Operating and installation manual

MV switchgear
PRO-AIR H

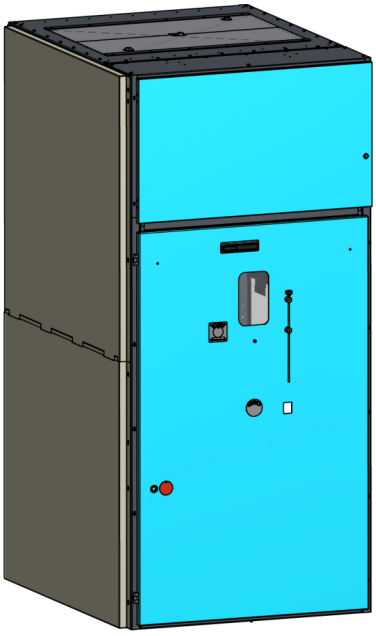

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Table of Contents

1 Introduction

Thank you for choosing one of our products. We hope it gives you many hours of successful and problem-free operation.

Do you have any questions you would like to ask us? We look forward to hearing from you.

1.1 Information on this manual

1.1.1 General information

This operating and maintenance manual contains all the information and descriptions required for installation and operation. This document was created with the utmost care. Any suggestions or comments would be gratefully received.
To make the instructions in this manual easier to follow, the descriptions are accompanied by figures and schematic diagrams of the products or their assemblies. The figures shown may deviate from those of your switching device.

1.1.2 Use of symbols / Key

The following symbols are used in these instructions:

WARNING: Warns of danger to people. Failure to comply with the warning indicated by this symbol could result in serious injuries and/or material damage.

CAUTION: Failure to comply with the warning indicated by this symbol could result in injuries and/or material damage.

WARNING: Risk of injury to hands (W024)

WARNING: Warning of electrical voltage (W012)

ATTENTION: Warns of possible material damage or malfunctions. Technical information requiring particular attention.

Fig. 1 Number of a figure

Fig. 1 (SD) Number of a schematic diagram

- Work step sequence
- Bullet point

1.1.3 Brand names and trademarks / Key

Product designations and/or company names mentioned in this documentation may be registered trademarks of the respective company. The same applies to (generally commercially standard or colloquial) acronyms and abbreviations concerning the product.

2 Safety

2.1 Intended use / Guarantee

Pro Air H switchgear systems are metal-enclosed AC switchgear for a rated voltage of 36 kV in line with IEC 62271-200. They are used for the distribution of electrical energy. The switchgear may only be operated up to the rated values stated (see Section Technical data on page 54). The switchgear systems are designed for use indoors under normal operating conditions in accordance with IEC 62271-1, Section 2.1.1.

If pressure relief ducts are connected to the switchgear, these must be manufactured by DRIESCHER or expressly certified by DRIESCHER in writing.

Any use other than what is outlined in this section is classed as an unintended use.
It is prohibited to use the product in explosion-proof environments.

Any of the following carried out without express written approval from the manufacturer could result in the guarantee becoming null and void:

- alterations or extensions
- using non-genuine spare parts
- repairs carried out by companies or persons not authorised by the manufacturer

2.2 Personnel selection and necessary qualifications

Persons working with these switchgear systems must

- be at least 18 years of age.
- be sufficiently qualified for the relevant tasks.
- be familiar and comply with the current valid rules and safety regulations.

The owner decides on the necessary qualifications for

- operators
- maintenance personnel
- repair personnel

The owner must ensure that only authorised personnel work on the switchgear.
Personnel learning to use or being introduced to the device, or operating the device as part of general training, may only work on the switchgear when constantly supervised by an experienced member of staff.
All work may only be carried out by trained specialist personnel (DIN VDE 0105-100) and in compliance with all valid regulations specified in the accident prevention regulations (UVVen).

2.3 Organisational safety

The owner must ensure that this operating and maintenance manual is always in the immediate vicinity of the persons responsible for assembling, operating and carrying out maintenance work.

2.4 Hazards posed by switchgear

Thorough introductory sessions and training for operators help minimise the danger to both people and equipment.
Carrying out regular checks on the knowledge levels and compliance with safety regulations contributes significantly to accident-free operation over the long term.

2.4.1 Danger due to moving parts

WARNING: Switchgear systems have moving parts which are capable of very fast and powerful motion. Touching these parts poses a risk of personal injury or material damage.
Before starting work, it is important to ensure that there is no danger from moving parts.

2.4.2 Danger due to parts controlled remotely

WARNING: Switchgear systems have parts which may move due to remote control. Touching these parts poses a risk of personal injury or material damage.
Before starting work, it must be ensured that there is no danger from such moving parts and that any remote control has been deactivated and secured against being unintentionally re-activated again.

2.4.3 Danger from electricity

WARNING: Switchgear systems contain components which carry hazardous electrical voltage. Even after switching off the power, there may still be high voltages present in the components. Protection devices, such as earthing switches or spatial isolating and disconnection devices intended to protect against these residual voltages, must be present and in functioning order.
Before starting work, it is important to ensure that the components are no longer live.

2.4.4 Danger due to spring force acting upon the hand crank

CAUTION: When operating switchgear with a hand crank, spring forces may have to be overcome (winding a spring accumulator). If the hand crank is suddenly released whilst the spring force is acting upon it, it may be thrown about and cause personal injury or material damage.
To avoid personal injury or material damage, the hand crank must only be removed from the hand crank connection when the switching operation has been completely executed.

2.4.5 Danger from falling hand crank

CAUTION: If a hand crank is not pressed against the spring pressure on the hand crank connection, it will fall down and could cause personal injury or material damage.
To prevent personal injury and material damage, the hand crank must be removed from the hand crank connection after every use.

2.4.6 Danger due to accidental arcing

WARNING: In the event of accidental arcing, hot gases arise in an explosive manner. These escape from the switch panel via the pressure relief openings, disperse in the area around the switchgear and/or are conducted away via an applicable duct. It must be ensured that the pressure relief panels can be opened unobstructed at all times. The pressure relief openings in the switchgear area must be designed and arranged such that, during operation, the endangerment of people is excluded and damage to material goods is avoided.

3 Product description

3.1 General

Switchgear systems consist of one or more switch panels joined to each other, which are intended for installation in electrical operating facilities which are only accessible to authorised personnel.

The switch panels are equipped with different switching devices. They comprise galvanised composite structures of different sizes which are provided with switch panel doors (solid sheet metal doors) of different designs and numbers.

The switching devices are either permanently installed in the composite structures, or designed to be pushed in and out.

The switch panel doors are provided with hinges on the left or right-hand side, as required, and equipped with an inspection window, central lock (e.g. double bit key) or other locking options (e.g. profile cylinder, padlock, interlocking mechanisms[1)]).

When the switch panel door is closed, the switching devices located in the switch panels (e.g. earthing switches or switch-disconnectors) can be operated either manually (e.g. detachable lever, hand crank) or by motor drives. Switching gates can prevent incorrect switching.

The operating elements for motor drives can be arranged both directly on the switch panel and externally (remote control). Auxiliary switches are used to feedback switching states.

Earthing switches or fixed ball points are used for earthing or short-circuiting.

Depending on requirements, pressure is relieved upwards, downwards or via pressure relief ducts.

The switch panels are set up screwed together. Mimic diagram boards are located on the fronts (doors or panels). The cables are fed into the switch panels from below and attached to beams that can be adjusted two-dimensionally.

If work is to be carried out in switch panels without the switchgear having to be de-energised completely, insulating protective barriers can be used. These prevent accidental proximity to and/or touching of live parts. They are inserted when the switch panel door is closed.

Short-circuit indicators, capacitive voltage detection systems and lighting for inside the switch panels are optionally available.

[1)] For example: a door can only be opened when the switch is in the OFF switch position

3.2 Versions

The switch panels from which the medium-voltage PRO-AIR H switchgear systems are comprised, are produced in three different types. The types are available in different versions.

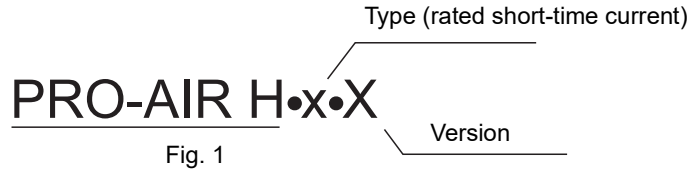


Fig. 1

Type	Rated short-time current (up to kA) [1]	Versions							Dimensions (WxDxH, mm)		
a	20	K	T	Ü	H		M		900	1200	2100
c	20	K	T	Ü	H	L	M		900	1200	2600
e	31.5	K	T	Ü	H	L	M	EL	1200	1500	2600

[1] I_k

Version		
Item	Abbreviation	Function
1	K	Cable panel
2	T	Transformer feeder panel
3	M	Measuring panel
4	L	Circuit breaker panel (semi-fixed panel)
5	EL	Circuit breaker panel in withdrawable unit design
6	H	Riser panel
7	Ü	Bus sectionalizer panel

The circuit diagrams of the different versions[1]:

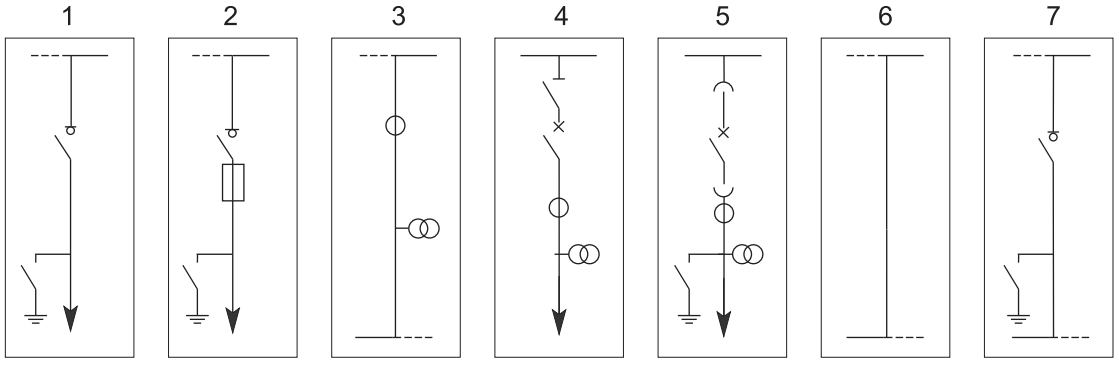


Fig. 2

[1] The circuit diagrams are placed on the switch panel doors

3.3 Identification plate

The information on the identification plate and its meaning

Type	Device designation
Serial No.	Serial number
Year of constr.	Year of construction
Manual	Operating and maintenance manual number
EN 62271-200	DIN/EN standard

	Rated
U_r	- voltage (kV)
U_p	- short-time power-frequency withstand voltage (kV)
U_d	- lightning impulse withstand voltage (kV)
I_r	- current (A)
I_k	- short-time current (kA)
t_k	- short-circuit duration (s)
f_r	- frequency (Hz)
IAC A	Internal arc classification

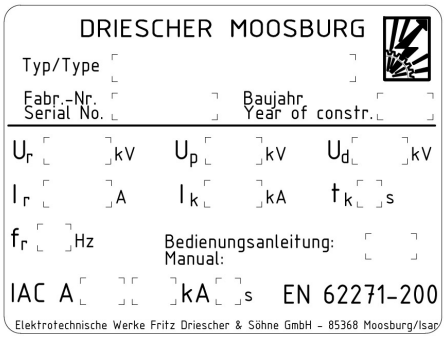


Fig. 3

3.4 Scope of delivery

- One or more switch panels
- Operating elements
- Operating and maintenance manual
- Circuit diagram according to customer specifications
- Installation materials
- Insulating protective barrier

Optional

- Operating elements
- Service trolley (to insert and remove the circuit breaker for maintenance purposes, for the type PRO-AIR H•eL and L)
- Pressure relief duct

4 Transport

Depending on the version and weight, one or more switch panels are delivered as a transport unit.
Transport can be carried out as shown.

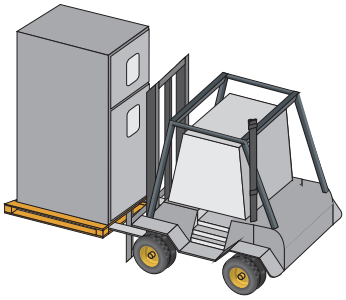


Fig. 4

WARNING Danger of personal injury and material damage due to falling switchgear. Angle (B) of the load handling equipment must not be smaller than 90°degrees; dimension (L) must not be less than 1 m (see detailed image A). Only attach the load handling equipment at the designated transport rails/points, and always use 4 attachment points.

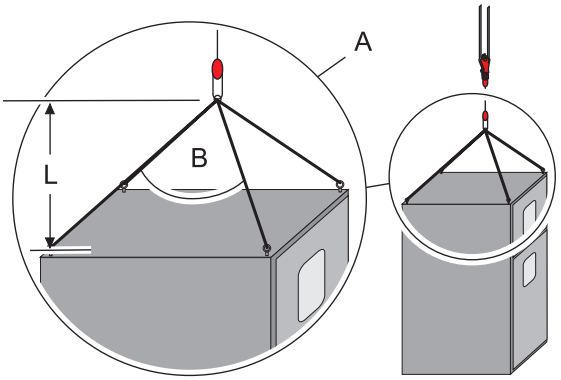


Fig. 5

Type PRO-AIR H•e•EL

If there are no load handling lugs on the top of the switch panels, transport rails are mounted there. These are for the attachment of lifting gear. They must be disassembled following transport.

Switch panels that are delivered horizontally, can be placed upright as shown.

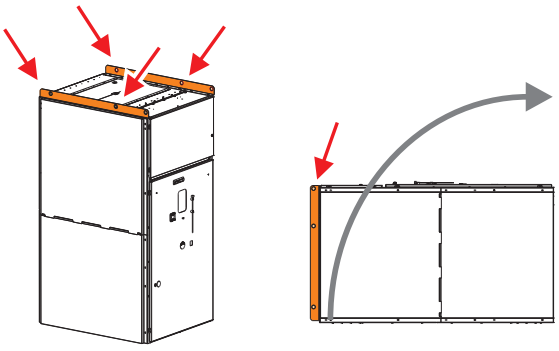


Fig. 6

All other types

If the panels must be lowered down or brought upright, the two crane lugs (1) must be replaced by VLBG M12 (2) attachment points for load handling.

The crane lugs (1 and 3) attached in the factory can be used for vertical crane transport.

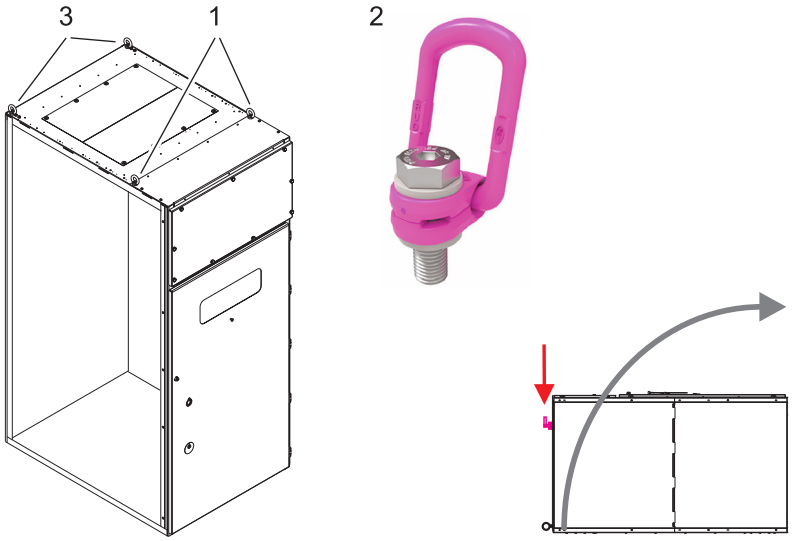


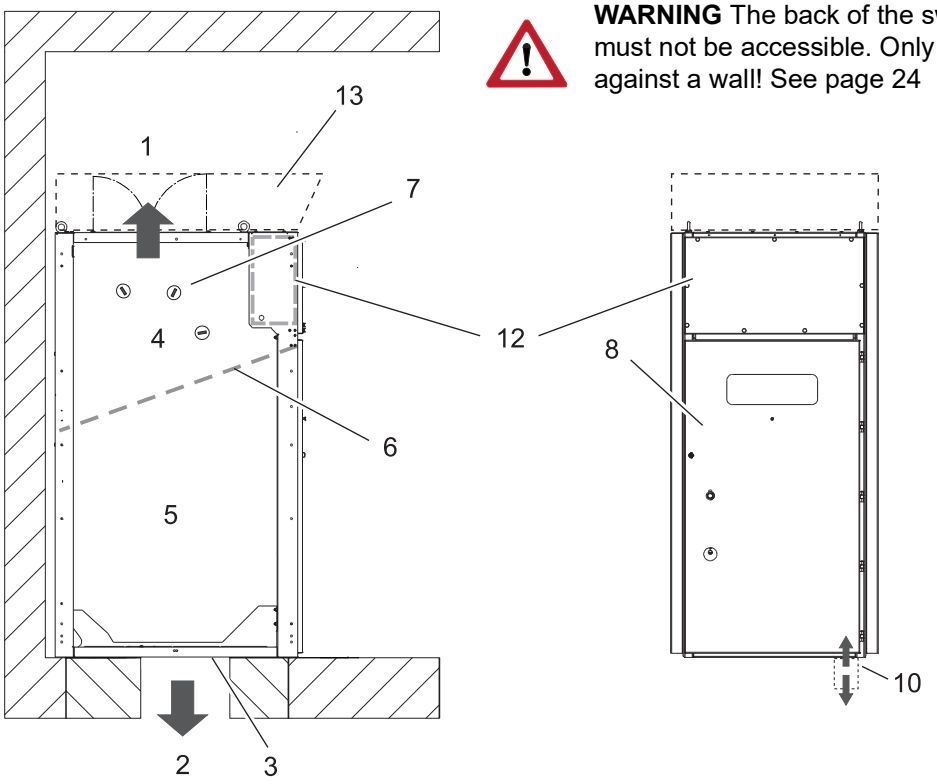
Fig. 7

5 Assembly overview, functional characteristics

5.1 Assemblies

5.1.1 Type PRO-AIR H•a

(Deviations and different arrangements possible)



WARNING The back of the switch panel must not be accessible. Only position it against a wall! See page 24

Fig. 8

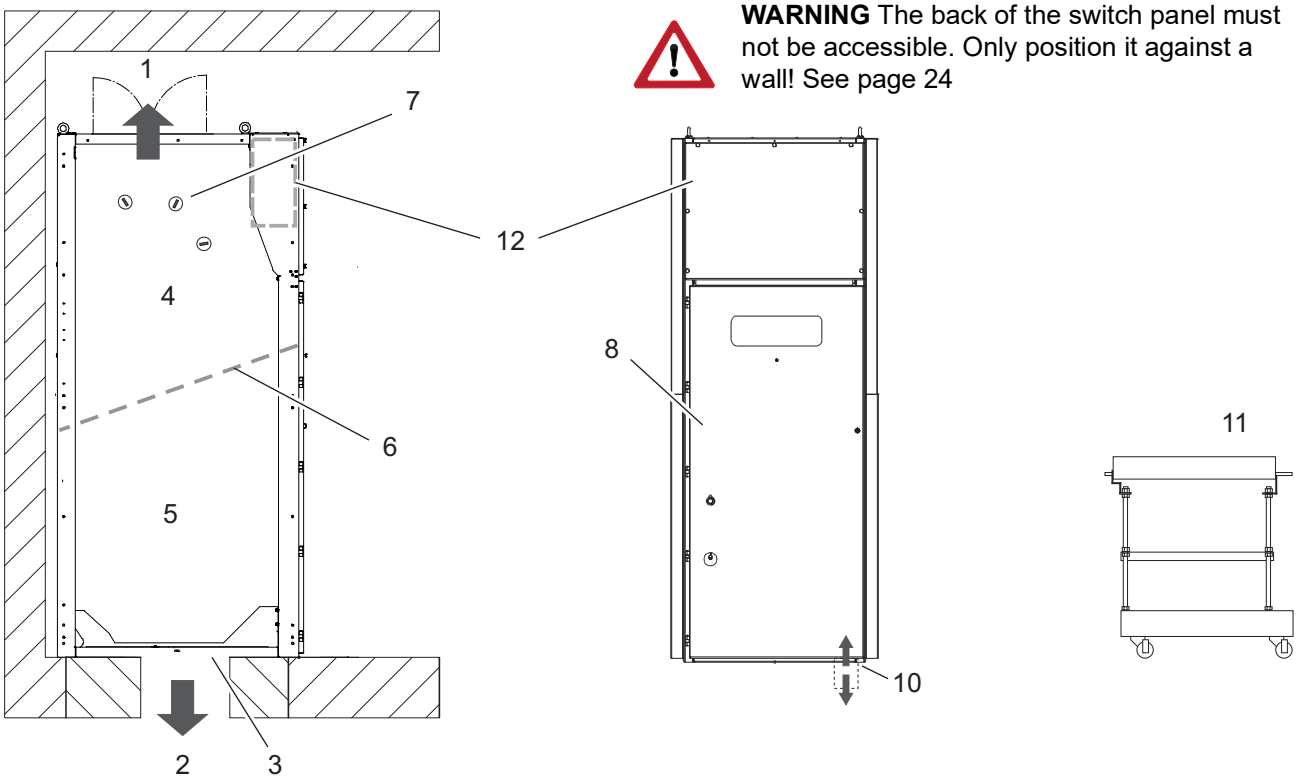
1	Pressure relief upwards. (pressure relief flaps/duct)
2	Pressure relief downwards into the cable duct
3	Opening in the ground for feeding in cables from below, provided with cover if necessary
4	Busbar area
5	Switch panel area, switching element and cable connection
6	Insulating protective barrier
7	Busbar
8	Switch panel door with indicator/operating elements
10	Cable duct opening for customer’s control lines

Optional

12	“Low-voltage compartment” measurement and protection devices, operating elements
13	Arc-deflecting shield for pressure relief upwards

5.1.2 Type PRO-AIR H•c

(Deviations and different arrangements possible)



WARNING The back of the switch panel must not be accessible. Only position it against a wall! See page 24

Fig. 9

1	Pressure relief upwards. (pressure relief flaps/duct)
2	Pressure relief downwards into the cable duct
3	Opening in the ground for feeding in cables from below, provided with cover if necessary
4	Busbar area
5	Switch panel area, switching elements and cable connection
6	Insulating protective barrier
7	Busbar
8	Switch panel door with indicator/operating elements
10	Cable duct opening for customer’s control lines

Optional

11	Service trolley
12	“Low-voltage compartment” measurement and protection devices, operating elements

5.1.3 Type PRO-AIR H•e

(Deviations and different arrangements possible)

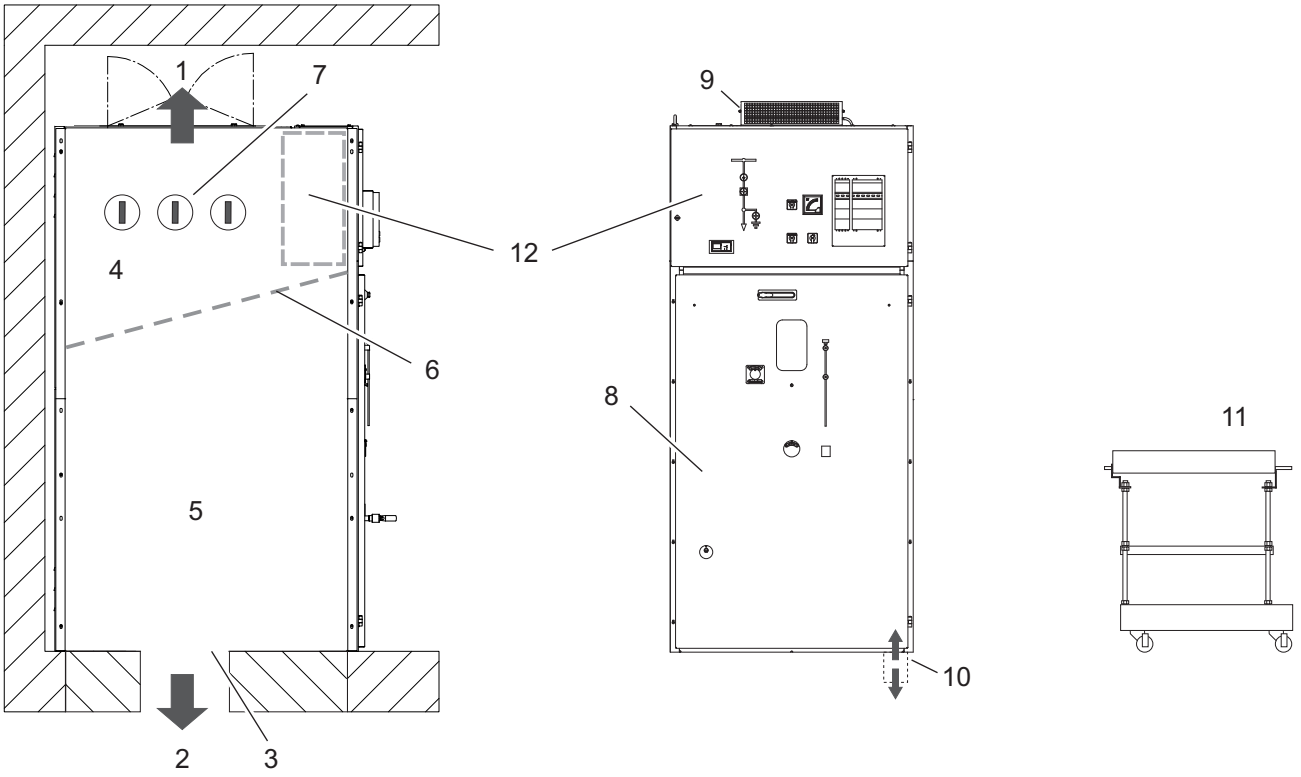


Fig. 10

1	Pressure relief upwards. (pressure relief flaps/duct)
2	Pressure relief downwards into the cable duct
3	Opening in the ground for feeding in cables from below, provided with cover if necessary
4	Busbar area
5	Switch panel area, switching element, mount for withdrawable unit and cable connection
6	Insulating protective barrier
7	Busbar
8	Switch panel door with indicator/operating elements
10	Cable duct opening for customer’s control lines

Optional

9	Damping resistor
11	Service trolley
12	“Low-voltage compartment” measurement and protection devices, operating elements

5.2 Operating elements and indicators

5.2.1 Type PRO-AIR H•a

The operating elements and indicators described in the following are used in the switch panels in different arrangements and functions.

		Version			
1	Manual operation and indicator for earthing switch switching state, operated with 1.2	K	T		
1.2	Detachable lever	K	T		
2	Operation and indicator for switching element switching state, operated with 1.2	K	T		
8*	Voltage detection systems*, short-circuit indicators* etc.				
14	Mimic diagram board	K	T	M	Ü
16	Inspection window for indicator of switching element switching state	K	T	M	Ü
18	Opening for insulating protective barrier (self-closing)	K	T		

* Optional

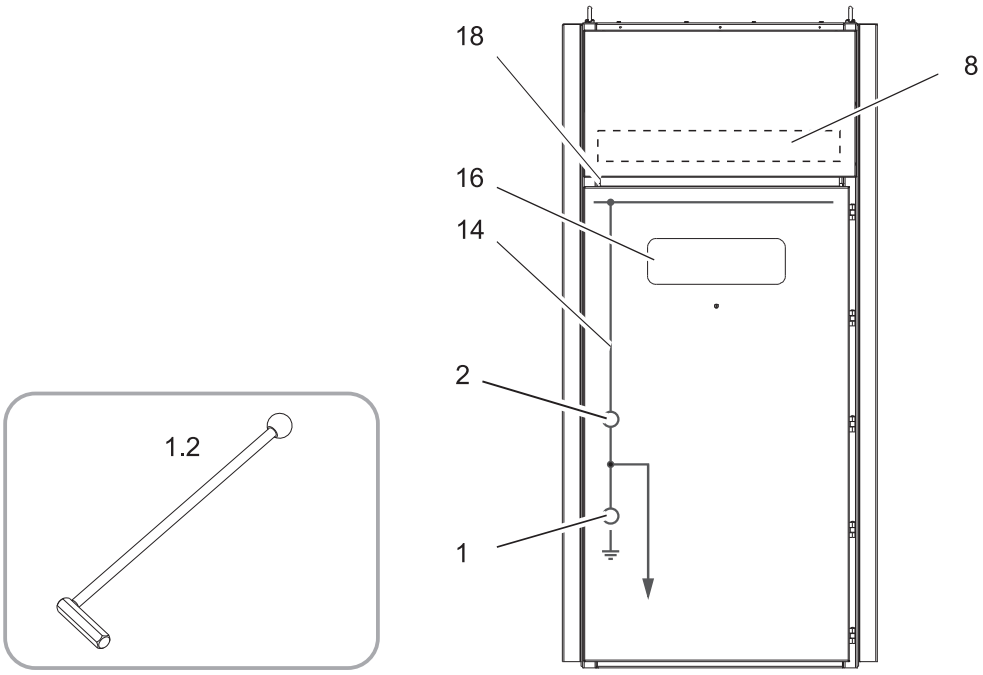


Fig. 11

5.2.2 Type PRO-AIR H•c

The operating elements and indicators described in the following are used in the switch panels in different
arrangements and functions.

		Version					
1	Manual operation and indicator for earthing switch switching state, operated with 1.2	K	T	Ü		L	
1.2	Detachable lever*	K	T	Ü		L	
1.5	Operating crank*					L	
2	Switching element operation, operated with 1.2	K	T	U			
5	Manual operation of CB, OFF switch position					L	
6	Manual operation of CB, ON switch position					L	
8*	Operating device, test plug, protective relay, voltage detection systems, short-circuit indicators etc.						
14	Mimic diagram board	K	T	Ü	H	L	M
16	Inspection window for indicator	K	T	Ü	H	L	M
16.6	Inspection window for indicator of circuit breaker switching state - 16.2 CB switch position** - Energy accumulator state - 16.4 not tensioned - 16.5 tensioned - 16.1 Counter for CB switching cycles** - 16.3 CB identification plate**					L	
17	Hand-wound mechanism for CB, operated with 1.5					L	
18	Opening for insulating protective barrier (self-closing)	K	T	Ü		L	
19	Operation/indicator of disconnector switching state, operated with 1.2					L	

* Optional
** CB circuit breaker

Type PRO-AIR H•c

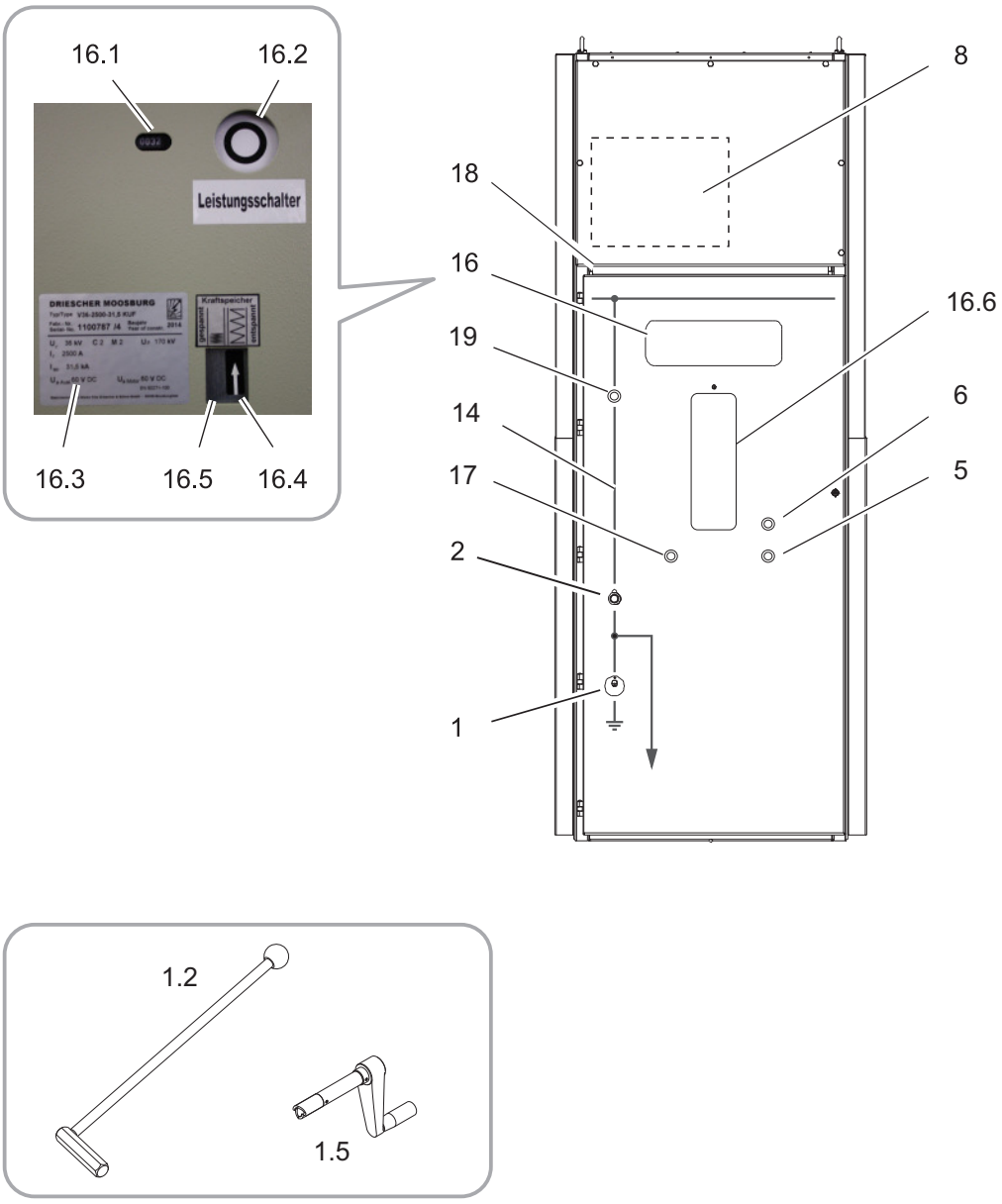


Fig. 12

5.2.3 Type PRO-AIR H•e

The operating elements and indicators described in the following are used in the switch panels in different arrangements and functions.

		Version					
1	Manual operation and indicator for earthing switch switching state operated with 1.1 or 1.2	K	T		L		EL
1.1	Operating crank*						EL
1.2	Detachable lever*	K	T		L		EL
1.3	Operating crank*						EL
1.4	Operating crank*						EL
1.5	Operating crank*				L		
2	Operation of CB withdrawable cassette, operated with 1.4						EL
3	Indicator of position of CB withdrawable cassette						EL
4	Operating rod for manual operation of CB						EL
5	Manual operation of CB, OFF switch position				L		EL
6	Manual operation of CB, ON switch position				L		EL
7	Central lock						
8*	Operating device, test plug, protective relay, voltage detection systems, short-circuit indicators etc.						
10	Voltmeter*						
11	Voltage selector switch*						
14	Mimic diagram board with visual display* and (optional) switching function for CB** and earthing switch						
14.1	Mimic diagram board						
15	Voltage indicator, capacitive*						
16	Inspection window for indicator - 16.2 CB switch position** - Energy accumulator state - 16.4 not tensioned - 16.5 tensioned - 16.1 Counter for CB switching cycles** - 16.3 CB identification plate**	K	T	H	L	M	EL
17	Hand-wound mechanism for CB, operated with 1.3/1.5				L		EL
18	Opening for insulating protective barrier (self-closing)	K	T		L		EL
19	Operation/indicator of disconnector switching state, operated with 1.2				L		
20	Operation and indicator for switching element switching state, operated with 1.2	K	T				

* Optional
** CB = circuit breaker

Type PRO-AIR H•e

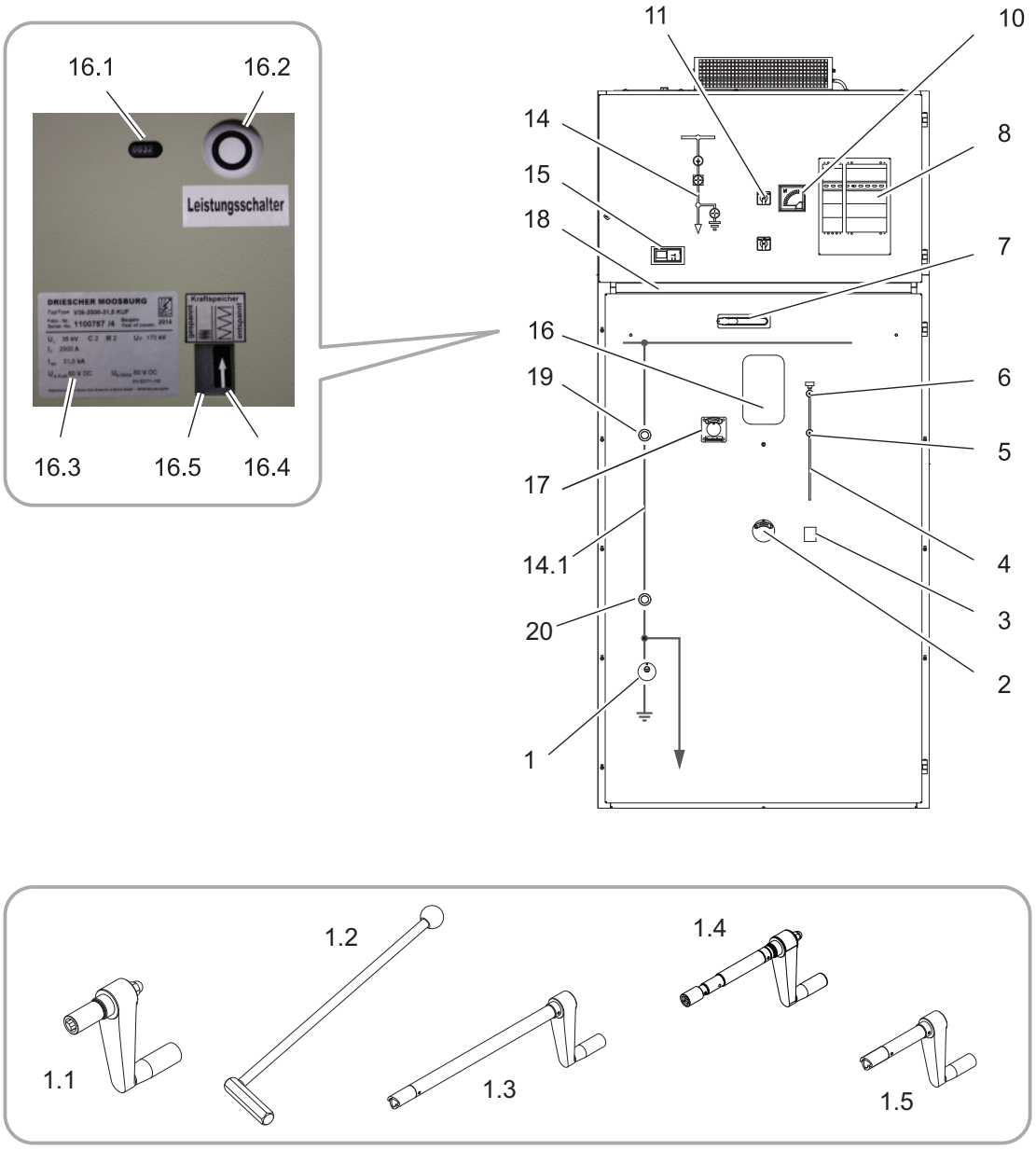


Fig. 13

6 Safety installations

For the protection of both personnel and the product, the safety installations available help prevent accidents or material damage caused by moving parts and assemblies, or by live parts.

The operator must ensure that trained personnel
- check all safety installations regularly.
- remove any problems on the safety installations immediately.
- secure the switchgear against being switched on if not all safety installations are present and working.

(Figure shows type PRO-AIR H•e and also applies for the types PRO-AIR H•a and PRO-AIR H•e)

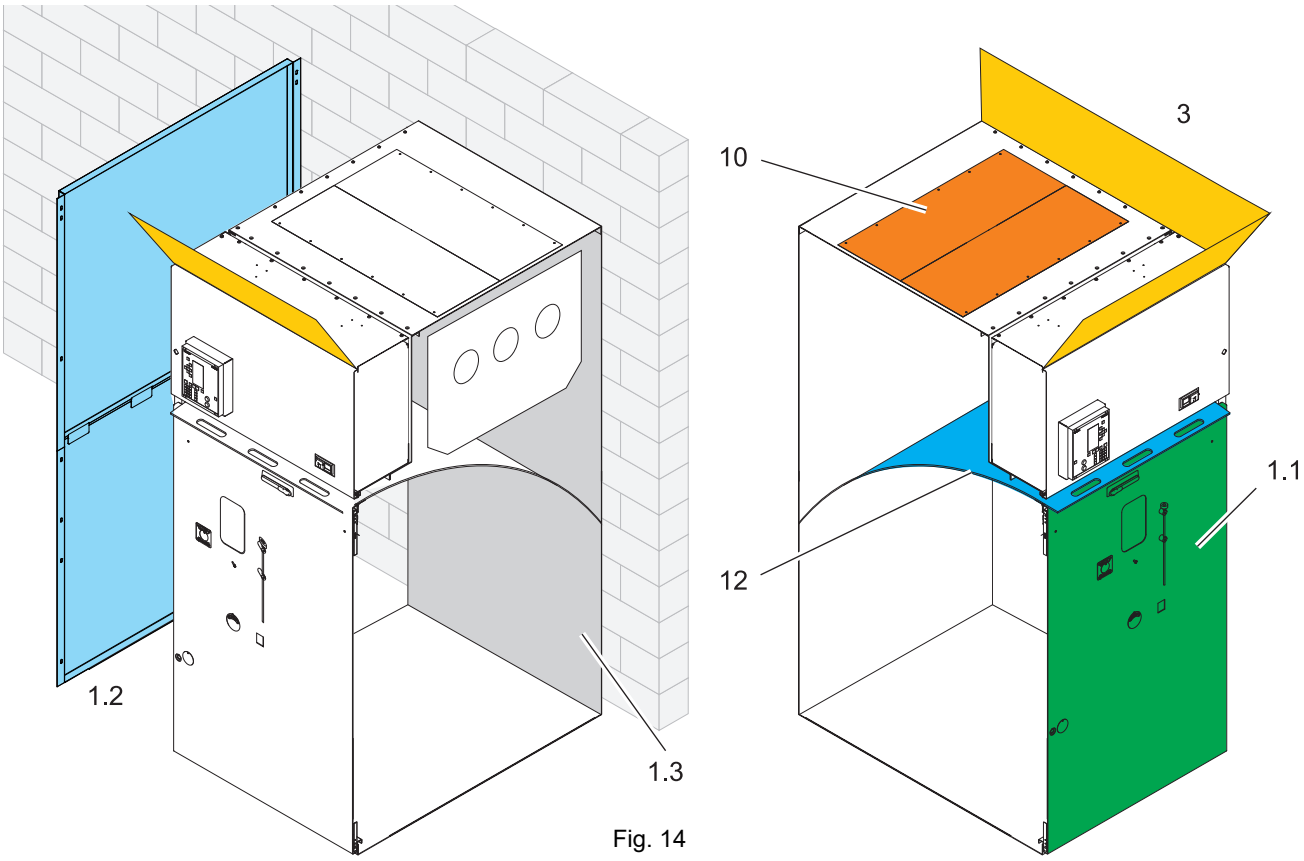


Fig. 14

	Safety installation	Description
1 enclosure, consisting of:		
	1.1 Switch panel door*	Lockable, prevents accidental contact with live components and protects against any accidental arcing.
	1.2 Partition wall	Prevents accidental contact with live components and protects against any accidental arcing. With the PRO-AIR H•a and PRO-AIR H•c the back of the switch panel must not be accessible!
	1.3 Rear wall	
	1.4 Side panelling (no image)	
3	Arc-deflecting shield	(Only with PRO-AIR H•a, panels arranged all around the top of the switch panel to provide protection against any escaping hot gases in the event of accidental arcing. In the event of pressure relief downwards, this is not provided.)
10	Pressure relief flaps	Predetermined breaking point, opening in the event of accidental arcing
12	Insulating protective barrier*	“Insulating protective barriers” are suitable for short-term use in indoor electrical switchgear [1)] with alternating voltages above 1 kV up to 36 kV with rated frequencies below 100 Hz for partial protection against direct contact [2)] when working in the vicinity of live parts.
35	Interlocking (no image)*	Mechanism that only allows operation (e.g. switching the switching device or opening the switch panel door) when one or more requirements are met.
36	Locking options (no image)	Locking options provided through padlocks, profile cylinders, for example.
37	Connection to a pressure relief duct (no image)	In the event of accidental arcing, dissipation of the hot gases via a duct into another room/out of the building

[1)] In accordance with DIN VDE 0101 and DIN VDE 0671-200

[2)] In accordance with DIN VDE 0105

* For a description of the functional check of the safety installation, please see 6.1

6.1 Checking safety installations

Description of the safety installations identified with * in the previous table.

1 Enclosure

- Ensure that all the enclosure elements are present and in working condition. The interlocking of the switch panel doors must be working. Check the correct connection with the earthing system, see 7.2.6 Earth connection

3) Arc-deflecting shield (for pressure relief upwards)

- Check for completeness and that it is firmly in place

10) Pressure relief flaps

- Check for completeness and that they are firmly in place
- Visually check that nothing prevents the flaps from opening

13 Insulating protective barrier

➡ Please observe the operating instructions for insulating protective barriers*. Note re-inspection. Only use insulating protective barriers for the right type.

* Operating instructions for insulating protective barriers, part no. 3-81201090

- Ensure that all insulating protective barriers are damage free and can be inserted and removed without problems

35 Interlocking

- Check all customer-specific interlocks for functional capability

7 Installation

7.1 Requirements for installation

Installation configuration: Wall installation

- Type PRO-AIR H•a => Page 28
- Type PRO-AIR H•c => Page 29
- Type PRO-AIR H•e => Page 30

7.1.1 Type PRO-AIR H•a

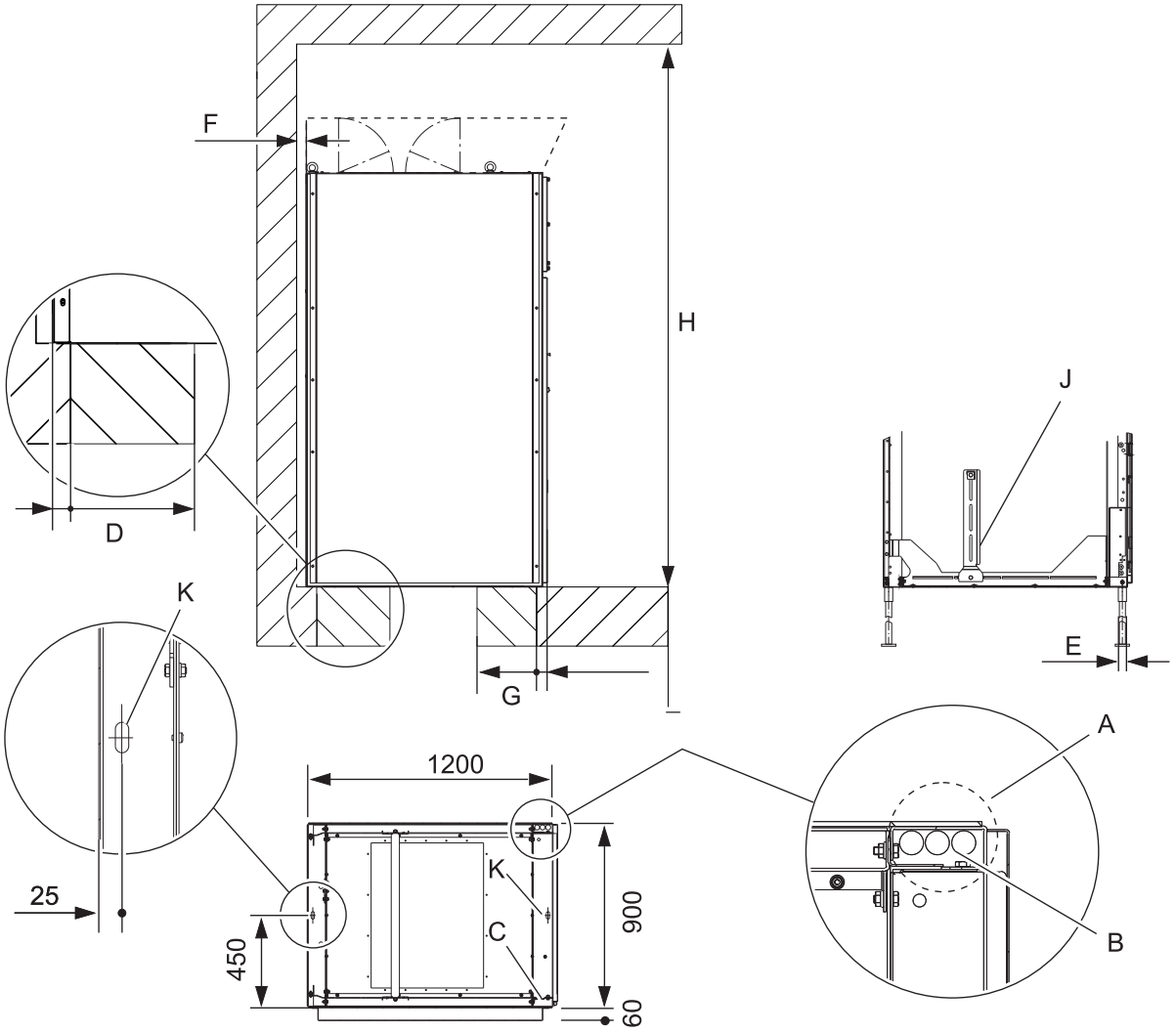


Fig. 15

A	Core drill hole/recess for control lines (see (B))	F	Rear wall of switchgear must not be accessible
B	Duct for customer's cabling (e.g. control lines)	G	Min. 40 mm, max. 340 mm (please also see D)
C	Duct for internal cabling	H	Min. 2,400 mm, with arc-deflecting shield, with pressure relief duct 2,450 mm
D	With concrete floor: min. 40 mm, max. 310 mm	J	Cable attachment beams
E	With raised floor: max. 40 mm, in order not to impair (A)	K	Attachment points, 2 slots 16x36 mm

7.1.2 Type PRO-AIR H•c

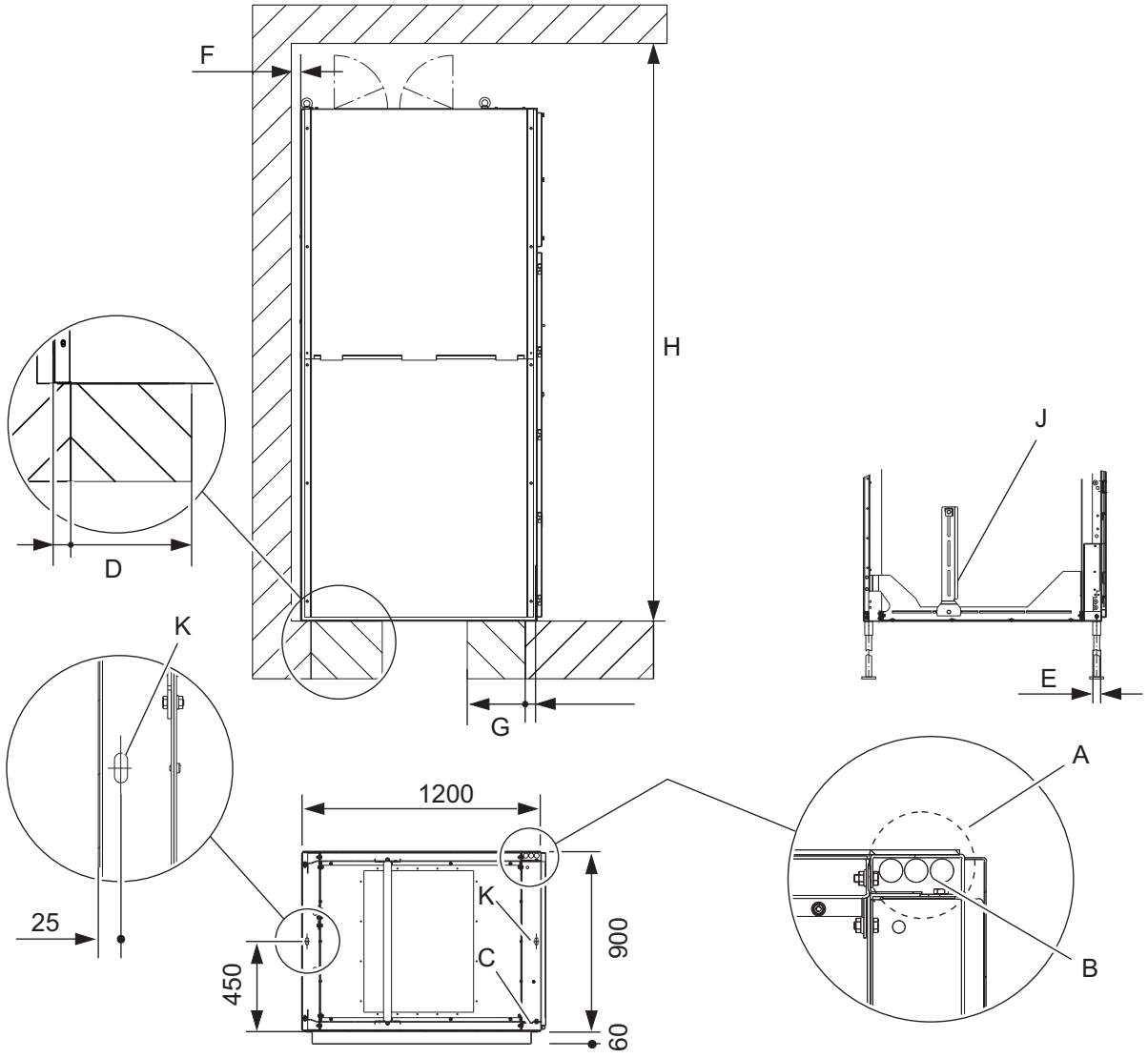


Fig. 16

A	Core drill hole/recess for control lines (see (B))
B	Duct for customer's cabling (e.g. control lines)
C	Duct for internal cabling
D	With concrete floor: min. 40 mm, max. 310 mm
E	With raised floor: max. 40 mm, in order not to impair (A)
F	Rear wall of switchgear must not be accessible
G	Min. 40 mm, max. 340 mm (please also see D)
H	Min. 3,000 mm
J	Cable attachment beams
K	Attachment points, 2 slots 16x36 mm

7.1.3 Type PRO-AIR H•e

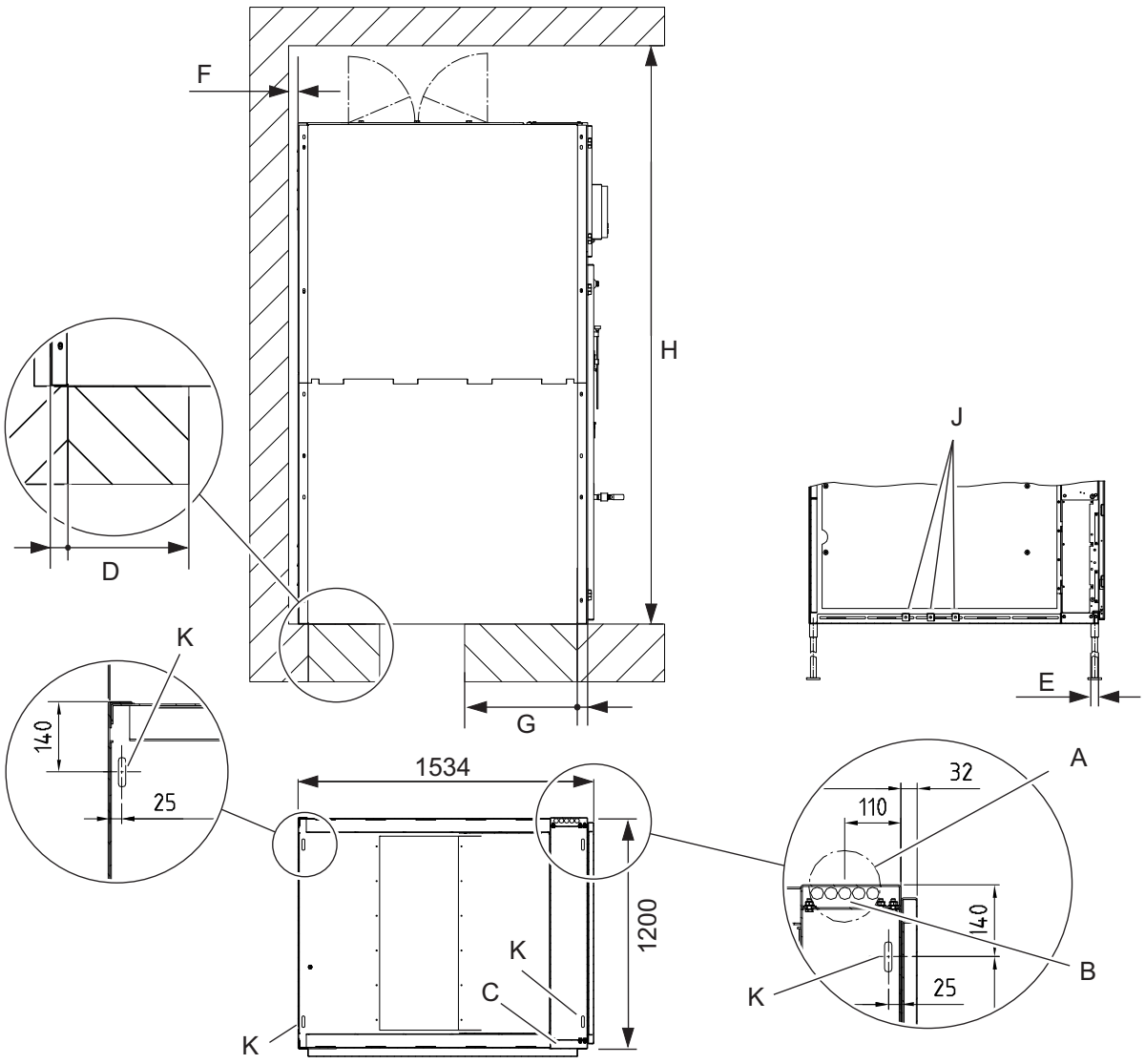


Fig. 17

A	Core drill hole/recess for control lines (see (B))	F	Min. distance to wall: rear 20 mm, side 100 mm (without side panelling)
B	Duct for customer's cabling (e.g. control lines)	G	Min. 40 mm, max. 420 mm (please also see D)
C	Duct for internal cabling	H	Min. 3,150 mm, (with pressure relief duct 3,000 mm)
D	With concrete floor: min. 40 mm, max. 420 mm	J	Cable attachment beams
E	With raised floor: max. 40 mm, in order not to impair (A)	K	Attachment points, 4 slots 14x60 mm

7.2 Setting up switchgear

The scope of delivery and the pre-assembly of the switchgear (one or more switch panels) are adapted to your operating conditions. Before starting work, please ensure that the intended set-up sequence can be complied with.

If the switchgear is to be set up flush right, for example, against a wall, installation is started with the element (1) which is to be directly placed next to the wall. Elements 1 and 4 of the switchgear are then each delivered with a partition wall (A) pre-installed by the factory.

WARNING The back of the switch panel types PRO-AIR H•a and PRO-AIR H•c must not be accessible. These must be set up directly against a wall.

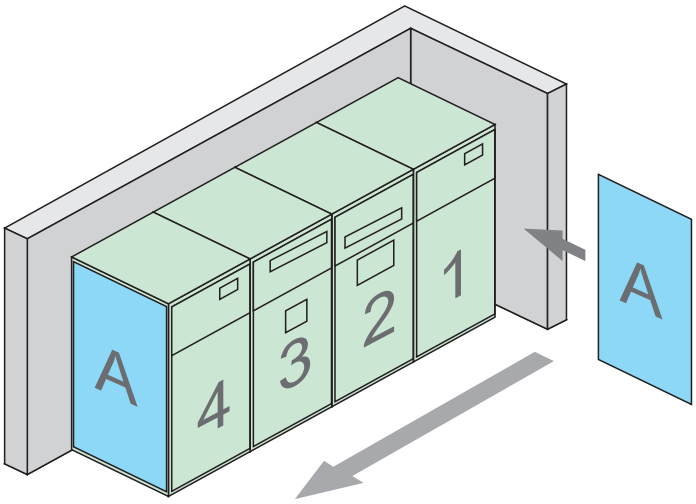


Fig. 18

7.2.1 Setting up and aligning

- Ensure that the requirements for setting up in accordance with 7.1 are complied with. This applies in particular for the bearing loads of the floor/set-up surface.
  Recommendation: Foundation: raised floors, floors on supports or reinforced concrete floors. A reinforced concrete floor must be equipped with foundation rails on which the switch panels stand (planning and execution in accordance with DIN 43661 and DIN 18202).
  Evenness tolerance: 1 mm/4 m length

7.2.1.1 Set-up on concrete floor

- Ensure that the bearing surfaces (D and G) at least correspond to the dimensions shown*
- Place the switch panel completely on the floor (free of tension)
- Align the switch panels evenly

7.2.1.2 Set-up on raised floor

- Ensure that the requirements for a raised floor in accordance with Chapter 10 (page 54) are met
- Place the switch panel (free of tension) on the metal frame:
  - In the process, ensure that the switch panel stands flush with the metal frame across the entire bearing surface
  - Align the switch panels evenly at right angles!

7.2.2 Fastening switch panels

Screwing switch panels together

- Screw all switch panels together (perfectly vertically). For screw connections, please see the following description

Type PRO-AIR H•a

- Screw switch panels together. 8 screw connections, each with 1x hexagon screw (M8 x 25 mm) and 1x flange nut (M8).
  Torque, 28 Nm

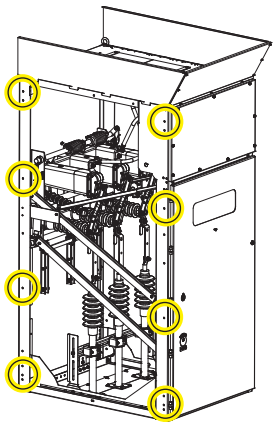


Fig. 19

Type PRO-AIR H•c

- Screw switch panels together. 10 screw connections, each with 1x hexagon screw (M8 x 25 mm) and 1x flange nut (M8).
  Torque, 28 Nm

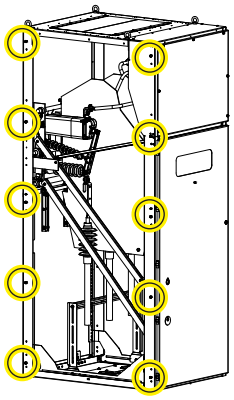


Fig. 20

Type PRO-AIR H•e

- Screw switch panels together. 9 screw connections, each with 1x hexagon screw (M8 x 25 mm) and 1x flange nut (M8).
  Torque, 28 Nm

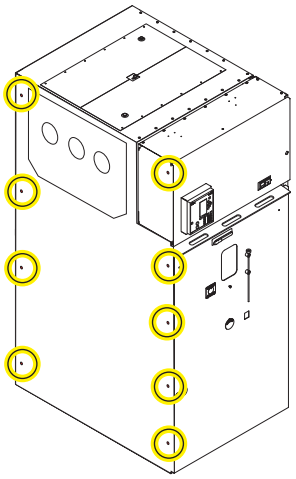


Fig. 21

- Fasten switch panels to the ground; here screw each switch panel to the ground at all attachment points (see attachment points (K), Fig. 15, 16 or 17, depending on type*)*

  * In accordance with images in Chapter 7.1

7.2.3 Disassemble transport rails if present

(only for PRO-AIR H-e-EL)

- If there are transport rails on the top (see Chapter 6 Safety installations), disassemble them

7.2.4 Installing arc-deflecting shields

(Option for type PRO-AIR H•a)

- If provided: install arc-deflecting shields at all attachment points provided

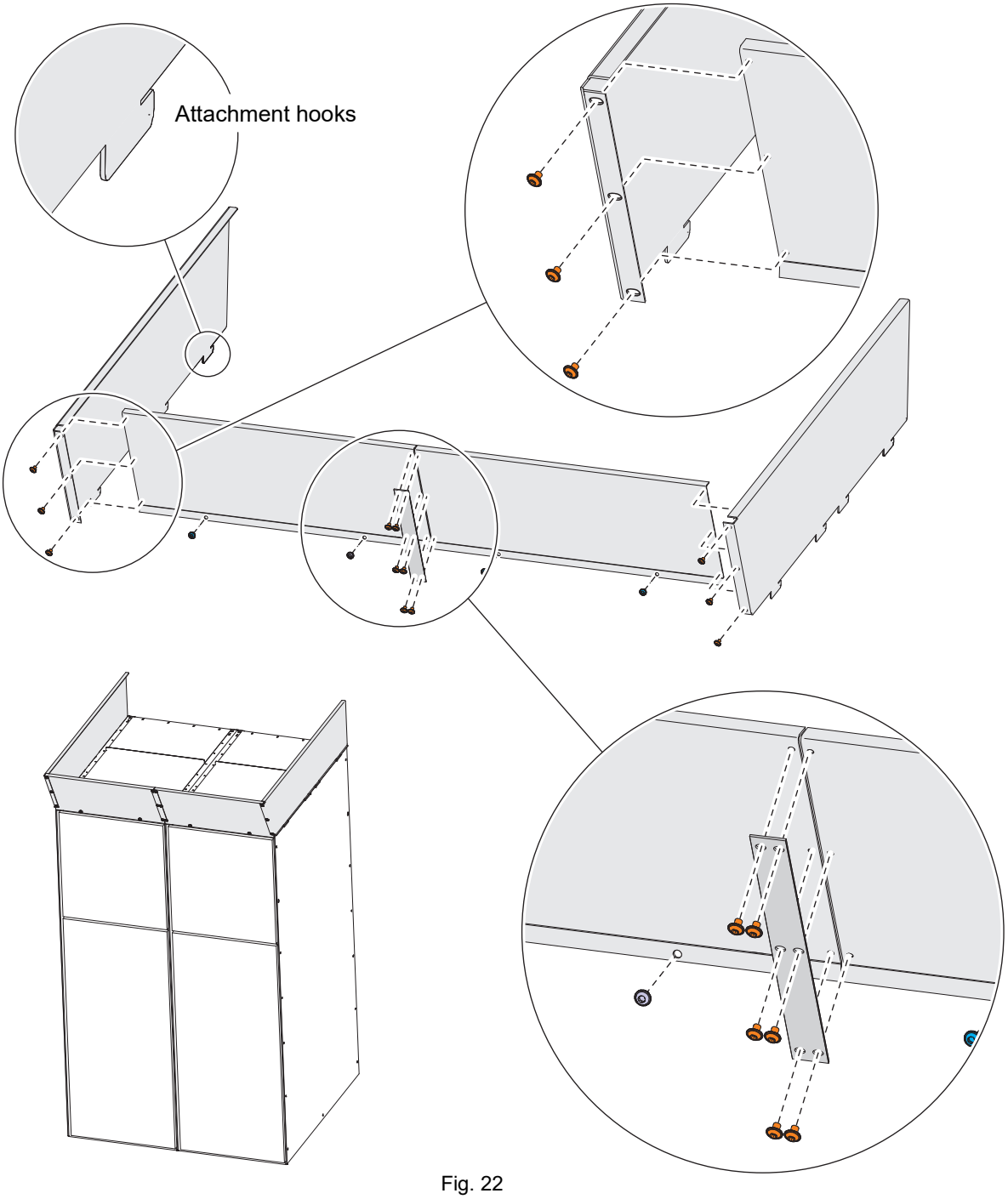


Fig. 22

7.2.5 Installing pressure relief duct *

- If provided: install pressure relief duct at all attachment points provided (in accordance with DRIESCHER planning documents)

* Optional

7.2.6 Establishing the earth connection

- Establish earth connection (1) (station earth) in each switch panel (M12, torque 75 Nm)

  For the design of the earth connections in alternating current systems for rated voltages over 1 kV, minimum cross sections and current load capacity of earthing conductors, please see VDE 0101

Type PRO-AIR H•a and PRO-AIR H**•c**

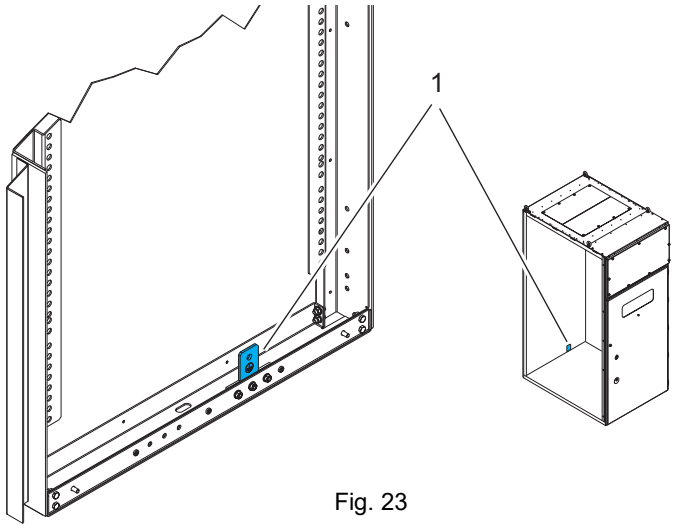


Fig. 23

Type PRO-AIR H•e

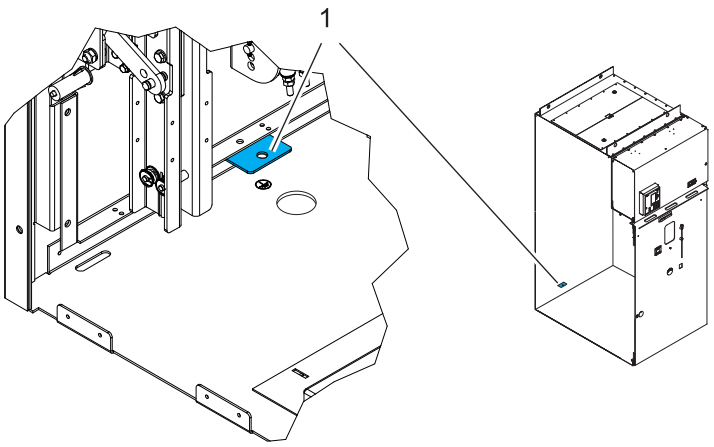


Fig. 24

7.2.7 Inserting busbars

Type PRO-AIR H•a and PRO-AIR H**•c**

- Install busbars as shown
  Torque 75 Nm

WARNING Danger of arcing. If longer screws are used or if the screws are not positioned as described, there is the danger of arcing due to insufficient distance between live parts.

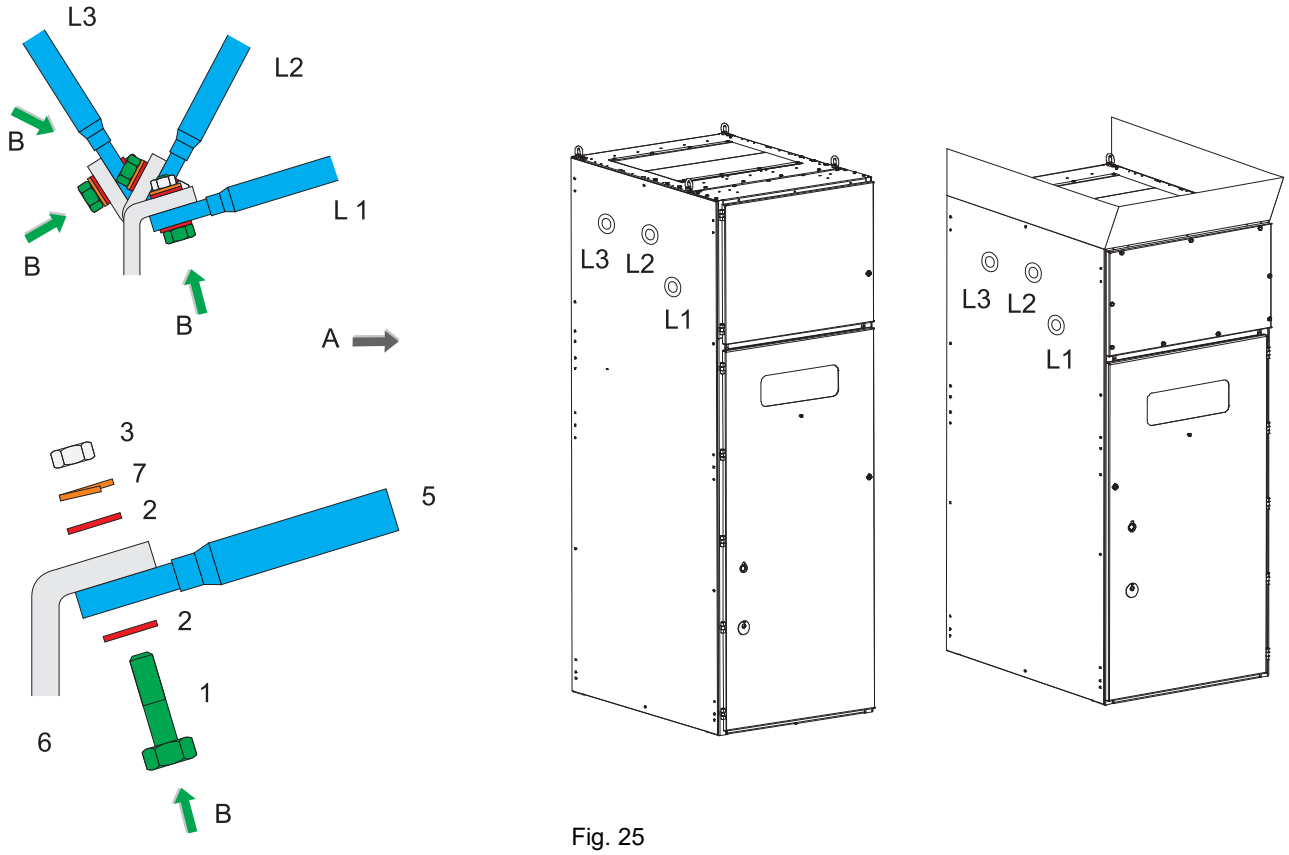
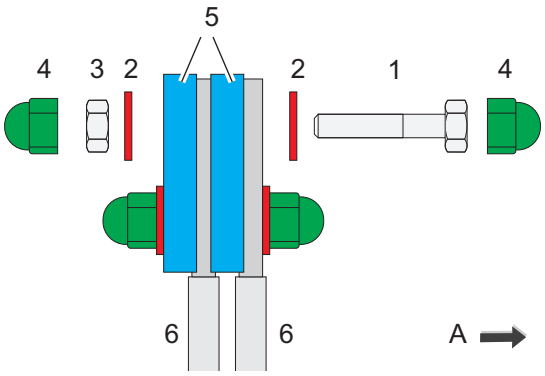


Fig. 25

A	Front side of switch panel	3	M12 hex nut
B	Installation direction of screw	5	Busbar
1	M12x40 hexagon screw	6	Discharge rail
2	M12 washer	7	M12 spring washer

Type PRO-AIR H•e

- Install busbars as shown
  Torque 75 Nm



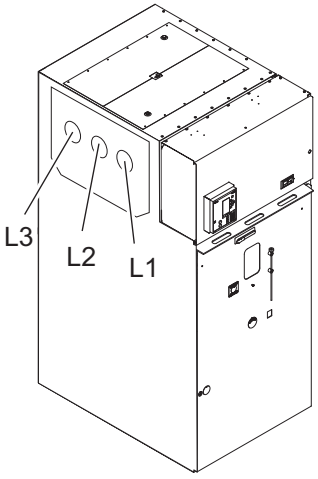


Fig. 26

A	Front side of switch panel	4	Hex protective cap
1	M12 hexagon screw	5	Busbars
2	M12 safety washer	6	Discharge rail
3	M12 hex nut		

7.2.8 Cable connection

Note: Cable attachment beams are available for cable retention purposes (e.g. “J”, Fig. 17). Please observe the safety and installation instructions of the cable and cable terminal manufacturer.

- Fasten all cables at the terminal contacts without any mechanical stress. When tightening, use a second spanner to hold in place. Torque 75 Nm, for M12.
  (For details, please see installation drawing/switch panel drawing)

Connection example

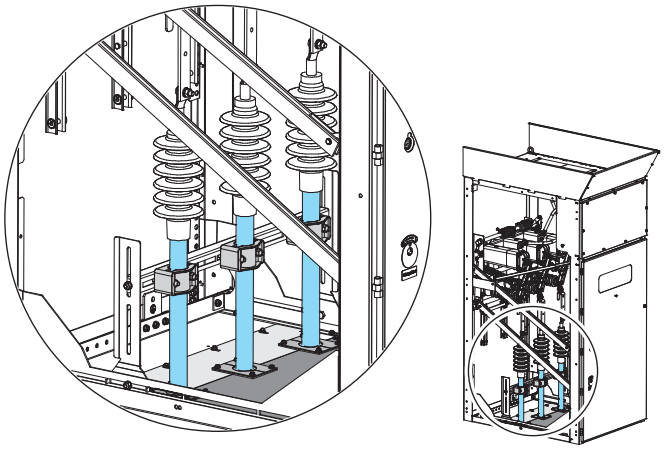


Fig. 27

7.2.9 Installing floor covers *

- If provided: install floor covers at all attachment points provided.

* Optional

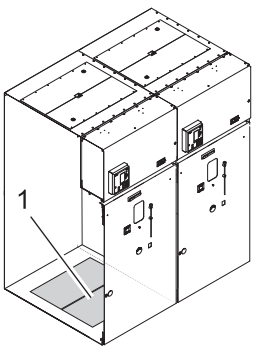


Fig. 28

➡ Warning: the panels of the floor cover (1) must not directly touch any cables!

7.3 Creating secondary wiring

- Connect secondary wiring, auxiliary and control voltage according to circuit diagram. Here, please also see duct for customer’s cabling, e.g. item B in Fig. 17.

7.4 Inserting circuit breaker

Only Type PRO-AIR H•e•EL - 31.5 kA

If necessary, lift circuit breaker on service trolley

- A) Attach transport panel (38) to circuit breaker (39). Here, hook in using the brackets (3) and secure using two M12 x 20 screws and two nuts (2)
- B) Suspend the circuit breaker on both crane lugs
- C) Lift circuit breaker onto the service trolley (1). In the process, ensure that the service trolley is aligned as shown. The two locks (8) must be located on the same side as the moving contacts (40) of the circuit breaker
- D) Disassemble transport panel

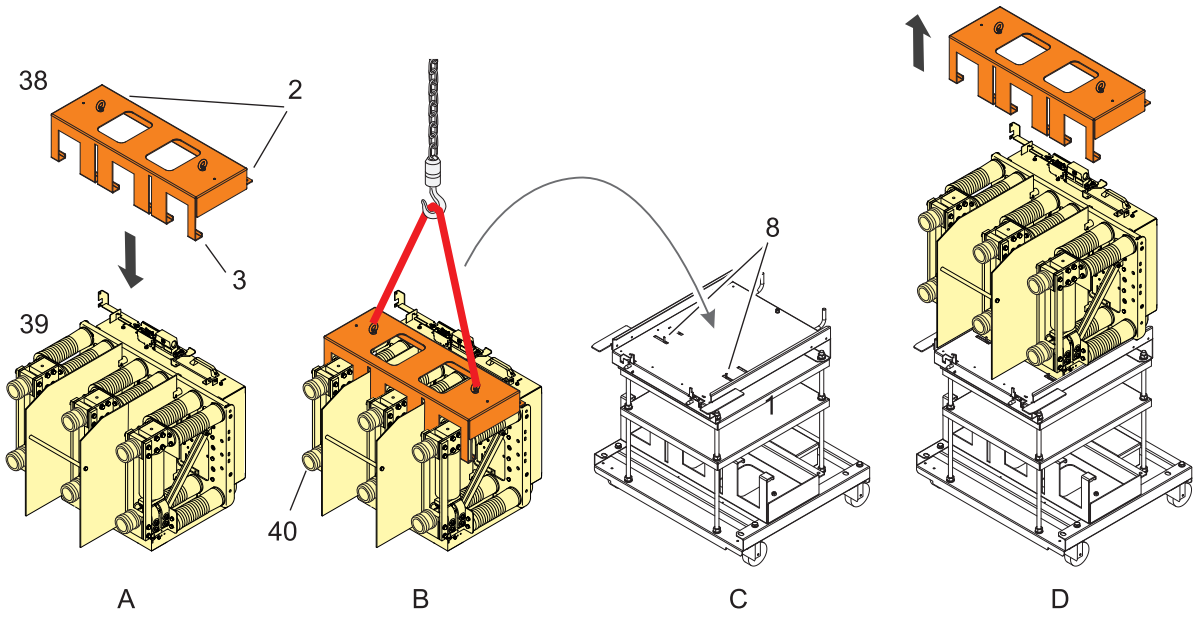


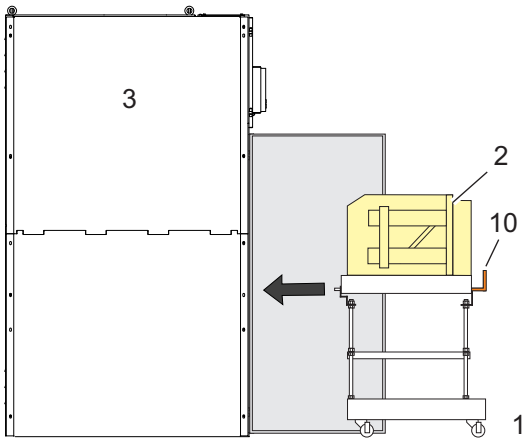
Fig. 29

Inserting circuit breaker

- Open switch panel door

WARNING The service trolley (1) has a very high centre of gravity and there is a risk of it tipping over. Always push it slowly and carefully.

- Push the service trolley (1) with the circuit breaker (2) towards the switch panel until both centring pins (6) are located completely in the openings (9)
- Turn both levers (10) as shown (A) outwards; the locks (7 and 8) are unlocked
- Push the circuit breaker (2) completely into the switch panel (3).
- Move both levers (10) so they are pointing upwards again; the locks (7 and 8) are swivelled upwards
- Ensure that the circuit breaker is mechanically locked. Both bolts (11) must protrude upwards into the recesses of the withdrawable cassette. If necessary, move the circuit breaker back and forth a little.
- Push the service trolley away



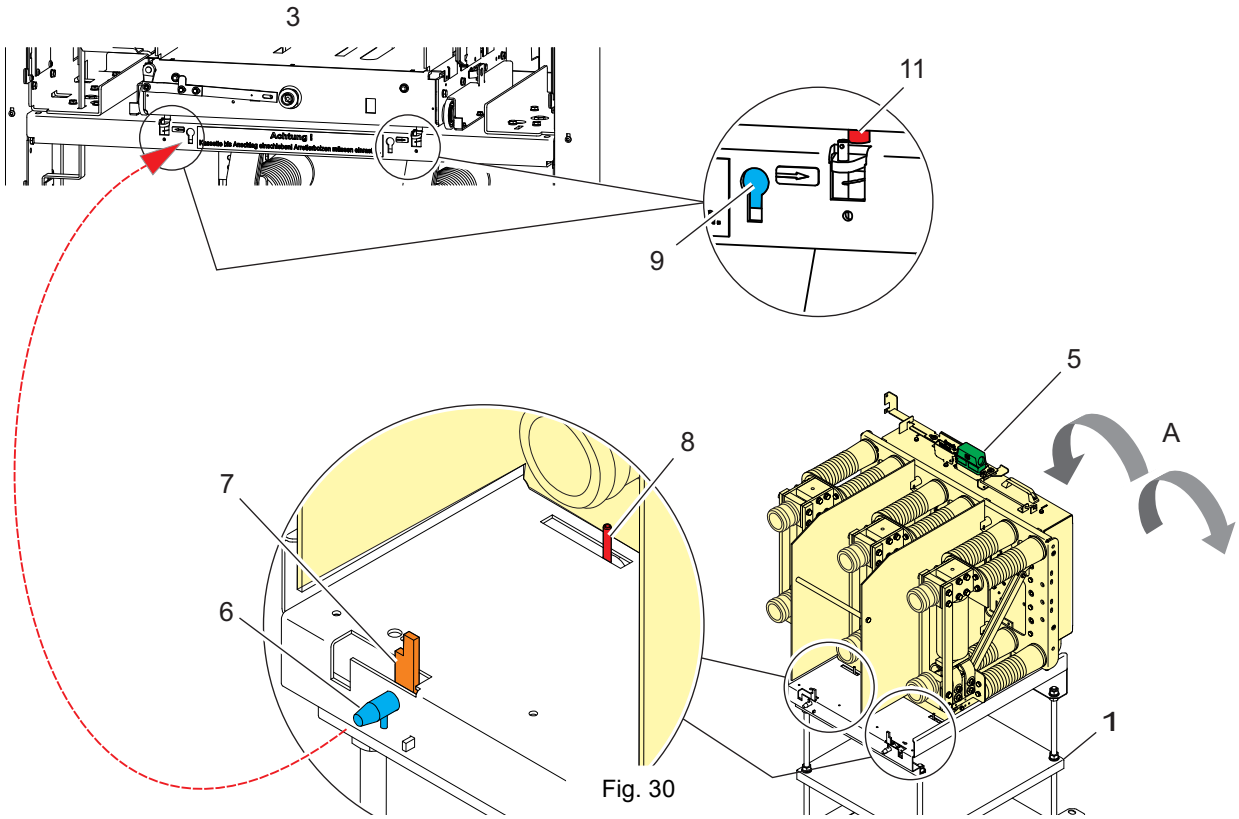


Fig. 30

- Plug in plug (5). For this, push bar (12) against the spring pressure in the direction of the arrow and hold until the plug is inserted (plug is located in the switch panel, in the holder, above the circuit breaker)
- Close the switch panel door

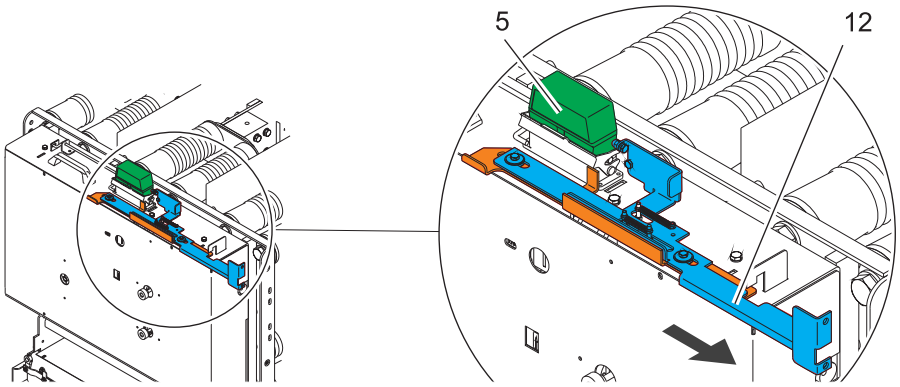


Fig. 31

7.5 Functional check

➡ It is recommended that you create a list of the components to be checked for the switchgear. This makes subsequent functional checks easier [1].

7.5.1 Are there sufficient operating elements?

- Ensure that there are enough operating elements for operation (e.g. operating levers, cranks, insulating protective barriers). If different switching devices are to be operated at the same time, or if work is to be carried out in parallel on different switch panels, there must be a sufficient number of operating elements.

7.5.2 Inserting fuses *

With the “T” transformer feeder panel version

- Insert the h.v.h.b.c. fuse inserts (see recommendation list [2]) in accordance with the requirements of DIN VDE 0105-100 into the fuse holder contacts. The striker pin must actuate the trigger mechanism (note marking on the fuse).

* Optional

7.5.3 Safety installations

- Ensure that all safety installations for the switchgear (see Chapter 6 on page 24) are complete and work faultlessly.

7.5.4 Remote control technology *

- Ensure that all remote control technology is working faultlessly.

* Optional

7.5.5 Switching switching devices

- In each switch panel, switch each switching device to a de-energised state several times using the provided drive (manual/motor drive) and ensure that the switch end positions are faultlessly reached. Here, please also observe the operating and maintenance manual of the applicable switching device.
- Ensure that the switch position indicators correspond to the respective switching state.

[1] Here, we recommend DRIESCHER station book, part number: 3-81900010
[2] DRIESCHER brochure “Application guide of switch-fuse combination”, part no.: 3-81701008

7.5.6 Reporting of the switching states via auxiliary switches *

- Ensure that the switch positions of the auxiliary switches reliably correspond to the state of the switching device, and the switching signals are transmitted to the intended point

➡ The auxiliary switches are set in the factory and checked for functionality. If an auxiliary switch is moved, for example due to transport or assembly, this must be re-adjusted by DRIESCHER Service.

* Optional

7.5.7 Capacitive voltage indicator/short-circuit indicator *

- Check function and detectability. Here, please observe the operating and maintenance manual of the respective indicators.

* Optional

7.6 Operational readiness of the switchgear

➡ The switchgear is ready for operation when all of the checks described in Chapter 7.5 (Functional check) have been performed and no defects have been determined.

8 Operation

8.1 Visual check

WARNING: Missing or loose components could result in personal injury.
Check that all mechanical components are complete and secured in place. If faulty components or loose mounting parts are detected, commissioning may only be performed after they have been repaired by an expert.

A check must be carried out to ensure that the safety installations are complete and functional (see 6, page 24) prior to commissioning.

8.2 Commissioning

Once the entire assembly and successful functional check are complete, the switchgear is ready for use.

8.3 Operation

Every switching operation may only be performed when the switch panel door is closed!

8.3.1 Protection device *

The protection device (8) serves the following applications, for example:
- Protection, control and monitoring technology
- Switching the circuit breaker
- Switching the earthing switch
- Positioning the circuit breaker

* Optional

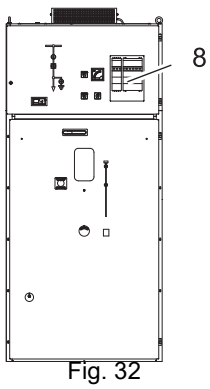


Fig. 32

8.3.2 Circuit breaker

EL version

Functioning principle:
The circuit breaker (41) is located in the switch panel with its withdrawable cassette (42). It can be positioned between disconnection position (A) and operating position (B).

In disconnection position (A) the moving contacts (40) do not have any contact with the current paths.

Positioning is executed either through electromechanical or manual operation.

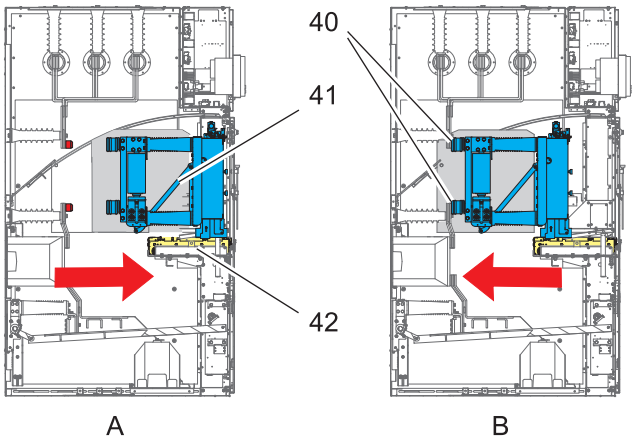


Fig. 33

Switching is executed through spring force (spring accumulator), triggered either through electromechanical or manual operation[1)] (emergency operation).

Both switching and positioning can only be performed in defined operating states.

Operating states in which it is possible to switch/position the circuit breaker

- Ensure that the earthing switch is in the OFF switch position (see 8.3.3). Otherwise the circuit breaker cannot be operated
- Ensure that the circuit breaker is in the OFF switch position (see description for Fig. 37). Otherwise the circuit breaker cannot be positioned

[1)] The energy accumulator must be loaded

Positioning the circuit breaker in operating position

The circuit breaker is moved from disconnection position (detailed image (A)) to operating position (detailed image (B)).

- Mechanically: using hand crank (2)
  or
- Electrically: motor with protection device (8) or remote control technology.

  Position the circuit breaker so that it is located as shown in detailed image (B) (check using inspection window (16)). The indicator of position of CB withdrawable cassette (3) is on "**I**"

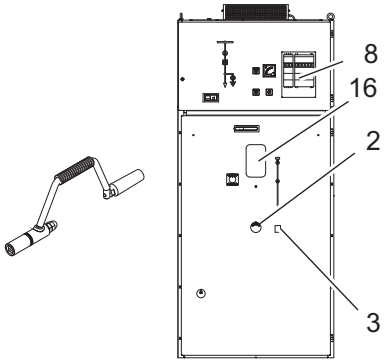


Fig. 34

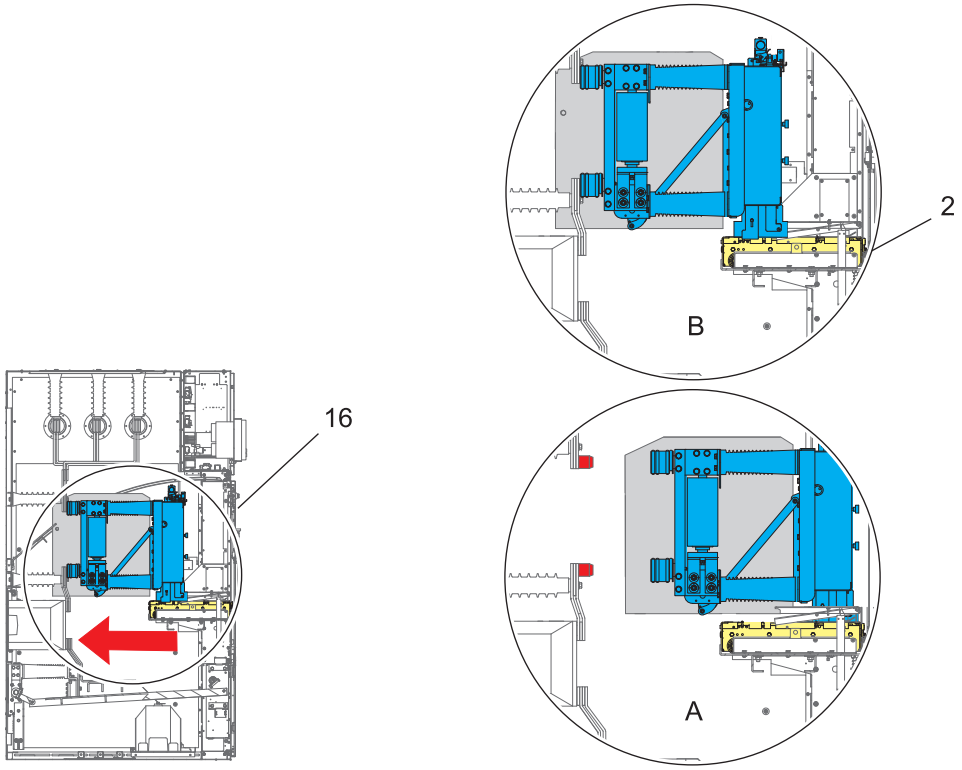


Fig. 35

Switching circuit breaker ON

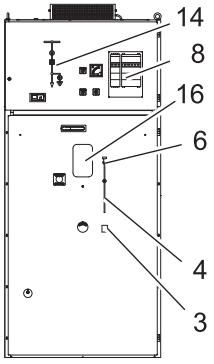


Fig. 36

In order to switch the circuit breaker, the energy accumulator (indicator 16) must be tensioned. With a circuit breaker actuated via motor, the energy accumulator is automatically tensioned following each switching operation.

- Mechanically[1)]: using the operating rod (4) through the opening (6) to actuate the switching button against the spring pressure
  or
- Electrically: motor via protection device (8) or remote control technology*
  or
- Push button: mimic diagram board (14)*

The switching of the circuit breaker can be heard loudly. The switching state indicator, visible through the inspection window (16), shows **"I"**

In the event of failure of the control voltage, all switching operations can also be performed manually. With the circuit breaker, the last possible switching operation is always an OFF switching operation. The energy accumulator can be wound using the hand crank (see 8.3.2.1).

* Optional

Switching circuit breaker OFF

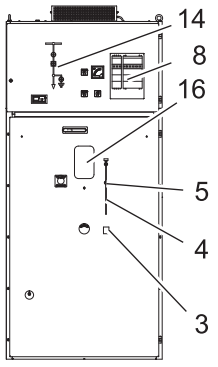


Fig. 37

- Mechanically[1)]: using the operating rod (4) through the opening (5) to actuate the switching button against the spring pressure
  or
- Electrically: motor via protection device* (8) or remote control technology*
  or
- Push button: mimic diagram board (14)*

The switching of the circuit breaker can be heard loudly. The switching state indicator, visible through the inspection window (16), shows **"0"**

In the event of failure of the control voltage, all switching operations can also be performed manually. With the circuit breaker, the last possible switching operation is always an OFF switching operation. The energy accumulator can be wound using the hand crank (see Fig. 13, page 23).

* Optional

[1)] The energy accumulator must be loaded

Positioning the circuit breaker in disconnection position

The circuit breaker is moved from operating position (detailed image (B)) to disconnection position (detailed image (A)).

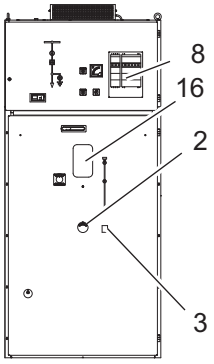


Fig. 38

- Mechanically: using hand crank (2) (see Fig. 13, page 23)
  or
- Electrically: motor via protection device* (8) or remote control technology*

  Position the circuit breaker so that it is located as shown in detailed image (A) (check using inspection window (16)). The indicator of position of CB withdrawable cassette (3) is on “**0**”

* Optional

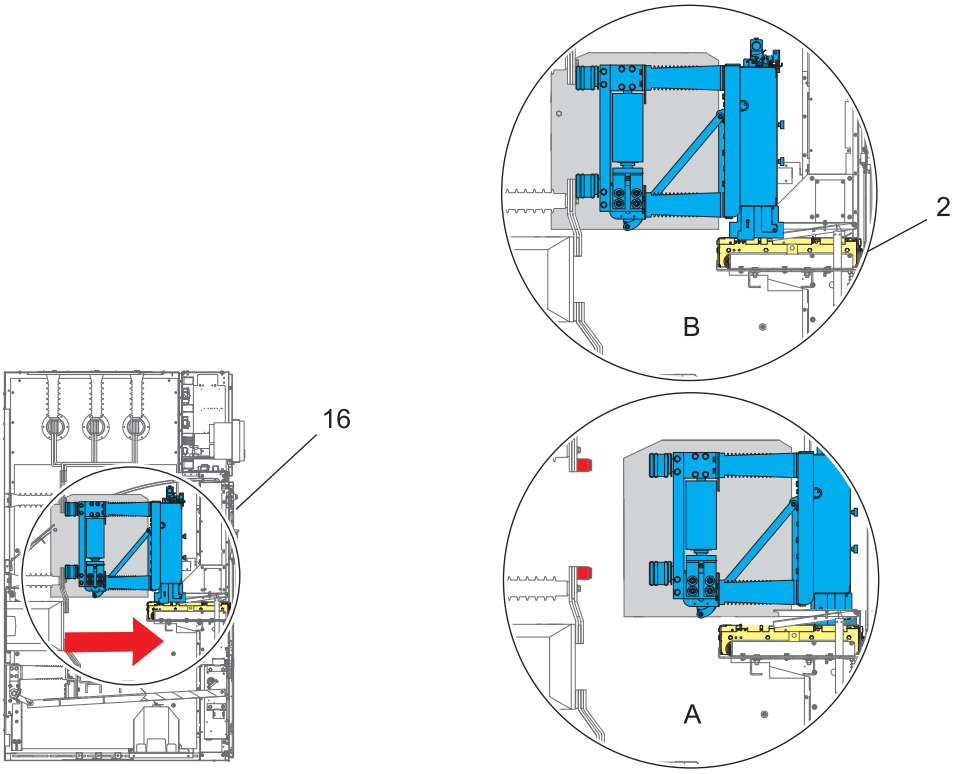


Fig. 39

Removing the circuit breaker

- Open switch panel door
- Unplug plug (5). Here, slide the bar (13) against the spring pressure in the direction of the arrow and hold until the plug is unplugged
- Insert the plug into the holder above the circuit breaker

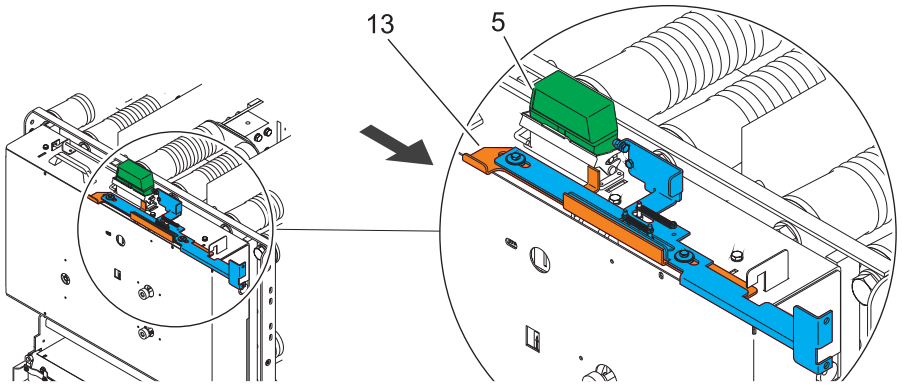


Fig. 40

- Remove the circuit breaker in reverse order to the process described in 7.4, on page 39.
- Close the switch panel door

8.3.2.1 Winding the energy accumulator manually

The energy accumulator is wound electromechanically (spring accumulator). If this is not possible (e.g. failure of the control voltage), the energy accumulator can be loaded using the hand crank.

If the energy accumulator is not loaded, this is shown with the indicator (16.4, Fig. 13).

Winding energy accumulator

- Insert hand crank into connection (17) and wind energy accumulator. The energy accumulator is loaded when the indicator (16.5, Fig. 13) can be seen.

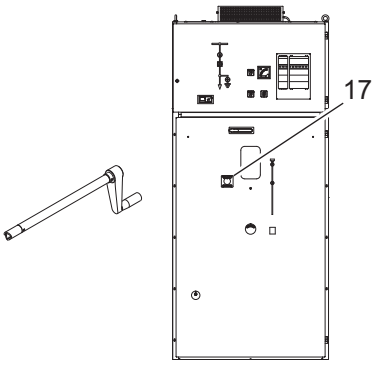


Fig. 41

8.3.3 Switching earthing switch

Ensure that the switching element* is positioned in the disconnection position (see 8.3.2, Fig. 39). Otherwise the earthing switch cannot be operated.

* Circuit breaker, disconnector, switch-disconnector or switch-fuse combination

- Mechanically: using hand crank (1)* or detachable lever (1)*
  or
- Electrically: protection device (8)*
  or
- Push button: mimic diagram board (14)*

The switching of the earthing switch can be heard loudly. Depending on the switching state, the switching state indicator (1) shows **"I"** for ON or **"0"** for OFF

* Optional

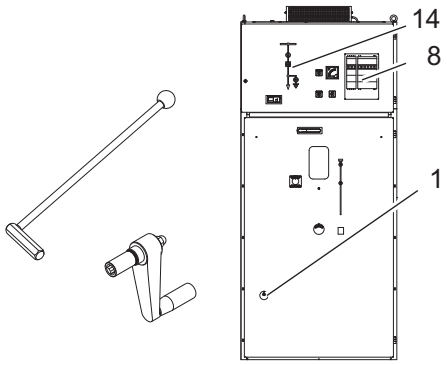


Fig. 42

8.3.4 Switching switch-disconnector

Ensure that the earthing switch is in the OFF position. Otherwise the switch-disconnector cannot be operated.

- Mechanically: using detachable lever (2)

or

- Electrically: protection device (8)

or

- Push button: mimic diagram board (14)*

The switching of the switch-disconnector can be heard loudly. Depending on the switching state, the switching state indicator (2) shows **"I"** for ON or **"0"** for OFF. The position of the switch-disconnector can be identified through the inspection window.

* Optional

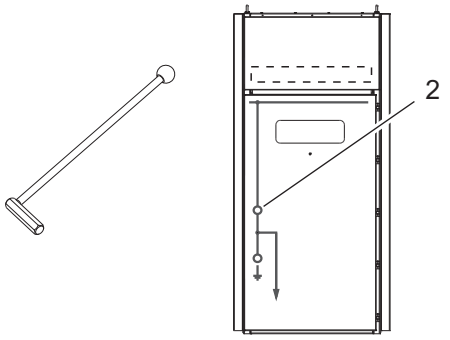


Fig. 43

8.3.5 Switching switch-fuse combination

With the “T” transformer feeder panel version

Operation is performed in the same way as for the switch-disconnector (see 8.3.4).

➡ During the switch-off process of the switch-fuse combination used in the transformer feeder panel, it is necessary to switch through as far as possible using the detachable lever. Only then is the switch position changed and the switching state indicator shows the correct value.

➡ In the event of triggering by the fuse or the shunt release, the drive and the switching state indicator remain in the ON position. Before switching on again, this must be manually placed in the OFF normal position. Here, the position of the drive is not changed.

The position of the switching device can be identified through the inspection window.

8.3.6 Replacing fuses

In the event that an h.v.h.b.c. fuse is triggered, the two other fuses should also be replaced due to any ageing caused by excess current.

- Using fuse tongs (observe enclosed instructions) clasp the h.v.h.b.c. fuse and remove from the fuse holder contacts
- Insert fuses, see 7.5.2, on page 42

8.3.7 Determining absence of voltage * and phase coincidence

➡ Please observe the supplied operating instructions from the manufacturer, e.g. Kries Capdis, Horstmann Wega, etc.
To determine phase coincidence, further devices are necessary, e.g. Kries CAP-Phase, Horstmann Orion 3.1, etc.

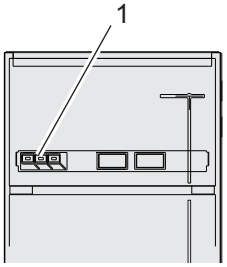


Fig. 44

- Remove cover (1) from the sockets
- Check for the absence of voltage using the voltage detector at the sockets

* Optional

8.3.8 Short-circuit indicator *

Please observe the supplied operating instructions from the manufacturer, e.g. Kries Capdis, Horstmann Wega, etc.

Please see the supplied instructions for the short-circuit indicator (2).

* Optional

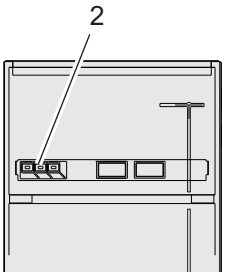


Fig. 45

8.4 Decommissioning

The switchgear can be decommissioned by dismantling the cable supply lines and dismantling optional auxiliary and/or control voltages.

WARNING Danger of mechanical forces originating from switching devices which are pre-loaded. Ensure that these pose no danger in accordance with the operating and maintenance manual. If necessary have any pre-load relieved by experts.

9 Maintenance

9.1 Maintenance intervals

Recommendation

Interval	Activities
Annual	Visual check, inspection • Remove soiling • Check that switch positions ON /OFF are reached completely.
Switching devices: Number of switching cycles [1]	• Activities as described under *annual*. • Lubricate all bearings and all mechanically moving components with S.K.D. 16 N [2] spray. • Check all screw and clamping pin connections for completeness and that they are firmly in place. Replace if necessary. • Perform a functional check.

[1] In accordance with the applicable operating and maintenance manual

[2] See Required lubricants, on page 55

9.2 Preparations for maintenance work

Insulating protective barrier

This prevents prohibited proximity to or accidental contact with live components. When the door is closed and the circuit breaker is in the OFF position, it should be inserted between the cable connection compartment and the busbar compartment if work is to be carried out on the panel and the switchgear cannot be completely de-energised (see Fig. 10).

Inserting insulating protective barrier

- Fully insert insulating protective barrier (12) through the opening (18) into the switch panel.

➡ The oval recesses (to remove the protective barrier) must be located outside the switch panel as shown.

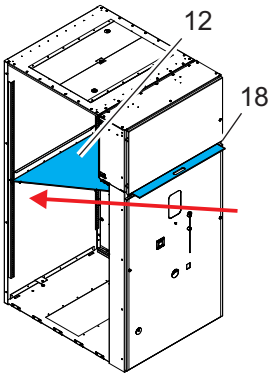


Fig. 46

Our specialist personnel can be contacted by telephone in the event of faults or to answer any questions you may have with regard to the compatibility, assembly or maintenance, including outside business hours.

Please always provide the information on the identification plates.

Tel.	+49 8761 681-0
E-mail	service@driescher.de

10 Technical data

General	
Dimensions (approx. W x D x H in mm)	See 3.2, on page 12
Weight, approx. kg (cable panel) Type a Type c Type e	 450 560 650
Required ground conditions Even Raised floor, surface load Point load	 See 7.2.1, on page 31 20 kN/m² 5 kN
Working room space requirements Free space in front of switch panel (mm)	 1,355
Protection class	IP 3X
Pressure relief	According to specification
Control voltage	VDC: 24 48 60 110 220 VAC: 110 230
Operating environment conditions, class according to DIN EN 62271-1	
Temperature / maximum daily average	-5 to +40 / +35 °C
Maximum height above “standard elevation zero”	1,000
Relative humidity, maximum daily average	95%
Relative humidity, maximum monthly average	90%
Water vapour pressure, maximum daily average	2.2 kPa
Water vapour pressure, maximum monthly average	1.8 kPa
Storage conditions	Upright, dry and free of dust -40 to +60 °Celsius

		Type PRO-AIR H•		
		a	c	e
Rated voltage	U_r	36 kV		
Rated frequency	f_r	50 Hz		
Rated operating current	I_r	630 A		up to 2000 A
Rated short-time current	I_k	20 kA		up to 31.5 kA
Rated short-circuit duration	t_k	3 s		
Rated peak withstand current	I_p	50 kA		up to 80 kA
Rated lightning impulse withstand voltage	U_p	170 kV		
Rated power-frequency withstand voltage	U_d	70 kV		

10.1 Tightening torques of screw connections

Standard steel screw connections using 8.8 galvanised steel screws in accordance with DIN ISO 898-1:

Screw connection	Tightening torques
M6	11.3 Nm
M8	27.3 Nm
M10	54 Nm
M12	93 Nm
M16	230 Nm

Current-carrying steel screw connections using 8.8 galvanised steel screws in accordance with DIN ISO 898-1:

Screw connection	Tightening torques
M12	75 Nm

10.2 Required lubricants

Item number [1)]	Lubricant name / type	Manufacturer
1-49007110	Rivolta S.K.D. 16 N	Bremer & Leguil

[1)] At DRIESCHER

11 Disposal

The switchgear must be dismantled by qualified personnel.
It must be disposed of in an environmentally friendly manner. Electrical components must not be disposed of as household waste.

12 Notes