SIEMENS

Medium-Voltage Switchgear

Air-Insulated Switchgear NXAIR M 24 kV / 25 kA / ≤ 2500 A Busbar Current

OPERATING INSTRUCTIONS



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Siemens AG Energy Management Division Medium Voltage & Systems

Since **1992**

Accreditation of the **Testing Department** according to **DIN EN ISO/IEC 17025** for the testing areas of high-voltage switching devices and switchgear, devices for electrical power engineering, and environmental simulation by DAkkS (German Accreditation Body) as **Testing Laboratory Medium Voltage, Frankfurt/Main, Germany**, DAkkS accreditation number: D-PL-11055-09, and as **PEHLA Testing Laboratory, Frankfurt/Main, Germany**, DAkkS accreditation number: D-PL-12072-01.

Since **1995**

Application of a quality and environmental management system for the **Medium Voltage Division** according to **DIN EN ISO 9001** and **DIN EN ISO 14001**, quality and environmental management systems. Model for description of the quality assurance in design, development, production, installation and maintenance.

Certification of the quality and environmental management system by the certification and environmental experts of DNV (DNV Zertifizierung und Umweltgutachter GmbH)

2008

Application of an industrial health and safety management system for the **Medium Voltage Division** according to **BS OHSAS 18001:2007**. Certification of the industrial health and safety management system by the certification and environmental experts of DNV (DNV Zertifizierung und Umweltgutachter GmbH)

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 Installation Instructions as follows:

A 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.

S HINT

Provides additional information to clarify or simplify a procedure.

Observe the hint.

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

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General instructions

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.

Please do 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 they are 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.

Any kind of modification on the product or alteration of the product must be coordinated with the manufacturer in advance. Uncoordinated modifications or alterations can cause the expiration of warranty claims, cause danger to life, limb and other legally protected interests. The fulfilment 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.

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 operating 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.

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 M is a type-tested and metal-clad switchgear for indoor installation, with type of accessibility A and internal arc classification (IAC): IAC A FLR 25 kA 1 s or IAC A FL 25 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) and VDE 0101 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 M 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 M is suitable for rated voltages up to $U_r = 24 \text{ kV}$ and a maximum rated short-time withstand current of $I_k = 25 \text{ kA}$.

The circuit-breaker to be used in a circuit-breaker panel must only be the Siemens type 3AE.

The air-insulated medium-voltage switchgear type NXAIR M 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 M is available with the panel versions:

- Circuit-breaker panel
- Disconnecting panel
- Metering panel
- Bus sectionalizer
- Bus coupler
- Circuit-breaker panel with HV HRC fuse

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 below internet site.

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

For protection relays of other manufacturers please get in touch with the Original Equipment Manufacturer.

Features

3 Features

The air-insulated medium-voltage switchgear type NXAIR M 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 25 kA 1 s or IAC A FL 25 kA 1 s according to IEC 62271 Part 200
- Loss of service continuity category: LSC 2B (metal-clad)
- Partition class: PM (metallic partition)
- 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, 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 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.

Technical data

4 Technical data

4.1 Complete switchgear

Rated voltage	[kV]	24
Rated frequency	[Hz]	50/60
Rated power-frequency withstand voltage	[kV]	50/65
Rated lightning impulse withstand voltage	[kV]	125
Rated short-time withstand current, max.	[kA]	25
Rated duration of short circuit, max.	[s]	3
Rated peak withstand current	[kA]	63/65

Rated voltage		24
Rated normal current of busbar, max.	[A]	2500
Rated normal current of feeders, max.		
with circuit-beaker	[A]	2500
with disconnector	[A]	2500
as bus coupler	[A]	2500
as bus sectionalizer	[A]	2500

4.2 Basic prescriptions and standards

The indoor switchgear complies with the following prescriptions and standards:

		IEC / EN standard
		62271-1
Switchgear		62271-200
		62271-210
	Circuit-breakers	62271-100
Switching	Disconnectors / earthing switches	62271-102
devices	Circuit-breaker / fuse combinations	62271-107
Current limiting fuses		60282-1
Voltage detecting systems		61243-5
Insulation		60071-1
Degree of protect	etion	60529
Instrument	Current transformers	61869-2
transformers	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 fulfil 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.

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:

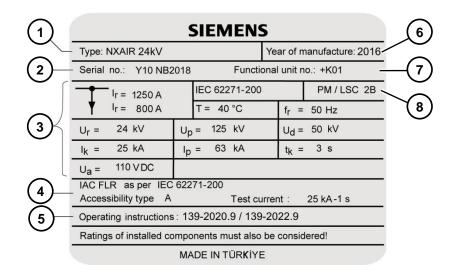


Fig. 1: Rating plate

- (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.

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

Technical data

4.6 Panel dimensions

Width

Panel type	I _k [kA]	I _r [A]	Width [mm]
Circuit breaker panel,		≤ 1250	800
disconnecting panel		2000/2500	1000
Metering panel		_	800
Circuit breaker panel with HV HRC fuse		_	800
	25	≤ 1250	2 × 800
Bus sectionalizer		2000/2500	2 × 1000 or 1 × 1000 with 1 × 800
		≤ 1250	2 × 800
Bus coupler		2000/2500	2 × 800 or 2 × 1000

Height

Panel design	Height [mm]
With standard low-voltage compartment	2510
With high low-voltage compartment	2550
With natural ventilation	2700
With pressure relief duct and arc absorber	2750
With additional compartment for busbar components	2770

Depth

Panel design	Depth [mm]	
Single busbar	1600	
Circuit-breaker panel for back-to-back arrangement (panel A)	angement (panel A) 1750	
Disconnecting panel for back-to-back arrangement (panel A)		
Circuit-breaker panel for back-to-back arrangement (panel B)	1600	
Disconnecting panel for back-to-back arrangement (panel B)	1600	

4.7 Room planning

According to chapter 6 in the Installation Instructions with order number: 139-2019.9

4.8 Operating conditions

NXAIR M 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 may be 1000 m above sea level as a maximum.

When NXAIR M 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 M is used under other service conditions than normal service conditions acc. to IEC 62271 Part 1 regarding ambient air temperature, the permissible current ratings of feeder and busbar can deviate. In this case, please contact your regional Siemens representative to clarify the 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 of 24 kV. Depending on the design of the NXAIR M switchgear, circuit-breakers type 3AE1 and type 3AE5 are used. The assignment of the circuit-breaker matching with the respective panel is shown on the rating plate.

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

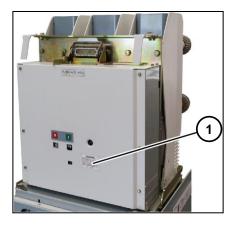


Fig. 2: Circuit-breaker type 3AE1

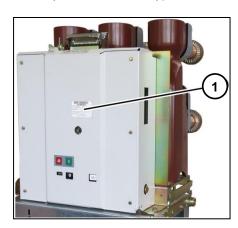


Fig. 3: Circuit-breaker type 3AE5

(1) Rating plate on circuit-breaker

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			
Language	Order number		
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		

Overview of panel types

5 Overview of panel types

The withdrawable circuit-breaker switchgear NXAIR M consists of various panel types, 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 withdrawable disconnector link
- Bus sectionalizer, type 2
 - 1 × circuit-breaker panel plus 1 × bus riser panel, optionally with withdrawable metering part
- Bus coupler, type 1
 - 1 × circuit-breaker panel plus 1 × bus riser panel with withdrawable disconnector link
- Bus coupler, type 2
 - 1 × circuit-breaker panel plus 1 × bus riser panel, optionally with withdrawable metering part
- Circuit-breaker panel with HV HRC fuse

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

Overview of panel types for single-busbar system:

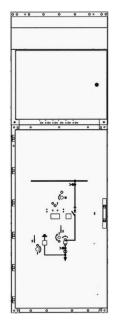


Fig. 5: Circuit-breaker panel

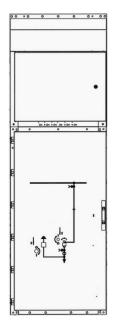


Fig. 6: Disconnecting panel

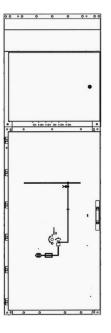


Fig. 7: Metering panel

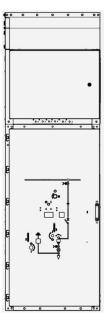
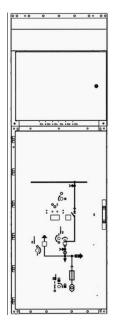
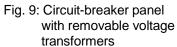


Fig. 8: Circuit-breaker panel with HV HRC fuse





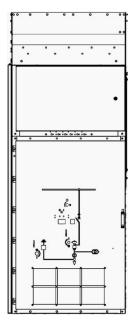


Fig. 10: Panel version with natural ventilation

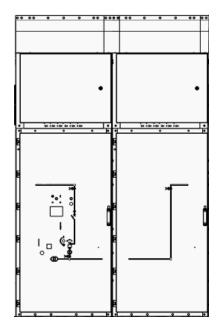


Fig. 11: Bus sectionalizer to the right ¹⁾, circuit-breaker panel and bus riser panel

Overview of panel types for single-busbar system:

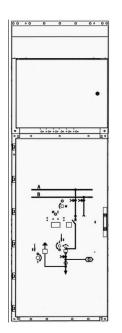


Fig. 12: Circuit-breaker panel, panel A

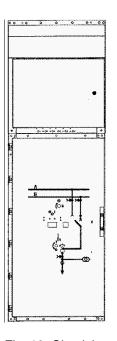


Fig. 13: Circuit breaker panel, panel B

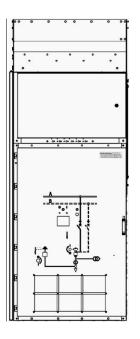


Fig. 14: Circuit-breaker panel, panel A with natural ventilation

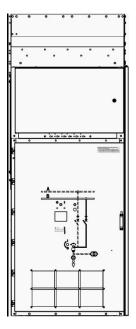


Fig. 15: Circuit-breaker panel, panel B with natural ventilation

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

Panel design

Panel design

6.1 Basic design circuit-breaker panel, single-busbar system

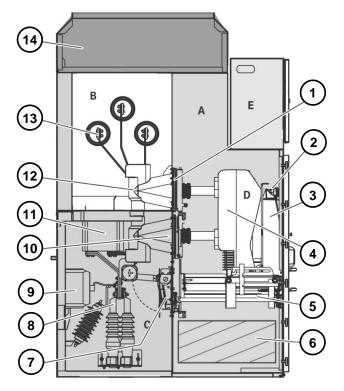


Fig. 16: Sectional view of circuit-breaker panel design

- Α Switching-device compartment
- В Busbar compartment
- С Connection compartment
- D Withdrawable circuit-breaker
- Е Low-voltage compartment
- (1) Metallic shutters
- (2)Low-voltage connection
- Operating and interlocking unit for (3)
 - circuit-breaker
- (4)Vacuum interrupters
- Operating and interlocking unit for racking the (5)withdrawable part and for earthing
- (6)Removable voltage transformers (optional)
- (7)Feeder earthing switch
- (8)Cable connection for up to 4 cables per phase
- (9)Voltage transformers (optional)
- (10) Contact systems
- (11)Block-type current transformers
- (12)Bushing-type insulators
- (13)Busbar
- (14)Pressure relief duct

6.2 Basic design circuit-breaker panel with HV HRC fuse

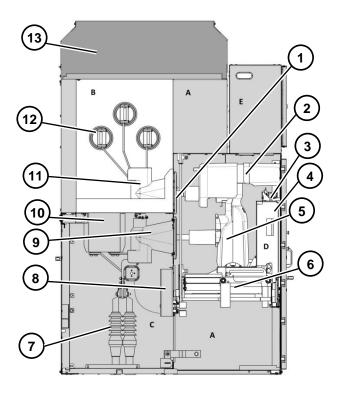


Fig. 17: Sectional view of circuit-breaker panel with HV HRC fuse design

- Α Switching-device compartment
- В Busbar compartment
- С Connection compartment
- D Withdrawable circuit-breaker / fuse combination
- Ε Low-voltage compartment
- (1) Metallic shutters
- Fuse assemblies with HV HRC fuses (2)
- (3) Low-voltage connection
- Operating and interlocking unit for (4)
 - circuit-breaker
- Vacuum interrupters (5)
- Operating and interlocking unit for racking the (6)withdrawable part and for earthing
- (7) Connection for up to 2 cables per phase
- (8)Feeder earthing switch
- (9) Contact systems
- Bushing-type current transformers (10)
- (11)Bushing-type insulators
- (12)Busbar
- (13)Pressure relief duct

6.3 Basic design circuit-breaker panel, double-busbar system

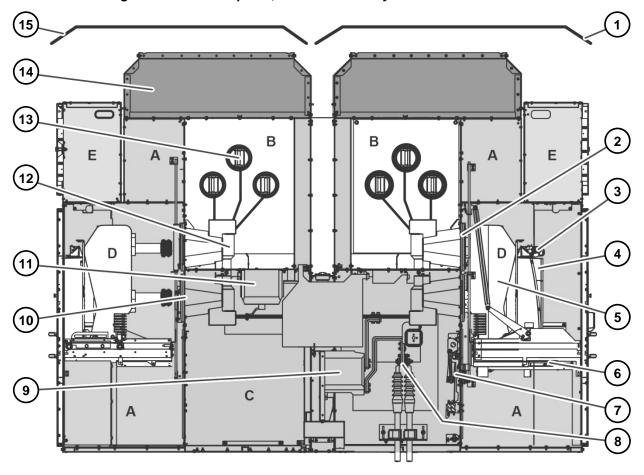


Fig. 18: Sectional view of circuit-breaker panel design

- A Switching-device compartment
- B Busbar compartment
- C Connection compartment
- D Withdrawable circuit-breaker
- E Low-voltage compartment
- (1) Panel A
- (2) Metallic shutters
- (3) Low-voltage connection
- (4) Operating and interlocking unit for circuit-breaker
- (5) Vacuum interrupters
- (6) Operating and interlocking unit for racking the withdrawable part and for earthing
- (7) Feeder earthing switch
- (8) Connection for up to 4 cables per phase
- (9) Block-type current transformers
- (10) Contact system
- (11) Voltage transformers
- (12) Bushing-type insulators
- (13) Busbars
- (14) Pressure relief duct
- (15) Panel B

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

Interlocks

7 Interlocks

7.1 Mechanical interlocks for single-busbar system

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
	Withdrawable part inserted and interlocked
	Low-voltage connector plugged on
Racking the withdrawable part to service position	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

7.2 Mechanical interlocks for double-busbar system

Action	Additional preconditions
Inserting the withdrawable part in the panel	Withdrawable part on the service truck
Pulling the withdrawable part out of the panel	None
	Withdrawable part inserted and interlocked
	Low-voltage connector plugged on
	High-voltage door closed
Racking the withdrawable part to service position, panel A and/or B	Circuit-breaker in OPEN position
	Feeder earthing switch in panel A in OPEN position
	Release of the actuating opening for racking the withdrawable part by the electromagnetic interlock from the feeder earthing switch in panel A
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)
Opening the circuit-breaker	None
	Withdrawable part in test position
Operating the feeder earthing switch (panel A only)	Release of the actuating opening for operating the feeder earthing switch by the electromagnetic interlocks from the withdrawable parts in panel A and B
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

7.3 Additional electromagnetic interlocks (optional)

Action	Additional preconditions
Racking the withdrawable part	General or external release
Operating the feeder earthing switch	General or external release
Operating the busbar earthing switch	General or external release

S HINT

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

Racking the withdrawable part is interlocked by a solenoid interlock.

When auxiliary voltage is missing, racking the withdrawable part is completely interlocked.

Operation of the earthing switch is interlocked by a solenoid interlock.

When auxiliary voltage is missing, operation of the earthing switch is completely interlocked.

CF HINT

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:

Operation of the earthing switch is interlocked by a solenoid interlock.

When auxiliary voltage is missing, operation of the earthing switch is completely interlocked.

7.4 Additional padlock interlock (optional)

Action	Additional preconditions
Racking the withdrawable part	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

7.5 Additional key-operated interlock (optional)

Action	Additional preconditions
Racking the withdrawable part 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. 19: Racking crank for moving the withdrawable part

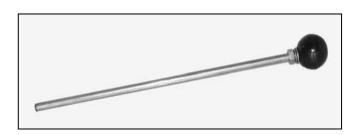


Fig. 20: Push rod for closing / opening the circuit-breaker manually

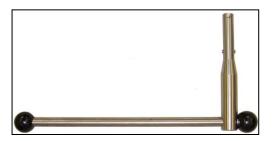


Fig. 21: Operating lever for operating the feeder earthing switch or busbar earthing switch



Fig. 22: Hand crank for manual charging of the spring energy store in the circuit-breaker



Fig. 23: Double-bit key with a diameter of 5 mm for unlocking and interlocking the withdrawable part



Fig. 24: Double-bit key with a diameter of 3 mm for opening and closing the door to the low-voltage compartment

Accessories

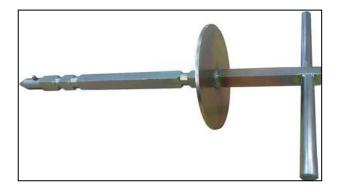


Fig. 25: Racking tool for the removable voltage transformers (optional)

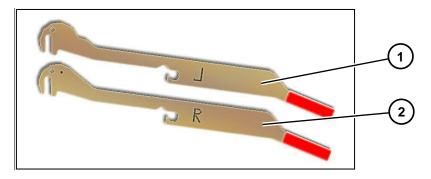


Fig. 26: Slip-on lever for opening the shutters (optional)
(1) for use on left side in panel and (2) for use on right side in panel

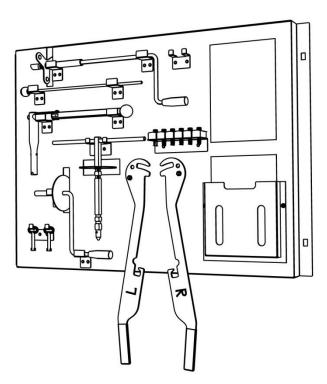


Fig. 27: Wall-mounting holder for storage of operating tools (optional)

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:

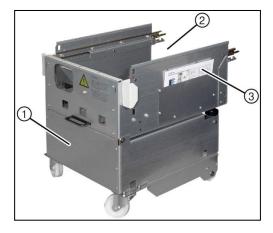
- Transporting a corresponding withdrawable part
- Removing a withdrawable part from a panel
- Inserting a withdrawable part into a panel

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:



- (1) Operating side
- (2) Rear side
- (3) Operating instructions for service truck

Fig. 28: 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:

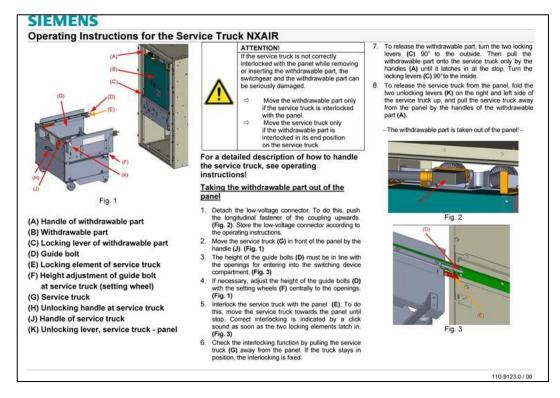


Fig. 29: Front page of operating instructions

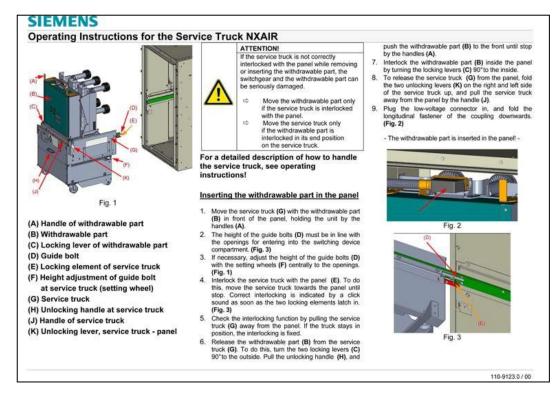


Fig. 30: Rear page of operating instructions

For panels with removable voltage transformers:

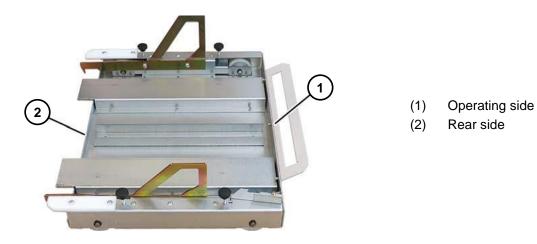


Fig. 31: Service truck to insert and remove the removable voltage transformers

Customer support

9 Customer support

9.1 Service

If the NXAIR M switchgear should not function as described, the Operating and Installation 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 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)
Panel 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:

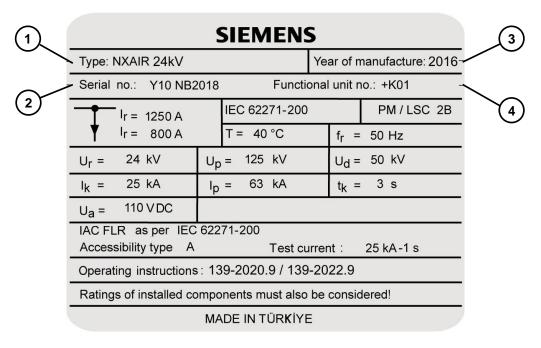


Fig. 32: Rating plate

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

Operating the circuit-breaker panel

10 Operating the circuit-breaker panel



Read and understand these instructions before attempting operating works.

10.1 Control elements at the front side of the panel

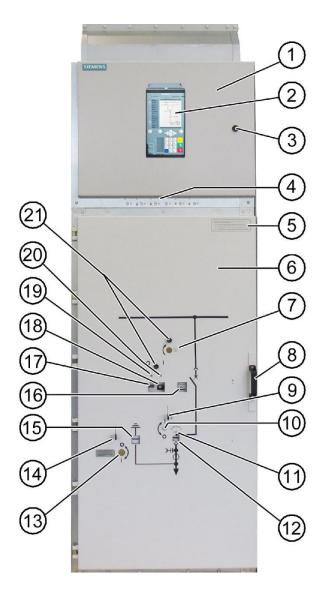


Fig. 33: Control elements on the panel front

- (1) Door to the low-voltage compartment
- (2) Protection device
- (3) Locking device for the door to the low-voltage compartment
- (4) Test sockets for voltage detecting system (type LRM)
- (5) Instruction label for closing the high-voltage door
- (6) High-voltage door
- (7) Opening for charging the spring in the circuitbreaker manually (covered)
- (8) Handle for opening the high-voltage door
- Control gate for opening and closing the actuating opening for racking the switching device
- device
- (10) Actuating opening for racking the switching device
- (11) Actuating opening for inserting the double-bit key to control racking of the withdrawable part
- (12) Mechanical position indicator for withdrawable part
- (13) Actuating opening for feeder earthing switch
- Operating slide for opening and closing the (14) actuating opening for operating the feeder earthing switch
- (15) Mechanical position indicator for feeder earthing switch
- (16) Operations counter for circuit-breaker
- (17) Spring state indicator for circuit-breaker
- (18) CLOSED/OPEN indicator of the circuit-breaker
- (19) Actuating opening for opening the circuitbreaker
- (20) Actuating opening for closing the circuitbreaker
- (21) Rotary button to close and open the actuating opening located below

Operating the circuit-breaker panel

10.2 Position indicators visible on high-voltage door

Circuit-breaker: CLOSED position or OPEN position	CLOSED	OPEN	_
Withdrawable circuit-breaker: 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	1
Feeder earthing switch: CLOSED position or OPEN position	CLOSED	OPEN	_

10.3 Access to compartments

Regarding accessibility to the individual compartments, NXAIR M 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 com	partment	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	

10.4 Opening the high-voltage door

<u> </u>	VARNING
Reduc	ed safety
The hig	osed high-voltage door is an important safety element of the switchgear. gh-voltage door is exclusively opened for performing operational activities the switching-device compartment, such as removing or inserting a wable circuit-breaker.
Close t	he high-voltage door:
\Rightarrow	If an activity inside the switching-device compartment is interrupted.
\Rightarrow	Immediately after an activity inside the switching-device compartment was completed.
\Rightarrow	Before leaving the panel front.

⚠ CAUTION

Injury

The mechanism inside a withdrawable part can cause injuries by getting squeezed, caught or cut.

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

Preconditions

- Withdrawable circuit-breaker in test position
- Spring energy store in the circuit-breaker discharged
- High-voltage door closed
- Padlock (optional) removed from door handle
- In case of removable voltage transformers (optional):
 - Removable voltage transformers in test position

Procedure

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



Fig. 34: Opening the high-voltage door of the circuit-breaker panel

The high-voltage door is open.

10.5 Closing the high-voltage door

MARNING

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.

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.



Injury

The mechanism inside a withdrawable part can cause injuries by getting squeezed, caught or cut.

Do not remove any parts of the covering.



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.

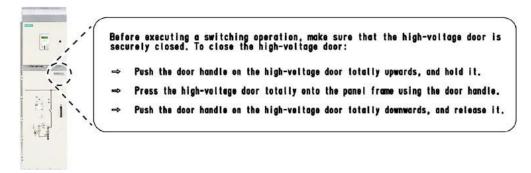


Fig. 35: Instruction label on high-voltage door

Preconditions

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

- Withdrawable circuit-breaker inserted in the panel in test position
- Low-voltage connector plugged on
- High-voltage door open
- Padlock for door handle (optional) available

In case of removable voltage transformers (optional):

• Removable voltage transformers in test position

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

Install a padlock (optional), and close it.

✓ The high-voltage door is closed.

Operating the circuit-breaker panel

10.6 Positions of the withdrawable circuit-breaker

General description of positions of the withdrawable circuit-breaker

Service position

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

Test position

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

Disconnected position

The withdrawable circuit-breaker 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:

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

Step 1 Insert and turn double-bit key		Step 2 Insert and turn racking crank as	Step 3 Turn and remove double-bit key			
from	by	to	far as it will go and pull it off	from	by	to
-	90°	+		+	90°	-

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

Step 1 Insert and turn double-bit key		Step 2 Insert and turn racking crank as	Step 3 Turn and remove double-bit key			
from	by	to	far as it will go and pull it off	from	by	to
-	90°	+		+	90°	-

10.7 Racking the withdrawable circuit-breaker to service position

NOTICE

Maloperation

Racking the withdrawable circuit-breaker 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 of withdrawable circuit-breaker visible on high-voltage door:



Fig. 37: Type 3AE1

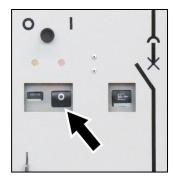


Fig. 38: Type 3AE5

Preconditions

- Withdrawable circuit-breaker 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 available
- Double-bit key available
- Padlock (optional) removed from operating slide
- For electromagnetic interlock (optional):
 - Electromagnetic interlock deactivated

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

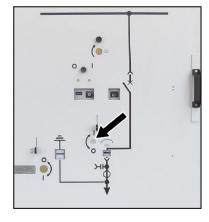


Fig. 39: Actuating opening for racking the withdrawable circuit-breaker

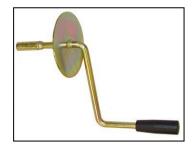


Fig. 40: Racking crank



Fig. 41: Double-bit key, diameter 5 mm

Procedure

NOTICE

Maloperation

All interlocks are only released when the withdrawable part is in a stable end position.

Rack the withdrawable circuit-breaker absolutely until end position.

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

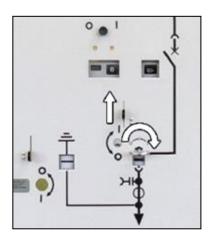


Fig. 42: Releasing access to the withdrawable part

- Push the racking crank for moving the withdrawable circuit-breaker onto the operating shaft, and turn clockwise as far as it will go.
- Remove the racking crank for moving the withdrawable circuit-breaker.
- Turn the double-bit key clockwise as far as it will go (that is 90°) to interlock the withdrawable circuit-breaker.

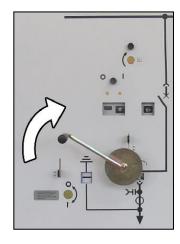


Fig. 43: Turning the racking crank clockwise

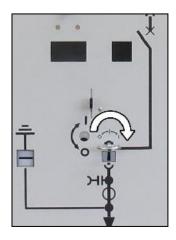


Fig. 44: Turning the double-bit key clockwise

- 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.

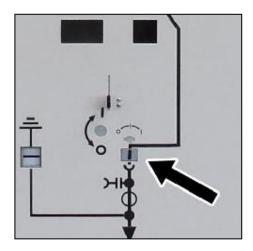


Fig. 45: Position indicator CLOSED (service position)

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

10.8 Racking the withdrawable circuit-breaker to test position

NOTICE

Maloperation

Racking the withdrawable circuit-breaker 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 of withdrawable circuit-breaker visible on high-voltage door:



Fig. 46: Type 3AE1



Fig. 47: Type 3AE5

Preconditions

- Withdrawable circuit-breaker in service position
- Circuit-breaker in OPEN position
- Racking crank for moving the withdrawable circuit-breaker 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):
 - Removable voltage transformers racked to test position

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



Fig. 48: Actuating opening for racking the withdrawable circuit-breaker



Fig. 49: Racking crank



Fig. 50: Double-bit key, diameter 5 mm

Procedure

NOTICE

Maloperation

All interlocks are only released when the withdrawable part is in a stable end position.

Rack the withdrawable circuit-breaker absolutely until end position.

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

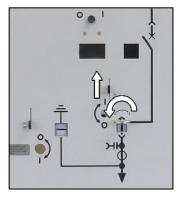


Fig. 51: Releasing access to the withdrawable part

- Push the racking crank for moving the withdrawable circuit-breaker onto the operating shaft, and turn counter-clockwise as far as it will go.
- Remove the racking crank for moving the withdrawable circuit-breaker.
- Turn the double-bit key counter-clockwise as far as it will go (that is 90°) to interlock the withdrawable circuit-breaker.

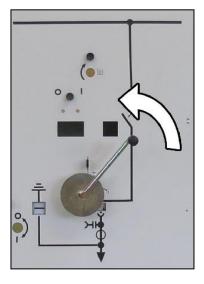


Fig. 52: Turning the racking crank counter-clockwise

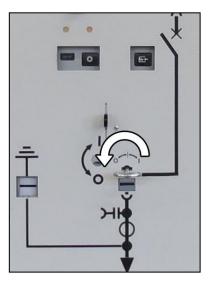


Fig. 53: Turning the double-bit key counter-clockwise

- 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.

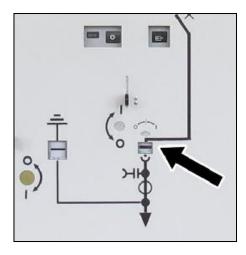


Fig. 54: Position indicator OPEN (test position)

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

10.9 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).



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



Unexpected motor 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.



The opening spring is charged during the closing operation.

Preconditions

- Withdrawable circuit-breaker 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.

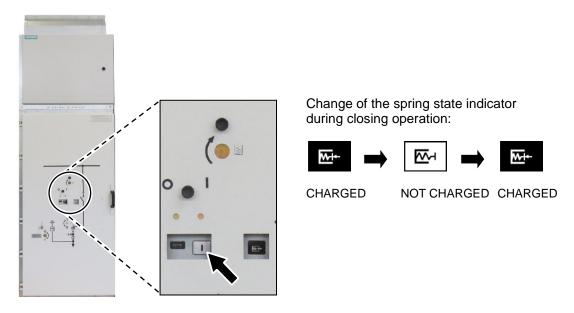


Fig. 55: Position indicator on the circuit-breaker, CLOSED

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.

10.10 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.

 \Rightarrow

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



Unexpected motor 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.



The opening spring is charged during the closing operation.

Preconditions

- Withdrawable circuit-breaker 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.

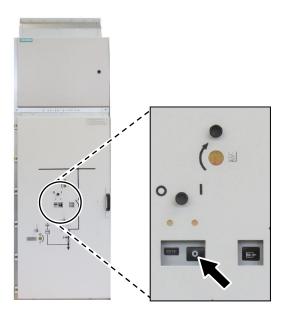


Fig. 56: Position indicator on the circuit-breaker, OPEN

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

10.11 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.

S HINT

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.

S HINT

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

S HINT

Unexpected motor 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.



The opening spring is charged during the closing operation.

Preconditions

- Withdrawable circuit-breaker 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 the actuating opening
- Push rod available

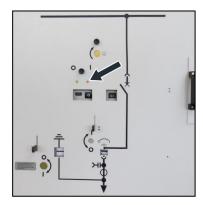


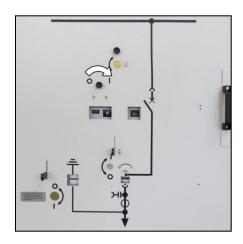
Fig. 57: High-voltage door with actuating opening



Fig. 58: 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.



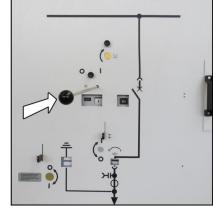


Fig. 59: Actuating opening released

Fig. 60: High-voltage door with push rod in the actuating opening

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

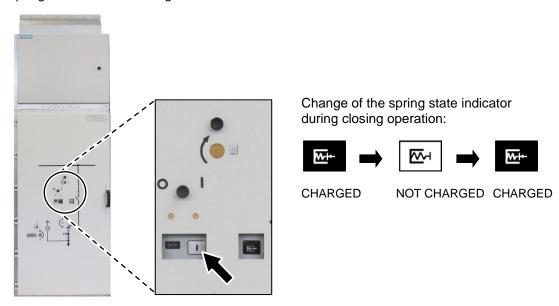


Fig. 61: Position indicator on the circuit-breaker, CLOSED

- Take the push rod out of the actuating opening.
- Close the cover of the actuating opening.
- Optional: Fit a padlock to the actuating opening.
- 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.

10.12 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.



Unexpected motor 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.

 \Rightarrow

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



The opening spring is charged during the closing operation.

Preconditions

- Withdrawable circuit-breaker 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

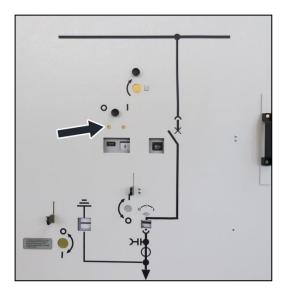
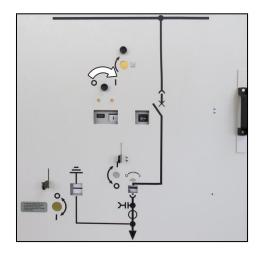


Fig. 62: High-voltage door with actuating opening

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.



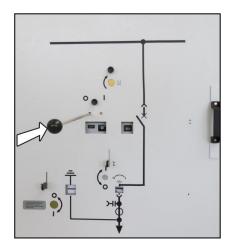


Fig. 63: Actuating opening released

Fig. 64: High-voltage door with push rod in the actuating opening

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



Fig. 65: Position indicator on the circuit-breaker, OPEN

- Take the push rod out of the actuating opening.
- Close the cover of the actuating opening.
- Optional: Fit a padlock to the actuating opening.
- The position indicator on the circuit-breaker changes from I position to 0 position. The circuit-breaker is open.

10.13 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.



Discharging the closing spring can only be done manually.



Unexpected motor noise and vibration

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



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

Preconditions

- Withdrawable circuit-breaker 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.

\Rightarrow	Open the circuit-breaker manually by using the push rod.
\Rightarrow	Close the circuit-breaker manually by using the push rod.

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

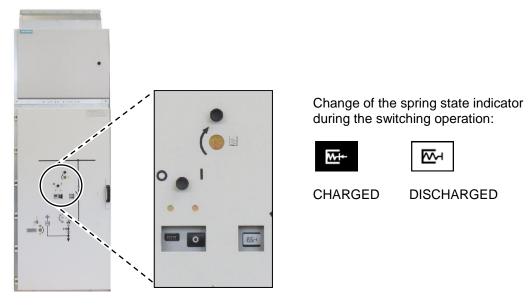


Fig. 66: Position indicator on the circuit-breaker, OPEN

▼ The spring energy store for the closing spring in the circuit-breaker is discharged.

10.14 Charging the spring 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 energy store indicator at the circuit-breaker changes from NOT CHARGED to CHARGED. After that, the energy required for the operating sequence OPEN-CLOSE-OPEN is stored in the circuit-breaker.

If the control voltage fails, the spring energy store for operating the circuit-breaker is no longer charged automatically by the motor after the circuit-breaker has been closed. To operate the circuit-breaker in spite of this, the spring energy store must be charged manually with a hand crank. The spring energy store in the circuit-breaker can be charged manually both in test position and in service position.



Fig. 67: Hand crank for manual charging of the spring energy store in the circuit-breaker

MARNING

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 slip coupling.

NOTICE

Maloperation

Racking the withdrawable circuit-breaker 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.

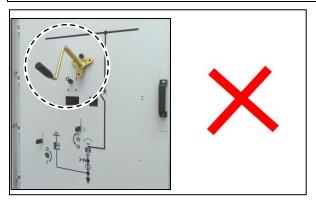


Fig. 68: Hand crank not removed

Preconditions

- Withdrawable circuit-breaker in service position or in test position
- Circuit-breaker in OPEN or CLOSED position
- Spring state indicator for the closing spring shows NOT CHARGED
- High-voltage door closed
- Auxiliary voltage for the panel disconnected
- Hand crank available



Fig. 69: Actuating opening on high-voltage door

Procedure

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

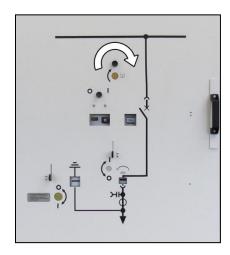


Fig. 70: Rotary button on high-voltage door

- Push the hand crank onto the operating shaft.
- Hold the freewheel (1) and turn the hand crank (2) clockwise approx. 25 turns until the CHARGED indication appears in the inspection window.

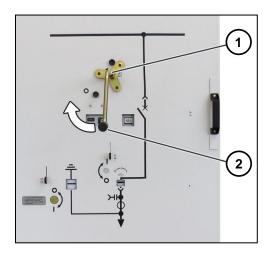


Fig. 71: Hand crank on high-voltage door

The closing spring is latched in automatically. The spring energy store indicator changes from NOT CHARGED to CHARGED.

- Remove the hand crank.
- Close 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.

10.15 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.

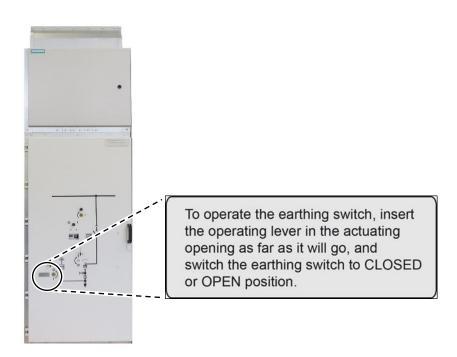


Fig. 72: Instruction label on high-voltage door

Preconditions

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

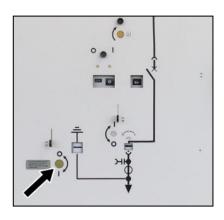


Fig. 73: Actuating opening on high-voltage door



Fig. 74: Operating lever for operating the feeder earthing switch

Procedure

Lift the operating slide to release the actuating opening.

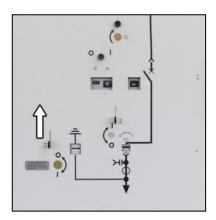


Fig. 75: Lifting the operating slide

- 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 in the actuating opening as far as it will go.

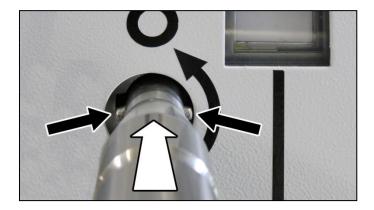


Fig. 76: Inserting the operating lever

 \Rightarrow

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.

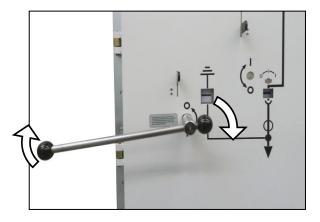


Fig. 77: Turning the operating lever clockwise

Fig. 78: 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.

10.16 De-earthing the feeder manually

NOTICE

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.

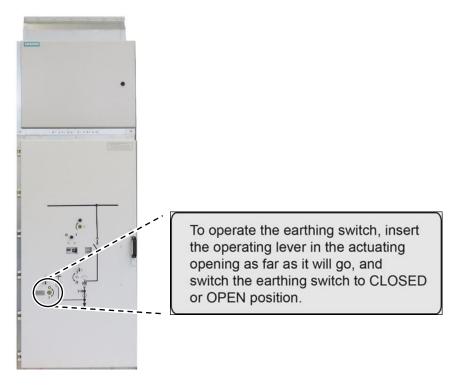


Fig. 79: Instruction label on high-voltage door

Preconditions

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

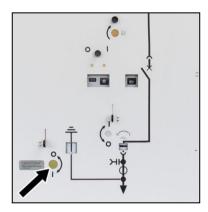


Fig. 80: Actuating opening on high-voltage door



Fig. 81: Operating lever for operating the feeder earthing switch

Procedure

Lift the operating slide to release the actuating opening.

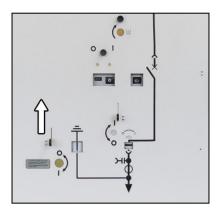


Fig. 82: Lifting the operating slide

- 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 in the actuating opening as far as it will go.

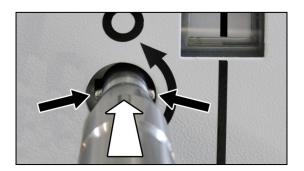


Fig. 83: Inserting the operating lever

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.

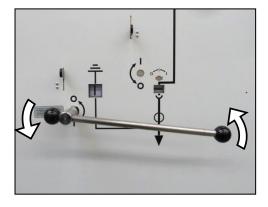


Fig. 84: Turning the operating lever counter-clockwise

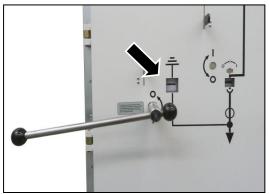


Fig. 85: Position indicator on the high-voltage door in OPEN position

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.

10.17 Removing the low-voltage connector

Preconditions

- Withdrawable circuit-breaker 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.

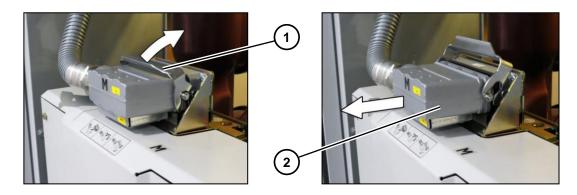


Fig. 86: Detaching the low-voltage connector

Fig. 87: Removing the low-voltage connector

Stow the low-voltage connector into the support located underneath the low-voltage compartment.

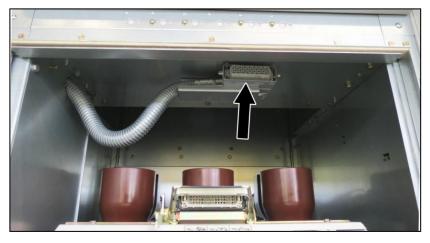


Fig. 88: Low-voltage connector stowed away



If no withdrawable circuit-breaker 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.

10.18 Plugging on the low-voltage connector



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 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



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.

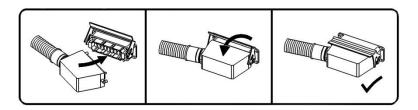


Fig. 89: Instruction label on withdrawable circuit-breaker

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

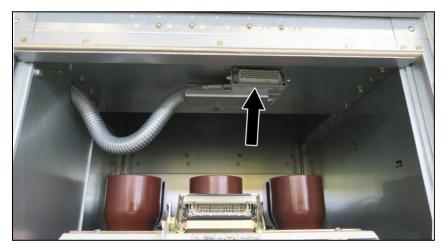


Fig. 90: Low-voltage connector stowed away

- 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.

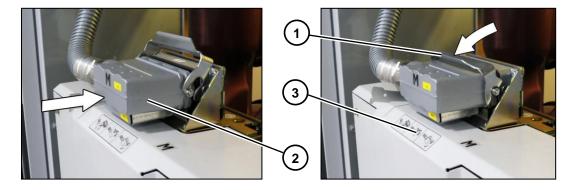


Fig. 91: Plugging on the low-voltage connector

Fig. 92: Locking 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 position indicator for the spring energy store in the circuit-breaker changes to CHARGED.

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

10.19 Taking the withdrawable circuit-breaker out of the panel

⚠ CAUTION

Injury

The mechanism inside a 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. 93: Circuit-breaker panel with high-voltage door open



Fig. 94: Circuit-breaker panel without service truck

Preconditions

- Service truck available and selected according to the corresponding panel width
- Withdrawable circuit-breaker racked to 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.

A 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.

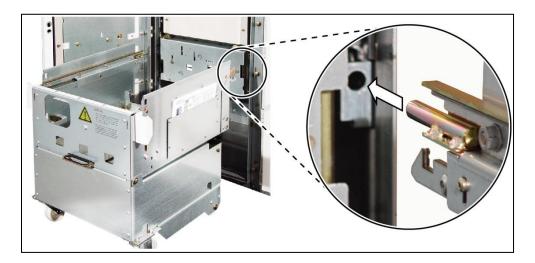


Fig. 95: Service truck in front of panel

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

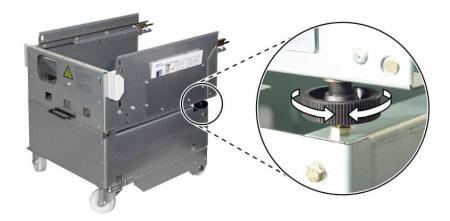


Fig. 96: Setting wheels on service truck

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.

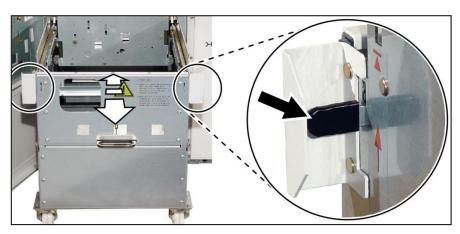


Fig. 97: Service truck interlocked

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. 98: 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. 99: Pulling out the withdrawable circuit-breaker, type 3AE5

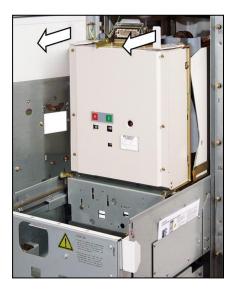


Fig. 100: Pulling out the withdrawable circuit-breaker, type 3AE1

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. 101: 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.

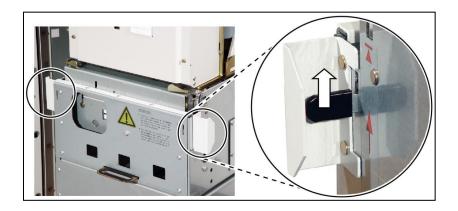


Fig. 102: Unlocking the service truck

Removing the service truck 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. 103: Moving the service truck

- 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.

10.20 Inserting the withdrawable circuit-breaker in a panel

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,

A 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.

deepening or floor joints.

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. 104: 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.

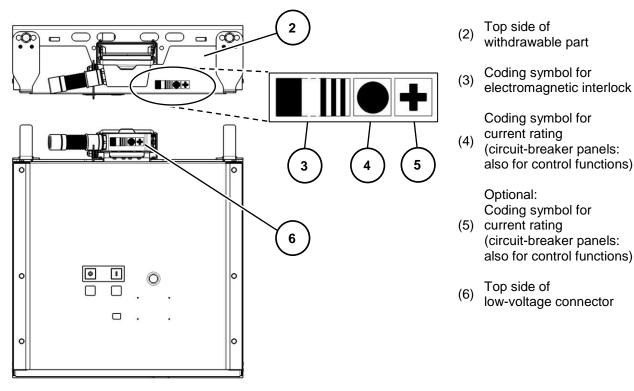


Fig. 105: Coding symbols on low-voltage connector and withdrawable part

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	
1 st 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	
2 nd symbol (4)	Circuit- breaker	Rated current and basic control functions		
	Other than circuit-breaker	Rated current	Examples:	
3 rd symbol (5; optional)	Circuit- breaker	Rated current and extended control functions		
			For single use of symbols or for use in combinations of symbols	
	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).

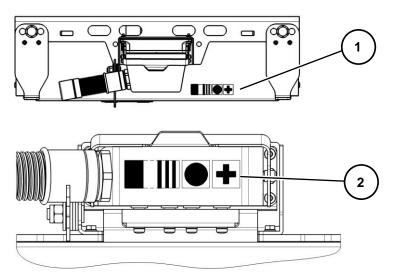
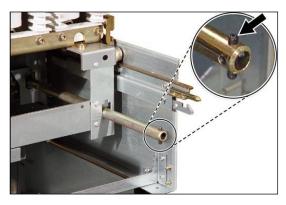


Fig. 106: Verifying correspondence of coding symbols on withdrawable part and low-voltage connector and (example)

Preparing the operating shaft for the feeder earthing switch

 \Rightarrow

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.



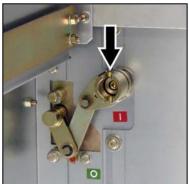


Fig. 107: Coupling pin of the operating shaft for the feeder earthing switch

Fig. 108 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.



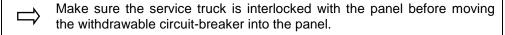
Fig. 109: Operating the feeder earthing switch operating shaft

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.



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 part can cause injuries or material damage.

- 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
 - 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.

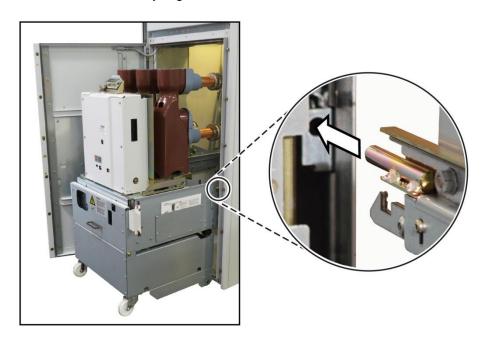


Fig. 110: Service truck in front of panel

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

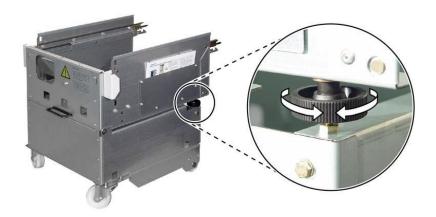


Fig. 111: Setting wheels on service truck

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.

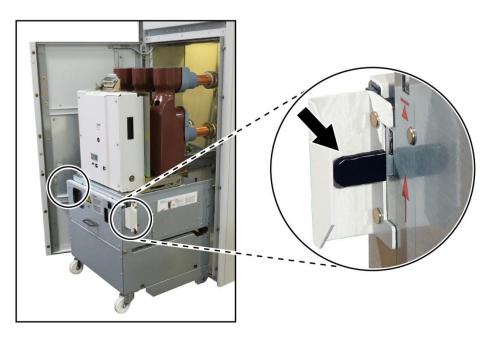


Fig. 112: Service truck interlocked with panel

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. 113: Releasing the interlocking of the withdrawable circuit-breaker

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

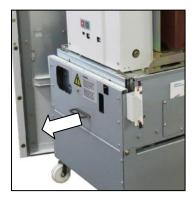


Fig. 114: Unlocking the handle of the service truck

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



Fig. 115: 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.

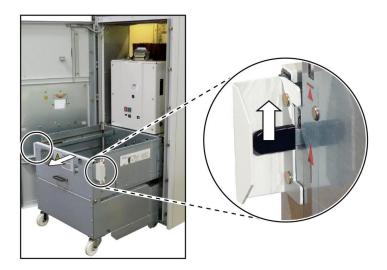


Fig. 116: Unlocking the service truck

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



Fig. 117: Unlocking the service truck

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. 118: Interlocking the withdrawable circuit-breaker

Locking the low-voltage connector



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.

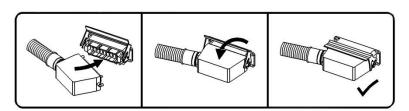


Fig. 119: Instruction label on withdrawable circuit-breaker

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

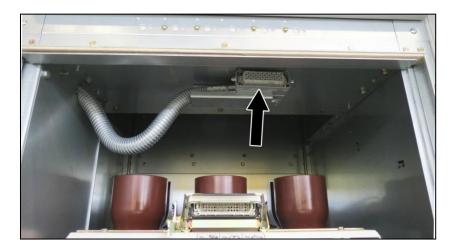


Fig. 120: Low-voltage connector stowed away

- 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.

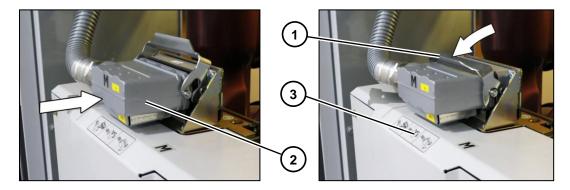


Fig. 121: Plugging on the low-voltage connector

Fig. 122: Locking 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 position indicator for the spring energy store in the circuit-breaker changes to CHARGED.

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

Operating the disconnecting panel

11 Operating the disconnecting panel

S HINT

Read and understand these instructions before attempting operating works.

11.1 Control elements at the front side of the panel

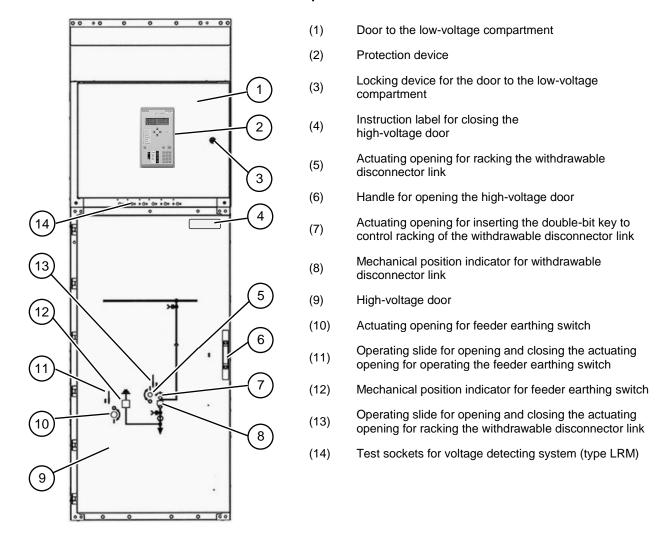


Fig. 123: Control elements on the panel front

11.2 Position indicators visible on high-voltage door

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

Operating the disconnecting panel

11.3 Access to compartments

Regarding accessibility to the individual compartments, NXAIR M 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	

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

⚠ WARNING

Injury due to effects of high-voltage

Racking the withdrawable disconnector link 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 while the busbar system and feeder are under operational high-voltage.

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

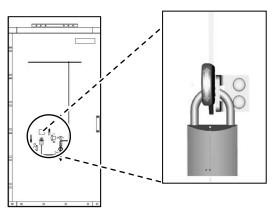
To release access for racking the withdrawable disconnector link, release the interlocking.

Interlocking for racking the withdrawable disconnector link

On disconnecting panels, racking the withdrawable disconnector link is interlocked with mechanical interlock by padlock and optionally also with electromagnetic interlock by solenoid.

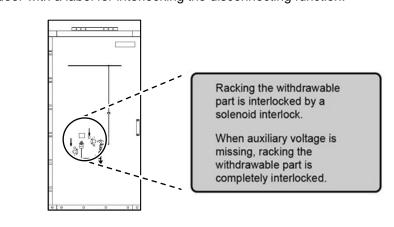


Releasing the mechanical interlock is only permissible to lift the operating slide for opening and closing the actuating opening. The operating slide must otherwise always be interlocked mechanically by padlock. This is also valid for panel versions with additional electromagnetic interlock:





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

For racking the withdrawable disconnector link to test position, see chapter 10.7 and/or 10.8.

Operating the disconnecting panel

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 10.17 and/or 10.18.

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

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

For inserting and/or removing the withdrawable disconnector link in the disconnecting panel, see chapter 10.20 and/or 10.19.

11.8 Earthing or de-earthing the feeder

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 10.15 and/or 10.16.

Operating the metering panel

12 Operating the metering panel



Read and understand these instructions before attempting operating works.

12.1 Control elements at the front side of the panel

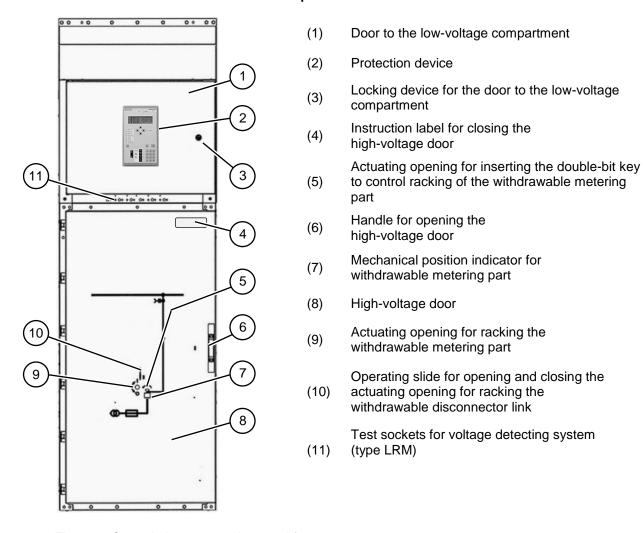
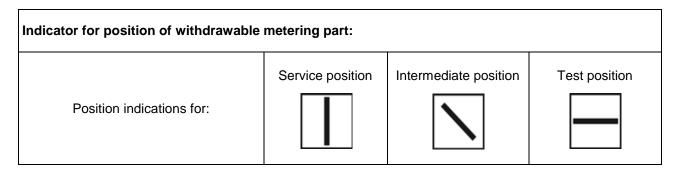


Fig. 124: Control elements on the panel front

12.2 Position indicators visible on high-voltage door



Operating the metering panel

12.3 Access to compartments

Regarding accessibility to the individual compartments, NXAIR M 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 con	npartment	Interlock-controlled
Busbar compartment		Tool-based
Connection	Access from the front side	Interlock-controlled and tool-based
compartment	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

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

For racking the withdrawable metering part to service position and/or test position, see chapter 10.7 and/or 10.8.

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 of the withdrawable metering part

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

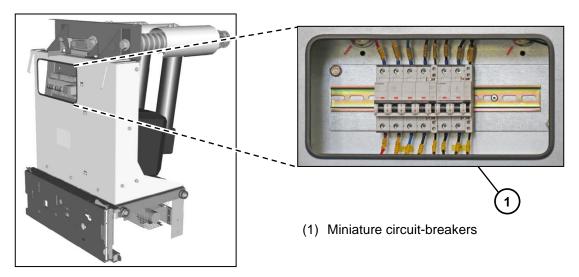


Fig. 125: Control elements at the front side of the withdrawable metering part, example

Before removing the low-voltage connector:

Switch off all MCBs at the front of the withdrawable metering part. The indicators change from red to green.

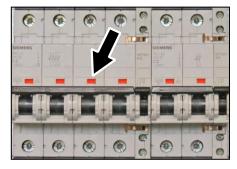


Fig. 126: MCBs switched on, indicators red

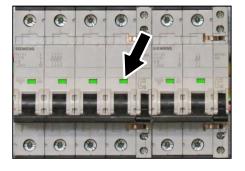


Fig. 127: MCBs switched on, indicators green

After plugging on the low-voltage connector:

Switch on all MCBs at the front of the withdrawable metering part. 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 disconnecting panel, see chapter 10.17 and/or 10.18.

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

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

For inserting and/or removing the withdrawable metering part in the metering panel, see chapter 10.20 and/or 10.19.

12.8 Replacing protection fuse-links

NOTICE

Maloperation

Withdrawable metering parts 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:
24	SIBA	3018013.6,3 / 6.3 A / 292 mm
Manufacturer information: www	v.siba-fuses.com	

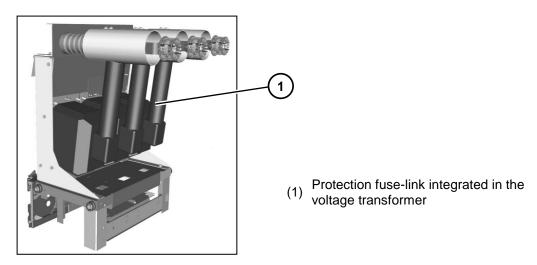


Fig. 128: Rear side of withdrawable metering part

Preconditions

- Withdrawable metering part 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 taken out of the panel
- Set of proper protection fuse-links available

Replacing protection fuse-links for rated voltage 24 kV

Remove the two plastic bolts M8x35 with the plastic washers 8.4 (1) completely from one of the plastic tubes (2), and keep for later use.

Remove the plastic tube, and keep for later use.

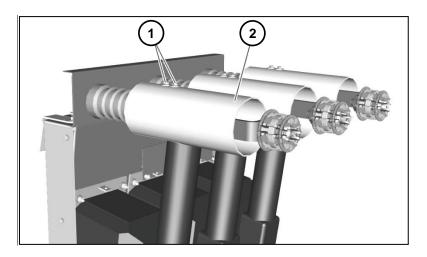
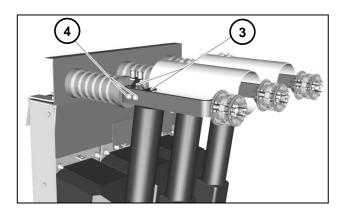


Fig. 129: Removing the plastic tube

- To remove the fuse holder (3), undo the two steel bolts M6x20 with the steel washers 6 (4) completely, and keep for later use.
- Remove the plastic tube, and keep for later use.



3 © C

Fig. 130: Removing the fuse holder

Fig. 131: Fuse holder

- Loosen the protection fuse-link by turning back and forth, and pull it out of the voltage transformer housing with mounted contact cap.
- Detach the contact cap from the protection fuse-link.

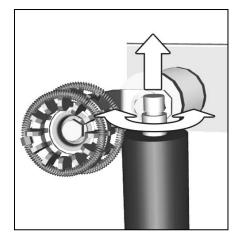


Fig. 132: Detaching the fuse-link



Fig. 133: Removing the fuse-link

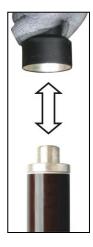
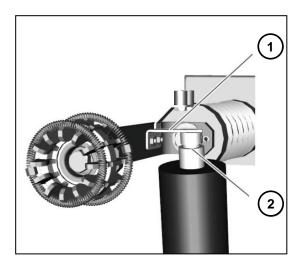


Fig. 134: Detaching the contact cap

Operating the metering panel

- Mount the contact cap on the new protection fuse-link.
- Insert the protection fuse-link with the contact cap in the voltage transformer housing.
- Apply the fuse holder to the bolted joints so that it is fully lying on the contact cap.



(1) Fuse holder

(2) Contact cap

Fig. 135: Applying the fuse holder

- Fasten the fuse holder with the two steel bolts M6x20 plus steel washers 6, and tighten with 12 Nm.
- Apply the plastic tube to the thread of the fuse holder, fasten with the two plastic bolts M8x35 plus plastic washers 8.4, and tighten with 16 Nm.
- Replace the other fuse-links in the same way.
- ✓ The protection fuse-links have been replaced.



Final procedure

 \Rightarrow

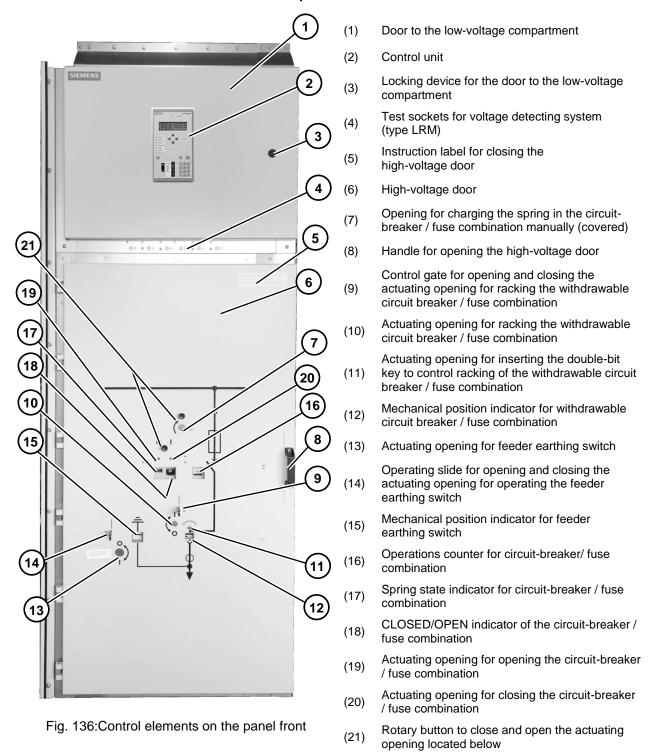
Next, insert the withdrawable part in the panel. After closing the high-voltage door, the panel can be integrated into the course of operation again.

13 Operating the circuit-breaker panel with HV HRC fuse

S HINT

Read and understand these instructions before attempting operating works.

13.1 Control elements at the front side of the panel



13.2 Position indicators visible on high-voltage door

Circuit-breaker:	CLOSED	OPEN	
CLOSED position or OPEN position	I	0	_
Withdrawable circuit-breaker:	Service position	Intermediate position	Test position
Service position, intermediate position or test position			
Spring state indicator:	CHARGED	NOT CHARGED	
CHARGED position or NOT CHARGED position	<u>~</u> +	™	_
Feeder earthing switch:	CLOSED	OPEN	
CLOSED position or OPEN position			_

13.3 Access to compartments

Regarding accessibility to the individual compartments, NXAIR M 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 com	partment	Interlock-controlled
Busbar compartment		Tool-based
Connection	Access from the front side	Interlock-controlled and Tool-based
compartment	Access from the rear side	Tool-based

13.4 Opening or closing the high-voltage door

The procedure for opening and/or closing the high-voltage door at the circuit breaker panel with HV HRC fuse 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 circuit breaker panel with HV HRC fuse, see chapter 10.4 and/or 10.5.

13.5 Racking the withdrawable part

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

\Box	For racking the withdrawable circuit breaker / fuse combination to service position and/or tes
— /	position, see chapter 10.7 and/or 10.8.

13.6 Closing or opening the circuit breaker / fuse combination

The procedure for closing and/or opening the circuit breaker / fuse combination in the circuit breaker panel with HV HRC fuse is identical with the procedure for closing and/or opening the circuit-breaker in the circuit-breaker panel.

Preconditions for closing the circuit breaker / fuse combination

\Rightarrow	For electrical closing and/or opening of the circuit breaker / fuse combination in the circuit breaker panel with HV HRC fuse, see chapter 10.9 and/or 10.10.
\Rightarrow	For manual closing and/or opening of the circuit breaker / fuse combination in the circuit breaker panel with HV HRC fuse, see chapter 10.11 and/or 10.12.

13.7 Discharging or charging the closing spring

No HV HRC fuse tripped

The procedure for discharging and/or charging the closing spring in the circuit breaker panel with HV HRC fuse is identical with the procedure for discharging and/or charging the closing spring in the circuit-breaker panel.

For discharging and/or charging the closing spring in the circuit breaker panel with HV HRC fuse, see chapter 10.13 and/or 10.14.

13.8 Earthing or de-earthing the feeder manually

The procedure for earthing and/or de-earthing the feeder in the circuit breaker panel with HV HRC fuse 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 circuit breaker panel with HV HRC fuse, see chapter 10.15 and/or 10.16.

13.9 Removing the low-voltage connector

Preconditions

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

Procedure

\Rightarrow	To detach the low-voltage connector, push the longitudinal fastener (1) of the coupling upwards.
\Rightarrow	Remove the low-voltage connector (2) carefully to the front.

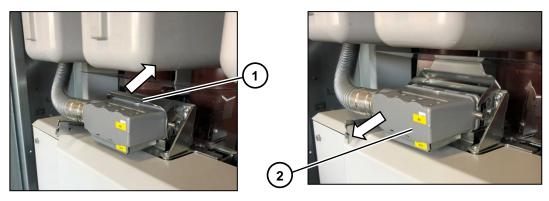


Fig. 137: Detaching the low-voltage connector

Fig. 138: Removing the low-voltage connector

Place the low-voltage connector (2) into the support located on the left side.



Fig. 139: Low-voltage connector placed on the left side

- If no withdrawable circuit-breaker / fuse combination is inserted in the panel and no further operation is executed: Close the high-voltage door.
- The removed low-voltage connector is placed at the support located on the left side.

13.10 Plugging on the low-voltage connector



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.

 \Rightarrow

Expect motor noise and low vibration.

Preconditions

- Withdrawable circuit-breaker / fuse combination in test position
- Spring energy store in the circuit-breaker discharged
- Auxiliary voltage for the panel disconnected
- High-voltage door open
- Low-voltage connector hanged down on the side wall

Procedure



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

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

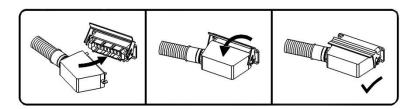


Fig. 140: Instruction label on withdrawable circuit-breaker / fuse combination

Take the low-voltage connector out of the support located on the left side.



Fig. 141: Low-voltage connector placed on the side wall

- 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.

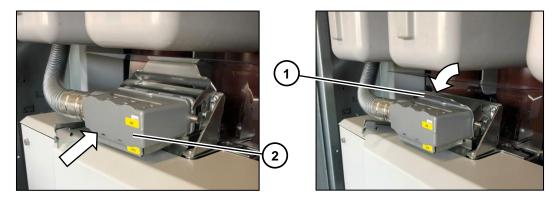


Fig. 142: Plugging on the low-voltage connector

Fig. 143: Locking 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 position indicator for the spring energy store in the circuit-breaker changes to CHARGED.

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

13.11 Taking the withdrawable circuit-breaker / fuse combination out of a panel or inserting in a panel

The procedure for inserting and/or removing the withdrawable circuit-breaker / fuse combination in the circuit-breaker panel with HV HRC fuse is identical with the procedure for inserting and/or removing the withdrawable circuit-breaker in the circuit-breaker panel.

For inserting and/or removing the withdrawable circuit-breaker / fuse combination in the circuit-breaker panel with HV HRC fuse, see chapter 10.20 and/or 10.19

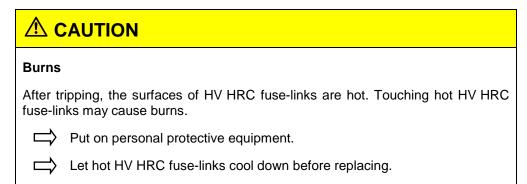
13.12 Replacement of HV HRC fuse-links

According to IEC 60282-1 (2009) Clause 6.6, the breaking capacity of HV HRC fuses 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 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 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 must be selected together with the fuse manufacturer.



NOTICE

Undetected damage

Even if the withdrawable circuit breaker / 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 compartment for deformations when a fuse-link has tripped.

Arrangement of HV HRC fuse-links

Circuit breaker / fuse combination is equipped with single fuse-link arrangement per phase.

- (1) Fuse assembly for phase L3
- (2) Contact arm assembly with tulip contact
- (3) Service truck
- (4) Fuse trip indicator

- (5) Outer phase L1
- (6) Middle phase L2
- (7) Outer phase L3

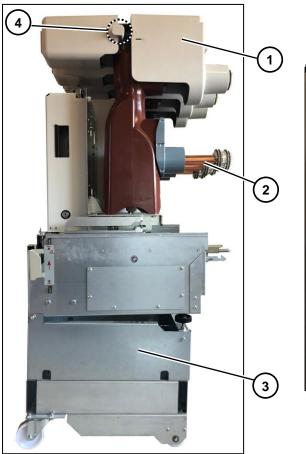




Fig. 144: Circuit breaker / fuse combination on the service truck

Fig. 145: Seen from front: Arrangement of HV HRC fuse-links



Fuse trip indicator

When the high voltage door open, a fuse trip indicator is visible inside the switching-device compartment.

Tripped fuse-links can be seen by checking the position of the fuse trip indicator on each phase. The fuse-link has not tripped, if the fuse trip indicator is in the horizontal position.



Position (1) Fuse-link has not tripped

Position (2) Fuse-link has tripped

Fig. 146: The positions of fuse-trip lever

Permissible HV HRC fuse-links

Design of HV HRC fuse-links according to IEC 60282-1 with dimensions according to DIN 43625.

NOTICE

Maloperation

Circuit breaker with HV HRC fuse panels 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]	Order details:
	63	442	3001443.63
24	80	442	3002443.80
	100	442	3002243.100
	125	442	3002243.125
Manufacturer information: www.siba-fuses.com			

Further information to all rated current of fuses and technical data is given in catalog HA 25.71.

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.



Electrical indication of tripped fuse-links

Electrical indications at the panel or in the remote control room are **not** automatically reset to operating mode by replacing the HV HRC fuse-links.



Recommended order of action

The HV HRC fuse-link in the middle phase L2 are only accessible after removing the HV HRC fuse-links from the neighboring phase L1 or L3.



First, remove the HV HRC fuse-links from the outer phases L1 and L3 on the left and right side of the circuit breaker / fuse combination. Then go on to remove the HV HRC fuse-links from the middle phase L2.

Preconditions

- Set of proper HV HRC fuse-links available
- Withdrawable circuit breaker / fuse combination taken out of the panel
- · High-voltage door closed

Procedure

When the withdrawable part is taken out of the panel, fuse assemblies are accessible for the replacement of the HV HRC fuse-links.



Hereafter, the disassembly of those parts is described, which are later assembled again at the same place.



Store disassembled parts carefully and keeps them available for later reuse.

- (1) Rear insulation cover
- (2) Front insulation cover
- (3) Removable HV HRC fuse-link
- (4) Clips for locking the covers

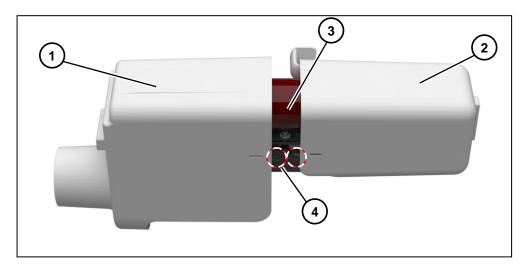


Fig. 147: Components of the fuse assembly

Removing HV HRC fuse-links

First, select one of the outer phases L1 or L3. Remove the insulation covers from the fuse assembly.

Push the clips towards the front insulation cover (2) from the right and left side until it is unlocked.

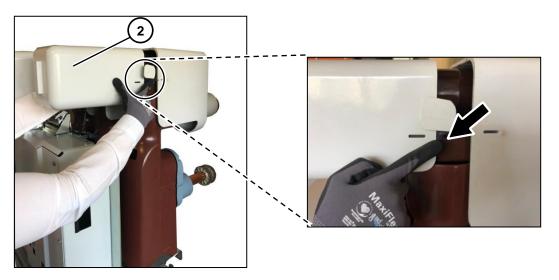


Fig. 148: Pushing the clips towards the front insulation cover from the both side

Then take the front insulation cover out of the fuse assembly and keep it for later use.

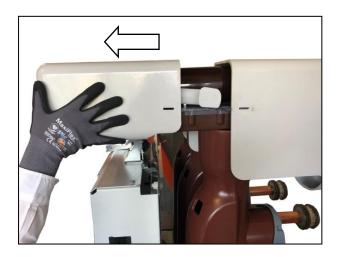


Fig. 149: Removing the front insulation cover

Push the clips towards the rear insulation cover (1) from the right and left side until it is unlocked.

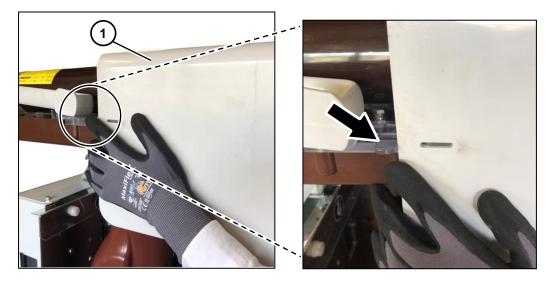


Fig. 150: Pushing the clips towards the rear insulation cover from the both side

Then take the rear insulation cover out of the fuse assembly and keep it for later use.

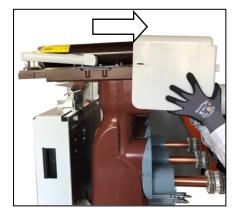


Fig. 151: Removing the rear insulation cover

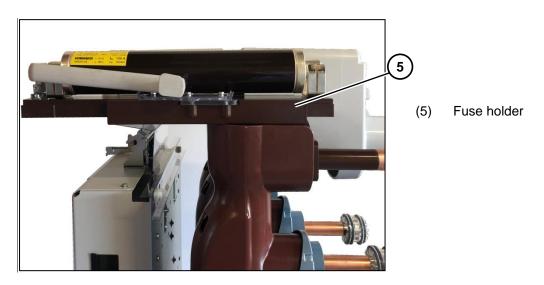


Fig. 152: HV HRC fuse-link on the fuse holder

Pull the HV HRC fuse-link at the end upwards out of the clip of the fuse holder.

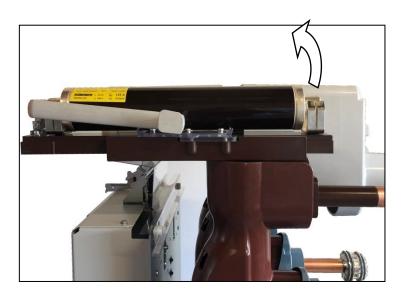


Fig. 153: Pulling the HV HRC fuse-link at the end

Take the HV HRC fuse-link out of the fuse holder and check empty fuse holder for damages.

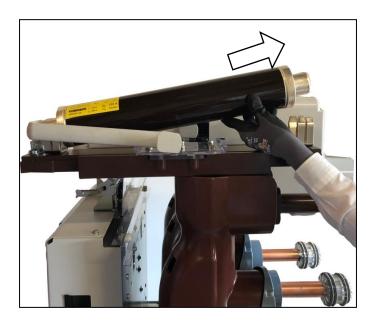


Fig. 154: Taking out the HV HRC fuse-link

Proceed in the same way with the HV HRC fuse-links of the other phases.

Inserting HV HRC fuse-links

⚠ CAUTION

Maloperation

If the insulation covers are not inserted correctly, the circuit-breaker panel with HV HRC fuse can be damaged.

Make sure the insulation covers are inserted on the withdrawable part before moving the withdrawable circuit-breaker / fuse combination into the panel.

Insert the new HV HRC fuse-link. Its striker must always point to the operating side of the withdrawable circuit breaker / fuse combination. The position of the striker is identified with a triangle representing an arrow on the rating plate of the HV HRC fuse-link.

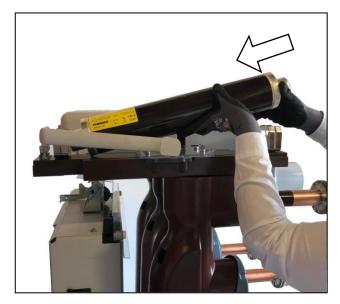


Fig. 155: Inserting the HV HRC fuse-link



Fig. 156: Triangle representing an arrow

Push the HV HRC fuse-link on the fuse holder.

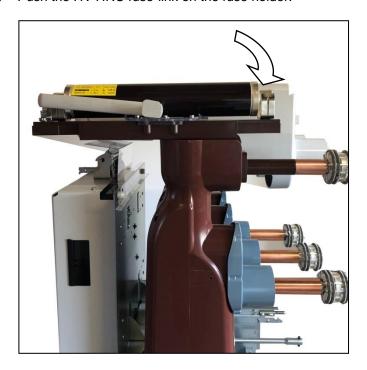


Fig. 157: Fitting the HV HRC fuse-link

- Pull the ends slightly to check if the HV HRC fuse-link is inserted firmly.
- Insert the rear insulation cover into the housing and push it until the click noise is heard.

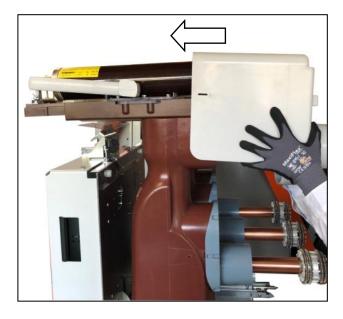


Fig. 158: Pushing rear insulation cover into the housing

Insert the front insulation cover into the housing and push it until the click noise is heard.

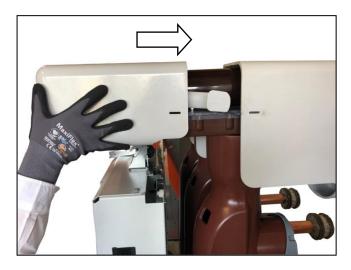


Fig. 159: Pushing front insulation cover into the housing

Proceed in the same way with the HV HRC fuse-links of the other phases.

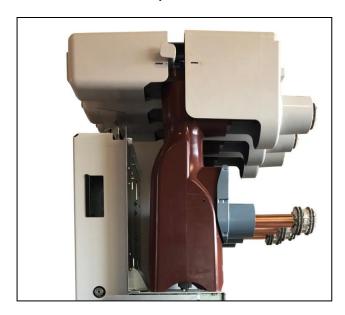


Fig. 160: The HV HRC fuse-links replaced

The HV HRC fuse-links have been replaced.



Final procedure

 \Rightarrow

Insert the withdrawable part in the panel and de-earth the feeder. After closing the high-voltage door, the panel can be integrated into the course of operation again.

Operating the double-busbar system

14 Operating the circuit-breaker panel for double-busbar system

S HINT

Read and understand these instructions before attempting operating works.

14.1 Control elements at the front side of the panel

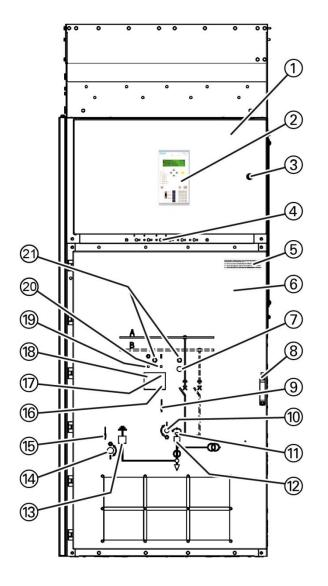


Fig. 161: Control elements on the panel front of the circuit-breaker panel for double-busbar system, panel A

- (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

(9)

- (7) Opening for charging the spring in the circuitbreaker manually (covered)
- (8) Handle for opening the high-voltage door
 - Control gate for opening and closing the actuating opening for racking the switching device
- (10) Actuating opening for racking the switching device
- (11) Actuating opening for inserting the double-bit key to control racking of the withdrawable part
- (12) Mechanical position indicator for withdrawable part
- (13) Mechanical position indicator for feeder earthing switch
- (14) Actuating opening for feeder earthing switch
- Operating slide for opening and closing the actuating opening for operating the feeder earthing switch
- (16) Operations counter for circuit-breaker
- (17) Spring state indicator for circuit-breaker
- (18) CLOSED/OPEN indicator of the circuit-breaker
- (19) Actuating opening for opening the circuitbreaker
- (20) Actuating opening for closing the circuitbreaker
- (21) Rotary button to close and open the actuating opening located below

Operating the double-busbar system

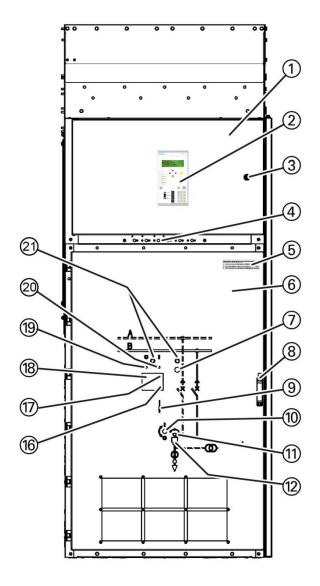


Fig. 162: Control elements on the panel front of the circuit-breaker panel for double-busbar system, panel B

- (1) Door to the low-voltage compartment
- (2) Protection device
- (3) Locking device for the door to the low-voltage compartment
- Test sockets for voltage detecting system (4) (type LRM) for the busbars as additional component
- (5) Instruction label for closing the high-voltage door
- (6) High-voltage door
- (7) Opening for charging the spring in the circuitbreaker manually (covered)
- (8) Handle for opening the high-voltage door
- Control gate for opening and closing the (9) actuating opening for racking the switching device
- (10) Actuating opening for racking the switching device
- (11) Actuating opening for inserting the double-bit key to control racking of the withdrawable part
- (12) Mechanical position indicator for withdrawable part
- (16) Operations counter for circuit-breaker
- (17) Spring state indicator for circuit-breaker
- (18) CLOSED/OPEN indicator of the circuit-breaker
- (19) Actuating opening for opening the circuitbreaker
- (20) Actuating opening for closing the circuitbreaker
- (21) Rotary button to close and open the actuating opening located below

14.2 Position indicators visible on high-voltage door, panel A

Circuit-breaker:	CLOSED	OPEN	
CLOSED position or OPEN position	I	0	_
Withdrawable circuit-breaker:	Service position	Intermediate position	Test position
Service position, intermediate position or test position			
Spring state indicator:	CHARGED	NOT CHARGED	
CHARGED position or NOT CHARGED position	<u> </u>	™	_
Feeder earthing switch:	CLOSED	OPEN	
CLOSED position or OPEN position			_

14.3 Position indicators visible on high-voltage door, panel B

Circuit-breaker:	CLOSED	OPEN	
CLOSED position or OPEN position	I	0	ı
Withdrawable circuit-breaker:	Service position	Intermediate position	Test position
Service position, intermediate position or test position			
Spring state indicator:	CHARGED	NOT CHARGED	
CHARGED position or NOT CHARGED position	<u>~</u>	™	ı

14.4 Access to compartments

Regarding accessibility to the individual compartments, NXAIR M 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

Operating the double-busbar system

14.5 Opening or closing the high-voltage door

The procedure for opening and/or closing the high-voltage door at the circuit-breaker panel for double-busbar system is identical with the procedure for opening and/or closing the high-voltage door at the circuit-breaker panel version for single-busbar system.

For opening and/or closing the high-voltage door at the circuit-breaker panel for double-busbar system, see chapter 10.4 and/or 10.5.

14.6 Positions of the withdrawable circuit-breaker

The positions of the circuit-breaker in the circuit-breaker panel for double-busbar system are identical with the positions of the circuit-breaker in the circuit-breaker panel version for single-busbar system.

For the circuit-breaker positions in the circuit-breaker panel for double-busbar system, see chapter 10.6.

14.7 Racking the withdrawable circuit-breaker



In the panel version for double-busbar system, the withdrawable parts in the panels A and B are generally interlocked electromagnetically against the position of the feeder earthing switch in panel A.

Observe the release of the actuating opening for racking the withdrawable parts.

The procedure for racking the withdrawable circuit-breaker to service position and/or test position in the circuit-breaker panel for double-busbar system is identical with the procedure for racking the withdrawable circuit-breaker to service position and/or test position in the circuit-breaker panel version for single-busbar system.

For racking the withdrawable circuit-breaker to service position and/or test position in the circuit-breaker panel for double-busbar system, see chapter 10.7 and/or 10.8.

14.8 Closing or opening the circuit-breaker

The procedure for closing and/or opening the circuit-breaker in the circuit-breaker panel for double-busbar system is identical with the procedure for closing and/or opening the circuit-breaker in the circuit-breaker panel version for single-busbar system.

For electrical closing and/or opening of the circuit-breaker in the circuit-breaker panel for double-busbar system, see chapter 10.9 and/or 10.10.

For manual closing and/or opening of the circuit-breaker in the circuit-breaker panel for double-busbar system, see chapter 10.11 and/or 10.12.

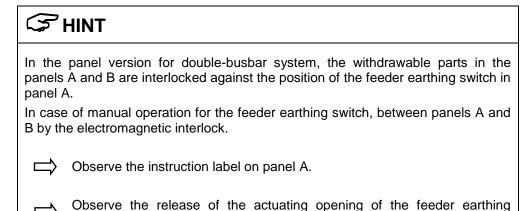
14.9 Discharging or charging the closing spring

The procedure for discharging and/or charging the closing spring in the circuit-breaker panel for double-busbar system is identical with the procedure for discharging and/or charging the closing spring in the circuit-breaker panel version for single-busbar system.

For discharging and/or charging the closing spring in the circuit-breaker panel for double-busbar system, see chapter 10.13 and/or 10.14.

14.10 Earthing or de-earthing the feeder

The procedure for earthing and/or de-earthing the feeder in the circuit-breaker panel for double-busbar system is identical with the procedure for earthing and/or de-earthing the feeder in the circuit-breaker pane version for single-busbar system.



Instruction label on high-voltage door:

In addition to these instructions, an instruction label provided on the high-voltage door of panel A informs about the interlocking of the feeder earthing switch.



Fig. 163: High-voltage door of panel A:
Instruction label about the interlocking of the feeder earthing switch

Preconditions

• Withdrawable part in panel A and B in test position

switch.

For manual earthing and/or de-earthing the feeder in the circuit-breaker panel for double-busbar system, see chapter 10.15 and/or 10.16.

14.11 Removing or plugging on the low-voltage connector

The procedure for removing and/or plugging on the low-voltage connector in the circuit-breaker panel for double-busbar system is identical with the procedure for removing and/or plugging on the low-voltage connector in the circuit-breaker panel version for single-busbar system.

For removing and/or plugging on the low-voltage connector in the circuit-breaker panel for double-busbar system, see chapter 10.17 and/or 10.18.

14.12 Taking the withdrawable part out of a panel or inserting in a panel

The procedure for inserting and/or removing the withdrawable part in the circuit-breaker panel for double-busbar system is identical with the procedure for inserting and/or removing the withdrawable part in the circuit-breaker panel version for single-busbar system.

For inserting and/or removing the withdrawable part in the circuit-breaker panel for double-busbar system, see chapter 10.19 and/or 10.20.

Operating the removable voltage transformers

15 Operating the removable voltage transformers



Read and understand these instructions before attempting operating works.

15.1 Control elements on the high-voltage door

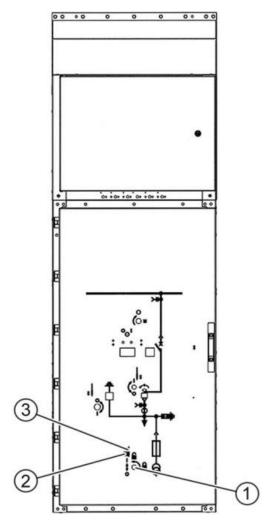


Fig. 164: Additional control elements at the panel front of the circuit-breaker panel with removable voltage transformers

- (1) Actuating opening for racking the removable voltage transformers
- Padlock for securing the operating lever
 Operating slide for opening and closing
- (3) the actuating opening for racking the removable voltage transformers

15.2 Opening or closing the high-voltage door

The procedure for opening and/or closing the high-voltage door at the panel with removable voltage transformers 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 panel with removable voltage transformers, see chapter 10.4 and/or 10.5.

15.3 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.

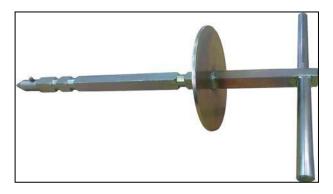


Fig. 165: Racking tool for the removable voltage transformers

Preconditions

- Removable voltage transformers inserted in the panel
- Low-voltage connector plugged on
- High-voltage door closed
- Racking tool available
- Key for padlock available

The actuating opening for racking the removable voltage transformers is located on the control board of the high-voltage door.

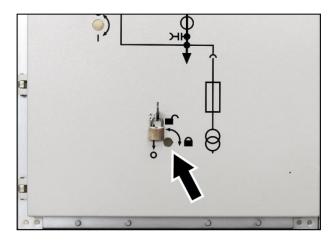
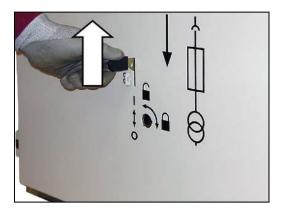


Fig. 166: Actuating opening for racking the removable voltage transformers

Operating the removable voltage transformers

Procedure

- Remove the padlock from the control gate.
- Lift and hold the operating slide.



167: Lifting the operating slide

Insert the racking tool into the actuating opening with the guide pin pointing to the right.

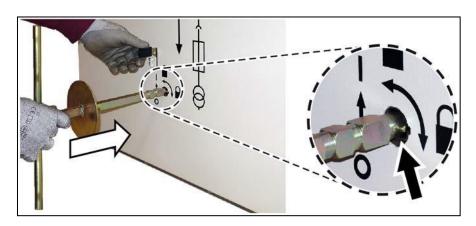


Fig. 168: Inserting the racking tool

- 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.

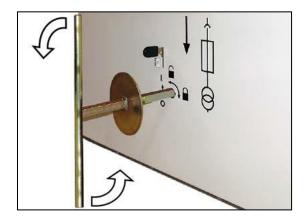


Fig. 169: Turning the racking tool 90° counter-clockwise for unlocking

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).

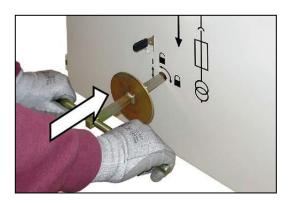


Fig. 170: Pushing the racking tool to rack

Turn the racking tool 90° clockwise to lock the racking mechanism.

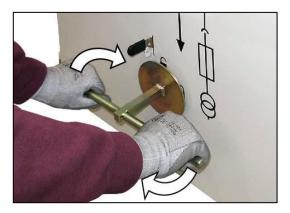


Fig. 171: Turning 90° clockwise to lock

Operating the removable voltage transformers

Remove the racking tool.

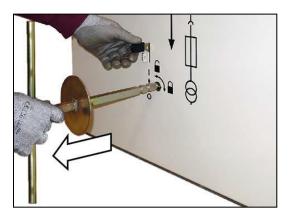


Fig. 172: Removing the racking tool

- 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.

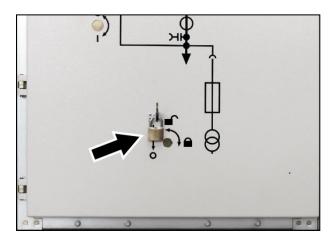


Fig. 173: Fitting a padlock

✓ The removable voltage transformers are in service position.

15.4 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.

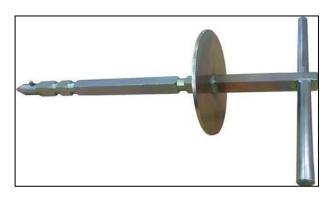


Fig. 174: Racking tool for the removable voltage transformers

Preconditions

- High-voltage door closed
- Removable voltage transformers in service position
- Racking tool available
- Key for padlock available

The actuating opening for racking the removable voltage transformers is located on the control board of the high-voltage door.

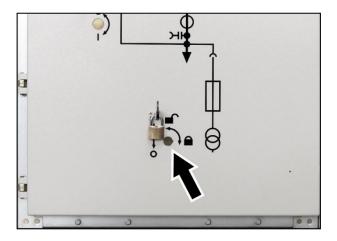


Fig. 175: Actuating opening for racking the removable voltage transformers

Operating the removable voltage transformers

Procedure

- Remove the padlock from the operating slide.
- Lift the operating slide and hold it.

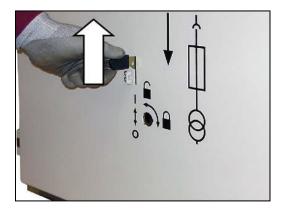


Fig. 176: Lifting the operating slide

Insert the racking tool into the actuating opening with the guide pin pointing to the right.

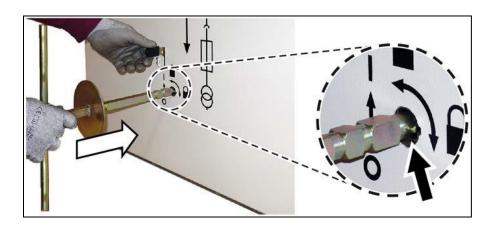


Fig. 177: Inserting the racking tool

- 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.

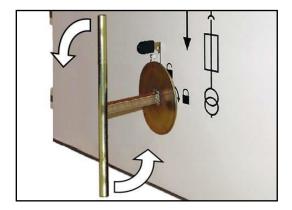


Fig. 178: Turning the racking tool 90° counter-clockwise to unlock

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, pull the racking tool as far as it will go (end position).

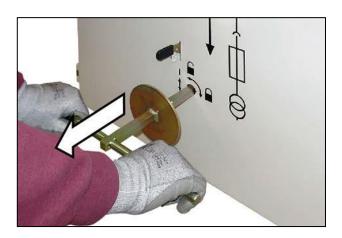


Fig. 179: Pulling the racking tool to rack

Turn the racking tool 90° clockwise to lock the racking mechanism.

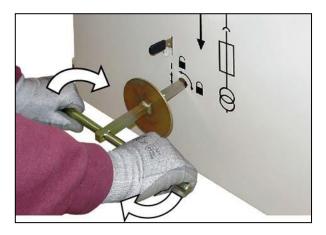


Fig. 180: Turning 90° clockwise to lock

Operating the removable voltage transformers

Remove the racking tool.

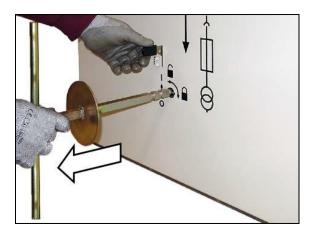


Fig. 181: Removing the racking tool

- 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.

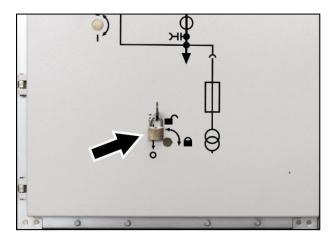


Fig. 182: Fitting a padlock

✓ The removable voltage transformers are in test position.

15.5 Taking the removable voltage transformers out of the panel

⚠ 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 and/or removable voltage transformers.

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.

Preconditions

- Withdrawable circuit-breaker in test position
- Removable voltage transformers in test position
- High-voltage door open
- Low-voltage connector plugged on
- 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.

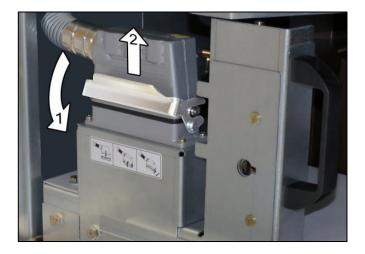


Fig. 183: Detaching and removing the low-voltage connector

Stow the low-voltage connector away in the shelf on the left inside the panel.

Operating the removable voltage transformers

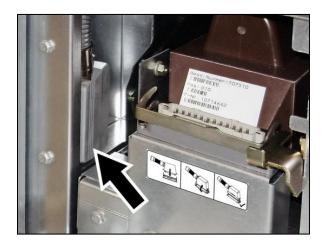


Fig. 184: Stowing the low-voltage connector

✓ 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.

 \Rightarrow

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.

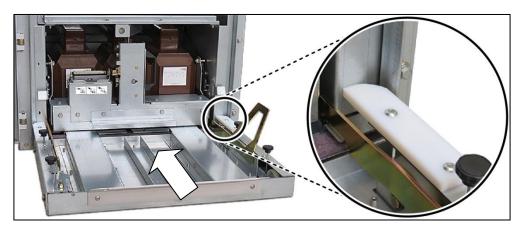


Fig. 185: Moving the service truck centrally in front of the panel

If necessary, adjust the height of the service truck with the 4 bolts to compensate unevenness in the floor.



Fig. 186: 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.

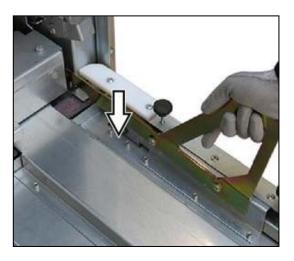


Fig. 187: Hooking the locking levers

To check whether the service truck is correctly interlocked with the panel, pull the service truck backwards using the handle.

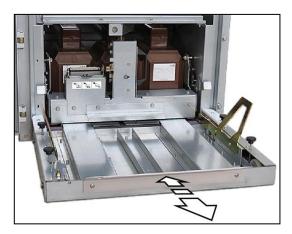


Fig. 188: Pulling the service truck back to check interlocking

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 their 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 they will go. In the end position, the removable voltage transformers are automatically interlocked with the service truck.





Fig. 189: Pulling the voltage transformers onto Fig. 190: Automatic interlocking the service truck

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.

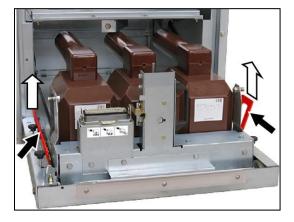


Fig. 191: Detaching the locking levers

To move the service truck with the removable voltage transformers on top away from the panel, pull the truck using the handle of the removable voltage transformers.

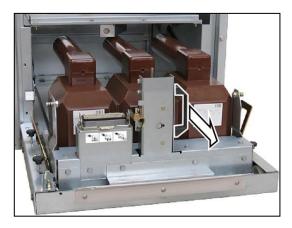


Fig. 192: Moving the service truck using the handle

- Close the high-voltage door.
- Fit a padlock to the operating slide and close it.
- ✓ The removable voltage transformers are taken out of the panel.

15.6 Inserting the removable voltage transformers in a panel

⚠ 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 and/or removable voltage transformers.

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.

Preconditions

- High-voltage door open
- Withdrawable part in the panel or removed from the panel
- Low-voltage connector stowed away in the shelf on the left inside the panel
- Removable voltage transformers ready on service truck

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.

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

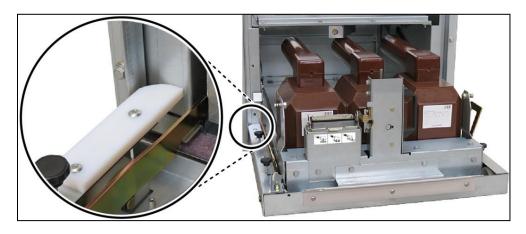


Fig. 193: Moving the service truck centrally in front of the panel

If necessary, adjust the height of the service truck with the 4 bolts to compensate unevenness in the floor.

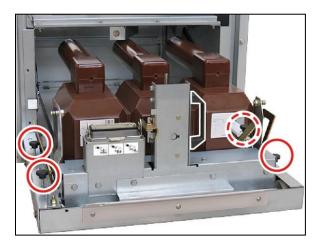


Fig. 194: Adjusting the height with the bolts

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.

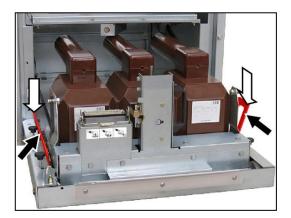


Fig. 195: Hooking the locking levers

To check whether the service truck is correctly interlocked with the panel, pull the service truck backwards using the handle.

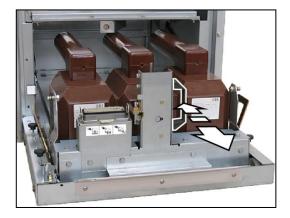


Fig. 196: Pulling the service truck back to check interlocking

✓ The service truck is interlocked with the panel.

Inserting the removable voltage transformers in the panel

To undo the interlocking between the removable voltage transformers and the service truck, push the lever to the left and hold it.

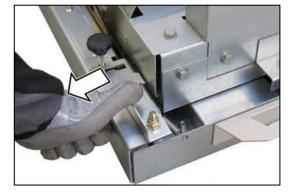


Fig. 197: Pushing the lever to unlock

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.

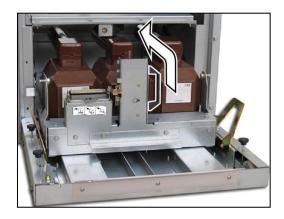


Fig. 198: Inserting the removable voltage transformers in the panel

Push the handle down to interlock the removable voltage transformers with the panel.

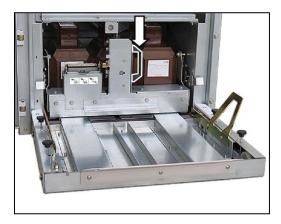


Fig. 199: Pushing the handle down

✓ 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.

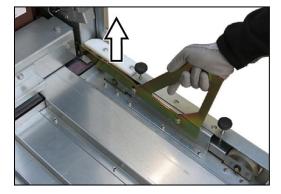


Fig. 200: Detaching the locking levers

Pull the service truck away from the panel.

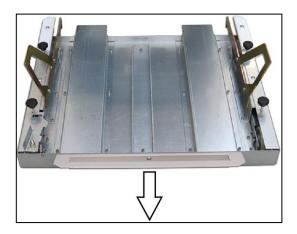


Fig. 201: Pulling the service truck away

✓ The service truck is removed from the panel.

Plugging on the low-voltage connector



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

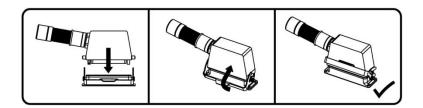


Fig. 202: Instruction label on removable voltage transformers

Take the low-voltage connector out of the shelf on the left inside the panel.

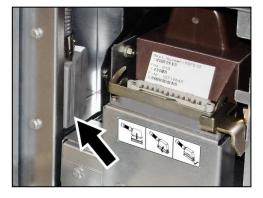


Fig. 203: Low-voltage connector stowed away

Operating the removable voltage transformers

- 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.

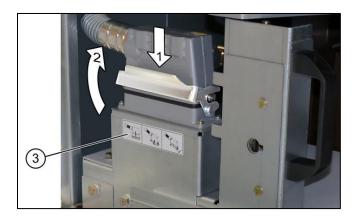


Fig. 204: Plugging on and securing the low-voltage connector

- Close the high-voltage door.
- Fit a padlock to the operating slide and close it.
- The removable voltage transformers are inserted in the panel.

15.7 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.

S HINT

Tripped protection fuse-links 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, [kV]	Rated current I _r [A]	Reference dimension "e" [mm]	Order details:		
24	6.3	292	3018013.6,3		
Manufacturer information: www.siba-fuses.com					

Removable voltage transformer rating plate

Further technical data is shown on the rating plate of each removable voltage transformer.

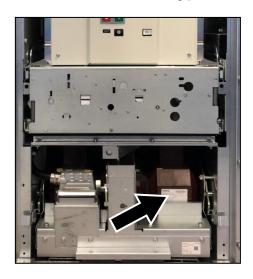


Fig. 205: Rating plate on removable voltage transformer

Preconditions

- Removable voltage transformers taken out of the panel
- Set of proper protection fuse-links available

Procedure



Move the service truck with the removable voltage transformers away from the panel. The protection fuse-links are accessible.

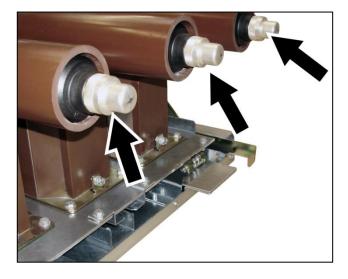


Fig. 206: Protection fuse-links are accessible

Operating the removable voltage transformers

 \Rightarrow

Loosen the protection fuse-link by turning, and pull it out of the voltage transformer housing with mounted contact cap.

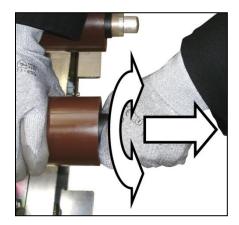




Fig. 207: Pulling out the protection fuse-link

Detach the contact cap from the protection fuse-link.

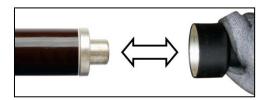


Fig. 208: Detaching the contact cap

- Mount the contact cap on the new protection fuse-link.
- Push the new protection fuse-link into the housing.
- Perform replacement with all other fuse-links.
- ✓ The protection fuse-links have been replaced.



Final procedure

 \Rightarrow

Next, insert the removable voltage transformers in the panel. After closing the high-voltage door, the panel can be integrated into the course of operation again.

Verifying safe isolation from supply

16 Verifying safe isolation from supply



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 three-phase capacitive voltage detecting system according to IEC 61243-5.

16.1 Application of voltage indicators

Electric shock Always verify safe isolation from supply without any doubt If safe isolation from supply is verified erroneously although operational high 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

16.2 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

function test unit and the voltage indicator.

 LRM device system as an indicator with the associated measuring system installed below the door to the low-voltage compartment



Fig. 209: Test sockets for feeder

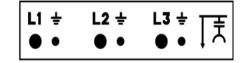


Fig. 210: Test sockets for busbar

Verifying safe isolation from supply

16.3 LRM system overview

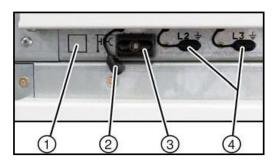


Fig. 211: LRM system at the panel

- Documentation to (1) repeat test of interface
- repeat test of interface condition
- (2) Cover of test socket for L1, removed
- (3) LRM-ST, plugged in for L1
- (4) Covers of tests sockets for L2 and L3, fitted

Indication on LRM-ST

LRM-ST indic	cation	Meaning
*	Indication flashes	Phase not isolated from supply
->	Indication lights up	Phase not isolated from supply
0	Indication does not light up or 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. 212: LRM-ST voltage indicator

16.4 Verifying LRM-ST voltage indicator

To verify proper functioning of the LRM-ST voltage indicator, use the battery-operated function test unit (optional).



Fig. 213: 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 into 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 the cover from the test sockets; the cover remains permanently at the panel.
- Plug the contact pins of the LRM-ST voltage indicator into 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.

16.5 Verifying safe isolation from supply with the LRM device system

A DANGER

Electric shock

Always verify safe isolation from supply without any doubt

If safe isolation from supply is verified erroneously although operational high 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 low-voltage compartment closed
- Tested LRM-ST voltage indicator available

Procedure

- Remove the cover from the test socket; the cover remains permanently at the panel.
- Plug the LRM-ST voltage indicator into the test socket.

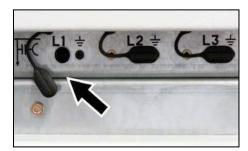


Fig. 214: Cover removed from test socket L1

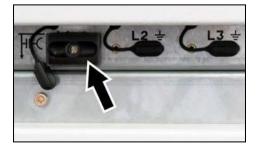


Fig. 215: LRM-ST voltage indicator on L1

Read the voltage indication at the LRM-ST.

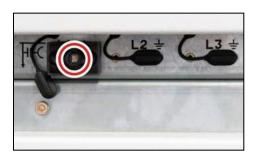


Fig. 216: LRM-ST indication

LRM-ST indication	on	Meaning
*	Indication flashes	Phase not isolated from supply
->-	Indication lights up	Phase not isolated from supply
0	Indication does not light up or flash	Phase isolated from supply

	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.

16.6 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. 217: VOIS+, cover closed

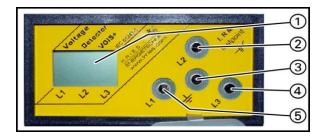


Fig. 218: VOIS+, cover open

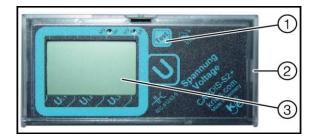


Fig. 219: CAPDIS-S2+, cover closed



Fig. 220: CAPDIS-S2+, cover open

- (1) LC display
- (2) Test socket L2
- (3) Earth socket
- (4) Test socket L3
- (5) Test socket L1
- (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+

VOIS+, VOIS-R+ Indication:			CAPDIS-S1+		CAPDIS-S2+		S2+			
	L1	L2	L3	L1	L2	L3	L1	L2	L3	
Α0										Operational high voltage not present
A1	4	q	f	4	f	f	4	f	f	Operational high voltage present
A2										 Operational high voltage not present Auxiliary voltage not available (only CAPDIS-S2+)
А3		q	f		4	f		f	f	Failure in phase L1, operational high voltage at L2 and L3
A4		_		F	F	F	F	F	Í	Voltage (not operational high voltage voltage) present
A5		_		13		B	14		B	Indication: "Test" passed (lights up shortly)
A6		_		19	I ITI ITI ERROP		17	I I I I I I I I I ERROP		Indication: "Test" not passed (lights up shortly)
A7		_		19		F	14			Overvoltage present (lights up permanently)
A8		_			_		14	ERROF		Indication: "ERROR" e.g. in case of missing auxiliary voltage

Fig. 221: 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

16.7 Verifying safe isolation from supply with the CAPDIS or VOIS device system

Observe the Five Safety Rules.

Electric shock Always verify safe isolation from supply without any doubt If safe isolation from supply is verified erroneously although operational high 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.

Preconditions

- High-voltage door closed
- Door to low-voltage compartment closed
- Indication "Operational 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.

16.8 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

Earthing and de-earthing the busbar system

17 Earthing and de-earthing the busbar system



Read and understand these instructions before attempting operating works.

17.1 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. 222: 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 door to low-voltage compartment:

In addition to these instructions, an instruction label on the door to the low-voltage compartment informs about proper handling of the operating lever for the busbar earthing switch.

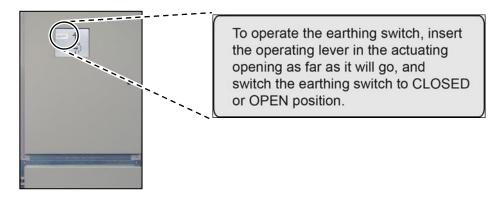


Fig. 223: Instruction label on door to low-voltage compartment

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 is inserted in the panel:
 - Withdrawable part in test position
 - Low-voltage connector plugged on

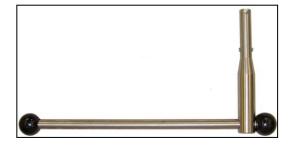


Fig. 224: Operating lever for operating the busbar earthing switch

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. 225: Operating slide on busbar earthing switch padlocked

Lift the operating slide and hold it.

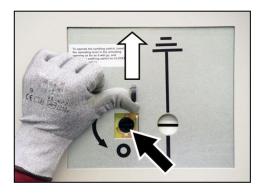


Fig. 226: Lifting the operating slide; actuating opening free

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.

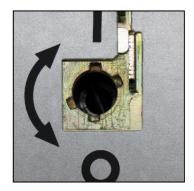


Fig. 227: Actuating opening for busbar earthing switch

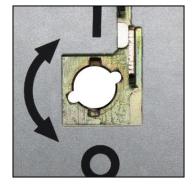


Fig. 228: Inserting the operating lever for closing

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.

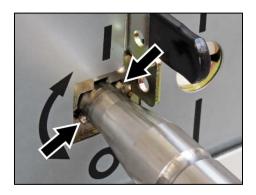


Fig. 229: Inserting the operating lever for closing

- 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 (approx. 115°) until the busbar earthing switch changes to CLOSED position.



Fig. 230: Closing the busbar earthing switch



Fig. 231: 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.

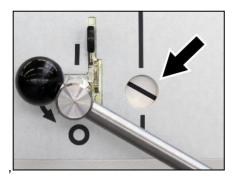


Fig. 232: Position indicator in intermediate position

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.

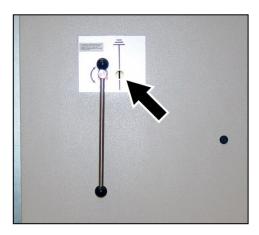


Fig. 233: Operating lever in end position

- 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. 234: Operating slide on busbar earthing switch padlocked

✓ The busbar system is earthed.

Earthing and de-earthing the busbar system

17.2 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. 235: 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 door to low-voltage compartment:

In addition to these instructions, an instruction label on the door to the low-voltage compartment informs about proper handling of the operating lever for the busbar earthing switch.

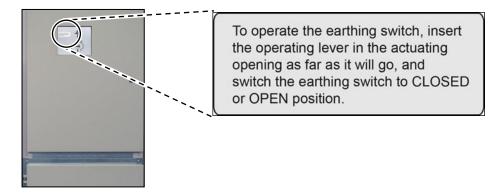


Fig. 236: Instruction label on door to low-voltage compartment

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

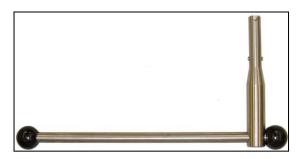


Fig. 237: Operating lever for operating the busbar earthing switch

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 deearthing of exactly this panel is available.
- Position the electrician's ladder correctly in front of the panel.

Open the padlock.



Fig. 238: Operating slide on busbar earthing switch padlocked

Lift the operating slide and hold it.

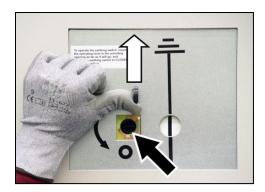


Fig. 239: Lifting the operating slide; actuating opening open

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.

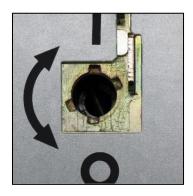


Fig. 240: Actuating opening for busbar earthing switch

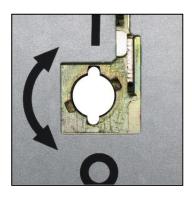


Fig. 241: Inserting the operating lever for opening

 \Rightarrow

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.

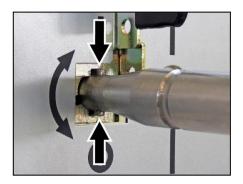


Fig. 242: Inserting the operating lever for opening

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 (approx. 115°) until the busbar earthing switch changes to OPEN position.



Fig. 243: Opening the busbar earthing switch



Fig. 244: Opening the busbar earthing switch using an electrician's ladder

 \Rightarrow

While turning the operating lever, the position indicator of the busbar earthing switch changes from the CLOSED position to the intermediate position.

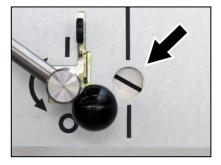


Fig. 245: Position indicator in intermediate position

Earthing and de-earthing the busbar system

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. 246: 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. 247: Operating slide on busbar earthing switch padlocked

The busbar system is de-earthed.

Operating the shutters

18 Operating the shutters



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 opened, the mechanism of the other one must be padlocked. If both shutters have to be opened at the same time, locking the other shutter mechanism is omitted.

18.1 Operating the shutter to the busbar compartment in the switching-device compartment

<u></u>	ANGER					
Electri	Electric shock					
	If the busbars in the busbar compartment have not been isolated, the contacts will be live at operational high voltage.					
\Rightarrow	Observe the Five Safety Rules.					
Before	opening the shutter to the busbar compartment:					
\Rightarrow	Verify safe isolation from supply.					
\Rightarrow	Put on personal protective equipment.					
\Rightarrow	Isolate and earth the busbars in the busbar compartment.					
\Rightarrow	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 t	he shutter to the busbar compartment safely :					
\Rightarrow	Only use the slip-on lever. Never try to open the shutter mechanism touching it directly.					
\Rightarrow	Always operate the slip-on lever outside the panel using the handle.					
Alway	s close the shutter to the busbar compartment:					
\Rightarrow	Before interrupting operations inside the switching-device compartment.					
\Rightarrow	Immediately after completing operations inside the switching-device compartment.					
	·					

⚠ 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.

Operating the shutters

Opening the shutter to the busbar compartment (upper shutter)

Preconditions

- Withdrawable part in test position
- Padlock (optional) removed from door handle
- High-voltage door open
- Low-voltage connector stowed away
- Withdrawable part taken out of the panel

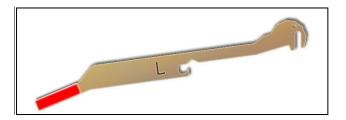


Fig. 248: Slip-on lever for opening the shutter (marked with L)

Padlock the shutter mechanism on the right side in the switching-device compartment.





Fig. 249: 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.

 \Rightarrow

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. 250: Pushing on the slip-on lever



Fig. 251: Pushing the handle downwards to end position

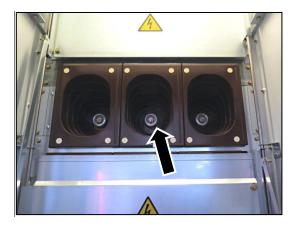


Fig. 252: Shutter to busbar compartment open

 \checkmark

The shutter to the busbar compartment is open.



Final procedure



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. 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.

18.2 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.				
\Rightarrow	Observe the Five Safety Rules.			
Before opening the shutter to the connection compartment:				
\Rightarrow	Verify safe isolation from supply.			
\Rightarrow	Put on personal protective equipment.			
\Rightarrow	Isolate and earth the cable / bar connections in the connection compartment.			
\Rightarrow	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 :				
$\Rightarrow \Rightarrow$	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:				
\Rightarrow	Before interrupting operations inside the switching-device compartment.			
\Rightarrow	Immediately after completing operations inside the switching-device compartment.			

⚠ 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.

Opening the shutter to the connection compartment (lower shutter)

Preconditions

- Withdrawable part in test position
- Padlock (optional) removed from door handle
- High-voltage door open
- Low-voltage connector removed and stowed away
- Withdrawable part taken out of the panel

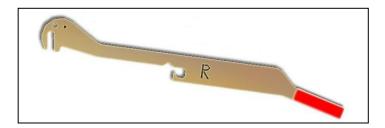


Fig. 253: Slip-on lever for opening the shutter (marked with R)

Padlock the shutter mechanism on the left side in the switching-device compartment.



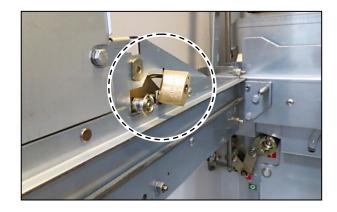


Fig. 254: Padlocking the shutter mechanism on the left side in the switching-device compartment

Push the slip-on lever (marked with R) on the shutter mechanism on the right side in the switching-device compartment.

Operating the shutters

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.

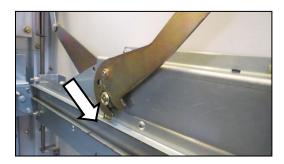


Fig. 255: Pushing on the slip-on lever

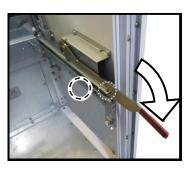


Fig. 256: Pushing the handle downwards to end position

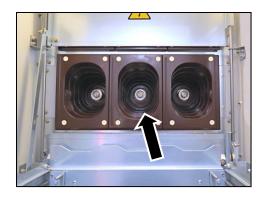


Fig. 257: Shutter to the connection compartment open

✓ The shutter to the connection compartment is closed.



Final procedure

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.
\Rightarrow		e handle of the slip-on lever slightly to the left (to release the latch) and let it slip s. The shutter closes.
\Rightarrow	Remove	e the slip-on lever.
\Rightarrow	Remove	e the padlock from the left side in the switching-device compartment.
√	The shu	itter to the connection compartment is closed.

19 Accessing the connection compartment through the front



Read and understand these instructions before attempting operating works.

19.1 Preparations before accessing the connection compartment

A 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 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.

THINT

Hereafter, the disassembly of those parts is described, which are later assembled again at the same place.

Store disassembled parts and bolting material carefully, and keep them available for later reuse.

Preconditions

- Withdrawable part inserted in the switching-device compartment:
 - High-voltage door closed
 - Withdrawable part in test position
 - Feeder earthing switch in CLOSED position

Procedure

Check if the position indicator of the feeder earthing switch on the high-voltage door is in vertical I position.

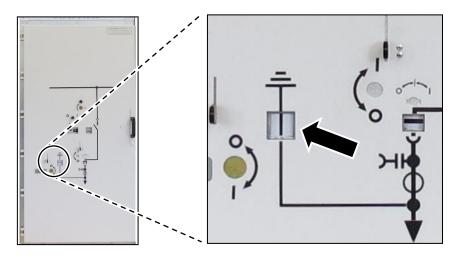


Fig. 258: Position indicator of feeder earthing switch on high-voltage door

- Open the high-voltage door.
- Take the withdrawable part out of the panel.



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.

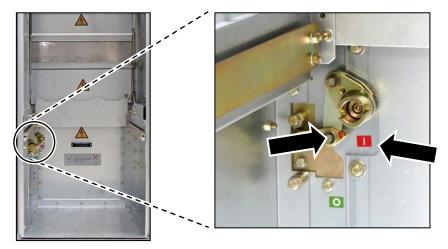


Fig. 259: Additional position indicator of feeder earthing switch in the switching-device compartment

19.2 Accessing the connection compartment through the switching-device compartment

MARNING

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 19.1 completed

Procedure

Panel versions with withdrawable circuit-breaker, withdrawable circuit-breaker / fuse combination or withdrawable disconnector link only:

Remove the connecting elements (2) from the protection plate of the switching-device compartment (1), and store them:

- 4 nuts M8 with contact washers
- Remove the protection plate of the switching-device compartment (1) from the switching-device compartment, and store it.

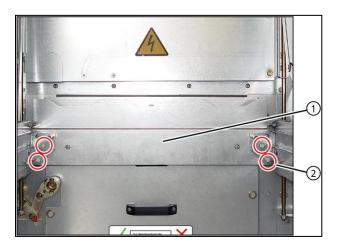


Fig. 260: 4 bolted joints on protection plate of switching-device compartment

All panel versions:

- Remove the connecting elements from the partition (3) to the connection compartment inside the switching-device compartment, and store them:
 - 15 bolts M8x20 with contact washers and plain washers
- Remove the partition (3), and store it.

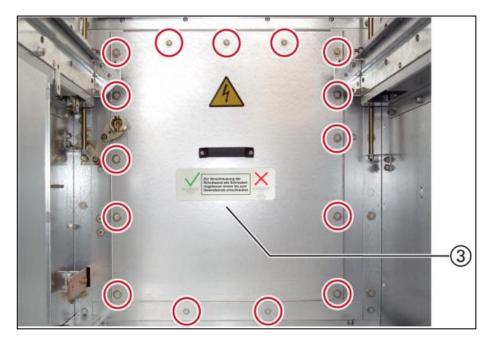


Fig. 261: 15 bolted joints on partition in circuit-breaker panel, panel spacing 800 mm

✓ Access to the connection compartment through the panel front is given.



Final procedure steps

Immediately proceed to perform the intended checks and works in the connection compartment.

19.3 Installing the vertical partition in the switching-device compartment

A 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 in the connection compartment will be live at operational high voltage.

- Observe the Five Safety Rules.
- **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.

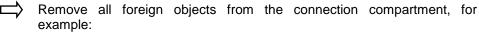
 \Rightarrow

Put on personal protective equipment.

NOTICE

Danger due to damages

Possible malfunctioning and switchgear damage caused by foreign objects:



- 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 in the switching-device compartment informs about safe fastening of the partition:

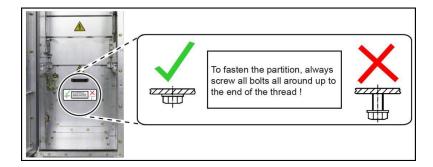


Fig. 262: Instruction label on door to low-voltage compartment

Preconditions

- Feeder earthing switch in CLOSED position
- High-voltage door open
- Low-voltage connector stowed away
- Panel versions with withdrawable circuit-breaker, withdrawable circuit-breaker / fuse combination or withdrawable disconnector link only:
 - Protection plate of switching-device compartment available
 - Connecting elements available:
 4 nuts M8 with contact washers
- All panel versions:
 - Partition available
 - Connecting elements available:
 10 bolts M8x20 with contact washers and plain washers
 5 bolts M8x20 with contact washers

Procedure

\Rightarrow	Install the partition (2) between the connection compartment and the switching-device compartment.
\Rightarrow	 To fix the partition (2), tighten the bolts all around hand-tight: 13 bolts M8x20 with contact washers and plain washers (4) 2 bolts M8x20 with contact washers (3)
\Rightarrow	Tighten the fixing bolts all around with a tightening torque of 25 Nm.

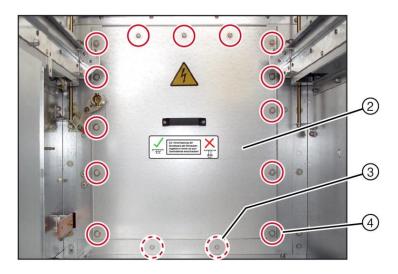


Fig. 263: Panel versions with panel width 800 mm : 15 bolted joints

Panel versions with withdrawable circuit-breaker, withdrawable circuit-breaker / fuse combination or withdrawable disconnector link only:

- Install the protection plate of the switching-device compartment (1).
- To fix the protection plate of the switching-device compartment (1), tighten the nuts (5) hand-tight.
 - 4 nuts M8 with contact washers
- Tighten the fixing bolts (5) with a tightening torque of 25 Nm.

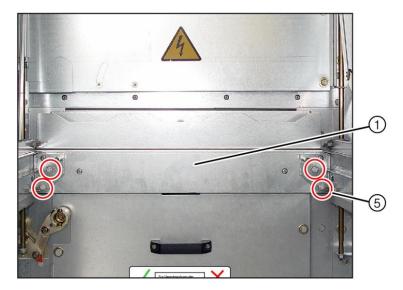


Fig. 264: 4 bolted joints on protection plate of switching-device compartment

The partition between the connection compartment and the switching-device compartment is installed.

S HINT			
Final procedure steps			
Now the panel can be integrated into the course of operation again, for example:			
\Rightarrow	Inserting the withdrawable part in the panel.		
\Rightarrow	Closing the high-voltage door.		
\Rightarrow	De-earthing the feeder.		
\Rightarrow	Racking the withdrawable part to service position.		

19.4 Accessing the connection compartment through the switching-device compartment in panel versions with ventilation system

⚠ 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.

A CAUTION

Sharp edges

The metal parts of the ventilation duct and the vertical partition may have sharp edges.

Put on personal protective equipment.

Put on personal protective equipment.

Preconditions

Preparations as described in chapter 19.1 completed



Fig. 265: Panel prepared

Procedure

Detach the holder of the air guide. To do this, loosen the lower bolt (2), and unscrew and store the upper bolt (1). Proceed in the same way on the other side.

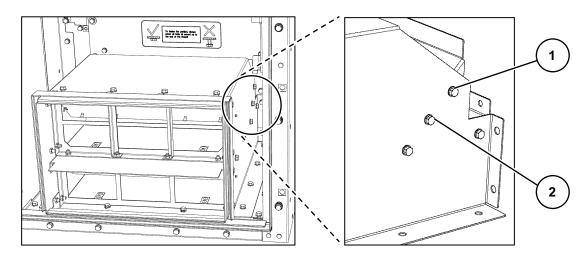


Fig. 266: Bolts for detaching the holder

Fold the air guide upwards.

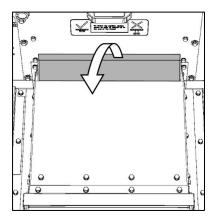


Fig. 267: Folding the air guide upwards

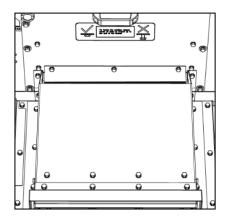


Fig. 268: Air guide folded upwards

Unscrew the upper bolts from the partition, and store them.

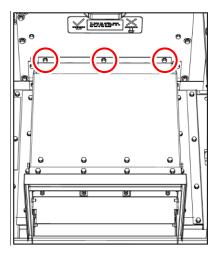


Fig. 269: 3 bolted joints on partition

Unscrew the lateral bolts from the partition and the base frame, and store them. Proceed in the same way on the other side.

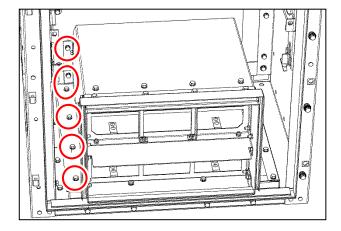


Fig. 270: 6 lateral bolted joints on partition and base frame

- Unscrew the 4 front nuts from the base frame, and store them.
- To get the ventilation duct over the door threshold, lift it approx. 2 cm. Pull the ventilation duct out of the panel, and store it.

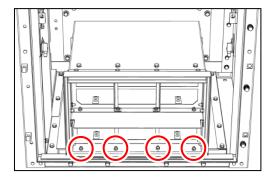


Fig. 271: 4 bolted joints on base frame front

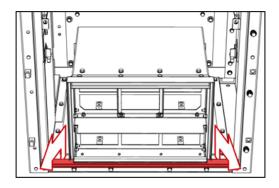


Fig. 272: Lifting and pulling

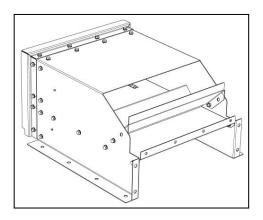


Fig. 273: Ventilation duct removed



Fig. 274: Switching-device compartment without ventilation duct

Please observe during all other removal and installation work that the links on the panel base are not dented.

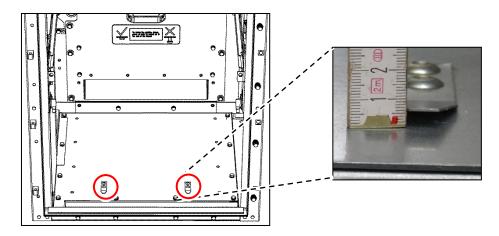


Fig. 275: 2 links on panel base

Fig. 276: Correct position of the links

- Remove the connecting elements (5) from the protection plate of the switching-device compartment (1), and store them:
 - 4 nuts M8 with contact washers
- Remove the protection plate of the switching-device compartment (1) from the switching-device compartment, and store it.

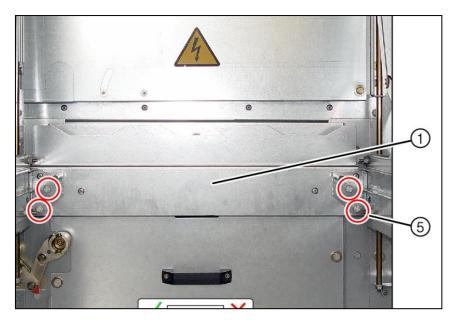


Fig. 277: 4 bolted joints on protection plate of switching-device compartment

- Remove the 16 connecting elements from the partition (2) to the connection compartment inside the switching-device compartment, and store them:
 - 16 bolts M8x20 and plain washers (4)
- Remove the partition (2), and store it.

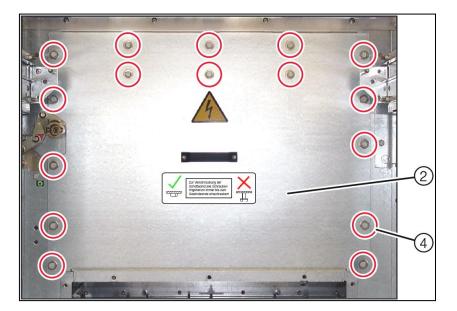


Fig. 278: 16 bolted joints on partition

✓ Access to the connection compartment through the panel front is given.

19.5 Installing the vertical partition and the ventilation duct in the switching-device compartment

A 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 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.

 \Rightarrow

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:

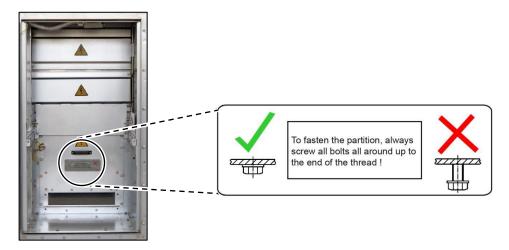


Fig. 279: Instruction label on the vertical partition

Preconditions

- Feeder earthing switch in CLOSED position
- High-voltage door open
- Low-voltage connector stowed away
- Protection plate and associated bolting material available:
 - 4 nuts M8 with contact washers
- Vertical partition and associated bolting material available:
 - 16 bolts M8x20 with contact washers and plain washers
 - Ventilation duct and associated bolting material available

Procedure

- Install the partition (2) between the connection compartment and the switching-device compartment.
- Fix the partition (2) by bolting the bolts in all around hand-tight:

 16 bolts M8x20 with contact washers and plain washers (4)
- Tighten the fixing bolts all around with torque 25 Nm.

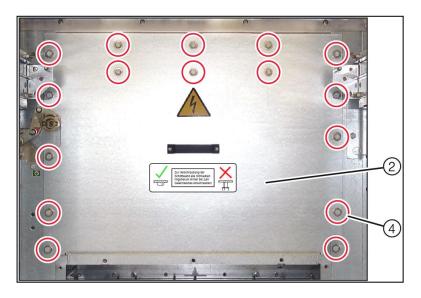


Fig. 280: 15 bolted joints on partition

- Install the protection plate of the switching-device compartment (1).
- Fix the protection plate (1) by bolting the nuts (5) hand-tight:
 - 4 nuts M8 with contact washers
- Tighten the fixing nuts (5) with torque 25 Nm.

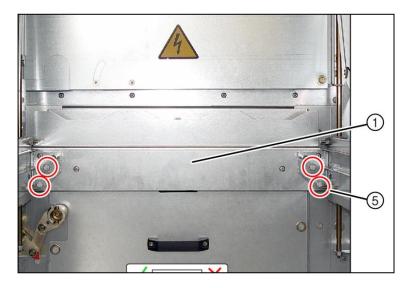


Fig. 281: 4 bolted joints on protection plate of switching-device compartment

If required, bend dented links back into the correct position before installing the ventilation duct.

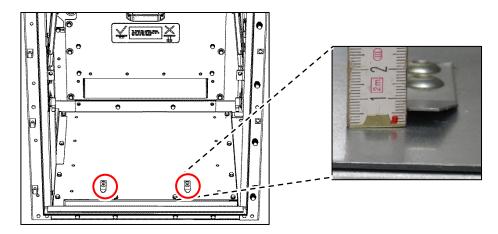


Fig. 282: 2 links on panel base

Fig. 283: Link bent in correct position

Make sure that the air guide (1) of the ventilation duct is folded upwards.

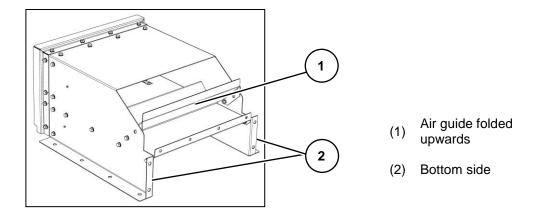


Fig. 284: Ventilation duct with air guide folded upwards

Set the ventilation duct down centrally on the base frame of the panel. The side of the ventilation duct holding the air guide (1) must border on the vertical partition.



Fig. 285: Ventilation duct placed centrally on the panel base frame

Fasten the front 4 nuts M8 hand-tight at the base frame. Tighten the nuts with torque 25 Nm.

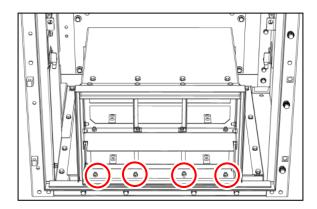


Fig. 286: 4 bolted joints on base frame front

Fasten the lateral bolts size M8x20 with contact washers at the vertical partition and the base frame hand-tight. Tighten the bolts with torque 25 Nm. Proceed in the same way on the other side.

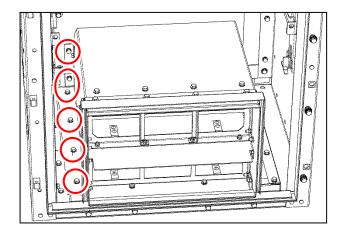


Fig. 287: 6 lateral bolted joints on partition and base frame

Fasten the upper bolts size M8x20 with contact washers at the vertical partition hand-tight. Tighten the bolts with torque 25 Nm.

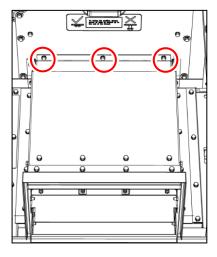


Fig. 288: 3 bolted joints on partition

Fold the air guide downwards.

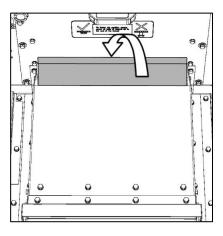


Fig. 289: Folding the air guide downwards

Fix the holder of the air guide by screwing the 2 bolts size M8 with contact washers in hand-tight. Tighten the bolts with torque 25 Nm. Proceed in the same way on the other side.

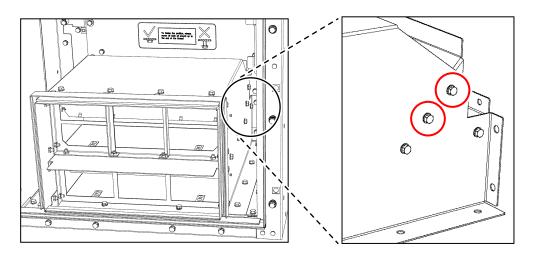
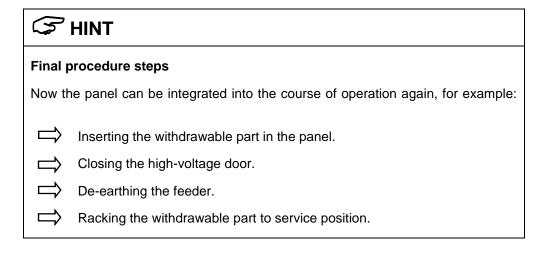


Fig. 290: Bolts for fixing the air guide

✓ The vertical partition and the ventilation duct are installed.



19.6 Accessing the connection compartment through the switching-device compartment in 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.

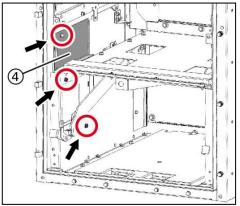
Remove the voltage transformer compartment absolutely with 2 persons.

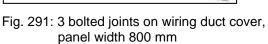
Put on personal protective equipment.

Preconditions

- Preparations as described in chapter 19.1 completed
- Withdrawable circuit-breaker in test position
- High-voltage door open
- Removable voltage transformers removed from panel as described in chapter 15.5

Remove 3 or 5 bolts M8x20 from the wiring duct cover, and store them.





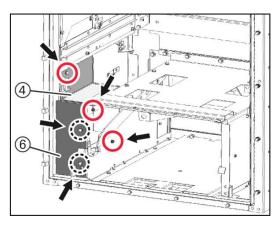


Fig. 292: 5 bolted joints on wiring duct cover, panel width 1000 mm

- Remove the wiring duct cover (4), and store it.
- For panel width 1000 mm: Remove the metal cover (6), and store it.
- Remove 8 bolts M8x20 at the voltage transformer compartment, and store them.

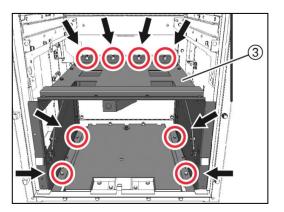


Fig. 293: 8 bolted joints on voltage transformer compartment

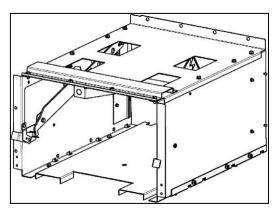


Fig. 294: Voltage transformer compartment, removed

- Take the voltage transformer compartment (3) out of the panel to the front, and store it.
- Remove 4 nuts M8 at the protection plate of the switching-device compartment, and store them.

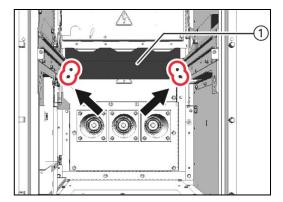


Fig. 295: 4 bolted joints on protection plate of switching-device compartment

- Remove the protection plate of the switching-device compartment (1), and store it.
- Remove 8 bolts M8x20 from the partition to the connection compartment, and store them.

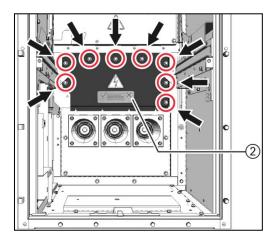


Fig. 296: 8 bolted joints on partition

- Remove the partition (2) from the switching-device compartment, and store it.
- Remove the bolted joint (3) at the 3 connecting cables from the cable connections to the insulating bushings for the removable voltage transformers. Remove the bolting elements, and store them.

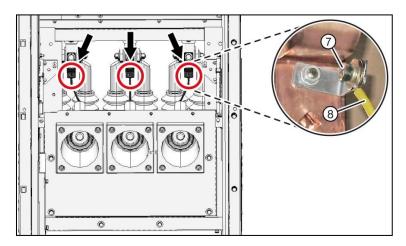


Fig. 297: Bolted joints at the cable connections

- Loosen the 3 connecting cables (8) for the removable voltage transformers from the cable connections.
- 6 bolted joints M8x20 of the bushing plate with bushings, and store them.

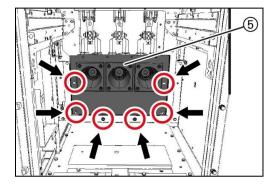


Fig. 298: 6 bolted joints on bushing plate with bushings

Remove the bushing plate with bushings (5) from the switching-device compartment, and store it.

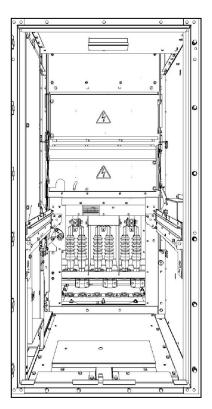


Fig. 299: Switching-device compartment prepared for cable installation from the front

✓ The connection compartment is accessible through the switching-device compartment.

19.7 Installing the bushing plate, the vertical partition and the voltage transformer compartment in the switching-device compartment

A 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 in the connection compartment will be live at operational high voltage.

Observe the Five Safety Rules.

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.

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
- In the switching-device compartment and in the voltage transformer compartment:
 - Low-voltage connector stowed away
- Bushing plate and associated bolting material available:
 - 6 bolts M8x20 with contact washers and plain washers
- Connecting cables and associated bolting material available:
 - 3 nuts M8 with contact washers and plain washers
 - Vertical partition and associated bolting material available:
 - 8 bolts M8x20 with contact washers and plain washers
 - Protection plate and associated bolting material available:
 - 4 nuts M8 with contact washers
- Voltage transformer compartment and associated bolting material available:
 - 8 bolts M8x20 with contact washers
- Lid of metal cover and associated bolting material available:
 - 2 bolts M8x20 with contact washers
- Wiring duct cover and associated bolting material available:
 - 3 bolts M8x20 with contact washers

Procedure

Install the bushing plate with bushings.

Fix the partition (5) by screwing the bolts in all around hand-tight:



6 bolts M8x20 with contact washers and plain washers

Tighten the bolts with torque 25 Nm.

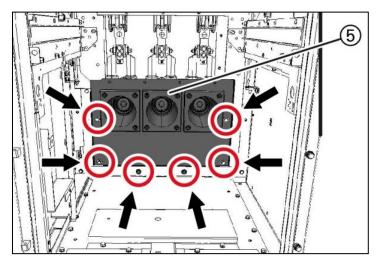


Fig. 300: 6 bolted joints on bushing plate with bushings

Fasten the 3 connecting cables (8) for the removable voltage transformers at the cable connections.

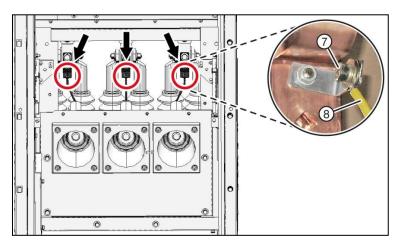


Fig. 301: Bolted joints at the cable connections

Insert the partition (2), and fasten with 8 bolts M8x20 with contact washers and plain washers.

Tighten the bolts with torque 25 Nm.

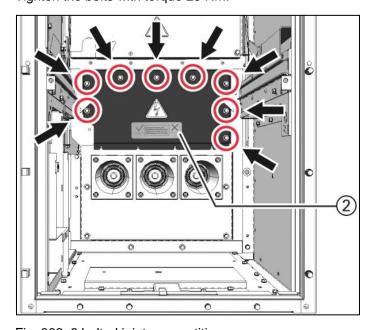


Fig. 302: 8 bolted joints on partition

Insert the protection plate of the switching-device compartment (1), and fasten with 4 nos. nuts M8 with contact washers. Tighten the nuts with torque 25 Nm.

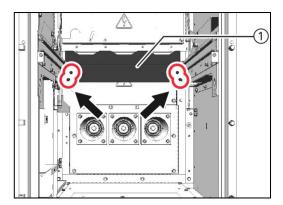


Fig. 303: 4 bolted joints on protection plate of switching-device compartment

Insert the voltage transformer compartment (3) in the panel towards the front, and fasten with 8 bolts M8x20 with contact washers. Tighten the bolts with torque 25 Nm.

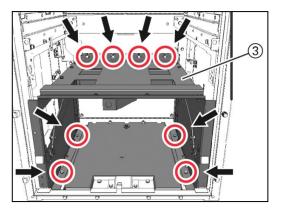


Fig. 304: 8 bolted joints on voltage transformer compartment

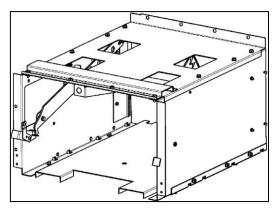


Fig. 305: Voltage transformer compartment, removed

Insert the wiring duct cover (4), and fasten with 3 / 5 bolts M8x20 with contact washers. Tighten the bolts with torque 25 Nm.

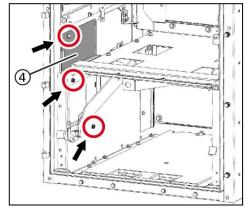


Fig. 306: 3 bolted joints on wiring duct cover, panel width 800 mm

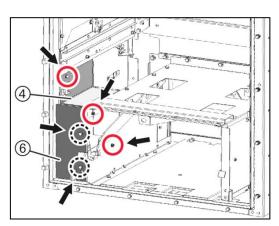


Fig. 307: 5 bolted joints on wiring duct cover, panel width 1000 mm

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.

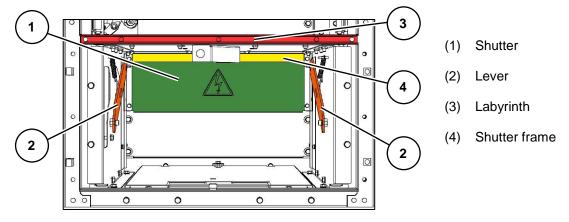
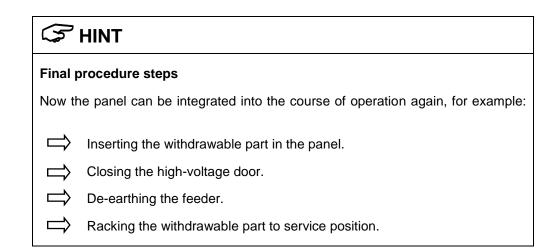


Fig. 308: Checking state and position of shutter and levers

The bushing plate, the vertical partition and the voltage transformer compartment are installed.



20 Accessing the connection compartment through the rear



Read and understand these instructions before attempting operating works.

20.1 Accessing the connection compartment through the rear side of the panel

A 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 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.



Hereafter, the disassembly of those parts is described, which are later assembled again at the same place.

二

Store disassembled parts and bolting material carefully, and keep them available for later reuse.

Preconditions

- Withdrawable part inserted in the switching-device compartment:
 - High-voltage door closed
 - Withdrawable part in test position
 - Feeder earthing switch in CLOSED position

Procedure

 \Rightarrow

Check if the position indicator of the feeder earthing switch on the high-voltage door is in vertical I position.

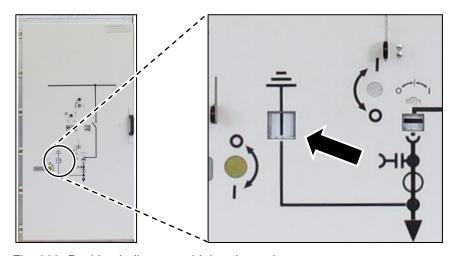


Fig. 309: Position indicator on high-voltage door

Access to the connection compartment through the rear side of the panel is described hereafter by the example of a 4-panel arrangement with 48 bolted joints size M8x20.

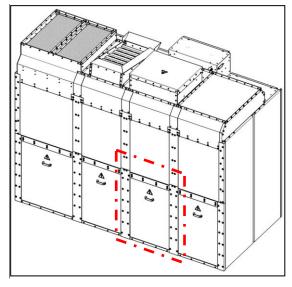


Fig. 310: 4-panel arrangement with rear wall and rear ledges closed (as an example)

- Remove the connecting elements from the horizontal ledge (1):
 - 8 bolts M8x25 with contact washers and plain washers
- Remove the horizontal ledge, and store it together with the associated bolting material. Store the bolting material.
- 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 bolting material.
- Proceed in the same way with the other vertical ledge.
- Remove the sealing brackets (3), and store them.

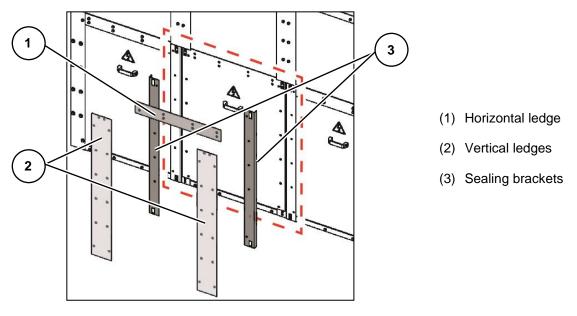


Fig. 311: Rear wall with ledges

- Unscrew and remove the bolting material at the panel base:
 - 4 bolts M8x20 with contact washers (5)
- To remove the rear wall, lift it and pull it away using the handle (4). Store the rear wall.

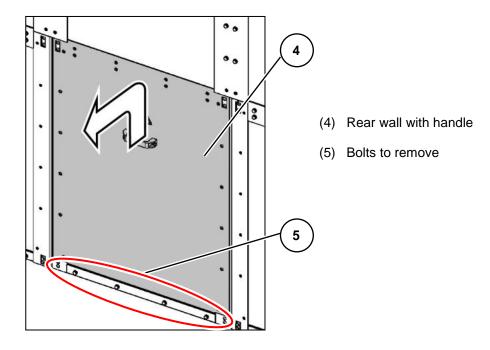


Fig. 312: Installing the rear wall

✓ Access to the connection compartment through the rear side is given.

20.2 Installing the rear wall on the connection compartment

A 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 in the connection compartment will be live at operational high voltage.

- Observe the Five Safety Rules.
- 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.

A 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

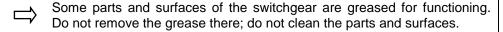
NOTICE

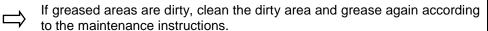
Cleaning

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
\Box	vacuum cleaner and a lint-free cloth. If necessary, moisten the cloth, use a
— /	mild household cleaner, and dry properly at the end.





Preconditions

- Rear wall available
- Corresponding number of sealing brackets, ledges and associated bolting material available:
 - 2 nos. sealing brackets
 - 1 no. horizontal ledge and associated 8 bolts M8x25 with contact washers and plain washers
 - 2 nos. vertical ledges and a total of 28 bolts M8x20 with contact washers
 - 4 bolts M8x20 with contact washers for fixing the rear wall to the panel base

Procedure

\Rightarrow	Insert the rear wall (1) at the rear side of the panel and push the wall down using the handle.
\Rightarrow	Fix the rear wall by screwing the lower bolts in hand-tight: 4 bolts M8x20 with contact washers (2)

Tighten the bolts with torque 25 Nm.

Accessing the connection compartment through the rear

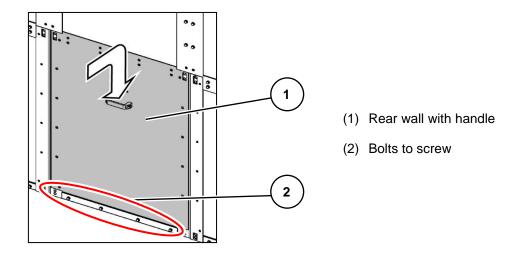


Fig. 313: Inserting the rear wall and pushing it down

- Insert the 2 sealing brackets (3) into the vertical gaps between the panels.
- Install the horizontal ledge (4). Fix it by screwing the bolts in hand-tight:
 - 8 bolts M8x25 with contact washers and plain washers size 8 acc. to ISO 7093
- Tighten the bolts with torque 25 Nm.
- Install one of the vertical ledges (5). Fix it by screwing the bolts in hand-tight:
 - 14 bolts M8x20 with contact washers
- Tighten the bolts with torque 25 Nm.
- Proceed in the same way with the other vertical ledge.

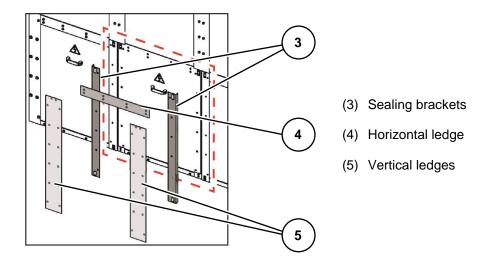
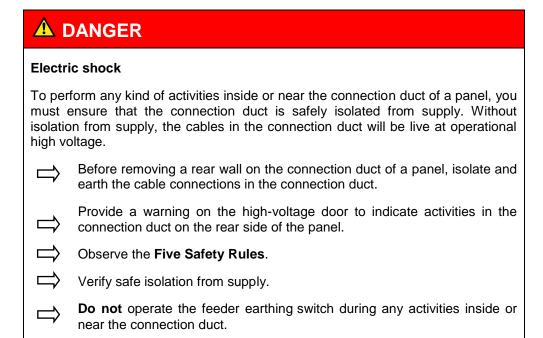


Fig. 314: Installing ledges and brackets

✓ The rear wall is installed on the connection compartment.

S HINT		
Final procedure steps		
Now the panel can be integrated into the course of operation again, for example:		
\Rightarrow	De-earthing the feeder.	
\Rightarrow	Racking the withdrawable part to service position.	

20.3 Accessing the connection duct through the rear side of the panel



⚠ 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.

⚠ CAUTION

High weight

Die upper rear wall is heavy.

Remove the upper rear wall absolutely with 2 persons.

A HINT

Hereafter, the disassembly of those parts is described, which are later assembled again at the same place.

Store disassembled parts and bolting material carefully, and keep them available for later reuse.

Preconditions

- Withdrawable part inserted in the switching-device compartment:
 - High-voltage door closed
 - Withdrawable part in test position
 - Feeder earthing switch in CLOSED position

Procedure

Check if the position indicator of the feeder earthing switch on the high-voltage door is in vertical I position.

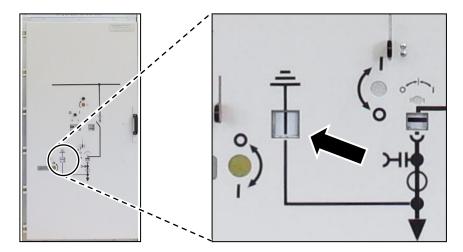


Fig. 315: Position indicator on high-voltage door

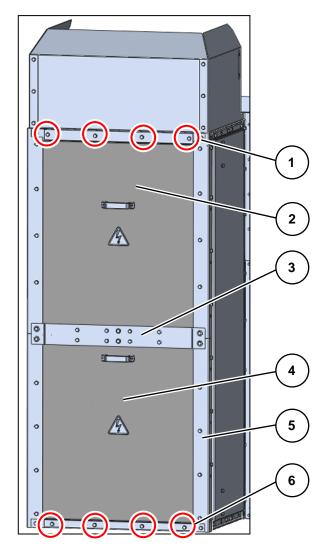
Remove the connecting elements from the horizontal ledge (3):

• 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



- (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. 316: Rear ledges and rear walls on connection duct

- Remove the vertical ledges, and store them together with the associated connecting elements.
- Proceed in the same way with the other vertical ledges.
- Loosen the connecting elements of the lower rear wall at the panel base (6):

 4 / 6 bolts M8x20 with contact washers
- Remove the 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 of the upper rear wall in the upper area (1):

 4 / 5 bolts M8x20 with contact washers
 - ., 6 2010 110720 11111 0011001 110011010
- To remove, pull the upper rear wall (4) downwards by the handle. Store the rear wall.
- ✓ Access to the connection duct through the rear side is given.

20.4 Installing the rear walls on the connection duct

A 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 cables 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.

⚠ CAUTION

High weight

The upper rear wall is heavy.

Mount the upper rear wall absolutely with 2 persons.

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

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

Preconditions

- Upper and lower rear wall available
- Corresponding number of ledges and associated bolting material available:

Proceed in the same way with the other vertical ledges.

to the maintenance instructions.

- 1 no. horizontal ledge
- 4 nos. vertical ledges
- Bolts size M8x20 with contact washers and plain washers

Procedure ☐ Insert the lower rear wall (4) at the rear side of the panel and push it down using the handle. ☐ Fix the rear wall by screwing the lower bolts in hand-tight: • 4/6 bolts M8x20 with contact washers (6) ☐ Insert the upper rear wall (2) at the rear side of the panel and push it up using the handle. ☐ Fix the 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 in hand-tight: • 9/19 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093

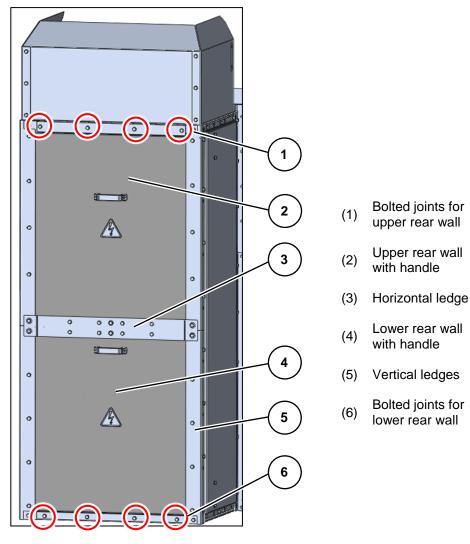
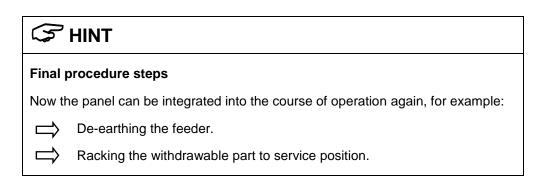


Fig. 317: Rear ledges and rear walls on connection duct

Install the horizontal ledge (3). Fix it by screwing the bolts in hand-tight:

- 12 / 14 bolts M8x20 with contact washers and plain washers with the bolt fixing in the area of the vertical ledges
- Tighten the bolts with torque 25 Nm.
- ✓ The rear walls are installed on the connection duct.



Key-operated interlocks

21 Key-operated interlocks



Read and understand these instructions before attempting operating works.

21.1 Key-operated interlocks

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 high-voltage door.

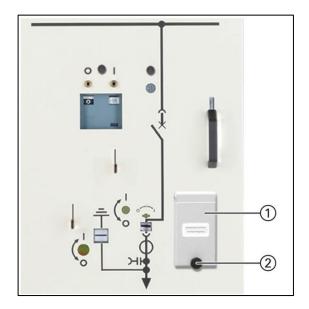
Key-operated interlocks allow interlocking or releasing associated operating functions depending on the state of the operated device. Key-operated interlocks are available for the following functions:

- If the withdrawable part 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 and changing the position of the feeder earthing switch. As the feeder earthing switch must always be either in CLOSED position or in 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. 318: Example: High-voltage door with key-operated interlocks, protected with cover

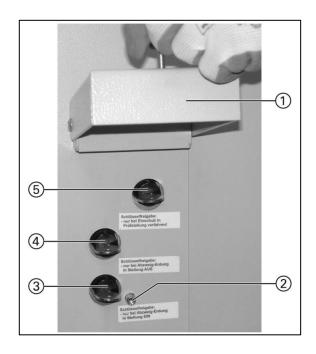


Fig. 319: Example: Cover lifted

- (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 is racked to test position

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 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.

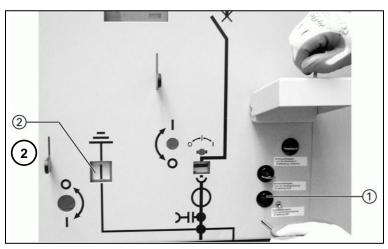


Fig. 320: Example: Interlocking / releasing switching to OPEN

- Lower the cover and secure it by turning the rotary button clockwise.
 - ✓ The selected operating function is interlocked / released.

21.2 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 the 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.

An interlocked function 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 in OPEN position.

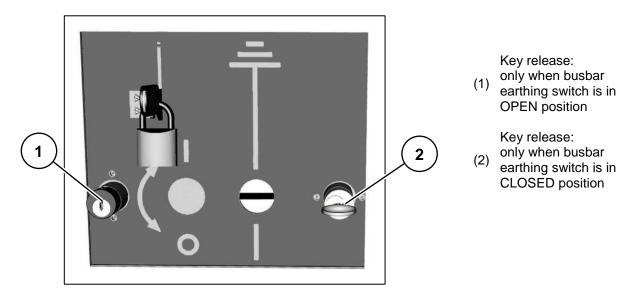


Fig. 321: Door to low-voltage compartment with key-operated interlocks

Key-operated interlocks

Operating the interlocks

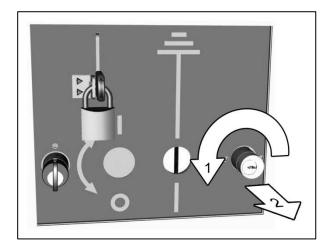
Precondition

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).



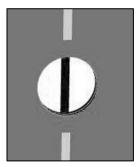
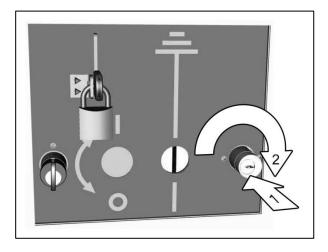


Fig. 323: Position indicator for busbar earthing switch: CLOSED

Fig. 322: Interlocking switching to OPEN

To release an interlocked function, insert the associated key, and turn 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).



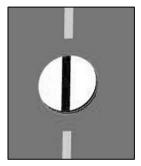


Fig. 325: Position indicator for busbar earthing switch: CLOSED

Fig. 324: Releasing switching to OPEN

✓ The selected operating function is interlocked / released.

Fitting the earthing device

22 Fitting the earthing device

S HINT

Read and understand these instructions before attempting operating works.

22.1 Design, application and inspection of the earthing accessories

A DANGER

Impermissibly high voltage and current

Inappropriate use of the earthing 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 accessories **before each** application.

	Panel width 800 mm
Max. short-circuit current and max. short-circuit duration	= 25 kA / 1 s
Diameter of the fixed contacts in the bushings	60 mm
Rated normal current of feeders	1250 A

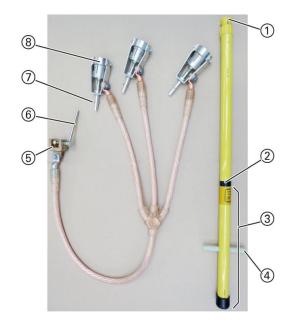


Fig. 326: Earthing accessories and earthing rod

- (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 tulips

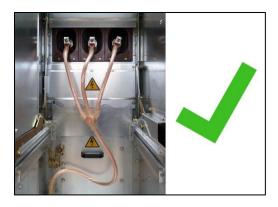
Fitting the earthing device

Mandatory inspection of the earthing 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.



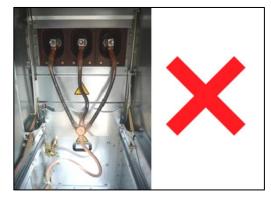


Fig. 327: Copper wires without coloration

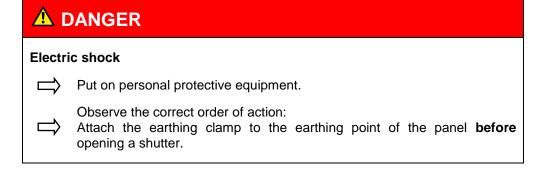
Fig. 328: Copper wires with brown coloration

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 tangible problems:

- Do not use these earthing accessories.
- Contact the local superior and responsible person.
- ✓ Inspection of the earthing accessories is successfully executed.

22.2 Connecting the earthing device



A DANGER

Impermissibly high voltage and current

Inappropriate use of the earthing 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 accessories **before each** application.

Preconditions

- Withdrawable part 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 accessories available and in perfect condition
- Slip-on lever for opening the shutter available
- Padlock for shutter not to be used available
- Personal protective equipment put on

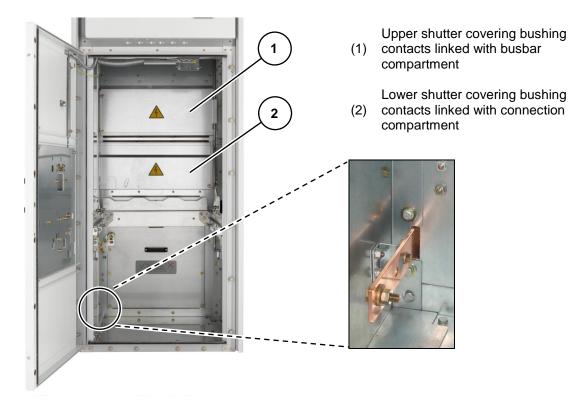


Fig. 329: Panel prepared

Fig. 330: Fixed earthing point for connecting the earthing clamp

Attaching the earthing clamp to the earthing point

A DANGER

Electric shock

Connect the earthing clamp **firmly** with the earthing point of the panel.

A 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. 331: Bolting the earthing clamp

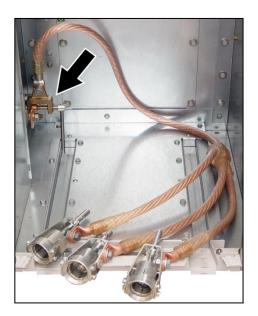
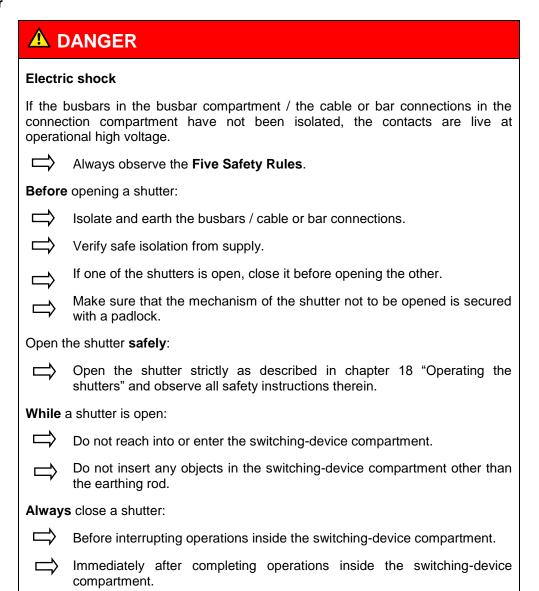


Fig. 332: Earthing clamp connected with earthing point

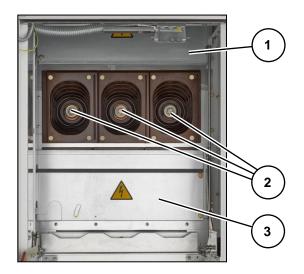
Opening the shutter



Fitting the earthing device

 \Rightarrow

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 18 "Operating the shutters".



- (1) Shutter to busbar compartment
- (2) Bushing contacts uncovered
- (3) Shutter to connection compartment

Fig. 333: Shutter to busbar compartment open (for 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 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.

A HINT

Unexpected light and noise

After isolation, the busbar system still carries some capacitive charging.

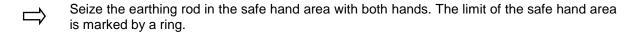
Expect short light and noise from a minor electrostatic discharge while leading the earthing rod with the earthing tulip on top towards the bushing contact.



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. 334: Plugging the tulip onto the earthing rod



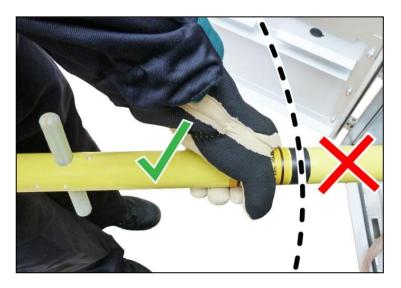
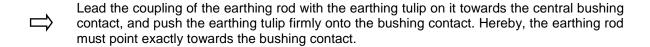
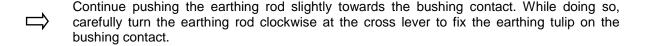


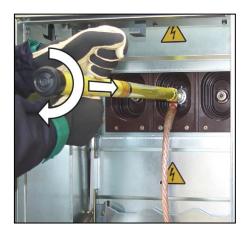
Fig. 335: Seizing the earthing rod in the safe hand area





Fitting the earthing device

Detach the earthing rod from the earthing tulip by pulling.



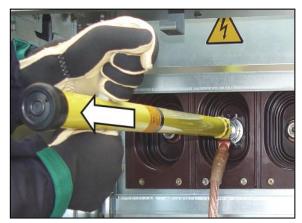


Fig. 336: Tightening the earthing tulip on the bushing contact

Fig. 337: Detaching the earthing rod

To earth the outer bushing contacts, proceed in the same way.



Fig. 338: Earthing tulip fixed on central bushing contact



Fig. 339: Earthing device completely mounted

✓ The earthing device is completely mounted.

22.3 Removing the earthing device



Preconditions

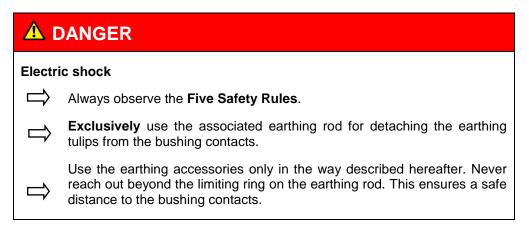
- Bushing contacts isolated
- Earthing rod available
- Slip-on lever for opening the shutter available
- Personal protective equipment put on



Fig. 340: 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 **bushar 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**.



Fitting the earthing device

Seize the earthing rod in the safe hand area with both hands. The limit of the safe hand area is marked by a ring.

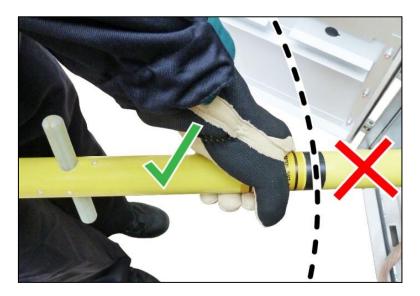


Fig. 341: Seizing the earthing rod in the safe hand area

- 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.

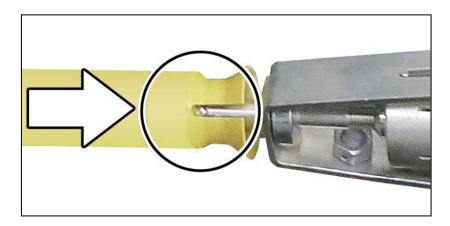


Fig. 342: Plugging the earthing rod onto the tulip

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 loosen the earthing tulip.

Detach the earthing tulip from the bushing contact by pulling the earthing rod off.



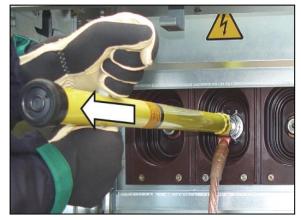


Fig. 343: Detaching the earthing tulip

Fig. 344: Pulling off the 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. 345: Pulling off the tulip

To detach the other two earthing tulips, proceed in the same way.

Closing the shutter

A DANGER

Electric shock

Close the shutter strictly as described in chapter 18 "Operating the shutters", but leave the other shutter padlocked.

Close the shutter as described in chapter 18 "Operating the shutters".

Detaching the earthing clamp from the earthing point

A 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.
- Unbolt the earthing clamp from the earthing point of the panel using the screw handle. Remove the earthing clamp.

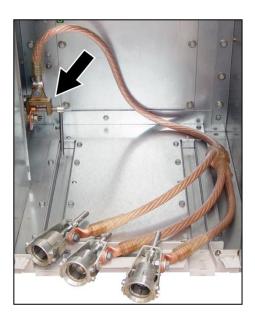


Fig. 346: Earthing clamp connected with earthing point



Fig. 347: 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.

Panels with motor operating mechanism control

23 Panels with motor operating mechanism control

S HINT

Read and understand these instructions before attempting operating works.

23.1 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 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:	Feeder earthing switch:	
Racking	Switching	
Electrical or manual operation	Manual operation only	
Electrical or manual operation	Electrical or manual operation	
Manual operation only	Manual operation only	
Manual operation only	Electrical or manual operation	

	Busbar earthing switch:	
Switching		
	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. 348: Example of a local-remote switch

Panels with motor operating mechanism control

Operating modes for racking the withdrawable circuit-breaker

For safe and consistent operation, it is not possible to rack the withdrawable circuit-breaker 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 highvoltage door is open. 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.

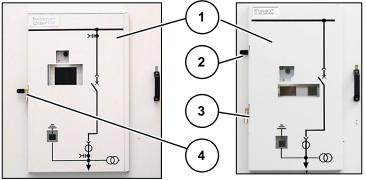


Fig. 349: Circuit-breaker type 3AE1: control door padlocked

control door padlocked

Fig. 350: Circuit-breaker type 3AE5:

- (1) Control door
- Type 3AE5: handle
- Type 3AE5: (3) appliance for fitting padlock
- Type 3AE1: handle with padlock

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:

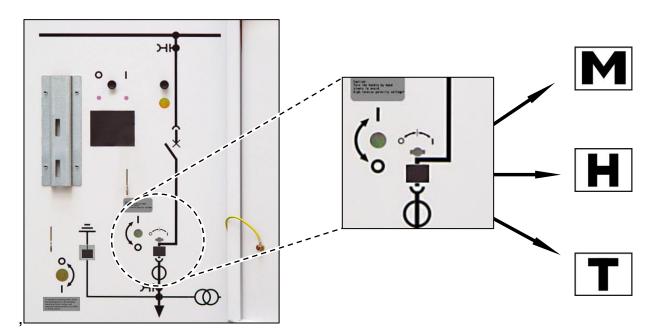


Fig. 351: Control door open, access mode indicator visible

Fig. 352: Access mode indicator for racking: possible indications

The following table gives an overview of the possible access mode indications, the corresponding operating options and their preconditions.

Indicator	Access mode	Operating options	
	Access is released for motor-operated racking	Racking the withdrawable circuit-breaker electrically from test position to service position, or from service position to test position	
M	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		
	Access is released for manual racking	Racking the withdrawable circuit-breaker manually from test position to service position, or from service position to test position	
H	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		
	Racking interlocked	 Closing the control door Opening the high-voltage door Taking the withdrawable circuit-breaker out of the panel 	
	Preconditions for operating opt	ions:	



Blocking any racking operation is the precondition for opening the high-voltage door.

 $\stackrel{}{\Longrightarrow}$ Before opening the high-voltage door, set the access mode indicator to "T".

Panels with motor operating mechanism control

Several electrical interlocks support safe electrical operation:

Operating option	Preconditions for operating option	Electrical interlocking
	Low-voltage connector plugged on	During an ongoing racking procedure, racking in opposite direction is interlocked electrically.
Racking the withdrawable circuit-breaker to test position electrically	 High-voltage door closed Feeder earthing switch in OPEN position Circuit-breaker in OPEN position Access is released for motor-operated racking Control door closed 	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 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 in service position 	Opening / closing the circuit- breaker electrically during service for testing purposes 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 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 in service position 	Closing the feeder earthing switch electrically during service is interlocked electrically.

23.2 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 is only possible when **both** the high-voltage door and the control door are closed. If the control door is opened 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.

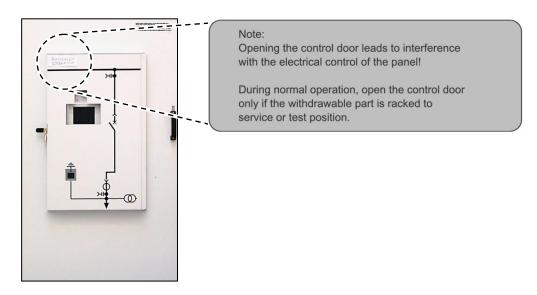


Fig. 353: High-voltage door: instruction label about opening the control door

Panels with motor operating mechanism control

Preconditions

- Withdrawable circuit-breaker 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.

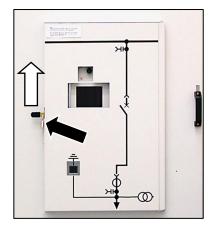


Fig. 354: Pulling out the withdrawable circuit-breaker, type 3AE1: removing the padlock, pulling the handle

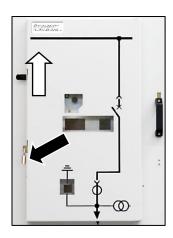


Fig. 355: Pulling out the withdrawable circuit-breaker, type 3AE5: removing the padlock, pulling the handle

 \checkmark

The control door is open.

23.3 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.

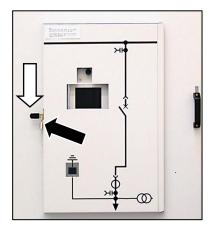


Fig. 356: Pulling out the withdrawable circuit-breaker, type 3AE1: pulling the handle, fitting the padlock

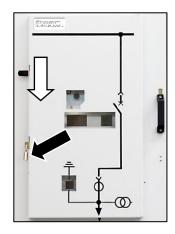


Fig. 357: Pulling out the withdrawable circuit-breaker, type 3AE5: pulling the handle, fitting the padlock

 \checkmark

The control door is closed.

23.4 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.

 \Rightarrow

For any local operations — manual or electrical — set the panel to local control, for example by switching the local-remote switch to LOCAL position.

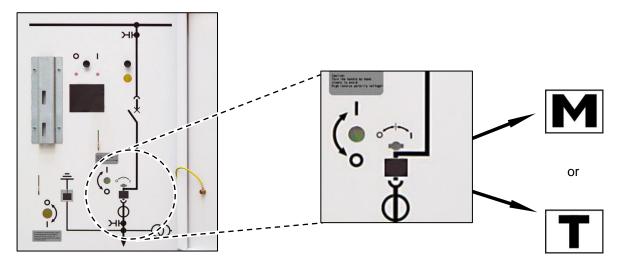


Fig. 358: Access mode indicator for racking: starting point "M" or "T"

Panels with motor operating mechanism control

Preconditions

- Feeder earthing switch in OPEN position
- Circuit-breaker in OPEN position
- Panel set to local control
- Control door open
- Withdrawable circuit-breaker 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).

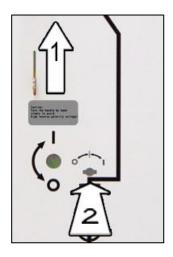
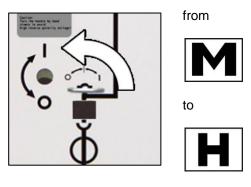


Fig. 359: Lifting the operating slide and inserting the key

To release manual access to the withdrawable circuit-breaker, 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





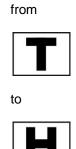


Fig. 360: Turning the key counter-clockwise

Fig. 361: Turning the key clockwise



Final procedure steps

Next, insert the racking crank for moving the withdrawable circuit-breaker.

✓ Racking the withdrawable circuit-breaker is set to manual operation.

23.5 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.



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, close the control door and padlock it.

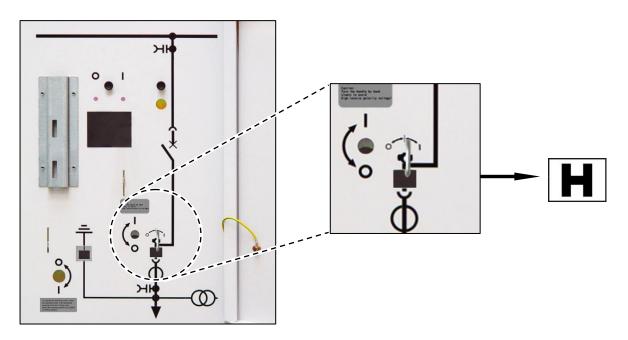


Fig. 362: Access mode indicator for racking: starting point "H"

Panels with motor operating mechanism control

Preconditions

- Feeder earthing switch in OPEN position
- Circuit-breaker in OPEN position
- Panel set to local control
- Control door open
- Withdrawable circuit-breaker 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, turn the double-bit key 90° clockwise until the operating mode indicator changes to "M".

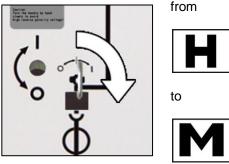




Fig. 363: Turning the key clockwise

- 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 the padlock.
- Racking the withdrawable circuit-breaker is set to electrical operation.

23.6 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.



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".

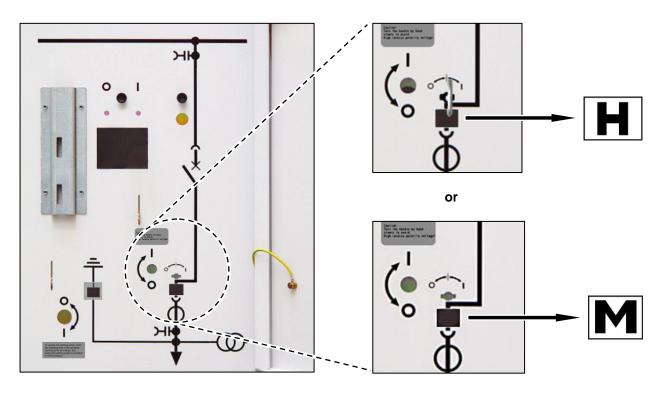


Fig. 364: Access mode indicator for racking: starting point "H" or "M"

Preconditions

- Withdrawable circuit-breaker 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).

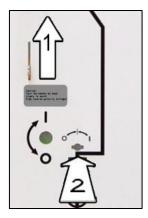


Fig. 365: Lifting the operating slide and inserting the key: starting point "M"

Panels with motor operating mechanism control

 \Rightarrow

To block any access to the withdrawable circuit-breaker, 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

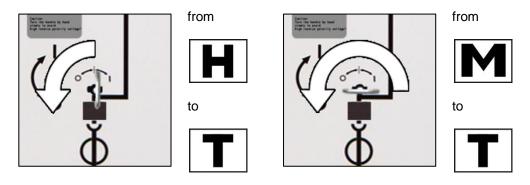


Fig. 366: Turning the key 90° counter-clockwise

Fig. 367: 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.



Final procedure steps

You may now open the high-voltage door and take the withdrawable circuit-breaker out of the panel.

S HINT

When the control door is closed, the access mode indicator for the withdrawable circuit-breaker is covered.

- □ If required, open the control door to read the indicator.
- ✓ Racking the withdrawable circuit-breaker is blocked.

23.7 Racking the withdrawable circuit-breaker 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 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 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 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 is in a stable end position.



Rack the withdrawable circuit-breaker 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 handling of the racking crank for moving the withdrawable circuit-breaker.

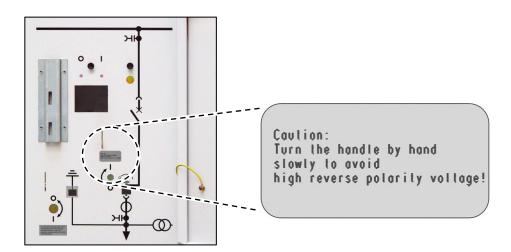


Fig. 368: High-voltage door: instruction label about operation of racking crank

Preconditions

- Withdrawable circuit-breaker 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 onto the operating shaft, and turn clockwise as far as it will go.

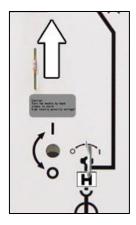




Fig. 369: Lifting the operating slide

Fig. 370: Turning the racking crank clockwise

- Remove the racking crank for moving the withdrawable circuit-breaker.
- Turn the double-bit key clockwise as far as it will go to block manual access and release electrical racking. The operating mode indicator changes to "M".

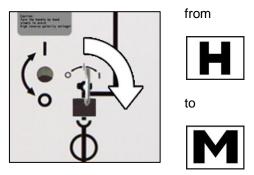


Fig. 371: Turning the key clockwise

- 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 has been manually racked from test position to service position.

23.8 Racking the withdrawable circuit-breaker to service position electrically



Maloperation

Racking the withdrawable circuit-breaker 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 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 is only possible when **both** the high-voltage door and the control door are closed. If the control door is opened 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 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 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 electrically to service position either locally or from the central control.



The withdrawable circuit-breaker has been electrically racked from test position to service position.

23.9 Racking the withdrawable circuit-breaker 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 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 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 is in a stable end position.



Rack the withdrawable circuit-breaker 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 handling of the racking crank for moving the withdrawable circuit-breaker.

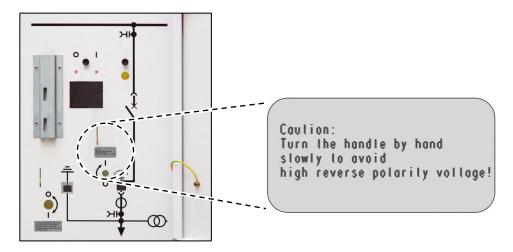


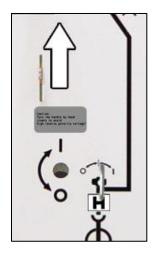
Fig. 372: High-voltage door: instruction label about operation of racking crank

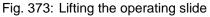
Preconditions

- Withdrawable circuit-breaker 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 onto the operating shaft, and turn counter-clockwise as far as it will go.





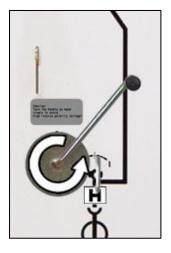


Fig. 374: Turning the racking crank counter-clockwise

Remove the racking crank for moving the withdrawable circuit-breaker.

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, change from "H" to "M" by turning 90° clockwise.
- To block any access to the withdrawable circuit-breaker, change from "H" to "T" by turning 90° counter-clockwise.

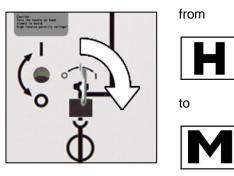


Fig. 375: Turning the key clockwise

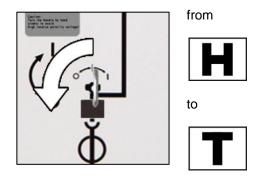


Fig. 376: Turning the key counter-clockwise

- Remove the double-bit key.
- To close the actuating opening, push the operating slide down as far as it will go.

Panels with motor operating mechanism control

\Rightarrow	Close th	e the control door.		
\Rightarrow	Fit a pa	dlock to	the control door and close the padlock.	
✓	The withdrawable circuit-breaker has been manually racked from service position to tes position.			
	F HINT			
	Final procedure steps			
		\Rightarrow	If "T" is selected, you may now open the high-voltage door and take the withdrawable circuit-breaker out of the panel.	
		\Rightarrow	Otherwise, you may now go on to close the circuit-breaker electrically for testing purposes.	

23.10 Racking the withdrawable circuit-breaker to test position electrically

NOTICE

Maloperation

Racking the withdrawable circuit-breaker 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 is only possible when **both** the high-voltage door and the control door are closed. If the control door is opened 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 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.

 \Rightarrow

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 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 electrically to service position either locally or from the central control.



The withdrawable circuit-breaker has been electrically racked from service position to test position.

23.11 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 underneath 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).

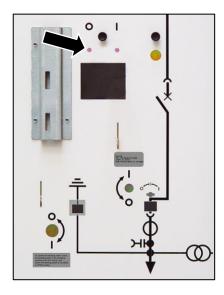


Fig. 377: Circuit-breaker type 3AE1: actuating opening for opening the circuit-breaker manually

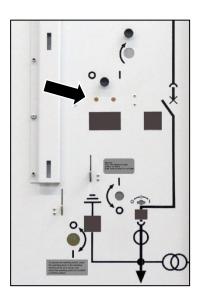


Fig. 378: Circuit-breaker type 3AE5: actuating opening for opening the circuit-breaker manually

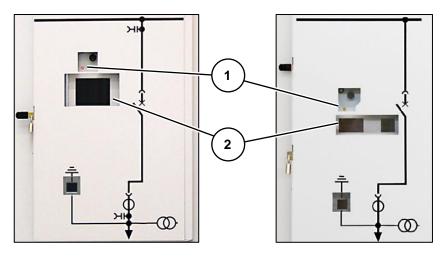


Fig. 379: Circuit-breaker type 3AE1: control door

Fig. 380: Circuit-breaker type 3AE5: control door

- Actuating opening
 (1) for opening the circuit-breaker
- 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.

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.

 \Rightarrow

For opening the circuit-breaker manually, see chapter 10.12.

23.12 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.

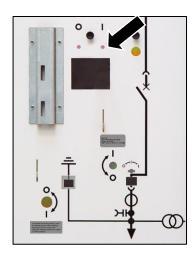


Fig. 381: Circuit-breaker type 3AE1: actuating opening for closing the circuit-breaker manually

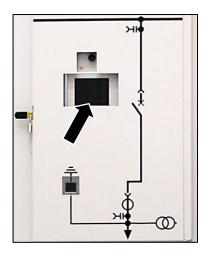


Fig. 383: Circuit-breaker type 3AE1: inspection window for CLOSED/OPEN indicator of the circuit-breaker



Fig. 382: Circuit-breaker type 3AE5: actuating opening for closing the circuit-breaker manually

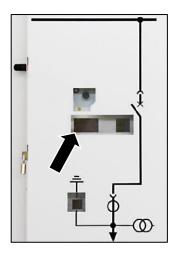


Fig. 384: Circuit-breaker type 3AE5: inspection window for CLOSED/OPEN indicator of the circuit-breaker

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 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 closing the circuit-breaker manually, see chapter 10.11.

23.13 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.

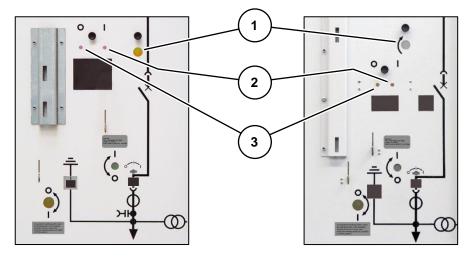


Fig. 385: Circuit-breaker type 3AE1: actuating openings for charging / discharging the spring energy store manually

Fig. 386: Circuit-breaker type 3AE5: actuating openings for charging / discharging the spring energy store manually

- Opening for charging the spring energy store in the circuit-breaker manually (covered)
- Actuating opening
 (2) for closing the circuit-breaker
- Actuating opening
 (3) for opening the circuit-breaker



Fig. 387: Circuit-breaker type 3AE1: inspection window for circuit-breaker position indicator and closing spring state indicator in control door

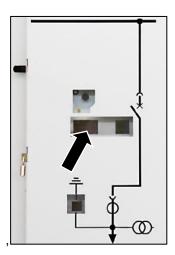


Fig. 388: Circuit-breaker type 3AE5: inspection window for circuit-breaker position indicator and closing spring state indicator in control door

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 10.13 and 10.14.

Panels with motor operating mechanism control

23.14 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.

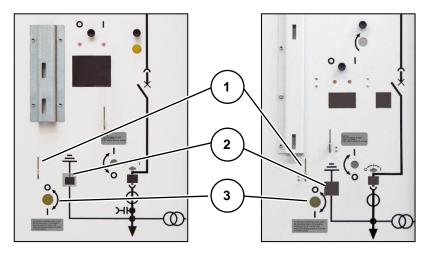


Fig. 389: Circuit-breaker type 3AE1: control elements for feeder earthing switch on high-voltage door

Fig. 390: Circuit-breaker type 3AE5: control elements for feeder earthing switch on high-voltage door

- Operating slide for opening and closing
- (1) the actuating opening for operating the feeder earthing switch
- Mechanical position
 (2) indicator for feeder
 earthing switch
- Actuating opening for operating the feeder earthing switch



Fig. 391: Circuit-breaker type 3AE1: inspection window for feeder earthing switch position in control door

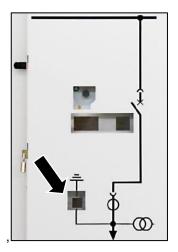


Fig. 392: Circuit-breaker type 3AE5: inspection window for feeder earthing switch position in the control door

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.

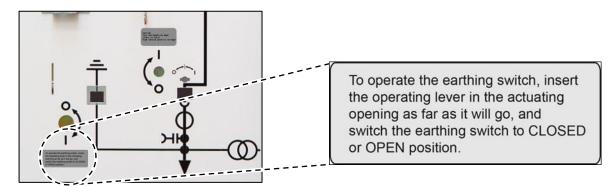


Fig. 393: High-voltage door: instruction label about operation of the feeder earthing switch

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.

🥰 HINT

Earthing the feeder is only permissible if the withdrawable circuit-breaker 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 10.15 and 10.16.

23.15 Earthing / de- earthing the feeder electrically

NOTICE

Maloperation

Earthing / de-earthing the feeder electrically is only possible when both the highvoltage 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).



Earthing the feeder is only permissible if the withdrawable circuit-breaker 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 in test position

Procedure



Set the feeder earthing switch to OPEN or CLOSED either locally or from the central control.

23.16 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.

ightharpoons

For earthing / de-earthing the busbar system manually, see chapter 17.

23.17 Earthing / de-earthing 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
- Withdrawable circuit-breaker inserted in the panel in test position:
 - o Withdrawable circuit-breaker in test position
 - Low-voltage connector plugged on

Panels with motor operating mechanism control

Procedure

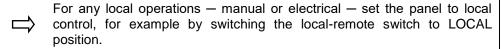
Set the busbar earthing switch to OPEN or CLOSED either locally or from the central control.

23.18 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 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.



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 23.1 to 23.17, 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 10.9
- Opening the circuit-breaker electrically, chapter 10.10
- Removing the low-voltage connector, chapter 10.17
- Plugging on the low-voltage connector, chapter 10.18
- Taking the withdrawable circuit-breaker out of the panel, chapter 10.19
- Inserting the withdrawable circuit-breaker in a panel, chapter 10.20

23.19 Technical data / operating times

Position	Functional unit	Technical data
		Wide-voltage range 24 V DC / 48 V DC / 60 V DC / 110 V DC / 220 V DC / 110 V AC / 230 V AC
1.	Voltage supply for control circuit and motor circuit	Control and motor circuit are executed separately
		Voltage fluctuations in the range from $0.85 \times U_n$ to $1.1 \times U_n$ 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.
	Mater was in a time of the value of the other	·
5.	Motor running time for racking function	< 65 s
6.	Feedback monitoring time for racking valid switching functions:	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.
	racking to service or test position	Fault indication and fault evaluation according to chapter 23.20.

Panels with motor operating mechanism control

23.20 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" 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 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 is being racked	On	Operating mechanism stops
The withdrawable circuit-breaker 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 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

Panel heater

24 Panel heater



Read and understand these instructions before attempting operating works.

24.1 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	125 (±10 %)	110
and/or connection compartmen	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.

24.2 Mechanical temperature controller

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. 394: Mechanical temperature controller

24.3 Electronic temperature and humidity controller

NOTICE

Damage due to incorrect application

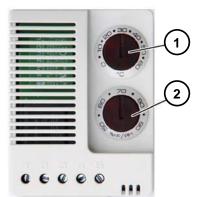
The temperature and humidity controllers require direct connection to the ambient air.

 \Rightarrow

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.

Town oretime function	If the ambient temperature falls below the adjusted value, the circuit for heater operation is closed (LED lights up).	
Temperature function	If the ambient temperature rises above the adjusted value, the circuit for heater operation is opened (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).	
Humidity function	If the relative humidity falls below the adjusted value, the circuit for heater operation is opened (LED does not light up).	



- 1 Selector for temperature control, with LED
- 2 Selector for humidity control, with LED

Fig. 395: Electronic temperature and humidity controller

24.4 Applications for temperature controller

NOTICE

Maloperation

Observe the manufacturer's information.

 \subseteq

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

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.

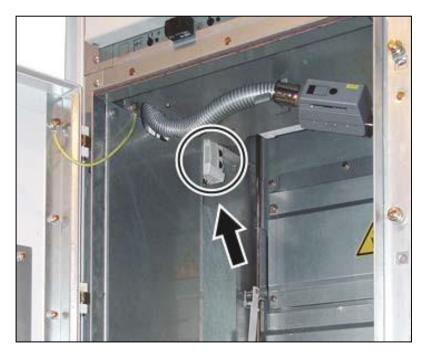


Fig. 396: Installation of the electronic temperature and humidity controller in the switching-device compartment

Service information

25 Service information

THINT

Read and understand these instructions before attempting operating works.

25.1 General maintenance

General 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.

25.2 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.	E.g. after a short-circuit breaking or 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.		
Protection relays and instruments	According to advice and requirements in respective instruction manuals.		

25.3 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. 397: View from above onto a ventilation unit in the pressure relief duct

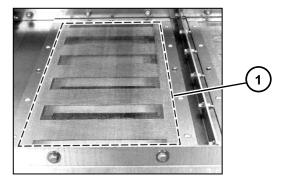


Fig. 398: View from above onto a ventilation unit in the pressure relief duct

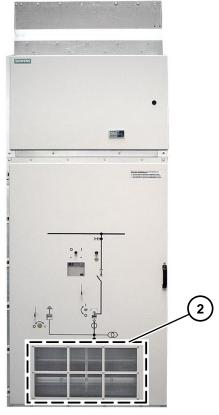


Fig. 399: Exemplary view of a ventilated panel with ventilation slots in the high-voltage door

- 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.

25.4 Preventive maintenance

A 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.

Earth the feeder in the respective panel or panels.

A DANGER

Danger due to foreign objects

Serious switchgear damage and malfunctioning due to flashovers caused by foreign objects.

 \Rightarrow

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 to 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.

\Rightarrow	Perform visual inspection and carry out the necessary maintenance work according to the problems determined.
\Rightarrow	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.
\Rightarrow	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.
\Rightarrow	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.
\Rightarrow	 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
\Rightarrow	Apply WD-40 waterproof spray oil to a cleaning cloth, and clean the shutter guiding linkage therewith.
\Rightarrow	Independently of the regular visual inspection and preventive maintenance, immediately determine the cause of failures and short circuits, and document it completely.
\Rightarrow	Read the protection relays (optional) immediately after the fault, and evaluate the information.
\Rightarrow	Add fault records and pictures to the documentation.
\Rightarrow	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.
\Rightarrow	Remove foreign objects, e.g. cleaning material.
\Rightarrow	Check the area directly around the panel and clean, if required.

25.5 Lubricants to be used

A 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	www.dowcorning.com
Main fixed contacts of bushings (4)	GREASE (Order No.: 8BX1022 1 kg)	

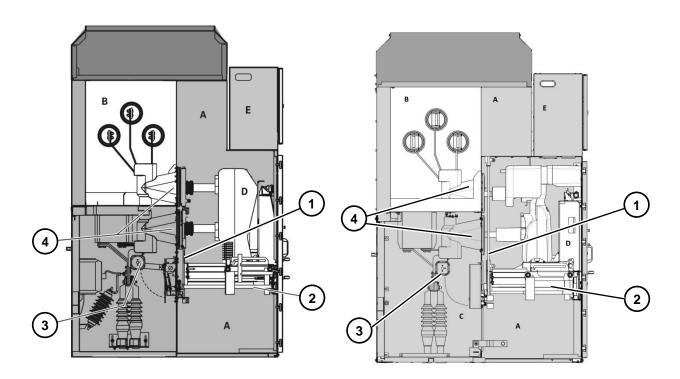


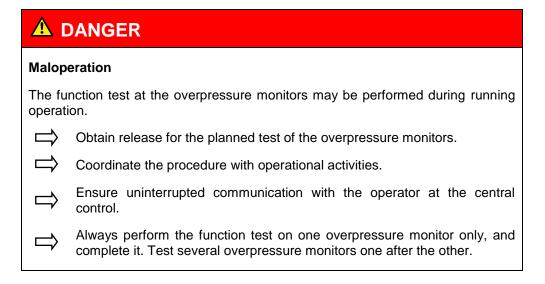
Fig. 400: Circuit-breaker, disconnecting and metering panels

Fig. 401: Circuit-breaker panel with HV HRC fuses

- (1) Shutter guiding linkage
- (3) Fixed contacts of the feeder earthing switch
- (2) Guide rail
- (4) Fixed contacts of the bushings

25.6 Overpressure sensors (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.



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.

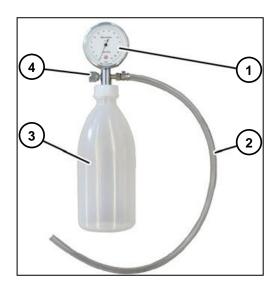


Fig. 402: Test unit

- (1) Manometer
- (2) Test tube
- (3) Lab bottle made of polyethylene
- (4) Locking cap

Preconditions

- High-voltage door closed
- Release for checking the overpressure monitors available
- Trouble-free communication established with the operator at the central control
- Door to low-voltage compartment open
- Test unit available, locking cap firmly screwed on

Service information

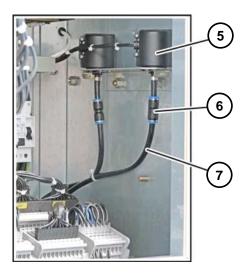


Fig. 403: Low-voltage compartment, for example with 2 overpressure monitors

- (5) Overpressure monitor
- (6) Tube connector
- (7) Tube to compartment

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. 404: Detail view of tube connector

Instead of the tube to the compartment, insert the tube of the test unit (2) into the tube connector as far as it will go.

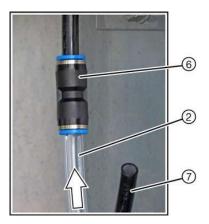


Fig. 405: Detail view of connection of test tube

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.

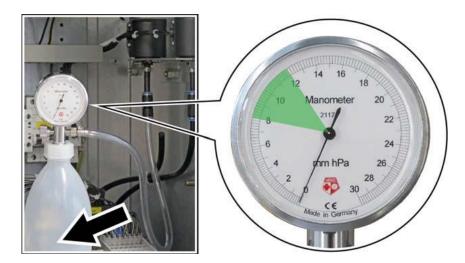


Fig. 406: Overpressure function test

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.

Service information

25.7 Switchgear extension

The switchgear can be extended at both ends without modification of existing panels. For switchgear extension, please contact the regional Siemens representative.

25.8 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 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.

25.9 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.

25.10 Disposal

NXAIR M 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

Trouble shooting

26 Trouble shooting

26.1 Panels

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.

Trouble shooting

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 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 M switchgear, please contact the Siemens sales partner or the regional Siemens representative.

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