

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 - EMC Guideline for Switchgear; A&D ATS SR/PTD M SP)

**Protection against solid foreign objects, electric shock and water**

The panels of 8DJH fulfill the following degrees of protection according to IEC 62 271-200, IEC 60 529 and DIN VDE 0671-200:

- IP2X standard for parts under high voltage in switchgear panels with HV HRC fuses
- IP3X option for switchgear enclosure of operating front and side walls with locking device
- IP65 for parts under high voltage in switchgear panels without HV HRC fuses, or without air-insulated metering panels

**Transport regulations**

According to "Annex 1 of the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) dated September 30th, 1957" Siemens gas-insulated medium-voltage switchgear does not belong to the category of dangerous goods regarding transportation, and is exempted from special transport regulations according to ADR, Clause 1.1.3.1 b.

### 8.7 Switchgear versions - Dimensions and weights

The transport weight results from the switchgear weight per transport unit and the packing weight. The packing weight results from the transport dimensions and the type of transport.

**Packing weights**

| Maximum width of switchgear unit [mm] | Packing weight for Europe, approx. [kg] | Packing weight for overseas, approx. [kg] |
|---|---|---|
| 850 | 30 | 90 |
| 1200 | 40 | 120 |
| 1550 | 50 | 150 |
| 1800 | 60 | 180 |
| 2000 | 75 | 225 |

**Switchgear weights**

The weight of the switchgear unit results from the sum of the weights per functional unit. Depending on the design and the degree to which it is equipped (e.g. current transformers, motor operating mechanism, low-voltage compartment), different values will result. The table shows mean values.

| Panel type | Width [mm] | Gross weight for a switchgear height of | | |
|---|---|---|---|---|
| | | 1200 mm | 1400 mm | 1700 mm |
| | | approx. [kg] | approx. [kg] | approx. [kg] |
| R | 310 | 100 | 110 | 120 |
| R(500) | 500 | 140 | 150 | 170 |
| K | 310 | 100 | 110 | 120 |
| K(E) | 430 | 130 | 140 | 160 |
| T | 430 | 135 | 145 | 160 |
| L | 430 | 130 | 140 | 155 |
| L (type 1.1) without 4MT3 | 500 | 210 | 220 | 240 |
| L (type 2) | 500 | 160 | 170 | 190 |

| Panel block | Width [mm] | Gross weight for a switchgear height (without low-voltage compartment) of | | |
|---|---|---|---|---|
| | | 1200 mm | 1400 mm | 1700 mm |
| | | approx. [kg] | approx. [kg] | approx. [kg] |
| KT,TK | 740 | 230 | 250 | 280 |
| K(E)T | 860 | 240 | 260 | 290 |
| KL*,LK | 740 | 230 | 250 | 280 |
| K(E)L* | 860 | 250 | 270 | 300 |
| RK, KR | 620 | 200 | 220 | 240 |
| RT, TR | 740 | 230 | 250 | 280 |
| RL*, LR | 740 | 230 | 250 | 280 |
| TT | 860 | 270 | 290 | 320 |
| RR | 620 | 200 | 220 | 240 |
| LL* | 860 | 260 | 280 | 310 |
| | | | | |
| RRT | 1050 | 330 | 360 | 400 |
| RRL* | 1050 | 320 | 350 | 390 |
| RTR | 1050 | 330 | 360 | 400 |
| RLR | 1050 | 320 | 350 | 390 |
| RRR | 930 | 300 | 330 | 360 |
| TTT | 1290 | 410 | 440 | 490 |
| LLL* | 1290 | 400 | 430 | 480 |
| | | | | |
| RRRT | 1360 | 430 | 470 | 520 |
| RRRL* | 1360 | 430 | 470 | 520 |
| RRRR | 1240 | 400 | 440 | 480 |
| TRRT | 1480 | 470 | 510 | 560 |
| LRRL | 1480 | 460 | 500 | 550 |
| TTTT | 1720 | 540 | 580 | 640 |
| LLLL* | 1720 | 520 | 560 | 620 |

* Applies to design with circuit-breaker type 2

### 8.8 Gas leakage rate

**Gas leakage rate**

The gas leakage rate is < 0.1% per year (referred to the absolute gas pressure).

### 8.9 Dielectric strength and site altitude

**Dielectric strength**

- The dielectric strength is verified by testing the switchgear with rated values of short-duration power-frequency withstand voltage and lightning impulse withstand voltage according to IEC 62271-1 / VDE 0671-1.
- The rated values are referred to sea level and to normal atmospheric conditions (101.3 hPa, 20 °C, 11g/$m^3$ humidity according to IEC 60071 and VDE 0111).
- The dielectric strength decreases with increasing altitude. For site altitudes above 1000 m (above sea level) the standards do not provide any guidelines for the insulation rating, but leave this to the scope of special agreements.

All parts housed inside the switchgear vessel which are subjected to high voltage are $SF_6$-insulated against the earthed enclosure.

**Site altitude**

The gas insulation at a relative gas pressure of 50 kPa (= 500 hPa) permits switchgear installation at any desired altitude above sea level without the dielectric strength being adversely affected. This also applies to the cable connection when using screened cable T-plugs or cable elbow plugs.

A decrease (reduction) of the dielectric strength with increasing site altitude must only be considered for panels with HV HRC fuses as well as for air-insulated metering panels and a site altitude of 1000 m above sea level. A higher insulation level must be selected, which results from the multiplication of the rated insulation level for 0 to 1000 m with the altitude correction factor $K_a$.

| Rated voltage (r.m.s. value) | [kV] | **7.2** | **12** | **15** | **17.5** | **24** |
|---|---|---|---|---|---|---|
| Rated short-duration power-frequency withstand voltage (r.m.s. value) | | | | | | |
| - Across isolating distances | [kV] | 23 | 32 | 39 | 45 | 60 |
| - Between phases and to earth | | 20 | 28 | 36 | 38 | 50 |
| Rated lightning impulse withstand voltage (peak value) | | | | | | |
| - Across isolating distances | [kV] | 70 | 85 | 105 | 110 | 145 |
| - Between phases and to earth | | 60 | 75 | 95 | 95 | 125 |

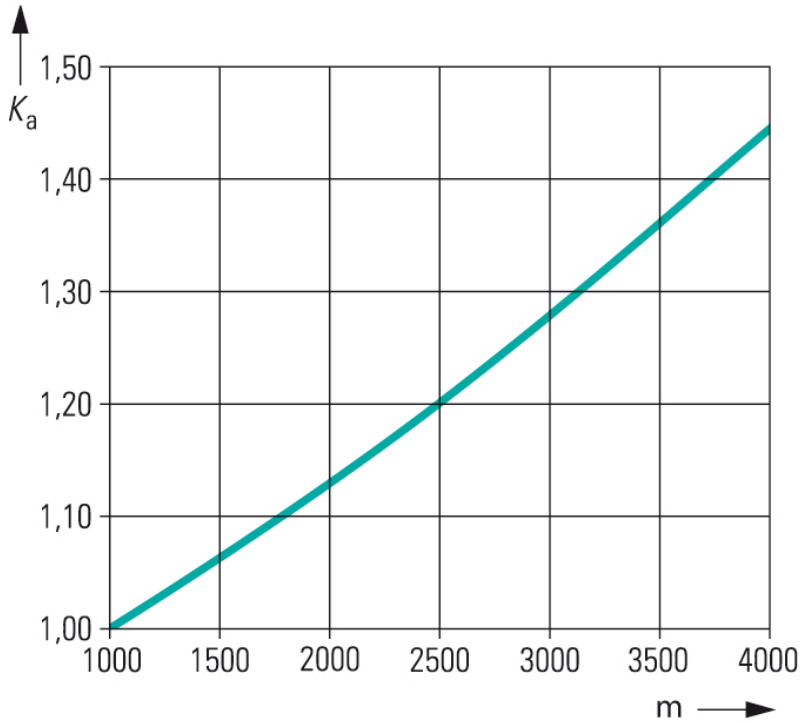



Fig. 34: Correction factor $K_a$ as a function of the site altitude in m above sea level

**Example**

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

≥ Rated short-duration power-frequency withstand voltage up to ≤ 1000 m * Ka

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

≥ Rated lightning impulse withstand voltage up to ≤ 1000 m * $K_a$

**Example**

3000 m site altitude above sea level

17.5 kV switchgear rated voltage

95.0 kV rated lightning impulse withstand voltage

Rated lightning impulse withstand voltage to be selected

95 kV * 1.28 = 122 kV

**Result**

According to the above table, a switchgear for a rated voltage of 24 kV with a rated lightning impulse withstand voltage of 125 kV is to be selected.

### 8.10 Selection of HV HRC fuse-links

**Allocation of HV HRC fuses and transformers**

The three-position switch-disconnector in the transformer feeder (transformer switch) was combined with HV HRC fuse-links and tested in accordance with IEC 62 271-105.

The transformer protection table below shows HV HRC fuse-links recommended for transformer protection. Furthermore, the switchgear also permits fuse protection of transformers up to ratings of 2000 kVA. Please contact us for such applications.

The **protection table** applies to:

- Maximum ambient air temperature in the switchgear room of 40°C according to IEC 62 271-1 considering the influence of the switchgear enclosure
- Requirements according to IEC 62271-105
- Protection of distribution transformers according to IEC 60787
- Rated power of transformer (no overload operation)

The specified HV HRC fuses make SIBA are type-tested partial range fuses according to IEC 60 282-1. The dimensions correspond to DIN 43625. The HV HRC fuses have a thermal protection in form of a temperature-limiting striker tripping operating in case of defective HV HRC fuse-links or high overload currents.

Please contact us if you want to use HV HRC fuses from other manufacturers.

Basis for selection of HV HRC fuse-links:

- IEC 60282-1
- IEC 62271-105
- IEC 60787
- Recommendations and data sheets of fuse manufacturers
- Permissible power loss in the switchgear enclosure at an ambient air temperature of 40° C

**Transformer protection table:**
**Recommendation for the allocation of HV HRC fuse-links make SIBA and transformers**

| Transformer | | | | HV HRC fuse | | | |
|---|---|---|---|---|---|---|---|
| U [kV] | $S_N$ [kVA] | $u_K$ [%] | $I_1$ [A] | $I_s$ [A] | $U_s$ [kV] | e [mm] | Order no. |
| 3.3-3.6 | 20 | 4 | 3.5 | 6.3 | 3-7.2 | 292 | 30 098 13.6,3 |
| | | | | 10 | 3-7.2 | 292 | 30 098 13.10 |
| | 30 | 4 | 5.25 | 10 | 3-7.2 | 292 | 30 098 13.10 |
| | | | | 16 | 3-7.2 | 292 | 30 098 13.16 |
| | 50 | 4 | 8.75 | 16 | 3-7.2 | 292 | 30 098 13.16 |
| | | | | 20 | 3-7.2 | 292 | 30 098 13.20 |
| | 75 | 4 | 13.1 | 20 | 3-7.2 | 292 | 30 098 13.20 |
| | | | | 25 | 3-7.2 | 292 | 30 098 13.25 |
| | 100 | 4 | 17.5 | 31.5 | 3-7.2 | 292 | 30 098 13.31,5 |
| | | | | 40 | 3-7.2 | 292 | 30 098 13.40 |
| | 125 | 4 | 21.87 | 31.5 | 3-7.2 | 292 | 30 098 13.31,5 |
| | | | | 40 | 3-7.2 | 292 | 30 098 13.40 |
| | 160 | 4 | 28 | 40 | 3-7.2 | 292 | 30 098 13.40 |
| | | | | 50 | 3-7.2 | 292 | 30 098 13.50 |
| | 200 | 4 | 35 | 50 | 3-7.2 | 292 | 30 098 13.50 |
| | | | | 63 | 3-7.2 | 292 | 30 099 13.63 |
| | 250 | 4 | 43.74 | 63 | 3-7.2 | 292 | 30 099 13.63 |
| | | | | 80 | 3-7.2 | 292 | 30 099 13.80 |
| 4.16-4.8 | 20 | 4 | 2.78 | 6.3 | 3-7.2 | 292 | 30 098 13.6,3 |
| | 30 | 4 | 4.16 | 10 | 3-7.2 | 292 | 30 098 13.10 |
| | 50 | 4 | 6.93 | 16 | 3-7.2 | 292 | 30 098 13.16 |
| | 75 | 4 | 10.4 | 16 | 3-7.2 | 292 | 30 098 13.16 |
| | | | | 20 | 3-7.2 | 292 | 30 098 13.20 |
| | 100 | 4 | 13.87 | 20 | 3-7.2 | 292 | 30 098 13.20 |
| | | | | 25 | 3-7.2 | 292 | 30 098 13.25 |
| | 125 | 4 | 17.35 | 25 | 3-7.2 | 292 | 30 098 13.25 |
| | | | | 31.5 | 3-7.2 | 292 | 30 098 13.31,5 |
| | 160 | 4 | 22.2 | 31.5 | 3-7.2 | 292 | 30 098 13.31,5 |
| | | | | 40 | 3-7.2 | 292 | 30 098 13.40 |
| | 200 | 4 | 27.75 | 40 | 3-7.2 | 292 | 30 098 13.40 |
| | | | | 50 | 3-7.2 | 292 | 30 098 13.50 |
| | 250 | 4 | 34.7 | 50 | 3-7.2 | 292 | 30 098 13.50 |
| | | | | 63 | 3-7.2 | 292 | 30 099 13.63 |
| | 315 | 4 | 43.7 | 63 | 3-7.2 | 292 | 30 099 13.63 |
| | | | | 80 | 3-7.2 | 292 | 30 099 13.80 |
| 5.0-5.5 | 20 | 4 | 2.3 | 6.3 | 3-7.2 | 292 | 30 098 13.6,3 |
| | 30 | 4 | 3.4 | 6.3 | 3-7.2 | 292 | 30 098 13.6,3 |
| | | | | 10 | 3-7.2 | 292 | 30 098 13.10 |
| | 50 | 4 | 5.7 | 10 | 3-7.2 | 292 | 30 098 13.10 |
| | | | | 16 | 3-7.2 | 292 | 30 098 13.16 |
| | 75 | 4 | 8.6 | 16 | 3-7.2 | 292 | 30 098 13.16 |
| | | | | 20 | 3-7.2 | 292 | 30 098 13.20 |
| | 100 | 4 | 11.5 | 16 | 3-7.2 | 292 | 30 098 13.16 |
| | | | | 20 | 3-7.2 | 292 | 30 098 13.20 |
| | 125 | 4 | 14.4 | 20 | 3-7.2 | 292 | 30 098 13.20 |
| | | | | 25 | 3-7.2 | 292 | 30 098 13.25 |

| Transformer | | | | HV HRC fuse | | | |
|---|---|---|---|---|---|---|---|
| U [kV] | $S_N$ [kVA] | $u_K$ [%] | $I_1$ [A] | $I_s$ [A] | $U_s$ [kV] | e [mm] | Order no. |
| 5.0-5.5 | 160 | 4 | 18.4 | 31.5 | 3-7.2 | 292 | 30 098 13.31,5 |
| | | | | 40 | 3-7.2 | 292 | 30 098 13.40 |
| | 200 | 4 | 23 | 40 | 3-7.2 | 292 | 30 098 13.40 |
| | | | | 50 | 3-7.2 | 292 | 30 098 13.50 |
| | 250 | 4 | 28.8 | 40 | 3-7.2 | 292 | 30 098 13.40 |
| | | | | 50 | 3-7.2 | 292 | 30 098 13.50 |
| | 315 | 4 | 36.3 | 50 | 3-7.2 | 292 | 30 098 13.50 |
| | | | | 63 | 3-7.2 | 292 | 30 099 13.63 |
| | 400 | 4 | 46.1 | 63 | 3-7.2 | 292 | 30 099 13.63 |
| | | | | 80 | 3-7.2 | 292 | 30 099 13.80 |
| 6 -7.2 | 20 | 4 | 1.9 | 6.3 | 6-12 | 292 | 30 004 13.6,3 |
| | | | | 6.3 | 3-7.2 | 292 | 30 098 13.6,3 |
| | | | | 6.3 | 6-12 | 442 | 30 101 13.6,3 |
| | 30 | 4 | 2.8 | 6.3 | 6-12 | 292 | 30 004 13.6,3 |
| | | | | 6.3 | 3-7.2 | 292 | 30 098 13.6,3 |
| | | | | 6.3 | 6-12 | 442 | 30 101 13.6,3 |
| | 50 | 4 | 4.8 | 10 | 3-7.2 | 292 | 30 098 13.10 |
| | | | | 10 | 6-12 | 292 | 30 004 13.10 |
| | | | | 10 | 6-12 | 442 | 30 101 13.10 |
| | | | | 16 | 3-7.2 | 292 | 30 098 13.16 |
| | | | | 16 | 6-12 | 292 | 30 004 13.16 |
| | | | | 16 | 6-12 | 442 | 30 101 13.16 |
| | 75 | 4 | 7.2 | 16 | 3-7.2 | 292 | 30 098 13.16 |
| | | | | 16 | 6-12 | 292 | 30 004 13.16 |
| | | | | 16 | 6-12 | 442 | 30 101 13.16 |
| | 100 | 4 | 9.6 | 16 | 3-7.2 | 292 | 30 098 13.16 |
| | | | | 16 | 6-12 | 292 | 30 004 13.16 |
| | | | | 16 | 6-12 | 442 | 30 101 13.16 |
| | | | | 20 | 3-7.2 | 292 | 30 098 13.20 |
| | | | | 20 | 6-12 | 292 | 30 004 13.20 |
| | | | | 20 | 6-12 | 442 | 30 101 13.20 |
| | 125 | 4 | 12 | 20 | 3-7.2 | 292 | 30 098 13.20 |
| | | | | 20 | 6-12 | 292 | 30 004 13.20 |
| | | | | 20 | 6-12 | 442 | 30 101 13.20 |
| | | | | 25 | 3-7.2 | 292 | 30 098 13.25 |
| | | | | 25 | 6-12 | 292 | 30 004 13.25 |
| | | | | 25 | 6-12 | 442 | 30 101 13.25 |
| | 160 | 4 | 15.4 | 31.5 | 3-7.2 | 292 | 30 098 13.31,5 |
| | | | | 31.5 | 6-12 | 292 | 30 004 13.31,5 |
| | | | | 31.5 | 6-12 | 442 | 30 101 13.31,5 |
| | 200 | 4 | 19.2 | 31.5 | 3-7.2 | 292 | 30 098 13.31,5 |
| | | | | 31.5 | 6-12 | 292 | 30 004 13.31,5 |
| | | | | 31.5 | 6-12 | 442 | 30 101 13.31,5 |
| | | | | 40 | 3-7.2 | 292 | 30 098 13.40 |
| | | | | 40 | 6-12 | 292 | 30 004 13.40 |
| | | | | 40 | 6-12 | 442 | 30 101 13.40 |
| | 250 | 4 | 24 | 40 | 3-7.2 | 292 | 30 098 13.40 |
| | | | | 40 | 6-12 | 292 | 30 004 13.40 |
| | | | | 40 | 6-12 | 442 | 30 101 13.40 |
| | | | | 50 | 3-7.2 | 292 | 30 098 13.50 |

| Transformer | | | | HV HRC fuse | | | |
|---|---|---|---|---|---|---|---|
| **U [kV]** | **$S_N$ [kVA]** | **$u_K$ [%]** | **$I_1$ [A]** | **$I_s$ [A]** | **$U_s$ [kV]** | **e [mm]** | **Order no.** |
| 6 -7.2 | | | | 50 | 6-12 | 292 | 30 004 13.50 |
| | | | | 50 | 6-12 | 442 | 30 101 13.50 |
| | | | | 63 | 6-12 | 292 | 30 012 43.63 |
| | 315 | 4 | 30.3 | 50 | 3-7.2 | 292 | 30 098 13.50 |
| | | | | 50 | 6-12 | 292 | 30 004 13.50 |
| | | | | 50 | 6-12 | 442 | 30 101 13.50 |
| | | | | 63 | 6-12 | 292 | 30 012 43.63 |
| | 400 | 4 | 38.4 | 63 | 6-12 | 292 | 30 012 43.63 |
| | | | | 80 | 6-12 | 292 | 30 012 43.80 |
| | | | | 80 | 6-12 | 442 | 30 102 43.80 |
| | | | | 63 | 3-7.2 | 292 | 30 099 13.63 |
| | | | | 63 | 6-12 | 292 | 30 012 13.63 |
| | | | | 63 | 6-12 | 442 | 30 102 13.63 |
| | 500 | 4 | 48 | 80 | 6-12 | 292 | 30 012 43.80 |
| | | | | 80 | 6-12 | 442 | 30 102 43.80 |
| | | | | 80 | 3-7.2 | 292 | 30 099 13.80 |
| | | | | 80 | 6-12 | 292 | 30 012 13.80 |
| | | | | 80 | 6-12 | 442 | 30 102 13.80 |
| | | | | 100 | 6-12 | 292 | 30 012 43.100 |
| | | | | 100 | 6-12 | 442 | 30 102 43.100 |
| | 630 | 4 | 61 | 100 | 6-12 | 442 | 30 102 43.100 |
| | | | | 125 | 6-12 | 442 | 30 103 43.125 |
| | | | | 125 | 6-12 | 292 | 30 020 43.125 |
| 10-12 | 50 | 4 | 2.9 | 10 | 6-12 | 292 | 30 004 13.10 |
| | | | | 10 | 6-12 | 442 | 30 101 13.10 |
| | | | | 10 | 10-17.5 | 292 | 30 255 13.10 |
| | | | | 10 | 10-17.5 | 442 | 30 231 13.10 |
| | | | | 10 | 10-24 | 442 | 30 006 13.10 |
| | 75 | 4 | 4.3 | 10 | 6-12 | 292 | 30 004 13.10 |
| | | | | 10 | 6-12 | 442 | 30 101 13.10 |
| | | | | 10 | 10-17.5 | 292 | 30 255 13.10 |
| | | | | 10 | 10-17.5 | 442 | 30 231 13.10 |
| | | | | 10 | 10-24 | 442 | 30 006 13.10 |
| | 100 | 4 | 5.8 | 16 | 6-12 | 292 | 30 004 13.16 |
| | | | | 16 | 6-12 | 442 | 30 101 13.16 |
| | | | | 16 | 10-17.5 | 292 | 30 255 13.16 |
| | | | | 16 | 10-17.5 | 442 | 30 231 13.16 |
| | | | | 16 | 10-24 | 442 | 30 006 13.16 |
| | 125 | 4 | 7.2 | 16 | 6-12 | 292 | 30 004 13.16 |
| | | | | 16 | 6-12 | 442 | 30 101 13.16 |
| | | | | 16 | 10-17.5 | 292 | 30 255 13.16 |
| | | | | 16 | 10-17.5 | 442 | 30 231 13.16 |
| | | | | 16 | 10-24 | 442 | 30 006 13.16 |
| | 160 | 4 | 9.3 | 20 | 6-12 | 292 | 30 004 13.20 |
| | | | | 20 | 6-12 | 442 | 30 101 13.20 |
| | | | | 20 | 10-17.5 | 292 | 30 221 13.20 |
| | | | | 20 | 10-17.5 | 442 | 30 231 13.20 |
| | | | | 20 | 10-24 | 442 | 30 006 13.20 |
| | 200 | 4 | 11.5 | 25 | 6-12 | 292 | 30 004 13.25 |
| | | | | 25 | 6-12 | 442 | 30 101 13.25 |

| Transformer | | | | HV HRC fuse | | | |
|---|---|---|---|---|---|---|---|
| U [kV] | $S_N$ [kVA] | $u_K$ [%] | $I_1$ [A] | $I_s$ [A] | $U_s$ [kV] | e [mm] | Order no. |
| 10-12 | | | | 25 | 10-17.5 | 292 | 30 221 13.25 |
| | | | | 25 | 10-17.5 | 442 | 30 231 13.25 |
| | | | | 25 | 10-24 | 442 | 30 006 13.25 |
| | 250 | 4 | 14.5 | 25 | 6-12 | 292 | 30 004 13.25 |
| | | | | 25 | 6-12 | 442 | 30 101 13.25 |
| | | | | 25 | 10-17.5 | 292 | 30 221 13.25 |
| | | | | 25 | 10-17.5 | 442 | 30 231 13.25 |
| | | | | 25 | 10-24 | 442 | 30 006 13.25 |
| | | | | 31.5 | 6-12 | 292 | 30 004 13.31,5 |
| | | | | 31.5 | 6-12 | 442 | 30 101 13.31,5 |
| | | | | 31.5 | 10-17.5 | 292 | 30 221 13.31,5 |
| | | | | 31.5 | 10-17.5 | 442 | 30 231 13.31,5 |
| | | | | 31.5 | 10-24 | 442 | 30 006 13.31,5 |
| | 315 | 4 | 18.3 | 31.5 | 6-12 | 292 | 30 004 13.31,5 |
| | | | | 31.5 | 6-12 | 442 | 30 101 13.31,5 |
| | | | | 31.5 | 10-17.5 | 292 | 30 221 13.31,5 |
| | | | | 31.5 | 10-17.5 | 442 | 30 231 13.31,5 |
| | | | | 31.5 | 10-24 | 442 | 30 006 13.31,5 |
| | | | | 40 | 6-12 | 292 | 30 004 13.40 |
| | | | | 40 | 6-12 | 442 | 30 101 13.40 |
| | | | | 40 | 10-17.5 | 292 | 30 221 13.40 |
| | | | | 40 | 10-17.5 | 442 | 30 231 13.40 |
| | | | | 40 | 10-24 | 442 | 30 006 13.40 |
| | 400 | 4 | 23.1 | 40 | 6-12 | 292 | 30 004 13.40 |
| | | | | 40 | 6-12 | 442 | 30 101 13.40 |
| | | | | 40 | 10-17.5 | 292 | 30 221 13.40 |
| | | | | 40 | 10-17.5 | 442 | 30 231 13.40 |
| | | | | 40 | 10-24 | 442 | 30 006 13.40 |
| | | | | 50 | 6-12 | 292 | 30 004 13.50 |
| | | | | 50 | 6-12 | 442 | 30 101 13.50 |
| | | | | 50 | 10-17.5 | 292 | 30 221 13.50 |
| | | | | 50 | 10-17.5 | 442 | 30 232 13.50 |
| | | | | 50 | 10-24 | 442 | 30 014 13.50 |
| | 500 | 4 | 29 | 50 | 6-12 | 292 | 30 004 13.50 |
| | | | | 50 | 6-12 | 442 | 30 101 13.50 |
| | | | | 50 | 10-17.5 | 292 | 30 221 13.50 |
| | | | | 50 | 10-17.5 | 442 | 30 232 13.50 |
| | | | | 50 | 10-24 | 442 | 30 014 13.50 |
| | | | | 63 | 6-12 | 292 | 30 012 43.63 |
| | | | | 63 | 10-24 | 442 | 30 014 43.63 |
| | 630 | 4 | 36.4 | 63 | 6-12 | 292 | 30 012 43.63 |
| | | | | 80 | 10-24 | 442 | 30 014 43.80 |
| | | | | 63 | 6-12 | 292 | 30 012 13.63 |
| | | | | 63 | 6-12 | 442 | 30 102 13.63 |
| | | | | 63 | 10-17.5 | 442 | 30 232 13.63 |
| | | | | 80 | 6-12 | 292 | 30 012 43.80 |
| | | | | 80 | 6-12 | 442 | 30 102 43.80 |
| | 800 | 5-6 | 46.2 | 63 | 6-12 | 292 | 30 012 13.63 |
| | | | | 80 | 6-12 | 292 | 30 012 43.80 |
| | | | | 80 | 6-12 | 442 | 30 102 43.80 |

| Transformer | | | | HV HRC fuse | | | |
|---|---|---|---|---|---|---|---|
| **U [kV]** | **$S_N$ [kVA]** | **$u_K$ [%]** | **$I_1$ [A]** | **$I_s$ [A]** | **$U_s$ [kV]** | **e [mm]** | **Order no.** |
| 10-12 | 1000 | 5-6 | 58 | 100 | 6-12 | 442 | 30 102 43.100 |
| | 1250 | 5-6 | 72.2 | 125 | 6-12 | 442 | 30 103 43.125 |
| 13.8 | 50 | 4 | 2.1 | 6.3 | 10-17.5 | 442 | 30 231 13.6,3 |
| | | | | 6.3 | 10-24 | 442 | 30 006 13.6,3 |
| | 75 | 4 | 3.2 | 6.3 | 10-17.5 | 442 | 30 231 13.6,3 |
| | | | | 10 | 10-17.5 | 442 | 30 231 13.10 |
| | | | | 10 | 10-24 | 442 | 30 006 13.10 |
| | 100 | 4 | 4.2 | 10 | 10-17.5 | 442 | 30 231 13.10 |
| | | | | 16 | 10-17.5 | 442 | 30 231 13.16 |
| | | | | 16 | 10-24 | 442 | 30 006 13.16 |
| | 125 | 4 | 5.3 | 10 | 10-17.5 | 442 | 30 231 13.10 |
| | | | | 16 | 10-17.5 | 442 | 30 231 13.16 |
| | | | | 16 | 10-24 | 442 | 30 006 13.16 |
| | 160 | 4 | 6.7 | 16 | 10-17.5 | 442 | 30 231 13.16 |
| | 200 | 4 | 8.4 | 16 | 10-17.5 | 442 | 30 231 13.16 |
| | | | | 20 | 10-17.5 | 442 | 30 231 13.20 |
| | | | | 20 | 10-24 | 442 | 30 006 13.20 |
| | 250 | 4 | 10.5 | 20 | 10-17.5 | 442 | 30 231 13.20 |
| | | | | 25 | 10-17.5 | 442 | 30 231 13.25 |
| | | | | 25 | 10-24 | 442 | 30 006 13.25 |
| | 315 | 4 | 13.2 | 25 | 10-17.5 | 442 | 30 231 13.25 |
| | | | | 31.5 | 10-17.5 | 442 | 30 231 13.31,5 |
| | | | | 31.5 | 10-24 | 442 | 30 006 13.31,5 |
| | 400 | 4 | 16.8 | 31.5 | 10-17.5 | 442 | 30 231 13.31,5 |
| | | | | 31.5 | 10-24 | 442 | 30 006 13.31,5 |
| | 500 | 4 | 21 | 40 | 10-17.5 | 442 | 30 231 13.40 |
| | | | | 40 | 10-24 | 442 | 30 006 13.40 |
| | 630 | 4 | 26.4 | 50 | 10-17.5 | 442 | 30 232 13.50 |
| | | | | 50 | 10-24 | 442 | 30 014 13.50 |
| | 800 | 5-6 | 33.5 | 63 | 10-24 | 442 | 30 014 43.63 |
| | 1000 | 5-6 | 41.9 | 80 | 10-24 | 442 | 30 014 43.80 |
| 15-17.5 | 50 | 4 | 1.9 | 6.3 | 10-17.5 | 442 | 30 231 13.6,3 |
| | | | | 6.3 | 10-24 | 442 | 30 006 13.6,3 |
| | 75 | 4 | 2.9 | 6.3 | 10-17.5 | 442 | 30 231 13.6,3 |
| | 100 | 4 | 3.9 | 10 | 10-17.5 | 442 | 30 231 13.10 |
| | 125 | 4 | 4.8 | 16 | 10-17.5 | 442 | 30 231 13.16 |
| | | | | 16 | 10-24 | 442 | 30 006 13.16 |
| | 160 | 4 | 6.2 | 16 | 10-17.5 | 442 | 30 231 13.16 |
| | 200 | 4 | 7.7 | 20 | 10-17.5 | 442 | 30 231 13.20 |
| | | | | 20 | 10-24 | 442 | 30 006 13.20 |
| | 250 | 4 | 9.7 | 25 | 10-17.5 | 442 | 30 231 13.25 |
| | | | | 25 | 10-24 | 442 | 30 006 13.25 |
| | 315 | 4 | 12.2 | 31.5 | 10-17.5 | 442 | 30 231 13.31,5 |
| | | | | 31.5 | 10-24 | 442 | 30 006 13.31,5 |
| | 400 | 4 | 15.5 | 31.5 | 10-17.5 | 442 | 30 231 13.31,5 |
| | | | | 31.5 | 10-24 | 442 | 30 006 13.31,5 |
| | 500 | 4 | 19.3 | 31.5 | 10-17.5 | 442 | 30 231 13.31,5 |
| | | | | 31.5 | 10-24 | 442 | 30 006 13.31,5 |
| | | | | 40 | 10-17.5 | 442 | 30 231 13.40 |
| | | | | 40 | 10-24 | 442 | 30 006 13.40 |

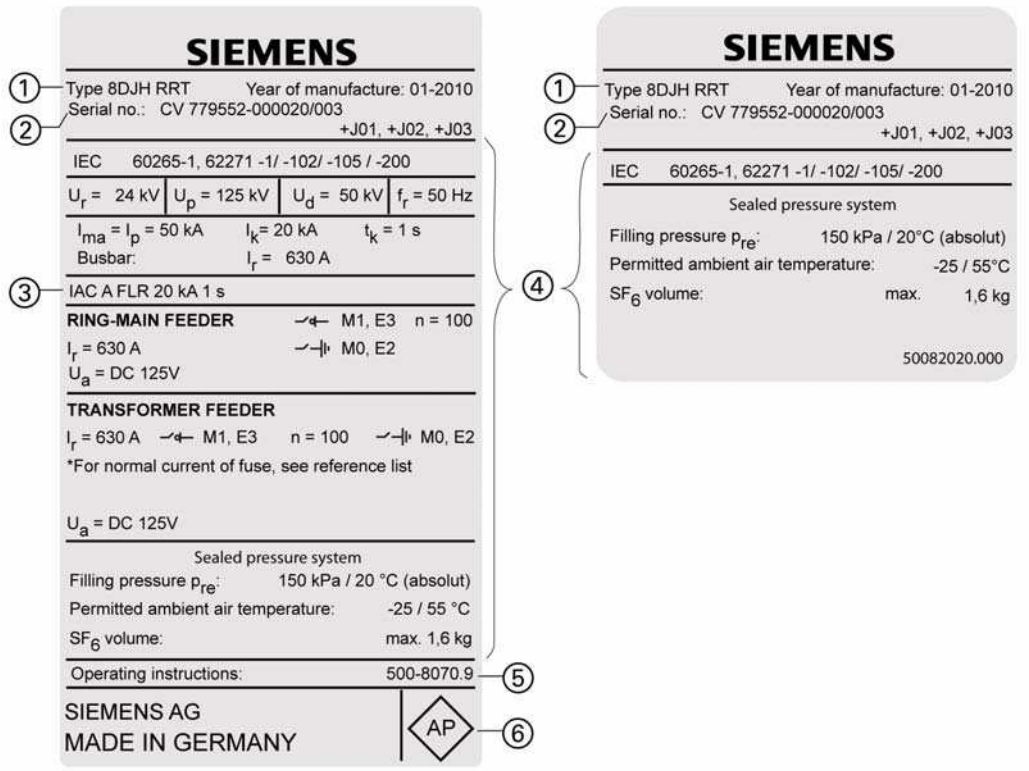
| Transformer | | | | HV HRC fuse | | | |
|---|---|---|---|---|---|---|---|
| **U [kV]** | **$S_N$ [kVA]** | **$u_K$ [%]** | **$I_1$ [A]** | **$I_s$ [A]** | **$U_s$ [kV]** | **e [mm]** | **Order no.** |
| 15-17.5 | 630 | 4 | 24.3 | 40 | 10-17.5 | 442 | 30 231 13.40 |
| | | | | 40 | 10-24 | 442 | 30 006 13.40 |
| | | | | 50 | 10-17.5 | 442 | 30 232 13.50 |
| | | | | 50 | 10-24 | 442 | 30 014 13.50 |
| | | | | 63 | 10-24 | 442 | 30 014 43.63 |
| | 800 | 5- 6 | 30.9 | 63 | 10-24 | 442 | 30 014 43.63 |
| | 1000 | 5-6 | 38.5 | 80 | 10-24 | 442 | 30 014 43.80 |
| | 1250 | 5-6 | 48.2 | 100 | 10-24 | 442 | 30 022 43.100 |
| 20-24 | 50 | 4 | 1.5 | 6.3 | 10-24 | 442 | 30 006 13.6,3 |
| | 75 | 4 | 2.2 | 6.3 | 10-24 | 442 | 30 006 13.6,3 |
| | 100 | 4 | 2.9 | 6.3 | 10-24 | 442 | 30 006 13.6,3 |
| | 125 | 4 | 3.6 | 10 | 10-24 | 442 | 30 006 13.10 |
| | 160 | 4 | 4.7 | 10 | 10-24 | 442 | 30 006 13.10 |
| | 200 | 4 | 5.8 | 16 | 10-24 | 442 | 30 006 13.16 |
| | 250 | 4 | 7.3 | 16 | 10-24 | 442 | 30 006 13.16 |
| | 315 | 4 | 9.2 | 16 | 10-24 | 442 | 30 006 13.16 |
| | | | | 20 | 10-24 | 442 | 30 006 13.20 |
| | 400 | 4 | 11.6 | 20 | 10-24 | 442 | 30 006 13.20 |
| | | | | 25 | 10-24 | 442 | 30 006 13.25 |
| | 500 | 4 | 14.5 | 25 | 10-24 | 442 | 30 006 13.25 |
| | | | | 31.5 | 10-24 | 442 | 30 006 13.31,5 |
| | 630 | 4 | 18.2 | 31.5 | 10-24 | 442 | 30 006 13.31,5 |
| | | | | 40 | 10-24 | 442 | 30 006 13.40 |
| | 800 | 5-6 | 23.1 | 31.5 | 10-24 | 442 | 30 006 13.31,5 |
| | | | | 40 | 10-24 | 442 | 30 006 13.40 |
| | 1000 | 5-6 | 29 | 50 | 10-24 | 442 | 30 014 13.50 |
| | | | | 63 | 10-24 | 442 | 30 014 43.63 |
| | 1250 | 5-6 | 36 | 80 | 10-24 | 442 | 30 014 43.80 |
| | 1600 | 5-6 | 46.5 | 100 | 10-24 | 442 | 30 022 43.100 |
| | 2000 | 5-6 | 57.8 | | | | On request |

| | |
|---|---|
| U | Rated system voltage |
| $S_N$ | Rated power |
| $U_K$ | Relative impedance voltage |
| $I_1$ | Rated current |
| $I_S$ | Rated current of fuse |
| $U_S$ | Rated voltage of fuse |
| e | Reference dimension |

**NOTE!**

- For switchgear with rated voltages up to 12 kV, a fuse slide for HV HRC fuse-links with dimension 292 mm is normally provided.
- 7.2 kV fuse-links with dimension 192 mm as well as 24 kV fuse-links with dimension 292 mm are not permissible.

## 8.11 Rating plates




**Rating plate at the front (example)**

**Rating plate inside the operating mechanism box (example)**

① Switchgear type and year of manufacture

② Serial number

③ Internal arc classification (option)

④ Technical data

⑤ Number of operating instructions

⑥ Test mark for the performed acceptance test (German: **A**bnahme-**P**rüfung ) (pressure test) of the vessel

# 9 Switchgear maintenance

**Maintenance**

8DJH switchgear is maintenance-free. Inspection/testing of the secondary equipment such as the capacitive voltage detecting system is done within the scope of national standards or customer-specific regulations.

**Replacement of components**

Due to the fact that all parts of this switchgear have been optimized to last the normal service life, it is not possible to recommend particular spare parts.

Information required for spare part orders of single components and devices:

- Type and serial number of the switchgear (see rating plates)
- Description/identification of the device or component on the basis of a sketch/photo or a circuit diagram.

# 10 End of service life

**$SF_6$ gas**

| | |
|---|---|
|  | **NOTE!** |
| | The equipment contains the fluorized greenhouse gas $SF_6$ registrated by the Kyoto Protocol with a global warming potential (GWP) of 22 200. $SF_6$ has to be reclaimed and must not be released into the atmosphere.<br><br>⇨ For use and handling of $SF_6$, IEC 62271-303 has to be observed: High-voltage switchgear and controlgear - Part 303 Use and handling of sulphur hexafluoride ($SF_6$). |

Before recycling the materials, evacuate the $SF_6$ gas professionally and prepare it for further use.

**Recycling**

The switchgear is an environmentally compatible product.

The components of the switchgear can be recycled in an environmentally compatible way by dismantling into sorted scrap and residual mixed scrap.

After evacuating the $SF_6$ gas, the switchgear mainly consists of the following materials:

- Steel (enclosure and operating mechanisms)
- Stainless steel (vessel)
- Copper (conductor bars)
- Silver (contacts)
- Cast-resin based on epoxy resin (bushings and post insulators)
- Plastic materials (switching devices and fuse tripping)
- Silicone rubber

The switchgear can be recycled in ecological manner in compliance with existing legislation.

Auxiliary devices such as short-circuit indicators have to be recycled as electronic scrap.

Batteries have to be recycled professionally.

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

For further information please contact your regional Siemens representative.

# Installation

## 11 Preparing installation

### 11.1 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 foil)
- Other packings in special cases (e.g. latticed crate, cardboard cover for air freight)

**ATTENTION!**

Packing and consumable materials of the switchgear must be disposed of in an environmentally compatible way or recycled.

⇨ Observe the local regulations for disposal and environmental protection.

**Transport unit**

On the customer's request, transport units may consist either of:

- Individual switchpanels

or

- Panel blocks with up to four functions

and accessories

### 11.2 Completeness and transport damage

**Checking for completeness**

⇨ Check whether the delivery is complete and correct using the delivery notes and packing lists.

⇨ Compare the serial numbers of the switchgear on the delivery note with those on the packing and the rating plates.

⇨ Check whether the accessories included in the subframe are complete.

**Transport damages**

⇨ Temporarily open the packing in a weatherproof place to detect hidden damages. Do not remove the PE foil until reaching the final mounting position in order to keep the switchgear as clean as possible.

⇨ Check the switchgear for transport damages.

⇨ Check the gas density (see Page 97, "Final tests after installation", Checking the "Ready-for-service indicator").

⇨ Refit the packing as far as possible and useful.

⇨ Determine and document detected defects and transport damages immediately, e.g. on freight documents.

⇨ As far as possible, document larger defects and transport damages photographically.

⇨ Repair or have the transport damages repaired.

### 11.3 Intermediate storage

| | |
|---|---|
|  | **DANGER!**<br>Risk of injury and damage to the stored goods if the storage space is overloaded.<br>⇨ Observe the load-bearing capacity of the floor.<br>⇨ Do not stack the transport units.<br>⇨ Do not overload lighter components by stacking. |

| | |
|---|---|
|  | **ATTENTION!**<br>Fire risk. The transport unit is packed in flammable materials.<br>⇨ No smoking.<br>⇨ Keep fire extinguishers in a weatherproof place.<br>⇨ Mark the location of the fire extinguisher. |

| | |
|---|---|
|  | **ATTENTION!**<br>Supplied desiccant bags lose their effectiveness if they are not stored in the undamaged original packings.<br>⇨ Do not damage or remove packing of desiccant bags.<br>⇨ Do not unpack desiccant bags before use. |

If the comprehensive accessories, the delivered switchgear or parts thereof have to be stored before installation, a suitable storage room or place has to be selected and prepared.

Intermediate storage of the transport units:

- In original packing as far as possible
- Switchgear with secondary system: Observe the permissible storage temperature from -25° C to +70° C in accordance with the installed secondary devices.
- Switchgear without secondary system: Observe the permissible storage temperature from -40° C to +70° C.
- In a weatherproof place
- Protected against damage
- If packed in seaworthy crates, the switchgear can be stored for a maximum of 6 months (desiccant bags)
- Store transport units in such a way that they can be taken out later in the correct order for installation.

**Switchgear storage in closed rooms**

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

- Floor with adequate load-bearing capacity (weights as per delivery note)
- Even floor to enable stable storage
- Well-ventilated and free of dust as far as possible
- Dry and protected against humidity and vermin (e.g. insects, mice, rats)
- Check humidity in the packings every 4 weeks (condensation)
- Do not unpack small parts to avoid corrosion and loss.

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

If the switchgear or parts thereof are delivered in seaworthy crates, these can be stored up to 6 months in other rooms or outdoors. The storage place must have the following characteristics:

- Floor with adequate load-bearing capacity (weights as per delivery note)
- Protected against humidity (rain water, flooding, melting water from snow and ice), pollution, vermin (rats, mice, termites, etc.) and unauthorized access
- Place all crates on planks and square timber for protection against floor humidity.
- After 6 months of storage, have the desiccant agent regenerated professionally. To do this, ask for expert personnel via your regional Siemens representative.

### 11.4 Unloading and transport to the place of installation

**ATTENTION!**

Non-observance of the following instructions can endanger people or damage the transport units while unloading.

⇨ Make sure that nobody is standing in the swinging area of lifted switchgear.

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

⇨ Observe the dimensions and weights of the transport unit (delivery note).

⇨ Observe even weight distribution and the high center of gravity of the switchgear.

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

⇨ Do not climb onto the roof of the switchpanels.

⇨ If the low-voltage compartment is removed, do not step on the mounting plates of the low-voltage compartments.

⇨ 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.

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

⇨ Sling the ropes around the ends of the wooden pallets.

⇨ Move the switchgear on their wooden pallets as far as possible.

⇨ Unload the transport units and set them down as close to the switchgear building as possible in order to avoid unnecessary ways.

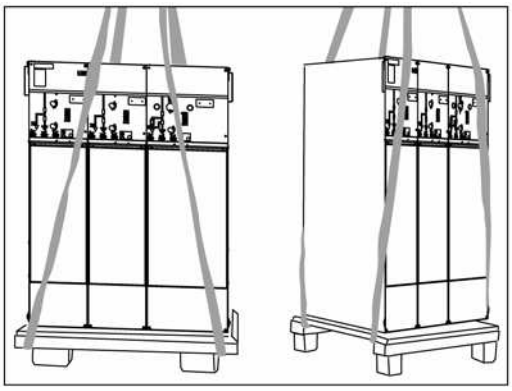
⇨ Move the transport units into the building, if possible on their wooden pallets. Only remove packing where absolutely necessary in order to keep the switchgear as clean as possible.

⇨ Remove foil only in the building, right before assembling the transport units, and temporarily to check for transport damages.

⇨ Set the transport units down in the correct sequence directly in front of the place of installation (leave a clearance for installation).

**Unloading and transport in orginal packing**

⇨ Transport the switchgear by means of a crane or a fork-lift truck.



**Removing the wooden pallets**

The transport units are screwed on the wooden pallets with transport angles or directly in the switchgear subframe.

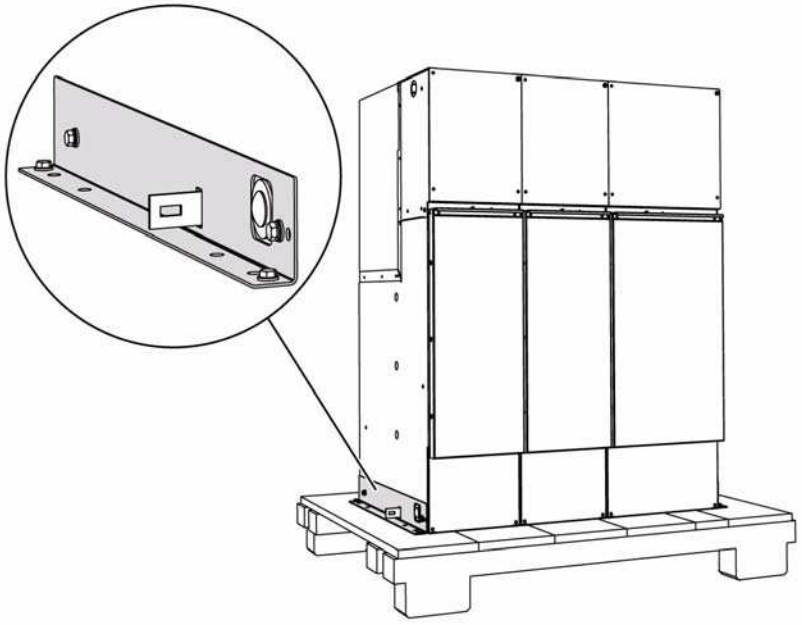


Fig. 35: Transport unit fixed on wooden pallet with transport angle (view from the left)

⇨ Remove the PE foil; if required, remove seaworthy or latticed crate before.

⇨ Remove the front cable compartment cover from the subframe of the switchgear.

⇨ Remove the fixing screws from the transport angles / pallet.

⇨ Remove the transport angles.

If the switchgear cannot be lifted directly from the wooden pallet onto its mounting position, please proceed as follows:

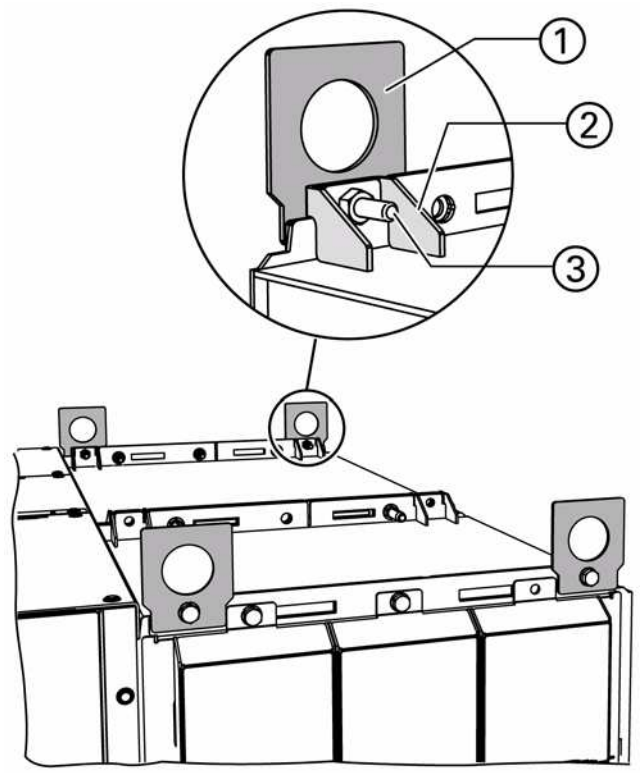
⇨ Lower the transport units by means of the lateral transport angles onto roller pads (reinforced rollers) or tubes.

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

**Switchgear transport with crane eyes**

⇨ The crane eyes are supplied with the supplementary equipment.

⇨ To crane the transport unit, fix the crane eyes at the metal clamping bracket with one nut-and-washer assembly M8 x 40.




① Crane eye
② Metal clamping bracket
③ Bolt M4 x 8

Fig. 36: Befestigung der Kranösen (Lupe zeigt Rückansicht der Kranöse)

⇨ Hang in the hook, or push rods in.

⇨ Transport the switchgear.

⇨ When the switchgear is in its definitive position, bring the eyes to the initial position again.

⇨ Please observe the following: To assemble panel groups, the crane eyes must be removed.

| | |
|---|---|
|  | **ATTENTION!**<br>Danger due to swinging switchgear. The center of gravity is not always located under the fixing point.<br>⇨ Lift the switchgear slowly.<br>⇨ Keep the safety distances.<br>⇨ Do not transport more than a maximum width of 2000 mm and a maximum height of 2.30 m in a block. |

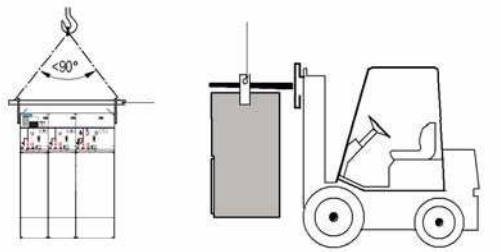



Fig. 37: Switchgear transport with crane or fork-lift truck

⇨ Lift or lower just slowly, as the switchgear will swing into the center of gravity when it is lifted.

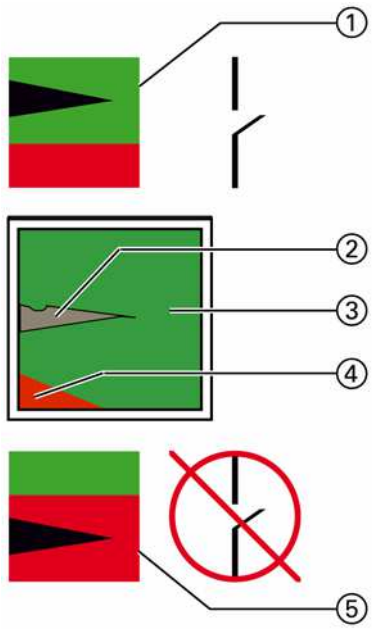
⇨ While lifting, observe parts laid inside such as e.g. cable-type transformers, connecting cables.

## 11.5 Checking the ready-for-service indicator

**Checking the ready-for-service indicator**

The switchgear is filled with insulating gas at a relative pressure. Before starting installation, please verify that the gas filling of the switchgear is sufficient by means of the ready-for-service indicator.

⇨ Read the ready-for-service indicator.




① Indication: "ready for service"
② Pointer
③ Green
④ Red
⑤ Indication: "not ready for service"

If the pointer is in the green area, the gas density is in order.
If the pointer is in the red area:

⇨ Check the auxiliary switch of the ready-for-service indicator.

**Checking the auxiliary switch**

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

⇨ Remove the front plate of the switchgear. Push the lever of the auxiliary switch carefully towards the switch.

✔ The ready-for-service indicator must be in the green area. If not, please stop installation and contact the Siemens representative.

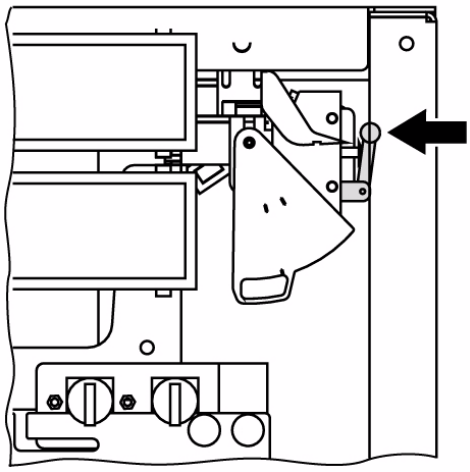


Fig. 38: Lever of auxiliary switch

### 11.6 Preparing the foundation

Please observe the following items 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 in the switchgear documentation.
- Determine level differences between the installation surfaces of the panels using a measuring sheet, and compensate them with shims.

**Stipulations for evenness and straightness**

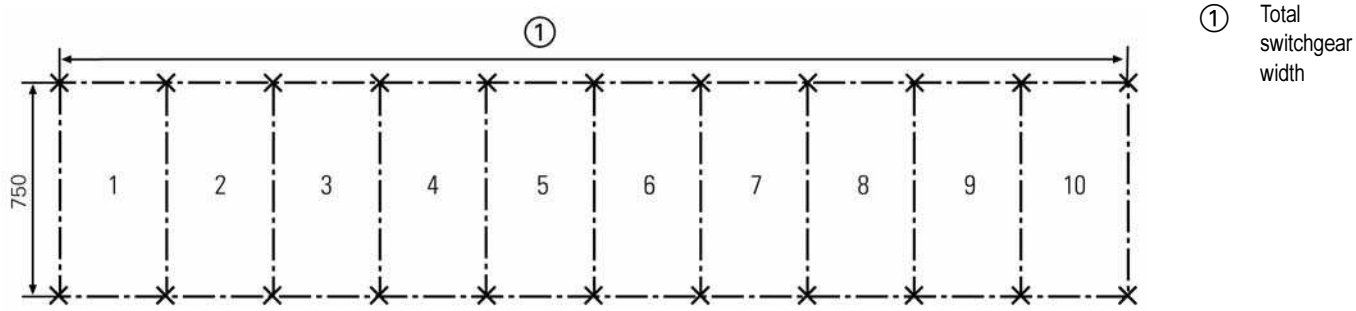



Fig. 39: Measuring sheet for the foundation. Evenness/straightness tolerance according to DIN 43661: 1 mm per 1 m length, 2 mm for the total length.

### 11.7 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.

# 12 Switchgear installation

## 12.1 Tools/auxiliary means

- Standard tools, such as a torque wrench
- Compensation shims with a thickness of 0.5 – 1.0 mm for floor unevenness
- Cleaning agents (e.g. make ARAL 4005 or make HAKU 1025/90)
- Soft, lint-free cloths

## 12.2 Installing the switchgear

**Preparations**

You may only start installing the switchgear when

- all transport damages have been repaired
- the base frame has been levelled (1 mm/m), see DIN 43661
- the gas filling of the switchgear vessels has been checked
- the accessories and the required material are complete

Precondition: Operating mechanism in "EARTHED" position.

**ATTENTION!**

Please observe the following for room planning and switchgear installation:

⇨ Dimensions of floor openings according to the dimension drawing in the switchgear documentation.

⇨ Direction of pressure relief according to the height of the cable basement in accordance with the cable bending radius.

⇨ Relief rooms according to the dimension drawing in the switchgear documentation.

⇨ Remove the front cable compartment cover from the subframe of the panels.
To do this, undo the bolted joints of the cable compartment cover.
Then lift the cable compartment cover and remove it to the front.

⇨ Remove the lower partition of the cable compartment.

**ATTENTION!**

To install the switchgear or the cables, the cross members can be removed.
Then, the switchgear must not be moved anymore, as there are no braces to guarantee stability during the movement.

⇨ Bring the switchgear to the required position.

⇨ Remove the cross members.

⇨ Do not move the switchgear as long as the cross members are removed.

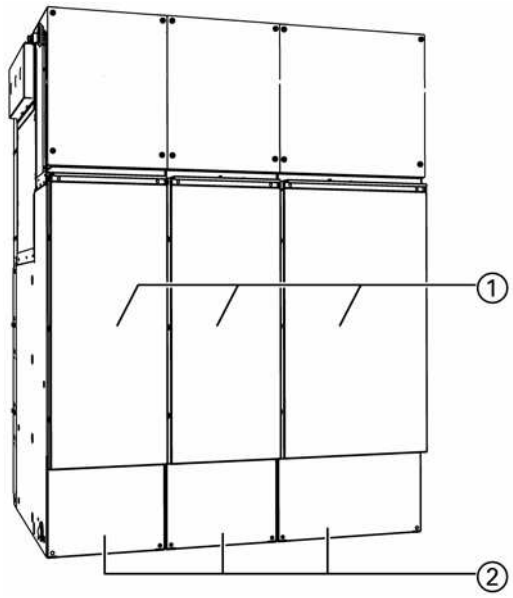



Fig. 40: Removing the cable compartment covers ① and the cross members ② if required

### Room planning

**Switchgear installation**

Please observe the following for room planning and switchgear installation:

- Wall-standing arrangement
  - 1 row
  - 2 rows (for face-to-face arrangement)

- Option: Free-standing arrangement
  - Switchgear dimensions
  - Floor openings: Dimensions (see Page 77, "Floor openings and fixing points")
  - Direction of pressure relief and the associated relief rooms (see Page 80, "Pressure relief options ")

**Pressure relief**

In the standard design, the pressure is relieved downwards.
For further information, see Page 80, "Pressure relief options ".

**Room dimensions**

See the dimension drawings below. For the internal arc classification according to IEC/EN 62271-200 / VDE 0671-200, the room height of accessible switchgear rooms results from the switchgear height of +600 mm (±100 mm).

**Door dimensions**

The door dimensions depend on

- the number of panels in one transport unit
- the switchgear design with or without low-voltage compartment

**Switchgear fixing**

- For floor openings and fixing points of the switchgear, see Page 77, "Floor openings and fixing points".
- Foundations:
  - Steel girder construction
  - Reinforced-concrete floor

**Switchgear installation with pressure relief downwards**

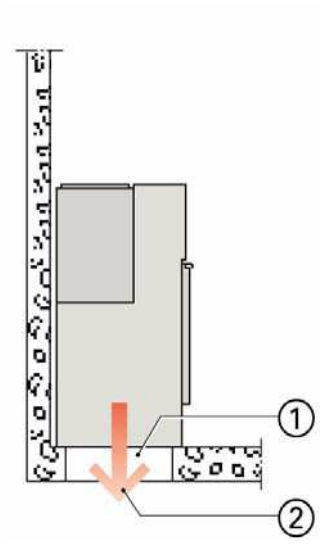



Fig. 41: Side view

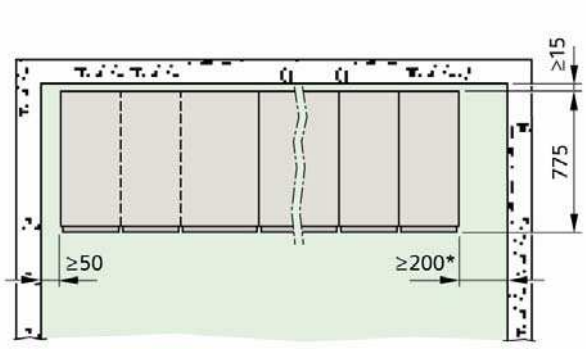



Fig. 42: Top view

**Switchgear installation with pressure relief downwards / to the rear (option)**

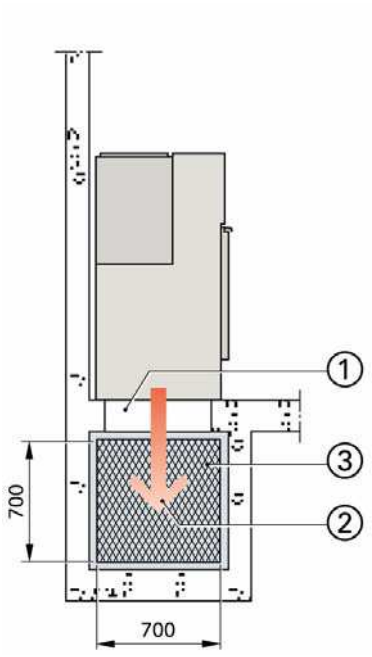



Fig. 43: Side view

① Floor opening

② Direction of pressure relief

③ Expanded metal (supplied by site)

* for lined up switchgear

** Depending on national requirements. For extension or panel replacement, a control aisle of at least 1000 mm is recommended

**Panel dimensions**

For binding switchgear dimensions, please refer to the order documentation (dimension drawing, front view).

**Weights**

For data, see Page 48, "Switchgear versions - Dimensions and weights".

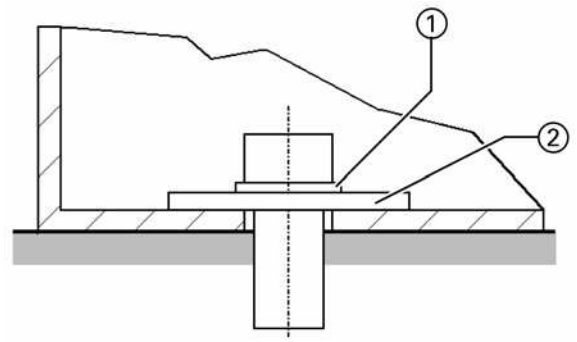
**Fixing options**

⇨ The switchgear must be fixed to the foundation so as to guarantee sufficient pressure resistance. The panels can be fastened to the foundation in the following ways:

- Bolted to foundation rails.
- Welded to foundation rails.
- Screwed into the concrete using size 10 dowels if there are no foundation rails available.

We recommend to fasten the switchgear with at least 4 bolts size M8 in each panel.

⇨ The base pieces of the panel frames contain cutouts for fastening the switchgear (see dimension drawing).




① Strain washer M8 (according to DIN 6796)

② 3D washer M10 (according to DIN EN ISO 7093)

Fig. 44: Switchgear fastening to the foundation

**Fastening the switchgear to the foundation**

Fasten each panel to the foundation as follows:

⇨ For direct fastening to the concrete, drill holes in the foundation and insert size 10 dowels.

⇨ Place shims in the spaces between the panel frame and the foundation in the area of the fastening cutouts, so that the switchgear is not distorted when it is bolted on, and the seam does not cover any air-filled gaps when the switchgear is welded on.

⇨ Bolt or weld the switchgear to the foundation.

⇨ Remove any dirt, as extreme cleanliness is required during installation.

⇨ Paint welding seams to protect them against corrosion.

**Mounting the partition in the cable compartment**

Mount the lower partition after having fixed the panels on the floor. The partitions for the individual panels are supplied separately, see supplementary equipment.
The partition is mounted on site.

⇨ Remove the cable compartment covers.

⇨ Fasten the lower partition. To do this, use M6 Torx bolts.
Tightening torque: Maximum 12 Nm.

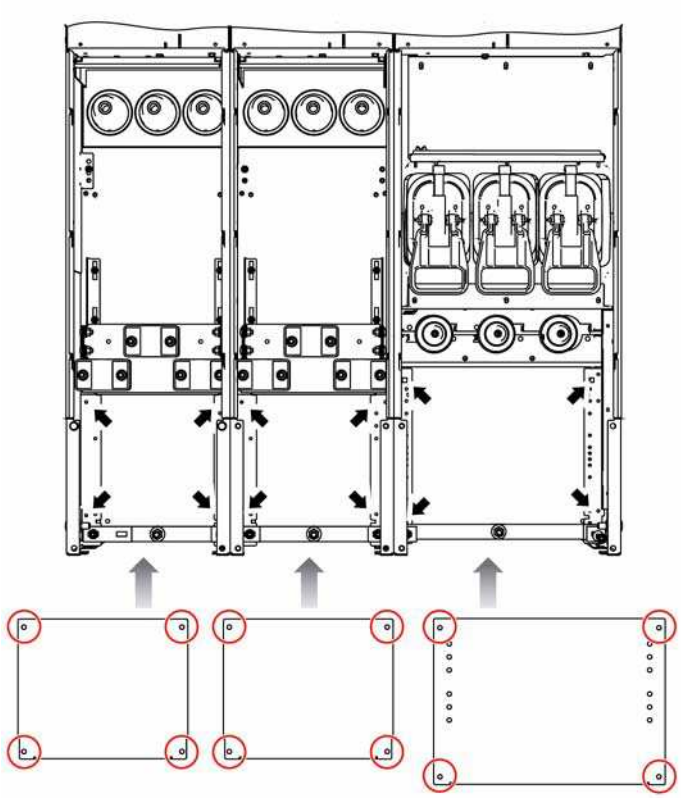


Fig. 45: Mounting the lower partition (front view)

⇨ The folding edges of the partition point to the rear.

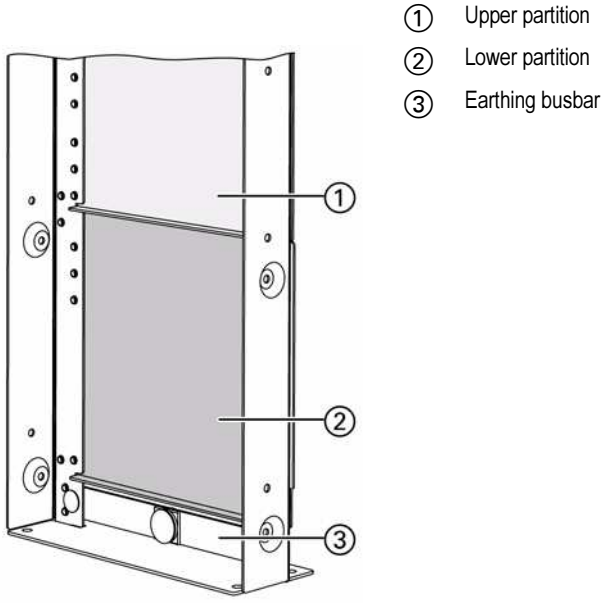
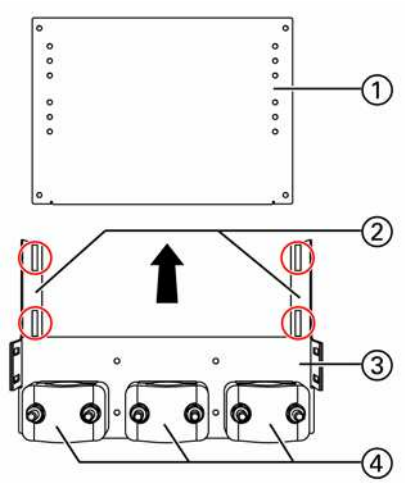



Fig. 46: Mounting postiion of the lower partition (rear view)

⇨ Then mount the **cable bracket in theT panel**.

⇨ Take the cable bracket out of the supplementary equipment and fasten it at the necessary height. To do this, use M6 Torx bolts.
Tightening torque: Maximum 12 Nm.

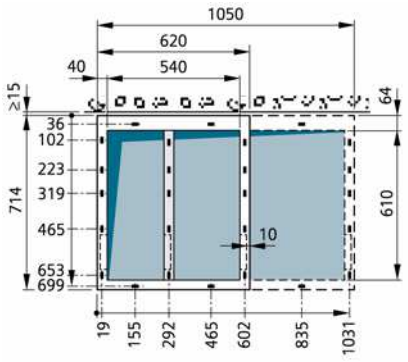



① Partition
② Adjustment rails
③ Cable bracket
④ Cable clamps

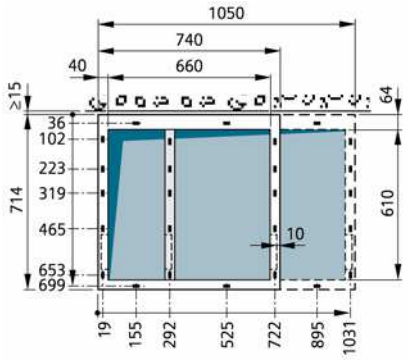
Fig. 47: Mounting the cable bracket in the T panel

## Floor openings and fixing points

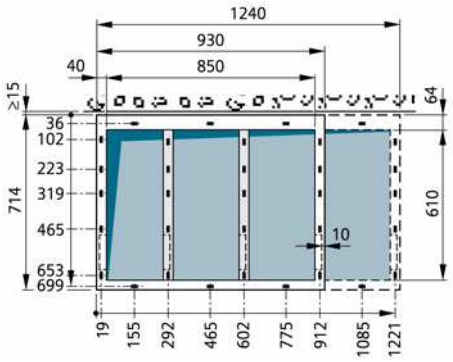
### Standard* panel blocks



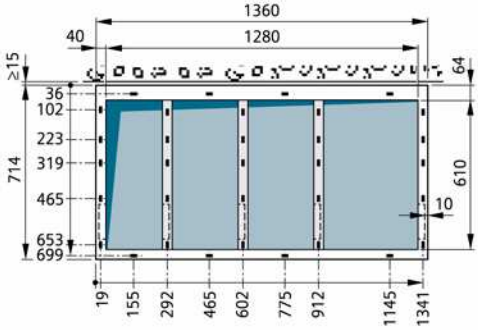

For schemes:
- RR
- RK
- KR
- RRT
- RRL



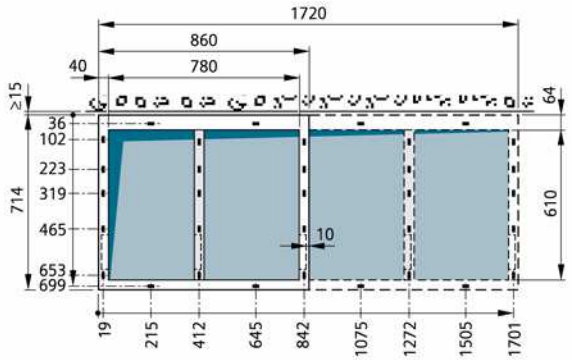

For schemes:
- RT
- RL
- KT
- KL
- RTR
- RLR



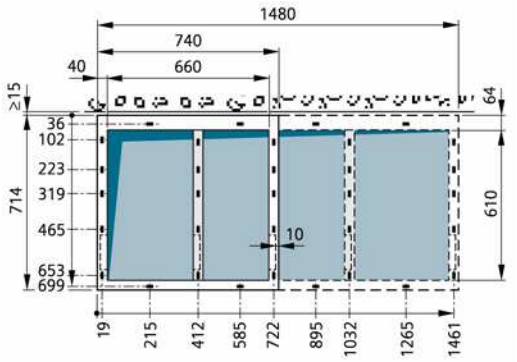

For schemes:
- RRR
- RRRR




For schemes:
- RRRT
- RRRL




For schemes:
- K(E)T
- K(E)L
- TT
- LL
- TTT
- LLL
- TTTT
- LLLL

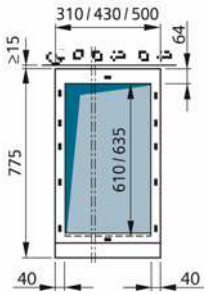



For schemes:
- TK
- LK
- TR
- LR
- TRRT
- LRRL

* For panel versions with double cables and deep cable compartment cover, as well as for other versions, please order the dimension drawings.

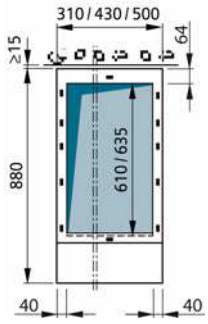
**Versions with deep cable compartment covers**

Versions with deep cable compartment covers (e.g. for double cable connections).

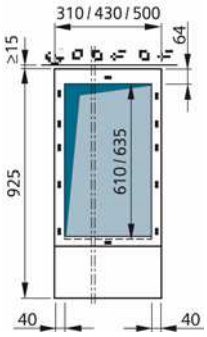



Deep cable compartment cover without base extension:

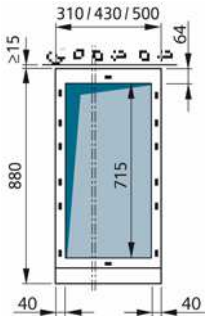
-




Deeper by 105 mm

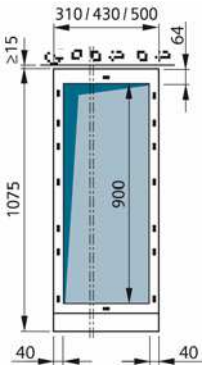



Deeper by 150 mm



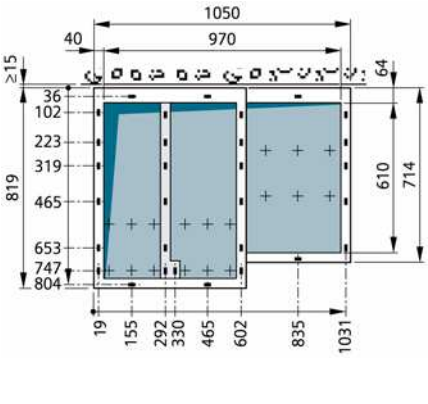

Deep cable compartment cover with base extension:

Deeper by 105 mm

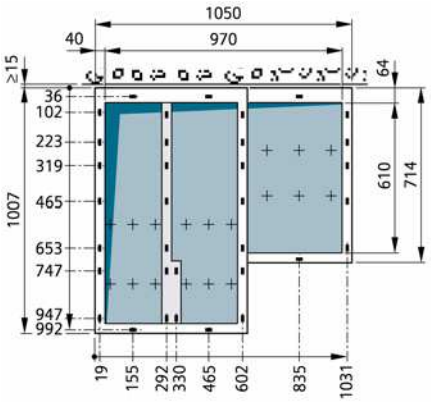



Deeper by 300 mm

Position of floor openings and fixing points for double cable connection in ring-main and circuit-breaker feeders




Type RRT deeper by 105 mm




Type RRT deeper by 300 mm

For concrete switchgear versions, please order the dimension drawings.

### 12.3 Pressure relief options

In the standard design, the pressure is relieved downwards. In the case of non-extendable panel blocks with an overall height of 1400 and 1700 mm and wall-standing arrangement, the pressure can optionally be relieved to the rear.

① Floor opening
② Direction of pressure relief
③ Expanded metal (supplied by site)
④ Partition (e.g. made of metal, supplied by site)

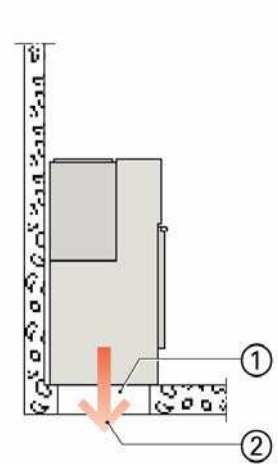



Fig. 48: Standard: Pressure relief downwards

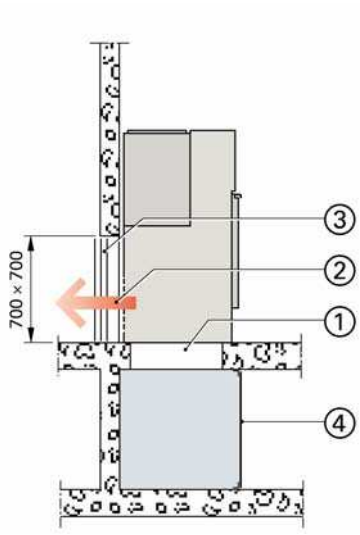



Fig. 49: Option: Pressure relief to the rear (side view)

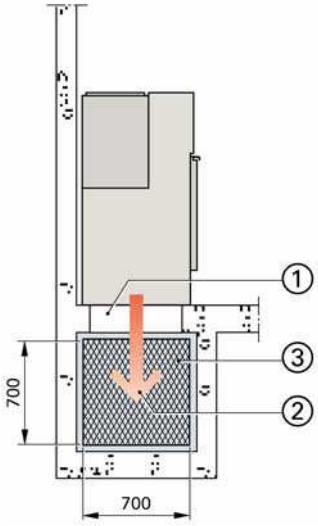



Fig. 50: Option: Pressure relief downwards (side view)

### 12.4 Switchgear earthing

In the case of non-extendable switchgear, the switchgear is connected to the substation earth through an earthing bolt.

① Earthing point (earthing bolt M12)

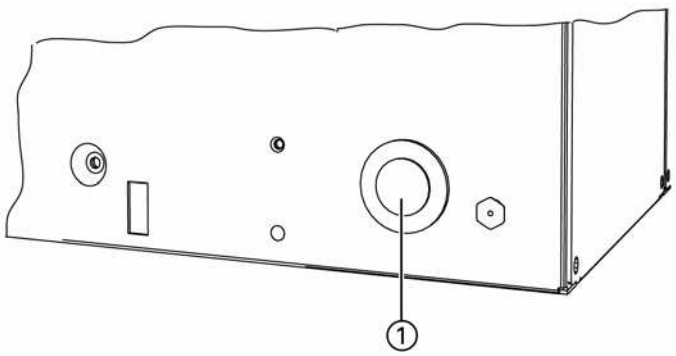



Fig. 51: Earthing via earthing point in **non-extendable** switchgear on the left or right switchgear side - view from outside on the right

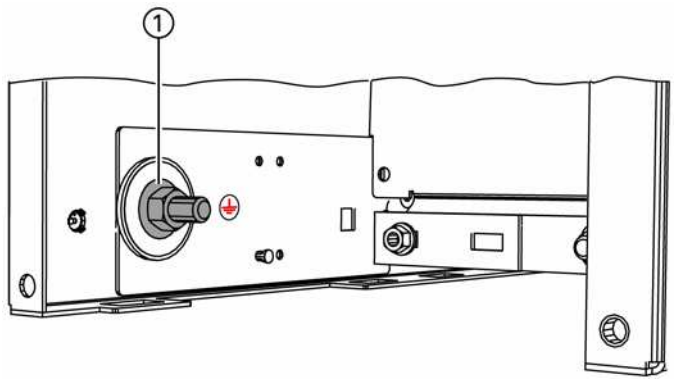



Fig. 52: View into cable compartment

⇨ In blocks with up to 4 panels, it is enough to the connect them to the substation earth once.

⇨ In panel groups of more than 4 panels, earth every fifth panel.

### 12.5 Retrofit of motor operating mechanism

**Options for motor operating mechanism**

The manual operating mechanisms of 8DJH switchgear can be equipped with motor operating mechanisms for the three-position switch-disconnector.

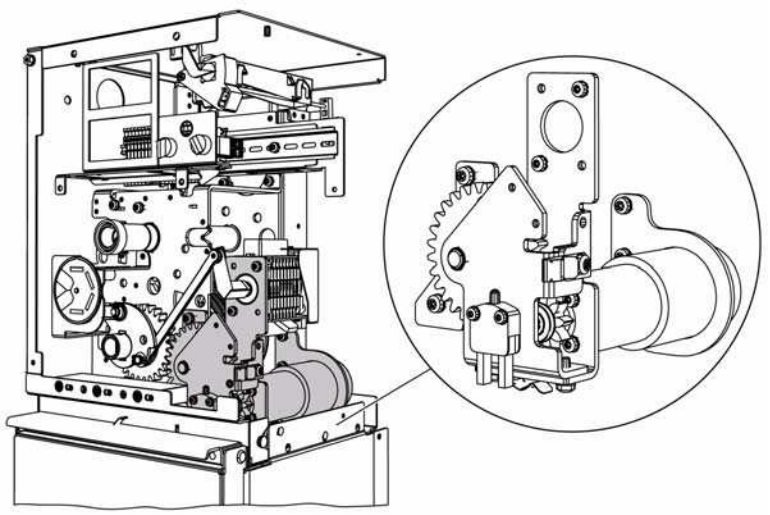


Fig. 53: Motor block assembly of spring-operated mechanism in ring-main feeder

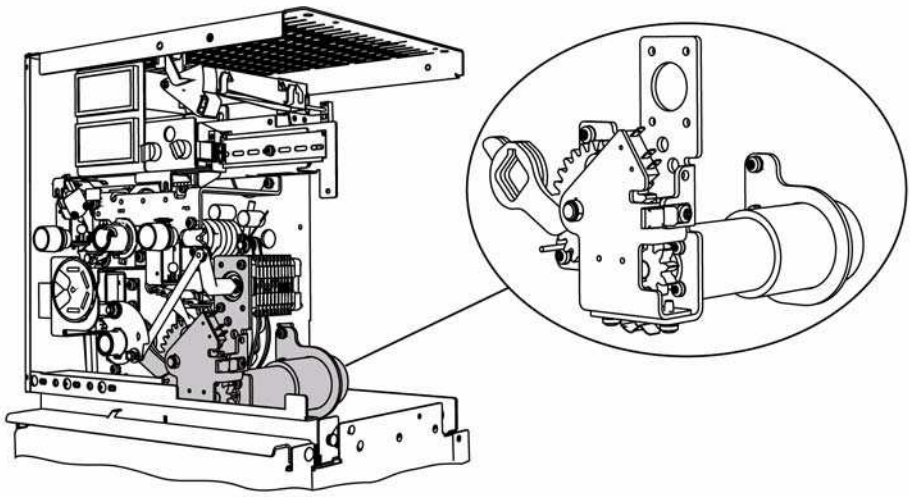


Fig. 54: Motor block assembly of spring-operated/stored-energy mechanism in transformer feeder

# 13 Electrical connections

## 13.1 Connecting high-voltage cables

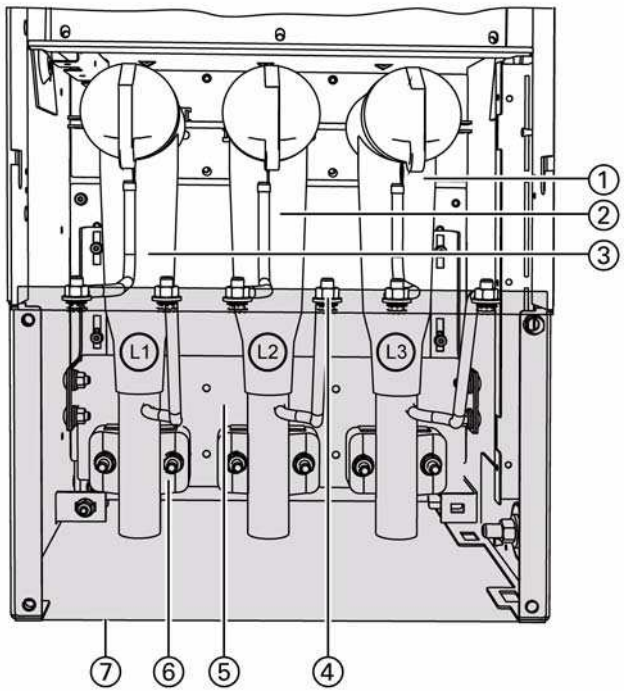
For common features and suitable cable sets (see Page 27, "Cable connection").

| | |
|---|---|
|  | **ATTENTION!** |
| | The high-quality joints at the bushings can easily be damaged by incorrect handling.<br>⇨ Observe extreme cleanliness.<br>⇨ Avoid damages caused by the threaded bolt while pushing on. |

| | |
|---|---|
|  | **ATTENTION!** |
| | If there are any spare feeders without connected cables, please observe the following:<br>⇨ Switch the three-position switch to "EARTHED" position and lock it.<br>⇨ Alternatively: Mount surge-proof caps. |

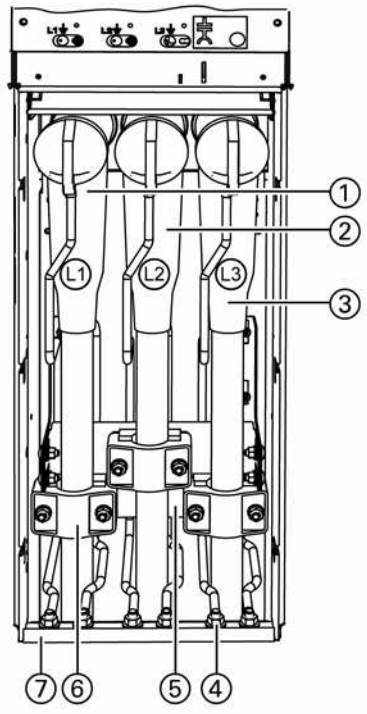
| | |
|---|---|
|  | **ATTENTION!** |
| | During metal work, please ensure the following:<br>⇨ Do not drill into the vessel.<br>⇨ Do not leave any metal cuttings on the vessel in order to avoid rust layers. |

**Connecting feeder cables**




① Phase L1: Make Euromold, type K400 TB as cable T-plug *
② Phase L2: Make Euromold, type K400 TB as cable T-plug *
③ Phase L3: Make Euromold, type K400 TB as cable T-plug *
④ Earthing connection for the cable shield and the plug housing
⑤ Cable bracket
⑥ Cable clamp
⑦ Cross member (removable)
* The plug types shown here as an example can be ordered via the accessories.

Fig. 55: Cable connection for transformer feeders




① Phase L1: Make Euromold, type K400 LB as cable T-plug *
② Phase L2: Make Euromold, type K400 TB as cable T-plug *
③ Phase L3: Make Euromold, type K400 TB as cable T-plug *
④ Earthing connection for the cable shield and the plug housing
⑤ Cable bracket
⑥ Cable clamp
⑦ Cross member (removable)
* The plug types shown here as an example can be ordered via the accessories.

Fig. 56: Cable connection for ring-main and circuit-breaker feeders

⇨ If necessary, detach the cross members ⑦ to swing in the cables.

⇨ Pre-adjust the cable bracket ⑤ and the lower part of the cable clamps ⑥.

⇨ If available, mount cable-type current transformers (see Page 93, "Cable connection with cable-type current transformers".

⇨ Fit the plugs on the conductor ends according to the manufacturer's instructions.

⇨ Carefully coat the push-on surfaces (high-quality joints) in the plug sets and the bushing cone with mounting paste (scope of supply of the plug set).

⇨ Push the plug sets ① to ③ onto the bushing and fix them according to the manufacturer's instructions. Observe the phase sequence!

⇨ Mount the upper part of the cable clamps ⑥, align the cable bracket and bolt it tight.

⇨ Connect the cable shield and the earthing of the plug housing at the front cross member ⑦.

Double cables and surge arresters can be connected to ring-main feeders using adequate plug-in cable systems.

Please observe the following:

- Depending on their type, double cable connections require a deep cable compartment cover and larger floor openings.
- Depending on their type, surge arresters also require a deep cable compartment cover.

For details, please refer to the order documents.

**Assembly operations at the panel for fastening the cable plug Raychem RICS5xxx with RDA 24**

⇨ Remove upper cross member.
To do this, undo the two bolt-and-washer assemblies M8 x 20.

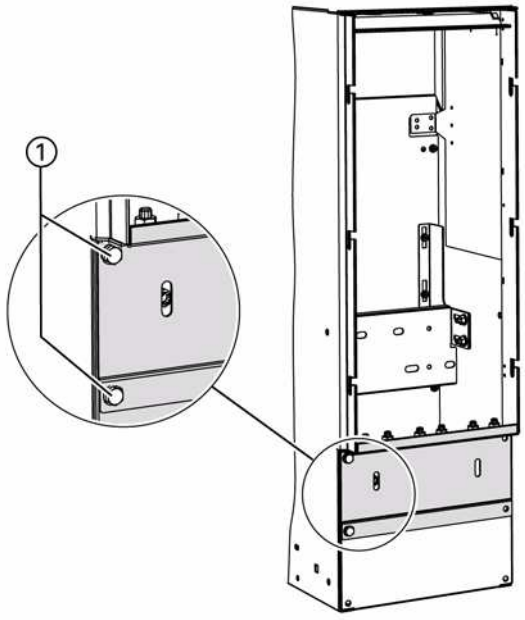



Fig. 57: Removing bolt-and-washer assemblies ① at the upper cross member.

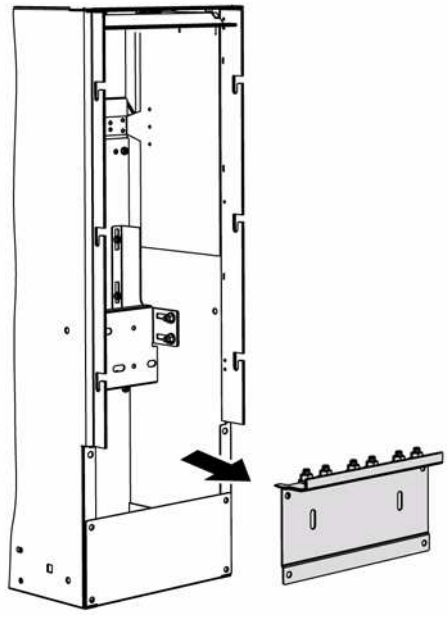


Fig. 58: Removing upper cross member

⇨ Mount cable plug type Rayschem RICS5xxx with surge arrester RAD according to the manufacturer's instructions (see order documents).

⇨ Fasten adapter feet with hexagonal nuts M12 and strain washers to the surge arrester plate.

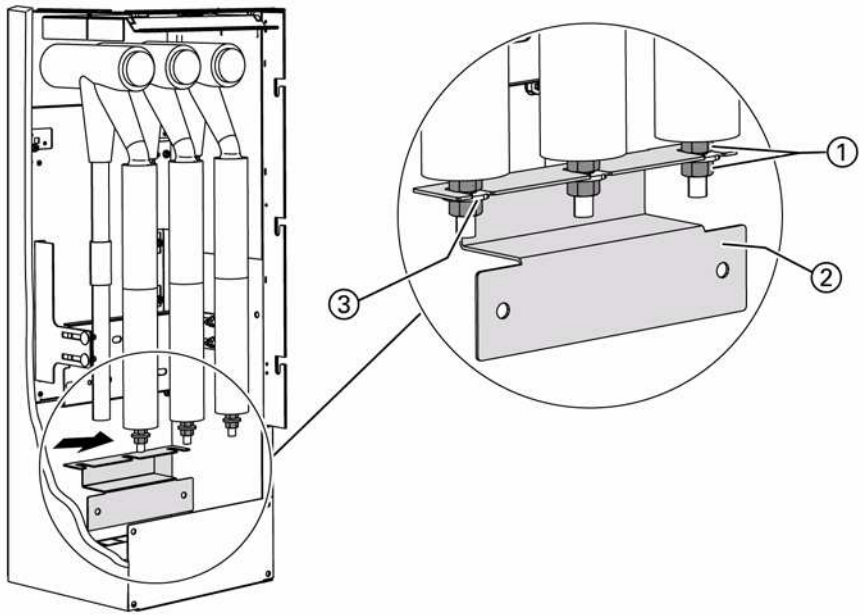



Fig. 59: Push the surge arrester plate ② between the hexagonal nuts M12 of the adapter feet, and tighten it. Use hexagonal nuts M12 ① with strain washers ③.

⇨ Fasten upper cross member with two bolt-and-washer assemblies M8 x 20.

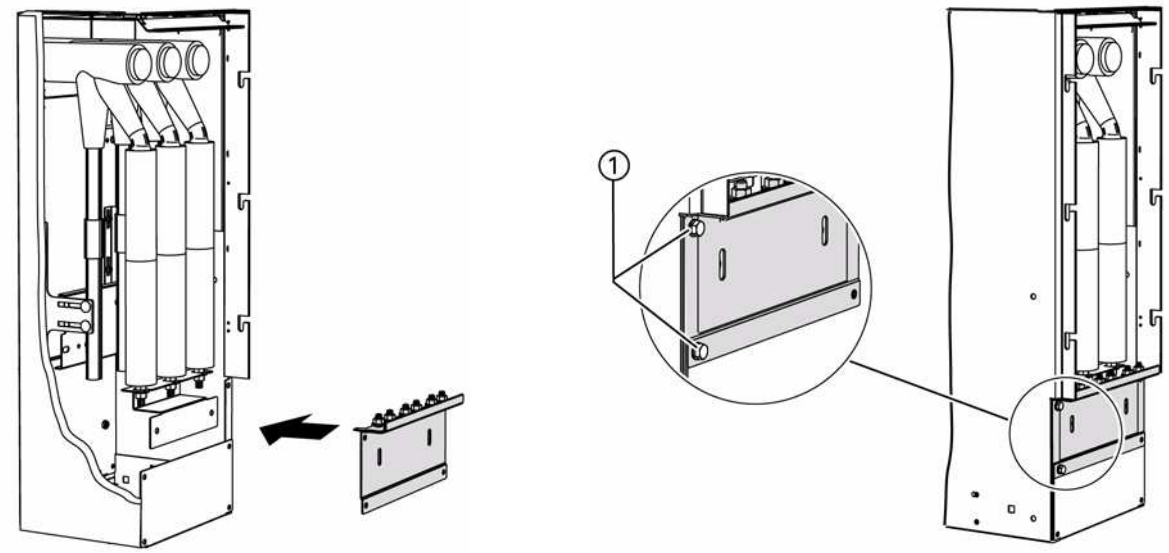



Fig. 60: Mounting bolt-and-washer assemblies ① on the upper cross member.

⇨ Fasten the surge arrester plate with two bolt-and-washer assemblies M8 x 20 and washers to the upper cross member.

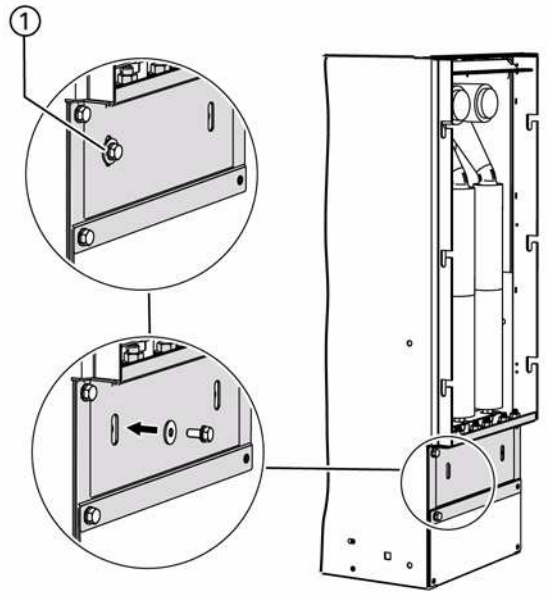
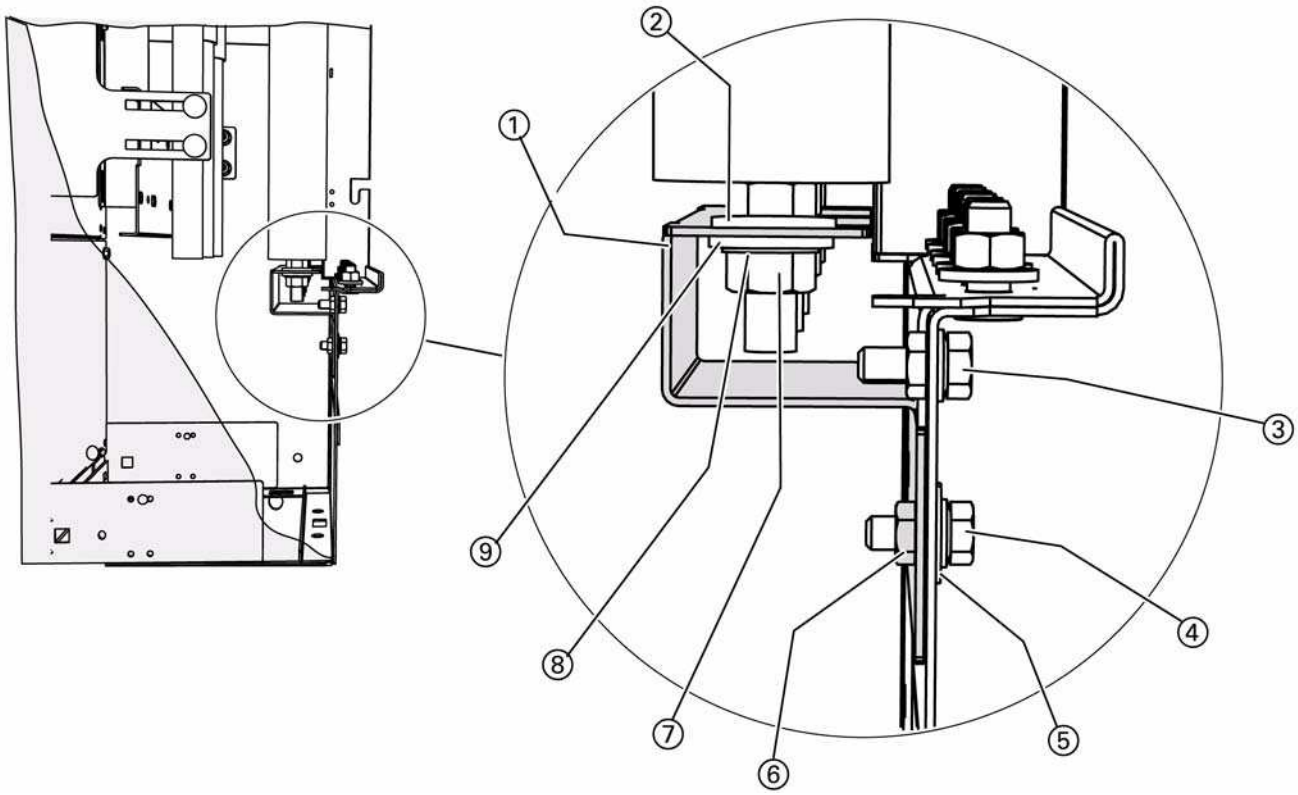


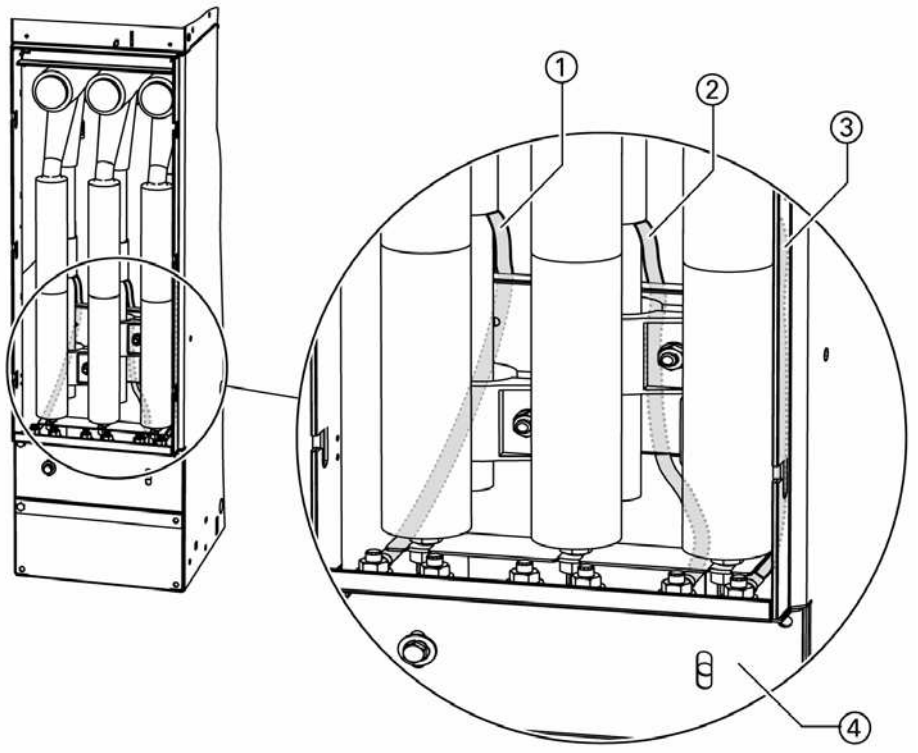

Fig. 61: Mounting the surge arrester plate with bolt-and-washer assemblies ① and washers on the upper cross member.

✔ Completely assembled surge arrester plate:




| | | | |
|---|---|---|---|
| ① | Surge arrester plate | ⑥ | Locknut pre-assembled on the surge arrester plate at the factory |
| ② | Upper washer (pre-assembled by the manufacturer) | ⑦ | Bolt-and-washer assembly (pre-assembled by the manufacturer) |
| ③ | Bolt-and-washer assembly M8 x 16 with locknut | ⑧ | Spring washer (pre-assembled by the manufacturer) |
| ④ | Bolt-and-washer assembly M8 x 20 with fixed locknut | ⑨ | Lower washer (pre-assembled by the manufacturer) |
| ⑤ | Plain washer | | |

| | **NOTE!** |
|---|---|
| | When connecting cable plugs type Raychem RICS5xxx with surge arresters type RDA 24, earth the cable as shown below.<br><br>⇨ The cable shield of the cables L1, L2, L3 is earthed via cable lugs/earthing bolts size M10 at the upper cross member. |



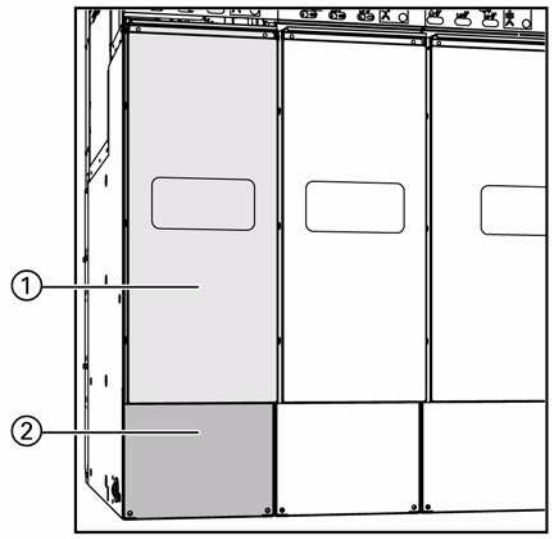

① Cable (phase L1)
② Cable (phase L2)
③ Cable (phase L3)
④ Upper cross member

⇨ For details, please refer to the order documents.

⇨ For connection of unscreened cable plugs / surge arresters, keep the necessary minimum distances according to the manufacturer's instructions.

⇨ If the minimum distances cannot be kept, please contact your regional Siemens representative.

**Cable installation in switchgear with pressure absorber up to 16 kA**




① Cable compartment cover
② Cross member

Fig. 62: Switchgear with pressure absorber up to 16 kA

⇨ Remove the two thread-ridging screws M6 of the cable compartment cover ①. Lift the cable compartment cover and remove it to the front..

⇨ Remove the cross member ②. To do this, undo the 4 bolt-and-washer assemblies M8.

⇨ Take the front floor cover out.

⇨ Lead the high-voltage cables into the cable compartment.

⇨ Push rubber sleeves over the high-voltage cables.

⇨ Push the high-voltage cables with the rubber sleeves into the cutouts provided for this purpose in the floor cover.

⇨ Refit the floor cover, observing that the floor cover is correctly seated in the slots of the rubber sleeves.

⇨ Bolt the front floor cover to the foundation together with the switchgear frame using one bolt.

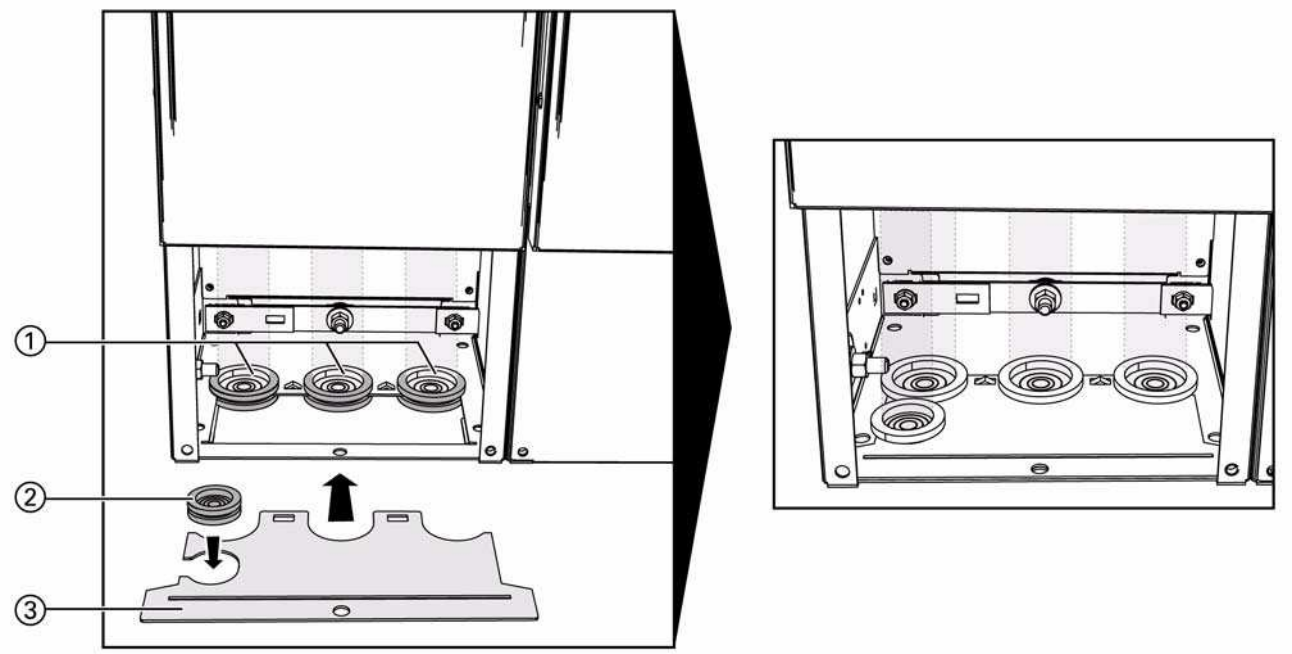



Fig. 63: Inserting the front floor cover and the rubber sleeves (switchgear up to 16 kA)

① Rubber sleeves for cable entry (diameter 70 mm)

② If required, use rubber sleeves for control cables (diameter 56 mm) / screened cable plugs

③ Front floor cover

⇨ Mount the cross member and the cable compartment cover.

**Cable installation in switchgear with pressure absorber up to 21 kA**

① Cable compartment cover

② Cross member

③ Front plate of the pressure absorber

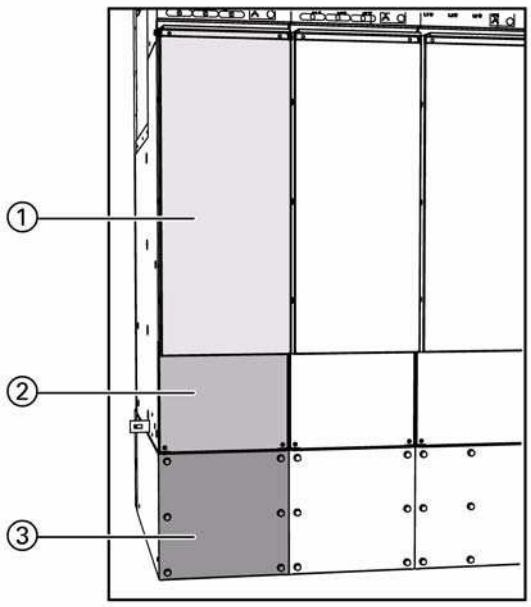



Fig. 64: Switchgear with pressure absorber up to 21 kA

⇨ Remove the two thread-ridging screws M6 of the cable compartment cover ①.
Lift the cable compartment cover and remove it to the front..

⇨ Remove the cross member ②.
To do this, undo the 4 bolt-and-washer assemblies M8.

⇨ Remove the front plate ③ of the pressure absorber.
To do this, undo the 6 bolt-and-washer assemblies M8.

⇨ Take the front floor cover out.

⇨ Lead the high-voltage cables into the cable compartment.

⇨ Push rubber sleeves over the high-voltage cables.

⇨ Push the high-voltage cables with the rubber sleeves into the cutout provided for this purpose in the front floor cover.

⇨ Refit the front floor cover observing that the floor cover fits correctly into the slot of the rubber sleeve.

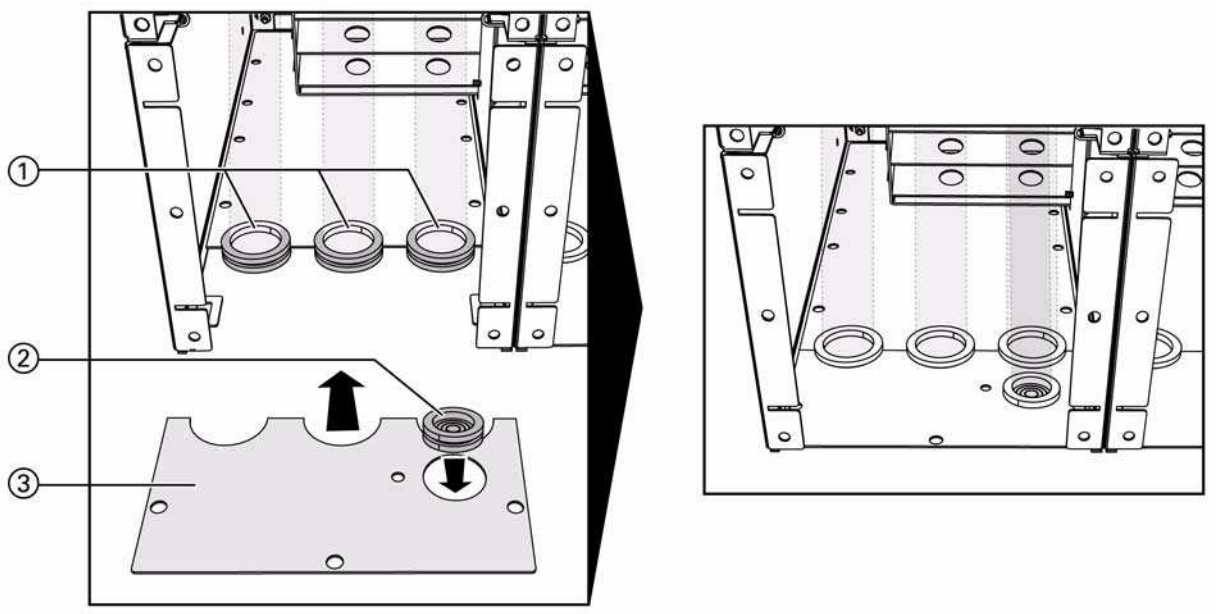



Fig. 65: Inserting the front floor cover and the rubber sleeves (switchgear up to 21 kA)

① Rubber sleeves for cable entry (diameter 70 mm)

② If required, use rubber sleeves for control cables (diameter 56 mm) / screened cable plugs

③ Front floor cover

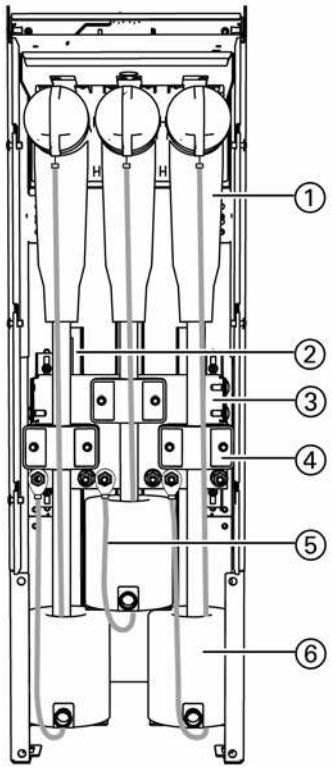
⇨ Bolt the front floor cover to the foundation together with the switchgear frame using three bolts.

⇨ Mount the cross member, the front plate of the pressure absorber and the cable compartment cover.

### 13.2 Cable connection with cable-type current transformers

**Mounting position of cable-type current transformers**

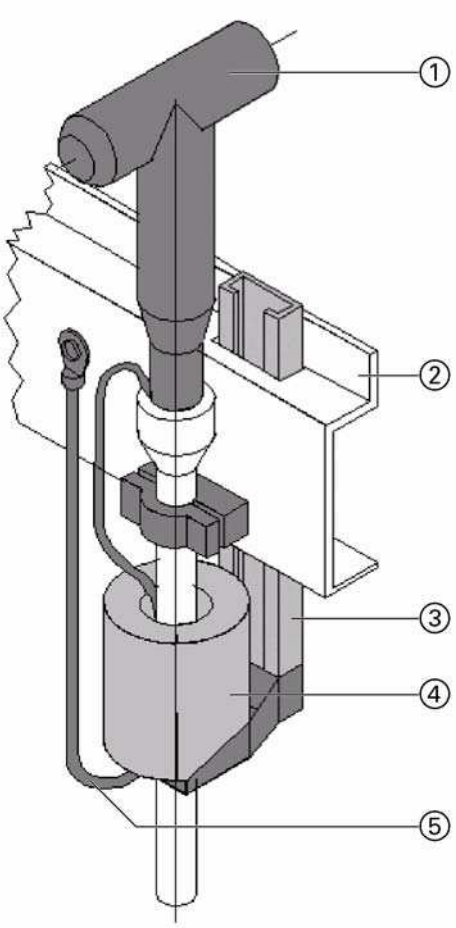
The transformer mounting plates are pre-assembled on the cable bracket at the factory. The cable-type current transformers are supplied in the cable compartment and must be mounted on the high-voltage cables at site.




① Cable plug
② Adjustment rail
③ Cable bracket
④ Cable clamp
⑤ Cable shield
⑥ Cable-type current transformer

Fig. 66: Cable connection with cable-type current transformers type 4MC7032

**Principle of installation for cable-type current transformers**




① Cable plug
② Cable bracket
③ Transformer mounting plate
④ Cable-type current transformer
⑤ Cable shield

Fig. 67: Cable connection with cable-type current transformers type 4MC7033

**Installation of cable-type current transformers**

⇨ Remove the cable compartment cover.

⇨ If necessary, remove the lower cross member of the switchgear frame.

⇨ Take the supplied cable-type current transformers out of the cable compartment.

⇨ Push the cable-type current transformers on the high-voltage cables.

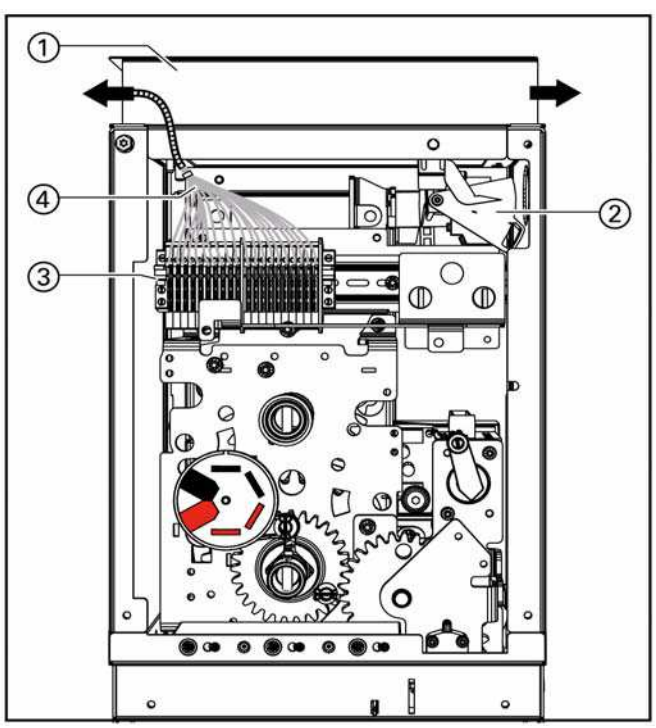
⇨ Mount the cable plugs according to the manufacturer's instructions.

⇨ Position the pre-assembled transformer mounting plates at the cable bracket in such a way that all three cable-type current transformers can be mounted.

⇨ Lead the cable shield back through the transformer, and fasten it at the earthing point.

⇨ Swing the high-voltage cables in together with the cable-type current transformers, and connect the cable plugs to the cable feeder (see Page 83, "Connecting high-voltage cables").

### 13.3 Connecting secondary equipment




① Wiring duct
② Ready-for-service indicator
③ Terminal strip
④ Customer-side wiring

Fig. 68: 8DJH: Operating mechanism box of ring-main panel

The terminal strips of the secondary equipment supplied are assigned to the associated operating mechanisms/feeders. For external connection you will require the circuit diagrams supplied.

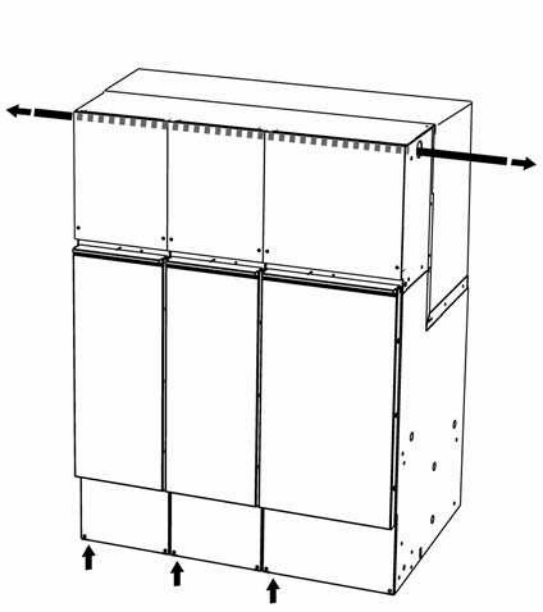


Fig. 69: Wire routing for switchgear without wiring duct

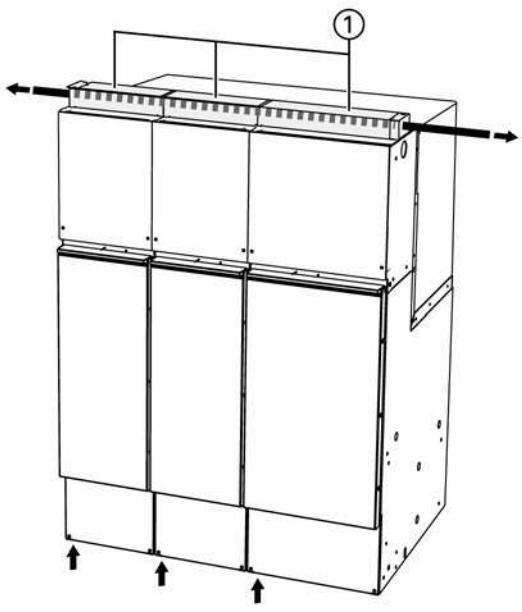



Fig. 70: Wire routing for switchgear with wiring duct ①

Recommended wire routing for secondary equipment: from the side, from the rear and from above. For access from below, use screened cable plugs.
Wire routing for panel blocks possible through wiring duct. For extendable switchgear, wire routing through the wiring duct is recommended.

**ATTENTION!**

The transmission linkage of the ready-for-service indicator ② must move freely.

⇨ Lay the cables following the dotted line ④.

⇨ Remove the fixing bolts of the front plate.

⇨ Remove the front plate of the switchgear to the front.

⇨ If the low-voltage niche is used by the customer: Remove four Torx bolts size M6 of the niche cover and remove the niche cover upwards.

⇨ Following the circuit diagrams, connect the wires ④ to the terminal strip ③ or directly to equipment terminals (e.g. CAPDIS S2+, short-circuit indicator), and lay them cleanly. Cables are routed to the outside laterally (arrow) through a cut-out stopper. Use the wiring duct ① as far as possible.

⇨ Do not switch on auxiliary voltage yet.

### 13.4 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.

# 14 Commissioning

**ATTENTION!**

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.

## 14.1 Final tests after installation

**Rating plate**

⇨ Check the data on the rating plate and the auxiliary voltage of the control and end devices according to the requirements.

**Readiness for service**

⇨ Check ready-for-service indicator
(see Page 67, "Checking the ready-for-service indicator ").

**Switchgear fastening/ Switchgear earthing**

⇨ Check switchgear fastening.

⇨ Check connection to substation earth.

**High-voltage connections**

⇨ Check earthing of cable terminations on all connected high-voltage cables.

⇨ If provided by the customer, perform cable test (see Page 124, "Cable testing")

**Feeder without cables**

⇨ Switch the switching device to EARTHED position and lock it, or cover the bushings with surge-proof caps.

**Bolted joints**

⇨ Check the tightening torques of the bolted joints of the low-voltage equipment at random.

⇨ Check all parts of the switchgear that have been disassembled and assembled again at site during installation, or that have been installed subsequently, to verify correct assembly and completeness.

**Auxiliary cable connections**

⇨ Check correct wiring according to the circuit diagrams.

⇨ Check clamping and plug-in connections at random (perfect contact, labels, etc.).

**Final work**

⇨ Remove any hanging instruction labels, documents, that are not required anymore for operation.

⇨ Remove any tools, materials etc. that are not required anymore from the area of switchgear.

⇨ Remove any dirt from the area of the switchgear (cleaning agent ARAL 4005 or HAKU 1025/90 and lint-free cloth / brush).

⇨ Fit all covers.

⇨ Put the covers on the capacitive test sockets.

⇨ Touch up scratches and impacts in the surface painting.
Available kit: Touch-up set (spatula and paint) and paint pen.

**Checking the accessories**

⇨ Ensure that the following accessories are ready to hand:

- Operating instructions
- Operating lever to operate the switchgear
- Circuit diagrams
- Warning signs

## 14.2 Mechanical and electrical function test

|  | **DANGER!** |
|---|---|
| | Putting defective switchgear into operation can endanger the life of people and damage the switchgear.<br><br>⇨ Never put switchgear into operation if you notice during test operation that a part of it does not work as described in here.<br><br>⇨ Perform test operations with auxiliary voltage only! |

**Mechanical function test**

The mechanical function is tested without high-voltage.

⇨ Switch the operating mechanism several times by hand. Check position indicators and interlocks, and verify smooth operation of covers.

⇨ Test fuse tripping with test fuse.

⇨ Install and check HV HRC fuse-links.

⇨ Check the ready-for-service indicator. Then, the pointer must be in the green area.

**Test operation/ Electrical function test**

Test operation helps you to verify the perfect operation of the switchgear without high voltage before commissioning.

⇨ Switch the three-position switch-disconnector with motor operation several times to CLOSED and OPEN position.

⇨ Make sure that the three-position switch is switched to OPEN position after completion of test operation.

⇨ Switch on all auxiliary and control voltages and verify correct polarity.

⇨ Check whether the mechanical and/or electrical interlocking conditions are fulfilled without using excessive force.

⇨ Check whether the switch positions of the three-position switches are displayed correctly.

**Malfunction during test operation**

If there are any faults that cannot be cleared at site:

⇨ Do not put the switchgear into operation.

⇨ Inform the competent Siemens representative.

### 14.3 Preparing the power-frequency voltage test

On request, a power-frequency voltage test can be performed at site on the ready-assembled switchgear. In this case, prepare the test as follows:

⇨ The voltage transformers as well as the surge arresters and surge limiters must be removed.

⇨ Short-circuit the current transformers at the secondary terminals.

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

⇨ Earth the capacitive test sockets.

✔ Now you can carry out the test.

### 14.4 Instructing the operating personnel

⇨ Instruct operating personnel in theory and practice of switchgear operation.

### 14.5 Applying operating voltage

**Preparations before switching on**

The operating personnel must have been instructed, the installation work checked, and test operation must have been performed without faults.

⇨ Close all covers.

⇨ Make sure that the capacitive test sockets are covered.

⇨ Switch switching devices in feeders without connected cables to EARTHED position and lock them, or cover the bushings with surge-proof caps.

⇨ Reset short-circuit indicators.

✔ Now you can apply operational high voltage and put the switchgear into operation as described hereafter.

**Switching on the first outgoing/incoming feeder**

⇨ First, apply voltage from opposite substation, then switch feeder from OPEN to CLOSED position.

|  | **DANGER!** |
|---|---|
| | Short-circuit in case of different phase sequence of the incoming feeders.<br><br>⇨ Make sure that all incoming feeders have the same phase sequence.<br><br>⇨ To check the phase sequence, use only phase comparison test units which are adequate for HR or LRM test sockets. |

⇨ Verify correct phase sequence of the next incoming feeder and switch on.

⇨ Switch on the tested incoming feeder.

The three-position switch-disconnector of the feeder to be tested must be in "OPEN" position. The opposite substation must be de-earthed and live.

Verify correct terminal-phase connections using a phase comparison test unit at the capacitive test sockets of the panel to be tested and a panel that has already been connected.

⇨ Plug the measuring cables of the phase comparison test unit into the "L1" test sockets of the two panels.

⇨ Read the indication.

⇨ Proceed in the same way with the test sockets of the two other phases ("L2" and "L3").

✔ If the test unit shows "coincidence" in any case, the phase sequence of the tested feeder is correct.

**Switching on consumer feeders**

When all incoming feeders are switched on:

⇨ One after the other, switch on all outgoing feeders that are connected to consumers only.

✔ Now, all feeders are switched on; the switchgear is totally in operation.

# Operation

| | |
|---|---|
|  | **DANGER!**<br>The internal arc classification of the switchgear according to IEC 62271-200 has only been proved by tests for the switchgear sides with internal arc classification and with closed high-voltage compartments.<br>⇨ Determine the IAC classification of the switchgear by means of the data on the rating plate (see Page 59, "Rating plates").<br>⇨ Regulations for access to switchgear areas without internal arc classification according to IEC 62271-200 must be defined by the entrepreneur or the switchgear owner. |

# 15 Indicators and control elements

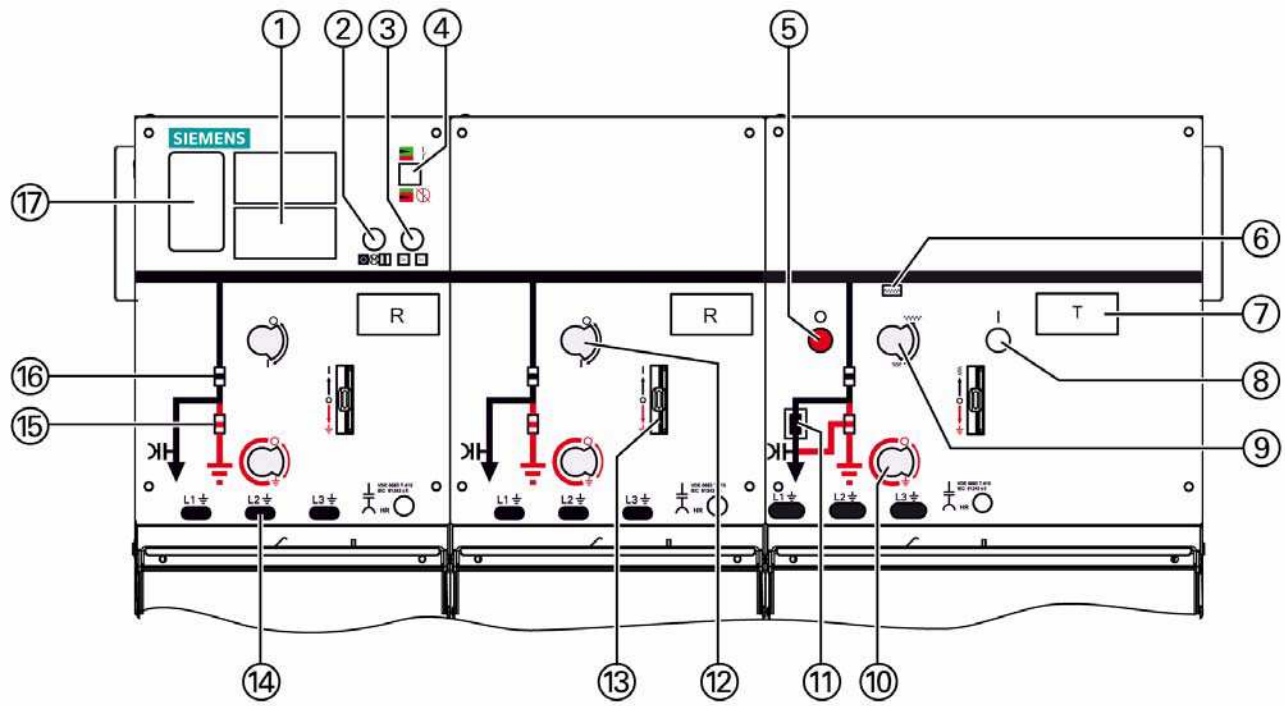



Fig. 71: 8DJH: RRT block

① Short-circuit/earth-fault indicator

② ON/OFF-pushbutton for motor operating mechanism (option)

③ Local/remote switch for motor operating mechanism (option)

④ Ready-for-service indicator

⑤ OFF pushbutton (transformer feeder only)

⑥ Spring "charged/not charged" indicator

⑦ Feeder designation labels

⑧ ON pushbutton (transformer feeder only)

⑨ Actuating opening for SPRING CHARGING

⑩ Manual operation for the mechanism of the earthing function CLOSED/OPEN

⑪ "Fuse tripped" indicator

⑫ Manual operation for the mechanism of ' the load-break function CLOSED/OPEN

⑬ Control gate/locking device (option for three-position switch-disconnector)

⑭ Socket of capacitive voltage detecting system (HR system)

⑮ Position indicator for earthing switch

⑯ Position indicator for disconnector

⑰ Rating plate

# 16 Operating the three-position switch-disconnector

**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.

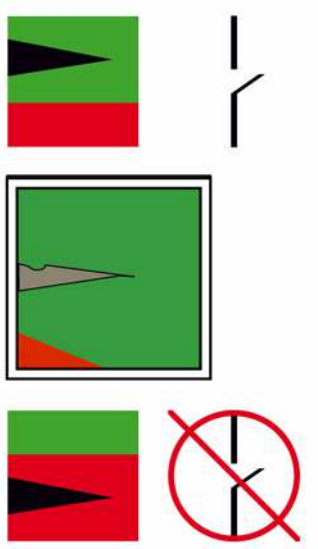
⇨ Do not remove covers.

⇨ Do not reach into openings.

**DANGER!**

If the gas filling is insufficient, this can cause personal injuries and material damages.

⇨ Check readiness for service before performing any switching operation; to do this, verify that the pointer of the ready-for-service indicator is in the green area.



⇨ If the pointer is in the red area:

- Do not operate the switchgear,
- Isolate the switchgear and put it out of service.

**ATTENTION!**

Earthing a live incoming cable will trip the upstream circuit-breaker.

⇨ Verify safe isolation from supply of the feeder before earthing.

## 16.1 Operations

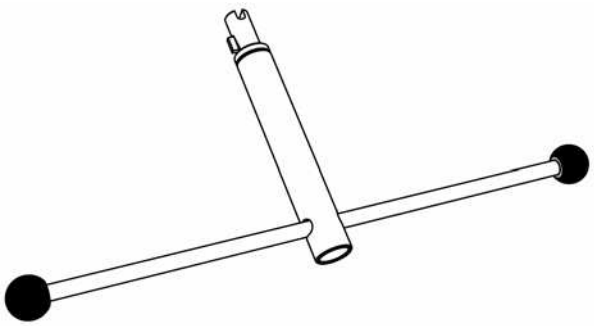
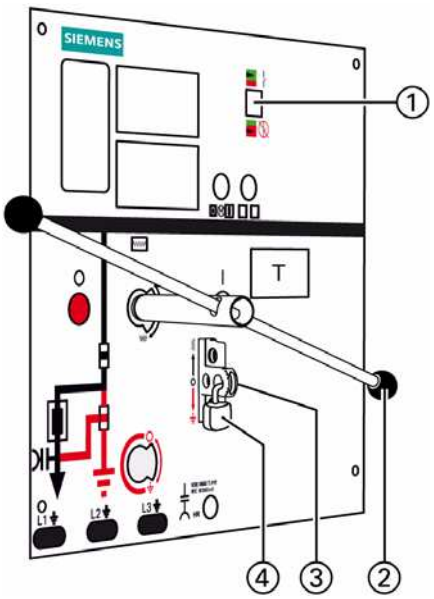


Fig. 72: Standard: Single-lever operation wth black handle and coding as universal lever. Alternative 1: One operating lever with red handle for earthing and de-earthing, and one operating lever with black handle for load breaking. Alternative 2: Single-lever operation with anti-reflex lever, with and without coding.




① Ready-for-service indicator
② Operating lever
③ Control gate/locking device (option for spring-operated mechanism)
④ Padlock (option)

Fig. 73: Control board of three-position switch

⇨ Check ready-for-service indicator ①.

⇨ Remove padlock ④ (optional).

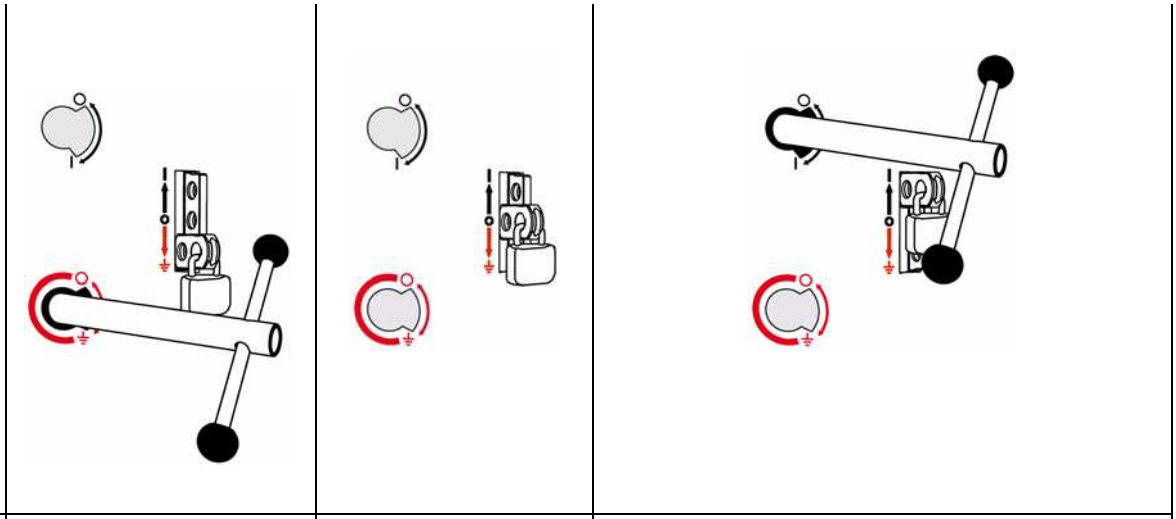
⇨ Operate control gate ③ (optional depending on situation) to release the switching gate and hold it tight.

⇨ Insert operating lever ② and move straight to the desired switch position.

⇨ Remove operating lever. The control gate moves to the center position automatically.

⇨ Refit padlock at desired position.

✔ The locking device (optional depending on situation) of the switching gate can be padlocked in all three switch positions.

| | | | | |
|---|---|---|---|---|
| |  | | | |
| **Padlock** | Down | Center | Up | |
| **Actuating opening** | Earthing switch | - | Disconnector/switch-disconnector | Circuit-breaker/transformer switch |
| **Possible switching operations** | Only EARTHING and DE-EARTHING possible | No switching operations possible | - Only CLOSING and OPENING possible<br>- Only possible if the circuit-breaker is open | - Charging the spring |

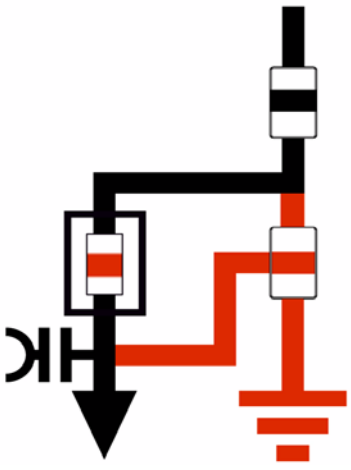
## 16.2 Protection tripping for the three-position switch-disconnector with spring-operated/ stored-energy mechanism

**NOTE!**

If the opening spring of the transformer switch was tripped by a fuse-link:

⇨ The fuse indicator shows red.

⇨ The motor operating mechanism (option) is out of operation.



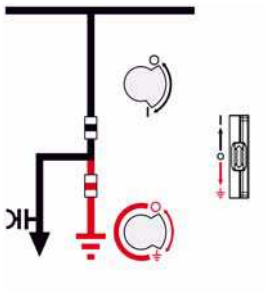
**Re-establishing readiness for service**

⇨ Earth the switching device.

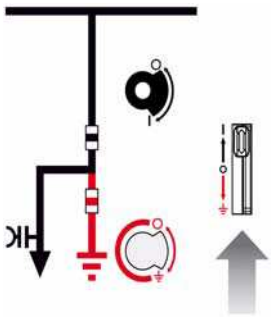
⇨ If necessary, replace all fuse-links, otherwise it will not be possible to charge the closing and opening springs, as the tripping command is still active through the striker.

## 16.3 Ring-main and circuit-breaker panels: Operating the three-position switch

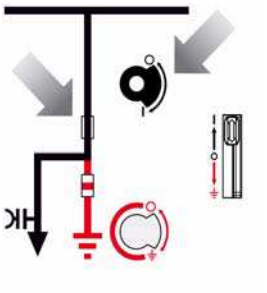
**Connecting the feeder to the busbar:**



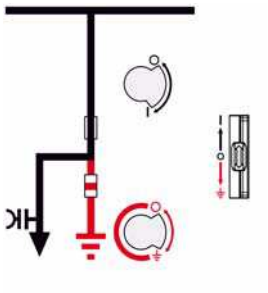
Initial situation (three-position switch OPEN, earthing switch OPEN)



Push control gate upwards

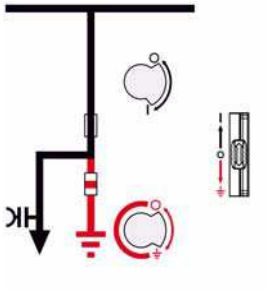


Switch three-position switch to CLOSED position (insert operating lever and turn approx. 70° clockwise)

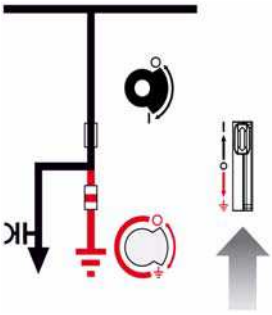


Remove operating lever (control gate returns to its initial position)

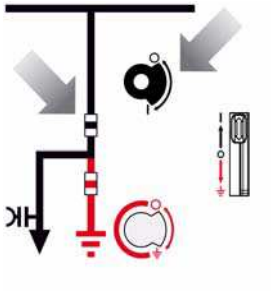
**Disconnecting the feeder from the busbar:**



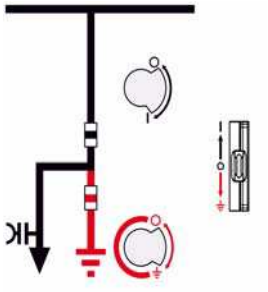
Initial situation (three-position switch CLOSED, earthing switch OPEN)



Push control gate upwards

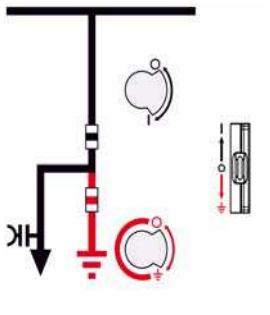


Switch three-position switch to OPEN position (insert operating lever and turn approx. 70° counter-clockwise)

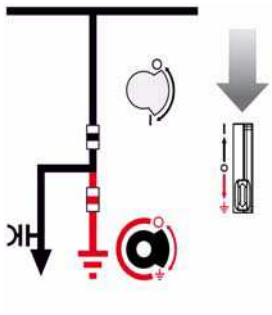


Remove operating lever (control gate returns to its initial position)

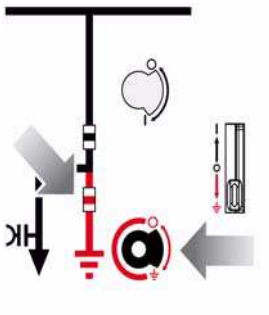
**Feeder earthing:**



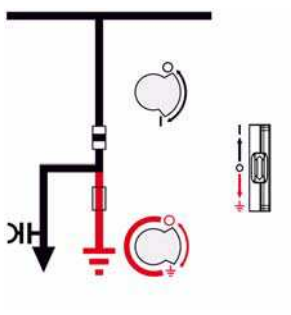
Initial situation (three-position switch OPEN, earthing switch OPEN)



Push control gate downwards

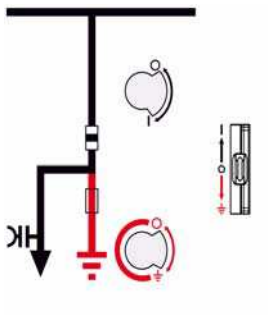


Switch earthing switch to CLOSED position (insert operating lever and turn approx. 55° clockwise)

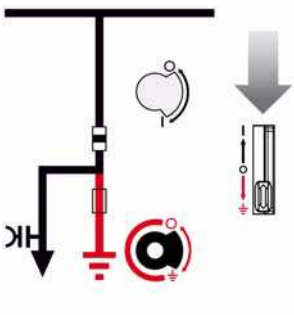


Remove operating lever (control gate returns to its initial position)

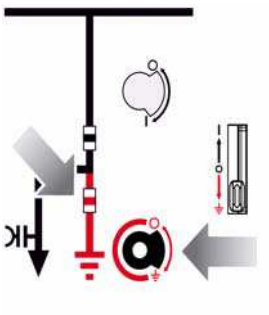
**Feeder de-earthing:**



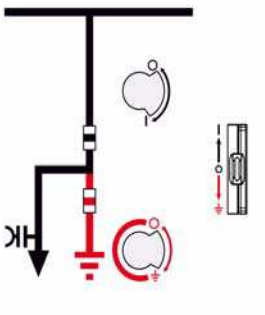
Initial situation (three-position switch OPEN, earthing switch CLOSED)



Push control gate downwards



Switch earthing switch to OPEN position (insert operating lever and turn approx. 55° counter-clockwise)

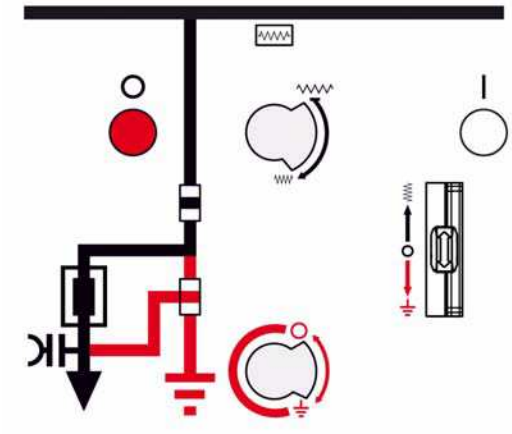


Remove operating lever (control gate returns to its initial position)

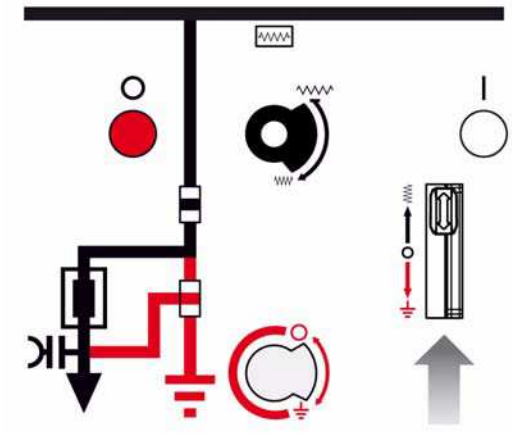
### 16.4 Operating the transformer feeder

**Connecting the transformer feeder to the busbar**

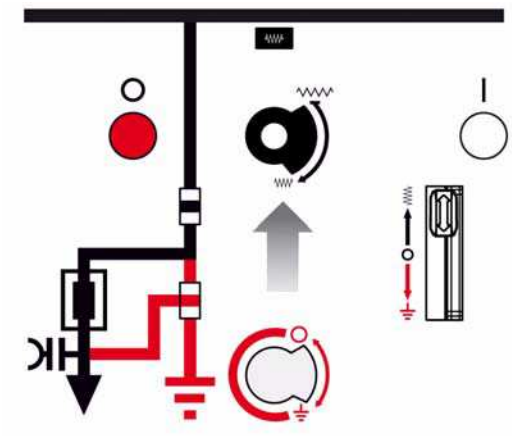
⇨ Initial situation OPEN.



⇨ Push control gate upwards.

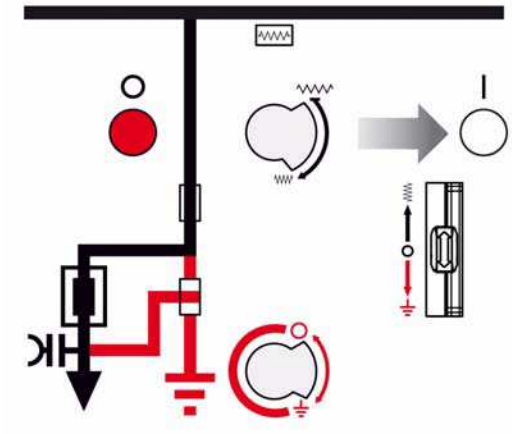


⇨ Insert operating lever and turn 70° clockwise.



⇨ Remove operating lever (control gate returns to its initial position).

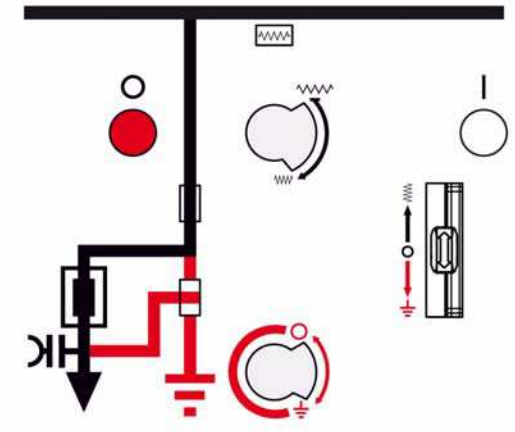
⇨ Actuate the "ON" pushbutton.



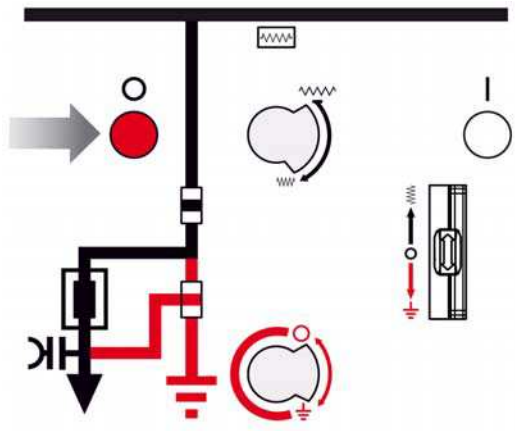
✔ The feeder is closed.

**Disconnecting the transformer feeder from the busbar**

⇨ Initial situation CLOSED.



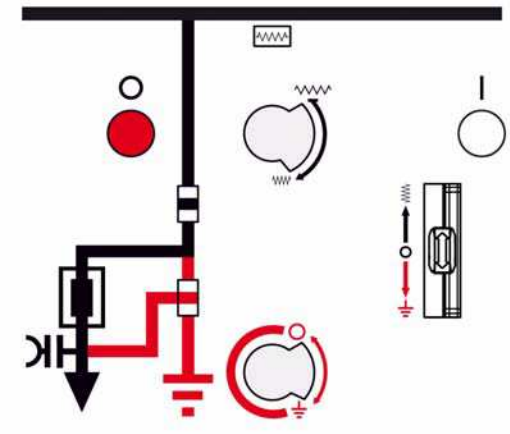
⇨ Actuate the "OFF" pushbutton.



✔ The feeder is open.

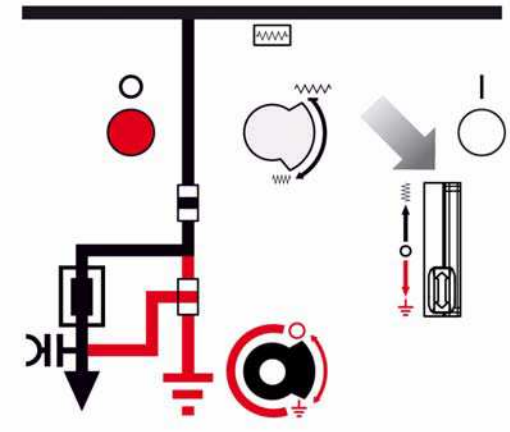
**Earthing the transformer feeder**

⇨ Initial situation OPEN.

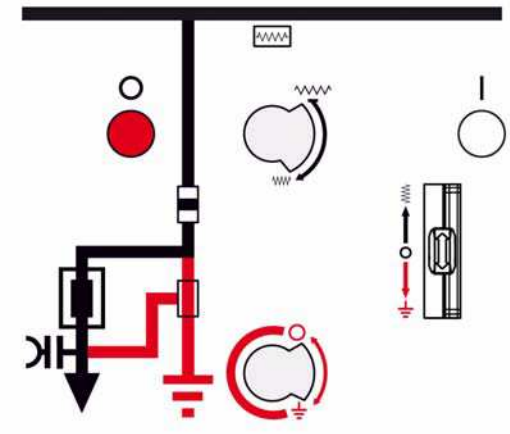


⇨ Push control gate downwards.

⇨ Insert operating lever and turn 55° clockwise.



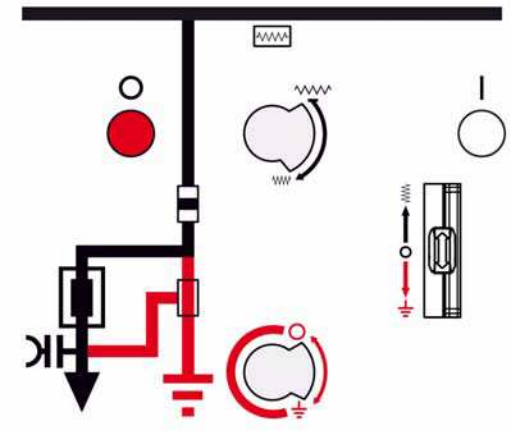
⇨ Remove operating lever (control gate returns to its initial position).



✔ The feeder is earthed.

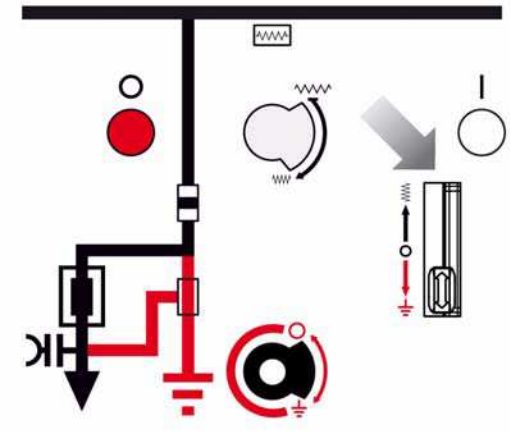
**De-earthing the transformer feeder**

⇨ Initial situation EARTHED.

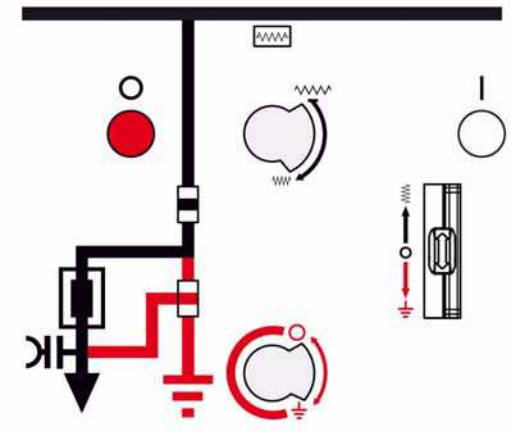


⇨ Push control gate downwards.

⇨ Insert operating lever and turn 55° counter-clockwise.



⇨ Remove operating lever (control gate returns to its initial position).



✔ The feeder is de-earthed.

# 17 Operating the vacuum circuit-breaker type 2

Possible switching operations:

- Manual local operation, i.e. at the panel itself
- Electrical remote operation, e.g. from the control center
- Automatic operation from the installed protection equipment, e.g. SIPROTEC

If the circuit-breaker is equipped with a motor operating mechanism, the closing and opening springs are charged automatically after applying auxiliary voltage.
The circuit-breaker can be closed via a closing pulse supplied by the closing coil.

If the circuit-breaker is operated manually, the closing and opening springs must be charged manually (see Page 114, "Charging the spring energy store manually").

The circuit-breaker can be closed and opened with the pushbuttons.

The opening spring is charged together with the closing spring.

The control elements of the circuit-breaker are located at the panel front in the upper control board.

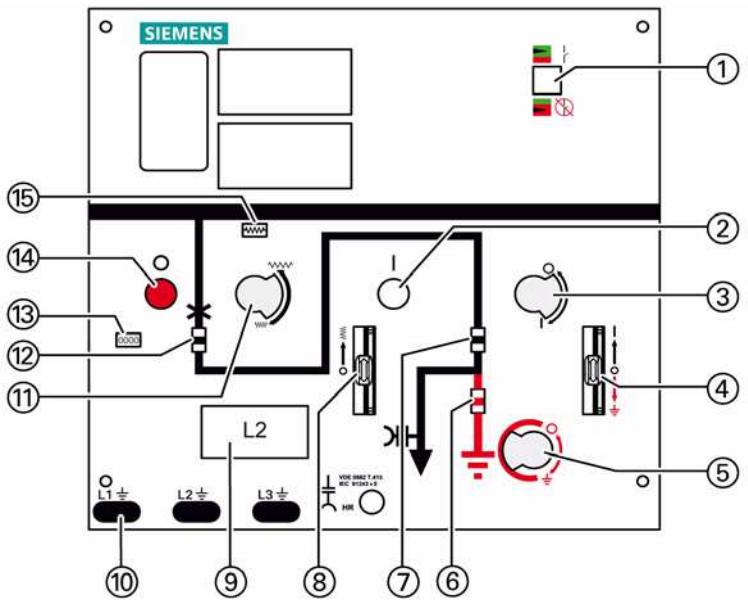



Fig. 74: Control board of circuit-breaker panel type 2

① Ready-for-service indicator
② ON pushbutton for circuit-breaker
③ Actuating opening for DISCONNECTING, three-position disconnector
④ Control gate/locking device for three-position disconnector
⑤ Actuating opening for EARTHING
⑥ Position indicator for earthing switch
⑦ Position indicator for disconnector
⑧ Control gate/locking device for circuit-breaker
⑨ Feeder designation label
⑩ Socket of capacitive voltage detecting system (HR system)
⑪ Actuating opening for "spring charging" at the circuit-breaker
⑫ Position indicator for circuit-breaker
⑬ Operations counter (option)
⑭ OFF pushbutton for circuit-breaker
⑮ Indicator for the circuit-breaker closing and opening springs (not charged / charged)

| | **ATTENTION!** |
|---|---|
|  | Please do absolutely observe the following:<br><br>⇨ The max. service life of the circuit-breaker panel depends on the permissible number of switching operations of the switching device used (see Page 44, "Vacuum circuit-breaker " and see Page 43, "Three-position disconnector "). |

### 17.1 Closing the circuit-breaker type 2 "locally"

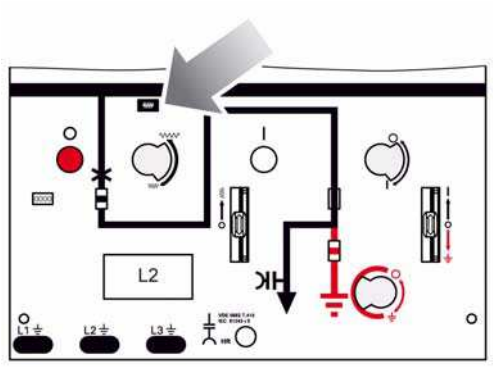
How to close the circuit-breaker depends on the equipment of the switchgear panel.

There are two versions of circuit-breaker operating mechanisms:

- Stored-energy spring mechanism
- Stored-energy spring mechanism with motor (option)

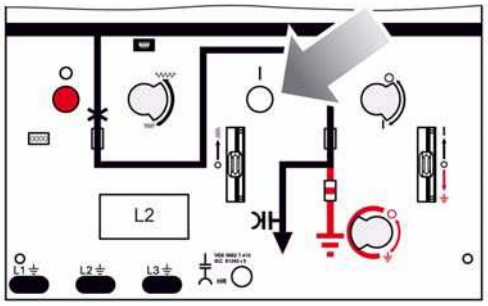
**Closing with stored-energy mechanism**

⇨ Make sure that the closing and opening springs of the stored-energy mechanism are charged.




⇨ Actuate the "ON" pushbutton.

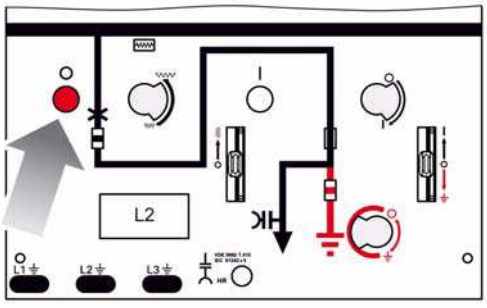
⇨ The position indicator of the circuit-breaker in the mimic diagram is in CLOSED position.




✔ The circuit-breaker is closed.

### 17.2 Opening the circuit-breaker type 2 "locally"

⇨ Actuate the "OFF" pushbutton.

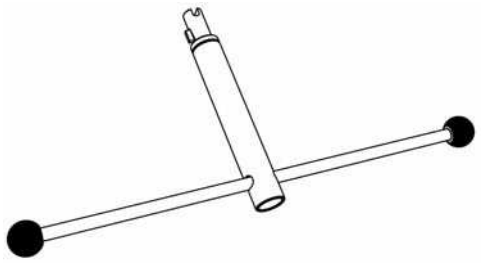



✔ The position indicator of the circuit-breaker in the mimic diagram is in OPEN position.

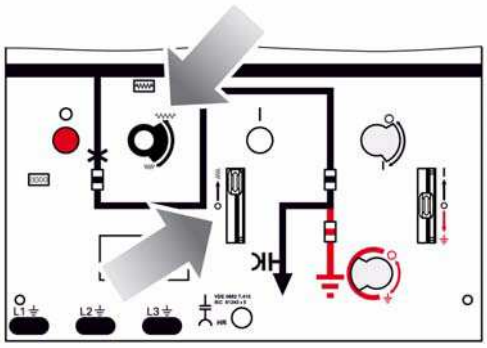
### 17.3 Charging the spring energy store manually

During manual operation or if the auxiliary voltage fails (motor operating mechanism), the spring energy store must be charged manually. The closing and opening springs are charged automatically after applying control voltage.

Auxiliary means required: Operating lever.



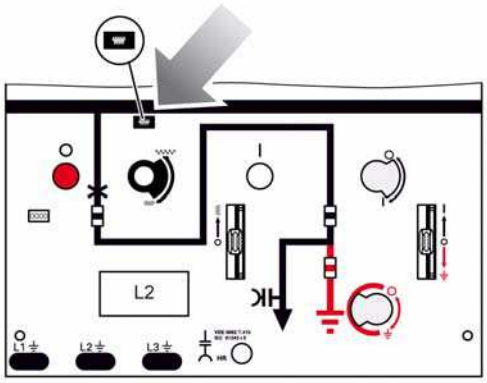
The opening for the operating lever is located top-left at the control board.



⇨ Open the locking device.

⇨ Insert the operating lever.

⇨ Turn the operating lever approx. 70° clockwise until the "spring charged" indication appears in the inspection window.




⇨ Remove the operating lever.

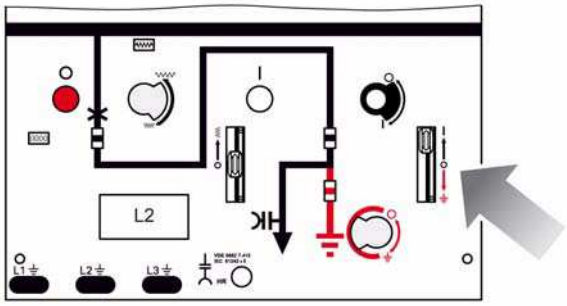
⇨ The control gate moves to the center position automatically.
The actuating opening is closed.

✔ The closing and opening springs of the circuit-breaker are charged.
The circuit-breaker can be closed and opened again.

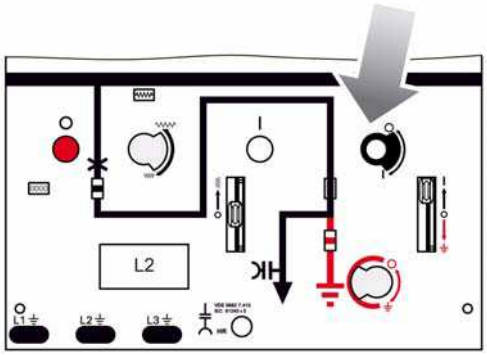
### 17.4 Closing the three-position disconnector in the circuit-breaker panel type 2

| | |
|---|---|
|  | **ATTENTION!**<br>Please do absolutely observe the following:<br><br>⇨ The max. service life of the circuit-breaker panel depends on the permissible number of switching operations of the switching device used (see Page 44, "Vacuum circuit-breaker " and see Page 43, "Three-position disconnector "). |

⇨ Push the control gate of the disconnector upwards. The actuating opening for the disconnector is free. Only possible with the circuit-breaker in OPEN position.

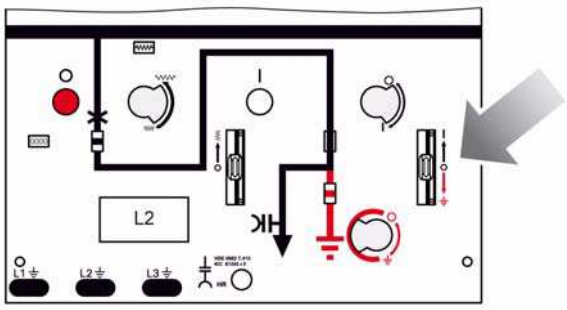



⇨ Insert the operating lever and turn 70° clockwise. The position indicator of the disconnector in the mimic diagram is in CLOSED position.




⇨ Remove the operating lever.

⇨ The control gate of the disconnector moves to the center position automatically. The actuating opening is closed.

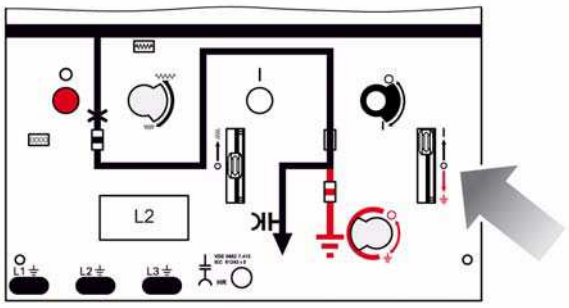



✔ The disconnector is closed.

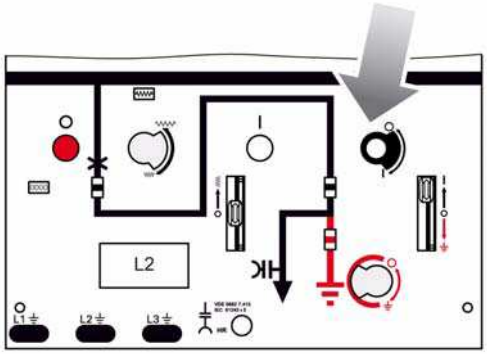
### 17.5 Opening the three-position disconnector in the circuit-breaker panel type 2

| | |
|---|---|
|  | **ATTENTION!**<br>Please do absolutely observe the following:<br><br>⇨ The max. service life of the circuit-breaker panel depends on the permissible number of switching operations of the switching device used (see Page 44, "Vacuum circuit-breaker " and see Page 43, "Three-position disconnector "). |

⇨ Push the control gate of the disconnector upwards.
The actuating opening for the disconnector is free.

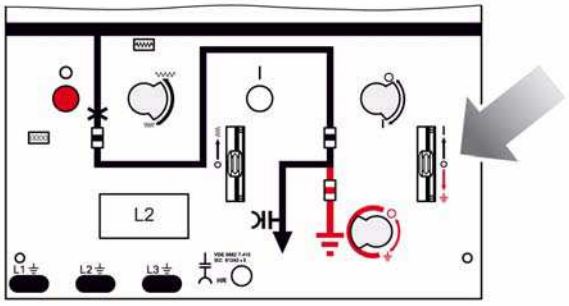



⇨ Insert the operating lever and turn 70° counter-clockwise. The position indicator of the disconnector in the mimic diagram is in OPEN position.




⇨ Remove the operating lever.

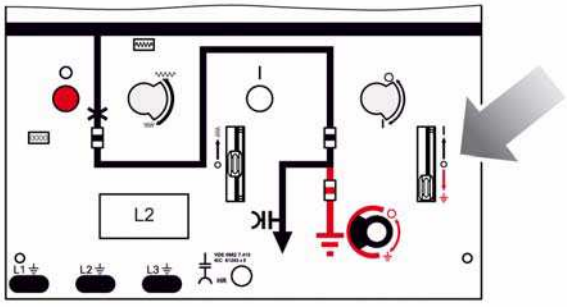
⇨ The control gate of the disconnector moves to the center position automatically.
The actuating opening is closed.



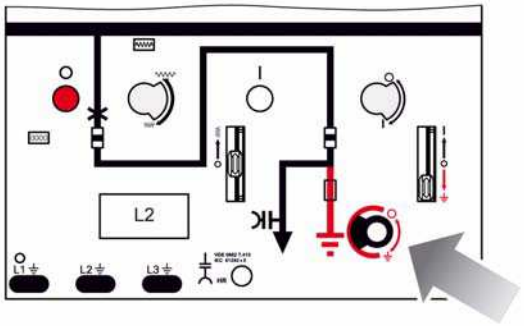

✔ The disconnector is open.

### 17.6 Three-position disconnector in the circuit-breaker panel type 2: EARTHED position

⇨ Push the control gate of the disconnector downwards.
The actuating opening is free.

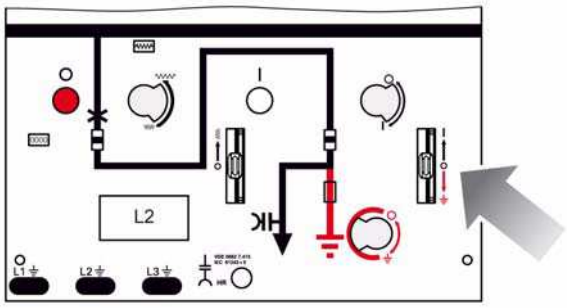



⇨ Insert the operating lever and turn 55° clockwise.




⇨ Remove the operating lever.

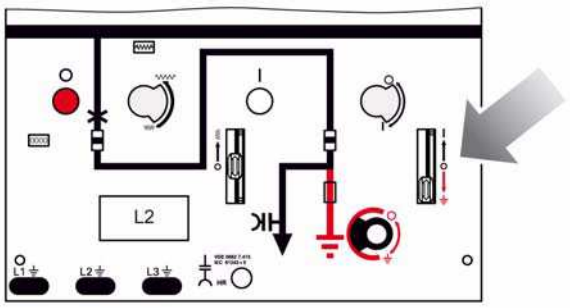
⇨ The control gate moves to the center position automatically.
The actuating opening is closed.



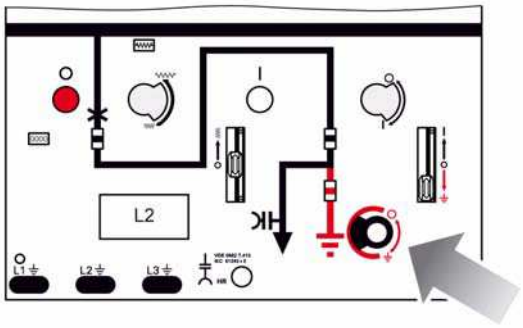

✔ The circuit-breaker panel is earthed.

### 17.7 Three-position disconnector in the circuit-breaker panel type 2: Deactivating the EARTHED position

⇨ Push the control gate of the disconnector downwards.
The actuating opening for the earthing switch is free.

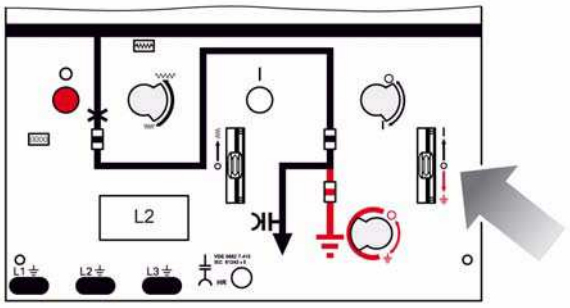



⇨ Insert the operating lever and turn 55 ° counter-clockwise.




⇨ Remove the operating lever.

⇨ The control gate moves to the center position automatically.
The actuating opening is closed.



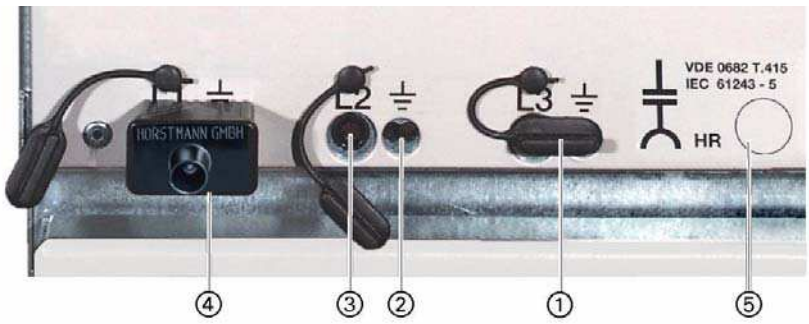

⇨ The circuit-breaker panel is de-earthed.

# 18 Verification of safe isolation from supply

| | |
|---|---|
|  | **DANGER!**<br>Mortal danger if safe isolation from supply is verified incorrectly!<br>⇨ Verify the perfect function of the voltage indicator and the coupling section in accordance with national standards<br>- on live equipment<br>- with a test unit according to IEC 61243-5/EN 61243-5<br>- on all poles<br>⇨ Use only voltage indicators or devices to test the function of the coupling section according to EN 61 243-5 / IEC 61 243-5 / VDE 0682-415. (There have been no changes as against the old standard VDE 0681 Part 7 regarding the interface conditions, so that the corresponding indicators can still be usedn.)<br>⇨ Perform repeat test of interface conditions at the capacitive interfaces, as well as on the indicators according to the customer's specifications or national standards.<br>⇨ Do not use short-circuiting jumpers as separate plugs. The function of the surge arrester installed is not guaranteed anymore if short-circuiting jumpers are used (see Page 31, "Voltage detecting systems"). |

Safe isolation from supply can be verified either with an HR or LRM voltage indicator or with a CAPDIS system.

**HR/LRM system**




① Cover of test sockets
② Earth socket
③ Capacitive test socket for L2
④ Voltage indicator type HR, make Horstmann
⑤ Documentation to repeat test of interface condition

⇨ Remove cover from capacitive interface.

⇨ Insert voltage indicators in the test sockets of the capacitive interface. If the indicator does not flash or light up in any case, the feeder is not live. The feeder can be earthed. If the indicator flashes or lights up, the feeder is live.

⇨ Refit covers of capacitive interface to protect it from pollution.

**Indications CAPDIS -S1+/-S2+**

⇨ Verify safe isolation from supply on the display of CAPDIS-S1+/-S2+ (see Page 31, "Voltage detecting systems").

# 19 Replacing HV HRC fuse-links

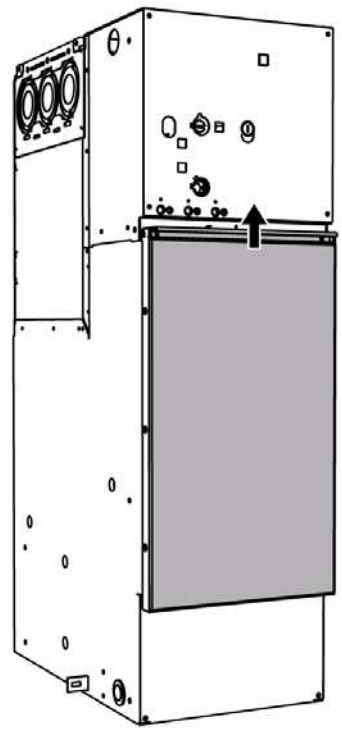
For data to usable HV HRC fuse-links, see Page 24, "HV HRC fuse assembly" and see Page 53, "Transformer protection table: Recommendation for the allocation of HV HRC fuse-links make SIBA and transformers".

**Removing the HV HRC fuse compartment cover**

The HV HRC fuse compartment cover can only be removed if the earthing switch is in "EARTHED" position.

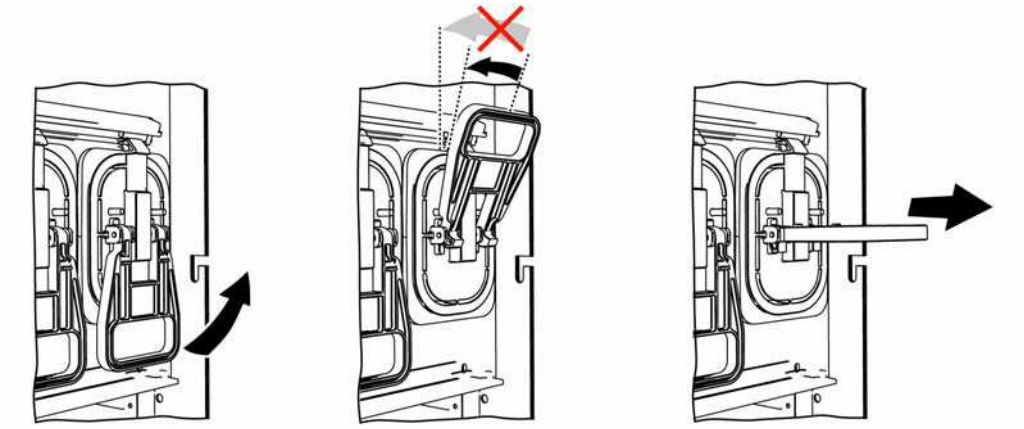
When the HV HRC fuse compartment cover is removed, the earthing switch is interlocked in "EARTHED" position.

⇨ Isolate and earth the transformer feeder.



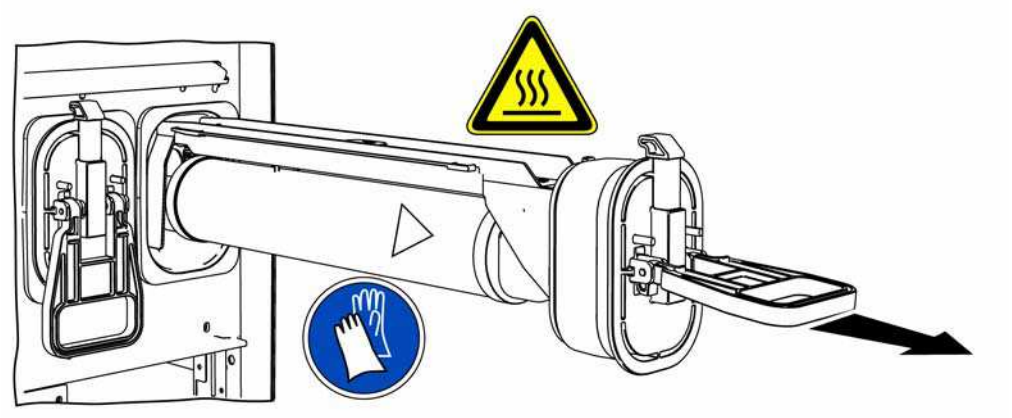
**Detaching the gasket of the fuse slide**

⇨ Push the handle of the fuse slide **slightly** upwards towards the stop in order to detach the gasket and be able to pull the fuse slide out more easily.



**Removing the HV HRC fuse slide**

| | |
|---|---|
|  | **ATTENTION!**<br>HV HRC fuse-links may be hot!<br><br>⇨ Let HV HRC fuse-links cool down or wear gloves to withdraw the fuse slide. |



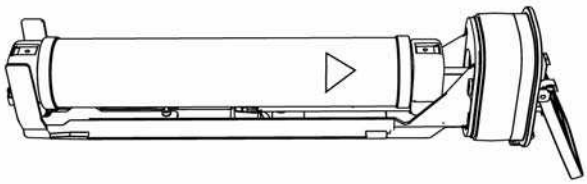
⇨ Withdraw the HV HRC fuse slide with the fuse-link.

**Replacing HV HRC fuse-links**

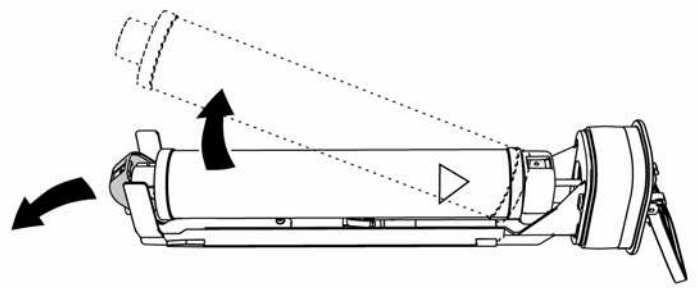
If one HV HRC fuse has tripped, always replace the fuses in all three phases.

| | |
|---|---|
|  | **ATTENTION!**<br>Incorrectly selected or mounted fuse-links and extension tubes can damage the fuse box or the switchgear.<br><br>⇨ 7.2 kV fuse-links with dimension 192 mm and 24 kV fuse-links with dimension 292 mm are **not** permissible. |

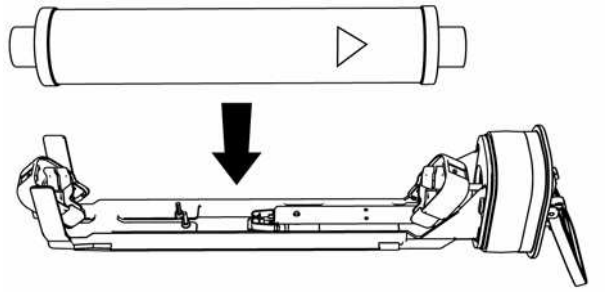
⇨ Lay the HV HRC fuse-link on a flat, clean and firm underground.



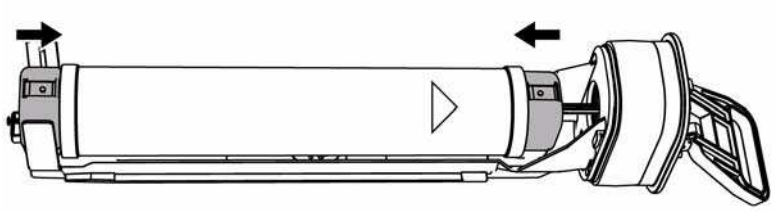
⇨ Push the cover of the HV HRC fuse-link (on the opposite side of the housing cover) aside, and pull the HV HRC fuse out of the fuse slide.



⇨ Fit new HV HRC fuse-link into the contact springs observing the striker position. The arrow on the HV HRC fuse points to the housing cover.



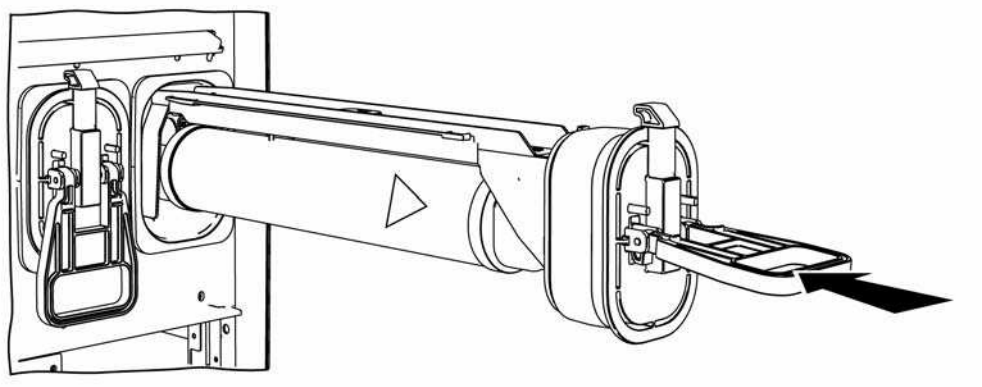
⇨ Verify correct seating of the covers and the fuse.



**Inserting the HV HRC fuse slides**

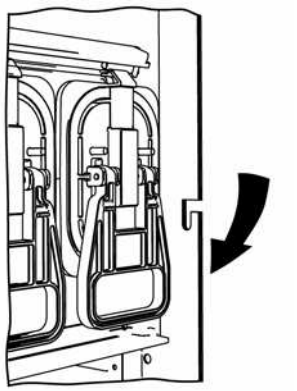
| | |
|---|---|
|  | **ATTENTION!** |
| | Incorrectly selected or mounted fuse-links and extension tubes can damage the fuse box or the switchgear.<br><br>⇨ 7.2 kV fuse-links with dimension 192 mm and 24 kV fuse-links with dimension 292 mm are **not** permissible. |

⇨ Inserting the HV HRC fuse slide into the guide slot of the HV HRC fuse box.



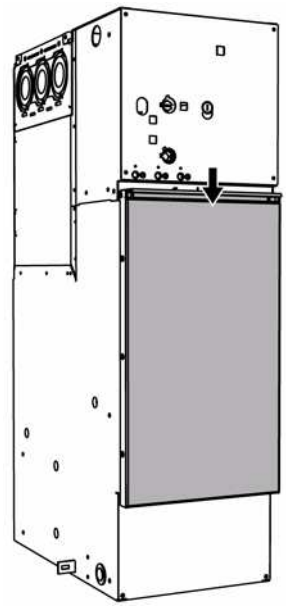
⇨ Insert the HV HRC fuse slide into the HV HRC fuse box as far as it will go. The collar of the HV HRC fuse slide cover must rest on the cast-resin frame of the HV HRC fuse box.

⇨ Push the handle of the fuse slide down as far as it will go, until the fuse slide latches tight.



**Closing the HV HRC fuse compartment cover**

⇨ Fit the HV HRC fuse compartment cover from above and let it slip down.



⇨ Due to the rail provided at the rear, the cover can only be closed if the HV HRC fuse slides have latched in correctly.

# 20 Cable testing

## 20.1 Cable testing via cable plugs

| | |
|---|---|
|  | **DANGER!**<br>Cable testing with connected cables represents a special stress for the isolating distance. If the busbar of the switchgear under test or the opposite substation are live with operating voltage, adequate measures must be taken in order to prevent overvoltages. Normally, the switch-disconnector is not interlocked during the cable test.<br>⇨ Fit switching prohibition signs.<br>⇨ Secure the locking device (option) with a lock. |

| | |
|---|---|
|  | **ATTENTION!**<br>In cable panels type K, the switching operation for the EARTHED position has no influence on the voltage state of the radial cable behind the screwed-on cable compartment cover.<br>⇨ Before removing the screwed-on cable compartment cover, isolate and earth the radial cable in the opposite substation. |

**Isolating and earthing the feeder under test**

⇨ Disconnect the feeder under test.

⇨ Make sure that the feeder in the opposite substation has also been isolated and secured against reclosing.

⇨ Verify safe isolation from supply.

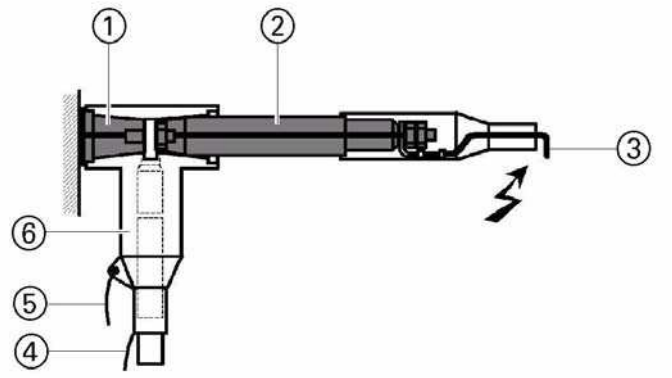
⇨ Earth the feeder.

**Preparations**

⇨ Remove the cable compartment cover.

⇨ Undo the screw-type cone at the T-plug or at the adapter.

⇨ Fit cable test equipment (e.g. measuring bolts) according to the operating instructions of the plug manufacturers.




① Bushing
② Measuring bolt
③ Test lead
④ Earthing connection of cable shield
⑤ Earthing connection of plug
⑥ T-plug

**Testing**

**Maximum values for the test voltage:**

| Rated voltage of the switchgear [kV] | DC test voltage, maximum value [kV] | AC test voltage VLF* 0.1 Hz, maximum value [kV] |
|---|---|---|
| 12 | 48 | 19 |
| 24 | 70 | 38 |

* Very Low Frequency

**ATTENTION!**

Cables, cable plugs and voltage detecting systems may be damaged by too high test voltages.

⇨ Observe the manufacturer's instructions for the cables, cable plugs and voltage detecting systems (maximum test values).

⇨ De-earth.

⇨ Perform the test in accordance with the cable manufacturers' recommendations or the customers' specifications.

**After completion of test**

⇨ Earth the feeder under test

⇨ Remove cable test elements.

⇨ Clean the screw-type cone, apply mounting paste and mount it on the T-plug according to the manufacturer's instructions.

⇨ Fit and lock the cable compartment cover.

⇨ De-earth the feeder in the switchgear and in the opposite substation and switch the feeder on again.

### 20.2 Cable sheath testing

| | |
|---|---|
|  | **DANGER!** |
| | Normally, the switch-disconnector panel is not interlocked during the cable sheath test. Prevent switching to OPEN or CLOSED position as follows:<br>⇨ Fit switching prohibition signs.<br>⇨ Secure the locking device (option) with a lock.<br>⇨ Closing lock-out (option) |

| | |
|---|---|
|  | **ATTENTION!** |
| | In cable panels type K, the switching operation for the EARTHED position has no influence on the voltage state of the radial cable behind the screwed-on cable compartment cover.<br>⇨ Before removing the screwed-on cable compartment cover, isolate and earth the radial cable in the opposite substation. |

**Work operations**

⇨ Isolate and earth the feeder under test.

⇨ Remove the cable compartment cover.

⇨ De-earth the cable shield at the cross member of the subframe as well as in the opposite substation.

⇨ Perform the cable sheath test according to the manufacturer's instructions or the customer's specifications.

⇨ Earth the cable shield again at the cross member of the subframe as well as in the opposite substation.

⇨ Refit and lock the cable compartment cover.

⇨ De-earth the feeder in the switchgear and in the opposite substation and switch the feeder on again.

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**T**



**U**



**V**

# Imprint

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