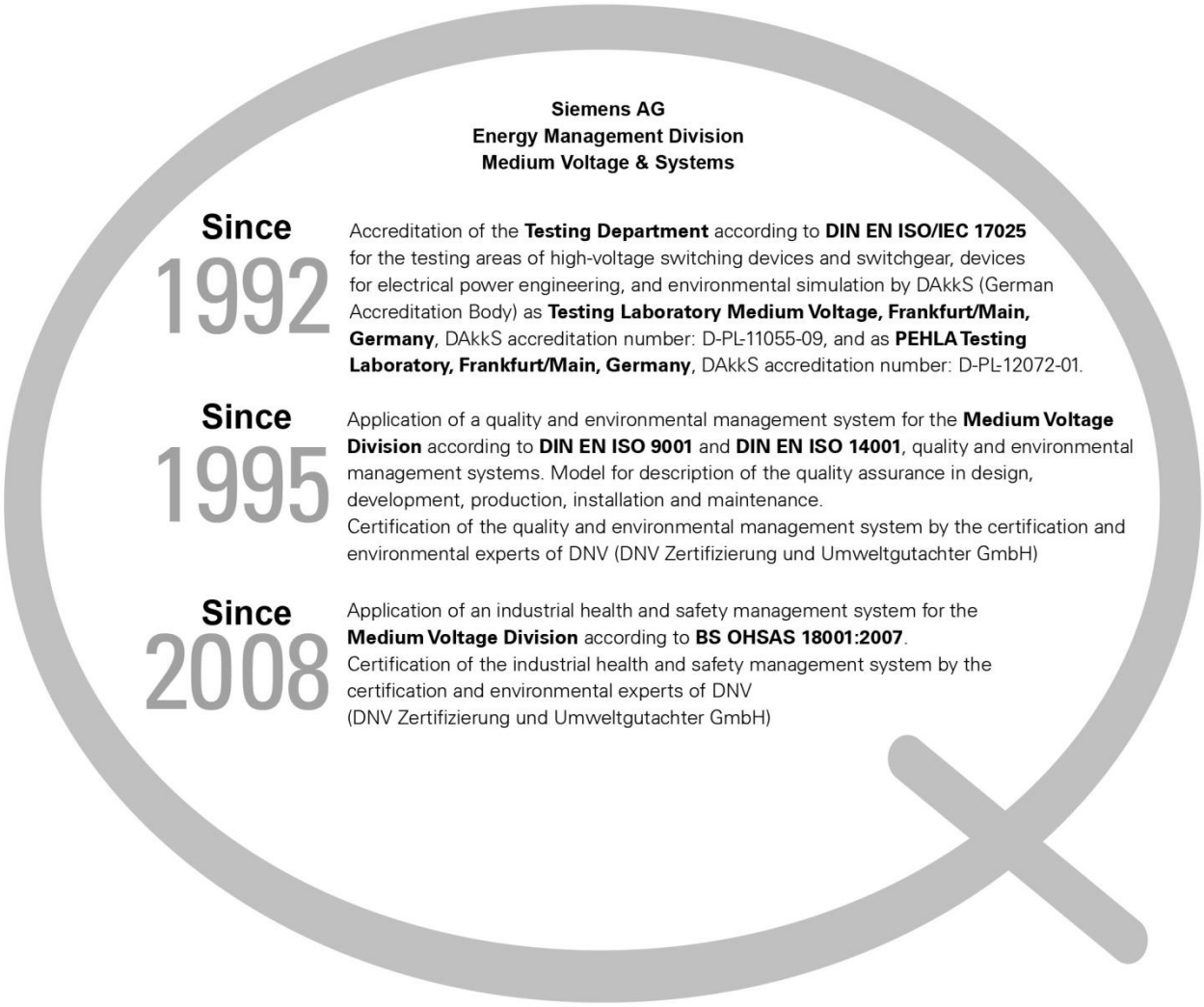
SIEMENS

Medium-Voltage Switchgear

Air-Insulated Switchgear NXAIR
≤ 17.5 kV / ≤ 40 kA / ≤ 4000 A Busbar Current

OPERATING INSTRUCTIONS

Order No.:	**110-0134.9**
Issue:	**January 2019**
Revision:	**14**



About these Instructions

These instructions do not purport to cover all details or variations in equipment. They can also not provide for every possible contingency to be met in connection with installation or operation.

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

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

All dimensions are given in mm.

For further details, e.g. about additional equipment, please refer to catalog HA 25.71.

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

The contents of this instruction manual shall not become part of or modify any prior or existing agreement, commitment or relationship. The Sales Contract contains the entire obligations of Siemens. The warranty contained in the contract between the parties is the sole warranty of Siemens.

Any statements contained herein do not create new warranties or modify the existing warranty.

1 Safety instructions

Hazards are classified in accordance with ISO 3864-2 using the following keywords:

- DANGER, WARNING or CAUTION, in case of personal injury
- NOTICE for material damage

Hazards are classified and indicated in the Operating Instructions as follows:

⚠ DANGER

Signal word indicates an immediate and imminent hazardous situation.

If the hazard is not avoided, death or serious injury will be the consequence.

⚠ WARNING

Signal word indicates a potentially hazardous situation.

If the hazardous situation is not avoided, death or serious injury can be the consequence.

⚠ CAUTION

Signal word indicates a potentially hazardous situation.

If the hazardous situation is not avoided, minor or moderate injury can be the consequence.

Definitions and symbols

NOTICE

Indicates a potentially damaging situation.

If the damaging situation is not avoided, the product or something in its vicinity may sustain damage.

INFORMATION

Provides additional information to clarify or simplify a procedure.

Observe the information.

Operation symbol:	⇨	Asks the operator to perform an operation.
Result symbol:	✓	Identifies the result of an operation.

Content

Content

Document information:

Title:	**Operating Instructions**
Order number:	**110-0134.9**
Additional order number:	**8BX3300-0LA00-0AB1**
Revision:	**14**
Issue:	**January 2019**

2 General instructions

2.1 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.

Absolutely observe the following:

- The personnel must read and understand these Operating Instructions before starting to work.
- Observe all safety instructions and warnings in these Operating Instructions, and follow the instructions.
- Store these Operating Instructions carefully, and so that it is accessible to the personnel at any time.
- These Operating Instructions are a part of the product. When the switchgear is transferred, supply these Operating Instructions as well.
- For questions about these Operating Instructions, please contact the regional Siemens representative.

Any kind of modification on the product or alteration of the product must be coordinated with the manufacturer in advance. Non-coordinated modifications or alterations can cause the expiration of warranty claims, and cause danger to life, limb and other legally protected interests. The fulfillment of the type tests (according to IEC 62271 Part 200) may not be guaranteed anymore. This applies especially though not exclusively to the following actions:

- Original Siemens spare parts were not used.
- Service technicians performing replacement were not trained and certified by Siemens.
- Parts were fitted or adjusted incorrectly.
- Settings were not made in accordance with Siemens specifications.
- After installation and setting, no final check was performed by a service technician approved by Siemens, including documentation of the test results.
- Maintenance was not done according to the Operating Instructions of the Siemens products.

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

These Operating Instructions should be used jointly with the Operating Instructions for circuit-breaker type 3AE and/or Operating Instructions for contactor type 3TL and 3TM.

2.2 Five Safety Rules of Electrical Engineering

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

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

2.3 Hazardous substances

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

2.4 Personal protective equipment (PPE)

For switchgear with proven internal arc classification according to IEC 62271 Part 200, no protective equipment is required **for operation the switchgear**.

To work on switchgear where covers have to be removed, personal protective equipment has to be worn for protection against hot gases exhausting in case of internal arc and protection against sharp edges.
To select the protective equipment, the national standards and specifications of the corresponding authorities and professional associations must absolutely be observed.

The protective equipment consists of:

- Protective clothing such as bib overall and long-arm jacket from NOMEX material (see Internet: NOMEX work clothes)
- Safety shoes
- Gloves
- Helmet and face protection
- Ear protection

2.5 Due application

The air-insulated medium-voltage switchgear type NXAIR is a type-tested and metal-clad switchgear for indoor installation, with type of accessibility A and internal arc classification (IAC): IAC A FLR ≤ 40 kA 1 s or IAC A FL ≤ 40 kA 1 s according to IEC 62271 Part 200.

The switchgear can be used as indoor installation according to IEC 61936 (Power Installations exceeding AC 1 kV) in lockable electrical service locations. A lockable electrical service location is a room or a place that is exclusively used for operating electrical equipment and which is kept under lock and key. Access to such a room is restricted to skilled electricians.

In the basic version, the degree of protection of the enclosure of NXAIR medium-voltage switchgear is IP3XD according to IEC 60529.

When the switchgear is operated within the technical parameters defined in these instructions, the air-insulated switchgear type NXAIR is suitable for rated voltages up to and Ur ≤ 17.5 kV and a maximum rated short-time withstand current of I_k = 40 kA.

The circuit-breaker to be used in a circuit-breaker panel depending on the panel version must only be either the Siemens type 3AE1 or 3AE5.

The air-insulated medium-voltage switchgear type NXAIR is suitable for operational switching of AC circuits in transformer substations of public power supply systems or in industrial plants.

The medium-voltage switchgear NXAIR is available with the following panel types:

- Circuit-breaker panel
- Disconnecting panel
- Metering panel
- Contactor panel
- Busbar current metering panel
- Bus sectionalizer
- Busbar connection panel
- Switch-disconnector panel

2.6 Qualified personnel

Qualified personnel in accordance with these Operating Instructions are persons who are familiar with operation and maintenance of the product and have appropriate qualifications for their work.

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

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

2.7 Update of the firmware of protection relays

NOTICE

Old firmware versions

If the firmware of the protection relays is not updated, it is theoretically possible for third parties to access the protection relay through the Internet due to a weak point in the firmware of the protection relays.

⇨ Verify the latest version of the firmware of the protection relays on the specified website.

⇨ Update the firmware of the protection relays with the latest firmware version.

Siemens protection relays are monitored for their firmware vulnerability. In case that any potential weak points are identified, which might allow third parties to access to the protection relay, information concerning this will be distributed by newsletter.

Please visit below website to register to the SIPROTEC and SICAM security update report to receive latest news.

- www.siemens.com/gridsecurity

Before commissioning, please ensure that the firmware of protection relays is up-to-date. For latest firmware version for Siemens devices, please visit the website below.

- http://w3.siemens.com/smartgrid/global/en/products-systems-solutions/downloads/Pages/Overview.aspx

For protection relays of other manufacturers, please contact the Original Equipment Manufacturer.

3 Features

The air-insulated medium-voltage switchgear type NXAIR has the following features:

- Factory-assembled, type-tested, metal-enclosed and metal-clad switchgear for indoor installation
- Type of accessibility A
- Internal arc classification (IAC): IAC A FLR ≤ 40 kA 1 s or IAC A FL ≤ 40 kA 1 s according to IEC 62271 Part 200
- Loss of service continuity category: LSC 2B (metal-clad) and LSC 2A (swtich-disconnector panel)
- Partition class: PM (metallic partition) and PI (shutter made of insulation material for switch-disconnector panel)
- All switching operations can be carried out at the panel front with the high-voltage door closed
- Standard degree of protection IP3XD for the metal enclosure according to IEC 60529
- Metallic, positively driven shutters protect against accidental contact with live parts inside the panel
- Logical interlock between actuation, circuit-breaker, switch-fuse combination, disconnecting function and feeder earthing switch operating mechanism prevent maloperation
- Earthing of feeders by means of earthing switches with short-circuit making capacity
- Mechanical position indicators for the withdrawable part / switching-device truck and the feeder earthing switch integrated in the mimic diagram at the panel front
- Enclosure made of galvanized sheet steel
- Front doors and lateral switchgear end walls are powder-coated with resistant epoxy resin material
- Individual modular compartments in solid-wall design
- Modular compartments bolted together

Further information to design features and design options is given in catalog HA 25.71.

4 Technical data

4.1 Complete switchgear

Rated voltage	**[kV]**	**7.2**	**12**	**17.5**
Rated frequency	[Hz]	50/60	50/60	50/60
Rated power-frequency withstand voltage	[kV]	20 [1)]	28 [1)]	38
Rated lightning impulse withstand voltage	[kV]	60	75	95
Rated short-time withstand current, max.	[kA]	40	40	40
Rated duration of short circuit, max.	[s]	3	3	3
Rated peak withstand current	[kA]	100/104	100/104	100/104

Rated voltage	**[kV]**	**7.2**	**12**	**17.5**
Rated normal current of busbar, max.	[A]	4000	4000	4000
Rated normal current of feeders, max.				
with circuit-beaker	[A]	4000	4000	4000
with disconnector	[A]	4000	4000	4000
with contactor	[A]	400 [2)]	400 [2)]	400 [2)]
with switch-fuse combination	[A]	200[2)]	200[2)]	200[2)]
as bus sectionalizer	[A]	4000	4000	4000

[1)] Available as special version: 32 kV at 7.2 kV, or, except for contactor, 42 kV at 12 kV
[2)] Depending on rated current of installed HV HRC fuse-links

4.2 Basic prescriptions and standards

The indoor switchgear complies with the following prescriptions and standards:

		IEC / EN standard
Switchgear		62271-1
		62271-200
Switching devices	Circuit-breakers	62271-100
	Contactors	60470
	Disconnectors / earthing switches	62271-102
	Switch-fuse combination	62271-105
Current limiting fuses		60282-1
Voltage detecting systems		61243-5
Insulation		60071-1
Degree of protection		60529
Instrument transformers	Current transformers	61869-2
	Voltage transformers	61869-3
Installation, erection		61936-1

4.3 Electromagnetic compatibility – EMC

The a.m. standards as well as the "EMC Guide for Switchgear" [1)] are applied during design, manufacture and erection of the switchgear. Installation, connection and maintenance have to be performed in accordance with the stipulations of the operating instructions. For operation, the legal stipulations applicable at the place of installation have to be observed additionally. In this way, the switchgear assemblies of this type series fulfill the basic protection requirements of the EMC Guide.
The switchgear operator / owner must keep the technical documents supplied with the switchgear throughout the entire service life, and keep them up-to-date in case of modifications of the switchgear.

[1)] Dr. Bernd Jäkel, Ansgar Müller; Medium-Voltage Systems - EMC Guide for Switchgear

4.4 Rating plates

Each panel has a rating plate fixed on the inside of the doors to the high-voltage and low-voltage compartment containing the following information:

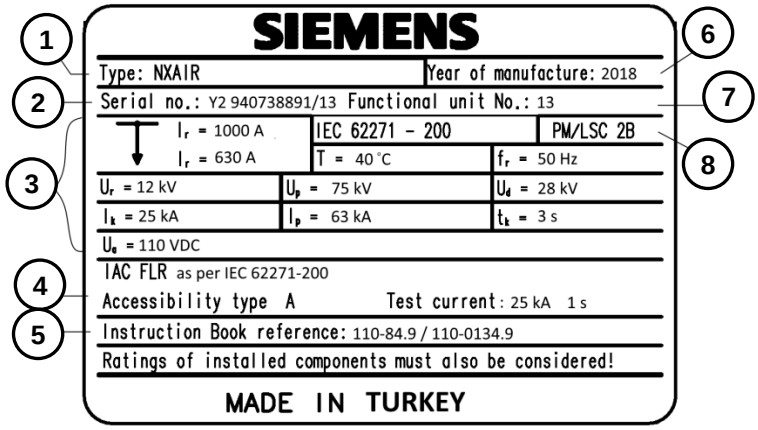


Fig. 1: Rating plate, as an example

(1) Switchgear type
(2) Serial number
(3) Technical data
(4) Internal arc classification
(5) Number of operating instructions for the panel
(6) Year of manufacture
(7) Panel number
(8) Loss of service continuity category, partition class

The block-type current transformers and the voltage transformers have their own type plates. A copy is provided on the inside of the high-voltage door.

4.5 IAC classification

The data (see fig. 1) describes the internal arc classification of the panel according to IEC 62271-200.
The entries **IAC A FLR 25 kA 1 s** and accessibility type **A** in the example shown mean:

- **IAC:** Internal Arc Classification
- **F:** Internal arc classification for the front side (Front)
- **L:** Internal arc classification for the lateral sides (Lateral)
- **R:** Internal arc classification for the rear side (Rear)
- **25 kA:** Tested short-circuit current
- **1 s:** Test duration
- **A:** Type of accessibility A; for authorized personnel only

The IAC classification is referred to each panel. The data on the rating plate (see fig. 1) describes the areas classified for the corresponding panel.

4.6 Panel dimensions

Width

Panel type		Dimension [mm]		
		I_k ≤ 31.5 kA		I_k = 40 kA
	I_r [A]	Busbar version ≤ 2500 A	Busbar version 3150/4000 A	Busbar version ≤ 4000 A
Circuit-breaker panel	≤ 1000	600	600	–
	1000	–	–	800
	1250	800	800	800
	2000	800	800	800
	2500	1000	1000	800, 1000
	3150	–	1000	800, 1000
	4000	–	1000	1000
Disconnecting panel	1250	800	800	800
	2000	800	800	800
	2500	1000	1000	800, 1000
	3150	–	1000	800, 1000
	4000	–	1000	1000
Bus sectionalizer	1250	2 × 800	–	2 × 800
	2500	2 × 1000 or	–	2 × 1000 or
		1 × 1000 with 1 × 800		1 × 1000 with 1 × 800
	3150	–	2 × 1000	2 × 1000
	4000	–	2 × 1000	2 × 1000
Busbar connection panel	≤ 2500	800	800	800
	3150	–	1000	1000
	4000	–	1000	1000
Metering panel	–	800	800	800
Contactor panel	400	435 [1)]	435 [1)]	435 [1)]
	400	600 [2)]	600 [2)]	600 [2)]
Switch-disconnector panel	200	800	800	–
	200	800	800	–
	200	800	800	–
	200	800	800	–

[1)] Contactor panel version with rated voltage 7.2 kV or 12 kV
[2)] Contactor panel version with rated voltage 7.2 kV

Technical data

Height

Panel type	Dimension [mm]		
	I_k ≤ 31.5 kA		I_k = 40 kA
	Busbar version ≤ 2500 A	Busbar version 3150/4000 A	Busbar version ≤ 4000 A
With standard low-voltage compartment	2300		
With high low-voltage compartment	2350		
With pressure relief duct and arc absorber	2500		
With natural ventilation	2300		
With forced ventilation	–	2450	
With additional compartment for busbar components	2350		

Depth

Panel type			Dimension [mm]		
			I_k ≤ 31.5 kA		I_k = 40 kA
	I_r [A]	Panel width [mm]	Busbar version ≤ 2500 A	Busbar version 3150/4000 A	Busbar version ≤ 4000 A
Circuit-breaker, disconnecting, bus sectionalizer, busbar connection, metering panel	≤ 2500	–	1350 or 1500	1500	1500
	3150	–	–	1540 or 1650	1540 or 1650
	4000	–	–	1540 or 1650	1540 or 1650
Rear duct version	≤ 4000		Panel version with rear duct is extended by 600 mm		
Contactor panel	400	435	1400	1500	1500
	400	600	1350	1500	1500
Switch-disconnector panel	200	800	1350	1500	–

4.7 Room planning

According to chapter 5 in the Installation Instructions with order number: 110-0084.9

4.8 Operating conditions

NXAIR switchgear is designed for normal indoor operating conditions according to IEC 62271-1.

In this respect, the following limit values for the ambient air temperature must be complied with:

Limit value	Temperature [°C]
Maximum value	+40*
Minimum value	−5*
Maximum value of 24-hour mean	+35*

The site altitude is maximum 1000 m above sea level as a standard level.

When NXAIR switchgear is used in regions with high air humidity or considerable temperature fluctuations, there is risk of condensation. The formation of condensation should be an exception under normal operating conditions. To prevent condensation, rusting or other serious consequences, the associated preventive measures must be taken by installing electrical heating equipment in the switchgear. The ambient air must not be significantly polluted by dust, smoke, corrosive and/or flammable gases, vapors or salt.

* If NXAIR is used under other service conditions than normal service conditions acc. to IEC 62271 Part 1 regarding the ambient air temperature, the permissible current ratings of feeder and busbar can deviate. In this case please contact the regional Siemens representative to clarify permissible current values.

4.9 Vacuum circuit-breaker type 3AE

The vacuum circuit-breaker type 3AE is a 3-pole indoor circuit-breaker for ratings from 7.2 kV to 17.5 kV.

Available circuit-breakers type 3AE depending on the design of the NXAIR switchgear:

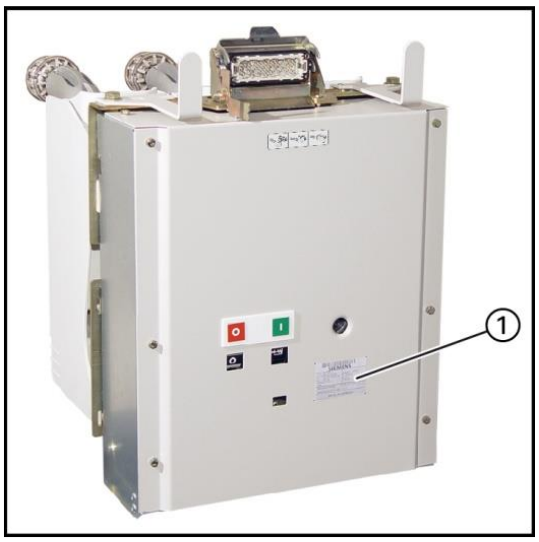


Fig. 2: 3AE1 circuit-breaker

Fig. 3: 3AE5 circuit-breaker

A rating plate (1) is provided on the operating mechanism unit of every circuit-breaker type 3AE.

4.10 Operating instructions for circuit-breaker type 3AE

For circuit-breakers type 3AE, separate operating instructions are available with detailed instructions and information. The operating instructions are supplied as standard with every circuit-breaker type 3AE. Additional operating instructions in different languages can be ordered at the regional Siemens representative.

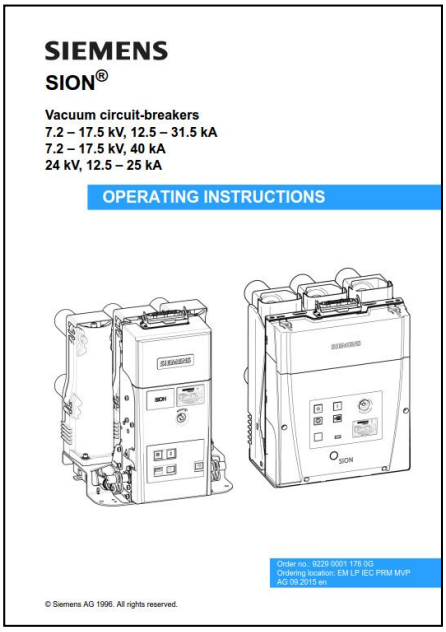


Fig. 4: Operating instructions for circuit-breaker type 3AE

Available operating instructions for circuit-breaker type 3AE:

Language	Order number of operating instructions
German	9229 0001 100 0F
Polish	9229 0001 155 0F
Russian	9229 0001 156 0F
Italian	9229 0001 172 0F
English	9229 0001 176 0F
French	9229 0001 177 0F
Spanish	9229 0001 178 0F
Portuguese	9229 0001 179 0F
Romanian	9229 0001 302 0F

4.11 Contactor type 3TL and 3TM

The vacuum contactor type 3TM3 is a 3-pole indoor contactor for ratings from 7.2 kV to 12 kV.
The vacuum contactor type 3TL8 is a 3-pole indoor contactor for ratings of 7.2 kV.
Available contactors type 3TL and 3TM depending on the design of the switchgear:

	Panel width [mm]	Rated voltage U_r [kV]
3TM3	435	7.2
		12
3TL8	600	7.2

A rating plate (1) is provided on the operating mechanism unit of every contactor type 3TL and 3TM.

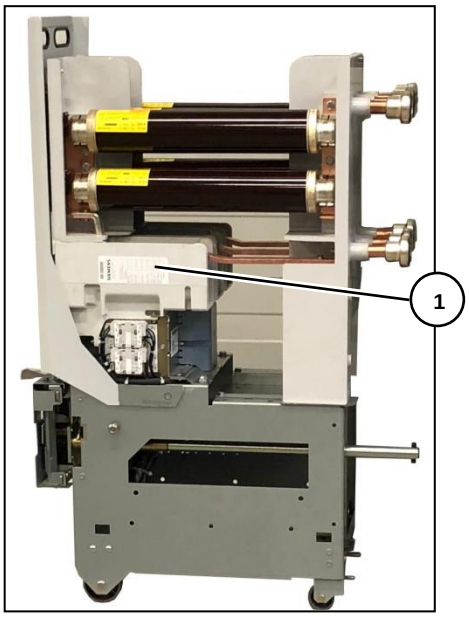


Fig. 5: Contactor truck type 3TM3

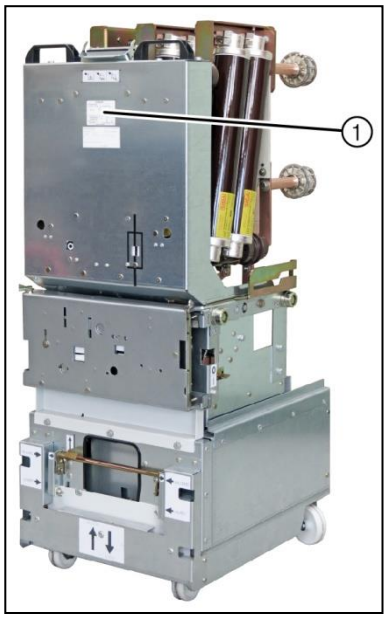


Fig. 6: Contactor truck type 3TL8

4.12 Operating instructions for contactor type 3TL8 and 3TM3

For contactors type 3TL8 and 3TM3, separate operating instructions are available with detailed instructions and information. The operating instructions are supplied as standard with every contactor type 3TL and 3TM. Additional operating instructions in different languages can be ordered at the regional Siemens representative.

Available operating instructions for contactor type 3TL and 3TM

Language	**Order number of operating instructions**
	3TL8
German-English	9229 9870 174 0G
French-Spanish	9229 9870 159 0G

Language	**Order number of operating instructions**
	3TM3
English	9229 0090 176 0A
German	9229 0090 100 0A
Russian	9229 0090 156 0A
Polish	9229 0090 155 0A

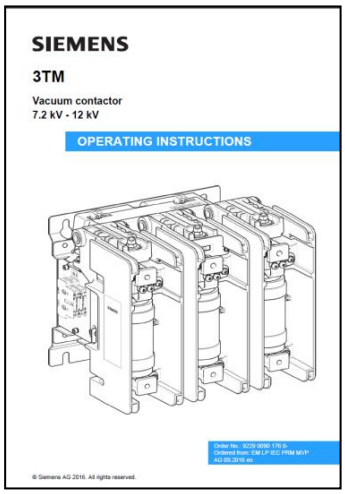


Fig. 7: Contactor type 3TM3

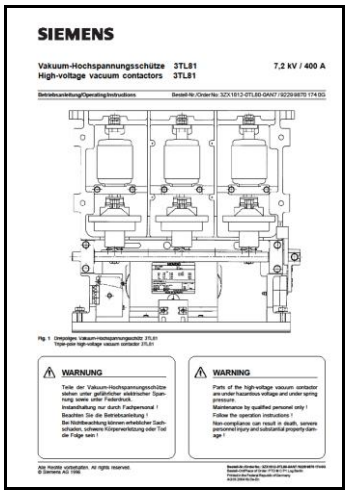


Fig. 8: Contactor type 3TL8

4.13 Switch-fuse combination type L-TRI 5F

The switch disconnector-fuse combination type L-TRI 5F with all-pole tripping for the striker pin release of the HV fuse links meets the specific test conditions of IEC 62271-105.

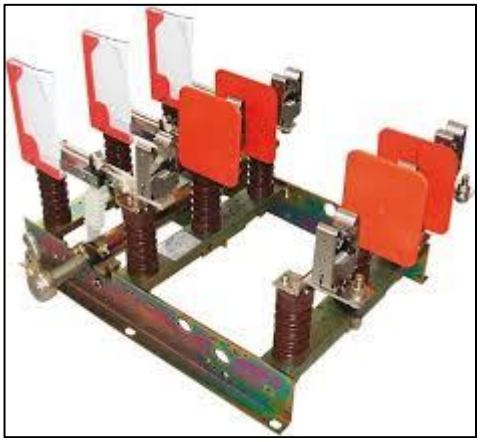


Fig. 9: Switch-fuse combination type L-TRI 5F

4.14 Operating instructions for switch-fuse combination L-TRI 5F

For switch-fuse combination type L-TRI 5F, separate operating instructions are available with detailed instructions and information.

For further information about maintenance and servicing, please refer to the operating instructions indoor switch-fuse combination L-TRI5. Operating instructions can be ordered at the regional Siemens representative.

Language	**Order number of operating instructions**
	L-TRI 5F
English	AGS531883-01

5 Overview of panel types

The air-insulated medium-voltage switchgear NXAIR consists of various panel versions which can be freely combined according to the requirements.

The following panel types are available:

- Circuit-breaker panel
- Disconnecting panel
- Metering panel
- Bus sectionalizer, type 1
  - 1 × circuit-breaker panel plus 1 × bus riser panel with disconnector link
- Bus sectionalizer, type 2
  - 1 × circuit-breaker panel plus 1 × bus riser panel, optionally with metering part
- Busbar current metering panel
- Busbar connection panel
  - optionally with metering part
- Contactor panel
- Switch-disconnector panel

Further information to design features and design options is given in catalog HA 25.71.

Overview of panel types:

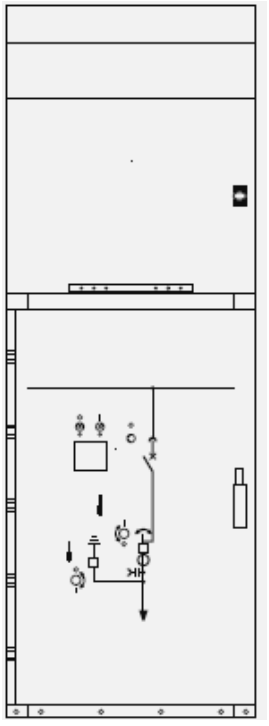


Fig. 10 Circuit-breaker panel

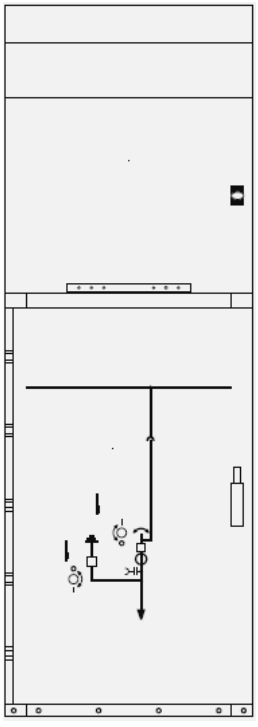


Fig. 11: Disconnecting panel

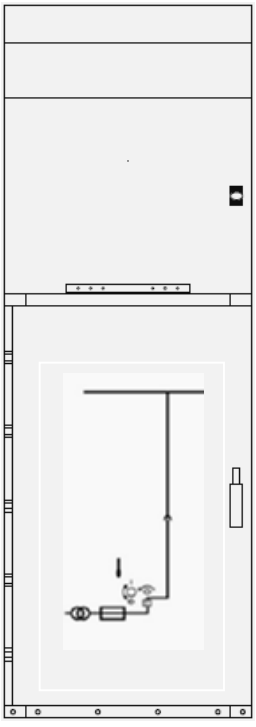


Fig. 12: Metering panel

Overview of panel types

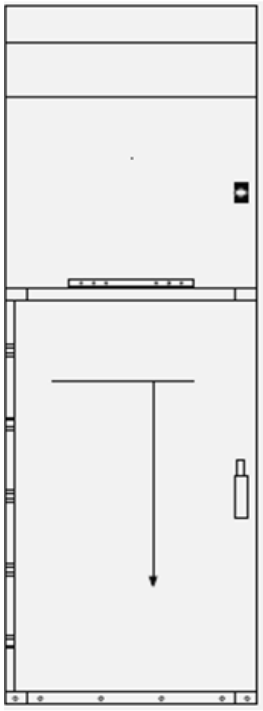


Fig. 13: Busbar connection panel without withdrawable metering part / metering truck

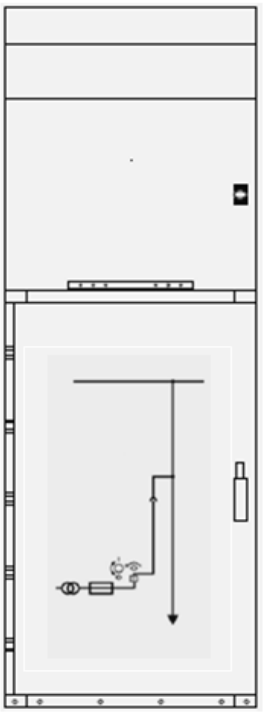


Fig. 14: Busbar connection panel with withdrawable metering part / metering truck

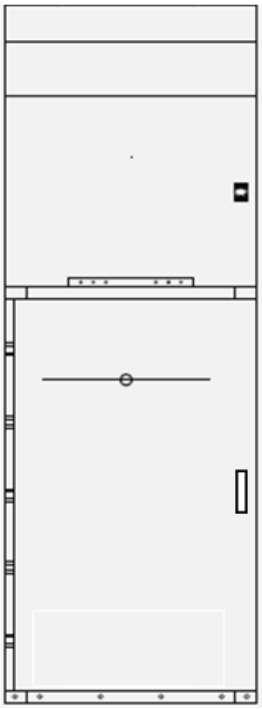


Fig. 15: Busbar current metering panel

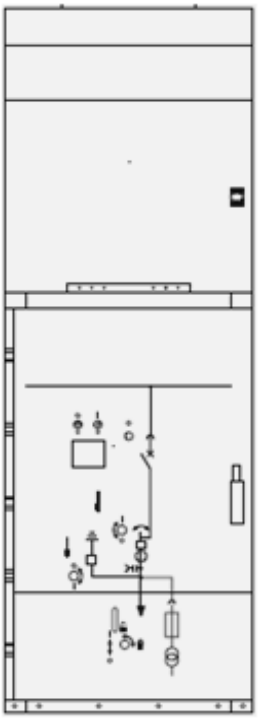


Fig. 16: Circuit-breaker panel with removable voltage transformers

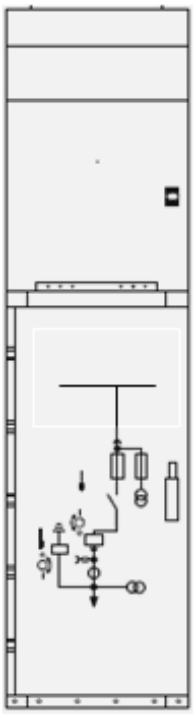


Fig. 17: Contactor panel width 600 mm

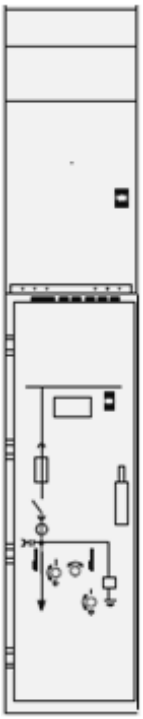


Fig. 18: Contactor panel width 435 mm

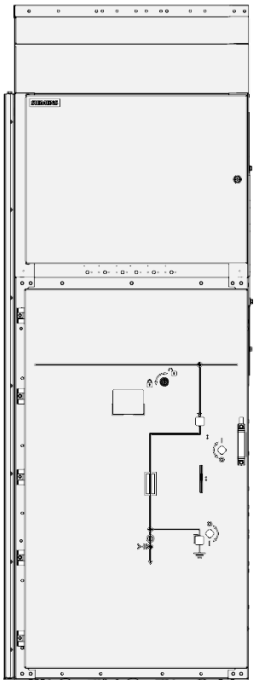


Fig. 19: Switch-disconnector panel

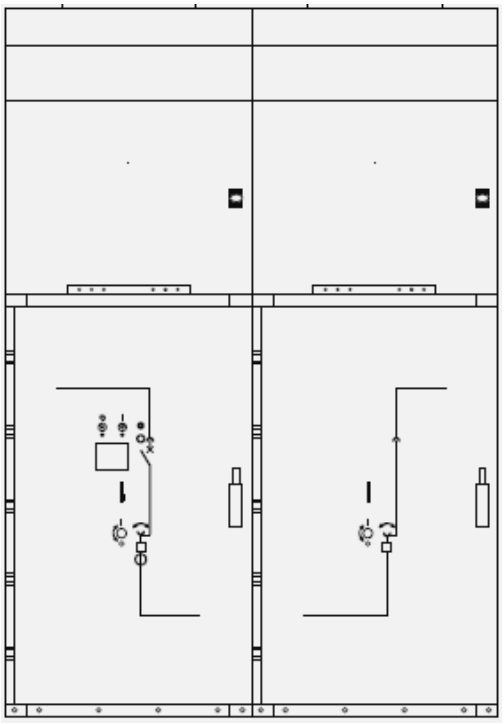


Fig. 20: Bus sectionalizer type 1 to the right [1], circuit-breaker and bus riser panel with withdrawable disconnector link / disconnector truck

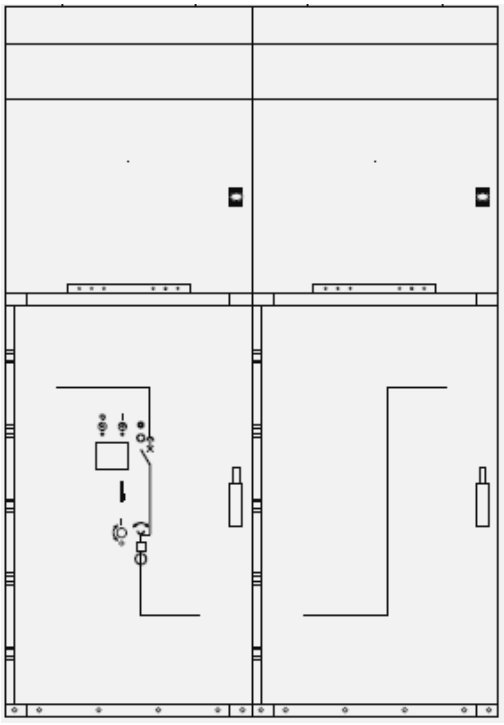


Fig. 21: Bus sectionalizer type 2 to the right [1], circuit-breaker and bus riser panel

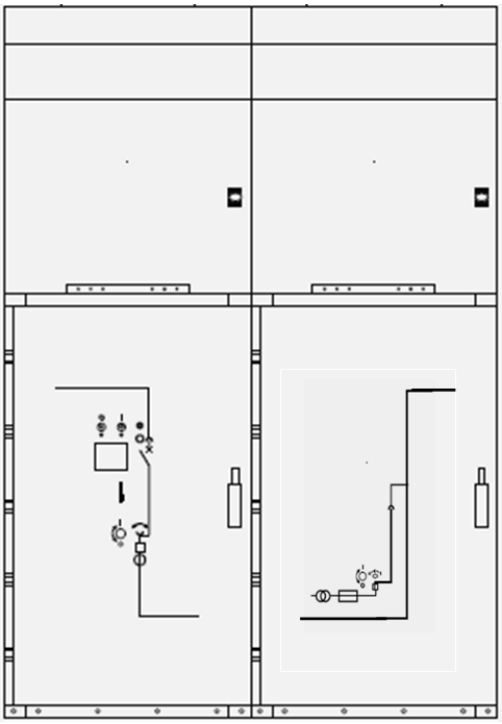


Fig. 22: Bus sectionalizer type 2 to the right [1], circuit-breaker and bus riser panel with withdrawable metering part / metering truck

1) Can also be designed as a mirror image to the left

Overview of panel types

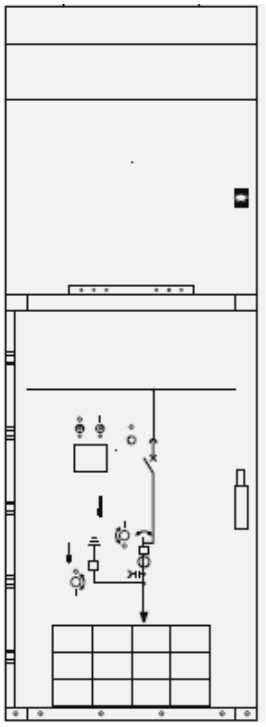


Fig. 23: Panel version with natural ventilation

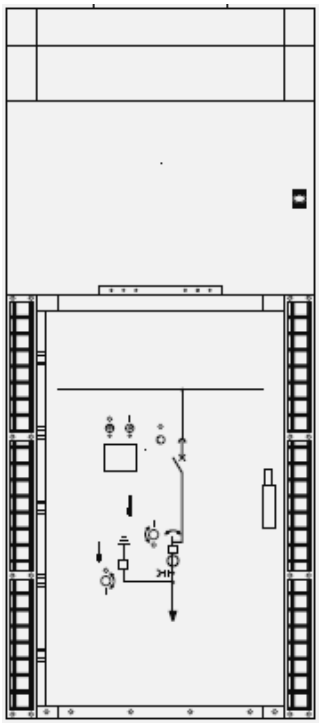


Fig. 24: Panel version with natural ventilation

6 Panel design

6.1 Basic design

In the basic design, NXAIR is available both as withdrawable and as truck-type switchgear. In the basic design as withdrawable switchgear, the removable part is taken out of the panel or inserted in the panel by means of a service truck.

In the basic design as truck-type switchgear, the removable part is always positively combined with a service truck. For truck-type switchgear, this means that always the complete truck is taken out of the panel or inserted in the panel.

The basic operation or interlocking of the switching devices in the two basic designs, such as:

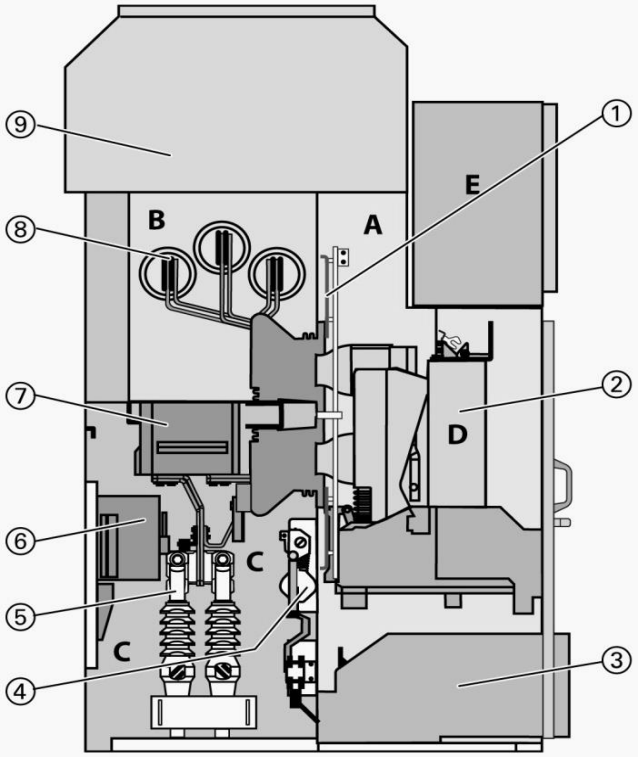
- Switching the circuit-breaker to CLOSED position or OPEN position
- Racking the withdrawable part / switching-device truck to service position or test position
- Switching the feeder earthing switch to CLOSED position or OPEN position
- Mechanical or electrical interlocking of the individual devices in the panel

is identical.

Fig. 25: Basic design as withdrawable switchgear

Fig. 26: Basic design as truck-type switchgear

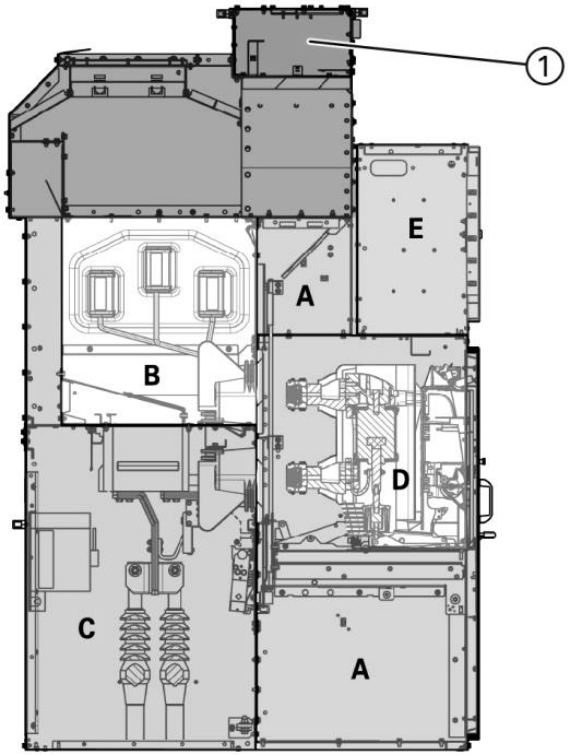
6.2 Basic design circuit-breaker panel



A Switching-device compartment
B Busbar compartment
C Connection compartment
D Withdrawable circuit-breaker / circuit-breaker truck
E Low-voltage compartment
(1) Metallic shutters
(2) Operating and interlocking unit for circuit-breaker
(3) Ventilation system (optional)
(4) Feeder earthing switch
(5) Cable / bar connection
(6) Voltage transformers (optional)
(7) Block-type current transformers
(8) Busbar
(9) Pressure relief duct

Fig. 27: Sectional view of circuit-breaker panel design

6.3 Basic design circuit-breaker panel with forced ventilation



A Switching-device compartment
B Busbar compartment
C Connection compartment
D Withdrawable circuit-breaker
E Low-voltage compartment
(1) Fan box

Fig. 28: Sectional view of circuit-breaker panel design with forced ventilation

6.4 Basic design contactor panel with panel width 435 mm

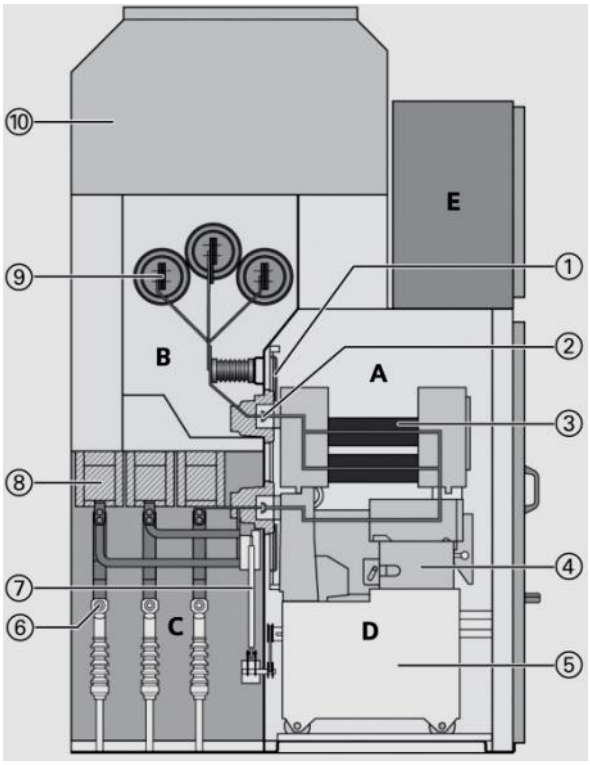


Fig. 29: Sectional view of contactor panel with panel width 435 mm

A Switching-device compartment
B Busbar compartment
C Connection compartment
D Contactor truck
E Low-voltage compartment
(1) Metallic shutters
(2) Contact system
(3) HV HRC fuse-links
(4) Vacuum contactor
(5) Operating and interlocking unit
(6) Cable connection
(7) Feeder earthing switch
(8) Block-type current transformers
(9) Busbar
(10) Pressure relief duct

6.5 Basic design contactor panel with panel width 600 mm

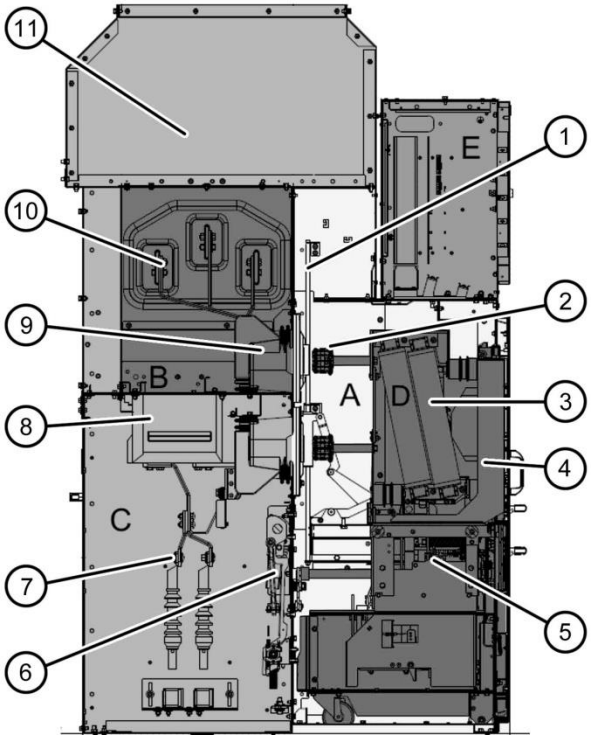
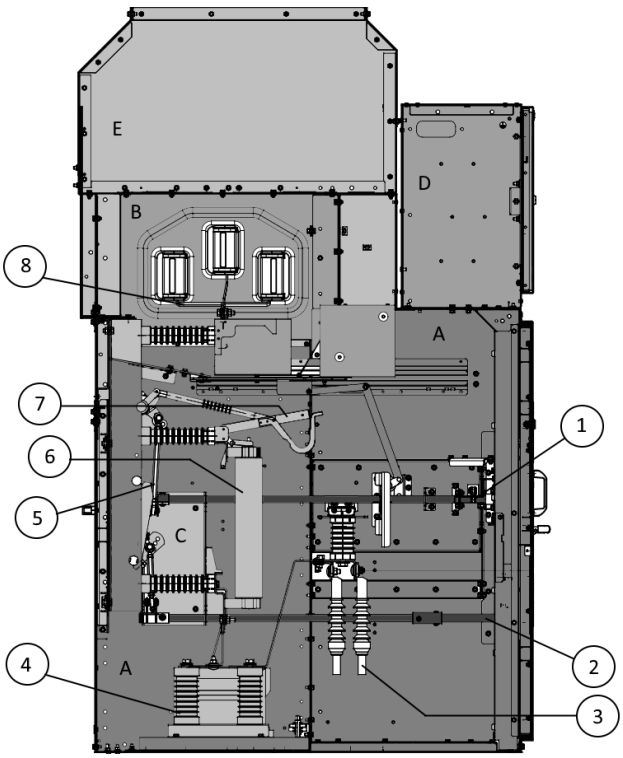


Fig. 30: Sectional view of contactor panel with panel width 600 mm

A Switching-device compartment
B Busbar compartment
C Connection compartment
D Contactor truck
E Low-voltage compartment
(1) Metallic shutters
(2) Contact system
(3) HV HRC fuse-links
(4) Vacuum contactor
(5) Operating and interlocking unit for racking the contactor truck and for earthing
(6) Feeder earthing switch
(7) Cable / bar connection
(8) Block-type current transformers
(9) Bushing-type insulators
(10) Busbar
(11) Pressure relief duct

6.6 Basic design switch-disconnector panel



A	Switching-device / connection compartment
B	Busbar compartment
C	Switch-fuse combination
D	Low-voltage compartment
E	Pressure relief duct
(1)	Operating mechanism for switch-fuse combination
(2)	Operating mechanism for feeder earthing switch
(3)	Cable sealing ends
(4)	Block-type current transformers
(5)	Blades of the feeder earthing switch
(6)	HV HRC fuse-links
(7)	Blades of the switch-fuse combination
(8)	Busbars

Fig. 31: Sectional view of switch-disconnector panel

Further information to design features and design options is given in catalog HA 25.71.

7 Interlocks

7.1 Mechanical interlocks in panel versions with withdrawable parts

Action	Internal preconditions
Inserting the withdrawable part in the panel	Withdrawable part on the service truck
Pulling the withdrawable part out of the panel	None
Racking the withdrawable part to service position	Withdrawable part inserted and interlocked
	Low-voltage connector plugged on
	High-voltage door closed
	Circuit-breaker in OPEN position
	Feeder earthing switch in OPEN position
Plugging on the low-voltage connector	Consistent coding between connector and withdrawable part fulfilled
Racking the withdrawable part to test position	Circuit-breaker in OPEN position
Closing the circuit-breaker	Withdrawable part in interlocked end position (test position or service position)
Closing the circuit-breaker	Undervoltage release not electrically operated
Opening the circuit-breaker	None
Operating the feeder earthing switch	Withdrawable part in test position
Operating the busbar earthing switch	None (see note given below)
Opening the high-voltage door	Withdrawable part in test position
Closing the high-voltage door	Low-voltage connector plugged on

INFORMATION

Contactor panels with panel width 435 mm and 600 width mm are not available for withdrawable switchgear.

7.2 Mechanical interlocks in panel versions with switching-device trucks

Action	Internal preconditions
Inserting the switching-device truck in the panel	Switching-device truck available
Pulling the switching-device truck out of the panel	None
Racking the switching-device truck to service position	Switching-device truck inserted and interlocked
	Low-voltage connector plugged
	High-voltage door closed
	Circuit-breaker in OPEN position / contactor in OPEN position
	Feeder earthing switch in OPEN position
Plugging on the low-voltage connector	Consistent coding between connector and switching-device truck fulfilled [1)]
Racking the switching-device truck to test position	Circuit-breaker in OPEN position / contactor in OPEN position
Closing the circuit-breaker	Switching-device truck in interlocked end position (test position or service position)
Closing the circuit-breaker / closing the contactor	Undervoltage release not electrically operated
Closing the contactor	HV HRC fuse-links not tripped
Opening the circuit-breaker / opening the contactor	None
Operating the feeder earthing switch	Switching-device truck in test position
Operating the busbar earthing switch	None (see note below)
Opening the high-voltage door	Switching-device truck in test position
Closing the high-voltage door	Low-voltage connector plugged on

[1)] Not feasible with contactor panel with panel width 435 mm

7.3 Mechanical interlocks in panel versions with switch-fuse combination

Action	Internal preconditions
Operating the switch-fuse combination	Feeder earthing switch in OPEN position and high-voltage door closed
Operating the feeder earthing switch	Switch-fuse combination in OPEN position and high-voltage door closed
Opening the high-voltage door	Switch-fuse combination in OPEN position

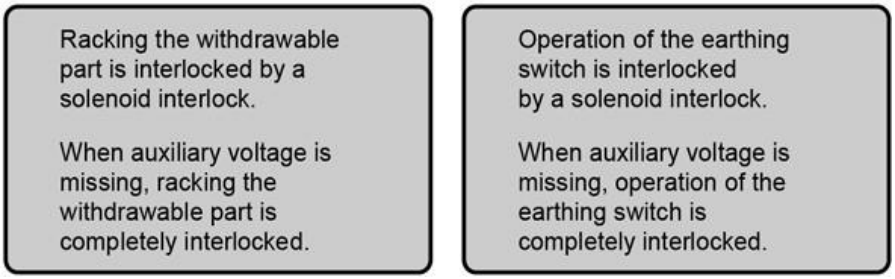
7.4 Additional electromagnetic interlocks (optional)

Action	Additional preconditions
Racking the withdrawable part / switching-device truck	General or external release
Operating the feeder earthing switch	General or external release [1)]
Operating the busbar earthing switch	General or external release

[1)] Not feasible with contactor panel with panel width 435 mm

INFORMATION

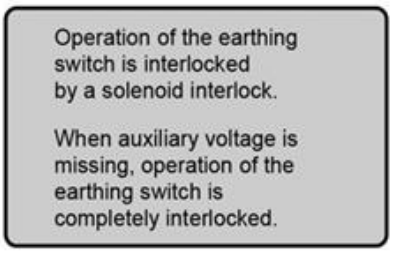
Panel versions with electromagnetic interlock are identified on the high-voltage door with labels for interlocking the disconnecting and/or the earthing function:



INFORMATION

The busbar earthing switch is secured against unintentional operation by means of a padlock or an electromagnetic interlock.

Panel version with electromagnetic interlock is identified on the door to the low-voltage compartment with a label:



7.5 Additional padlock interlock (optional)

Action	Additional preconditions
Racking the withdrawable part / switching-device truck	Access to actuating openings only after removing the padlock
Operating the feeder earthing switch	Access to actuating openings only after removing the padlock
Operating the busbar earthing switch	Access to actuating openings only after removing the padlock
Opening the high-voltage door	Access to actuating openings only after removing the padlock

7.6 Additional key-operated interlock (optional)

Action	Additional preconditions
Racking the withdrawable part / switching-device truck to service position	Access to actuating openings only after opening the lock
Switching the feeder earthing switch to CLOSED position	Access to actuating openings only after opening the lock
Switching the feeder earthing switch to OPEN position	Access to actuating openings only after opening the lock
Switching the busbar earthing switch to CLOSED position	Access to actuating openings only after opening the lock
Switching the busbar earthing switch to OPEN position	Access to actuating openings only after opening the lock

8 Accessories

8.1 Operating tools

Fig. 32: Racking crank for moving the withdrawable part / switching-device truck

Fig. 33: Push rod for closing / opening the circuit-breaker manually and for manual emergency opening of the 3TM3 contactor

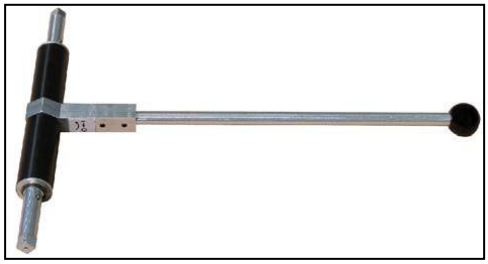


Fig. 34: Operating lever for operating the feeder earthing switch in the switch-disconnector panel

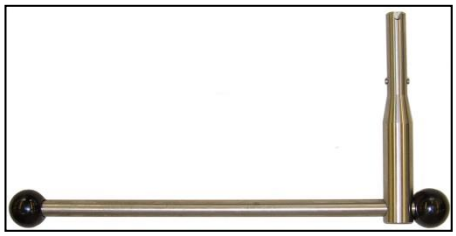


Fig. 35: Operating lever for operating the feeder earthing switch or busbar earthing switch / operating the switch-fuse combination

Fig. 36: Hand crank for manual charging of the spring energy store in the circuit-breaker

Fig. 37: Double-bit key with a diameter of 5 mm for unlocking and interlocking the withdrawable part / switching-device truck

Fig. 38: Double-bit key with a diameter of 3 mm for opening and closing the door to the low-voltage compartment

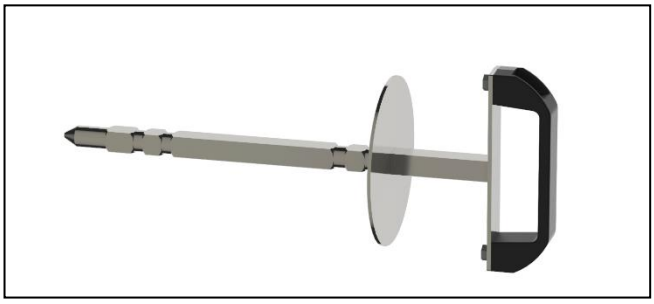


Fig. 39: Racking tool for the removable voltage transformers (optional)

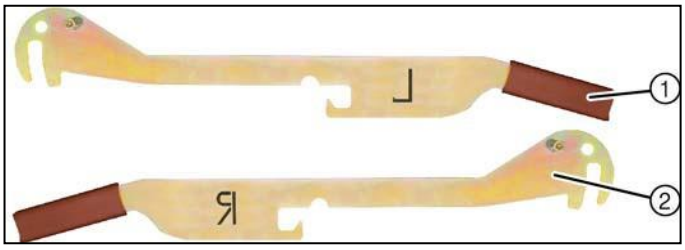


Fig. 40: Slip-on levers for opening the shutters (optional)
(1) for use on left side in panel and (2) for use in right side in panel

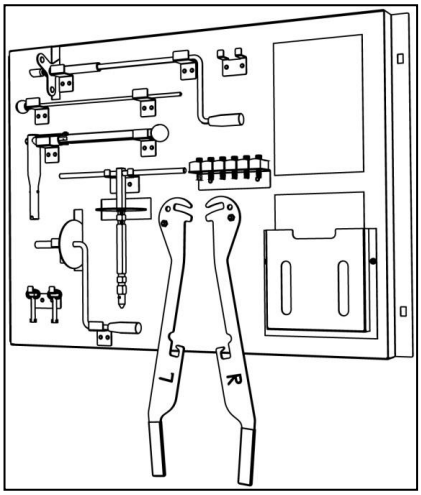


Fig. 41: Wall-mounting holder for storage of operating tools (optional)

Fig. 42: Slip-on lever for opening the shutters of the contactor panel (optional)

8.2 Service truck

⚠ CAUTION

High weight

Due to the weights of the service truck and the withdrawable parts, careless handling can cause injuries by getting squeezed.

⇨ Move the service truck only if there is no withdrawable part on the service truck, or if a withdrawable part is interlocked in its end position on the service truck.

⇨ Move and operate the service truck only at the operating side.

⇨ Move the service truck only slowly and carefully.

⚠ CAUTION

Protruding parts

Protruding parts at the rear side of the service truck can cause injuries by cuts or impacts.

⇨ Always park the service truck in such a way that nobody can pass by at the rear side, e.g. move the rear side of the service truck close to a wall.

Using the service trucks:

Service trucks are exclusively designed for:

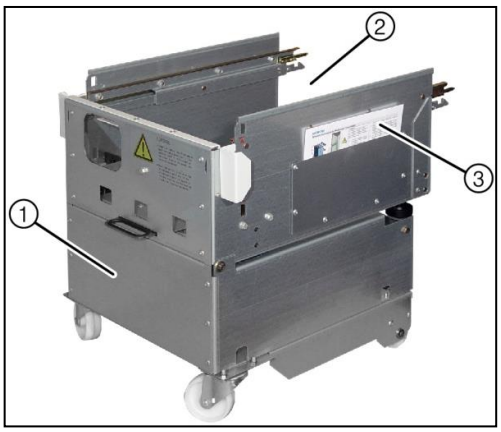
- Transporting a corresponding withdrawable part
- Removing a withdrawable part from a panel
- Inserting a withdrawable part into a panel

Service trucks are **not** designed for:

- Transporting people
- Transporting other objects than the corresponding withdrawable part

8.3 Service truck versions

Depending on the panel version, the following service trucks are included as accessories:
For panels with withdrawable circuit-breaker, withdrawable disconnector link or withdrawable metering part:



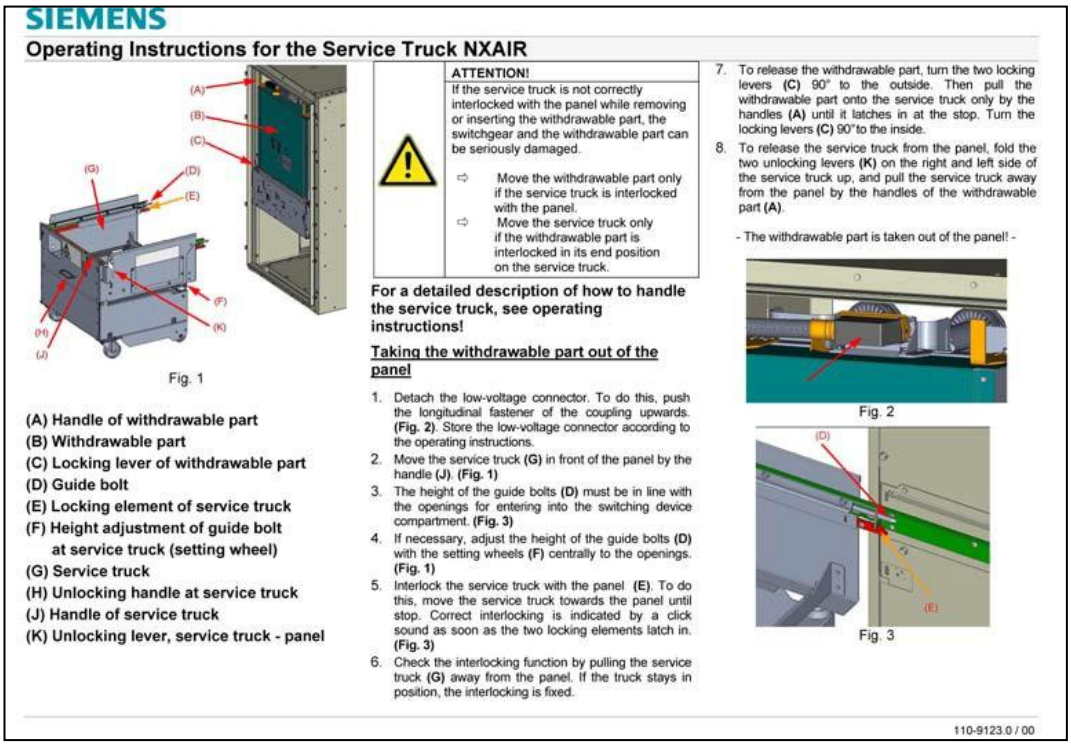
(1) Operating side

(2) Rear side

(3) Operating instructions for service truck

Fig. 43: Service truck to insert and remove a withdrawable part

On the right side of the service truck there is the pocket for the operating instructions:



SIEMENS

Operating Instructions for the Service Truck NXAIR

Fig. 1

(A) Handle of withdrawable part
(B) Withdrawable part
(C) Locking lever of withdrawable part
(D) Guide bolt
(E) Locking element of service truck
(F) Height adjustment of guide bolt at service truck (setting wheel)
(G) Service truck
(H) Unlocking handle at service truck
(J) Handle of service truck
(K) Unlocking lever, service truck - panel

ATTENTION!

If the service truck is not correctly interlocked with the panel while removing or inserting the withdrawable part, the switchgear and the withdrawable part can be seriously damaged.

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

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

For a detailed description of how to handle the service truck, see operating instructions!

Taking the withdrawable part out of the panel

1. Detach the low-voltage connector. To do this, push the longitudinal fastener of the coupling upwards. **(Fig. 2)**. Store the low-voltage connector according to the operating instructions.
2. Move the service truck **(G)** in front of the panel by the handle **(J)**. **(Fig. 1)**
3. The height of the guide bolts **(D)** must be in line with the openings for entering into the switching device compartment. **(Fig. 3)**
4. If necessary, adjust the height of the guide bolts **(D)** with the setting wheels **(F)** centrally to the openings. **(Fig. 1)**
5. Interlock the service truck with the panel **(E)**. To do this, move the service truck towards the panel until stop. Correct interlocking is indicated by a click sound as soon as the two locking elements latch in. **(Fig. 3)**
6. Check the interlocking function by pulling the service truck **(G)** away from the panel. If the truck stays in position, the interlocking is fixed.
7. To release the withdrawable part, turn the two locking levers **(C)** 90° to the outside. Then pull the withdrawable part onto the service truck only by the handles **(A)** until it latches in at the stop. Turn the locking levers **(C)** 90° to the inside.
8. To release the service truck from the panel, fold the two unlocking levers **(K)** on the right and left side of the service truck up, and pull the service truck away from the panel by the handles of the withdrawable part **(A)**.

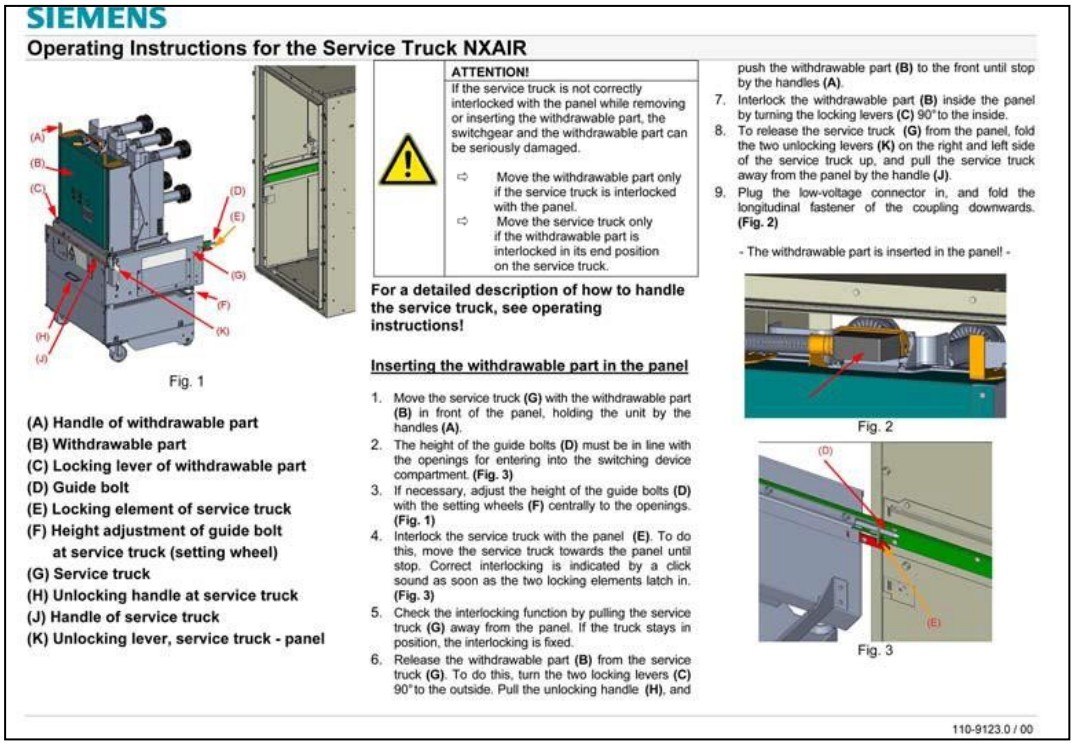
- The withdrawable part is taken out of the panel! -

Fig. 2

Fig. 3

110-9123.0 / 00

Fig. 44: Front page of operating instructions



SIEMENS

Operating Instructions for the Service Truck NXAIR

Fig. 1

(A) Handle of withdrawable part
(B) Withdrawable part
(C) Locking lever of withdrawable part
(D) Guide bolt
(E) Locking element of service truck
(F) Height adjustment of guide bolt at service truck (setting wheel)
(G) Service truck
(H) Unlocking handle at service truck
(J) Handle of service truck
(K) Unlocking lever, service truck - panel

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

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

For a detailed description of how to handle the service truck, see operating instructions!

Inserting the withdrawable part in the panel

1. Move the service truck **(G)** with the withdrawable part **(B)** in front of the panel, holding the unit by the handles **(A)**.
2. The height of the guide bolts **(D)** must be in line with the openings for entering into the switching device compartment. **(Fig. 3)**
3. If necessary, adjust the height of the guide bolts **(D)** with the setting wheels **(F)** centrally to the openings. **(Fig. 1)**
4. Interlock the service truck with the panel **(E)**. To do this, move the service truck towards the panel until stop. Correct interlocking is indicated by a click sound as soon as the two locking elements latch in. **(Fig. 3)**
5. Check the interlocking function by pulling the service truck **(G)** away from the panel. If the truck stays in position, the interlocking is fixed.
6. Release the withdrawable part **(B)** from the service truck **(G)**. To do this, turn the two locking levers **(C)** 90° to the outside. Pull the unlocking handle **(H)**, and push the withdrawable part **(B)** to the front until stop by the handles **(A)**.
7. Interlock the withdrawable part **(B)** inside the panel by turning the locking levers **(C)** 90° to the inside.
8. To release the service truck **(G)** from the panel, fold the two unlocking levers **(K)** on the right and left side of the service truck up, and pull the service truck away from the panel by the handle **(J)**.
9. Plug the low-voltage connector in, and fold the longitudinal fastener of the coupling downwards. **(Fig. 2)**

- The withdrawable part is inserted in the panel! -

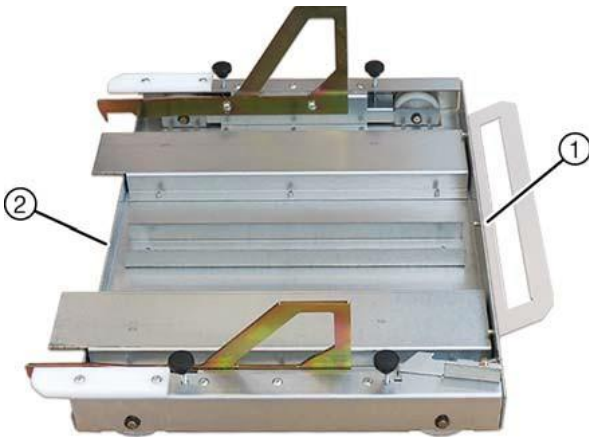
Fig. 2

Fig. 3

110-9123.0 / 00

Fig. 45: Rear page of operating instructions

For panels with removable voltage transformers:



(1) Operating side

(2) Rear side

Fig. 46: Service truck to insert and remove the removable voltage transformers

9 Customer support

9.1 Service

If the NXAIR switchgear should not function as described, the Installation and Operating Instructions provide information for the avoidance and elimination of faults. For further support, contact the Siemens after-sales service.

9.2 Repairs

Repairs are carried out by fully trained Siemens technicians, who arrive equipped with original spare parts for the switchgear.

9.3 Before you call

To help us deal with your query more quickly, make sure that the following information is at hand:

- Switchgear type (1)
- Serial no. (2)
- Year of manufacture (3)
- Functional unit no. (4)

This information is available on the rating plate on the inside of the high-voltage door and of the door to the low-voltage compartment:

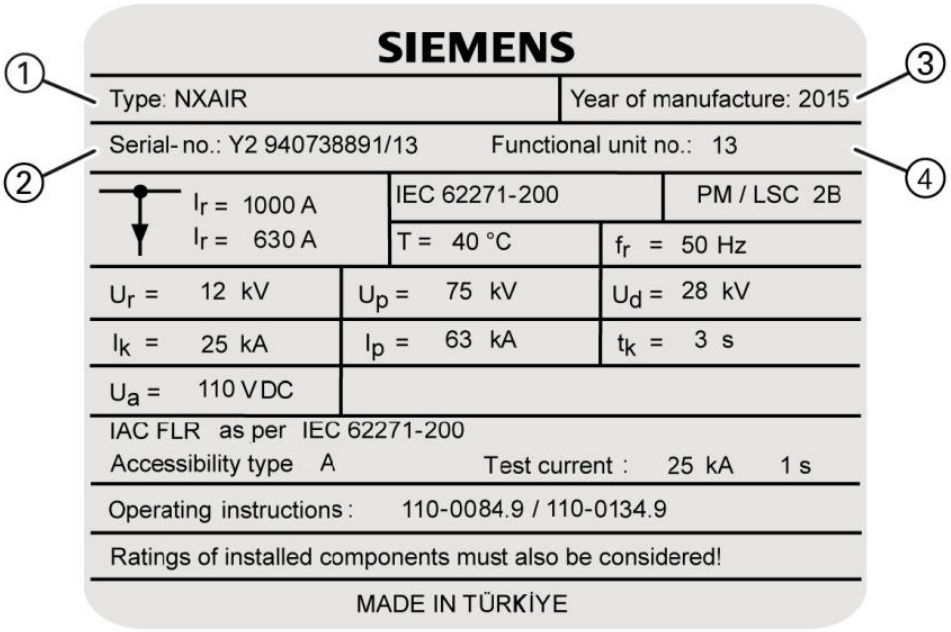


Fig. 47: Rating plate

9.4 Service contact

The Energy Customer Support Center is available:
24 hours a day, 365 days a year.

Telephone: **+49 180 5247000**
Fax: **+49 180 5247001**
Mail to: **support.energy@siemens.com**

10 Operating the circuit-breaker panel

> **INFORMATION**
>
> Read and understand these instructions before attempting operating works.

10.1 Control elements at the front side of the panel

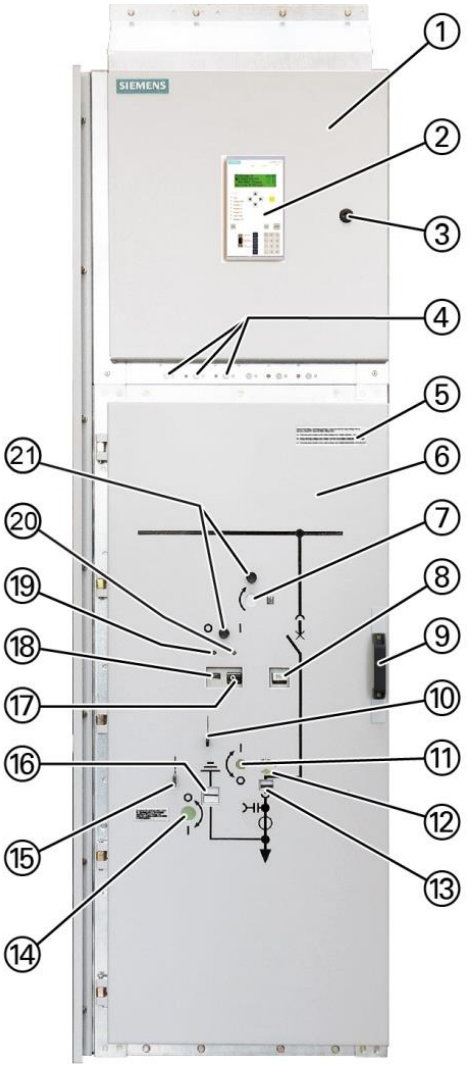


Fig. 48: Control elements on the panel front of the circuit-breaker panel

(1) Door to the low-voltage compartment

(2) Protection device

(3) Locking device for the door to the low-voltage compartment

(4) Test sockets for busbar voltage detecting system (type LRM) as additional component

(5) Instruction label for closing the high-voltage door

(6) High-voltage door

(7) Opening for charging the spring energy store in the circuit-breaker manually (covered)

(8) Spring state indicator for the closing spring

(9) Handle for opening the high-voltage door

(10) Operating slide for opening and closing the actuating opening for racking the withdrawable circuit-breaker / circuit-breaker truck

(11) Actuating opening for racking the withdrawable circuit-breaker / circuit-breaker truck

(12) Actuating opening for inserting the double-bit key to control racking of the withdrawable circuit-breaker / circuit-breaker truck

(13) Mechanical position indicator for withdrawable circuit-breaker / circuit-breaker truck

(14) Actuating opening for operating the feeder earthing switch

(15) Operating slide for opening and closing the actuating opening for operating the feeder earthing switch

(16) Mechanical position indicator for feeder earthing switch

(17) CLOSED/OPEN indicator of the circuit-breaker

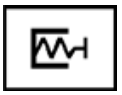
(18) Operations counter for circuit-breaker

(19) Actuating opening for opening the circuit-breaker

(20) Actuating opening for closing the circuit-breaker

(21) Rotary button to close and open the actuating opening located below

10.2 Position indicators visible on high-voltage door

Circuit-breaker: CLOSED position or OPEN position	CLOSED 	OPEN 	–
Withdrawable circuit-breaker / circuit-breaker truck: Service position, intermediate position or test position	Service position 	Intermediate position 	Test position 
Spring state indicator: CHARGED position or NOT CHARGED position	CHARGED 	NOT CHARGED 	–
Feeder earthing switch: CLOSED position or OPEN position	CLOSED 	OPEN 	–

10.3 Access to compartments

Regarding accessibility to the individual compartments, NXAIR switchgear fulfills the loss of service continuity category LSC 2B according to IEC 62271-200.

The degree of protection between the individual compartments is IP2X in standard design.

The type of accessibility is provided as follows:

Compartment		**Type of accessibility**
Switching-device compartment		Interlock-controlled
Voltage transformer compartment		Tool-based
Busbar compartment		Tool-based
Connection compartment	Access from the front side	Interlock-controlled and tool-based
	Access from the rear side	Tool-based

10.4 Opening the high-voltage door

⚠ WARNING

Reduced safety

The closed high-voltage door is an important safety element of the switchgear. The high-voltage door is exclusively opened for performing operational activities inside the switching-device compartment, such as removing or inserting a withdrawable circuit-breaker / circuit-breaker truck.

Close the high-voltage door:

- ⇨ If an activity inside the switching-device compartment is interrupted.
- ⇨ Immediately after an activity inside the switching-device compartment was completed.
- ⇨ Before leaving the panel front.

⚠ CAUTION

Injury

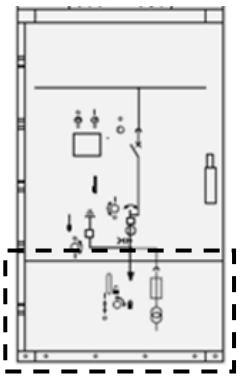
The mechanism inside the withdrawable circuit-breaker / circuit-breaker truck can cause injuries by getting squeezed, caught or cut.

- ⇨ No maintenance or installation work on withdrawable circuit-breakers / circuit-breaker trucks.
- ⇨ Do not undo or remove any bolts.
- ⇨ Do not remove any parts of the covering.

☞ INFORMATION

Circuit-breaker panels with removable voltage transformers have an extra door to the separate voltage transformer compartment.

If the panel front shows this extra door, first read and understand the information regarding the handling of the removable voltage transformers; see chapter 19.



Preconditions

- Withdrawable circuit-breaker / circuit-breaker truck in test position
- Spring energy store in the circuit-breaker discharged
- High-voltage door closed
- Padlock (optional) removed from door handle

Procedure

⇨ Pull door handle upwards and open the high-voltage door.

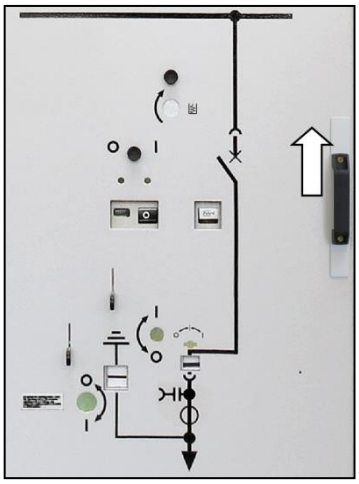


Fig. 49: Opening the high-voltage door of the circuit-breaker panel

✓ The high-voltage door is open.

10.5 Closing the high-voltage door

⚠ WARNING

Reduced safety

The closed high-voltage door is an important safety element of the switchgear. The high-voltage door is exclusively open for performing operational activities inside the switching-device compartment, such as removing or inserting a withdrawable circuit-breaker / circuit-breaker truck.

Close the high-voltage door:

⇨ If an activity inside the switching-device compartment is interrupted.

⇨ Immediately after an activity inside the switching-device compartment was completed.

⇨ Before leaving the panel front.

⚠ CAUTION

Injury

The mechanism inside the withdrawable circuit-breaker / circuit-breaker truck can cause injuries by getting squeezed, caught or cut.

⇨ Do not remove any parts of the covering.

INFORMATION

Unexpected motor noise and vibration

When auxiliary voltage is applied, a motor inside the circuit-breaker starts immediately after plugging on the low-voltage connector in order to charge the spring energy store. This is a permissible operating state.

⇨ Expect motor noise and low vibration.

Instruction label on high-voltage door:
In addition to these instructions, an instruction label on the high-voltage door describes safe closing of the high-voltage door before executing a switching operation.

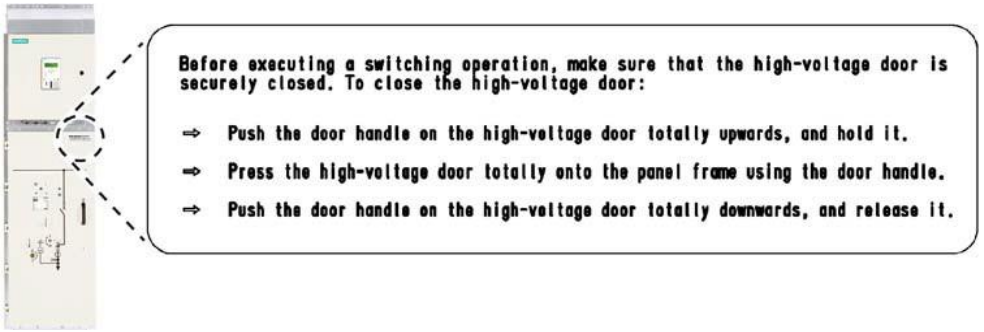


Fig. 50: Instruction label on high-voltage door

Preconditions
Either without withdrawable circuit-breaker / circuit-breaker truck in the panel, or:

- Withdrawable circuit-breaker / circuit-breaker truck inserted in the panel in test position
- Low-voltage connector plugged on
- High-voltage door open
- For high-voltage doors with ventilation flap: Ventilation flap in operational position
- Padlock for door handle (optional) available

Procedure

⇨ Push the door handle on the high-voltage door totally upwards, and hold it.

⇨ Press the high-voltage door totally onto the panel frame using the door handle.

⇨ Push the door handle on the high-voltage door totally downwards, and release it.

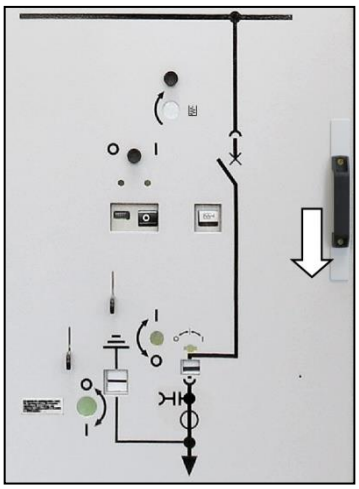


Fig. 51: Closing the high-voltage door of the circuit-breaker panel

⇨ Fit a padlock (optional) to the door handle and close it.

✓ The high-voltage door is closed.

10.6 High-voltage door with ventilation flap

On high-voltage doors with ventilation flap, a position indicator shows the position of the ventilation flap.

NOTICE

Incorrect position of ventilation flap

Closing the high-voltage door when the ventilation flap is not in operational position could cause damage in the switching-device compartment.

⇨ The position indicator of the ventilation flap in the high-voltage door must indicate operational position.

Reading the position indicator

⇨ Read the position indicator for the ventilation flap in the high-voltage door:

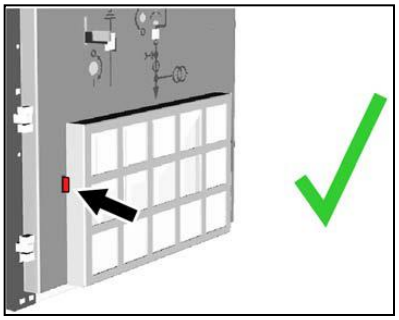


Fig. 52: Ventilation flap in operational position, positive indication

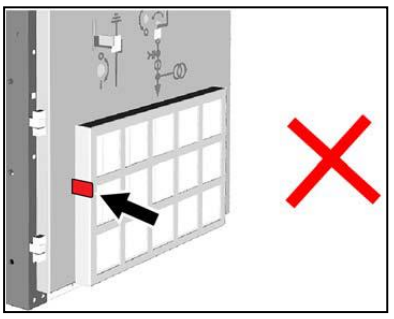


Fig. 53: Ventilation flap **not** in operational position, negative indication

Ventilation flap in the high-voltage door in operational position
If the position indicator shows that the ventilation flap in the high-voltage door is not in operational position, bring the ventilation flap into operational position as described in the following.

Procedure

⇨ Open the high-voltage door.

⇨ Move the ventilation flap (1) on the inside of the high-voltage door from the center of the lower edge upwards away from the high-voltage door until the mechanism of the position indicator (2) reaches the end stop (3).

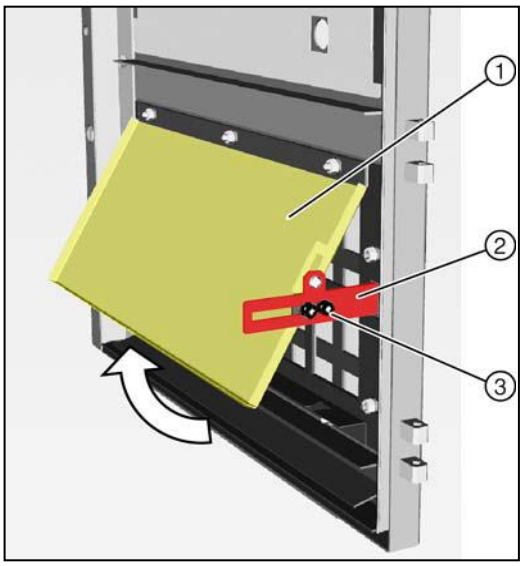


Fig. 54: Inside view of high-voltage door

⇨ Now the mechanism holds the ventilation flap in this position by itself.

⇨ Close the high-voltage door.

✓ The ventilation flap in the high-voltage door is in operational position.

10.7 Positions of the withdrawable circuit-breaker / circuit-breaker truck

General description of positions of the withdrawable circuit-breaker / circuit-breaker truck:

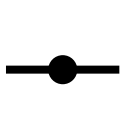
Service position
The withdrawable circuit-breaker / circuit-breaker truck is connected with the busbar system and the outgoing feeder. The auxiliary circuit of the withdrawable circuit-breaker / circuit-breaker truck is connected through the low-voltage connector.

Test position
The withdrawable circuit-breaker / circuit-breaker truck is disconnected from the busbar system and the outgoing feeder. The auxiliary circuit of the withdrawable circuit-breaker / circuit-breaker truck is connected through the low-voltage connector.

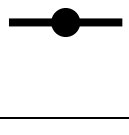
Disconnected position
The withdrawable circuit-breaker / circuit-breaker truck is disconnected from the busbar system and the outgoing feeder. The auxiliary circuit is disconnected by pulling out the low-voltage connector.

Short instruction for racking the withdrawable circuit-breaker / circuit-breaker truck:

Racking the withdrawable circuit-breaker / circuit-breaker truck manually from test / disconnected position to service position:

Step 1 Insert and turn double-bit key			**Step 2** Insert and turn racking crank as far as it will go and pull it off	**Step 3** Turn and remove double-bit key		
from	by	to		from	by	to
						

Racking the withdrawable circuit-breaker / circuit-breaker truck manually from service position to test / disconnected position:

Step 1 Insert and turn double-bit key			**Step 2** Insert and turn racking crank as far as it will go and pull it off	**Step 3** Turn and remove double-bit key		
from	by	to		from	by	to
						

10.8 Racking the withdrawable circuit-breaker / circuit-breaker truck to service position

NOTICE

Maloperation

Racking the withdrawable circuit-breaker / circuit-breaker truck to service position is only permissible if the circuit- breaker is in OPEN position.

⇨ Check through the inspection window in the high-voltage door if the circuit-breaker is in OPEN position.

⇨ Switch the circuit-breaker to OPEN position, if required.

Position indicators on high-voltage door for circuit-breaker types 3AE1 and 3AE5

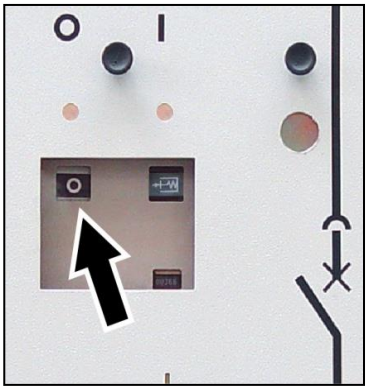


Fig. 55: Circuit-breaker type 3AE1: Position indicator OPEN

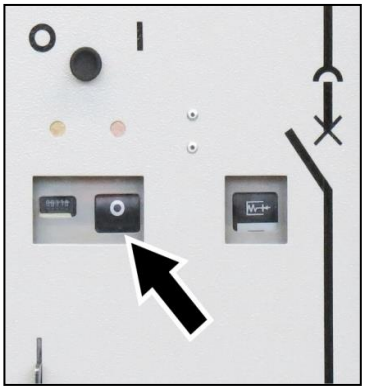


Fig. 56: Circuit-breaker type 3AE5: Position indicator OPEN

Preconditions

- Withdrawable circuit-breaker / circuit-breaker truck in test position
- Low-voltage connector plugged on
- High-voltage door closed
- Circuit-breaker in OPEN position
- Feeder earthing switch in OPEN position
- Racking crank for moving the withdrawable circuit-breaker / circuit-breaker truck available
- Double-bit key available
- Padlock (optional) removed from operating slide
- For electromagnetic interlock (optional):
  - Electromagnetic interlock deactivated
- For panels with removable voltage transformers (optional):
  - Door to voltage transformer compartment closed and screwed tight

Operating the circuit-breaker panel

The actuating opening for racking the withdrawable circuit-breaker / circuit-breaker truck is located on the control board of the high-voltage door.

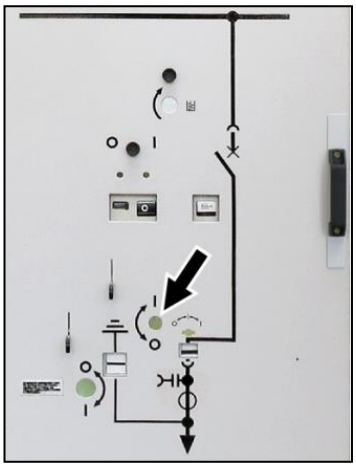


Fig. 57: Actuating opening for racking the withdrawable circuit-breaker / circuit-breaker truck

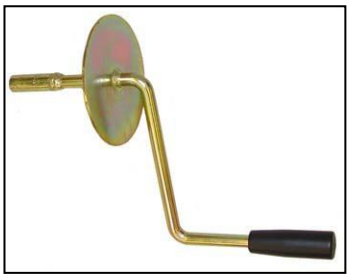


Fig. 58: Racking crank

Fig. 59: Double-bit key, diameter 5 mm

Procedure

NOTICE

Maloperation

All interlocks are only released when the withdrawable circuit-breaker / circuit-breaker truck is in a stable end position.

⇨ Rack the withdrawable circuit-breaker / circuit-breaker truck absolutely until end position.

⇨ Lift the operating slide and hold it.

⇨ To release access to the withdrawable circuit-breaker / circuit-breaker truck, insert the double-bit key and turn clockwise as far as it will go (that is 90°).

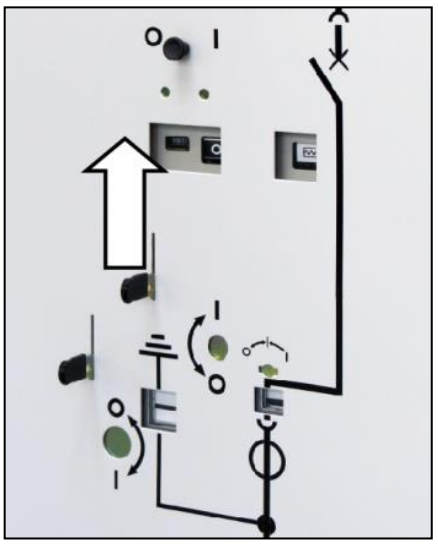


Fig. 60: Lifting the operating slide

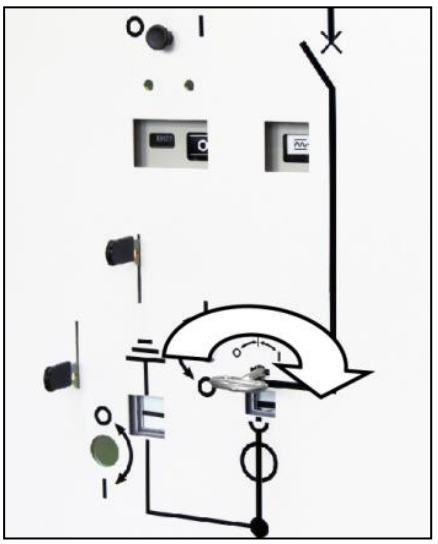


Fig. 61: Turning the double-bit key clockwise

⇨ Push the racking crank for moving the withdrawable circuit-breaker / circuit-breaker truck onto the operating shaft, and turn clockwise as far as it will go.

⇨ Remove the racking crank for moving the withdrawable circuit-breaker / circuit-breaker truck.

⇨ Turn the double-bit key clockwise as far as it will go (that is 90°) to interlock the withdrawable circuit-breaker / circuit-breaker truck.

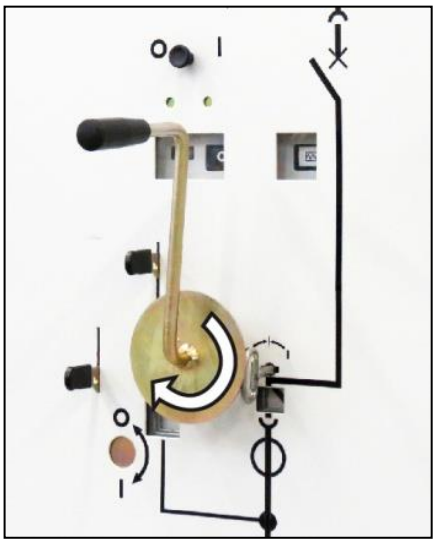


Fig. 62: Turning the racking crank clockwise

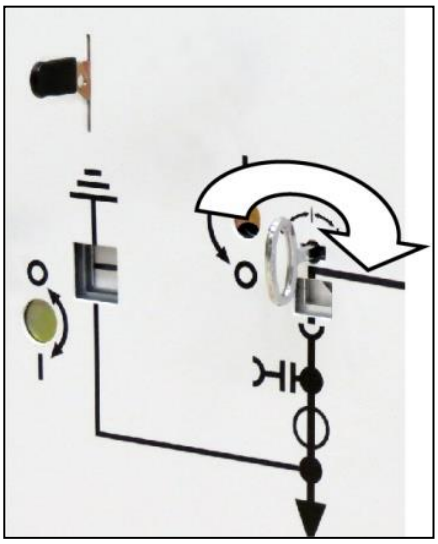


Fig. 63: Turning the double-bit key clockwise

⇨ Remove the double-bit key.

⇨ To close the actuating opening, push the operating slide down as far as it will go.

⇨ Fit a padlock (optional) to the operating slide and close it.

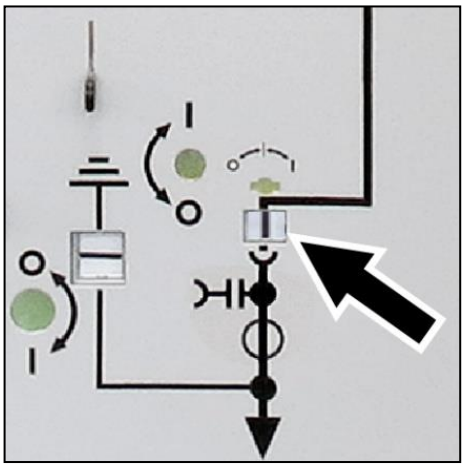


Fig. 64: Position indicator in service position

✓ The withdrawable circuit-breaker / circuit-breaker truck has been racked from test position to service position; the position indicator is in service position (vertical bar).

10.9 Racking the withdrawable circuit-breaker / circuit-breaker truck to test position

NOTICE

Maloperation

Racking the withdrawable circuit-breaker / circuit-breaker truck to test position is only permissible if the circuit-breaker is in OPEN position.

⇨ Check through the inspection window in the high-voltage door if the circuit-breaker is in OPEN position.

⇨ Switch the circuit-breaker to OPEN position, if required.

Position indicators on high-voltage door for circuit-breaker types 3AE1 and 3AE5

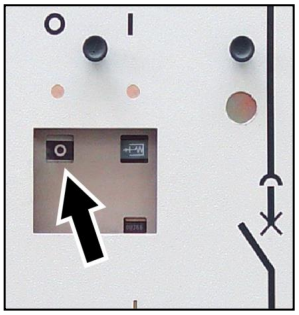


Fig. 65: Circuit-breaker type 3AE1: position indicator OPEN

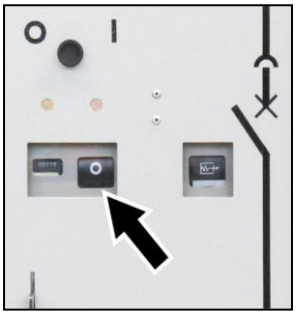


Fig. 66: Circuit-breaker type 3AE5: position indicator OPEN

Preconditions

- Withdrawable circuit-breaker / circuit-breaker truck in service position
- Circuit-breaker in OPEN position
- Racking crank for moving the withdrawable circuit-breaker / circuit-breaker truck available
- Double-bit key available
- Padlock (optional) removed from operating slide
- For electromagnetic interlock (optional):
  - Electromagnetic interlock deactivated
- For panels with removable voltage transformers (optional):
  - Door to voltage transformer compartment closed and screwed tight

The actuating opening for racking the withdrawable circuit-breaker / circuit-breaker truck is located on the control board of the high-voltage door.

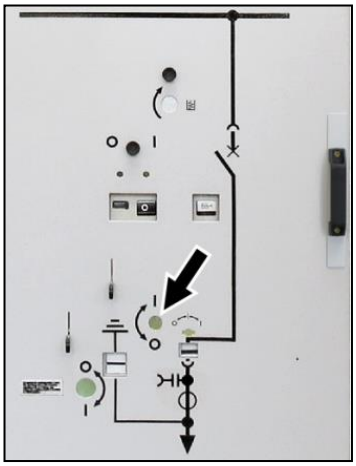


Fig. 67: Actuating opening for racking the withdrawable circuit-breaker / circuit-breaker truck

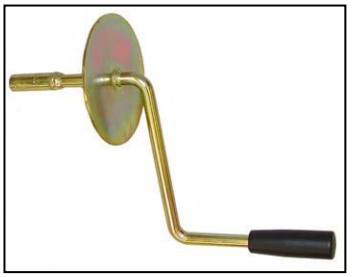


Fig. 68: Racking crank

Fig. 69: Double-bit key, diameter 5 mm

Procedure

NOTICE

Maloperation

All interlocks are only released when the withdrawable circuit-breaker / circuit-breaker truck is in a stable end position.

⇨ Always rack the withdrawable circuit-breaker / circuit-breaker truck completely up to the end position.

⇨ Lift the operating slide and hold it.

⇨ To release access to the withdrawable circuit-breaker / circuit-breaker truck, insert the double-bit key and turn counter-clockwise as far as it will go (that is 90°).

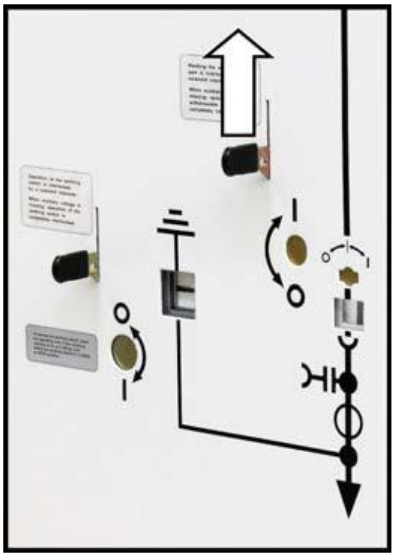


Fig. 70: Lifting the operating slide

Fig. 71: Turning the double-bit key counter-clockwise

⇨ Push the racking crank for moving the withdrawable circuit-breaker / circuit-breaker truck onto the operating shaft, and turn counter-clockwise as far as it will go.

⇨ Remove the racking crank for moving the withdrawable circuit-breaker / circuit-breaker truck.

⇨ Turn the double-bit key counter-clockwise as far as it will go (that is 90°) to interlock the withdrawable circuit-breaker / circuit-breaker truck.

Fig. 72: Turning the racking crank counter-clockwise

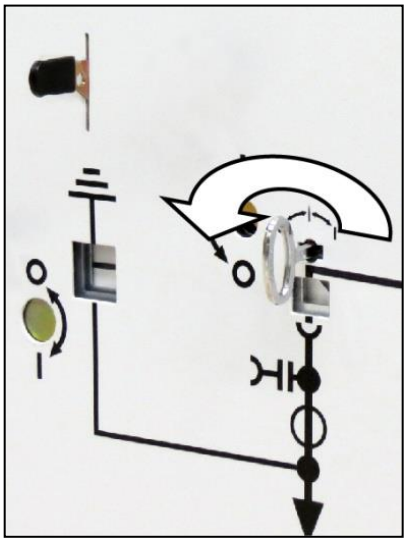


Fig. 73: Turning the double-bit key counter-clockwise

⇨ Remove the double-bit key.

⇨ To close the actuating opening, push the operating slide down as far as it will go.

⇨ Fit a padlock (optional) to the operating slide and close it.

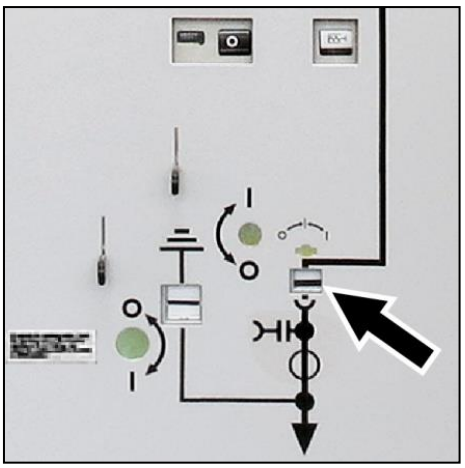


Fig. 74: Position indicator in test position

✓ The withdrawable circuit-breaker / circuit-breaker truck has been racked from service position to test position; the position indicator is in test position (horizontal bar).

10.10 Closing the circuit-breaker electrically

NOTICE

Conflicting operation

Operating the circuit-breaker electrically is possible locally or from a central control. The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ Depending on the intended operating mode, set the panel to either local or remote control (for example by switching the local-remote switch).

INFORMATION

If an undervoltage release is fitted, it must be connected to the auxiliary voltage for the switching operation, as otherwise closing is not possible.

INFORMATION

Unexpected switching noise and vibration

Operating the circuit-breaker discharges and/or charges the spring energy store abruptly. This causes a short loud noise and low vibration.

⇨ Expect switching noise and low vibration from inside the circuit-breaker.

INFORMATION

The opening spring is charged during the closing operation.

Preconditions

- Withdrawable circuit-breaker / circuit-breaker truck in service position or in test position
- Circuit-breaker in OPEN position
- Spring state indicator for the closing spring shows CHARGED
- High-voltage door closed
- Auxiliary voltage for the panel connected
- Remote or local control

Procedure

⇨ Close the circuit-breaker via central or local electrical control element.

After closing, the closing spring is immediately automatically charged by the motor and the spring state indicator changes to CHARGED.

Change of the spring state indicator during closing operation:

Charged Discharged Charged

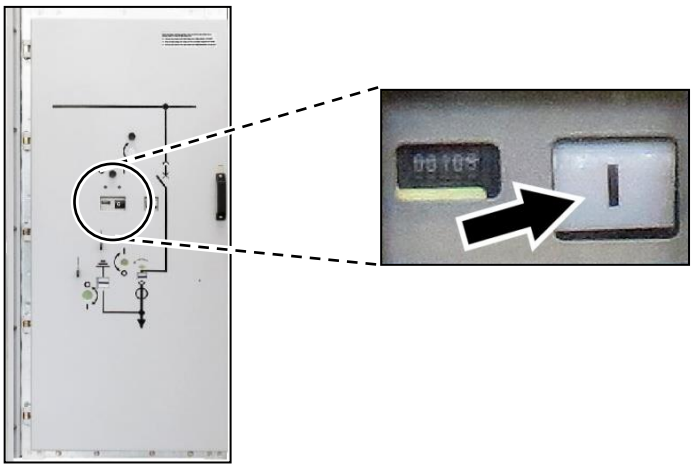


Fig. 75: Position indicator on the circuit-breaker, closed
(circuit-breaker 3AE5 as an example)

✓ The position indicator on the circuit-breaker changes from 0 position to I position.
The operations counter is increased by 1. The circuit-breaker is closed.

10.11 Opening the circuit-breaker electrically

NOTICE

Conflicting operation

Operating the circuit-breaker electrically is possible locally or from a central control. The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ Depending on the intended operating mode, set the panel to either local or remote control (for example by switching the local-remote switch).

INFORMATION

Unexpected switching noise and vibration

Operating the circuit-breaker discharges and/or charges the spring energy store abruptly. This causes a short loud noise and low vibration.

⇨ Expect switching noise and low vibration from inside the circuit-breaker.

INFORMATION

The opening spring is charged during the closing operation.

Preconditions

- Withdrawable circuit-breaker / circuit-breaker truck in service position or in test position
- Circuit-breaker in CLOSED position
- Spring state indicator for the closing spring shows CHARGED
- High-voltage door closed
- Auxiliary voltage for the panel connected
- Remote or local control

Procedure

⇨ Open the circuit-breaker via central or local electrical control element.

The spring state indicator for the closing spring does not change.

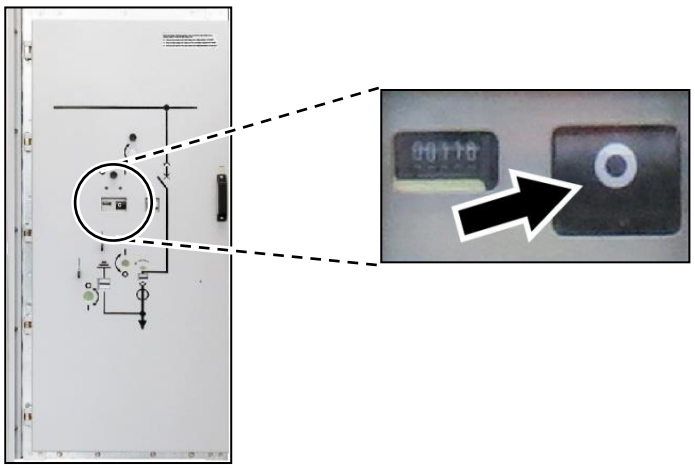


Fig. 76: Position indicator on the circuit-breaker, open
(circuit-breaker 3AE5 as an example)

✓ The position indicator on the circuit-breaker changes from I position to 0 position.
The circuit-breaker is open.

10.12 Closing the circuit-breaker manually

NOTICE

Conflicting operation

The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ For operating the circuit-breaker manually, set the panel to local control, for example by switching the local-remote switch to LOCAL position.

INFORMATION

Auxiliary voltage for the panel connected

If the auxiliary voltage is disconnected when closing the circuit-breaker manually, the spring energy store for closing the circuit-breaker is no longer recharged automatically.

⇨ Connect the auxiliary voltage before closing the circuit-breaker manually. Otherwise the spring energy store must be recharged manually with a hand crank.

INFORMATION

If an undervoltage release is fitted, it must be connected to the auxiliary voltage for the switching operation, as otherwise closing is not possible.

INFORMATION

Unexpected switching noise and vibration

Operating the circuit-breaker discharges and/or charges the spring energy store abruptly. This causes a short loud noise and low vibration.

⇨ Expect switching noise and low vibration from inside the circuit-breaker.

INFORMATION

The opening spring is charged during the closing operation.

Preconditions

- Withdrawable circuit-breaker / circuit-breaker truck in service position or in test position
- Circuit-breaker in OPEN position
- Spring state indicator for the closing spring shows CHARGED
- High-voltage door closed
- Panel set to local control
- Padlock (optional) removed from actuating opening
- Push rod available

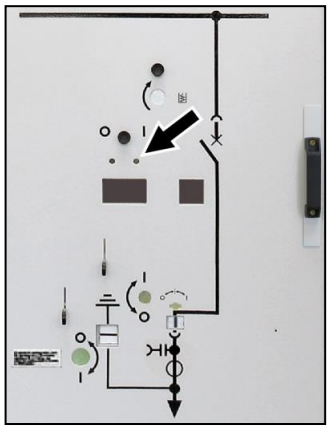


Fig. 77: High-voltage door with actuating opening

Fig. 78: Push rod

Procedure

⇨ Turn cover of actuating opening aside using the rotary button located over it.

⇨ Insert the push rod through the actuating opening in the high-voltage door and operate the ON pushbutton until the switching noise of the circuit-breaker can be heard.

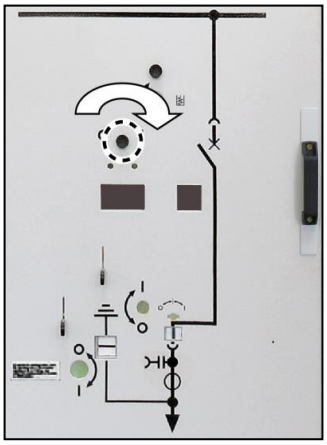


Fig. 79: Rotary button

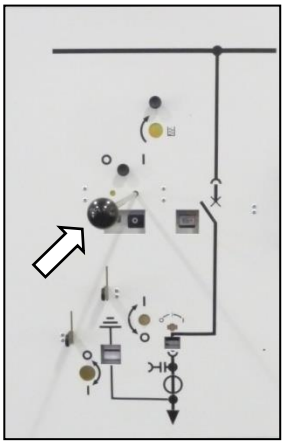


Fig. 80: Push rod inserted

After closing, the closing spring is immediately automatically charged by the motor and the spring state indicator changes to CHARGED.

Change of the spring state indicator during closing operation:

Charged Discharged Charged

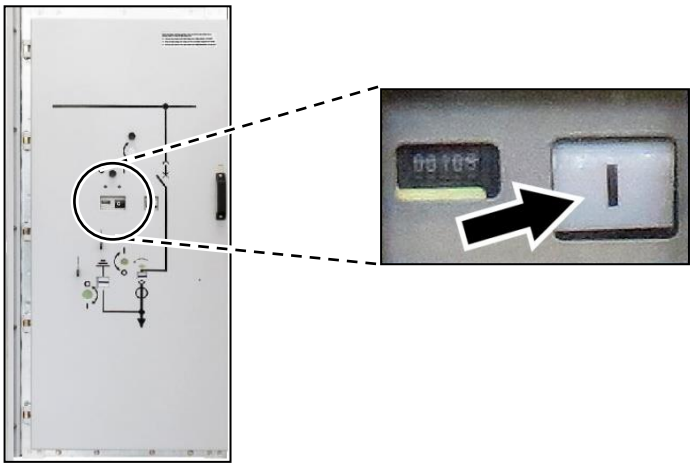


Fig. 81: Position indicator on the circuit-breaker, closed
(circuit-breaker 3AE5 as an example)

⇨ Take the push rod out of the actuating opening.

⇨ Fit a padlock (optional) to the actuating opening and close it.

✓ The position indicator on the circuit-breaker changes from 0 position to I position.
The operations counter is increased by 1. The circuit-breaker is closed.

10.13 Opening the circuit-breaker manually

NOTICE

Conflicting operation

The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ For operating the circuit-breaker manually, set the panel to local control, for example by switching the local-remote switch to LOCAL position.

INFORMATION

Unexpected switching noise and vibration

Operating the circuit-breaker discharges and/or charges the spring energy store abruptly. This causes a short loud noise and low vibration.

⇨ Expect switching noise and low vibration from inside the circuit-breaker.

INFORMATION

The opening spring is charged during the closing operation.

Preconditions

- Withdrawable circuit-breaker / circuit-breaker truck in service position or in test position
- Circuit-breaker in CLOSED position
- High-voltage door closed
- Panel set to local control
- Padlock (optional) removed from actuating opening
- Push rod available

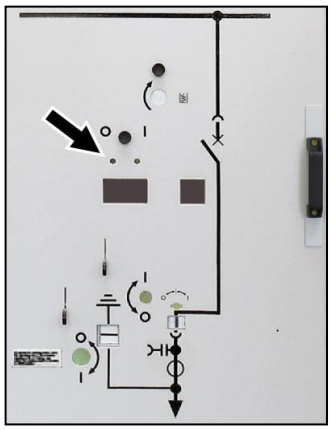


Fig. 82: High-voltage door with actuating opening

Fig. 83: Push rod

Procedure

⇨ Turn cover of actuating opening aside using the rotary button located over it.

⇨ Insert the push rod through the actuating opening in the high-voltage door and operate the OFF pushbutton until the switching noise of the circuit-breaker can be heard.

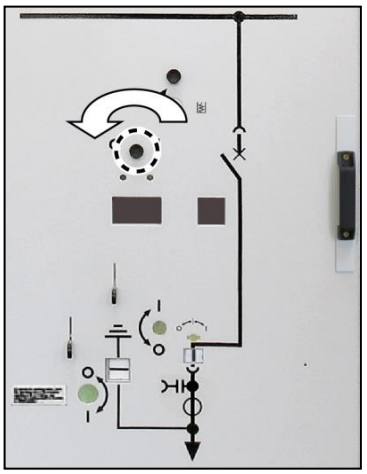


Fig. 84: Rotary button

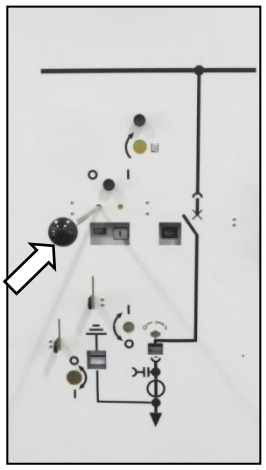


Fig. 85: Push rod inserted

The spring state indicator for the closing spring does not change.

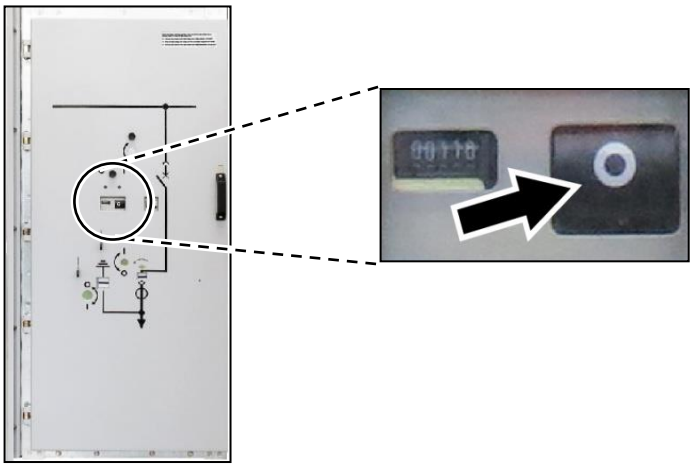


Fig. 86: Position indicator on the circuit-breaker, open
(circuit-breaker 3AE5 as an example)

⇨ Take the push rod out of the actuating opening.

⇨ Fit a padlock (optional) to the actuating opening and close it.

✓ The position indicator on the circuit-breaker changes from I position to 0 position.
The circuit-breaker is open.

10.14 Discharging the spring energy store

NOTICE

Conflicting operation

The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ For operating the circuit-breaker manually, set the panel to local control, for example by switching the local-remote switch to LOCAL position.

INFORMATION

Discharging the spring energy store can only be done manually.

INFORMATION

Unexpected switching noise and vibration

The spring energy store is discharged abruptly. This causes a short loud noise and low vibration.

⇨ Expect noise and low vibration from inside the circuit-breaker.

Preconditions

- Withdrawable circuit-breaker / circuit-breaker truck in test position
- Circuit-breaker in CLOSED position
- Spring state indicator for the closing spring shows CHARGED
- High-voltage door closed
- Panel set to local control
- Auxiliary voltage for the panel disconnected
- Push rod available

Procedure

The operating sequence is OPEN-CLOSE-OPEN manually.

⇨ Open the circuit-breaker manually by using the push rod.

⇨ Close the circuit-breaker manually by using the push rod.

Change of the spring state indicator during closing operation:

Charged Discharged

⇨ Open the circuit-breaker manually by using the push rod.

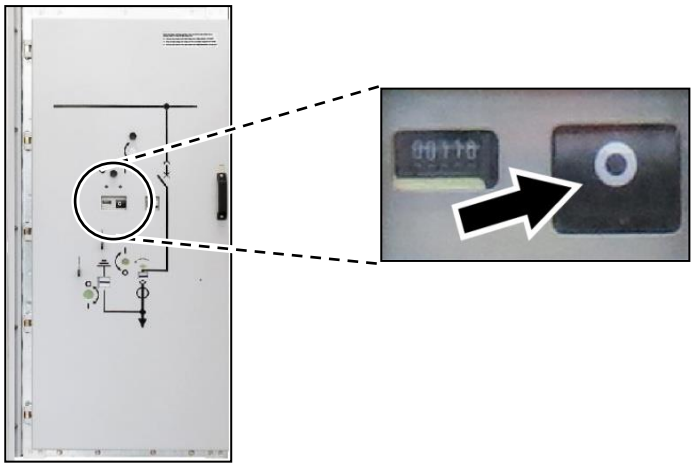


Fig. 87: Position indicator on the circuit-breaker, open
(circuit-breaker 3AE5 as an example)

✓ The spring energy store for operating the circuit-breaker is discharged.

10.15 Charging the spring energy store manually

In order to operate the circuit-breaker, it is necessary that the spring energy store in the circuit-breaker is charged. If auxiliary voltage is connected, the spring energy store is recharged via a motor inside the circuit-breaker immediately after closing the circuit-breaker. The spring state indicator for the closing spring then changes from DISCHARGED to CHARGED. After that, the energy required for the operating sequence OPEN-CLOSE-OPEN is stored in the circuit-breaker.
If the auxiliary voltage is disconnected, the spring energy store for operating the circuit-breaker is no longer charged automatically by the motor after closing the circuit-breaker. To operate the circuit-breaker in spite of this, the spring energy store can be charged manually with a hand crank. This can be done both in test position and in service position.

⚠ WARNING

Injury when using inappropriate tool

When the auxiliary voltage is connected, the motor immediately recharges the spring energy store after the closing operation. If the hand crank does not have a freewheel, the hand crank will rotate.

⇨ Use only the original hand crank with freewheel.

NOTICE

Maloperation

Racking the withdrawable circuit-breaker / circuit-breaker truck while the hand crank is inserted in the actuating opening can damage the circuit-breaker.

⇨ Remove the hand crank from the actuating opening immediately after manual charging of the spring energy store.

⇨ Never leave the hand crank in the actuating opening.

NOTICE

Conflicting operation

The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ For charging the spring energy store manually, set the panel to local control, for example by switching the local-remote switch to LOCAL position.

INFORMATION

Rhythmical noises

Turning the hand crank for charging the spring energy store in the circuit-breaker causes rhythmical noises and low vibration.

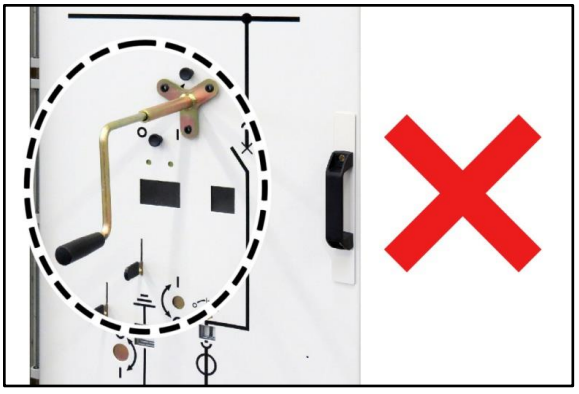


Fig. 88: Hand crank not removed

Preconditions

- Withdrawable circuit-breaker / circuit-breaker truck in service position or in test position
- Circuit-breaker in OPEN position or CLOSED position
- Spring state indicator for the closing spring shows DISCHARGED
- High-voltage door closed
- Auxiliary voltage for the panel disconnected
- Hand crank available

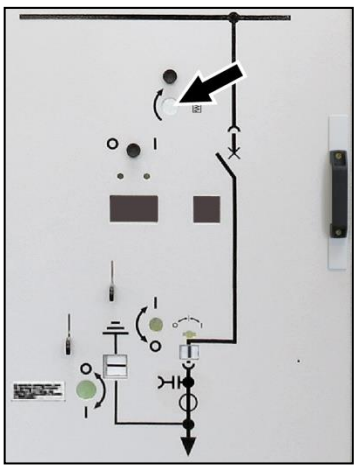


Fig. 89: Actuating opening on high-voltage door

Fig. 90: Hand crank for manual charging of the spring energy store in the circuit-breaker

Procedure

⇨ Turn the access cover of operating shaft aside using the rotary button located over it.

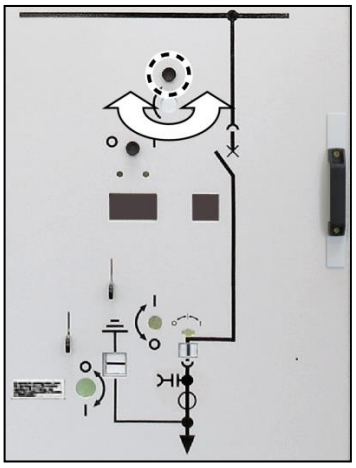


Fig. 91: Rotary button on high-voltage door

⇨ Push the hand crank onto the operating shaft.

⇨ Hold the freewheel (1) and turn the hand crank (2) clockwise approx. 50 turns until the CHARGED indication appears in the inspection window (3).

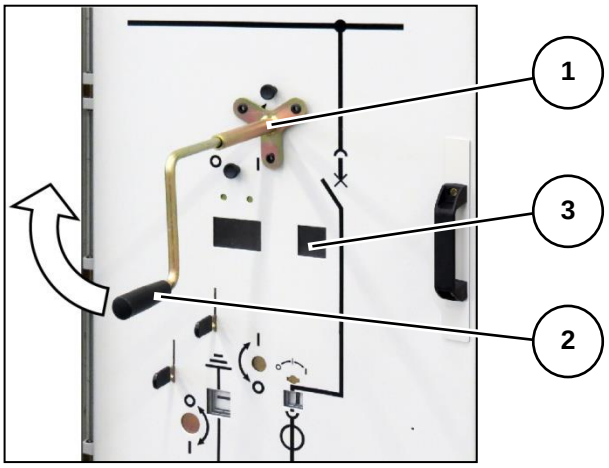


Fig. 92: Hand crank on high-voltage door

The closing spring is latched in automatically. The spring state indicator for the closing spring changes to CHARGED.

⇨ Remove the hand crank.

⇨ Close the access cover of operating shaft using the rotary button.

✓ Manual charging of the spring energy store is completed. The energy required for the operating sequence (OPEN-)CLOSE-OPEN is stored in the spring energy store.

10.16 Earthing the feeder manually

NOTICE

Maloperation

A switching operation once started must be completed totally! A switching operation that was not completed cannot be turned back.

⇨ Do not try to remove the operating lever at intermediate positions.

NOTICE

Maloperation

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

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

Instruction label on high-voltage door:
In addition to these instructions, an instruction label on the high-voltage door informs about proper handling of the operating lever for the feeder earthing switch.

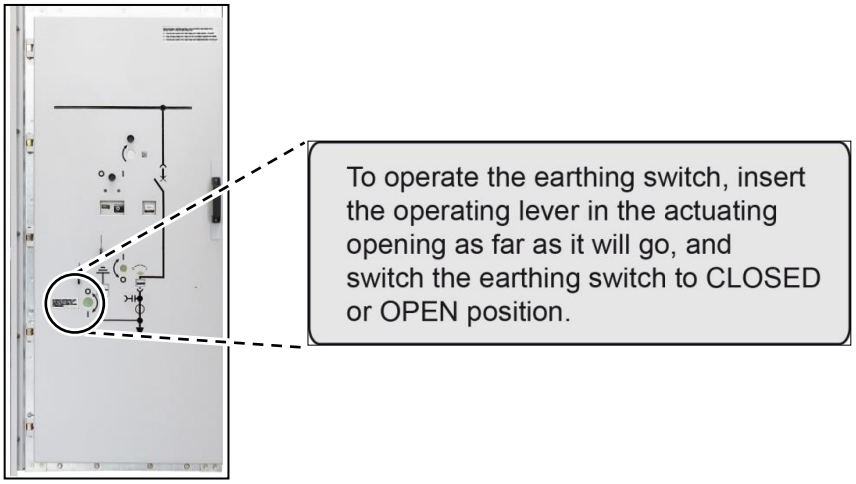


Fig. 93: Instruction label on the high-voltage door

Preconditions

- High-voltage door closed
- Feeder to be earthed is isolated
- Withdrawable circuit-breaker / circuit-breaker truck in test position
- Operating lever available
- Padlock (optional) removed from operating slide
- For electromagnetic interlock (optional):
  - Electromagnetic interlock deactivated

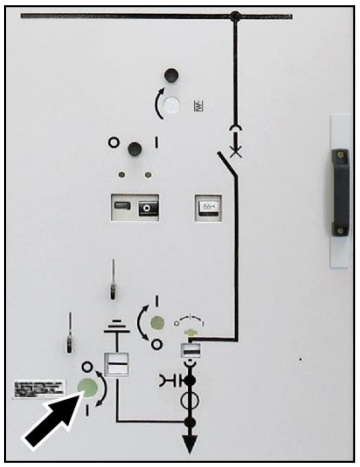


Fig. 94: Actuating opening on high-voltage door

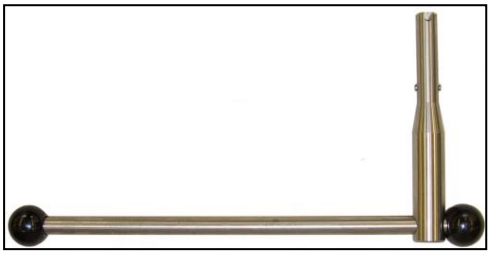


Fig. 95: Operating lever for operating the feeder earthing switch

Procedure

⇨ Lift the operating slide to release the actuating opening.

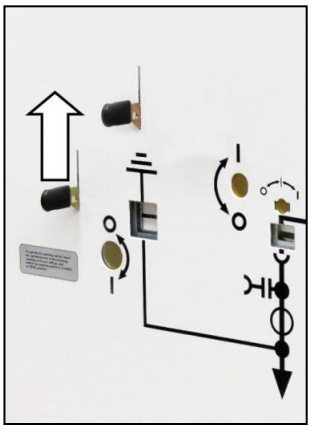


Fig. 96: Lifting the operating slide

⇨ While keeping the operating slide lifted, insert the operating lever slightly into the actuating opening such that the pins in the operating lever are horizontal.

⇨ Insert the operating lever into the actuating opening as far as it will go.

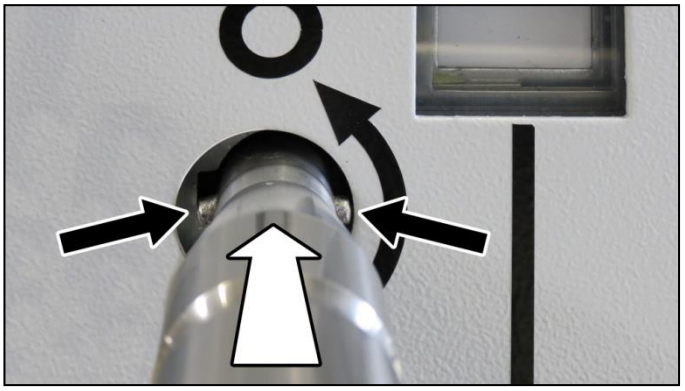


Fig. 97: Inserting the operating lever

⇨ Hold the operating lever with one hand straight in the actuating opening and turn the operating lever with the other hand clockwise 180° until the feeder earthing switch changes to CLOSED position.

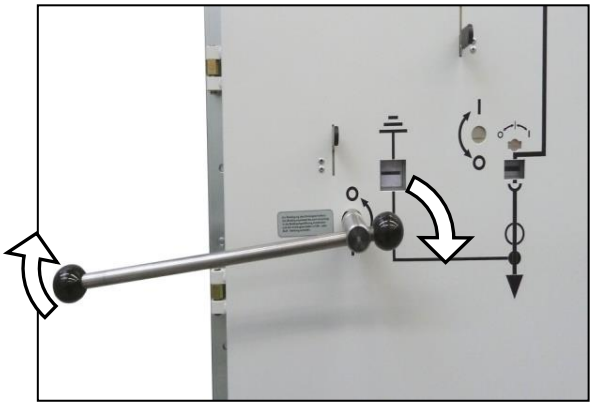


Fig. 98: Turning the operating lever clockwise

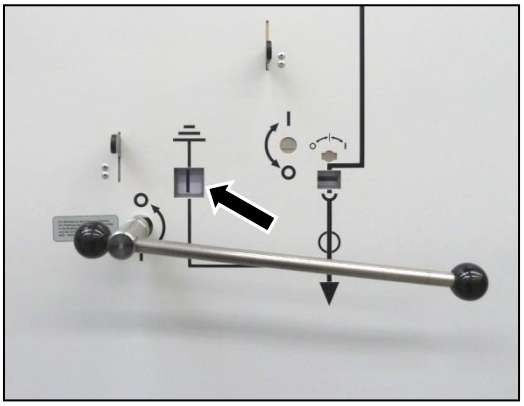


Fig. 99: Position indicator on high-voltage door in CLOSED position

⇨ Remove the operating lever.

⇨ To close the actuating opening, push the operating slide down as far as it will go.

⇨ Fit a padlock (optional) to the operating slide and close it.

✓ The feeder is earthed.

10.17 De-earthing the feeder manually

NOTICE

Maloperation

A switching operation once started must be completed totally! A switching operation that was not completed cannot be turned back.

⇨ Do not try to remove the operating lever at intermediate positions.

NOTICE

Maloperation

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

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

Instruction label on high-voltage door:
In addition to these instructions, an instruction label on the high-voltage door informs about proper handling of the operating lever for the feeder earthing switch.

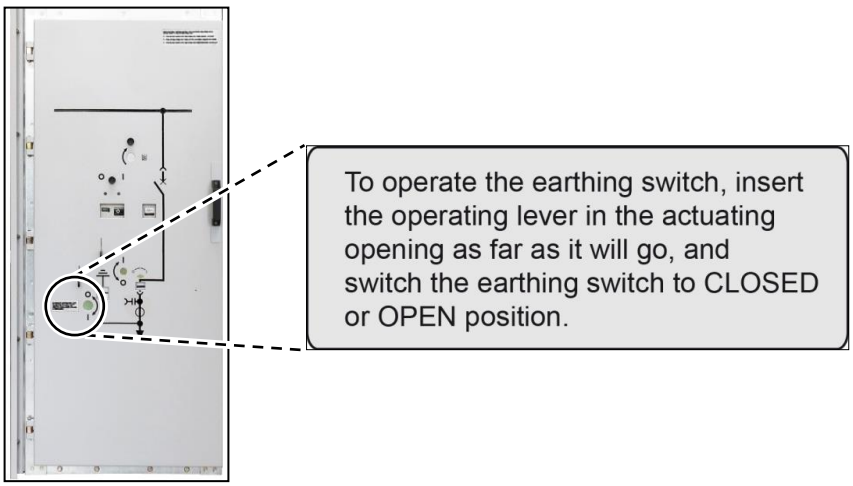


Fig. 100: Instruction label on the high-voltage door

Preconditions

- High-voltage door closed
- Withdrawable circuit-breaker / circuit-breaker truck in test position
- Operating lever available
- Padlock (optional) removed from operating slide
- For electromagnetic interlock (optional):
  - Electromagnetic interlock deactivated

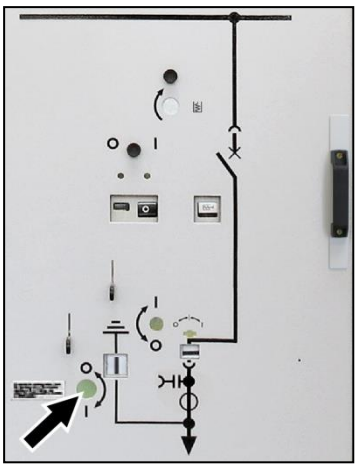


Fig. 101: Actuating opening on high-voltage door

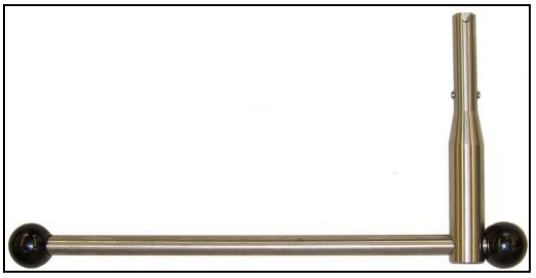


Fig. 102: Operating lever for operating the feeder earthing switch

Procedure

⇨ Lift the operating slide to release the actuating opening.

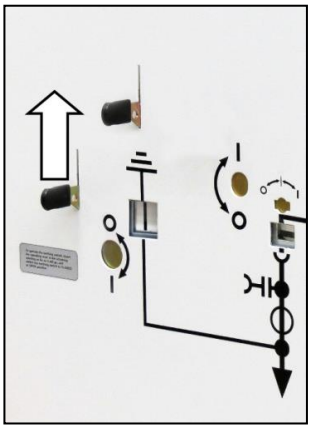


Fig. 103: Lifting the operating slide

⇨ While keeping the operating slide lifted, insert the operating lever slightly into the actuating opening such that the pins in the operating lever are horizontal.

⇨ Insert the operating lever into the actuating opening as far as it will go.

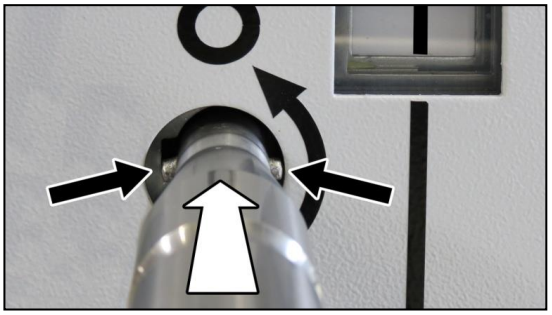


Fig. 104: Inserting the operating lever

⇨ Hold the operating lever with one hand straight in the actuating opening and turn the operating lever with the other hand counter-clockwise 180° until the feeder earthing switch changes to OPEN position.

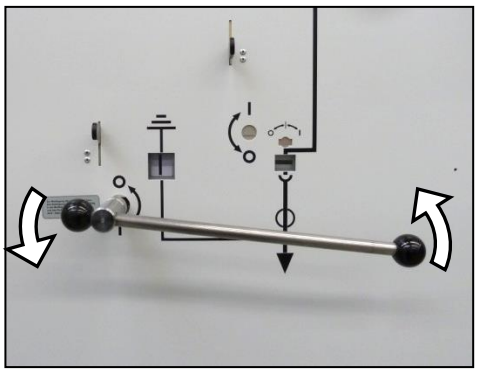


Fig. 105: Turning operating lever counter-clockwise

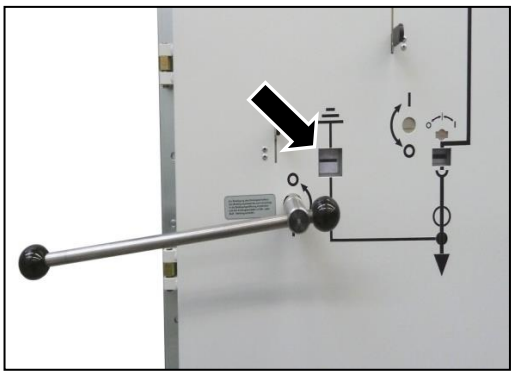


Fig. 106: Position indicator on the high-voltage door in OPEN position

⇨ Remove the operating lever.

⇨ To close the actuating opening, push the operating slide down as far as it will go.

⇨ Fit a padlock (optional) to the operating slide and close it.

✓ The feeder is de-earthed.

10.18 Removing the low-voltage connector

Preconditions

- Withdrawable circuit-breaker / circuit-breaker truck in test position
- Spring energy store in the circuit-breaker discharged
- Auxiliary voltage for the panel disconnected
- High-voltage door open
- Low-voltage connector plugged on

Procedure

⇨ To detach the low-voltage connector, push the longitudinal fastener (1) of the coupling upwards.

⇨ Remove the low-voltage connector (2) carefully to the front.

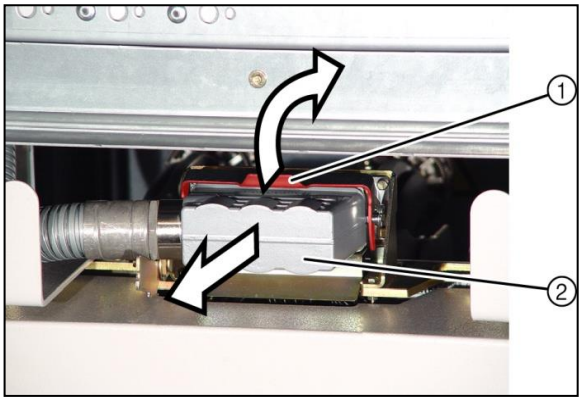


Fig. 107: Removing the low-voltage connector

⇨ Hang the low-voltage connector into the support located underneath the low-voltage compartment.

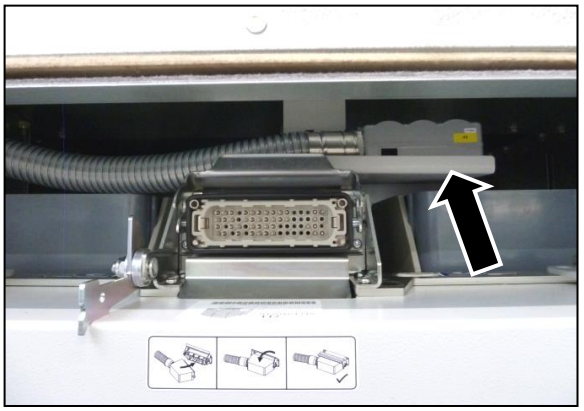


Fig. 108: Low-voltage connector stowed away

⇨ If no withdrawable circuit-breaker / circuit-breaker truck is inserted in the panel and no further operation is executed: Close the high-voltage door.

✓ The removed low-voltage connector is lying in the support located underneath the low-voltage compartment.

10.19 Plugging on the low-voltage connector

INFORMATION

Unexpected motor noise and vibration

When auxiliary voltage is applied, a motor inside the circuit-breaker starts immediately after plugging on the low-voltage connector in order to charge the spring energy store. This is a permissible operating state.

⇨ Expect motor noise and low vibration.

Preconditions

- Withdrawable circuit-breaker / circuit-breaker truck in test position
- Spring energy store in the circuit-breaker discharged
- Auxiliary voltage for the panel disconnected
- High-voltage door open
- Low-voltage connector stowed away

Procedure

INFORMATION

In addition to these instructions, an instruction label on the withdrawable circuit-breaker / circuit-breaker truck informs about plugging on the low-voltage connector.

Follow the advice on the label (3) to push the longitudinal fastener.

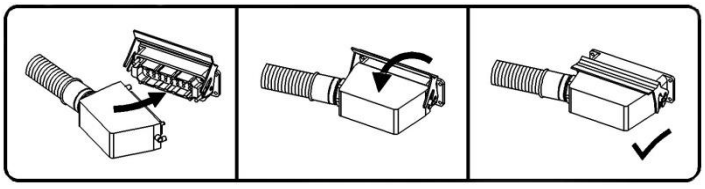


Fig. 109: Instruction label on the withdrawable circuit-breaker / circuit-breaker truck

⇨ Take the low-voltage connector out of the support located underneath the low-voltage compartment.

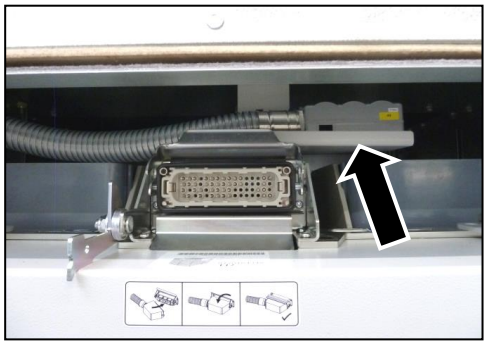


Fig. 110: Low-voltage connector stowed away

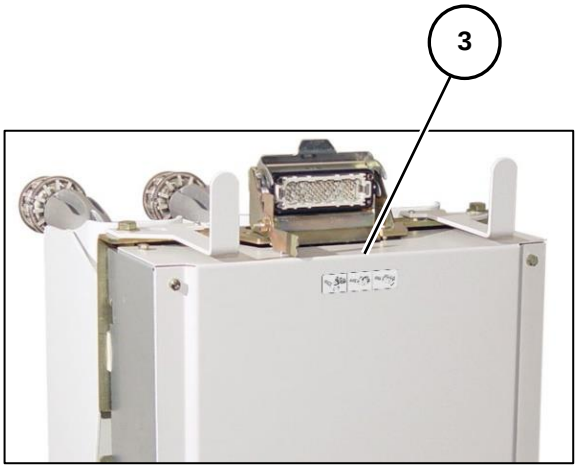


Fig. 111: Instruction label for the low-voltage connector

⇨ Carefully plug on the low-voltage connector (2) from the front.

⇨ To secure the low-voltage connector, push the longitudinal fastener (1) of the coupling downwards.

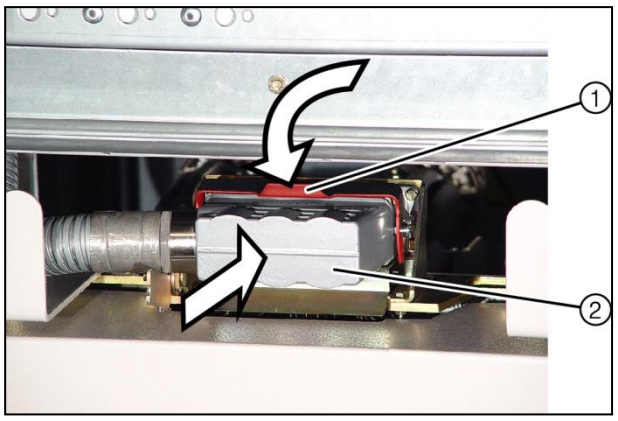


Fig. 112: Plugging on and securing the low-voltage connector

⇨ Close the high-voltage door.

⇨ Switch the auxiliary voltage on.

The motor in the circuit-breaker starts up and charges the spring energy store. The spring state indicator for the closing spring changes to CHARGED.

✓ The low-voltage connector is plugged on and secured by the longitudinal fastener.

10.20 Taking the withdrawable circuit-breaker out of the panel

⚠ CAUTION

Injury

The mechanism inside the withdrawable circuit-breaker can cause injuries by getting squeezed, caught or cut.

⇨ Do not remove any parts of the covering.

⇨ Do not charge the spring energy store in the circuit-breaker.

⚠ CAUTION

Heavy weight of withdrawable part

Removing the withdrawable part without service truck can cause injuries.

⇨ Do not try to remove the withdrawable part while service truck is not interlocked with the panel.

Fig. 113: Circuit-breaker panel with high-voltage door open (type 3AE5 as an example)

Fig. 114: Circuit-breaker panel without service truck

Preconditions

- Service truck available and selected according to the corresponding panel width
- Withdrawable circuit-breaker in test position
- Spring energy store in the circuit-breaker discharged
- High-voltage door open
- Low-voltage connector stowed away

Positioning the service truck in front of the panel

⚠ CAUTION

Maloperation

Protruding parts such as locking elements at the service truck or at the rear of the withdrawable circuit-breaker can cause injuries.

⇨ Move and operate the service truck only at the front side.

⇨ Move the service truck only slowly and carefully.

⚠ CAUTION

Maloperation

Interlocks placed at the panel front prevent being injured when taking the withdrawable circuit-breaker out of the panel.

⇨ Make sure the service truck is correctly interlocked with the panel before moving the withdrawable circuit-breaker onto the service truck.

⇨ Observe the notes and the operating instructions on the service truck.

⇨ Move the service truck centrally in front of the panel.

⇨ Push the locking elements on the left and right side of the truck into the openings provided for this purpose in the panel frame. Observe that the guide rails of the panel and the service truck are horizontally aligned with each other.

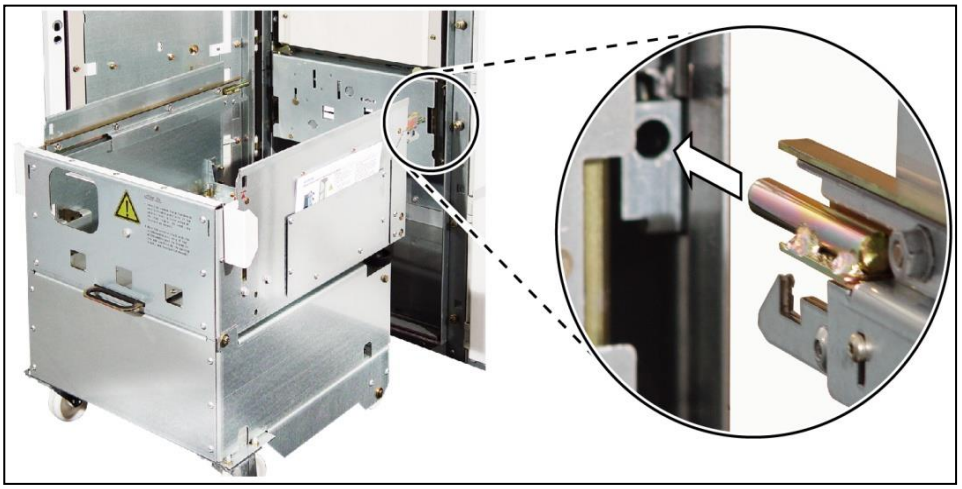


Fig. 115: Service truck in front of panel

⇨ If required, adjust the height of the guide rails at the service truck with the two setting wheels.

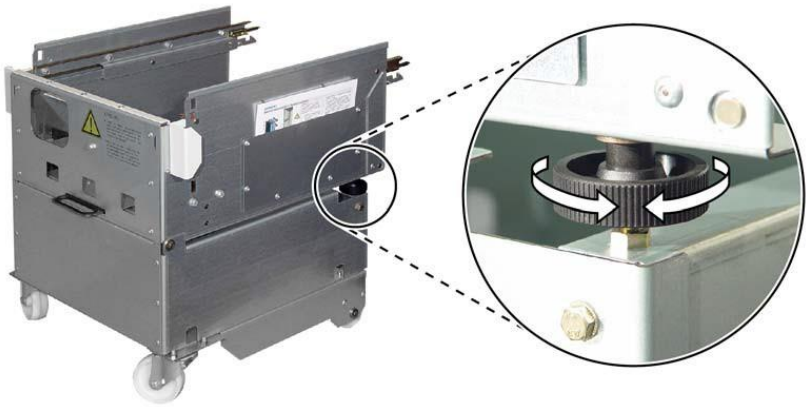


Fig. 116: Setting wheels on service truck

⇨ Check the position of the left and right unlocking levers at the service truck. Check whether the service truck is correctly interlocked with the panel by pulling it backwards.

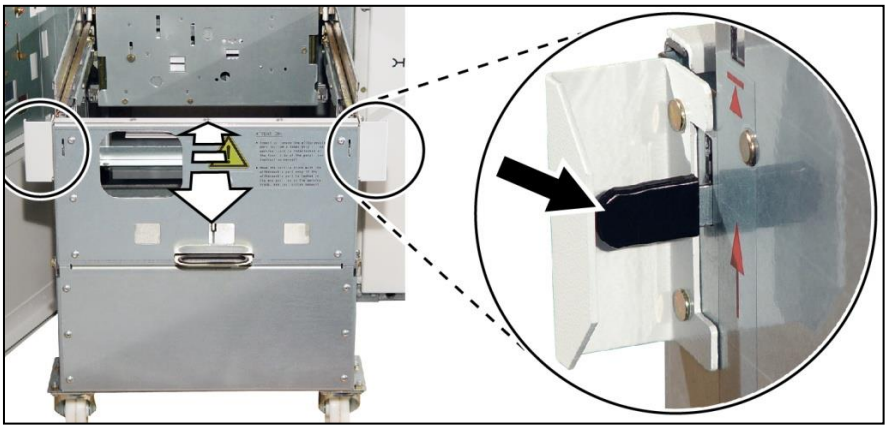


Fig. 117: Service truck interlocked

Unlocking the withdrawable circuit-breaker from the panel

⇨ To unlock the withdrawable circuit-breaker from the panel frame, turn the two locking levers at the withdrawable circuit-breaker to the outside.

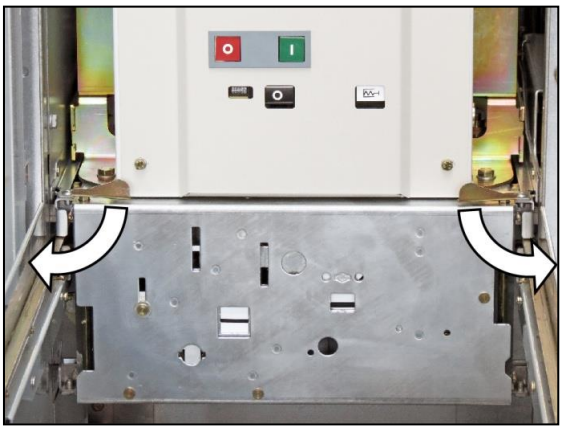


Fig. 118: Unlocking the withdrawable circuit-breaker

Pulling the withdrawable circuit-breaker onto the service truck

⇨ Pull the withdrawable circuit-breaker onto the service truck until the end position using the handles.

Fig. 119: Pulling out the withdrawable circuit-breaker type 3AE1

Fig. 120: Pulling out the withdrawable circuit-breaker type 3AE5

⇨ Turn the two locking levers at the withdrawable circuit-breaker to the inside in order to interlock the withdrawable circuit-breaker with the service truck.

Fig. 121: Interlocking the withdrawable circuit-breaker

⇨ Pull the two unlocking levers on the left and right side of the service truck upwards to release the interlocking with the panel frame.

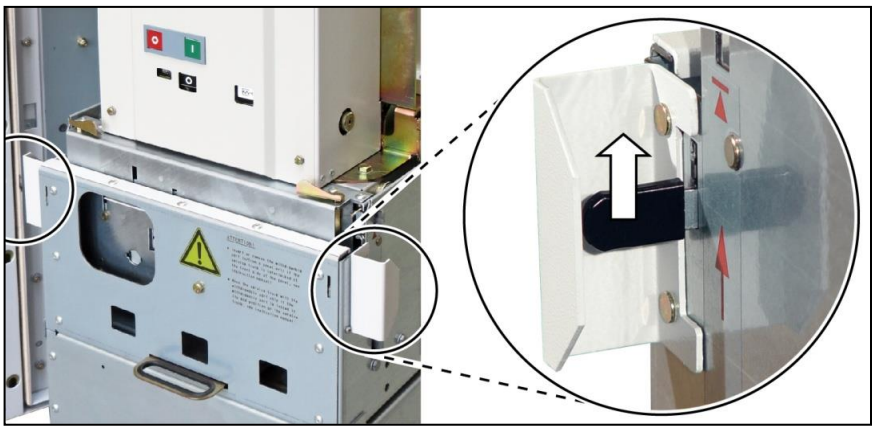


Fig. 122: Unlocking the service truck

Moving the service truck away from the panel

⚠ CAUTION

Maloperation

Interlocks placed on the service truck prevent being injured when moving the service truck with the withdrawable circuit-breaker on it away from the panel.

⇨ Move the service truck only if the withdrawable circuit-breaker is interlocked in its end position on the service truck.

⇨ Observe the notes and the operating instructions on the service truck.

⚠ CAUTION

Maloperation

The service truck is designed exclusively for slow and careful driving on obstacle-free paths.

⇨ Before moving the service truck, check the path.

⇨ Keep the shunting area and paths free of obstacles and dry.

⇨ Remove objects such as small parts, installation material or tools from the floor in the travel area.

⇨ Move the service truck only slowly and constantly.

⇨ The service truck is not suitable for unsteady floor, such as stairs, deepening or floor joints.

⇨ Move the service truck away from the panel using the handles.

Fig. 123: Moving the service truck with circuit-breaker type 3AE1

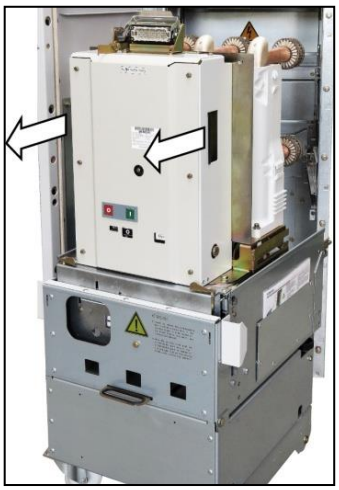


Fig. 124: Moving the service truck with circuit-breaker type 3AE5

⇨ If no further operation is executed: Close the high-voltage door.

✓ The withdrawable circuit-breaker can now be moved outside the panel on the service truck.

10.21 Inserting the withdrawable circuit-breaker in a panel

⚠ CAUTION

Maloperation

The service truck is designed exclusively for slow and careful driving on obstacle-free paths.

- ⇨ Before moving the service truck, check the path.
- ⇨ Keep the shunting area and paths free of obstacles and dry.
- ⇨ Remove objects such as small parts, installation material or tools from the floor in the travel area.
- ⇨ Move the service truck only slowly and constantly.
- ⇨ The service truck is not suitable for unsteady floor, such as stairs, deepening or floor joints.

⚠ CAUTION

Injury

The mechanism inside the withdrawable circuit-breaker can cause injuries by getting squeezed, caught or cut.

- ⇨ Do not remove any parts of the covering.
- ⇨ Do not charge the spring energy store in the circuit-breaker.

NOTICE

Maloperation

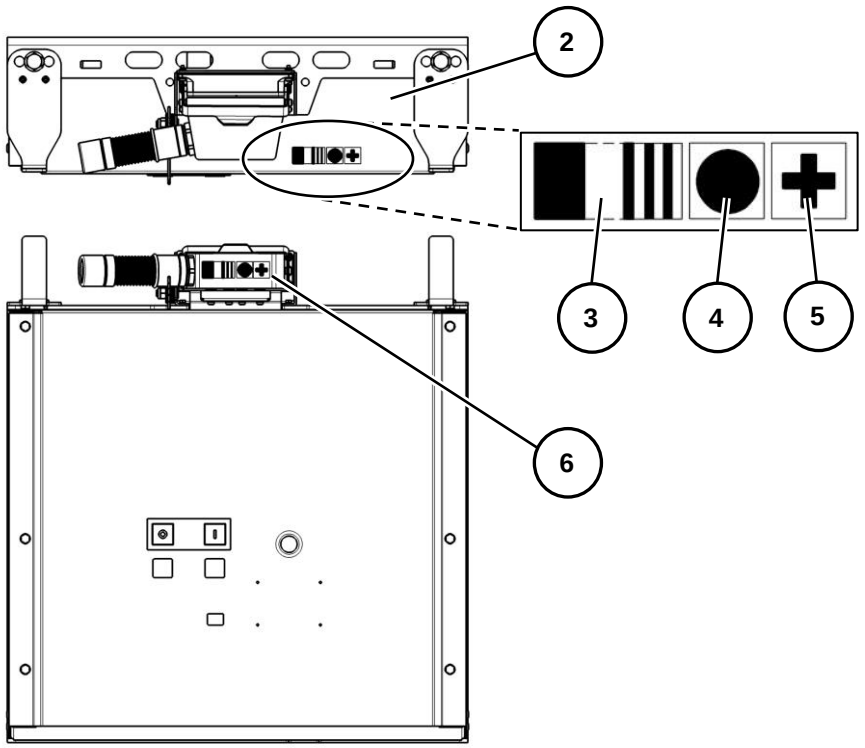
Risk of damaging safety-relevant parts. Operating the switchgear with a withdrawable part version that is not suitable for the corresponding panel version can cause serious damage to the switchgear.

- ⇨ Do not change the mechanical coding or the coding symbols.

Mechanical coding
The low-voltage connections are coded with regard to specific current ratings. In the case of circuit-breaker panels, the coding comprises also the specific control functions of a panel version.
The 4 coding pins (1) on the low-voltage plug connection prevent plugging on the low-voltage connector of a panel which is not suitable for the particular withdrawable part.

Fig. 125: Low-voltage plug connection

Coding symbols
On the top side of every withdrawable part (2) and on the top side of every low-voltage connector (6) there are 2 or 3 coding symbols respectively. A withdrawable part may only be inserted in a panel, if the coding symbols are identical in number and kind with those on the low-voltage connector.



(2) Top side of withdrawable part

(3) Coding symbol for electromagnetic interlock

(4) Coding symbol for current rating (circuit-breaker panels: also for control functions)

(5) Optional: Coding symbol for current rating (circuit-breaker panels: also for control functions)

(6) Top side of low-voltage connector

Fig. 126: Coding symbols on low-voltage connector and withdrawable part

The coding symbols characterize the functional properties of a panel version. The leftmost symbol (3) characterizes the functional properties as regards electromagnetic interlocks.
A second symbol or a combination of two further symbols (4; 5) characterizes the panel version as regards its current ratings.
In the case of circuit-breaker panels, the second symbol or the combination of two further symbols characterizes the panel version additionally as regards its specific control functions. Circuit-breaker panels with basic control functions are equipped with 1 shunt release and no other releases. Basic control functions are coded by one symbol only. Circuit-breaker panels with extended control functions are equipped with a second release (a second shunt release / a c.t.-release / an undervoltage release). Extended control functions are coded by a combination of two symbols.

Position (left to right)	Panel type	Function coded	Symbols	
1st symbol (3)	All types	Electromagnetic interlock		Without electromagnetic interlock
				With electromagnetic interlock: • For racking mechanism of withdrawable part • For operating mechanism of feeder earthing switch
				With electromagnetic interlock: For racking mechanism of withdrawable part
				With electromagnetic interlock: For operating mechanism of feeder earthing switch
2nd symbol (4)	Circuit-breaker	Rated current and **basic** control functions	Examples:  For single use of symbols or for use in combinations of symbols	
	Other than circuit-breaker	Rated current		
3rd symbol (5; optional)	Circuit-breaker	Rated current and **extended** control functions		
	Other than circuit-breaker	Rated current		

Verifying correspondence of withdrawable part version and panel version
A withdrawable part may only be inserted in a panel, if the coding symbols are identical in number and kind with those on the low-voltage connector.

⇨ Carefully compare the coding symbols on the top side of the withdrawable part (1) with the symbols on the top side of the low-voltage connector (2).

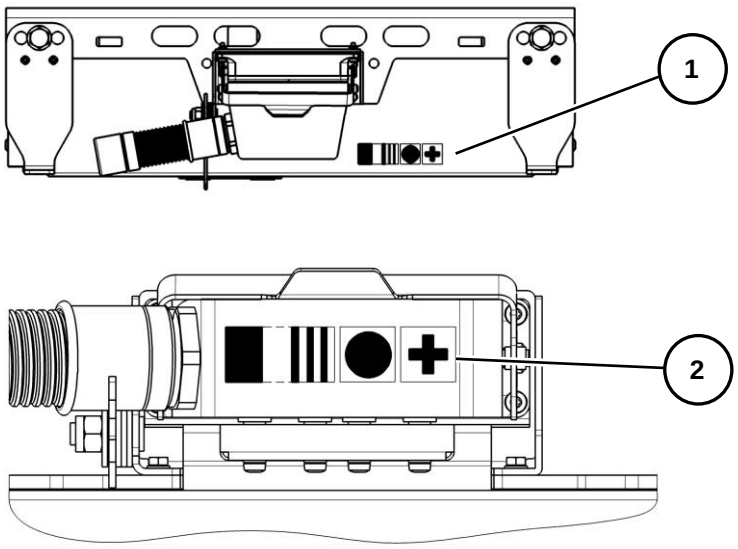


Fig. 127: Verifying correspondence of coding symbols on withdrawable part and low-voltage connector (example)

Preparing the operating shaft for the feeder earthing switch

⇨ Make sure that the coupling pin of the operating shaft for the feeder earthing switch at the withdrawable circuit-breaker and the coupling in the switching-device compartment are in vertical position.

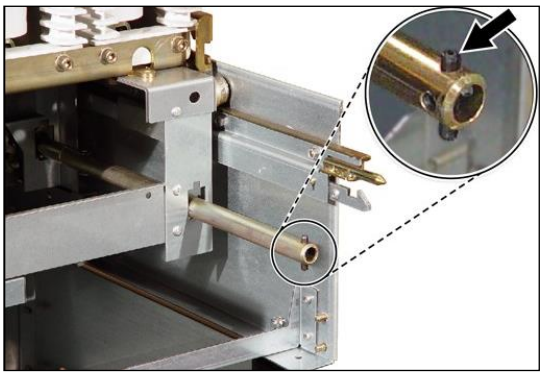


Fig. 128: Coupling pin of the operating shaft for the feeder earthing switch

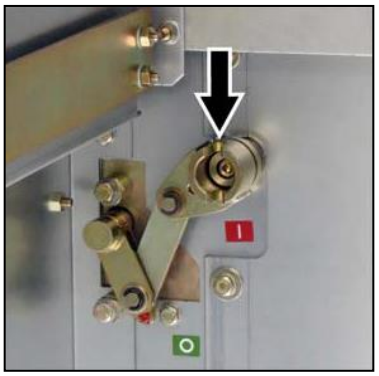


Fig. 129: Coupling of the feeder earthing switch in the switching-device compartment

⇨ If required, put the coupling pin of the feeder earthing switch operating shaft in vertical position using the operating lever.

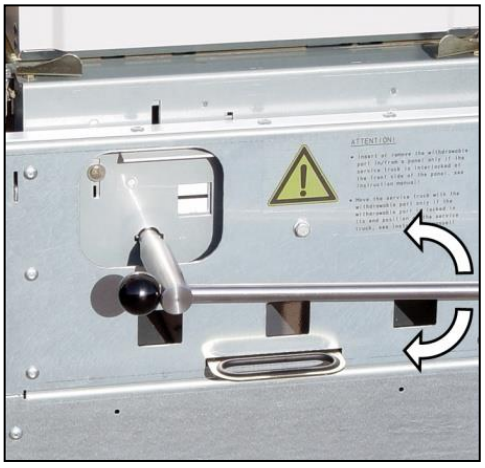


Fig. 130: Operating the feeder earthing switch operating shaft

Interlocking the service truck with the withdrawable circuit-breaker at the panel

⚠ CAUTION

Maloperation

Interlocks placed at the panel front prevent being injured when moving the withdrawable circuit-breaker into the panel.

⇨ Make sure the service truck is interlocked with the panel before moving the withdrawable circuit-breaker into the panel.

⇨ Observe the notes and the operating instructions on the service truck.

⚠ CAUTION

Maloperation

Protruding parts such as locking elements at the service truck or at the rear of the withdrawable circuit-breaker can cause injuries.

⇨ Move and operate the service truck only at the front side.

⇨ Move the service truck only slowly and carefully.

Preconditions

- Panel prepared, no withdrawable circuit-breaker inserted
- Withdrawable circuit-breaker available on service truck
- Withdrawable circuit-breaker with the same coding as panel available
- Coupling pin of the operating shaft in vertical position
- Spring energy store in the circuit-breaker discharged
- High-voltage door open
- Low-voltage connector stowed away
- Auxiliary voltage for the panel disconnected

Procedure

⇨ Move the service truck centrally in front of the panel.

⇨ Push the locking elements on the left and right side of the service truck into the openings provided for this purpose in the panel frame. Observe that the guide rails of the panel and the service truck are horizontally aligned with each other.

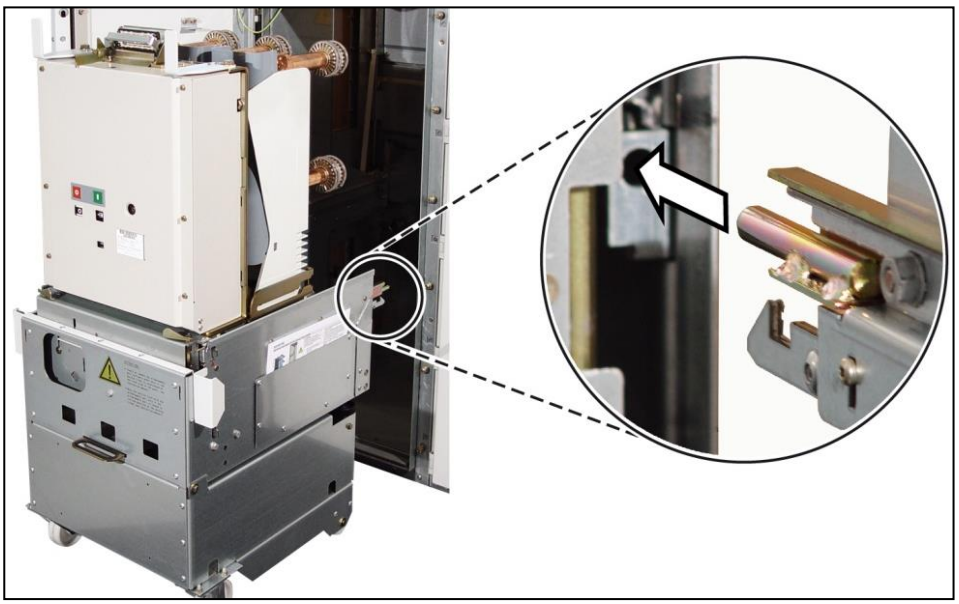


Fig. 131: Service truck in front of panel

⇨ If required, adjust the height of the guide rails at the service truck with the two setting wheels.

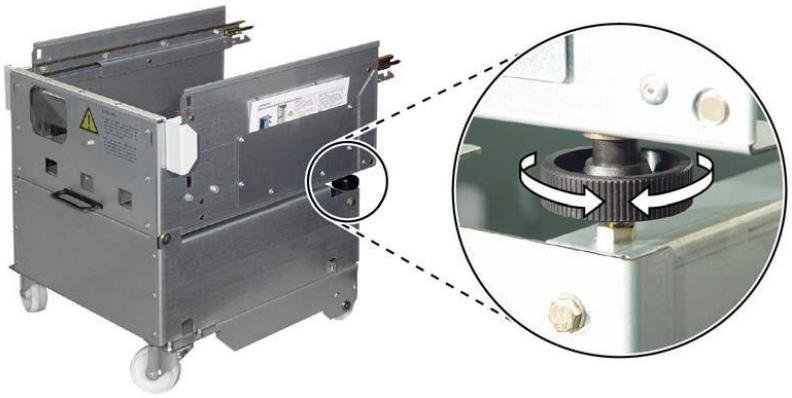


Fig. 132: Setting wheels on service truck

⇨ Check the position of the left and right unlocking levers at the service truck. Check whether the service truck is correctly interlocked with the panel by pulling it backwards.

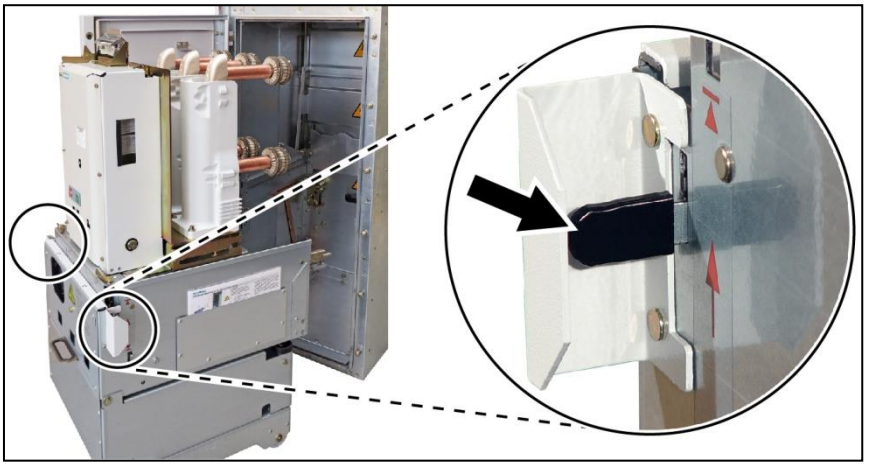


Fig. 133: Service truck interlocked with the panel

⇨ To release the interlocking of the withdrawable circuit-breaker with the service truck, turn the two locking levers at the withdrawable circuit-breaker to the outside.

Fig. 134: Releasing the interlocking of the withdrawable circuit-breaker

⇨ Pull the unlocking handle of the service truck out and hold it.

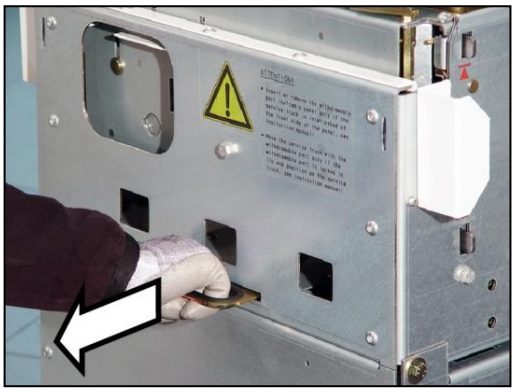


Fig. 135: Unlocking the handle of the service truck

⇨ Push the withdrawable circuit-breaker into the panel as far as it will go.

Fig. 136: Pushing the withdrawable circuit-breaker into the panel

Unlocking the service truck from the panel

⇨ Pull the two unlocking levers on the left and right side of the service truck upwards to release the interlocking with the panel frame.

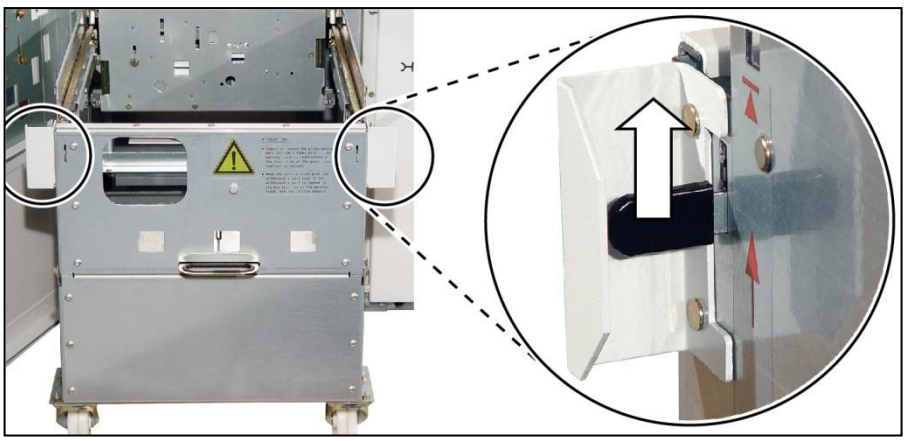


Fig. 137: Unlocking the service truck

⇨ Pull the service truck back at its upper edge, away from the panel.

Fig. 138: Pulling the service truck away

⇨ Interlock the withdrawable circuit-breaker with the panel by turning the two locking levers to the inside.
The withdrawable part is correctly interlocked with the panel as soon as both locking levers latch tight inside.

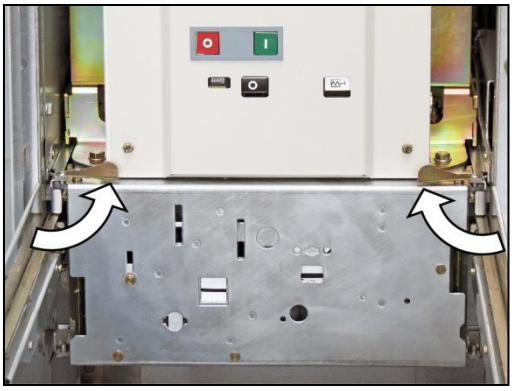


Fig. 139: Interlocking the withdrawable circuit-breaker

Locking the low-voltage connector

> **INFORMATION**
>
> In addition to these instructions, an instruction label on the withdrawable circuit-breaker informs about plugging on the low-voltage connector.
>
> Follow the advice on the label (3) to push the longitudinal fastener.

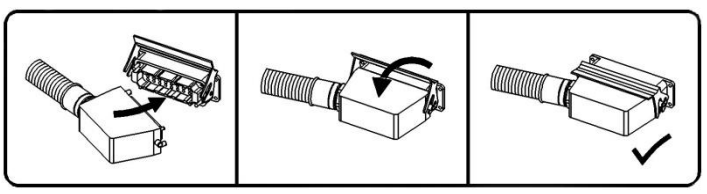


Fig. 140: Instruction label on the withdrawable circuit-breaker

⇨ Take the low-voltage connector out of the support located underneath the low-voltage compartment.

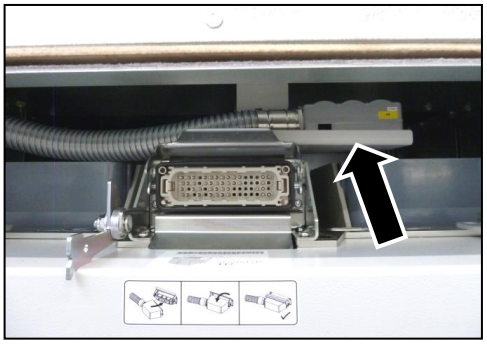


Fig. 141: Low-voltage connector stowed away

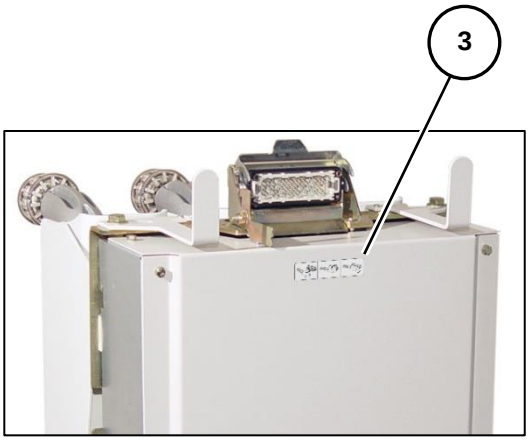


Fig. 142: Instruction label for the low-voltage connector

⇨ Carefully plug on the low-voltage connector (2) from the front.

⇨ To secure the low-voltage connector, push the longitudinal fastener (1) of the coupling downwards.

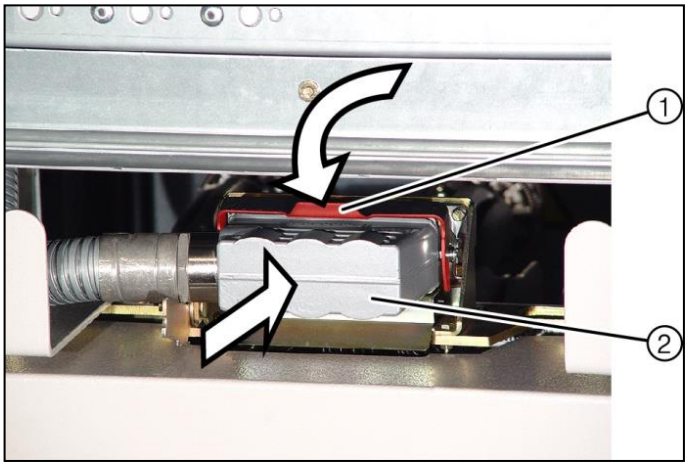


Fig. 143: Plugging on and securing the low-voltage connector

⇨ Close the high-voltage door.

⇨ Switch the auxiliary voltage on.

The motor in the circuit-breaker starts up and charges the spring energy store. The spring state indicator for the closing spring changes to CHARGED.

✓ The withdrawable circuit-breaker is inserted in the panel and the high-voltage door is closed.

10.22 Taking the circuit-breaker truck out of the panel

⚠ CAUTION

Injury

The mechanism inside the circuit-breaker truck can cause injuries by getting squeezed, caught or cut.

⇨ Do not remove any parts of the covering.

⇨ Do not charge the spring energy store in the circuit-breaker.

Fig. 144: Circuit-breaker panel with high-voltage door open

Preconditions

- Circuit-breaker truck in test position
- Spring energy store in the circuit-breaker discharged
- High-voltage door open
- Low-voltage connector stowed away

Unlocking the circuit-breaker truck from the panel

⇨ To unlock the circuit-breaker truck from the panel frame at the center, turn the two locking levers at the circuit-breaker truck to the outside.

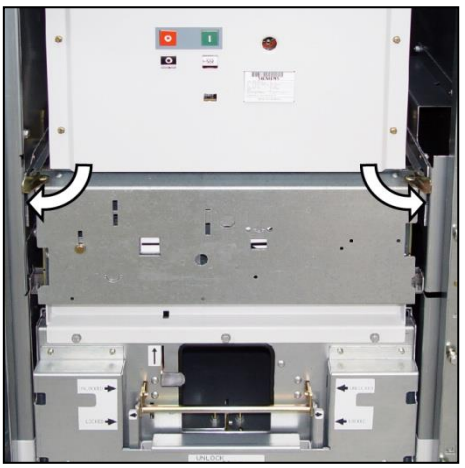


Fig. 145: Unlocking the circuit-breaker truck from the panel at the center

⇨ To unlock the circuit-breaker truck from the panel frame at the bottom, pull the locking bracket (1) upwards until it latches into the retaining hook.

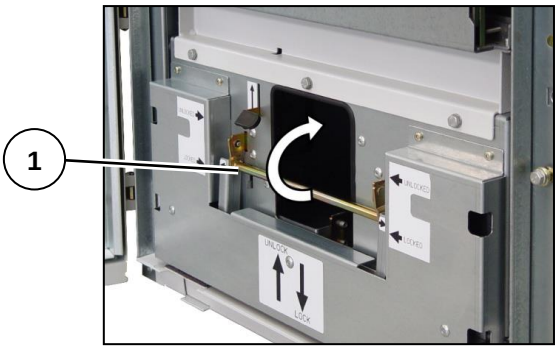


Fig. 146: Unlocking the circuit-breaker truck at the bottom

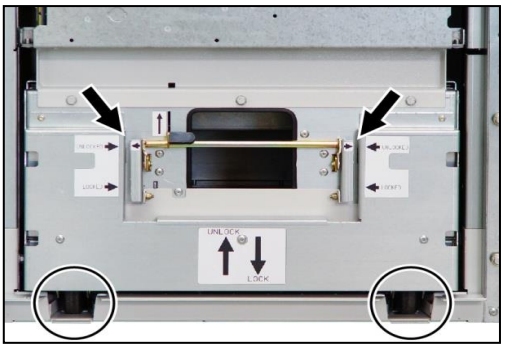


Fig. 147: Circuit-breaker truck ready to move

Moving the circuit-breaker truck out of the panel

⚠ CAUTION

Maloperation

The circuit-breaker truck is designed exclusively for slow and careful driving on obstacle-free paths.

⇨ Before moving the circuit-breaker truck, check the path.

⇨ Keep the shunting area and paths free of obstacles and dry.

⇨ Remove objects such as small parts, installation material or tools from the floor in the travel area.

⇨ Move the circuit-breaker truck only slowly and constantly.

⇨ The circuit-breaker truck is not suitable for unsteady floor, such as stairs, deepening or floor joints.

⚠ CAUTION

Maloperation

Protruding parts at the rear of the circuit-breaker truck can cause injuries.

⇨ Move and operate the circuit-breaker truck only at the front side.

NOTICE

Maloperation

The locking bracket at the circuit-breaker truck is exclusively designed for interlocking the circuit-breaker truck with the switchgear frame.

⇨ Do **not** push the locking bracket downwards towards LOCK if the circuit-breaker truck is outside the panel.

⇨ Pull the circuit-breaker truck out of the panel using the handles.

Fig. 148: Pulling out the circuit-breaker truck

⇨ If no further operation is executed: Close the high-voltage door.

✓ The circuit-breaker truck can now be moved away from the panel.

10.23 Inserting the circuit-breaker truck in a panel

⚠ CAUTION

Maloperation

The circuit-breaker truck is designed exclusively for slow and careful driving on obstacle-free paths.

- ⇨ Before moving the circuit-breaker truck, check the path.
- ⇨ Keep the shunting area and paths free of obstacles and dry.
- ⇨ Remove objects such as small parts, installation material or tools from the floor in the travel area.
- ⇨ Move the circuit-breaker truck only slowly and constantly.
- ⇨ The circuit-breaker truck is not suitable for unsteady floor, such as stairs, deepening or floor joints.

⚠ CAUTION

Injury

The mechanism inside the circuit-breaker truck can cause injuries by getting squeezed, caught or cut.

- ⇨ Do not remove any parts of the covering.
- ⇨ Do not charge the spring energy store in the circuit-breaker.

NOTICE

Maloperation

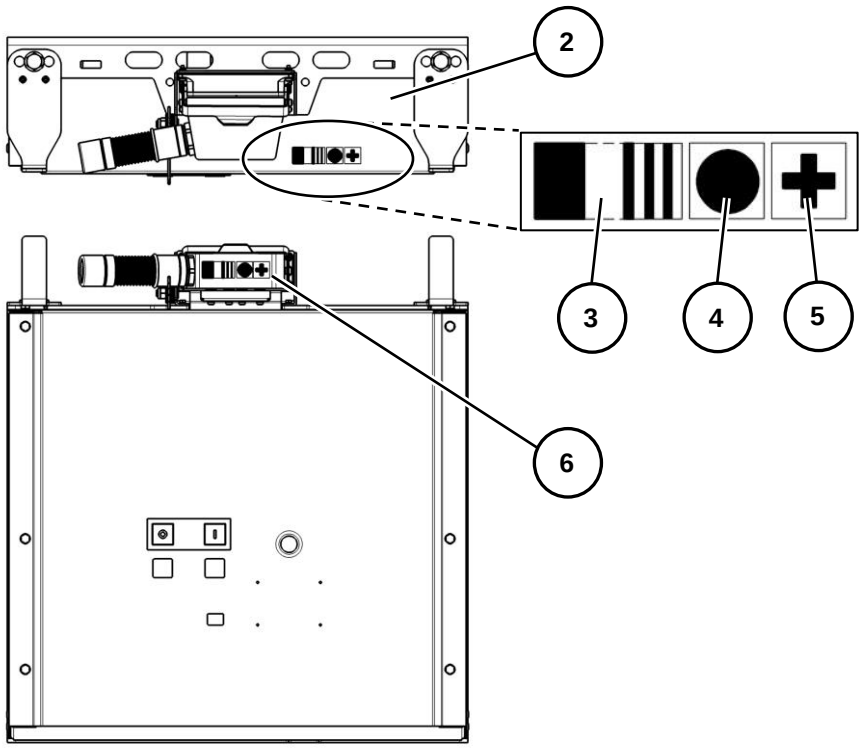
Risk of damaging safety-relevant parts. Operating the switchgear with a circuit-breaker truck version that is not suitable for the corresponding panel version can cause serious damage to the switchgear.

- ⇨ Do not change the mechanical coding or the coding symbols.

Mechanical coding
The low-voltage connections are coded with regard to specific current ratings. In the case of circuit-breaker panels, the coding comprises also the specific control functions of a panel version.
The 4 coding pins (1) on the low-voltage plug connection prevent plugging on the low-voltage connector of a panel which is not suitable for the particular switching-device truck.

Fig. 149: Low-voltage plug connection

Coding symbols
On the top side of every switching-device truck (2) and on the top side of every low-voltage connector (6) there are 2 or 3 coding symbols respectively. A switching-device truck may only be inserted in a panel, if the coding symbols are identical in number and kind with those on the low-voltage connector.



(2) Top side of switching-device truck

(3) Coding symbol for electromagnetic interlock

(4) Coding symbol for current rating (circuit-breaker panels: also for control functions)

(5) Optional: Coding symbol for current rating (circuit-breaker panels: also for control functions)

(6) Top side of low-voltage connector

Fig. 150: Coding symbols on low-voltage connector and switching-device truck

The coding symbols characterize the functional properties of a panel version. The leftmost symbol (3) characterizes the functional properties as regards electromagnetic interlocks.
A second symbol or a combination of two further symbols (4; 5) characterizes the panel version as regards its current ratings.
In the case of circuit-breaker panels, the second symbol or the combination of two further symbols characterizes the panel version additionally as regards its specific control functions. Circuit-breaker panels with basic control functions are equipped with 1 shunt release and no other releases. Basic control functions are coded by one symbol only. Circuit-breaker panels with extended control functions are equipped with a second release (a second shunt release / a Ct release / an undervoltage release). Extended control functions are coded by a combination of two symbols.

<table>
<tr><th>Position (left to right)</th><th>Panel type</th><th>Function coded</th><th colspan="2">Symbols</th></tr>
<tr><td rowspan="4">1st symbol (3)</td><td rowspan="4">All types</td><td rowspan="4">Electromagnetic interlock</td><td>  </td><td>Without electromagnetic interlock</td></tr>
<tr><td>  </td><td>With electromagnetic interlock:
• For racking mechanism of switching-device truck
• For operating mechanism of feeder earthing switch</td></tr>
<tr><td>  </td><td>With electromagnetic interlock:
For racking mechanism of switching-device truck</td></tr>
<tr><td>  </td><td>With electromagnetic interlock:
For operating mechanism of feeder earthing switch</td></tr>
<tr><td>2nd symbol (4)</td><td>Circuit-breaker</td><td>Rated current and basic control functions</td><td colspan="2" rowspan="3">Examples:
 
For single use of symbols or for use in combinations of symbols</td></tr>
<tr><td>Other than circuit-breaker</td><td>Rated current</td></tr>
<tr><td>3rd symbol (5; optional)</td><td>Circuit-breaker</td><td>Rated current and extended control functions</td></tr>
<tr><td></td><td>Other than circuit-breaker</td><td>Rated current</td><td colspan="2"></td></tr>
</table>

Verifying correspondence of switching-device truck version and panel version
A switching-device truck may only be inserted in a panel, if the coding symbols are identical in number and kind with those on the low-voltage connector.

⇨ Carefully compare the coding symbols on the top side of the switching-device truck (1) with the symbols on the top side of the low-voltage connector (2).

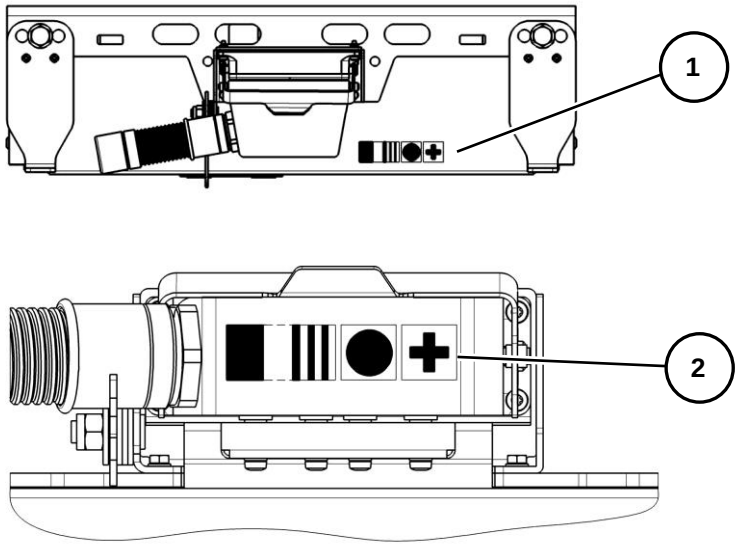


Fig. 151: Verifying correspondence of coding symbols on switching-device truck and low-voltage connector (example)

Preparing the operating shaft for the feeder earthing switch

⇨ Make sure that the coupling pin of the operating shaft for the feeder earthing switch at the circuit-breaker truck and the coupling in the switching-device compartment are in vertical position.

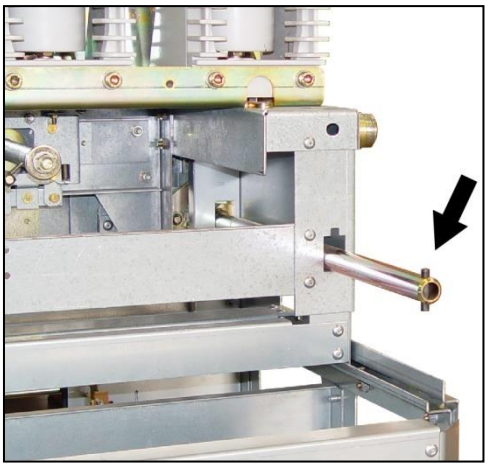


Fig. 152: Coupling pin of the operating shaft for the feeder earthing switch

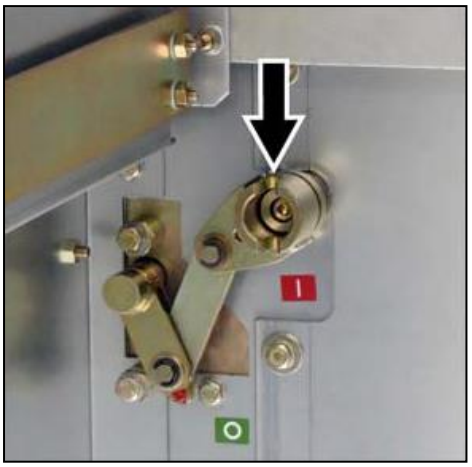


Fig. 153: Coupling of the feeder earthing switch in the switching-device compartment

⇨ If required, put the coupling pin of the feeder earthing switch operating shaft in vertical position using the operating lever.

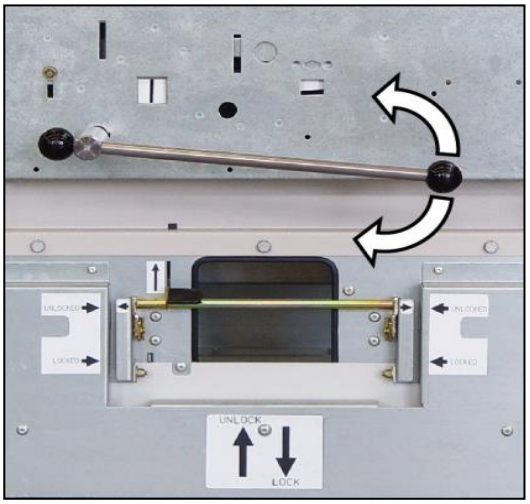


Fig. 154: Operating the feeder earthing switch operating shaft

Inserting the circuit-breaker truck in a panel

⚠ CAUTION

Maloperation

Protruding parts at the rear of the circuit-breaker truck can cause injuries.

⇨ Move and operate the circuit-breaker truck only at the front side.

NOTICE

Maloperation

The locking bracket at the circuit-breaker truck is exclusively designed for interlocking the circuit-breaker truck with the switchgear frame.

⇨ As long as the circuit-breaker truck is not completely moved into the panel, the locking indication at the locking bracket must show UNLOCKED!

⇨ Operate the locking bracket only if the circuit-breaker truck has been completely moved into the panel.

⇨ Do **not** push the locking bracket downwards towards LOCK if

- the circuit-breaker truck is outside the panel.
- the circuit-breaker truck is moved only partially into the panel.

Operating the circuit-breaker panel

Preconditions

- Panel prepared, no circuit-breaker truck inserted
- Circuit-breaker truck with the same coding as panel available
- Coupling pin of the operating shaft in vertical position
- Spring energy store in the circuit-breaker discharged
- High-voltage door open
- Low-voltage connector stowed away
- Auxiliary voltage for the panel disconnected

Fig. 155: Panel prepared to insert circuit-breaker truck

Procedure

⇨ Move the circuit-breaker truck centrally in front of the panel. The rollers (1) of the circuit-breaker truck point towards the guide rails (2) at the bottom of the panel.

⇨ Push the circuit-breaker truck into the panel as far as it will go.

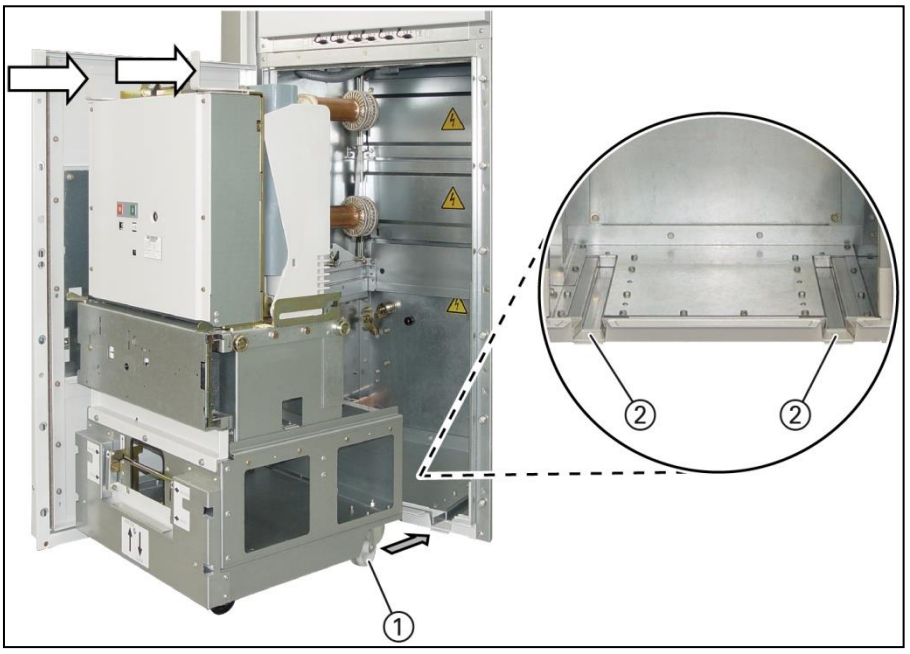


Fig. 156: Circuit-breaker truck in front of panel

⇨ To interlock the circuit-breaker truck with the panel frame at the bottom, lift the locking hook (3) and pull the locking bracket (4) totally downwards until snap-in.

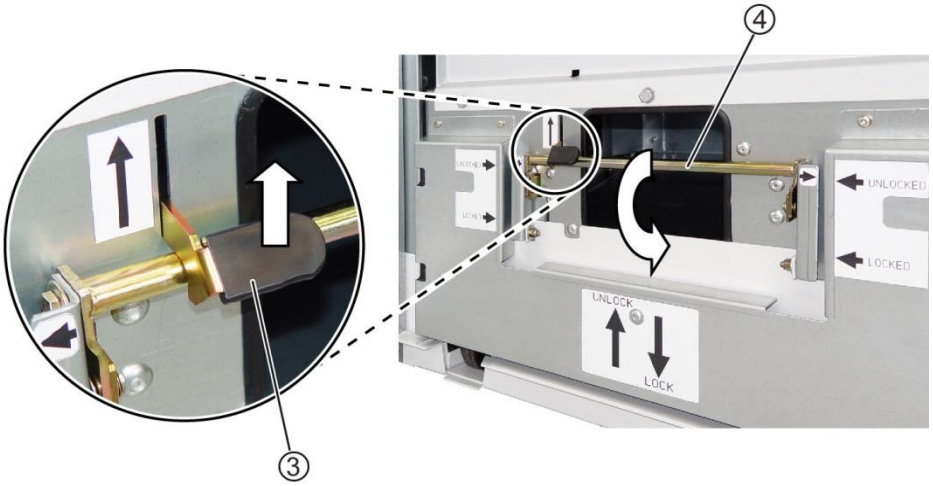


Fig.157: Interlocking circuit-breaker truck at the bottom

The circuit-breaker truck is now interlocked with the panel frame at the bottom. The locking indicator at the locking bracket shows LOCKED.

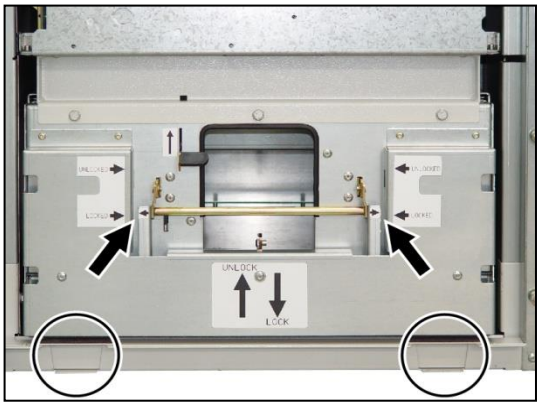


Fig. 158: Circuit-breaker truck interlocked with panel frame

⇨ To interlock the circuit-breaker truck with the panel frame at the center, turn the two locking levers to the inside.
The circuit-breaker truck is correctly interlocked with the panel as soon as both locking levers latch tight inside.

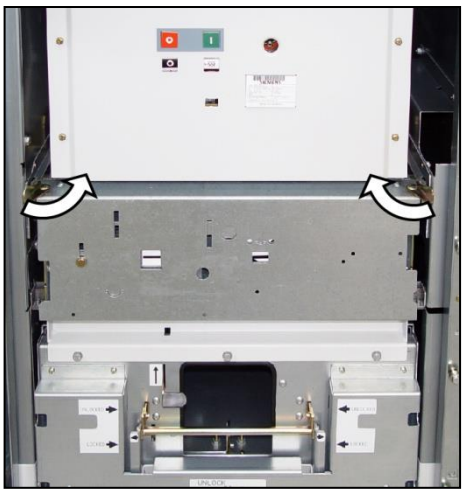


Fig. 159: Interlocking circuit-breaker truck at the center

Locking the low-voltage connector

INFORMATION

In addition to these instructions, an instruction label on the circuit-breaker truck informs about plugging on the low-voltage connector.

Follow the advice on the label (3) to push the longitudinal fastener.

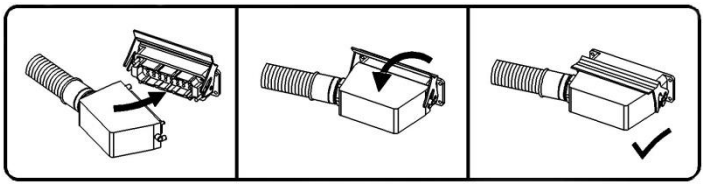


Fig. 160: Instruction label on the circuit-breaker truck

⇨ Take the low-voltage connector out of the support located underneath the low-voltage compartment.

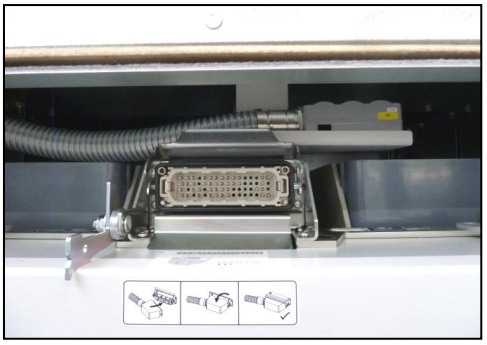


Fig. 161: Low-voltage connector stowed away

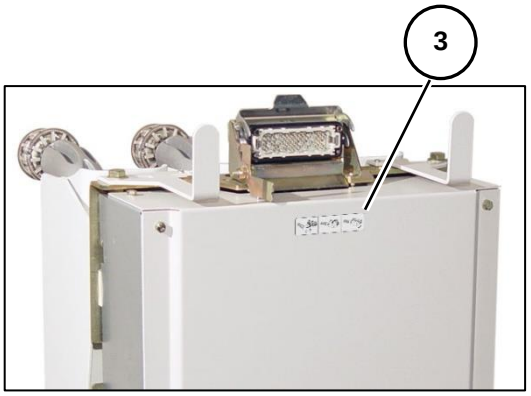


Fig. 162: Instruction label for the low-voltage connector

⇨ Carefully plug on the low-voltage connector (2) from the front.

⇨ To secure the low-voltage connector, push the longitudinal fastener (1) of the coupling downwards.

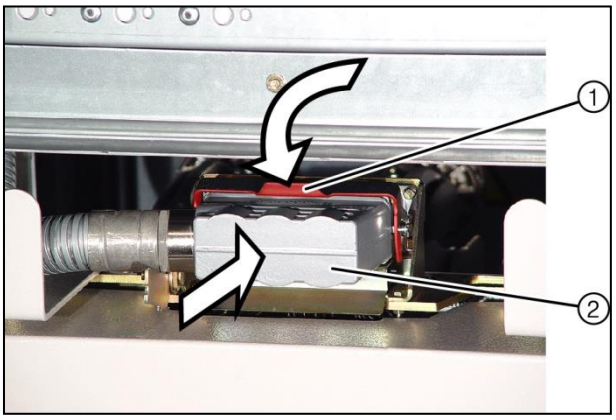


Fig. 163: Plugging on and securing the low-voltage connector

⇨ Close the high-voltage door.

⇨ Switch the auxiliary voltage on.

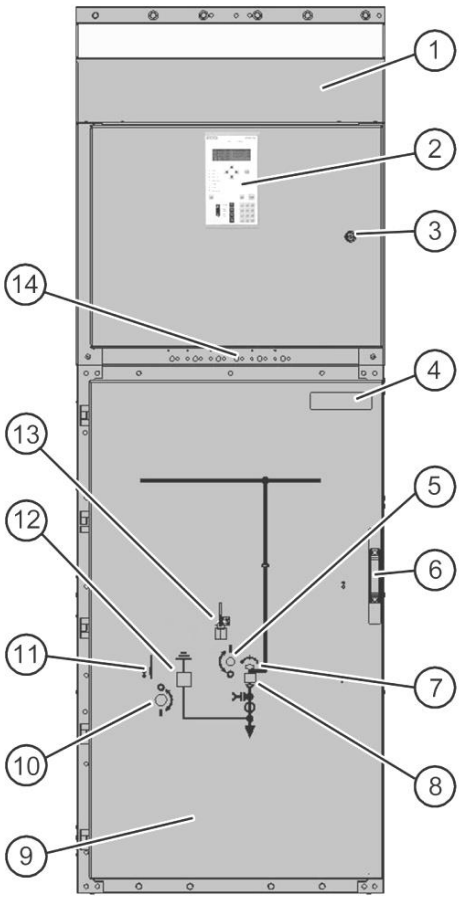
The motor in the circuit-breaker starts up and charges the spring energy store. The spring state indicator for the closing spring changes to CHARGED.

✓ The circuit-breaker truck is inserted in the panel and the high-voltage door is closed.

11 Operating the disconnecting panel

> **INFORMATION**
>
> Read and understand these instructions before attempting operating works.

11.1 Control elements at the front side of the panel



(1) Door to the low-voltage compartment

(2) Protection device

(3) Locking device for the door to the low-voltage compartment

(4) Instruction label for closing the high-voltage door

(5) Actuating opening for racking the withdrawable disconnector link / disconnector truck

(6) Handle for opening the high-voltage door

(7) Actuating opening for inserting the double-bit key to control racking of the withdrawable disconnector link / disconnector truck

(8) Mechanical position indicator for withdrawable disconnector link / disconnector truck

(9) High-voltage door

(10) Actuating opening for operating the feeder earthing switch

(11) Operating slide for opening and closing the actuating opening for operating the feeder earthing switch

(12) Mechanical position indicator for feeder earthing switch

(13) Operating slide for opening and closing the actuating opening for racking the withdrawable disconnector link / disconnector truck

(14) Test sockets for busbar voltage detecting system (type LRM) as additional component

Fig. 164: Control elements on the panel front

11.2 Position indicators visible on high-voltage door

Withdrawable disconnector link / disconnector truck: Service position, intermediate position or test position	Service position 	Intermediate position 	Test position 
Feeder earthing switch: CLOSED position or OPEN position	CLOSED 	OPEN 	–

11.3 Access to compartments

Regarding accessibility to the individual compartments, NXAIR switchgear fulfills the loss of service continuity category LSC 2B according to IEC 62271-200.

The degree of protection between the individual compartments is IP2X.

The type of accessibility is provided as follows:

Compartment		**Type of accessibility**
Switching-device compartment		Interlock-controlled
Voltage transformer compartment		Tool-based
Busbar compartment		Tool-based
Connection compartment	Access from the front side	Interlock-controlled and tool-based
	Access from the rear side	Tool-based

11.4 Opening or closing the high-voltage door

The procedure for opening and/or closing the high-voltage door at the disconnecting panel is identical with the procedure for opening and/or closing the high-voltage door at the circuit-breaker panel.

⇨ For opening and/or closing the high-voltage door at the disconnecting panel, see chapter 10.4 and/or 10.5.

11.5 Racking the withdrawable disconnector link / disconnector truck

⚠ WARNING

Injury due to effects of high-voltage

Racking the withdrawable disconnector link / disconnector truck while busbar system and feeder are under operational high-voltage can cause serious damages which may result in:

- Lightning
- Heat
- Loud noise
- Vibration

⇨ **Never** rack the withdrawable disconnector link / disconnector truck while the busbar system and feeder are under operational high-voltage.

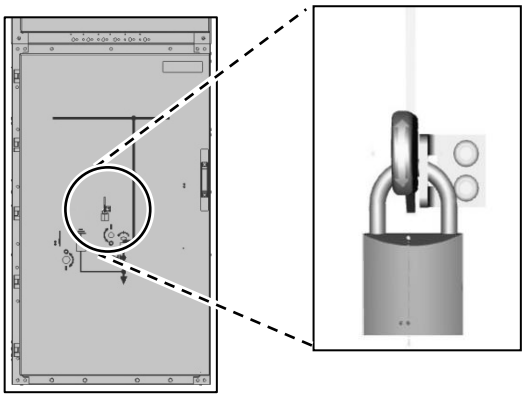
⇨ Get authorization from control station **before** racking the withdrawable disconnector link / disconnector truck.

⇨ To release access for racking the withdrawable disconnector link / disconnector truck, release the interlocking.

Interlocking for racking the withdrawable disconnector link / disconnector truck
On disconnecting panels racking the withdrawable disconnector link or disconnector truck is interlocked with mechanical interlock by padlock and optionally also with electromagnetic interlock by solenoid.

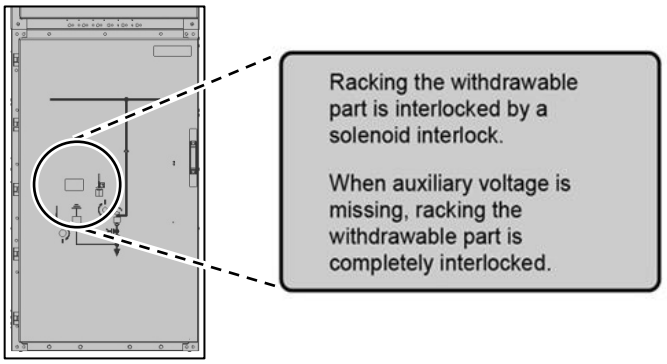
INFORMATION

Releasing the mechanical interlock is only permissible to lift the operating slide for opening and closing the actuating opening. The operating slide must otherwise always be interlocked mechanically by padlock. This is also valid for panel versions with additional electromagnetic interlock:



INFORMATION

Panel versions with electromagnetic interlock are identified on the high-voltage door with a label for interlocking the disconnecting function:



The procedure for racking the withdrawable disconnector link / disconnector truck to service position and/or test position is identical with the procedure for racking the withdrawable circuit-breaker / circuit-breaker truck to service position and/or test position.

⇨ For racking the withdrawable disconnector link / disconnector truck to service position and/or test position, see chapter 10.8 and/or 10.9.

11.6 Removing or plugging on the low-voltage connector

The procedure for removing and/or plugging on the low-voltage connector in the disconnecting panel is identical with the procedure for removing and/or plugging on the low-voltage connector in the circuit-breaker panel.

⇨ For removing and/or plugging on the low-voltage connector in the disconnecting panel, see chapter 10.18 and/or 10.19.

11.7 Taking the withdrawable disconnector link / disconnector truck out of a panel or inserting in a panel

The procedure for inserting and/or removing the withdrawable disconnector link / disconnector truck in the disconnecting panel is identical with the procedure for inserting and/or removing the withdrawable circuit-breaker / circuit-breaker truck in the circuit-breaker panel.

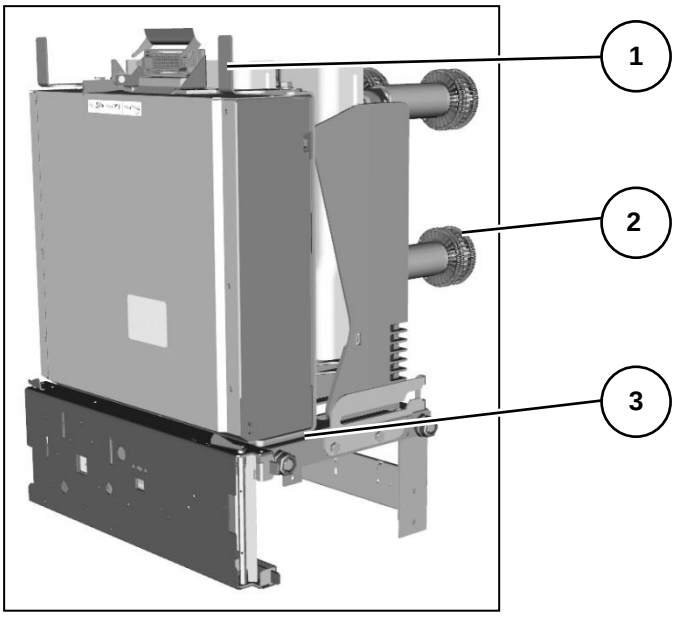
⇨ For inserting and/or removing the withdrawable disconnector link in the disconnecting panel, see chapter 10.20 and/or 10.21.
For inserting and/or removing the disconnector truck in the disconnecting panel, see chapter 10.22 and/or 10.23.

11.8 Earthing or de-earthing the feeder manually

The procedure for earthing and/or de-earthing the feeder in the disconnecting panel is identical with the procedure for earthing and/or de-earthing the feeder in the circuit-breaker panel.

⇨ For earthing and/or de-earthing the feeder in the disconnecting panel, see chapter 10.16 and/or 10.17.

11.9 Design of the withdrawable disconnector link / disconnector truck



(1) Handle for pulling

(2) Contact arm assembly with tulip contact

(3) Racking mechanism

Fig. 165: Design of the withdrawable disconnector link / disconnector truck (example)

12 Operating the metering panel

> **INFORMATION**
>
> Read and understand these instructions before attempting operating works.

12.1 Control elements at the front side of the panel

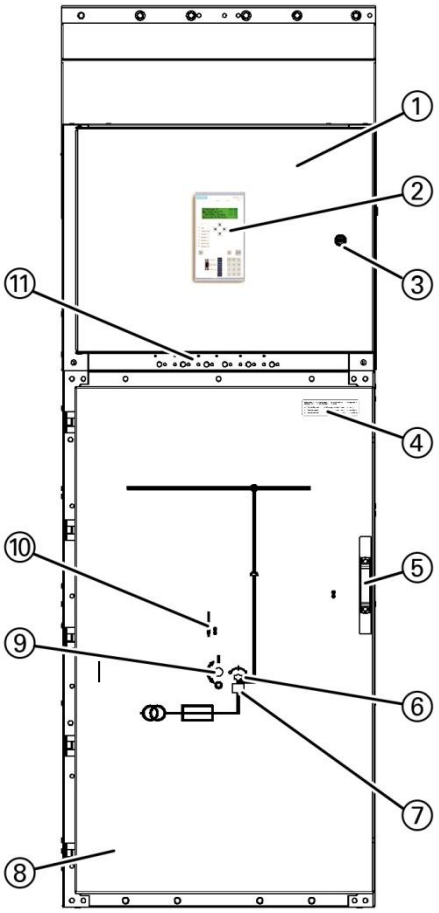


Fig. 166: Control elements on the panel front

(1) Door to the low-voltage compartment

(2) Protection device

(3) Locking device for the door to the low-voltage compartment

(4) Instruction label for closing the high-voltage door

(5) Handle for opening the high-voltage door

(6) Actuating opening for inserting the double-bit key to control racking of the withdrawable metering part / metering truck

(7) Mechanical position indicator for withdrawable metering part / metering truck

(8) High-voltage door

(9) Actuating opening for racking the withdrawable metering part / metering truck

(10) Operating slide for opening and closing the actuating opening for racking the withdrawable metering part / metering truck

(11) Test sockets for busbar voltage detecting system (type LRM) as additional component

12.2 Position indicator visible on high-voltage door

Indicator for position of withdrawable metering part / metering truck:			
Position indications for:	Service position 	Intermediate position 	Test position 

12.3 Access to compartments

Regarding accessibility to the individual compartments, NXAIR switchgear fulfills the loss of service continuity category LSC 2B according to IEC 62271-200.

The degree of protection between the individual compartments is IP2X.

The type of accessibility is provided as follows:

Compartment:		**Type of accessibility:**
Switching-device compartment		Interlock-controlled
Busbar compartment		Tool-based
Connection compartment	Access from the front side	Interlock-controlled and tool-based
	Access from the rear side	Tool-based

12.4 Opening or closing the high-voltage door

The procedure for opening and/or closing the high-voltage door at the metering panel is identical with the procedure for opening and/or closing the high-voltage door at the circuit-breaker panel.

⇨ For opening and/or closing the high-voltage door at the metering panel, see chapter 10.4 and/or 10.5.

12.5 Racking the withdrawable metering part / metering truck

The procedure for racking the withdrawable metering part / metering truck to service position and/or test position is identical with the procedure for racking the withdrawable circuit-breaker / circuit-breaker truck to service position and/or test position.

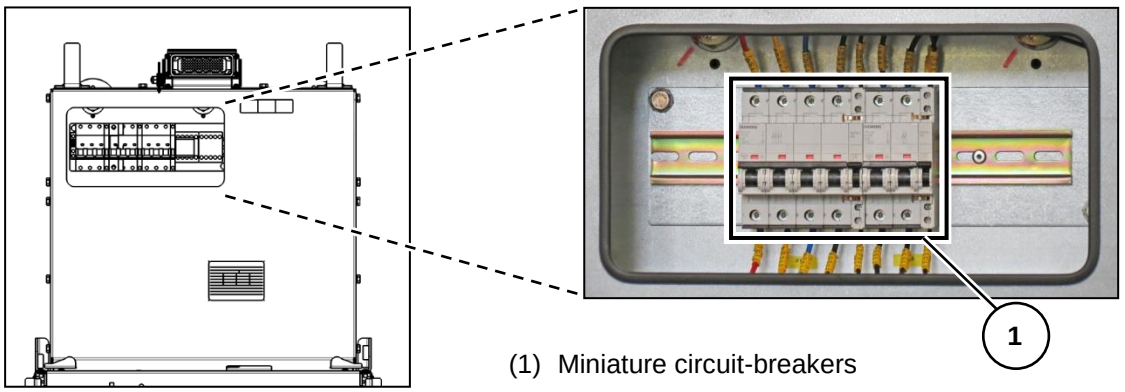
⇨ For racking the withdrawable metering part / metering truck to service position and/or test position, see chapter 10.8 and/or 10.9.

12.6 Removing or plugging on the low-voltage connector

The procedure for removing and/or plugging on the low-voltage connector in the metering panel is identical with the procedure for removing and/or plugging on the low-voltage connector in the circuit-breaker panel.

Control elements at the front side of the withdrawable metering part / metering truck

Access to the control elements at the front side of the withdrawable metering part / metering truck is given after opening the high-voltage door.



(1) Miniature circuit-breakers

Fig. 167: Control elements at the front of the withdrawable metering part / metering truck, example

Before removing the low-voltage connector:

⇨ Switch off all miniature circuit-breakers at the front of the withdrawable metering part / metering truck. The indicators change from red to green.

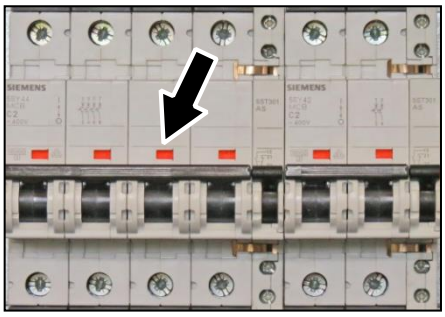


Fig. 168: Miniature circuit-breakers switched on, indicators red

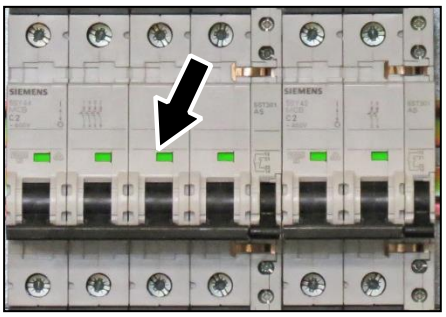


Fig. 169: Miniature circuit-breakers switched off, indicators green

After plugging on the low-voltage connector:

⇨ Switch on all miniature circuit-breakers at the front of the withdrawable metering part / metering truck. The indicators change from green to red.

Removing or plugging on the low-voltage connector:

⇨ For removing and/or plugging on the low-voltage connector in the metering panel, see chapter 10.18 and/or 10.19.

12.7 Taking the withdrawable metering part / metering truck out of the panel or inserting in a panel

The procedure for inserting and/or removing the withdrawable metering part / metering truck in the metering panel is identical with the procedure for inserting and/or removing the withdrawable circuit-breaker / circuit-breaker truck in the circuit-breaker panel.

⇨ For inserting and/or removing the withdrawable metering part in the metering panel, see chapter 10.20 and/or 10.21.
For inserting and/or removing the metering truck in the metering panel, see chapter 10.22 and/or 10.23.

12.8 Replacing protection fuse-links

NOTICE

Maloperation

Withdrawable metering parts / metering trucks are exclusively designed for operation with specific protection fuse-links.

⇨ Use only the fuse-link types listed in the following table.

⇨ Do not mount bridging links instead of protection fuse-links.

NOTICE

Undetected damage

A tripped protection fuse-link can cause hidden damages on the other protection fuse-links.

⇨ Always replace all protection fuse-links, even if only one protection fuse-link has tripped.

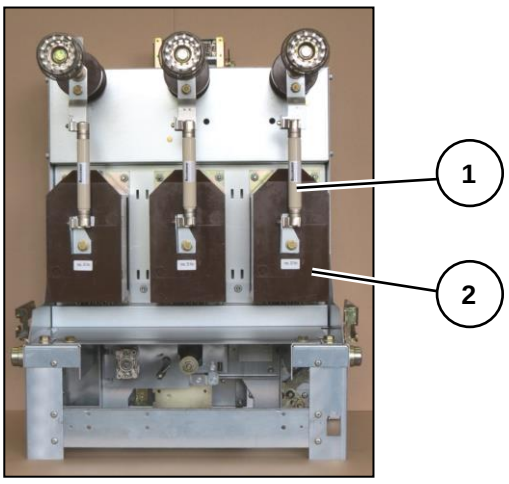
Selection table for protection fuse-links:

Rated voltage U_r [kV]	Supplier:	Order details:
7.2	Bussmann (a business of Eaton)	7.2ABWNA / 3.15 A / 142 mm
12	Bussmann (a business of Eaton)	12ABCNA / 3.15 A / 195 mm
17.5	Bussmann (a business of Eaton)	17.5CAV2 / 2 A / 220 mm
Supplier information: www.eaton.com		

Preconditions

- Withdrawable metering part / metering truck in test position
- Padlock (optional) removed from door handle
- High-voltage door open
- All voltage transformer MCBs are switched to OPEN position
- Low-voltage connector stowed away
- Withdrawable metering part / metering truck taken out of the panel
- Set of proper protection fuse-links available

Replacing protection fuse-links for rated voltage ≤ 12 kV



(1) Removable protection fuse-link

(2) Fixed-mounted voltage transformer

Fig. 170: Withdrawable metering part, taken out of the panel

⇨ Pull the upper end of the protection fuse-link off the clamp.

⇨ Pull the lower end of the protection fuse-link off the clamp and remove the protection fuse-link.

Fig. 171: Pulling off the fuse-link

⇨ Push the lower end of the new protection fuse-link into the clamp.

⇨ Push the upper end of the new protection fuse-link into the clamp.

⇨ Perform replacement with all other fuse-links.

✓ The protection fuse-links have been replaced.

INFORMATION

Final procedure steps

⇨ Next, insert the withdrawable metering part / metering truck into the panel. After closing the high-voltage door, the panel can be integrated into the course of operation again.

Replacing protection fuse-links for rated voltage 17.5 kV

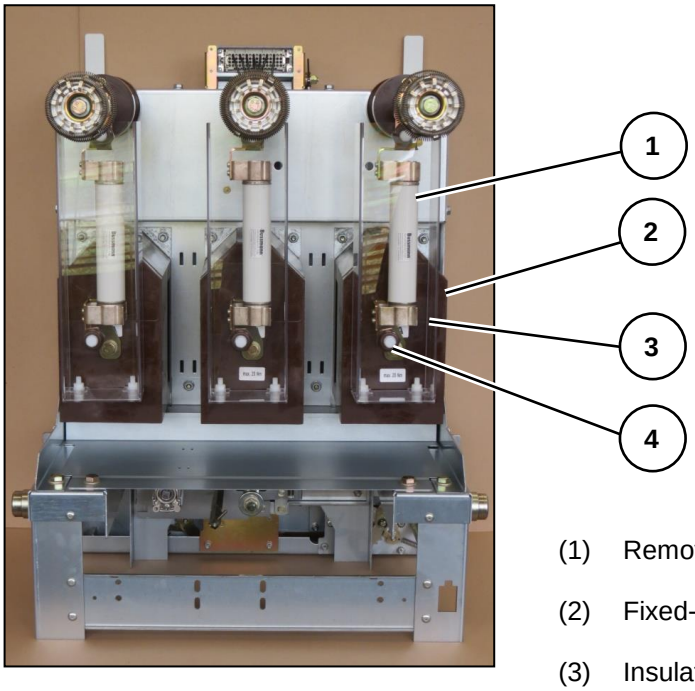


Fig. 172: Withdrawable metering part, taken out of the panel

(1) Removable protection fuse-link

(2) Fixed-mounted voltage transformer

(3) Insulating cover

(4) Bolted joint of insulating cover

⇨ Remove the upper and lower bolt M8x12 with washer 8.4 mm completely from the three insulating covers.

⇨ Keep the 3 insulating covers, 6 bolts and 6 washers 8.4 mm for later reuse.

⇨ Pull the lower end of the protection fuse-link off the clamp by means of a screwdriver.

⇨ Pull the upper end of the protection fuse-link off the clamp and remove the protection fuse-link.

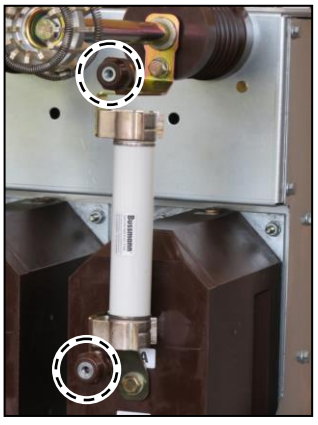


Fig. 173: Insulating cover removed

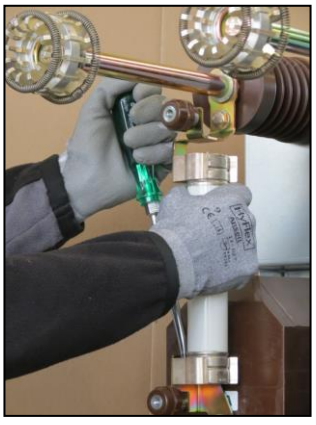


Fig. 174: Use of a screwdriver

Fig. 175: Pulling off the fuse-link

⇨ Push the upper end of the new protection fuse-link into the clamp.

⇨ Push the lower end of the new protection fuse-link into the clamp.

⇨ Perform replacement with all other fuse-links.

⇨ Fasten an insulating cover over each protection fuse-link at the upper and lower fixing point using a plastic bolt M8x12 and washer 8.4 mm; to do this, turn the M8 bolt into the bolted joint with simple hand force.

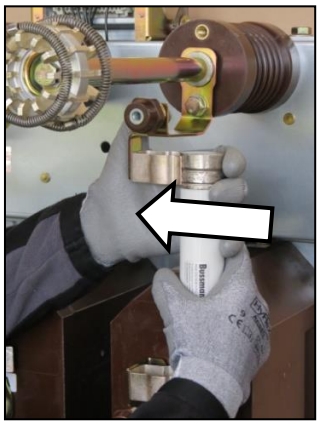


Fig. 176: Pushing the upper end into the clamp

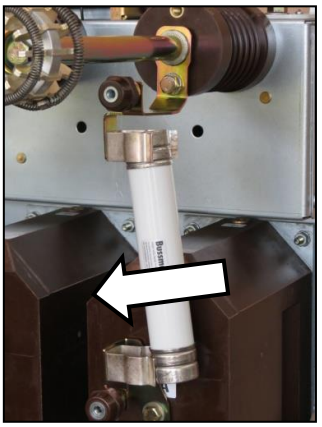


Fig. 177: Pushing the lower end into the clamp

Fig. 178: Installation of insulating covers

✓ The protection fuse-links have been replaced.

INFORMATION

Final procedure steps

⇨ Next, insert the withdrawable metering part / metering truck into the panel. After closing the high-voltage door, the panel can be integrated into the course of operation again.

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13 Operating the contactor panel with panel width 435 mm

INFORMATION

Read and understand these instructions before attempting operating works.

13.1 Control elements at the front side of the panel

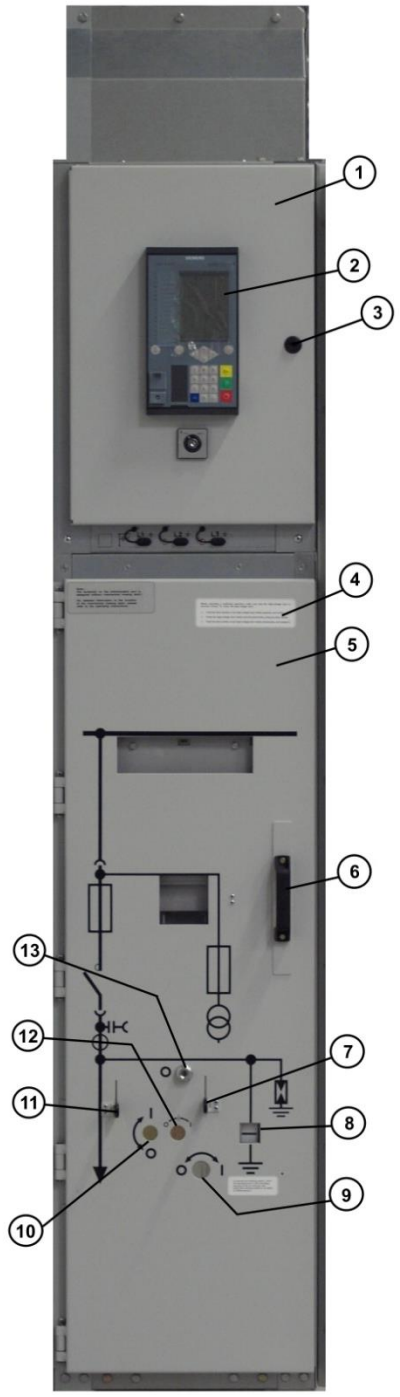


Fig. 179: Control elements on the panel front

(1) Door to the low-voltage compartment

(2) Protection device

(3) Locking device for the door to the low-voltage compartment

(4) Instruction label for closing the high-voltage door

(5) High-voltage door

(6) Handle for opening the high-voltage door

(7) Operating slide for opening and closing the actuating opening for operating the feeder earthing switch

(8) Mechanical position indicator for feeder earthing switch

(9) Actuating opening for operating the feeder earthing switch

(10) Actuating opening for racking the contactor truck

(11) Operating slide for opening and closing the actuating opening for racking the contactor truck

(12) Actuating opening for inserting the double-bit key to control racking the contactor truck

(13) Actuating opening for manual emergency opening of the contactor

13.2 Position indicator visible on high-voltage door

Indicator for position of the feeder earthing switch:		
Position indications for:	CLOSED 	OPEN 

13.3 Access to compartments

Regarding accessibility to the individual compartments, NXAIR switchgear fulfills the loss of service continuity category LSC 2B according to IEC 62271-200.

The degree of protection between the individual compartments is IP2X in standard design.

The type of accessibility is provided as follows:

Compartment		Type of accessibility
Switching-device compartment		Interlock-controlled
Busbar compartment		Tool-based
Connection compartment	Access from the front side	Interlock-controlled and tool-based
	Access from the rear side	Tool-based

13.4 Opening the high-voltage door

⚠ WARNING

Reduced safety

The closed high-voltage door is an important safety element of the switchgear. The high-voltage door is exclusively opened for performing operational activities inside the switching-device compartment, such as removing or inserting a contactor truck.

Close the high-voltage door:

⇨ If an activity inside the switching-device compartment is interrupted.

⇨ Immediately after an activity inside the switching-device compartment was completed.

⇨ Before leaving the panel front.

⚠ CAUTION

Injury

The mechanism inside the contactor truck can cause injuries by getting squeezed, caught or cut.

⇨ Do not remove any parts of the covering.

Preconditions

- Contactor truck in test position
- High-voltage door closed
- Padlock (optional) removed from door handle

Procedure

⇨ Pull door handle upwards and open the high-voltage door.

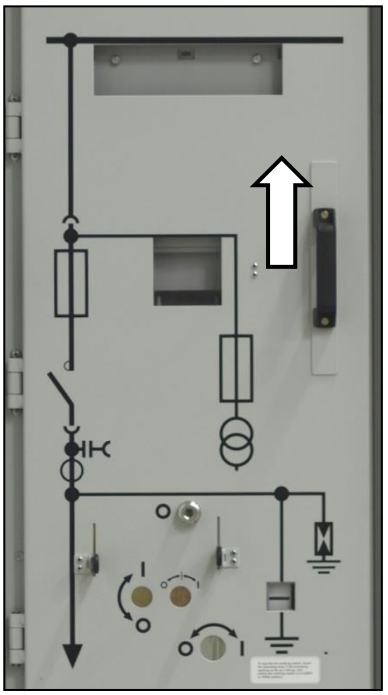


Fig. 180: Opening the high-voltage door

✓ The high-voltage door is open.

13.5 Closing the high-voltage door

⚠ WARNING

Reduced safety

The closed high-voltage door is an important safety element of the switchgear. The high-voltage door is exclusively opened for performing operational activities inside the switching-device compartment, such as removing or inserting a contactor truck.

Close the high-voltage door:

⇨ If an activity inside the switching-device compartment is interrupted.

⇨ Immediately after an activity inside the switching-device compartment was completed.

⇨ Before leaving the panel front.

Operating the contactor panel with panel width 435 mm

Instruction label on high-voltage door:
In addition to these instructions, an instruction label on the high-voltage door describes safe closing of the high-voltage door before executing a switching operation.

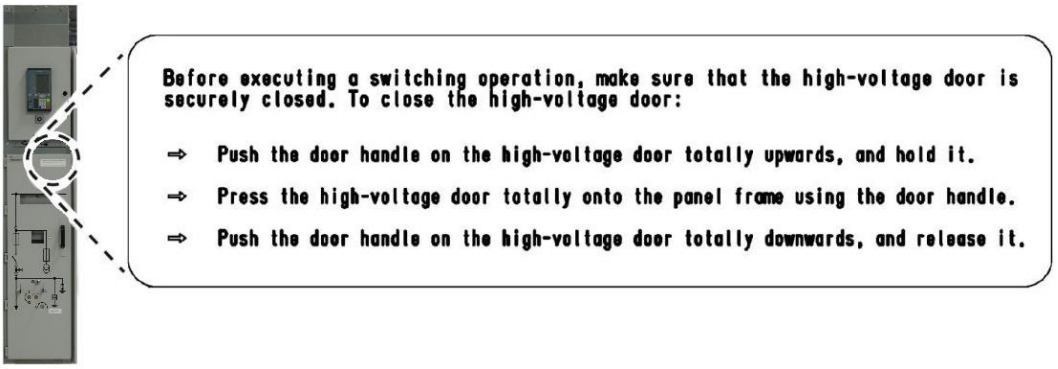


Fig. 181: Instruction label on high-voltage door

Preconditions

- Contactor truck:
  - Contactor truck removed from the panel

  or
  - Contactor truck inserted in test position
- High-voltage door open
- Padlock for door handle (optional) available

Procedure

⇨ Push the door handle on the high-voltage door totally upwards and hold it.

⇨ Press the high-voltage door totally onto the panel frame using the door handle.

⇨ Push the door handle on the high-voltage door totally downwards and release it.

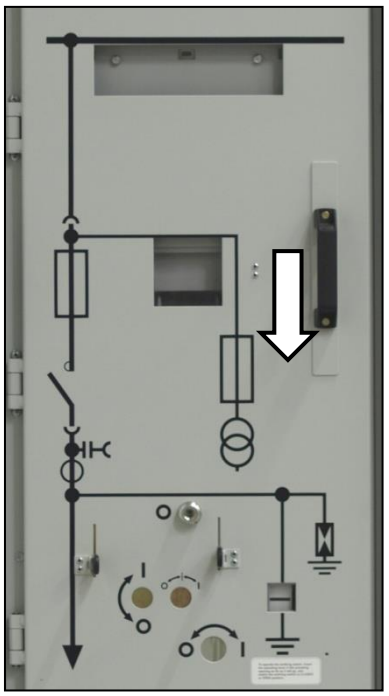


Fig. 182: Closing the high-voltage door

⇨ Fit a padlock (optional) to the door handle and close it.

✓ The high-voltage door is closed.

13.6 Positions of the contactor truck

General description of positions of the contactor truck:

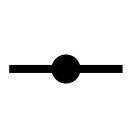
Service position
The contactor truck is connected with the busbar system and the outgoing feeder. The auxiliary circuit of the contactor truck is connected through the low-voltage connector.

Test position
The contactor truck is disconnected from the busbar system and the outgoing feeder. The auxiliary circuit of the contactor truck is connected through the low-voltage connector.

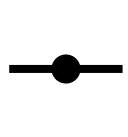
Disconnected position
The contactor truck is disconnected from the busbar system and the outgoing feeder. The auxiliary circuit is disconnected by pulling out the low-voltage connector.

Short instruction for racking the contactor truck:

Racking the contactor truck manually from test / disconnected position to service position:

Step 1 Insert and turn double-bit key			**Step 2** Insert and turn racking crank as far as it will go and pull it off	**Step 3** Turn and remove double-bit key		
from	by	to		from	by	to
						

Racking the contactor truck manually from service position to test / disconnected position:

Step 1 Insert and turn double-bit key			**Step 2** Insert and turn racking crank as far as it will go and pull it off	**Step 3** Turn and remove double-bit key		
from	by	to		from	by	to
						

13.7 Racking the contactor truck to service position

NOTICE

Maloperation

Racking the contactor truck to service position is only permissible if the contactor is in OPEN position.

⇨ Switch the contactor to OPEN position, if required.

Preconditions

- Contactor truck in test position
- Low-voltage connector plugged on (automatically)
- High-voltage door closed
- Contactor in OPEN position
- Feeder earthing switch in OPEN position
- For electromagnetic interlock (optional):
  - Electromagnetic interlock deactivated
- Racking crank for moving the contactor truck available
- Double-bit key available
- Padlock (optional) removed from operating slide

Fig. 183: Racking crank

Fig. 184: Double-bit key with a diameter of 5 mm

Procedure

NOTICE

Maloperation

All interlocks are only released when the contactor truck is in a stable end position.

⇨ Rack the contactor truck absolutely until end position.

⇨ To release the actuating opening for the double-bit key, lift the operating slide and hold it.

⇨ To release access to the contactor truck, insert the double-bit key and turn clockwise as far as it will go (that is 90°).

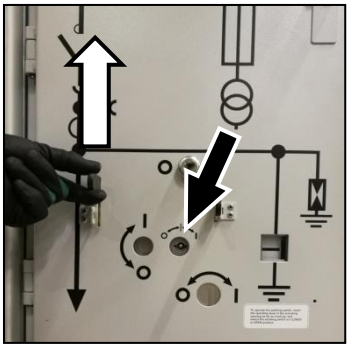


Fig. 185: Lifting the operating slide

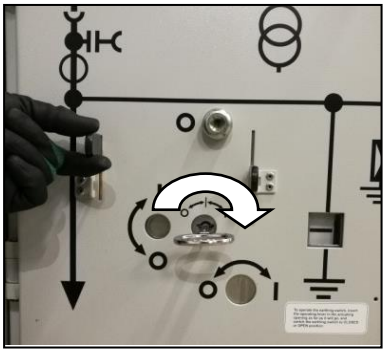


Fig. 186: Turning the double-bit key clockwise

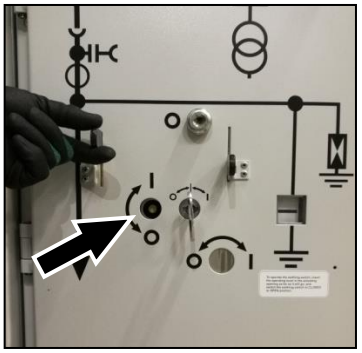


Fig. 187: Operating shaft for racking crank

⇨ Push the racking crank for moving the contactor truck onto the operating shaft and turn clockwise as far as it will go.

⇨ Remove the racking crank for moving the contactor truck.

⇨ Turn the double-bit key clockwise as far as it will go (that is 90°) to interlock the contactor truck.

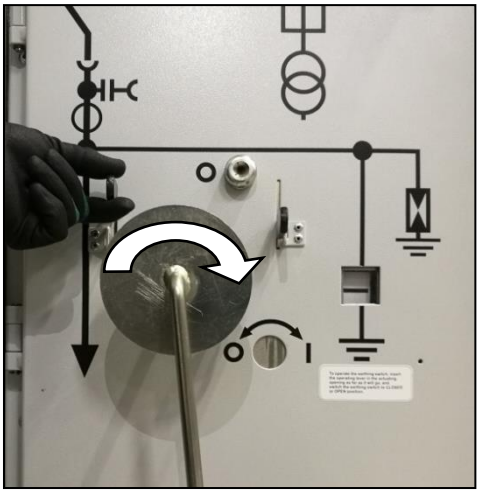


Fig. 188: Turning the racking crank clockwise

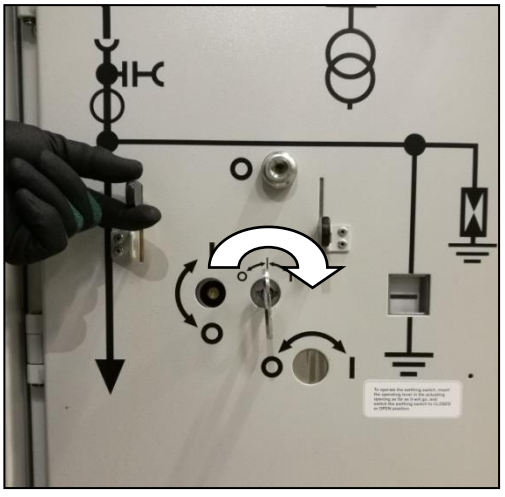


Fig. 189: Turning the double-bit key clockwise

⇨ Remove the double-bit key.

⇨ To close the actuating opening, push the operating slide down as far as it will go.

⇨ Fit a padlock (optional) to the operating slide and close it.

✓ The contactor truck has been racked from test position to service position.

13.8 Racking the contactor truck to test position

NOTICE

Maloperation

Racking the contactor truck to test position is only permissible if the contactor is in OPEN position.

⇨ Switch the contactor to OPEN position, if required.

Preconditions

- Contactor truck in service position
- Contactor in OPEN position
- For electromagnetic interlock (optional):
  - Electromagnetic interlock deactivated
- Racking crank for moving the contactor truck available
- Double-bit key available
- Padlock (optional) removed from operating slide

Fig. 190: Racking crank

Fig. 191: Double-bit key with a diameter of 5 mm

Procedure

NOTICE

Maloperation

All interlocks are only released when the contactor truck is in a stable end position.

⇨ Rack the contactor truck absolutely until end position.

⇨ To release the actuating opening for the double-bit key, lift the operating slide and hold it.

⇨ To release access to the contactor truck, insert the double-bit key and turn counter-clockwise as far as it will go (that is 90°).

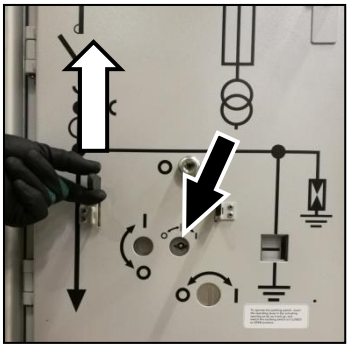


Fig. 192: Lifting the operating slide

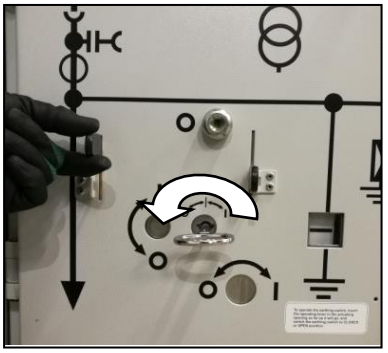


Fig. 193: Turning the double-bit key counter-clockwise

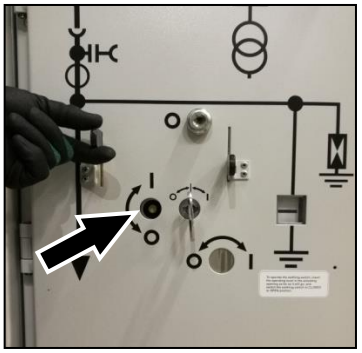


Fig. 194: Operating shaft for racking crank

⇨ Push the racking crank for moving the contactor truck onto the operating shaft and turn counter-clockwise as far as it will go.

⇨ Remove the racking crank for moving the contactor truck.

⇨ Turn the double-bit key counter-clockwise as far as it will go (that is 90°) to interlock the contactor truck.

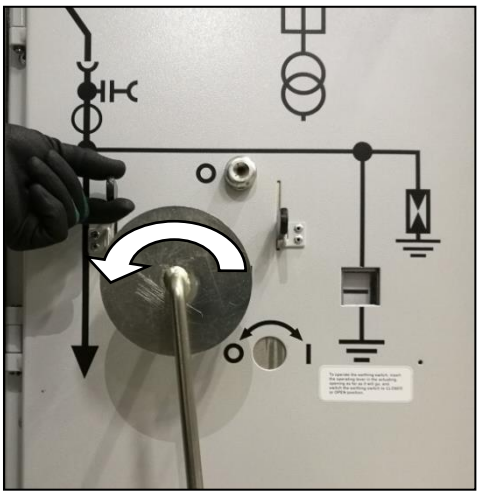


Fig. 195: Turning the racking crank counter-clockwise

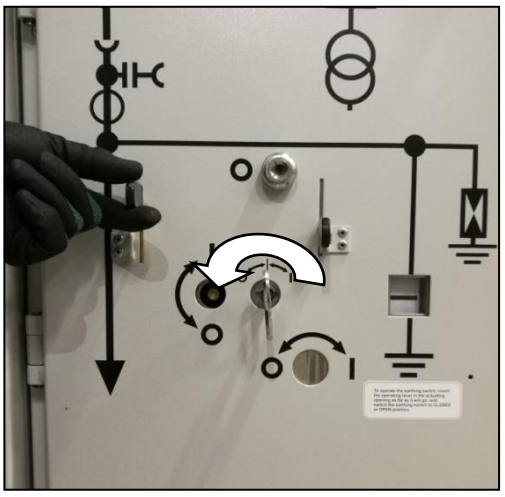


Fig. 196: Turning the double-bit key counter-clockwise

⇨ Remove the double-bit key.

⇨ To close the actuating opening, push the operating slide down as far as it will go.

⇨ Fit a padlock (optional) to the operating slide and close it.

✓ The contactor truck has been racked from service position to test position.

13.9 Closing the contactor electrically

NOTICE

Conflicting operation

Operating the contactor electrically is possible locally or from a central control. The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ Depending on the intended operating mode, set the panel to either local or remote control (for example by switching the local-remote switch).

INFORMATION

Unexpected switching noise and vibration

Operating the contactor causes a short loud noise and low vibration.

⇨ Expect switching noise and low vibration from inside the contactor.

Preconditions

- Contactor truck in service position or in test position
- Contactor in OPEN position
- High-voltage door closed
- Auxiliary voltage for the panel connected
- Remote or local control

Procedure

⇨ Close the contactor via central or local electrical control command element.

✓ The contactor is closed.

13.10 Opening the contactor electrically

NOTICE

Conflicting operation

Operating the contactor electrically is possible locally or from a central control. The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ Depending on the intended operating mode, set the panel to either local or remote control (for example by switching the local-remote switch).

INFORMATION

Unexpected switching noise and vibration

Operating the contactor causes a short loud noise and low vibration.

⇨ Expect switching noise and low vibration from inside the contactor.

INFORMATION

Contactor truck version with mechanical closing latch

Opening the contactor also opens the closing latch.

Preconditions

- Contactor truck in service position or in test position
- Contactor in CLOSED position
- High-voltage door closed
- Auxiliary voltage for the panel connected
- Remote or local control

Procedure

⇨ Open the contactor via central or local electrical control command element.

✓ The contactor is open.

13.11 Opening the contactor manually

NOTICE

Conflicting operation

The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ For operating the contactor manually, set the panel to local control, for example by switching the local-remote switch to LOCAL position.

INFORMATION

Unexpected switching noise and vibration

Operating the contactor causes a short loud noise and low vibration.

⇨ Expect switching noise and low vibration from inside the contactor.

INFORMATION

Manual operation of the contactor is limited to manual opening of the contactor. Manual closing of the contactor is not possible.

INFORMATION

Contactor truck version with mechanical closing latch

Opening the contactor also opens the closing latch.

Operating the contactor panel with panel width 435 mm

Preconditions

- Contactor truck in service position or in test position
- Contactor in CLOSED position
- For electromagnetic interlock (optional):
  - Electromagnetic interlock deactivated
- High-voltage door closed
- Panel set to local control
- Double-bit key available

Procedure

⇨ To release the actuating opening for the double-bit key, lift the operating slide and hold it.

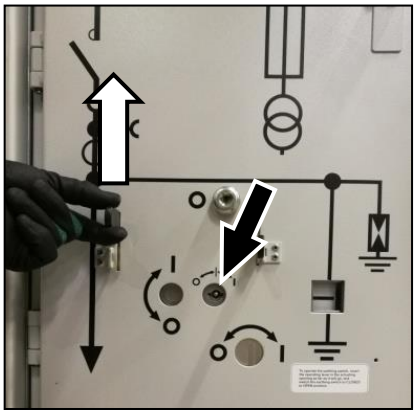


Fig. 197: Operating slide lifted

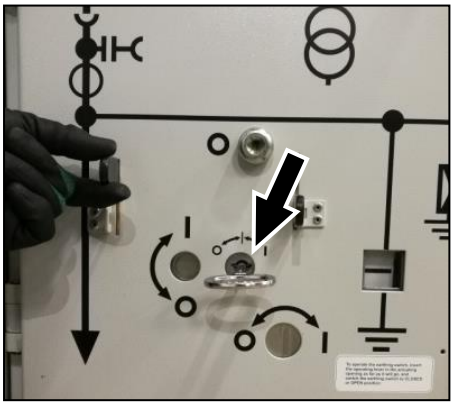


Fig. 198: Double-bit key to turn

To open the contactor manually, insert the double-bit key and turn as far as it will go:

⇨

- Contactor truck in service position: 90° counter-clockwise
- Contactor truck in test position: 90° clockwise

✓ The contactor is open.

INFORMATION

Final procedure steps

⇨ You may now go on to insert the crank for racking the contactor truck.

⇨ Otherwise remove the double-bit key, push the operating slide down, fit a padlock (optional) to the operating slide and close it.

13.12 Manual emergency opening of the contactor

NOTICE

Maloperation

Manual emergency opening of the contactor is only permissible in case of emergency (for example the electrical malfunction of the contactor).

⇨ Perform the following activities only in case of emergency.

⇨ For operating the contactor manually, use the push rod only in the way described hereafter.

Preconditions

- Contactor truck in service position or in test position
- Contactor in CLOSED position
- High-voltage door closed
- Push rod available

Procedure

⇨ Insert the push rod through the actuating opening in the high-voltage door and press it to the frame as far as it will go.

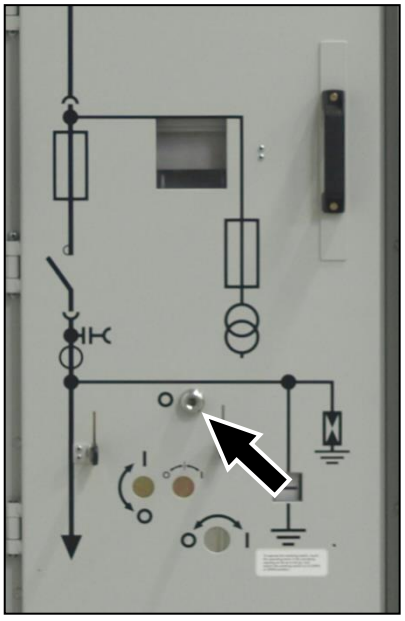


Fig. 199: High-voltage door with actuating opening

Fig. 200: Push rod inserted

✓ The contactor is open.

13.13 Operating conditions without auxiliary voltage

Contactor panels with electromagnetic interlock for racking the contactor truck (optional) plus mechanical closing latching for the contactor (optional) are equipped with an additional feature.
In case the auxiliary voltage is disconnected, the electromagnetic interlock can be unlocked manually. This manual unlocking is operated on the high-voltage door with a lever. This lever is padlocked during standard operating conditions.

NOTICE

Maloperation

Without auxiliary voltage, turning the double-bit key is mechanically interlocked.

⇨ Do **not** try to turn the double-bit key while the mechanical interlock is active.

⇨ Perform manual unlocking of the electromagnetic interlock to release turning of the double-bit key.

In addition to these instructions, instruction labels on the high-voltage door inform about the operation of the manual unlocking:

Fig. 201: Manual unlocking, padlocked

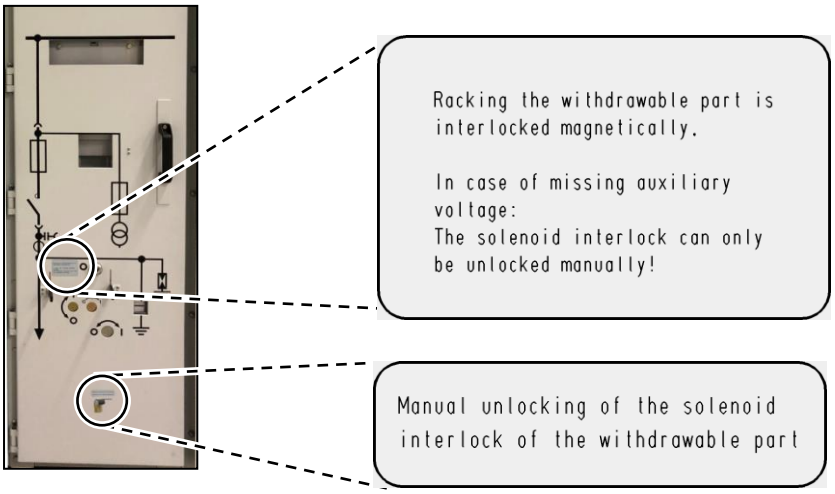


Fig. 202: Instruction labels on high-voltage door

Racking the contactor truck to test position

INFORMATION

Unexpected switching noise and vibration

If the contactor is in CLOSED position before starting the procedure, turning the double-bit key 90° opens the contactor. This causes a short loud noise and low vibration.

⇨ Expect switching noise and low vibration from inside the contactor when turning the double-bit key.

Preconditions

- Authorization to operate the manual unlocking available
- Auxiliary voltage for the panel disconnected
- High-voltage door closed
- Contactor truck in service position
- Contactor in CLOSED position or OPEN position
- Key for padlock available
- Double-bit key available
- Racking crank available

Procedure

⇨ Make sure to operate the particular contactor panel authorization is given for.

⇨ To release the actuating opening for the double-bit key, lift the operating slide and hold it.

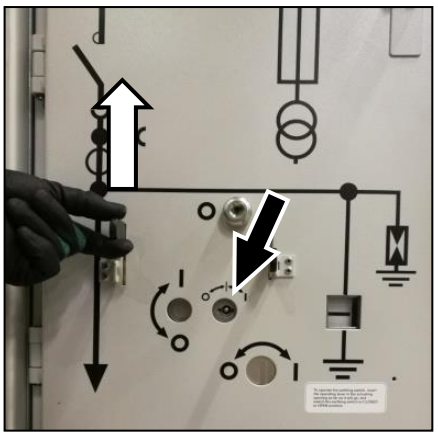


Fig. 203: Lifting the operating slide

⇨ Insert the double-bit key without turning.

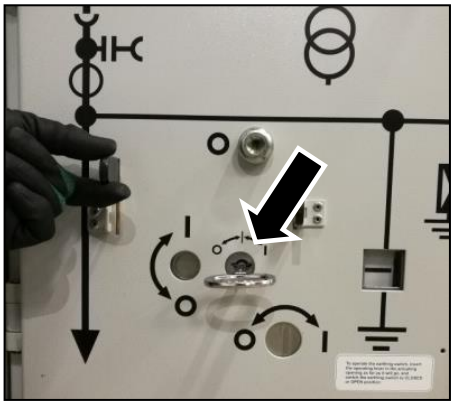


Fig. 204: Double-bit key inserted

⇨ Remove the padlock from the manual unlocking.

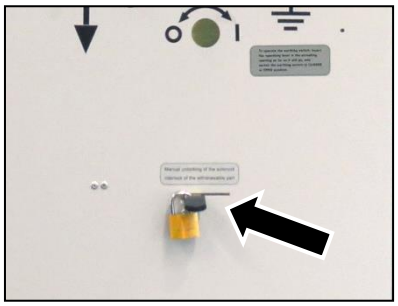


Fig. 205: Manual unlocking, padlocked

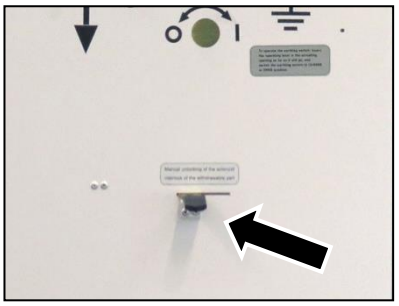


Fig. 206: Manual unlocking, padlock removed

⇨ Move the lever for the manual unlocking to the right as far as it will go and hold it.

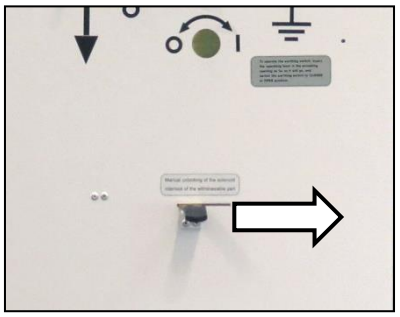


Fig. 207: Moving the lever to the right

⇨ To release access to the contactor truck, turn the double-bit key counter-clockwise as far as it will go (that is 90°).

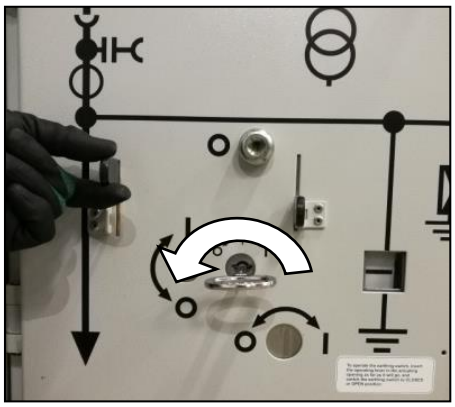


Fig. 208: Turning the double-bit key counter-clockwise

⇨ Move the lever for the manual unlocking to the left as far as it will go. Fit the padlock to the lever and close the padlock.

⇨ Push the racking crank for moving the contactor truck onto the operating shaft, and turn counter-clockwise as far as it will go.

⇨ Remove the racking crank for moving the contactor truck.

⇨ Turn the double-bit key counter-clockwise as far as it will go (that is 90°) to interlock the contactor truck.

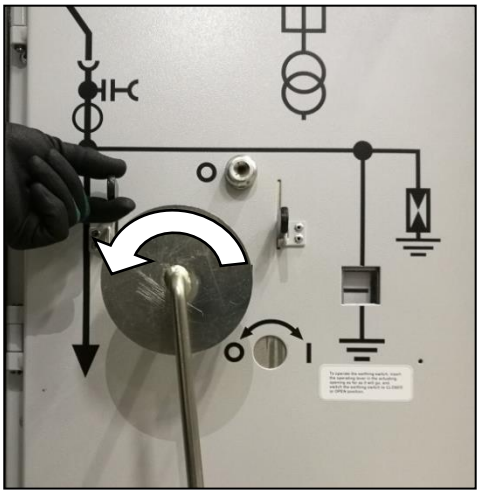


Fig. 209: Turning the racking crank counter-clockwise

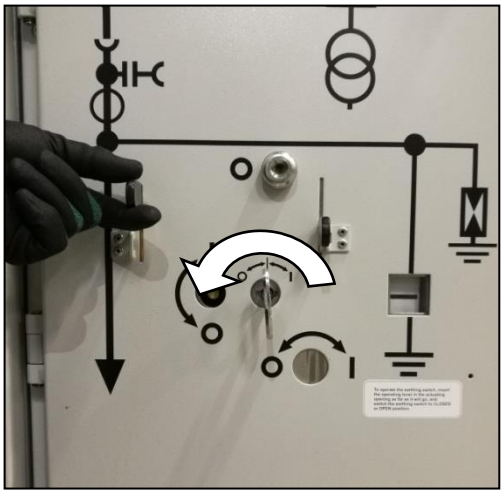


Fig. 210: Turning the double-bit key counter-clockwise

⇨ Remove the double-bit key.

⇨ To close the actuating opening, push the operating slide down as far as it will go.

⇨ Fit a padlock (optional) to the operating slide and close it.

✓ The contactor truck has been racked from service position to test position.

13.14 Earthing the feeder manually

NOTICE

Maloperation

A switching operation once started must be completed totally! A switching operation that was not completed cannot be turned back.

⇨ Do not try to remove the operating lever at intermediate positions.

NOTICE

Maloperation

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

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

Operating the contactor panel with panel width 435 mm

Instruction label on high-voltage door:
In addition to these instructions, an instruction label on the high-voltage door informs about proper operation of the operating lever for the feeder earthing switch.

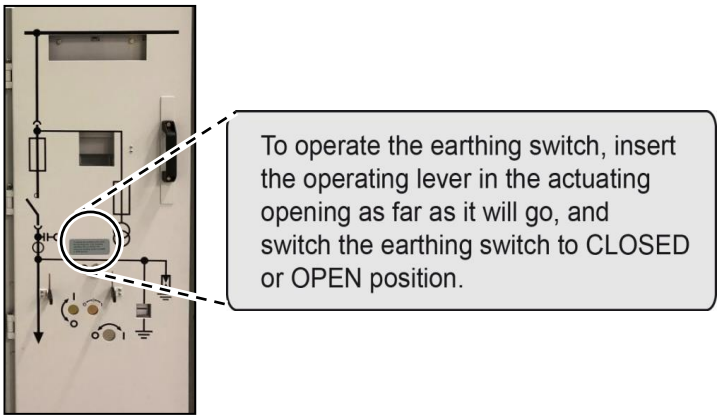


Fig. 211: Instruction label on high-voltage door

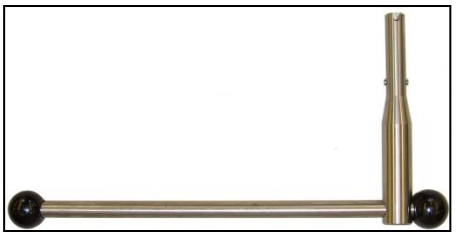


Fig. 212: Operating lever

Preconditions

- High-voltage door closed
- Contactor truck in test position
- Feeder to be earthed isolated
- Padlock (optional) removed from operating slide
- For electromagnetic interlock (optional):
  - Electromagnetic interlock deactivated
- Operating lever available

Procedure

⇨ To release the actuating opening, lift the operating slide and hold it.

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

⇨ Turn the operating lever clockwise 180° until the feeder earthing switch changes to CLOSED position.

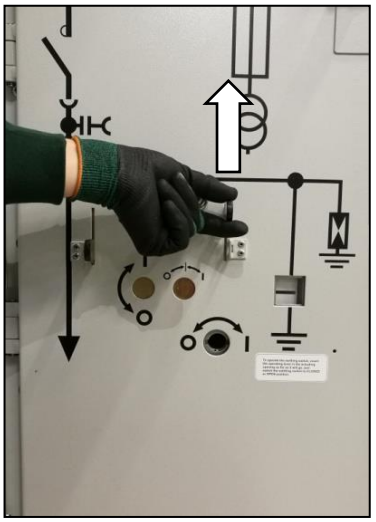


Fig. 213: Lifting the operating slide

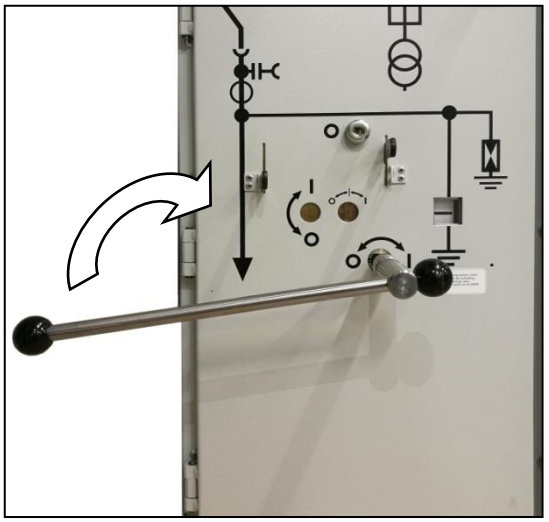


Fig. 214: Inserting the operating lever

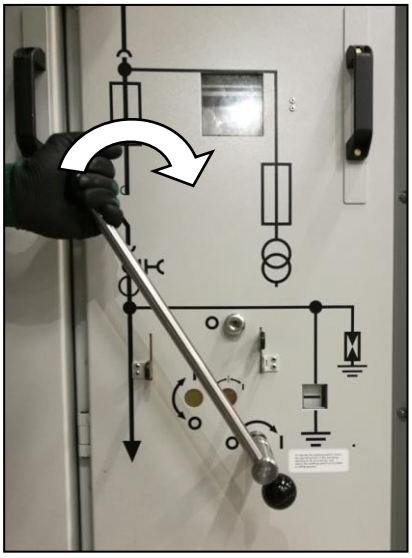


Fig. 215: Turning the operating lever clockwise

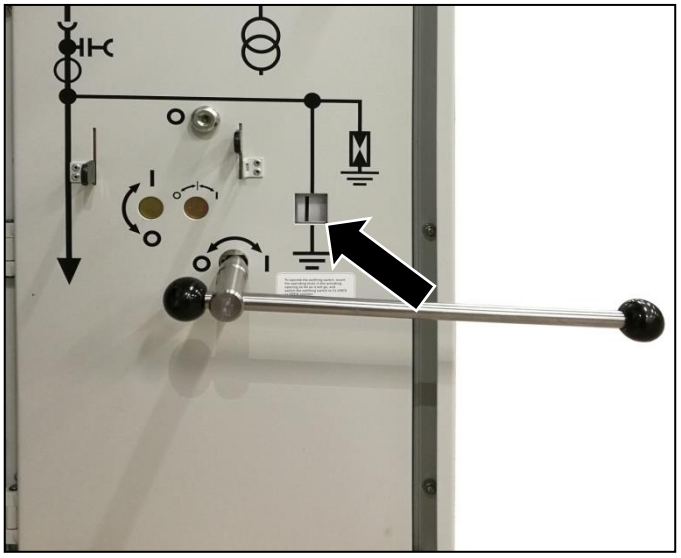


Fig. 216: Position indicator on high-voltage door in CLOSED position

⇨ Remove the operating lever.

⇨ To close the actuating opening, push the operating slide down as far as it will go.

⇨ Fit a padlock (optional) to the operating slide and close it.

✓ The feeder is earthed.

13.15 De-earthing the feeder manually

NOTICE

Maloperation

A switching operation once started must be completed totally! A switching operation that was not completed cannot be turned back.

⇨ Do not try to remove the operating lever at intermediate positions.

NOTICE

Maloperation

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

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

Operating the contactor panel with panel width 435 mm

Instruction label on high-voltage door:
In addition to these instructions, an instruction label on the high-voltage door informs about proper operation of the operating lever for the feeder earthing switch.

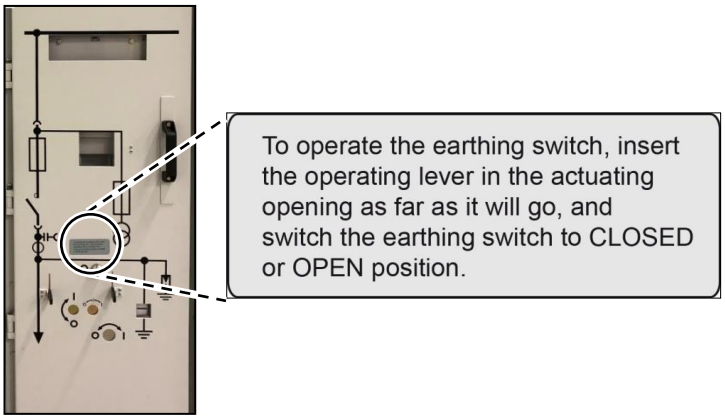


Fig. 217: Instruction label on high-voltage door

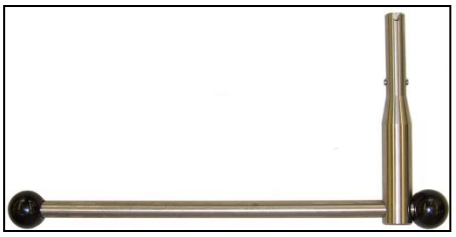


Fig. 218: Operating lever

Preconditions

- High-voltage door closed
- Contactor truck in test position
- Padlock (optional) removed from operating slide
- For electromagnetic interlock (optional):
  - Electromagnetic interlock deactivated
- Operating lever available

Procedure

⇨ To release the actuating opening, lift the operating slide and hold it.

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

⇨ Turn the operating lever counter-clockwise 180° until the feeder earthing switch changes to OPEN position.

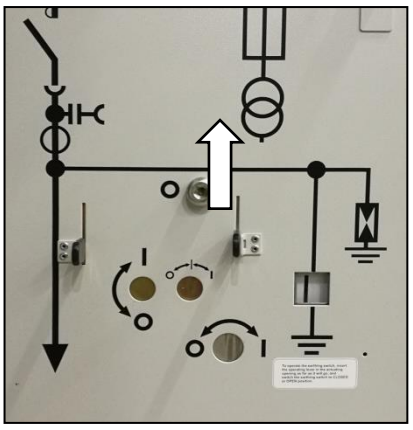


Fig. 219: Lifting the operating slide

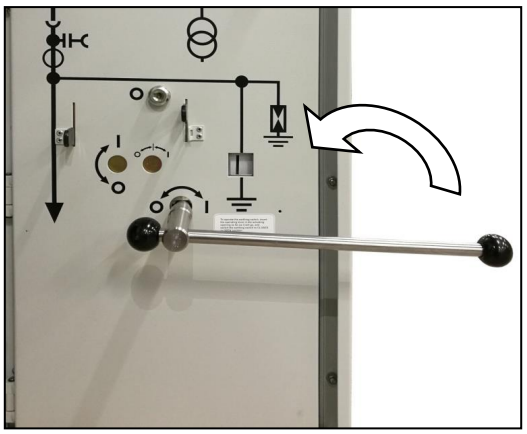


Fig. 220: Inserting the operating lever

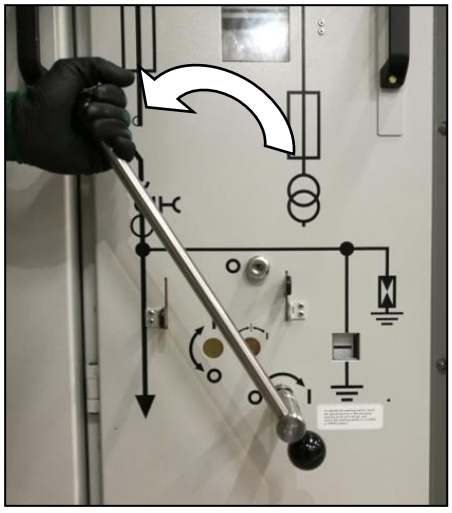


Fig. 221: Turning the operating lever counter-clockwise

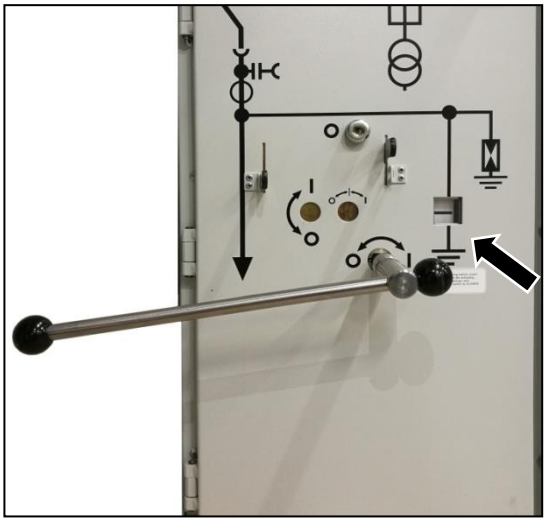


Fig. 222: Position indicator in OPEN position

⇨ Remove the operating lever.

⇨ To close the actuating opening, push the operating slide down as far as it will go.

⇨ Fit a padlock (optional) to the operating slide and close it.

✓ The feeder is de-earthed.

13.16 Taking the contactor truck out of the panel

⚠ DANGER

Electric shock

The shutter mechanism of the busbar compartment is accessible when the contactor truck has been moved away from the panel.

⇨ Padlock the busbar shutter mechanism immediately against actuation as soon as the contactor truck was moved away from the panel.

⇨ As long as no contactor truck is in the panel, the shutter mechanism on left side of the switching-device compartment must remain secured with the padlock.

⇨ Do not remove the padlock at the shutter mechanism on the left side until right before moving the contactor truck into the panel.

⚠ CAUTION

Injury

The mechanism inside the contactor truck can cause injuries by getting squeezed, caught or cut.

⇨ Do not remove any parts of the covering.

INFORMATION

Plugging on the low-voltage connector

The low-voltage connection decouples automatically when taking out the contactor truck.

(1) Handle

(2) Front cover

(3) Locking levers

(4) Step on the bottom side of the truck to stabilize the contactor truck during replacement of HV HRC fuse-links

(5) Ramps

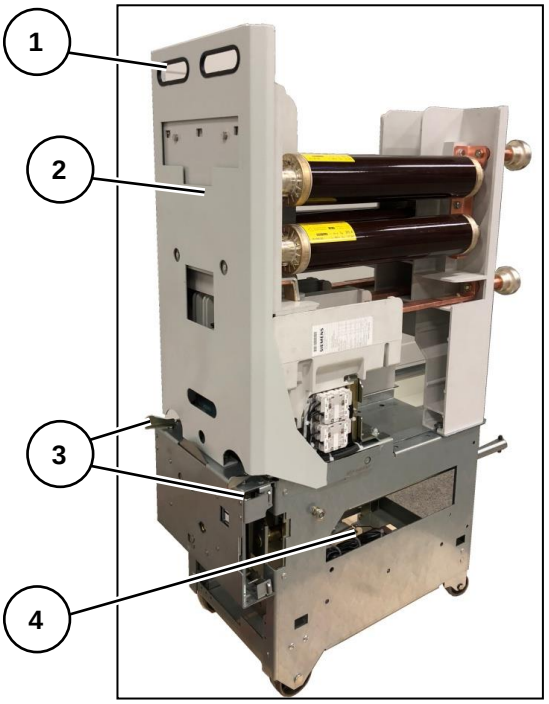


Fig. 223: Contactor truck

Fig. 224: Contactor panel with high-voltage door open

Preconditions

- Contactor truck available
- Contactor truck in test position
- High-voltage door open

Procedure

Pulling the ramp downwards

CAUTION

Protruding parts

Protruding parts such as locking elements at the contactor truck or at the rear of the contactor truck can cause injuries.

⇨ Move the contactor truck only at the front side.

⚠ CAUTION

Sharp edges

The metal parts of the contactor truck may have sharp edges.

⇨ Put on personal protective equipment.

⇨ Lower the ramps (1) of the panel base.

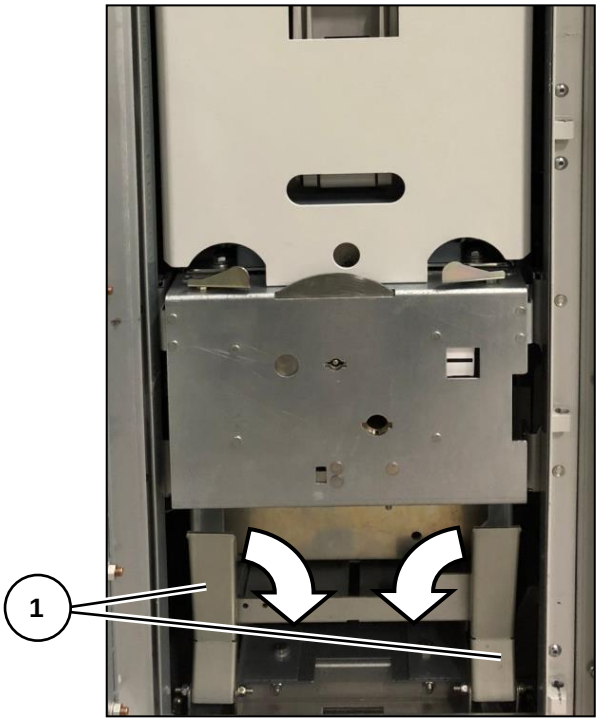


Fig. 225: Lowering the ramps

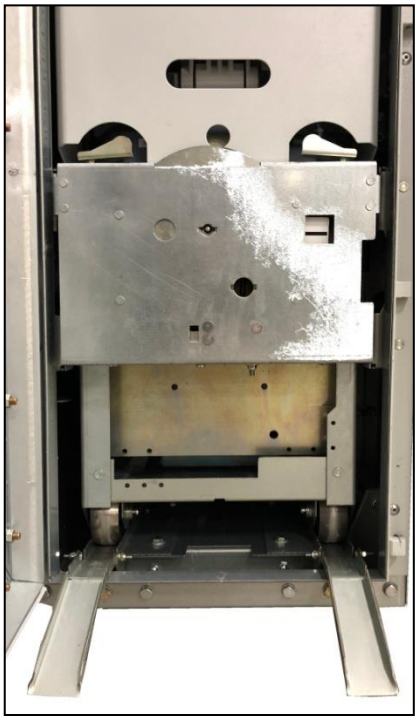


Fig. 226: Ramps in open position

Unlocking the contactor truck from the panel

⇨ Release the interlocking with the panel by turning the two locking levers at the contactor truck to the outside.

Fig. 227: Releasing the interlocking with the panel

Fig. 228: Contactor truck unlocked

Moving contactor truck outside of the panel

⚠ CAUTION

Maloperation

The contactor truck is designed exclusively for slow and careful driving on obstacle-free paths.

- ⇨ Before moving the contactor truck, check the path and the ramps.
- ⇨ Keep the shunting area, paths and ramps free of obstacles and dry.
- ⇨ Remove objects such as small parts, installation material or tools from the floor in the travel area.
- ⇨ Move the contactor truck only slowly and constantly.
- ⇨ The contactor truck is not suitable for unsteady floor, such as stairs, deepening or floor joints.

⚠ CAUTION

Protruding parts

Protruding parts such as locking elements at the contactor truck or at the rear of the contactor truck can cause injuries.

- ⇨ Move and operate the contactor truck only at the front side.

⇨ To move the contactor truck outside of the panel, use two handles.

Fig. 229: Handle on contactor truck

Fig. 230: Moving the contactor truck using two handles

⇨ Pull the contactor truck at the top of the front cover (1) onto the ramps (2).

⇨ Keep pulling the contactor truck until it is outside of the panel. By doing so, the low-voltage connection is separated automatically.

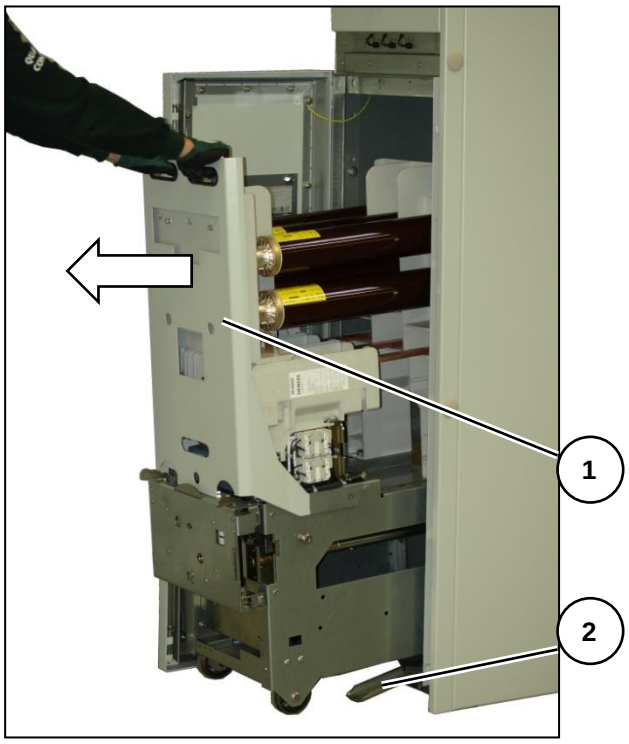


Fig. 231: Pulling the contactor truck

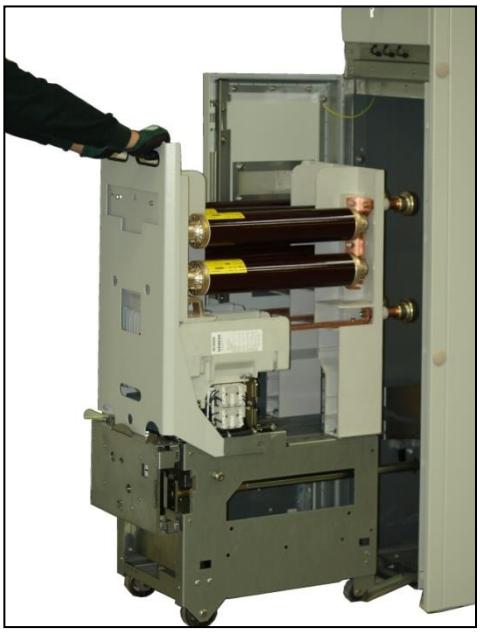


Fig. 232: Contactor truck taken out of the panel

⇨ If no further operation is executed: Close the high-voltage door.

✓ The contactor truck is taken out of the panel.

13.17 Inserting the contactor truck in a panel

⚠ CAUTION

Injury

The mechanism inside the contactor truck can cause injuries by getting squeezed, caught or cut.

⇨ Do not remove any parts of the covering.

⚠ CAUTION

Maloperation

Protruding parts such as locking elements at the contactor truck or at the rear of the contactor truck can cause injuries.

⇨ Move and operate the contactor truck only at the front side.

⚠ CAUTION

Maloperation

The contactor truck is designed exclusively for slow and careful driving on obstacle-free paths.

- ⇨ Before moving the contactor truck, check the path and the ramps.
- ⇨ Keep the shunting area, paths and the ramps free of obstacles and dry.
- ⇨ Remove objects such as small parts, installation material or tools from the floor in the travel area.
- ⇨ Move the contactor truck only slowly and constantly.
- ⇨ The contactor truck is not suitable for unsteady floor, such as stairs, deepening or floor joints.

NOTICE

Maloperation

A contactor truck may only be operated in a panel if the HV HRC fuse-links installed match the particular panel version. However, there is no coding on the contactor truck to prevent inserting it in a panel not suitable for the particular contactor version.

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

Preconditions

- Panel prepared, no contactor truck inserted
- High-voltage door open
- Contactor truck available
- HV HRC fuse-links in the contactor correspond to the particular panel

(1) Handle

(2) Front cover

(3) Handle for supporting the truck

(4) Locking levers

(5) Step on the bottom side of the truck to stabilize the contactor truck during replacement of HV HRC fuse-links

(6) Ramps

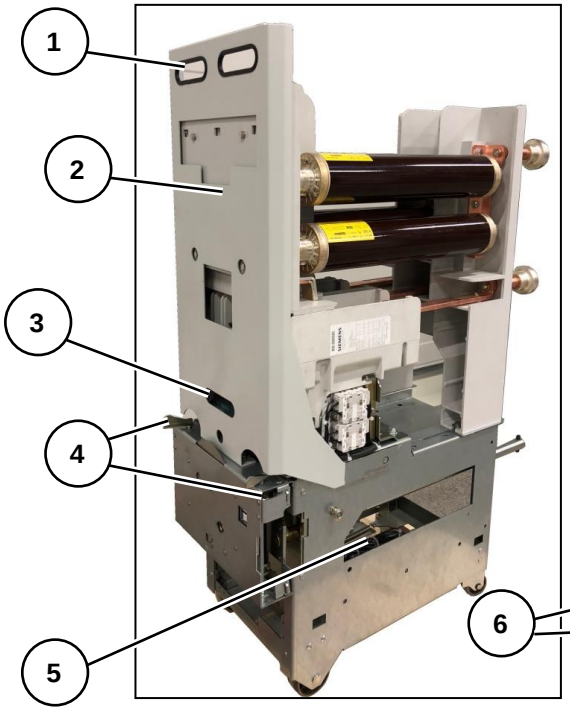


Fig. 233: Contactor truck

Fig. 234: Contactor panel with high-voltage door open

Preparing the operating shaft for the feeder earthing switch

⇨ Make sure that the coupling pin of the operating shaft for the feeder earthing switch at the contactor truck and the coupling in the switching-device compartment are in vertical position.

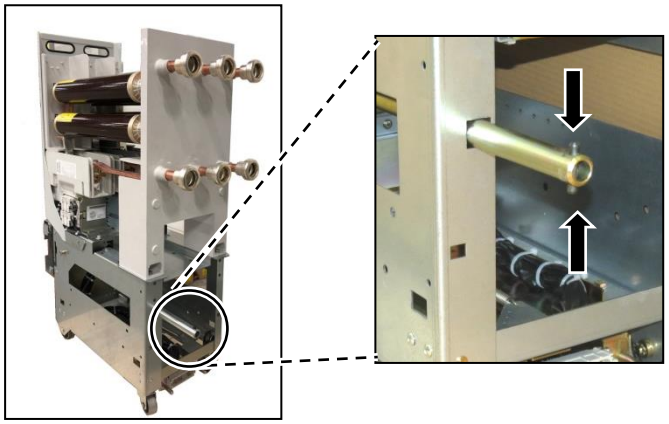


Fig. 235: Coupling pin of the operating shaft at the contactor truck

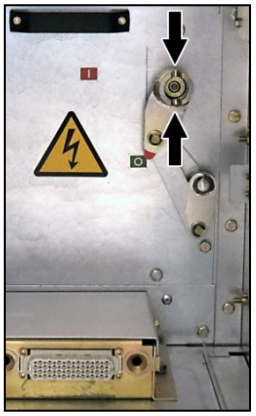


Fig. 236: Coupling in the switching-device compartment

⇨ If required, put the coupling pin of the feeder earthing switch operating shaft in vertical position. To do so, reinsert the contactor truck into the corresponding panel and operate the feeder earthing switch accordingly.

Checking if mechanical closing latch is needed

Depending on the number of fuse-links and their rated currents it may be necessary that a contactor truck is equipped with a mechanical closing latch. Contactor trucks with mechanical closing latch have no corresponding label. Contactor trucks without mechanical closing latch are labelled accordingly on the front side:

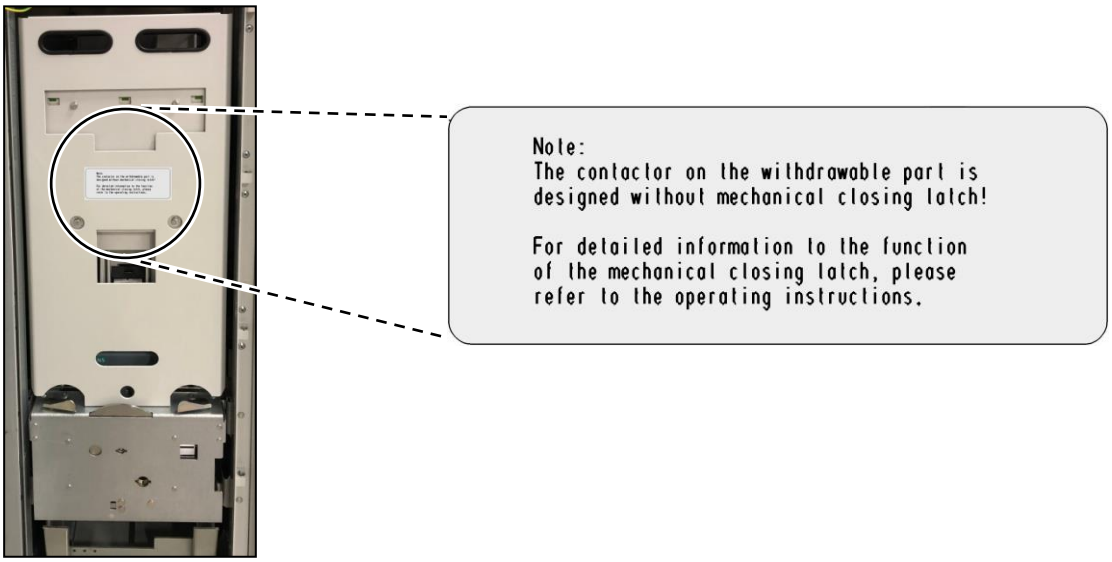


Fig. 237: Instruction label on the front side of the contactor truck

⇨ First, check if the panel requires a contactor truck with/without mechanical closing latch to be inserted. Second, check the front side of the contactor truck for the corresponding instruction label.

Operating the contactor panel with panel width 435 mm

Positioning the contactor truck in front of the panel

INFORMATION

Plugging on the low-voltage connector

The low-voltage connection couples automatically when the contactor truck is inserted.

⇨ Move the contactor truck centrally in front of the contactor panel. The front wheels (1) of the contactor truck point towards the ramps (2) at the bottom of the panel.

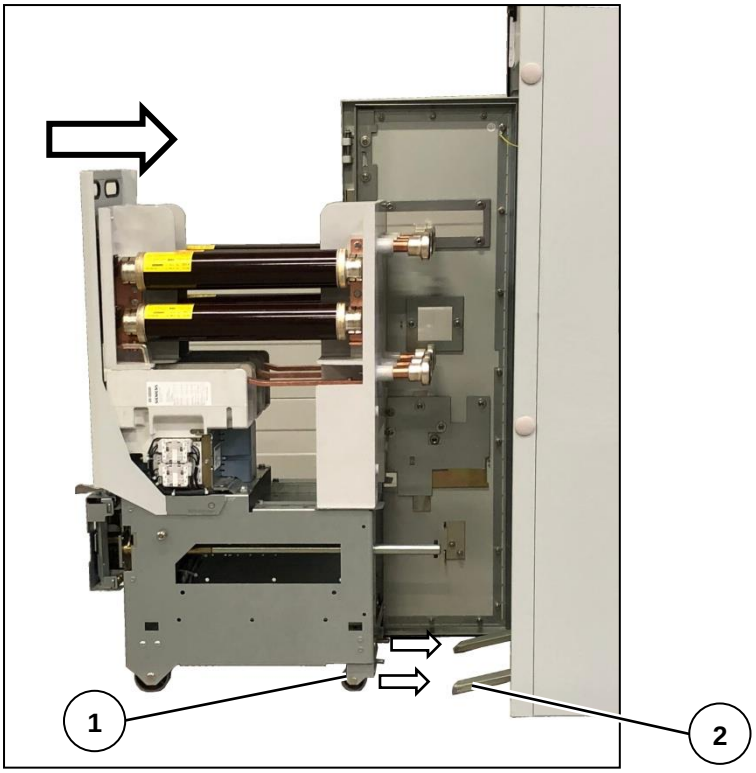


Fig. 238: Positioning the contactor truck in front of the panel

⇨ If required, support the contactor truck with the handle (3) to move it onto the ramps.

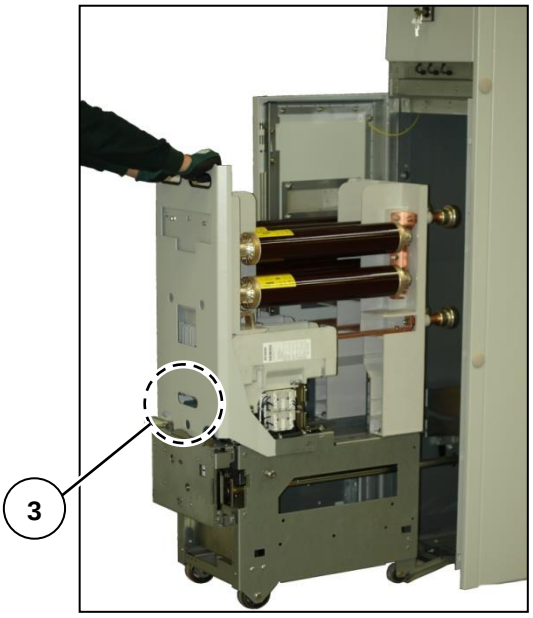


Fig. 239: Moving the contactor truck into the panel

Pushing the contactor truck into the panel

⇨ Push the contactor truck at the top into the panel as far it will go.

⇨ Lift the ramps (1) at the panel base upwards.

Fig. 240: Pushing the contactor truck at the top into the panel

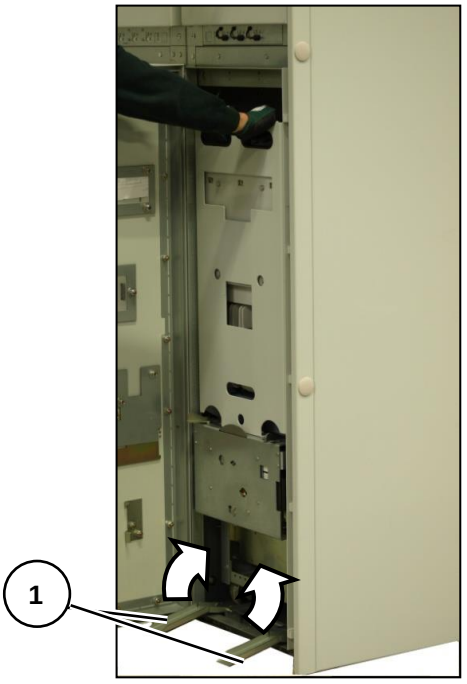


Fig. 241: Lifting the ramps

⇨ Check whether the contactor truck is correctly placed into the panel by pulling it backwards.

Interlocking the contactor truck with the panel

⇨ Interlock the contactor truck with the panel by turning the two locking levers to the inside.

The contactor truck is correctly interlocked with the panel as soon as both locking levers latch tight inside.

Fig. 242: Interlocking the contactor truck

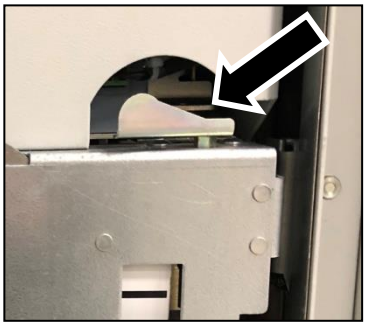


Fig. 243: Contactor truck locked

✓ The contactor truck is inserted in the panel and the high-voltage door is closed.

13.18 Replacing HV HRC fuse-links

According to IEC 60282-1 (2009) Clause 6.6, the breaking capacity of HV HRC fuse-links is tested within the scope of the type test at 87 % of their rated voltage.

In three-phase systems with resonance-earthed or isolated neutral, under double earth fault and other conditions, the full phase-to-phase voltage may be available at the HV HRC fuse-link during breaking. Depending on the size of the operating voltage of such a system, this applied voltage may then exceed 87 % of the rated voltage.

It must therefore already be ensured during configuration of the switching devices and selection of the HV HRC fuse-link that only such fuse-links are used, which either satisfy the above operating conditions, or whose breaking capacity was tested at least with the maximum system voltage.

In case of doubt, a suitable HV HRC fuse-link must be selected together with the fuse-link manufacturer.

⚠ CAUTION

Burns

After tripping, the surfaces of HV HRC fuse-links are hot. Touching hot HV HRC fuse-links may cause burns.

⇨ Put on personal protective equipment.

⇨ Let hot HV HRC fuse-links cool down before replacing.

NOTICE

Undetected damage

Even if the contactor truck shows no visible damages of a fault, the HV HRC fuse-link may have tripped due to a fault.

⇨ Check the switching-device compartment for deformations when a fuse-link has tripped.

Arrangement of HV HRC fuse-links

Depending on the panel version, contactors are equipped with either single or double fuse-link arrangement per phase. Hereafter, replacing HV HRC fuse-links is shown using the example of a double fuse-link arrangement.

When inserting a new HV HRC fuse-link, its striker must always point to the operating side of the contactor truck (1). The position of the striker is identified with a triangle (2) representing an arrow on the rating plate of the HV HRC fuse-link.

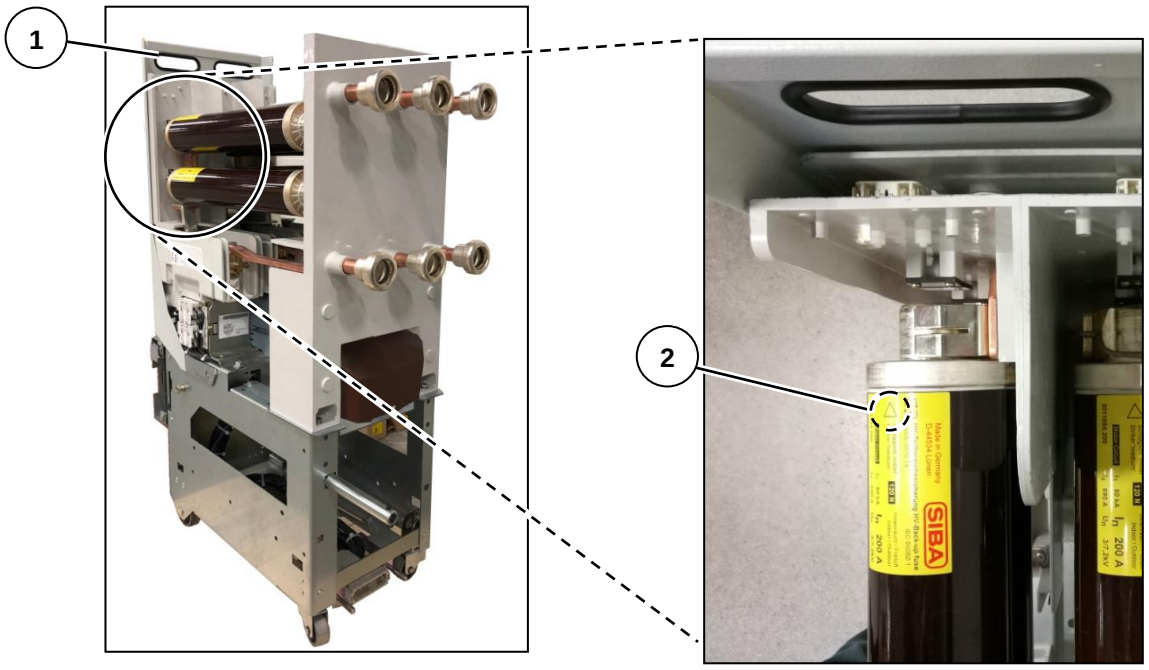


Fig. 244: Arrangement of HV HRC fuse-links (example with double fuse-link arrangement)

(3) Outer phase L1 with double fuse-link arrangement

(4) Outer phase L3 with double fuse-link arrangement

(5) Middle phase L2 with double fuse-link arrangement

(6) Front side of the contactor truck

Fig. 245: Seen from top: Arrangement of HV HRC fuse-links (example with double fuse-link arrangement)

Permissible HV HRC fuse-links

The specified SIBA HV HRC fuse-links are motor protection back-up fuse-links according to IEC 60282-1. The dimensions of the HV HRC fuse-links correspond to DIN 43625.

NOTICE

Maloperation

Contactor trucks are exclusively designed for operation with specific HV HRC fuse-links. Using other types of fuse-links may cause damages on the panel.

⇨ Use only the fuse-link types listed in the following table.

⇨ Do not mount bridging links instead of HV HRC fuse-links.

Selection table for HV HRC fuse-links

Rated voltage U_r [kV]	Rated current I_r [A]	Dimension "e" [mm]	Number of fuse-links permitted per phase	Order details (SIBA)	Order details (Inter-teknik)
7.2	50	442	1	3010853.50	+S68T.12KV.442.050.08-7.2
	63		1	3010853.63	+S68T.12KV.442.063.08-7.2
	80		1	3010853.80	+S68T.12KV.442.080.08-7.2
	100		1	3010853.100	+S4T.12KV.442.100.08-7.2
	125		1	3010953.125	+S4T.12KV.442.125.08-7.2
	160		1 or 2	3010953.160	+S4T.12KV.442.160.08-7.2
	200		1 or 2	3011054.200	+S4T.12KV.442.200.08-7.2
	250		1 or 2	3011054.250	+S4T.12KV.442.250.08-7.2
	315		1	3011054.315	+S4T.12KV.442.315.08-7.2
Supplier information : www.siba-fuses.com Supplier information : www.inter-teknik.com					

Rated voltage U_r [kV]	Rated current I_r [A]	Dimension "e" [mm]	Number of fuse-links permitted per phase	Order details (SIBA)	Order details (Inter-teknik)
12	50	442	1	3010153.50	+S68T.12KV.442.050.08
	63		1	3010153.63	+S68T.12KV.442.063.08
	80		1	3010253.80	+S68T.12KV.442.080.08
	100		1	3010253.100	+S4T.12KV.442.100.08
	125		1 or 2	3010253.125	+S4T.12KV.442.125.08
	160		1 or 2	3010353.160	+S4T.12KV.442.160.08
Supplier information : www.siba-fuses.com Supplier information : www.inter-teknik.com					

Replacing HV HRC fuse-links

NOTICE

Undetected damage

Tripped HV HRC fuse-links can cause hidden damages on the other HV HRC fuse-links.

⇨ Always replace all HV HRC fuse-links, even if only one HV HRC fuse-link has tripped.

INFORMATION

Number of installed fuse-links

Usually the contactor truck is equipped with two HV HRC fuse-links per phase.

⇨ If only one HV HRC fuse-link per phase is installed, use the upper position at the clamps.

INFORMATION

Electrical indication of tripped fuse-links

Electrical indications at the panel or in the remote control room are automatically reset to operating mode by replacing the HV HRC fuse-links.

INFORMATION

Recommended order of action

The HV HRC fuse-links in the middle phase L2 are only accessible after removing the HV HRC fuse-links from the adjacent phase L3.

⇨ First, remove the HV HRC fuse-links from the outer phases L1 and L3 on the left and right side of the contactor truck. Then go on to remove the HV HRC fuse-link from the middle phase L2.

Preconditions

- Set of proper HV HRC fuse-links available
- Contactor truck taken out of the panel
- High-voltage door closed

Procedure

⇨ Step on the bottom side of the truck to stabilize the contactor truck during the replacement of HV HRC fuse-links.

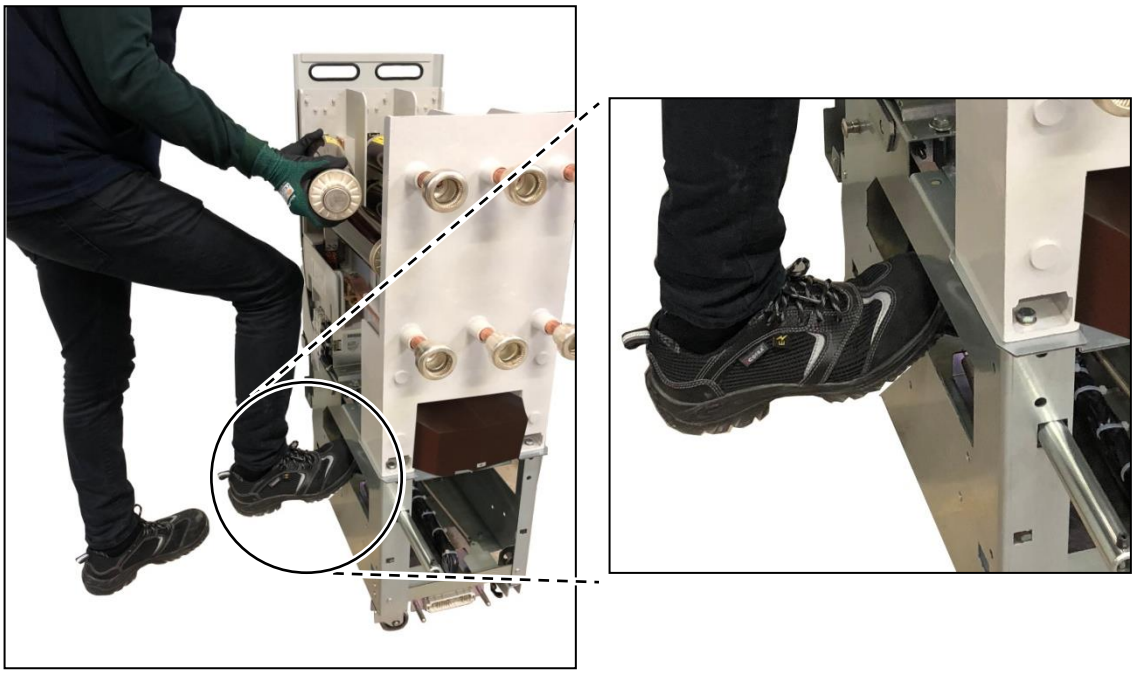


Fig. 246: Step on the bottom side of the truck

Outer phases L1 and L3

⇨ Select one of the phases. Release the HV HRC fuse-link by turning while pulling it out of the clamps.

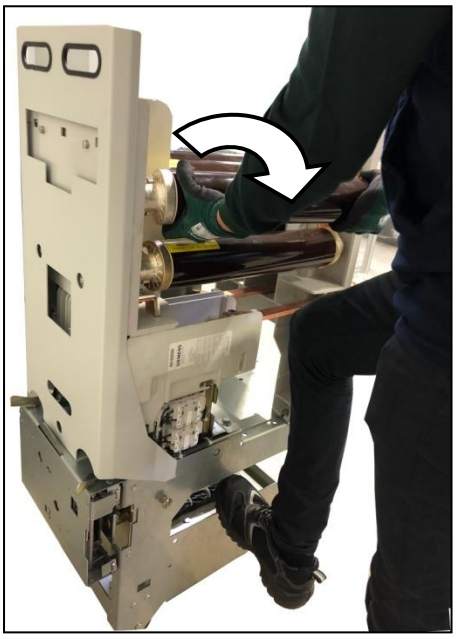


Fig. 247: Opening the fuse-link bracket in the striker area (operating side of contactor truck)

Fig. 248: Opening the fuse-link bracket on the opposite side of the striker area (contact tulip side of contactor truck)

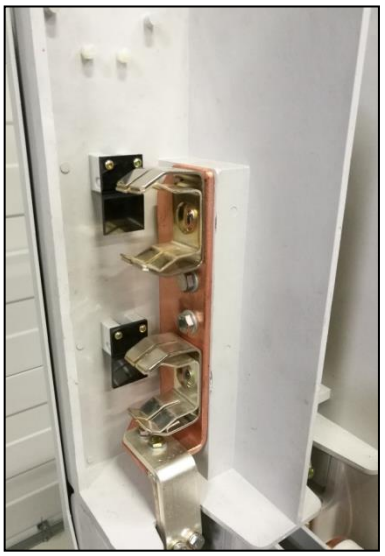


Fig. 249: HV HRC fuse-link removed in the striker area

Fig. 250: HV HRC fuse-link removed on the opposite side of the striker area

⇨ Insert the HV HRC fuse-link by turning while pushing it into the clamps. The position of the striker is identified with a triangle representing an arrow on the rating plate of the HV HRC fuse-link.
If only one HV HRC fuse-link is to be installed in the phase, use the upper position at the clamps.

Fig. 251: Inserting the HV HRC fuse-link in the striker area

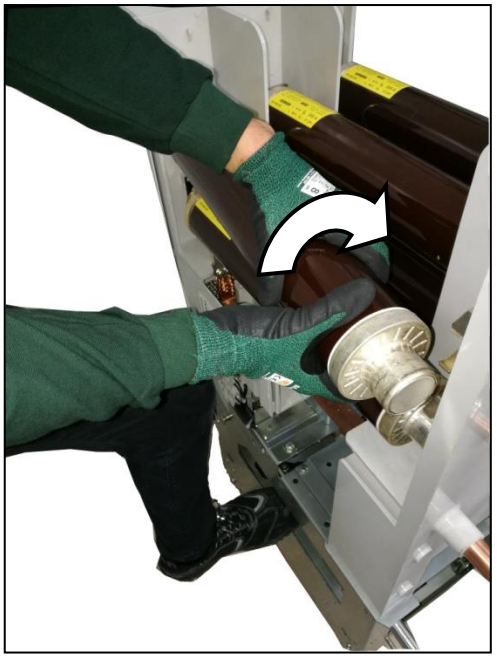


Fig. 252: Inserting the HV HRC fuse-link on the opposite side of the striker area

Fig. 253: HV HRC fuse-link inserted and fuse -link bracket closed in the striker area

Fig. 254: HV HRC fuse-link inserted and fuse-link bracket closed on the opposite side of striker area

⇨ Proceed in the same way with the other HV HRC fuse-links at the L1 and L3 phases.

Middle phase L2

⇨ After removing the HV HRC fuse-links from the outer phases L1 or L3, the fuse-links in the middle phase L2 are accessible from the right or left side of the contactor truck.
Open both fuse-link brackets of the phase manually or with a suitable tool, for example a screwdriver.

⇨ First remove the upper HV HRC fuse-link by pulling it upwards out of the clamps. If a second lower fuse-link is installed in the phase, remove it too.

Fig. 255: Opening the fuse-link bracket in the striker area (operating side of contactor truck)

Fig. 256: Opening the fuse-link bracket on the opposite side of striker area (contact tulip side of contactor truck)

Fig. 257: HV HRC fuse-link removed in the striker area

Fig. 258: HV HRC fuse-link removed on the opposite side of the striker area

⇨ Insert the HV HRC fuse-link with the striker pointing to the operating side of the contactor truck. The position of the striker is identified with a triangle representing an arrow on the rating plate of the HV HRC fuse-link.
If only one HV HRC fuse-link is to be installed in the phase, use the upper position at the clamps.

⇨ Close both fuse-link brackets.

Fig. 259: HV HRC fuse-link inserted and fuse -link bracket closed in the striker area

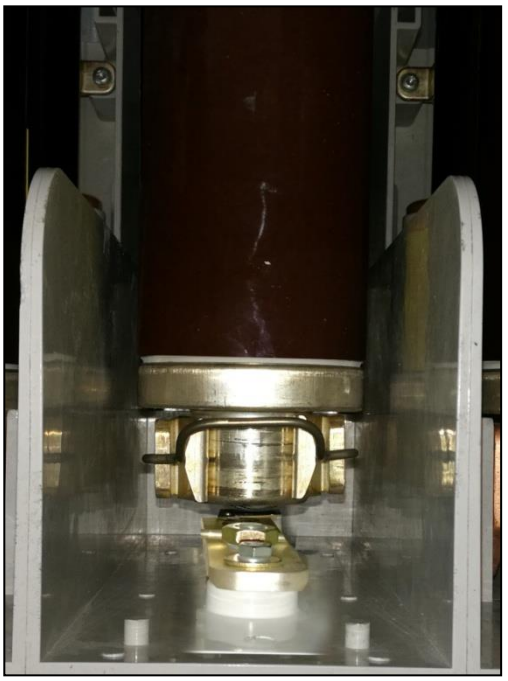


Fig. 260: HV HRC fuse-link inserted and fuse-link bracket closed on the opposite side of striker area

✓ The HV HRC fuse-links have been replaced.

INFORMATION

Final procedure steps

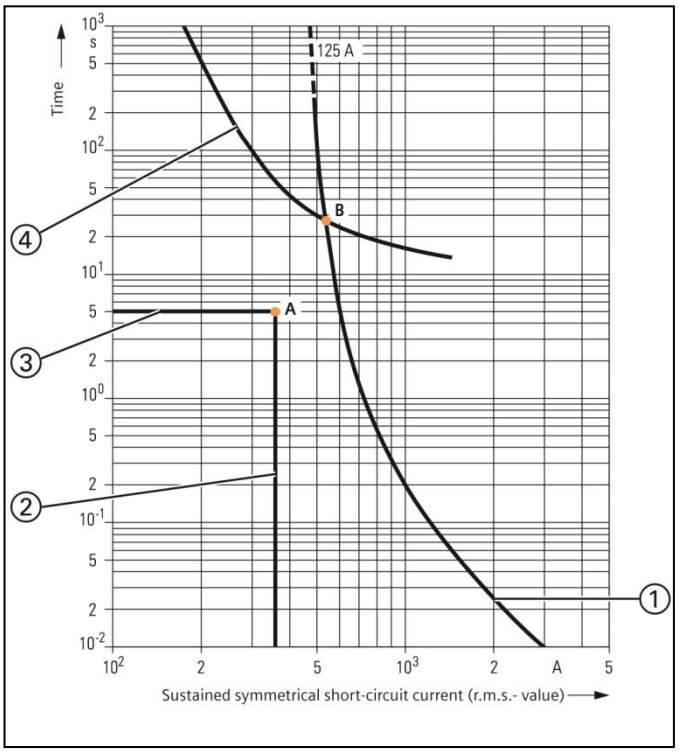
⇨ Next, insert the contactor truck into the panel. After closing the high-voltage door, the panel can be integrated into the course of operation again.

13.19 Motor starting currents

Due to the arising motor starting current, the instant when the motor starts represents the maximum stress for the HV HRC fuse-link. Motor starting currents are dependent on the starting time and the starting frequency.
The latest motor protection tables with HV HRC fuse-links type HHM are available in the download area of the SIBA company: www.siba-fuses.com
These motor protection tables show the correspondence between the maximum permissible starting currents of downstream HV motors (depending on the starting time and the starting frequency) and the associated HV HRC fuse-links.

13.20 Coordinating the components of the motor circuit

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



(1) Characteristic of the HV HRC fuse-link

(2) Motor starting current

(3) Motor starting time

(4) Characteristic of the time-overcurrent protection

Fig. 261: Example for the coordination of a HV HRC fuse-link characteristic 125 A with a motor characteristic

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

Coordination

Rules for coordinating the components of the motor circuit:

- The time-current characteristic must be located on the right of the motor starting current (point A).
- The rated current of the HV HRC fuse-link must exceed the normal current of the motor.
- The current corresponding to the intersection B of the HV HRC fuse-link characteristic and the characteristic of the time-overcurrent protection must be higher than the minimum breaking current of the HV HRC fuse-link.
- If this is not feasible, it must be ensured that overload currents that are smaller than the minimum breaking current of the HV HRC fuse-link are interrupted by the switching-device via the striker. This prevents thermal overloading of the HV HRC fuse-link, which would otherwise be destroyed.

- The selected HV HRC fuse-link limits the sustained symmetrical short-circuit current I_K to the let-through current I_D, shown in the diagram for the current-limiting characteristics (I_D as a function of I_K for HV HRC fuse-links with different rated currents). The maximum permissible let-through current is I_D = 46 kA.

Requirements

The coordination of the components of the motor circuit requires the following:

- The let-through current I_D must not exceed 46 kA at 7.2 kV/12 kV.
- In case of low-voltage supply via a control transformer, short-circuit currents ranging above the limit breaking capacity must be interrupted within 80 ms. This requirement does not apply if
  - the mechanical latch is provided.

  or
  - the opening times have been extended so much that – in the a.m. current range – the contactor can only open when the fuse-link has interrupted the current.
- Due to the arising motor starting current, the instant when the motor starts represents the maximum stress for the HV HRC fuse-link. This stress must neither operate nor pre-damage the fuse-link.
- Other factors of influence on the stress of the HV HRC fuse-links are the starting time and the starting frequency of the motors.

14 Operating the contactor panel with panel width 600 mm

INFORMATION
Read and understand these instructions before attempting operating works.

14.1 Control elements at the front side of the panel

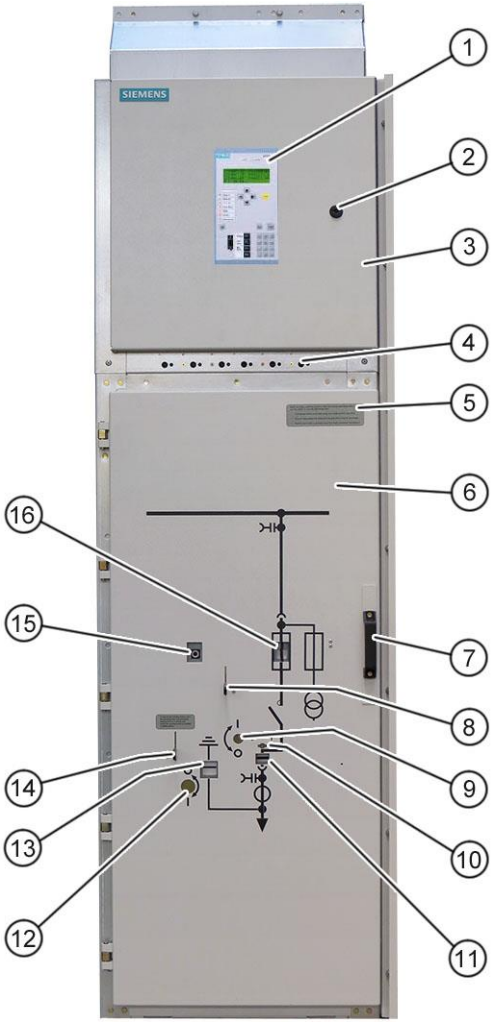


Fig. 262: Control elements on the panel front

(1) Protection device

(2) Locking device for the door to the low-voltage compartment

(3) Door to the low-voltage compartment

(4) Test sockets for busbar voltage detecting system (type LRM) as additional component

(5) Instruction label for closing the high-voltage door

(6) High-voltage door

(7) Handle for opening the high-voltage door

(8) Operating slide for opening and closing the actuating opening for racking the contactor truck

(9) Actuating opening for racking the contactor truck

(10) Actuating opening for inserting the double-bit key to control racking the contactor truck

(11) Mechanical position indicator for contactor truck

(12) Actuating opening for operating the feeder earthing switch

(13) Mechanical position indicator for feeder earthing switch

(14) Operating slide for opening and closing the actuating opening for operating the feeder earthing switch

(15) CLOSED/OPEN indicator of the contactor

(16) Indicator for operation state of HV HRC fuse-links

14.2 Position indicators visible on high-voltage door

Contactor: CLOSED position or OPEN position	CLOSED 	OPEN 	–
Contactor truck: Service position, intermediate position or test position	Service position 	Intermediate position 	Test position 
Indicator for operation state of HV HRC fuse-links: Service position or tripped position	Service position 	Tripped position 	–
Feeder earthing switch: CLOSED position or OPEN position	CLOSED 	OPEN 	–

14.3 Access to compartments

Regarding accessibility to the individual compartments, NXAIR switchgear fulfills the loss of service continuity category LSC 2B according to IEC 62271-200.

The degree of protection between the individual compartments is IP2X in standard design.

The type of accessibility is provided as follows:

Compartment		**Type of accessibility**
Switching-device compartment		Interlock-controlled
Busbar compartment		Tool-based
Connection compartment	Access from the front side	Interlock-controlled and tool-based
	Access from the rear side	Tool-based

14.4 Opening the high-voltage door

⚠ WARNING

Reduced safety

The closed high-voltage door is an important safety element of the switchgear. The high-voltage door is exclusively opened for performing operational activities inside the switching-device compartment, such as removing or inserting a contactor truck.

Close the high-voltage door:

⇨ If an activity inside the switching-device compartment is interrupted.

⇨ Immediately after an activity inside the switching-device compartment was completed.

⇨ Before leaving the panel front.

⚠ CAUTION

Injury

The mechanism inside the contactor truck can cause injuries by getting squeezed, caught or cut.

⇨ Do not remove any parts of the covering.

Preconditions

- Contactor truck in test position
- High-voltage door closed
- Padlock (optional) removed from door handle

Procedure

⇨ Pull door handle upwards and open the high-voltage door.

Fig. 263: Opening the high-voltage door

✓ The high-voltage door is open.

14.5 Closing the high-voltage door

⚠ WARNING

Reduced safety

The closed high-voltage door is an important safety element of the switchgear. The high-voltage door is exclusively opened for performing operational activities inside the switching-device compartment, such as removing or inserting a contactor truck.

Close the high-voltage door:

⇨ If an activity inside the switching-device compartment is interrupted.

⇨ Immediately after an activity inside the switching-device compartment was completed.

⇨ Before leaving the panel front.

Instruction label on high-voltage door:
In addition to these instructions, an instruction label on the high-voltage door describes safe closing of the high-voltage door before executing a switching operation.

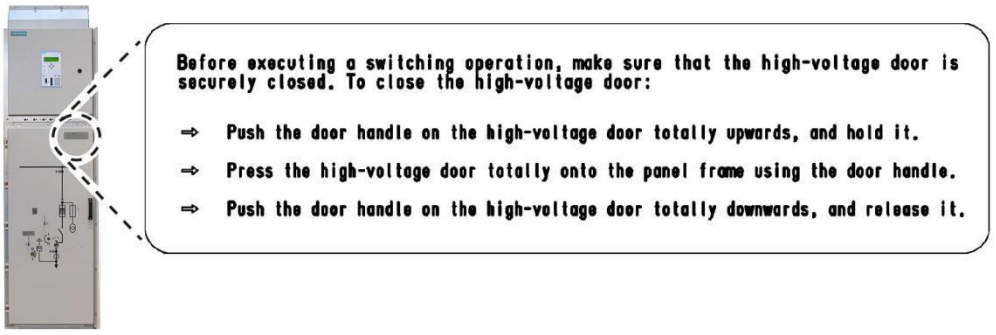


Fig. 264: Instruction label on high-voltage door

Preconditions

- Contactor truck:
  - Contactor truck removed from the panel

  or
  - Contactor truck inserted in test position
- High-voltage door open
- Padlock for door handle (optional) available

Procedure

⇨ Push the door handle on the high-voltage door totally upwards, and hold it.

⇨ Press the high-voltage door totally onto the panel frame using the door handle.

⇨ Push the door handle on the high-voltage door totally downwards and release it.

Fig. 265: Closing the high-voltage door

⇨ Fit a padlock (optional) to the door handle and close it.

✓ The high-voltage door is closed.

14.6 Positions of the contactor truck

General description of positions of the contactor truck:

Service position
The contactor truck is connected with the busbar system and the outgoing feeder. The auxiliary circuit of the contactor truck is connected through the low-voltage connector.

Test position
The contactor truck is disconnected from the busbar system and the outgoing feeder. The auxiliary circuit of the contactor truck is connected through the low-voltage connector.

Disconnected position
The contactor truck is disconnected from the busbar system and the outgoing feeder. The auxiliary circuit is disconnected by pulling out the low-voltage connector.

Short instruction for racking the contactor truck:

Racking the contactor truck manually from test / disconnected position to service position:

Step 1 Insert and turn double-bit key			**Step 2** Insert and turn hand crank as far as it will go and pull it off	**Step 3** Turn and remove double-bit key		
from	by	to		from	by	to
						

Racking the contactor truck manually from service position to test / disconnected position:

Step 1 Insert and turn double-bit key			**Step 2** Insert and turn racking crank as far as it will go and pull it off	**Step 3** Turn and remove double-bit key		
from	by	to		from	by	to
						

14.7 Racking the contactor truck to service position

NOTICE

Maloperation

Racking the contactor truck to service position is only permissible if the contactor is in OPEN position.

⇨ Switch the contactor to OPEN position, if required.

Preconditions

- Contactor truck inserted in test position
- Low-voltage connector plugged on
- High-voltage door closed
- Contactor in OPEN position
- Feeder earthing switch in OPEN position
- For electromagnetic interlock (optional):
  - Electromagnetic interlock deactivated
- Racking crank for moving the contactor truck available
- Double-bit key available
- Padlock (optional) removed from operating slide

Fig. 266: Racking crank

Fig. 267: Double-bit key with a diameter of 5 mm

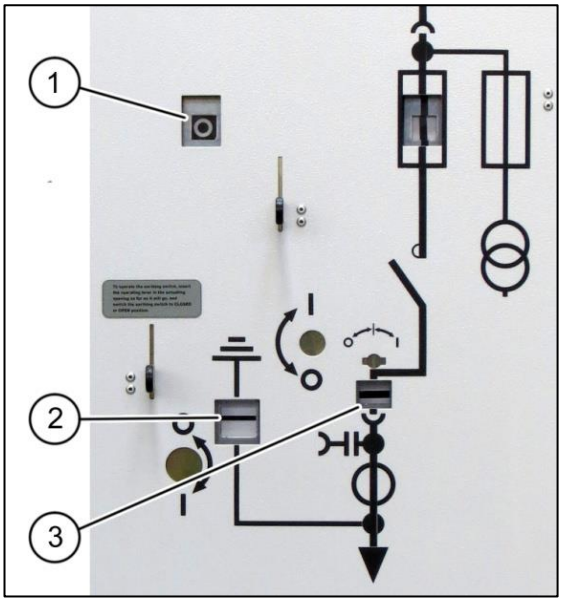


Fig. 268: Position indicators on high-voltage door

(1) Position indicator for contactor: OPEN position

(2) Position indicator for feeder earthing switch: OPEN position

(3) Position indicator for contactor truck: test position

Procedure

NOTICE

Maloperation

All interlocks are only released when the contactor truck is in a stable end position.

⇨ Rack the contactor truck absolutely until end position.

⇨ To release the actuating opening for the double-bit key, lift the operating slide and hold it.

⇨ To release access to the contactor truck, insert the double-bit key and turn clockwise as far as it will go (that is 90°).

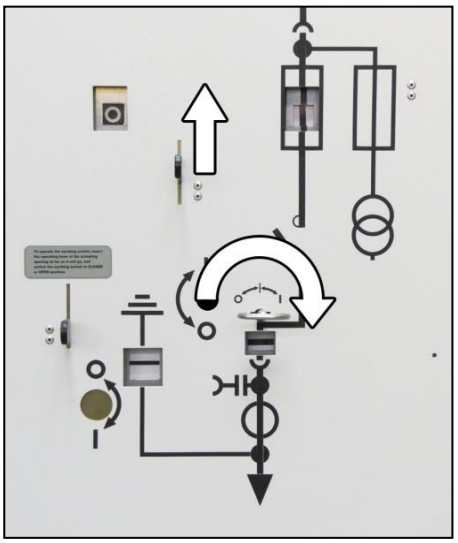


Fig. 269: Lifting operating slide and turning the double-bit key clockwise

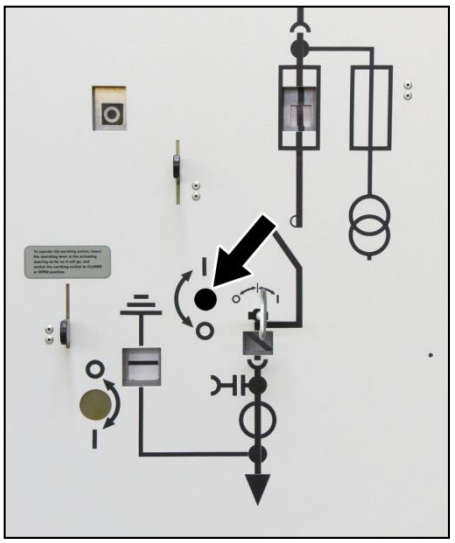


Fig. 270: Operating shaft for racking crank

⇨ Push the racking crank for moving the contactor truck onto the operating shaft, and turn clockwise as far as it will go.

⇨ Remove the racking crank for moving the contactor truck.

⇨ Turn the double-bit key clockwise as far as it will go (that is 90°) to interlock the contactor truck.

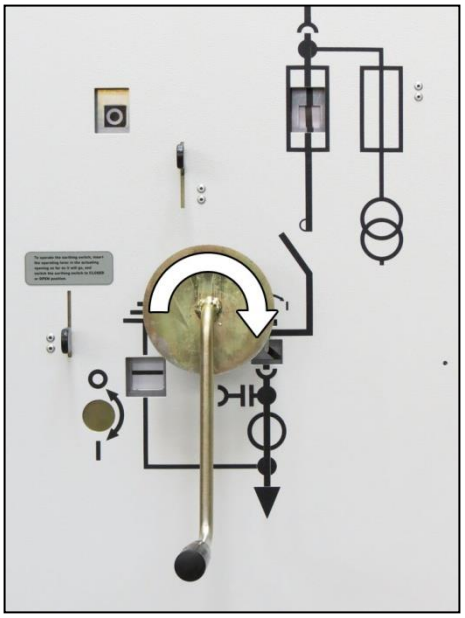


Fig. 271: Turning the racking crank clockwise

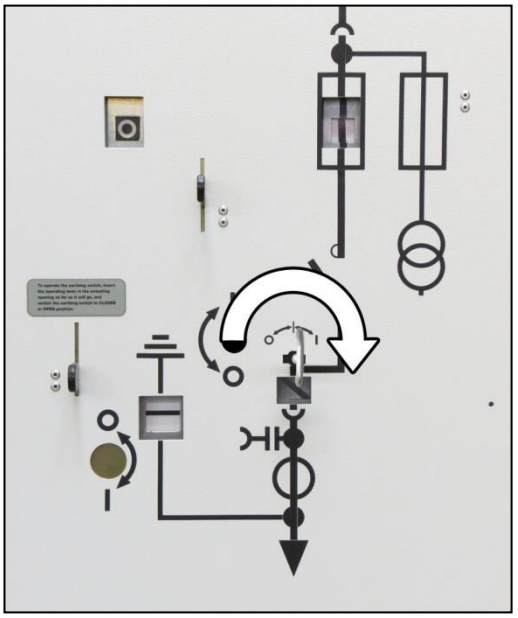


Fig. 272: Turning the double-bit key clockwise

⇨ Remove the double-bit key.

⇨ To close the actuating opening, push the operating slide down as far as it will go.

⇨ Fit a padlock (optional) to the operating slide and close it.

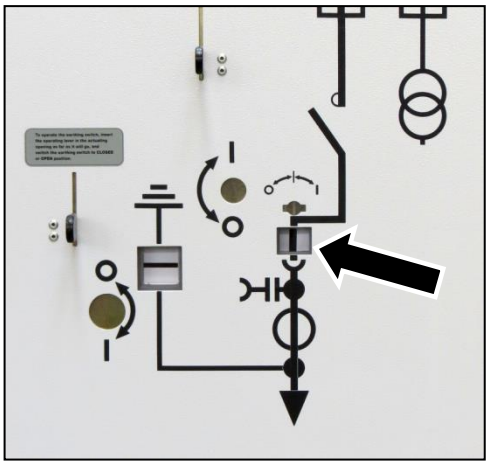


Fig. 273: Position indicator of racking mechanism in service position

✓ The contactor truck has been racked from test position to service position.

14.8 Racking the contactor truck to test position

NOTICE

Maloperation

Racking the contactor truck to test position is only permissible if the contactor is in OPEN position.

⇨ Switch the contactor to OPEN position, if required.

Preconditions

- Contactor truck in service position
- Contactor in OPEN position
- For electromagnetic interlock (optional):
  - Electromagnetic interlock deactivated
- Racking crank for moving the contactor truck available
- Double-bit key available
- Padlock (optional) removed from operating slide

Fig. 274: Racking crank

Fig. 275: Double-bit key with a diameter of 5 mm

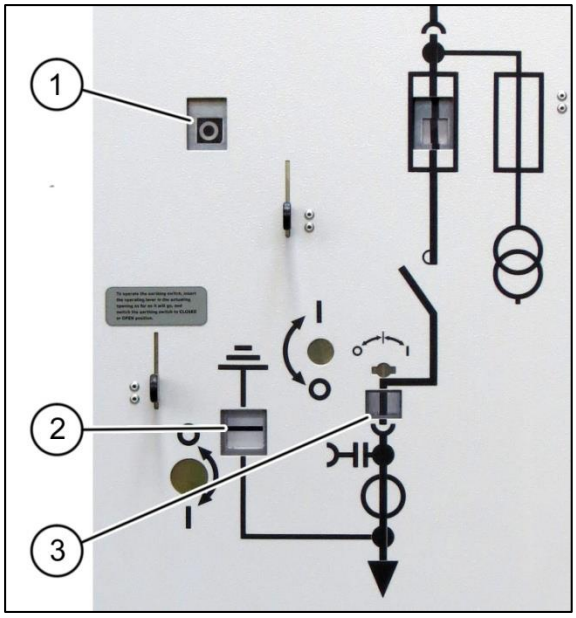


Fig. 276: Position indicators

(1) Position indicator for contactor:
OPEN position

(2) Position indicator for feeder earthing switch:
OPEN position

(3) Position indicator for contactor truck:
Service position

Operating the contactor panel with panel width 600 mm

Procedure

> **NOTICE**
>
> **Maloperation**
>
> All interlocks are only released when the contactor truck is in a stable end position.
>
> ⇨ Rack the contactor truck absolutely until end position.

⇨ To release the actuating opening for the double-bit key, lift the operating slide and hold it.

⇨ To release access to the contactor truck, insert the double-bit key and turn counter-clockwise as far as it will go (that is 90°).

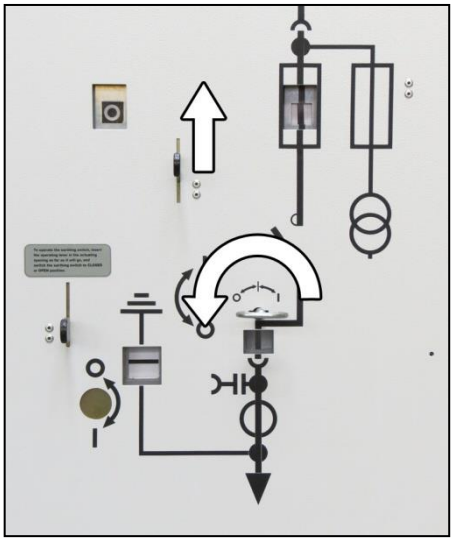


Fig. 277: Lifting operating slide and turning the double-bit key counter-clockwise

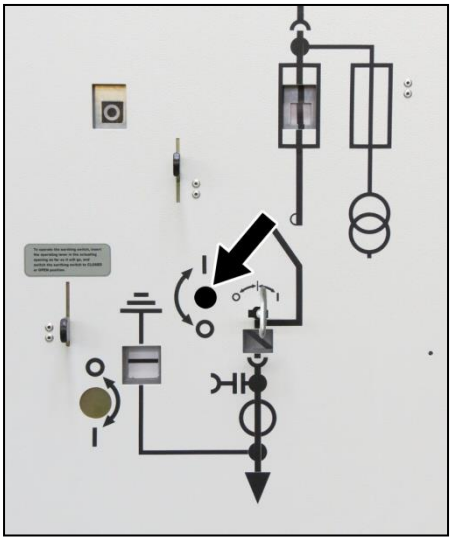


Fig. 278: Operating shaft for racking crank

⇨ Push the racking crank for moving the contactor truck onto the operating shaft, and turn counter-clockwise as far as it will go.

⇨ Remove the racking crank for moving the contactor truck.

⇨ Turn the double-bit key counter-clockwise as far as it will go (that is 90°) to interlock the contactor truck.

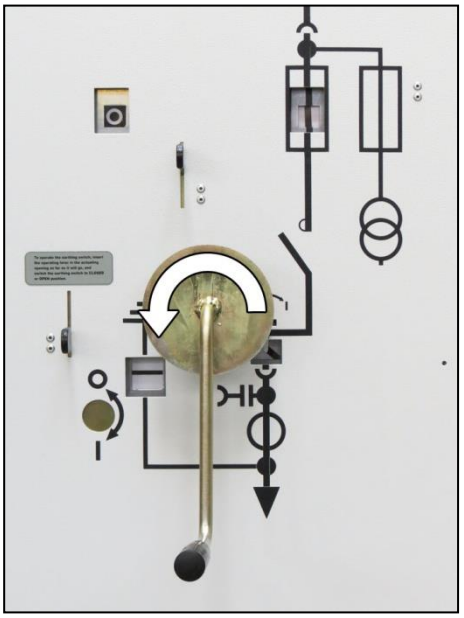


Fig. 279: Turning the racking crank counter-clockwise

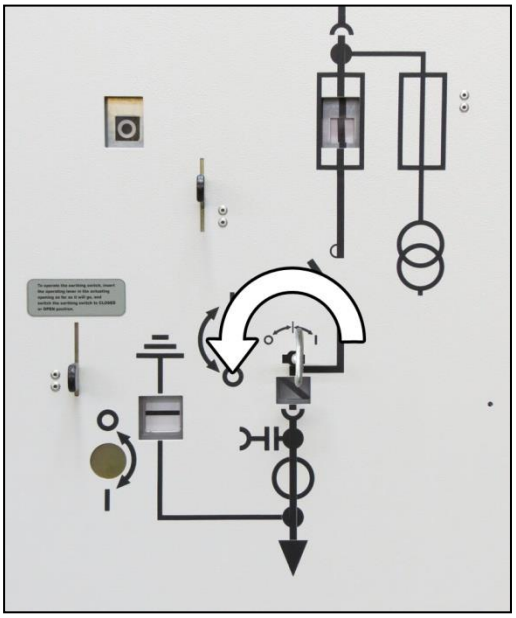


Fig. 280: Turning the double-bit key counter-clockwise

⇨ Remove the double-bit key.

⇨ To close the actuating opening, push the operating slide down as far as it will go.

⇨ Fit a padlock (optional) to the operating slide and close it.

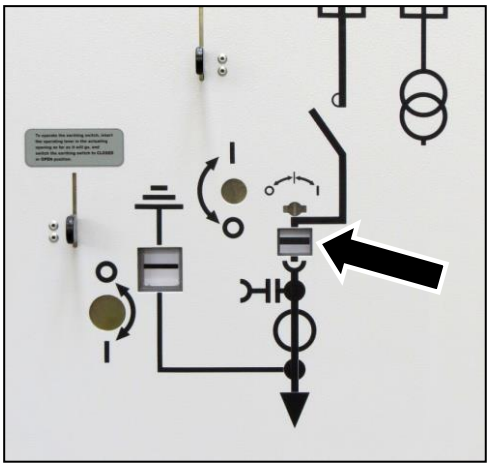


Fig. 281: Position indicator of racking mechanism in OPEN position

✓ The contactor truck has been racked from service position to test position.

14.9 Closing the contactor electrically

NOTICE

Conflicting operation

Operating the contactor electrically is possible locally or from a central control. The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ Depending on the intended operating mode, set the panel to either local or remote control (for example by switching the local-remote switch).

INFORMATION

Unexpected switching noise and vibration

Operating the contactor causes a short loud noise and low vibration.

⇨ Expect switching noise and low vibration from inside the contactor.

Preconditions

- Contactor truck in service position or in test position
- Contactor in OPEN position
- High-voltage door closed
- Auxiliary voltage for the panel connected
- Remote or local control

Procedure

⇨ Close the contactor via central or local electrical control command element.

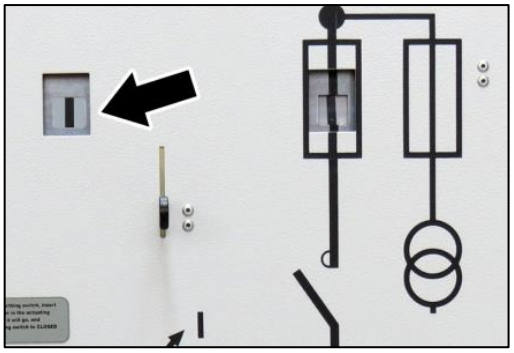


Fig. 282: Position indicator for contactor in CLOSED position

✓ The contactor is closed.

14.10 Opening the contactor electrically

NOTICE

Conflicting operation

Operating the contactor electrically is possible locally or from a central control. The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ Depending on the intended operating mode, set the panel to either local or remote control (for example by switching the local-remote switch).

INFORMATION

Unexpected switching noise and vibration

Operating the contactor causes a short loud noise and low vibration.

⇨ Expect switching noise and low vibration from inside the contactor.

INFORMATION

Contactor truck version with mechanical closing latch

Opening the contactor also opens the closing latch.

Preconditions

- Contactor truck in service position or in test position
- Contactor in CLOSED position
- High-voltage door closed
- Auxiliary voltage for the panel connected
- Remote or local control

Procedure

⇨ Open the contactor via central or local electrical control command element.

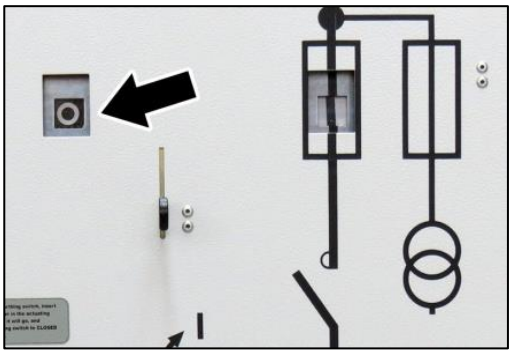


Fig. 283: Position indicator for contactor in OPEN position

✓ The contactor is open.

14.11 Opening the contactor manually

NOTICE

Conflicting operation

The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ For operating the contactor manually, set the panel to local control, for example by switching the local-remote switch to LOCAL position.

INFORMATION

Unexpected switching noise and vibration

Operating the contactor causes a short loud noise and low vibration.

⇨ Expect switching noise and low vibration from inside the contactor.

INFORMATION

Manual operation of the contactor is limited to manual opening of the contactor. Manual closing of the contactor is not possible.

INFORMATION

Contactor truck version with mechanical closing latch

Opening the contactor also opens the closing latch.

Preconditions

- Contactor truck in service position or in test position
- Contactor in CLOSED position
- For electromagnetic interlock (optional):
  - Electromagnetic interlock deactivated
- High-voltage door closed
- Panel set to local control
- Double-bit key available

Procedure

⇨ To release the actuating opening for the double-bit key, lift the operating slide and hold it.

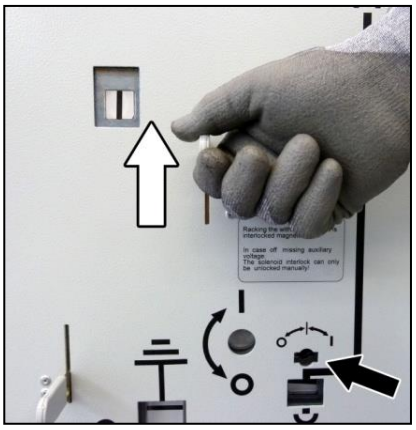


Fig. 284: Operating slide lifted

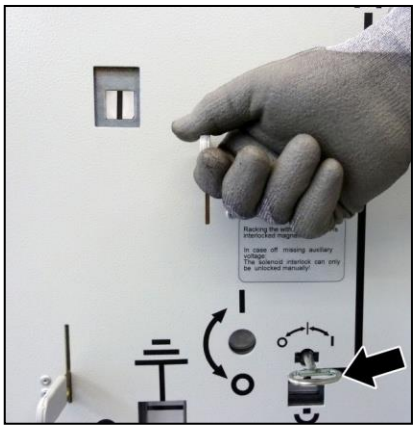


Fig. 285: Double-bit key to turn

To open the contactor manually, insert the double-bit key and turn as far as it will go:

⇨
- Contactor truck in service position: 90° counter-clockwise
- Contactor truck in test position: 90° clockwise

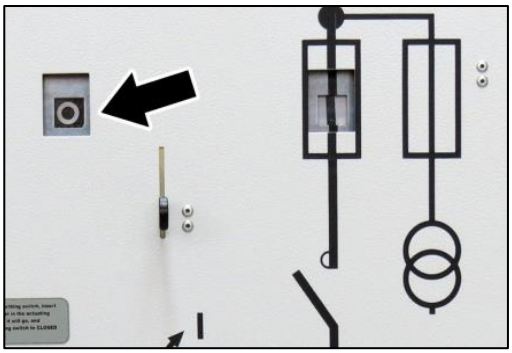


Fig. 286: Position indicator for contactor in OPEN position

✓ The contactor is open.

INFORMATION

Final procedure steps

⇨ You may now go on to insert the crank for racking the contactor truck.

⇨ Otherwise remove the double-bit key, push the operating slide down, fit a padlock (optional) to the operating slide and close it.

14.12 Operating conditions without auxiliary voltage

Contactor panels with electromagnetic interlock for racking the contactor truck (optional) plus mechanical closing latch for the contactor (optional) are equipped with an additional feature.
In case the auxiliary voltage is disconnected, the electromagnetic interlock can be unlocked manually. This manual unlocking is operated on the high-voltage door with a lever. This lever is padlocked during standard operating conditions.

NOTICE

Maloperation

Without auxiliary voltage, turning the double-bit key is mechanically interlocked.

⇨ Do **not** try to turn the double-bit key while the mechanical interlock is active.

⇨ Perform manual unlocking of the electromagnetic interlock to release turning of the double-bit key.

In addition to these instructions, instruction labels on the high-voltage door inform about the operation of the manual unlocking:

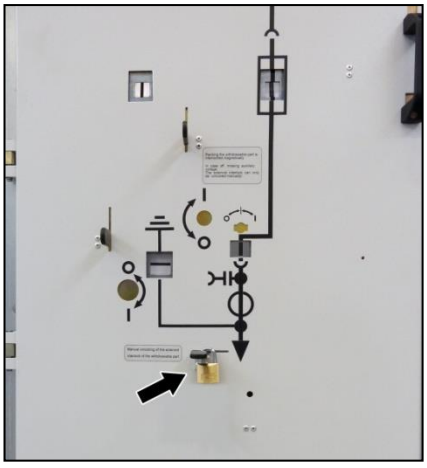


Fig. 287: Manual unlocking, padlocked

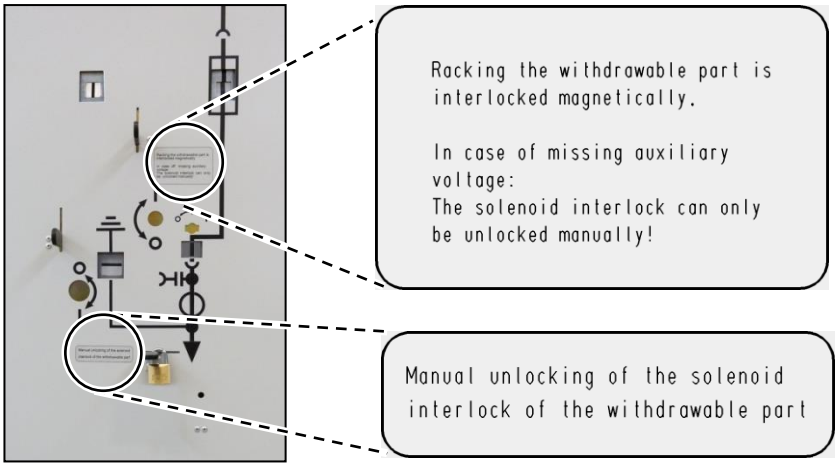


Fig. 288: Instruction labels on high-voltage door

Racking the contactor truck to test position

INFORMATION

Unexpected switching noise and vibration

If the contactor is in CLOSED position before starting the procedure, turning the double-bit key 90° opens the contactor. This causes a short loud noise and low vibration.

⇨ Expect switching noise and low vibration from inside the contactor when turning the double-bit key.

Preconditions

- Authorization to operate the manual unlocking available
- Auxiliary voltage for the panel disconnected
- High-voltage door closed
- Contactor truck in service position
- Contactor in CLOSED position or OPEN position
- Key for padlock available
- Double-bit key available
- Racking crank available

Procedure

⇨ Make sure to operate the particular contactor panel authorization is given for.

⇨ To release the actuating opening for the double-bit key, lift the operating slide and hold it.

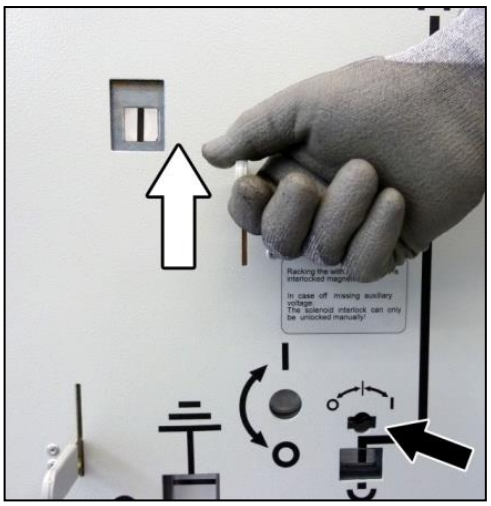


Fig. 289: Lifting the operating slide

⇨ Insert the double-bit key without turning.

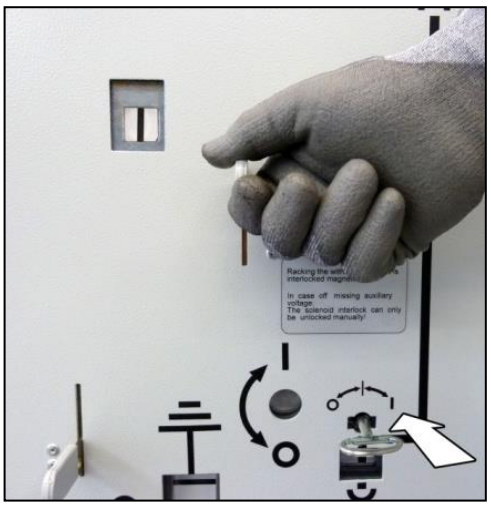


Fig. 290: Double-bit key inserted

⇨ Remove the padlock from the manual unlocking.

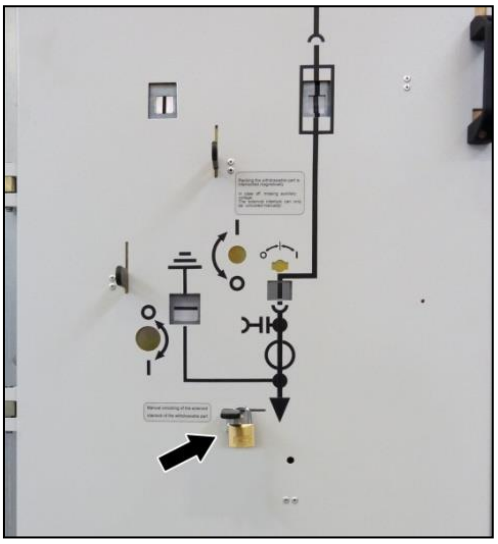


Fig. 291: Removing the padlock

⇨ Move the lever for the manual unlocking to the right as far as it will go and hold it.

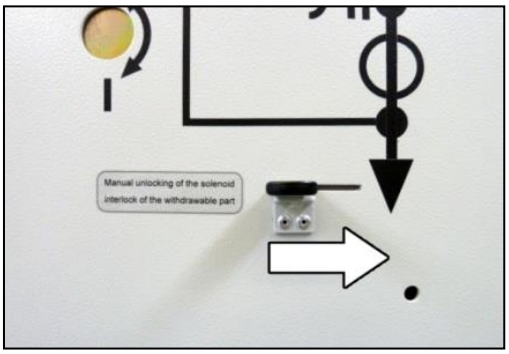


Fig. 292: Moving lever to the right

⇨ To release access to the contactor truck, turn the double-bit key counter-clockwise as far as it will go (that is 90°).

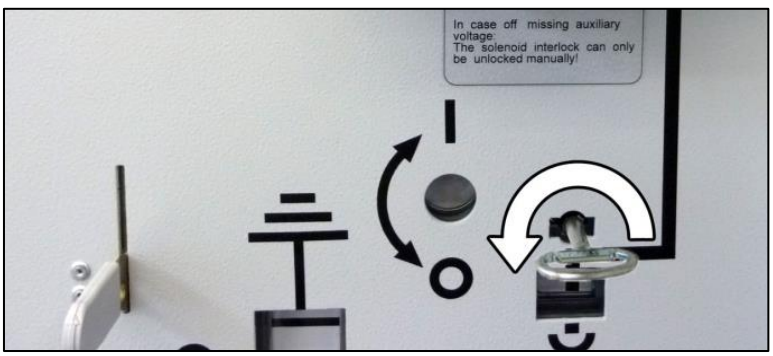


Fig. 293: Turning the double-bit key counter-clockwise

⇨ Move the lever for the manual unlocking to the left as far as it will go. Fit the padlock to the lever and close it.

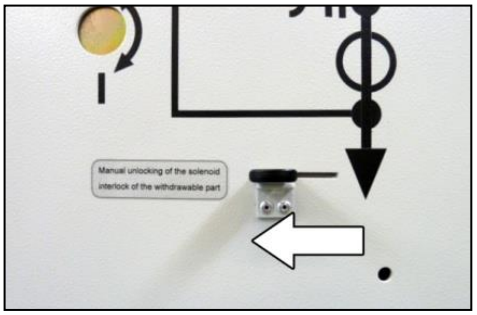


Fig. 294: Moving the lever to the left

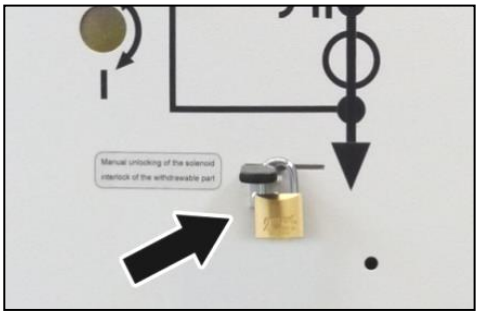


Fig. 295: Lever is padlocked

⇨ Push the racking crank for moving the contactor truck onto the operating shaft, and turn counter-clockwise as far as it will go.

⇨ Remove the racking crank for moving the contactor truck.

⇨ Turn the double-bit key counter-clockwise as far as it will go (that is 90°) to interlock the contactor truck.

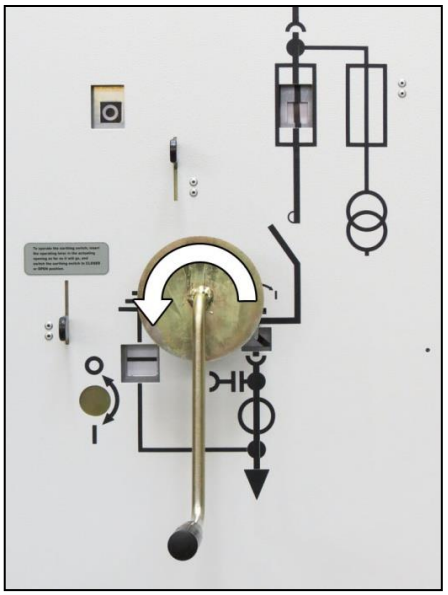


Fig. 296: Turning the racking crank counter-clockwise

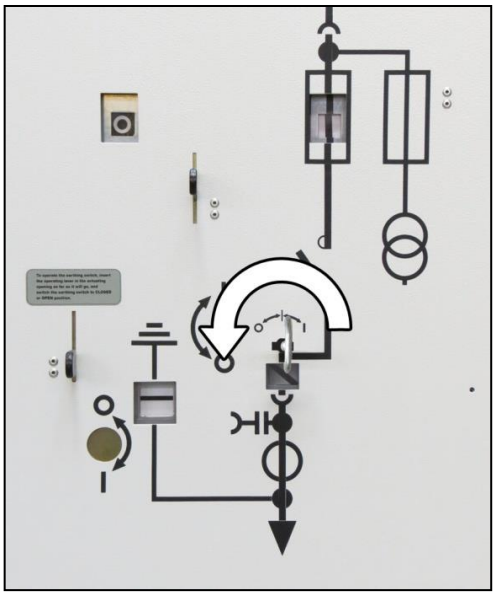


Fig. 297: Turning the double-bit key counter-clockwise

⇨ Remove the double-bit key.

⇨ To close the actuating opening, push the operating slide down as far as it will go.

⇨ Fit a padlock (optional) to the operating slide and close it.

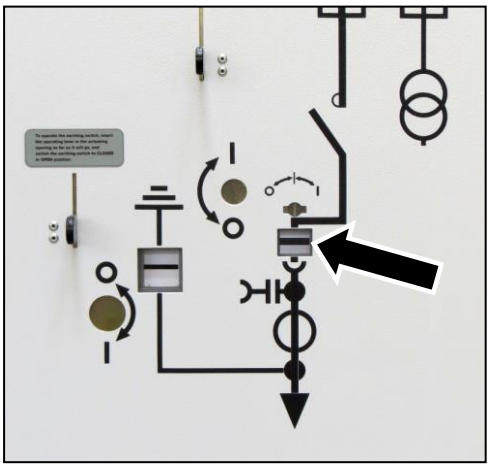


Fig. 298: Position indicator of racking the mechanism in test position

✓ The contactor truck has been racked from service position to test position.

14.13 Earthing the feeder manually

NOTICE

Maloperation

A switching operation once started must be completed totally! A switching operation that was not completed cannot be turned back.

⇨ Do not try to remove the operating lever at intermediate positions.

NOTICE

Maloperation

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

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

Instruction label on high-voltage door:
In addition to these instructions, an instruction label on the high-voltage door informs about proper operation of the operating lever for the feeder earthing switch.

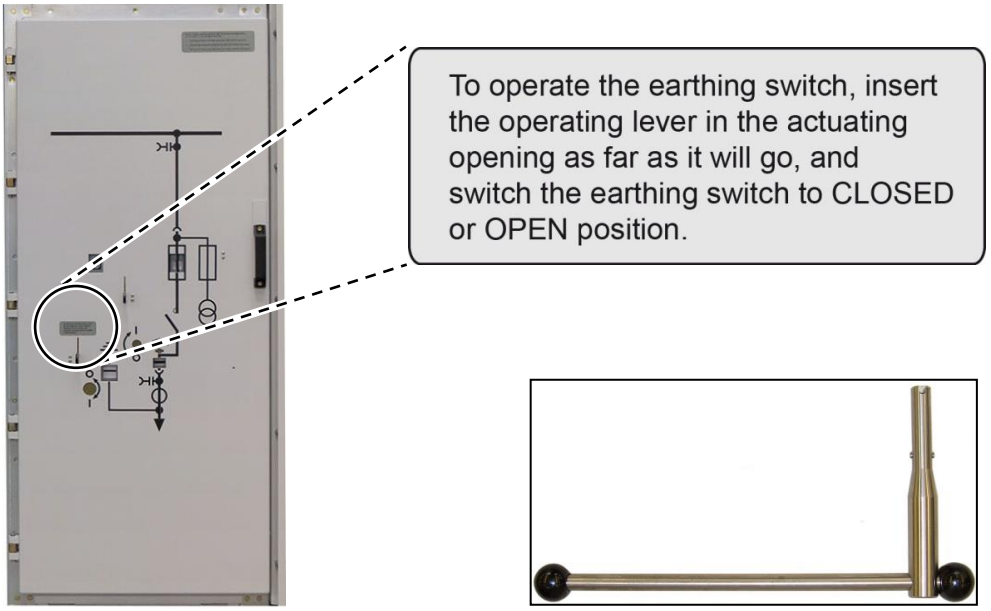


Fig. 299: Instruction label on high-voltage door

Fig. 300: Operating lever

Preconditions

- High-voltage door closed
- Contactor truck in test position
- Feeder to be earthed isolated
- Padlock (optional) removed from operating slide
- For electromagnetic interlock (optional):
  - Electromagnetic interlock deactivated
- Operating lever available

Operating the contactor panel with panel width 600 mm

Procedure

⇨ To release the actuating opening, lift the operating slide and hold it.

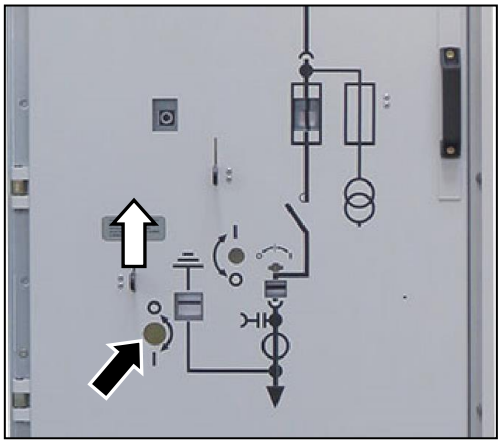


Fig. 301: Lifting the operating slide; actuating opening

⇨ While keeping the operating slide lifted, insert the operating lever slightly into the actuating opening such that the pins in the operating lever are horizontal.

⇨ Insert the operating lever into the actuating opening as far as it will go.

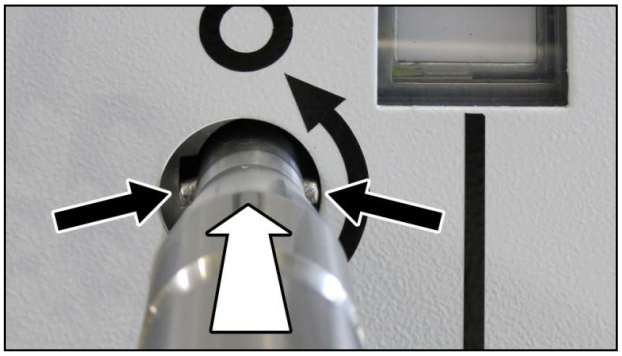


Fig. 302: Inserting the operating lever

⇨ Hold the operating lever with one hand straight in the actuating opening and turn the operating lever with the other hand clockwise 180° until the feeder earthing switch changes to CLOSED position.

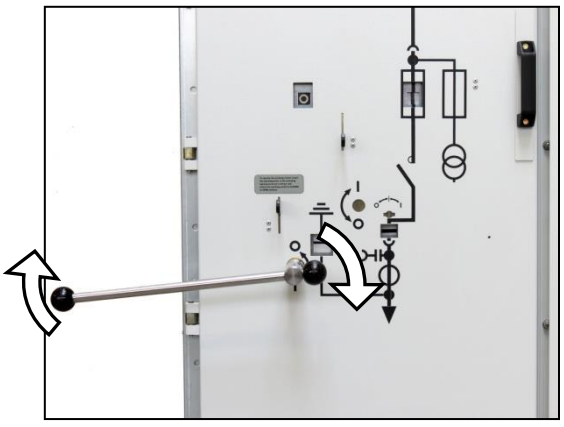


Fig. 303: Turning the operating lever clockwise

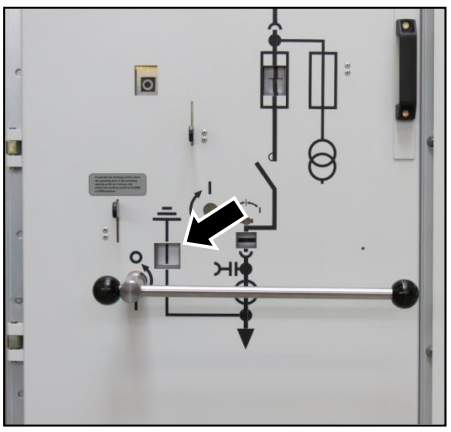


Fig. 304: Position indicator vertical bar

⇨ Remove the operating lever.

⇨ To close the actuating opening, push the operating slide down as far as it will go.

⇨ Fit a padlock (optional) to the operating slide and close it.

✓ The feeder is earthed.

14.14 De-earthing the feeder manually

NOTICE

Maloperation

A switching operation once started must be completed totally! A switching operation that was not completed cannot be turned back.

⇨ Do not try to remove the operating lever at intermediate positions.

NOTICE

Maloperation

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

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

Instruction label on high-voltage door:
In addition to these instructions, an instruction label on the high-voltage door informs about proper operation of the operating lever for the feeder earthing switch.

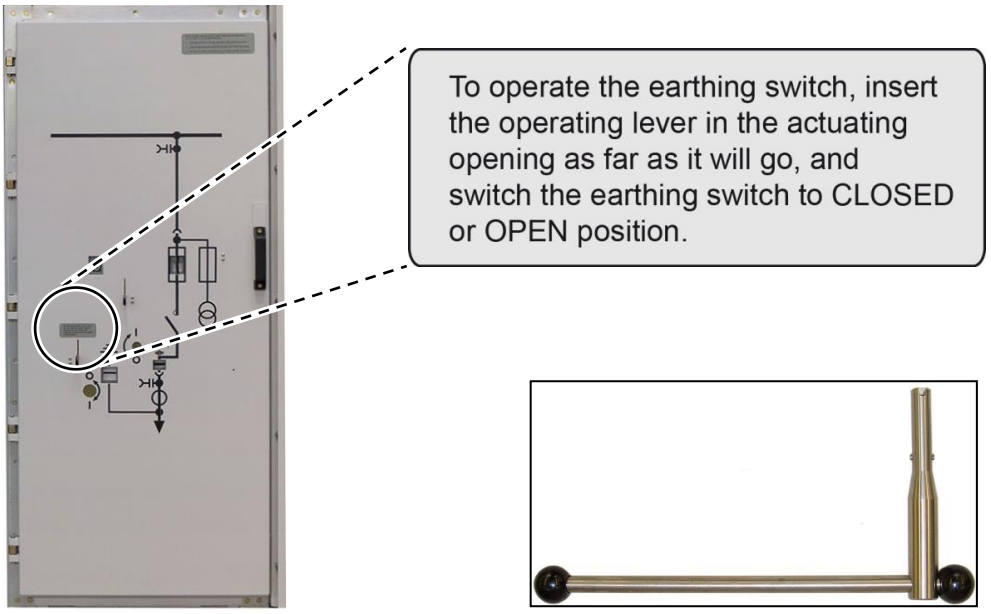


Fig. 305: Instruction label on high-voltage door

Fig. 306: Operating lever

Operating the contactor panel with panel width 600 mm

Preconditions

- High-voltage door closed
- Contactor truck in test position
- Padlock (optional) removed from operating slide
- For electromagnetic interlock (optional):
  - Electromagnetic interlock deactivated
- Operating lever available

Procedure

⇨ To release the actuating opening, lift the operating slide and hold it.

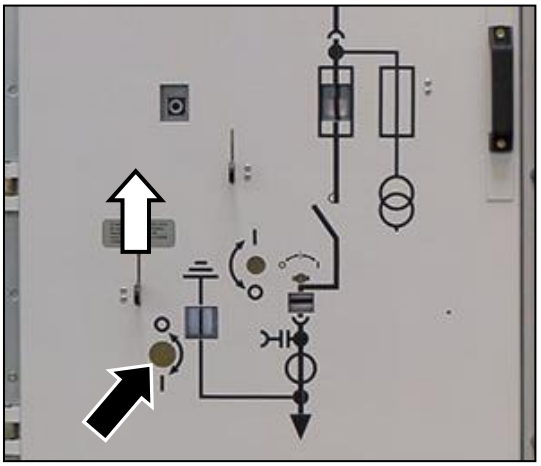


Fig. 307: Lifting the operating slide; actuating opening

⇨ While keeping the operating slide lifted, insert the operating lever slightly into the actuating opening such that the pins in the operating lever are horizontal.

⇨ Insert the operating lever into the actuating opening as far as it will go.

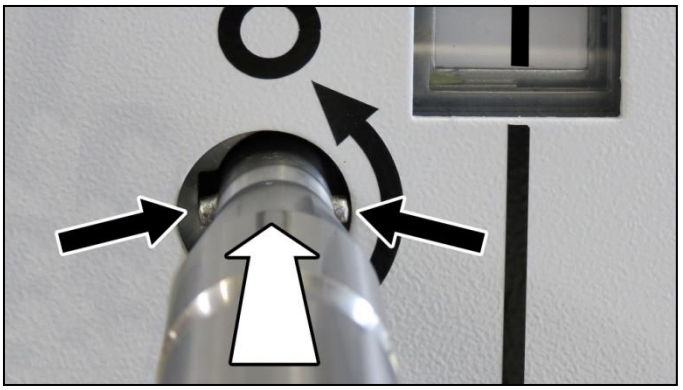


Fig.308: Inserting the operating lever

⇨ Hold the operating lever with one hand straight in the actuating opening and turn the operating lever with the other hand counter-clockwise 180° until the feeder earthing switch changes to OPEN position.

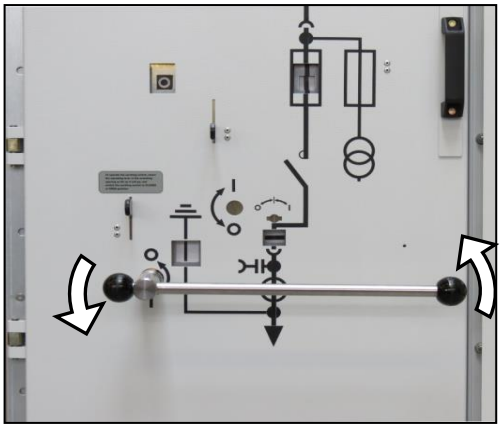


Fig.309: Turning the operating lever counter-clockwise

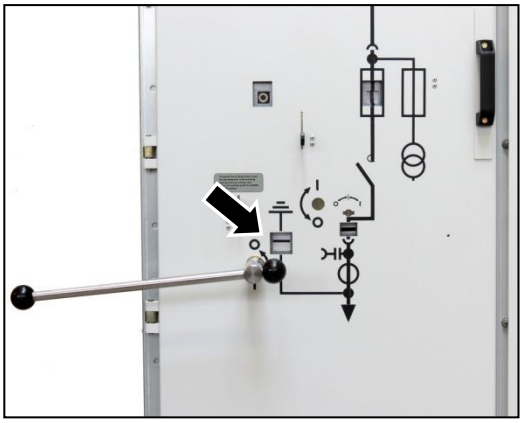


Fig. 310: Position indicator horizontal bar

⇨ Remove the operating lever.

⇨ To close the actuating opening, push the operating slide down as far as it will go.

⇨ Fit a padlock (optional) to the operating slide and close it.

✓ The feeder is de-earthed.

14.15 Removing the low-voltage connector

Preconditions

- Contactor truck in test position
- Contactor in OPEN position
- Auxiliary voltage for the panel disconnected
- High-voltage door open
- Low-voltage connector plugged on

Procedure

⇨ To detach the low-voltage connector, push the longitudinal fastener (1) of the coupling downwards.

⇨ Remove the low-voltage connector (2) carefully upwards.

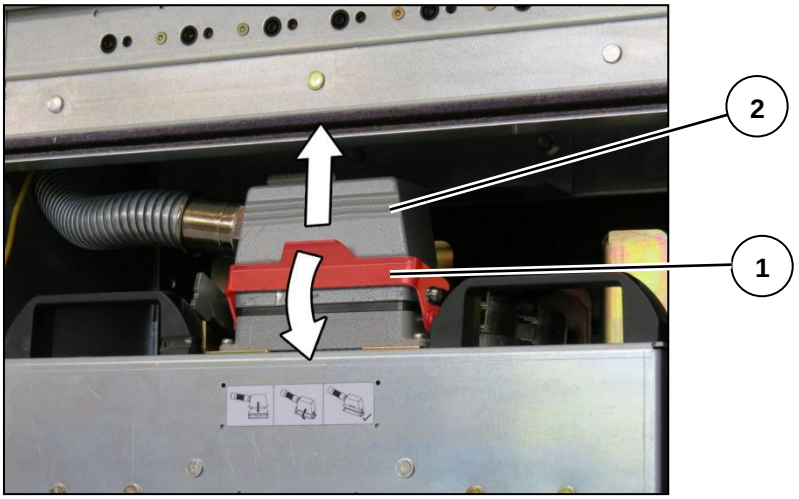


Fig. 311: Removing the low-voltage connector

⇨ Hang the low-voltage connector into the support located underneath the low-voltage compartment.

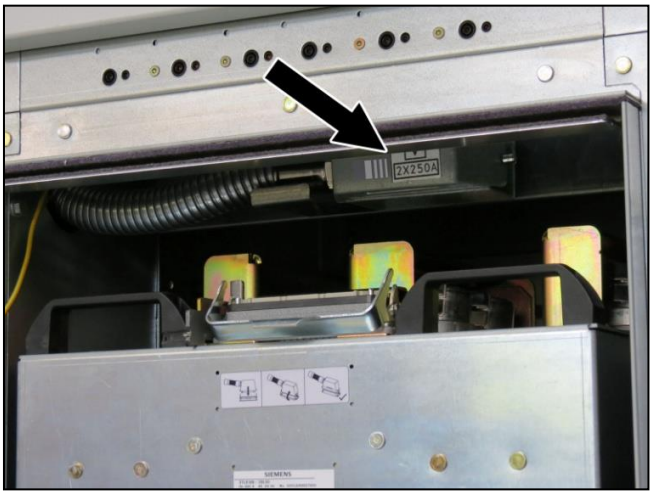


Fig. 312: Low-voltage connector stowed away

⇨ If no contactor truck is inserted in the panel and no further operation is executed: Close the high-voltage door.

✓ The removed low-voltage connector is lying in the support located underneath the low-voltage compartment.

14.16 Plugging o the low-voltage connector

Preconditions

- Contactor truck in test position
- Contactor in OPEN position
- Auxiliary voltage for the panel disconnected
- High-voltage door open
- Low-voltage connector stowed away

Procedure

> **INFORMATION**
>
> In addition to these instructions, an instruction label (1) on the contactor truck informs about plugging on the low-voltage connector.
>
> Follow the advice on the label to push the longitudinal fastener.

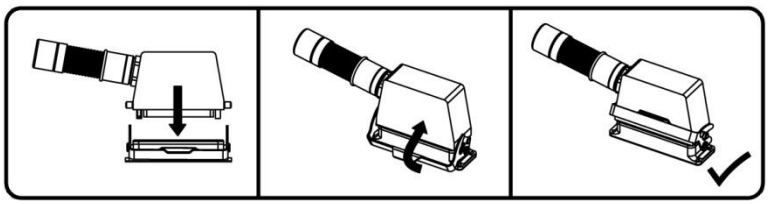


Fig. 313: Instruction label on the contactor truck

⇨ Take the low-voltage connector out of the support located underneath the low-voltage compartment.

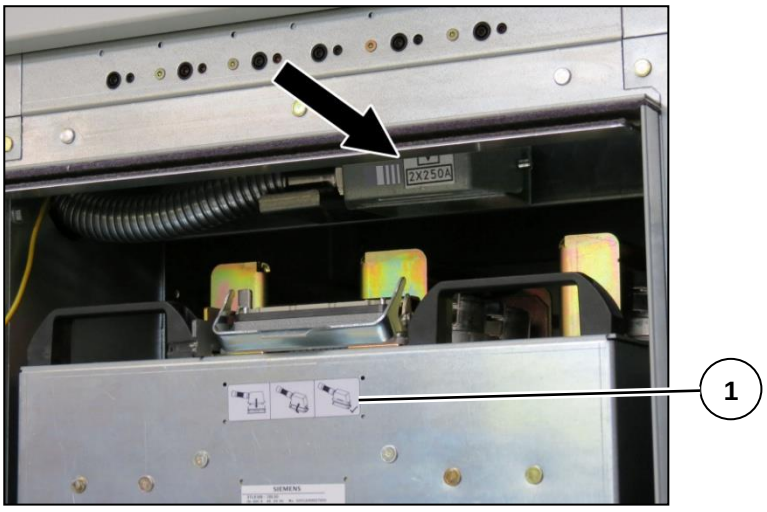


Fig. 314: Low-voltage connector stowed away

⇨ Compare the two coding symbols on the rear side of the low-voltage plug connector and on the top side of the operating mechanism box of the contactor truck. The symbols must be identical.

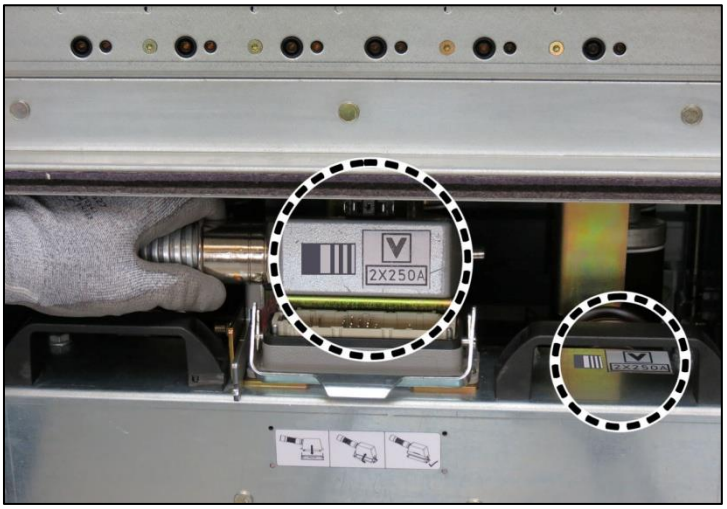


Fig. 315: Coding symbols on the low-voltage connector and on contactor truck

⇨ If the coding symbols are identical, carefully plug on the low-voltage connector (2) from above.
Otherwise insert a contactor truck with the proper coding symbol before plugging on the low-voltage connector.

⇨ To secure the low-voltage connector, push the longitudinal fastener (3) of the coupling upwards.

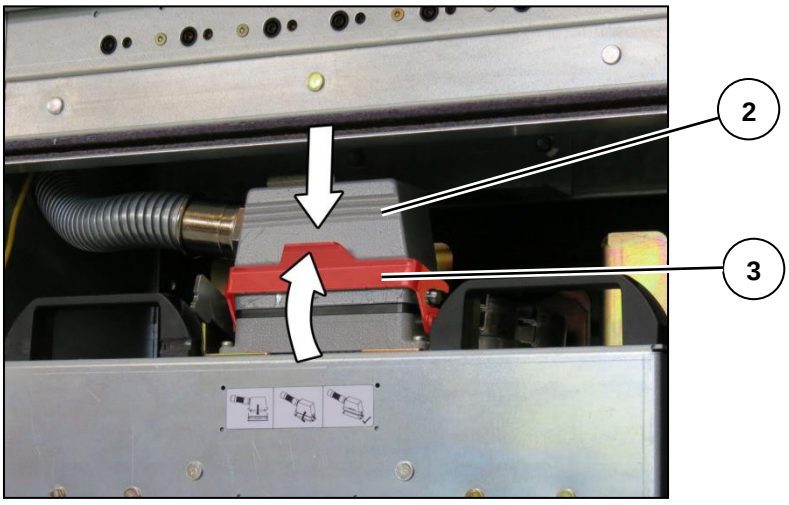


Fig. 316: Plugging on and securing the low-voltage connector

⇨ Close the high-voltage door.

⇨ Switch the auxiliary voltage on.

✓ The low-voltage connector is plugged on and secured by the longitudinal fastener.

14.17 Taking the contactor truck out of the panel

⚠ CAUTION

Injury

The mechanism inside the contactor truck can cause injuries by getting squeezed, caught or cut.

⇨ Do not remove any parts of the covering.

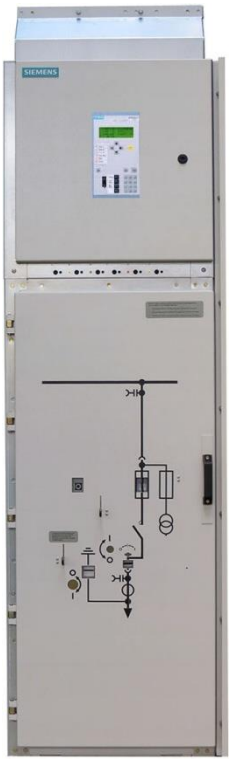


Fig. 317: Panel front with closed high-voltage door

Fig. 318: Panel front with open high-voltage door

Preconditions

- Contactor truck in test position
- Contactor in OPEN position
- High-voltage door open
- Low-voltage connector stowed away

Operating the contactor panel with panel width 600 mm

Procedure

Unlocking the contactor truck from the panel

⇨ To unlock the contactor truck from the panel frame at the center, turn the two locking levers at the contactor truck to the outside.

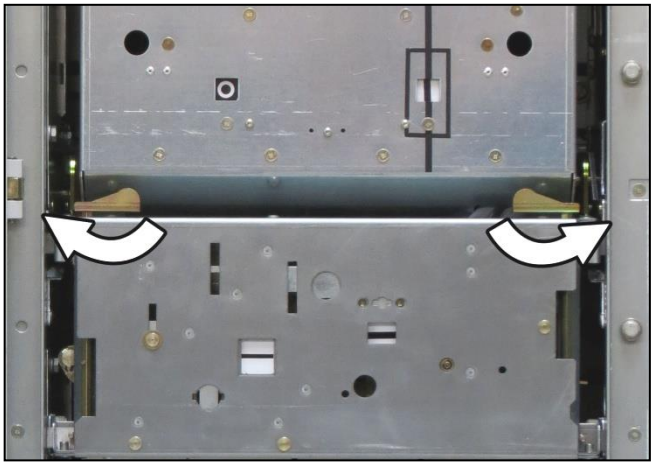


Fig. 319: Unlocking the contactor truck from the panel at the center

⇨ To unlock the contactor truck from the panel frame at the bottom, pull the locking bracket (1) upwards until it latches into the retaining hook.

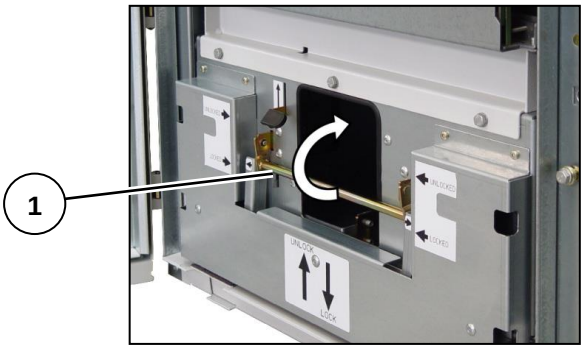


Fig. 320: Unlocking the contactor truck at the bottom

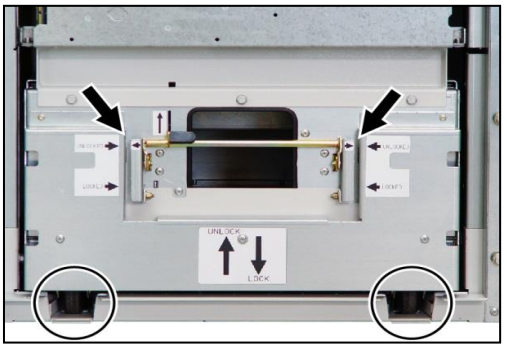


Fig. 321: Contactor truck ready to move

Moving the contactor truck out of the panel

⚠ CAUTION

Maloperation

The contactor truck is designed exclusively for slow and careful driving on obstacle-free paths.

⇨ Before moving the contactor truck, check the path.

⇨ Keep the shunting area and paths free of obstacles and dry.

⇨ Remove objects such as small parts, installation material or tools from the floor in the travel area.

⇨ Move the contactor truck only slowly and constantly.

⇨ The contactor truck is not suitable for unsteady floor, such as stairs, deepenings or floor joints.

⚠ CAUTION

Maloperation

Protruding parts at the rear of the contactor truck can cause injuries or material damage.

⇨ Move and operate the contactor truck only at the front side.

NOTICE

Maloperation

The locking bracket at the contactor truck is exclusively designed for interlocking the contactor truck with the switchgear frame.

⇨ Do **not** push the locking bracket downwards towards LOCK if the contactor truck is outside the panel.

⇨ Pull the contactor truck out of the panel using the handles.

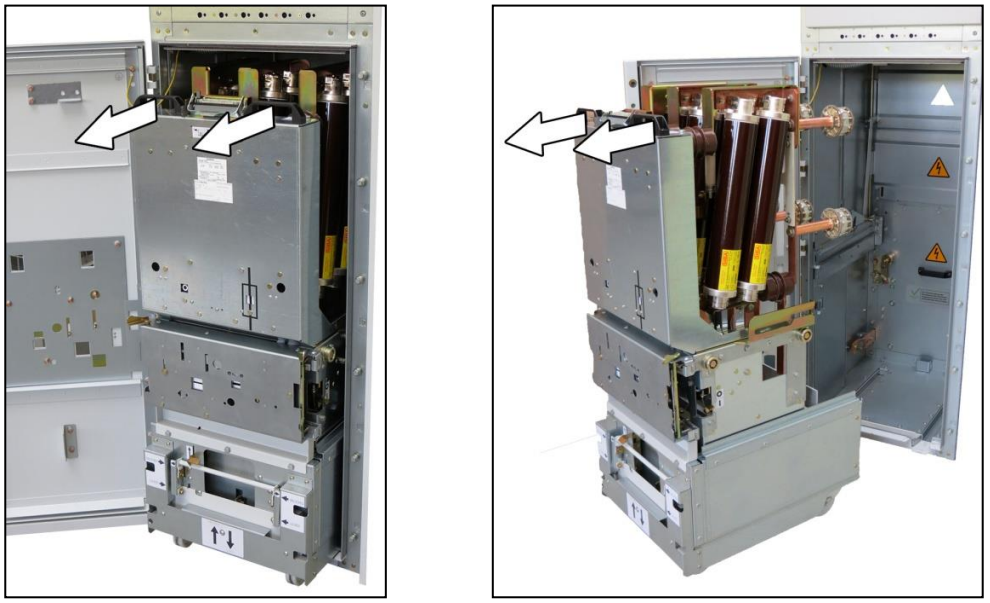


Fig. 322: Pulling the contactor truck

⇨ If no further operation is executed: Close the high-voltage door.

✓ The contactor truck can now be moved away from the panel.

14.18 Inserting the contactor truck in a panel

⚠ CAUTION

Injury

The mechanism inside the contactor truck can cause injuries by getting squeezed, caught or cut.

⇨ Do not remove any parts of the covering.

⚠ CAUTION

Maloperation

Protruding parts at the rear of the contactor truck can cause injuries or material damage.

⇨ Move and operate the contactor truck only at the front side.

⚠ CAUTION

Maloperation

The contactor truck is designed exclusively for slow and careful driving on obstacle-free paths.

⇨ Before moving the contactor truck, check the path.

⇨ Keep the shunting area and paths free of obstacles and dry.

⇨ Remove objects such as small parts, installation material or tools from the floor in the travel area.

⇨ Move the contactor truck only slowly and constantly.

⇨ The contactor truck is not suitable for unsteady floor, such as stairs, deepening or floor joints.

NOTICE

Maloperation

The locking bracket at the contactor truck is exclusively designed for interlocking the contactor truck with the switchgear frame.

⇨ As long as the contactor truck is not completely moved into the panel, the locking indication at the locking bracket must show UNLOCKED!

⇨ Operate the locking bracket only if the contactor truck has been completely moved into the panel.

⇨ Do **not** push the locking bracket downwards towards LOCK if

- the contactor truck is outside the panel.
- the contactor truck is moved only partially into the panel.

NOTICE

Maloperation

Risk of inserting a truck into a panel not suitable for the truck type.

⇨ Verify that you have a contactor truck at hand and that the present panel is a contactor panel.

⇨ To do so, carefully examine both the mimic diagram on the high-voltage door and the front side of the truck.

NOTICE

Maloperation

Danger due to damaging of safety-relevant parts. Operating the switchgear with a contactor version that is not suitable for the corresponding panel version can cause serious damage to the switchgear.

⇨ Do not change the mechanical coding of the low-voltage connection.

⇨ Leave any information directly applied to the switchgear (labels, symbols, imprints and the like) in as-delivered condition, and do not cover any of it.

⇨ Verify correspondence between panel version and contactor version as regards coding and mechanical closing latch.

Mechanical coding

The low-voltage plug connector (1) of each contactor truck is coded with regard to the number of HV HRC fuse-links used in every phase of the respective contactor and their rated currents.
The 4 coding pins (2) on the low-voltage plug connection prevent plugging on the low-voltage connector (3) of a panel which is not suitable for this contactor.

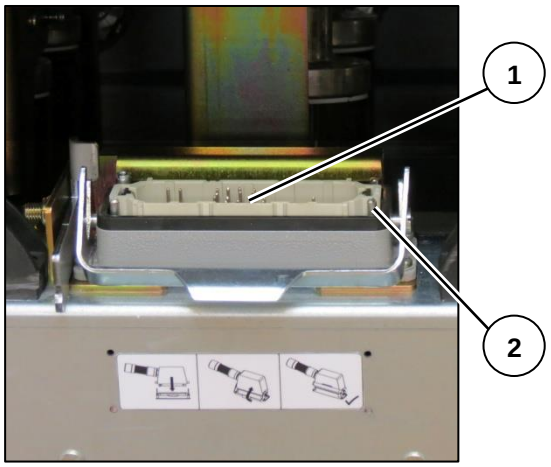


Fig. 323: Low-voltage plug connection of contactor truck

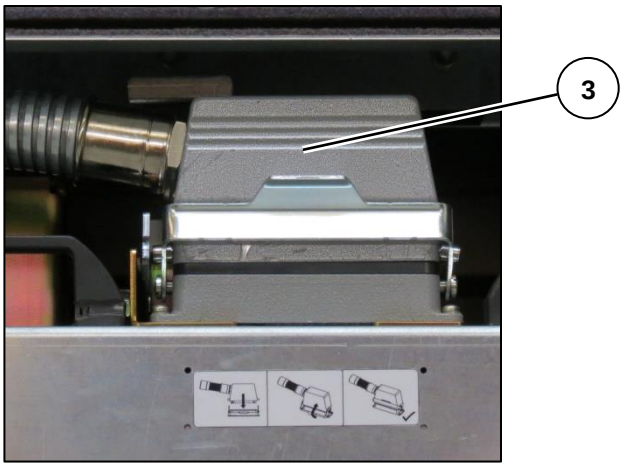
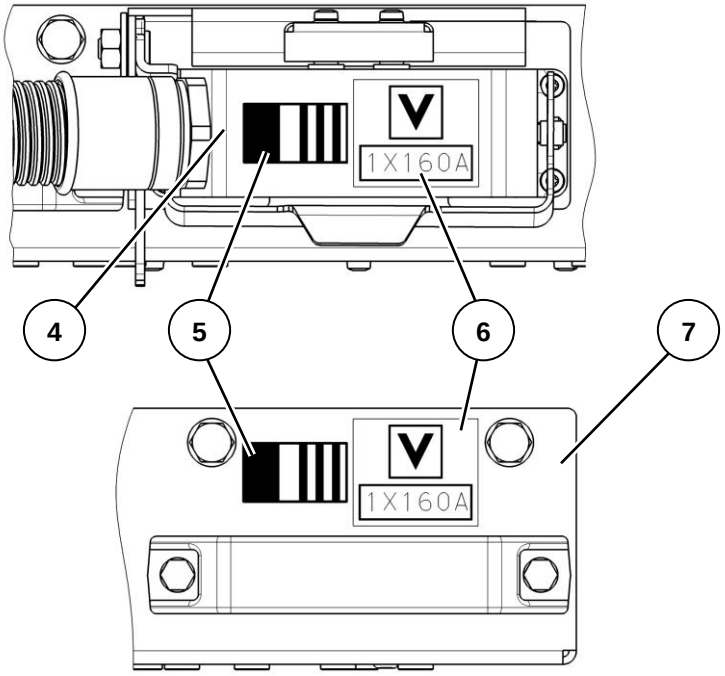


Fig. 324: Low-voltage connector plugged on

Coding symbols

On the top side of every low-voltage connector (4) and on the top side of every contactor truck (7) there are two coding symbols respectively. A contactor truck may only be inserted in a panel, if **both** symbols on the contactor truck are identical with those on the low-voltage connector.



(4) Top side of low-voltage connector

(5) Coding symbol for electromagnetic interlock

(6) Coding symbol for configuration of HV HRC fuse-links

(7) Top side of contactor truck

Fig. 325 Coding symbols for low-voltage connection

The coding symbols characterize the functional properties of a panel version:

<table>
<tr><th>Function</th><th colspan="2">Panel version</th></tr>
<tr><td>Configuration of HV HRC fuse-links (6)</td><td colspan="2">Available configurations:
<table>
<tr><th></th><th colspan="2">Number of HV HRC fuse-links</th></tr>
<tr><th>Rated current of HV HRC fuse-links</th><th>1 × per phase</th><th>2 × per phase</th></tr>
<tr><td>50 A</td><td>X</td><td>–</td></tr>
<tr><td>63 A</td><td>X</td><td>–</td></tr>
<tr><td>80 A</td><td>X</td><td>–</td></tr>
<tr><td>100 A</td><td>X</td><td>–</td></tr>
<tr><td>125 A</td><td>X</td><td>–</td></tr>
<tr><td>160 A</td><td>X</td><td>X</td></tr>
<tr><td>200 A</td><td>X</td><td>X</td></tr>
<tr><td>250 A</td><td>X</td><td>X</td></tr>
<tr><td>315 A</td><td>X</td><td>–</td></tr>
</table></td></tr>
<tr><td rowspan="4">Electromagnetic interlock (5)</td><td></td><td>Without electromagnetic interlock</td></tr>
<tr><td></td><td>With electromagnetic interlock:
• For racking mechanism of contactor truck
• For operating mechanism of feeder earthing switch</td></tr>
<tr><td></td><td>With electromagnetic interlock:
For racking mechanism of contactor truck</td></tr>
<tr><td></td><td>With electromagnetic interlock:
For operating mechanism of feeder earthing switch</td></tr>
</table>

Preparations

The preparations for inserting the contactor truck include:

- Verifying correspondence of truck type / version and panel type / version
- Preparing the operating shaft for the feeder earthing switch

Verifying correspondence of truck type and panel type

⇨ To avoid inserting a truck into a panel not suitable for the truck type, verify that you have a contactor truck at hand and that the present panel is a contactor panel.
To do so, carefully examine both the mimic diagram on the high-voltage door and the front side of the truck.

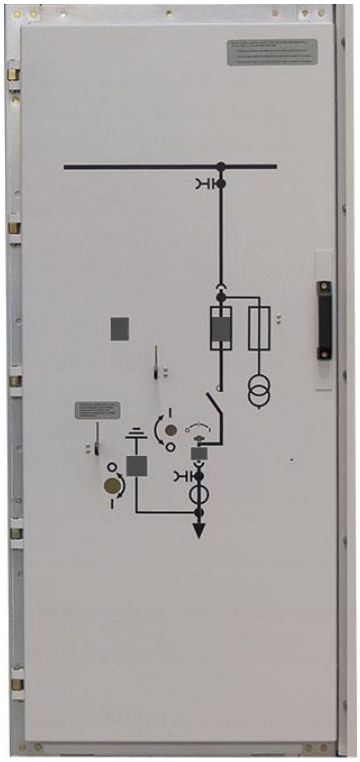


Fig. 326: Mimic diagram on high-voltage door of contactor panel

Fig. 327. Front side of contactor truck

Verifying correspondence of truck version and panel version

To avoid inserting a contactor truck into a contactor panel not suitable for the truck type, verify correspondence as regards (a) coding and (b) mechanical closing latch:

(a) The contactor truck must have the same coding as the panel.

⇨ Carefully compare the pair of coding symbols on the top side of the low-voltage connector with the pair of symbols on the top side of the contactor truck.

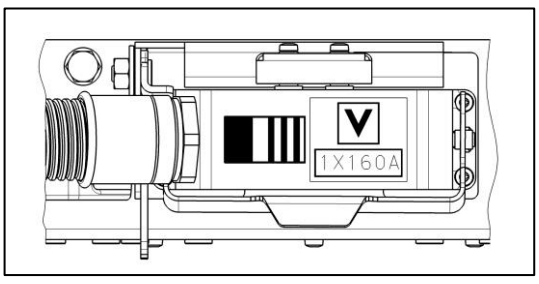


Fig. 328: Coding symbols on top side of low-voltage connector

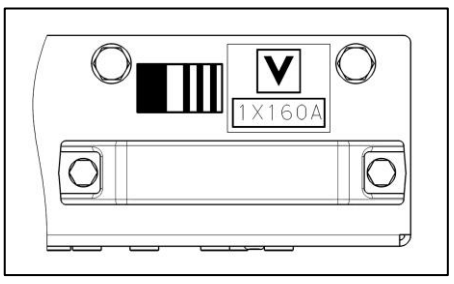


Fig. 329: Coding symbols on top side of contactor truck

(b) Depending on the number of fuse-links and their rated currents it may be necessary that a contactor truck is equipped with a mechanical closing latch. Contactor trucks **with** mechanical closing latch have no corresponding label. Contactor trucks versions **without** mechanical closing latch are labelled accordingly on the front side:

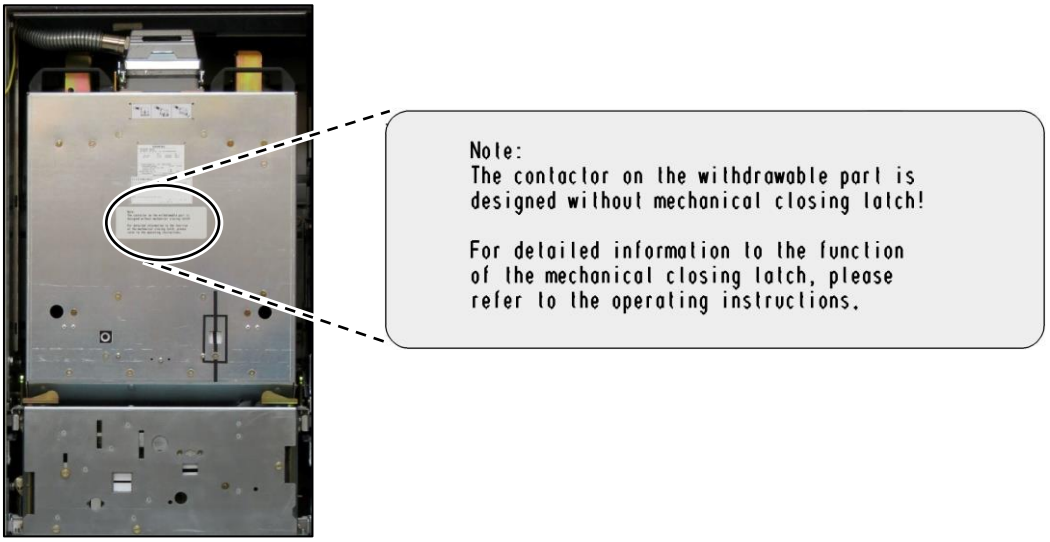


Fig. 330: Instruction label on the front side of the truck

⇨ First, check if the panel requires a contactor truck with / without mechanical closing latch to be inserted. Second, check the front side of the contactor truck for the according label.

Preparing the operating shaft for the feeder earthing switch

⇨ Make sure that the coupling pin of the operating shaft for the feeder earthing switch at the contactor truck and the coupling in the switching-device compartment are in vertical position.

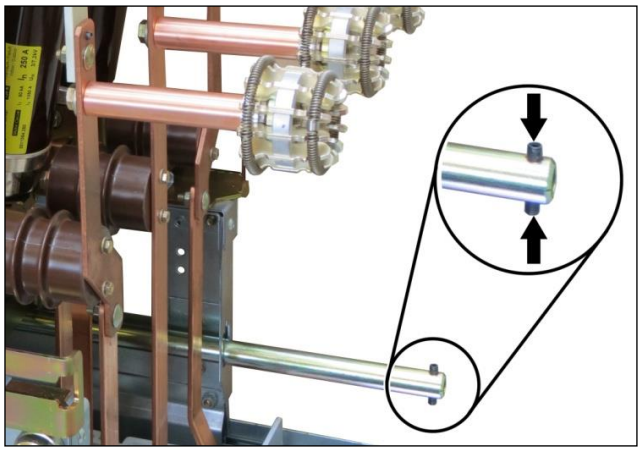


Fig. 331: Coupling pin of the operating shaft for the feeder earthing switch

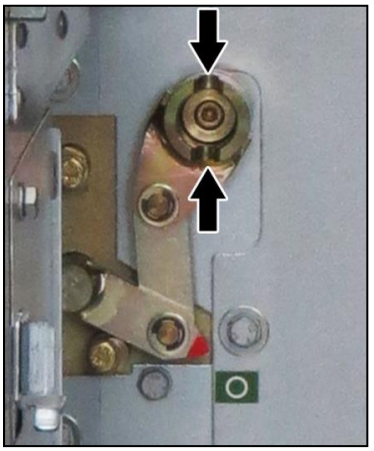


Fig. 332: Coupling of the feeder earthing switch in the switching-device compartment

⇨ If required, put the coupling pin of the feeder earthing switch operating shaft in vertical position using the operating lever.

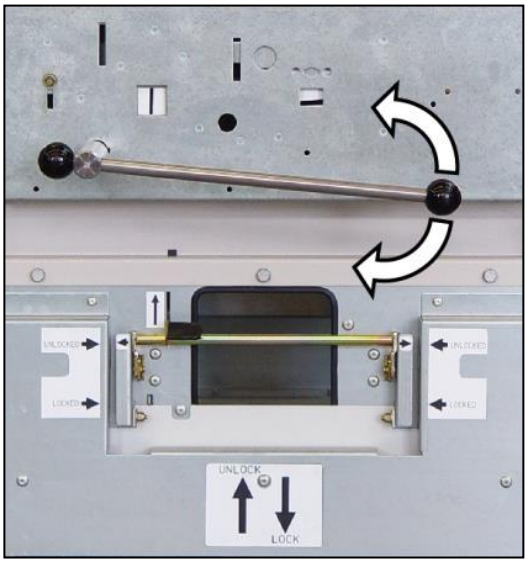


Fig. 333: Operating the feeder earthing switch operating shaft

✓ The contactor truck is prepared to be inserted into a panel.

Inserting the contactor truck in a panel

⚠ CAUTION

Maloperation

Protruding parts at the rear of the contactor truck can cause injuries.

⇨ Move and operate the contactor truck only at the front side.

NOTICE

Maloperation

The locking bracket at the contactor truck is exclusively designed for interlocking the contactor truck with the switchgear frame.

⇨ As long as the contactor truck is not completely moved into the panel, the locking indication at the locking bracket must show UNLOCKED!

⇨ Operate the locking bracket only if the contactor truck has been completely moved into the panel.

⇨ Do **not** push the locking bracket downwards towards LOCK if

- the contactor truck is outside the panel.
- the contactor truck is moved only partially into the panel.

Operating the contactor panel with panel width 600 mm

Preconditions

- Contactor truck with the same coding as panel available
- Coupling pin of the operating shaft in vertical position
- High-voltage door open
- Low-voltage connector stowed away
- Auxiliary voltage for the panel disconnected

Fig. 334: Panel prepared to insert contactor truck

Procedure

⇨ Move the contactor truck centrally in front of the panel. The rollers (1) of the contactor truck point towards the guide rails (2) at the bottom of the panel.

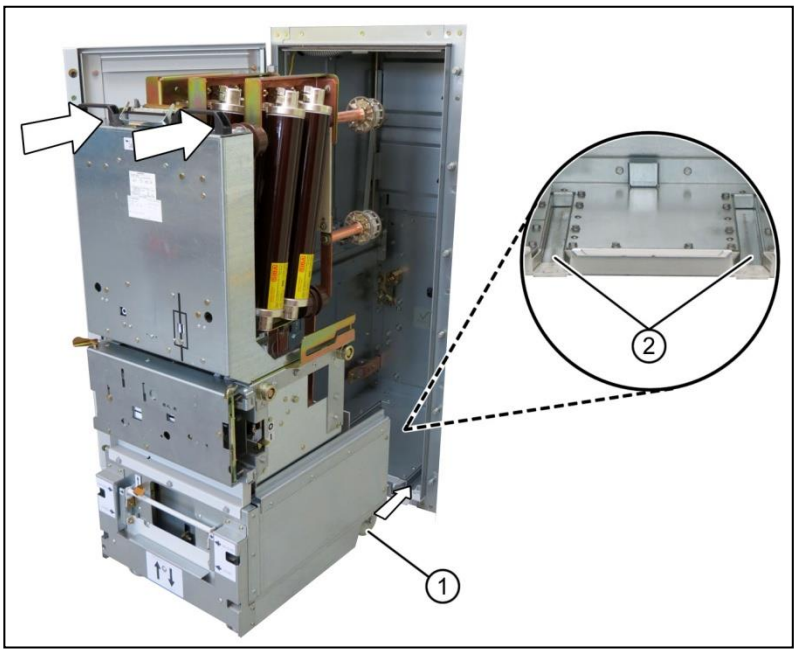


Fig. 335: Contactor truck in front of panel

⇨ Push the contactor truck into the panel as far as it will go.

⇨ To interlock the contactor truck with the panel frame at the bottom, lift the locking hook (3) and pull the locking bracket (4) totally downwards until snap-in.

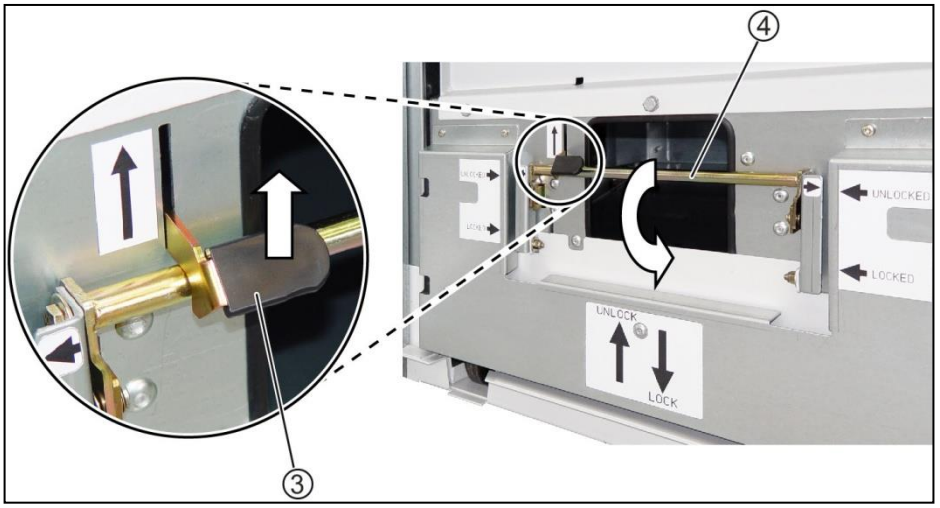


Fig. 336: Interlocking the contactor truck at the bottom

The contactor truck is now interlocked with the panel frame at the bottom. The locking indicator at the locking bracket shows LOCKED.

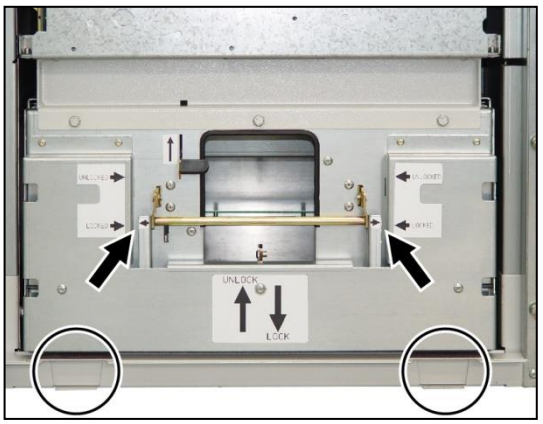


Fig. 337: Contactor truck interlocked with panel frame

⇨ To interlock the contactor truck with the panel frame at the center, turn the two locking levers to the inside.
The contactor truck is correctly interlocked with the panel as soon as both locking levers latch tight inside.

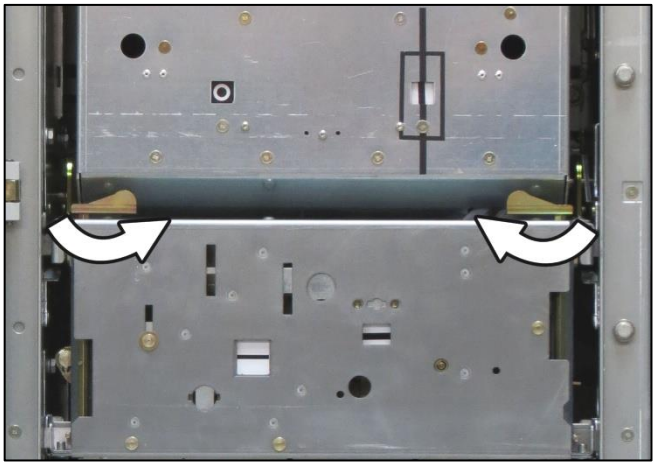


Fig. 338: Interlocking the contactor truck at the center

Plugging on the low-voltage connector

> **INFORMATION**
>
> In addition to these instructions, an instruction label (1) on the contactor truck informs about plugging on the low-voltage connector.
>
> Follow the advice on the label to push the longitudinal fastener.

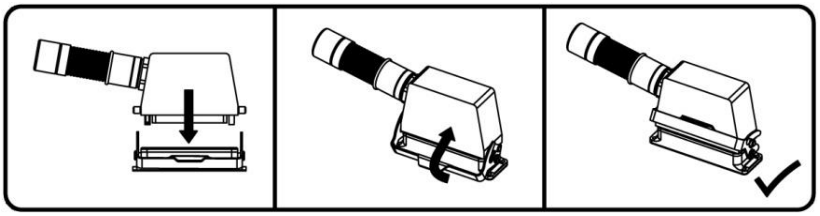


Fig. 339: Instruction label on the contactor truck

⇨ Take the low-voltage connector out of the support located underneath the low-voltage compartment.

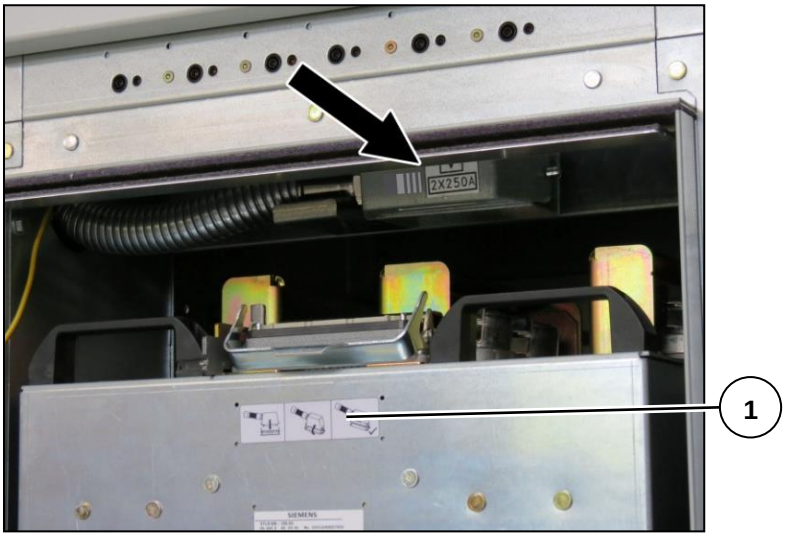


Fig. 340: Low-voltage connector stowed away

⇨ Carefully plug on the low-voltage connector (2) from above

⇨ To secure the low-voltage connector, push the longitudinal fastener (3) of the coupling upwards.

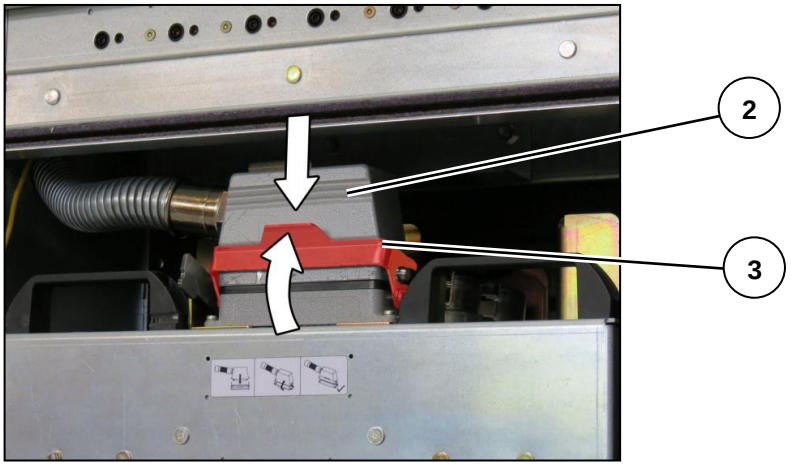


Fig. 341: Plugging on and securing the low-voltage connector

⇨ Close the high-voltage door.

⇨ Switch the auxiliary voltage on.

✓ The contactor truck is inserted in the panel and the high-voltage door is closed.

14.19 Replacing HV HRC fuse-links

According to IEC 60282-1 (2009) Clause 6.6, the breaking capacity of HV HRC fuse-links is tested within the scope of the type test at 87% of their rated voltage.

In three-phase systems with resonance-earthed or isolated neutral, under double earth fault and other conditions, the full phase-to-phase voltage may be available at the HV HRC fuse-link during breaking. Depending on the size of the operating voltage of such a system, this applied voltage may then exceed 87 % of the rated voltage.

It must therefore already be ensured during configuration of the switching devices and selection of the HV HRC fuse-link that only such fuse-links are used, which either satisfy the above operating conditions, or whose breaking capacity was tested at least with the maximum system voltage.

In case of doubt, a suitable HV HRC fuse-link must be selected together with the fuse-link manufacturer.

⚠ CAUTION

Burns

After tripping, the surfaces of HV HRC fuse-links are hot. Touching hot HV HRC fuse-links may cause burns.

⇨ Put on personal protective equipment.

⇨ Let hot HV HRC fuse-links cool down before replacing.

NOTICE

Undetected damage

Even if the contactor truck shows no visible damages of a fault, the HV HRC fuse-link may have tripped due to a fault.

⇨ Check the switching-device compartment for deformations when a fuse-link has tripped.

Indicator for operating state of HV HRC fuse-links
On the front side of the contactor truck, there is an indicator for the two operating states of the HV HRC fuse-links installed in the phases. The symbols indicate the following:

Symbol	Indication
	Vertical bar position: All HV HRC fuse-links are in service
	Horizontal bar position: At least one HV HRC fuse-link has tripped

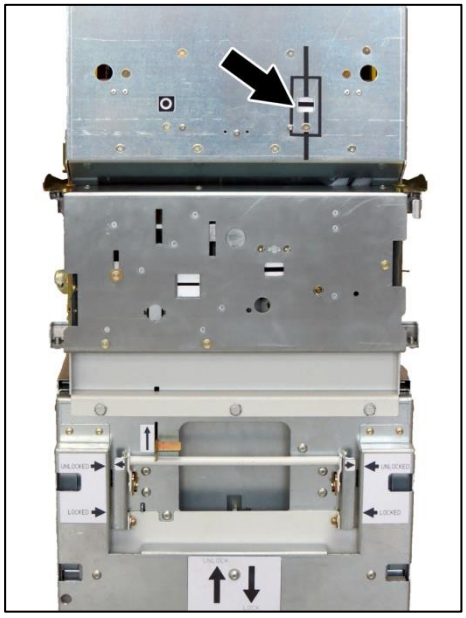


Fig. 342: Front side of contactor truck:
Indicator for HV HRC fuse-links

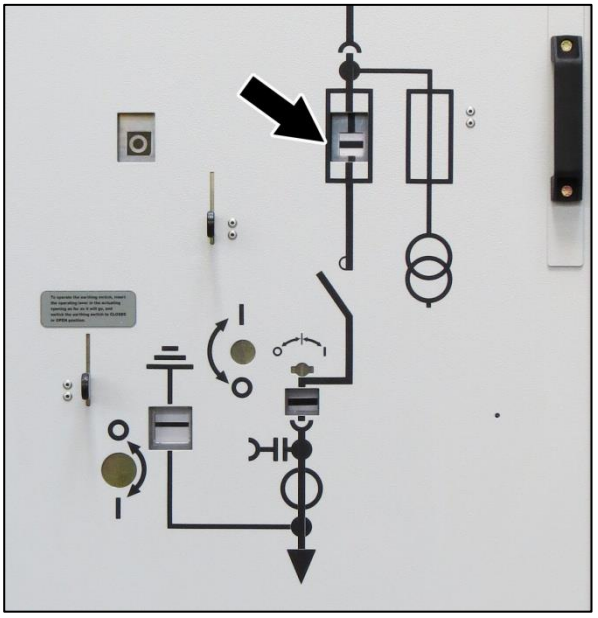
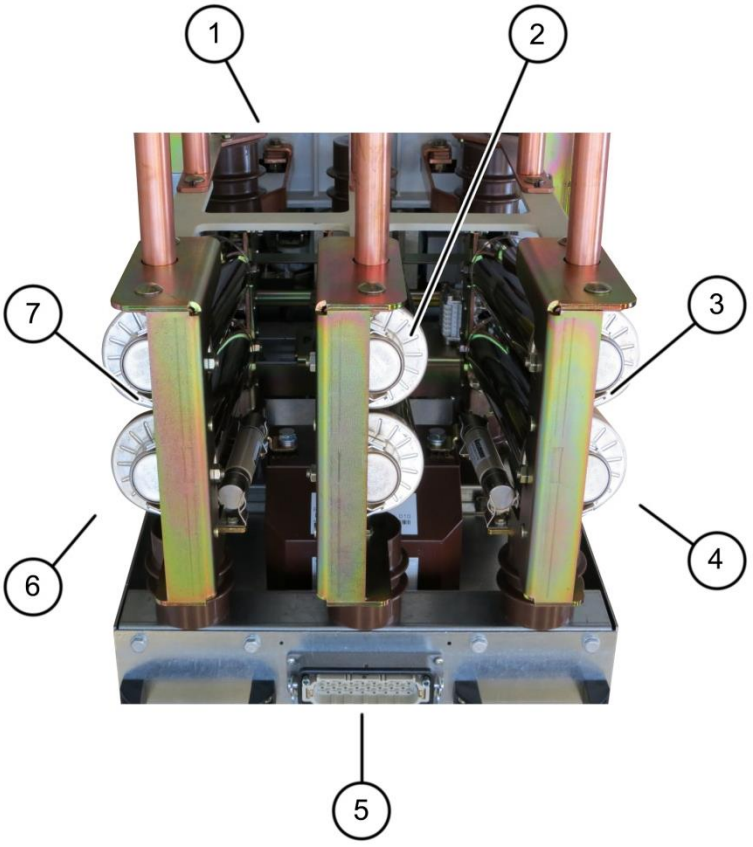


Fig. 343: High-voltage door:
Indicator for HV HRC fuse-links

Arrangement of HV HRC fuse-links

Depending on the panel version, contactors are equipped with either single or double fuse-link arrangement per phase. Hereafter, replacing HV HRC fuse-links is shown using the example of a double fuse-link arrangement.

⇨ When replacing a single fuse-link arrangement, proceed in an analogous way.



(1) Rear side of contactor truck

(2) Middle phase L2 with double fuse-link arrangement

(3) Outer phase L3 with double fuse-link arrangement

(4) Right side of contactor truck

(5) Front side of contactor truck

(6) Left side of contactor truck

(7) Outer phase L1 with double fuse-link arrangement

Fig. 344: Seen from top: Arrangement of HV HRC fuse-links
(example with double fuse-link arrangement)

Operating the contactor panel with panel width 600 mm

When inserting a new HV HRC fuse-link, the striker pin must always point to the lower clamp. The position of the striker pin is marked on the HV HRC fuse-link by a triangle representing an arrow (8).

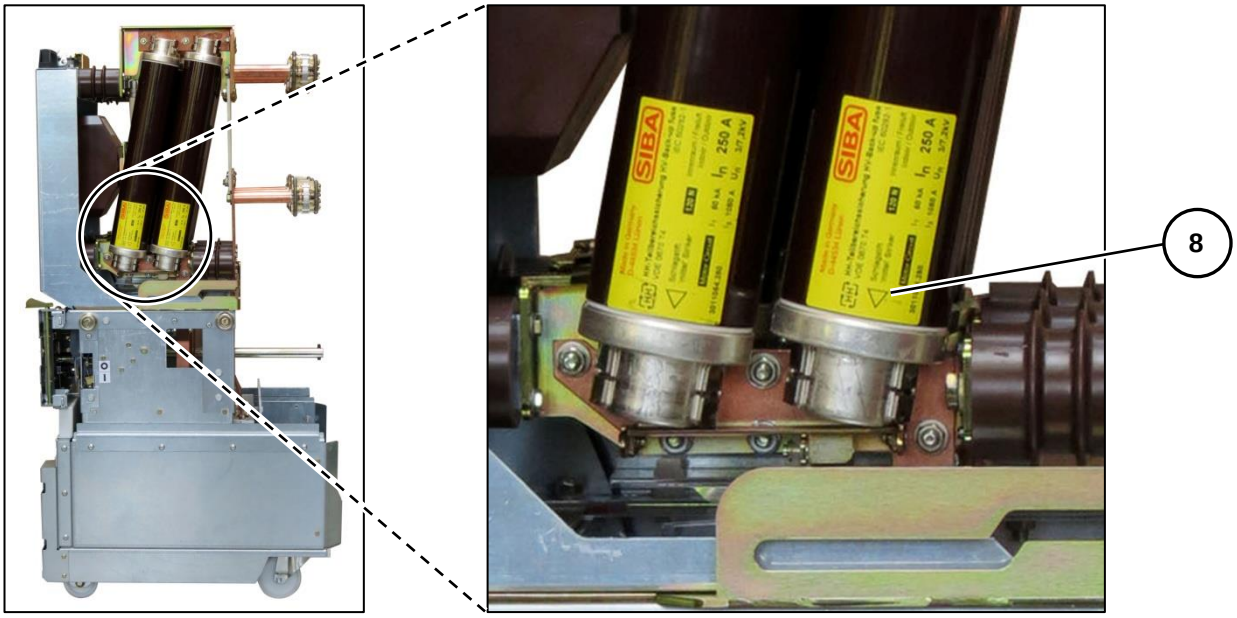


Fig. 345: Seen from right side of truck: Striker pin pointing to lower clamp

Permissible HV HRC fuse-links
The specified SIBA HV HRC fuse-links are motor protection back-up fuse-links according to IEC 60282-1. The dimensions of the HV HRC fuse-links correspond to DIN 43625.

NOTICE

Maloperation

Contactor trucks are exclusively designed for operation with specific HV HRC fuse-links. Using the different type of fuse-links may cause damages on the panel.

⇨ Use only the fuse-link types listed in the following table.

⇨ Do not mount bridging links instead of HV HRC fuse-links.

Selection table for HV HRC fuse-links

Rated voltage U_r [kV]	Rated current I_r [A]	Dimension "e" [mm]	Number of fuse-links permitted per phase	Order details (SIBA)	Order details (Inter-teknik)
7.2	50	442	1	3010853.50	+S68T.12KV.442.050.08-7.2
	63		1	3010853.63	+S68T.12KV.442.063.08-7.2
	80		1	3010853.80	+S68T.12KV.442.080.08-7.2
	100		1	3010853.100	+S4T.12KV.442.100.08-7.2
	125		1	3010953.125	+S4T.12KV.442.125.08-7.2
	160		1 or 2	3010953.160	+S4T.12KV.442.160.08-7.2
	200		1 or 2	3011054.200	+S4T.12KV.442.200.08-7.2
	250		1 or 2	3011054.250	+S4T.12KV.442.250.08-7.2
	315		1	3011054.315	+S4T.12KV.442.315.08-7.2
Supplier information : www.siba-fuses.com Supplier information : www.inter-teknik.com					

Replacing HV HRC fuse-links

NOTICE

Undetected damage

Tripped HV HRC fuse-links can cause hidden damages on the other HV HRC fuse-links.

⇨ Always replace all HV HRC fuse-links, even if only one HV HRC fuse-link has tripped.

INFORMATION

Electrical indication of tripped fuse-links

Electrical indications at the panel or in the remote control room are automatically reset to operating mode by resetting the mechanical indicator for the HV HRC fuse-links.

INFORMATION

Recommended order of action

The HV HRC fuse-links in the middle phase L2 are only accessible after removing the HV HRC fuse-links from the neighboring phase L3.

⇨ First, remove the HV HRC fuse-links from the outer phases L1 and L3 on the left and right side of the contactor truck. Next, remove the HV HRC fuse-links from the middle phase L2.

Operating the contactor panel with panel width 600 mm

Preconditions

- Set of proper HV HRC fuse-links available
- Contactor truck taken out of the panel
- High-voltage door closed

Procedure

Removing HV HRC fuse-links

⇨ Select one of the outer phases L1 or L3. First, pull the upper end of the HV HRC fuse-link out of the clamp. Second, pull the lower end out of the clamp and remove the HV HRC fuse-link.

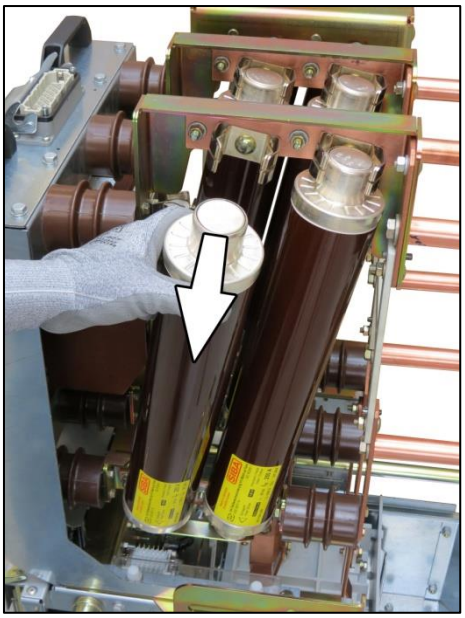


Fig. 346: Pulling the upper end

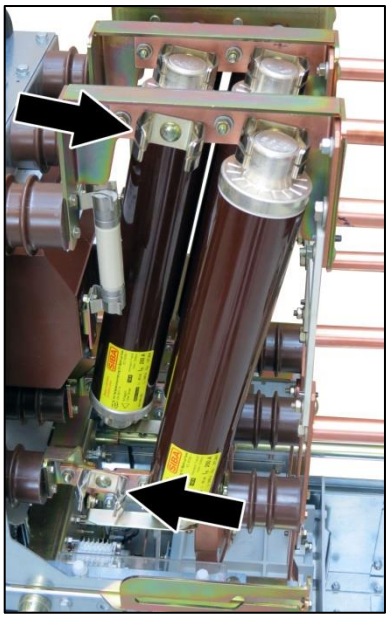


Fig. 347: First HV HRC fuse-link removed

⇨ Remove the second HV HRC fuse-link from that phase in the same way.

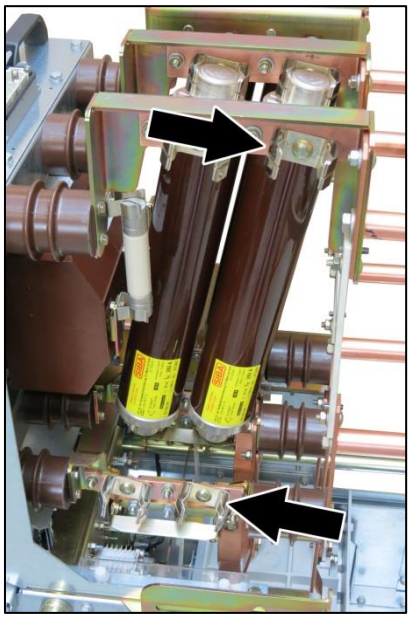


Fig. 348: Both HV HRC fuse-links removed from outer phase

⇨ Remove both HV HRC fuse-links from the second outer phase in the same way.

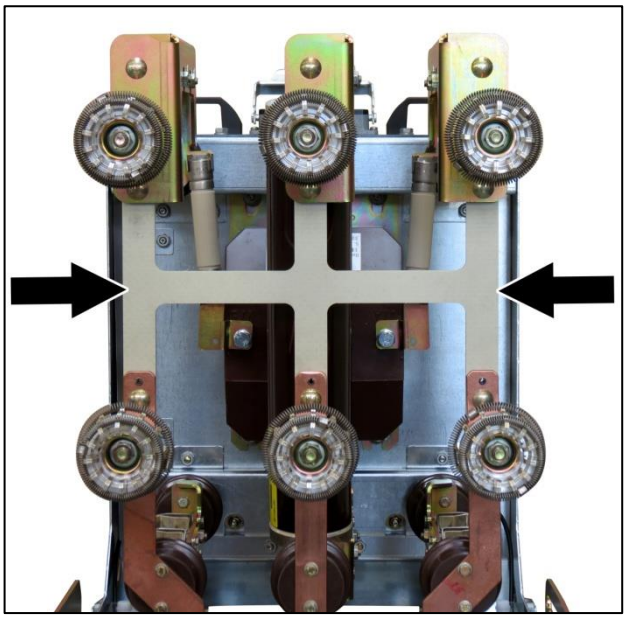


Fig. 349: Rear side of truck: All HV HRC fuse-links removed from outer phases

⇨ After removing the HV HRC fuse-links from the outer phase L3, the fuse-links in the middle phase are accessible from the right side of the contactor truck.
Remove both HV HRC fuse-links from the middle phase.

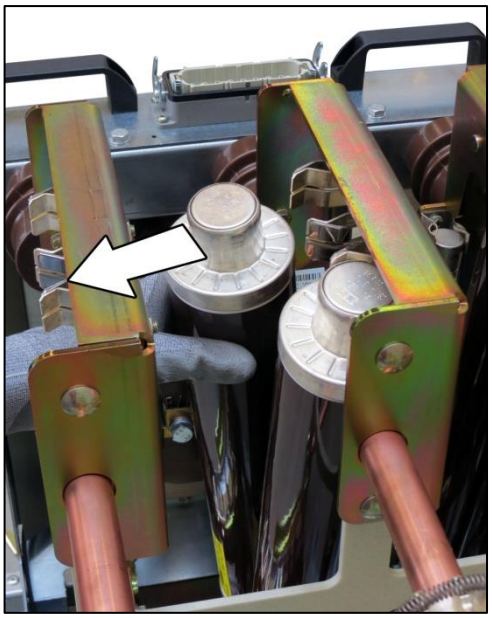


Fig. 350: Removing HV HRC fuse-links from the middle phase

Inserting HV HRC fuse-links

Inserting HV HRC fuse-links is carried out in the reverse order as removing HV HRC fuse-links.

⇨ Hold a new HV HRC fuse-link vertically such that the striker pin points to the lower clamps of the contactor truck.
The position of the striker pin is marked on the HV HRC fuse-link by a triangle representing an arrow.

Fig. 351: Striker pin pointing to lower clamp

⇨ Approaching from the right side of the contactor truck, push the ends of the new HV HRC fuse-links into the lower and upper clamp.
Pull the ends slightly to check if the HV HRC fuse-link is inserted firmly.

⇨ Insert the second HV HRC fuse-link into the middle phase in the same way.

Fig. 352: Both HV HRC fuse-links inserted in middle phase

⇨ Insert the new HV HRC fuse-links into the outer phases in the same way.

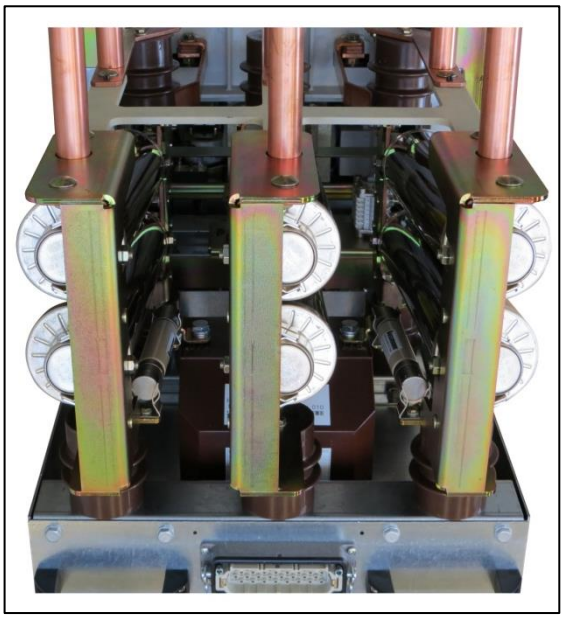


Fig. 353: New HV HRC fuse-links inserted completely

⇨ To reset the mechanical indicator for the HV HRC fuse-links from tripped position to service position, push down the lever at the right side of the contactor truck until it latches into vertical bar **I** position.

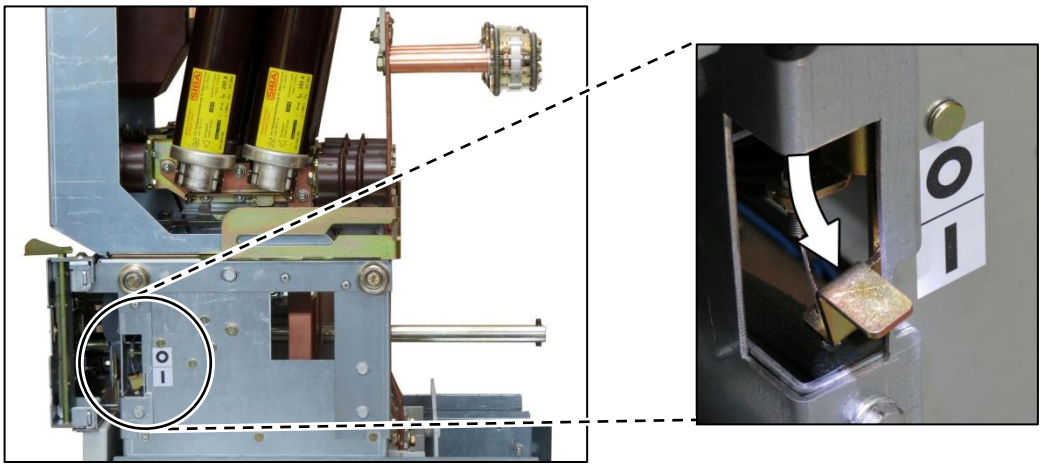


Fig. 354: Resetting position indicator for HV HRC fuse-links

✓ The HV HRC fuse-links have been replaced.

INFORMATION

Final procedure steps

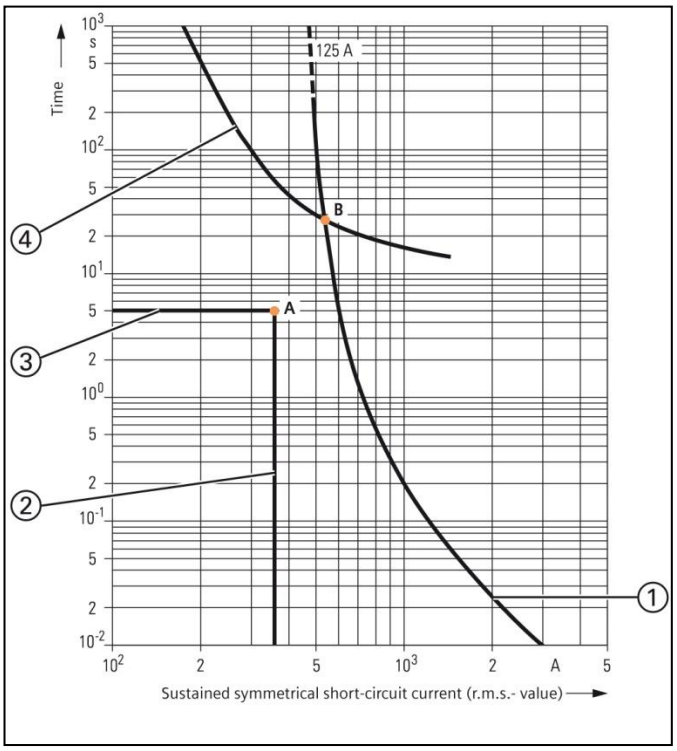
⇨ Next, insert the contactor truck into the panel. After closing the high-voltage door the panel can be integrated into the course of operation again.

14.20 Motor starting currents

Due to the arising motor starting current, the instant when the motor starts represents the maximum stress for the HV HRC fuse-link. Motor starting currents are dependent on the starting time and the starting frequency.
The latest motor protection tables with HV HRC fuse-links type HHM are available in the download area of the SIBA company: www.siba-fuses.com
These motor protection tables show the correspondence between the maximum permissible starting currents of downstream HV motors (depending on the starting time and the starting frequency) and the associated HV HRC fuse-links.

14.21 Coordinating the components of the motor circuit

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



(1) Characteristic of the HV HRC fuse-link

(2) Motor starting current

(3) Motor starting time

(4) Characteristic of the time-overcurrent protection

Fig. 355: Example for the coordination of a HV HRC fuse-link characteristic 125 A with a motor characteristic

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

Coordination

Rules for coordinating the components of the motor circuit:

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

Requirements
The coordination of the components of the motor circuit requires the following:

- The let-through current I_D must not exceed 46 kA at 7.2 kV.
- In case of low-voltage supply via a control transformer, short-circuit currents ranging above the limit breaking capacity must be interrupted within 80 ms. This requirement does not apply if
  - the mechanical latch is provided

  or
  - the opening times have been extended so much that – in the a.m. current range – the contactor can only open when the fuse-link has interrupted the current.
- Due to the arising motor starting current, the instant when the motor starts represents the maximum stress for the HV HRC fuse-link. This stress must neither operate nor pre-damage the fuse-link.
- Other factors of influence on the stress of the HV HRC fuse-links are the starting time and the starting frequency of the motors.

14.22 Replacing protection fuse-links for the control transformer

Arrangement of protection fuse-links
The control transformer (2) is equipped with 2 protection fuse-links (1). The protection fuse-links are only accessible after removing the HV HRC fuse-links from the outer phases.

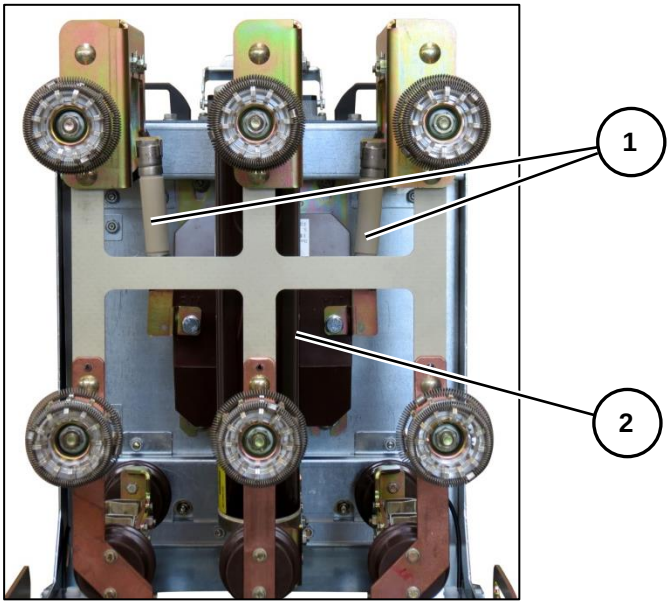


Fig. 356: Rear side of truck: Arrangement of protection fuse-links for control transformer

Operating the contactor panel with panel width 600 mm

Permissible protection fuse-links

NOTICE

Maloperation

Contactor trucks are exclusively designed for operation with specific protection fuse-links for the control transformer.

⇨ Use only the fuse-link types listed in the following table.

⇨ Do not mount bridging links instead of protection fuse-links.

Rated voltage U_r [kV]	Supplier	Order details
7.2	Bussmann (a business of Eaton)	7.2ABWNA / 3.15 A / 142 mm
Supplier information: www.eaton.com		

Removing protection fuse-links for the control transformer

NOTICE

Undetected damage

A tripped protection fuse-link for the control transformer can cause hidden damages on the other protection fuse-links.

⇨ Always replace all protection fuse-links for the control transformer, even if only one protection fuse-link has tripped.

Preconditions

- Set of proper protection fuse-links for the control transformer available
- Contactor truck taken out of the panel
- HV HRC fuse-links removed from the outer phases (1) and available
- High-voltage door closed

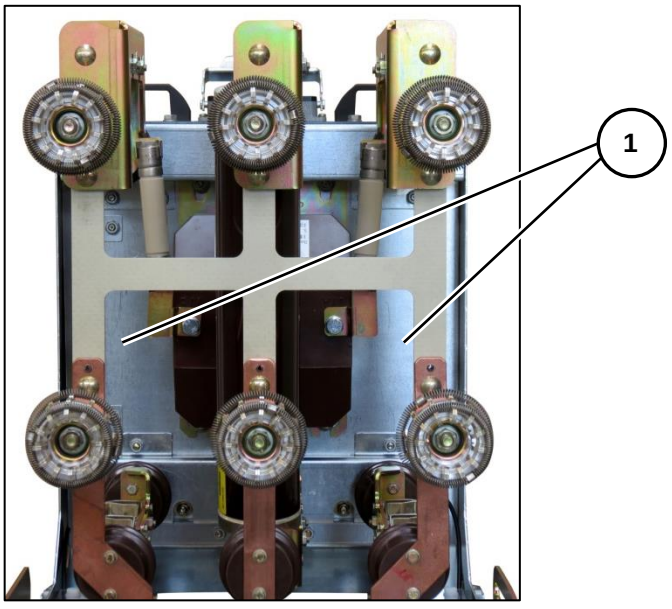


Fig. 357: HV HRC fuse-links removed from the outer phases

Procedure

⇨ Approaching from either the left or right side of the contactor truck, first pull the upper end of the protection fuse-link off the clamp. Second, pull the lower end off the clamp and remove the protection fuse-link.

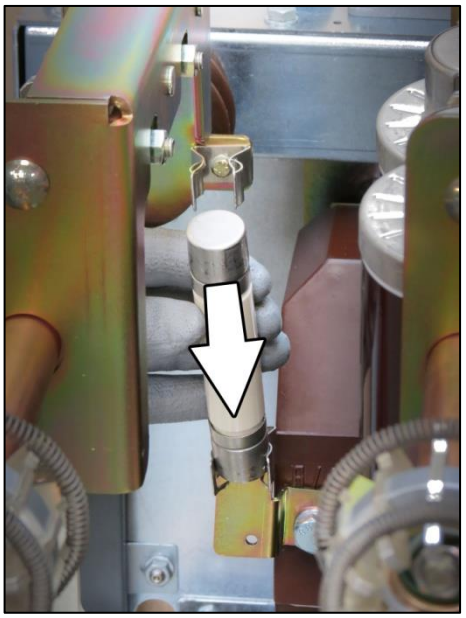


Fig. 358: Pulling the upper end

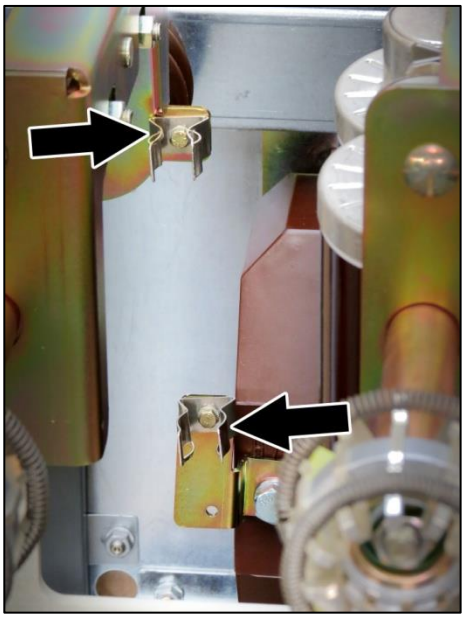


Fig. 359: First protection fuse-link removed

⇨ Push the ends of the new protection fuse-link into the lower and upper clamp.
Pull the ends slightly to check if the protection fuse-link is inserted firmly.

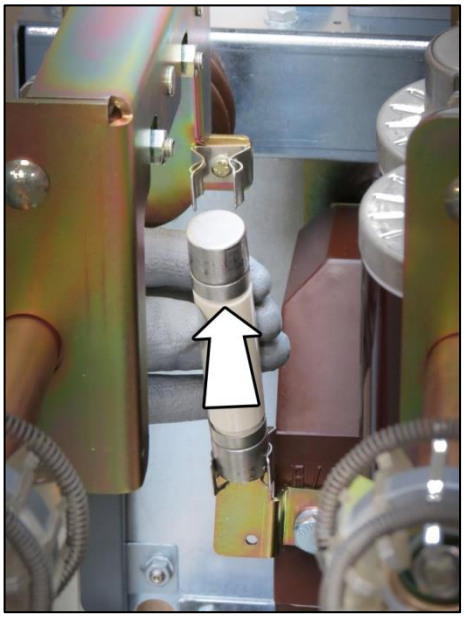


Fig. 360: Pushing the upper end

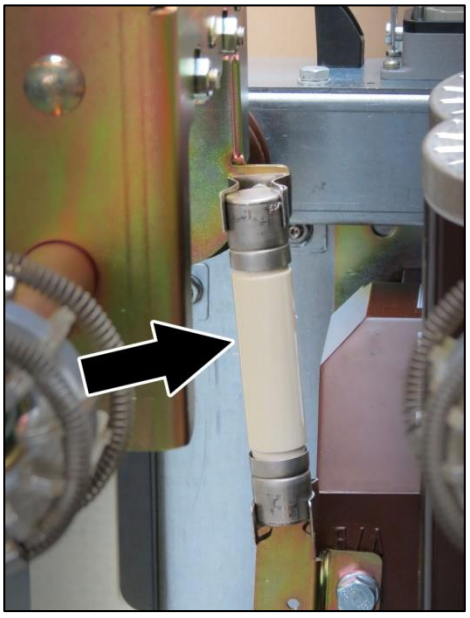


Fig. 361: First protection fuse-link replaced

⇨ Replace the second protection fuse-link on the other side in the same way.

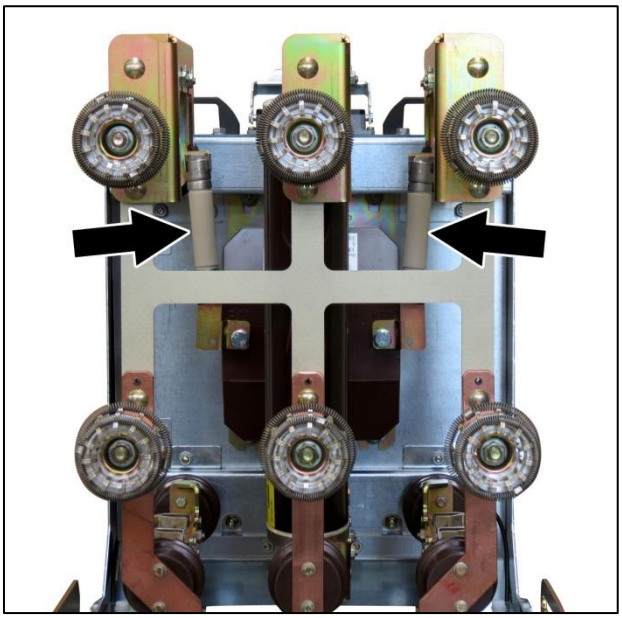


Fig. 362: Protection fuse-links inserted

✓ The protection fuse-links for the control transformer have been replaced.

INFORMATION

Final procedure steps

⇨ Next, insert the protection fuse-links into the outer phases again. Next, insert the contactor truck into the panel. After closing the high-voltage door the panel can be integrated into the course of operation again.

15 Operating the busbar connection panel type I

INFORMATION

Read and understand these instructions before attempting operating works.

15.1 Control elements at the front side of the panel

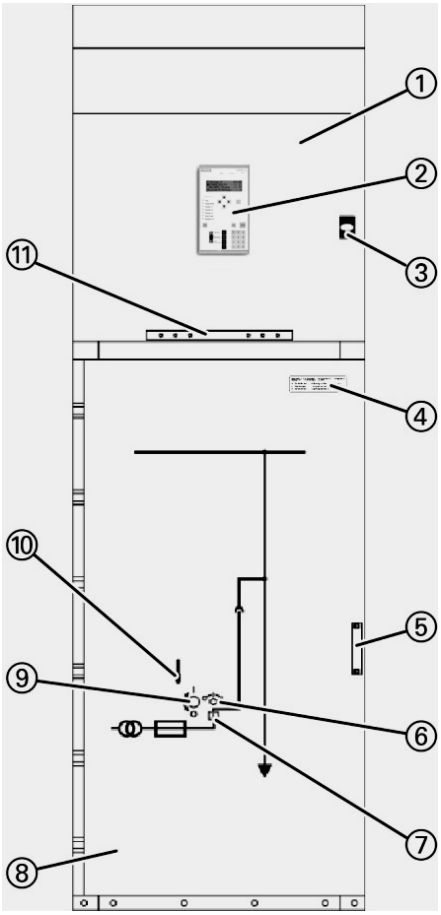


Fig. 363: Control elements on the panel front

(1) Door to the low-voltage compartment

(2) Protection device

(3) Locking device for the door to the low-voltage compartment

(4) Instruction label for closing the high-voltage door

(5) Handle for opening the high-voltage door

(6) Actuating opening for inserting the double-bit key to control racking of the withdrawable metering part / metering truck

(7) Mechanical position indicator for withdrawable metering part / metering truck

(8) High-voltage door

(9) Actuating opening for racking the withdrawable metering part / metering truck

(10) Operating slide for opening and closing the actuating opening for racking the withdrawable metering part / metering truck

(11) Test sockets for busbar voltage detecting system (type LRM) as additional component

15.2 Position indicator visible on high-voltage door

Indicator for position of withdrawable metering part / metering truck:			
Position indications for:	Service position 	Intermediate position 	Test position 

15.3 Access to compartments

Regarding accessibility to the individual compartments, NXAIR switchgear fulfills the loss of service continuity category LSC 2B according to IEC 62271-200.

The degree of protection between the individual compartments is IP2X.

The type of accessibility is provided as follows:

Compartment		**Type of accessibility**
Switching-device compartment		Interlock-controlled
Busbar compartment		Tool-based
Connection compartment	Access from the front side	Interlock-controlled and tool-based
	Access from the rear side	Tool-based

15.4 Opening or closing the high-voltage door

The procedure for opening and/or closing the high-voltage door at the busbar connection panel type I is identical with the procedure for opening and/or closing the high-voltage door at the circuit-breaker panel.

⇨ For opening and/or closing the high-voltage door at the busbar connection panel type I, see chapter 10.4 and/or 10.5.

15.5 Racking the withdrawable metering part / metering truck

The procedure for racking the withdrawable metering part / metering truck to service position and/or test position is identical with the procedure for racking the withdrawable circuit-breaker / circuit-breaker truck to service position and/or test position.

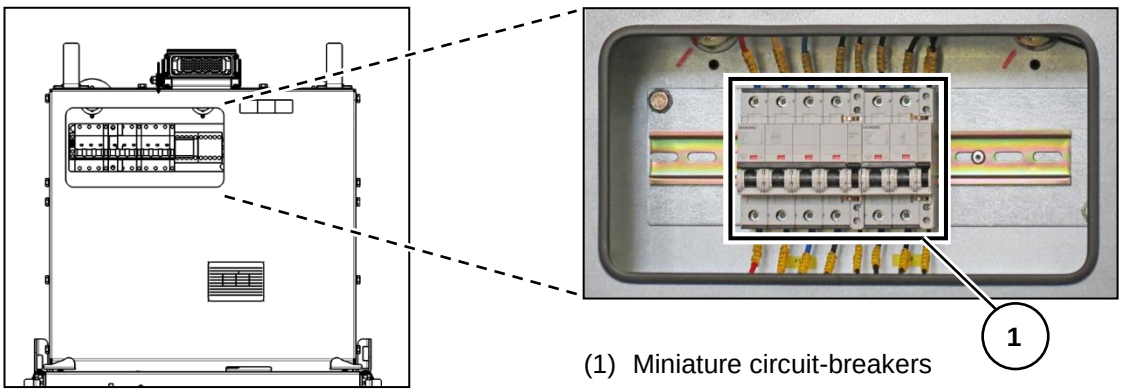
⇨ For racking the withdrawable metering part / metering truck to service position and/or test position, see chapter 10.8 and/or 10.9.

15.6 Removing or plugging on the low-voltage connector

The procedure for removing and/or plugging on the low-voltage connector in the busbar connection panel type I is identical with the procedure for removing and/or plugging on the low-voltage connector in the circuit-breaker panel.

Control elements at the front side of the withdrawable metering part / metering truck

Access to the control elements at the front side of the withdrawable metering part / metering truck is given after opening the high-voltage door.



(1) Miniature circuit-breakers

Fig. 364: Control elements at the front of the withdrawable metering part / metering truck, example

Before removing the low-voltage connector:

⇨ Switch off all miniature circuit-breakers at the front of the withdrawable metering part / metering truck. The indicators change from red to green.

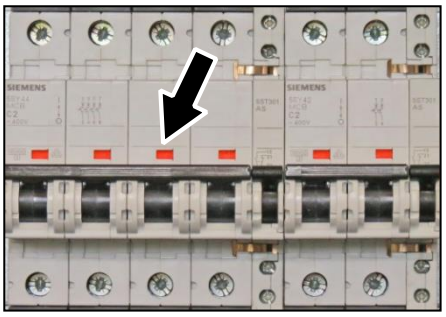


Fig. 365: Miniature circuit-breakers switched on, indicators red

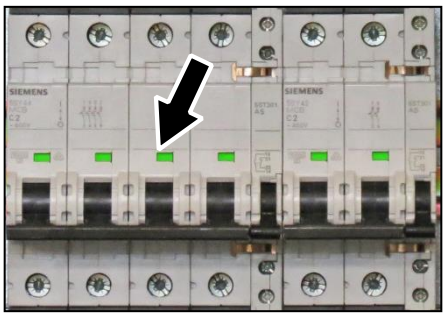


Fig. 366: Miniature circuit-breakers switched off, indicators green

After plugging on the low-voltage connector:

⇨ Switch on all miniature circuit-breakers at the front of the withdrawable metering part / metering truck. The indicators change from green to red.

Removing or plugging on the low-voltage connector:

⇨ For removing and/or plugging on the low-voltage connector in the busbar connection panel type I, see chapter 10.18 and/or 10.19.

15.7 Taking the withdrawable metering part / metering truck out of a panel or inserting in a panel

The procedure for inserting and/or removing the withdrawable metering part / metering truck in the busbar connection panel type I is identical with the procedure for inserting and/or removing the withdrawable circuit-breaker / circuit-breaker truck in the circuit-breaker panel.

⇨ For inserting and/or removing the withdrawable metering part in the busbar connection panel type I, see chapter 10.20 and/or 10.21.
For inserting and/or removing the metering truck in the busbar connection panel type I, see chapter 10.22 and/or 10.23.

15.8 Replacing protection fuse-links

NOTICE

Maloperation

Withdrawable metering parts / metering trucks are exclusively designed for operation with specific protection fuse-links.

⇨ Use only the fuse-link types listed in the following table.

⇨ Do not mount bridging links instead of protection fuse-links.

NOTICE

Undetected damage

A tripped protection fuse-link can cause hidden damages on the other protection fuse-links.

⇨ Always replace all protection fuse-links, even if only one protection fuse-link has tripped.

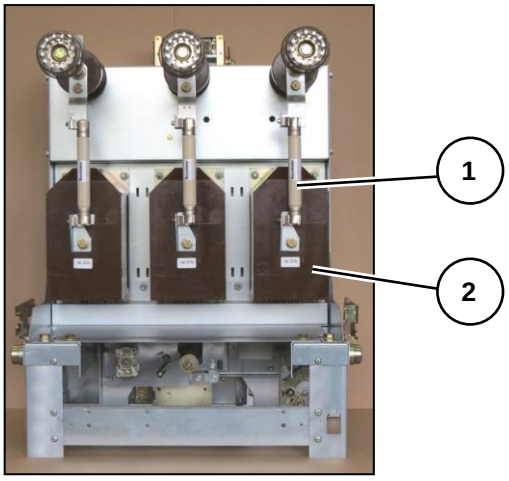
Selection table for protection fuse-links:

Rated voltage U_r [kV]	Supplier:	Order details:
7.2	Bussmann (a business of Eaton)	7.2ABWNA / 3.15 A / 142 mm
12	Bussmann (a business of Eaton)	12ABCNA / 3.15 A / 195 mm
17.5	Bussmann (a business of Eaton)	17.5CAV2 / 2 A / 220 mm
Supplier information: www.eaton.com		

Preconditions

- Withdrawable metering part / metering truck in test position
- Padlock (optional) removed from door handle
- High-voltage door open
- All voltage transformer MCBs switched to OPEN position
- Low-voltage connector stowed away
- Withdrawable metering part / metering truck taken out of the panel
- Set of proper protection fuse-links available

Replacing protection fuse-links for rated voltage ≤ 12 kV



(1) Removable protection fuse-link

(2) Fixed-mounted voltage transformer

Fig. 367: Withdrawable metering part, taken out of the panel

⇨ Pull the upper end of the protection fuse-link off the clamp.

⇨ Pull the lower end of the protection fuse-link off the clamp and remove the protection fuse-link.

Fig. 368: Pulling off the fuse-link

⇨ Push the lower end of the new protection fuse-link into the clamp.

⇨ Push the upper end of the new protection fuse-link into the clamp.

⇨ Perform replacement with all other fuse-links.

✓ The protection fuse-links have been replaced.

INFORMATION

Final procedure steps

⇨ Next, insert the withdrawable metering part / metering truck into the panel. After closing the high-voltage door, the panel can be integrated into the course of operation again.

Replacing protection fuse-links for rated voltage 17.5 kV

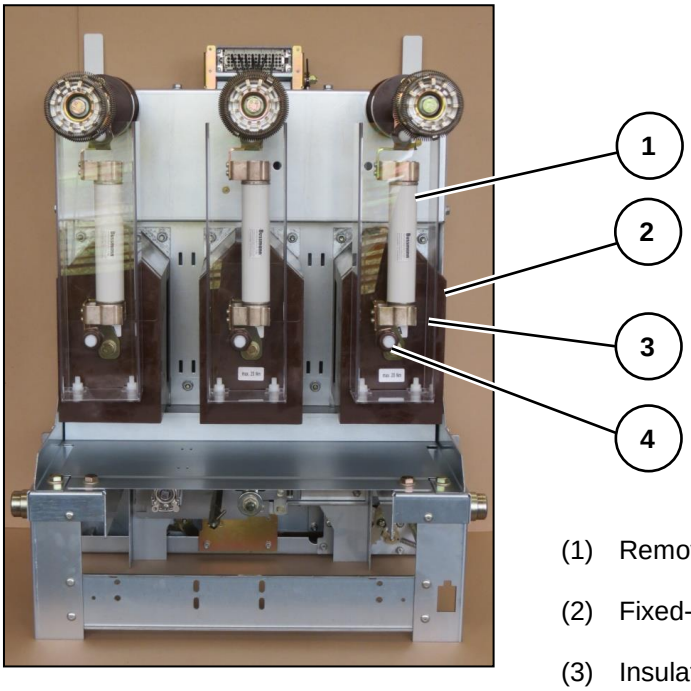


Fig. 369: Withdrawable metering part, taken out of the panel

(1) Removable protection fuse-link

(2) Fixed-mounted voltage transformer

(3) Insulating cover

(4) Screwed joint of insulating cover

⇨ Remove the upper and lower bolt M8x12 with washer 8.4 mm completely from the three insulating covers.

⇨ Keep the 3 insulating covers, 6 bolts and 6 washers 8.4 mm for later reuse.

⇨ Pull the lower end of the protection fuse-link off the clamp by means of a screwdriver.

⇨ Pull the upper end of the protection fuse-link off the clamp and remove the protection fuse-link.

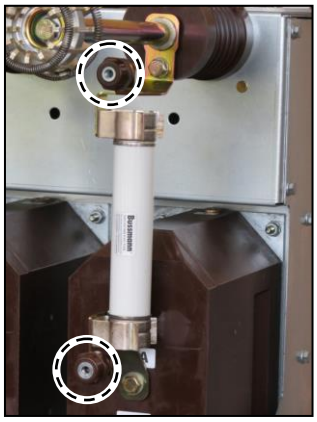


Fig. 370: Insulating cover removed

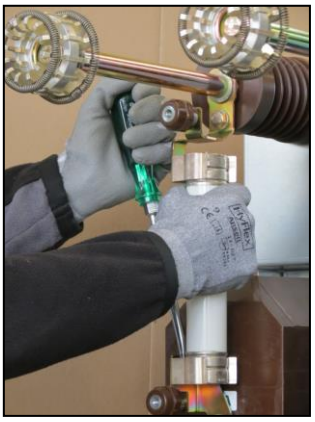


Fig. 371: Use of a screwdriver

Fig. 372: Pulling off the fuse-link

⇨ Push the upper end of the new protection fuse-link into the clamp.

⇨ Push the lower end of the new protection fuse-link into the clamp.

⇨ Perform replacement with all other fuse-links.

⇨ Fasten an insulating cover over each protection fuse-link at the upper and lower fixing point using a plastic bolt M8x12 and washer 8.4 mm; to do this, turn the M8 bolt into the bolted joint with simple hand force.

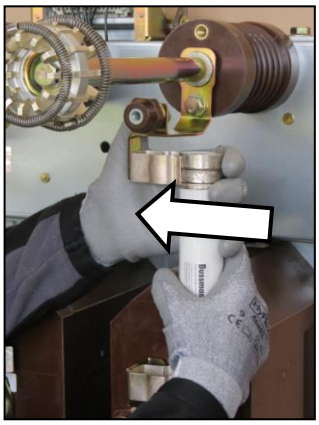


Fig. 373: Pushing the upper end into the clamp

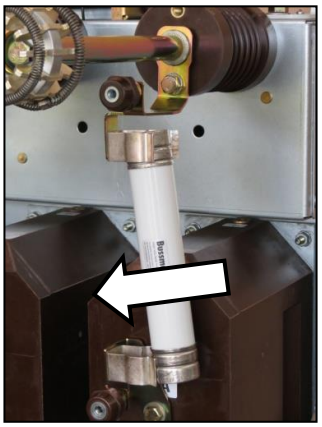


Fig. 374: Pushing the lower end into the clamp

Fig. 375: Installation of insulating covers

✓ The protection fuse-links have been replaced.

INFORMATION

Final procedure steps

⇨ Next, insert the withdrawable metering part / metering truck into the panel. After closing the high-voltage door the panel can be integrated into the course of operation again.

16 Operating the busbar connection panel type II

INFORMATION

Read and understand these instructions before attempting operating works.

16.1 Panel front

INFORMATION

The busbar connection panel type II is not equipped with any kind of withdrawable part / switching-device truck.

No switching operations must be executed at the busbar connection panel type II. For revision and maintenance, the high-voltage door at the panel front can be opened. For opening and closing the high-voltage door, **do absolutely** observe the following notes.

16.2 Opening the high-voltage door

DANGER

Electric shock

If the busbars in the switchgear have not been isolated, the contacts in the panel will be live at operational high-voltage.

- ⇨ Isolate the busbars in the switchgear.
- ⇨ Do **not** open the high-voltage door at the busbar connection panel type II unless the busbars have been isolated.
- ⇨ Observe the **Five Safety Rules**.
- ⇨ Verify safe isolation from supply.

WARNING

Reduced safety

The closed high-voltage door is an important safety element of the switchgear. The high-voltage door is exclusively opened for performing operational activities inside the busbar connection panel type II.

Close the high-voltage door:

- ⇨ If an activity inside the compartment behind the high-voltage door is interrupted.
- ⇨ Immediately after an activity inside the compartment behind the high-voltage door was completed.
- ⇨ Before leaving the panel front.

Preconditions

- Release for opening the high-voltage door available
- High-voltage door closed

Procedure

⇨ Remove the padlock (1), and store it.

⇨ Pull door handle totally upwards and open the high-voltage door.

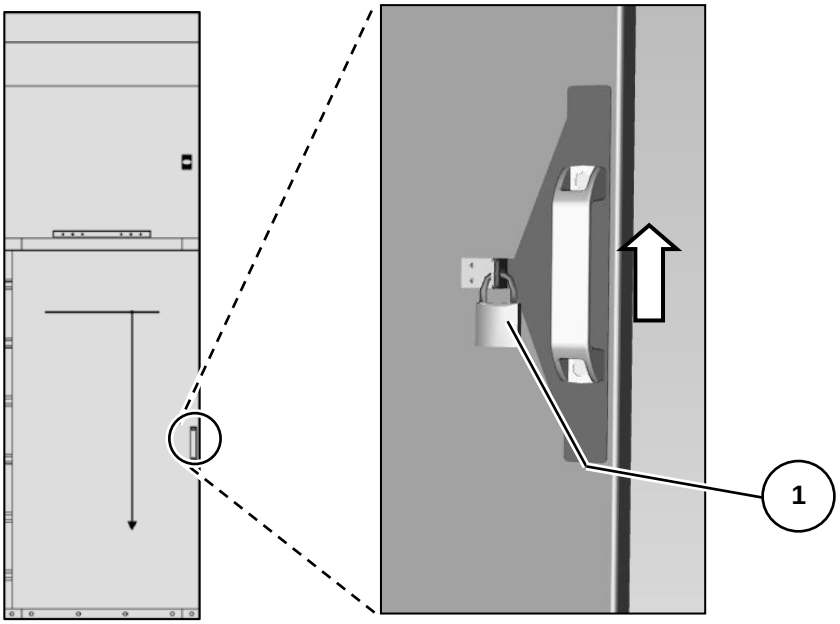


Fig. 376: Opening the high-voltage door

✓ The high-voltage door is open.

16.3 Closing the high-voltage door

⚠ WARNING

Reduced safety

The closed high-voltage door is an important safety element of the switchgear. The high-voltage door is exclusively opened for performing operational activities inside the busbar connection panel type II.

Close the high-voltage door:

⇨ If an activity inside the compartment behind the high-voltage door is interrupted.

⇨ Immediately after an activity inside the compartment behind the high-voltage door was completed.

⇨ Before leaving the panel front.

Operating the busbar connection panel type II

Preconditions

- High-voltage door open

Procedure

⇨ Push the door handle on the high-voltage door totally upwards, and hold it.

⇨ Press the high-voltage door totally onto the panel frame using the door handle.

⇨ Push the door handle on the high-voltage door totally downwards, and release it.

⇨ Fit padlock to the door handle and close it (1).

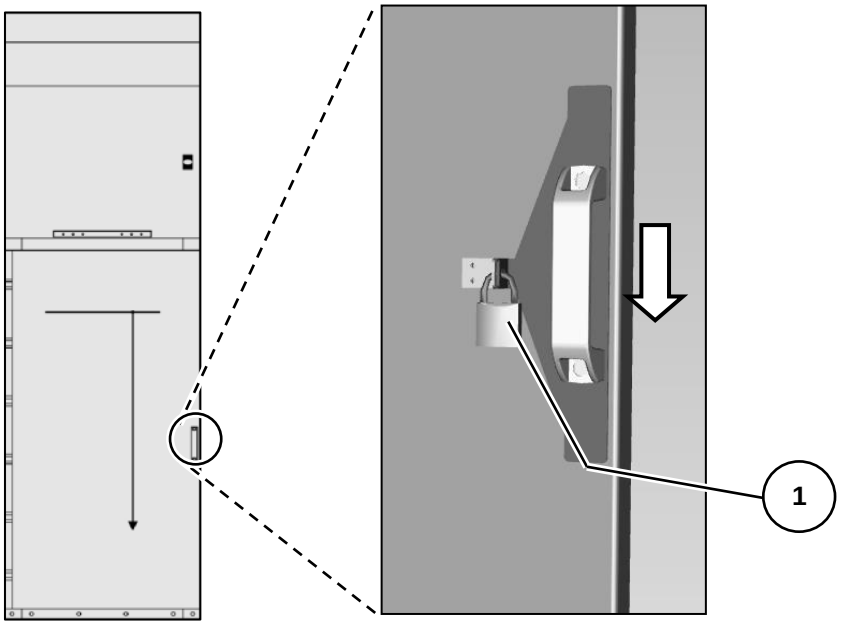


Fig. 377: Closing the high-voltage door

✓ The high-voltage door is closed.

17 Operating the busbar current metering panel

INFORMATION

Read and understand these instructions before attempting operating works.

17.1 Panel front

No switching operations must be executed at the busbar current metering panel. For revision and maintenance, the high-voltage door at the panel front can be opened. For opening and closing the high-voltage door, **do absolutely** observe the following notes.

17.2 Opening the high-voltage door

DANGER

Electric shock

If the busbars in the switchgear have not been isolated, the contacts in the panel will be live at operational high-voltage.

- ⇨ Isolate the busbars in the switchgear.
- ⇨ Do **not** open the high-voltage door at the busbar current metering panel unless the busbars have been isolated.
- ⇨ Observe the **Five Safety Rules**.
- ⇨ Verify safe isolation from supply.

WARNING

Reduced safety

The closed high-voltage door is an important safety element of the switchgear. The high-voltage door is exclusively opened for performing operational activities inside the busbar current metering panel.

Close the high-voltage door:

- ⇨ If an activity inside the compartment behind the high-voltage door is interrupted.
- ⇨ Immediately after an activity inside the compartment behind the high-voltage door was completed.
- ⇨ Before leaving the panel front.

Operating the busbar current metering panel

Preconditions

- Release for opening the high-voltage door available
- Hexagon socket head key size 6 available
- Personal protective equipment put on

Procedure

⇨ Undo 6 hexagon socket head bolts size 6 (1). The bolts remain permanently in the high-voltage door.

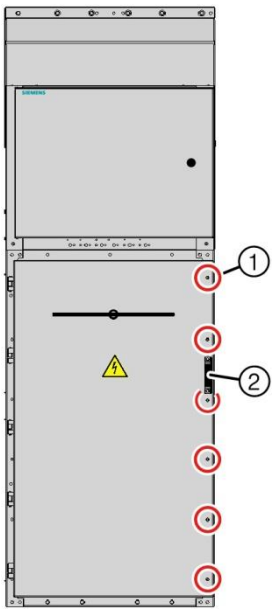


Fig. 378: High-voltage door at the busbar current metering panel

⇨ Open the high-voltage door using the handle (2).

✓ The high-voltage door is open.

17.3 Closing the high-voltage door

⚠ WARNING

Reduced safety

The closed high-voltage door is an important safety element of the switchgear. The high-voltage door is exclusively opened for performing operational activities inside the busbar current metering panel.

Close the high-voltage door:

⇨ If an activity inside the compartment behind the high-voltage door is interrupted.

⇨ Immediately after an activity inside the compartment behind the high-voltage door was completed.

⇨ Before leaving the panel front.

Preconditions

- High-voltage door open
- Hexagon socket head key size 6 available

Procedure

⇨ Close the high-voltage door using the handle (2).

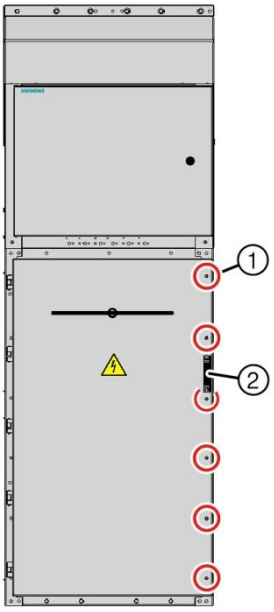


Fig. 379: High-voltage door at the busbar current metering panel

⇨ Screw in 6 hexagon socket head bolts size 6 (1) by hand force. This corresponds to a tightening torque of approx. 20 Nm.

✓ The high-voltage door is closed.

18 Operating the switch-disconnector panel

INFORMATION
Read and understand these instructions before attempting operating works.

18.1 Control elements at the front side of the panel

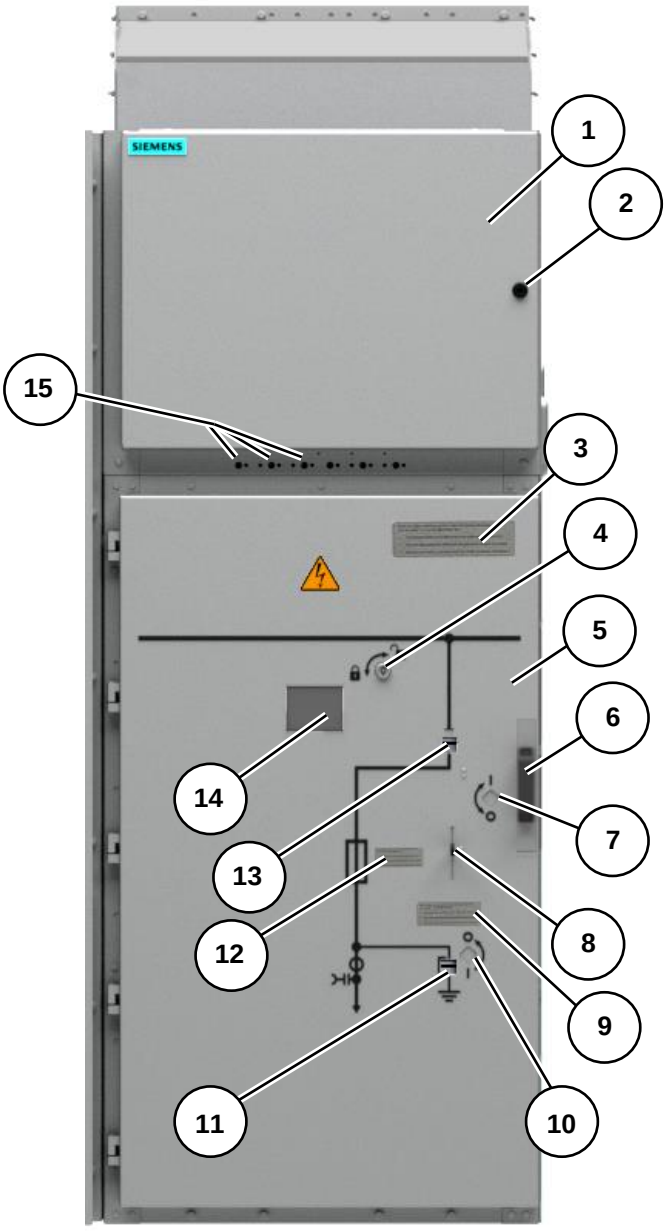


Fig. 380: Control elements on the panel front

(1) Door to the low-voltage compartment

(2) Locking device for the door to the low-voltage compartment

(3) Instruction label for closing the high-voltage door

(4) Actuating opening for inserting the double-bit key to opening high-voltage door

(5) High-voltage door

(6) Handle for opening the high-voltage door

(7) Actuating opening for operating the switch-fuse combination

(8) Operating slide for opening and closing the actuating opening for operating earthing switch / switch-fuse combination

(9) Instruction label for the operating lever for the earthing switch

(10) Actuating opening for operating the earthing switch

(11) Mechanical position indicator for earthing switch

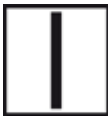
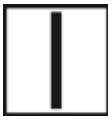
(12) Instruction label for replacing the HV HRC fuses

13 Mechanical position indicator for switch-fuse combinaton

(14) Inspection window to identify the switch positions of the switch-fuse combination

(15) Test sockets for busbar voltage detecting system (type LRM) as additional component

18.2 Position indicators visible on high-voltage door

Feeder earthing switch: CLOSED position or OPEN position	CLOSED 	OPEN 
Switch-fuse combination: CLOSED position or OPEN position	CLOSED 	OPEN 

18.3 Access to compartments

Regarding accessibility to the individual compartments, NXAIR switchgear fulfills the loss of service continuity category LSC 2B but “switch-disconnector panel with HV HRC fuses fulfills the loss of service continuity category LSC 2A; Partition class PI (shutter made of insulating material) according to IEC 62271-200”.

The degree of protection between the individual compartments is IP2X in standard design.

The type of accessibility is provided as follows:

Compartment:		**Type of accessibility:**
Busbar compartment		Tool-based
Switching-device / connection compartment	Access from the front side	Interlock-controlled
	Access from the rear side	Tool-based

18.4 Opening the high-voltage door

⚠ DANGER

Electric shock

If the busbars and cable / bar connections in the switchgear have not been isolated, the contacts in the panel will be live at operational high-voltage.

Before opening the high-voltage door:

- ⇨ Isolate the busbars in the busbar compartment and the cable / bar connections in the switching-device / connection compartment.
- ⇨ Do **not** open the high-voltage door at the switch-disconnector panel unless the panel has been earthed.
- ⇨ Observe the **Five Safety Rules**.
- ⇨ Verify safe isolation from supply.

⚠ WARNING

Reduced safety

The closed high-voltage door is an important safety element of the switchgear. The high-voltage door is exclusively opened for performing operational activities inside the switching-device/connection compartment, such as replacing the HV HRC fuses.

Close the high-voltage door:

⇨ If an activity inside the switching-device/connection compartment is interrupted.

⇨ Immediately after an activity inside the switching-device/connection compartment was completed.

⇨ Before leaving the panel front.

Preconditions

- Switch-fuse combination in OPEN position
- High-voltage door closed
- Padlock (optional) removed from door handle

Procedure

⇨ To open the high-voltage door insert the double-bit key, push and turn clockwise as far as it will go (that is 90°).

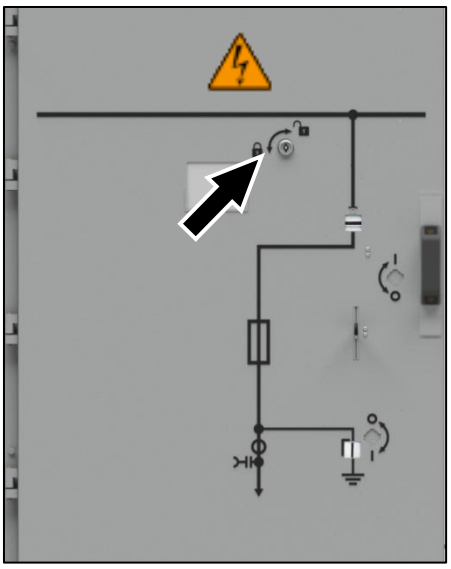


Fig. 381: Inserting the double-bit key

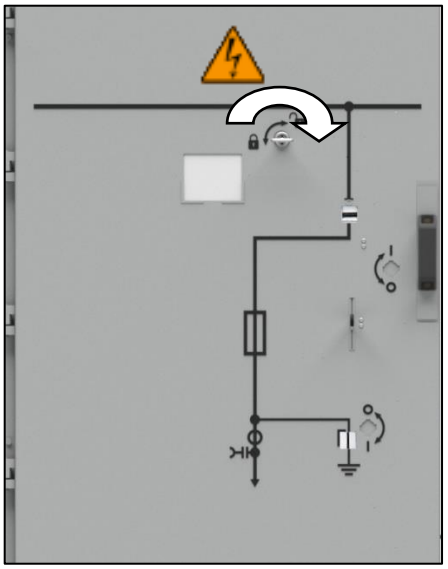


Fig. 382: Turning the double-bit key clockwise

⇨ Pull door handle upwards and open the high-voltage door.

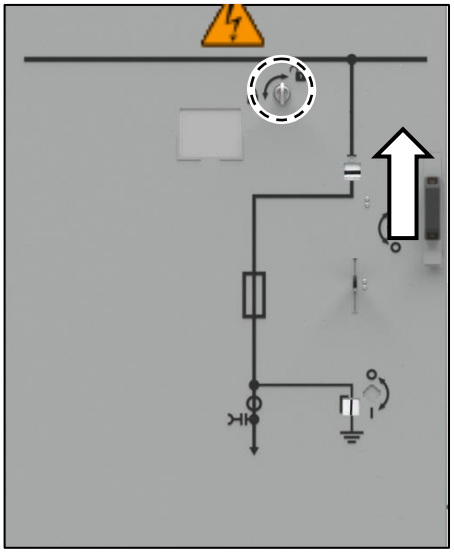


Fig. 383: Opening the high-voltage door

✓ The high-voltage door is open.

18.5 Closing the high-voltage door

⚠ WARNING

Reduced safety

The closed high-voltage door is an important safety element of the switchgear. The high-voltage door is exclusively open for performing operational activities inside the switching-device/connection compartment, such as replacing the HV HRC fuses.

Close the high-voltage door:

⇨ If an activity inside the switching-device/connection compartment is interrupted.

⇨ Immediately after an activity inside the switching-device/connection compartment was completed.

⇨ Before leaving the panel front.

Instruction label on high-voltage door:

In addition to these instructions, an instruction label on the high-voltage door describes safe closing of the high-voltage door before executing a switching operation.

Operating the switch-disconnector panel

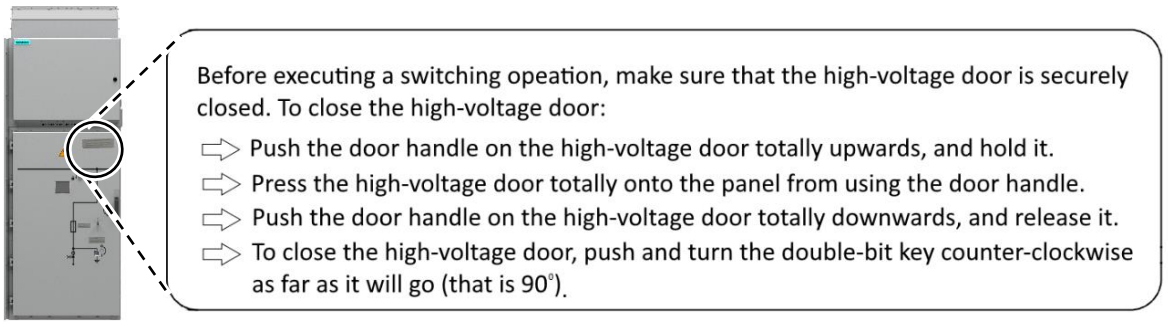


Fig. 384: Instruction label on high-voltage door

Preconditions

- Switch-fuse combination in OPEN position
- High-voltage door open
- Padlock for door handle (optional) available

Procedure

⇨ Push the door handle on the high-voltage door totally upwards and hold it.

⇨ Press the high-voltage door totally onto the panel frame using the door handle.

⇨ Push the door handle on the high-voltage door totally downwards and release it.

⇨ To close the high-voltage door, push and turn the double-bit key counter-clockwise as far as it will go (that is 90°).

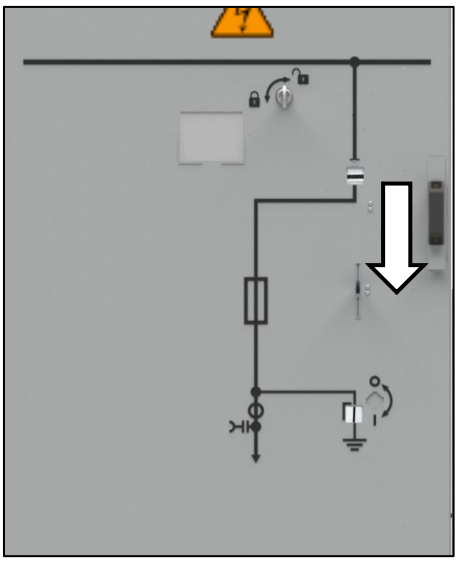


Fig. 385: Pushing the door handle downwards

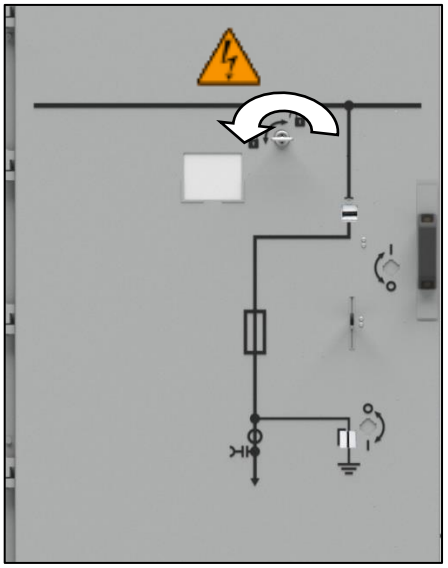


Fig. 386: Turning the double-bit key counter-clockwise

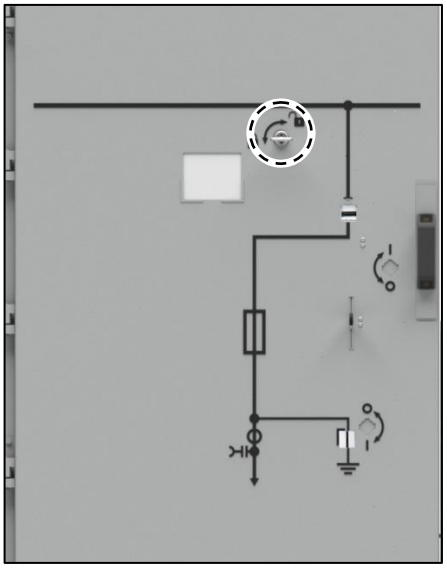


Fig. 387: Closing the high-voltage door

⇨ Fit a padlock (optional) to the door handle and close it.

✓ The high-voltage door is closed.

18.6 Operating the switch-fuse combination to CLOSED position

NOTICE

Maloperation

Risk of damaging the mechanism due to incomplete switching operation.

⇨ After closing the switch-fuse combination, the operating lever must be pushed all the way down to the end position for latching the mechanism to prevent accidental opening.

Preconditions

- Switch-fuse combination in OPEN position
- Switch-fuse combination must be latched
- High-voltage door closed
- Feeder earthing switch in OPEN position
- Striker of HV HRC fuse-link not tripped
- For electromagnetic interlock (optional):
  - Electromagnetic interlock activated
- Operating lever available
- Padlock (optional) removed from operating slide

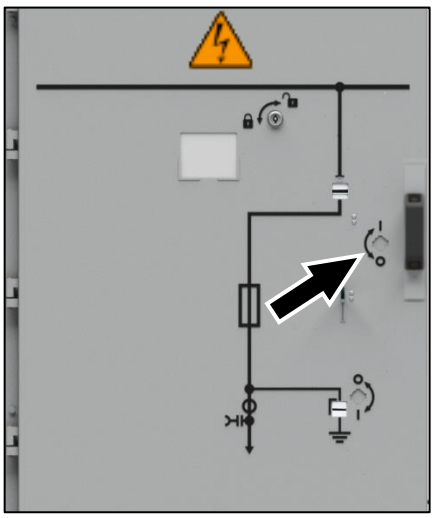


Fig. 388: High-voltage door with actuating opening

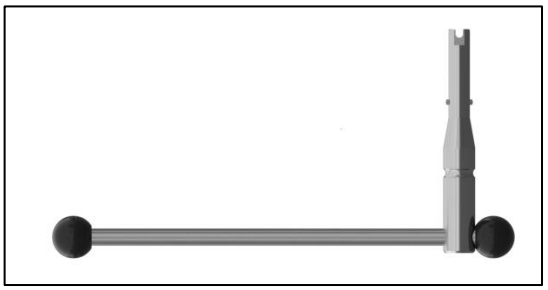


Fig. 389: Operating lever

Procedure

NOTICE

Maloperation

Operating the switch-fuse combination to CLOSED position is only permissible if the feeder earthing switch is in OPEN position.

⇨ Switch feeder earthing switch to OPEN position, if required.

⇨ To release the actuating opening for the operating lever, push the operating slide down as far as it will go.

⇨ Insert the operating lever slightly into the actuating opening such that the pins in the operating lever are horizontal.

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

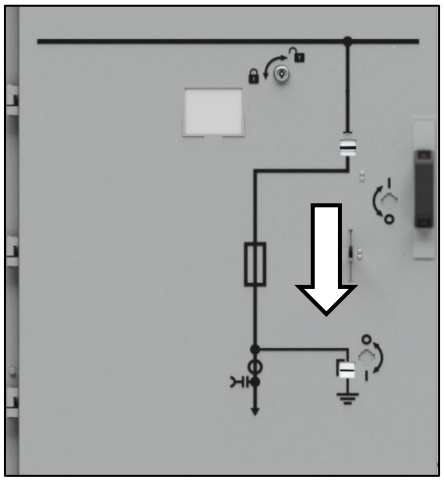


Fig. 390: Pushing the operating slide down

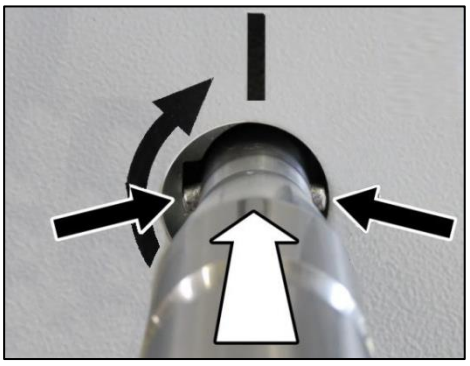


Fig. 391: Inserting the operating lever

⇨ Turn the operating lever clockwise 90° until the switch-fuse combination changes to CLOSED position.

⇨ Check if all the blades are in CLOSED position through the inspection window.

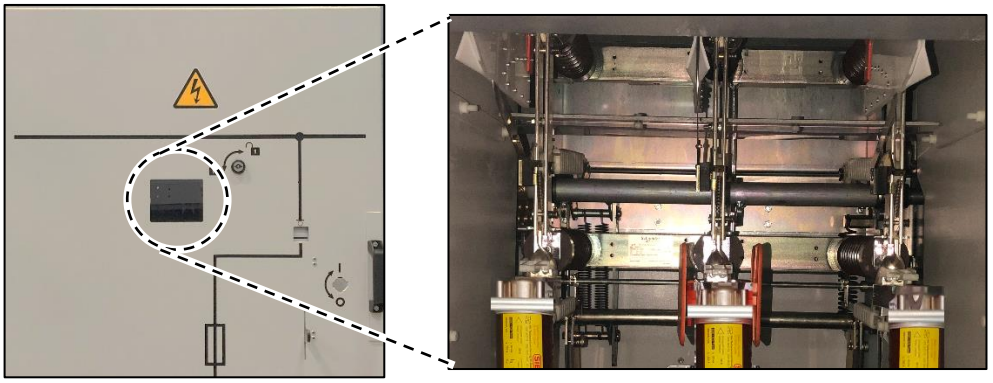


Fig. 392: Looking inside through the insperction window (blades are in CLOSED position)

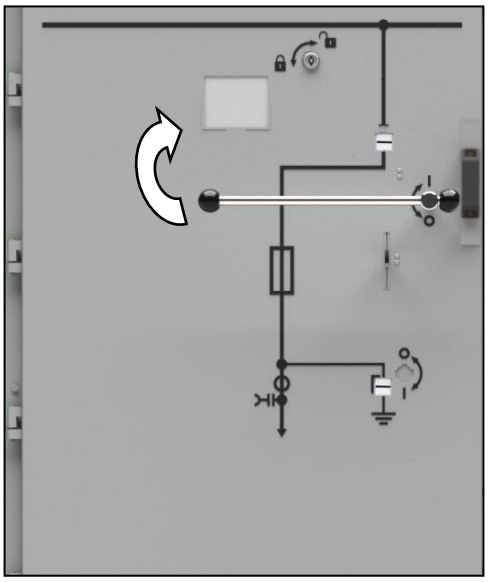


Fig. 393: Turning the operating lever clockwise

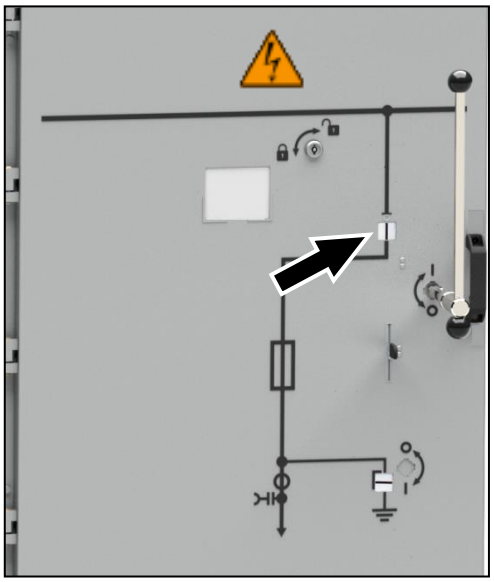


Fig. 394: Position indicator on high-voltage door in CLOSED position

⇨ Remove the operating lever.

⇨ To close the actuating opening, lift the operating slide to the middle.

⇨ Fit a padlock (optional) to the operating slide and close it.

✓ The switch-fuse combination has been racked from OPEN position to CLOSED position.

18.7 Operating the switch-fuse combination to OPEN position

Preconditions

- Switch-fuse combination in CLOSED position
- High-voltage door closed
- For electromagnetic interlock (optional):
  - Electromagnetic interlock activated
- Operating lever available
- Padlock (optional) removed from operating slide

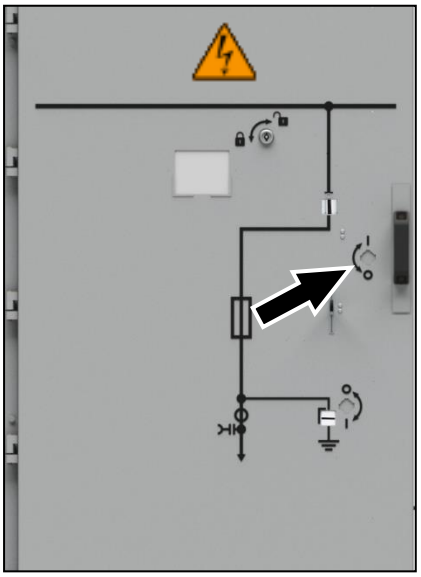


Fig. 395: High-voltage door with actuating opening

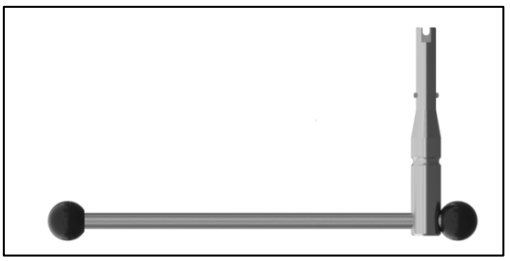


Fig. 396: Operating lever

Procedure

⇨ To release the actuating opening for the operating lever, push the operating slide down as far as it will go.

⇨ Insert the operating lever slightly into the actuating opening such that the pins in the operating lever are horizontal.

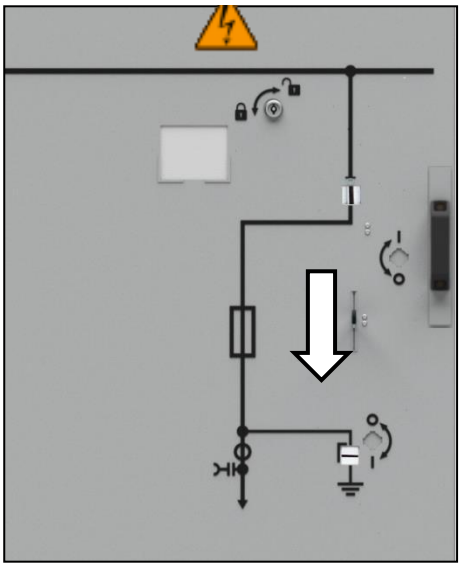


Fig. 397: Pushing the operating slide down

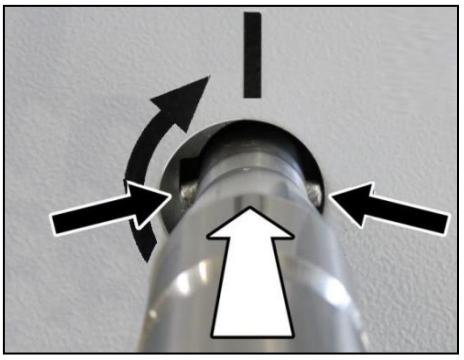


Fig. 398: Inserting the operating lever

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

⇨ Turn the operating lever counter-clockwise 90° until the switch-fuse combination changes to OPEN position.

⇨ Turn the operating lever completely to the end position to ensure that the toggle fastener of the switch-fuse combination latches tight and the switch-fuse combination can be closed again.

⇨ Check if all the blades are in OPEN position through the inspection window.

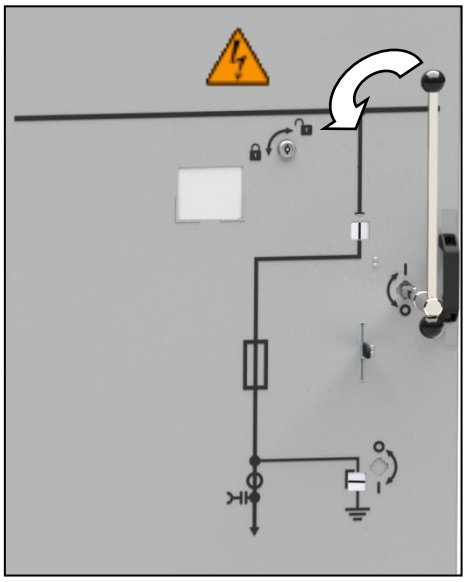


Fig. 399: Turning the operating lever counter-clockwise

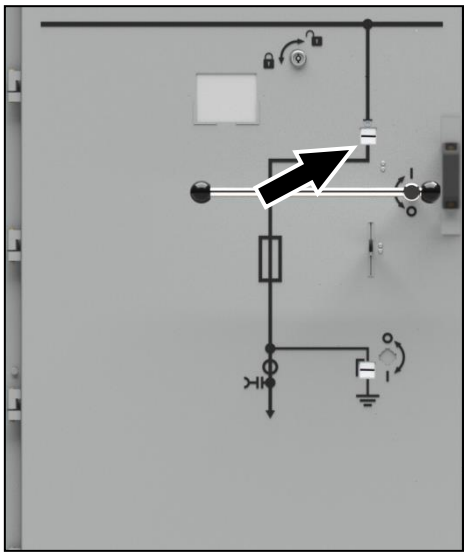


Fig. 400: Position indicator on high-voltage door in OPEN position

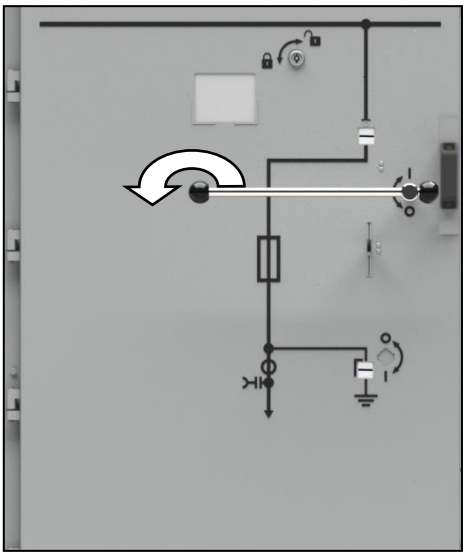


Fig. 401: Turning the operating lever completely to the end position to latch it

⇨ Remove the operating lever.

⇨ To close the actuating opening, lift the operating slide to the middle.

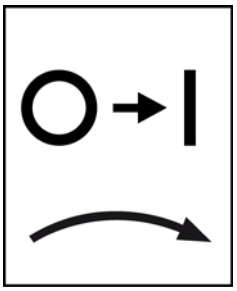
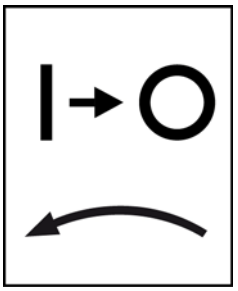
⇨ Fit a padlock (optional) to the operating slide and close it.

✓ The switch-fuse combination has been operated from CLOSED position to OPEN position.

18.8 Operating lever for earthing switch

Operating lever for earthing switch:

- With the operating lever, the switching process at the feeder earthing switch can only be executed in turning direction.
- The turning movement into the opposite direction has a freewheel and does not move the feeder earthing switch; the operating lever works like a ratchet spanner.
- The feeder earthing switch is operated either clockwise or counter-clockwise according to the switching function.
- To use the operating lever, two instruction labels show the turning direction for the corresponding switching function.

Switching function:	From OPEN to CLOSED position	From CLOSED to OPEN position
Turning direction of the operating lever:	Clockwise	Counter-clockwise
Instruction label on the operating lever:		

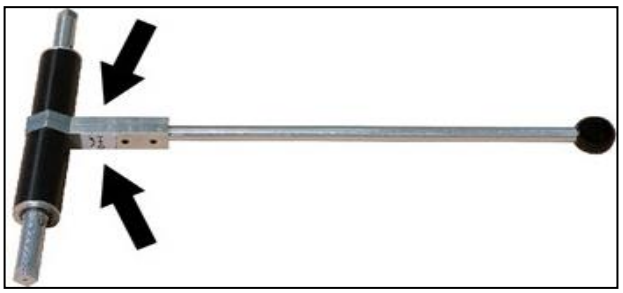


Fig. 402: Instruction labels on the operating lever

18.9 Earthing the feeder manually

NOTICE

Maloperation

A switching operation once started must be completed totally! A switching operation that was not completed cannot be turned back.

⇨ Do not try to remove the operating lever at intermediate positions.

NOTICE

Maloperation

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

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

Instruction label on high-voltage door:
In addition to these instructions, an instruction label on the high-voltage door informs about proper operation of the operating lever for the feeder earthing switch.

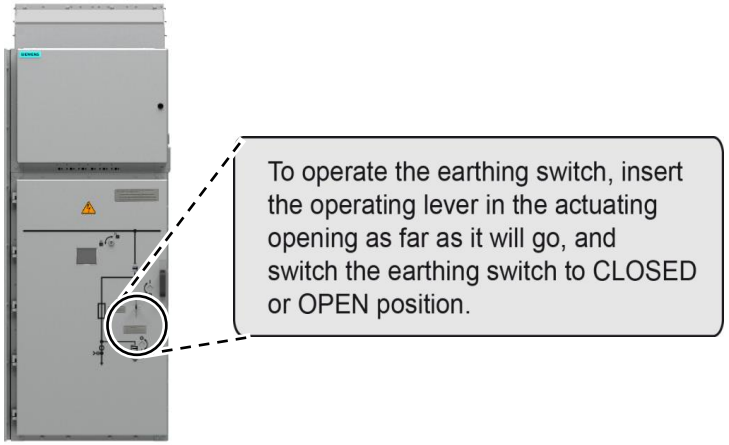


Fig. 403: Instruction label on high-voltage door

Preconditions

- High-voltage door closed
- Switch-fuse combination in OPEN position
- Padlock (optional) removed from operating slide
- For electromagnetic interlock (optional):
  - Electromagnetic interlock activated
- Operating lever available

Procedure

⇨ To release the actuating opening, lift the operating slide and hold it.

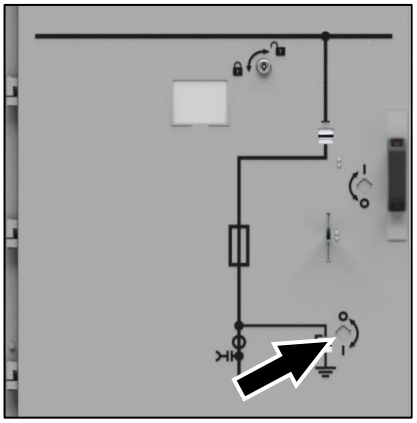


Fig. 404: High-voltage door with actuating opening

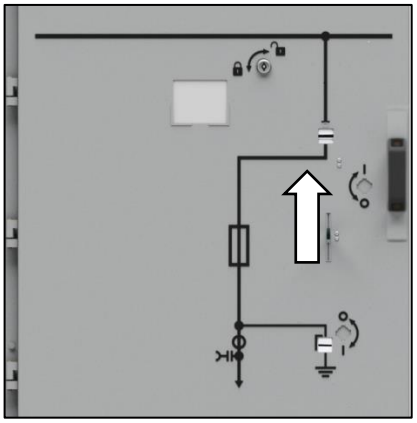


Fig. 405: Lifting the operating slide

⇨ While keeping the operating slide lifted, insert the operating lever slightly into the actuating opening such that the instruction label for clockwise turning direction is visible.

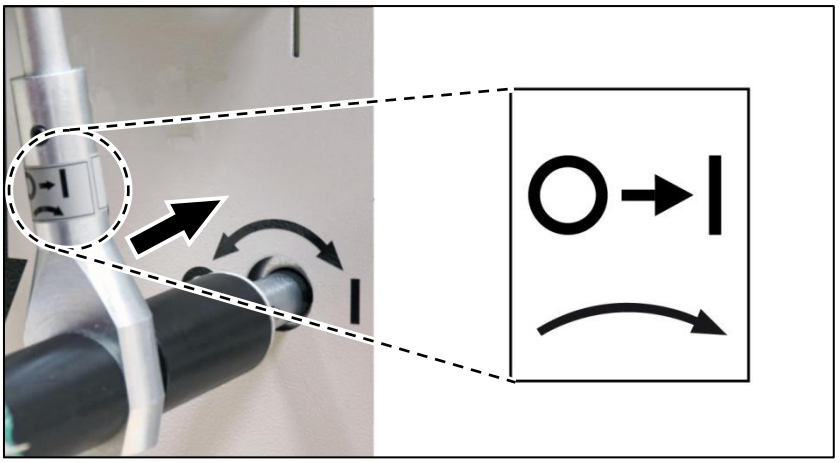


Fig. 406: Instruction label on operating lever

⇨ Adjust the position of the lever such that the pins on the lever are horizontal and parallel with the openings in the feeder earthing switch operating mechanism.

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

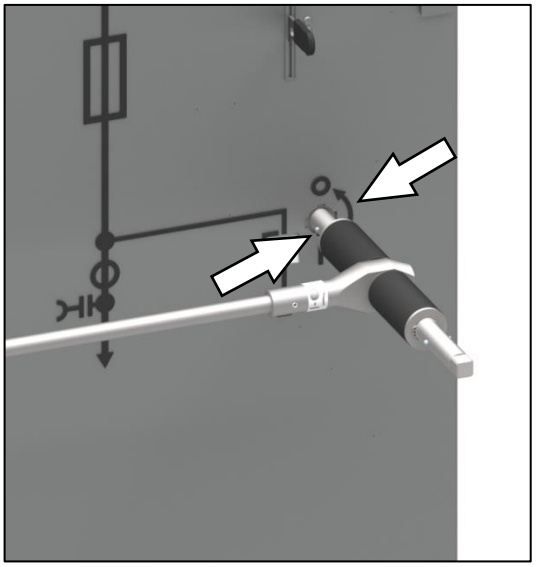


Fig. 407: Inserting lever with pins and openings parallel

⇨ Turn the operating lever clockwise 90° until the feeder earthing switch changes to CLOSED position.

⇨ Check the feeder earthing switch is in CLOSED position through the inspection window.

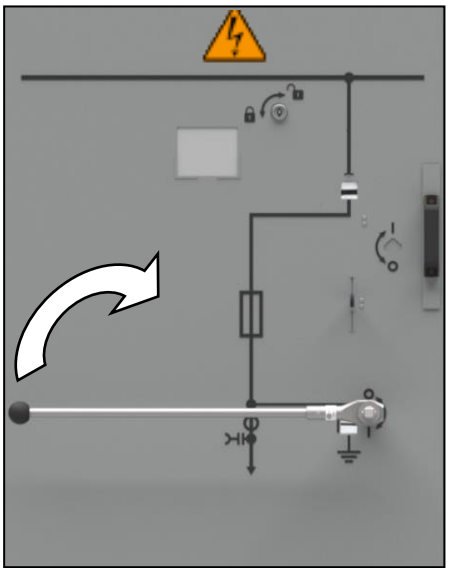


Fig. 408: Turning the operating lever clockwise

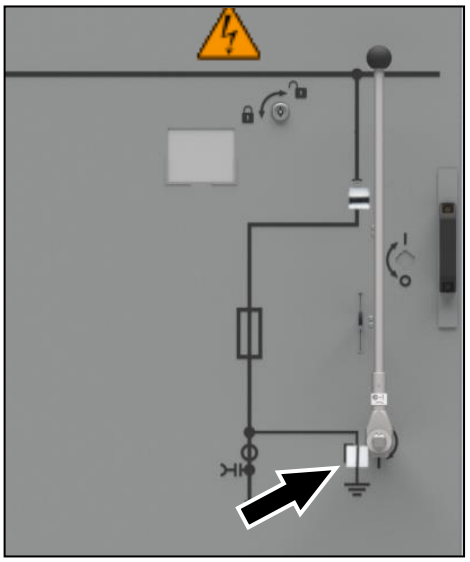


Fig. 409: Position indicator on high-voltage door in CLOSED position

⇨ Remove the operating lever.

⇨ To close the actuating opening, push the operating slide down to the middle.

⇨ Fit a padlock (optional) to the operating slide and close it.

✓ The feeder is earthed.

18.10 De-earthing the feeder manually

NOTICE

Maloperation

A switching operation once started must be completed totally! A switching operation that was not completed cannot be turned back.

⇨ Do not try to remove the operating lever at intermediate positions.

NOTICE

Maloperation

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

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

Instruction label on high-voltage door:
In addition to these instructions, an instruction label on the high-voltage door informs about proper operation of the operating lever for the feeder earthing switch.

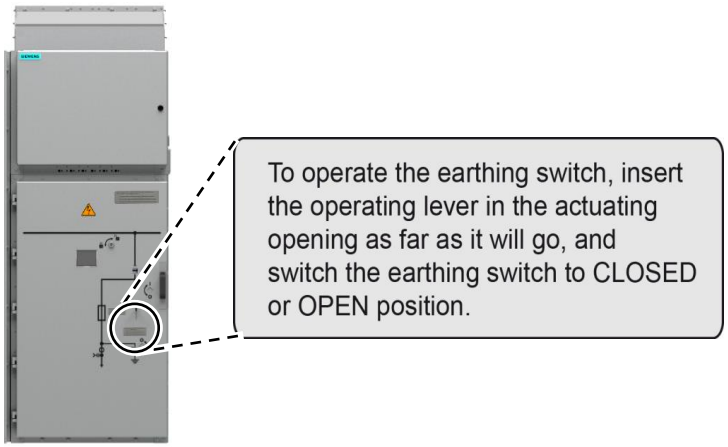


Fig. 410: Instruction label on high-voltage door

Preconditions

- High-voltage door closed
- Padlock (optional) removed from operating slide
- For electromagnetic interlock (optional):
  - Electromagnetic interlock activated
- Operating lever available

Procedure

⇨ To release the actuating opening, lift the operating slide and hold it.

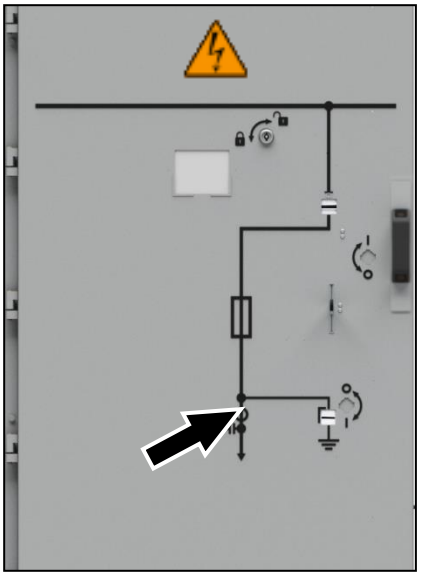


Fig. 411: High-voltage door with actuating opening

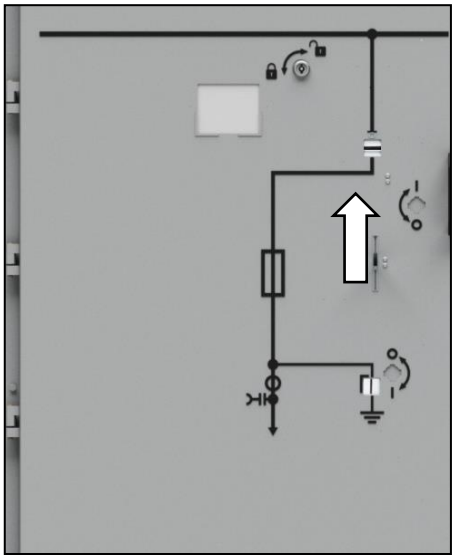


Fig. 412: Lifting the operating slide

⇨ While keeping the operating slide lifted, insert the operating lever slightly into the actuating opening such that the instruction label for counter-clockwise turning direction is visible.

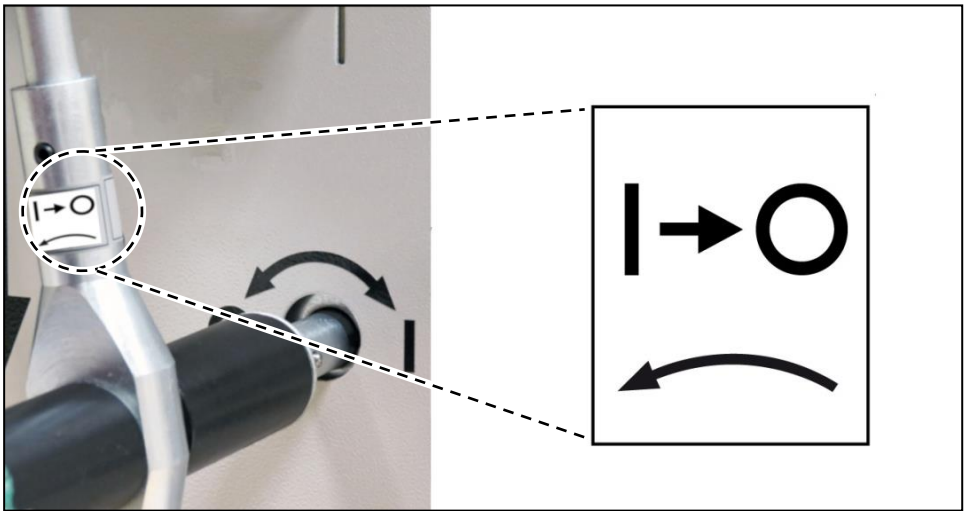


Fig. 413: Instruction label on operating lever

⇨ Adjust the position of the lever such that the pins on the lever are horizontal and parallel with the openings in the feeder earthing switch operating mechanism.

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

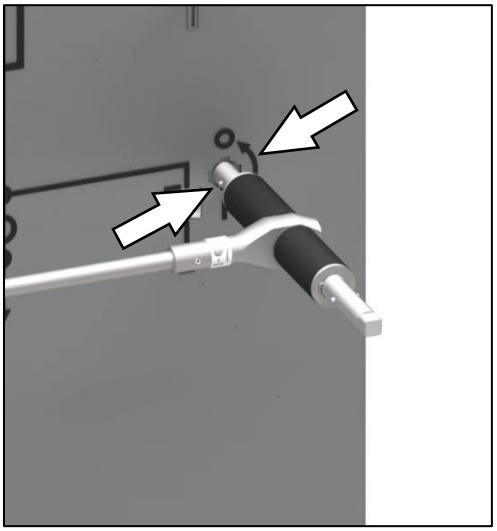


Fig. 414: Inserting the lever with pins and openings parallel

⇨ Turn the operating lever counter-clockwise 90° until the feeder earthing switch changes to OPEN position.

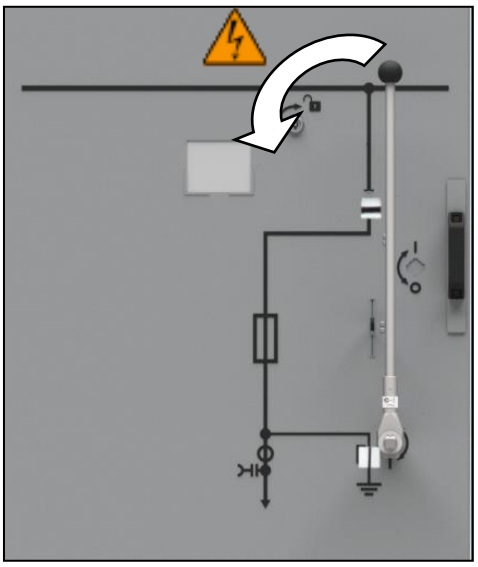


Fig. 415: Turning the operating lever counter-clockwise

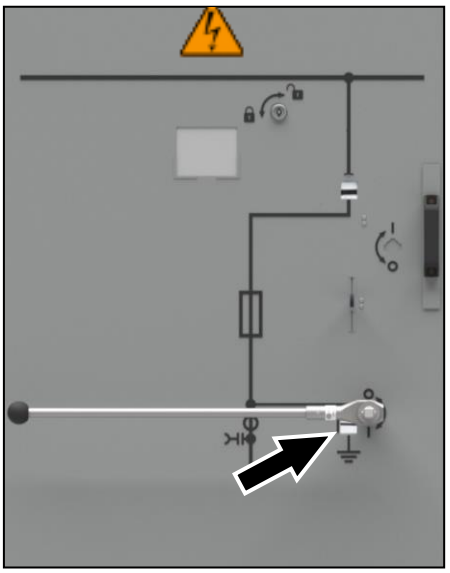


Fig. 416: Position indicator in OPEN position

⇨ Check the feeder earthing switch is in OPEN position through the inspection window.

⇨ Remove the operating lever.

⇨ To close the actuating opening, push the operating slide down to the middle.

⇨ Fit a padlock (optional) to the operating slide and close it.

✓ The feeder is de-earthed.

18.11 Replacing HV HRC fuse-links

⚠ WARNING

Electric shock

To perform any kind of activities inside or near the switching-device / connection compartment of a switch-disconnector panel, you must ensure that the shutter mechanism of the busbar compartment is closed.

⇨ **Do not** open the high-voltage door with the shutter mechanism of the busbar compartment open.

⚠ CAUTION

Burns

After tripping, the surfaces of HV HRC fuse-links are hot. Touching hot HV HRC fuse-links may cause burns.

⇨ Put on personal protective equipment.

⇨ Let hot HV HRC fuse-links cool down before replacing.

NOTICE

Undetected damage

Even if the switch-fuse combination shows no visible damages of a fault, the HV HRC fuse-link may have tripped due to a fault.

⇨ Check the switching-device/connection compartment for deformations when a fuse-link has tripped.

Instruction label on high-voltage door:
In addition to these instructions, an instruction label on the high-voltage door informs about proper operation of the feeder earthing switch.

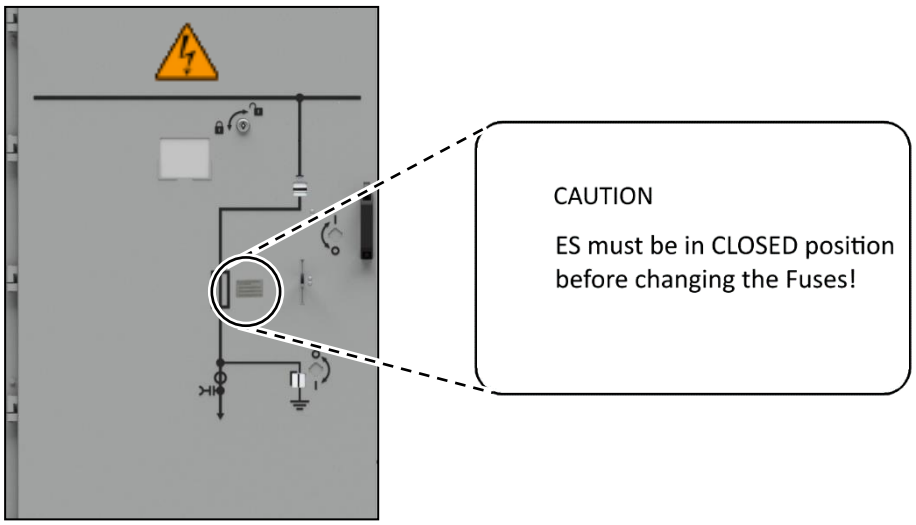


Fig. 417: Instruction label on high-voltage door

Permissible HV HRC fuse-links

The specified SIBA HV HRC fuse-links are transformer protection back-up fuse-links according to IEC 60282-1. The dimensions of the HV HRC fuse-links correspond to DIN 43625.

NOTICE

Maloperation

Switch-fuse combination is exclusively designed for operation with specific HV HRC fuse-links. Using the different type of fuse-links may cause damages on the panel.

⇨ Use only the fuse-link types listed in the following table.

⇨ Do not mount bridging links instead of HV HRC fuse-links.

Selection table for HV HRC fuse-links

Rated voltage U_r [kV]	Rated current I_r [A]	Dimension “e" [mm]	Number of fuse-links permitted per phase	Order details
7.2	20	442	1	3010813.20
	25		1	3010813.25
	31,5		1	3010813.31,5
	40		1	3010813.40
	50		1	3010913.50
	63		1	3010913.63
	80		1	3010913.80
Supplier information: www.siba-fuses.com				

Rated voltage U_r [kV]	Rated current I_r [A]	Dimension “e" [mm]	Number of fuse-links permitted per phase	Order details
12	16	442	1	3010113.16
	20		1	3010113.20
	25		1	3010113.25
	31,5		1	3010113.31,5
	40		1	3010113.40
	50		1	3010113.50
	63		1	3010213.63
	80		1	3010213.80
Supplier information : www.siba-fuses.com				

Rated voltage U_r [kV]	Rated current I_r [A]	Dimension “e" [mm]	Number of fuse-links permitted per phase	Order details
17,5	6,3	442	1	3023113.6,3
	10		1	3023113.10
	16		1	3023113.16
	20		1	3023113.20
	25		1	3023113.25
	31,5		1	3023113.31,5
	40		1	3023113.40
	50		1	3023213.50
	63		1	3001443.63
	80		1	3001443.80
Supplier information : www.siba-fuses.com				

Selection table for the fuses for protection of transformers

Transformer Rated voltage [kV]	Transformer rated output [kVA]													Fuse rated voltage [kV]
	50	100	160	200	250	315	400	500	630	800	1000	1250	1600	
	Rated current of SIBA HHD Fuse-link I_r [A]													
3	25	40	63	80	80	-	-	-	-	-	-	-	-	3,6 / 7,2 BSSK types 6 / 12
5	16	20	40	40	50	63	80	80	-	-	-	-	-	
6	16	20	31,5	40	50	63	80 BSSK	80 BSSK	-	-	-	-	-	
10	10	16	20	25	31,5	40	50	63	63	80 BSSK	-	-	-	6 / 12
12	10	16	20	25	31,5	40	50	63	63	80 BSSK	-	-	-	
15	6,3	10	16	20	20	25	31,5	40	40	50	63 BSSK	80 BSSK	-	10 / 17,5 BSSK types 10 / 24
Supplier information: www.siba-fuses.com														

Replacing HV HRC fuse-links

NOTICE

Undetected damage

Tripped HV HRC fuse-links can cause hidden damages on the other HV HRC fuse-links.

⇨ Always replace all HV HRC fuse-links, even if only one HV HRC fuse-link has tripped.

INFORMATION

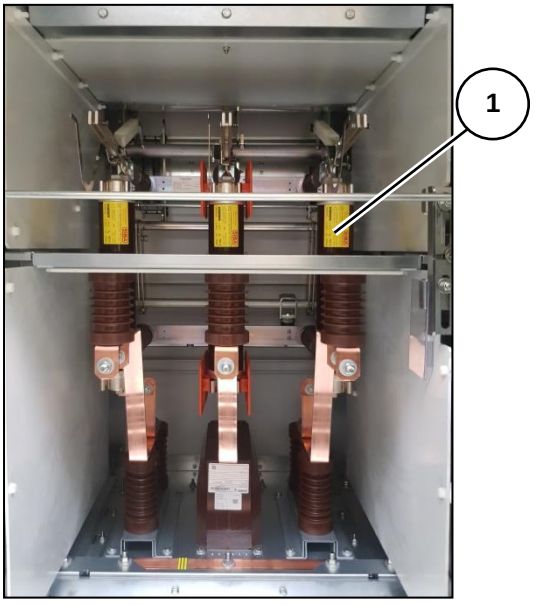
Final procedure steps

⇨ After closing the high-voltage door, the panel can be integrated into the course of operation again.

Preconditions

- Set of proper HV HRC fuse-links available
- Switch-fuse combination in OPEN position
- Feeder earthing switch in CLOSED position
- High-voltage door open

Procedure



(1) HV HRC Fuses

Fig. 418: Front view: Arrangement of HV HRC fuse-links (high-voltage door open)

⇨ Select one of the phases. Remove the HV HRC fuse-link by pulling it out of the clamps.

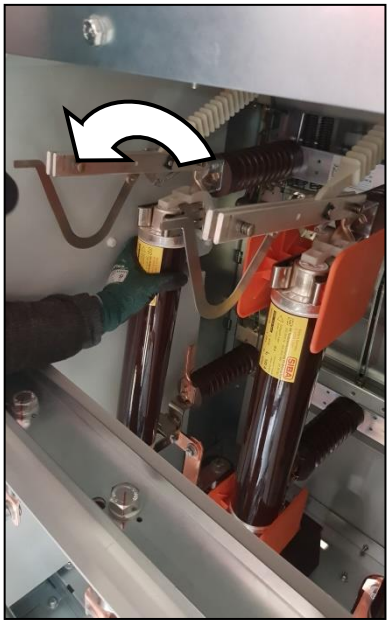


Fig. 419: Removing the fuse-link in the striker area (upper side)

Fig. 420: Removing the fuse-link on the opposite side of striker area (bottom side)

⇨ Insert the new fuse-links into the clamps with the striker at the upper side.
The position of the striker is identified with a triangle representing an arrow on the rating plate of the HV HRC fuse-link.

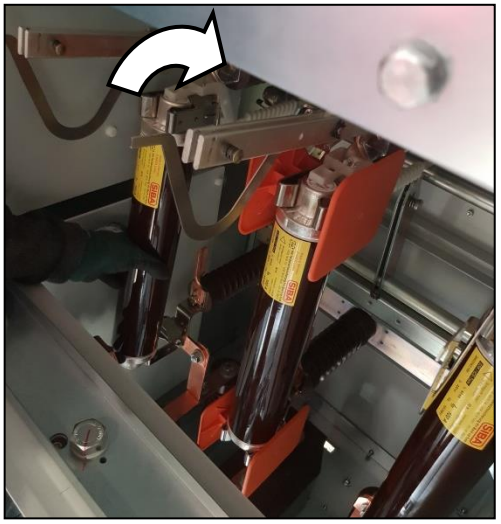


Fig. 421: HV HRC fuse-link inserted in the striker area

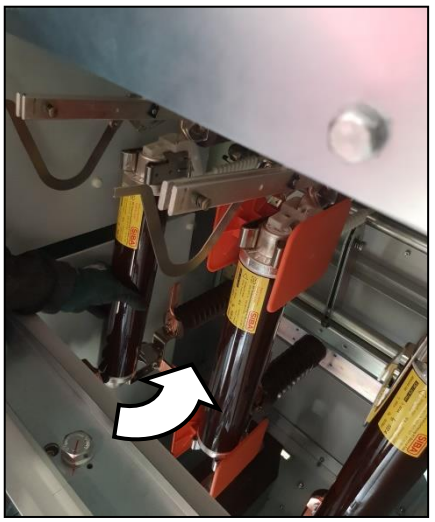


Fig. 422: HV HRC fuse-link inserted on the opposite side of striker area

Fig. 423: The position of the striker

⇨ Proceed in the same way with the other HV HRC fuse-links.

✓ The HV HRC fuse-links have been replaced.

INFORMATION

Final procedure steps

Now the panel can be integrated into the course of operation again, for example:

⇨ Close the high-voltage door.

⇨ Switch the feeder earthing switch to OPEN position.

⇨ Insert the operating lever in the actuating opening of the switch-fuse combination.

⇨ Turn the operating lever completely to the end position and switch strongly towards the OPEN position again. This makes the toggle fastener latch tight again and the switch-fuse combination can now be closed.

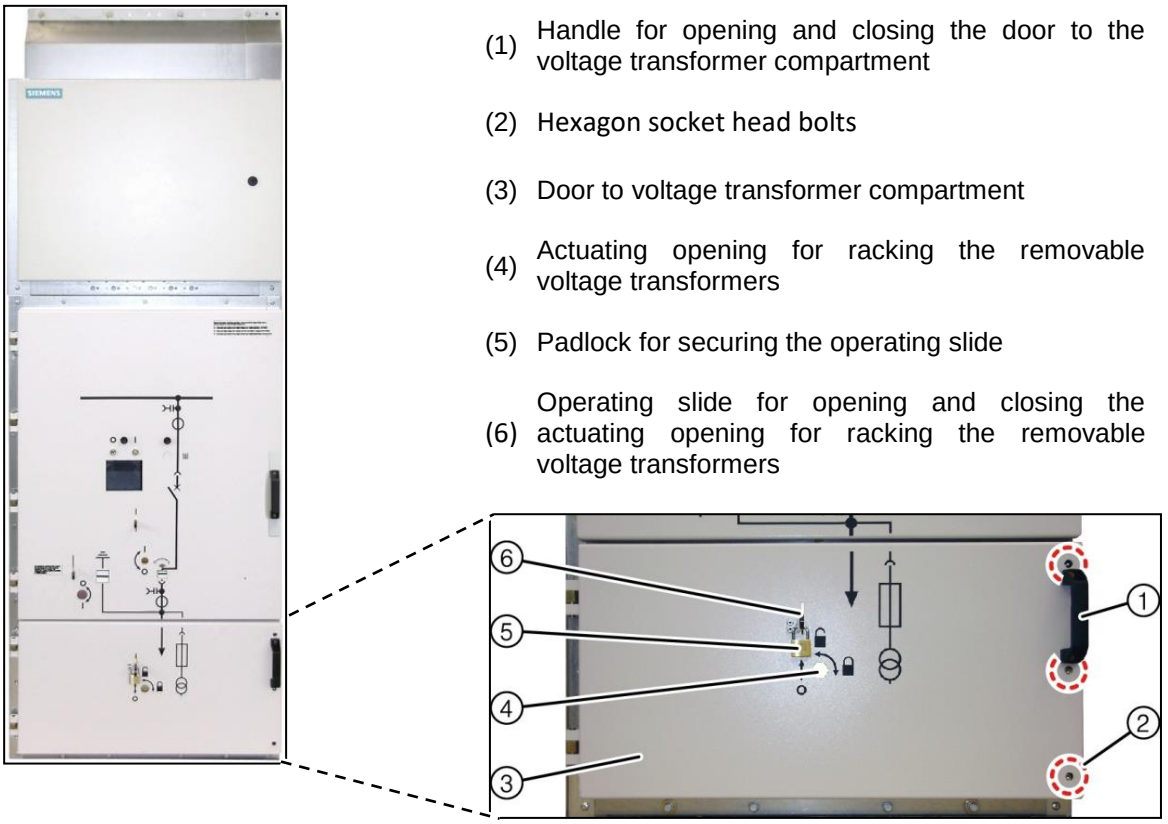
⇨ Close the switch-fuse combination.

19 Operating the removable voltage transformers

INFORMATION

Read and understand these instructions before attempting operating works.

19.1 Control elements on the door to the voltage transformer compartment



(1) Handle for opening and closing the door to the voltage transformer compartment

(2) Hexagon socket head bolts

(3) Door to voltage transformer compartment

(4) Actuating opening for racking the removable voltage transformers

(5) Padlock for securing the operating slide

(6) Operating slide for opening and closing the actuating opening for racking the removable voltage transformers

Fig. 424: Control elements on the door to the voltage transformer compartment

19.2 Opening the door to the voltage transformer compartment

WARNING

Electric shock

⇨ Do not operate the panel with the door to the voltage transformer compartment open.

⇨ Open the door to the voltage transformer compartment only to remove or insert the removable voltage transformers.

INFORMATION

The door to the voltage transformer compartment is not linked with the high-voltage door.

⇨ The door to the voltage transformer compartment can be operated independently of the high-voltage door.

Preconditions

- High-voltage door closed
- Door to voltage transformer compartment closed
- If inserted: removable voltage transformers in test position
- Hexagon socket head key size 6 available
- Key for padlock available

Procedure

⇨ Remove the padlock from the operating slide (3).

⇨ Undo 3 hexagon socket head bolts (1). The bolts remain permanently in the door to the voltage transformer compartment.

⇨ Open the door to the voltage transformer compartment using the handle (2).

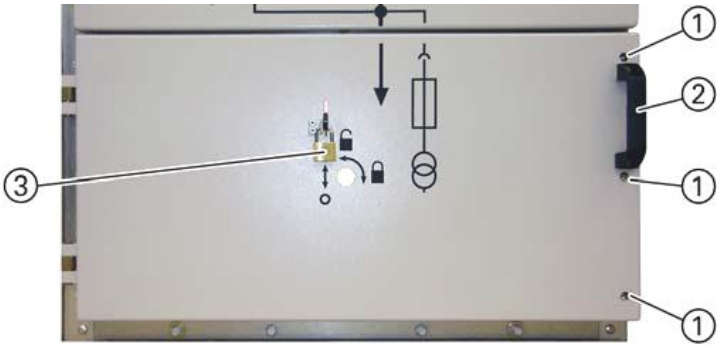


Fig. 425: Opening the door to the voltage transformer compartment

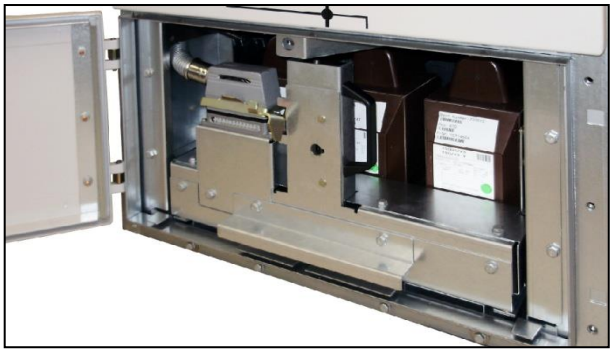


Fig. 426: Door to the voltage transformer compartment open

✓ The door to the voltage transformer compartment is open.

19.3 Closing the door to the voltage transformer compartment

⚠ WARNING

Electric shock

⇨ Do not operate the panel with the door to the voltage transformer compartment open.

⇨ Always secure the closed door to the voltage transformer compartment with the bolts.

INFORMATION

The door to the voltage transformer compartment is not linked with the high-voltage door.

⇨ The door to the voltage transformer compartment can be operated independently of the high-voltage door.

Preconditions

- High-voltage door closed
- Door to voltage transformer compartment open
- If removable voltage transformers inserted: low-voltage connector plugged on
- Hexagon socket head key size 6 available
- Padlock available

Procedure

⇨ Close the door to the voltage transformer compartment using the handle (2).

⇨ Screw in 3 hexagon socket head bolts (1) hand-tight using the hexagon socket head key. This corresponds to a tightening torque of approx. 20 Nm.

⇨ Fit the padlock (3) to the operating slide and close it.

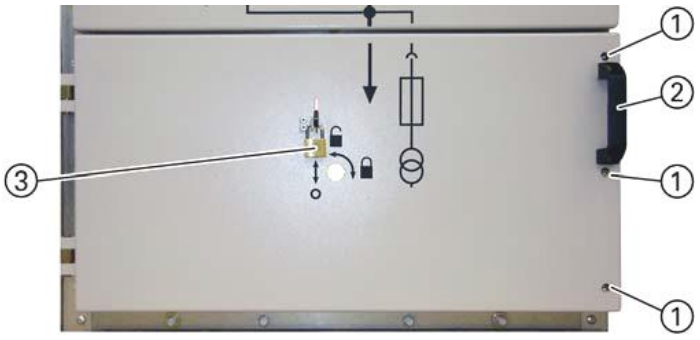


Fig. 427: Closing the door to the voltage transformer compartment

✓ The door to the voltage transformer compartment is closed.

19.4 Racking the removable voltage transformers to service position

NOTICE

Maloperation

If the removable voltage transformers are not correctly positioned in the panel, damages may occur when the removable voltage transformers are racked.

⇨ If you hear a noise or if you notice a resistance, stop racking immediately.

⇨ Inform the regional Siemens representative.

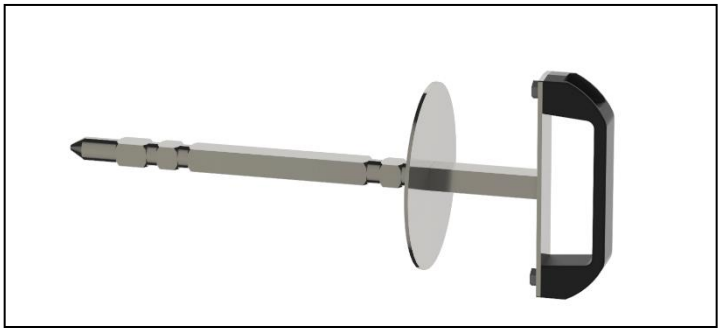


Fig. 428: Racking tool for the removable voltage transformers

Preconditions

- High-voltage door closed
- Removable voltage transformers inserted in the panel
- Low-voltage connector plugged on
- Door to voltage transformer compartment closed and screwed tight
- Racking tool available
- Key for padlock available

The actuating opening for racking the removable voltage transformers is located on the control board of the door to the voltage transformer compartment.

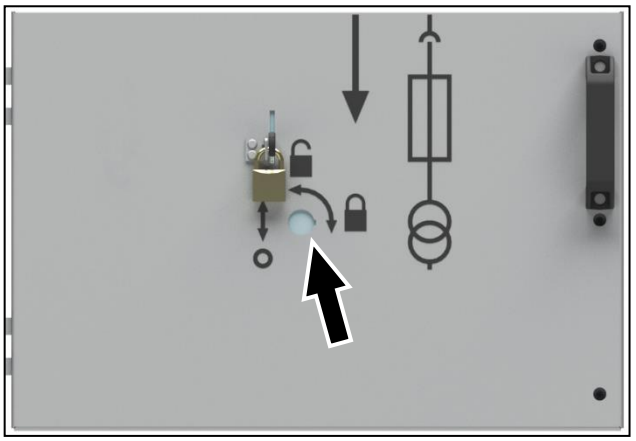


Fig. 429: Actuating opening for racking the removable voltage transformers

Procedure

⇨ Remove the padlock from the operating slide.

⇨ Lift the operating slide and hold it.

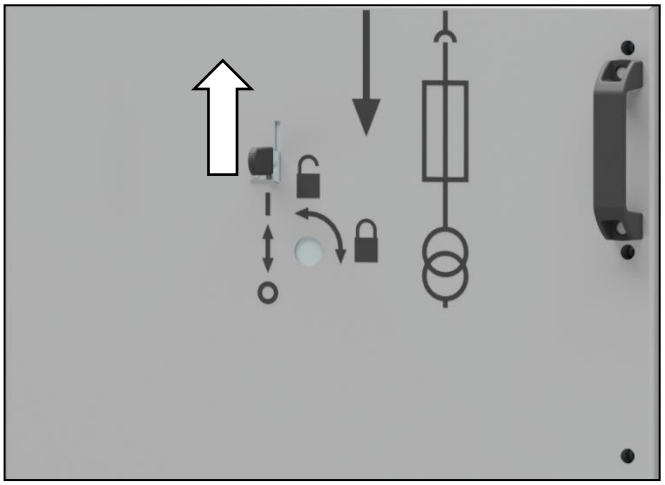


Fig. 430: Lifting the operating slide

⇨ Insert the racking tool into the actuating opening with the guide pin pointing to the right.

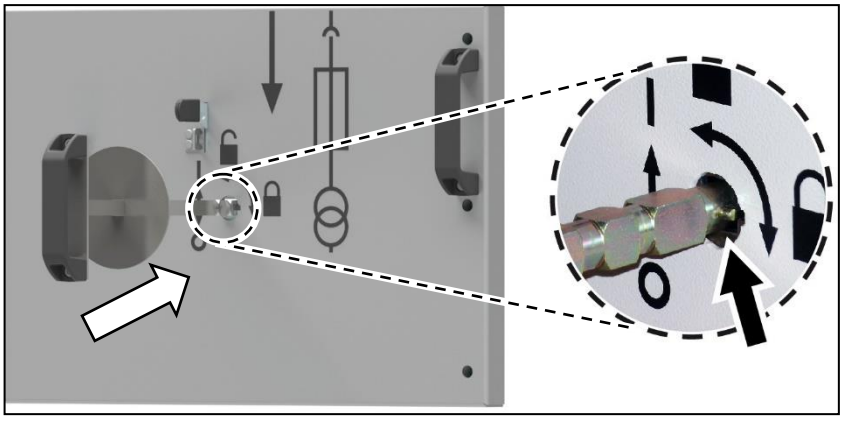


Fig. 431: Inserting the racking tool

⇨ Push the racking tool into the door as far as it will go.

⇨ Turn the racking tool 90° counter-clockwise to unlock the racking mechanism.

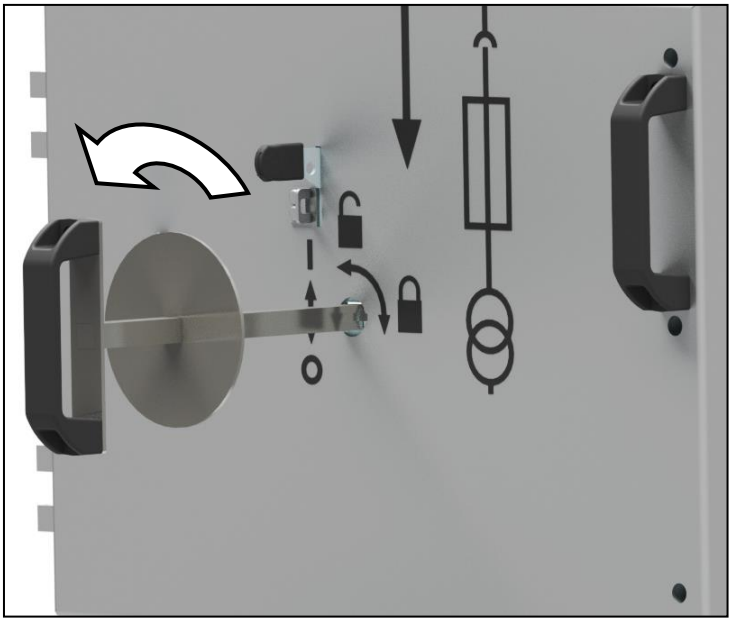


Fig. 432: Turning 90° counter-clockwise to unlock

NOTICE

Maloperation

Turning the racking tool while racking the removable voltage transformers in the voltage transformer compartment can cause damages.

⇨ Rack the removable voltage transformers always up to the end position.

⇨ Turn the racking tool only in stable end positions of the removable voltage transformers.

⇨ To rack the removable voltage transformers, push the racking tool into the voltage transformer compartment as far as it will go (end position).

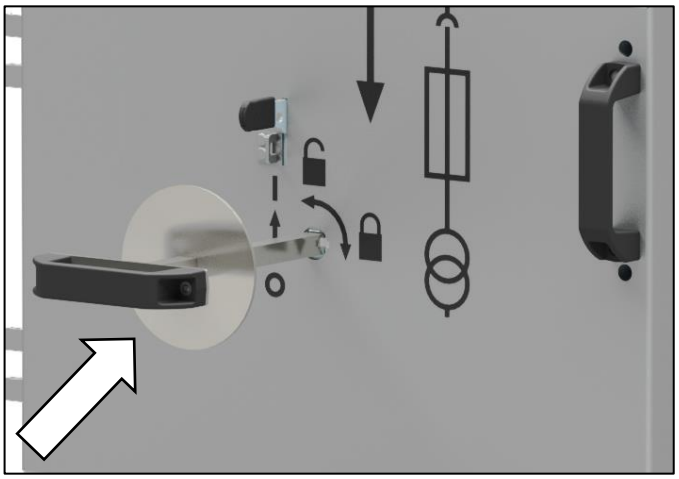


Fig. 433: Pushing the racking tool to rack

⇨ Turn the racking tool 90° clockwise to lock the racking mechanism.

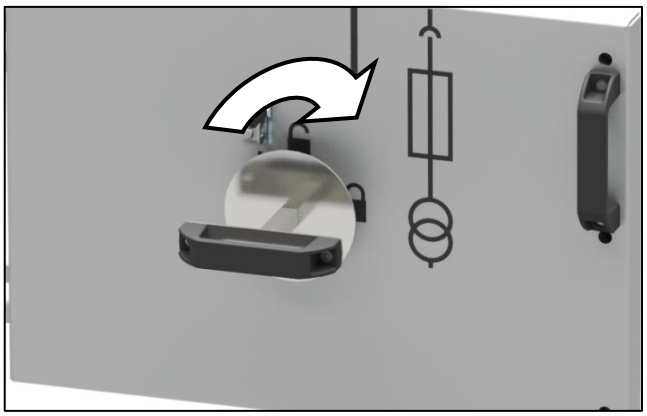


Fig. 434: Turning 90° clockwise to lock

⇨ Remove the racking tool.

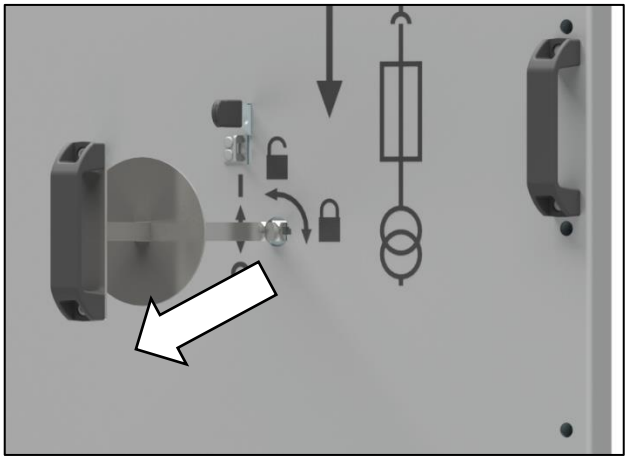


Fig. 435: Removing the racking tool

⇨ To close the actuating opening, push the operating slide down as far as it will go.

⇨ Fit a padlock to the operating slide and close it.

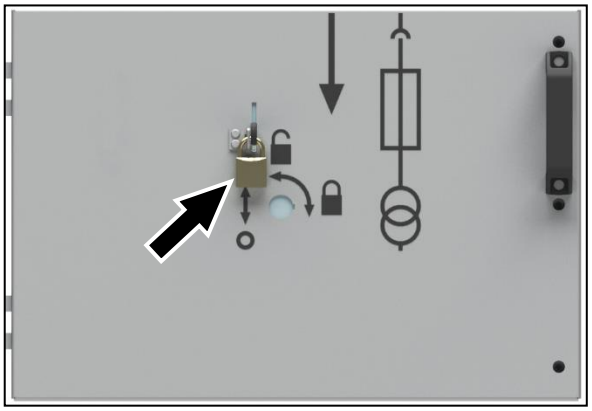


Fig. 436: Fitting a padlock

✓ The removable voltage transformers are in service position.

19.5 Racking the removable voltage transformers to test position

NOTICE

Maloperation

If the removable voltage transformers are not correctly positioned in the panel, damages may occur when the removable voltage transformers are racked.

⇨ If you hear a noise or if you notice a resistance, stop racking immediately.

⇨ Inform the regional Siemens representative.

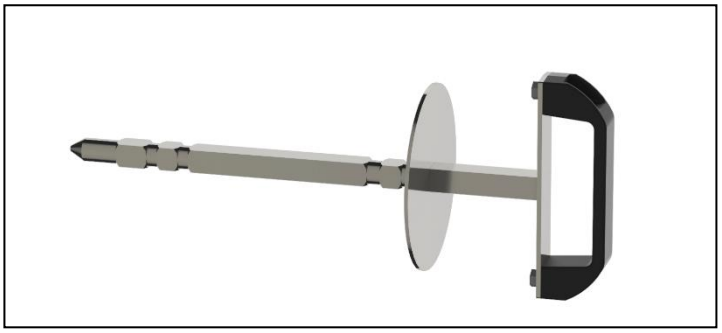


Fig. 437: Racking tool for the removable voltage transformers

Preconditions

- High-voltage door closed
- Removable voltage transformers in service position
- Door to voltage transformer compartment closed and screwed tight
- Racking tool available
- Key for padlock available

The actuating opening for racking the removable voltage transformers is located on the control board of the door to the voltage transformer compartment.

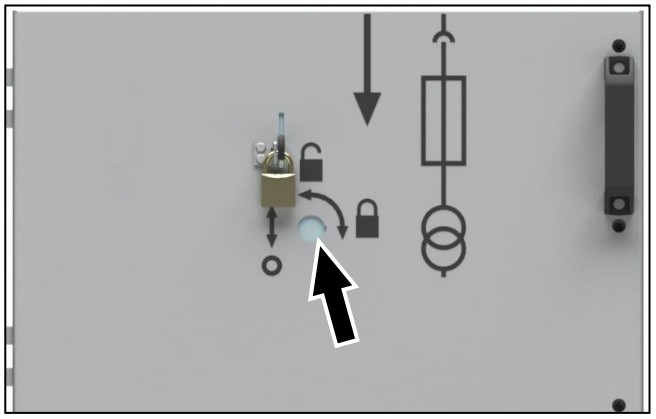


Fig. 438: Actuating opening for racking the removable voltage transformers

Procedure

⇨ Remove the padlock from the operating slide.

⇨ Lift the operating slide and hold it.

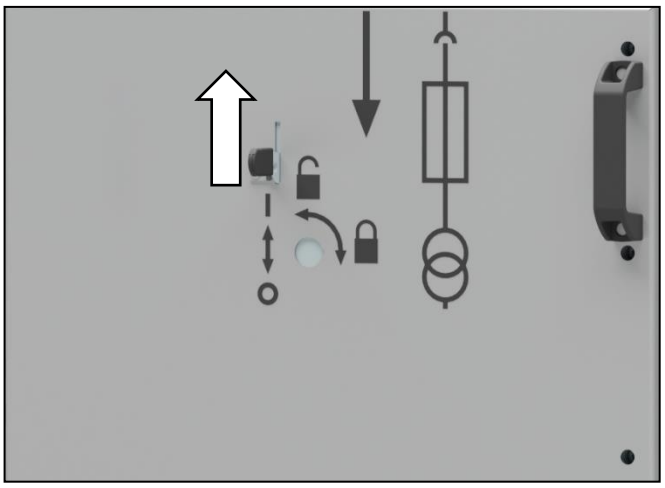


Fig. 439: Lifting the operating slide

⇨ Insert the racking tool into the actuating opening with the guide pin pointing to the right.

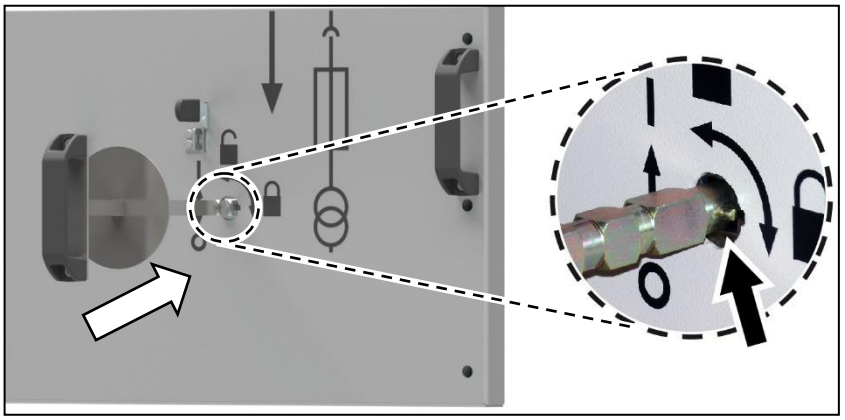


Fig. 440: Inserting the racking tool

⇨ Push the racking tool into the door as far as it will go.

⇨ Turn the racking tool 90° counter-clockwise to unlock the racking mechanism.

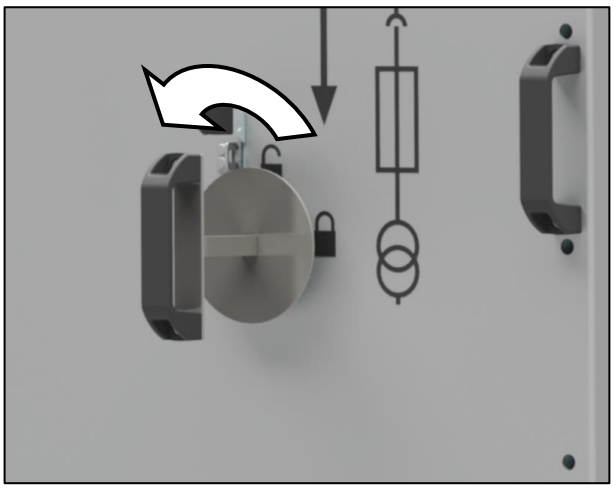


Fig. 441: Turning 90° counter-clockwise to unlock

NOTICE

Maloperation

Turning the racking tool while racking the removable voltage transformers in the voltage transformer compartment can cause damages.

⇨ Rack the removable voltage transformers always up to the end position.

⇨ Turn the racking tool only in stable end positions of the removable voltage transformers.

⇨ To rack the removable voltage transformer, pull the racking tool as far as it will go (end position).

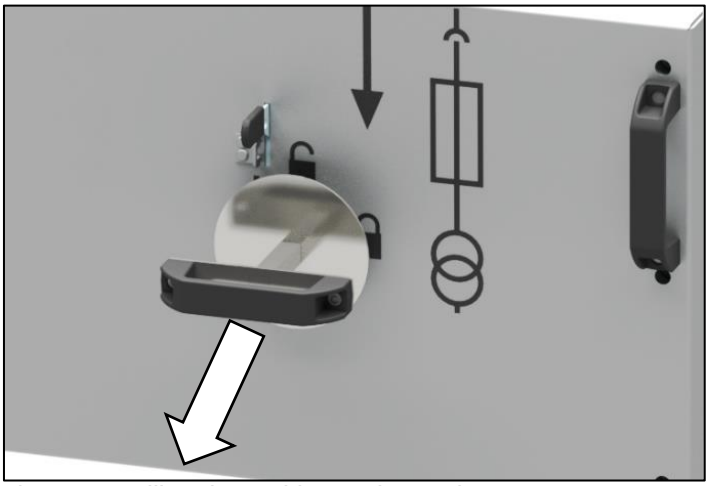


Fig. 442: Pulling the racking tool to rack

⇨ Turn the racking tool 90° clockwise to lock the racking mechanism.

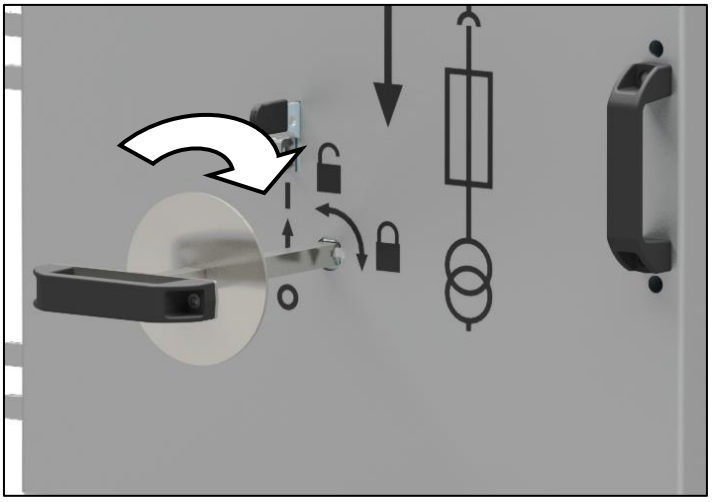


Fig. 443: Turning 90° clockwise to lock

⇨ Remove the racking tool.

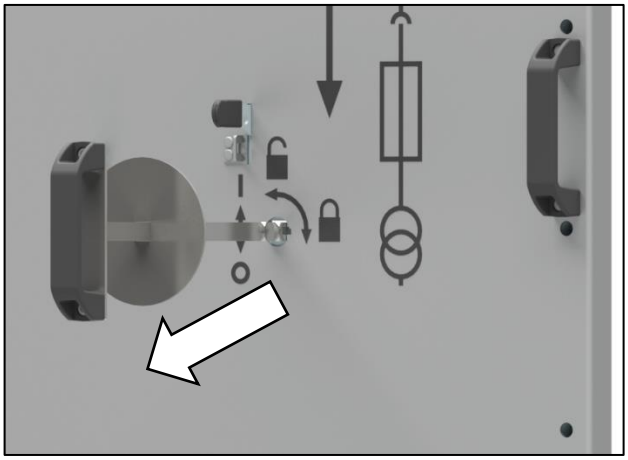


Fig. 444: Removing the racking tool

⇨ To close the actuating opening, push the operating slide down as far as it will go.

⇨ Fit a padlock to the operating slide and close it.

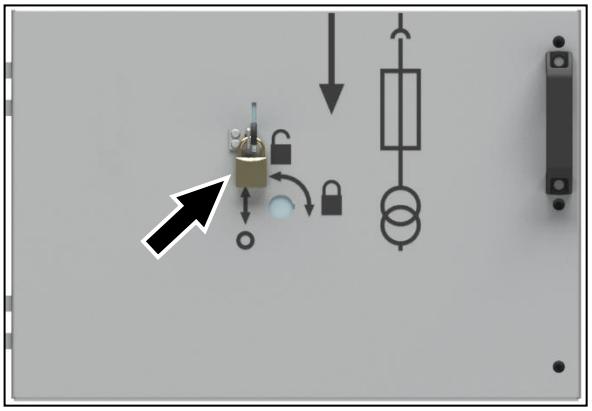


Fig. 445: Fitting a padlock

✓ The removable voltage transformers are in test position.

19.6 Taking the removable voltage transformers out of the panel

Preconditions

- High-voltage door closed
- Removable voltage transformers in test position
- Door to voltage transformer compartment open
- Service truck available

Removing the low-voltage connector

⇨ To detach the low-voltage connector, push the longitudinal fastener (1) of the coupling downwards.

⇨ Remove the low-voltage connector (2) carefully upwards.

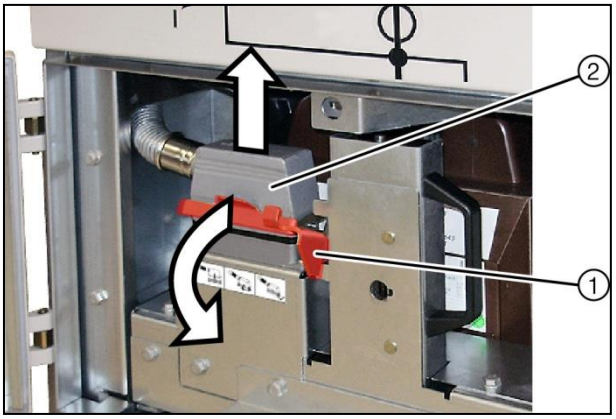


Fig. 446: Detaching and removing the low-voltage connector

⇨ Stow the low-voltage connector away in the shelf on the left inside the panel.

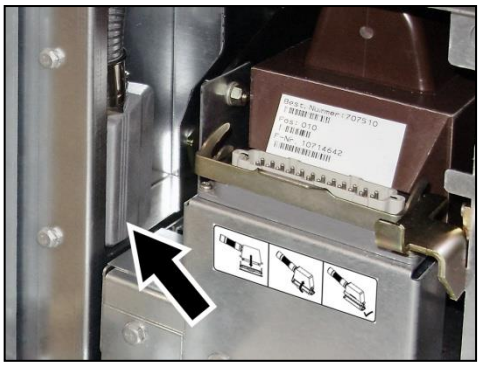


Fig. 447: Stowing the low-voltage connector

✓ The low-voltage connector is removed and stowed away.

Positioning the service truck in front of the panel

NOTICE

Maloperation

If the service truck is not correctly interlocked with the panel while moving the removable voltage transformers onto the service truck, the switchgear and the removable voltage transformers can be seriously damaged.

⇨ The service truck must be interlocked with the panel before moving the removable voltage transformers onto the service truck.

⇨ Move the service truck centrally in front of the panel. The guide lugs bring the service truck to the correct position at the panel frame.

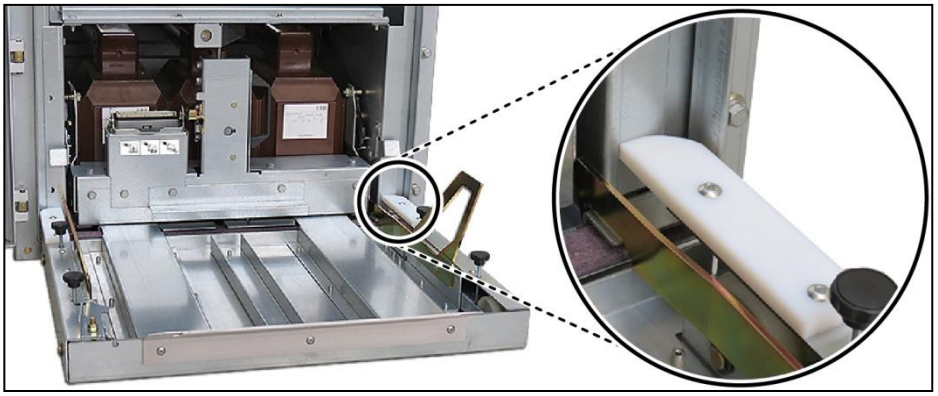


Fig. 448: Moving the service truck centrally in front of the panel

⇨ If necessary, adjust the height of the service truck with the 4 bolts to compensate unevenness in the floor.

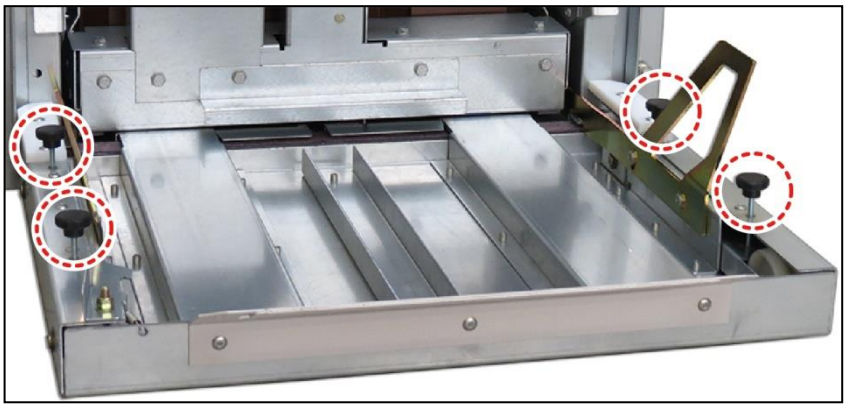


Fig. 449: Adjusting the height with the bolts

⇨ To hook the locking levers in at the panel frame, push the locking levers on the left and right side of the service truck downwards.

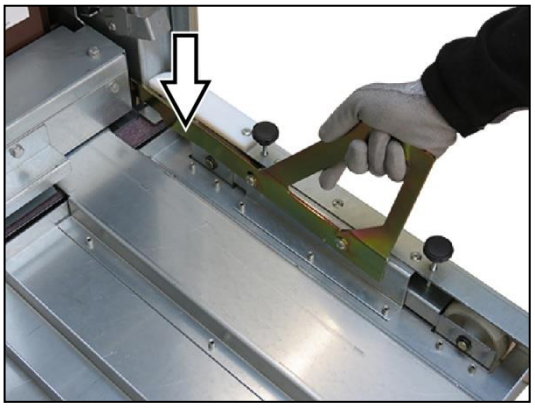


Fig. 450: Hooking the locking levers

⇨ To check whether the service truck is correctly interlocked with the panel, pull the service truck backwards using the handle.

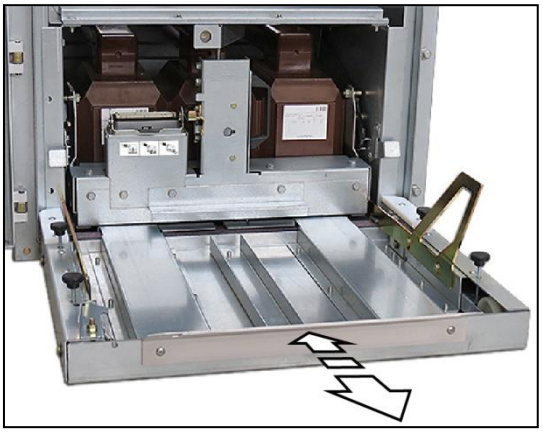


Fig. 451: Pulling the service truck back to check interlocking

✓ The service truck is interlocked with the panel.

Moving the removable voltage transformers onto the service truck

NOTICE

Maloperation

If the removable voltage transformers are not correctly interlocked with the service truck when moving the service truck away from the panel, the removable voltage transformers can be seriously damaged.

⇨ Move the service truck only if the removable voltage transformers are interlocked in its end position on the service truck.

⇨ Lift the handle of the removable voltage transformers. Keep it lifted and pull the removable voltage transformers onto the service truck as far as it will go. In the end position, the removable voltage transformers are automatically interlocked with the service truck.

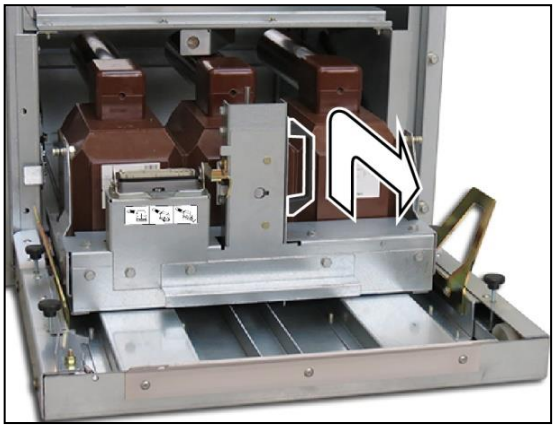


Fig. 452: Pulling the voltage transformers onto the service truck

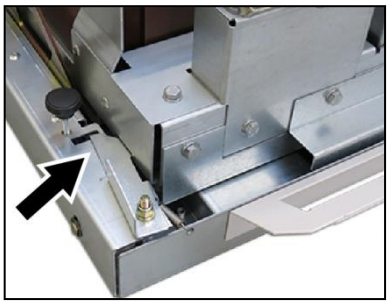


Fig. 453: Automatic interlocking on service truck

Removing the service truck with the removable voltage transformers on top from the panel

⇨ To detach the locking levers from the panel frame, pull the locking levers on the left and right side of the service truck.

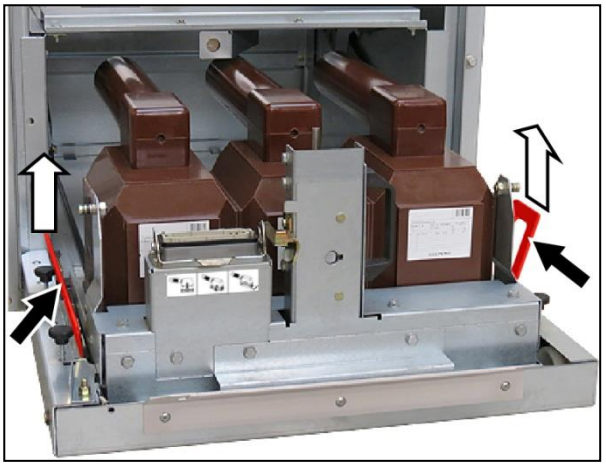


Fig. 454: Detaching the locking levers

⇨ To move the service truck with the removable voltage transformers on top away from the panel, pull the service truck using the handle of the removable voltage transformers.

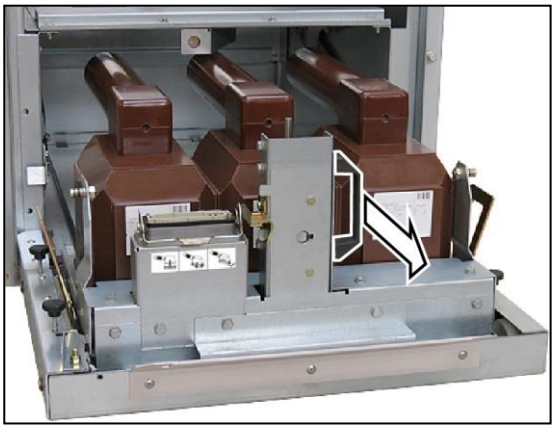


Fig. 455: Moving the service truck using the handle

⇨ Close the door to the voltage transformer compartment and screw it tight.

⇨ Fit a padlock to the operating slide and close it.

✓ The removable voltage transformer is taken out of the panel.

19.7 Inserting the removable voltage transformers in a panel

Preconditions

- High-voltage door closed
- Door to voltage transformer compartment open
- Low-voltage connector stowed away
- Removable voltage transformers ready on service truck

Positioning the service truck with the removable voltage transformers in front of the panel

NOTICE

Maloperation

If the service truck is not correctly interlocked with the panel while moving the removable voltage transformers into the panel, the switchgear and the removable voltage transformers can be seriously damaged.

⇨ The service truck must be interlocked with the panel before moving the removable voltage transformers into the panel.

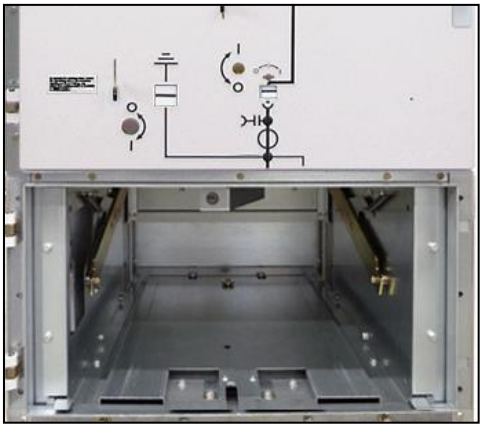


Fig. 456: Panel prepared

⇨ Move the service truck with the removable voltage transformers on top centrally in front of the panel. The guide lugs bring the service truck directly to the correct position at the panel frame.

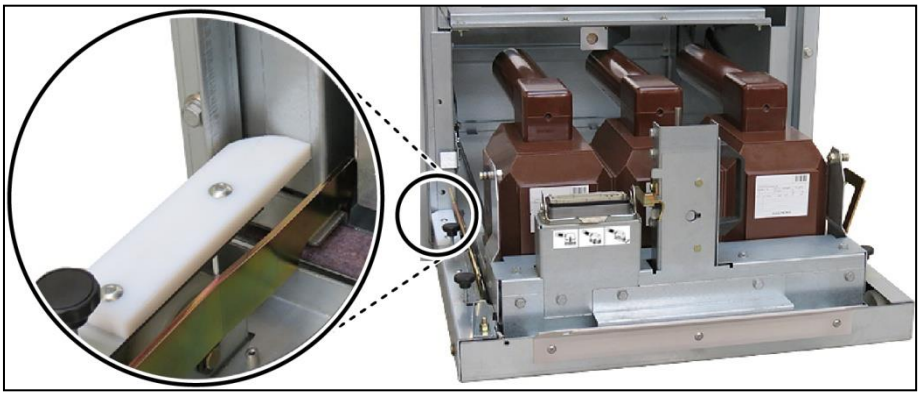


Fig. 457: Moving the service truck centrally in front of the panel

⇨ If necessary, adjust the height of the service truck with the 4 bolts to compensate unevenness in the floor.

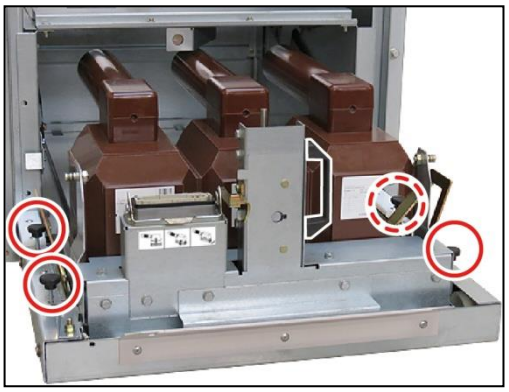


Fig. 458: Adjusting the height with the bolts

⇨ To hook the locking levers in at the panel frame, push the hooking levers on the left and right side of the service truck downwards.

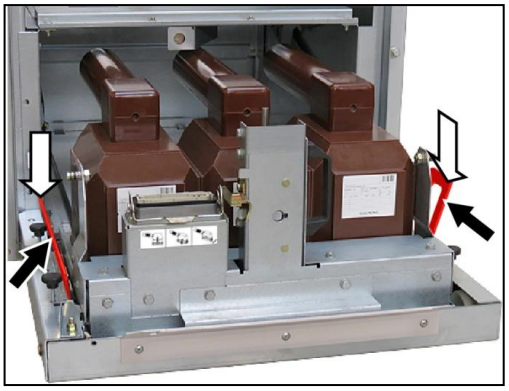


Fig. 459: Hooking the locking levers

⇨ To check whether the service truck is correctly interlocked with the panel, pull the service truck backwards using the handle.

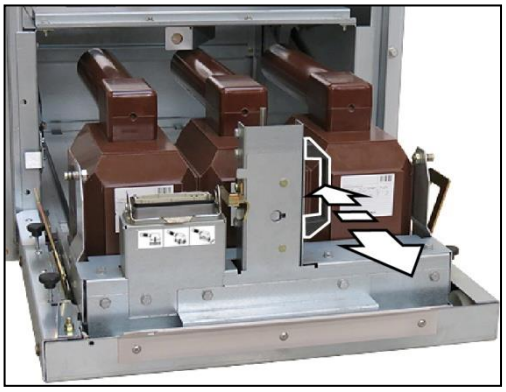


Fig. 460: Pulling the service truck to check interlocking

✓ The service truck is interlocked with the panel.

Operating the removable voltage transformers

Moving the removable voltage transformers into the panel

⇨ To undo the interlocking between the removable voltage transformers and the service truck, push the lever to the left and hold it.

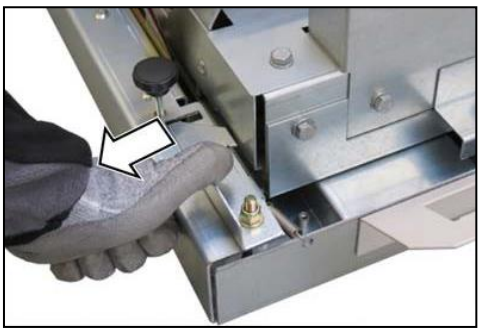


Fig. 461: Pulling the lever to unlock

⇨ Lift the handle of the removable voltage transformers. Keep it lifted and push the removable voltage transformers into the panel as far as it will go.

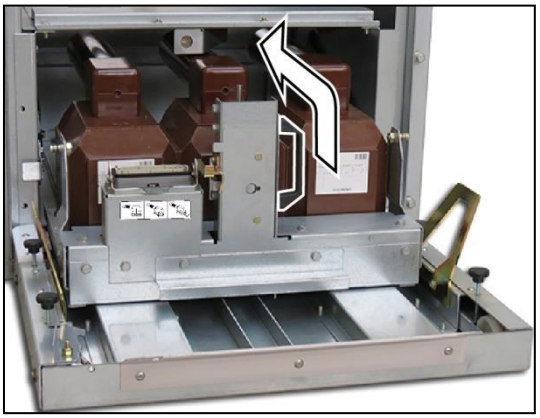


Fig. 462: Pushing the removable voltage transformers into the panel

⇨ Push the handle down to interlock the removable voltage transformers with the panel.

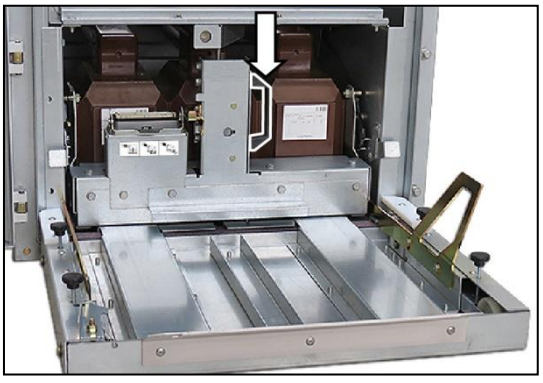


Fig. 463: Pushing the handle down

✓ The removable voltage transformers are inserted in the panel.

Removing the service truck from the panel

⇨ To detach the locking levers from the panel frame, pull the locking levers on the left and right side of the service truck.

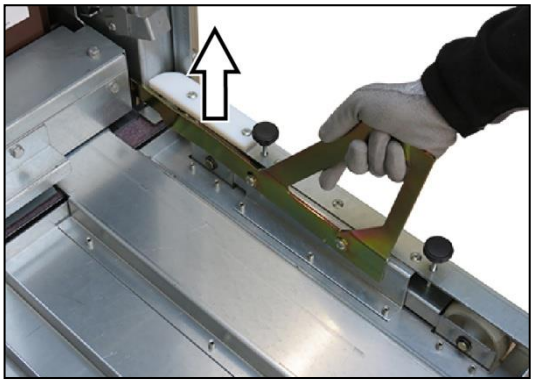


Fig. 464: Detaching the locking levers

⇨ Pull the service truck away from the panel.

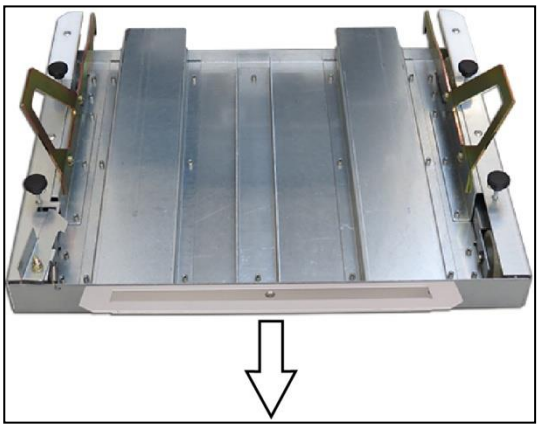


Fig. 465: Pulling the service truck away

✓ The service truck is removed from the panel.

Plugging on the low-voltage connector

> **INFORMATION**
>
> In addition to these instructions, an instruction label on the removable voltage transformers informs about plugging on the low-voltage connector.
>
> Follow the advice on the label (3) to push the longitudinal fastener.

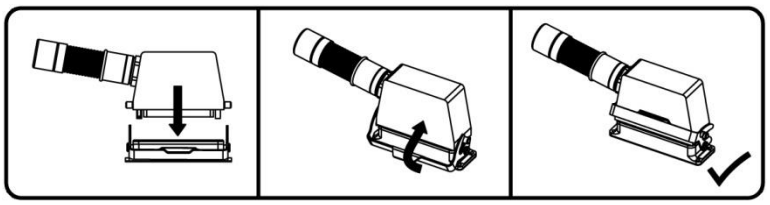


Fig. 466: Instruction label on the removable voltage transformers

⇨ Take the low-voltage connector out of the shelf on the left inside the panel.

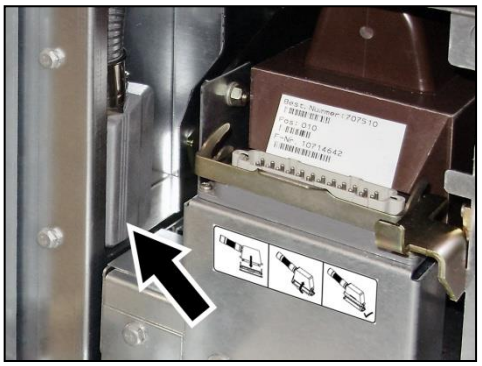


Fig. 467: Low-voltage connector stowed away

⇨ Carefully plug on the low-voltage connector (1) from above.

⇨ To secure the low-voltage connector, push the longitudinal fastener (2) of the coupling upwards.

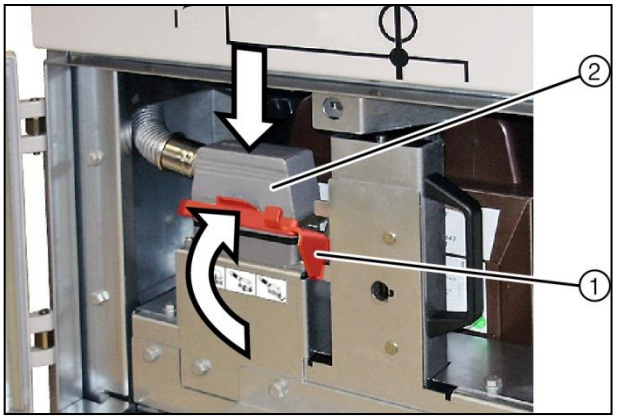


Fig. 468: Plugging on and securing the low-voltage connector

⇨ Close the door to the voltage transformer compartment and screw it tight.

⇨ Fit a padlock to the operating slide and close it.

✓ The removable voltage transformers are inserted in the panel.

19.8 Replacing protection fuse-links

NOTICE

Maloperation

Removable voltage transformers are exclusively designed for operation with specific protection fuse-links.

⇨ Use only the fuse-link types listed in the following table.

⇨ Do not mount bridging links instead of protection fuse-links.

INFORMATION

A tripped protection fuse-link can cause hidden damages on the other protection fuse-links.

⇨ Always replace all protection fuse-links, even if only one protection fuse-link has tripped.

Selection table for protection fuse-links:

Rated voltage U_r [kV]	Supplier:	Order details:
7.2	SIBA	3000211.2/ 2 A / 192 mm
12	SIBA	3011911.2/ 2 A / 192 mm
17.5	SIBA	3017911.2 / 2 A / 192 mm
Supplier information : www.siba-fuses.com		

Alternative supplier for fuse-links:

Rated voltage U_r [kV]	Supplier:	Order details:
7.2	Inter-Teknik	S1Z1002 / 2 A / 192 mm
12	Inter-Teknik	+S1Z.12KV.192.002 / 2 A / 192 mm
17.5	Inter-Teknik	+S1Z.17.5KV.192.002 / 2 A / 192 mm
Supplier information : www.inter-teknik.com		

Removable voltage transformer rating plate
Further technical data is shown on the rating plate of each removable voltage transformer.

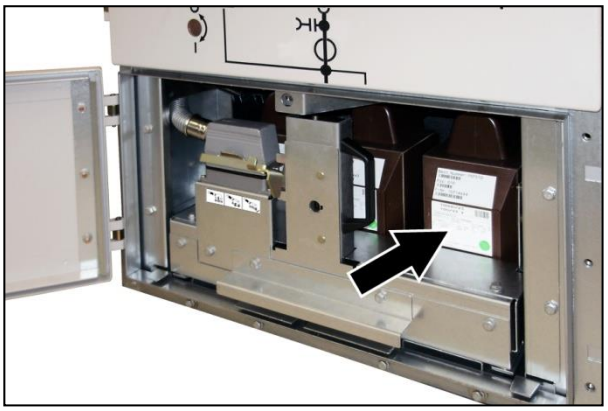


Fig. 469: Rating plate on removable voltage transformers

Operating the removable voltage transformers

Design types of removable voltage transformers
Replacing the protection fuse-links is carried out differently depending on the design of a removable voltage transformer. There are four possible design types. Type 1 is substantially different from the others in that no tool is required for (un-)locking the contact caps of the voltage transformer housing. The other types require a tool. This tool is part of the delivery and is the same for all types.

Preconditions

- Removable voltage transformers taken out of the panel
- Set of proper protection fuse-links available
- Except for design type 1: Tool available

Procedure for design type 1: No tool required

⇨ Move the service truck with the removable voltage transformers away from the panel. The protection fuse-links are accessible.

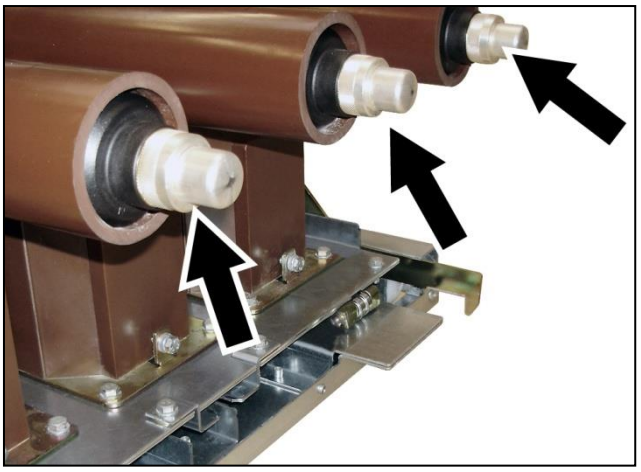


Fig. 470: Protection fuse-links accessible

⇨ Loosen the protection fuse-link by turning, and pull it out of the voltage transformer housing with mounted contact cap.

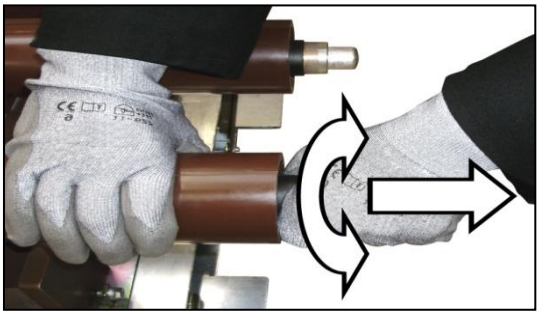


Fig. 471: Loosening fuse-link

Fig. 472: Pulling fuse-link out of the housing

⇨ Detach the contact cap from the protection fuse-link.

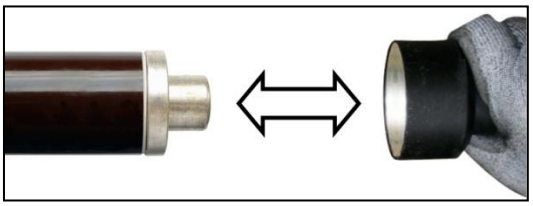


Fig. 473: Detaching contact cap from fuse-link

⇨ Mount the contact cap on the new protection fuse-link.

⇨ Insert the new protection fuse-link.

⇨ Perform replacement with all other fuse-links.

✓ The protection fuse-links have been replaced.

INFORMATION

Final procedure steps

⇨ Next, insert the removable voltage transformers into the panel. After closing the high-voltage door, the panel can be integrated into the course of operation again.

Procedure for design types 2, 3 and 4: Tool required
Hereafter, the procedure is shown using the example of a removable voltage transformer type 2. For design types 3 and 4, the procedure is basically the same. Those types differ from type 2 only in that the contact caps are interlocked with the housing by a screw thread. The contact caps are unscrewed by turning counter-clockwise using the accessory tool:

Fig. 474: Tool for (un-)locking

Fig. 475: Type 3: Unscrewing the contact cap

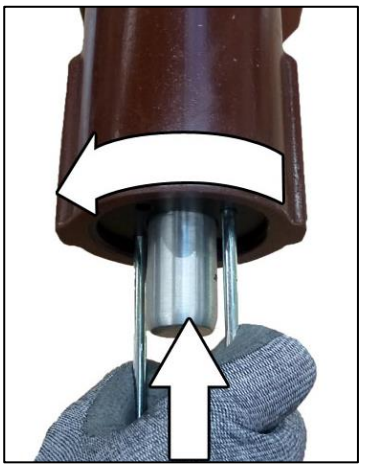


Fig. 476: Type 4: Unscrewing the contact cap

⇨ Move the service truck with the removable voltage transformers away from the panel. The protection fuse-links are covered by contact caps which are interlocked by a guide pin with the housing of the voltage transformer.

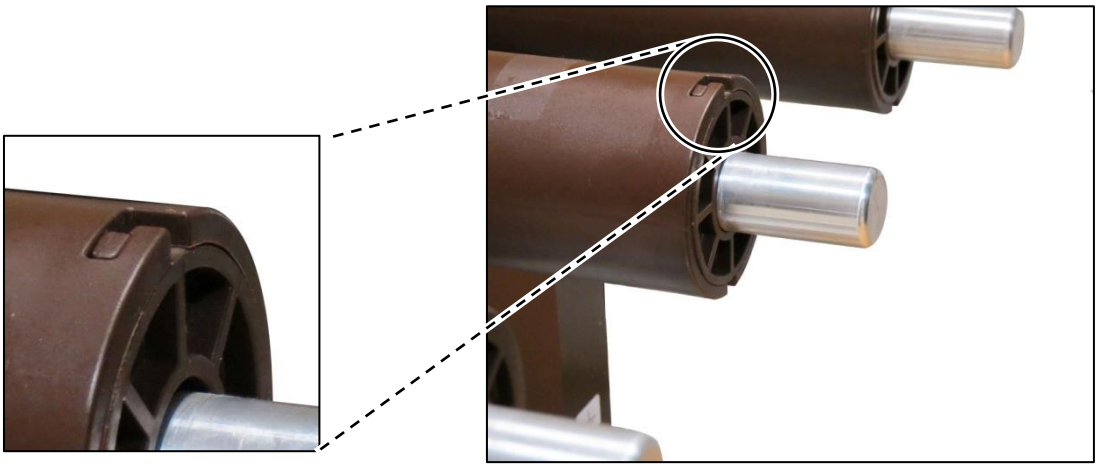


Fig. 477: Contact caps covering the protection fuse-link

⇨ To unlock the contact cap, insert both ends of the tool in the openings of the contact cap and turn clockwise as far as it will go.

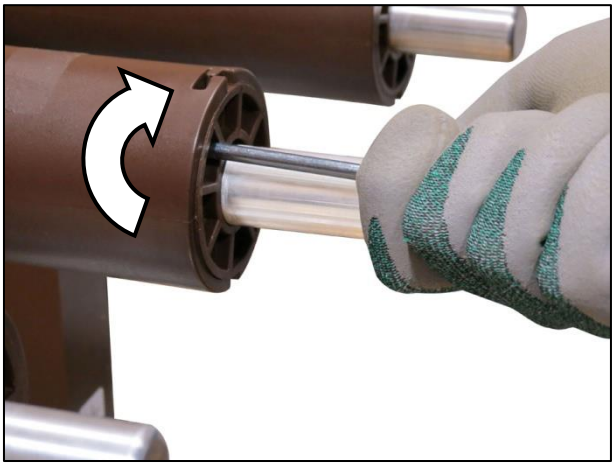


Fig. 478: Unlocking the contact cap

⇨ Holding it by the contact, pull the contact cap off the housing, and store it.

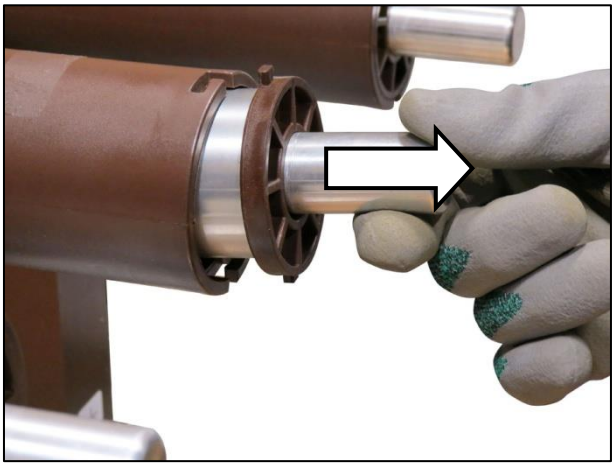


Fig. 479: Pulling the contact cap off the housing

⇨ Pull the spring off the protection fuse-link and store it.

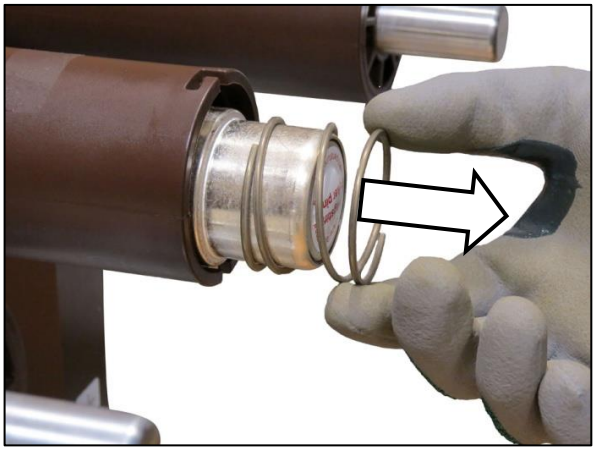


Fig. 480: Pulling the spring off the fuse-link

⇨ Pull the protection fuse-link out of the housing and dispose of it.

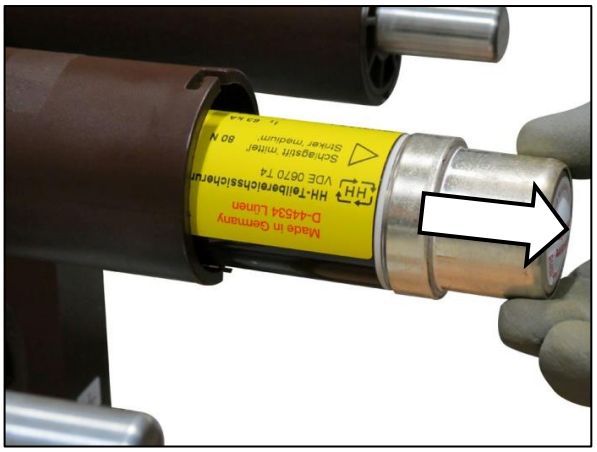


Fig. 481: Pulling the fuse-link out

⇨ Push the new protection fuse-link into the housing.

⇨ Push the spring on the protection fuse-link.

⇨ To insert the contact cap, align its guide pin with the angular slot in the housing. Then push the contact cap into the housing as far as it will go.

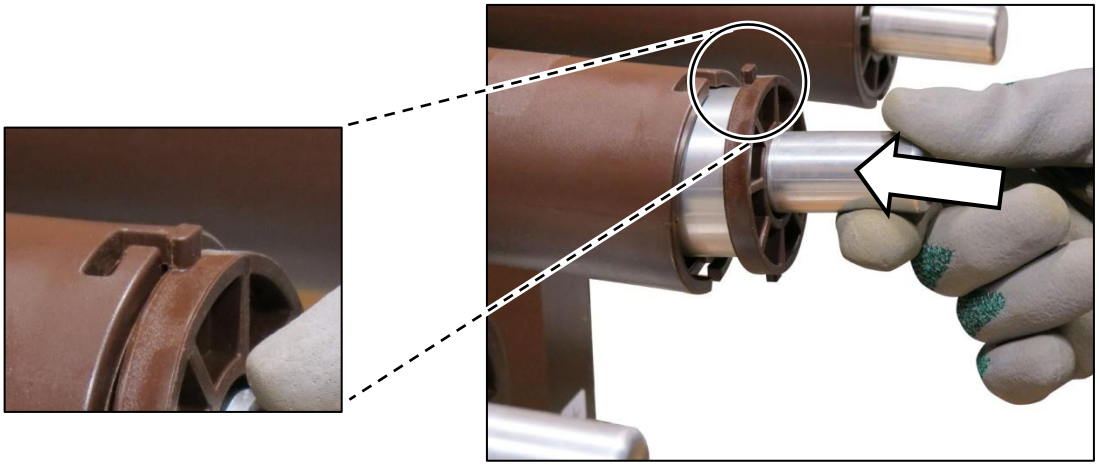


Fig. 482: Pushing the contact cap into the housing

⇨ To lock the contact cap, insert both ends of the tool in the openings of the contact cap and turn counter-clockwise as far as it will go.

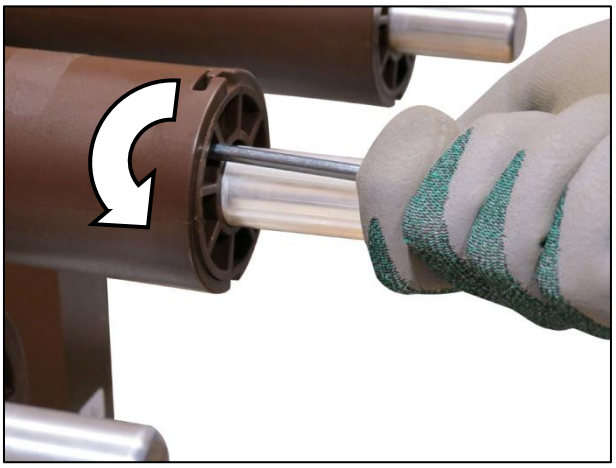


Fig. 483: Locking the contact cap

⇨ Perform replacement with all other fuse-links.

✓ The protection fuse-links have been replaced.

INFORMATION

Final procedure steps

⇨ Next, insert the removable voltage transformers into the panel. After closing the high-voltage door, the panel can be integrated into the course of operation again.

20 Verifying safe isolation from supply

INFORMATION

Read and understand these instructions before attempting operating works.

Before performing any kind of check or work in the busbar compartment or the connection compartment of each panel, it has to be ensured that these compartments are safely isolated from supply.
To ensure the safe isolation from supply, use the integrated three-phase capacitive voltage detecting system according to IEC 61243-5.

20.1 Application of voltage indicators

DANGER

Electric shock

Always verify safe isolation from supply without any doubt

If safe isolation from supply is verified erroneously although operational voltage is still applied, there is danger to life.

- ⇨ Before performing any kind of checks or work in the busbar compartment or the connection compartment of each panel, verify safe isolation from supply in these compartments without any doubt.
- ⇨ Observe the **Five Safety Rules**.
- ⇨ To verify safe isolation from supply, do exclusively use intact LRM voltage indicators that have been tested immediately before.
- ⇨ Please do absolutely observe the enclosed operating instructions for the function test unit and the voltage indicator.

20.2 Overview of voltage indicating systems

As voltage indicators, two device systems are used:

- **CAPDIS** and **VOIS** device systems installed in the door to the low-voltage compartment
- **LRM** device system as an indicator with the associated measuring system installed below the door to the low-voltage compartment

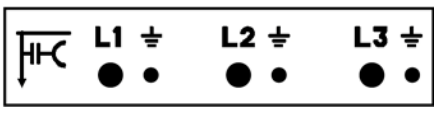


Fig. 484: Test sockets for feeder

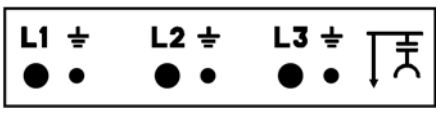
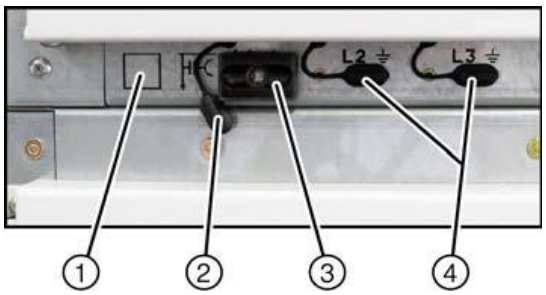


Fig. 485: Test sockets for busbar

20.3 LRM system overview



(1) Documentation to repeat test of interface condition

(2) Cover of test socket for L1, removed

(3) LRM-ST, plugged on for L1

(4) Covers of tests sockets for L2 and L3, fitted

Fig. 486: LRM system at the panel

Indication on LRM-ST

LRM-ST indication		Meaning
✳	Indication flashes	Phase not isolated from supply
✳	Indication lights up	Phase not isolated from supply
○	Indication does not light up or does not flash	Phase isolated from supply

NOTICE

Device system LRM

Before verifying safe isolation from supply with the LRM device system, do absolutely check proper functioning of the LRM-ST voltage indicator.

Fig. 487: LRM-ST voltage indicator

20.4 Verifying proper functioning of LRM-ST voltage indicator

To verify proper functioning of the LRM-ST voltage indicator, use the battery-operated function test unit (optional).

Fig. 488: Function test unit for LRM-ST voltage indicator

Preconditions

- Function test unit available ready for operation on LRM-ST voltage indicators
- LRM voltage indicator available to be tested

Procedure

⇨ Plug the contact pins of the LRM-ST voltage indicator on the test sockets at the function test unit.

⇨ Perform the test.

Alternative test method

If no function test unit is available to check the LRM-ST voltage indicator, the check must be executed on a live panel.

Procedure

⇨ Remove one cover from the test sockets. The cover remains permanently at the panel.

⇨ Plug the contact pins of the LRM-ST voltage indicator on the test sockets at the panel.

⇨ Perform the test.

✓ The test of the LRM-ST voltage indicator is completed. If the voltage indicator does not pass the function test, do not use this voltage indicator to verify safe isolation from supply.

20.5 Verifying safe isolation from supply with the LRM device system

⚠ DANGER

Electric shock

Always verify safe isolation from supply without any doubt

If safe isolation from supply is verified erroneously although operational voltage is still applied, there is danger to life.

⇨ Before performing any kind of checks or work in the busbar compartment or the connection compartment of each panel, verify safe isolation from supply in these compartments without any doubt.

⇨ Observe the **Five Safety Rules**.

⇨ To verify safe isolation from supply, do exclusively use intact LRM voltage indicators that have been tested immediately before.

⇨ Please do absolutely observe the enclosed operating instructions for the function test unit and the voltage indicator.

Preconditions

- High-voltage door closed
- Door to the low-voltage compartment closed
- Tested LRM voltage indicator available

Procedure

⇨ Remove the cover from the test socket. The cover remains permanently at the panel.

⇨ Plug the LRM-ST voltage indicator on the test socket.

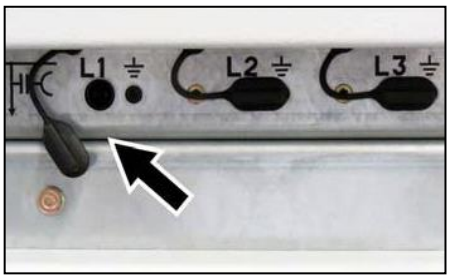


Fig. 489: Cover removed from test socket L1

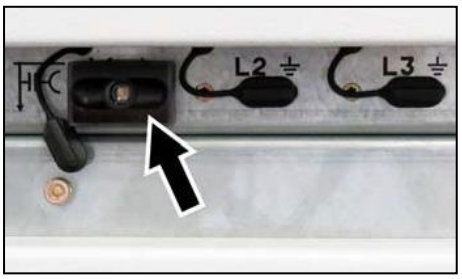


Fig. 490: LRM-ST voltage indicator at L1

⇨ Read the voltage indication at the LRM-ST.

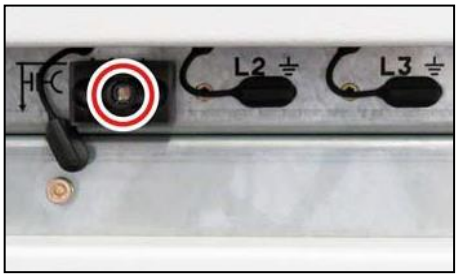


Fig. 491: LRM-ST indication

LRM-ST indication		Meaning
	Indication flashes	Phase not isolated from supply
	Indication lights up	Phase not isolated from supply
○	Indication does not light up or does not flash	Phase isolated from supply

⇨ Indication does not light up or does not flash.

⇨ Refit the cover on the test socket.

⇨ Proceed in the same way with the test sockets for L2, and then for L3.

✓ Safe isolation from supply is verified as soon as L1, L2 and L3 have been determined to be isolated from supply.

20.6 CAPDIS and VOIS systems overview

CAPDIS-S1+	Integrated capacitive voltage detecting system
CAPDIS-S2+	Integrated capacitive voltage monitoring system with relay output
VOIS+	Economic integrated capacitive voltage detecting system
VOIS-R+	Economic integrated capacitive voltage detecting system with relay output

Verifying safe isolation from supply

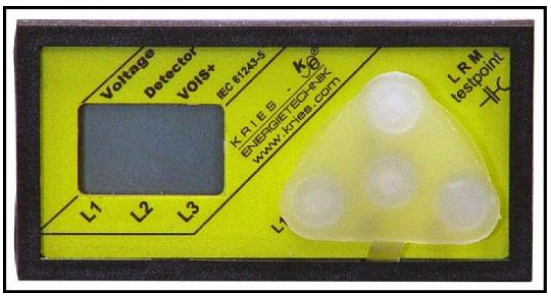


Fig. 492: VOIS+, cover closed

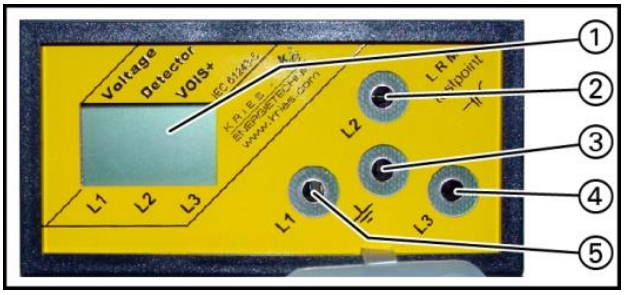


Fig. 493: VOIS+, cover open

(1) LC display
(2) Test socket L2
(3) Earth socket
(4) Test socket L3
(5) Test socket L1

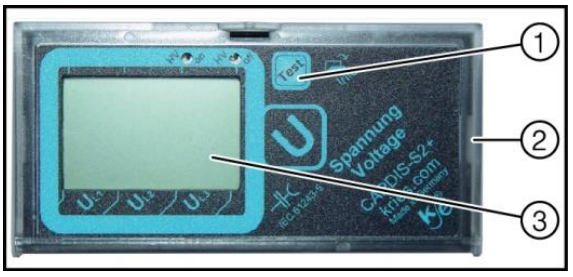


Fig. 494: CAPDIS-S2+, cover closed

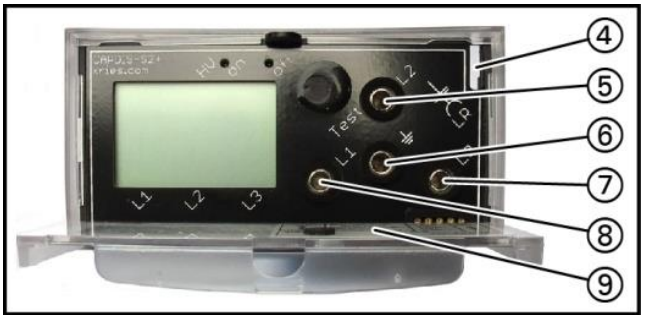


Fig. 495: CAPDIS-S2+, cover open

(1) "Test" button
(2) Cover
(3) LC display
(4) Duct for signaling cables CAPDIS-M
(5) Test socket L2
(6) Earth socket
(7) Test socket L3
(8) Test socket L1
(9) Short instructions

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

Indication:	VOIS+, VOIS-R+			CAPDIS-S1+			CAPDIS-S2+			
	L1	L2	L3	L1	L2	L3	L1	L2	L3	
A0							0 0 0			Operational high-voltage not present
A1	ϟ	ϟ	ϟ	ϟ	ϟ	ϟ	ϟ	ϟ	ϟ	Operational high-voltage present
A2										• Operational high-voltage not present • Auxiliary voltage not available (only CAPDIS-S2+)
A3		ϟ	ϟ		ϟ	ϟ		ϟ	ϟ	Failure in phase L1, operational high-voltage at L2 and L3
A4	–			ϟ	ϟ	ϟ	ϟ	ϟ	ϟ	Voltage (not operatinal high-voltage) present
A5	–			ϟ	ϟ	ϟ	ϟ	ϟ	ϟ	Indication: "Test" passed (lights up shortly)
A6	–			ϟ ERROR	ϟ	ϟ	ϟ ERROR	ϟ	ϟ	Indication: "Test" not passed (lights up shortly)
A7	–			ϟ	ϟ	ϟ	ϟ	ϟ	ϟ	Overvoltage present (lights up permanently)
A8	–			–			ϟ ERROR	ϟ	ϟ	Indication: "ERROR" for example in case of disconnected auxiliary voltage

Fig. 496: Indications VOIS+, VOIS-R+, CAPDIS-S1+/-S2+

Features VOIS+, VOIS-R+, CAPDIS-S1+ / CAPDIS-S2+

VOIS+, VOIS-R+	CAPDIS-S1+ / CAPDIS-S2+
Integrated display, without auxiliary power	Integrated display, without auxiliary power
Maintenance-free, repeat test required	Maintenance-free
Degree of protection IP54	Degree of protection IP54
With integrated 3-phase test socket for phase comparison	With integrated 3-phase test socket for phase comparison
–	With signal-lead test
–	Integrated repeat test of the interfaces

20.7 Verifying safe isolation from supply with the CAPDIS or VOIS device system

⚠ DANGER

Electric shock

Always verify safe isolation from supply without any doubt

If safe isolation from supply is verified erroneously although operational voltage is still applied, there is danger to life.

⇨ Before performing any kind of checks or work in the busbar compartment or the connection compartment of each panel, verify safe isolation from supply in these compartments without any doubt.

⇨ Observe the **Five Safety Rules**.

Preconditions

- High-voltage door closed
- Door to the low-voltage compartment closed
- Indication "Operatinal high-voltage not present" visible

✓ Safe isolation from supply is verified as soon as L1, L2 and L3 have been determined to be isolated from supply.

20.8 Supplier information

Further information for the devices to get from:

Device	**Supplier**
VOIS+ / VOIS-R+ / CAPDIS-S1+ / CAPDIS-S2+	www.kries.com
LRM system	www.horstmanngmbh.com
LRM-ST voltage indicator	Siemens AG / Order No.: 8DX1620

21 Earthing and de-earthing the busbar system

INFORMATION

Read and understand these instructions before attempting operating works.

21.1 Earthing the busbar system manually

Arrangement of control elements
The operating mechanism of the earthing switch provided for earthing the busbar system is located in the front upper area of the low-voltage compartment.

Fig. 497: Control elements of earthing switch for busbar system

WARNING

Risk of falling

Falling from a ladder can lead to injuries and bone fractures.

- ⇨ Observe the guidelines for the use of working materials.
- ⇨ Use approved electrician's ladders only.
- ⇨ Observe the manual and the instructions on the ladder.

NOTICE

Maloperation

A switching operation once started must be completed totally! A switching operation that was not completed cannot be turned back.

- ⇨ Do not try to remove the operating lever at intermediate positions.

NOTICE

Maloperation

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

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

Instruction label on the door to the low-voltage compartment:
In addition to these instructions, an instruction label on the door to the low-voltage compartment informs about proper operation of the operating lever for the busbar earthing switch.

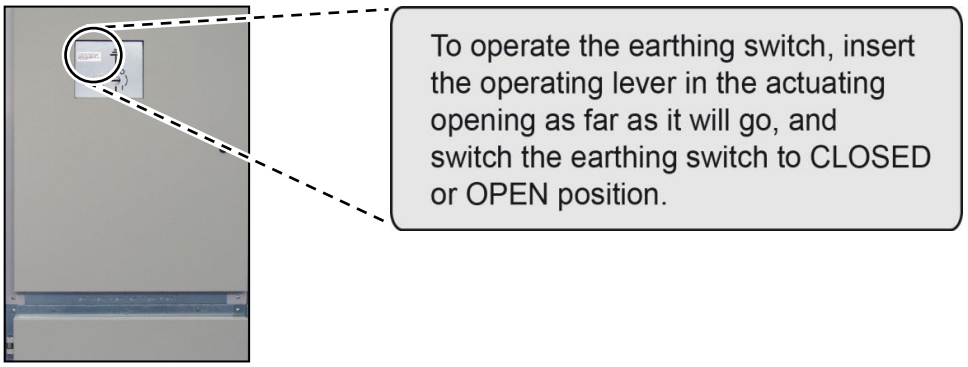


Fig. 498: Instruction label on door to the low-voltage compartment

Preconditions

- Busbar earthing switch in OPEN position
- Intended opening of the padlock released externally
- Operating lever available
- Electrician's ladder available as double-step ladder
- Electromagnetic interlock (optional) deactivated
- If a withdrawable part / switching-device truck is inserted in the panel:
  - Withdrawable part / switching-device truck in test position
  - Low-voltage connector plugged on

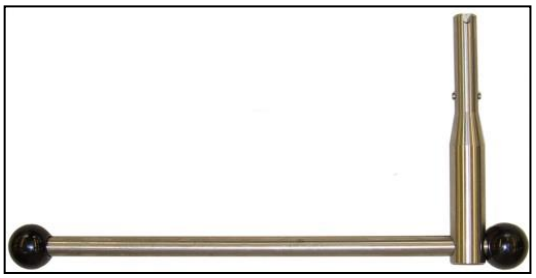


Fig. 499: Operating lever for operating the busbar earthing switch

Procedure

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

⇨ Make sure according to the panel number at the panel that the release for manual earthing of exactly this panel is available.

⇨ Position the electrician's ladder correctly in front of the panel.

⇨ Open the padlock.

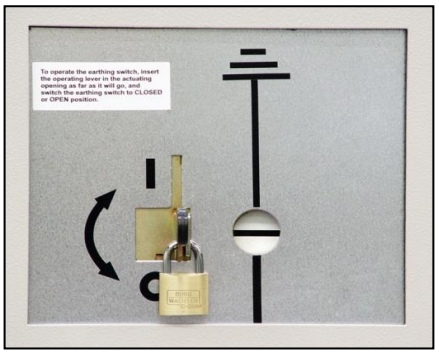


Fig. 500: Operating slide on busbar earthing switch padlocked

⇨ Lift the operating slide and hold it.

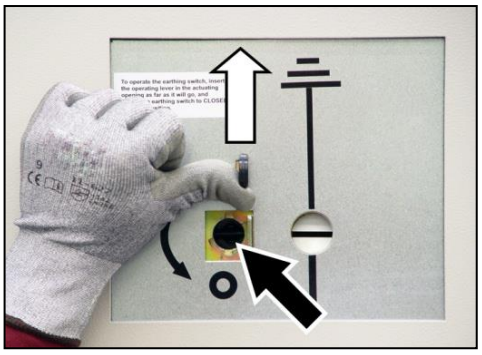


Fig. 501: Lifting the operating slide; actuating opening open

Actuating opening for busbar earthing switch

The actuating opening for the busbar earthing switch has different receptacles for inserting the operating lever for closing and opening the busbar earthing switch.

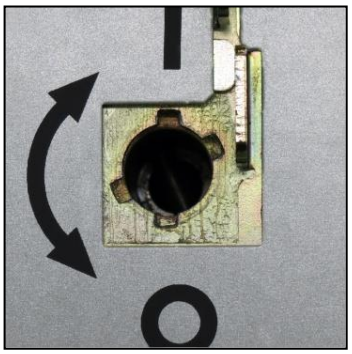


Fig. 502: Actuating opening for busbar earthing switch

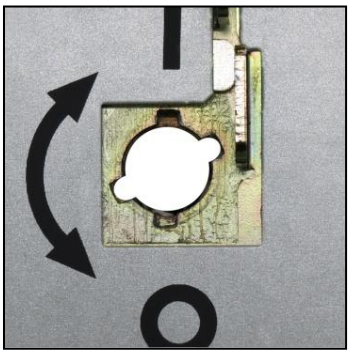


Fig. 503: Inserting the operating lever for closing

⇨ Insert the operating lever in the actuating opening for the busbar earthing switch in such a way that the pins of the operating lever coincide with the actuating opening in "10 past 8" position.

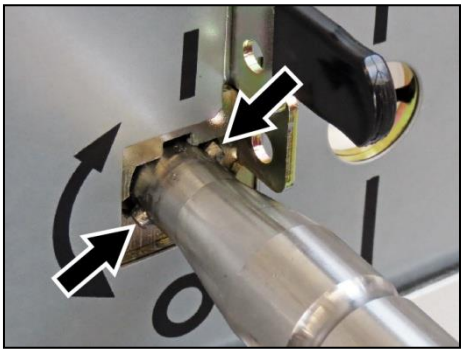


Fig. 504: Inserting the operating lever for closing

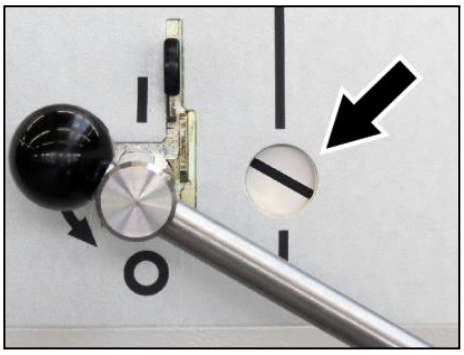
⇨ Insert the operating lever in the actuating opening as far as it will go.

⇨ Hold the operating lever with one hand straight in the actuating opening and turn the operating lever with the other hand clockwise as far as it will go (that is approx. 115°) until the busbar earthing switch changes to CLOSED position.

Fig. 505: Closing the busbar earthing switch

Fig. 506: Closing the busbar earthing switch using an electrician's ladder

⇨ While turning the operating lever, the position indicator of the busbar earthing switch changes from the OPEN position to the intermediate position.



,

Fig. 507: Position indicator in intermediate position

⇨ After turning the operating lever to the end position, the position indicator of the busbar earthing switch changes from the intermediate position to the CLOSED position.

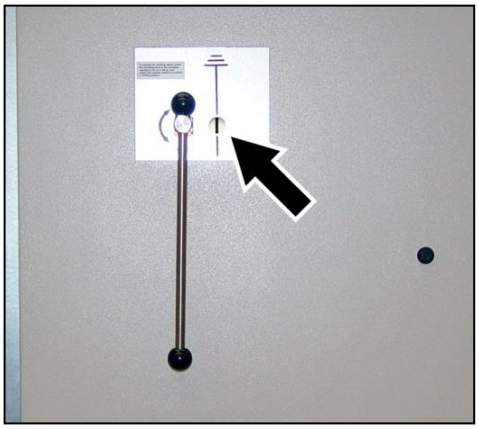


Fig. 508: Operating lever in end position

⇨ Remove the operating lever.

⇨ To close the actuating opening, push the operating slide down as far as it will go.

⇨ Fit a padlock to the operating slide and close it.

The busbar earthing switch has been switched from the OPEN position to the CLOSED position, thus earthing the busbar. The position indicator of the busbar earthing switch changes from the OPEN position via the intermediate position to the CLOSED position.

Fig. 509: Operating slide on
busbar earthing switch padlocked

✓ The busbar system is earthed.

21.2 De-earthing the busbar system manually

Arrangement of control elements
The operating mechanism of the earthing switch provided for earthing the busbar system is located in the front upper area of the low-voltage compartment.

Fig. 510: Control elements of earthing switch for busbar system

⚠ WARNING

Risk of falling

Falling from a ladder can lead to injuries and bone fractures.

- ⇨ Observe the guidelines for the use of working materials.
- ⇨ Use approved electrician's ladders only.
- ⇨ Observe the manual and the instructions on the ladder.

NOTICE

Maloperation

A switching operation once started must be completed totally! A switching operation that was not completed cannot be turned back.

- ⇨ Do not try to remove the operating lever at intermediate positions.

NOTICE

Maloperation

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

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

Instruction label on the door to the low-voltage compartment:
In addition to these instructions, an instruction label on the door to the low-voltage compartment informs about proper operation of the operating lever for the busbar earthing switch.

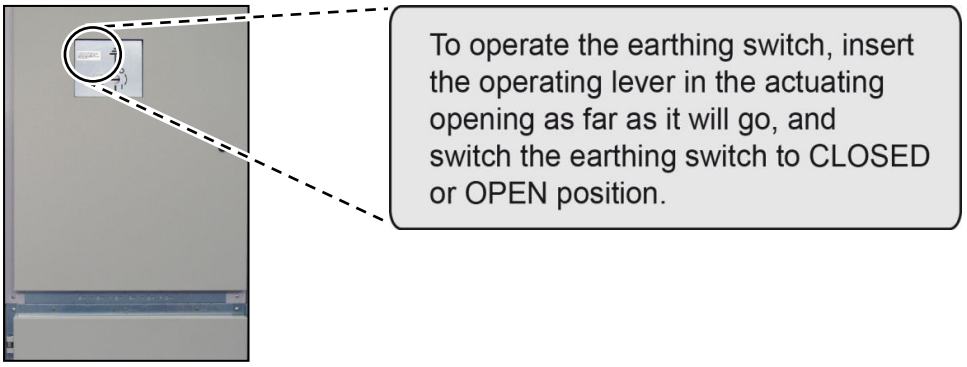


Fig. 511: Instruction label on door to the low-voltage compartment

Preconditions

- Busbar earthing switch in CLOSED position
- Intended opening of the padlock released externally
- Operating lever available
- Electrician's ladder available as double-step ladder
- Electromagnetic interlock (optional) deactivated

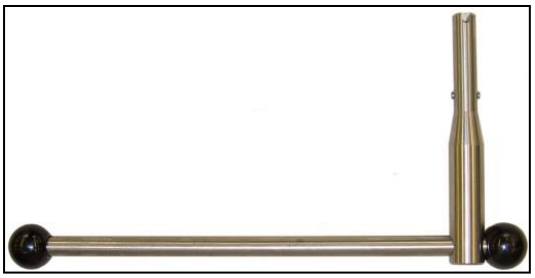


Fig. 512: Operating lever for operating the busbar earthing switch

Procedure

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

⇨ Make sure according to the panel number at the panel that the release for manual de-earthing of exactly this panel is available.

⇨ Position the electrician's ladder correctly in front of the panel.

⇨ Open the padlock.

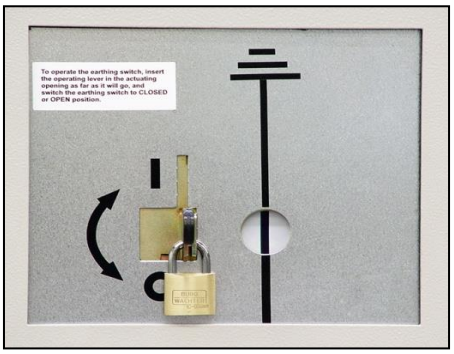


Fig. 513: Operating slide on busbar earthing switch padlocked

⇨ Lift the operating slide and hold it.

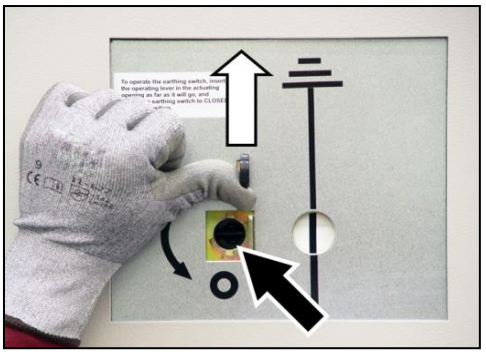


Fig. 514: Lifting the operating slide; actuating opening open

Actuating opening for busbar earthing switch

The actuating opening for the busbar earthing switch has different receptacles for inserting the operating lever for closing and opening the busbar earthing switch.

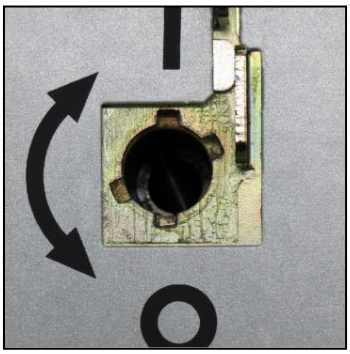


Fig. 515: Actuating opening for busbar earthing switch

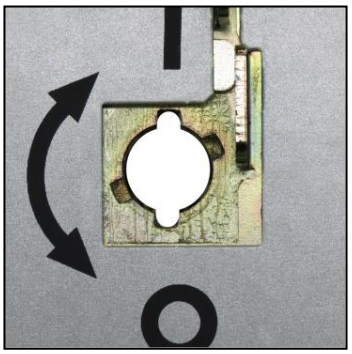


Fig. 516: Inserting the operating lever for opening

⇨ Insert the operating lever in the actuating opening for the busbar earthing switch in such a way that the pins of the operating lever coincide with the actuating opening in vertical position.

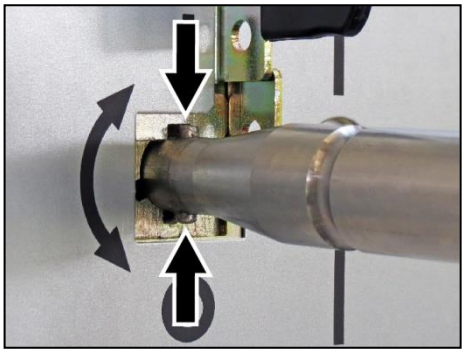


Fig. 517: Inserting the operating lever for opening

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

⇨ Hold the operating lever with one hand straight in the actuating opening and turn the operating lever with the other hand counter-clockwise as far as it will go (that is approx. 115°) until the busbar earthing switch changes to OPEN position.

Fig. 518: Opening the busbar earthing switch

Fig. 519: Opening the busbar earthing switch using an electrician's ladder

⇨ While turning the operating lever, the position indicator of the busbar earthing switch changes from the CLOSED position to the intermediate position.

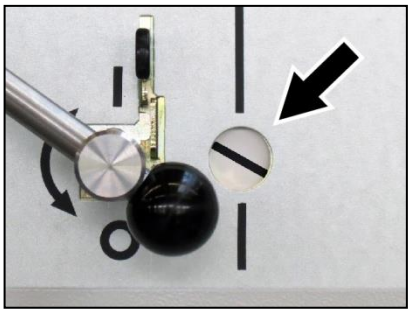


Fig. 520: Position indicator in intermediate position

⇨ After turning the operating lever to the end position, the position indicator of the busbar earthing switch changes from the intermediate position to the OPEN position.

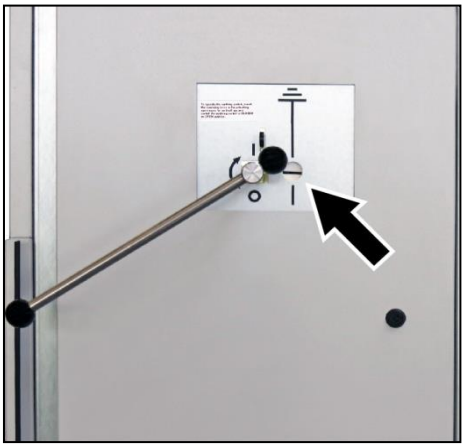


Fig. 521: Operating lever in end position

⇨ Remove the operating lever.

⇨ To close the actuating opening, push the operating slide down as far as it will go.

⇨ Fit a padlock to the operating slide and close it.

The busbar earthing switch has been switched from the CLOSED position to the OPEN position, thus de-earthing the busbar. The position indicator of the busbar earthing switch changes from the CLOSED position via the intermediate position to the OPEN position.

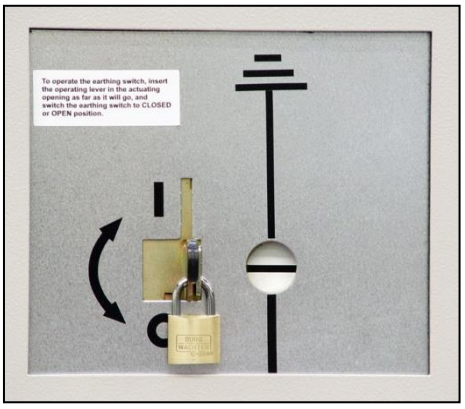


Fig. 522: Operating slide on busbar earthing switch padlocked

✓ The busbar system is de-earthed.

22 Operating the shutters

INFORMATION

Read and understand these instructions before attempting operating works.

The shutter to the busbar compartment and the shutter to the connection compartment can be opened individually. When one shutter is open, the mechanism of the other one must be padlocked. If both shutters have to be open at the same time, locking the other shutter mechanism is omitted.

22.1 Operating the shutter to the busbar compartment in the switching-device compartment

DANGER

Electric shock

If the busbars in the busbar compartment have not been isolated, the contacts will be live at operational high-voltage.

⇨ Always observe the **Five Safety Rules**.

Before opening the shutter to the busbar compartment:

⇨ Put on personal protective equipment.

⇨ Isolate and earth the busbars in the busbar compartment.

⇨ Verify safe isolation from supply.

⇨ Padlock the shutter mechanism on the right side in the switching-device compartment unless you intend to open the shutter to the connection compartment, too.

Open the shutter to the busbar compartment **safely**:

⇨ Only use the slip-on lever. Never try to open the shutter mechanism touching it directly.

⇨ Always operate the slip-on lever **outside** the panel using the handle.

Always close the shutter to the busbar compartment:

⇨ Before interrupting operations inside the switching-device compartment.

⇨ Immediately after completing operations inside the switching-device compartment.

⚠ CAUTION

Injury

The shutter mechanism on the left and right side in the switching-device compartment can cause injuries by getting squeezed, caught or cut.

⇨ Do not remove any parts of the covering.

⇨ Do not reach into the shutter mechanism with hands or tools.

Opening the shutter to the busbar compartment (upper shutter)

Preconditions

- Withdrawable part / switching-device truck in test position
- Padlock (optional) removed from door handle
- High-voltage door open
- Low-voltage connector stowed away
- Withdrawable part / switching-device truck taken out of the panel

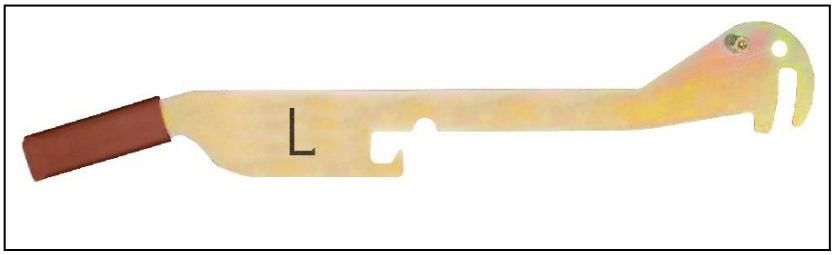


Fig. 523: Slip-on lever for opening the shutter (marked with L)

⇨ Padlock the shutter mechanism on the right side in the switching-device compartment.

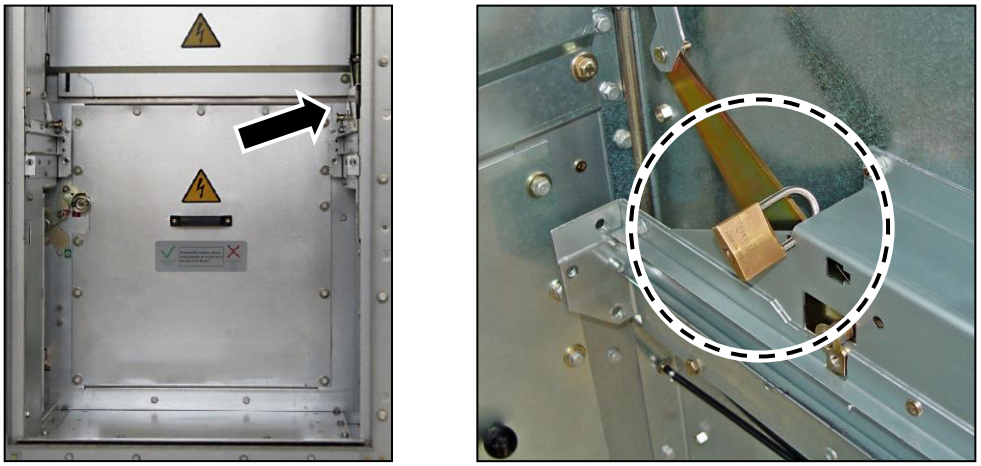


Fig. 524: Padlocking the shutter mechanism on the right side in the switching-device compartment

⇨ Push the slip-on lever (marked with L) on the shutter mechanism on the left side in the switching-device compartment.

⇨ Operate the slip-on lever outside the panel using the handle: Push the handle downwards as far as it will go. The slip-on lever latches tight and the shutter opens.

Fig. 525: Pushing on the slip-on lever

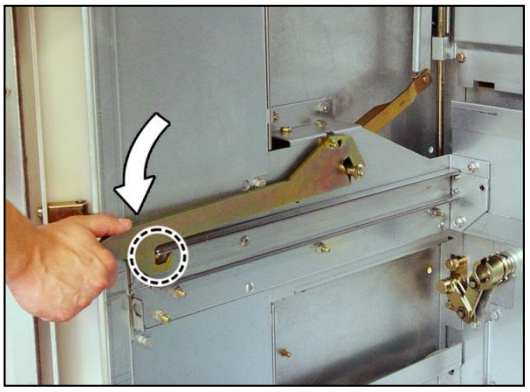


Fig. 526: Pushing the handle downwards to end position

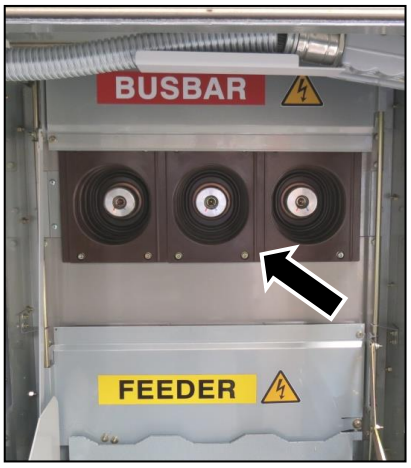


Fig. 527: Shutter to the busbar compartment open

✓ The shutter to the busbar compartment is open.

INFORMATION

Final procedure steps

⇨ Immediately proceed to perform a voltage test with recommended suitable equipment or other intended operations.

Closing the shutter to the busbar compartment (upper shutter)

NOTICE

Maloperation

Risk of damaging safety-relevant parts.

⇨ Remove the padlock **before** inserting the withdrawable part / switching-device truck in the switching-device compartment.

⇨ Push the handle of the slip-on lever slightly to the right (to release the latch) and let it slip upwards. The shutter closes.

⇨ Remove the slip-on lever.

⇨ Remove the padlock from the right side in the switching-device compartment.

✓ The shutter to the busbar compartment is closed.

22.2 Operating the shutter to the connection compartment in the switching-device compartment

⚠ DANGER

Electric shock

If the cable / bar connections in the connection compartment have not been isolated, the contacts will be live at operational high-voltage.

⇨ Always observe the **Five Safety Rules**.

Before opening the shutter to the connection compartment:

⇨ Put on personal protective equipment.

⇨ Isolate and earth the cable / bar connections in the connection compartment.

⇨ Verify safe isolation from supply.

⇨ Padlock the shutter mechanism on the left side in the switching-device compartment unless you intend to open the shutter to the busbar compartment, too.

Open the shutter to the connection compartment **safely**:

⇨ Only use the slip-on lever. Never try to open the shutter mechanism touching it directly.

⇨ Always operate the slip-on lever **outside** the panel using the handle.

Always close the shutter to the connection compartment:

⇨ Before interrupting operations inside the switching-device compartment.

⇨ Immediately after completing operations inside the switching-device compartment.

⚠ CAUTION

Injury

The shutter mechanism on the left and right side in the switching-device compartment can cause injuries by getting squeezed, caught or cut.

⇨ Do not remove any parts of the covering.

⇨ Do not reach into the shutter mechanism with hands or tools.

Opening the shutter to the connection compartment (lower shutter)

Preconditions

- Withdrawable part / switching-device truck in test position
- Padlock (optional) removed from door handle
- High-voltage door open
- Low-voltage connector stowed away
- Withdrawable part / switching-device truck taken out of the panel

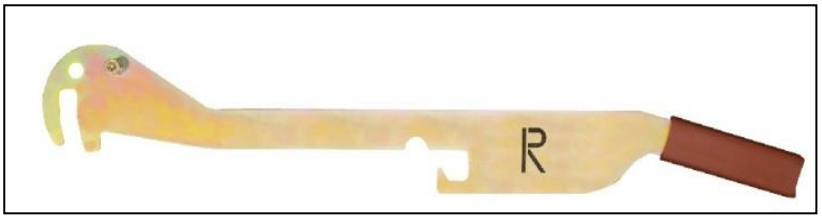


Fig. 528: Slip-on lever for opening the shutter (marked with R)

⇨ Padlock the shutter mechanism on the left side of the switching-device compartment.

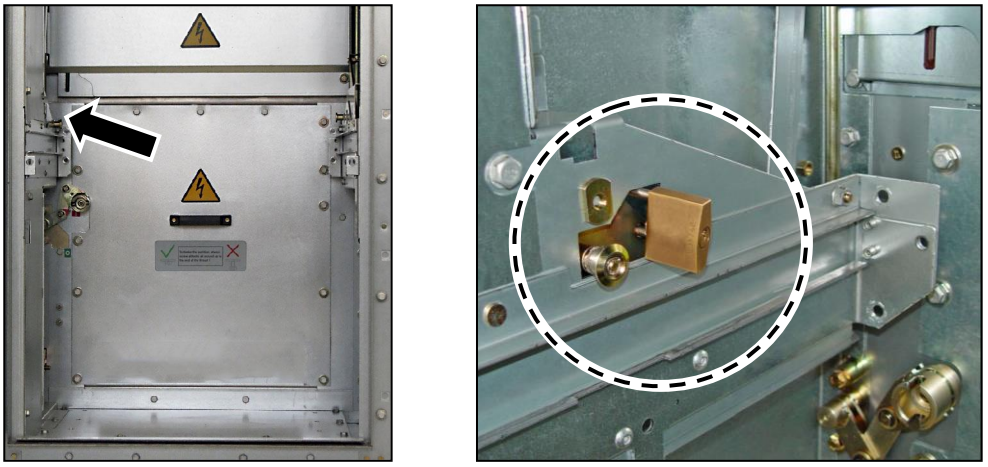


Fig. 529: Padlocking the shutter mechanism on the left side in switching-device compartment

⇨ Push the slip-on lever (marked with R) on the shutter mechanism on the right side in the switching-device compartment.

⇨ Operate the slip-on lever outside the panel using the handle: Push the handle downwards as far as it will go. The slip-on lever latches tight and the shutter opens.

Fig. 530: Pushing on the slip-on lever

Fig. 531: Pushing the handle downwards to end position

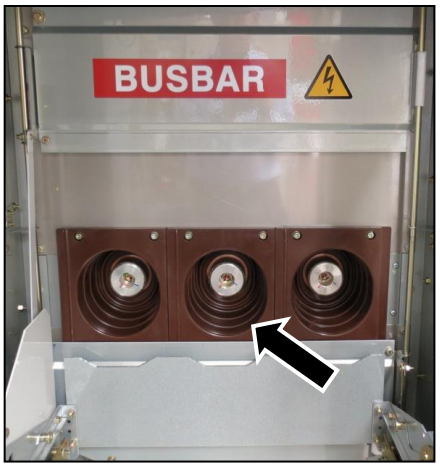


Fig. 532: Shutter to the connection compartment open

✓ The shutter to the connection compartment is open.

INFORMATION

Final procedure steps

⇨ Immediately proceed to perform a voltage test with recommended suitable equipment or other intended operations.

Closing the shutter to the connection compartment (lower shutter)

NOTICE

Maloperation

Risk of damaging safety-relevant parts.

⇨ Remove the padlock **before** inserting the withdrawable part / switching-device truck in the switching-device compartment.

⇨ Push the handle of the slip-on lever slightly to the left (to release the latch) and let it slip upwards. The shutter closes.

⇨ Remove the slip-on lever.

⇨ Remove the padlock from the left side in the switching-device compartment.

✓ The shutter to the connection compartment is closed.

22.3 Operating the shutter to the busbar compartment in the contactor panel with panel width 435 mm

The mechanism for operating the shutter to the busbar compartment in the contactor panel with panel width 435 mm is different from the mechanism in the other panel versions.

⚠ DANGER

Electric shock

If the busbars in the busbar compartment have not been isolated, the contacts will be live at operational high voltage.

⇨ Always observe the **Five Safety Rules**.

Before opening the shutter to the busbar compartment:

⇨ Put on personal protective equipment.

⇨ Isolate and earth the busbars in the busbar compartment.

⇨ Verify safe isolation from supply.

⇨ Padlock the shutter mechanism on the right side in the switching-device compartment unless you intend to open the shutter to the connection compartment, too.

Open the shutter to the busbar compartment **safely**:

⇨ Only use the slip-on lever. Never try to open the shutter mechanism touching it directly.

⇨ Always operate the slip-on lever **outside** the panel using the handle.

Always close the shutter to the busbar compartment:

⇨ Before interrupting operations inside the switching-device compartment.

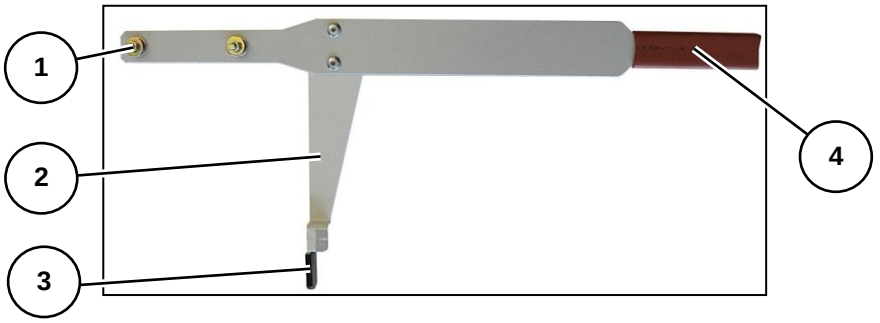
⇨ Immediately after completing operations inside the switching-device compartment.

> **⚠ CAUTION**
>
> **Injury**
>
> The shutter mechanism on the left and right side in the switching-device compartment can cause injuries by getting squeezed, caught or cut.
>
> ⇨ Do not remove any parts of the covering.
>
> ⇨ Do not reach into the shutter mechanism with hands or tools.

Opening the shutter to the busbar compartment (upper shutter)

Preconditions

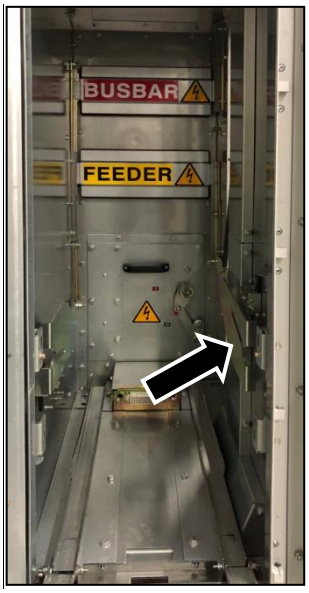
- Contactor truck in test position
- Padlock (optional) removed from door handle
- High-voltage door open
- Contactor truck taken out of the panel



(1) Roller
(2) Latching rod
(3) Handle of latching rod
(4) Main handle

Fig. 533: Slip-on lever for opening the shutter; vertical latching rod (2) pointing downwards

⇨ On the right side in the switching-device compartment: Move the vertical interlocking lever (5) downwards and padlock (6) the shutter mechanism.



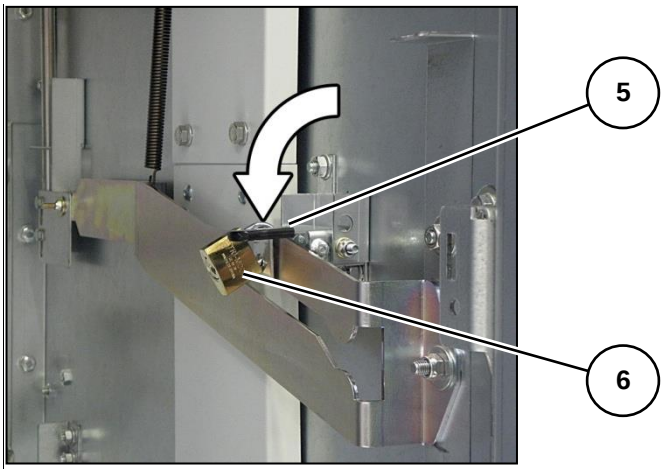


Fig. 534: Padlocking the shutter mechanism on the right side in the switching-device compartment

⇨ Take the slip-on lever by the main handle (4) with the vertical latching rod (2) pointing downwards.

⇨ Turn to the left side in the switching-device compartment. Insert the rollers (1) of the slip-on lever into the guide groove (7) of the shutter mechanism.

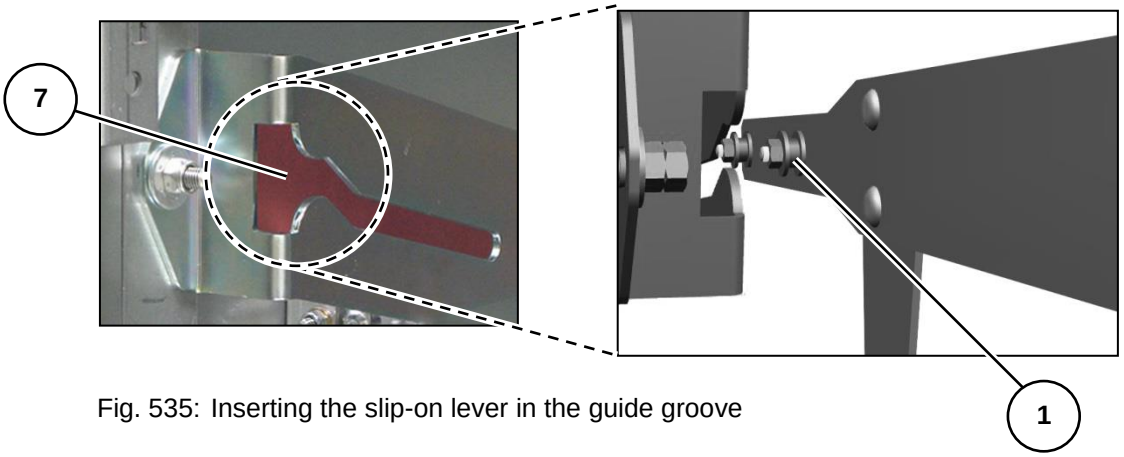


Fig. 535: Inserting the slip-on lever in the guide groove

⇨ Push the slip-on lever into the guide groove as far as it will go.

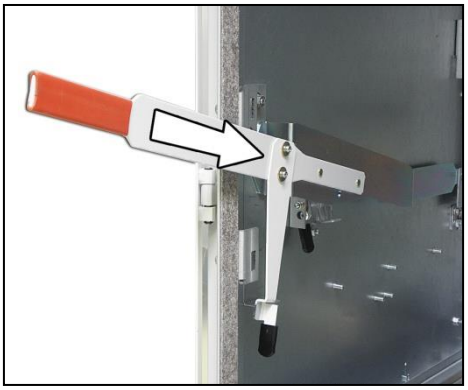


Fig. 536: Pushing the slip-on lever into the guide groove to end position

⇨ Push the main handle downwards as far as it will go. The shutter opens.

⇨ To hook in the slip-on lever to the shutter mechanism, engage the latching rod (2). To do so, hold the latching rod by the handle (3) and move it in a semi-circular way as shown.
The slip-on lever is in stable position and the shutter stays open.

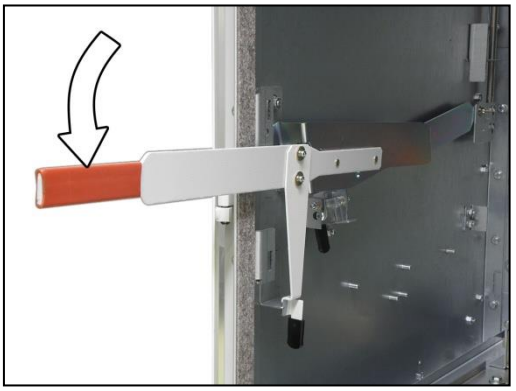


Fig. 537: Pushing the main handle downwards to end position

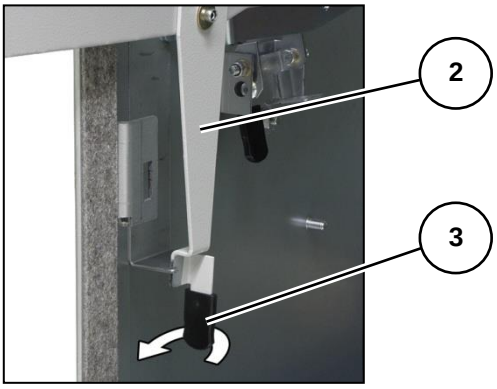


Fig. 538: Engaging the latching rod

Fig. 539: Shutter to the busbar compartment open

✓ The shutter to the busbar compartment is open.

INFORMATION

Final procedure steps

⇨ Immediately proceed to perform a voltage test with recommended suitable equipment or other intended operations.

Closing the shutter to the busbar compartment (upper shutter)

NOTICE

Maloperation

Risk of damaging safety-relevant parts.

⇨ Remove the padlock **before** inserting the contactor truck in the switching-device compartment.

⇨ Release the latching rod (2). To do so, hold the latching rod by the handle (3) and move it in a semi-circular way as shown. Let the slip-on lever slip upwards. The shutter closes.

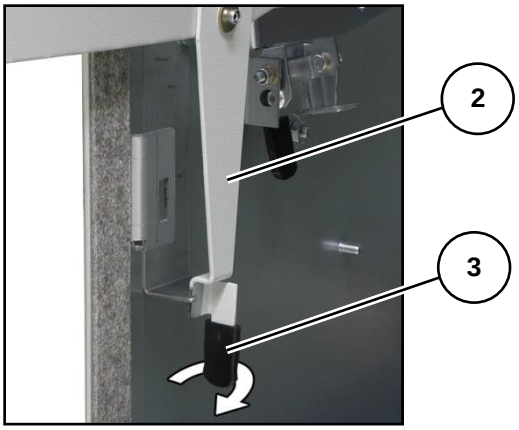


Fig. 540: Releasing the latching rod

⇨ Remove the slip-on lever.

⇨ Remove the padlock from the right side in the switching-device compartment and move the vertical interlocking lever upwards.

✓ The shutter to the busbar compartment is closed.

22.4 Operating the shutter to the connection compartment in the contactor panel with panel width 435 mm

The mechanism for operating the shutter to the connection compartment in the contactor panel with panel width 435 mm is different from the mechanism in the other panel versions.

⚠ DANGER

Electric shock

If the cable / bar connections in the connection compartment have not been isolated, the contacts will be live at operational high voltage.

⇨ Always observe the **Five Safety Rules**.

Before opening the shutter to the connection compartment:

⇨ Put on personal protective equipment.

⇨ Isolate and earth the cable / bar connections in the connection compartment.

⇨ Verify safe isolation from supply.

⇨ Padlock the shutter mechanism on the left side in the switching-device compartment unless you intend to open the shutter to the busbar compartment, too.

Open the shutter to the connection compartment **safely**:

⇨ Only use the slip-on lever. Never try to open the shutter mechanism touching it directly.

⇨ Always operate the slip-on lever **outside** the panel using the handle.

Always close the shutter to the connection compartment:

⇨ Before interrupting operations inside the switching-device compartment.

⇨ Immediately after completing operations inside the switching-device compartment.

⚠ CAUTION

Injury

The shutter mechanism on the left and right side in the switching-device compartment can cause injuries by getting squeezed, caught or cut.

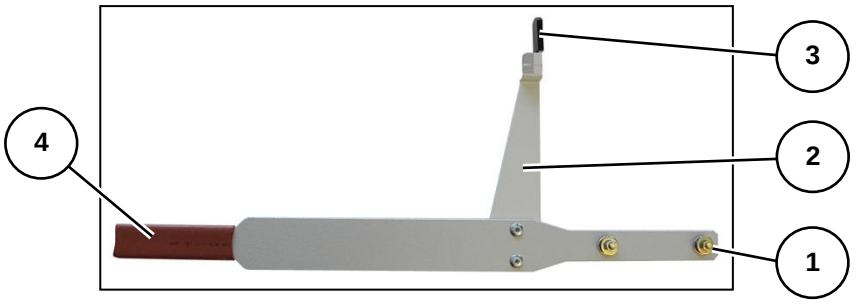
⇨ Do not remove any parts of the covering.

⇨ Do not reach into the shutter mechanism with hands or tools.

Opening the shutter to the connection compartment (lower shutter)

Preconditions

- Contactor truck in test position
- Padlock (optional) removed from door handle
- High-voltage door open
- Contactor truck taken out of the panel



(1) Roller
(2) Latching rod
(3) Handle of latching rod
(4) Main handle

Fig. 541: Slip-on lever for opening the shutter; vertical latching rod (2) pointing upwards

⇨ On the left side in the switching-device compartment: Move the vertical interlocking lever (5) upwards and padlock (6) the shutter mechanism.

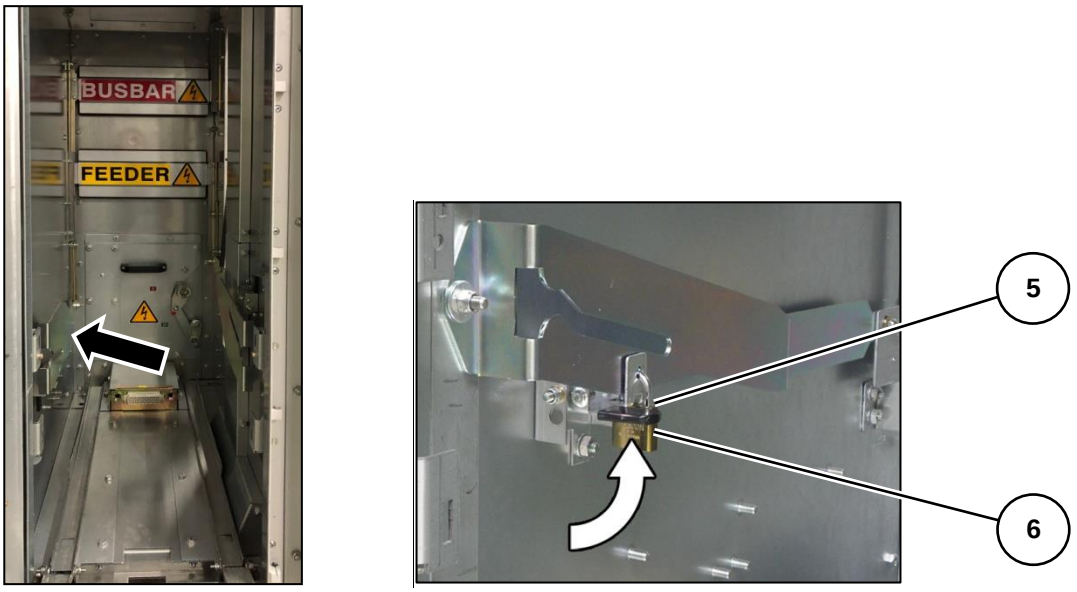


Fig. 542: Padlocking the shutter mechanism on the left side in the switching-device compartment

⇨ Take the slip-on lever by the main handle (4) with the vertical latching rod (2) pointing upwards.

⇨ Turn to the right side in the switching-device compartment. Insert the rollers (1) of the slip-on lever into the guide groove (7) of the shutter mechanism.

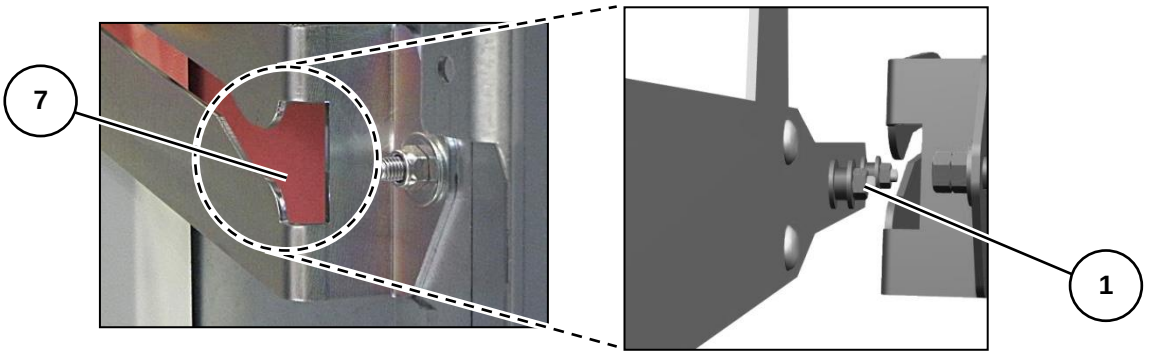


Fig. 543: Inserting the slip-on lever in the guide groove

⇨ Push the slip-on lever into the guide groove as far as it will go.

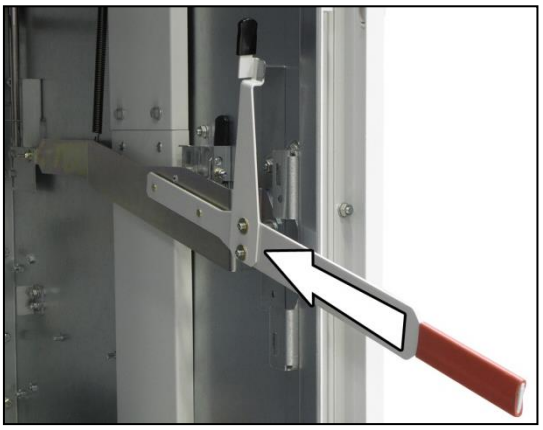


Fig. 544: Pushing the slip-on lever into the guide groove to end position

⇨ Push the main handle upwards as far as it will go. The shutter opens.

⇨ To hook in the slip-on lever to the shutter mechanism, engage the latching rod (2). To do so, hold the latching rod by the handle (3) and move it in a semi-circular way as shown.
The slip-on lever is in stable position and the shutter stays open.

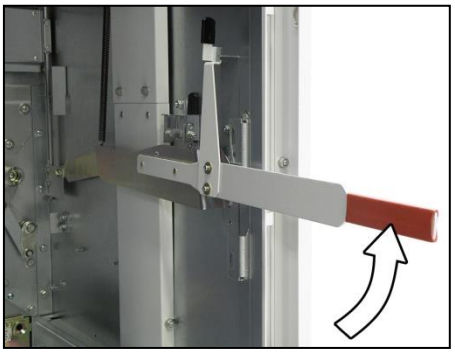


Fig. 545: Pushing the main handle upwards to end position

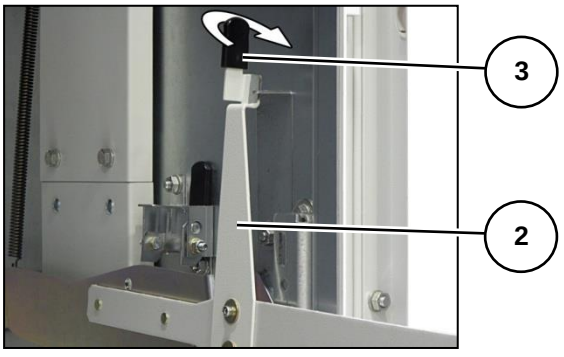


Fig. 546: Engaging the latching rod

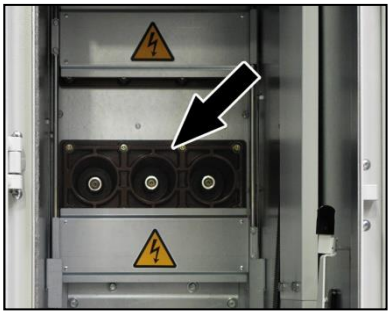


Fig. 547: Shutter to the connection compartment open

✓ The shutter to the connection compartment is open.

INFORMATION

Final procedure steps

⇨ Immediately proceed to perform a voltage test with recommended suitable equipment or other intended operations.

Closing the shutter to the connection compartment (lower shutter)

NOTICE

Maloperation

Risk of damaging safety-relevant parts.

⇨ Remove the padlock **before** inserting the contactor truck in the switching-device compartment.

⇨ Release the latching rod (2). To do so, hold the latching rod by the handle (3) and move it in a semi-circular way as shown. Let the slip-on lever slip downwards. The shutter closes.

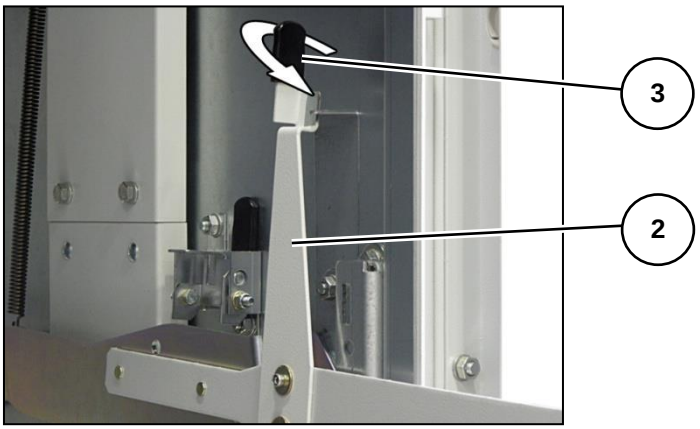


Fig. 548: Releasing the latching rod

⇨ Remove the slip-on lever.

⇨ Remove the padlock from the left side in the switching-device compartment and move the vertical interlocking lever downwards.

✓ The shutter to the connection compartment is closed.

23 Accessing the connection compartment through the front

INFORMATION

Read and understand these instructions before attempting operating works.

23.1 Preparations before accessing the connection compartment

DANGER

Electric shock

To perform any kind of activities inside or near the connection compartment of a panel, you must ensure that this compartment is safely isolated from supply. Without isolation from supply, the cables / bar connections in the connection compartment will be live at operational high-voltage.

- ⇨ Before removing the vertical partition inside the switching-device compartment of a panel, isolate and earth the cable / bar connections in the connection compartment.
- ⇨ Provide a warning on the high-voltage door to indicate activities in the connection compartment.
- ⇨ Observe the **Five Safety Rules**.
- ⇨ Verify safe isolation from supply.
- ⇨ Do **not** operate the feeder earthing switch during any activities inside or near the connection compartment.

INFORMATION

Hereafter, the disassembly of those parts is described, which are later assembled again at the same place.

- ⇨ Store disassembled parts and connecting elements carefully and keep them ready for later reuse.

Preconditions

- If a withdrawable part / switching-device truck is inserted in the switching-device compartment:
  - High-voltage door closed
  - Withdrawable part / switching-device truck in test position
  - Feeder earthing switch in CLOSED position

Procedure

⇨ Verify that the position indicator of the feeder earthing switch on the high-voltage door shows the vertical **I** position.

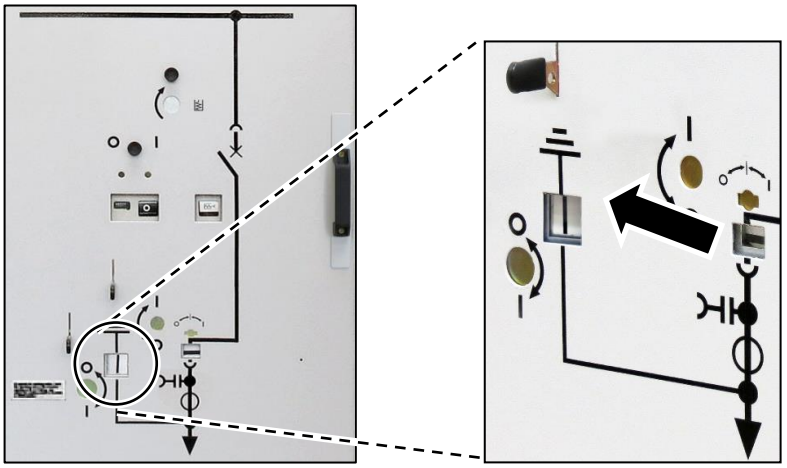


Fig. 549: All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel: Position indicator of feeder earthing switch on high-voltage door

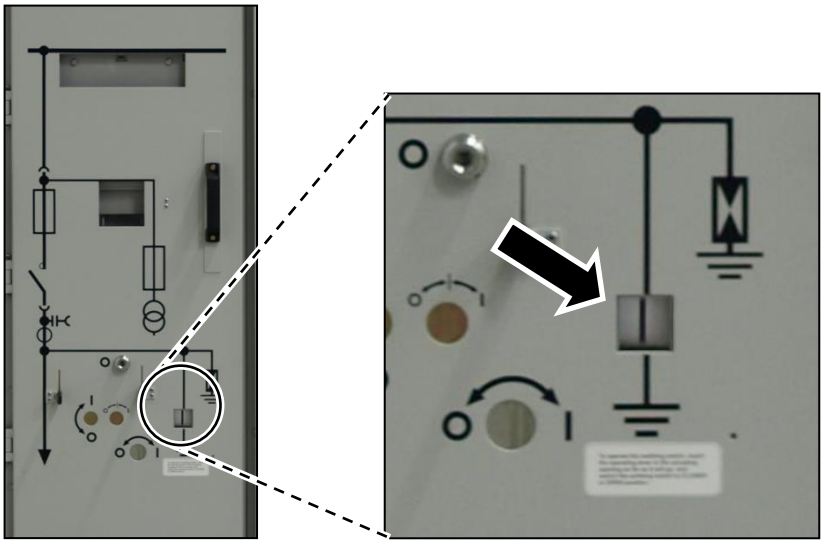


Fig. 550: Contactor panels with panel width 435 mm only: Position indicator of feeder earthing switch on high-voltage door

⇨ Open the high-voltage door.

⇨ Take the withdrawable part / switching-device truck out of the panel.

INFORMATION

Position indicator of the feeder earthing switch

An additional position indicator of the feeder earthing switch is visible inside the switching-device compartment. The feeder earthing switch is earthed, if the additional position indicator points to the vertical **I** symbol.

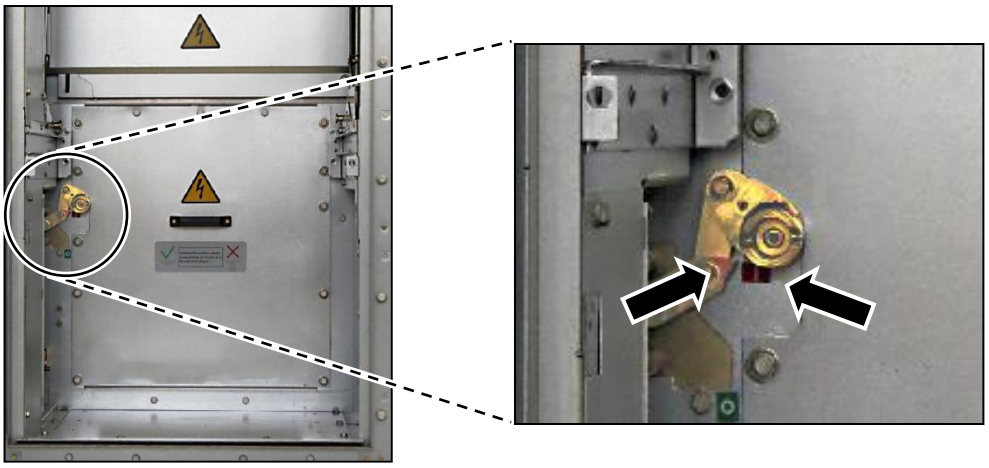


Fig. 551: All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel: Additional position indicator of the feeder earthing switch inside the switching-device compartment

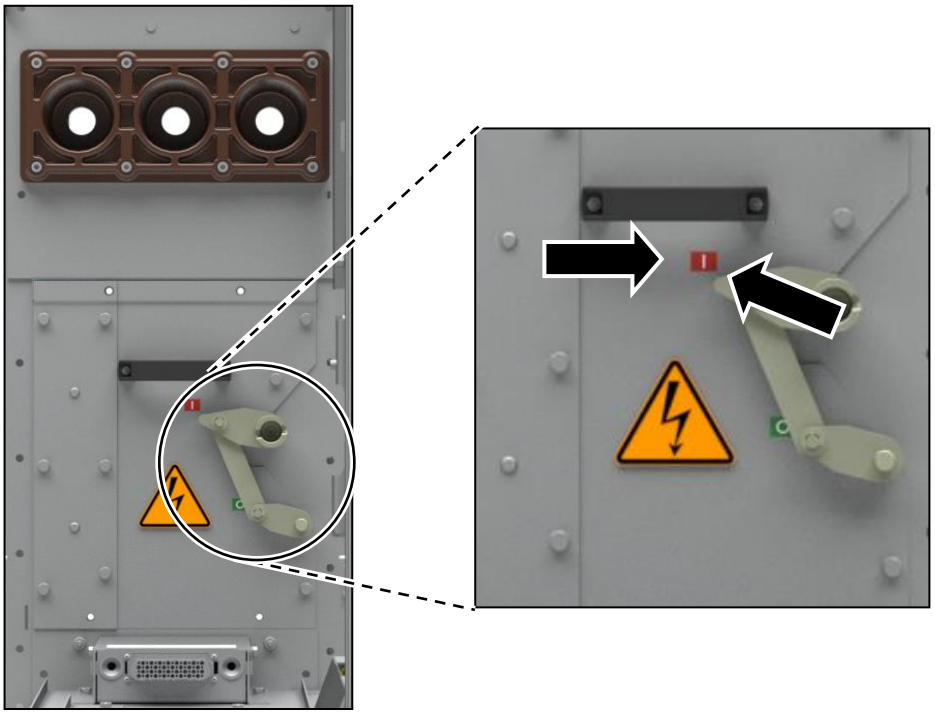


Fig. 552: Contactor panels with panel width 435 mm only:
Additional position indicator of the feeder earthing switch inside the switching-device compartment

Switch-disconnector panel only:

⚠ WARNING

Electric shock

To perform any kind of activities inside or near the switching-device / connection compartment of a switch-disconnector panel, you must ensure that the shutter mechanism of the busbar compartment is closed.

⇨ **Do not** open the high-voltage door with the shutter mechanism of the busbar compartment open.

Switch-disconnector panel is the modular type and has two compartments. There is a direct access to the cable terminals without vertical partition. When the high voltage door is opened, switching-device / connection compartment is accessible.

⇨ Verify that the position indicator of the feeder earthing switch on the high-voltage door shows the vertical **I** position.

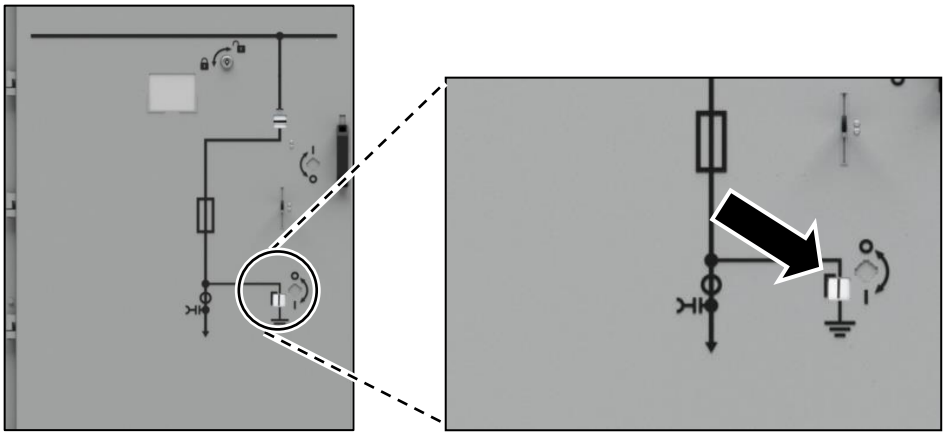


Fig. 553: Switch-disconnector panel only: Position indicator of feeder earthing switch on high-voltage door

⇨ Open the high-voltage door, see chapter 18.4.

Fig. 554: Switch-disconnector panel only: Switching-device / connection compartment accessible

23.2 Accessing the connection compartment through the switching-device compartment

⚠ WARNING

Reduced safety

The closed connection compartment is an important safety element of the switchgear. The connection compartment is exclusively opened for performing operational activities inside the connection compartment.

Always install the partition between the connection compartment and the switching-device compartment:

⇨ If an activity inside the connection compartment is interrupted.

⇨ Immediately after an activity inside the connection compartment was completed.

⚠ CAUTION

Sharp edges

The metal parts of the vertical partition may have sharp edges.

⇨ Put on personal protective equipment.

Preconditions

- Preparations as described in chapter 23.1 completed

Procedure

Panel versions with withdrawable circuit-breaker / circuit-breaker truck or withdrawable disconnector / disconnector truck only:

⇨ Remove the connecting elements (2) from the protection plate (1), and store it:
- 4 nuts M8 with contact washers

⇨ Remove the protection plate (1) and store it.

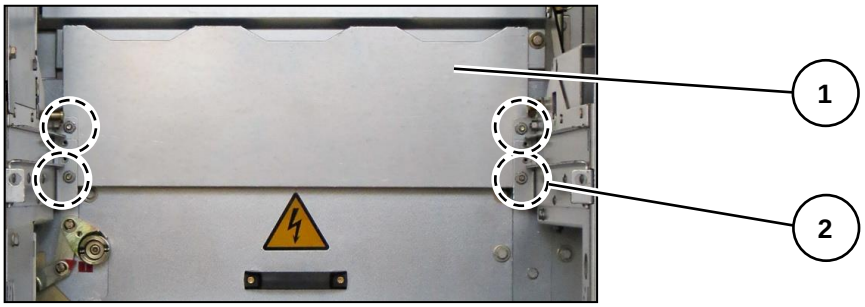


Fig. 555: 4 bolted joints on protection plate

Removing the partition, all panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel

⇨ Remove the connecting elements from the partition to the connection compartment (3), and store them:

All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel:

- 10 bolts M8x20 with contact washers and plain washers (4)
- 5 bolts M8x20 with contact washers (5)

⇨ Remove the partition (3), and store it.

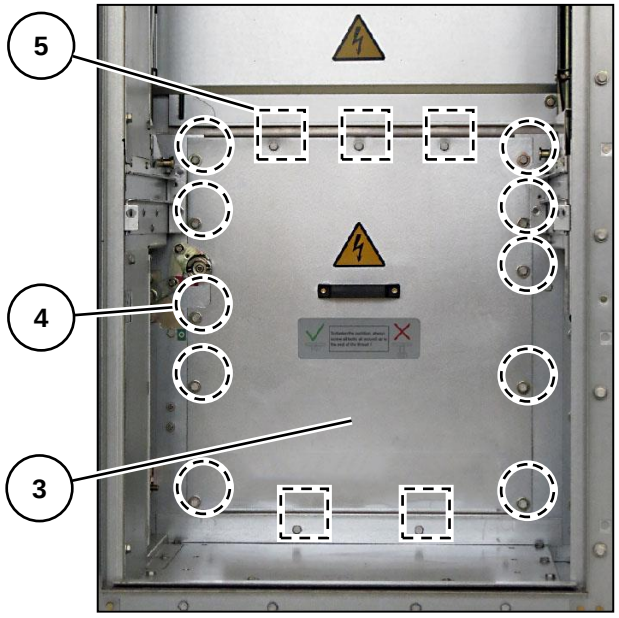


Fig. 556: All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel: 15 bolted joints on partition

Removing the partition, for contactor panels with panel width 435 mm without heater

⇨ Remove the connecting elements (1) from the left part of the partition (2) to the connection compartment, and store them:

- 7 bolts M8x20 with contact washers (1)

⇨ Remove the left part of the partition (2), and store it

⇨ Remove the connecting elements (4) from the right part of the partition (3) to the connection compartment and store them:

- 4 bolts M8x16 with contact washers (4)

⇨ Remove the right part of the partition (3), and store it.

Accessing the connection compartment through the front

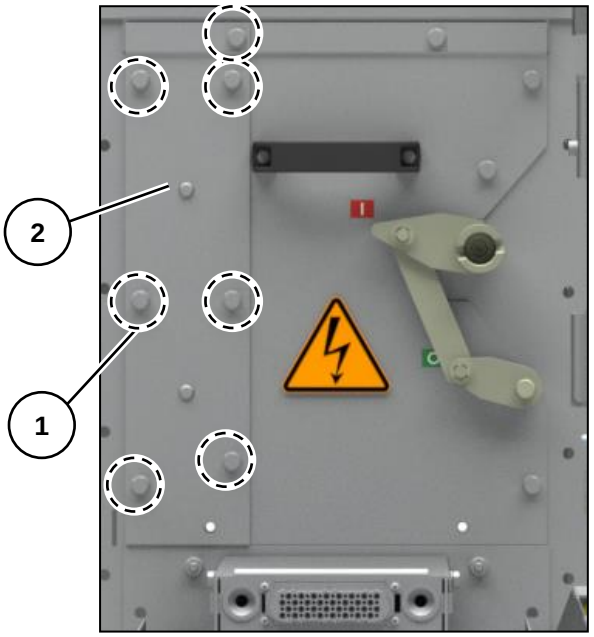


Fig. 557: Left part of partition (2)

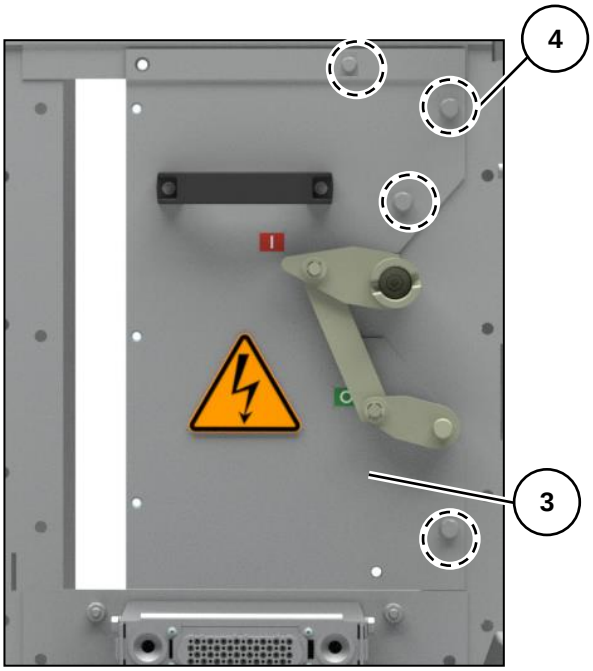


Fig. 558: Right part of partition (3)

Fig. 559: Partition removed

Removing the partition, for contactor panels with panel width 435 mm with heater (optional)

⚠ CAUTION

Burns

The heater and its protective cover can be hot. Touching hot heater may cause burns.

- ⇨ Put on personal protective equipment.
- ⇨ Switch off the heater before touching the protective cover and let the hot heater cool down.

⇨ Remove the connecting elements (2) from the heater (1), and store them:
- 2 nuts M8 with contact washers and plain washers (2)

⇨ Install the heater (1) into the available side of the switching-device compartment.

⇨ Remove the connecting elements (4) from the heater support (3), and store them:
- 2 bolts M8x20 with contact washers (4)

⇨ Install the heater support (3) into the available side of the switching-device compartment.

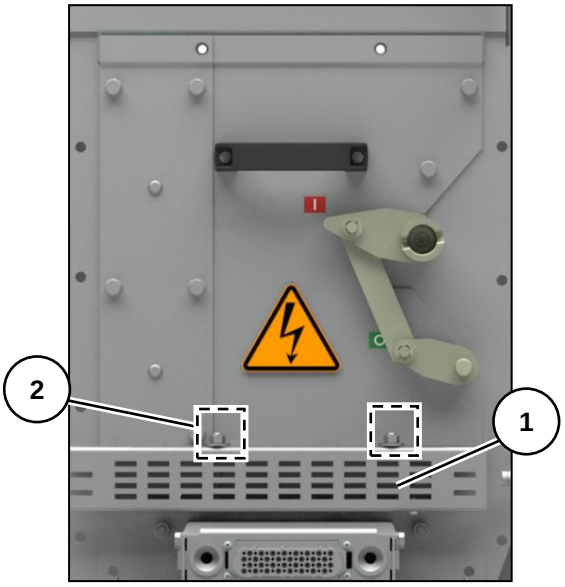


Fig. 560: Contactor panels with panel width 435 mm only: 2 bolted joints on the heater

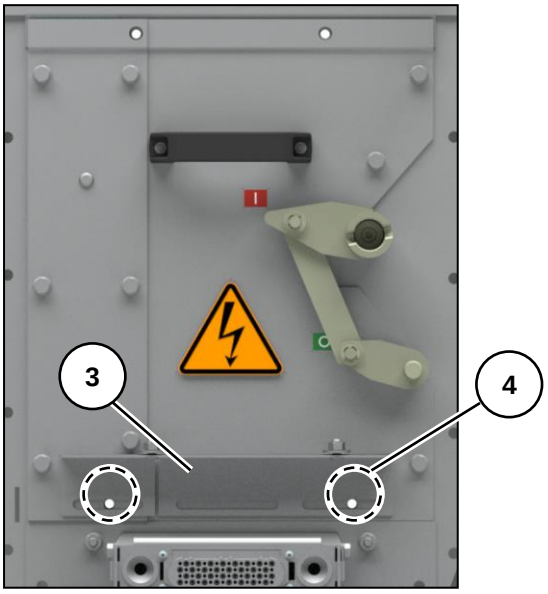


Fig. 561: Contactor panels with panel width 435 mm only: 2 bolted joints on the heater support

⇨ Remove the connecting elements (6) from the left part of the partition (5) to the connection compartment and store them:
- 7 bolts M8x20 with contact washers (6)

⇨ Remove the left part of the partition (5), and store it

⇨ Remove the connecting elements (8) from the right part of the partition (7) to the connection compartment and store them:
- 4 bolts M8x16 with contact washers (8)

⇨ Remove the right part of the partition (7), and store it.

Accessing the connection compartment through the front

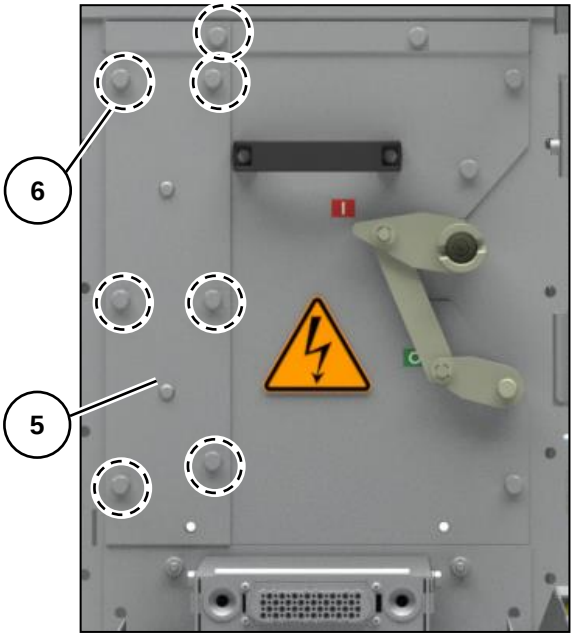


Fig. 562: Left part of partition (5)

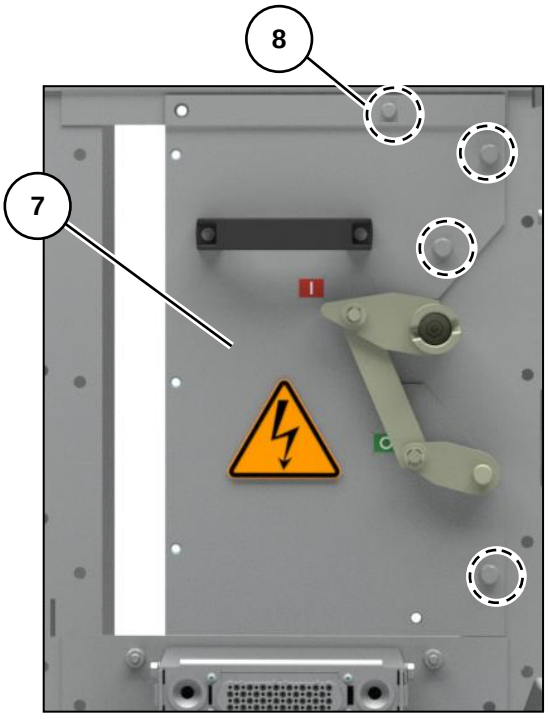


Fig. 563: Right part of partition (7)

Fig. 564: Partition removed

✓ Access to the connection compartment through the panel front is given.

INFORMATION

Final procedure steps

⇨ Immediately proceed to perform the intended checks and works in the connection compartment.

23.3 Installing the vertical partition in the switching-device compartment

⚠ DANGER

Electric shock

To perform any kind of activities inside or near the connection compartment of a panel, you must ensure that this compartment is safely isolated from supply. Without isolation from supply, the cables / bar connections in the connection compartment will be live at operational high-voltage.

⇨ Observe the **Five Safety Rules**.

⇨ Verify safe isolation from supply.

⇨ Do **not** operate the feeder earthing switch during any activities inside or near the connection compartment.

⚠ CAUTION

Sharp edges

The metal parts of the vertical partition may have sharp edges.

⇨ Put on personal protective equipment.

NOTICE

Danger due to damages

Possible malfunctioning and switchgear damage caused by foreign objects:

⇨ Remove all foreign objects from the connection compartment, for example:

- Tools
- Unused installation material
- Packing material
- Cleaning material

NOTICE

Cleaning

Possible malfunctioning and damage to the panels caused by pollution.

Before closing the connection compartment:

⇨ Clean polluted areas in the connection compartment. To do this, use a vacuum cleaner and a lint-free cloth. If necessary, moisten the cloth, use a mild household cleaner, and dry properly at the end.

⇨ Some parts and surfaces of the switchgear are greased for functioning. Do not remove the grease there; do not clean the parts and surfaces.

⇨ If greased areas are dirty, clean the dirty area and grease again according to the maintenance instructions.

NOTICE

Damages inside the switching-device compartment

Damages inside the switching-device compartment due to incorrect or incomplete installation of the partition.

⇨ To fasten the partition, always assemble all bolted joints of the partition all around, and screw them in up to the end of the thread.

All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel:
In addition to these instructions, an instruction label on the vertical partition informs about safe fastening of the partition:

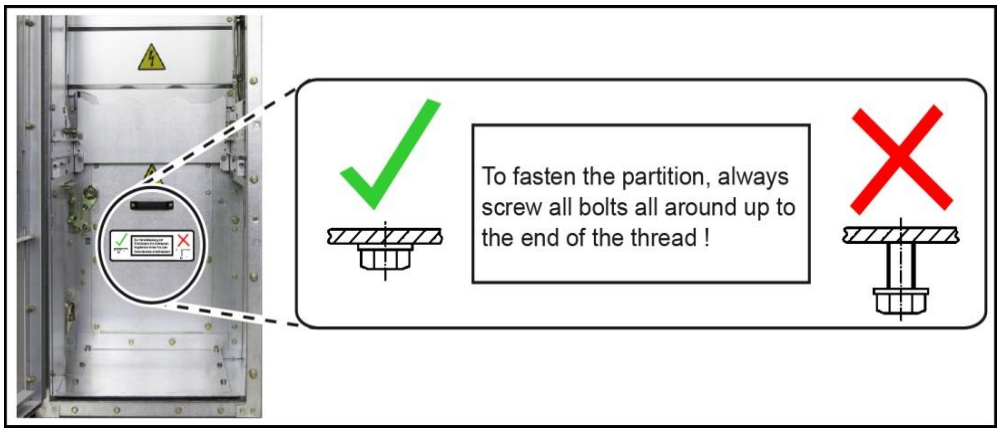


Fig. 565: All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel: Instruction label on the vertical partition

Preconditions

- Feeder earthing switch in CLOSED position
- High-voltage door open
- Low-voltage connector stowed away

- Panel versions with withdrawable circuit-breaker / circuit-breaker truck or withdrawable disconnector / disconnector truck only:
  - Protection plate available
  - Connecting elements available: 4 nuts size M8

- All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel:
  - Partition available
  - Connecting elements available:
    - 10 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093
    - 5 bolts M8x20 with contact washers

- Contactor panels with 435 mm width only:
  - Partition available
  - Connecting elements available:
    - 7 bolts M8x20 with contact washers for left part of partition
    - 4 bolts M8x16 with contact washers for right part of partition

Procedure

All panel versions except for contactor panels with panel width 435 mm:

⇨ Install the partition (1) between the connection compartment and the switching-device compartment.

⇨ To fix the partition (1), tighten the bolts all around hand-tight:
All panel versions except for contactor panels with panel width 435 mm:

- 10 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093 (2)
- 5 bolts M8x20 with contact washers (3)

⇨ Tighten the fixing bolts all around with a tightening torque of 25 Nm.

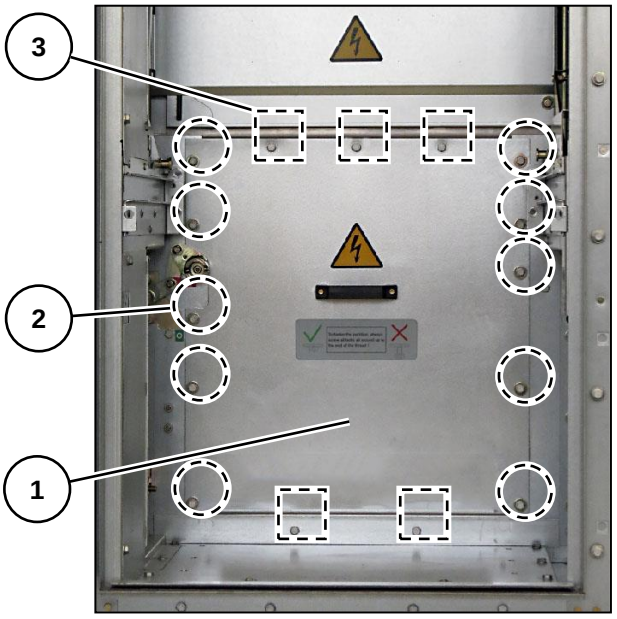


Fig. 566: All panel versions except for contactor panels with panel width 435 mm: 15 bolted joints on partition

Accessing the connection compartment through the front

Contactor panels with panel width 435 mm without heater

⇨ Install the right part of the partition (1) between the connection compartment and the switching-device compartment.

Fix the right part of the partition (1), tighten the bolts all around hand-tight:

- 4 bolts M8x16 with contact washers (2)

⇨ Install the left part of the partition (3) between the connection compartment and the switching-device compartment.

Fix the left part of the partition (3), tighten the bolts all around hand-tight:

- 7 bolts M8x20 with contact washers (4)

⇨ Tighten the fixing bolts all around with a tightening torque of 25 Nm.

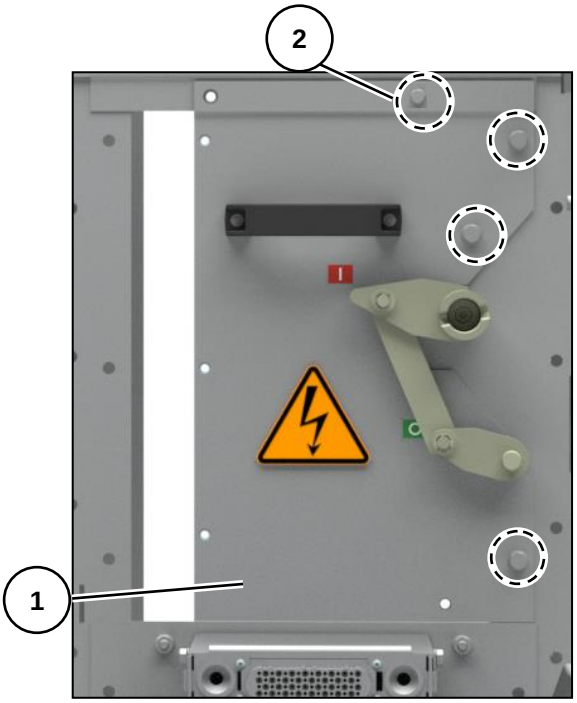


Fig. 567: Right part of partition (1)

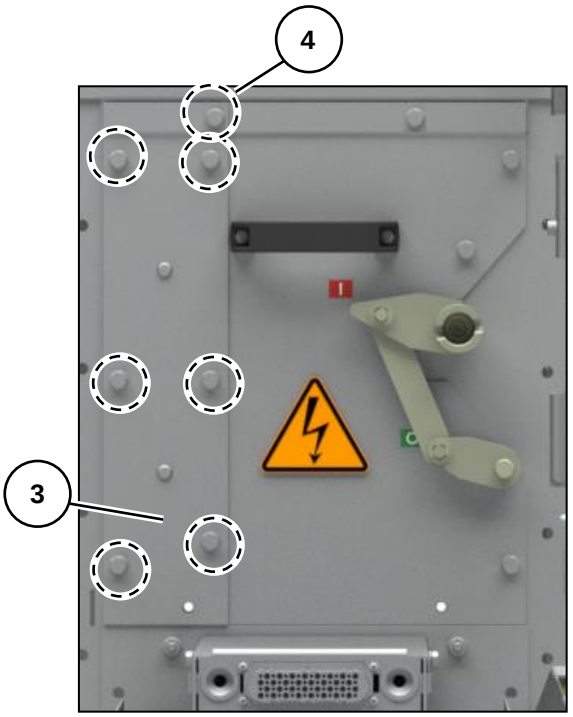


Fig. 568: Left part of partition (3)

Contactor panels with panel width 435 mm with heater (optional)

⇨ Install the right part of the partition (1) between the connection compartment and the switching-device compartment.

Fix the right part of the partition (1), tighten the bolts all around hand-tight:

- 4 bolts M8x16 with contact washers (2)

⇨ Install the left part of the partition (3) between the connection compartment and switching-device compartment.

Fix the left part of the partition (3), tighten the bolts all around hand-tight:

- 7 bolts M8x20 with contact washers (4)

⇨ Tighten the fixing bolts all around with a tightening torque of 25 Nm.

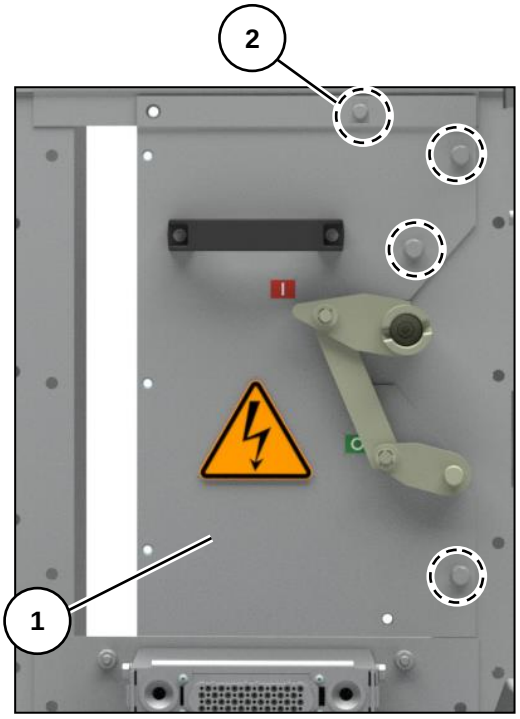


Fig. 569: Right part of partition (1)

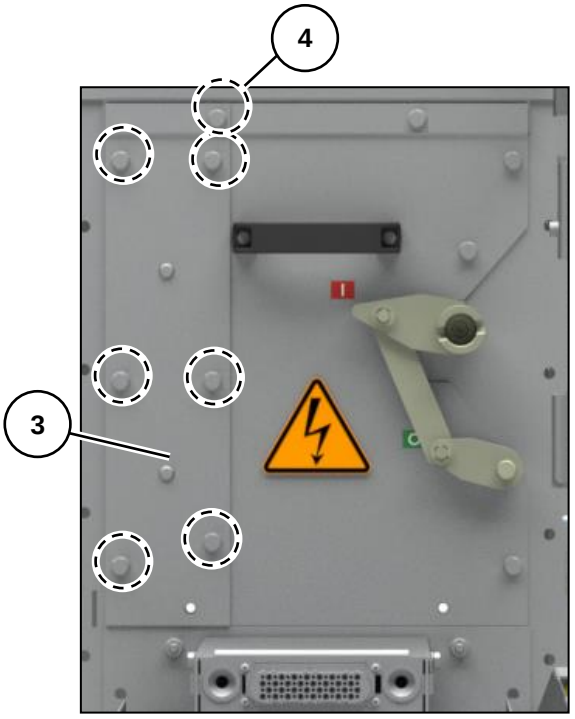


Fig. 570: Left part of partition (3)

⇨ Install the heater support (5).

Fix the heater support (5) by screwing the nuts (6) hand-tight:

- 2 bolts M8x20 (6)

⇨ Tighten the fixing bolts all around with a tightening torque of 25 Nm.

⇨ Install the heater (7).

Fix the heater (7) by screwing the nuts (8) hand-tight:

- 2 nuts M8 (8)

⇨ Tighten the fixing nuts (8) with a tightening torque of 25 Nm.

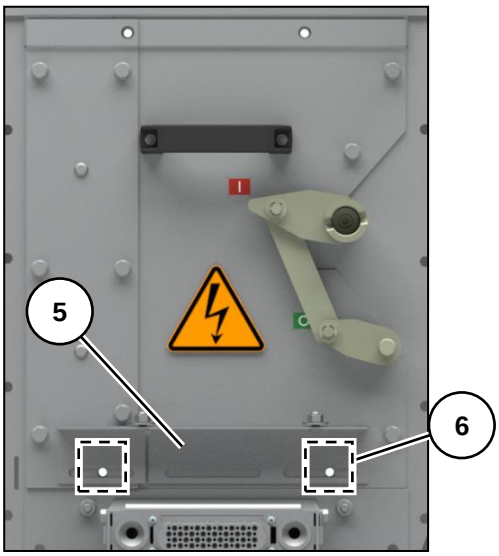


Fig. 571: 2 bolted joints on the heater support

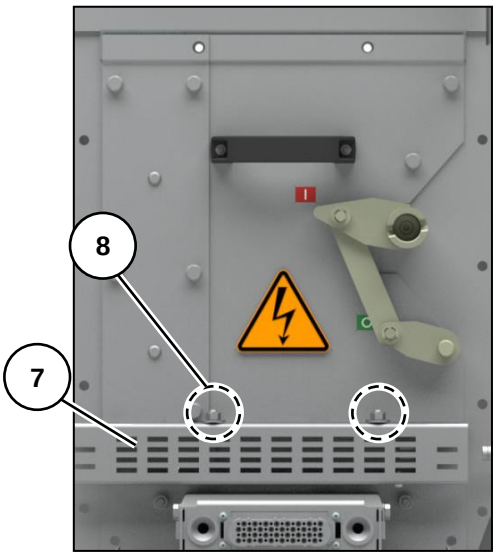


Fig. 572: 2 bolted joints on the heater

INFORMATION

Final procedure step

⇨ Do not forget to switch on the heater after the installation.

Panel versions with withdrawable circuit-breaker / circuit-breaker truck or withdrawable disconnector / disconnector truck only:

⇨ Install the protection plate of the switching-device compartment (9).

⇨ To fix the protection plate of the switching-device compartment (9), tighten the nuts (10) hand-tight.

- 4 nuts M8 with contact washers

⇨ Tighten the fixing bolts (10) with a tightening torque of 25 Nm.

Fig. 573: 4 bolted joints on protection plate of switching-device compartment

✓ The partition between the connection compartment and the switching-device compartment is installed.

INFORMATION

Final procedure steps

Now the panel can be integrated into the course of operation again, for example:

⇨ Inserting a withdrawable part / switching-device truck in the panel.

⇨ Closing the high-voltage door.

⇨ De-earthing the feeder.

⇨ Racking the withdrawable part / switching-device truck to service position.

23.4 Accessing the connection compartment through the switching-device compartment at panel versions with ventilation system type I

⚠ WARNING

Reduced safety

The closed connection compartment is an important safety element of the switchgear. The connection compartment is exclusively opened for performing operational activities inside the connection compartment.

Always install the partition between the connection compartment and the switching-device compartment:

⇨ If an activity inside the connection compartment is interrupted.

⇨ Immediately after an activity inside the connection compartment was completed.

⚠ CAUTION

Sharp edges

The metal parts of the ventilation duct and the vertical partition may have sharp edges.

⇨ Put on personal protective equipment.

⚠ CAUTION

High weight

The ventilation duct is heavy.

⇨ Remove the ventilation duct absolutely with 2 persons.

⇨ Put on personal protective equipment.

Preconditions

- Preparations as described in chapter 23.1 completed

Fig. 574: Panel prepared

Procedure

⇨ To detach the holder of the air guide, loosen the lower bolt (2) size M8, and Remove the upper bolt (1) size M8, and store it. Proceed in the same way on the other side.

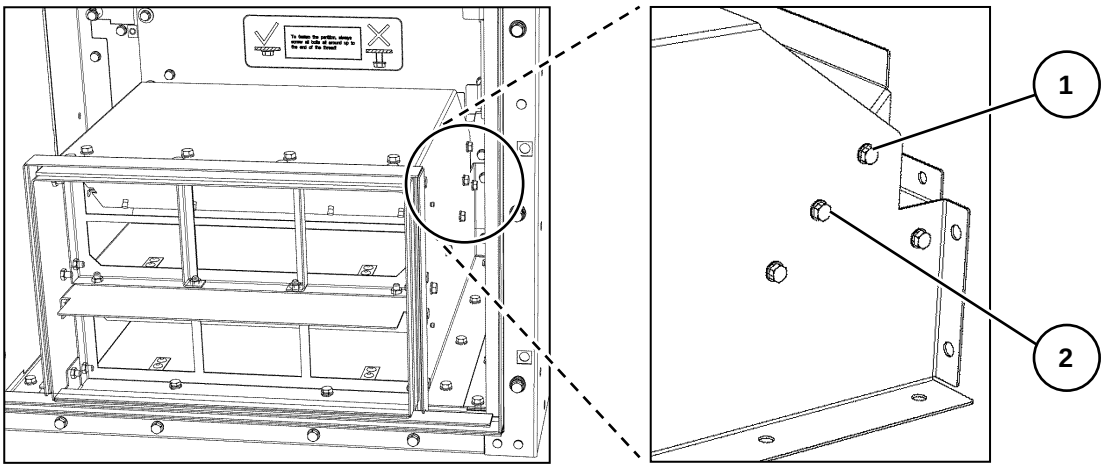


Fig. 575: Bolts for detaching the holder

⇨ Fold the air guide upwards.

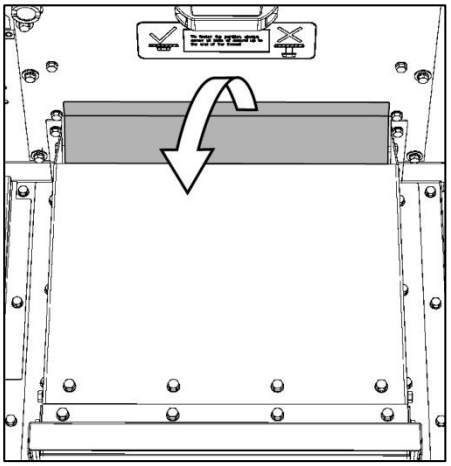


Fig. 576: Folding the air guide upwards

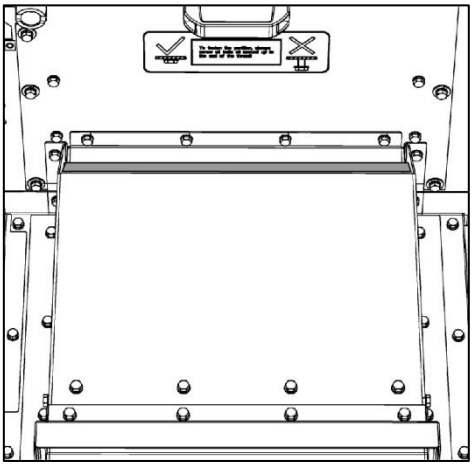


Fig. 577: Air guide folded upwards

⇨ Remove the upper bolts size M8 from the vertical partition, and store them.

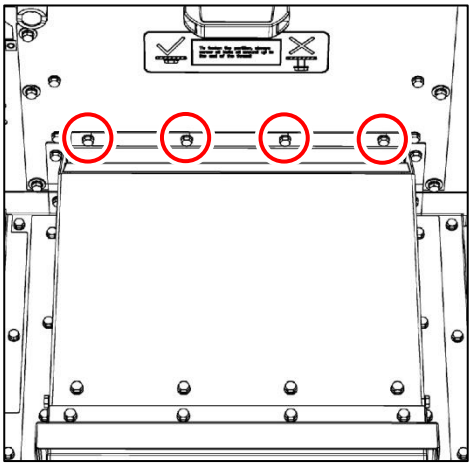


Fig. 578: 4 bolted joints on partition

⇨ Remove the lateral bolts size M8 from the vertical partition and the base frame, and store them. Proceed in the same way on the other side.

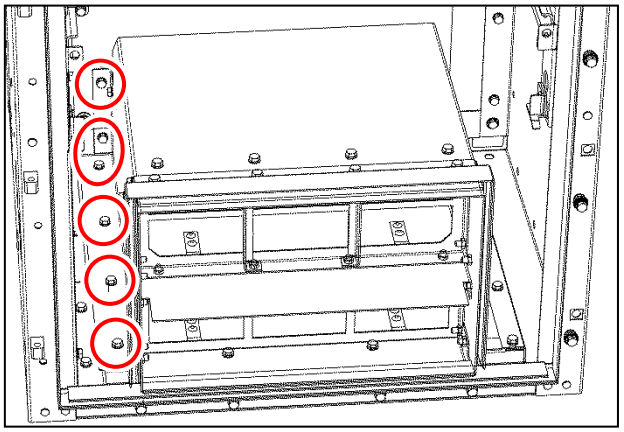


Fig. 579: 6 bolted joints fixed laterally on base frame and partition

⇨ Remove the front bolts size M8 from the base frame, and store them.

⇨ To get the ventilation duct over the door threshold, lift it approx. 2 cm. Pull it out of the panel, and store it.

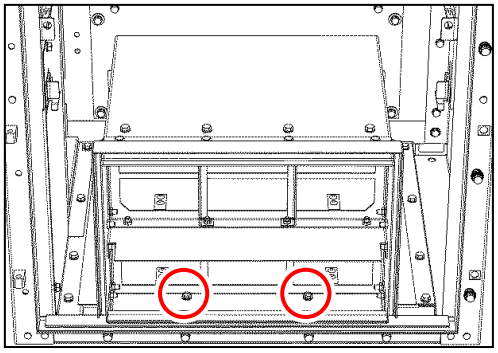


Fig. 580: 2 bolted joints on the base frame front

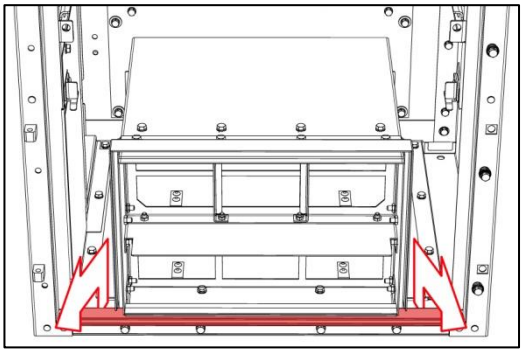


Fig. 581: Lifting and pulling

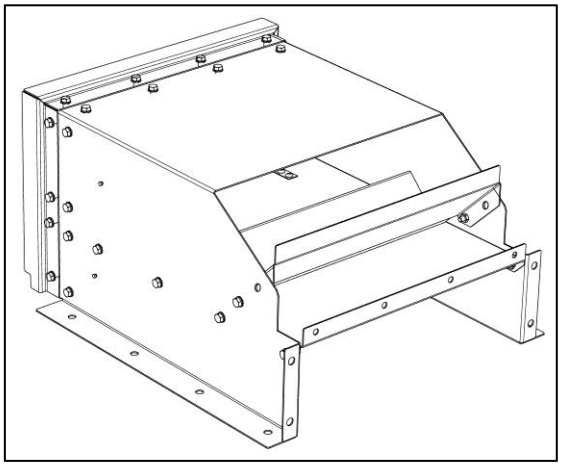


Fig. 582: Removed ventilation duct

Fig. 583: Switching-device compartment without ventilation duct

⇨ Make sure not to dent the links on the panel base while performing any further removal and installation work.

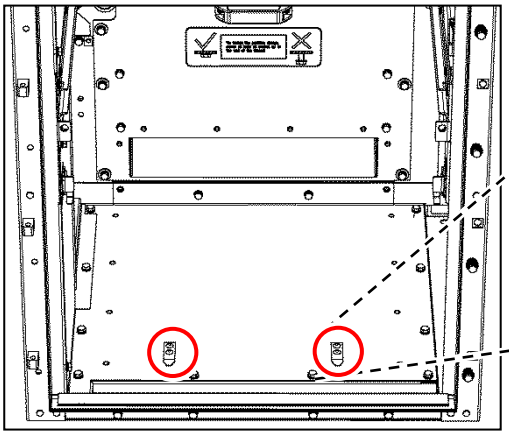


Fig. 584: 2 links on panel base

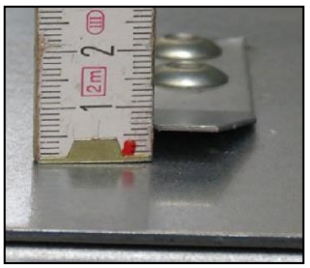


Fig. 585: Link bent in correct position

⇨ Remove the connecting elements (2) from the protection plate (1), and store it:

- 4 nuts M8 with contact washers

⇨ Remove the protection plate (1), and store it.

Fig. 586: 4 bolted joints on protection plate

⇨ Remove the connecting elements from the partition to the connection compartment (3) inside the switching-device compartment, and store it:

- 10 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093 (4)
- 5 bolts M8x20 with contact washers (5)

⇨ Remove the partition (3), and store it.

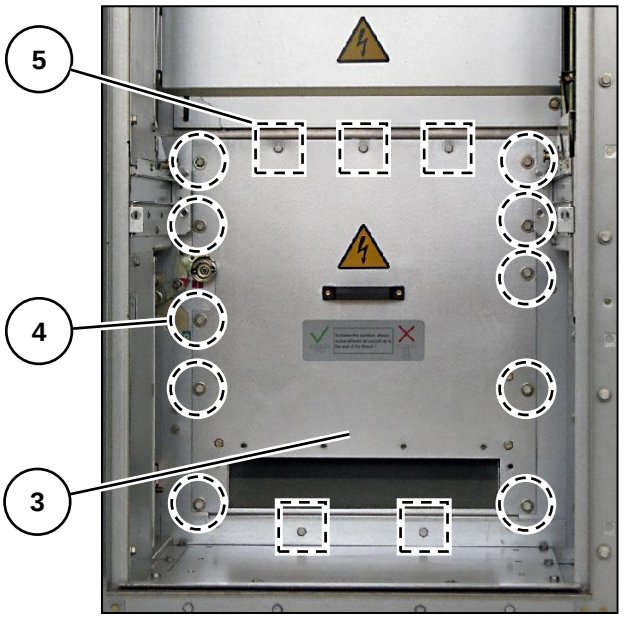


Fig. 587: 15 bolted joints on partition

⇨ If required, immediately bend dented links back into the correct position.

✓ Access to the connection compartment through the panel front is given.

23.5 Installing the vertical partition and the ventilation duct type I in the switching-device compartment

⚠ DANGER

Electric shock

To perform any kind of activities inside or near the connection compartment of a panel, you must ensure that this compartment is safely isolated from supply. Without isolation from supply, the cables / bar connections in the connection compartment will be live at operational high-voltage.

⇨ Observe the **Five Safety Rules**.

⇨ Verify safe isolation from supply.

⇨ Do **not** operate the feeder earthing switch during any activities inside or near the connection compartment.

⚠ CAUTION

Sharp edges

The metal parts of the ventilation duct and the vertical partition may have sharp edges.

⇨ Put on personal protective equipment.

NOTICE

Danger due to damages

Possible malfunctioning and switchgear damage caused by foreign objects:

⇨ Remove all foreign objects from the connection compartment, for example:

- Tools
- Unused installation material
- Packing material
- Cleaning material

NOTICE

Cleaning

Possible malfunctioning and damage to the panels caused by pollution.

Before closing the connection compartment:

⇨ Clean polluted areas in the connection compartment. To do this, use a vacuum cleaner and a lint-free cloth. If necessary, moisten the cloth, use a mild household cleaner, and dry properly at the end.

⇨ Some parts and surfaces of the switchgear are greased for functioning. Do not remove the grease there; do not clean the parts and surfaces.

⇨ If greased areas are dirty, clean the dirty area and grease again according to the maintenance instructions.

NOTICE

Damages inside the switching-device compartment

Damages inside the switching-device compartment due to incorrect or incomplete installation of the partition.

⇨ To fasten the partition, always assemble all bolted joints of the partition all around, and screw them in up to the end of the thread.

In addition to these instructions, an instruction label on the vertical partition informs about safe fastening of the partition:

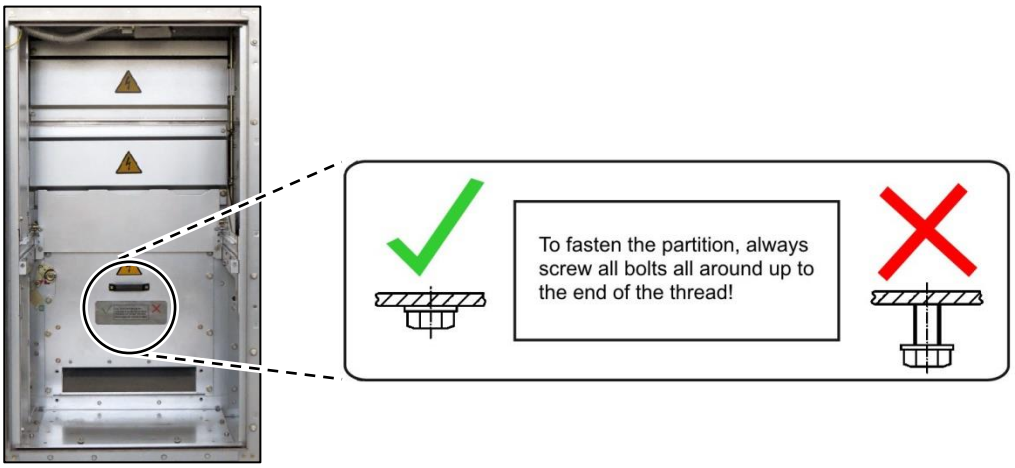


Fig. 588: Instruction label on the vertical partition

Preconditions

- Feeder earthing switch in CLOSED position
- High-voltage door open
- Low-voltage connector stowed away
  Protection plate and associated connecting elements available:
  - 4 nuts M8 with contact washers
- Vertical partition and associated connecting elements available:
  - 10 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093
  - 5 bolts M8x20 with contact washers
- Ventilation duct and associated connecting elements available:
  - 20 bolts M8

Accessing the connection compartment through the front

Procedure

⇨ Install the partition (1) between the connection compartment and the switching-device compartment.

⇨ To fix the partition (1), tighten the bolts all around hand-tight:

- 10 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093 (2)
- 5 bolts M8x20 (3)

⇨ Tighten the fixing bolts all around with a tightening torque of 25 Nm.

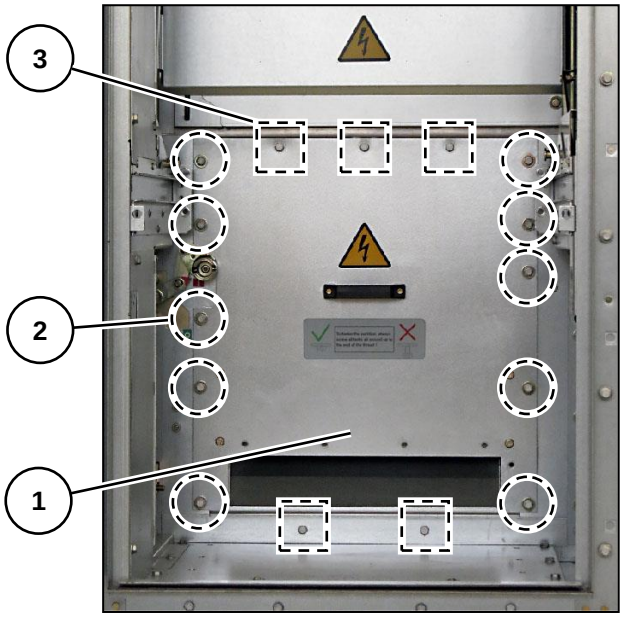


Fig. 589: 15 bolted joints on partition

⇨ Install the protection plate of the switching-device compartment (4) in the switching-device compartment.

⇨ To fix the protection plate of the switching-device compartment (4), tighten the nuts (5) hand-tight.

- 4 nuts M8 with contact washers

⇨ Tighten the fixing nuts (5) with a tightening torque of 25 Nm.

Fig. 590: 4 bolted joints on protection plate of switching-device compartment

⇨ If required, bend dented links back into the correct position before installing the ventilation duct.

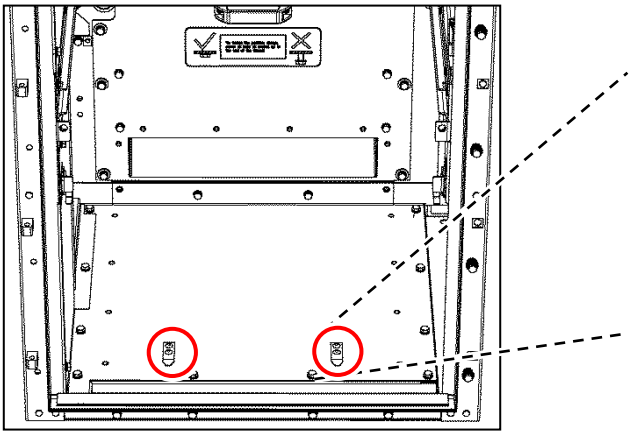


Fig. 591: 2 links on panel base

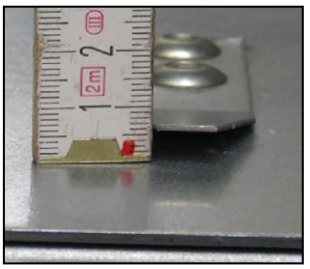
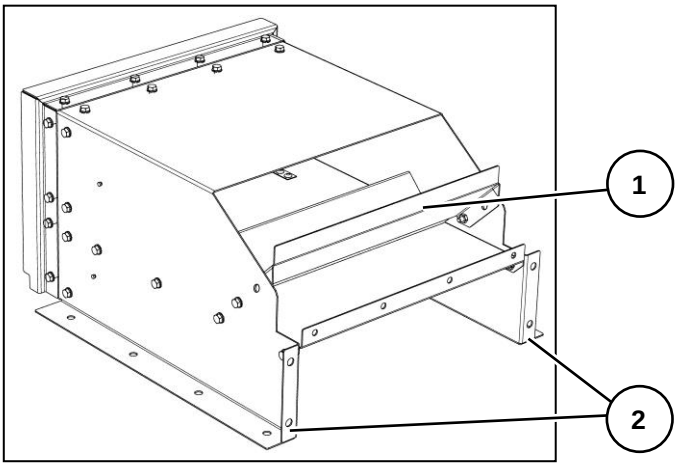


Fig. 592: Link bent in correct position

⇨ Make sure that the air guide (1) of the ventilation duct is folded upwards.



(1) Air guide folded upwards

(2) Bottom side

Fig. 593: Ventilation duct with air guide folded upwards

⇨ Set the ventilation duct down centrally on the base frame of the panel. The side of the ventilation duct to which the air guide is fixed must adjoin to the vertical partition.

Fig. 594: Ventilation duct placed centrally on panel base frame

⇨ Tighten the front bolts at the base frame hand-tight. Tighten the bolts with a tightening torque of 25 Nm.

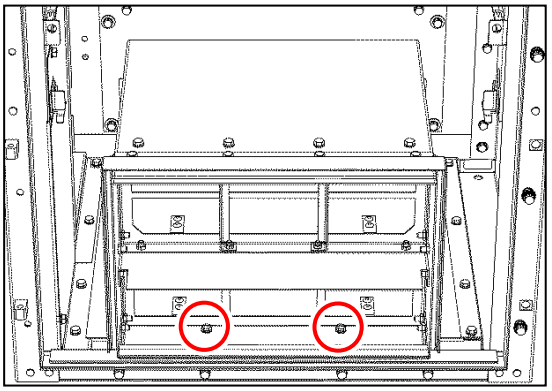


Fig. 595: 2 bolted joints on base frame front

⇨ Tighten the lateral bolts M8x20 at the vertical partition and the base frame hand-tight. Tighten the bolts with a tightening torque of 25 Nm. Proceed in the same way on the other side.

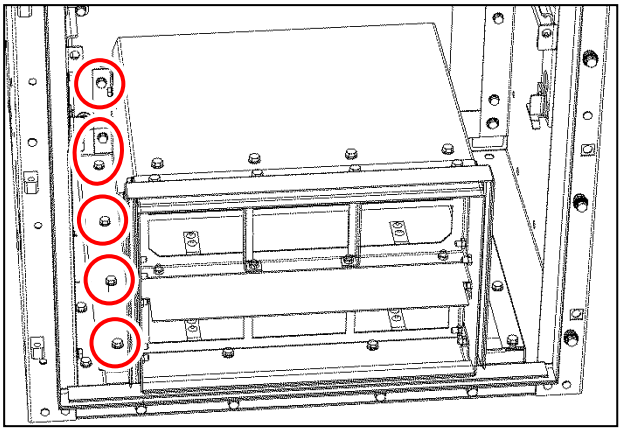


Fig. 596: 6 bolted joints fixed laterally on base frame and partition

⇨ Tighten the upper bolts M8x20 at the vertical partition hand-tight. Tighten the bolts with a tightening torque of 25 Nm.

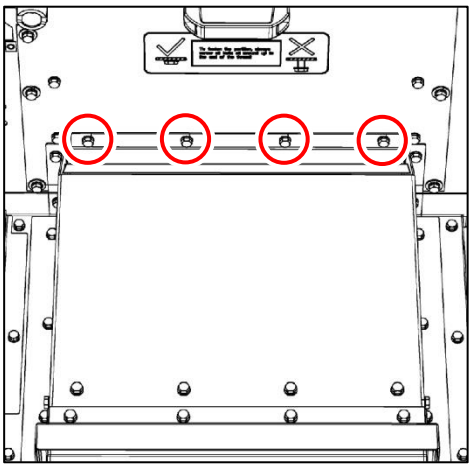


Fig. 597: 4 bolted joints on partition

⇨ Fold the air guide downwards.

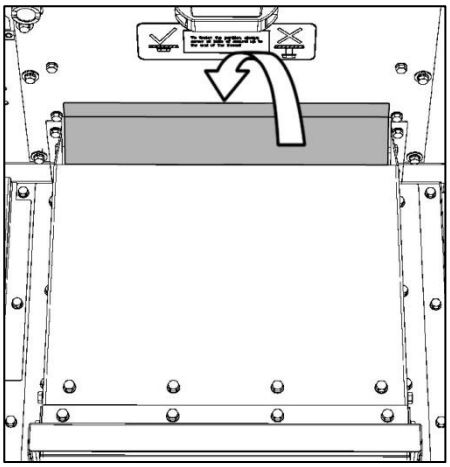


Fig. 598: Folding the air guide downwards

⇨ Fix the holder of the air guide by screwing the 2 bolts M8 hand-tight. Tighten the bolts with a tightening torque of 25 Nm. Proceed in the same way on the other side.

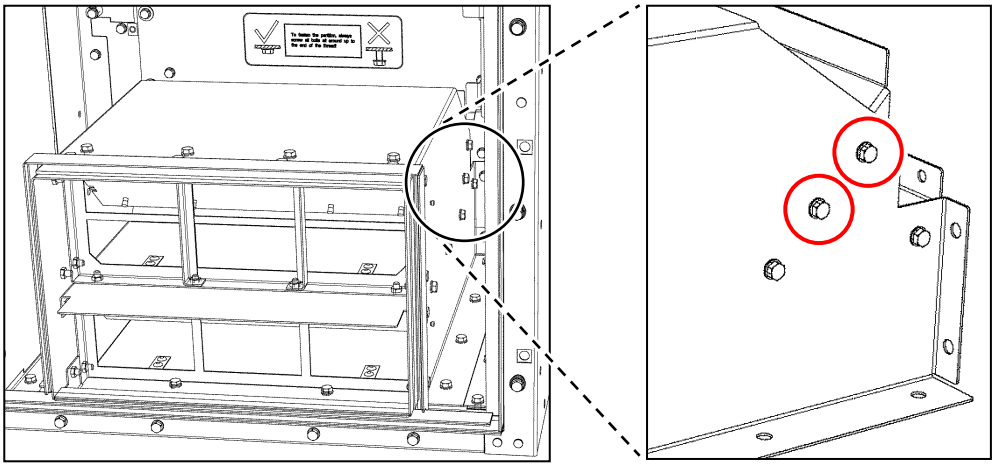


Fig. 599: Bolts for fixing the air guide

✓ The vertical partition and the ventilation duct are installed.

INFORMATION

Final procedure steps

Now the panel can be integrated into the course of operation again, for example:

- ⇨ Inserting a withdrawable part / switching-device truck in the panel.
- ⇨ Closing the high-voltage door.
- ⇨ De-earthing the feeder.
- ⇨ Racking the withdrawable part / switching-device truck to service position.

23.6 Accessing the connection compartment through the switching-device compartment at panel versions with ventilation system type II

⚠ WARNING

Reduced safety

The closed connection compartment is an important safety element of the switchgear. The connection compartment is exclusively opened for performing operational activities inside the connection compartment.

Close the high-voltage door:

⇨ If an activity inside the connection compartment is interrupted.

⇨ Immediately after an activity inside the connection compartment was completed.

⚠ CAUTION

Sharp edges

The metal parts of the ventilation duct and the vertical partition may have sharp edges.

⇨ Put on personal protective equipment.

⚠ CAUTION

High weight

The ventilation duct is heavy.

⇨ Remove the ventilation duct absolutely with 2 persons.

⇨ Put on personal protective equipment.

NOTICE

Damages to the ventilation duct

Loosening certain bolted joints could damage the ventilation duct.

⇨ When disassembling the ventilation duct, proceed exactly as described hereafter. Do **not** loosen any bolted joints other than those described.

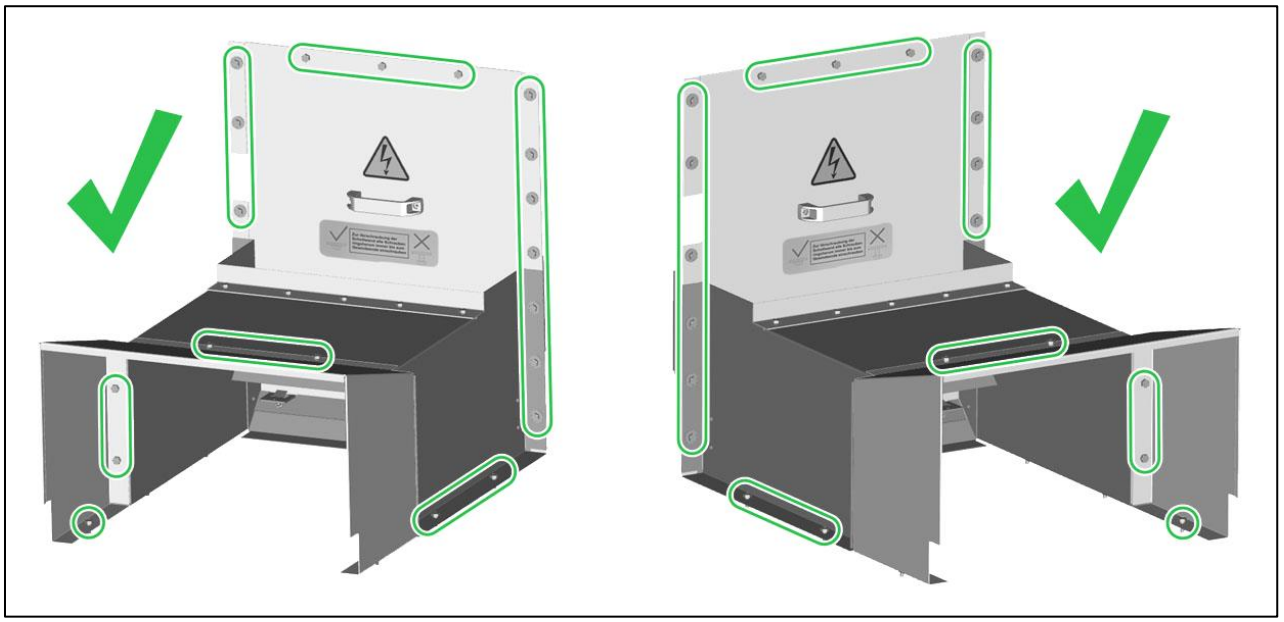


Fig. 600: Bolted joints to be loosened

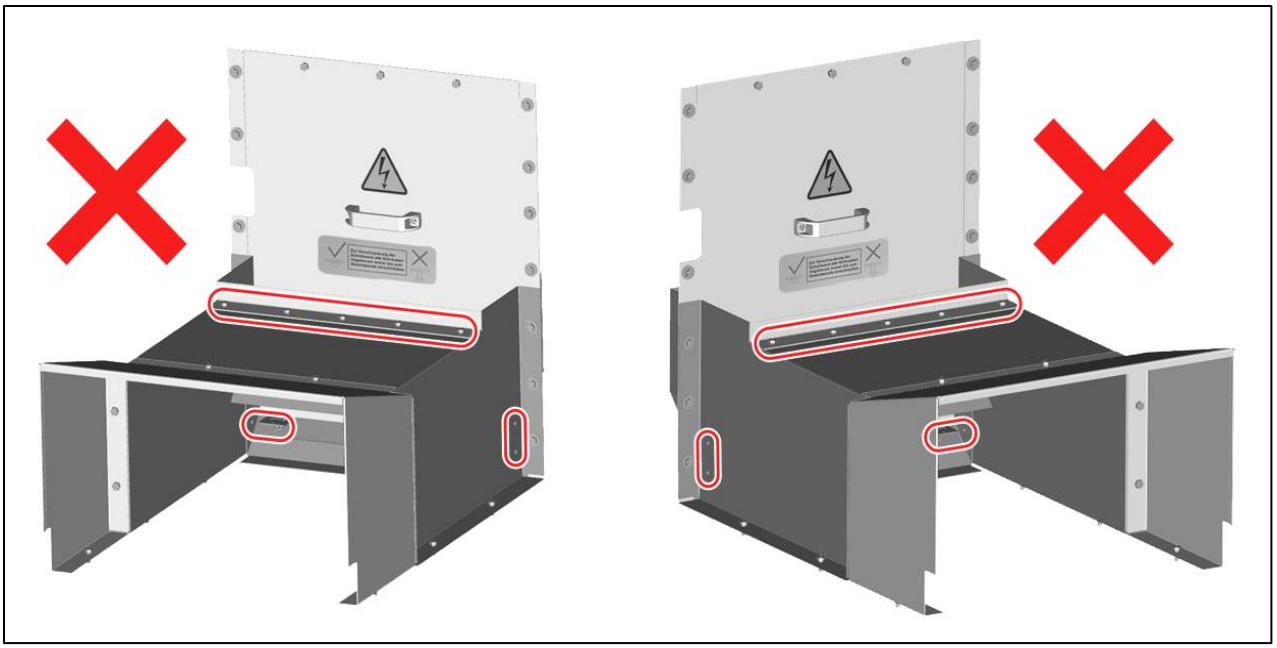


Fig. 601: Bolted joints not to be loosened

Accessing the connection compartment through the front

Preconditions

- Preparations as described in chapter 23.1 completed

Fig. 602: Panel prepared

Procedure

⇨ Remove the connecting elements (2) from the protection plate (1), and store it:
- 4 nuts M8 with contact washers

⇨ Remove the protection plate (1), and store it.

Fig. 603: 4 bolted joints on protection plate

⇨ Remove the connecting elements from the front part (3) of the ventilation duct, and store it:
- 8 bolts M8x20 with contact washers

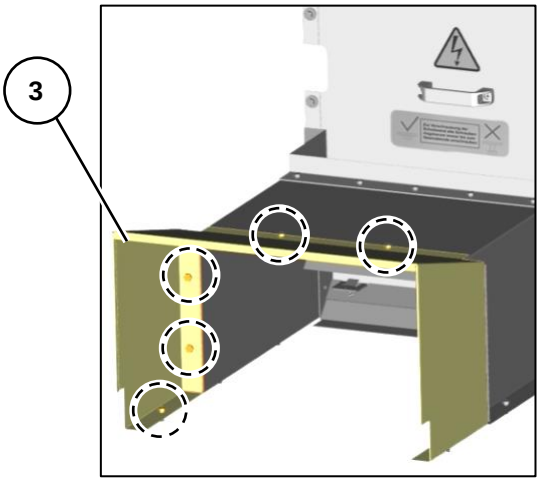


Fig. 604: Front part of ventilation duct, seen from center-right

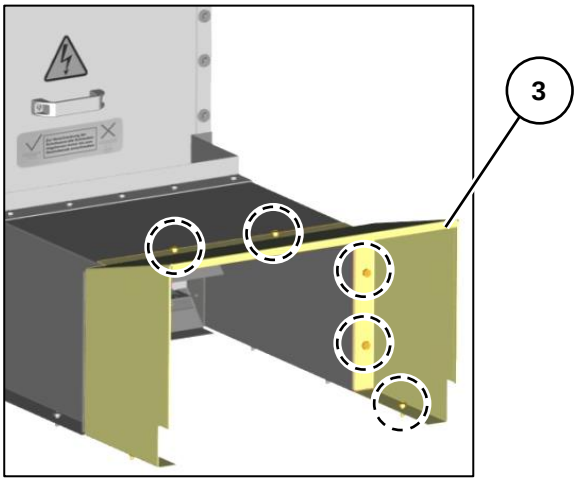


Fig. 605: Front part of ventilation duct, seen from center-left

⇨ To get the front part of the ventilation duct over the door threshold, lift it approx. 2 cm. Pull it out of the panel, and store it.

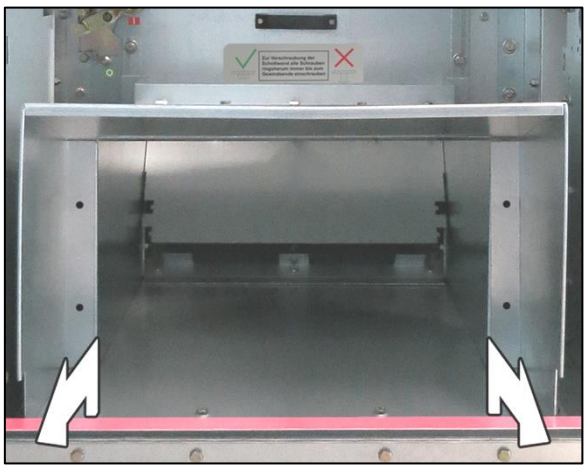


Fig. 606: Lifting and pulling the front part

⇨ Remove the connecting elements from the remaining part of the ventilation duct (4) and the vertical partition to the connection compartment (5), and store it:

- 13 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093 (6)
- 7 bolts M8x20 with contact washers (7)

Accessing the connection compartment through the front

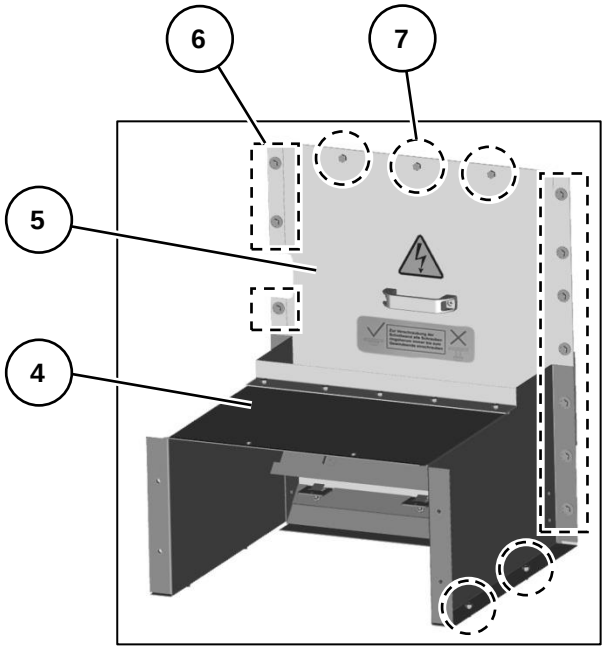


Fig. 607: Ventilation duct and partition, seen from center-right

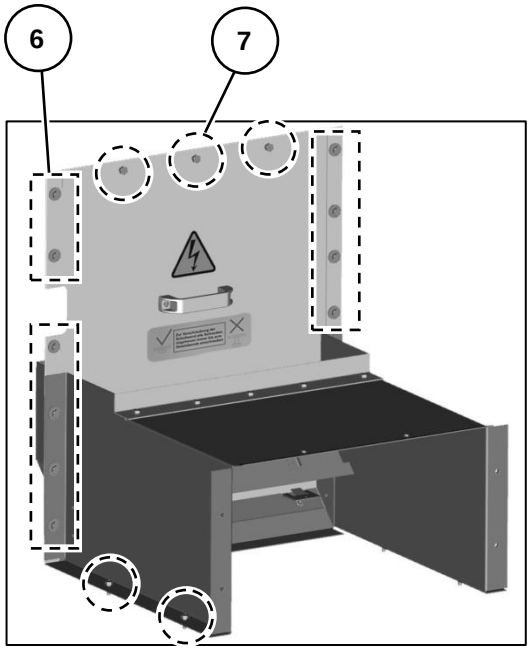


Fig. 608: Ventilation duct and partition, seen from center-left

⇨ Pull the unit consisting of ventilation duct and vertical partition towards the door threshold as far as it will go.

⇨ To get the unit over the door threshold, lift it approx. 2 cm. Pull it out of the panel. Store the unit, but do **not** disassemble the unit any further.

✓ Access to the connection compartment through the panel front is given.

23.7 Installing the vertical partition and the ventilation duct type II in the switching-device compartment

⚠ DANGER

Electric shock

To perform any kind of activities inside or near the connection compartment of a panel, you must ensure that this compartment is safely isolated from supply. Without isolation from supply, the cables / bar connections in the connection compartment will be live at operational high-voltage.

⇨ Observe the **Five Safety Rules**.

⇨ Verify safe isolation from supply.

⇨ Do **not** operate the feeder earthing switch during any activities inside or near the connection compartment.

⚠ CAUTION

Sharp edges

The metal parts of the ventilation duct and the vertical partition may have sharp edges.

⇨ Put on personal protective equipment.

NOTICE

Danger due to damages

Possible malfunctioning and switchgear damage caused by foreign objects:

⇨ Remove all foreign objects from the connection compartment, for example:

- Tools
- Unused installation material
- Packing material
- Cleaning material

NOTICE

Cleaning

Possible malfunctioning and damage to the panels caused by pollution.

Before closing the connection compartment:

⇨ Clean polluted areas in the connection compartment. To do this, use a vacuum cleaner and a lint-free cloth. If necessary, moisten the cloth, use a mild household cleaner, and dry properly at the end.

⇨ Some parts and surfaces of the switchgear are greased for functioning. Do not remove the grease there; do not clean the parts and surfaces.

⇨ If greased areas are dirty, clean the dirty area and grease again according to the maintenance instructions.

Accessing the connection compartment through the front

NOTICE

Damages inside the switching-device compartment

Damages inside the switching-device compartment due to incorrect or incomplete installation of the partition.

⇨ To fasten the partition, always assemble all bolted joints of the partition all around, and screw them in up to the end of the thread.

In addition to these instructions, an instruction label on the vertical partition informs about safe fastening of the partition:

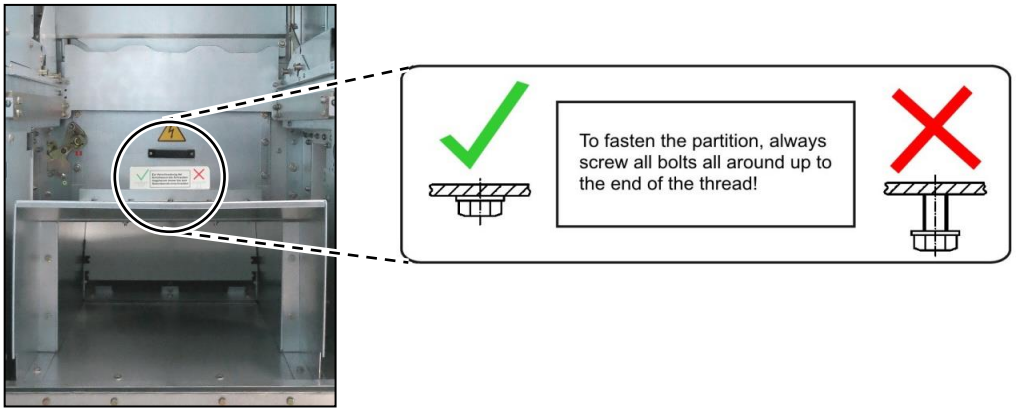


Fig. 609: Instruction label on the vertical partition

Preconditions

- Feeder earthing switch in CLOSED position
- High-voltage door open
- Low-voltage connector stowed away
- Unit consisting of ventilation duct and vertical partition available. Associated connecting elements available:
  - 13 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093
  - 7 bolts M8x20 with contact washers
- Protection plate and associated connecting elements available:
  - 4 nuts M8 with contact washers
- Front part of ventilation duct and associated connecting elements available:
  - 8 bolts M8x20 with contact washers

Procedure

⇨ Place the unit consisting of ventilation duct (1) and vertical partition (2) centrally on the panel base frame. The vertical partition must point towards the connection compartment.

⇨ Push the unit towards the connection compartment as far as it will go.

⇨ Fix the unit by screwing the bolts hand-tight:

- 13 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093 (3)
- 7 bolts M8x20 with contact washers (4)

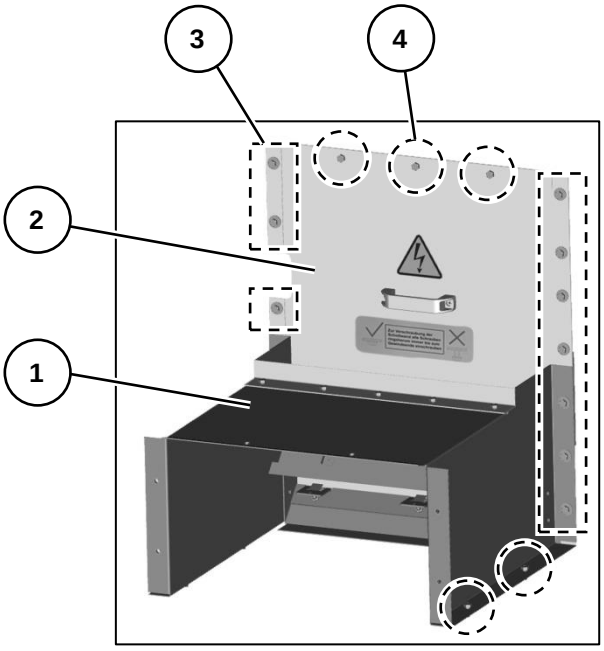


Fig. 610: Ventilation duct and partition, seen from center-right

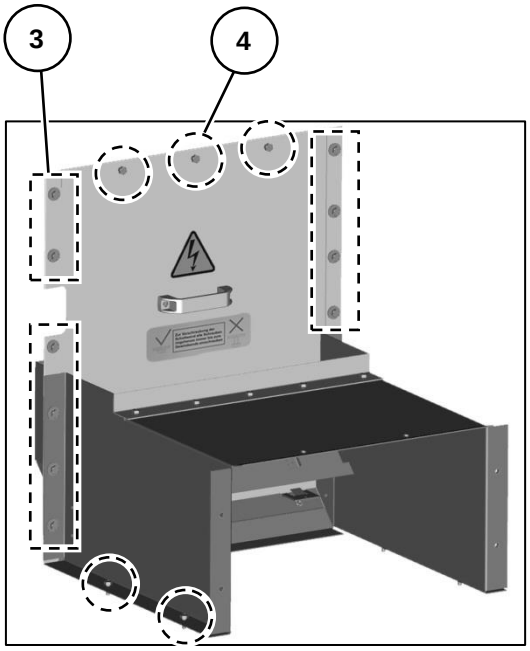


Fig. 611: Ventilation duct and partition, seen from center-left

⇨ Tighten the fixing bolts all around with a tightening torque of 25 Nm.

⇨ Install the protection plate (5).

⇨ Fix the protection plate (5) by screwing the nuts (6) hand-tight:
- 4 nuts M8 with contact washers

⇨ Tighten the fixing nuts with a tightening torque of 25 Nm.

Fig. 612: 4 bolted joints on protection plate

⇨ Place the front part of the ventilation duct (7) centrally on the panel base frame.

⇨ Fix the front part by screwing the bolts hand-tight:
- 8 bolts M8x20 with contact washers

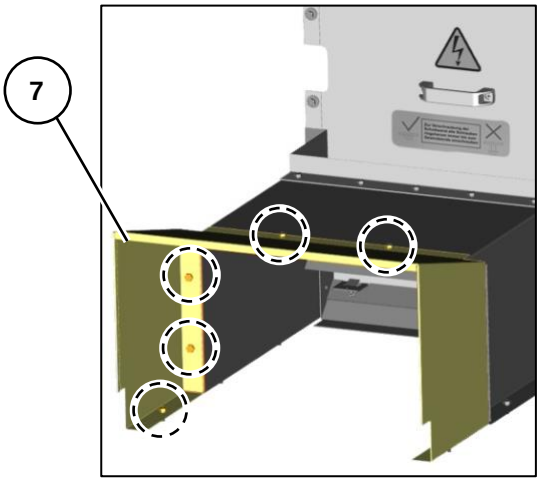


Fig. 613: Front part of ventilation duct, seen from center-right

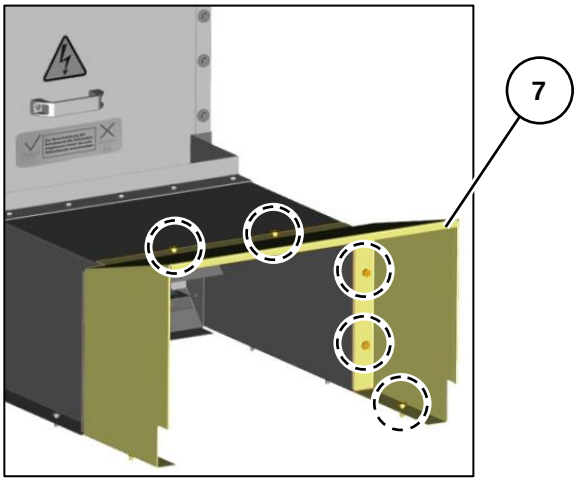


Fig. 614: Front part of ventilation duct, seen from center-left

✓ The vertical partition and the ventilation duct are installed.

INFORMATION

Final procedure steps

Now the panel can be integrated into the course of operation again, for example:

⇨ Inserting a withdrawable part / switching-device truck in the panel.

⇨ Closing the high-voltage door.

⇨ De-earthing the feeder.

⇨ Racking the withdrawable part / switching-device truck to service position.

23.8 Accessing the connection compartment through the switching-device compartment at panel versions with voltage transformer compartment

⚠ WARNING

Reduced safety

The closed connection compartment is an important safety element of the switchgear. The connection compartment is exclusively opened for performing operational activities inside the connection compartment.

Always install the bushing plate and the vertical partition:

⇨ If an activity inside the connection compartment is interrupted.

⇨ Immediately after an activity inside the connection compartment was completed.

⚠ CAUTION

Sharp edges

The metal parts of the voltage transformer compartment and the vertical partition may have sharp edges.

⇨ Put on personal protective equipment.

⚠ CAUTION

High weight

The voltage transformer compartment is heavy.

⇨ Remove the voltage transformer compartment absolutely with 2 persons.

⇨ Put on personal protective equipment.

Preconditions

- Preparations as described in chapter 23.1 completed
- Door to voltage transformer compartment open
- Removable voltage transformers removed from panel as described in chapter 19.6

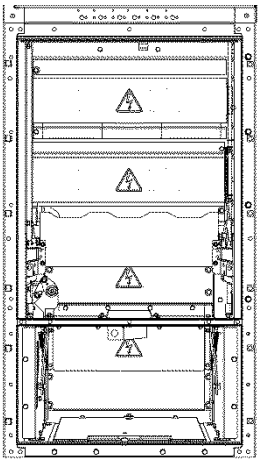


Fig. 615: Panel prepared

Accessing the connection compartment through the front

Procedure

⇨ Remove the connecting elements from the front of the labyrinth, and store it:
- 2 nuts M8 with contact washers

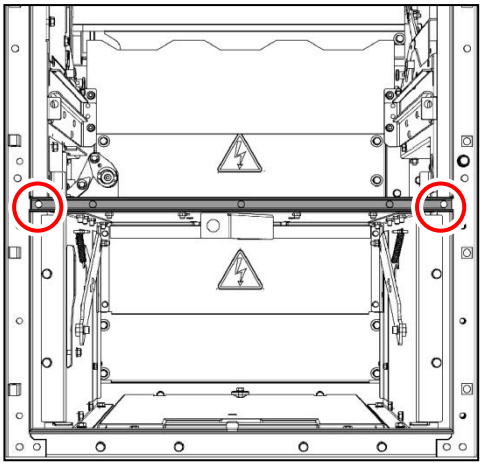


Fig. 616: 2 bolted joints at front of labyrinth

⇨ Remove the connecting elements from the top side of the labyrinth, and store it:
- 4 bolts M8x16 with contact washers

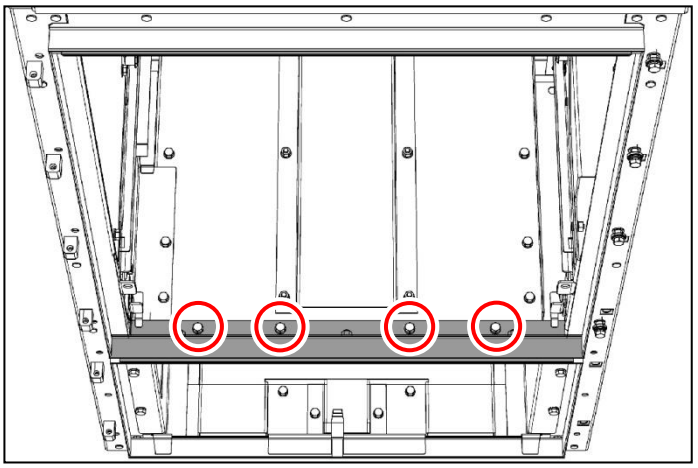


Fig. 617: 4 bolted joints at top side of labyrinth

⇨ Remove the labyrinth, and store it.

⇨ Remove the connecting elements from the wiring duct cover, and store it:

- 3 bolts M8x20 with contact washers

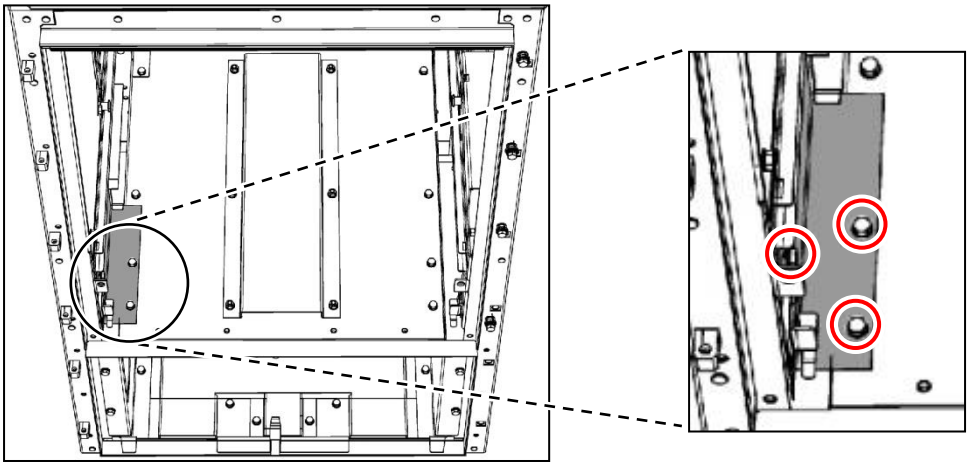


Fig. 618: 3 bolted joints on wiring duct cover

⇨ Remove the wiring duct cover, and store it.

⇨ Remove the connecting elements from the metal cover (1) for stowing the low-voltage connector, and store it:

- 6 bolts M8x20 with contact washers

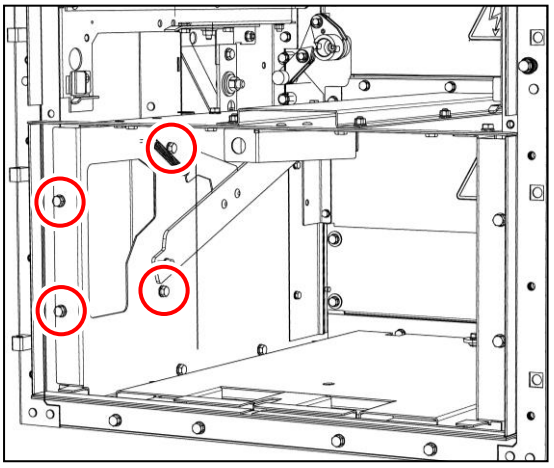


Fig. 619: 4 bolted joints on metal cover in voltage transformer compartment

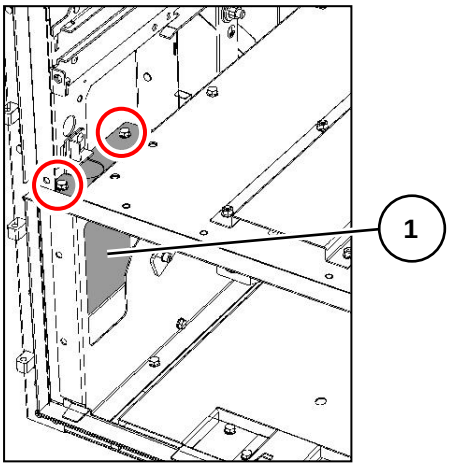


Fig. 620: 2 bolted joints on metal cover in switching-device compartment

⇨ Remove the lid (2) of the metal cover, and store it.

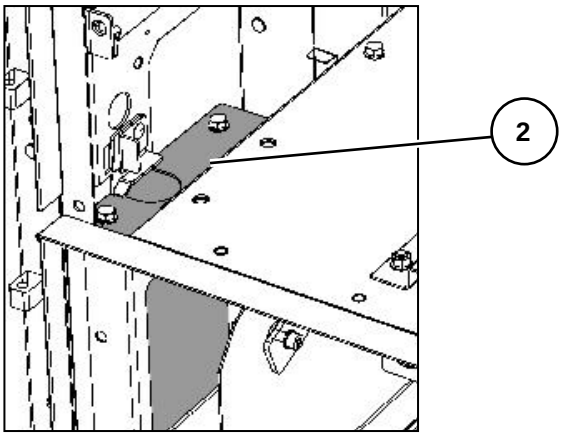


Fig. 621: Lid of metal cover

⇨ Remove the connecting elements from the voltage transformer compartment, and store it:

- 10 bolts M8x20 with contact washers

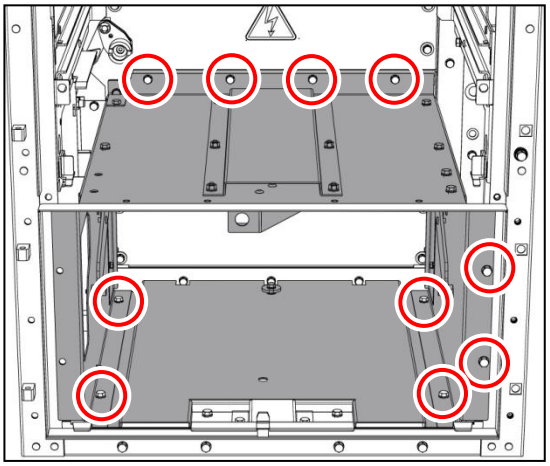


Fig. 622: 10 bolted joints at voltage transformer compartment

⇨ To get the voltage transformer compartment over the door threshold, lift it approx. 2 cm. Pull it out of the panel, and store it.

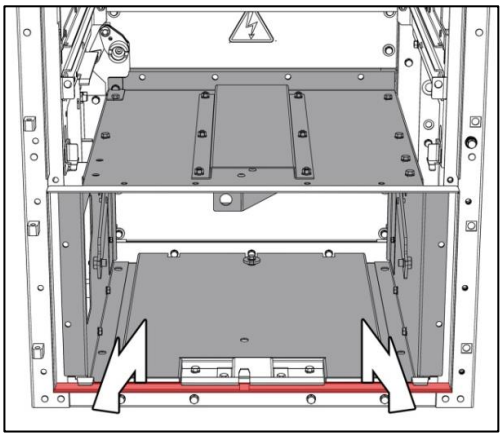


Fig. 623: Lifting and pulling the voltage transformer compartment

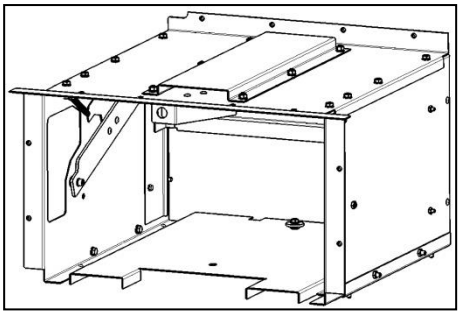


Fig. 624: Voltage transformer compartment, removed

⇨ Remove the connecting elements from the protection plate of the switching-device compartment, and store it:

- 4 nuts M8 with contact washers

⇨ Remove the protection plate of the switching-device compartment, and store it.

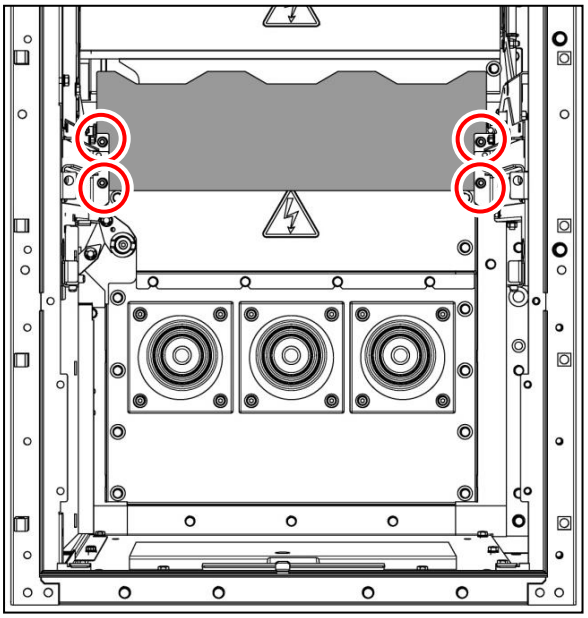


Fig. 625: 4 bolted joints on protection plate of switching-device compartment

⇨ Remove the connecting elements from the vertical partition, and store it:

- 8 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093.

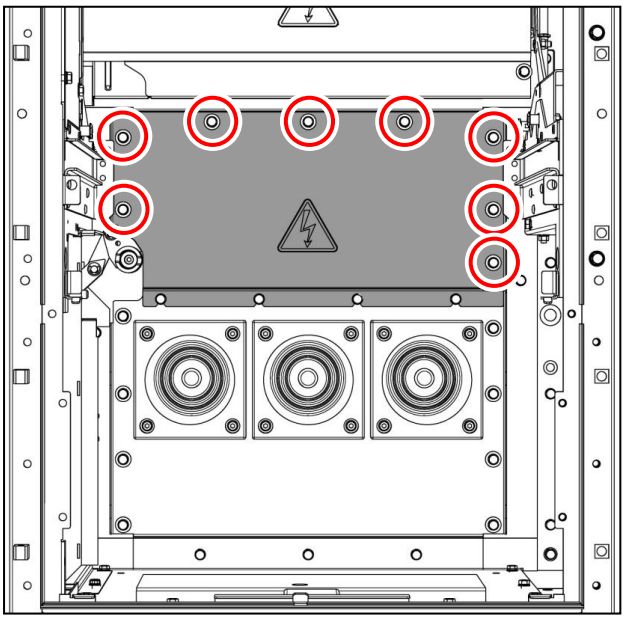


Fig. 626: 8 bolted joints on vertical partition

⇨ Remove the partition, and store it.

⇨ Remove the connecting elements (3) at the 3 connecting leads from the cable / bar connections to the insulating bushings for the removable voltage transformers, and store it:

- 3 nuts M8 with contact washers and plain washers (3)

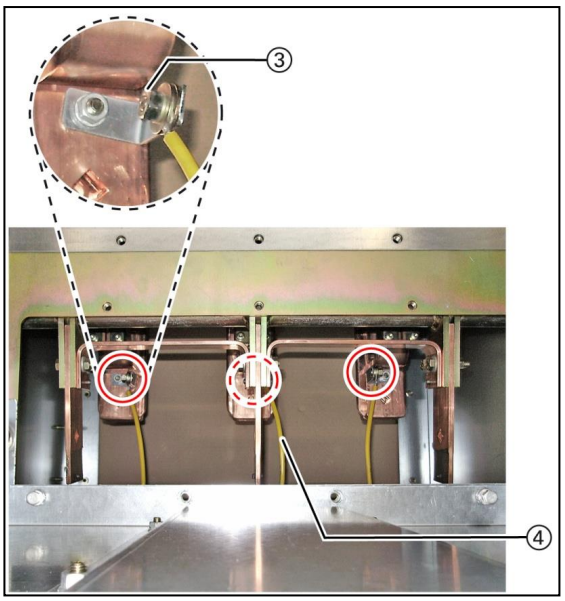


Fig. 627: Bolted joints at the cable connections (central joint covered)

⇨ Loosen the 3 connecting leads (4) for the removable voltage transformers from the cable / bar connections.

⇨ Remove the connecting elements from the left and right side of the bushing plate, and store it:

- 8 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093 (5)

Loosen the fixing bolts at the lower side of the bushing plate:

- 3 bolts M8x20 with contact washers (6)

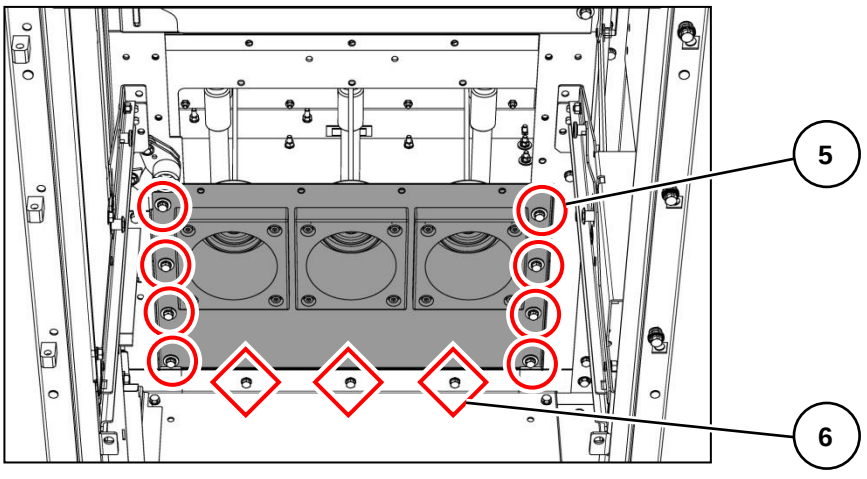


Fig. 628: 11 bolted joints on bushing plate

⇨ Remove the bushing plate with bushings, and store it.

✓ Access to the connection compartment through the panel front is given.

23.9 Installing the bushing plate, the vertical partition and the voltage transformer compartment in the switching-device compartment

⚠ DANGER

Electric shock

To perform any kind of activities inside or near the connection compartment of a panel, you must ensure that this compartment is safely isolated from supply. Without isolation from supply, the cables / bar connections in the connection compartment will be live at operational high-voltage.

⇨ Observe the **Five Safety Rules**.

⇨ Verify safe isolation from supply.

⇨ Do **not** operate the feeder earthing switch during any activities inside or near the connection compartment.

⚠ CAUTION

Sharp edges

The metal parts of the voltage transformer compartment and the vertical partition may have sharp edges.

⇨ Put on personal protective equipment.

NOTICE

Danger due to damages

Possible malfunctioning and switchgear damage caused by foreign objects:

⇨ Remove all foreign objects from the connection compartment, for example:

- Tools
- Unused installation material
- Packing material
- Cleaning material

NOTICE

Cleaning

Possible malfunctioning and damage to the panels caused by pollution.

Before closing the connection compartment:

⇨ Clean polluted areas in the connection compartment. To do this, use a vacuum cleaner and a lint-free cloth. If necessary, moisten the cloth, use a mild household cleaner, and dry properly at the end.

⇨ Some parts and surfaces of the switchgear are greased for functioning. Do not remove the grease there; do not clean the parts and surfaces.

⇨ If greased areas are dirty, clean the dirty area and grease again according to the maintenance instructions.

Accessing the connection compartment through the front

NOTICE

Damages inside the switching-device compartment

Damages inside the switching-device compartment / voltage transformer compartment due to incorrect or incomplete installation of the partition / bushing plate.

⇨ To fasten the partition / bushing plate, always assemble all bolted joints all around, and screw them in up to the end of the thread.

Preconditions

- Feeder earthing switch in CLOSED position
- High-voltage door open
- Door to voltage transformer compartment open
- In the switching-device compartment and in the voltage transformer compartment:
  - Low-voltage connectors stowed away
- Bushing plate and associated connecting elements available:
  - 8 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093
  - 3 bolts M8x20 with contact washers
- Connection leads and associated connecting elements available:
  - 3 nuts M8 with contact washers and plain washers
- Vertical partition and associated connecting elements available:
  - 8 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093
- Protection plate and associated connecting elements available:
  - 4 nuts M8 with contact washers
- Voltage transformer compartment and associated connecting elements available:
  - 14 bolts M8x20 with contact washers
- Lid of metal cover and associated connecting elements available:
  - 2 bolts M8x20 with contact washers
- Wiring duct cover and associated connecting elements available:
  - 3 bolts M8x20 with contact washers
- Labyrinth and associated connecting elements available:
  - 4 bolts M8x16 with contact washers
  - 2 nuts M8 with contact washers

Procedure

⇨ Install the bushing plate with bushings.

⇨ Fix the bushing plate by screwing the bolts hand-tight:
- 8 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093 (1)
- 3 bolts M8x20 with contact washers (2)

Tighten the bolts with a tightening torque of 25 Nm.

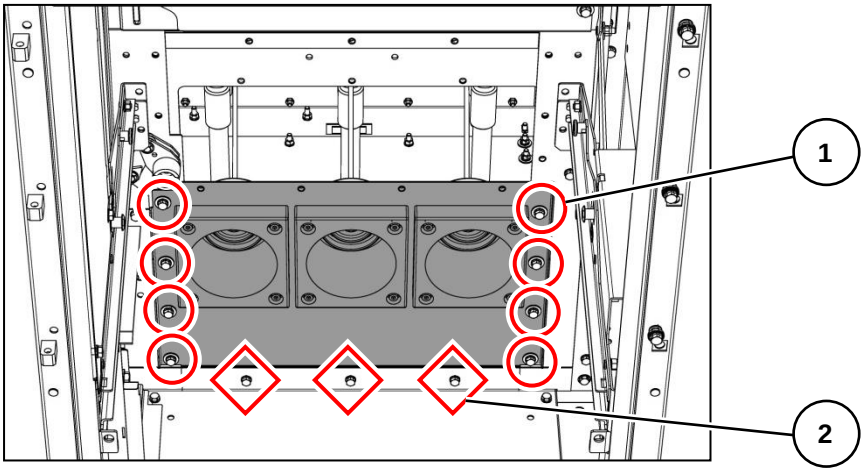


Fig. 629: 11 bolted joints on bushing plate

⇨ Fix the connecting leads (4). To do this, mount the connecting elements (3) and tighten hand-tight:

- 3 nuts M8 with contact washers and plain washers

⇨ Tighten the nuts with a tightening torque of 25 Nm.

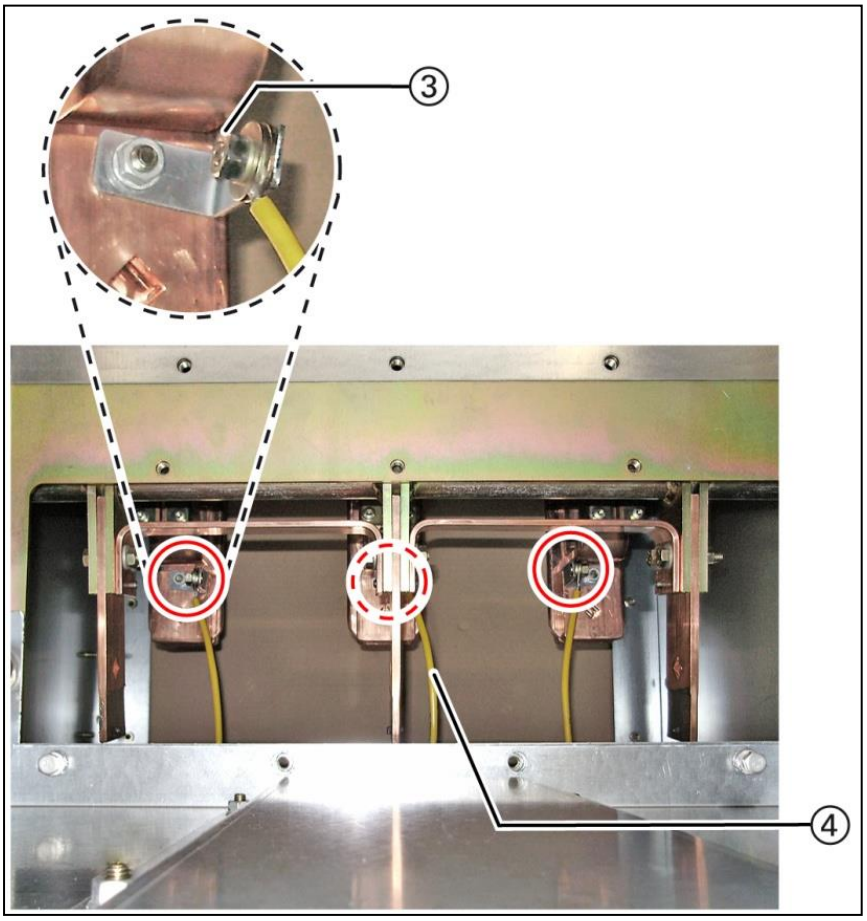


Fig. 630: 3 bolted joints at the cable connections (central joint covered)

⇨ Install the vertical partition in the connection compartment.

Fix the partition by screwing the bolts hand-tight:

- 8 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093

Tighten the bolts with a tightening torque of 25 Nm.

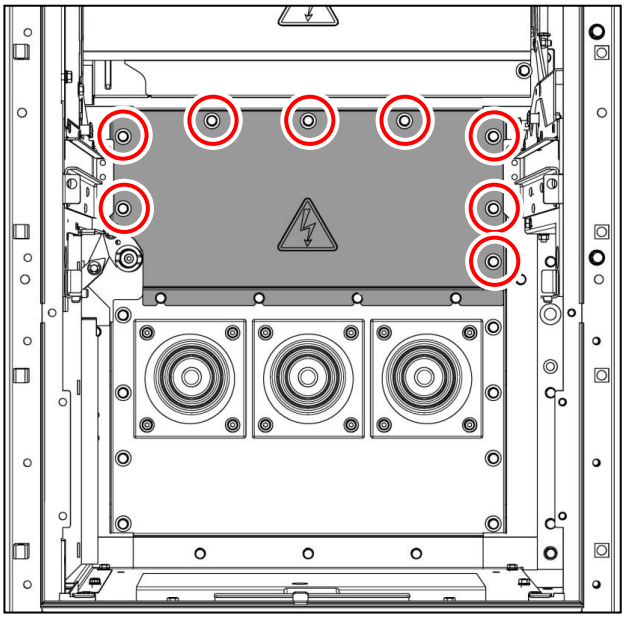


Fig. 631: 8 bolted joints on vertical partition

Install the protection plate in the switching-device compartment.

Fix the protection plate by screwing the nuts hand-tight:

- 4 nuts M8 with contact washers

Tighten the nuts with a tightening torque of 25 Nm.

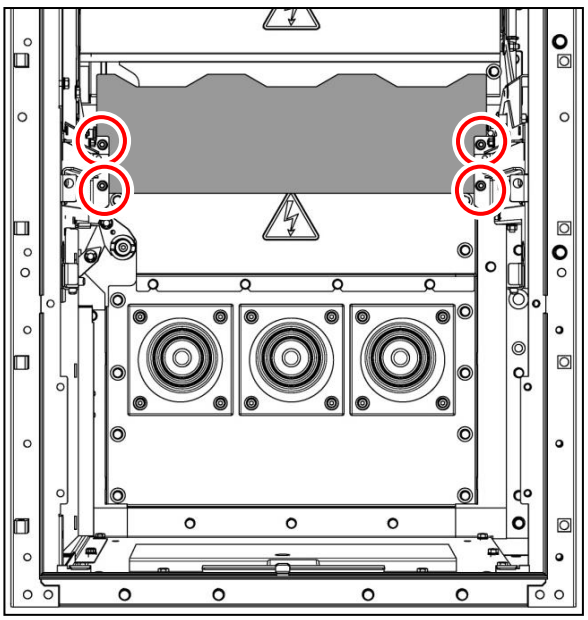
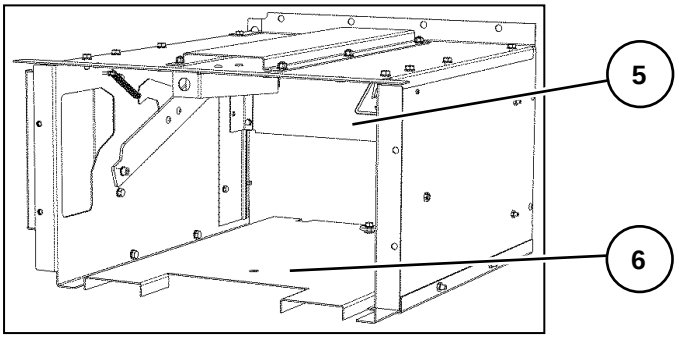


Fig. 632: 4 bolted joints on protection plate of switching-device compartment

Prepare the voltage transformer compartment for installation by laying it down centrally in front of the panel. The shutter (5) must point to the bushing plate.

⇨ To install the voltage transformer compartment, lift it approx. 2 cm. Push the voltage transformer compartment into the panel and set it down on the base frame.



(5) Shutter

(6) Bottom side

Fig. 633: Voltage transformer compartment

⇨ Fix the voltage transformer compartment by screwing the bolts hand-tight:

- 10 bolts M8x20 with contact washers

Tighten the bolts with a tightening torque of 25 Nm.

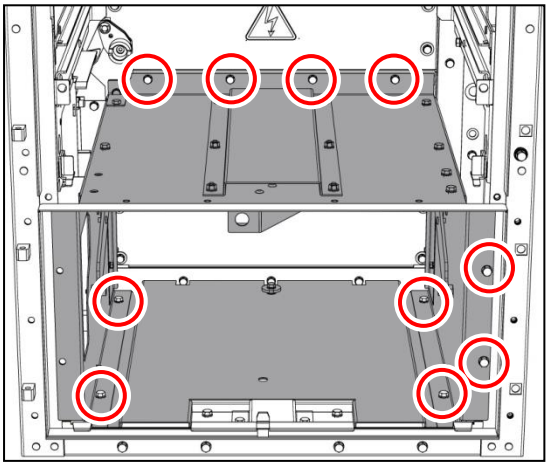


Fig. 634: 10 bolted joints at voltage transformer compartment

⇨ Put the metal cover in upright position. To link the voltage transformer compartment and the metal cover together, tighten the bolts hand-tight:

- 4 bolts M8x20 with contact washers

Tighten the bolts with a tightening torque of 25 Nm.

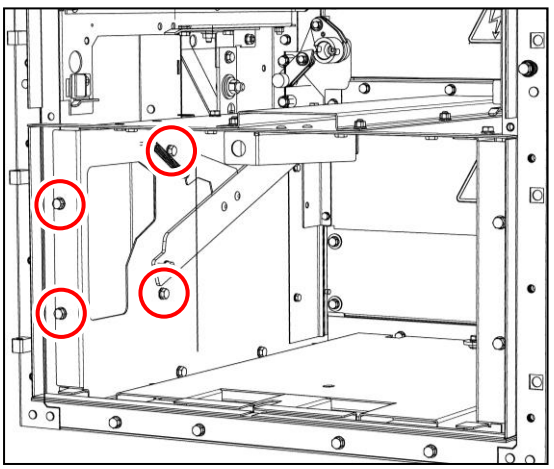


Fig. 635: 4 bolted joints on metal cover in voltage transformer compartment

⇨ Install the lid (7) of the metal cover. Fix it by screwing the bolts hand-tight:
- 2 bolts M8x20 with contact washers

Tighten the bolts with a tightening torque of 25 Nm.

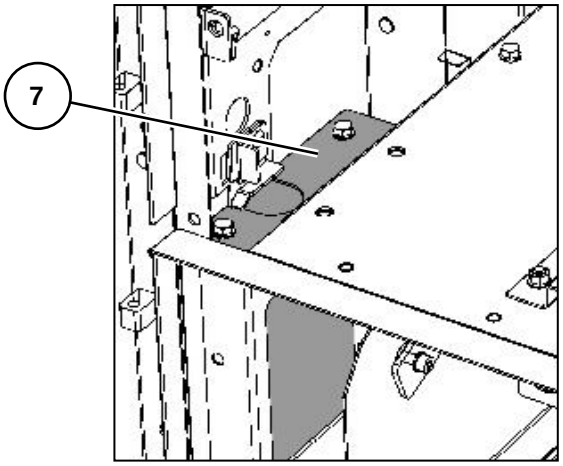


Fig. 636: Lid of metal cover

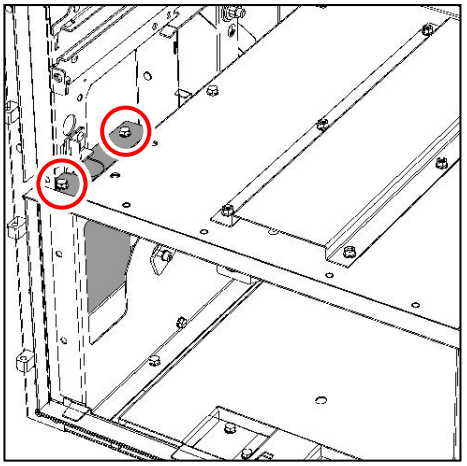


Fig. 637: 2 bolted joints on metal cover in switching-device compartment

⇨ Install the wiring duct cover.

⇨ Fix the wiring duct cover by screwing the bolts hand-tight:
- 3 bolts M8x20 with contact washers

Tighten the bolts with a tightening torque of 25 Nm.

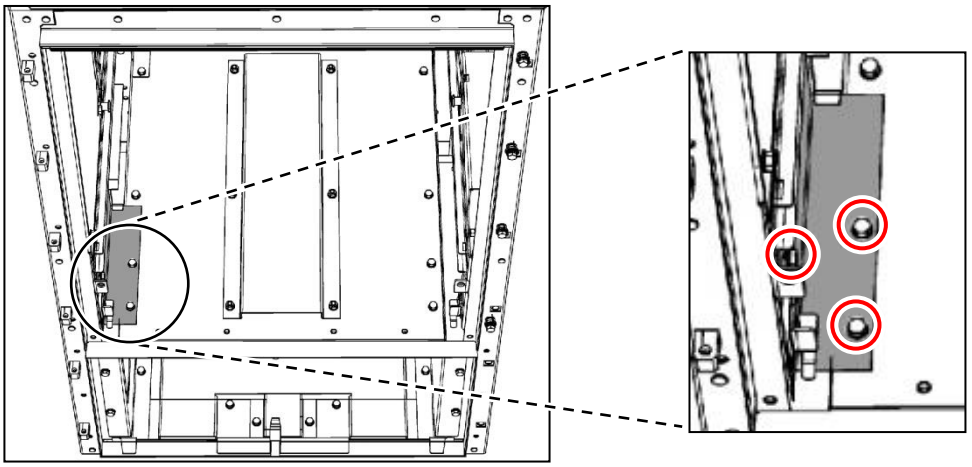


Fig. 638: 3 bolted joints on wiring duct cover

⇨ Install the labyrinth.

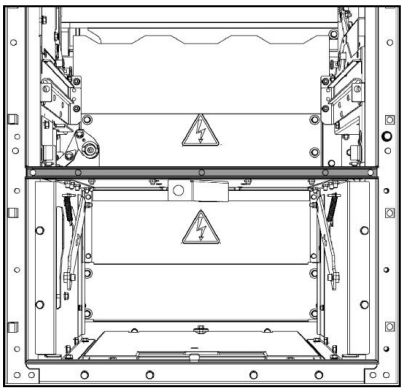


Fig. 639: Labyrinth installed, front

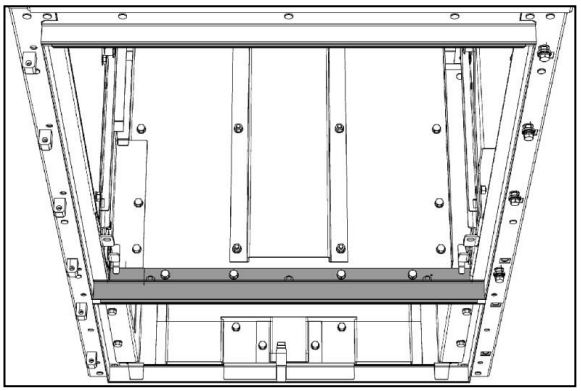


Fig. 640: Labyrinth installed, top side

⇨ Fix the labyrinth by screwing the outermost nuts hand-tight:

- 2 nuts M8 with contact washers

Tighten the nuts with a tightening torque of 25 Nm.

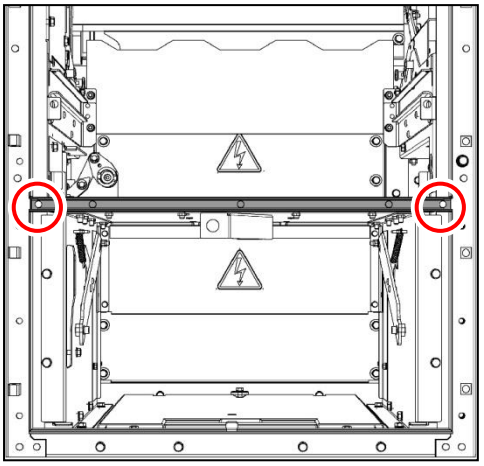


Fig. 641: 2 bolted joints at front of labyrinth

⇨ Tighten the fixing bolts at the top side of the labyrinth hand-tight:

- 4 bolts M8x16 with contact washers

Tighten the bolts with a tightening torque of 25 Nm.

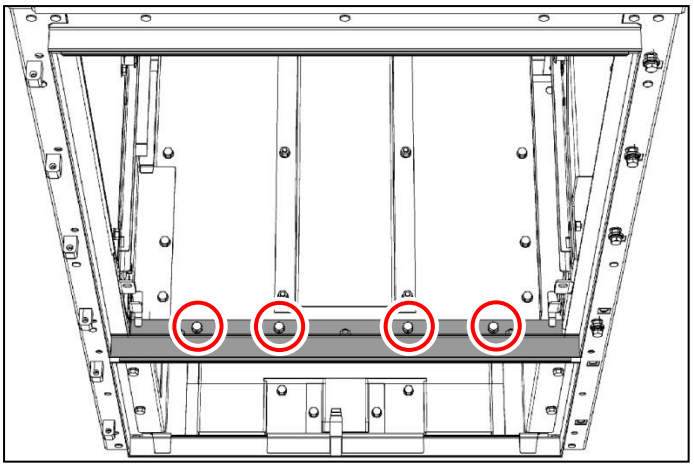


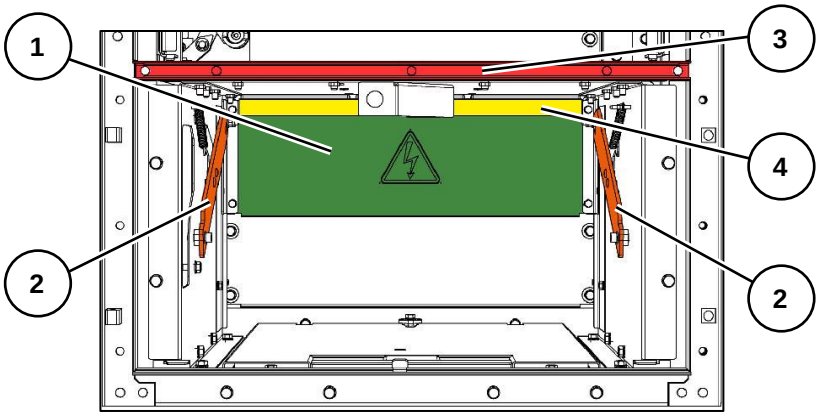
Fig. 642: 4 bolted joints at top side of labyrinth

Perform final checks regarding the correct state and position of the shutter (1) and the levers (2) for moving the shutter. If any of these checks fails, do **not** insert any removable voltage transformers in the voltage transformer compartment, but inform the regional Siemens representative.

⇨ Check against the labyrinth (3) if the shutter (1) is horizontally arranged.

⇨ Check if the top edge of the shutter is flush with the shutter frame (4).

⇨ Check if the levers (2) are in perfectly straight condition.



(1) Shutter

(2) Lever

(3) Labyrinth

(4) Shutter frame

Fig. 643: Checking state and position of shutter and levers

✓ The bushing plate, the vertical partition and the voltage transformer compartment are installed.

INFORMATION

Final procedure steps

Now the panel can be integrated into the course of operation again, for example:

⇨ Inserting a withdrawable part / removable voltage transformers in the panel.

⇨ Closing the high-voltage door / door to the voltage transformer compartment.

⇨ De-earthing the feeder.

⇨ Racking the withdrawable part / removable voltage transformers to service position.

24 Accessing the connection compartment through the rear

INFORMATION

Read and understand these instructions before attempting operating works.

24.1 Accessing the connection compartment through the rear side of the panel

DANGER

Electric shock

To perform any kind of activities inside or near the connection compartment of a panel, you must ensure that this compartment is safely isolated from supply. Without isolation from supply, the cables / bar connections in the connection compartment will be live at operational high-voltage.

- ⇨ Before removing the rear wall on the rear side of a panel, isolate and earth the cable / bar connections in the connection compartment.
- ⇨ Provide a warning on the high-voltage door to indicate activities in the connection compartment on the rear side of the panel.
- ⇨ Observe the **Five Safety Rules**.
- ⇨ Verify safe isolation from supply.
- ⇨ Do **not** operate the feeder earthing switch during any activities inside or near the connection compartment.
- ⇨ Do **not** remove any ledges on the rear side of the busbar compartment.

WARNING

Reduced safety

The closed connection compartment is an important safety element of the switchgear. The connection compartment is exclusively opened for performing operational activities inside the connection compartment.

Close the connection compartment with the rear wall, ledges and tightened bolts:

- ⇨ If an activity inside the connection compartment is interrupted.
- ⇨ Immediately after an activity inside the connection compartment was completed.

CAUTION

Sharp edges

The metal parts of the rear wall may have sharp edges.

- ⇨ Put on personal protective equipment.

Accessing the connection compartment through the rear

INFORMATION

Hereafter, the disassembly of those parts is described, which are later assembled again at the same place.

⇨ Store disassembled parts and connecting elements carefully, and keep them ready for later reuse.

INFORMATION

Switch-disconnector panel

Accessing the switching-device / connection compartment through rear side of the panel is **not** possible in the switch-disconnector panel.

Preconditions

- If a withdrawable part / switching-device truck is present in the switching-device compartment:
  - High-voltage door closed
  - Withdrawable part / switching-device truck in test position
  - Feeder earthing switch in CLOSED position

Procedure

⇨ Verify that the position indicator of the feeder earthing switch on the high-voltage door shows the vertical **I** position.

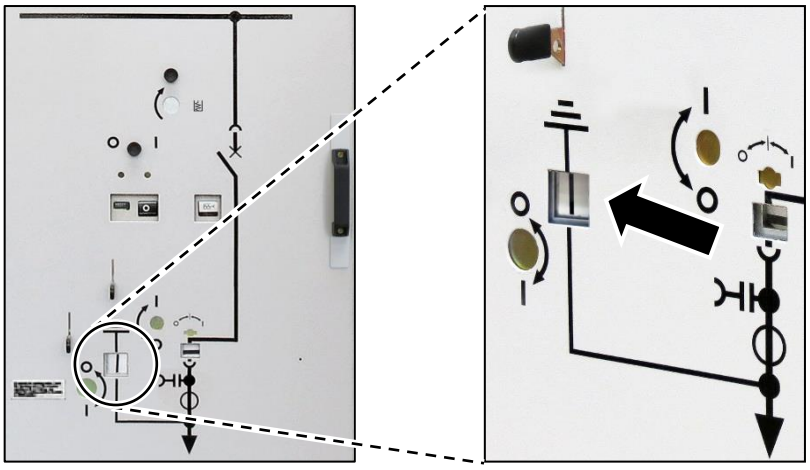


Fig. 644: All panel versions except for contactor panels with panel width 435 mm: Position indicator of feeder earthing switch on high-voltage door

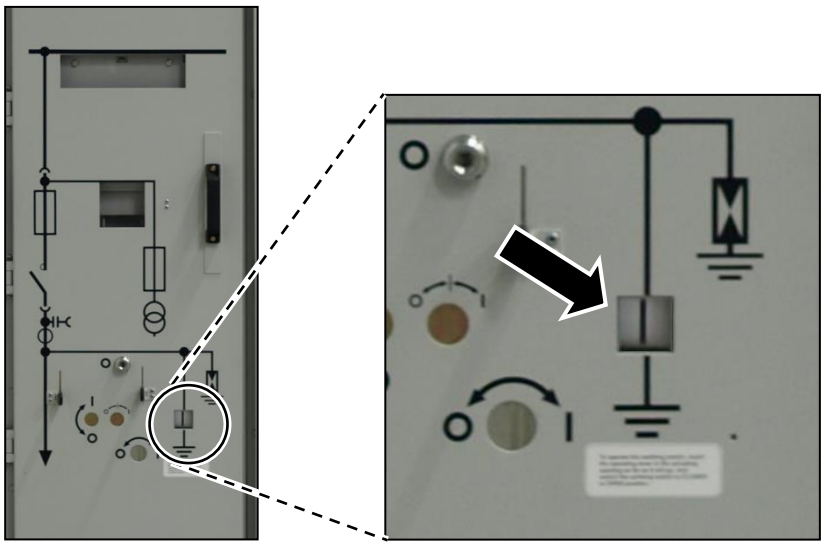


Fig. 645: Contactor panels with panel width 435 mm only:
Position indicator of the feeder earthing switch on high-voltage door

Accessing through the rear wall is described hereafter by the example of a 3-panel arrangement.

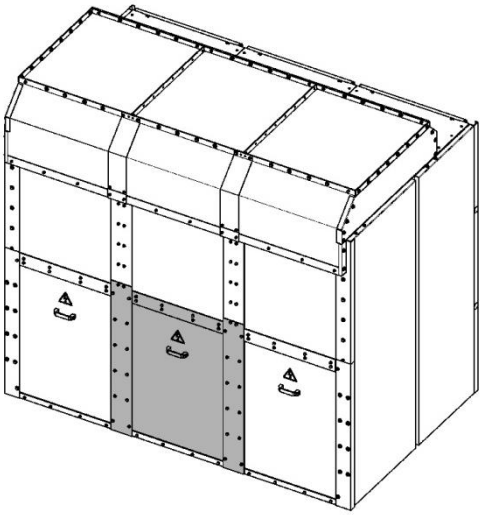


Fig. 646: All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel:
Rear wall, 3-panel arrangement

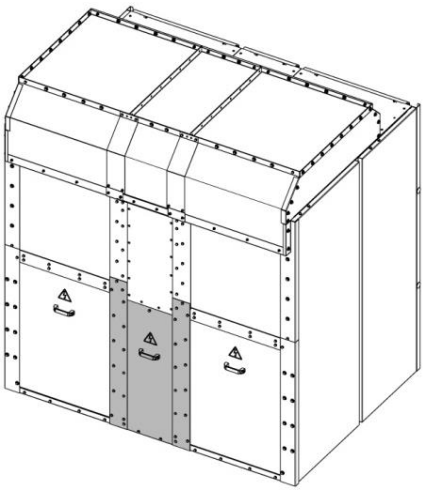


Fig. 647: Contactor panels with panel width 435 mm only:
Rear wall,
3-panel arrangement

All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel:

⇨ Remove the connecting elements from the horizontal ledge (1):

- 8 bolts M8x25 with contact washers and plain washers size 8 acc. to ISO 7093

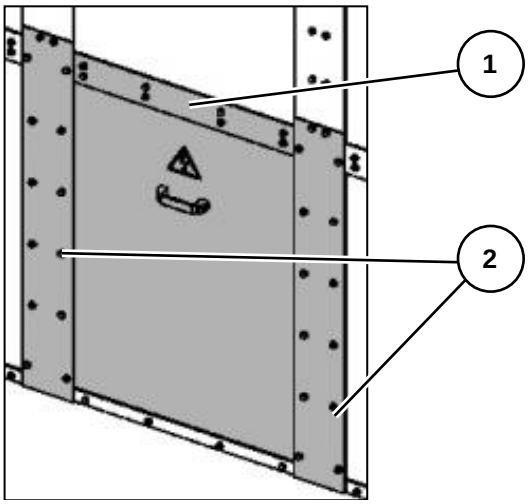
⇨ Remove the horizontal ledge, and store it together with the associated connecting elements.

⇨ Remove the connecting elements from one of the vertical ledges (2):

- 14 bolts M8x20 with contact washers

⇨ Remove the vertical ledge, and store it together with the associated connecting elements.

⇨ Proceed in the same way with the other vertical ledge.

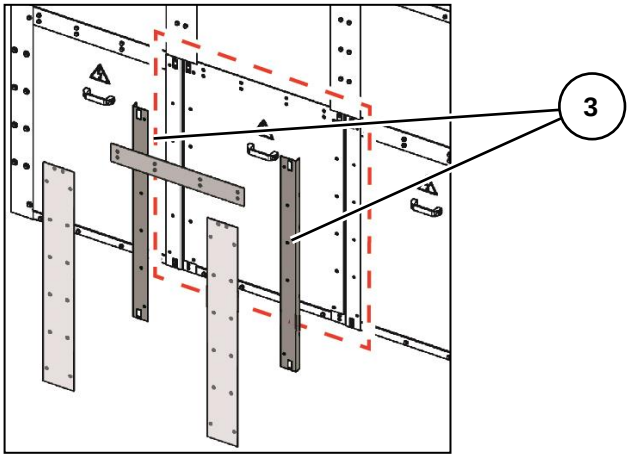


(1) Horizontal ledge

(2) Vertical ledges

Fig. 648: All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel: 36 bolts on ledges

⇨ Remove the 2 sealing brackets (3), and store them.

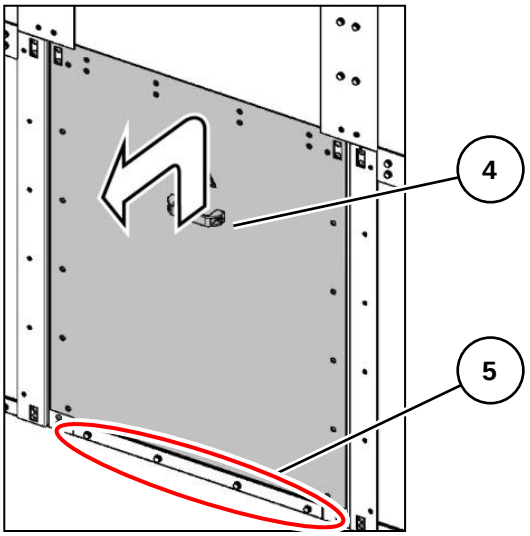


(3) Sealing brackets

Fig. 649: All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel: Removing the sealing brackets

⇨ Loosen the connecting elements at the panel base:
- 4 bolts M8x20 with contact washers (5)

⇨ Remove the rear wall (4). To do this, lift the rear wall by the handle, and pull it out. Store the rear wall.



(4) Rear wall with handle

(5) Bolts to remove

Fig. 650: All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel: Removing the rear wall

✓ Access to the connection compartment through the rear side is given.

INFORMATION

Final procedure steps

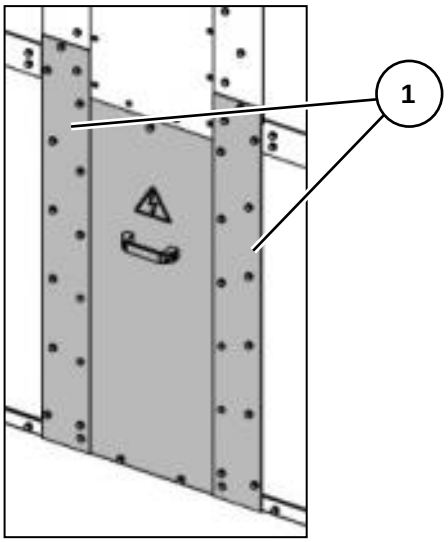
⇨ Immediately proceed to perform the intended checks and works in the connection compartment.

Contactor panels with panel width 435 mm only:

⇨ Remove the connecting elements from one of the vertical ledges (1):
- 15 bolts M8x20 with contact washers

⇨ Remove the vertical ledge, and store it together with the associated connecting elements.

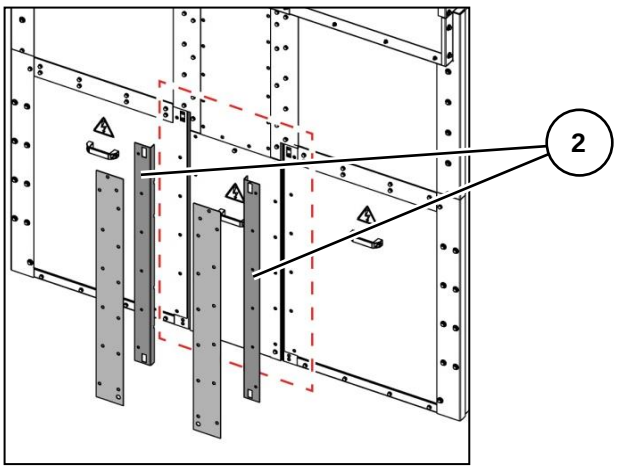
⇨ Proceed in the same way with the other vertical ledge.



(1) Vertical ledges

Fig. 651: Contactor panels with panel width 435 mm only:
30 bolts on ledges

⇨ Remove the sealing brackets (2) and store them.

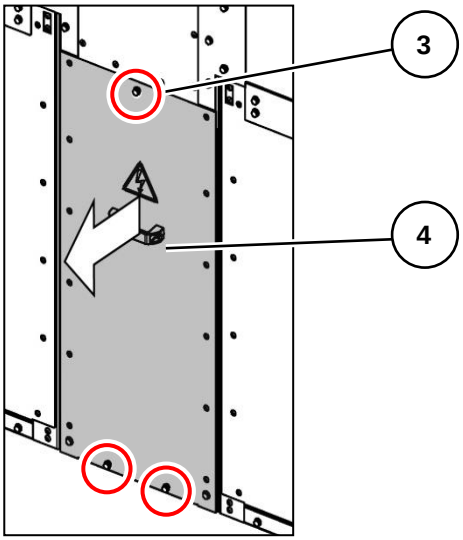


(2) Sealing brackets

Fig. 652: Contactor panels with panel width 435 mm only:
Removing the sealing brackets

⇨ Remove the connecting elements from the rear wall:
- 3 bolts M8x20 with contact washers (3)

⇨ To remove the rear wall (4), pull at the handle. Store the rear wall together with the associated connecting elements.



(3) Bolts to remove

(4) Rear wall with handle

Fig. 653: Contactor panels with panel width 435 mm only:
Removing the rear wall

✓ Access to the connection compartment through the rear side is given.

INFORMATION

Final procedure steps

⇨ Immediately proceed to perform the intended checks and works in the connection compartment.

24.2 Installing the rear wall on the connection compartment

DANGER

Electric shock

To perform any kind of activities inside or near the connection compartment of a panel, you must ensure that this compartment is safely isolated from supply. Without isolation from supply, the cables / bars connection in the connection compartment will be live at operational high-voltage.

⇨ Observe the **Five Safety Rules**.

⇨ Verify safe isolation from supply.

⇨ Make sure all openings on the rear side are closed by fixing bolts before the panel is put into operation again.

⇨ Do **not** operate the feeder earthing switch during any activities inside or near the connection compartment.

⇨ Do **not** remove any ledges on the rear side of the busbar compartment.

Accessing the connection compartment through the rear

⚠ CAUTION

Sharp edges

The metal parts of the rear wall may have sharp edges.

⇨ Put on personal protective equipment.

NOTICE

Danger due to damages

Possible malfunctioning and switchgear damage caused by foreign objects:

⇨ Remove all foreign objects from the connection compartment, for example:
- Tools
- Unused installation material
- Packing material
- Cleaning material

NOTICE

Cleaning

Possible malfunctioning and damage to the panels caused by pollution.

Before closing the connection compartment:

⇨ Clean polluted areas in the connection compartment. To do this, use a vacuum cleaner and a lint-free cloth. If necessary, moisten the cloth, use a mild household cleaner, and dry properly at the end.

⇨ Some parts and surfaces of the switchgear are greased for functioning. Do not remove the grease there; do not clean the parts and surfaces.

⇨ If greased areas are dirty, clean the dirty area and grease again according to the maintenance instructions.

Preconditions

- Rear wall available
- Corresponding number of sealing brackets, ledges and associated connecting elements available:
  - All panel versions except for contactor panels with panel width 435 mm:
    - 2 sealing brackets
    - 1 horizontal ledge and associated 8 bolts M8x25 with contact washers and plain washers size 8 acc. to ISO 7093
    - 2 vertical ledges and a total of associated 28 bolts M8x20 with contact washers
    - 4 bolts M8x20 with contact washers to fix the rear wall at the panel bottom
  - Contactor panels with panel width 435 mm only:
    - 2 sealing brackets
    - 2 vertical ledges and a total of associated 28 bolts M8x20
    - 3 bolts M8x20 to fix the rear wall

Procedure

Installation of the rear wall is described hereafter by the example of a 3-panel arrangement.

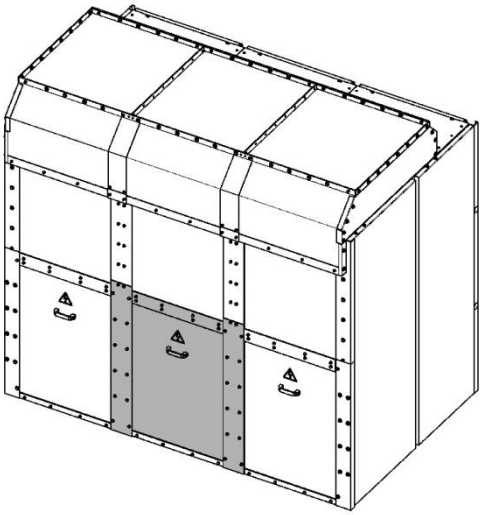


Fig. 654: All panel versions except for contactor panels with panel width 435 mm: Rear wall, 3-panel arrangement

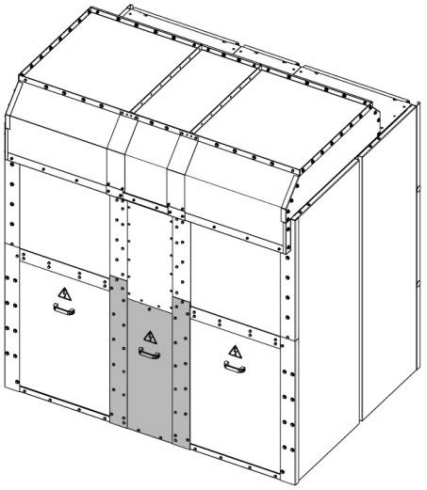


Fig. 655: Contactor panels with panel width 435 mm only: Rear wall, 3-panel arrangement

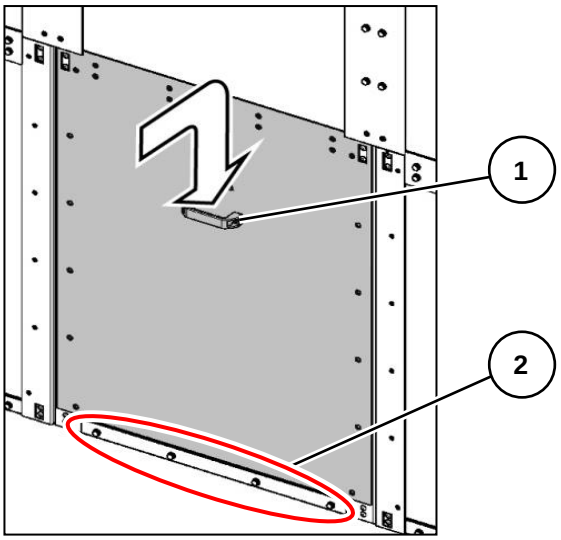
All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel:

⇨ At the rear side of the panel, insert the rear wall (1) by the handle, and push it down.

⇨ Fix the rear wall by screwing the bolts at the bottom hand-tight:

- 4 bolts M8x20 with contact washers (2)

⇨ Tighten the bolts with a tightening torque of 25 Nm.



(1) Rear wall with handle

(2) Bolts to screw

Fig. 656: All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel: Inserting and fixing the rear wall

⇨ Insert the 2 sealing brackets (3) into the vertical gaps between the panels.

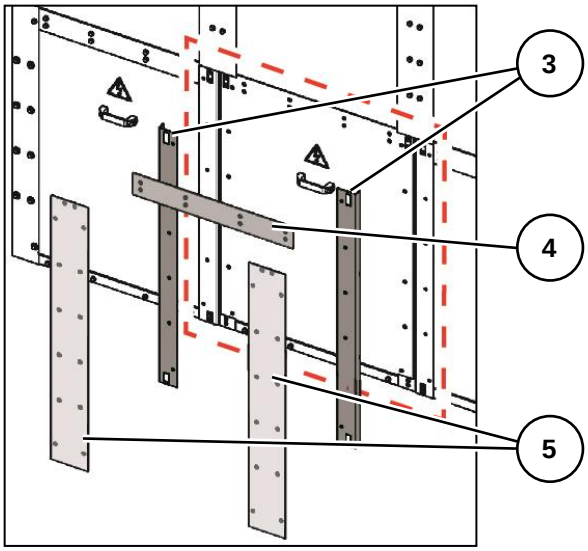
⇨ Install the horizontal ledge (4). Fix it by screwing the bolts hand-tight:
- 8 bolts M8x25 with contact washers and plain washers size 8 acc. to ISO 7093

⇨ Tighten the bolts with a tightening torque of 25 Nm.

⇨ Install one of the vertical ledges (5). Fix it by screwing the bolts hand-tight:
- 14 bolts M8x20 with contact washers

⇨ Tighten the bolts with a tightening torque of 25 Nm.

⇨ Proceed in the same way with the other vertical ledge.



(3) Sealing brackets

(4) Horizontal ledge

(5) Vertical ledges

Fig. 657: All panel versions except for contactor panels with panel width 435 mm: Installing ledges and brackets

✓ The rear wall is installed on the connection compartment.

INFORMATION

Final procedure steps

Now the panel can be integrated into the course of operation again, for example:

⇨ De-earthing the feeder.

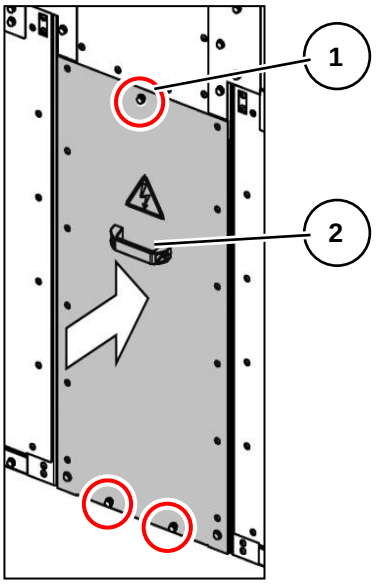
⇨ Racking the withdrawable part / switching-device truck to service position.

Contactor panels with panel width 435 mm only:

⇨ At the rear side of the panel, insert the rear wall (2) by the handle.

⇨ Fix the rear wall by screwing the bolts hand-tight:
- 3 bolts size M8x20 (1)

⇨ Tighten the bolts with a tightening torque of 25 Nm.



(1) Bolts to screw

(2) Rear wall with handle

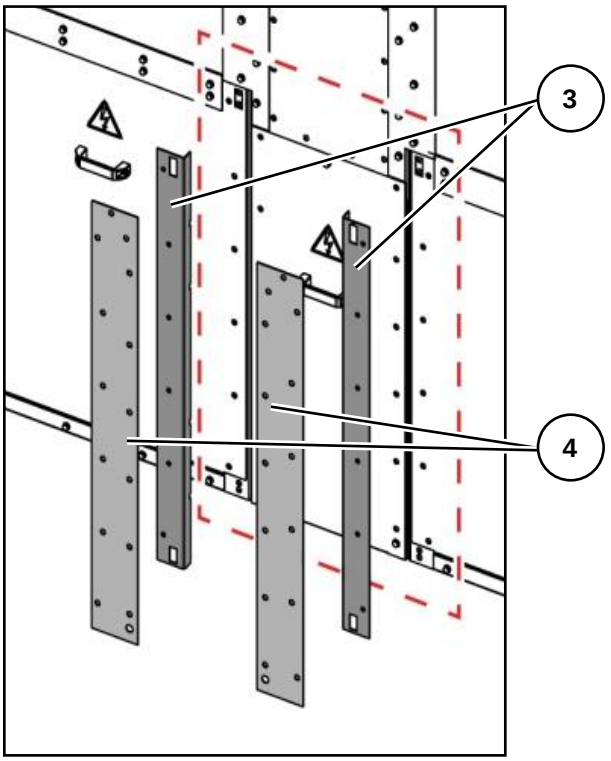
Fig. 658: Contactor panels with panel width 435 mm only:
Inserting and fixing the rear wall

⇨ Insert the 2 sealing brackets (3) into the vertical gaps between the panels.

⇨ Install one of the vertical ledges (4). Fix it by screwing the bolts hand-tight:
- 15 bolts size M8x20 with contact washers

⇨ Tighten the bolts with a tightening torque of 25 Nm.

⇨ Proceed in the same way with the other vertical ledge.



(3) Sealing brackets

(4) Vertical ledges

Fig. 659: Contactor panels with panel width 435 mm only: Installing ledges and brackets

✓ The rear wall is installed on the connection compartment.

INFORMATION

Final procedure steps

Now the panel can be integrated into the course of operation again, for example:

⇨ De-earthing the feeder.

⇨ Racking the withdrawable part / switching-device truck to service position.

24.3 Accessing the connection duct through the rear side of the panel

⚠ DANGER

Electric shock

To perform any kind of activities inside or near the connection duct of a panel, you must ensure that the connection duct is safely isolated from supply. Without isolation from supply, the cable connections in the connection duct will be live at operational high-voltage.

- ⇨ Before removing a rear wall on the connection duct of a panel, isolate and earth the cable connections in the connection duct.
- ⇨ Provide a warning on the high-voltage door to indicate activities in the connection duct on the rear side of the panel.
- ⇨ Observe the **Five Safety Rules**.
- ⇨ Verify safe isolation from supply.
- ⇨ Do **not** operate the feeder earthing switch during any activities inside or near the connection duct.

⚠ WARNING

Reduced safety

The closed connection duct is an important safety element of the switchgear. The connection duct is exclusively opened for performing operational activities inside the connection duct.

Close the connection duct with rear walls, ledges and tightened bolts:

- ⇨ If an activity inside the connection duct is interrupted.
- ⇨ Immediately after an activity inside the connection duct was completed.

⚠ CAUTION

Sharp edges

The metal parts of the rear walls may have sharp edges.

- ⇨ Put on personal protective equipment.

INFORMATION

Hereafter, the disassembly of those parts is described, which are later assembled again at the same place.

- ⇨ Store disassembled parts and connecting elements carefully, and keep them ready for later reuse.

Accessing the connection compartment through the rear

Preconditions

- If a withdrawable part / switching-device truck is present in the switching-device compartment:
  - High-voltage door closed
  - Withdrawable part / switching-device truck in test position
  - Feeder earthing switch in CLOSED position

Procedure

⇨ Verify that the position indicator of the feeder earthing switch on the high-voltage door shows the vertical **I** position.

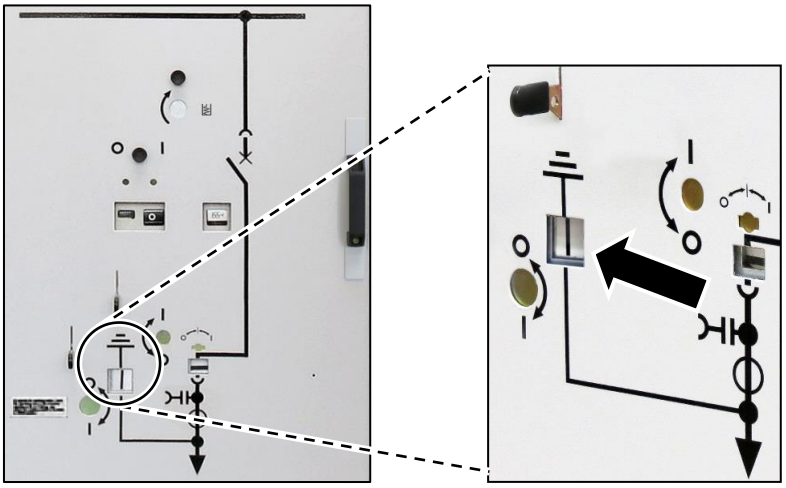
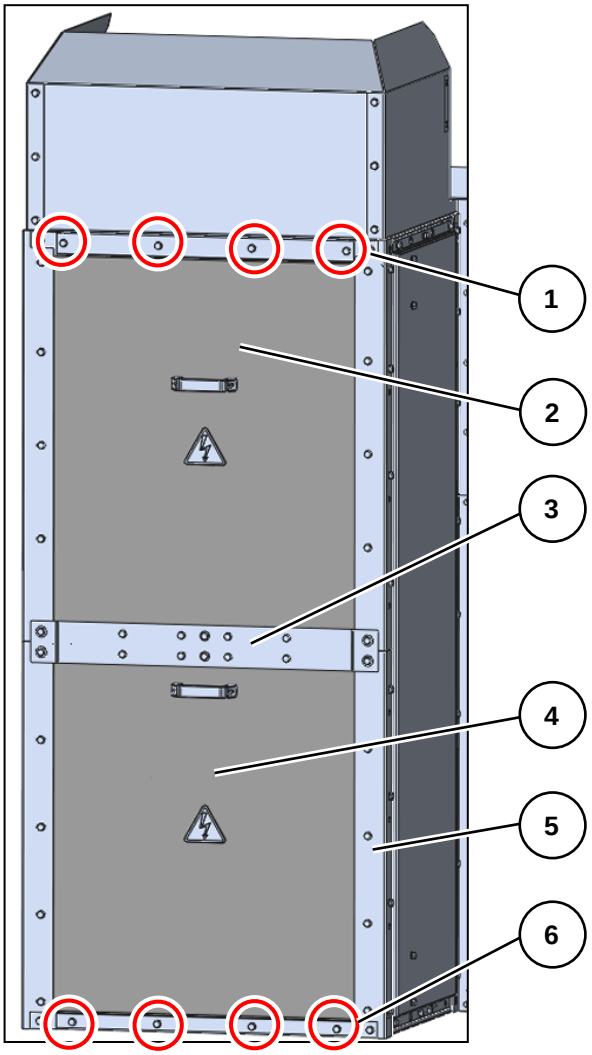


Fig. 660: Position indicator of feeder earthing switch on high-voltage door



(1) Bolted joints for upper rear wall

(2) Upper rear wall with handle

(3) Horizontal ledge

(4) Lower rear wall with handle

(5) Vertical ledges

(6) Bolted joints for lower rear wall

Fig. 661: Rear ledges and rear walls on connection duct

⇨ Remove the connecting elements from the horizontal ledge (3):
- 12 / 14 bolts M8x20 with contact washers

⇨ Remove the horizontal ledge and store it together with the associated connecting elements.

⇨ Remove the connecting elements from one of the vertical ledges (5):
- 9 / 19 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093

⇨ Remove the vertical ledge and store them together with the associated connecting elements.

⇨ Proceed in the same way with the other vertical ledges.

⇨ Loosen the connecting elements for the lower rear wall at the panel bottom (6):
- 4 / 6 bolts M8x20 with contact washers

⇨ Remove the lower rear wall (4). To do this, lift the rear wall by the handle, and pull it out. Store the rear wall.

⇨ Loosen the connecting elements for the upper rear wall in the upper area (1):
- 4 / 5 bolts M8x20 with contact washers

⇨ To remove, pull the upper rear wall (2) downwards by the handle. Store the rear wall.

✓ Access to the connection duct through the rear side is given.

INFORMATION

Final procedure steps

⇨ Immediately proceed to perform the intended checks and works in the connection duct.

24.4 Installing the rear walls on the connection duct

DANGER

Electric shock

To perform any kind of activities inside or near the connection duct of a panel, you must ensure that the connection duct is safely isolated from supply. Without isolation from supply, the cable connections in the connection duct will be live at operational high-voltage.

⇨ Observe the **Five Safety Rules**.

⇨ Verify safe isolation from supply.

⇨ Make sure all openings on the rear side are closed by fixing bolts before the panel is put into operation again.

⇨ Do **not** operate the feeder earthing switch during any activities inside or near the connection duct.

CAUTION

Sharp edges

The metal parts of the rear walls may have sharp edges.

⇨ Put on personal protective equipment.

NOTICE

Danger due to damages

Possible malfunctioning and switchgear damage caused by foreign objects:

⇨ Remove all foreign objects from the connection duct, for example:
- Tools
- Unused installation material
- Packing material
- Cleaning material

NOTICE

Cleaning

Possible malfunctioning and damage to the panels caused by pollution.

Before closing the connection duct:

⇨ Clean polluted areas in the connection duct. To do this, use a vacuum cleaner and a lint-free cloth. If necessary, moisten the cloth, use a mild household cleaner, and dry properly at the end.

⇨ Some parts and surfaces of the switchgear are greased for functioning. Do not remove the grease there; do not clean the parts and surfaces.

⇨ If greased areas are dirty, clean the dirty area and grease again according to the maintenance instructions.

Preconditions

- Upper and lower rear wall available
- Corresponding number of ledges and associated connecting elements available:
  - 1 horizontal ledge
  - 4 vertical ledges
  - Bolts size M8x20 and plain washers size 8 acc. to ISO 7093

Procedure

⇨ At the rear side of the panel, insert the lower rear wall (4) by the handle, and push it down.

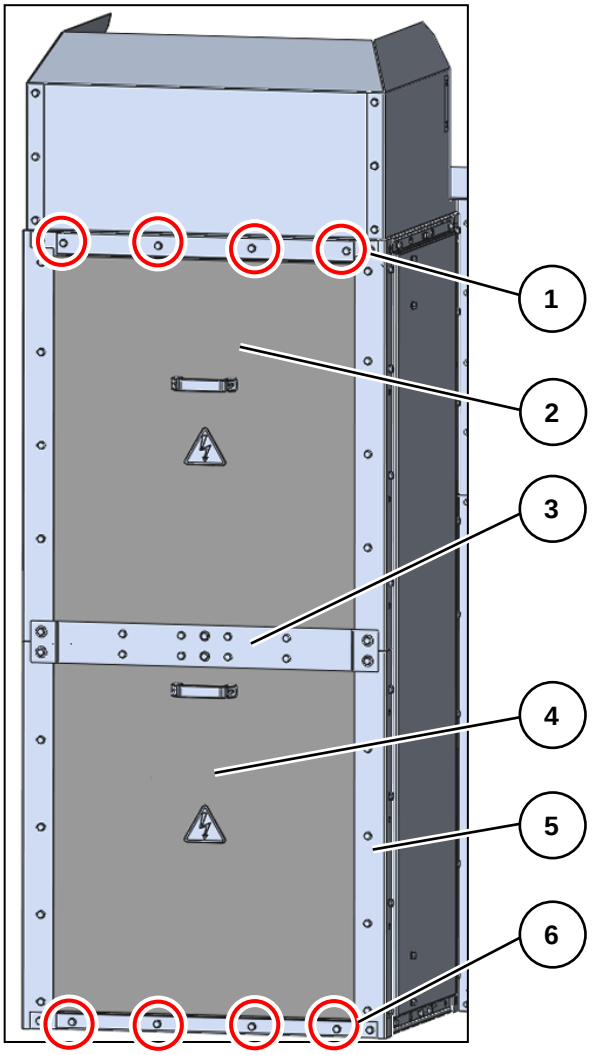
⇨ Fix the rear wall by screwing the bolts at the bottom hand-tight:
- 4 / 6 bolts M8x20 with contact washers (6)

⇨ Insert the upper rear wall (2) on the rear side of the panel and push it up using the handle.

⇨ Fix the rear wall by screwing the bolts in the upper area hand-tight:
- 4 / 5 bolts M8x20 with contact washers (1)

⇨ Install one of the 4 vertical ledges (5). Fix it by screwing the bolts hand-tight:
- 9 / 19 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093

⇨ Proceed in the same way with the other vertical ledges.



(1) Bolted joints for upper rear wall

(2) Upper rear wall with handle

(3) Horizontal ledge

(4) Lower rear wall with handle

(5) Vertical ledges

(6) Bolted joints for lower rear wall

Fig. 662: Rear ledges and rear walls on connection duct

⇨ Install the horizontal ledge (3). Fix it by screwing the bolts hand-tight:

- 12 / 14 bolts M8x20 with contact washers; use washers size 8 acc. to ISO 7093 with the bolt fixing in the area of the vertical ledges

⇨ Tighten the bolts with a tightening torque of 25 Nm.

✓ The rear walls are installed on the connection duct.

INFORMATION

Final procedure steps

Now the panel can be integrated into the course of operation again, for example:

⇨ De-earthing the feeder.

⇨ Racking the withdrawable part / switching-device truck to service position.

25 Key-operated interlocks

INFORMATION
Read and understand these instructions before attempting operating works.

25.1 Key-operated interlocks for the withdrawable part / switching-device truck

Function and design

Key-operated interlocks are available for circuit-breaker, disconnecting and contactor panels. Access to the key of any interlock is given with closed high-voltage door.

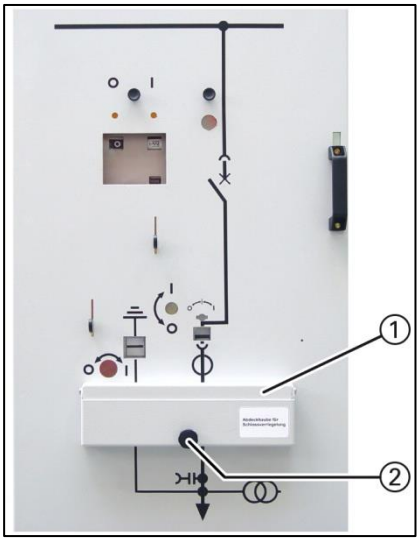
Key-operated interlocks allow interlocking or releasing associated operating functions depending on the state of the operated device. Key-operated interlocking is available for the following functions:

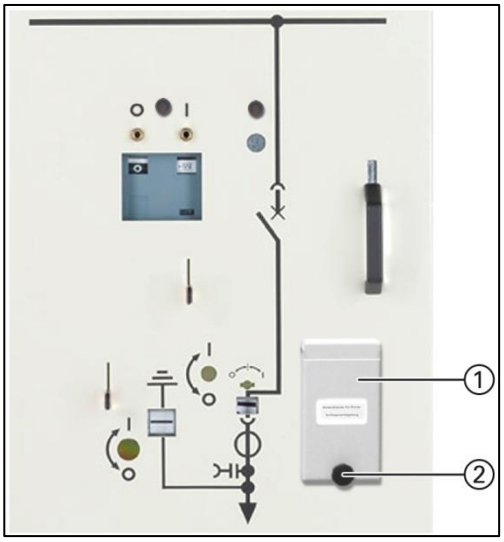
- If the withdrawable part / switching-device truck is racked to test position, racking it to service position can be interlocked by turning and removing the associated key.
- If the feeder earthing switch is in OPEN position, switching it to CLOSED position can be interlocked by turning and removing the associated key.
- If the feeder earthing switch is in CLOSED position, switching it to OPEN position can be interlocked by turning and removing the associated key.

The interlocked functions can be released again by reinserting the associated key, and subsequently turning it in opposite direction.

For customization, the interlocking options are available individually and can be combined at will. When operating the panel, it is possible to interlock two operating functions in combination: racking the withdrawable part / switching-device truck and changing the position of the feeder earthing switch. As the feeder earthing switch must always be either in CLOSED position or OPEN position, removing both associated keys simultaneously is not possible.

A cover protects the locks against accidental access. The cover is secured on the high-voltage door with a rotary button.





(1) Cover

(2) Rotary button to secure the cover

Fig. 663: Example: High-voltage door with key-operated interlocks protected by cover
Left: Circuit-breaker panel width 600 mm
Right: Circuit-breaker panel width 800 / 1000 mm

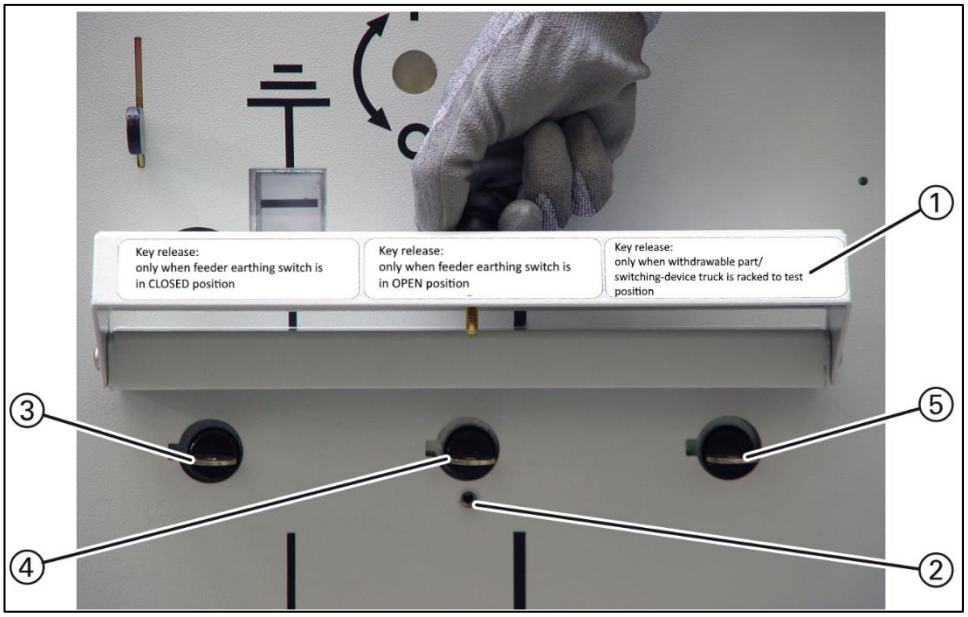
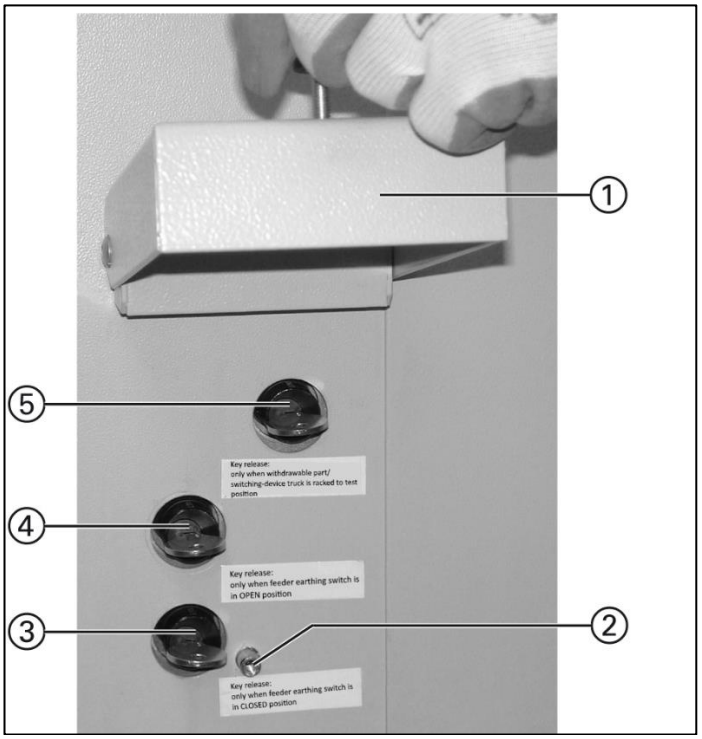


Fig. 664: Example: Cover lifted (circuit-breaker panel width 600 mm)



(1) Cover, lifted

(2) Screw thread for rotary button

Key release:
(3) Only when feeder earthing switch is in CLOSED position

Key release:
(4) Only when feeder earthing switch is in OPEN position

Key release:
(5) Only when withdrawable part / switching-device truck is racked to test position

Fig. 665: Example: Cover lifted
(circuit-breaker panel width 800 / 1000 mm)

Operating the interlocks

Precondition

- High-voltage door closed

Procedure

⇨ Turn the rotary button counter-clockwise until it is possible to lift the cover.

⇨ To interlock an operating function, turn the associated key counter-clockwise as far as it will go (that is 180°), and remove it.
Example: The feeder earthing switch is in CLOSED position (2). To interlock switching to OPEN, turn the associated key (1) counter-clockwise as far as it will go, and remove it.

⇨ To release an interlocked function, insert the associated key, and turn it clockwise as far as it will go (that is 180°).
Example: The feeder earthing switch is in CLOSED position (2). To release switching to OPEN, insert the associated key (1) as far as it will go, and turn clockwise.

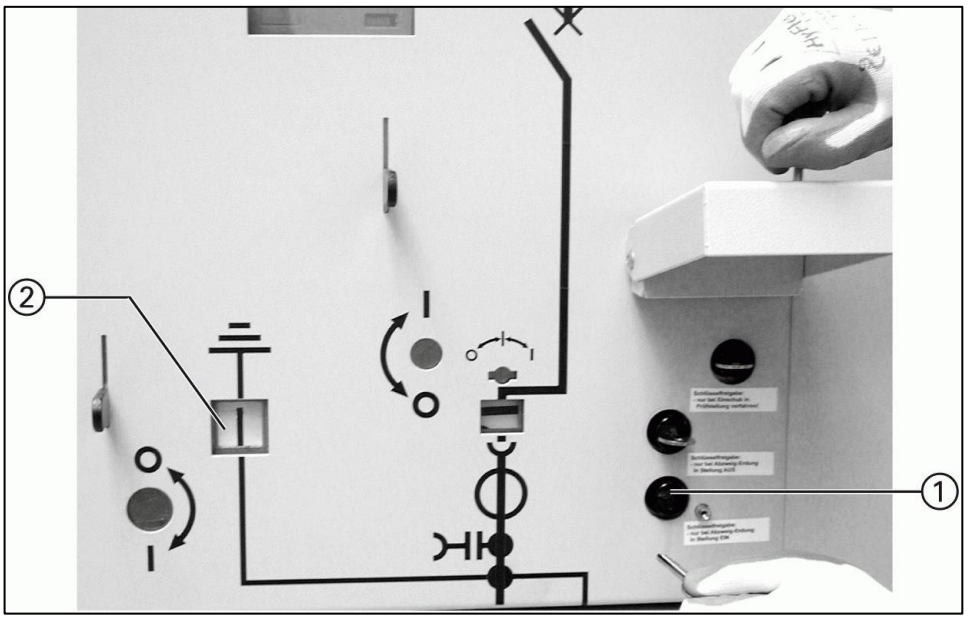


Fig. 666: Example: Interlocking / releasing switching to OPEN

⇨ Lower the cover and secure it by turning the rotary button clockwise.

✓ The selected operating function is interlocked / released.

25.2 Key-operated interlocks for the busbar earthing switch

Function and design

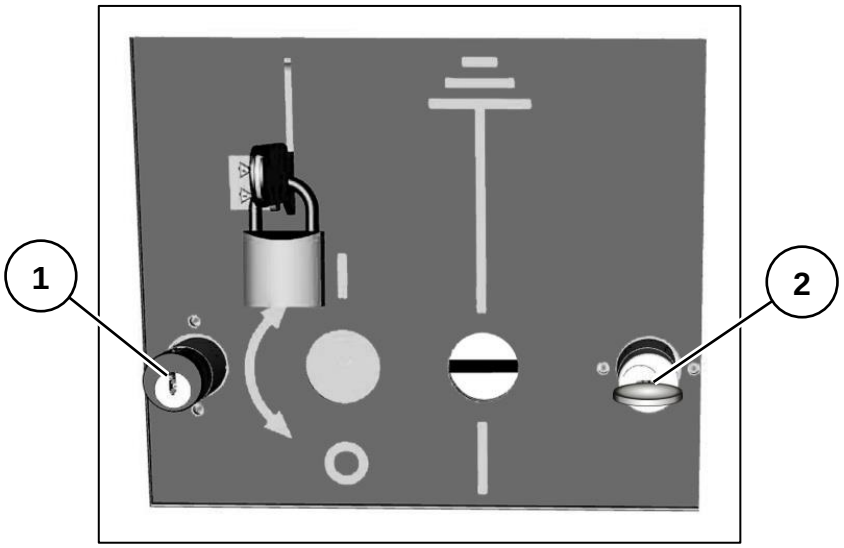
Key-operated interlocks are available for circuit-breaker and disconnecting panels. Access to the key of any interlock is given with closed door to low-voltage compartment.

Key-operated interlocks allow interlocking or releasing the following operating functions:

- If the busbar earthing switch is in OPEN position, switching it to CLOSED position can be interlocked by turning and removing the associated key.
- If the busbar earthing switch is in CLOSED position, switching it to OPEN position can be interlocked by turning and removing the associated key.

The interlocked functions can be released again by reinserting the associated key, and subsequently turning it in opposite direction.

For customization, the interlocking options are available individually. In case of two interlocks, removing both keys simultaneously is not possible because the busbar earthing switch must always be either in CLOSED position or OPEN position.



(1) Key release: only when busbar earthing switch is in OPEN position

(2) Key release: only when busbar earthing switch is in CLOSED position

Fig. 667: Door to low-voltage compartment with key-operated interlocks

Operating the interlocks

Precondition

- Door to low-voltage compartment closed

Procedure

⇨ To interlock an operating function, turn the associated key counter-clockwise as far as it will go (that is 180°), and remove it.
Example: The busbar earthing switch is in CLOSED position. To interlock switching to OPEN, turn the associated key counter-clockwise as far as it will go (1), and remove it (2).

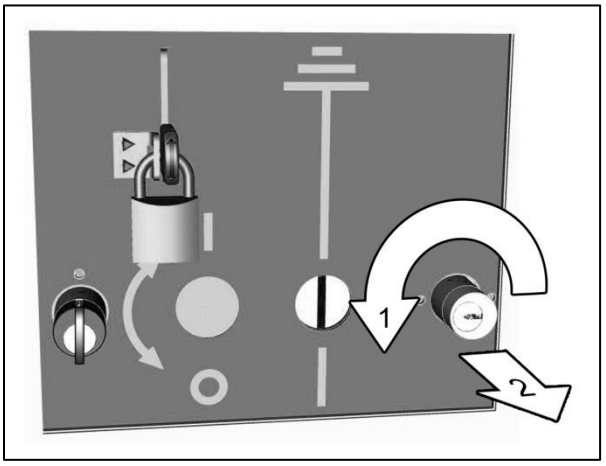


Fig. 668: Interlocking switching to OPEN

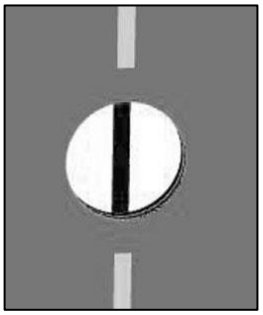


Fig. 669: Position indicator for busbar earthing switch: CLOSED

⇨ To release an interlocked function, insert the associated key, and turn it clockwise as far as it will go (that is 180°).
Example: The busbar earthing switch is in CLOSED position. To release switching to OPEN, insert the associated key (1), and turn clockwise as far as it will go (2).

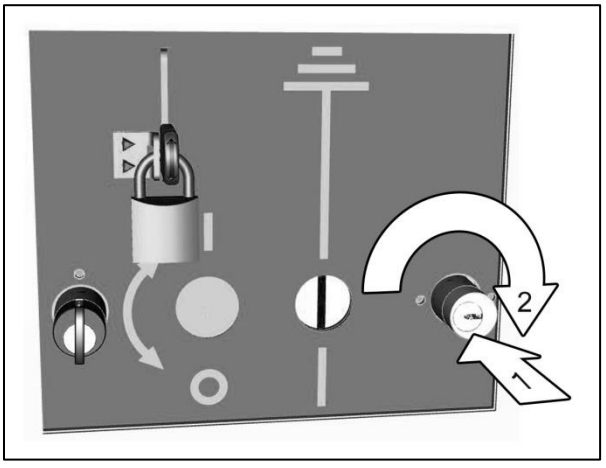


Fig. 670: Releasing switching to OPEN

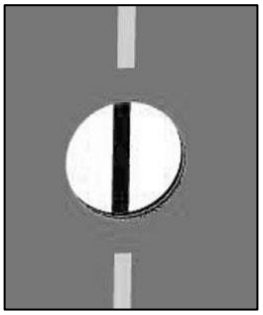


Fig. 671: Position indicator for busbar earthing switch: CLOSED

✓ The selected operating function is interlocked / released.

26 Fitting the earthing device

INFORMATION

Read and understand these instructions before attempting operating works.

26.1 Design, application and inspection of the earthing device accessories

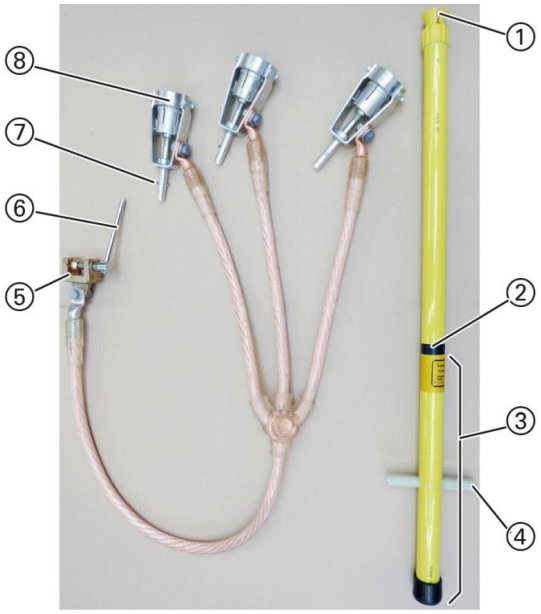
DANGER

Impermissibly high voltage and current

Inappropriate use of the earthing device accessories will result in impermissibly high voltage and current.

- ⇨ Use the earthing device **exclusively** for the maximum permissible short-circuit current and the maximum permissible short-circuit duration.
- ⇨ Do **not** use the earthing device for short-circuit tests or purposes causing similarly high voltages and currents.
- ⇨ Perform diligent inspection of the earthing device accessories **before each** application.

	Panel width 600 mm	Panel width 800 mm
Max. short-circuit current and max. short-circuit duration	= 25 kA / 1 s	= 25 kA / 1 s
Diameter of the fixed contacts in the bushings	40 mm	60 mm
Rated normal current of feeders	≤ 1000 A	1250 A



(1) Coupling of the earthing rod
(2) Limiting ring
(3) Hand area
(4) Cross bar
(5) Earthing clamp
(6) Screw handle of the earthing clamp
(7) Spindle of the earthing tulip
(8) Earthing tulip

Fig. 672: Earthing device and earthing rod

Mandatory inspection of the earthing device accessories
To ensure safe operation of the earthing device and the earthing rod, inspect them diligently **before each** application.

⇨ Perform a visual check of the earthing device and the earthing rod.
Especially, check the copper wires and the wire wrappings for noticeable brown coloration and inflexibility resulting from high currents.

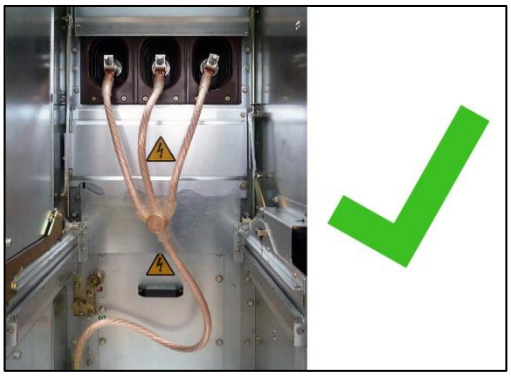


Fig. 673: Copper wires without coloration

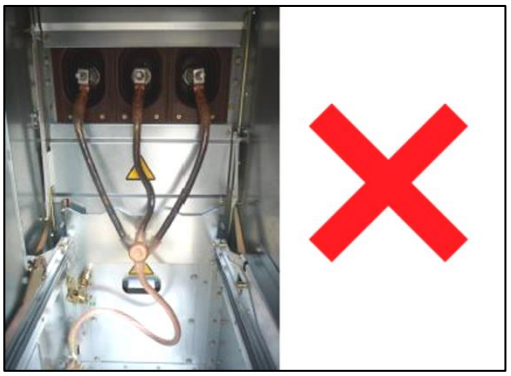


Fig. 674: Copper wires with brown coloration

⇨ Perform a manual check of the earthing device and the earthing rod.
Especially, check if all bolted joints at the earthing tulips are firmly tightened.

If a check shows noticeable problems:

⇨ Do not use these earthing device accessories.

⇨ Contact the locally superior and responsible person.

✓ Inspection of the earthing device accessories is successfully executed.

26.2 Connecting the earthing device

⚠ DANGER

Electric shock

⇨ Put on personal protective equipment.

⇨ Observe the correct order of action:
Attach the earthing clamp to the earthing point of the panel **before** opening a shutter.

Fitting the earthing device

⚠ DANGER

Impermissibly high voltage and current

Inappropriate use of the earthing device accessories will result in impermissibly high voltage and current.

⇨ Use the earthing device **exclusively** for the maximum permissible short-circuit current and the maximum permissible short-circuit duration.

⇨ Do **not** use the earthing device for short-circuit tests or purposes causing similarly high voltages and currents.

⇨ Perform diligent inspection of the earthing device accessories **before each** application.

Preconditions

- Withdrawable part / switching-device truck taken out of the panel
- Low-voltage connector stowed away
- Both shutter to the connection compartment and shutter to the busbar compartment closed
- Bushing contacts to be earthed isolated
- Earthing device accessories available and in perfect condition
- All panel versions except for contactor panels with 435 mm width:
  Slip-on lever for opening the shutter available
- Padlock for shutter not to be used available
- Personal protective equipment put on

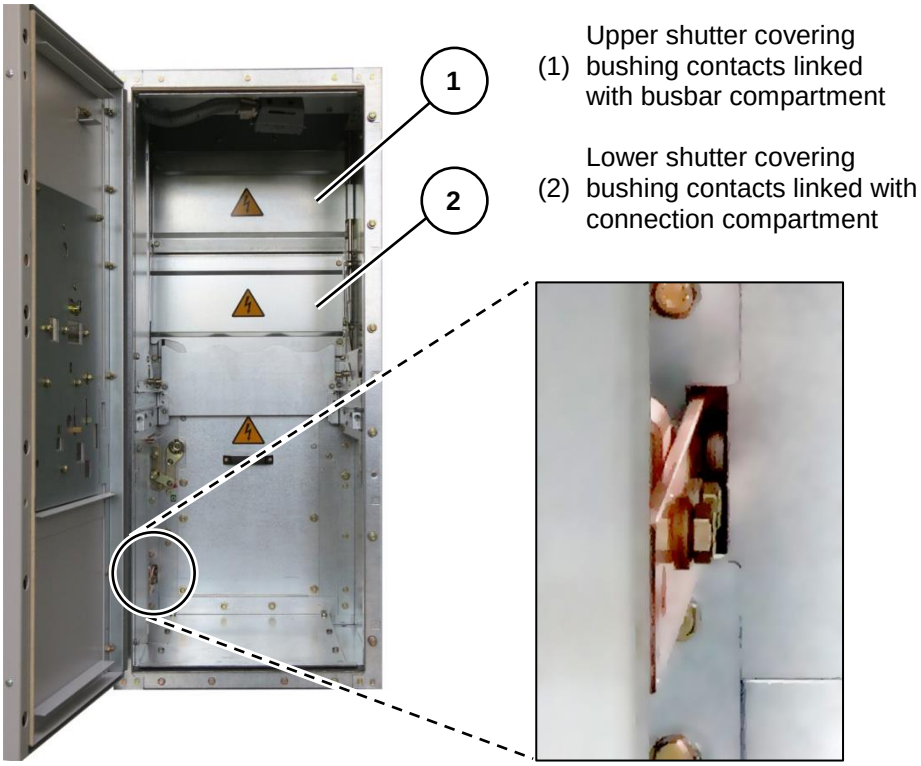


Fig. 675: Panel prepared

Fig. 676: Fixed earthing point for connecting the earthing clamp

Attaching the earthing clamp to the earthing point

⚠ DANGER

Electric shock

⇨ Connect the earthing clamp **firmly** with the earthing point of the panel.

⚠ CAUTION

Injury

The mechanism for the shutters on the left and right side in the switching-device compartment can cause injuries by getting squeezed, caught or cut.

⇨ Do not remove any parts of the covering.

⇨ Do not reach into the shutter mechanism with hands or tools.

⇨ Bolt the earthing clamp hand-tight to the earthing point of the panel using the screw handle. This corresponds to a tightening torque of approx. 20 Nm.

Fig. 677: Bolting earthing clamp

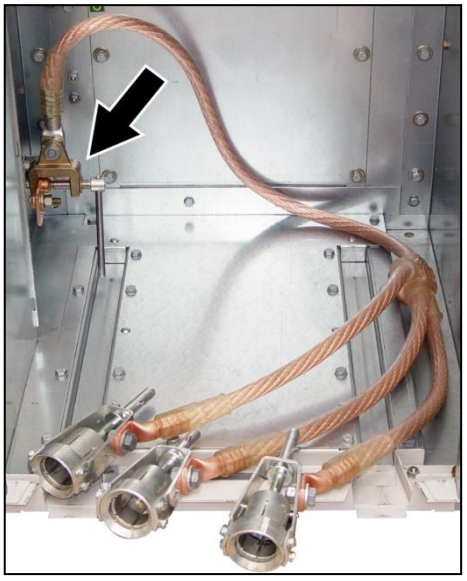


Fig. 678: Earthing clamp connected with earthing point

Opening the shutter

⚠ DANGER

Electric shock

If the busbars in the busbar compartment / cable or bar connections in the connection compartment have not been isolated, the bushing contacts will be live at operational high-voltage.

⇨ Always observe the **Five Safety Rules**.

Before opening a shutter:

⇨ Isolate the busbars / cable or bar connections.

⇨ Verify safe isolation from supply.

⇨ If one of the shutters is open, close it before opening the other.

⇨ Make sure that the mechanism of the shutter not to be opened is secured with a padlock.

⇨ Contactor panels with panel width 435 mm only:
Make sure that the main shutter mechanism is secured with a padlock.

Open the shutter **safely**:

⇨ Open the shutter strictly as described in chapter 22 "Operating the shutters" and observe all safety instructions therein.

While a shutter is open:

⇨ Do not reach into or enter the switching-device compartment.

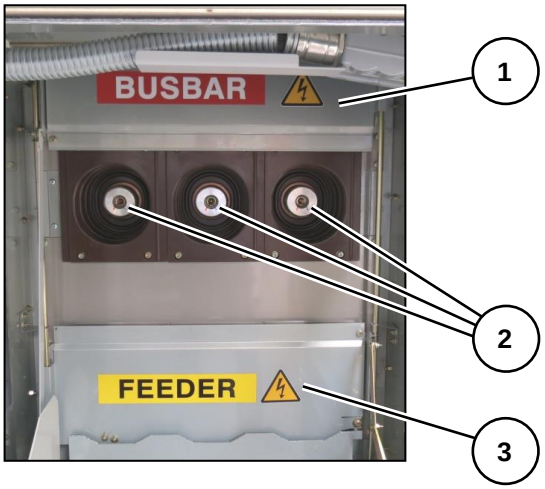
⇨ Do not insert any objects in the switching-device compartment other than the earthing rod.

Always close a shutter:

⇨ Before interrupting operations inside the switching-device compartment.

⇨ Immediately after completing operations inside the switching-device compartment.

⇨ To uncover the bushing contacts (2) to be earthed, open the shutter either to the busbar compartment (1) or to the connection compartment (3) as described in chapter 22 "Operating the shutters".



(1) Shutter to busbar compartment

(2) Bushing contacts uncovered

(3) Shutter to connection compartment

Fig. 679: Shutter to the busbar compartment open (as example)

Earthing the bushing contacts

Hereafter, it is exemplarily shown how to attach the earthing device to the bushing contacts in the upper row of bushings linked with the **busbar compartment**. Proceed in the same way when attaching the earthing device to the bushing contacts in the lower row of bushings linked with the **connection compartment**.

⚠ DANGER

Electric shock

⇨ Perform the following activities in the presence of an observer until the earthing device is completely mounted to all three bushing contacts. In case of emergency, this person can call for help.

⇨ **Exclusively** use the associated earthing rod for attaching the earthing tulips to the bushing contacts.

⇨ Use the earthing device accessories only in the way described hereafter. Never reach out beyond the limiting ring on the earthing rod. This ensures a safe distance to the bushing contacts.

INFORMATION

Unexptected light and noise

After isolation, the busbar system still carries some capacitive charging.

⇨ Expect short light and noise from a minor electrostatic discharge while leading the earthing rod with the earthing tulip on top towards the bushing contact.

⇨ Align the two cross bolts on the spindle of the central earthing tulip with the guides in the coupling of the earthing rod. Plug the earthing tulip on the coupling and push it in until the two cross bolts touch the end of the guides.

Fig. 680: Plug on tulip onto earthing rod

⇨ Seize the earthing rod in the safe hand area with both hands. The limit of the safe hand area is marked by a ring.

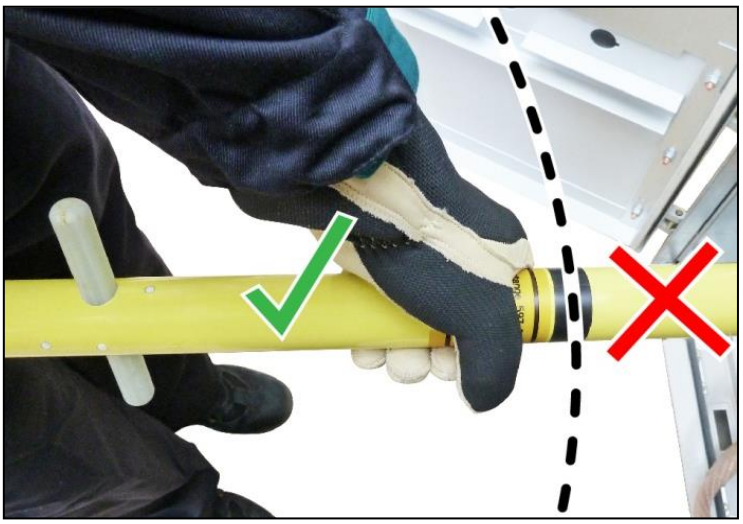


Fig. 681: Seizing the earthing rod in the safe hand area

⇨ Lead the coupling of the earthing rod with the earthing tulip on it towards the central bushing contact, and push the earthing tulip firmly onto the bushing contact. Hereby, the earthing rod must point exactly towards the bushing contact.

⇨ Continue pushing the earthing rod slightly towards the bushing contact. While doing so, carefully turn the earthing rod clockwise at the cross lever to fix the earthing tulip on the bushing contact.

⇨ Detach the earthing rod from the earthing tulip by pulling.

Fig. 682: Tightening earthing tulip on bushing contact

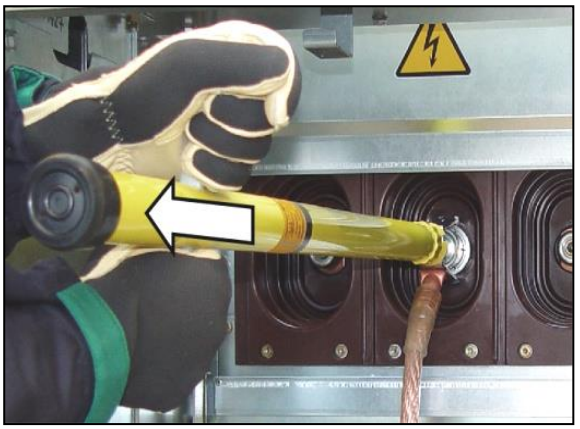


Fig. 683: Detaching earthing rod

⇨ To earth the outer bushing contacts, proceed in the same way.

Fig. 684: Earthing tulip fixed on central bushing contact

Fig. 685: Earthing device completely mounted

✓ The earthing device is completely mounted.

26.3 Removing the earthing device

⚠ DANGER

Electric shock

⇨ Put on personal protective equipment.

Preconditions

- Bushing contacts isolated
- Earthing rod available
- All panel versions except for contactor panels with panel width 435 mm:
  Slip-on lever for closing the shutter available
- Personal protective equipment put on

Fig. 686: Earthing device to be removed

Detaching the earthing device from the bushing contacts

Hereafter, it is exemplarily shown how to detach the earthing device from the bushing contacts in the upper row of bushings linked with the **busbar compartment**. Proceed in the same way when detaching the earthing device from the bushing contacts in the lower row of bushings linked with the **connection compartment**.

⚠ DANGER

Electric shock

⇨ Always observe the **Five Safety Rules**.

⇨ **Exclusively** use the associated earthing rod for detaching the earthing tulips from the bushing contacts.

⇨ Use the earthing device accessories only in the way described hereafter. Never reach out beyond the limiting ring on the earthing rod. This ensures a safe distance to the bushing contacts.

⇨ Seize the earthing rod in the safe hand area with both hands. The limit of the safe hand area is marked by a ring.

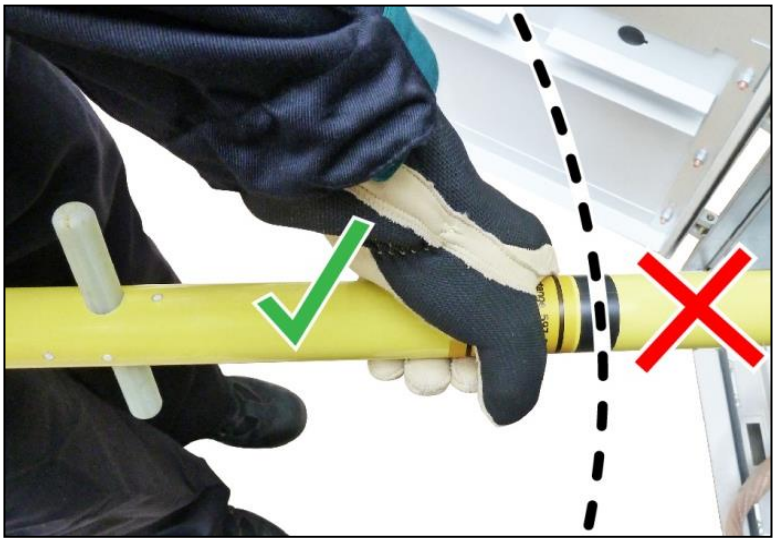


Fig. 687: Seizing the earthing rod in the safe hand area

⇨ Lead the coupling of the earthing rod towards the earthing tulip to be detached. Hereby, the earthing rod must point exactly towards the earthing tulip.

⇨ Align the guides in the coupling of the earthing rod with the two cross bolts on the spindle of the earthing tulip. Plug the earthing rod on the earthing tulip and push it in until the two cross bolts touch the end of the guides.

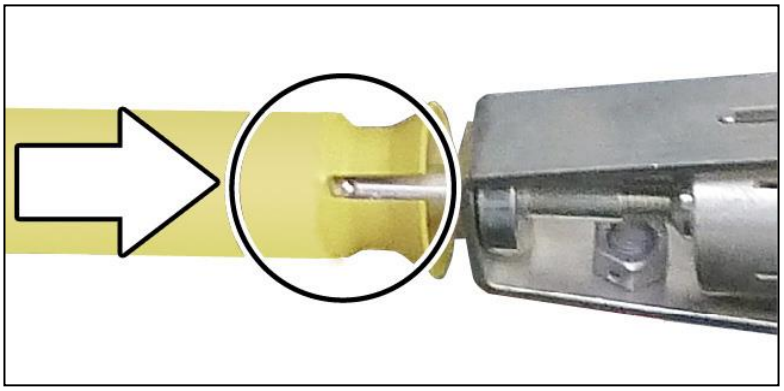


Fig. 688: Plugging the earthing rod onto the tulip

⇨ Continue pushing the earthing rod slightly towards the earthing tulip. While doing so, carefully turn the earthing rod counter-clockwise at the cross lever in order to detach the earthing tulip.

⇨ Detach the earthing tulip from the bushing contact by pulling the earthing rod off.

Fig. 689: Detaching the earthing tulip

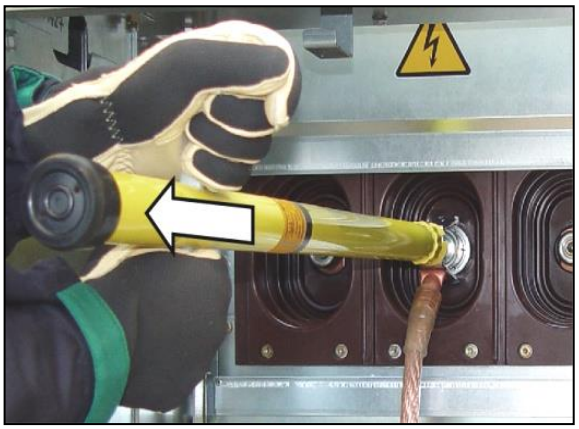


Fig. 690: Pulling earthing rod

⇨ Pull the tip with the tulip on it as far away as possible from the bushing contacts.

⇨ Pull the earthing tulip off the earthing rod and put it carefully on the panel base.

Fig. 691: Pulling off the tulip

⇨ To detach the other two earthing tulips, proceed in the same way.

Closing the shutter

⚠ DANGER

Electric shock

⇨ Close the shutter strictly as described in chapter 22 "Operating the shutters" but leave the other shutter padlocked.

⇨ Close the shutter as described in chapter 22 "Operating the shutters".

Detaching the earthing clamp from the earthing point

> **⚠ CAUTION**
>
> **Injury**
>
> The shutter mechanism on the left and right side in the switching-device compartment can cause injuries by getting squeezed, caught or cut.
>
> ⇨ Do not remove any parts of the covering.
>
> ⇨ Do not reach into the shutter mechanism with hands or tools.

⇨ Unscrew the earthing clamp from the earthing point of the panel using the screw handle. Remove the earthing clamp.

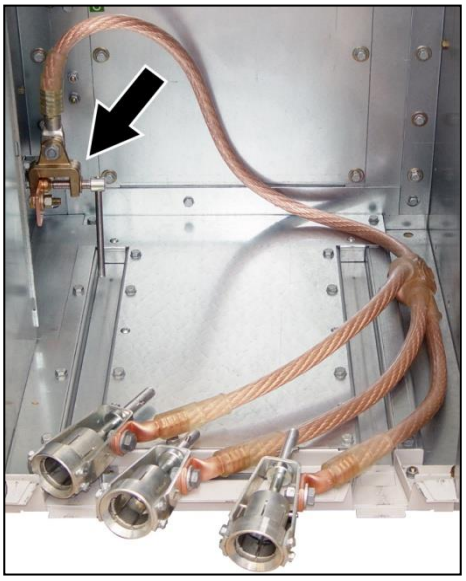


Fig. 692: Earthing clamp connected with earthing point

Fig. 693: Unscrewing the earthing clamp

⇨ Remove the earthing device from the switching-device compartment.

⇨ Remove the padlock from the mechanism of the other shutter.

✓ The earthing device is completely detached from the bushing contacts.

27 Panels with motor operating mechanism control

INFORMATION
Read and understand these instructions before attempting operating works.

27.1 Overview of functionality

Circuit-breaker panels can optionally be equipped with motor operating mechanism control as an electrical operating mode (as opposed to manual operating mode) for the following functions:

- Racking the withdrawable circuit-breaker / circuit-breaker truck from test position to service position, and from service position to test position
- Switching the feeder earthing switch to CLOSED position or OPEN position
- Switching the busbar earthing switch to CLOSED position or OPEN position

Manual operation versus electrical operation
For the mentioned functions, manual operation and electrical operation can be operated independently from one another. Hence, any combination is possible:

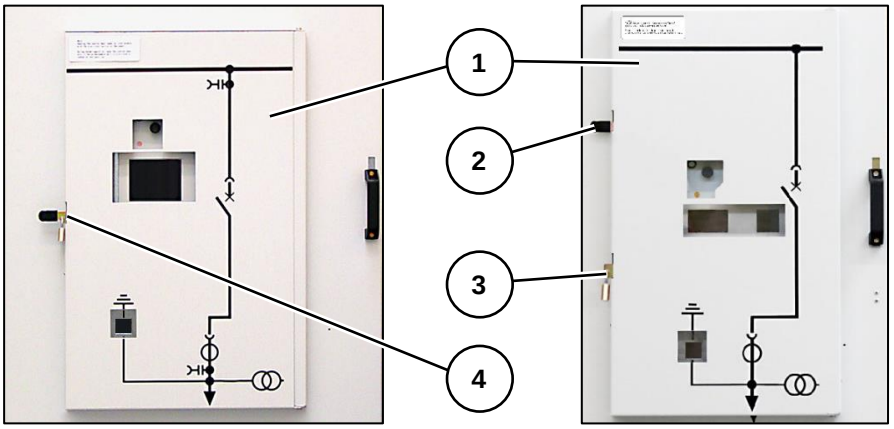
Withdrawable circuit-breaker / circuit-breaker truck: **Racking**	**Feeder earthing switch:** **Switching**	**Busbar earthing switch:** **Switching**
Electrical or manual operation	Manual operation only	Manual operation only
Electrical or manual operation	Electrical or manual operation	
Manual operation only	Manual operation only	Electrical or manual operation
Manual operation only	Electrical or manual operation	

Central versus local control
All functions possible from the central control can also be operated locally at the panel, either manually or electrically. For safe and consistent operation, it is not possible to operate from the central control and locally at the same time. Depending on the design of the panel version, switching between local and central control is carried out in different ways, for example via a local-remote switch located on the door to the low-voltage compartment.

Fig. 694: Example of a local-remote switch

Operating modes for racking the withdrawable circuit-breaker / circuit-breaker truck
For safe and consistent operation, it is not possible to rack the withdrawable circuit-breaker / circuit-breaker truck manually and electrically at the same time. This is ensured via two mechanisms.

First, the panel automatically blocks access for electrical operation when the control door (1) on the high-voltage door is opened. To prevent accidentally blocking access for electrical operation, the control door has to be padlocked (3; 4) when the panel is set to the electrical racking for normal operation. This measure also prevents accidentally stopping the motor, for example during an ongoing electrical racking procedure by opening the control door.



(1) Control door
(2) Type 3AE5: Handle
(3) Type 3AE5: appliance for fitting Padlock
(4) Type 3AE1: Handle with padlock

Fig. 695: Circuit-breaker type 3AE1: Control door closed and padlocked

Fig. 696: Circuit-breaker type 3AE5: Control door closed amd padlocked

Second, the user is required to select the appropriate access mode before racking manually or electrically. Once an access mode is selected, the mechanism blocks access for manual racking and releases access for electrical racking, and vice versa. However, it is important to stress: When access is released for electrical racking, it is not until the control door is closed that this operating mode becomes active. A third mode blocks any racking altogether as a precondition for opening the high-voltage door.
An indicator on the high-voltage door informs about the selected access mode:

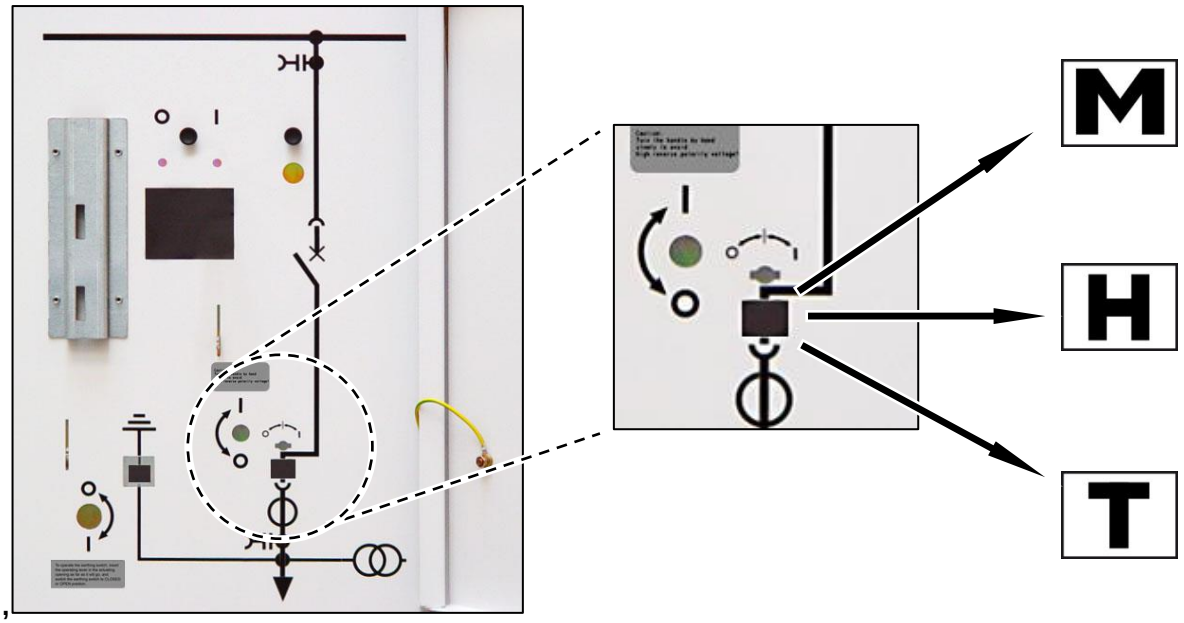


Fig. 697: Control door open, access mode indicator visible

Fig. 698: Access mode indicator for racking: Possible indications

Panels with motor operating mechanism control

The following table gives an overview of the possible access mode indications, the corresponding operating options and their preconditions.

<table>
<tr><th>Indication</th><th>Access mode</th><th>Operating options</th></tr>
<tr><td rowspan="2">  </td><td>Access is released for motor-operated racking</td><td>Racking the withdrawable circuit-breaker / circuit-breaker truck electrically from test position to service position, or from service position to test position</td></tr>
<tr><td colspan="2">Preconditions for operating options:
Low-voltage connector plugged on
High-voltage door closed
Feeder earthing switch in OPEN position
Circuit-breaker in OPEN position
Control door closed and padlocked
Local or remote control</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td rowspan="2">  </td><td>Access is released for manual racking</td><td>Racking the withdrawable circuit-breaker / circuit-breaker truck manually from test position to service position, or from service position to test position</td></tr>
<tr><td colspan="2">Preconditions for operating options:
High-voltage door closed
Feeder earthing switch in OPEN position
Circuit-breaker in OPEN position
Panel set to local control
Control door open</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td rowspan="2">  </td><td>Racking interlocked</td><td>Closing the control door
Opening the high-voltage door
Taking the withdrawable circuit-breaker / circuit-breaker truck out of the panel</td></tr>
<tr><td colspan="2">Preconditions for operating options:
Circuit-breaker in OPEN position
Withdrawable circuit-breaker / circuit-breaker truck in test position
Panel set to local control</td></tr>
</table>

INFORMATION

Blocking any racking operation is the precondition for opening the high-voltage door.

⇨ Before opening the high-voltage door, set the access mode indicator to "T".

Several electrical interlocks support safe electrical operation:

Operating option	Preconditions for operating option	Electrical interlock
Racking the withdrawable circuit-breaker / circuit-breaker truck electrically	• Low-voltage connector plugged on • High-voltage door closed • Feeder earthing switch in OPEN position • Circuit-breaker in OPEN position • Access released for motor-operated racking • Control door closed	During an ongoing racking procedure, racking in opposite direction **is interlocked** electrically.
		During an ongoing racking procedure, opening / closing the circuit-breaker **is interlocked** electrically.
		During an ongoing racking procedure, opening / closing the feeder earthing switch **is interlocked** electrically.
Opening / closing the circuit-breaker electrically for testing purposes	• Low-voltage connector plugged on • High-voltage door closed • Control door closed • Withdrawable circuit-breaker / circuit-breaker truck **in test position**	Opening / closing the circuit-breaker electrically for testing purposes is **not interlocked** electrically.
Opening / closing the circuit-breaker electrically during service	• Low-voltage connector plugged on • High-voltage door closed • Control door closed • Withdrawable circuit-breaker / circuit-breaker truck **in service position**	Opening / closing the circuit-breaker electrically during service is **not interlocked** electrically.
Opening / closing the feeder earthing switch electrically for testing purposes	• Low-voltage connector plugged on • High-voltage door closed • Control door closed • Withdrawable circuit-breaker / circuit-breaker truck **in test position**	Opening / closing the feeder earthing switch electrically for testing purposes is **not interlocked** electrically.
Closing the feeder earthing switch electrically during service	• Low-voltage connector plugged on • High-voltage door closed • Control door closed • Withdrawable circuit-breaker / circuit-breaker truck **in service position**	Closing the feeder earthing switch electrically during service **is interlocked** electrically.

27.2 Opening the control door

NOTICE

Conflicting operation

The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ For any local operations – manual or electrical – set the panel to local control, for example by switching the local-remote switch to LOCAL position.

NOTICE

Maloperation

Electrically racking the withdrawable circuit-breaker / circuit-breaker truck is only possible when both the high-voltage door **and** the control door are closed. If the control door is open during an electrical racking procedure, the motor stops immediately.

⇨ Do **not** open the control door during an electrical racking procedure.

Instruction label on control door
In addition to these instructions, an instruction label provided on the control door informs about opening the control door.

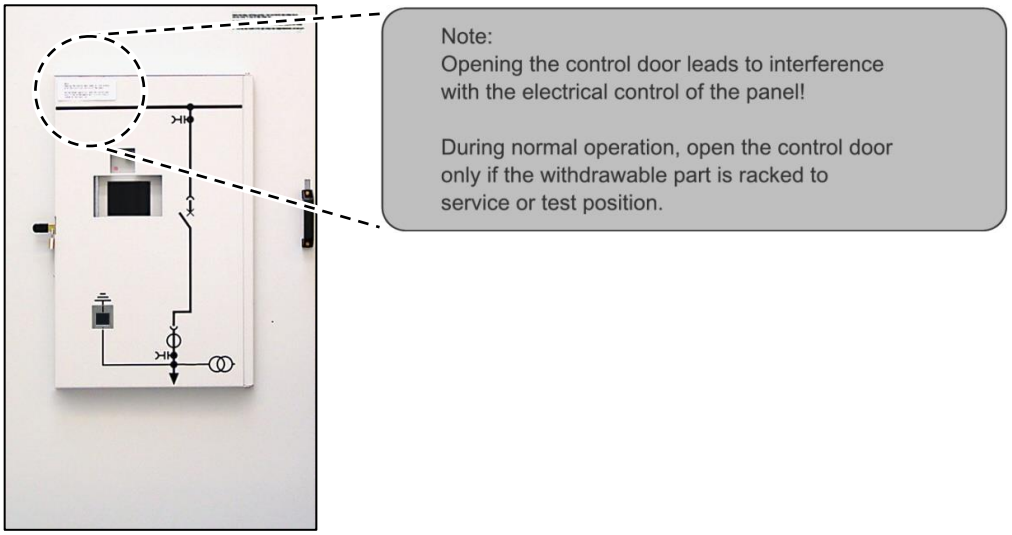


Fig. 699: Control door:
Instruction label about opening the control door

Preconditions

- Withdrawable circuit-breaker / circuit-breaker truck in service position or in test position
- Panel set to local control
- High-voltage door closed

Procedure

⇨ Open the padlock at the control door and remove it.

⇨ Pull the handle of the control door upwards, and open the door to the right.

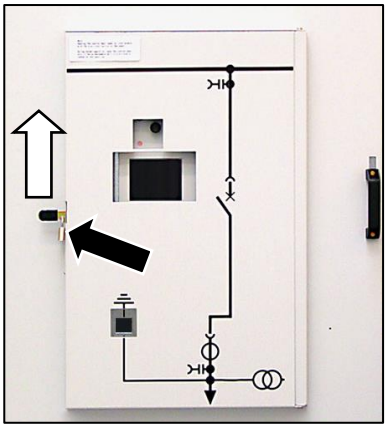


Fig. 700: Circuit-breaker type 3AE1: Removing the padlock, pulling the handle

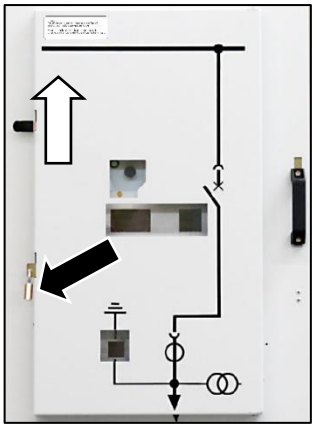


Fig. 701: Circuit-breaker type 3AE5: Removing the padlock, pulling the handle

✓ The control door is open.

27.3 Closing the control door

NOTICE

Maloperation

The panel automatically blocks electrical racking when the control door is open.

⇨ To prevent accidentally blocking access for electrical racking by opening the control door, padlock the control door immediately after closing it.

Preconditions

- High-voltage door open or closed
- Padlock for control door available

Procedure

⇨ Pull the handle upwards and hold it.

⇨ Press the control door totally against the high-voltage door.

⇨ Push the handle downwards as far as it will go.

⇨ Fit a padlock to the control door and close it.

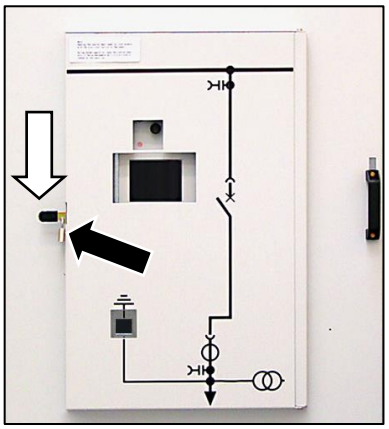


Fig. 702: Circuit-breaker type 3AE1: Pulling the handle, fitting the padlock

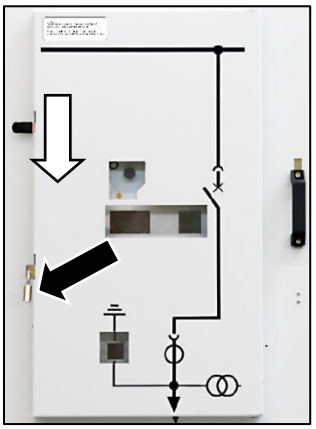


Fig. 703: Circuit-breaker type 3AE5: Pulling the handle, fitting the padlock

✓ The control door is closed.

27.4 Selecting manual operation for racking

NOTICE

Conflicting operation

The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ For any local operations — manual or electrical — set the panel to local control, for example by switching the local-remote switch to LOCAL position.

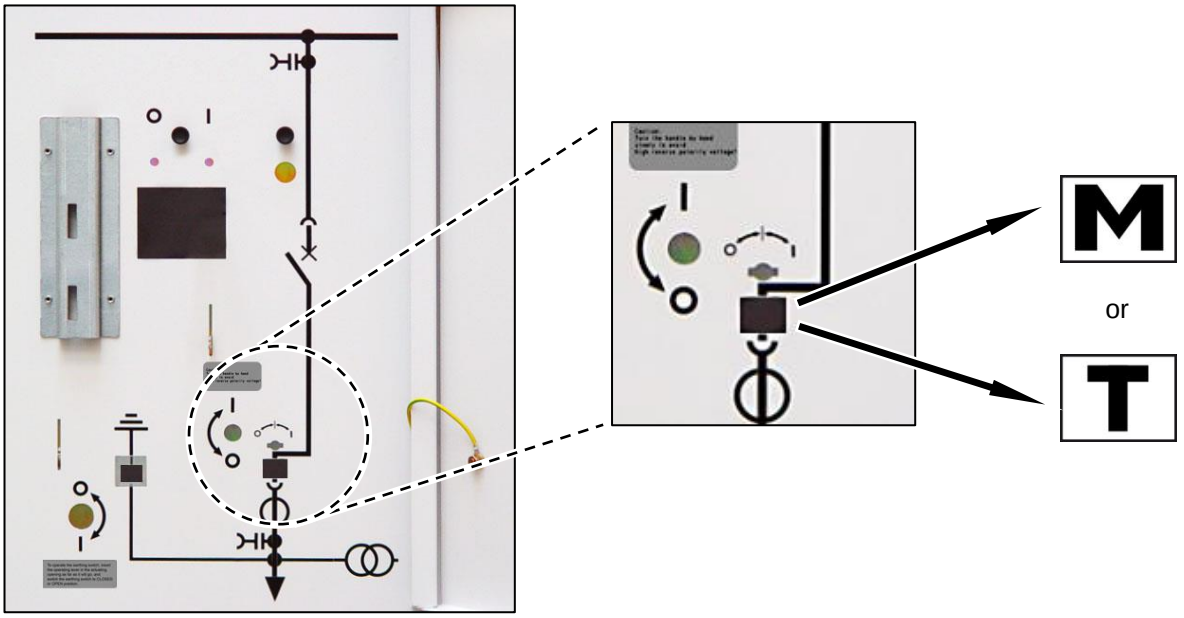


Fig. 704: Access mode indicator for racking: starting point "M" or "T"

Preconditions

- Feeder earthing switch in OPEN position
- Circuit-breaker in OPEN position
- Panel set to local control
- Control door open
- Withdrawable circuit-breaker / circuit-breaker truck in service position or in test position
- For electromagnetic interlock (optional):
  - Electromagnetic interlock deactivated
- Access mode indicator shows "M" or "T"

Procedure

⇨ To release the actuating opening for the double-bit key, lift the operating slide (1) and hold it.

⇨ Insert the double-bit key (2).

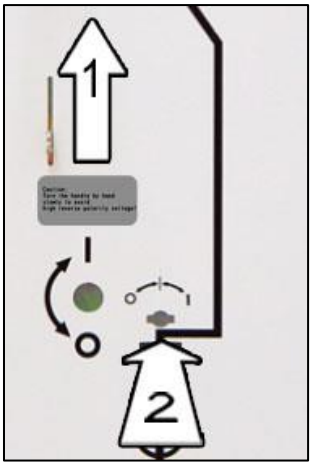


Fig. 705: Lifting the operating slide and inserting the key

⇨ To release manual access to the withdrawable circuit-breaker / circuit-breaker truck, turn the double-bit key until the operating mode indicator changes to "H":

- To change from "M" to "H", turn 90° counter-clockwise
- To change from "T" to "H", turn 90° clockwise

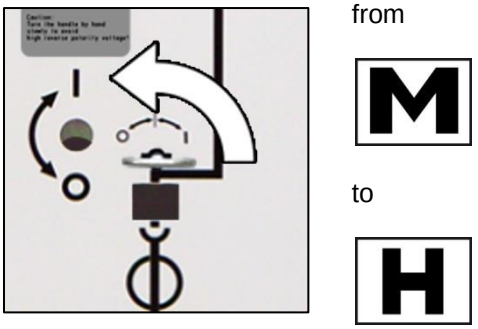


Fig. 706: Turning the key counter-clockwise

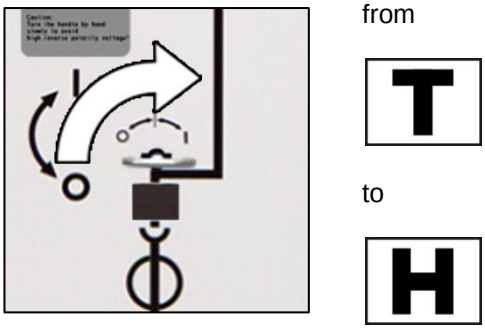


Fig. 707: Turning the key clockwise

INFORMATION

Final procedure steps

⇨ Next, insert the racking crank for moving the withdrawable circuit-breaker / circuit-breaker truck.

✓ Racking the withdrawable circuit-breaker / circuit-breaker truck is set to manual operation.

27.5 Selecting electrical operation for racking

NOTICE

Conflicting operation

The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ For any local operations – manual or electrical – set the panel to local control, for example by switching the local-remote switch to LOCAL position.

INFORMATION

Electrical racking is only possible when both the high-voltage door **and** the control door are closed.

⇨ After releasing electrical access to the withdrawable circuit-breaker / circuit-breaker truck, close the control door and padlock it.

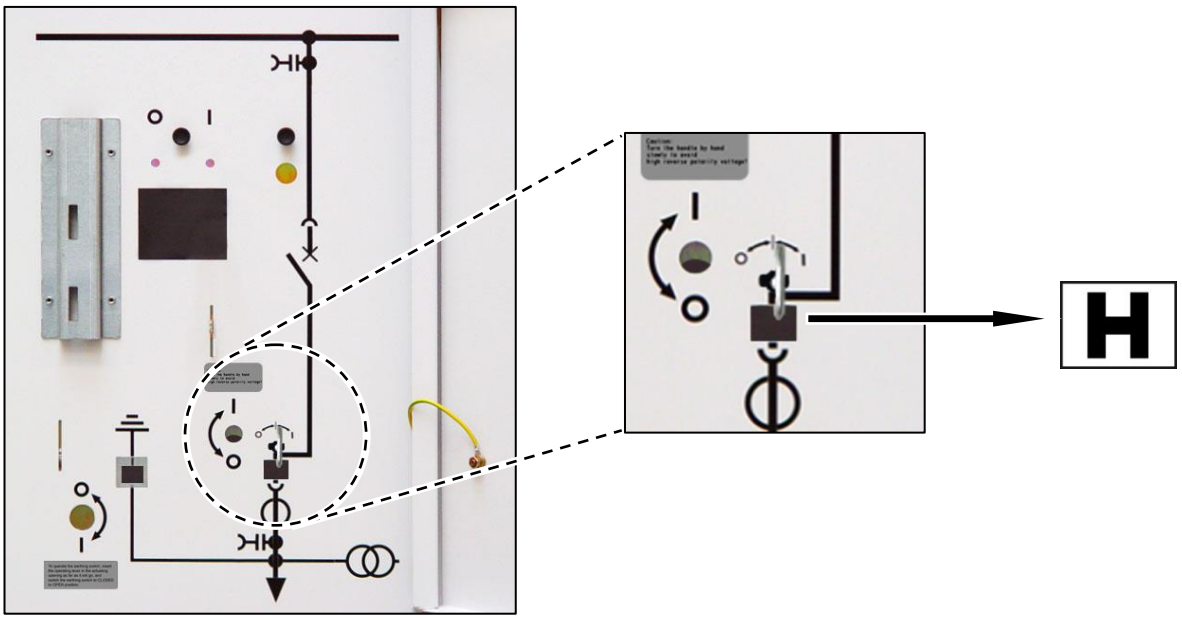


Fig. 708: Access mode indicator for racking: Starting point "H"

Preconditions

- Feeder earthing switch in OPEN position
- Circuit-breaker in OPEN position
- Panel set to local control
- Control door open
- Withdrawable circuit-breaker / circuit-breaker truck in service position or in test position
- Double-bit key for selecting racking mode inserted and access mode indicator shows "H"

Procedure

⇨ To release electrical access to the withdrawable circuit-breaker / circuit-breaker truck, turn the double-bit key 90° clockwise until the operating mode indicator changes to "M".

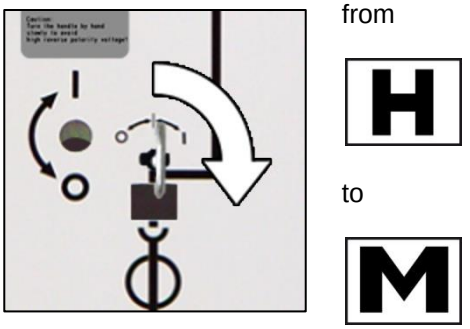


Fig. 709: Turning the key clockwise

⇨ Remove the double-bit key and push the operating slide downwards as far as it will go.

⇨ Close the control door.

⇨ Fit a padlock to the control door and close it.

✓ Racking the withdrawable circuit-breaker / circuit-breaker truck is set to electrical operation.

27.6 Selecting interlocking

NOTICE

Conflicting operation

The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ For any local operations – manual or electrical – set the panel to local control, for example by switching the local-remote switch to LOCAL position.

INFORMATION

Blocking any racking operation is the precondition for opening the high-voltage door.

⇨ Before opening the high-voltage door, set the access mode indicator to "T".

Panels with motor operating mechanism control

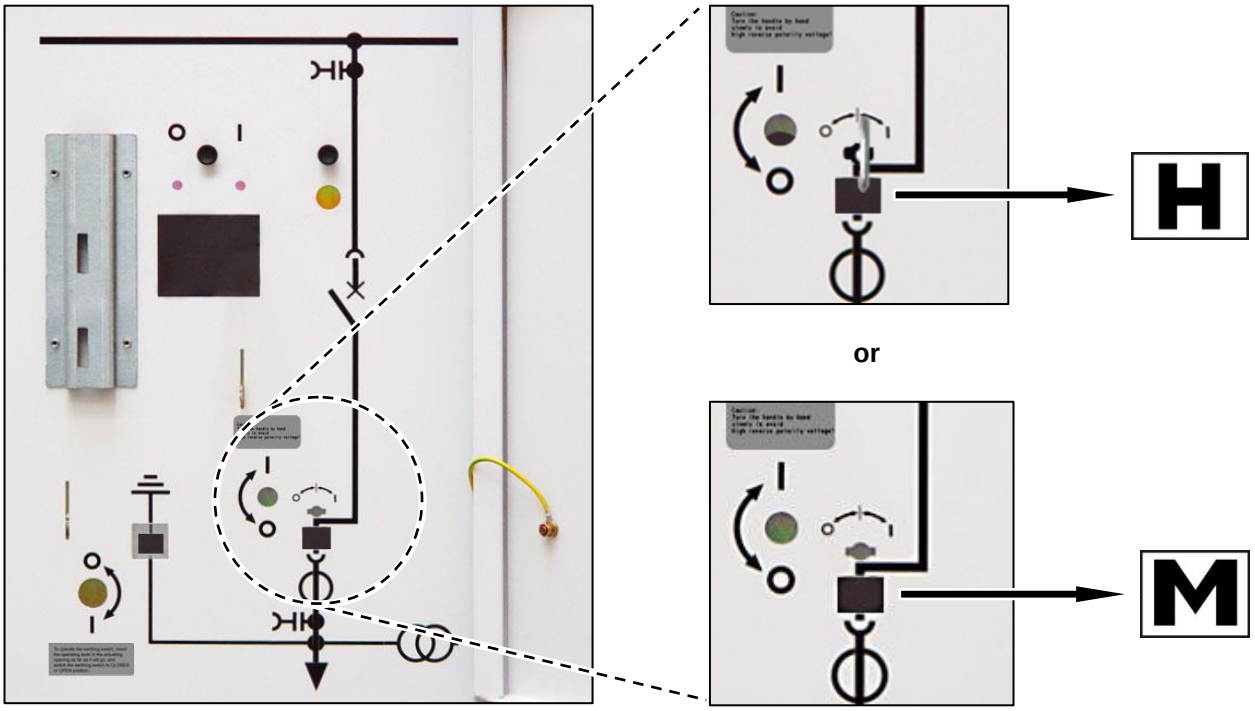


Fig. 710: Access mode indicator for racking: starting point "H" or "M"

Preconditions

- Withdrawable circuit-breaker / circuit-breaker truck in test position
- Panel set to local control
- Control door open
- Feeder earthing switch in OPEN position
- Access mode indicator shows "M", or double-bit key for selecting racking mode inserted and access mode indicator shows "H"
- For electromagnetic interlock (optional):
  - Electromagnetic interlock deactivated

Procedure

If the access mode indicator shows “M” and the double-bit key is not inserted, insert it:

⇨ To release the actuating opening for the double-bit key, lift the operating slide (1) and hold it.

⇨ Insert the double-bit key (2).

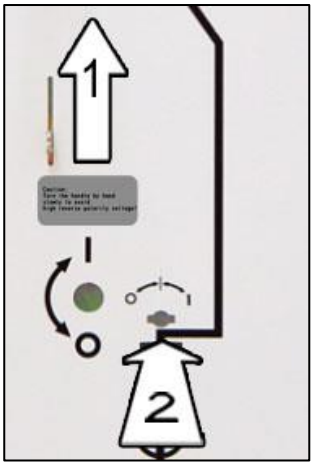


Fig. 711: Lifting the operating slide and inserting the key: Starting point "M"

⇨ To block any access to the withdrawable circuit-breaker / circuit-breaker truck, turn the double-bit key until the operating mode indicator changes to "T":

- To change from "H" to "T" turn 90° counter-clockwise
- To change from "M" to "T" turn 180° counter-clockwise

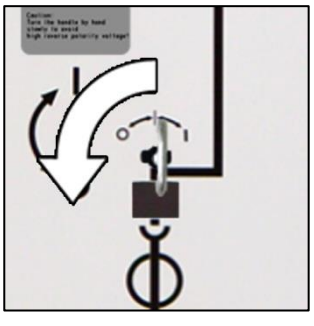


Fig. 712: Turning the key 90° counter-clockwise

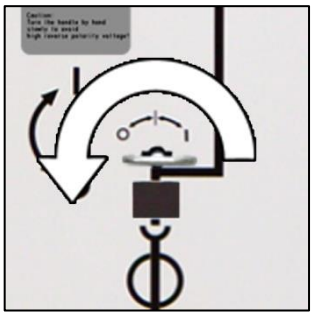


Fig. 713: Turning the key 180° counter-clockwise

⇨ Remove the double-bit key and push the operating slide downwards as far as it will go.

⇨ Close the control door.

⇨ Fit a padlock to the control door and close the padlock.

INFORMATION

Final procedure steps

⇨ You may now open the high-voltage door and take the withdrawable circuit-breaker / circuit-breaker truck out of the panel.

INFORMATION

When the control door is closed, the access mode indicator for the withdrawable circuit-breaker / circuit-breaker truck is covered.

⇨ If required, open the control door to read the indicator.

✓ Racking the withdrawable circuit-breaker / circuit-breaker truck is blocked.

27.7 Racking the withdrawable circuit-breaker / circuit-breaker truck to service position manually

NOTICE

Conflicting operation

The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ For any local operations – manual or electrical – set the panel to local control, for example by switching the local-remote switch to LOCAL position.

NOTICE

Maloperation

Racking the withdrawable circuit-breaker / circuit-breaker truck is only permissible if the circuit-breaker is in OPEN position.

⇨ Check if the circuit-breaker is in OPEN position.

⇨ If required, switch the circuit-breaker to OPEN position before racking.

NOTICE

Maloperation

Racking the withdrawable circuit-breaker / circuit-breaker truck is only permissible if the feeder earthing switch is in OPEN position.

⇨ Check if the feeder earthing switch is in OPEN position.

⇨ If required, switch the feeder earthing switch to OPEN position before racking.

NOTICE

Incorrect stress of the motor operating mechanism

When the withdrawable circuit-breaker / circuit-breaker truck is racked manually, the motor operating mechanism is also turned via the wheel chain mechanism.

⇨ Turn the racking crank slowly and uniformly to avoid high reverse polarity voltage.

NOTICE

Maloperation

All interlocks are only released when the withdrawable circuit-breaker / circuit-breaker truck is in a stable end position.

⇨ Rack the withdrawable circuit-breaker / circuit-breaker truck absolutely until end position.

NOTICE

Maloperation

The panel automatically blocks electrical racking when the control door is open.

⇨ To prevent accidentally blocking access for electrical racking by opening the control door, padlock the control door immediately after closing it.

Instruction label on high-voltage door:
In addition to these instructions, an instruction label on the high-voltage door informs about proper operation of the racking crank for moving the withdrawable circuit-breaker / circuit-breaker truck.

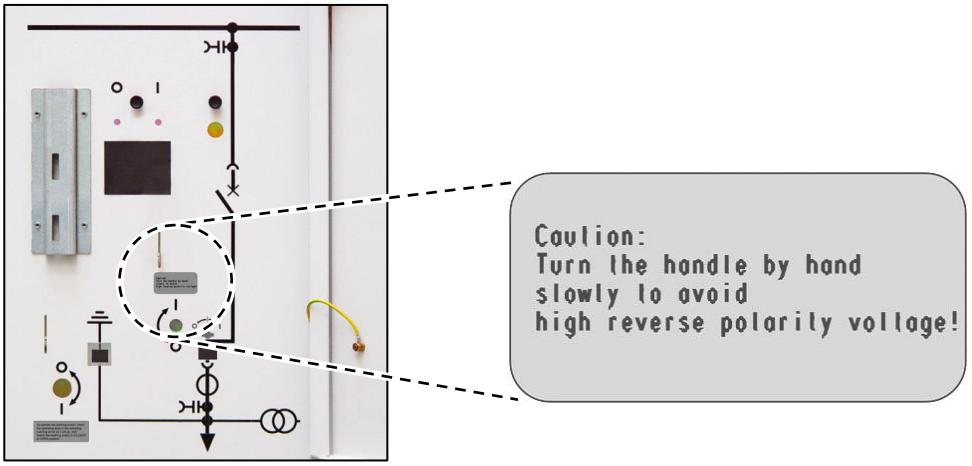


Fig. 714: High-voltage door: Instruction label about operation of racking crank

Preconditions

- Withdrawable circuit-breaker / circuit-breaker truck in test position
- Low-voltage connector plugged on
- High-voltage door closed
- Feeder earthing switch in OPEN position
- Circuit-breaker in OPEN position
- Panel set to local control
- Control door open
- Double-bit key for selecting racking mode inserted and access mode indicator shows "H"

Procedure

⇨ To open the actuating opening for racking, lift the operating slide as far as it will go and hold it.

⇨ Push the racking crank for moving the withdrawable circuit-breaker / circuit-breaker truck onto the operating shaft, and turn clockwise as far as it will go.

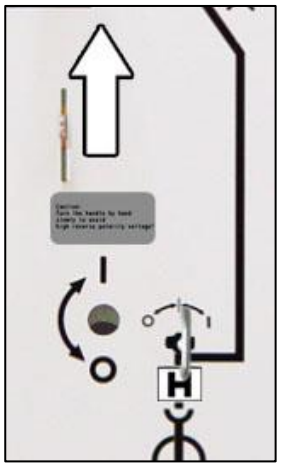


Fig. 715: Lifting the operating slide

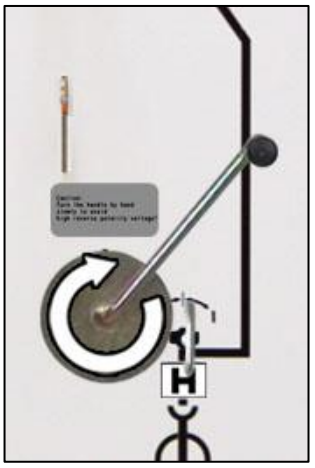
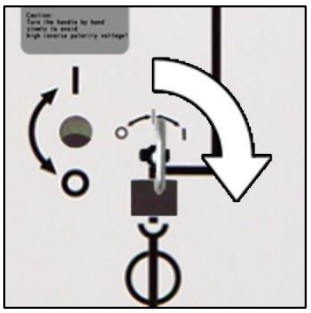


Fig. 716: Turning the racking crank clockwise

⇨ Remove the racking crank for moving the withdrawable circuit-breaker / circuit-breaker truck.

⇨ Turn the double-bit key clockwise as far as it will go to block access for manual racking and release electrical racking. The operating mode indicator changes to "M".



from

to

Fig. 717: Turning the key clockwise

⇨ Remove the double-bit key.

⇨ To close the actuating opening, push the operating slide down as far as it will go.

⇨ Close the control door.

⇨ Fit a padlock to the control door and close the padlock.

✓ The withdrawable circuit-breaker / circuit-breaker truck has been manually racked from test position to service position.

27.8 Racking the withdrawable circuit-breaker / circuit-breaker truck to service position electrically

NOTICE

Maloperation

Racking the withdrawable circuit-breaker / circuit-breaker truck is only permissible if the circuit-breaker is in OPEN position.

⇨ Check if the circuit-breaker is in OPEN position.

⇨ If required, switch the circuit-breaker to OPEN position before racking.

NOTICE

Maloperation

Racking the withdrawable circuit-breaker / circuit-breaker truck is only permissible if the feeder earthing switch is in OPEN position.

⇨ Check if the feeder earthing switch is in OPEN position.

⇨ If required, switch the feeder earthing switch to OPEN position before racking.

NOTICE

Maloperation

Electrically racking the withdrawable circuit-breaker / circuit-breaker truck is only possible when both the high-voltage door **and** the control door are closed. If the control door is open during an electrical racking procedure, the motor stops immediately.

⇨ Do **not** open the control door during an electrical racking procedure.

NOTICE

Conflicting operation

Racking the withdrawable circuit-breaker / circuit-breaker truck electrically is possible locally or from a central control. The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ Depending on the intended operating mode, set the panel to either local or remote control (for example by switching the local-remote switch).

Panels with motor operating mechanism control

Preconditions

- Withdrawable circuit-breaker / circuit-breaker truck in test position
- Low-voltage connector plugged on
- High-voltage door closed
- Feeder earthing switch in OPEN position
- Circuit-breaker in OPEN position
- Remote or local control
- Control door closed and padlocked
- Access mode indicator for racking shows "M"

Procedure

⇨ Rack the withdrawable circuit-breaker / circuit-breaker truck electrically to service position either locally or from the central control.

✓ The withdrawable circuit-breaker / circuit-breaker truck has been electrically racked from test position to service position.

27.9 Racking the withdrawable circuit-breaker / circuit-breaker truck to test position manually

NOTICE

Conflicting operation

The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ For any local operations – manual or electrical – set the panel to local control, for example by switching the local-remote switch to LOCAL position.

NOTICE

Maloperation

Racking the withdrawable circuit-breaker / circuit-breaker truck is only permissible if the circuit-breaker is in OPEN position.

⇨ Check if the circuit-breaker is in OPEN position.

⇨ If required, switch the circuit-breaker to OPEN position before racking.

NOTICE

Incorrect stress of the motor operating mechanism

When the withdrawable circuit-breaker / circuit-breaker truck is racked manually, the motor operating mechanism is also turned via the wheel chain mechanism.

⇨ Turn the racking crank slowly and uniformly to avoid high reverse polarity voltage.

NOTICE

Maloperation

All interlocks are only released when the withdrawable circuit-breaker / circuit-breaker truck is in a stable end position.

⇨ Rack the withdrawable circuit-breaker / circuit-breaker truck absolutely until end position.

NOTICE

Maloperation

The panel automatically blocks electrical racking when the control door is open.

⇨ To prevent accidentally blocking access for electrical racking by opening the control door, padlock the control door immediately after closing it.

Instruction label on high-voltage door:
In addition to these instructions, an instruction label on the high-voltage door informs about proper operation of the racking crank for moving the withdrawable circuit-breaker / circuit-breaker truck.

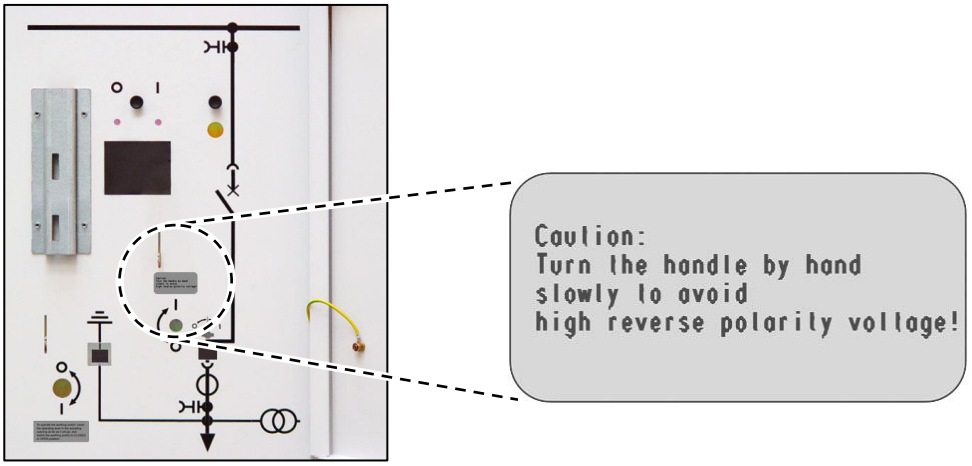


Fig. 718: High-voltage door: Instruction label about operation of racking crank

Preconditions

- Withdrawable circuit-breaker / circuit-breaker truck in service position
- Circuit-breaker in OPEN position
- Panel set to local control
- Control door open
- Double-bit key for selecting racking mode inserted and access mode indicator shows "H"

Procedure

⇨ To open the actuating opening for racking, lift the operating slide as far as it will go and hold it.

⇨ Push the racking crank for moving the withdrawable circuit-breaker / circuit-breaker truck onto the operating shaft, and turn counter-clockwise as far as it will go.

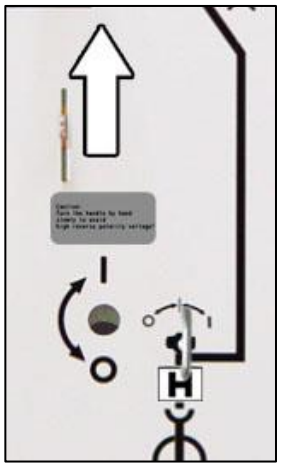


Fig. 719: Lifting the operating slide

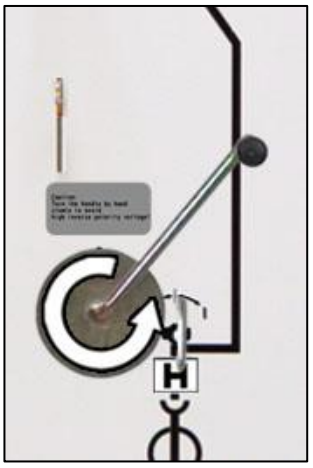


Fig. 720: Turning the racking crank counter-clockwise

⇨ Remove the racking crank for moving the withdrawable circuit-breaker / circuit-breaker truck.

⇨ Depending on the access mode intended, turn the double-bit key until the operating mode indicator changes to "M" or to "T":

- To release electrical access to the withdrawable circuit-breaker / circuit-breaker truck, change from "H" to "M" by turning 90° clockwise.
- To block any access to the withdrawable circuit-breaker / circuit-breaker truck, change from "H" to "T" by turning 90° counter-clockwise.

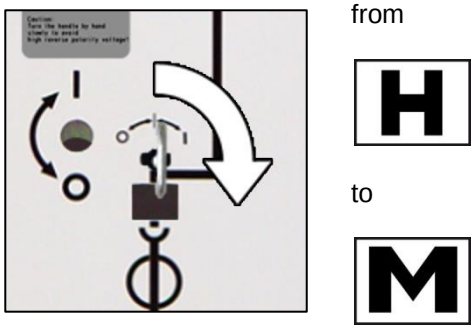


Fig. 721: Turning the key clockwise

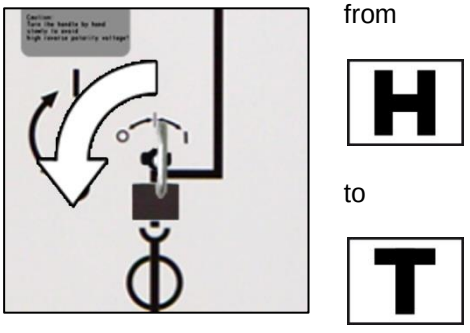


Fig. 722: Turning the key counter-clockwise

⇨ Remove the double-bit key.

⇨ To close the actuating opening, push the operating slide down as far as it will go.

⇨ Close the control door.

⇨ Fit a padlock to the control door and close it.

✓ The withdrawable circuit-breaker / circuit-breaker truck has been manually racked from service position to test position.

INFORMATION

Final procedure steps

⇨ If "T" is selected, you may now open the high-voltage door and take the withdrawable circuit-breaker / circuit-breaker truck out of the panel.

⇨ Otherwise, you may now go on to close the circuit-breaker electrically for testing purpose.

27.10 Racking the withdrawable circuit-breaker / circuit-breaker truck to test position electrically

NOTICE

Maloperation

Racking the withdrawable circuit-breaker / circuit-breaker truck is only permissible if the circuit-breaker is in OPEN position.

⇨ Check if the circuit-breaker is in OPEN position.

⇨ If required, switch the circuit-breaker to OPEN position before racking.

NOTICE

Maloperation

Electrically racking the withdrawable circuit-breaker / circuit-breaker truck is only possible when both the high-voltage door **and** the control door are closed. If the control door is open during an electrical racking procedure, the motor stops immediately.

⇨ Do **not** open the control door during an electrical racking procedure.

NOTICE

Conflicting operation

Racking the circuit-breaker / circuit-breaker truck electrically is possible locally or from a central control. The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ Depending on the intended operating mode, set the panel to either local or remote control (for example by switching the local-remote switch).

Preconditions

- Withdrawable circuit-breaker / circuit-breaker truck in service position
- Circuit-breaker in OPEN position
- Remote or local control
- Control door closed and padlocked
- Access mode indicator for racking shows "M"

Procedure

⇨ Rack the withdrawable circuit-breaker / circuit-breaker truck electrically to test position either locally or from the central control.

✓ The withdrawable circuit-breaker / circuit-breaker truck has been electrically racked from service position to test position.

27.11 Opening the circuit-breaker manually

Opening the circuit-breaker manually is carried out by pushing a rod through an actuating opening in the high-voltage door, thereby operating the OFF pushbutton behind the high-voltage door. This can be done with the control door either open or closed. When the control door is closed, the push rod is inserted through an opening in the control door (1). The indicator for the circuit-breaker position can be seen through an inspection window (2).

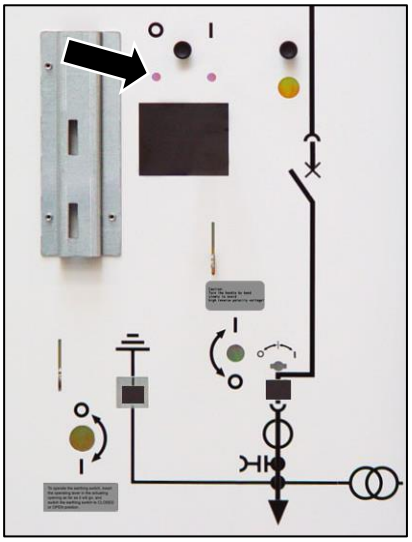


Fig. 723: Circuit-breaker type 3AE1: Actuating opening for opening the circuit-breaker manually

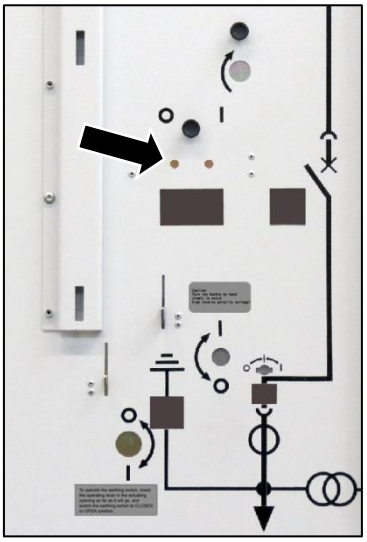


Fig. 724: Circuit-breaker type 3AE5: Actuating opening for opening the circuit-breaker manually

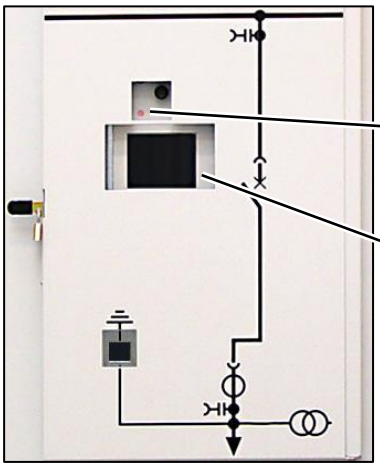


Fig. 725: Circuit-breaker type 3AE1: Control door

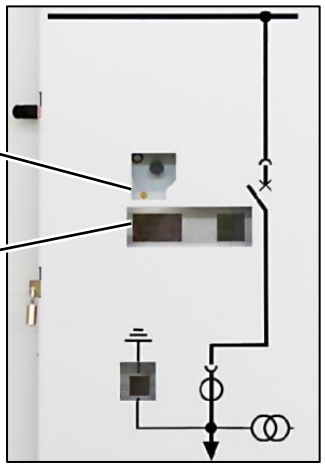


Fig. 726: Circuit-breaker type 3AE5: Control door

(1) Actuating opening for opening the circuit-breaker

(2) Inspection window for CLOSED/OPEN indicator of the circuit-breaker

NOTICE

Conflicting operation

The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ For any local operations – manual or electrical – set the panel to local control, for example by switching the local-remote switch to LOCAL position.

Panels with motor operating mechanism control

The procedure for opening the circuit-breaker manually in panels with motor operating mechanism control is identical with the procedure in panels without motor operating mechanism control.

⇨ For opening the circuit-breaker manually, see chapter 10.13.

27.12 Closing the circuit-breaker manually

Closing the circuit-breaker manually is carried out by pushing a rod through an actuating opening in the high-voltage door, thereby operating the ON pushbutton underneath the high-voltage door. In contrast to manually opening the circuit-breaker, closing is only possible when the control door is open. However, the indicator for the circuit-breaker position can still be seen through an inspection window after closing the control door.

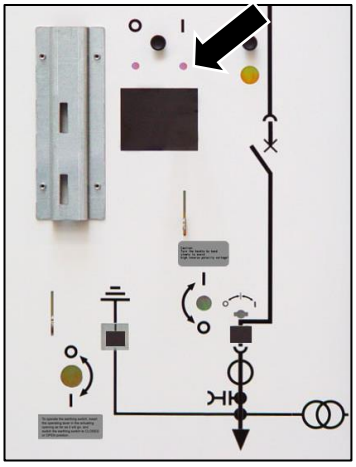


Fig. 727: Circuit-breaker type 3AE1:
Actuating opening for closing the circuit-breaker manually

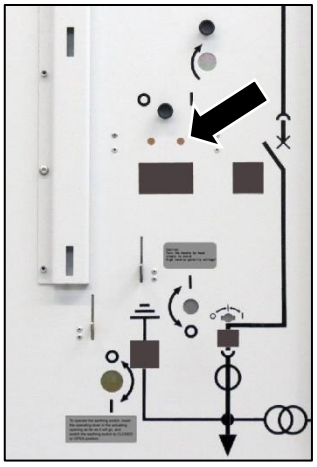


Fig. 728: Circuit-breaker type 3AE5:
Actuating opening for closing the circuit-breaker manually

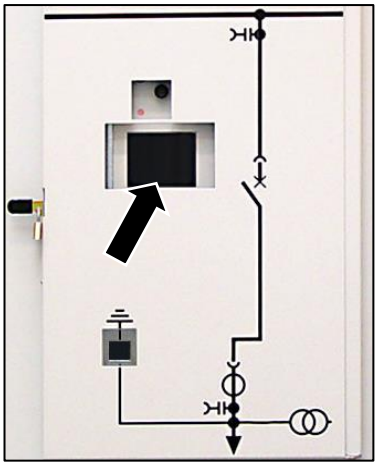


Fig. 729: Circuit-breaker type 3AE1:
Inspection window for CLOSED/OPEN indicator of the circuit-breaker

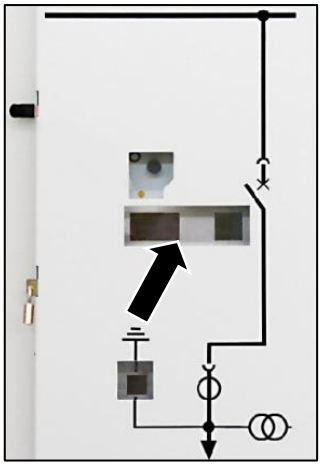


Fig. 730: Circuit-breaker type 3AE5:
Inspection window for CLOSED/OPEN indicator of the circuit-breaker

NOTICE

Conflicting operation

The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ For any local operations – manual or electrical – set the panel to local control, for example by switching the local-remote switch to LOCAL position.

NOTICE

Covered control elements

For safety reasons, the actuating opening for closing the circuit-breaker is covered by the control door.

⇨ Open the control door to uncover the actuating opening on the high-voltage door.

The procedure for closing the circuit-breaker manually in panels with motor operating mechanism control is identical with the procedure in panels without motor operating mechanism control.

⇨ For closing the circuit-breaker manually, see chapter 10.12.

27.13 Charging / discharging the spring energy store manually

Charging the spring energy store manually is carried out by inserting a hand crank through an actuating opening in the high-voltage door, and turning it subsequently. Discharging can only be done manually. It is carried out by pushing a rod alternately through the actuating openings for opening / closing the circuit-breaker.
Charging and discharging manually can only be carried out when the control door is open. However, the indicators for the circuit-breaker position and the closing spring state can still be seen through an inspection window after closing the control door.

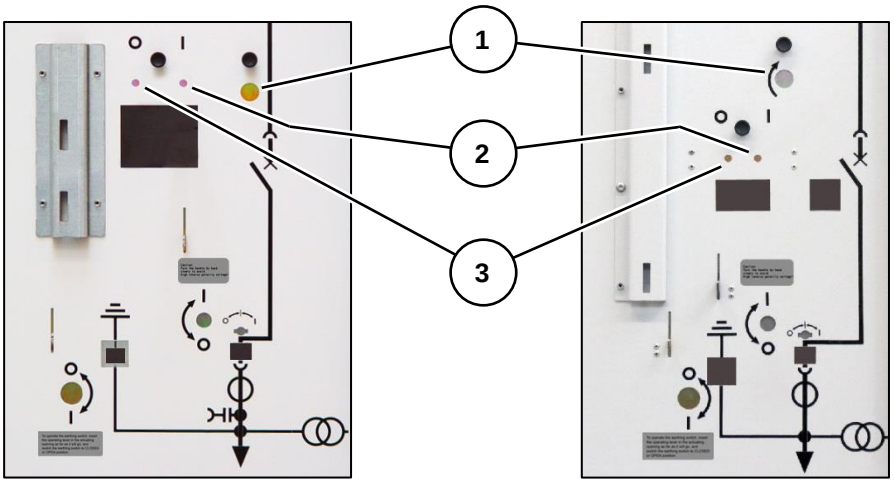


Fig. 731: Circuit-breaker type 3AE1: Actuating openings for charging / discharging the spring energy store

Fig. 732: Circuit-breaker type 3AE5: Actuating openings for charging / discharging the spring energy store

(1) Opening for charging the spring energy store in the circuit-breaker manually (covered)

(2) Actuating opening for closing the circuit-breaker

(3) Actuating opening for opening the circuit-breaker

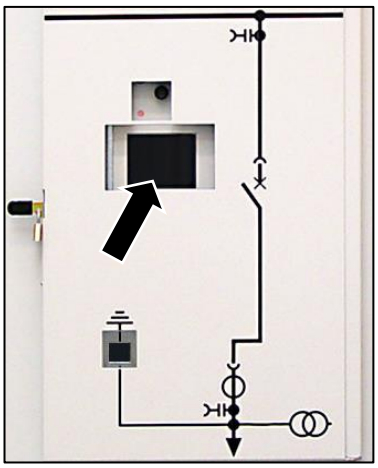


Fig. 733: Circuit-breaker type 3AE1:
Inspection window for circuit-breaker position and closing spring state in control door

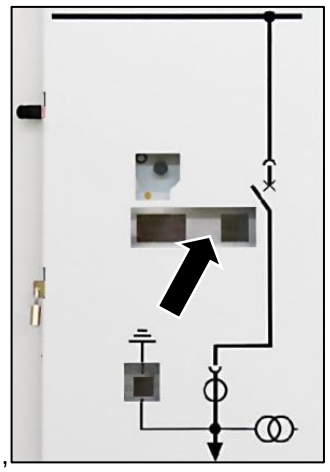


Fig. 734: Circuit-breaker type 3AE5:
Inspection window for circuit-breaker position and closing spring state in control door

NOTICE

Conflicting operation

The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ For any local operations – manual or electrical – set the panel to local control, for example by switching the local-remote switch to LOCAL position.

NOTICE

Covered control elements

For safety reasons, some of the actuating openings involved in charging / discharging the spring energy store are covered by the control door.

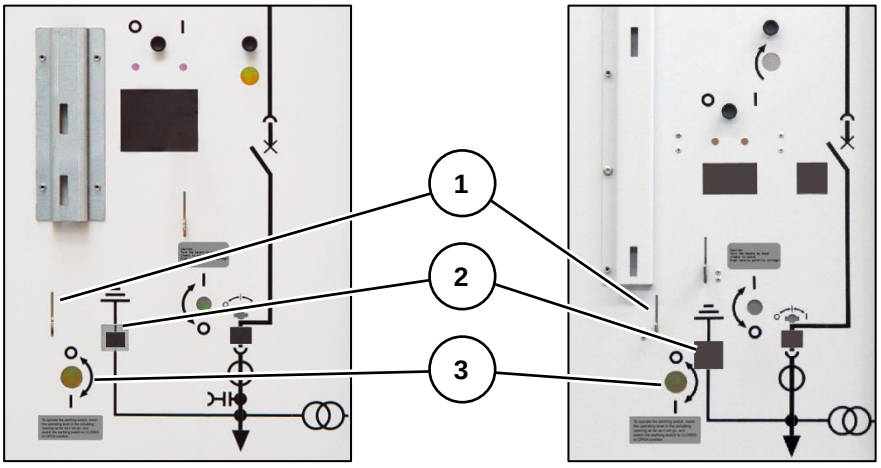
⇨ Open the control door to uncover the actuating openings on the high-voltage door.

The procedures for charging / discharging the spring energy store manually in panels with motor operating mechanism control are identical with the procedures in panels without motor operating mechanism control.

⇨ For charging / discharging the spring energy store manually, see chapters 10.14 and 10.15.

27.14 Earthing / de-earthing the feeder manually

Earthing / de-earthing the feeder manually is carried out by inserting a lever through an actuating opening in the high-voltage door, and turning it subsequently. Depending on the turning direction, the feeder earthing switch in the connection compartment is set to either CLOSED (= earthed) position or OPEN (= de-earthed) position.
Earthing / de-earthing the feeder manually can only be carried out when the control door is open. However, the indicator for the feeder earthing switch position can still be seen through an inspection window after closing the control door.



(1) Operating slide for opening and closing the actuating opening for operating the feeder earthing switch

(2) Mechanical position indicator for feeder earthing switch

(3) Actuating opening for operating the feeder earthing switch

Fig. 735: Circuit-breaker type 3AE1: Control elements for feeder earthing switch on high-voltage door

Fig. 736: Circuit-breaker type 3AE5: Control elements for feeder earthing switch on high-voltage door

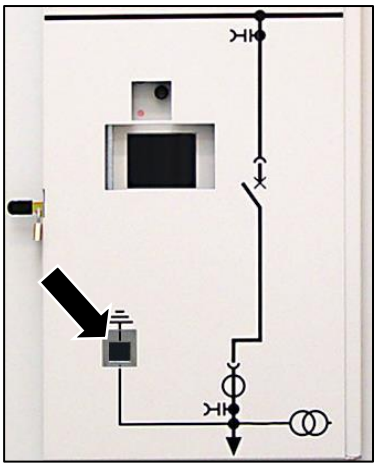


Fig. 737: Circuit-breaker type 3AE1: Inspection window for feeder earthing switch position in control door

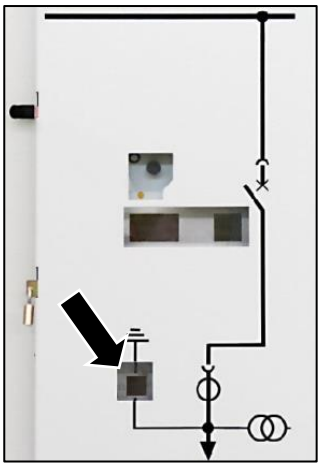


Fig. 738: Circuit-breaker type 3AE5: Inspection window for feeder earthing switch position in control door

Instruction label on high-voltage door:
In addition to these instructions, an instruction label on the high-voltage door informs about proper operation of the operating lever for the feeder earthing switch.

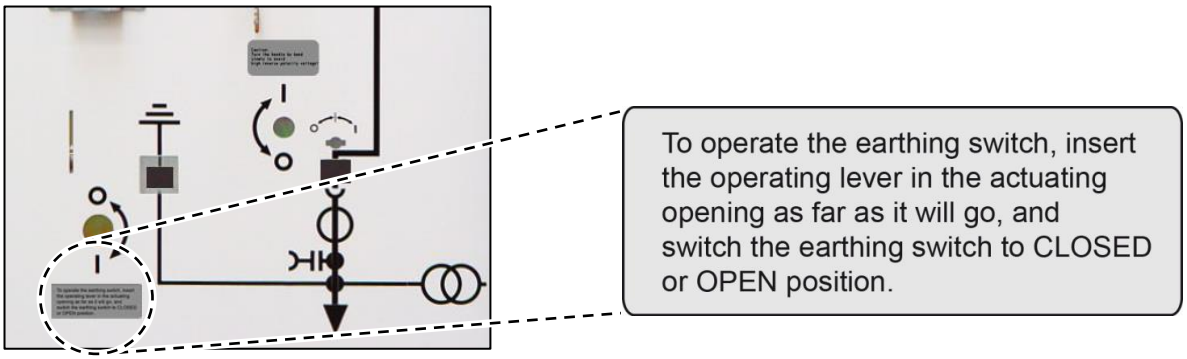


Fig. 739: High-voltage door: Instruction label about operation of feeder earthing switch

NOTICE

Conflicting operation

The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ For any local operations – manual or electrical – set the panel to local control, for example by switching the local-remote switch to LOCAL position.

NOTICE

Covered control elements

For safety reasons, the actuating opening for earthing / de-earthing the feeder is covered by the control door.

⇨ Open the control door to uncover the actuating opening on the high-voltage door.

INFORMATION

Earthing the feeder is only permissible if the withdrawable circuit-breaker / circuit-breaker truck is in test position.

When earthing the feeder in this way, the position of the circuit-breaker is not significant: The feeder may be earthed while the circuit-breaker is in OPEN position or CLOSED position.

The procedures for earthing / de-earthing the feeder manually in panels with motor operating mechanism control are identical with the procedures in panels without motor operating mechanism control.

⇨ For earthing / de-earthing the feeder manually, see chapters 10.16 and 10.17.

27.15 Earthing / de- earthing the feeder electrically

NOTICE

Maloperation

Earthing / de-earthing the feeder electrically is only possible when both the high-voltage door **and** the control door are closed.

⇨ Close the control door before earthing / de-earthing the feeder electrically.

NOTICE

Conflicting operation

Earthing / de-earthing the feeder electrically is possible locally or from a central control. The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ Depending on the intended operating mode, set the panel to either local or remote control (for example by switching the local-remote switch).

INFORMATION

Earthing the feeder is only permissible if the withdrawable circuit-breaker / circuit-breaker truck is in test position.

When earthing the feeder in this way, the position of the circuit-breaker is not significant: The feeder may be earthed while the circuit-breaker is in OPEN position or CLOSED position.

Preconditions

- Low-voltage connector plugged on
- High-voltage door closed
- Feeder to be earthed is isolated
- Control door closed
- Remote or local control
- Withdrawable circuit-breaker / circuit-breaker truck in test position

Procedure

⇨ Set the feeder earthing switch to OPEN or CLOSED either locally or from the central control.

27.16 Earthing / de-earthing the busbar system manually

Earthing / de-earthing the busbar system manually is carried out by inserting a lever through an actuating opening in the door to the low-voltage compartment, and turning it subsequently. Depending on the turning direction, the busbar earthing switch in the busbar compartment is set to either CLOSED (= earthed) position or OPEN (= de-earthed) position.

NOTICE

Conflicting operation

The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ For any local operations – manual or electrical – set the panel to local control, for example by switching the local-remote switch to LOCAL position.

The procedures for earthing / de-earthing the busbar system manually in panels with motor operating mechanism control are identical with the procedures in panels without motor operating mechanism control.

⇨ For earthing / de-earthing the busbar system manually, see chapter 21.

27.17 Earthing / de- the busbar system electrically

NOTICE

Conflicting operation

Earthing / de-earthing the busbar system electrically is possible locally or from a central control. The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ Depending on the intended operating mode, set the panel to either local or remote control (for example by switching the local-remote switch).

Preconditions

- Remote or local control
- If a withdrawable part / switching-device truck is inserted in the panel:
  - Withdrawable circuit-breaker / circuit-breaker truck in test position
  - Low-voltage connector plugged on

Procedure

⇨ Set the busbar earthing switch to OPEN or CLOSED either locally or from the central control.

27.18 Further operating options

NOTICE

Conflicting operation

The requirement of setting the panel to either local or remote control prevents operating the panel locally and centrally at the same time.

⇨ For any local operations – manual or electrical – set the panel to local control, for example by switching the local-remote switch to LOCAL position.

⇨ For any central operations set the panel to remote control.

NOTICE

Covered control elements

For safety reasons, some of the control elements on the high-voltage door are covered by the control door.

⇨ If required, open the control door to uncover the control elements on the high-voltage door.

INFORMATION

Blocking any racking operation is the precondition for opening the high-voltage door.

⇨ Before opening the high-voltage door, set the access mode indicator to "T".

For any operating options concerning circuit-breaker panels with motor operating mechanism control that have not been described in the chapters 27.1 to 27.17, see the relevant chapters in these Operating Instructions, in particular:

- Opening the high-voltage door, chapter 10.4
- Closing the high-voltage door, chapter 10.5
- Closing the circuit-breaker electrically, chapter 10.10
- Opening the circuit-breaker electrically, chapter 10.11
- Removing the low-voltage connector, chapter 10.18
- Plugging on the low-voltage connector, chapter 10.19
- Taking the withdrawable circuit-breaker out of the panel, chapter 10.20
- Inserting the withdrawable circuit-breaker in a panel, chapter 10.21
- Taking the circuit-breaker truck out of the panel, chapter 10.22
- Inserting the circuit-breaker truck in a panel, chapter 10.23

27.19 Technical data / operating times

Item number	Functional unit	Technical data
1.	Voltage supply for control circuit and motor circuit	Wide-voltage range 24 V DC / 48 V DC / 60 V DC / 110 V DC / 220 V DC / 110 V AC / 230 V AC Control and motor circuit are executed separately Voltage fluctuations in the range from 0.85 × U_n to 1.1 × U_n are permissible
2.	Power consumption of control circuit	< 100 mA in operating mode
3.	Energizing when the command is given	Until the motor starts up > 180 ms
4.	Power consumption of geared motor for racking function	110 V DC: Motor starting current, approx. 6.5 A Continuous motor current while racking, approx. 1 A Motor power, approx. 1.2 W Further values on request.
5.	Motor running time for racking function	< 65 s
6.	Feedback monitoring time for racking valid switching functions: Racking to service or test position	After giving the command and when a motor has started, a fault signal is issued if the feedback contacts detect no end position within 65 s. Fault indication and fault evaluation according to chapter 26.20.

27.20 Fault indication and fault evaluation

A fault will always shut down the associated motor operating mechanism, and can be issued as a fault indication when a SIPROTEC relay is installed. The fault is generally reset by switching the auxiliary voltage off and on again.

For several fault outputs, the fault signal is reset automatically or by certain actions.

Type of fault	Reverse interlocking to circuit-breaker	Cause / Remedy
Motor voltage is not switched on	On	Check MCB or wiring
Motor voltage is not switched off	On	Motor voltage relay in motor control unit defective
No feedback of auxiliary switch during command "rack withdrawable circuit-breaker / circuit-breaker truck to service position"	On	Check operating mechanism or motor with respect to blocking [1)]
No feedback of auxiliary switch during command "rack withdrawable circuit-breaker / circuit-breaker truck to test position"	On	Check operating mechanism or motor with respect to blocking [1)]
No automatic shutdown after end of command	On	Circuit for automatic shutdown in motor control unit defective
High-voltage door is open while the withdrawable circuit-breaker / circuit-breaker truck is being racked	On	Operating mechanism stops
The withdrawable circuit-breaker / circuit-breaker truck is racked and stops in an intermediate position when the motor voltage fails	On	When the motor voltage is switched on again, the withdrawable circuit-breaker / circuit-breaker truck can be racked to a valid end position by hand. Then, the fault is reset
The auxiliary voltage and the motor voltage fail while racking. The auxiliary switch does not report a valid end position	On	When the auxiliary voltage and motor voltage are switched on again, the fault can be reset by manual operation to a valid end position

[1)] This fault signal can be reset

28 Panel heater

INFORMATION
Read and understand these instructions before attempting operating works.

28.1 Heater versions

Optionally, one heater is installed each in the switching-device compartment and/or the connection compartment. The panel heater is designed as high-load wire resistor in the following versions:

Types

Mounting location	High-load wire resistor [Ω]	Operational voltage [V AC]
Switching-device compartment and/or connection compartment	125 (±10 %)	110
	500 (±10 %)	230 to 240

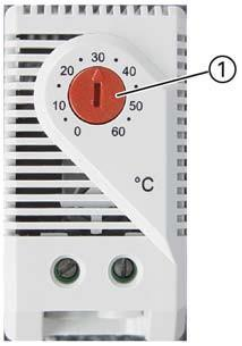
Temperature control in the panel is done via a mechanical temperature controller or via an electronic temperature and humidity controller.

28.2 Mechanical temperature controllers

NOTICE
Damage due to incorrect application The temperature controllers require direct connection to the ambient air. ⇨ Do **not** cover the ventilation slots of the temperature controllers.

The mechanical temperature controller can either be designed as a normally closed contact or as a normally open contact:

Normally closed contact	Contact opens when temperature rises
Normally open contact	Contact closes when temperature rises



(1) Selector for temperature control

Fig. 740: Mechanical temperature controller

28.3 Electronic temperature and humidity controller

NOTICE

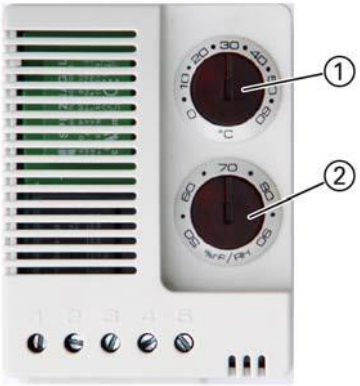
Damage due to incorrect application

The temperature and humidity controllers require direct connection to the ambient air.

⇨ Do **not** cover the ventilation slots of the temperature and humidity controllers.

The electronic temperature and humidity controller can either be designed as a normally closed contact or as a normally open contact:

Temperature function	If the ambient temperature falls below the adjusted value, the circuit for heater operation is closed (LED lights up).
	If the ambient temperature rises above the adjusted value, the circuit for heater operation is open (LED does not light up).
Humidity function	If the relative humidity rises above the adjusted value, the circuit for heater operation is closed (LED lights up).
	If the relative humidity falls below the adjusted value, the circuit for heater operation is open (LED does not light up).



1 Selector for temperature control, with LED

2 Selector for humidity control, with LED

Fig. 741: Electronic temperature and humidity controller

28.4 Applications for temperature controller

NOTICE

Maloperation

Observe the manufacturer's information.

⇨ Please do absolutely observe the enclosed operating instructions for the temperature and humidity controllers.

	Temperature for application [°C]	Humidity for application, not condensing [% r h]
Mechanical temperature controller	−20 to +80	≤ 90
Electronic temperature and humidity controller	0 to +60	≤ 90

Panel heater

Factory default settings
The temperature and humidity controllers are preset at the factory.

	Temperature [°C]	Humidity [% r h]
Mechanical temperature controller	approx. +30	–
Electronic temperature and humidity controller	approx. +30	approx. 70

Adjustment during operation
At the place of operation of the switchgear, the integrated temperature and humidity controllers must be adjusted to the local temperature and/or humidity conditions in the application area of the switchgear panels by the respective operator.

Installation in the panel
The temperature and humidity controllers are installed top-left inside the switching-device compartment, directly at the side of the vertical wiring duct.

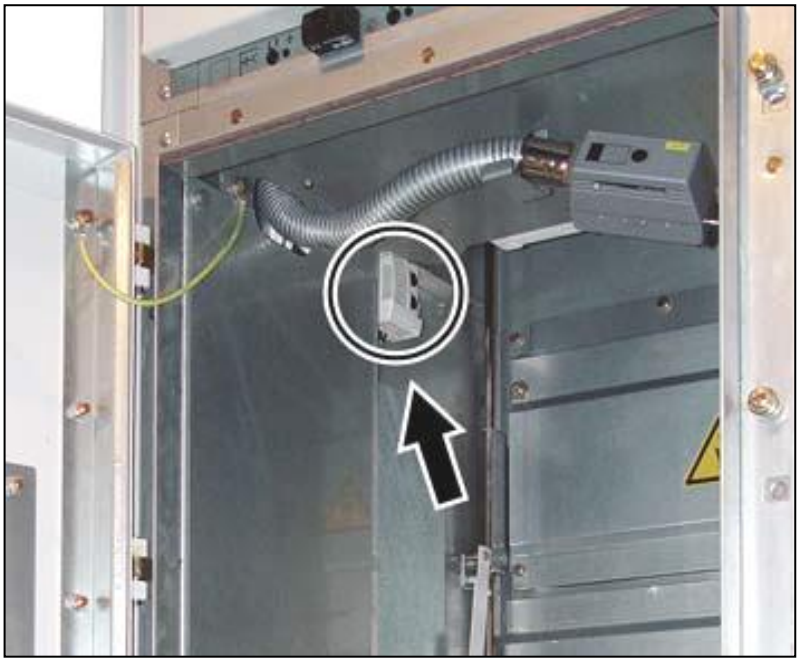


Fig. 742: Installation of the electronic temperature and humidity controller in the switching-device compartment

29 Service information

INFORMATION
Read and understand these instructions before attempting operating works.

29.1 Maintenance

Maintenance ensures undisturbed and uninterrupted operation of the switchgear. The frequency of inspection, periodic cleaning and preventive maintenance schedule will depend upon the operating conditions of the switchgear.
The maintenance measures are divided into the following fields:

- Visual inspection
- Maintenance

NOTICE
Non-observance of instructions Non-observance of the following instructions can damage the switchgear. • All measures within the scope of maintenance may only be executed by qualified personnel. • Furthermore, the relevant IEC standards and the local and site-related safety regulations must be observed. • For questions about maintenance measures, please contact your regional Siemens representative.

29.2 Time schedule for maintenance measures

Besides the recommended maintenance intervals, additional maintenance measures may be required for operational reasons.

Recommended time schedule for maintenance measures:

Measure	Interval	Operational fact
Visual inspection	Every year or at the operator's discretion.	–
Maintenance	Every 10 years, or depending on operational facts, or at the operator's discretion.	For example, after a short circuit or breaking / making operation of a circuit-breaker and/or an earthing switch when the permissible number of operating cycles has been reached.
Cleaning	Depending on operational facts, or at the operator's discretion.	Visual inspection, maintenance.
Circuit-breaker	According to advice and requirements in Operating Instructions of circuit-breaker.	
Vacuum contactor	According to advice and requirements in Operating Instructions of vacuum contactor.	
Protection relays and instruments	According to advice and requirements in respective instruction manuals.	

29.3 Visual inspection

The visual inspection is performed every year or at the operator's discretion.

⇨ General check for paint damages on all panels of a switchgear assembly in the area of the front doors, the lateral and the rear termination. If required, repair damages.

⇨ General check of the switchgear for dust layers, especially of the ventilation units in the pressure relief duct, as well as the fan box.

⇨ Clean dust layers on the units by using a customary vacuum cleaner without damaging the metal grids (1) or ventilation slots (2).

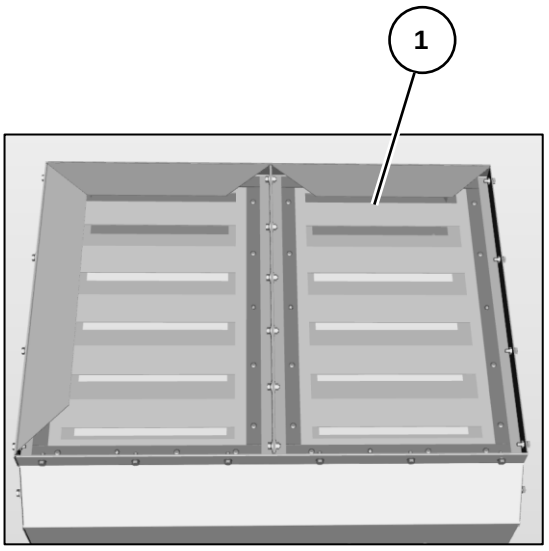


Fig. 743: View from above onto a ventilation unit in the pressure relief duct

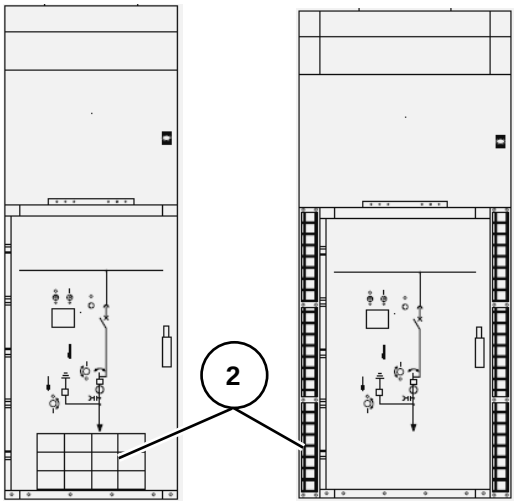


Fig. 744: Exemplary view of a ventilated panel with ventilation slots at the side and in the high-voltage door

⇨ Clean dust layers or foreign objects in the fan box by using a customary vacuum cleaner without damaging the metal grids (1).

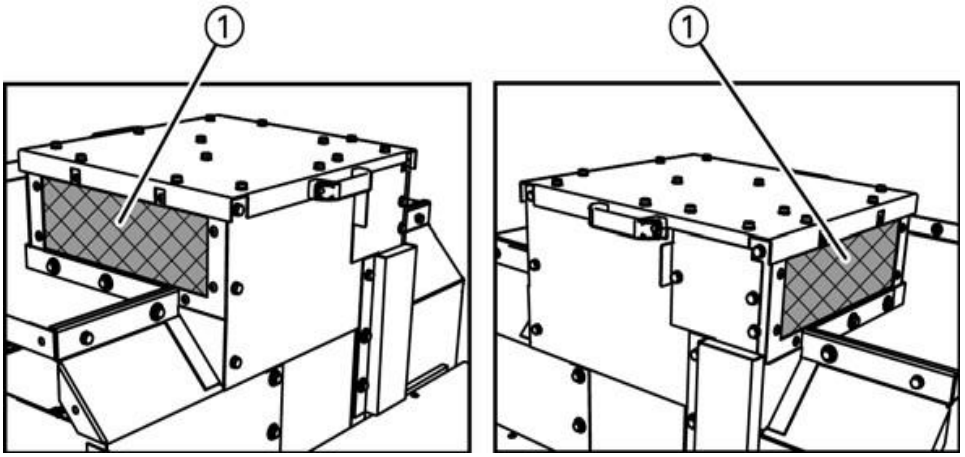


Fig. 745: Exemplary view of a fan box with metal grid on the right and left in the front area of the pressure relief duct

⇨ General check for humidity. To do this, open the high-voltage door of the switching-device compartment of every third panel and check the switching-device compartment for humidity or condensation.

⇨ If there is humidity or condensation inside a switching-device compartment, determine the cause thereof. To do this, do also observe the climatic conditions of the switchgear room, and arrange for suitable measures such as room ventilation or room heating.

⇨ General check for partial discharge noises. If there are any partial discharge noises, determine the cause thereof and take adequate countermeasures.

⇨ Check whether the accessories are complete.

29.4 Preventive maintenance

⚠ DANGER

Electric shock

Before any maintenance work is performed within primary compartments, it is to make certain that the respective panel or panels are completely de-energized, tagged or locked out and released for work in an authorized manner.

⇨ Disable remote control and automatic schemes.

⇨ De-energize all direct and back-feed power and control sources.

⇨ Disconnect all voltage and control power transformers.

⇨ Verify safe isolation from supply.

⇨ Earth the feeder in the respective panel or panels.

⚠ DANGER

Danger due to foreign objects

Serious switchgear damage and malfunctioning due to flashovers caused by foreign objects.

⇨ Remove all foreign objects from the switchgear, e.g. tools, cleaning cloths or lubricants.

NOTICE

Damage due to removal of greasing

Some parts and surfaces of the switchgear are greased for functioning.

⇨ Do not remove the grease from greased parts and surfaces.

⇨ Do not clean greased parts and surfaces.

If greased areas are dirty.

⇨ Clean the dirty area and grease again according these maintenance instructions.

NOTICE

Damage due to incorrect cleaning

Dust and loose pollutants can impair the functioning of the switchgear and lead to damages. For cleaning, remove dust and loose pollutants precisely from the switchgear.

⇨ Use vacuum cleaners and dry, lint-free cloths.

⇨ Do **not** clean with compressed air or similar means.

⇨ Perform visual inspection and carry out the necessary maintenance work according to the problems determined.

⇨ When an earthing switch has performed two short-circuit making operations, maintenance work has to be done by means of a visual inspection of the earthing switch blades and the fixed laminated contacts. If there is any visible erosion, the stressed components must be replaced. To do this, please contact the regional Siemens representative.

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

⇨ Carry out maintenance and servicing at shorter intervals (at the operator's discretion) if there is a lot of dust, or if the air is extremely humid and/or polluted.

⇨ Following the results of the visual inspection, grease the following:

- Guide rails and shutter guiding linkage
- Fixed contacts of the earthing switch
- Fixed contacts of the bushings

⇨ Apply WD-40 waterproof spray oil to a cleaning cloth, and clean the shutter guiding linkage therewith.

⇨ Independently of the regular visual inspection and preventive maintenance, immediately determine the cause of failures and short circuits, and document it completely.

⇨ Read the protection relays (optional) immediately after the fault and evaluate the information.

⇨ Add fault records and pictures to the documentation.

⇨ At the panel concerned, check the switching-device and the compartments for damages. If damage is determined, inform the Siemens representative and submit the documentation of the fault.

⇨ Remove foreign objects, for example cleaning material.

⇨ Check the area directly around the panel and clean, if required.

29.5 Lubricants to be used

⚠ CAUTION

Injury due to incorrect application

Incorrect application of the lubricants can cause injuries of the sense organs or the hands.

⇨ Observe the safety instructions in the safety data sheets of the lubricant suppliers.

⇨ Put on personal protective equipment.

Component	Lubricant	Supplier
Shutter guiding linkage (1)	WD-40 waterproof spray oil	Hardware store
Guide rails (2)	ISOFLEX TOPAS L 32 (Order no.: 3AX1133-3E 1 kg)	www.klueber.com
Fixed contacts of feeder earthing switch (3)	MOLYKOTE® LONGTERM 2 PLUS EXTREME PRESSURE BEARING GREASE (Order no.: 8BX1022 1 kg)	www.dowcorning.com
Main fixed contacts of bushings (4)		
Fixed contacts of the switch-fuse combination (5)		

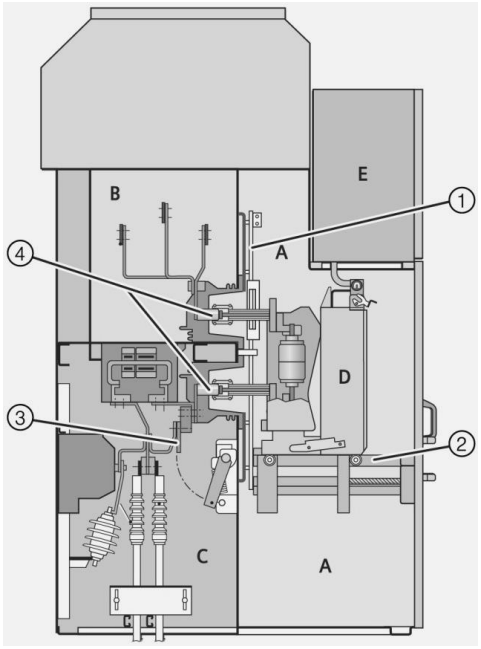


Fig. 746: Circuit-breaker, disconnecting, metering and contactor panels (panel width 600 mm)

(1) Shutter guiding linkage

(2) Guide rails

(3) Fixed contacts of the feeder earthing switch

(4) Fixed contacts of the bushings

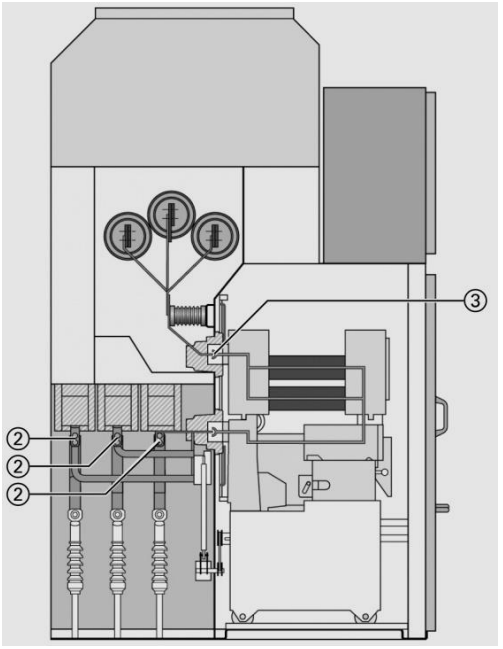
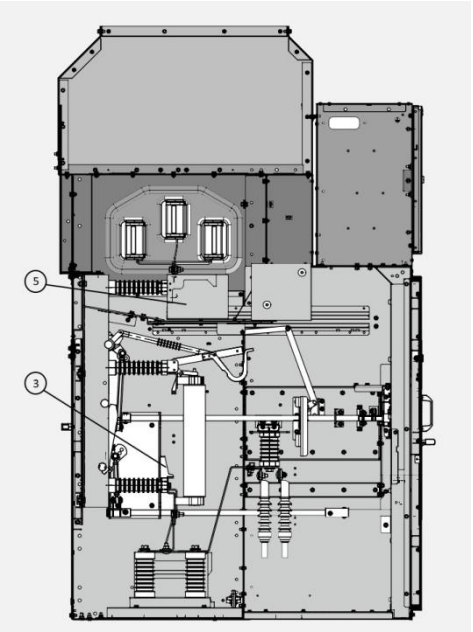


Fig. 747: Contactor panel with panel width 435 mm

(2) Fixed contacts of the feeder earthing switch

(3) Fixed contacts of the bushings



(3) Fixed contacts of the feeder earthing switch

(5) Fixed contacts of the switch-fuse combination

Fig. 748: Switch-disconnector panel with 800 mm width

29.6 Overpressure monitors (optional), function test

Depending on the panel version, overpressure monitors for the individual compartments are located in the low-voltage compartment. To check proper functioning of the overpressure monitors, use the test unit from the accessories.

⚠ DANGER

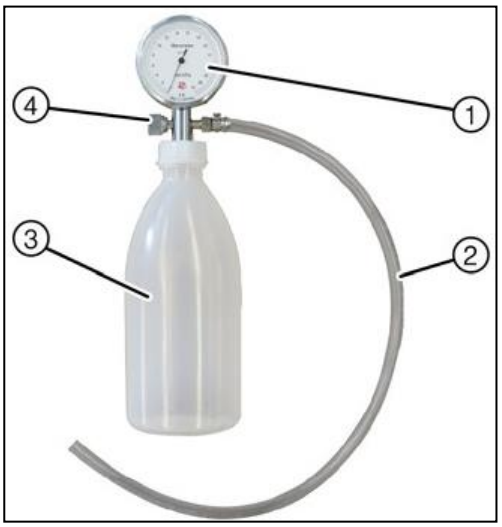
Maloperation

The function test at the overpressure monitors may be performed during running operation.

- ⇨ Obtain release for the planned test of the overpressure monitors.
- ⇨ Coordinate the procedure with operational activities.
- ⇨ Ensure uninterrupted communication with the operator at the central control.
- ⇨ Always perform the function test on one overpressure monitor only, and complete it. Test several overpressure monitors one after the other.

Test unit

To perform the function test of the overpressure monitors, a test unit is available as an accessory. The test unit enables the function test of every single overpressure monitor.



(1) Manometer

(2) Test tube

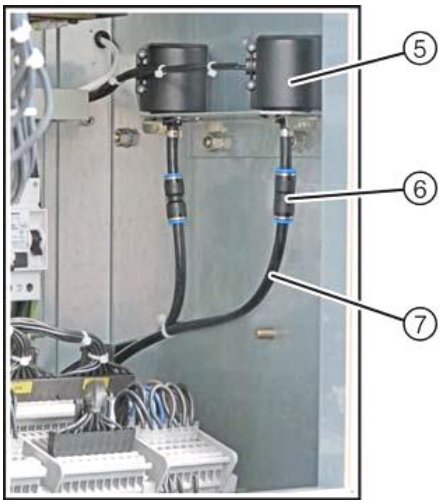
(3) Lab bottle made of polyethylene

(4) Locking cap

Fig. 749: Test unit

Preconditions

- High-voltage door closed
- Release for checking the overpressure monitors available
- Uninterrupted communication established with the operator at the central control
- Door to the low-voltage compartment open
- Test unit available, locking cap firmly screwed on



(5) Overpressure monitor

(6) Tube connector

(7) Tube to compartment

Fig. 750: Low-voltage compartment, for example with 2 overpressure monitors

Procedure

⇨ Detach the tube to the compartment (7) from the tube connector (6). To do this, push the detachment ring (8) at opposite points towards the tube connector, and ─ at the same time ─ pull the tube to the compartment out of the tube connector in opposite direction.

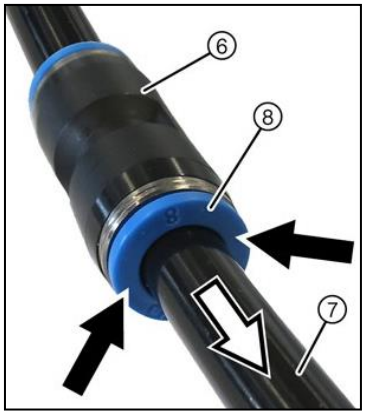


Fig. 751: Detail view of tube connector

⇨ Instead of the tube to the compartment (7), insert the tube of the test unit (2) into the tube connector (6) as far as it will go.

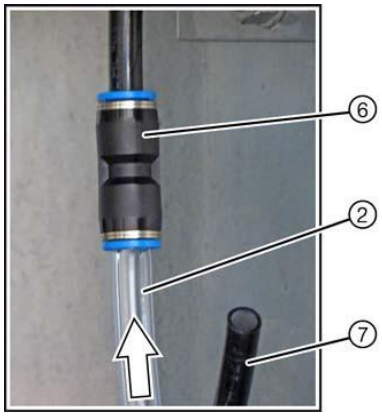


Fig. 752: Detail view of connection of test tube

⇨ Press the soft lab bottle of the test unit carefully and observe the manometer indication (1). In the indication range from 8 to 12, the overpressure monitor must trip.

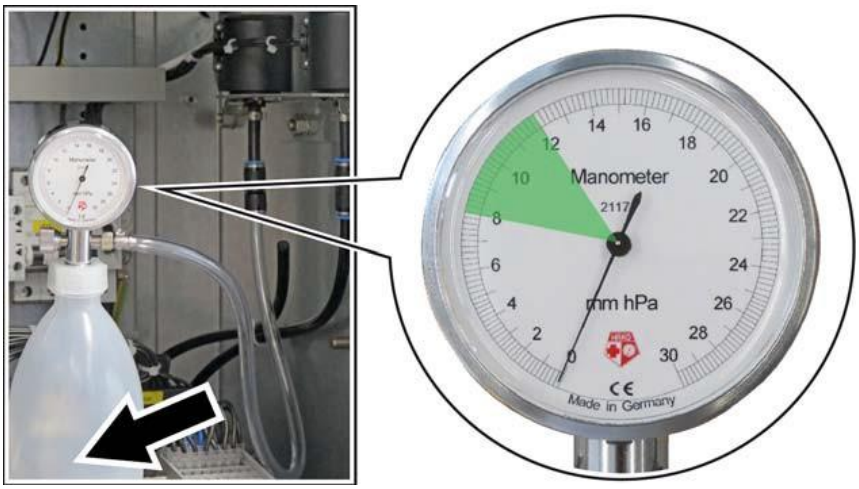


Fig. 753: Overpressure function test

Overpressure monitor trips in the indication range from 8 to 12:

⇨ Push the detachment ring again, and pull the test tube out of the tube connector.

⇨ Insert the tube to the compartment into the tube connector as far as it will go.

⇨ Perform the function test of the other overpressure monitors in the same way.

⇨ After the function test of all overpressure monitors, close the door to the low-voltage compartment.

✓ The function test of the overpressure monitor is completed.

Overpressure monitor does not trip in the indication range from 8 to 12:

⇨ Document the tripping value and repeat the test. If this overpressure monitor does not trip in the indication range from 8 to 12 again, mark the overpressure monitor.

⇨ Push the detachment ring again, and pull the test tube out of the tube connector.

⇨ Insert the tube to the compartment into the tube connector as far as it will go.

⇨ Inform the regional Siemens representative and ask for support and advice.

29.7 Maintenance of fan(s) for forced ventilation

The fans used for forced ventilation are designed for a maximum operating time of 40,000 hours.

⇨ Replace a fan in the fan box on the pressure relief duct before it reaches 40,000 operating hours.
The procedure is described in the Installation Instructions; order number 110-0084.9.

Specification of fans to be used		
Manufacturer	ebm-papst company	
Type	R2E270-AA01-05	
Power consumption	280 W / 50 Hz	430 W / 60 Hz
Operating hours	40,000 h	
Operating manual	Item no. 11005-5-9970 EN	
Contact	www.ebmpapst.com / phone: +49793881-0	

29.8 Switchgear extension

The switchgear can be extended at both ends without modification of existing panels. For switchgear extension, please contact the regional Siemens representative.

29.9 Spare part orders

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

- Type and serial number of the switchgear and the withdrawable part / switching-device truck as per rating plates.
- Precise designation of the device or component, if applicable on the basis of the information and illustrations in the associated instructions, a drawing, sketch or circuit diagram.
- Spare parts have to be ordered at the regional Siemens representative.

29.10 Replacement of panels and components

Replacement of panels:

- For replacement of panels, please contact the regional Siemens representative.

Replacement of components:

- The individual components, such as measuring instruments, current transformers, etc., can be replaced. The contact pieces in the bushings are bolted and can be replaced. In case of wear or changed environmental conditions, the contact pieces can be replaced from the front without dismantling any conductor bars.
- For replacement of components, please contact the regional Siemens representative.

29.11 Disposal

NXAIR switchgear is an environmentally compatible product.
The panels are made of galvanized sheet metal. The doors and lateral switchgear end walls are powder-coated with resistant epoxy resin material.
The switchgear materials should be recycled as far as possible. The switchgear can be disposed of in an environmentally compatible manner in compliance with existing legislation.

The components of the switchgear can be recycled as mixed scrap; however, dismantling as far as possible into sorted scrap with a residual mixed-scrap portion is the more environmentally compatible way.
Electronic scrap must be disposed of in accordance with the existing regulations. The switchgear consists of the following materials:

- Sheet metal: galvanized / powder-coated / Cr-Ni steel
- Copper and aluminum
- Polycarbonate (PC)
- Epoxy resin
- Cast resin
- Fiber-reinforced plastics
- Rubber materials
- Ceramic materials
- Lubricants
- Bolts, washers, nuts, rivets made of steel
- Electrical wires and electronic equipment such as relays, control boards, voltmeters, ammeters

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, regarding declarable or restricted substances in this product, please contact:

- materialcompliance.ms.ehs@siemens.com.

30 Trouble shooting

30.1 Panels with withdrawable part

Interlocking of withdrawable part

Fault	Cause	Remedy
Withdrawable part cannot be pushed completely into the panel and interlocked.	Positions of feeder earthing switch operating mechanism (withdrawable part) and feeder earthing switch (panel) not in line.	Bring the positions of the feeder earthing switch operating mechanism (withdrawable part) and the feeder earthing switch (panel) into line.
Withdrawable part cannot be pulled out of panel.	Interlocking of withdrawable part closed.	Open interlocking of withdrawable part.
High-voltage door cannot be closed.	Low-voltage connector is not plugged on.	Plug on the low-voltage connector.
High-voltage door cannot be opened.	Withdrawable part is in service position.	Rack the withdrawable part to test position.

Withdrawable part

Fault	Cause	Remedy
Actuating opening cannot be opened (withdrawable part cannot be moved to service position).	Operating lever is inserted in the manual CLOSE/OPEN operating mechanism of the feeder earthing switch.	Remove the operating lever.
	Operating slide for opening the actuating opening is locked.	Open the padlock.
	Operating slide for opening the actuating opening is interlocked by the electromagnetic interlock.	Request external release.
Double-bit key for releasing the withdrawable part can be inserted, but not turned to the right.	Circuit-breaker is in CLOSED position.	Switch the circuit-breaker to OPEN position.
	Feeder earthing switch is in CLOSED position.	Switch the feeder earthing switch to OPEN position.
	High-voltage door is not closed.	Close the high-voltage door.

Earthing switch

Fault	Cause	Remedy
Actuating opening for feeder earthing switch cannot be opened.	Racking crank for moving the withdrawable part is inserted.	Remove the racking crank for moving the withdrawable part.
	General panel interlock active.	Observe general panel interlock.
	Operating slide for opening the actuating opening is locked.	Open the padlock.
Actuating opening for busbar earthing switch cannot be opened.	General panel interlock active.	Observe general panel interlock.
	Operating slide for opening the actuating opening is locked.	Open the padlock.
	Operating slide for opening the actuating opening is interlocked by the electromagnetic interlock.	Request external release.
Operating lever cannot be inserted.	Withdrawable part in service position.	Rack the withdrawable part to test position; switch the circuit-breaker to OPEN position, if required.

Circuit-breaker

Fault	Cause	Remedy
Circuit-breaker cannot be closed.	Racking crank for moving the withdrawable part is inserted.	Remove the racking crank for moving the withdrawable part.
	Withdrawable part is in intermediate position.	Rack the withdrawable part to service position or test position.
	Spring energy store not charged.	Wait for 15 s (motor) or charge manually.
	Undervoltage release not energized.	Activate the undervoltage release.
Spring energy store is not charged automatically.	No auxiliary voltage.	Apply auxiliary voltage or charge the spring manually.

If these Operating Instructions should not clarify all questions regarding operation and maintenance of the NXAIR switchgear, please contact the Siemens sales partner or the regional Siemens representative.

30.2 Panels with switching-device truck

Interlocking of switching-device truck

Fault	Cause	Remedy
Switching-device truck cannot be pushed completely into the panel and interlocked.	Positions of feeder earthing switch operating mechanism (switching-device truck) and feeder earthing switch (panel) not in line.	Bring the positions of the feeder earthing switch operating mechanism (switching-device truck) and the feeder earthing switch (panel) into line.
Switching-device truck cannot be pulled out of panel.	Interlocking of switching-device truck closed.	Open interlocking of switching-device truck.
High-voltage door cannot be closed.	Low-voltage connector is not plugged on.	Plug on the low-voltage connector.
High-voltage door cannot be open.	Switching-device truck is in service position.	Rack the switching-device truck to test position.

Switching-device truck

Fault	Cause	Remedy
Actuating opening cannot be open (switching-device truck cannot be moved to service position).	Operating lever is inserted in the manual CLOSE/OPEN operating mechanism of the feeder earthing switch.	Remove the operating lever.
	Operating slide for opening the actuating opening is locked.	Open the padlock.
	Operating slide for opening the actuating opening is interlocked by the electromagnetic interlock.	Request external release.
Double-bit key for releasing the switching-device truck can be inserted, but not turned to the right.	Circuit-breaker is in CLOSED position.	Switch the circuit-breaker to OPEN position.
	Feeder earthing switch is in CLOSED position.	Switch the feeder earthing switch to OPEN position.
	High-voltage door is not closed.	Close the high-voltage door.

Earthing switch

Fault	Cause	Remedy
Actuating opening for feeder earthing switch cannot be open.	Racking crank for moving the switching-device truck is inserted.	Remove the racking crank for moving the switching-device truck.
	General panel interlock active.	Observe general panel interlock.
	Operating slide for opening the actuating opening is locked.	Open the padlock.
Actuating opening for busbar earthing switch cannot be open.	General panel interlock active.	Observe general panel interlock.
	Operating slide for opening the actuating opening is locked.	Open the padlock.
	Operating slide for opening the actuating opening is interlocked by the electromagnetic interlock.	Request external release.
Operating lever cannot be inserted.	Switching-device truck in service position.	Rack the switching-device truck to test position; switch the circuit-breaker to OPEN position, if required.

Circuit-breaker

Fault	Cause	Remedy
Circuit-breaker cannot be closed.	Racking crank for moving the switching-device truck is inserted.	Remove the racking crank for moving the switching-device truck.
	Switching-device truck is in intermediate position.	Rack the switching-device truck to service position or test position.
	Spring energy store not charged.	Wait for 15 s (motor) or charge manually.
	Undervoltage release is not energized.	Activate the undervoltage release.
Spring energy store is not charged automatically.	No auxiliary voltage.	Apply auxiliary voltage or charge the spring manually.

If these Operating Instructions should not clarify all questions regarding operation and maintenance of the NXAIR switchgear, please contact the Siemens sales partner or the regional Siemens representative

30.3 Panels with switch-fuse combination

Fault	Cause	Remedy
Switch-fuse combination cannot be switched to CLOSED position (operating lever cannot be pushed on completely)	Feeder earthing switch is in CLOSED position.	Switch the feeder earthing switch to OPEN position.
Switch-fuse combination cannot be switched to CLOSED position (closing spring for fused switch-fuse combination is not charged)	Fuse has tripped	Replace fuse
Switch-fuse combination cannot be switched to CLOSED position	Switch-fuse combination has not latched	Turn the operating lever completely to the end position to ensure that the toggle fastener of the switch-fuse combination latches tight and the switch-fuse combination can be closed again.

If these operating instructions should not clarify all questions regarding operation and maintenance of the NXAIR switchgear, please contact the Siemens sales partner or the regional Siemens representative

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Imprint

Siemens AG

Energy Management
Medium Voltage & Systems

Switchgear Factory Frankfurt
Carl-Benz-Str. 22
D-60386 Frankfurt