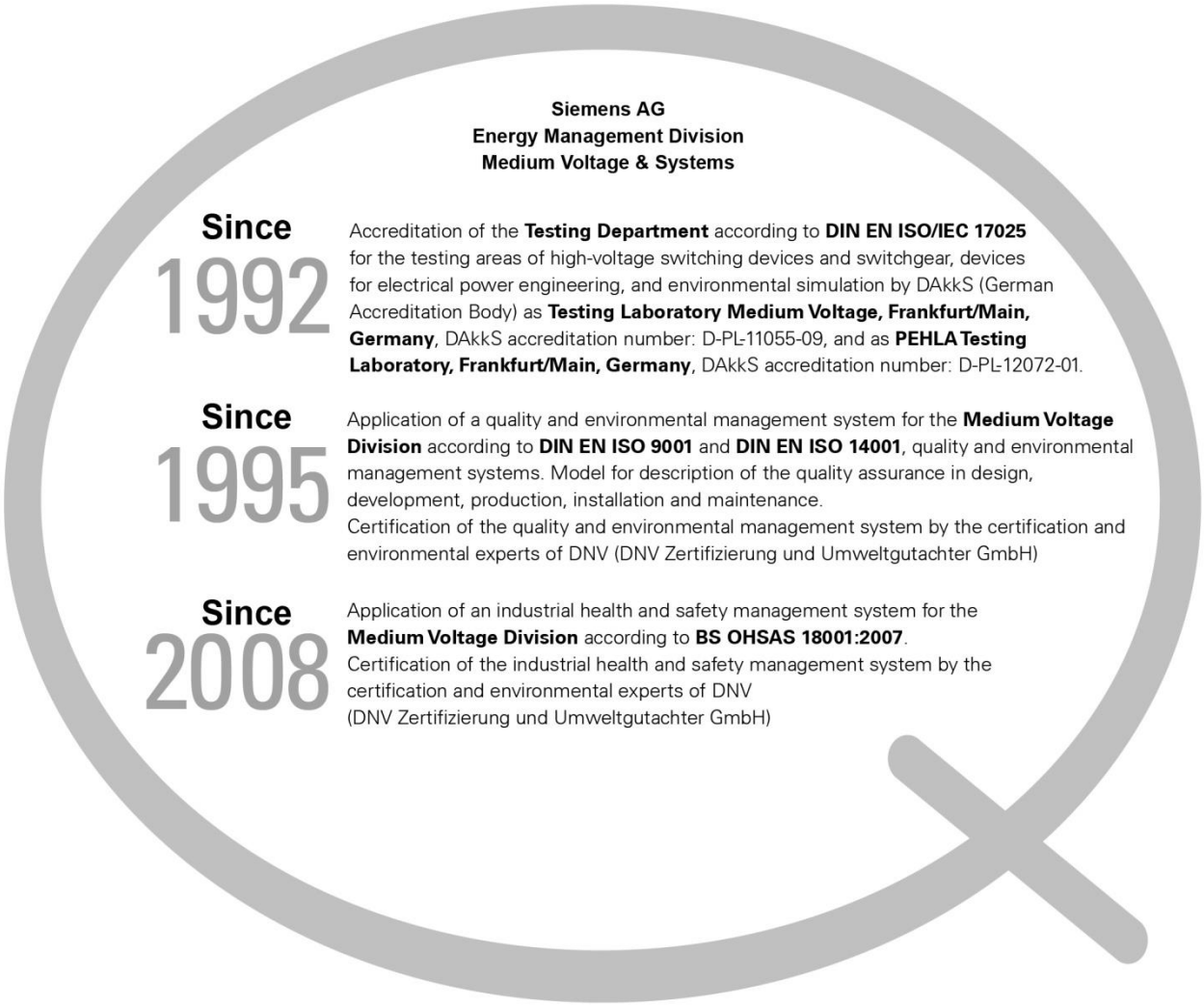
SIEMENS

Medium-Voltage Switchgear

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

INSTALLATION INSTRUCTIONS

Order No.:	**139-2019.9**
Issue:	**September 2018**
Revision:	**07**



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.

☞ HINT

Provides additional information to clarify or simplify a procedure.

Observe the hint.

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

Contents

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Document information:

Title:	**Installation Instructions**
Order number:	**139-2019.9**
Additional order number:	**8BX3300-0LA00-0AD1**
Revision:	**07**
Issue:	**September 2018**

2 General instructions

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 they are 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 fulfilment of the type tests (according to IEC 62271 Part 200) may not be guaranteed anymore. This applies especially though not exclusively to the following actions:

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

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

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

The protective equipment consists of:

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

3 Due application

The air-insulated medium-voltage switchgear type NXAIR M is a type-tested and metal-clad switchgear for indoor installation, with type of accessibility A and internal arc classification (IAC): IAC A FLR 25 kA 1 s or IAC A FL 25 kA 1 s according to IEC 62271 Part 200.

The switchgear can be used as indoor installation according to IEC 61936 (Power Installations exceeding AC 1 kV) and VDE 0101 in lockable electrical service locations. A lockable electrical service location is a room or a place that is exclusively used for 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 M medium-voltage switchgear is IP3XD according to IEC 60529.

When the switchgear is operated within the technical parameters defined in these instructions, the air-insulated switchgear type NXAIR M is suitable for rated voltages up to U_r = 24 kV and a maximum rated short-time withstand current of I_k = 25 kA.

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

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

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

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

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 M.

This installation training provides detailed information about design, operation, installation and trouble shooting on the primary part of NXAIR M 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
Energy Management

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 installation

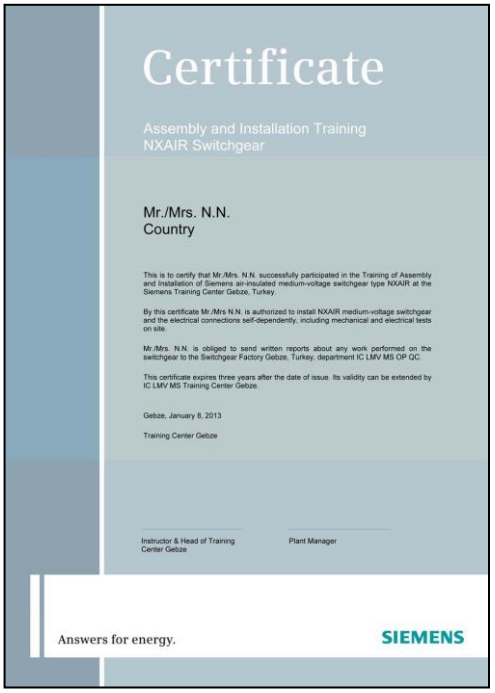


Fig. 1: Certificate (example)

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

Preparing installation

5 Differentiation concerning the assembly of busbar systems

In the following, the assembly is described by means of the panel version for single-busbar system. The installation of the panel version for double-busbar system differs from this in certain aspects. These deviating assembly operations are described in chapter 9 of these instructions.

⚠ CAUTION

Validity of safety instructions

The **specific** assembly operations for panel versions for double-busbar system are described separately.

⇨ All safety information and instructions of the Installation Instructions remain unchanged and must generally be observed for installation!

They are generally valid for:
- Panel version for single-busbar system
- Panel version for double-busbar system

6 Installation of the panel version for single-busbar system

☞ HINT

Read and understand these instructions before attempting installation works.

6.1 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

6.2 Switchgear room

Associated information to the panel version for double-busbar system is given in chapter 9 of these instructions.

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

6.3 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 to 1.0 mm).
- The foundation area in front of the high-voltage doors of the panels, on which the withdrawable parts 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 M, order number 139-2084.9.

Feeder current [A]	Panel design	Depth complete [mm]	Standing surface without high-voltage door [mm]
≤ 2500	without rear connection duct, without extended current transformers	1600	1565
	with extended current transformers	1750	1715
	with rear connection duct	2300	2265

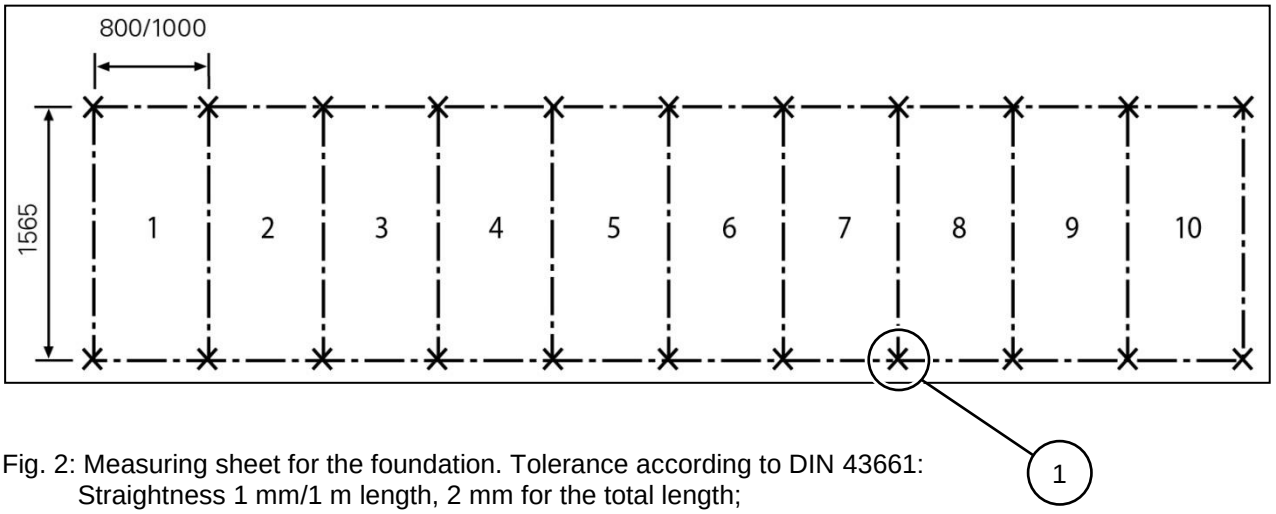


Fig. 2: Measuring sheet for the foundation. Tolerance according to DIN 43661:
Straightness 1 mm/1 m length, 2 mm for the total length;
evenness 1 mm within 1 m measured length

(1) Measuring points on the foundation rails

6.4 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.

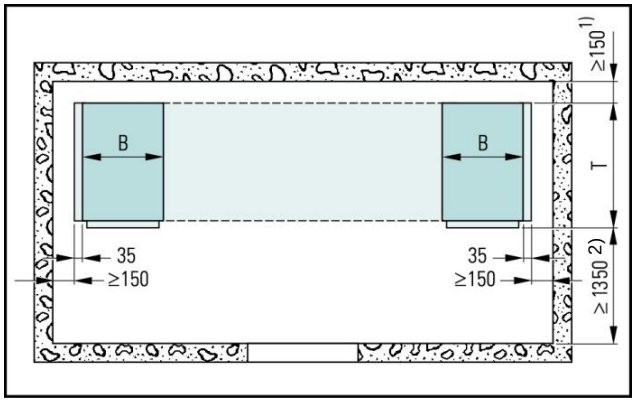
⇨ In case of a deviating room height in the relation between the technical data and the room height according to the following table, the installation of the switchgear is not permissible.

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:

	Rated voltage U_r [kV]	Height of switchgear room [mm]
Switchgear with evacuation ducts	24	min. ≥ 3000
Switchgear with absorber or evacuation ducts		min. ≥ 3300

6.5 Switchgear with absorber



B = panel width /
T = panel depth complete

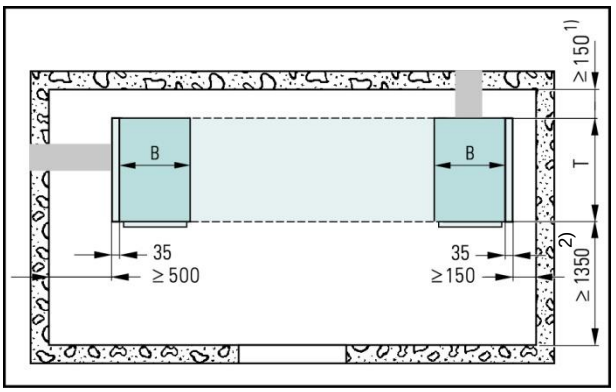
Fig. 3: Dimensions of the switchgear room, absorber

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

2) For panel replacement: Control aisle: ≥ 1350 mm

For further information, see information drawings NXAIR M, order number 139-2084.9.

6.6 Switchgear with evacuation ducts



B = panel width /
T = panel depth complete

Fig. 4: Dimensions of the switchgear room, evacuation duct

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

2) For panel replacement: Control aisle: ≥ 1350 mm

For further information, see information drawings NXAIR M, order number 139-2084.9.

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 M, order number 139-2084.9.

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 to 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.

6.7 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.

6.8 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 an air humidity of 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.

6.9 Accessories

The following accessories are available:

- Racking crank with protective shield for moving the withdrawable part
- 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
- Racking tool for the removable voltage transformers
- Double-bit key for low-voltage door
- Double-bit key for withdrawable part
- 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
- 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 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)
- 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,
- Circuit-breaker panel-circuit breaker with HV HRC fuse panel transformation kit (8BX1102)

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.

6.10 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 up 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
- 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
- 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
- Self-levelling line laser

6.11 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 LV compartment, the secondary devices are mounted in defined zones.
- Shortest possible connection between corresponding modules in subracks.
- Consideration of the magnetic leakage fields of conductor bars and cables.
- Protection of subracks and wiring backplanes against interference by perforated shielding plates.
- Large surface bonding between all modules and devices as well as bonding to the earthing conductor of the switchgear assembly.

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

In an environment with heavy electromagnetic interference it may be necessary to use shielded cables and wires for the external connections. 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, e.g. 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.

6.12 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

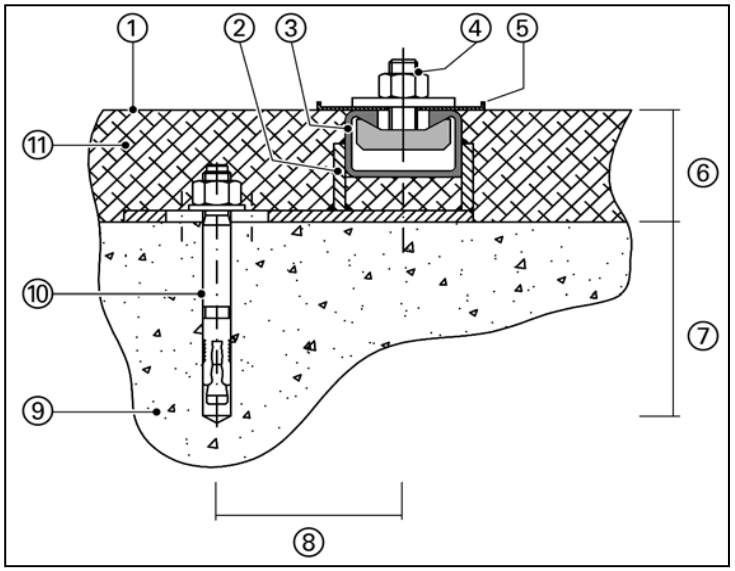


Fig. 5: Bolted floor fixing

(1)	Upper edge of finished floor	(7)	Min. 90 mm
(2)	Floor fixing plate (holder for profiles at a distance ≥ 1200 mm), Fig. 8: 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 HR 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

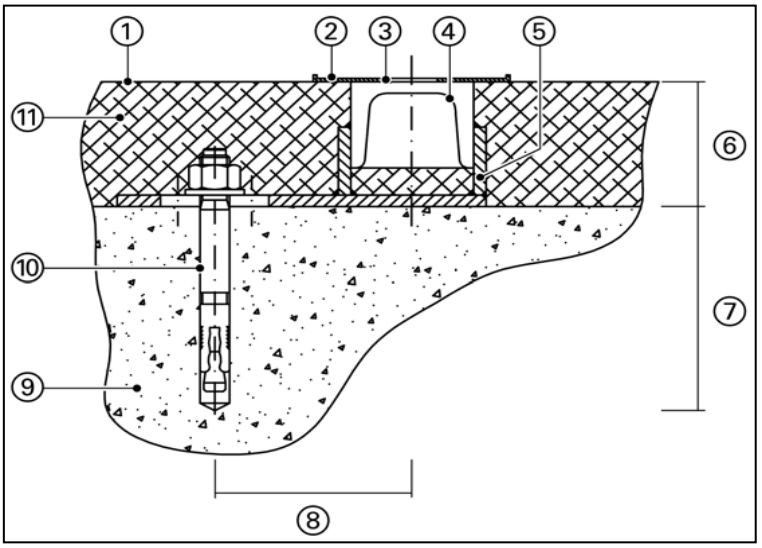


Fig. 6: Welded floor fixing

(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. 8: Side view of the fixing plate	(11)	Floor finish
(6)	Min. 55 mm	---	---

Version with fixing on double floor

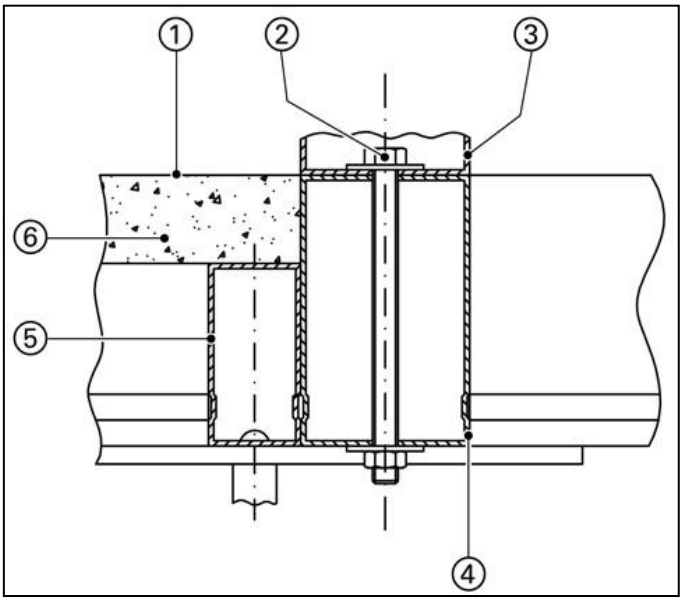


Fig. 7: Fixing on double floor

(1)	Upper edge of double floor	(4)	Substructure
(2)	Hexagon head bolt ISO 4017 – M10 – 8.8 Washer ISO 7093-1 - 10 - 200 HR 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.

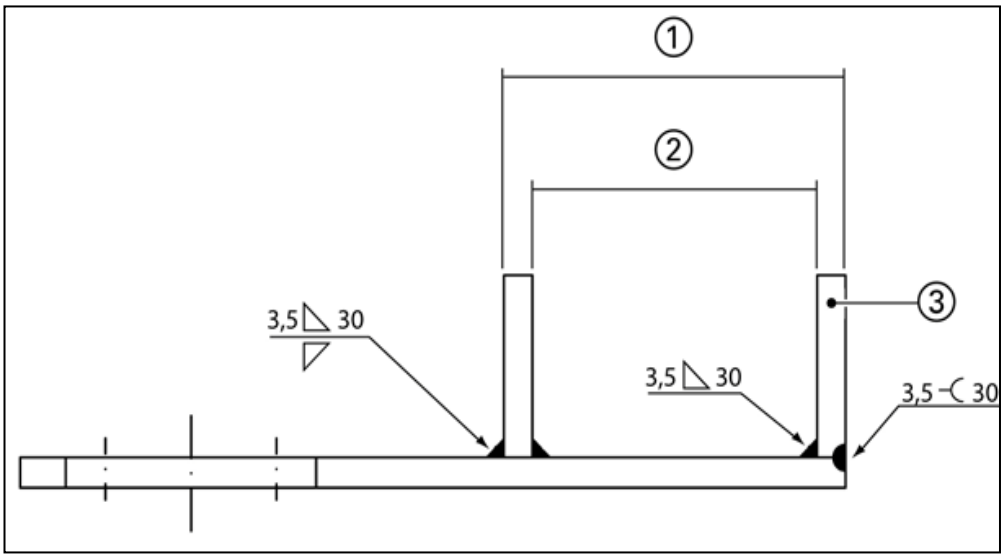


Fig. 8: Side view of the fixing plate

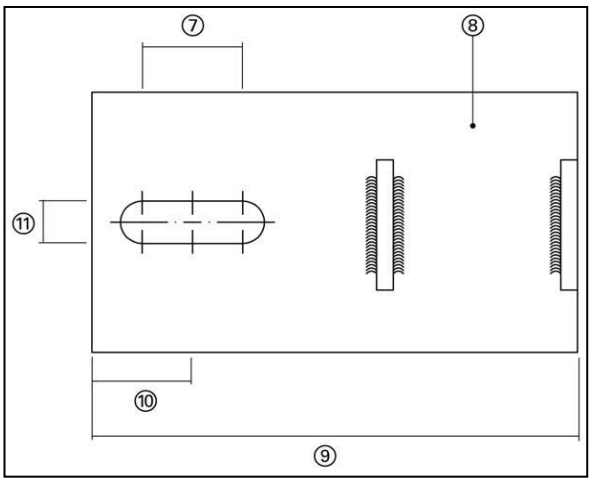


Fig. 9: Top view of the fixing plate

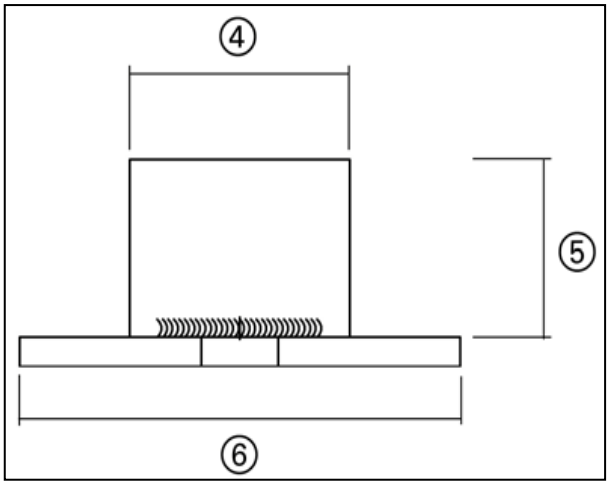


Fig. 10: Front view of the fixing plate

(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 M, order number 139-2084.9.

6.13 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

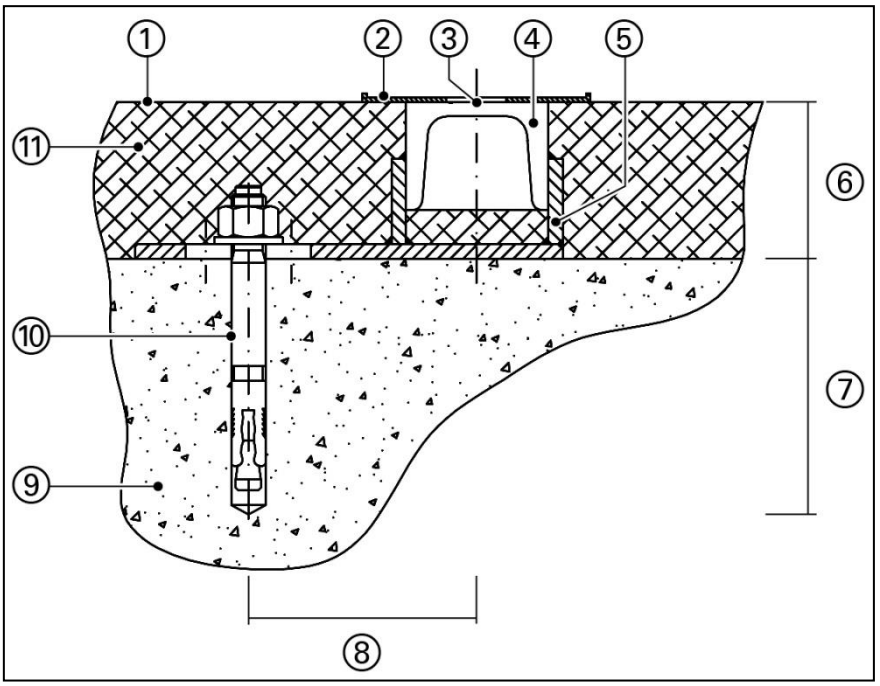


Fig. 11: Bolted floor fixing

(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. 12: 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.

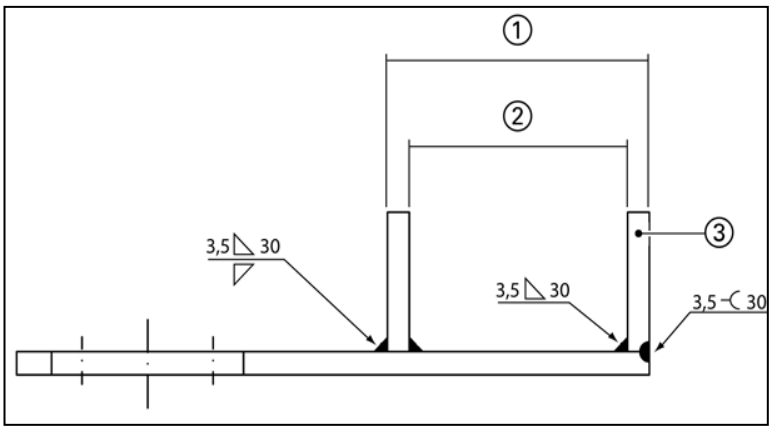


Fig. 12: Side view of the fixing plate

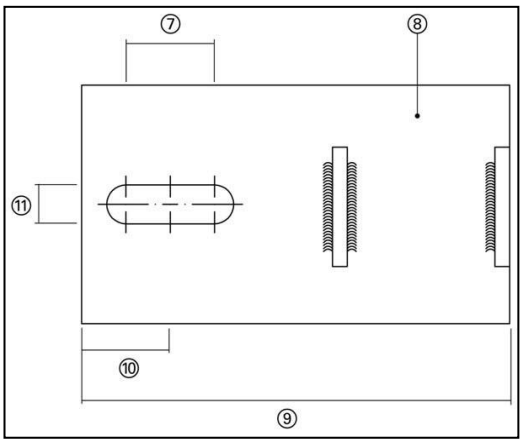


Fig. 13: Top view of the fixing plate

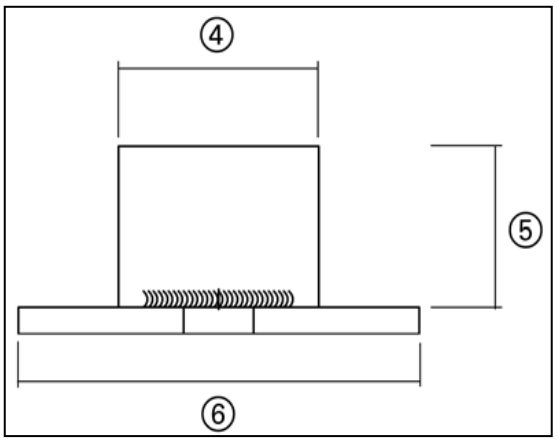


Fig. 14: Side view of the fixing plate

(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 M, order number 139-2084.9.

6.14 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 washers, is supplied with the supplementary equipment of the respective panel.

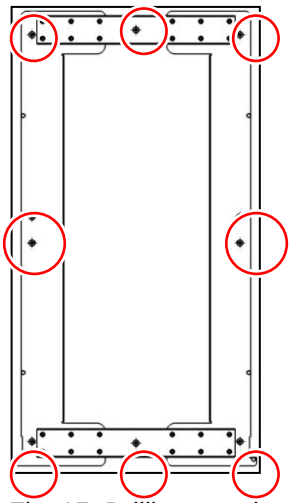
NOTICE

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 M, order number 139-2084.9

Overview of drilling template



(1) Drilling points

Fig. 15: Drilling template for 800 mm panel width

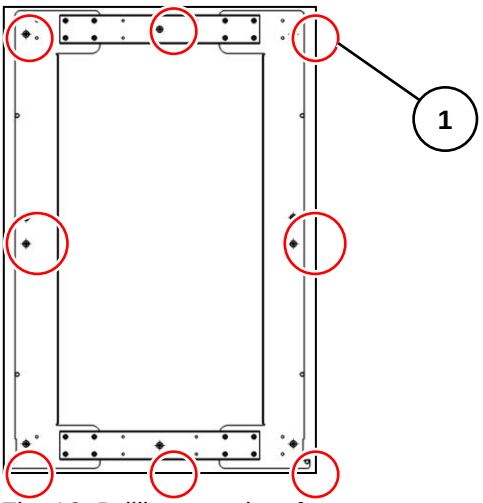


Fig. 16: Drilling template for 1000 mm panel width

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

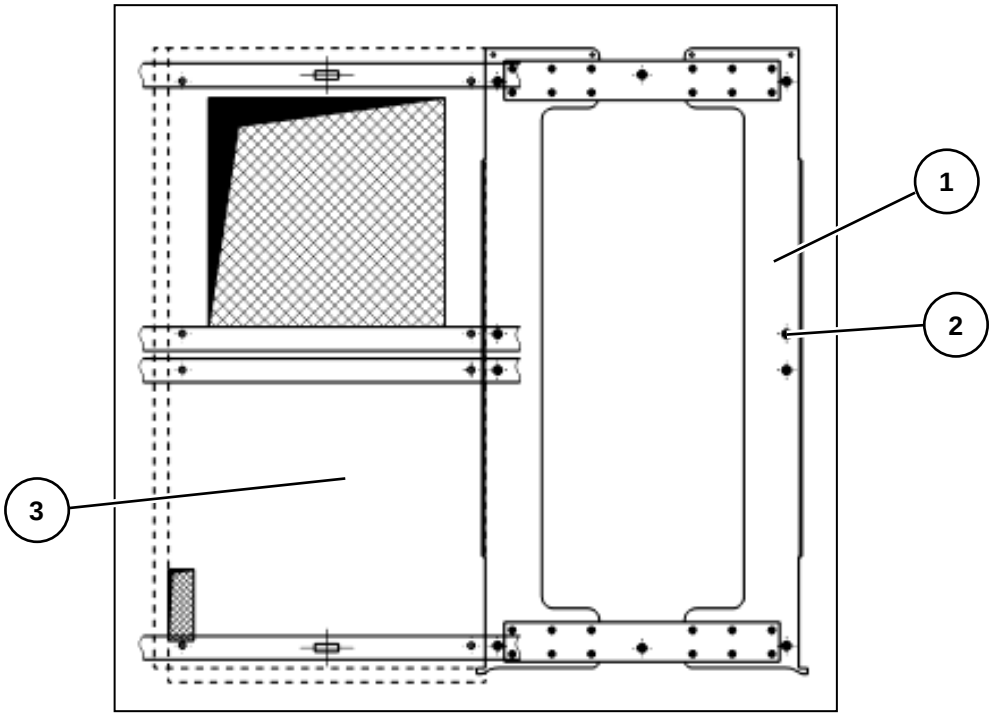


Fig. 17: Applied drilling template, for example

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.

⇨ 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.

7 Unloading and erection

HINT

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

7.1 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 film over the panels
Sea, road and air freight with intermediate storage	Panels on pallets in closed crate, with sealed upper and lower PE protective film, with desiccant bags, with hermetically sealed wooden base (max. storage time: 6 months)

7.2 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

The withdrawable part 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 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 crossbar.

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

⇨ Do not damage the PE protective film 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.

7.3 Checking for completeness and transport damages

⇨ 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.

⇨ In case of transport damage, inform the claims agent if necessary.

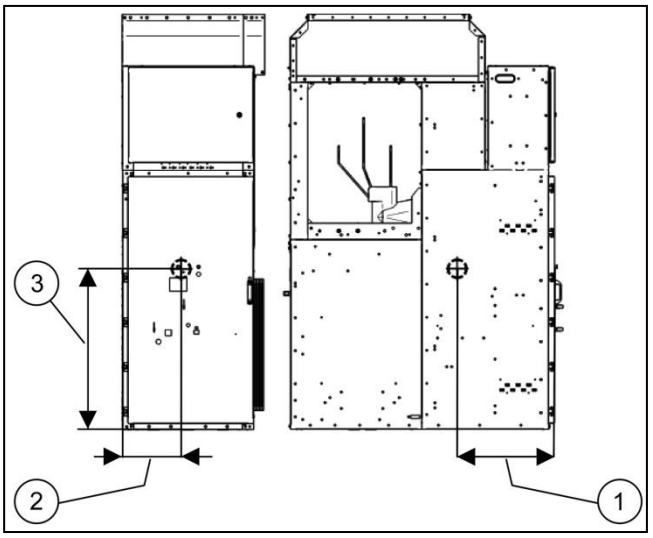
⇨ Repair transport damage or have it repaired, otherwise you may not start installation.

⇨ 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 film until reaching the place of installation in order to keep the switchgear as clean as possible.

7.4 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:



(1) 590 mm
(2) 350 mm
(3) 970 mm

Fig. 18: Position of the center of gravity, for example for a panel width of 800 mm

Fig. 19: Symbol for center of gravity

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

7.5 Transport weights and dimensions without packing

Panel type NXAIR M (without rear duct)	Feeder current	Panel width (W)	Panel depth (D)	Panel height (H)	Weight approx.
	[A]	[mm]	[mm]	[mm]	[kg]
Circuit-breaker panel	≤ 1250	800	1600/1750	2510/ 2550/ 2680/ 2750/ 2770	1300
Disconnecting panel					
Circuit-breaker panel with HV HRC fuse					
Metering panel					
Circuit-breaker panel	2500	1000	1600/1750		1400
Disconnecting panel					

Additional weight of rear duct

	Panel width (W)	Duct depth	Weight approx.
	[mm]	[mm]	[kg]
Rear duct	800	700	250
Rear duct	1000	700	350

For further information, see information drawings NXAIR M, order number 139-2084.9.

7.6 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.

7.7 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

The withdrawable part 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 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.

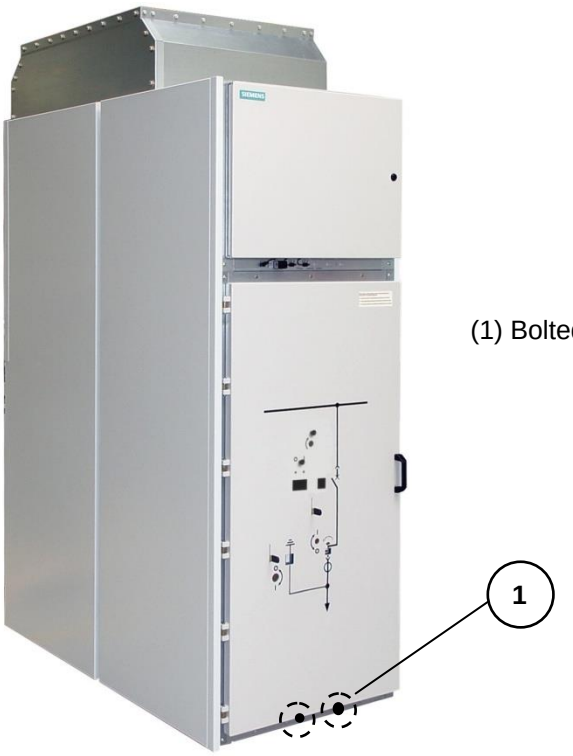
The transport units are screwed onto the wooden pallets. If they can no longer be transported together with the pallets, they are removed as follows:

⇨ Lift PE film 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 bolts M8x20 with contact washers again into the open bolted joints (1) at the front and rear of the panel.

⇨ Dispose of the angle brackets.



(1) Bolted joints of the angle brackets

Fig. 20: Circuit-breaker panel

7.8 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.

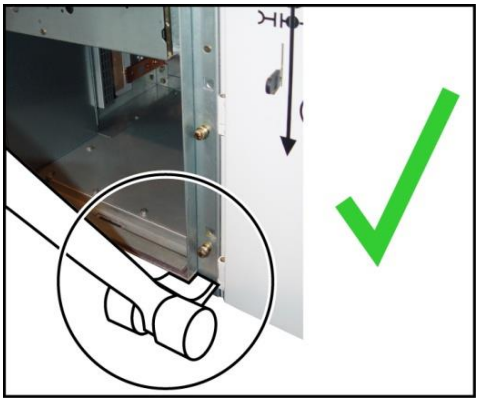


Fig. 21: Permissible application on the right below the switchgear frame

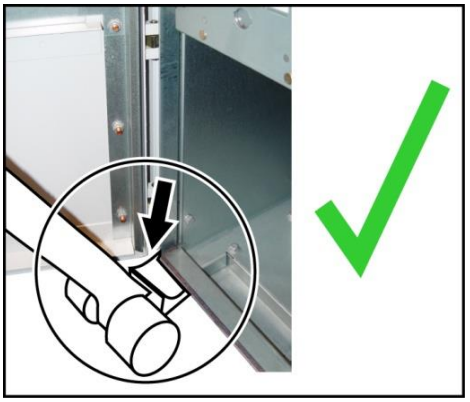


Fig. 22: Permissible application on the left below the switchgear frame

Incorrect application of lifting tool

Not permissible application of a lifting tool:

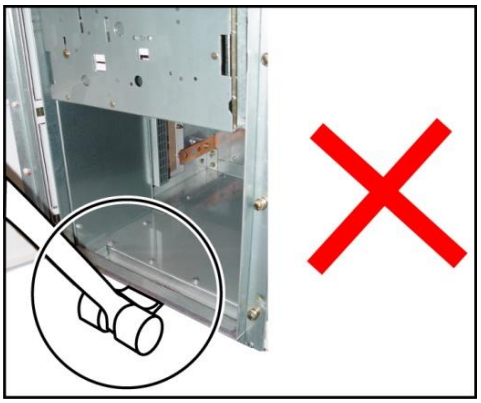


Fig. 23: Incorrect application of lifting tool

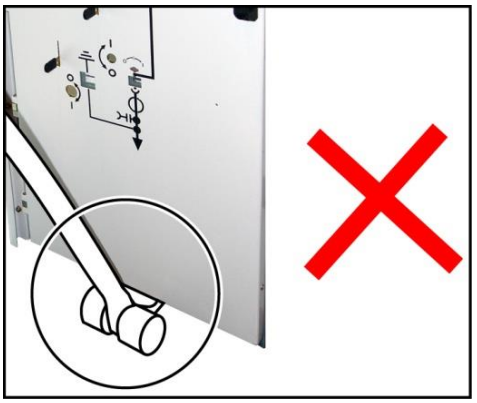


Fig. 24: Incorrect application of lifting tool

7.9 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 from the set are to be mounted.

- ⇨ Craning angles at the side of the panel: 3 bolted joints M8x20.
- ⇨ Craning angles at the rear of the panel:
  2 bolted joints M8x20.
- ⇨ Observe the information drawings NXAIR M,
  order number 139-2084.9.

HINT

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.

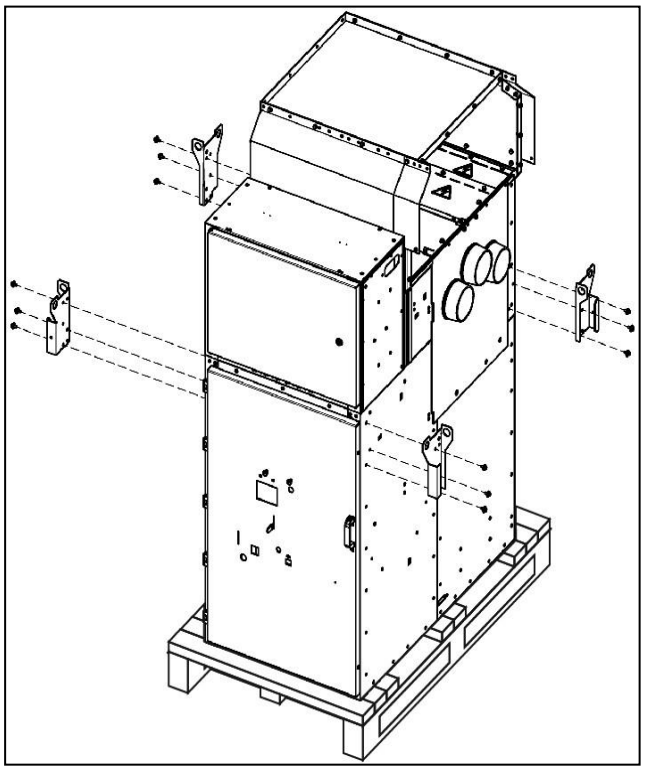


Fig. 25: Example for a panel without end wall:
4 craning angles with
3 bolted joints M8x20 each

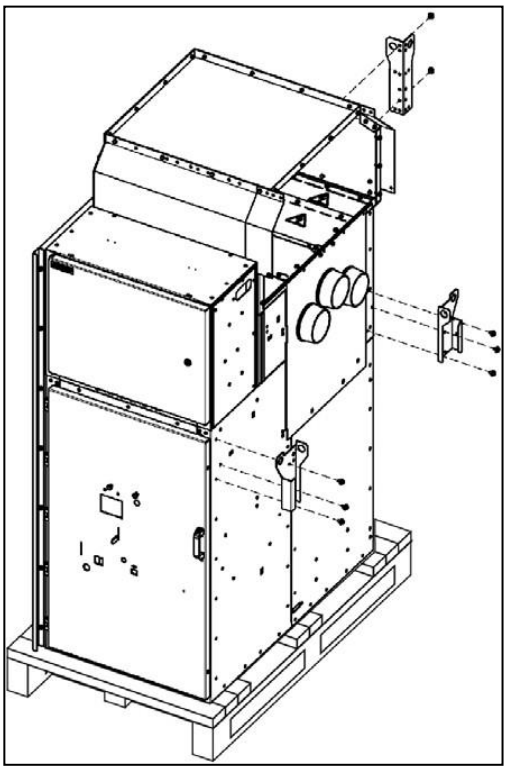


Fig. 26: Example for a panel with end wall:
3 craning angles with 3 or
2 bolted joints M8x20 each

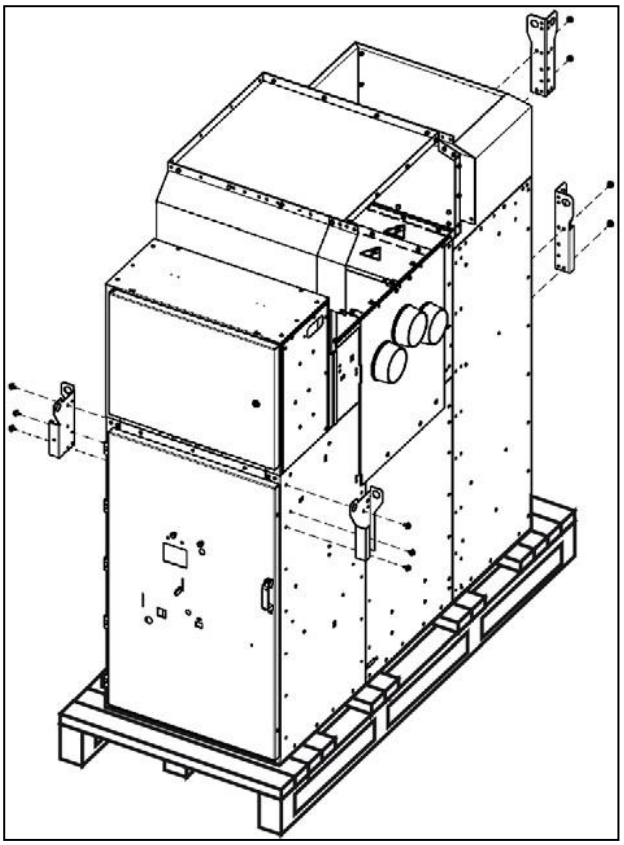


Fig. 27: Example for a panel with rear duct:
4 craning angles with 3 or 2 bolted joints M8x20 each

Mounting the craning angles
Cut PE film, open to mount the craning angles.

HINT

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 M, order number 139-2084.9).

⇨ 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.

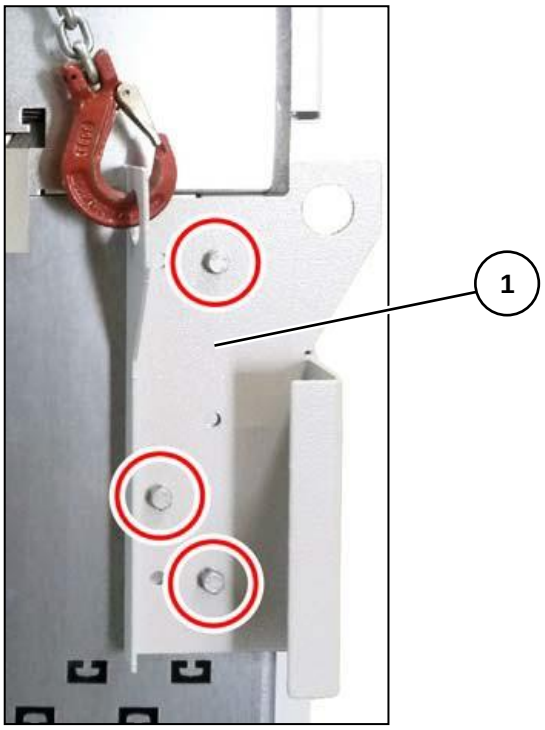


Fig. 28: Craning angle (1) mounted at the side of the panel front (3 bolted joints), shown here with crane hooks

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 store it. The sealing stopper is pushed back into the end wall at the end of installation.

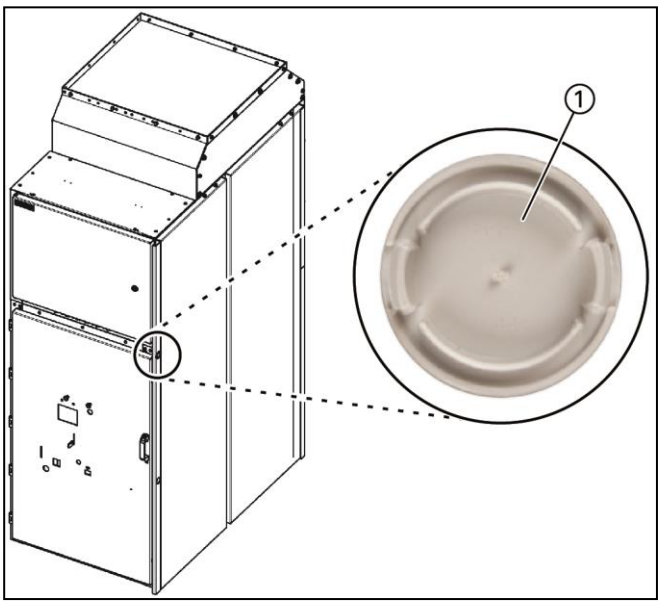


Fig. 29: End panel as an example

7.10 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	> 1600 mm, > 2200 mm	(1) Locking cotter pin (3) Washer size 27 according to ISO 7089

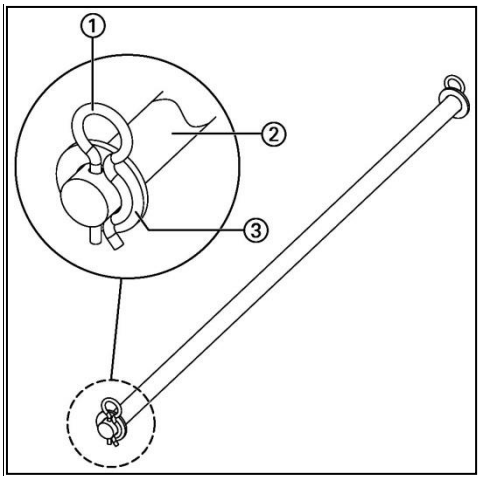


Fig. 30: Design of crane rods

Length of crane rods

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

Panel width [mm]	Panel depth [mm]	Rear duct	Length of crane rods B [mm]		Protrusion A [mm]
			Front / Rear	Lateral	
800	1600, 1750	without	> 1600	> 2200	> 300
1000		without			
800	2300, 2450	with			
1000		with		---	

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 M, order number 139-2084.9.

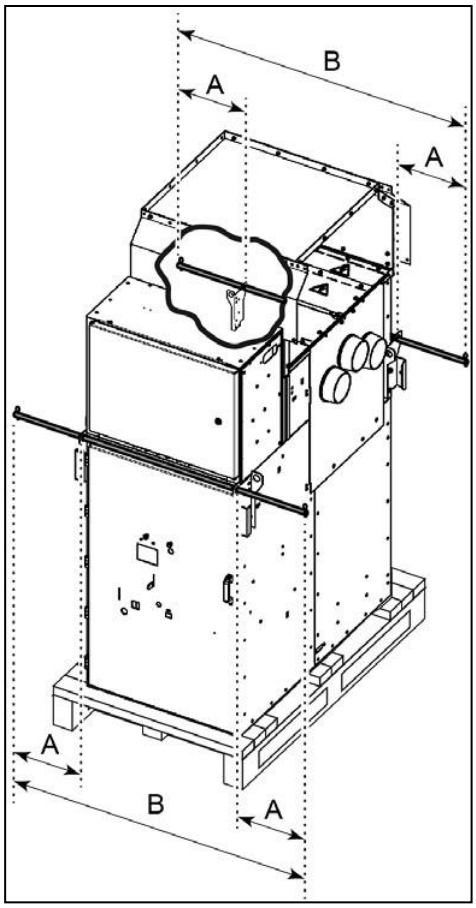


Fig. 31: Crane rods at the front and rear

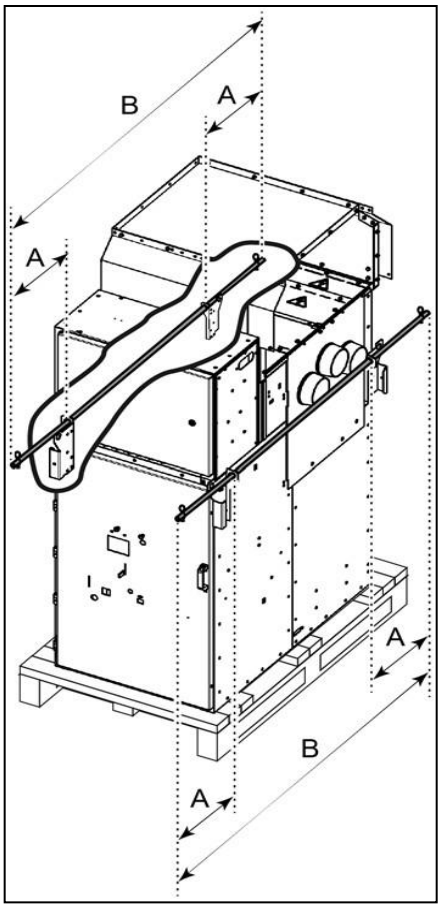


Fig. 32: Crane rods at the side

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.

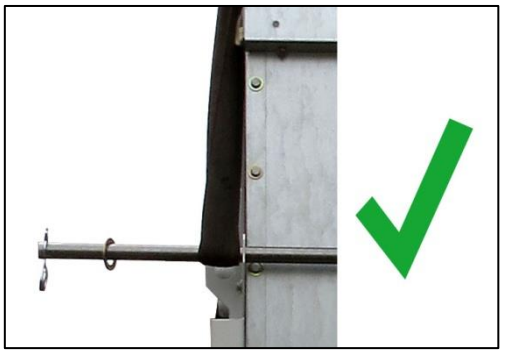


Fig. 33: Heavy weight sling attached correctly

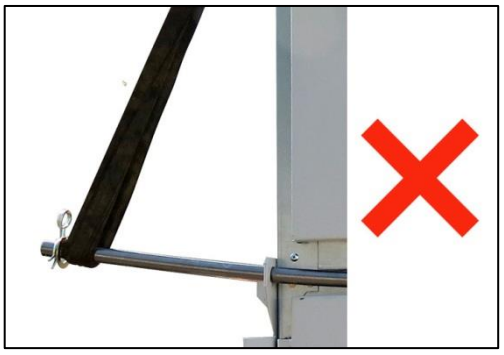


Fig. 34: Heavy weight sling attached incorrectly

Distances:

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

(2) Protrusion A: > 300 mm

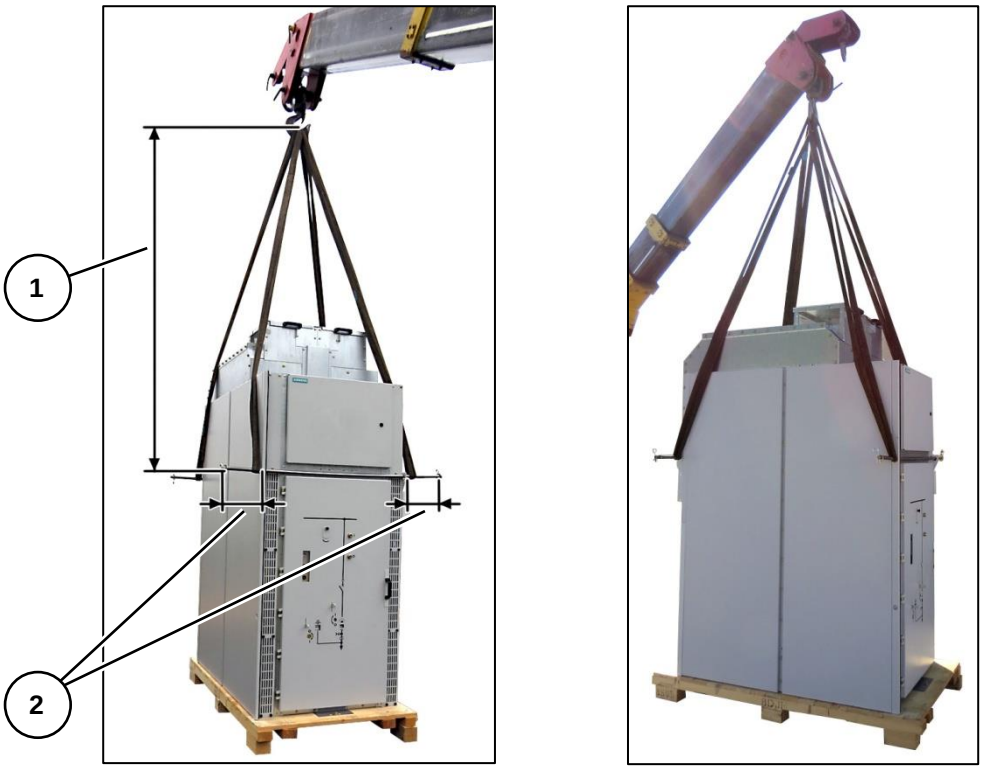


Fig. 35: Distances for craning

✓ The panel is prepared for craning with crane rods.

7.11 Lifting by means of chains and crane hooks

⚠ DANGER

Transport units 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 27 as a minimum.
- ⇨ Attach crane hooks directly at the craning angle.
- ⇨ Observe the installation height of the crane crossbar 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 crossbar

Panel width [mm]	Length 1 [mm]	Length 2 [mm]
800	1500	880
1000	1500	1080

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

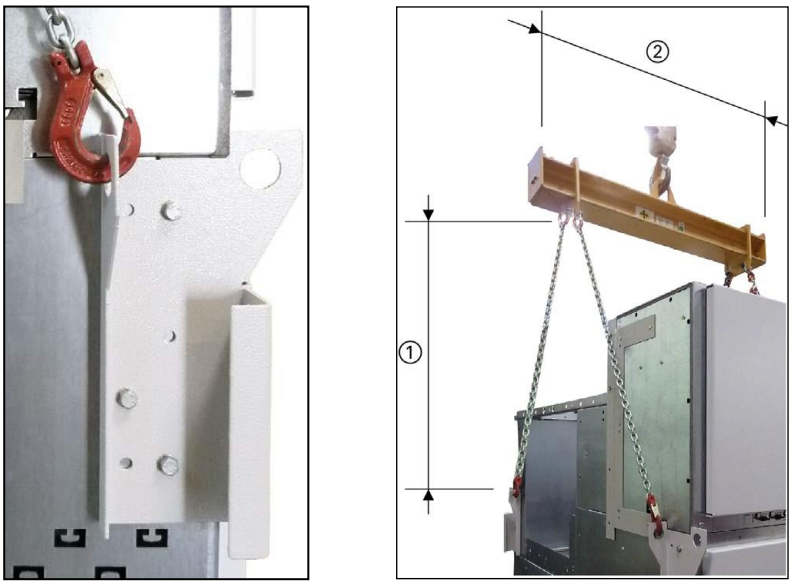


Fig. 36: Transport unit suspended from a crane crossbar

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

HINT

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

- ⇨ Unscrew all craning angles from the panel.
- ⇨ Remove the complete PE protective film.

7.12 Further transport without wooden pallets

There are a number of 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. 37: 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. 38: The panel placed on hydraulic lifter

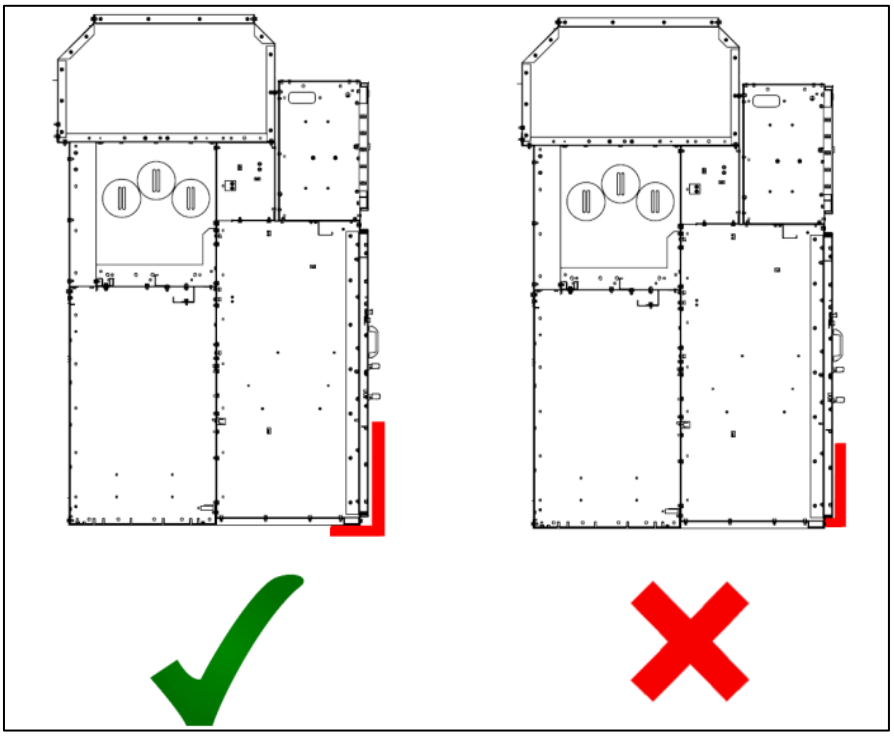


Fig. 39: Permissible application on the switchgear frame

7.13 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.

7.14 Foundation cutouts

HINT

Dimensions of the 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 M, order number 139-2084.9.

7.15 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.

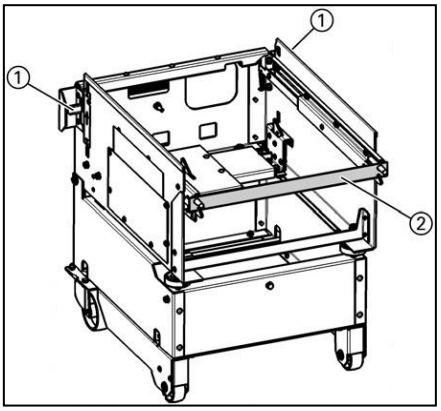


Fig. 40: Service truck with transport protection

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

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

✓ The service truck is ready for use.

8 Assembling the panels

HINT
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.

HINT
To take a withdrawable part out of a panel while assembling the panels: ⇨ See Operating Instructions with order number 139-2021.9.

8.1 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.

8.2 Switchgear configuration

Example of a switchgear configuration:

(1) Circuit-breaker panel with natural ventilation and left end wall
(2) Circuit-breaker panel with absorber
(3) Circuit-breaker panel with additional compartment to the busbar compartment
(4) Circuit-breaker panel with right end wall

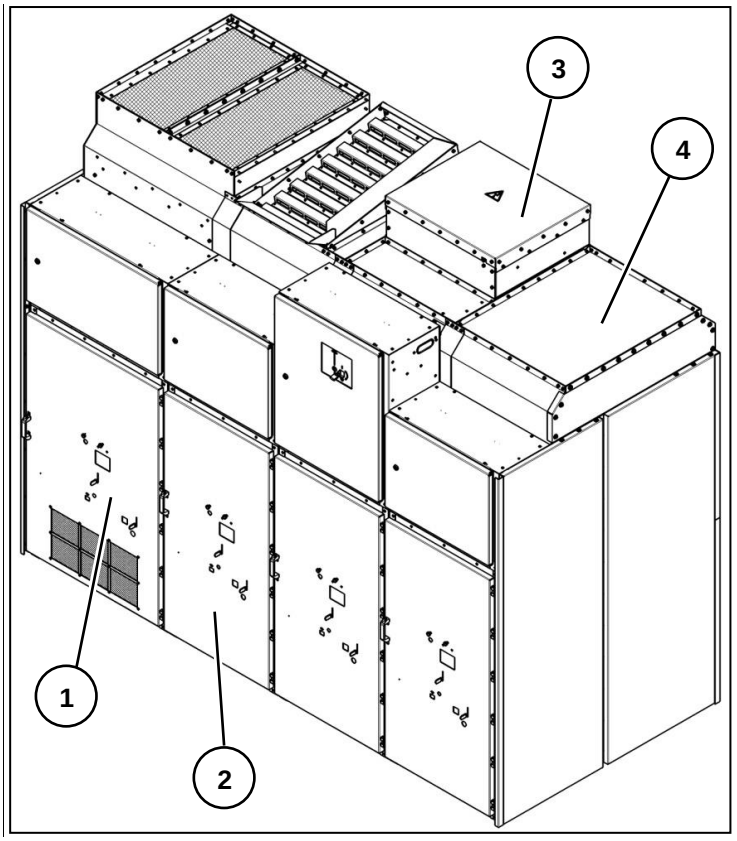


Fig. 41: Example of a switchgear configuration

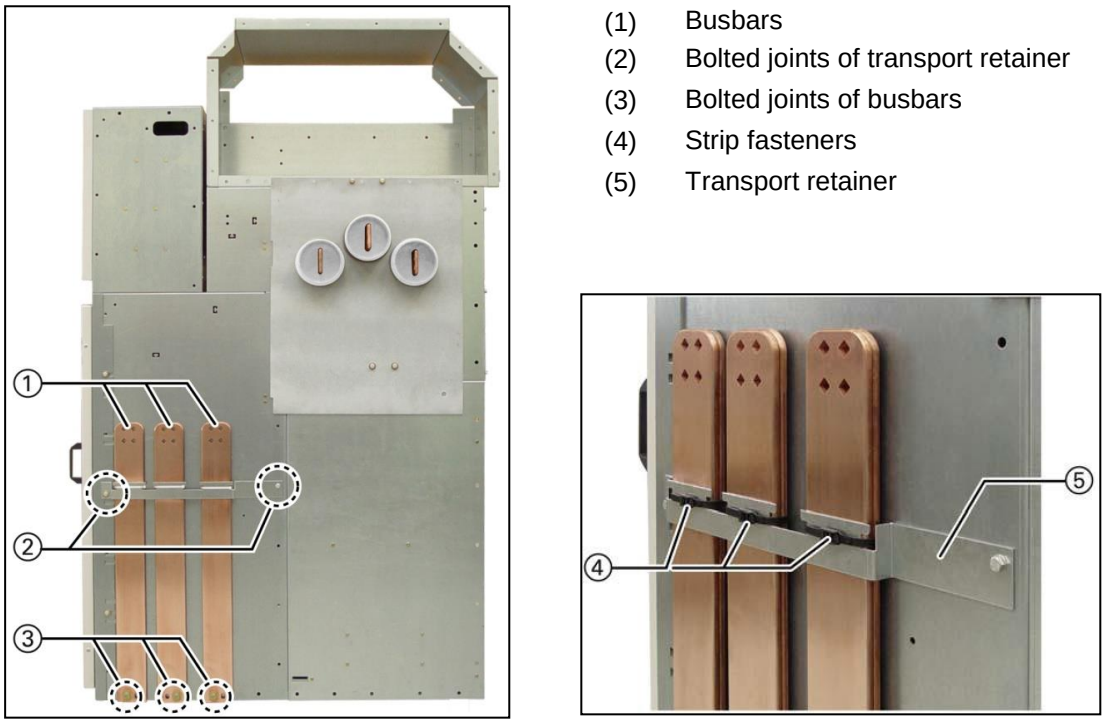
8.3 Interconnecting the panels, preparation

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 busbars
- Assembling and interconnecting the additional compartment to the busbar compartment (optional)
- Assembling and interconnecting the pressure relief duct

8.4 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. 42: Transport fixing of the busbars

⇨ Remove the strip fasteners (4).

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

⇨ Remove transport retainer (5).

⇨ Remove fixing bolts of busbars (3).

⇨ Detach the busbars (1).

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

✓ The busbars are ready for use.

8.5 Installing additional compartment for busbar connection to the top (optional)

The additional compartment to the busbar compartment pre-assembled at the factory is supplied with the associated installation and fixing material and the pressure relief duct separately from the respective panel. The assignment to the panel is done at the place of installation.

HINT

Observe the local spatial conditions such as the dimensions of the switchgear room.

⇨ If possible, install the additional compartment to the busbar compartment for busbar connection to the top on the **individual** panel **before** bringing the panel to its final position according to the room planning.

⇨ If possible, line up the panels individually and install the additional compartment to the busbar compartment before positioning the next panel.

⇨ Perform busbar assembly from the side.

For further information, see information drawings NXAIR M, order number 139-2084.9.

Preparing the panel

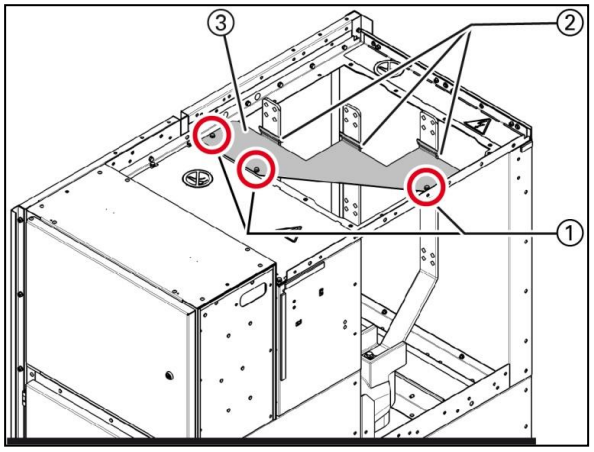


Fig. 43: Busbar system 1250 A

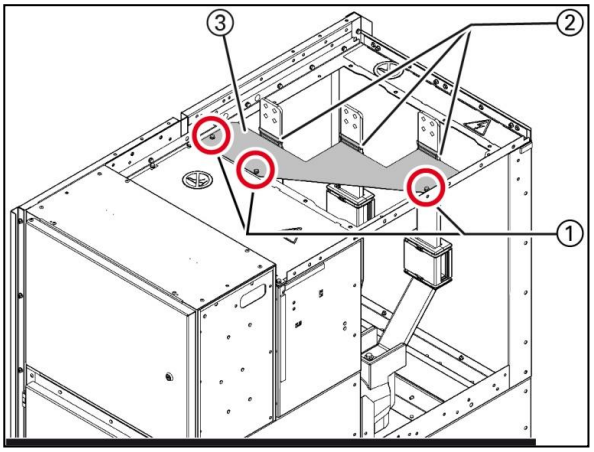


Fig. 44: Busbar system 2500 A

(1) Bolted joints M8x20
(2) Strip fasteners
(3) Transport plate

⇨ Remove and dispose of the 3 bolts M8x20 with contact washers (1).

⇨ Remove and dispose of the 3 strip fasteners (2).

⇨ Remove and dispose of the transport plate (3).

✓ The panel is prepared for the installation of the additional compartment to the busbar compartment.

Preparing the additional compartment to the busbar compartment

(4) Roof of the additional compartment

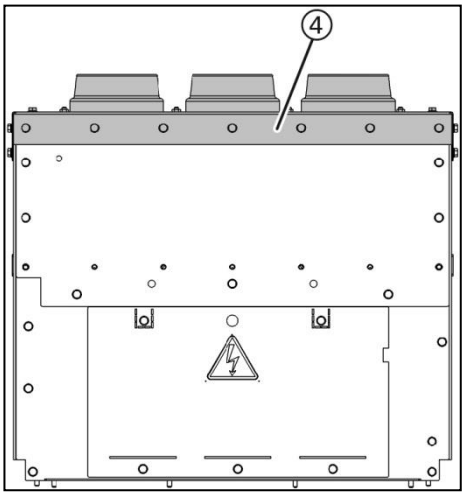


Fig. 45: Additional compartment to busbar compartment, pre-assembled at the factory

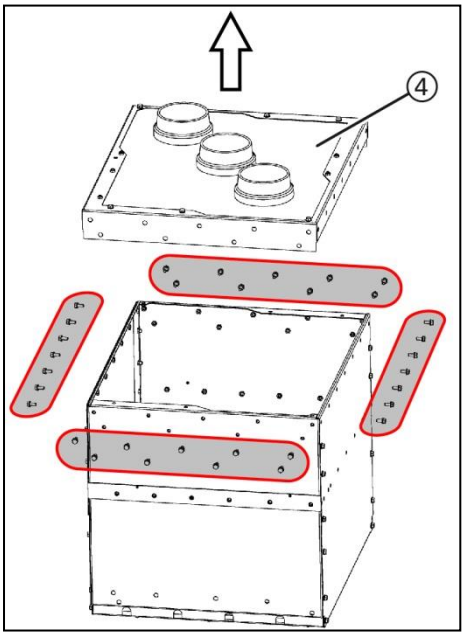


Fig. 46: Removing the roof of the additional compartment

⇨ Remove 32 bolts M8x20 with contact washers all around at the upper part on the sides of the additional compartment, and remove the roof (4) of the additional compartment together with the pre-installed bushings.

⇨ Keep the roof of the additional compartment together with the 32 bolts M8x20 for later re-installation.

✓ The additional compartment to the busbar compartment is prepared for installation.

For busbar system 1250 A

⚠ WARNING

Suspended loads

An additional compartment to the busbar compartment weighs approx. 150 kg, and can endanger people during transport and installation.

⇨ Do not stay under a suspended additional compartment to the busbar compartment!

NOTICE

Hoisting tackle

The use of a hoisting tackle can damage the switchgear and the additional compartment to the busbar compartment.

⇨ When lifting with a crane or similar lifting gear, use a crane crossbar suitable for the weight (approx. 150 kg), and for the panel dimensions.

⇨ Use lashing means such as ropes, chains, heavy weight slings and similar symmetrically to the lifted load and with the same length.

⇨ Pad the lashing means and affected areas of the transport unit accordingly.

Preconditions

- Transport plate removed from the panel
- Roof of the additional compartment to the busbar compartment removed and available
- Installation material available:
  - 3 nos. bushing for 1 no. busbar 80x10 mm each
  - 3 nos. toroidal sealing ring for bushing
  - 3 nos. insulating tube, diameter 125 mm and length 230 mm
  - 2 nos. insulating tube, diameter 125 mm and length 615 mm
  - 3 nos. busbar 80x10x745.5 mm
  - 12 nos. cup head bolt M12x40 with conical spring washer 12 and nut M12
  - Retaining plate for bushings and bolting material
  - Parts of pressure relief duct and bolting material
- Procedure for busbar assembly known acc. to chapter 8.9

HINT

For a better overview, the right side wall at the additional compartment to the busbar compartment is hidden in some of the following illustrations.

⇨ **Do not** remove the right side wall at the additional compartment to the busbar compartment.

Bolting the additional compartment to the busbar compartment together with the panel

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

⇨ Insert the retaining plate for the bushings (5) into the additional compartment to the busbar compartment (4) from above so that the marking hole (7) points to the front of the panel.

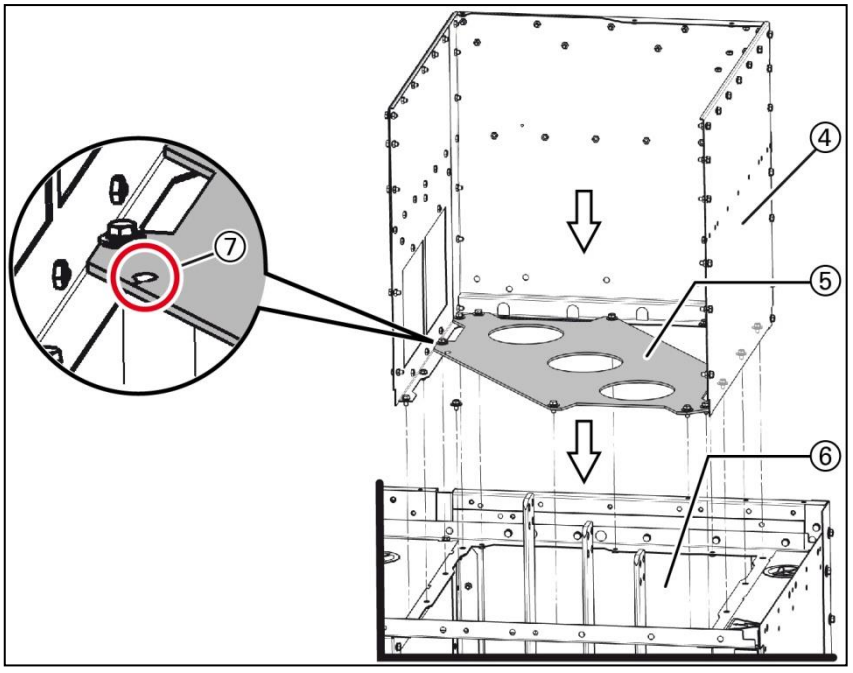


Fig. 47: Inserting the retaining plate for the bushings

⇨ Set the additional compartment with the retaining plate onto the panel over the busbar compartment (6) from above, and bolt it together with the panel at 14 points.

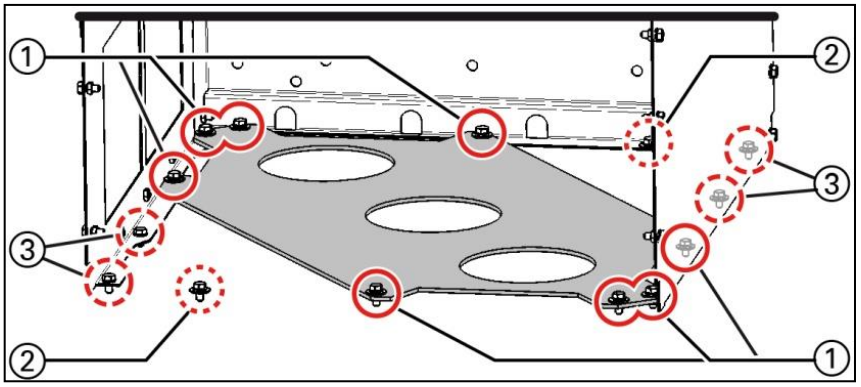


Fig. 48: Bolting the retaining plate and the additional compartment together

(1) Bolt M8x20 with contact washer and plain washer size 8 acc. to ISO 7093

(2) Bolt M8x26 with contact washer and plain washer size 8 acc. to ISO 7093

(3) Bolt M8x16 with contact washer

⇨ When bolting the additional compartment together, observe the different types of bolted joints.

To bolt the additional compartment together with the panel, the following is required:

- 8 bolts M8x20 with contact washers and plain washers (1)
- 2 bolts M8x16 with contact washers and plain washers (2)
- 4 bolts M8x16 with contact washers (3)

Mounting the bushings in the additional compartment

⇨ Push one toroidal sealing ring (2) each over the 3 busbars from above through the opening in the retaining plate.

⇨ Push one bushing (1) each over the busbars from above until the bead at the bushing is completely lying on the retaining plate.

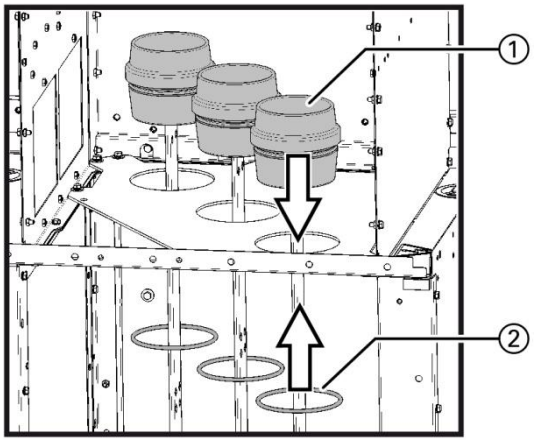


Fig. 49: Inserting the bushings and the sealing rings

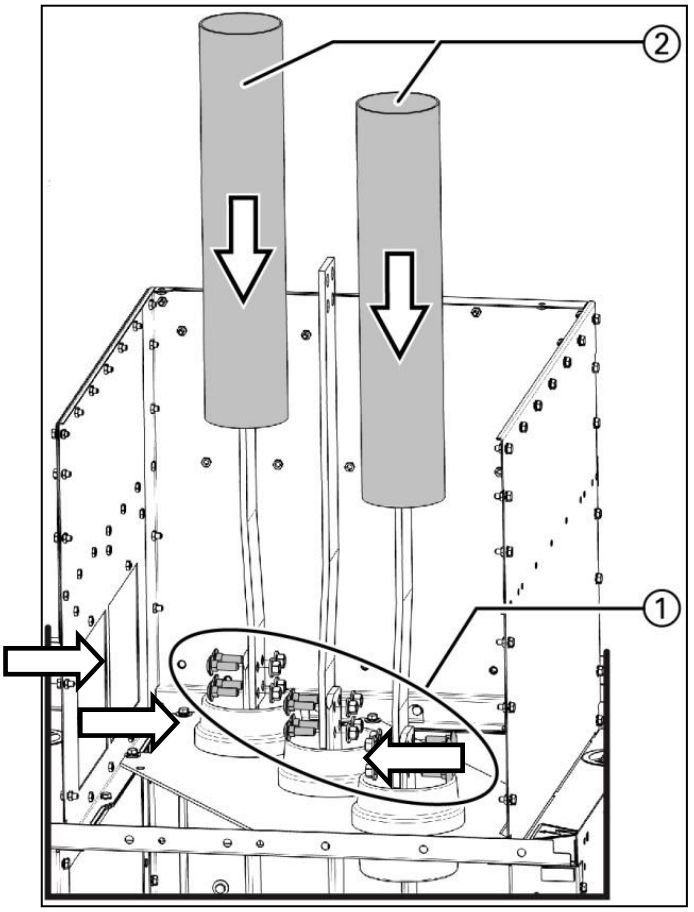
⇨ Hold the bushing and push the toroidal sealing rings (2) over the bushings from below until the respective toroidal sealing ring is lying all around in the groove.

⇨ The toroidal sealing rings fix the bushings in the retaining plate. Verify firm seat of the bushings in the retaining plate.

Fastening the busbars in the additional compartment

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.

⇨ Fasten the 3 busbar units 80x10x745.5 mm to the busbars of the panel using 4 cup head bolts M12x40 with conical spring washers 12 and nuts M12 each (1). Observe the inserting direction of the bolted joint.



Arrowhead indicates the inserting direction of the bolts.

Fig. 50: Fastening and insulating the busbars

⇨ Push an insulating tube 125x615 mm (2) over the external busbars (L1 and L3) from above until the insulating tube is firmly inserted in the bushing mounted in the previous work operation.

⇨ Align the insulating tubes centrally at the top of the busbars.

Fastening the roof at the additional compartment

NOTICE

Foreign objects

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

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

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

⇨ Set the roof (1) of the additional compartment on the additional compartment from above so that the marking hole (3) points to the front of the panel, and fasten laterally all around with 32 bolts M8x20 with contact washers.

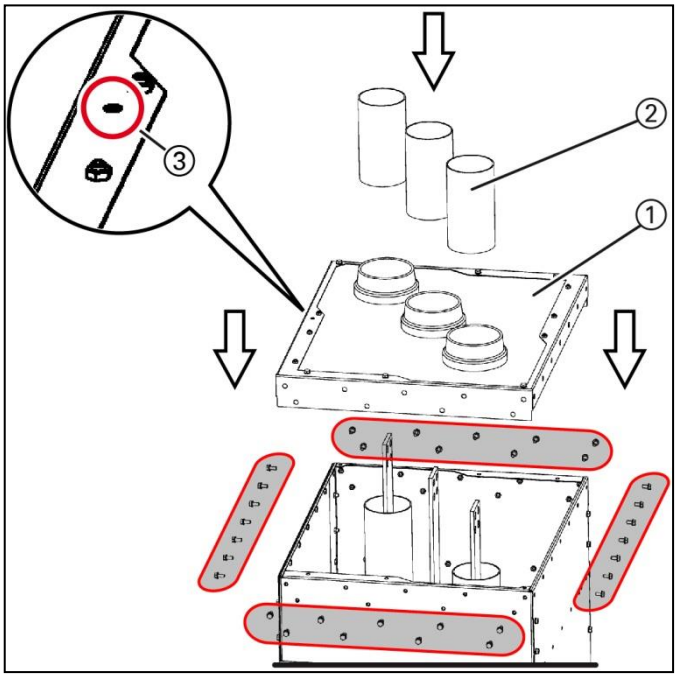


Fig. 51: Fastening the roof of the additional compartment

⇨ Push an insulating tube 125x230 mm (2) over each busbar from above until it is firmly inserted in the pre-assembled bushing.

Fastening the pressure relief duct

On end panel

⇨ Set the pressure relief duct onto the panel, and bolt it together.

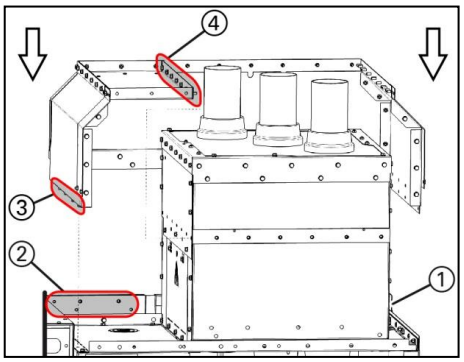


Fig. 52: Bolted joints at the front

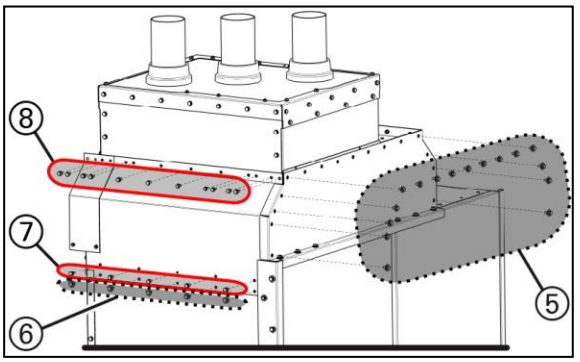


Fig. 53: Bolted joints at the rear and at the end wall, on the left as an example

(1) 2 bolts M8x20 with contact washers (covered)

(2) 6 bolts M8x20 with contact washers

(3) 4 bolts M8x20 with contact washers

(4) 7 bolts M8x20 with contact washers

(5) 22 bolts M8x20 with contact washers and plain washers

(6) 5 bolts M8x20 with contact washers and plain washers

(7) 5 bolts M8x20 with contact washers

(8) 11 bolts M8x20 with contact washers

On intermediate panel

⇨ Set the pressure relief duct onto the panel, and bolt it together.

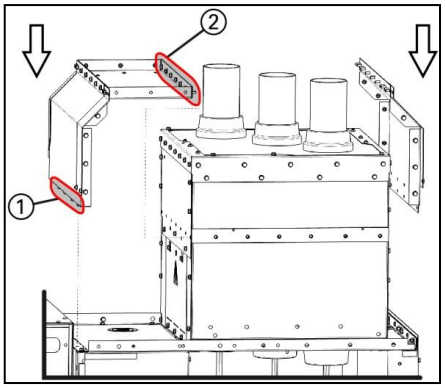


Fig. 54: Bolted joints at the front

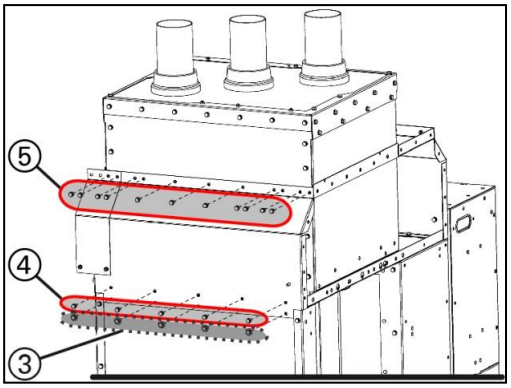


Fig. 55: Bolted joints at the rear

(1) 4 bolts M8x20 with contact washers

(2) 7 bolts M8x20 with contact washers

(3) 5 bolts M8x20 with contact washers and plain washers

(4) 5 bolts M8x20 with contact washers

(5) 11 bolts M8x20 with contact washers

⇨ Check whether all bolting holes of the pressure relief duct are closed with bolts.

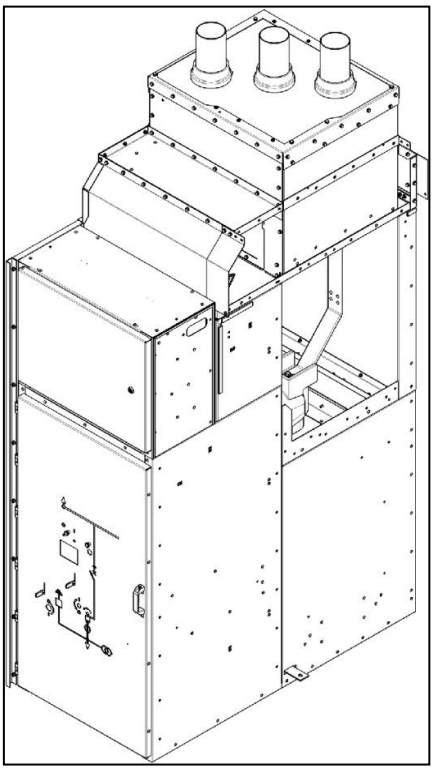


Fig. 56: Mounted additional compartment to busbar compartment,
on an intermediate panel as an example, 1250 A busbar system

✓ The additional compartment to the busbar compartment for busbar connection to the top is completely installed.

For busbar system 2500 A

⚠ WARNING

Suspended loads

An additional compartment to the busbar compartment weighs approx. 150 kg, and can endanger people during transport and installation.

⇨ Do not stay under a suspended additional compartment to the busbar compartment!

NOTICE

Hoisting tackle

The use of a hoisting tackle can damage the switchgear and the additional compartment to the busbar compartment.

⇨ When lifting with a crane or similar lifting gear, use a crane crossbar suitable for the weight (approx. 150 kg), and for the panel dimensions.

⇨ Use lashing means such as ropes, chains, heavy weight slings and similar symmetrically to the lifted load and with the same length.

⇨ Pad the lashing means and affected areas of the transport unit accordingly.

Preconditions

- Transport plate removed from the panel
- Roof of the additional compartment to the busbar compartment removed and available
- Installation material available:
  - 3 nos. bushing for 2 nos. busbar 100x10 mm each
  - 3 nos. toroidal sealing ring for bushing
  - 3 nos. insulating tube, diameter 125 mm and length 230 mm
  - 3 nos. insulating tube, diameter 125 mm and length 615 mm
  - 6 nos. busbar 100x10x745.5 mm
  - 12 nos. cup head bolt M12x55 with conical spring washer and nut
  - Bushing retainer and bolting material
  - Parts of pressure relief duct and bolting material
  - 6 nos. busbar with associated bolting material available from the scope of supply of the panel (as-delivered condition: fixed laterally on the outside of the panel)

- Procedure for busbar assembly known acc. to chapter 8.9

HINT

For a better overview, the right side wall at the additional compartment to the busbar compartment is hidden in some of the following illustrations.

⇨ **Do not** remove the right side wall at the additional compartment to the busbar compartment.

Bolting the additional compartment to the busbar compartment together with the panel

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

⇨ Insert the retaining plate for the bushings (5) into the additional compartment to the busbar compartment (4) from above so that the marking hole (7) points to the front of the panel.

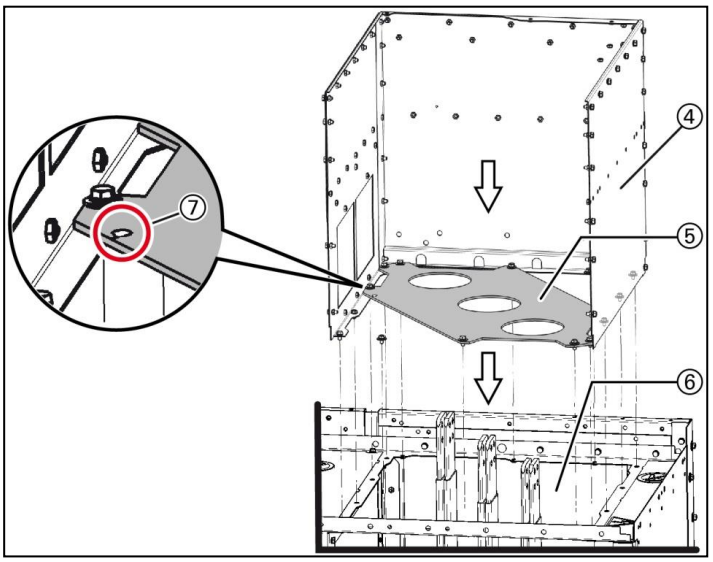


Fig. 57: Inserting the retaining plate for the bushings

⇨ Set the additional compartment with the retaining plate onto the panel over the busbar compartment (6) from above, and bolt it together with the panel at 14 points.

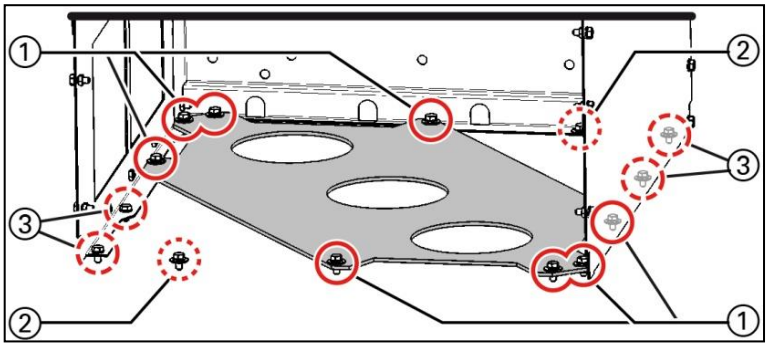


Fig. 58: Bolting the retaining plate and the additional compartment together

(1) Bolt M8x20 with contact washer and flat washer size 8 acc. to ISO 7093

(2) Bolt M8x26 with contact washer and flat washer size 8 acc. to ISO 7093

(3) Bolt M8x16 with contact washer

⇨ When bolting the additional compartment together, observe the different types of bolted joints.

To bolt the additional compartment together with the panel, the following is required:

- 8 bolts M8x20 with contact washers and plain washers (1)
- 2 bolts M8x16 with contact washers and plain washers (2)
- 4 bolts M8x16 with contact washers (3)

Mounting the bushings in the additional compartment

⇨ Push one toroidal sealing ring (2) each over the 3 busbars from above through the opening in the retaining plate.

⇨ Push one bushing (1) each over the busbars from above until the bead at the bushing is completely lying on the retaining plate.

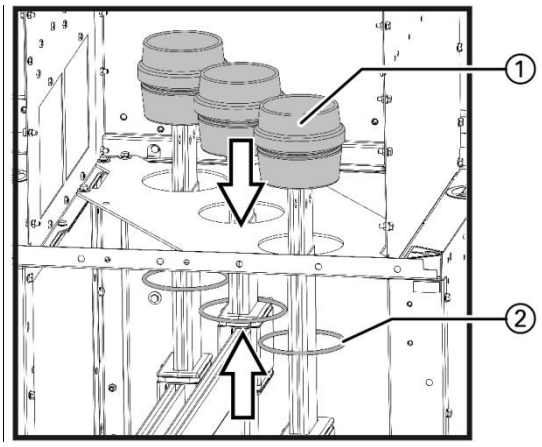


Fig. 59: Inserting the bushings and the sealing rings

⇨ Hold the bushing and push the toroidal sealing rings (2) over the bushings from below until the respective toroidal sealing ring is lying all around in the groove.

⇨ The toroidal sealing rings fix the bushings in the retaining plate. Verify firm seat of the bushings in the retaining plate.

Fastening the busbars in the additional compartment

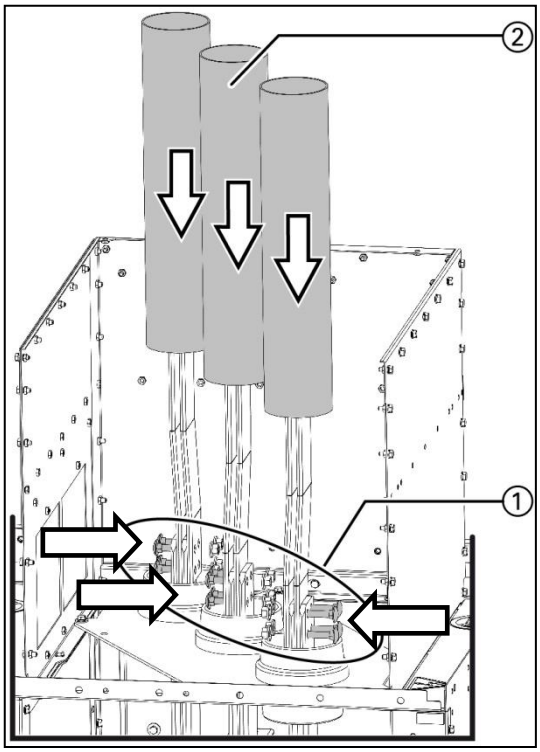
NOTICE

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.

⇨ Fasten the 6 busbar units 100x10x745.5 mm (2 nos. per phase) using 4 nos. cup head bolts M12x55 with conical spring washers 12 and nuts M12 each (1). Observe the inserting direction of the bolted joint.



Arrowhead indicates the inserting direction of the bolts.

Fig. 60: Fastening and insulating the busbars

⇨ Push an insulating tube 125x615 mm (2) each over the busbars from above until the insulating tube is firmly inserted in the bushing mounted in the previous work operation.

⇨ Align the insulating tubes centrally at the top of the busbars.

Fastening the roof at the additional compartment

NOTICE

Foreign objects

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

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

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

⇨ Set the roof (1) of the additional compartment on the additional compartment from above so that the marking hole (3) points to the front of the panel, and fasten laterally all around with 32 bolt-and-washer assemblies M8x20.

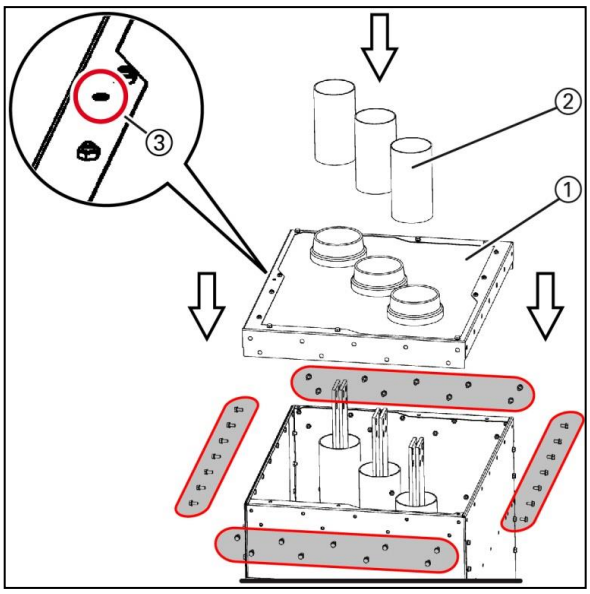


Fig. 61: Fastening the roof of the additional compartment

⇨ Push an insulating tube 125x230 mm (2) over each busbar from above until it is firmly inserted in the pre-assembled bushing.

Fastening the pressure relief duct

On end panel

⇨ Set the pressure relief duct onto the panel, and bolt it together.

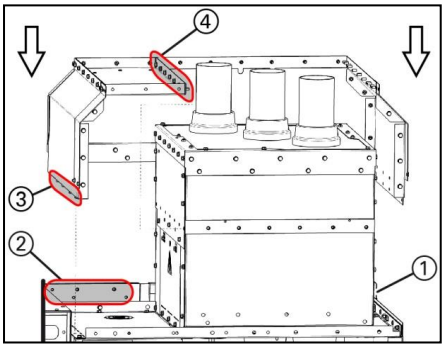


Fig. 62: Bolted joints at the front

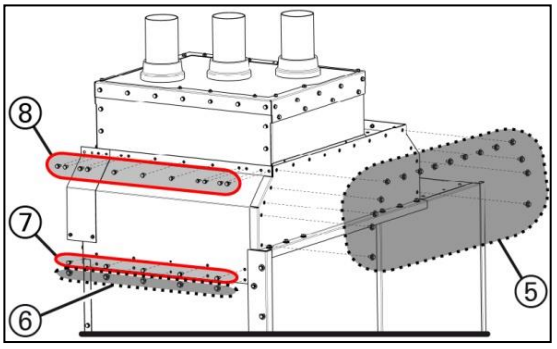


Fig. 63: Bolted joints at the rear and at the end wall, on the left as an example

(1) 2 bolts M8x20 with contact washers (covered)

(2) 6 bolts M8x20 with contact washers

(3) 4 bolts M8x20 with contact washers

(4) 7 bolts M8x20 with contact washers

(5) 22 bolts M8x20 with contact washers and plain washers

(6) 5 bolts M8x20 with contact washers and plain washers

(7) 5 bolts M8x20 with contact washers

(8) 11 bolts M8x20 with contact washers

On intermediate panel

⇨ Set the pressure relief duct onto the panel, and bolt it together.

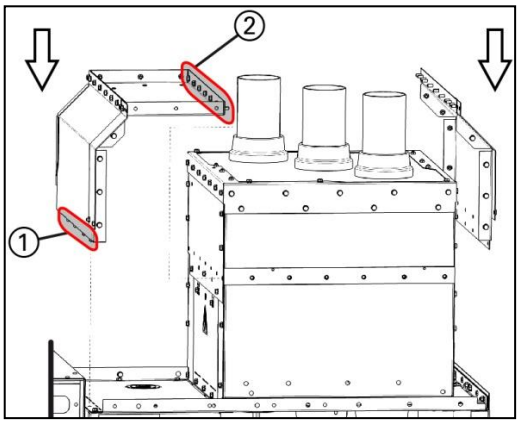


Fig. 64: Bolted joints at the front

(1) 4 bolts M8x20 with contact washers

(2) 7 bolts M8x20 with contact washers

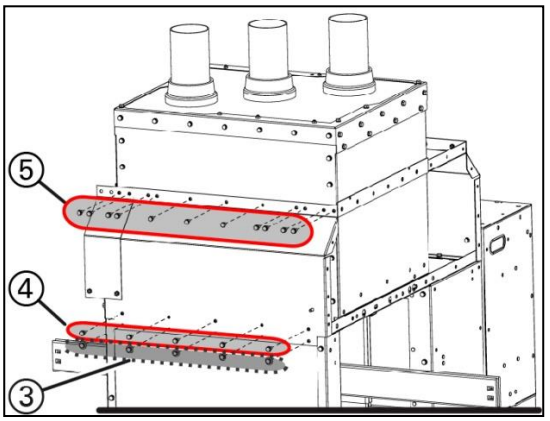


Fig. 65: Bolted joints at the rear

(3) 5 bolts M8x20 with contact washers and flat washers

(4) 5 bolts M8x20 with contact washers

(5) 11 bolts M8x20 with contact washers

⇨ Check whether all bolting holes of the pressure relief duct are closed with bolts.

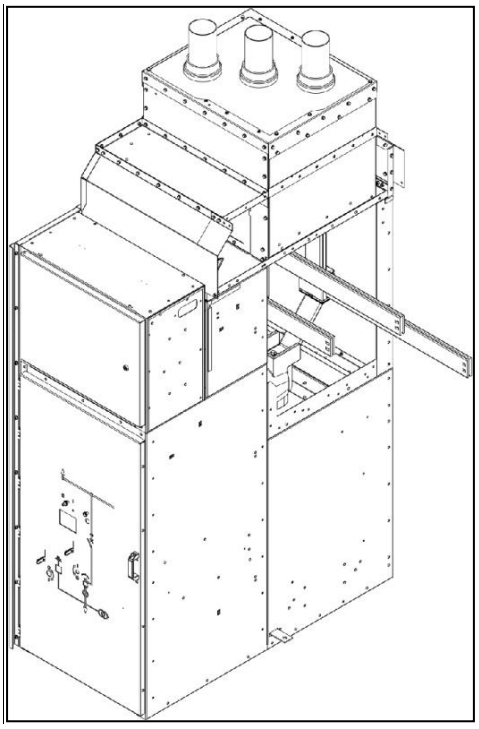


Fig. 66: Mounted additional compartment to busbar compartment, on an intermediate panel as an example, 2500 A busbar system

✓ The additional compartment to the busbar compartment for busbar connection to the top is completely installed.

8.6 Installing additional compartment with voltage transformers (optional)

The additional compartment to the busbar compartment pre-assembled at the factory is supplied with the associated installation and fixing material and the pressure relief duct separately from the respective panel. The assignment to the panel is done at the place of installation.

Note: In the version with voltage transformers pre-assembled at the factory, the additional compartment to the busbar compartment does not have any bushings in the roof.

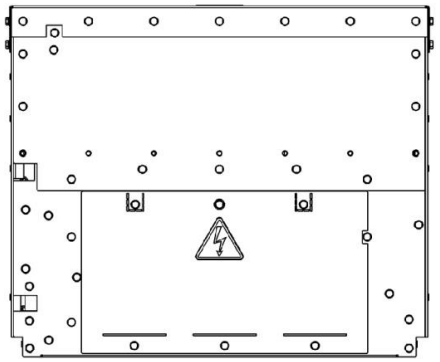


Fig. 67: Additional compartment to busbar compartment, pre-assembled at the factory

⚠ WARNING

Suspended loads

An additional compartment to the busbar compartment weighs approx. 150 kg, and can endanger people during transport and installation.

⇨ Do not stay under a suspended additional compartment to the busbar compartment!

NOTICE

Hoisting tackle

The use of a hoisting tackle can damage the switchgear and the additional compartment to the busbar compartment.

⇨ When lifting with a crane or similar lifting gear, use a crane crossbar suitable for the weight (approx. 150 kg), and for the panel dimensions.

⇨ Use lashing means such as ropes, chains, heavy weight slings and similar symmetrically to the lifted load and with the same length.

⇨ Pad the lashing means and affected areas of the transport unit accordingly.

HINT

Observe the local spatial conditions such as the dimensions of the switchgear room.

⇨ If possible, install the additional compartment to the busbar compartment with the busbar voltage transformers pre-assembled at the factory on the **individual** panel **before** bringing the panel to its final position according to the room planning.

⇨ If possible, line up the panels individually and install the additional compartment to the busbar compartment before positioning the next panel.

⇨ Perform busbar assembly from the side.

HINT

Depending on the local conditions, the weight of approx. 150 kg of the additional compartment to the busbar compartment can be a handicap during transport and installation, for example, when the additional compartment is set down on the panel in a switchgear room with small dimensions. In such exceptional cases, removing the voltage transformers pre-assembled at the factory from the additional compartment leads to manageable weights.
For safe re-installation, document the removal of the voltage transformers completely step by step, e.g. by photos and notes!

⇨ Remove the voltage transformers one after the other from the additional compartment to the busbar compartment.

⇨ Bolt the additional compartment to the busbar compartment together with the panel (see chapter 8.5).

⇨ Re-install the voltage transformers one after the other into the additional compartment to the busbar compartment.

Preconditions

- Additional compartment to busbar compartment available with voltage transformers
- Installation and fixing material available

For further information, see information drawings NXAIR M, order number 139-2084.9.

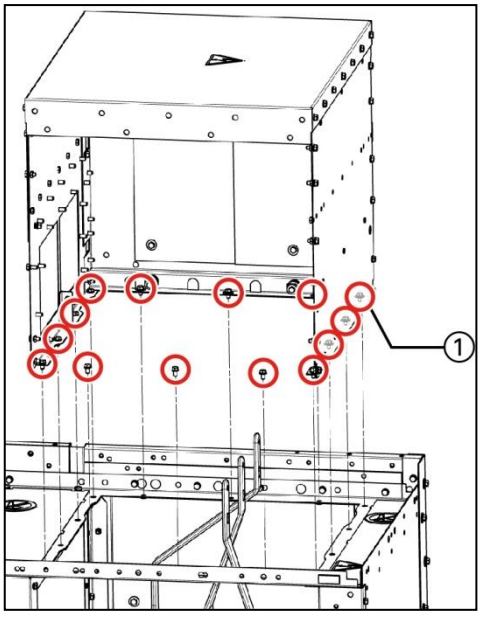
HINT

For a better overview, the right side wall at the additional compartment to the busbar compartment is hidden in some of the following illustrations.

⇨ **Do not** remove the right side wall at the additional compartment to the busbar compartment.

Bolting the additional compartment to the busbar compartment together with the panel

⇨ Set the additional compartment onto the panel over the busbar compartment from above, and bolt it together with the panel at 14 points.



(1) Bolts M8x16 with contact washers

Fig. 68: Bolting the additional compartment together with the panel

⇨ Undo 4 bolts M8x20 with contact washers at the additional compartment to the busbar compartment, and remove the cover (1).

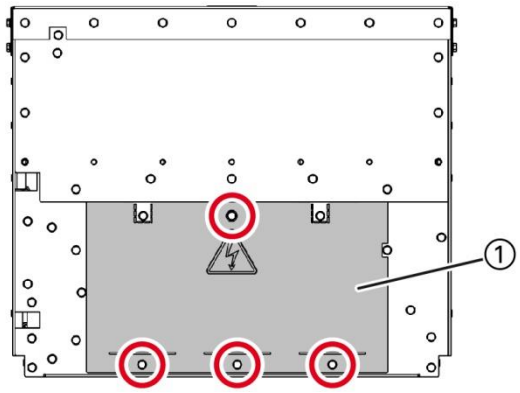


Fig. 69: Removing the cover at the front of the additional compartment

Routing the low-voltage cables

HINT

If the switchgear room is sufficiently high, the roof of the additional compartment to the busbar compartment can also be removed for the subsequent assembly operation.

⇨ Remove the roof of the additional compartment to the busbar compartment according to chapter 8.5, and keep it available for re-installation.

⇨ After complete installation of the additional compartment to the busbar compartment on the switchgear panel, re-fasten the roof.

The low-voltage cables between the additional compartment to the busbar compartment and the low-voltage compartment are routed in a flexible steel tube. This flexible steel tube is pre-assembled in the additional compartment to the busbar compartment at the factory, and laid through the pressure relief duct to the low-voltage compartment on site.

⇨ Route the flexible steel tube through the opening (1) out of the additional compartment to the busbar compartment, and prepare it for laying into the low-voltage compartment.

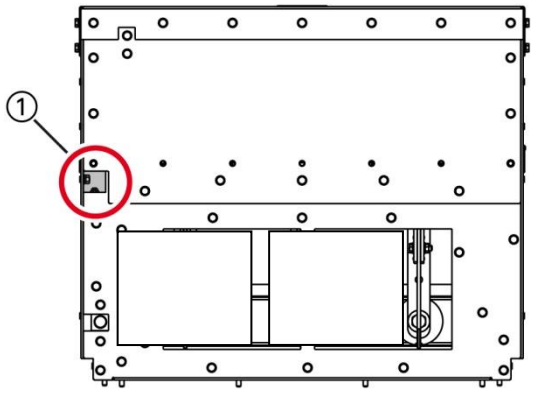


Fig. 70: Routing the low-voltage cables out

Fastening the insulating plates in operational position
For the transport, the lateral and internal 4 insulating plates are fastened inside the additional compartment to the busbar compartment. The insulating plates are mounted in operational position on site.

For the transport, the bag unit with the installation and fixing material (order number 139-1618.3) is located inside the additional compartment to the busbar compartment at the central post insulator.

HINT

For a better overview, the right side wall at the additional compartment to the busbar compartment is hidden in some of the following illustrations.

⇨ **Do not** remove the right side wall at the additional compartment to the busbar compartment.

NOTICE

Incorrect bolted joint

The insulating plates are designed for plastic bolted joints.

⇨ Use only bolts M8x16 made of plastic and washers made of plastic for bolting the insulating plates together.

NOTICE

Excessive torque

Observe the tightening torques at the bolted joints of the insulating plates.

⇨ Applicable tightening torques for the bolted joints of the insulating plates in the additional compartment to the busbar compartment:

- Tightening torque: **8 Nm**
- Control tightening torque: **6 Nm**

Fastening the lateral insulating plate in operational position

⇨ Remove 2 plastic bolts M8x20 (1) inside the additional compartment to the busbar compartment, and dispose of properly.

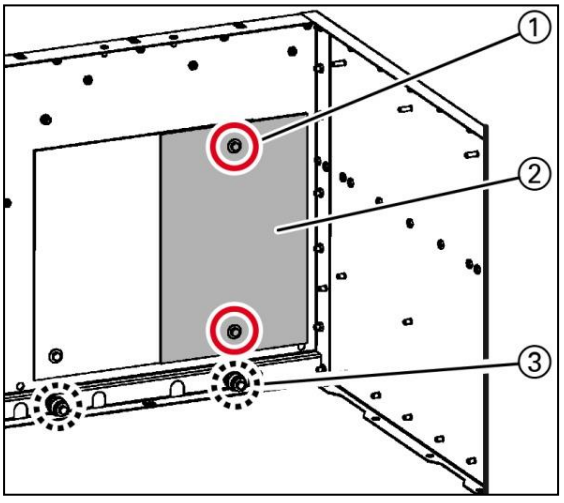


Fig. 71: Bolted joints of lateral insulating plate, left side

⇨ Remove the lateral insulating plate (2).

⇨ Execute 2 bolted joints (1) with plastic bolts M8x16 and flat plastic washers size 8 acc. to DIN 34816 as shown in fig. 69.

⇨ Remove 2 plastic bolts M8x16 with flat plastic washers size 8 acc. to DIN 34816 (3), and use them to fasten the lateral insulating plate in operational position.

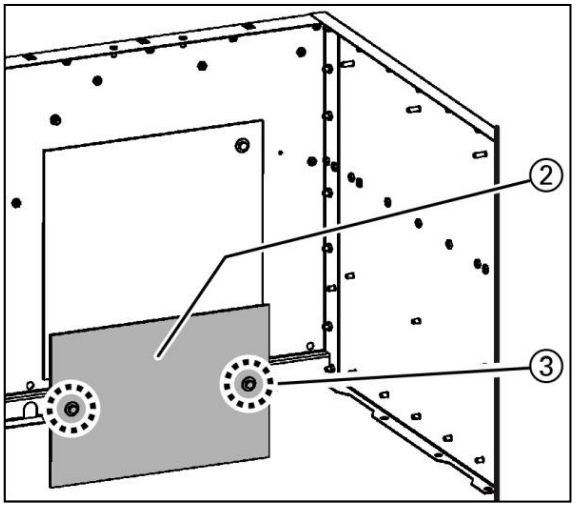


Fig. 72: Lateral insulating plate fastened in operational position, left side

⇨ Fasten the lateral insulating plate on the right inner side of the additional compartment to the busbar compartment in operational position in the same way as described above for the left side.

✓ The lateral insulating plates in the additional compartment to the busbar compartment are mounted in operational position.

Fastening the phase separation plates in operational position

⇨ In the additional compartment to the busbar compartment, remove 2 pairs of plastic bolted joints M8 (2) per phase separation plate (1) each, and keep them available.

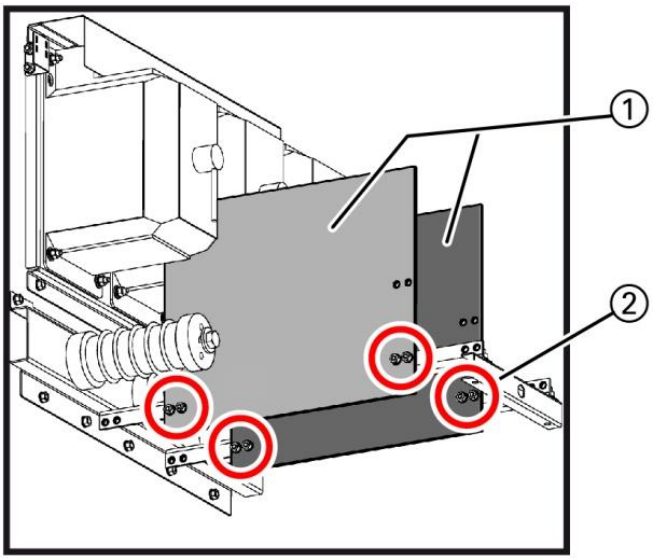


Fig. 73: Bolted joints of phase separation plates

⇨ Remove the phase separation plates (1) and re-fasten them in a lower position using the previously removed plastic bolted joints M8 (2).

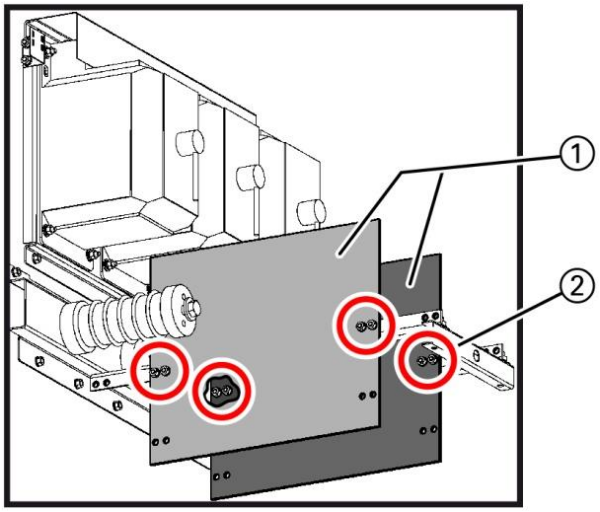


Fig. 74: Phase separation plates fastened in operational position

✓ The phase separation plates are mounted in operational position in the additional compartment to the busbar compartment.

Connecting the voltage transformers in the additional compartment

⇨ Underneath each voltage transformer (6), bolt (4) the busbars (3) together with the post insulators (2).

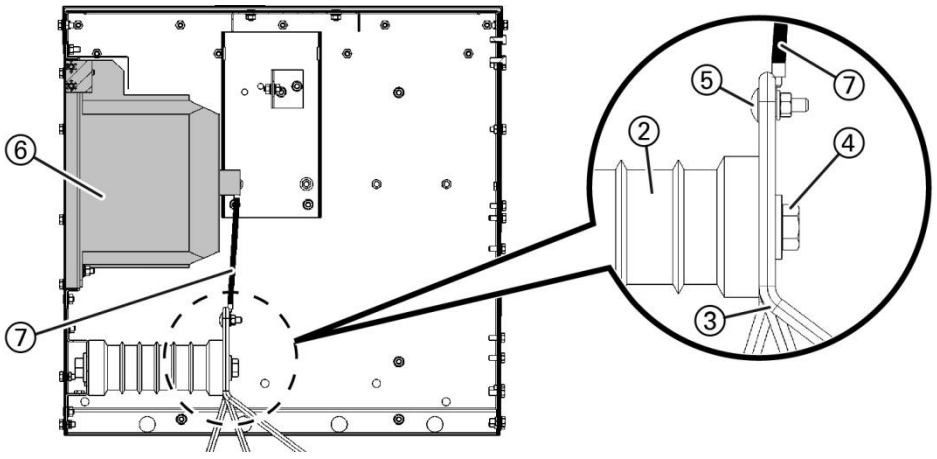


Fig. 75: Connection of voltage transformer

(2) Post insulator
(3) Busbar
(4) Bolt M16x45 with conical spring washer 16
(5) Cup head bolt M8x30
(6) Voltage transformer
(7) Connecting cable to the voltage transformer, with cable lug for bolted joint (5)

⇨ Attach one cable lug Ø 8 from the flat bag each at the end of the respective connecting cable to the three voltage transformers (7).

NOTICE

Flashovers

The connecting cables to the voltage transformers must be routed straight and slightly tightened between the voltage transformer housing and the post insulators.

⇨ Fasten the connecting cables to the voltage transformers with slight tension. The lateral deflection of a connecting cable must be ≤ 3 mm.

⇨ Observe the inserting direction of the bolted joint at the post insulator.

⇨ Check the connection points for the bolted joint (5) at the busbars, brush if necessary, and apply a thin grease film of Vaseline.

⇨ Bolt the connecting cables to the voltage transformers onto the busbars with slight tension (5).

⇨ Check the dimensions:

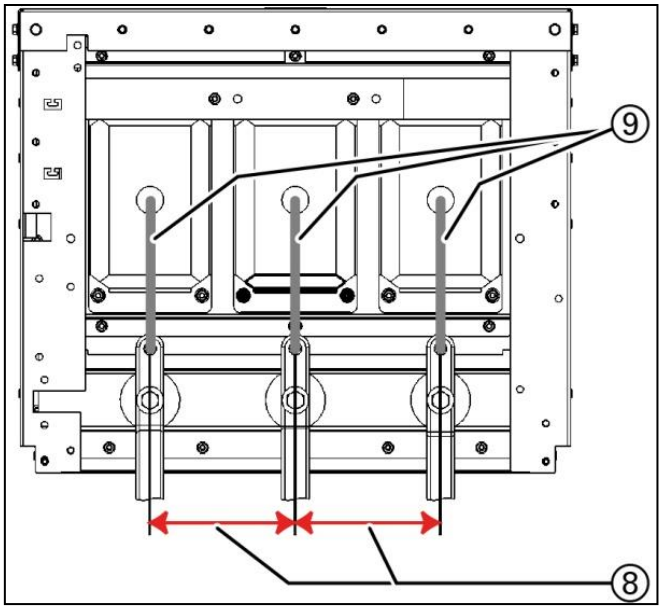


Fig. 76: Connecting cable to the voltage transformers

(8)	Center-to-center distance between adjacent post insulators:	210 mm
(9)	Lateral deflection of the connecting cables:	≤ 3 mm

NOTICE

Foreign objects

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

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

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

⇨ Re-fasten the cover (1) at the additional compartment to the busbar compartment using 4 nos. bolts M8x20 plus contact washers.

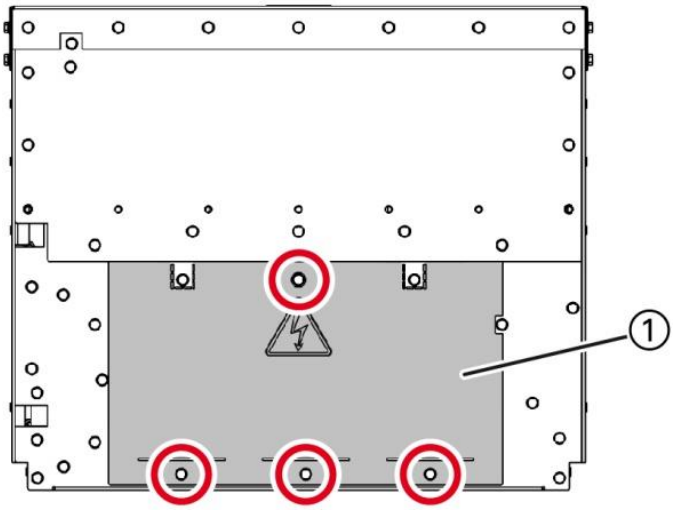


Fig. 77: Fastening the cover at the front of the additional compartment

If the roof of the additional compartment to the busbar compartment was removed due to sufficient height of the switchgear room:

⇨ Re-fasten the roof of the additional compartment to the busbar compartment, see page 48: Fastening the roof at the additional compartment.

Installing the pressure relief duct

⇨ Install the pressure relief duct according to the panel version, see page 49: Fastening the pressure relief duct.

Low-voltage cables from the additional compartment to the low-voltage compartment

⇨ Lay the flexible steel tube inside the pressure relief duct, and fasten with 2 strip fasteners (2).

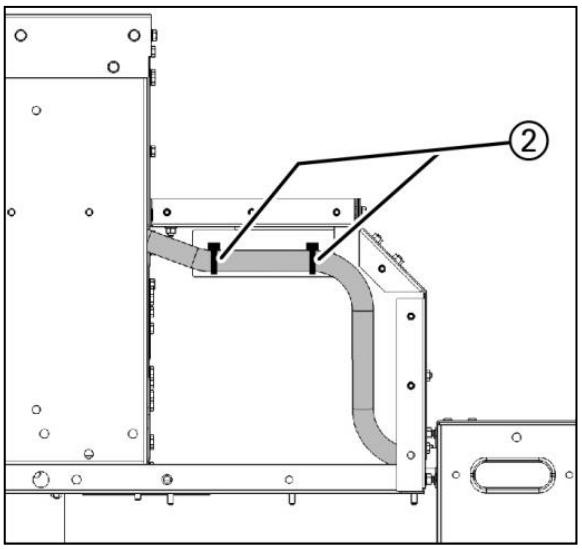


Fig. 78: Low-voltage cables in the pressure relief duct

⇨ Undo the bolted joints of the sealing plates (3) and (4), and lay the flexible steel tube into the low-voltage compartment.

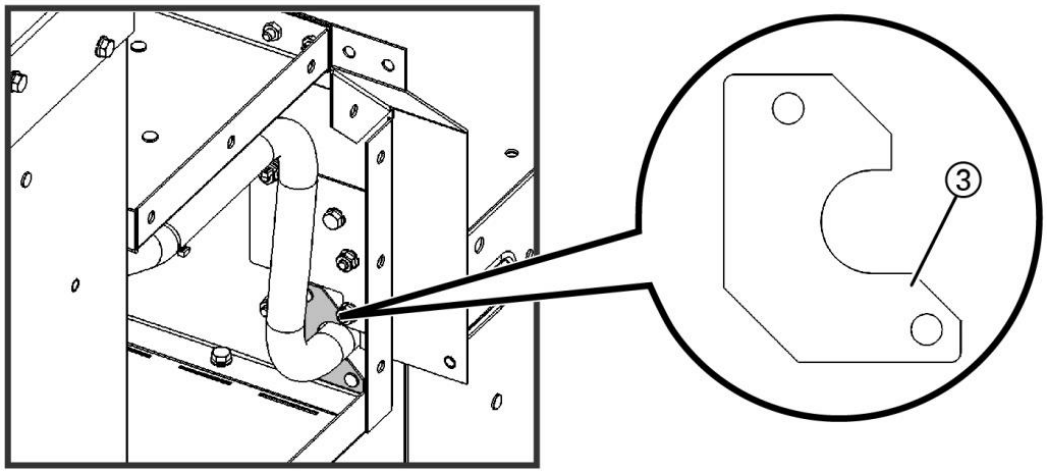


Fig. 79: Sealing plate in the pressure relief duct

⇨ Close the entry opening for the flexible steel tube into the low-voltage compartment by adjusting the sealing plate (3).

⇨ Re-tighten the bolted joints of the sealing plate (3).

⇨ Re-tighten the bolted joints of the sealing plate (4) at the low-voltage compartment.

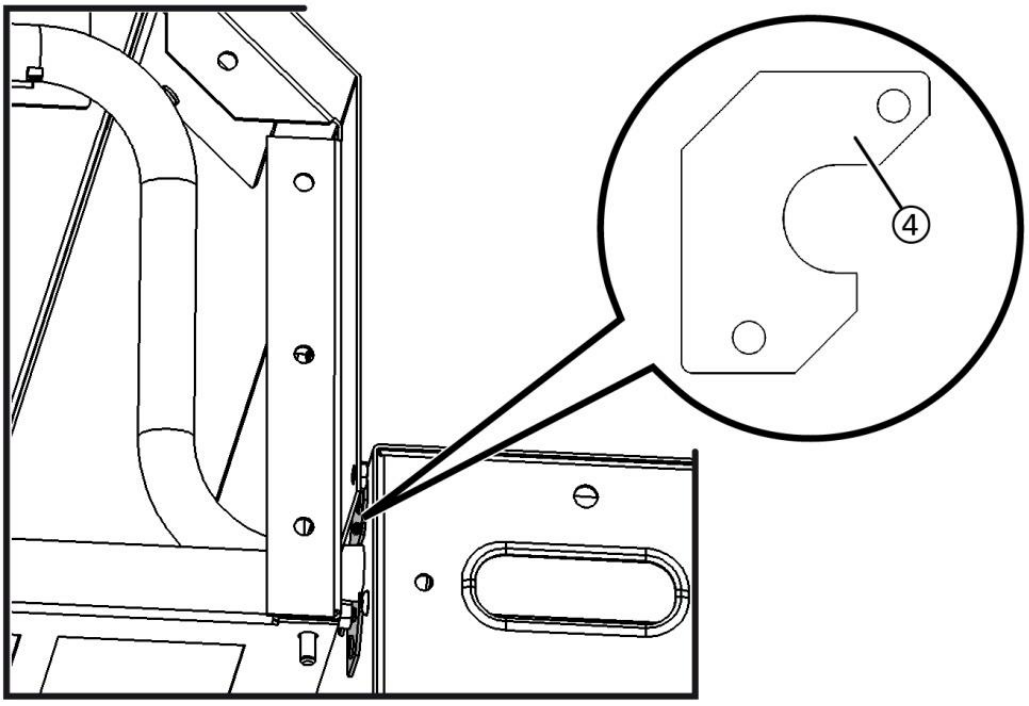


Fig. 80: Sealing plate at the low-voltage compartment

⇨ Close the entry opening for the flexible steel tube into the low-voltage compartment by adjusting the sealing plate (4).

⇨ Re-tighten the bolted joints of the sealing plate (4).

✓ The additional compartment to the busbar compartment with voltage transformers is completely mounted.

8.7 Installing additional compartment with busbar earthing switch (optional)

The additional compartment to the busbar compartment pre-assembled at the factory is supplied with the associated installation and fixing material and the pressure relief duct separately from the respective panel. The assignment to the panel is done at the place of installation.

In the version with busbar earthing switch pre-assembled at the factory, the additional compartment to the busbar compartment does not have any bushings in the roof.

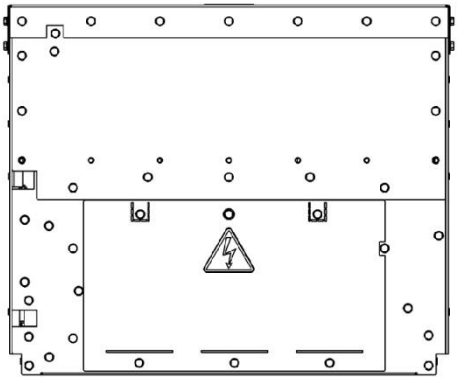


Fig. 81: Additional compartment to busbar compartment, pre-assembled at the factory

NOTICE

Damage to the installed components

Parts of the busbar earthing switch are bolted together with the roof of the additional compartment to the busbar compartment.

⇨ **Do not** undo or remove any bolted joint at the roof of the additional compartment to the busbar compartment.

⇨ **Do not** try to remove the roof of the additional compartment to the busbar compartment.

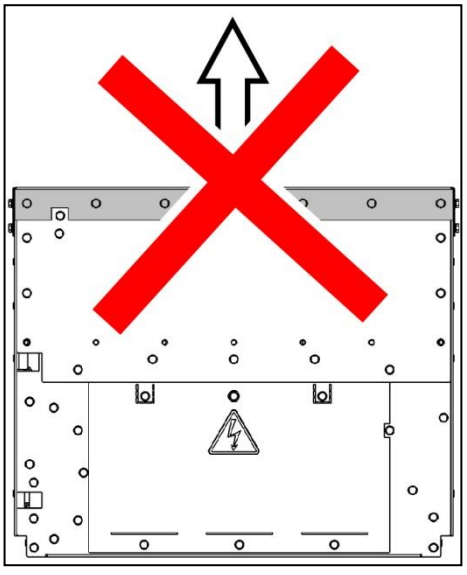


Fig. 82: Do not remove the roof of the additional compartment to the busbar compartment

In delivery condition, the spring of the busbar earthing switch in the additional compartment to the busbar compartment is charged ready for operation. To prevent the earthing switch blades from turning by approx. 90°, the earthing switch blades of the busbar earthing switch are secured mechanically at the central earthing switch blade by means of a clip.

⚠ WARNING

High speed moving parts

The sudden rotation of the earthing switch blades inside the withdrawable part can cause injuries by getting squeezed, caught or cut. In delivery condition, the earthing switch blades of the busbar earthing switch are secured mechanically at the central earthing switch blade by means of a clip.

⇨ **Do not** undo and remove the clip **before completing** the installation of the additional compartment to the busbar compartment with busbar earthing switch.

⇨ If the clip is missing:

- Inform the regional Siemens representative.
- Stop the installation work at the additional compartment to the busbar compartment.

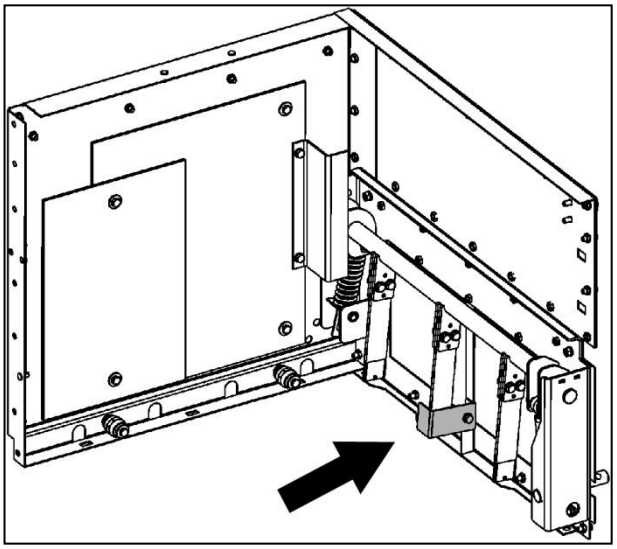


Fig. 83: Position of the clip at the central earthing switch blade
(virtual view into the additional compartment to the busbar compartment)

Visual inspection of the clip
Good view onto the clip at the central earthing switch blade:

- From below into the additional compartment to the busbar compartment

  or

- From the front with removed cover (1)

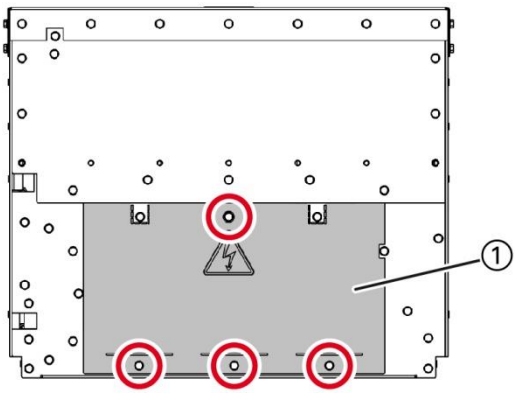


Fig. 84: Cover at the front of the additional compartment

⚠ WARNING

Suspended loads

An additional compartment to the busbar compartment weighs approx. 150 kg, and can endanger people during transport and installation.

⇨ Do not stay under a suspended additional compartment to the busbar compartment!

NOTICE

Hoisting tackle

The use of a hoisting tackle can damage the switchgear and the additional compartment to the busbar compartment.

⇨ When lifting with a crane or similar lifting gear, use a crane crossbar suitable for the weight (approx. 150 kg), and for the panel dimensions.

⇨ Use lashing means such as ropes, chains, heavy weight slings and similar symmetrically to the lifted load and with the same length.

⇨ Pad the lashing means and affected areas of the transport unit accordingly.

HINT

Observe the local spatial conditions such as the dimensions of the switchgear room.

⇨ If possible, install the additional compartment to the busbar compartment with the busbar earthing switch pre-assembled at the factory on the **individual** panel **before** bringing the panel to its final position according to the room planning.

⇨ If possible, line up the panels individually and install the additional compartment to the busbar compartment before positioning the next panel.

⇨ Perform busbar assembly from the side.

Preconditions

- Additional compartment to busbar compartment with busbar earthing switch available
- Installation and fixing material available

For further information, see information drawings NXAIR M, order number 139-2084.9.

HINT

For a better overview, the right side wall at the additional compartment to the busbar compartment is hidden in some of the following illustrations.

⇨ **Do not** remove the right side wall at the additional compartment to the busbar compartment.

Bolting the additional compartment to the busbar compartment together with the panel

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

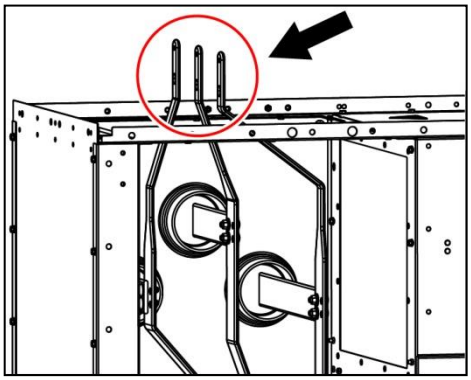
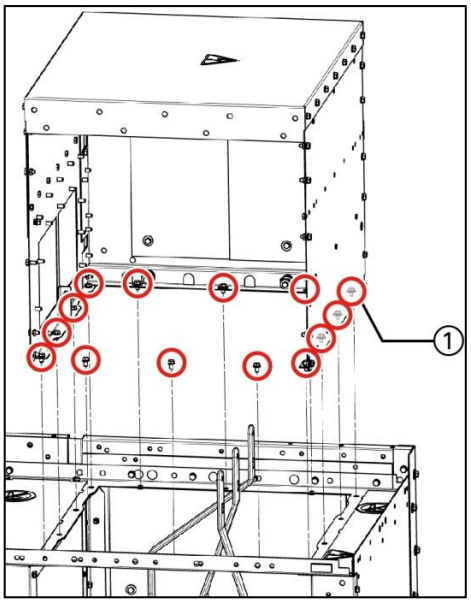


Fig. 85: Contact surfaces of busbars

⇨ Set the additional compartment onto the panel over the busbar compartment from above, and bolt it together with the panel at 14 points.



(1) Bolts M8x16
with contact washers

Fig. 86: Bolting the additional compartment together with the panel

⇨ Undo 4 bolts M8x20 with contact washers at the additional compartment to the busbar compartment, and remove the cover (1).

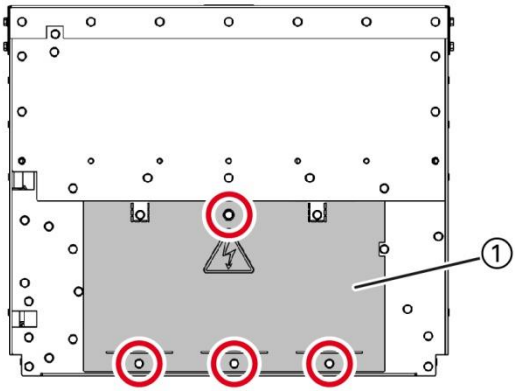


Fig. 87: Removing the cover at the front of the additional compartment

⚠ WARNING

High speed moving parts

The sudden rotation of the earthing switch blades inside the withdrawable part can cause injuries by getting squeezed, caught or cut. In delivery condition, the earthing switch blades of the busbar earthing switch are secured mechanically at the central earthing switch blade by means of a clip.

⇨ **Do not** undo and remove the clip **before completing** the installation of the additional compartment to the busbar compartment with busbar earthing switch.

⇨ If the clip is missing:

- Inform the regional Siemens representative.
- Stop the installation work at the additional compartment to the busbar compartment.

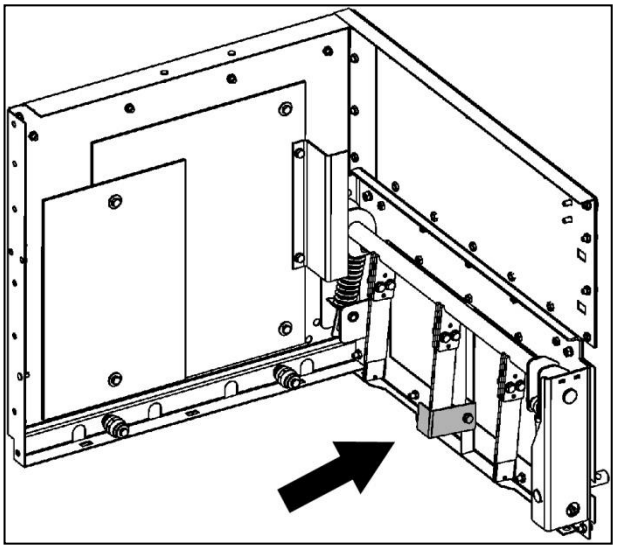


Fig. 88: Position of the clip at the central earthing switch blade
(virtual view into the additional compartment to the busbar compartment)

Routing the low-voltage cables

The low-voltage cables between the additional compartment to the busbar compartment and the low-voltage compartment are routed in a flexible steel tube. This flexible steel tube is pre-assembled in the additional compartment to the busbar compartment at the factory, and laid through the pressure relief duct to the low-voltage compartment on site.

⇨ The flexible steel tube is routed out of the additional compartment to the busbar compartment through the opening (1) at the factory.

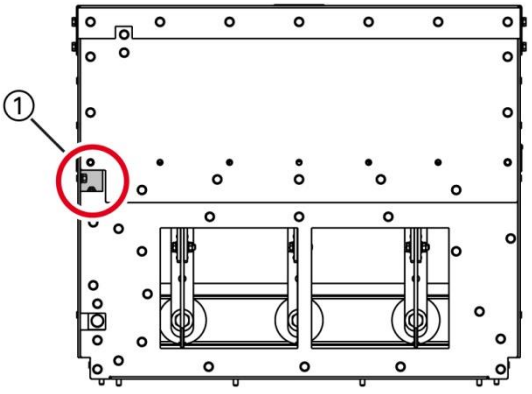


Fig. 89: Removing the cover at the front of the additional compartment

Connecting the connection bars

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.

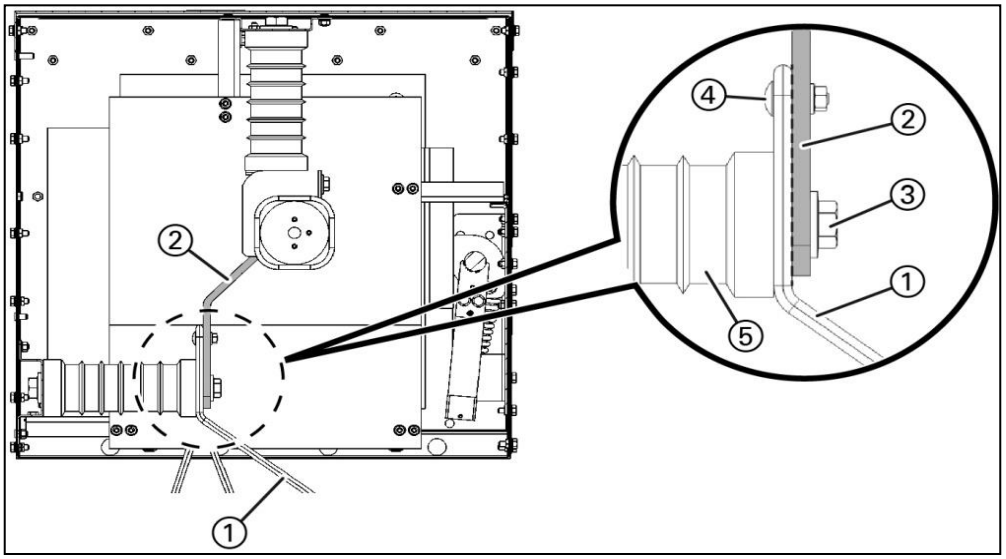


Fig. 90: Connection of busbar earthing switch

(1) Connection bar from the busbar compartment
(2) Connection bar at the busbar earthing switch
(3) Bolt M16x45 with conical spring washer 16
(4) Cup head bolt M8x30 with conical spring washer 8 and nut M8
(5) Post insulator

⇨ Bolt the 3 connection bars from the busbar compartment (1) together with the connection bars at the busbar earthing switch (2).

Fastening the insulating plates in operational position

For transport, the lateral and internal insulating plates are fastened inside the additional compartment to the busbar compartment. The insulating plates are mounted in operational position on site.
The bag unit with the installation and fixing material (order number 139-1618.3) is located inside the additional compartment to the busbar compartment at the central post insulator.

NOTICE

Incorrect bolted joint

The insulating plates are designed for plastic bolted joints.

⇨ Use only hexagon head bolts M8x16 made of plastic and washers made of plastic for bolting the insulating plates together.

NOTICE

Excessive torque

Observe the tightening torques at the bolted joints of the insulating plates.

⇨ Applicable tightening torques for the bolted joints of the insulating plates in the additional compartment to the busbar compartment:

- Tightening torque: **8 Nm**
- Control tightening torque: **6 Nm**

HINT

For a better overview, the right side wall at the additional compartment to the busbar compartment is hidden in some of the following illustrations.

⇨ **Do not** remove the right side wall at the additional compartment to the busbar compartment.

Fastening the lateral insulating plate in operational position

⇨ Remove 2 plastic bolts M8x20 (1) inside the additional compartment to the busbar compartment, and dispose of properly.

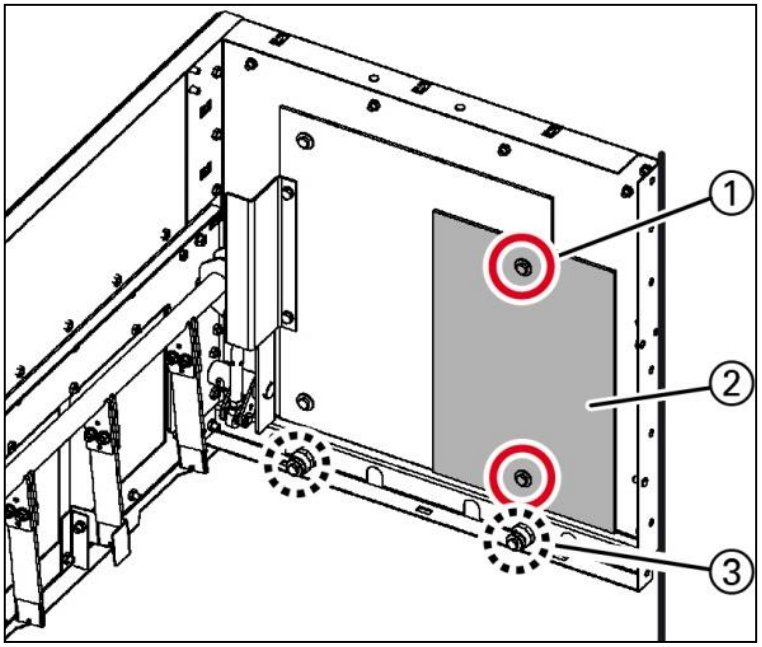


Fig. 91: Bolted joints of lateral insulating plate, left side

⇨ Remove the lateral insulating plate (2).

⇨ Execute 2 new bolted joints (1) with plastic bolts M8x16 and plain plastic washer size 8 acc. to DIN 34816.

⇨ Remove 2 plastic bolts M8x16 with plain plastic washers size 8 acc. to DIN 34816 (3), and use them to fasten the lateral insulating plate in operational position.

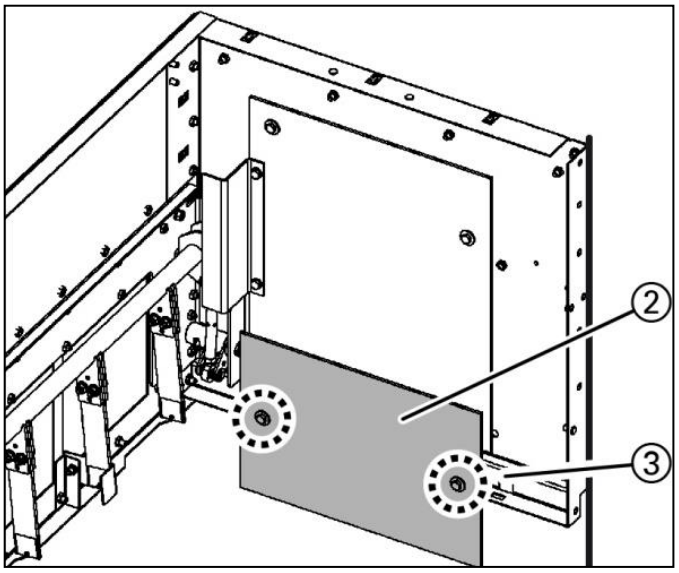


Fig. 92: Lateral insulating plate fastened in operational position, left side

⇨ Fasten the lateral insulating plate on the right inner side of the additional compartment to the busbar compartment in operational position in the same way as described above for the left side.

✓ The lateral insulating plates in the additional compartment to the busbar compartment are mounted in operational position.

Fastening the phase separation plates in operational position

⇨ In the additional compartment to the busbar compartment, remove 2 pairs of plastic bolted joints (2) per phase separation plate (1) each, and keep them available.

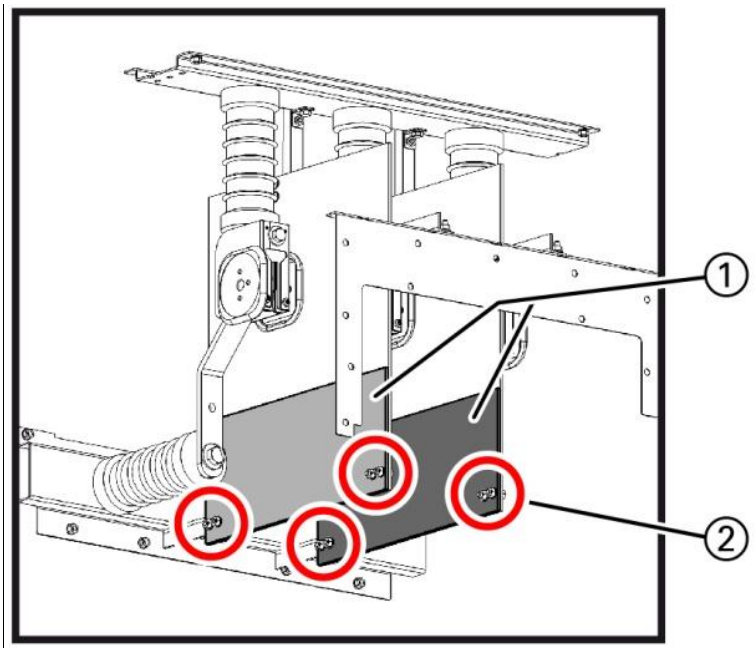


Fig. 93: Bolted joints of phase separation plates

⇨ Remove the phase separation plates (1) and re-fasten them in a lower position using the previously removed plastic bolted joints (2).

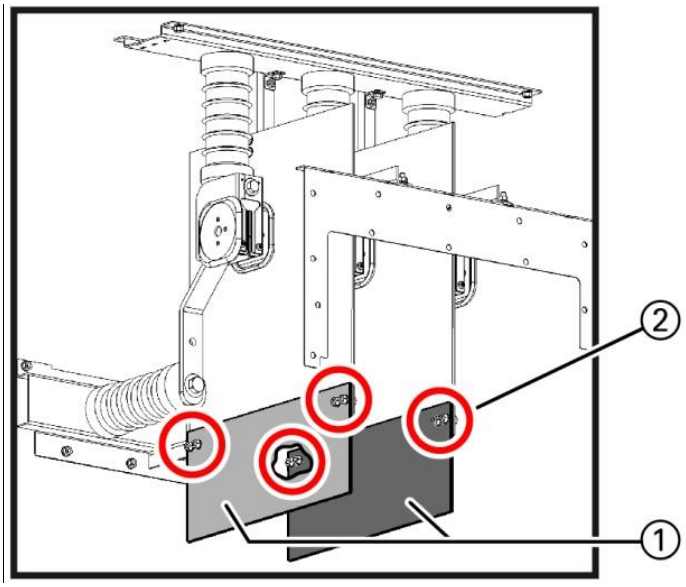


Fig. 94: Phase separation plates fastened in operational position

✓ The phase separation plates are mounted in operational position in the additional compartment to the busbar compartment.

Checking the contact surfaces of the earthing switch blades

The contact surfaces of the earthing switch blades are greased at the factory with Longterm 2. The contact surfaces must be greased with a uniform, thin film and completely.

After installation of the insulating plates, greasing may have to be repeated:

⇨ For all 3 earthing switch blades, check the grease on the contact surfaces on both sides of each earthing switch blade. If required, apply a uniform thin film of Longterm 2.

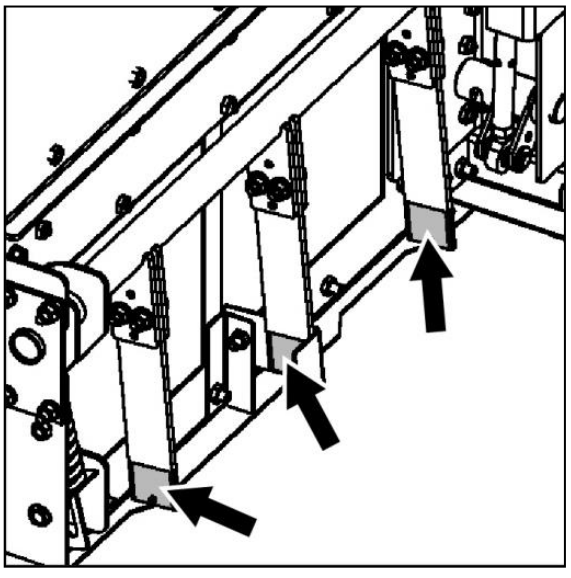


Fig. 95: Contact surfaces of the earthing switch blades

Removing the mechanical fastening from the busbar earthing switch

⚠ WARNING

High speed moving parts

Without the clip for mechanical securing, the earthing switch blades of the busbar earthing switch can turn suddenly by approx. 90° and cause injuries by getting squeezed, caught or cut.

⇨ After having removed the clip for mechanical fastening as described in the following, do by no means pull or push the earthing switch blades.

⇨ Re-install the front cover at the additional compartment to the busbar compartment immediately **after** having removed the clip.

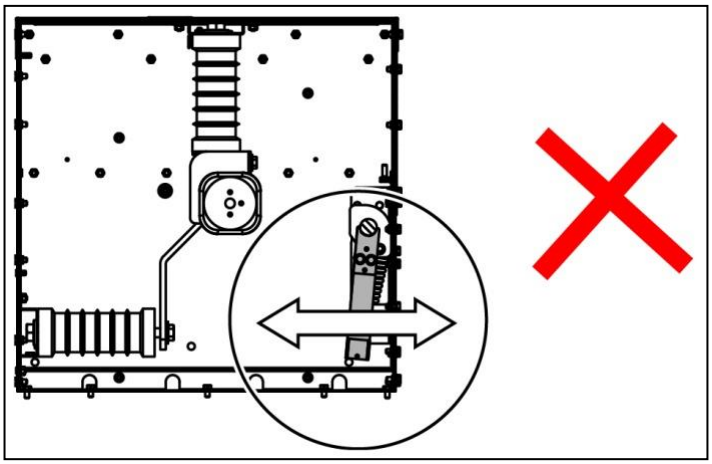


Fig. 96: Do not move the earthing switch blades of the busbar earthing switch

⇨ Undo the clip for mechanical fastening of the busbar earthing switch at the central earthing switch blade (M8x20), and remove. Dispose of the clip and the bolt properly.

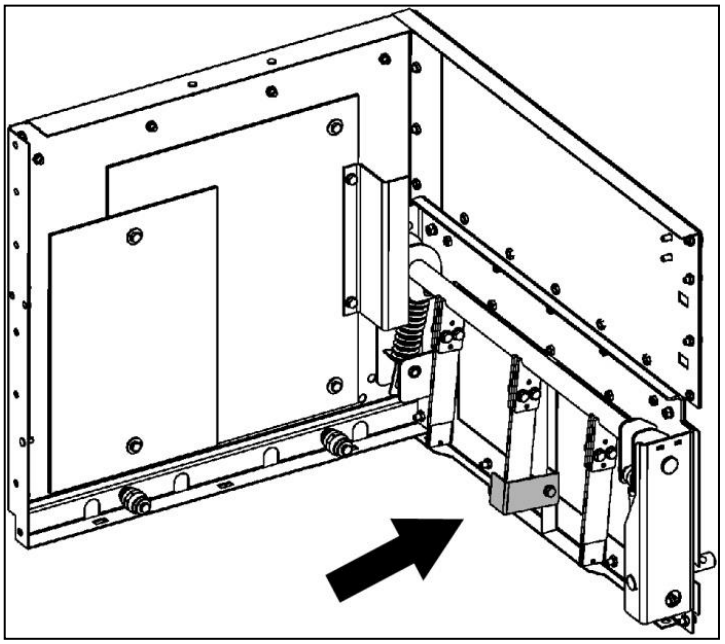


Fig. 97: Clip to be removed at the central earthing switch blade

⇨ Re-fasten the cover (1) at the additional compartment to the busbar compartment using 4 bolts M8x20 with contact washers.

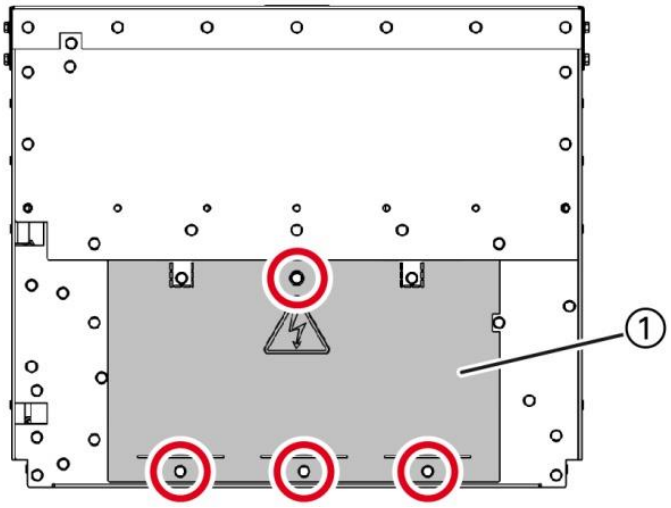
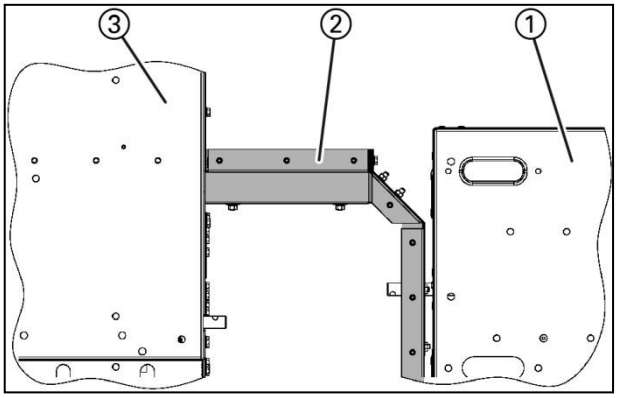


Fig. 98: Cover at the front of the additional compartment

Installing the pressure relief duct

⇨ Install the pressure relief duct according to the panel version, see chapter 8.5.



(1) Low-voltage compartment
(2) Pressure relief duct
(3) Additional compartment to busbar compartment

Fig. 99: Pressure relief duct, installed

Low-voltage cables from the additional compartment to the low-voltage compartment

⇨ Undo 3 nuts M8 with contact washers (4) and take out the wiring duct (5) downwards out of the pressure relief duct.

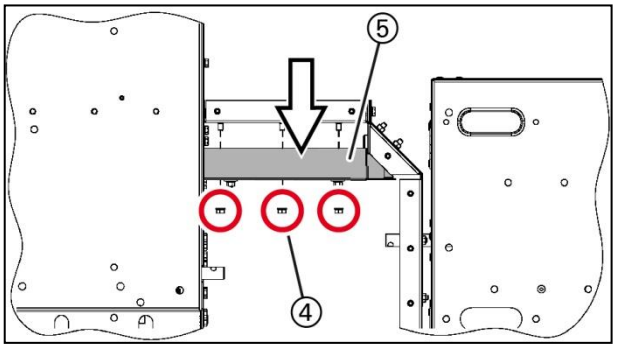


Fig. 100: Removing the wiring duct from the pressure relief duct

⇨ Lay the flexible steel tube through the pressure relief duct into the low-voltage compartment.

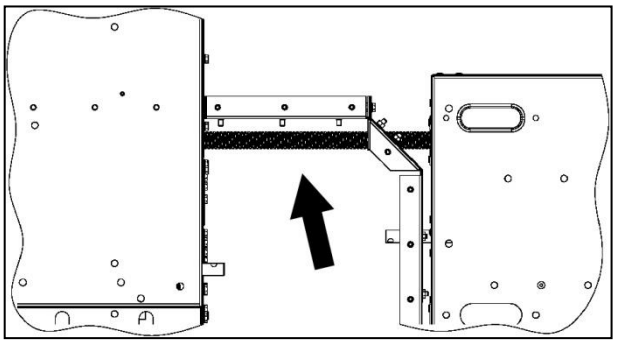


Fig. 101: Steel tube in the pressure relief duct

⇨ Undo the bolted joints of the sealing plate (6) inside the pressure relief duct.

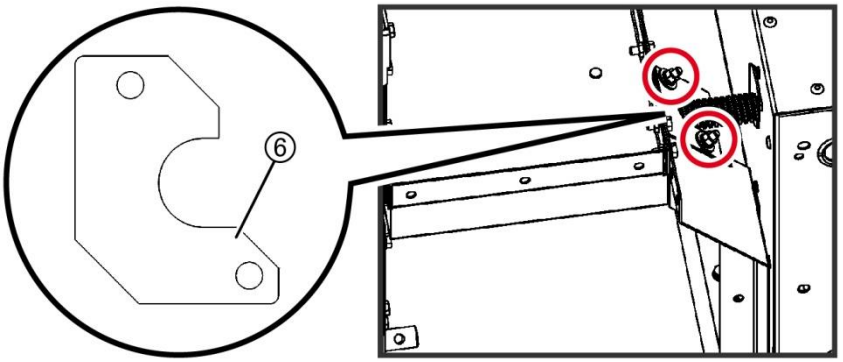


Fig. 102: Sealing plate in the pressure relief duct

⇨ Close the entry opening for the flexible steel tube into the low-voltage compartment by adjusting the sealing plate (6).

⇨ Re-tighten the bolted joints of the sealing plate (6).

⇨ Re-insert the wiring duct (5) from below into the pressure relief duct, and fasten with 3 nos. nuts M8 with contact washers (4).

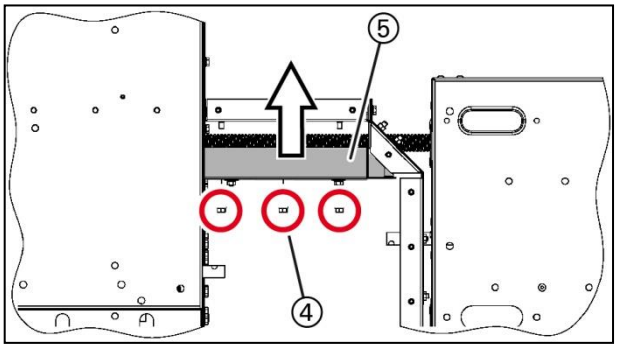


Fig. 103: Installing the wiring duct in the pressure relief duct

⇨ Undo the bolted joints of the sealing plate (7) inside the low-voltage compartment.

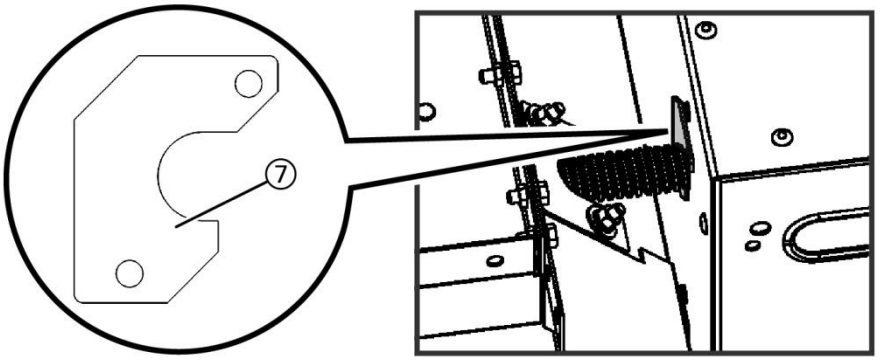


Fig. 104: Sealing plate in the low-voltage compartment

⇨ Close the entry opening for the flexible steel tube into the low-voltage compartment by adjusting the sealing plate (7).

⇨ Re-tighten the bolted joints of the sealing plate (7).

✓ The flexible steel tube with the low-voltage cables between the low-voltage compartment and the additional compartment to the busbar compartment is installed inside the pressure relief duct.

Installing the coupling for the busbar earthing switch
A coupling is installed through the pressure relief duct to connect the busbar earthing switch in the additional compartment to the busbar compartment with the operating mechanism in the low-voltage compartment. The coupling pre-assembled at the factory is supplied with the supplementary equipment.

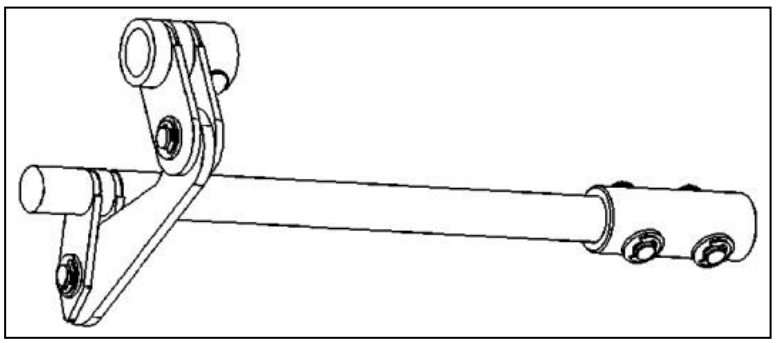


Fig. 105: Coupling for busbar earthing switch, pre-assembled at the factory

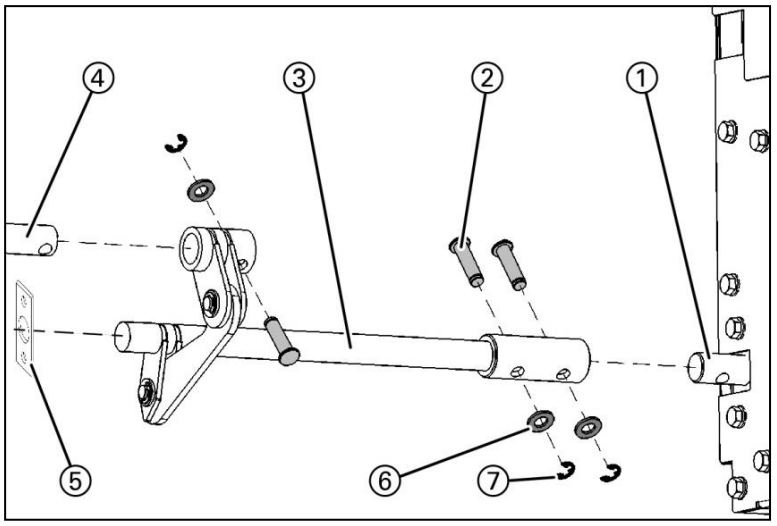


Fig. 106: Overview of coupling installation

(1)	Stub of the busbar earthing switch, additional compartment to the busbar compartment	(5)	Bearing plate
(2)	Stud with head 10x40	(6)	Flat washer size 10.5
(3)	Drive shaft	(7)	Retaining ring
(4)	Stub of the operating mechanism, in the low-voltage compartment		

Preconditions

- Busbar earthing switch in the additional compartment to the busbar compartment in OPEN position (earthing switch blade points vertically downwards)
- Operating mechanism for the busbar earthing switch in the low-voltage compartment in OPEN position (position indicator shows horizontal bar)
- Coupling, installation and fixing material provided

Procedure

⇨ In the pressure relief duct at the rear of the low-voltage compartment, bolt the bearing plate (5) together with 2 nuts M8 with contact washers.

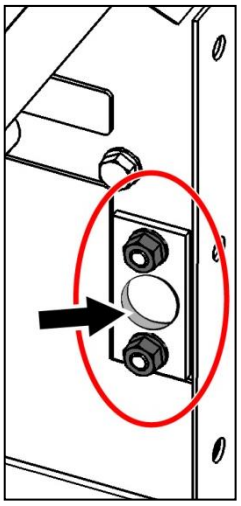


Fig. 107: Bearing plate in the pressure relief duct

⇨ Clean the surface of the hole in the bearing plate, and apply a thin film of ISOFLEX TOPAS L32 grease.

⇨ Remove 3 studs with head, each with plain washer and retaining ring, from the coupling and keep them available.

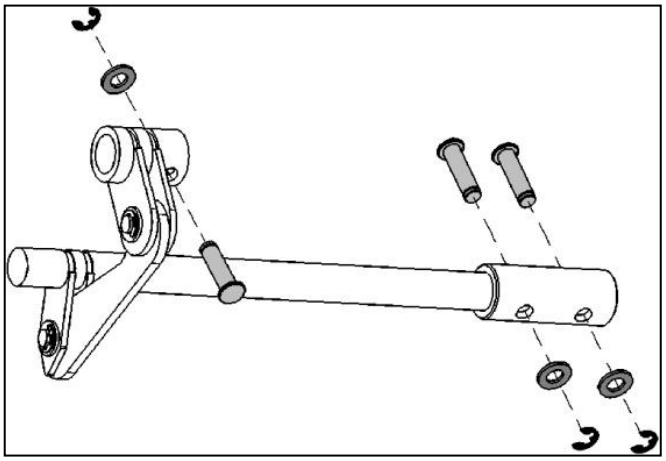


Fig. 108: Removing 3 studs from the coupling

⇨ Push the sleeve, which can now move freely, to the center of the drive shaft.

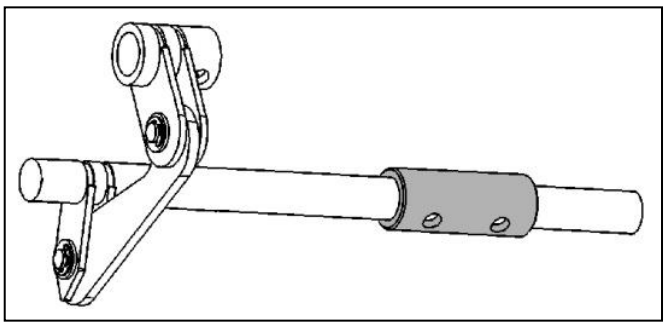


Fig. 109: Sleeve moves freely

⇨ Clean the end area of the drive shaft and apply a thin film of ISOFLEX TOPAS L32 grease.

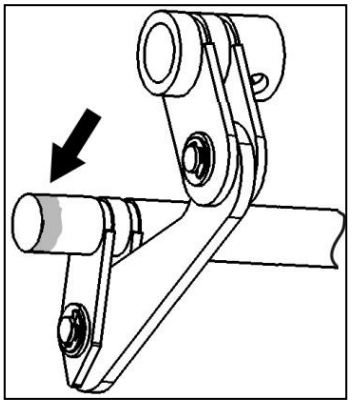


Fig. 110: End area of drive shaft

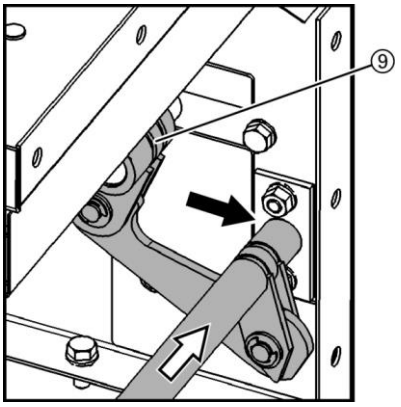


Fig. 111: Rear side of low-voltage compartment

⇨ Push the coupling with the bush (9) over the stub in the low-voltage compartment in such a way that the previously greased end of the drive shaft slides into the bearing plate.

⇨ Push the sleeve mounted on the drive shaft over the stub of the busbar earthing switch at the additional compartment to the busbar compartment.

⇨ Push 2 studs with head through the sleeve again, and mount with a plain washer and a retaining ring each.

⇨ Push 1 stud with head through the bush again, and mount with a plain washer and a retaining ring.

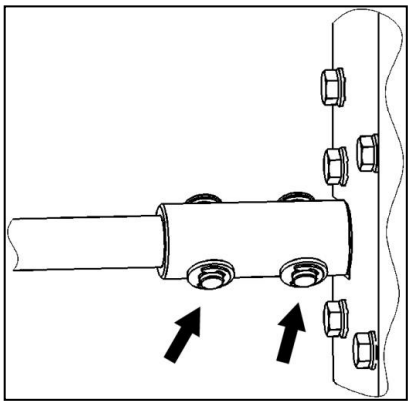


Fig. 112: At the additional compartment to the busbar compartment: 2 studs in sleeve

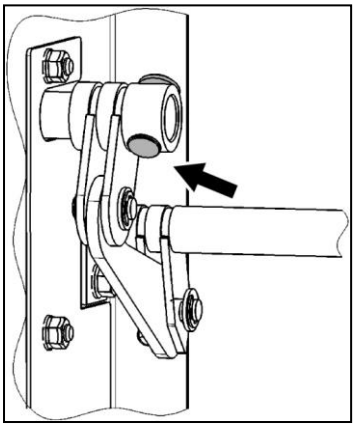


Fig. 113: At the rear of the low-voltage compartment: 1 stud in sleeve

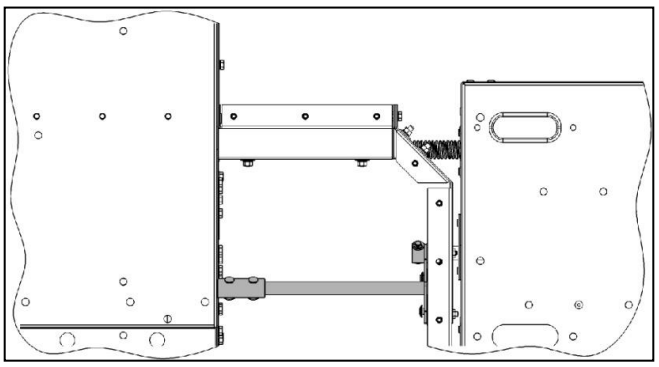


Fig. 114: Completely mounted coupling in the pressure relief duct

Mechanical function test of the busbar earthing switch

⚠ WARNING

High speed moving parts

During operation of the busbar earthing switch, the earthing switch blades turn suddenly by approx. 90° and can cause injuries by getting squeezed, caught or cut.

⇨ Do not reach into openings.

⇨ Perform the mechanical function test of the installed busbar earthing switch with 2 or more persons from outside the panel.

NOTICE

Maloperation

A switching operation once started at the earthing switch must be completed totally. A switching operation that was not completed cannot be turned back.

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

HINT

During the mechanical function test of the busbar earthing switch, the operating lever must be operated at the panel front, and the movement of the earthing switch blades in the additional compartment to the busbar compartment must be observed at the same time.

⇨ Perform the mechanical function test of the busbar earthing switch with 2 or more persons from **outside** the panel.

⇨ From outside the panel, the observer has a good view onto the earthing switch blades through the side of the panel and from below into the additional compartment to the busbar compartment. If necessary, illuminate, e.g. using a hand lamp.

⇨ For operation of the busbar earthing switch, see Operating Instructions NXAIR M, order number 139-2021.9.

Preconditions

- Busbar earthing switch in OPEN position
- Free view from below onto the earthing switch blades ensured
- Operating lever available
- Persons at position:
  - Operator of operating lever at the front of panel
  - Observer at the panel side, view onto earthing switch blades

Procedure

⇨ Visual inspection: Check vertical position of earthing switch blades in OPEN position.

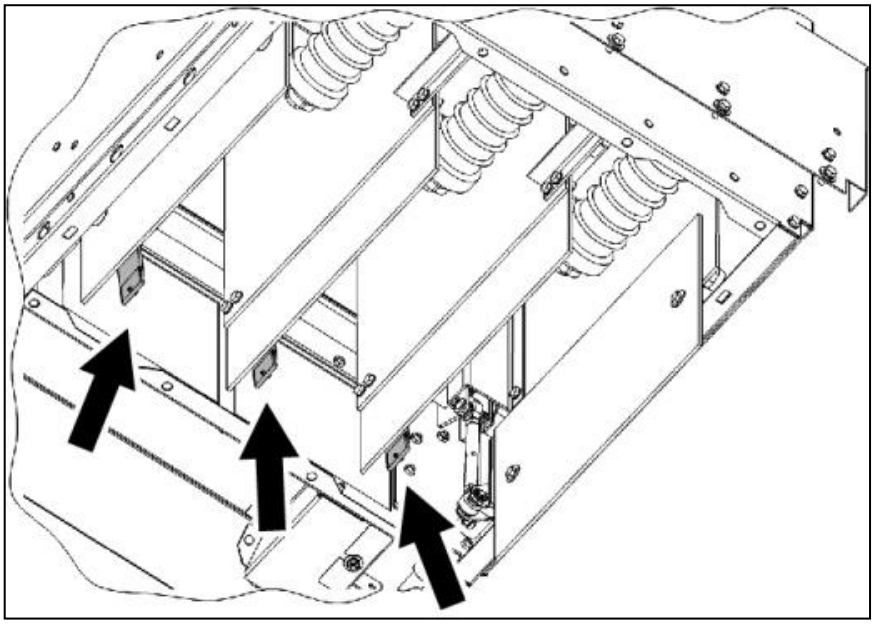


Fig. 115: Vertical position of earthing switch blades

⇨ Visual inspection: Check grease on contact surfaces of earthing switch blades.

⇨ Insert the operating lever at the panel front.

⇨ Turn the operating lever slowly and continuously approx. 115° clockwise until the position indicator changes to CLOSED position (vertical bar).

⇨ Remove the operating lever at the panel front.

⇨ Check the insertion depth of the (10) earthing switch blades into the earthing switch contacts:

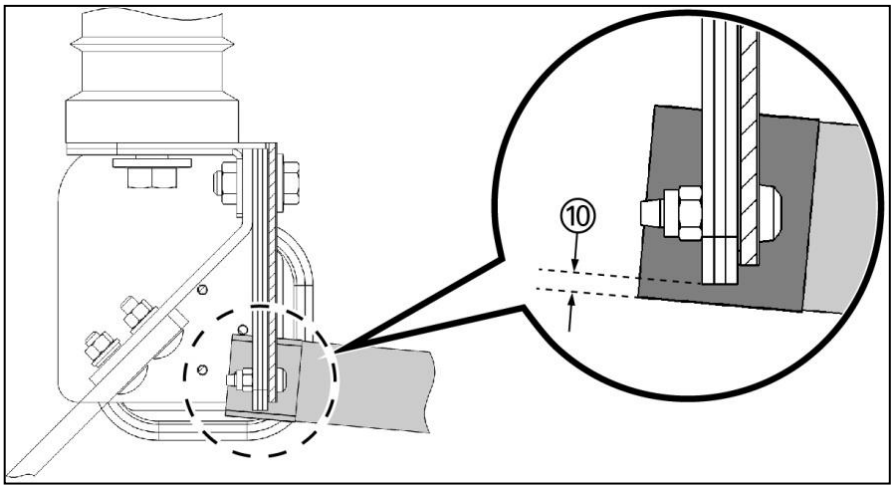


Fig. 116: Earthing switch blades in CLOSED position

Measuring result for the dimension (10) less than 3 mm or more than 7 mm:

⇨ Stop test and contact the regional Siemens representative.

Measuring result for the dimension (10) between 3 mm and 7 mm:

⇨ Open the busbar earthing switch using the operating lever at the panel front, then close it again. Perform these alternating opening and closing operations 5 times in total.

⇨ After having closed the busbar earthing switch for the fifth time, check the dimension (10) again:

Measuring result for the dimension (10) less than 3 mm or more than 7 mm:

⇨ Stop test and contact the regional Siemens representative.

Measuring result for the dimension (10) between 3 mm and 7 mm:

⇨ Conclude the mechanical function test of the busbar earthing switch; the test was successful.

✓ The additional compartment to the busbar compartment with busbar earthing switch pre-assembled at the factory is completely mounted.

8.8 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 a thickness of 0.5 mm to 1.0 mm under the panel frame, if required.

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

Aligning the first panel

HINT

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 dimensions of the panels, refer to the relevant dimension drawing and arrangement diagram.

⇨ Align the panel in horizontal position.

⇨ Align the panel in vertical position.

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

⇨ Lay thin shims with a thickness of 0.5 mm to 1.0 mm 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.

8.9 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 size 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 with contact washers at the bottom part (2) and 2 bolts M8x20 with contact washers (1) on the left and right side of the ventilation duct; keep the bolting material.

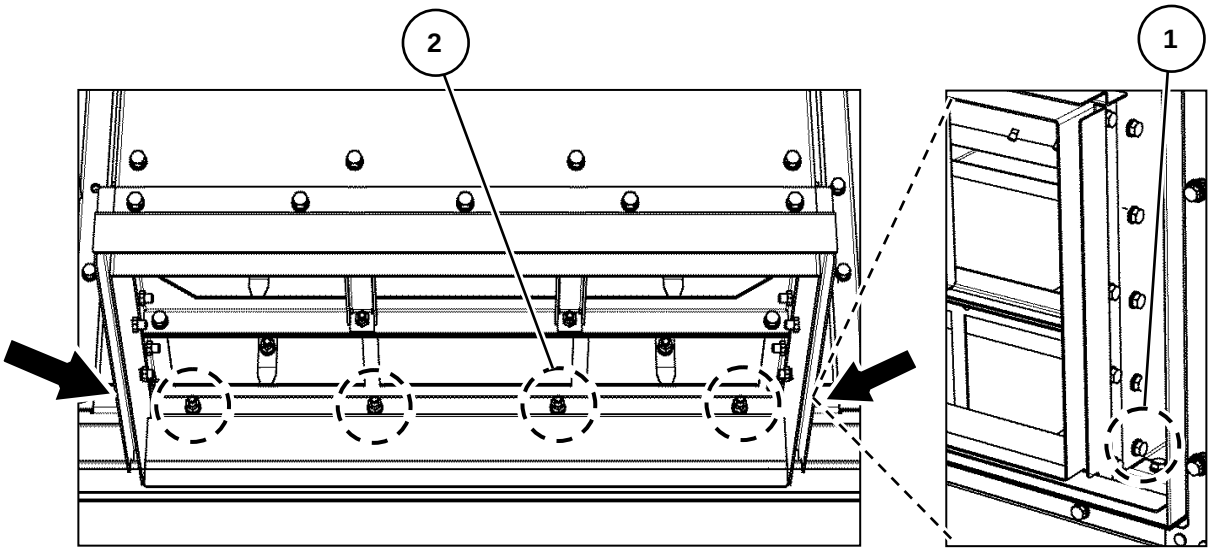


Fig. 117: 6 nos. bolted joints to be removed from the ventilation duct

(1) Bolt M8x20 with contact washer
(2) Nut-and-washer assembly M8 with contact washer

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

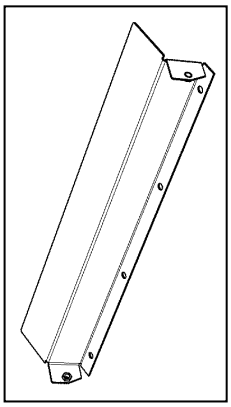


Fig. 118: Bottom part, removed

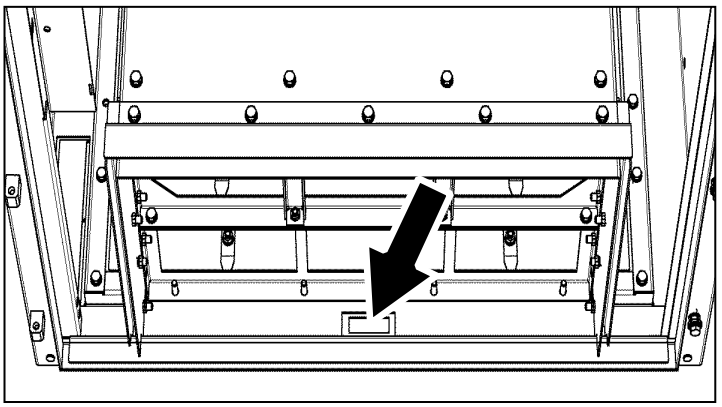


Fig. 119: Front floor opening in panel frame

✓ Additional preparations 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 bolted floor fastening: Weld the cross members to the U-profiles in the foundation in the area of the elongated holes 60 x 20 at 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

HINT

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.

⇨ Fasten the bottom part of the ventilation duct using 4 nuts M8 with contact washers and 2 bolts M8x20 on the left and right side of the ventilation duct.

✓ The panel is fastened to the foundation.

8.10 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.

HINT

Hint for busbar assembly:

- The **easiest** way to assemble the busbar is **from the side** of the panel!
- The busbar can also be assembled from above; however, this is **not** recommended as it is incomparably more complicated due to the pressure relief duct.

HINT

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.

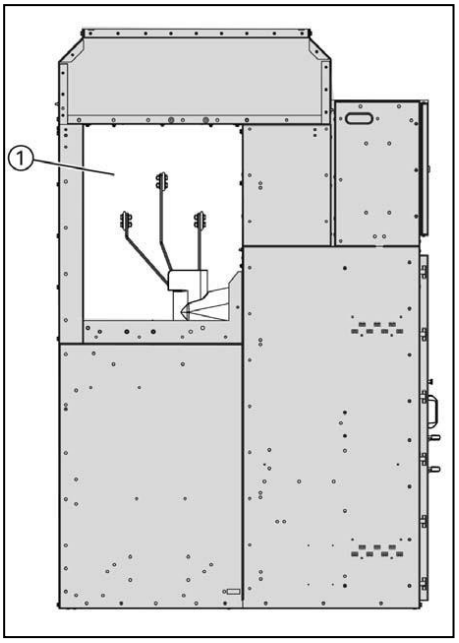
⇨ Bolt the busbars to the corresponding feeder bars without distortions or gaps between both bars.

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

⇨ Observe the screwing 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.

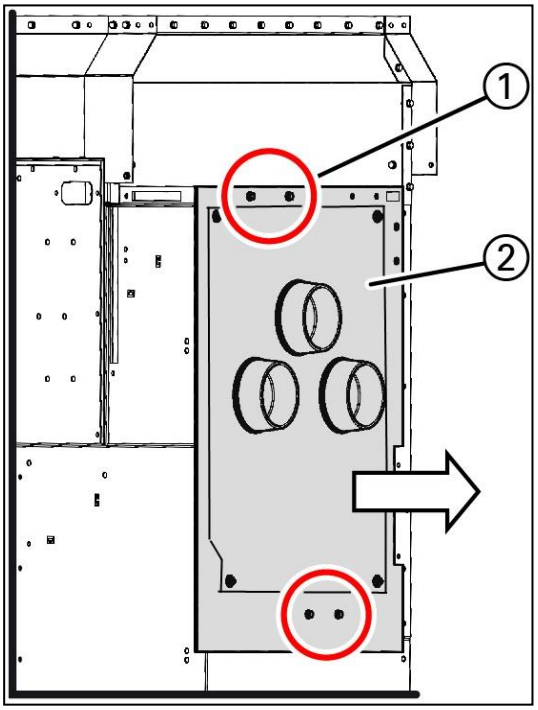


(1) Busbar compartment

Fig. 120: Side view of 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 edge (1) together with 2 bolts M8x20 and plain washers size 8, and store both for later use.



(1) Bolted joint
(2) Transverse partition plate

Fig. 121: Removing the transverse partition plate

Busbar version with insulating shells
Depending on the position of the panel inside the switchgear, insulating shells cover the bolted joints of the busbars and the feeder bars. At the end, these insulating shells are mounted additionally after bolting the busbars together with the feeder bars.

Panel type	Insulating shells
End panel	Compulsory
Intermediate panel	Depending on the design

NOTICE

Damage to the switchgear panels

For busbar version with insulation (optional):

⇨ For busbar versions with insulation, equip the busbar units individually with insulating tubes. The insulating tubes are supplied with the correct size for each panel.

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

HINT

The insulating half-shells have a different shape for the bolt head side and the bolting side.

⇨ Observe the direction of the bolted joints while mounting the insulating shells.

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

HINT

The strip fasteners are reclosable and reusable.

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

(1) strip fastener, reclosable, (2) end cap, (3) insulating half-shell, bolt head side, (4) insulating half-shell, bolting side

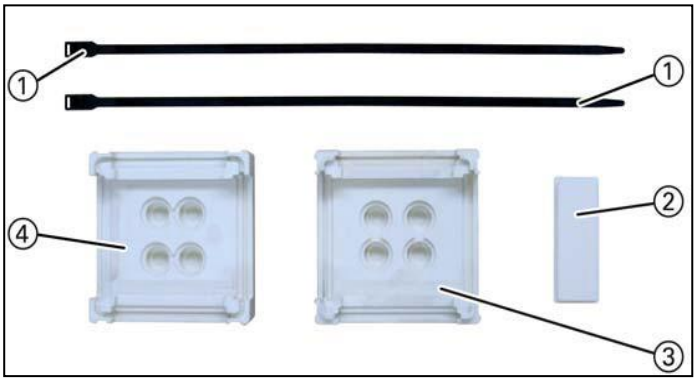


Fig. 122: Assembly parts for insulating shells

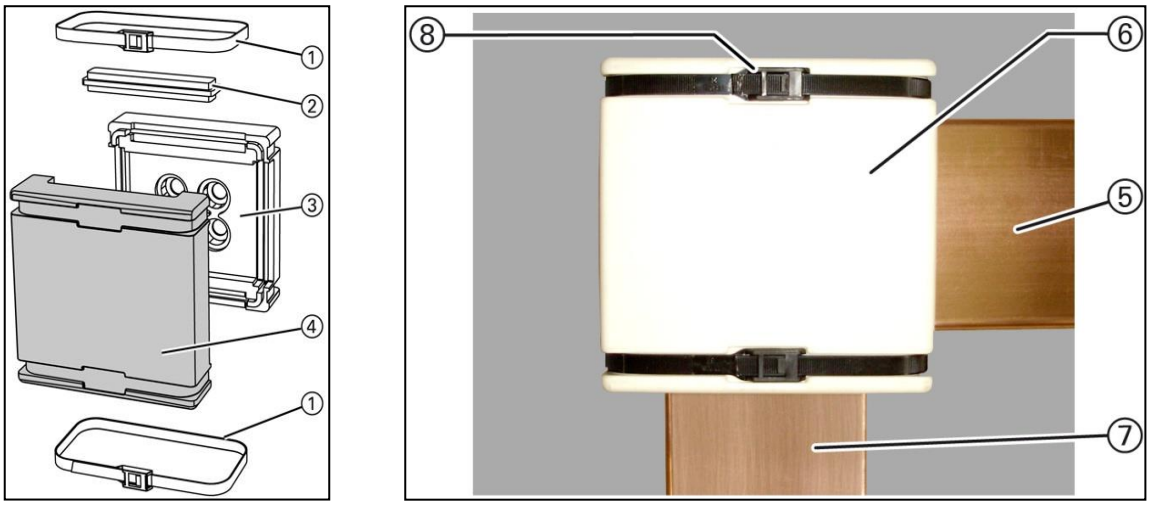


Fig. 123: Assignment of assembly parts for insulating shells; for example: end panel

(5) busbar, (6) insulating half-shells, mounted, (7) feeder bar, (8) strip fastener, shortened with protrusion

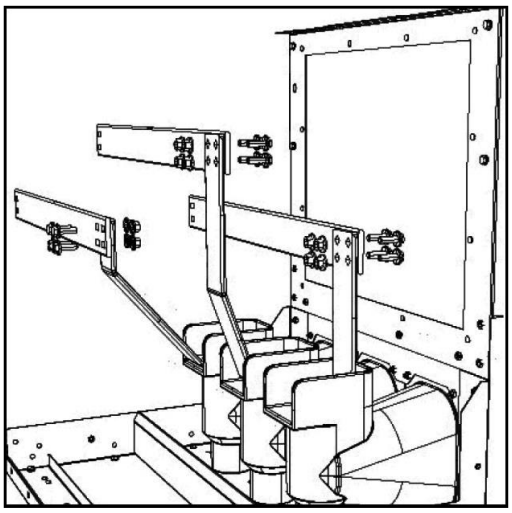


Fig. 124: Bolted joints before mounting insulating shells; for example: end panel

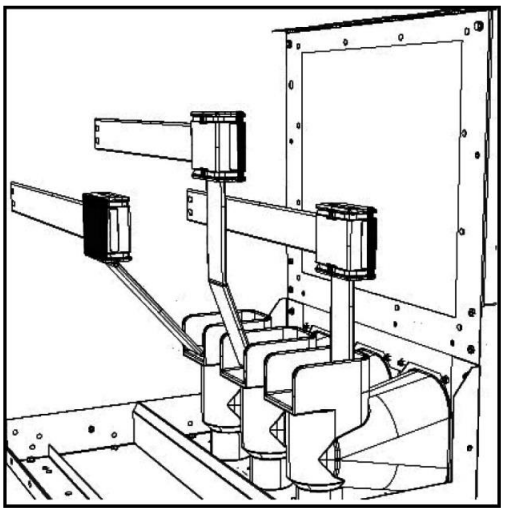
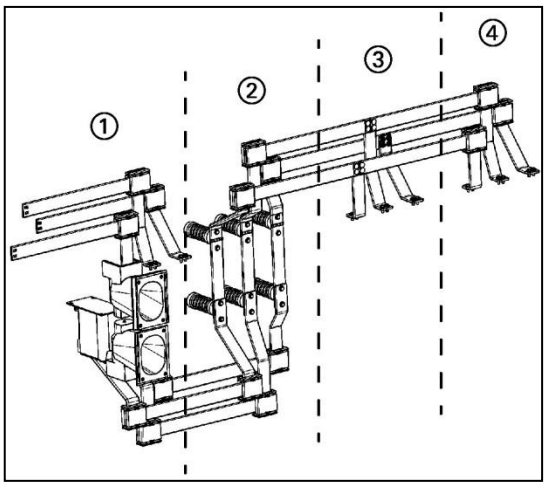


Fig 125: Mounted insulating shells, for example: end panel

Busbar system 1250 A, example



(1) Bus sectionalizer panel

(2) Bus riser panel

(3) Intermediate panel

(4) End panel

Fig. 126: Busbar system 1250 A, for example

Busbar version 1250 A for U_r = 24 kV, end panel

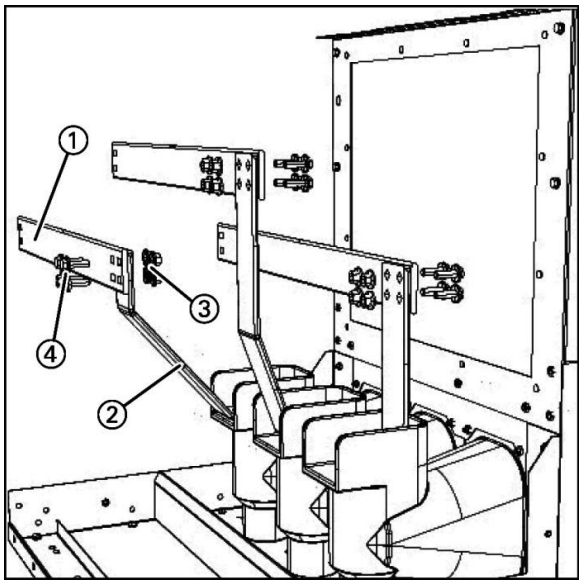


Fig. 127: Assembly of 1250 A busbar,
feeder ≤ 1250 A, Ur = 24 kV,
bolted joints at the end panel

(1)	Busbar
(2)	Feeder bar
(3)	Nut M12, conical spring washer 12
(4)	Bolt M12x40, conical spring washer 12
(5)	Insulating half-shell, bolt head side
(6)	End cap
(7)	Insulating half-shell, bolting side
The bolt symbol indicates the screwing direction of the bolts.	
Bag with connecting elements: 139-0242.3	

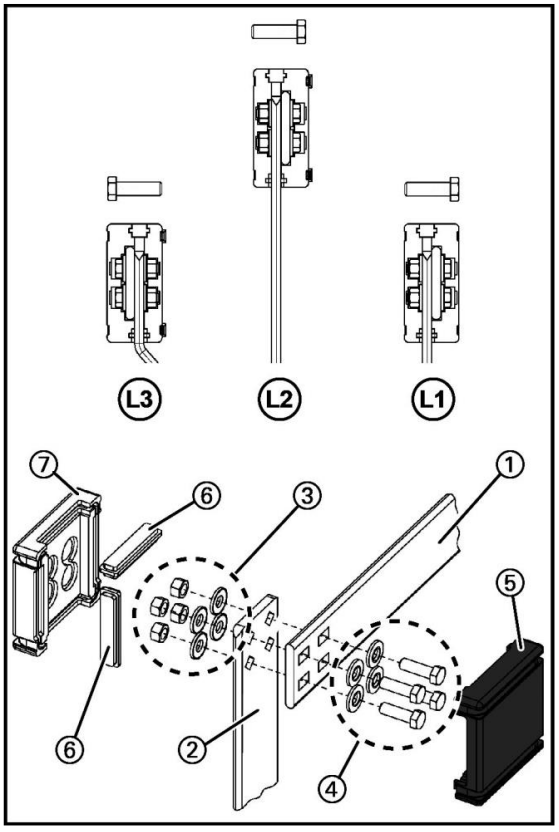


Fig. 128: Busbar 1250 A,
feeder ≤ 1250 A, Ur = 24 kV,
end panel with insulating shells

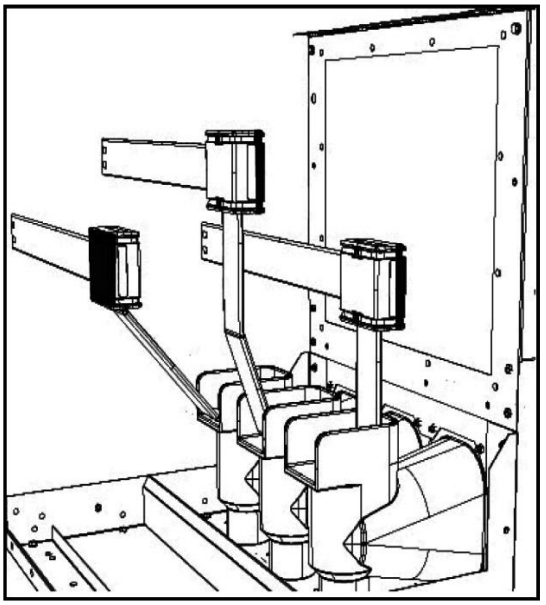
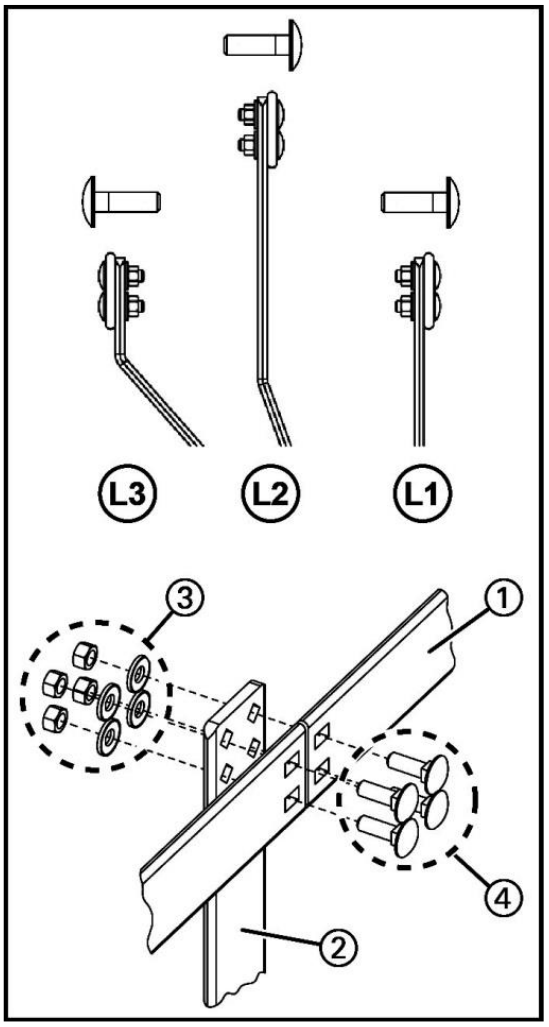


Fig. 129: Busbar 1250 A,
feeder ≤ 1250 A, Ur = 24 kV,
end panel with mounted insulating shells

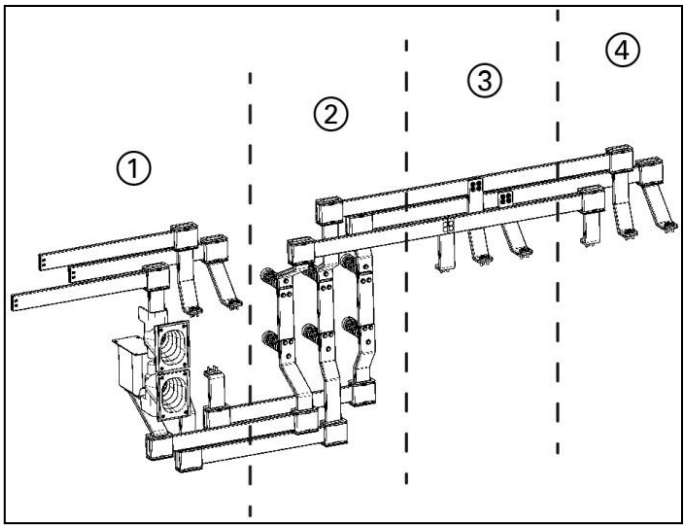
Busbar version 1250 A for U_r = 24 kV, intermediate panel



(1)	Busbar
(2)	Feeder bar
(3)	Nut M12, conical spring washer 12
(4)	Cup head bolt M12x35
The bolt symbol indicates the screwing direction of the bolts.	
Bag with connecting elements: 139-0159.3	

Fig. 130: Assembly of 1250 A busbar,
feeder ≤ 1250 A, Ur = 24 kV,
intermediate panel without insulating shells

Busbar system 2500 A, example



(1) Bus sectionalizer panel

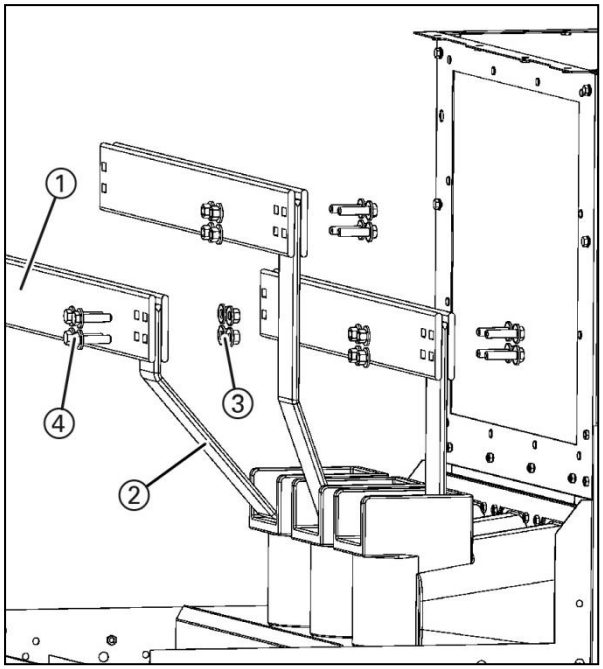
(2) Bus riser panel

(3) Intermediate panel

(4) End panel

Fig. 131: Busbar system 2500 A, for example

Busbar version 2500 A with feeder ≤ 1250 A for U_r = 24 kV, end panel



(1)	Busbar
(2)	Feeder bar
(3)	Nut M12, conical spring washer 12
(4)	Bolt M12x50, conical spring washer 12
(5)	Insulating half-shell, bolt head side
(6)	End cap
(7)	Insulating half-shell, bolting side
The bolt symbol indicates the screwing direction of the bolts.	
Bag with connecting elements: 139-0731.3	

Fig. 132: Assembly of 2500 A busbar,
feeder ≤ 1250 A, Ur = 24 kV,
bolted joints at the end panel

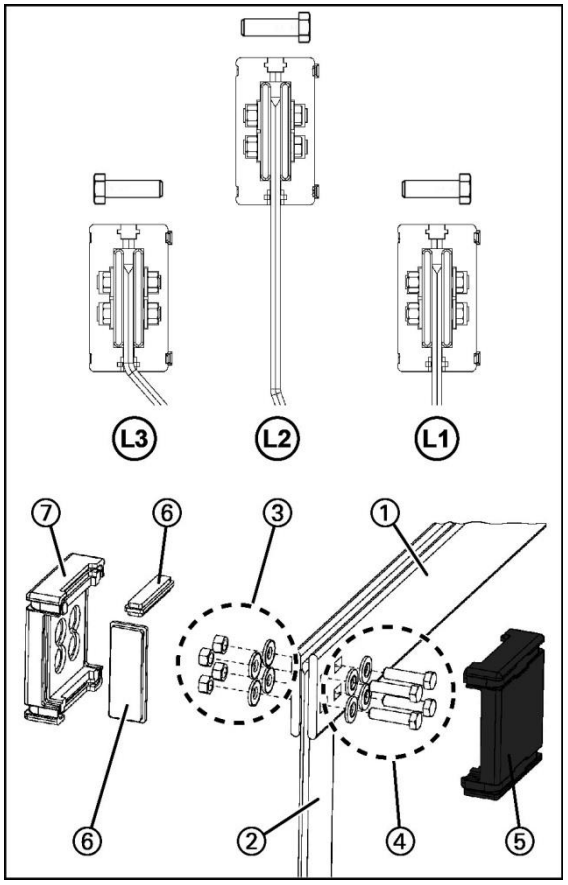


Fig. 133: Busbar 2500 A,
feeder ≤ 1250 A, Ur = 24 kV,
end panel with insulating shells

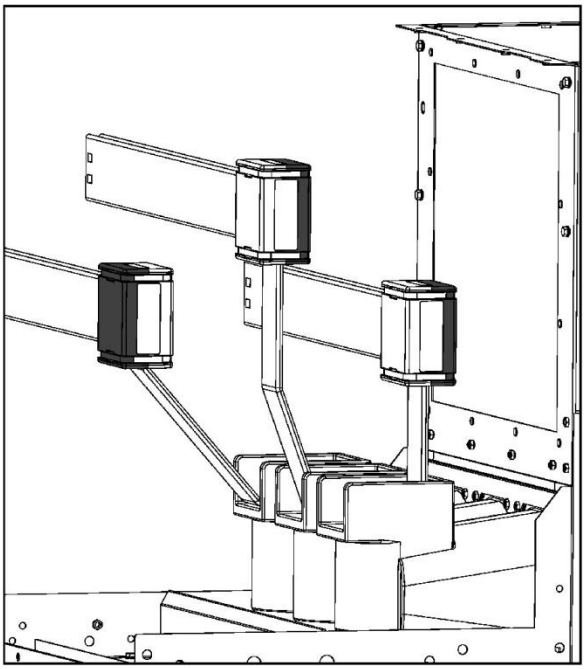
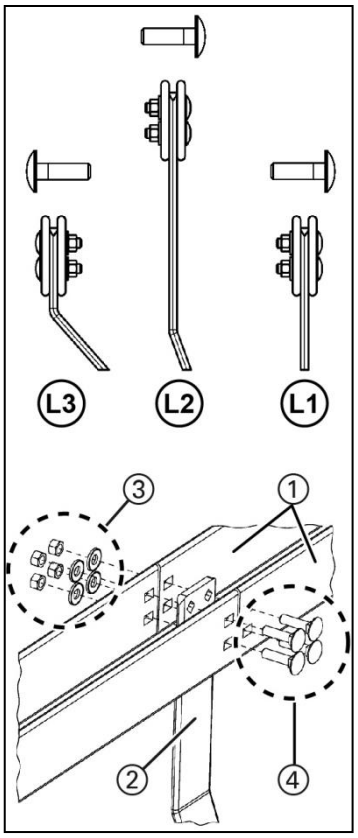


Fig. 134: Busbar 2500 A,
feeder ≤ 1250 A, Ur = 24 kV,
end panel with mounted insulating shells

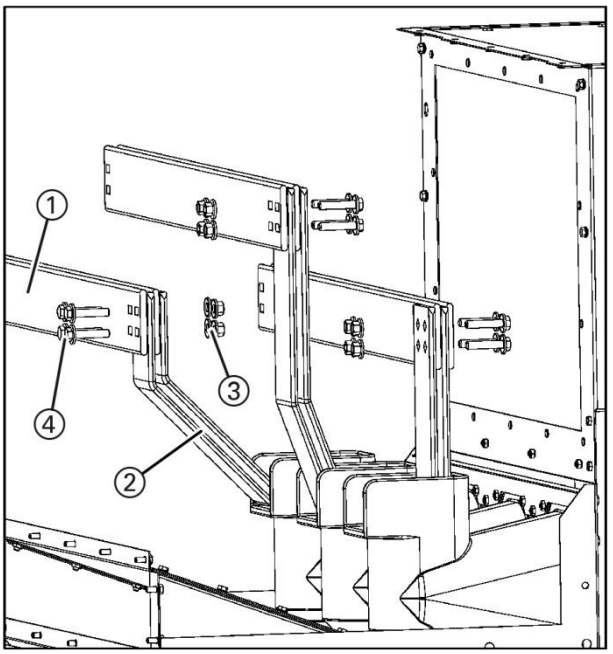
Busbar version 2500 A with feeder ≤ 1250 A for U_r = 24 kV, intermediate panel



(1)	Busbar
(2)	Feeder bar
(3)	Nut M12, conical spring washer 12
(4)	Cup head bolt M12x45
The bolt symbol indicates the screwing direction of the bolts.	
Bag with connecting elements: 139-0179.3	

Fig. 135: Assembly of 2500 A busbar,
feeder ≤ 1250 A, Ur = 24 kV,
intermediate panel without insulating shells

Busbar version 2500 A with feeder 2500 A for U_r = 24 kV, end panel



(1)	Busbar
(2)	Feeder bar
(3)	Nut M12, conical spring washer 12
(4)	Bolt M12x60, conical spring washer 12
(5)	Insulating half-shell, bolt head side
(6)	End cap
(7)	Insulating half-shell, bolting side
The bolt symbol indicates the screwing direction of the bolts.	
Bag with connecting elements: 139-0731.3	

Fig. 136: Assembly of 2500 A busbar,
feeder ≤ 2500 A, Ur = 24 kV,
bolted joints at the end panel

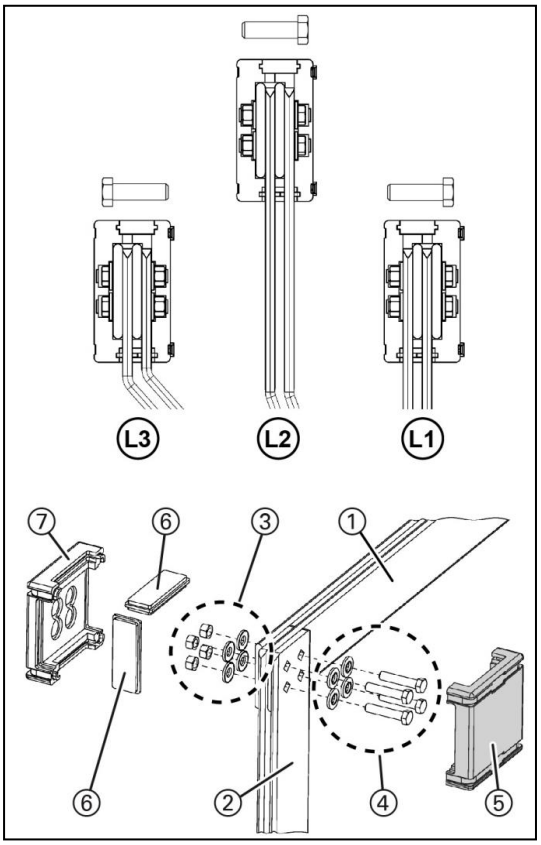


Fig. 137: Busbar 2500 A, feeder 2500 A, Ur = 24 kV, end panel with insulating shells

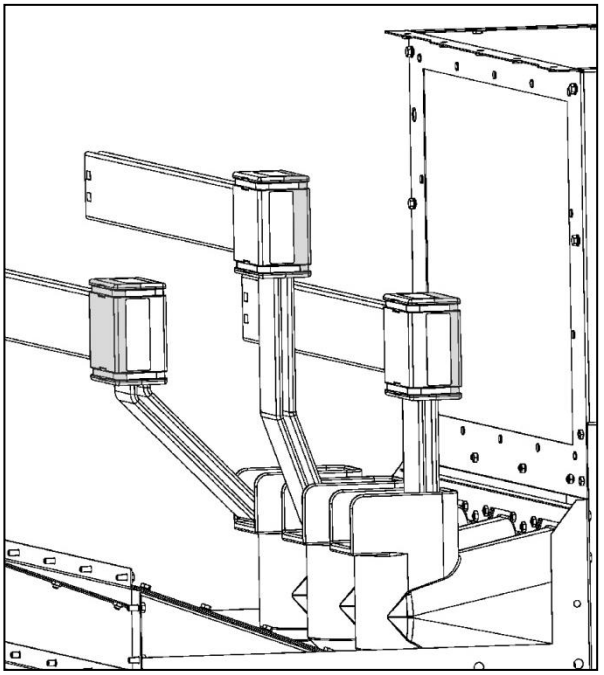
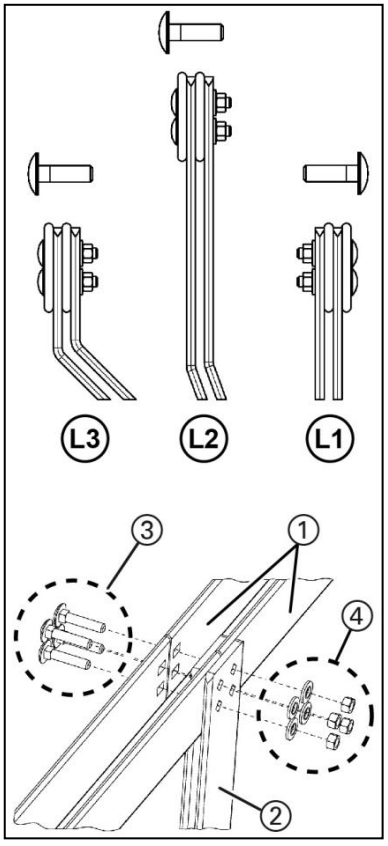


Fig. 138: Busbar 2500 A, feeder 2500 A, Ur = 24 kV, end panel with mounted insulating shells

Busbar version 2500 A with feeder 2500 A for U_r = 24 kV, intermediate panel



(1)	Busbar
(2)	Feeder bar
(3)	Nut, conical spring washer
(4)	Cup head bolt M12x55
The bolt symbol indicates the screwing direction of the bolts.	
Bag with connecting elements: 139-0179.3	

Fig. 139: Assembly of 2500 A busbar, feeder ≤ 2500 A, Ur = 24 kV, intermediate panel without insulating shells

Installing the transverse partition

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.

HINT

Before commissioning the panels, the busbar compartment must only be permanently closed by bolting the transverse partition 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 torques 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.

⇨ Insert the bushings (1) in the transverse partition plate (2).

⇨ Fasten the bushings with rubber rings (3).

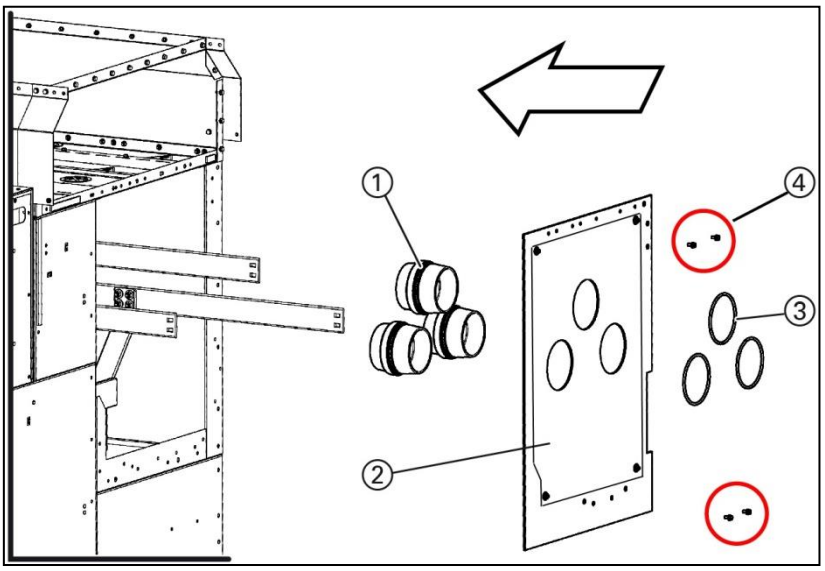


Fig. 140: Mounting the transverse partition plate from the right

⇨ Slide the transverse partition plate with mounted bushings onto the busbars.

⇨ Screw the transverse partition plate together with the busbar compartment at the upper and lower edge using 2 bolts M8x20 with contact washers and plain washers size 8 (4).

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.

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 in all phases L1, L2, L3.

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

HINT

The insulating half-shells have a different shape for the bolt head side and the bolting side.

⇨ Observe the direction of the bolted joints while mounting the insulating shells.

HINT

The strip fasteners are reclosable and reusable.

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

⇨ For assembly of insulating half-shells and strip fasteners, observe figs. 121 and 122.

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

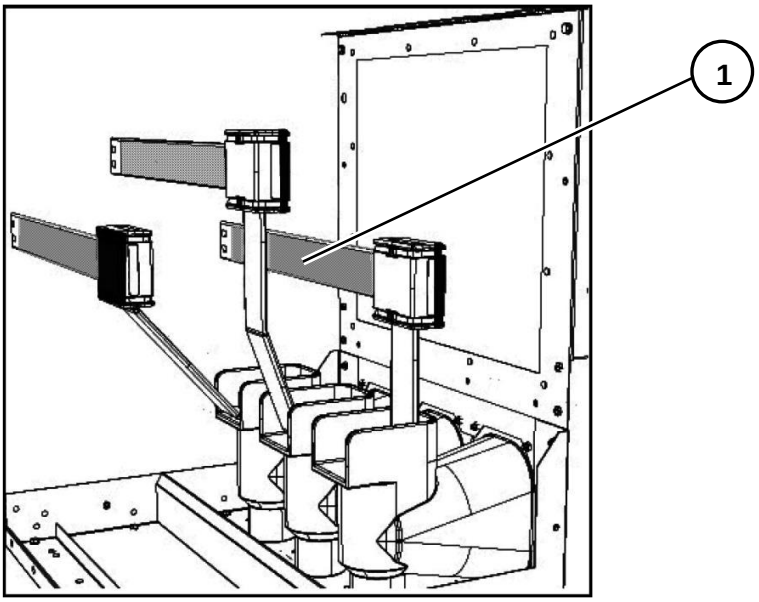


Fig. 141: Detail view of busbar system with plastic tubes,
for example: left end panel

8.11 Bolting panels together

NOTICE

Panel frame

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

⇨ Lay thin shims with a thickness of 1 mm under the panel frame, if required.

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

HINT

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.

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.

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

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

⇨ Insert the panel connection links (4) between two switching-device compartments in the front area.

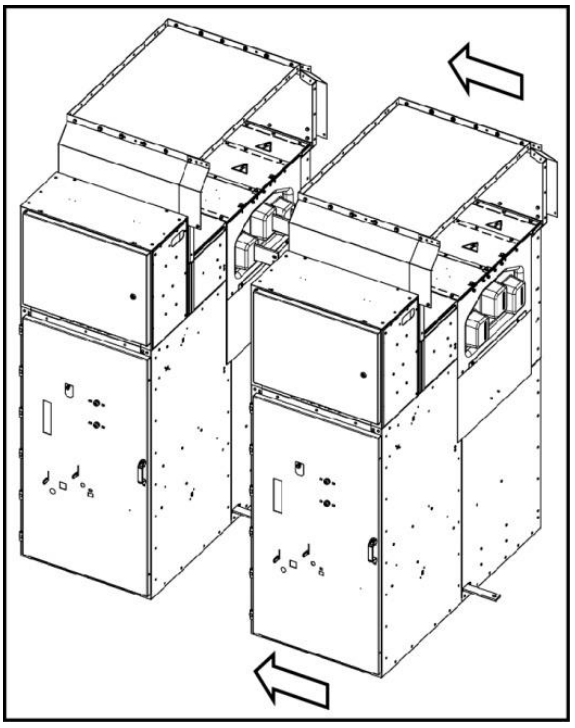


Fig. 142: Aligning the panel

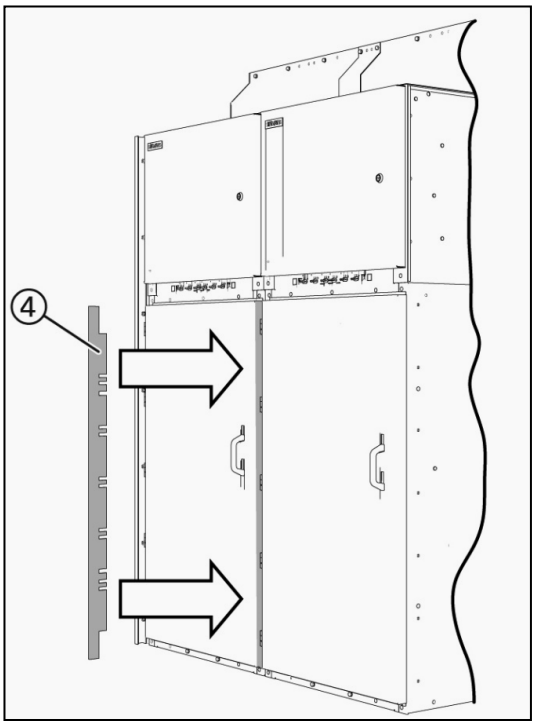


Fig. 143: Panel connection link

Wiring duct cover in switching-device compartment

⚠ CAUTION

Sharp edges

The metal parts of the wiring duct covers may have sharp edges.

⇨ Put on personal protective equipment.

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 bolts M8x20 with contact washers (1) 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 (2) and the lower (3) wiring duct cover from the switching-device compartment.

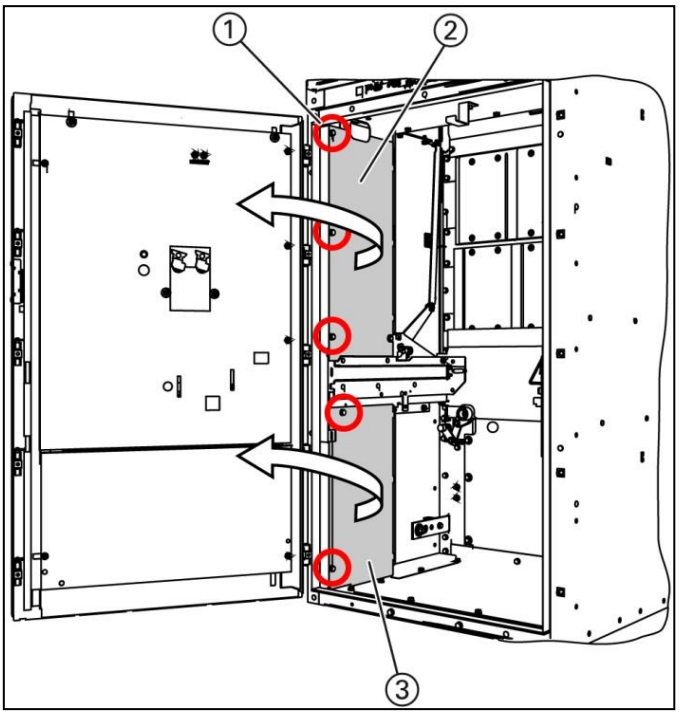


Fig. 144: Removing the wiring duct covers

HINT

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 139-6749.3.

⇨ 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 8 bolts M8x25 with contact washers and plain washers size 8 acc. to ISO 7093 from the supplied bag, and screw them into the adjacent switching-device compartment from left inner side of the switching-device compartment.

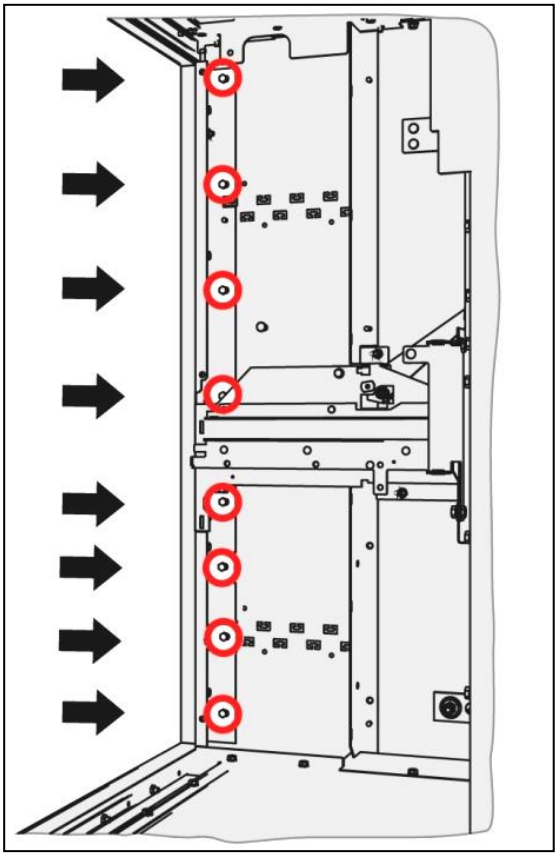


Fig. 145: Bolted joints in the switching-device compartment

⇨ Insert upper and lower wiring duct cover on the left inner side of the switching-device compartment, and fix each cover with bolts M8x20 with contact washers.

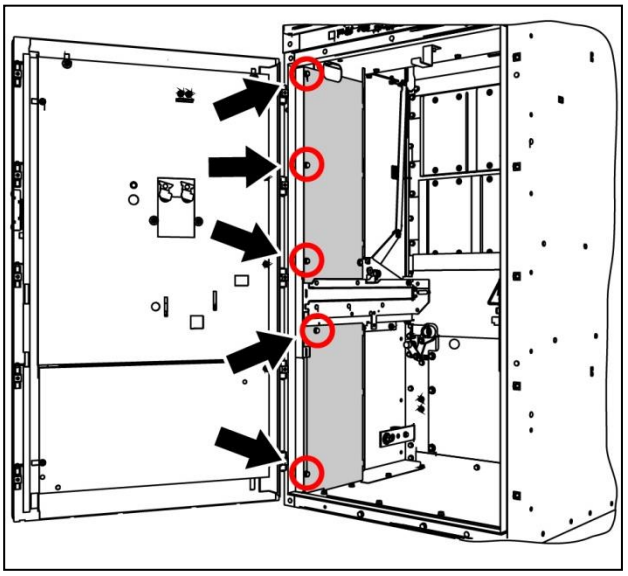


Fig. 146: Fastening the wiring duct covers

Bolted joints in the pressure relief duct (PRC) area

⚠ CAUTION

Sharp edges

The metal parts of the pressure relief duct may have sharp edges.

⇨ Put on personal protective equipment.

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

⇨ Fasten the two pressure relief ducts in the upper area with 9 bolts M8x20 with contact washers.

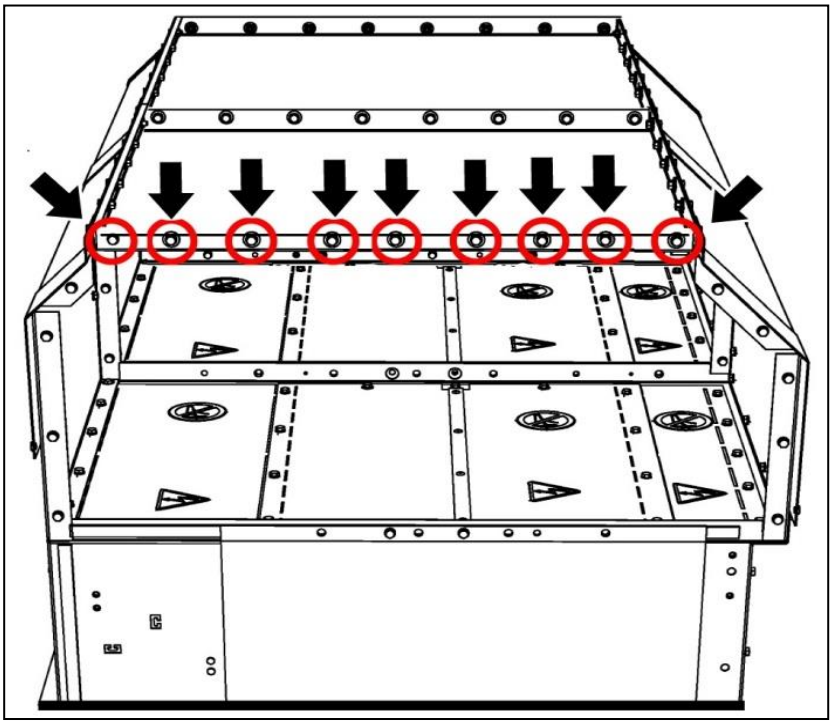


Fig. 147: Bolted joints in the upper area of the PRC

⇨ Fasten the two pressure relief ducts inside on the left and right with 5 bolts M8x20 with contact washers each.

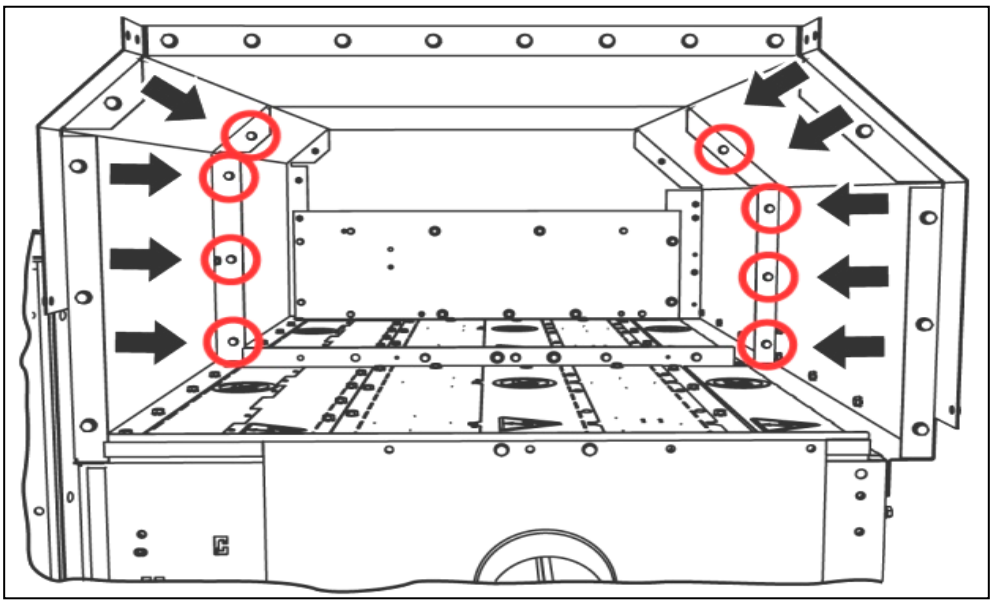


Fig. 148: Bolted joint on the left and right inside the PRC

⇨ Fasten the two panels in the lower area of the PRC with 6 bolts M8x25 with contact washers, plain washers size 8 and nuts M8.

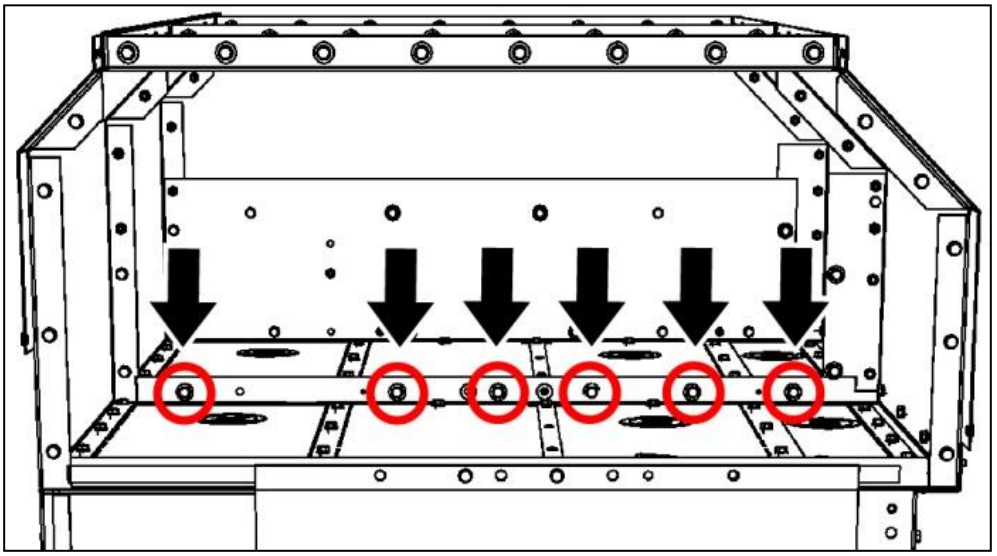


Fig. 149: Bolted joints in the lower area of the PRC

Installation of deflector plates

For further information, see information drawings NXAIR M, order number 139-2084.9.

Bolting the low-voltage compartment together

⇨ Bolt 2 panels each together laterally inside the low-voltage compartment using bolts M8x20 with contact washers and nuts M8. 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.

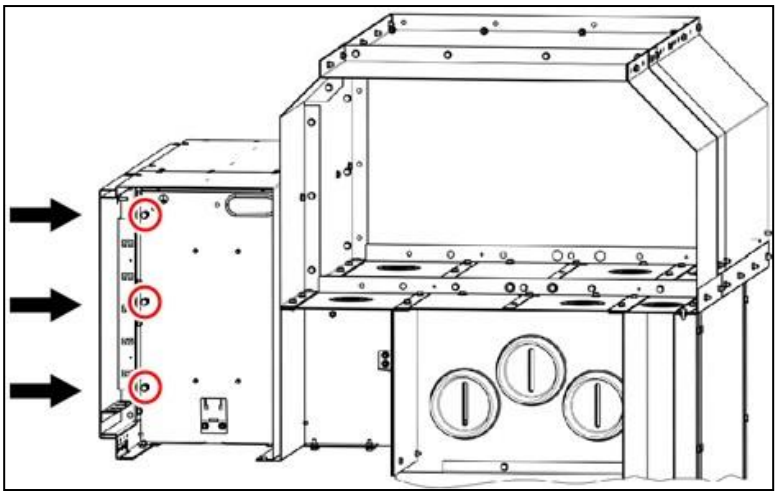


Fig. 150: Bolted joints on low-voltage compartment

Fastening links 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 using 28 bolts with contact washers and the panel connection links (5).

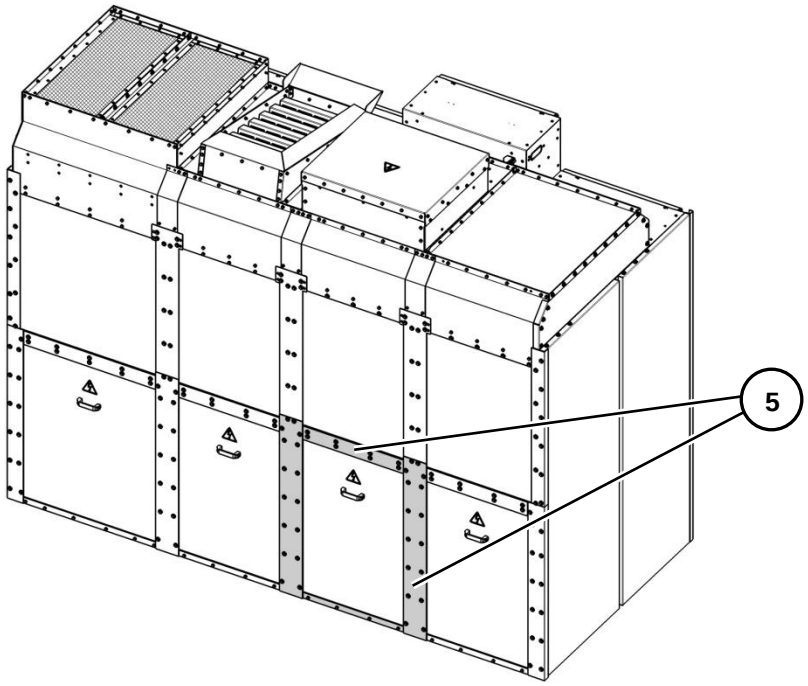


Fig. 151: Bolted joints at the rear side

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.

HINT

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.

HINT

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 in the area. In this context, also check the control tightening torque 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.

Assembling the panels

⇨ Remove parts according to the following illustrations showing exemplary 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 join all removed parts in reverse order.

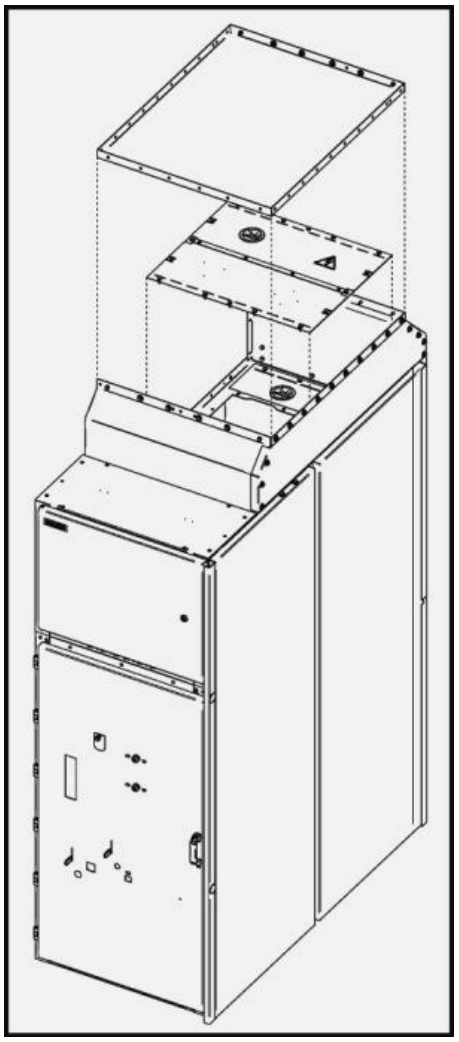


Fig. 152: PRD without additional installations

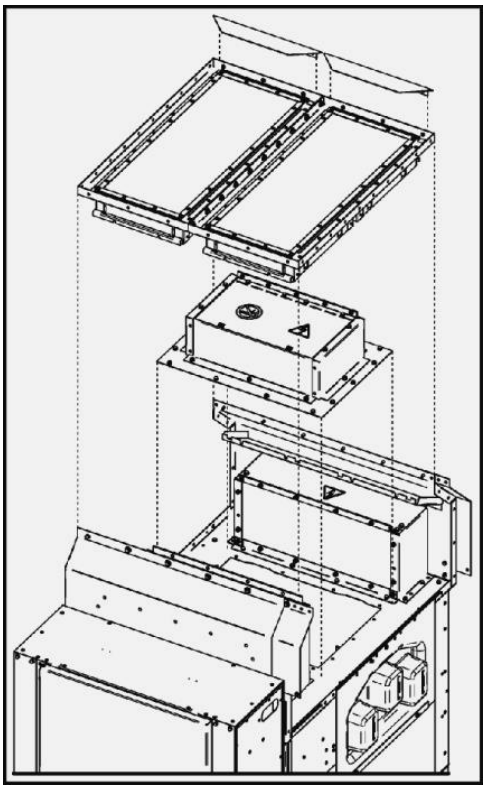


Fig. 153: PRD with natural ventilation

Function test of absorber system (optional version)
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.

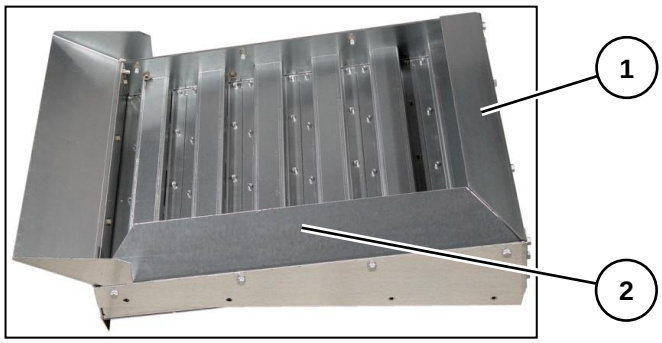


Fig. 154: View from the rear: Absorber system (for example, with lateral deflector plate on the right side)

(1) Front deflector plate

(2) Lateral deflector plate mounted on the right side

(3) Lateral deflector plate mounted on the left side

(4) Metal grid

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

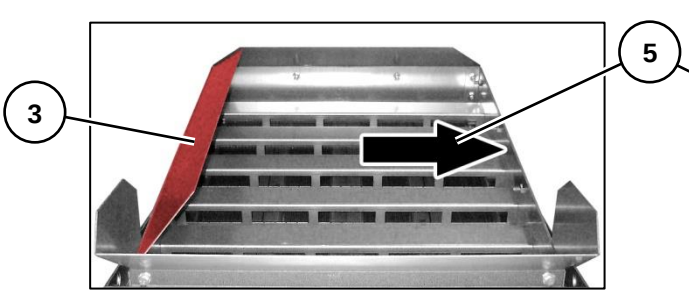


Fig. 155: View from the front: Absorber system installed left of the center of the switchgear row

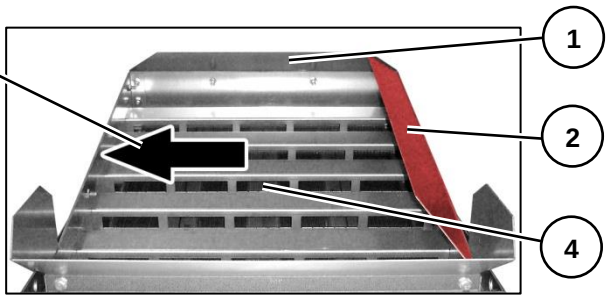


Fig. 156: View from the front: Absorber system installed right of the center of the switchgear row

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.

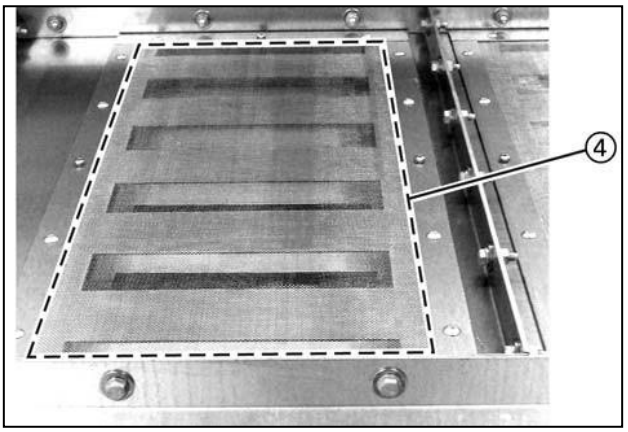


Fig. 157: View onto the ventilation system in the pressure relief duct

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.

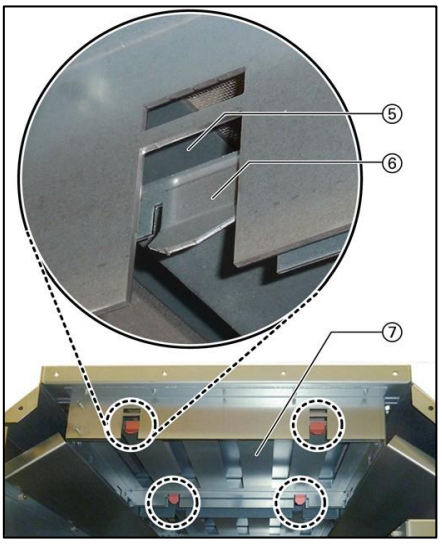


Fig. 158: Ventilation system in the pressure relief duct, view laterally from below

8.12 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.

⇨ Open 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 bolted joint size M12.

⇨ Remove the pre-assembled bolted joint (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 with contact washers).

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

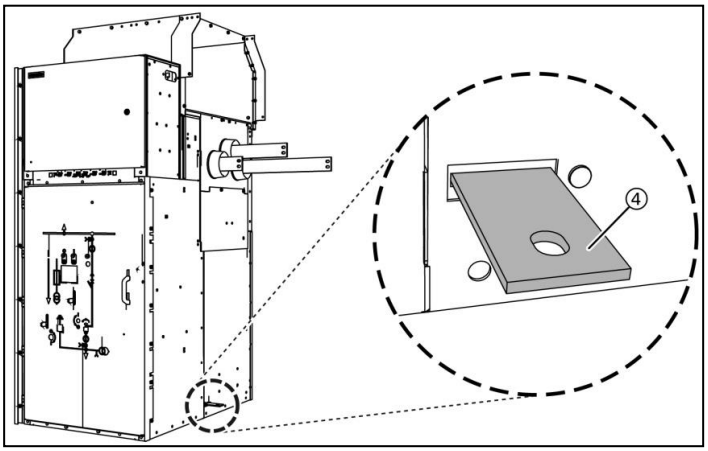


Fig. 159: Link, view from the right

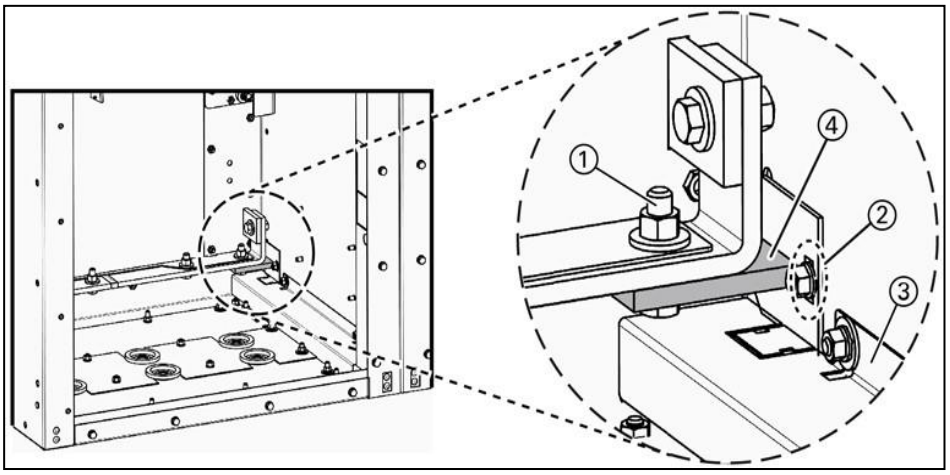


Fig. 160: Cable compartment of the adjacent panel, rear view

✓ The interconnections of the earthing busbar are completed.

8.13 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.

> **HINT**
>
> 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.

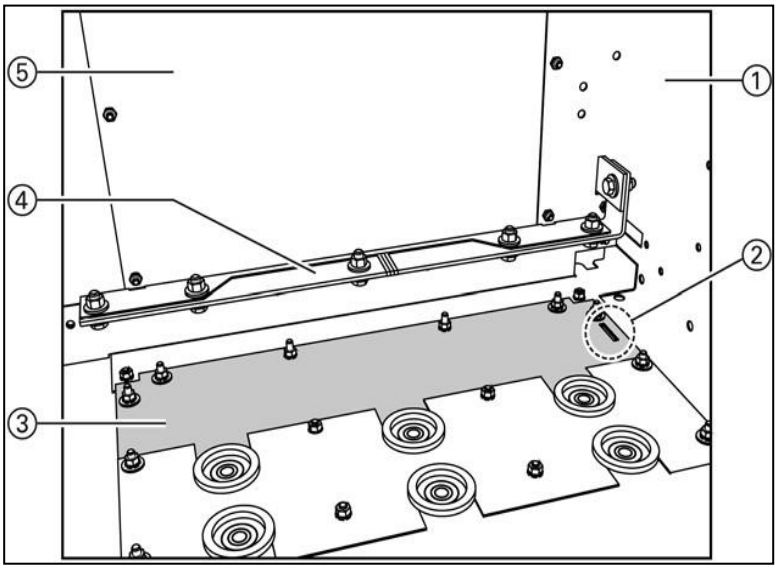


Fig. 161: View from the rear side into the connection compartment

(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 size 310 ML

✓ Earthing of the switchgear is completed.

8.14 Switchgear protection IP4X (optional)

Preparations

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

SIKAFLEX 221 size 310 ML is supplied with the accessories.

For further information, see information drawings NXAIR M, order number 139-2084.9.

8.15 Components without installation activity

HINT

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

Fig. 162: Control unit

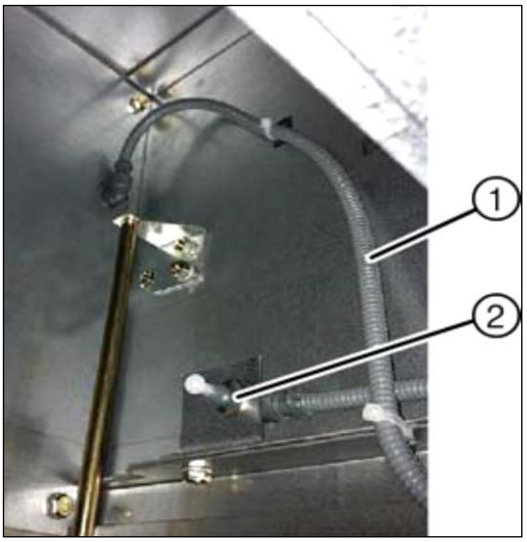


Fig. 163: Optical sensor (2) and connecting cable (1), for example, in the switching-device compartment

Overpressure sensors (optional)

Depending on its version, the switchgear panel may feature a system with overpressure sensors (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

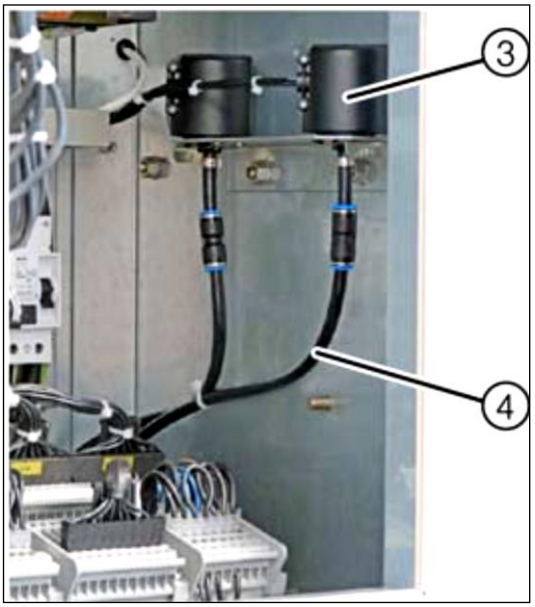


Fig. 164: Overpressure monitors (3) and tubes (4) in the low-voltage compartment

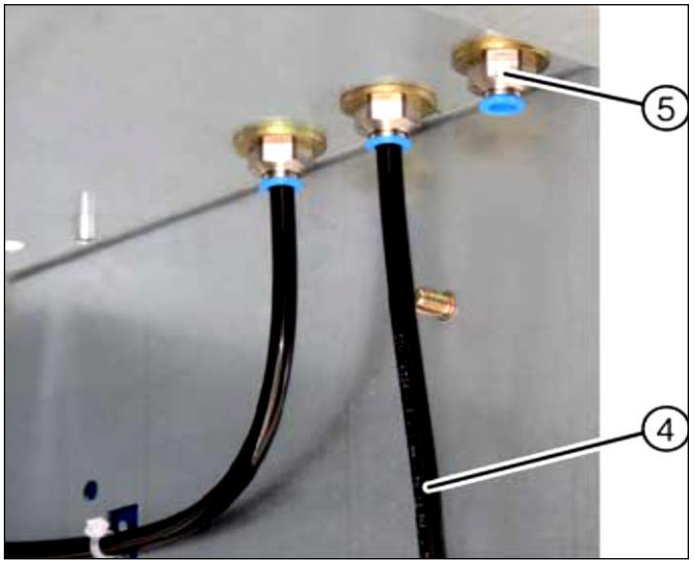


Fig. 165: Overpressure sensors (5) and tubes (4), for example in the switching-device compartment

9 Installation of the panel version for double-busbar system

HINT

Read and understand these instructions before attempting installation works.

9.1 Panel version for double-busbar system

CAUTION

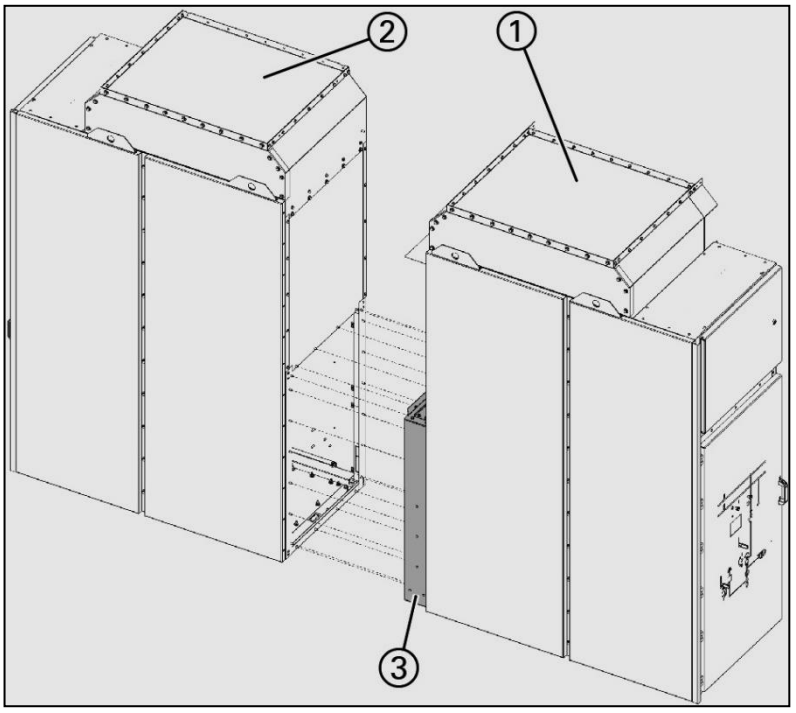
Non-observance of safety instructions

Only the **specific** assembly operations for panel versions for **double**-busbar system are described separately.

⇨ All safety information and instructions of the Installation Instructions remain unchanged and must generally be observed for installation!
They are generally valid for:

- Panel version for single-busbar system
- Panel version for double-busbar system

The panel version for double-busbar system is designed for the back-to-back arrangement of two panels. In a back-to-back arrangement, two panels are combined to one functional unit and are provided with a common connection compartment. The panel with the interconnection frame at the rear, pre-assembled at the factory, is called panel A, the other one is panel B.



(1) Panel A

(2) Panel B

(3) Interconnection frame, pre-assembled on panel A at the factory

Fig. 166: Panels for back-to-back arrangement

9.2 Transport units and packing

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

Transport packing

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

9.3 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

The withdrawable part 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 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 crossbar.
- ⇨ Unload the transport units in packed condition and leave packed for as long as possible.
- ⇨ Do not damage the PE protective film 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.

9.4 Checking for completeness and transport damages

- ⇨ 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.
- ⇨ In case of transport damage, inform the claims agent if necessary.
- ⇨ 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.

9.5 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:

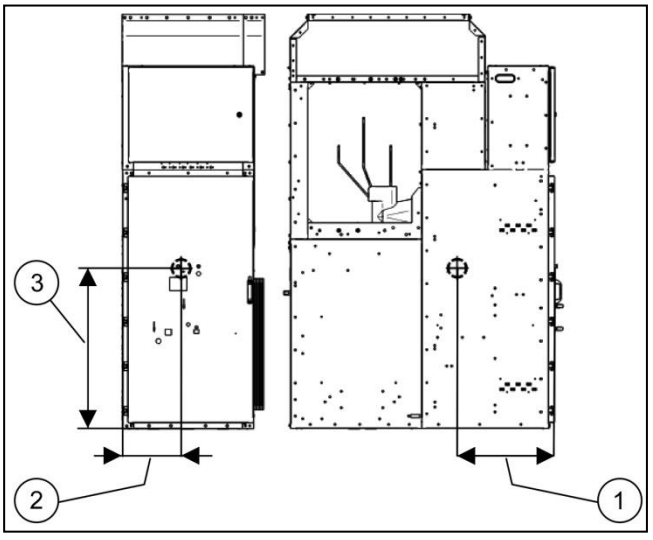


Fig. 167: Position of the center of gravity, for example, for a panel width of 800 mm

(1) 590 mm
(2) 350 mm
(3) 970 mm

Fig. 168: Symbol for center of gravity

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

9.6 Transport weights and dimensions without packing

<table>
<tr><th rowspan="2">Panel type NXAIR
(without rear duct)</th><th>Feeder current</th><th>Panel width (W)</th><th>Panel depth (D)</th><th>Panel height (H)</th><th>Weight approx.</th></tr>
<tr><th>[A]</th><th>[mm]</th><th>[mm]</th><th>[mm]</th><th>[kg]</th></tr>
<tr><td>Circuit-breaker panel, panel B</td><td rowspan="4">≤ 1250</td><td rowspan="4">800</td><td rowspan="2">1600</td><td rowspan="8">2510/
2550/
2680/
2750/
2770</td><td rowspan="4">1300</td></tr>
<tr><td>Disconnecting panel, panel B</td></tr>
<tr><td>Circuit-breaker panel, panel A</td><td rowspan="2">1750*</td></tr>
<tr><td>Disconnecting panel, panel A</td></tr>
<tr><td>Circuit-breaker panel, panel B</td><td rowspan="4">2500</td><td rowspan="4">1000</td><td rowspan="2">1600</td><td rowspan="4">1400</td></tr>
<tr><td>Disconnecting panel, panel B</td></tr>
<tr><td>Circuit-breaker panel, panel A</td><td rowspan="2">1750*</td></tr>
<tr><td>Disconnecting panel, panel A</td></tr>
</table>

Note*: Panel depth of 1600 mm plus 150 mm interconnecting frame

For further information, see information drawings NXAIR M, order number 139-2084.9.

9.7 Switchgear room

The requirements on the foundation design and the foundation fixing are identical with those of panel versions for single-busbar system. Associated information is given in chapter 6 of these instructions.

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

9.8 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 to 1.0 mm).

The following illustrations show general measuring sheets. For further information, see information drawings NXAIR M, order number 139-2084.9.

Feeder current [A]	Panel version	Panel depth complete [mm]	Standing surface without HV door [mm]
≤ 2500	Panel A	1750*	1565
	Panel B	1600	1565

Note*: Panel depth of 1600 mm plus 150 mm interconnecting frame

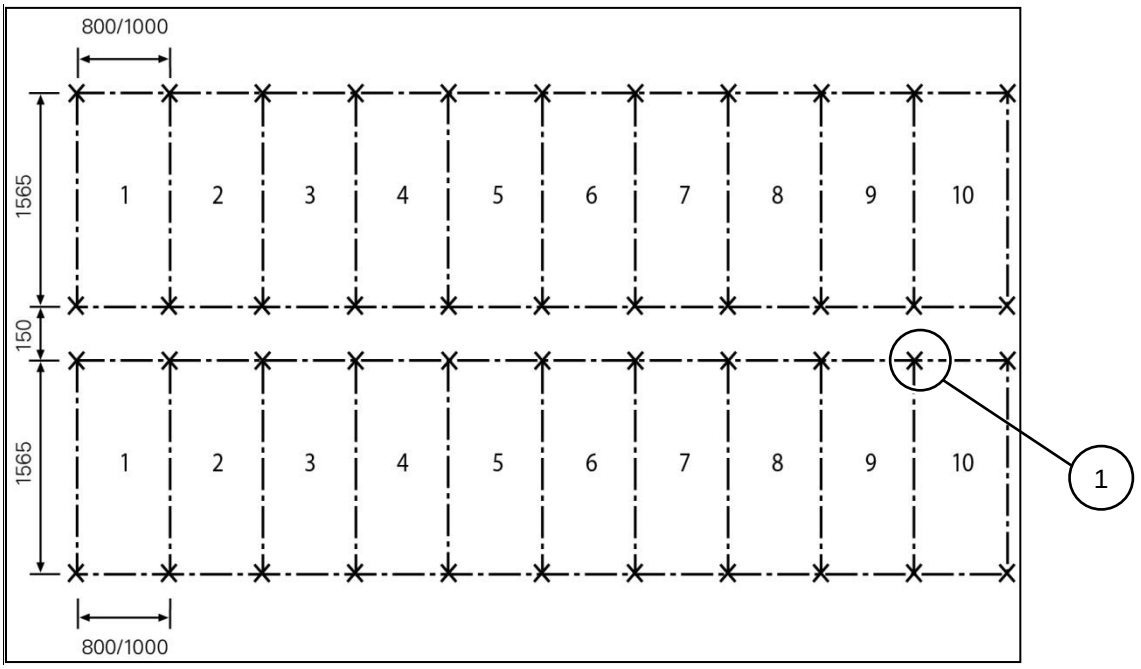


Fig. 169: Measuring sheet for the foundation. Tolerance according to DIN 43661:
Straightness 1 mm/1 m length, 2 mm for the total length;
evenness 1 mm within 1 m measured length

(1) Measuring points on the foundation rails

9.9 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.

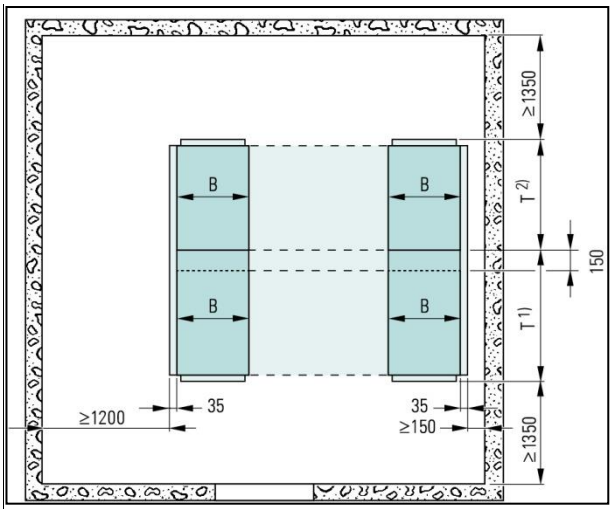
⇨ In case of a deviating room height in the relation between the technical data and the room height according to the following table, the installation of the switchgear is not permissible.

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:

	Rated voltage U_r [kV]	Height of switchgear room [mm]
Switchgear with evacuation ducts	24	min. ≥ 3000
Switchgear with absorber or evacuation ducts		min. ≥ 3300

9.10 Switchgear with absorber



B = panel width /
T = panel depth complete

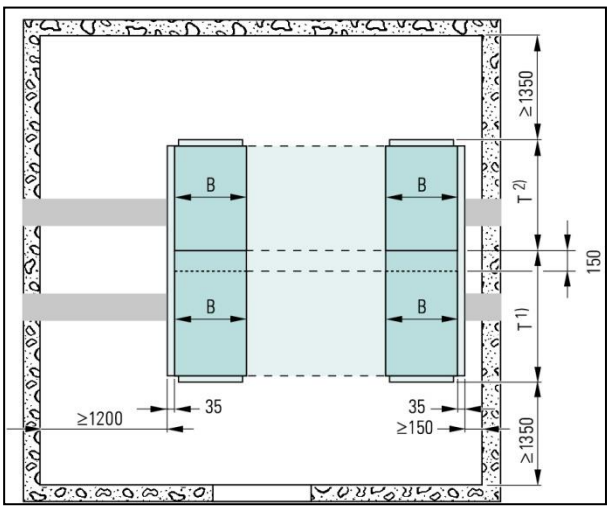
Fig. 170: Dimensions of the switchgear room, absorber

1) Panels A

2) Panels B

For further information, see information drawings NXAIR M, order number 139-2084.9.

9.11 Switchgear with evacuation ducts



B = panel width /
T = panel depth complete

Fig. 171: Dimensions of the switchgear room, evacuation duct

1) Panels A

2) Panels B

For further information, see information drawings NXAIR M, order number 139-2084.9.

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 M, order number 139-2084.9.

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, specific 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.

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

9.12 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.

9.13 Joining the panels

HINT

If not otherwise described, the following activities must always be executed starting from panel B.

⇨ In back-to-back arrangement, the further assembly operations, such as busbar assembly, do not differ from the assembly of single-busbar systems, and have to be executed accordingly.

⇨ Execute the activities described in the following for the next pair of panels until all panels are positioned in accordance with the room planning.

Preconditions

- The transport units to be combined are available in pairs for back-to-back arrangement
- Bag unit taken from the interconnection frame on panel A:

  - Article number of bag unit for panel with a width of 800 mm: 139-3791.3
  - Article number of bag unit for panel with a width of 1000 mm: 139-3792.3

- Copper bar units, insulating plates and insulating boxes taken from interconnection compartment panel B on base frame

For further information, see information drawings NXAIR M, order number 139-2084.9.

Procedure
Additional activities to be performed to interconnect panels in back-to-back arrangement:

- Erect the first two transport units that will be standing back-to-back in the switchgear room, and align them back-to-back as a pair. Both panels shall be easily accessible all around
- Undo the transport fixing of the busbars
- Starting with the first pair of panels, interconnect these two panels.
- Position the completely interconnected two panels in accordance with the room planning, align them and bolt them onto the foundation

Preparing the panels for back-to-back arrangement

⇨ On panel A, remove the partition to the interconnection compartment.

⇨ On panel B, remove the partition to the interconnection compartment.

⇨ Only for panels with a width of 1000 mm :
On panel B, remove the ventilation duct from the switching-device compartment.

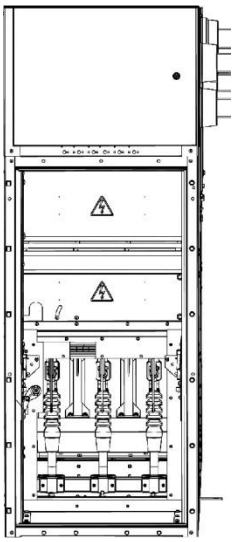


Fig. 172: Panel A, prepared

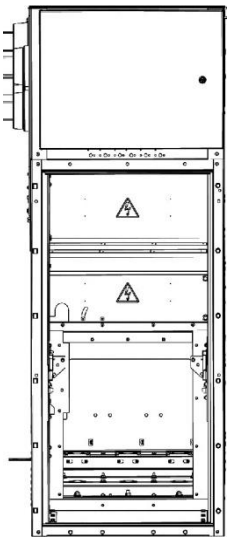
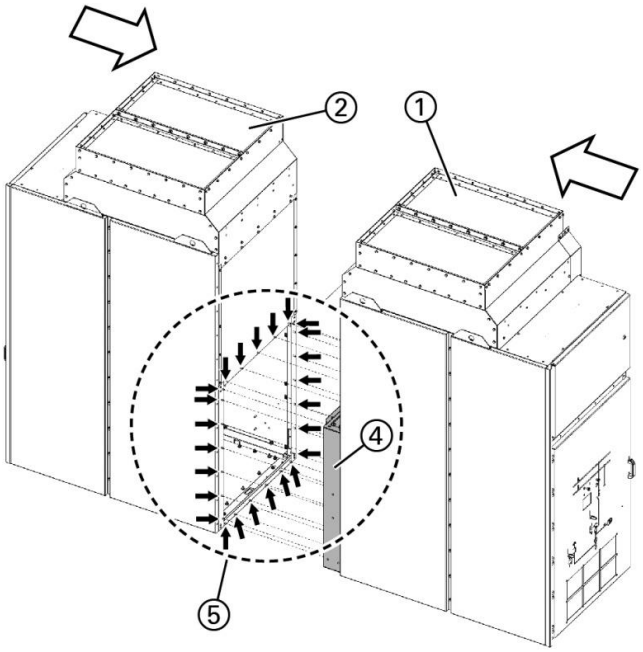


Fig. 173: Panel B, prepared

Bolting the panel frames together

⇨ Align panel A and panel B with each other for back-to-back arrangement, and push them together.

⇨ Starting from panel B, bolt the panel frames together with 22 or 25 bolts M8x20 with contact washers from the bag unit. Tighten the bolted joints M8 with a tightening torque of 30 Nm.



(1) Panel A
(2) Panel B
(3) Bolt-and-washer assemblies M8x20
(4) Interconnection frame

Fig. 174: Bolting the panel frames together

Bolting the internal connection bars together, panel width 800 mm

NOTICE

Different bolted joints

The 3 bolted joints of the internal connection bars have different screwing directions and tightening torques.

⇨ Observe the screwing direction and tightening torque of the 3 bolted joints.

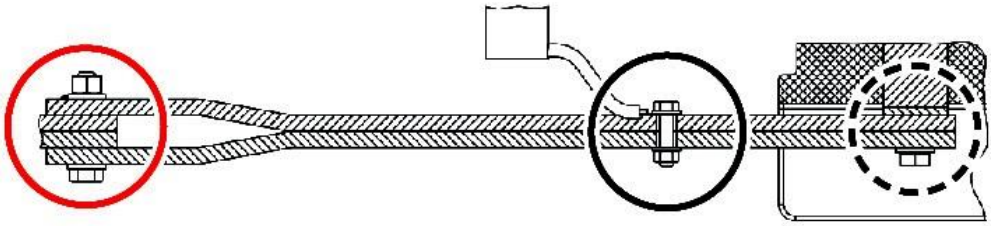
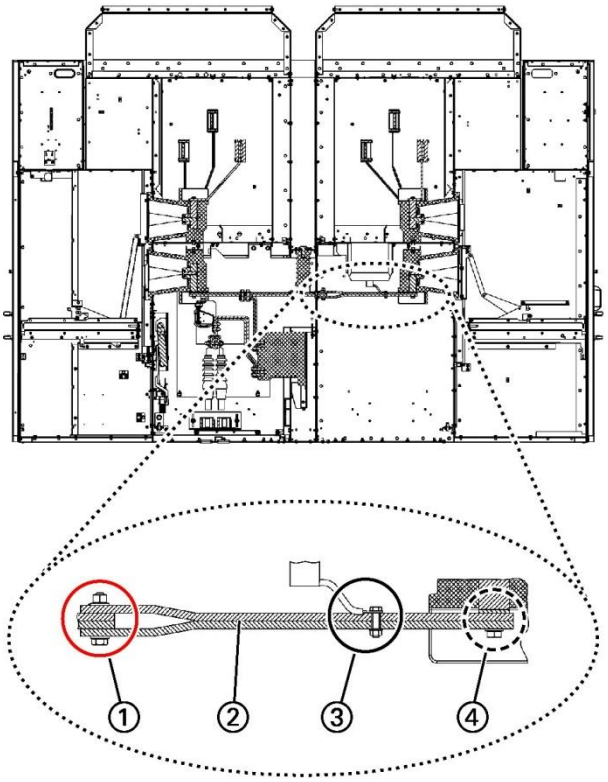


Fig. 175: Bolted joints of internal connection bars, panel width 800 mm

⇨ Provide 6 copper bar units for internal connection bars (2).

⇨ Check contact surfaces of internal connection bars, brush if necessary, and apply a thin grease film of Vaseline.



(1) 2 bolts M12x60 with 2 conical spring washers Ø 29 mm and 2 nuts each

(2) Internal connection bars

(3) Bolt M8x35 with 2 conical spring washers, for connecting the cable of a voltage transformer

(4) 2 bolts M12x50 with 1 conical spring washer Ø 24 mm each

Fig. 176: Internal connection bars, panel width 800 mm

⇨ Tighten the bolted joints M8 with a tightening torque of 30 Nm and the bolted joints M12 with a tightening torque of 70 Nm.

Bolting the internal connection bars together, panel width 1000 mm

> ***NOTICE***
>
> **Different bolted joints**
>
> The 3 bolted joints of the internal connection bars have different screwing directions and tightening torques.
>
> ⇨ Observe the screwing direction and tightening torque of the 3 bolted joints.

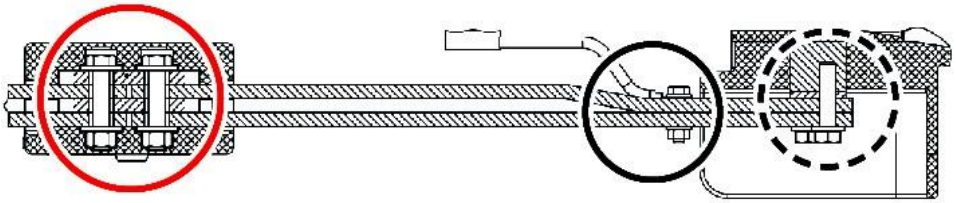
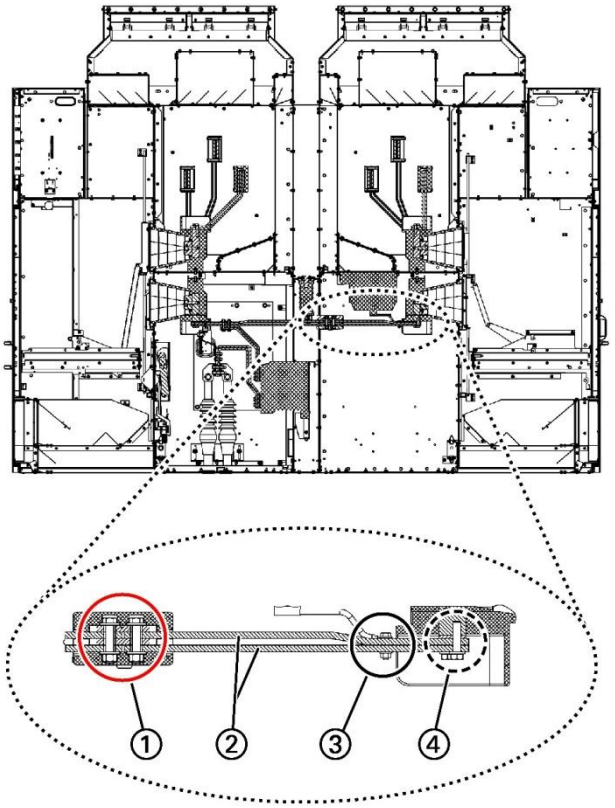


Fig. 177: Bolted joints of internal connection bars, panel width 1000 mm

⇨ Provide 6 copper bar units for internal connection bars.

⇨ Check contact surfaces of internal connection bars, brush if necessary, and apply a thin grease film of Vaseline.



(1) 2 bolts M12x60 with 2 conical spring washers Ø 29 mm and 2 nuts each

(2) Internal connection bars

(3) Bolt M8x35 with 2 conical spring washers, for connecting the cable of a voltage transformer

(4) 2 bolts M12x50 with 1 conical spring washer Ø 24 mm each

Fig. 178: Internal connection bars, panel width 1000 mm

⇨ Tighten the bolted joints M8 with a tightening torque of 30 Nm and the bolted joints M12 with a tightening torque of 70 Nm.

Insulating shells for panel width 1000 mm

In panels with a width of 1000 mm, the fourfold bolted joint of the internal connection bars is covered with insulating shells. At the end, these insulating shells are mounted additionally after bolting the internal connection bars together.

HINT

The insulating half-shells have a different shape for the bolt head side and the bolting side.

⇨ Observe the inserting direction of the bolted joints while mounting the insulating shells.

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

HINT

The strip fasteners are reclosable and reusable.

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

⇨ Mount the insulating shells for all three phases, and close with strip fasteners.

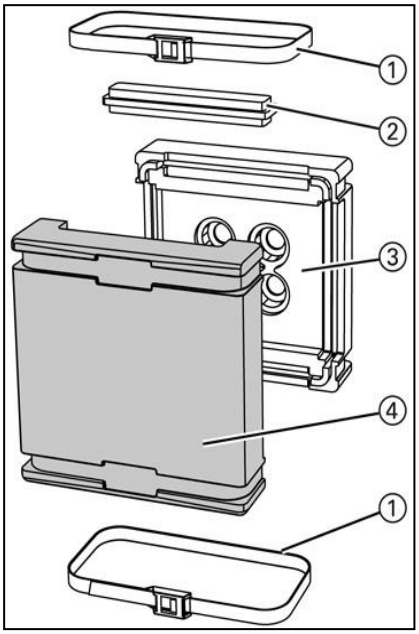


Fig. 179: Assembly parts

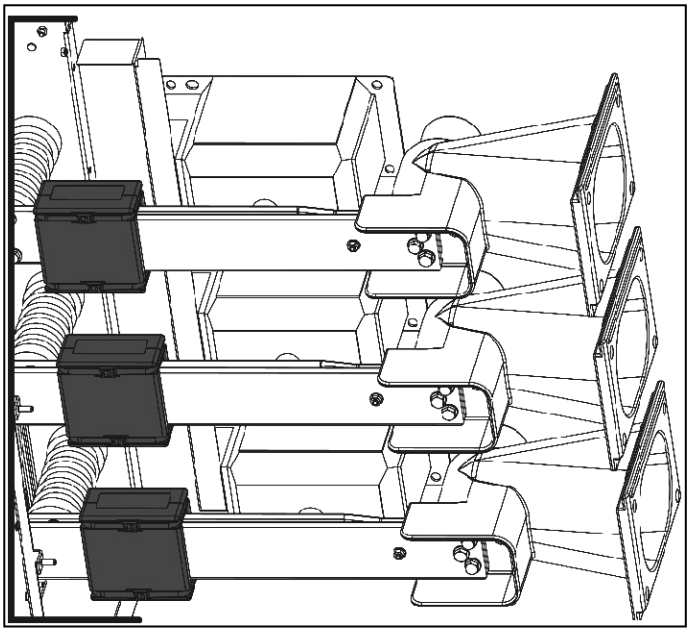


Fig. 180: Insulating shells, mounted

(1) Strip fastener

(2) End cap

(3) Insulating half-shell, bolt head side

(4) Insulating half-shell, bolting side

Mounting the lateral insulating plates

NOTICE
Excessive torque Observe the tightening torques at the bolted joints of the insulating plates. Applicable tightening torques for the bolted joints of the insulating plates: • Tightening torque: **16 Nm** • Control tightening torque: **12 Nm**

⇨ Each on the left and on the right, insert an insulating plate (1) into the hooks (3) pre-assembled in panel A at the factory, and bolt together with a bolt M8x20 with contact washer and flat washer size 8 acc. to ISO 7093.

⇨ Tighten the bolted joints M8 with a tightening torque of 16 Nm.

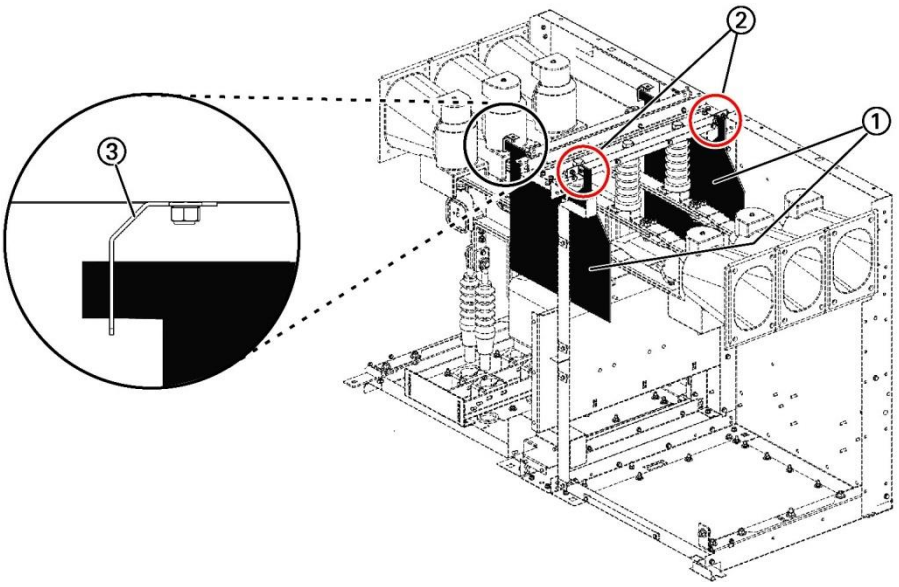


Fig. 181: Mounting the lateral insulating plates, panel width 800 mm

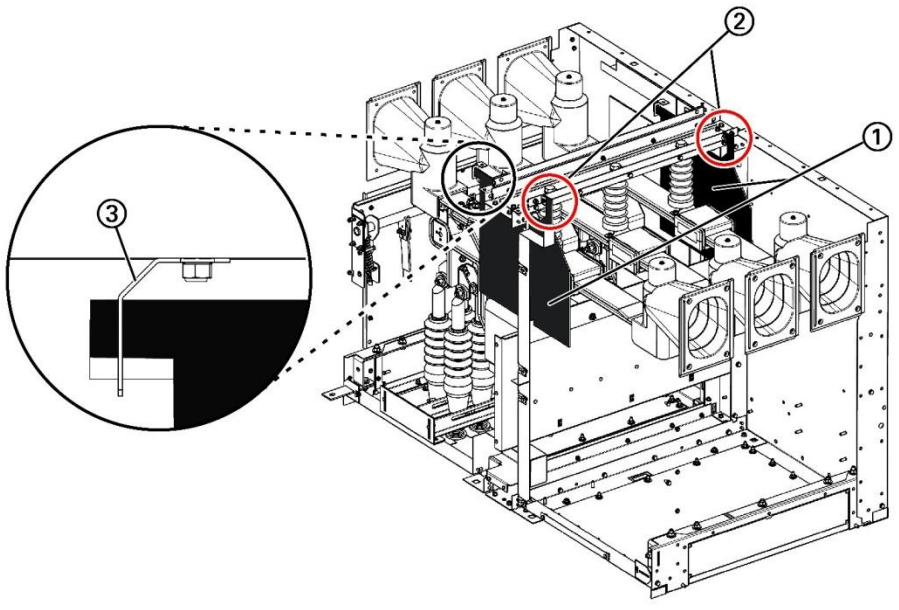


Fig. 182: Mounting the lateral insulating plates, panel width 1000 mm

Mounting the central insulating plates

NOTICE

Excessive torque

Observe the tightening torques at the bolted joints of the insulating plates.

Applicable tightening torques for the bolted joints of the insulating plates:
- Tightening torque: **8 Nm**
- Control tightening torque: **6 Nm**

HINT

Mount the central insulating plates only in panels with a width of 800 mm.

⇨ Do not mount central insulating plates in panels with a width of 1000 mm!

HINT

The central insulating plates in panel A are pre-assembled at the factory.

⇨ No installation activities must be performed on the central insulating plates in panel A.

⇨ Each between the bars of the three phases, insert a central insulating plate (1) into the hooks (3) pre-assembled in panel B at the factory, and bolt together with 2 plastic bolts M8x25 acc. to DIN 34810 plus 2 plain washers size 8 acc. to DIN 34816 plus 2 plastic nuts M8 acc. to DIN 34814 (2).

⇨ Tighten the bolted joints M8 with a tightening torque of 8 Nm.

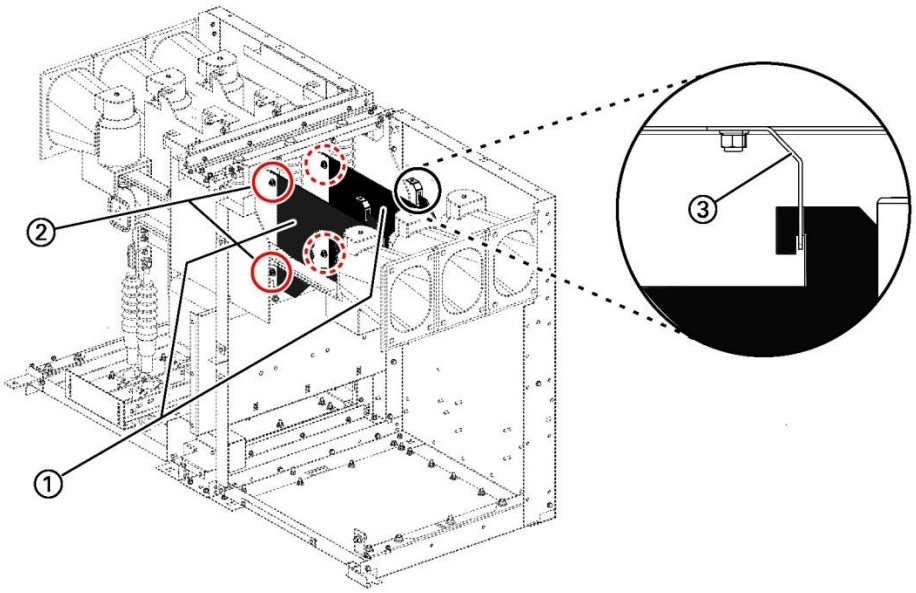


Fig. 183: Mounting the central insulating plates, panel width 800 mm

Laying low-voltage cables

⇨ For laying the low-voltage cables, the panels are equipped with wiring ducts (2).

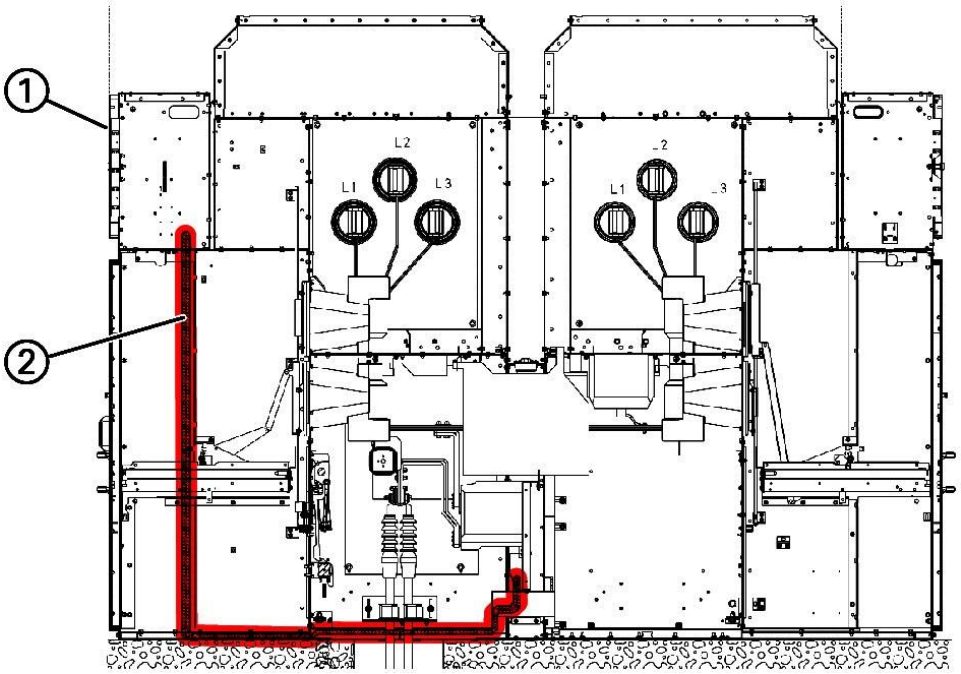


Fig. 184: Laying of low-voltage cables,
with view onto panel A (1), left inner side of panel

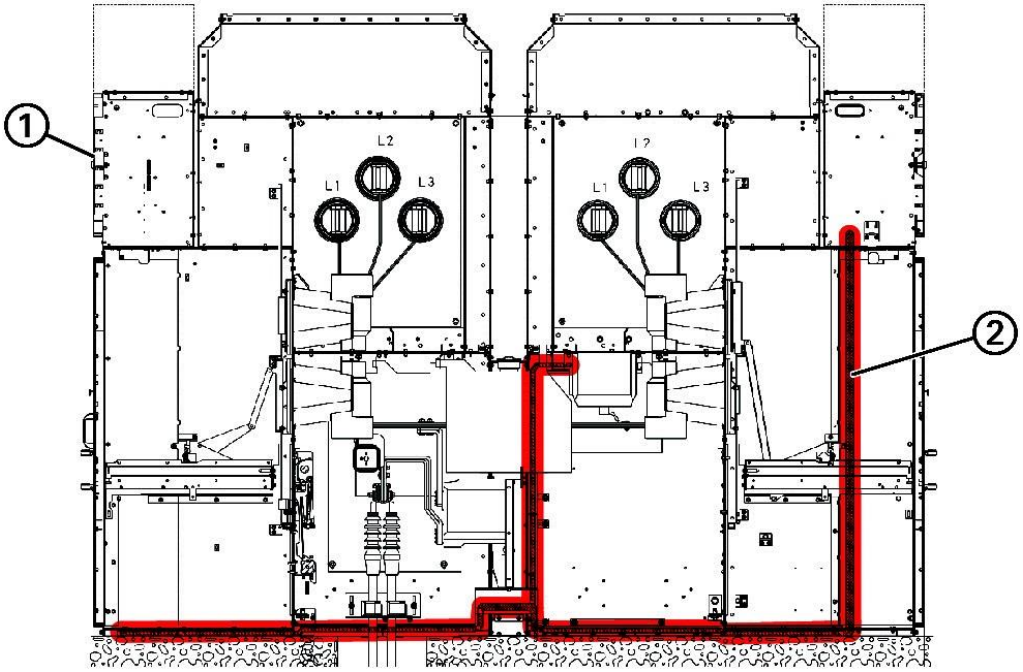


Fig. 185: Laying of low-voltage cables,
with view onto panel A (1), right inner side of panel

Panels with end wall

⇨ On panels with an end wall, bolt the connection link (1) between the end walls of the panels A and B using 24 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093.

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

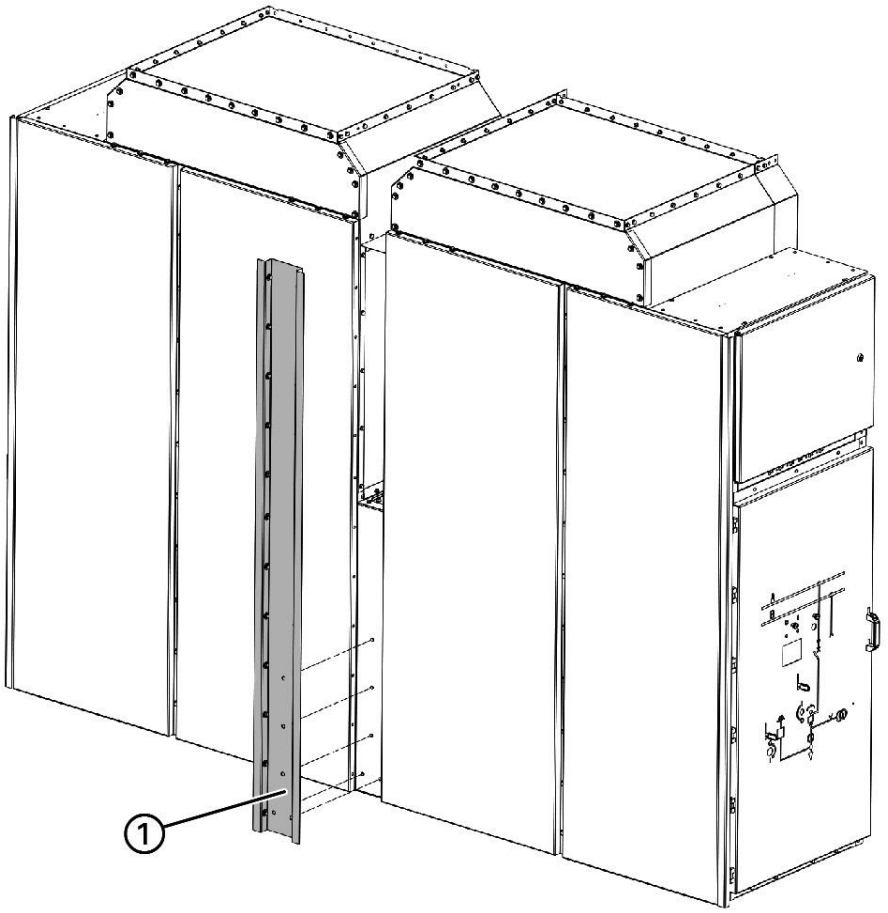


Fig. 186: Connection link between the end walls

⇨ For further activities such as busbar assembly, see chapter 8.

✓ The installation work required for back-to-back arrangement is completed.

10 Accessing the connection compartment through the front

HINT

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 139-2021.9.

HINT

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

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

10.1 Preparations before accessing the connection compartment

Preconditions

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

Procedure

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

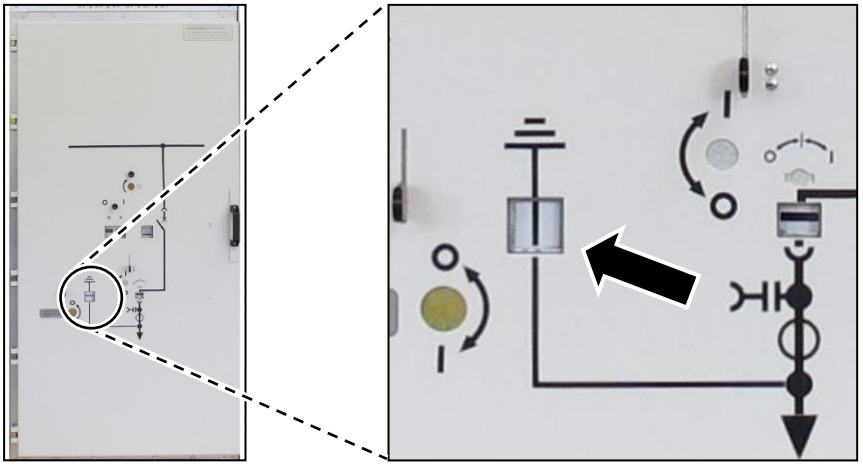


Fig. 187: Position indicator of feeder earthing switch on high-voltage door

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: 139-2021.9.

⇨ Then take the withdrawable part out of the switching-device compartment, see Operating Instructions with order number 139-2021.9.

If **no** withdrawable part 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.

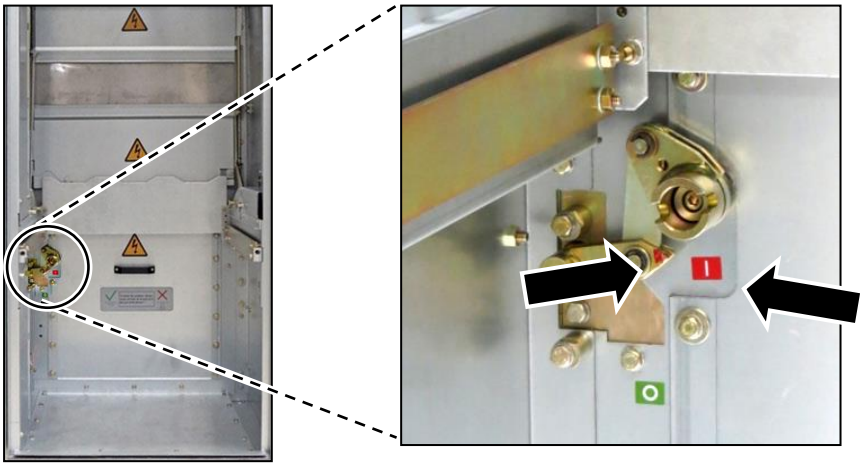


Fig. 188: Additional position indicator of feeder earthing switch in switching-device compartment

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:

⇨
- For inserting a withdrawable part in the panel, see Operating Instructions with order number 139-2021.9.
- Earth the feeder, see Operating Instructions with order number 139-2021.9

10.2 Accessing the connection compartment through the switching-device compartment

Preconditions

- Preparations as described in chapter 10.1 completed

Procedure

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

⇨ Remove the connecting elements (5) from the protection plate of the switching-device compartment (1), and store them:

- 4 nuts M8 with contact washers

⇨ Remove the protection plate of the switching-device compartment (1) from the switching-device compartment, and store it.

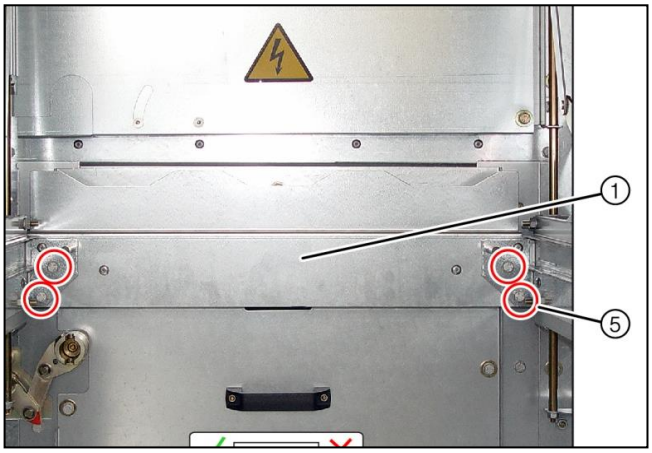


Fig. 189: 4 bolted joints on protection plate of switching-device compartment

All panel versions:

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

- 15 bolts M8x20 with contact washers and plain washers

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

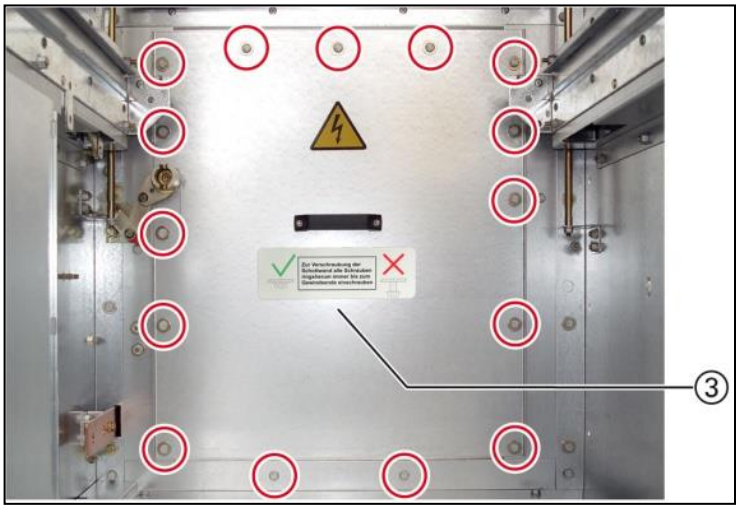


Fig. 190: 15 bolted joints on partition in circuit-breaker panel, panel spacing 800 mm

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

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

⚠ CAUTION

Sharp edges

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

⇨ Put on personal protective equipment.

⚠ CAUTION

High weight

The ventilation duct is heavy.

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

⇨ Put on personal protective equipment.

Preconditions

- Preparations as described in chapter 10.1 completed

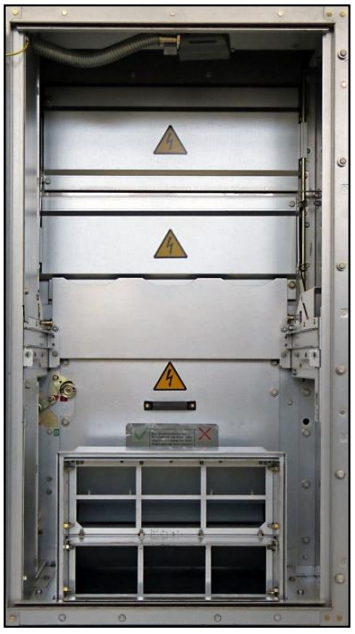


Fig. 191: Panel prepared

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.

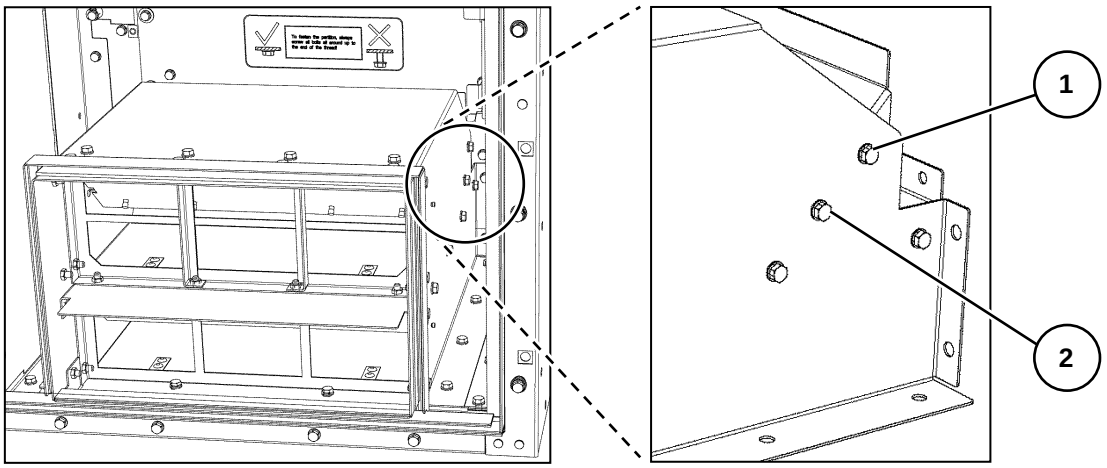


Fig. 192: Bolts for detaching the holder

⇨ Fold the air guide upwards.

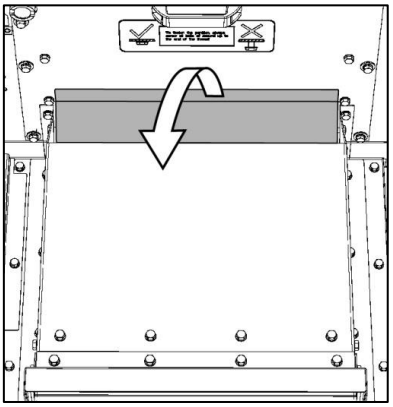


Fig. 193: Folding the air guide upwards

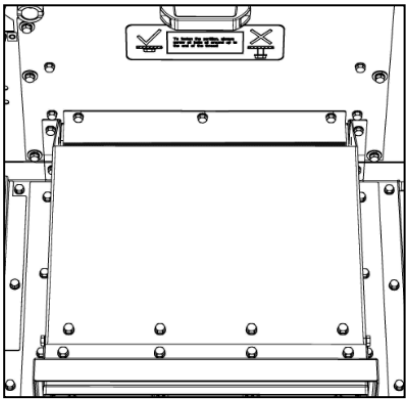


Fig. 194: Air guide folded upwards

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

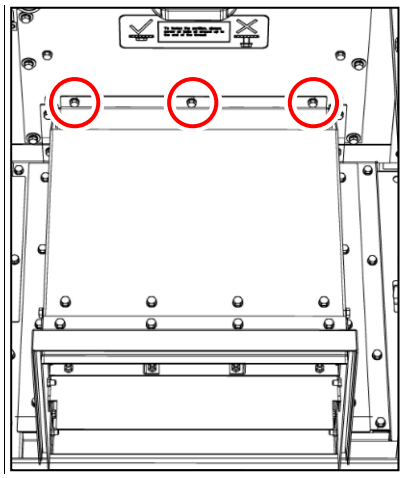


Fig. 195: 3 bolted joints on partition

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

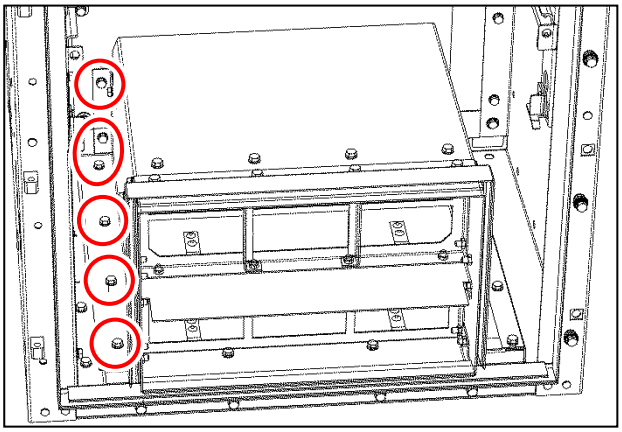


Fig. 196: 6 lateral bolted joints on partition and base frame

⇨ Unscrew the 4 front nuts from the base frame, and store them.

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

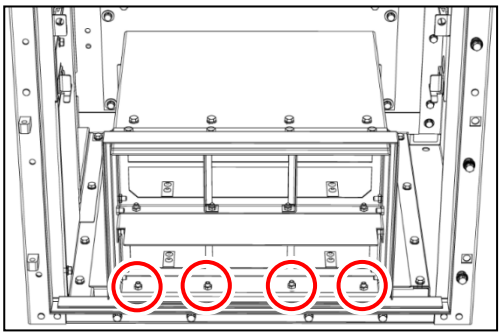


Fig. 197: 4 bolted joints on base frame, at the front

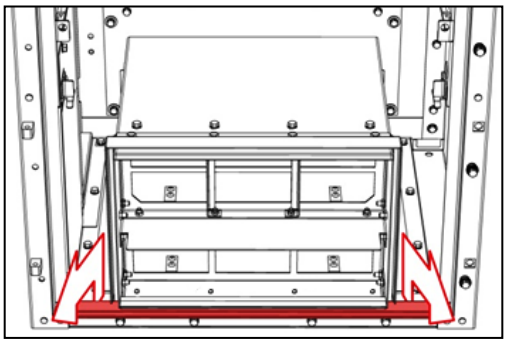


Fig. 198: Lifting and pulling

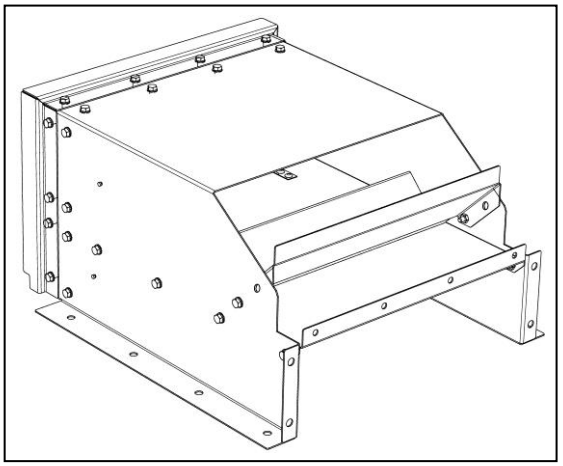


Fig. 199: Ventilation duct removed

Fig. 200: 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.

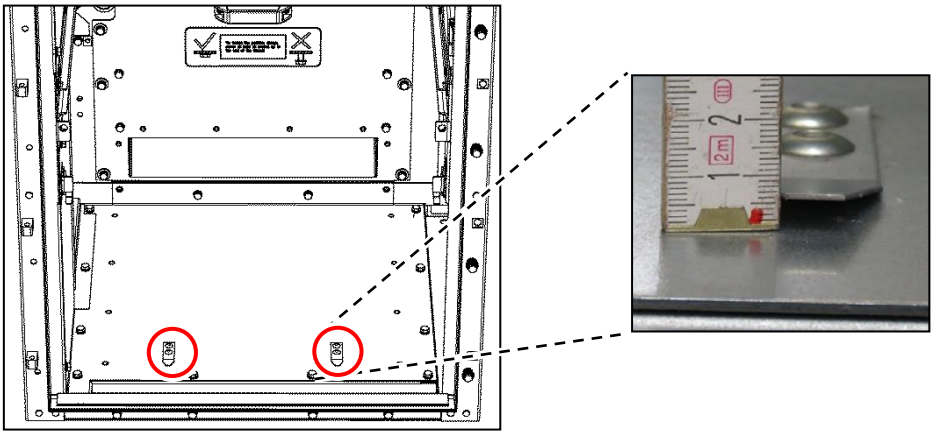


Fig. 201: 2 links on panel base

Fig. 202: Correct position of the links

⇨ Remove the connecting elements (5) from the protection plate of the switching-device compartment (1), and store them:

- 4 nuts M8 with contact washers

⇨ Remove the protection plate of the switching-device compartment (1) from the switching-device compartment, and store it.

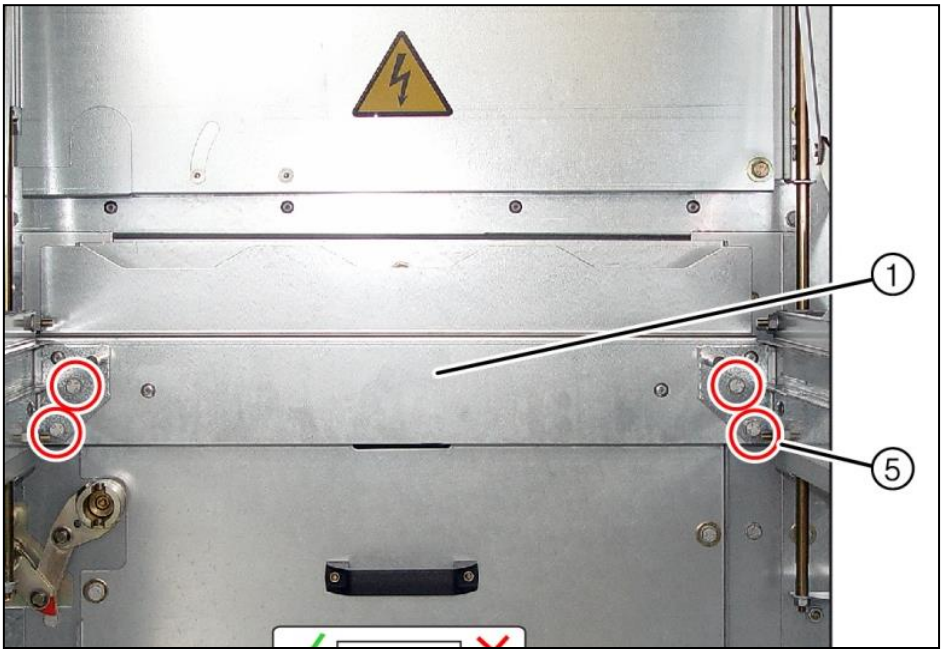


Fig. 203: 4 bolted joints on protection plate of switching-device compartment

Accessing the connection compartment through the front

⇨ Remove the 16 connecting elements from the partition (2) to the connection compartment inside the switching-device compartment, and store them:

- 16 bolts M8x20 and plain washers (4)

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

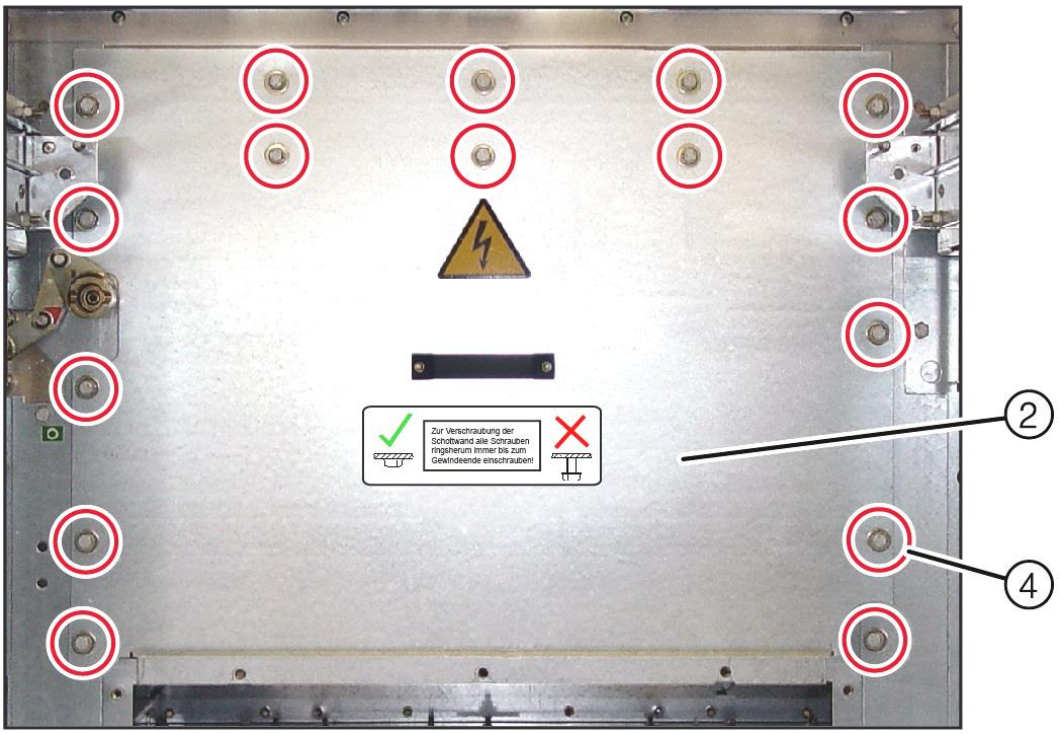


Fig. 204: 16 bolted joints on partition

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

10.4 Accessing the connection compartment through the switching-device compartment in panel versions with voltage transformer compartment

⚠ CAUTION

Sharp edges

The metal parts of the voltage transformer compartment and the vertical partition may have sharp edges.

⇨ Put on personal protective equipment.

⚠ CAUTION

High weight

The voltage transformer compartment is heavy.

⇨ Remove the voltage transformer compartment absolutely with 2 persons.

⇨ Put on personal protective equipment.

Preconditions

- Preparations as described in chapter 10.1 completed

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

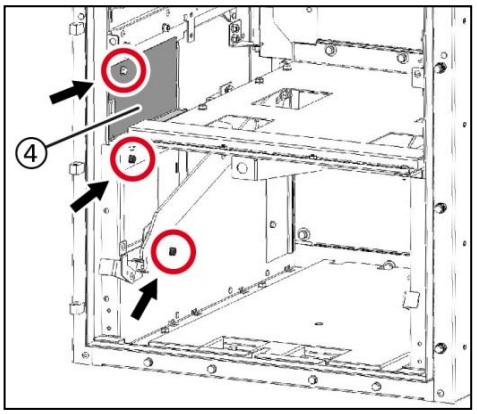


Fig. 205: 3 bolted joints on wiring duct cover, panel width 800 mm

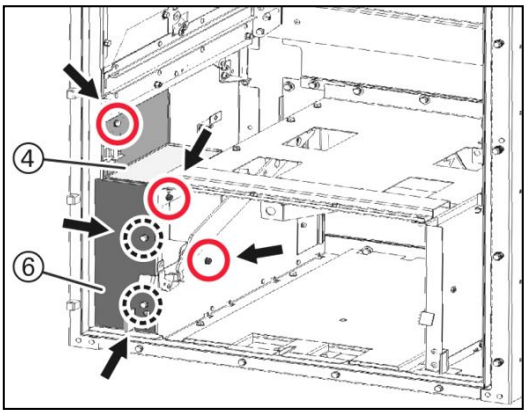


Fig. 206: 5 bolted joints on wiring duct cover, panel width 1000 mm

⇨ Remove the wiring duct cover (4), and store it.

⇨ For panel width 1000 mm: Remove the metal cover (6), and store it.

⇨ Remove 8 bolts M8x20 at the voltage transformer compartment, and store them.

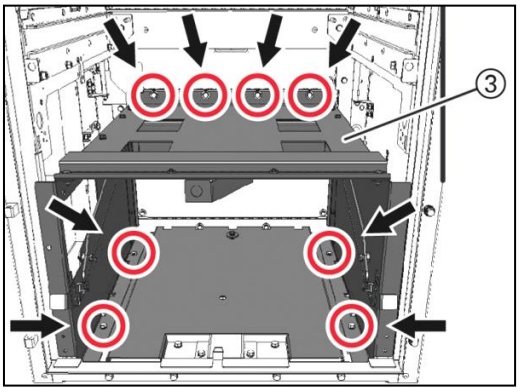


Fig. 207: 8 bolted joints on voltage transformer compartment

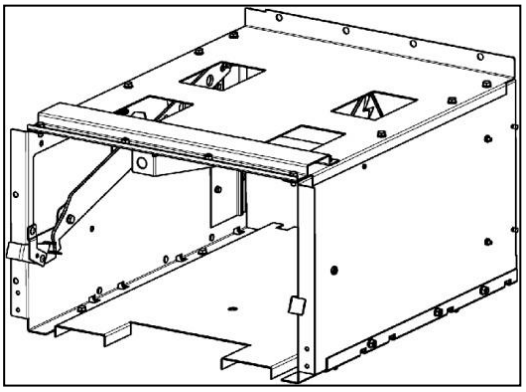


Fig. 208: Voltage transformer compartment, removed

⇨ Take the voltage transformer compartment (3) out of the panel to the front, and store it.

⇨ Remove 4 nuts M8 at the protection plate of the switching-device compartment, and store them.

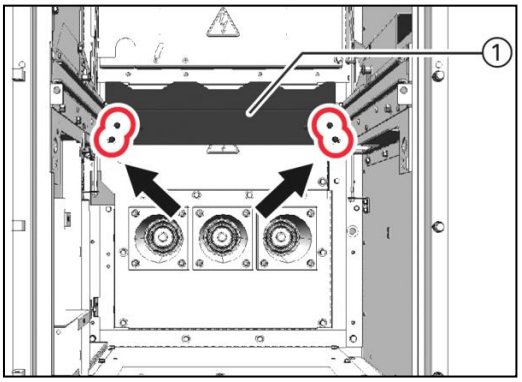


Fig. 209: 4 bolted joints on protection plate of switching-device compartment

⇨ Remove the protection plate of the switching-device compartment (1), and store it.

⇨ Remove 8 bolts M8x20 from the partition to the connection compartment, and store them.

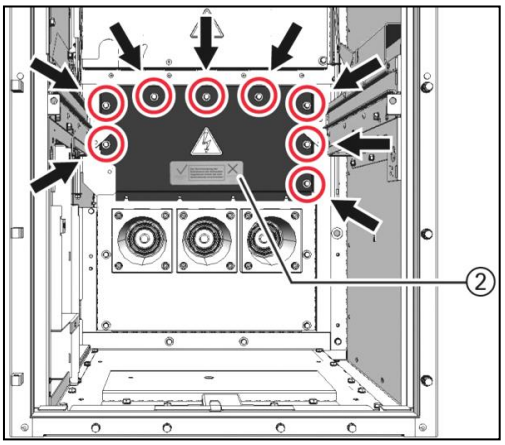


Fig. 210: 8 bolted joints on partition

⇨ Remove the partition (2) from the switching-device compartment, and store it.

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

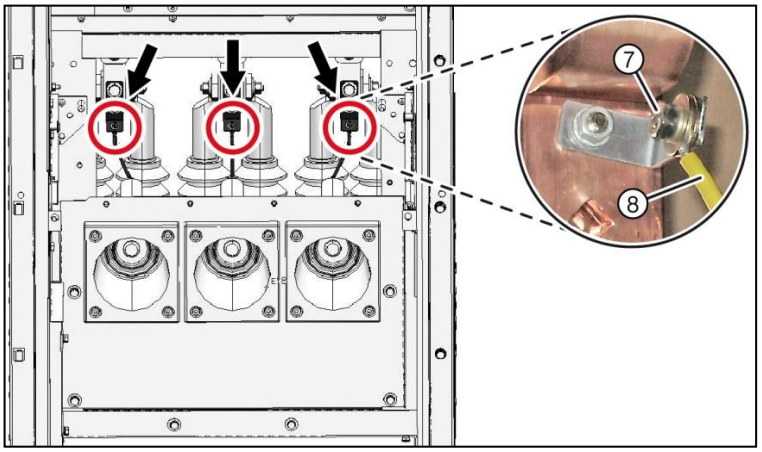


Fig. 211: Bolted joints at the cable connections

⇨ Loosen the 3 connecting cables (8) for the removable voltage transformers from the cable connections.

⇨ 6 bolted joints M8x20 of the bushing plate with bushings, and store them.

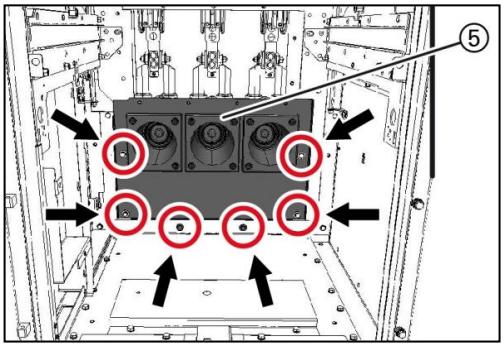


Fig. 212: 6 bolted joints on bushing plate with bushings

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

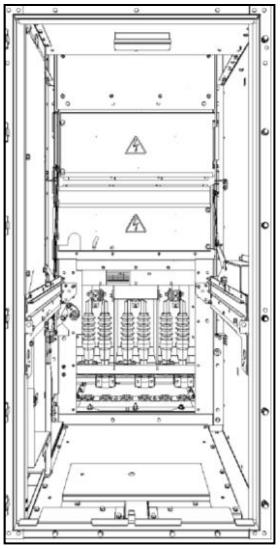


Fig. 213: Switching-device compartment prepared for cable installation from the front

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

11 Accessing the connection compartment through the rear

HINT

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 139-2021.9.

CAUTION

Sharp edges

The metal parts at the rear wall may have sharp edges.

⇨ Put on personal protective equipment.

HINT

⇨ Before executing any installation activities read and understand the corresponding chapters in the Operating Instructions with order number 139-2021.9.

HINT

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

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

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

Preconditions

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

Procedure

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

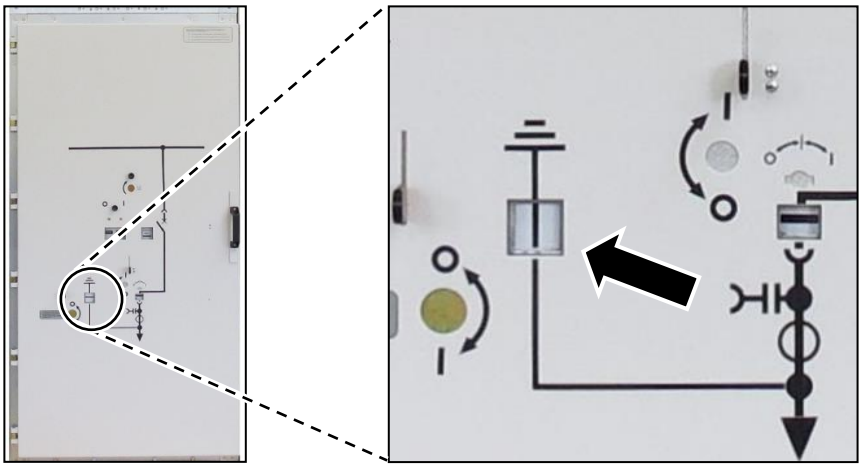


Fig. 214: Position indicator on high-voltage door

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: 139-2021.9.

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

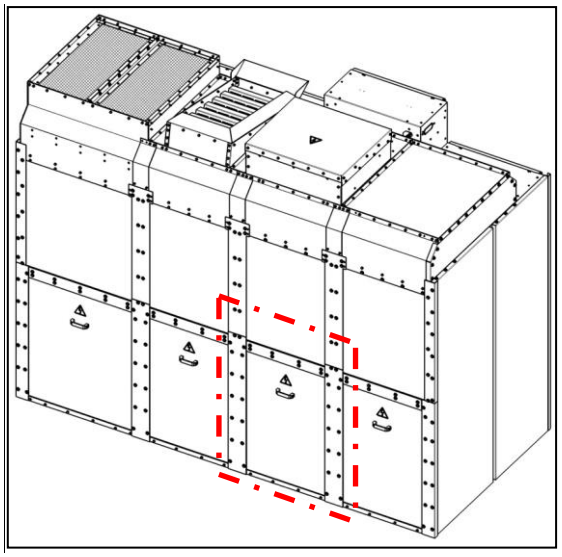


Fig. 215: 4-panel arrangement with rear wall and rear ledges closed (as an example)

Accessing the connection compartment through the rear

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

⇨ Remove the horizontal ledge, and store it together with the associated bolting material.

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

⇨ Remove the vertical ledge, and store it together with the associated bolting material.

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

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

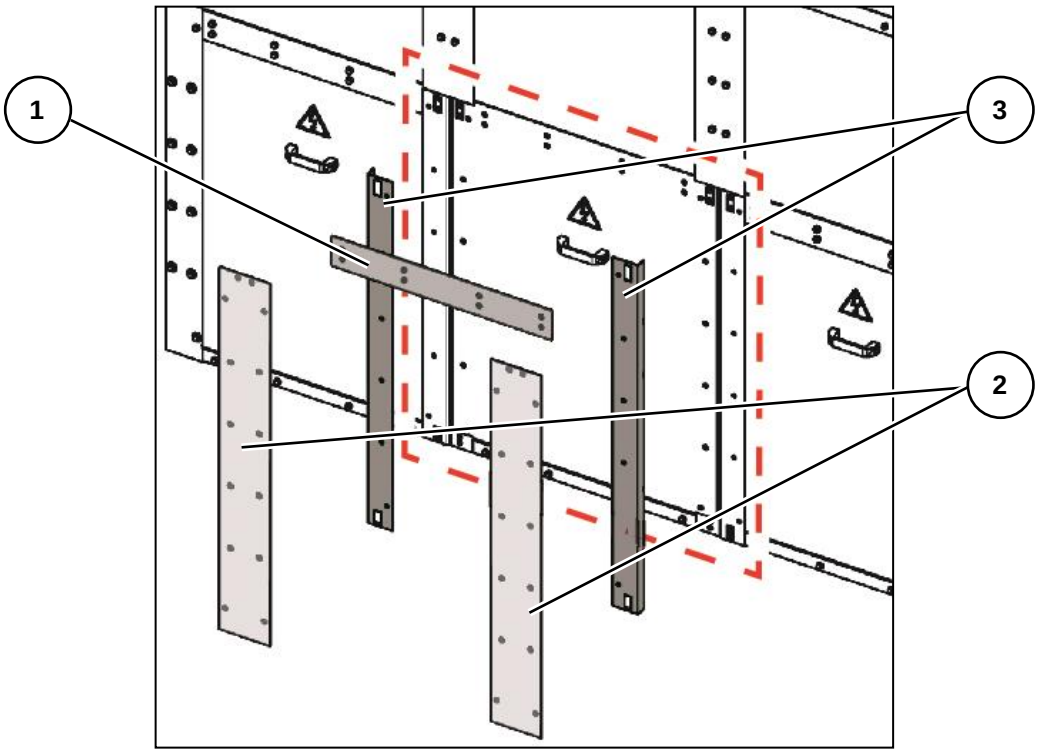


Fig. 216: Rear wall with ledges

(1) Horizontal ledge

(2) Vertical ledges

(3) Sealing brackets

⇨ Unscrew and remove the bolting material at the panel base:
- 4 bolts M8x20 with contact washers (5)

⇨ To remove the rear wall, lift it and pull it away using the handle (4). Store the rear wall.

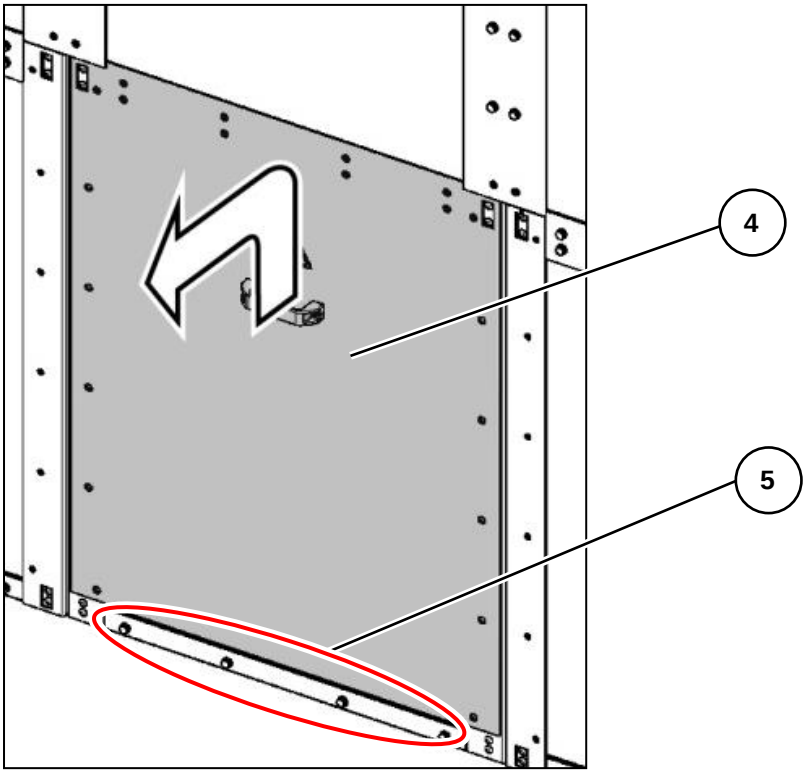


Fig. 217: Removing the rear wall

(4) Rear wall with handle

(5) Bolts to remove

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

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

⚠ CAUTION

Sharp edges

The metal parts of the rear walls may have sharp edges.

⇨ Put on personal protective equipment.

⚠ CAUTION

High weight

Die upper rear wall is heavy.

⇨ Remove the upper rear wall absolutely with 2 persons.

Preconditions

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

Procedure

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

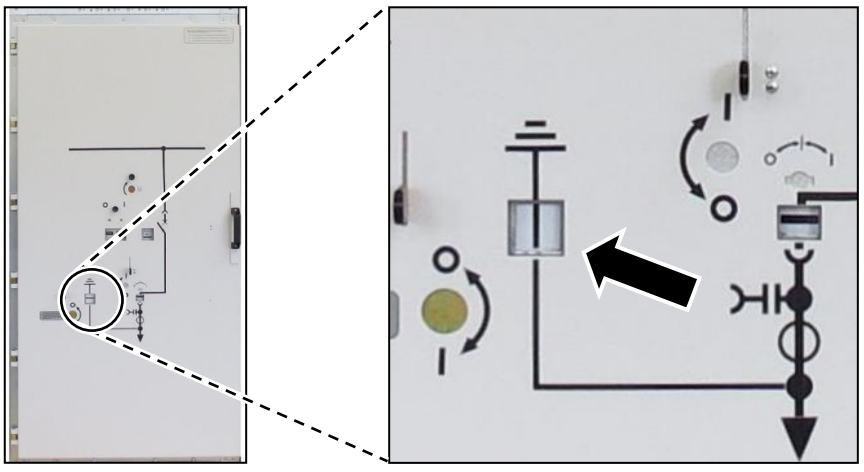
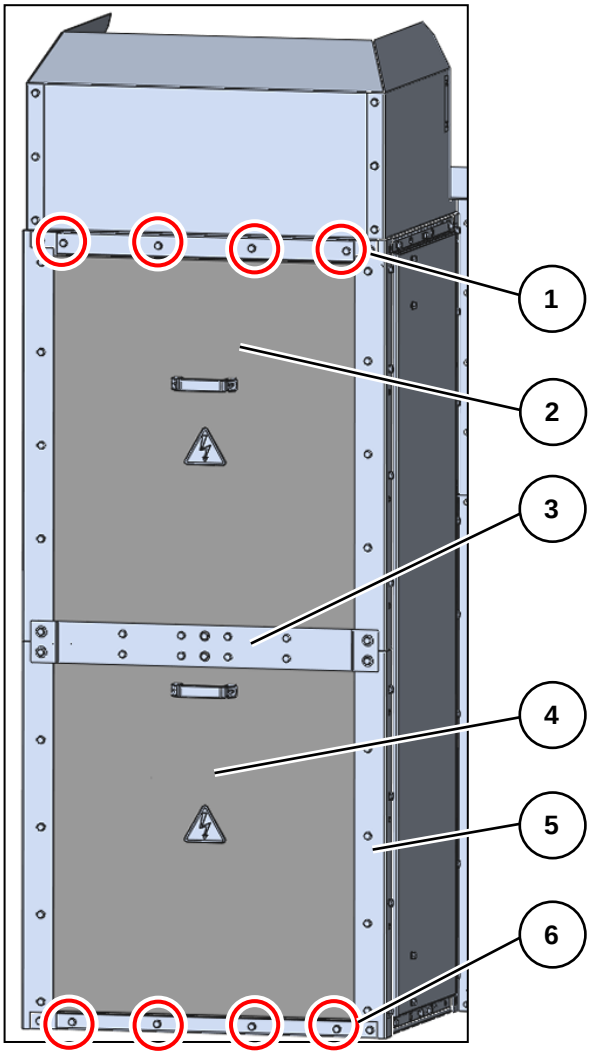


Fig. 218: Position indicator on high-voltage door

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

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

⇨ Remove the connecting elements from one of the vertical ledges (5):
- 9 / 19 bolts M8x20 with contact washers and plain washers



(1) Bolted joints for upper rear wall
(2) Upper rear wall with handle
(3) Horizontal ledge
(4) Lower rear wall with handle
(5) Vertical ledges
(6) Bolted joints for lower rear wall

Fig. 219: Rear ledges and rear walls on connection duct

⇨ Remove the vertical ledges, and store them together with the associated connecting elements.

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

⇨ Loosen the connecting elements of the lower rear wall at the panel base (6):
- 4 / 6 bolts M8x20 with contact washers

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

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

⇨ To remove, pull the upper rear wall (4) downwards by the handle. Store the rear wall.

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

12 Electrical connections

HINT

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 connected to the mains, and is not live.

⇨ 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**.

HINT

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.

12.1 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 M8 with contact washers (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.

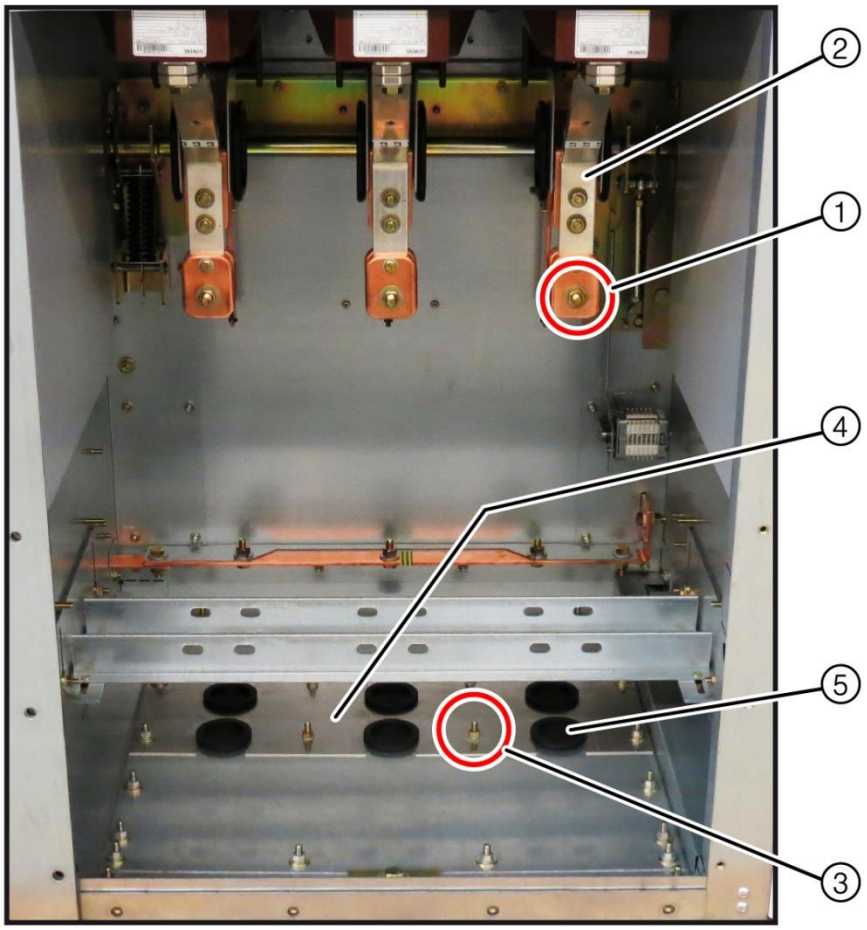


Fig. 220: Cable compartment, view from the rear side of the panel

12.2 Cutting the rubber sleeves to size

HINT

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.

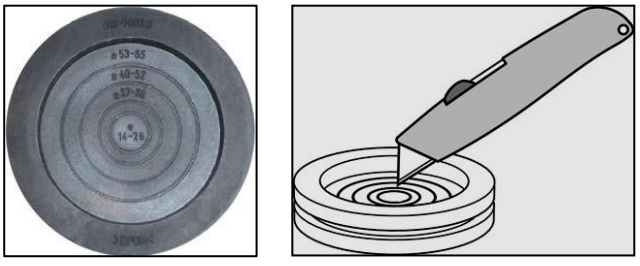


Fig. 221: Rubber sleeve for cable, for example

12.3 Use of cable lugs

NOTICE

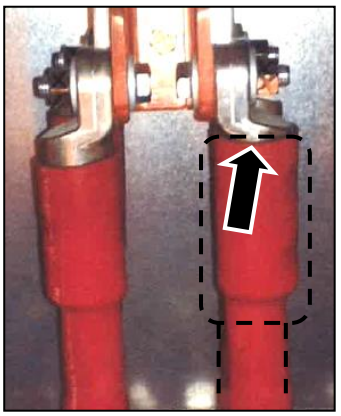
Damage to the switchgear panels

An incorrect installation of cable lugs will cause damages.

⇨ After installation of cable lugs with shear-off head bolts, 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 bolts, 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: • 1 bolt M12 • 2 plain washers size 12 acc. to ISO 7093 • 2 conical spring washers 12 • 1 nut M12
Bolt size M16	Connecting elements per phase: • 1 bolt M16 • 2 conical spring washers 16 • 1 nut M16

12.4 Cable clamps

HINT

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 specifications of the cable manufacturer.

Bolting material

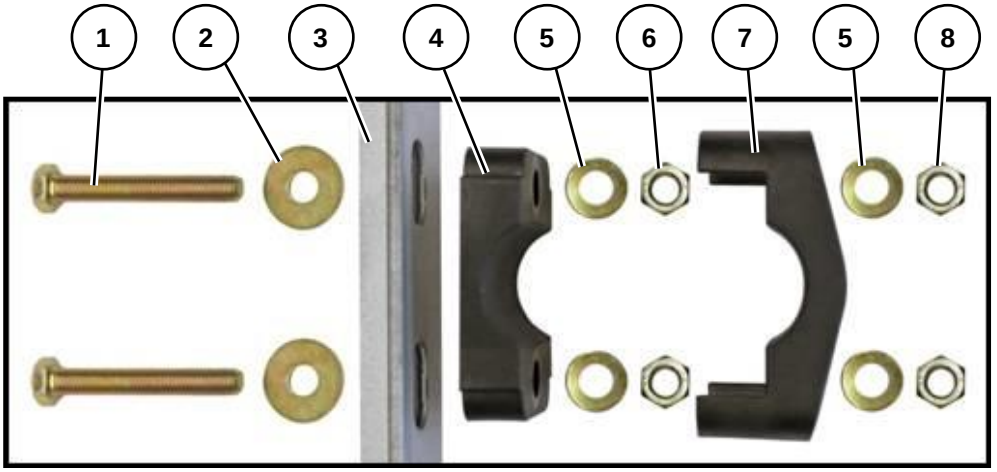


Fig. 222: Bolting material

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

12.5 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 size 310 ML.

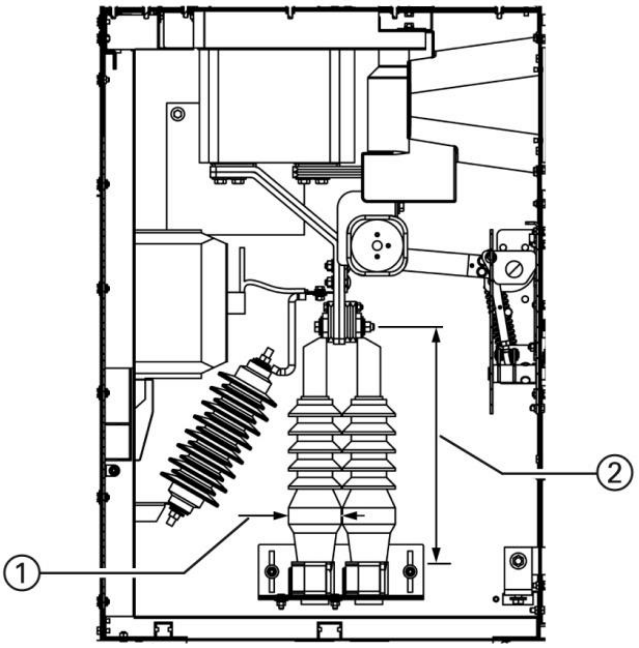
⇨ In case of gaps > 2.5 mm between the outside diameter of the cable and the opening in the rubber sleeve of the floor cover: Fit new rubber sleeve.

12.6 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.

U_r = 24 kV	Dimensions
Diameter of cable sealing end	max. 95 mm
Length of cable sealing end, incl. cable lug	max. 495 mm
Cable cross-section	max. 500 mm²



(1) Diameter of cable sealing end

(2) Length of cable sealing end, including cable lug

Fig. 223: Dimensions of single-core cables,
max. 4 indoor sealing ends per phase

12.7 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.

U_r = 24 kV	Dimensions
Diameter of cable sealing end	max. 60 mm
Length from cable sealing up to and including heat-shrinkable splitting cap	max. 500 mm
Length of cable sealing end, incl. cable lug	max. 300 mm
Cable cross-section	max. 240 mm²

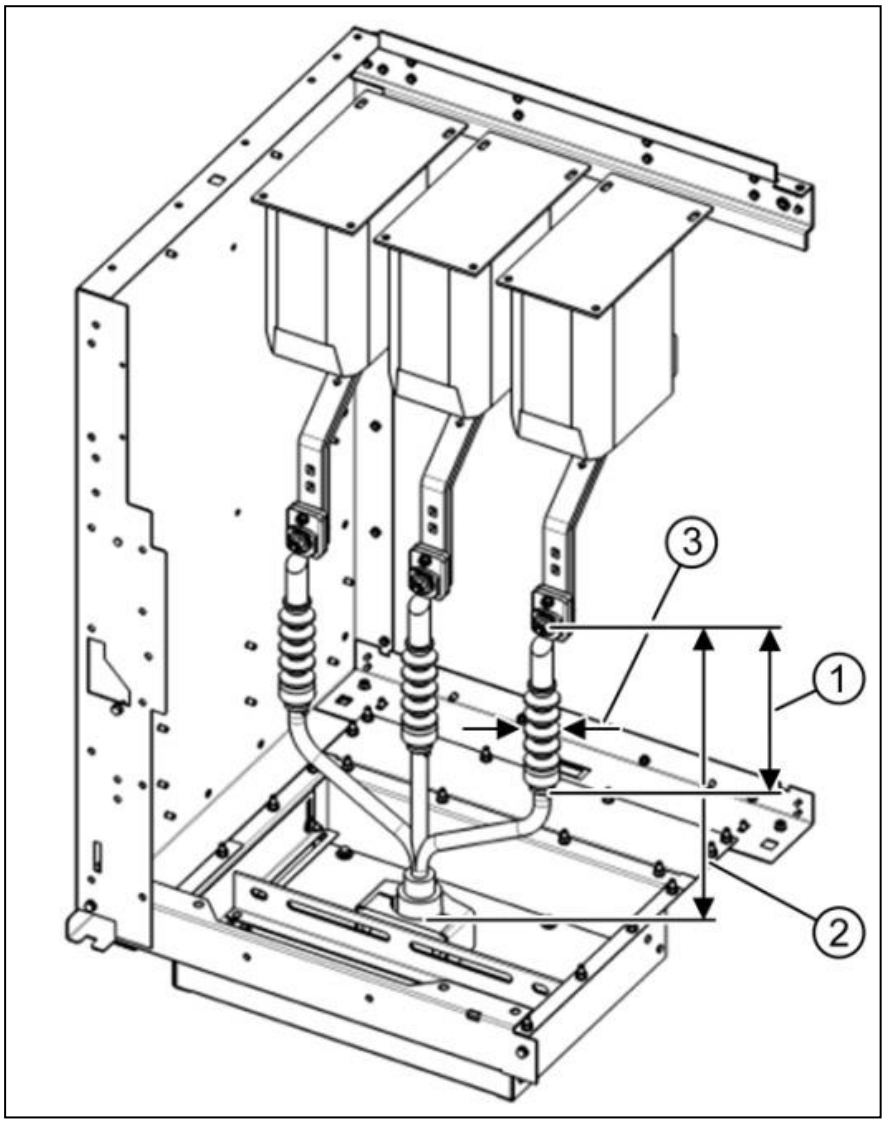


Fig. 224: Dimension of three-core cable, view from the rear side of the panel

(1) Length of cable sealing end, including cable lug

(2) Length of cable sealing end up to and including heat-shrinkable splitting cap

(3) Diameter of cable sealing end

12.8 Assembly of cable sealing ends for single-core cables

NOTICE

Damage to the switchgear panels

⇨ Observe the manufacturer's specifications about the tightening torques of the cable lugs / cable sealing ends.

HINT

⇨ Do not attach phase tapes to the cable sealing ends.

Panel versions with at least 1 connection point per phase

In panel versions with 1 connection point per phase, the connection points for cable sealing ends are arranged one behind the other (viewed from the access to the connection compartment).

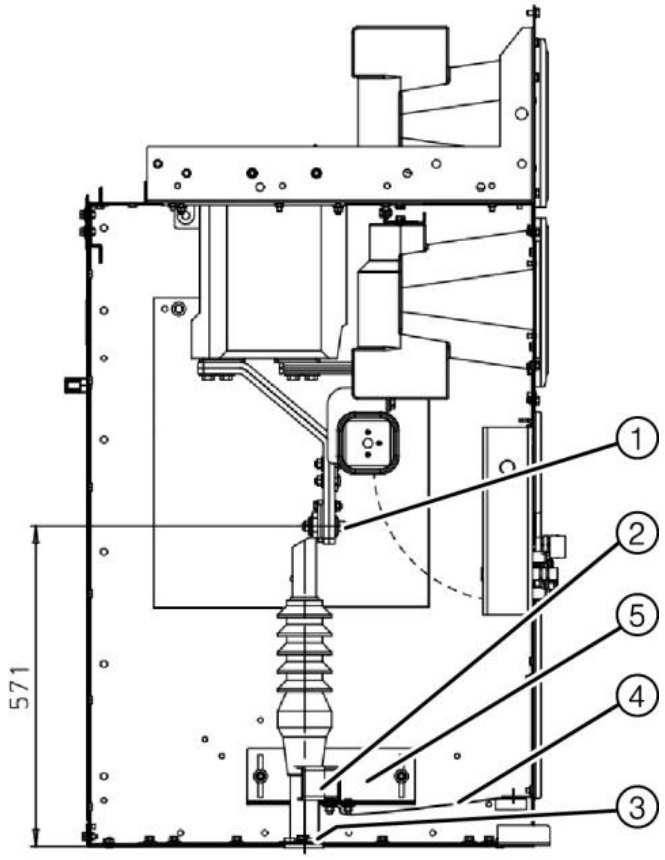


Fig. 225: Connection compartment with connection for 1 cable per phase (example)

(1) Cable connection

(2) Cable clamp

(3) Floor plate with rubber sleeves

(4) Earth connections, connection bolt for earth connection size M12x35

(5) Cable bracket

Panel versions with at least 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).

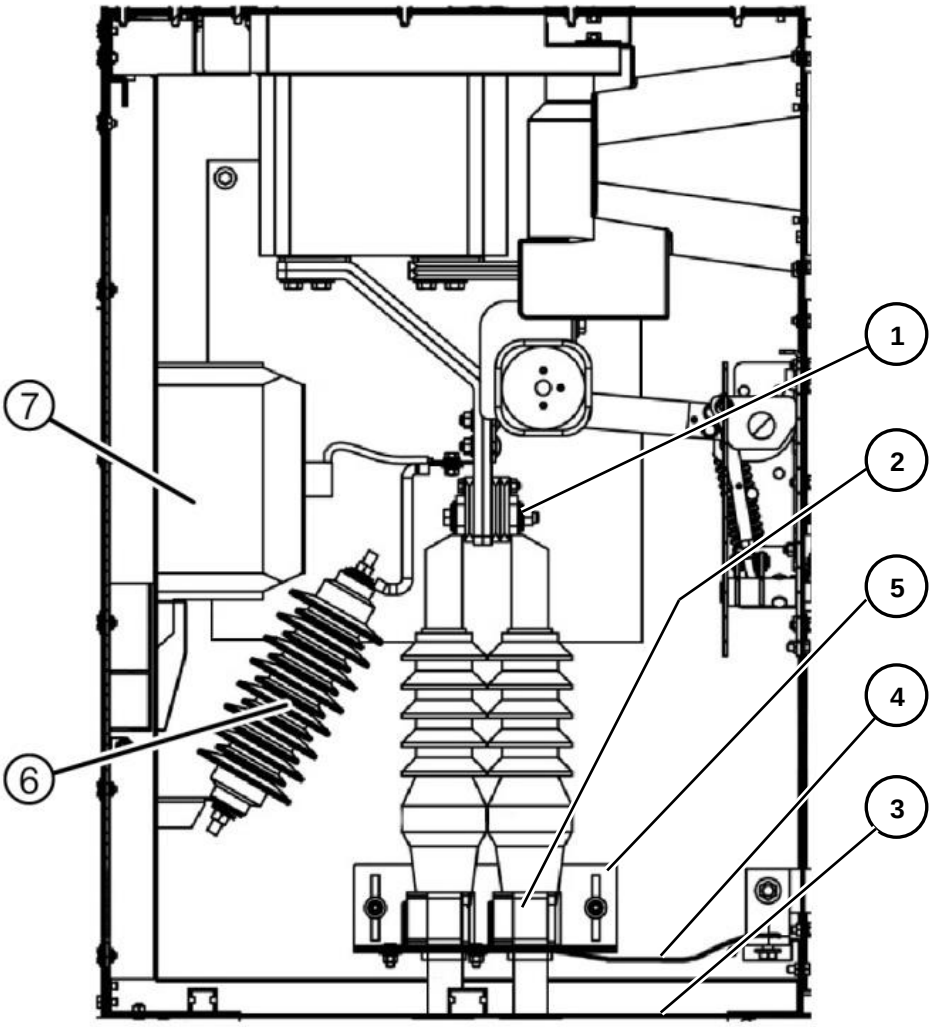


Fig. 226: Connection compartment with connections for 2 cables per phase (example)

(1) Cable connection

(2) Cable clamp

(3) Floor plate with rubber sleeves

(4) Earth connections, connection bolt for earth connection size M12x35

(5) Cable bracket

(6) Surge arrester (optional)

(7) Voltage transformer (optional)

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

⇨ The panel connections in the connection compartment must all be equipped with cable sealing ends.

⇨ To coordinate a different procedure, please contact the regional Siemens representative.

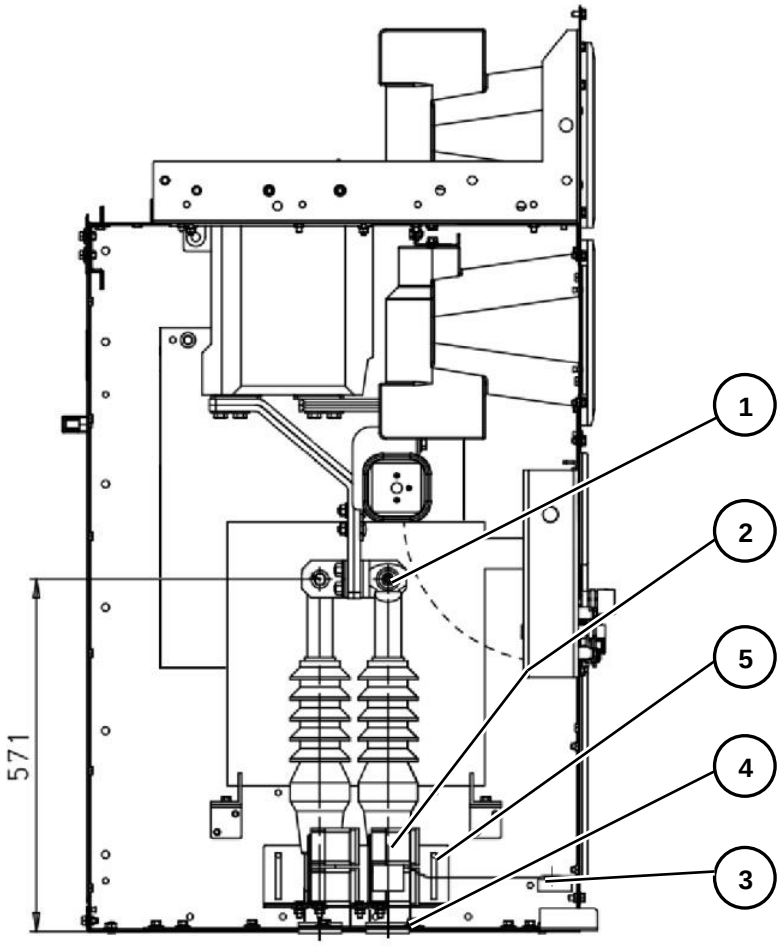


Fig. 227: Connection compartment with connections for 3-4 cables per phase (example)

(1) Cable connection

(2) Cable clamp

(3) Floor plate with rubber sleeves

(4) Earth connections, connection bolt for earth connection size M12x35

(5) Cable bracket

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 bolt-and-washer assemblies size M8.

⇨ Lead the earthing of the cable sealing end directly to the earthing busbar and bolt tight, keeping the maximum possible distance to live parts.

✓ The cables and the cable sealing ends are mounted in the connection compartment.

12.9 Assembly of cable sealing ends for three-core cables

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.

HINT

The deep bottom pan can only be installed when the associated panel is standing on its assigned place of installation.

HINT

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.

HINT

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.

HINT

Do not attach phase tapes to the cable sealing ends.

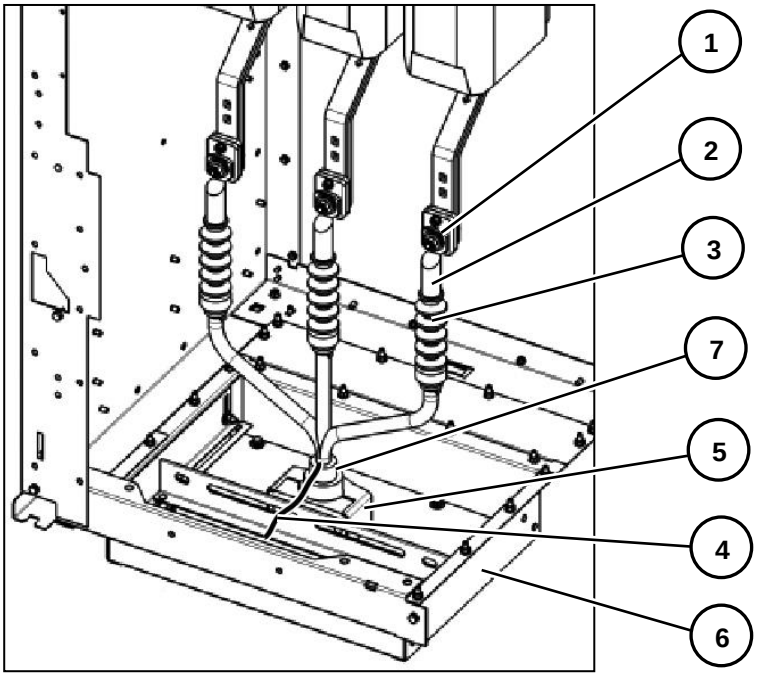


Fig. 228: Side view of connection compartment with three-core cables, 1 core per phase (example)

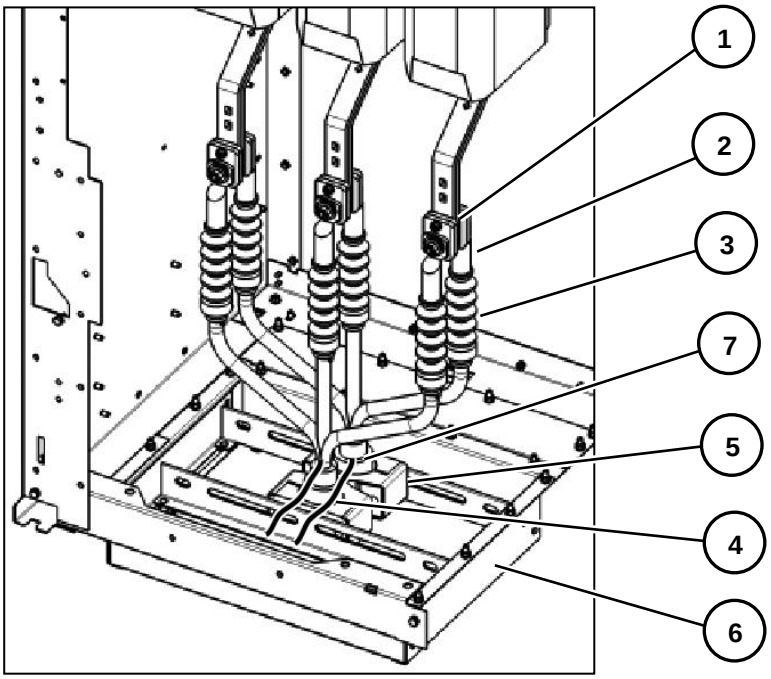


Fig. 229: Side view of connection compartment with three-core cables, 2 cores per phase (example)

(1) cable connection point, (2) cable lug, (3) cable sealing end, (4) earth connections, connection bolt for earth connection size M12x35, (5) cable clamp at the cable bracket, (6) deep bottom pan, (7) heat-shrinkable splitting cap

Electrical connections

Preconditions

- The panel is placed on its assigned place of installation
- Access to the connection compartment is established
- Deep bottom pan from the supplementary equipment available for the switchgear

Procedure

⇨ Install the deep bottom pan in the connection compartment according to the stipulations in the information drawings NXAIR M, order number 139-2084.9.

⇨ Cut an opening into the floor plates that fits the diameter of the cable.

⇨ Lay the cable through the opening in the floor plates.

⇨ 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, and bolt tight.

⇨ Insert, position and fasten the cable bracket with bolts.

⇨ Fasten the cable to the cable bracket underneath the heat-shrinkable splitting cap; use a clamp.

⇨ Optional: Mount a zero-sequence current transformer between the cable clamp and the floor plate. When doing so, lead the earth connection back through the zero-sequence current transformer.

⇨ Lead the earth connections directly to the central bolt of the earthing busbar, 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.

12.10 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:
- On the left inner side of the panels

⇨ 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.

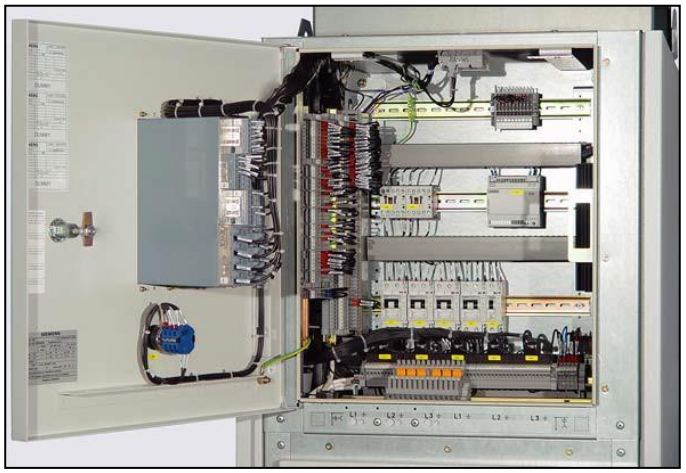


Fig. 230: Inside view of the low-voltage compartment as an example

12.11 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.

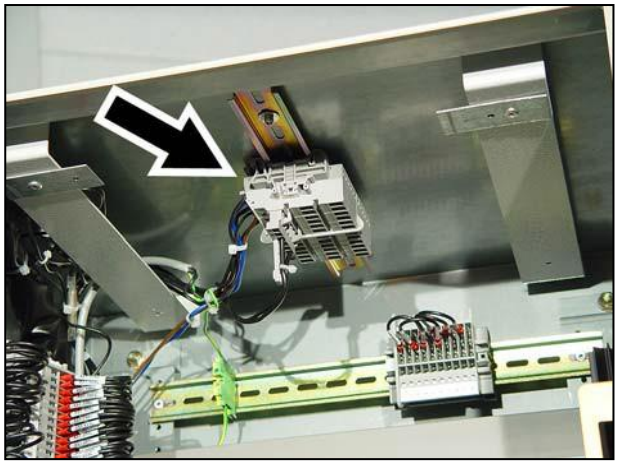


Fig. 231: Inside view of the low-voltage compartment with terminal block

✓ Control cables and bus wires are connected.

13 Closing the connection compartment / connection duct

HINT

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 139-2021.9.

NOTICE

Foreign objects

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

⇨ Before closing, 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.

HINT

Before commissioning the switchgear, the connection compartment / connection duct may only be permanently closed with bolts 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 the 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.

HINT

⇨ Before executing any installation activities, read and understand the corresponding chapters in the Operating Instructions with order number 139-2021.9.

13.1 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:

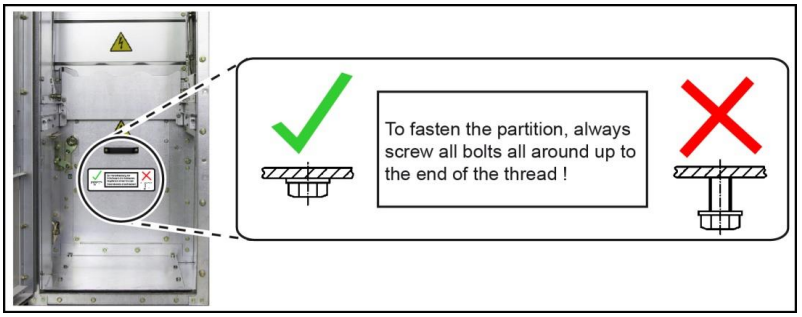


Fig. 232: Instruction label on the partition

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, withdrawable circuit-breaker / fuse combination or withdrawable disconnector link only:
    - Protection plate of switching-device compartment available
    - Connecting elements available:
      4 nuts M8 with contact washers

- All panel versions:
    - Partition available
    - Connecting elements available:
      10 bolts M8x20 with contact washers and plain washers
      5 bolts M8x20 with contact washers

Procedure

⇨ Install the partition (2) between the connection compartment and the switching-device compartment.

⇨ To fix the partition (2), tighten the bolts all around hand-tight:
- 13 bolts M8x20 with contact washers and plain washers (4)
- 2 bolts M8x20 with contact washers (3)

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

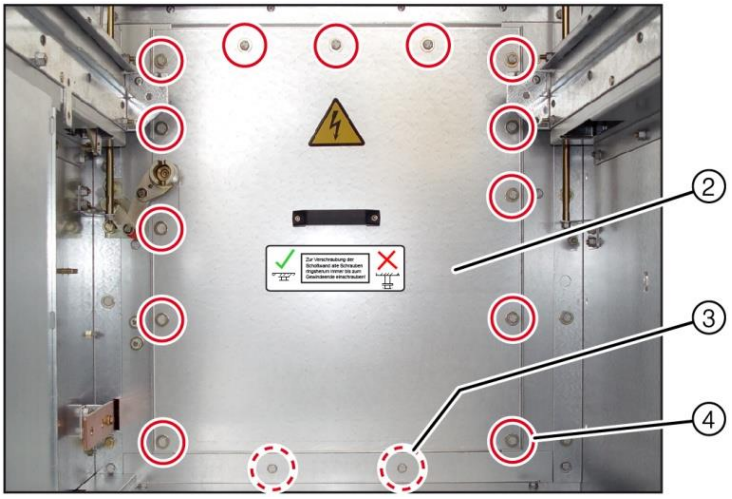


Fig. 233: Panel versions with panel width 800 mm: 15 bolted joints

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

⇨ Install the protection plate of the switching-device compartment (1).

⇨ To fix the protection plate of the switching-device compartment (1), tighten the nuts (5) hand-tight.
- 4 nuts M8 with contact washers

⇨ Tighten the fixing bolts (5) with a tightening torque of 25 Nm.

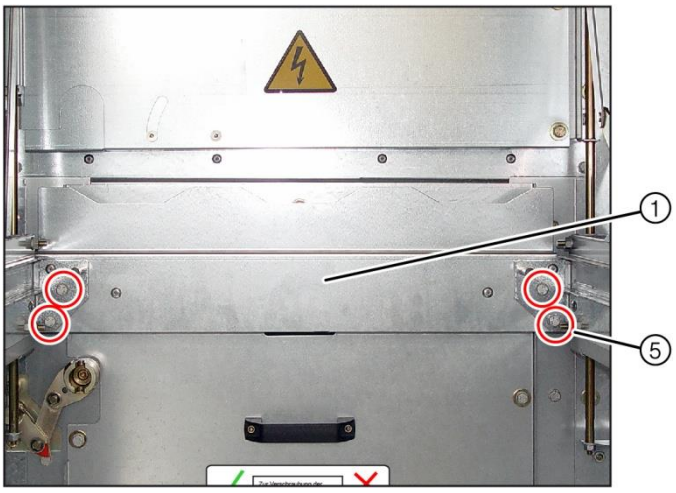


Fig. 234: 4 bolted joints on protection plate of switching-device compartment

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

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

⚠ CAUTION

Sharp edges

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

⇨ Put on personal protective equipment.

⚠ CAUTION

High weight

The ventilation duct is heavy.

⇨ 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 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:

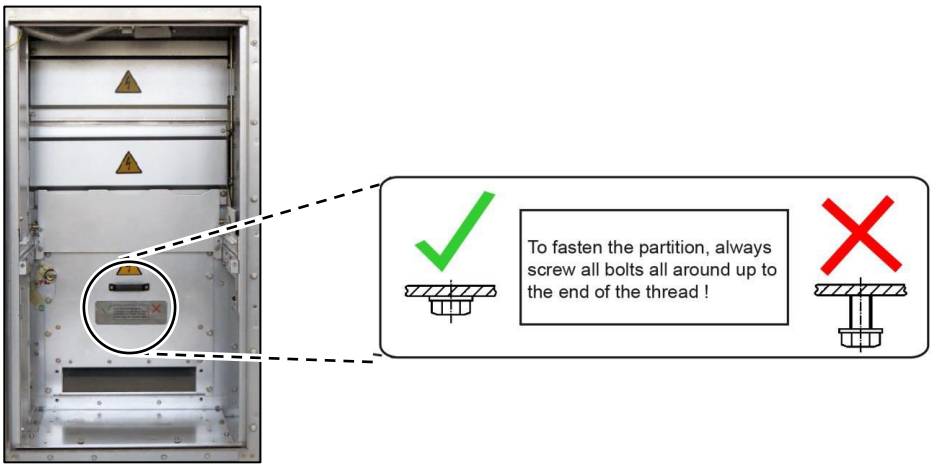


Fig. 235: Instruction label on the vertical partition

Preconditions

- Feeder earthing switch in CLOSED position
- High-voltage door open
- Low-voltage connector stowed away

- Protection plate and associated bolting material available:
  - 4 nos. nuts size M8 with contact washers
- Vertical partition and associated bolting material available:
  - 16 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093
  - Ventilation duct and associated bolting material available

Procedure

⇨ Install the partition (2) between the connection compartment and the switching-device compartment.

⇨ Fix the partition (2) by bolting the bolts in all around hand-tight:
- 16 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093 (4)

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

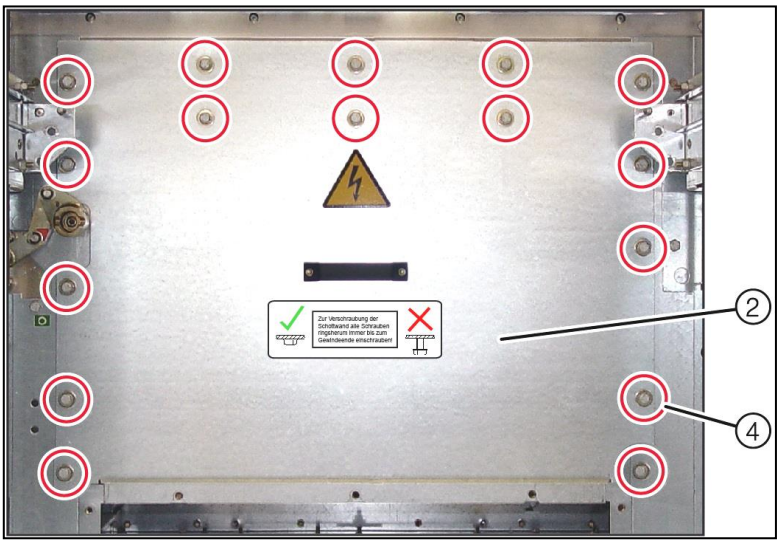


Fig. 236: 15 bolted joints on partition

⇨ Install the protection plate of the switching-device compartment (1).

⇨ Fix the protection plate (1) by bolting the nuts (5) hand-tight:
- 4 nos. nuts size M8 with contact washers

⇨ Tighten the fixing nuts (5) with torque 25 Nm.

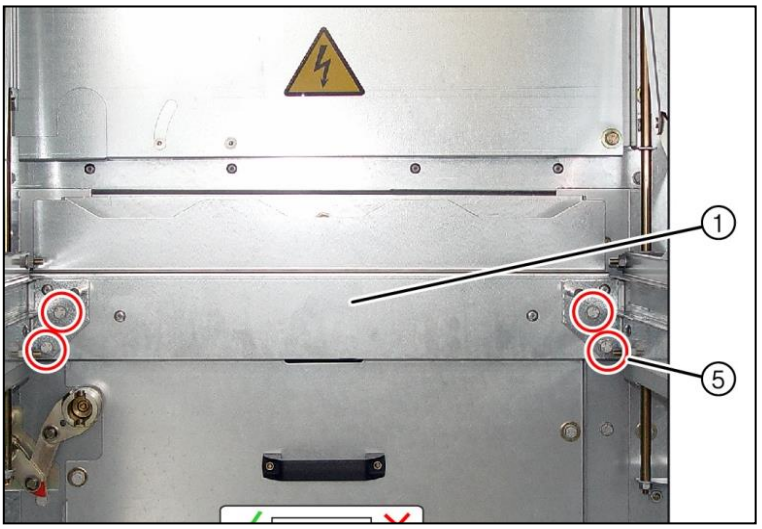


Fig. 237: 4 bolted joints on protection plate of switching-device compartment

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

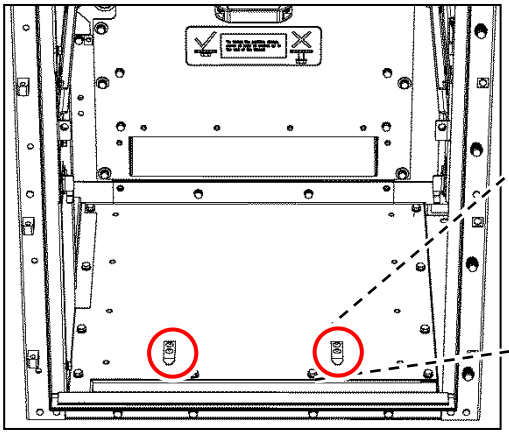


Fig. 238: 2 links on panel base

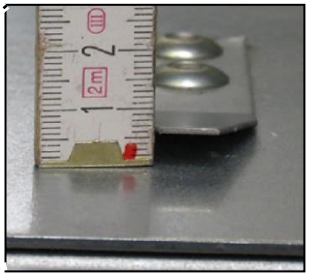
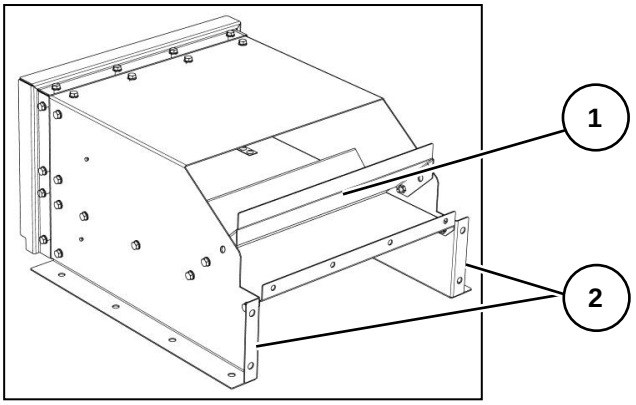


Fig. 239: Link bent in correct position

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



(1) Air guide folded upwards

(2) Bottom side

Fig. 240: Ventilation duct with air guide folded upwards

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

Fig. 241: Ventilation duct set down centrally on the base frame of the panel

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

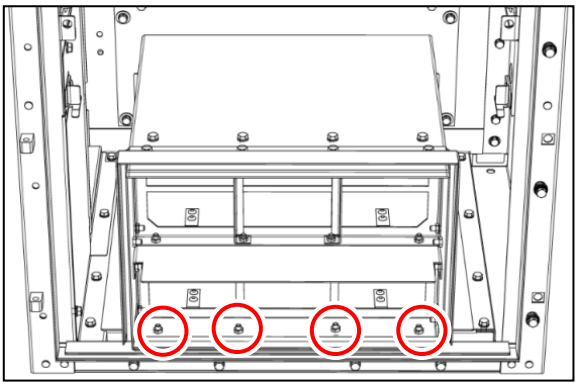


Fig. 242: 4 bolted joints on base frame front

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

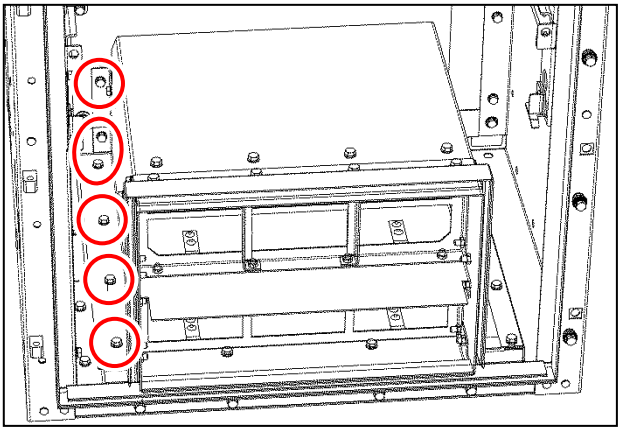


Fig. 243: 6 lateral bolted joints on partition and base frame

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

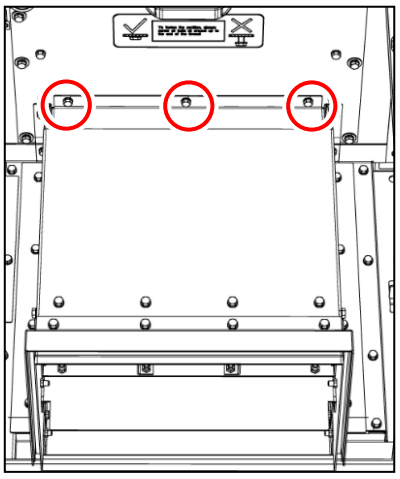


Fig. 244: 3 bolted joints on partition

⇨ Fold the air guide downwards.

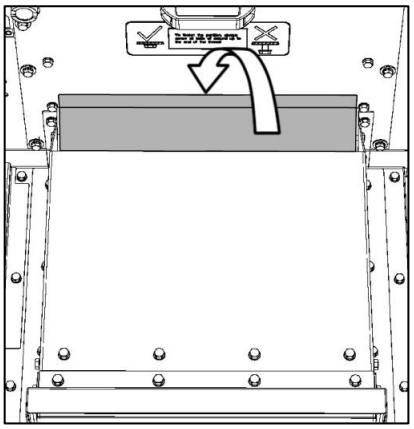


Fig. 245: Folding the air guide downwards

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

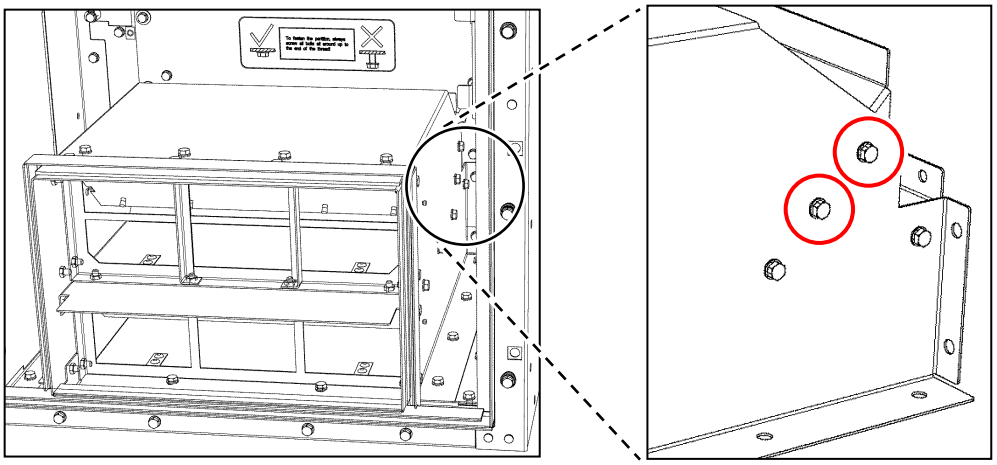


Fig. 246: Bolts for fixing the air guide

✓ The vertical partition and the ventilation duct are installed.

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

⚠ CAUTION

Sharp edges

The metal parts of the voltage transformer compartment and the vertical partition may have sharp edges.

⇨ Put on personal protective equipment.

NOTICE

Danger due to damages

Possible malfunctioning and switchgear damage caused by foreign objects:

⇨ Remove all foreign objects from the connection compartment, for example:

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

NOTICE

Cleaning

Possible malfunctioning and damage to the panels caused by pollution.

Before closing the connection compartment:

⇨ Clean polluted areas in the connection compartment. To do this, use a vacuum cleaner and a soft, lint-free cloth. If necessary, moisten the cloth, use a mild household cleaner, and dry properly at the end.

⇨ Some parts and surfaces of the switchgear are greased for functioning. Do not remove the grease there; do not clean the parts and surfaces.

⇨ If greased areas are dirty, clean the dirty area and grease again according to the maintenance instructions.

NOTICE

Damages inside the switching-device compartment

Damages inside the switching-device compartment / voltage transformer compartment possible due to incorrect or incomplete installation of the partition / bushing plate.

⇨ To fasten the partition / bushing plate, always assemble all bolted joints, and screw them in up to the end of the thread.

Closing the connection compartment / connection duct

Preconditions

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

Procedure

⇨ Install the bushing plate with bushings.

⇨ Fix the partition (5) by screwing the bolts in all around hand-tight:
- 6 bolts M8x20 with contact washers and plain washers

Tighten the bolts with torque 25 Nm.

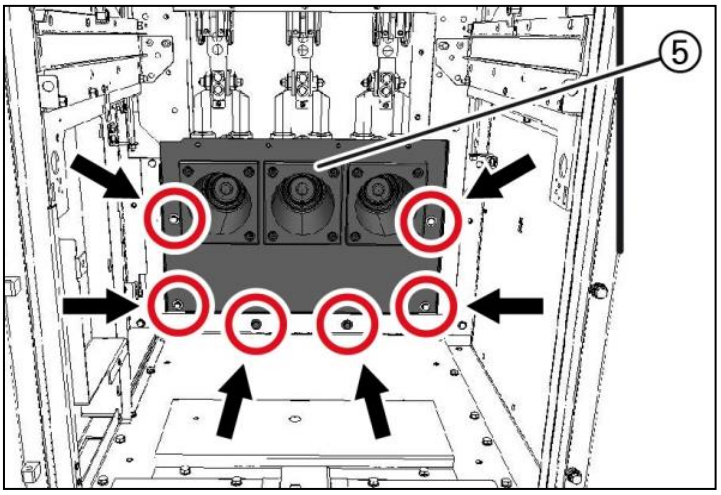


Fig. 247: 6 bolted joints on bushing plate with bushings

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

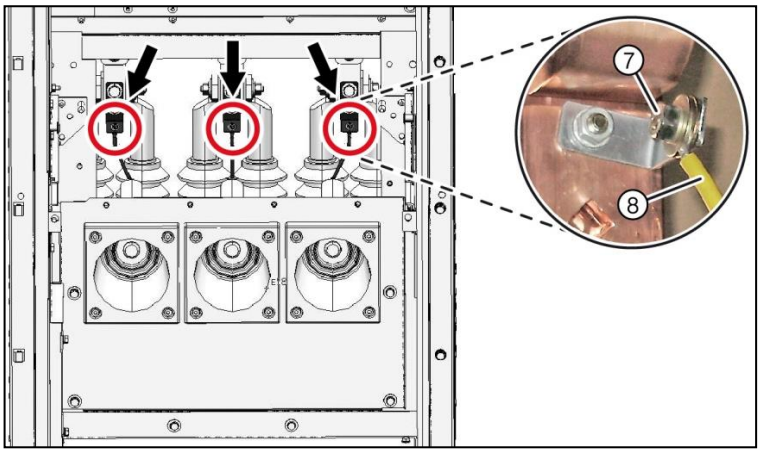


Fig. 248: Bolted joints at the cable connections

⇨ Insert the partition (2), and fasten with 8 bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093.
Tighten the bolts with torque 25 Nm.

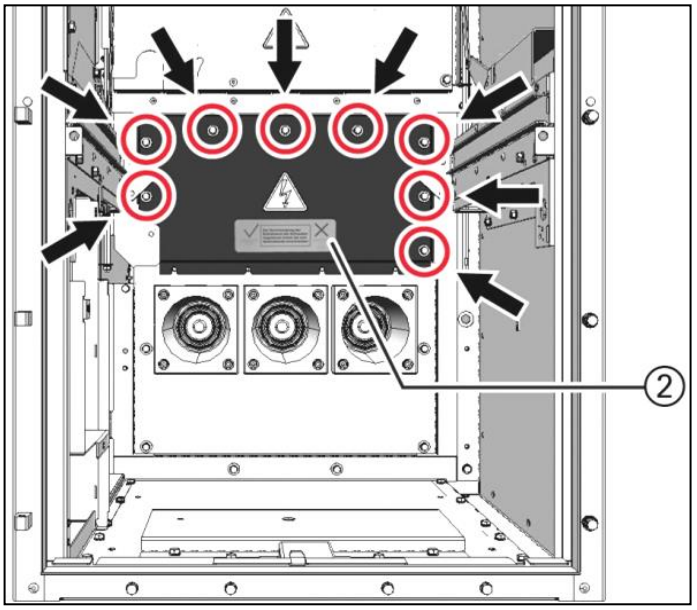


Fig. 249: 8 bolted joints on partition

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

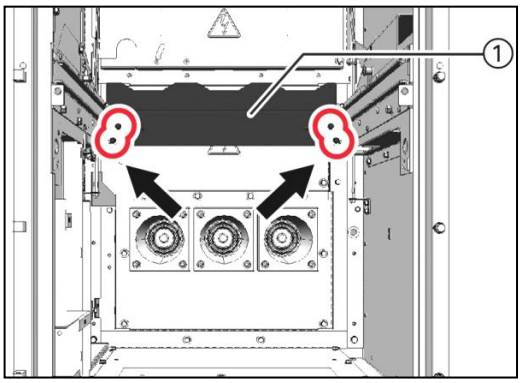


Fig. 250: 4 bolted joints on protection plate of switching-device compartment

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

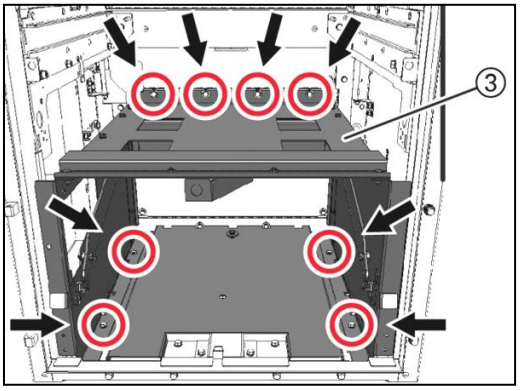


Fig. 251: 8 bolted joints on voltage transformer compartment

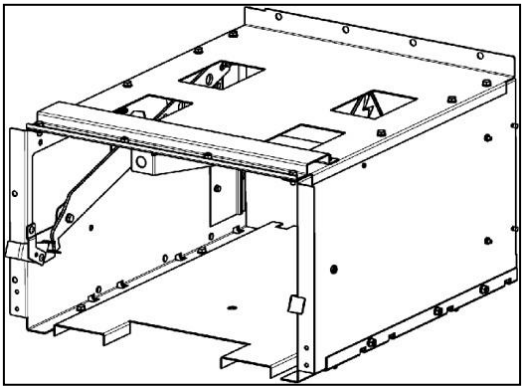


Fig. 252: Voltage transformer compartment, removed

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

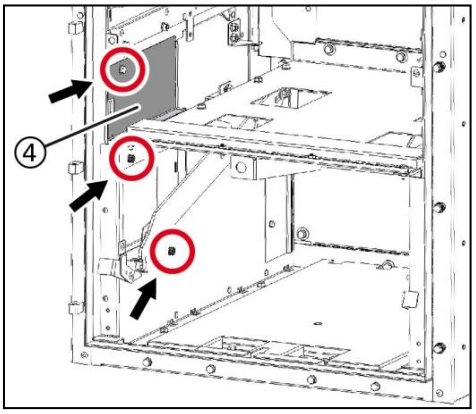


Fig. 253: 3 bolted joints on wiring duct cover, panel width 800 mm

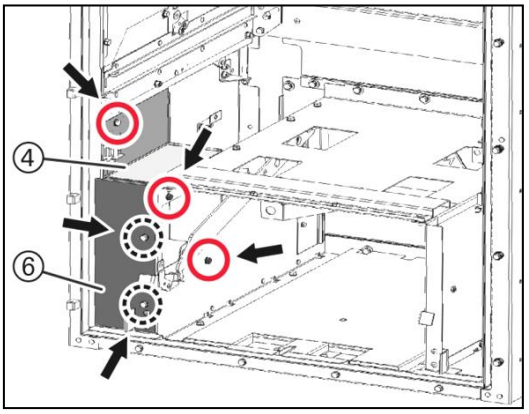


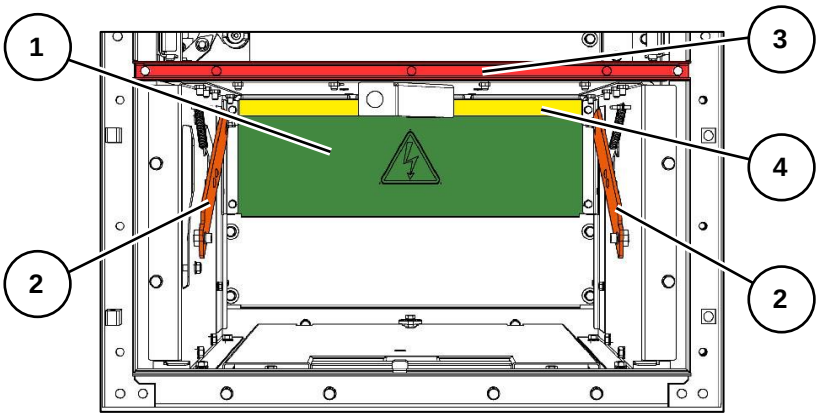
Fig. 254: 5 bolted joints on wiring duct cover, panel width 1000 mm

Perform final checks regarding the correct state and position of the shutter (1) and the levers (2) for moving the shutter. If any of these checks fails, **do not** insert any removable voltage transformers in the voltage transformer compartment, but inform the regional Siemens representative.

⇨ Check against the labyrinth (3) if the shutter (1) is horizontally arranged.

⇨ Check if the top edge of the shutter is flush with the shutter frame (4).

⇨ Check if the levers (2) are in perfectly straight condition.



(1) Shutter

(2) Lever

(3) Labyrinth

(4) Shutter frame

Fig. 255: Checking state and position of shutter and levers

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

13.4 Installing the rear wall of the connection compartment

⚠ CAUTION

Sharp edges

The metal parts of the rear walls may have sharp edges.

⇨ Put on personal protective equipment.

NOTICE

Damage to the switchgear panels

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

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

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

Closing the connection compartment / connection duct

NOTICE

Cleaning

Possible malfunctioning and damage to the panels caused by pollution.

Before closing the connection compartment:

⇨ Clean polluted areas in the connection compartment. To do this, use a vacuum cleaner and a lint-free cloth. If necessary, moisten the cloth, use a mild household cleaner, and dry properly at the end.

⇨ Some parts and surfaces of the switchgear are greased for functioning. Do not remove the grease there; do not clean the parts and surfaces.

⇨ If greased areas are dirty, clean the dirty area and grease again according to the maintenance instructions.

HINT

Before commissioning the switchgear, the connection compartment may only be permanently closed by bolting the rear wall tight under the following conditions:

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

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

- Check the control tightening torques of the bolted joints, and correct the torques if required
- Check the 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 after bolting together, so that this is clear without any doubt before commissioning the switchgear.

Preconditions

- Rear wall available
- Corresponding number of sealing brackets, ledges and associated bolting material available:
  - 2 sealing brackets
  - 1 horizontal ledge and associated 8 bolts M8x25 with contact washers and plain washers
  - 2 vertical ledges and a total of 28 bolts M8x20 with contact washers
  - 4 bolts M8x20 with contact washers for fixing the rear wall to the panel base

Procedure

⇨ Insert the rear wall (1) at the rear side of the panel and push the wall down using the handle.

⇨ Fix the rear wall by screwing the lower bolts in hand-tight:
- 4 bolts M8x20 with contact washers (2)

⇨ Tighten the bolts with torque 25 Nm.

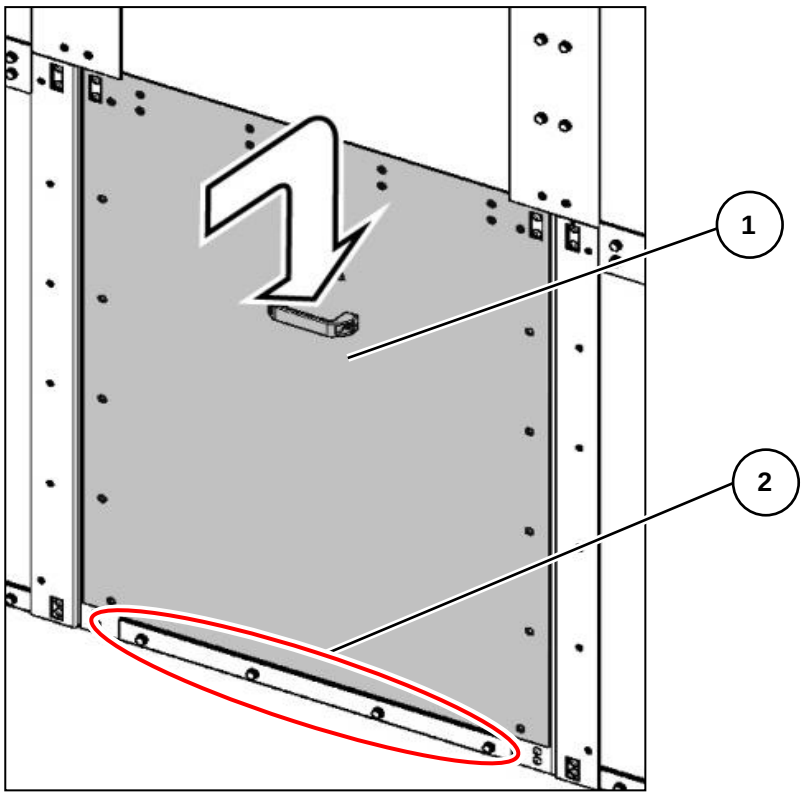


Fig. 256: Removing the rear wall

(4) Rear wall with handle

(5) Bolts to remove

⇨ Insert the 2 sealing brackets (3) into the vertical gaps between the panels.

⇨ Install the horizontal ledge (4). Fix it by screwing the bolts in hand-tight:
- 8 bolts M8x25 with contact washers and plain washers

⇨ Tighten the bolts with torque 25 Nm.

⇨ Install one of the vertical ledges (5). Fix it by screwing the bolts in hand-tight:
- 14 bolts M8x20 with contact washers

⇨ Tighten the bolts with torque 25 Nm.

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

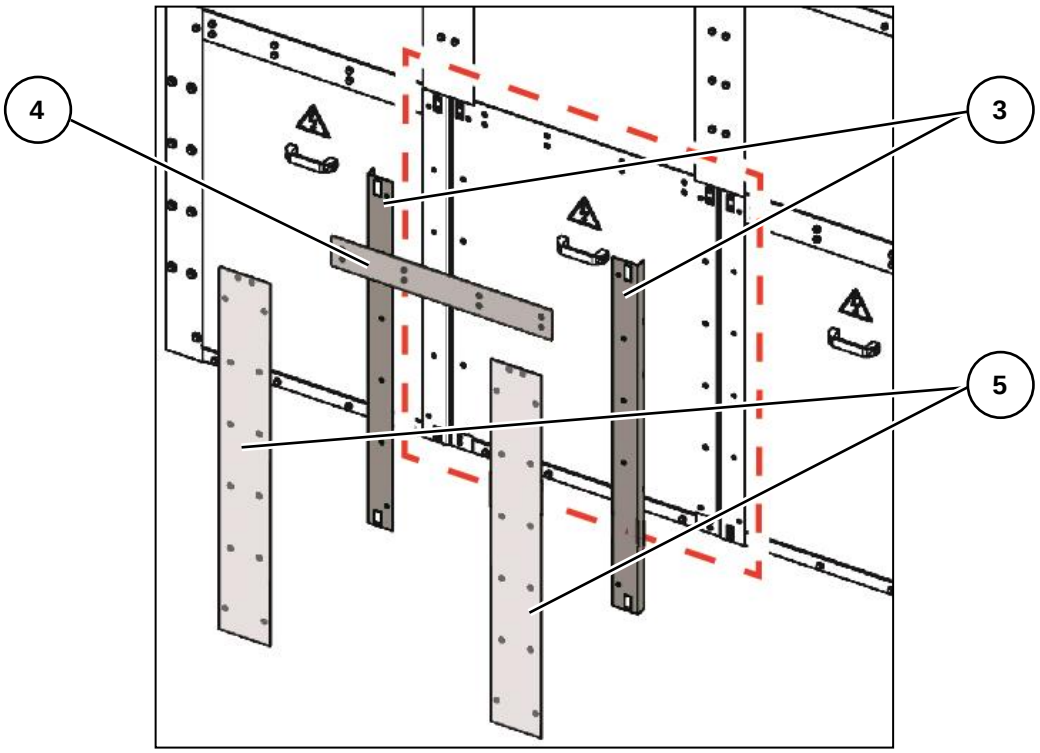


Fig. 257: Rear wall with ledges

(1) Horizontal ledge

(2) Vertical ledges

(3) Sealing brackets

Fig. 258: Installing ledges and sealing brackets

✓ The rear wall is installed on the connection compartment.

13.5 Installing the rear walls on the connection duct

⚠ CAUTION

High weight

The upper rear wall is heavy.

⇨ Remove the upper rear wall absolutely with 2 persons.

⚠ CAUTION

Sharp edges

The metal parts of the rear walls may have sharp edges.

⇨ Put on personal protective equipment.

NOTICE

Danger due to damages

Possible malfunctioning and switchgear damage caused by foreign objects:

⇨ Remove all foreign objects from the connection duct, for example:
- Tools
- Unused installation material
- Packing material
- Cleaning material

NOTICE

Cleaning

Possible malfunctioning and damage to the panels caused by pollution.

Before closing the connection duct:

⇨ Clean polluted areas in the connection duct. To do this, use a vacuum cleaner and a lint-free cloth. If necessary, moisten the cloth, use a mild household cleaner, and dry properly at the end.

⇨ Some parts and surfaces of the switchgear are greased for functioning. Do not remove the grease there; do not clean the parts and surfaces.

⇨ If greased areas are dirty, clean the dirty area and grease again according to the maintenance instructions.

Preconditions

- Upper and lower rear wall available
- Corresponding number of ledges and associated bolting material available:
  - 1 horizontal ledge
  - 4 vertical ledges
  - Bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093

⇨ Insert the lower rear wall (4) at the rear side of the panel and push it down using the handle.

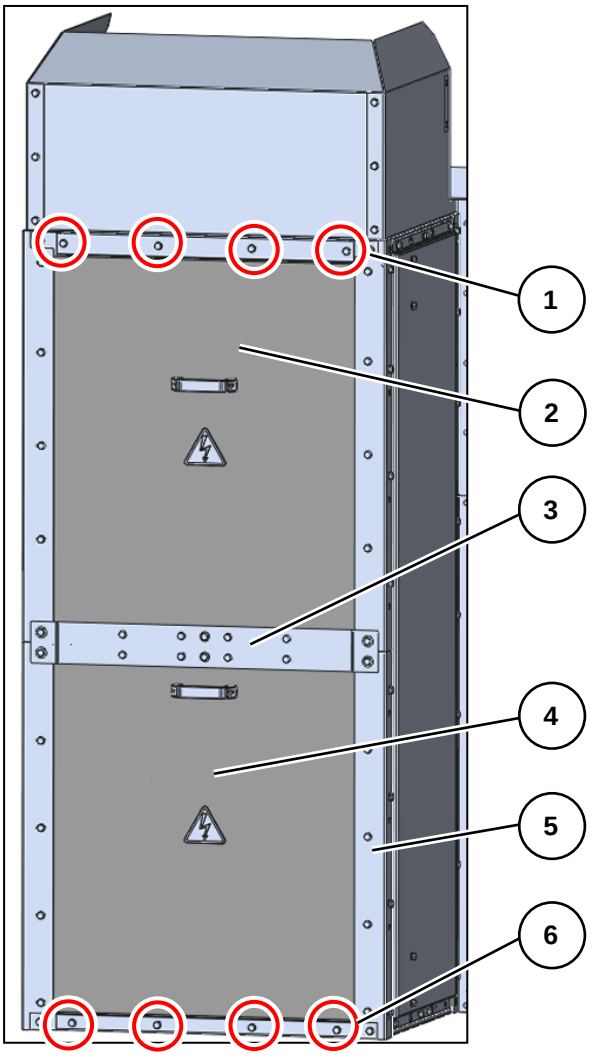
⇨ Fix the rear wall by screwing the lower bolts in hand-tight:
- 4 / 6 nos. bolts M8x20 with contact washers (6)

⇨ Insert the upper rear wall (2) at the rear side of the panel and push it up using the handle.

⇨ Fix the rear wall by screwing the bolts in hand-tight:
- 4 / 5 bolts M8x20 with contact washers (1)

⇨ Install one of the 4 vertical ledges (5). Fix it by screwing the bolts in hand-tight:
- 9 / 19 bolts M8x20 with contact washers and plain washers

⇨ 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. 259: Rear ledges and rear walls on connection duct

⇨ Install the horizontal ledge (3). Fix it by screwing the bolts in hand-tight:
- 12 / 14 nos. bolts M8x20 with contact washers and plain washers size 8 acc. to ISO 7093 with the bolt fixing in the area of the vertical ledges

⇨ Tighten all bolts with torque 25 Nm.

✓ The rear walls are installed on the connection duct.

14 Final assembly work

HINT

Read and understand these instructions before attempting final assembly works.

14.1 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.

14.2 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.

HINT

⇨ 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.

14.3 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.

14.4 Checking the panel connection links

⇨ At the front of all panels, check the installation of the panel connection link between the switching-device compartments.

14.5 Checking the installation of the wiring duct covers

⇨ Check the installation of the wiring duct covers on the left inside of the panel.

14.6 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.

14.7 Checking the vertical partition between the switching-device compartment and the connection compartment

⇨ Check **all** bolted joints all around with the torque wrench.

14.8 Checking the rear wall at the connection compartment

⇨ Check all bolted joints at the ledges of the rear wall with the torque wrench.

14.9 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, order number 139-2021.9.

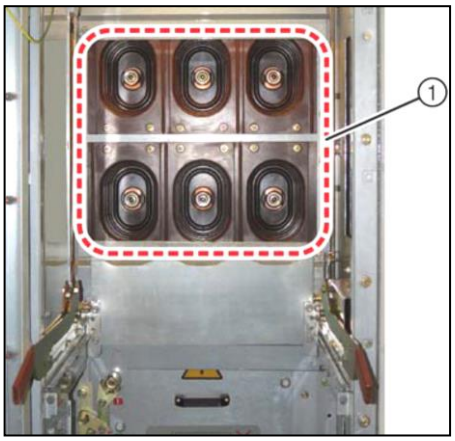


Fig. 260: Bushings in switching-device compartment

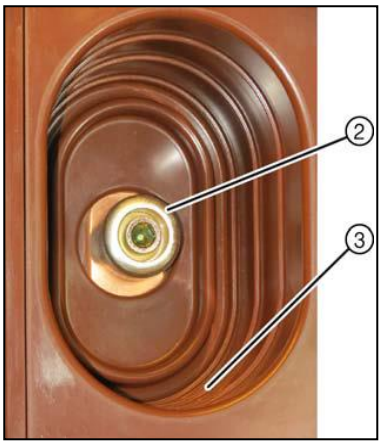


Fig. 261: Detail of bushing

⇨ 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 139-2021.9.

⇨ 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 139-2021.9.

⇨ Clean the switching-device compartment.

✓ The 6 bushings in the switching-device compartment are ready for service.

14.10 Checking the withdrawable part on the service truck

⇨ Remove foreign objects.

⇨ For cleaning the circuit-breaker, see separate operating instructions for circuit-breaker 3AE.

14.11 Checking the service truck

⇨ Remove foreign objects.

⇨ Clean the service truck.

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

⇨ Touch up scratches and impact marks on surface painting with paint acc. to RAL 7035.

14.13 Checking assembly work

HINT

⇨ 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

14.14 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.

14.15 Installation report

After erecting the switchgear, fill in the installation report according to chapter 19 and send it to the address given in the installation report.

15 Installation of withdrawable parts

HINT
Read and understand these instructions before attempting installation works.

15.1 Solenoid interlocks (optional) in the operating mechanism for withdrawable parts

The operating mechanisms for withdrawable parts of circuit-breaker and disconnecting 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.

15.2 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 and be disposed of.

Preconditions

- Auxiliary voltage in the switchgear is available
- Withdrawable part in test position
- LV connector plugged in
- High-voltage door open

⇨ Remove 2 locking bolts of the solenoid interlock at the withdrawable part of the circuit-breaker panel or the disconnecting panel.

Fig. 262: Front view of withdrawable circuit-breaker

✓ The solenoid interlocks in the operating mechanism for withdrawable parts are now ready for operation.

16 Commissioning procedure

HINT

Read and understand these instructions before executing the commissioning procedure.

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.

16.1 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 devices.

- ⇨ 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.

16.2 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 out of the panel to support the air flow.

16.3 Instructing the operating personnel

⇨ Give the Operating Instructions with order number 139-2021.9 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.

16.4 Checking the accessories

Provide the following accessories to have them ready to hand:

- Operating instructions
- Racking crank for moving the withdrawable part
- 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

16.5 Checking the interlocks mechanically

NOTICE

Detection of an error

⇨ **Do not** put the switchgear into operation.

⇨ Inform the regional Siemens representative.

Single-busbar system

⇨ Check each panel to establish whether the withdrawable part 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 associated withdrawable parts are in interlocked end position (test or service position).

⇨ Check all earthing switches to establish whether the earthing switches can only be operated when the respective withdrawable parts are in test position.

⇨ Check whether the high-voltage doors can only be opened when the associated withdrawable parts are in interlocked "test position".

Double-busbar system

⇨ Check each panel A to establish whether the withdrawable part can only be racked to service position when the circuit-breaker and the earthing switch in the associated panel A are in OPEN position and the high-voltage door is closed.

⇨ Check each panel B to establish whether the withdrawable part can only be racked to service position when the following conditions are fulfilled at the same time:

- Circuit-breaker in OPEN position
- High-voltage door closed
- Earthing switch in the associated panel A in OPEN position

⇨ Check all circuit-breaker panels to establish whether the circuit-breakers can only be operated when the associated withdrawable parts are in interlocked end position (test or service position).

⇨ Check all earthing switches to establish whether the earthing switches can only be operated when the respective withdrawable parts in panel A and in the associated panel B are in test position.

⇨ Check whether the high-voltage doors can only be opened when the associated withdrawable parts are in interlocked "test position".

16.6 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 from test position to service position and back five times. At the same time, check whether the associated positions of the withdrawable part 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, order number 139.2022.9. At the same time, check whether the associated positions of the withdrawable part are displayed correctly at the panel and, if applicable, in the control room.

⇨ Close and open each circuit-breaker five times locally and from remote for test, see Operating Instructions with order number 139-2021.9. At the same time, check whether the switch positions are displayed correctly at the panel and, if applicable, in the control room, and if the auxiliary switches and position switches operate correctly.

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

16.7 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

⇨ Close all high-voltage doors of the panels.

⇨ Open all circuit-breakers, see Operating Instructions with order number 139-2021.9.

⇨ Rack all withdrawable parts to test position, see Operating Instructions with order number 139-2021.9.

⇨ 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 139-2021.9.

⇨ 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 to service position and close the circuit-breaker, see Operating Instructions with order number 139-2021.9.

✓ 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.

17 Customer support

17.1 Service

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

17.2 Repairs

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

17.3 Before you call

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

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

This data is available on the rating plate located inside on the high-voltage and low-voltage doors:

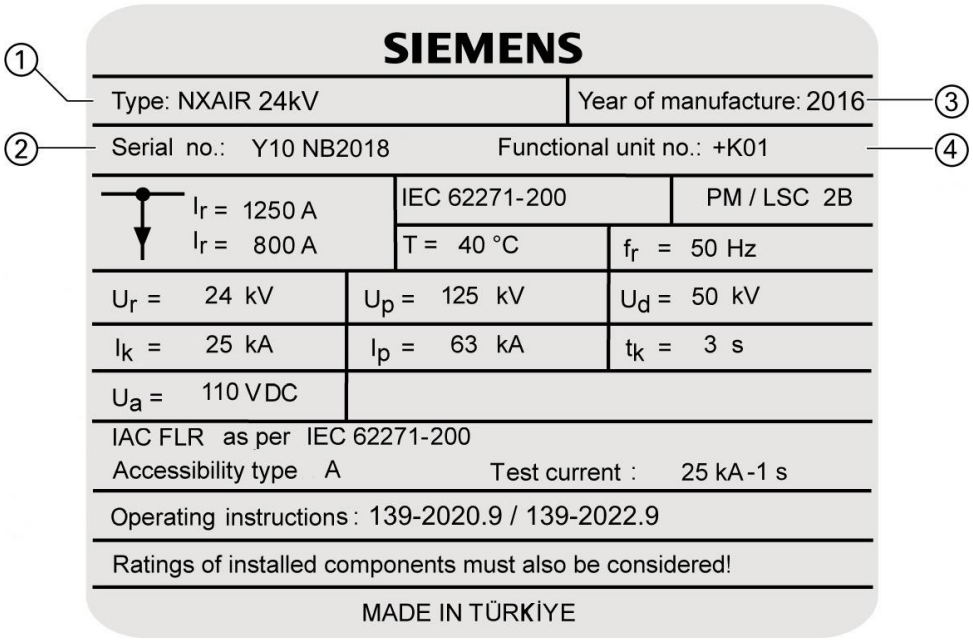


Fig. 263: Rating plate

17.4 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**

18 Service information

18.1 Switchgear extension

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

18.2 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 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.

18.3 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.

18.4 Disposal

NXAIR M switchgear is an environmentally compatible product.
The panels are made of galvanized sheet metal. The doors and lateral switchgear end walls are powder-coated with resistant epoxy resin material.
The switchgear materials should be recycled as far as possible. The switchgear can be disposed of in an environmentally compatible manner in compliance with existing legislation.

The components of the switchgear can be recycled as mixed scrap; however, dismantling as far as possible into sorted scrap with a residual mixed-scrap portion is the more environmentally compatible way.
Electronic scrap must be disposed of in accordance with the existing regulations. The switchgear consists of the following materials:

- Sheet metal: galvanized / powder-coated / Cr-Ni steel
- Copper and aluminum
- Polycarbonate (PC)
- Epoxy resin
- Cast resin
- Fiber-reinforced plastics
- Rubber materials
- Ceramic materials
- Lubricants
- Bolts, washers, nuts, rivets made of steel
- Electrical wires and electronic equipment such as relays, control boards, voltmeters, ammeters

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

For further information regarding declarable or restricted substances in this product, please contact:

- materialcompliance.ms.ehs@siemens.com**.**

19 Installation report

Installation report for air-insulated switchgear				Type:	NXAIR M	
Customer:				Factory ref. no.:		
Switchgear type	NXAIR	-	Number of panels		-	
Rated voltage U_r	24	kV	Rated current of busbar		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 according to the data given in the Operating and Installation 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 or right end panel min. 150 mm?				☐	☐	☐
	Room height	Rated voltage	Rated short-time withstand current	Design of the pressure relief duct	-----	-----	-----
	≥ 3000 mm	24 kV	25 kA	Arrangement with evacuation duct	☐	☐	☐
	≤ 3300 mm	24 kV	25 kA	Arrangement with absorber	☐	☐	☐
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?	☐	☐	☐
1.10	Earthing busbar connected and tightened with 70 Nm for bolted joint size M12?	☐	☐	☐

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 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	yes	no	n/a
4.1	Transport block for electromagnetic interlocking removed?	☐	☐	☐
4.2	Tulip contacts at the withdrawable parts undamaged?	☐	☐	☐
4.3	Tulip contacts greased with a thin film of Molykote® Longterm 2 plus?	☐	☐	☐
4.4	Withdrawable parts coded according to the withdrawable part specification of the complete switchgear?	☐	☐	☐
4.5	Withdrawable parts cleaned?	☐	☐	☐

5.	Mechanical function and interlocks	yes	no	n/a
5.1	Is the high-voltage door interlocked as soon as the withdrawable part is not in "interlocked test position"?	☐	☐	☐
5.2	Unlocking and locking function of withdrawable part tested with double-bit key according to Operating Instructions?	☐	☐	☐
5.3	Is closing of the circuit-breaker locked out while racking the withdrawable part?	☐	☐	☐
5.4	Is racking in and out of the withdrawable part interlocked when the circuit-breaker is in "CLOSED" position?	☐	☐	☐
5.5	Is racking-in of the withdrawable part interlocked when the earthing switch is in "CLOSED" position?	☐	☐	☐
5.6	Is closing of the earthing switch only possible when the withdrawable part is in "interlocked disconnected position"?	☐	☐	☐
5.7	Withdrawable parts with same codification interchangeable?	☐	☐	☐
5.8	Interlocks between service truck and panel respectively withdrawable part are smooth?	☐	☐	☐
5.9	Function of the earthing switches or position indicators tested?	☐	☐	☐

6.	Commissioning and electrical tests	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	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"?	☐	☐	☐
	Earthing switch in connection compartment?	☐	☐	☐

7.3	Remote control tested for:			
	Circuit-breaker?	☐	☐	☐
	Withdrawable part?	☐	☐	☐
	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?	☐	☐	☐

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?	☐	☐	☐
11.4	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

High electrical 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:

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Responsible for installation / commissioning:	
Signature of tester:	
Name:	
Department:	
Telephone:	
Date:	
City:	

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Imprint

Siemens AG

Energy Management
Medium Voltage & Systems

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