

**Assembly, Operating and
Maintenance Instructions for
DRIESCHER - Air-Insulated
Medium-Voltage Switchgears**

- Type F24 - 606519-27
- Type F24 - 756519-27
- Type F24 - 906519
- Rated voltage 24 kV
- Rated current 630 A



F 24

**ELEKTROTECHNISCHE WERKE
FRITZ DRIESCHER & SÖHNE GMBH**

D-85366 Moosburg • Phone: +49 8761 681-0 • Fax: +49 8761 681-137
www.driescher.de info@service@driescher.de



• 3	Operating conditions, Technical description
• 4	Technical data, H.v.h.b.c. fuse link, Inserting and replacing of h.v.h.b.c. fuses
• 5	Insulating protective barrier (optional), Motor drive (optional), Supplementary equipment
• 6	Shipping, Transport, Storage and weights
• 8	Installation switch panels
• 9	Bolting switch panels, Mounting of arc rejection devices and side covers of the end panels
• 10	Installation and connection of busbars
• 11	Busbar earthing (optional)
• 12	Earthing, Cable mounting and cable connection
• 13	Operation, Insulating plates (optional)
• 14	Capacitive voltage test system and short-circuit indicator (optional)
• 16	Commissioning, Maintenance, Service



General notes

These operating and maintenance instructions must always be kept at the place of installation and must be available to operating personnel at all times.

The operating and maintenance personnel must have read and understood these instructions prior to the commencement of any work.

Correct transport, storage, installation and assembly, as well as careful operating and commissioning are essential to ensure the satisfactory and safe operation of these switchgears.

Guarantee

Driescher shall not accept any liability for damage which is based on incorrect use, incorrect implementation of work or work carried out by non-trained persons, or third party liability.



Warning

During the operation of these electrical switchgears some parts are inevitably under hazardous voltage and mechanical parts, also those remotely controlled, may move fast.

Non-observance of the warning signs can lead to severe injury or damage to property.

Only appropriately qualified personnel, as specified in the VDE 0105 (trained electricians) are to work on this equipment or in the vicinity thereof.

These persons must have a sound knowledge of all general regulations; VDE/IEC specifications, 5 rules on safety in compliance with VDE, safety regulations, accident prevention regulations as well as all warnings and maintenance measures given in these instructions.

Please take also into consideration the enclosed operating instruction of each switch !

Operating Conditions

The switch panels of Type F 24 are installed in closed electrical operating areas which are only to be entered by skilled personnel and appropriately instructed persons.

The equipment can be used at an altitude of up to 1000 m above sea level. For installations above an altitude of 1000 m the rated insulating level of the switchgear must be corrected accordingly. The switch panels are designed for use under normal

operating conditions in compliance with the standard EN 62271-1.

According to this the following limiting values applies:
Ambient temperature:

Peak value of the ambient temperature	+40°C
Average value over 24 hours	+35°C
Min. value of the ambient temperature (class "minus 5 Indoor")	- 5°C

Technical description

General

The air-insulated switchpanels

- Type F24 - 606519-27
Panel dimensions WxDxH: 600 x 650 x 1900 mm
- Type F24 - 756519-27
Panel dimensions WxDxH: 750 x 650 x 1900 mm
- Type F24 - 906519
Panel dimensions WxDxH: 900 x 650 x 1900 mm

are suitable for all kind of indoor use.

In case of a voltage of 24 kV, switch disconnectors with a rated current of 630 A are used. The switch arc of the switch disconnector is quenched through the principle of hard-gas.

Switch panel design

The switch panel framework is of a bolted composite design. The front side of the switch panels is fitted with a folded, reinforced solid sheet door, alternatively with hinges on the right or left. The hinges from type F can be changed on site.

The compound glass window fitted in the door permits operating personnel to inspect the installed components without involving hazards.

The cover in front of the busbars is swivelling and bolted to prevent any unintentional opening.

Pressure relief can be in upward or downward direction.

Encapsulating and partitioning

The air-insulated switchgears are metal enclosed.

All switch panels of Type F 24 are partitioned off from panel to panel (Partition class PI).

The switch panels are sealed at the back and can also be covered at the bottom, if requested.

An insulating protective barrier, to cover live parts in the busbar section, can be inserted when the panel door is closed.

Equipment

The switch panels of Type F 24 are available in the following versions:

• Cabel panel	Type FK
• Transformer feeder panel	Type FT
• Measuring panel	Type FM
• Bus sectionalizer panel	Type FÜ
• Riser panel	Type FH

With pressure relief in upward direction, arc barriers of 250 mm in height are mounted across the front and the side walls.

Cables having to be connected are guided into the switch panels from the bottom and are fixed on cross arms, that are adjustable two-dimensional.

Switch panels equipped with switch-disconnectors can optionally be fitted with an earthing switch.

Through the optional locking of switch disconnector and earthing switch, wrong operations are practically ruled out.

The mounted earthing switches can be operated manually, the switch disconnectors can be operated manually or via motor-operated mechanisms when the panel door is closed.

Earthing switches or spherical fixed points are available for earthing and short-circuiting.

It is possible to install appropriate surge voltage protectors in the panel, if required.

All switch panels are designed with central locking and double-bit key.

There are additional locking features available in the form of profile cylinders or padlocks, if required.

Technical data

The air insulated switchgears of Type F 24 are metal enclosed and acc. to EN 62271-200.

The resistance of the switch panels to accidental arcs has been successfully verified by a neutral testing institute corresponding to IAC - AFL 16/20 kA; 1 s.

Through the front wall mounted switch disconnecter **H27 F-EK** or **H27 F-SuT** is at a panel wide from 600 mm a clearance between phases $p = 170$ mm, respectively at a panel wide from 750 mm a clearance between phases $p = 225$ mm possible.

For transformer feeder panel (750 mm wide) the clearance between phases in the range of the h.v.h.b.c. fuses is 250 mm, for a measuring panel (900 mm wide) above and below 250 mm.

Technical data of the switch panels Type F24

Rated voltage	U_r	24	kV
Rated lightning impulse withstand voltage	U_p	125	kV
Rated short-duration power-frequency withstand voltage	U_d	50	kV
Rated (operating) current	I_r	630	A
Rated short-time current	I_k	16/20	kA
Accidental arc qualification	IAC A FL 16/20* kA /1s		
Category for operating availability	LSC1		
Partition class	PI		

* 20 kA with pressure relief in downward direction

Switch disconnecter Type

	H27 F-EK	H27 F-SuT ¹⁾
Rated (operating) current	630	630 / 125 ²⁾ A
Rated short-time current	16/20	16 ³⁾ kA
Rated impulse current	40	40 ³⁾ kA

- 1) Type H 27 SuT Switch disconnecter – fuse combination
- 2) in compliance with Driescher fuse table
- 3) prospective values

Further technical data available in List 727

Fuse recommendations for Driescher HV-HBC fuse links Type **STA/EMPA** and Type **SSK**

Transformer rated power [kVA]	Fuse rated current in A	
	Rated voltage $U_r = 24$ kV	
	Fuse gauge $e = 442^{-1}$ mm	
	min. (A)	max. (A)
50	6,3	6,3
80	6,3	6,3
100	6,3	10
125	10	16
160	10	20
200	16	20
250	16	25
315	20	25
400	25	31,5
500	25	40
630	31,5	50
800	40	50
1000	50	63
1250	63	
1600	80	
2000	100, Type SSK and tripping delay	
2500	125, Type SSK and tripping delay	
3150	Circuit-breaker	

Inserting and replacing of h.v.h.b.c. fuses

- Switch off the switch-disconnector positioned above the h.v.h.b.c. fuse.
- Confirm the absence of voltage
- Close earthing switch

To remove a fuse from the panel, get hold of it using fuse tongs and remove from the fuse mounting contacts.

When inserting, the h.v.h.b.c. fuses are taken with the fuse tongs and inserted into the contact in that way that the striker pin can operate the release mechanism (observe marking on h.v.h.b.v. fuse)

For a better handling, we recommend an fuse tongs with lateral clamping shoes (Part-no. 77212001, *Brochure 773*).

If a h.v.h.b.c. fuse has operated, the two other fuses should also be replaced due to the possibility of overcurrent ageing.

Insulating protective barrier

The insulating protective barrier prevents any impermissible approach or accidental contact of live parts. It has to be inserted between cable terminal compartment and bus bar compartment with closed panel door and opened switch disconnector, when

it has to be worked in the panel and the switchgear cannot be put completely into the dead status (see *Picture 12*).

After closing the panel door the barrier can be removed through pulling at the pulling hole.

Motor drive (optional)

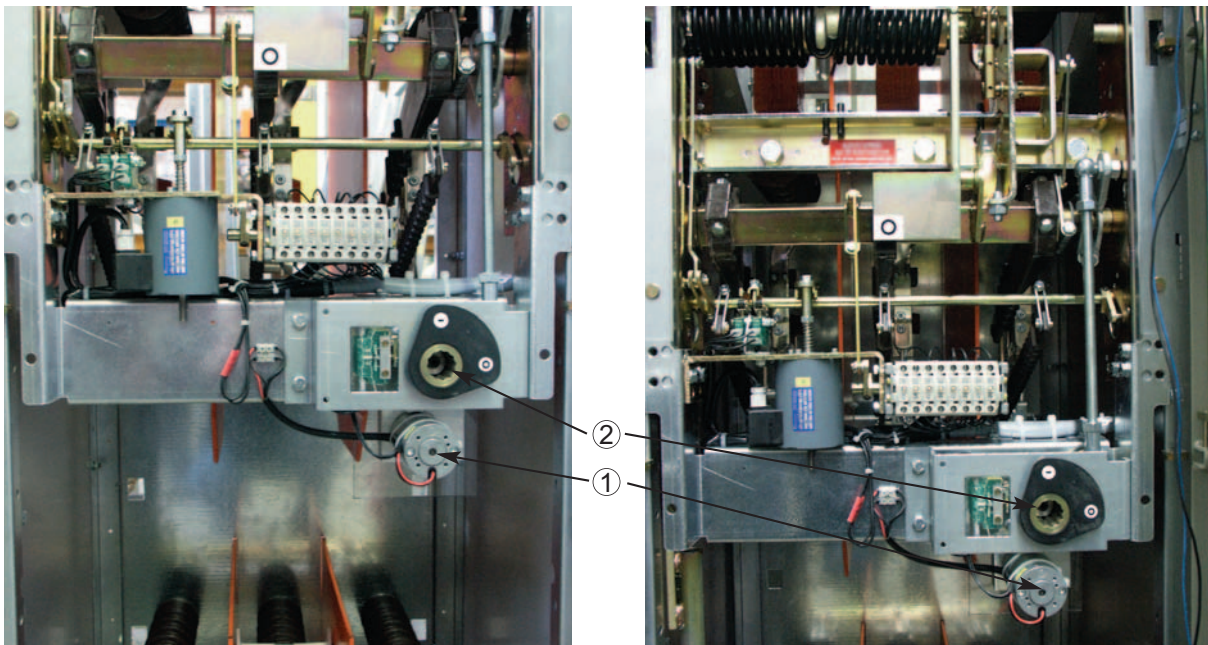
We use in our company motor drives which stop themselves at a limit position. The motor drive ① replaces the actuating arm. In case of emergency the switch

can be operated with the actuating arm ②, but it has to be taken care that the actuating arm is fixed to the stop. The corresponding motor voltage is noted on the type plate.

Torque up to 250 Nm

Voltage supply	24 V DC	60 V DC	110 V DC	220 V DC	230 V AC*
max. current input	3,6 A	2,6 A	0,9 A	0,4 A	0,6 A
max. operation time	16 s	25 s	9 s	10 s	15 s

* =220V DC with bridge rectifier



Examples for installed motor drives: left side in a cable panel / right side in a transformer feeder panel

Supplementary equipment (optional)

- Panel illumination
- Base
- Busbar earthing with spherical bolts
- Capacitive voltage testing system
- Installation of surge voltage protectors
- Short-circuit indicator
- Floor covers
- Additional locking options with profile cylinder and lockable operating mechanisms
- Wiring niche

Delivery condition

We deliver individual panels or complete switch gears bolted.

The individual panels or units are usually fully pre-assembled at the manufacturing factory.

Transportation on the site

There are transporting lugs on the top of the switch panels or units. These must be removed again after installation. To transport the panels using lifting tackle please proceed as shown in *Fig. 1, 2, 3, 5, 6*.

For transportation using a shovel loader it is necessary to insert pallets or square timber beneath, which are then taken up by the lifting arm as shown in *Fig. 4*.

Storage

The switch panels must be appropriately stored in a dry, well-vented area and protected against contamination.

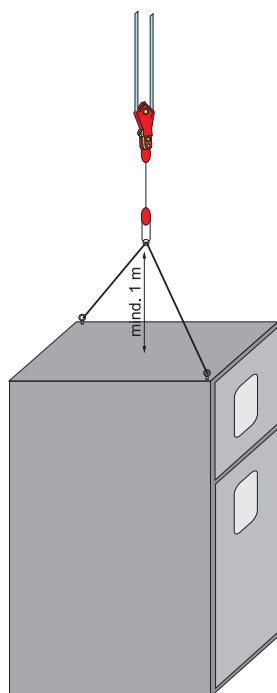
Weights

Type	Description	Weight approx. kg	Drawing-no.
FK 24-606519-27	Cable panel 600 mm wide	155	102347-001
FT 24-606519-27	Transformer feeder panel 600 mm wide	170	102347-001
FÜ 24-606519-27	Bus sectionalizer panel 600 mm wide	165	102347-001
FH 24-606519-27	Riser panel 600 mm wide	125	102347-001
FK 24-756519-27	Cable panel 750 mm wide	180	102347-001
FT 24-756519-27	Transformer feeder panel 750 mm wide	195	102347-001
FÜ 24-756519-27	Bus sectionalizer panel 750 mm wide	185	102347-001
FH 24-756519-27	Riser panel 750 mm wide	145	102347-001
FM 24-906519	Measuring panel 900 mm wide	220	102347-001

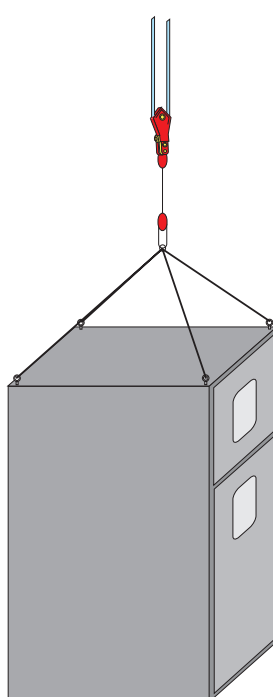


If panel combinations contain transformers, they have to be carried individually and with four transporting lugs.

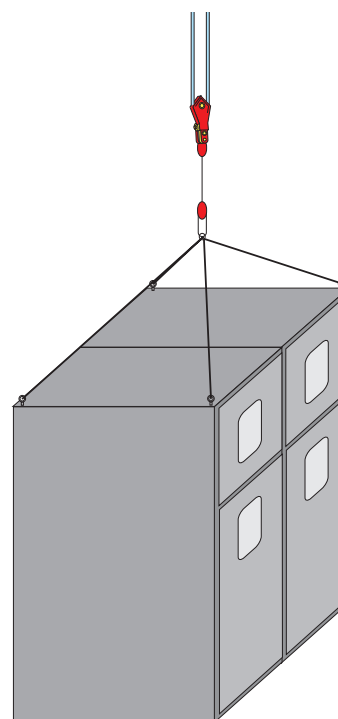
The minimum distance (1 m) between top of panel and hook of crane (*see picture 1*) is valid for all kind of transportation varieties.



Picture 1: Shipping of a single panel on the crane



Picture 2: Shipping of a single panel with transformers on the crane



Picture 3: Shipping unit consisting of two switch panels on the crane

Shipping, Transport and Storage

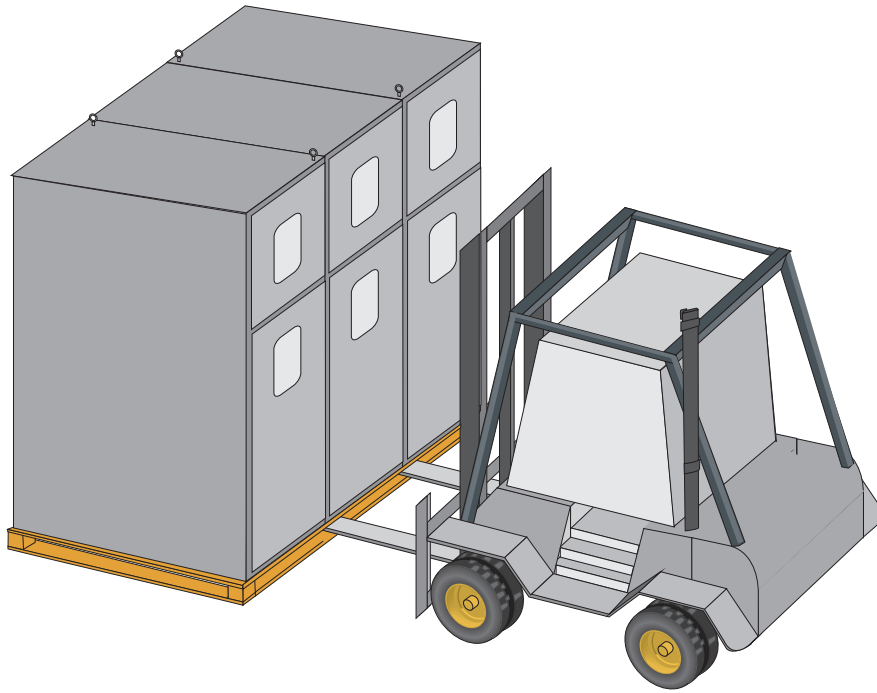
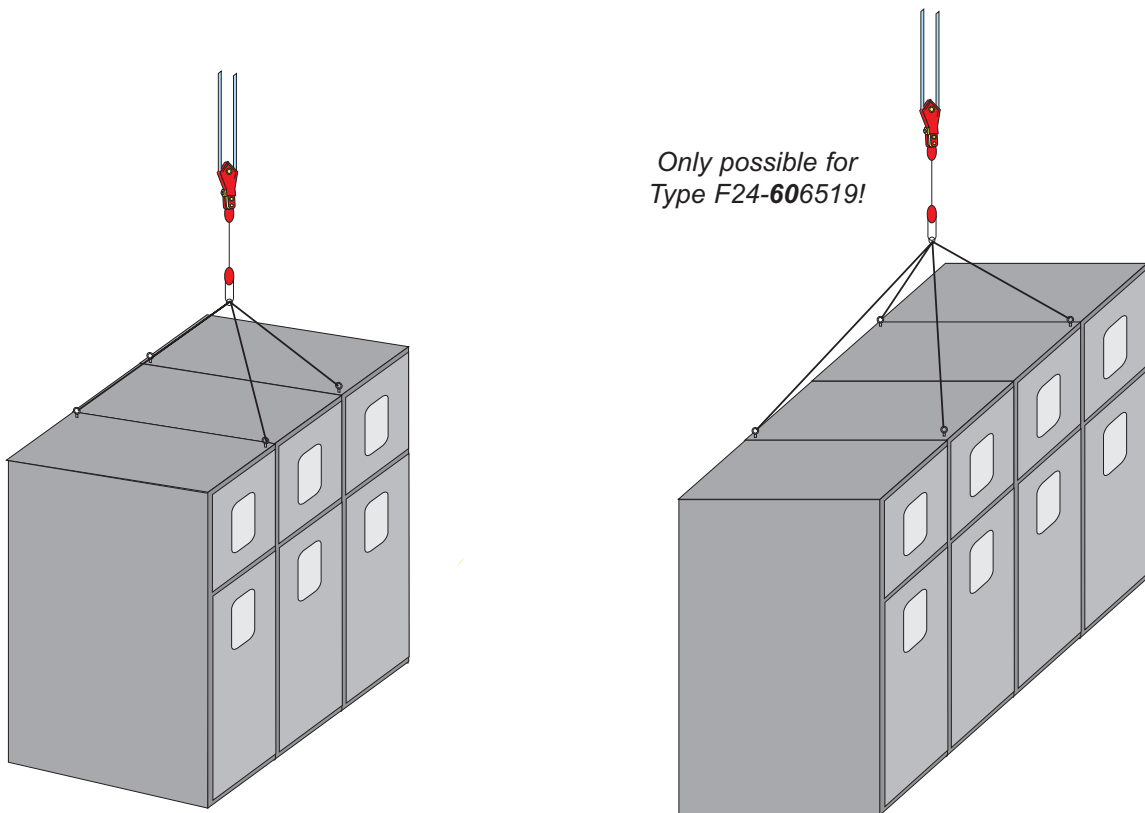


Bild 4: Loading an shipping unit using shovel loader (lifting arms take up panel end)



Picture 5: Shipping unit consisting of three switch panels on the crane

Picture 6: Shipping unit consisting of four switch panels on the crane

Installation switch panels

Floor properties

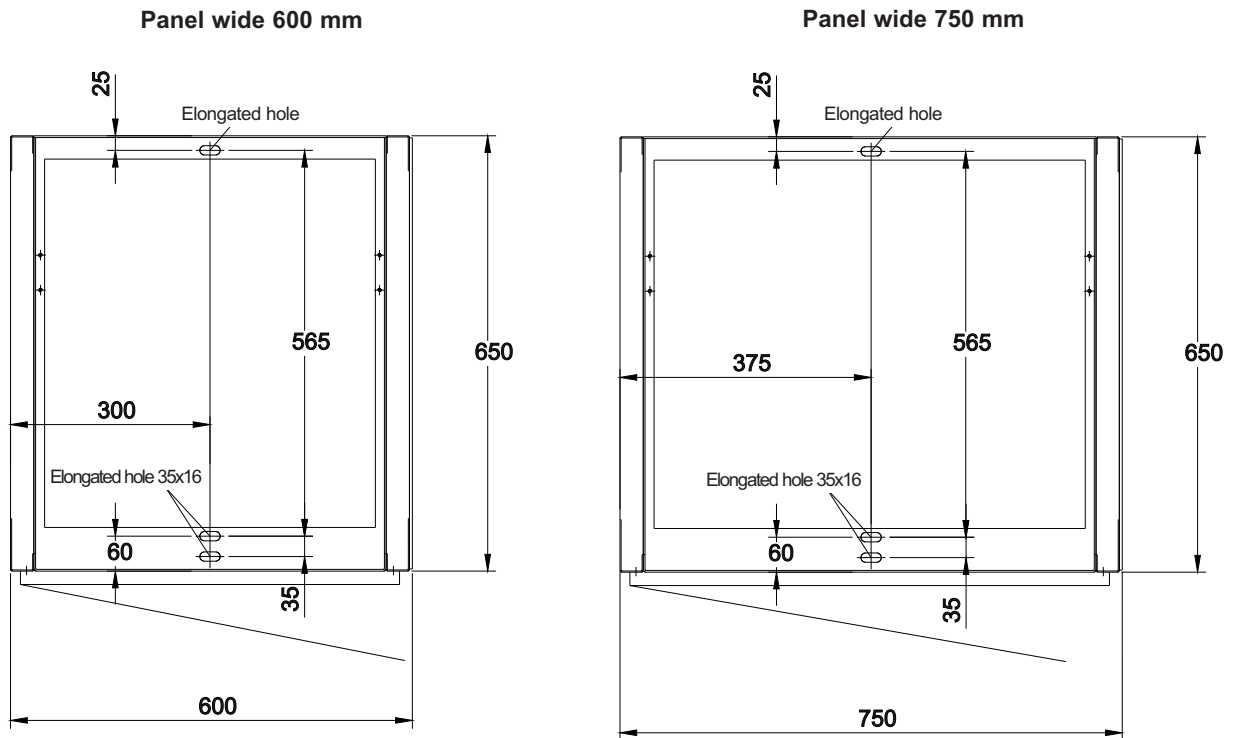
A level floor is sufficient.
Compensate any irregularities by metal strips. Make sure to avoid any distortion of the panels and the panel doors!

Floor openings

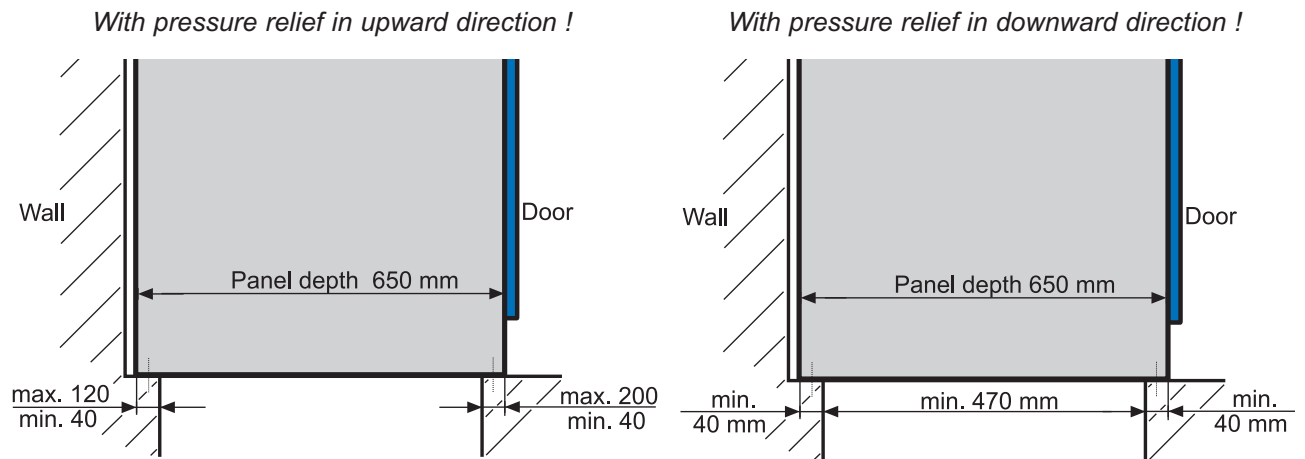
These are shown in *Picture 7 and 8*.
The openings can also be continuous along the length of the switchgear.

Securing the panels

The switch panels can be bolted directly to the floor of the building or bolted to an iron frame in the floor.
The panels can also be installed on an elevated floor.



Picture 7: Floor plan (Top view)



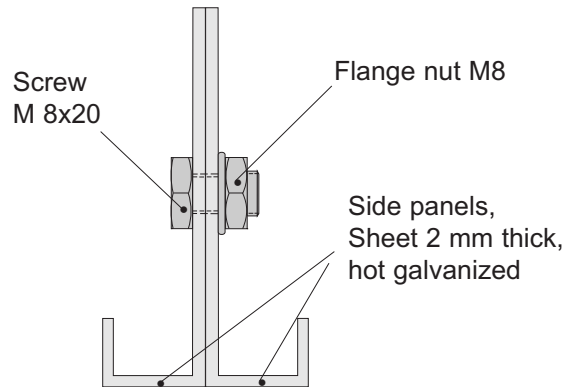
Picture 8: Floor plan (Side view)

Bolting switch panels together

Bolting of the panels

The housings are bolted at the front and rear with hexagonal screws M8 x 20 ISO 4017 and Flange nuts DIN 6923.

The panels have to be screwed acc. to *picture 9*. The corresponding screws, nuts and washers are provided as accessories.



Picture 9: Bolting of the panels

Mounting of arc rejection devices and side covers of the end panels

Side cover of the end panels

The side covers right and left side from the switch gear are bolted with a sheet steel end cover. These side covers are fastened with bolts M8x20. Securing see *picture 10 left side*.

Mounting of arc rejection devices

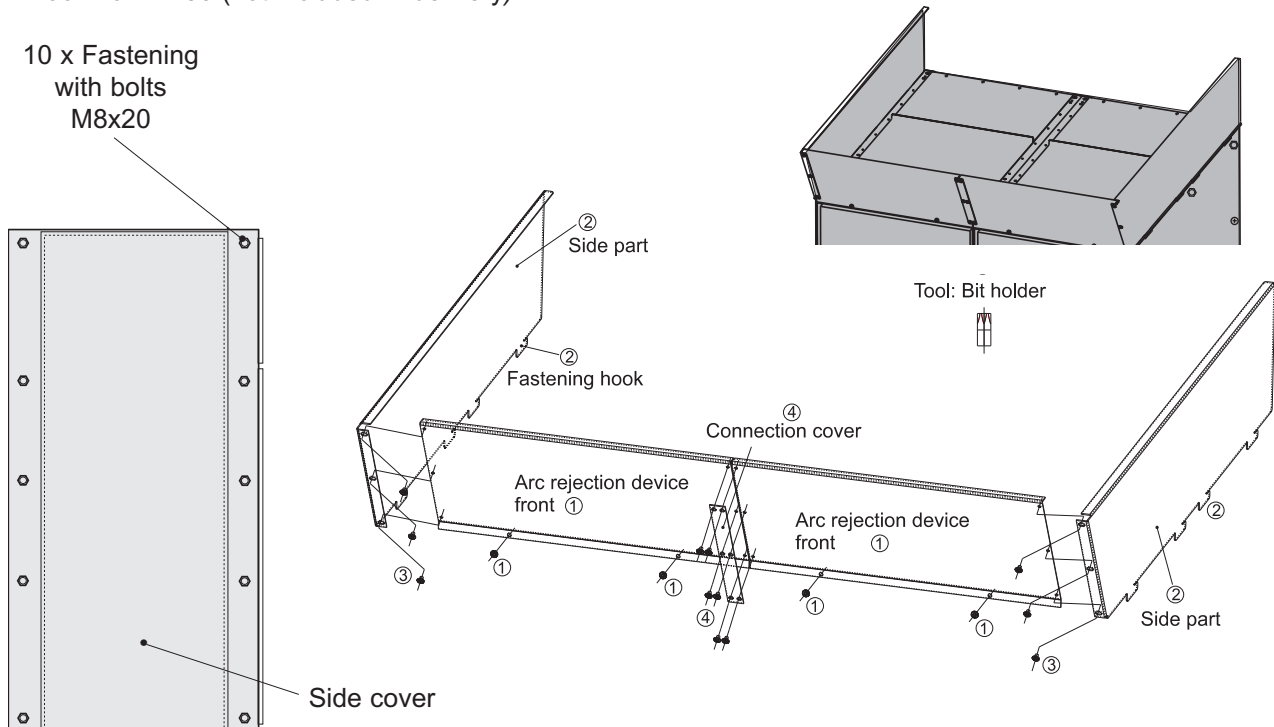
Generally, arc rejection devices are mounted on these switch panels. (Height 250 mm).

Description *picture 10 right side*:

- ① Fix the arc rejection devices on the front side with C M6x12-DIN7500-4.8-Torx-A2K (thread grooving screw).
- ② Fix side parts with fastening hooks from above in the slots from the side cover and push backwards.
- ③ Bolt arc rejection devices and side parts in the corners together.
- ④ Screw the connection cover between the front arc rejection devices.

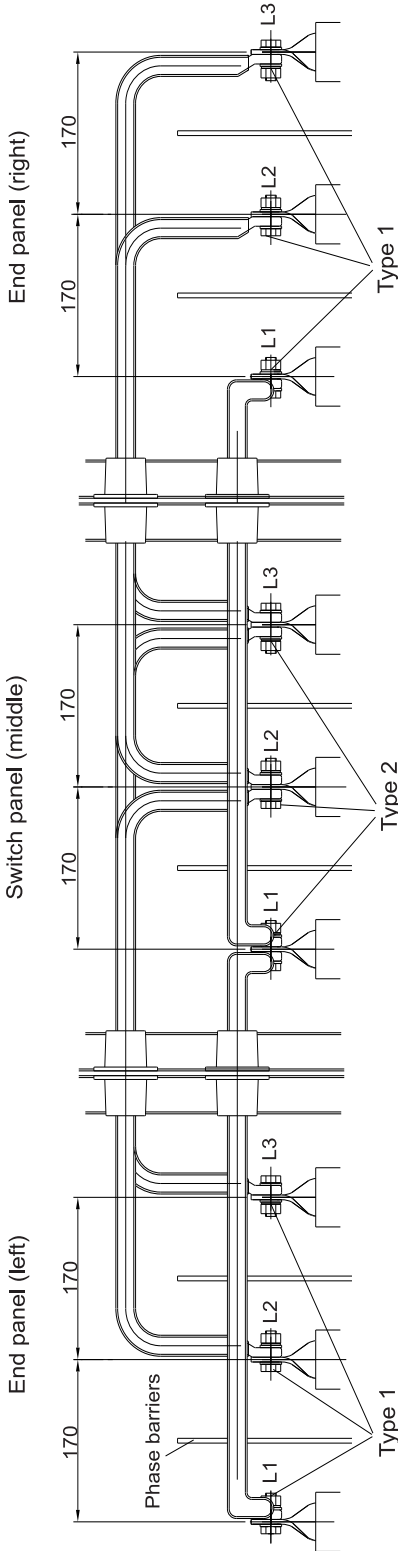
Tool: Torx Tx30 (not included in delivery).

10 x Fastening with bolts M8x20

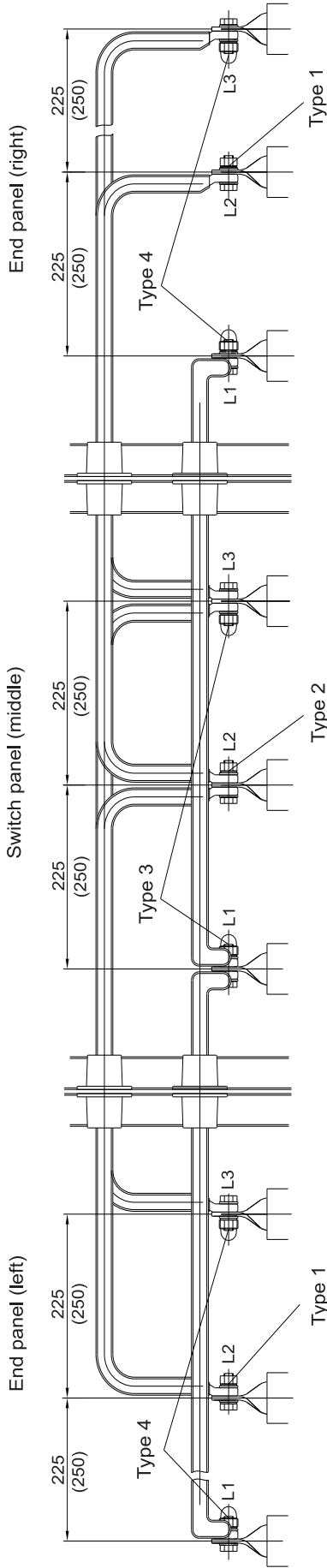


Picture 10: Mounting of arc rejection devices and side covers in side view

Switch panels with phase barriers, Clearance between phases p=170



Switch panels without phase barriers, Clearance between phases p=225 or p=250



<p>Type 1</p> <p>M12x35 DIN 933 ISO 7089-A13 M12 DIN 934 A12 DIN 128</p>	<p>Type 2</p> <p>M12x45 DIN 933 ISO 7089-A13 M12 DIN 934 A12 DIN 128</p>	<p>Type 3</p> <p>M12x45 DIN 933 ISO 7089-A13 M12 DIN 934 A12 DIN 128 Hexagon protective cap GPN part-no.35900103</p>	<p>Type 4</p> <p>M12x35 DIN 933 ISO 7089-A13 M12 DIN 934 A12 DIN 128 Hexagon protective cap GPN part-no.35900103</p>
--	--	--	--

Connection busbars (see page 10)

As shown on *page 10* the panels are linked from panel to panel and bolted to the upper connection fitting.

The phase arrangement from the left side to the right:

L1, L2, L3 is essential to observe!

(see picture 11 and 12)

Do **not distort** the connections.

Hold the connecting bolts in place with a second wrench when tightening the nuts (*see picture 12*).

75 Nm tightening torque.

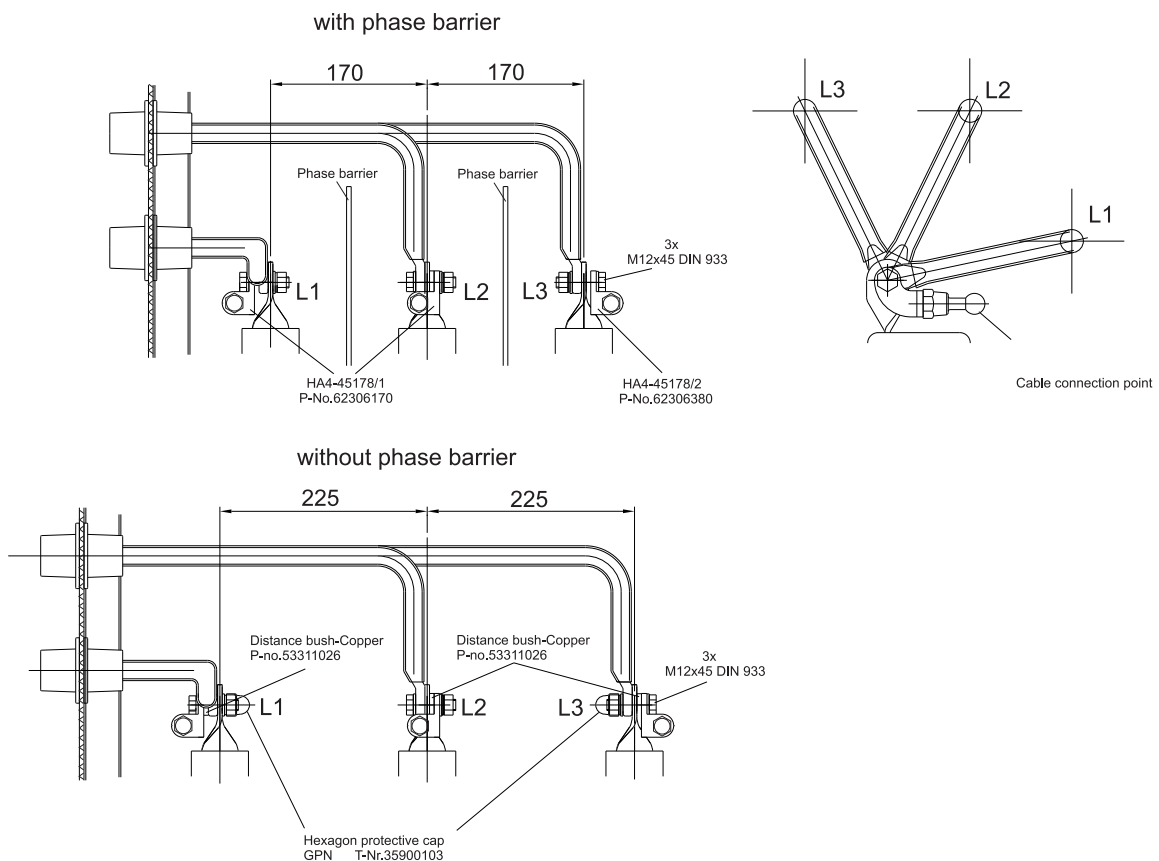
Note: Prior to installation of the busbars remove any foreign coatings from the contact surfaces using a steel brush and grease (use white Vaseline). Then bolt the bars with immediate contacting.

Busbars earthing (optional)

As option a busbar earthing in the right end panel is possible.

The busbar earthing takes place using spherical terminal stud, see *picture 11*.

End panel (right)



Picture 11: Busbars earthing using spherical terminal stud

Connection to the station earth

It is sufficient to connect the station earth once for each switchgear. With switchgear lengths of over 10 m, connect at least twice at places as far away from each other as possible (DIN VDE 0141).

For this purpose there is a panel earthing in each panel, drill $\varnothing 14,5$ mm.

Satisfactory earthing of the entire system is provided by using hot-galvanized sheeting and with the bolting of the individual panels.

The earthing of the switch panel door is about the hinges warranted.

Earthing the cable

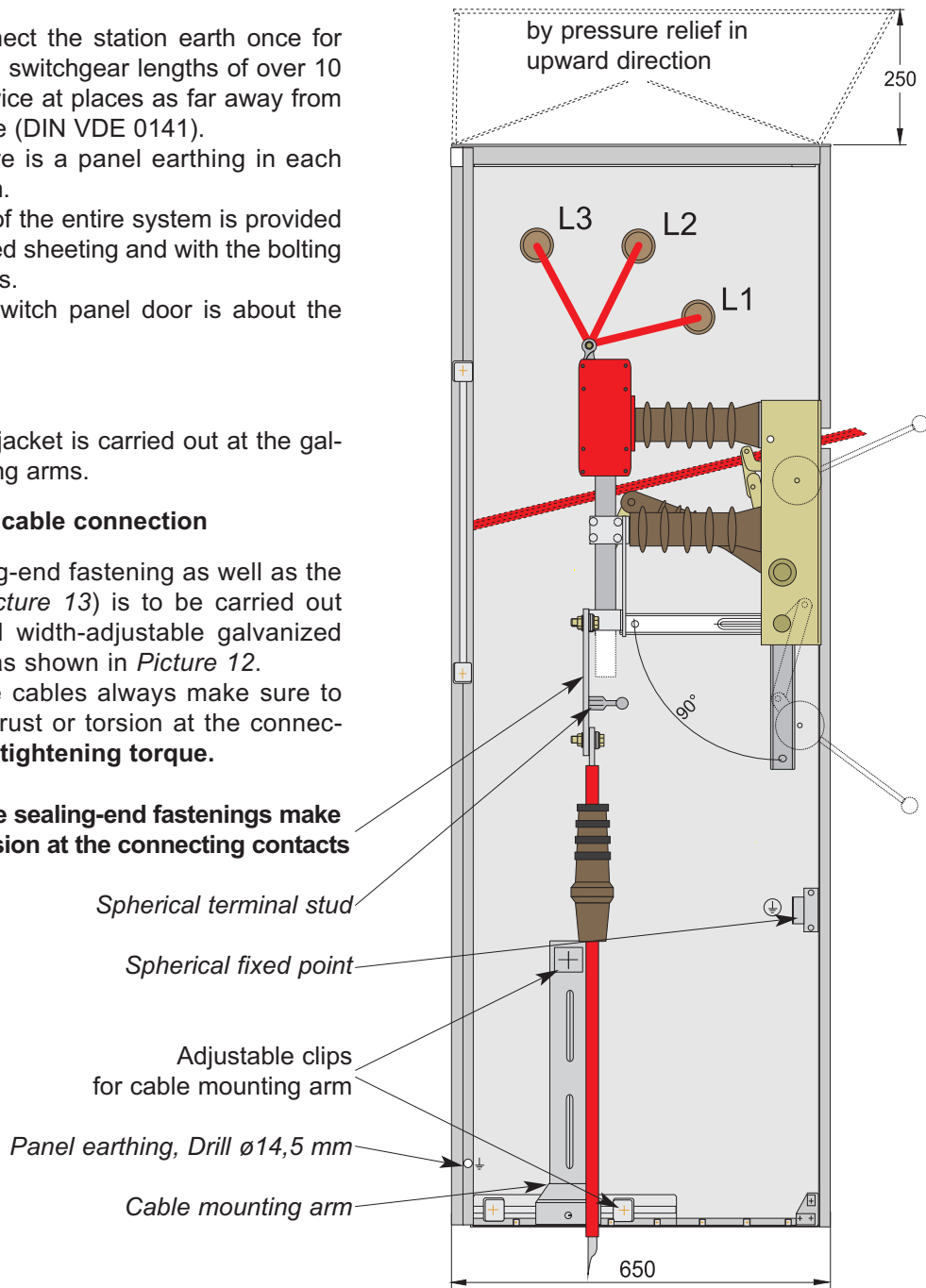
Earthing of the cable jacket is carried out at the galvanized cable mounting arms.

Cable fastening and cable connection

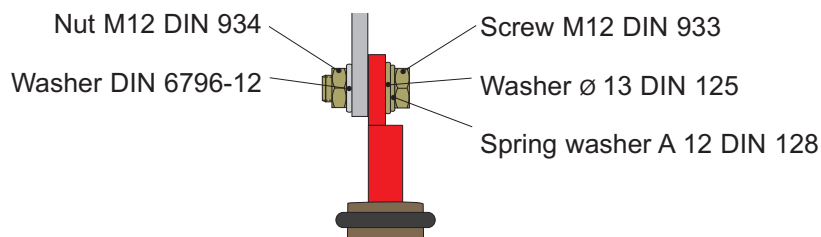
The cable and sealing-end fastening as well as the cable connection (picture 13) is to be carried out using the height and width-adjustable galvanized sealing-end mounts as shown in Picture 12.

When connecting the cables always make sure to avoid any tension, thrust or torsion at the connecting contacts. **75 Nm tightening torque.**

When connecting the sealing-end fastenings make sure to avoid any torsion at the connecting contacts



Picture 12: Example, Cable panel with switch disconnecter H27 F-EK



Picture 13: Cable connection

Operation

The position of the switch disconnecter can be seen through the inspection windows *picture 14* in the door.

In addition, there is a mechanical position indicator which is directly connected to the switch shaft and which shows each position of the switch.

The position indicator of the earthing switch is analogue to the position indicator of the switch disconnecter.

For operating the disconnecting and earthing switch use the operating lever.

Please notice: Always put in operating lever to the stop!

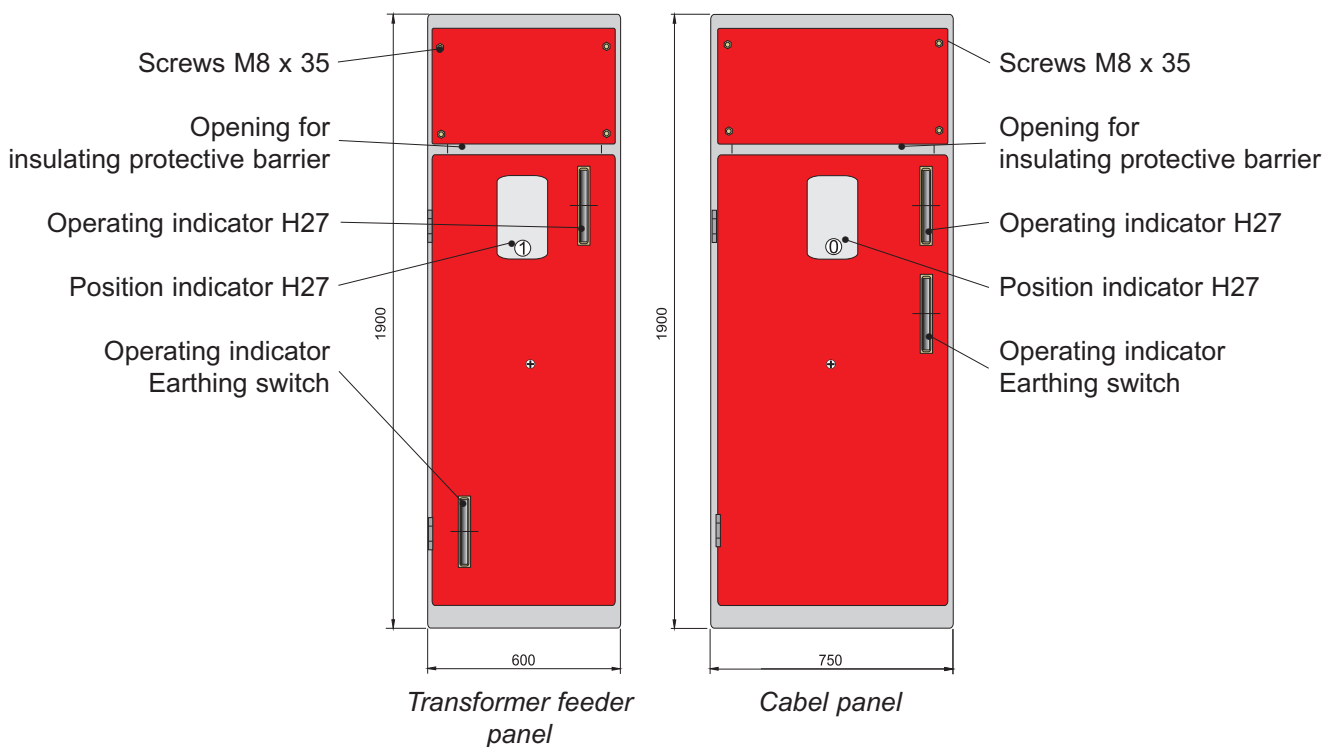
The switches can be operated acc. to the operating direction noticed in the actuating labelling when the panel door is closed.

During breaking operation of the fused switch disconnecter type H 27 F-SuT with trip free release inserted in the transformer panel, it has to be taken into consideration that the operating lever is turned 90° downward to the stop. When the release is not effected manually (fuse or overload release) the switch wave keeps in "ON"-position and must be manually brought into "OFF"-position for reclosing.

Optionally, the switches can also be equipped with a motor actuator type SPN, please also see page 5. The corresponding switching diagrams are enclosed.

Notice:

Please verify the isolation from supply before closing the earthing switch. Both switches, switch disconnecter and earthing switch, can be mechanically interlocked against each other. There is also the possibility to avoid switching operations through the mounting of a locking device on the panel door.



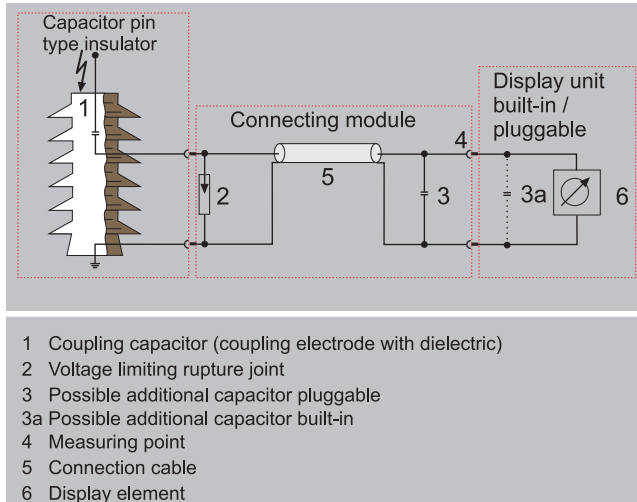
Picture14: Operating

After proper installation and connection of all cable and wires, the switch panel is fully functional. In the product-specific documentation (specification, wiring diagram) you can find all individual functions according to the customer's request.

Capacitive Test System (as an option)

In VDE 0682 Part 415 / EN 61243-5 the minimum requirements and testing conditions are specified for capacitive voltage testing systems.

Our product program for capacitive voltage testing systems comprises:



Voltage test systems are interconnected single-pole, capacitively to live parts and serve to verify the isolation from supply in 3-phase alternating current switchgears (three-phase system). They also can be used to carry out phase comparisons.

A capacitive indication system consists of a coupling part fixed-mounted in the switchgear and the pluggable indicator locally changeable.

With the components capacitive DRIESCHER divider insulator and line module DEHNcap/M one coupling part can be erected.

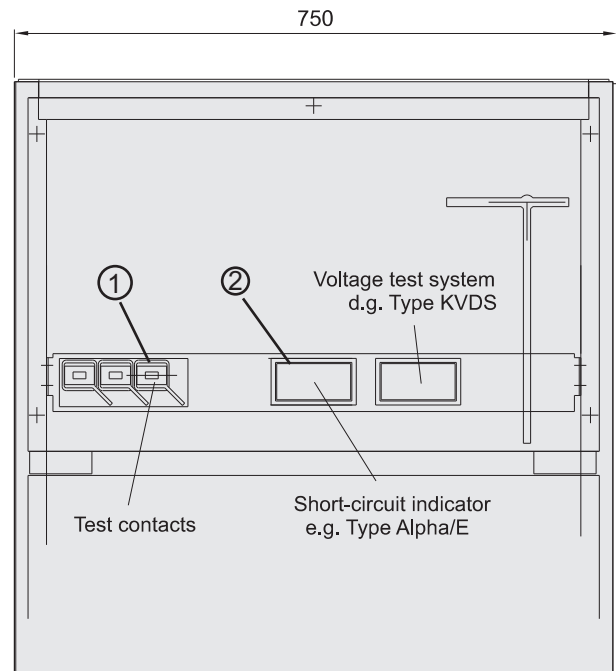
The coupling part comprises the individual components coupling capacitor (1), connecting lead (5), voltage restricting rupture joint (2), measuring circuit (3) and measuring point (4).

Normally, one coupling part per phase is mounted in medium voltage switchgears.

HR as well as LRM-line modules can be connected to the capacitive divider insulators.

The ordered components are completely assembled in the company or- if necessary- can also be added later. On page 15 you can see all possible combinations of insulators and connecting modules.

Please also read the instructions of DEHN enclosed in delivery of the switch panel !



Picture 15: F-panel with capacitive interface and short-circuit indicator

For testing voltage free condition

- Check **test apparatus** before use
- Remove cover ① of socket-contact
- Test voltage-free condition on the socket-contacts with voltage indicator.

Do not use shorting plugs, because the protective function of the voltage limiting rupture joint will get ineffective!

For testing In-phase condition

- The phase comparison measuring has to be carried out before the first connection to the system of a live cable.
- Remove cover ① of socket-contact
- Check socket-contacts (L1-L1, L2-L2, L3-L3) of the corresponding outgoing cable unit for in-phase condition with a phase comparison device.

Periodic test

Acc. to DGUV regulation 3 the coupling parts for capacitive voltage test systems have to be checked at least all 6 years. The periodic test has to be written down in the field of designation.

Short-circuit indicator ②

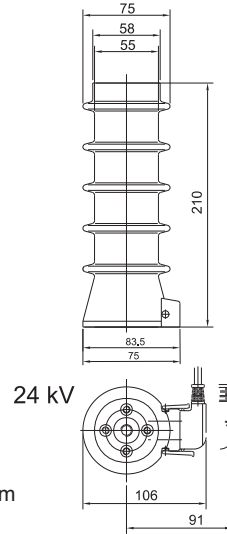
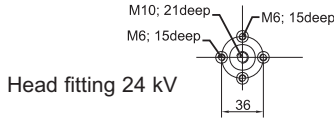
- a corresponding instruction for short-circuit indicator is enclosed in delivery.

Capacitive Test System (as an option)

DRIESCHER-divider insulator with coupling parts DEHNcap for voltage test system acc. to VDE 682 part 415 / EN 61243-5

for testing

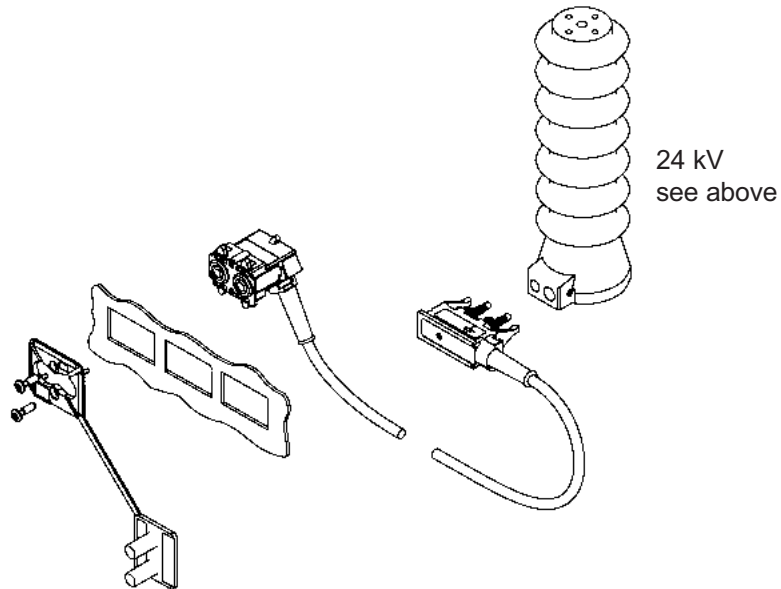
- voltage-free condition
- In-phase condition



* Needed space for plug-in and plug-out 50 mm

Drawing-no.	Rated Voltage in kV	Coupling capacity in pF	Creeping distance in mm	Number of screens	Weight in kg	Part-no.
SI3-108505	24	15	275	5	1,3	2-45165984

Coupling parts DEHNcap



Rated voltage in kV	Distance between sockets in mm	Length of connecting cable in mm	Additional capacity in pF	Response threshold in kV	Weight ca. kg	Part-no.
Dehncap/M-HR 24	19	4500	420	2,9	0,9	2-33601020

General

Our products have been on the market for many years and thousands of these switchgears are used successfully. We are able to say that the quality of our products is distinguished by a high level of ruggedness and operational safety and reliability. To guarantee that the requirements put to the switchgear are met and to avoid any possible power failures, appropriate maintenance, inspection and possible repair measures are necessary to provide a reliable power supply. The measures employed depend on the age of the switchgear, its operating frequency and the level of the operated currents.

Commissioning

- Before commissioning every kind of installation work as their check must be finished.
- Every switch leaves the manufacturer adjusted and tested. Nevertheless, before commissioning every switch should be tested for proper function by carrying out some switchings in the off-load condition.
- Check of h.v.h.b.c. (see page 5).
- The switchgear should only be commissioned in dry condition. The user has to take care that the substation keeps clean and dry.
- Check of additional equipment
 - e.g. reset short-circuit indicator
- Earthing of cable feeder resp. fuse feeder with free cable connections with belonging earthing switch.
- Switching-on of auxiliary and control voltages.
- All protection measures like short-circuit and earthing connections have to be debiased without endangering of persons.

Inspection and maintenance

In addition to an annual visual inspection, these measures should be carried out after approx. 4 years (DGUV reg. 3), even if the switches are not operated frequently and only under minimal load. Shorter intervals between inspections may be necessary in the event of negative impact from the environment, such as:

- corrosive atmospheres, air with a high dust content, damp plant facilities etc.
- high operating frequency

The switchgear has to be disconnected acc. to the five safety rules.

All insulating parts must be cleaned with a clean, dry cloth (do not use aggressive cleansing agents like solvents).

The contact systems and hinges of the mounted switches have to be cleaned acc. to instruction B727 and B731.

If damages are discovered, please immediately inform our service staff!

All screwing connections as well as electric contact connections have to be checked and – if necessary – be tightened.



Disassembly as well as removal and installation of the switch (parts) are only to be carried out by DRIESCHER personnel or appropriately authorized skilled personnel, this being due in particular to the expertise required for the correct adjustment. Only original DRIESCHER parts and accessory or parts cleared from us may be mounted.

Service

Our skilled personnel are always available to assist you in the event of any malfunctions or queries regarding the compatibility, assembly or maintenance - also out of normal office hours.

Please always inform us about the data on the type plate.

Tel. +49 (0) 87 61 6 81-0 Email: service@driescher.de

Dimensions, weights, diagrams and descriptions in this brochure are non-binding. Subject to change without notice.

STROM • SICHER • SCHALTEN

Printed on chlorine free bleached paper. For nature's sake.

**ELEKTROTECHNISCHE WERKE
FRITZ DRIESCHER & SÖHNE GMBH**

D-85366 Moosburg • Phone: +49 8761 681-0 • Fax: +49 8761 681-137
www.driescher.de infoservice@driescher.de

