AHA
Metal-clad
Medium Voltage Switchgear

Assembly Instructions
No. 531 686, Edition 09/98

AREVA

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Important notes on assembly instructions

- The assembly instructions contain a brief overview of the assembly procedure with assembly drawings (Chapters 1 and 2).

- The individual assembly sequences are described in detail in Chapter 4. These are refered to directly in the assembly overview.

- The checks and work described in Chapter 3 must be performed before the switchgear is commissioned.

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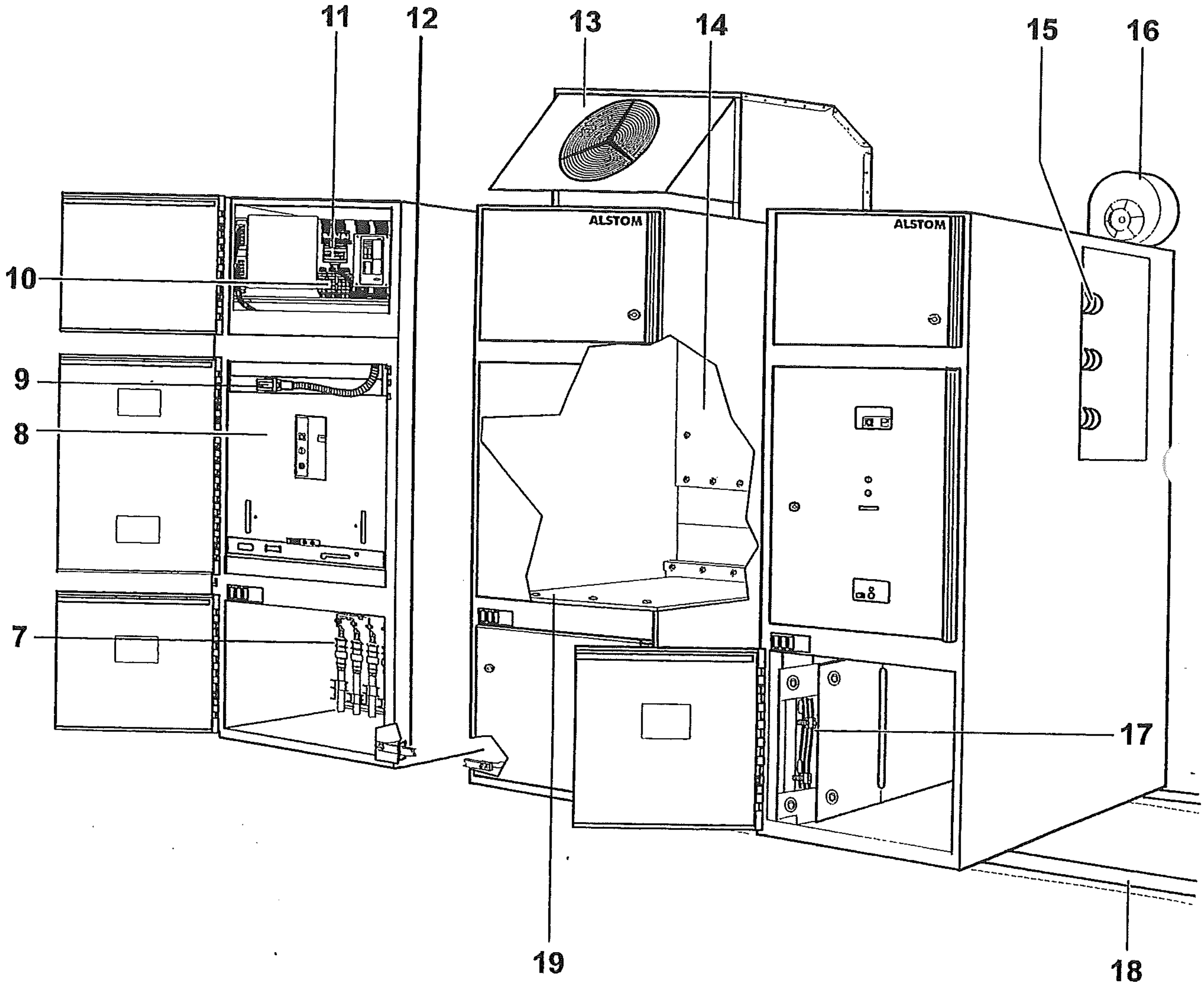
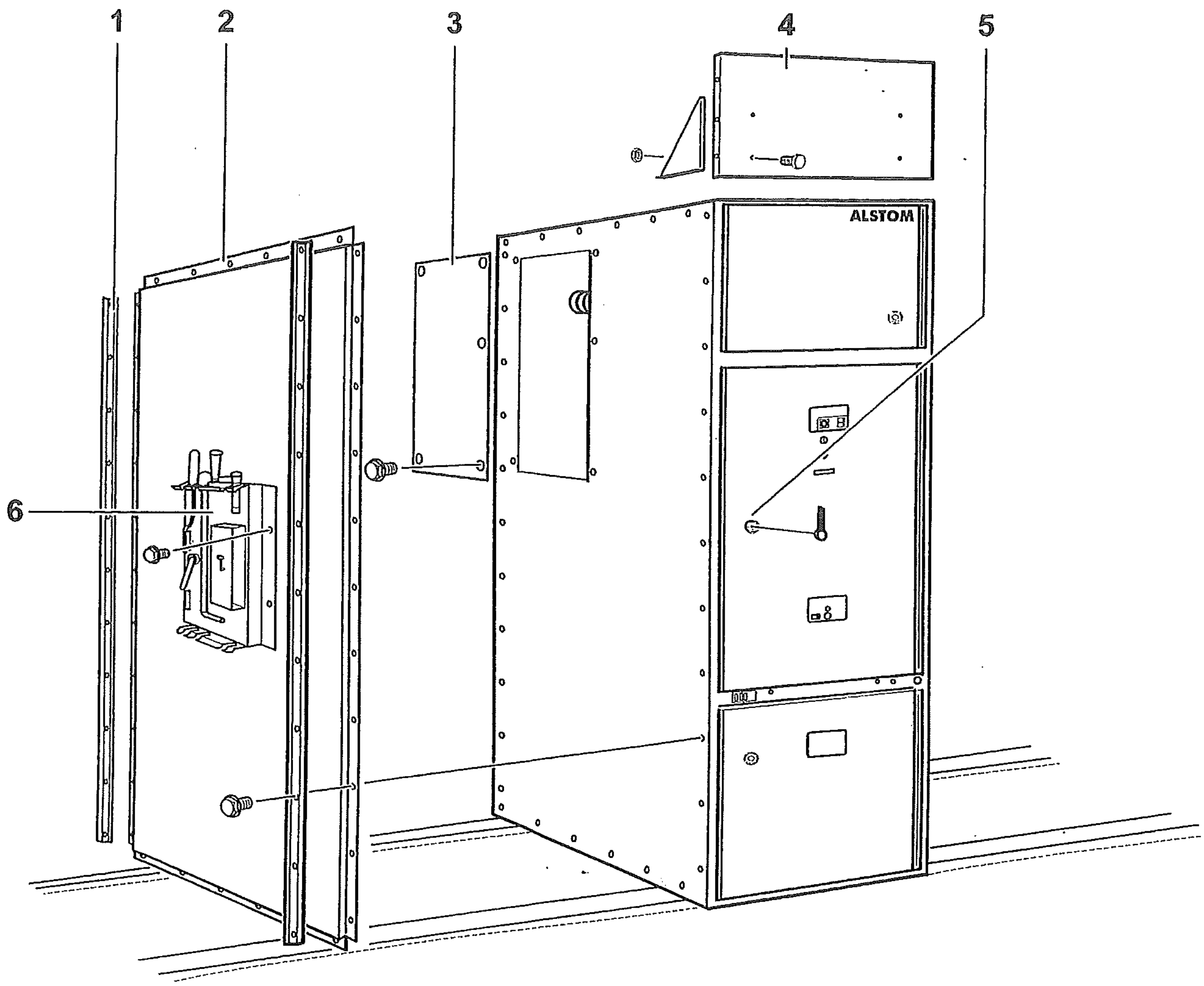


Key:

7) Primary Connection
8) Circuit-breaker cassette
9) Low-voltage connector
10) Low-voltage cubicle
11) ILIS, optional
12) Connecting link for earth bus
13) Duct with gas cooler, optional
14) Partition (busbar compartment)
15) Screw connection of busbars
16) Centrifugal fan, optional
17) Connection of secondary supply
18) Foundation bar
19) Partition (cable connection compartment)

1 Overview drawings



Key:

1) Bracket, optional
2) End panel
3) End panel inset
4) Front cover, optional
5) Actuating lever for lifting gate
6) Tool board (one per switchgear station)

Overview drawings

please open

2 Assembly overview

Assembly sequences	For detailed description of assembly sequences, see Chapter
Transporting the switchgear panels. - Mounting the heavy-load lifting rollers. ⚠ Watch out for floor cut-outs. Danger of accidents!	4.1
⚠ The stored-energy mechanisms must not be tensioned during assembly. Danger of injury!	
Prior to installing the switchgear panels: - Draw out the cassette (8). - Disassemble the partition plate (14) in front of the busbar compartment (on assembly of the busbar). - Disassemble the partition plate (19) covering the cable connection compartment (on assembly of the cable end boxes).	4.2
Erecting the switchgear panels: - The location of the switchgear panels is indicated in the foundation plan. - Position switchgear panels parallel on the foundation bar (18).	4.3
Aligning the switchgear panels: - Compensate the clearance between the supporting structure and the foundation bar (18) using shims.	4.4
Screw-fastening the switchgear panels to one another.	4.5
Screw connection of busbars (15): - Circuit-breaker panel. - Busbar sectionalizer unit with riser and low transfer.	4.6
Earthing the switchgear: - Assembly the connecting links (12) for earth bus	4.7
Mounting the end panel (2) with end panel inset (3): - Install > 25 kA end panel (2) with bracket (1).	4.8
Fastening the switchgear panels on the foundation bar (18): - Provide Ø 8.5 mm drill holes in spacer bar and cut M10 thread. - Screw-fasten switchgear panels to foundation bar (18).	4.9
Laying and establishing connection of secondary supply (17); the following connections can be established: - finely stranded conductors up to 1.5 mm^2. - solid conductors up to 2.5 mm^2.	4.10
For ILIS (11), please refer to the Operating Instructions of Intelligent Light Information System.	4.11
Primary connection (7): - Cable connection. - Outgoing feeder with plug sockets.	4.12
Mounting the cover strips.	4.13
Mounting the centrifugal fan (16).	4.14
Mounting the front cover (4).	4.15
Mounting the tool board (6).	4.16
Mounting the panel-to-wall gap cover.	4.17
Mounting the gas cooler (13).	4.18

3 Final operations before commissioning

The high-voltage supply must not be switched on.

1. Clean switchgear; remove any dirt left from assembly work.
2. Repair any damage to the paintwork.
3. Remove all the attached notes, labels, brochures and any data which are no longer required.
4. Re-assemble all parts which were unscrewed during work on site.
5. Rack in and lock cassette.
6. Check whether the switchgear's functional ability has been prejudiced during transport and assembly work.
7. Check the rated supply voltage of the control units and actuating devices.
8. Operate the switching devices as described in the operating instructions.
9. Look at the position indicators.
10. Check the control circuits:
    Check the wiring laid on the construction site.
11. Switch on rated supply voltage and check the following functions:
    - Electric drives of the switching devices.
    - Position indicators.
12. Deposit operating elements at the info tool board.

4 Detailed description of assembly operations

4.1 Transporting the switchgear panels

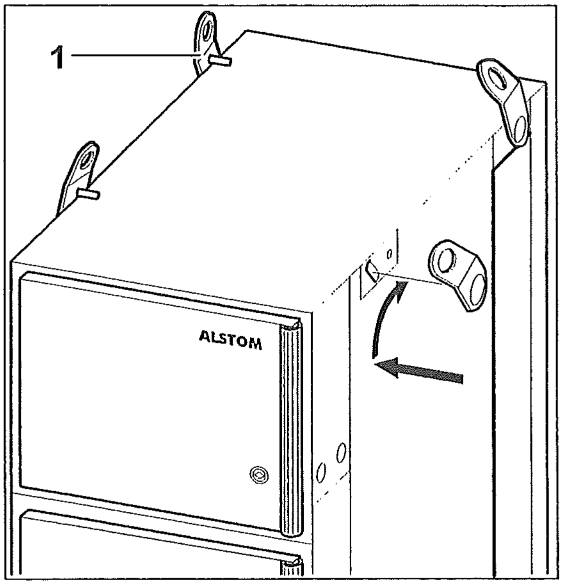


Fig. 4-1 1 Crane lifting eyelets

⚠ Watch out for floor cut-outs.
Danger of accidents!

Lift the switchgear panel.

- Attach crane eyelets (1) to the switchgear panel.

ⓘ Hoisting equipment may only be fastened to the crane lifting eyelets.

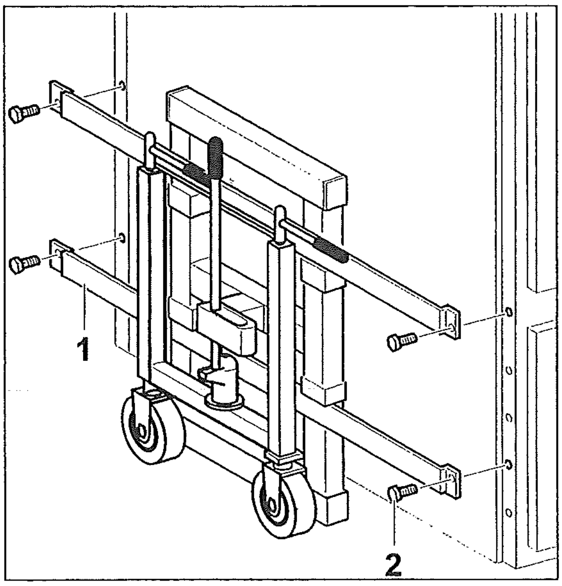


Fig. 4-2 1 Heavy-load lifting rollers
2 Hex. bolt

Recommendation: Transport with heavy-load lifting rollers.
Mount heavy-load lifting rollers.

- Fasten heavy-load lifting rollers (1) on both sides with four hex. bolts (2).

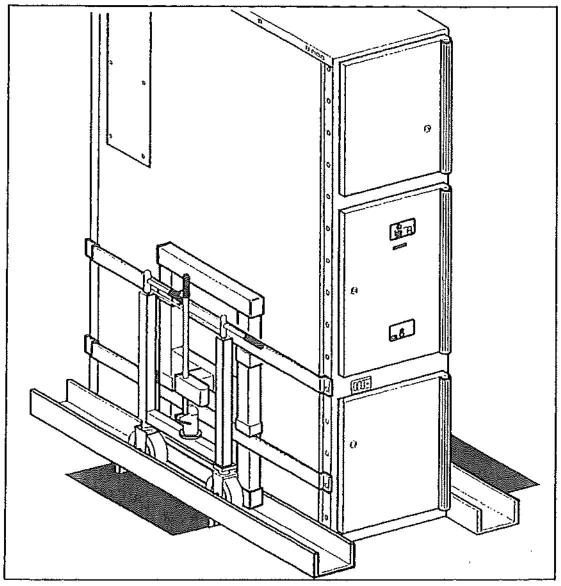


Fig. 4-3 Displacement via the heavy-load lifting rollers

Displacement via the heavy-load lifting rollers to the area of the foundation bars

- To facilitate the rest of the manual sliding process, slightly lubricate the foundation bars.
- Lift the panel on the left and right uniformly using the hydraulic hoisting device.
- Position the panel over the cable duct using bridges.
- Lower the panel to the foundation bars by actuation of the cross-handle on the hydraulic cylinder.
- Remove the heavy-load lifting rollers on both sides.
- Remove the bridges.

4.2 Prior to installing the switchgear panels

The following installation variants are possible:

- Wall-mounting.
- Free-standing installation.
- Back-to-back installation.
- Face-to-face installation.

Draw out the cassette.

- Insert actuating lever (1) and turn it to the left.
- Open the lifting gate.

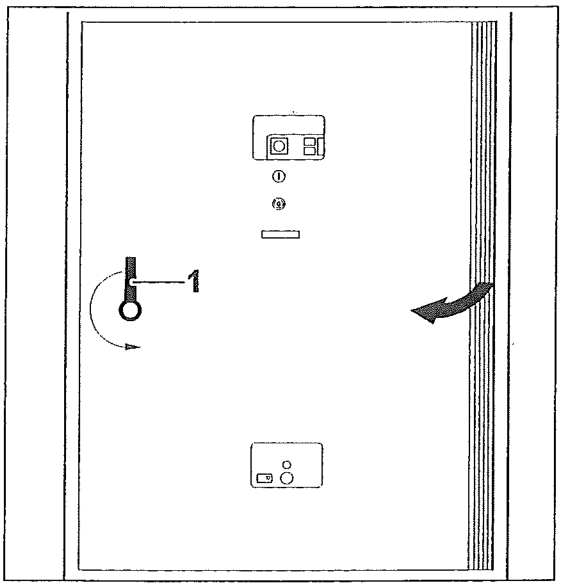


Fig. 4-4 1 Actuating lever

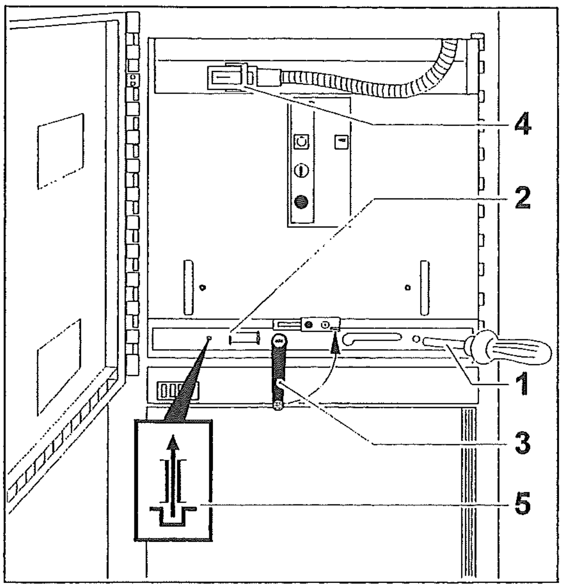


Fig. 4-5
1 Release pin
2 Slider for insertion opening
3 Crank
4 Low-voltage plug
5 Symbol for magnetic interlock

- Insert release pin (1) for magnetic interlock (optional, applicable only if fitted; indication via symbol (5) on cassette and on the front door of circuit-breaker compartment).
- Unblock the insertion opening with the slider (2).
- Insert the crank (3) and turn it anti-clockwise as far as it will go.
- Unlock the low-voltage plug (4) (clip on left) and store it in compartment above.

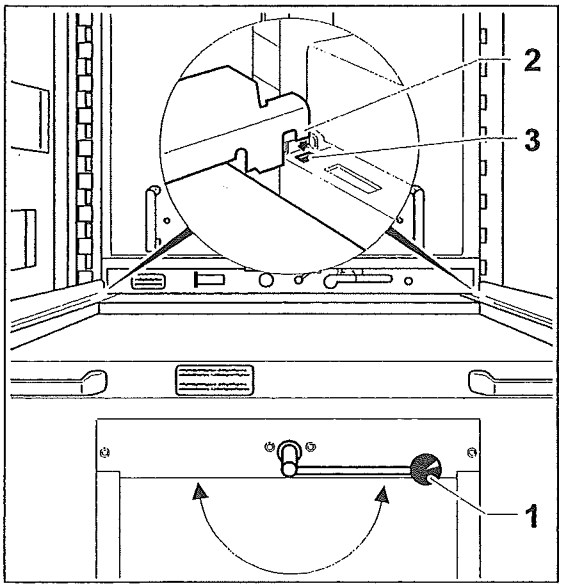


Fig. 4-6
1 Lever
2 Stud
3 Recesses

- Lift the table of the transport trolley by swinging the lever (1) to the left.
- Move the transport trolley up so that the studs (2) lock into the rectangular recesses (3) when the transport trolley is lowered.
- Lower the table of the transport trolley by swinging the lever (1) to the right.

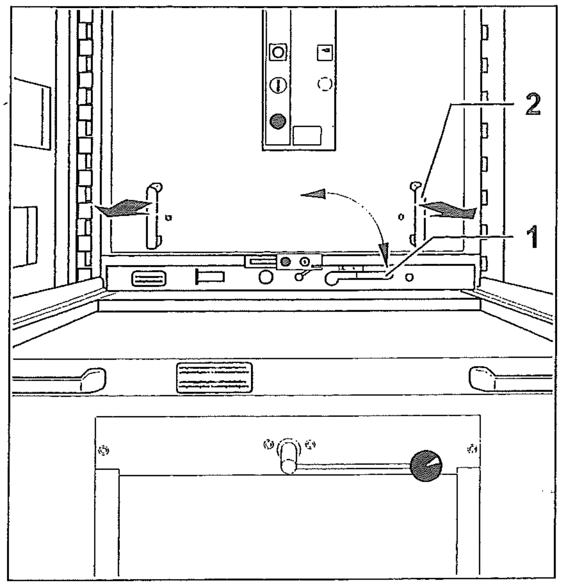


Fig. 4-7 1 Interlocking lever
2 Handles

- Release cassette (interlocking lever (1) vertical).
- Pull cassette onto the transport trolley via the handles (2).
- Lock cassette with the transport trolley (interlocking lever (1) horizontal).

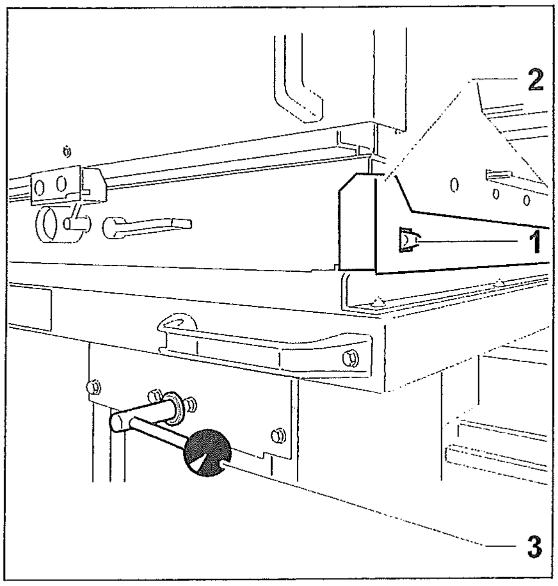


Fig. 4-8 1 Interlocking stud
2 Guide rails
3 Lever

Check interlocking of cassette with the transport trolley.

- The interlocking studs (1) of the cassette must be interlocked on the right and on the left with the guide rails (2) of the transport trolley.

⚠ Move the cassette only with the transport trolley in interlocked condition.
Danger of accidents!

- Lift table of transport trolley (lever (3) to the right) and move it away with cassette.

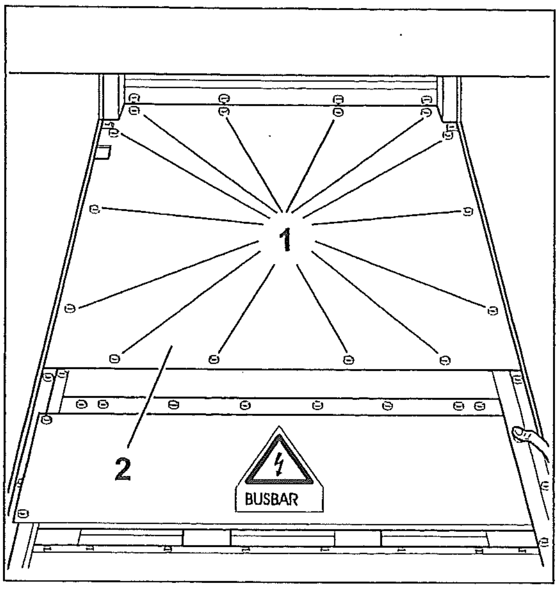


Fig. 4-9 1 Hex. bolts
2 Partition plate

Dismantle the partition plate (in front of the busbar compartment).

- Release the hex. bolts (1).
- Remove the partition plate (2).

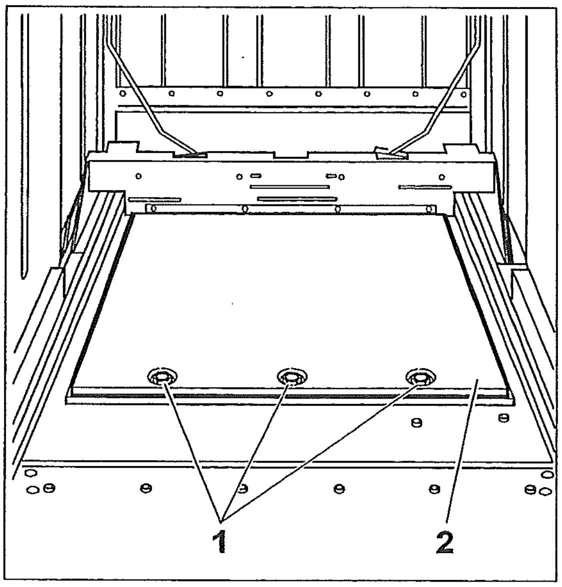


Fig. 4-10 1 Hex. bolts
2 Partition plate

Dismantle the partition plate covering the cable connection compartment to facilitate assembly in the cable connection compartment.

- Release the hex. bolts (1).
- Remove the partition plate (2).

4.3 Erecting the switchgear panels

For the location of the switchgear panels in the switchgear building, please refer to the foundation plan available to the fitters.

Position switchgear panel parallel on the foundation bars.

⚠ Watch out for floor cut-outs.
Danger of accidents!

ⓘ Do not screw-fasten the switchgear panel to the foundation bars yet; in this case, alignment is no longer possible.

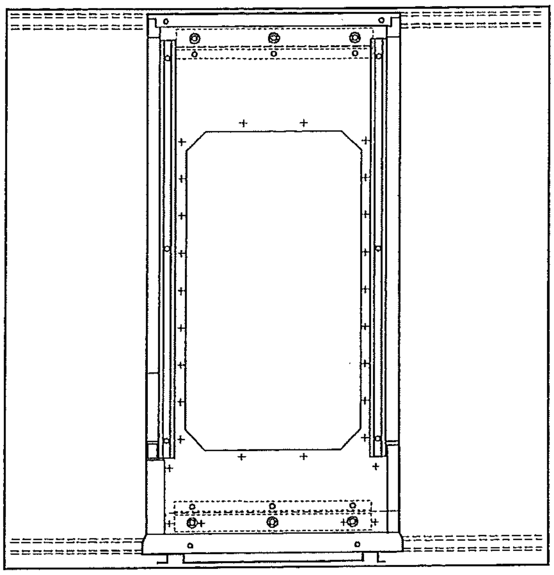


Fig. 4-11 Positioning the switchgear panels

4.4 Aligning the switchgear panels

Align the first switchgear panel horizontallly using appropriate tools (leveling batten and spirit level). The position of the other switchgear panels depend on the position of the first switchgear panel. Also align the other switchgear panels and line them up.
If necessary, compensate any clearance between the panel supporting structure and the foundation bars using shims (as close as possible to the securing bolts).

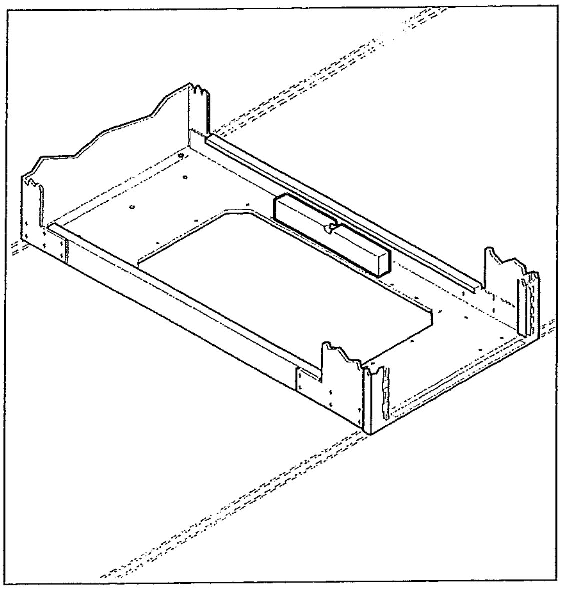


Fig. 4-12 Align switchgear panels

4.5 Screw-fastening the switchgear panels to one another

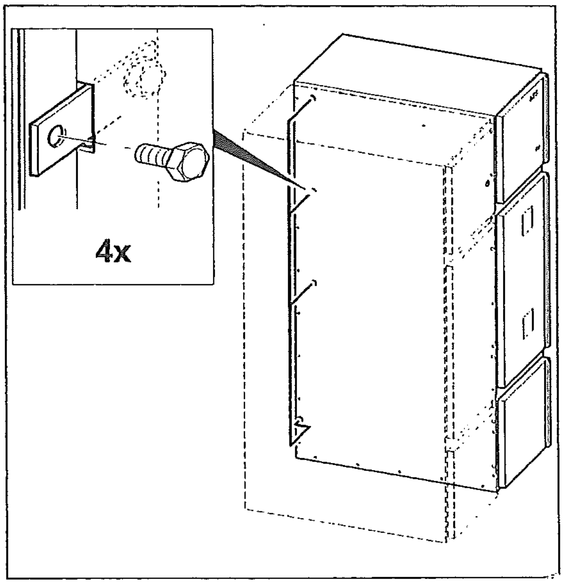


Fig. 4-13 Screw-fasten switchgear panels on the rear side

Rear side before installation of busbars

- 3 screw connections in busbar compartment and 1 screw connection in cable compartment
- Tightening torque for screw connections M8: 15 $^{+7}/_{-4}$ Nm.

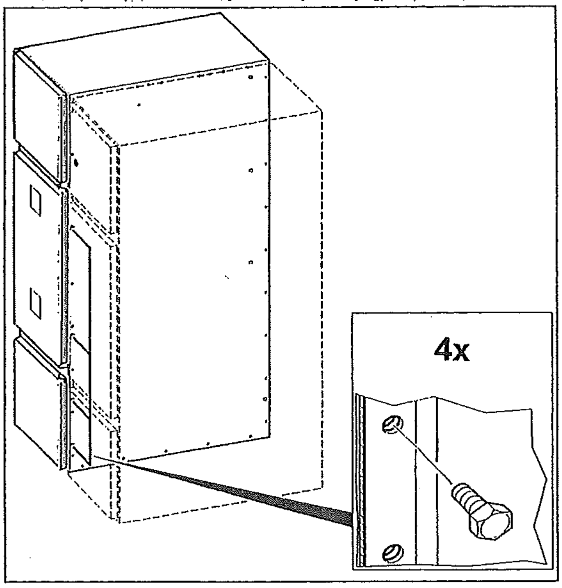


Fig. 4-14 Screw-fasten switchgear panels on the front side

Front side

- Tightening torque for screw connections M8: 15 $^{+7}/_{-4}$ Nm.

4.6 Screw connection of busbars

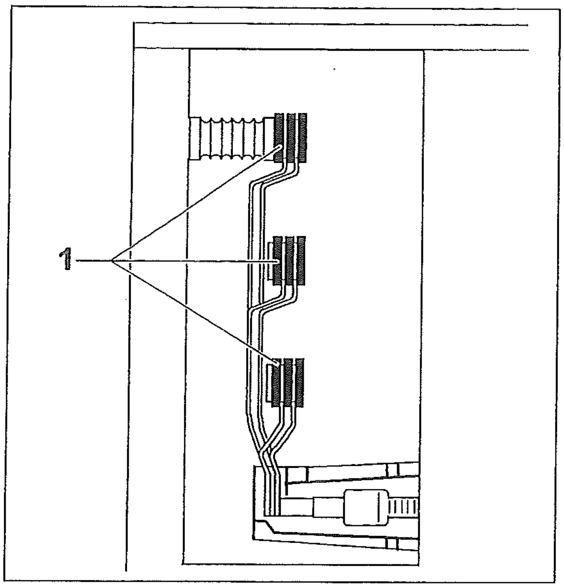


Fig. 4-15 Circuit-breaker panel
1 Busbars

Circuit-breaker panel

- Treat contact surfaces according to Chapter 5.
- Establish the electrical connection by inserting and screw-fastening the busbars (1); tightening torque for screw connections M10: 35 $\pm$ 5 Nm.

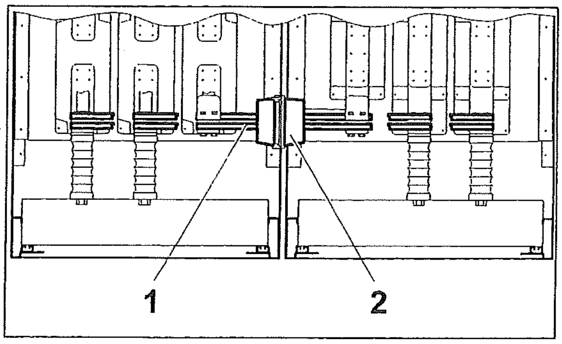


Fig. 4-16 1 Busbars
2 Busbar bushing

Busbar sectionalizer unit with riser and low transfer

- Treat contact surfaces according to Chapter 5.
- Mount the busbar bushing (2).
- Establish electrical connections block by block by inserting and screw-fastening the busbars (1); tightening torque for screw connections M10: 35 $\pm$ 5 Nm.

4.7 Earthing the switchgear

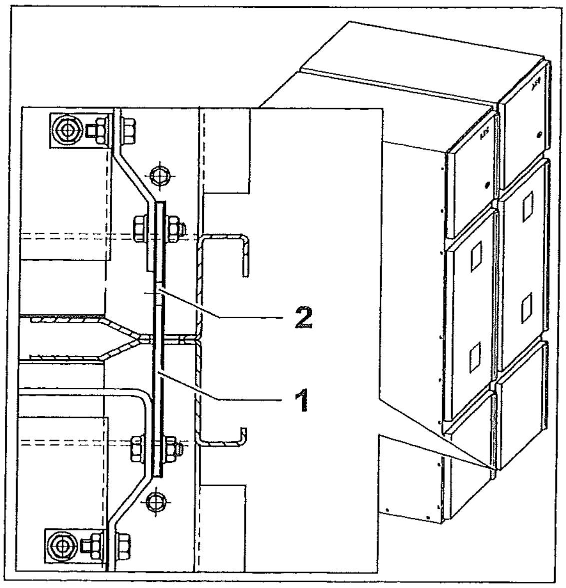


Fig. 4-17 1 Connecting link
2 Earth connection

Assemble the connecting links for earth bus

- Treat contact surfaces according to Chapter 5.
- Insert connecting links (1), tightening torque for screw connections M10: 40 $\pm$ 4 Nm.

Earth connection

- Treat contact surfaces according to Chapter 5.
- Connect cable between earthing system of switchgear building and earth connection (2) of switchgear. Tightening torque for screw connections M10: 40 $\pm$ 4 Nm.

The connecting cable is not included in the scope of supplies.

4.8 Mounting the end panel

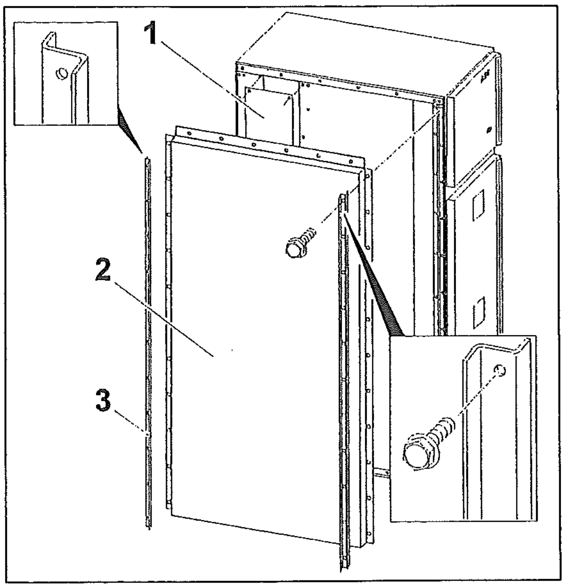


Fig. 4-18 1 End panel inset
2 End panel
3 Bracket

- Mount the end panel inset (1). Tightening torque for screw connections M6: 14 ± 1 Nm.
- Mount the end panel (2). Tightening torque for screw connections M8: 20 ± 2 Nm.
- In the case of switchgear panels > 25 kA, the end panels (2) must be assembled using brackets (3).

4.9 Fastening the switchgear panels on the foundation bars

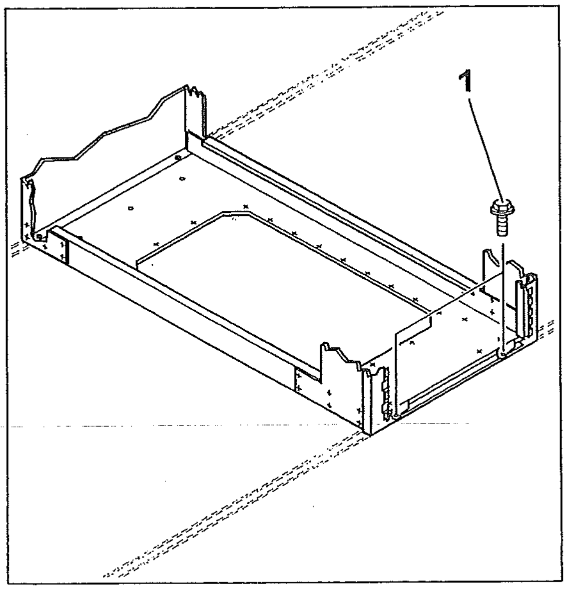


Fig. 4-19 Fastening of switchgear panel using foundation bars
1 Hex. bolts

- Drill boreholes Ø 8.5 mm into the foundation bars through the fastening holes in the supporting structure.
- Cut thread M10.
- Screw-fasten the switchgear panel to the foundation bar; tightening torque for screw connections M10: 30-35 Nm.

4.10 Connection of secondary supply

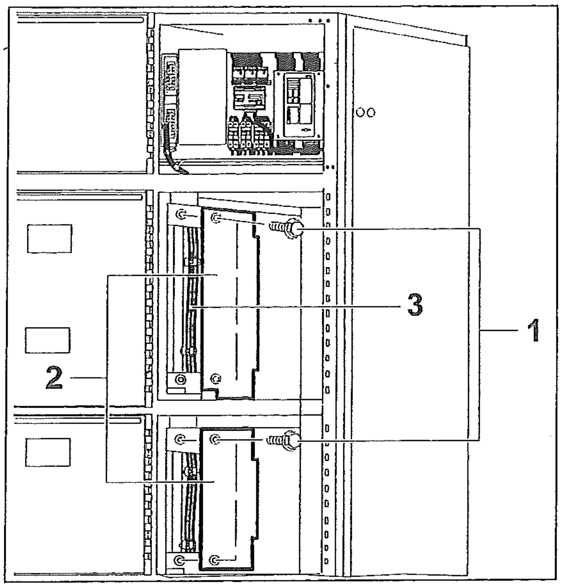


Fig. 4-20 1 Hex. bolts
2 Cover plates
3 Control wires

- Release hex. bolts (1), remove cover plates (2).
- Route the control wires (3) to be provided upwards into the appropriate low-voltage cubicle and fasten them laterally using cable clamps. Place control wires (3) on terminal strip and connect them according to the wiring diagram.
- Route the wiring from panel to panel through the openings in the side panels of the low-voltage cubicles.

The following connections can be established:
- finely stranded conductors up to 1.5 mm^2.
- solid conductors up to 2.5 mm^2.

4.11 ILIS (Intelligent Light Information System / optional)

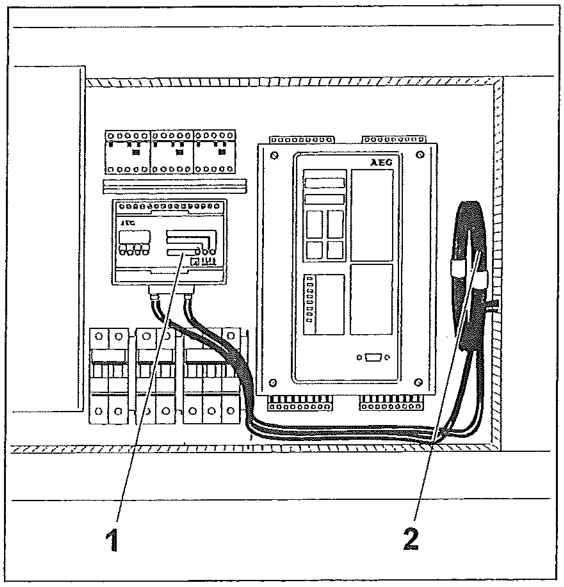


Fig. 4-21 1 ILIS
2 Reeled-up surplus length

ⓘ The fibre-optics cables must not be shortened or kinked; the bending radius must exceed 35 mm.

- The surplus length of the fibre-optics cables (2) must be reeled up in the low-voltage cubicle with a minimum diameter of 130 mm and tied up with adhesive tape (do not use metallic cable clamps).

4.12 Primary connection

Plastic single-conductor cables in partially insulated design can be screw-connected to the medium-voltage switchgear. Tools and accessories (cable clips, screws, spring washers etc.) required for mounting the single-conductor cables are not included in the scope of supplies.

For assembly of the cable end boxes, the assembly instructions of the relevant manufacturers must be complied with to the letter.

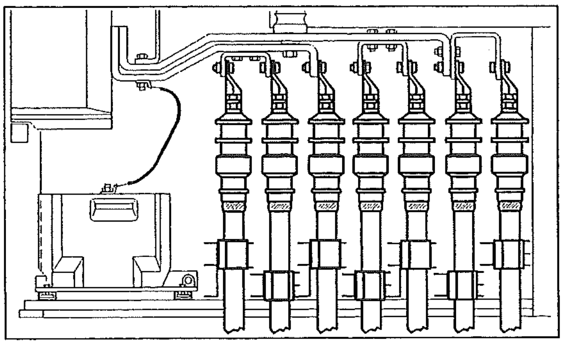


Fig. 4-22 Cable connection

- Treat contact surfaces according to Chapter 5.
- The single-conductor cables must be connected to the cable connection links according to the project-specific documents.

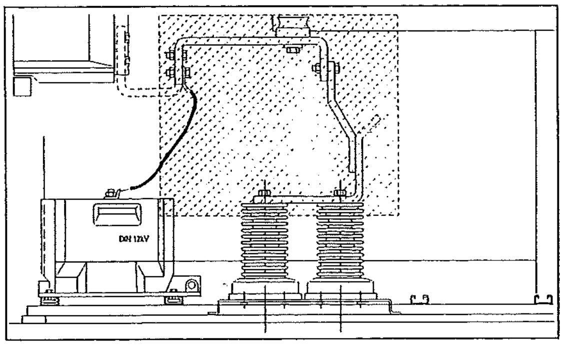


Fig. 4-23 Outgoing feeder with plug sockets

- Treat contact surfaces according to Chapter 5.
- The plug sockets in the switchgear have been installed ready for operation.
- Select the cable plugs. For assembly and fastening of the cable plugs (cable iron outside of the switchgear panel), comply with the assembly instructions of the manufacturers of the cable plugs.

4.13 Mounting the cover strips

- Close the gap between the switchgear panels using cover strips (1), and screw-fasten them.
- Tightening torque for screw connections M6: 14 $\pm$ 1 Nm.

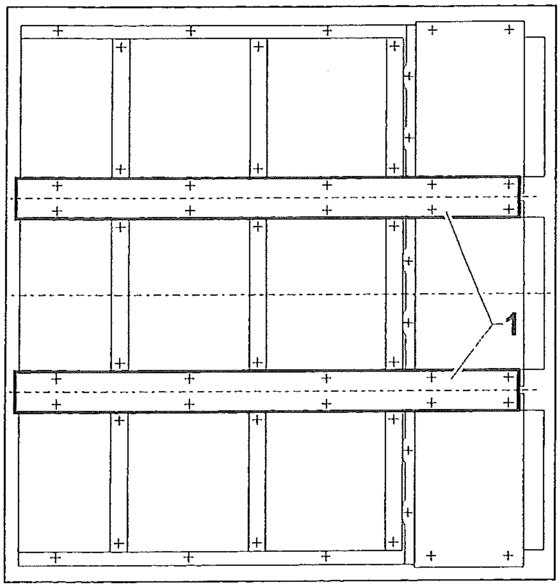


Fig. 4-24 1 Cover strips
(Panel top side shown)

4.14 Mounting the centrifugal fan

- Position the centrifugal fan (1) and screw-fasten it. Tightening torque for screw connections (2) M6: 8 $\pm$ 1 Nm.
- Connect the power supply (3).

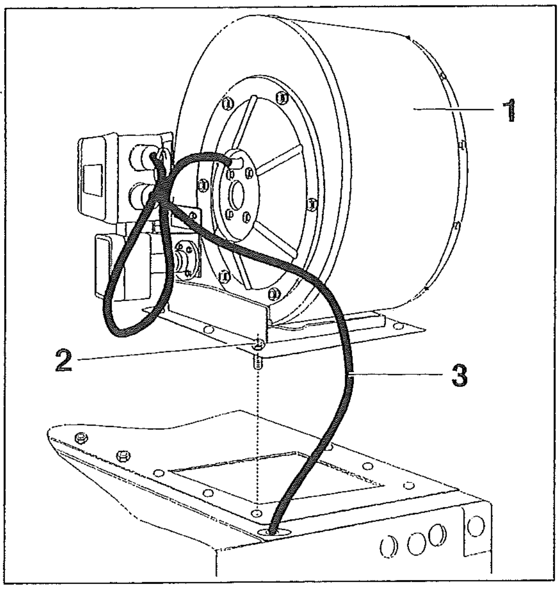


Fig. 4-25 1 Centrifugal fan
2 Hex. bolt
3 Power supply

4.15 Mounting the front cover

- Screw-fasten the support bracket (1).
- Screw-fasten the front metal sheet (3).
- Tightening torque for all screw connections M8: 15 $^{+7}/_{-4}$ Nm.

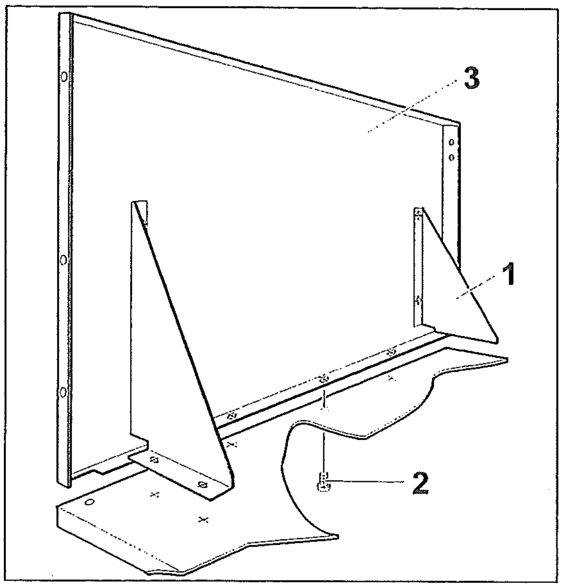


Fig. 4-26 1 Support bracket
2 Hex. bolt
3 Front metal sheet

4.16 Mounting the tool board

The tool board (1) can be mounted at choice to the left-hand or right-hand end panel.

- Loosen screws at the end panel (approx. 4 mm), push tool board on and fasten the screws.

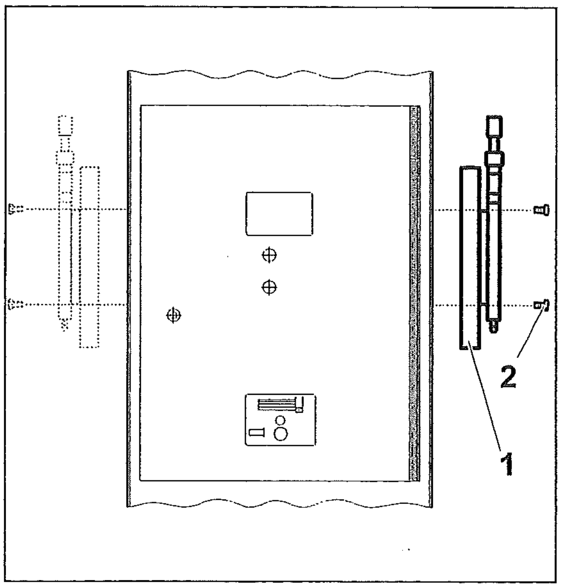


Fig. 4-27 1 Tool board
2 Hex. bolt

4.17 Mounting the panel-to-wall gap cover

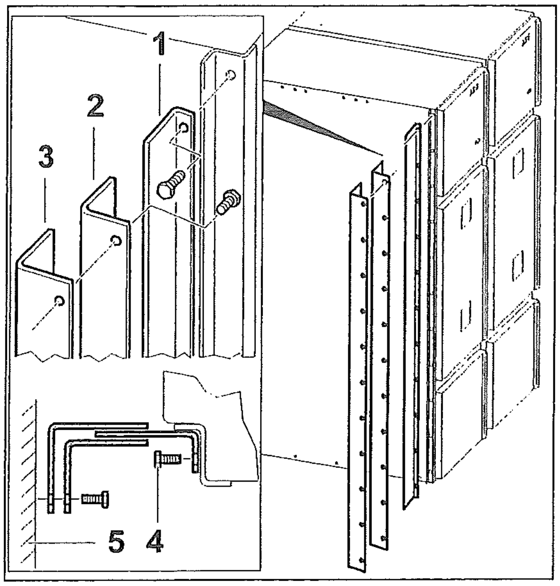


Fig. 4-28
1 Gap cover
2 Leveling bracket
3 Leveling bracket
4 Hex. bolt
5 Building wall

Panel-to-wall gap on operator side

Close gap between the switchgear panel and the building wall using the gap cover (1) and the leveling brackets (2,3) and screw-fasten them.

- Tightening torque for screw connections M8 : 20 ± 2 Nm.

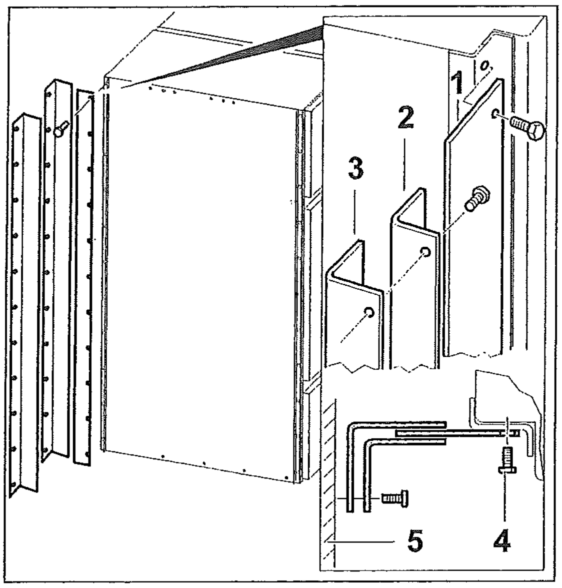


Fig. 4-29
1 Gap cover
2 Leveling bracket
3 Leveling bracket
4 Hex. bolt
5 Building wall

Panel-to-wall gap on rear side

Close gap between the switchgear panel and the building wall using the gap cover(1) and the leveling brackets (2,3) and screw-fasten them.

- Tightening torque for screw connections M8 : 20 ± 2 Nm.

4.18 Mounting the gas cooler

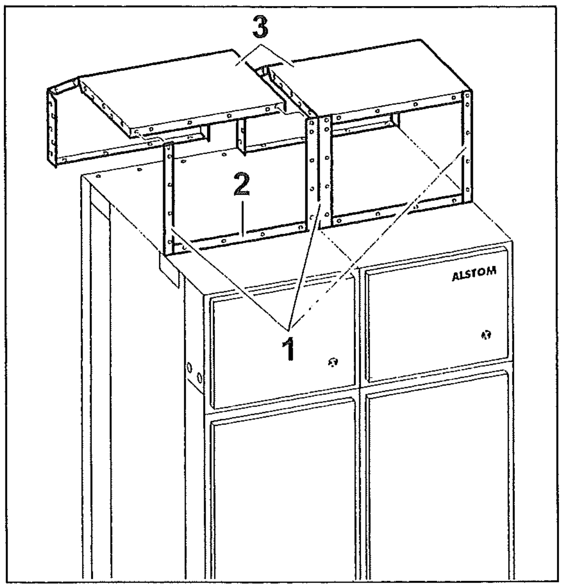


Fig. 4-30 1 Carrier support
2 Transverse bracket
3 Ventilation duct

- Position and screw-down carrier support (1). Tightening torque for screw connections M8: 15 $^{+7}/_{-4}$ Nm.
- Insert and screw-down transverse bracket (2). Tightening torque for screw connections M8: 15 $^{+7}/_{-4}$ Nm.
- Position the ventilation duct (3) and screw it down. Tightening torque for screw connections M8: 15 $^{+7}/_{-4}$ Nm.
- Screw-connect the ventilation ducts (3); tightening torque for screw connections M8: 36 $\pm$ 4 Nm.

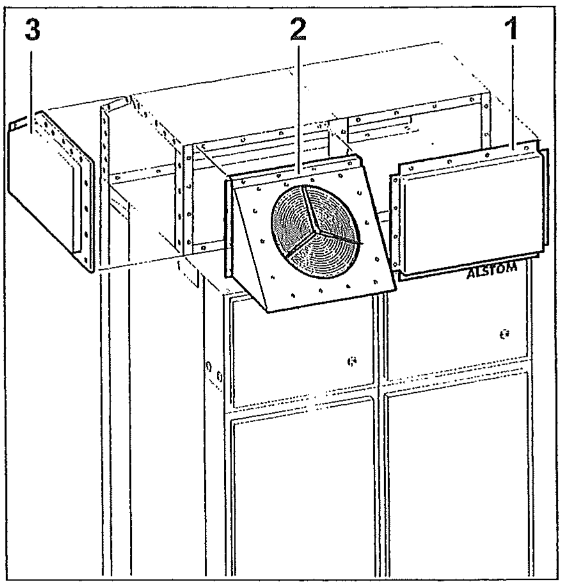


Fig. 4-31 1 Front shutter
2 Gas cooler
3 Side panel

- Position and screw-down front shutter (1) to the ventilation ducts which are not to be equipped with gas cooler (2).
- Tightening torque for screw connections M8: 15 $^{+7}/_{-4}$ Nm.
- Insert and screw-down gas cooler (2); tightening torque for screw connections M8: 15 $^{+7}/_{-4}$ Nm.
- Position and screw-down side panel (3) to the end panels.
- Tightening torque for screw connections M8: 15 $^{+7}/_{-4}$ Nm.

5 Annex

5.1 How to treat sliding contact surfaces

- Cleaning by means of a lint-free cloth.
- Use a cleaning agent in case of severe dirt accumulation.
- Apply a thin, uniform film of contact lubricant KL Δ .

5.2 How to treat screw-fastened contact surfaces

Preliminary treatment:

Material of contact surfaces	Preliminary treatment
Copper or copper base alloy	Clean (1) and bright-polish (2).
Steel or galvanized steel	Clean (1) and bright-polish (2), eliminate any existing passivation.
Steel, silver-plated	Clean (1).
Aluminium	Clean (1) and bright-polish (2); coat immediately afterwards with contact lubricant KL Δ , and screw-fasten.

(1) Clean:
- using a lint-free cloth.
- Use cleaning agents in case of severe dirt accumulation.

(2) Bright-polish:
- using abrasive cloth (grain size 100 or less), or
- using a steel brush which is only used for copper or only for aluminium, or treat using "Scotch Brite handpads"
- and treat with contact lubricant KL Δ .

- Coat the two contact surfaces so that the clearance between the contact surfaces is filled after the screws have been tightened.
- Grease busbar connections specifically with tiny amounts of lubricant.

5.3 Screw connections

Use the following elements for all screw couplings:
- Screws, grade 8.8.
- Nuts, grade M 8.

Coat the threads of screws or nuts with a thin film of multi-purpose lubricant ML □.

5.4 Auxiliary material, accessories and spare parts

The use of any other auxiliary materials is not admissible!

Auxiliary material	Item no.
Cleaning agent, 1 l can	008 152
Contact lubricant KL Δ 0.5 kg can	008 157
Multi-purpose lubricant ML □ 0.5 kg can	008 154
Repair paint, 100 g can RAL 7032 Pebble gray RAL 7044 Silk gray	 008 795 -
Repair paint, 500 g can RAL 7032 Pebble gray RAL 7044 Silk gray	 008 796 009 492

Accessories, spare parts	Item no.
Actuating lever for lifting gate	C64 020
Detachable lever for earthing switch	447 489
Double-bit key	434 101
Manual crank for actuation of cassette	C66 911
Manual crank for tensioning the closing spring	617 810

5.5 Weights

Rated voltage [kV]	Width [mm]	Weight of circuit-breaker panel *) [kg]		
		-1250 A	-2000 A	≥ 2000 A
12/17.5	700	935	995	1165
	900	965	1025	1195
	1200	1005	1065	1235
24	800	995	1045	1045
	1000	1035	1085	1085

*) Including set of 3 current transformers

These weights are approximate values, measured without packaging.

Weight for:
1 single-pole or double pole insulated voltage transformer 12 kV = 19 kg
1 single-pole or double pole insulated voltage transformer 24 kV = 28 kg

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Metal-Clad Switchgear AHA

up to 24 kV, 5000 A, 125 kA

Latest Amendment No. 535 030, Edition 11/01
to Installation Instructions No. 531 686, Edition 09/98

T&D

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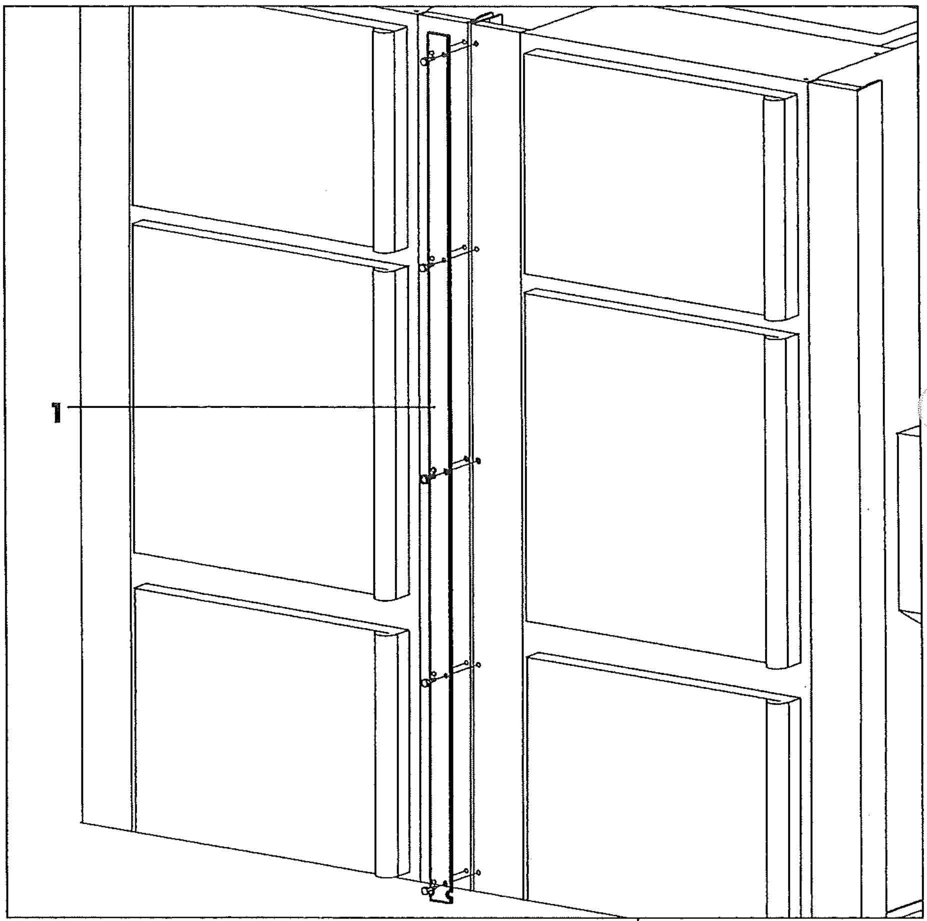
Contents

1 Unit screw connection, operating side (1200 mm wide units)

- Place the connection strip on the joint between the both units.
- Fasten it by bolts M8, tightening torque 15 $^{+7}/_{-2}$ Nm.



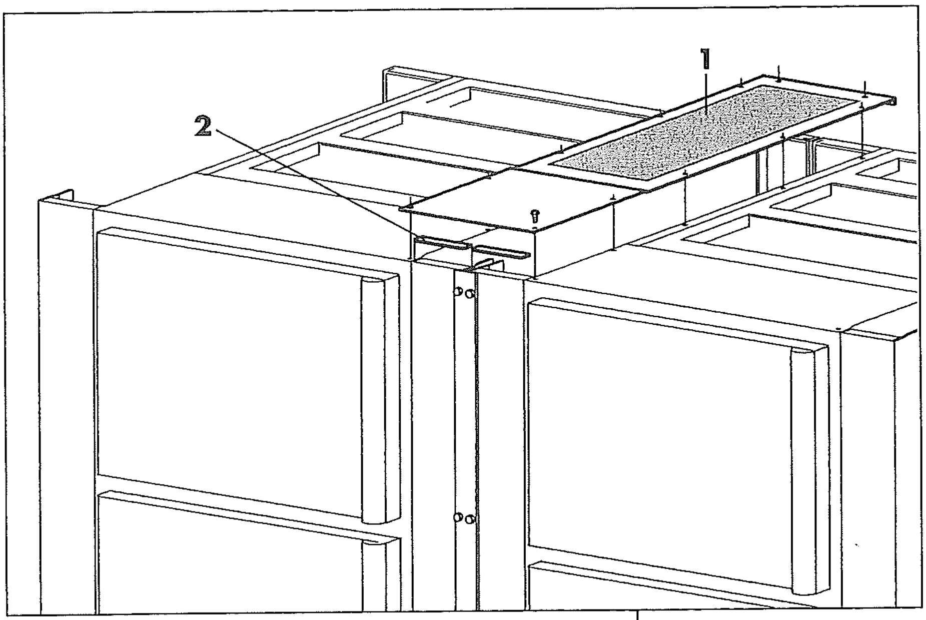
1
Unit screw connection, operating side
1 connection strip

2 Assembling the cover strips (partitions with venting ducts, mid-position unit)

- Paste the cellular rubber strips.
- Place the cover strips on the openings of both partitions with venting ducts at the left and right sides of the standard units.

Leave open the screw connections in the area of the top boxes for busbar outlets (see Figure 4 and section 4.1).

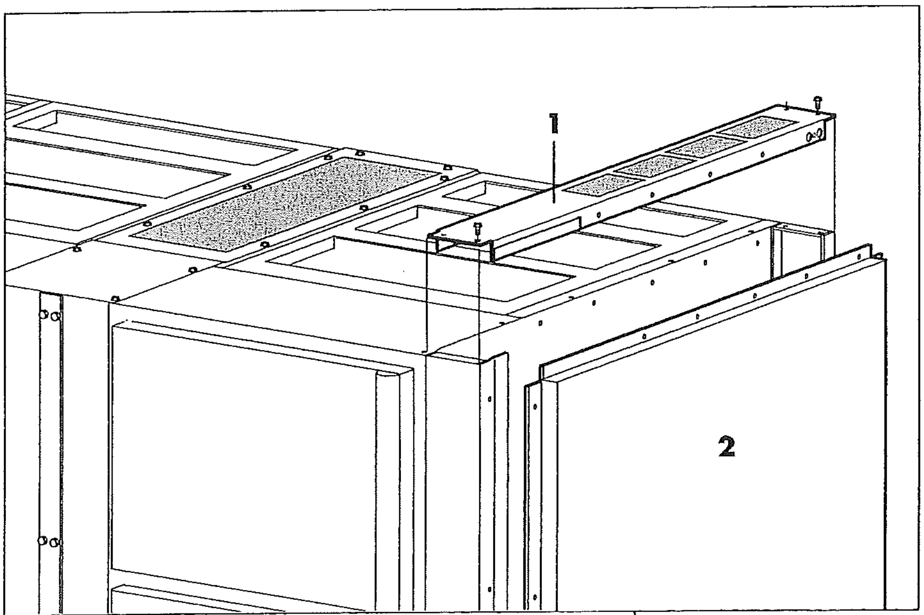
Tighten the screws M6 on the sides of the standard units with a tightening torque of 6 $^{+3}/_{-2}$ Nm. Tighten the screws on the rear covers of the partitions with a tightening torque of 15 $^{+7}/_{-2}$ Nm.



2
Assembling cover strips
1 Cover strip
2 Cellular rubber strip

2.1 Assembling the cover plate (partition with venting ducts end unit left or right side)

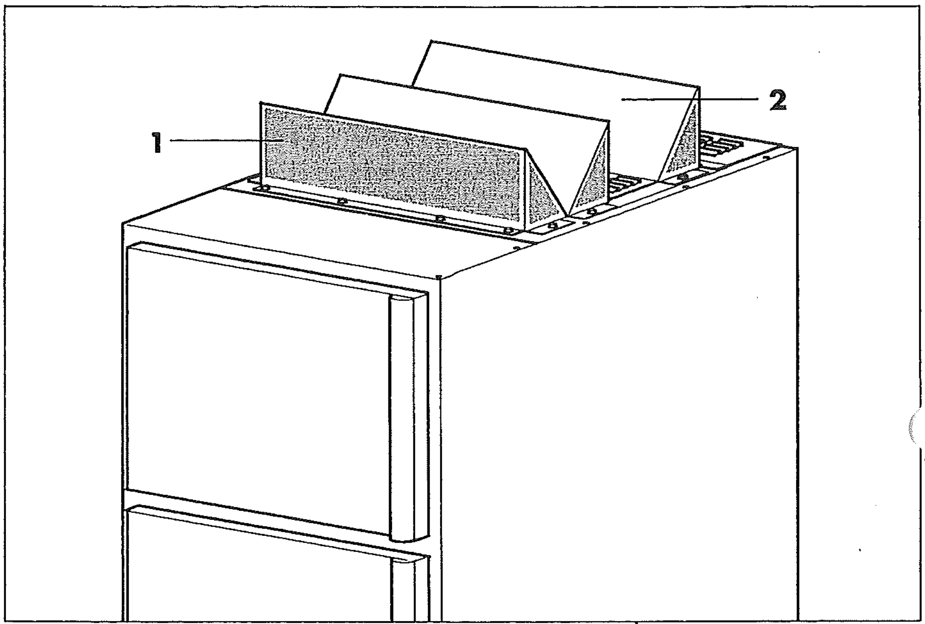
- Place the cover plate on the opening of the partition with venting ducts (end unit left or right side).
- Tighten the screws M8 using a tightening torque of 15 $^{+7}/_{-2}$ Nm. [Please refer also to section 4.8 in the Installation Instructions (Assembling the end wall).]



3
Assembling the cover plate
1 Cover plate
2 End wall

3 Assembling the venting tops

- Place the front-side venting top.
- Tighten the screws M8 (towards the operating side) using a tightening torque of 15 $^{+7}/_{-2}$ Nm. Tighten the screw connections M6 on the sides and on the rear side using a tightening torque of 6 $^{+3}/_{-2}$ Nm.
- Place the mid-position venting top with gill plate.
- Tighten the screws M8 (towards the operating side) using a tightening torque of 15 $^{+7}/_{-2}$ Nm. Tighten the screw connections M6 on the sides and on the rear side using a tightening torque of 6 $^{+3}/_{-2}$ Nm.



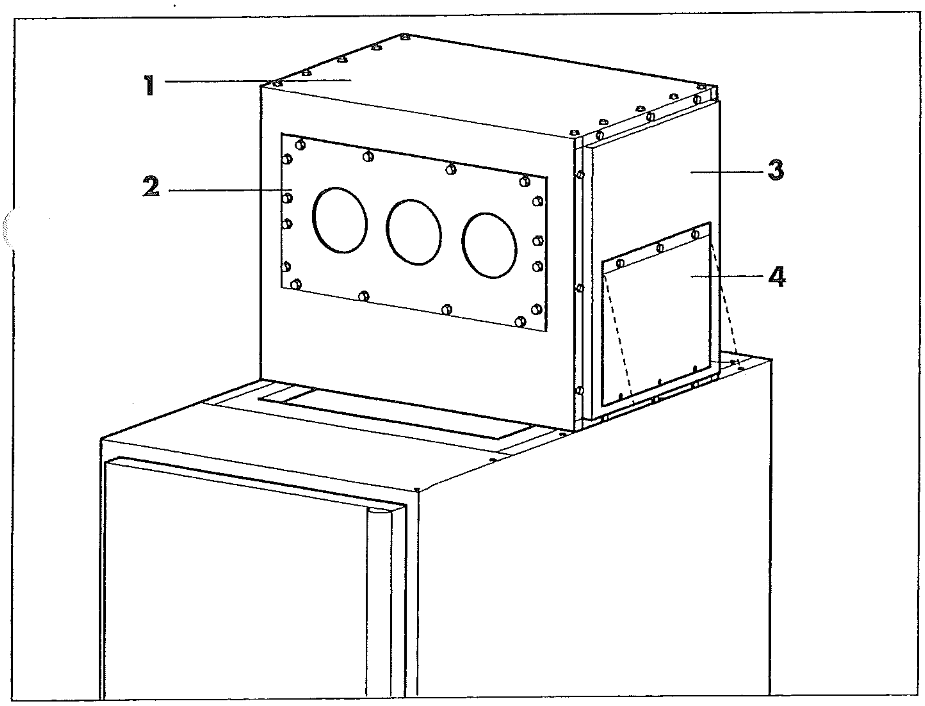
4
Assembling the venting tops
1 Front-side venting top
2 Mid-position venting top with gill plate

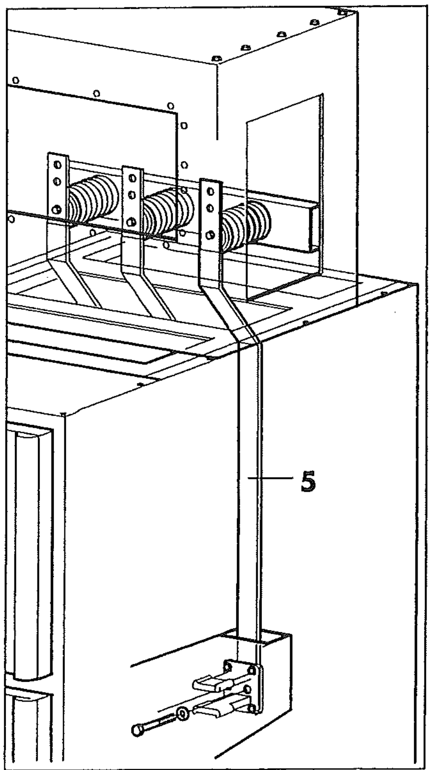
4 Assembling the top box (standard version)

- Place the pre-assembled top box for busbar outlet on the cover plate.
- Tighten the srew connections M8 using a tightening torque of 36 ± 4 Nm.

Assembly of the fully insulated outlet bar according to the assembly instructions issued by the manufacturer of the fully insu-'ed outlet bar.

- Fix the cover plate.
  Screw connections M8 with tightening torque of 15 $^{+7}/_{-2}$ Nm.
- Fix the end wall with pressure relief flap. Make sure that blowing out is towards the middle of the switchgear.
- Screw connections M8 with tightening torque of 15 $^{+7}/_{-2}$ Nm.





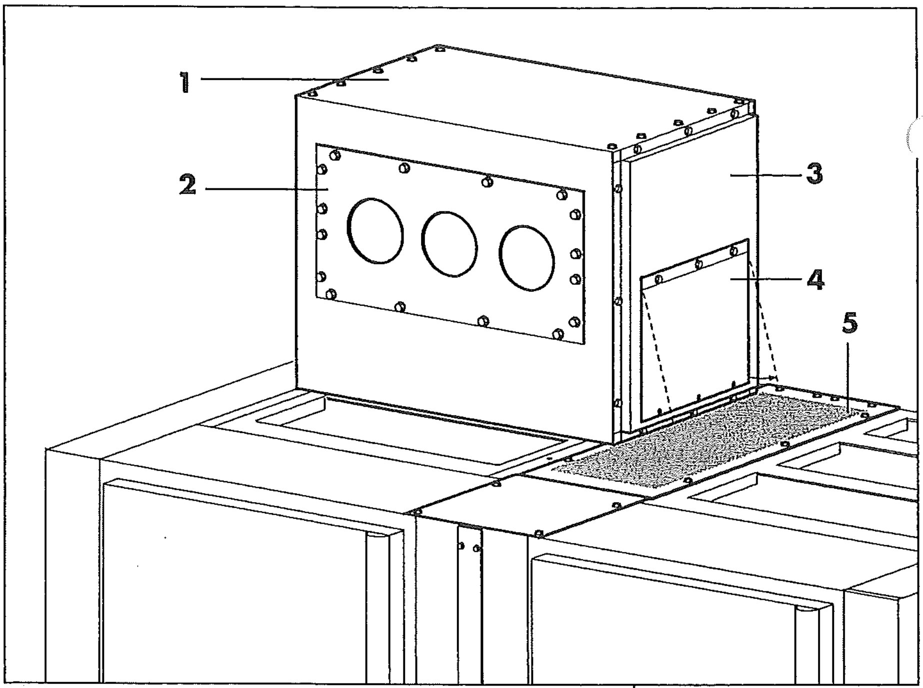
5
Assembling the top box (standard version)
1 Top box
2 Cover plate
3 End wall
4 Pressure relief flap
5 Outlet bar

4.1 Assembling the top box (3150 A version)

- Place the pre-assembled top box for the busbar outlet on the cover plate.
- Screw connections M8 with tightening torque 36 ± 4 Nm.

Assembly of the fully insulated outlet bar according to the assembly instructions issued by the manufacturer of the fully insulated outlet bar.

- Fix the cover plate. Screw connections M8 with tightening torque of 15 $^{+7}/_{-2}$ Nm.
- Fix the end wall with pressure relief flap. Make sure that blowing out is towards the middle of the switchgear.
- Screw connections M8 with tightening torque15 $^{+7}/_{-2}$ Nm.



6
Assembling the top box
(3150 A version)
1 Top box
2 Cover plate
3 End wall
4 Pressure relief flap
5 Cover strip

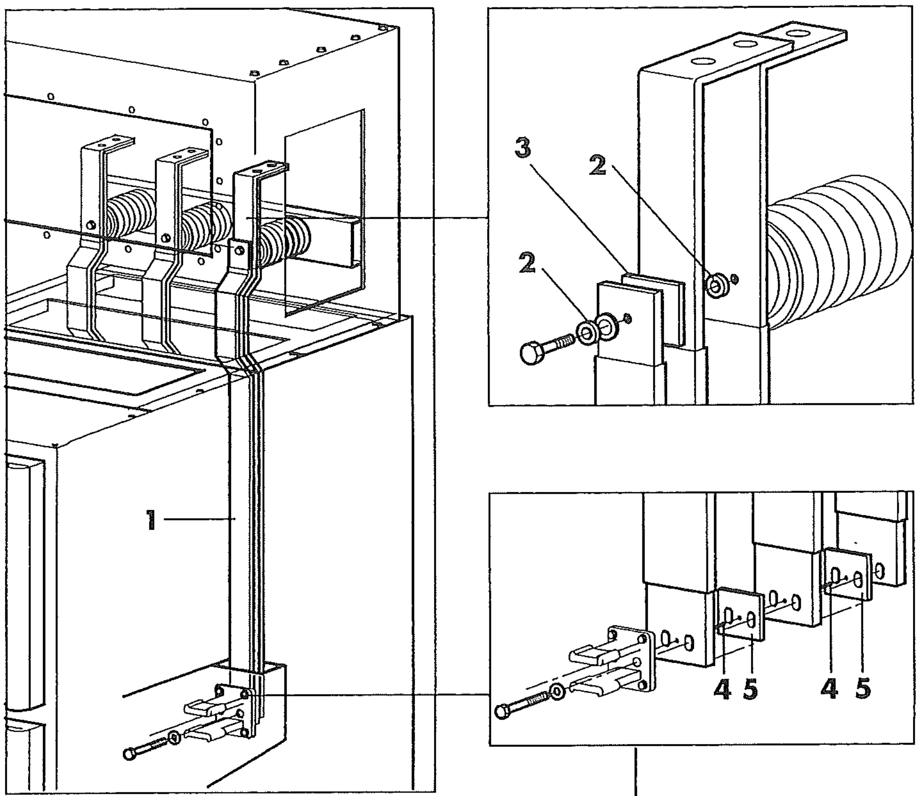
5 Assembling the busbar outlet (3150 A version)

Screw connections in the funnel-type bushings:

- Fix the spacers between the outlet bars using spring-type slotted straight pins 4x16.
- Treat the contact surfaces according to section 5 of the Installation Instructions.
- Screw connections M10 with tightening torque 23.5 ± 3 Nm.

Screw connections within the top box:

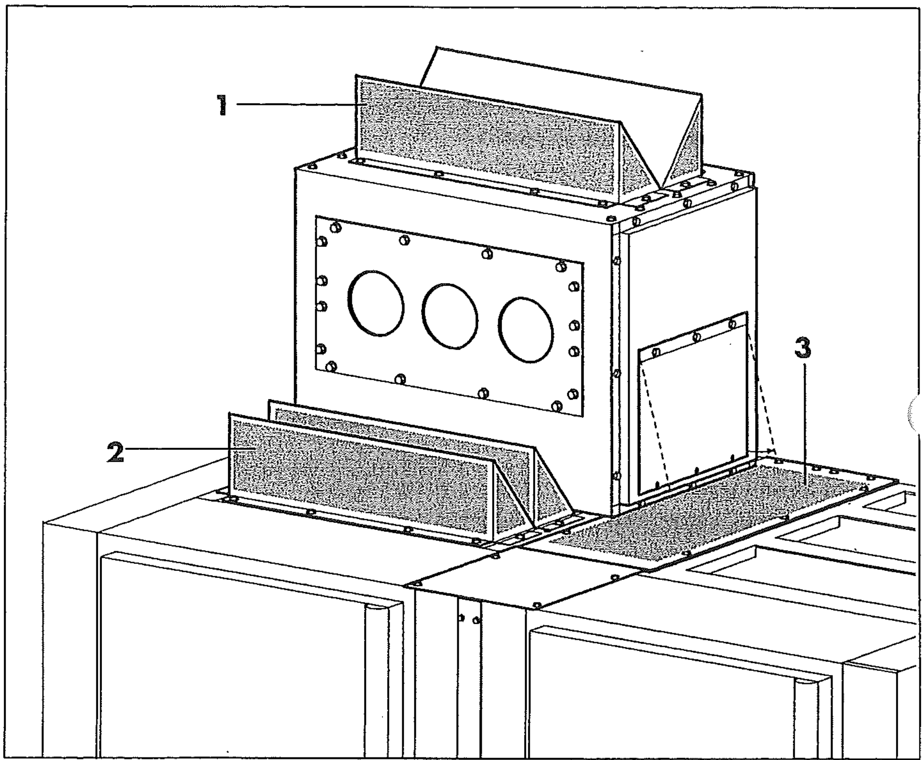
- Treat the contact surfaces according to section 5 of the Installation Instructions.
- Insert the distance sleeves and spacers between the outlet bars.
- Screw connections M16 with tightening torque 110 ± 22 Nm.



7
Assembling the busbar outlets (3150 A version)
1 Outlet bar
2 Distance sleeve
3 Spacer
4 Spring-type slotted straight pin
5 Spacer

6 Assembling the venting tops (unit with top box for busbar outlet)

- Place the venting top (towards the operating side).
- Screw connections M8 (towards the operating side) with tightening torque $15\ ^{+7}/_{-2}$ Nm.
  Screw connections M6 on the sides with tightening torque $6\ ^{+3}/_{-2}$ Nm.
- Position the venting top (in front of the top box).
- Screw connections M6 (on the sides and towards the top box) with tightening torque $6\ ^{+3}/_{-2}$ Nm.



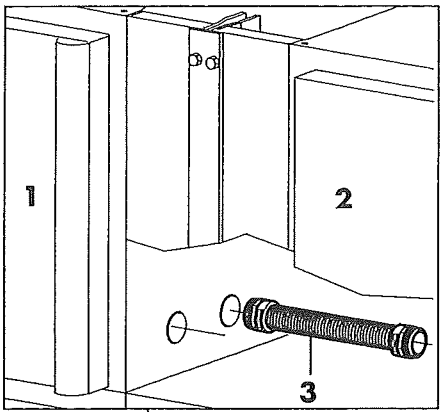
8
Assembling the venting tops
1 Venting top (top box)
2 Venting top
3 Cover plate

6.1 Assembling the venting top (venting top for busbar outlet)

- Place the venting top.
- Screw connections M8 (towards the operating side) with tightening torque $15\ ^{+7}/_{-2}$ Nm.
  Screw connections M6 on the sides and on the rear side with tightening torque $6\ ^{+3}/_{-2}$ Nm.

7 Inserting the protective hose (connection between two low voltage cabinets)

- Screw off both hexagon nuts from the protective hose.
- Insert the protective hose in the clearance between both low voltage cabinets.
- Make the screw connection to the protective hose in the right or left side wall of the low voltage cabinets.



9
Inserting the protective hose
1 Low voltage cabinet 1
2 Low voltage cabinet 2
3 Protective hose

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