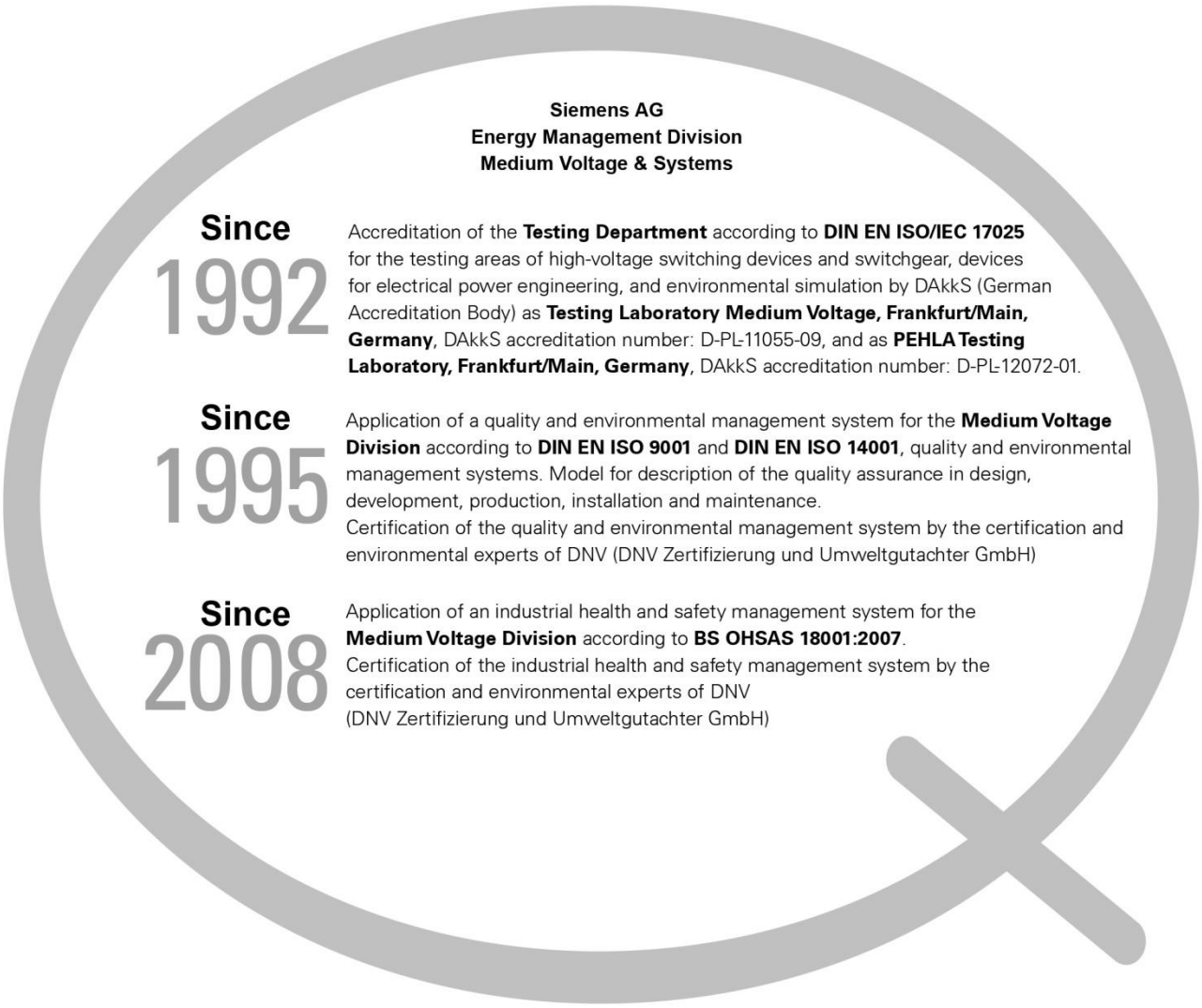
SIEMENS

Medium-Voltage Switchgear

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

INSTALLATION INSTRUCTIONS

Order No.:	**110-0084.9**
Issue:	**December 2020**
Revision:	**15**



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:

⚠ DANGER

Signal word indicates an immediate and imminent hazardous situation.

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

⚠ WARNING

Signal word indicates a potentially hazardous situation.

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

⚠ CAUTION

Signal word indicates a potentially hazardous situation.

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

Definitions and symbols

NOTICE

Indicates a potentially damaging situation.

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

☞ INFORMATION

Provides additional information to clarify or simplify a procedure.

Observe the information.

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

Contents

Contents

Document information:

Title: **Installation Instructions**
Order number: **110-0084.9**
Additional order number: **8BX3300-0LA00-0AA1**
Revision: **15**
Issue: **December 2020**

2 General instruction

2.1 General instructions

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

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

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

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

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 Installation 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)

The personal protective equipment must be determined by the switchgear operator depending on the work to be performed at the switchgear and on the IAC classification of the switchgear. To select the personal protective equipment, the local laws and regulations, among others, must be complied with.

If covers are opened or removed from a switchgear in operation, the IAC classification according to IEC 62271 Part 200 is no longer fulfilled. The switchgear operator must take this into account when selecting personal protective equipment. In case of internal arc, full personal protection is then not provided, even if the personal protective equipment is worn.

3 Due application

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

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

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

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

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

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

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

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

4 Qualified personnel

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

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

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

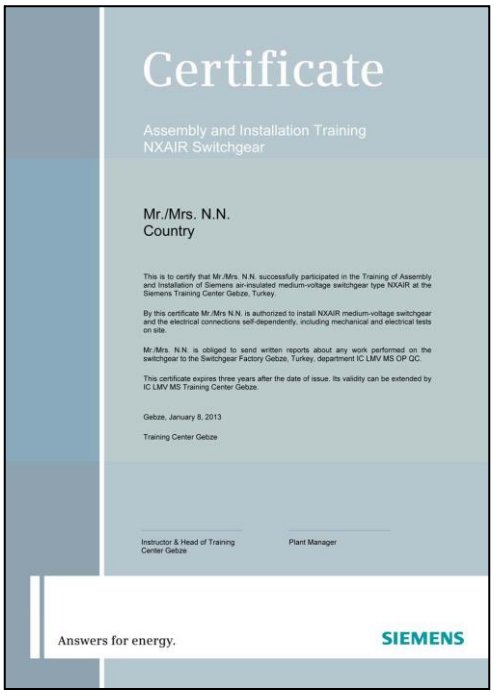
For further information about this installation training, please contact:

Siemens AG
Smart Infrastructure

Siemens Power Academy TD
Humboldtstraße 59
90459 Nuremberg, Germany

Tel: +49 911 433 7415
E-Mail: poweracademy@siemens.com

Siemens Power Academy TD:
- Energy management
- Primary Technology
- Medium Voltage
- Switchgear Assembly & Installation


Certificate

Assembly and Installation Training
NXAIR Switchgear

Mr./Mrs. N.N.
Country

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

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

Mr./Mrs. N.N. is obliged to send written reports about any work performed on the switchgear to the Switchgear Factory Gebze, Turkey, department IC LMV MS OP QC.

This certificate expires three years after the date of issue. Its validity can be extended by IC LMV MS Training Center Gebze.

Gebze, January 8, 2013

Training Center Gebze

Instructor & Head of Training Center Gebze

Plant Manager

Answers for energy.

SIEMENS

Fig. 1: Certificate (as an example)

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

5 Preparing installation

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

5.1 Preliminary clarifications

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

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

5.2 Switchgear room

Observe the following points when preparing the switchgear room:

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

5.3 Foundation

Please observe the following items when preparing the foundation:

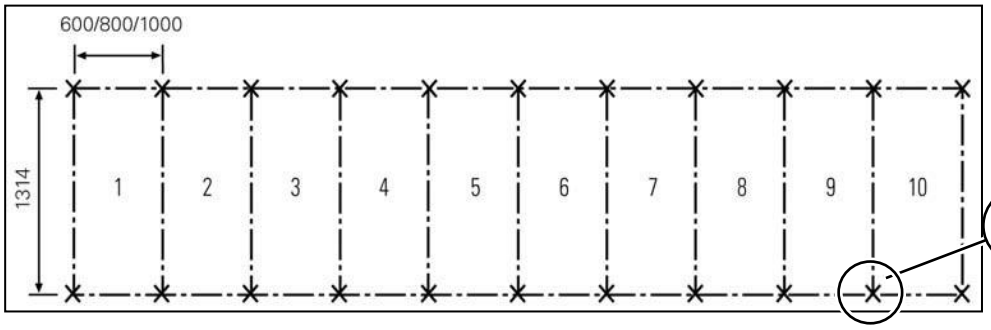
- A suitable foundation can be a false floor, a double floor or a reinforced-concrete foundation. The reinforced-concrete floor must be equipped with foundation rails for supporting the panels.
- As for design and construction of the foundation, the relevant standards DIN 43661 “Fundamentschienen in Innenanlagen der Elektrotechnik” (Foundation rails in electrical indoor installations) and DIN 18202 “Maßtoleranzen im Hochbau” (Blatt 3) (Measuring tolerances in structural engineering (Sheet 3)) apply.
- The dimensions of the floor opening and the fixing points of the switchgear frame are given in the associated dimension drawings. These dimension drawings are made available by the regional Siemens representative.
- If the foundation has to be resistant to earthquakes, additional points must be considered. Please seek the corresponding information in time. Your regional Siemens representative will be pleased to give you advice.
- Determine level differences between the installation surfaces of the panels using a measuring sheet, and compensate these level differences with shims (0.5 mm to 1.0 mm).
- The foundation area in front of the high-voltage doors of the panels, on which the withdrawable parts or switching-device trucks are approached, inserted and removed, must be at the same level as the standing surface of the panels.

The panel version with/without rear duct has no influence on the fastening to the foundation.

The following illustrations show general measuring sheets. For further information, see information drawings NXAIR, order number 110-2300.9.

Rated short-time withstand current I_k ≤ 31.5 kA			
Panel version	Busbar version [A]	Panel depth complete [mm]	Standing surface without high-voltage door [mm]
Circuit-breaker panel	≤ 2500	1350, 1500	1314
Disconnecting panel			
Metering panel	≤ 2500	1350	1314
Busbar current metering panel			
Bus sectionalizer			
Busbar connection panel			
Switch-disconnector panel			
Contactor panel, panel width 435 mm	≤ 2500	1400	1363
Circuit-breaker panel	3150/4000	1500, 1540, 1650	1464
Disconnecting panel			
Metering panel	3150/4000	1500	1464
Busbar current metering panel			
Bus sectionalizer			
Busbar connection panel			
Contactor panel, panel width 435 mm			
Switch-disconnector panel			

Rated short-time withstand current I_k = 40 kA			
Panel version	Busbar version [A]	Panel depth complete [mm]	Standing surface without high-voltage door [mm]
Circuit-breaker panel	3150/4000	1500, 1540, 1650	1464
Disconnecting panel			
Metering panel	3150/4000	1500	1464
Busbar current metering panel			
Bus sectionalizer			
Busbar connection panel			
Contactor panel, panel width 435 mm			



(1) Measuring point on the foundation rails

Fig. 2: Measuring sheet for the foundation. Tolerance according to DIN 43661:
Straightness 1 mm/1 m length, 2 mm for the total length;
evenness 1 mm within 1 m measured length;
NXAIR version with I_k ≤ 31.5 kA and busbar version up to 2500 A

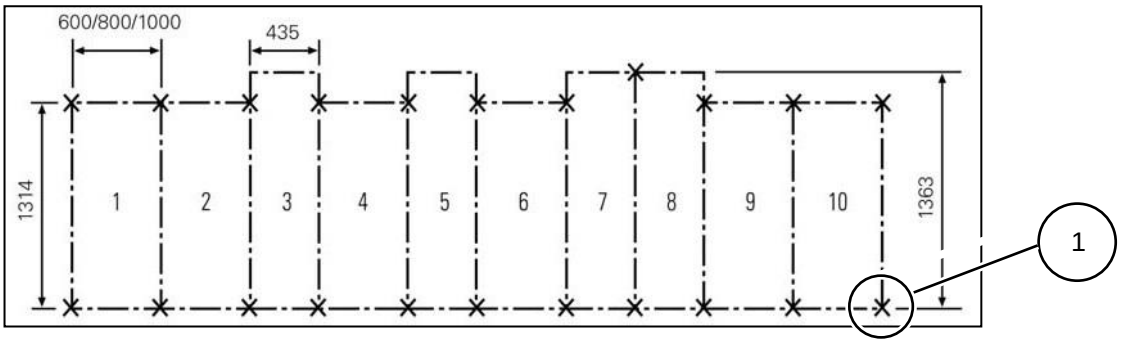


Fig. 3: Measuring sheet for the foundation. Tolerance according to DIN 43661:
Straightness 1 mm/1 m length, 2 mm for the total length;
evenness 1 mm within 1 m measured length;
NXAIR version with $I_k \leq 31.5$ kA and busbar version up to 2500 A
(with contactor panels)

(1) Measuring point on the foundation rails

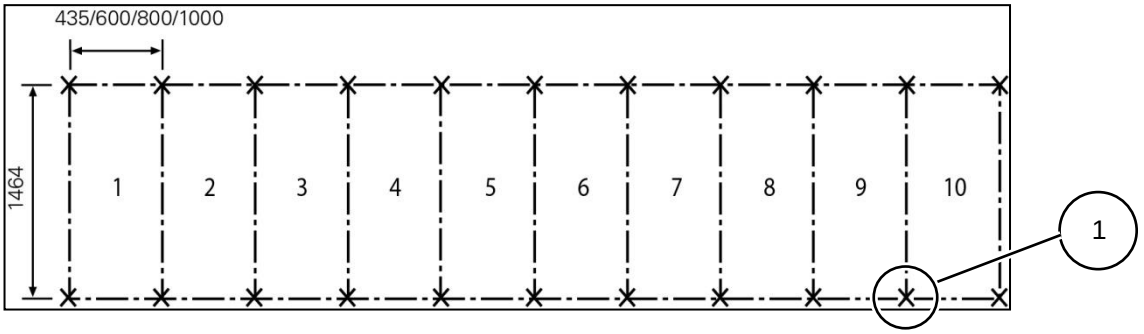


Fig. 4: Measuring sheet for the foundation. Tolerance according to DIN 43661:
Straightness 1 mm/1 m length, 2 mm for the total length;
evenness 1 mm within 1 m measured length;
NXAIR version with $I_k \leq 31.5$ kA and busbar version up to 3150/4000 A
and NXAIR version with $I_k = 40$ kA
(with or without contactor panels)

(1) Measuring point on the foundation rails

5.4 Dimensions of the switchgear room

⚠ DANGER

Incorrect installation

The installation of panels designed **without** evacuation duct in the pressure relief duct is only permissible with the stipulated minimum room height given in the following table. If the panel is installed in a switchgear room where the room height is too low, the internal arcing behavior of the panels can be influenced in a negative way, including hazard for the operator.

⇨ Check the room height according to the stipulations in the following table before installing the switchgear.

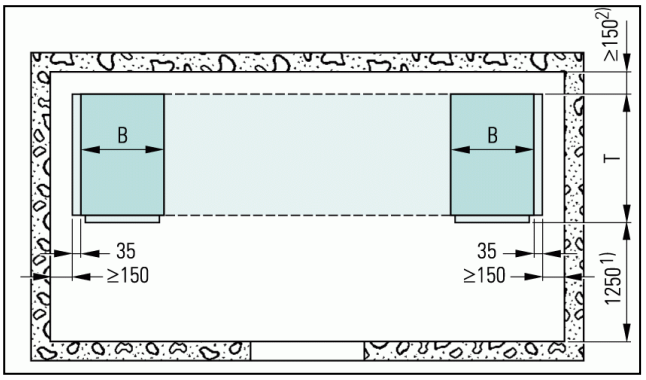
⇨ In case of a deviating room height in the relation between the technical data and the room height according to the following table, the installation of the switchgear is not permissible.

To install the switchgear, the switchgear room must have certain minimum dimensions.

Depending on the room height, the pressure relief system of the switchgear must be designed with evacuation ducts leading out of the switchgear building:

	Height of switchgear room [mm]	Rated voltage U_r [kV]	Rated short-time withstand current I_k[kA]
Switchgear with evacuation ducts	≥ 2500	≤ 17.5	≤ 40
Switchgear with evacuation ducts or absorber	≥ 2800	≤ 12	≤ 25
	≥ 3000	≤ 12	31.5
	≥ 3500	17.5	≤ 31.5
	≥ 3500	≤ 17.5	40

5.5 Switchgear with absorber



B = panel width / T = panel depth complete

Fig. 5: Dimensions of the switchgear room, absorber

1) For panel replacement: Control aisle ≥ 1250 mm

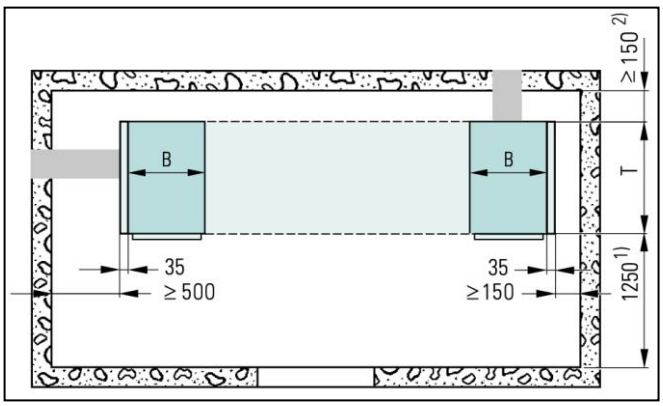
2) For connection from the rear: ≥ 500 mm; also valid with rear connection duct

For contactor panel with panel width 435 mm: ≥ 100 mm

For a panel depth of 1540 mm: ≥ 110 mm

For further information, see information drawings NXAIR, order number 110-2300.9.

5.6 Switchgear with evacuation ducts



B = panel width / T = panel depth complete

Fig. 6: Dimensions of the switchgear room, evacuation duct

1) For panel replacement: Control aisle ≥ 1250 mm

2) For connection from the rear: ≥ 500 mm; also valid with rear connection duct
For contactor panel with panel width 435 mm: ≥ 100 mm
For a panel depth of 1540 mm: ≥ 110 mm

For further information, see information drawings NXAIR, order number 110-2300.9.

All parts of the evacuation duct are included in the scope of supply of the switchgear. The parts of the evacuation duct are made of galvanized sheet steel, thickness 2 mm, with bolted joints M8-8.8.

The following parts can be interconnected and bolted together, cross-section 530x245 mm:
Adapter unit on standard pressure relief duct to the left
Adapter unit on standard pressure relief duct to the right
Adapter unit on standard pressure relief duct to the rear
For further information, see information drawings NXAIR, order number 110-2300.9.

Additional fixing elements must be provided locally.

As a rule, all type tests are performed according to IEC 62271-200 on representative switchgear panels. As mentioned in this IEC, special type tests cannot be performed for all switchgear arrangements. Due to the variety of types, rated values and possible component combinations, every specific arrangement can be substantiated by test data or simulation calculations of comparable arrangements in accordance with the standard. For this reason, and due to the fact that the switchgear rooms will never have exactly the same dimensions, installed equipment, etc., the functionality of these evacuation systems has been evaluated by means of type tests in connection with simulation calculations.

The evacuation duct must be implemented laterally or to the rear.

At least one panel of each busbar section (if bus sectionalizer available) must have one duct system connected laterally or at the rear.

The length of the switchgear and the number of busbar components has no influence on the configuration of the duct system.

Lateral evacuation duct:
The end panel (all available panel versions) used to adapt the evacuation duct must not contain any fittings for busbar voltage transformers, busbar earthing switches or power supply bars/cables from above. Ventilated panels are possible.

Evacuation duct to the rear:
The end panel used to adapt the evacuation duct must not contain any fittings for busbar voltage transformers, busbar earthing switches or power supply bars/cables from above. Adaptation to an individual contactor panel with panel width 435 mm is not possible, only in the middle between two contactor panels with panel width 435 mm.

5.7 Intermediate storage

DANGER

Fire risk

Transport units are packed in flammable materials.

⇨ Keep fire extinguishers in a weatherproof place.

⇨ Mark the location of the fire extinguisher.

WARNING

Transport units falling over

Danger due to transport units falling over, or parts falling down if the storage space is overloaded.

⇨ Observe the load-bearing capacity of the floor.

⇨ Do not stack the transport units.

WARNING

Overloading

While loading and unloading the means of transport and while moving the transport units, there is risk of overloading the human body.

⇨ Use appropriate lifting equipment and floor conveyors.

⇨ At the place of installation, observe the valid limit values for lifting and carrying.

⇨ Do **not** move transport units with bodily power.

⇨ Put on personal protective equipment.

NOTICE

Effectiveness of the desiccants

Supplied desiccant bags lose their effectiveness if they are not stored in the undamaged original packings.

⇨ Do not damage or remove packing of desiccant bags.

⇨ Do not unpack desiccant bags before use.

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

No condensation shall be possible in a suitable storage room; if necessary, air conditioning or heating systems should be installed to avoid condensation.

5.8 Intermediate storage of the transport units

- In original packing as far as possible
- Observe permissible storage temperature from −25 °C to +70 °C.
- In a weatherproof place
- Protected against damage
- If packed in seaworthy crates, the switchgear can be stored for a maximum of 6 months (desiccant bags) at a humidity of max. 60 %
- Store transport units in such a way that they can be taken out later in the correct order for installation.

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

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

If the switchgear or parts thereof are delivered in seaworthy crates, these can be stored up to 6/12 months in other rooms or outdoors. The storage location must have the following characteristics:

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

5.9 Accessories

The following accessories are available:

- Racking crank with protective shield for moving the withdrawable part / switching-device truck
- Push rod for closing/opening the circuit-breaker mechanically
- Hand crank with freewheel for charging the circuit-breaker manually
- Operating lever for feeder and busbar earthing switch
- Operating lever for the switch-fuse combination
- Racking tool for removable voltage transformers
- Double-bit key for low-voltage door
- Double-bit key for withdrawable part / switching-device truck
- Service truck for withdrawable parts
- Installation and operating instructions
- Craning angle
- Slip-on levers for shutter operation (set for left and right side)
- Additional service truck for withdrawable parts
- Wall-mounting holder for accessories
- Earthing accessories (for a panel width of 600 mm and 800 mm)
- Plug-in voltage indicator IEC 61243-5/VDE 0682, Part 415, LRM system for capacitive voltage tap
- Test unit for voltage indicator
- Coupling unit, 64-pole - 3 m long connection between the withdrawable part / switching-device truck and the panel for function testing
- Tin of Longterm 2 grease (used for contact system, earthing switch blades)
- Vaseline (used for busbar and earth connections)
- Grease Isoflex TOPAS L32 (used for shutter linkage, guide of withdrawable part / switching-device truck)
- Sealing compound SIKAFLEX 221 (cartridge)
- Test equipment for pressure switch
- Phase comparison test units
- Electrician's ladder (e.g. for operation of the busbar earthing switch)
- Craning angles to lift the panel with a crane
- Drilling template

The actually delivered accessories depend on the respective switchgear version and the purchase order. For detailed information about the actually delivered accessories, please refer to the packing lists.

5.10 Tools

Items required for correct installation:

- These instructions
- Measuring sheet of the base frame
- Lifting truck
- Several roller pads (reinforced rollers)
- Several strong boards
- Rope or chain with transport shackles
- Reinforcing bars, roller crowbars
- Torque wrench 8 to 20 Nm, 20 to 70 Nm
- Electrical or pneumatic screwdriver with a torque of 110 Nm for hexagon head bolts M16
- Shims 0.5 mm to 1 mm
- Phase tape (L1, L2, L3, gn / ye)
- Plumb bob, nylon thread (kite string or similar)
- Wire brush, copper sponge
- Soft, lint-free cloths
- Brush, cleaning cloth
- Household cleaner
- WD-40 waterproof spray oil

Also useful tools:

- Building site distribution board for 400/230 V AC (50/60 Hz)
- Extensions for 230 V AC (50/60 Hz)
- Hydraulic jack (2 to 3 t for vertical and horizontal stroke)
- Sling ropes
- Transport rollers
- Various pieces of squared timber
- Step-ladders
- Work bench with vice
- 1/2” and 3/8” ratchet spanners with various extensions
- Nuts for M8, M10, M12, M16 and M20
- Ring spanners size 8, 10, 12, 16 and 20
- Open end spanner size 19
- Hexagon socket head key size 6
- Various slotted-head or Torx screwdrivers
- Side cutter
- Water pump pliers
- Various crimping pliers, stripping pliers, flat nose pliers, universal pliers, pointed pliers, etc.
- Water level
- Guide string
- Scriber
- Try-square
- Tape measure
- Thickness gauge (measure the distance in switch-fuse combination)
- Vernier caliper
- Measuring instrument with test probes, measuring cables, clamp-type test probes
- Continuity tester (beeper)
- Site illumination
- Hand lamp
- Pocket lamp
- Vacuum cleaner
- Hammer drill

5.11 Comments on electromagnetic compatibility

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

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

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

These measures basically enable proper operation of the switchgear itself. The planner or operator of the switchgear must decide whether additional measures are required depending on the electromagnetic environment where the switchgear is installed. Such measures must be implemented by the installation company in charge.
In an environment with heavy electromagnetic interference it may be necessary to use shielded cables and wires for the external connections. This makes it possible to avoid interferences in the low-voltage compartment and thus, undesired influences on the electronic protection and control or other automation devices.
Cable shields must be electrically bonded to be able to carry high frequencies, and contacted concentrically at the cable ends.
The shields of cables and wires are connected and earthed in the low-voltage compartment.
Connect the shields to earth potential - with high electrical conductivity and all around as far as possible. Protect the contact surfaces from corrosion in case of humidity (regular condensation).
When laying cables into the switchgear assembly, separate the control, signaling and data cables and other lines with different signal and voltage levels by laying them on separate racks or riser cable routes.
Corresponding to the different shield designs, there is a number of methods to perform connection. The planning department or site management determines which of the methods will be used, taking EMC requirements into account. The preceding points should always be taken into account.
The shield is connected to cables or wires with clamps contacting all around. If low demands are placed on EMC, it is also possible to connect the shield directly to earth potential (combine or twist the shield wires) or via short cable connections. Use cable lugs or wire-end ferrules at the connecting points.
Always keep the connecting leads of the shields as short as possible (< 10 cm).
If shields are used as protective earth conductors at the same time, the connected plastic-insulated lead must be marked green/yellow over its entire length. Non-insulated connections are inadmissible.

5.12 Installation and fixing material without additional earthquake stabilization

Before installing the individual components, the installation and fixing material required has to be prepared.

NOTICE

Damages due to corrosion

Welded seams are susceptible to corrosion.

⇨ After welding, protect the welded seams professionally against corrosion.

Floor fixing versions:

	Bolted floor fixing	Welded floor fixing
Foundation	possible	possible
Double floor	possible	not possible

Version with bolted floor fixing

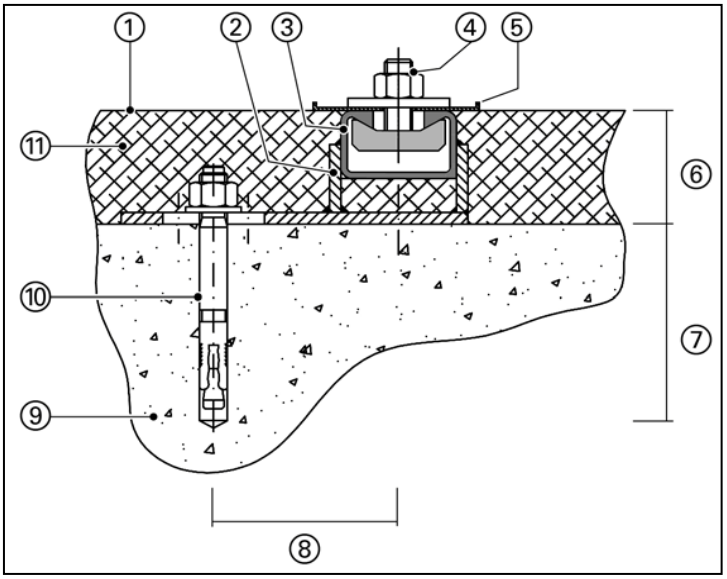


Fig. 7: Bolted floor fixing

(1)	Upper edge of finished floor	(7)	Min. 90 mm
(2)	Floor fixing plate (holder for profiles at a distance ≥ 1200 mm), Fig. 10 "Side view of the fixing plate"	(8)	80 mm
(3)	C-profile CB 50 x 30 x 3, EN 10025, S235JR	(9)	Raw floor
(4)	Hook-head bolt M16x35-4.6-galvanized Washer ISO 7094 - 16 - 100 HV Hexagon nut ISO 4032 – M16 – 8	(10)	Expansion dowel with hexagon head bolt and washer: FAN 12/10
(5)	Base frame of panel	(11)	Floor finish
(6)	Min. 50 mm	—	—

Version with welded floor fixing

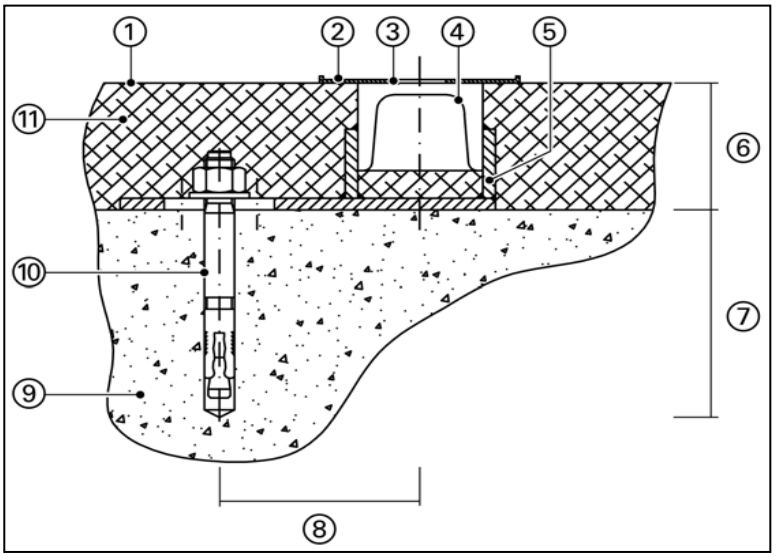


Fig. 8: Welded floor fixing

(1)	Upper edge of finished floor	(7)	Min. 90 mm
(2)	Base frame of panel	(8)	80 mm
(3)	Welding in fixing opening of base frame	(9)	Raw floor
(4)	U-profile U50, DIN 1026	(10)	Expansion dowel with hexagon head bolt and washer, FAN 12/10
(5)	Floor fixing plate (holder for profiles at a distance ≥ 1200 mm), Fig. 10 "Side view of the fixing plate"	(11)	Floor finish
(6)	Min. 55 mm	—	—

Version with fixing on double floor

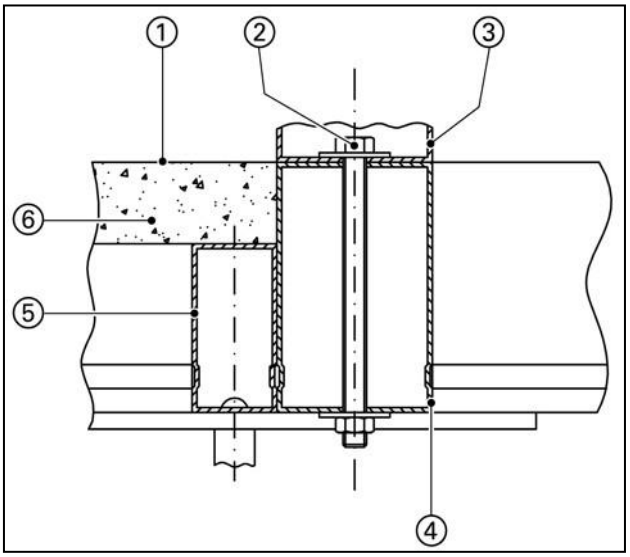


Fig. 9: Fixing on double floor

(1)	Upper edge of double floor	(4)	Substructure
(2)	Hexagon head bolt ISO 4017 – M10 – 8.8 Washer ISO 7093-1 - 10 - 200 HV Hexagon nut ISO 4032 – M10 – 8	(5)	Supporting profile (e.g. profile 70 x 40 x 2)
(3)	Base frame of panel	(6)	Floor plate (approx. 36 mm thick)

Floor fixing plate

NOTICE

Damages due to corrosion

Welded seams are susceptible to corrosion.

⇨ After welding, protect the welded seams professionally against corrosion.

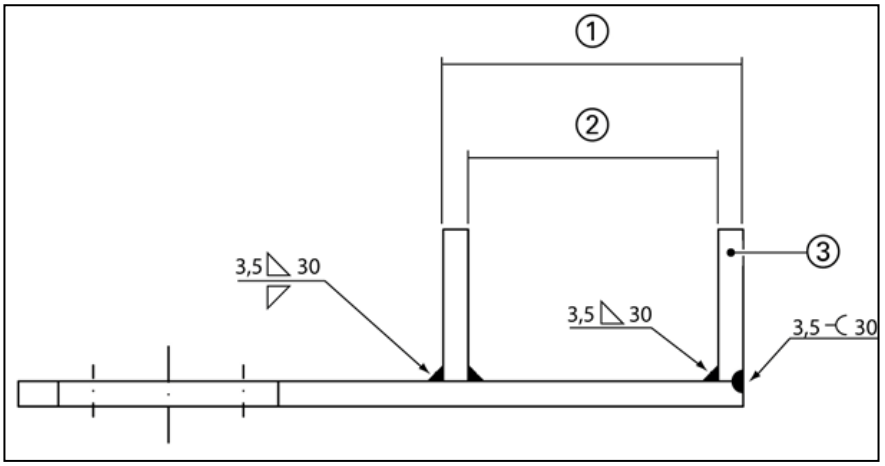


Fig. 10: Side view of the fixing plate

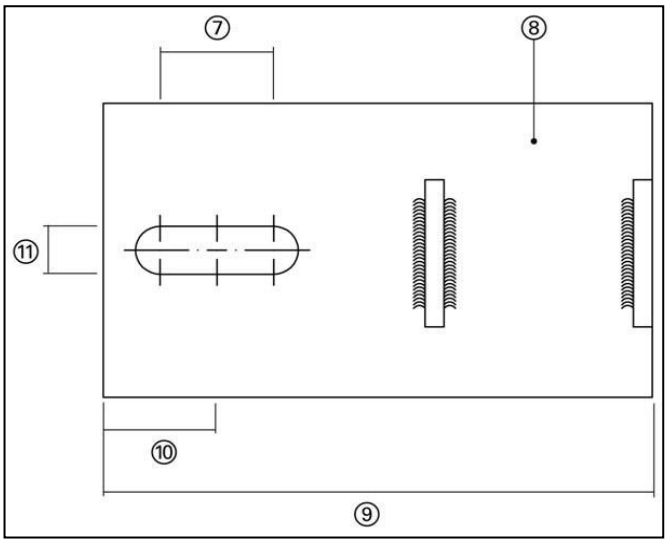


Fig. 11: Top view of the fixing plate

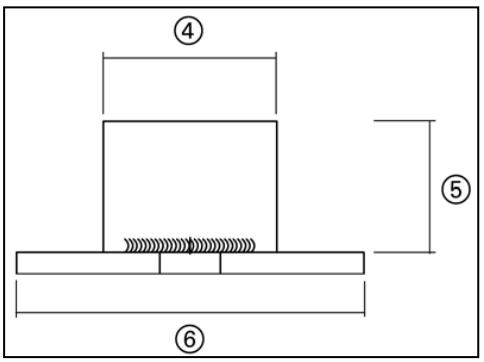


Fig. 12: Front view of the fixing plate

(1)	60 plus 2 mm	(7)	30 plus/minus 1 mm
(2)	50 plus 2 mm	(8)	Plate 80 x 5 x 145 (160) mm, EN 10025, S235 JR, galvanized
(3)	Plate 30 x 5 x 40 mm, EN 10025, S235 JR, galvanized	(9)	145 plus/minus 2 mm
(4)	40 plus/minus 1 mm	(10)	30 mm
(5)	30 plus/minus 2 mm	(11)	13 mm
(6)	80 plus/minus 1.5 mm	—	—

The number and arrangement of the necessary foundation rails of the base frame are illustrated in detail in a dimension drawing. For further information, see information drawings NXAIR, order number 110-2300.9.

5.13 Installation and fixing material with additional earthquake stabilization

Before installing the individual components, the installation and fixing material required has to be prepared.

NOTICE

Vibrations

For panels with additional earthquake stabilization, a welded floor fixing is not allowed.

⇨ Do **not** apply welded floor fixing on panels with additional earthquake stabilization.

Version with bolted floor fixing

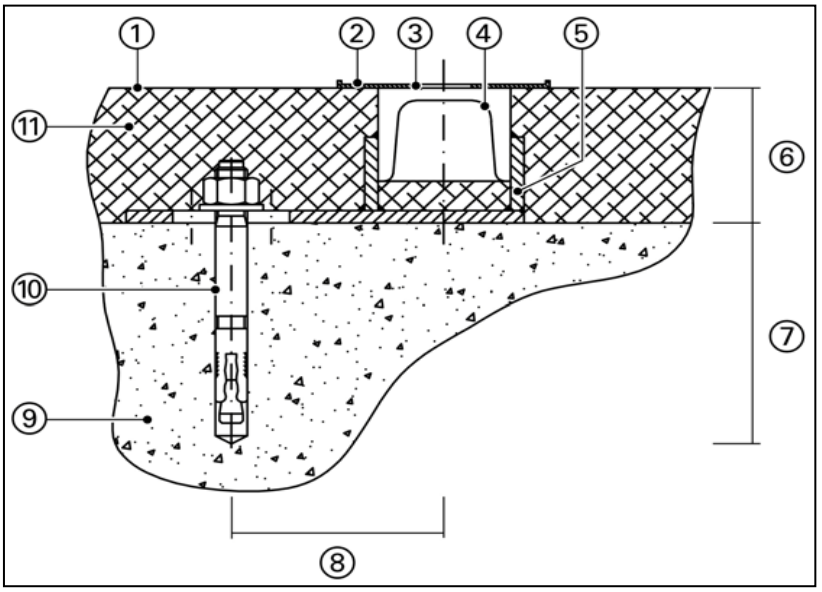


Fig. 13: Bolted floor fixing

(1)	Upper edge of finished floor	(7)	Min. 90 mm
(2)	Base frame of panel	(8)	80 mm
(3)	Thread for bolt M12 in the U-profiles of the base frame	(9)	Raw floor
(4)	U-profile U60, DIN 1026	(10)	Expansion dowel with hexagon head bolt and washer, FAN 12/10
(5)	Floor fixing plate (holder for profiles at a distance ≥ 1200 mm), Fig. 14 "Fig. 14: Side view of the fixing plate"	(11)	Floor finish
(6)	Min. 55 mm	—	—

Floor fixing plate

NOTICE

Damages due to corrosion

Welded seams are susceptible to corrosion.

⇨ After welding, protect the welded seams professionally against corrosion.

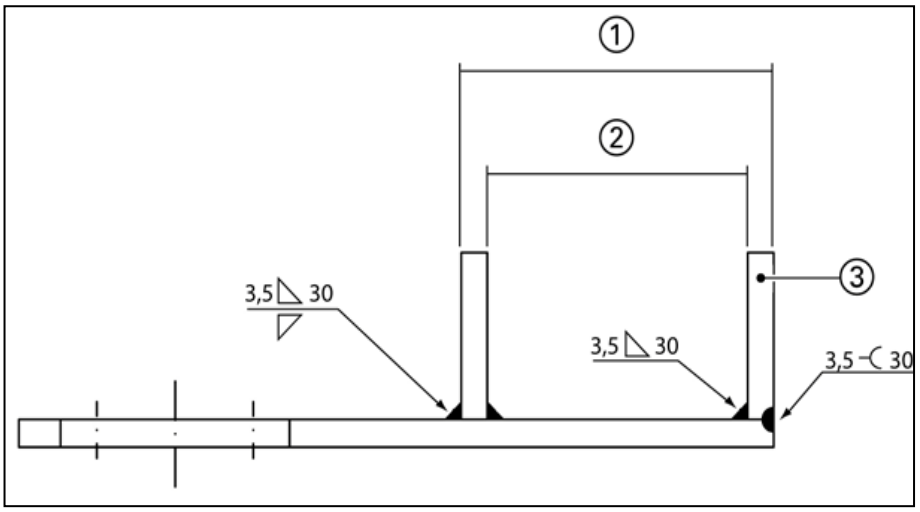


Fig. 14: Side view of the fixing plate

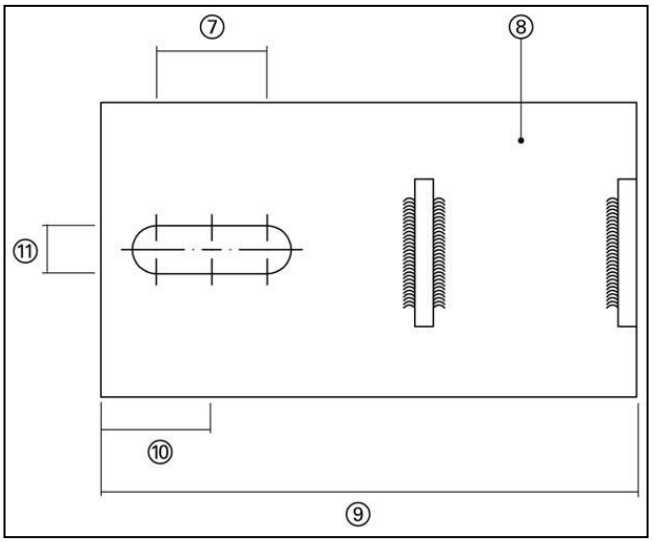


Fig. 15: Top view of the fixing plate

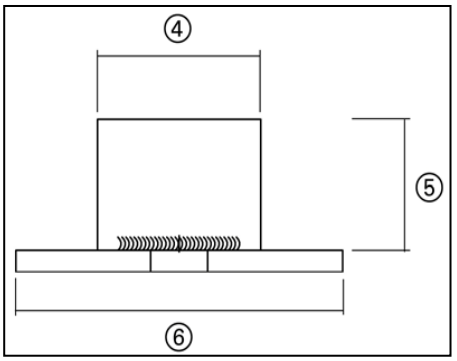


Fig. 16: Side view of the fixing plate

(1)	70 plus 2 mm	(7)	30 plus/minus 1 mm
(2)	60 plus 2 mm	(8)	Plate 80 x 5 x 145 (160) mm, EN 10025, S235 JR, hot-dip galvanized
(3)	Plate 45 x 5 x 40 mm, EN 10025, S235 JR, hot-dip galvanized	(9)	145 plus/minus 2 mm
(4)	45 plus/minus 1 mm	(10)	30 mm
(5)	40 plus/minus 2 mm	(11)	13 mm
(6)	80 plus/minus 1.5 mm	—	—

The number and arrangement of the necessary foundation rails of the base frame are illustrated in detail in a dimension drawing. For further information, see information drawings NXAIR, order number 110-2300.9.

5.14 Drilling template for additional earthquake stabilization

As support to determine the marking points of the threaded holes M12, a drilling template is available as an optional accessory. Exchangeable elements enable quick and easy adjustment of the drilling template to the base layout of the respective panel on site. The drilling template supports both lining up of another panel to the left and lining up to the right.
The necessary installation and fixing material, such as threaded bolts M12x45 and suitable plain washers, is supplied with the supplementary equipment of the respective panel.

NOTICE

Incorrect alignment

To avoid misdrilling and incorrect alignment of the panels:

⇨ Align the drilling template only on a panel that is already exactly aligned and fixed.

⇨ Do **not** align the drilling template via another drilling template or other markings.

⇨ For information about the assembly of the drilling template for the respective panel and the drillings to the performed, see information drawings NXAIR, order number 110-2300.9.

Overview of drilling template

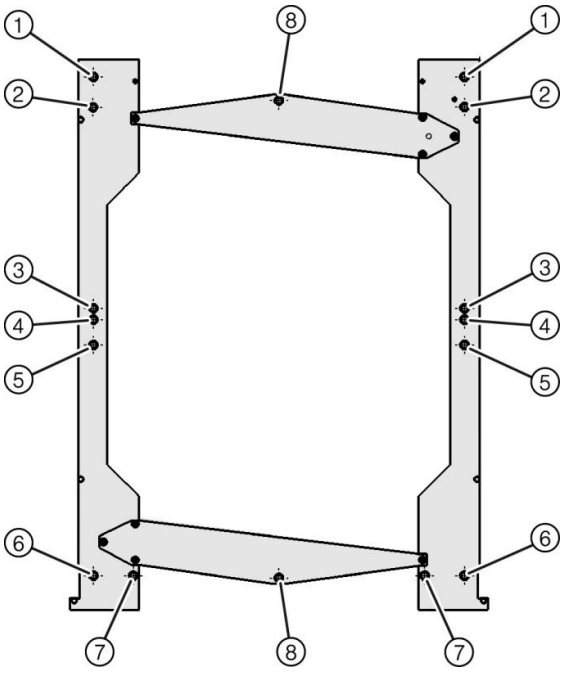


Fig. 17: Drilling template, arrangement for 1000 mm panel width as an example

Panel width [mm]	Earthquake stabilization	Drilling points:							
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
435	x	**x**	-	-	**x**	-	**x**	-	**x**
600	x	-	**x**	**x**	-	**x**	**x**	-	**x**
800	x	-	**x**	**x**	-	**x**	**x**	-	**x**
1000	x	-	**x**	**x**	-	-	-	**x**	**x**

Preparing installation

Preconditions

- Drilling template available for the respective panel version
- At least one panel exactly aligned (3) and bolted onto the foundation rails of the base frame

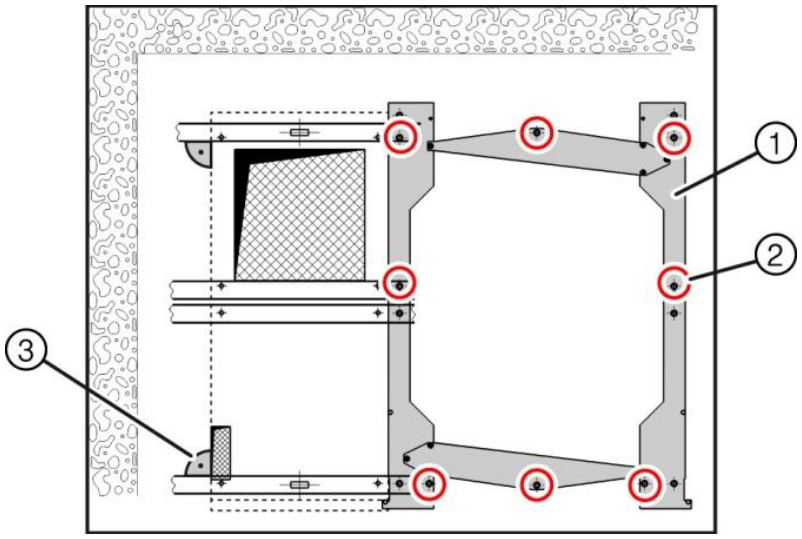


Fig. 18: Applied drilling template, arrangement for 1000 mm panel width as an example

Procedure

⇨ Assemble the drilling template to suit the next panel to be marked, and bolt together (1).

⇨ Apply the drilling template as planned on the left or right side of the already positioned and fixed panel.

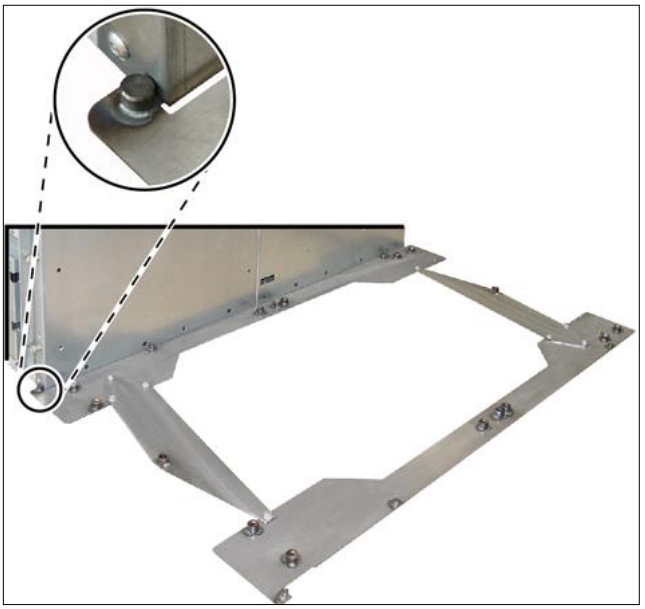


Fig. 19: Applied drilling template, here at the right side of the panel as an example

⇨ Provide markings according to the panel version (2).

⇨ Remove the drilling template.

⇨ Perform drillings according to the markings.

⇨ Clean the working area.

✓ The panel can now be exactly positioned and bolted together.

6 Unloading and erection

INFORMATION

Read and understand these instructions before attempting unloading and erection works.

6.1 Transport units and packing

The switchgear is delivered in transport units. These transport units consist of individual panels without mounted busbar. Accessories are packed separately and included with the switchgear.

Transport packing

Freight and storage	Packing type
Road and air freight without intermediate storage	Panels on pallets and open packings with PE protective foil over the panels
Sea, road and air freight with intermediate storage	Panels on pallets in closed crate, with sealed upper and lower PE protective foil, with desiccant bags, with hermetically sealed wooden base (max. storage time: 6 months)

6.2 Unloading

DANGER

Transports falling down or over

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

- ⇨ Please ensure that the lifting and transport gear used meets the requirements as regards construction and load-bearing capacity.
- ⇨ Use appropriate lifting equipment and floor conveyors.
- ⇨ Observe the center of gravity of the transport units.
- ⇨ Secure the transport units against tipping.
- ⇨ Move the transport units slowly and carefully.
- ⇨ Do not move transport units with bodily power.
- ⇨ Do not climb onto the roof of the panels.
- ⇨ Put on personal protective equipment.

NOTICE

Damage to the withdrawable part / switching-device truck

The withdrawable part / switching-device truck is an integral part of the transport unit, and can only be removed after lifting the panel from the wooden pallet and placing it directly on even firm ground. Normally, this is only the case inside the switchgear room.

⇨ Do not try to remove the withdrawable part / switching-device truck while the panel is standing on the wooden pallet.

⇨ Do not move the service truck in front of the panel if the panel is not standing directly on the floor.

⇨ Observe the instructions on the packing.

⇨ Attach ropes, chains, heavy weight slings and comparable means far enough on the hoisting tackle so that they cannot exert any forces on the panel walls under load.

⇨ Use the crane cross-member.

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

⇨ Do not damage the PE protective foil while unloading.

⇨ Set the transport units down as close to the switchgear building as possible in order to avoid unnecessary ways.

⇨ Move the transport units into the building. Only remove packing where absolutely necessary in order to keep the switchgear as clean as possible.

6.3 Checking for completeness and transport damage

⇨ Temporarily open the packing in a weatherproof place, preferably in the building.

⇨ Immediately determine and record any damage (and the cause thereof if possible). In case of transport damage, do this together with the forwarding agent.

⇨ If necessary inform the claims agent about the transport damage.

⇨ Repair transport damage or have it repaired, otherwise you may not start installation.

⇨ Check whether the delivery is complete using the delivery notes and packing lists. If the delivery is incomplete, inform the regional Siemens representative.

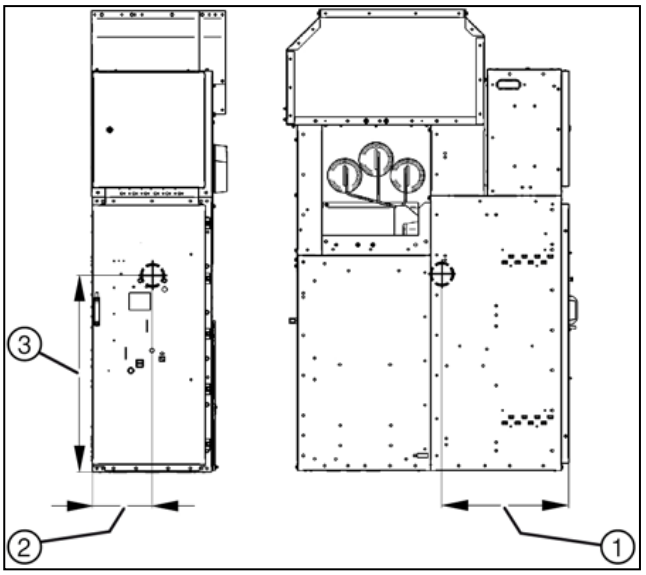
⇨ Re-pack the switchgear as far as possible and reasonable. Do not remove the PE foil until reaching the place of installation in order to keep the switchgear as clean as possible.

6.4 Center of gravity of the panel

On the packing of each panel, at the front and on the right and left sides, the position of the center of gravity is marked. The position of the center of gravity is marked with the following symbol:

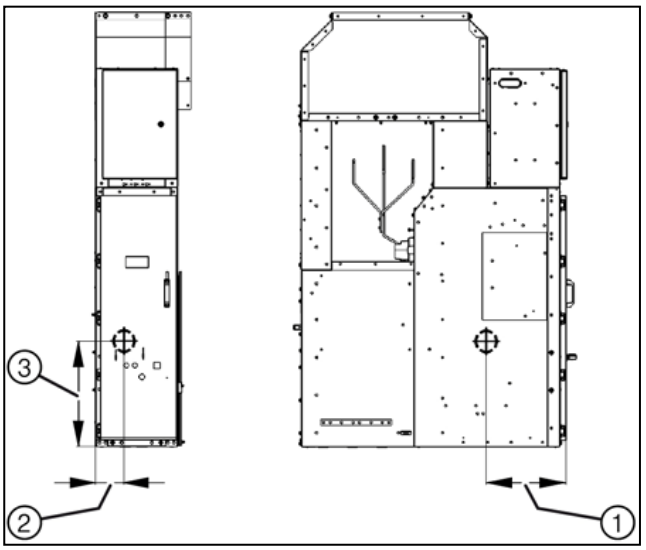
Fig. 20: Symbol for center of gravity

The position of the center of gravity of a panel depends on the panel version.



(1) 630 mm
(2) 400 mm
(3) 980 mm

Fig. 21: Position of the center of gravity, for example for a circuit-breaker panel width of 800 mm



(1) 390 mm
(2) 145 mm
(3) 560 mm

Fig. 22: Position of the center of gravity, for example for a contactor panel width of 435 mm

6.5 Transport weights and dimensions without packing

Panel type NXAIR (without rear duct)	Short-time current	Busbar version	Feeder current	Panel width (W)	Panel depth (D)	Panel height (H)	Weight approx.
	[kA]	[A]	[A]	[mm]	[mm]	[mm]	[kg]
Circuit-breaker panel	≤ 31.5	1250/ 2000/ 2500	600/1000	600	1350/1500	2300/ 2350/ 2450/ 2500	950
Circuit-breaker panel			1000/ 1250/ 2000	800			1170
Disconnecting panel							
Metering panel							
Circuit-breaker panel			2500	1000			1250
Disconnecting panel							
Contactor panel			≤ 400	435	1400		750
Switch-disconnector panel		1250/ 2500	200	800	1350		650
Circuit-breaker panel		3150/ 4000	1250	800	1500		1180
Disconnecting panel							
Circuit-breaker panel			2500	1000			1330
Disconnecting panel							
Circuit-breaker panel			3150/ 4000		1540/1650		1650
Disconnecting panel							
Metering panel			-	800	1500		840
Contactor panel			≤ 400	435			770
Switch-disconnector panel			200	800	1500		700
Circuit-breaker panel	40	1250/ 2500 3150/ 4000	1250	800	1500		1210
Disconnecting panel							
Circuit-breaker panel			2000				1320
Disconnecting panel							
Circuit-breaker panel			2500		1500		1380
Disconnecting panel							
Circuit-breaker panel				1000	1500		
Disconnecting panel							
Circuit-breaker panel			3150	800	1540/1650		1650
Disconnecting panel							
Circuit-breaker panel			3150/ 4000	1000	1540/1650		
Disconnecting panel							
Metering panel			-	800	1500		840
Contactor panel			≤ 400	435			770

Additional weight of rear duct

	Panel width (W)	Duct depth (D)	Weight approx.
	[mm]	[mm]	[kg]
Rear duct with cables	600	600	250
Rear duct with cables	800	600	250
Rear duct with cables	1000	600	350

For further information, see information drawings NXAIR, order number 110-2300.9.

6.6 Transport to the place of installation (switchgear room)

There are a number of methods that can be used in handling the transport units. The handling method used will be determined by conditions and available equipment at the installation site. Lifting with a crane is the preferred method of handling; however, overhead obstructions or low ceilings often dictate that other methods must be used. Rollers, jacks or fork-lift trucks may be used prior to removal the switchgear from the wooden pallets.

⇨ Thoroughly clean the switchgear room, since extreme cleanliness is required during installation.

⇨ Move the transport units on their wooden pallets as far as possible.

⇨ Move the transport units to the switchgear room in the order of installation.

⇨ Inside the building, move the transport units to the place of installation using a lifting truck, fork-lift truck or rollers.

⇨ Set down the transport units in the correct sequence directly in front of the place of installation.

⇨ Leave enough clearance between the transport units to perform installation work.

6.7 Removing the transport units from the wooden pallets

⚠ DANGER

Transports falling down or over

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

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

⇨ Observe the center of gravity of the transport units.

⇨ Secure the transport units against tipping.

⇨ Move the transport units slowly and carefully.

⇨ Do not move transport units with bodily power.

⇨ Do not climb onto the roof of the panels.

⇨ Put on personal protective equipment.

NOTICE

Damage to the withdrawable part / switching-device truck

The withdrawable part / switching-device truck is an integral part of the transport unit, and can only be removed after lifting the panel from the wooden pallet and placing it directly on even firm ground. Normally, this is only the case inside the switchgear room.

⇨ Do not try to remove the withdrawable part / switching-device truck while the panel is standing on the wooden pallet.

⇨ Do not move the service truck in front of the panel if the panel is not standing directly on the floor.

The transport units are screwed onto the wooden pallets. If they can no longer be transported together with the pallets, they are removed as follows:

⇨ Lift PE foil about 30 cm.

⇨ Undo the screwed angle brackets from the wooden pallet; one each at the front and rear at the bottom of the panel.

⇨ Remove both angle brackets from the panel and then screw the hexagon head bolts again into the open bolted joints (1) at the front and rear of the panel.

⇨ Dispose of the angle brackets.

⇨ Additionally for contactor panels with panel width 435 mm: Screw all hexagon head bolts (2) out of the two transport retainers (3). Remove the transport retainers and dispose of them together with the bolts.

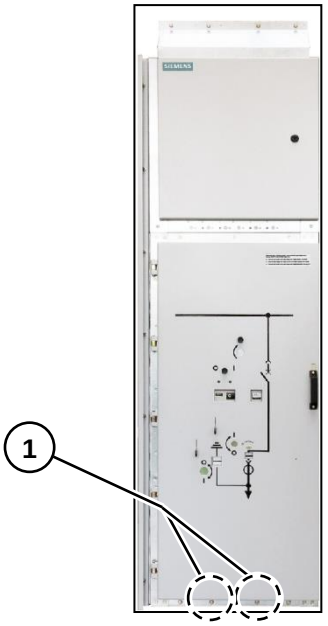


Fig. 23: Circuit-breaker panel

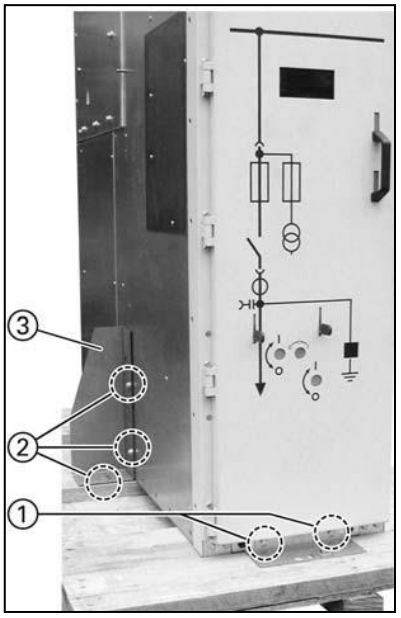


Fig. 24: Contactor panel with panel width 435 mm

(1) Bolted joints of the angle brackets

(2) Bolted joints of the transport retainers

(3) Left-hand transport retainer (also available on the right as a mirror image)

6.8 Applying the lifting tool at the panel

⚠ WARNING

Overloading

While moving panels, there is risk of overloading the human body.

- ⇨ Use only suitable lifting tools.
- ⇨ At the place of installation, observe the valid limit values for lifting and carrying.
- ⇨ Put on personal protective equipment.

NOTICE

Damage to the switchgear panels

Direct application of lifting tools at the panel can cause damages.

- ⇨ Do **not** apply lifting tools such as roller crowbars at the sides or the rear of the panel.
- ⇨ Do **not** apply lifting tools such as roller crowbars at the front of the panel if the high-voltage door is closed.

Correct application of lifting tool

Applying the lifting tool at the sides of the switchgear frame is permissible if the high-voltage door is open.

⇨ Leave an appropriate distance to the inner edge of the door (arrow) on the side with the high-voltage door when doing so.

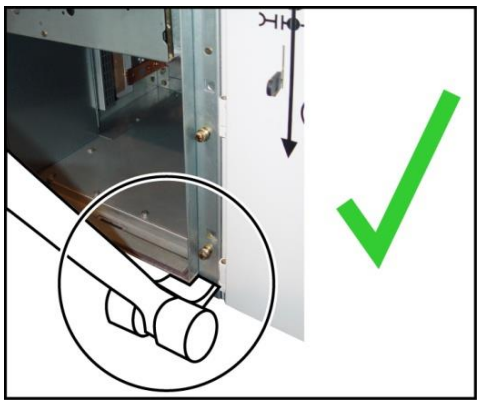


Fig. 25: Permissible application on the right below the switchgear frame

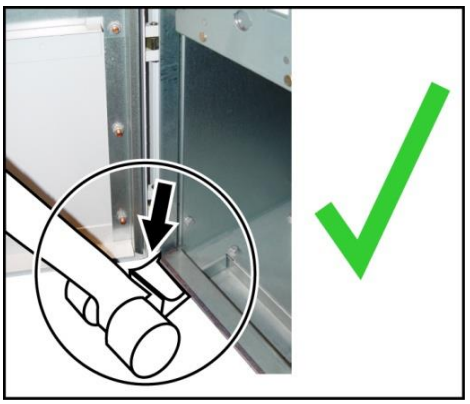


Fig. 26: Permissible application on the left below the switchgear frame

Incorrect application of lifting tool

Not permissible application of a lifting tool:

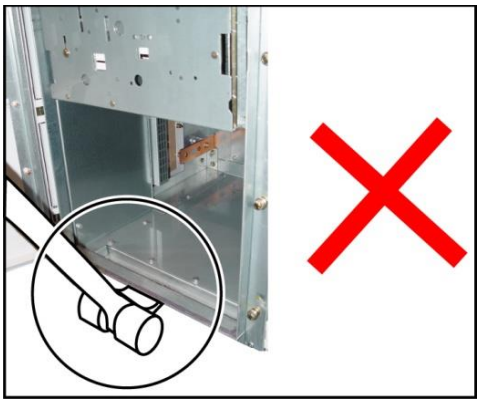


Fig. 27: Incorrect application of lifting tool

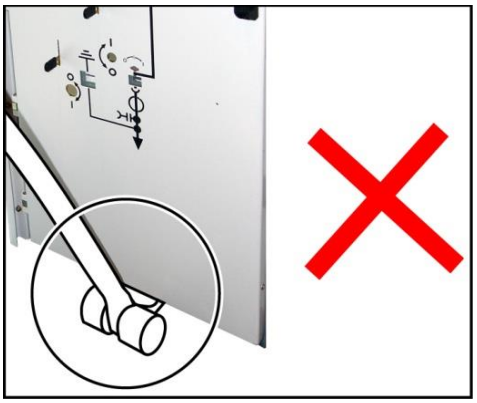


Fig. 28: Incorrect application of lifting tool

6.9 Mounting the craning angles

The craning angles are delivered in a set. The set comprises the craning angles and the necessary bolted joints. Depending on the panel version, 3 or 4 craning angles must be mounted on the panel.

NOTICE

Mounting the craning angles

Depending on the panel version, different craning angles of the set are to be mounted.

- ⇨ Craning angle at the side of the panel: 3 bolted joints M8x20.
- ⇨ Craning angle at the rear of the panel:
  2 bolted joints M8x20.
- ⇨ Observe the information drawings NXAIR, order number 110-2300.9.

INFORMATION

The craning angles allow the use of crane rods as well as the attachment of crane hooks to transport the panels without wooden pallet.

Craning angles according to panel design
In the following, the craning angles and their mounting locations are exemplarily shown for some panel versions to explain the principles.

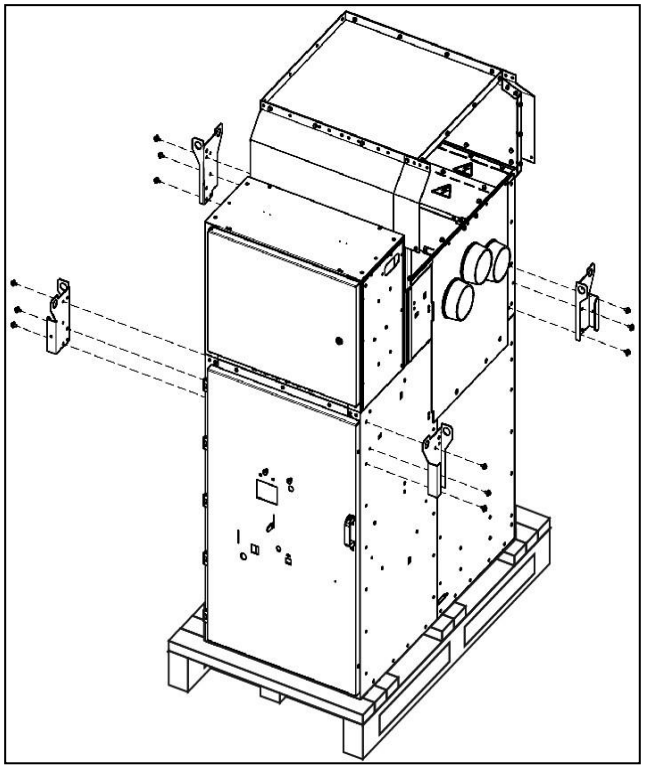


Fig. 29: Example for a panel without end wall:
4 craning angles with 3 bolted joints M8x20 each

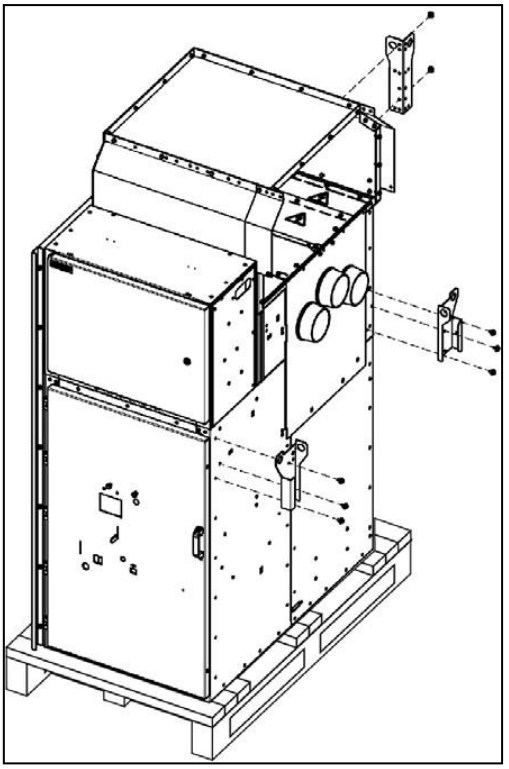


Fig. 30: Example for a panel with end wall:
3 craning angles with 3 or
2 bolted joints M8x20 each

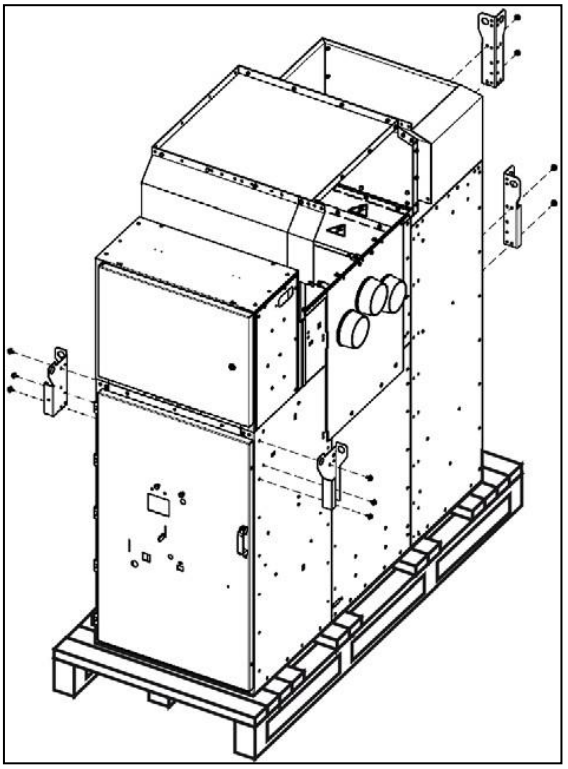


Fig. 31: Example for a panel with rear duct:
4 craning angles with 3 or 2 bolted joints M8x20 each

Mounting the craning angles
Cut PE foil open to mount the craning angles.

INFORMATION

Depending on the panel version, the craning angles at the rear of the panel can be mounted at different heights.

⇨ First, bolt the craning angles laterally at the front of the panel.

⇨ Then bolt the craning angles laterally at the rear of the panel, at the same height as at the front.

⇨ According to the panel version, select the suitable craning angles from the set (see preceding illustrations or also information drawings NXAIR, order number 110-2300.9).

⇨ Bolt each craning angle with 2 or 3 bolts M8x20 onto the panel at the corresponding position.

⇨ Tighten the bolted joints M8 with a tightening torque of 30 Nm.

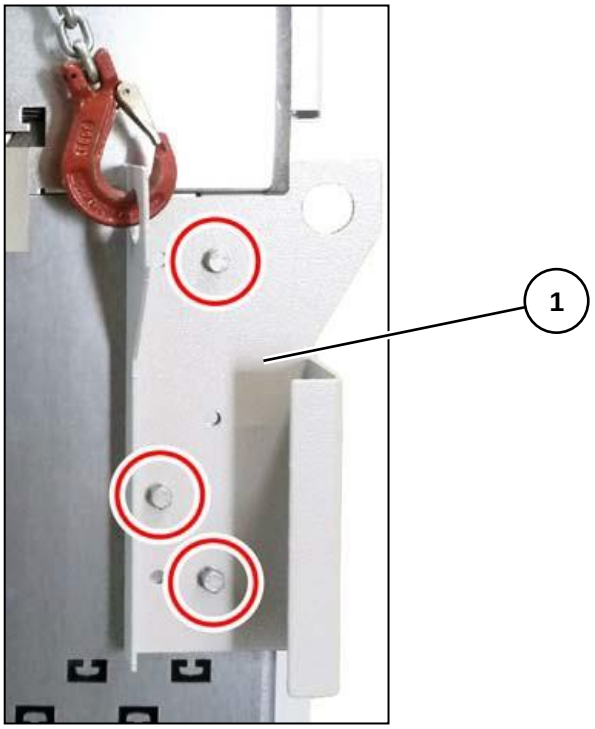


Fig. 32: Craning angle (1) mounted at the side of the panel front (3 bolted joints), shown here with crane hooks

Panels with end wall
For panel versions with end wall, the craning angle at the panel front, on the side of the end wall, is omitted. The crane rod is pushed through the end wall.

⇨ Push the sealing stopper (1) out of the end wall to clear the opening for the crane rod.

⇨ Lay the sealing stopper down in the low-voltage compartment, and keep it. The sealing stopper is pushed back into the end wall at the end of installation.

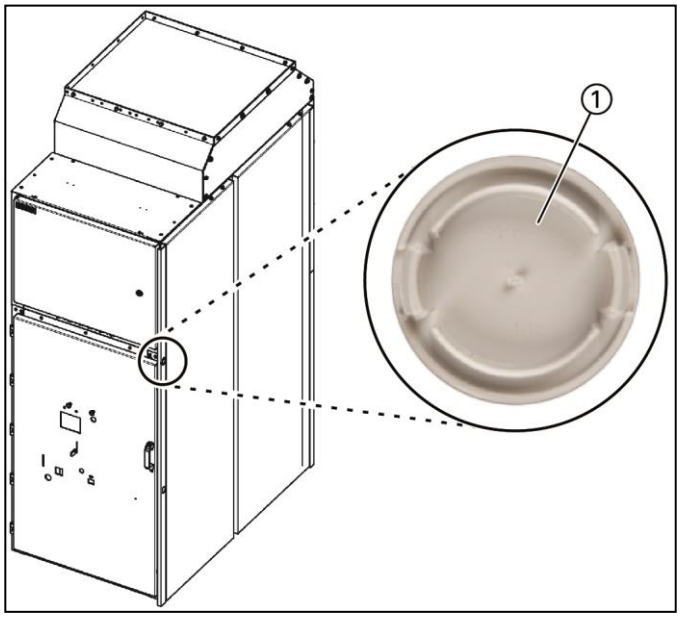


Fig. 33: End panel as an example

6.10 Lifting with crane rods

After mounting the craning angles on the panel, two crane rods of the same length can be pushed in per panel. A crane with heavy weight slings can lift the panel by means of these crane rods.
Crane rods are **not** an integral part of the scope of supply of the switchgear.

⚠ DANGER

Transports falling down or over

If the crane rods are applied incorrectly, or if incorrect crane rods are used, there is risk of injury. Crane rods are non-fixed load lifting attachments according to EN 13155.

⇨ Observe the requirements and instructions from EN 13155.

⇨ Use exclusively crane rods complying with the specification of these instructions.

Design/specification of the crane rods (2)

Material	Diameter	Length	Assembly parts:
S355JR	25 mm	> 1200, > 1600, > 1900 mm	(1) Locking cotter pin (3) Washer size 27 according to ISO 7089

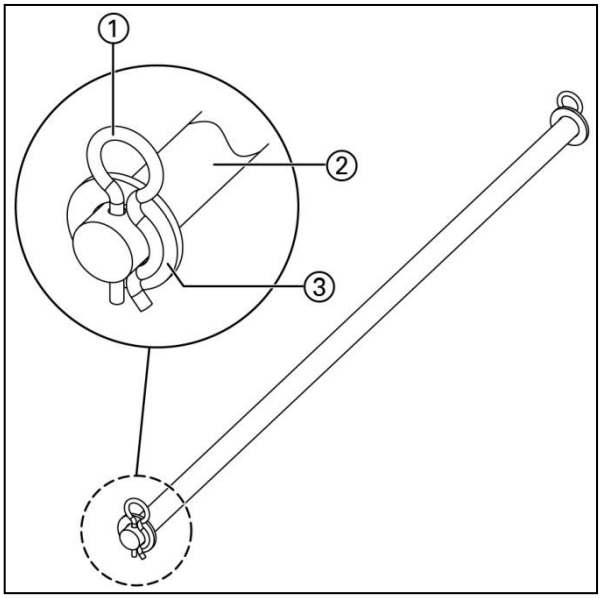


Fig. 34: Design of crane rods

Length of crane rods
The required length of the two crane rods depends on the panel version.

Panel width [mm]	Panel depth [mm]	End wall	Rear duct	Length of crane rods B [mm]		Protrusion A [mm]
				Front/rear	Lateral	
600	1350, 1500	Without	Without	1200	1900	> 300
	1950, 2100	With		1200	—	
800	1350, 1500	Without		1600	1900	
	1950, 2100	With		1600	—	
1000	1350, 1500, 1540, 1650	Without		1600	1900	
	1950, 2100, 2140, 2250	With		1600	—	
600	1950, 2100	Without	With	1200		
800	1950, 2100			1600		
1000	1950, 2100, 2140, 2250			1600		
435	1400, 1500		—	1200	1900	
435	1400, 1500	With		1200	—	

Attaching the crane rods
Depending on the panel version, the crane rods are attached differently.

The following examples show the basic attachment of the crane rods. For further information, see information drawings NXAIR, order number 110-2300.9.

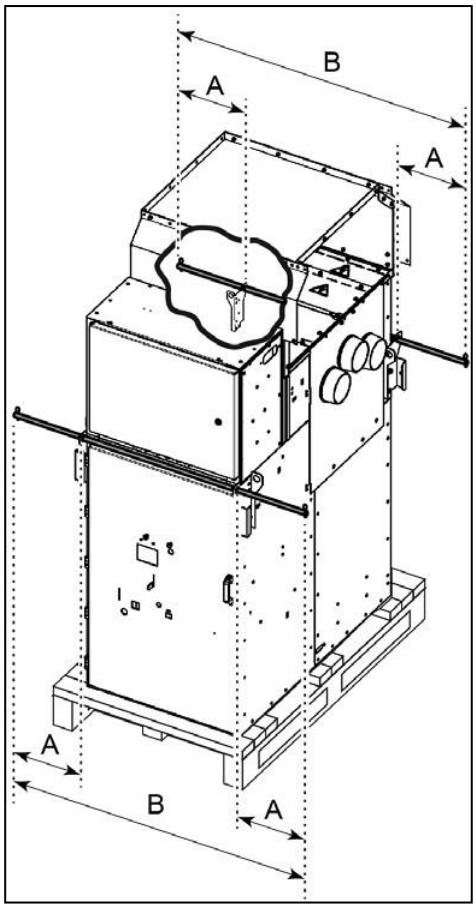


Fig. 35: Crane rods at the front and rear

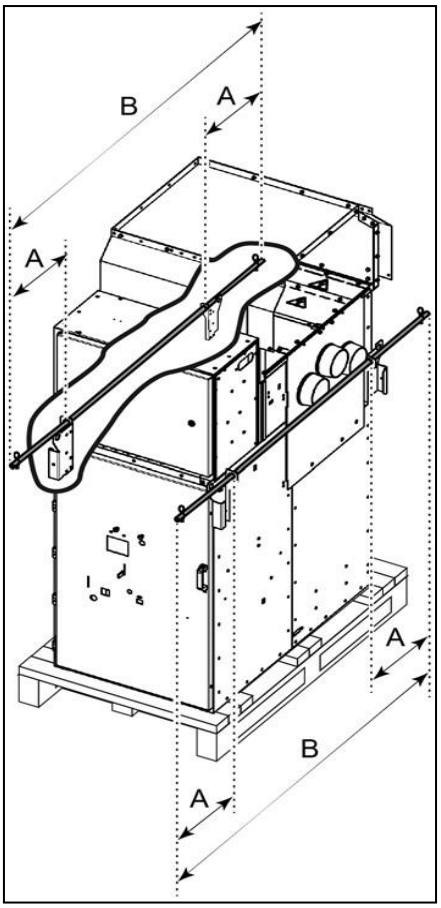


Fig. 36: Crane rods at the side

The two crane rods can be pushed into the craning angles at the front and rear on all panels. Depending on the panel version, it is also possible to push the crane rods in at the side of the panel.

⇨ Pull out the locking cotter pin, remove the washer, and push the crane rod through the craning angles at the panel. Then, slide the washer onto the crane rod again, and fit the locking cotter pin.

⇨ If required, move the crane rod until protrusion A is the same at both ends of the crane rods.

⇨ Check protrusion A at the ends of the crane rods: > 300 mm.

Attaching heavy weight slings
The heavy weight slings are to be attached to the protrusions A of the crane rods.

⇨ Place the heavy weight slings on the crane rods as close as possible to the craning angles. Do **not** attach the heavy weight slings to the ends of the crane rods.

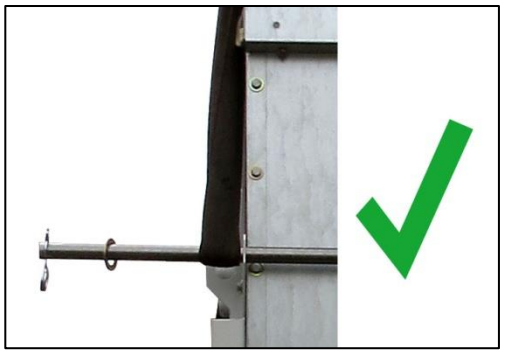


Fig. 37: Heavy weight sling attached correctly

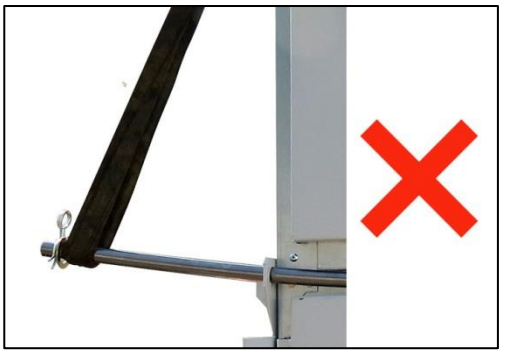


Fig. 38: Heavy weight sling attached incorrectly

Distances:

(1) Clearance between crane rod and crane hook: > 2000 mm

(2) Protrusion A: > 300 mm

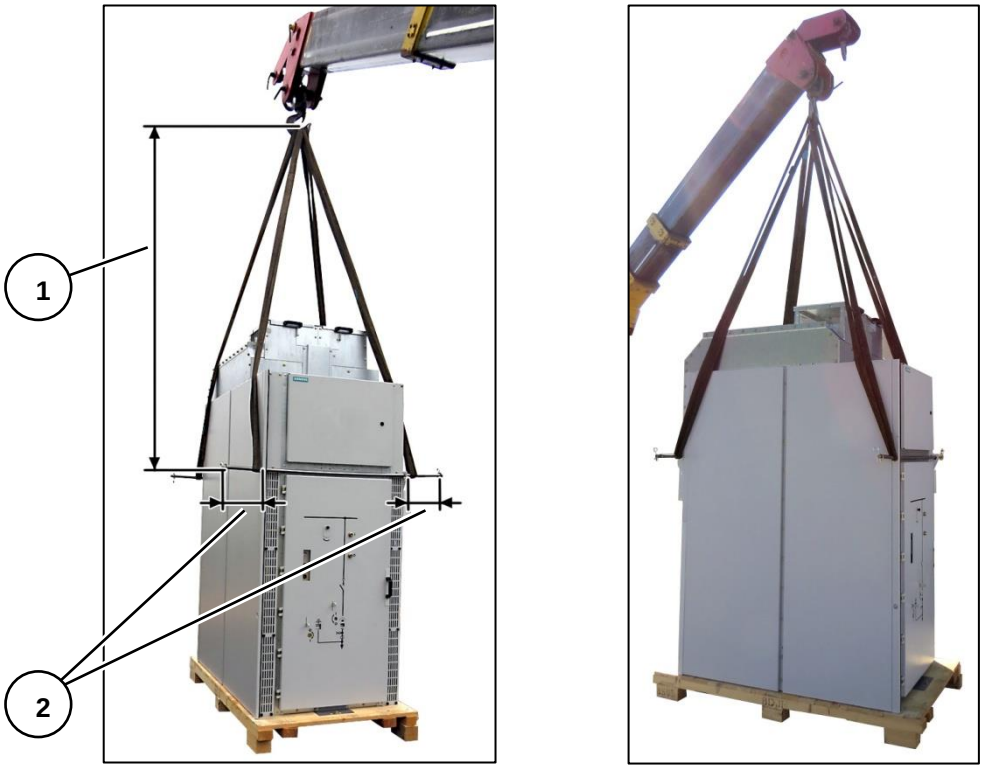


Fig. 39: Distances for craning

✓ The panel is prepared for craning with crane rods.

6.11 Lifting by means of chains and crane hooks

⚠ DANGER

Transports falling down or over

Non-observance of the weight loads of the panels can endanger people or damage the transport units while unloading.

- ⇨ Ensure that the lifting gear used meets the requirements of the weight loads of the transport units from the table on page 30 as a minimum.
- ⇨ Attach crane hooks directly at the craning angle.
- ⇨ Observe the installation height of the crane cross-member consequently.
- ⇨ Lift transport units with end wall only by means of crane rods.

NOTICE

Damages due to impacts

Chains and crane hooks may cause damages due to impacts on the transport unit.

- ⇨ Secure the chains, hooks and affected areas of the transport unit with pads.

Mounting the crane cross-member

Panel width [mm]	Length 1 [mm]	Length 2 [mm]
435	1500	520
600	1500	680
800	1500	880
1000	1500	1080

⇨ According to the guide of the crane cross-member, attach the crane hooks at the side of the panel or at the front and rear to the craning angles.

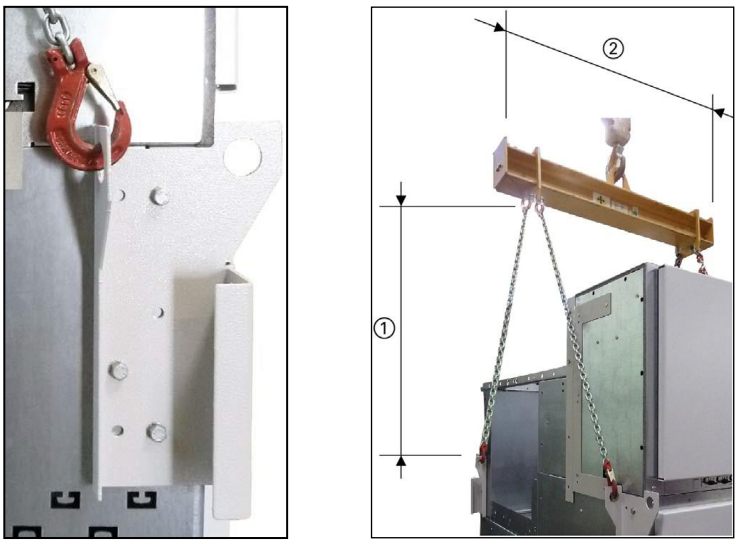


Fig. 40: Transport unit suspended from a crane cross-member

✓ The panel is prepared for craning with chains and crane hooks.

Removing the craning angles

INFORMATION

After having craned a transport unit and removed the lifting equipment:

- ⇨ Unscrew all craning angles from the panel.
- ⇨ Keep the craning angles and bolted joints for later use.

⇨ Remove the connecting elements from the craning angles (1).

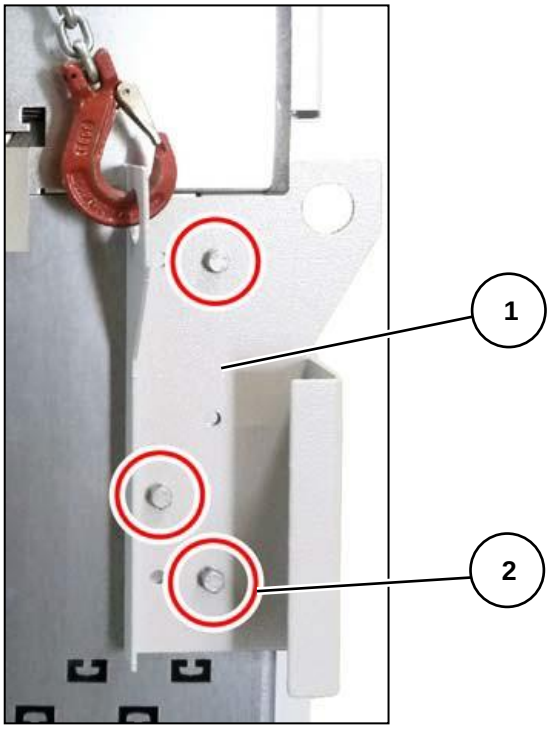


Fig. 41: Craning angle (1) mounted at the side of the panel front (3 bolted joints), shown here with crane hooks

NOTICE

Removing the craning angles

After removing the craning angles from the panel, in case that any connection holes at the rear side of panel are identified which might not covered by the adjacent panel, these holes are closed with sealing compound.

- ⇨ Connection holes at the corresponding position of the panel (2) must be sealed with SIKAFLEX 221-GR 310 ML compound to achieve the degree of protection of the switchgear.

6.12 Further transport without wooden pallets

There are several methods that can be used in handling the further transport without wooden pallet. Panel transportation on the site is under the responsibility of the customer. The handling method used will be determined by conditions and available equipment at the installation site. The hydraulic lifters, roller pads or other transportation devices can be used for the transportation.

Hydraulic lifters, roller pads or other transportation devices are **not** an integral part of the scope of supply of the switchgear.

⚠ DANGER

Transport units falling down or over

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

- ⇨ Please ensure that the lifting and transport gear used meets the requirements as regards construction and load-bearing capacity.
- ⇨ Observe the center of gravity of the transport units.
- ⇨ Secure the transport units against tipping.
- ⇨ Move the transport units slowly and carefully.
- ⇨ Put on personal protective equipment.

If the transport units cannot be directly lifted from the wooden pallets onto their place of installation:

Roller pads:

- ⇨ Lower the transport unit onto boards placed on roller pads (reinforced rollers), i.e. one board placed on two roller pads. Distribute the roller pads so as to support the outer edges of the transport unit.
- ⇨ Lift one side, then the other side of the transport unit and slowly lower it on the place of installation.

Fig. 42: Transport unit placed on roller pads

✓ The panel is placed on the floor at the place of installation.

Hydraulic lifter:

⇨ Since the hydraulic lifter consists of two parts, it is necessary for two persons to operate it.

⇨ Before transporting the panel, the platforms of the hydraulic lifter should be lowered to the floor until the hydraulic lifter is standing vertically.

⇨ Push the platform of the hydraulic lifter under the front and rear sides of the switchgear panel.

Ensure that the transportation platform is placed on the underside of switchgear frame; it must not be placed on the underside of the high-voltage door. The centers of the platform must be beneath the center of gravity of the panel.

⇨ Place the securing straps in position and tighten them. The securing strap, which has to be fastened correctly on both sides, is an additional absolute necessity.

⇨ Move the hydraulic lifter with the panel slowly and carefully.

Fig. 43: The panel placed on hydraulic lifter

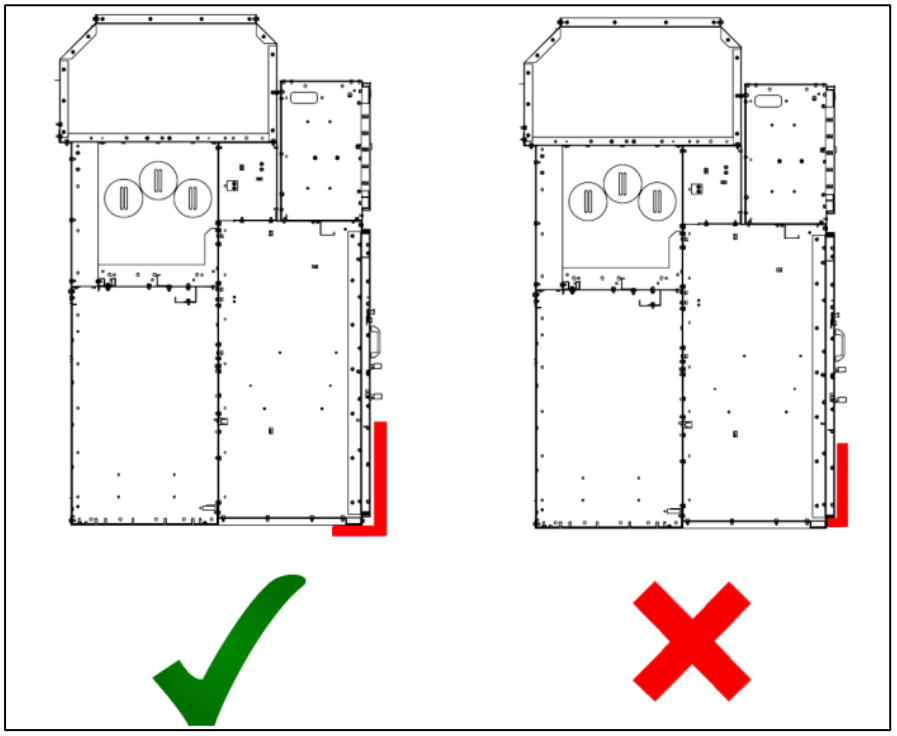


Fig. 44: Permissible application on the switchgear frame

6.13 Installing the transport units

Positioning the panels

⇨ Determine, according to the room planning, whether to start from the right or from the left. Accordingly, the outermost left-hand or the outermost right-hand panel with end wall will be the first in this order.

⇨ Lift the transport unit with suitable lifting gear or roller crowbar at the permissible points.

⇨ Place the first (i.e. rearmost) transport unit as exactly as possible on its place of installation and place the second one at a distance of approx. 300 mm, so that the units can still be aligned before bolting together.

⇨ Remove packing and transport materials from the place of installation. Remove any dirt occurred during transport, as extreme cleanliness is required during installation.

✓ The transport units are now in the correct order for assembling the switchgear.

6.14 Foundation cutouts

INFORMATION

Dimensions of foundation cutouts

The dimension drawing containing all relevant dimensions of the foundation cutouts for different panel versions is **not** part of these instructions. For further information, see information drawings NXAIR, order number 110-2300.9.

6.15 Transport protection at the service truck

In order to prevent transport damages, the service truck is equipped at the factory with a plate for transport protection. This transport protection must be removed before the first use of the service truck, and may be disposed of.

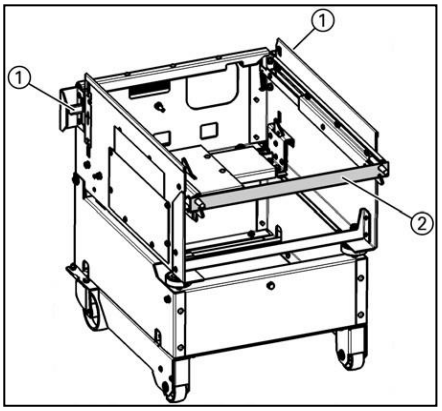


Fig. 45: Service truck with transport protection

⇨ Lift the left and right unlocking levers (1) at the service truck, and hold them.

⇨ Remove and dispose of the transport protection (2).

✓ The service truck is ready for use.

7 Assembling the panels

INFORMATION

Read and understand these instructions before attempting installation works.

The operations described in this chapter and in the next one are listed by logical content and are therefore not always in the actual order of execution.

Assembling the transport units can be started when the following conditions are fulfilled:

- All panels are at the place of installation.
- All transport damages have been repaired.
- The accessories and other required materials are completely available.
- The busbars are taken out of the transport fixing.

INFORMATION

To take a withdrawable part / switching-device truck out of a panel while assembling the panels:

⇨ See Operating Instructions with order number 110-0134.9.

7.1 Tightening torques and control tightening torques for bolted joints

Tightening torques
The following tightening torques apply to bolted joints.

Bolted joint	Tightening torque
M8	30 Nm
M12	70 Nm
M16	110 Nm

Control tightening torques
The following tightening torques apply when checking bolted joints.

Bolted joint	Tightening torque
M8	25 Nm
M12	60 Nm
M16	90 Nm

Specific tightening torques are stated separately in the respective assembly operation.

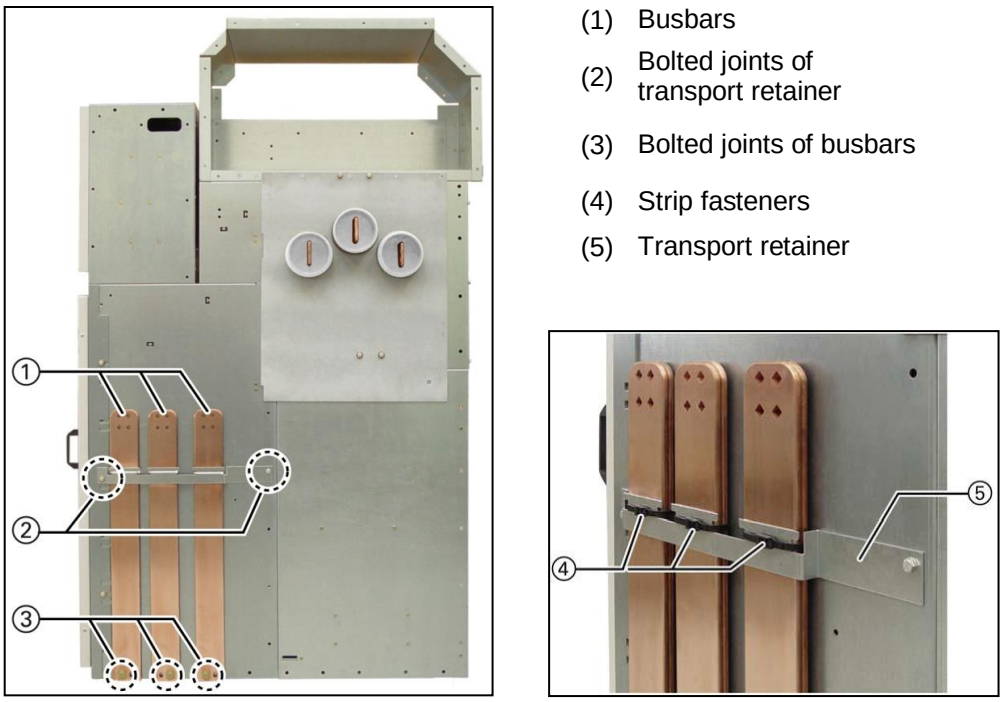
7.2 Interconnecting the panels, preparation

To interconnect the panels, execute the following work:

- Undoing the transport fixing of the busbars
- Aligning the panels
- Assembling the busbar
- Fastening the panels to the foundation
- Bolting the panels together
- Opening the busbar compartment
- Interconnecting the busbars
- Closing the busbar compartment
- Assembling and interconnecting the earthing busbar
- Assembling and interconnecting the additional compartment to the busbar compartment (optional)
- Assembling and interconnecting the pressure relief duct

7.3 Undoing the transport fixing of the busbars

For transportation, the busbars are temporarily attached to the sides of the respective panel with bolts and the transport retainer. The right end panel is delivered **without** assigned busbars.



(1) Busbars
(2) Bolted joints of transport retainer
(3) Bolted joints of busbars
(4) Strip fasteners
(5) Transport retainer

Fig. 46: Transport fixing of the busbars

⇨ Remove strip fasteners (4).

⇨ Remove 2 fixing bolts of the transport retainer (2).

⇨ Remove transport retainer (5).

⇨ Remove fixing bolts of busbars (3).

⇨ Detach the busbars (1) and store the busbars related to the panel type for later use

⇨ Dispose of strip fasteners, transport retainer and bolts correctly.

✓ The busbars are ready for use.

7.4 Aligning the panels

The first transport unit is on the place of installation and the next unit is placed at a distance of approx. 300 mm.

> **NOTICE**
>
> **Panel frame**
>
> A distorted panel frame will impair the function of the switchgear.
>
> ⇨ Lay thin shims with 0.5 mm to 1.0 mm thickness under the panel frame, if required.
>
> ⇨ Consider the results of the measuring sheet for the foundation.

Aligning the first panel

> **INFORMATION**
>
> The first transport unit should be the left end panel.

⇨ Observe the minimum distance to the side and the rear wall of the switchgear room in accordance with the switchgear arrangement.

⇨ As for the exact dimension and minimum distance of the panels, refer to the relevant dimension drawing and arrangement diagram.

⇨ Align the panel horizontally.

⇨ Align the panel in vertical position.

⇨ The first panel may have a level difference of 1mm/m as a maximum.

⇨ Lay thin shims with 0.5 mm to 1.0 mm thickness under the panel frame, if required.

⇨ Place the next panel at a distance of approximately 300 mm beside the first panel.

✓ The first panel is aligned.

7.5 Fastening the panels to the foundation

NOTICE

Fastening to the foundation

When the panel is bolted or welded to the floor, this can cause gaps and openings that do not meet the degree of protection of the switchgear.

⇨ After bolting or welding the panel to the floor, verify the gap dimensions according to the degree of protection.

⇨ If necessary, re-align the parts moved for bolting the panel to the floor, in order to provide the gap dimensions according to the degree of protection.

⇨ Compensate gaps up to 2.5 mm with sealing compound, e.g. SIKAFLEX 221-GR 310 ML.

⇨ In case of gaps > 2.5 mm, inform the regional Siemens representative.

NOTICE

Cleaning

Possible malfunctioning and damage to the panels caused by pollution.

⇨ Clean polluted areas. 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.

The switchgear panels can be fastened to the foundation as follows:

- Welded floor fixing or bolted floor fixing on concrete floor with C- or U-profile foundation rails
- Bolted floor fixing on double floor
- Bolted floor fixing on concrete floor with U-profile foundation rails and additional earthquake stabilization

Additional preparations for panels with ventilation duct

In panels with ventilation duct, the front floor opening in the panel frame is not directly accessible. Access to the front floor opening is achieved by removing a part from the front of the ventilation duct.

⇨ Open the high-voltage door.

⇨ Remove 4 nuts M8 at the bottom part (2) and 2 bolts M8x20 (1) on the left and right side of the ventilation duct. Store the connecting elements.

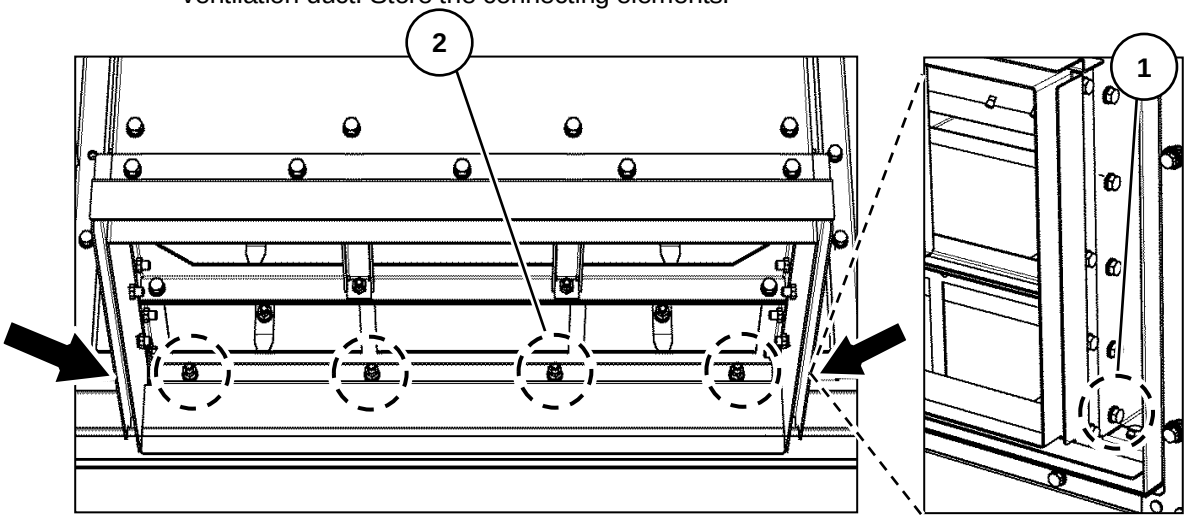


Fig. 47: 6 bolted joints to be removed from the ventilation duct

(1) Hexagon head bolt M8x20

(2) Nut-and-washer assembly M8

⇨ Remove the bottom part from the front of the ventilation duct, and store it.

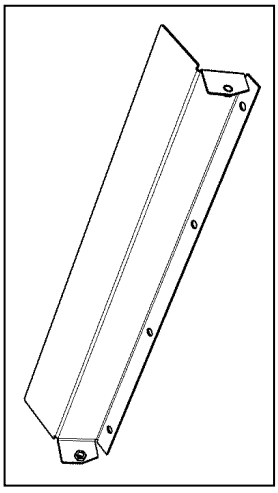


Fig. 48: Bottom part, removed

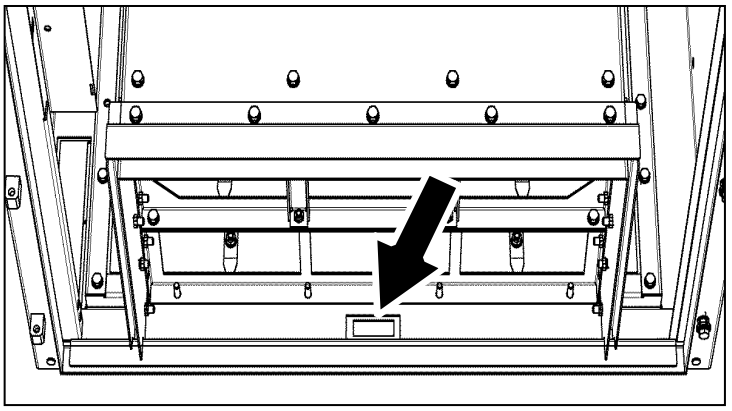


Fig. 49: Front floor opening in panel frame

✓ Additional preparations on the panel with ventilation duct are completed.

Assembling the panels

Fastening the panels

For fastening the panels on the floor, elongated holes 60x20 mm have been provided in the cross members inside the panel frame, both at the front and rear side of the panel frame.
Fasten each panel to the foundation at two points:

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

⇨ For bolted floor fastening: Bolt the cross members inside the panel frame onto C-profiles in the foundation using anchor bolts and shims.
Installation and fixing material with anchor bolts: Order no.: 8BX2060.

⇨ For welded floor fastening: Weld the cross members to the U-profiles in the foundation in the area of the elongated holes 60x20 mm the bottom.

⇨ Remove any pollution that may occur during drilling or welding. Extreme cleanliness is required during installation.

⇨ Paint welded seams to protect them against corrosion.

For panels with ventilation duct

NOTICE

Foreign objects

Possible malfunctioning and damage to the panels caused by foreign objects.

⇨ Before closing the compartment below the ventilation duct, remove all foreign objects, e.g.:

- Tools
- Unused installation material
- Packing material
- Cleaning material

INFORMATION

Before commissioning the panels, the area below the ventilation duct may only be permanently closed by fixing the ventilation duct under the following conditions:

- The area is free from foreign objects and pollution
- The floor fixing has been properly mounted

⇨ Verify completeness and correctness of the previous assembly work in the area. This also includes:

- Check the tightening torques of the bolted joints, and correct the torques if required
- In case of welded floor fixing: Check the welded seam and the corrosion protection

⇨ Record the proper condition of the area after bolting together, so that this is clear without any doubt before commissioning the switchgear.

⇨ Refasten the previously removed bottom part at the front of the ventilation duct.

✓ The panel is fastened to the foundation.

7.6 Assembling the busbars

The following instructions for busbar assembly also apply to busbar versions with insulation (optional).

NOTICE

Bolts and nuts

The threads of the bolts and nuts must be dry and non-greasy.

⇨ Do not apply grease to the threads of the bolts and nuts.

INFORMATION

Busbar assembly

- The **easiest** way to assemble the busbar is **from the side** of the panel!
- The busbar can also be assembled from the top; however, this is **not** recommended as it is incomparably more complicated due to the pressure relief duct.
- Alternatively, the busbar can be assembled and monitored by using the busbar cover in the switching-device compartment.
- In the case of contactor panels with panel width 435 mm, the busbar must absolutely be mounted from the side, as the busbar compartment is accessible neither through the rear wall nor through the roof plate.

INFORMATION

Connecting elements

- The bolts, conical spring washers and nuts necessary for assembling the busbar are supplied in a bag unit together with each panel.
- The bag unit is attached to the sheet-steel enclosure of the busbar compartment.

⇨ Check contact surfaces of busbar, brush if necessary and apply a thin film of Vaseline.

⇨ Bolt the busbars to the corresponding feeder bars without distortions or gaps between both bars.

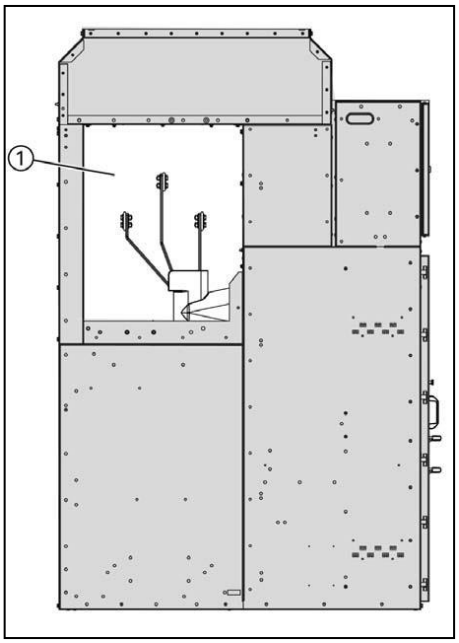
⇨ Bolt the busbars to the corresponding feeder bars using 2 of the supplied bolts each.

⇨ Observe the inserting direction of the bolts (see the drawings below). The threads of the bolts and nuts must be dry and non-greasy.

⇨ After removing the connecting elements, the packing materials of the bag unit must be disposed of in an environmentally compatible way.

Busbar compartment

The bolted joints between the busbars and the feeder bars are located in the busbar compartment.



(1) Busbar compartment

Fig. 50: Side view of panel

7.7 Accessing the busbar compartment

⚠ DANGER

Electric shock

Always verify safe isolation from supply without any doubt.

In the instructions given in the following sections it is assumed that new switchgear is being installed, which has not yet been energized with operational high voltage.

If the switchgear is already in operation, operational high voltage could be applied at the connections / bars in the busbar compartment.

⇨ To perform tests or work in the busbar compartment of a switchgear that is already in operation, follow the directives of the Operating Instructions with order number 110-0134.9.

⚠ CAUTION

Sharp-edged sheets

If the covers have to be removed from the switchgear, sharp-edged sheets inside switchgear can cause injuries by getting cut. Sharp-edged sheets inside the switchgear can damage cables.

⇨ Put on personal protective equipment (e.g. cut-resistant gloves and arm sleeves).

⇨ When working inside the switchgear, it must be observed that cables do not touch any sharp-edged sheets. Cover sharp-edged spots, if required.

INFORMATION

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

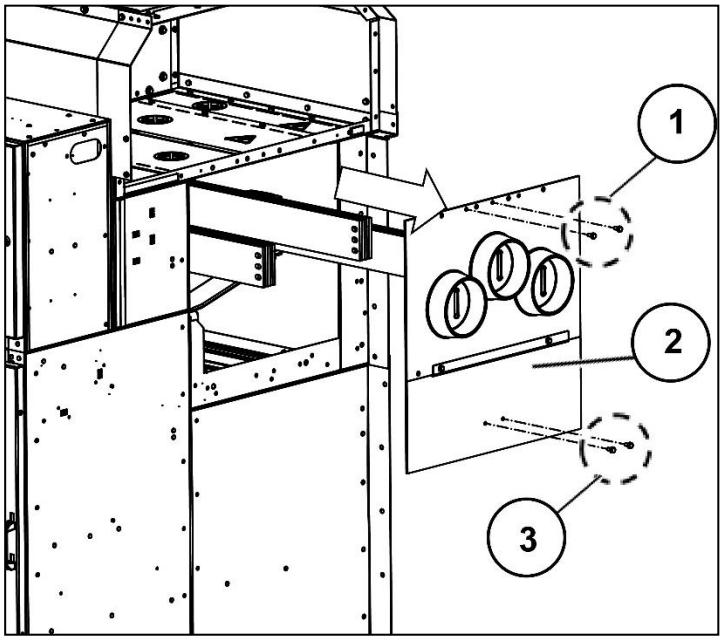
⇨ Store disassembled parts and connecting elements carefully, and keep them ready for later reuse.

Busbar compartment is accessible either through the switching-device compartment or through the side of the panel.

Removing the transverse partition

For panels with transverse partition, the transverse partition plate with the bushings is pre-assembled at the factory. If the busbars are mounted from the side, the transverse partition plate must be removed. The bushings remain in the transverse partition plate.

⇨ Remove the transverse partition plate from the busbar compartment at the upper and lower edges together with connecting elements (1), (3) and store both for later use.



(1) 2 hexagon head bolts M8x20 and plain washers size 8.4 mm

(2) Transverse partition plate

(3) 2 bolts M8x20 with contact washers

Fig. 51: Removing the transverse partition plate

Accessing the busbar compartment through the front

INFORMATION

Read and understand these instructions before attempting installation works.

HINT

Accessing the busbar compartment through the front is not available with the contactor panel with panel width 435 mm.

Preparations before accessing the busbar compartment

Preconditions

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

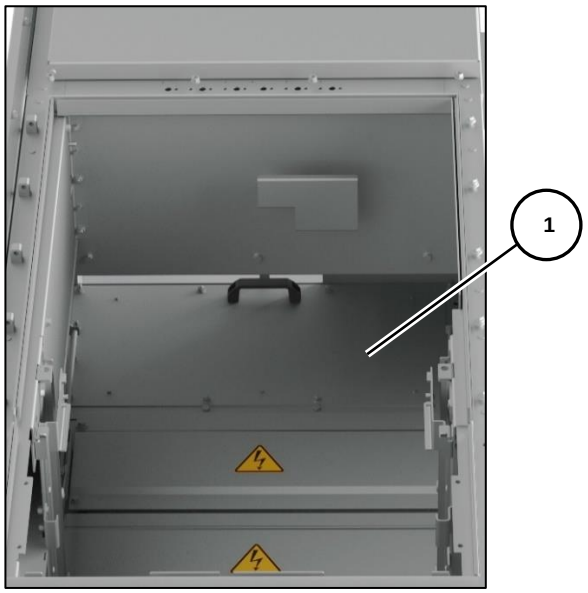
Procedure

To access the busbar compartment through the front side of the panel, open the high-voltage door and access the switching-device compartment first.

⇨ For accessing the switching-device compartment, see chapter 8.1.

- Busbar compartment is accessible through switching-device compartment.

Fig. 52: Accessing the busbar compartment:
Switching-device compartment accessible



1) Busbar cover

Fig. 53: View of switching-device compartment from bottom side

⇨ Remove the connecting elements from the busbar cover (1), and store them:
- 11 nuts M8 with contact washers (2)

⇨ Remove the busbar cover (1). To do this, lift the busbar cover by the handle, and pull it out. Store the busbar cover.

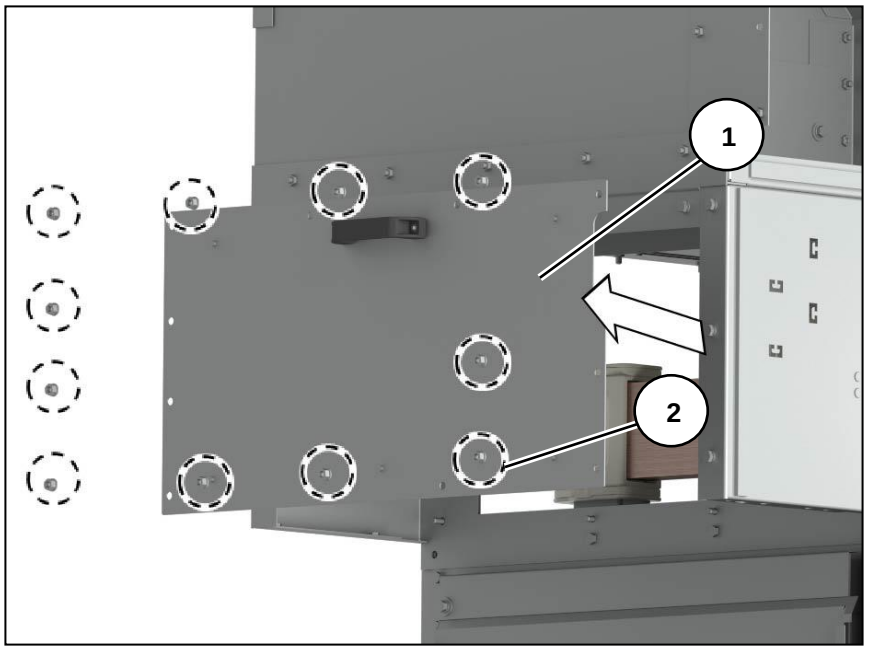


Fig. 54: Removing the busbar cover

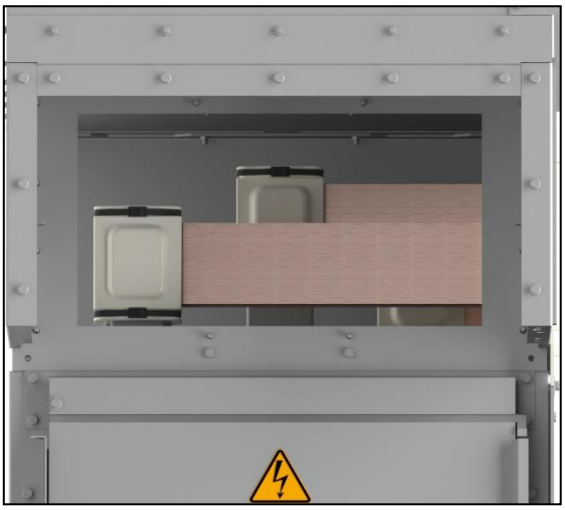


Fig. 55: Busbar compartment accessible

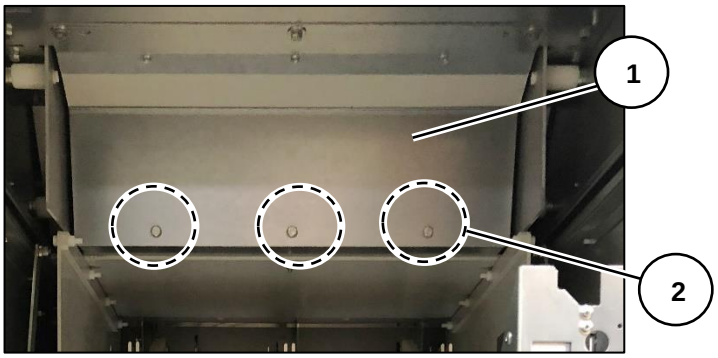
✓ Access to the busbar compartment through the front side of the panel is given.

Switch-disconnector panel only:

- Busbar compartment is accessible through switching-device compartment.

Fig. 56: Panel prepared for accessing the busbar compartment

⇨ Remove the connecting elements from the busbar cover (1), and store them:
  - 3 bolts M8x20 with contact washers (2)



1) Busbar cover
2) Connecting elements

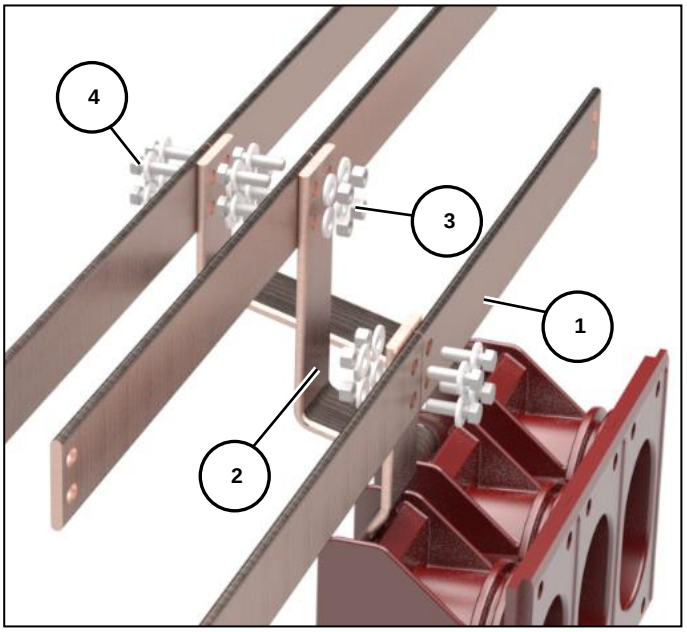
Fig. 57: View of switching-device compartment from inside

✓ Access to the busbar compartment through the front side of the switch-disconnector panel is given.

Busbar assembly
Bag unit with connecting elements
An individual bag with connecting elements for connection of the busbars with the feeders is attached to each busbar compartment.

Busbar version NXAIR for $U_r \leq 12$ kV

> **INFORMATION**
>
> Number of connecting elements in end panel:
>
> ⇨ The connections between busbars and feeder bars in the end panel are to be executed with 4 connecting elements on each phase.



(1)	Busbar
(2)	Feeder bar
(3)	Nut, conical spring washer
(4)	Bolt M12x40, conical spring washer
Arrowhead indicates the inserting direction of the bolts	
Bag with connecting elements: 110-0770.3 or 110-1221.3	

Fig. 58: Assembly of 1250 A busbar,
feeder ≤ 1250 A, $U_r \leq 12$ kV

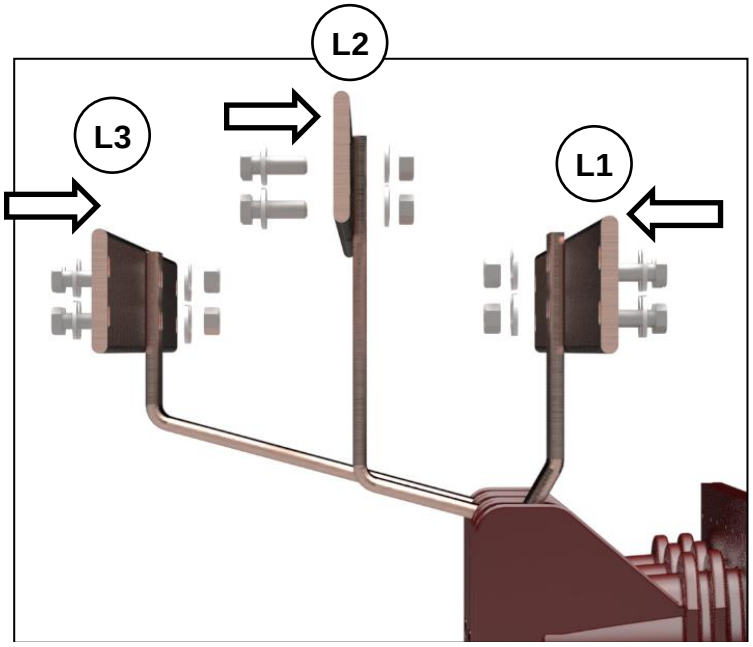
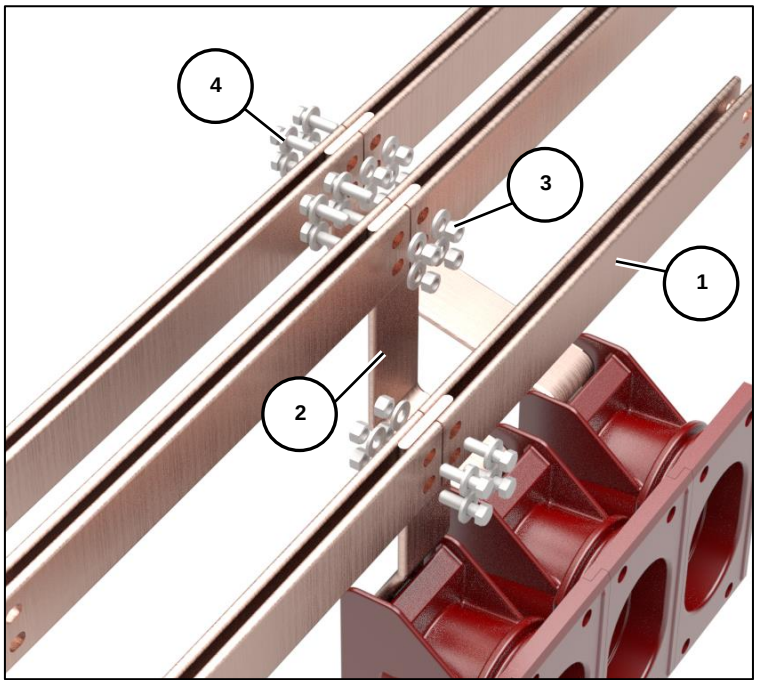


Fig. 59: Side view of 1250 A busbar assembly,
feeder ≤ 1250 A, $U_r \leq 12$ kV



(1)	Busbar
(2)	Feeder bar
(3)	Nut, conical spring washer
(4)	Bolt M12x50, conical spring washer
Arrowhead indicates the inserting direction of the bolts.	
Bag with connecting elements: 110-0771.3	

Fig. 60: Assembly of 2000 A / 2500 A busbar,
feeder ≤ 1250 A, U_r ≤ 12 kV, I_k ≤ 31.5 kA or
feeder ≤ 2500 A, I_k ≤ 40 kA with forced ventilation

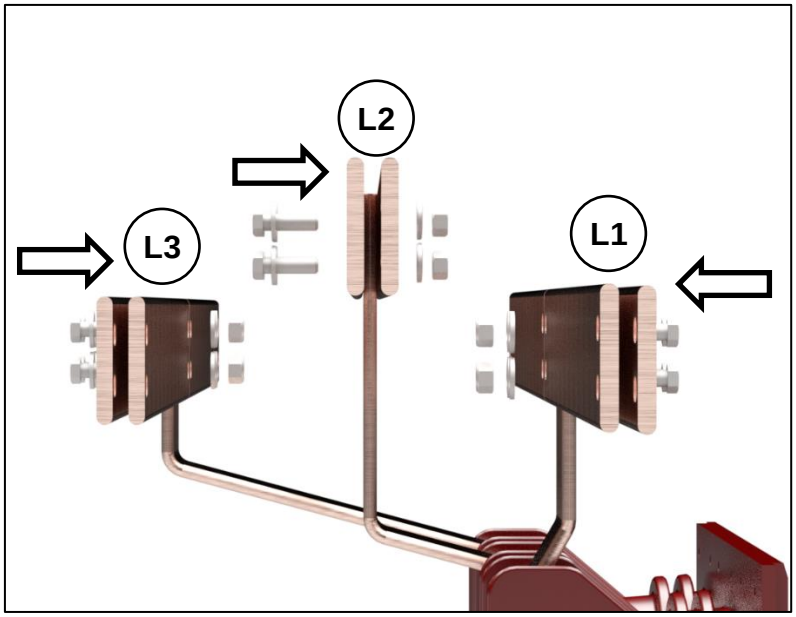
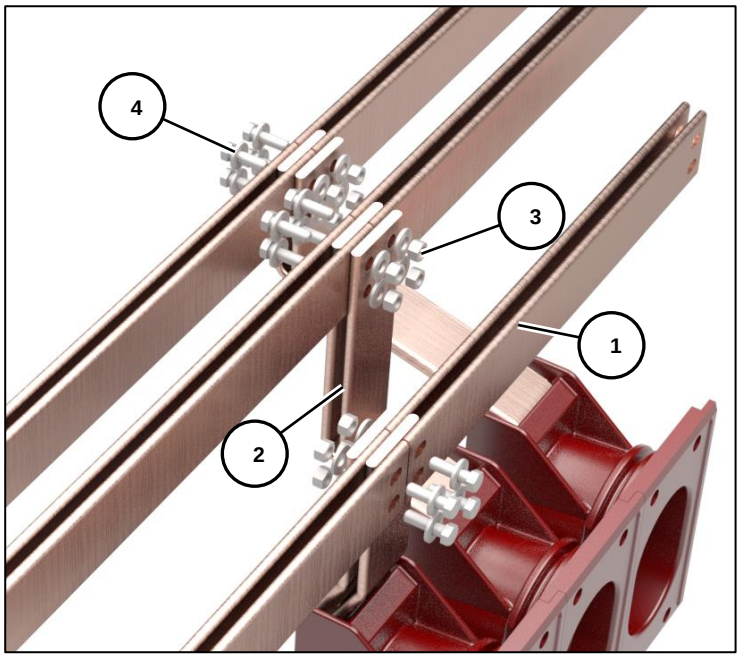


Fig. 61: Side view of 2000 A / 2500 A busbar assembly,
feeder ≤ 1250 A, U_r ≤ 12 kV, I_k ≤ 31.5 kA or
feeder ≤ 2500 A, I_k ≤ 40 kA with forced ventilation



(1)	Busbar
(2)	Feeder bar
(3)	Nut, conical spring washer
(4)	Bolt M12x60, conical spring washer
Arrowhead indicates the inserting direction of the bolts	
Bag with connecting elements: 110-0772.3 or 110-1222.3	

Fig. 62: Assembly of 2500 A busbar,
feeder 1600 A – 2500 A, $U_r \leq 12$ kV

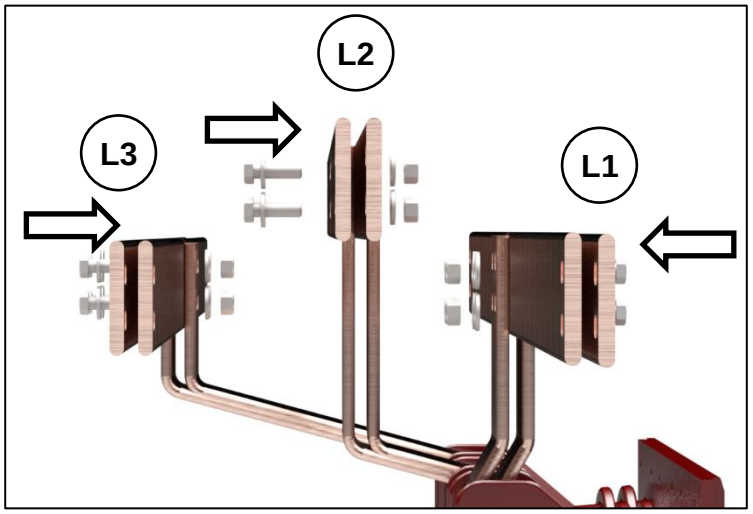
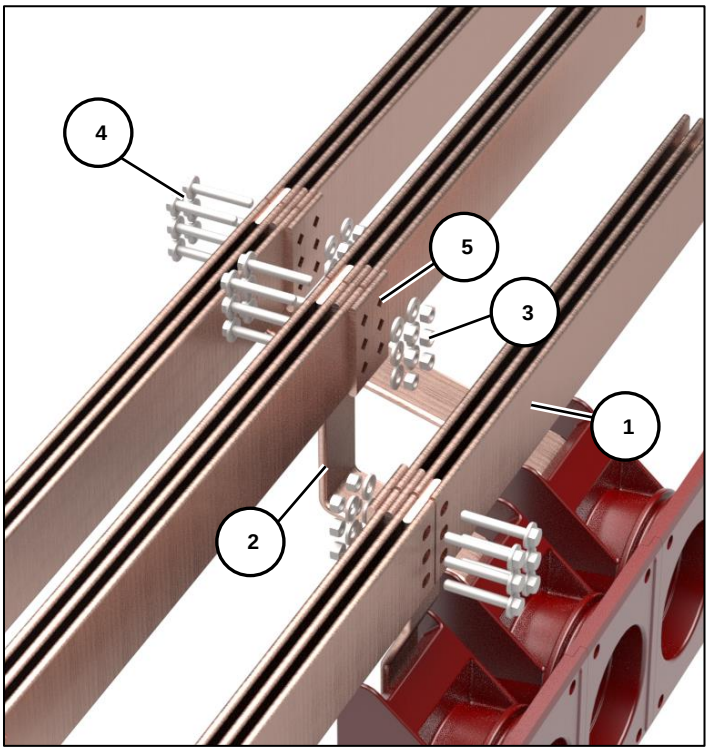


Fig. 63: Side view of 2500 A busbar assembly,
feeder 1600 A – 2500 A, $U_r \leq 12$ kV



(1)	Busbar
(2)	Feeder bar
(3)	Nut, conical spring washer
(4)	Bolt M12x80, conical spring washer
(5)	Copper spacer
Arrowhead indicates the inserting direction of the bolts	
Bag with connecting elements: 110-1223.3	

Fig. 64: Assembly of 3150 A / 4000 A busbar,
feeder ≤ 1250 A, U_r ≤ 12 kV

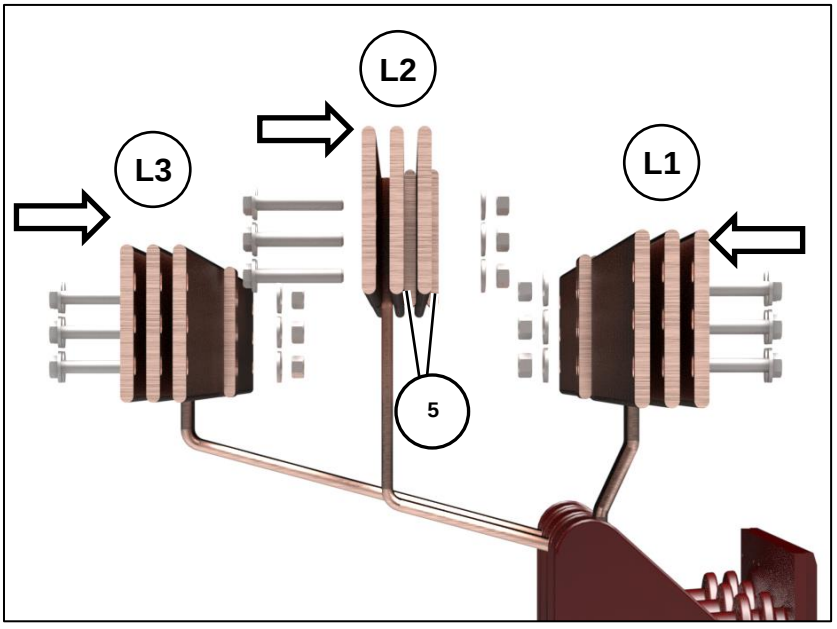
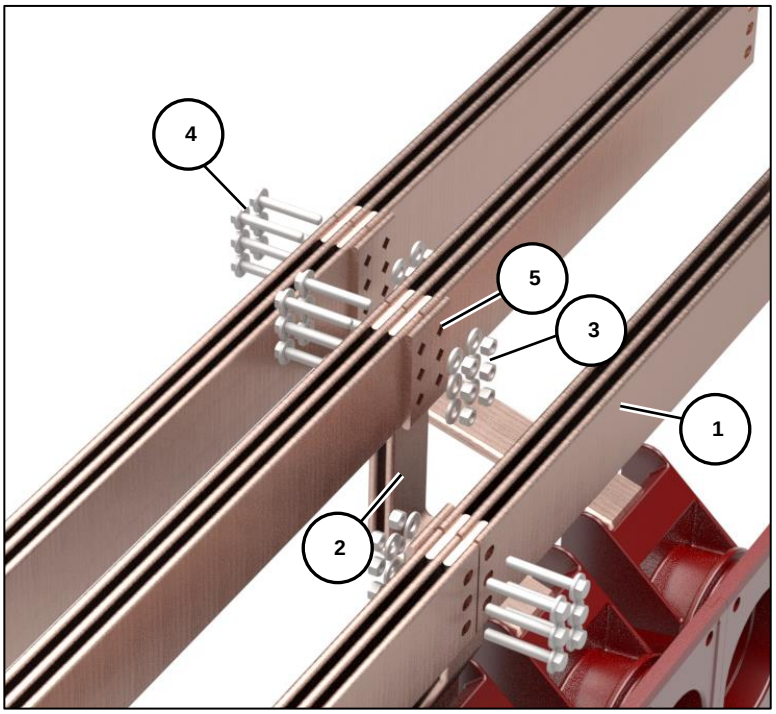


Fig. 65: Side view of 3150 A / 4000 A busbar assembly,
feeder ≤ 1250 A, Ur ≤ 12 kV



(1)	Busbar
(2)	Feeder bar
(3)	Nut, conical spring washer
(4)	Bolt M12x80, conical spring washer
(5)	Copper spacer
Arrowhead indicates the inserting direction of the bolts	
Bag with connecting elements: 110-1223.3	

Fig. 66: Assembly of 3150 A / 4000 A busbar,
feeder 2500 A, $U_r \leq 12$ kV, $I_k \leq 31.5$ kA or
feeder ≤ 2500 A, $I_k \leq 40$ kA with forced ventilation

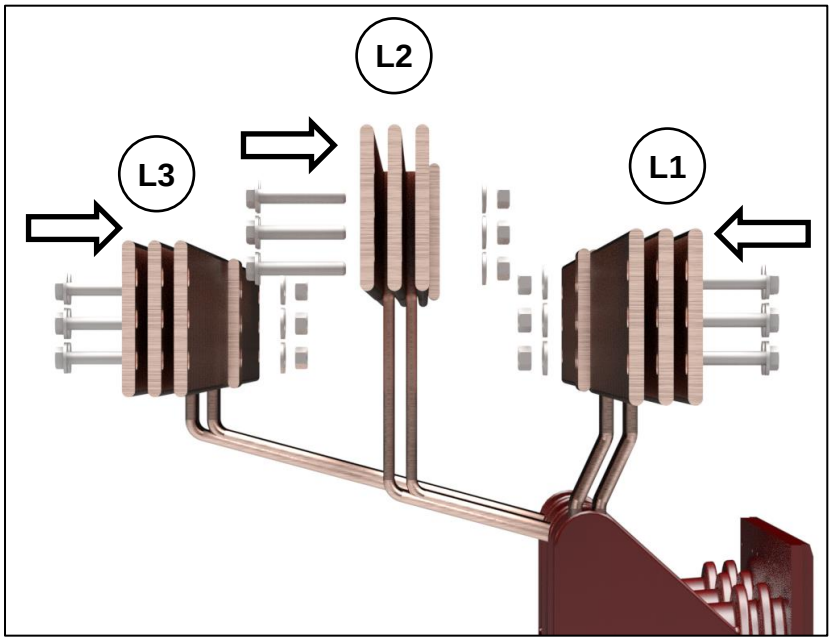
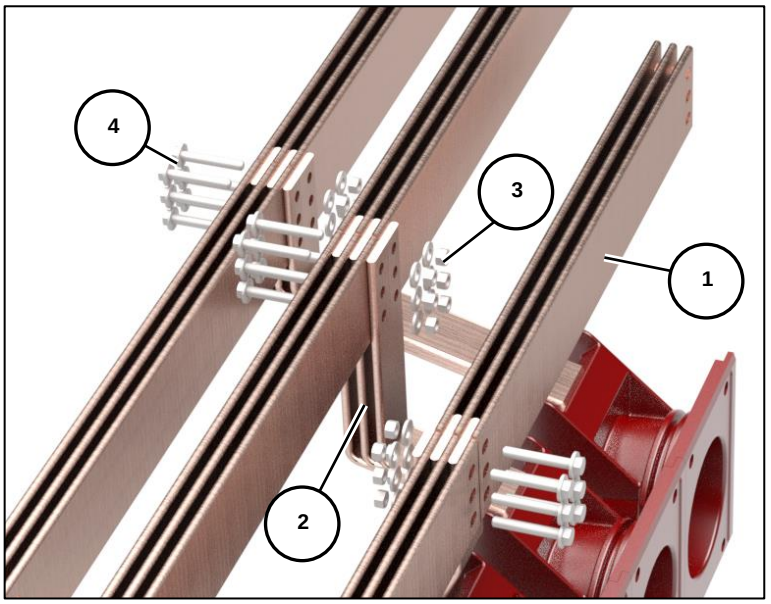


Fig. 67: Side view of 3150 A / 4000 A busbar assembly,
feeder 2500 A, $U_r \leq 12$ kV, $I_k \leq 31.5$ kA or
feeder 2500 A, $I_k \leq 40$ kA with forced ventilation



(1)	Busbar
(2)	Feeder bar
(3)	Nut, conical spring washer
(4)	Bolt M12x80, conical spring washer
Arrowhead indicates the inserting direction of the bolts	
Bag with connecting elements: 110-1223.3	

Fig. 68: Assembly of 3150 A / 4000 A, busbar,
feeder 3150 A / 4000 A, $U_r \leq 12$ kV

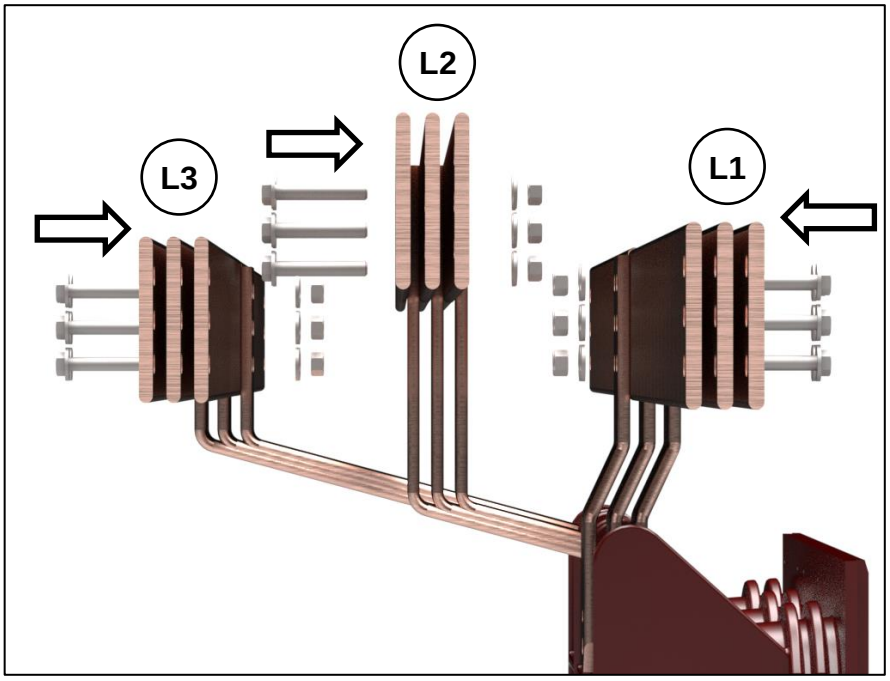


Fig. 69: Side view of 3150 A / 4000 A busbar assembly,
feeder 3150 A / 4000 A, $U_r \leq 12$ kV

Busbar version for contactor panel with panel width 435 mm for $U_r \leq 12$ kV
In the contactor panel with panel width 435 mm, the busbars of phases L1, L2 and L3 are bolted with the copper spacer to the feeder bars. Thereby, observe the following instructions as shown below.

INFORMATION

The feeder bars are delivered with connecting elements. Before attempting installation works, detach the connecting elements from feeder bars. Hereafter, the disassembly of connecting elements is described, which are later assembled again at the same place.

- Remove strip fasteners (1).
- Detach the connecting elements (2) from feeder bars.
- Store disassembled connecting elements (2) carefully and keep them ready for later reuse.
- Dispose of strip fasteners correctly.

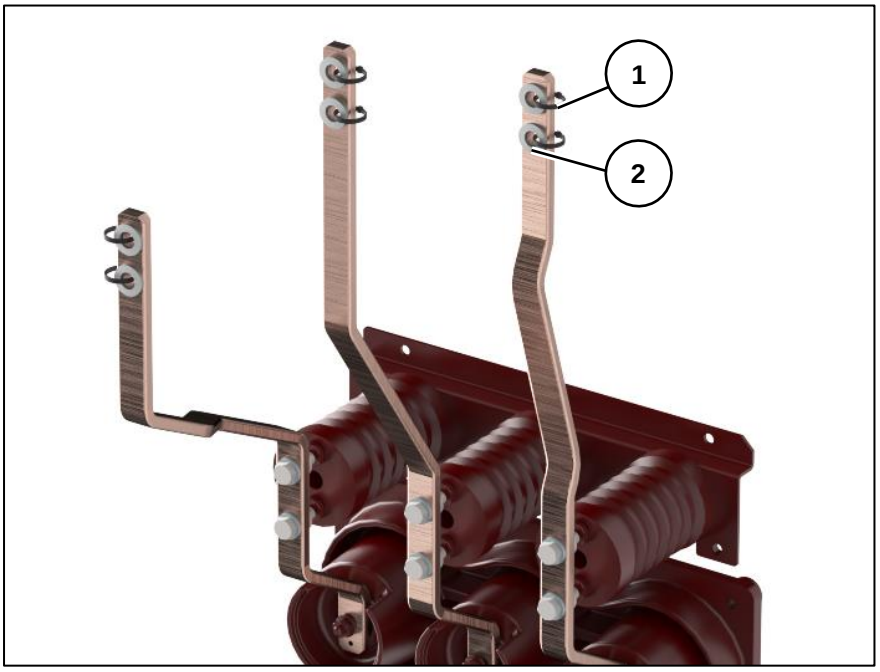
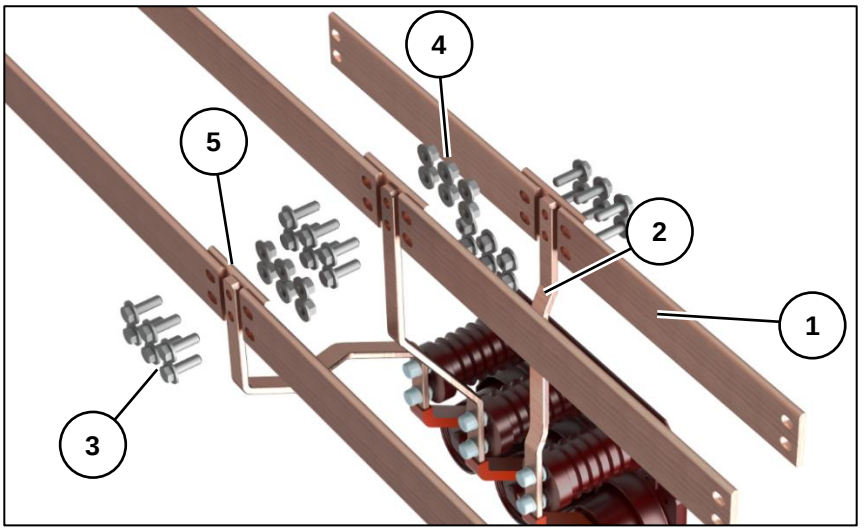


Fig. 70: As-delivered condition of the feeder bars with conical spring washers



(1)	Busbar
(2)	Feeder bar
(3)	Bolt M12x40, conical spring washer
(4)	Nut, conical spring washer
(5)	Copper spacer
Bag with connecting elements: 110-2804.3	

Fig. 71: Assembly of 1250 A busbar, feeder 400 A

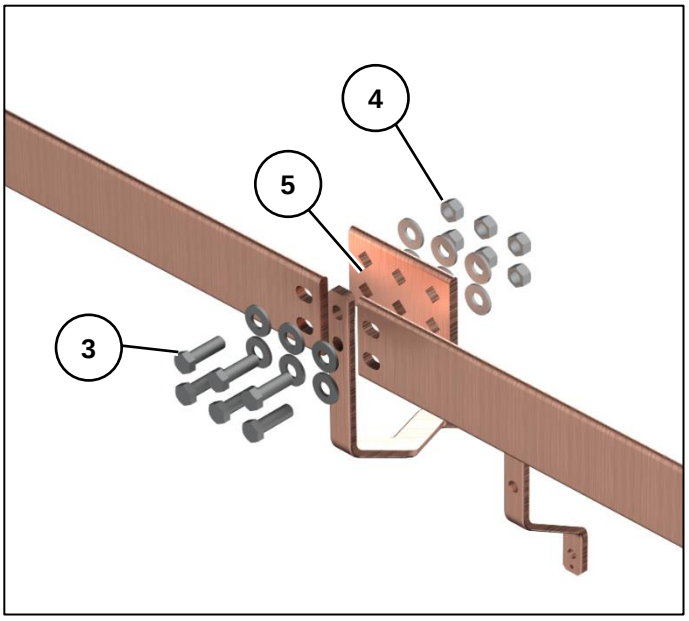
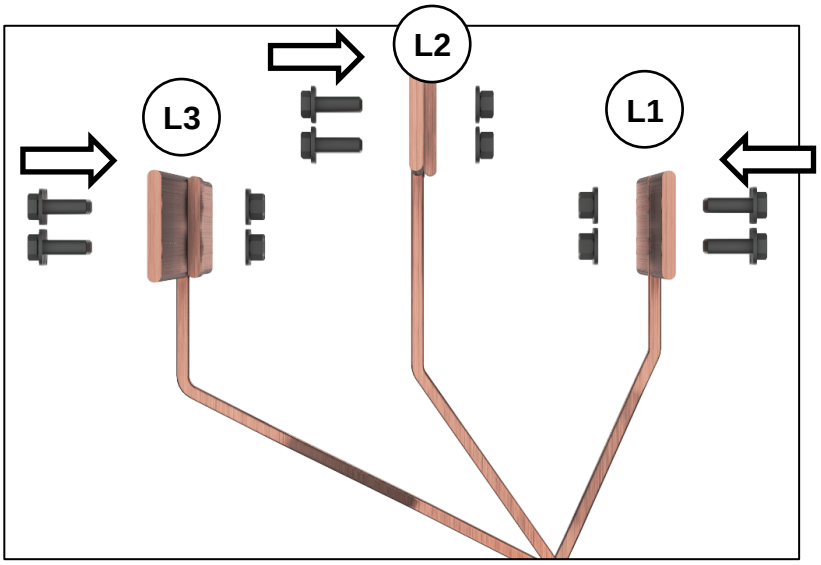
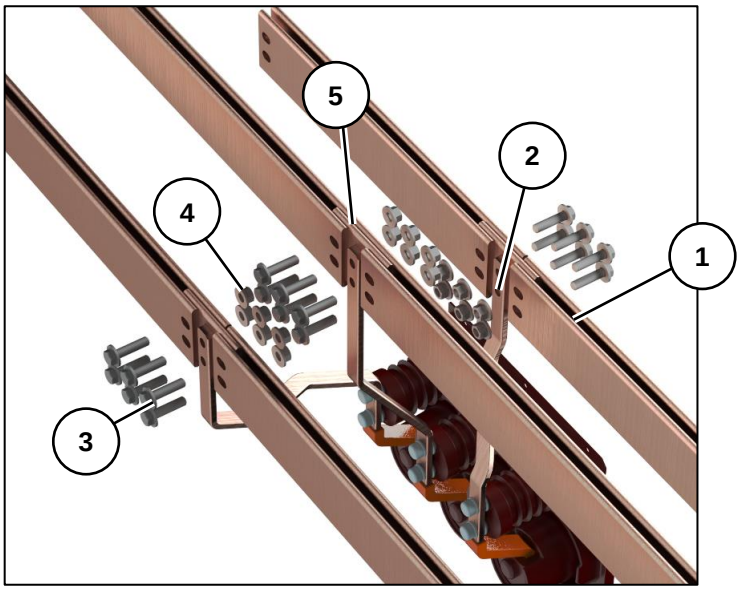


Fig. 72: Detail view of the feeder bar connection (L3 phase as an example)



Arrowhead indicates the inserting direction of the bolts

Fig. 73: Side view of 1250 A busbar assembly, feeder 400 A



(1)	Busbar
(2)	Feeder bar
(3)	Bolt 12x50, conical spring washer
(4)	Nut, conical spring washer
(5)	Copper spacer
Bag with connecting elements: 110-2805.3	

Fig. 74: Assembly of 2500 A busbar, feeder 400 A

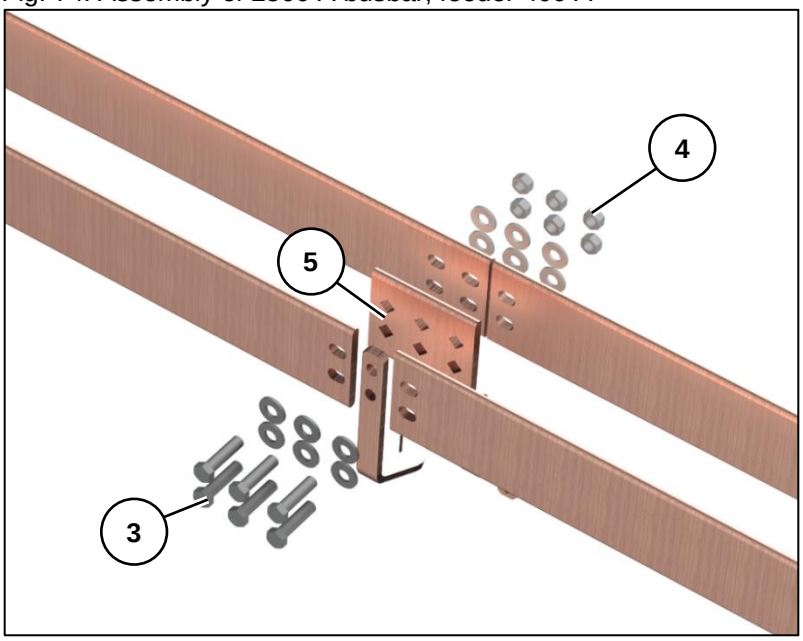
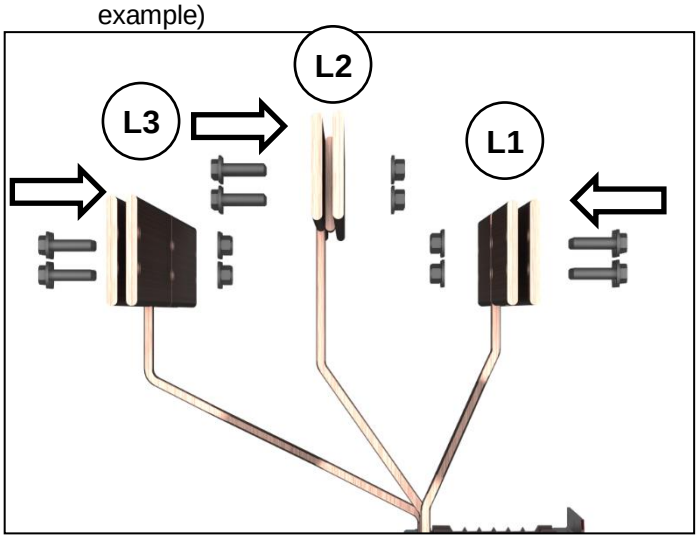
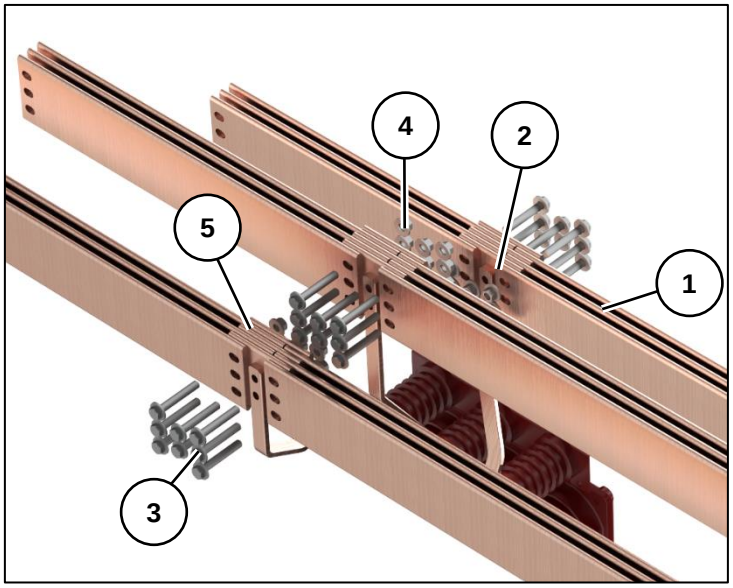


Fig. 75: Detail view of the feeder bar connection (L3 phase as an example)



Arrowhead indicates the inserting direction of the bolts

Fig. 76: Side view of 2500 A busbar assembly, feeder 400 A



(1)	Busbar
(2)	Feeder bar
(3)	Bolt M12x80, conical spring washer
(4)	Nut, conical spring washer
(5)	Copper spacer
Bag with connecting elements: 110-2807.3	

Fig. 77: Assembly of 3150 A / 4000 A busbar, feeder 400 A

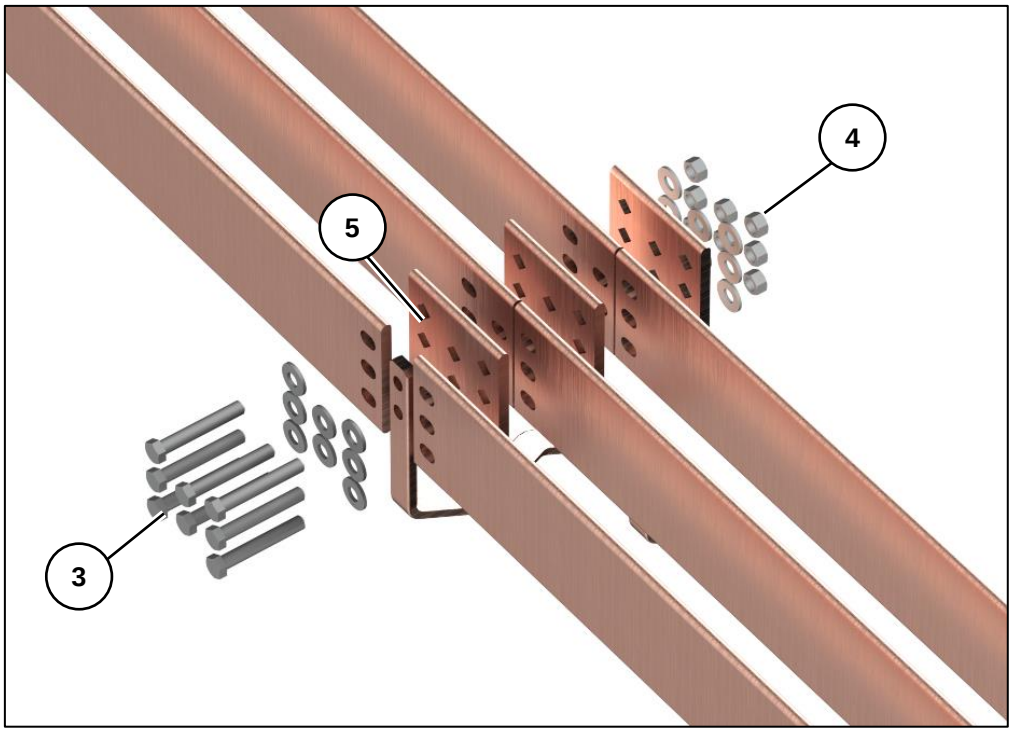
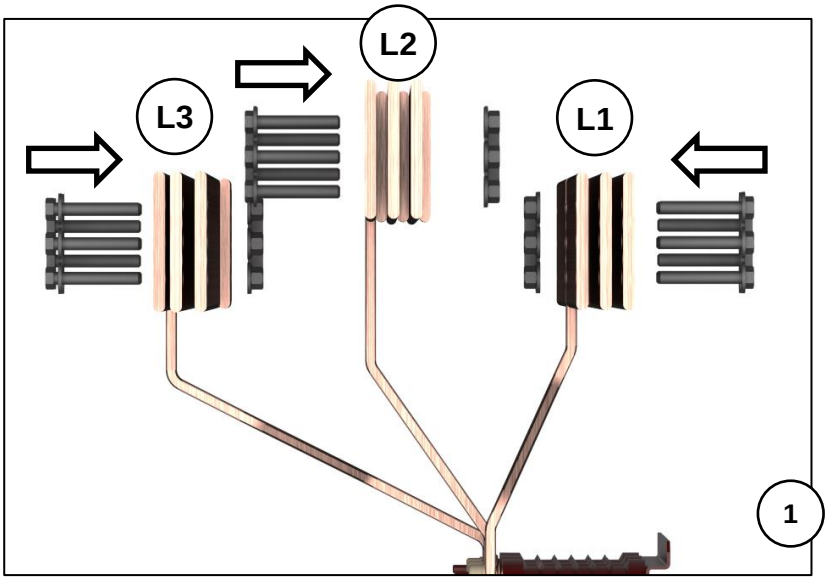


Fig. 78: Detail view of the feeder bar connection (L3 phase as an example)



Arrowhead indicates the inserting direction of the bolt

Fig. 79: Side view of 3150 A / 4000 A busbar assembly, feeder 400 A

Busbar version for busbar current metering panel for $U_r \leq 12$ kV

In the busbar current metering panel, the busbars of phases L1 and L3 are directly bolted onto the current transformers. The busbar of phase L2 has to be connected with a feeder bar. Thereby, observe the inserting direction as shown below.

(1) Bolt, conical spring washer
(2) Nut, conical spring washer
(3) Feeder bar, phase L2
(4) Busbar, phase L2

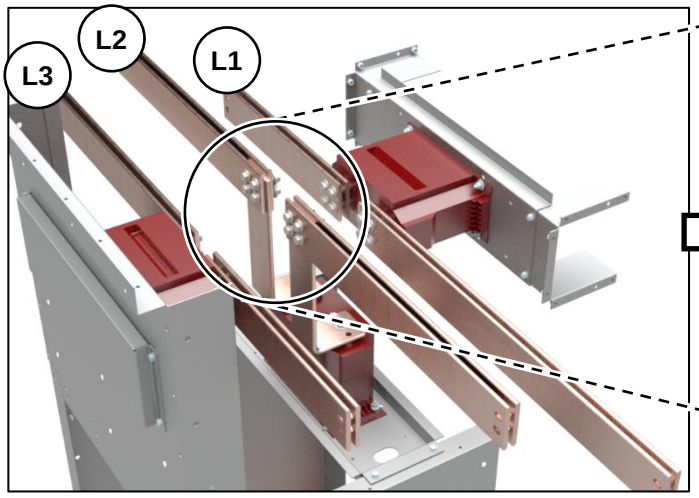


Fig. 80: Busbar current metering panel: Busbar assembly phase L2 (for example, 2500 A busbar)

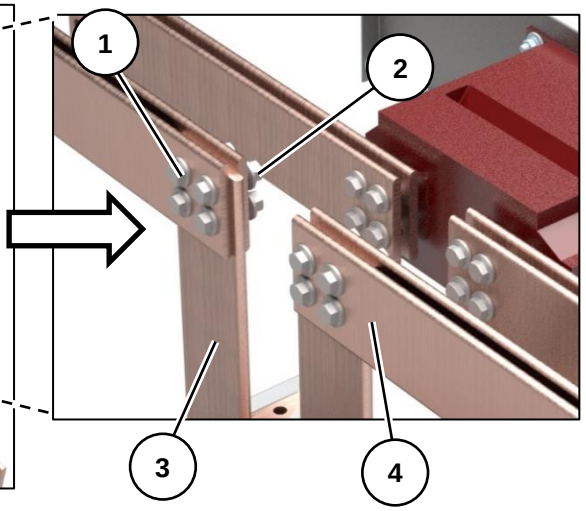


Fig. 81: Details; the arrowhead indicates the inserting direction of the bolt

	Busbar current		
	1250 A	2000 A / 2500 A	3150 A / 4000 A
Bolt type	M12x40	M12x60	M12x80
Bag with connecting elements	110-1827.3	110-1828.3	110-1829.3

Busbar version for switch-disconnector panel for $U_r \leq 17{,}5$ kV

The standard version of the busbar system contains plastic tubes that cover each horizontal bar. Before assembling the busbars, plastic insulation tubes must insert on each horizontal bar of busbar system.
In the switch-disconnector panel, the busbars of phases L1, L2 and L3 are bolted with the copper spacer to the feeder bars. Thereby, observe the following instructions as shown below.

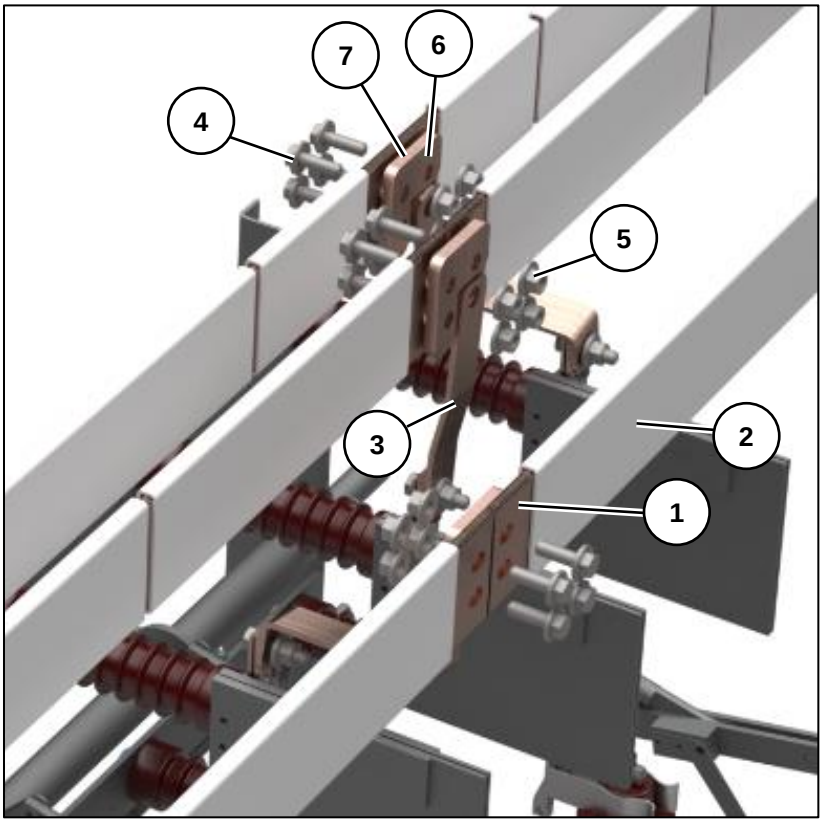
NOTICE

Mounting the feeder bars

The connection of the feeder bars is always fixed at the last step to avoid the stress on the feeder bars.

⇨ **First,** always mount the main busbars from right and left panel, on all phases L1, L2, L3, and then make the connection of the feeder bars.

⇨ Observe the direction of the bolt head side and the bolted joint side of the busbar connection with feeder bars.



(1)	Busbar
(2)	Plastic insulation tube
(3)	Feeder bar
(4)	Bolt M12x40, conical spring washer
(5)	Nut, conical spring washer
(6)	Copper spacer with three holes
(7)	Copper spacer with four holes
Bag with connecting elements: 110-0770.3	

Fig. 82: Assembly of 1250 A busbar, feeder 1250A

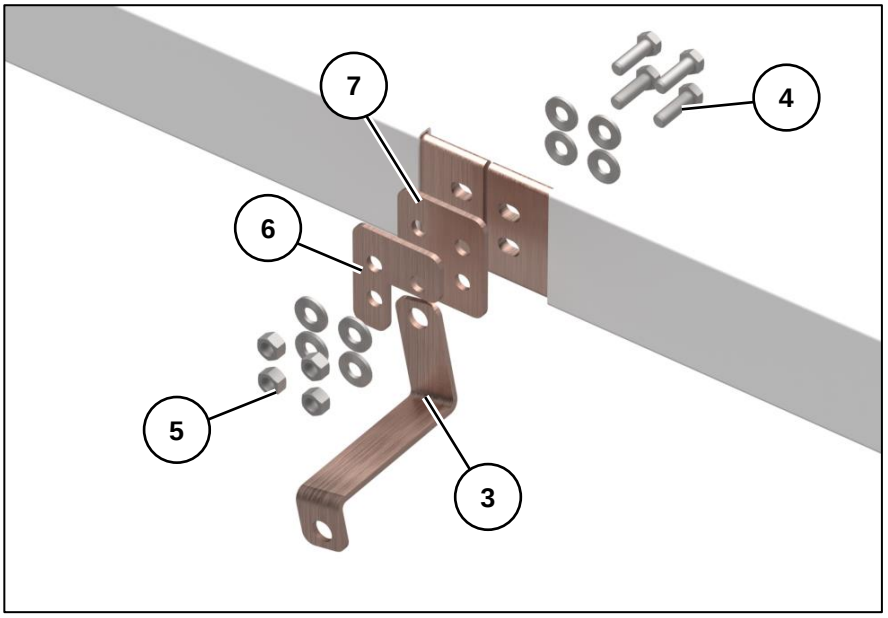
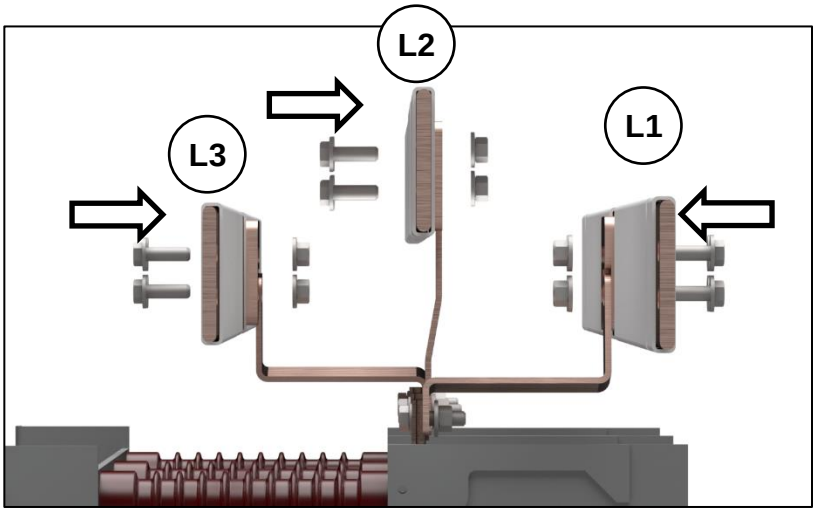
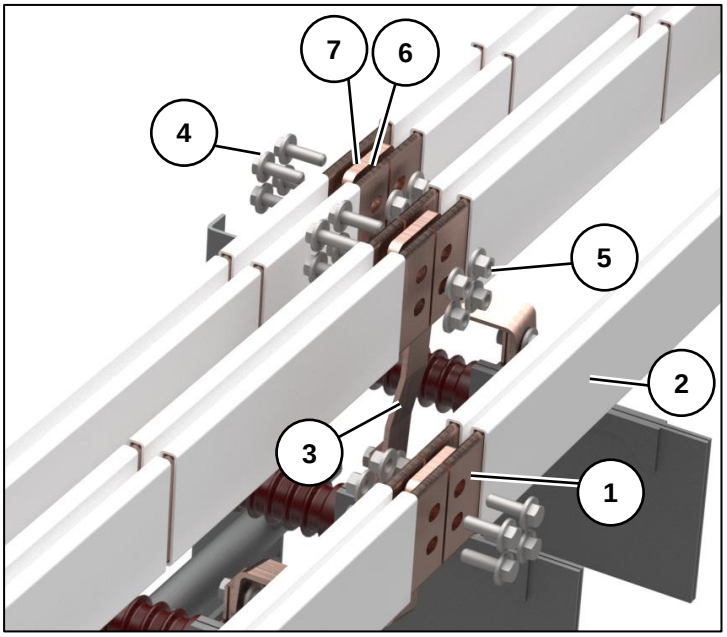


Fig. 83: Detail view of the feeder bar connection (L1 phase as an example)



Arrowhead indicates the inserting direction of the bolts

Fig. 84: Side view of 1250 A busbar assembly, feeder 1250A



(1)	Busbar
(2)	Plastic insulation tube
(3)	Feeder bar
(4)	Bolt 12x50, conical spring washer
(5)	Nut, conical spring washer
(6)	Copper spacer with three holes
(7)	Copper spacer with four holes
Bag with connecting elements: 110-0771.3	

Fig. 85: Assembly of 2500 A busbar, feeder 1250A

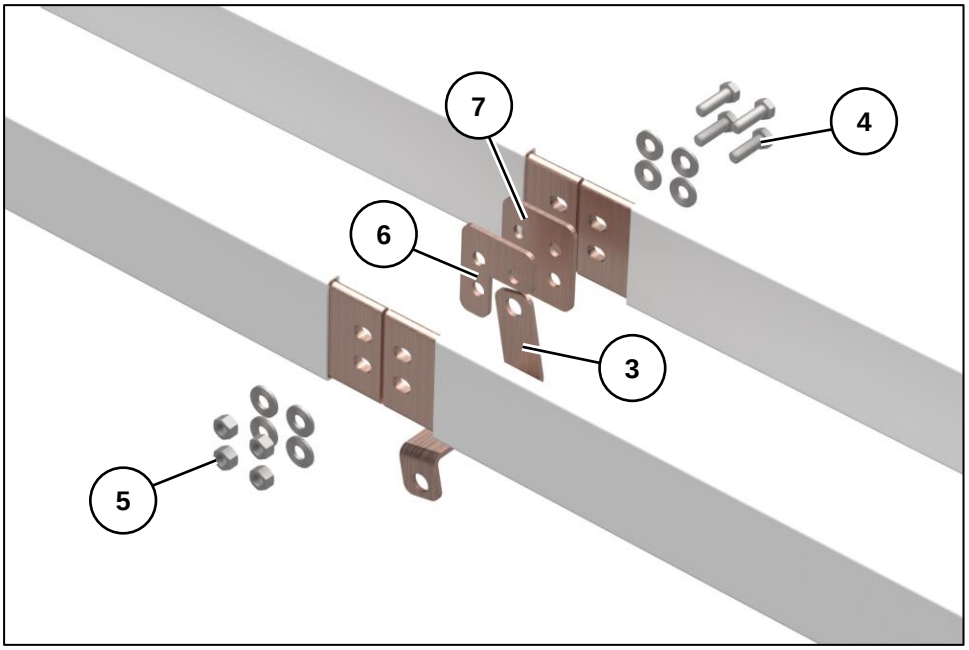
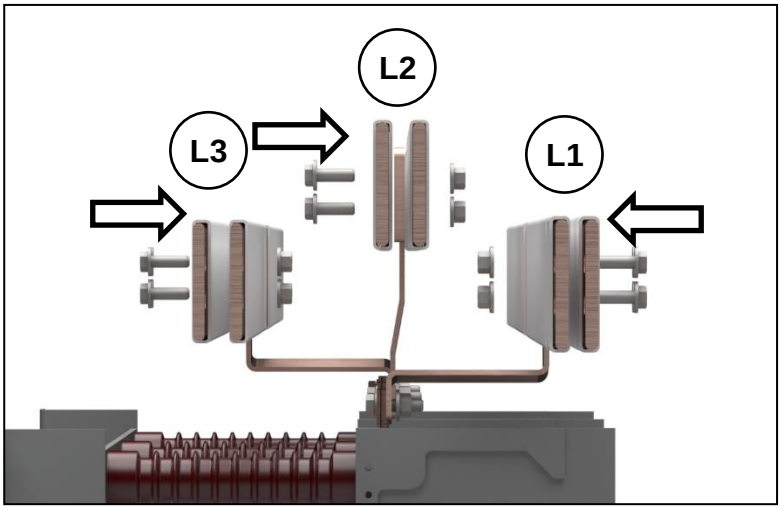
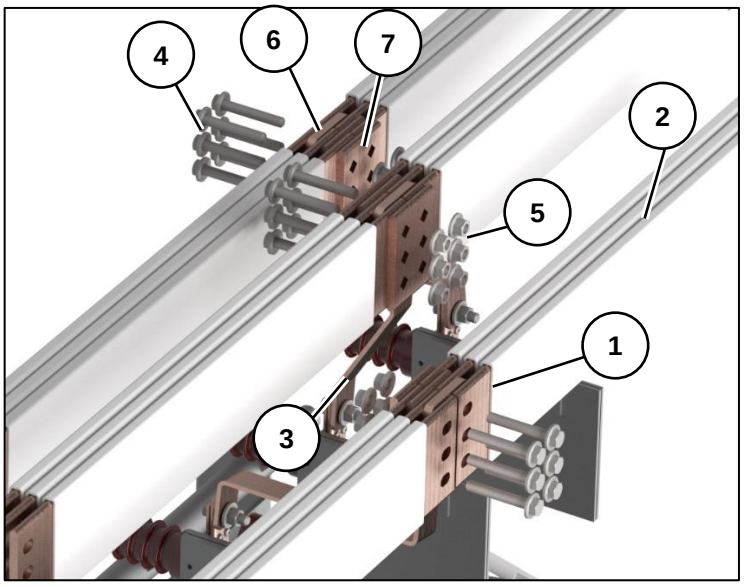


Fig. 86: Detail view of the feeder bar connection (L1 phase as an example)



Arrowhead indicates the inserting direction of the bolts

Fig. 87: Side view of 2500 A busbar assembly, feeder 1250A



(1)	Busbar
(2)	Plastic insulation tube
(3)	Feeder bar
(4)	Bolt M12x80, conical spring washer
(5)	Nut, conical spring washer
(6)	Copper spacer with five holes
(7)	Copper spacer with six holes
Bag with connecting elements: 119-2365.3	

Fig. 88: Assembly of 3150 A / 4000 A busbar, feeder 1250A

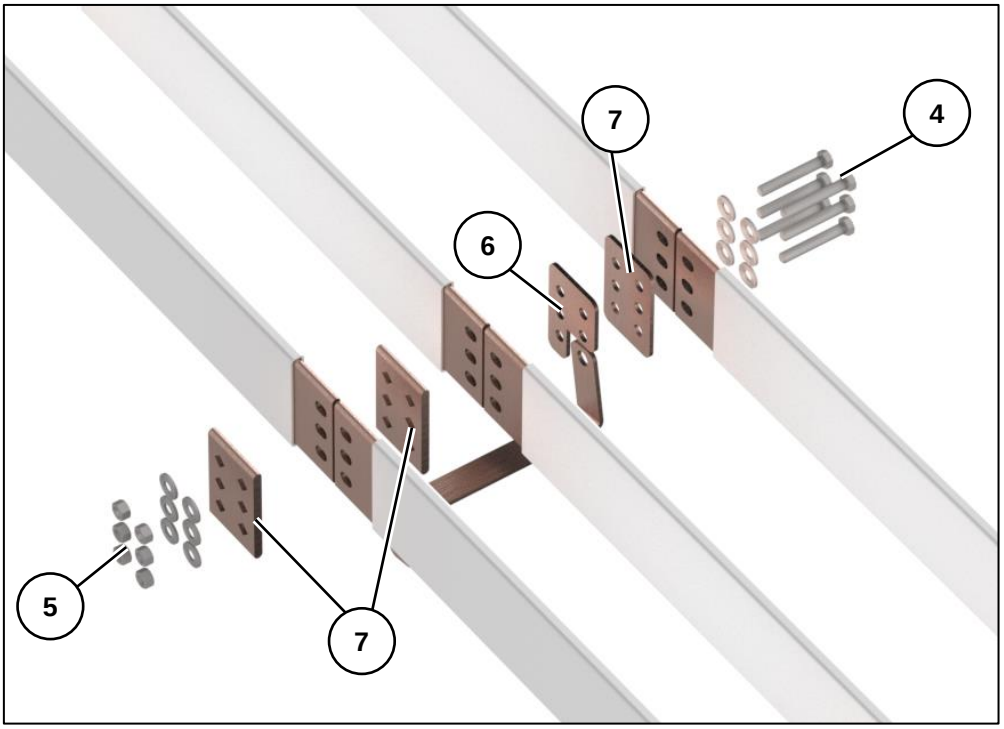
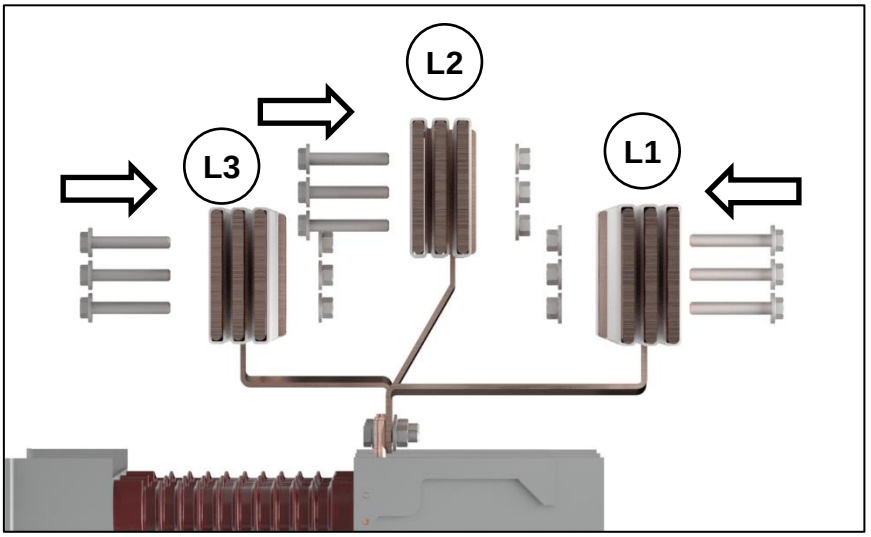


Fig. 89: Detail view of the feeder bar connection (L1 phase as an example)



Arrowhead indicates the inserting direction of the bolt

Fig. 90: Side view of 3150 A / 4000 A busbar assembly, feeder 1250A

Contact blade and the edges of the notch in the switch-fuse combination

⇨ Measure the distance from the main contact blade (1) to the edges of the notch (2) in the conductor bar terminal, use the thickness gauge for it. If required adjust this distance to min 0.1 mm

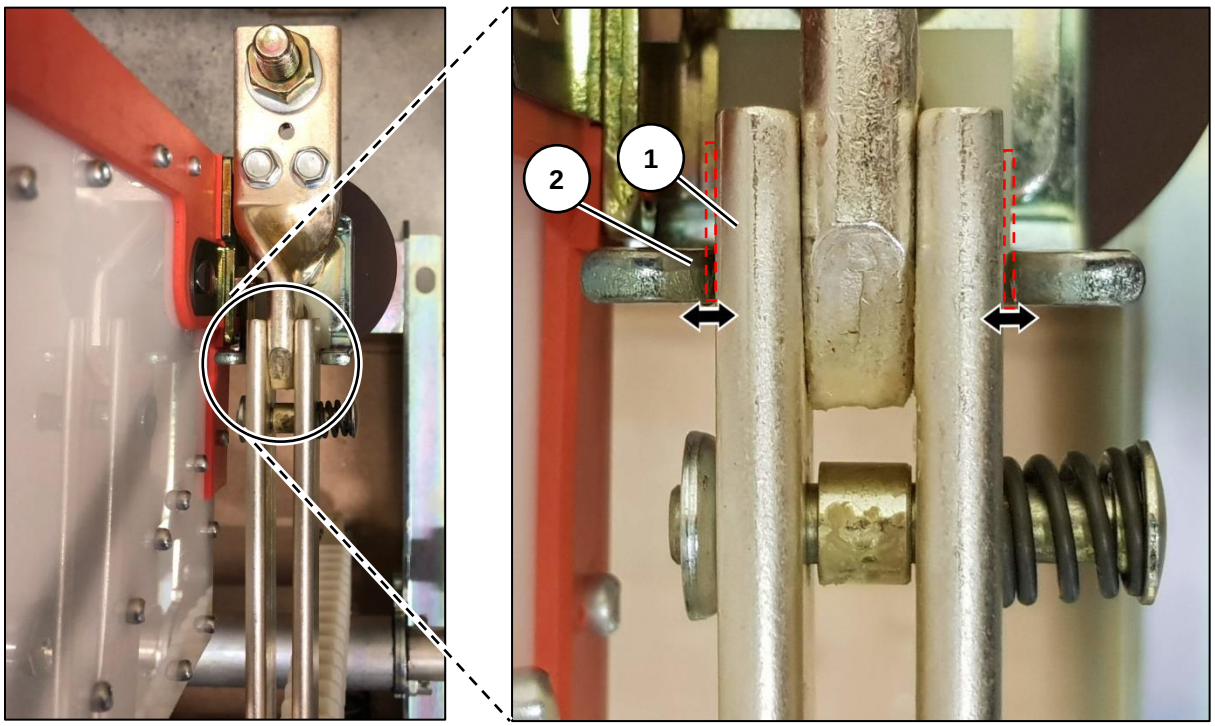


Fig. 91: Minimum distance between the main contact blade (closed position) and the edges of the notch

Busbar version NXAIR for U_r = 17.5 kV

For panel versions with a rated voltage of U_r = 17.5 kV, insulating shells cover the joints of the busbar with the feeder bars.

The busbars are assembled like in panel versions with a rated voltage of $U_r \leq 12$ kV (described above). Finally, the insulating shells are mounted additionally.

NOTICE

Damage to the switchgear panels

Insulating half-shells are supplied with the correct size for each panel.

⇨ Do always mount insulating half-shells on the joints of the busbars with the feeder bars, on all phases L1, L2, L3.

⇨ Observe the positions of the busbar connection with feeder bars in the end panels and assemble the insulating half-shells accordingly.

INFORMATION

The strip fasteners are reclosable and reusable.

⇨ Leave a protrusion of approx. 15 mm when shortening the strip fasteners.

INFORMATION

The insulating half-shells have a different shape for the locking labyrinth on the corners.

⇨ Press the insulating half-shells onto each other to interlock them together.

⇨ Attach the insulating shells in pairs at the bolted joint and fasten with the strip fastener.

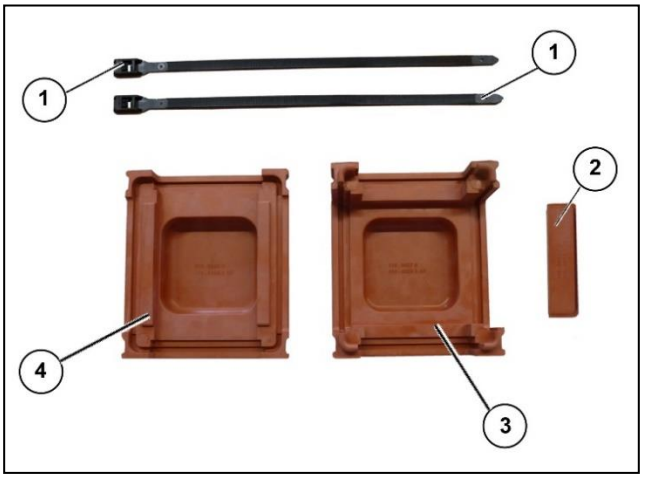


Fig. 92: Assembly parts for insulating shells

(1) Strip fastener, reclosable
(2) End cap
(3) Insulating half-shell, male
(4) Insulting half-shell, female

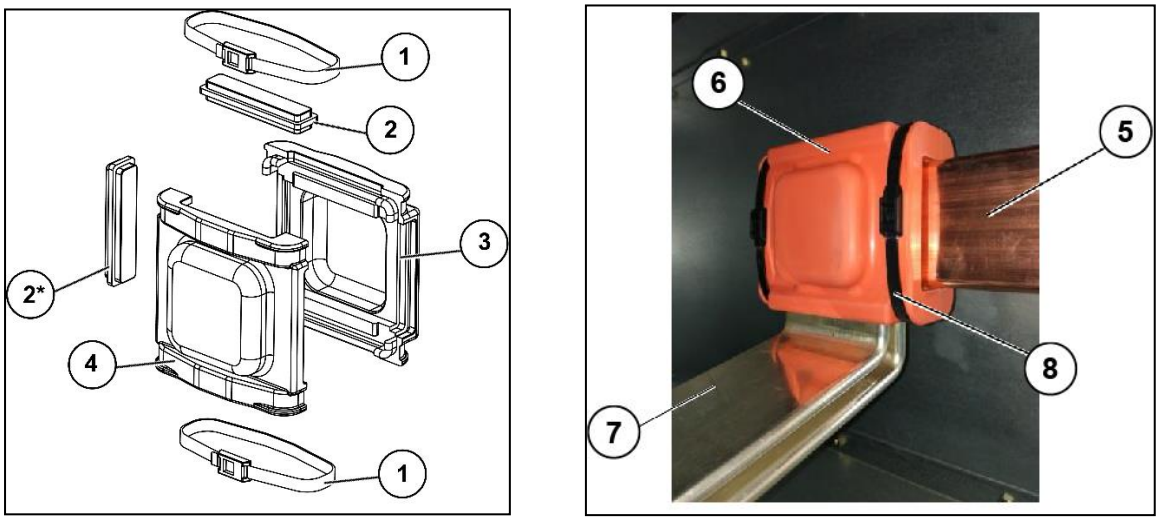


Fig. 93: Assignment of assembly parts for insulating shells

(5) Busbar
(6) Insulating half-shells, mounted
(7) Feeder bar
(8) Strip fastener, shortened with protrusion

*) Available for end panels

Busbar version with insulation
For panel versions with insulated busbar, insulating shells cover the joints of the busbar with the feeder bars, and plastic tubes cover the horizontal bars from the busbar system.
The busbars are assembled like in panel versions with a rated voltage of $U_r \leq 12$ kV (described above). Finally, the insulating shells and plastic tubes are mounted additionally.

⇨ For assembly of insulating half-shells and strip fasteners, consider Fig. 92 and Fig. 93.

⇨ Finally insert a plastic tube (1) on each horizontal bar of busbar system. Consider the panel width and numbers of bars in the busbar system while fitting the plastic tubes.

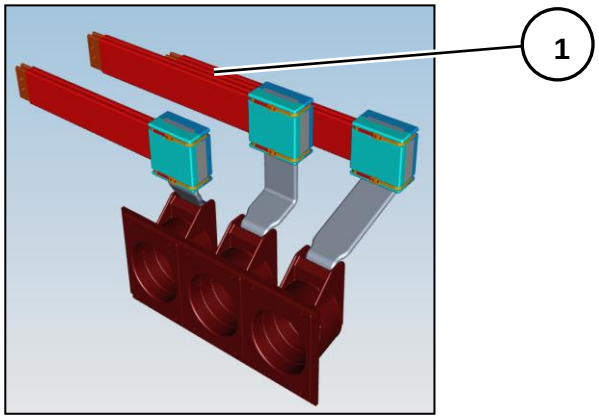


Fig. 94: Detail view of busbar system with plastic tubes;
right end panel as an example

Busbar version with insulation on contactor panels with panel width 435 mm
For panel versions with insulated busbar, insulating shells cover the joints of the busbar with the feeder bars, and plastic tubes cover the horizontal bars from the busbar system.
The busbars are assembled like in panel versions with a rated voltage of $U_r \leq 12$ kV (described above). Finally, the insulating shells and plastic tubes are mounted additionally.

NOTICE

Damage to the switchgear panels

Insulating half-shells are supplied with the correct size for each panel.

⇨ Do always mount insulating half-shells on the joints of the busbars with the feeder bars, on all phases L1, L2, L3.

⇨ Observe the positions of the busbar connection with feeder bars in the end panels and assemble the insulating half-shells accordingly.

INFORMATION

The strip fasteners are reclosable and reusable.

⇨ Leave a protrusion of approx. 15 mm when shortening the strip fasteners.

INFORMATION

The insulating half-shells have a different shape for the locking labyrinth on the corners.

⇨ Press the insulating half-shells onto each other to interlock them together.

⇨ Attach the insulating shells in pairs at the bolted joint and fasten with the strip fastener.

⇨ For assembly of insulating half-shells and strip fasteners, consider Fig. 92 and Fig. 93.

⇨ Finally insert a plastic tube (1) on each horizontal bar of busbar system. Consider the panel width and numbers of bars in the busbar system while fitting the plastic tubes.

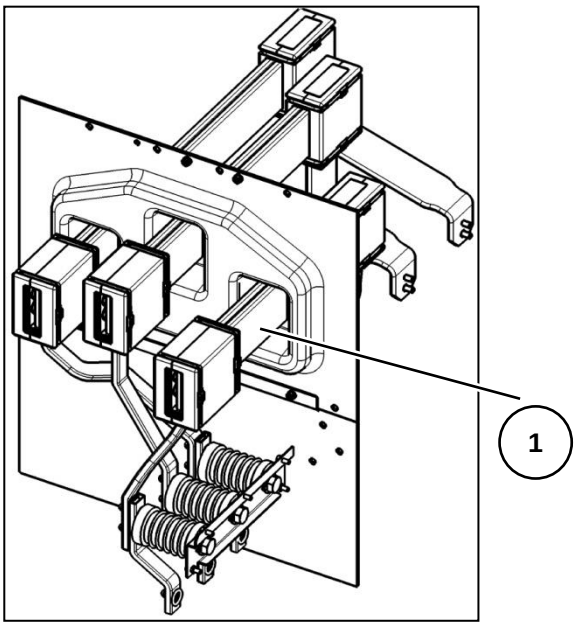


Fig. 95: Contactor panels with panel width 435 mm:
Detail view of busbar system with plastic tubes, for example

7.8 Closing the busbar compartment

⚠ DANGER

Electric shock

Always verify safe isolation from supply without any doubt.

In the instructions given in the following sections it is assumed that new switchgear is being installed, which has not yet been energized with operational high voltage.

If the switchgear is already in operation, operational high voltage could be applied at the connections / bars in the busbar compartment.

⇨ To perform tests or work in the busbar compartment of a switchgear that is already in operation, follow the directives of the Operating Instructions with order number 110-0134.9.

NOTICE

Foreign objects

Possible malfunctioning and damage to the panels caused by foreign objects.

⇨ Before closing the busbar compartment, remove all foreign objects, e.g.:

- Tools
- Unused installation material
- Packing material
- Cleaning material

NOTICE

Cleaning

Possible malfunctioning and damage to the panels caused by pollution.

Before closing the busbar compartment:

⇨ Clean polluted areas. 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.

INFORMATION

Before commissioning the panels, the busbar compartment must only be permanently closed by bolting the transverse partition or busbar cover tight under the following conditions:

- The compartment is free from foreign objects and pollution
- All previous assembly work inside the compartment has been fully and properly completed

⇨ Verify completeness and correctness of the previous assembly work inside the compartment. In this context, also check the control tightening torque of the bolted joints and correct the torques if required.

⇨ Record the proper condition of the compartment after bolting together, so that this is clear without any doubt before commissioning the panels.

INFORMATION

In the case of contactor panels with panel width 435 mm, the busbar compartment is accessible neither through the rear wall of the busbar compartment nor through the roof plate.

⇨ The busbars must absolutely be mounted from the side of the panel **before** mounting the transverse partition.

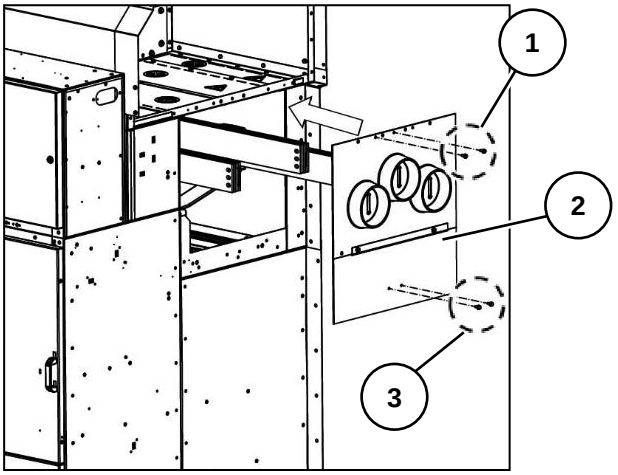
Panel depth [mm]	**Transverse partition**
1350	Optional
1400/1500/1540/1650	Compulsory

Mounting the transverse partition

Mounting the transverse partition, all panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel

⇨ Slide the transverse partition plate (2) onto the busbars.

⇨ Screw the transverse partition plate together with the busbar compartment at the upper and lower edges using connecting elements (1), (3).



(1) 2 hexagon head bolts M8x20 and plain washers size 8.4 mm

(2) Transverse partition plate

(3) 2 bolts M8x20 with contact washers

Fig. 96: Mounting the transverse partition plate from the right, panel depth 1500/1540/1650 mm

Mounting the transverse partition on contactor panel with panel width 435 mm
On contactor panels with panel width 435 mm, the transverse partition plate is not fastened before the adjacent panel has been approached. The 3 bolted joints of the transverse partition plate are fitted through the busbar compartment of the adjacent panel.

INFORMATION

Mounting the transverse partition plate on contactor panels with panel width 435 mm:

⇨ Approach the adjacent panel **first**, then fasten the transverse partition plate.

⇨ Slide the transverse partition plate (2) onto the busbars.

⇨ Approach the adjacent panel and fasten the transverse partition plate between the two busbar compartments at the upper edge using 2 hexagon head bolts size M8x20 and plain washers size 8.4 mm (1) and at the lower edge using hexagon socket head bolt size 6 (3).

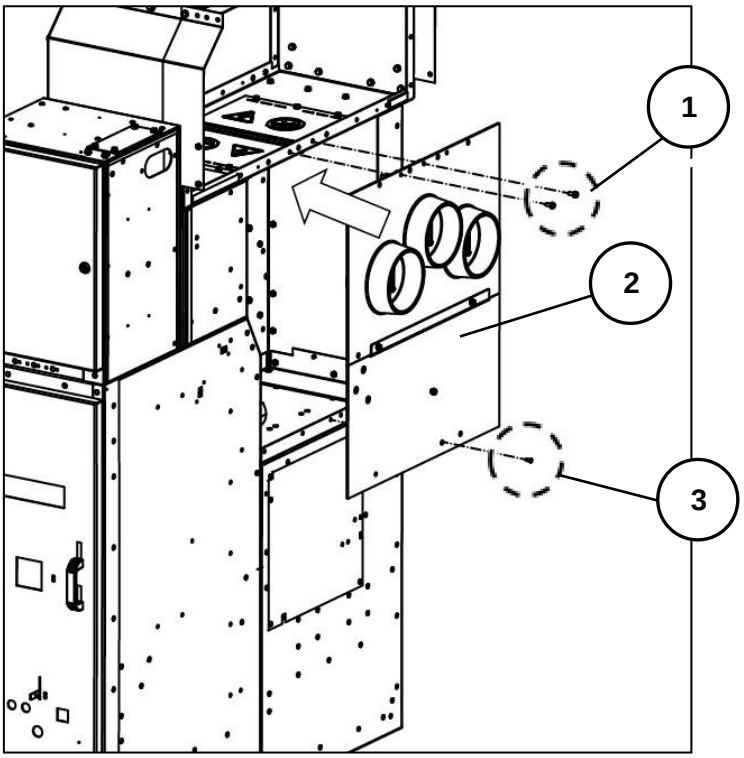


Fig. 97: Contactor panels with panel width 435 mm:
Mounting the transverse partition plate from the right

Mounting the transverse partition on switch-disconnector panel

On switch-disconnector panels, the transverse partition plate is fastened on both right and left sides even if there is no transverse partition plate for the rest of the panels. In the case of the switch-disconnector panel is end panel, transverse partition plate is fastened on the one side.

⇨ Slide the transverse partition plate (2) onto the busbars on the right and left sides.

⇨ Screw the transverse partition plate together with the busbar compartment at the upper and the lower edges using connecting elements:

- 2 hexagon head bolts M8x20 and plain washers size 8.4 mm (1)
- 2 bolts M8x20 with contact washers (3)

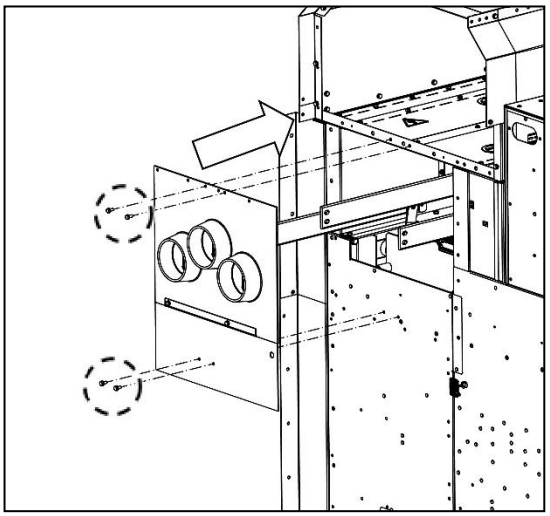


Fig. 98: Mounting the transverse partition plate from the left on the switch-disconnector panel

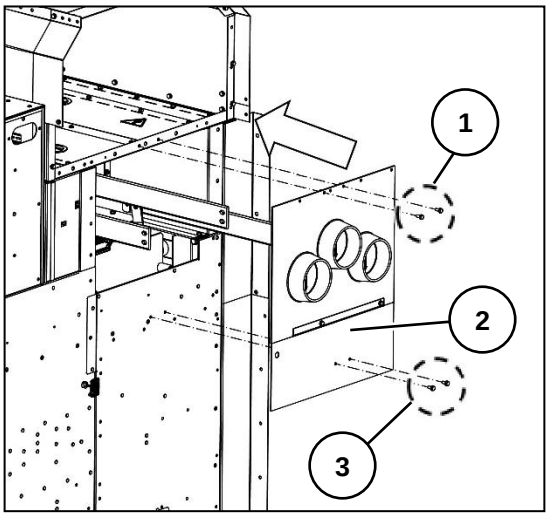


Fig. 99: Mounting the transverse partition plate from the right on the switch-disconnector panel

Installing the busbar cover in the busbar compartment

> **⚠ CAUTION**
>
> **Sharp-edged sheets**
>
> The metal parts of the busbar cover and upper shutter may have sharp edges. Sharp-edged sheets inside the switchgear can cause injuries by getting cut and damage cables.
>
> ⇨ Put on personal protective equipment (e.g. cut-resistant gloves and arm sleeves).
>
> ⇨ When working inside the switchgear, it must be observed that cables do not touch any sharp-edged sheets. Cover sharp-edged spots, if required.

Preconditions

- Feeder earthing switch in CLOSED position
- High-voltage door open
- Low-voltage connector stowed away
- All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel:
  - Busbar cover available
  - Connecting elements available: 11 nuts size M8
- Switch-disconnector panel only:
  - Busbar cover available
  - Connecting elements available: 3 bolts M8x20 with contact washers

Procedure

⇨ Install the busbar cover (1) between the busbar compartment and the switching-device compartment.

⇨ To fix the busbar cover (1), tighten the nuts all around hand-tight:
- 11 nuts M8 with contact washers (2)

⇨ Tighten the fixing nuts all around with a tightening torque of 25 Nm.

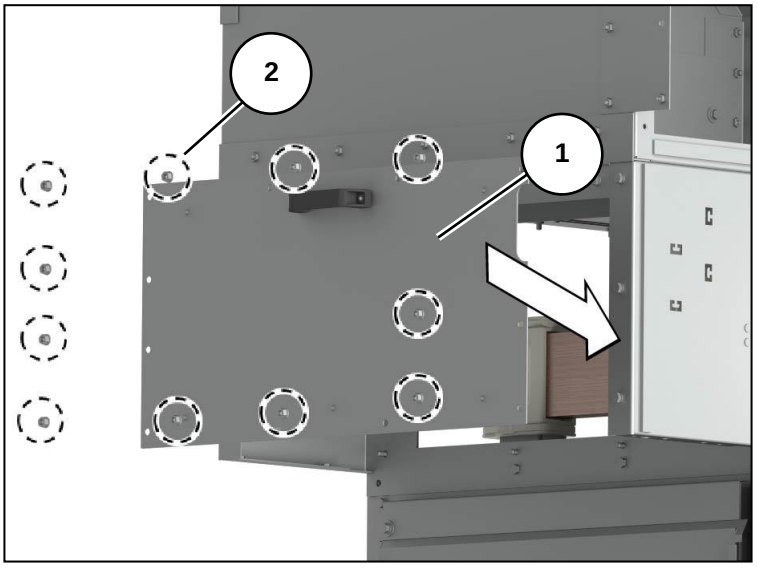


Fig. 100:11 bolted joints on busbar cover

Fig. 101:Busbar cover installed

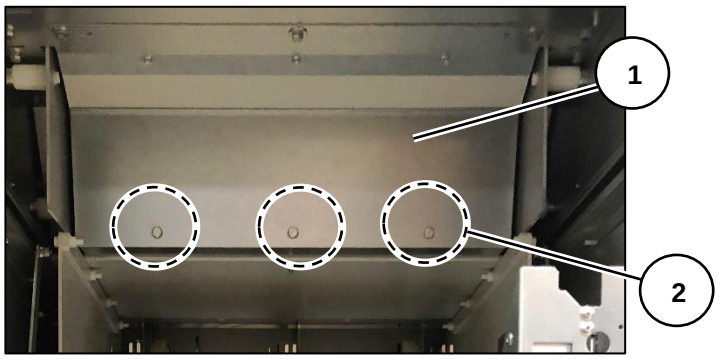
✓ The busbar cover between the busbar compartment and the switching-device compartment is installed.

Switch-disconnector panel only:

⇨ Install the busbar cover (1) between the busbar compartment and the switching-device compartment.

⇨ To fix the busbar cover (1), tighten the bolts all around hand-tight:
- 3 bolts M8x20 with contact washers (2)

⇨ Tighten the fixing bolts all around with a tightening torque of 25 Nm.



1) Busbar cover
2) Connecting elements

Fig. 102: 3 bolted joints on the busbar cover

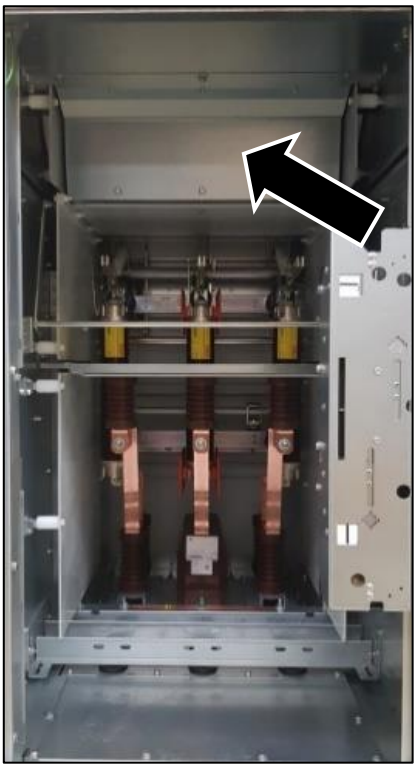


Fig. 103: Busbar cover installed

✓ The busbar cover between the busbar compartment and the switching-device compartment is installed.

7.9 Bolting panels together

NOTICE

Panel frame

A distorted panel frame will impair the function of the switchgear.

⇨ Lay thin shims with 0.5 mm to 1.0 mm thickness under the panel frame, if required.

⇨ Consider the results of the measuring sheet for the foundation.

INFORMATION

Joining another panel covers the bolted joints of the transverse partition plate of the adjacent panel:

⇨ Check the bolted joints of the transverse partition plate in advance with the control tightening torques and correct if required.

INFORMATION

Mounting the transverse partition plate on contactor panels with panel width 435 mm:

⇨ Approach the adjacent panel **first**, then fasten the transverse partition plate.

INFORMATION

When lining up contactor panels with panel width 435 mm:

⇨ Screw the supplied connecting element of the earthing busbar in between the panels.

Preconditions

- The first panel is placed on its place of installation and fixed onto the floor.

Procedure

⇨ Align the adjacent panel in horizontal and vertical position beside the first panel.

⇨ Establish the same level (1 mm/m) as for the first panel using shims.

⇨ While lining up a contactor panel with panel width 435 mm (1) to a panel featuring a panel width ≥ 600 mm, screw the supplied connecting element (2) of the earthing busbar in between the two panels.

⇨ Bolt or weld the adjacent panel onto the foundation rails without distortions.

⇨ Assemble the busbars and the transverse partition plate in / at the busbar compartment in the adjacent panel.

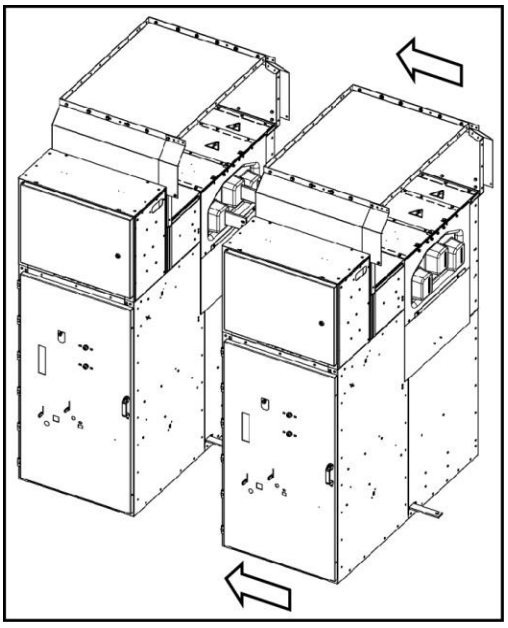


Fig. 104: Aligning the panel

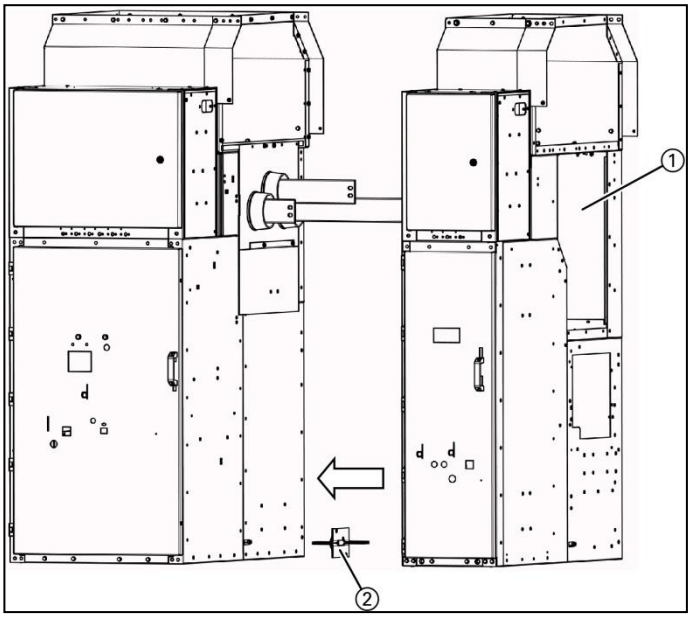


Fig. 105: Connecting element for lining up a contactor panel with panel width 435 mm with a panel featuring a panel width ≥ 600 mm

⇨ Insert the panel connection links (3) between two switching-device compartments in the front area.

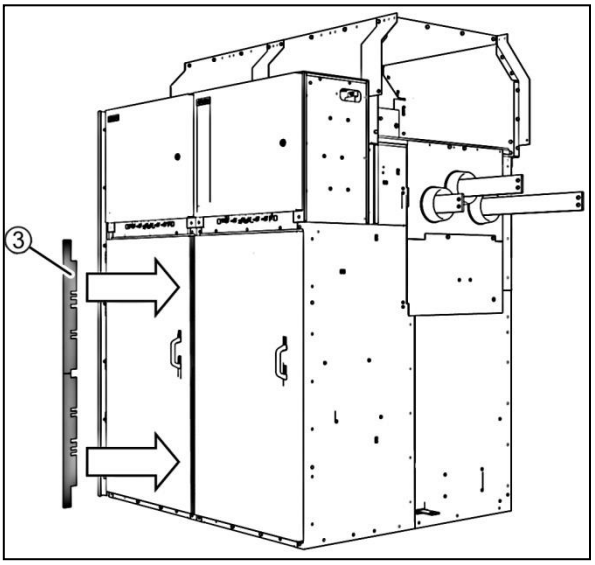


Fig. 106: Panel connection link

Wiring duct cover in switching-device compartment

⚠ CAUTION

Sharp-edged sheets

The metal parts of the wiring duct covers may have sharp edges. Sharp-edged sheets inside the switchgear can cause injuries by getting cut and damage cables.

⇨ Put on personal protective equipment (e.g. cut-resistant gloves and arm sleeves).

⇨ When working inside the switchgear, it must be observed that cables do not touch any sharp-edged sheets. Cover sharp-edged spots, if required.

NOTICE

Foreign objects

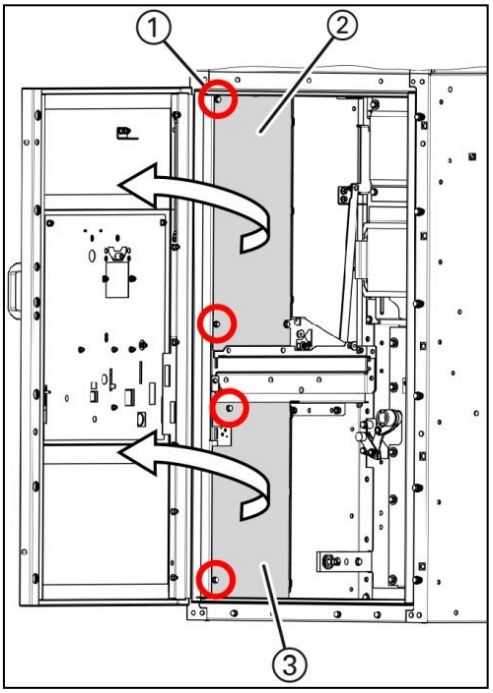
Possible malfunctioning and switchgear damage caused by foreign objects.

⇨ Remove all foreign objects from the switching-device compartment, e.g.:

- Tools
- Unused installation material
- Packing material
- Cleaning material

⇨ Remove 2 hexagon head bolts M8x20 each from the upper and the lower wiring duct cover on the left inner side of the panel in the switching-device compartment.

⇨ Remove the upper and the lower wiring duct cover from the switching-device compartment.



(1)	Hexagon head bolt M8x20
(2)	Upper wiring duct cover
(3)	Lower wiring duct cover

Fig. 107: Removing the wiring duct cover

INFORMATION

The necessary bolting elements are delivered in a bag unit together with each panel. The bag units are attached to the sheet-steel enclosure of the busbar compartment.

⇨ For bolting the panels together, use bag unit with order number 110-0788.3.

⇨ After removing the connecting elements, the packing materials of the bag unit must be disposed of in an environmentally compatible way.

⇨ The bag units can be re-ordered individually.

⇨ Take 7 bolts M8x25 (hexagon head bolt with contact washer) and 7 plain washers size 8 according to ISO 7093 from the bag unit supplied, and screw them from the left inner side of the switching-device compartment into the adjacent switching-device compartment.

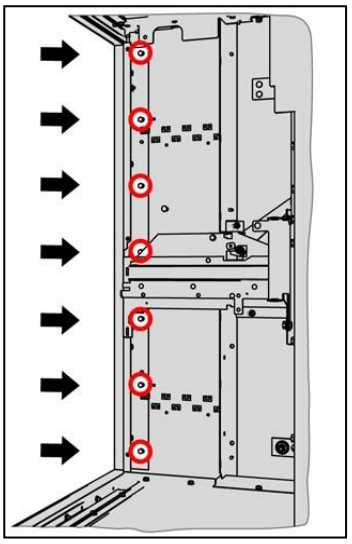


Fig. 108: Bolted joints in the switching-device compartment

⇨ Insert upper and lower wiring duct cover on the left inner side of the switching-device compartment and fix each cover with 2 bolts M8x20 (hexagon head bolt with contact washer).

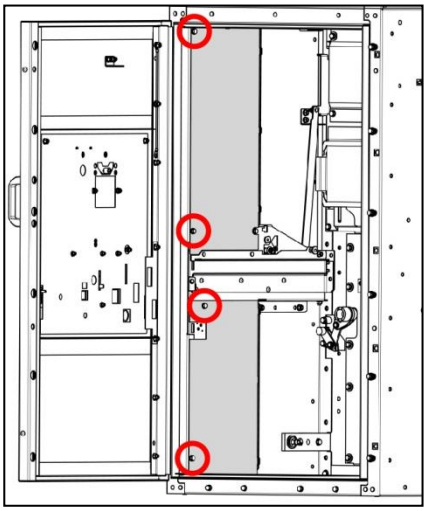


Fig. 109: Fastening the wiring duct covers

Bolted joints in the pressure relief duct (PRC) area

⚠ CAUTION

Sharp-edged sheets

The metal parts of the pressure relief duct may have sharp edges. Sharp-edged sheets inside the switchgear can cause injuries by getting cut and damage cables.

⇨ Put on personal protective equipment (e.g. cut-resistant gloves and arm sleeves).

⇨ When working inside the switchgear, it must be observed that cables do not touch any sharp-edged sheets. Cover sharp-edged spots, if required.

NOTICE

Foreign objects

Possible malfunctioning and switchgear damage caused by foreign objects.

⇨ Remove all foreign objects from the PRC, e.g.:

- Tools
- Unused installation material
- Packing material
- Cleaning material

⇨ Bolt two panels together in the lower area of the PRC and on the left and right side of the PRC, using 14 bolts M8x20, contact washers and nuts.

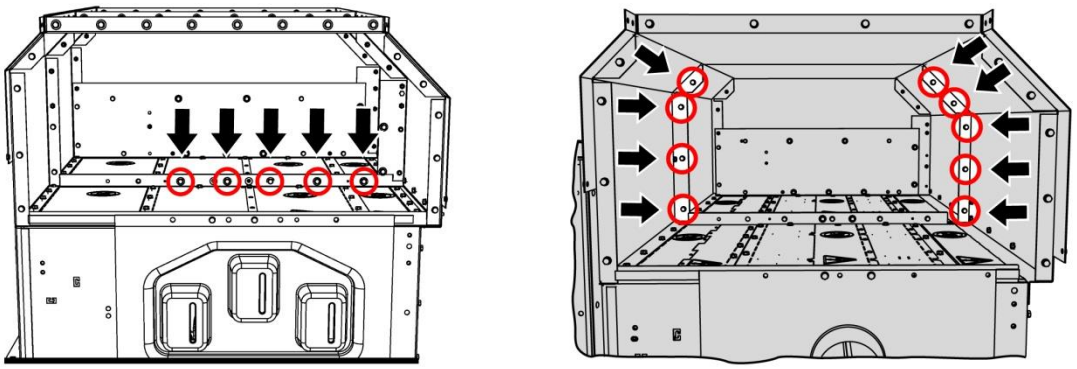


Fig. 110: Bolted joints inside the PRC

⇨ Bolt two panels together in the upper area of the PRC, using 8 bolts M8x20, contact washers and nuts.

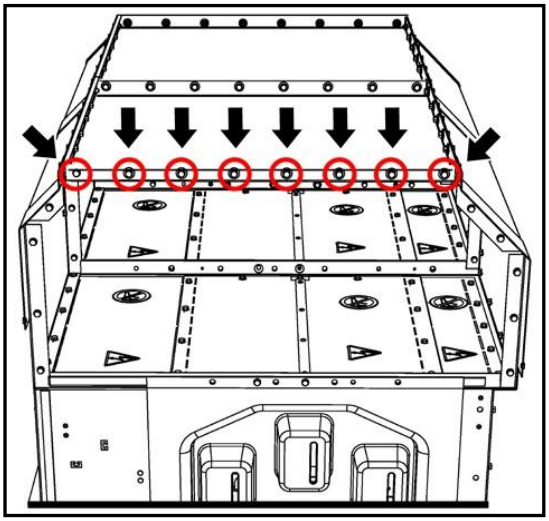


Fig. 111: Bolted joints in the upper area of the PRC

Installation of deflector plates

For further information, see information drawings NXAIR, order number 110-2300.9.

Bolting the low-voltage compartment together

⇨ Bolt 2 panels each together at the side of the low-voltage compartment using bolts M8x20, contact washers and nuts. Depending on the panel version, there are 3 (height of low-voltage compartment 630 mm) or 5 (height of low-voltage compartment 980 mm) bolted joints.

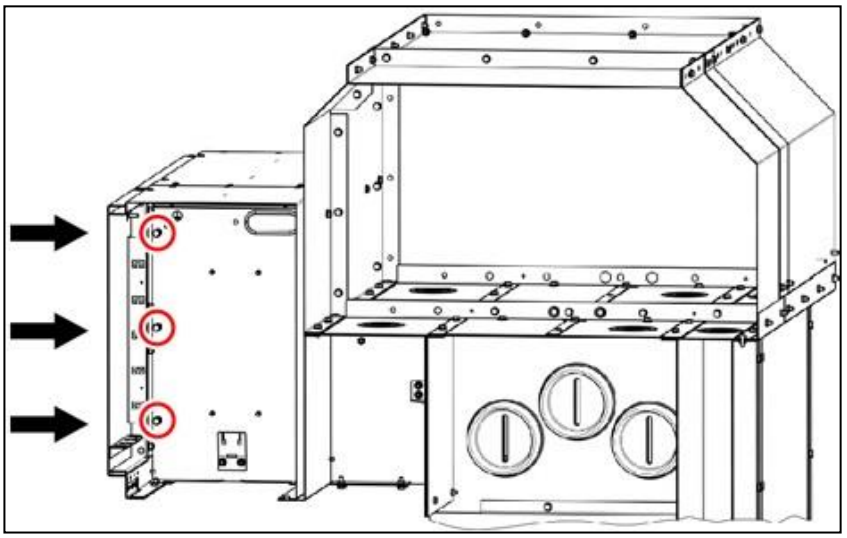


Fig. 112: Bolted joints at the low-voltage compartment

Bolting ledges together at the rear side of the panels

⇨ When the panels are free-standing, the rear sides of the busbar compartments and connection compartments must be bolted together with panel connection links. To do this, screw bolts M8x20 in at **all** bolted joints.

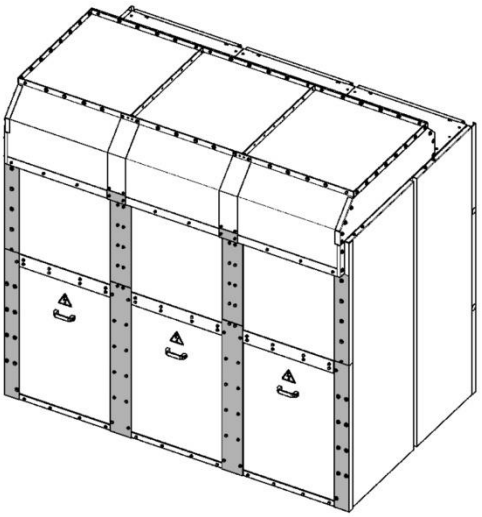


Fig. 113: Panels with panel width ≥ 600 mm: Panel connection links and bolted joints at the rear

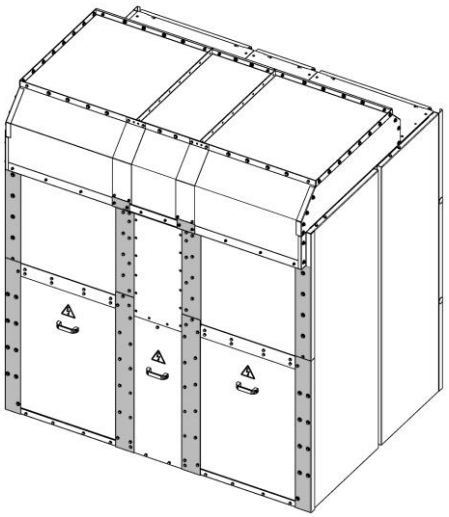


Fig. 114: Contactor panel with panel width 435 mm (center): Panel connection links and bolted joints at the rear

For further information, see information drawings NXAIR, order number 110-2300.9.

Assembling the busbars in the end panel
The installation of the busbar in the end panel cannot be done from the side. In the upper area of the busbar compartment, several parts as well as bolts, nuts and washers must be removed.

NOTICE

Foreign objects

Possible malfunctioning and damage to the panels caused by foreign objects.

⇨ Before closing panel compartments, remove all foreign objects, e.g.:
- Tools
- Unused installation material
- Packing material
- Cleaning material

NOTICE

Cleaning

Possible malfunctioning and damage to the panels caused by pollution.

Before closing switchgear compartments:

⇨ Clean polluted areas. 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.

INFORMATION

Joining another panel covers the bolted joints of the transverse partition plate of the adjacent panel:

⇨ Check the bolted joints of the transverse partition plate in advance with the control tightening torques, and correct if required.

INFORMATION

Mounting the transverse partition plate on contactor panels with panel width 435 mm:

⇨ Approach the adjacent panel **first**, then fasten the transverse partition plate.

INFORMATION

When lining up contactor panels with panel width 435 mm and panels with panel width ≥ 600 mm:

⇨ Screw the supplied connecting element of the earthing busbar in between the panels.

INFORMATION

Before commissioning the panels, every compartment may only be permanently closed by bolting under the following conditions:

- The compartment is free from foreign objects and pollution
- All previous assembly work inside the compartment has been fully and properly completed

⇨ Verify completeness and correctness of the previous assembly work inside every compartment. For this purpose, also check the control tightening torques of the bolted joints, and correct the torques if required

⇨ Record the proper condition of every compartment after bolting together, so that this is clear without any doubt before commissioning the switchgear.

⇨ Remove parts according to the following illustrations showing different panel versions.

⇨ Store all parts as well as bolts, nuts and washers for later use.

⇨ Align the end panel with the adjacent panel in horizontal and vertical position.

⇨ Establish the same level (1 mm/m) as for the adjacent panel using shims.

⇨ Bolt or weld the end panel onto the foundation rails without distortions.

⇨ Assemble the busbars and the transverse partition plate in / at the busbar compartment in the adjacent panel.

⇨ Install and connect all removed parts in reverse order.

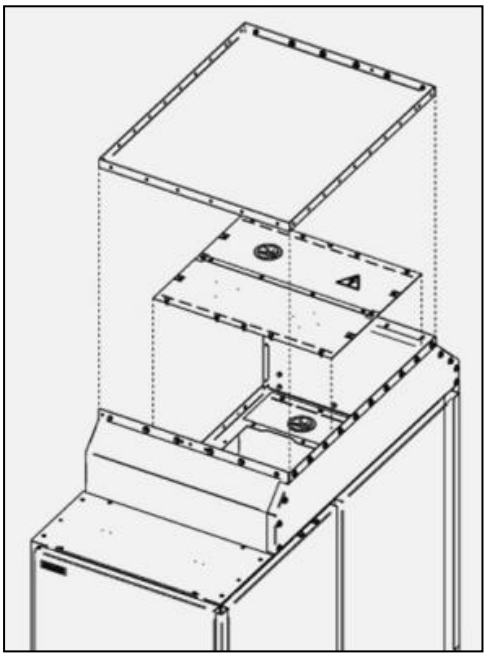


Fig. 115: PRC without additional components

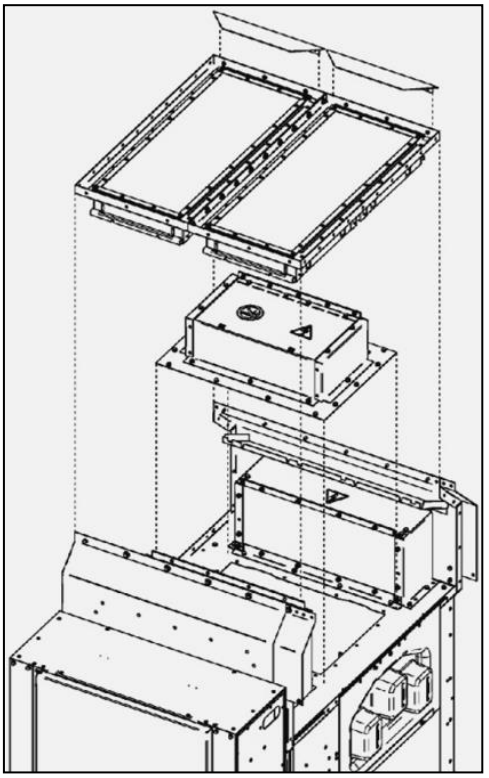


Fig. 116: PRC with natural ventilation

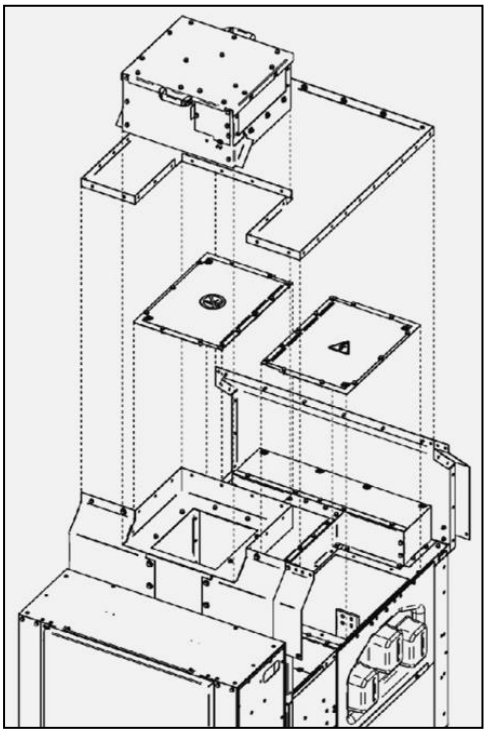


Fig. 117: PRC with fan installation

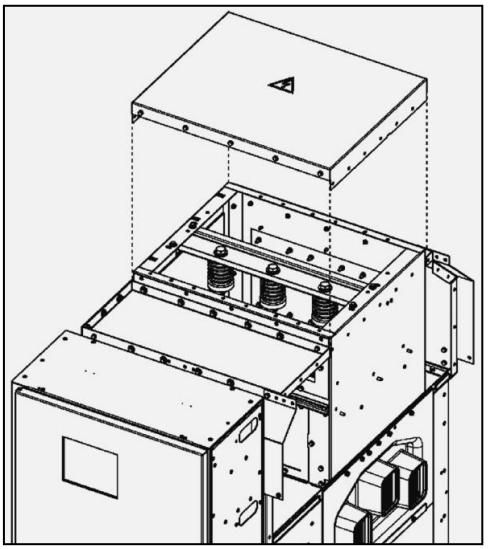


Fig. 118: PRC with e.g. busbar earthing switch installation

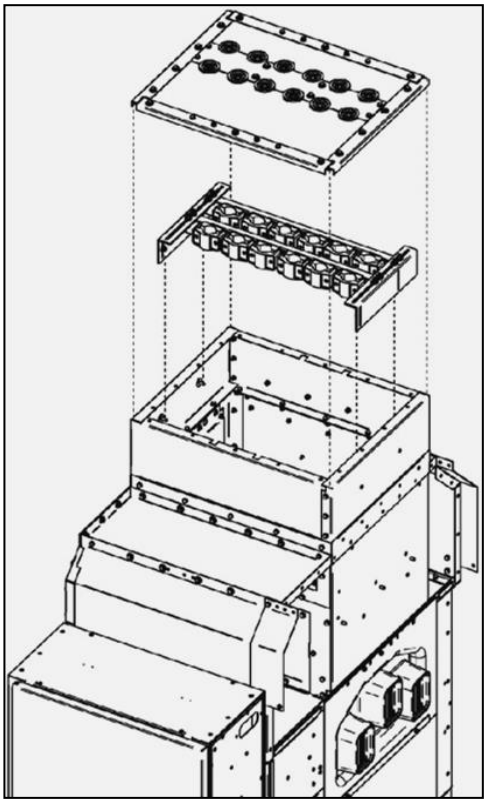


Fig. 119: PRC with cable connection from above

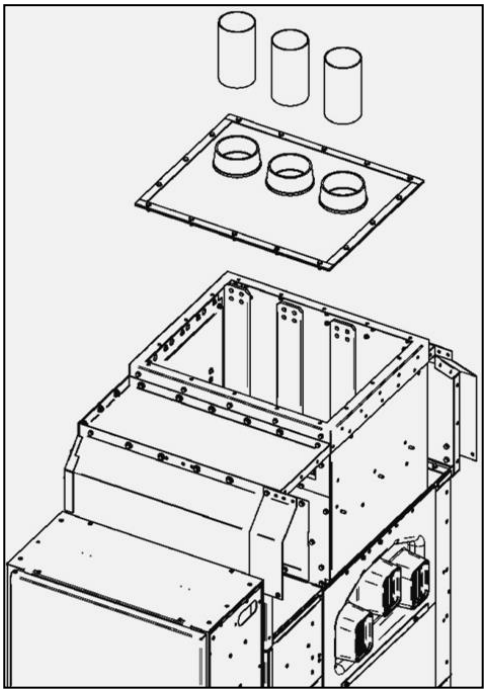


Fig. 120: PRC with bar connection from above

Function test of absorber system (optional version) I_k = 25 kA
Depending on the configuration of the complete switchgear, certain individual panels are equipped with absorber systems in the pressure relief duct, which must undergo a function test.

NOTICE

Metal grids

The upper metal grids (2) of the absorber system must not be damaged, i.e. there must be neither cracks nor holes.

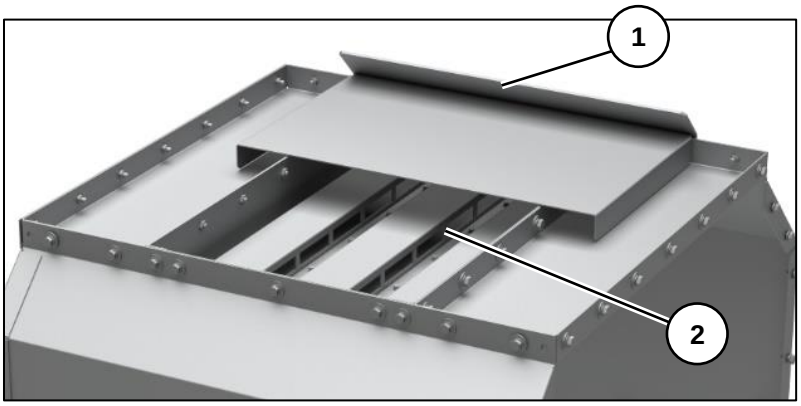
⇨ Check the metal grids of the absorber system.

NOTICE

Deflector plates

The front defector plates (1) of the absorber system must be mounted in the rear area (area with rear wall) of the absorber system.

⇨ Check the position of the deflector plates of the absorber system.



(1) Front deflector plate

(2) Metal grids

Fig. 121: View from the front side: Absorber system
(with front deflector plate on the rear area)

Function test of absorber system (optional version) I_k = 40 kA
Depending on the configuration of the complete switchgear, certain individual panels are equipped with absorber systems in the pressure relief duct, which must undergo a function test.

NOTICE

Metal grids

The upper metal grids (4) of the absorber system must not be damaged, i.e. there must be neither cracks nor holes.

⇨ Check the metal grids of the absorber system.

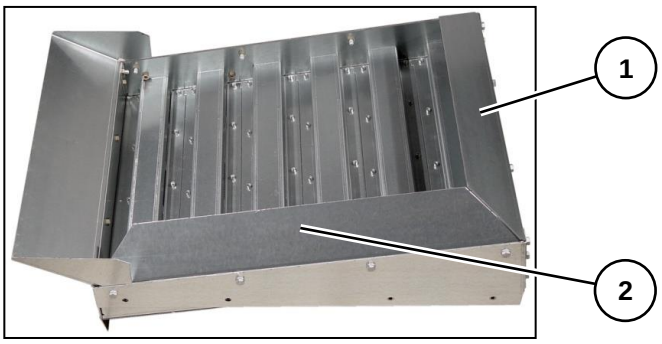
NOTICE

Deflector plates

The front defector plates (1) of the absorber system must be mounted in the rear area (area with rear wall) of the absorber system.

The lateral deflector plate (2; 3) must be mounted pointing to the center of the switchgear row.

⇨ Check the position of the deflector plates of the absorber system.



(1) Front deflector plate

(2) Lateral deflector plate mounted on the right side

(3) Lateral deflector plate mounted on the left side

(4) Metal grids

(5) Arrowhead pointing to the center of the switchgear row

Fig. 122: View from the right: Absorber system (with lateral deflector plate on the right side as an example)

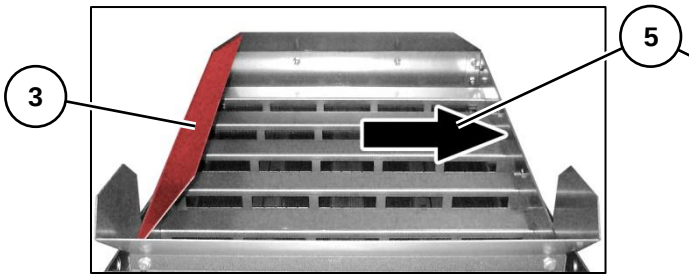


Fig. 123: View from the front: Absorber system installed left of the center of the switchgear row

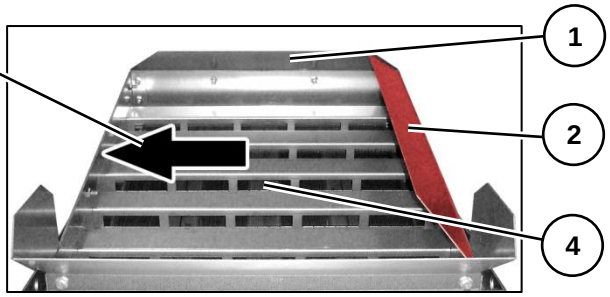


Fig. 124: View from the front: Absorber system installed right of the center of the switchgear row

Function test for ventilation system (optional version)

NOTICE

Metal grids

The upper metal grids (4) of the ventilation system in the PRC must not be damaged, i.e. there must be neither cracks nor holes.

⇨ Check the metal grids of the ventilation system.

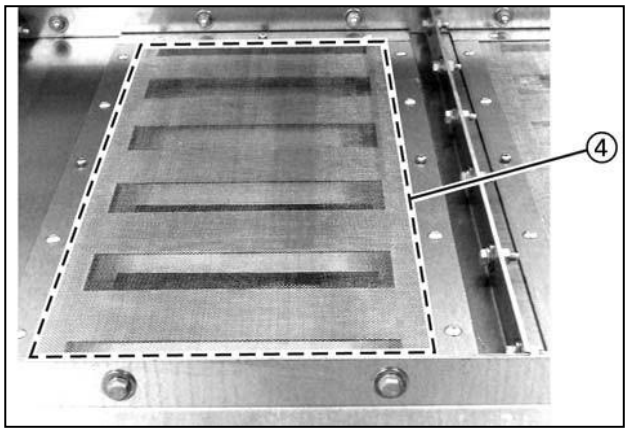


Fig. 125: View onto the ventilation system in the pressure relief duct

NOTICE

Ventilation elements

The ventilation segments (7) of the ventilation system **must** rest in the lower latching positions (6). They must **not** be located in the upper latching positions (5).

⇨ Check the position of the ventilation segments of the ventilation system.

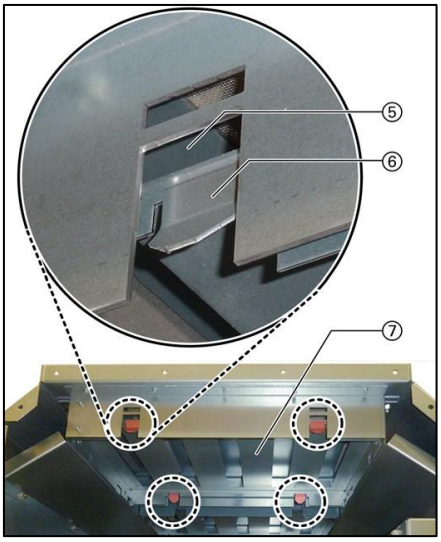


Fig. 126: Ventilation system in the pressure relief duct, view laterally from below

7.10 Interconnecting the earthing busbar

The earthing busbar is connected by means of links from panel to panel, starting from the end panel with the left end wall. For transport, the link is fastened in the connection compartment on the right side at the joint of the earthing busbar. The link is to be refastened on site.

End panels with right end walls are provided without link.

⇨ Provide access to the connection compartment.

⇨ Undo the bolted joint size M12 (1) at the link (4) and push the link to the right, partially out of the panel.

⇨ Refasten the link (4) at the joint, using its second hole and bolt size M12.

⇨ Remove the pre-assembled connecting bolt (1) from the earthing busbar joint in the adjacent panel.

⇨ Check contact surfaces of the earthing busbar in the panel to be connected, brush if necessary, and apply a thin grease film of Vaseline.

⇨ If required, adjust the opening for the earthing busbar through the elongated hole (2). If required, remove a part of the wiring duct (3) for better handling (2 bolts size M8x20).

⇨ Undo the bolted joint of the link in the connection compartment of the adjacent panel, and screw it in again with bolt size M12 as connecting element of the earthing busbar with the adjacent panel.

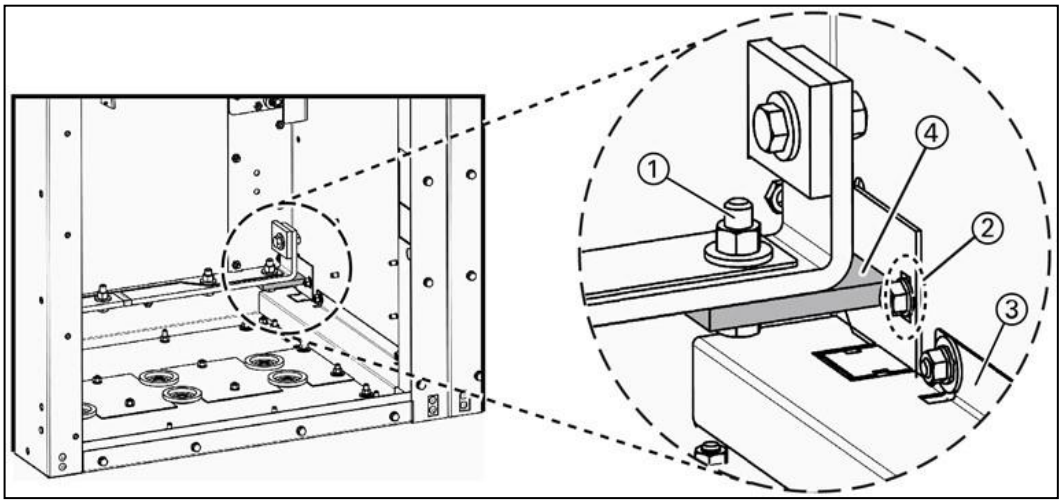


Fig. 127: Connection compartment of the adjacent panel, rear view

✓ The interconnections of the earthing busbar are completed.

7.11 Earthing the switchgear

⇨ To earth the switchgear row, connect at least the earthing busbar of the left and right end panel to the substation earth of the switchgear building. The connection is available in every panel in the connection compartment.

INFORMATION

The solid connection of the earthing busbar with the substation earth of the switchgear building can also be tested with 100 A DC.

The test must be done from the left end panel and the right end panel, via the switchgear row to the substation earthing point with 100 A DC, and the result must be < 200 µΩ.

If the resistance from the earthing bar in the end panels to the substation earthing point is given with < 200 µΩ, there is no need for an additional earthing connection to the substation earth in every fifth panel.

⇨ In addition, every fifth panel must be connected to the substation earth, starting from the left and right end panel.

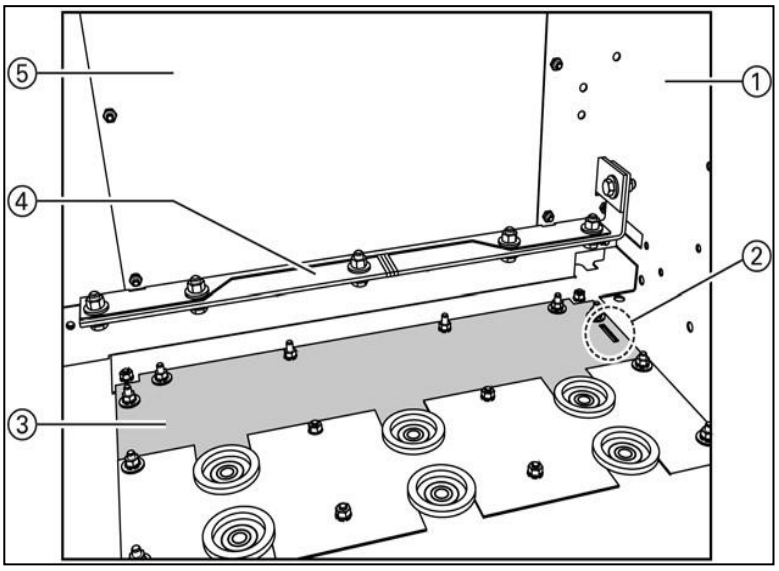


Fig. 128: View from the rear side into the connection compartment

(1) left panel side, inside of connection compartment, (2) elongated cutout in floor cover, width x length = 7x42 mm; if not visible, turn (3) longitudinally through 180°, (3) floor cover, (4) earthing busbar, (5) partition between switching-device compartment and connection compartment

⇨ Open access to the connection compartment. To do this, remove the partition (5) between the switching-device compartment and the connection compartment.

⇨ To insert the cable or strip of the substation earth, use the cutout (2) at the left corner of the floor cover which corresponds to the cross-section of the substation earth.

⇨ Pull the substation earth into the connection compartment through the cutout (2) in the floor cover.

⇨ Connect the substation earth according to the customer's specifications.

⇨ Seal the cutout (2) in the floor cover, e.g. with SIKAFLEX 221-GR 310 ML.

✓ Earthing of the switchgear is completed.

7.12 Installing the fan for forced ventilation

The fan is installed in a fan box at the factory and is delivered separately from the switchgear.

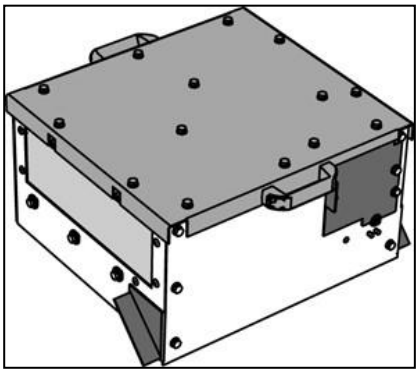


Fig. 129: As-delivered condition of the fan box with installed fan

Versions
The standard version contains a fan in the fan box. As an optional version it is also possible to install two fans, each of them in a fan box of its own.

The forced ventilation with fan can only be used for panels with the following feeder currents:

- 4000 A (panel width 1000 mm)

Fan

Fan manufacturer: ebm-papst	
Type	R3G250-RO06-71
Power input	385 W
Operating hours	40,000 h
Operating instructions	Item no. 51193-5-9970 · Revision 82624
Contact	www.ebmpapst.com / phone: +49793881-0

Installation
The fan with fan box is to be installed on the pressure relief duct in the front area:

(1) Low-voltage compartment (2) Fan in the fan box (3) Pressure relief duct

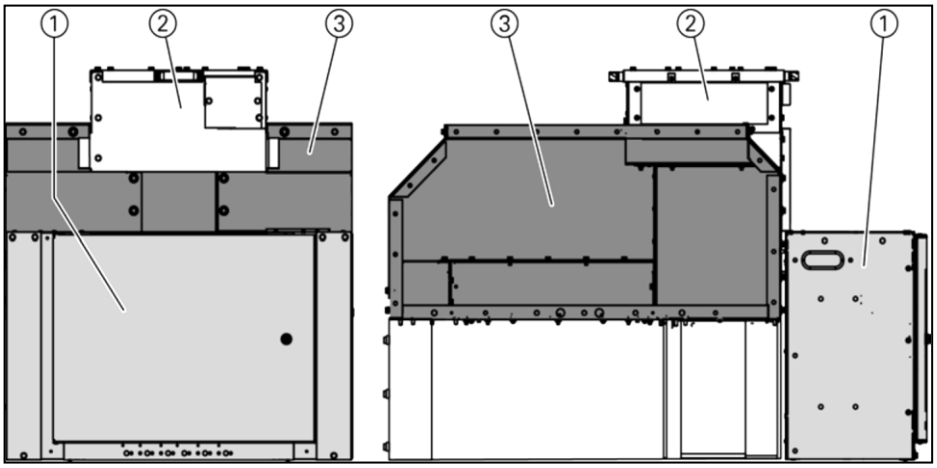


Fig. 130: Installation area for fan box

Preparations for fan installation
To install the fan, dismantling work must be executed at the pressure relief duct and at the fan box.

> **INFORMATION**
>
> In the optional version of the forced ventilation with 2 fans, each of them in a fan box of its own, preparation and installation are done in parallel at the front in the pressure relief duct.

Preparing the pressure relief duct

INFORMATION

⇨ Store all bolts and components that will be dismantled hereafter for later assembly.

⇨ Screw out 6 bolts M8x20.

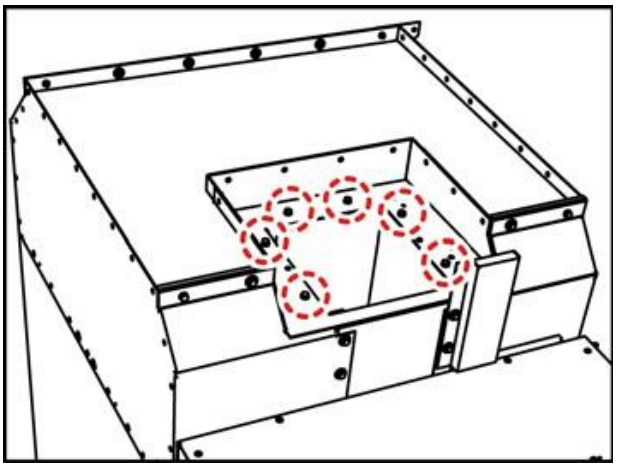


Fig. 131: Pressure relief duct for fan box

⇨ Screw out 2 bolts M8x25 with associated plain washer.

⇨ Remove the front cover.

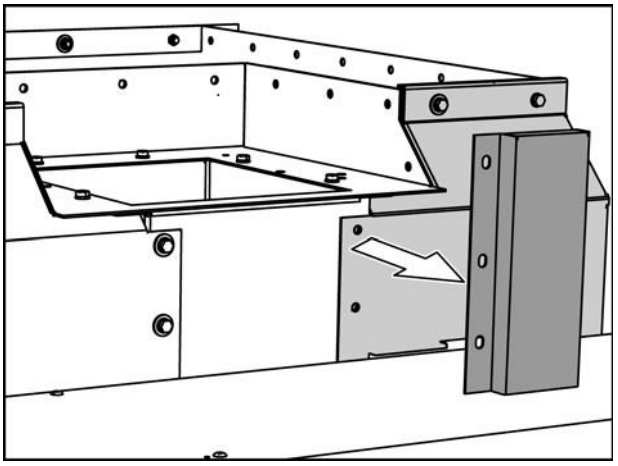


Fig. 132: Front cover at pressure relief duct

Preparing the fan box

⇨ Screw out 2 bolts M8x20.

⇨ Remove the fan box cover.

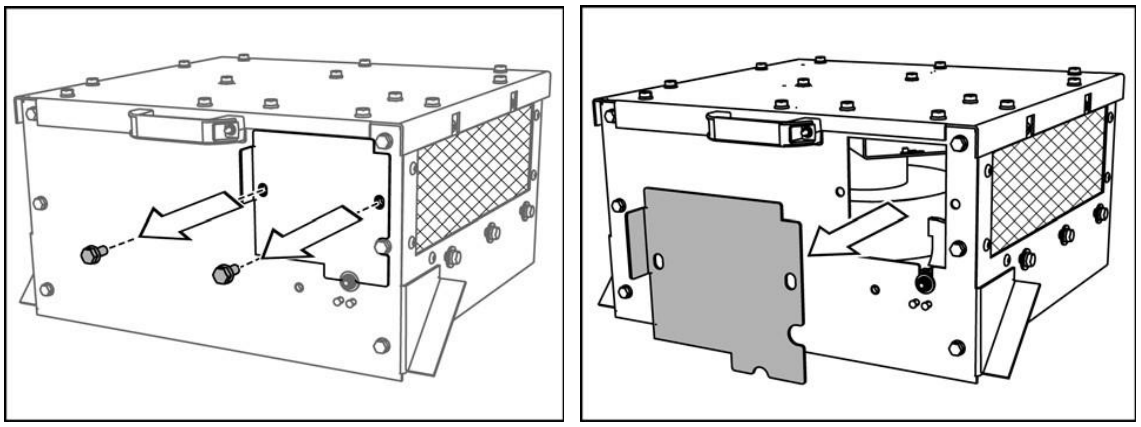


Fig. 133: Fan box with cover

⇨ Screw out 10 bolts M8x25 with associated plain washer.

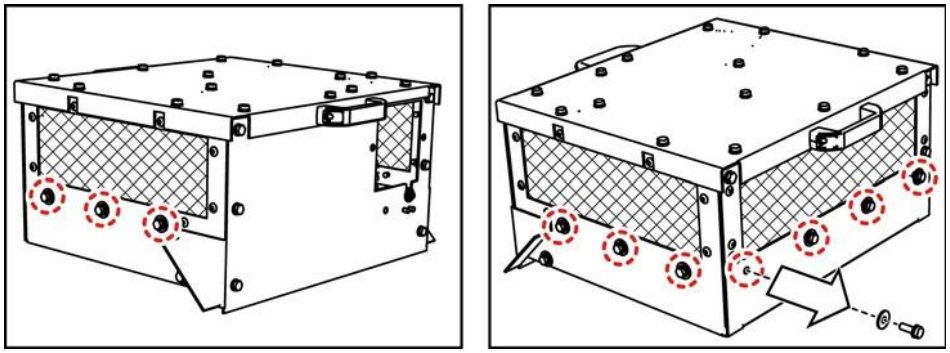


Fig. 134: Fan box connecting bolts (laterally)

NOTICE

Connecting cables

The connection cables of the fan are connected in the fan box at the factory. Risk of damage when the roof plate is removed.

⇨ Disconnect the connection cables carefully.

⇨ Check through the opening at the front of the fan box if the connection cables of the fan are connected.

⇨ Disconnect the connection cables.

⇨ Screw out 10 bolts M8x20.

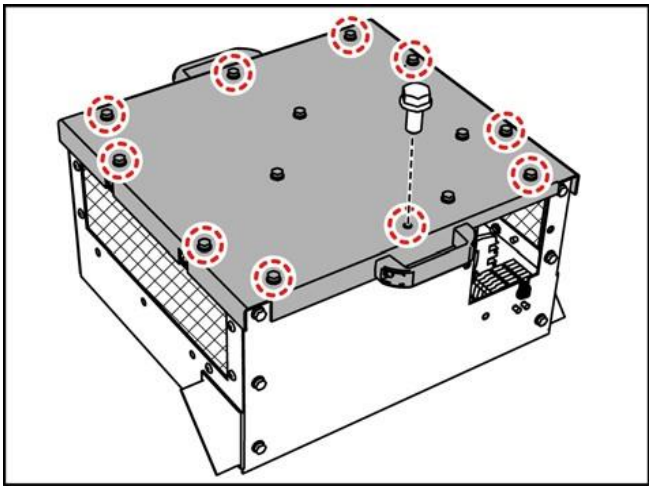


Fig. 135: Fan box connecting bolts (top)

⇨ Remove the roof plate using the handles.

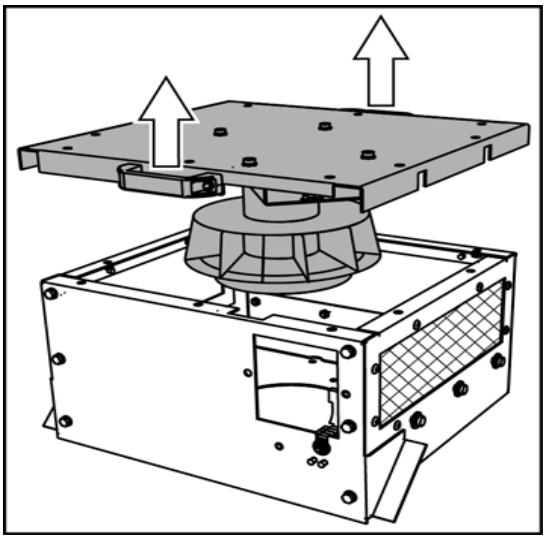


Fig. 136: Fan box roof plate

⇨ Store the roof plate with the fan and the connection cables correctly.

Mounting the fan box

NOTICE

Wind vane in the fan box

The wind vane might be damaged during installation of the fan.

⇨ Disconnect the connection cables carefully.

⇨ Insert the fan box in the front area of the pressure relief duct.

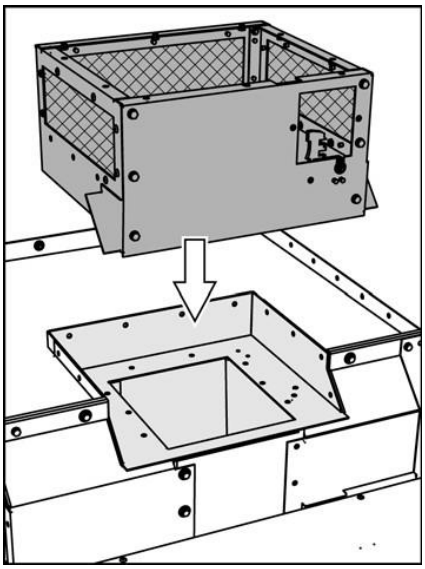
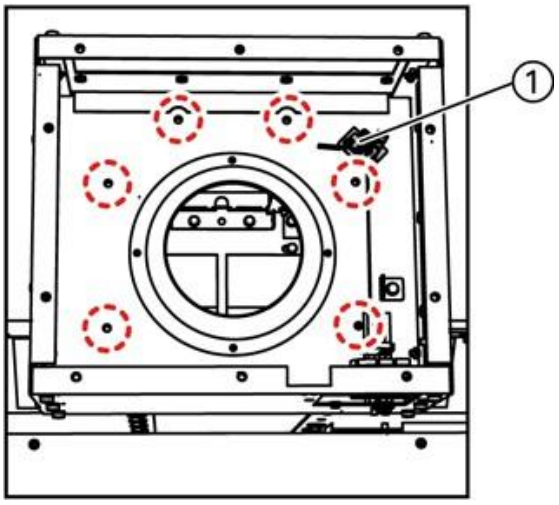


Fig. 137: Fan box position

⇨ Bolt the fan box together with the pressure relief duct using 6 bolts M8x20.



(1) Wind vane

Fig. 138: View from above into the fan box

⇨ Bolt the fan box together with the pressure relief duct using 10 bolts M8x25 and the associated plain washers.

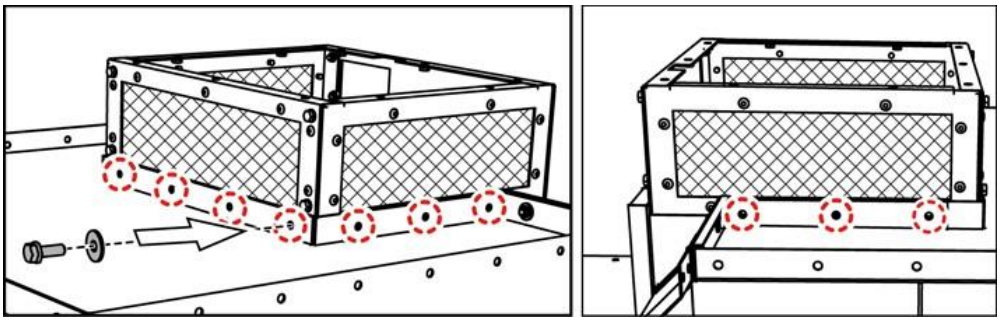


Fig. 139: Fan box connections (laterally)

Cable connection in the low-voltage compartment

⇨ Push the connection cables of the low-voltage compartment into the grommet.

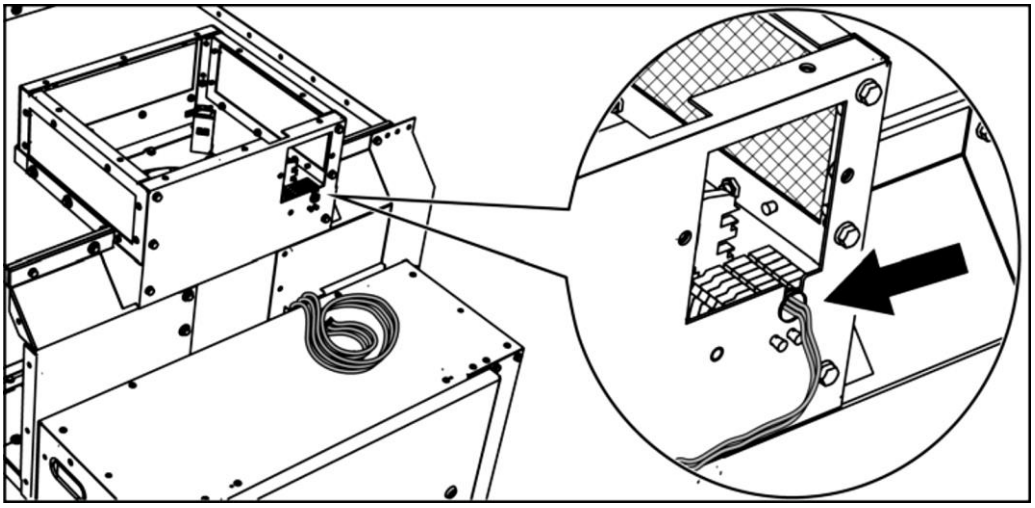


Fig. 140: Connection cables

⇨ Connect the connection cables according to the schematic diagram and the design option.

Schematic diagrams

Schematic diagram for installation of one fan, order number 110-7120.5

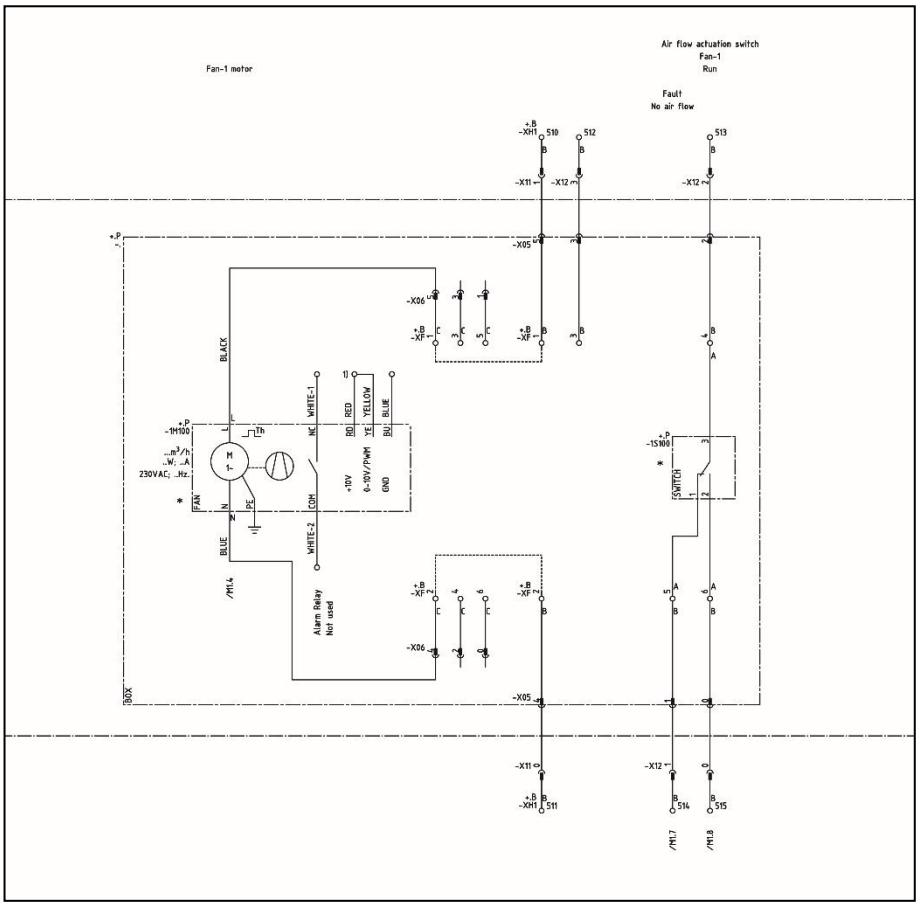


Fig. 141: Schematic diagram for installation of one fan

Schematic diagram for installation of two fans, order number 110-7121.5

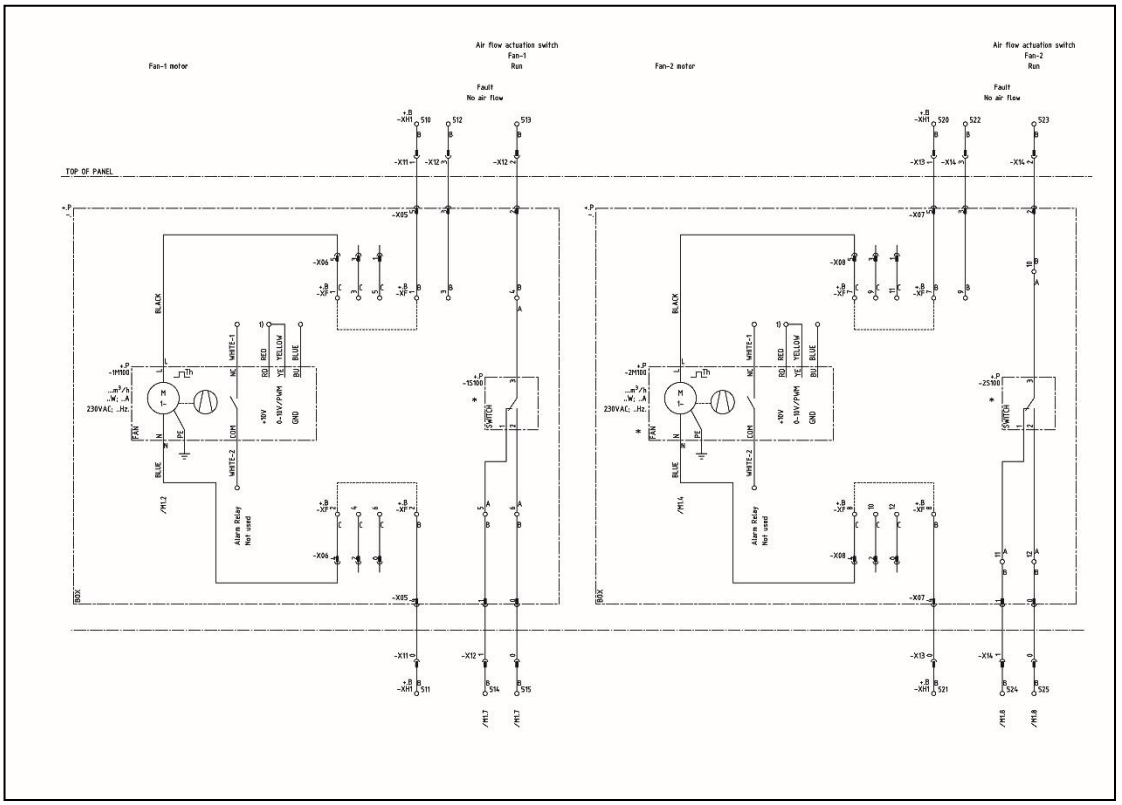


Fig. 142: Schematic diagram for installation of two fans

Inserting the fan

NOTICE

Foreign objects

Possible malfunctioning and damage to the panels caused by foreign objects.

Before mounting the roof plate of the fan:

⇨ Before mounting the roof plate of the fan, remove all foreign objects from the fan box, e.g.:
- Tools
- Unused installation material
- Packing material
- Cleaning material

NOTICE

Cleaning

Possible malfunctioning and damage to the panels caused by pollution.

Before mounting the roof plate of the fan:

⇨ Clean polluted areas in the fan box. 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.

INFORMATION

Before commissioning the switchgear, the fan box may only be permanently closed by bolting the roof plate of the fan together under the following conditions:
- The inside area of the fan is free from foreign objects and pollution
- All previous assembly work inside the fan area has been fully and properly completed

⇨ Verify completeness and correctness of the previous assembly work in the inside area of the fan. For this purpose, also check the tightening torques of the bolted joints, and correct the torques if required

⇨ Record the proper condition of the inside area of the fan after bolting together, so that this is clear without any doubt before commissioning the switchgear.

⇨ Set the roof plate with the fan and the connection cables on the fan box.

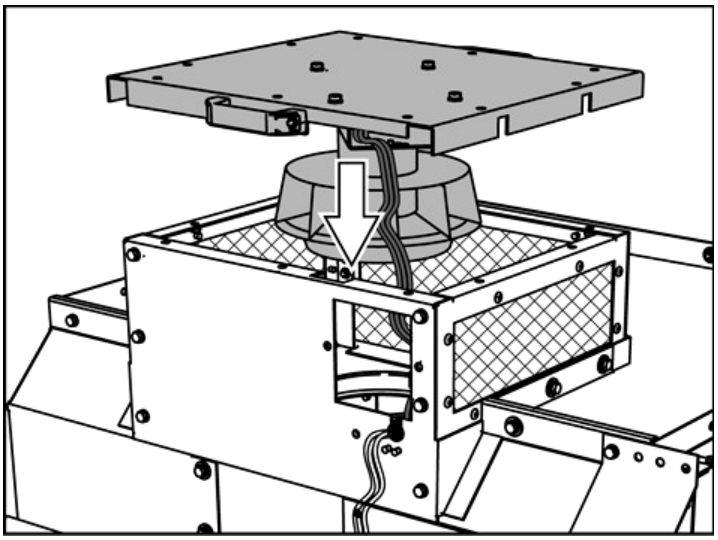


Fig. 143: Installing the roof plate

⇨ Bolt the roof plate together with the fan box using 10 bolts M8x20.

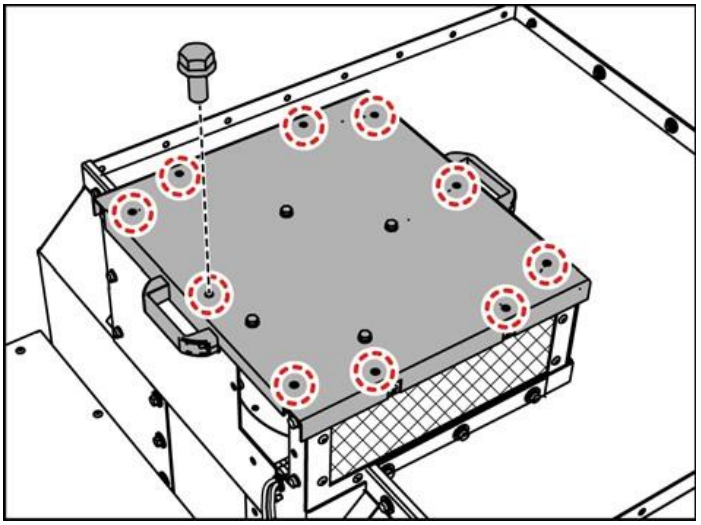


Fig. 144: Fixing the roof plate

Checking smooth operation of the fan

⚠ CAUTION

Rotating fan blades

⇨ Do not reach into the fan box if the voltage supply for the fan is switched on!

⇨ Interrupt the voltage supply of the fan.

⇨ Remove the 2 connection cables to the fan from the terminals -X01/0 and -X01/1 in the low-voltage compartment in order to interrupt the voltage supply of the fan.

⇨ Reach through the front opening of the fan box.

⇨ Turn the fan blades manually.

⇨ The smooth operation of the fan blades is proven when the fan blades do not get blocked during rotation and do not scrape the fan box.

⇨ In case of sluggishness of the fan blades, repeat the installation of the fan until smooth operation is achieved.

⇨ After successful test of the fan blades, connect the cables to the terminals -X01/0 and -X01/1 in the low-voltage compartment.

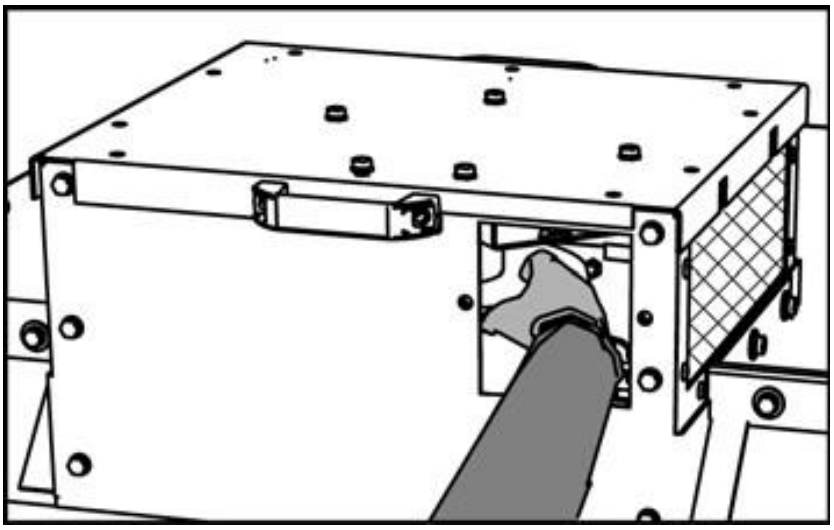


Fig. 145: Testing the fan blades

Completing fan installation

⇨ Fasten the cover using 2 bolt-and-washer-assemblies M8x20.

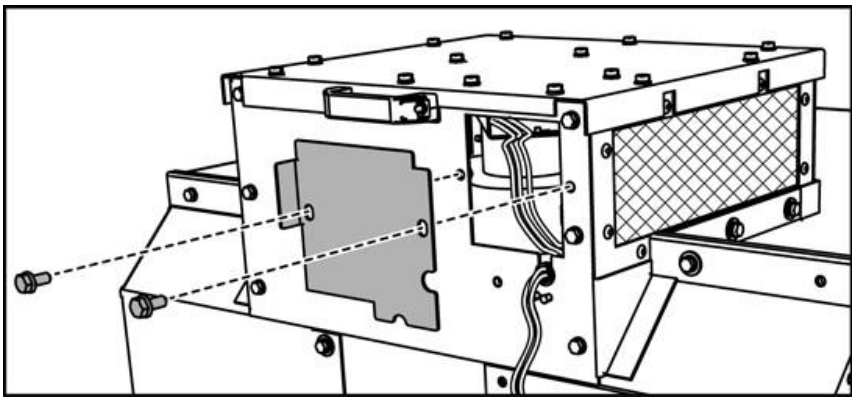


Fig. 146: Assembling the cover

⇨ Fasten the front cover using 2 bolt-and-washer-assemblies M8x25 and the associated plain washers.

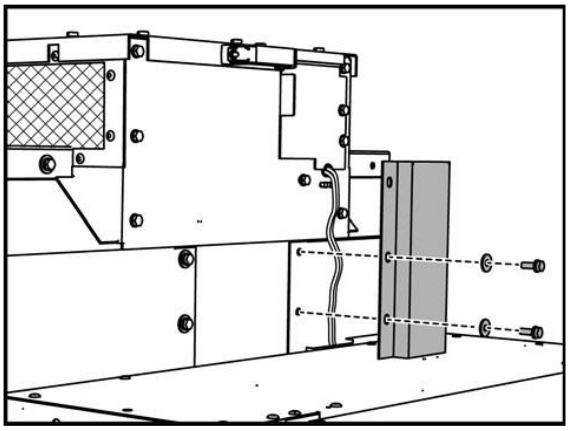


Fig. 147: Installing the front cover

Testing the fan

⇨ Switch off the 3RV circuit-breakers -F03, -F101, -1F101 and -2F101 in the low-voltage compartment in order to interrupt the voltage supply of the fan.

⇨ Apply correct auxiliary voltage to the fan externally through these detached connection cables and verify the following functions.

	Test item	**Remedy action**
Fan start-up	Trouble-free fan operation, only streaming noises are heard	Establish free rotation of the fan blades
Wind vane	Continuity test Terminals for: Fan 1: -XH1: 510 (L), -XH1: 511 (N) Fan 2: -XH1: 520 (L), -XH1: 521 (N) in the low-voltage compartment Fan stands still: Continuity Fan rotates: Interruption	Interrupt external voltage supply immediately, check the wind vane in the fan box

⇨ Let the fan rotate for 5 minutes and observe it.

⇨ In case of faults like unusual noises, interrupt the external voltage supply immediately and eliminate the reason for the fault. Then repeat the test.

⇨ After 5 minutes of trouble-free rotation, interrupt the external voltage supply of the fan.

⇨ Reconnect the connection cables to the wind vane and the fan in the low-voltage compartment.

✓ The fan installation and fan test is completed.

7.13 Switchgear protection IP4X (optional)

Preparations

To achieve the degree of protection IP4X for the switchgear, some components must be sealed with SIKAFLEX 221-GR 310 ML compound according to the information drawings before final assembly of the switchgear.

SIKAFLEX 221-GR 310 ML is supplied with the accessories.

For further information, see information drawings NXAIR, order number 110-2300.9.

7.14 Components without installation activity

> **INFORMATION**
>
> **Systems assembled and tested at the factory are excluded from installation.**
>
> Therefore, do not execute any installation work on:
>
> - Optical sensors for arc detection (optional)
> - Overpressure monitors for arc detection (optional)
>
> Do not modify or remove any systems assembled and tested at the factory.

Optical sensors (optional)

Depending on its version, the panel may feature a system with optical sensors for arc detection. The system can cover up to 4 compartments.

The system consists of:

- Control units in the low-voltage compartment
- 1 optical sensor per covered compartment
- Connecting cables between the control unit and the sensors

Fig. 148: Control units

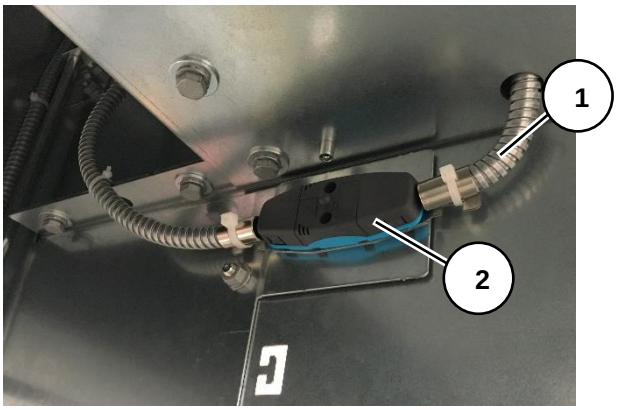


Fig. 149: Optical sensor (2) and connecting cable (1), for example in the switching-device compartment

Overpressure monitors (optional)

Depending on its version, the switchgear panel may feature a system with Overpressure monitors (optional). The system can cover up to 4 compartments.

The system consists of:

- Overpressure monitors in the low-voltage compartment
- 1 sensor per covered compartment
- 1 connecting tube each between the overpressure monitor and the sensor

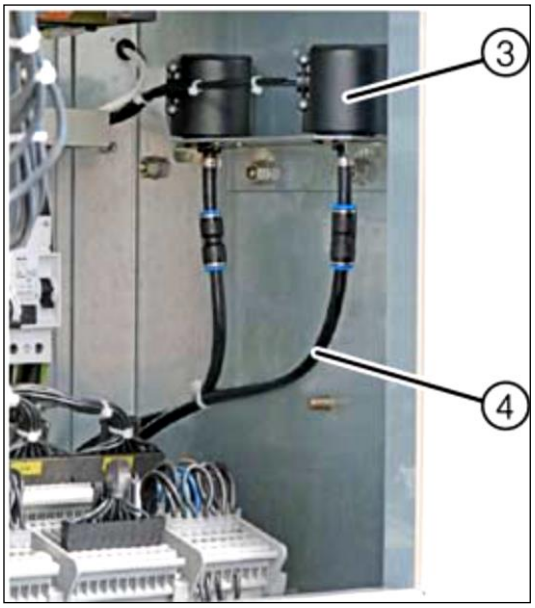


Fig. 150: Overpressure monitors (3) and tubes (4) in the low-voltage compartment

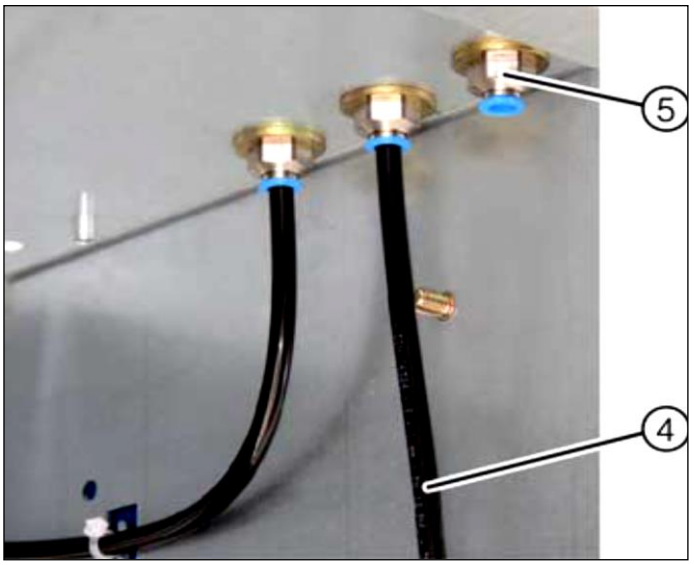


Fig. 151: Overpressure monitors (5) and tubes (4),
for example in the switching-device compartment

8 Accessing the connection compartment through the front

INFORMATION

Read and understand these instructions before attempting installation works.

DANGER

Electric shock

Always verify safe isolation from supply without any doubt.

In the instructions given in the following sections it is assumed that new switchgear is being installed, which has not yet been energized with operational high voltage.

If the switchgear is already in operation, operational high voltage could be applied at the connections in the connection compartment.

⇨ To perform tests or work in the connection compartment of a switchgear that is already in operation, follow the directives of the Operating Instructions with order number 110-0134.9.

INFORMATION

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

⇨ Store disassembled parts and connecting elements carefully, and keep them ready for later reuse.

8.1 Preparations before accessing the connection compartment

Preconditions

- If a withdrawable part / switching-device truck is inserted in the switching-device compartment:
  - High-voltage door closed
  - Withdrawable part / switching-device truck in test position
  - Feeder earthing switch in CLOSED position

Accessing the connection compartment through the front

Procedure

⇨ Verify that the position indicator of the feeder earthing switch on the high-voltage door shows the vertical **I** position.

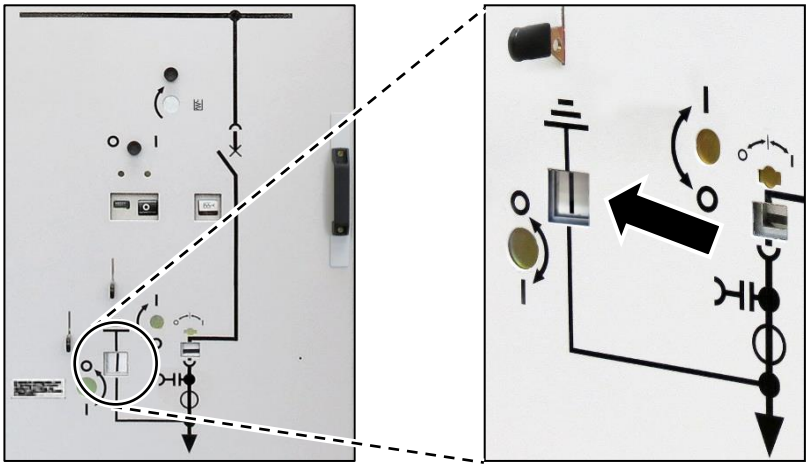


Fig. 152: All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panels: Position indicator of feeder earthing switch on high-voltage door

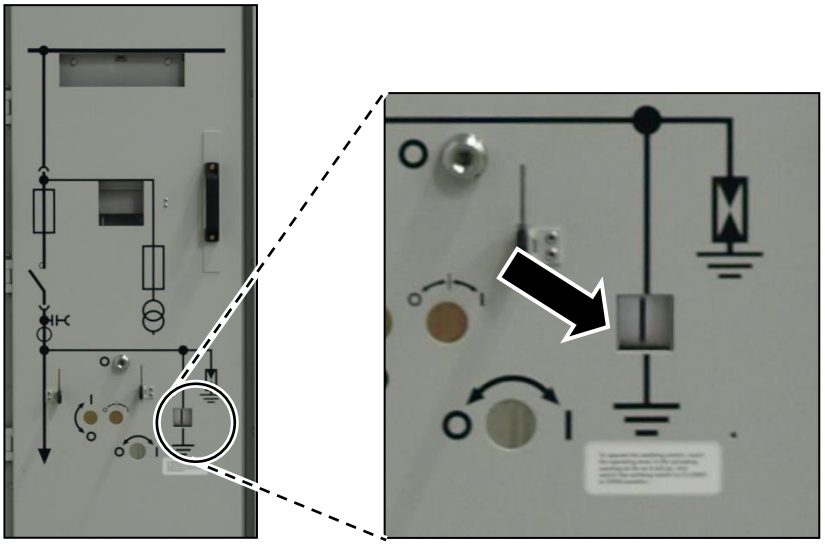


Fig. 153: Contactor panels with panel width 435 mm only:
Position indicator of feeder earthing switch on high-voltage door

If the position indicator of the feeder earthing switch on the high-voltage door shows horizontal position, the feeder is **not** earthed.

Before proceeding, do absolutely earth the feeder; see Operating Instructions with order number 110-0134.9.

⇨ Then take the withdrawable part or switching-device truck out of the switching-device compartment, see Operating Instructions with order number 110-0134.9.

⇨ If **no** withdrawable part / switching-device truck is inserted in the switching-device compartment:
Verify that the position indicator of the feeder earthing switch in the switching-device compartment points to the **I** symbol.

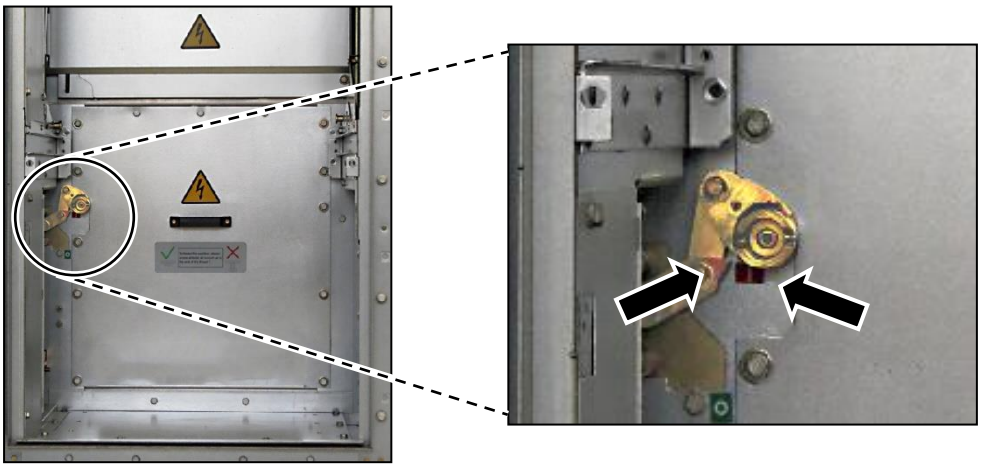


Fig. 154: All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panels: Additional position indicator of feeder earthing switch in switching-device compartment

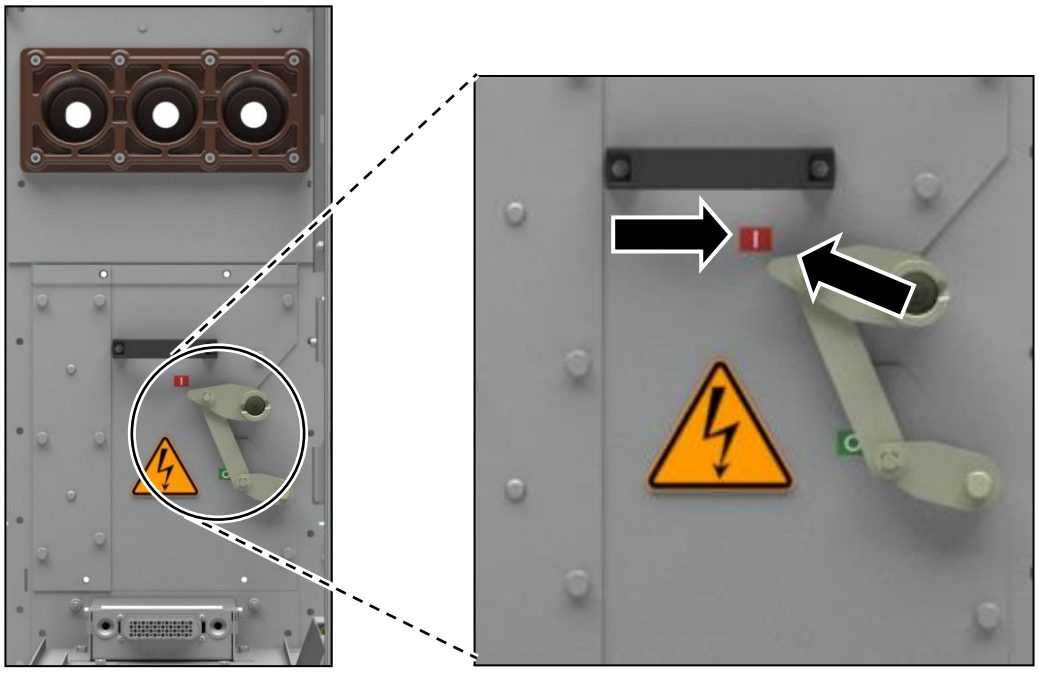


Fig. 155: Contactor panels with panel width 435 mm only:
Additional position indicator of the feeder earthing switch inside the switching-device compartment

If the position indicator of the feeder earthing switch in the switching-device compartment points to the **O** symbol, the feeder is **not** earthed.

⇨ Before proceeding, do absolutely earth the feeder:

- Insert a withdrawable part / switching-device truck in the panel, see Operating Instructions with order number 110-0134.9.
- Earth the feeder, see Operating Instructions with order number 110-0134.9.

Switch-disconnector panel only:
Switch-disconnector panel is the modular type and has two compartments. There is a direct access to cable terminals without partition. When the high-voltage door is open, switching-device / connection compartment is accessible.

⇨ Verify that the position indicator of the feeder earthing switch on the high-voltage door shows the vertical **I** position.

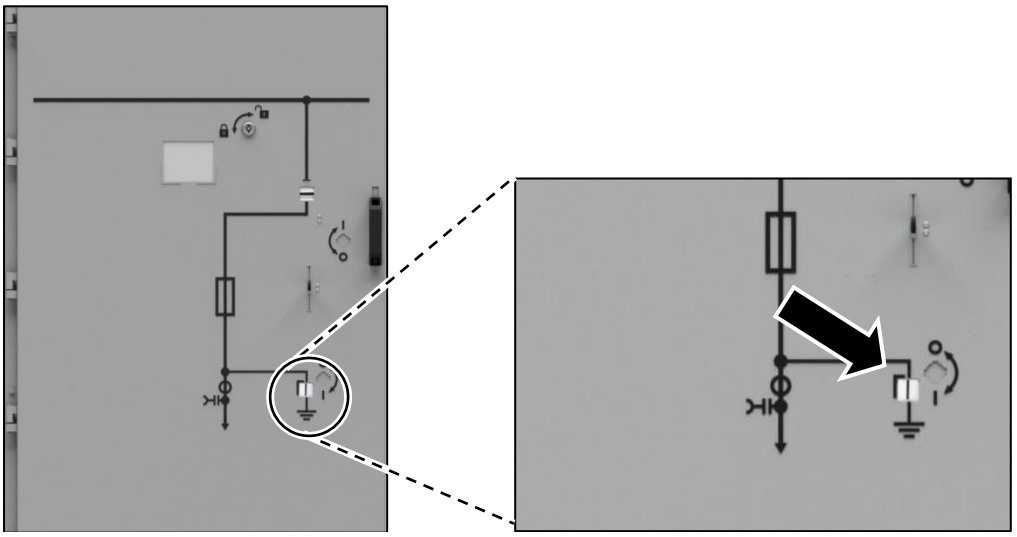


Fig. 156: Switch-disconnector panel only: Position indicator of feeder earthing switch on high-voltage door

⇨ Open the high-voltage door, see Operating Instructions with order number 110-0134.9.

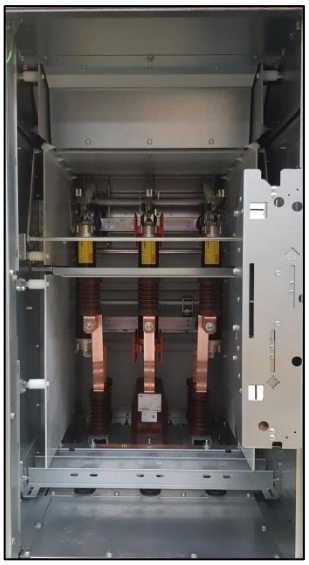


Fig. 157: Switch-disconnector panel only: Switching-device / connection compartment accessible

8.2 Accessing the connection compartment through the switching-device compartment

Preconditions

- Preparations as described in chapter 8.1 completed

Procedure

Panel versions with withdrawable circuit-breaker / circuit-breaker truck or withdrawable disconnector / disconnector truck only:

⇨ Remove the connecting elements (2) from the protection plate 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.

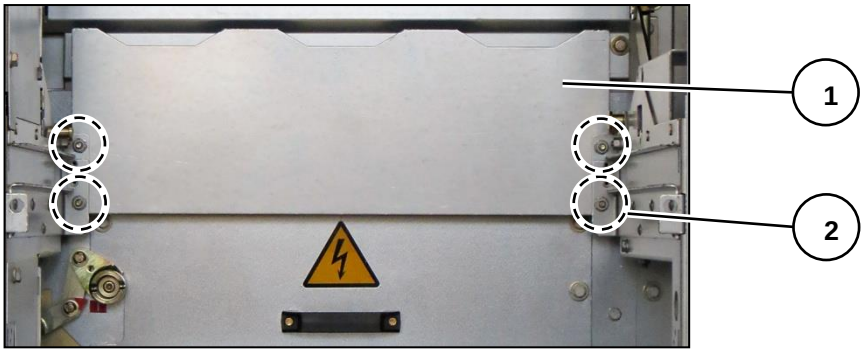


Fig. 158: 4 bolted joints on protection plate of switching-device compartment.

Removing the partition, all panel versions except for contactor panels with panel width 435 mm

⇨ Remove the connecting elements from the partition to the connection compartment (3), and store them:

All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel:

⇨
- 10 bolts M8x20 with contact washers and plain washers (4)
- 5 bolts M8x20 with contact washers (5)

Remove the partition (3), and store it.

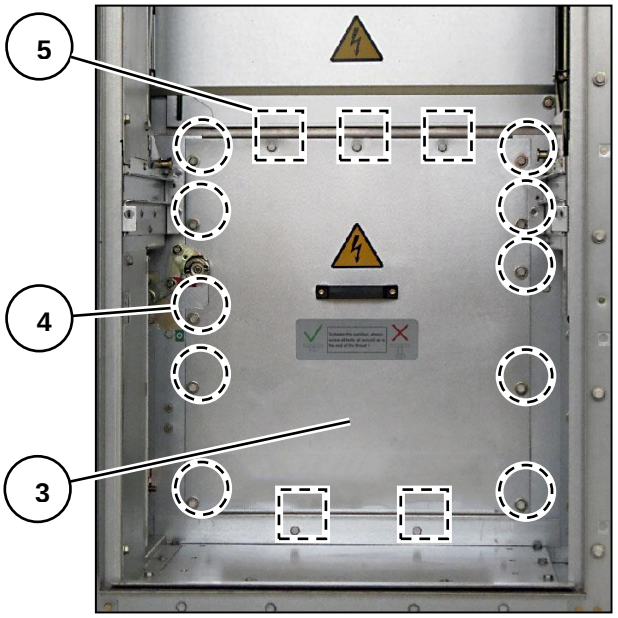


Fig. 159: All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel:15 bolted joints on partition

Removing the partition, for contactor panels with panel width 435 mm without heater

⇨ Remove the connecting elements (1) from the left part of the partition (2) to the connection compartment and store them:

- 7 bolts M8x20 with contact washers (1)

⇨ Remove the left part of the partition (2), and store it.

⇨ Remove the connecting elements (4) from the right part of the partition (3) to the connection compartment and store them:

- 4 bolts M8x16 with contact washers (4)

⇨ Remove the right part of the partition (3), and store it.

Accessing the connection compartment through the front

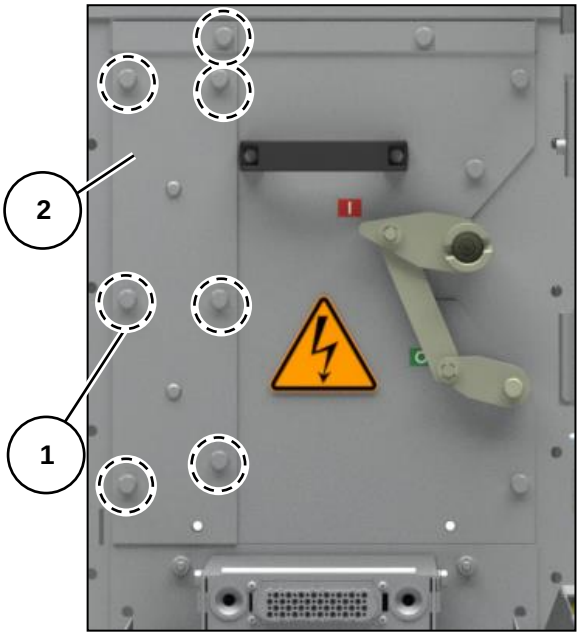


Fig. 160: Left part of partition (1)

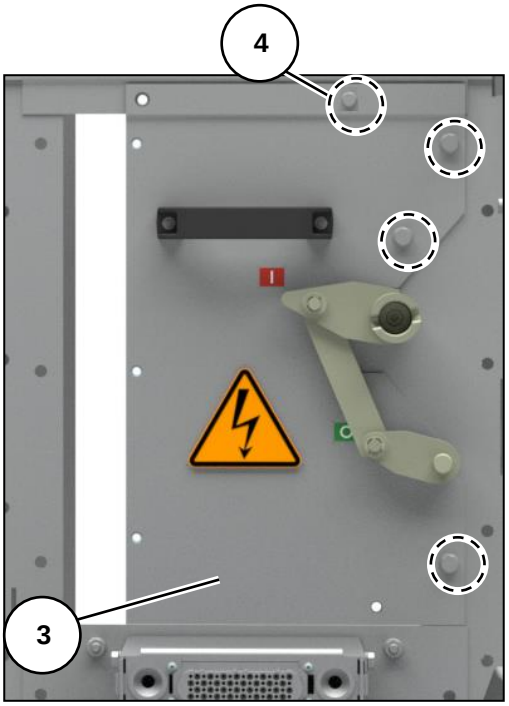


Fig. 161: Right part of partition (3)

Fig. 162: Partition removed

Removing the partition, for contactor panels with panel width 435 mm with heater (optional)

⚠ CAUTION

Burns

The heater and its protective cover can be hot. Touching hot heater may cause burns.

⇨ Put on personal protective equipment.

⇨ Switch off the heater before touching the protective cover and let the hot heater cool down.

Accessing the connection compartment through the front

⇨ Remove the connecting elements (2) from the heater (1), and store them:
- 2 nuts M8 (2)

⇨ Install the heater (1) into the available side of the switching-device compartment.

⇨ Remove the connecting elements (4) from the heater support (3), and store them:
- 2 bolts M8x20 with contact washers (4)

⇨ Install the heater support (3) into the available side of the switching-device compartment.

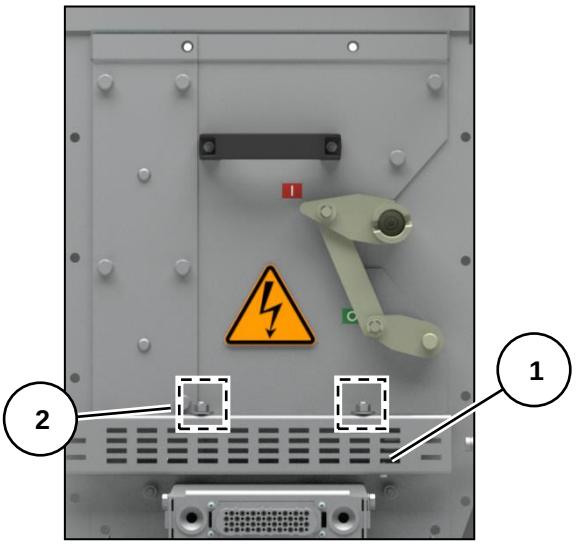


Fig. 163: Contactor panels with panel width 435 mm only: 2 bolted joints on the heater

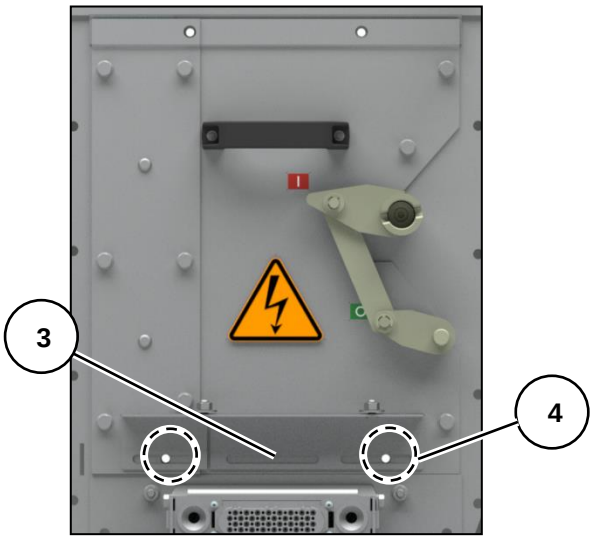


Fig. 164: Contactor panels with panel width 435 mm only: 2 bolted joints on the heater support

⇨ Remove the connecting elements (6) from the left part of the partition (5) to the connection compartment, and store them:
- 7 bolts M8x20 with contact washers (6)

⇨ Remove the left part of the partition (5), and store it.

⇨ Remove the connecting elements (8) from the right part of partition (7) to the connection compartment, and store them:
- 4 bolts M8x16 with contact washers (8)

⇨ Remove the right part of the partition (7), and store it.

Accessing the connection compartment through the front

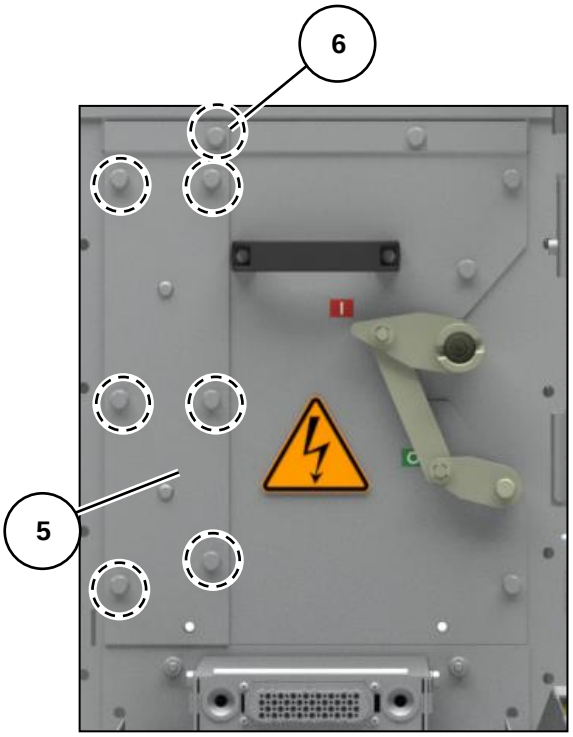


Fig. 165: Left part of partition (5)

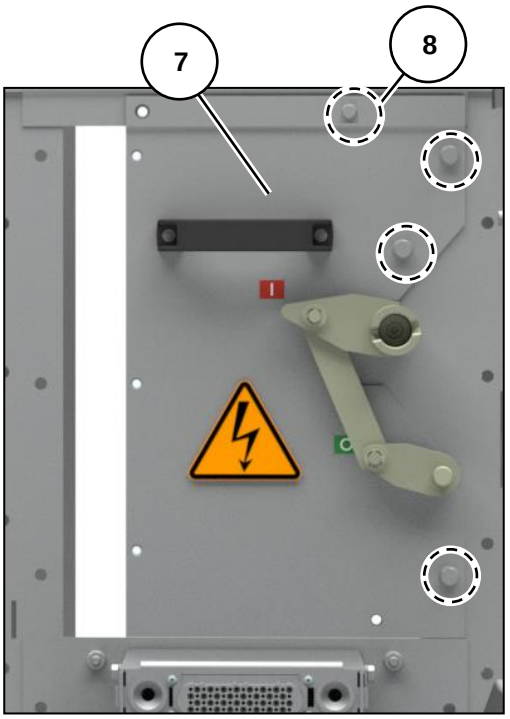


Fig. 166: Right part of partition (7)

Fig. 167: Partition removed

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

8.3 Accessing the connection compartment through the switching-device compartment at panel versions with ventilation system type I

⚠ CAUTION

Sharp-edged sheets

The metal parts of the ventilation duct and vertical partition may have sharp edges. Sharp-edged sheets inside the switchgear can cause injuries by getting cut and damage cables.

⇨ Put on personal protective equipment (e.g. cut-resistant gloves and arm sleeves).

⇨ When working inside the switchgear, it must be observed that cables do not touch any sharp-edged sheets. Cover sharp-edged spots, if required.

⚠ CAUTION

High weight

The ventilation duct is heavy.

⇨ The ventilation duct must absolutely be lifted by 2 persons.

⇨ Put on personal protective equipment.

Preconditions

- Preparations as described in chapter 8.1 completed

Fig. 168: 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.

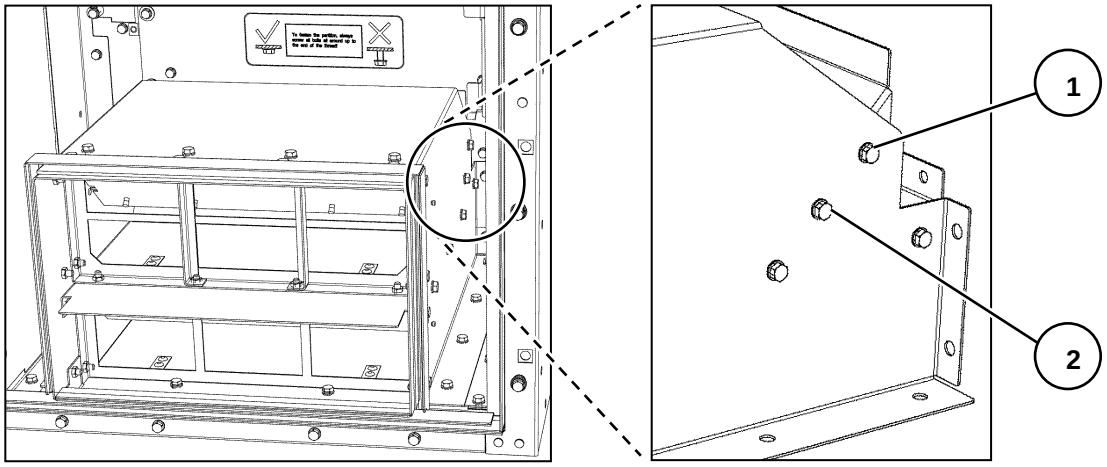


Fig. 169: Bolts for detaching the holder

⇨ Fold the air guide upwards.

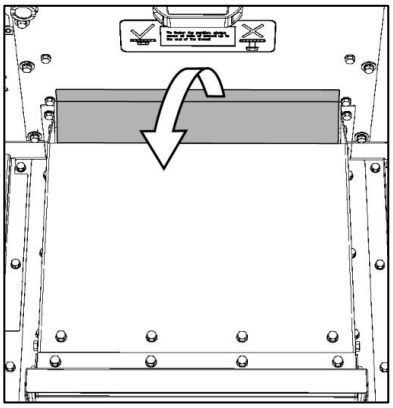


Fig. 170: Folding the air guide upwards

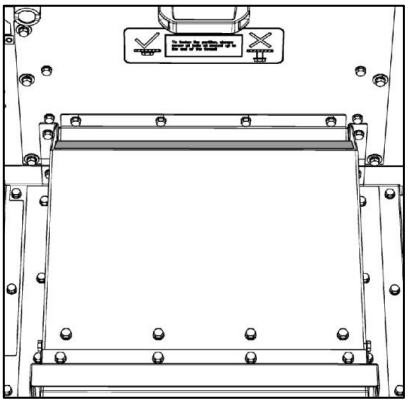


Fig. 171: Air guide folded upwards

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

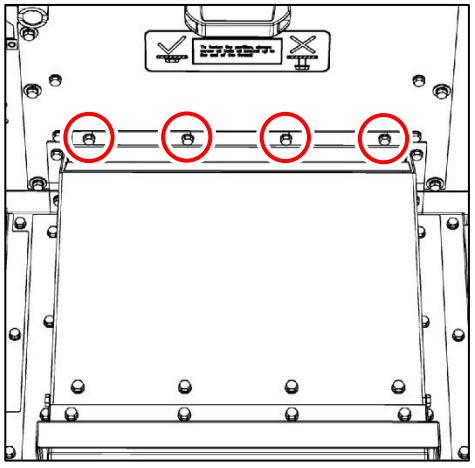


Fig. 172: 4 bolted joints on partition

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

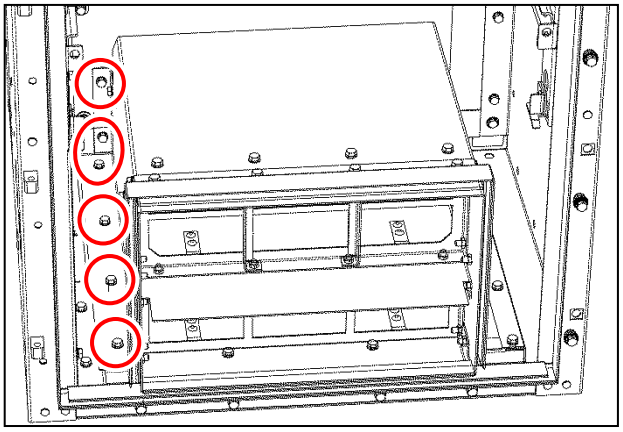


Fig. 173: 6 lateral bolted joints on partition and base frame

⇨ Unscrew the front bolts 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.

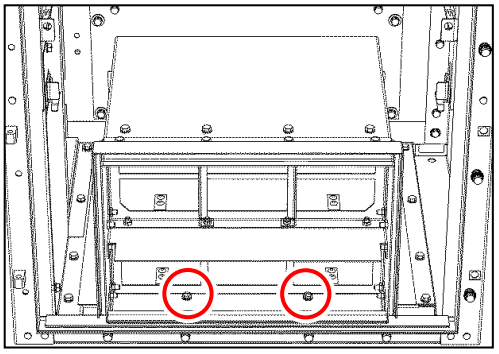


Fig. 174: 2 bolted joints on base frame at the front

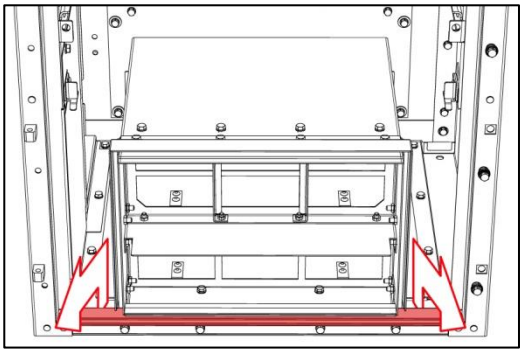


Fig. 175: Lifting and pulling

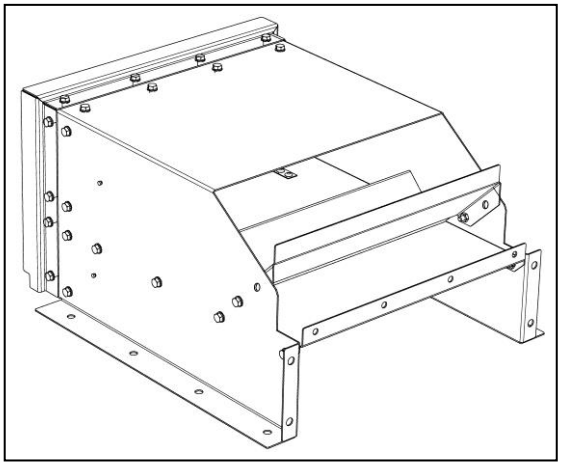


Fig. 176: Ventilation duct removed

Fig. 177: 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.

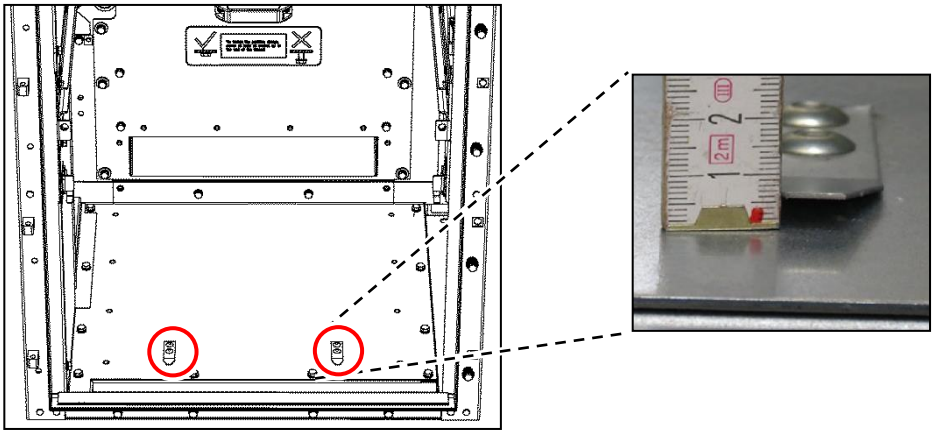


Fig. 178: 2 links on panel base

Fig. 179: Correct position of link

⇨ 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. 180: 4 bolted joints on protection plate of switching-device compartment

⇨ Remove the connecting elements from the partition to the connection compartment (3), and store them:

- 10 bolts M8x20 with contact washers and plain washers (4)
- 5 bolts M8x20 with contact washers (5)

⇨ Remove the partition (3), and store it.

Accessing the connection compartment through the front

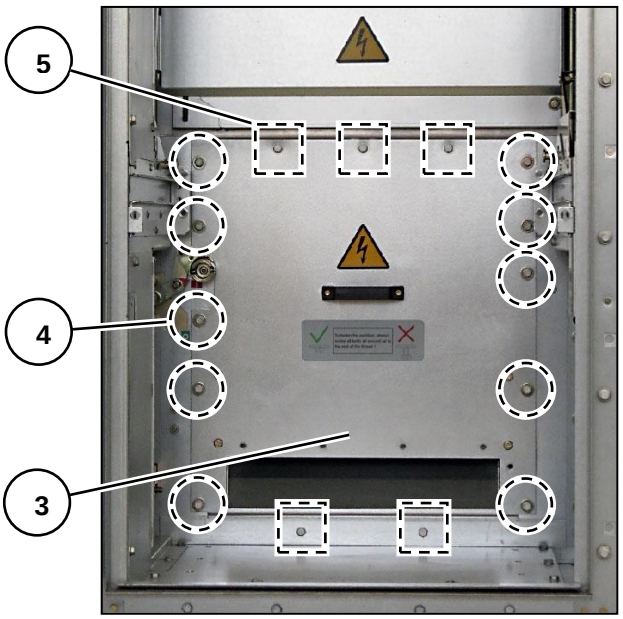


Fig. 181: 15 bolted joints on partition

⇨ If required, bend dented links back into the correct position.

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

8.4 Accessing the connection compartment through the switching-device compartment at panel versions with ventilation system type II

⚠ CAUTION

Sharp-edged sheets

The metal parts of the ventilation duct and vertical partition may have sharp edges. Sharp-edged sheets inside the switchgear can cause injuries by getting cut and damage cables.

⇨ Put on personal protective equipment (e.g. cut-resistant gloves and arm sleeves).

⇨ When working inside the switchgear, it must be observed that cables do not touch any sharp-edged sheets. Cover sharp-edged spots, if required.

⚠ CAUTION

High weight

The ventilation duct is heavy.

⇨ The ventilation duct must absolutely be lifted by 2 persons.

⇨ Put on personal protective equipment.

NOTICE

Damages to the ventilation duct

Loosening certain bolted joints could damage the ventilation duct.

⇨ When disassembling the ventilation duct, proceed exactly as described hereafter. Do **not** loosen any bolted joints other than those described.

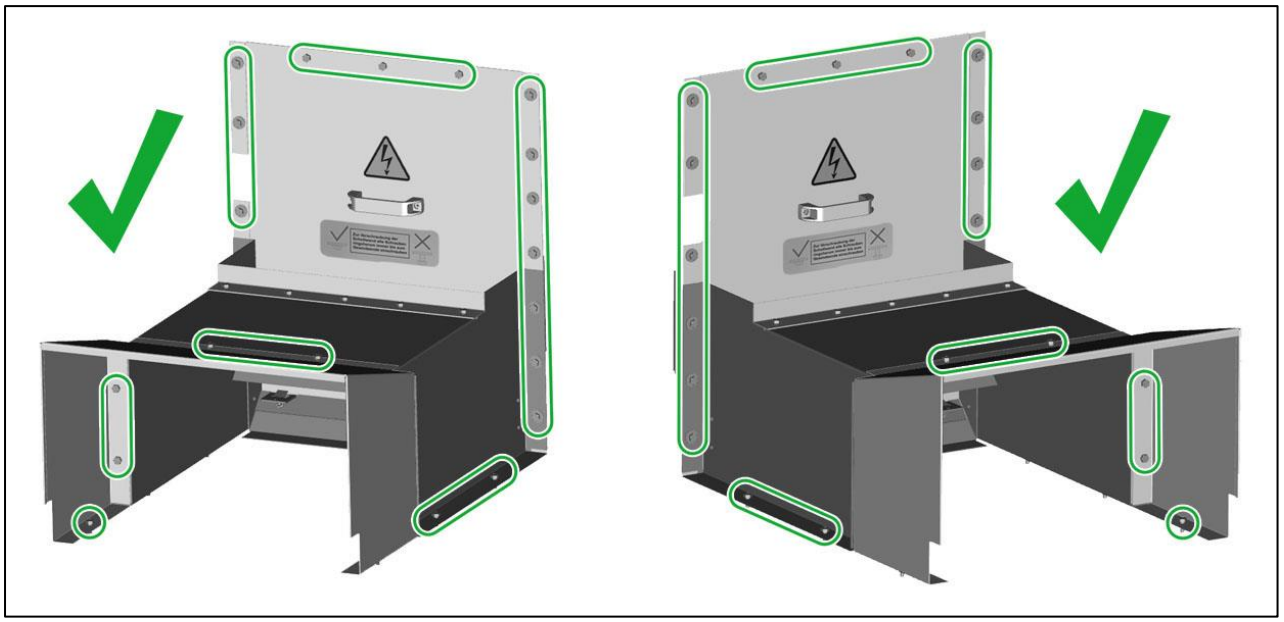


Fig. 182: Bolted joints to be loosened

Accessing the connection compartment through the front

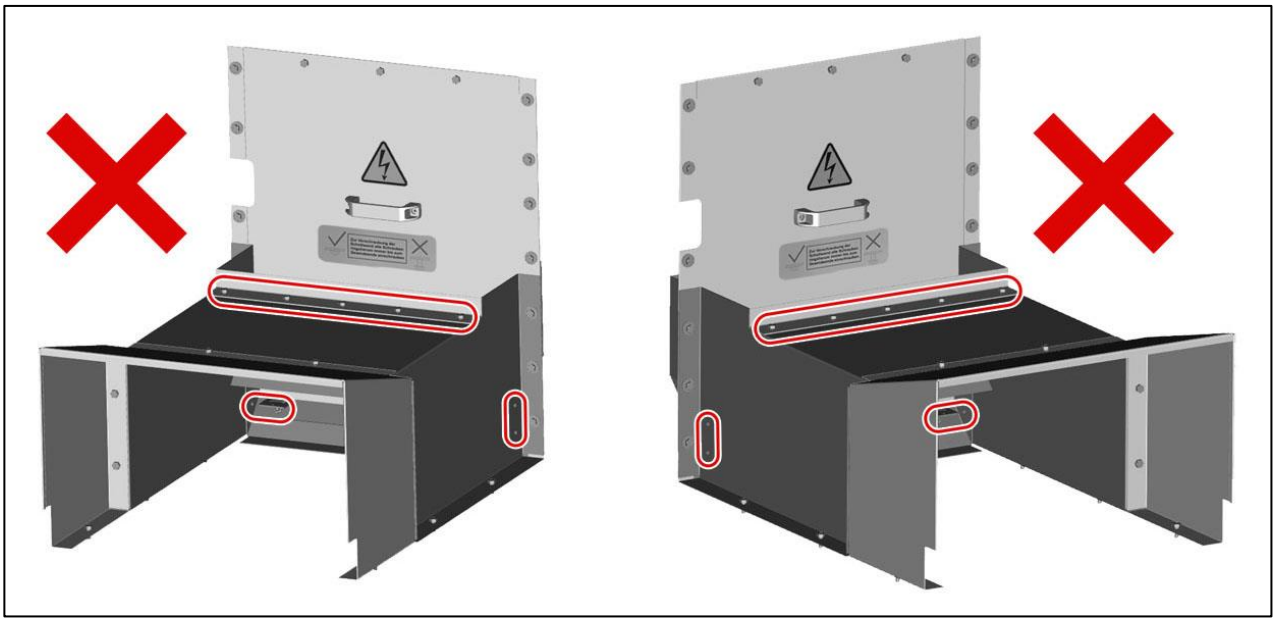


Fig. 183: Bolted joints not to be loosened

Preconditions

- Preparations as described in chapter 8.1 completed

Fig. 184: Panel prepared

Procedure

⇨ Remove the connecting elements (2) from the protection plate (1), and store it:
- 4 nuts M8 with contact washers

⇨ Remove the protection plate (1), and store it.

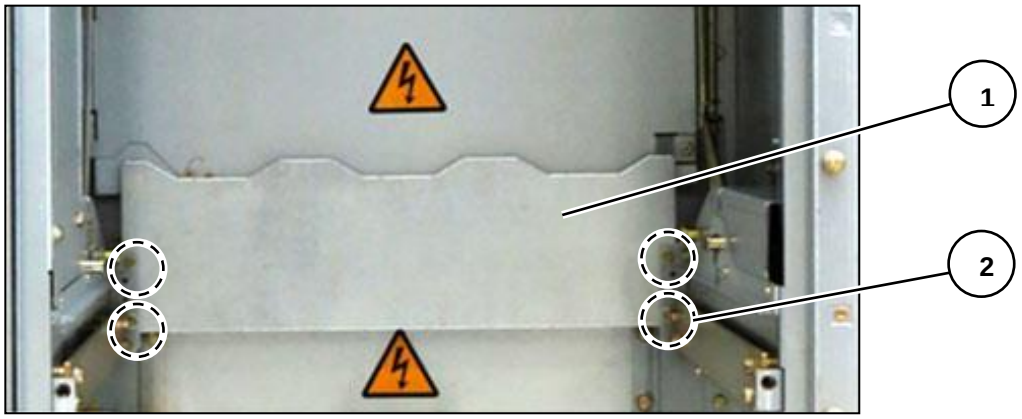


Fig. 185: 4 bolted joints on protection plate

⇨ Remove the connecting elements from the front part (3) of the ventilation duct, and store it:

- 8 bolts M8x20 with contact washers

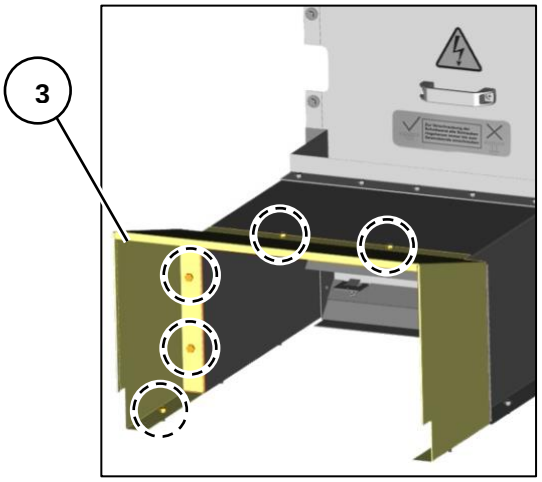


Fig. 186: Front part of ventilation duct, seen from center-right

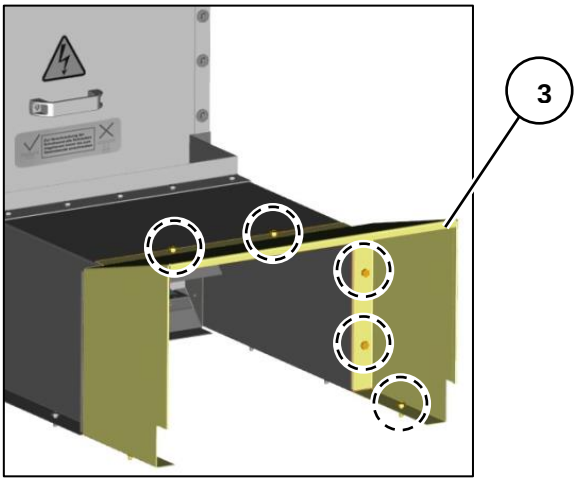


Fig. 187: Front part of ventilation duct, seen from center-left

⇨ To get the front part of the ventilation duct over the door threshold, lift it approx. 2 cm. Pull it out of the panel, and store it.

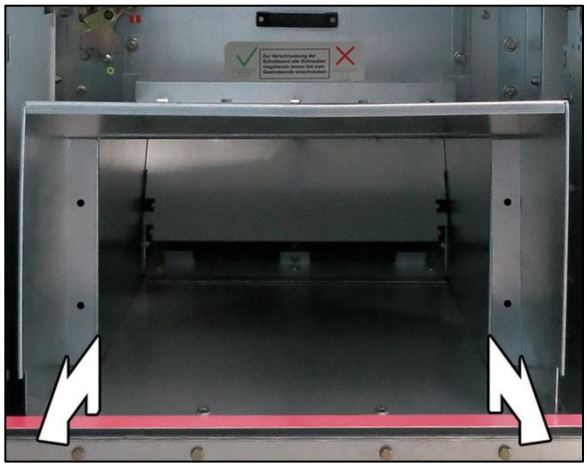


Fig. 188: Lifting and pulling the front part

Accessing the connection compartment through the front

⇨ Remove the connecting elements from the remaining part of the ventilation duct (4) and the vertical partition to the connection compartment (5), and store it:

- 13 bolts M8x20 with contact washers and plain washers (6)
- 7 bolts M8x20 with contact washers (7)

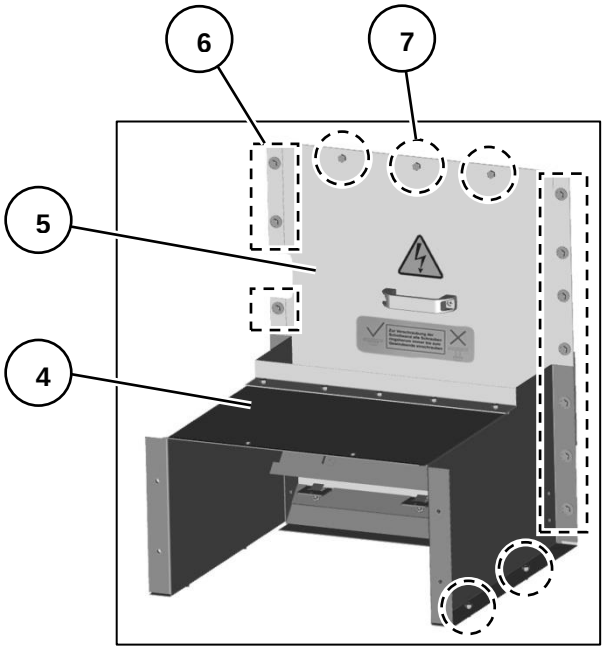


Fig. 189: Ventilation duct and partition, seen from center-right

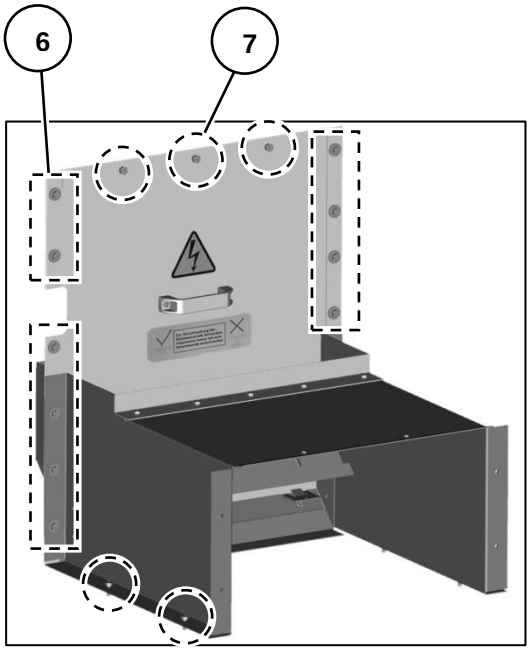


Fig. 190: Ventilation duct and partition, seen from center-left

⇨ Pull the unit consisting of ventilation duct and vertical partition towards the door threshold as far as it will go.

⇨ To get the unit over the door threshold, lift it approx. 2 cm. Pull it out of the panel. Store the unit, but do **not** disassemble the unit any further.

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

8.5 Accessing the connection compartment through the switching-device compartment at panel versions with voltage transformer compartment

⚠ CAUTION

Sharp-edged sheets

The metal parts of the voltage transformer compartment and vertical partition may have sharp edges. Sharp-edged sheets inside the switchgear can cause injuries by getting cut and damage cables.

⇨ Put on personal protective equipment (e.g. cut-resistant gloves and arm sleeves).

⇨ When working inside the switchgear, it must be observed that cables do not touch any sharp-edged sheets. Cover sharp-edged spots, if required.

⚠ CAUTION

High weight

The voltage transformer compartment is heavy.

⇨ The voltage transformer compartment must absolutely be lifted by 2 persons.

⇨ Put on personal protective equipment.

Preconditions

- Preparations as described in chapter 8.1 completed
- Door to voltage transformer compartment open
- Removable voltage transformers removed from panel

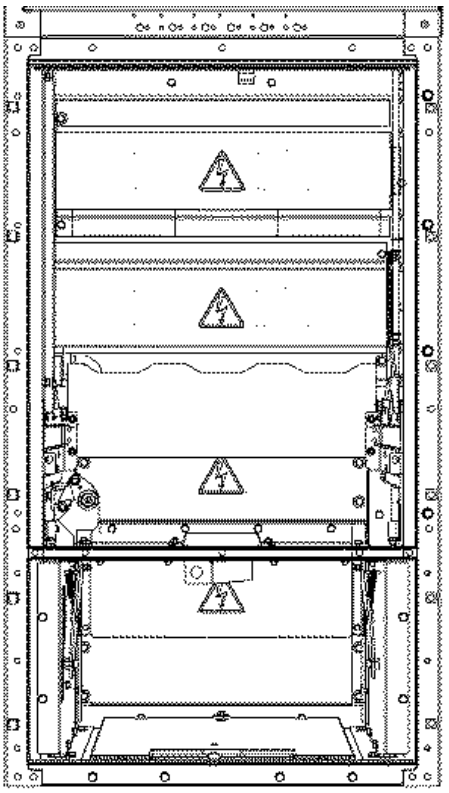


Fig. 191: Panel prepared

Accessing the connection compartment through the front

Procedure

⇨ Remove the connecting elements from the front of the labyrinth, and store them:

- 2 nuts M8 with contact washers

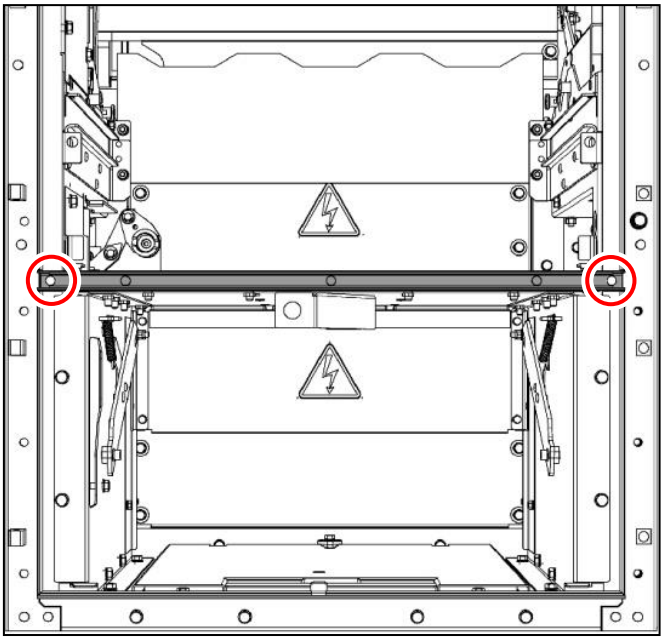


Fig. 192: 2 bolted joints at the labyrinth, front

⇨ Remove the connecting elements from the top side of the labyrinth, and store them:

- 11 bolts M8x16 with contact washers and plain washers

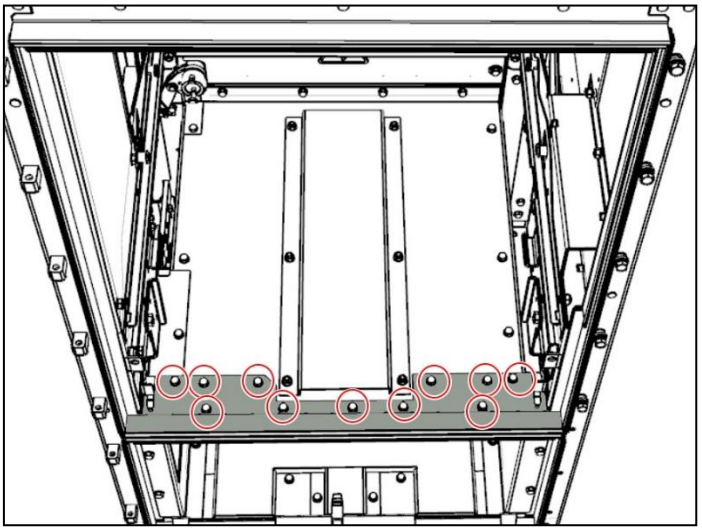


Fig. 193: 11 bolted joints at the labyrinth, top side

⇨ Remove the labyrinth, and store it.

⇨ Remove the connecting elements from the wiring duct cover, and store them:

- 2 bolts M8x20 with contact washers

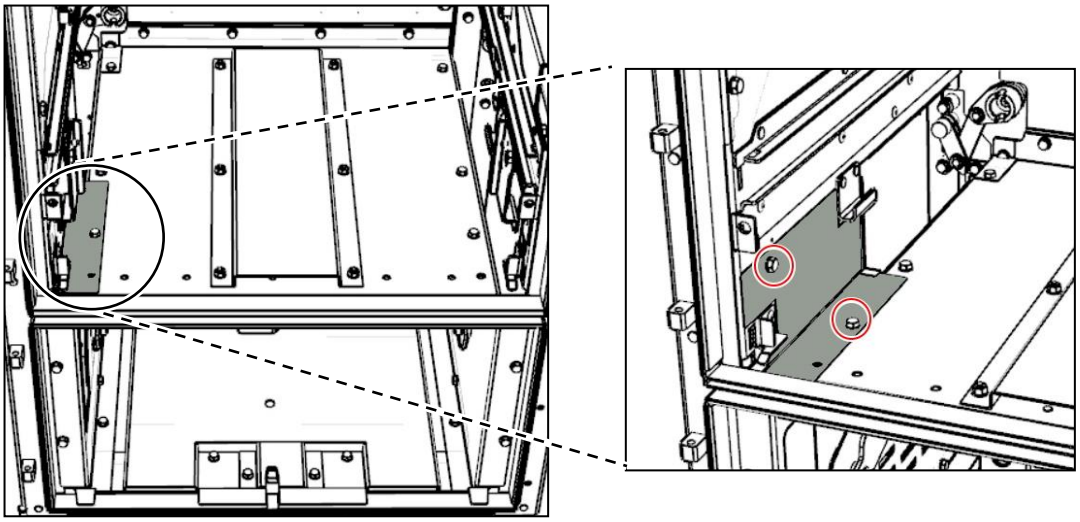


Fig. 194: 2 bolted joints on wiring duct cover

⇨ Remove the wiring duct cover, and store it.

⇨ Remove the connecting elements from the metal cover (1) to stow away the low-voltage connector, and store them:

- 6 bolts M8x20 with contact washers

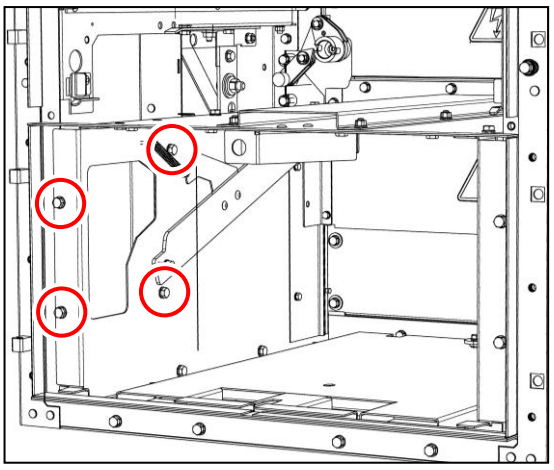


Fig. 195: 4 bolted joints on metal cover in voltage transformer compartment

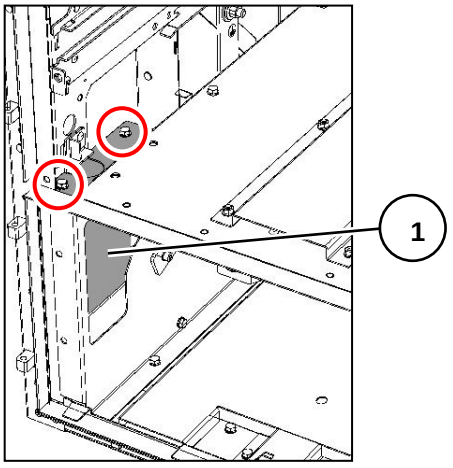


Fig. 196: 2 bolted joints on metal cover in switching-device compartment

⇨ Remove the lid of the metal cover (2), and store it.

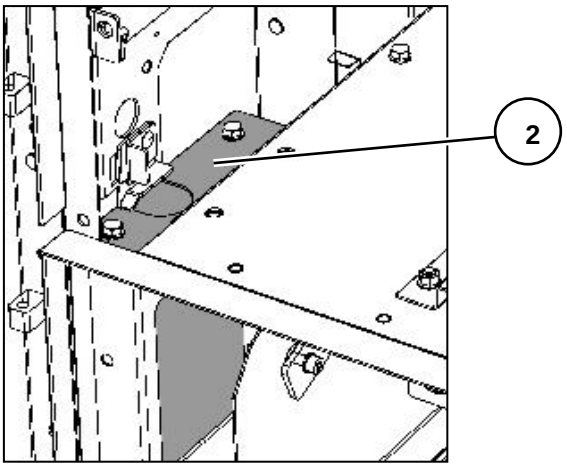


Fig. 197: Lid of metal cover

⇨ Remove the connecting elements from the voltage transformer compartment, and store them:

- 10 bolts M8x20 with contact washers

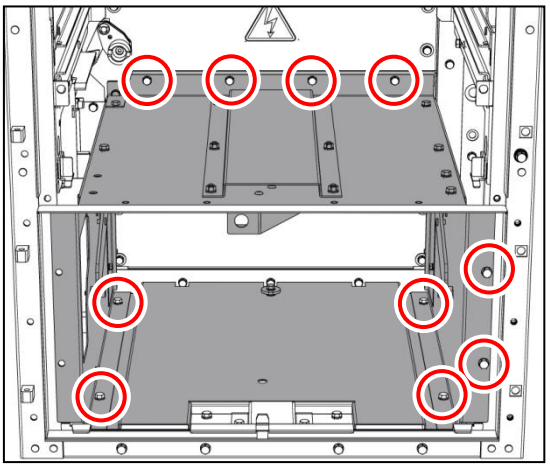


Fig. 198: 10 bolted joints at voltage transformer compartment

⇨ To get the voltage transformer compartment over the door threshold, lift it approx. 2 cm. Pull the voltage transformer compartment out of the panel, and store it.

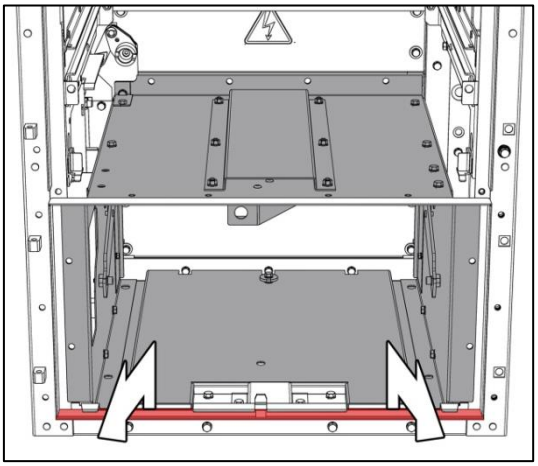


Fig. 199: Lifting and pulling

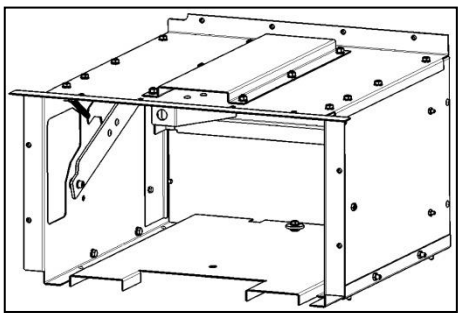


Fig. 200: Voltage transformer compartment, removed

⇨ Remove the connecting elements from the protection plate of the switching-device compartment, and store them:

- 4 nuts M8 with contact washers

⇨ Remove the protection plate of the switching-device compartment from the switching-device compartment, and store it.

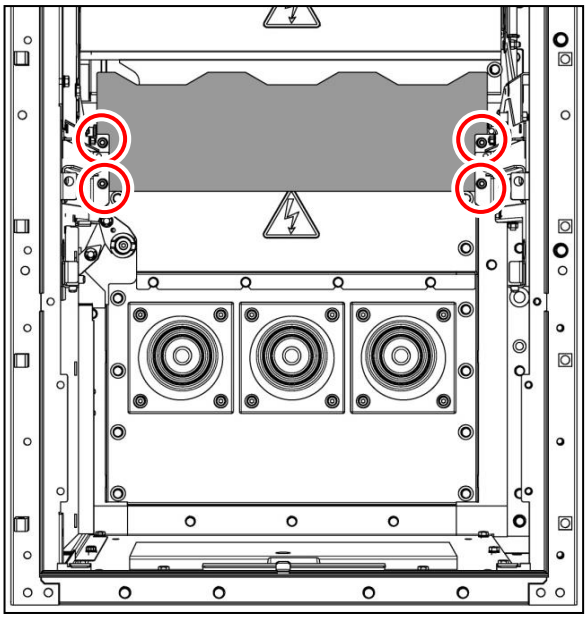


Fig. 201: 4 bolted joints on protection plate of switching-device compartment

⇨ Remove the connecting elements from the partition, and store them:

- 8 bolts M8x20 with contact washers and plain washers (4)

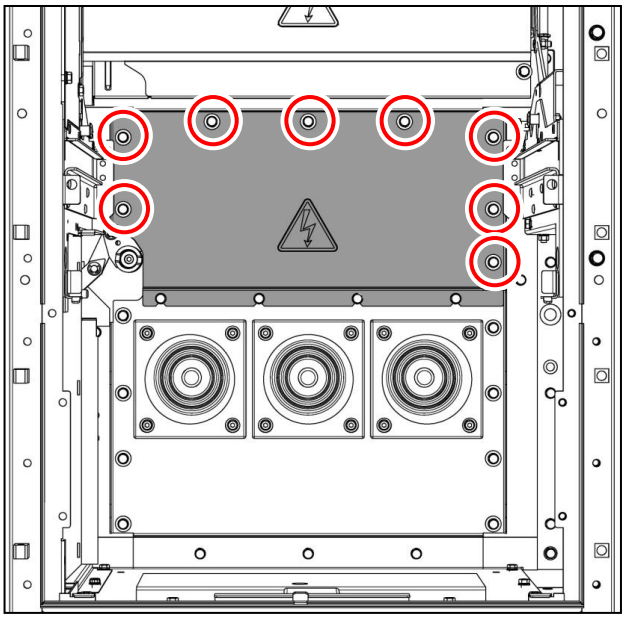


Fig. 202: 8 bolted joints on partition

⇨ Remove the partition, and store it.

⇨ Remove the connecting elements (3) for the removable voltage transformers at the 3 connecting cables from the cable connections / bar connections to the insulating bushings, and store them.

- 3 nuts M8 with contact washers and plain washers (3)

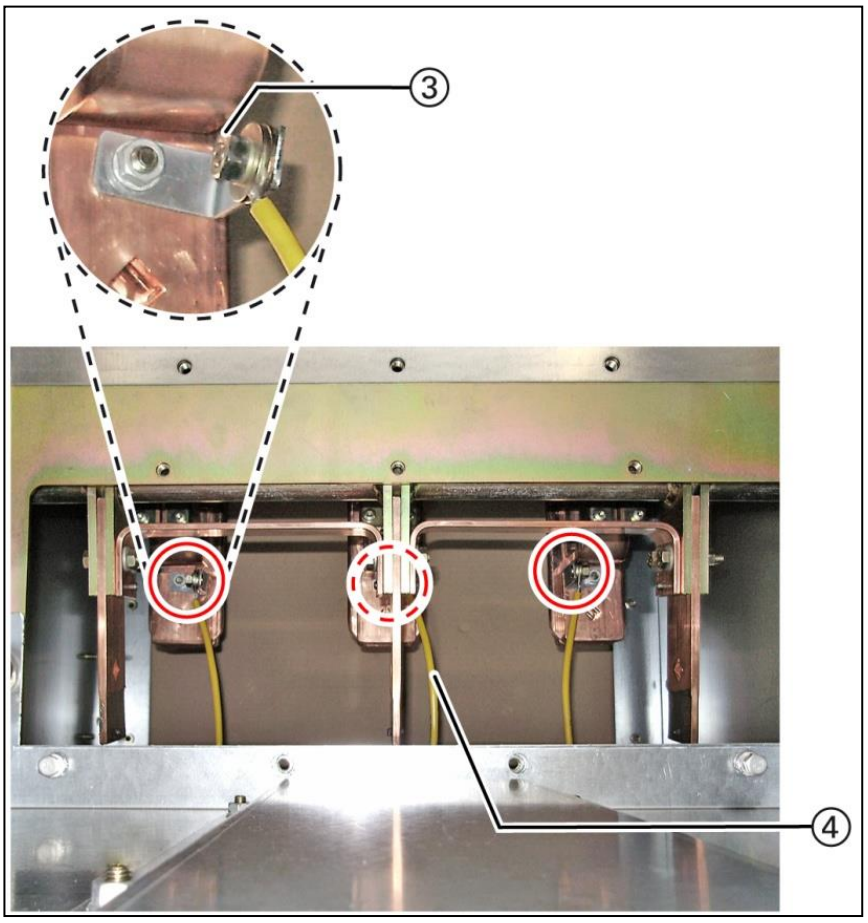


Fig. 203: Bolted joints at the cable connections (central joint covered)

⇨ Detach the 3 connecting cables (4) for the removable voltage transformers from the cable connections / bar connections.

⇨ Remove the connecting elements from the left and right side of the bushing plate, and store them:

- 8 bolts M8x20 with contact washers and plain washers (5)

⇨ Loosen the connecting elements on the underside of the bushing plate:

- 3 bolts M8x20 with contract washers (6)

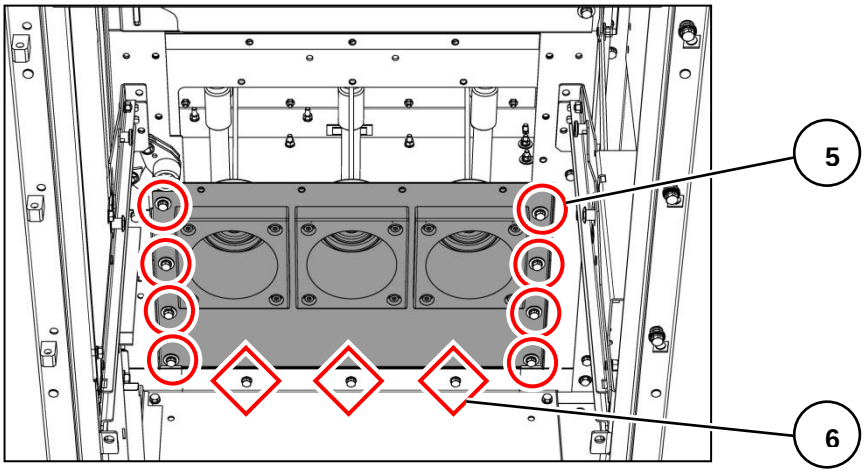


Fig. 204: 11 bolted joints on bushing plate

⇨ Remove the bushing plate, and store it.

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

9 Accessing the connection compartment through the rear

INFORMATION

Read and understand these instructions before attempting installation works.

DANGER

Electric shock

Always verify safe isolation from supply without any doubt.

In the instructions given in the following sections it is assumed that new switchgear is being installed, which has not yet been energized with operational high voltage.

If the switchgear is already in operation, operational high voltage could be applied at the connections in the connection compartment.

⇨ To perform tests or work in the connection compartment of a switchgear that is already in operation, follow the directives of the Operating Instructions with order number 110-0134.9.

INFORMATION

⇨ Before executing any installation work, read and understand the corresponding chapters in the Operating Instructions with order number 110-0134.9.

INFORMATION

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

⇨ Store disassembled parts and connecting elements carefully, and keep them ready for later reuse.

INFORMATION

Switch-disconnector panel

Accessing the switching-device / connection compartment through rear side of the switch-disconnector panel is **not** possible in the switch-disconnector panel.

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

⚠ CAUTION

Sharp-edged sheets

If the covers have to be removed from the switchgear, sharp-edged sheets inside switchgear can cause injuries by getting cut. Sharp-edged sheets inside the switchgear can damage cables.

⇨ Put on personal protective equipment (e.g. cut-resistant gloves and arm sleeves).

⇨ When working inside the switchgear, it must be observed that cables do not touch any sharp-edged sheets. Cover sharp-edged spots, if required.

Preconditions

- If a withdrawable part / switching-device truck is inserted in the switching-device compartment:
  - High-voltage door closed
  - Withdrawable part / switching-device truck racked to test position
  - Feeder earthing switch in CLOSED position

Procedure

⇨ Verify that the position indicator of the feeder earthing switch on the high-voltage door shows the vertical **I** position.

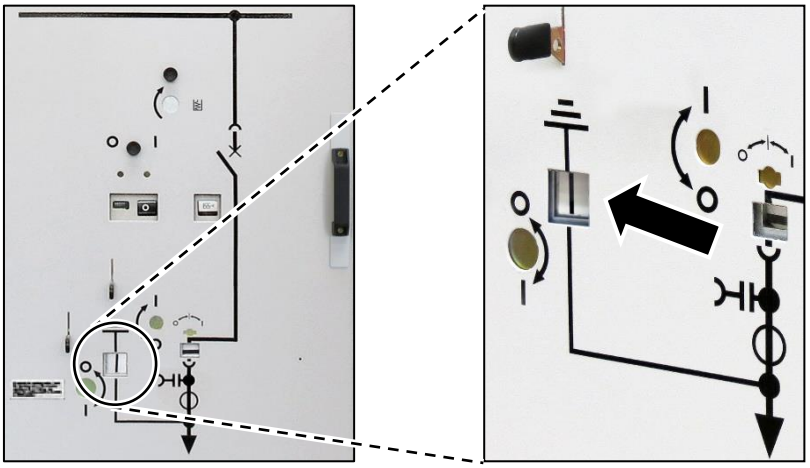


Fig. 205: All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel: Position indicator of feeder earthing switch on high-voltage door

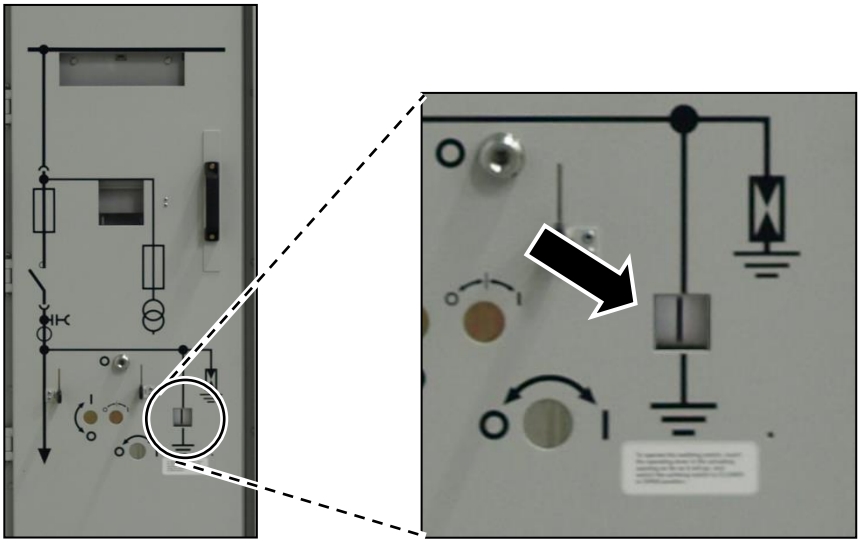


Fig. 206: Contactor panels with panel width 435 mm only:
Position indicator of feeder earthing switch on high-voltage door

Accessing through the rear wall is described hereafter by the example of a 3-panel arrangement.

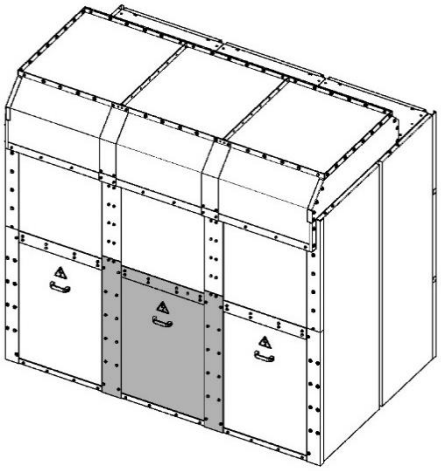


Fig. 207: All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel: Rear wall, 3-panel arrangement

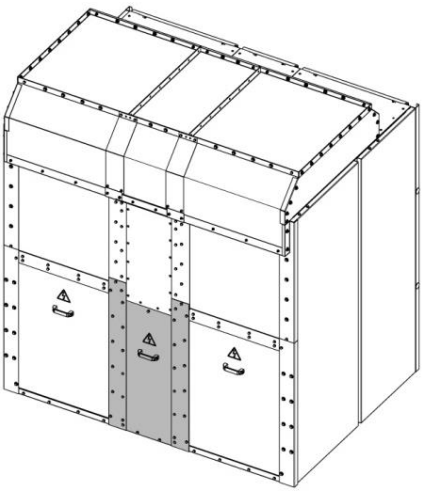


Fig. 208: Contactor panels with panel width 435 mm only: Rear wall, 3-panel arrangement

All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel:

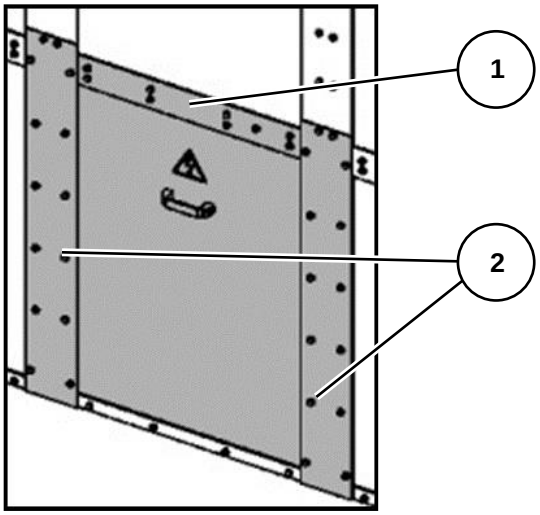
⇨ Remove the connecting elements from the horizontal ledge (1):
- 9 bolts M8x25 with contact washers and plain washers

⇨ Remove the horizontal ledge, and store it together with the associated connecting elements.

⇨ Remove the connecting elements from one of the vertical ledges (2):
- 14 bolts M8x20 with contact washers

⇨ Remove the vertical ledge, and store it together with the associated connecting elements.

⇨ Proceed in the same way with the other vertical ledge.

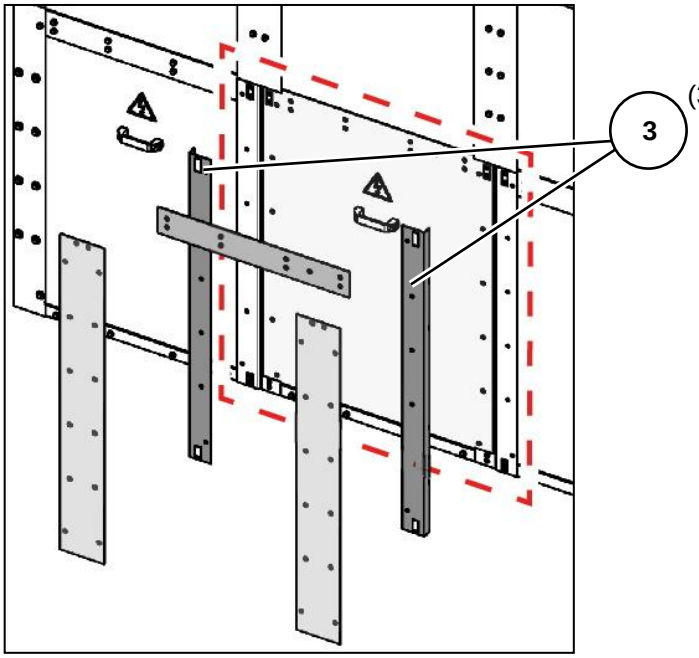


(1) Horizontal ledge

(2) Vertical ledges

Fig. 209: All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel: 37 bolts on ledges

⇨ Remove the 2 sealing brackets (3), and store them.



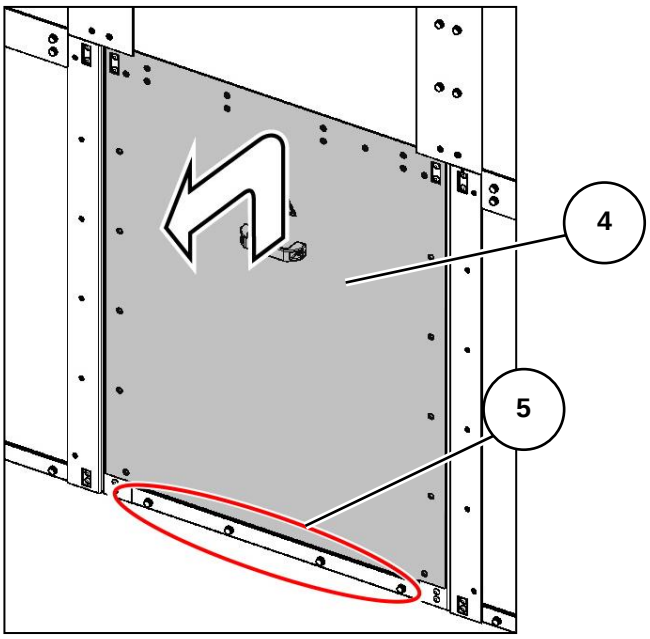
(3) Sealing brackets

Fig. 210: All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel: Removing the sealing brackets

⇨ Loosen the connecting elements at the panel base:
- 4 bolts M8x20 with contact washers (5)

⇨ Remove the rear wall (4). To do this, lift the rear wall by the handle, and pull it out. Store the rear wall.

Accessing the connection compartment through the rear



(4) Rear wall with handle

(5) Bolts to loosen

Fig. 211: All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel: Removing the rear wall

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

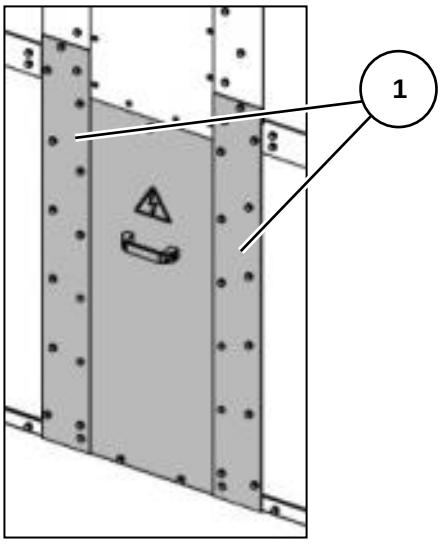
Contactor panels with panel width 435 mm only:

⇨ Remove the connecting elements from one of the vertical ledges (1):

- 15 bolts M8x20 with contact washers

⇨ Remove the vertical ledge, and store it together with the associated connecting elements.

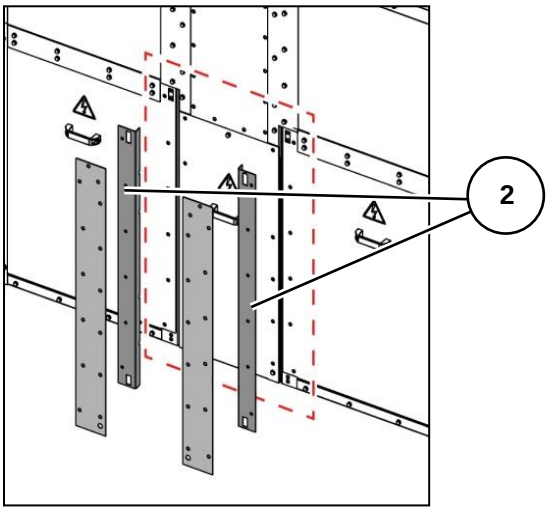
⇨ Proceed in the same way with the other vertical ledge.



(1) Vertical ledges

Fig. 212: Contactor panels with panel width 435 mm only: 30 bolts in the ledges

⇨ Remove the sealing brackets (2), and store them.

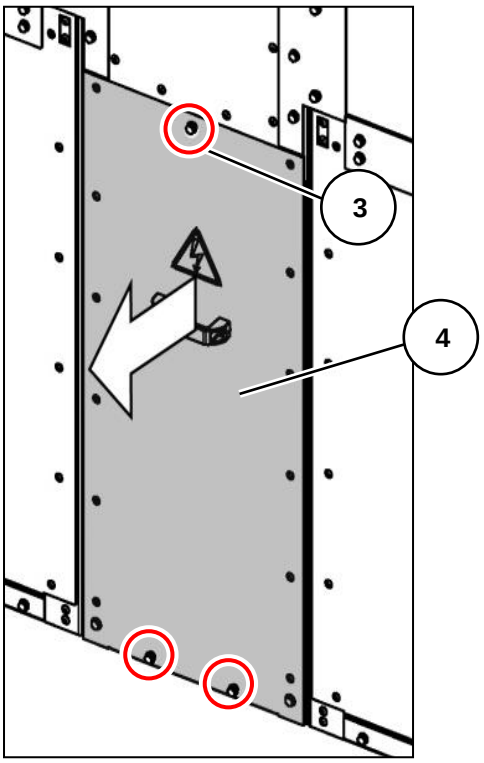


(2) Sealing brackets

Fig. 213: Contactor panels with panel width 435 mm only:
Removing the sealing brackets

⇨ Remove the connecting elements from the rear wall:
- 3 bolts M8x20 with contact washers (3)

⇨ To remove the rear wall (4), pull at the handle. Store the rear wall together with the associated connecting elements.



(3) Bolts to remove

(4) Rear wall with handle

Fig. 214: Contactor panels with panel width 435 mm only:
Removing the rear wall

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

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

> **⚠ CAUTION**
>
> **Sharp-edged sheets**
>
> If the covers have to be removed from the switchgear, sharp-edged sheets inside switchgear can cause injuries by getting cut. Sharp-edged sheets inside the switchgear can damage cables.
>
> ⇨ Put on personal protective equipment (e.g. cut-resistant gloves and arm sleeves).
>
> ⇨ When working inside the switchgear, it must be observed that cables do not touch any sharp-edged sheets. Cover sharp-edged spots, if required.

Preconditions

- If a withdrawable part / switching-device truck is inserted in the switching-device compartment:
  - High-voltage door closed
  - Withdrawable part / switching-device truck racked to test position
  - Feeder earthing switch in CLOSED position

Procedure

⇨ Verify that the position indicator of the feeder earthing switch on the high-voltage door shows the vertical **I** position.

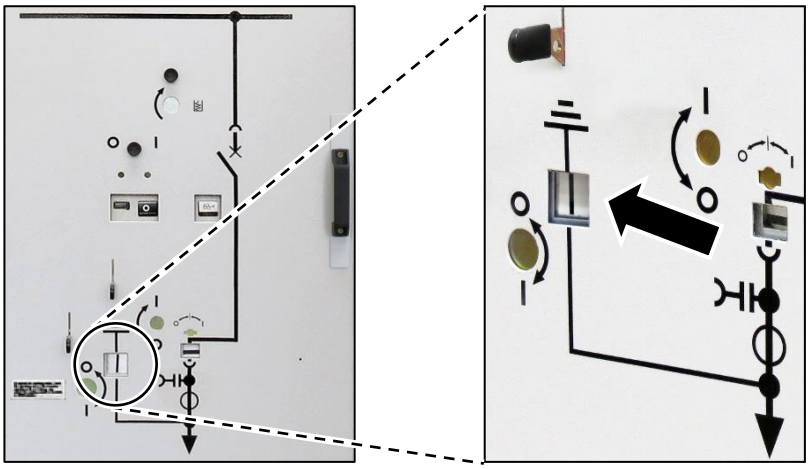
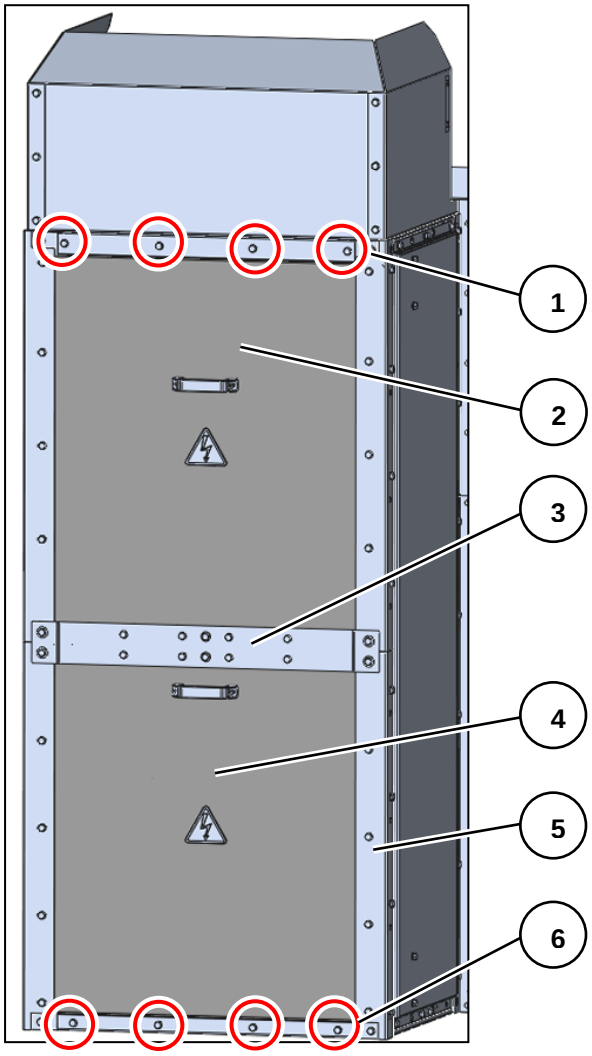


Fig. 215: Position indicator of feeder earthing switch on high-voltage door

Accessing the connection compartment through the rear



(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. 216: Rear ledges and rear walls on connection duct

⇨ Remove the connecting elements from the horizontal ledge (3):
- 12 / 14 bolts M8x20 with contact washers

⇨ Remove the horizontal ledge, and store it together with the associated connecting elements.

⇨ Remove the connecting elements from one of the vertical ledges (5):
- 9 / 19 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093

⇨ Remove the vertical ledge, and store it 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 lower rear wall (4). To do this, lift the rear wall by the handle, and pull it out. Store the rear wall.

⇨ Loosen the connecting elements of the upper rear wall in the upper area (1):
- 4 / 5 bolts M8x20 with contact washers

Accessing the connection compartment through the rear

⇨ To remove, pull the upper rear wall (2) downwards by the handle. Store the rear wall.

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

10 Electrical connections

INFORMATION

Read and understand these instructions before attempting installation works.

DANGER

Electric shock

Always verify safe isolation from supply without any doubt.

In the instructions given in the following sections it is assumed that new switchgear is being installed, which has not yet been energized with operational high voltage.

⇨ Before performing any kind of checks or work in the connection compartment of any panel, verify safe isolation from supply without any doubt.

Observe the **Five Safety Rules**.

⇨

INFORMATION

Easier installation

Perform work operations in the connection compartment of a panel through the switching-device compartment only if access is not possible through the rear side of the panel.

10.1 Checking the contact surfaces

NOTICE

Insufficient contact

Insufficient electrical contact increases the contact resistance.

⇨ Clean oxidized contact points, and grease them.

⇨ Mount cable lug of cable sealing end tight and free from distortions and gaps.

⇨ Remove the connecting elements (1) for connection of the cable lugs from the connection bars (2), and store the connecting elements.

⇨ Check contact surfaces of all connection points of cable sealing ends, brush if necessary, and apply a thin film of Vaseline; then mount the connecting elements again.

⇨ Remove the nuts size M8 (3) for fixing the floor plates (4), take connecting elements and floor plates out of the panel, and store all.

⇨ Take all rubber sleeves (5) out of the floor plates.

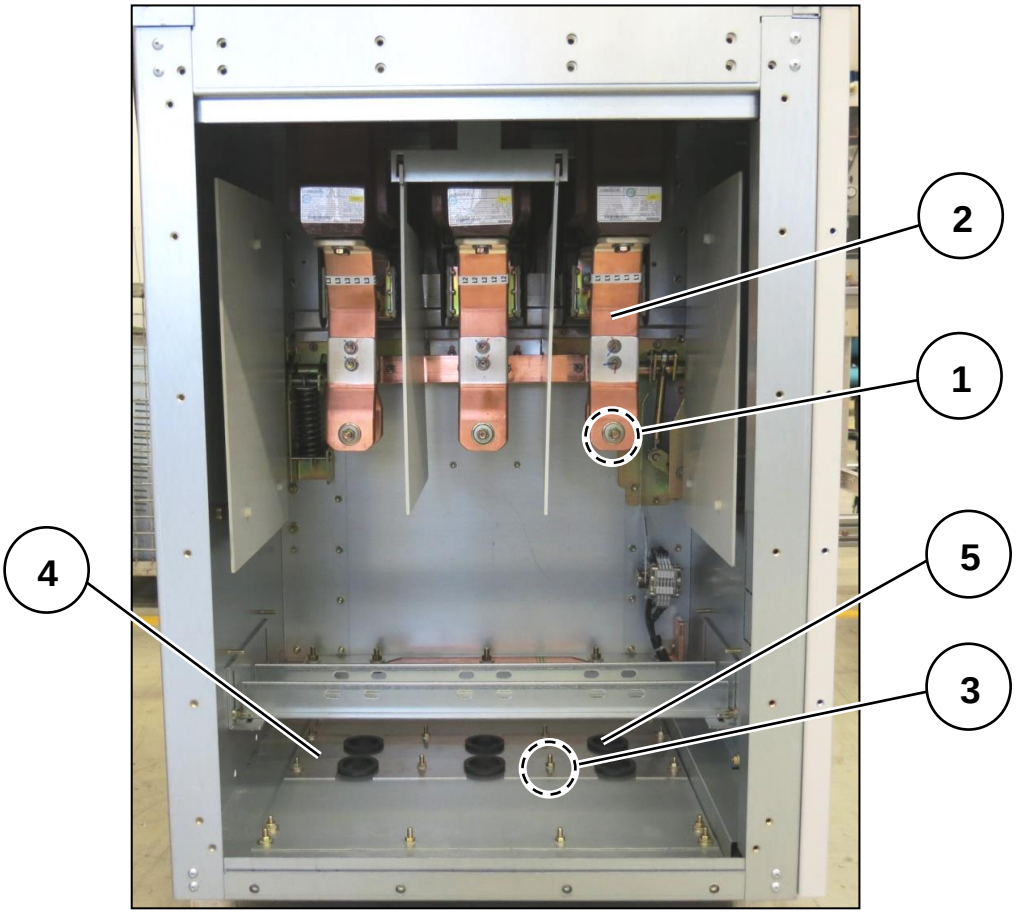


Fig. 217: Connection compartment, view from the rear side of the panel
(installation of insulating plates only for U_r = 17.5 kV)

10.2 Cutting the rubber sleeves to size

INFORMATION

The rings in the rubber sleeves serve only as rough orientation.

⇨ Cut the opening matching with the actual cable diameter to size during installation.

⇨ Cut an opening into the rubber sleeve that fits the diameter of the cable.

⇨ Lead the cable through the opening in the rubber sleeve.

⇨ Use one rubber sleeve per cable.

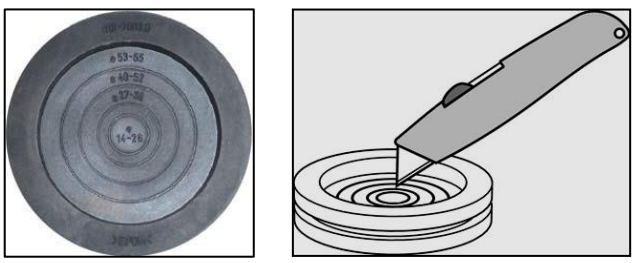


Fig. 218: Rubber sleeve for cable, for example

10.3 Use of cable lugs

NOTICE

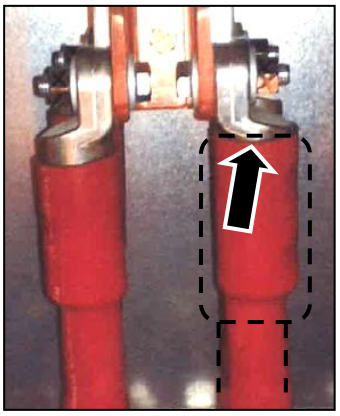
Damage to the switchgear panels

An incorrect installation of cable lugs will cause damages.

⇨ After installation of cable lugs with shear-off head bolt, all sharp edges in the area of each sheared off bolt must be removed.

⇨ After installation of cable lugs with shear-off head bolts, the heat shrinkable tube must be extended up to the connection area on the cable lug.

Type of cable lugs

Compression cable lug acc. to **DIN 46235**	Cable lug with shear-off head bolt(s)	When using cable lugs with shear-off head bolt, the heat shrinkable tube must be extended up to the connection area on the cable lug.
		

Bolted connection of cable lugs

Bolt size M12	Connecting elements per phase: 1x bolt M12 plus 2x plain washer acc. to ISO 7093 plus 2x conical spring washer 12 plus 1x nut M12
Bolt size M16	Connecting elements per phase: 1x bolt M16 plus 2x conical spring washer 16 plus 1x nut M16

10.4 Cable clamps

> **INFORMATION**
>
> Cable clamps and associated bolting material are not included in the scope of supply of the switchgear.
>
> ⇨ Use only cable clamps of the type **id-Technik series K**.
>
> ⇨ Follow the instructions of the cable manufacturer.

Bolting material

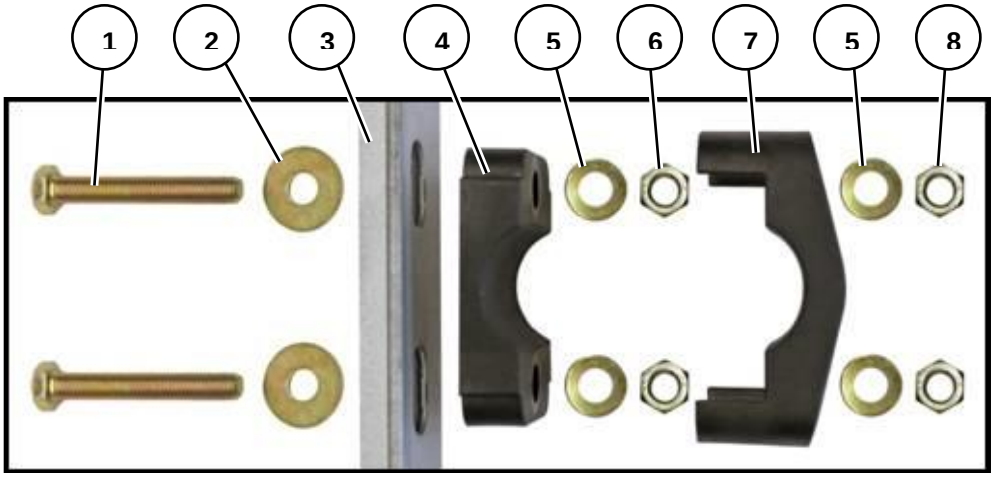


Fig. 219: Bolting material

(1) Hexagon head bolt, steel, size M10, ISO 4017, 8.8, fully threaded
(2) Plain washer, steel, size 10.5, ISO 7093-1
(3) Cable bracket of panel
(4) Cable clamp, lower part
(5) Plain washer, steel, size 10.5, ISO 7089
(6) Hexagon nut, steel, size M10, ISO 4032, tightening torque **20 Nm**
(7) Cable clamp, upper part
(8) Hexagon nut, steel, size M10, ISO 4032, tightening torque **5 Nm**

The length of the steel hexagon head bolts (1) depends on the type of cable clamp:

Cable clamp type	Outside diameter of cable (without insert)	Hexagon head bolt, steel (1)
K 26/38	26 - 38 mm	M10x80
K 36/52	36 - 52 mm	M10x80
K 50/75	50 - 75 mm	M10x100
K 66/90	66 - 90 mm	M10x120
Manufacturer information: www.id-technik.com		

10.5 Cable sealing ends

To connect the high-voltage cables, customary indoor sealing ends for air-insulated medium-voltage switchgear have to be used.

NOTICE

Damage to the switchgear panels

The connection compartment can be destroyed by flashovers if cable sealing ends with non-matching dimensions are used.

⇨ Use only sealing ends with the dimensions described hereafter.

⇨ Depending on the manufacturer of the cable sealing ends, the dimensions may differ from those described in here. If the dimensions are different, please do absolutely contact the regional Siemens representative **before installation**.

NOTICE

Damage to the switchgear panels

When the cables are mounted, this can cause gaps and openings that do not meet the degree of protection of the switchgear.

⇨ After assembling the cable sealing ends, verify the gap dimensions according to the degree of protection.

⇨ If necessary, re-align the parts moved for mounting the cables, in order to provide the gap dimensions according to the degree of protection.

⇨ Compensate gaps up to 2.5 mm with sealing compound SIKAFLEX 221-GR 310 ML.

⇨ In case of gaps > 2.5 mm between the outside diameter of the cable and the opening in the rubber sleeve of the floor cover: Fit new rubber sleeve.

10.6 Dimensions of single-core cables

The most important dimensions of indoor sealing ends for single-core cables are the permissible length and diameter of the sealing ends.

The bolts for the cable sealing ends are pre-assembled at the cable connection and must **not** be changed.

	All versions (except for contactor panel with panel width 435 mm)		**Contactor panel with panel width 435 mm**
	$U_r \leq 12$ kV	**$U_r = 17.5$ kV**	**$U_r \leq 12$ kV**
Diameter of cable sealing end	max. 95 mm	max. 95 mm	max. 60 mm
Length of cable sealing end, incl. cable lug	max. 450 mm	max. 450 mm	max. 350 mm
Cable cross-section	max. 500 mm^2	max. 500 mm^2	max. 240 mm^2

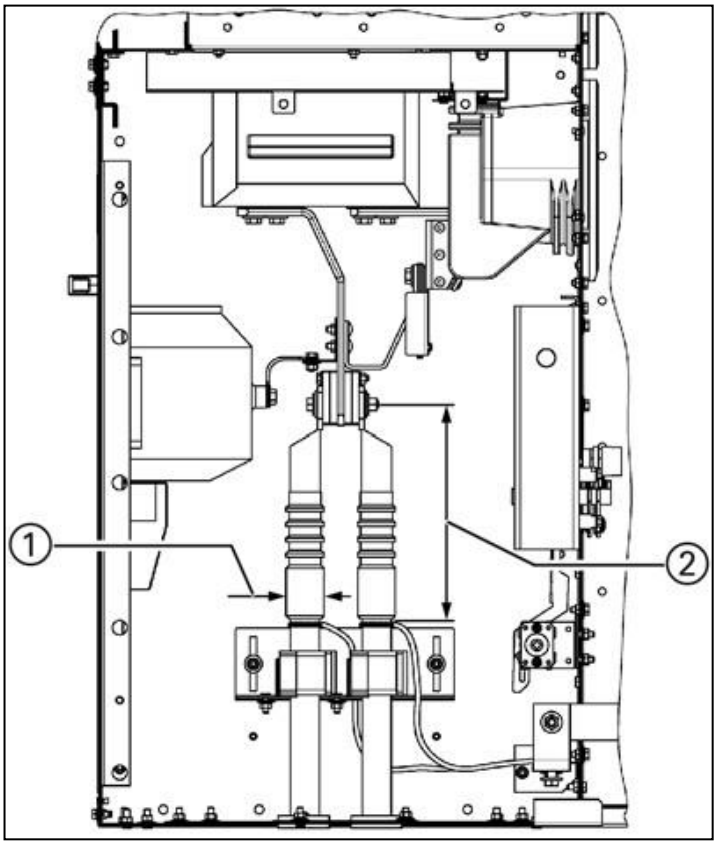


Fig. 220: Dimensions of single-core cables (side view), except for contactor panel with panel width 435 mm

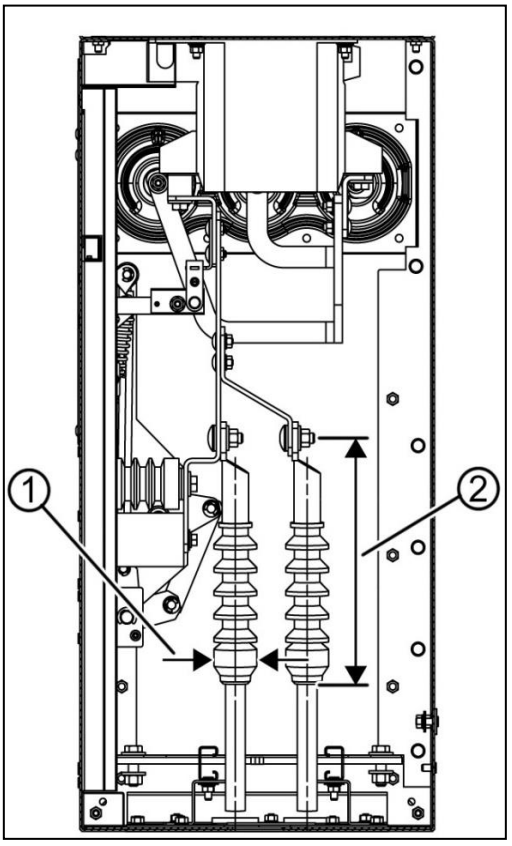


Fig. 221: Dimensions of single-core cables in contactor panel with panel width 435 mm (rear view)

(1) Diameter of cable sealing end

(2) Length of cable sealing end, incl. cable lug

For panels with removable voltage transformers

NOTICE

Damage to the switchgear panels

Danger of flashovers if the connecting cables from the insulating bushings for the removable voltage transformers are laid too close to the earthing conductors of the cable shield.

⇨ Keep the minimum distances of the connecting cables between the cable connections to the insulating bushings for the removable voltage transformers and the earthing conductors of the cable shield:

- For $U_r \leq 12$ kV: Minimum distance 100 mm
- For $U_r = 17.5$ kV: Minimum distance 160 mm

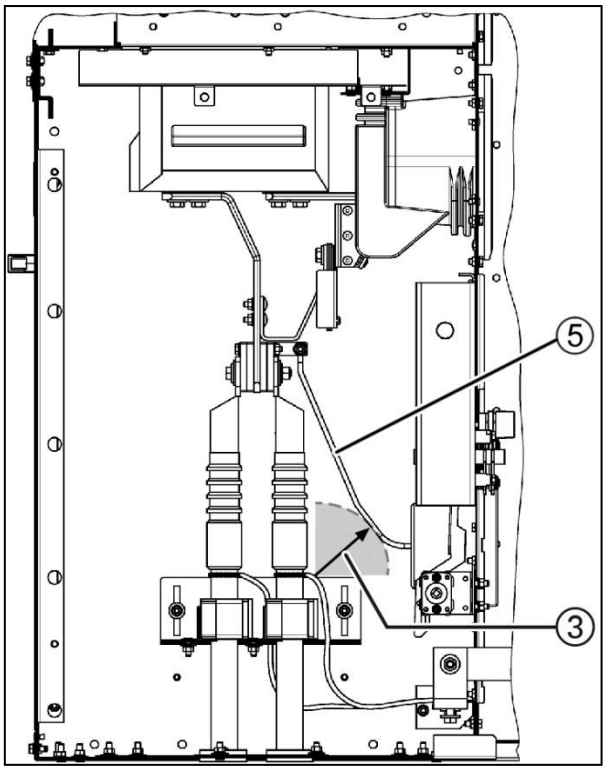


Fig. 222: Connection compartment on panel with removable voltage transformers: $U_r \leq 12$ kV

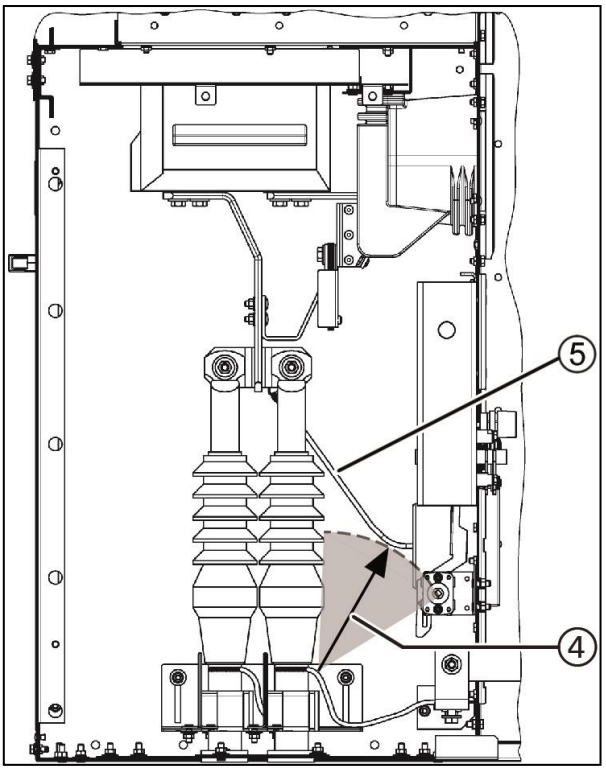


Fig. 223: Connection compartment on panel with removable voltage transformers: $U_r = 17.5$ kV

(3) Distance ≥ 100 mm

(4) Distance ≥ 160 mm

(5) Connecting cables from the insulating bushings for the removable voltage transformers

10.7 Dimensions of three-core cables

The most important dimensions of indoor sealing ends for three-core cables are the permissible length and diameter of the sealing ends, as well as the length of the cable lug up to and including the heat-shrinkable splitting cap.

The bolts for the cable sealing ends are already pre-assembled at the cable connection and must **not** be changed.

	All versions (except for contactor panel with panel width 435 mm)		**Contactor panel with panel width 435 mm**
	$U_r \leq 12$ kV	**$U_r = 17.5$ kV**	**$U_r \leq 12$ kV**
Diameter of cable sealing end	max. 60 mm	max. 60 mm	max. 60 mm
Length from cable lug up to and including heat-shrinkable splitting cap	max. 500 mm	max. 500 mm	max. 500 mm
Length of cable sealing end, incl. cable lug	max. 300 mm	max. 300 mm	max. 300 mm
Cable cross-section	max. 240 mm²	max. 240 mm²	max. 240 mm²

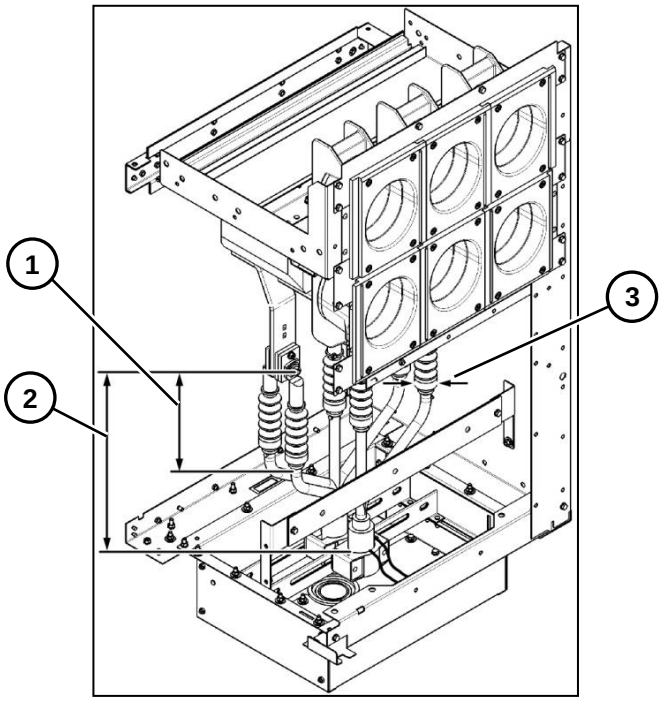


Fig. 224: Dimensions of three-core cables (except for contactor panel with panel width 435 mm)

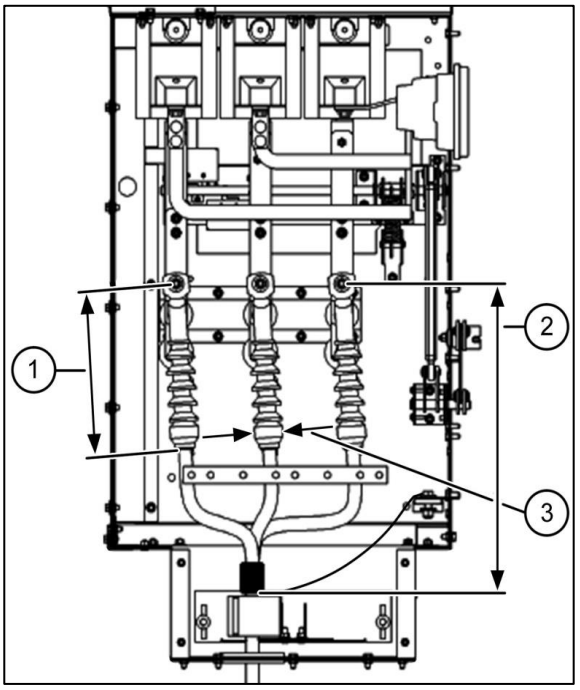


Fig. 225: Dimensions of three-core cables in contactor panel with panel width 435 mm (side view)

(1) Length of cable sealing end, incl. cable lug

(2) Length from cable lug up to and including heat-shrinkable splitting cap

(3) Diameter of cable sealing end

10.8 Assembly of cable sealing ends for single-core cables (except for contactor panel with panel width 435 mm)

NOTICE

Damage to the switchgear panels

⇨ Observe the manufacturer's information about the tightening torques of the cable lugs / cable sealing ends.

INFORMATION

⇨ Do not attach phase tapes to the cable sealing ends.

Panel versions with up to 2 connection points per phase

In panel versions with 2 connection points per phase, the connection points for cable sealing ends are arranged one behind the other (viewed from the access to the connection compartment).

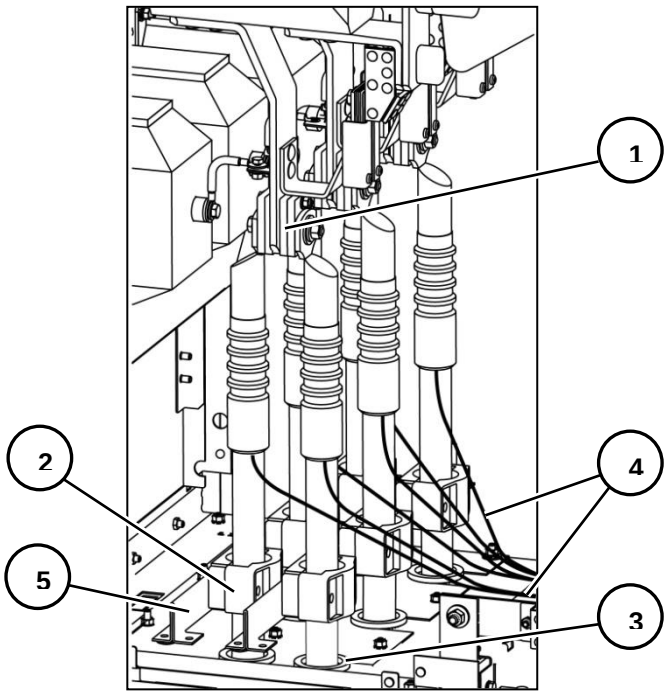


Fig. 226: Connection compartment with connections for 2 cables per phase (example)

(1) Cable connection for 2 cables per phase

(2) Cable clamp (not supplied)

(3) Floor plate with rubber sleeve

(4) Earth connection, connection bolt for earth connection size M12x35

(5) Cable bracket

Panel versions with at least 3 connection points per phase

In panel versions with at least 3 connection points per phase, the connection points for cable sealing ends are arranged both one behind the other and side by side (viewed from the access to the connection compartment).

NOTICE

Damage to the switchgear panels

- ⇨ Depending on the cable lugs used, the cable lugs of adjacent phases can be too close to each other. Use only cable lugs keeping the minimum distance between the cable lugs of adjacent phases.
- ⇨ The panel connections in the connection compartment must all be equipped with cable sealing ends.
- ⇨ To bolt the cable sealing ends together with the cable connecting lug, always use the bolting material pre-assembled at the connecting lug.
- ⇨ To coordinate a different procedure, please contact the regional Siemens representative.

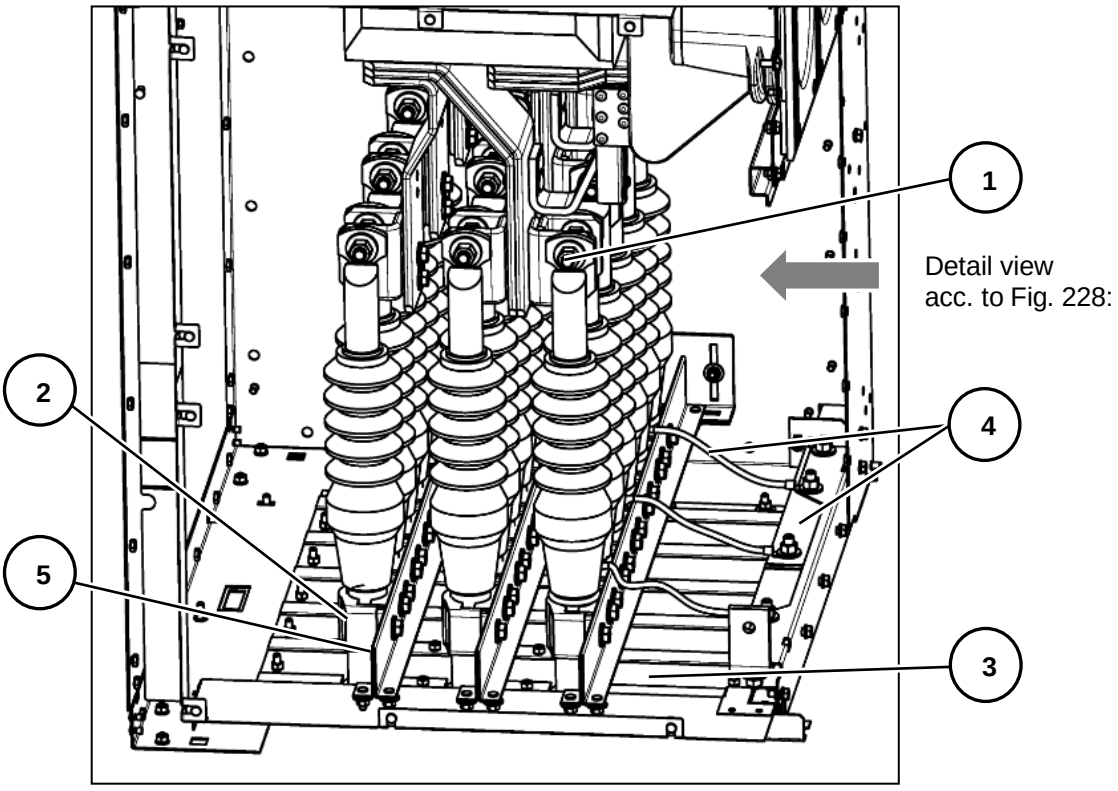


Fig. 227: Connection compartment with connections for 6 cables per phase (example)

(1) cable connection for 6 cables per phase, (2) cable clamp (not supplied),
(3) floor plate with rubber sleeves, (4) earth connection with connection bolt size M12x35, (5) cable bracket

Minimum distance between cable lugs of adjacent phases	d = 74 mm
Rated voltage	≤ 17.5 kV
Phase separation plates	Minimum distance must be given directly from cable lug to cable lug.

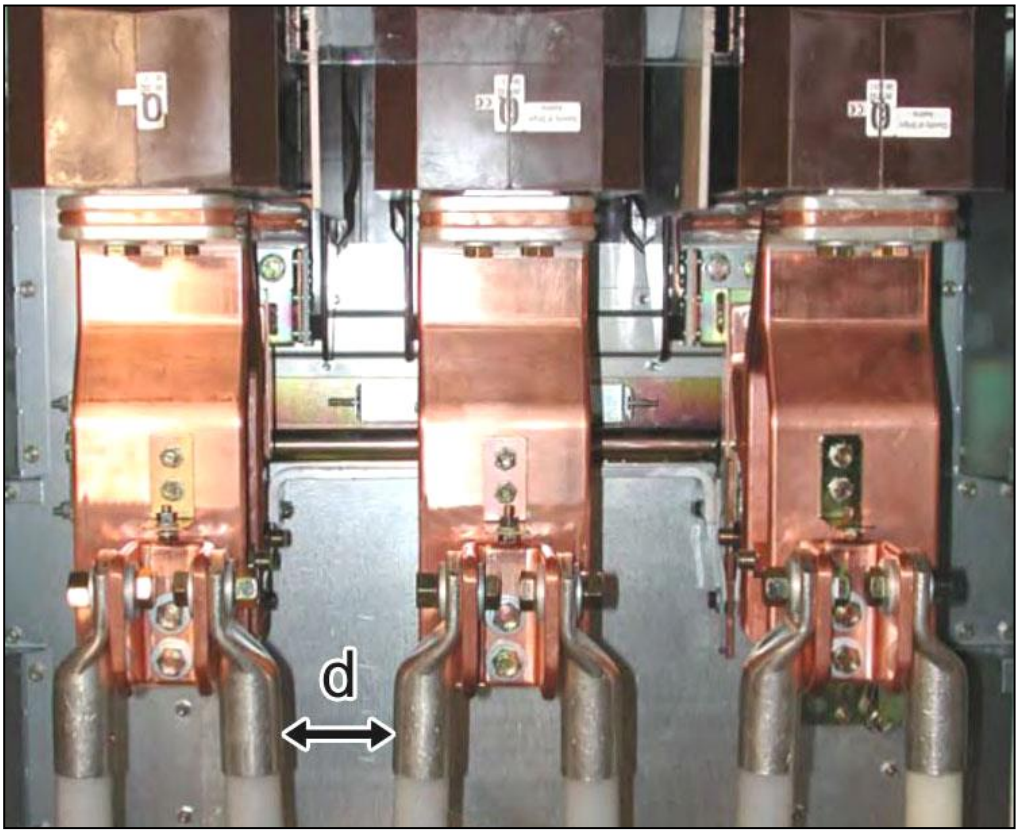


Fig. 228: Detail view: Minimum distance between cable lugs of adjacent phases

Procedure

⇨ Pull the cable into the connection compartment.

⇨ Bolt the cable lug of the cable sealing end onto the connection points without distortions or gaps using the delivered connecting bolts.

⇨ Fasten the cable at the cable bracket.
(Use antimagnetic clamps for single-core cables).

⇨ If the cable bracket is located in the area of the cable sealing end, shift the cable bracket so that the cable clamps are located underneath the sealing end.

⇨ Install the floor plates again and insert the rubber sleeves into the floor plates; fasten the floor plates with bolts size M8.

⇨ Lead the cable lug of each earth connection directly to the earthing busbar, keeping the maximum possible distance to live parts.

✓ The cables and the cable sealing ends are mounted in the connection compartment.

10.9 Assembly of cable sealing ends for single-core cables in contactor panel with panel width 435 mm

NOTICE

Damage to the switchgear panels

⇨ Observe the manufacturer's information about the tightening torques of the cable lugs / cable sealing ends.

INFORMATION

The connection points of the cable sealing ends (5) and the floor openings in the floor cover (4) are **not** lying perpendicularly one above the other.

⇨ Mount the cables and the cable sealing ends with a slight inclination towards the rear side; please refer to the side view shown below.

INFORMATION

⇨ Do not attach phase tapes to the cable sealing ends.

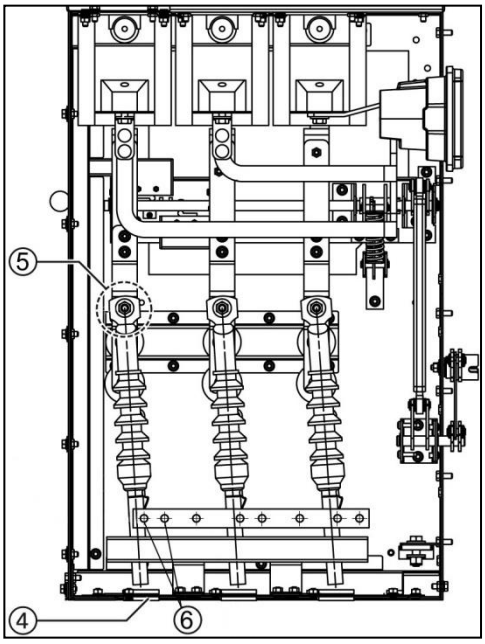


Fig. 229: Side view of connection compartment in contactor panel

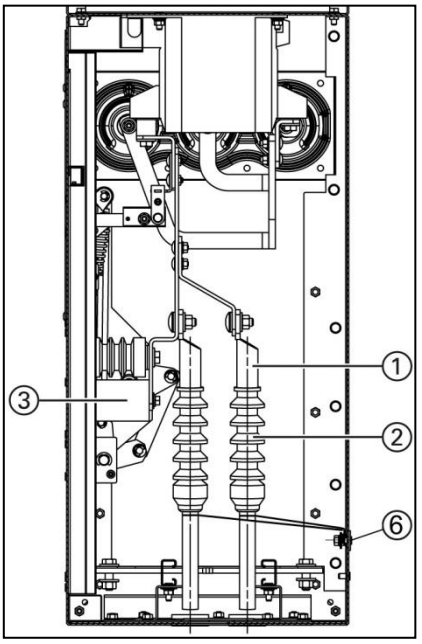


Fig. 230: Rear view of connection compartment in contactor panel

(1) Cable lug
(2) Cable sealing end
(3) Surge limiter (optional)
(4) Floor opening in the floor cover
(5) Connection point for cable sealing end
(6) Connection point of earth connection, stud M8

⇨ Pull the cable into the connection compartment.

⇨ Bolt the cable lug of the cable sealing end onto the connection points without distortions or gaps using the delivered connecting bolts.

⇨ Fasten the cable at the cable bracket.
(Use antimagnetic clamps for single-core cables).

⇨ If the cable bracket is located in the area of the cable sealing end, shift the cable bracket so that the cable clamps are located underneath the sealing end.

⇨ Install the floor plates again and insert the rubber sleeves into the floor plates; fasten the floor plates with bolts size M8.

⇨ Lead the earthing of the cable sealing end directly to the earthing busbar on the right side in the connection compartment and bolt tight, keeping the maximum possible distance to live parts.

✓ The cables and the cable sealing ends are mounted in the connection compartment.

10.10 Assembly of cable sealing ends for three-core cables (except for contactor panel with panel width 435 mm)

Installing a deep bottom pan in the connection compartment is only required for panels with connection of three-core cables in the connection compartment.

NOTICE

Damage to the switchgear panels

⇨ Observe the manufacturer's information about the tightening torques of the cable lugs / cable sealing ends.

INFORMATION

The deep bottom pan can only be installed when the associated panel is standing on its assigned place of installation.

INFORMATION

For space-saving installation of the switchgear, the compact construction can hinder the installation of deep bottom pans.

⇨ Dismantle deep bottom pan.

⇨ If possible, mount the parts of the deep bottom pan in the connection compartment through the rear access to the connection compartment.

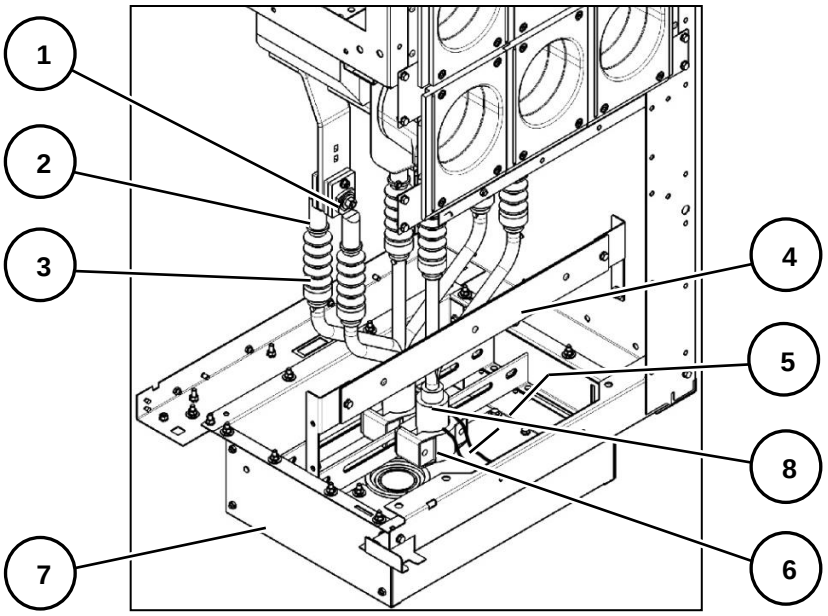
INFORMATION

When a zero-sequence current transformer is installed, a fault current may arise through the earth connection.

⇨ Lead the earthing cable back through the cable clamp and the zero-sequence current transformer, and connect it to the earthing busbar.

INFORMATION

⇨ Do not attach phase tapes to the cable sealing ends.



(1) Cable connection point
(2) Cable lug
(3) Cable sealing end
(4) Shielding cover
(5) Earth connections with connection bolt size M12x35
(6) Cable clamp at the cable bracket
(7) Deep bottom pan
(8) Heat-shrinkable splitting cap

Fig. 231: Side view of connection compartment with three-core cables

Preconditions

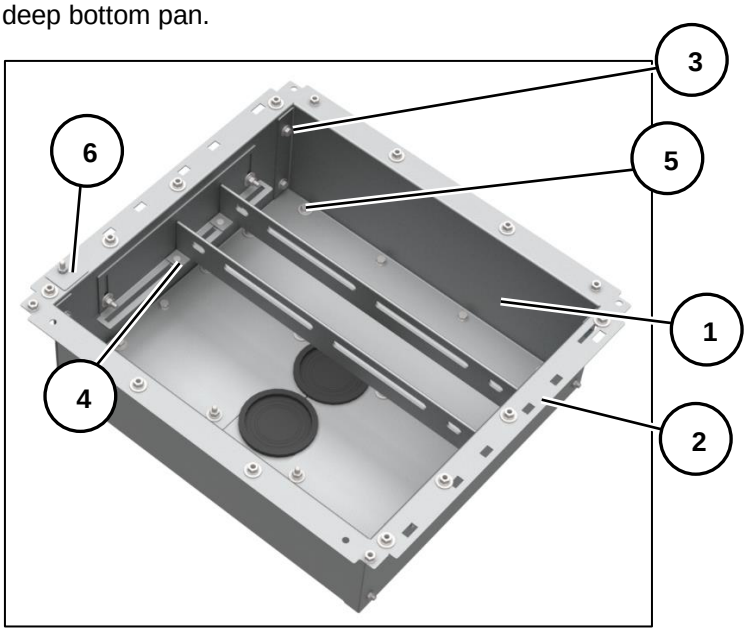
- The panel is placed on its assigned place of installation
- Access to the connection compartment is established
- Deep bottom pan available from the supplementary equipment for the switchgear

Procedure

⇨ Take the pre-assembled bottom pan from the supplementary equipment of the delivery.

⇨ For further installation, the pre-assembled bottom pan must be disassembled, so that the parts can be installed individually in the base frame of the connection compartment. To do this, unscrew the connecting elements (3), (4) and (5) completely, and store the individual components and the connecting elements for later use.

⇨ If there is a substation earth in the panel, remove and dispose of the cover plate (6) for elongated cutout. If there is no substation earth in the panel, keep the cover plate (6) for elongated cutout in the deep bottom pan.



(1) Front plates
(2) Side plates
(3) 8 bolts M8x16
(4) 4 nuts M8 plus plain washers size 8 acc. to ISO 7093
(5) 16 bolts M8x20 plus plain washers size 8 acc. to ISO 7093
(6) Cover plate for elongated cutout in deep bottom

Fig. 232: Pre-assembled bottom pan

⇨ Set 1 side plate each down onto 4 standing studs size M8, each on the left and right side in the connection compartment.

⇨ Set 1 front plate each down onto 4 standing studs size M8, each at the front and rear side in the connection compartment.

⇨ Take the bag unit with the connecting elements from the supplementary equipment of the delivery.

⇨ Bolt the front and side plates to the studs of the connection compartment using the connecting elements (1) and (2) from the bag unit.

⇨ Bolt the front and side plates together using the stored connecting elements (3).

⇨ If necessary, bolt the cover plate (4) to the studs of the connection compartment using the connecting elements.

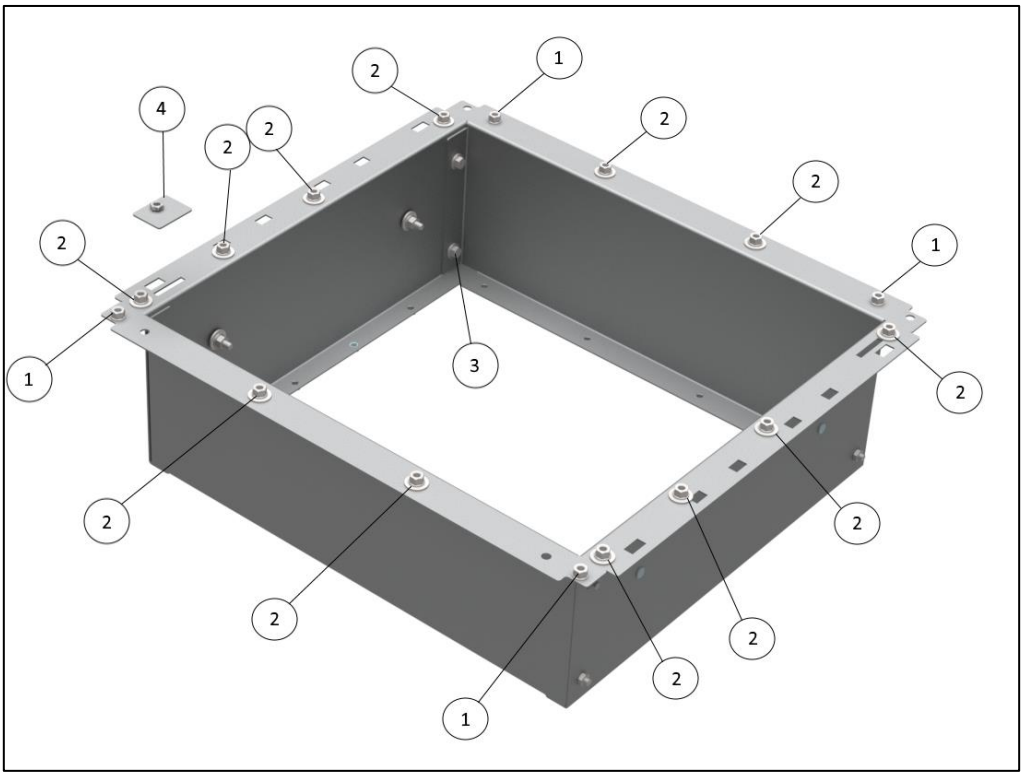


Fig. 233: Assembly of the front and side plates

(1) Hexagon nut size M8, contact washer size 8

(2) Hexagon nut size M8, contact washer size 8, plain washer size 8 acc. to ISO 7093

(3) Hexagon head bolt size M8x16, contact washer size 8

(4) Cover plate with fixing nut size M8

⇨ Cut an opening into the rubber sleeve that fits the diameter of the cable.

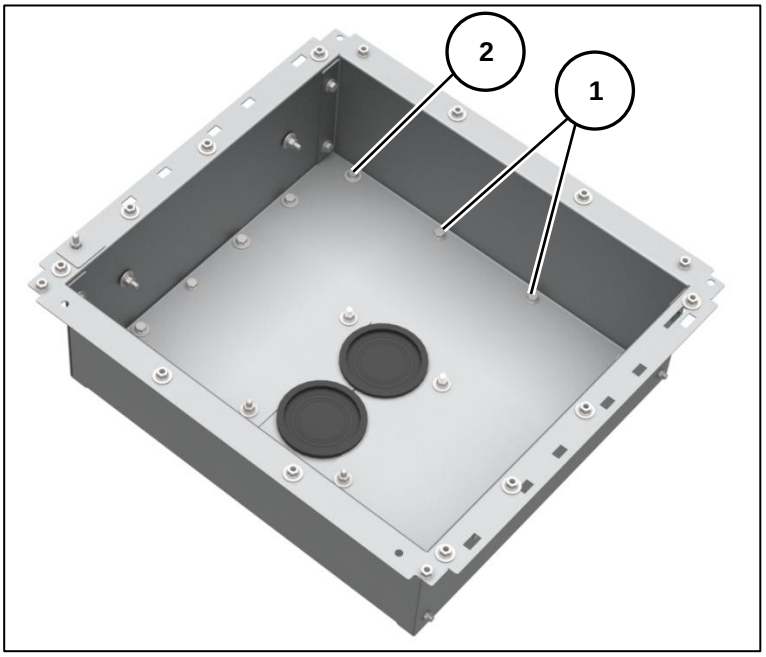
⇨ Lead the cable through the opening in the rubber sleeve.

⇨ Split the three-core cable into single cables, mount the heat-shrinkable splitting cap, and lead the earthing connection out.

⇨ Connect one single cable each with a cable sealing end. Connect one cable sealing end each with a cable lug.

⇨ Lay the components of the floor cover into the bottom pan. While doing so, insert the rubber sleeve in the floor cover.

⇨ Bolt the components of the floor cover together using the connecting elements (1) and (2).



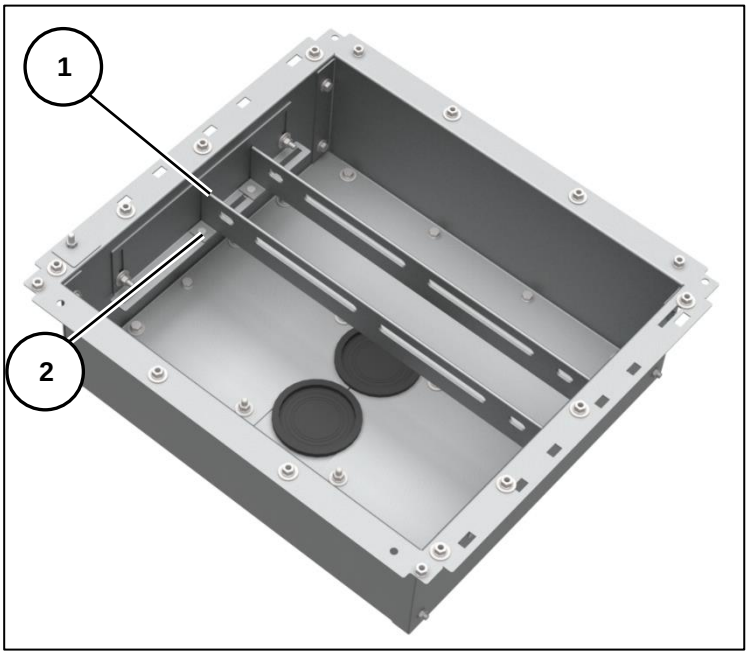
(1) 4 bolts size M8x20

(2) 12 bolts size M8x20 plus plain washers size 8 acc. to ISO 7093

Fig. 234: Assembly of the floor cover

⇨ Insert the cable bracket (1), and put it in position.

⇨ Fasten the cable bracket using the connecting elements (2).



(1) Cable bracket

(2) 4 bolts size M8 plus plain washers size 8 acc. to ISO 7093

Fig. 235: Assembly of the cable bracket

⇨ Fasten the cable to the cable bracket underneath the heat-shrinkable splitting cap; use a clamp.

⇨ Optionally: Mount a zero-sequence current transformer between the cable clamp and the rubber sleeve. When doing so, lead the earth connection back through the zero-sequence current transformer.

⇨ Lead the cable lug of an earth connection directly to the earthing busbar, apply it to the central connection bolt size M12 and bolt tight, keeping the maximum possible distance to live parts. Proceed in the same way with the other earth connections. Each cable sealing end must be connected to the earthing busbar.

⇨ Bolt one cable lug each to one of the connection points of a phase, without distortions and gaps, using the supplied connecting elements.

⇨ Check whether the minimum distance between the lower end of the cable lug and the upper edge of the shielding cover is kept.

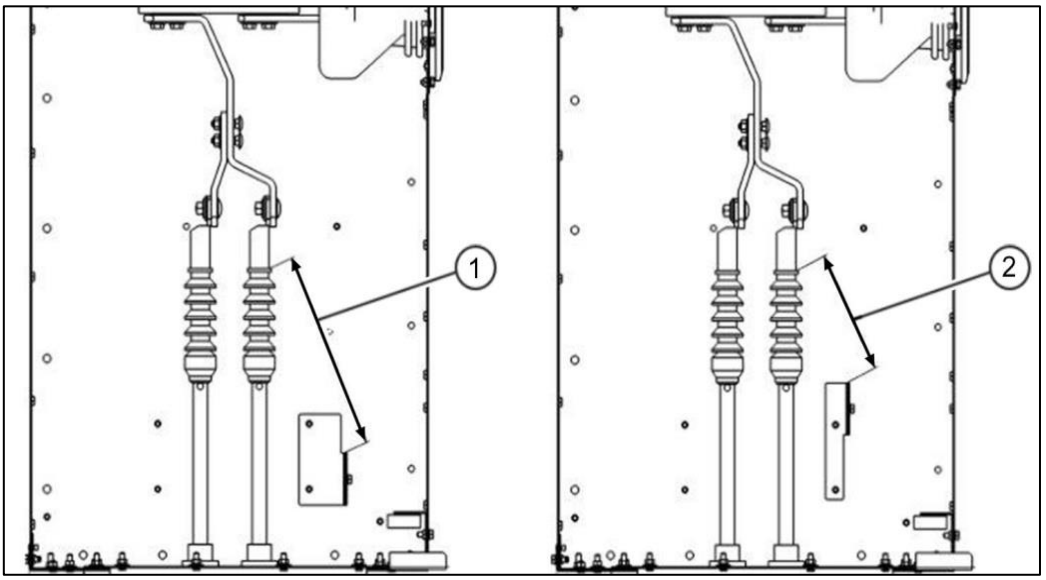


Fig. 236: Minimum distances between cable lug and shielding cover:

		Panel width		
		600 mm	**800 mm**	**1000 mm**
U_r = 17.5 kV	Length (1) [mm]	300	300	312
U_r ≤ 12 kV	Length (2) [mm]	180	180	195

✓ The bottom pan, the cables and the cable sealing ends are mounted in the connection compartment.

10.11 Assembly of cable sealing ends for three-core cables in contactor panel with panel width 435 mm

Installing a deep bottom pan in the connection compartment is only required for panels with connection of three-core cables in the connection compartment.

NOTICE

Damage to the switchgear panels

⇨ Observe the manufacturer's information about the tightening torques of the cable lugs / cable sealing ends.

INFORMATION

The connection points of the cable sealing ends (1) and the floor openings in the floor cover (6) are **not** lying perpendicularly one above the other.

⇨ Mount the cables and the cable sealing ends with a slight inclination towards the rear side; please refer to the side view shown below.

INFORMATION

The deep bottom pan can only be installed when the associated panel is standing on its assigned place of installation.

INFORMATION

For space-saving installation of the switchgear, the compact construction can hinder the installation of deep bottom pans.

⇨ Dismantle deep bottom pan.

⇨ If possible, mount the parts of the deep bottom pan in the connection compartment through the rear access to the connection compartment.

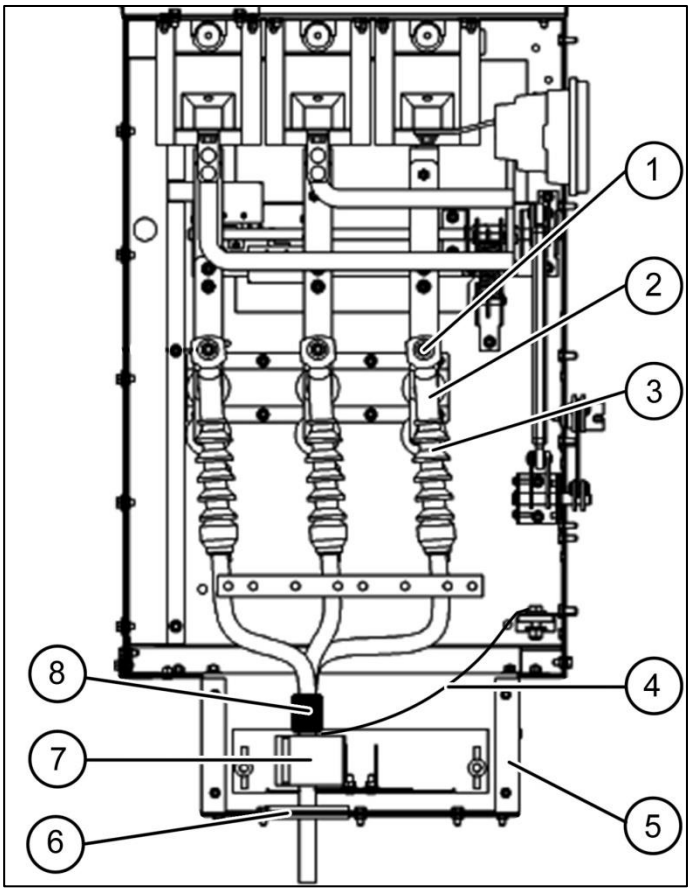
INFORMATION

When a zero-sequence current transformer is installed, a fault current may arise through the earth connection.

⇨ Lead the earthing cable back through the cable clamp and the zero-sequence current transformer, and connect it to the earthing busbar.

INFORMATION

⇨ Do not attach phase tapes to the cable sealing ends.



(1) Cable connection point of one phase
(2) Cable lug
(3) Cable sealing end
(4) Earth connection with connection bolt size M12x35
(5) Deep bottom pan
(6) Floor opening with rubber sleeve
(7) Cable clamp at the cable bracket
(8) Heat-shrinkable splitting cap

Fig. 237: Side view of connection compartment with three-core cables in contactor panel with panel width 435 mm

Preconditions

- The panel is placed on its assigned place of installation
- Access to the connection compartment is established
- Deep bottom pan available from the supplementary equipment for the switchgear

Procedure

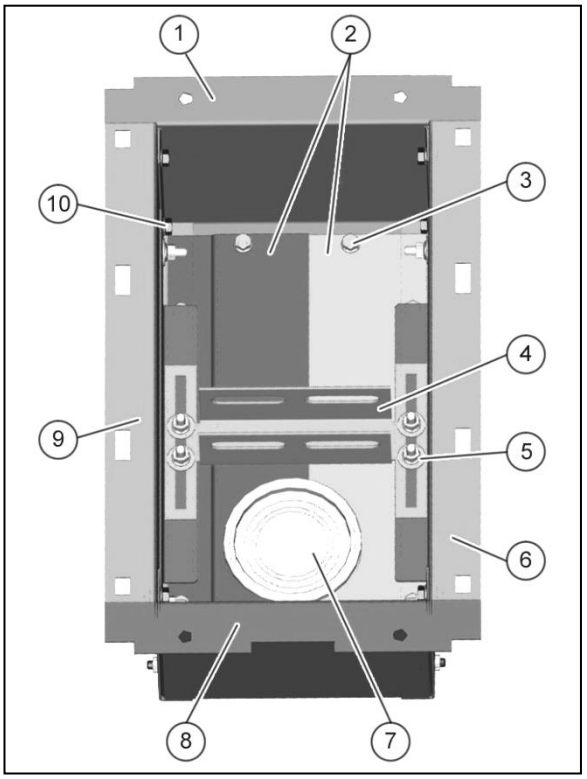
⇨ Take the pre-assembled bottom pan from the supplementary equipment of the delivery.

⇨ For further installation, the pre-assembled bottom pan must be disassembled, so that the parts can be installed individually in the base frame of the connection compartment. To do this, unscrew the connecting elements (3), (5) and (10) completely, and store the individual components and the connecting elements for later use.

⇨ Set the left side wall and the right side wall down onto 4 standing studs size M8 each in the connection compartment.

⇨ Set the front plate and the rear wall down onto 4 standing studs size M8 each at the front and rear side in the connection compartment.

⇨ Take the bag unit with the connecting elements from the supplementary equipment of the delivery.



(1) Front plate

(2) 2 floor covers

(3) 4 bolts M8x20

(4) 1 cable bracket

(5) 4 nuts M8 plus
4 plain washers 8 acc. to ISO 7093

(6) Right side wall

(7) 1 rubber sleeve

(8) Rear wall

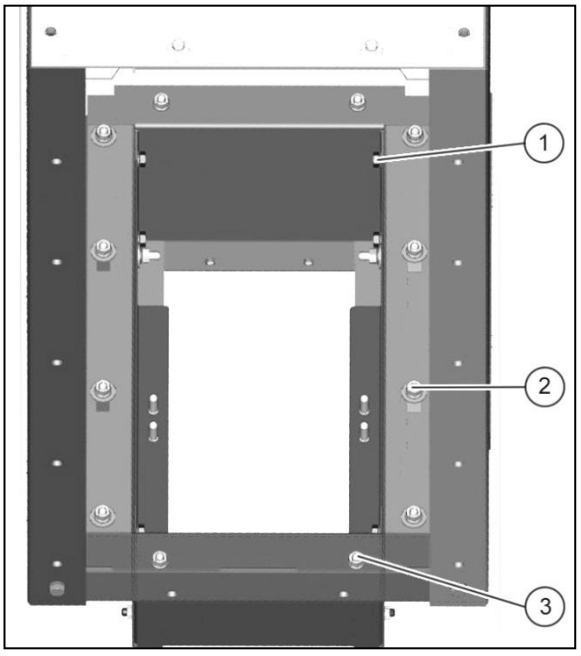
(9) Left side wall

(10) 8 hexagon head bolts M8x16 plus
8 contact washers 8

Fig. 238: Pre-assembled bottom pan

⇨ Bolt the side walls with the connecting elements (1), and the front plate and the rear wall with the connecting elements (2) from the bag unit onto the studs of the connection compartment.

⇨ Bolt the front plate / rear wall and side walls together using the stored connecting elements (3).



(1) 8 hexagon head bolts M8x16 plus 8 contact washers size 8

(2) 8 hexagon nuts M8 plus 8 plain washers size 8 acc. to ISO 7093 (from bag unit)

(3) 4 nuts M8 (from bag unit)

Fig. 239: Assembly of the lateral parts

⇨ Cut an opening into the rubber sleeve that fits the diameter of the cable.

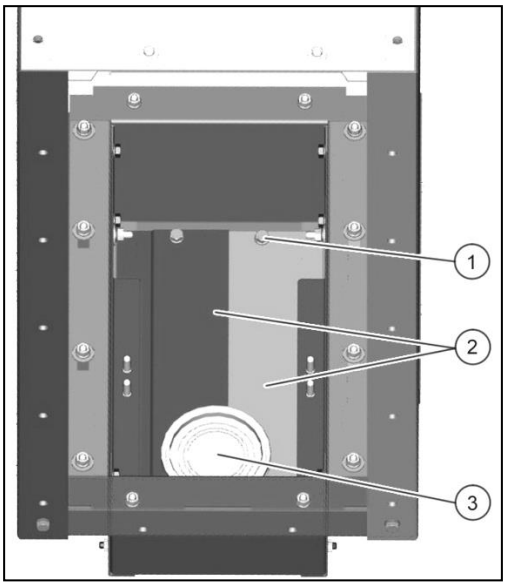
⇨ Lead the cable through the opening in the rubber sleeve.

⇨ Split the three-core cable into single cables, mount the heat-shrinkable splitting cap, and lead the earthing connection out.

⇨ Connect one single cable each with a cable sealing end. Connect one cable sealing end each with a cable lug.

⇨ Lay the components of the floor cover into the bottom pan. While doing so, insert the rubber sleeve in the floor cover.

⇨ Bolt the components of the floor cover together using the connecting elements (1).



(1) 4 bolts M8x20

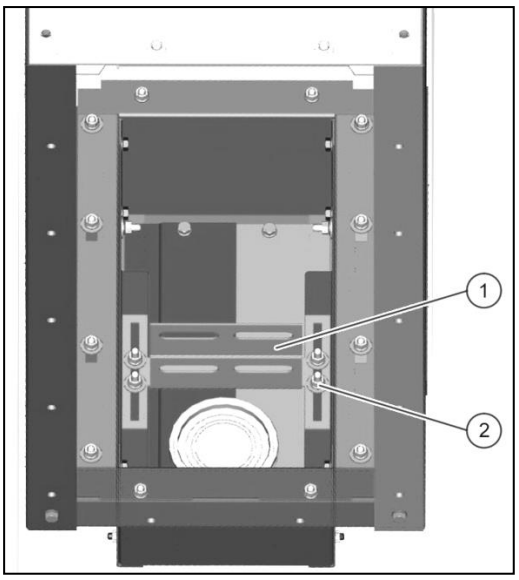
(2) 2 floor covers

(3) Rubber sleeve

Fig. 240: Assembly of the floor cover

⇨ Insert the cable bracket (1), and put it in position.

⇨ Fasten the cable bracket using the connecting elements (2).



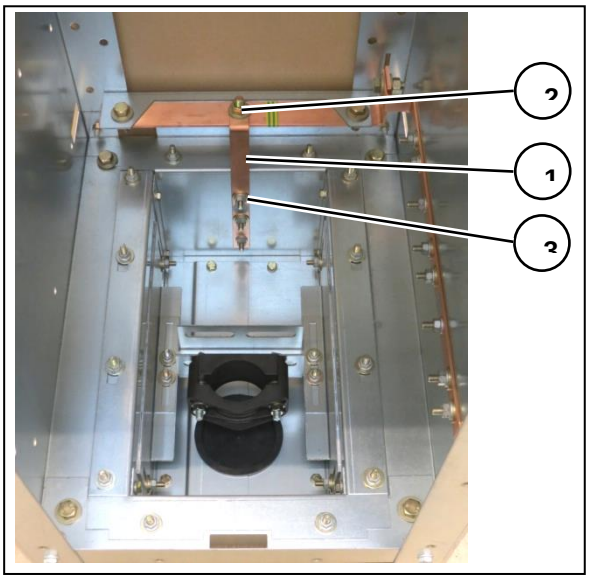
(1) Cable bracket

(2) 4 nuts M8 plus 4 plain washers size 8 acc. to ISO 7093

Fig. 241: Assembly of the cable brackets

⇨ Fasten the cable to the cable bracket underneath the heat-shrinkable splitting cap; use a clamp.

⇨ Optionally: Mount a zero-sequence current transformer between the cable clamp and the rubber sleeve. When doing so, lead the earth connection back through the zero-sequence current transformer.



(1) Connection bar

(2) Bolted joint size M12
plus conical spring washer 12

(3) 3 nuts M8 plus 3 plain washers
size 8 acc. to ISO 7093

Fig. 242: Assembly of the connection bar

⇨ Mount the connection bar (3) as interconnection between the earthing busbar and the bottom pan. To do this, remove the connection bar from the earthing busbar.

⇨ Lead the cable lug of an earth connection to the connection bar of the earthing busbar, apply it to the bolted joint size M8 and bolt tight.

⇨ Bolt one cable lug each to one of the connection points of a phase, without distortions and gaps, using the supplied connecting elements.

✓ The bottom pan, the cables and the cable sealing ends are mounted in the connection compartment.

10.12 Connecting control cables

The circuit diagrams for connecting the control cables are included in the low-voltage compartment.

⇨ Remove the customer wiring duct covers in the switching-device compartment:
- For contactor panels with panel width 435 mm: On the right inner side
- For all other panel types: on the left inner side

⇨ Lay the cables from the foundation through the customer wiring duct in the low-voltage compartment.

⇨ Refit customer wiring duct covers.

⇨ Connect control cables according to the circuit diagrams.

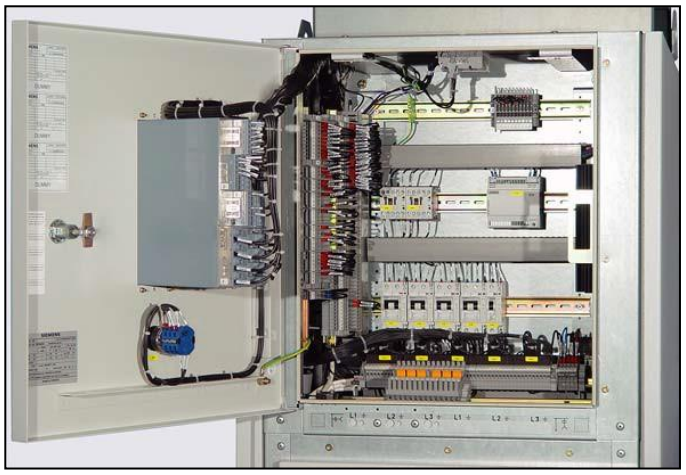


Fig. 243: Inside view of the low-voltage compartment as an example

10.13 Connecting bus wires

The bus wire is the electrical connection from panel to panel.

⇨ Clamp or plug bus wires into the bus wire terminal block in the low-voltage compartment.

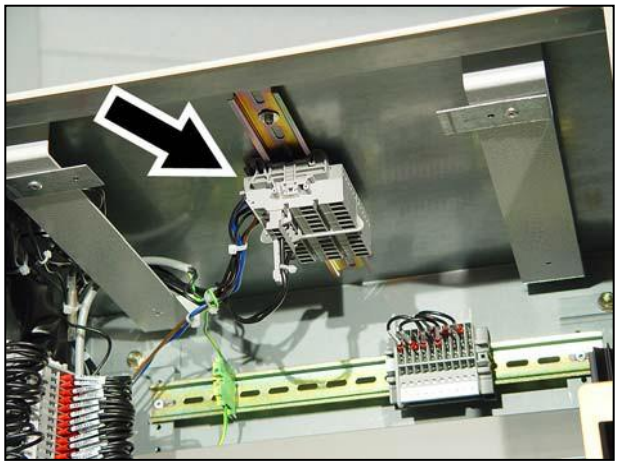


Fig. 244: Inside view of the low-voltage compartment with terminal block

✓ Control cables and bus wires are connected.

11 Closing the connection compartment / connection duct

INFORMATION

Read and understand these instructions before attempting installation works.

DANGER

Electric shock

Always verify safe isolation from supply without any doubt.

In the instructions given in the following sections it is assumed that new switchgear is being installed, which has not yet been energized with operational high voltage.

If the switchgear is already in operation, operational high voltage could be applied at the connections in the connection compartment / connection duct.

⇨ To perform tests or work in the connection compartment / connection duct of a switchgear that is already in operation, follow the directives of the Operating Instructions with order number 110-0134.9.

NOTICE

Foreign objects

Possible malfunctioning and damage to the panels caused by foreign objects.

⇨ Before closing the connection compartment, remove all foreign objects from the connection compartment / connection duct, e.g.:

- 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 / connection duct:

⇨ Clean polluted areas in the connection compartment / connection duct. To do this, use a vacuum cleaner and a lint-free cloth. If necessary, moisten the cloth, use a mild household cleaner, and dry properly at the end.

⇨ Some parts and surfaces of the switchgear are greased for functioning. Do not remove the grease there; do not clean the parts and surfaces.

⇨ If greased areas are dirty, clean the dirty area and grease again according to the maintenance instructions.

INFORMATION

Before commissioning the switchgear, the connection compartment / connection duct may only be permanently closed by bolting tight under the following conditions:

- The connection compartment / connection duct is free from foreign objects and pollution
- All previous assembly work inside the connection compartment / connection duct has been fully and properly completed

⇨ Verify completeness and correctness of the previous assembly work in the connection compartment / connection duct. This also includes:

- Check the control tightening torques of the bolted joints, and correct the torques if required
- Check earthing of sealing ends
- In case of welded floor fixing: Check the welded seam and the corrosion protection

⇨ Record the proper condition of the connection compartment / connection duct after bolting together, so that this is clear without any doubt before commissioning the switchgear.

INFORMATION

⇨ Before executing any installation work, read and understand the corresponding chapters in the Operating Instructions with order number 110-0134.9.

11.1 Installing the vertical partition in the switching-device compartment

NOTICE

Damages inside the switching-device compartment

Damages inside the switching-device compartment possible due to incorrect or incomplete installation of the partition.

⇨ To fasten the partition, always screw in all bolts all around 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:

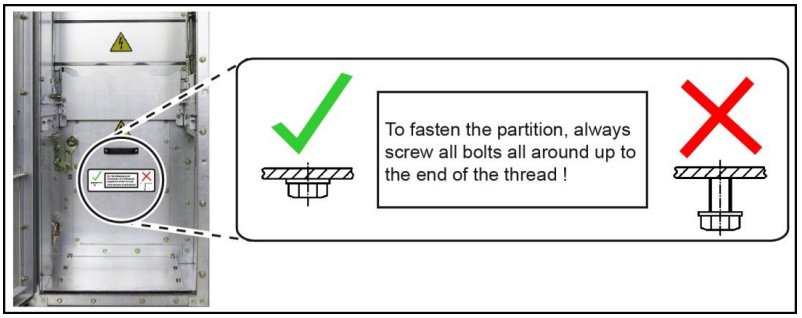


Fig. 245: All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel: Instruction label on the vertical partition

Closing the connection compartment / connection duct

Preconditions

- Feeder earthing switch in CLOSED position
- High-voltage door open
- Low-voltage connector stowed away

- Panel versions with withdrawable circuit-breaker / circuit-breaker truck or withdrawable disconnector / disconnector truck only:
  - Protection plate of switching-device compartment available
  - Connecting elements available:
    - 4 nuts M8 with contact washers

- All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel:
  - Partition available
  - Connecting elements available:
    - 10 bolts M8x20 with contact washers and plain washers size 8
    - 5 bolts M8x20 with contact washers

- Contactor panels with panel width 435 mm only:
  - Partition available
  - Connecting elements available:
    - 7 bolts M8x20 with contact washers for the left part of the partition
    - 4 bolts M8x16 with contact washers for the right part of the partition

Procedure

All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel:

⇨ Install the partition (1) between the connection compartment and the switching-device compartment.

⇨ To fix the partition (1), tighten the bolts all around hand-tight:
All panel versions except for contactor panels with panel width 435 mm:

- 10 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093 (2)
- 5 bolts M8x20 with contact washers (3)

⇨ Tighten the fixing bolts all around with a tightening torque of 25 Nm.

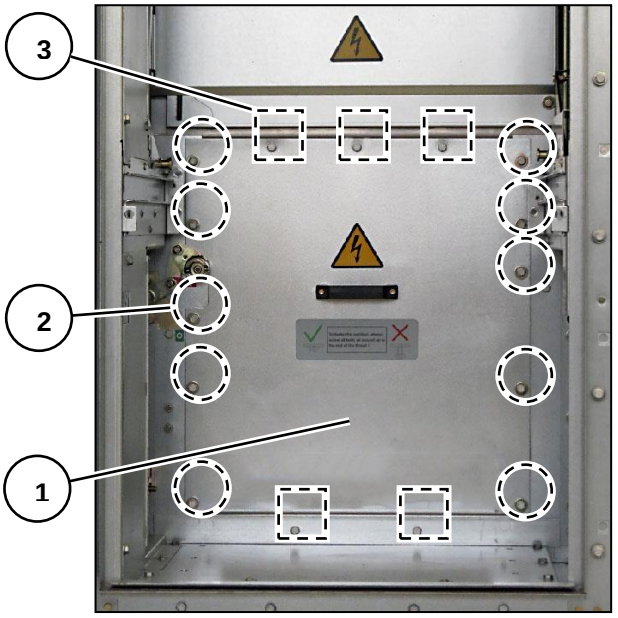


Fig. 246: All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel: 15 bolted joints on partition

Contactor panels with panel width 435 mm without the heater

⇨ Install the right part of the partition (1) between the connection compartment and the switching-device compartment.

Fix the right part of the partition (1), tighten the bolts all around hand-tight:

- 4 bolts M8x16 with contact washers (2)

⇨ Install the left part of the partition (3) between the connection compartment and the switching-device compartment.

Fix the left part of the partition (3), tighten the bolts all around hand-tight:

- 7 bolts M8x20 with contact washers (4)

⇨ Tighten the fixing bolts all around with a tightening torque of 25 Nm.

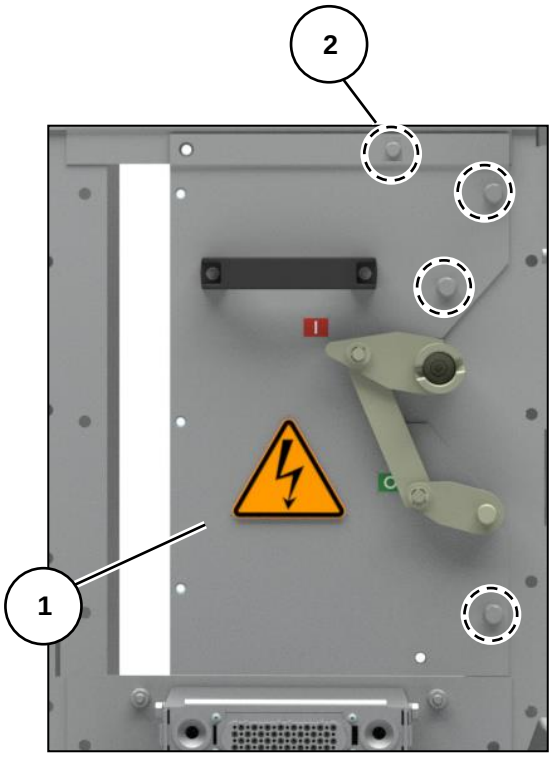


Fig. 247: Right part of partition (1)

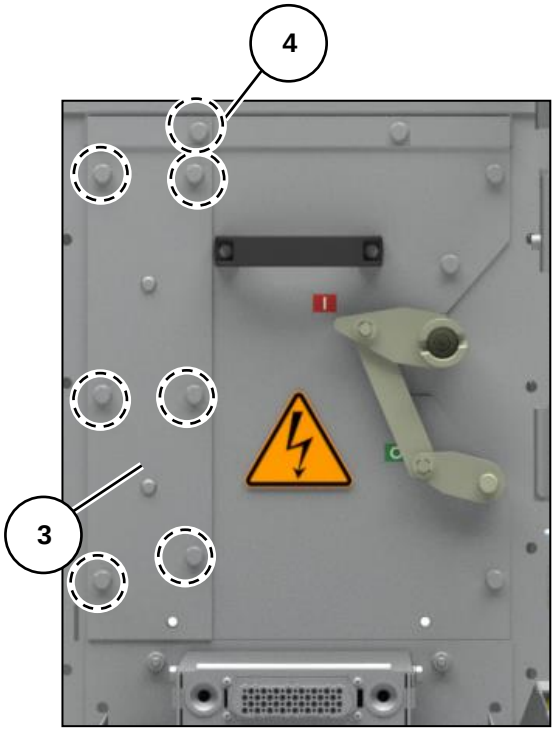


Fig. 248: Left part of partition (3)

Contactor panels with panel width 435 mm with heater (optional)

⇨ Install the right part of the partition (1) between the connection compartment and the switching-device compartment.

Fix the right part of the partition (1), tighten the bolts all around hand-tight:

- 4 bolts M8x16 with contact washers (2)

⇨ Install the left part of the partition (3) between the connection compartment and the switching-device compartment.

Fix the left part of the partition (3), tighten the bolts all around hand-tight:

- 7 bolts M8x20 with contact washers (4)

⇨ Tighten the fixing bolts all around with a tightening torque of 25 Nm.

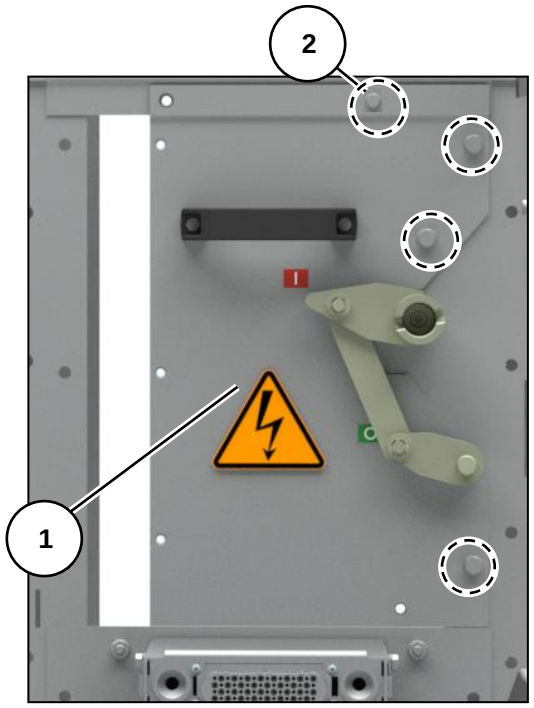


Fig. 249: Right part of partition (1)

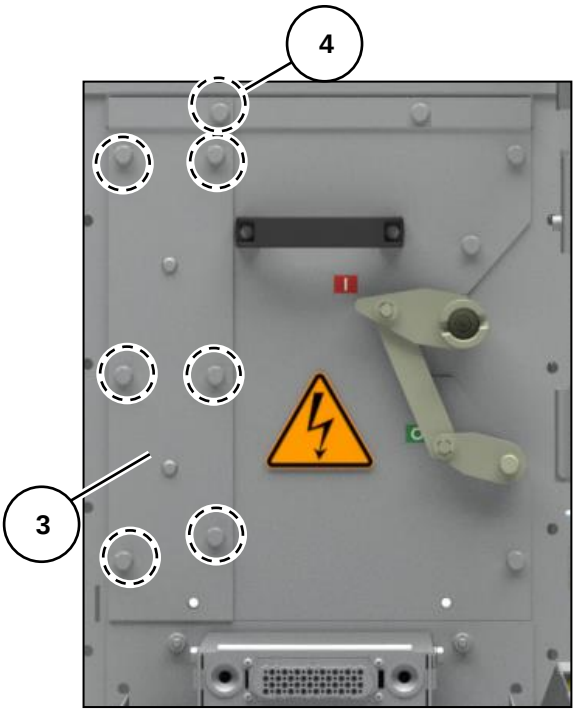


Fig. 250: Left part of partition (3)

⇨ Install the heater support (5).

Fix the heater support (5) by screwing the bolts (6) hand-tight:

- 2 bolts M8x20 with contact washers (6)

Tighten the fixing bolts all around with a tightening torque of 25 Nm.

⇨ Install the heater (7).

Fix the heater (7) by screwing the nuts (8) hand-tight:

- 2 nuts M8 with contact washers (8)

⇨ Tighten the fixing nuts (4) with a tightening torque 25 N.

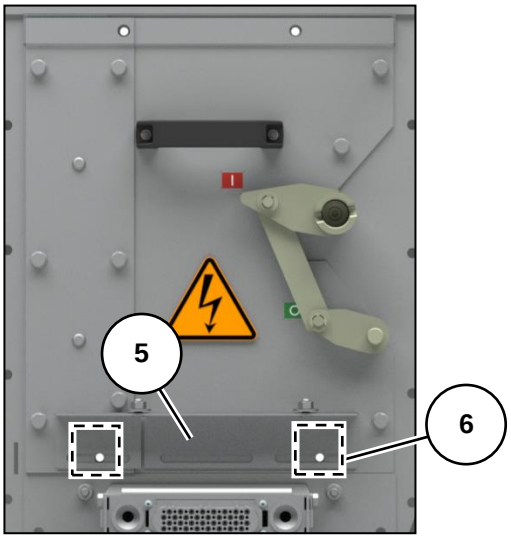


Fig. 251: 2 bolted joints on the heater support

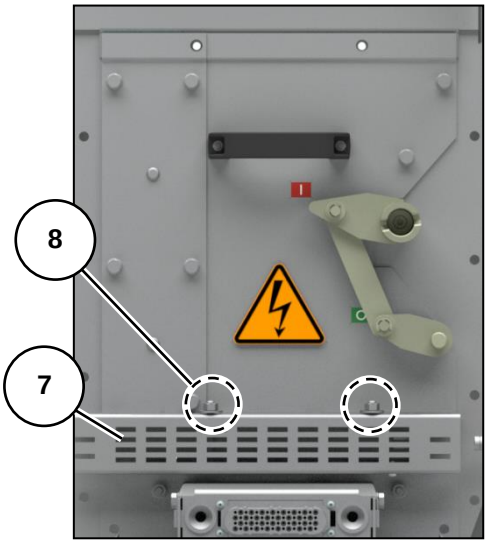


Fig. 252: 2 bolted joints on the heater

INFORMATION

Final procedure step

⇨ Do not forget to switch on the heater after the installation.

Panel versions with withdrawable circuit-breaker / circuit-breaker truck or withdrawable disconnector / disconnector truck only:

⇨ Install the protection plate of the switching-device compartment (9).

⇨ To fix the protection plate of the switching-device compartment (9), tighten the nuts (10) hand-tight.

- 4 nuts M8 with contact washers

⇨ Tighten the fixing bolts (10) with a tightening torque of 25 Nm.

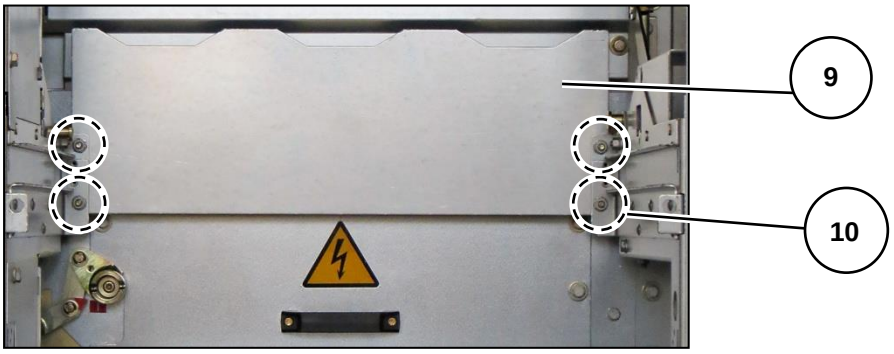


Fig. 253: 4 bolted joints on protection plate of switching-device compartment

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

11.2 Installing the vertical partition and the ventilation duct type I in the switching-device compartment

⚠ CAUTION

Sharp-edged sheets

The metal parts of the ventilation duct may have sharp edges. Sharp-edged sheets inside the switchgear can cause injuries by getting cut and damage cables.

⇨ Put on personal protective equipment (e.g. cut-resistant gloves and arm sleeves).

⇨ When working inside the switchgear, it must be observed that cables do not touch any sharp-edged sheets. Cover sharp-edged spots, if required.

⚠ CAUTION

High weight

The ventilation duct is heavy.

⇨ The ventilation duct must absolutely be lifted by 2 persons.

⇨ Put on personal protective equipment.

Closing the connection compartment / connection duct

NOTICE

Damages inside the switching-device compartment

Damages inside the switching-device compartment possible due to incorrect or incomplete installation of the partition.

⇨ To fasten the partition, always screw in all bolts all around 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:

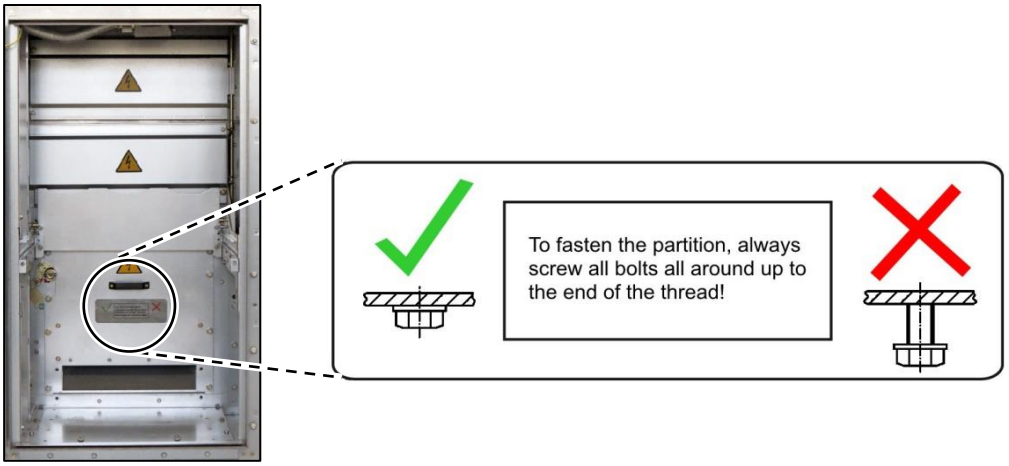


Fig. 254: Instruction label on the vertical partition

Preconditions

- Feeder earthing switch in CLOSED position
- High-voltage door open
- Low-voltage connector stowed away
- Protection plate of switching-device compartment and associated connecting elements available:
  - 4 nuts M8 with contact washers
- Vertical partition and associated connecting elements available:
  - 10 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093
  - 5 bolts M8x20 with contact washers
- Ventilation duct and associated connecting elements available:
  - 20 bolts M8

Procedure

⇨ Install the partition (1) between the connection compartment and the switching device compartment.

⇨ To fix the partition (1), tighten the bolts all around hand-tight:
- 10 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093 (2)
- 5 bolts M8x20 with contact washers (3)

⇨ Tighten the fixing bolts all around with a tightening torque of 25 Nm.

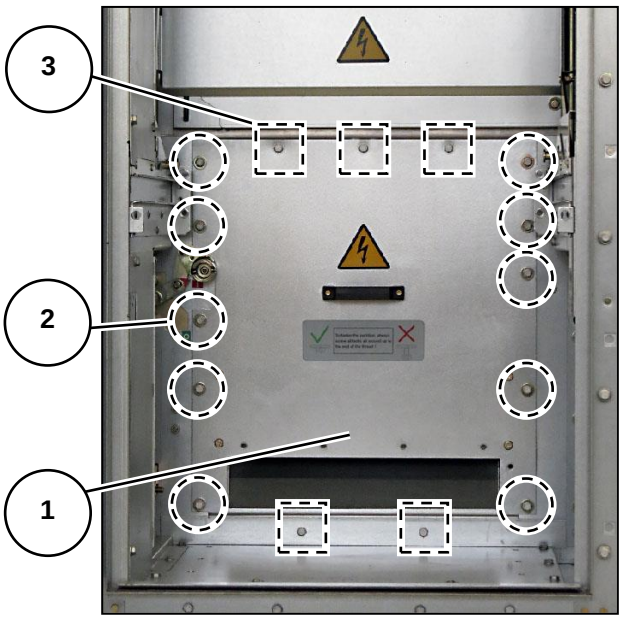


Fig. 255: 15 bolted joints on partition

⇨ Install the protection plate of the switching-device compartment (4) in the switching-device compartment.

⇨ To fix the protection plate of the switching-device compartment (4), tighten the nuts (5) hand-tight.

- 4 nuts M8 with contact washers

⇨ Tighten the fixing nuts (5) with a tightening torque of 25 Nm.

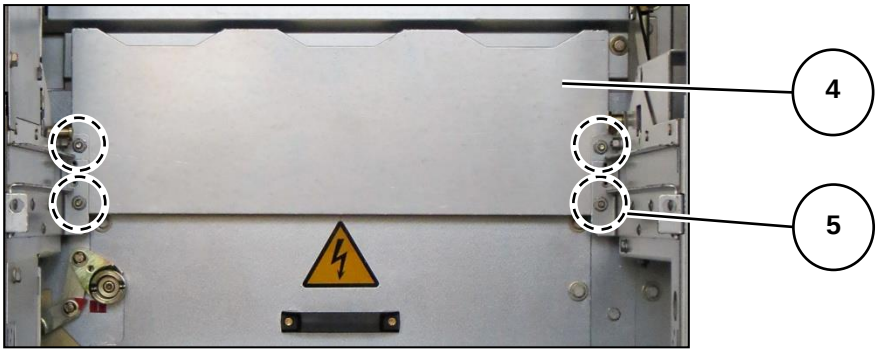


Fig. 256: 4 bolted joints on protection plate of switching-device compartment

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

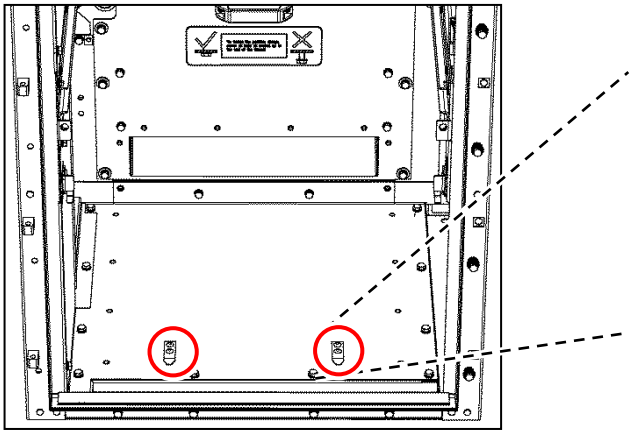


Fig. 257: 2 links on panel base

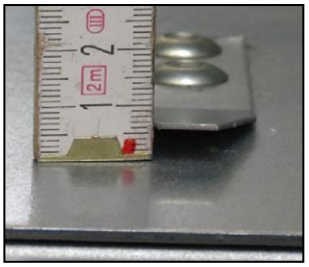
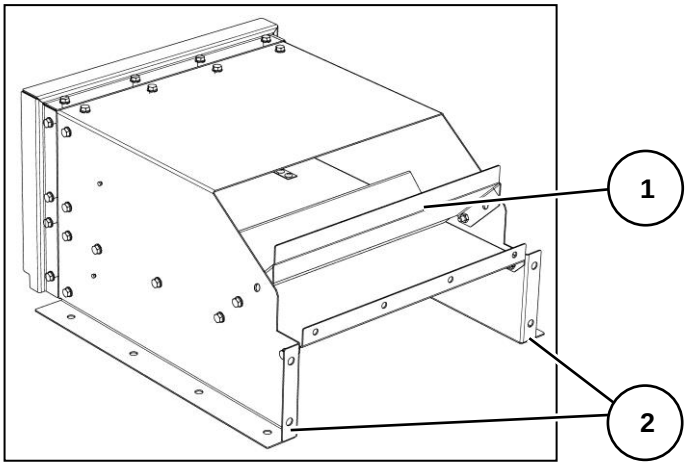


Fig. 258: Correct position of link

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



(1) Air guide folded upwards

(2) Bottom side

Fig. 259: Ventilation duct with air guide folded upwards

⇨ Set the ventilation duct down centrally on the base frame of the panel. The side of the ventilation duct to which the air guide is fixed must adjoin to the vertical partition.

Fig. 260: Set the ventilation duct down centrally on the base frame of the panel

⇨ Tighten the front bolts at the base frame hand-tight. Tighten the bolts with a tightening torque of 25 Nm.

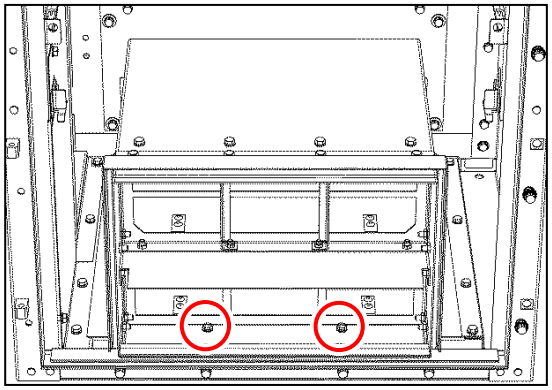


Fig. 261: 2 bolted joints on base frame at the front

⇨ Tighten the lateral bolts M8x20 at the vertical partition and the base frame hand-tight. Tighten the bolts with a tightening torque of 25 Nm. Proceed in the same way on the other side.

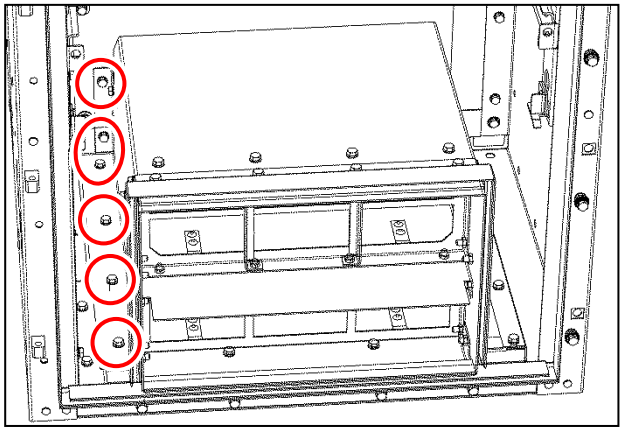


Fig. 262: 6 lateral bolted joints on partition and base frame

⇨ Tighten the upper bolts M8x20 at the vertical partition hand-tight. Tighten the bolts with a tightening torque of 25 Nm.

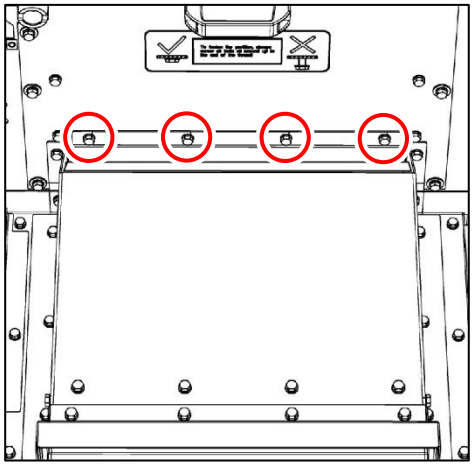


Fig. 263: 4 bolted joints on partition

⇨ Fold the air guide downwards.

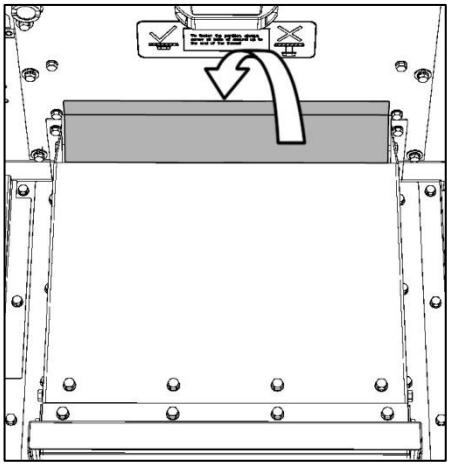


Fig. 264: Folding the air guide downwards

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

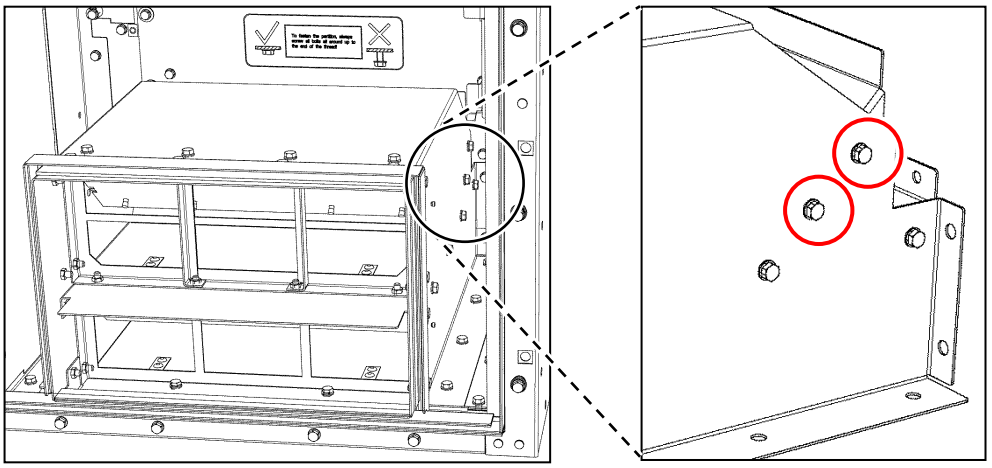


Fig. 265: Bolts for fixing the holder

✓ The vertical partition and the ventilation duct are installed.

11.3 Installing the vertical partition and the ventilation duct type II in the switching-device compartment

⚠ CAUTION

Sharp-edged sheets

The metal parts of the ventilation duct and the vertical partition may have sharp edges. Sharp-edged sheets inside the switchgear can cause injuries by getting cut and damage cables.

⇨ Put on personal protective equipment (e.g. cut-resistant gloves and arm sleeves).

⇨ When working inside the switchgear, it must be observed that cables do not touch any sharp-edged sheets. Cover sharp-edged spots, if required.

⚠ CAUTION

High weight

The ventilation duct is heavy.

⇨ The ventilation duct must absolutely be lifted by 2 persons.

⇨ Put on personal protective equipment.

NOTICE

Damages inside the switching-device compartment

Damages inside the switching-device compartment possible due to incorrect or incomplete installation of the partition.

⇨ To fasten the partition, always assemble all bolted joints of the partition all around, and screw them in up to the end of the thread.

In addition to these instructions, an instruction label on the vertical partition informs about safe fastening of the partition:

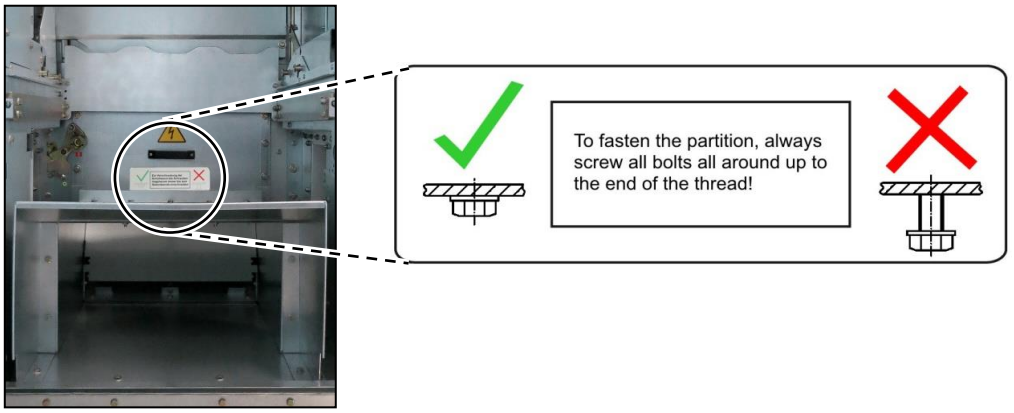


Fig. 266: Instruction label on the vertical partition

Closing the connection compartment / connection duct

Preconditions

- Feeder earthing switch in CLOSED position
- High-voltage door open
- Low-voltage connector stowed away
- Unit consisting of ventilation duct and vertical partition available. Associated connecting elements available:
  - 13 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093
  - 7 bolts M8x20 with contact washers
- Protection plate and associated bolting material available:
  - 4 nuts M8 with contact washers
- Front part of ventilation duct and associated bolting material available:
  - 8 bolts M8x20 with contact washers

Procedure

⇨ Place the unit consisting of ventilation duct (1) and vertical partition (2) centrally on the panel base frame. The vertical partition must point towards the connection compartment.

⇨ Push the unit towards the connection compartment as far as it will go.

⇨ Fix the unit by screwing the bolts hand-tight:
- 13 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093 (3)
- 7 bolts M8x20 with contact washers (4)

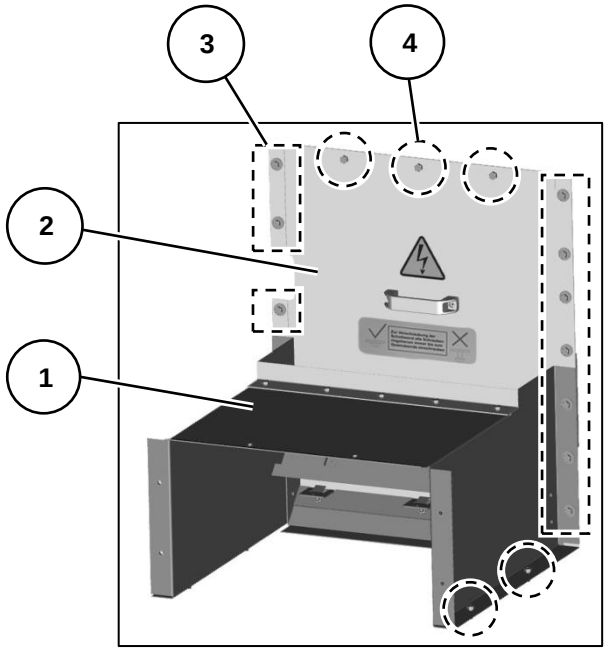


Fig. 267: Ventilation duct and partition, seen from center-right

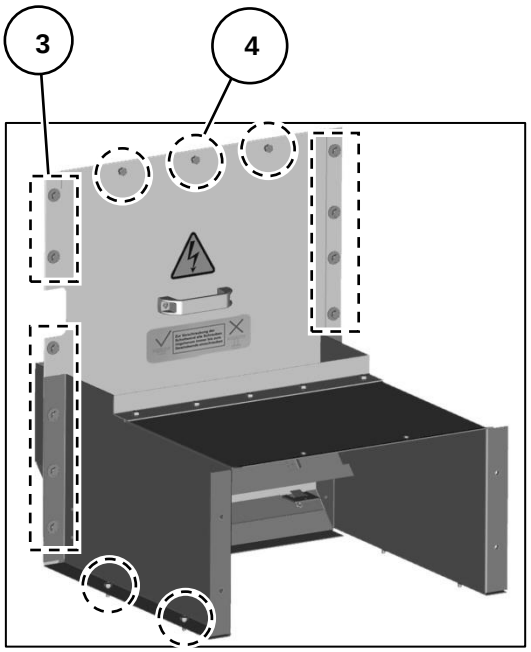


Fig. 268: Ventilation duct and partition, seen from center-left

⇨ Tighten the fixing bolts all around with a tightening torque 25 Nm.

⇨ Install the protection plate (5).

⇨ Fix the protection plate (5) by screwing the nuts (6) hand-tight.
- 4 nuts M8 with contact washers

⇨ Tighten the fixing nuts with a tightening torque 25 Nm.

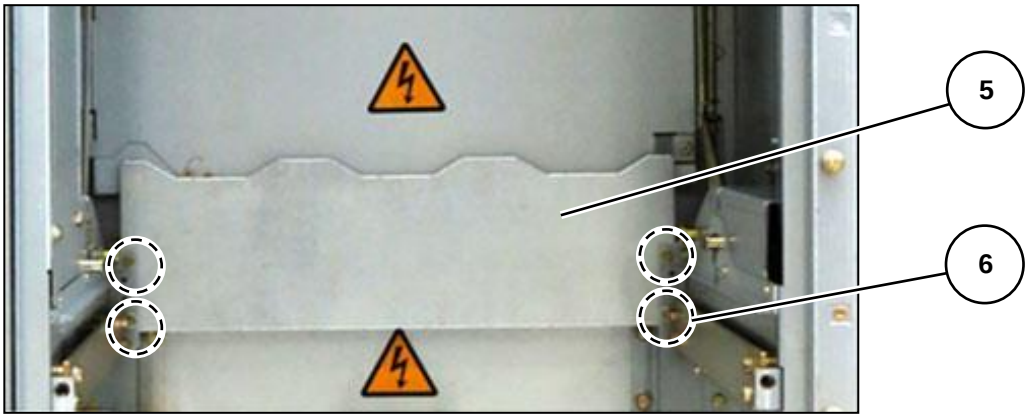


Fig. 269: 4 bolted joints of protection plate

⇨ Place the front part of the ventilation duct (7) centrally on the panel base frame.

⇨ Fix the front part by screwing the bolts hand-tight:
- 8 bolts M8x20 with contact washers

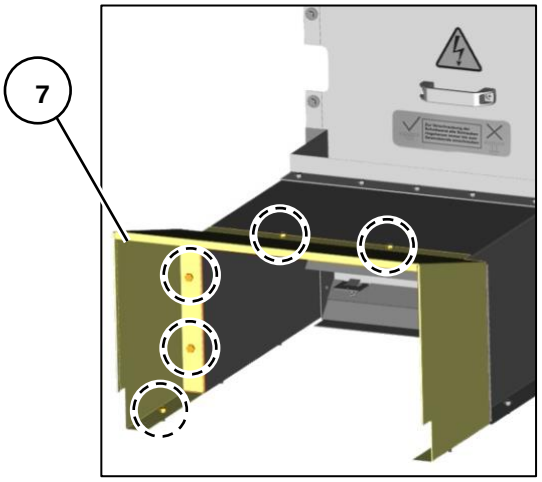


Fig. 270: Front part of ventilation duct, seen from center-right

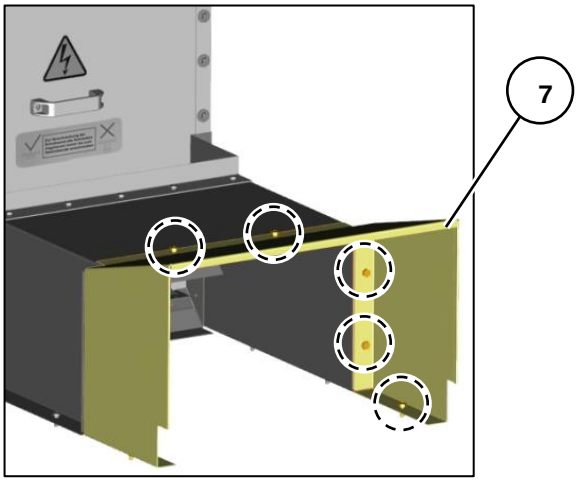


Fig. 271: Front part of ventilation duct, seen from center-left

✓ The vertical partition and the ventilation duct type II are installed.

INFORMATION

Final procedure steps

Now the panel can be integrated into the course of operation again, for example:

⇨ Inserting a withdrawable part in the panel.

⇨ Closing the high-voltage door.

⇨ De-earthing the feeder earthing switch.

⇨ Racking the withdrawable part to service position.

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

⚠ CAUTION

Sharp-edged sheets

The metal parts of the voltage transformer compartment may have sharp edges. Sharp-edged sheets inside the switchgear can cause injuries by getting cut and damage cables.

⇨ Put on personal protective equipment (e.g. cut-resistant gloves and arm sleeves).

⇨ When working inside the switchgear, it must be observed that cables do not touch any sharp-edged sheets. Cover sharp-edged spots, if required.

⚠ CAUTION

High weight

The voltage transformer compartment is heavy.

⇨ The voltage transformer compartment must absolutely be lifted by 2 persons.

⇨ Put on personal protective equipment.

NOTICE

Damages inside the switching-device compartment

Damages inside the switching-device compartment / voltage transformer compartment possible due to incorrect or incomplete installation of the partition / bushing plate.

⇨ To fasten the partition / bushing plate, always screw all bolts up to the end of the thread!

Preconditions

- Feeder earthing switch in CLOSED position
- High-voltage door open
- Door to the voltage transformer compartment opened
- In the switching-device compartment and in the voltage transformer compartment:
  - Low-voltage connector stowed away
- Bushing plate and associated connecting elements available:
  - 8 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093
  - 3 bolts M8x20 with contact washers
- Connecting cables and associated connecting elements available:
  - 3 bolts M8 with contact washers and plain washers
- Vertical partition and associated connecting elements available:
  - 8 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093
- Protection plate of switching-device compartment and associated connecting elements available:
  - 4 nuts M8 with contact washers
- Voltage transformer compartment and associated connecting elements available:
  - 14 bolts M8x20 with contact washers

- Lid of metal cover and associated connecting elements available:
  - 2 bolts M8x20 with contact washers
- Wiring duct cover and associated connecting elements available:
  - 2 bolts M8x20 with contact washers
- Labyrinth and associated connecting elements available:
  - 11 bolts M8x16 with contact washers
  - 2 nuts M8 with contact washers

Procedure

⇨ Install the bushing plate.

⇨ Fix the bushing plate by screwing the bolts hand-tight:
- 8 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093 (1)
- 3 bolts M8x20 with contact washers (2)

Tighten the bolts with a tightening torque of 25 Nm.

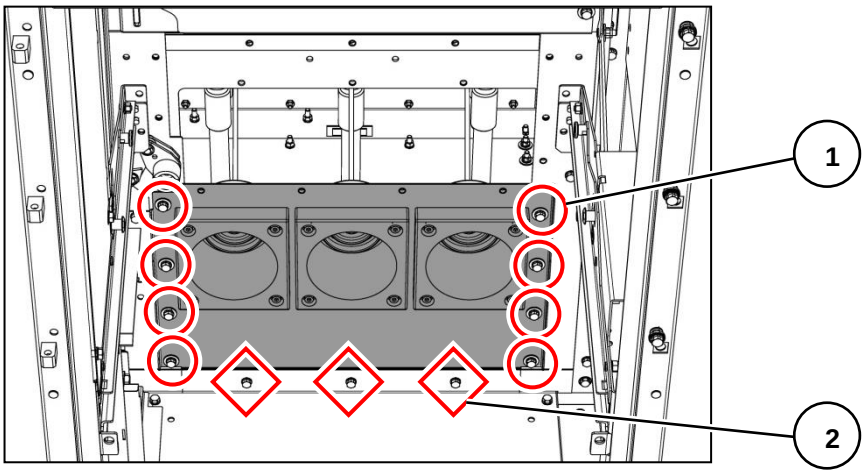


Fig. 272: 11 bolted joints on bushing plate

⇨ Connect the 3 connecting cables (4) for the removable voltage transformers with the cable connections / bar connections.

⇨ Fix the connecting leads (4). To do this, mount the connecting elements (3) and tighten hand-tight:
- 3 nuts M8 with contact washers and plain washers

Tighten the nuts with a tightening torque of 25 Nm.

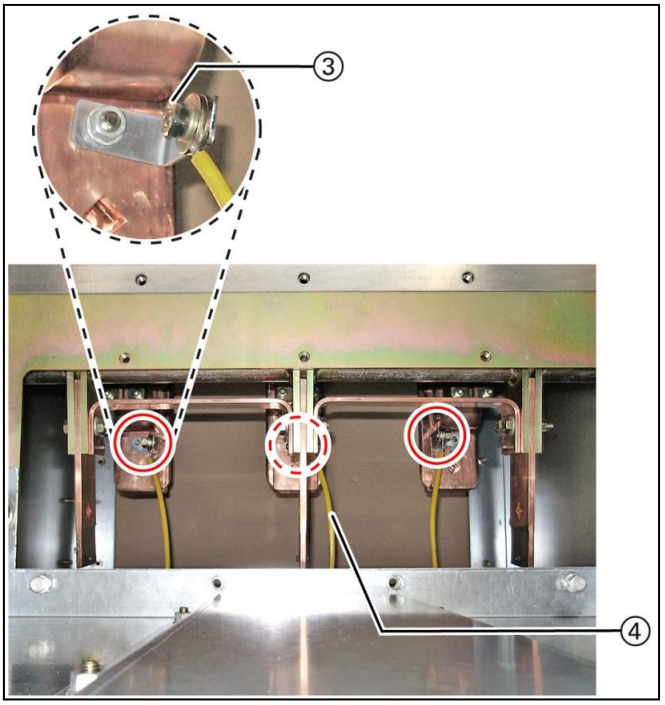


Fig. 273: 3 bolted joints at the cable connections (central joint covered)

⇨ Install the vertical partition in the connection compartment.

⇨ Fix the partition by screwing the bolts hand-tight:
- 8 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093

Tighten the bolts with a tightening torque of 25 Nm.

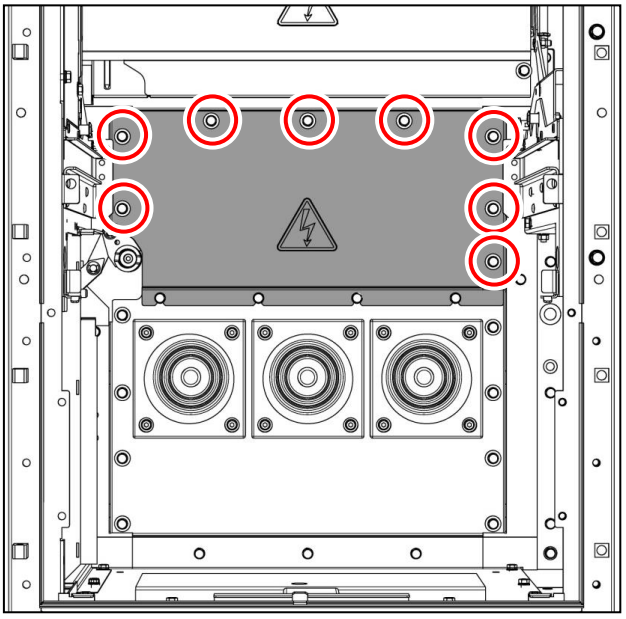


Fig. 274: 8 bolted joints on partition

⇨ Install the protection plate of the switching-device compartment.

⇨ Fix the protection plate by screwing the nuts hand-tight:
- 4 nuts M8 with contact washers

Tighten the nuts with a tightening torque of 25 Nm.

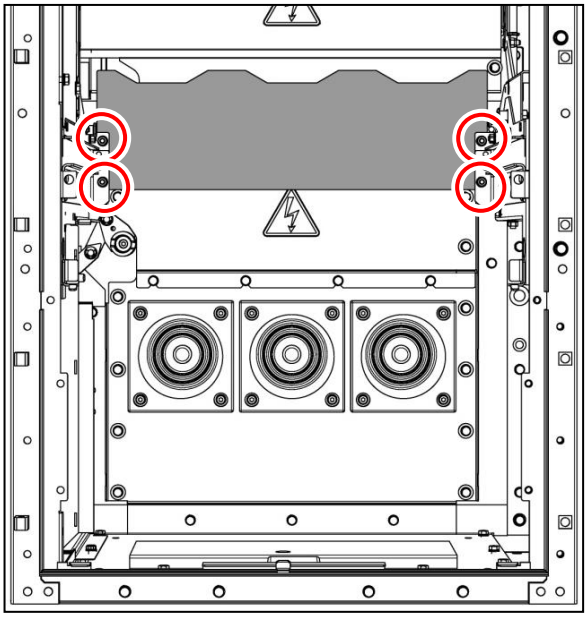
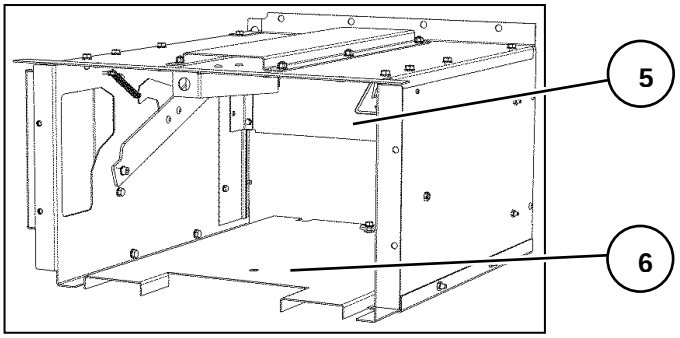


Fig. 275: 4 bolted joints on protection plate of switching-device compartment

⇨ Prepare the voltage transformer compartment for installation by laying it down centrally in front of the panel. The shutter (5) must point to the bushing plate.

⇨ To install the voltage transformer compartment, lift it approx. 2 cm. Push the voltage transformer compartment into the panel and set it down on the base frame.



(5) Shutter

(6) Bottom side

Fig. 276: Voltage transformer compartment

⇨ Fix the voltage transformer compartment by screwing the bolts hand-tight:

- 10 bolts M8x20 with contact washers

Tighten the bolts with a tightening torque of 25 Nm.

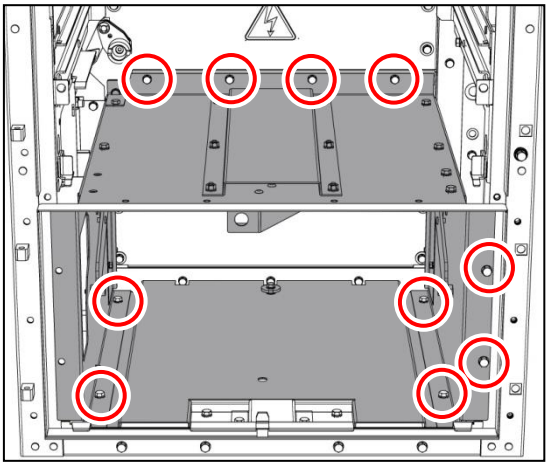


Fig. 277: 10 bolted joints at voltage transformer compartment

Put the metal cover in upright position. To link the voltage transformer compartment and the metal cover together, tighten the bolts hand-tight:

⇨
- 4 bolts M8x20 with contact washers

Tighten the bolts with a tightening torque of 25 Nm.

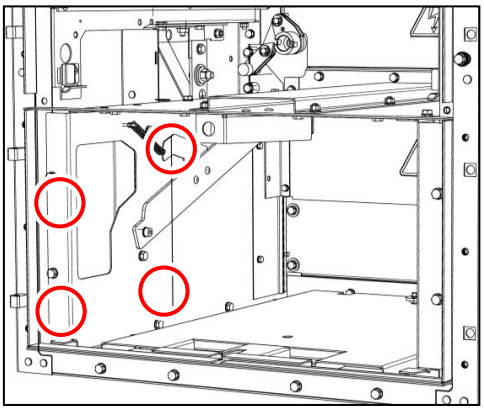


Fig. 278: 4 bolted joints on metal cover in voltage transformer compartment

Install the lid (7) of the metal cover. Fix it by screwing the bolts hand-tight:

⇨
- 2 bolts M8x20 with contact washers

Tighten the bolts with a tightening torque of 25 Nm.

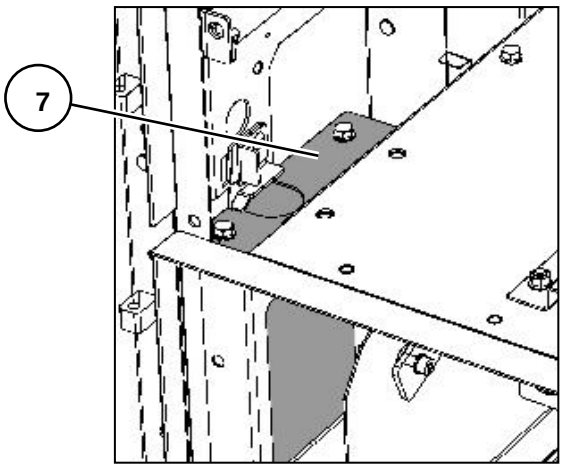


Fig. 279: Lid of metal cover

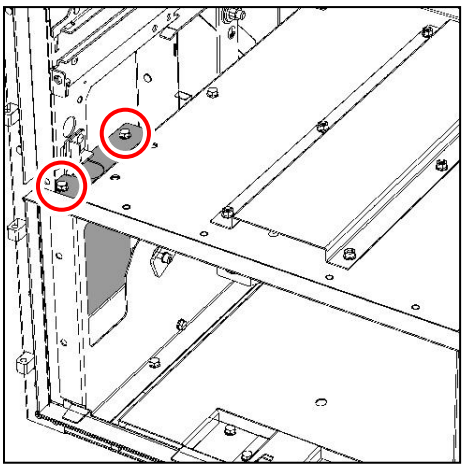


Fig. 280: 2 bolted joints on metal cover in switching-device compartment

⇨ Install the wiring duct cover.

⇨ Fix the wiring duct cover by screwing the bolts hand-tight:
- 2 bolts M8x20 with contact washers

Tighten the bolts with a tightening torque of 25 Nm.

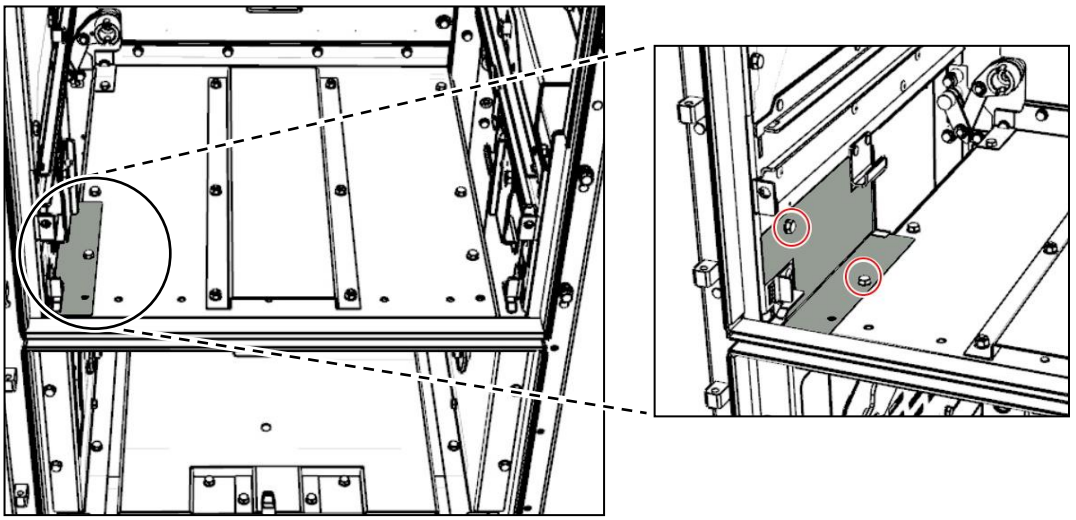


Fig. 281: 2 bolted joints on wiring duct cover

⇨ Install the labyrinth.

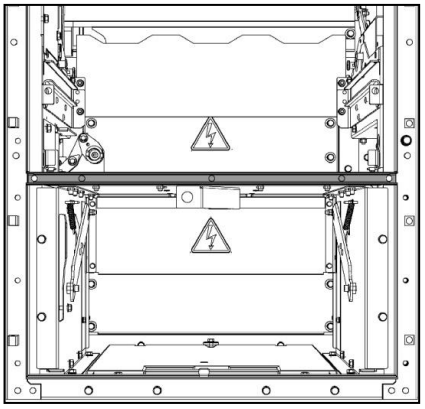


Fig. 282: Labyrinth installed, front

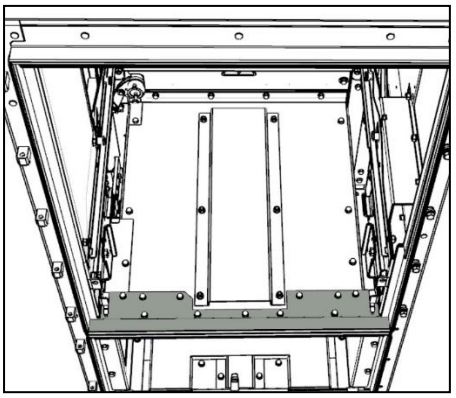


Fig. 283: Labyrinth installed, top side

⇨ Fix the labyrinth by screwing the outermost nuts hand-tight:

- 2 nuts M8 with contact washers

Tighten the nuts with a tightening torque of 25 Nm.

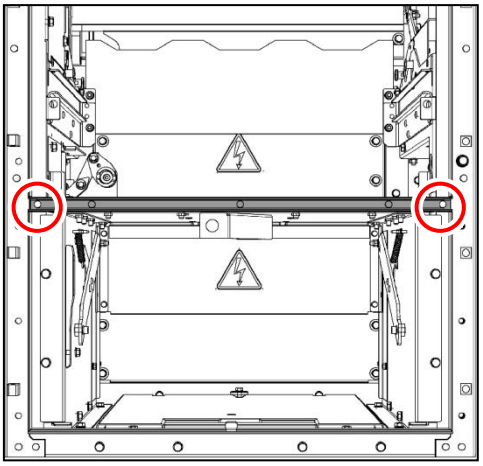


Fig. 284: 2 bolted joints at the labyrinth, front

⇨ Tighten the fixing bolts at the top side of the labyrinth hand-tight:

- 11 bolts M8x16 with contact washers

Tighten the bolts with a tightening torque of 25 Nm.

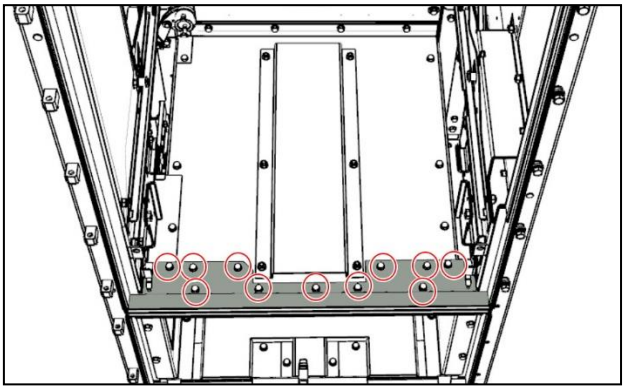


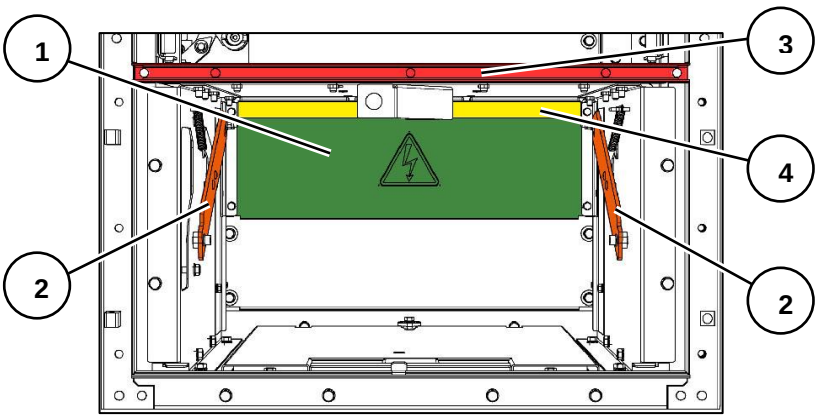
Fig. 285: 11 bolted joints at the labyrinth, top side

Perform final checks regarding the correct state and position of the shutter (1) and the levers (2) for moving the shutter. If any of these checks fails, do **not** insert any removable voltage transformers in the voltage transformer compartment, but inform the regional Siemens representative.

⇨ Check against the labyrinth (3) if the shutter (1) is horizontally arranged.

⇨ Check if the top edge of the shutter is flush with the shutter frame (4).

⇨ Check if the levers (2) are in perfectly straight condition.



(1) Shutter

(2) Lever

(3) Labyrinth

(4) Shutter frame

Fig. 286: Checking state and position of shutter and levers

⇨ Install the removable voltage transformers in the panel.

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

11.5 Installing the rear wall on the connection compartment

Preconditions

- Rear wall available
- Corresponding number of sealing brackets, ledges and associated connecting elements available:
  - All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel:
    - 2 sealing brackets
    - 1 horizontal ledge and associated 9 bolts size M8x25 plus plain washers size 9 acc. to ISO 7093
    - 2 vertical ledges and a total of associated 28 bolts size M8x20
    - 4 bolts size M8x20 to fix the rear wall at the panel bottom
  - Contactor panels with panel width 435 mm only:
    - 2 sealing brackets
    - 2 vertical ledges and a total of associated 28 bolts size M8x20
    - 3 bolts size M8x20 to fix the rear wall

Closing the connection compartment / connection duct

Procedure

Installation of the rear wall is described hereafter by the example of a 3-panel arrangement.

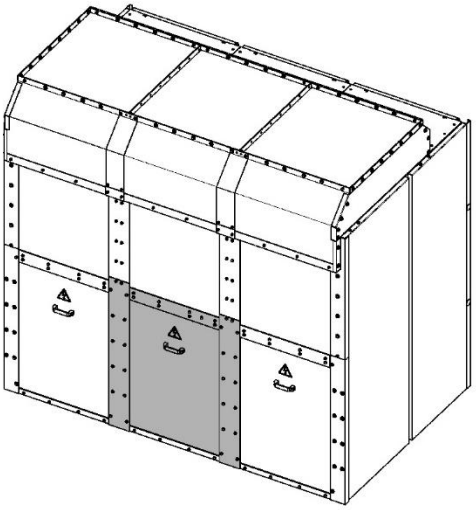


Fig. 287: All panel versions except for contactor panels with panel width 435 mm:
Rear wall, 3-panel arrangement

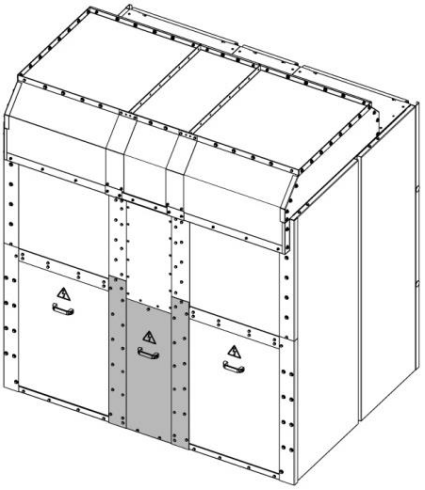


Fig. 288: Contactor panels with panel width 435 mm only:
Rear wall,
3-panel arrangement

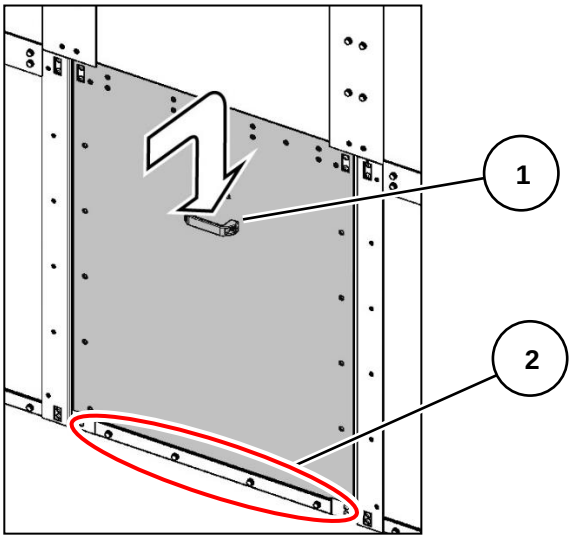
All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel:

⇨ At the rear side of the panel, insert the rear wall (1) by the handle, and push it down.

⇨ Fix the rear wall by screwing the bolts at the bottom hand-tight:

- 4 bolts M8x20 with contact washers (2)

⇨ Tighten the bolts with a tightening torque of 25 Nm.



(1) Rear wall with handle

(2) Bolts to screw

Fig. 289: All panel versions except for contactor panels with panel width 435 mm and switch-disconnector panel: Installing and fixing the rear wall

⇨ Insert the 2 sealing brackets (3) into the vertical gaps between the panels.

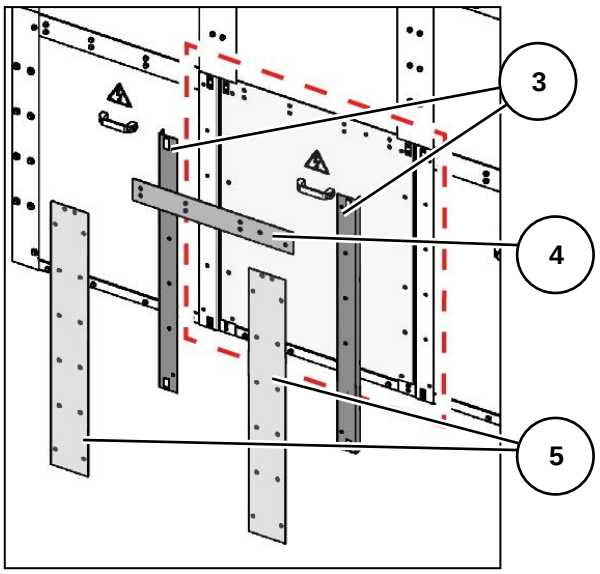
⇨ Install the horizontal ledge (4). For fixing, tighten the bolts hand-tight:
- 9 bolts M8x25 with contact washers and plain washers size 8 acc. to ISO 7093

⇨ Tighten the bolts with a tightening torque of 25 Nm.

⇨ Install one of the vertical ledges (5). For fixing, tighten the bolts hand-tight:
- 14 bolts M8x20 with contact washers

⇨ Tighten the bolts with a tightening torque of 25 Nm.

⇨ Proceed in the same way with the other vertical ledge.



(3) Sealing brackets

(4) Horizontal ledge

(5) Vertical ledges

Fig. 290: All panel versions except for contactor panels with panel width 435 mm: Installing the sealing brackets and ledges

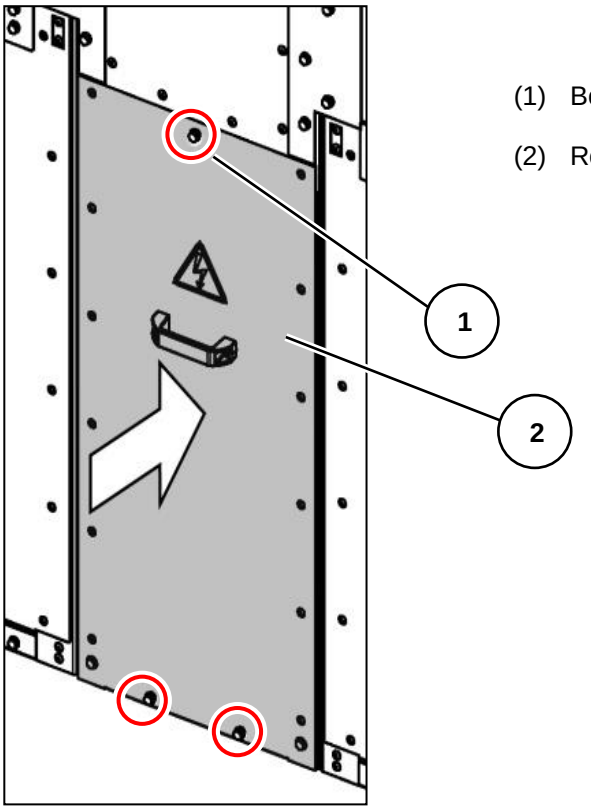
✓ The rear wall is installed on the connection compartment.

Contactor panels with panel width 435 mm only:

⇨ At the rear side of the panel, insert the rear wall (2) by the handle.

⇨ Fix the rear wall by screwing the bolts hand-tight:
- 4 bolts M8x20 (1)

⇨ Tighten the bolts with a tightening torque of 25 Nm.



(1) Bolts to screw

(2) Rear wall with handle

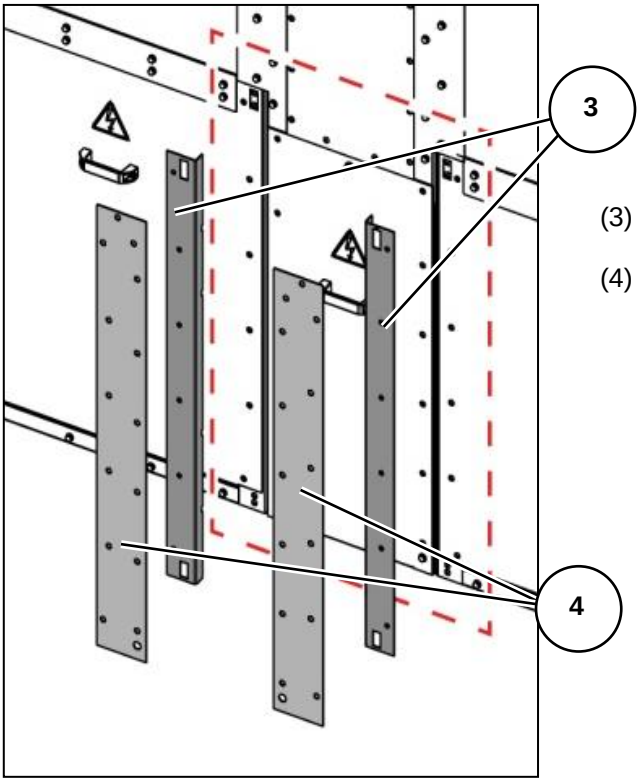
Fig. 291: Contactor panels with panel width 435 mm only:
Installing and fixing the rear wall

⇨ Insert the 2 sealing brackets (3) into the vertical gaps between the panels.

⇨ Install one of the vertical ledges (4). For fixing, tighten the bolts hand-tight:
- 15 bolts M8x20 with contact washers

⇨ Tighten the bolts with a tightening torque of 25 Nm.

⇨ Proceed in the same way with the other vertical ledge.



(3) Sealing brackets

(4) Vertical ledges

Fig. 292: Contactor panels with panel width 435 mm only:
Installing the sealing brackets and ledges

✓ The rear wall is installed on the connection compartment.

11.6 Installing the rear walls on the connection duct

Preconditions

- Upper and lower rear wall available
- Corresponding number of sealing brackets, ledges and associated connecting elements available:
  - 1 horizontal ledge
  - 4 vertical ledges
  - Bolts size M8x20 and plain washers size 8 acc. to ISO 7093

Procedure

⇨ At the rear side of the panel, insert the lower rear wall (4) by the handle, and push it down.

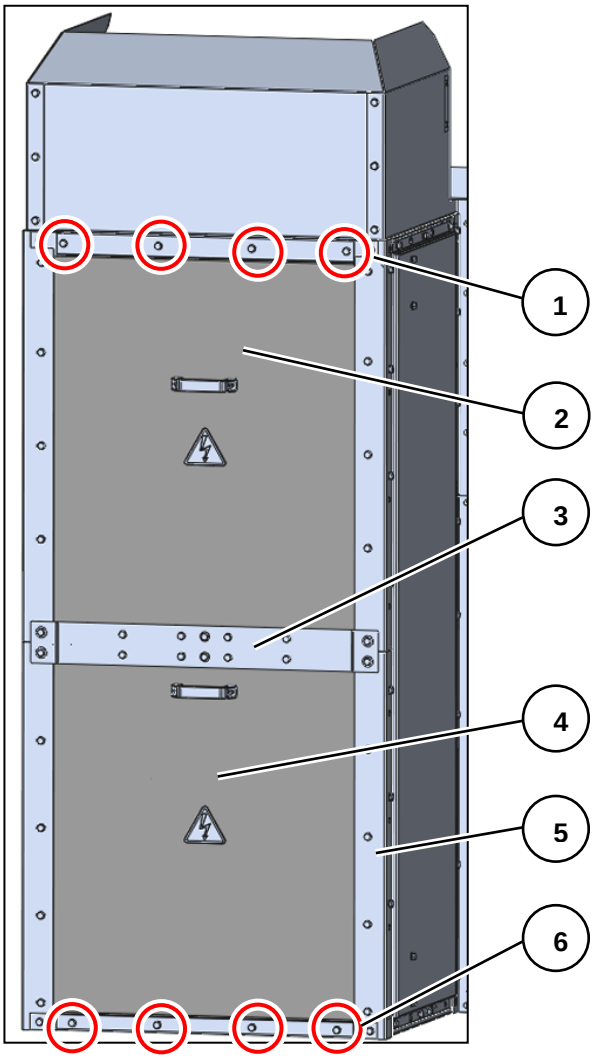
⇨ Fix the rear wall by screwing the bolts at the bottom hand-tight:
- 4 / 6 bolts M8x20 with contact washers (6)

⇨ Insert the upper rear wall (2) on the rear side of the panel and push it up using the handle.

⇨ Fix the rear wall by screwing the bolts in the upper area hand-tight:
- 4 / 5 bolts M8x20 with contact washers (1)

⇨ Install one of the 4 vertical ledges (5). Fix it by screwing the bolts hand-tight:
- 9 / 19 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093

⇨ Proceed in the same way with the other vertical ledges.



(1) Bolted joints for upper rear wall
(2) Upper rear wall with handle
(3) Horizontal ledge
(4) Lower rear wall with handle
(5) Vertical ledges
(6) Bolted joints for lower rear wall

Fig. 293: Rear ledges and rear walls on connection duct

⇨ Install the horizontal ledge (3). Fix it by screwing the bolts hand-tight:
- 12 / 14 bolts M8x20 with contact washers; use washers size 8 acc. to ISO 7093 with the bolt fixing in the area of the vertical ledges

⇨ Tighten all bolts with a tightening torque of 25 Nm.

✓ The rear walls are installed on the connection duct.

12 Final assembly work

INFORMATION

Read and understand these instructions before attempting final assembly works.

12.1 Cleaning the switchgear

NOTICE

Foreign objects

Possible malfunctioning and switchgear damage caused by foreign objects.

⇨ Check whether the **non**-fastened compartments of the switchgear still contain foreign objects, and remove them if required:
- Switching-device compartment
- Low-voltage compartment

⇨ If it cannot be determined **without any doubt** that the bolted busbar compartment, pressure relief duct and connection compartment do not contain any foreign objects, make these compartments accessible and check as well:
- Busbar compartment
- Pressure relief duct
- Connection compartment

NOTICE

Greased parts and surfaces

⇨ 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

Cleaning

⇨ Use vacuum cleaners and dry, lint-free cloths.

Procedure

Remove foreign objects, for example:

- Tools
- Unused installation material and cable sections
- Cleaning material

⇨ Remove loose installation residues and dust with the vacuum cleaner.

⇨ Clean surfaces with a soft, dry and lint-free cloth.

⇨ If required, clean with a humid cloth and soft household cleaner; then dry well.

12.2 Tightening torques and control tightening torques for bolted joints

Tightening torques

Bolted joint	Tightening torque
M8	30 Nm
M12	70 Nm
M16	110 Nm

Control tightening torques

Bolted joint	Tightening torque
M8	25 Nm
M12	60 Nm
M16	90 Nm

Tightening torques for other than the mentioned bolted joints are stated separately in the respective assembly operation.

INFORMATION

Check the control tightening torques of those bolted joints at random, which are located at the freely accessible points of the switchgear. They also include those inside non-bolted compartments:

- Switching-device compartment
- Low-voltage compartment

⇨ If it cannot be determined **without any doubt** that the not freely accessible bolted joints are properly mounted, make them accessible and check as well:

- At covered points of the external enclosure
- In the busbar compartment
- In the pressure relief duct
- In the connection compartment

The check of the bolted joints comprises:

⇨ Check of the tightening torque with a torque wrench.

⇨ If required, correction of the tightening torque according to the above specifications.

12.3 In panels without ventilation duct: Check the floor fixing in the switching-device compartment

Bolted floor fixing:

⇨ Check the bolted joint of the floor fixing in the switching-device compartment at random with the torque wrench.

Welded floor fixing:

⇨ Check the corrosion protection of the floor fixing in the switching-device compartment at random.

12.4 Checking the panel connection links

⇨ At the front of all panels, check the installation of the panel connection link between the switching-device compartments.

12.5 Checking the installation of the wiring duct covers

⇨ Check the installation of the wiring duct covers on the left inside of the panel (only for contactor panels with panel width 435 mm on the right inside).

12.6 Checking control cable connections

Check the following screw-type connections of control cables:

⇨ Perform random checks of the control cable connections on devices and terminal blocks.

⇨ Check all control cable connections of current transformer terminals in the low-voltage compartment (including slides and jumpers).

⇨ If there are any terminal blocks without labels, complete labels using the information given in the circuit diagrams.

12.7 Checking the vertical partition between the switching-device compartment and the connection compartment

⇨ Check **all** bolted joints all around with the torque wrench.

12.8 Checking the rear wall at the connection compartment

⇨ Check all bolted joints at the ledges of the rear wall with the torque wrench.

12.9 Checking the bushings

⚠ CAUTION

Sharp edges

Mechanical parts may have sharp edges.

⇨ Do not reach into the right-hand and left-hand shutter mechanism in the switching-device compartment.

⇨ Do not reach into the shutters in front of the bushings.

⇨ Do not operate the shutters in front of the bushings manually.

⇨ Do only open and close the shutters with the corresponding shutter levers, see Operating Instructions with order number 110-0134.9.

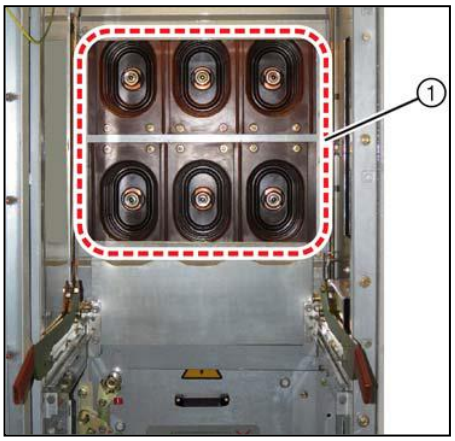


Fig. 294: Bushings in switching-device compartment

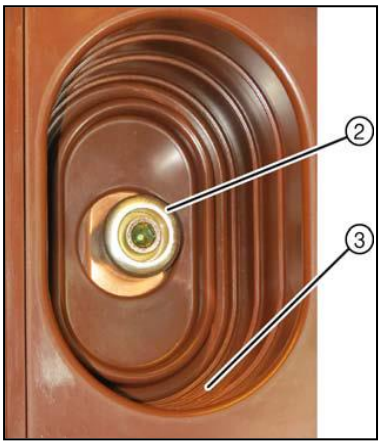


Fig. 295: Detail of bushing

⇨ To access the 6 bushings in the switching-device compartment (1), open the shutter to the connection compartment and the shutter to the busbar compartment, see Operating Instructions with order number 110-0134.9.

⇨ Check the grease film on the silver-plated surface (2) of the fixed contacts in the 6 bushings. The grease film must be uniformly thin, and applied all around.

- If required, clean the silver-plated surface (2) with a soft, lint-free cloth, and grease: Apply a uniformly thin film of Longterm 2 plus all around.

⇨ The surface of the bushing tulips (3) must be clean, dry and non-greasy.

- If required, clean with a soft, lint-free cloth.
- Check all 6 bushings, and clean if required.
- Close the shutter to the connection compartment and the shutter to the busbar compartment, see Operating Instructions with order number 110-0134.9.

⇨ Clean the switching-device compartment.

✓ The 6 bushings in the switching-device compartment are ready for service.

12.10 Checking the withdrawable part on the service truck / checking the switching-device truck

⇨ Remove foreign objects.

⇨ For cleaning the circuit-breaker, see separate operating instructions for circuit-breaker 3AE.

12.11 Checking the service truck

⇨ Remove foreign objects.

⇨ Clean the service truck.

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

⇨ Touch up scratches and impact marks on surface painting with paint according to RAL 7035.

12.13 High-voltage door with ventilation flap

NOTICE

Damage in the switching-device compartment

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

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

Reading the position indicator

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

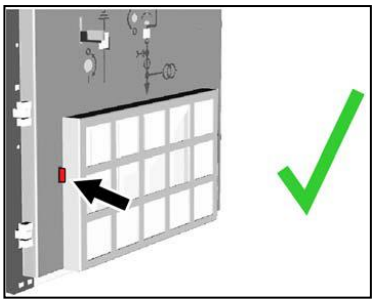


Fig. 296: Ventilation flap in operational position, positive indication

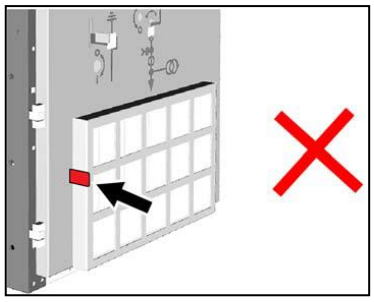


Fig. 297: Ventilation flap **not** in operational position, negative indication

⇨ If the position indicator shows that the ventilation flap in the high-voltage door is not in operational position:
Bring the ventilation flap into operational position as described in the Operating Instructions with order number 110-0134.9.

12.14 Checking assembly work

INFORMATION

⇨ Check all assembly work executed in the freely accessible areas of the switchgear. This also includes areas inside non-bolted compartments:

- Switching-device compartment
- Low-voltage compartment

⇨ If it cannot be determined **without any doubt** that the assembly work in the not freely accessible areas has been executed properly, make these areas accessible and check as well:

- At covered points of the external enclosure
- In the busbar compartment
- In the pressure relief duct
- In the connection compartment

12.15 Correcting circuit diagrams

⇨ Note any modifications in the supplied circuit documentation, which may have been made during installation or commissioning, in the associated documents.

⇨ Send the corrected documentation to the regional Siemens representative, so that the modifications can be included.

12.16 Installation report

After erecting the switchgear, fill in the Installation Report according to chapter 17 and send it to the address given in the Installation Report.

13 Installation of withdrawable parts / switching-device trucks

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

13.1 Solenoid interlocks (optional) in the operating mechanism for withdrawable parts / switching-device trucks

The operating mechanisms for withdrawable parts /switching-device trucks of circuit-breakers, disconnecting and contactor panels can be equipped with solenoid interlocks according to the customers' requirements. In as-delivered condition, these solenoid interlocks are bypassed by means of locking bolts, as the solenoid interlock would block the disconnector and earthing switch functions if there was no auxiliary voltage available.

13.2 Removing the locking bolts

After completion of the installation work and availability of auxiliary voltage in the switchgear, the locking bolts must be taken out of the operating mechanisms for the withdrawable parts / switching-device trucks and be disposed of.

Preconditions

- Auxiliary voltage in the switchgear is available
- Withdrawable part / switching-device truck in test position
- Low-voltage connector plugged in
- High-voltage door open

⇨ Remove 1 or 2 locking bolts of the solenoid interlock at the withdrawable part / switching-device truck of the circuit-breaker panel or the disconnecting panel.

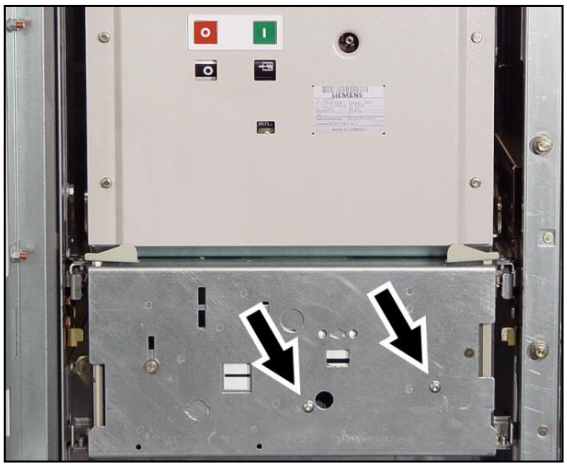


Fig. 298: Front view of withdrawable circuit-breaker

⇨ Remove 1 locking bolt of the solenoid interlock at the switching-device truck of the contactor panel with panel width 435 mm

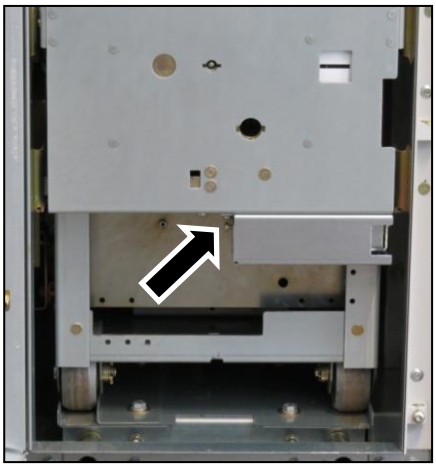


Fig. 299: Front view of contactor truck

✓ The solenoid interlocks in the operating mechanism for withdrawable parts / switching-device trucks are now ready for operation.

14 Commissioning procedure

INFORMATION

Read and understand these instructions before executing the commissioning procedure.

14.1 Safety instructions

DANGER

Electric shock

Touching live parts causes electric shock

- ⇨ Do not touch live components.
- ⇨ Ensure that the panels are only operated by qualified personnel who are familiar with the Operating Instructions and observe the safety instructions.

WARNING

Risk of crushing

During operation of electrical equipment and switchgear panels, mechanical components may move quickly, even remotely controlled.

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

14.2 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-systems-solutions/downloads/Pages/Overview.aspx

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

14.3 Drying dampness

If the panels become damp by condensation or high humidity, e.g. prevailing during erection, they must be dried. Use several electrical heaters of 1000 to 2000 W each. Alternatively, the anti-condensation heater must be switched on if such is part of the switchgear.
The warm air has to flow through all compartments of the switchgear until the panels are completely dry. Take the withdrawable part / switching-device truck out of the panel to support the air flow.

14.4 Instructing the operating personnel

⇨ Give the Operating Instructions with order number 110-0134.9 to the operating personnel in good time.

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

⇨ Make sure that the operating personnel are familiar with all operational details when the commissioning procedure takes place.

14.5 Checking the accessories

Provide the following accessories to have them ready to hand:

- Operating instructions
- Racking crank for moving the withdrawable part / switching-device truck
- Operating levers for the earthing switches
- Slip-on lever for the shutters (optional)
- Hand crank for the spring energy store
- Racking tool for the removable voltage transformers (optional)
- Double-bit keys
- Circuit diagrams
- Warning signs
- Voltage tester or voltage detecting system

14.6 Checking the interlocks mechanically

NOTICE

Detection of an error

⇨ Do **not** put the switchgear into operation.

⇨ Inform the regional Siemens representative.

⇨ Check each panel to establish whether the withdrawable part / switching-device truck can only be racked to service position when the circuit-breaker and the earthing switch are in OPEN position and the high-voltage door is closed.

⇨ Check all circuit-breaker panels to establish whether the circuit-breakers can only be operated when the respective withdrawable parts / switching-device trucks are in interlocked end position (test or service position).

⇨ Check all switch-disconnector panels to establish whether the switch-disconnector fuse combination can only be operated when the feeder earthing switch is in OPEN position.

⇨ Check all earthing switches to establish whether the earthing switches can only be operated when the respective withdrawable parts / switching-device trucks are in test position.

⇨ Check all earthing switches to establish whether the earthing switches can only be operated when the switch-disconnector fuse combination is in OPEN position in the switch-disconnector panel.

⇨ Check whether the high-voltage doors can only be opened when the associated withdrawable parts / switching-device trucks are in interlocked test position.

⇨ Check whether the high-voltage doors can only be opened when the switch-disconnector fuse combination is in OPEN position in the switch-disconnector panel.

14.7 Test operation

By means of test operations, correct operation of the panels is verified before commissioning without being endangered by operational high voltage.

⚠ DANGER

Electric shock

Touching live parts causes electric shock

⇨ Do **not** switch on operational high-voltage during test operation!

Preparing test operation

⚠ CAUTION

Motor noise

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

⇨ Expect motor noise and low vibration.

⇨ Switch the auxiliary voltage on.

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

Malfunction during test operation

NOTICE
Detection of an error ⇨ Do **not** put the switchgear into operation. ⇨ Inform the regional Siemens representative.

Checking the switching process and the position indicators

⇨ Rack each withdrawable part / switching-device truck from test position to service position and back five times. At the same time, check whether the associated positions of the withdrawable part / switching-device truck are displayed correctly at the panel and, if applicable, in the control room.

⇨ Switch each earthing switch from the OPEN to the CLOSED position and back five times, see Operating Instructions with order number 110-0134.9. At the same time, check whether these switch positions are correctly indicated on the panel and in the control room, if applicable.

⇨ Close and open each circuit-breaker five times locally and from remote for test, see Operating Instructions with order number 110-0134.9. At the same time, check whether the switch positions are correctly indicated on the panel and in the control room, if applicable, and whether the auxiliary switches and position switches operate correctly.

⇨ Close and open each switch-disconnector fuse combination five times for test, see Operating Instructions with order number 110-0134.9. At the same time, check whether the switch positions are correctly indicated on the panel and in the control room, if applicable, and whether the auxiliary switches and position switches operate correctly.

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

14.8 Switching on operational high voltage

Preparations before switching on

Preconditions

- The operating personnel was trained
- The assembly work was successfully checked
- The test operation was successfully carried out without malfunctions

Procedure

⇨ Close all high-voltage doors of the panels.

⇨ Open all circuit-breakers, see Operating Instructions with order number 110-0134.9.

⇨ Rack all withdrawable parts / switching-device trucks to test position, see Operating Instructions with order number 110-0134.9.

⇨ If there is a panel without connected cables in the connection compartment, the earthing switch in the connection compartment must be switched to CLOSED position; to do this, see Operating Instructions with order number 110-0134.9.

⇨ Check whether all consumers connected to all outgoing feeders are switched off. If necessary, switch off any energized consumers.

✓ Operational high voltage can now be switched on, and the panels can be put into operation.

Applying operational high voltage to the busbar

DANGER

Electric shock

During operation of the panels, parts of those are under life-endangering electrical voltage. Only completely assembled and tested panels can be connected to operational high voltage.

Before switching on operational high voltage:

⇨ The installation has been completely checked as described in these instructions.

⇨ Test operation was carried out without malfunctions

⇨ Energize the incoming feeder in the respective opposite substation.

⇨ Connect the incoming feeder to the busbar. To do this, rack the withdrawable part / switching-device truck to service position and close the circuit-breaker, see Operating Instructions with order number 110-0134.9.

✓ The busbar of the panels is now connected to operational high voltage.

Energizing further incoming feeders

NOTICE

Phase sequence

Short-circuit on the busbar in case of different phase sequence of the incoming feeders.

⇨ Verify that all incoming feeders have the same phase sequence.

⇨ Verify phase coincidence of the respective incoming feeder and the busbar.

⇨ Energize tested incoming feeder.

Energizing consumer feeders

After having energized all incoming feeders:

⇨ Switch on all feeders with connected consumers successively.

✓ **Now all feeders are energized.**
Thus, the switchgear is completely in operation.

15 Customer support

15.1 Service

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

15.2 Repairs

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

15.3 Before you call

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

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

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

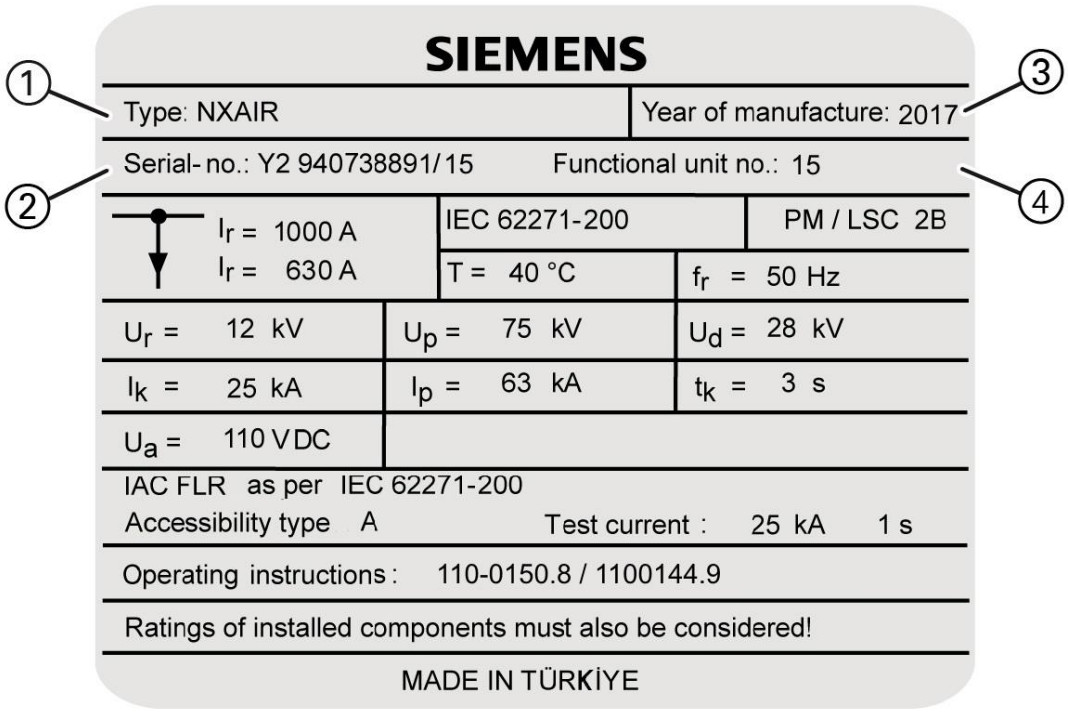


Fig. 300: Rating plate

15.4 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**

16 Service information

16.1 Switchgear extension

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

16.2 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 or switching-device truck as per rating plates.
- Precise designation of the device or component, if applicable on the basis of the information and illustrations in the associated instructions, a drawing, sketch or circuit diagram.
- Spare parts have to be ordered at the regional Siemens representative.

16.3 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.

16.4 Disposal

NXAIR switchgear is an environmentally compatible product.
The panels are made of galvanized sheet metal. The doors and lateral switchgear end walls are powder-coated with resistant epoxy resin material.
The switchgear materials should be recycled as far as possible. The switchgear can be disposed of in an environmentally compatible manner in compliance with existing legislation.

The components of the switchgear can be recycled as mixed scrap; however, dismantling as far as possible into sorted scrap with a residual mixed-scrap portion is the more environmentally compatible way.
Electronic scrap must be disposed of in accordance with the existing regulations. The switchgear consists of the following materials:

- Sheet metal: galvanized / powder-coated / Cr-Ni steel
- Copper and aluminum
- Polycarbonate (PC)
- Epoxy resin
- Cast resin
- Fiber-reinforced plastics
- Rubber materials
- Ceramic materials
- Lubricants
- Bolts, washers, nuts, rivets made of steel
- Electrical wires and electronic equipment such as relays, control boards, voltmeters, ammeters

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

For further information regarding declarable or restricted substances in this product, please contact:

- materialcompliance.ms.ehs@siemens.com.

17 Installation report

Installation report for air-insulated switchgear					Type:	NXAIR	
Customer:					Factory ref. no.:		
Switchgear type		NXAIR	-	Number of panels			-
Rated voltage U_r			kV	Rated busbar current			A
Rated short-time withstand current I_k			kA	Control voltage			V
Rated voltage motor operating mechanism			V	Alarm signaling voltage			V

Note: All inspections and settings have to be performed acc. to the data given in the Installation and Operating Instructions!

* = not applicable

A	General checks before installation				yes	no	n/a*
A.1	Building base frame designed according to the requirements?				☐	☐	☐
A.2	Switchgear room clean and dry?				☐	☐	☐
A.3	Switchgear room: - Wall distance between wall and left and right end panel min. 150 mm?				☐	☐	☐
	Room height	Rated voltage	Rated short-time withstand current	Design of the pressure relief duct	—	—	—
	≥ 2500 mm	≤ 17.5 kV	≤ 40 kA	Arrangement with evacuation duct	☐	☐	☐
	≥ 2800 mm	≤ 12 kV	≤ 25 kA	Arrangement with absorber	☐	☐	☐
	≥ 3000 mm	≤ 12 kV	31.5 kA		☐	☐	☐
	≥ 3500 mm	17.5 kV	≤ 31.5kA		☐	☐	☐
	≥ 3500 mm	≤ 17.5 kV	40 kA		☐	☐	☐
A.4	Panels checked for transport damages?				☐	☐	☐
A.5	If panels or parts thereof show corrosion, please inform the Energy Customer Support Center immediately! **Tel**.: +49 180 5247000 **E-mail**: support.energy@siemens.com				☐	☐	☐

1.	Installation and configuration of panels	yes	no	n/a
1.1	Panels placed according to arrangement diagram?	☐	☐	☐
1.2	Straightness tolerance: 1 mm/1 m length, 2 mm over the total length? Higher tolerances compensated with shims?	☐	☐	☐
1.3	Fixing of switchgear to base frame carried out?	☐	☐	☐
1.4	Panel interconnection completed and panel connecting bolts tightened with 30 Nm?	☐	☐	☐
1.5	Conductor bars brushed and greased with a thin film of Vaseline?	☐	☐	☐
1.6	Inserting direction of the fixing bolts during busbar assembly observed according to the specifications in the Installation Instructions?	☐	☐	☐
1.7	Bolted joints of conductor bars (busbars) tightened with 70 Nm for M12?	☐	☐	☐
1.8	Busbar compartment cleaned?	☐	☐	☐
1.9	Insulating caps installed in busbar compartment at U_r = 17.5 kV?	☐	☐	☐
1.10	Insulation caps installed in busbar compartment at switch-disconnector panel?	☐	☐	☐

1.11	Transverse partition plate installed from both sides in the busbar compartment at switch-disconnector panel?	☐	☐	☐
1.12	Earthing busbar connected and tightened with 70 Nm for bolted joint size M12?	☐	☐	☐
1.13	Gaps between the main contact blade (closed position) and the edges of the notch in the conductor bar terminal min. 0.1 mm at switch-disconnector?	☐	☐	☐

2.	Fixed part of switchgear	yes	no	n/a
2.1	Mimic diagram according to single-line diagram fixed on high-voltage door?	☐	☐	☐
2.2	Can the high-voltage door be opened and closed easily?	☐	☐	☐
2.3	Cable protection tubes between panel and withdrawable part / switching-device truck undamaged?	☐	☐	☐
2.4	Primary connections of voltage transformers and surge arresters undamaged and connected with 20 Nm?	☐	☐	☐
2.5	Earthing of cable sealing ends connected in the connection compartment?	☐	☐	☐
2.6	Pressure relief flaps resting flush on top of the busbar compartment?	☐	☐	☐
2.7	Pressure relief duct connected from panel to panel, and bolts tightened with 30 Nm?	☐	☐	☐
2.8	Metal grids of the absorber system checked for cracks or holes?	☐	☐	☐
2.9	Metal grids of the ventilation system in the high-voltage doors checked for cracks or holes?	☐	☐	☐
2.10	Position of the lower flaps of the ventilation system checked?	☐	☐	☐
2.11	IP4X degree of protection for panel acc. to specifications from Installation Instructions?	☐	☐	☐
2.12	Switching-device compartment and connection compartment cleaned?	☐	☐	☐

3.	Low-voltage compartment	yes	no	n/a
3.1	Bus wire plug connector appropriately latched or wired to terminal strip?	☐	☐	☐
3.2	Jamming of wires and protective tubes avoided?	☐	☐	☐
3.3	Wire markings and terminal designation labels complete?	☐	☐	☐
3.4	Damping resistor for earth-fault winding installed and connected?	☐	☐	☐
3.5	Can the low-voltage door be opened and closed easily?	☐	☐	☐
3.6	High-voltage and low-voltage doors flush?	☐	☐	☐
3.7	Low-voltage compartment cleaned?	☐	☐	☐
3.8	Firmware of protection devices updated?	☐	☐	☐

4.	Withdrawable parts / switching-device trucks	yes	no	n/a
4.1	Transport block for electromagnetic interlocking removed?	☐	☐	☐
4.2	Tulip contacts at the withdrawable parts / switching-device trucks undamaged?	☐	☐	☐
4.3	Tulip contacts greased with a thin film of Molykote® Longterm 2 plus?	☐	☐	☐
4.4	Withdrawable parts / switching-device trucks coded according to the withdrawable part / switching-device truck specification of the complete switchgear?	☐	☐	☐
4.5	All withdrawable contactors equipped with HV HRC fuse-links?	☐	☐	☐
4.6	Withdrawable parts / switching device trucks cleaned?	☐	☐	☐

5.	Mechanical function and interlocks	yes	no	n/a
5.1	Is the high-voltage door interlocked as soon as the withdrawable part / switching-device truck is not in "interlocked test position"?	☐	☐	☐
5.2	Is the high-voltage door interlocked as soon as the switch-disconnector fuse combination is in "CLOSED position" in the switch-disconnector panel?	☐	☐	☐
5.3	Unlocking and locking function of withdrawable part / switching-device truck tested with double-bit key according to Operating Instructions?	☐	☐	☐
5.4	Is closing of the circuit-breaker locked out while racking the withdrawable part / switching-device truck?	☐	☐	☐
5.5	Is closing of the vacuum contactor locked out while racking the withdrawable part / switching-device truck?	☐	☐	☐
5.6	Is racking in and out of the withdrawable part / switching-device truck interlocked when the circuit-breaker is in “CLOSED” position?	☐	☐	☐
5.7	Is racking in and out of the withdrawable part interlocked when the vacuum contactor is in “CLOSED” position?	☐	☐	☐
5.8	Is racking-in of the withdrawable part / switching-device truck interlocked when the earthing switch is in "CLOSED" position?	☐	☐	☐
5.9	Is closing of the earthing switch only possible when the withdrawable part / switching-device truck is in "interlocked disconnected position"?	☐	☐	☐
5.10	Is closing of the earthing switch only possible when the switch-disconnector fuse combination is in "OPEN position" in the switch-disconnector panel?	☐	☐	☐
5.11	Withdrawable parts / switching-device trucks with same codification interchangeable?	☐	☐	☐
5.12	Interlocks between service truck and panel respectively withdrawable part are smooth?	☐	☐	☐
5.13	Interlocks between switch-disconnector fuse combination and earthing switch are tested in the switch-disconnector panel?	☐	☐	☐
5.14	Function of the earthing switches or position indicators tested?	☐	☐	☐

6.	Mechanical function and interlocks	yes	no	n/a
6.1	Closing and opening of the circuit-breaker performed manually and by electrical command?	☐	☐	☐
6.2	Closing of the circuit-breaker locked out during spring charging?	☐	☐	☐
6.3	Electrical anti-pumping protection of the circuit-breaker tested?	☐	☐	☐
6.4	Position indicator for "spring charged" indicator and operations counter tested for proper functioning?	☐	☐	☐
6.5	Closing and opening of the vacuum contactor performed by electrical command?	☐	☐	☐
6.6	Opening of the vacuum contactor performed manually?	☐	☐	☐
6.7	Function of the voltage indicators checked?	☐	☐	☐

7.	Electrical position signaling and remote control	yes	no	n/a
7.1	Position signaling and remote control was tested up to:			
	Terminal strip in feeder panel?	☐	☐	☐
	Transfer terminal strip?	☐	☐	☐
	Digital input/output unit?	☐	☐	☐

7.2	Position signaling tested for:			
	Circuit-breaker?	☐	☐	☐
	"Circuit-breaker spring charged"?	☐	☐	☐
	Vacuum contactor?	☐	☐	☐
	Earthing switch in connection compartment?	☐	☐	☐
	Earthing switch in additional compartment to busbar compartment?	☐	☐	☐

7.3	Remote control tested for:			
	Circuit-breaker?	☐	☐	☐
	Vacuum contactor?	☐	☐	☐
	Withdrawable part / switching-device truck?	☐	☐	☐
	Earthing switch in connection compartment?	☐	☐	☐
	Earthing switch in additional compartment to busbar compartment?	☐	☐	☐

8.	Warning	yes	no	n/a
8.1	Alarm signaling has been tested up to:			
	Terminal strip in feeder panel?	☐	☐	☐
	Transfer terminal strip?	☐	☐	☐
	Digital input/output unit?	☐	☐	☐
8.2	Alarm signaling tested for:			
	MCB trip?	☐	☐	☐
	VT MCB trip?	☐	☐	☐
	Circuit-breaker trip?	☐	☐	☐
	Vacuum contactor tripping?	☐	☐	☐

9.	Current transformers	yes	no	n/a
9.1	Secondary windings earthed?	☐	☐	☐
9.2	Jumpers on current transformer terminal strips in correct position?	☐	☐	☐
9.3	Current transformer circuits for measurement tested?	☐	☐	☐
9.4	Non-required secondary windings are short-circuited?	☐	☐	☐
9.5	Current transformer circuits for protection tested? Name, Dept., Date:	☐	☐	☐

10.	Voltage transformers	yes	no	n/a
10.1	Primary test of voltage transformers completed? (test of transformer ratio with e.g. 5 kV)	☐	☐	☐
10.2	Voltage transformers earthed on primary side (X, N)?	☐	☐	☐
10.3	Secondary test completed? (test of sense of direction of the secondary winding, e.g. with battery box)	☐	☐	☐
10.4	Secondary windings earthed?	☐	☐	☐

10.5	Earthing via earthing bolt at the transformer?	☐	☐	☐
10.6	Earthing at terminal strip completed?	☐	☐	☐
10.7	Insulation test carried out on the non-fuse-protected wiring up to the open MCB?	☐	☐	☐
10.8	Voltage transformer circuits tested?	☐	☐	☐
10.9	Damping resistor connected in open delta winding?	☐	☐	☐

11.	Additional functions	yes	no	n/a
11.1	Control and functioning of panel heating tested?	☐	☐	☐
11.2	Control and functioning of illumination in low-voltage compartment tested?	☐	☐	☐
11.3	Control and functioning of panel pressure switches tested?	☐	☐	☐
11.5	Control and functioning of fan tested?	☐	☐	☐
11.6	Accessories for switchgear complete?	☐	☐	☐

12.	Final check after installation	yes	no	n/a
12.1	Switchgear is connected to the earthing system of the building?	☐	☐	☐
12.2	All openings in the connection compartment and in the switching-device compartment of the panels are closed towards the outside?	☐	☐	☐
12.3	Switchgear is totally clean?	☐	☐	☐
12.4	Documentation (operating instructions of switchgear and protection devices, test certificates of voltage and current transformers, etc.) handed over to the customer's personnel?	☐	☐	☐

⚠ DANGER

Hazardous voltage

During the high-voltage test, the equipment is subjected to hazardous voltages and may be controlled remotely.

- Serious personal injury or property damage can result if safety instructions are not followed.
- Only qualified personnel may work on or around this equipment after becoming thoroughly familiar with all safety instructions for this equipment.

⚠ DANGER

Hazardous voltage

Before high-voltage test:

- Capacitive voltage indicators must be short-circuited.
- Secondary circuits of current transformers must be short-circuited.
- Voltage transformers and surge arresters/limiters must be disconnected.

NOTICE

Too high test voltage

Excessive test voltages may result in damage to equipment.

- Do not perform dielectric test at test voltages exceeding the ratings of the tested equipment.

13.	High-voltage tests acc. to IEC 62271 Part 200 Clause 7.105	yes	no	n/a
	High-voltage test performed and reported in attached document? Annex: _____	☐	☐	☐

⚠ DANGER

Hazardous voltage

After high-voltage test:

⇨ Switch off high-voltage test equipment and remove high-voltage test equipment carefully.

NOTICE

After successful high-voltage testing:

⇨ Reset capacitive voltage indicators.

⇨ Remove short circuits from current transformers.

⇨ Put voltage transformers and surge arresters/limiters back into operation.

Installation report to be submitted after completion via e-mail or normal mail to:

E-mail:	support.energy@siemens.com
Postal address:	Siemens AG Global Customer Care AIS-MV EM MS GCC AIS-MV Carl-Benz-Straße 22 60386 Frankfurt am Main Germany
Fax:	+49 69 4008-2623

Remarks:

.....

.....

Responsible for installation / commissioning:	
Signature of tester:	
Name:	
Department:	
Telephone:	
Date:	
City:	

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Imprint

Siemens AG

Smart Infrastructure
Distribution Systems

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